Single Output High Capacity Power Supply GPSA-600 Series

Model	Description	Stock
GPSA-600-12P-TP	+12V output	Standard stock
GPSA-600-24P-TP	+24V output	Standard stock
GPSA-600-36P-TP	+36V output	Standard stock
GPSA-600-48P-TP	+48V output	Standard stock

■Model Name Coding

GPSA - 600 - ** P - T P

① ② ③ ④ ⑤ ⑥

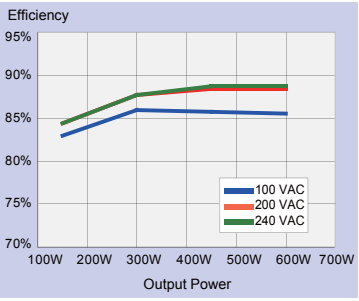
1. Series name
2. Output power
3. 12:+12V output
   24:+24V output
   36:+36V output
   48:+48V output
4. Peak output compliant
5. Signal output : TTL signal
6. Fan signal : rotation pulse signal

Features

- Industrial power supply with simple design for low price
- Power supply back-up functionality available at AC fail (+24V output only)
- Various safety standards (UL/CSA60950-1) are approved.
- High efficiency
- Width 61mm, height 3U; easily fits into 19-inch racks
- External remote ON-OFF control signal available
- Worldwide range input (85-264 VAC), power factor 94% or higher with PFC circuit
- +12VSB output available

GPSA-600-24P-TP Efficiency chart

At rated output and 240 VAC input, 88.8% high efficiency is achieved. Energy-saving and the reduction of CO_2 emission can be contributed at this age.



Safety standard / Approval	UL	CSA	EN	CE	CCC
Reliability Grade	HFA	FA	HOA	OA	

Function

DC start | RS 232C | USB | TTL | PFC | Silence | 5VSB FAN | TSFC FAN | Connection | RoHS

Input

Input	85-264VAC (worldwide range)
	120-370VDC*

*The rated input voltage range at the application of safety standard is "100-240 VAC (50/60Hz)".
In the case of DC input use, an external DC fuse shall be equipped to protect from power supply failure.

Output

Output voltage	*+12V*	*+24*	*+36V*	*+48V*	*+12VSB*
Max. current/ max. power (continuous)	50A	25A	16.7A	12.5A	0.5A(0.3A)
	600W	600W	601.2W	360W	6W(3.6W)
Peak current / peak power (5 sec. max.) 100VAC	80A	50A	33.3A	25A	–
	960W	1200W	1198.8W	1200W	–
Peak current / peak power (5 sec. max.) 200VAC	100A	60A	40A	30A	–
	1200W	1440W	1440W	1440W	–
Min. current	0A	0A	0A	0A	0A

*Refer to () for the 24V backup operation

Dimensions

W×H×D (mm)	128×61×240 (Width 128mm/Height 3U size)

General Specification Condition: at normal temperature and humidity unless otherwise specified

