Nipron
GAZE into the future

2019 January

Power Supply for Desktop PC

HPCSF-400P series

Nipron Co.,Ltd.

Small size and high efficiency SFX power supply
optimum for industrial application.


HPCSF-400P-X2S1


BS28A-H350/2.5L

HPCSF-400P-X2B


mHPCSF-400P-X2S1

HPCSF-400P series Continuous: 310 W Peak: 400 W

Series lineup

Standard model
HPCSF-400P-X2S1

Small size and high efficiency SFX power supply optimum for industrial application.

Even though it is a small SFX power supply, it achieves a max. efficiency of 88.9%* and is certified with 80 PLUS BRONZE.

*Typical value at 200V AC input

Supports backup for momentary power failure and blackout model
HPCSF-400P-X2B


BS28A-H350/2.5L

HPCSF-400P-X2B

Use a Nonstop power supply to build a secure system that does not stop running with a blackout.

Even in blackouts, it switches to the battery power with no instantaneous interruption to enable a secure backup system without damaging the system. Also, because the battery pack can be embedded in the PC housing, it can be more space-saving than common UPS.

Medical standard IEC60601-1 Ed.3.1 (MOOP) certified model
mHPCSF-400P-X2S1

The system becomes miniaturized and less expensive by the power supply certified with medical standard.

This model with the medical standard has built-in dual fuses and a medical insulated transformer, so fuses or a transformer are not necessary externally. It is possible to reduce the size and the cost of the device in comparison with a power supply that is not certified with the medical standard.

Output specification X2S1 X2B Medical

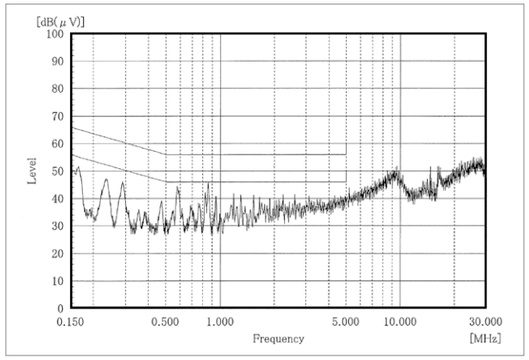
Output voltage	+3.3V	+5V	+12V	-12V	+5VSB
Continuous maximum current/power	16A	16A	25A	0.5A	2A
	90W		300W	6W	10W
	300W				
	310W				
Peak current/power (within 5s)	20A	20A	30A	0.5A	3A
	120W		360W	6W	15W
	385W				
	400W				
Minimum current	0A	0A	0A	0A	0A

Low noise, low leakage current X2S1 X2B Medical

The power supply unit clears VCCI Class B for conducted emissions. It reduced leakage current to 0.05mA at 100V AC and 0.06mA at 240V AC. No need for an external noise filter, helping to save associated work and costs.

Conducted emission

[At 100V AC rated load]
* an example measurement



Leakage current

*an example measurement

Input voltage	Rated load	Minimum load
100V AC	0.05mA	0.04mA
200V AC	0.06mA	0.04mA
240V AC	0.06mA	0.05mA

Standby power

*an example measurement

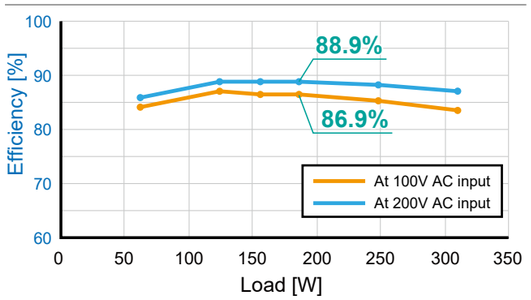
It achieved standby power 0.5W or less and supports ErP directive.

Input voltage	100V AC	240V AC
Standby power	0.08W	0.08W

High efficiency X2S1 X2B Medical

It achieves maximum efficiency of 88.9% typ. It reduces significantly power loss, minimizes power consumption during operation of equipment and contributes to mitigation of environmental load.

Efficiency graph (an example measurement)



Other features X2S1 X2B Medical

- Low sound noise design by adopting a temperature controlled variable-speed fan
- Minimum load current 0A for all outputs
- Double-sided PCB with plated through hole adopted

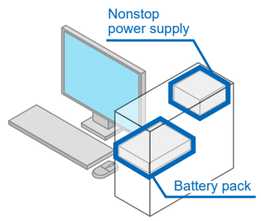
What is Nonstop power supply? *X2B*

Nonstop PSU enables a secure backup system even with a blackout.

Even in blackouts, it switches to the battery power with no instantaneous interruption to enable a secure backup system without damaging the system.

Space saving

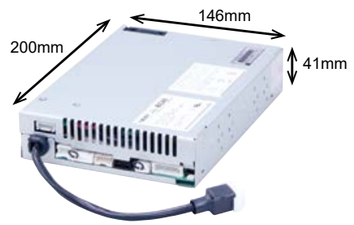
Because the battery pack can be contained in the PC housing, more space can be saved compared to commonly found external UPS.



Compatible battery pack *X2B*

For 5-inch bay installation

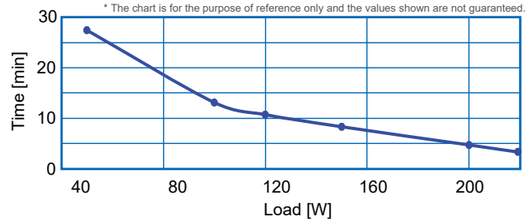
BS28A-H350/2.5L Nickel metal hydride battery pack



Battery backup discharge characteristics

Measured with power supply unit [HPCSF-400P-X2B]

* The chart is for the purpose of reference only and the values shown are not guaranteed.



Battery features *X2B*

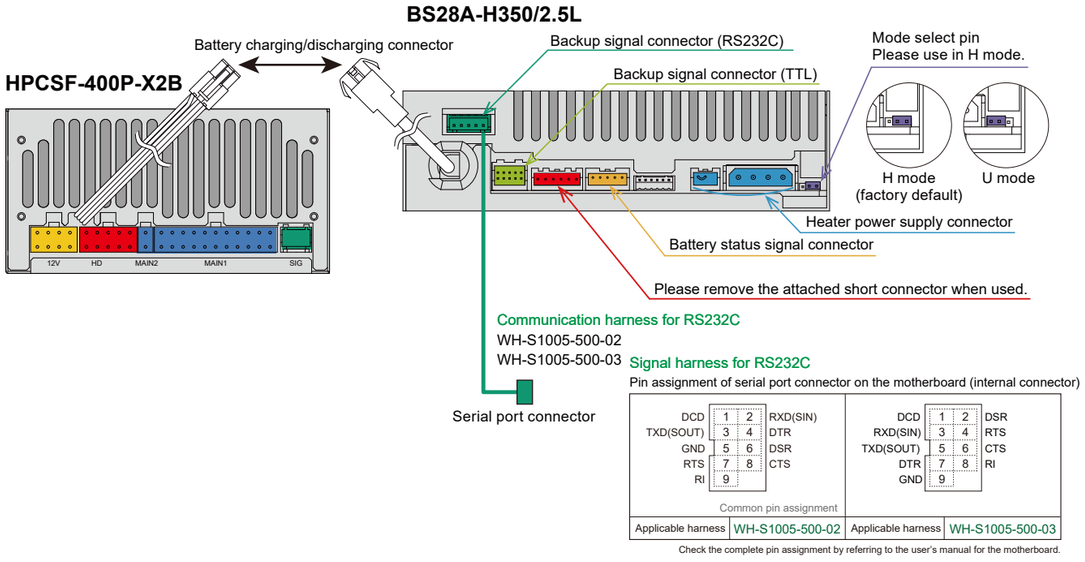
- Adoption of a nickel metal-hydrate battery
- Prevents the drop in the capacity at low temperature with a built-in heater
- Status outputs (remaining capacity/battery life notification) available for the battery pack
- Low standby power consumption

Measured with power supply unit [HPCSF-400P-X2B]

*an example measurement

Input AC	Standby power
	PSU + battery
100V	0.19W
115V	0.19W
240V	0.26W

Conceptual connection diagram *X2B*



Pin assignment of serial port connector on the motherboard (internal connector)

Applicable harness	WH-S1005-500-02	Applicable harness	WH-S1005-500-03

Check the complete pin assignment by referring to the user's manual for the motherboard.

Feature of the Power supply certified with medical standard *Medical*

Medical standard IEC60601-1 Ed.3.1(MOOP) certified

MOOP Means of Operator Protection:
Protective measures to reduce the risk of electric shock to people other than the patient

In the medical sector, electrical devices are required to conform to each country's medical standards in accordance with IEC 60601-1, the technical standard for medical electrical equipment published by the International Electrotechnical Commission (IEC). Because of the emphasis on safety, the required specifications are quite strict in comparison with IEC 62368-1, the standard for safety of information processing equipment.

