

energy storage (power storage technologies), and energy saving (technologies for greater efficiency), and We are providing products for each of these areas. Kikusui Provides Our primary products include DC power supplies, as well as electronic loads that absorb Solutions for Energy and and consume electrical energy. In particular, our electronic loads are used as evaluation instruments The Infrastructure that are essential for energy creation and energy storage, and large growth in sales of these products is expected. of Society. 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,



of electrical and electronic devices and

EMC testers for testing electromagnetic safety.

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),

as well as withstanding voltage testers for testing the safety

Company Profile



Head Quarters

Corporate name Kikusui Electronics Corp.

President & C.E.O N.Matsumura

Main activities Manufacture, sale, and export & import of electronic test and measuring

instruments, power supplies and software.

Headquarters 1-1-3, Higashiyamata, Tsuzuki-ku, Yokohama, Kanagawa, 224-0023,

Japan

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

1960s





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.

established in China.

2019 A representative office opened in Düsseldorf, Germany.

2021 Beijing Branch of Kikusui Trading (Shanghai) Co., Ltd.

established in China.

2022 Guangzhou Branch of Kikusui Trading (Shanghai) Co., Ltd.

established in China.

Transition to a holding company structure.

2024 Kikusui Electronics Europe GmbH established

in Duesseldorf, Germany.







2000s







INTERNET

KIKUSUI WEB

https://global.kikusui.co.jp/

We at Kikusui Electronics Corporation would like to offer you information through our website such as our company profile, full line of Kikusui products, overseas distributors, services, new technologies, and an introduction about our latest products. We also have available popular instrument drivers, which can be used with Lab VIEW or Visual Basic. Electronic catalogues in PDF format are also available for each product on our web site.



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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



Identifies new products appearing in this years catalog.











Products equipped with these interfaces as standard.











Products optionally available with these interfaces.



Products supporting instrument drivers for VisualBasic, LabVIEW, LabWindows/CVI and IVI-COM.

Please visit our website to download these drivers.

CE marked products

UKCA marked products



LXI(LAN eXtensions 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)

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CE/UKCA MARKING PRODUCT LIST

DC Power Supply

Series	Model	Reference page	
PXB Series	All models	12	*1
BATTERY EMULATOR SYSTEM	All models	15	*1
PXT Series	All models	16	*1
PWR-01 Series	All models	19	*1
PAV Series	All models	25	*1
	PWX750LF	31	*1
	PWX750MLF	31	*1
PWX Series	PWX750MHF	31	*1
	PWX750HF	31	*1
	PWX1500L	31	*1
	PWX1500ML	31	*1
	PWX1500MH	31	*1
	PWX1500H	31	*1
PMX-A Series	All models	36	*1
PMX-Multi Series	All models	40	*2
PBZ Series	All models	43	*1
PBZ20-20A		46	*1
PBZ SR Series	All models	48	*1
PBZ BP Series	All models	49	*1

AC Power Supply

Series	Model	Reference page	
PCR-WEA/WEA2 Series	All models	50	*1
PCR-MA Series	All models	54	*1
PCR-LE Series	All models	56	*1
PCR-LE2 Series	PCR6000LE2	60	*1
PCR-LEZ Selles	PCR9000LE2	60	*1

Electronic Load

Series	Model	Reference page	
PXZ Series	All models	63	*1
PLZ-5W/5WZ Series	All models	66	*1
PLZ-5WH2 Series	All models	71	*1
PLZ-U Series	All models	75	*1

Battery Test System

Series	Model	Reference page	
PFX2731S		79	*1
PFX2500 Series	All models	83	*1

Safety Tester

Series	Model	Reference page	
	TOS9300 Series	90	*1
	TOS9311	93	*1
TOS Series	TOS5300 Series	103	*1
105 Selles	TOS5200	107	*1
	TOS6210	111	*1
	TOS6200A	111	*1

Measuring Instrument

Series	Model	Reference page
BIM1000 Series	All models	115
DME1600	All models	116

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ORDERING INFORMATION

- *1. CE/UKCA Marked model is available for all standard Input voltage as specified in each specification.
- *2. CE/UKCA Marked model is available only for the unit equipped with 234 V Input voltage.
- * Please indicate 'CE/UKCA Marked Products' when ordering or requesting a quote.

Selection

DC Power Supply





















P.12



SWITCHING SYSTEM **₽ P.31**









P.36

USB

LAN

LXI

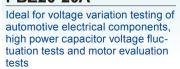


SWITCHING + LINEAR SYSTEM



Inteligent Bipolar Power Supply (CV/CC) **PBZ20-20A**

LINEAR SYSTEM



SWITCHING + LINEAR SYSTEM



P.46

High Power Inteligent Bipolar Power Supply (CV/CC) **PBZ SR Series** GPIB/ BS232C High-speed response with even USB higher power LAN LXI DRIVERS

P.48

SWITCHING + LINEAR SYSTEM



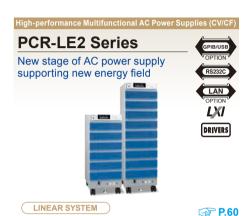
Selection

AC Power Supply









Electronic Load









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

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



P.75

Battery Test System

High Rate Battery Tester

PFX2731S

LAN

Supports single-cell evaluation for all-solid-state batteries, lithium-ion batteries, etc



P.79

Charge/Discharge System

PFX2500 Series



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



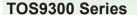
P.83

USB

LAN

Safety Tester

Electrical Safety Multi-analyze



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





P.90

TOS9311

With its AC/DC withstand voltage testing capability of up to 10 kV



P.93

Hipot Tester/Hipot Tester with Insulation Resistance Tester **TOS5300 Series**

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





P.103

Hipot Tester

TOS5200

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



Ground Bond Tester

TOS6210

Supports UL60950-1

- new standard for Information Technology Equipment (ITE)



Ground Bond Tester

TOS6200A

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





P.107

USB

P.115



P.111

GPIB



P.111

Measuring Instrument

BIM1000 Series

Easy & reliable **Battery measurements**



DME1600

6 1/2 digit resolution, essential device of "Electronic Measurement" supporting basic measurement with variety of options





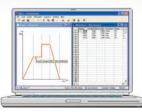
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Software

Application Software for Power Supplies and Electronic Loads

WAVY

Easy-to-operate software expanding functions of power supplies and electronic loading units



P.117

Bidirectional High-Capacity DC Power Supply (CV/CC/CP)

XB Series







A bidirectional power supply that can flexibly respond to various "X" requirements related to advancing technology

The PXB series, bidirectional high-capacity DC power supplies, condenses a 20kW large-capacity output into a 3U-size chassis. Not only handling high voltages of 1500V, but also capable of both power and regeneration in both directions in a single unit. We provide a new power supply test environment for electrical and electronic equipment that is becoming increasingly high-powered. In addition, a variety of analog, digital, and communication interfaces are provided for optimal operation at any stage of research, development, and manufacturing! A new generation of bidirectional DC power supplies that support the progression of advancing technologies.

Dimensions / Weight

PXB20K-50:

430(16.93")W × 128(5.04")H × 720(28.35")Dmm(inch)/ 41 kg(90.39 lbs) PXB20K-250:

430(16.93")W × 128(5.04")H × 720(28.35")Dmm(inch)/ 39 kg(85.98 lbs) PXB20K-500:

430(16.93")W × 128(5.04")H × 720(28.35")Dmm(inch)/ 38 kg(83.78 lbs) PXB20K-1000:

430(16.93")W × 128(5.04")H × 720(28.35")Dmm(inch)/ 37 kg(81.57 lbs) PXB20K-1500:

430(16.93")W×128(5.04")H×720(28.35")Dmm(inch)/ 37 kg(81.57 lbs)

Accessories

Input terminal cover. External control connector kit. Chassis connection wire, OUTPUT terminal cover, DC OUTPUT terminal screws, EXT SYNC connector cover, SENSING connector cover, SENSING connector (2 pc.), Synchronized operation signal cable kit, Safety Information, China RoHS sheet, Getting Started Guide, Heavy object warning label

Features

- High power density: 20 kW in 3U size
- A single unit can handle both power and regeneration
- Rated output voltage 50 V/250 V/500 V/1000 V/1500 V
- Select a model with an input voltage of 200 Vac (3-phase) or 400 Vac (3-phase)
- Continuous operation at rated power at ambient temperature of 50°C (Excluding some models)
- Up to 25 units (500 kW) can be operated in parallel *Please contact us if you wish to operate more than 10 units in parallel.
- Equipped with touch panel display
- LAN, USB, RS232C, external analog control (isolated type) standard
- Regenerative function (on-site)
- External control I/O is standard for both NPN and PNP type **PLCs**

Options

■ Load cable (3 m)

DC200-4P3M-M12M12 (For PXB20K-50) DC80-2P3M-M10M10 (For PXB20K-250, PXB20K-500) HV22-2P3M-M12M8 (For PXB20K-1000, PXB20K-1500)

■ Three-phase input power cord (3 m)

AC22-4P3M-M6C-4S

The switchboard ends of the power cords have not been prepared for connection.

■ Parallel operation signal cable kit (1.5 m) PC01-PXB

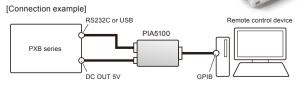
■ Rack mount bracket KRB3-TOS (EIA inch rack) KRB150-TOS (JIS millimeter rack)

■ GPIB converter

PIA5100

This converter converts RS232C or USB of the product to GPIB. enabling connection of a remote controller using GPIB.

*Not CE/UKCA certified product



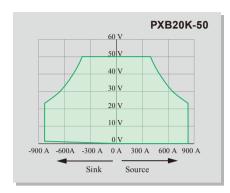
^{*}Power cord is not included.

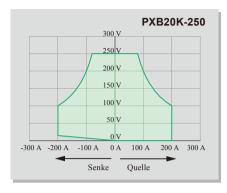
Please purchase the optional accessory separately (AC22-4P3M-M6C-4S).

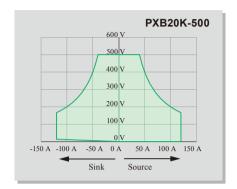
Operation Area

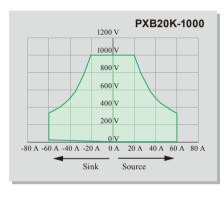
■ 2 to 3 times mains-powered operation

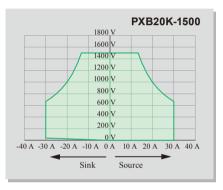
Mains-powered power supply with a wide range of operating ranges and combinations of voltage and current settings. If the voltage of the connected DUT is lower than the voltage setting of the PXB series, current flows from the PXB series to the DUT. If the voltage of the connected DUT is higher than the voltage setting of the PXB series, current flows from the DUT to the PXB series.











Functions

■ Optimized for different purposes and applications, with selectable response speeds

Required response speed of power supply equipment varies depending on test conditions and load specifications. The PXB series can change the response speed of the power supply as desired to suit the application.

Response	FAST/SLOW
Slew rate	Selectable in 5 steps

Priority operation mode

Mode of operation can be set, as constant voltage (CV), constant current (CC), or constant power (CP), when output is turned on. Overshoot can be prevented by setting CC mode priority when batteries, power supplies, etc. are connected.

I-V characteristic function

By registering multiple arbitrary points on the I-V characteristics, arbitrary I-V characteristics can be set for each CC and CV operation mode. Arbitrary points can be registered from 3 to 100, making it possible to simulate the I-V characteristics of rechargeable batteries and other devices.

■ Regenerative function (On-site) contributes to carbon neutrality When power is regenerated to the main unit from an inverter or battery, the load power is converted to reusable power and regenerated to the AC LINE. This can contribute to reducing the amount of heat exhaust and saving energy. *Regenerative efficiency of over 90% (at rated load).

■ VMCB (virtual multi-channel bus) function

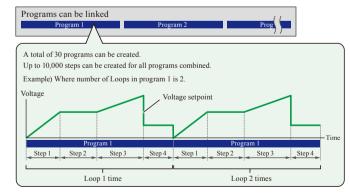
If you use VMCB function, you can connect one PC with up to 8 units of PXB series to construct a virtual multichannel power supply system. You can utilize this to reduce the number of communication ports and control several PXB units together.

■ Equipped with touch panel display

By pressing or swiping a finger on the display, on-screen items can be selected, or numerical values set. The display is pressure-sensitive and can be operated even with gloves.

■ Sequence function

Preset operations can be run continuously. Total of 30 programs, and up to 10,000 steps can be created for all programs. Programs stored in the unit's memory, and data can be exported to a USB memory stick from the front panel.



■ Pulse function / Sine function

"Pulse" operation can be set, which repeatedly executes a binary setting, or "sine" operation, which changes the current in a sinusoidal manner.

■ Safety Protection Function

OVP (Over voltage protection), UVP (Under voltage protection), WDOG (Communication error protection), OPP (Over power protection), OCP (Over current protection), EXT LOW (External input alarm detection)

PXB Series Specifications

Item/Model			PXB20K-50	PXB20K-250	PXB20K-500	PXB20K-1000	PXB20K-1500
Output ra	ating						
Rated po	ower		±20000 W	±20000 W	±20000 W	±20000 W	±20000 W
Rated vo	oltage (sou	urce) *1	0 V to 50 V	0 V to 250 V	0 V to 500 V	0 V to 1000 V	0 V to 1500 V
	ig voltage	(sink) *2	3 V to 50 V	15 V to 250 V	10 V to 500 V	20 V to 1000 V	30 V to 1500 V
Rated cu	ırrent *1		±800 A	±200 A	±120 A	±60 A	±30 A
Output v			1	1	ı	1	
	m settable	voltage	52.5 V	262.5V	525 V	1050 V	1575 V
	accuracy				setting + 0.1 %		
	esolution	**	0.005 V	0.02 V	0.05 V	0.1 V	0.1 V
	uctuation	^3	±10 mV	±50 mV	±100 mV	±200 mV	±300 mV
Load var	sensing N	lovimum	±40 mV	±125 mV	±250 mV	±500 mV	±750 mV
	sation volt				10 % of rating		
(reciproc		3.			· · · · · · · · · · · · · · · · · · ·		
	resistance	esetting	63 mΩ	1575 mΩ	5250 mΩ	21000 mΩ	63000 mΩ
upper lin			00 11122	107011122	0200 11122	2100011112	0000011112
resolutio	resistance	e setting	1 mΩ	1 mΩ	1 mΩ	2 mΩ	5 mΩ
	se switchir	na			FAST, SLOW		
	e switchin		12.5 V/ms or	62.5 V/ms or	125 V/ms or	250 V/ms or	375 V/ms or
		3()	more *5	more *5	more *5	more *5	more *5
			12.5 V/ms	62.5 V/ms	125 V/ms	250 V/ms	375 V/ms
			1.25 V/ms	6.25 V/ms	12.5 V/ms	25 V/ms	37.5 V/ms
			0.125 V/ms	0.625 V/ms	1.25 V/ms	2.5 V/ms	3.75 V/ms
			0.0125 V/ms	0.0625 V/ms	0.125 V/ms	0.25 V/ms	0.375 V/ms
Source only *6	Transien sponse *		8 ms or less	8 ms or less	8 ms or less	10 ms or less	10 ms or less
. ,	Ripple	p-p *9	250 mV	375 mV	1000 mV	1500 mV	2500 mV
	noise *8	rms *10	30 mV	125 mV	250 mV	500 mV	750 mV
	Rise	Full load	10 ms				
	time *11	*12					
	Fall time Full load		10 ms				
			10 ms				
		No load			10 ms		
Output c							
Settable current *	maximun	n source	+840 A	+210 A	+126 A	+63 A	+31.5 A
	maximun	n cink					
current *		I SIIIK	-840 A	-210 A	-126 A	-63 A	-31.5 A
	s setting	current	-840 A to	-210 A to	-126 A to	-63 A to	-31.5 A to
range *1	4		+840 A	+210 A	+126 A	+63 A	+31.5 A
	accuracy		±(0.75 % of rating)				
	esolution		0.1 A	0.02 A	0.01 A	0.005 A	0.002 A
	uctuation		±1600 mA	±400 mA	±240 mA	±120 mA	±60 mA
Load var			±1600 mA	±400 mA	±240 mA	±120 mA	±60 mA
(TYP) *1	e (Short-c 5	arcuit)			5 ms		
Fall time	(Short-ci	rcuit)	5 ms				
(TYP) *1 Charge/o	discharge	switch-					
ing time					10 ms		
	se switchir				FAST, SLOW		
	e switchin	g (TYP)	200 A/ms or	50 A/ms or	30 A/ms or	15 A/ms or	7.5 A/ms or
*14			more *17 200 A/ms	more *17	more *17	more *17	7.5 A/ms
			200 A/ms	50 A/ms 5 A/ms	30 A/ms 3 A/ms	15 A/ms 1.5 A/ms	0.75 A/ms
			2 A/ms	0.5 A/ms	0.3 A/ms	0.15 A/ms	0.75 A/ms
			0.2 A/ms	0.05 A/ms	0.03 A/ms	0.015 A/ms	0.0075 A/ms
Output p	ower						
Settable	maximun	n source			+21000 W		
power *1		a aint					
Settable power *1	maximun 8	n sink			-21000 W		
	s setting	power		-210	00 W to +2100	00 W	
	accuracy *	19	±(0.5 9	% of power rati	ing + 0.5 % of	current rating	× Vout)
	esolution				2 W		

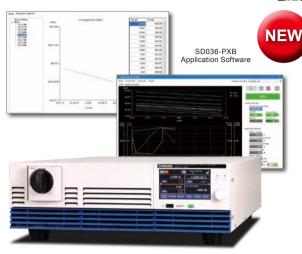
- Limited by the maximum output power.
- Operating voltage at which the rated sink current can be applied.
- 180 Vac to 252 Vac for 200 Vac input, 342 Vac to 504 Vac for 400 Vac input. At the constant load.
- The amount of change that occurs when the load is changed from no load to full load (rated output power/rated output voltage) with rated output voltage. The value is measured at the sensing point.
- MAX will appear on the display.
- In the case that the CV mode response setting is set to FAST.
- 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. At the rated output current. Values measured using JEITA RC-9131C probe and 100:1 probe.

- Item/Model PXB20K-50 PXB20K-250 PXB20K-500 PXB20K-1000 PXB20K-1500 Specifications for models having an input voltage rating of 200 Vac. 200 Vac to 240 Vac, 50 Hz to 60 Hz Nominal input rating Input voltage and 180 Vac to 252 Vac / 47 Hz to 63 Hz frequency range Input current (MAX) *20 80 A (180 V) Input power (MAX) *20 24 kVA Inrush current (TYP) *21 130 A Power factor (TYP) *20 0.96 Output hold time 10 ms or more Specifications for models having an input voltage rating of 400 Vac Nominal input rating 380 Vac to 480 Vac. 50 Hz to 60 Hz Input voltage and 342 Vac to 504 Vac / 47 Hz to 63 Hz frequency range Input current (MAX) *20 40 A (342 V) Input power (MAX) *20 24 kVA Inrush current (TYP) *21 70 A Power factor (TYP) *20 0.96 Output hold time 10 ms or more Environ-Operating Indoor use. Overvoltage category II mental environment condi-Operating 0 °C to +40 °C 0 °C to +50 °C (32 °F to +122 °F) tions temperature (32 °F to +104 °F) Operating 20 % rh to 85% rh (no condensation) humidity Storage -25°C to +60°C (-13 °F to +140 °F) temperature Storage humidity 90 % rh or less (no condensation) Altitude Up to 2000m Cooling system Forced air cooling using fan With-Between input stand and GND 2200 Vac for 1 minute voltage Between input and output 1000 Vdc for | 1800 Vdc for | 1800 Vdc for | 3000 Vdc for Between output 500 Vdc for and GND 1 minute 1 minute 1 minute 1 minute 1 minute Insulation Between input $30~\text{M}\Omega$, 500~Vdcresisand GND tance Between input 30 MΩ, 30 MΩ, 30 MΩ. 1000 Vdc and output 500 Vdc 600 Vdc +2000 V/ Isolation voltage ±250 V ±600 V ±1000 V ±1000 V -1000 V Electromagnetic compatibility (EMC) *22 *23 Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A *24) Safety *22 Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *23, EN 61010-1 (Class I *25, Overvoltage category II, Pollution Degree 2 *26), UL 61010-1 27, CAN/CSA -C 22.2 NO.61010-1 *27
- *9. Measurement frequency band: 10 Hz to 20 MHz
- *10. Measurement frequency band: 10 Hz to 1 MHz
- *11. 10 % to 90 % of the rated output voltage.
- *12. For a pure resistance.
- *13. 90 % to 10 % of the rated output voltage
- *14. During parallel operation, this will be the value multiplied by the number of units in the configu-
- *15. In the case that the CC mode response setting is set to FAST: Applied in response to changes from 10 % to 90 % of rated output current.
- *16. In the case that the CC mode response setting is set to FAST: Applied in response to changes from 90 % to 10 % of rated output current
- *17. MAX will appear on the display.
- *18. During parallel operation, this will be the value multiplied by the number of units in the configu-
- *19. Equal to or higher than 5 % of the rated power is guaranteed. Less than 5 % of the rated power is guaranteed as a TYP value.
- *20. At the rated output power for the rated output current.
- *21. Maximum peak current value when the POWER switch is turned on. (Excluding the surge current to the input filter capacitor.)
- *22. Does not apply to specially ordered or modified products.
- *23. Only for models with CE marking / UKCA marking on their body.
- *24. 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.
- *25. 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
- *26. 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
- *27. Only on models that have cTUVus marking on the panel.

Battery Emulator System for PXB

Battery Emulator System

(**€** 26



Bidirectional High-Capacity DC Power Supply PXB Series

Simple battery emulator composed of the PXB series and application software

This battery emulator system was created by combining the PXB series of bidirectional high-capacity DC power supplies and the SD036-PXB application software. Battery charging and discharging can be simulated based on the preset I-V characteristic data.

To replicate battery-like behavior, the voltage value can be changed in real-time according to the SOC and current value. This allows for repetitive tests that are difficult to perform with real batteries.

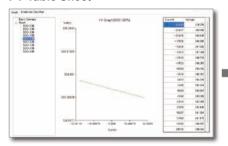
Features

- CV mode-based battery emulation is possible
- The auto-completion function automatically generates missing I-V characteristic data
- Battery characteristics correspond to each SOC's I-V data (3D IV-table)
- SOC or capacity at the start of operation can be defined
- SOC range can be set for stop conditions
- The I-V curve graph for each SOC is displayed
- Measured values and graphs are displayed in real-time

Specifications

	Output			Input current	Weight
Item/Model	CV	CC	Rated power	AC (200 V three-phase/	kg/lb
	V	A	kW	400 V three-phase) A	
BATTERY EMULATOR SYSTEM PXB20K-50	50	±800	±20		41/90.39
BATTERY EMULATOR SYSTEM PXB20K-250	250	±200	±20		39/85.98
BATTERY EMULATOR SYSTEM PXB20K-500	500	±120	±20	80/40	38/83.78
BATTERY EMULATOR SYSTEM PXB20K-1000	1000	±60	±20		37/81.57
BATTERY EMULATOR SYSTEM PXB20K-1500	1500	±30	±20		37/81.57

I-V Table Sheet



Import base I-V files for each SOC. More than 10 points of current and voltage data, up to a maximum of 1000 points, can be imported into one sheet.

*Battery Emulator requires a base I-V file (CSV format) on which the emulation is based.

Emulation Conditions Settings Screen



Set the battery specs/conditions.

Test Execution Screen



When the operation starts, the interpolated I-V file that will be simulated is selected, and control operating points are plotted in orange.

Connect via LAN or USB. LAN connection can also be made via a hub.



Required System Configuration

- A PC with Core i5 or higher
- Windows 11 or Windows 10
- 8 GB or more RAM
- Hard disk with at least 10 GB of free space
- Display supporting image resolutions of 1366 × 768 (FWXGA) or higher
- Mouse
- USB *1 or LAN (depends on the interface)
- KI-VISA Library 5.5.0 or higher
- USB Dongle Key
- 1. 1 port is required to connect the USB dongle key.

High-Capacity Wide-Range DC Power Supply (CV/CC/CP)

2XT Series





Excellent size and versatility This high-capacity DC power supply is an optimal solution

The PXT Series of high-performance, high-capacity, wide-range DC power supplies offers a maximum rated output of 20 kW in a compact 3U size. In addition to variable internal resistance, bleeder ON/OFF, and output ON/OFF delay functions, the PXT series has various communication interfaces (LAN, USB, and RS232C as standard). It can be used as a standalone device or integrated into testing equipment. Furthermore, the excellent heat dissipation design guarantees an ambient operating temperature of 50°C, making the unit suitable for harsh, high-temperature testing environments. The PXT Series is also highly scalable, and its capacity can be increased to 500 kW in parallel operation (up to 25 units).

Dimensions / Weight

PXT20K-500. PXT20K-1000:

 $430(16.93^{\circ})W \times 128(5.04^{\circ})H \times 720(28.35^{\circ})Dmm(inch)/38 kg(83.78 lbs)$ PXT20K-1500:

 $430(16.93^{\circ})W \times 128(5.04^{\circ})H \times 720(28.35^{\circ})Dmm(inch)/37 kg(81.57 lbs)$

Accessories

AC INPUT terminal cover. External control connector kit. Chassis connection wire, DC OUTPUT terminal cover, DC OUTPUT terminal screws, EXT SYNC connector cover, SENSING connector (2 pc.), SENSING connector cover. Synchronized operation signal cable kit, Safety Information, China RoHS sheet, Getting Started Guide, Heavy object warning label

Features

- Maximum 20 kW output in a 3U size
- Supports a maximum voltage of 1500 V
- Select input voltage from 200 Vac (3-phase) or 400 Vac (3-phase)
- Bleeder ON/OFF function
- Output ON/OFF delay function
- Full-load continuous operation is possible even at ambient temperatures as high as 50 °C (122 °F)
- One-control parallel operation function Parallel operation is possible between models with different input rated voltages.
- Touch panel for intuitive operation
- LAN, USB, RS232C, external analog control (isolated type)
- External control I/O is standard for both NPN and PNP type PLCs

Functions

■ External control function

The EXT CONT connector on the rear panel can be used to control the PXT series with external devices. The general-purpose digital input and output terminals can be assigned any function, facilitating system construction in combination with other measurement devices.

■ Bleeder ON/OFF function

Turning the bleeder function on quickly discharges the electrical charge accumulated in the load when the OUTPUT is turned off and allows the output voltage to be lowered. A battery connected to the output terminal will be discharged when the bleeder function is on, even if the OUTPUT is turned off. In such cases, unnecessary discharge can be prevented by turning the bleeder function off.

■ Priority operation mode

Mode of operation can be set, as constant voltage (CV), constant current (CC), or constant power (CP), when output is turned on. Overshoot can be prevented by setting CC mode priority when batteries, power supplies, etc. are connected.

■ Sequence function

Preset operations can be run continuously. Total of 30 programs, and up to 10,000 steps can be created for all programs. Programs stored in the unit's memory, and data can be exported to a USB memory stick from the front panel.

■ Up to 25 units can be operated in parallel, achieving 500 kW Including master machine, up to 25 units (500 kW) can be operated in parallel. Connection is with one-control parallel operation, and the panel of the master machine can control and display the entire system. With the automatic recognition function, the need for complicated settings is eliminated, allowing the construction of high-capacity systems.

*Please contact us if you wish to operate more than 10 units in parallel.

■ Variable internal resistance function

Function can change the output voltage value in constant voltage operation, according to the output current value based on the set resistance value. Simple simulation of Internal resistance of rechargeable batteries and wire harnesses etc.

■ I-V characteristic function

By registering multiple arbitrary points on the I-V characteristics, arbitrary I-V characteristics can be set for each CC and CV operation mode. Arbitrary points can be registered from 3 to 100, making it possible to simulate the I-V characteristics of rechargeable batteries and other devices.

Options

■ Load cable (3 m)

DC80-2P3M-M10M10 (For PXT20K-500)

HV22-2P3M-M12M8 (For PXT20K-1000, PXT20K-1500)

■ Three-phase input power cord (3 m)

AC22-4P3M-M6C-4S

The switchboard ends of the power cords have not been prepared for connection.

■ Parallel operation signal cable kit (1.5 m)

PC01-PXB

■ GPIB converter

PIA5100 *Not CE/UKCA certified product

■ Rack mount bracket

KRB3-TOS (EIA inch rack)

KRB150-TOS (JIS millimeter rack)

^{*}Power cord is not included

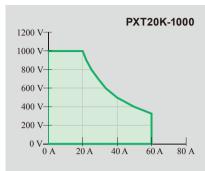
Please purchase the optional accessory separately (AC22-4P3M-M6C-4S).

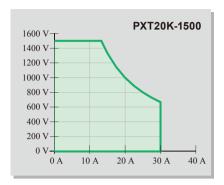
Operation Area

■ 2.25 to 3 times mains-powered operation

For example, the PXT20K-500 can seamlessly operate from 500 V-40 A to 166.6 V-120 A within the rated output power range of 20 kW.



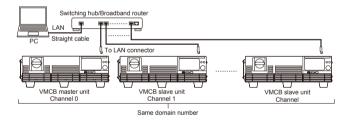




Equipped with standard LAN interface and VMCB function to support network-based remote control and monitoring

The PXT 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. This feature can also be used to save communication ports or to synchronize the control timing of multiple PXT series units (up to 8 units). The PXB series manufactured by our company can also be mixed and matched for multi-channel connection.

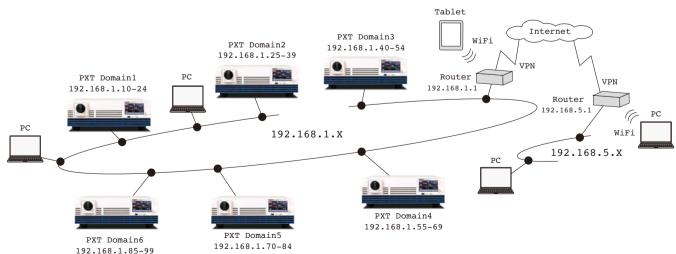
When connecting the VMCB master unit via LAN



Communication monitoring function

This function monitors the communication status. For example, the alarm will be activated and the output will be turned off when the LAN cable is disconnected and the communication is not being confirmed within the specified time of setting. This function protects the operation from the uncontrolled condition, and it improves the system reliability.

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



Security for LAN connections
 Access to the built-in web server can be restricted with a password.

PXT Series Specifications

Item/Model		PXT20K-500	PXT20K-1000	PXT20K-1500	
Output rating					
Rated power			20000 W		
Rated voltage *1		0 V to 500 V	0 V to 1000 V	0 V to 1500 V	
Rated current *1		120 A	60 A	30 A	
Output voltage					
Maximum settab	le voltage	525 V	1050 V	1575 V	
Setting accuracy		±(0.2 %	of setting + 0.1 % o	f rating)	
Setting resolutio	n	0.05 V	0.1 V	0.1 V	
Power fluctuation	ower fluctuation *2		±200 mV	±300 mV	
Load variation *	3	±250 mV	±750 mV	±750 mV	
Remote sensing Maximum compe (reciprocating) (ensation voltage		10 % of rating		
Internal resistance setting upper limit		5250 mΩ	21000 mΩ	63000 mΩ	
Internal resistan resolution			2 mΩ	5 mΩ	
Response switch	ning		FAST, SLOW		
Slew rate switch	ing	25 V/ms	50 V/ms	75 V/ms	
			25.0 V/ms	37.5 V/ms	
		1.25 V/ms	2.50 V/ms	3.75 V/ms	
		0.125 V/ms			
Slew rate setting	accuracy	±(20 % of setting +2.5 ms)			
Transient respor	ise *4		6 ms or less		
Ī	p-p *6	700 mV	1500 mV	1750 mV	
	rms *7	100 mV	250 mV	300 mV	
Rise time *8	Full load *9		25 ms		
	No load		25 ms		
Fall time *10	Full load *9		25 ms		
	No load	750 ms			
Output current					
Maximum settab	le current *11	126 A	63 A	31.5 A	
Setting accuracy	/		±(0.75 % of rating)		
Setting resolutio		0.01 A	0.005 A	0.002 A	
Power fluctuation	n	±240 mA	±120 mA	±60 mA	
Load variation		±240 mA	±120 mA	±60 mA	
	-circuit) (TYP) *12	25 ms	25 ms	25 ms	
	circuit) (TYP) *13	25 ms	25 ms	25 ms	
Response switch			FAST, SLOW		
Slew rate switch	ing (TYP) *11	6 A/ms	3 A/ms	1.5 A/ms	
		3 A/ms	1.5 A/ms	0.75 A/ms	
		0.3 A/ms	0.15 A/ms	0.075 A/ms	
		0.03 A/ms	0.015 A/ms	0.0075 A/ms	
Slew rate setting	accuracy	±(2	0 % of setting +2.5	ms)	
Output power					
Maximum settab	le power *14		21000 W		
Setting accuracy		±(0.5 % of power rating + 0.5 % of current rating × Vout)			
Setting resolutio	n	2 W			
	Johnny Todolation				

- Limited by the maximum output power.
- 180 Vac to 252 Vac for 200 Vac input, 342 Vac to 504 Vac for 400 Vac input. At the constant load
- 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
- The amount of time required for the output voltage to return to a value within the rated output voltage \pm (0.1 % + 10 mV) when the response setting of the CV mode is FAST. The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
- In the case where the CV mode response setting is FAST and having the rated output current. Values measured using JEITA RC-9131C probe and 100:1 probe.
- Measurement frequency band: 10 Hz to 20 MHz
- Measurement frequency band: 10 Hz to 1 MHz
- Applicable to the case where the CV mode response setting is FAST and the rated output voltage changes from 10 % to 90 %.
- For a pure resistance.
- *10. Applicable to the case where the CV mode response setting is FAST and the rated output voltage changes from 90 % to 10 %
- *11. During parallel operation, this will be the value multiplied by the number of units in the con-
- *12. In the case that the CC mode response setting is set to FAST: Applied in response to changes from 10 % to 90 % of rated output current.
- *13. In the case that the CC mode response setting is set to FAST: Applied in response to changes from 90 % to 10 % of rated output current.
- *14. During parallel operation, this will be the value multiplied by the number of units in the con-
- *15. Equal to or higher than 5 % of the rated power is guaranteed. Less than 5 % of the rated power is guaranteed as a TYP value.

Item/Model	PXT20K-500	PXT20K-1000	PXT20K-1500		
200 V three-phase three-wire input	t				
Specifications for models having a	n input voltage ratin	g of 200 Vac.			
Nominal input rating	200 Vad	to 240 Vac, 50 Hz t	o 60 Hz		
Input voltage range		180 Vac to 252 Vac			
Input frequency range	47 Hz to 63 Hz				
Input current (MAX) *16	80 A (W	hen Input voltage is	180 V)		
Input power (MAX) *16		24 kVA			
Inrush current (TYP) *17		90 A			
Power factor (TYP) *16	0.96				
Output hold time	10 ms or more				
400 V three-phase three-wire input					
Specifications for models having a	n input voltage ratin	g of 400 Vac.			
Nominal input rating	380 Va	to 480 Vac, 50 Hz t	o 60 Hz		
Input voltage range		342 Vac to 504 Vac			
Input frequency range		47 Hz to 63 Hz			
Input current (MAX) *16	40 A (W	hen Input voltage is	342 V)		
Input power (MAX) *16 24 kVA					
Inrush current (TYP) *17		70 A			
Power factor (TYP) *16		0.96			
Output hold time		10 ms or more			

- *16. At the rated output power for the rated output current.
- *17. Maximum peak current value when the POWER switch is turned on. (Excluding the surge current to the input filter capacitor.)

Item/Model		PXT20K-500	PXT20K-1000	PXT20K-1500	
General specific	ations				
Weight		Approx. 38 kg (83.78 lbs)	Approx. 38 kg (83.78 lbs)	Approx. 37 kg (81.57 lbs)	
Dimensions		430 (16.93)(MAX455 (17.91))W×128 (5.04)(MAX160 (6.30))H×720 (28.35)(MAX980 (38.58))Dmm(mm (inches))			
Environmental conditions	Operating environment	Indoor ι	use, Overvoltage ca	tegory II	
	Operating temperature	0 °C to	+50 °C (32 °F to +1	22 °F)	
	Operating humidity	20 % rh t	to 85 % rh (no conde	ensation)	
Storage temperature		-25 °C t	o +60 °C (-13 °F to +	+140 °F)	
Storage humidity		90 % rh or less (no condensation)			
	Altitude	Up to 2000 m			
Cooling system			ced air cooling using	j fan	
Withstand voltage	Between input and GND	2200 Vac for 1 minute			
	Between input and output				
	Between output and GND	1800 Vdc for 1 minute	1800 Vdc for 1 minute	3000 Vdc for 1 minute	
Insulation resistance	Between input and GND	30 MΩ, 500 Vdc			
	Between input and output	30 MΩ, 1000 Vdc			
Isolation voltage		±1000 V	±1000 V	+2000 V/-1000 V	
Electromagnetic compatibility (EMC) *18 *19		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A *20)			
Safety *18		Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *19 EN 61010-1 (Class I *21, Overvoltage category II, Pollution Degree 2 *22)			

- *18. Does not apply to specially ordered or modified products.
- *19. Only for models with CE marking / UKCA marking on their body.
- *20. 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.
- *21. 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.
- *22. 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 nonconductive pollution will occur except for an occasional temporary conductivity caused by condensation

Compact Wide Range DC Power Supply (CV/CC)

Series





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, 1200 W 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.

Dimensions / Weight

400 W model:

 $71(2.80^{\circ})W \times 124(4.88^{\circ})H \times 350(13.78^{\circ})Dmm(inch)/3 kg(6.61 lbs)$ 800 W model:

 $142.5(5.61")W \times 124(4.88")H \times 350(13.78")Dmm(inch)/5.5 kg(12.13 lbs)$ 1200 W model:

 $214(8.43")W \times 124(4.88")H \times 350(13.78")Dmm(inch)/7.5 kg(16.53 lbs)$ 2000 W model:

 $428.5(16.87")W \times 128(5.04")H \times 350(13.78")Dmm(inch)/13 kg(28.66 lbs)$

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

Features

- All models are equipped with front-facing output terminals as standard (maximum 10 A)
- A wide range of voltage and current settings can be combined within its output power rating (3 to 4 times)
- Bleeder (sink) can be turned ON/OFF, with an even stronger bleeder mode setting available
- Customizable startup when turning on output
- Output ON/OFF delay function
- Soft start/stop function
- Setting preset memory function (3 combinations of settings for voltage, current, OVP, OCP, and UVL)
- CONFIG setting shortcut function and display (Up to three parameters can be registered.)
- LAN (LXI compliant) /USB/RS232C as standard interface
- Supporting universal input voltage (85 V to 265 V)
- Durable Performance

Operating temperature guaranteed up to 50 °C (122 °F). (Storage temperature is -25 °C to +60 °C (-13 °F to 140 °F).)

Functions

■ Sequence function

The sequence function allows you to automatically execute programs that you have set in advance, one operation at a time. However, you cannot create sequences using only the panel. Sequence programs are created using commands from a PC. Once a sequence is executed via remote control, the program is saved onto the PWR-01's internal memory and then can be executed directly from the front panel without a PC.

■ Synchronized operation

Synchronized operation allows for settings and sequence programs to be synchronized via trigger signals. Different PWR-01 models (e.g., 400 W model and 800 W model) can be easily mixed and matched with no difficulties. Synchronized operation is also possible in parallel operation. In order to successfully synchronize your power supplies, please configure various settings using remote control commands. After completing configuration, synchronized operation can be performed without a PC.

■ Variable internal resistance function

The variable internal resistance function 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.

Master-slave parallel operation

The maximum number of parallel units including the master device is 3 units for the 400 W and 800 W models and 2 units for the 1200 W and 2000 W models. Differences in output voltage and output current between the master and slave devices are within approximately 5% of their respective rated output.

■ Series operation

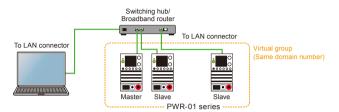
Up to two units can be connected in series (excluding the H type). The total combined output voltage of the two units is applied to the load. The voltage setting accuracy is the same as the accuracy of an individual unit. *You cannot perform master-slave configuration in series operation.

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)

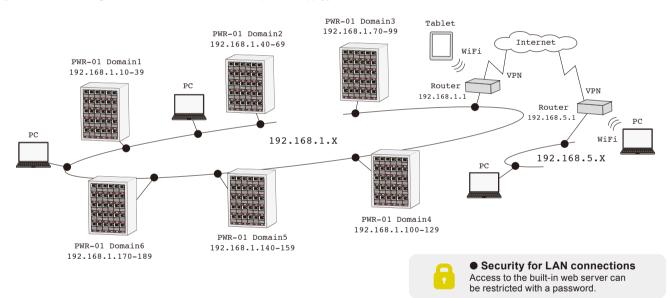
As shown in the figure below, it is possible to connect a PC and the PWR-01 series with a hub to create a virtual group using a LAN connection. A maximum of 254 virtual groups can be set, and the maximum number of units can be configured up to 31 units per group. A group can have a mixture of models.



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

^{*} A DHCP server can also establish settings automatically

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



■ 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 PWR-01 series for convenient control and monitoring.

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

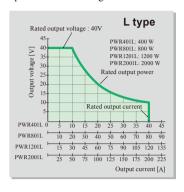
* Connecting with a smartphone, tablet, etc., requires a Wi-Fi environment (wireless LAN router etc.)

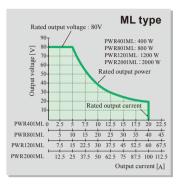


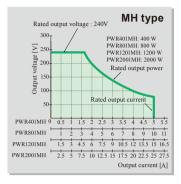
Operation Area

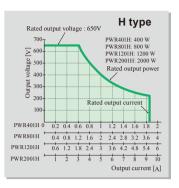
■ 3 to 4 times ratio-power operation

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.









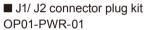
Options

■ AC power cord for 1200 W model AC5.5-3P3M-M4C-VCTF

*Not CE/UKCA certified product

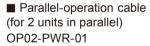
■ AC power cord for 2000 W model AC5.5-1P3M-M6C-3S

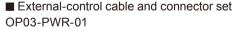
*CE/UKCA certified product



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





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)







AC5.5-3P3M-M4C-VCTF



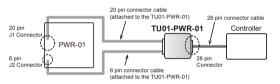






■ Terminal unit TU01-PWR-01

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



*It is not possible to convert the functions of external resistance control of output voltage (current) and one-control parallel operation (series operation)

■ GPIB Converter

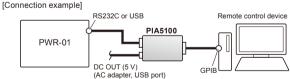
PIA5100

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/UKCA certified product

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





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

PWR-01 Series 400 W Type Specifications

Item/Mod	del			PWR401L	PWR401ML	PWR401MH	PWR401H
AC input							
Nominal i	nput ratin	g		100 Vac t	o 240 Vac, 50 h	dz to 60 Hz, sin	gle phase
Input volt	age range	9		85 Vac to 265 Vac			
Input frequency range				47 Hz t	o 63 Hz		
Current (TYP) *1	100 Vac	c/ 200 Vac		5.6 A/	2.8 A	
Inrush cu	rrent (MA	X) *2			25 A c	or less	
Power (M	IAX) *3				560	VA	
Power fac	ctor (TYP)) *1		0.99 (input v	oltage: 100 V),	0.97 (input vol	tage: 200 V)
Efficiency	/ (MIN) *1				75 %	(TYP)	
Output ho	old time *3	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)				
	Resoluti	on		200 mV	400 mV	1000 mV	2500 mV
		Using F	INE, OUT OFF	10 mV	10 mV	100 mV	100 mV
		Using F	INE, OUT ON	1 mV	1 mV	10 mV	10 mV
			sing a communi- nterface	0.1 mV	0.1 mV	0.1 mV	0.1 mV
	Line regi	ulation *	6	±6 mV	±10 mV	±26 mV	±67 mV
	Load reg	gulation	*7	±6 mV	±10 mV	±26 mV	±67 mV
	Transien	it respor	rse *8	1 ms or less	2 ms or less	2 ms or less	3 ms or less
	Ripple n	oise *9	p-p *10	50 mV	50 mV	100 mV	300 mV
			rms *11	5 mV	5 mV	20 mV	50 mV
	Rise time	е	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
			e sensing com- e (single line)	1.5 V	4 V	5 V	5 V
	Tempera	ature coe	efficient *13		100 p	pm/°C	

- At the rated output power for the rated output current.
- 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/Mo	del			PWR401L	PWR401ML	PWR401MH	PWR401H	
Output								
Current	Maxin	num settable	current *5	42 A	21 A	5.25 A	1.9425 A	
	Settin	g accuracy *	14		(0.5 % of set	+0.1 % of rating)	
	Resol	ution		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 cation inter	g a communi- face	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	oad regulation		±13 mA	±9 mA	±6.0 mA	±5.4 mA	
	Ripple noise*15 rms **		rms *11	80 mA	40 mA	12 mA	6 mA	
	Rise t	time (TYP) At full load		50 ms		100 ms		
	Fall tir	ne (TYP)	At full load	50	50 ms		100 ms	
	Temp	erature coef	ficient *13	100 ppm/°C				
Maximun	n interna	al resistance	that can be set	1.000 Ω	4.000 Ω	36.00 Ω	263.5 Ω	
Display f	unction							
Voltage		Maximum o	display	99.99 999.9		9.9		
display		Display acc	curacy	± (0.2 % of reading + 5 digit)				
Current		Maximum o	display	99.99 9.999			99	
display Display accuracy		± (0.5 % of reading + 8 digit)						
Power di	splay			The PWR DSPL LED lights in red.				
		Maximum o	display		99	99		
		Display acc	curacy			ying the current ne voltage or cu		

- *3. 100 Vac, at the rated output power.
- The maximum output voltage and maximum output current are limited by the maximum output power.
- Can be limited to approximately 95 % of the OVP trip point or OCP trip point.
- 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load
- 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.
- 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/Mo	del		PWR801L	PWR801ML	PWR801MH	PWR801H		
AC input								
Nominal	input rating		100 Vac t	o 240 Vac, 50 H	Hz to 60 Hz, sin	gle phase		
Input volt	age range		85 Vac to 265 Vac					
Input free	quency range			47 Hz t	o 63 Hz			
Current (TYP) *1 100 \	ac/ 200 Vac		11.2 A	/ 5.6 A			
Inrush cu	rrent (MAX) *2			50 A d	or less			
Power (N	IAX) *3			1120	O VA			
Power fa	ctor (TYP) *1		0.99 (input v	oltage: 100 V)	0.97 (input vol	tage: 200 V)		
Efficiency	y (MIN) *1			75 %	(TYP)			
Output ho	old time *3			20 ms	or more			
Output								
Rating	Output voltag	e *4	40 V	80 V	240 V	650 V		
	Output curren	tput current *4 80 A 40 A				3.70 A		
	Output power			800	O W			
Voltage	Maximum set	able voltage *5	42 V	84 V	252 V	682.5 V		
	Setting accura	icy	± (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		
		using a communi- interface	0.1 mV	0.1 mV	0.1 mV	0.1 mV		
	Line regulatio	ı *6	±6 mV	±10 mV	±26 mV	±67 mV		
	Load regulation	n *7	±6 mV	±10 mV	±26 mV	±67 mV		
	Transient resp	onse *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		
		ote sensing com- age (single line)	1.5 V	4 V	5 V	5 V		
	Temperature	coefficient *13		100 p	pm/°C			

- *1. At the rated output power for the rated output current.
- 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).

tem/Model				PWR801L	PWR801ML	PWR801MH	PWR801H	
Output								
Current	Maxim	num settable	current *5	84 A	42 A	10.5 A	3.885 A	
	Setting	g accuracy *	14	:	± (0.5 % of set	+0.1 % of rating)	
	Resolu	ution		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	
	cation inte		When using a communi- cation interface		0.1 mA	0.1 mA	0.1 mA	
	Line re	ine regulation		±10 mA	±6 mA	±3 mA	±2.4 mA	
	Load r	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 ti	me (TYP)	At full load	50	ms	100 ms		
	Fall tin	ne (TYP)	At full load	50	ms	100 ms		
	Tempe	erature coeff	icient *13	100 ppm/°C				
Maximum	n interna	al resistance	that can be set	0.500 Ω	2.000 Ω	18.00 Ω	131.8 Ω	
Display for								
Voltage		Maximum o	display	99	.99	999	9.9	
display		Display acc	curacy		± (0.2 % of rea	ading + 5 digit)		
Current		Maximum o	display		99.99		9.999	
display		Display acc	curacy		± (0.5 % of rea	ading + 8 digit)		
Power dis	splay			TI	ne PWR DSPL	LED lights in re	d.	
		Maximum o	display		99	99		
		Display acc	curacy			ying the current he voltage or cu		

- *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.
- 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load
- 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. The amount of time required for the output voltage to return to a value within "rated output voltage \pm (0.1 %).
- +10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage. 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 1200 W Type Specifications

Item/Mod	iel			PWR1201L	PWR1201ML	PWR1201MH	PWR1201H			
AC input										
Nominal i	nput ratir	ng		100 Vac t	o 240 Vac, 50 H	Hz to 60 Hz, sin	gle phase			
Input volt	ut voltage range			85 Vac to 265 Vac						
Input freq	uency ra	nge			47 Hz to 63 Hz					
Current (ΓΥΡ) *1	100 Vac	c/ 200 Vac		16.8 A	/ 8.4 A				
Inrush cu	rrent (MA	(X) *2			75 A d	or less				
Power (M	AX) *3				168	0 VA				
Power fac	tor (TYP	') *1		0.99 (input v	oltage: 100 V),	0.97 (input vol	tage: 200 V)			
Efficiency	(MIN) *1				75 %	(TYP)				
Output ho	old time *	3			20 ms	or more				
Output										
Rating	Output v	/oltage *	4	40 V	80 V	240 V	650 V			
	Output	current *	4	60 A	15.0 A 5.55 A					
	Output p	oower		1200 W						
Voltage	Maximu	m settab	le voltage *5	42 V	84 V	252 V	682.5 V			
	Setting	accuracy	/	± (0.05 % of set +0.05 % of rating)						
	Resoluti	ion		200 mV	400 mV	1000 mV	2500 mV			
		Using F	INE, OUT OFF	10 mV	10 mV	100 mV	100 mV			
		Using F	INE, OUT ON	1 mV	1 mV	10 mV	10 mV			
			sing a communi- nterface	0.1 mV	0.1 mV	0.1 mV	0.1 mV			
	Line reg	ulation *	6	±6 mV	±10 mV	±26 mV	±67 mV			
	Load re	gulation	*7	±6 mV	±10 mV	±26 mV	±67 mV			
	Transier	nt respor	nse *8	1 ms or less	2 ms or less	2 ms or less	3 ms or less			
	Ripple n	ioise *9	p-p *10	50 mV	50 mV	100 mV	300 mV			
			rms *11	5 mV	5 mV	20 mV	50 mV			
	Rise tim	e	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			
			e sensing com- le (single line)	1.5 V	4 V	5 V	5 V			
	Tempera	ature co	efficient *12		100 p	pm/°C				

- At the rated output power for the rated output current.
- 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).

PWR-01 Series 2000 W Type Specifications

Item/Mo	del			PWR2001L	PWR2001ML	PWR2001MH	PWR2001H			
AC input										
Nominal	input rat	ing		100 Vac t	o 240 Vac, 50 l	Hz to 60 Hz, sin	gle phase			
Input volt	age rang	ge		85 Vac to 265 Vac						
Input frequency range				47 Hz t	o 63 Hz					
Current (TYP) *1	100 Vac	/ 200 Vac		28.0 A	/ 14.0 A				
Inrush cu	irrent (M	AX)			125 A	or less				
Power (N	1AX) *2				280	0 VA				
Power fa	ctor (TY	P) *1		0.99 (input v	/oltage: 100 V)	, 0.97 (input vol	tage: 200 V)			
Efficiency	y (TYP)	*1			75	5 %				
Output h	old 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	Maxim	ximum settable voltage *4		42 V	84 V	252 V	682.5 V			
	Setting	accuracy	/	±	(0.05 % of set	+0.05 % of ratin	g)			
	Resolution			200 mV	400 mV	1000 mV	2500 mV			
		Using FINE, OUT OFF		10 mV	10 mV	100 mV	100 mV			
		Using FI	NE, OUT ON	1 mV	1 mV	10 mV	10 mV			
		When us cation in	sing a communi- terface	0.1 mV	0.1 mV	0.1 mV	0.1 mV			
	Line re	gulation *	5	±6 mV	±10 mV	±26 mV	±67 mV			
	Load re	egulation	*6	±6 mV	±10 mV	±26 mV	±67 mV			
	Transie	ent respor	nse *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 tir	ne	At full load	50 ms	or less	100 ms	or less			
			No load	50 ms	or less		or less			
	Fall tim	ne *11	At full load	50 ms	or less	150 ms or less 250 ms or les				
			No load	500 ms	or less	1200 ms or less	2000 ms or les			
			e sensing com- le (single line)	1.5 V	4 V	5 V	5 V			
	Tempe	rature co	efficient *12		100 p	pm/°C				

- At the rated output power for the rated output current.
- 100 Vac, at the rated output power.
- The maximum output voltage and maximum output current are limited by the maximum output power.

Item/Mo	del			PWR1201L	PWR1201ML	PWR1201MH	PWR1201H		
Output									
Current	Maxim	num settable	current *5	126 A	63 A	15.75 A	5.8275 A		
	Setting	g accuracy *	14	± (0.5 % of set +0.1 % of rating)					
	Resolu	ution		600 mA	300 mA	60 mA	30 mA		
		Using FINE	, OUT OFF	100 mA	10 mA	10 mA	1 mA		
	Using FINE, OUT ON When using a communication interface Line regulation Load regulation		10 mA	1 mA	1 mA	0.1 mA			
				0.1 mA	0.1 mA	0.1 mA	0.1 mA		
			±14 mA	±8 mA	±3.5 mA	±2.6 mA			
				±29 mA	±17 mA	±8.0 mA	±6.1 mA		
	Ripple	oise*15	rms *11	240 mA	120 mA	36 mA	18 mA		
	Rise ti	me (TYP)	At full load	50	ms	100	ms		
	Fall tin	ne (TYP)	At full load	50	ms	100 ms			
	Tempe	erature coeff	icient *13	100 ppm/°C					
Maximun	n interna	al resistance	that can be set	0.333 Ω	1.333 Ω	12.00 Ω	87.84 Ω		
Display for	unction								
Voltage		Maximum o	lisplay	99	.99	999	9.9		
display		Display acc	curacy		± (0.2 % of rea	ading + 5 digit)			
Current		Maximum o	lisplay	999.9	99	.99	9.999		
display		Display acc	curacy		± (0.5 % of rea	ading + 8 digit)			
Power di	splay			TI	he PWR DSPL	LED lights in re	d.		
		Maximum o	lisplay	9999					
		Display acc	curacy	Displays the result of multiplying the current and voltage. The display is toggled with the voltage or current display.					

- 100 Vac, at the rated output power.
- The maximum output voltage and maximum output current are limited by the maximum output power.
- Can be limited to approximately 95 % of the OVP trip point or OCP trip point.
- 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.
- 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.