	Items		Specification					Measurement conditions, etc.
AC Input	Rated Voltage		100 - 240 VAC (85* - 264 VAC) DC120-370V*1					Worldwide range *Refer to Fig.1
	Input Frequency		50 / 60Hz					47 - 63Hz
	Efficiency		80% typ. (100 VAC), 82% typ. (240 VAC) *Characteristic data: Fig.4					At rated output
	Power Factor		94% min. (100 VAC), 90% min. (240 VAC) *Characteristic data: Fig.5					
	Inrush Current		30A peak (100 VAC) *Characteristic data: Fig.6					At rated input/output at cold start (25°C)*2
	Input Current		7.5A max. (100 VAC), 3.2A max. (240 VAC)					At rated input and max. output
			16.2A max. (100 VAC), 8.1A max. (240 VAC)					At rated input and peak output
Output	Model		GPSA-600-12P-TP	GPSA-600-12P-TP	GPSA-600-12P-TP	GPSA-600-12P-TP	Common for all models	
	Rated Voltage		+12V	+24V	+36V	+48V	+12VSB	
	Rated Current / Power		50A	25A	16.7A	12.5A	0.5A	
			600W	600W	601.2W	600W	6W	
	Peak Current / Power	100 VAC	80A	50A	33.3A	25A	-	Time: 5 sec. or less Duty ratio of repetitive load: 35% or less *Refer to Fig.2, 3
			960W	1200W	1198.8W	1200W	-	
		200 VAC	100A	60A	40A	30A	-	
			1200W	1440W	1440W	1440W	-	
	Min. Current		0A	0A	0A	0A	0A	
	Setup voltage at factory		12V±2%	24V±2%	36V±2%	48V±2%	12V±5%	At rated output
	Voltage adjustable range		12V±10%	24V±10%	36V-20%, +5%	48V±10%	-	
	Static input fluctuation		48mV max.	96mV max.	144mV max.	192mV max.	120mV max.	The values shall be measured at output terminal block or connector.
	Static load fluctuation		100mV max.	150mV max.	150mV max.	300mV max.	600mV max.	
	Time-lapse drift		48mV max.	96mV max.	144mV max.	192mV max.	120mV max.	At 25°C
	Temperature fluctuation		0.02%/°C max.	0.02%/°C max.	0.02%/°C max.	0.02%/°C max.	0.02%/°C max.	
	Max. Ripple Voltage (mVp-p)	-10 to 0°C	160 max.	160 max.	160 max.	300 max.	160 max.	Two wires are coming out from the output terminal block and connected into one at the edge of 100cm max. long. 47μF electrolytic capacitor and 0.1μF ceramic capacitor are placed on it and it is measured by the 100MHz oscilloscope. *Characteristic data: Fig.17
		0 to 60°C	120 max.	120 max.	150 max.	150 max.	120 max.	
	Max. Spike Voltage (mVp-p)	-10 to 0°C	180 max.	180 max.	240 max.	400 max.	180 max.	
		0 to 60°C	150 max.	150 max.	200 max.	200 max.	150 max.	
Protection	Overcurrent Protection	OCP Point (A)	101% min. of peak current					Applying peak current 5 sec. Or more shutdowns PSU. (Recovery: AC input reclosing) At 12VSB overcurrent, the recovery of main output (when the load factor of main output is 1% or less) shall be reclosing of AC input or PS_ON signal. *Characteristic data: Fig.19
		Method	Hold down current limiting					
	Recovery (Overcurrent)	At AC Operation	Reclosing of AC input					
	Overvoltage Protection	OVP Point (V)	1.05 - 1.25	1.1 - 1.3	1.05 - 1.25	1.05 - 1.25	-	Output voltage follow-up type
		Method	Output shutdown				-	
	Recovery (Overvoltage)	At AC Operation	Reclosing of AC input				-	
Environment	Operating Temp. / Humidity		-10 to 60°C* / 10 to 90%					*Refer to Fig.3 No condensation
	Storage Temp. / Humidity		-25 to 75°C / 10 to 95%					No condensation
	Vibration		Acceleration amplitude: 2G (10 - 55Hz), Sweep cycles: 10, Test duration: 10 minutes each axis					JIS-C-60068-2-6, at no operation
	Mechanical Shock		Lift one bottom edge up to 50mm and let it fall. Number of bumps: 3 each of 4 edges					JIS-C-60068-2-31, at no operation
Insulation	Dielectric Strength		AC input - DC output: 3000 VAC for 1 minute AC input - FG: 2000 VAC for 1 minute					Cut-off current: 15mA Completion inspection: at 1 sec. each
	Insulation Resistance		AC input - DC output: 50MΩ min. AC input - FG: 50MΩ min. DC output - FG: 50MΩ min.					At 500 VDC
	Leakage Current		0.5mA max. (100 VAC) / 1mA max. (240 VAC) *Characteristic data: Fig.7					YEW. TYPE3226 (1kΩ) or equivalent
EMC	Line Noise Immunity		± 2000V (pulse width: 100/1000ns, repetitive cycle: 30-100Hz, normal/common mode with pos./neg. polarity for 10 minutes)					Measured by INS-410 No fluctuation of DC output or malfunction
	Electrostatic Discharge		EN61000-4-2 compliant					
	Radiated, Radio-Frequency EM Field		EN61000-4-3 compliant					
	Fast Transient Burst		EN61000-4-4 compliant					
	Lightning Surge		EN61000-4-5 compliant					
	RF Conducted Immunity		EN61000-4-6 compliant					
	Magnetic Field Immunity		EN61000-4-8 compliant					
	Voltage Dip / Regulation		EN61000-4-11 compliant					
	Conducted Emission		VCCI-B, FCC-B, EN55022-B, CISPR22-B compliant					Measured by single unit
	Harmonic Current Regulation		IEC61000-3-2 (Ver.2.1) Class D compliant *Characteristic data: Fig.8,9					At rated input/output
Others	Safety Standard		UL60950-1, CSA60950-1 (c-UL) approved, CE Marking					
	Cooling System		Forced air cooling					Thermal-sensing variable speed fan embedded
	Output Grounding		Capacitor grounding					
	Output Hold-up Time		PWR_OK holds up 20ms min. after AC failure *Characteristic data: Fig.14					At rated output
	Reliability Grade		FA (industrial equipment grade, double-sided through hole PCB)					Follow our standard
	MTBF		70,000 H min.					Based on EIAJ RCR-9102
	Weight		1.95 kg typ.					
	Warranty		3 years after delivery. If any faults belong to us, the defective unit shall be repaired or replaced at our cost.					Except for errors caused by operation not listed

*1 The rated input voltage range at the application of safety standard is "100-240 VAC (50/60Hz)". If it is used with DC input, an external DC fuse shall be equipped in case of the power supply failure.
*2 The inrush current into input noise filter is not specified unless its period is more than 100μs.

Fig.1 Derating for Low Input Voltage

When the input voltage is 90 VAC or less, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.

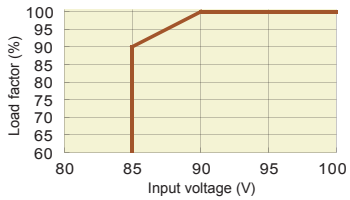


Fig.2 Duty Ratio

Peak current/power shall be 5 sec. or less continuously. For repetitive loads, duty ratio shall be 10% or less.

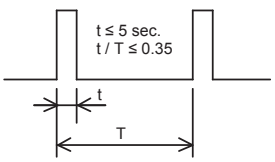


Fig.3 Peak output power condition

Peak output power shall follow the curve below and <Fig. 2>. Keep average output power under 550W when in use of peak output power.

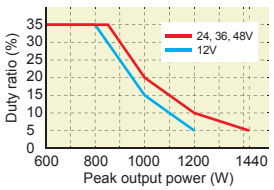
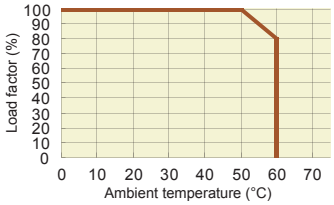


Fig.4 Temperature Derating

When the ambient temperature (near the airflow inlet) exceeds 50°C, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.