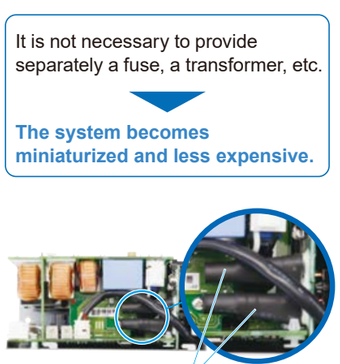
Achieve low-cost, secure, and safe medical electrical equipment

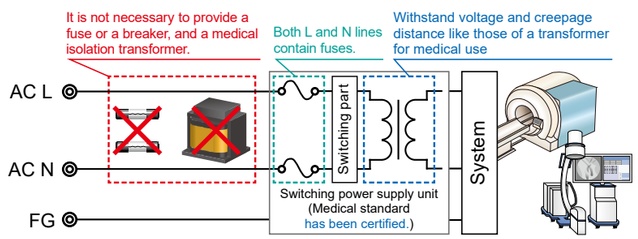
Use of the m-series (medical standard approved) eliminates the need for an external fuse or insulated transformer in applying for the medical standard. In addition, it is also possible to reduce the size and cost of the device in comparison with power supply units that are not certified for the medical standard.

▶ In the case that a power supply is certified with medical standard.

It is not necessary to provide separately a fuse, a transformer, etc.

The system becomes miniaturized and less expensive.

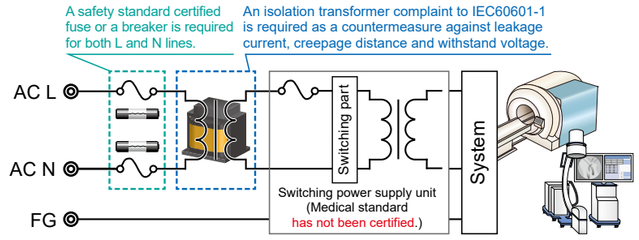




▶ In the case that a power supply is not certified with medical standard.

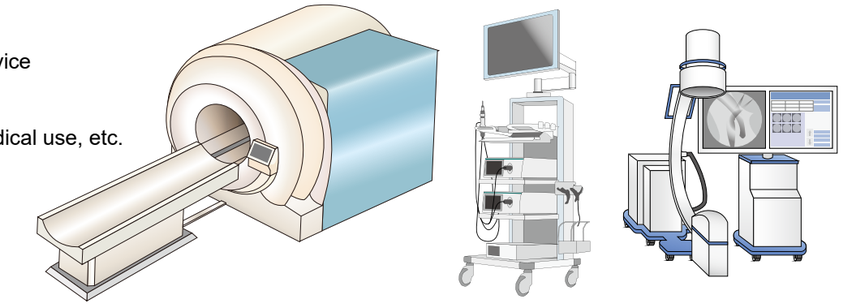
It is necessary to provide separately a fuse, a transformer, etc.
A fuse and a transformer shall be installed separately from a power supply unit.

The system becomes enlarged and more expensive.



Track record of adoption of PC power supply with medical standard *Medical*

PC for control of MRI
C-arm
3D imaging device
Endoscope
Monitor for medical use, etc.



Desktop PC Power Supply HPCSF-400P Series

Model	Description
HPCSF-400P-X2S	–
HPCSF-400P-X2S1	AC power cord retention clamp attachable
HPCSF-400P-X2B	Supports blackout backup

■Model Name Coding

HPCSF-400P-X2**

① ② ③ ④ ⑤ ⑥ ⑦

① Series name
② Output power
③ Peak power available
④ ATX output
⑤ +3.3V output equipped
⑥ S: Standard
B: Supports backup and AC power cord retention clamp
⑦ 1: AC power cord retention clamp attachable

Features

- ●80PLUS BRONZE approved SFX power supply
- ●Double-sided PCB with plated through hole suitable for industrial use.
- ●High efficiency with synchronous rectification circuit
- ●Min. load current is 0A for all outputs.
- ●Safety standard certified (IEC/UL/CSA/CCC)
- ●By building in the thermal-sensing variable speed fan, noise reduction can be realised.
- ●Power supply certified with medical standard model lineup (P.15)
- ●Blackout backup available model lineup

Safety standards	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

AC input	85-264V AC (Worldwide range, with PFC)

●Output

Output voltage	+3.3V	+5V	+12V	-12V	+5VSB
Max. current/ max. power (coutinuous)	16A	16A	25A	0.5A	2A
	Total 90W		300W	6W	10W
	Total 300W				
	Total 310W				
Peak current/ peak power (within 5s)	20A	20A	30A	0.5A	3A
	Total 120W		360W	6W	15W
	Total 385W				
	Total 400W				
Min. current	0A	0A	0A	0A	0A

●Dimension

W×H×D (mm)	125×63.5×125 (SFX APPENDIX C mounting surface size)

●Output connector (optional component)

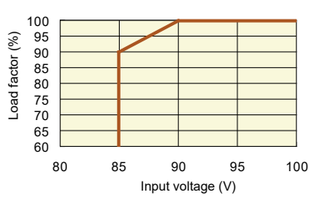
Main 20+4pin | Main 24pin | Main 20pin | AT | AUX | 12V 4pin | 12V 8pin | PCI-E 6pin | PCI-E 6+2pin | HDD | S-ATA | FDD

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification					Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)					Worldwide range *See <Fig.1> Low input voltage derating below.
	Input Frequency		50/60Hz					Frequency range 47-63Hz
	Efficiency		82% typ (100VAC), 85% typ (240VAC) *Characteristic data: Fig.4					At rated input/output
	Power Factor		96% min. (100VAC), 90% min. (240VAC) *Characteristic data: Fig.5					At rated input/output
	Inrush Current		31A peak (100VAC), 75A peak (240VAC) *Characteristic data: Fig.6					Rated input/output and reclosing input interval shall be 10s min. Cold start (25°C). Inrush current, 100µs or less, into X-capacitors of input noise filter is not specified here.
	Input Current		3.8A typ (100VAC), 1.6A typ (240VAC) *Characteristic data: Fig.4					
Output	Rated Voltage		+3.3V	+5V	+12V	-12V	+5VSB	
	Rated Current		8A	8A	19A	0.5A	2A	Reference value at measurement of input/output characteristics.
	Max. Current / Power		16A	16A	25A	0.5A	2A	Max. output power 310W
			90W max.		300W	6W	10W	
			300W max.					
			310W max.					
	Peak Current / Power		20A	20A	30A	0.5A	3A	Peak output power 400W Time: 5 sec or less Duty ratio of repetitive load: 10% or less
			120W max.		360W	6W	15W	
			385W max.					
			400W max.					
	Min. Current		0A	0A	0A	0A	0A	
	Total Voltage Accuracy (%)		±5 max.	±5 max.	±5 max.	±5 max.	±5 max.	Summation of temperature regulation, input regulation and load regulation.
	Max. Ripple Voltage (mVp-p)		50 max.	50 max.	120 max.	120 max.	50 max.	Connect an electrolytic capacitor (47µF) on the test board and measure with a 100MHz oscilloscope. The test board shall be separated from the load wire and placed within 150mm from the output terminal. *Characteristic data: Fig.17
	Max. Spike Voltage (mVp-p)		100 max.	100 max.	170 max.	170 max.	100 max.	
Protection	Over Current Protection	OCP point (A)	21 min.	21 min.	31 min.	Short protection		Other outputs are at rated load and rated input.
		Method	All outputs except +5VSB are shut down.			Hold down current limiting	All outputs shut down	All outputs shut down with a +5VSB short-circuit (automatic recovery)
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'			Automatic recovery		Reclosing AC input (10 sec min. interval)
	Over Voltage Protection	OVP point (V)	3.76-4.3	5.74-7.0	13.4-15.6	–	7.0	
		Method	All outputs except +5VSB are shut down.			–	Zener Clamp	
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'			–	–	Reclosing AC input (10 sec min. interval)
Environment	Operating Temp./ Humidity		0-60°C*/10-90%					*Refer to <Fig.3> Temperature derating below. There shall be no condensation
	Storage Temp./Humidity		-20-70°C/10-95%					There shall be no condensation
	Vibration		Acceleration amplitude: 2G (10-55Hz), Sweep cycles: 10 times in the X-, Y-, and Z-axes					Follow 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					Follow JIS-C-60068-2-31 at no operation
Insulation	Dielectric Strength		AC input - FG/DC output: 1500VAC for 1 minute					Cut-off current 10mA
	Insulation Resistance		AC input - FG/DC output: 50MΩ min.					At 500VDC
	Leakage Current		0.2mA max. (100VAC)/0.4mA max. (200VAC)/0.5mA max. (240VAC) *Characteristic data: Fig.7					IEC60950 compliant
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS, cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)					Measured by INS-410 There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant					
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant					
	Fast Transient Burst		EN61000-4-4 compliant					
	Lightning Surge		EN61000-4-5 compliant					
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant					
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant					
	Voltage dips/Regulation		EN61000-4-11 compliant					
	Conducted Emmision		VCCI-B, FCC-B, CISPR22-B, EN55022-B compliant *Characteristic data: Fig.8, 9					Measured by single unit
	Harmonic Current Regulations		IEC61000-3-2 (Ver 2.1) classD					At rated input/output
Others	Safety Standards		UL60950, CSA60950(c-UL), CCC certified, PSE (ordinance clause 2) compliant, CE Marking (LVD,EMC)					
	Cooling System		Forced air cooling: thermal-sensing variable speed fan embedded					The speed changes with the temperature and the load condition.
	Output Grounding		Connected chassis (FG)					
	Output Hold-up Time		AC cut-off → PWR_OK holds up 16ms min. *Characteristic data: Fig.14					At rated output
	Reliability Grade		FA (Industrial equipment grade to use double-sided PCB with plated through hole)					Following our standard
	MTBF		80,000 H min					Based on EIAJ RCR-9102
	Weight		1.0 kg typ					
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.					Except for errors caused by operation not specified in this specification.