Item/Mo	em/Model PWR2001L PWR2001ML PWR2001MH PWR2						PWR2001H		
Output									
Current	Maxim	um settable	current *4	210 A	105 A	26.25 A	9.7125 A		
	Setting	accuracy *	13	± (0.5 % of set +0.1 % of rating)					
	Resolu	ition		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 r	egulation		±45 mA	±25 mA	±10.0 mA	±6.9 mA		
	Ripple	noise*14	rms *10	400 mA	200 mA	60 mA	30 mA		
	Rise ti	me (TYP)	At full load	50 ms		100 ms			
	Fall tin	ne (TYP)	At full load	50 ms		100 ms			
	Tempe	rature coeff	icient *12	100 ppm/°C					
Maximun	n interna	l resistance	that can be set	0.200 Ω	0.800 Ω	7.200 Ω	52.70 Ω		
Display for									
Voltage o	lisplay	Maximum (display	99	.99	999.9			
		Display ac	curacy		± (0.2 % of rea	ading + 5 digit)			
Current o	lisplay	Maximum (display	99	9.9	99.	99		
		Display ac	curacy		± (0.5 % of rea	ading + 8 digit)			
Power di	splay			TI	he PWR DSPL	LED lights in re	d.		
		Maximum (display	9999					
		Display ac	curacy			ying the current ne voltage or cu			

- *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
- 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.
- The amount of time required for the output voltage to return to a value within "rated output voltage \pm (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.
- 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/Mod	del		400 W model 800 W model	1200 W model 2000 W model
	n functions			
				t-panel output terminal overcur-
				on (OHP), Incorrect sensing con- lown (SD), Power limit (POWER
			tchdog), Master-slave parallel op	
	tput and ir	•		
Monitor signal	1 -	nonitor (VMON)	Selectable monitor voltage range	ge: 0 V to 5 V or 0 V to 10 V
output	_	Accuracy	2.5 % of f.s. *3	
		nonitor (IMON)	Selectable monitor voltage range	ge: 0 V to 5 V or 0 V to 10 V
Ctatus sis		Accuracy	2.5 % of f.s. *3 OUTON STATUS, CV STATUS	CCCTATUC
Status sig	gnal outpu	1 4	ALARM STATUS, POWER ON	
Trigger	Input (TR	(G IN)	Logic selectable: LOW (0 V to 1	
signal			Input impedance: 10 kΩ (TYP)	,
	Output (T	RG OUT)	Logic selectable: LOW (0 V to 0	0.6 V), HIGH (4.2 V to 5 V)
			Pulse width: 100 µs (TYP)	
Control fu				
External control	(VPGM)	oltage control	0 % to 100 % of the rated output Selectable control voltage range	
CONTROL	I '-	Accuracy	5 % of rating	0.0 7 10 0 7 01 0 7 10 10 7
	_	urrent control	0 % to 100 % of the rated output	it current
	(IPGM)		Selectable control voltage rang	
		Accuracy	5 % of rating	
		n/ off control	Logic selectable:	0.510
	OUTPUT	ON/OFF CONT	when set to HIGH (4.5 V or 5 V	V to 0.5 V) or shorted; output off
				1.5 V to 5 V) or open; output off
			when set to LOW (0 V or 0.5 V)	or shorted
	Output sh	nutdown control	Output on when set to LOW (0	V to 0.5 V) or shorted
		ear control ALM		
	CLR	ar control / Livi	Alarm cleared when set to LOV	(0 V to 0.5 V) or shorted
Other fun	ictions			
Output-or	n/ off delay	/	Setting range: 0.0 s, 0.5 s to 99	.9 s *5 setting resolution: 0.1 s
Soft start	and soft s	top	Setting range: 0.0 s, 0.5 s to 10	.0 s *5 setting resolution: 0.1 s
		ion (OCP)	Setting range: 0.0 s to 2.0 s *5	setting resolution: 0.1 s
activation Preset me				settings can be saved: the set volt-
FIESCLIII	eniory		age, the set current, the set OVP	
Key lock			Locks the operation of all keys	
CONFIG	shortcut			rs can be registered to the SC1,
			SC2, and SC3 keys	
Sequence	е		Number of programs: 1, Number Repetition count: 1 to 99998, IN	
			Number of configurable interva	
			Number of interval loops: 2 to 9	
			Step time: 0.1 s to 100 h (comil transition)	mon to step transition and ramp
Synchron	nized Oper	ation	· '	d current settings, synchroniza-
0,110111011	200 0 00.	4.1011	tion of the resumption of steps	
Master-sl	ave paralle	el operation *6		Up to two units (same models)
			els) including the master unit	including the master unit
	eration *7		Two units (the same model)	
Multi- channel		on bet-ween the nit and PC	LAN, USB, RS232C	
(VMCB)		on with slave units	LAN	
Operation				
OUTPUT	ON/ OFF		OUTPUT LED lights green whe	n the output is on.
0 :			"DLY" lights when it is set and b	
Output-or	n/ off delay	/		
Output-or	n/ off delay	/	OUTPUT LED blinks orange wh	nile output-on delay is in effect.
			OUTPUT LED blinks orange who OUTPUT LED blinks green whi	nile output-on delay is in effect. le output-off delay is in effect.
	n/ off delay		OUTPUT LED blinks orange who OUTPUT LED blinks green whi "SS" lights when it is set and blinks orange who output led blinks green who output led blinks orange who output led blinks orange who output led blinks orange who	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect.
			OUTPUT LED blinks orange who OUTPUT LED blinks green whi	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. en soft start is in effect.
	and soft s		OUTPUT LED blinks orange wh OUTPUT LED blinks green whi "SS" lights when it is set and bl OUTPUT LED lights green whe	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. en soft start is in effect.
Soft start	and soft s		OUTPUT LED blinks orange who OUTPUT LED blinks green whis "SS" lights when it is set and bli OUTPUT LED blinks green whe OUTPUT LED blinks green whe OUTPUT LED blinks green when CV LED lights in green. CC LED lights in red.	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. en soft stop is in effect.
Soft start	and soft s		OUTPUT LED blinks orange who OUTPUT LED blinks green whing "SS" lights when it is set and bli OUTPUT LED lights green who OUTPUT LED blinks green who OUTPUT LED blinks green who CV LED lights in green. CC LED lights in red. ALM LED lights in red when it	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. en soft stop is in effect.
Soft start CV opera CC opera	and soft s		OUTPUT LED blinks orange wit OUTPUT LED blinks green whit "SS" lights when it is set and bli OUTPUT LED lights green whe OUTPUT LED blinks green whe CV LED lights in green. CC LED lights in green. ALM LED lights in red when activated. ALM LED blinks red	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. en soft stop is in effect. a protection function has been when the power limit (POWER
Soft start CV opera CC opera	and soft s		OUTPUT LED blinks orange wit OUTPUT LED blinks green whit "SS" lights when it is set and bli OUTPUT LED lights green whe OUTPUT LED blinks green whe CV LED lights in green. CC LED lights in green. ALM LED lights in red when activated. ALM LED blinks red	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. en soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a pro-
Soft start CV opera CC opera	and soft sation		OUTPUT LED blinks orange with OUTPUT LED blinks green whith "SS" lights when it is set and bith OUTPUT LED blinks green when OUTPUT LED blinks green when CV LED lights in green. CC LED lights in red. ALM LED lights in red when activated. ALM LED blinks red LIMIT) is activated. OUTPUT Lettion function is activated when PRESET A, B, or C LED lights.	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. ins off start is in effect. en soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a proent the output is on. s green when a preset memory
Soft start CV opera CC opera Alarm ope	and soft s		OUTPUT LED blinks orange with OUTPUT LED blinks green whith "SS" lights when it is set and bling output LED lights green when output LED blinks green when cover a light of the control of	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. en soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a pro- en the output is on. s green when a preset memory
Soft start CV opera CC opera Alarm opera Preset me	and soft s attion attion eration emory operation		OUTPUT LED blinks orange with OUTPUT LED blinks green whith "SS" lights when it is set and bling output LED lights green when output LED blinks green when cover a light of the control of	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. en soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a pro- en the output is on. s green when a preset memory limit levels are locked.
Soft start CV opera CC opera Alarm ope	and soft s attion attion eration emory operation operation	top	OUTPUT LED blinks orange wit OUTPUT LED blinks green white SS" lights when it is set and bli OUTPUT LED blinks green when OUTPUT LED blinks green when EV LED lights in green. CC LED lights in green. CC LED lights in red. ALM LED lights in red when activated. ALM LED blinks red LIMIT) is activated. OUTPUT tection function is activated when PRESET A, B, or C LED lightentry is being recalled or saved LOCK LED lights green when the REMOTE LED lights green durity.	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. in soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a pro- ent the output is on. In the week of the week of the week of the week Leb blinks orange when a pro- ent the output is on. In the week of the week of the week of the week Leb blinks orange when a pro- ent the output is on. In the week of the week
Soft start CV opera CC opera Alarm opera Preset me	and soft s attion attion eration emory operation	top	OUTPUT LED blinks orange wit OUTPUT LED blinks green white "SS" lights when it is set and bit OUTPUT LED blinks green when OUTPUT LED blinks green when OUTPUT LED blinks green when CV LED lights in green. CC LED lights in red. ALM LED lights in red when activated. ALM LED blinks red LIMIT) is activated. OUTPUT tection function is activated when the sactivated with the present and present green when the LOCK LED lights green when the REMOTE LED lights green during LAN LED lights or blinks dependent.	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. in soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a pro- ent the output is on. In the week of the week of the week of the week Leb blinks orange when a pro- ent the output is on. In the week of the week of the week of the week Leb blinks orange when a pro- ent the output is on. In the week of the week
Soft start CV opera CC opera Alarm opera Preset me	and soft s attion attion eration emory operation operation	top	OUTPUT LED blinks orange wit OUTPUT LED blinks green white SS" lights when it is set and bli OUTPUT LED blinks green when OUTPUT LED blinks green when EV LED lights in green. CC LED lights in green. CC LED lights in red. ALM LED lights in red when activated. ALM LED blinks red LIMIT) is activated. OUTPUT tection function is activated when PRESET A, B, or C LED lightentry is being recalled or saved LOCK LED lights green when the REMOTE LED lights green durity.	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. in soft start is in effect. in soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a pro- ent the output is on. In the week of the week of the week of the week Leb blinks orange when a pro- ent the output is on. In the week of the week of the week of the week Leb blinks orange when a pro- ent the output is on. In the week of the week
Soft start CV opera CC opera Alarm opera Preset me	and soft s attion attion eration emory operation operation	top	OUTPUT LED blinks orange wit OUTPUT LED blinks green white SS" lights when it is set and bli OUTPUT LED blinks green when OUTPUT LED blinks green when CV LED lights in green. CC LED lights in green. CC LED lights in red. ALM LED lights in red when activated. ALM LED blinks red LIMIT) is activated. OUTPUT tection function is activated when the same of the set	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. ins soft start is in effect. en soft stop is in effect. en soft stop is in effect. a protection function has been when the power limit (POWER LED blinks orange when a proen the output is on. s green when a preset memory len keys are locked. ing remote control. ding on the status.
CV opera CC opera Alarm op Preset me Key lock of Remote o	and soft s	top	OUTPUT LED blinks orange wit OUTPUT LED blinks green white SS" lights when it is set and bit OUTPUT LED blinks green when OUTPUT LED blinks green when DUTPUT LED blinks green when LED blinks green when LED blinks green. CC LED lights in green. CC LED lights in red. When activated. ALM LED blinks red LIMIT) is activated. OUTPUT tection function is activated when reactivated with LED blights green when the lights being recalled or saved LOCK LED lights green when the LED lights green during LEN LED lights green during LEN LED lights green. Fault status: Lights green. Fault status: Lights green. Standby status: Lights orange WEB identify status: Blinks green WEB lights grange WEB lidentify status: Blinks green.	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. ins off start is in effect. In soft start is in effect. In soft stop is in effect. In a protection function has been when the power limit (POWER LED blinks orange when a proen the output is on. In a green when a preset memory in the le keys are locked. In gremote control. In a green the status. In a control is in effect. In a protection function has been when a proen the output is on. In a control is in a control in
Soft start CV opera CC opera Alarm opi Preset me Key lock of Remote of	and soft s ation ation eration emory operation LAN operation	ration	OUTPUT LED blinks orange with OUTPUT LED blinks green whith "SS" lights when it is set and blind UTPUT LED blinks green when OUTPUT LED blinks green when OUTPUT LED blinks green when DUTPUT LED blinks green. CC LED lights in green. CC LED lights in red when activated. ALM LED blinks red LIMIT) is activated. OUTPUT tection function is activated when PRESET A, B, or C LED lights entry is being recalled or saved LOCK LED lights green when till REMOTE LED lights green during LAN LED lights or blinks depen No fault status: Lights green. Fault status: Lights green. Standby status: Lights orange WEB identify status: Blinks green "HB" lights when the hyper blees".	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. ins off start is in effect. In soft start is in effect. In soft stop is in effect. In a protection function has been when the power limit (POWER LED blinks orange when a proen the output is on. In a green when a preset memory in the le keys are locked. In gremote control. In a green the status. In a control is in effect. In a protection function has been when a proen the output is on. In a control is in a control in
Soft start CV opera CC opera Alarm opi Preset mo Key lock of Remote of	and soft s attion attion eration emory operation LAN operation circuit	top	OUTPUT LED blinks orange will OUTPUT LED blinks green while "SS" lights when it is set and bli OUTPUT LED lights green whe OUTPUT LED blinks green whe OUTPUT LED blinks green whe CV LED lights in green. CC LED lights in red. ALM LED blinks red when activated. ALM LED blinks red LIMIT] is activated. OUTPUT tection function is activated when the compact of the com	nile output-on delay is in effect. le output-off delay is in effect. inks when it is in effect. ins off start is in effect. In soft start is in effect. In soft stop is in effect. In a protection function has been when the power limit (POWER LED blinks orange when a proen the output is on. In a green when a preset memory in the le keys are locked. In gremote control. In a green the status. In a control is in effect. In a protection function has been when a proen the output is on. In a control is in a control in

Item/Mode	el	400 W model	800 W model	1200 W model 2000 W model				
Interface	Ta a	I						
Common	Software protocol	IEEE Std 488.2-						
	Ons Command language	Complies with S						
RS232C	Hardware	Complies with the		cifications				
		(excluding the c						
		RJ-45 connecto	, ,					
		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 recep	tion, CR/LF duri	ng transmission				
USB	Hardware	Complies with the (HighSpeed), So		cifications; data rate: 480 Mbps				
	Program message terminator	LF or EOM during	ng reception, LF	+ EOM during transmission				
	Device class	Complies with th	e USBTMC-USI	B488 device class specifications				
LAN	Hardware	LXI Specification	n2011 Ver.1.4,	ase-T Ethernet, Complies with Complies with LXI HiSLIP Ex- RJ-45 connector *9				
	Communication protocol	VXI-11, SCPI-R	AW, HISLIP					
	Program message terminator			ring reception, LF + END dur- LF during reception, LF during				
General								
Environ-	Operating environment	Indoor use, over	rvoltage categor	ry II				
mental	Operating temperature	0 °C to +50 °C (
conditions	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 me	ethod	Forced air coolii	ng using fan					
Grounding				grounding possible				
Isolation vo	· · ·		• •	type: ±800 Vmax				
With- standing	Across the primary circuit and chassis			c is applied for 1 minute				
voltage	Across the primary and secondary circuits	L/ ML/ MH type: No abnormalitie		c is applied for 1 minute				
	,	H type: No abno	rmalities when	1900 Vac is applied for 1 minute				
	Across the secondary	L/ ML/ MH type:						
	circuit and chassis			Ic is applied for 1 minute				
		H type: No abno	rmalities when 2	2640 Vdc is applied for 1 minute				
Insulation resis-	Across the primary circuit and chassis	100 MΩ or more	e (70 % or less) a	at 500 Vdc				
tance	Across the primary and	LL/ ML/ MH type	e: 100 MΩ or mo	ore (70 % or less) at 500 Vdc				
	secondary circuits	H type: 100 MΩ	or more (70 % c	or less) at 1000 Vdc				
	Across the secondary	L/ ML/ MH type:	40 MΩ or more	(70 % or less) at 500 Vdc				
	circuit and chassis	H type: 40 MΩ c	or more (70 % or	less) at 1000 Vdc				
Electromaç *10 *11	netic compatibility (EMC)	Complies with t standards. EMC EN61326-1 (Cla EN 61000-3-2, I Applicable unde	he requirement Directive 2014/ ss A *12), EN 55 EN 61000-3-3 er the following cength of all cabl	s of the following directive and 30/EU, 5011 (Class A *12, Group 1 *13),				
Safety *10		standards. Low	Voltage Directiv	s of the following directive and e 2014/35/EU *11, on Degree 2 *15)				

- *1. 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.

 *2. 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.
- *3. 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.
- *4. 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 $\dot{\text{V}});$ and status signals are not mutually isolated.
- *5. Factory default is 0.0 s.
- *6. Current difference between the master and slaves is 5 % (TYP).
- *7. H type is excluded
- *8. The RD-8P/9P adapter cable is an option.
- *9. Category 5; use a straight cable.
- *10. Does not apply to specially ordered or modified products.
- *11. Limited to products that have the CE mark/UKCA mark on their panels. Does not apply unless a core is attached to the J1 connector cable.
- *12. 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.
- *13. 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.
- *14. 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.
- *15. 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.

Compact Variable Switching Regulated DC Power Supply(CV/CC)

Series









Dimensions

 $70(2.76")W \times 83(3.27")H \times 350(13.78")Dmm(inch)$

Accessories

Common to all models:

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(2 pcs.), J1, J2, and J3 connector cover, Connector housing 12P, Connector housing 8P, Connector housing 4P, Contact pins(26 pcs.)

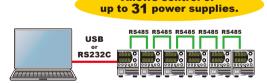
Models whose rated output voltage is 160 V to 650 V:

Output terminal plug 4P, Output terminal cover(top and bottom), PT screws, Connector housing 12P, Connector housing 8P, Connector housing 5P, Contact pins(26 pcs.)

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. Allows control of



- 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 be monitored.

High power density up to 800 W in a Palm-sized power supply with a 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)

■ 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.

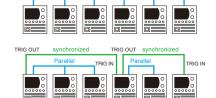
* Parallel operation and synchronized operation can be achieved without the optional KRA2-PAV and CC01-PAV

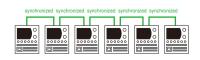
Up to 4.8 kW (up to 6 units) can be mounted into a 19-inch general-purpose rack



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)



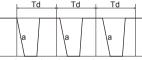




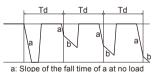
PAV Series 200 W Type Specifications

Rated output voltage *1	320 V 0.65 A 208 W phase 2.64 A/1.30 A 79% / 81% 25 A / 25 A or les	650 V 0.32 A 208 W
Rated output current *2	0.65 A 208 W phase 2.64 A/1.30 A 79% / 81% 25 A / 25 A or les	0.32 A 208 W
Rated output power 200 W 200 W 216 W 210 W 200 W	2.64 A/1.30 A 79% / 81% 25 A / 25 A or les	208 W
AC input Nominal input rating 100 Vac to 240 Vac continuous input, 50 Hz to 60 Hz, single 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 Power factor (typ) (100 Vac/200 Vac, at the rated output power) Efficiency (typ) *3 76% / 77.5% 77% / 79% 79% / 80.5% 79% / 80.5% 79% / 81% Inrush current (100 Vac/200 Vac) *4 Constant voltage mode Maximum line regulation *5 (for the rated output voltage) Maximum load regulation *6 (for the rated output voltage) Ripple noise *7 20 MHz, p-p 50 mV 50 mV 50 mV 80 mV 100 mV 5 Hz to 1 MHz, rms 5 mV 6 mV 7 mV 8 mV 10 mV Temperature coefficient	2.64 A/1.30 A 79% / 81% 25 A / 25 A or les	
Nominal input rating	2.64 A/1.30 A 79% / 81% 25 A / 25 A or les	s
Input voltage range	2.64 A/1.30 A 79% / 81% 25 A / 25 A or les	S
Input frequency range	79% / 81% 25 A / 25 A or les	S
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	79% / 81% 25 A / 25 A or les	S
Power factor (typ)	79% / 81% 25 A / 25 A or les	is
Constant voltage mode	25 A / 25 A or les	S
Inrush current (100 Vac/200 Vac) *4	25 A / 25 A or les	S
Inrush current (100 Vac/200 Vac) *4		is
Constant voltage mode	0.01%	
(for the rated output voltage) 0.01% + 2 mV Maximum load regulation *6 (for the rated output voltage) 0.01% + 2 mV Ripple noise *7 20 MHz, p-p 50 mV 50 mV 50 mV 50 mV 80 mV 100 mV 5 Hz to 1 MHz, rms 5 mV 6 mV 7 mV 8 mV 10 mV Temperature coefficient 30 PPM /*C (after a 30 minute warm-up, for the rated output	0.01%	
(for the rated output voltage) 0.01% + 2 mV Maximum load regulation *6 (for the rated output voltage) 0.01% + 2 mV Ripple noise *7 20 MHz, p-p 50 mV 50 mV 50 mV 50 mV 80 mV 100 mV 5 Hz to 1 MHz, rms 5 mV 6 mV 7 mV 8 mV 10 mV Temperature coefficient 30 PPM /*C (after a 30 minute warm-up, for the rated output	0.01%	
Maximum load regulation *6 (for the rated output voltage) 6 (for the rated output voltage) 50 mV 50 mV 50 mV 50 mV 80 mV 100 mV Ripple noise *7 20 MHz, p-p 50 mV 50 mV 50 mV 50 mV 80 mV 100 mV 5 Hz to 1 MHz, rms 5 mV 6 mV 7 mV 8 mV 10 mV Temperature coefficient 30 PPM /°C (after a 30 minute warm-up, for the rated output	0.0176	
Ripple noise *7 20 MHz, p-p 50 mV 50 mV 50 mV 50 mV 80 mV 100 mV 5 Hz to 1 MHz, rms 5 mV 6 mV 6 mV 7 mV 8 mV 10 mV Temperature coefficient 30 PPM /°C (after a 30 minute warm-up, for the rated output		
5 Hz to 1 MHz, rms 5 mV 6 mV 6 mV 7 mV 8 mV 10 mV Temperature coefficient 30 PPM /°C (after a 30 minute warm-up, for the rated output		
Temperature coefficient 30 PPM /°C (after a 30 minute warm-up, for the rated output	150 mV	250 mV
	25 mV	60 mV
	/oltage)	
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 1 V 1 V 2 V 3 V 5 V	5 V	
voltage (single line (positive or negative))		470
Rise time *10	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		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 roted output ourselt) 0.01% + 2 mA	0.02%	
(at the rated output current)		
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 0.05% or less (for 30 minutes after the load conditions are cl	anged)	
output current)		
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 driff *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 cons	tant current mode	or vice versa.
Can be set as necessary.		
Overvoltage protection (OVP) Inverter shutoff system. Prevents the output voltage from being set higher		e.
Also shuts off the output when an output overvoltage (exceeding the CO Overvoltage protection voltage setting range 0.5 V to 12 V		E \
	V 5 V to 353 V	5 V to 717 V
Undervoltage limit (UVI)		antrol
Undervoltage limit (UVL) Prevents the output voltage from being set lower than the UVL value. Disable Shute off the output when the output voltage falls below the UT.		ontrol.
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U	/P value.	
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th	/P value.	
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds the Setting and readback (USB, RS232, RS485, optional LAN interface)	/P value. e safe operation te	mperature.
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage Accuracy On5% of the rated output voltage 0.05%	/P value. e safe operation ten	mperature. ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy 0.05% of the rated output voltage of	/P value. e safe operation telepote the output voltage the rated output voltage.	mperature. ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy 0.05% of the rated output voltage Number of decimal digits 3 digits	/P value. e safe operation ten	mperature. ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy O.05% of the rated output voltage Number of decimal digits Resolution Approx. 1/60000 of rated output voltage	/P value. e safe operation teleptor the output voltage the rated output voltage the rated output voltage to grant voltage the rated output voltage to grant voltage the rated output voltage to grant voltage the voltage to grant	mperature. ge + 0.05% oltage
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output voltage Number of decimal digits Resolution Approx. 1/60000 of rated output voltage Output current Accuracy *18 O.1% of output current + 0.1% of the rated output current O.2%	/P value. e safe operation telepote the output voltage the rated output voltage.	mperature. ge + 0.05% oltage
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds the Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy 0.05% of the rated output voltage Number of decimal digits Resolution Approx. 1/60000 of rated output voltage Output current setting Number of decimal digits 3 digits 4 digits	/P value. e safe operation teleptor the output voltage the rated output voltage the rated output voltage to grant voltage the rated output voltage to grant voltage the rated output voltage to grant voltage the voltage to grant	mperature. ge + 0.05% oltage
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds th Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output voltage Number of decimal digits Resolution Approx. 1/60000 of rated output voltage Output current setting Number of decimal digits 3 digits Accuracy *18 Output current + 0.1% of the rated output current 0.2% Number of decimal digits 3 digits Approx. 1/60000 of rated output current Output voltage Output current Approx. 1/60000 of rated output current Output voltage Output current Approx. 1/60000 of rated output current	/P value. e safe operation te of the output voltag the rated output vo 2 digits of the rated output	mperature. ge + 0.05% oltage
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output current Setting Output current Setting Accuracy Output current Output current Output voltage Output current Output voltage Accuracy Output voltage	/P value. e safe operation teleptor the output voltage the rated output voltage the rated output voltage to grant voltage the rated output voltage to grant voltage the rated output voltage to grant voltage the voltage to grant	mperature. ge + 0.05% bitage t current ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output current Setting Output current Setting Accuracy Output current Output current Output voltage Output current Output voltage Accuracy Output voltage	/P value. e safe operation te of the output voltag the rated output vo 2 digits of the rated output	mperature. ge + 0.05% bitage t current ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output voltage Resolution Output current setting Accuracy *18	/P value. e safe operation te of the output voltag the rated output vo 2 digits of the rated output of the rated output voltag	mperature. ge + 0.05% bitage t current ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output current setting Accuracy Output soltage Resolution Output voltage Resolution Output voltage Resolution Output voltage Resolution Approx. 1/60000 of rated output current Output voltage Resolution Approx. 1/60000 of rated output current Output voltage Resolution Approx. 1/60000 of rated output voltage Output voltage Resolution Approx. 1/60000 of rated output voltage	/P value. e safe operation te of the output voltag the rated output vo 2 digits of the rated output of the rated output voltag	mperature. ge + 0.05% bitage t current ge + 0.05%
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds the Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output outp	/P value. e safe operation te of the output voltag the rated output vo 2 digits of the rated output of the rated output voltag	mperature. ge + 0.05% bitage t current ge + 0.05%
Undervoltage protection (UVP)	/P value. e safe operation te of the output voltag the rated output vol 2 digits of the rated output of the output voltag the rated output of the output voltag the rated output vo th g resolution switch foldback) • Output with USB, RS232 voltage (5 V or 10	mperature. ge + 0.05% bitage t current ge + 0.05% bitage able). •Knob t shutoff Lunc, ,RS485. LAH V) or externa
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds the Setting and readback (USB, RS232, RS485, optional LAN interface) Output voltage setting Accuracy Output voltage Resolution Output current setting Accuracy *18 Output current setting Accuracy *18 Output oltage readback Resolution Output voltage Resolution Output voltage readback Accuracy *18 Output oltage readback Accuracy *0.05% of the rated output voltage utility of the rated output current voltage output voltage Output voltage readback Accuracy *0.05% of the rated output voltage utility of the rated output current voltage output current voltage utility of the rated output voltage output voltage output current voltage output voltage output current voltage output voltage and output current (setting encoders) for setting OVP, UVP, and UVL. ◆Protection functions (OVP, UVP, UVL, voltage output on/off control, shutdown) ◆Communication functions: Standard equipped optional. ◆Baudrate, address setting ◆External control: Configuration suige external resistance (5 kΩ or 10 kΩ), output voltage voltage and output voltage ± 1 count volt	/P value. e safe operation te of the output voltag the rated output vol 2 digits of the rated output of the output voltag the rated output of the output voltag the rated output vo th g resolution switch foldback) • Output with USB, RS232 voltage (5 V or 10	mperature. ge + 0.05% bitage t current ge + 0.05% bitage able). •Knob t shutoff Lunc, ,RS485. LAH V) or externa
Undervoltage protection (UVP)	/P value. e safe operation te of the output voltag the rated output vol 2 digits of the rated output of the output voltag the rated output of the output voltag the rated output vo th g resolution switch foldback) • Output with USB, RS232 voltage (5 V or 10	mperature. ge + 0.05% bitage t current ge + 0.05% bitage able). •Knob t shutoff funcl , RS485 LAL V) or externa
Undervoltage protection (UVP)	/P value. e safe operation tel of the output voltag the rated output vol 2 digits of the rated output vol the rat	mperature. ge + 0.05% bitage t current ge + 0.05% bitage able). •Knob t shutoff funcl , RS485 tfuncl , V) or externa
Undervoltage protection (UVP)	/P value. e safe operation te of the output voltage the rated output voltage the rated output voltage of the output voltage the rated output of the output voltage the rated output voltage the rate	mperature. ge + 0.05% oltage t current ge + 0.05% oltage able). •Knob t shutoff fund, , RS485. LAI V) or externa operation loc
Undervoltage protection (UVP) Shuts off the output when the output voltage falls below the U Overheat protection Shuts off the output before the temperature of the internal components exceeds the Setting and readback (USB, RS232, RS485, optional LAN interface)	/P value. e safe operation te of the output voltage the rated output voltage the rated output voltage of the output voltage the rated output of the output voltage the rated output voltage the rate	mperature. ge + 0.05% oltage t current ge + 0.05% oltage able). •Knob t shutoff fund , RS485. LAt V) or externa operation loci

- 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 con-
- *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.



- 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

PAV10-40 PAV20-20 PAV36-12

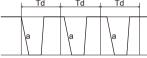
PAV60-7

PAV100-4 PAV160-2.6 PAV320-1.3 PAV650-0.64

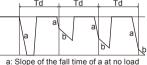
Item/Model

Rated output vol Rated output cur	tage "I			36 V	60 V			320 V	650 V	
Rated output cur	-	10 V	20 V	-		100 V	160 V			
reacca output car	rent *2	40 A	20 A	12 A	7 A	4 A	2.6 A	1.3 A	0.64 A	
Rated output pov	wer	400 W	400 W	432 W	420 W	400 W	416 W	416 W	416 W	
AC input										
Nominal input ra	ting		100	0 Vac to 240 Va	ic continuous in	nut 50 Hz to 6	∩ Hz sinale nh	250		
			100	5 Vac to 240 Va			o 112, sirigic pri	430		
Input voltage ran				-		265 Vac				
Input frequency i	range				47 Hz t	o 63 Hz				
Input current (typ	o) *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	2)						,			
	c, at the rated output power)				0.9	99				
•		80% / 82%	81% / 83%	83% / 85%	83% / 85%	84% / 88%		84% / 86%		
Efficiency (typ) *		00 70 7 02 70				0470 / 0070				
	00 Vac/200 Vac) *4		2	5 A / 25 A or les	SS		25 A / 25 A or less			
Constant voltage	e mode									
Maximum line re	gulation *5									
for the rated out	tput voltage)			0.01% + 2mV				0.01%		
Maximum load re	egulation *6	1		0.01% + 2111V				0.01%		
(for the rated out	tput voltage)									
Ripple noise *7	20 MHz, p-p	50 mV	50 mV	50 mV	50 mV	80 mV	100 mV	150 mV	250 mV	
uppio noico .										
	5 Hz to 1 MHz, rms	5 mV	6 mV	6 mV	7 mV	8 mV	10 mV	25 mV	60 mV	
Temperature coe	efficient		30 F	PPM /°C (after a	a 30 minute war	m-up, for the ra	ated output volt	age)		
Aging drift *8 (for	r the rated output voltage)				0.0	2%				
nitial drift *9 (for	the rated output voltage)			0.05% + 2 mV				0.05%		
	e sensing compensation									
	ne (positive or negative))	1 V	1 V	2 V	3 V	5V		5 V		
	no (positive of negative))	45	20	20	FO	FO	00	450	450	
Rise time *10	1	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			290 ms			2000 ms	2500 ms	3000 ~-	
		200 ms	200 ms		310 ms	1100 ms	ZUUU MS		3000 ms	
Transient respon	nse 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	t mode									
Maximum line re										
at the rated out				0.01% + 2 mA				0.02%		
	· · · · · · · · · · · · · · · · · · ·									
Maximum load re				0.01% + 5 mA				0.09%		
				0.09%						
·										
Change in the lo	ad due to the temperature									
Change in the load			0.05	5% or less (for 3	30 minutes afte	r the load cond	itions are chan	ged)		
Change in the load	ad due to the temperature		0.08	5% or less (for 3	30 minutes afte	r the load cond	itions are chan	ged)		
Change in the load drift of internal coutput current)	ad due to the temperature	70 mA	0.05 40 mA	5% or less (for 3	30 minutes afte	r the load cond	itions are chan	ged)	0.6 mA	
Change in the loadrift of internal coutput current) Ripple noise *17	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms)	70 mA	40 mA	15 mA	8 mA	3 mA	1.5 mA	1 mA	0.6 mA	
Change in the loadrift of internal coutput current) Ripple noise *17 Temperature coe	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient	70 mA	40 mA		8 mA a 30 minute wa	3 mA arm-up, at the ra	1.5 mA	1 mA	0.6 mA	
Change in the load drift of internal coutput current) Ripple noise *17 Temperature coe Aging drift *8 (at	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current)	70 mA	40 mA	15 mA	8 mA a 30 minute wa	3 mA arm-up, at the ra 5%	1.5 mA	1 mA	0.6 mA	
Change in the loadrift of internal coutput current) Ripple noise *17 Temperature coe Aging drift *8 (at Initial drift *9 (at	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current)	70 mA	40 mA	15 mA	8 mA a 30 minute wa	3 mA arm-up, at the ra	1.5 mA	1 mA	0.6 mA	
drift of internal co output current) Ripple noise *17 Temperature coe Aging drift *8 (at	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current)		40 mA 100	15 mA PPM /°C (after	8 mA a 30 minute wa 0.0	3 mA arm-up, at the ra 5%	1.5 mA ated output cur	1 mA		
Change in the lo- drift of internal co- output current) Ripple noise *17 Temperature coe Aging drift *8 (at Initial drift *9 (at ' Protection function	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current) ons		40 mA 100	15 mA	8 mA a 30 minute wa 0.0 0.* tches from cons	3 mA arm-up, at the ra 5% 1% stant voltage m	1.5 mA ated output cur	1 mA		
Change in the loadrift of internal coutput current) Ripple noise *17 Temperature coe Aging drift *8 (at Initial drift *9 (at	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current) ons		40 mA 100	15 mA PPM /°C (after	8 mA a 30 minute wa 0.0	3 mA arm-up, at the ra 5% 1% stant voltage m	1.5 mA ated output cur	1 mA		
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Change in the lo- drift of internal co- output current) Ripple noise *17 Temperature coe Aging drift *8 (at Initial drift *9 (at ' Protection functif	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current) ons	Turns off the o	40 mA 100 boutput when the verter shutoff s	15 mA PPM /°C (after	8 mA a 30 minute wa 0.0 0.* tches from con: Can be set a	3 mA arm-up, at the ra 5% 1% stant voltage m s necessary. ttage from being	1.5 mA ated output cur ode to constan	1 mA rent) It current mode	or vice vers	
Change in the lo- drift of internal co- output current) Ripple noise *17 Temperature coe Aging drift *8 (at Initial drift *9 (at Protection funcit Foldback protect	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current) ons tection (OVP)	Turns off the o	40 mA 100 output when the verter shutoff s Also shuts off	15 mA PPM /°C (after e operation swi ystem. Prevent the output whe	8 mA a 30 minute wa 0.0 0.* tches from con: Can be set a s the output vol en an output ove	3 mA arm-up, at the ra 55% 1% stant voltage m s necessary. ttage from bein ervoltage (exce	1.5 mA ated output cur ode to constan g set higher tha eding the OVP	1 mA rent) It current mode an the OVP valu value) occurs.	or vice vers	
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Change in the locarities of internal country to the locarities of internal country to the locarities of the locarities o	ad due to the temperature omponents (at the rated (5 Hz to 1 MHz, rms) efficient the rated output current) the rated output current) the rated output current) ons tition tection (OVP) tection voltage setting range nit (UVL) otection (UVP) tition lback (USB, RS232, RS485, Accuracy Number of decimal digits Resolution Accuracy *18 Number of decimal digits Resolution Accuracy *18 Resolution	Turns off the office of the control	40 mA 100 butput when the verter shutoff s Also shuts off 1 V to 24 V Ints the output v Shuts the output before terface) 0.05% of 3 d of output curre 0.05% of 0.05% of 2 d 2 digits	15 mA PPM /°C (after e operation swi ystem. Prevent the output whe 2 V to 40 V voltage from be s off the output e the temperatu f the rated output gifts Appr 10.1% of the gigits Appr 0.1% of output Appr 0.1% of output Appr 0.1% of output Esternation of setting the JVP, and UVL. s setting •Exter utput voltage/cu 0.5% gigits 0.5% T, ALARM, REI	8 mA a 30 minute wa 0.0 0.1 tches from con- Can be set a is the output voit an an output ove 5 V to 86 V ing set lower th when the outpu ure of the intern ut voltage fox. 1/60000 of at current + 0.3 fox. 1/60000 of ut voltage Protection fur munication fun rnal control: Co urrent monitor c of the rated out	3 mA arm-up, at the ra 5% stant voltage ms necessary. 5 V to 110 V an the UVL valid to voltage falls ball components al components al components rated output voltage falls ball components rated output voltage falls ball components and output to voltage falls ball components rated output voltage falls ball components rated output voltage falls ball components and output voltage falls ball components and output current and output current output (5 V or 10 put voltage ± 1 put current ± 1	1.5 mA ated output cur ode to constan g set higher tha eding the OVP 5 V to 176 V ue. Disabled du lelow the UVP exceeds the sa 0.05% of th 0.2% of the 1 di tage 0.2% of the count 1 di count 3 digits LARM (OVP, U	1 mA rent) It current mode an the OVP valu value) occurs. 5 V to 353 V uring external c value. afe operation te the output voltage rated output voltage ra	or vice versile. 5 V to 717 ontrol. mperature. ge + 0.05% oltage t current ge + 0.05% oltage	

- *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 con-
- *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 dron
- *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.

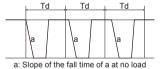


- b: Slope of the fall time of b at no load
- *14. The amount of time required for the output voltage to return to a value within 0.5 % of the rated output voltage. The change in the load current is 10 % to 90 % of the rating. The output voltage is between 10 % and 100 % of the rating. During local sensing.
- *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.

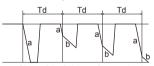
PAV Series 600 W Type Specifications

Item/Model		PAV10-60	PAV20-30	PAV36-18	PAV60-10	PAV100-6	PAV160-4	PAV320-2	PAV650-1	
Output										
Rated output vol		10 V	20 V	36 V	60 V	100 V	160 V	320 V	650 V	
Rated output cur		60 A	30 A	18 A	10 A	6 A	4 A	2 A	1 A	
Rated output pov	wer	600 W	600 W	648 W	600 W	600 W	640 W	640 W	650 W	
AC input		ı								
Nominal input ra			100	Vac to 240 Va	ac continuous ir		0 Hz, single ph	nase		
Input voltage ran	-					265 Vac				
Input frequency r					1	o 63 Hz			1	
Power factor (typ	o) *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		7.47 A / 3.69 A 7.59 A/3.75 A			
(100 Vac/200 Va	c, 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 (1) Constant voltage	00 Vac/200 Vac) *4		3	0 A / 30 A or le	SS		3	80 A / 30 A or le	ss	
Maximum line re										
(for the rated out				0.040/ + 2 \				0.040/		
Maximum load re]		0.01% + 2 mV				0.01%		
(for the rated out	put 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 coe			30 F	PPM /°C (after a	a 30 minute wa	rm-up, for the ra	ated output vol	tage)		
Aging drift *8 (for	r the rated output voltage)			0.05%				0.02%		
Initial drift *9 (for	the rated output voltage)			0.05% + 2 mV	'			0.05%		
	e sensing compensation	1 V	1 V	2 V	3 V	5 V		5 V		
	ne (positive or negative))									
Rise time *10	1	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 respon	nse 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 re				0.01% + 2 mA				0.02%		
(at the rated outp Maximum load re				0.01% + 5 mA						
(at the rated outp	out current) ad due to the temperature						0.09% 0.05% or less			
	omponents (at the rated	0.15% or less (for 30 minutes after the load conditions are changed)					(for 30 minutes after the load conditions ar 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 coe	efficient		100	PPM /°C (after	a 30 minute wa	arm-up, at the r	ated output cu	rrent)		
Aging drift *8 (at	the rated output current)				0.0	15%				
Initial drift *9 (at t	the rated output current)	0.3%	0.1	5%	0.	1%		0.1%		
Protection function										
Foldback protect	tion	Turns off the	output when the	e operation sw		stant voltage m	ode to constar	nt current mode	or vice versa.	
Overvoltage prot	tection (OVP)	In	verter shutoff s			Itage from bein			ue.	
Overvoltage prot	tection voltage setting range	0.5 V to 12 V		2 V to 40 V	5 V to 66 V	, ,		5 V to 353 V	5 V to 717 V	
Undervoltage lim			ents the output v							
Undervoltage pro		rieve			when the outpu				,5110101.	
Overheat protect		Shuts off th	he output befor						emperature.	
	back (USB, RS232, RS485,	optional LAN ir	nterface)							
Output voltage setting	Accuracy		0.05% of	the rated outp	ut voltage			the output volta e rated output v		
	Number of decimal digits		3 d	igits				ligits		
	Resolution				rox. 1/60000 of					
Output current	Accuracy *18	0.1%	of output curre		e rated output c	urrent		the rated outp	ut current	
setting	Number of decimal digits		3 d	igits			4 d	ligits		
	Resolution			Арр	rox. 1/60000 of	rated output cu	ırrent			
Output voltage readback	Accuracy		0.05% of	the rated outp	ut voltage			the output volta e rated output v		
	Resolution			Аррі	rox. 1/60000 of	rated output vo		•		
Output current	Accuracy *18				ut current + 0.3				-	
readback	Resolution				rox. 1/60000 of					
Front panel						· ·				
Control function		(encoders) for tion (output or optional. •Bau	obs (encoders) r setting OVP, n/off control, sh udrate, address kΩ or 10 kΩ), o	JVP,and UVL. autdown) •Com s setting •Exte autput voltage/c	 Protection fundamental control: Courrent monitor 	nctions (OVP, actions: Standa onfiguration using butput (5 V or 1)	UVP, UVL, fol rd equipped w ng external vol 0 V), output on	dback) •Outpuith USB, RS23: Itage (5 V or 10	it shutoff func 2, RS485. LAI) V) or externa	
Output voltage display	Accuracy Number of decimal digits		2 4	0.5% igits	of the rated ou	tput voltage ± 1		digit		
Output current	Accuracy				of the rated ou	tnut current ± 1		uigit		
display	Number of decimal digits		2 4	igits	or the rateu ou	ipui currerii ± 1		ligits		
LED display	umbor or accinial digits	Green: Ell	NE, MENU, SE	<u> </u>	M OUTDUT O	V CC Dod- A) AC EALL)	
Setting keys		5.00m. 1 m	, IVILIAO, OL		MENU, SET, AI			, 011,1011	2, AO I AIL)	

- *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 con-
- *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 dron
- *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.



- *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.



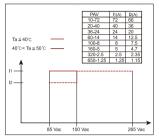
- a: Slope of the fall time of a at no load b: Slope of the fall time of b at no load
- *14. The amount of time required for the output voltage to return to a value within 0.5 % of the rated output voltage. The change in the load current is 10 % to 90 % of the rating. The output voltage is between 10 % 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, linear ity, 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

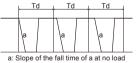
Item/Model		PAV10-72	PAV20-40	PAV36-24	PAV60-14	PAV100-8	PAV160-5	PAV320-2.5	PAV650-1.25
Output Poted output vo	altaga *1	10.1/	20.1/	36 V	60.1/	100 \/	160 \/	220.1/	650 V
Rated output vo	, •	10 V 72 A	20 V 40 A	24 A	60 V 14 A	100 V 8 A	160 V 5 A	320 V	1.25 A
Rated output current *2	100 Vac ≤ Vin *3 Ta *4 ≤ 50°C Vin < 100 Vac Ta ≤ 40°C	72 A	40 A	24 A 24 A	14 A	8 A	5 A	2.5 A 2.5 A	1.25 A 1.25 A
ourront 2	Vin < 100 Vac 40°C < Ta ≤ 50°C		36 A	24 A 20 A	12.5 A	7.5 A	4.7 A	2.35 A	1.25 A 1.15 A
Data d autaut	100 Vac ≤ Vin Ta ≤ 50°C				840 W	7.5 A 800 W	4.7 A 800 W		812.5 W
Rated output power		720 W	800 W	864 W				800 W	
oowei	Vin < 100 Vac Ta ≤ 40°C	720 W	800 W	864 W	840 W	800 W	800 W	800 W	812.5 W
C innut	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			10.	01/ 1 0/01/		. 5011 1 0			
Nominal input ra			100	0 Vac to 240 Va			U Hz, single pr	iase	
nput voltage ra						265 Vac			
nput frequency						o 63 Hz			
nput current (ty	yp) *5 (100 Vac/200 Vac)	9.00 A /	9.65 A /	10.30 A /	10.00 A /	9.50 A /	9.34 A /	9.34 A /	9.43 A /
	,	4.45 A	4.75 A	5.10 A	4.95 A	4.70 A	4.61 A	4.59 A	4.66 A
Power factor (ty	/p) 'ac, at the rated output power)				0.99	/ 0.98			
		040/ / 020/	0.40/ / 0.00/	0.50/ / 0.70/	0.50/ / 0.70/	050/ / 070/	00 50/ / 00 50/	06 50/ / 000/	070/ / 000/
fficiency (typ)		81% / 83%	84% / 86%	85% / 87%	85% / 87%	85% / 87%	86.5% / 88.5%	86.5% / 89%	87% / 89%
	100 Vac/200 Vac) *6				30 A / 30	A or less			
onstant voltag							1		
Maximum line r									
for the rated ou		-		0.01% + 2 mV				0.01%	
Maximum load									
for the rated ou	· · · · · · · · · · · · · · · · · · ·	F0	F0 11	50	00	00 11	400 ***	450	050 ::
Ripple noise *9		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
emperature co			30 F	PPM /°C (after a	a 30 minute war	m-up, for the r	ated output vol		
ging drift *10 ((for the rated output voltage)			0.05%				0.02%	
nitial drift *11 (f	for the rated output voltage)			0.05% + 2 mV				0.05%	
	te sensing compensation	1 V	1 V	2 V	3 V	5 V		5 V	
oltage (single l	line (positive or negative))	1 V	ı V	V	3 V	5 V		υ V	
Rise time *12		50 ms	50 ms	50 ms	50 ms	100 ms	45 ms	55 ms	55 ms
all 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
ransient respo				1 ms or less				2 ms or less	
output hold time				10 ms			13 ms	,	5 ms
Constant currer				10 1113			10 1113	11.	71113
Maximum line r									
at the rated out				0.01% + 2 mA				0.02%	
Maximum load	<u> </u>							-	
at the rated out				0.01% + 5 mA				0.09%	
	oad due to the temperature	0.15% or less		0.1%	or less			0.05% or less	
	components (at the rated	0.1070 01 1000						0.0070 01 1000	
output current)				(for 30 minu	ites after the lo	ad conditions a	ire changed)		
Ripple noise *19	9 (5 Hz to 1 MHz, rms)	180 mA	100 mA	31 mA	28 mA	12 mA	2 mA	1.5 mA	1 mA
emperature co	pefficient		100	PPM /°C (after	a 30 minute wa	arm-up, at the r	ated output cui	rrent)	
Aging drift *10 ((at the rated output current)			•		5%	•		
	at the rated output current)			0.3%				0.1%	
Protection funct									
oldback protec		Turns off the	output when th	e operation swi	tches from con	stant voltage m	node to constar	nt current mode	or vice versa
olabaok protec	0.001	Turno orrane v	output which th	c operation ow		s necessary.	iode to constan	it dan ont mode	or vice versu.
Overvoltage pro	otection (OVP)	Inv	verter shutoff s	system. Prevent			a set higher th	an the OVP val	ue.
roi roilago pi	0.000.0 (0.11.)			the output whe					
vervoltage pro	otection voltage setting range								5 V to 717 V
Indervoltage li				voltage from be					
	rotection (UVP)			s off the output					
verheat protec		Shuts off th		e the temperatu					emnerature
	dback (USB, RS232, RS485,			o tomperati		sompononta	2,000000 010 3	sporation to	
output voltage							0.05% of	he output volta	ne + 0.05%
etting	/ toouracy		0.05% of	f the rated outp	ut voltage			rated output voita	
zig	Number of decimal digits		3 4	igits				ligits	ago
		 	3 0		ox. 1/60000 of	rated output		igito	
lutnut auro	Resolution Accuracy *20	0.401	of output					the reted - · ·	ıt ourrant
Output current etting	Accuracy *20		oi output curre	nt + 0.1% of the		urrent	U.2% Of	the rated outpu	n current
cung	Number of decimal digits	2 digits			igits			4 digits	
	Resolution			Appı	ox. 1/60000 of	rated output cu			
utput voltage	Accuracy		0.05% of	f the rated outpo	ut voltage			he output volta	
eadback	D 1 "			<u> </u>				e rated output v	oıtage
	Resolution				ox. 1/60000 of				
utput current	Accuracy *20	-			ut current + 0.3				
adback	Resolution			Аррі	ox. 1/60000 of	rated output cu	ırrent		
ront panel									
ontrol functior	n	(encoders) for tion (output on	setting OVP, l	for setting the UVP, and UVL. nutdown) •Com	 Protection fu munication fun 	nctions (OVP, ctions: Standa	UVP, UVL, fol rd equipped wi	dback) •Outpuith USB, RS23	t shutoff func- 2, RS485. LAN
	1.			utput voltage/ci	urrent monitor of	output (5 V or 1	0 V), output on		V) or external operation lock
Output voltage					of the rated out	put voltage ± 1			
isplay	Number of decimal digits	-	2 d	igits				digit	
utput current					of the rated out	tput current ± 1			
isplay	Number of decimal digits			igits				ligits	
ED display		Green: FIN	IE, MENU, SE	T, ALARM, REI	M, OUTPUT, C	V, CC Red: A	LARM (OVP, U	VP, OTP, FOLI), AC FAIL)
Setting keys				FINE I	MENU. SET. AL	ADM DEM O	LITDUT		

FINE, MENU, SET, ALARM, REM, OUTPUT

- *1. The minimum voltage is 0.1% the rated output
- *2. The minimum current is 0.2% of the rated output current.
- Vin: Input voltage
- Ta: Ambient temperature (performance depending on the input voltage versus rated output current and ambient tempera-ture shown below)

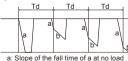


- *5. Input voltage 100 Vac/200 Vac, at the rated output power, ambient temperature 25 °C If the LAN option is built in, the efficiency decreases by 0.5% and the input current increases by 0.5%.
- *6. Excludes input surge current (duration 0.2 ms or less) applied to the built-in noise filter section
- *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.



*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.



- 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

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: 0Ω to $5 k\Omega$ or 0Ω to $10 k\Omega$) Accuracy and linearity: $\pm 1\%$ 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 k Ω or 0 Ω to 10 k Ω) Accuracy and linearity: \pm 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.
- 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.
 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 FG 707 Vdc: Between input and FG 707 Vdc: Between input and signal terminals (excluding J1/J2) and FG 4242 Vdc: Between input and signal terminals (excluding J1/J2) and FG 4242 Vdc: Between input and signal terminals (excluding J1/J2) and FG 4242 Vdc: Between input and signal terminals (excluding J1/J2) 4244 Vdc: Between input and signal terminals (excluding J1/J2) 4244 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) 4248 Vdc: Between output as well as J1/J2 terminals and signal terminals (excluding J1/J2) 4260 Vdc: Between output as well as J1/J2 terminals and signal terminals (exc
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.
- Test voltage application time: 1 minute
- 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 (CV/CC)

VX Series









Dimensions / Weight

PWX750LF/PWX750MLF:

 $422.8(16.65^{\circ})W \times 43(1.69^{\circ})H \times 500(19.69^{\circ})Dmm(inch)/8 kg(17.64 lbs)$ PWX750MHF/PWX750HF:

 $422.8(16.65")W \times 43(1.69")H \times 500(19.69")Dmm(inch)/7.5 kg(16.53 lbs)$ PWX1500L/PWX1500ML:

 $422.8(16.65")W \times 43(1.69")H \times 500(19.69")Dmm(inch)/9.5 kg(20.94 lbs)$ PWX1500MH/PWX1500H:

422.8(16.65")W × 43(1.69")H × 500(19.69")Dmm(inch)/ 9 kg(19.84 lbs)

Accessories

OUTPUT terminal cover, INPUT terminal cover set, Output terminal bolt set (2 sets), Chassis connection wire, J1 connector plug kit (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, Quick reference (1 each for English and Japanese), Safety information, CD-ROM

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 CV/CC 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 eXtensions 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/UKCA certified product
- RS232C control conversion cable RD-8P/9P
- GPIB Converter PIA5100
 - * Not CE/UKCA 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)
- Interface ISO PROGRAMING VOLT CONT factory option ISO PROGRAMING CURR CONT factory option

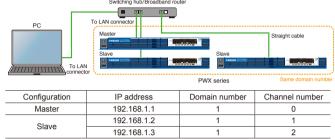
Note: Only one interface board can be installed The interface option can not be sold separately

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

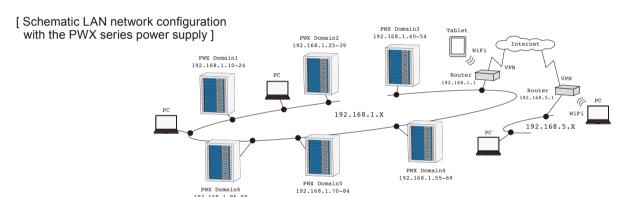
The PWX series is equipped with LAN, USB, and RS232C interfaces as standard features. By using the feature of virtual multi-channel bus (VMCB), it allows you to control remotely and monitoring for 1-to-N as well as N-to-M for large-scale networks. In particular, the LAN interface is LXI compliant, enabling 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 VMCBconnected 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.



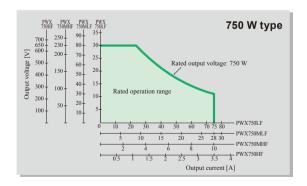
^{*} A DHCP server can also establish settings automatically

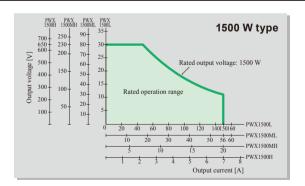


Security for LAN connections

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

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





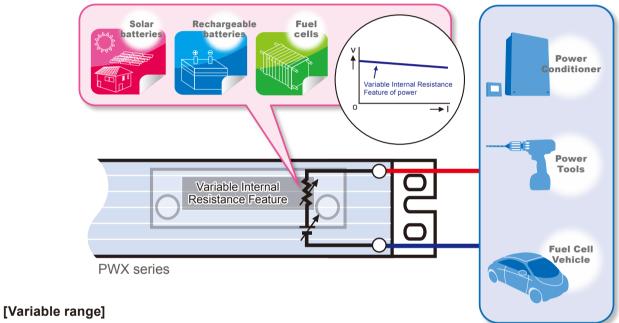
Variable Internal Resistance Feature

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



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 $[\Omega]$	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/Mo			PWX750LF	PWX750MLF	PWX750MHF	PWX750HF		
AC input								
Nominal input rating		100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase						
	tage range			85 Vac to 265 Vac				
	quency rang	ĭ			o 63 Hz			
Current ((MAX) *1	100 Vac			5 A			
		200 Vac		5.2	5 A			
Inrush cu	urrent (MAX	() * <mark>2</mark>		70 Apea	k or less			
Power (N	ЛАХ) * <mark>3</mark>			110	0 VA			
Power fa	ctor (TYP)	*1		(input voltage 10 (input voltage 20		0.98 (input voltage 100 V), 0.96 (input voltage 200 V)		
Efficienc	y (MIN) *1			74 % c	or more			
Hold-up	time for pov	ver interrup-		00				
tion (MIN		<u>'</u>		20 ms o	r greater			
Output								
Rating	Output vol	tage *4	30 V	80 V	230 V	650 V		
	Output cui	rrent *4	75 A	28 A	10 A	3.5 A		
	Output por	wer		750) W			
Voltage	Setting ran	nge	0 V to 31.5 V	0 V to 84 V	0 V to 241.5 V	0 V to 682.5 V		
	Setting ac	curacy		± (0.05 % of set	+0.05 % of rating)		
	Line regula	ation *5	± 5 mV	± 10 mV	± 25 mV	± 67 mV		
	Load regulation *6		± 5 mV	± 10 mV	± 25 mV	± 67 mV		
		response *7		or less		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	Rated load	100 ms 150 ms			250 ms		
	time*11	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 coef- ficient (MAX) *12		100 ppm/°C (during external control)					
Current	Setting ran	nge	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 ac	curacy *13		±(0.5 % of set	+0.1 % of rating)			
	Line regula	ation	± 9.5 mA	± 4.8 mA	± 3 mA	± 2.35 mA		
	Load regu	lation	± 20 mA	± 10.6 mA	±7 mA	± 5.7 mA		
	Ripple noise *14	(rms) *10	150 mA	65 mA	30 mA	15 mA		
	Temperatu ficient (TY			100 p	pm/°C			
Display f								
Voltage display	Maximum		99.99 (fixed o	decimal point)		decimal point)		
	Display ac			± (0.2 % of rea	ading +5 digits)			
Current display			99.99 (fixed decimal point) 9.999 (fixed decimal point)					
	Display accuracy				ading +5 digits)			
Power				-	key lights in red			
display *15	Maximum				199			
	Display ac	curacy		e result of multip				
Operatio	n display			OFF, CV operation (LAN				
Prot <u>ectio</u>	n 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)

- With rated load
- 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).
- 100 Vac with rated load.
- The maximum output voltage and current are limited by the maximum output power.
- 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load.
- 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
- The amount of time required for the output voltage to return to a value within "rated output voltage \pm (0.1 % + 10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
- Measured using an RC-9131 1:1 probe that conforms to the JEITA specifications. At the rated output current.
- 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.
- *14. When the authorit temperature is within 0 can 30 c.

 *14. 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
- *15. Press PWR DSPL to display the power on the ammeter. Each time you press this key, the display switches between power and current.

				1				
Item/Mo			PWX750LF	PWX750MLF	PWX750MHF	PWX750HF		
Signal ou	itput							
Monitor	Volta	ge monitor (VMON)	Selectable mon	itor voltage rang	e: 0 V to 5 V or 0	V to 10 V		
signal		Setting accuracy	2.5 % of f.s.					
output *1	Curre	nt monitor (IMON)	Selectable mon	itor voltage rang	e: 0 V to 5 V or 0	V to 10 V		
·		Setting accuracy	2.5 % of f.s.					
Status sig	gnal o	utput *1 *2	OUTON STATU PWR ON STAT		CC STATUS,ALI	M STATUS,		
Control fe	eature							
External control	Outpi (VPG	ut voltage control iM)		the rated output rol voltage range	voltage e: 0 V to 5 V or 0	V to 10 V		
*3		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					
		clear control CLR]	Clears alarms with a low TTL level signal					
Other fea	tures							
Master-slave parallel operation			Including the master unit, up to four units(all the same model) can be connected.					
Series op	eratio	n *4	Up to two units (all the same model) can be connected.					
Preset m	emory	,	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.					

- J1 connector on the rear panel.
- 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.
- J1 connector on the rear panel

*4. Excluding the PWX750HF								
Item/Mode	I	PWX750LF	PWX750MLF	PWX750MHF	PWX750HF			
General								
Environ-	Operating environment	li li	ndoor use, overv	oltage category	II			
mental conditions	Operating tempera- ture/humidity	0 °C to +	50 °C/20 %rh to	85 %rh (no cond	ensation)			
	Storage temperature/ humidity	-10 °C to +60		°C to +70 °C)/9 lensation)	0 %rh or less			
	Altitude		Up to 2	2000 m				
Cooling me	thod		Forced air cod	oling using fan				
Grounding	polarity	Negative	grounding or po	sitive grounding	possible			
Isolation vo	ltage	± 250	Vmax	± 500 Vmax	± 800 Vmax			
	Isolated analog interface *1		± 60	Vmax				
Withstand	Input-FG	No a	bnormalities at 1	1500 Vac for 1 m	inute			
voltage	Input-Output	No abnormalities at 2000 Vac for 1 minute		No abnormali- ties at 2250 Vac for 1 minute				
	Output-FG	No abnormalities at 1500 Vdc for 1 minute		No abnormali- ties at 1600 Vac for 1 minute	No abnormali- ties at 2000 Vac for 1 minute			
	Input-Isolated ana- log interface *1	No a	inute					
	Output-Isolated analog interface *1		es at 2300 Vdc minute	No abnormali- ties at 2650 Vac for 1 minute	No abnormali- ties at 3300 Vac for 1 minute			
Insulation re	esistance	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)					
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.						

- Option
- Limited to products that have the CE mark/UKCA mark on their panels. Does not apply to specially ordered or modified PWXs.
- 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.
- 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.
- 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.

PWX Series 1500 W Type Specifications

Item/Mo			PWX1500L	PWX1500ML	PWX1500MH	PWX1500H		
AC input								
	input rating		100 Vac	100 Vac to 240 Vac, 50 Hz to 60 Hz, single phase				
	tage range		85 Vac to 265 Vac					
Input frequency range				47 Hz to				
Current ((MAX) *1	100 Vac		21 A				
		200 Vac			5 A			
	urrent (MA)	() *2		75 Apea				
Power (N				2200) VA			
Powerta	ictor (TYP)	*1		(input voltage 10 (input voltage 20		0.98 (input voltage 100 V), 0.96 (input voltage 200 V)		
Efficienc	y (MIN) *1			74 % o	r more			
Hold-up tion (MIN		ver interrup-		20 ms o	greater			
Output								
Rating	Output vo		30 V	80 V	230 V	650 V		
	Output cu		150 A	56 A	20 A	7 A		
	Output po			150				
Voltage	Setting ra		0 V to 31.5 V	0 V to 84 V	0 V to 241.5 V	0 V to 682.5 V		
	Setting ac		1	± (0.05 % of set +	`	i e		
	Line regul		± 5 mV	± 10 mV	± 25 mV	± 67 mV		
	Load regu		± 5 mV	± 10 mV	± 25 mV	± 67 mV		
		response *7	1 ms or less			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			ms			
		No load	100 ms					
	Fall time *11	Rated load) 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		
	Temperati ficient (MA		100 ppm/°C (during external control)					
Current	Setting ra		0 A to 157.5 A 0 A to 58.8 A 0 A to 21 A 0 A to 7.35					
		curacy *13		± (0.5 % of set				
	Line regul		± 17 mA	± 7.6 mA	± 4 mA	± 2.7 mA		
	Load regu		± 35 mA	± 16.2 mA	± 9 mA	± 6.4 mA		
	Ripple noise *14	(rms) *10	300 mA	130 mA	60 mA	30 mA		
	Temperati ficient (TY		100 ppm/°C					
Display f			1					
Voltage	Maximum		99.99 (fixed	decimal point)		decimal point)		
display	Display ac			± (0.2 % of rea	iding +5 digits)			
Current display	Maximum		999.9 (fixed decimal point)	<u> </u>	lecimal point)	9.999 (fixed decimal point)		
	Display ac	curacy			iding +5 digits)			
Power				The PWR DSPL				
display *15	Maximum			99				
	Display ac	curacy		e result of multipl				
Operatio	n display			OFF, CV operation (LAN o				
Protection	n functions		seete.nory					

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)

- *1. With rated load.
- 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).
- 100 Vac with rated load.
- The maximum output voltage and current are limited by the maximum output power
- 85 Vac to 135 Vac or 170 Vac to 265 Vac, fixed load.