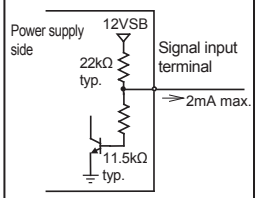
Signal Input / Output Specification Condition: at normal temperature and humidity unless otherwise specified

	Items	Specification	Note
Input Signal	Output ON / OFF Control Signal (PS_ON#)	The power supply starts up with 'L' input and shuts down with 'H' or 'OPEN' input (except for 12VSB).	The pin 4 of SIG connector
Output Signal	Normal Output Signal (PWR_OK)	'H'signal is delivered at normal output (detection delay time: 100 - 500ms). Voltage detection: 9.8V or higher for 12V output,19.9V or higher for 24V output, 26.5V or higher for 36V output, 39.8V or higher for 48V output	The pin 5 of SIG connector
	Fan Monitor Signal (FAN_M)	Two cycle pulses per one rotation of the fan motor are delivered (open collector output).	The pin 2 of SIG connector
	Blackout Detection Signal (AC FAIL)	The signal goes 'OPEN' at low AC input voltage and blackout detection. (detection voltage: 80 VAC typ., detection delay time: 20 - 40ms after AC input failure.)	The pin 6 of SIG connector
	Low Battery Voltage Signal (BATT LOW) *Only available when a dedicated battery package is connected.	The low battery voltage signal, "BATT_LOW" will be sent from the power supply after receiving from the dedicated battery package. If the battery package is not connected, the status shall be 'OPEN'. Detailed specifications shall be based on the specification of the battery package connected.	The pin 7 of SIG connector

Signal Circuit

Input Signal Circuit

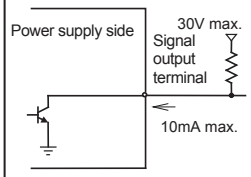
(PS_ON#)



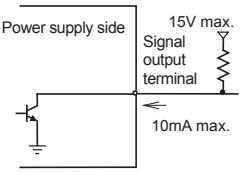
('L'≤0.8V, 2.0V≤'H')

Output Signal Circuit

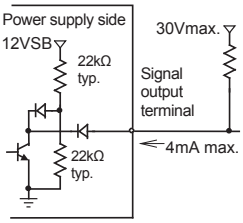
(PWR_OK)



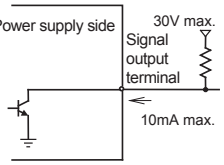
(FAN_M)



(AC FAIL)

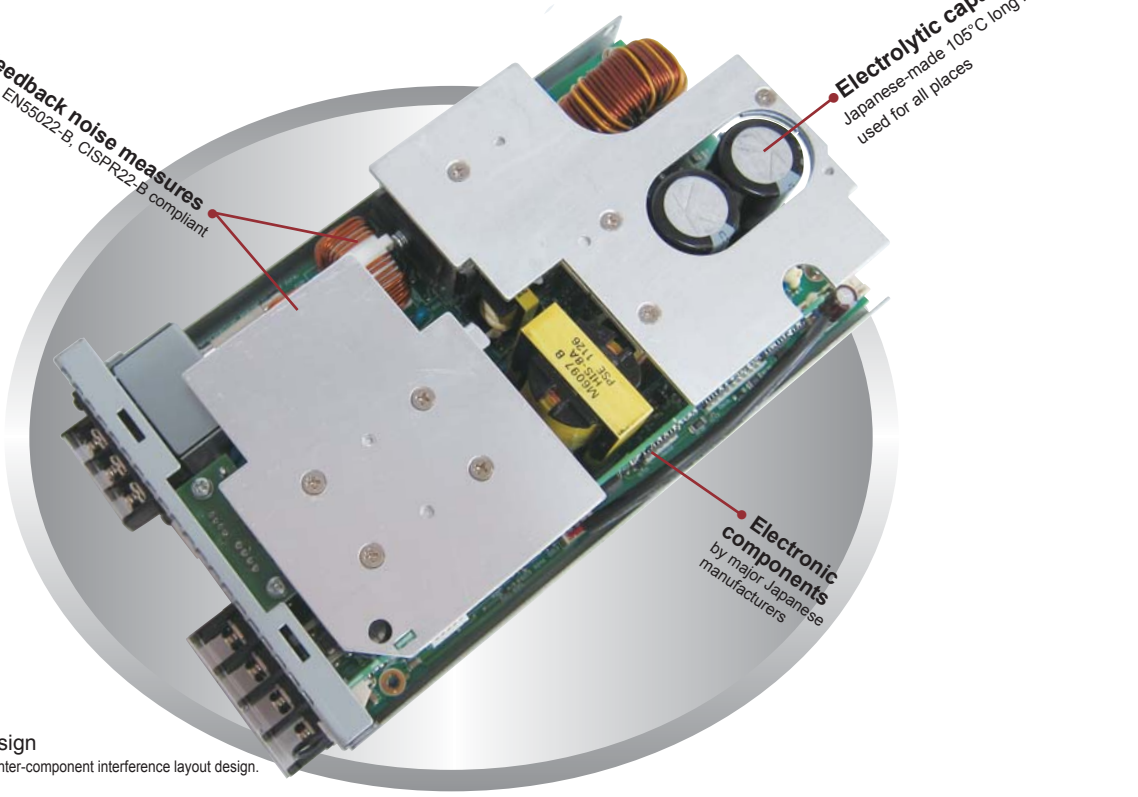


(BATT LOW)