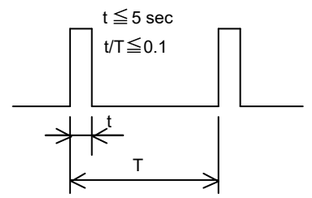
<Fig.1> Low input voltage derating

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



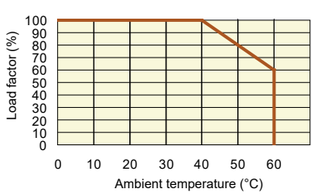
<Fig.2> Duty Ratio

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

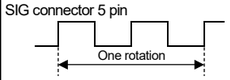


<Fig.3> Temperature Derating

When the ambient temperature (near the airflow inlet) exceeds 45°C, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.



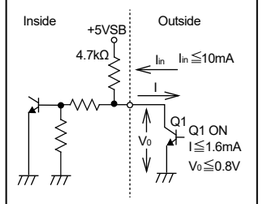
Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (PS_ON#)	+3.3V, +5V, +12V and -12V outputs are delivered with 'L' input. +3.3V, +5V, +12V and -12V outputs shutdown with 'H' or 'OPEN' input.	MAIN1 connector 22 pin
	+3.3V SENSE	The input terminal to detect the voltage of +3.3V output; by connecting to the load terminal, only the line drop of the + side of the output cable is compensated.	MAIN1 connector 2 pin SIG connector 8 pin
	FAN control signal (FAN_C)	The control terminal of fan motor; the fan motor is forcibly rotated at full speed at 'L' input.	SIG connector 4 pin
Output Signal	Normal output signal (PWR_OK)	'H' signal is delivered when the +5V output is normal.	MAIN connector 21 pin
	Fan monitoring signal (Fan_M)	Two cycle pulses per one rotation of the fan motor are delivered (open collector output). Duty ratio of the pulse shall be 0.5 typ. (Interval between the signals becomes longer at low speed and shorter at high speed.) The signal remains 'L' or 'OPEN' when the fan stops caused by any failure or malfunction.	SIG connector 5 pin 

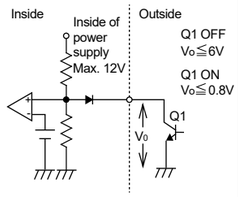
Signal Circuit

Input Signal Circuit

(PS_ON#)

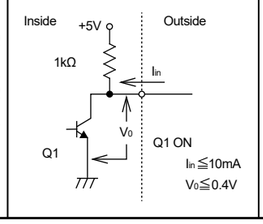


(FAN_C)

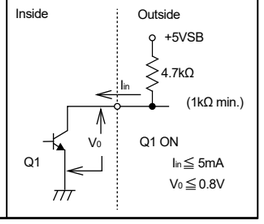


Output Signal Circuit

(PWR_OK)

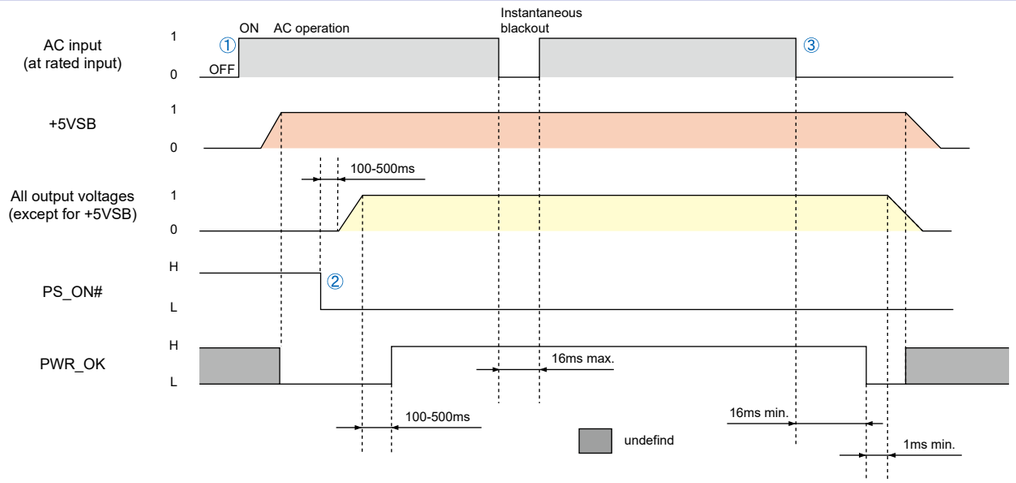


(FAN_M)



Internal structure (HPCSF-400P-X2S)

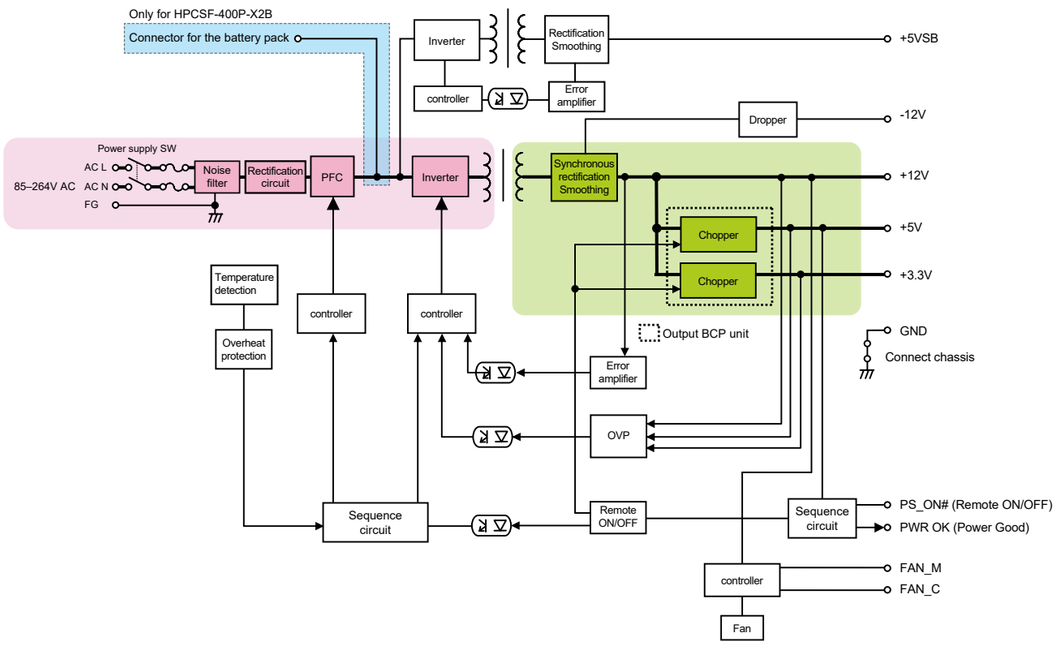
Sequence Timing Chart



(1) Only +5VSB output starts up by supplying AC input while PS_ON# is "H" status.
(2) All outputs start up by inputting PS_ON# "L". PWR_OK 'H' is delivered at 100-500 ms after +5V output starts up.
(3) At blackout, PWR_OK 'L' is delivered after 16ms or more. After that, all outputs (except +5VSB) shut down after 1ms or more.

-Rise time difference among outputs shall be 50ms max.
-The output voltage level at rising of +12V shall be higher than that of +3.3V.
Also, difference in output voltage level between +5V and +3.3V shall be from -0.6V to 2.25V inclusive.
-The order and difference in level of output voltage for each output voltage at falling shall not be specified.
-Rise time of PWR_OK signal shall be 10ms or less.
(provided that capacitive load is not connected to PWR_OK signal output)

Block Diagram

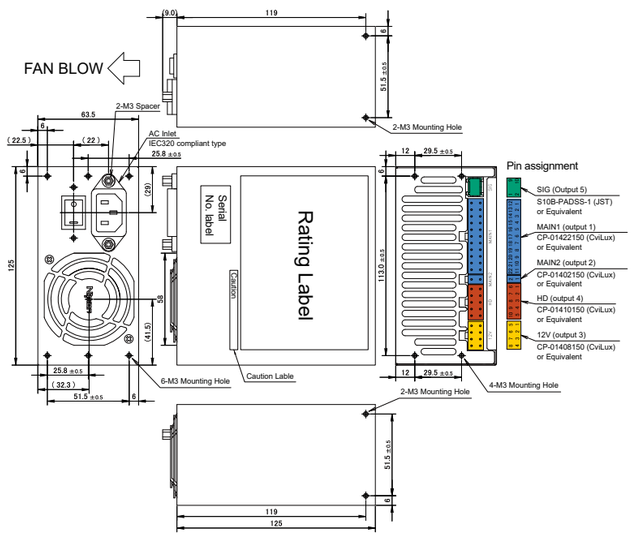


Outline Drawing

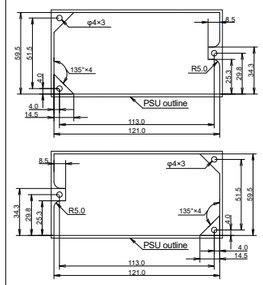
HPCSF-400P-X2S1

CN Name	PIN No.	FUNCTION	MAX. CURRENT
MAIN1	1	+3.3V	6 A
	2	+3.3V SE	–
	3	+12V	6 A
	4	+5V	6 A
	5	+5V	6 A
	6	COM	6 A
	7	COM	6 A
	8	COM	6 A
	9	COM	6 A
	10	+12V	0.5A
	11	+5VSB	2 A
	12	+3.3V	6 A
	13	+3.3V	6 A
	14	+12V	6 A
	15	+5V	6 A
	16	+5V	6 A
	17	COM	6 A
	18	COM	6 A
	19	COM	6 A
	20	COM	6 A
	21	PWR_OK	10 mA
	22	PS_ON	10 mA
MAIN2	1	+5V	6 A
	2	+3.3V	6 A