 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.
- The amount of time required for the output voltage to return to a value within "rated output voltage \pm (0.1 % + 10 mV)." The load current fluctuation is 50 % to 100 % of the maximum current with the set output voltage.
- Measured using an RC-9131 1:1 probe that conforms to the JEITA specifications. At the rated output current.
- 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
- *15. Press PWR DSPL to display the power on the ammeter. Each time you press this key, the display switches between power and current

Item/Mo	del	PWX1500L	PWX1500ML	PWX1500MH	PWX1500H		
Signal ou	itput						
Monitor	Voltage monitor (VMON)	Selectable monitor voltage range: 0 V to 5 V or 0 V to 10 V			V to 10 V		
signal	Setting accuracy	2.5 % of f.s.					
output *1	Current monitor (IMON)	Selectable mon	itor voltage rang	e: 0 V to 5 V or 0	V to 10 V		
•	Setting accuracy	2.5 % of f.s.					
Status si	gnal output *1 *2	OUTON STATE	JS, CV STATUS JS	, CC STATUS,	ALM STATUS,		
Control f	eatures						
External control	Output voltage control (VPGM)		the rated output rol voltage range		V to 10 V		
*3	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 fea	atures						
Master-s	lave parallel operation	Including the master unit, up to four units(all the same model) can be connected.					
Series of	peration *4	Up to two units (all the same model) can be connected.					
Preset m	emory	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.					
*1 .11.00	nnector on the rear pane	<u> </u>					

- 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.
- J1 connector on the rear panel
- *4. Excluding the PWX1500H

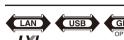
Item/Mode	I	PWX1500L	PWX1500ML	PWX1500MH	PWX1500H		
General							
Environ-	Operating environment	lı	Indoor use, overvoltage category II				
mental conditions	Operating tempera- ture/humidity	0 °C to +	50 °C/20 %rh to	85 %rh (no cond	ensation)		
	Storage temperature/ humidity	-10 °C to	-10 °C to +60 °C/90 %rh or less (no conder				
	Altitude		Up to 2	2000 m			
Cooling me	thod		Forced air co	oling using fan			
Grounding	polarity	Negative	grounding or po	sitive grounding	possible		
Isolation vo	Itage	± 250	Vmax	± 500 Vmax	± 800 Vmax		
	Isolated analog interface *1		± 60	Vmax			
Withstand	Input-FG	No a	bnormalities at	1500 Vac for 1 m	inute		
voltage	Input-Output	No abnormal	No abnormalities at 2000 Vac for 1 minute				
	Output-FG	for 1 minute		No abnormali- ties at 1600 Vac for 1 minute	No abnormali- ties at 3300 Vac for 1 minute		
	Input-Isolated ana- log interface *1	No a	inute				
	Output-Isolated analog interface *1		es at 2300 Vdc ninute	No abnormali- ties at 2650 Vac for 1 minute	No abnormali- ties at 3300 Vac for 1 minute		
Insulation re	esistance	500 Vdc, 100 MΩ or more(70 % or less)			1000 Vdc, 100 MΩ or more (70 % or less)		
	Output-FG	500 Vdc, 4	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)					
Electromag		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.					

- Option
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 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.
- 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.
- 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.

Compact DC Power Supply (CV/CC)

PMX-A Series













Dimensions

 $107(4.21")W \times 124(4.88")H \times 315(12.40")Dmm(inch)$

Accessories

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

Options

- Connector kit
- OP01-PMX
- Terminal unit(for use with the PMC-A series)
- TU01-PMX
- GPIB Converter

PIA5100

- * Not CE/UKCA certified product
- Sequence creation software SD025-PMX(Wavy for PMX)

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 eXtensions 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.

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 (18 V, 35 V 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.).



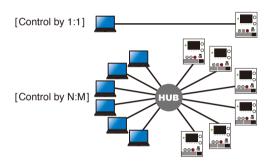
■ Digital, analog and other various external controls are supported. Remote control and monitoring can also be performed from Web browsers!

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

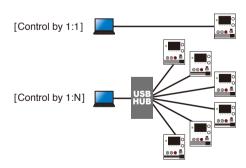
The LAN interface can control the number of devices with high speed, and it's theoretical controllable maximum number is to be calculated by approximately 4.2 billion. (The maximum transmission speed varies by the number of connected devices) In accordance with its applied standard, it is possible to 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

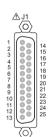
It can be used for communication with PCs and programmable logic controller.



■ 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 curren
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 (% 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 k Ω to outpu 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).*:
12	CC STATUS	On when the PMX series is in CC mode (open-collector output from a photocoupler).*
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 k Ω to 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

	el		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 in	put rating		100 Vac *1, 50 Hz / 60 Hz, single phase								
Input voltage							± 10 %	g.c pec			
Input frequ	iency range						47 Hz to 63 Hz				
Inrush curr	rent (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 (MA	AX) *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
Voltage	Output power		36 W 0 V to 18.90 V	90 W 0 V to 18.90 V	35 W 0 V to 36.75 V	105 W	70 W 0 V to 73.5 V	66 W 0 V to 115.5 V	62.5 W 0 V to 262.5 V	70 W 0 V to 367.5 V	50 W 0 V to 525.0 V
Voltage	Setting range Setting resolution	*4	0 0 10 16.90 0		mV	0 V to 36.75 V	2 mV	0 0 10 115.5 0		mV	0 V to 525.0 V
	Setting resolution	7			IIIV	+ (0.2 %	of setting +0.1 %	of rating)	10	IIIV	
	Line regulation *5		±1 mV	±1 mV	±3 mV	±3 mV	±5 mV	±7 mV	±15 mV	±25 mV	±30 mV
	Load regulation *6	 S	±2 mV	±5 mV	±3 mV	±4 mV	±5 mV	±7 mV	±15 mV	±25 mV	±30 mV
	Transient respons	e *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				orless		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			or less	1	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 compensation vol			0.6	6 V						
	Temperature coef						100 ppm / °C				
Current	Setting range	noicht (111)	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 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	1			
	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 coef	ficient (TYP)					200 ppm / °C				
Display fur											
Voltage display	Maximum display			99.9	9 (fixed decimal			L	999.9 (fixed o	decimal point)	
	Display accuracy	*11					% of reading +2	• .			
Current display	Maximum display Display accuracy	*11					9 (fixed decimal) % of reading +5 of				
Operation	OUTPUT ON / OF				Output on: O	· · · · · · · · · · · · · · · · · · ·	ts in green. Out	• '	I ED turns off		
display	CV operation				Output on. O		LED lights in gre		LLD turns on.		
	CC operation						C LED lights in re				
	Alarm operation				ALARM LE		hen a protection		n activated.		
	Remote operation					REMOTE LED lig	hts in green duri	ng remote contro	l.		
		LAN operation					epending on the l				
			No	fault status: Ligh					• •	status: Blinks gre	en.
	Key lock operation	1		14			in green when th			_	
Protection	Preset memory			V	vnen a preset me	mory entry is be	ing used, the PRE	SETA, B, OF CL	LED lights in gree	n.	
	ge protection	Operation			7	urns the output o	off, displays OVP,	and lights ALAR	M		
(OVP)	ge proteotion	Setting range	1.8 V to 19.8 V	1.8 V to 19.8 V		3.5 V to 38.5 V		11 V to 121.0 V		35 V to 385.0 V	50 V to 550.0 V
		Setting accuracy					± (1 % of rating)				
	nt protection	Operation *12			Т		off, displays OCP,				
(OCP)		Setting range	0.2 A to 2.2 A	0.5 A to 5.5 A	0.1 A to 1.1 A	1	0.100 A to 1.100 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 or				
		Setting range					± (1 % of rating)				
	protection (OHP)	Operation				urns the output o	off, displays OHP,	and lights ALAR	M		
Monitor	Voltage monitor	1					10.00.1/ +0.1.1/				
signal	(VMON)	At a t o V output					10.00 V ±0.1 V 0.00 V ±0.1 V				
output	Current monitor	At rated current output					10.00 V ±0.1 V				
*13, *14	(IMON)	At 0 A output					0.00 V ±0.1 V				
Status	OUTON STATUS					Turns	on when the outp	ut is on			
signal	CV STATUS						on during CV op				
	CC STATUS					Turns	on during CC op	eration			
output						Turns on whe	en an alarm has b	een activated			
	ALM STATUS					Turns on v	when the power is	turned on			
output *14, *15	PWR ON STATUS				0 % to 1	00 % of the rated	d output voltage i	n the range of 0 V			
output *14, *15	PWR ON STATUS	(CV external									
output *14, *15	PWR ON STATUS EXT-V CV CONT voltage control)	(CV external Accuracy		1 % of ratir	ng +10 mV	20.0/			1 % of rating		
output *14, *15 External control	PWR ON STATUS EXT-V CV CONT voltage control) EXT-R CV CONT	(CV external Accuracy (CV external			ng +10 mV 0 % to 10	00 % of the rated	output voltage in	the range of 0 Ω	to 10 kΩ.		
output *14, *15 External control	PWR ON STATUS EXT-V CV CONT voltage control) EXT-R CV CONT resistance control	(CV external Accuracy (CV external) Accuracy			ng +10 mV 0 % to 10 ng +10 mV				to 10 kΩ. 1 % of rating		
output *14, *15 External control	PWR ON STATUS EXT-V CV CONT voltage control) EXT-R CV CONT resistance control EXT-V CC CONT	(CV external Accuracy (CV external) Accuracy (CV external		1 % of ratir	ng +10 mV 0 % to 10 ng +10 mV 0 % to 1		output voltage in		to 10 kΩ. 1 % of rating to 10 V.		
output *14, *15 External control	PWR ON STATUS EXT-V CV CONT voltage control) EXT-R CV CONT resistance control EXT-V CC CONT voltage control)	(CV external Accuracy (CV external) Accuracy (CV external Accuracy		1 % of ratir	ng +10 mV 0 % to 10 ng +10 mV 0 % to 2 ng +5 mV	00 % of the rate	d output current in	n the range of 0 V	to 10 kΩ. 1 % of rating 1 to 10 V. 1 % of rating		
output *14, *15 External control	PWR ON STATUS EXT-V CV CONT voltage control) EXT-R CV CONT resistance control EXT-V CC CONT voltage control) EXT-R CC CONT	(CV external Accuracy (CV external) Accuracy (CV external Accuracy (CV external		1 % of ratin	ng +10 mV 0 % to 10 ng +10 mV 0 % to 10 ng +5 mV	00 % of the rate		n the range of 0 V	to 10 kΩ. 1 % of rating 1 to 10 V. 1 % of rating to 10 kΩ.		
output *14, *15 External control	PWR ON STATUS EXT-V CV CONT voltage control) EXT-R CV CONT resistance control EXT-V CC CONT voltage control)	(CV external Accuracy (CV external) Accuracy (CV external Accuracy (CV external) Accuracy		1 % of ratir	ng +10 mV 0 % to 10 ng +10 mV 0 % to 10 ng +5 mV	00 % of the rated	d output current in	the range of 0 V the range of 0 Ω	to 10 kΩ. 1 % of rating 1 to 10 V. 1 % of rating		

PMX-A Series Specifications

Item/Model		PMX18-2A	PMX18-5A	PMX35-1A	PMX35-3A	PMX70-1A	PMX110-0.6	PMX250-0.25A PMX350-0.2A PMX500-
Other features								
Preset memory	/			Save up	to 3 combination	ns of the voltage	and current set	ting 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	Software protocol				IE	EE Std 488.2-19	992	
specifications	Command language				Complies w	ith SCPI Specific	cation 1999.0	
RS232C	Hardware		Baud		h the EIA232D sp fixed, Data length			ector (male) *17 it: 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				I). Standard Type B socket	
	Program message terminator		LF or EOM during reception, LF + EOM during transmission					nission
	Device class			Compl	ies with the USB	TMC-USB488 de	evice class spec	cifications
LAN	Hardware		IEEE 802	.3 100Base-TX /	10Base-T Ethern	et Complies with	LXI Device Co	re Specification 2011 Rev 1.4
					IPv4	, RJ-45 connect	or *18	
	Communication protocol				VXI-11	, HiSLIP, or SCI	PI-RAW	
	Program message terminator				SLIP: LF or END PI-RAW: LF duri			ing transmission ssion
General specifi	ications							
Weight (main u	nit only)	Approximately Ap						
Dimensions (m	m(inch))(maximum dimensions)	107 (4.21") W×124 (4.88")(150 (5.91")) H×315 (12.40")(355 (13.98")) Dmm						
Environmental	Operating environment				Indoor us	se, overvoltage	category II	
conditions	Operating temperature / Operating humidity			0 °C to +4	10 °C / 20 %rh to	85 %rh (no cond	ensation) (32 °I	to +104 °F)
	Storage temperature / Storage humidity			−25 °C to	+70 °C / 90 %rh	or less (no cond	ensation) (-13 °I	to +158 °F)
	Altitude	Up to 2000 m						
Cooling method	d				Force	ed air cooling us	ing fan	
Grounding pola	arity				Negative ground	ing or positive g	rounding possib	ole
Isolation voltag	je		±70	Vdc				±550 Vdc
Withstand	Between input and FG				No abnorma	lities at 1500 Va	c for 1 minute	
voltage	Between input and output				No abnorma	lities at 2100 Va	c for 1 minute	
	Between output and FG	No a	bnormalities at	1600 Vac for 1 mi	nute		No abnorr	nalities at 2000 Vac for 1 minute
Insulation	Between input and FG							
resistance	Between input and output		500 Vdc, 30	MΩ or more			10	000 Vdc, 30 MΩ or more
	Between output and FG							
Safety *19					with the requiren Directive 2014/35/			nd standard. ollution degree 2)
Electromagneti	ic compatibility *19	EM	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 (App	roximately 2.5 m		copy. Quick refer		e:1 copy, English: 1 copy, Chinese: 1 copy.

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 val-
- 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.

- 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).
- With the rated load.
- 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.
- 100 Vac to 90 Vac or 100 Vac to 110 Vac, rated load.
- 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.
- The amount of time required for the output voltage to return to a value within "rated output voltage $\pm (0.05~\% + 10 \text{mV})."$ When the load current is changed from 10 % to 100 % of the rated output current When the measurement frequency bandwidth is 5 Hz to 1 MHz.
- The time it takes for the output voltage to rise from 10 % to 90 % of the rating when the output is turned
- *10. The time it takes for the output voltage to fall from 90 % to 10 % of the rating when the output is turned
- *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/UKCA 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 of material or inspection/analysis purpose.

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

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)/13 kg(28.66 lbs)

Accessories

Power cord, Output terminal cover set, Packing list, Safety information, CD-ROM

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%

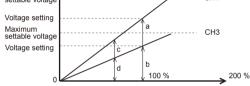
Example: Here we will use TRACKING 2 on CH1 and CH2 of a PMX32-2QU.

When you turn the rotary knob during tracking operation, the outputs change at the same percentage as the preset output percentage (b/a).

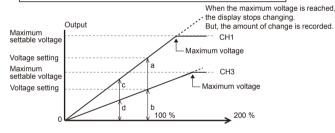
b/a = d/c

This proportional expression is satisfied.



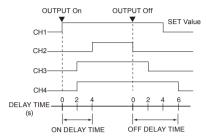


Example when the voltage is changed above the maximum settable output



■ 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

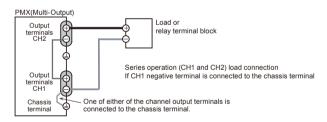
* The actual rise/fall time with output off will vary depending on the output and load conditions. Note that the timing chart above ignores rise and fall time. There are cases where the actual delay time varies by a few tens of milliseconds even when the delay time is set to 0 seconds.

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

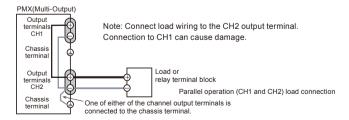
CH1 and CH2 can be connected in series to increase the overall voltage output range. CH2 operates as master and CH1 as slave. The total output voltage will be the sum of CH1 and CH2.



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

Item/Mod	el		PMX32-3DU	PMX32-3TR	PMX32-2QU			
AC input			00414					
Nominal in			234 Vac	*1, 50 Hz/ 60 Hz, sing	gle phase			
Input volta				± 10 %				
	ency range			47 Hz to 63 Hz				
	rent (MAX)	*2	150 A	150 A	150 A			
Power (MA	AX)		700 VA	900 VA	800 VA			
Output								
Rating	Output voltage	CH1	32.000 V	32.000 V	32.000 V			
	Voltage	CH2	32.000 V	32.000 V	32.000 V			
		CH3		6.000 V	18.000 V			
		CH4			18.000 V			
	Output	CH1	3.000 A	3.000 A	2.000 A			
	Current	CH2	3.000 A	3.000 A	2.000 A			
		CH3		5.000 A	2.500 A			
		CH4			2.500 A			
Constant	Maximum	CH1	33.600 V	33.600 V	33.600 V			
voltage	voltage setting	CH2	33.600 V	33.600 V	33.600 V			
	- 59	CH3	_	6.300 V	18.900 V			
		CH4	_	_	18.900 V			
	Resolution			1 mV				
	Voltage se accuracy *			±(0.03 % set +5 mV)				
	Input line	CH1	3 mV	3 mV	3 mV			
	regulation	CH2	3 mV	3 mV	3 mV			
	*4	CH3	_	1 mV	1 mV			
		CH4	_	_	1 mV			
	Load	CH1	4 mV	4 mV	2 mV			
	regulation *5	CH2	4 mV	4 mV	2 mV			
		CH3	_	5 mV	3 mV			
		CH4	_	_	3 mV			
	Transient r	esponse	50 µs					
	Ripple noise (rms)		500 μV					
	Command	delay		80 ms				
	Rise time (at rated load) *8			10 ms ±30 %				
	Fall time	CH1	350 ms ±30 %	350 ms ±30 %	350 ms ±30 %			
	(at no	CH2	350 ms ±30 %	350 ms ±30 %	350 ms ±30 %			
	load) *9	СНЗ	_	220 ms ±30 %	240 ms ±30 %			
		CH4	_	_	240 ms ±30 %			
	Temperatu			100 ppm/ °C				
Constant	Maximum	CH1	3.150 A	3.150 A	2.100 A			
current	current	CH2	3.150 A	3.150 A	2.100 A			
	setting	СНЗ	_	5.250 A	2.625 A			
		CH4	_	_	2.625 A			
	Resolution			0.1 mA				
	Current se accuracy *		±(0.3 % set +0.1 % rating)					
	Input line r			0.01 % + 0.25 mA				
	Load regul	ation *10		5 mA				
	Ripple	CH1	1 mA	1 mA	1 mA			
	noise	CH2	1 mA	1 mA	1 mA			
	(rms) *7	CH3		2 mA	1 mA			
		CH4		_	1 mA			
	Temperatu				. 110 (
		t (TYP)		200 ppm/ °C				

- *1. 100 Vac, 117 Vac, 200 Vac, and 217 Vac are factory options. (Not CE/UKCA certified product.)
- 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).
- At an ambient temperature of 23 °C±5 °C.
- 90 % to 100 % or 100 % to 110 % of the nominal input voltage rating, rated load.
- 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.
- 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.
- When the measurement frequency bandwidth is 5 Hz to 1 MHz.
- The time for the output voltage to rise from 10 % to 90 % of the rating when the output is turned on.
- 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, whichever is higher, to the rated voltage at rated output current.

Item/Mod	el	PMX32-3DU	PMX32-3TR	PMX32-2QU			
Interface	Oeftwarenesta	IEEE 014 400 C 400	2				
common specifi-	Software protocol	IEEE Std 488.2-199	2				
cations	Command language	Complies with SCPI	Specification 199	0.0			
RS232C	Hardware	Complies with the E terminal block) D-si Baudrate: 1200, 240 115200 bps Data length: 8 bits, \$ control: No	ub 9-pin terminal l 00, 4800, 9600, 19	block (male) 0200, 38400, 57600			
	Program message terminator	LF during reception,	, LF during transm	ission.			
USB	Hardware	Standard type B soc specifications; data					
	Program message terminator	LF or EOM during reception, LF + EOM during transmission.					
	Device class	Complies with the U specifications.	SBTMC-USB488	device class			
LAN	Hardware	IEEE 802.3 100Bas IPv4, RJ-45 termina		hernet,			
	Compliant standards	LXI Device Specification Function Rev. 1.0, L					
	Communication protocol	VXI-11, HISLIP, SCF	PI-RAW, SCPI-Tel	net			
	Message terminator	VXI-11, HiSLIP: LF or END during reception, LF + END during transmission. SCPI-RAW: LF during reception, LF during transmission.					
General s	pecifications						
Environ- mental	Operating temperature range	0 °C to 40 °C (32 °F	to 104 °F)				
iana I	Operating humidity range	20 %rh to 85 %rh (n	o condensation)				
	Storage temperature range	-25°C to 70°C (13°F to 158°F)					
	Storage humidity range	90 %rh or less (no c					
	Installation location	Indoor use, altitude of up to 2 000 m, overvoltage category					
Isolation	Between channels	±70 Vdc					
voltage	Between the output and chassis	±70 Vdc					
With- standing	Between the primary circuit and chassis	No abnormalities at	1500 Vac for 1 mi	nute.			
voltage	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 mi	nute.			
Insula- tion	Between the primary circuit and chassis						
resis- tance	Between the primary and secondary circuits	500 Vdc, 30 MΩ or g	greater				
	Between the secondary circuit and chassis						
	Between channels						
Cooling m	ethod	Forced air cooling u					
Common		All channels are ind	•				
Grounding		Negative grounding					
Electroma *12	gnetic compatibility *11	Complies with the reand standards. EMC Directive 2014 55011(Class A*13, G EN 61000-3-3 Applicable under the length of all cabling must be less than 3	4/30/EU, EN 6132 Group 1*14), EN 67 e following conditi and wiring connec	6-1(Class A*13), El 1000-3-2, ons. The maximum			
Safety *11		Complies with the re and standards. Low EN 61010-1(Class I*	equirements of the Voltage Directive	2014/35/EU*12,			

- *11. Does not apply to specially ordered or modified products.
- *12. Limited to products that have the CE mark/UKCA mark on their panels.
- *13. 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.
- *14. 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.
- *15. 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.
- *16. 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 nonconductive pollution will occur except for an occasional temporary conductivity caused by

Programmable Bipolar Power Supply (CV/CC)

PBZ Series





Dimensions / Weight

 $429.5(16.91")W \times 128(5.0")H \times 550(21.65")Dmm / 22 kg(48.5 lbs)$

Accessories

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

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.) Sine wave, half-cycle (positive pole) Sine wave, half-cycle (negative pole) Sine wave, half-wave rectification (negative polarity) Exponential function (falling) Sine wave, half-wave rectification (positive polarity) Triangular wave Second order step response (damping coefficient 0.2) Second order step response (damping coefficient 0.1)

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 100 kHz (CV)

■ 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)

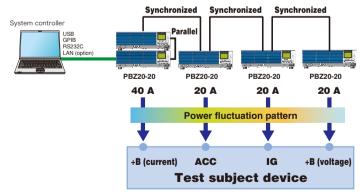
4 mVrms, Noise 30 mVp-p (PBZ80-5)

■ Synchronized operation function

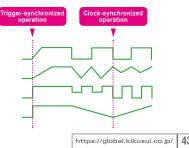
(Trigger synchronized, Clock synchronization)

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 clocksynchronized operation



Functions

■ Sequence function

The basic sine, triangular and square waveforms, as well as the 16 userdefined 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.

Bipolar mode (quadrant 4) Unipolar mode (quadrant 2) Quadrant 2 Quadrant 1 Quadrant 2 Quadrant 1 0 Quadrant 3 Quadrant 4

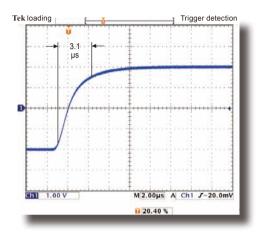
■ Parallel operation function

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 ■ Sequence creation software SD022-PBZ (Wavy for PBZ)

PBZ Series Specifications

AC input	t, rated output	PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5		
AC	Nominal input voltage	100 V to 240 V AC, 50/60 Hz					
input	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 Apea	k or less			
	Power	900 VA or less (at rated load)					
	Power factor	0.95 (at input voltage 100 V, rated load) (TYP)					
Rated	Output power	400) W	402 W	400 W		
output	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 perm	itted at COM ter	minal only		

Constant	t voltage	(CV mode)	PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5			
DC voltage	Set- ting	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			
	range *1	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 % o	f rating				
	Setting	resolution		0.001 V (Fine function setting resolution 0.0001 V) resolution 0.0001 V) resolution 0.0002 V)					
	Setting	accuracy *2	±(0	0.05 % of setting	+ 0.05 % of ration	ng)			
	Temp.	coefficient		±(100 ppm/°C	of rating) (TYP)				
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	Setting	range	0.01 Hz to 100.00 kHz						
frequen-	Setting	resolution	0.01 Hz						
су	Setting	accuracy	±200 ppm						
	Sweep		Linear, log						
	Sweep	time	100 μs to 1000 s (resolution 100 μs)						
AC wave-	Туре		Sine wave, square wave, triangular wave, user-defined waves (16 waves)						
form	Start p	hase	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)						
Con- stant	Freque charac	ency teristic *4	DC to 100 kHz (TYP)						
voltage	Respo	nse *5, *6	3	3.5 µs, 10 µs, 35	μs, 100 μs (TYP	')			
charac- teristic	Oversh	noot		5 % or le	ss (TYP)				
toriotio		(p-p) *7	20 mV	(TYP)	30 mV	(TYP)			
	Noise	(rms) *8	2 mV (TYP)		4 mV (TYP)				
	Load e	ffect *9		±(0.005 % of s	setting + 1 mV)				
	Source	e effect *10		±(0.005 % of s	setting + 1 mV)				

- The peak value of the sum of the DC voltage and AC voltage is limited by the DC voltage's settable range.
- At an ambient temperature between 18 °C and 28 °C.
- At an ambient temperature between 18 °C and 28 °C, with a 1 kHz sine wave, 3.5 μs response, and no load.
- 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).
- 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)
- 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.
- The measurement frequency bandwidth is 10 Hz to 20 MHz (at the output terminals)
- The measurement frequency bandwidth is 10 Hz to 1 MHz (at the output terminals).
- 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).
- *11. The peak value of the sum of the DC current and AC current is limited by the DC current's settable range.
- *12. At an ambient temperature between 18 °C and 28 °C.
- *13. At an ambient temperature between 18 °C and 28 °C, with a 100 Hz sine wave, 35 µs response,
- *14. 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 $\mu s,$ and a rated load is connected). The frequency response changes according to the load impedance. When the load impedance increases, the frequency response decreases.
- *15. 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.
- *16. 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. *17. 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).

Constant	current	(CC mode)	PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5	
DC current			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	
		Fine function		±5 % o	f rating		
	Setting	resolution	0.001 A	Fine function se	tting resolution 0).0001 A)	
	Setting	accuracy *12		±(0.3 %	of rating)		
	Temp. c	coefficient		±(100 ppm/°C o	of rating) (TYP)		
AC current	Setting	range *11	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		0.0	1 A		
	Setting	accuracy *13		±0.5 %	of rating		
AC	Setting	range	0.01 Hz to 100.00 kHz				
frequen-	Setting	resolution	0.01 Hz				
су	Setting	accuracy	±200 ppm				
	Sweep		Linear, log				
	Sweep	time	100 μs to 1000 s (resolution 100 μs)				
AC wave-	Туре		Sine wave, square wave, triangular wave, user-defined waves (16 waves)				
form	Start ph	nase	0 ° to 359 °				
	Square	wave duty		% (f < 100 Hz), 1 % (1 kHz ≤ f < 10			
Con- stant	Frequei charact	ncy eristic *14	DC to 10 kHz (TYP)	DC to 5 kHz (TYP)	DC to 10 l	(Hz (TYP)	
current	Respon	se *15, *16	35 µs (TYP)	70 μs (TYP)	35 µs	(TYP)	
charac- teristic	Oversh	oot		5 % or le	ss (TYP)		
toriotio	Ripple	noise (rms) *17		3 mA	(TYP)		
	Load ef	fect *18		±(0.01 % of se	etting + 1 mA)		
	Source	effect *19		±(0.01 % of se	etting + 1 mA)		

General:	specifications	PBZ20-20	PBZ40-10	PBZ60-6.7	PBZ80-5			
Environ-	Operating environment	I	ndoor use, over	oltage category	II			
ment	Operating temp./ humidity range	0 to +40 $^{\circ}\text{C}$ / 20 to 85 % RH (no condensation)						
	Storage temp./ humidity range	-25 to +	-25 to +70 °C / Max. 90 % RH (no condensation)					
Groundir	ng polarity	Only th	e output COM te	rminal can be gr	ounded.			
Voltage t	o ground		DC 500	V Max.				
With- stand	Between primary side and chassis	150						
voltage	Between primary side and output terminal	1500 V AC, no abnormalities at 1 minute						
	Between primary side and chassis	500 V DC	500 V D Q 00					
sistance	Between primary side and output terminal	500 V DC, 30 MΩ or more (at humidity 70 % RH or less)						
	Between output termi- nal and chassis	$500V$ DC, 1 $M\Omega$ or less (at humidity 70 % RH or less)						
Ground continu-ity	Between power cord connector, grounding pin <-> chassis	25 A AC, 0.1 Ω or less						
Cooling r	method	Forced air cooli	ng by a tempera	ture-sensitive va	riable-speed fan			
Safety *2	20	Complies with the requirements of the following directive and standard. Low Voltage Directive 2014/35/EU [EN 61010-1 (Class I *21, Pollution degree 2)						
	Electromagnetic compatibility EMC) *20 Complies with the requirements of the following directive an standard. EMC Directive 2014/30/EU EN 61326-1 (Class A *22), EN 55011 (Class A *22, 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 PBZ Series must be less than 3 m.							

- *18. The change in the output current in response to a change in the output voltage from 10 % to 100 % of the voltage rating.
- *19. 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).
- 20. Cannot be used for special-order or modified products.
- *21. 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.
- *22. 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.
- *23. 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





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) / 22 kg(48.5 lbs)

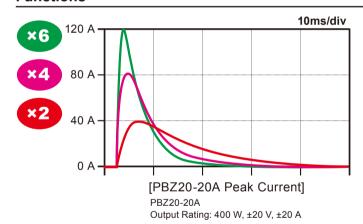
Accessories

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

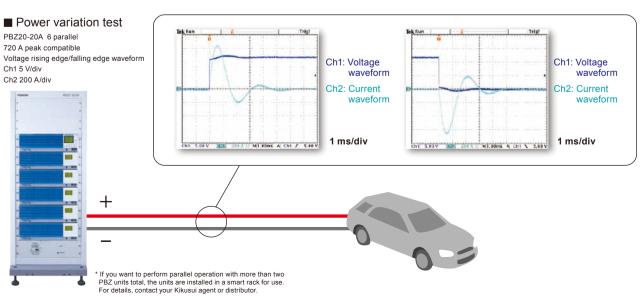
Features

- 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



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 required 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 modernday automotive testing.



PBZ20-20A Series Specifications

AC Inpu	t					
Nomina	l input ra	iting	100 Vac to 240 Vac, 50 Hz to 60 Hz			
Input vo	Itage rar	nge	90 Vac to 250 Vac			
Input fre	quency	range	47 Hz to 63 Hz			
Current			10 Aac or less (when connected to a rated load)			
Inrush c	urrent *1		40 Apeak or less			
Power			900 VA or less (when connected to a rated load)			
Power fa	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 C	utput					
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)			
	Isolatio	n voltage	500 Vdc			

- 1 ms or more
- Leakage current flowing through the protective conductor terminal
- 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.
- Only the output's COM terminal can be grounded.

CV Mode (Juipui						
DC	Settable Bipolar mode		0.000 V to ±21.000 V				
voltage	range *1	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)				
	Temperatu	re coefficient	±100 ppm/°C of rtg (TYP)				
AC	Settable ra		0.00 Vpp to 42.00 Vpp				
voltage	Resolution		0.01 V				
	Accuracy *		±0.5 % of rtg				
AC	Settable range		0.01 Hz to 200.00 kHz				
frequency			0.01 Hz				
	Resolution Accuracy		±200 ppm				
	Sweep		Linear and logarithmic				
	Sweep tim		100 µs to 1000 s (resolution of 100 µs)				
A.C.		e					
AC waveform	Туре		Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms				
	Start phas		0 ° to 359 °				
	Square wa	ive duty cycle	0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz \leq f < 1 kHz), 10 % to 90 % (1 kHz \leq f < 10 kHz), and fixed to 50 % (10 kHz $<$ 1				
Constant	Frequency	response *4	DC to 150 kHz (TYP)				
voltage character-	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				
istics	Overshoot		5 % or less (TYP)				
	Ripple	(p-p) *7	20 mV (TYP)				
	noise	(rms) *8	2 mV (TYP)				
	Load effect *9		±(0.005 % of setting + 1 mV)				
	Source eff	ect *10	±(0.005 % of setting + 1 mV)				
CC Mode (,				
DC current	Settable 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 *		±0.3 % of rtg				
			·				
	Temperature coefficient						
AC.	<u> </u>		±100 ppm/°C of rtg (TYP)				
	Settable ra	ange *11	0.00 App to 42.00 App				
	Settable ra	ange *11	0.00 App to 42.00 App 0.01 A				
current	Settable ra Resolution Accuracy *	ange *11 1 12	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg				
AC	Settable ra Resolution Accuracy * Settable ra	ange *11 1 12 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz				
AC	Settable ra Resolution Accuracy * Settable ra Resolution	ange *11 1 12 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz				
AC	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy	ange *11 1 12 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm				
AC	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep	ange *11 1 12 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic				
AC frequency	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim	ange *11 1 12 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 μs to 1000 s (resolution of 100 μs)				
AC frequency	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim Type	ange *11 112 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 μs to 1000 s (resolution of 100 μs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms				
AC frequency	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim	ange *11 112 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 μs to 1000 s (resolution of 100 μs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0 ° to 359 °				
AC frequency	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim Type Start phas	ange *11 112 ange	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 µs to 1000 s (resolution of 100 µs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0 ° to 359 ° 0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz),				
AC AC waveform	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim Type Start phas Square wa	ange *11 112 ange e	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 µs to 1000 s (resolution of 100 µs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0 ° to 359 ° 0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz),				
AC AC waveform Constant current character-	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim Type Start phas Square wa	e e eve duty cycle	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 µs to 1000 s (resolution of 100 µs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0 ° to 359 ° 0.1% to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz), 10 % to 90 % (10 kHz < f < 10 kHz), and fixed to 50 % (10 kHz < f < 10 kHz), and fixed to 50 % (10 kHz < f < 10 kHz).				
AC frequency AC waveform Constant current character-	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim Type Start phas Square wa	e e evve duty cycle response *13	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 μs to 1000 s (resolution of 100 μs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0° to 359° 0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz), 10 % to 99.9 % (11 kHz ≤ f < 10 kHz), and fixed to 50 % (10 kHz < 10 to 15 kHz (TYP) 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				
AC current AC frequency AC waveform Constant current character-istics	Settable ra Resolution Accuracy ** Settable ra Resolution Accuracy Sweep Sweep tim Type Start phas Square wa Frequency Response	e e evve duty cycle response *13	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 μs to 1000 s (resolution of 100 μs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0 ° to 359 ° 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 < 1 CTYP) Ct to 15 kHz (TYP) 23 μs (TYP)/ 35 μs max, 67 μs (TYP)/ 100 μs max,				
AC frequency AC waveform Constant current character-	Settable ra Resolution Accuracy * Settable ra Resolution Accuracy Sweep Sweep tim Type Start phas Square wa Frequency Response Overshoot Ripple	e e eve duty cycle response *13 *14 *15 (rms) *16	0.00 App to 42.00 App 0.01 A ±0.5 % of rtg 0.01 Hz to 200.00 kHz 0.01 Hz to 200.00 kHz 0.01 Hz ±200 ppm Linear and logarithmic 100 µs to 1000 s (resolution of 100 µs) Sine wave, square wave, triangle wave, and 16 user-defined arbitrary waveforms 0 ° to 359 ° 0.1 % to 99.9 % (f < 100 Hz), 1 % to 99 % (100 Hz ≤ f < 1 kHz), 10 % to 99 % (11 kHz ≤ f < 10 kHz), and fixed to 50 % (10 kHz < 1 to 15 kHz (TYP) 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 5 % or less (TYP)				

Interface		
RS232C	cable (null modem cable	A232D specifications. D-SUB 9-pin connector (male) *Use a cross able). Baud rate: 1200, 2400, 4800, 9600, 19200, and 38400 bps *8 bits. Stop bit: 1 bit or 2 bits. Parity bit: None. or none.
GPIB	Complies with IEEE SH1, AH1, T6, L4, SI	Std 488.1-1987 R1, RL1, PP0, DC1, DT1, C0, and E1. 24-pin connector (receptacle)
USB	Complies with the U	SB 2.0 specifications. Data rate: 12 Mbps(full speed). Socket B type
LAN (factory option)		e-TX/10Base-T Ethernet. Complies with the LXI 1.4 Core 2011 or *Category 5; use a straight cable.
General		
Environ-	Operating environment	Indoor use, overvoltage category II
mental	Operating temperature	0 °C to +40 °C (+32 °F to +104 °F)
conditions	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 po	olarity	Only the output's COM terminal can be grounded.
Isolation volt	age	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	No autormanues at 1500 vac for 1 minute
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	300 vac, 30 was or greater (at 70 /mm numbers)
	Across the output terminals and chassis	500 Vdc, 1 M Ω 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 meth	nod	Forced air cooling using variable-speed, heat-sensitive fan
Safety *19		Complies with the requirements of the following standards. Low Voltage Directive 2014/35/EU EN 61010-1 (Class I*20, Pollution degree 2*21)
Electromagn (EMC) *19	etic compatibility	Complies with the requirements of the following standard. EMC Directive 2014/30/EU, EN 61326-1 (Class A*22), EN 55011 (Class A*21, Group 1*23), 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. The peak value of the sum of the DC voltage and AC voltage is limited by the DC voltage's settable
- At an ambient temperature between 18 °C and 28 °C.
- At an ambient temperature between 18 °C and 28 °C, with a 1 kHz sine wave, 3.5 µs response, and
- 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). The rise or fall time (at rated load; excluding when output is turned on and off). The frequency re-
- sponse is based on the specified response setting (frequency bandwidth = 0.35/the rise time)
- 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 $0\,\mathrm{V}$. The measurement frequency bandwidth is 10 Hz to 20 MHz (at the output terminals).
- The measurement frequency bandwidth is 10 Hz to 1 MHz (at the output terminals).
- 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).
- *11. The peak value of the sum of the DC current and AC current is limited by the DC current's settable range. *12. At an ambient temperature between 18 °C and 28 °C, with a 100 Hz sine wave, 35 µs response, and shorted output.
- *13. 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.
- *14. 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.
- *15. 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.

 *16. 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).
- *17. The change in the output current in response to a change in the output voltage from 10 % to 100 % of the voltage rating. *18. 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).

 *19. Does not apply to specially made or modified PBZs.
- *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. Pollution is addition of foreign matter (solid, liquid or gaseous) that may produce a reduction of dielec-
- tric strength or surface resistivity. Pollution Degree 2 assumes that only non-conductive pollution will occur except for an occasional temporary conductivity caused by condensation.
- *22. 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
- *23. 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 of material or inspection/analysis purpose

High Power Intelligent Bipolar Power Supply (CV/CC)

PBZ SR Series





Dimensions / Weight

Three parallel:

 $432.6(17.03")W \times 579.4(22.81")H \times 700(27.56")Dmm(inch)/110 kg(242.5 lbs)$ Four parallel:

 $432.6(17.03")W \times 712.1(28.04")H \times 700(27.56")Dmm(inch)/130 kg(286.6 lbs)$ Five parallel:

 $432.6(17.03")W \times 844.8(33.26")H \times 700(27.56")Dmm(inch)/160 kg(352.7 lbs)$

Accessories

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

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 $\pm 100~\text{A}$) 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.

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

•										
	Ou	tput	Ripple • N	loise	Line Regulation		Load Regulation		Input (AC)	
Model	CV	CC	CV	CC	CV	СС	CV	CC	nominal voltage	Current
	V	Α	rms/p-p	rms	mV	mA	mV	mA	V	А
PBZ20-60 SR	±20	±60	3 mV/30 mV(TYP)							
PBZ40-30 SR	±40	±30	6 mV/30 mV(TYP)	5 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240,	15 A (max)
PBZ60-20.1 SR	±60	±20.1	6 mV/40 mV(TYP)	(TYP)	10.005 %+1	±0.01 %+1	10.005 %+1	±0.01 %+1	single phase	15 A (IIIax)
PBZ80-15 SR	±80	±15	6 mv/40 mv(1 fP)						6+1 l	

Four parallel type

	Ou	tput	Ripple • Noise		Line Regulation		Load Regulation		Input (AC)	
Model	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	A	rms/p-p	rms	mV	mA	mV	mA	V	Α
PBZ20-80 SR	±20	±80	3 mV/30 mV(TYP)							
PBZ40-40 SR	±40	±40	6 mV/30 mV(TYP)	5 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240,	20 A (max)
PBZ60-26.8 SR	±60	±26.8	6 mV/40 mV(TYP)	(TYP)	10.005 %+1	±0.01 %+1	10.005 %+1	±0.01 %+1	single phase	20 A (IIIax)
PBZ80-20 SR	±80	±20	0 IIIV/40 IIIV(1 1 F)							

Five parallel type

	Ou	tput	Ripple • Noise		Line Regulation		Load Regulation		Input (AC)	
Model	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	A	rms/p-p	rms	mV	mA	mV	mA	V	Α
PBZ20-100 SR	±20	±100	3 mV/30 mV(TYP)							
PBZ40-50 SR	±40	±50	6 mV/30 mV(TYP)	5 mA	±0.005 %+1	±0.01 %+1	.0.005.0/ .4	±0.01 %+1	200 to 240, single phase	25 A (max)
PBZ60-33.5 SR	±60	±33.5	6 mV/40 mV(TYP)	(TYP)			±0.005 %+1	±0.01 %+1		
PBZ80-25 SR	±80	±25	6 mv/40 mv(1 fP)							

High Power Intelligent Bipolar Power Supply (CV/CC)

Series





Dimensions / Weight

570(22.44")W × 1350(53.15")H × 950(37.40")Dmm(inch)/ 265 kg (584.2 lbs) Six parallel: **Seven parallel:** 570(22.44")W × 1350(53.15")H × 950(37.40")Dmm(inch)/ 290 kg (639.3 lbs) **Eight parallel:** 570(22.44")W × 1350(53.15")H × 950(37.40")Dmm(inch)/ 310 kg (683.4 lbs) Nine parallel: $570(22.44'')W \times 1750(68.90'')H \times 950(37.40'')Dmm(inch)/350 kg (771.6 lbs)$ **Ten parallel:** $570(22.44")W \times 1750(68.90")H \times 950(37.40")Dmm(inch)/370 kg (815.7 lbs)$

Accessories

J1 connector kit (Socket: 1 pc., Protection cover: 2 sets, Pin: 30 pcs.), OUT-PUT2 sensing cables, Heavy object warning label, CD-ROM, Setup guide, Quick reference (Japanese/English), Safety information, China RoHS sheet

Options

■ AC power cord AC14-3P3M-M5C

High-speed response with even higher power

The PBZ BP 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 ± 200 A) and is assembled with rack system (bipolar pack). 4-quadrant operation 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.

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)
- 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)
- 80 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.

Six parallel type

	Ou	tput	Ripple • Noise		Line regulation		Load re	gulation	Input (AC)	
Model	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	Α	rms / p-p	rms	mV	mA	mV	mA	V	A
PBZ20-120 BP	± 20	± 120	6 mV / 50 mV (TYP)	10 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240,	20 (may)
PBZ40-60 BP	± 40	± 60	12 mV / 50 mV (TYP)	(TYP)	±0.005 %+1	±0.01%+1	±0.005 %+1	±0.01 %+1	single phase	30 (max)

Seven parallel type

	Ou	tput	Ripple • Noise		Line regulation		Load regulation		Input (AC)	
Model	CV	CC	CV CC		CV	CC	CV	CC	nominal voltage	Current
	V	A	rms / p-p	rms	mV	mA	mV	mA	V	A
PBZ20-140 BP	± 20	± 140	6 mV / 50 mV (TYP)	10 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240,	35 (max)
PBZ40-70 BP	± 40	± 70	12 mV / 50 mV (TYP)	(TYP)	10.005 %+1	±0.01 %+1	10.005 %+1	±0.01 %+1	single phase	35 (IIIax)

Eight parallel type

	Output		Ripple • Noise		Line regulation		Load regulation		Input (AC)	
Model	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	Α	rms / p-p	rms	mV	mA	mV	mA	V	Α
PBZ20-160 BP	± 20	± 160	6 mV / 50 mV (TYP)	10 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240,	40 (max)
PBZ40-80 BP	± 40	± 80	12 mV / 50 mV (TYP)	(TYP)	±0.005 %+1	±0.01%+1	±0.005 %+1	±0.01%+1	single phase	40 (max)

Nine parallel type

	Output		Ripple • Noise		Line regulation		Load regulation		Input (AC)	
Model	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	Α	rms / p-p	rms	mV	mA	mV	mA	V	Α
PBZ20-180 BP	± 20	± 180	6 mV / 50 mV (TYP)	10 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200 to 240,	45 (max)
PBZ40-90 BP	± 40	± 90	12 mV / 50 mV (TYP)	(TYP)	±0.005 %+1	±0.01%+1	±0.005 %+1	±0.01 %+1	single phase	45 (max)

Ten parallel type

	Output		Ripple • Noise		Line regulation		Load regulation		Input (AC)	
Model	CV	CC	CV	CC	CV	CC	CV	CC	nominal voltage	Current
	V	A	rms / p-p	rms	mV	mA	mV	mA	V	Α
PBZ20-200 BP	± 20	± 200	6 mV / 50 mV (TYP)	10 mA	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	200,	50 (max)
PBZ40-100 BP	± 40	± 100	12 mV / 50 mV (TYP)	(TYP)	±0.005 %+1	±0.01 %+1	±0.005 %+1	±0.01 %+1	single phase	50 (max)

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

CR-WEA/WEA2 Series





Dimensions

PCR1000WEA: $430(16.93")W \times 129.2(5.09")H \times 674(26.54")Dmm(inch)$ PCR2000WEA: 430(16.93")W × 129.2(5.09")H × 674(26.54")Dmm(inch) PCR3000WEA2: 430(16.93")W × 129.2(5.09")H × 674(26.54")Dmm(inch) 430(16.93")W × 262(10.32")H × 563(22.17")Dmm(inch) PCR6000WEA2R: PCR6000WEA2: $430(16.93")W \times 262(10.32")H \times 563(22.17")Dmm(inch)$ PCR12000WEA2R: 430(16.93")W × 389(15.32")H × 563(22.17")Dmm(inch) PCR12000WEA2: $430(16.93")W \times 389(15.32")H \times 563(22.17")Dmm(inch)$ **PCR18000WEA2R:** 430(16.93")W × 690(27.17")H × 563(22.17")Dmm(inch) PCR18000WEA2: 430(16.93")W × 690(27.17")H × 563(22.17")Dmm(inch) **PCR24000WEA2R:** 430(16.93")W × 690(27.17")H × 563(22.17")Dmm(inch) PCR24000WEA2: $430(16.93")W \times 690(27.17")H \times 563(22.17")Dmm(inch)$ **PCR30000WEA2R:** 430(16.93")W × 944(37.17")H × 563(22.17")Dmm(inch) PCR30000WEA2: $430(16.93")W \times 944(37.17")H \times 563(22.17")Dmm(inch)$ **PCR36000WEA2R:** 430(16.93")W × 944(37.17")H × 563(22.17")Dmm(inch) PCR36000WEA2: 430(16.93")W × 944(37.17")H × 563(22.17")Dmm(inch)

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 poweredup our products in key areas including output voltage and transient response/response speed to meet our customers' wishes. Ideal for automotive, aerospace, and anechoic chamber testing.

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

Accessories

Cable tie, External control (DIGITAL I/O) connector, Heavy object warning label, Setup guide, Quick reference, CD-ROM, Safety information, China RoHS sheet

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

INOTICE1 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 of chemistry and physics

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.







power outage

voltage increase(pop)

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%.

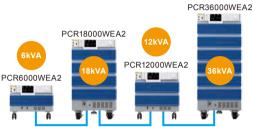
Approx. 120 kg Approx. 43 kg PCR6000W2 Weight Approx. 78% Efficiency PCR6000WEA2

■ Parallel operation function

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

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





Parallel operation cable (option)

72 kVA

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 200 V/400 V input), PCR12000WEA2R (3P3W 400 V input))

AC14-1P3M-M5C-4S (For PCR12000WEA2R (3P3W 200 V input))

AC22-1P3M-M8C-4S (For PCR18000WEA2R (3P3W 200 V input).

PCR30000WEA2R/36000WEA2R (3P3W 400 V input))

AC38-1P3M-M8C-4S (For PCR24000WEA2R (3P3W 200 V input))

AC60-1P3M-M8C-4S (For PCR30000WEA2R/36000WEA2R (3P3W 200 V input))

AC8-1P3M-M8C-4S (For PCR18000WEA2R (3P3W 400 V input))

AC14-1P3M-M8C-4S (For PCR24000WEA2R (3P3W 400 V input))

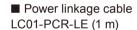
AC5.5-1P3M-M5C-5S(For PCR6000WEA2/PCR12000WEA2 (3P4W 400 V input))

AC8-1P3M-M5C-5S (For PCR18000WEA2 (3P4W 400 V input))

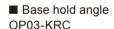
AC14-1P3M-M5C-5S (For PCR24000WEA2 (3P4W 400 V input))

AC22-1P3M-M5C-5S (For PCR30000WEA2/36000WEA2 (3P4W 400 V input))

■ Parallel operation cable PC01-PCR-WE (1 m)







■ External control connector OP01-PCR-WE (DIGITAL I/O) OP02-PCR-WE (ANALOG I/O)



OP01-PCR-WE

OP02-PCR-WE



LC01-PCR-LE



IB07-PCR-WE



■ 6kVA Single/Three-phase output transformer OT03-PCR-WEA

The OT03-PCR-WEA high-voltage transformer is a step-up transformer that can be used with the PCR-WEA series and the SD012-PCR-LE/WE avionics test software. Depending on the wiring, a single unit with 4U and 6 kVA output can be used in a single-phase or three-phase configuration.

* The CE/UKCA marked products

- 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

		Single-phase	output model			Single-phase/	three-phase swi	itchable model					
	Item/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	1P2W input model	100 Vrms to 120	Vrms, 200 Vrms	to 240 Vrms *1									
(nominal)	3P 200 V input model		-		200 Vrms to 240 Vrms (3 phase line voltage)								
	3P 400 V input model		-		380 Vrms to 480 Vrms (3 phase line voltage)								
Voltage	1P2W input model	85 Vrms to 132	Vrms, 170 Vrms	to 250 Vrms *1	-								
(allowable varation range)	3P 200 V input model		-				/rms to 250 Vrms						
	3P 400 V input model		-				/rms to 519 Vrms	(3 phase line vo	Itage)				
Frequency (nomin	,				-	50 Hz to 60 Hz							
	able variation range)				T	45 Hz to 65 Hz		I	1	T			
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	1P2W input model		0.95 (TYP)					-	-				
	3P 200 V input model		-				0.97	(TYP)					
	3P 400 V input model		-				0.95	(TYP)					
Max.	1P2W input model	17 A / 8.5 A	32 A / 16 A	48 A / 24 A				-					
current *3	3P 200 V input model		-		27 A	53 A	80 A	106 A	133 A	159 A			
	3P 400 V input model		-		14 A 28 A 42 A 56 A 70 A 84 A								
Hold-up time for p	ower interruption *2					10 ms							
Protective con-	1P2W input model	3.5 mA or less						-					
ductor current *4	3P 200 V input model		-		10 mA or less	15 mA or less	20 mA or less	25 mA or less	30 mA or less	35 mA or less			
	3P3W 400 V input model	-			10 mA or less 20 mA or less 30 mA or less 40 mA or less 50 mA or less 60 mA or less								
	3P4W 400 V input model		-		3.5 mA or less								
Output													
Maximum peak cu	ırrent *5				M	aximum current >	(4						
Inrush current cap	pacity *6		um current x 3 (0. num current x 1.4				Maximum curr	ent x 1.4 (0.5 s)					
Efficiency *8			82 %(TYP)				85 %	(TYP)					
AC	Rating					160 V / 320V *10							
voltage *9	Setting range				0 V to	161.0 V / 0 V to 3	22.0 V						
9	Resolution					0.1 V							
	Setting accuracy *11 *12					setting + 0.3 V), tting + 0.3 V), ±(0							
Maximum current	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			
*9 *14	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		1	P			1P2W,	1P3W, 3P4W swi	itchable					
Power capacity	Single-phase output Three-phase output	1 kVA	2 kVA	3 kVA	6 kVA	12 kVA	18 kVA	24 kVA	30 kVA	36 kVA			
	Single-phase three-wire output			2 kVA	4 kVA	8 kVA	12 kVA	16 kVA	20 kVA	24 kVA			
l				2 KVA				16 KVA	20 KVA	24 KVA			
Load power factor						1 (leading or lage			-				
Frequency	Setting range			04 11- /4 00 11- 4		15 (5 kHz -3dB, <		0011-4-500011	_\				
	Resolution		0	.01 HZ (1.00 HZ 1		Hz (100.0 Hz to 1			Z)				
Dhara	Setting accuracy					perature coefficie			I=\				
Phase	Resolution Setting accuracy *6		-		0.01° *16, 0.1° (1 Hz to 500 Hz), 1°(500 Hz to 4 kHz), 2°(4 kHz or more)								
DC	,	'	- Within ±(0.4°+ fo×0.9) *17 fo: frequency [kHz]										
voltage	Rating *9	-226 V to +226 V, -452 V to +452 V *19 -227.5 V to +227.5 V, -455.0 V to +455.0 V											
	Setting range *9				-227.5 V (0 +227.5 V, -495.0 V (0 +495.0 V								
	Resolution				±(0.05 % of setting + 0.1 V)								
	Setting accuracy *18	10 0 / 5 0	20 4 / 10 4	20 A / 1E A				240 A / 120 A	200 A / 150 A	260 A / 100 A			
	Maximum current *20	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 24 kW	300 A / 150 A 30 kW	360 A / 180 A 36 kW			
	Power capacity	1 kW	2 kW	3 kW	6 kW	12 kW	18 kW						

- *1. 100 V/200 V input system (auto select)
- At output voltage 100 V/200 V, rated output current, sine wave, load power factor 1, output frequency 40 Hz to 1 kHz
- Current at the minimum voltage (within the allowable variation range)
- At output voltage 100 V/200 V, rated output current, sine wave, load power factor 1, output frequency 45 Hz to 65 Hz
- *5. Repeated output is possible when the crest factor is 4.*6. At an ambient temperature of 23 °C ±5 °C.
- 125 Vac/ 250 Vac (output L range/ H range)
- At output voltage 100 V/200 V, rated output current, sine wave, load power factor 1, output frequency 40 Hz to 1 kHz.
- Output L range, H range
- *10. The spec guaranteed voltage range is 1 V to 160 V and 2 V to 320 V.
 *11. At an ambient temperature of 23 °C±5 °C.

- *12. At no load, output frequency 45 Hz to 65 Hz. *13. At the phase angle of 120° of each phase.
- *14. 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.
- *15. On the 500 Hz limit model, the frequency is limited to 1 Hz to 500.0 Hz for three-phase output.
 *16. Waveform bank 0, at 1 Hz to 500 Hz.
 *17. Within $\pm (0.4^{\circ} + 2.5 \, \mu s \times 360^{\circ} \times fo \times 10^{3})$

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)

- *18. At no load, 23 °C ±5 °C.
- *19. The spec guaranteed voltage range is 1.4 Vdc to 226 Vdc, 2.8 Vdc to 452 Vdc.
 *20. When the output voltage is between 100 Vdc and 226 Vdc or 200 Vdc and 452 Vac, the output current is reduced by the output voltage.

PCR-WEA/WEA2 Series Specifications

	Single-phase	output model	Single-phase/three-phase switchable model									
Item/Model	PCR	PCR	PCR	PCR 6000WEA2	PCR 12000WEA2	PCR 18000WEA2	PCR 24000WEA2	PCR 30000WEA2	PCR 36000WEA2			
	1000WEA	2000WEA	3000WEA2	PCR 6000WEA2R	PCR 12000WEA2R	PCR 18000WEA2R	PCR 24000WEA2R	PCR 30000WEA2R	PCR 36000WEA2R			
Output voltage stability (phase voltage)												
Line regulation *1					Within ±0.1 %							
Load regulation *2		Within ±0.3	1 V/±0.2 V (1 Hz V/±0.6 V (100.1 H V/±2 V (500.1 Hz	lz to 500 Hz)		With	hin ±0.3 V/±0.6 V	V (1 Hz to 100 H (100.1 Hz to 500 500.1 Hz to 1 kH	Hz)			
Variation according to output frequency *3		When the output			bled: within ±0.3 correction function			001 Hz to 5 kHz)				
Ripple noise *4					≤ 0.25 Vrms							
Temperature coefficient *5					100ppm/°C (TYP)						
Total harmonic distortion *6	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 *7	Response FAST: 40 μs (TYP)											
Response speed Tr/Tf *8	Response FAST: 40 μs (TYP), Response MEDIUM: 100 μs (TYP), Response SLOW: 300 μs (TYP)											

- *1. For input voltage changes within the rated range.
- *2. For output current changes within 0 to 100 % of the rating. Output L range, H range. When the output phase voltage is between 80 V and 160 V or 160 V and 320 V, the load power factor is 1, and the response is FAST At the output terminal block. When the compensation function is not used
- *3. 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.
- *4. 5 Hz to 1 MHz components in DC mode.
- For changes within the operating temperature range. At output phase voltage 100 V/200 V, no load.
- 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.
- 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.
- *8. At 10 % to 90 % of the output voltage.