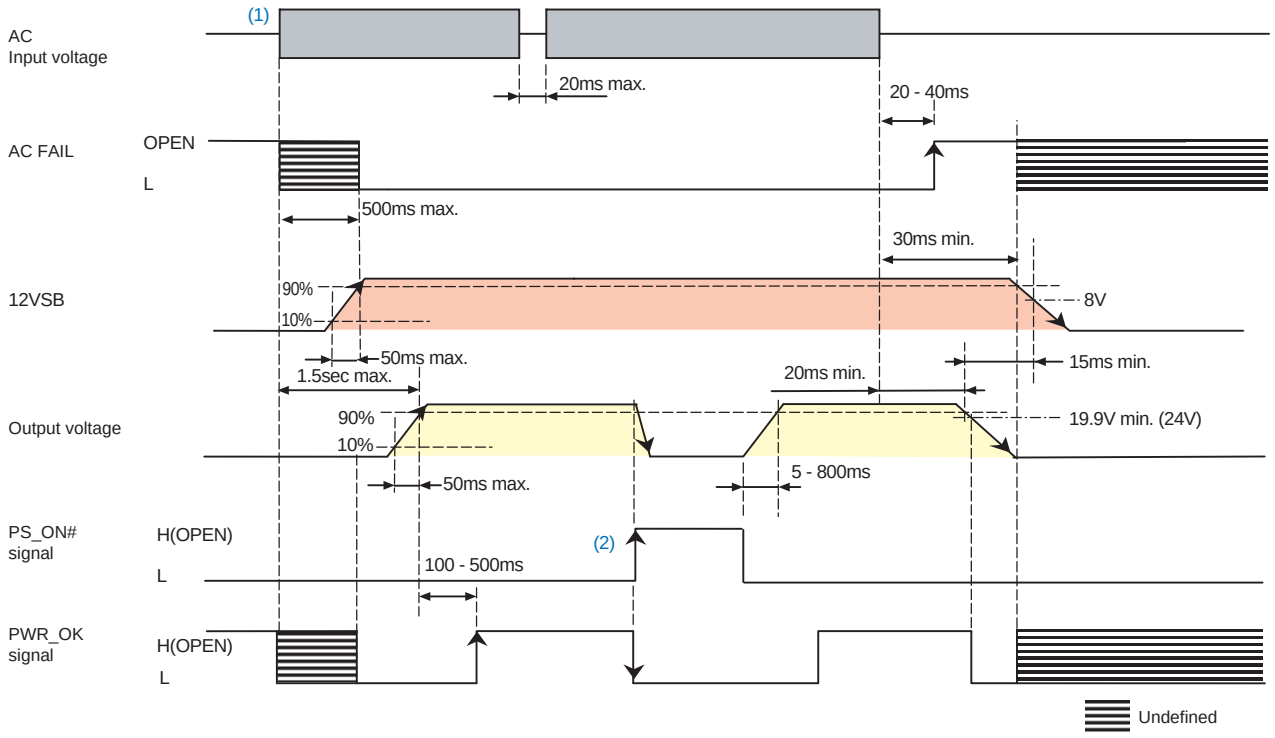
Internal Structure

RoHS fully compliant
Amount of hazardous materials in PWBs, wires, electronic components, coils, chassis, and labels specified by International standard is lower than acceptable level.



Simple layout design
Superior cooling and low inter-component interference layout design.

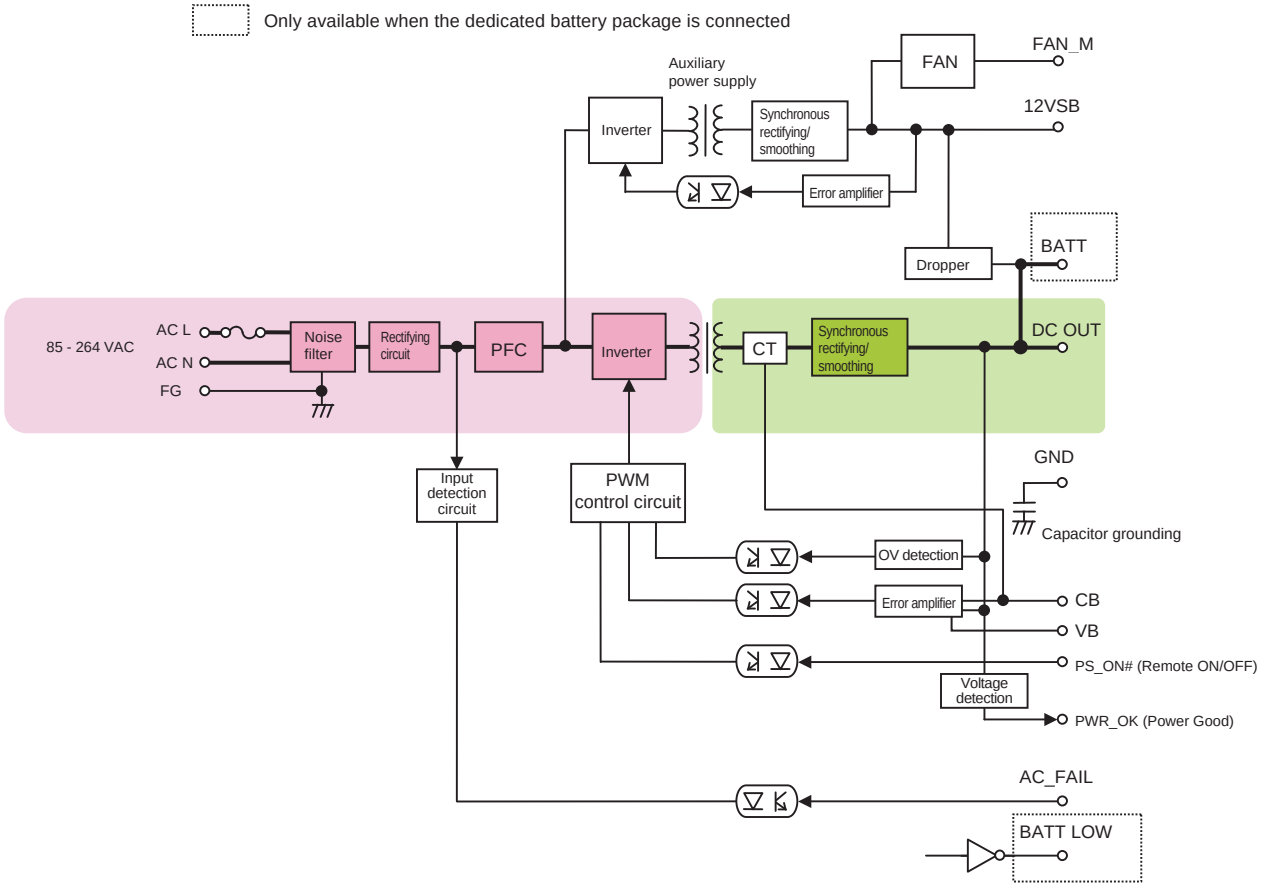
Sequence Diagram



* The time chart for when a dedicated battery package is connected is shown with thick broken lines.