CN Name	PIN No.	FUNCTION	MAX. CURRENT
12V	1	COM	6 A
	2	COM	6 A
	3	COM	6 A
	4	COM	6 A
	5	+12V	6 A
	6	+12V	6 A
	7	+12V	6 A
	8	+12V	6 A
HD	1	+3.3V	6 A
	2	+5V	6 A
	3	COM	6 A
	4	COM	6 A
	5	+12V	6 A
	6	+3.3V	6 A
	7	+5V	6 A
	8	COM	6 A
	9	COM	6 A
	10	+12V	6 A
SIG	1	NC	–
	2	NC	–
	3	NC	–
	4	FAN_C	–
	5	FAN_M	5 mA
	6	PS_ON	10 mA
	7	COM	2 A
	8	+3.3V SE	–
	9	NC	–
	10	+5VSB	2 A



How to process the mounting holes
(Recommended)



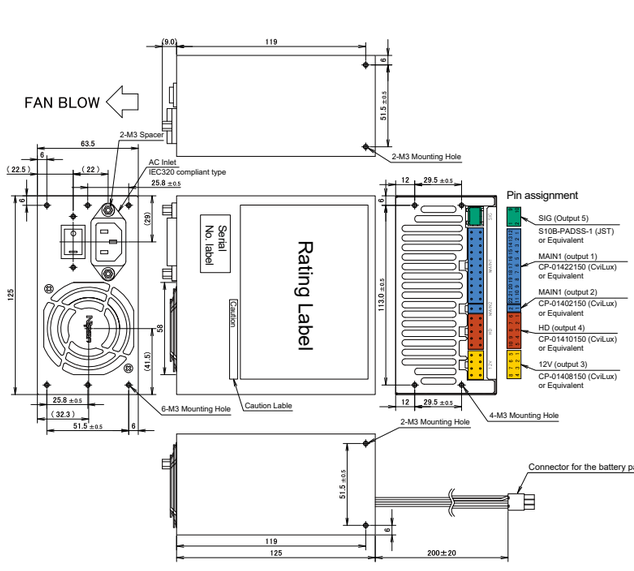
■Installation direction
The unit can be installed in any directions.

*1 Dimensional tolerance shall be ± 1mm unless otherwise specified.
*2 The screw depth of penetration into PSU is 6mm max.

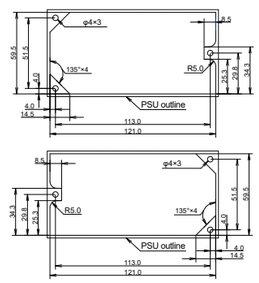
HPCSF-400P-X2B

CN Name	PIN No.	FUNCTION	MAX. CURRENT
MAIN1	1	+3.3V	6 A
	2	+3.3V SE	–
	3	+12V	6 A
	4	+5V	6 A
	5	+5V	6 A
	6	COM	6 A
	7	COM	6 A
	8	COM	6 A
	9	COM	6 A
	10	+12V	0.5A
	11	+5VSB	2 A
	12	+3.3V	6 A
	13	+3.3V	6 A
	14	+12V	6 A
	15	+5V	6 A
	16	+5V	6 A
	17	COM	6 A
	18	COM	6 A
	19	COM	6 A
	20	COM	6 A
	21	PWR_OK	10 mA
	22	PS_ON	10 mA
MAIN2	1	+5V	6 A
	2	+3.3V	6 A

CN Name	PIN No.	FUNCTION	MAX. CURRENT
12V	1	COM	6 A
	2	COM	6 A
	3	COM	6 A
	4	COM	6 A
	5	+12V	6 A
	6	+12V	6 A
	7	+12V	6 A
	8	+12V	6 A
HD	1	+3.3V	6 A
	2	+5V	6 A
	3	COM	6 A
	4	COM	6 A
	5	+12V	6 A
	6	+3.3V	6 A
	7	+5V	6 A
	8	COM	6 A
	9	COM	6 A
	10	+12V	6 A
SIG	1	NC	–
	2	NC	–
	3	NC	–
	4	FAN_C	–
	5	FAN_M	5 mA
	6	PS_ON	10 mA
	7	COM	2 A
	8	+3.3V SE	–
	9	NC	–
	10	+5VSB	2 A



How to process the mounting holes
(Recommended)



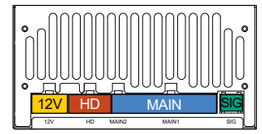
■Installation direction
The unit can be installed in any directions.

*1 Dimensional tolerance shall be ± 1mm unless otherwise specified.
*2 The screw depth of penetration into PSU is 6mm max.

Options (Sold separately)

Detachable output harness

Model	Length and type of connector
Main harness MAIN	
WH-M2022-500	MAIN 500±10 20Pin
WH-M2022-300	MAIN 300±10 20Pin
WH-M2422-500	MAIN 500±15 24Pin
12V harness 12V	
WH-V0808-500	12V 500±15 12V 8Pin
WH-V0408-500	12V 500±15 12V 4Pin
WH-VG208-500	12V 500±15 12V 4Pin / PCI-E 6Pin
WH-VV208-500-02	12V 500±10 12V 8Pin / 12V 8Pin
WH-VG208-500-02	12V 500±10 12V 8Pin / PCI-E 6Pin
HD harness HD	
WH-PP610-850	HD 550±15 150±15 150±15 Peripheral (HD)
WH-PS610-850	HD 550±15 150±15 150±15 FD
WH-PS710-850	HD 550±15 150±15 150±15 850±15 S-ATA
WH-PS810-1000	HD 550±15 150±15 150±15 150±15
SIG harness SIG	
WH-S0610-500	SIG 500±15 SIG-1
WH-S0610-500-01	SIG 500±15 SIG-2
WH-S0310-500	SIG 500±15 SIG-3



Acceptable cables

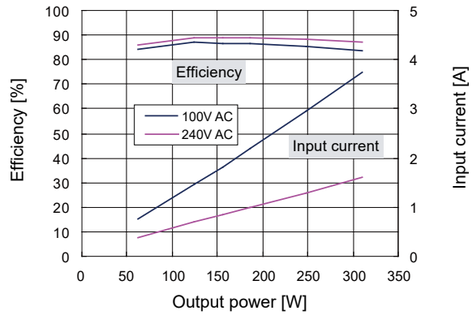
MAIN	12V	HD	SIG
1 model	1 model	1 model	1 model

Cable

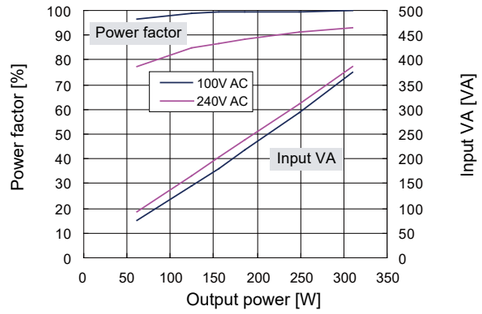
Photos	Model	Category	Description
	WH2753-02	AC power cord	125VAC 12V (tracking resistance type) [PSE]
	WH-S1005-500-02	Harness for RS232C communication	Harness for automatically shut down at blackout Connect to battery pack (BS28A-H350/2.5L).
	WH-S1005-500-03	Harness for RS232C communication	Harness for automatically shut down at blackout Connect to battery pack (BS28A-H350/2.5L).