			Single-phase	output model	Single-phase/three-phase switchable model							
			Single-phase	output model		PCR	PCR	PCR	PCR	PCR	PCR	
	Item/	Model	PCR	PCR	PCR	6000WEA2	12000WEA2	18000WEA2	24000WEA2	30000WEA2	36000WEA2	
			1000WEA	2000WEA	3000WEA2	PCR 6000WEA2R	PCR	PCR	PCR 24000WEA2R	PCR 30000WEA2R	PCR 36000WEA2R	
Measuremer												
Voltage Rms	value	Resolution					0.1 V					
		Accuracy *1		DC	, 40 Hz to 999.9	Hz: ±(0.3 % of re	ading +1 V), 1 kl	Hz to 5 kHz: ±(0.	5 % of reading +	1 V)		
Current Rms	value	Resolution				0 to 99.99 A	: 0.01 A, 100 to 9	999.9 A: 0.1 A				
		Accuracy *1 *2			DC	, 40 Hz to 999.9	±(0.3 % of reading	ading + 0.6 % of	ff.s)			
Current Peal	k value	Resolution		1 kHz to 5 kHz: ±(1.2 % of reading + 1.2 % of f.s) 0 to 99.99 A: 0.01 A, 100 to 999.9 A: 0.1 A								
Ouricili Cai	K Value	Accuracy *1 *3				0 to 33.33 A	4 % of f.s	755.5 A. O.1 A				
Active power	r	Resolution					1 W *5					
Active power	Accuracy *1 *2 *4 45 Hz to 65 Hz: ±(0.3 % of reading + 0.3 % of f.s)											
Apparent por												
power factor		Resolution					0.01					
Phase differen		Resolution			-		0.01°					
Harmonic		ange (fundamental wave)					10 Hz to 1 kHz					
measure-		f harmonic analysis					5th to 50th					
ment	FFT data len	· · · · · · · · · · · · · · · · · · ·					4096			,		
	Measuremen	•		Rms voltage and current, phase angle, THD								
Recommend	led calibration					Tuno voltago t	1 vear	oc angle, mis				
General		<u> </u>					,,,,,					
Insulation resistance		ut and chassis, output and input and output				500	Vdc, 10 MΩ or n	nore				
Withstand voltage		ut and chassis, output and input and output				1.5 kVa	c, 2.15 kVdc for 1	I minute				
Electromagn	etic compatibil	lity (EMC) *7 *8	sta EN 61326-1 (C EN Applicable unde	Indards. EMC Di lass A *9), EN 5 N 61000-3-2 *11, er the following co	ts of the following frective 2014/30/ 55011 (Class A *5, EN 61000-3-3 on ditions. The math the product must	EU 9, Group 1 *10) 111 ximum length of	Applicable un	EMC EN 6 EN 55011 der the following	ents of the follow Directive 2014/3 61326-1 (Class A (Class A *9, Gro conditions. The	80/EU *9) oup 1*10) maximum lengtl	n of all cabling	
Safety *7				Lo	Complies w w Voltage Direct	rith the requirement ive 2014/35/EU *	ents of the follow 8, EN 61010-1 (ving directive and	d standards. ution Degree 2 *	13)		
Environ-	Operating en	vironment				Indoor us	se, overvoltage c	ategory II				
mental	Operating ter	nperature and humidity range			0 °C to +50	°C (32 °F to +12	22 °F), 20 %rh to	80 %rh (no con	densation).			
conditions	Storage temp	perature and humidity range			-10 °C to -	-60 °C (14 °F to -	+140 °F), 90 %rh	or less (no cond	lensation).			
	Altitude						Up to 2000 m					
Weight	Models without	out regeneration function	18 kg(39.7 lb) / 21 kg*14(46.3 lb)	21 kg(46.3 lb) / 24 kg*14(52.9 lb)	25 kg(55.1 lb) / 28 kg*14(61.7 lb)	43 kg (94.8 lb)	66 kg (145.5 lb)	120 kg (264.6 lb)	130 kg (286.6 lb)	160 kg (352.7 lb)	180 kg (396.8 lb)	
	200 V input mo	odels with regeneration function	-	-	-	43 kg (94.8 lb)	67 kg (147.7 lb)	120 kg (264.6 lb)	130 kg (286.6 lb)	160 kg (352.7 lb)	180 kg (396.8 lb)	
	400 V input mo	odels with regeneration function	-	-	-	46 kg (101.4 lb)	70 kg (154.3 lb)	120 kg (264.6 lb)	140 kg (308.6 lb)	170 kg (374.8 lb)	180 kg (396.8 lb)	
Input termina	al		M6 M5 3P3W input model: M8, 3P4W input m				3P4W input mo	del: M5				
Output terminals M6 M5				16	N.	18						

- At an ambient temperature of 23 °C±5 °C.
- At 10 % to 100 % of maximum rated current, sine wave.
- Pulse height of sine wave.
- At a power factor of 1.
- When the measured value is 0 to less than 100 W, the resolution is 0.1 W.
- When the measured value is 0 to less than 100 VA, the resolution is 0.1 VA.
- Does not apply to specially ordered or modified products.
- Only on models that have the CE/UKCA marking on the panel.
- 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.
- *10. 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.
- *11. This does not apply to the PCR6000WEA2R (3P3W 200 V input model).
- *12. 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.
- *13. 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.
- *14. Only on models that have cTUVus marking on the panel.

Compact AC Power Supply (CV/CF)

PCR-MA Series







Models with C/BF/O front outlet terminals are available for customers using C/BF/O type power supply plugs.

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, Core, Packing list, Quick reference (Japanese 1 sheet, English 1 sheet), Safety information, CD-ROM, Heavy object warning label(Included only with the PCR4000MA)

Features

■ Compact design (PCR500MA) Small enough to fit on your work desk!

Small and light. Only 6.5 kg Only 214 W \times 124 H \times 350 D mm! Weighs only 6.5 kg and easy to carry!



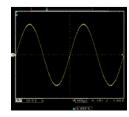




Easy to carry with only one hand

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)

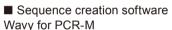


Compact AC power supply using the PWM inverter method

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 310 Vrms AC while maintaining a compact, portable design. The digital interface now includes LAN (LXI) and USB as standard, with GPIB as a 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 include DC mode, memory functions, and various protections, which make the PCR-MA the most accessible AC power supply on the market.

Options

- GPIB interface board
- Analog interface board EX08-PCR-MA



*Use the PCR-M series compatible mode switching function. (Restrictions apply)

EX08-PCR-MA

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)

■ LAN-RS232C converter *The following interface can be used.

XDT2321002-01-S xDirect232 Ver. RS232C (AC Adapter Included)/ (LAN-RS232C Converter)

LANTRONIX, Inc. xDirect https://www.lantronix.com/products/xdirect/

[Notes] *Please refer to the LANTRONIX Corporation instruction manual for details on RS232C control using the LAN-RS232C converter. *We can not guarantee compatibility with your computer, etc.

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



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

nput voltage		PCR1000MA	PCR2000MA	PCR4000MA			
	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						
nput 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			
nput power factor *1		0.9 (stand	lard value)				
Efficiency		≥ 7	0 %				
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	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, sett	ing: 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)						
perating 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		
	Туре		BNC		
	Input impedance		10 kΩ ±5 % (unbalanced)		
	Isolation voltage		42 Vpk		
EXT-AC mode *4	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 *5	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 i	ratio *6		≤ main unit specifications +0.5 %		

^{*4.} ATT ON at all times *5. Measurable ranges of voltage, current, and power are DC and 40 Hz to 500 Hz. Set the frequency according to the input waveform period. *6. For DC input in EXT-AC mode and sine wave with 0.1% or less distortion in EXT-DC mode.

■ General specifications

- Contoral opecinications	
Safety *7	Complies with the requirements of the following directive and standards.
	Low Voltage Directive 2014/35/EU *8 EN 61010-1 (Class I *11, Pollution Degree 2 *12)
Electromagnetic compatibility *7, *8	Complies with the requirements of the following directive and standards.
	EMC Directive 2014/30/EU, EN 61326-1 (Class A *9), EN 55011 (Class A *9, Group 1 *10) 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.

^{*7.} Does not apply to specially ordered or modified products. *8. Limited to products that have the CE mark/UKCA mark on their panels. *9. 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. *10. 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. *11. 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. *12. 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

High-performance Multifunctional AC Power Supplies

CR-LE Series



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 threephase 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

PCR3000LE: 430(16.93")W × 690(27.17")H × 550(21.65")Dmm/ 82kg(180.78 lbs) **PCR4000LE:** 430(16.93")W × 690(27.17")H × 550(21.65")Dmm/ 96kg(211.64 lbs) **PCR6000LE**: 430(16.93")W × 944(37.17")H × 550(21.65")Dmm/ 140kg(308.65 lbs) **PCR9000LE:** 430(16.93")W × 1325(52.17")H × 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

[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 3 kVA 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.

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

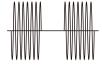
Allows to select a response mode for the internal amplifier system depending on the load condition and application.

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) US05-PCR-LE (USB) LN05-PCR-LE (LAN/LXI) EX05-PCR-LE (Analog)*4 EX06-PCR-LE (Analog)*5

- 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

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*6 PD05M-PCR-LE

(For master unit operated in parallel)

PD05S-PCR-LE

(For slave unit operated in parallel)

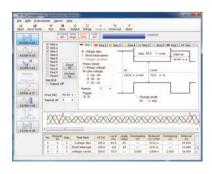
- Three-phase output driver 3P05-PCR-LE 3P05-PCR-LE (500 Hz LMT)
- Single-phase Three-wire Output Driver 2P05-PCR-LF
- Power linkage cable (1 m) LC01-PCR-LE

■ 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!



- *4. The input waveform is directly amplified and output.
- *5. The voltage of the output alternating current can be changed based on the level input DC signal.
- *6. PCR6000LE2 and PCR9000LE2 can not be operated in parallel.

^{*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

PCR-LE Series Specifications

Item/Model			PCR3000LE	PCR4000LE		PCR6000LE	1		000LE
nput ratings (AC rms)				1P2W		3P3W 200V	3P4W 400V	3P3W 200V	3P4W 400V
Voltage			85 V to 132 V/17	70 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 \ (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
requency						47 Hz to 63 Hz			
Apparent power			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			66 A, 32 A	88 A, 43 A	64 A	38 A	21 A	55 A	30 A
AC mode output ratings (AC rms)									
/oltage (output L range, output	t H range)*	3			1 V	to 150 V / 2 V to 30	10 V		
	Resolution	n				0.1V			
/oltage setting range					0 V to	o 152.5 V / 0 V to 30	5.0 V		
/oltage setting accuracy						(0.3 % of set + 0.6)	/)		
output L range, output H range	<u> </u>					<u>'</u>			
Max. current (output L range, o	utput H ra	nge) *5	30 A, 15 A	40 A, 20 A		60 A, 30 A		90 A	, 45 A
Phase						Single phase			
Power capacity			3 kVA	4 kVA		6 kVA		9 k	(VA
Maximum peak current *6						. current (rms) × 4 (
Max. reverse current *7						of the max. current	` '		
oad power factor					0 to	1 (leading or laggin	g) *5		
requency *5						1 Hz to 999.9 Hz			
	Resolution	n		(0.01 Hz (1.00 Hz to	100.0 Hz), 0.1 Hz (1	00.0 Hz to 999.9 Hz)	
OC mode output ratings									
Voltage (output L range, output H range)*3			±1.4 V to ±212 V/±2.8 V to ±424 V						
	Resolution	n	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	e) *8		±(0.05 % of set + 0.05/0.1 V)						
Max. current (output L range, o	utput H ra	nge) *9	21 A, 10.5 A					31.5 A	
Max. instantaneous current *10)				Max. current (rms) × 3.6				
Power capacity Output voltage stability			2.1 kW	2.1 kW 2.8 kW 4.2 kW 6.3 kW					kW
ine regulation *11						Within ±0.1 %			
oad regulation (output L range	e, 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)	0.2 Vrms or less 0.25 Vrms or less						
Ambient temperature variation					Į.	100 ppm/°C (TYP)			
Output frequency stability, outp		waveform dist	tortion rati <u>o, output v</u>	oltage response sp	eed, efficiency				
Output frequency stability *15					<u></u>	Within ±5×10 ⁻⁵			
	Setting ac	curacy				±1×10 ⁻⁴			
Output voltage waveform distort	rtion ratio	FAST	±0.2 %	or less					
16		MEDIUM			±0.3 % or less				
Output voltage response speed	d *17	FAST	20 µs	(TYP)			-		
		MEDIUM		, ,		30 μs (TYP)	,		
Efficiency *18			55 % or more,	57 % or more		,	58 % or more		
Meters (fluorescent display)									
. , , , ,	Resolution	n	0.1V						
ŀ	Accuracy			± (*	1 % of rdng + 2 digit		d at room temperatu	ire)	
	Resolution	n	0.1 A						
	Accuracy		± (1 % of rdng + 2 digits) (5 % of the max. rated current to max. rated current and at room temperature)						
	Resolution	n	_	. 39		1 W			*
					±	(1 % of rdng +3 digi	ts)		
Wattmeter *20	Accuracy		± (1 % of rong +3 digits) (10 % of the rated power capacity to the rated power capacity, when the load power factor is 1, and at room temperature.)						
Wattmeter *20	Accuracy		(10 % of the	(10 % of the rated power capacity to the rated power capacity, when the load power factor is 1, and at room temperature.)					
Wattmeter *20	Accuracy		(10 % of the	rated power capac	ity to the rated pow	cr capacity, which the			
Wattmeter *20 BNC terminals		dth approx. 10	(10 % of the						
Wattmeter *20	Pulse wid			utput, pullup at +5 V	and approx. 10 kΩ s	serial resistance ap	prox. 220 Ω, maximu	ım sink current 10 m	nA, BNC connect

- *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
- L/H range can be changed by means of a switch on the front panel.

 When the output frequency is between 45 Hz and 65 Hz, with no load, and at room temperature.
- 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.
- For capacitor-input rectifier loads (however, this is limited by the rated output current's rms value) 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).
- With no load at room temperature
- 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 *11. With respect to changes in the rated range

- 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.
- 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 cur-
- rent 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 possible.

PCR-LE Series Specifications

Item/Model		PCR3000LE	PCR4000LE		PCR6000LE		PCR9	000LE
General		1P:	2W		3P3W 200V	3P4W 400V	3P3W 200V	3P4W 400V
Insulation resistance	Between input and chassis, output and chassis, and input and output		500 Vdc, 10 M Ω or more					
Withstand voltage	Between input and chassis, output and chassis, and input and output		1.5 kVAC for 1 minute					
Circuit method				Li	near amplifier syste	m		
Environmental	Operating environment			Indoor (use, overvoltage cat	tegory II		
conditions	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. 82 kg Approx. 96 kg Approx. 140 kg Approx. 190 kg (180.78 lbs) (211.64 lbs) (308.65 lbs) (418.88 lbs)						
Input terminal		M8	M8	M8	M5	M5	M5	M5
Output terminal		M5	M5	M8	M8	M8	M8	M8
Accessories	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				lies with the require Low Volt		ng directive and sta 35/EU *2		

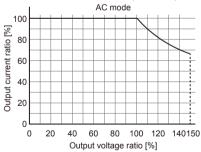
- 1. Does not apply to specially ordered or modified PCR-LEs.
- *2. Limited to products that have the CE mark/UKCA mark on their panels.
- *3. This is a Class A equipment. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. 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

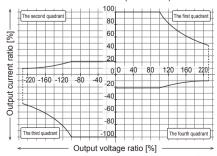
The output voltage ratio is a percentage where 100 % represents an output voltage of 100 V (output L range) or 200 V (output H range) in AC mode or DC mode.

The output current ratio is a percentage where 100 % represents the maximum rated output current in AC mode or DC mode.

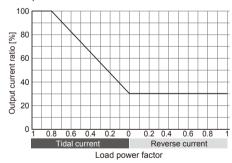
Output voltage ratio versus rated output current characteristics (AC mode)



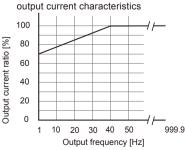
■ Output voltage ratio versus rated output current characteristics (DC mode)



■ Load power factor versus rated output current characteristics



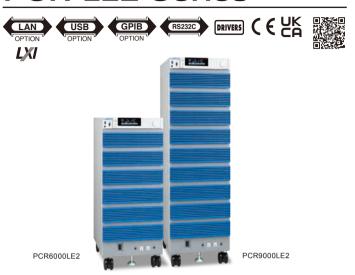
Output frequency versus rated



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

CR-LE2 Series



Capable of single-phase, single-phase threewire 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:

 $430(16.93")W \times 944(37.17")H \times 550(21.65")Dmm/ 140 kg(308.65 lbs)$ PCR9000LE2:

430(16.93")W × 1325(52.17")H × 550(21.65")Dmm/ 190 kg(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

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.

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

PCR-LE2 Series Specifications

Item/Model				PCR6000LE2		PCR9	000LE2		
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 pov				Approx. 10.6 kVA		Approx	. 15.7 kVA		
Power factor					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 out									
		e, output H range) *2			1 V to 150 V, 2 V to 300 V 0 V to 152.5 V / 0 V to 305.0 V	1			
Voltage settir		ov (output L range, output H range) *2			±(0.3 % of set + 0.6 V)	/			
Max. current		cy (output L range, output H range) *3 Single phase, poly phase, L range, H range		60 A. 30 A · 20 A. 10 A	I(0.3 % 01 Set + 0.0 V)	00 A 45 A	· 30 A, 15 A		
Phase *5	-	Joingle phase, poly phase, Litalige, Trialige		,	· Single phase 3-wire · Three		1 30 A, 13 A		
Power capaci	itv	Single phase, Three-phase 4-wire, Single phase 3-wire		6 kVA · 4 kVA	onigie pridace o wife Trifee	<u>'</u>	· 6 kVA		
Maximum per	,				Max. current (rms) × 4 (TYP)	0 11.17			
Max. reverse					30 % of the max. current (rms)			
Load power fa	factor *4			,	0 to 1 (leading or lagging)	,			
Frequency *4	1 *8				1 Hz to 999.9 Hz *				
DC mode out	tput rating	s (for Single-phase and Single-phase Three-wire o	utput only)						
Voltage (outp	out L rang	e, output H range) *2		±1	.4 V to ±212 V/±2.8 V to ±424	V			
Voltage settir					V to +215.5 V / -431.0 V to +4				
		cy (output L range, output H range) *9			± (0.05% of set + 0.05V/0.1V	<u>' </u>			
Max. current		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. instanta					Max. current (rms) × 3.6				
Power capac		Single phase, Single phase 3-wire		4.2 kW · 2.8 kW		6.3 kW	· 4.2 kW		
Output voltag					14/211 2 4 0/				
		espect to changes in the rated range)			Within ±0.1 % ±0.3 V				
		respect to 0 % to 100 % changes in the rating) *11 tion in AC mode (Between 40 Hz and 999.9 Hz) *12	±0.3 V Within ±0.5 %						
		de(5 Hz to 1 MHz components)	0.25 Vrms or less						
		riation (With respect to changes in the rated range) *13							
		ility, output voltage waveform distortion ratio, output	t voltage response speed, e	fficiency	100 ррии О (111)				
		ility(With respect to changes in all rated ranges)			×10 ⁻⁵ , Setting accuracy: With	in ±1×10 ⁻⁴			
		rm distortion ratio *14	0.3 % or less						
Output voltag	ge respon	se speed *15	30 µs (TYP)						
Efficiency *1			58 % or more						
Phase differe				Within ±(0.4°+fo×	1.8×10 ⁻³ °), where the output f	requency is fo. *17			
output phase									
Meters (fluore					0.4.)/				
		RMS,AVE Display mode RMS,AVE Display mode		Within ± (1.0/ of rdna	0.1 V + 2 digits) (10 V to 848 V and	at room tomporatura)			
, ,		RMS,AVE Display mode RMS,AVE Display mode Single phase · Poly phase		0.1 A · 0.01 A	+ 2 digits) (10 V to 646 V and		.1 A		
		RMS Display mode	Within + (1 %	of reading + 2 digits) (5 % o					
1.1		1 /	VVIUIII1 ± (1 /0	1 W · 0.1 W/1 W	i the max. rated current to me		W		
	ccuracy	onigio pinaco i dij pinaco			ithin ± (1 % of reading + 3 dig		•••		
, ,	.cou.uo,		(10 % of the rated		power capacity, when the loa		room temperature.)		
Frequency R	Resolution		,		0.01 Hz/0.1 Hz	•	· ,		
meter *20					0.01112/0.1112				
General									
Insulation res		Between input and chassis, output and chassis,			500 V, 10 MΩ or more				
Withstand vo		and input and output			1.5 kVAC for 1 minute				
Circuit metho		Operating temporal we spage (Circumstance)			Linear amplifier system	10			
Environmenta conditions	aı	Operating temperature range / Storage temperature range			°C to +50 °C / -10 °C to +60 °				
Input termina	al .	Operating humidity range / Storage humidity range Input terminal board [3φ]	M8	· · · · · · · · · · · · · · · · · · ·	o condensation) / 90 % rh or I M5		M5		
Output termina		Output terminal board [søj	IVIO	l N			VIJ		
Output terrilli	iidi	phase 3-wire,Three-phase 4-wire			M8 · M5				
Input power of	cord	Shape			Single-core cable				
[Sold separat		The number	3 pc	4 pc	5 pc	4 pc	5 pc		
tion]		Conductor cross section/Length	14 mm ² /3 m	8 mm ² /3m	5.5 mm ² /3 m	14 mm²/3 m	5.5 mm ² /3 m		
Other		Electromagnetic compatibility (EMC)		EN61326-1, The maximum	length of all cables and wires				
		Safety			2014/35/EU, EN61010-1(Clas				
		Output voltage ratio versus rated output current characteristics		Same	e as PCR-LE series. (Refer to	P59)			
				Janie		/			

- 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. L/H range can be changed by means of a switch on the front panel. Resolution: 0.1V

- When the output frequency is between 45 Hz and 65 Hz, with no load, and at room temperature. 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 $\stackrel{\lor}{V}$ (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)
 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
- 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).
- 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). Resolution: 0.01Hz (1.00Hz to 100.0Hz), 0.1Hz (100.0Hz to 999.9Hz)
- 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 power factor is 1. At the output terminal block. When the response mode is set to ME-DIUM.(There is no F mode)

- 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)

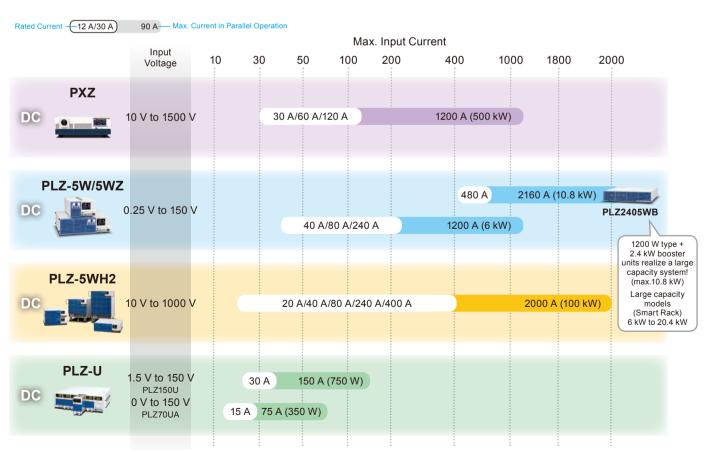
 *18. With the true rms display, a waveform with a crest factor of 3 or less.
- *19. When the output frequency is between 45 Hz and 65 Hz.
- *20. Displays the output frequency setting (frequency of the internal reference voltage).
- ★ PCR-LE2 Series 500Hz Limit Model

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

ELECTRONIC LOAD SELECTION GUIDE

Series		PXZ	PLZ-5W/5WZ	PLZ-5WH2	PLZ-U
Line up		3 models	4 models	5 models	4 models
Features		Regenerative	Multi Functional	High Voltage	Multi Channel
Input		DC	DC	DC	DC
	CC	V	V	V	V
	CC+CV	-	V	V	V
	CR	V	V	V	V
Mode	CR+CV	-	V	V	V
	CV	V	V	V	V
	СР	V	V	V	-
	ARB*	V	V	V	-
:	44	20 kW	200 W/ 400 W/ 1.2 kW	1 kW/ 2 kW/ 4 kW/ 12 kW/ 20 kW	75 W/ 150 W
Input rating	(Max.)	1500 V 1000 V 500 V	150 V	1000 V	150 V
		30 A 60 A 120 A	240 A	400 A	30 A
Zero Voltage Input		-	-	-	Available
GPIB		Option	Option	Option	Standard
RS232C		Standard	Standard	Standard	Standard
USB		Standard	Standard	Standard	-
LAN		Standard	Standard	Standard	-

^{*}Arbitrary I-V characteristics



High-Capacity Regenerative Electronic Load (CC/CV/CR/CP)

PXZ Series











Dimensions / Weight

PXZ20K-500:

430(16.93")W × 128(5.04")H × 720(28.35")Dmm(inch) / 38 kg(83.78 lbs) PXZ20K-1000:

 $430(16.93")W \times 128(5.04")H \times 720(28.35")Dmm(inch) / 37 kg(81.57 lbs)$ PXZ20K-1500:

 $430(16.93")W \times 128(5.04")H \times 720(28.35")Dmm(inch) / 37 kg(81.57 lbs)$

Accessories

AC INPUT terminal cover, DC INPUT terminal cover, DC INPUT terminal screws, External control connector kit, Chassis connection wire, EXT SYNC connector cover, SENSING connector (2 pc.). SENSING connector cover. Synchronized operation signal cable kit, Heavy object warning label, Safety Information, China RoHS sheet, Getting Started Guide

This high-capacity regenerative electronic load series contributes to carbon neutrality. Its highly efficient power regeneration reduces energy loss

The PXZ series of highly efficient, reliable, high-capacity regenerative electronic loads has a rated power of 20 kW in 3U. In addition to the constant-current, constant-resistance, constant-voltage, and constantpower operating modes, this series has an I-V characteristic function that allows the user to set arbitrary I-V characteristics for each CC and CV operating mode. The series is also equipped with various functions, such as sequence, pre-charge, synchronous operation, pulse, sine, and VMCB functions. LAN, USB, and RS232C communication functions are included as standard, allowing easy integration into various evaluation systems. The PXZ series is highly scalable, and its capacity can be increased up to 500 kW when operating in parallel (up to 25 units).

Features

- Rated power of 20 kW in 3U
- Maximum operating voltage of 1500 V
- Operating modes: CC, CR, CV, CP
- Up to 25 units (500 kW) can be operated in parallel
- Equipped with a touch panel display
- Pre-charge function
- I-V characteristic function
- Sequence function
- LAN, USB, RS232C, external analog control (isolated type) as standard *GPIB optional
- Regenerative efficiency of over 90% (on-site regeneration)

Options

■ Load cable (3 m) DC80-2P3M-M10M10 (For PXZ20K-500) HV22-2P3M-M12M8 (For PXZ20K-1500)

■ Three-phase input power cord (3 m) AC22-4P3M-M6C-4S

*The switchboard ends of the power cords have not been prepared for connection.

■ Parallel operation signal cable kit (1.5 m) PC01-PXB

■ GPIB converter PIA5100

This converter converts RS232C or USB of the PXZ to GPIB. enabling connection of a remote controller using GPIB. [Accessories: Power cord set, Magnetic sheet]

*Not CE/UKCA certified product

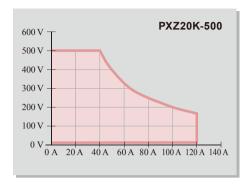
■ Rack mount bracket KRB3-TOS (EIA inch rack) KRB150-TOS (JIS millimeter rack)

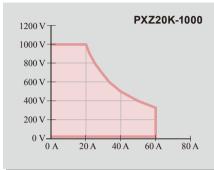


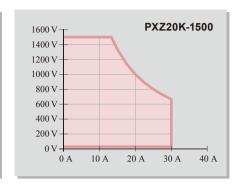
Functions

■ Wide operating range with an expansion ratio of 2.25 to 3 times

The PXZ20K-500 has an operating range of 10 V to 500 V, while the PXZ20K-1000 has a range of 20 V to 1000 V, and the PXZ20K-1500 has a range of 30 V to 1500 V. An operating area ranges from 2.25 to 3 times the expansion ratio.







■ Pre-charge function

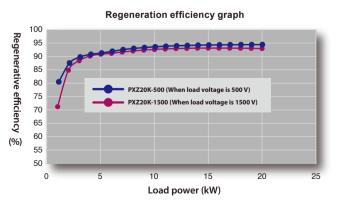
The pre-charge function allows 5% of the rated current to flow in CC mode until the set CV voltage is reached. This function can be used to charge DC link capacitors during inverter evaluation in OBC development or charge the DC link capacitor for DC/DC converter evaluation to a desired voltage before starting discharge tests. This suppresses inrush current and prevents battery and DUT device deterioration. In addition, when conducting system verification with the PXZ as a battery simulator, the pre-charge function can be used to raise the voltage to a set level in advance, avoiding a situation where the test cannot be started due to false system diagnostics (wire breakage, battery failure, etc.).

*The interlock must be released and precharge enabled.



■ Regenerative efficiency of over 90 % (at rated input)

Thanks to high-performance switching technology, the PXZ series regenerates power with an efficiency of 90 % or higher (maximum regenerative efficiency of approximately 95 %) and load power of 6 kW or more. Since the regenerated power can be reused, carbon dioxide emission is significantly reduced.



■ The value of regenerative power is visible at a glance!

A large LCD display shows regenerative power value in real time. Energysaving benefits are visible at a glance.

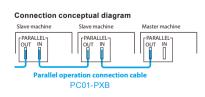
*The displayed power value is for reference only and may differ by up to ±500 W.

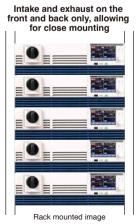


■ Parallel operation

Including master machine, up to 25 units (500 kW) can be operated in parallel. Connection is with one-control parallel operation, and the panel of the master machine can control and display the entire system. With the automatic recognition function, the need for complicated settings is eliminated, allowing the construction of high-capacity systems. Parallel operation is possible between models with different input rated voltages.

*Please contact us if you wish to operate more than 10 units in parallel





PXZ Series Specifications

Item/Model	PXZ20K-500	PXZ20K-1000	PXZ20K-1500			
DC Input Rating						
Rated power		20000 W				
Rated voltage (DC) *1	10 V to 500V	20 V to 1000 V	30 V to 1500 V			
Rated current *1	120 A	60 A	30 A			
Constant voltage (CV) mode	IZO A	00 A	30 A			
Maximum settable voltage *2	525 V	1050 V	1575 V			
Setting accuracy		of setting + 0.1 % of				
	0.05 V	0.1 V	0.1 V			
Setting resolution	0.05 V	0.1 V	U.1 V			
Remote sensing Maximum compensation voltage (reciprocating) (TYP)		10 % of rating				
Response switching		FAST, SLOW				
Slew rate switching (TYP) *2	125 V/ms or more *3	250 V/ms or more *3	375 V/ms or more *3			
	125 V/ms	250 V/ms	375 V/ms			
	12.5 V/ms	25 V/ms	37.5 V/ms			
	1.25 V/ms	2.5 V/ms	3.75 V/ms			
	0.125 V/ms	0.25 V/ms	0.375 V/ms			
Constant current (CC) mode						
Maximum settable current *2	+126 A	+63 A	+31.5 A			
Setting accuracy *4	±(0.75 % of rating)					
Setting resolution	0.01 A	0.005 A	0.002 A			
Power fluctuation *5	±240 mA	±120 mA	±60 mA			
Load variation *6	±240 mA	±120 mA	±60 mA			
Rise time (TYP) *7	1 ms					
Fall time (TYP) *8	1 ms					
Response switching	FAST, SLOW					
Slew rate switching (TYP) *2	120 A/ms or more *3	60 A/ms or more	30 A/ms or more *3			
	60 A/ms	30 A/ms	15 A/ms			
	30 A/ms	15.0 A/ms	7.5 A/ms			
	3 A/ms	1.50 A/ms	0.75 A/ms			
	0.3 A/ms	0.150 A/ms	0.075 A/ms			
Constant resistance (CR) mode						
Conductance rating	2400.0 mS	600.000 mS	200.000 mS			
Setting range	0 mS to 2520.0 mS	0 mS to 630.000 mS	0 ms to 210.000 mS			
Setting accuracy *9	±(0.5 %	of setting + 0.5 % of	f rating)			
Setting resolution	0.20 mS	0.05 mS	0.02 mS			
Response switching		FAST, SLOW				
Constant power (CP) mode						
Maximum settable power		21000 W				
Setting accuracy *10	±(0.5 % of power	rating + 0.5 % of cur	rent rating × Vin)			
Setting resolution		2 W				
	1					

- *1. Maximum input current and maximum input voltage are limited by maximum input power.
- *2. During parallel operation, this will be the value multiplied by the number of units in the configuration.
- *3. MAX will appear on the display.
- *4. Applies to a range of 1 % to 100 % of the rated current.
- *5. 180 Vac to 252 Vac for 200 Vac input, 342 Vac to 504 Vac for 400 Vac input. At the constant load.
- *6. This is the amount of change when the voltage is changed from the rated voltage and rated power to 1/10 of the rated voltage.
- *7. In the case that the CC mode response setting is set to FAST. The time required for the input current in CC mode to change from 10 % to 90 % of the rated current when the input current value is changed from 0 % to 100 % of the rated current. When the slew rate is set to MAX.
- *8. In the case that the CC mode response setting is set to FAST. The time required for the input current in CC mode to change from 90 % to 10 % of the rated current when the input current value is changed from 100 % to 0 % of the rated current. When the slew rate is set to MAX.
- *9. Converted value at the input current.
- $^{\star}10.$ Guaranteed in the range from 5 % to 100 % of rated power. Rating indicates the rated current value.

Item/Model	PXZ20K-500	PXZ20K-1000	PXZ20K-1500				
200 V three-phase three-wire input							
Specifications for models having an input voltage rating of 200 Vac.							
Nominal AC input rating	200 Va	c to 240 Vac, 50 Hz to	60 Hz				
AC Input voltage range		180 Vac to 252 Vac					
AC Input frequency range		47 Hz to 63 Hz					
AC Input current (MAX) *11	80 A (V	hen Input voltage is	180 V)				
AC Input power (MAX) *11		22 kVA					
Inrush current (TYP) *12		90 A					
Power factor (TYP) *11		0.96					
Input hold time		10 ms or more					
400 V three-phase three-wire ir							
Specifications for models having	g an input voltage rat	ing of 400 Vac.					
Nominal AC input rating	380 Va	c to 480 Vac, 50 Hz to	60 Hz				
AC Input voltage range		342 Vac to 504 Vac					
AC Input frequency range		47 Hz to 63 Hz					
AC Input current (MAX) *11	40 A (V	hen Input voltage is	342 V)				
AC Input power (MAX) *11		22 kVA					
Inrush current (TYP) *12		70 A					
Power factor (TYP) *11	0.96						
Input hold time		10 ms or more					

- *11. At the rated input power for the rated input current.
- *12. Maximum peak current value when the POWER switch is turned on. (Excluding the surge current to the input filter capacitor.)

Item/Model		PXZ20K-500	PXZ20K-1000	PXZ20K-1500	
General Specifications					
Environ- mental	Operating envi- ronment	Indoor	Indoor use, Overvoltage category II		
conditions	Operating temperature	0 °C to +50 °C (32 °F to +122 °F)			
	Operating humid- ity	20 % rh to 85 % rh (no condensation)			
	Storage tempera- ture	-25 °C	to +60 °C (-13 °F to +	-140 °F)	
	Storage humidity	90 % r	h or less (no conden	sation)	
	Altitude		Up to 2000 m		
Cooling syst	em	For	ced air cooling using	fan	
Withstand voltage	Between primary and FG	2200 Vac for 1 minute			
	Between primary and secondary				
	Between second- ary and FG	1800 Vdc for 1 minute	1800 Vdc for 1 minute	3000 Vdc for 1 minute	
Insulation resistance	Between primary and FG		30 MΩ, 500 Vdc		
	Between primary and secondary		30 MΩ, 1000 Vdc		
Isolation vol	tage	±1000 V	±1000 V	+2000 V/-1000 V	
Electromagnetic compatibility (EMC) *13 *14		Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU, EN 61326-1 (Class A *15)			
Safety *13		standards. Low Voltage Directiv	ve 2014/35/EU *14, E tegory II, Pollution D		

- *13. Does not apply to specially ordered or modified products.
- *14. Only for models with CE marking / UKCA marking on their body.
- *15. 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.
- *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 nonconductive pollution will occur except for an occasional temporary conductivity caused by condensation.

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

LZ-5W/5WZ Series





Dimensions / Weight

PLZ205W:

 $214.5(8.45^{\circ})W \times 124(4.88^{\circ})H \times 400(15.75^{\circ})Dmm(inch)/7 kg(15.4 lbs)$ PLZ405W:

 $214.5(8.45")W \times 124(4.88")H \times 400(15.75")Dmm(inch)/7.5 kg(16.5 lbs)$ PLZ1205W:

 $429.5(16.91")W \times 128(5.04")H \times 400(15.75")Dmm(inch)/14 kg(30.9 lbs)$

Accessories

Power 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.), External control connector kit, Front-panel load input terminal cover, Front-panel load input knob set, Setup guide, CD-ROM, Quick reference (Japanese/English), Safety information, China RoHS sheet

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 0.25 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 setup 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 highspeed 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: 0.25 V to 150 V
 - *If the input voltage to the PLZ-5W falls below 1V, Maximum operation current is reduced by 10 % per 0.1 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 optional
- Improved sequence feature (Maximum 10000 steps)
- Setup memory can be saved to or loaded from a USB flash drive.

Options

■ Parallel operation signal cable kit PC01-PLZ-5W (Cable length: Approx. 30 cm) PC02-PLZ-5W (Cable length: Approx. 1 m)

■ Low inductance cable Maximum allowable current: 100 A ①TL02-PLZ (Cable length: Approx. 1 m) ②TL03-PLZ (Cable length: Approx. 2 m)



200 nH

150 nH

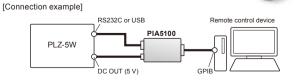
Inductance level (TYP level)

Maximum allowable current: 50 A LIC40-2P1M-M6M6 (Cable length: Approx. 1 m) LIC40-2P2M-M6M6 (Cable length: Approx. 2 m)

■ 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/UKCA certified product

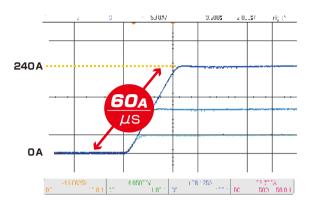


■ Sequence creation software SD023-PLZ-5W (Wavy for PLZ-5W)

Functions

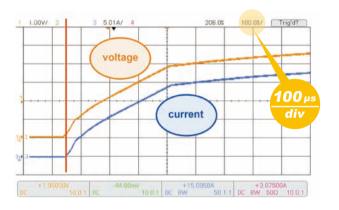
■ Maximum slew rate of 60 A/µs

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.



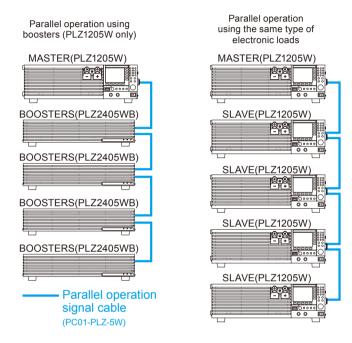
■ Parallel operation

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.

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

Increased power with optional booster units (Maximum currents and maximum voltages)







▲ 3.6 kW system combined with the PLZ1205W (upper unit) and PLZ2405WB (lower unit).

PLZ-5W Series Specifications

Item/Mod	el		PLZ205W	PLZ405W	PLZ1205W
Rating Operating voltage (DC) *1			0.25 \/ to 450 \/ *2		
Operating	voltage (DC	ا^ (ز		0.25 V to 150 V *2	240 A (80 A *3 for
Current			40 A	80 A	the load input terminals on the front panel)
Power			200 W	400 W	1200 W
		the load is off		Approx. 660 kΩ *4	
Load input	terminal's is	solation voltage		±500 V	
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 rai	nge	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	า	H range	1 mA	2 mA	5 mA
		M range	0.1 mA	0.2 mA	0.5 mA
0-44:		L range	0.01 mA	0.02 mA	0.05 mA
Setting ac	curacy	H range		% of set + 0.1% of ra	• ,
		M range		% of set + 0.3% of ra	
	D " :	L range	,	% of set + 1% of rang	0 ,
	Parallel operation	H, M range	,	% of set + 0.8% of ra	<u> </u>
Input line	<u> </u>	L range	,	% of set + 5% of rang	,
	regulation *	1	4 mA	8 mA 8 mA	24 mA
Ripple		rms *6	4 mA 40 mA	8 mA 80 mA	24 mA 200 mA
CR mode		p-p *7	40 IIIA	OU IIIA	200 IIIA
Operating Operating	rango *0	H range	40 S to 0.002 S	80 S to 0.004 S	240 S to 0.012 S
Operating	range 6	H range M range	(0.025 Ω to 500 Ω) 4 S to 0.0002 S	(0.0125 Ω to 250 Ω) 8 S to 0.0004 S	
		L range	(0.25 Ω to 5000 Ω) 400 mS to 0.02 mS	(0.125 Ω to 2500 Ω) 800 mS to 0.04 mS	
Setting rai	nge	H range	(2.5 Ω to 50000 Ω) 42 S to 0 S	(1.25 Ω to 25000 Ω) 84 S to 0 S	(0.42 Ω to 8333.3Ω) 252 S to 0 S
Octung rai	rigo	M range	(0.0238 Ω to Open) 4.2 S to 0 S	(0.0119 Ω to Open) 8.4 S to 0 S	(0.00397 Ω to Open) 25.2 S to 0 S
		L range	(0.238 Ω to Open) 420 mS to 0 S	(0.119 Ω to Open) 840 mS to 0 S	(0.0397 Ω to Open) 2520 mS to 0 S
		,	(2.38 Ω to Open)	(1.19 Ω to Open)	(0.397 Ω to Open)
Resolution	า	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 ac	curacy *9	H, M range		% of set + 0.5% of ra	
		L range		% of set + 1.5% of ra	
	Parallel	H, M range		% of set + 1.5% of ra	
CV/ mada	operation	L range	±(0.5	% of set + 5% of rang	ge)
CV mode Operating	rango	H range		1 V to 150 V	
Operating	range	L range		1 V to 15 V	
Setting rai	nge	H range		0 V to 157.5 V	
Jording rai	ngc	L range		0 V to 157.5 V	
Resolution	1	H range	1	5 mV	
		L range		0.5 mV	
Setting ac	curacy *10	190	+(0.1	% of set + 0.1% of ra	ange)
	Parallel op	eration		% of set + 0.2% of r	
Input curre	ent variation		(0.2	12 mV	3-7
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 rai	nge	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	1	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 ac	curacy *12	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	H, M range		nge + 0.4% current ra	
	operation	L range	±(2% of rai	nge + 2.5% current ra	ange × Vin)

Itom	/Model		PLZ205W	PLZ405W	PLZ1205W	
	mode		PLZZUSW	PLZ405VV	PLZ1205VV	
	Operating range Three to 100 points of current values can be set for the input				he set for the input	
Opci	Operating range			between two points is		
Rest	Response speed			e for input voltage m		
	meter					
Disp		H range		0.00 V to 150.00 V		
- 1	-,	L range 0.000 V to 15.000 V				
Accı	ıracy	1-1	±(0.1%	of reading + 0.1% of	range)	
	Parallel oper	ration(TYP)	,	of reading + 0.1% of	<u> </u>	
Amn	neter		,		, , , , , , , , , , , , , , , , , , ,	
Disp	lay	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	0.00 mA to	0.0000 A to	
			400.00 mA	800.00 mA	2.4000 A	
Accı	ıracy	H, M range	±(0.2%	of reading + 0.3% of	f range)	
		L range	±(0.2%	of reading + 1% of ra	ange)	
	Parallel op-	H, M range	±(0.4%	of reading + 0.8% of	range)	
	eration (TYP)	L range	±(0.4%	of reading + 5% of ra	ange)	
Pow	er display					
Disp	lay		Displays the produ	Displays the product of the voltmeter reading and ammeter		
				reading.		
	ching function	ו	l			
	ration mode		CC and CR			
	uency setting		1.0 Hz to 100.0 kHz			
	uency	1 Hz to 10 Hz		0.1 Hz		
settii	ng Iution	11 Hz to 100 Hz	1 Hz			
1030	idiloii	110 Hz to 1000 Hz		10 Hz		
		1.1 kHz to 10.0 kHz		0.1 kHz		
		10 kHz to 100 kHz	20	0 kHz, 50 kHz, 100 kH	Hz	
	uency setting		±(0.5% of set)			
	cycle set-	1 Hz to 10 Hz				
*13	range, step	11 Hz to 100 Hz	5.0	0% to 95.0%, 0.1% ste	eps	
15		110 Hz to 1000 Hz				
		1.1 kHz to 10.0 kHz		5% to 95%, 1% steps		
01		10 kHz to 100 kHz	10% to 90%, 10% steps			
	rate .					
	ration mode		0.04.47.4.40.47	CC	0.004/ 1.004/	
Setti	ing range	H range	<u> </u>	0.02 A/µs to 20 A/µs	 	
		M range	0.001 A/µs to 1 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	
Poor	olution	H range	0.01 A/μs	0.02 A/μs	0.06 A/μs	
Rest	Jiulion	M range	0.001 A/µs	0.02 A/µs	0.006 A/μs	
		L range		0.002 A/µs	· ·	
Setti	ina	H, M range				
	irig iracy *14	L range	±(10% of set +1.25 µs) ±(12% of set +5 µs)			
		Liange		±(12 /0 UI SEL +3 μS)		
Soft start Operation mode CC						
	e setting rang	2	100 µs, 200 µs, 500 µs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, or off			
Time setting accuracy		±(30% of set +10 µs)				

- *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.
- $^{\star}2$. In switching mode, for every slew rate setting of 1 A/ μ s, the minimum operating voltage (including the voltage drop due to the wiring inductance component) increases by approximately 150 $\,\mathrm{mV}$ for the PLZ205W, 125 mV for the PLZ405W, and 75 mV for the PLZ1205W.
- $^{\star}3$. 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 $k\Omega$
- $^{\star}5$. When the input voltage is changed from 1 V to 150 V at a current of rated power/150 V.
- *6. Measurement frequency bandwidth: 10 Hz to 1 MHz
- *7. Measurement frequency bandwidth: 10 Hz to 20 MHz
- *8. Conductance [S] = input current [A]/input voltage [V] = $1/resistance [\Omega]$
- *9. Converted value at the input current. At the connectors.
- *10. With the input voltage within the operating range, and at the connector during remote sensing.
- *11. For a current change in the range of 10% to 100% of the rating at an input voltage of 5 V (during remote sensing).
- *12. Vin: The voltage at the load input terminals on the rear panel or sensing connectors.
- *13. The minimum time span is 5us. The minimum duty cycle is limited by the minimum time span.
- *14. The time it takes to shift from 10% to 90% when the current is varied from 0% to 100% of the rated current.

PLZ-5W Series Specifications

Item/Model		PLZ205W	PLZ405W	PLZ1205W	
	note sensing compensat				
approx.	7 V (Total potential differ	ence between the inp	out terminals and sen	sing connectors)	
Protective fu					
	Setting range	0.0 A to 44.0 A	0.0 A to 88.0 A	0.0 A to 264.0 A	
protection	Resolution	10 mA	10 mA	10 mA	
(OCP)	Protection operation		off or limitation can b	e selected.	
Overpower	Setting range	0 W to 220 W	0 W to 440 W	0 W to 1320 W	
protection	Resolution	0.1 W	0.1 W	0.1 W	
(OPP)	Protection operation	Either load	off or limitation can b	e selected.	
Undervolt-	Setting range	0.	00 V to 150.00 V, or	off	
age protec-	Resolution		0.01 V		
tion (UVP)	Protection operation	Load off			
Watchdog	Setting range		1 s to 3600 s or off		
protection (WDP)	Protection operation		Load off		
Sequence fu	unction				
Operation m	node		CC, CR, CV, CP		
-	umber of programs		30		
	umber of steps		10000		
Step execut			25 µs to 1000 h		
Time resolu			25 µs		
Other functi					
Elapsed time		Displays t	he time from load on	to load off	
Liapood iiii	Range		1s to 999h 59min 59s		
Integrated c	urrent display		ated current from loa	,	
	ower display				
Auto load of		Displays integrated power from load on to load off. Automatically turns off the load after the specified time			
Setting range		elapses.			
		1s to 3599999s, or off			
General spe	cifications				
	e range / Input fre-		/ac (90 Vac to 250 Va		
quency rang			ntinuous / 47 Hz to 63		
Power cons	<u> </u>	50 VAmax	50 VAmax	85 VAmax	
	nt (peak value)		45 A		
Environ- mental	Operating temperature range	0 °C	to 40 °C (32 °F to 10	14°F)	
conditions	Operating humidity range	20%rh to 85%rh (no condensation)			
	Storage temperature range	-20 °	C to 70 °C (-4 °F to 1	°F to 158°F)	
	Storage humidity range	90%r	h or less (no condens	sation)	
	Installation location	Indoor use, altitude	of up to 2000 m, ove	rvoltage category II	
Insulation	Between primary and	.,	, , , , , , , , , , , , , , , , , , , ,	<u> </u>	
resistance	input terminals Between primary and	500.1/1	20 MO as re (700)	rh or looo\	
	chassis Between input termi-	500 Vdc,	30 MΩ or more (70%	III OF IESS)	
	nals and chassis				
Withstand- ing voltage	Between primary and input terminals	No abnorm	nalities at 1500 Vac fo	or 1 minute.	
	Between primary and chassis	No abnormalities at 1500 Vac for 1 minute.			
	Between input termi- nals and chassis	No abnormalities at 750 Vac for 1 minute.			
Electromagi (EMC) *1 *2	netic compatibility	standards. EMC Dir EN 61326-1 (Class / EN 61000-3-2, EN 6 Applicable under the	A *3), EN 55011 (Class 31000-3-3 e following conditions and wiring connected	ss A *3, Group 1 *4)	
Safety *1		Complies with the restandards. Low Vol	equirements of the fo tage Directive 2014/3	85/EU *2,	
		EN 61010-1 (Class I	*5, Pollution Degree	2 *6)	

- *1. Does not apply to specially ordered or modified PLZ-5Ws.
- Limited to products that have the CE mark/UKCA mark on their panels.
- 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 radiofrequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/analysis purpose.
- 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.
- 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.

PLZ2405WB Specifications

	•	
Item/Model		PLZ2405WB
Rating		
Operating vo	oltage	0.25 Vdc to 150 Vdc
Power		2400 W
Current		480 A
Current rang	ie	
H range	,-	0 A to 480 A
M range		0 A to 48 A
L range		0 A to 4.8 A
Setting accu	iracv	071.0 4.0 T
CC mode	H, M range	±(0.4% of set + 0.8% of range)
00000	L range	±(0.4% of set + 5% of range)
CR mode	H, M range	±(0.5% of set + 1.5% of range)
Ortmode	L range	±(0.5% of set + 5% of range)
CV mode	Liange	±(0.2% of set + 0.2% of range)
CP mode *	⊔ Mranga	±(2% of range + 0.4% current range × Vin)
CF IIIode	H, M range	
* \ /:== = = = :	L range	±(2% of range + 2.5% current range × Vin)
		sensing terminal voltage.
Measureme		. (0.40)
Voltmeter ac		±(0.1% of reading + 0.1% of range)
Ammeter	H, M range	±(0.4% of set + 0.8% of range)
accuracy	L range	±(0.4% of set + 5% of range)
Protection fu		
		e below are detected and activated on the PLZ1205W.
	see the PLZ-5W user's n	
Over temper	rature protection (OTP)	Turns off the load when the heatsink temperature
0 1		reaches 100 °C
General spe		40074 4 04074 (0074 4 05074) ; 4 4
Input power	supply voltage range	100 Vac to 240 Vac (90 Vac to 250 Vac), single-phase,
Innuit francis	20112000	continuous 47 Hz to 63 Hz
Input freque		
Power consi		95 VAmax
	nt (peak value)	45 Apeak
Environ- ment	Operating temperature range	0 °C to 40 °C (32 °F to 104 °F)
	Operating humidity	000/ 1 / 050/ 1 / 1 / 1
	range	20%rh to 85%rh (no condensation)
	Storage temperature	-20°C to 70°C (-4 °F to 158 °F)
	range	-20 0 10 70 0 (-4 1 10 100 1)
	Storage humidity	90%rh or less (no condensation)
	range	` '
	Installation location	Indoor use, altitude of up to 2000 m, overvoltage category II
Isolation vol		±500 V
Insulation	Between primary	
resistance	and input terminals,	500 Vdc
	between primary and chassis, between input	30 MΩ or greater (at 70%rh humidity or less)
	terminals and chassis	(at 70 /6111 Hullilidity Of less)
Withstand-	Between primary and	
ing voltage	input terminals	No abnormalities at 1500 Vac for 1 minute
0 0	Between primary and	No abnormalities at 1500 Vac for 1 minute
	Chassis	
	Between input termi- nals and chassis	No abnormalities at 750 Vdc for 1 minute
Electromagn	netic compatibility	Complies with the requirements of the following directive and
(EMC) *1 *2		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
Juicty		standards. Low Voltage Directive 2014/35/EU *2,
		EN 61010-1 (Class I *5, Pollution Degree 2 *6)

- Does not apply to specially made or modified products.
- Limited to products that have the CE mark/UKCA mark on their panels.
- 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.
- 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.
- 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.

PLZ-5WZ series models with impedance measurement function

Impedance measurement function has been added as a factory option for the electronic load PLZ-5W series.

Impedance measurement can be easily performed without creating a program by simply using the attached application software Imp. Meas. for PLZ-5WZ.

- An impedance measurement system can be easily created with a single PLZ-5WZ unit and dedicated impedance measurement software.
- Real-time impedance values of the DUT can be obtained during discharge.
- R, jX, 0 and Z measurements available.
- AC frequency from 100 Hz 10 kHz (seven fixed settings) and signal levels are programmable.
- Voltage slope correction feature that minimizes the effect of voltage slope due to discharge.
- Improved accuracy during minute impedance measurement with the zero adjustment function.
- Measurement results and graphs from the application software can be copied directly to Excel.

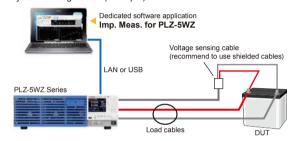
■ PLZ-5WZ series lineup (SPEC21192)

Model	Maximum operating current (A)	Operating voltage (V)	Power (W)
PLZ205WZ	40	0.25 to 150	200
PLZ405WZ	80	0.25 to 150	400
PLZ1205WZ	240	0.25 to 150	1200

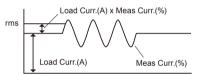
Application software Imp. Meas. for PLZ-5WZ (accessory)



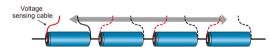
System Configuration (example)



Measurement condition diagram



• Impedance measurement for each single cell is also possible



■ Measurement functions

Item	Details	Conditions & remarks	
Measurement AC frequency	100 Hz, 200 Hz, 500 Hz, 1 kHz, 2 kHz, 5 kHz, 10 kHz	Seven fixed settings	
Measurement AC current (Meas Curr.)	0.1 % to 10 % of the DC load current (Load Curr.)	Set as a percentage	
Measurement time	50ms to 5s	Depends on the measurement AC frequency.	
Measurement items	R, X, Z , θ.	θ is calculated from R and X.	
Measurement average	Averages 1 to 16 measured values.	Function available when using application	
Zero adjustment (0 ADJ)	Zero adjustment on the DUT voltage sensing end	Function available when using application	
Voltage slope correction	Eliminates the effect that the slope of the DUT voltage caused by discharge has on measurements	Complete elimination is not possible if the slope is nonlinear	
Measurement method	2-phase lock-in amplifier method	Based on digital computation.	
Operating environment	Windows7/Windows10 (32 bit/64 bit)		

■ Measurement accuracy

Conditions ■ Ambient temperature: 18°C to 28°C ■ DUT: Reference resistance ■ Bias power supply: 12 V 54 Ah lead battery ■ Measurement AC current: Depends on DUT impedance (refer to the following table).

Voltage range at L range (15 V)

<u> </u>					
Percentage of ±Z readout value		Measurement AC frequency			
DUT impedance	Measurement AC current	100 Hz, 200 Hz, 500 Hz	1 kHz, 2 kHz	5 kHz, 10 kHz	
1.0 m Ω to 9.9 m Ω	500 mArms or more	±(5 % of reading+0.5 mΩ)	\pm (5 % of reading+0.5 m Ω)	-	
10.0 mΩ to 99.9 mΩ	250 mArms or more	\pm (5 % of reading+0.5 mΩ)	\pm (5 % of reading+0.5 m Ω)	-	
100.0 m Ω to 1000.0 m Ω	150 mArms or more	±(2 % of reading+0.5 mΩ)	\pm (3 % of reading+0.5 m Ω)	-	

Voltage range at H range (150 V)

Percentage of ±Z readout value		Measurement AC frequency		
DUT impedance	Measurement AC current	100 Hz, 200 Hz, 500 Hz	1 kHz, 2 kHz	5 kHz, 10 kHz
1.0 m Ω to 9.9 m Ω	2 Arms or more	±(5 % of reading+0.5 mΩ)	\pm (5 % of reading+0.5 m Ω)	-
10.0 m Ω to 99.9 m Ω	500 mArms or more	±(5 % of reading+0.5 mΩ)	\pm (5 % of reading+0.5 m Ω)	-
100.0 m Ω to 1000.0 m Ω	250 mArms or more	±(3 % of reading+0.5 mΩ)	±(4 % of reading+0.5 mΩ)	-

- * Accuracy of measurements outside the measurement range, L range current, and shaded portion is not guaranteed.
- θ is calculated from R and X by the application software
- * Specifications not listed above are in accordance with PLZ-5W Series product specifications.
- * Please contact our sales department for firmware update.

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

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 / Weight

PLZ1005WH2:

 $429.5(16.91")W \times 128(5.04")H \times 400(15.75")Dmm(inch) / 13 kg(28.7 lbs)$ PLZ2005WH2:

 $429.5(16.91")W \times 128(5.04")H \times 400(15.75")Dmm(inch) / 16 kg(35.3 lbs)$ PLZ4005WH2:

 $429.5(16.91")W \times 128(5.04")H \times 500(19.69")Dmm(inch) / 20 kg(44.1 lbs)$ PLZ12005WH2:

 $430(16.93")W \times 396.2(15.6")H \times 550(21.65")Dmm(inch)/64 kg(141.1 lbs)$ **PLZ20005WH2**:

 $430(16.93") W \times 573.5(22.58") H \times 550(21.65") Dmm(inch)/93 \ kg(205 \ lbs)$

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, China RoHS sheet

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 memory.)
- 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

■ 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).

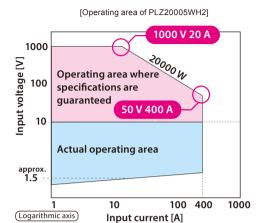
* Connecting with a smartphone, tablet, etc. requires a Wi-Fi environment (wireless LAN router etc.).



Functions

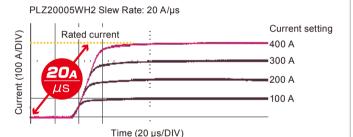
■ Wide ranging operation voltage up to 1000 V

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



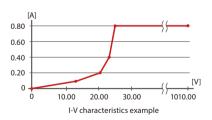
■ Maximum slew rate of 20 A/µs

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



■ Arbitrary I-V characteristics (ARB) mode

In ARB mode, arbitrary I-V characteristics can be set by registering multiple I-V characteristic points (pairs of voltage and current values). Three to 100 points can be registered, and the space between two points is linearly interpolated. The minimum voltage (0.00 V) and current (0.00 A) and the maximum voltage (1010.00 V) are fixed.



Example of setting value (* Value is fixed)

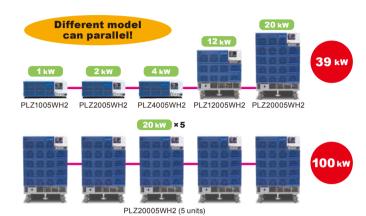
Current[A]
0.00*
0.10
0.20
0.40
0.80
0.80

■ 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.



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.

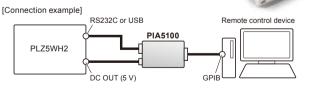
*When parallel operation between 5WH and 5WH2, only same capacity model is available.

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/UKCA 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(2000 V). Up to 80 A(Kikusui-recommended current) is supported.