(1)All outputs start up by being supplied AC input under the condition of PS_ON# 'L'. PWR_OK 'H (OPEN)' is delivered at 100 - 500ms after the output has risen.
(2) At PS_ON# 'H'(OPEN) input, outputs except for +12VSB shut down (all outputs including 12VSB shut down at backup operation).

Block Diagram

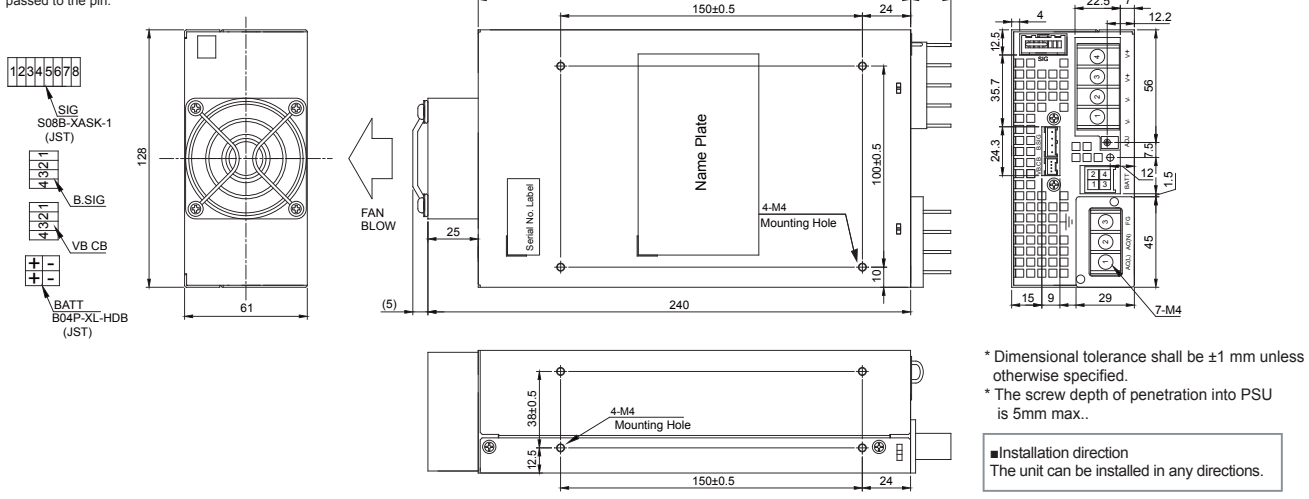


Outline Drawing

SIG Connector Pin assignments

Connector	Pin #	Signal Name	Max Current	Note
SIG	1	COM	0.6A	Common with output GND
	2	FAN_M1	10mA	
	3	N.C	10mA	
	4	PS_ON#	10mA	
	5	PWR_OK	10mA	
	6	AC FAIL	4mA	
	7	BATT LOW	10mA	Only if the battery is connected.
	8	+12VSB	0.5A	0.3A max. during backup operation

Note: When using the pin 1 COM of the SIG connector, make sure that the current of main output will not be passed to the pin.

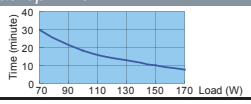


* Dimensional tolerance shall be ±1 mm unless otherwise specified.
* The screw depth of penetration into PSU is 5mm max..

■Installation direction
The unit can be installed in any directions.

Optional Components (Sold Separately)

Battery package

Picture	Model	Type	Shape (size)	Backup Time
	BS14A-H24/2.5L	Ni-MH	1U/3U size (W×D×H=128×211×41mm)	

* The backup time is a reference value at initial use; it is not a guaranteed value.
* The backup time can be extended with parallel connection.
* Battery package can be connected to GPSA-600-24-TP (backup type) only.

Cable

Picture	Model	Type	Description
	WH-08XA08XA-500	Signal harness	For BATT_LOW, AC_FAIL, FAN_M, PS_ON, PWR_OK, and +12VSB
	WH-16PAD04XA-350	Signal harness for connecting the battery pack	Signal harness to connect one battery package (BS14A-H24/2.5L)*
	WH-16PAD04XA-350-01	Signal harness for connecting the battery pack	Signal harness to connect two battery packages (BS14A-H24/2.5L)*
	WH-04XL04XL-350	Power harness for connecting the battery pack	Power harness to connect one battery package (BS14A-H24/2.5L)*
	WH-02XL04XL-350-01	Power harness for connecting the battery pack	Power harness to connect two battery packages (BS14A-H24/2.5L)*
	WH-04PA04PA-100	Signal harness for parallel operation	For connecting 2 pieces of GPSA-600 in parallel
	WH-04PA04PA-100-1	Signal harness for parallel operation	For connecting 3 pieces of GPSA-600 in parallel

* The harness is necessary to connect with the battery package (BS14A-H24/2.5L) for backup operation (See the following figures “Configurations of Battery Connection Harnesses”).