Characteristics Data HPCSF-400P-X2S (Examples of actual measurement)

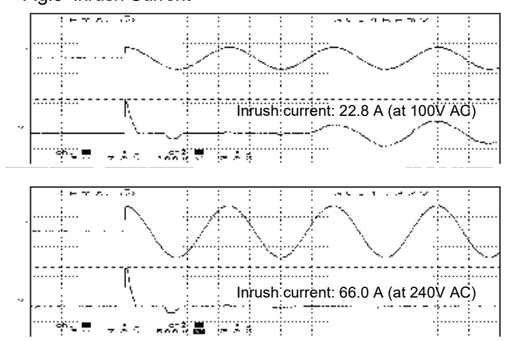
● Fig.4 Efficiency/Input Current vs. Output Power



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



● Fig.6 Inrush Current



● Fig.7 Leakage Current

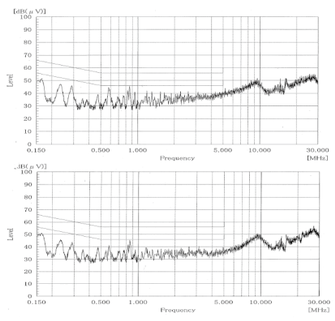
Input : 100, 200, 240V AC
Load : Rated load and Min. load
Measurement conditions: IEC60950 compliant

	Rated load	Min. load
100V AC	0.053mA	0.041mA
200V AC	0.061mA	0.047mA
240V AC	0.065mA	0.050mA

● Fig.8 Conducted Emission at 100V AC

Input : 100V AC
Load : Rated
Mode : Peak

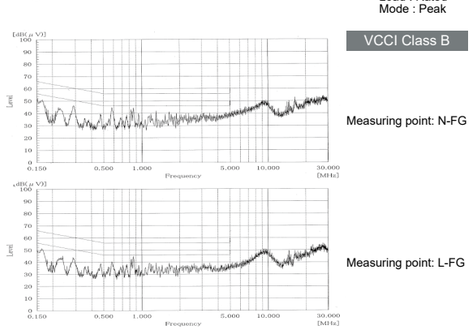
VCCI Class B



● Fig.9 Conducted Emission at 230V AC

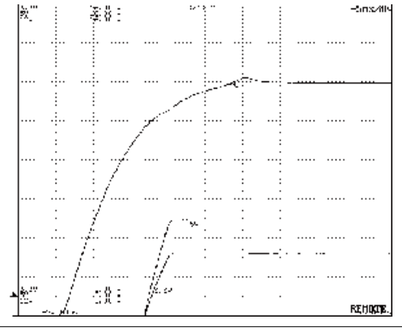
Input : 230V AC
Load : Rated
Mode : Peak

VCCI Class B



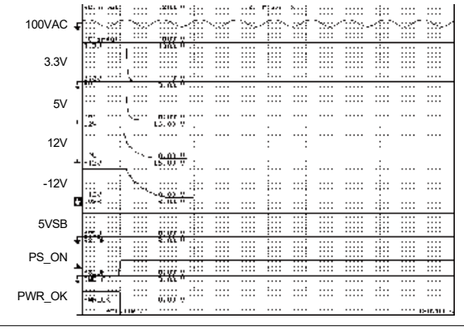
● Fig.10 Rising Characteristics at 100V AC

Input : 100V AC
Load : Rated
Time axis : 5 ms/DIV



● Fig.11 Falling Characteristics at 100V AC (at remote OFF)

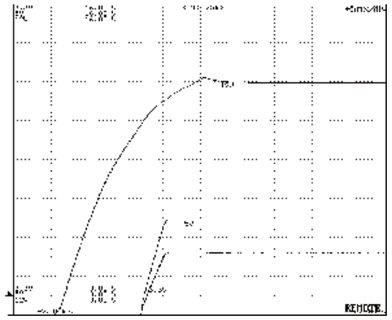
Input : 100V AC
Load : Rated
Time axis : 20 ms/DIV



Characteristics Data HPCSF-400P-X2S (Examples of actual measurement)

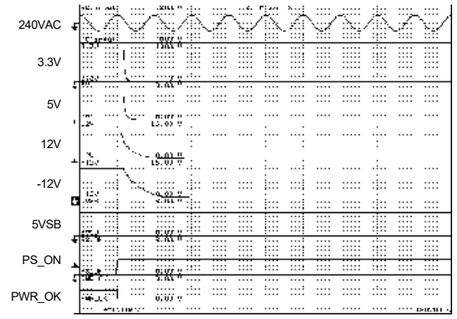
● Fig.12 Rising Characteristics at 240V AC

Input : 240V AC
Load : Rated
Time axis : 5 ms/DIV



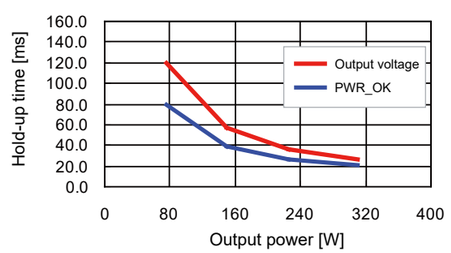
● Fig.13 Falling Characteristics at 240V AC (at remote OFF)

Input : 240V AC
Load : Rated
Time axis : 20 ms/DIV



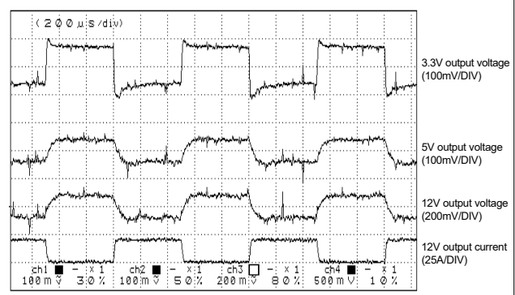
● Fig.14 Output Hold-up Time vs. Output power

Output voltage: the point that output voltage fails down to 95%.
PWR_OK: the pont that PWR_OK signal "L" is delivered.



● Fig.15 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100V AC
Load : Rated
Time axis : 200 µs/DIV



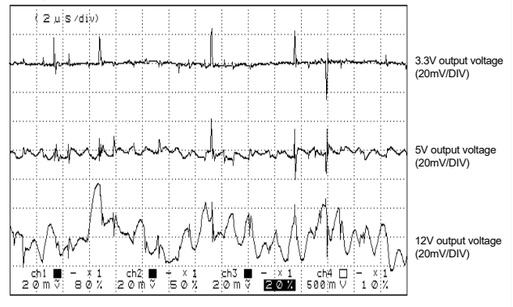
● Fig.16 Output Voltage Regulation (Load Fluctuation)

Output	Min. load	Rated load	Peak load
12V output	0A	19A	30A
5V output	0A	8A	20A
3.3V output	0A	8A	20A

AC input	85 V	100 V	240V	264V
3.3V output (min.)	3.405 V	3.405 V	3.405 V	3.405 V
3.3V output (rated)	3.388 V	3.388 V	3.387 V	3.387 V
3.3V output (peak)	3.385 V	3.383 V	3.385 V	3.385 V
5V output (min.)	5.101 V	5.101 V	5.100 V	5.100 V
5V output (rated)	5.066 V	5.066 V	5.065 V	5.065 V
5V output (peak)	5.047 V	5.046 V	5.046 V	5.046 V
12V output (min.)	12.066 V	12.066 V	12.066 V	12.065 V
12V output (rated)	12.059 V	12.059 V	12.058 V	12.059 V
12V output (peak)	11.924 V	12.057 V	12.059 V	12.058 V

● Fig.17 Ripple and Spike Voltage

Input : 100V AC
Load : Rated
Time axis : 2 µs/DIV



● Fig.18 Ambient Temperature vs. Lifetime Expectancy

■Electrolytic capacitors

Input : 100V AC
Load : Rated
Operating time: 24 consecutive hours

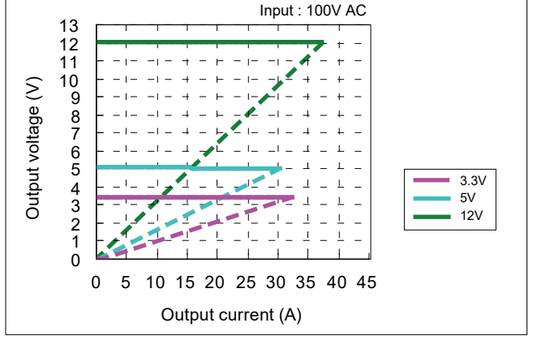
Power supply intake temperature	20°C	30°C	40°C
Lifetime expectancy (about)	104 years	52.3 years	26.2 years

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

■FAN

FAN ambient temperature	20°C	30°C	40°C
Lifetime expectancy (about)	26 years	17 years	11 years

●Fig.19 Overcurrent Protection Characteristics (V - I Characteristics)



Battery Pack BS28A-H350/2.5L

5 inch bay fixed type Ni-MH battery

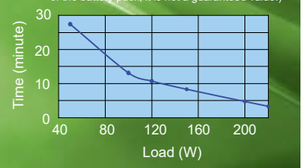
Lead | Ni-Cd | **Ni-MH** | other

RoHS Directive

BS28A-H350 / 2.5L

Battery backup discharge characteristics

(Be aware that it is a reference value at initial use of the battery pack; it is not a guaranteed value.)