Sequence creation and control software SD023-PLZ-5W (Wavy for PLZ-5W)

PLZ-5WH2 Series Specifications

Item/Model			PLZ- 1005WH2	PLZ- 2005WH2	PLZ- 4005WH2	PLZ- 12005WH2	PLZ- 20005WH2	
Rating			Г					
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 isolation v	oltage	•	F	Positive pin: ±1	000 V, Negat	ive pin: ±900 \	/	
Minimum operating					10 V			
voltage		n the current is to flow			1.5 V or less			
Constant		nt (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 rai	nge		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	<u> </u>		0.0005 A	0.001 A	0.002 A	0.005 A	0.01 A	
Setting ac		V			setting + 0.1 %			
		eration			setting + 0.2 9			
		ance (CR) m	ode	_(0117101	Jenning en			
Operating		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	
range *1		L range	5 mS to 0 S	10 mS to 0 S		60 mS to 0 S	100 mS to 0 S	
	200		505.00 mS	1.01000 S to	2.02000 S to	6.0600 S to	10.1000 S to	
Setting rai	ige	H range	to 0.00 S	0.00000 S to	0.00000 S to	0.00000 S to	0.0000 S	
		L range	5.05000 mS	10.1000 mS	20.2000 mS	60.600 mS	101.000 mS	
		Liange	to 0.00000 S	to 0.0000 S	to 0.0000 S	to 0.000 S	to 0.000 S	
Resolution	1	H range	0.01 mS	0.00000 S	0.00005 S	0.0002 S	0.0002 S	
ivesoinfiol	'	-	0.001 mS	0.00002 S 0.0002 mS	0.00005 S 0.0005 mS	0.0002 S 0.002 mS	0.0002 S 0.002 mS	
0-44		L range	0.0001 mS	l			U.UU2 MS	
Setting	+2	H range			etting + 0.5 %			
accuracy '		L range			etting + 0.2 %			
Paral		H range			etting + 1.0 %			
opera	ation	L range		±(1.0 % of s	etting + 0.4 %	of rating *3)		
Response	spee	d			NORM/FAST			
Constant	voltag	e (CV) mode						
Operating	range	=			10 V to 1000 V	,		
Setting rai				0.0	00 V to 1010.00) V		
Resolution			0.02 V					
Setting ac			±(0.05 % of setting + 0.05 % of rating)					
			±(0.1 % of setting + 0.05 % of rating)					
		eration						
Response					NORM/FAST			
		(CP) mode						
Operating	range	9	0 W to	0 W to	0 W to	0 W to	0 W to	
Setting rai	200		1000 W 0.00 W to	2000 W 0.00 W to	4000 W 0.0 W to	12000 W 0.0000 kW to	20000 W 0.0000 kW to	
Setting rai	ige		1010.00 W	2020.00 W	4040.0 W	12.1200 kW	20.2000 kW	
Resolution			0.02 W	0.05 W	0.1 W)5 kW	
Setting ac			±(0.5 % of	±(0.5 % of	±(0.5 % of	±(0.5 % of	±(0.5 % of	
Setting ac	curac	у	rating*5 +	rating*5 +	rating*5 +	rating*5 +	rating*5 +	
				0.04 A × Vin*6)				
Paral	lel op	eration	_	% of power ra				
			±(1 % of power rating + 0.1 % current rating × Vin*6) + 0.1 % current rating × Vin*6)					
Arbitrary I	-V cha	aracteristics	(ARB) mode	Ť				
Operating				0 points of curi	rent values ca	n be specified	for the input	
,	9			near interpolati				
Response	spee	d	_	ms, 2 ms, 5 m				
Measurem								
Voltmeter	$\overline{}$			0.0	00 V to 1000.0	O V		
	⊢÷	lution		3.0	10 mV			
	Accu			+(0.05 % of	reading + 0.05	% of rating)		
	Accu	Parallel						
		operation		±(0.1 % of rea	ding + 0.1 % o	f rating) (TYP)		
Ammeter	Disp		0.000 A to	0.000 A to	0.000 A to	0.00 A to	0.00 A to	
Annietel	Dish	ay	20.000 A to	40.000 A to	80.000 A to	240.00 A to	400.00 A	
	Reso	lution	0.001 A	0.000 A	0.000 A	0.01 A	0.01 A	
	_		0.001A		reading + 0.1		0.017	
	Accu			±(∪.∠ % 0Ĭ	reaurity + 0.1	o or rauriy)		
		Parallel operation		±(0.4 % of rea	ding + 0.2 % o	f rating) (TYP))	
Dower di	nle:	operation						
Power display			Displays the product of the voltmeter reading and ammeter reading					
	Measure- Trigger Source		Imme	diate, BUS, D		iic, iALink, Lo	adUtf	
ment trigger		er Count			1 to 65536			
trigger	Trigg	er Delay		0.000	00 s to 100.00	000 s		
	Inter	val		[Disable/Enable	•		
	Inter	val Time		0.0	00001 s to 360	0 s		
	Sens	e Aperture			001 s to 1.000			
Slew rate								
Operation	mode				CC			
Operating			0.001 A/µs	0.002 A/µs	0.004 A/µs	0.01 A/µs to	0.02 A/µs to	
Operating	range	,	to 1 A/μs	to 2 A/μs	to 4 A/μs	12 A/µs to	0.02 A/μs to 20 A/μs	
Resolution	1		_	0.00005 A/µs		· ·		
		*7	U.UUUUZ A/µS				υ.υυυυ Α/μ\$	
Setting accuracy *7			±(10 '	% of setting +2	υ με)			

Item/Mod	el	PLZ-	PLZ-	PLZ-	PLZ-	PLZ-
		1005WH2	2005WH2	4005WH2	12005WH2	20005WH2
Pulse function Operation mode				CC and CR		
Frequency setting range			1	0 Hz to 10.0 kł		
Frequency				0.1 Hz	12	
setting	11 Hz to 100 Hz			1 Hz		
resolution	110 Hz to 1000 Hz			10 Hz		
-8	1.1 kHz to 10.0 kHz			0.1 kHz		
Frequency	1 Hz to 5.0 kHz		±(0.5 % of settin	ıg)	
setting accuracy	5.1 Hz to 10.0 kHz		±(1.0 % of settin	g)	
Duty cycle	1 Hz to 10 Hz					
setting range,	11 Hz to 100 Hz		5.0 % t	o 95.0 %, 0.1 %	% steps	
step	110 Hz to 1000 Hz					
	1.1 kHz to 10.0 kHz			95 % *9, 1 %		
Switch value	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
(Depth) *10	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
Sine funct	ion					
Operation	mode			CC		
Frequency	setting range	1	Hz to 1000 Hz	, 2000 Hz, 500	00 Hz, 10000 H	-lz
Frequen-	1 Hz to 10 Hz			1 Hz		
cy setting resolution	20 Hz to 100 Hz	10 Hz				
*11	200 Hz to 1000 Hz	100 Hz				
Frequen-	300 Hz to 900 Hz	±(1.0 % of setting)				
cy setting accuracy	Other than the frequencies above	±(0.5 % of setting)				
Soft start						
Operation	mode	CC				
Time setti	ng range	500 μs, 1 ms, 2 ms, 5 ms, 10 ms, 20 ms, 50 ms, 100 ms, or off				
Alarm fund	ction	ı				
Alarm 1		tection, over-	current detecti	erse-connection on of the front- llel operation a	-panel DC INP	UT terminals,
Alarm 2				P), Overpower atchdog prote		PP), Under-
Sequence	function					
Operation			(CC, CR, CV, CI	P	
Maximum programs	number of	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				ime from load		
	Range			000 s (1000 h		
Ampere-h	our meter display			ys integrated of		
	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	7 0000 All		ays integrated		1400000 All
• • • • • • • • • • • • • • • • • • •	Range	0 Wh to	0 Wh to	0 Wh to	0 Wh to	0 Wh to
	90	40000000 Wh		160000000 Wh		

- *1. Conductance [S] = input current [A]/input voltage [V] = 1/resistance $[\Omega]$
- *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.
- *7. Time to change from 10 % to 90 % when the current is changed from 0 % to 100 % of the rated
- *8. (Reference) The resolution actually set in the device is period resolution \varDelta T = 1 $\mu s,$ as shown in the equation below. For example, if you specify 9300 Hz, the period set in the device will be n × \varDelta T = 108 × 1 μ s = 108 μ s (where n is a number set in the device). Converted to frequency, this becomes $1/108 \mu s = 9259 Hz$.
- ${}^\star 9. \;\;$ The minimum time span is 20 $\mu s.$ The minimum duty cycle is limited by the minimum time span.
- *10. The switch value is limited to the set current or set conductance or less.
- *11. (Reference) The resolution actually set in the device is period resolution \varDelta T= 20 μ s, as shown in the equation below. For example, if you specify 900 Hz, the period set in the device will be $\ensuremath{\text{n}}$ \times \triangle T = 56 \times 20 μ s = 1120 μ s (where n is a number set in the device). Converted to frequency, this becomes 1/1120 μ s \approx 893 Hz.

PLZ-5WH2 Series Specifications

Item/Model		PLZ- 1005WH2	PLZ- 2005WH2	PLZ- 4005WH2	PLZ- 12005WH2	PLZ- 20005WH2	
Cutoff function							
Elapsed	time	The load			time value rea	ches the	
D				specified value			
,	Range		0 s to 3600	0000 s (1000 h	1 0 min 0 s)		
Integrate	Resolution ed current	The load tu	ns off when th	1 s	ır meter value	reaches the	
integrate		THE load tu		specified value		Todorios trio	
	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		h), 0.001 kAh		Ah), 0.001 Ah (1000.000 kAh) 1 MAh)		
Integrate	ed power	The load t		the watt-hour specified value	meter value re	eaches the	
	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 kWh (1. dWh to 800.00		
Voltage o	drop		rns off when th	ne voltmeter va	alue becomes		
1	Range			o the specified 00 V to 1000.0			
	Resolution		0.0	0.02 V	0 V		
Other fur				5.02 V			
	Input voltage			4000 \ / +0			
	rating *1			1000 V *2			
	Isolation voltage			±1000 V			
	of units in parallel			5 units			
operation Mutual sy	n ynchronized	Synchronizes	load on/off.	Synchronizati	on of sequen	ce execution	
operation	n *3	and sequence sured values.	resumption.	Synchronizing	the recording	timing of mea-	
EXT_CO	NT connector *4						
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. An alarm is activated with a voltage between 0 V and 1.5 V.					
Alarm inp	put	Pulled up to 5	V by a 10 kΩr	esistor.	en 0 V and 1.5 W: 0 V to 1.5		
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 k Ω resistor. The thresholds are HIGH: 3.5 V to 5.0 V, LOW: 0 V to 1.5 V.					
Trigger ir	nput	Paused sequence operation resumes when a voltage between 0 V and 0.66 V is received. Pulled up to 5 V by a 10 k Ω resistor. The thresholds are HIGH: 2.31 V to 3.3 V, LOW: 0 V to 0.66 V.					
	voltage control C, CR, CP mode)	Controls the load settings of CC, CR, CP mode through external voltage input. Input impedance: Approx. 10 k Ω . 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 input (CV	voltage control	input. The rate	ed voltage can	be controlled	lled through exin the range of		
	Setting accuracy	with 0 V to 10 V. Input impedance: Approx. 10 kΩ. ±(1 % of rating) (TYP)					
	voltage control perimposing in CC	nal voltage in	put. Adds curr	ent in the rang	dding current ge of -100 % to dance: Approx	100 % of the	
,	Setting accuracy	3.5.2.30.1071		% of rating) (T			
Load-on	status output	On when load is on. Open-collector output from a photocoupler.*5					
ALARM 1 output		ON when load is oil. Open-collector output from a priodocupler. 3 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.*5					
		Turns on when OCP, OPP, UVP, or WDP is activated. Open-collector output from a photocoupler.*5					
		output from a	photocoupler.	*5			
	. 0 output/DIGITAL	output from a Can be contr	photocoupler. olled through	*5 sequences. (Output impeda 3.3 V, LOW: 0	ance: Approx	
1 output	. 0 output/DIGITAL	output from a Can be contr 330 Ω. The th Input/output s Output: Sequ The threshold Input: Trigger	photocoupler. olled through resholds are b witchable. lence trigger ls are HIGH: 2 input signal fo	*5 sequences. (HIGH: 2.5 V to output. The o .5 V to 3.3 V, L r the sequence	Output impeda	ance: Approx V to 0.4 V. nce is 330 Ω 4 V. urement func	
DIGITAL 1 output DIGITAL	. 0 output/DIGITAL	output from a Can be contr 330 Ω. The th Input/output s Output: Sequ The threshold Input: Trigger tions. The thre	photocoupler. olled through resholds are I- witchable. Hence trigger Is are HIGH: 2 input signal fo esholds are HIGO 0 10 V for 0 %	sequences. (HIGH: 2.5 V to output. The o .5 V to 3.3 V, L r the sequence GH: 2.31 V to 3	Output impeda 3.3 V, LOW: 0 utput impedal LOW: 0 V to 0.0 and the meas	ance: Approx V to 0.4 V. nce is 330 Ω 4 V. urement func / to 0.66 V.	

Item/Model			PLZ- 1005WH2	PLZ- 2005WH2	PLZ- 4005WH2	PLZ- 12005WH2	PLZ- 20005WH2
BNC con	nector					1200011112	
Trigger output			Transmits 10 μ s pulses during step execution when trigger output is set in a sequence. Transmits 10 μ s 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	Output v	oltage	Output	s 0 V to 10 V f	or 0 % to 100 °	% of the rated	current
monitor	Output ir	npedance			50 Ω (TYP)		
output	Accurac	:y		:	±(1 % of rating)	
Voltage	Output v	oltage	Outputs the m	easured voltag	e with 1/100 m	agnification fro	om 0 V to 10 V.
monitor	Output in	npedance			50 Ω (TYP)		
output	Accurac	:у		:	±(1 % of rating)	
Isolation	voltage				±30 V		
Commun	ication fu	ınction					
RS232C			Data length: 8 CTS/RTS	connector. Ba 3 bits, Stop bit	s: 1 bit, Parity	bit: None, Flo	w control: No,
USB (dev			Data rate: 480 Complies with	B socket.Cor Mbps (High S the USBTMC	Speed). -USB488 dev	ice class spec	ifications.
USB (hos	st)		Data rate: 480	A socket. Co Mbps (High S	Speed).		
LAN			IEEE 802,3 10	00Base-TX/10	Base-T Etherr	net, IPv4, RJ-4	15 connector.
General							
Input volt			100 \	/ac to 240 Vac	<u> </u>		hase
Input free			47 Hz to 63 Hz				
Power co		_	70 VAmax	90 VAmax	150 VAmax	360 VAmax	590 VAmax
Inrush cu (peak val		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			0.5 mA or less	U.6 MA or less	U.8 mA or less	1.6 mA or less	2.4 mA or less
Environ- mental condi-	ature ran		0 °C to 40 °C (32 °F to 104 °F)				
tions	ity range		20 %rh to 85 %rh (no condensation)				
	ture rang			-25 °C to	60 °C (-13 °F	to 140 °F)	
	Storage range		90 %rh or less (no condensation)				
	Installation	on loca-	Indoor use, altitude of up to 2000 m, overvoltage category II				ategory II
Insula- tion re- sistance	and chas monitor t	primary ssis, input, terminals		1000 Vdc, 30	MΩ or more (7	'0 %rh or less)	
	Between input terminals and chassis, monitor terminal		1000 Vdc, 3 MΩ or more (70 %rh or less)				
With- standing voltage Between primary and chassis, input, monitor terminals			No abnormalities at 1500 Vac for 2 s				
	Between terminals chassis, terminal	s and	No abnormalities at 1500 Vac for 2 s				
Electromagnetic compatibility *7 *8		dards. EMC D EN 55011 (Cla Applicable un cabling and w	Pirective 2014/ ass A *9, Grounder the following connected	30/EU, EN 613 p 1 *10), EN 6 fing conditions ed to the produ	326-1 (Člass A 1000-3-2, EN , The maximul lot must be les	61000-3-3 m length of all s than 3 m.	
Safety *7			Directive 2014/			tive and stan- ss I *11, Pollu-	

- There are limitations depending on the actual power that the load consumes.
- Total potential difference between the DC INPUT terminals and SENSING terminals
- The terminals for mutual synchronized operation are isolated from the DC INPUT terminals and operate at the chassis potential.
- . 1000 V reinforced insulation between each terminal and the DC INPUT terminal
- The maximum voltage that can be applied to the photocoupler is 30 V. The maximum current is 4 mA.
- *6. Leakage current between the positive and negative terminals of the rear-panel DC INPUT. At 1000 Vdc.
- Does not apply to specially ordered or modified products.
- Limited to products that have the CE mark/UKCA mark on their panels.
- 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.
- *10. 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.
- *11. 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.
 *12. 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.

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

Z-U Series













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

Dimensions / Weight

PLZ-30F:

 $292(11.50^{\circ})W \times 128(5.04^{\circ})H \times 400(15.75^{\circ})Dmm(inch)/5 kg(11.02 lbs)$ PLZ-50F:

 $435(17.13")W \times 128(5.04")H \times 400(15.75")Dmm(inch)/7 kg(15.43 lbs)$

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 par-
- 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.

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 multichannel 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.

Accessories

Load unit: Rear load input terminal cover, Rear sensing terminal screws (2 pcs.), Set of screws for the load input terminal (2 pcs. each), Load unit attachment screw (2 pcs./M3-10 screw), Frame: Power cord (2.5 m), Front/Rear blank panel (2 pcs./PLZ-30F or 4 pcs./PLZ-50F), FRAME CONT protection dummy plug (2 pcs.), Operation manual

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 nosignal 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

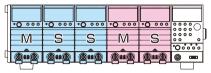
■ Control flat cable PC01-PLZ-4W (300 mm) PC02-PLZ-4W (550 mm) (for connection between frames)



■ Sequence creation software Wavy for PLZ-U

Parallel Operation for Larger Capacity

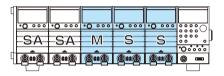
Up to five adjacent load units of the same models can be operated in parallel. For example, you can build a 375-watt load system by operating five PLZ70UA load units in parallel in the PLZ-50F frame or a 750-watt load system by operating five PLZ150U load units in parallel.



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

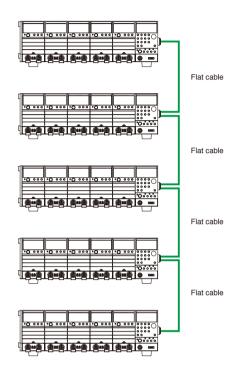
When three load units of the same model are operated in parallel and two standalone load units are operated independently in the PLZ-50F frame

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		0	1	1
PLZ30F-70UA0-150U2		0	2	2
PLZ30F-70UA0-150U3		0	3	3
PLZ30F-70UA1-150U0		1	0	1
PLZ30F-70UA1-150U1	PLZ-30F	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		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	PLZ-50F	1	4	5
PLZ50F-70UA2-150U0	FLZ-50F	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

Item/Model			PLZ150U	PLZ70UA	
Rating			<u> </u>		
Operating voltage (I	DC)		1.5 V to 150 V	0 V to 150 V	
Current/power	Range	Н	30 A/150 W	15 A/75 W	
	•	М	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 b terminal channels	etween load	d input	500	VDC	
Minimum start volta	ge *1		0.3 V or	greater	
CC mode					
Operating range	Range	Н	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 10	5 % of f.s	
Resolution	Range	Н	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	Range	Н	2 mA		
variation *3	•	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	Range	Н	PLZ150U OPEN to 50 mΩ (0 S to 20 S)	OPEN to 100 mΩ (0 S to 10 S)	
parentheses is the conductance *6		М	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	Range	Н	0.2 mS (0 S to 2 S)	0.1 mS (0 S to 1 S)	
The value inside parentheses is the			2 mS (2 S to 20 S)	1 mS (1 S to 10 S)	
operating range		M	20 μS (0 S to 200 mS)	10 μS (0 S to 100 mS)	
operating range			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	Н	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 10	5 % of f.s	
Resolution	Range	Н	10	mV	
		L	1 r	mV	
Accuracy of setting	Range	H and L	±(0.1 % of set + 0.1 % of f.s)		
Input current variation				mV	
•			ts flowing to the PLZ-LL (The PLZ-LL detects no sig-		

^{*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

- At a current greater than or equal to (Vin/500 k Ω) Measurement frequency bandwidth: 10 Hz to 1 MHz Measurement frequency bandwidth: 10 Hz to 20 MHz
- Conductance [S] = (Input current [A]/input voltage [V]) = (1/resistance $[\Omega]$)
- *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

Item/Model			PLZ150U	PLZ70UA	
Measurement rang	е		0 V to 150.0 V		
Resolution	15.75 V to 1	50 V	0.0	1 V	
	0 V to 15.75	V	0.00	01 V	
Measurement accuracy			±(0.1 % of rd	g + 15 digits)	
Ammeter			(**************************************	3 - 	
Measurement	Range	Н	0 A to 30 A	0 A to 15 A	
range	i tango	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	0.00		
resolution	range	M		01 A	
		L		mA	
Measurement accu	racy	L		+ 0.3 % of f.s)	
Wattmeter *12	тасу		±(0.2 % 01 lug	+ 0.3 % 01 1.5)	
Measurement rang	e		0 W to 150 W	0 W to 150 W	
Resolution	100 W minir	mum		1 W	
resolution	100 W mmm			W	
Switching mode	100 W OI gi	ealei	0.1	VV	
Operation mode			CC and CR		
Selectable frequen	ov range		1 Hz to 20 kHz		
Duty cycle setting	cy range		2 % to 98 %, 0.1 % steps		
Frequency	1 Hz to less than 1 kHz			Hz	
resolution	1 kHz to less than 10 kHz		10 Hz		
	10 kHz to 20 kHz		100 Hz		
Accuracy of freque	1	KIIZ	±(0.5 % of set)		
Slew rate	ncy setting		I(0.5 %	o or set)	
Operation mode			CC ar	od CD	
	Danas	Н			
Selectable range (CC)	Range	M	0.10 A/µs to 2.40 A/µs	0.05 A/µ to 1.20 A/µs	
(00)		I	0.10 A/µs to 0.24 A/µs	0.05 A/μ to 0.12 A/μs	
0-14-61	Danas	_	24 mA/µs *13	12 mA/µs *13	
Selectable range (CR)	Range	Н	0.10 A/µs to 0.24 A/µs	0.05 A/μ to 0.12 A/μs	
(OIV)		M	24 mA/µs *13	12 mA/µs *13	
		L	2.4 mA/µs *13	1.2 mA/µs *13	
Resolution	***		0.01 A/µs		
Accuracy of setting	^14		±(10 % of	set + 5 µs)	
Soft start					
Operation mode			C		
Selectable time range			0.1, 1, 3, 10, 30, 100, or 300 ms		
Time accuracy			±(30 % of s	et +100 µs)	
Sequence function					
Sequence	Operation m			nd CR	
		mber of steps	25		
	Step execut			9 999 s	
	Number of le	oops	1 to 9999 (9999	is infinite loop)	

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

Item/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 rang whichever is less. The action taken when the OCP trips can be set to lo			
Overpower protection (OPP)	Set the value in the range of 0 % to 110 % of the rated power of H range is less. The action taken when the OPP trips can be set to load off or lin			
Overheat protection (OHP)	Trips when the heat sink temperature reaches 95 °C. The action taken v	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 protect	ion 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.			
			resets ABC on all channels simultaneously,		
		and recall setup			
External control	Recall input of preset mem-ories A, B, and C		d C on all channels simultaneously		
	Setup memory recall input		p memory 0 to 3		
	Enable input	Enables the turning on/off of the load, recalling and recalling of set	of presets ABC on all channels simultaneously, up memories 0 to 3.		
	Load-on input	Turns on the load on all of	channels simultaneously.		
	Load on status output	On when the load is on	(open collector output)		
	Alarm status output	On when the alarm is or	n (open collector output)		
	Internal power output	5 V and maximum out	put current of 100 mA		
Input signal		Low active, pull up Low level input voltage: 0 V to 1 V,	to 5 V using 10 kΩ. high level input voltage: 4 V to 5 V		
Output signal		Open collector, output wit output saturation voltage of approximately 1.			
Remote sensing		Output Saturation Voltage of approximately 1.	1 V, and maximum output current or 100 mA.		
	at can be compensated	2 V for a	single line		
Miscellaneous	at can be compensated	2 101 4 3	single line		
ABC preset memo	ries	Saves settings (A. B. and C) for ea	ach operation mode of each range		
Setup memories		Saves four sets of setup parameters			
Elapsed time displ	ay	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 co	ntrol	·			
Power output		12 V and maximum ou	itput current of 50 mA.		
External voltage co	ontrol 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), Low level input voltage: 0 V to 1 V,	pull up to 5 V using 10 kΩ. high level input voltage: 4 V to 5 V		
Current monitor ou	tput	0 % to 100 % of the rated curr	rent in the range of 0 V to 10 V		
Common		Negative pin electric potent	ial of the load input terminal		
General Specificat	ions		·		
Weight		Approx. 2 k	g (4.41 lbs)		
Accessories	Rear load input terminal cover	1,	DC.		
	Set of screws for the load input connector	·	S spring washer, M4 screw)		
	Load unit attachment screws	2 pcs. (M3-10 screws			
		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 hear	t sensing variable speed fan.		
Operating temperatur	re range	0 °C to	40 °C		
Operating humidity ra	ange	20 % to 85 % RH (wit	hout condensation)		
Storage temperature	range	−20 °C to	70 °C		
Storage humidity rang	ge	90 % RH or less (with	hout condensation)		
Insulation resistance	Primary - chassis	500 VDC, 30 MΩ or more (ambie	nt humidity of 70 % RH or less)		
Withstand voltage	Primary - chassis	No abnormalities at 15	00 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 EN 61000-3-2. EN 61000-3-3			
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. Limited to products that have the CE mark/UKCA mark on their panels.

*3. Not applicable to custom order models.

*4. This unit is a Class I device. Be sure to ground the protective conductor terminal of the unit. The safety of the unit is not guaranteed unless the unit is grounded properly.

High Rate Battery Tester

PFX2731S







Dimensions / Weight

 $440(17.32^{\circ})W \times 173(6.81^{\circ})H \times 620(24.41^{\circ})Dmm(inch) / 34 kg(74.96 lbs)$

Accessories

Power cord, Rear panel cover set, Temperature measurement box, Temperature measurement cable, TRIP connector, Signal I/O connector, LAN cable, Heavy object warning label, Operation manual, Safety information, China RoHs sheet

*Cable set is not included. Please purchase the optional cable set

Options

■ Cable set

TL13-PFX

Output cable (with connector): AWG10(equivalent to 5.5 mm²), cable length: approx. 2 m Voltage sensing cable (with connector): AWG24, cable length: approx. 2 m Thermocouple: AWG24, T type, Teflon, wire diameter: 0.32 mm², cable length: approx. 3 m Cable ties: 4



TL14-PFX

Output cable (with connector): AWG10(equivalent to 5.5 mm²), cable length; approx. 5 m Voltage sensing cable (with connector): AWG24, cable length: approx. 5 m Thermocouple: AWG24, T type, Teflon, wire diameter: 0.32 mm², cable length: approx. 5 m Cable ties: 10

Supports single-cell evaluation for all-solid-state batteries, lithium-ion batteries, etc

The PFX2731S is a 6 V-20 A 6-channel battery tester that supports high-rate charge/discharge tests. It is operated with the application software BPChecker4000, which is exclusive to the PFX2731S. As one PC can operate up to 4 units (24 channels), one can construct a multichannel charge/discharge system according to the required number of channels. In order to safely conduct long-term continuous testing, it also has 2-system independent protection functions for hardware and software, as well as various protection functions such as a connection confirmation function that detects incorrect wiring and integrated capacity protection.

Features

- 10 ms continuous measurement (at the fastest setting)
- Supports single-cell evaluation (can be set with C-rate)
- Various charge/discharge modes (9 modes in total)
 - Charge: CC, CC-CV, CP, CP-CV
 - Discharge: CC, CC-CV, CP, CP-CV
 - Pattern charge/discharge (CC(+CV), CP(+CV))
- When an error is found, a built-in path switch immediately terminates the test
- Four constant temperature chambers (produced by Espec) can be operated synchronously
- A T-type thermocouple (optional) can be used to measure temperature
- Simply connecting a LAN cable enables system construction
- Enhanced protection function

Application Software SD035-PFX BPChecker4000

BPChecker4000 enables you to set conditions for battery charging/ discharging characteristic tests, run the tests, and analyzes test results using a PC. BPChecker4000 consists of the following two components, Test Condition Editor, which creates test conditions, and Test Executive, which executes tests.

[Test Condition Editor]

This program is used to create and edit all of test conditions related to charge/ discharge testing. After profile creation, sequence and total settings, etc, are performed to create a project. BPChecker4000 executes the test by the project.



[Test Executive]

This program executes charge/discharge tests according to the test condition file created using the Test Condition Editor.



Operating Environment for BPChecker4000

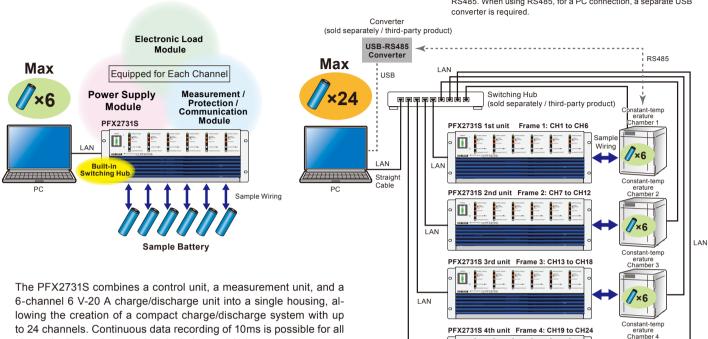
- · OS: Windows 11, Windows 10 Pro (64 bit)
- · Processor: Core i5 or higher · Memory: 8 GB or more
- · Storage: 2-drive configuration recommended Drive1 SSD Free space 150 GB or more (System Drive) Drive2 HDD Free space 540 GB or more (Data Drive)
- Display resolution: 1280 × 1024 (19 inch) or more
- Communication: Wired LAN (100Base-TX) CD-ROM drive KI-VISA

System Configuration

- Example of connecting one PFX2731S with a LAN cable
- Example of connecting four units of PFX2731S and four thermostatic chambers* via LAN cable

*The connection to the thermostatic chamber can be either LAN or RS485. When using RS485, for a PC connection, a separate USB

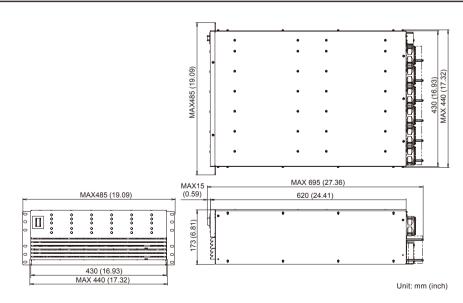
Manufactured by ESPEC



LAN

channels due to the complete isolation and independent measurement functions of each channel.

External Dimensional Diagrams



PFX2731S Specifications

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

· The product is warmed up for at least 30 minutes.

The used terminology is as follows:

- TYP: These are typical values that are representative of situations where the product operates in an environment with an ambient temperature of 23 °C (73.4 °F). These values do not guarantee the performance of this product.
- setting: Indicates a set value.
- reading: Indicates a readout value.
 rating: Indicates a rated value.
- Static: General term to indicate CC charge, CC CV charge, CC discharge, CC CV discharge, CP discharge, and CP - CV discharge.

 • Pattern: General term to indicate pattern charge/discharge.

C-rate entry is supported.

- Individual CC values, pattern charge/discharge step current, limit current, current capacity of end condition/It cutoff current can be set using a C-rate.
- C-rate calculation specifications

The nominal capacity setting value is assumed to be 1C. C-rate setting range: 0.001 to 99.999 (the range is common.)

The conversion result from a C-rate to a current/capacity value is rounded to the nearest control resolution.

*DUT cable: 5.5 mm2 in diameter, 5 min length

Rated output					
Number of outputs		6 ch (per frame)			
Isolation		Between channels, Ch-chassis			
Charge current range	2 A range	0.0000 A to 2.0000 A			
	20 A range	0.000 A to 20.000 A			
Charge voltage range		-1.000 V to 6.000 V			
Discharge current range	2 A range	0.0000 A to 2.0000 A			
	20 A range	0.000 A to 20.000 A			
Discharge voltage range		-1.000 V to 6.000 V			

Discharge vo	itage range		-1.000 V to 0.000 V		
Setting accur	acy				
Static					
Constant	2 A range	Range	0.0000 A to 2.0000 A		
current		Accuracy *1	±(0.15 % of setting + 1.0 mA)		
charge/		Resolution	0.1 mA		
discharge	20 A range	Range	0.000 A to 20.000 A		
		Accuracy *1	±(0.15 % of setting + 10.0 mA)		
		Resolution	1 mA		
Constant volt	age	Range	-1.000 V to 6.000 V		
charge/discha	arge	Accuracy *1	±(0.05 % of setting + 1.2 mV)		
		Resolution	1 mV		
Constant	2 A range	Range	-0.100 W to 12.000 W		
power		Accuracy *1, *3	±(0.5 % of setting + 0.01 W)		
charge/		Resolution	1 mW		
discharge *2	20 A range	Range	0.10 W to 120.00 W		
		Accuracy *1, *3	±(0.5 % of setting + 0.1 W)		
		Resolution	10 mW		
Pattern					
Constant	2 A range	Range	-2.0000 A to 2.0000 A (negative values are discharge currents)		
pattern		Accuracy *1	±(0.15 % of setting + 1.0 mA)		
		Resolution	0.1 mA		
	20 A range	Range	-20.000 A to 20.000 A		
		Accuracy *1	±(0.15 % of setting + 10.0 mA)		
		Resolution	1 mA		
	Number of s	settings	100000 step (maximum number of steps)		
	Range		100 ms to 999.9 s (the time width per step)		
	Resolution		100 ms		
	Switching ti	me *4	100 ms max.		
Constant	2 A range	Range	-12.000 W to 12.000 W (negative values are discharge power)		
pattern *2		Accuracy *1, *3	±(0.5 % of setting + 0.01 W)		
		Resolution	1 mW		
	20 A range		-120.00 W to 120.00 W		
		Accuracy *1, *3	±(0.5 % of setting + 0.1 W)		
		Resolution	10 mW		
	Number of s		100000 step (maximum number of steps)		
	Range	.3-	100 ms to 999.9 s (the time width per step)		
	Resolution		100 ms		
	Switching ti	me *4	100 ms max.		
	10 witching ti	-	Too mo max.		

- Ambient temperature range: 18 °C to 28 °C
- The battery voltage is measured, and the control current (constant current control) is calculated from the set power value through software calculation.
- *3. Battery voltage range: 1 V to 6 V or higher
- *4. Maximum time required for switching: charge -> discharge, discharge -> charge

Measuremer	it accuracy				
Static/ Patter	'n				
Charge/	Range	2 A range	-2.00000 A to 2.00000 A		
discharge		20 A range	-20.0000 A to 20.0000 A		
Current measure-	Accuracy *5	2 A range	±(0.15 % of reading + 1.0 mA)		
ment		20 A range	±(0.15 % of reading + 10.0 mA)		
	Resolution	2 A range	0.01 mA		
		20 A range	0.1 mA		
Voltage	Range		-2.0000 V to 7.0000 V		
measure-	Accuracy *5		±(0.05 % of reading + 1.2 mV)		
ment	Resolution		0.1 mV		
	Input resistar	nce	10 GΩ (voltage range: -2 V to 7 V)		
Power	Range	2 A range	-12.000 W to 12.000 W		
measure-		20 A range	-120.00 W to 120.00 W		
ment	Accuracy		Software calculation (voltage measurement × current measurement)		
	Resolution	2 A range	1 mW		
		20 A range	10 mW		
Capacity	Range *6		-100.0000 Ah to 100.0000 Ah		
measure- ment	Accuracy		Software calculation (voltage measurement × current measurement)		
	Resolution *6	;	0.1 mAh		
Time *7	Accuracy *5,	*8	±10 ppm (TYP)		

- *5. At an ambient temperature between 18 °C and 28 °C.
- *6. The same for the 2 A range and 20 A range.
- Accuracy of signal source used for elapsed time in charge/discharge
- *8. Monthly error: approximately 30 seconds

Protection fun						
	overcharge) pro	otection				
Software OVP	Setting range		0.000 V to 6.300 V			
OVP	Resolution		1 mV			
	Setting accura		Depends on the voltmeter accuracy			
	Operating time	9	50 ms max.			
Hardware	Setting range		0.0 V to 6.6 V			
OVP *10	Resolution		100 mV			
	Setting error *		± 0.5 % of ratir	ng		
	Operating time	е	10 ms (TYP) From overvolta	age detection to output shutoff.		
Undervoltage	(overdischarge	e) protection				
Software	Setting range		-1.100 V to 5.7	00 V		
UVP	Resolution		1 mV			
	Setting accura	acy *9	Depends on th	e voltmeter accuracy		
	Operating time	е	50 ms max.			
Hardware	Setting range		-1.1 V to 6.0 V			
UVP *10	Resolution		100 mV			
	Setting error *	9	± 0.5 % of rating			
	Operating time	е	10 ms(TYP)			
			From undervoltage detection to output shutoff.			
Overcurrent p	rotection					
Software	Setting range	Charge	2 A range	0.000 A to 2.100 A		
OCP			20 A range	0.000 A to 21.000 A		
		Discharge	2 A range	0.000 A to 2.100 A		
			20 A range	0.000 A to 21.000 A		
	Resolution *11		1 mA			
	Setting accura	acy *9	Depends on th	e ammeter accuracy		
	Operating time	e	50 ms max.			
	Delay time		0 ms min. Detection delay timer setting			
Hardware	Setting range	Charge/	2 A range	0.0 A to 2.2 A		
OCP *10		discharge	20 A range	0.0 A to 22.0 A		
	Resolution *11		100 mA			
	Setting error *	9	± 0.5 % of ratir	ng		
	Operating time	е	10 ms(TYP) From overcurrent detection to output off.			
Overcharge/o	verdischarge c	apacity protec	tion			
Software	Setting range		1.0000 Ah to 2	000.0000 Ah		
OAH *12 Setting accuracy *9			Depends on th	te ammeter accuracy and the main curacy		
	Resolution		0.1 mAh			
Temperature	(overheat) prote	ection	1			
Software	Setting range		-100 °C to 400	°C		
OTP	Setting accura	acv *9		e temperature measurement accuracy		
	Resolution	-, -	1 °C	, , , , , , , , , , , , , , , , , , , ,		
*O At an amb	ient temperatu	ro hotwoon 10				

- *9. At an ambient temperature between 18 °C and 28 °C.
- *10. Set values are retained in the charging/discharging unit. The system always protects the DUT even when BPC4000 is executing no test.
- *11. The same for the 2 A range and 20 A range.
- *12. The application software calculates the value by multiplying the nominal capacity by the preset percentage and sets the capacity.

PFX2731S Specifications

The temperature scale conforms to JIS C 1602-1995 (115-90: International temperature scale)						
Temperature measurement						
Thermocouple voltage (temperature) measurement block						
Number of measured terminals Per channel						
Thermocouple type	rmocouple type T					
Range	-100.0 °C to 400.0 °C *1					
Accuracy *2, *3 ±1.5 °C (TYP)						
Reference junction compensation *2, *4 ±0.7 °C (TYP)						
Resolution 0.1 °C						
Measurement interval	2 s					

- The accuracy of the thermocouple is not guaranteed when it is used outside the operating range. The range depends on the thermocouple specifications (thermocouple class, wire diameter, and insulation).
- At an ambient temperature between 18 $^{\circ}\text{C}$ and 28 $^{\circ}\text{C}.$
- When the voltage that the thermocouple calibrator produces is measured (the thermocouple tolerance is not included).
- Indicates the performance of a thermometer at a reference junction (cold junction).

General spe	ecifications	
Nominal inp	out rating	200 Vac to 240 Vac, 50 Hz / 60 Hz, single phase
Input voltag	e range	180 Vac to 250 Vac
Maximum p	ower consumption	1870 VAmax. in 1 frame (6 ch) at rated charge
Environ-	Operating temperature	0 °C to 40 °C
mental	Humidity range	20 %rh to 85 %rh (no condensation)
conditions	Storage temperature	-10 °C to 60 °C
	Humidity range	0 %rh to 90 %rh (no condensation)
	Operating environment	Indoors, overvoltage category II
	Altitude	Up to 2000 m
Isolation voltage	Between I/O terminals and chassis	Maximum ±50 V
Insulation resistance	Between primary and chassis	500 Vdc, 30 MΩ or greater, 70 %rh humidity or less
	Between primary and I/O terminals *5	500 Vdc, 30 MΩ or greater, 70 %rh humidity or less
	Between I/O terminals and chassis *5	50 Vdc, 30 MΩ or greater, 70 %rh humidity or less
Withstand voltage	Between primary and chassis	No abnormalities at 1500 Vac for 1 minute.
	Between primary and I/O terminals *5	No abnormalities at 1500 Vac for 1 minute.
Outline drav	ving	430(16.93)(MAX 440(17.32))W×173(6.81)H× 620(24.41)MAX 695(27.36)D mm(inch)
Weight		Approx. 34 kg (75 lbs)

General specifications	
Accessories	Power cord × 1, Rear panel cover set × 1, Temperature measurement boxes × 6, Temperature measurement cables × 6, Temperature measurement boxes TRIP connector × 1, Signal I/O connector × 1, LAN cable × 1, Heavy object warning label × 1, Operation Manual(Japanese and English,one each) × 1, Safety Information × 1, China RoHs sheet × 1
	*Cable set is not included. Please purchase the optional cable set together with the main unit.
Electromagnetic compatibility *6, *7	Complies with the requirements of the following directive and standards. EMC Directive 2014/30/EU EN 61326-1 (Class A *8) EN 55011 (Class A 8, Group 1 9) 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 5 m.
Safety *6	Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *7 EN 61010-1 (Class I *10 , Pollution Degree 2 *11) EN IEC 61010-2-030

- $^{\star}5.$ The input/output terminals refer to charging and discharging terminals connected to the DUT, voltage sensing terminal, and external signal input/output. Does not apply to specially ordered or modified products.
- Only for products with CE marking / UKCA marking on their body.
- 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.

 *9. This product belongs to Group 1 products. 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.
- *10. 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.
- *11. 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 nonconductive pollution will occur except for an occasional temporary conductivity caused by condensation.

							End co	ndition							
Charge/discharge mode	Maximum voltage	Minimum voltage	Specified time after charge/ discharge start	starting constant	Specified current af- ter starting constant voltage operation	time after current falls below	-dV (mask time can be set)	dT/dt (°C/min)	Integrated current (Ah)	Integrated power (Wh)	Maximum SOC	Minimum SOC	Time since pattern charge/ discharge start	Number of loops	Battery tempera- ture
Constant current charge (CC)	~		~				~	~	~	~	~				~
Constant current-constant voltage charge (CC-CV)			~	~	~	~			~	~	~				~
Constant power charge (CP)	~		~						~	~	~				~
Constant power-constant voltage charge (CP-CV)			~	~	~	~			~	~	~				~
Constant current discharge (CC)		~	~						~	~		~			~
Constant current-constant voltage discharge (CC-CV)			~	~	~	~			~	~		~			~
Constant power discharge (CP)		~	~						~	~		~			~
Constant power-constant voltage discharge (CP-CV)			~	~	~	~			~	~		~			~
Pattern constant current charge/discharge (Pattern)	~	~							~	~	~	~	~	~	~

Charge/Discharage System

PFX2500 Series







Dimensions / Weight

PFX2512: 214.5(8.45")WX124(4.88")HX400(15.75")Dmm(inch)/7 kg (15.43 lbs) **PFX2532**: 429.5(16.91")WX128(5.04")HX550(21.65")Dmm(inch)/17 kg (37.48 lbs)

Accessories

PFX2512: Power cord, Cable with solderless terminal (4 pcs.), Sensing connector, Thermistor, 26-core flat cable (I/F cable for PWR400L/PWR800L/PWR1600L/ PAS), 20-core flat cable (I/F cable for PLZ-4W), Ferrite core for 26-core flat cable, Ferrite core for 20-core flat cable, Lock lever (2 pcs.), LAN cable, Operation manual PFX2532: Power cord (not CE/UKCA compliant), 26-core flat cable (I/F cable for PWR1600L), 20-core flat cable (I/F cable for PLZ-4W), Ferrite core for 26-core/20core flat cable, I/F cable for PAT-T, LAN cable, Sensing connector, Sensing connector cover set, Lock lever (2 pcs.), Thermistor, Load input terminal cover set (4 sets), I/O terminal M8x18 screw set (6 sets), I/O terminal cover set, Operation manual

Options

■ Load cable

TI 08-PFX

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

■ Sensing cable set

TL09-PFX (for OP02-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) Max.200 A, length:3 m

■ Voltage/thermometer unit OP02-PFX* (only for PFX2512/2532)

Up to 3 boards can be mounted

■ Voltage unit

OP03-PFX* (only for SL01-PFX) Up to 8 boards can be mounted

■ 8 slot unit SL01-PFX*

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

■ Application software SD007-PFX BPChecker3000

■ Rack mount frame KRB3-TOS (EIA) (for PFX2532) KRB150-TOS (JIS) (for PFX2532) KRA3 (EIA) (for PFX2512) KRA150 (JIS) (for PFX2512)









SC07-PFX

SC05-PFX

* The CE/UKCA marked products

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 10000 steps are
- 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)
- High speed sampling with maximum 1 ms can be realized
- A 6 V range is newly installed and is capable of high-precision
- LAN as standard interface (system only)

The comparison of PFX2500 Series

Item	PFX2512	PFX2532			
Rating	60 V / 50 A	60 V / 200 A			
Communication interface	LA	AN			
Monitoring data minimum time interval	0.1 s				
High speed data sampling		✓ (Selected form 1 ms/10 ms/ 100 ms maximum 6000 points for every profile)			
Charge/discharge mode	9 modes Charging: CC, CC-CV(Cell CV Voltage)*1 Discharging: CC, CP,CC-CV(Cell CV Voltage) CP-CV(Cell CV Voltage)*1 Others: Pattern(CC, CP, Cell CV voltage*2), I-V, Pause				
Test condition configuration	for Charging/D Conditional branc	Setting (unlimited) ischarging, etc hing function from results is available.			
Seamless charge/discharge	✓ (Response with	in 50 ms (TYP)*3)			
Rest time control	The time variable t	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.

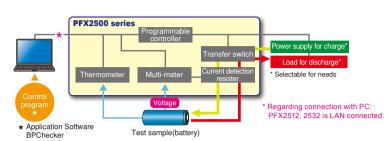
^{*3.} It is defined as the time for the charge/discharge current to change from 10 % to 90 % of the preset value (ratedvalue).

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





[Applied configuration (model ID)]

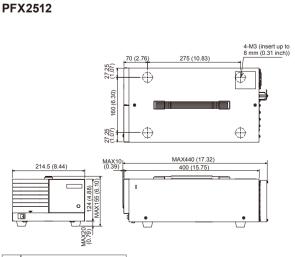
Model ID is used for combination of the selected power supply and electronic load if you wish to have a combination that is not on the available model ID list, please consult with us. More model IDs will be added in future. The latest information for the system configuration is available on our website.

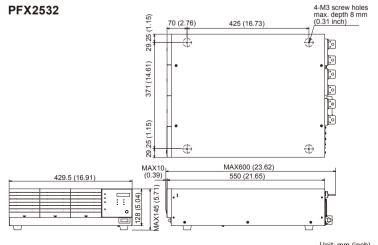
Model ID	Power supply for charge	Electronic load for discharge		
PFX2512	т			
7103	PWR1600L	PLZ1004W (2 units in parallel) *2		
7105 *4	PAT60-67T	PLZ1004W+2000WB *1		
7106	PWR1600L	PLZ1004W *2		
7107	PAS10-70	PLZ1004W *2		
7110	PAS40-27	PLZ1004W *2		
7112	PAS10-35	PLZ334W *2		
7119	PWR1600L	PLZ1004W+2004WB *1		
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	r ower supply for charge	Liectionic load for discharge		
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		
7307	PWR1601L	PLZ1004W *2 x 2 (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		

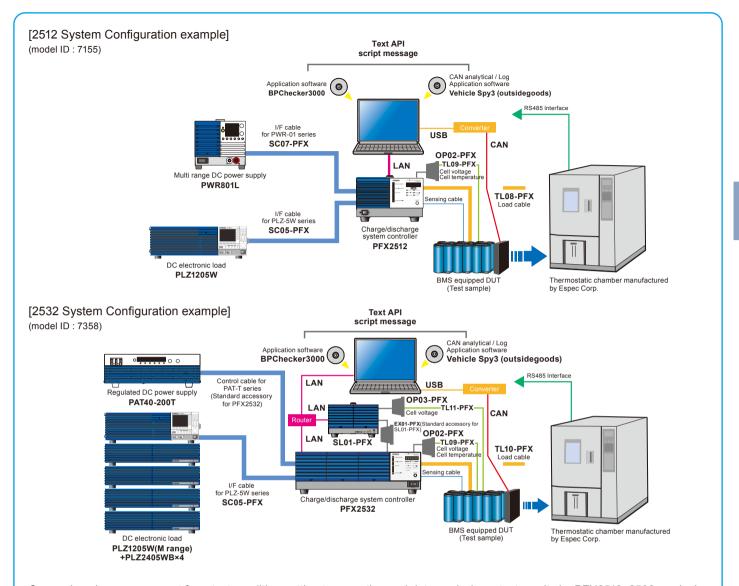
- *1. M range
- *2. H range
- *3. Can be replaced with the Kikusui SR Large Capacity Electronic Load Smart Rack System PLZ5004W.
- *4. A separate cable is required. For details, contact your Kikusui agent or distributor.
- *A SC07-PFX (optional) is necessary to connect the PWR-01 series with the PFX2500 series. *A SC05-PFX (optional) is necessary to connect the PLZ-5W series with the PFX2500 series.

External Dimensional Diagrams





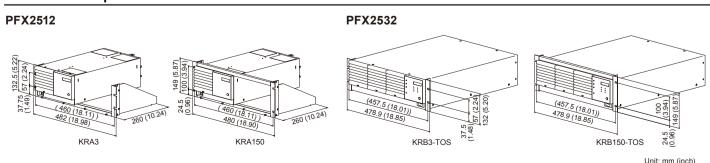
Unit: mm (inch)



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.

Rack Mount Option



PFX2500 Series Specifications

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

- The warm-up time is 30 minutes.
- TYP (typical) values do not guarantee the performance.
- · reading: Indicates the readout value.
- set: Indicates the setting value.
- rating: Indicates the rated.
- Static: General term to indicate CC charge, CC CV charge, CC discharge, CC CV discharge, CP discharge, and CP - CV discharge
- Pattern: General term to indicate pattern charge / discharge and I V characteristics charge / discharge

Rated output		PFX2512	PFX2532
Number of outputs		1 ch	1 ch
Charging current range *1		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
	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 200.000 A
Discharge voltage range *1	60 V range	0.000 V to 60.000 V	0.000 V to 60.000 V
*2	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 accurac	у		PFX2512	PFX2532
Static				
Constant cur-	Range *1		0.000 A to 50.000 A	0.000 A to 200.000 A
rent charge/	Accuracy *	2	*3	*3
discharge	Resolution		1 mA	1 mA
Constant volt-	Range *1	60 V range	0.000 V to 60.000 V	0.000 V to 60.000 V
age charge/		6 V range	0.000 V to 6.000 V	0.000 V to 6.000 V
discharge	Accuracy *	2	*3	*3
	Resolution		1 mV	1 mV
Constant cell	Range *1		0.000 V to 20.000 V	0.000 V to 20.000 V
voltage charge/	Accuracy *	2	*3	*3
discharge *4	Resolution		1 mV	1 mV
Constant pow-	Range *1		0.1 W to 3000.0 W	1 W to 12000 W
er discharge	Accuracy *	2	±(0.5 % of set +1 W) *5	±(0.5 % of set +10 W) *5
	Resolution		10 mW	1 W
Pattern *6				
Pattern con-	Range *1		-50.000 A to 50.000 A	-200.000 A to 200.000 A
stant current	Accuracy *	2	*3	*3
	Resolution		1 mA	1 mA
	Number of	settings	10000 (Maximum number of steps)	10000 (Maximum number of steps)
	Time width	Range	0.1 s to 9999.9 s (the time width per step)	0.1 s to 9999.9 s (the time width per step)
		Accuracy *2	±(0.05 % of set + 10 ms)	±(0.05 % of set + 10 ms)
		Resolution	100 ms	100 ms
Pattern con-	Range *1		-3000.00 W to 3000.00 W	-12000 W to 12000 W
stant power	Accuracy *	2 *7	±(0.5 % of set + 1 W) *5	±(0.5 % of set + 10 W) *5
	Resolution		10 mW	1 W
	Number of	settings	10000 (Maximum number of steps)	10000 (Maximum number of steps)
	Time width	Range	0.1 s to 9999.9 s (the time width per step)	0.1 s to 9999.9 s (the time width per step)
		Accuracy *2	±(0.05 % of set + 10 ms)	±(0.05% of set + 10 ms)
		Resolution	100 ms	100 ms

- *1. The range varies depending on factors such as the connected DC power supplies and electronic loads and the wiring configuration of the system.
- *2. Ambient temperature at 18 °C to 28 °C
- *3. The external devices are controlled through software so that the measured values are equal to the settings. The accuracy of the settings is the same as the measurement accuracy. Because this is dependent on the control cycle, correct control may not be possible for a DUT (battery) with high impedance or a DUT whose circuit is open.
 - Control cycle for constant current / constant voltage control is 1 ms and for constant cell voltage control is 100 ms.
- *4. Can be set only when the optional Volt / Thermometer Unit OP02-PFX or OP03-PFX Voltmeter Unit is installed.
- *5. 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.
- *6. The operating voltage range is 1 V or more (when the TL08-PFX is being used; regardless of whether a bias DC power supply is being used).
- *7. With battery voltage of 2 V or more.

Measureme	ent accuracy		PFX2512	PFX2532		
Static						
Charge/	Range		0.0000 A to 50.0000 A *1	0.000 A to 200.000 A *1		
discharge current	Accuracy *2	2	±(0.15 % of reading + 0.02 % of rating)	±(0.2 % of reading + 0.1 % of rating)		
measure- ment	Resolution		0.1 mA	1 mA		
Voltage	Range	60 V range	-6.0000 V to 60.0000 V *3	-6.0000 V to 60.0000 V *3		
measure-	, tango	6 V range	-1.0000 V to 6.0000 V *4	-1.0000 V to 6.0000 V *4		
ment	Accuracy *2 *5	60 V range	±(0.05 % of reading + 0.02 % of rating)	±(0.05 % of reading + 0.02 % of rating)		
	2 3	6 V range	±(0.05 % of reading +	±(0.05 % of reading +		
	Resolution	*5	0.04 % of rating) 0.1 mV	0.04 % of rating) 0.1 mV		
Power	Range	J	0.000 W to 3000.000 W	0.000 W to 12000.0 W		
measure- ment	Accuracy		Software calculation (Voltage m	easurement × current measure-		
	Docalution		1 mW	100 mW		
Current	Resolution		0.000 Ah to 2000.000 Ah	0.000 Ah to 2000.000 Ah		
capacity	Range					
calculation	Accuracy *2	<u>.</u>	accu	rement accuracy and the time		
	Resolution		1 mAh	1 mAh		
Power	Range		0.000 Wh to 120000.000 Wh	0.000 Wh to 120000.000 Wh		
capacity calculation	Accuracy *2	2		asurement accuracy, current		
Calculation	Resolution		measurement accuracy 1 mWh	and the time accuracy 1 mWh		
Time *6	Accuracy *2) *7	±10 ppm (TYP)	±10 ppm (TYP)		
Pattern	Accuracy 2	. /		±10 μμπ (1117)		
Charge/	Range		-50.0000 A to 50.0000 A *1	-200.000 A to 200.000 A *1		
discharge	Accuracy *2)	±(0.2 % of reading +	±(0.2 % of reading +		
current measure-	Accuracy 2		0.03 % of rating)	0.1 % of rating)		
ment	Resolution		0.1 mA 1 mA			
	Measured v		Average current; updated every 1 s (Consecutive measureme			
Voltage	Range	60 V range	-6.0000 V to 60.0000 V *3	-6.0000 V to 60.0000 V *3		
measure- ment		6 V range	-1.0000 V to 6.0000 V *4	-1.0000 V to 6.0000 V *4		
mem	Accuracy *2	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 +	±(0.05 % of reading +		
			0.04 % of rating)	0.04 % of rating)		
	Resolution	*5	0.1 mV	0.1 mV		
Power	Range		-3000.000 W to 3000.000 W -12000.00 W to 12000.00 W			
measure- ment	Accuracy *2	2	, ,	surement × current measurement)		
	Resolution		1 mW 10 mW			
Current	Range		-2000.000 Ah to 2000.000 Ah -2000.000 Ah to 2000.000			
capacity	Accuracy *2	2	·	ent accuracy and the time accuracy		
	Resolution		1 mAh	1 mAh		
Power capacity	Range		-120000.000 Wh to 120000.000 Wh -120000.000 Wh to 120000.000 Wh			
calculation	Accuracy *2	<u>.</u>	Depends on the voltage measurement accuracy, current measurement accuracy and the time accuracy			
	Resolution		1 mWh	1 mWh		
Time *6	Accuracy *2	2 *7	±10 ppm (TYP)	±10 ppm (TYP)		
High-speed	sampling					
Current	Range *8		-50.0000 A to 50.0000 A	-200.000 A to 200.000 A		
measure- ment	Accuracy *2 *8	1 ms sam- pling	±(0.2 % of reading + 0.5 % of rating)	±(0.4 % of reading + 0.5 % of rating)		
	*9	10 ms sam-	±(0.15 % of reading +	±(0.3 % of reading +		
		pling 100 ms	0.05 % of rating) ±(0.15 % of reading +	0.1 % of rating) ±(0.2 % of reading +		
	sampling		0.02 % of rating)	0.1 % of rating)		
	Resolution		0.1 mA	1 mA		
Voltage measure-	Range *8	60 V range	-6.0000 V to 60.0000 V *3 -1.0000 V to 6.0000 V *4	-6.0000 V to 60.0000 V *3 -1.0000 V to 6.0000 V *4		
ment	Accuracy	6 V range 1 ms sam-				
	*2 *8 *9	pling *5 10 ms sam-	±(0.1 % of reading + 0.1 % of rating)			
		pling *5	±(0.1 % of reading			
		100 ms sampling	• '	eading + 0.02 % of rating)		
	Popolistics:	Jamping		ading + 0.04 % of rating)		
	Resolution		0.1 mV. The same for all sampling settings.			

- *1. Measurable range: -52.500 A to 52.5.00 A (TYP).
- However, the accuracy is not guaranteed for values outside of the range listed in the table.
- *2. Ambient temperature at 18 °C to 28 °C
- *3. Measurable range: -6.500 V to 65.000 V (TYP).
- However, the accuracy is not guaranteed for values outside of the range listed in the table.
- Measurable range: -6.500 V to 6.500 V (TYP).
- However, the accuracy is not guaranteed for values outside of the range listed in the table.
- *5. The same for the 6 V range and 60 V range
- *6. Accuracy of the elapsed time (Cutoff condition) when charging / discharging or resting.
- *7. Monthly error: approximately 30 seconds.
- *8. The accuracy is not guaranteed for values outside of the rated output range.
- $^{\star}9$. The wavering caused by the ripple noise and AC line noise (50 Hz/ 60 Hz) of the DC power supply that you are using is not included.

PFX2500 Series Specifications

*Thermistor 103AT-2 (by SEMITEC Corporation) is used for the temperature detector					
Temperature measurement	PFX2512	PFX2532			
Resistance (temperature) measuremen	t section *1				
Measurement range	-40.0 °C to	o 100.0 °C			
Measurement resolution	0.1	°C			
Measurement accuracy *2 *3	asurement accuracy *2 *3 ±0.5 °C (Measurement temperature at 0 °Cto 40.				
	±1 °C (Measurement temp	erature at -20 °C to 80 °C)			
Reference (thermistor 103AT-2)					
Model	103AT-2 by SEM	TEC Corporation			
R25	Nominal zero-load resistance at 10.0 kΩ, 25 °C				
Operating temperature range	perating 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	3435K±1 % (Measureme	ent temperature at 25 °C)			

- The temperature measurement does not trace the absolute temperature. Temperature converted from resistance.
- Excludes temperature detector errors.
- *3 Ambient temperature at 18 °C to 28 °C

Protection functions	PFX2512	PFX2532
Overvoltage (overcharge) protection	Software OVP, Hardware OVP	
Undervoltage (overdischarge) protection	Software UVP, Hardware UVP	
Overcurrent protection	Software OCP *1, Hardware OCP, Load short-circuit protection	
Capacity (overcharge/overdischarge) protection	Software OAH *2	
Overheat protection (DUT)	Software OTP	

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

General spe		PFX2512	PFX2532	
Nominal input rating		100 Vac to 240 Vac, 50 Hz/60 Hz		
Input voltage	e range	90 Vac to 250 Vac		
Power cons	umption	60 VAmax (when three OP02-	PFXs are installed: 80 VAmax)	
Operating to range	emperature and humidity		2 °F to 104 °F), (no condensation)	
Storage tem range	perature and humidity		14 °F to 140 °F), no condensation)	
Operating e	nvironment	Indoors, overvo	Itage category II	
Altitude		Up to 2000 m		
Isolation voltage	I/O terminals ⇔ chassis	±60 Vmax		
Insulation	Primary ⇔ chassis	500 Vdc, 30 MΩ or greater, 70 %rh humidity or less		
resistance	Primary ⇔ I/O terminals			
Withstand	Primary ⇔ chassis	No abnormalities at 1500 Vac for 1 minute		
voltage	Primary ⇔ I/O terminals			
Safety *1		standards. Low Voltage	ts of the following directive and Directive 2014/35/EU *2, Pollution Degree 2 *4)	
Electromagr	netic /(EMC) *1 *2	standards. EMC Di EN61326-1 (Class A *5), EN5	ts of the following directive and rective 2014/30/EU 5011 (Class A *5, Group 1 *6), EN61000-3-3	

- *1. Does not apply to specially ordered or modified products.
- Limited to products that have the CE mark/UKCA mark on their panels.
- When the optional OP03-PFX Voltmeter Unit is used, compliance is achieve by using the optional TL12-PFX sensing cable (length: approx. 3 m, connector area: with cover, with core).
- *3. 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.
- *4. 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.
- *5. 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.
- *6. 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.