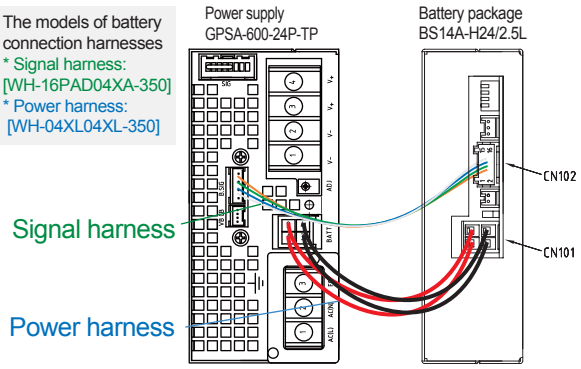
Parts / Unit

Picture	Model	Type	Description
	ACC6183	Output bar for parallel operation	For connecting 2 pieces of GPSA-600 in parallel
	ACC6185	Output bar for parallel operation	For connecting 3 pieces of GPSA-600 in parallel

Battery connection harness and connection images

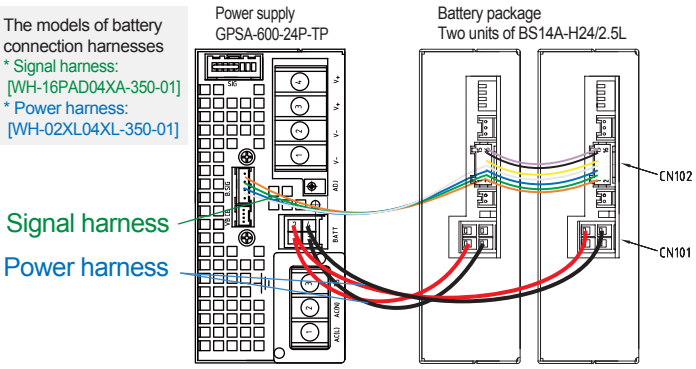
Connecting one battery package (BS14A-H24/2.5L)

The models of battery connection harnesses
* Signal harness: [WH-16PAD04XA-350]
* Power harness: [WH-04XL04XL-350]



Connecting two battery packages (BS14A-H24/2.5L)

The models of battery connection harnesses
* Signal harness: [WH-16PAD04XA-350-01]
* Power harness: [WH-02XL04XL-350-01]



Connection in Series and Parallel

■Series operation

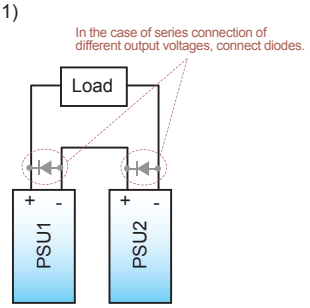
Series connection is available as shown on the right.
* Series connection with different output voltage of GPSA is available, such as 12V and 24V.

Note: In the case that different voltages are connected in series like Fig. (1) on the right;

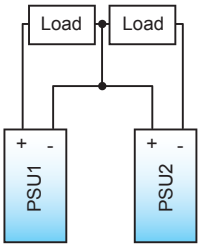
1. The output current shall be the rated current or less of the smaller rated current among the PSU1 and PSU2 connected in series.

2. Connect diodes for protection as shown in the Fig. (1).
Current rating of the diode shall be 1.5 times or more of rated output current whose unit has larger rated output current among PSU1 and PSU2.
Also, use Schottky diodes whose forward voltage is lower than the forward voltage of the diodes used in the PSU.

(1)

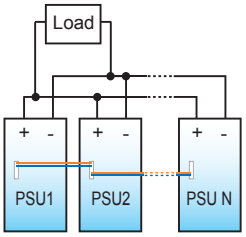


(2)



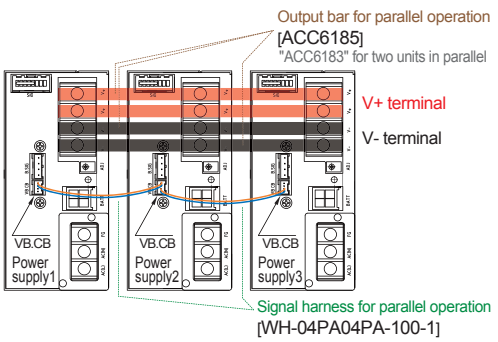
■Parallel connection

Parallel connection up to three units is available by the connecting method as shown below.
*By connecting the outputs of N power supplies in parallel, output capacity "Rated output x N units x 0.9" will be obtained.
In this case, please beware of the followings.



1. Current balancing:
Output current of each parallel connected power supply will be balanced.
Connect voltage balancing connector (VB), and current balancing connector (CB) of power supply. (Refer to parallel connecting diagram)
2. Wiring:
Load wires from each power supplies should be wired to make both impedance equal as much as possible.
- Connecting by the output bar for parallel operation, ACC6183 (for two units in parallel) or ACC6185 (forthree units in parallel) is recommended.
3. Parallel operation is not available for 12VSB.
4. Output voltage adjustment:
EXCEPT master power supply, set output voltage adjusting knob to minimum (to the leftmost). Adjust output voltage with master power supply output voltage adjusting knob.
5. Starting time:
When starting up the power supply by AC input, operating waveform of output voltage may be tiered or dropped down (caused by the operation of over current protection circuit) due to dispersion of start up time of the power supplies connected in parallel. It can be prevented by starting up each output at the same time using output ON/OFF control signal of both power supplies connected in parallel.
6. Power supply failure:
Because it does not include ORing diode in the output terminal, output power does not remain when one of the power supplies is damaged due to short mode etc. In addition, output power does not remain normally when power supply in operation is connected to the one in shutdown condition in parallel.
7. Please turn ON/OFF AC voltage or input PS_ON signal at the same time.
8. Please set the min. output current "more than 5% of number of units connected x rated current".
(eg. More than 2.5A when connecting two 24V output models in parallel)