Model	Description
BS28A-H350 / 2.5L	—

■Model name coding

BS28 A - H 350 / 2.5 L

① ② ③ ④ ⑤ ⑥

① Series name
② Modification
③ Ni-MH
④ Output voltage
⑤ Capacity
⑥ Long life battery

Features

- The battery pack can be fixed to a 5-inch bay.
- Ni-MH battery
- Built-in heater prevents capacity loss at low temperatures.
- It is possible to output the status of the battery pack (notification of remaining battery level and battery replacement time).
- Low standby power

AC input	Standby power	
100V	0.064W	0.19W
115V	0.065W	0.19W
240V	0.101W	0.26W
	PSU	PSU + Battery

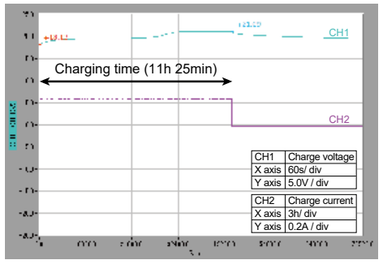
Used with HPCSF-400P-X2B

Battery Charge/Discharge Characteristics (Measured with HPCSF-400P-X2B)

(Be aware that it is a reference value at initial use of the battery pack; it is not a guaranteed value.) (Examples measurement)

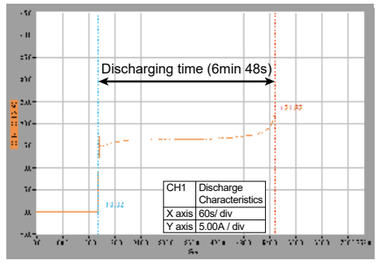
[Charge Characteristics]

Temperature: 20°C
load condition: Rated load



[Discharge Characteristics]

Temperature: 20°C
load condition: Rated load

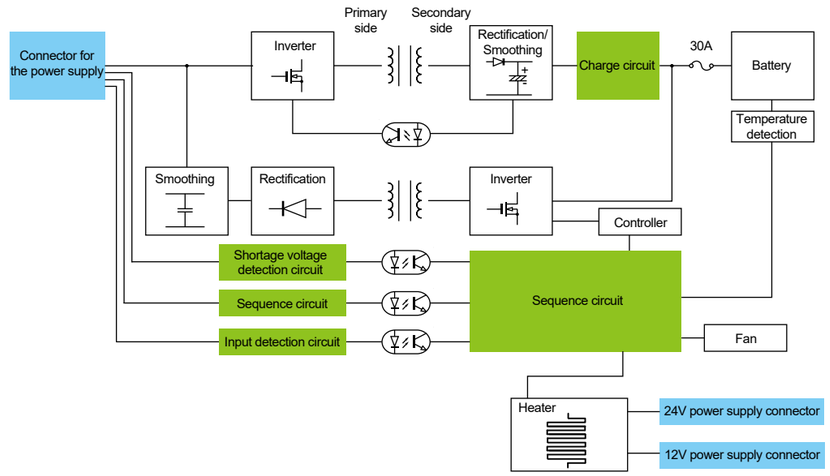


General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

Items	Specification	Measurement condition, etc.
Battery	16.8V 2.5Ah	Sealed nickel hydoride battery
Nominal Battery Power Voltage	16.8V	
Rated Capacity	2.5Ah	10 hours rate
Max. Output Capacity	230W (Peak 380W)	Peak output within 10ms. (time ratio 10%) The effective value should not exceed 230W.
Over Discharge Protection	11.2V typ	Backup operation shut down
Charge Specification	0.25A typ	27V DC Max.
Heater	The elements operates at battery temperature 20°C (typ.) or less. (It warm up in order to improve the battery discharging characteristics at low temperature. The warm up time is about 1 hour from 0°C.) (Heater consumption power at operation: 10W typ)	It is valid when AC input is available, regardless of the PS_ON# signal of the power supply unit.
Built-in Fuse rating	30A	
Operating Temp./Humidity	0-50°C, 20-90%	There shall be no condensation. Internal heater will operate at 20°C typ. or less.
Storage Temp./Humidity	-20-65°C, 20-90%	
Vibration	To endure the vibration acceleration of 2G with vibration frequency of 10 to 55Hz for 10 sweep cycles in each X, Y, Z direction.	Follow JIS-C-60068-2-6 at no operation (With the normal packaging)
Mechanical Shock	Lift one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Repeat three times for each of four bottom edges.	Follow JIS-C-60068-2-31 at no operation (With the normal packaging)
Weight	1.8 kg typ	
Reliability Grade	FA	Following our standard
Expected Life*	About 9-10 years (5 times/year discharge), about 3-4 year (1 time/day discharge)	Environmental temp. 30°C, 100W 3min discharge at a time
Storage condition	Recharging once at least per year (or 6 months if available) is required for 6 months or longer storage. Storage within 1 year: -20 to +30°C or less / humidity 10-95% Storage within 90 days: -20 to +40°C or less / humidity 10-95% Storage within 30 days: -20 to +50°C or less / humidity 10-95%	When recharging is not conducted beyond the period on the left, the battery may not recover its capacity completely. Approximately 19 hours of charging time may be required in such a case.
Warranty	One year after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost. Except for failure by over discharge.	Except for errors caused by operation not specified in this specification.

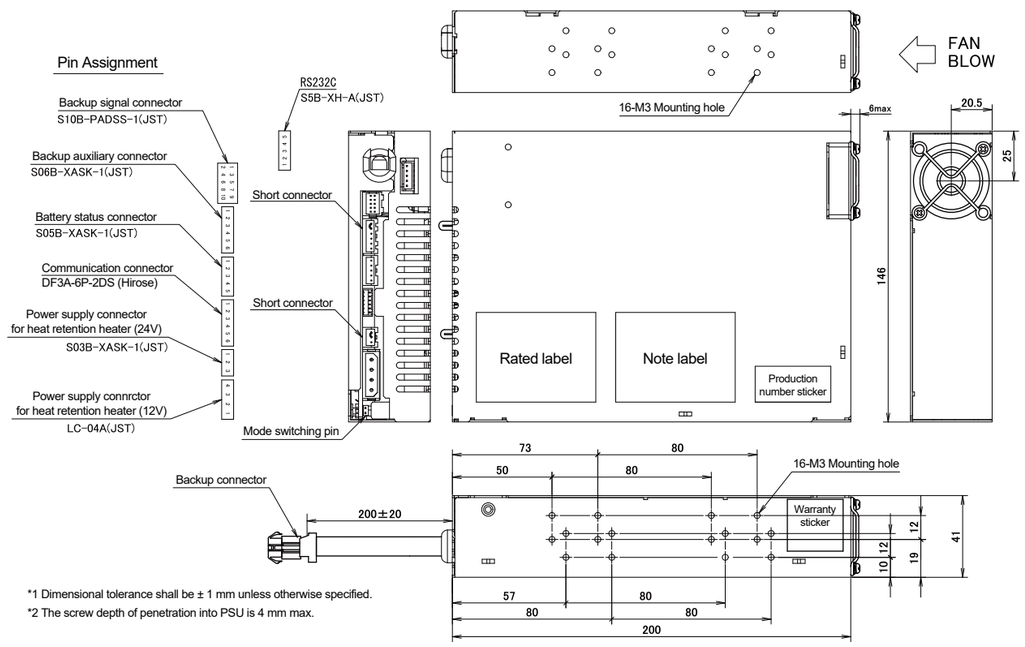
*Life expectancy is a reference value. It is not a guaranteed value.

Block Diagram



Outline Drawing

5-inch bay fixed type



*1 Dimensional tolerance shall be ± 1 mm unless otherwise specified.
*2 The screw depth of penetration into PSU is 4 mm max.

Connector pin allocation

Connector	Pin#	Signal name	Note
Backup signal connector (SIG_T)	1	AC_FAIL_T	
	2	SHUT_DOWN_T	
	3	BATT_LOW_T	
	4	-	
	5	FAN_M	
	6	-	
	7	GND	
	8	-	
	9	-	
	10	VCC5V	Total output of VCC 5V: 0.02A max

Connector	Pin#	Signal name	Note
Backup auxiliary connector	1	VCC5V	Total output of VCC 5V: 0.02A max
	2	R_ON	
	3	-	
	4	GND	
	5	Reserved	
	6	BATT+	Max. 0.02A

Connector	Pin#	Signal name	Note
Battery status connector	1	VCC5V	Total output of VCC 5V: 0.02A max
	2	BATT_E0	
	3	BATT_E1	
	4	BATT_E2	
	5	BATT_LIFE	

Connector	Pin#	Signal name	Note
Communication connector	1	VCC5V	Total output of VCC 5V: 0.02A max
	2	Reserved	
	3	Reserved	
	4	Reserved	
	5	Reserved	
	6	GND	

Connector	Pin#	Signal name	Note
RS232C	1	VCC5V	Total output of VCC 5V: 0.02A max
	2	GND	
	3	BATT_LOW_R	
	4	SHUT_DOWN_R	
	5	AC_FAIL_R	

Connector	Pin#	Signal name	Note
Power supply connector for heat retention heater (12V)	1	Power input for 12V heater	12V ± 5%
	2	GND	
	3	GND	
	4	-	

Connector	Pin#	Signal name	Note
Power supply connector for heat retention heater (24V)	1	Power input for 24V heater	24V ± 5%
	2	GND	
	3	-	

Desktop PC Power Supply mHPCSF-400P-X2S1

Model	Description
mHPCSF-400P-X2S1	–

■Model Name Coding

mHPCSF-400P-X2S1
① ② ③ ④⑤⑥⑦

① Series name
② Output power
③ Peak power available
④ ATX output
⑤ +3.3V output equipped
⑥ Standard
⑦ AC power cord retention clamp attachable

Features

- Medical standard IEC60601-1 Ed.3.1 (MOOP) certified
- Double-sided PCB with plated through hole suitable for industrial use.
- High efficiency with synchronous rectification circuit
- Min. load current is 0A for all outputs.
- By building in the thermal-sensing variable speed fan, noise reduction can be realised.