Volt/Thermometer Unit OP02-PFX Specifications

Cell voltage measurement	
Static	
Number of measured terminals	4
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
Cell temperature measurement	
Thermocouple voltage (temperature) mea	asurement block *3
Number of measured terminals	4
Thermocouple type	K type
Measurement range *4	-100.0 °C to 400.0 °C
Measurement accuracy *2 *5	±1.5 °C (TYP)
Reference junction compensation *2 *6	±0.5 °C (TYP)
Resolution	0.1 °C
Measurement interval	1 s

- *1. You can apply a voltage from -20 V to 22 V.
- Ambient temperature at 18 °C to 28 °C.
- *3. The temperature scale conforms to JIS C 1602-1995 (ITS-90). (ITS-90 is an international temperature scale.)
- *4. Depending on your thermocouple's specifications (thermocouple class, wire diameter, and insulation), the usable temperature range will vary
- *5. When the voltage that the thermocouple calibrator produces is measured
- *6. 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 Specifications

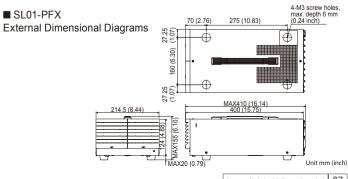
Cell voltage measurement	
Static	
Number of measured terminals	8
Measurement range *1	-2.0000 V to 20.0000 V
Measurement accuracy *2	±(0.05 % of reading + 0.02 % of rating)
Resolution	0.1 mV
Measured value	Average voltage every 100 ms
Measurement interval	100 ms

^{*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 Specifications

Input voltage range	90 Vac to 250 V	90 Vac to 250 Vac, 50 Hz/60 Hz		
Power consumption	60 VAmax (when 8 OP03-PFXs are installed: 80 VAmax)			
Operating temperature and humidity range		0 °C to 40 °C (32 °F to 104 °F), 20 %rh to 85 %rh (no condensation)		
Storage temperature and humidity range	-10 °C to 60 °C (14 °F to 140 °F), 0 %rh to 90 %rh (no condensation)			
Number of slots		8		
Compatible boards *1	Voltmeter Ur	nit OP03-PFX		
Interface	LAN(Ethernet) PC connection	Sync connector EX01-PFX connection		
Dimensions (mm (inch))	214.5(8.44) W × 155(6.10) H × 410(16.14) Dmm (inch)			
Weight	Approx. 5 kg (11.02 lb)			
Accessories	Power cord/100 V System (1 pc.)			
	Power cord/200 V System (1 pc.)			
	EX01-PFX *2 (1 pc.) extension board (for installing in a PFX2512/2532 slot)			
	LAN cable (1 pc.) 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. *2. Installed in the SL01-PFX by factory default.



TOS SERIES SELECTION GUIDE

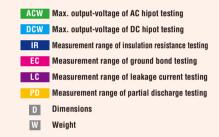
High-End Multi-type

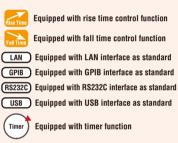
Hipot, Insulation Resistance, Ground Bond, Leakage or Partial discharge testing, this analyzer covers it all!

Hipot Tester









Hipot Tester with Insulation Resistance Test

Standard type suitable for production and inspection lines

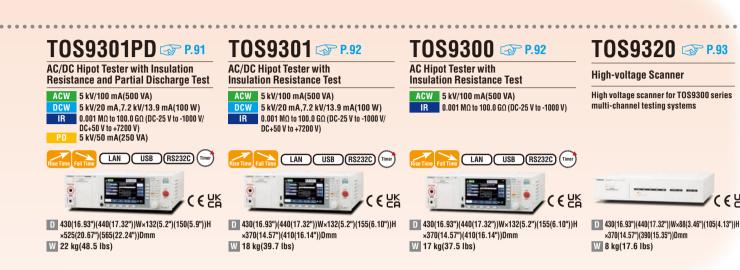




D 320(12.60")W×132(5.2")H×350(13.78")Dmm

W 14 kg(30.9 lbs)





Ground Bond Tester



Options Remote Control Box Test Lead Warning Light Unit Load resistor for calibration of a Hipot Tester P.114

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 your specific application.

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.

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

TOS9303LC







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 highvoltage 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], Highvoltage warning sticker, Cable tie, SIGNAL I/O plug (Assembly type D-sub plug unit), Setup guide, China RoHS sheet, 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

- Hipot(Withstanding voltage): AC 5 kV/100 mA, DC 7.2 kV/100 W Insulation resistance: -25 V to -1000 V(Negative polarity), +50 V to +7200 V(Positive polarity)
- New amplifier type allows for 40 A AC/DC ground bond testing
- Touch current/protective conductor current/leakage current testina
- 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

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

TOS9303







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

 $430(16.93^{\circ})W \times 132(5.2^{\circ})H \times 500(19.69^{\circ})Dmm(inch)/21 kg(46.3 lbs)$

Accessories

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

- Hipot(Withstanding voltage): AC 5 kV/100 mA, DC 7.2 kV/100 W Insulation resistance: -25 V to -1000 V(Negative polarity), +50 V to +7200 V(Positive polarity)
- 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

AC Hipot Tester with Ground Bond Test

TOS9302







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

 $430(16.93")W \times 132(5.2")H \times 500(19.69")Dmm(inch)/20 kg(44.1 lbs)$

Accessories

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

Features

- Hipot(Withstanding voltage): AC 5 kV/100 mA
- 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

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

TOS9301PD







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. Wideranging 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. 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

 $430(16.93")W \times 132(5.2")H \times 525(20.67")Dmm(inch)/22 kg(48.5 lbs)$

Accessories

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

- Hipot(Withstanding voltage): AC 5 kV/100 mA, DC 7.2 kV/100 W Insulation resistance: -25 V to -1000 V(Negative polarity), +50 V to +7200 V(Positive polarity)
- 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 tests. All measurement values and standard outlines displayed in each test

AC/DC Hipot Tester with Insulation Resistance Test

TOS9301







High-performance AC/DC hipot tester with insulation resistance capabilities

The TOS9301 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 TOS9301 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

430(16.93")W × 132(5.2")H × 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 Dsub plug unit). Setup guide. China RoHS sheet. CD-ROM. Safety information, Heavy object warning label (Affix this to the product as necessary.)

Features

- Hipot(Withstanding voltage): AC 5 kV/100 mA, DC 7.2 kV/100 W Insulation resistance: -25 V to -1000 V(Negative polarity), +50 V to +7200 V(Positive polarity)
- 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

AC Hipot Tester with Insulation Resistance Test

OS9300









High-performance AC hipot tester with insulation resistance capabilities

The TOS9300 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 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

430(16.93")W × 132(5.2")H × 370(14.57")Dmm(inch)/ 17 kg(37.5 lbs)

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, Cable tie, SIGNAL I/O plug (Assembly type Dsub plug unit), Setup guide, China RoHS sheet, CD-ROM, Safety information

- Hipot(Withstanding voltage): AC 5 kV/100 mA Insulation resistance: -25 V to -1000 V
- 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

High-voltage Scanner

TOS9320

C € EK





Dimensions / Weight

 $430(16.93")W \times 132(5.2")H \times 500(19.69")Dmm(inch)/8 kg(17.6 lbs)$

Accessories

Power cord, High-voltage test lead [TL31-TOS], Lead for high voltage parallel connection [TL33-TOS], Interface cable, CON-TROLLER INTERFACE plug (Assembly type) [D-sub plug unit], High-voltage warning sticker (2 pc.), Channel labels (For the panel , For the test leads), User's manual, China RoHS sheet, Safety information

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 CONTROL-LER 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

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 [TOS5300 series, etc.]

Hipot Tester with Insulation Resistance Test

OS9311







Dimensions / Weight

 $430(16.93^{\circ})W \times 174.2(6.86^{\circ})H \times 500(19.69^{\circ})Dmm(inch)/27 \text{ kg}(59.5 \text{ lbs})$

Accessories

Power cord, High-voltage test lead [TL34-TOS], SIGNAL I/O plug, Cable tie, High-voltage warning sticker, Heavy object warning label, Getting Started Guide, China RoHS sheet, Safety Information

With its AC/DC withstand voltage testing capability of up to 10 kV, this multi-analyzer is an excellent choice for evaluating the insulation of advanced equipment and various components

The TOS9311 is an electrical safety multi-analyzer capable of AC/ DC withstand voltage and insulation resistance testing. It can reach an output voltage of up to 10kV for both AC and DC. This multi-analyzer is suitable for testing cutting-edge devices and insulating materials requiring insulation evaluation at high voltages exceeding 5 kV.

- Hipot(Withstanding voltage): AC 10 kV/50 mA, DC 10 kV/100 W Insulation resistance: -25 V to -1000 V(Negative polarity), +50 V to +10000 V(Positive polarity)
- Variable response speed of current detection
- Discharge function (equipped with a discharge circuit)
- Easy to read LCD display for real time monitoring during tests. All measurement values and standard outlines displayed in each test
- Rise time/fall time control function (AC/DC withstand voltage test only)
- Easy setting with memory function
- Offset cancellation function
- LAN/USB/RS232C standard digital interface

Wishtanding Voltage Test

Output function			TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC
AC	Output	range	0.050 kV to 5.000 kV					
output	o atput	Resolution	1 V					
section		Setting ac- curacy		±(1.2 %	of setting + (0.02 kV) (at	no load)	
	Max. ra	ted load *1			500 VA(5 k\	/ / 100 mA)		
	Max. ra	ted current	10	00 mA (wher	the output v	oltage is 0.2	2 kV or high	er)
	Transfo	rmer rating			500	VA		
	Output voltage wave- form *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)				d no load or	
	Crest fa	ctor	√2 ± 3 % (0.8 kV or more)					
	Frequer	псу	50 Hz / 60 Hz					
		Accuracy	±0.1 %					
	Voltage	regulation	±3 % or less (when changing from maximum rated load to no load)					
	Short-ci	ircuit 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					age exceeds off, and the			

DC Output function			TOS9301	TOS9301PD	TOS9303	TOS9303LC		
DC	Output	voltage range	0.050 kV to 7.200 kV					
output		Resolution	1 V					
section		Setting ac- curacy	±(1.2 % of setting + 0.02 kV)					
	Max. ra	ted load *1		100 W (5 kV/20 m/	A, 7.2 kV/13.9 mA)		
	Max. ra	ted 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-c	ircuit current	100 mA (TYP) (200 mA peak)					
	Dischar	ge function	Forced discharge after test completion (discharge resistance: 125					
Start vo	Itage		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				ut voltage exceeds turned off, and the				

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

	nent 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 read	ing + 0.005	kV)		
	Response	Can be s	witched bet	ween true rn conve		n-value resp	onse rms	
		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 a				ent after a te ail judgment			le the pass/	
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.					ile the pass	
	Offset cancel function	Cancels up to 10 mA of the current flowing through the insulation of tance and stray capacitance components across output cables an like (resistance component only for DC tests). OFF function available.				oles and the		
	Calibration	Active com	Active component: Calibrated with the rms of a sine wave using a pure resistive load. Reactive component: Not calibrated.					

- 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"
- 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 μ A may be generated.

	ment functi		TOS9300 TOS9301 TOS9301PD TOS9302 TOS9303 TOS9303LC
Curre	ent judgme	nt 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.
Volta		e judgment	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		ng range	AC: 0.01 mA to 110.00 mA, DC: 0.01 mA to 21.00 mA
Lower limit setting range		ng 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.
Judg	Judgment accuracy *5 *6		±(1 % of setting + 5 μA)
Current detection method		on method	Compares to the reference value using the following method. Calculate true rms values, convert mean-value responses to rms values
Resp	onse spee hing	d (filter)	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"
- 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 μ A 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 100	0.0 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.
- 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 specifica	ations	TOS9300	TOS9301	TOS9301PD	TOS9302	TOS9303	TOS9303LC		
Analog monitor *10		Outputs a	Outputs a voltage signal according to the current waveform or voltage waveform						
	I		Curre	nt waveform	: Scale 50 m	nA/1 V			
V Voltage waveform: Scale 1 kV/1 V						V/1 V			
Grounding mod	de (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.

Insulation Resistance Test

Output fur	nction		TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC
Negative	Output			-(0.025 kV to -1 k	V	
polarity	voltage	Resolution		1 V			
	range	Setting accuracy		±(1.2 % of setting + 0.002 kV)			
	Max. rat	ed load		1	W (-1 kV/1 mA	١)	
	Ripple	1 kV no load			2 Vp-p or less		
		Max. rated load			10 Vp-p or less	;	
	Short-ci	rcuit current	12 mA or less				
Positive	Output			+0.05 kV to +7.2 kV			
polarity	voltage	Resolution		1 V			
*1	range	Setting accuracy	±(1.2 % of setting + 0.02 kV)			')	
	Max. rat	ed 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-ci	rcuit current			100 mA (TYP)	(200 mA pea	k)
Max. rate	d current		1 mA				
Voltage re	gulation		1 % or less (when changing from maximum rated load to no load)				d to no load)
Discharge	function		Forced discharge after test completion (discharge resistance: 20 kΩ)				
Output vo	Itage moi	nitor function			exceeds ±(10 % and the protect		

^{*1.} TOS9300 are not supported.

Measureme	nt function		TOS9300	TOS9301	TOS930	01PD	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	Measurem	ent range						d current of 1
meter	Measurement range			`	mA to 5	nA)		
	Accuracy			$1\Omega \le R < 1.0$				
	*2 *3	s ——		$\Omega \leq R < 10.0$				
	(when GND is			≤ R ≤ 100.0				
	set to	50 nA < i		$1\Omega \le R < 1.0$				
	Guard)	≤ 100 nA *4	1.000 G	$\Omega \leq R < 10.0$	00 GΩ: ±	£(10 %	of reading +	- 5 MΩ)
	(i:	"4	10.000 G	$\Omega \leq R < 50.0$	00 GΩ: ±	£(10 %	of reading +	- 50 MΩ)
	measured		50.000 GΩ	≤ R ≤ 100.0	00 GΩ: ±	£(20 %	of reading +	- 200 MΩ)
	current)	100 nA <	100.000 N	$1\Omega \le R < 1.0$	00 GΩ: ±	±(7 % o	f reading +	0.5 MΩ)
	(R: mea- surement	i ≤ 200 nA	1.000 0	$\Omega \leq R \leq 2.0$	00 GΩ: ±	±(7 % o	f reading +	5 MΩ)
	resis-	*5	2.000 G	$\Omega \leq R < 10.0$	00 GΩ: ±	±(7 % o	f reading +	10 MΩ)
	tance)		10.000 G	$\Omega \leq R < 50.0$	00 GΩ: ±	±(7 % o	f reading +	100 MΩ)
		200 nA <	10.000 MΩ	≤ R < 100.0	00 MΩ: ±	£(5 % o	f reading +	0.05 MΩ)
		i ≤ 1 μA *5	100.000 N	$M\Omega \le R < 1.0$	00 GΩ: ±	£(5 % o	f reading +	0.5 MΩ)
			1.000 G	$\Omega \leq R < 10.0$	00 GΩ: ±	£(5 % o	f reading +	5 MΩ)
			10.000 G	Ω ≤ R < 25.0	00 GΩ: ±	£(5 % o	f reading +	50 MΩ)
		1 µA < i ≤ 1 mA *5	0.001 Mg	$\Omega \leq R < 10.0$	00 MΩ: ±	£(2 % o	f reading +	0.003 MΩ)
			10.000 MΩ	≤ R < 100.0	00 MΩ: ±	£(2 % o	f reading +	0.03 MΩ)
			100.000 N	$10 \le R < 1.0$	00 GΩ: ±	£(2 % o	f reading +	0.3 MΩ)
			1.000 0	$\Omega \leq R < 5.0$	00 GΩ: ±	£(2 % o	f reading + :	3 MΩ)
	Accuracy	5 nA ≤ i ≤	500.000 N	$10 \le R < 1.0$	00 GΩ: ±	£(25 %	of reading +	- 0.5 MΩ)
	*6	50 nA *4	1.000 G	Ω ≤ R < 10.0	00 GΩ: ±	£(25 %	of reading +	- 5 MΩ)
	(when		10.000 GΩ	≤ R ≤ 100.0	00 GΩ: ±	±(30 %	of reading +	- 200 MΩ)
	GND is set to	50 nA < i	200.000 N	IΩ ≤ R < 1.0	00 GΩ: ±	£(20 %	of reading +	- 0.5 MΩ)
	Low)	≤ 100 nA	1.000 G	Ω ≤ R < 10.0	00 GΩ: ±	£(20 %	of reading +	- 5 MΩ)
	(i:	*4	10.000 G	Ω ≤ R < 50.0	00 GΩ: ±	£(20 %	of reading +	- 50 MΩ)
	measured		50.000 GΩ	≤ R ≤ 100.0	00 GΩ: ±	±(30 %	of reading +	- 200 MΩ)
	current)	100 nA <	100.000 N	IΩ ≤ R < 1.0	00 GΩ: ±	£(10 %	of reading +	· 0.5 MΩ)
	(R: mea-	i ≤ 200 nA	1.000 0	SΩ ≤ R < 2.0	00 GΩ: ±	£(10 %	of reading +	- 5 MΩ)
	surement resis-	*5		Ω ≤ R < 10.0				
	tance)			Ω ≤ R < 50.0		<u> </u>		
	tanoo,	200 nA <		≤R < 100.0		<u> </u>		
		i ≤ 1 μA *5		IΩ ≤ R < 1.0				
				Ω ≤ R < 10.0				
				Ω ≤ R < 25.0				
		1 µA < i ≤		Ω ≤ R < 10.0				
		1 mA *5		≤ R < 100.0				
				$M\Omega \le R < 1.0$				
				$\Omega \leq R < 5.0$				
	Hold functi	ion	The resistance					
					udgment			
	Offset can	cel function	Cancels up t					n resistance
	Office carloci function			utput cables				

- Humidity: 70 %rh or less (no condensation), when there is no interference caused by wobbly test leads or other problems.
- If the grounding mode (GND) is set to low in a highly humid environment, leakage current to ground If the grounding mode (GND) is set to low in a nignly numin 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 n to several tens of μ A 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.

 Add 10 % to the accuracy when measuring 100 V or less.
- Add 5 % to the accuracy when measuring 100 V or less.

 When the measured current is limited to 100 nA or more (no condensation) when the humidity is 50 %rh or less, no external disturbance is present such as swinging test leads, and the offset is enabled.

Benavior ha	unction		TOS9300 TOS9301 TOS9301PD TOS9303 TOS9303L0			
2251 50	ased on jud	gment	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	ludament	UPPER FAIL results when a resistance greater than or equal to the Up			
	FAIL	Judgment method	per limit is detected. Judgment is not made during or Voltage rise time			
	IAIL	Display	"Upper-FAIL" is displayed.			
		Buzzer	On			
		SIGNAL I/				
		O SIGNAL I/	The Upper-FAIL signal is generated continuously until a STOP			
	LOWED	+	signal is received.			
	LOWER FAIL	Judgment method	LOWER FAIL results when a resistance less than or equal to the Lower lim			
	FAIL		is detected. Judgment is not made during the judgment delay (Judge Delay			
		Display	"Lower-FAIL" is displayed.			
		Buzzer	On			
		SIGNAL I/	The Lower-FAIL signal is generated continuously until a STOP			
		0	signal is received.			
	PASS	Judgment	PASS judgment is made if Upper-FAIL or Lower-FAIL has not oc-			
		method	curred when the test time elapses.			
		Display	"PASS" is displayed.			
		Buzzer	On (fixed to 50 ms)			
		SIGNAL I/	The PASS signal is generated for the length of time specified by th			
		0	Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is			
			generated continuously until a STOP signal is received.			
Voltage rise			Monitors the voltage rise rate during Voltage rise time. This is valid when Au			
judgment op	peration		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 vo			
	D // II	I	ume level can be set in the range of 0 (OFF) to 10 for pass and fail separatel			
	dV/dt	Judgment	When the voltage rise rate (dV/dt) is less than approx. 1 V/s.			
	FAIL	method	· · · · · · · · · · · · · · · · · · ·			
		Display	"Lower-FAIL (dV/dt)" is displayed.			
		Buzzer	On			
		SIGNAL I/	The L FAIL signals are generated continuously until a STOP signa			
		0	is received.			
Upper limit :	setting rang	ge	0.001 MΩ to 100.000 GΩ			
			(in the range up to the maximum rated current), OFF			
Lower limit :	setting rang	ge	$0.000~\text{M}\Omega$ to 99.999 G Ω (in the range up to the maximum rated cur			
			rent), OFF. Setting 0.000 is equivalent to OFF.			
Accuracy *7		5 nA ≤ i ≤	$500.000 \text{ M}\Omega \le R < 1.000 \text{ G}\Omega$: ±(15 % of setting + 0.51 MΩ)			
(i: measured		50 nA *10	1.000 GΩ ≤ R < 10.000 GΩ: ±(15 % of setting + 15 MΩ)			
(R: measure	e-ment		10.000 GΩ ≤ R ≤ 100.000 GΩ: \pm (20 % of setting + 210 MΩ)			
resistance)		50 nA < i	200.000 MΩ ≤ R < 1.000 GΩ: \pm (10 % of setting + 0.51 MΩ)			
		≤ 100 nA	1.000 GΩ ≤ R < 10.000 GΩ: \pm (10 % of setting + 15 MΩ)			
		*10	10.000 GΩ ≤ R < 50.000 GΩ: \pm (10 % of setting + 60 MΩ)			
			$50.000 \text{ G}\Omega \le R \le 100.000 \text{ G}\Omega$: ±(20 % of setting + 210 MΩ)			
		100 nA <	100.000 MΩ ≤ R < 1.000 GΩ: ±(7 % of setting + 0.51 MΩ)			
		i ≤ 200 nA	1.000 GΩ ≤ R < 2.000 GΩ: ±(7 % of setting + 15 MΩ)			
		*11	2.000 GΩ ≤ R < 10.000 GΩ: \pm (7 % of setting + 20 MΩ)			
		000	10.000 GΩ ≤ R < 50.000 GΩ: ±(7 % of setting + 110 MΩ)			
		200 nA < i	10.000 MΩ ≤ R < 100.000 MΩ: \pm (5 % of setting + 0.06 MΩ)			
		200 nA < i ≤ 1 µA *11	10.000 MΩ \leq R $<$ 100.000 MΩ: \pm (5 % of setting + 0.06 MΩ) 100.000 MΩ \leq R $<$ 1.000 GΩ: \pm (5 % of setting + 0.51 MΩ)			
			10.000 MΩ ≤ R < 100.000 MΩ: \pm (5 % of setting + 0.06 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: \pm (5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: \pm (5 % of setting + 15 MΩ)			
		≤ 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 < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ)			
		≤ 1 μA *11 1 μA < i ≤	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) 0.001 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ)			
		≤ 1 µA *11	10.000 MΩ ≤ R < 100.000 MΩ: \pm (5 % of setting + 0.06 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: \pm (5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: \pm (5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: \pm (5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 10.000 MΩ: \pm (2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 100.000 MΩ: \pm (2 % of setting + 0.04 MΩ)			
		≤ 1 μA *11 1 μA < i ≤	$\begin{array}{l} 10.000 \ M\Omega \leq R < 100.000 \ M\Omega: \ \pm (5\ \% \ of \ setting + 0.06 \ M\Omega) \\ 100.000 \ M\Omega \leq R < 1.000 \ G\Omega: \ \pm (5\ \% \ of \ setting + 0.51 \ M\Omega) \\ 1.000 \ G\Omega \leq R < 10.000 \ G\Omega: \ \pm (5\ \% \ of \ setting + 15 \ M\Omega) \\ 10.000 \ G\Omega \leq R < 25.000 \ G\Omega: \ \pm (5\ \% \ of \ setting + 60 \ M\Omega) \\ 0.001 \ M\Omega \leq R < 10.000 \ M\Omega: \ \pm (2\ \% \ of \ setting + 0.013 \ M\Omega) \\ 10.000 \ M\Omega \leq R < 100.000 \ M\Omega: \ \pm (2\ \% \ of \ setting + 0.04 \ M\Omega) \\ 100.000 \ M\Omega \leq R < 1.000 \ G\Omega: \ \pm (2\ \% \ of \ setting + 0.31 \ M\Omega) \\ \end{array}$			
Δουιταον ***	2	≤ 1 µA *11 1 µA < i ≤ 1 mA *11	$\begin{array}{l} 10.000 \ M\Omega \le R < 100.000 \ M\Omega: \ \pm (5\ \% \ of \ setting + 0.06 \ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000 \ G\Omega: \ \pm (5\ \% \ of \ setting + 0.51 \ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000 \ G\Omega: \ \pm (5\ \% \ of \ setting + 15 \ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000 \ G\Omega: \ \pm (5\ \% \ of \ setting + 60 \ M\Omega) \\ 0.001 \ M\Omega \le R < 10.000 \ M\Omega: \ \pm (2\ \% \ of \ setting + 0.013 \ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000 \ M\Omega: \ \pm (2\ \% \ of \ setting + 0.04 \ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000 \ G\Omega: \ \pm (2\ \% \ of \ setting + 0.31 \ M\Omega) \\ 1.000 \ G\Omega \le R < 5.000 \ G\Omega: \ \pm (2\ \% \ of \ setting + 13 \ M\Omega) \end{array}$			
		≤ 1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤	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) 0.001 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 100.000 MΩ: ±(2 % of setting + 0.014 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) 500.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 15 MΩ)			
(when GND		≤ 1 µA *11 1 µA < i ≤ 1 mA *11	$\begin{array}{l} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \% \ of \ setting + 0.06 \ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000 \ G\Omega : \pm (5\ \% \ of \ setting + 0.51 \ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000 \ G\Omega : \pm (5\ \% \ of \ setting + 15 \ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000 \ G\Omega : \pm (5\ \% \ of \ setting + 60 \ M\Omega) \\ 0.001 \ M\Omega \le R < 10.000 \ M\Omega : \pm (2\ \% \ of \ setting + 0.013 \ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000 \ M\Omega : \pm (2\ \% \ of \ setting + 0.014 \ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000 \ G\Omega : \pm (2\ \% \ of \ setting + 0.31 \ M\Omega) \\ 1.000 \ G\Omega \le R < 5.000 \ G\Omega : \pm (2\ \% \ of \ setting + 13 \ M\Omega) \\ 500.000 \ M\Omega \le R < 1.000 \ G\Omega : \pm (25\ \% \ of \ setting + 15 \ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000 \ G\Omega : \pm (25\ \% \ of \ setting + 15 \ M\Omega) \end{array}$			
(when GND Low)	is set to	1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤ 50 nA *10	$\begin{array}{c} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \% \ of \ setting + 0.06 \ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000 \ G\Omega : \pm (6\ \% \ of \ setting + 0.51 \ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000 \ G\Omega : \pm (5\ \% \ of \ setting + 15 \ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000 \ G\Omega : \pm (5\ \% \ of \ setting + 60 \ M\Omega) \\ 0.001 \ M\Omega \le R < 10.000 \ M\Omega : \pm (2\ \% \ of \ setting + 0.013 \ M\Omega) \\ 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (2\ \% \ of \ setting + 0.014 \ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000 \ G\Omega : \pm (2\ \% \ of \ setting + 13 \ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000 \ G\Omega : \pm (2\ \% \ of \ setting + 1.51 \ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000 \ G\Omega : \pm (2\ \% \ of \ setting + 15 \ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000 \ G\Omega : \pm (2\ \% \ of \ setting + 15 \ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000 \ G\Omega : \pm (2\ \% \ of \ setting + 15 \ M\Omega) \\ 10.000 \ G\Omega \le R < 100.000 \ G\Omega : \pm (30\ \% \ of \ setting + 210 \ M\Omega) \end{array}$			
(when GND Low) (i: measured	d current)	1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤ 50 nA *10 50 nA < i	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 < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 25.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 100.000 MΩ: ±(2 % of setting + 0.014 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 0.31 MΩ) 1.000 GΩ ≤ R < 5.000 GΩ: ±(2 % of setting + 13 MΩ) 500.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(30 % of setting + 15 MΩ) 200.000 MΩ ≤ R < 1.000 GΩ: ±(30 % of setting + 210 MΩ) 200.000 MΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 0.51 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤ 50 nA *10 50 nA < i ≤ 100 nA	10.000 MΩ ≤ R < 100.000 MΩ: \pm (5 % of setting + 0.06 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: \pm (5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: \pm (5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: \pm (5 % of setting + 60 MΩ) 10.000 MΩ ≤ R < 25.000 GΩ: \pm (2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 10.000 MΩ: \pm (2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: \pm (2 % of setting + 0.31 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: \pm (2 % of setting + 13 MΩ) 1.000 GΩ ≤ R < 5.000 GΩ: \pm (2 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: \pm (25 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: \pm (26 % of setting + 10 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: \pm (30 % of setting + 210 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: \pm (20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.0000 GΩ: \pm (20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.0000 GΩ: \pm (20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.0000 GΩ: \pm (20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.0000 GΩ: \pm (20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.0000 GΩ: \pm (20 % of setting + 1.51 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤ 50 nA *10 50 nA < i	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 < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 25.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 100.000 MΩ: ±(2 % of setting + 0.014 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 0.31 MΩ) 1.000 GΩ ≤ R < 5.000 GΩ: ±(2 % of setting + 13 MΩ) 500.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(30 % of setting + 15 MΩ) 200.000 MΩ ≤ R < 1.000 GΩ: ±(30 % of setting + 210 MΩ) 200.000 MΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 0.51 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	≤ 1 μA *11 1 μA < i≤ 1 mA *11 5 nA ≤ i≤ 50 nA *10 50 nA < i ≤ 100 nA *10	$\begin{array}{c} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \%\ of\ setting + 0.06\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.013\ M\Omega) \\ 0.001 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 100.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 13\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (25\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 200.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 50.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 50.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 10\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 10\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000\ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000 \ G\Omega : \pm (20\ \%\ of\ setting + 210\ M\Omega) \\ 50.000 \ G\Omega \le R \le 100.000 \ G\Omega : \pm (20\ \%\ of\ setting + 210\$			
(when GND Low) (i: measured (R: measured	d current) ement	1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤ 50 nA *10 50 nA < i ≤ 100 nA	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 < 1.000 GΩ: ±(5 % of setting + 60 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(5 % of setting + 60 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.014 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 10.31 MΩ) 1.000 GΩ ≤ R < 5.000 GΩ: ±(2 % of setting + 13 MΩ) 500.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R ≤ 1.000 GΩ: ±(2 % of setting + 15 MΩ) 1.000 GΩ ≤ R ≤ 1.000 GΩ: ±(2 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 50.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 50.000 GΩ: ±(20 % of setting + 60 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	≤ 1 μA *11 1 μA < i ≤ 1 mA *11 5 nA ≤ i ≤ 50 nA *10 50 nA < i ≤ 100 nA *10 100 nA <	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 < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 60 MΩ) 10.000 MΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 10.000 GΩ: ±(2 % of setting + 0.31 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 13 MΩ) 1.000 GΩ ≤ R < 5.000 GΩ: ±(2 % of setting + 13 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(25 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R ≤ 100.000 GΩ: ±(30 % of setting + 10 MΩ) 10.000 GΩ ≤ R ≤ 100.000 GΩ: ±(30 % of setting + 210 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: ±(30 % of setting + 210 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 0.51 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 0.51 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	\$\leq 1 \ \mu A \ \cdot 1\] 1 \ \mu A < i \leq 1 \ \mu A \ \cdot 1\] 5 \ \ma A \ \cdot i \leq 5 \ \ma A \ \cdot 1\] 5 \ \ma A \ \cdot i \leq 50 \ \ma A \ \cdot 1\] 50 \ \ma A \ \cdot i \leq 100 \ \ma A \ \cdot 10\] 100 \ \ma A \ \cdot i \leq 200 \ \ma A \ \c	10.000 MΩ ≤ R < 100.000 MΩ: ±(5 % of setting + 0.06 MΩ) 100.000 MΩ ≤ R < 1.000 GΩ: ±(6 % of setting + 0.15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(6 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 100.000 MΩ: ±(2 % of setting + 0.31 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 0.31 MΩ) 1.000 GΩ ≤ R < 5.000 GΩ: ±(2 % of setting + 13 MΩ) 500.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(30 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(30 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(30 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 210 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 210 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 2.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 2.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 2.000 GΩ: ±(10 % of setting + 15 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	\$\leq 1 \ \mu A \ \cdot 1\] 1 \ \mu A < i \leq 1 \ \mu A \ \cdot 1\] 5 \ \ma A \ \cdot i \leq 5 \ \ma A \ \cdot 1\] 5 \ \ma A \ \cdot i \leq 50 \ \ma A \ \cdot 1\] 50 \ \ma A \ \cdot i \leq 100 \ \ma A \ \cdot 10\] 100 \ \ma A \ \cdot i \leq 200 \ \ma A \ \c	$\begin{array}{c} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \%\ of\ setting + 0.06\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 0.31\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 15\ M\Omega) \\ 100.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (25\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (25\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (30\ \%\ of\ setting + 20\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.00$			
(when GND Low) (i: measured (R: measured	d current) ement	≤1 µA *11 1 µA < i≤ 1 mA *11 5 nA ≤ i≤ 50 nA *10 50 nA < i ≤ 100 nA < 1≤ 100 nA < 1≤ 200 nA *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 < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 10.000 GΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 10.000 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 10.000 GΩ: ±(2 % of setting + 0.31 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 13 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 13 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(25 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(20 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(30 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 10.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 10 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 10 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 10 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 10 MΩ) 10.000 GΩ ≤ R < 50.000 GΩ: ±(10 % of setting + 10 MΩ)			
(when GND Low) (i: measured (R: measured	d current) ement	≤1 µA *11 1 µA < i≤ 1 mA *11 5 nA ≤ i≤ 50 nA *10 50 nA < i ≤ 100 nA *10 100 nA < i≤ 200 nA *11 200 nA < i 200 nA < i	$\begin{array}{c} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \%\ of\ setting + 0.06\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 0.31\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 15\ M\Omega) \\ 100.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (25\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (25\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (30\ \%\ of\ setting + 20\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 50.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.00$			
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Accuracy *1 (when GND Low) (i: measure (R: measure resistance)	d current) ement	\$1 μA *11 1 μA < i≤ 1 mA *11 5 nA ≤ i≤ 5 o nA *10 50 nA < i ≤ 100 nA < i ≤ 200 nA *11 200 nA < i ≤ 1 μA *11	$\begin{array}{c} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \%\ of\ setting + 0.06\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (6\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 0.001 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 100.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 0.31\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (2\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (25\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (25\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (10\ \%\ of\ setting + 110\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.06\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 1$			
(when GND Low) (i: measured (R: measured	d current) ement	≤1 µA *11 1 µA < i≤ 1 mA *11 5 nA ≤ i≤ 50 nA *10 50 nA < i ≤ 100 nA *10 100 nA < i≤ 200 nA *11 200 nA < i 200 nA < i	$\begin{array}{c} 10.000 \ M\Omega \le R < 100.000 \ M\Omega : \pm (5\ \%\ of\ setting + 0.06\ M\Omega) \\ 100.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 1.000\ G\Omega : \pm (5\ \%\ of\ setting + 0.51\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 60\ M\Omega) \\ 0.001 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000\ M\Omega : \pm (2\ \%\ of\ setting + 0.013\ M\Omega) \\ 10.000 \ M\Omega \le R < 10.000\ G\Omega : \pm (2\ \%\ of\ setting + 0.31\ M\Omega) \\ 10.000 \ G\Omega \le R < 5.000\ G\Omega : \pm (2\ \%\ of\ setting + 13\ M\Omega) \\ 500.000 \ M\Omega \le R < 1.000\ G\Omega : \pm (25\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (25\ \%\ of\ setting + 0.51\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (25\ \%\ of\ setting + 15\ M\Omega) \\ 200.000 \ M\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (20\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (30\ \%\ of\ setting + 210\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 1.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 10.000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.0000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.0000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.0000\ G\Omega : \pm (10\ \%\ of\ setting + 10\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.0000\ G\Omega : \pm (5\ \%\ of\ setting + 10.00\ M\Omega) \\ 10.000 \ G\Omega \le R < 1.0000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 15\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 60\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 60\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 60\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\ G\Omega : \pm (5\ \%\ of\ setting + 60\ M\Omega) \\ 10.000 \ G\Omega \le R < 25.000\$			
(when GND Low) (i: measured (R: measured	d current) ement	≤ 1 μA *11 1 μA < i≤ 1 mA *11 5 nA ≤ i≤ 50 nA *10 50 nA < i ≤ 100 nA *10 100 nA < i≤ 200 nA *11 200 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: ±(6 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 GΩ ≤ R < 1.000 GΩ: ±(5 % of setting + 15 MΩ) 10.000 MΩ ≤ R < 25.000 GΩ: ±(5 % of setting + 60 MΩ) 0.001 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 10.000 MΩ: ±(2 % of setting + 0.013 MΩ) 10.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 0.31 MΩ) 1.000 GΩ: R < 5.000 GΩ: ±(2 % of setting + 13 MΩ) 500.000 MΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 13 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(2 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(25 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 1.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 10.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 10.51 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(20 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 15 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 10 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 10 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 10 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 10 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(10 % of setting + 10 MΩ) 1.000 GΩ ≤ R < 1.000 GΩ: ±(5 % of setting + 0.06 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.51 MΩ) 1.000 GΩ ≤ R < 10.000 GΩ: ±(5 % of setting + 0.000 GΩ: ±(

- judgments when the low pass filter is set to on requires at least 10 seconds after the rise time ends. Humidity: 70 %rh or less (no condensation), when there is no interference caused by wobbly test
- leads or other problems.
- 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.
- When the measured current is limited to 100 nA or more (no condensation) when the humidity is 50 %rh or less, no external disturbance is present such as swinging test leads, and the offset is enabled.

Timer function	TOS9300 TOS9301 TOS9301PD TOS9303 TOS9				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 specific	cations	TOS9300	TOS9301	TOS9301PD	TOS9303	TOS9303LC	
Grounding mode (GND)			Can be switch	ed between Lo	ow and Guard	d.	
	Low	Measures th	GND is connected to the low terminal. Measures the current flowing across the low terminal and chassis (normal applications).				
	Guard *16	(curre	throu ent flowing thro	lard. Measures ligh the low terr bugh the chass accuracy meas	minal sis is not mea	sured)	
Filter function	า	A low-pass	filter can be i	nserted into the	e ammeter m	easurement	

^{*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

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

- *1. No greater than the maximum rated output and resistance no greater than the output terminal volt-
- when tests are performed consecutively, output time limit and rest time may become necessary depending on the upper limit setting

Measurem	nent function	TOS9302						
Output	Measurement range	0.0 A to 45.0 A AC/DC						
ammeter	Resolution		0.1 A					
	Accuracy	±(1 % of reading + 0.2 A)						
	Response	AC: tru	AC: true rms value: DC: mean value					
	Hold function		ment after a test is finis or fail judgment is displ					
Output	Measurement range	AC: 0.00	V to 6.00 V, DC: 0.00 V	to 8.50 V				
voltmeter	Resolution	0.001 V						
	Offset cancel function	Cancels up to 5 V (AC/DC) of the unnecessary voltage from mea- surements. OFF function available.						
	Accuracy	±(1 % of setting + 0.02 V)						
	Response	AC: tru	ie rms value: DC: mear	value				
	Hold function		ment after a test is finis or fail judgment is displ					
Resis-	Measurement range *3		1 mΩ to 600 mΩ					
tance	Resolution		1 mΩ					
meter	Offset cancel function		f the unnecessary resis nts. OFF function availa					
	Accuracy	$\pm (2 \% \text{ of reading} + 3 \text{ m}\Omega)$						
	Hold function	The resistance measurement after a test is finished is held while pass judg-ment is displayed.						

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

Judgment	function		TOS9302	TOS9303	TOS9303LC		
Behavior b	ased on ju	dgment	The output is shut of level can be set in the rately. In an auto test,	esistance or sensing vo ff when a judgment is n range of 0 (OFF) to 10 the buzzer is valid only lace at the end of the p	nade. Buzzer volume for pass and fail sepa- y for the judgment that		
	UPPER FAIL	Judgment method	Upper limit is detected	when a resistance great I or when a sensing volt not made during a conta	tage is detected. Judg-		
		Display	"	Jpper-FAIL" is displaye	d.		
		Buzzer		On			
		SIGNAL I/O	The Upper-FAIL sig	nal is generated contin signal is received.	uously until a STOP		
	LOWER FAIL	Judgment method		s when a resistance less etected or when a sens	s than or equal to the ing voltage is detected.		
		Display	"Lower-FAIL" is displayed.				
		Buzzer	On				
		SIGNAL I/O	The Lower-FAIL sig	nal is generated contin signal is received.	uously until a STOP		
	PASS	Judgment method		ade if Upper-FAIL or Lo			
		Display		"PASS" is displayed.			
		Buzzer		On (fixed to 50 ms)			
		SIGNAL I/O	Pass Hold setting. If F	enerated for the length of Pass Hold is set to Infin nuously until a STOP si	ity, the PASS signal is		
Resis-	Upper limi	t setting range		0.0001 Ω to 10.0000 Ω			
tance	Lower limi	t setting range		$0.0000~\Omega$ to $9.9999~\Omega$,		
judgment	Judgmen	t accuracy	1	(2 % of UPPER + 3 mΩ	Σ)		
Voltage	Upper limi	t setting range	0	.001 V to 5.000 V AC/D	C		
judgment	Lower limi	t setting range		.000 V to 4.999 V AC/D			
	Judgmen	t accuracy	±	(2 % of UPPER + 0.05	V)		
Calibration				Calibrated using a pure resistive load (with the rms of a sine wave for AC)			
Contact ch	eck functi	on		ows through the test least. (OFF setting availab			

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 s	etting + 20 ms) (excludi	ng the fall time)		

^{*4.} This setting is used only when a PASS judgment occurs. During a DC test, the voltage may not drop all the way within the set time because of the electrostatic capacity inside the product and the EUT.

Partial Discharge Test

Output fui	nction		TOS9301PD
AC out-	Outp	ut range	0.050 kV to 5.000 kV
put		Resolution	1 V
section	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)
		ut voltage form *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)
	Cres	t factor	√2 ± 3 % (800 V or higher)
	Frequ	uency	50 Hz / 60 Hz
		Accuracy	±0.1 %
	Volta	ge regulation	±3 % or less (when changing from maximum rated load to no load)
	Outp	ut method	PWM switching
Output voltage monitor function		monitor	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 PVMM 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.

Measurem	ment function		TOS9301PD
Voltmeter	Measurement range		0.00 kV to 7.50 kV AC/DC
	Resolution	1	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	Electric ch surement	arge mea- method	IEC60664-1 Edition 3.0 compliant
measure- ment	Measurement range		0 pC to 10000 pC
ment	Measure- ment	100 pC range	0.1 pC
	resolu- tion	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)
	Measuren 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 electro- static 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 chara		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		ion	TOS9301PD
Electr	ic dischar	ge judgment	The output is shut off when a judgment is made.
	Upper FAIL	Judgment method	A current higher than or equal to the upper limit is measured.
	(Cur-	Display	"Upper-FAIL (Current)" is displayed.
	rent)	Buzzer	On
		SIGNAL I/O	The U FAIL signal is generated continuously until a STOP signal is received.
	Upper FAIL	Judgment method	An electric charge greater than or equal to the upper limit is measured.
	(Cou-	Display	"Upper-FAIL (Coulomb)" is displayed.
	lomb)	Buzzer	On
		SIGNAL I/O	The U FAIL signal is generated continuously until a STOP signal is received.
	Upper FAIL	Judgment method	A discharge pulse count greater than or equal to the upper limit is measured.
	(Pulse)	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.
Uppei	current li	mit	50 mA (with no calibration)
	limit of	Setting range	1 pC to 10000 pC
electric charge (Upper Cou- lomb)		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
Q	pd	Electric discharge: Full scale of the scale measurement range/10 V
Ip	d *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.

Leakage Current Test

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

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.

Measure	ment circ	uit network	TOS9303LC
		0990 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 6	0990 compliant)	$(1.5 \text{ k}\Omega \text{ // } 0.22 \mu\text{F}) + 500 \Omega \text{ // } (10 \text{ k}\Omega + (20 \text{ k}\Omega + 6.2 \text{ n}\text{F}) \text{ // }$
			9.1 nF), reference measurement element: 500 Ω, voltage measurement U1 and U3 switchable
		rical Appliances and s Safety Act, etc.)	1 k Ω , reference measurement element: 1 k Ω
		rical Appliances and	1 kΩ // (10 kΩ + 11.225 nF + 579 Ω),
		s Safety Act)	reference measurement element:1 kΩ
	F (UL an	d the like)	1.5 kΩ // 0.15 μF, reference measurement element: 1.5 kΩ
	G H (IEC 61010-1, 60601-1wet)		2 kΩ, reference measurement element: 2 kΩ
			375 Ω // 0.22 μF + 500 Ω ,
			reference measurement element: 500 Ω
	I (Patien	t)	1 kΩ // 10 kΩ + 0.015 μF,
			reference measurement element: 1 kΩ
	J (throug	jh)	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 racy	accu-	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.

ement se	ction_		TOS9303LC
			DC, RMS: 1.00 μA(min.) to 200.00 μA(max),
			Peak: 1.00 μA(min.) to 282.00 μA(max)
Range 2	<u>.</u>		DC, RMS: 12.50 μA(min.) to 2000.0 μA(max), Peak: 17.50 μA(min.) to 2830.0 μA(max)
Range 3	3		DC, RMS: 125.0 μA(min.) to 20.000 mA(max), Peak: 175.0 μA(min.) to 28.300 mA(max)
Range 4	1		DC, RMS: 1.250 mA(min.) to 100.00 mA(max), Peak: 1.750 mA(min.) to 100.00 mA(max)
Range	witchi	na	Auto or Fix selectable. If a measurement falls outside
. tungo c	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	.9	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
Bandwid	dth swi	tching	fixed to the specified range. Can be expanded to a bandwidth that allows measure-
			ments from 0.1 Hz, which is required in the measure- ment of medical instruments and the like.
	Norm	al	Normal measurement bandwidth: 15 Hz to 1 MHz
		nd	Expands the measurement range to 0.1 Hz to 1 MHz
Range	DC		±(5.0 % of reading + 2 μA)
1	RMS		±(10.0 % of reading + 2 μA)
			±(7.0 % of reading + 2 μA)
	- ·		±(10.0 % of reading + 2 μA)
	Peak		±(10.0 % of reading + 10 μA)
			±(10.0 % of reading + 10 μA)
			±(10.0 % of reading + 10 μA)
Danas	DC	100 KHZ < 1 \(1 \) I IVIHZ	±(20.0 % of reading + 10 μA)
Range 2		0.1 Hz < f < 15 Hz	±(5.0 % of reading + 20 μA) ±(10.0 % of reading + 10 μA)
	IXIVIO		±(7.0 % of reading + 8 μA)
			±(10.0 % of reading + 10 μA)
	Peak		±(10.0 % of reading + 10 μA)
	1 Cuit		±(10.0 % of reading + 10 μA)
			±(10.0 % of reading + 10 μA)
			±(20.0 % of reading + 10 µA)
Range	DC	100 1112 112 1111112	±(5.0 % of reading + 50 μA)
3		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	DC		±(5.0 % of reading + 0.5 mA)
4	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		±(10.0 % of reading + 0.5 mA)
			±(7.0 % of reading + 0.5 mA)
			±(10.0 % of reading + 0.5 mA)
		100 kHz < f ≤ 1 MHz	±(20.0 % of reading + 0.5 mA)
			1 MΩ ± 1 %
pacitanc	е		200 pF or less
n mode r	ejectio	n ratio	(internal voltmeter input capacitance: 100 pF or less) 10 kHz or less: 60 dB or more,
			10 kHz to 1 MHz: 40 dB or more
ancel fur			Cancels up to 10 mA of the unnecessary current from
	Range 2 Range 3 Range 4 Range 8 Range 9 Range 9 Range 9 Range 1 Range 1 Range 1	Range DC RMS Range DC RMS Peak Range DC RMS Peak Range DC RMS Peak Range DC RMS Peak Range DC RMS Peak	Range 2 Range 3 Range 4 Range switching Auto Fix Bandwidth switching Normal Expand Expand The control Expand The control

- Voltmeter band expansion is possible when network I is selected. 0.1 Hz \leq f \leq 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.

For Network other than A, B, C or H is used, calculate as follows: For Network D, E, or I, the \blacksquare part of $\pm(\Box\%$ of reading + \blacksquare 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)

Judgment			TOS9303LC
Behavior b		dgment	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 fai
			separately. In an auto test, the buzzer is valid only for the judgment
		T	that takes place at the end of the program.
	UPPER FAIL	Judgment	UPPER FAIL results when a current greater than or equal to the up-
	FAIL	method	per limit (Upper) is detected.
		Display	"Upper-FAIL" is displayed.
		Buzzer	On The Hand State of the Control of
		SIGNAL I/O	The Upper-FAIL signal is generated continuously until a
	LOWER		STOP signal is received.
	FAIL	Judgment method	LOWER FAIL results when a current less than or equal to the lower limit (Lower) is detected.
	I AIL	Display	"Lower-FAIL" is displayed.
		Buzzer	On
		SIGNAL	The Lower-FAIL signal is generated continuously until a
		I/O	STOP signal is received.
	PASS	Judgment	PASS judgment is made if Upper-FAIL or Lower-FAIL has not
		method	occurred when the test time elapses.
		Display	"PASS" is displayed.
		Buzzer	On (fixed to 50 ms)
		SIGNAL	The PASS signal is generated for the length of time specified by the
		1/0	Pass Hold setting. If Pass Hold is set to Infinity, the PASS signal is generated continuously until a STOP signal is received.
Upper	RANGE	1	DC, RMS: 0.1 μA(min.) to 200 μA(max), Peak: 0.1 μA(min.) to 282 μA(max)
Setting	RANGE		DC, RMS: 15.1 μA(min.) to 2.00 mA(max), Peak: 21.3 μA(min.) to 2.83 mA(max)
range	RANGE		DC, RMS: 151 μA(min.) to 20.00 mA(max), Peak: 213 μA(min.) to 28.3 mA(max)
	RANGE		DC, RMS: 1.51 mA(min.) to 100 mA(max), Fear: 213 mA(min.) to 100 mA(max)
Judgment			Conforms to total accuracy
Jauginoill	asouracy		(Read "reading" as "upper setting" of total accuracy.)
			() and the distriction of the desired of the desir
Other spec	rifications		TOS9303LC
Voltage co			Displays the estimated current converted with the preset supply
voltage co	nversion		voltage (Conv Voltage), based on the voltage supplied to the EUT
			and the measured current. (This is invalid in meter mode.)
	Setting ra	nge	80.0 V to 300.0 V, OFF
	Resolutio		0.1 V
Power sun	ply line pol		Set the polarity of the power supply line to supply to the EUT to
selection			positive or negative.
Single fault mode (Condition)			Set the EUT single fault mode to normal, neutral line disconnection
selection	`	,	(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.
Measurem	ent check		Checks the measurement function by shorting across the A and B
			terminals. If an error is found, the protection function is activated.
Supply vol		Measure-	80.0 V to 250.0 V
measurem		ment range	
LINE (EUT)	Resolution	0.01 V
		Accuracy	±(3 % of reading + 1 V)
Supply cur		Measure-	0.1 A to 15.00 A
measurement			
		ment range	0.004.4
		Resolution	0.001 A
AC LINE (E	EUT)	Resolution Accuracy	0.001 A ±(5 % of reading + 30 mA)
AC LINE (E	EUT)	Resolution Accuracy Measure-	
AC LINE (E	EUT)	Resolution Accuracy Measure- ment range	±(5 % of reading + 30 mA) 10 W to 1500 W
AC LINE (E	EUT)	Resolution Accuracy Measure-	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more,
AC LINE (E Power mea (active pov	EUT) asurement ver)	Resolution Accuracy Measure- ment range Accuracy	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1)
Power mea (active pov	asurement ver)	Resolution Accuracy Measure- ment range Accuracy DC	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V
Power mea (active pow	asurement ver) Measurement ment	Resolution Accuracy Measure- ment range Accuracy DC RMS	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V
AC LINE (E Power mea (active pow Voltage measure- ment	asurement ver) Measure- ment range	Resolution Accuracy Measurement range Accuracy DC RMS Peak	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V
Power mea (active pow Voltage measure- ment across the A and B	Measurement wer) Measurement range	Resolution Accuracy Measurement range Accuracy DC RMS Peak edance	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ
AC LINE (E Power mea (active pow Voltage measure- ment across the	asurement ver) Measurement range Input impu	Resolution Accuracy Measurement range Accuracy DC RMS Peak edance *6	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO)
Power mea (active pow Voltage measure- ment across the A and B	Measurement wer) Measurement range	Resolution Accuracy Measurement range Accuracy DC RMS Peak edance *6	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded,
Power mea (active pow Voltage measure- ment across the A and B	asurement ver) Measurement range Input impu	Resolution Accuracy Measurement range Accuracy DC RMS Peak eection	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MQ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights.
Power mea (active pow Voltage measure- ment across the A and B	asurement ver) Measurement range Input impu	Resolution Accuracy Measurement range Accuracy DC RMS Peak edance *6 ection Setting range	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF
AC LINE (E Power mea (active pow Voltage measure- ment across the A and B termi-nals	Measurement wer) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MQ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights.
AC LINE (E Power mea (active pow Voltage measure- ment across the A and B termi-nals	asurement ver) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measurement range Accuracy DC RMS Peak edance *6 ection Setting range	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V
Power mea (active pow Voltage measure- ment across the A and B	Measurement wer) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	asurement ver) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	asurement ver) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measure-ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals Between the terminals	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	Measurement ver) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measure-ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals Between the terminals and chassis	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	Measurement ver) Measurement range Input impu Accuracy SELV determined voltage	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals and chassis rent	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	Measurement ver) Measurement range Input impu Accuracy SELV determined voltage	Resolution Accuracy Measure-ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals Between the terminals and chassis	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	Measurement ver) Measurement range Input impu Accuracy SELV dete	Resolution Accuracy Measure-ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals Between the terminals and chassis rerent tent category inal display	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display.
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	Measurement wer) Measurement range Input imput Accuracy SELV dete	Resolution Accuracy Measure-ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals Between the terminals and chassis rerent tent category inal display	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line.
AC LINE (I Power mea (active pow Voltage measure- ment across the A and B termi-nals Measure- ment terminal	Measurement ver) Measurement range Input impu Accuracy SELV determined voltage Rated voltage Rated cur Measurem Valid term 110% term	Resolution Accuracy Measure-ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals Between the terminals and chassis rerent tent category inal display	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display.
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals Measure- ment terminal	Measurement ver) Measurement ver) Measurement range Input impu Accuracy SELV determent voltage Rated voltage Rated cur Measurem Valid term 110% term Nominal v Input voltage	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and Beterminals and chassis rent eent category inal display ninal oltage range	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line. 100 V to 240 V, 50 Hz/60 Hz
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals Measure- ment terminal	Measurement ver) Measurement ver) Measurement range Input impu Accuracy SELV dete Rated cur Measurem Valid term 110% term Nominal verification of the company of the comp	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals and chassis rent terminals and chassis rent ent category tinal display ninal oltage range yoltage range yoltage range	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line. 100 V to 240 V, 50 Hz/60 Hz 85 Vac to 250 Vac
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals	Measurement ver) Measurement ver) Measurement range Input impu Accuracy SELV dete Rated voltage Rated voltage Rated cur Measurem Valid term 110% term Nominal v Input voltag (allowable Rated out	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and 8 terminals and chassis rent tent category and display ninal oltage range youldage range youldage range youldage range youldage range) put capacity	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line. 100 V to 240 V, 50 Hz/60 Hz
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals Measure- ment terminal	Measurement ver) Measurement range Input impu Accuracy SELV determent voltage Rated cur Measurem Valid term Valid term Input voltag (allowable Rated out Maximum	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals and chassis rent terminals and chassis rent ent category tinal display ninal oltage range yoltage range yoltage range	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line. 100 V to 240 V, 50 Hz/60 Hz 85 Vac to 250 Vac
AC LINE (I Power mea (active pov Voltage measure- ment across the A and B termi-nals Measure- ment terminal	Measurement ver) Measurement range Input impu Accuracy SELV dete voltage Rated cur Measurem Valid term Valid term Input voltag (allowable Rated out Maximum current	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals and chassis rent uent category ninal display ninal oltage range ge range uotage range put capacity operating	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line. 100 V to 240 V, 50 Hz/60 Hz 85 Vac to 250 Vac 1500 VA
AC LINE (I Power mea (active pow Voltage measure- ment across the A and B termi-nals Measure- ment terminal	Measurement ver) Measurement range Input impu Accuracy SELV determent voltage Rated cur Measurem Valid term Valid term Input voltag (allowable Rated out Maximum	Resolution Accuracy Measure- ment range Accuracy DC RMS Peak edance *6 ection Setting range Resolution Between the A and B terminals and chassis rent uent category ninal display ninal oltage range ge range uotage range put capacity operating	±(5 % of reading + 30 mA) 10 W to 1500 W ±(5 % of reading + 8 W) (with the supply voltage at 80 V or more, at a load power factor of 1) 10.00 V to 300.0 V 10.00 V to 300.0 V 15.00 V to 430.0 V Approx. 40 MΩ ±(3 % of reading + 2 V) (measurement range fixed to AUTO) Set a voltage for detecting SELV. When the value is exceeded, the DANGER LED lights. 10.0 V to 99.9 V, OFF 0.1 V 250 V 250 V 100 mA CAT-II Terminals valid for measurement are indicated on the display. Terminal for supplying 110% voltage of the AC line. 100 V to 240 V, 50 Hz/60 Hz 85 Vac to 250 Vac

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

Interface (Common)

REMOTE	Ē		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
CICNAL	1/0		voltage is 4 kVac 5 kVdc or less)
SIGNAL	Function		D-sub 37-pin connector. For the pin arrangement Enable/disable interlock, recall setup memories, recall auto test programs, start/stop testing, monitor the test and voltage genera- tion status, monitor the test status, monitor judgment results, monit tor 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	0 V to 4 V
		Low-level input current Input time	-5 mA max.
	Output	width	5 ms min.
	Output specifica- tions	Output method Output withstanding	Open collector output (4.5 Vdc to 30 Vdc)
		voltage Output saturation voltage	Approx. 1.1 V (25 °C)
		Maximum output cur- rent	400 mA(TOTAL)
STATUS	OUT	1	Output terminal of an option product.
	Positive ter	minal (red)	Outputs +24 V. Use Status Out of CONFIG settings to set the output conditions.
		rminal (black)	+24 V circuit common.
SCANNE	ER		MINI DIN 8-pin connector. Terminal for the optional TOS9320 high voltage scanner. The maximum number of connections is 4 devices(16 channels).
USB (hos	st)		Standard type A socket, FAT32, 32 GB or less Complies with the USB 2.0 specifications; data rate: 12 Mbps (full speed)
Remote o	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 (de- vice)	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
		Commu- nica-tion 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 transmis sion.
Display			7-inch LCD

Other Functions (Common)

		Auto execution by combining ACW, DCW, IR, and EC. For LC, a combination is possible only using TC, PCC, and Patient.
Test condi-	Setup memory	Up to 51 test conditions (ACW, DCW, IR, EC, PD, LC) can be saved.
tion memory	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 resu	Ilt 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 o	clock	For recording the calibration time and test times
	Recordable time	Up to year 2038
	Calibration period set- ting	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.
Measure	ment display	Maximum and minimum measurements can be displayed.
	Normal	Displays measurements during a test. Maximum and minimum values are not held.
	Maximum and mini- mum 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	Double Action	When you press STOP, "READY" is shown for 0.5 seconds. A test starts only when you press START within this period.
method	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 jud (Pass Ho	dgment display time	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 sig	gnal 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.
Protectio	n 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: \pm (10 % of setting + 50 V), EC test: \pm (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): 10 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 signa
	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 cur rent flows from the high voltage output of this product to ground

General Specifications (Common)

Installation location Indoors, 2000 m or less	Backup battery life			3 years (at 25 °C)
Surana- teed Humidity 20 %rh to 80 %rh (20%rh to 70%rh for partial discharge tests)		1	location	
teed range Humidity 20 %rh to 80 %rh (20%rh to 70%rh for partial discharge tests) (no condensation)	ment			
Power arange Tempera- transition Tempera tra			ture	
Tange Humidity 20 with to 80 with (no condensation)			Humidity	, , ,
Storage range Tempera- range Humidity 90 %rh or less (no condensation)				0 °C to 40 °C (32 °F to 104 °F)
range ture -20 °C to 70 °C (-4 °F to 188 °F)			Humidity	20 %rh to 80 %rh (no condensation)
Power supply Pow				-20 °C to 70 °C (-4 °F to 158 °F)
Supply Power Power No load (READY tition No load (READY tition Rated load Received Rated load Rate			Humidity	90 %rh or less (no condensation)
Consumption READY State 100 VA or less	Power supply	(allowable		
Allowable frequency range Insulation resistance (between AC LINE and chassis) Withstanding voltage (between AC LINE and chassis) Earth continuity 25 Aac, 0.1 Ω or less TOS9300: Approx. 17 kg (37.5 lb.) TOS9301: Approx. 20 kg (48.5 lb.) TOS9303: Approx. 20 kg (44.1 lb.) TOS9303: Approx. 21 kg (46.3 lb.) TOS9303: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 20 kg (44.1 lb.) TOS9303: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 22 kg (48.5 lb.) TOS9303: 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. *Two pieces included for the TOS9303LC.) High-voltage test lead [TL31-TOS] (1 pair, SIGNAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), China RoHS sheet (1 sheet), 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., *TOS9303, TOS9303,		consump-	(READY	100 VA or less
range 47 Fiz to 03 Fiz			Rated load	800 VA max.
(between AC LINE and chassis) Withstanding voltage (between AC LINE and chassis) Earth continuity Weight TOS9300: Approx. 17 kg (37.5 lb.) TOS9301: Approx. 18 kg (39.7 lb.) TOS9301: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 21 kg (46.3 lb.) TOS9303: Approx. 21 kg (46.3 lb.) TOS9303: 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. "Two pieces included for the TOS9303LC.) High-voltage test lead [TL31-TOS (1 pair), SIGNAL I/O plug (1 set), High-voltage test lead [TL31-TOS (1 pair), SIGNAL I/O plug (1 set), High-voltage with the TOS9303, T			requency	47 Hz to 63 Hz
(between AC LINE and chassis) Earth continuity 25 Aac, 0.1 \(\Omega \) or less Weight TOS9300: Approx. 17 kg (37.5 lb.) TOS9301: Approx. 22 kg (48.5 lb.) TOS9301: Approx. 20 kg (44.1 lb.) TOS9302: Approx. 20 kg (44.1 lb.) TOS9303: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 22 kg (48.5 lb.) TOS9303: 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. *Two pieces included for the TOS93031.C.) High-voltage test lead [TL31-TOS (1 pair), SIGNAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), China RoHS sheet (1 sheet), 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., *TOS9303.C only), Flat probe [FP01-TOS] (2 red, 1 black, *TOS9303LC only), Flat probe [FP01-TOS] (1 sheet, *TOS9303LC only)) Electromagnetic compatibility *1 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. Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU *2 EN 61010-1 (Class 1 *5, Pollution Degree 2 *6)				30 MΩ or more (500 Vdc)
Weight TOS9300: Approx. 17 kg (37.5 lb.) TOS9301: Approx. 18 kg (39.7 lb.) TOS9301: Approx. 22 kg (48.5 lb.) TOS9302: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 21 kg (46.3 lb.) TOS9303: Approx. 22 kg (44.1 lb.) TOS9303: 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. "Two pieces included for the TOS9303LC.) High-voltage test lead [TL31-TOS (1 pair), SIGMAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), China RoHS sheet (1 sheet), 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., "TOS9301, TOS9303, TOS9303, TOS9303, Conly), Spare fuse (1 pc., 15 A, 250 V, "TOS9303LC only), Spare fuse (1 pc., 15 A, 250 V, "TOS9303LC only), Spare fuse (1 pc., 15 A, 250 V, "TOS9303LC only), Test leads for leakage current test [TL22-TOS] (2 red, 1 black, "TOS9303LC only), Flat probe [FP01-TOS] (1 sheet, "TOS9303LC only) Electromagnetic compatibility "1 Electromagnetic compatibility "1 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) EN 55011 (Class A "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 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. Complies with the requirements of the following directive and standards. Low Voltage Directive 2014/35/EU "2 EN 61010-1 (Class 1 "5, Pollution Degree 2 "6)				1500 Vac, 1 minute, 20 mA or less
TOS9301: Approx. 28 kg (39.7 lb.) TOS9301PD: Approx. 22 kg (48.5 lb.) TOS9303: Approx. 20 kg (44.1 lb.) TOS9303: Approx. 21 kg (46.3 lb.) TOS9303: Approx. 22 kg (48.5 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. *Two pieces included for the TOS9303LC. High-voltage test lead [TL31-TOS (1 pair), SIGNAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), China RoHS sheet (1 sheet), 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, TOS9303, TOS9303, Conly), Fest leads for leakage current test [TL22-TOS] (2 red, 1 black, *TOS9303LC only), Flat probe [FP01-TOS] (1 sheet, *TOS9303LC only), Flat probe [FP01-TOS] (1 sheet, *TOS9303LC only) Electromagnetic compatibility *1 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) 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)	Earth co	ntinuity		25 Aac, 0.1 Ω or less
varies depending on the shipment destination. *Two pieces included for the TOS9303LC.) High-voltage test lead [TL31-TOS] (1 pair), SIGNAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), China RoHS sheet (1 sheet), 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), Spare fuse (1 pc., 15 A, 250 V, *TOS9303LC only), Fast leads for leakage current test [TL22-TOS] (2 red, 1 black, *TOS9303LC only), Flat probe [FP01-TOS] (1 sheet, *TOS9303LC only), Flat probe [F	vveigit			TOS9301: Approx. 18 kg (39.7 lb.) TOS9301PD: Approx. 22 kg (48.5 lb.) TOS9302: Approx. 20 kg (44.1 lb.) TOS9303: Approx. 21 kg (46.3 lb.)
*2 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)	Accessories			Power cord (1 pc., *length: 2.5 m, The attached power cord varies depending on the shipment destination. *Two pieces included for the TOS9303LC.) High-voltage test lead [TL31-TOS] (1 pair), SIGNAL I/O plug (1 set), High-voltage warning sticker (1 pc.), Setup Guide (1 copy), China RoHS sheet (1 sheet), 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), Spare fuse (1 pc., 15 A, 250 V, *TOS9303LC only), Test leads for leakage current test [TL22-TOS] (2 red, 1 black, *TOS9303LC only), Flat probe [FP01-TOS] (1 sheet, *TOS9303LC only)
standards. Low Voltage Directive 2014/35/EU *2 EN 61010-1 (Class I *5 , Pollution Degree 2 *6)	Electromagnetic compatibility *1 *2			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-
	Safety *1			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 radiofrequency energy, in the form of electromagnetic radiation, inductive and/or capacitive coupling, for the treatment of material or inspection/anal-ysis purpose.