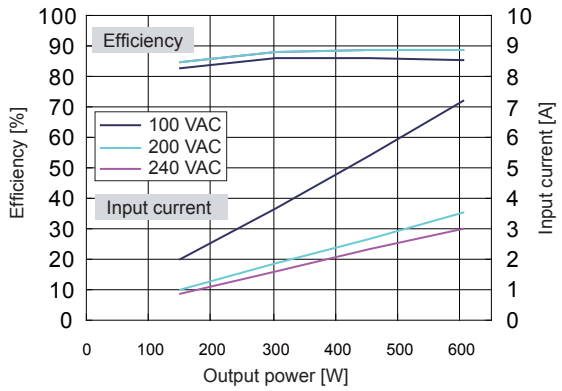
■Paralell connecting diagram
(In case of connecting three power supplies,GPSA-600-**P-**,in parallel)



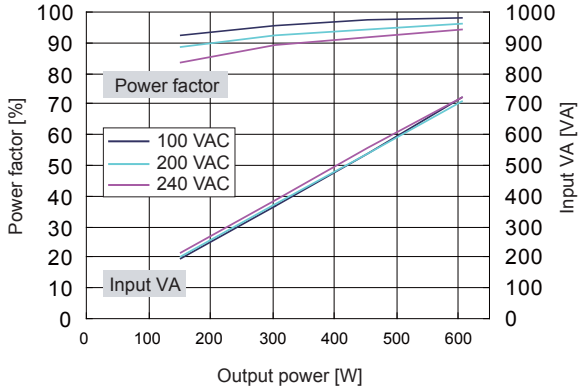
As in parallel connecting diagram, connect each voltage balancing connector (VB) and current balancing connector (CB) with parallel operating signal harness "WH-04PA04PA-100-1".

Characteristics Data GPSA-600-24P-TP (Examples of actual measurement)

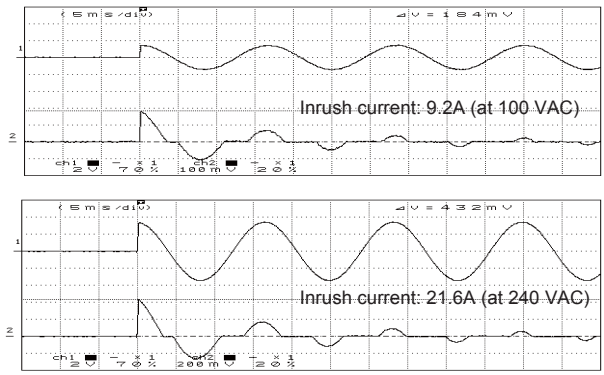
● Fig.4 Efficiency / Input Current vs. Output Power



● Fig.5 Power Factor / Input VA vs. Output Power



● Fig.6 Inrush Current



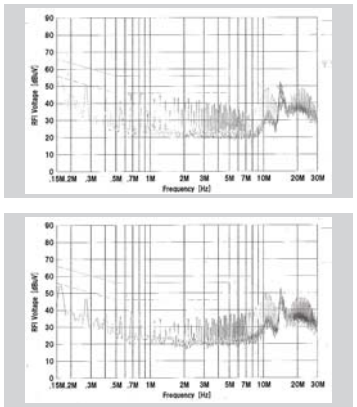
● Fig.7 Leakage Current

Input: 100 / 240 VAC
Load: Rated and min. load

	Rated load	Min. load
100 VAC	0.22mA	0.22mA
240 VAC	0.57mA	0.58mA

● Fig.8 Conducted Emission at 100 VAC

Input: 100 VAC
Load: Rated
Mode: Peak



VCCI Class B

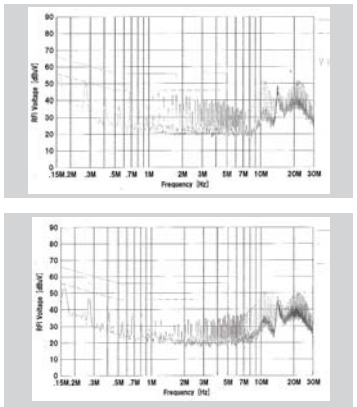
Measuring point: L1-FG

Measuring point: L2-FG

In-house measurement data

● Fig.9 Conducted Emission at 230 VAC

Input: 230 VAC
Load: Rated
Mode: Peak



VCCI Class B

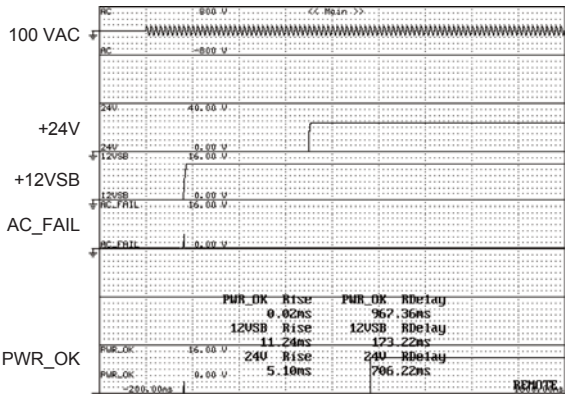
Measuring point: L1-FG

Measuring point: L2-FG

In-house measurement data

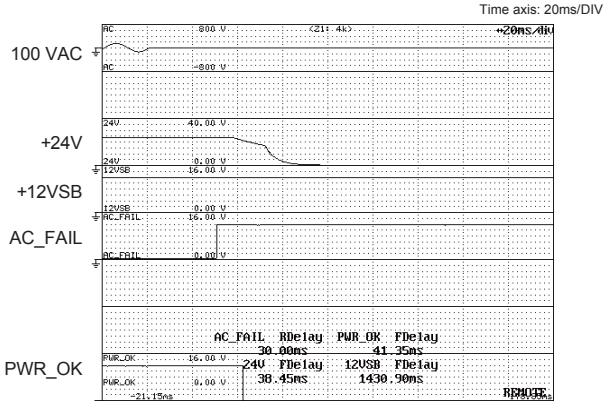
● Fig.10 Rising Characteristics at 100 VAC