Safety standard	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

AC input	85-264V AC (Worldwide range, with PFC)

●Output

Output voltage	+3.3V	+5V	+12V	-12V	+5VSB
Max. current/ max. power (coutinuous)	16A	16A	25A	0.5A	2A
	Total 90W		300W	6W	10W
	Total 300W				
	Total 310W				
Peak current/ peak power (within 5s)	20A	20A	30A	0.5A	3A
	Total 120W		360W	6W	15W
	Total 385W				
	Total 400W				
Min. current	0A	0A	0A	0A	0A

●Dimension

W×H×D (mm)	125×63.5×125 (SFX APPENDIX C mounting surface size)

●Output connector (optional component)

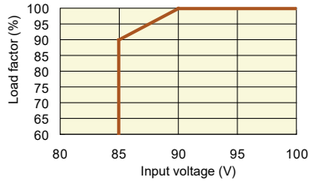
Main 20+4pin | Main 24pin | Main 20pin | AT | AUX | 12V 4pin | 12V 8pin | PCI-E 6pin | PCI-E 6+2pin | HDD | S-ATA | FDD

General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items		Specification					Measurements conditions, etc.
AC Input	Rated Voltage		100-240VAC (85*-264VAC)					Worldwide range *See <Fig.1> Low input voltage derating below.
	Input Frequency		50/60Hz					Frequency range 47-63Hz
	Efficiency		82% typ (100VAC), 85% typ (240VAC) *Characteristic data: Fig.4					At rated input/output
	Power Factor		96% min. (100VAC), 90% min. (240VAC) *Characteristic data: Fig.5					At rated input/output
	Inrush Current		31A peak (100VAC), 75A peak (240VAC) *Characteristic data: Fig.6					Rated input/output and reclosing input interval shall be 10s min. Cold start (25°C). Inrush current, 100µs or less, into X-capacitors of input noise filter is not specified here.
	Input Current		3.8A typ (100VAC), 1.6A typ (240VAC) *Characteristic data: Fig.4					
Output	Rated Voltage		+3.3V	+5V	+12V	-12V	+5VSB	
	Rated Current		8A	8A	19A	0.5A	2A	Reference value at measurement of input/output characteristics.
	Max. Current / Power		16A	16A	25A	0.5A	2A	Max. output power 310W
			90W max.		300W	6W	10W	
			300W max.					
			310W max.					
	Peak Current / Power		20A	20A	30A	0.5A	3A	Peak output power 400W Time: 5 sec or less Duty ratio of repetitive load: 10% or less
			120W max.		360W	6W	15W	
			385W max.					
			400W max.					
	Min. Current		0A	0A	0A	0A	0A	
	Total Voltage Accuracy (%)		±5 max.	±5 max.	±5 max.	±5 max.	±5 max.	Summation of temperature regulation, input regulation and load regulation.
	Max. Ripple Voltage (mVp-p)		50 max.	50 max.	120 max.	120 max.	50 max.	Connect an electrolytic capacitor (47µF) on the test board and measure with a 100MHz oscilloscope. The test board shall be separated from the load wire and placed within 150mm from the output terminal. *Characteristic data: Fig.17
	Max. Spike Voltage (mVp-p)		100 max.	100 max.	170 max.	170 max.	100 max.	
Protection	Over Current Protection	OCP point (A)	21 min.	21 min.	31 min.	Short protection		Measurements done with no load except for the voltage measurement
		Method	All outputs except +5VSB are shut down.			Hold down current limiting	All outputs shut down	All outputs shut down with a +5VSB short-circuit (automatic recovery)
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'			Automatic recovery		Reclosing AC input (10 sec min. interval)
	Over Voltage Protection	OVP point (V)	3.76-4.3	5.74-7.0	13.4-15.6	–	7.0	
		Method	All outputs except +5VSB are shut down.			–	Zener Clamp	
		Recovery	Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'			–	–	Reclosing AC input (10 sec min. interval)
Environment	Operating Temp./ Humidity		0-60°C*/10-90%					*Refer to <Fig.3> Temperature derating below. There shall be no condensation
	Storage Temp./Humidity		-20-70°C/10-95%					There shall be no condensation
	Vibration		Acceleration amplitude: 2G (10-55Hz), Sweep cycles: 10 times in the X-, Y-, and Z-axes					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 - FG/DC output: 1500VAC for 1 minute					Cut-off current 10mA
	Insulation Resistance		AC input - FG/DC output: 50MΩ min.					At 500VDC
	Leakage Current		0.2mA max. (100VAC)/0.4mA max. (200VAC)/0.5mA max. (240VAC) *Characteristic data: Fig.7					YEW.TYPE3226 (1kΩ) or equivalent
EMC	Line Noise Immunity		±2000V (pulse width of 100/1000nS, cycle period of 30 to 100Hz, Normal/Common mode with Positive/Negative polarity for 10 minutes)					Measured by INS-410 There shall be no fluctuation of DC output or malfunction.
	Electrostatic Discharge		EN61000-4-2 compliant					
	Radiated, Radio-Frequency, Electromagnetic Field		EN61000-4-3 compliant					
	Fast Transient Burst		EN61000-4-4 compliant					
	Lightning Surge		EN61000-4-5 compliant					
	Radio Frequency Conducted Immunity		EN61000-4-6 compliant					
	Power-Frequency Magnetic Field Immunity		EN61000-4-8 compliant					
	Voltage dips/Regulation		EN61000-4-11 compliant					
	Conducted Emmision		VCCI-B, FCC-B, CISPR22-B, EN55022-B compliant *Characteristic data: Fig.8, 9					Measured by single unit
	Harmonic Current Regulations		IEC61000-3-2 (Ver 2.1) classD					At rated input/output
Others	Safety Standards		UL60601-1 (ANSI/AAMI 60601-1), CSA60601-1, CE Marking, EN60601-1 compliant					
	Cooling System		Forced air cooling: thermal-sensing variable speed fan embedded					The speed changes with the temperature and the load condition.
	Output Grounding		Connected chassis (FG)					
	Output Hold-up Time		AC cut-off → PWR_OK holds up 16ms min. *Characteristic data: Fig.14					At rated output
	Reliability Grade		FA (Industrial equipment grade to use double-sided PCB with plated through hole)					Following our standard
	MTBF		80,000 H min					Based on EIAJ RCR-9102
	Weight		1.0 kg typ					
	Warranty		Three years after delivery: If any defects belong to us, the defective unit shall be repaired or replaced at our cost.					Except for errors caused by operation not specified in this specification.

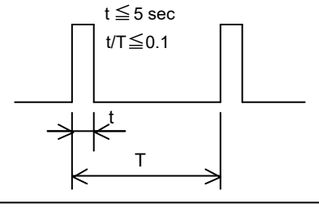
<Fig.1> Low input voltage derating

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



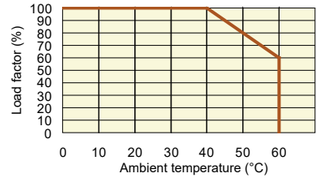
<Fig.2> Duty Ratio

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

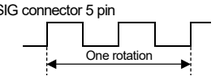


<Fig.3> Temperature Derating

When the ambient temperature (near the airflow inlet) exceeds 45°C, follow the derating curve to derate rated current/power, max. current/power, and peak current/power.



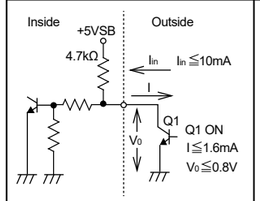
Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

	Items	Specification	Note
Input Signal	Output ON/OFF control signal (PS_ON#)	+3.3V, +5V, +12V and -12V outputs are delivered with 'L' input. +3.3V, +5V, +12V and -12V outputs shutdown with 'H' or 'OPEN' input.	MAIN1 connector 22 pin
	+3.3V SENSE	The input terminal to detect the voltage of +3.3V output; by connecting to the load terminal, only the line drop of the + side of the output cable is compensated.	MAIN1 connector 2 pin SIG connector 8 pin
	Fan control signal (FAN_C)	The control terminal of fan motor; the fan motor is forcibly rotated at full speed at 'L' input.	SIG connector 4 pin
Output Signal	Normal output signal (PWR_OK)	'H' signal is delivered when the +5V output is normal.	MAIN connector 21 pin
	Fan monitoring signal (Fan_M)	Two cycle pulses per one rotation of the fan motor are delivered (open collector output). Duty ratio of the pulse shall be 0.5 typ. (Interval between the signals becomes longer at low speed and shorter at high speed.) The signal remains 'L' or 'OPEN' when the fan stops caused by any failure or malfunction.	SIG connector 5 pin 

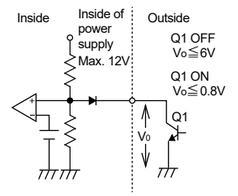
Signal Circuit

Input Signal Circuit

(PS_ON#)

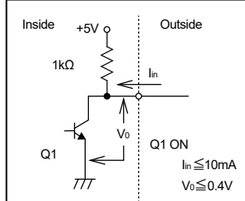


(FAN_C)