 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.

TOS9311 Specifications

	ding voltage t						
AC	Output rang		0.050 kV to 10.000 kV				
output		Resolution	1 V				
section (ACW		Setting accuracy	±(1.2 % of setting + 0.02 kV) (at no load)				
only)	Max. rated I	oad *1	500 VA (10 kV/50 mA)				
,	Max. rated	current	50 mA (When the output voltage is 0.5 kV or higher)				
	Transforme	r rating	500 VA				
	Output volta	ige waveform *2	Sine				
	Distortion Rate		2 % or less (When the output voltage is 1.0 kV or more and the				
			pure resistive load is 200 kΩ)				
	Crest factor		√2 ± 3 %(1500 V or more)				
	Frequency		50 Hz/60 Hz				
		Accuracy	±0.1 %				
	Voltage reg		±3 % or less (When changing from maximum rated load to no load				
	Short-circui		100 mA or more (Output voltage 1.0 kV or higher)				
	Output meth		PWM switching				
DC	Output rang		0.100 kV to 10.000 kV				
output	Output rang	Resolution	1 V				
section							
(DCW		Setting accuracy	±(1.2 % of setting + 0.02 kV)				
only)	Max. rated I		100 W (5 kV/20 mA, 10 kV/10 mA)				
	Max. rated		20 mA				
	Ripple	10 kV no load	30 Vp-p Typ.				
		Max. rated load	100 Vp-p Typ.				
	Voltage reg	ulation	1 % or less (When changing from maximum rated load to no load				
	Short-circui		50 mA (100 mA peak)				
	Discharge f	unction	Forced discharge after test completion				
			(Discharge resistance: 125 kΩ)				
Start volt	age		The voltage at the start of the test can be set.				
	•	Setting range	1 % to 99 % of the test voltage (1% resolution)				
Output vo	oltage monito		If the output voltage exceeds ±(10 % of setting + 0.05 kV), the				
output re	mago momo		output is turned off, and the protection function is activated.				
Insulation	n resistance t	est section					
Output	Output voltage range		-25 V to -1000 V/+0.05 kV to +10.000 kV				
section	output voite	Resolution	1 V				
	Setting accuracy		±(1.2 % of setting + 2 V)/ ±(1.2 % of setting + 0.02 kV)				
	Max. rated load		1 W (-1000 V/1 mA)/10 W (10 kV/1 mA)				
	Max. rated current		1 mA				
	Ripple	1 kV no load	2 Vp-p or less/30 Vp-p or less				
	Max. rated load		10 Vp-p or less/70 Vp-p or less				
	Voltage reg	ulation	1 % or less (when changing from maximum rated load to no load				
	Short-circui	t current	12 mA or less/As per DCW specifications				
	Discharge f	unction	Forced discharge after test completion				
			(discharge resistance: 20 kΩ)/As per DCW specifications				
	Output volta	ige monitor	If the output voltage exceeds ±(10 % of setting + 50 V), the				
	function		output is turned off, and the protection function is activated.				
General	specifications	;					
Environ-	Installation	location	Indoors, 2000 m or less, Pollution Degree 2				
ment	Spec guar-	Temperature	5 °C to 35 °C (41 °F to 95 °F)				
	anteed range		20 %rh to 80 %rh (no condensation)				
	Operating	Temperature	0 °C to 40 °C (32 °F to 104 °F)				
	range	Humidity	20 %rh to 80 %rh (no condensation)				
	Storage	Temperature	-20 °C to 70 °C (-4 °F to 158 °F)				
	range		90 %rh or less (no condensation)				
Davis	-	Humidity	, ,				
Power	Nominal vol		100 Vac to 120 V, 200 V to 240 V (90 Vac to 132 V, 170 V to 250				
supply		oltage range) No load	V), no switching required				
	Power consump-	(READY state)	100 VA or less				
	tion	,	900 VA may				
		Rated load	800 VA max.				
Inna I II		equency range	47 Hz to 63 Hz				
(between	AC LINE and	d chassis)	30 MΩ or more (500 Vdc)				
(between	AC LINE and	d chassis)	1500 Vac, 1 minute, 20 mA or less				
Earth cor		I =	25 Aac, 0.1 Ω or less				
Electrom compatib		EMC Directive 2 EN 61000-3-2, E Applicable unde	r the following conditions: The maximum length of all cabling				
		are being used v	ected to the product must be less than 2.5 m. Shielded cables when using the SIGNAL I/O. Use the included high voltage test discharges are applied only to the EUT.				
Safety			e requirements of the following directive and standards. ective 2014/35/EU *3, EN 61010-1 (Class I, Pollution Degree 2)				

- When tests are performed consecutively, output time limit and rest time may become necessary depending on the upper limit setting.
- 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 1 000 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. Only on models that have CE/UKCA marking on the panel.

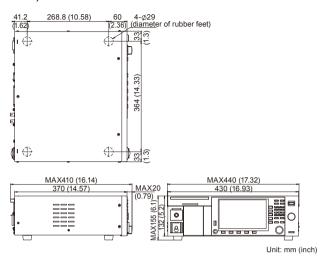
TOS9320 Specifications

		- 174	Joinoacic				
Basic spe	cificatio	ns					
Maximum			AC	5 kV			
age			DC	7.2 kV			
Number o	of channe	els		4 (Each channel can be set to high, low, or open.)			
Maximum	connec	tions		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 c	heck fur	nction		Available			
Indicators		iction	DANGER	Lights in sync with the TOS9300 series tester			
maioatore	•		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		er functio	ns				
Control s	witch			EXTERNAL I/O switch for switching the following controls. ON: External control through the CONTROLLER INTER- FACE OFF: Control from the TOS9300 series tester			
CONTRO	LLER IN	ITERFAC	E	D sub 25 pin connector			
(external	control)			D-sub 25-pin connector.			
	Functio	n		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 to minal is pulled up to +12 V by a resistor. Leaving the inp terminal open is equivalent to applying a high level signal			
			el input voltage	11 V to 15 V			
			el input voltage	0 V to 4 V			
			el input current	-5 mA max.			
	Outmut	Input tim		5 ms min.			
	Output	Output n		Open collector output (4.5 Vdc to 30 Vdc)			
		<u> </u>	thstanding voltage				
				Approx. 1.1 V (25°C, 77°F)			
TOS9300) agrica t		m output current	MINI DIN 8-pin connector			
1059300	series	ester inte	riace	Up to 4 units (16 channels) can be connected.			
Generals	specifica	tions		() () () () () () () () () ()			
Environ-		tion locat	ion	Indoors, 2000 m or less			
ment	Spec gi	uaran-	Temperature	5°C to 35°C (41°F to 95°F)			
	teed rai			20%rh to 70%rh (no condensation)			
	Operati	ng	Temperature	0°C to 40°C (32°F to 104°F)			
	range		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		il voltage ble voltag	range je range)	100 Vac to 240 Vac (90 Vac to 250 Vac)			
		consumpt		50 VA max.			
			ency range	47 Hz to 63 Hz			
(between	AC LINE	and cha	assis)	30 MΩ or more (500 Vdc)			
(between	AČ LINE		assis)	1500 Vac for 1 minute, 20 mA or less			
Earth con	itinuity			25 Aac/0.1 Ω or less			
Weight	nane#!-	- 1:1 ·	lib., \$4, \$0	Approx. 8 kg (17.6 lb)			
Electroma	agnetic c	compatibi	iity *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), EN61010-2-030			
*1. Does	not appl	ly to spec	ially ordered or m	odified products.			

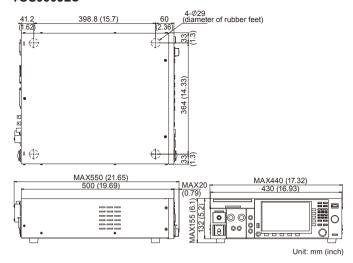
- Does not apply to specially ordered or modified products.
- Only on models that have CE/UKCA marking on the panel.
- This is a Class A instrument. This product is intended for use in an industrial environment. This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.
- 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.
- 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.
- 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

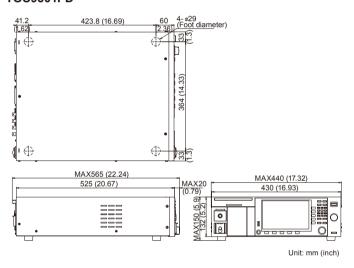
TOS9300, TOS9301



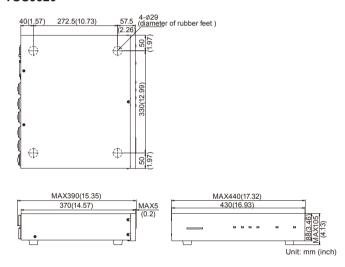
TOS9303LC



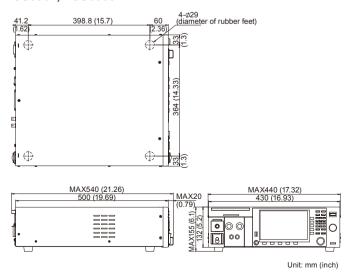
TOS9301PD



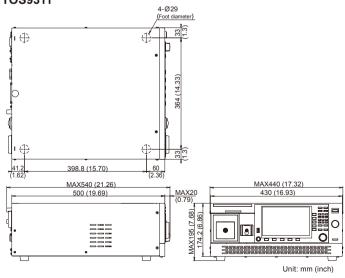
TOS9320



TOS9302, TOS9303



TOS9311



Hipot Tester / Hipot Tester with Insulation Resistance Test

OS5300 Series







TOS5301



Dimensions / Weight

TOS5302:

320(12.60")W × 132(5.20")H × 350(13.78")Dmm / 14 kg(30.9 lbs) TOS5301:

 $320(12.60^{\circ})W \times 132(5.20^{\circ})H \times 350(13.78^{\circ})Dmm / 15 kg(33.1 lbs)$ TOS5300:

 $320(12.60^{\circ})W \times 132(5.20^{\circ})H \times 350(13.78^{\circ})Dmm / 14 kg(30.9 lbs)$

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, SIGNAL I/O plug (D-sub plug unit), CD-ROM, Setup guide, Quick reference (Japanese/English), Safety information

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.

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 \pm 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 \pm 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 highprecision, high-resolution, high-speed measurement and the judgment functions.



▲ AC Hipot (Withstanding voltage) test settings display (example)

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 $5.00 \text{ G}\Omega$.

*At 500 V and above, measurements up to 5.00 G Ω 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.

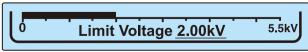




▲ Flat surface design of the HIGH terminal with free rotation mechanism, and the LOW terminal with lock function

■ Limit voltage function

Prevents the user from setting a test voltage that exceeds the preset voltage.



▲ LIMIT VOLTAGE setting (example)

■ Monitoring output voltage function

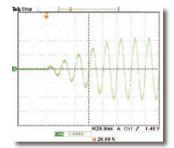
If the output voltage exceeds the setting voltage of (± 350 V), it turns off the output and the system switches to PROTECTION mode.

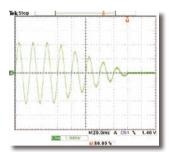
In order to handle kilo's of high voltage when the Hipot (Withstand voltage) and insulation tests are conducted, there are number of safety measures are required to take place. Having with these functions improve, the operational safety and the protection for the EUT.

■ 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

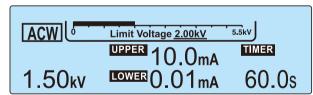
The product is equipped with an interlock function that operates together with external devices to interrupt output. To ensure the safe operation of tester, the interlock function activates when the SIGNAL I/O connector pins number 1 and 13 are opened, and when they are short-circuited, the interlock 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.

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

		3 : 3 -	TOS5300	TOS	5301	TOS5302		
AC output	Output r	ange	.000000	0.05 kV to		1000002		
section	Output	Accuracy	+(2 % 0			nnected		
		Setting range	±(2 % of set + 20 V) when no load is connected 0.00 kV to 5.50 kV					
		Resolution	10 V steps					
	May rat	ed output *1	500 VA (5 kV/100 mA)					
		ed voltage		51				
		ed current	100 mA (w	hen the output v		or greater)		
		mer rating	TOO TITA (WI	500		or greater)		
		oltage waveform		Sir				
	*2	Distortion	If the out	put voltage is 0.5		9/ or loss		
	-	Distortion		oad or a pure re				
	Frequer	ICV	(50 Hz o				
		Accuracy	±0.5 °	% (excluding dur		time)		
	Voltage	regulation	10 % or less (who					
		Itage variation		% (5 kV when n				
				wer supply volta				
	Short-ci	rcuit current		e (when the outp				
	Output r	nethod		PWM sv				
DC output	Output r	ange		0.05 kV to	6.00 kV			
section		Accuracy	1	± (2 % of s	et + 20 V)			
				When no load				
		Setting range		0.00 kV to	6.20 kV			
		Resolution		10 V S	STEP			
	Max. rat	ed output *1		50 W (5 k	V/10 mA)			
	Max. rat	ed voltage		6 H	۲V			
	Max. rat	ed current		10 ו	mΑ			
	Ripple	5 kV when no		50 V	'n-n			
	(TYP)	load is connected	-			-		
		Max. rated load		100 \				
	Voltage	regulation		3% 0				
				(When changi mum rated loa				
	Short-circuit current (TYP)			40 1				
	Discharge feature			(when generation				
				Forced discha				
		9		completion (di				
			tance: 125 kΩ)					
Start Volta	ge			e at the start of				
Limit Valta	~~			n be set to 50%		•		
Limit Volta	ge			test voltage upp 0 kV to 5.50 kV,				
Output volt	age mon	itor feature		ut voltage excee				
	3			is lower than th				
			output is turn	ed off, and prote	ective features	are activated.		
Voltmeter	Analog	Scale	6 kV AC/DC f.s					
		Accuracy		± 5 %	6 f.s			
		Indication	A	verage value res	ponse/rms sca	le		
	Digital	Measurement range		0.000 kV to 6.5				
		Display		0.00	I□ kV			
		Accuracy	V < 500 V: ±(1.	.5 % of rdng + 20) V); V ≥ 500 V:	$\pm 1.5~\%$ of rdng		
		Response *3	-	True rms (respor	nse time: 50 ms)		
		Hold feature		test is finished, t				
				ntil the PASS or				
Ammeter	Digital	Measurement	AC: 0.00 mA to					
,		range	110 mA	DC: 0.00 m		110 mA		
7 1111110101					ed current			
, unineter		Display			1 mA ≤ i < 1	10 mA		
, uninicion		Display		< 1 mA				
, unineter		ыѕріау	ι	300 μA	0.000	mA		
, unineter		Ызріау	10 mA	⊒□□ μA . ≤ i < 100 mA	0 . 000 100 mA	mA ≤ i		
, unineter		Display	10 mA	300 μA	0.000	mA ≤ i		
7.1111110001			10 mA	□□□ μA .≤i < 100 mA]. □□ mA	0 . 000 100 mA 000 . 0	mA ≤i mA		
, minicol		Accuracy *4	10 mA □□□	□□□ μA .≤ i < 100 mA □ . □□ mA 5 % of rdng); i < 1	0 . 000 100 mA 000 . 0	mA ≤ i mA of rdng + 30 μA		
, minicol			10 mA ⊆ i: ±(1.5	□□□ μA .≤i < 100 mA]. □□ mA	0 . 000 100 mA 000 . 0 .00 mA: ±(1.5 %	mA ≤ i mA o of rdng + 30 μA		

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	
		50 mA < i ≤ 110 mA	Greater than or equal to the output time	30 min. max.	
t≤40 °C	AC	i ≤ 50 mA	Not necessary	Continuous output possible	
1240 0		5 mA < i ≤ 11 mA	Greater than or equal to the output time	1 min. max.	
	DC	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)

		TOS530	00	TOS5301		TOS	5302
Judgment feature	Judgment method and judgment operation	Judgment		Judgment method	Display	Buzzer	SIGNAL I/O
		UPPER FAIL	or equitected and a turned judgm voltage DC w an UF occur	urrent that is greater than ual to the upper limit is de- d, the output is turned off, n UPPER the output is d off, and an UPPER FAIL nent occurs. During the per ise time (Rise Time) of ithstanding voltage tests, PPER FAIL judgment also sif there is a problem he voltage rise ratio.	FAIL LEI lights OVER is displaye on the screen	ON	Gener- ates a U-FAIL signal
		LOWER FAIL	or equitected and a occur perfortime (and d (Fall	urrent that is less than ual to the lower limit is de- than the dependent is the dependent s. This judgment is not med during voltage rise Rise Time) of all tests uring the voltage fall time Time) of AC withstanding je tests.	FAIL LEI lights UN- DER is displaye on the screen	ON	Gener- ates a L-FAIL signal
		PASS	witho outpu	specified time elapses ut any problems, the t is turned off, and a s judgment occurs.	PASS LED lights	ON	Gener- ates a PASS signal
		• The UPF continuo • The FAII • For PAS for is fixe	y until PER F ously o L and S judged to 0	Dis enabled, the PASS of the TOS5300 Series re AlL and LOWER FAIL surtil the TOS5300 Series PASS buzzer volume legments, the length of tin 1.2 seconds. Even if PA ff after 0.2 seconds.	ceives a signals ar s receive evels can ne that th	STOP sig e genera s a STOF be chang e buzzer	gnal. ted signal. ged. sounds
	Upper limit setting	AC: 0.01 m 110 mA		AC: 0.01 mA to 110 DC: 0.01 mA to 11		AC: 0.0	
	Lower limit setting	AC: 0.01 m 110 mA / 0	OFF	AC: 0.01 mA to 110 m/ DC: 0.01 mA to 11 m/	A/OFF	AC: 0.01 110 mA	/OFF
	Judgment accuracy *4 Current detection method			.5 % of set), i < 1.00 mA urrent's true rms value with the reference v	and com		
	Calibration	Calibrated	with t	he rms of a sine wave u		re resisti	ive load
Time	Voltage rise time	Summated	.vicii ti	0.1 s to 10.0 s	onig a pu		
	Resolution			0.1 s			
	Voltage fall time	0.1 s / 0	OFF (d	only enabled when a PA	SS judgr	nent occ	urs)
	Test time			999 s, can be turned o			
	Resolution			s to 99.9 s: 0.1 s. 100 s			
	Accuracy		±(10	0 ppm + 20 ms) exclud	ing Fall T	ime	

*2. Regarding the test voltage waveform:

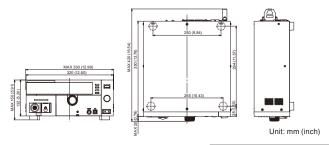
Waveform distortions may occur if an DUT whose capacitance is dependent on voltage (for example, an DUT that consists of ceramic capacitors) is connected as the load. However, if the test voltage is 1.5 kV, the effect of a capacitance of 1000 pF or less can be ignored. Because the product's high-voltage 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	3 kV	4 kV	5 kV
When using 350 mm long test leads that are suspended in air (TYP)	2 μΑ	4 μΑ	6 μΑ	8 μΑ	10 μΑ
When using the accessory, high test lead TL31-TOS (TYP)	16 µA	32 µA	48 µA	64 µA	80 μΑ

External Dimensional Diagrams



Insulation resistance test section

Output			Г				TOS530)2		
Output	Output vo	ltage	-	25 V, 50 V, 100 V, 125 V, 250 V, 500 V, 1000 VDC (negative)						
section		Accuracy	-	-0 %, +5 V						
	Max. rate		-	1 W (-1000 V DC / 1 mA) 1 mA						
	Max. rate Ripple	1000 V when no								
	Tappie	load is connected	2	Vp-p or le	SS					
		Max. rated load	+	Vp-p or l						
	Voltage regulation		+		_	n changing	from maxi	mum rated lo	ad to n	o load)
	Short-circuit current Discharge feature		-	2 mA or les		fttt		-1		05 1:0\
	Limit volta							charge resista 25 V, 50 V, 1		
	Lillil volte	age		00 V, 1000		ipper ilitilit c	an be set.	25 V, 50 V, 1	00 V, 12	.5 V, 250 V
	Output vo	Itage monitor	-			xceeds "10	% of set +	10 V" or is low	er than	"-(10 % of
	feature		-			it is turned o	off, and pro	tective feature	es are a	ctivated.
Voltme- ter	Analog	Scale	-	kV AC/DC	f.s					
ter		Accuracy	-	5 % f.s						
	Digital	Indication Measurement	Г			sponse/rms	s scale			
	Digital	range	0	V to -1200	V					
		Display	П	Measured	voltad	ie V < 10	0 V 100) V ≤ V < 1000	V 100	00 V ≤ V
				Displ				000 V	_	000 V
		Accuracy	_	(1 % of rdr						
Resis-	Measure-	Accuracy				5 MΩ / ±(2 9	% of rdna +	+ 2 digits)		
tance	ment	25 V				MΩ / ±5 %		L digito)		
meter	range /		-			0 MΩ / ±10				
	measure- ment	50 V				$M\Omega / \pm (2.9)$		+ 2 digits)		
	accuracy	50 V				$M\Omega / \pm 5 \%$ 0 $M\Omega / \pm 10$				
	*1 *2		-			00 MΩ / ±2				
		100 V	10	00 MΩ < R	≤ 50	0 MΩ / ±5 %	% of rdng			
						GΩ / ±10 %				
		125 V				25 MΩ / ±2 5 MΩ / ±5 %				
		.20 .				25 GΩ / ±10		l		
						250 MΩ / ±2		3		
		250 V		250 MΩ < R ≤ 1.25 GΩ / \pm 5 % of rdng 1.25 GΩ < R ≤ 2.5 GΩ / \pm 10 % of rdng						
			-	$0.50 \text{ M}\Omega \le R \le 500 \text{ M}\Omega / \pm 2\% \text{ of rdng}$						
		500 V		$500 \text{ M}\Omega < R \le 2.5 \text{ G}\Omega / \pm 5 \% \text{ of rdng}$						
			$2.5 \text{ G}\Omega < R \le 5 \text{ G}\Omega / \pm 10 \text{ % of rdng}$ $1 \text{ M}\Omega \le R < 1 \text{ G}\Omega / \pm 2 \text{ % of rdng}$							
		1000 V				/ ±2 % of r / ±5 % of r				
	Display *2									0.00 + D
	Display 2			25 kΩ ≤ R 1.00 MΩ		I.00 MΩ ≤ R < 10.0 MΩ	10.0 MΩ ≤ < 100 MΩ			0 GΩ ≤ R 9.99 GΩ
				000 kΩ	_		00.0M		_	. □□ GΩ
Hold feat	tura		Δ	fter a test i	ie fini	shad tha m	neacured r	esistance is i	etainer	Luntil the
riola ica	tuic					s cleared.	icasurca i	Colotalice io i	Ctanico	dilli lilo
Current of	detection re	esponse speed	С	an be swit	ched	between th	ree levels	: Fast, Mid, S	low	
Judg-		t method and	l	Judgment		Judgment	method	Display	Ruzzer	SIGNAL I/O
ment feature	Juagment	operation		ouuginone	lf a	resistance th		r	DULLO	0.011.12.110
							he upper lim	nit FAIL LED		Gener-
										Control
			1 1	UPPER		tected, the o		OVEDIC	ON	ates
				UPPER FAIL	off,	tected, the or and an UPPE	R FAIL judg	OVER is displayed	ON	a U-FAIL
					off, mer	tected, the or and an UPPE it occurs. Thi performed d	ER FAIL judg s judgment uring voltag	OVER is displayed on the	ON	
					off, mer not	tected, the or and an UPPE at occurs. Thi performed d rise time (Ris	ER FAIL judg s judgment uring voltag se Time).	OVER is displayed on the screen	ON	a U-FAIL
					off, mer not	tected, the or and an UPPE it occurs. Thi performed di rise time (Ris esistance tha	ER FAIL judg s judgment uring voltag se Time). at is less tha	OVER is displayed on the screen	ON	a U-FAIL signal
				FAIL	off, mer not	tected, the or and an UPPE at occurs. Thi performed d rise time (Ris	ER FAIL judg s judgment uring voltag se Time). at is less that ower limit is	OVER is displayed on the screen FAIL LED lights;	ON	a U-FAIL signal
					off, mer not If a r or dete du	tected, the or and an UPPE it occurs. Thi performed dourise time (Rise esistance the equal to the I cted or if a pring the volta	ER FAIL judg s judgment uring voltag se Time). at is less that ower limit is oblem occu ge rise time	OVER is displayed on the screen FAIL LED lights; UNDER is	ON	a U-FAIL signal Gener- ates
				FAIL	off, mer not If a r or dete du (F	tected, the or and an UPPE it occurs. Thi performed di rise time (Rise esistance the equal to the I cted or if a pring the volta Rise Time), the	ER FAIL judges in judgment uring voltages e Time). The set is less that ower limit is roblem occurage rise time in output is	OVER is displayed on the screen FAIL LED lights; UNDER is displayed on the		a U-FAIL signal
				FAIL	off, mer not If a r or dete du (F	tected, the or and an UPPE it occurs. Thi performed dourise time (Rise esistance the equal to the I cted or if a pring the volta	ER FAIL judges judgment uring voltages Time). at is less that ower limit is oblem occurage rise time to output is LOWER FA	OVER is displayed on the screen FAIL LED lights; UNDER is displayed on the		a U-FAIL signal Generates a L-FAIL
				FAIL	off, mer not If a I or dete du (F turn	tected, the or and an UPPE it occurs. Thi performed di rise time (Risesistance the equal to the I cted or if a pring the volta Rise Time), the ed off, and a judgment on the specified to	ER FAIL judges judgment uring voltages ETime). The second is less that ower limit is roblem occurge rise time output is LOWER FADCCURS.	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen s e		a U-FAIL signal Generates a L-FAIL
				FAIL	off, mer not If a I or dete du (F turn	tected, the or and an UPPE it occurs. Thi performed di rise time (Ris esistance the equal to the le cted or if a pring the volta Rise Time), the ded off, and a judgment one specified to out any proble	ER FAIL judgs sjudgment uring voltages Time). at is less the ower limit is oblem occur, ge rise time e output is LOWER FADCCURS. ime elapses lems, the output output is lems, the output i	OVER is displayed on the screen FAIL LED lights; UNDER is displayed on the screen State PASS		Generates a L-FAIL signal Generates a Generates
				LOWER	off, mer not If a I or dete du (F turn	tected, the or and an UPPE of occurs. Thi performed di rise time (Ri- esistance tha- equal to the lected or if a pri ring the volta kise Time), the ed off, and a judgment of the specified to out any proble is turned off,	ER FAIL judg s judgment uring voltag se Time). at is less that ower limit is oblem occu gor rise time le output is LOWER FA occurs. ime elapses lems, the ou and a PASS	OVER is displayed on the screen FAIL LED lights; UNDER is displayed on the screen State PASS	ON	Generates a L-FAIL signal Generates a L-FAIL signal Generates a PASS
				LOWER FAIL PASS	off, mer not or dete du (F turnor lift)	tected, the orand an UPPE to occur. This performed di rise time (Risesistance the equal to the located or if a pring the voltation of an appropriate to the located or if and an independent of the unit of the voltage of the unit of the	ER FAIL judgs sjudgment uring voltags er Time). at is less that ower limit is to blem occuge rise time to oblem occuge rise time to oblem occurs. Time elapses tems, the out and a PASS occurs.	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen st. PASS LED lights	ON	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal
				FAIL LOWER FAIL PASS If PASS Hi the TOS53	off, mer not or dete du (F turn)	tected, the orand an UPPE and an UPPE or to occurs. This performed dirise time (Ricesistance the equal to the lotted or if a pring the voltakes Time), the ded off, and a judgment of the up of the	R FAIL judgs judgment uring voltag se Time). se Time). at is less that so wer limit is oblem occuge rise time to output is eoutput is LOWER FADCURS. ime elapses ems, the output is and a PASSOCCURS.	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen S Hall LED lights; UNDER is displayed on the screen S LED lights anal is generating and is generating an	ON ON	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal
				FAIL LOWER FAIL PASS If PASS HI the TOSS3 The UPPE	off, mer not or dete du (F turn)	tected, the or and an UPPE of the cocurs. This performed dirise time (Rie essistance the equal to the lotted or if a pr ing the voltatise Time), the additional properties of the specified to out any proble is turned off, judgment or se enabled, the river services receives IL and LOW	R FAIL judgs judgment uuring voltag se Time). at is less that ower limit is obelem occurge rise time e output is LOWER FA occurrs. ime elapses ems, the ou and a PASS occurs. Le PASS sigs a STOP sig ER FAIL signer FAIL signer FAIL signer signer and signer fail to the passes of the passes are passes and signer fail to the passes are passes are passes are fail to the passes are passes are fail to the passes are passes	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen E. B. LED lights; UNDER is displayed on the screen S. LED lights graal is generate gnal.	ON ON	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal
				FAIL LOWER FAIL PASS If PASS HI the TOS53 The UPPE until the TC	off, mer not or dete du (Ff turn) If a i or dete du (Ff turn) If turn) If t with put on Se FA	tected, the orand an UPPE or to course, the course, this performed dirise time (Ricesistance the equal to the 1 cited or if a pring the voltatise Time), the doff, and a judgment or especified to output the course of the course	R FAIL judgs judgment urring voltages Time). at is less that ower limit is oblem occur ge rise time le output is LOWER FA occurs. the output is LOWER FA occurs. The less that a PASS occurs. The PASS sign a STOP sign is every a STOP sign is	OVER is displayed on the screen and state of the screen and screen an	ON ON ed contin	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal
				FAIL LOWER FAIL PASS If PASS HI the TOSS3 The UPPE until the TC The FAIL a For PASS ji	off, mer not or dete du (F turn) If a II or or dete du (F turn) If t with put 00 Se R FA 08531 and P rudgme	tected, the or and an UPPE or and a upper or and a	R FAIL jude, s judgment uring voltage se Time). at is less the ower limit is oblem occ. Upon the time the output is LOWER FA Docurs. imme elapses elems, the output of a PASC sign is a STOP sign ER FAIL si elives a STI volume level h of time tha	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen by the screen state of th	ON ON ed continerated coged.	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal nuously unticontinuously sis fixed to 0.2
				FAIL LOWER FAIL PASS If PASS Hither TOS53 The UPPE until the TC The FAIL a For PASS jiseconds. Ei	off, mer not of the not of the not of the du (Fit turn) of the not	tected, the or and an UPPE to occurs. This performed di rise time (Ric esistance the equal to the lotted or if a pr ing the voltatise Time), the ad off, and a judgment of especified to out any proble is turned off, judgment of se enabled, the river services receives IL and LOW 0.0 Series rec SS buzzer v mits, the lenging PASS HOLD in occurs.	R FAIL jude, s judgment uring voltage se Time). at is less the ower limit is oblem occ. Upon the time the output is LOWER FA Docurs. imme elapses elems, the output of a PASC sign is a STOP sign ER FAIL si elives a STI volume level h of time tha	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen at FAIL LED lights; UNDER is displayed on the screen at PASS LED lights until gnals are gen DP signal. Is can be chan	ON ON ed continerated coged.	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal nuously unticontinuously sis fixed to 0.2
		it setting range	0.	FAIL LOWER FAIL PASS If PASS H the TOS53 The UPPE until the TC The FAIL a For PASS ju seconds. E 03 MΩ to	off, mer not or dete du (F turn) If a i or dete du (F turn) OLD i 00 Se R FA 0853 and P ven if 5.00	tected, the orand an UPPE to occurs this performed dissesting (Ricesistance the equal to the 1 cted or if a pring the voltation of voltation of the voltation of the voltation of the voltation of voltation of the voltation of the voltation of the voltation of voltation of the voltation of the voltation of the voltation of voltation of the voltation of the voltation of the voltation of voltation of the voltation of the voltation of the voltation of voltation of the voltation of the voltation of the voltation of voltation of the voltation of voltation	R FAIL jude, s judgment uring voltage se Time). at is less the ower limit is oblem occ. Upon the time the output is LOWER FA Docurs. imme elapses elems, the output of a PASC sign is a STOP sign ER FAIL si elives a STI volume level h of time tha	OVER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen an FAIL LED lights; UNDER is displayed on the screen by the screen state of th	ON ON ed continerated coged.	a U-FAIL signal Generates a L-FAIL signal Generates a PASS signal nuously unticontinuously sis fixed to 0.2
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pressing START within 0.5 seconds of releasing the STOP switch.			TOS5300	TOS5301	TOS5302			
Momentary feature	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.					
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. 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. We lock Locks panel key operations (settings and changes). 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 Power Supply Protection An interlock signal has been detected. Power Supply Protection Volt Error Protection Volt Error Protection Volt Error Protection Unring a withstanding voltage, a voltage outside of the rated limits was detected. A or DC withstanding voltage tests: ±350 V. Insulation resistance test: ±(10 % of set + 10 V). Over Load Protection Over Heat Protection Over Rating Protection Over Rating Protection Over Rating 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 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 internal temperature of the TOS5300 Series became too high. Calibration Protection The specified calibration period has elapsed. Remote Protection The rear-panel SIGNAL I/O connector's ENABLE signal has changed the use of the protection of the connector was detected. Signal I/O Protection The USB connector has been disconnected while the TOS5300 Series was being controlled through the USB interface. System clock Set when the TOS5300 Series is calibrated. Calibration period setting Sets the operation that is performed when the specifi			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.					
Signals from clearing FAIL judgments and PROTECTION modes. Timer feature This feature finishes tests when the specified time elapses. 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 Power Supply Protection An interlock signal has been detected. Volt Error Protection Over Load Protection Over Load Protection Over Heat Protection Over Heat Protection The internal temperature of the TOS5300 Series became too high. Over Heat Protection Over Rating Protection Power Supply a withstanding voltage test: ±50 VA. Over Heat Protection Over Rating Protection Over Rating Protection Over Rating Protection Protection The internal temperature of the TOS5300 Series became too high. Over Heat Protection The specified calibration period has elapsed. A connection to or disconnection from the front-panel REMOTE connector was detected. SIGNAL I/O 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 period setting Notification of when the calibration period delapses. When the TOS5300 Series is calibrated. Sets the period before the next calibration is necessary. Notification of when the calibration period delapses. When the TOS5300 Series turns on, it can display a notification or switch to the protection mode and disable testing. USB Pront-panel 9-pin MINI DIN connector. By connecting	Moment	ary feature	Tests are only execute	d while the START swit	ch is held down.			
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). 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 Power Supply Protection An interlock signal has been detected. Power Supply 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: 55 VA. Over Heat Protection The internal temperature of the TOS5300 Series became too high. Over Rating Protection Over Rating 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 Series was being controlled through the USB interface. System clock Set in the following format: year/month/day hour/minutes/seconds. Set when the TOS5300 Series is calibration is necessary. Notification of when the calibration period elapses. When the TOS5300 Series turns on, it can display a notification or switch to the protection mode and disable testing. Interfaces 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.	Fail mod	de feature						
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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. When the TOS5300 Series turns on, it can display a notification or switch to the protection mode and disable testing. USB USB Specification 2.0 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.		USB Protection						
Calibration period setting Notification of when the calibration period elapses Interfaces REMOTE Calibration period setting Sets the period before the next calibration is necessary. 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. USB Specification 2.0 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.	System	clock	Set in the following for	mat: year/month/day h	our/minutes/seconds.			
Notification of when the calibration period elapses When the TOS5300 Series turns on, it can display a notification or switch to the protection mode and disable testing. 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.		Calibration date	Set when the TOS530	0 Series is calibrated.				
the calibration period elapses. When the TOS5300 Series turns on, it can display a notification or switch to the protection mode and disable testing. 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.		Calibration period setting	Sets the period before	the next calibration is r	necessary.			
faces 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.		the calibration period	period elapses. When	the TOS5300 Series tu	rns on, it can display			
device to this connector, you can control the starting and stopping of tests remotely.		USB	USB Specification 2.0					
SIGNAL I/O Rear-panel D-sub 25-pin connector	faces	REMOTE	Front-panel 9-pin MINI DIN connector. By connecting an optional device to this connector, you can control the starting and stopping					
		SIGNAL I/O	Rear-panel D-sub 25-	pin connector				

General

			TOS5300	TOS5301	TOS5302			
Display			VFD: 256 × 64 dots + 4	VFD: 256 × 64 dots + 4 status indicators				
Backup b	attery life		3 years (at 25 °C or 77	3 years (at 25 °C or 77 °F)				
Environ-	Installation location		Indoors, at a height of	up to 2000 m				
ment	Spec guar-	Temperature	5 °C to 35 °C (41 °F to	95 °F)				
	anteed range	Humidity	20 %rh to 80 %rh (no condensation)					
	Operating		0 °C to 40 °C (32 °F to	104 °F)				
	range	Humidity	20 %rh to 80 %rh (no condensation)					
	Storage	Temperature	-20 °C to 70 °C (-4 °F to 158 °F)					
	range	Humidity	90 %rh or less (no con	densation)				
Power supply	Nominal volt (allowable vo	tage range oltage range)	100 VAC to 240 VAC (90 VAC to 250 VAC)					
	Power consump- tio	When no load is connected (READY)	100 VA or less					
		When rated load iscon- nected	800 VA max.					
	Allowable frequency range		47 Hz to 63 Hz					
	n resistance (30 MΩ or more (500 VDC)					
	ding voltage and the chas		1390 VAC, 2 seconds, 20 mA or less					
Earth cor	ntinuity		25 AAC, 0.1 Ω or less					
Safety *3	3		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) *3 *4			tromagnetic compatibility Complies with the requirements of the following directive and sta					

- *1. Humidity: 20 %rh to 70 %rh (no condensation). No bends in the test leads.
 *2. R = measured insulation resistance
 *3. Does not apply to specially ordered or modified TOS5300 Series testers.
 *4. Limited to products that have the CE mark/UKCA mark on their panels.

Hipot Tester

DS5200





RS232C (C UK





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

 $320(12.60^{\circ})W \times 132(5.20^{\circ})H \times 350(13.78^{\circ})Dmm / 14 kg(30.9 lbs)$

Accessories

Power cord, High-voltage test lead [TL31-TOS], High-voltage warning sticker, SIGNAL I/O plug (D-sub plug unit), CD-ROM, Setup guide, Quick reference(Japanese/English), Safety information

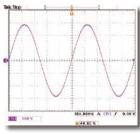
Features

- 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

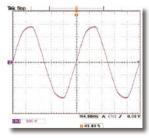
Features and Functions

■ 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 highvoltage 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!



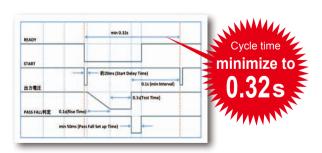




▲ AC output waveform of the slide

■ Capable of test time setting from 0.1s, which enables to reduce the tact time!

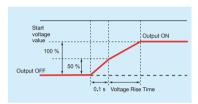
The TOS5200 can set the test time from 0.1 sec without sacrificing measurement accuracy. This makes test time 5 times faster compared to the TOS5050A (max test time:0.5sec) and it leads to reduce the tact time. Reduction of the tact time leads to improve the productivity, so it has been an issue that reducing the tact time may cause to worsen the measurement accuracy when the test time is faster than measurement respond speed.



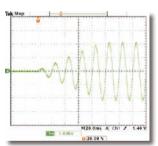
Features and Functions

■ Rise time / Fall time control function

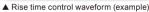
The rise time control function is to prevent the excessive stress that is being applied to the EUT (equipment under test). The Hipot (Withstanding voltage) test is conducted to verify the safety performance of the EUT and which test voltage for Hipot (Withstanding voltage) test is applied approximately 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).

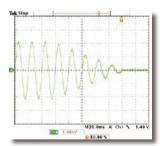


▲ Start voltage can be set at 50 % of the test voltage



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.





▲ Fall 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).

- 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 from 0.01 mA to 110 mA. (TOS5050A: 0.1 mA to 110 mA)
 - •Enables to clarify the actual value of device under test (DUT)
 - •The 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	range	0.05	kV to 5.00 kV	
Output		Accuracy	± (2 °	% of set + 20 V) when no loa	ad is connected
section		Operating range	0.00	kV to 5.50 kV	
		Resolution	10 V	steps	
	Max. ra	ated output *1	500	VA (5 kV/100 mA)	
	Max. ra	ated voltage	5 kV		
	Max. ra	ated current	100 ı	mA (when the output voltage	e is 0.5 kV or greater)
	Transfo	ormer rating	500	VA	
	Output voltage waveform *2		Sine		
		Distortion		output voltage is 0.5 kV or n no load or a pure resistive	
	Crest f	actor		3 % less than n the output voltage is 800	V or greater, no load)
	Freque	ency	_	z or 60 Hz	,
		Accuracy	± 0.5	% (excluding during voltage	e rise time)
	Voltage	e regulation	_	or less	•
			(whe	n changing from maximum	rated load to no load)
	Input v			% (5 kV when no load is co to 250 V)	nnected; power supply voltage:
	Short-d	circuit current	200 ו	mA or more (when the outpu	ut voltage is 1.0 kV or greater)
	Output method		PWM switching		
Start volta	ge		The voltage at the start of withstanding voltage tests can be set to 50 % of the test voltage.		
Limit volta	ge		The	est voltage upper limit can	be set . AC: 0.00 kV to 5.50 kV
Output vol	tage mo	onitor feature	than		ecified value + 350 V or is lower output is turned off, and protec-
Voltmeter	Digital	Measurement range	0.00	0 kV to 6.500 kV AC	
		Display	0.0	l□□ kV	
		Accuracy	V < 5	600 V: ± (1.5 % of reading +	20 V),
			V ≥ 5	00 V: ±1.5 % of reading	
		Response *3	_	rms, Average value respon	
		Hold feature		a test is finished, the meas S or FAIL judgment is cleare	ured voltage is retained until the ed.
Ammeter	Digital	Measurement range	0.00	mA to 110 mA	
		Display	i = m	easured current	
				i < 1 mA	1 mA ≤ i < 10 mA
					□.□□□ mA
				10 mA ≤ i < 100 mA	100 mA ≤ i
				□□.□□ mA	□□□ .□ mA
		A	1.00		
		Accuracy *4		$mA \le i$: ± (1.5 % of reading), 00 mA : ± (1.5 % of reading	
		Response *3		rms, Average value respon	
		Hold feature	_		ured current value is retained
				the PASS judgment is clear	

Judg-	Judgment metho	d					
ment feature	and judgment operation		Judg- ment	Judgment method	Display	Buzz- er	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	Gener- ates 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	Gener- ates 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	Gener- ates a PASS signal
			continu signal. • The UF continu signal. • The FA • For PA sounds	S HOLD is enabled, the PA lously until the TOS5300 S PPER FAIL and LOWER F, lously until the TOS5300 S ILL and PASS buzzer volur SS judgments, the length for is fixed to 0.2 second d, the buzzer turns off afte	Series rece AIL signals Series rece me levels ca of time that ls. Even if F	are ge ives a s an be c the bu PASS H	nerated STOP changed. zzer
	Upper limit settir	a 0.0	01 mA to	110 mA			
	Lower limit settir		01 mA to	110 mA / OFF			
	Judgment accura		00 mA ≤	i: ± (1.5 % of set), i < 1.00	mA: ± (1.5	% of se	et + 30 µA)
	Current detectio method	n Ca	alculates	the current's true rms val			
	Calibration	Ca	alibrated	with the rms of a sine way	e using a p	ure res	sistive load
Time	Voltage rise time		1 s to 10.	.0 s			
	Resolution	n 0.1	1 s				
	Voltage fall time	0.1	1s/OFF	(only enabled when a PA	SS judgme	nt occi	ırs)
	Test Time			9 s, can be turned off (TIM			
	Resolution			.9 s: 0.1 s/100 s to 999 s: 1			
	Accuracy	± ((100 ppm	n + 20 ms) excluding Fall T	ime		

*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

*2. Regarding the test voltage waveform:

(Output time = voltage rise time + test time + voltage fall time)

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 distort-

*3. For both True rms and Mean-value response, 50 ms or above response time is required to satisfy the measurement accuracy.

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 capacitance pacitances 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 μΑ	4 μΑ	10 μΑ
When using the accessory,	16 μΑ	32 μΑ	80 μΑ

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		
Dou	ible 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.
	gth of time to maintain ASS 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.
Mor	mentary 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.
Tim	er feature	This feature finishes tests when the specified time elapses.
Out feat	put voltage monitor ure	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.
Mer	mory	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.
Inte	rlock Protection	An interlock signal has been detected.
Pow	ver 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
Ove	er 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.
Ove	er Heat Protection	The internal temperature of the TOS5200 became too high.
Ove	er Rating Protection	During a withstanding voltage test, the output current was generated for a length of time that exceeds the regulated time.
Ren	note Protection	A connection to or disconnection from the front-panel REMOTE connector was detected.
SIG	NAL I/O Protection	The rear-panel SIGNAL I/O connector's ENABLE signal has changed.
USE	3 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. &}quot;Talk mode" can be set, when RS232C is used as comunication interface.

Talk mode	Description		
0	It responds o	nly for command	ds from PC. (Default setting)
	It responds a measured va		start and end test, and returns the status, setting value,
	Response at	start	<start></start>
1		Status	<pass>, <u_fail>, <l_fail>, <prot>, <about></about></prot></l_fail></u_fail></pass>
	Response at end of test	Setting value, Measured value	Test No., Programme No., Test mode, Measured voltage, Measured current, Test time

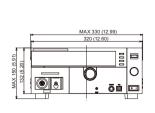
General

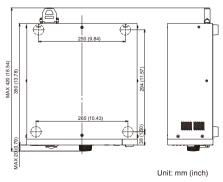
Display			LCD: LED backlight
Envi-	Installation	location	Indoors, at a height of up to 2000 m
ron-		inteed range	5 °C to 35 °C (41 °F to 95 °F)/
ment	temperatur		20 %rh to 80 %rh (no condensation)
	Operating r		0 °C to 40 °C (32 °F to 104 °F)/
	temperatur		20 %rh to 80 %rh (no condensation)
	Storage rar	nge	-20 °C to 70 °C (-4 °F to 158 °F)/
	temperatur	e/humidity	90 %rh or less (no condensation)
Power supply		ltage range voltage range)	100 Vac to 240 Vac (90 Vac to 250 Vac)
	Power consump-	When no load is connected (READY)	100 VA or less
	tio	When rated load isconnected	800 VA max.
	Allowable f	requency range	47 Hz to 63 Hz
	on resistance en AC LINE a	e and the chassis)	$30~\text{M}\Omega$ or more (500 Vdc)
	nding voltag en AC LINE a	e and the chassis)	1500 Vac, one minute
Earth co	ontinuity		25 Aac, 0.1 Ω or less
Electron	magnetic cor	mpatibility (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)
Dimens	ions (mm(ind	ches))(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)
Access	ories		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. Limited to products that have the CE mark/UKCA mark on their panels. 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





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

OS6210













Dimensions / Weight

 $430(16.93^{\circ})W \times 88(3.47^{\circ})H \times 270(10.63^{\circ})Dmm / 11 kg(24.25 lbs)$

Accessories

AC power cord, Test leadwire [TL12-TOS], Short bar (2 pcs., these are inserted between the OUTPUT and SAMPLING terminals.), AC power fuse (2 pcs., including one spare in the fuse holder), Operation manual

Supports UL standards 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 UL 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 RS232C 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

OS6200A













Dimensions / Weight

 $430(16.93")W \times 88(3.47")H \times 270(10.63")Dmm / 9 kg(19.84 lbs)$

Accessories

AC power cord, Test leadwire [TL11-TOS], Short bar (2 pcs., these are inserted between the OUTPUT and SAMPLING terminals.), AC power fuse (2 pcs., 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 RS232C 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)
- Capable to judge by the resistance value and the voltage drop

TOS6210 Specifications

Outrot LL		
Output block		
Current setting	ng 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)
Resolutio		0.1 A
Accuracy Maximum rat		± (1 % of setting + 0.4 A) 220 VA (at the output terminals)
Distortion fac		2 % or less (with respect to 0.1 Ω pure resistance load of 20 A or greater)
Frequency	7.01	50/60 Hz, sine wave (selectable)
Accuracy	,	±200 ppm
Open termina		6 Vrms or less
Output metho		PWM switching method
Output amme	eter	
Measuremen	it 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 func		The current measured at the end of test is held during the PASS or FAIL inteval
Output voltm		
Measuremen	it range	0.00 Vac to 6.00 Vac 0.01 V
Resolution Offset cance	I function	0.00 to 5.40 V (Offset ON/OFF function provided)
Accuracy	Tunction	± (1 % of reading + 0.02 V)
Response		Mean value response/rms value display (response time: 200 ms)
Holding func	tion	The voltage measured at the end of test is held during the PASS or FAIL inteval
Ohmmeter *2	2	The reliage measured at the end of test to hold during the rives of the model
Measuremen	it range	0.001 to 0.600 Ω
Resolution		0.001 Ω
Offset cance	I function	0.000 to 0.600 Ω (Offset ON/OFF function provided)
Accuracy		\pm (2 % of reading + 0.003 Ω)
Holding func	tion	The resistance measured at the end of test is held during the PASS or
		FAIL interval
	gement functior	
Resistance v judgement	alue-based	Window comparator system • If a resistance value equal to or greater than the upper reference value is
juugement		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
Cotting ror	ago for the upper	output and generates a PASS signal.
	nge for the upper value (UPPER)	0.001 to 0.600 Ω
	nge for the lower	
	value (LOWER)	0.001 to 0.600 Ω
Resolutio		0.001 Ω
Judgeme	nt accuracy	± (2 % of UPPER + 0.003 Ω)
Sampled volt	age	Window comparator system
value-based	judgement	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.
	ige for the upper	0.04 to 5.40 V
		10.01 t0 5.40 V
reference v		0.01 to 5.40 V
Setting ran	nge for the lower	
Setting rar reference	nge for the lower value (LOWER)	0.01 to 5.40 V
Setting ran reference Resolution	nge for the lower value (LOWER) on	0.01 to 5.40 V 0.01 V
Setting ran reference Resolution Judgeme	nge for the lower value (LOWER)	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V)
Setting ran reference Resolution	nge for the lower value (LOWER) on	0.01 to 5.40 V 0.01 V
Setting ran reference Resolution Judgeme	nge for the lower value (LOWER) on	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure
Setting rai reference Resolution Judgeme	nge for the lower value (LOWER) on ent accuracy	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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.
Setting rai reference Resolution Judgeme	nge for the lower value (LOWER) on ent accuracy	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper ref-
Setting rai reference Resolution Judgeme	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL.
Setting rai reference Resolution Judgeme	nge for the lower value (LOWER) on ent accuracy	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper ref-
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V 2.00 of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL.
Setting rai reference Resolution Judgeme	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. • The buzzer sounds for the pass holding time has been set if the mea-
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *The buzzer sounds for the pass holding time has been set if the measured value has been judged as PASS.
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. • The buzzer sounds for the pass holding time has been set if the mea-
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. - 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.
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V 1.01 V 2.02 of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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.
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. • 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.
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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.
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V 1.01 V 1.02 V 1.03 V 1.04 V 1.05 V
Setting rai reference Resolutio Judgeme Calibration	nge for the lower value (LOWER) on ent accuracy PASS UPPER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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.
Setting rai reference Resolutic Judgeme Calibration LED Buzzer	page for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL	0.01 to 5.40 V 0.01 V 1.01 V 1.02 V 1.03 V 1.04 V 1.05 V
Setting rai reference Resolutio Judgeme Calibration	page for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. • The buzzer sounds for the pass holding time has been set if the measured value has been judged as PASS. • 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 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.
Setting rai reference Resolutic Judgeme Calibration LED Buzzer Time Test time Environment	pge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL Setting range Accuracy	0.01 to 5.40 V 0.01 V 2.00 of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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. Setting range 0.3 to 999 s Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms)
Setting rai reference Resolutio Judgeme Calibration LED Buzzer Time Test time Environment Operating en	pge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL Setting range Accuracy	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. • The buzzer sounds for the pass holding time has been set if the measured value has been judged as PASS. • 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 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. Setting range 0.3 to 999 s. Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms)
Setting rai reference Resolutic Judgeme Calibration LED Buzzer Time Test time Environment Operating en Warranty	pge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL Setting range Accuracy Vironment Temperature	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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. Setting range 0.3 to 999 s Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms) Indoor use, Overvoltage Category II 5 °C to 35 °C
Setting rai reference Resolutic Judgeme Calibration LED Buzzer Time Test time Environment Operating en Warranty range	ge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL Setting range Accuracy vironment Temperature Humidity	0.01 to 5.40 V 0.01 V 0.01 V Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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. Setting range 0.3 to 999 s Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms) Indoor use, Overvoltage Category II **S °C to 35 °C 20 %rh to 80 %rh (non condensing)
Setting rai reference Resolutic Judgeme Calibration LED Buzzer Time Test time Environment Operating en Warranty range Operating	setting range Accuracy Setting range Accuracy Setting range Accuracy Vironment Temperature Humidity Temperature	0.01 to 5.40 V 0.01 V 1.01 V 1.02 of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. 1.1 The buzzer sounds for the pass holding time has been set if the measured value has been judged as PASS. 1.1 The buzzer sounds continuously under the following condition: 1.2 The measured value has been judged as PASS when the PASS holding time is set to HOLD. 1.3 The measured value has been judged as UPPER FAIL. 1.4 The measured value has been judged as LOWER FAIL. 1.5 The buzzer volume for FAIL or PASS judgment are adjustable. 1.6 Note that it cannot be adjusted individually since setting is shared with the setting for PASS. Setting range 0.3 to 999 s. Timer ON/OFF function is available. 1.1 (100 ppm of setting + 20 ms) Indoor use, Overvoltage Category II 1.5 °C to 35 °C 20 %rh to 80 %rh (non condensing) 0 °C to 40 °C
Setting rai reference Resolution Judgeme Calibration LED Buzzer Time Test time Environment Operating en Warranty range Operating range	pge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL LOWER FAIL Temperature Humidity Temperature Humidity Humidity Humidity Humidity	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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 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. Setting range 0.3 to 999 s Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms) Indoor use, Overvoltage Category II 5 °C to 35 °C 20 %rh to 80 %rh (non condensing) 0 °C to 40 °C 20 %rh to 80 %rh (non condensing)
Setting rai reference Resolutic Judgeme Calibration LED Buzzer Time Test time Environment Operating en Warranty range Operating stopped Storage	pge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL LOWER FAIL LOWER FAIL Temperature Humidity Temperature Temperature Humidity Temperature	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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. Setting range 0.3 to 999 s Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms) Indoor use, Overvoltage Category II 5 °C to 35 °C 20 %rh to 80 %rh (non condensing) 0 °C to 40 °C 20 %rh to 80 %rh (non condensing) -20 °C to 70 °C
Setting rai reference Resolution Judgeme Calibration LED Buzzer Time Test time Environment Operating en Warranty range Operating range	pge for the lower value (LOWER) on the accuracy PASS UPPER FAIL LOWER FAIL LOWER FAIL Temperature Humidity Temperature Humidity Humidity Humidity Humidity	0.01 to 5.40 V 0.01 V ± (2 % of UPPER + 0.05 V) Calibration is performed with the rms value of the sine wave, using a pure resistance load. 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. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. Lights if a resistance or voltage value equal to or greater than the upper reference value is detected and judged FAIL. *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 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. Setting range 0.3 to 999 s Timer ON/OFF function is available. ± (100 ppm of setting + 20 ms) Indoor use, Overvoltage Category II 5 °C to 35 °C 20 %rh to 80 %rh (non condensing) 0 °C to 40 °C 20 %rh to 80 %rh (non condensing)

Power requir	ement	
Allowable voltage range		85 Vac to 250 Vac
Power consump-	At no load (READY)	60 VA or less
tion	At rated load	420 VA max.
Allowable fre	quency range	47 Hz to 63 Hz
Insulation res	sistance	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.
Electromagn	etic compatibili	ty (EMC) *5 *6
	0 .	