Input: 100 VAC
Load: Rated
Time axis: 200ms/DIV



● Fig.11 Falling Characteristics at 100 VAC

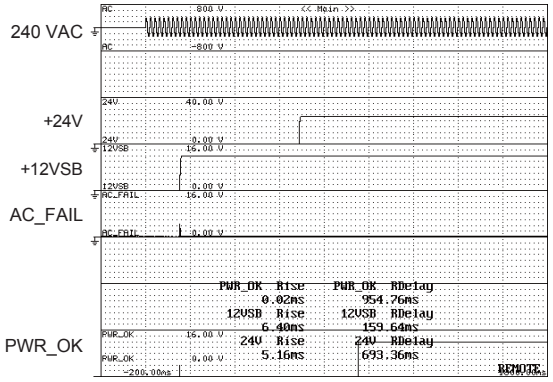
Input: 100 VAC
Load: Rated
Time axis: 20ms/DIV



Characteristics Data GPSA-600-24P-TP (Examples of actual measurement)

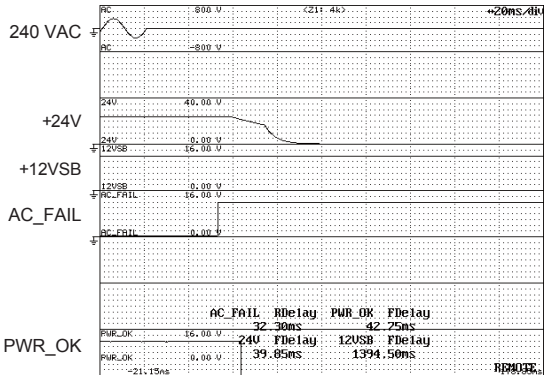
● Fig.12 Rising Characteristics at 240 VAC

Input: 240 VAC
Load: Rated
Time axis: 200ms/DIV



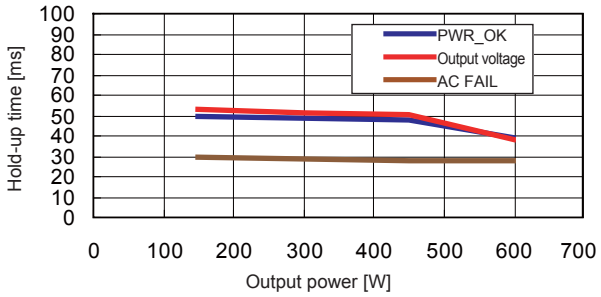
● Fig.13 Falling Characteristics at 240 VAC

Input: 240 VAC
Load: Rated
Time axis: 20ms/DIV



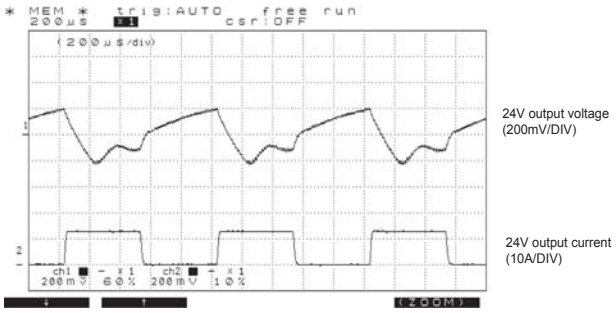
● Fig.14 Output Hold-up Time vs. Output Power

PWR_OK: the point that PWR_OK signal goes to "L"
Output voltage: the point that output voltage decreases to 95%
AC FAIL: the point that AC FAIL signal is delivered



● Fig.15 Dynamic Load Fluctuation Characteristics at 1kHz

Input: 100 VAC
Load: 300W
Time axis: 200μs/DIV



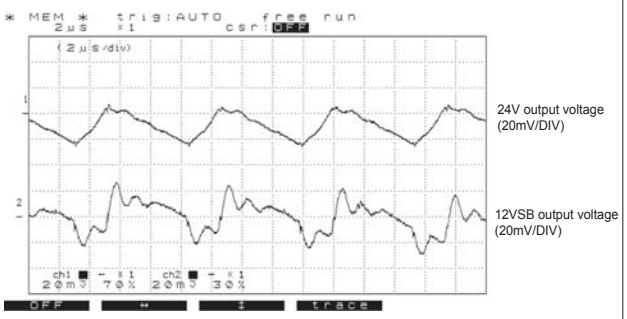
● Fig.16 Output Voltage Regulation

Output	Min. load	Rated load	Peak load
24V output	0A	25A	60A

AC input voltage	85 VAC	100 VAC	240 VAC	264 VAC
24V output (min. load)	23.983V	23.983 V	23.972 V	23.972 V
24V output (50%)	23.967 V	23.969 V	23.960 V	23.960 V
24V output (rated load)	23.956 V	23.958 V	23.953 V	23.953 V
24V output (peak)	23.929 V	23.928 V	23.893 V	23.894 V

● Fig.17 Ripple and Spike Voltage

Input: 100 VAC
Load: Rated
Time axis: 2μs/DIV



● Fig.18 Ambient Temperature vs. Expected Service Life

Input: 100 VAC
Load: Rated
Operating time: 24 consecutive hours

■ Electrolytic capacitors

Intake air temp.	20°C	30°C	40°C
Expected service life (yr)	approx. 63.2	approx. 31.6	approx. 15.8

* Lifetime shall be 15 years at longest due to deterioration of sealing plates.

■ Fan

Ambient temp.	20°C	30°C	40°C
Expected service life (yr)	approx. 14.5	approx. 14.5	approx. 14.5

● Fig.19 Over Current Protection (V-I Characteristic)

Input: 100 VAC