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.

Conforms to the requirements of the following directive and standard.
Low Voltage Directive 2014/35/EU, EN61010-1 (Class I, Pollution degree 2)

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.

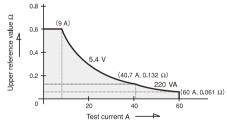
		Output time limitation	
Ambient temperature t (°C)	Test current I (A)	Pause time	Maximum allowable continuous test time
	40 < l ≤ 60	Equal to or greater than the test time	≤ 10 minutes
t ≤ 40°C	20 < l ≤ 40	Equal to or greater than the test time	≤ 30 minutes
	I ≤ 20	Not required	Continuous output possible

*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

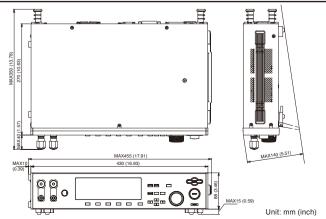
- *3. Resistance value-based and sampled voltage value-based judgments cannot be simultaneously conducted.
- *4. Limited by the maximum rated output and the output terminal voltage. The tester can be used within the range shown below.

Allowable range in which to determine the test current value and upper reference value



- *5. Not applicable to custom order models
- *6. Limited to products that have the CE mark/UKCA mark on their panels.

External Dimensional Diagrams



TOS6200A Specifications

Current H'	a rongo *4	2.0.4 a a to 20.0.4 a a
Current setting	g 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 rate	ed output	150 VA (at the output terminals)
Distortion fact	or	2 % or less(with respect to 0.1 Ω pure resistance load of 10 R or greater)
Frequency		50/60 Hz, sine wave (selectable)
	Accuracy	± 200 ppm
Open terminal	l voltage	6 Vrms or less
Output metho	d	PWM switching method
Output ammet	ter	
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 functi	on	The current measured at the end of test is held during the PASS or FAIL inteval
Output voltme	ter	I AGG OF FAIL HILEVAL
		0.00 Vac to 6.00 Vac
Measurement Resolution	range	0.00 Vac to 6.00 Vac

Accuracy		± (1 % of reading + 0.02 V)
Response		Mean value response/rms value display (response time: 200 ms)
Holding functi	on	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	$0.000~\Omega$ to $1.200~\Omega$ (Offset ON/OFF function provided)
A		± (2 % of reading + 0.003 Ω)
Accuracy		(11 1 11 3 1 1 1 1 1
	on	The resistance measured at the end of test is held during the PASS interval
Holding functi	ement function	The resistance measured at the end of test is held during the PASS interval
Holding functi Pass/fail judge Resistance va		The resistance measured at the end of test is held during the PASS interval Window comparator system • If a resistance value equal to or greater than the upper refe ence 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.
Holding functi Pass/fail judge Resistance vament	ement function ilue-based judge-	The resistance measured at the end of test is held during the PASS interval 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.
Holding functi Pass/fail judge Resistance vament Setting range ence value (U Setting range	ement function ilue-based judge- for the upper refer- PPER) for the lower refer-	The resistance measured at the end of test is held during the PASS interval Window comparator system • If a resistance value equal to or greater than the upper refe ence 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 shu off the output and generates a PASS signal.
Holding functi Pass/fail judge Resistance vament Setting range ence value (U Setting range ence value (L0	ement function ilue-based judge- for the upper refer- PPER) for the lower refer-	The resistance measured at the end of test is held during the PASS interval
Resistance va ment Setting range ence value (U	ement function ilue-based judge- for the upper refer- PPER) for the lower refer- DWER)	The resistance measured at the end of test is held during the PASS interval
Holding functi Pass/fall judge Resistance vament Setting range ence value (U Setting range ence value (LU Resolution Judgement ac	ement function ilue-based judge- for the upper refer- PPER) for the lower refer- DWER)	The resistance measured at the end of test is held during the PASS interval 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 shut off the output and generates a PASS signal. 0.001 Ω to 1.200 Ω 0.001 Ω to 1.200 Ω 0.001 Ω to 1.200 Ω 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.
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Pass/fail judge Resistance vament Setting range ence value (U Setting range ence value (LC Resolution Judgement ac Sampled volta judg- ment Setting range ence value (U Setting range	for the upper refer- DWER) for the upper refer- DWER) for the lower refer- DWER) for the upper refer- DWER) for the upper refer- DWER)	The resistance measured at the end of test is held during the PASS interval 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 shut off the output and generates a PASS signal. 0.001 Ω to 1.200 Ω 0.001 Ω to 1.200 Ω 0.001 Ω to 1.200 Ω 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 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 shut off the output and generates a PASS signal. 0.01 V to 5.40 V 0.01 V to 5.40 V 0.01 V
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Holding functi Pass/fall judg Resistance vament Setting range ence value (L' Resolution Judgement ac Sampled volta judg- ment Setting range ence value (L' Resolution Judgement ac Calibration Judgement ac Calibration	for the upper refer- per value-based for the upper refer- per value-based for the lower refer- per value-based for the upper refer- per value-based for the upper refer- per value-based for the upper refer- per value-based for the lower refer- per value-based	The resistance measured at the end of test is held during the PASS interval 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 shut off the output and generates a PASS signal. 0.001 Ω to 1.200 Ω 0.001 Ω to 1.200 Ω 0.001 Ω to 1.200 Ω 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 apual to or less than the lower reference value is detected, a FAIL determination is returned. • If a voltage value apual to or less than the lower reference value is detected, a FAIL determination is returned. • If a voltage value apual to or less than the lower reference value is detected, a FAIL determination is returned. • If a voltage value apases without abnormalities, the tester shut off the output and generates a FAIL signal. • If the set time elapses without abnormalities, the tester shut off the output and generates a PASS signal. 0.01 V to 5.40 V 0.01 V to 5.40 V 0.01 V to 5.40 V Calibration is performed with the rms value of the sine wave, using a pure resistance load. Lights for approximately 0.2 sec when the measured value has been judged as PASS. It is lit continuously when the PASS.

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 env	ironment	Indoor use, Overvoltage Category II	
Warranty rang	je	Temperature: 5 °C to 35 °C Humidity: 20 %rh to 80 %rh (non condensing)	
Operating ran	ge	Temperature: 0 °C to 40 °C Humidity: 20 %rh to 80 %rh (non condensing)	
Storage range	е	Temperature: -20 °C to 70 °C Humidity: 90 %rh or less (non condensing)	
Altitude		Up to 2000 m	
Power require			
Allowable volt	age range	85 Vac to 250 Vac	
Power	At no load (READY)	60 VA or less	
consumption	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			
		e following directive and standard. EN61010-1, Class I, Pollution degree 2	

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.

430(16.93")(455(17.91"))W × 88(3.46")(140(5.51"))H × 270(10.63")(345(13.58"))D	
Approx. 9 kg (19.84 lbs)	
1 piece	
1 set	
2 pieces (These are inserted between the OUTPUT and SAM-PLING terminals.)	
2 pieces (2, including one spare in the fuse holder)	
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.

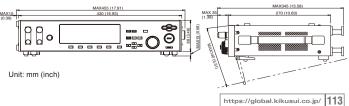
	Output time limitation				
	Ambient temperature t (°C)	Test current I (A)	Pause time	Maximum allowable continuous test time	
	t ≤ 40°	15 < I ≤ 30	Equal to or greater than the test time	≤ 30 minutes	
		I ≤ 15	Not required	Continuous output possible	

*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 voltme-

- *3. Not applicable to custom order models.
 *4. Limited to products that have the CE mark/UKCA mark on their panels.

External Dimensional Diagrams



Options for Electrical Safety Testers

■ Test Lead

TL01-TOS [cable length: 1.5 m/max. operating voltage: 5 kV]



TL12-TOS [cable length: 1.5 m/max. operating current: 60 A (for TOS6210)]



TL34-TOS [cable length: 1.5 m/max. operating voltage: 10 kV (for TOS9311)]



TL02-TOS [cable length: 3 m/max.



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]

[cable length: 1.5 m/max.

operating voltage: 5 kV]

TL04-TOS



TL06-TOS [cable length: 0.5 m/max. operating voltage: 5 kV



TL31-TOS [cable length: 1.5 m/max. operating voltage: 5 kV]



operating voltage: 5 kV]

[cable length: 1.5 m/max.

TL07-TOS

TL32-TOS [cable length: 3 m/max. operating voltage: 5 kV]



TL33-TOS [cable length: 0.5 m/max. operating voltage: 5 kV]

TL11-TOS

[cable length: 1.5 m/max.

operating current: 30 A]





■ DIN Cable DD-3 5P

[Cable length: 3 m/ DIN plug to DIN plug]



DD-5P/6P [Adaptor/DIN to Mini DIN]



■ Terminal Unit TU01-TOS TOS5300/TOS5200 series signal I/O converter unit

(25 pin to 14 pin)



A terminal unit that converts the 25-pin SIGNAL I/O connector of the TOS5300/5301/5302/5200 to the 14-pin SIGNAL I/O connector of the TOS5050A/5051A.

■ Remote Control Box

RC01-TOS * [one-hand operation/ dimensions: 200(7.87")W \times 70(2.76")H \times 39(1.54")D mm/cable length: 1.5 m]



* The optional adaptor DD-5P/9P is required for the connection with TOS5300, TOS5200 series and TOS9300 series...

■ Warning Light Unit RC02-TOS * [both-hands operation/

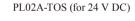
dimensions: 330(12.99")W \times 70(2.76")H \times 39(1.54")D mm/cable length: 1.5 m]



PL01-TOS (for 100 V AC) *This can not be used with

TOS5300 series, TOS5200, and TOS9300 series







EIA Standard Rack (Inch Size) Mounting Options

Product name	Bracket		
Product name	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	
TOS9311	KRB4	4	
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, casters, and levelers

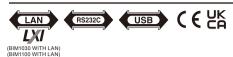
JIS Standard Rack (Millimeter Size) Mounting Options

Product name	Bracket	
Product name	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
TOS9311	KRB200	4
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 levelers.

Battery Impedance Meter

BIM1000 Series







Lineup

BIM1030 BIM1030 WITH LAN BIM1100 BIM1100 WITH LAN

Dimensions / Weight

 $214(8.43")W \times 80(3.15")H \times 300(11.81")Dmm(inch) / 3 kg(6.61 lbs)$

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

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.

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: $3 \text{ m}\Omega/30 \text{ m}\Omega/300 \text{ m}\Omega/3 \Omega$
- High resolution: Voltage 10 µV(6 V range), Resistance 0.1 $\mu\Omega(3 \text{ m}\Omega \text{ range})$
- 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 equipment Models with LAN* are also available

*Model with LAN Interface: BIM1030 WITH LAN and BIM1100 WITH LAN

Specifications

Voltmeter		BIM1030	BIM1100
Rated input		±300 V	±1000 V
Range		6 V, 60 V, 300 V,	6 V, 60 V, 600 V,
		AUTO	1000 V, AUTO
Maximum	6 V range	±6.30000 V	±6.30000 V
display value *1	60 V range	±63.0000 V	±63.0000 V
value	300 V range	±315.000 V	-
	600 V range	-	±630.000 V
	1000 V range	-	±1050.00 V
Resolution		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 *			ading + 3 digit)
Temperatu	re coefficient	±(0.001 % of read	ing + 0.3 digit) /°C
Resistance meter		BIM1030	BIM1100
Measurem	ent method	Four-terminal measurement method	
Range		3 mΩ, 30 mΩ, 300 mΩ, 3 Ω, AUTO	
Maximum	3 mΩ range	3.1000 mΩ	
display value *1	30 mΩ range	31.000 mΩ	
value	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 m Ω range	10 μΩ	
	3 Ω range	100 μΩ	
Measured			mA
current *3	30 mΩ range		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)	
Tempera-	3 mΩ range		ling + 1 digit) /°C
ture coef-	30 mΩ range	±(0.05 % of reading + 0.5 digit) /°C	
ficient	300 mΩ range		
	3 Ω range	±(0.05 % of reading + 0.5 digit) /°C	

Sampin	ig tillie	DIMITOSO	DIMITIOU	
Sam- pling	Power supply frequency 50 Hz	FAST: 20 ms, MID: 5	0 ms, SLOW: 160 ms	
speed	Power supply frequency 60 Hz	FAST: 20 ms, MID: 4:	2 ms, SLOW: 150 ms	
Judgme	nt function	BIM1030	BIM1100	
Judgme	nt method	Window compa		
Resis-	Setting range	0.0000 Ω t	ο 3.1000 Ω	
tance	Resolution		μΩ	
Voltage	Setting range			
	Resolution	1 mV	10 mV	
Other fu	inctions	BIM1030	BIM1100	
Trigger	Function	Select external trigger internal trigger	ger (EXTERNAL) or r (INTERNAL).	
IN	ITERNAL	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		
Tr	igger delay	0 to 9.999 s, OFF		
	Accuracy	±0.2	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.		
A	djustment rang	1000	digit	
Interfac	e	BIM1030	BIM1100	
RS2320	;	D-SUB 9-pin connecto		
USB			Complies with USB Specification 2.0. 12 Mbps max. (Full Speed)	
LAN *5		IEEE 802.3, 100Base-Tx/10Base-T Ethernet, IPv4, RJ45, Auto-negotiation supported but Auto MDI/MDI-X not supported.		
SIGNAL	1/0	D-SUB 25-p		

General	specifications	BIM1030	BIM1100
Envi- ron-	Installation location	Indoors, 20	00 m or less
ment	Spec guaran- teed range		28 °C (-4 °F to 158 °F) %rh (no condensation)
	Operating range		10 °C (32 °F to +122 °F) Wrh (no condensation)
	Storage range		60 °C (-4 °F to 158 °F) ess (no condensation)
Power supply	Input voltage range	85 Vac to 264 Vac ((100 Vac to 240 Vac)
	Input frequency range	47 Hz t	o 63 Hz
	Rated power	30	VA
Isolation	voltage	±300 V max	±1000 V max
	resistance (be- LINE and chassis)	$30~\text{M}\Omega$ or more (500 Vdc)	
With- standing voltage	Between the AC LINE and the chassis	1500 Vac for 1 mir	nute, 10 mA or less
	Between all the mea- surement terminals and the chassis	2000 Vdc for 1 mi	inute, 1 mA or less
	Between all the mea- surement terminals and SIGNAL I/O	2000 Vdc for 1 mi	inute, 1 mA or less
Electromagnetic compatibility (EMC)		directive and standards.	irements of the following EMC Directive 2014/30/A), EN 55011 (Class A, EN 61000-3-3
Safety		directive and standards	irements of the following s. Low Voltage Directive -1 (Class I, Pollution De- 2-030. EN 61010-031

- *1. Displays OVER when the measurement range is exceeded
- Add ±2 digit when the sampling speed is set to FAST or MID.
- Within error ± 10 %.
- Add ±3 digit when the sampling speed is set to FAST and ±2 digit when the sampling speed is set to MID.
 - BIM1030 WITH LAN or BIM1100 WITH LAN only

Digital Multimeter

DME1600





(€ EK





Lineup

DME1600

DME1600GC (with GPIB)

Dimensions / Weight

224(8.82")W \times 113(4.45")H \times 373(14.69")Dmm(inch) / 3.7 kg(8.16 lbs)

Accessories

Power cord(with 3P plug), Test lead (1 each for Red, Black), USB cable, Fuse (spare), CD-ROM (Contains the User's Manual and the Remote Interface Manual.), Safety precautions, Packing list

6 1/2 digit resolution, Essential device of "Electronic Measurement" Supporting basic measurement with variety of options

The DME1600 is a digital multi-meter with a resolution of 6 1/2 digit. It can be performed up to 2000 times per second at the setting condition of 4 1/2 digit as fastest measurement, and it can measures 50 times per second when it is set for the 6 1/2 digit. The DME1600 offers fully function of measurement for the voltage, current, resistance, frequency and temperature which can be used various application of measurement and evaluation in design, development and debugging of electronics devices. The DME1600 provides USB and GPIB interface* as standard feature for automated measurement besides manual operation. Furthermore, the DME1600 offers wide range of options such as 20-channel multi-point scanner card supporting the basic measurement.

Features

- Resolution: 6 1/2 digit
- Display: 5 x 7 dot matrix VFD, dual display with 3-color
- Basic measurement function: DC voltage [0.1 V, 1 V, 10 V, 100 V, 1000 V], AC voltage [0.1 V, 1 V, 10 V, 100 V, 750 V], DC current [10 mA, 100 mA, 1 A, 3 A], AC current [1 A, 3 A], 2-wire/4-wire resistance [100 Ω , 1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω , 10 M Ω , 100 M Ω], Frequency [3 Hz to 300 kHz], Continuity test, Diode test, Temperature test
- Built-in USB Interface (GPIB Interface*: selected model)

*Model with GPIB Interface: DME1600GC

Options

- 20-channel multi-point scanner card DME1600-OPT09
- 10-channel multi-point scanner card DME1600-OPT01
- 10-channel thermocouple multi-point scanner card DME1600-OPT12
- Kelvin probe (for 4-wire resistance measurement) DME1600-OPT07
- 4-wire test lead DME1600-OPT08
- Thermocouple adapter DME1600-OPT02
- K type thermocouple cable DME1600-OPT11

Specifications

DC Characteristics Accuracy *1

DC Voltage			
Range	Resolution	Input resistance	1 year (23 °C ± 5 °C)
100.0000 mV	0.1 μV	> 10 GΩ	0.0050+0.0035
1.000000 V	1.0 µV	> 10 GΩ	0.0040+0.0007
10.00000 V	10 μV	> 10 GΩ	0.0035+0.0005
100.0000 V	100 μV	10 MΩ	0.0045+0.0006
1000.000 V	1 mV	10 MΩ	0.0045+0.0010
DC Current			
Range	Resolution	Shunt resistance	1 year (23 °C ± 5 °C)
10.00000 mA	10 nA	5.1 Ω	0.050+0.020
100.0000 mA	100 nA	5.1 Ω	0.050+0.005
1.000000 A	1 µA	0.1 Ω	0.100+0.010
3.000000 A	10 μA	0.1 Ω	0.120+0.020
Resistance			
Range	Resolution	Test current	1 year (23 °C ± 5 °C)
100.0000 Ω	100 μΩ	1 mA	0.010+0.004
1.000000 kΩ	1 mΩ	1 mA	0.010+0.001
10.00000 kΩ	10 mΩ	100 µA	0.010+0.001
100.0000 kΩ	100 mΩ	10 μA	0.010+0.001
1.000000 MΩ	1 Ω	5 μΑ	0.010+0.001
10.00000 MΩ	10 Ω	500 nA	0.040+0.001
100.0000 MΩ	100 Ω	500 nA 10 MΩ	0.800+0.010
Diode test			
Range	Resolution	Test current	1 year (23 °C ± 5 °C)
1.0000 V	10 μV	1 mA	0.010+0.020
Continuity test			
Range	Resolution	Test current	1 year (23 °C ± 5 °C)
1 kΩ	10 mΩ	1 mA	0.010+0.030

AC Characteristics Accuracy *2 AC Voltage (TRMS)

Range Resolution		Frequency	1 year (23 °C ± 5 °C)		
		3 Hz to 5 Hz	1.00+0.04		
		5 Hz to 10 Hz	0.35+0.04		
100.0000 mV	0.1 μV	10 Hz to 20 kHz	0.06+0.04		
100.0000 1110	0.1 μν	20 kHz to 50 kHz	0.12+0.05		
		50 kHz to 100 kHz	0.60+0.08		
		100 kHz to 300 kHz	4.00+0.50		
		3 Hz to 5 Hz	1.00+0.03		
	1.0 µV to 1 mV	5 Hz to 10 Hz	0.35+0.03		
1.000000 V		10 Hz to 20 kHz	0.06+0.03		
to 750.000 V		20 kHz to 50 kHz	0.12+0.05		
		50 kHz to 100 kHz	0.60+0.08		
		100 kHz to 300 kHz	4.00+0.50		
AC Current (7	AC Current (TRMS)				
Range	Resolution	Frequency	1 year (23 °C ± 5 °C)		
	1 μΑ	3 Hz to 5 Hz	1.00+0.04		
1.000000 A		5 Hz to 10 Hz	0.30+0.04		
		10 Hz to 5 kHz	0.10+0.04		
		3 Hz to 5 Hz	1.10+0.06		
3.000000 A	10 μA	μA 5 Hz to 10 Hz 0.35			
		10 Hz to 5 kHz	0.15+0.06		

Measuring characteristics

_		
	Item	Specifications
		Capable 20 % of the over range excluding "750 V RMS range"
	Measuring frequency	750 V DMS Dange is limited to 100 kHz

Measuring characteristics

measuring characteristics			
Item	Specifications		
DC voltage measurement: Over range	Capable 20 % of the over range excluding "1,000 V range"		
DC voltage measurement: Input bias current	Less than 30 pA (at 25 °C)		
DC voltage measurement: Input voltage protection	1,000 V for all ranges		
DC current measurement: Over range	Capable 20 % of the over range excluding "3 A range"		
Resistance measurement: Maximum resistance value for usable test lead	10 Ω (100 Ω range), 100 Ω (1 k Ω range), 1 k Ω (Other ranges)		
Resistance measurement: Input voltage protection	1,000 V for all ranges		

Frequency and period characteristics Accuracy *3

Range	Frequency	1 year (23 °C ± 5 °C)
	3 Hz to 5 Hz	0.10
100 mV RMS to	5 Hz to 10 Hz	0.05
750 V RMS	10 Hz to 40 Hz	0.03
	40 Hz to 300 kHz	0.01

Measuring characteristics

mode and gold action of the					
Item	Specifications				
	Capable 20 % of the over range excluding "750 V RMS Range"				
Measuring frequency	750 V RMS Range is limited to100 kHz				

General

Item	Specifications
Voltage range	100 Vac/120 Vac/220 Vac/240 Vac ± 10 % (single phase)
Frequency range	50 Hz/60 Hz ± 10 %
Power consumption	25 VAmax
Operating temperature range	0 °C to 50 °C
Operating humidity range	Up to 80 % rh (0 °C to 31 °C, non condensing)
Storage temperature range	-40 °C to 70 °C
Operating altitude	Up to 2000 m

*1. • ± (% of reading + % of range)

 6 1/2 digit resolution, measured by Auto Trigger mode after the unit has been warmed up more than two hours.

• For the resistance measurement, it applies to use either 4-wires resistance measurement or 2-wires resistance measurement of the Null function.

2. • ± (% of reading + % of range)

Specifications are for 2-hours warm-up at 6 1/2 digit, slow AC filter with Bandwidth 3 Hz, sine wave input.

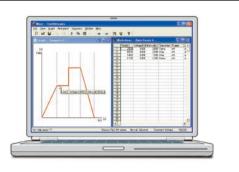
• Measured by the sine-wave input exceeding 5 % of the range • For the input range from 1 % to 5 %, add 0.1 % of the range (when it is less than 50 $\,$ kHz) or adding 0.13 % of the range (when it is from 50 kHz to 100 kHz)

*3. • ± (% of reading)

• 6 1/2 digit resolution, measured after the unit has been warmed up more than two hours.

Application Software for Power Supplies and Electronic Loads

NAVY 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.

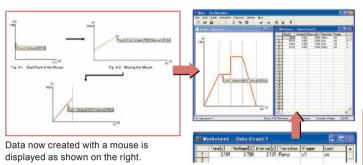
Operating Environment

- CPU: Pentium IV or later (Core i5 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.



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)	6.1	✓ (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 (SD022-PBZ)	6.0	✓ (1024 steps)	-	CC, CV/DC, AC+DC
Wavy for PCR-M	5.1	-	✓ (2048 steps)	CV (AC, DC, AC+DC)
Wavy for PCR-LE (SD011-PCR-LE)	5.6		-	CV (AC, DC, AC+DC)
Wavy for PLZ-5W/5WH2 (SD023-PLZ-5W)	5.2	✓ (10000 steps)	-	CV, CC, CR, CP
Wavy for PLZ-U	3.2	✓ (256 steps)	✓ (1024 steps)	CC, CV, CR, CC + CV, CR + CV

^{*1 &}quot;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"

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	<u>'</u>						
TOS5300 Series	V	V	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
TOS6210/6200A			V				
TOS9300 Series	V	V	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
AC Power Supplies							
PCR-MA Series	<i>V</i>	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PCR-LE Series	✓ (IviACPwr)	✓ (IviACPwr)	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PCR-WEA/WEA2 Series	~	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
DC Power Supplies							
PWR-01 Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PMX-A Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PBZ Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PWX Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PMX-Multi Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PXB Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PXT Series	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
Electronic Loads							
PLZ Series (5W/5WH2/U)	✓	✓	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
PXZ Series	<i>V</i>	V	✓ (IVI-COM)	✓ (IVI-C)	✓ (IVI-C)		
Common Libraries							
VISA	KI-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 (1 3/4 inch) 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

Mode	al	Pay load weight	Number	of panels	Overall height	Weight	The length for	Support	Support		Options			
Mode	5 1	kg	JIS	EIA	mm	kg	maximum surface	angle	leveler	Support angle	Base hold angle	Eyebolt		
	KRO1600		32	36	1825	55		12 (6 pairs)						
Open rack (KRO series)	KRO1250	Approx. 300	25	28	1475	50	700	10 (5 pairs)	4					
(ICICO SCIICS)	KRO900]	18	20	1125	45		8 (4 pairs)						
Decorative rack	KRC363L	Approx. 300		36	1835	95	950	12 (6 pairs)	4					
(KRC series)	KRC273L	Approx. 300	Approx. 300	Арргох. 300		27	1435	85	950	10 (5 pairs)	5 pairs)			
	KRC363			36	1835	90	800	12 (6 pairs)						
Decorative rack	KRC273]		27	1435	75	800	10 (5 pairs)		OP01-KRC OP02-KRC	OP03-KRC	OP04-KRC		
(KRC series)	KRC1603	Approx. 300	32		1835	90	800	12 (6 pairs)	4	*1	*2	*3		
	KRC1603L Approx. 300	Approx. 300	32		1035	95	950	12 (6 pairs)	12 (6 pails) 4					
upon order	KRC1203		24		1435	75	800	10 (5 pairs)						
KRC1203L		24		1435	85	950	10 (5 pairs)							

- 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

Back model No. JIS Standard rack (millimeter size) EIA Standard rack (inch size) 1 panel height : 50 mm 1 panel height: 44.45 mm KBO1600 1601.5 mm 1601.5 mm KRC363(L) KRC1603(L) 32 panels pitches 36 panels pitches 25 mm 50 mm 1250 mm 1250 mm KRO1250 25 panels pitches 28 panels pitches KRO Series Pitch magnified view 1200 mm 24 panels pitches KBC273(L) 1200 mm 27 panels pitche Pitch magnified view KRC1203(L) 900 mm 900 mm KRO900 20 panels pitches 18 panels pitches KRC Series Pitch magnified view ---KRO(465)/KRC(452) -KRO(530)/KRC(570) -KRO(530)/KRC(570)

Racks & Accessories

■ Bracket

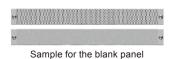
The bracket can be used to install models of 1 (1/1) rack in width directly in the rack.



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.



■ 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.

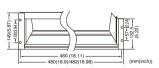
Complied products

- PWR-01 Series
- PMX-A Series
- PMX-Multi Series
- PCR500MA
- PLZ-5W Series (200/400 W)
- PFX2512
- SD01-PFX

KRA150



KRA3



EIA Standard Rack (Inch Size) Mounting Options

			Bracket		Blank panel	Rack mount frame		nount frame	Rack adapter		
	Product name			Bracket	Panel	"M" is added	Rack mount frame	Panel	Bracket necessary when fastening	Rack adaptor	Panel
	Series	Туре	Width	model No.	width(*1)	for mesh type	model No.	width(*1)	mainframe to rack mount frame	model Ño.	width(*1)
		400	1/6							KRA3	3
	PWR-01	800	1/3							KRA3	3
	PWK-01	1200	1/2							KRA3	3
<u>></u>		2000	1	KRB3-TOS	3						
ddns	PAV		1/6							KRA2-PAV	2
wer	PWX	750/1500	1							KRB1-PWX SUP	ORT ANGLE (*2)
DC power supply	PMX-A		1/4			BP191(-M)				KRA3	3
ļă	PMX-Multi		1/2			BP191(-M)				KRA3	3
	PBZ		1	KRB3-TOS	3						
	PXB		1	KRB3-TOS	3						
	PXT		1	KRB3-TOS	3						
	PCR-WEA/WEA2	1000/2000/3000	1	KRB3-TOS	3						
AC power supply		6000	1	KRB6	6						
er su		12000	1	KRB9	9						
)00K		500	1/2							KRA3	3
AC 1	PCR-MA	1000/2000	1	KRB3-TOS	3						
		4000	1	KRB6	6						
	PLZ-5W	200/400	1/2							KRA3	
	FLZ-3 W	1200	1	KRB3-TOS	3						
l pe	PLZ2405WB		1	KRB2-TOS	2						
c Lo	PLZ-5WH2	1000/2000/4000	1	KRB3-TOS	3						
roni		12000	1	KRB9	9						
Electronic Load		20000	1	KRB13	13						
"	PLZ-U	PLZ-30F	2/3	KRB3-PLZ-30F	3						
	FLZ-U	PLZ-50F	1	KRB3-PLZ-50F	3				·		
	PXZ		1	KRB3-TOS	3						
*3	PFX2512/SD01-PFX		1/2							KRA3	3
*3	PFX2532		1	KRB3-TOS	3						

JIS Standard Rack (Millimeter Size) Mounting Options

			Bracket		Blank panel	Rack mount frame		Rack adapter			
	Product name		Bracket	Panel	"M" is added	Rack mount frame	Panel	Bracket necessary when fastening	Rack adaptor	Panel	
	Series	Туре	Width	model No.	width(*1)	for mesh type	model No.	width(*1)	mainframe to rack mount frame	model Ño.	width(*1)
		400	1/6							KRA150	3
	PWR-01	800	1/3							KRA150	3
	PWR-01	1200	1/2							KRA150	3
Ş		2000	1	KRB150-TOS	3						
DC power supply	PAV		1/6							KRA2-PAV	2
wer	PWX	750/1500	1							KRB1-PWX SUPI	PORT ANGLE (*2)
C po	PMX-A		1/4			BP1H(-M)				KRA150	3
Ā	PMX-Multi		1/2			BP1H(-M)				KRA150	3
	PBZ		1	KRB150-TOS	3						
	PXB		1	KRB150-TOS	3						
	PXT		1	KRB150-TOS	3						
	PCR-WEA/WEA2	1000/2000/3000	1	KRB150-TOS	3						
AC power supply		6000	1	KRB300	6						
er su		12000	1	KRB400-PCR-LE	8						
wod		500	1/2					-		KRA150	3
AC	PCR-MA	1000/2000	1	KRB150-TOS	3						
		4000	1	KRB300	6						
	PLZ-5W	200/400	1/2							KRA150	3
	TEE-5 W	1200	1	KRB150-TOS	3						
ad	PLZ2405WB			KRB100-TOS	2						
c Lo	PLZ-5WH2	1000/2000/4000	1	KRB150-TOS	3						
roni		12000	1	KRB400-PCR-LE	8						
Electronic Load		20000	1	KRB600	13						
_	PLZ-U	PLZ-30F	2/3	KRB150-PLZ-30F	3						
		PLZ-50F	1	KRB150-PLZ-50F	3						
	PXZ		1	KRB150-TOS	3				,		
*3	PFX2512/SL01-PFX		1/2							KRA150	3
*3	PFX2532		1	KRB150-TOS	3			_]	

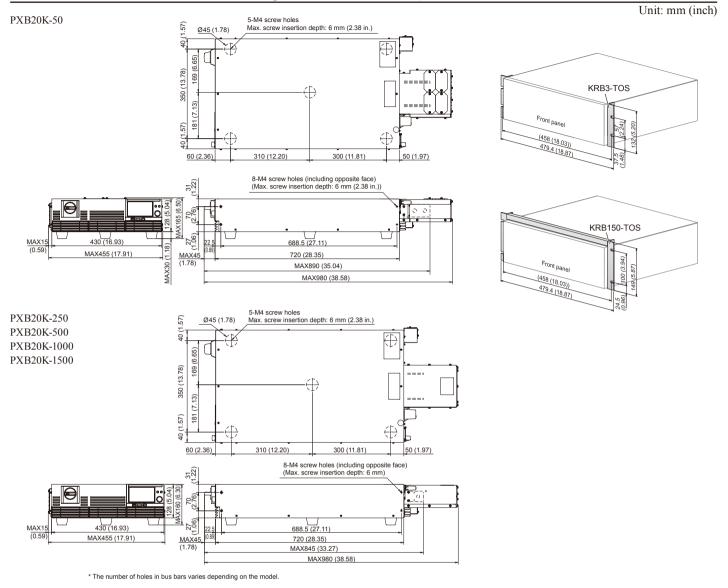
^{*1.} EIA panel width is 44.45 mm (1 3/4 inch). The panel width does not include the rubber feet, casters, and levelers.
*2. The instrument may fall. Install the suitable support angles applying to the used rack system to support the instrument.
*3. Battery Tester

^{*1.} JIS panel width is 50 mm. The panel width does not include the rubber feet, casters, and levelers.

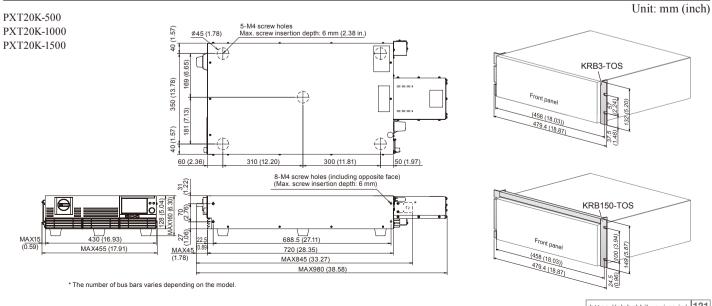
*2. The instrument may fall. Install the suitable support angles applying to the used rack system to support the instrument.

*3. Battery Tester

PXB Series External Dimensional Diagrams/Rack Mount Option



PXT Series External Dimensional Diagrams/Rack Mount Option

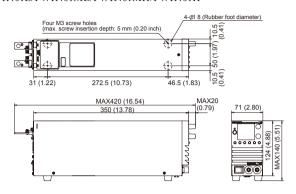


PWR-01 Series External Dimensional Diagrams / Rack Mount Option

Unit: mm (inch)

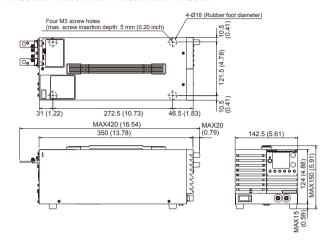
■ 400 W Model (6 units can be rack mounted)

PWR401L/PWR401ML/PWR401MH/PWR401H



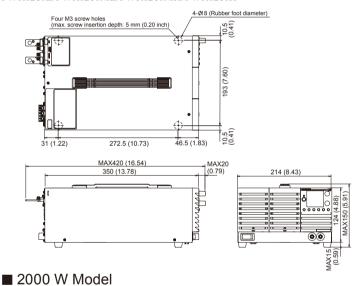
■ 800 W Model (3 units can be rack mounted)

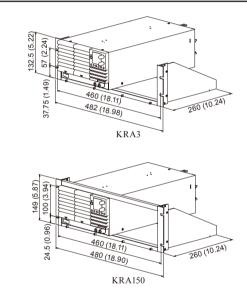
PWR801L/PWR801ML/PWR801MH/PWR801H



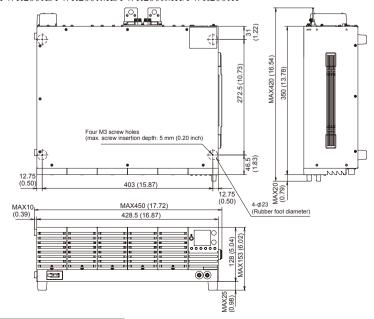
■ 1200 W Model (2 units can be rack mounted)

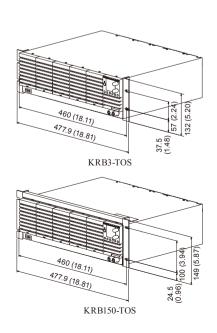






PWR2001L/PWR2001ML/PWR2001MH/PWR2001H



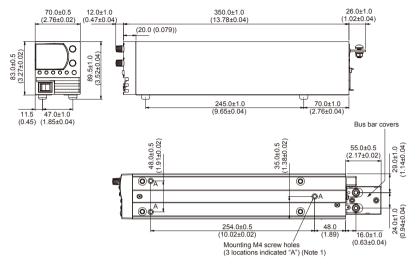


PAV Series External Dimensional Diagrams

■ Models whose rated output voltage is 10 V to 100 V

Unit: mm (inch)

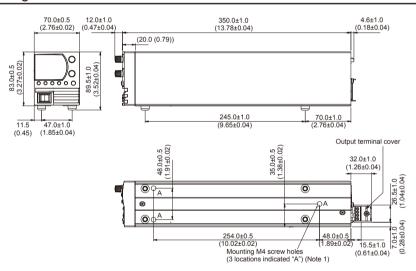
PAV10-20/PAV20-10/PAV36-6 PAV60-3.5/PAV100-2/PAV10-40 PAV20-20/PAV36-12/PAV60-7 PAV100-4/PAV10-60/PAV20-30 PAV36-18/PAV60-10/PAV100-6 PAV10-72/PAV20-40/PAV36-24 PAV60-14/PAV100-8



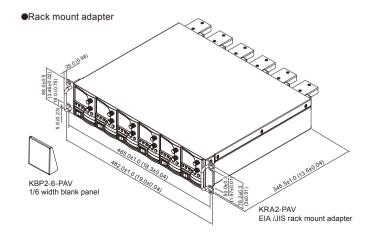
(Note 1) Keep screw insertion depth to 6 mm or less

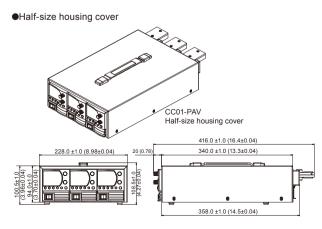
■ Models whose rated output voltage is 160 V to 650 V

PAV160-1.3/PAV320-0.65/PAV650-0.32 PAV160-2.6/PAV320-1.3/PAV650-0.64 PAV160-4/PAV320-2/PAV650-1 PAV160-5/PAV320-2.5/PAV650-1.25



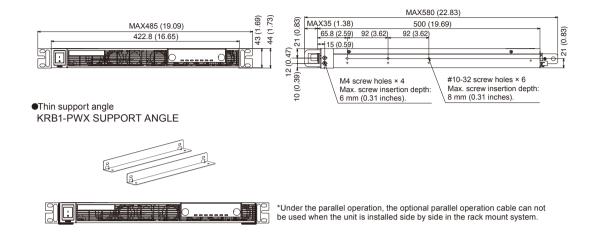
(Note 1) Keep screw insertion depth to 6 mm or less.



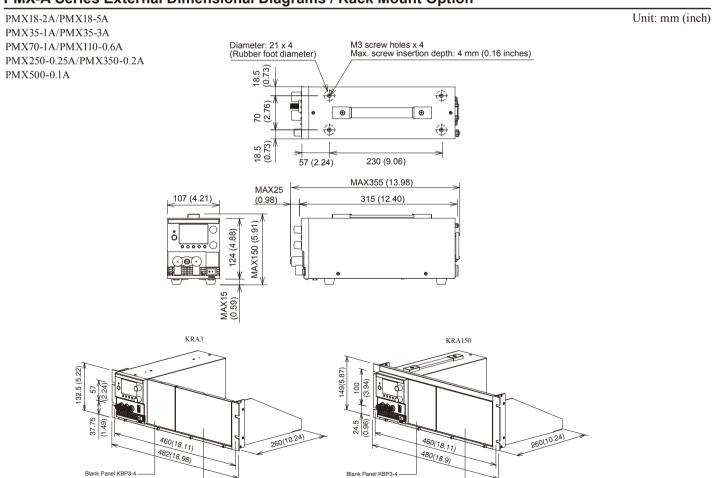


PWX Series External Dimensional Diagrams / Rack Mount Option

PWX750LF/PWX750MLF/PWX750MHF/PWX750HF PWX1500L/PWX1500ML/PWX1500MH/PWX1500H Unit: mm (inch)



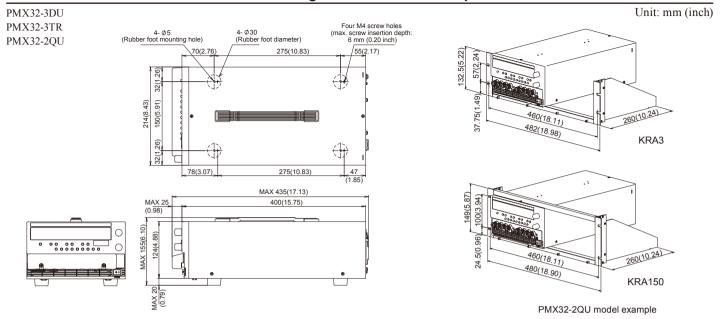
PMX-A Series External Dimensional Diagrams / Rack Mount Option



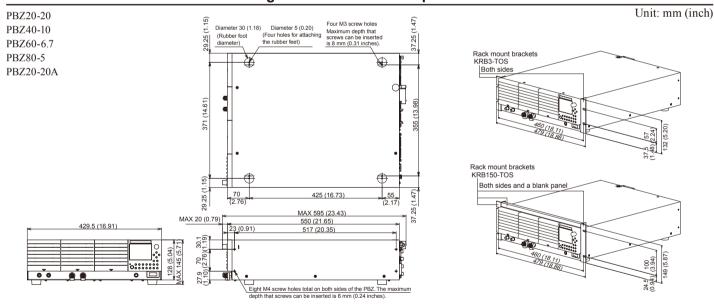
Blank Panel KBP3-2

Blank Panel KBP3-2

PMX-Multi Series External Dimensional Diagrams / Rack Mount Option



PBZ Series External Dimensional Diagrams / Rack Mount Option



PBZ SR Series External Dimensionals

■ Dimensions (mm (inch) (Maximum dimensions))					
PBZ20-60 SR	PBZ60-20.1 SR	432.6 (17.03") (445 (17.52")) W × 579.4 (22.81") (685 (26.97")) H × 700 (27.56") (730 (28.74")) D			
PBZ40-30 SR	PBZ80-15 SR	432.0 (17.03) (443 (17.32)) W \(\text{373.4} (22.01) (003 (20.97)) 11 \(\text{700 (27.30)} (17.00 (20.14)) D			
PBZ20-80 SR	PBZ60-26.8 SR	422 6 (47 03") (44E (47 E3")) IN V 742 4 (20 04") (94E (22 00")) IL V 700 (27 E8") (720 (29 74")) D			
PBZ40-40 SR	PBZ80-20 SR	432.6 (17.03") (445 (17.52")) W × 712.1 (28.04") (815 (32.09")) H × 700 (27.56") (730 (28.74")) D			
PBZ20-100 SR	PBZ60-33.5 SR	422 C (47 03"\ (44 E (47 E 3"\) \			
PBZ40-50 SR	PBZ80-25 SR	432.6 (17.03") (445 (17.52")) W × 844.8 (33.26") (950 (37.40")) H × 700 (27.56") (730 (28.74")) D			

PBZ BP Series External Dimensionals

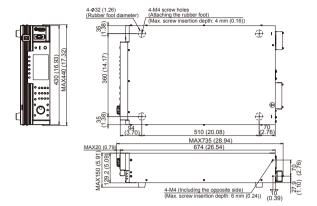
■ Dimensions (mm (inch))						
PBZ20-120 BP	570/22 44"\ \\\ \ 1250/52 15"\ \ \ \ 050/27 40"\ Dmm					
PBZ40-60 BP	570(22.44") W × 1350(53.15") H × 950(37.40") Dmm					
PBZ20-140 BP	570(22.44") W × 1350(53.15") H × 950(37.40") Dmm					
PBZ40-70 BP	570(22.44) W X 1330(53.15) 11 X 930(37.40) DIIIII					
PBZ20-160 BP	570/22 44"\ \\\ \ 1250/52 15"\ \ \ \ 050/27 40"\ Dmm					
PBZ40-80 BP	570(22.44") W × 1350(53.15") H × 950(37.40") Dmm					

PBZ20-180 BP	570/22 44"\\W × 1750/69 00"\ H × 050/27 40"\ Dmm	
PBZ40-90 BP	570(22.44") W × 1750(68.90") H × 950(37.40") Dmm	
PBZ20-200 BP	570(22.44") W × 1750(68.90") H × 950(37.40") Dmm	
PBZ40-100 BP	570(22.44) W X 1750(08.90) 11 X 950(57.40) DIIIIII	

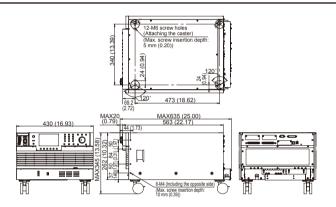
PCR-WEA/WEA2 Series External Dimensional Diagrams / Rack Mount Option

Unit: mm (inch)

■ PCR1000WEA/PCR2000WEA/PCR3000WEA2

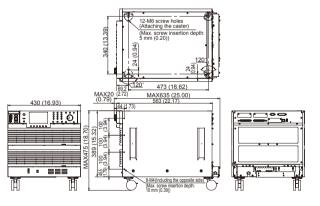


■ PCR6000WEA2

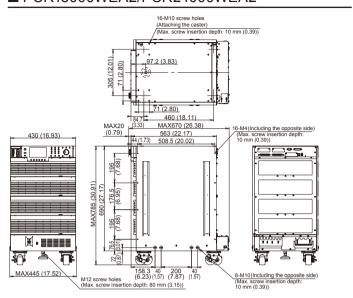


■ PCR12000WEA2

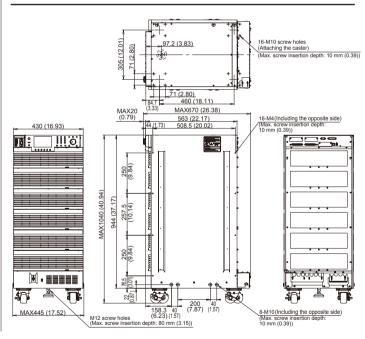
126 https://global.kikusui.co.jp/

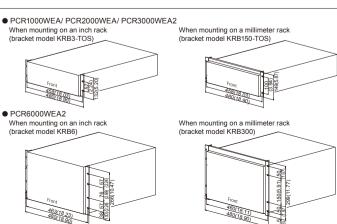


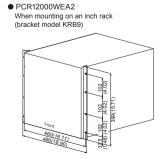
■ PCR18000WEA2/PCR24000WEA2



■ PCR30000WEA2/PCR36000WEA2





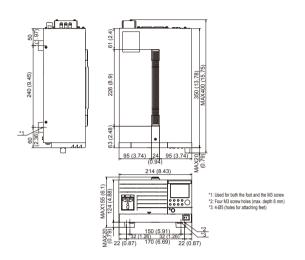




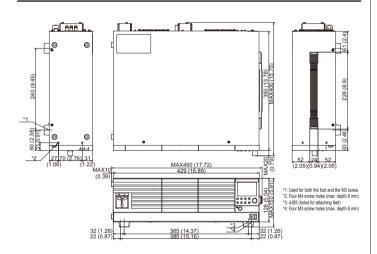
PCR-MA Series External Dimensional Diagrams / Rack Mount Option

Unit: mm (inch)

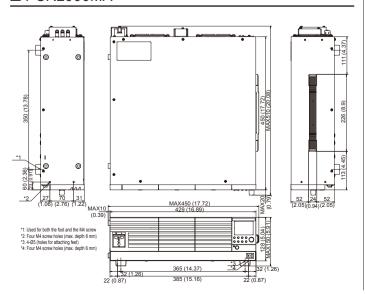
■ PCR500MA



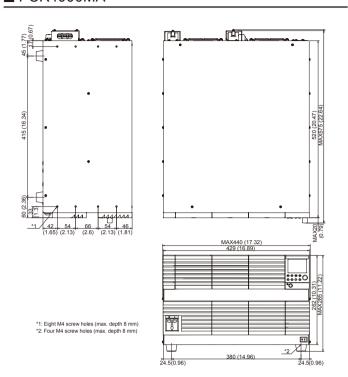
■ PCR1000MA



■ PCR2000MA



■ PCR4000MA



●PCR500MA

When mounting on an inch rack (Bracket model: KRA3)



When mounting on a millimeter rack (Bracket model: KRA150)

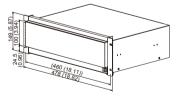


●PCR1000MA/PCR2000MA

When mounting on an inch rack (Bracket model: KRB3-TOS)

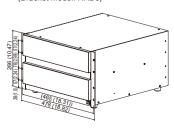


When mounting on a millimeter rack (Bracket model: KRB150-TOS)

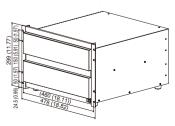


●PCR4000MA

When mounting on an inch rack (Bracket model: KRB6)



When mounting on a millimeter rack (Bracket model: KRB300)

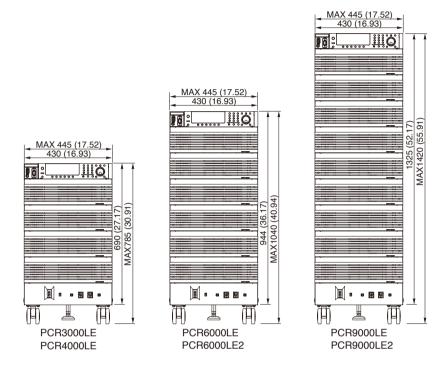


PCR-LE/LE2 Series External Dimensional Diagrams / Rack Mount Option

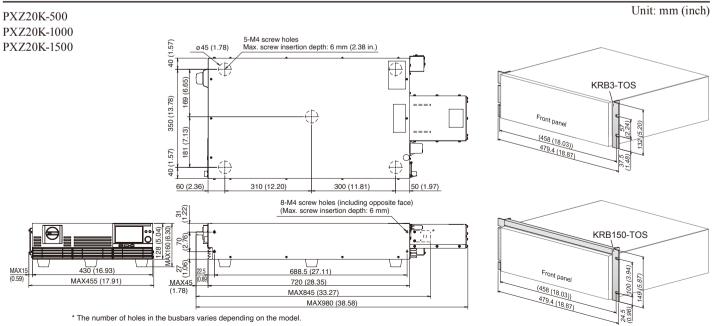
Input terminal Output terminal Model PCR3000LE M8 M5 PCR4000LE M8 M5 PCR6000LE M8 · M5 M8 PCR9000LE M5 M8

Model	Input terminal	Output terminal *				
PCR6000LE2	M8 · M5	M8·M5				
PCR9000LE2	M5	M8·M5				
* Single phase Single phase Three wire,Three phase four wire						

Unit: mm (inch)



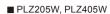
PXZ Series External Dimensional Diagrams/Rack Mount Option

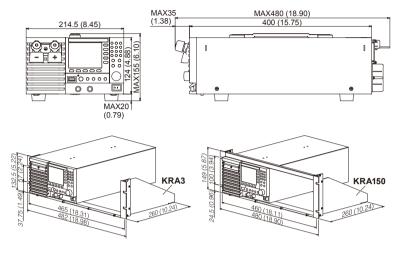


PLZ-5W Series External Dimensional Diagrams / Rack Mount Option

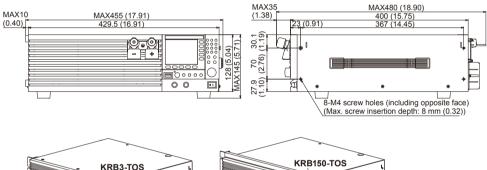
PLZ205W/PLZ405W PLZ1205W PLZ2405WB

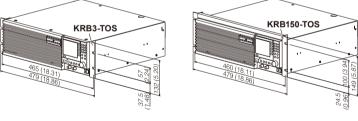
Unit:mm (inch)



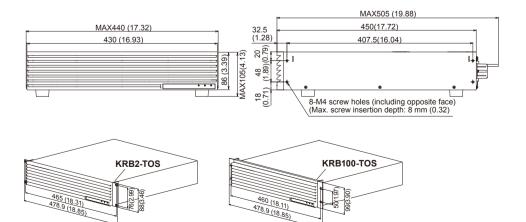


■ PLZ1205W





■ PLZ2405WB



PLZ-5WH2 Series External Dimensional Diagrams / Rack Mount Option Unit:mm (inch) PLZ1005WH2/PLZ2005WH2/PLZ4005WH2 PLZ12005WH2/PLZ20005WH2 74.2 (2.92) .31.8 (1.25) ■ PLZ1005WH2/PLZ2005WH2 ■ PLZ20005WH2 4-M3 screw holes (Max. screw insertion depth: 6 mm (0.24)) 323 (12.72) 22 (0.87) ø30 (22 (0.87) ø30 (1.18) 4-ø5 (0.20) (Four holes for attaching the 360 (14.17) 36 (1.42) 16 M6 screw holes (Max. screw insertion depth: 8 mm (0.31)) 448 (17.64) MAX445 (17.52) MAX710 (27 95) 550 (21.65) MAX15 (0.59) **(** 430 (16.93) 42.75 MAX<u>25 (0.98)</u> 22.5 (<u>0.89</u>) MAX455 (17.91) 429.5 (16.91) 400 (15.75) 367.5 (14.47) (1.1)(2.76)(1.19) 573.5 (22.58) 8-M4 screw holes (including opposite face) (Max. screw insertion depth: 8 mm (0.31)) 9 18-M4 screw holes (including opposite face) (Max. screw insertion depth: 8 mm (0.31)) 4-ø5 (0.20) 220 (8.66) (Four holes for attaching the rubber feet) M12 screw hole ■ PLZ4005WH2 515 (20.28) 8-M10 screw holes (including opposite face) (Max. screw insertion depth: 35 mm (1.38)) 4.M3 screw holes (Max. screw insertion depth: 6 mm (0.24) ø30 (1.18) (Max. screw insertion depth: 10 mm (0.39)) PLZ1005WH2/PLZ2005WH2/PLZ4005WH2 KRB150-TOS KRB3-TOS (1) MAX640 (25.2) 500 (19.69) 467.5 (18.41) MAX440 (17.32) 429.5 (16.91) ● PL 712005WH2 KRB400-PCR-LE KRB9 8-M4 screw holes (including opposite face) (Max. screw insertion depth: 8 mm (0.31) 74.2 (2.92) ■ PLZ12005WH2 40 (1.57) PLZ20005WH2 KRB600 36 (1.42) KRB13 58.5 (2.30) 448 (17.64) MAX710 (27.95) 550 (21.65) MAX445 (17.52) 123.5 (4.86) 396.2 (15.60) MAX495 (19.49) 3.94) 243.9 (9.60) 206 (8.11) • 18-M4 screw holes (including opposite face) 459.4 (18.09)

(Max. screw insertion depth: 8 mm (0.31))

8-M10 screw holes (including opposite face) (Max. screw insertion depth: 10 mm (0.39))

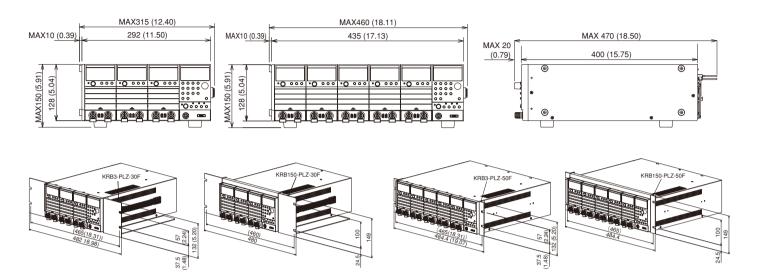
depth: 35 mm (1.38))

PLZ-U Series External Dimensional Diagrams / Rack Mount Option

PLZ70UA/ PLZ150U Unit: mm (inch)

PLZ-30F/PLZ-50F 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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