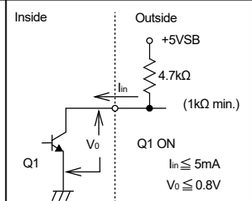


Output Signal Circuit

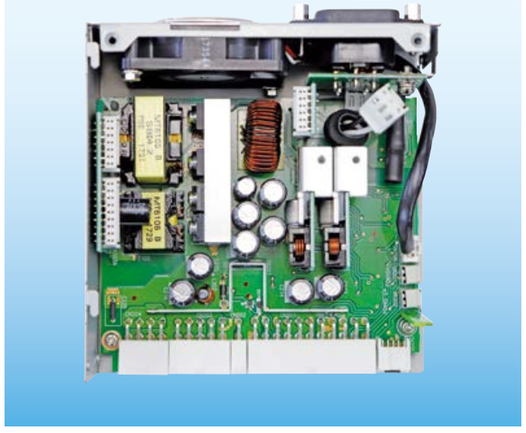
(PWR_OK)

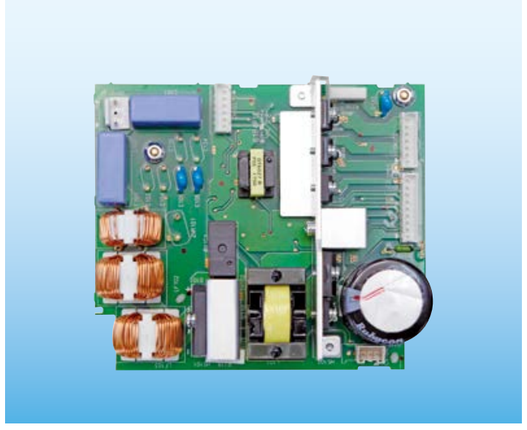


(FAN_M)

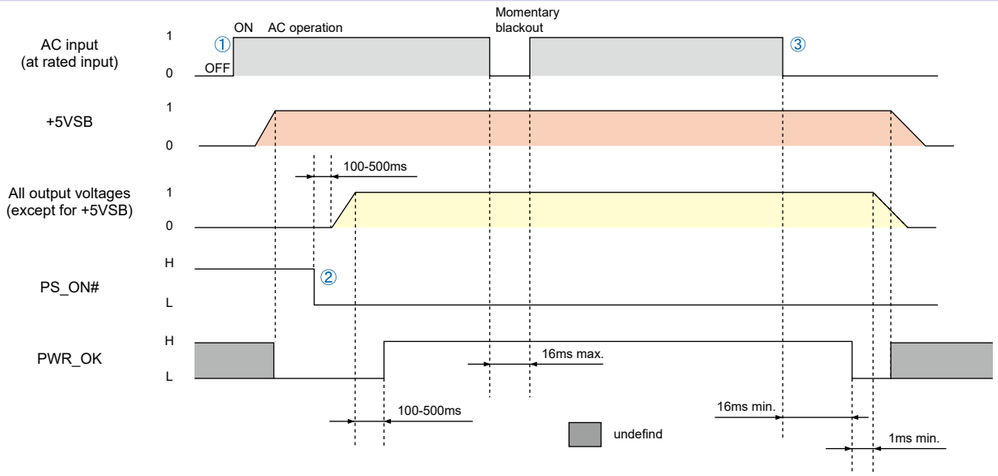


Internal structure





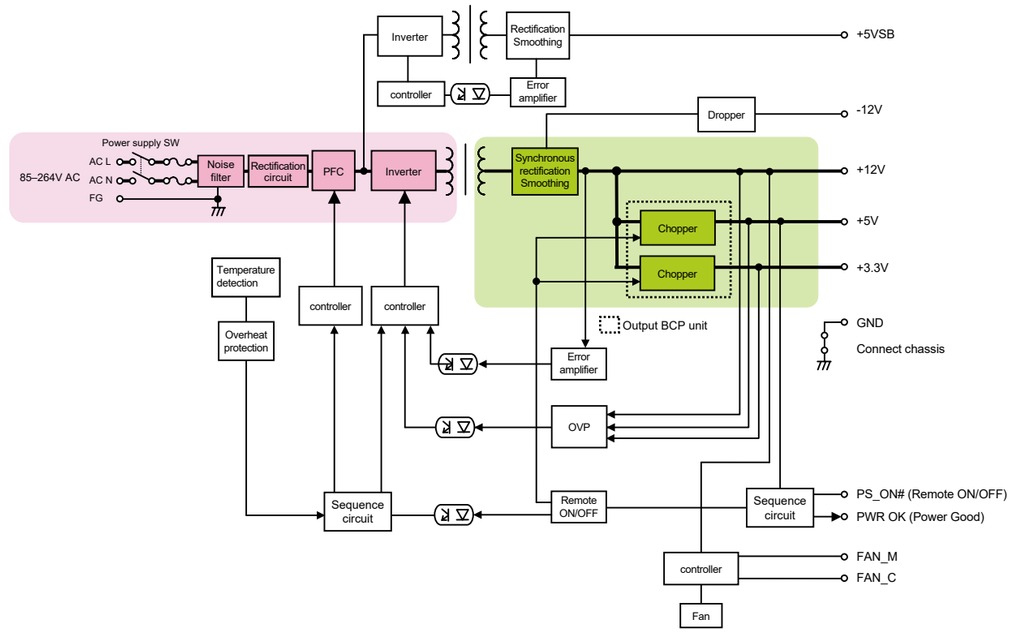
Sequence Timing Chart



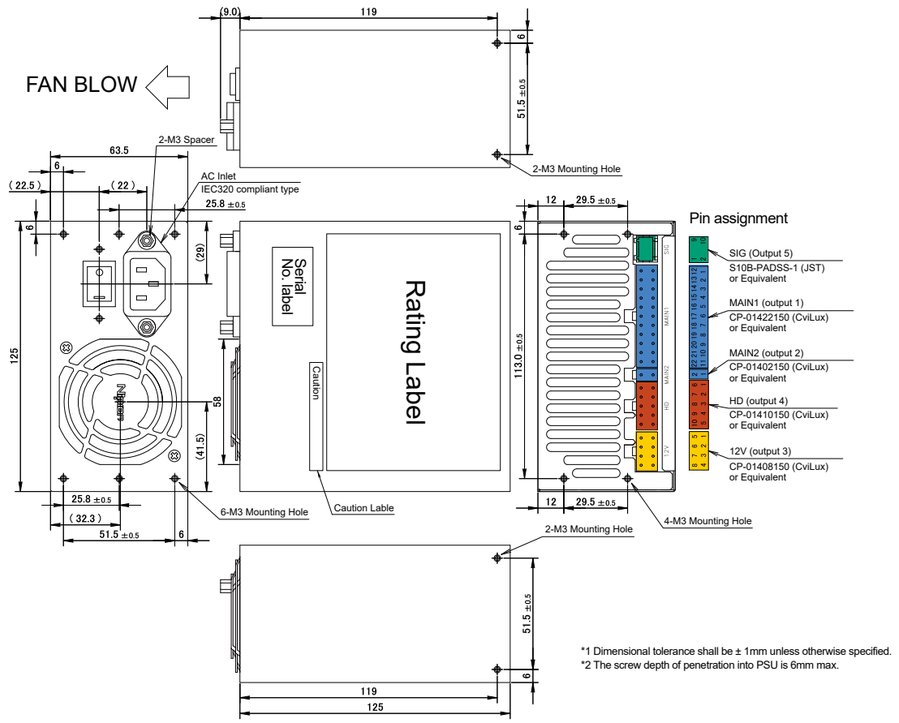
(1) Only +5VSB output starts up by supplying AC input while PS_ON# is "H" status.
(2) All outputs start up by inputting PS_ON# "L". PWR_OK 'H' is delivered at 100-500 ms after +5V output starts up.
(3) At blackout, PWR_OK 'L' is delivered after 16ms or more. After that, all outputs (except +5VSB) shut down after 1ms or more.

-Rise time difference among outputs shall be 50ms max.
-The output voltage level at rising of +12V shall be higher than that of +3.3V.
Also, difference in output voltage level between +5V and +3.3V shall be from -0.6V to 2.25V inclusive.
-The order and difference in level of output voltage for each output voltage at falling shall not be specified.
-Rise time of PWR_OK signal shall be 10ms or less.
(provided that capacitive load is not connected to PWR_OK signal output)

Block Diagram

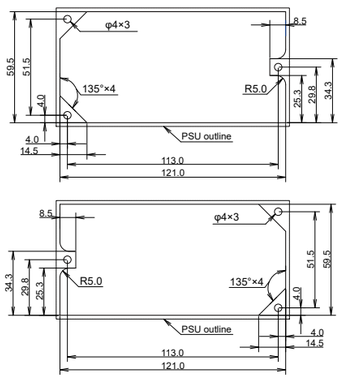


Outline Drawing



*1 Dimensional tolerance shall be ± 1mm unless otherwise specified.
*2 The screw depth of penetration into PSU is 6mm max.

How to process the mounting holes
(Recommended)



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

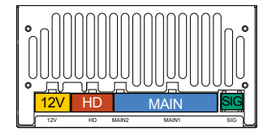
CN Name	PIN No.	FUNCTION	MAX. CURRENT
MAIN1	1	+3.3V	6 A
	2	+3.3V SE	–
	3	+12V	6 A
	4	+5V	6 A
	5	+5V	6 A
	6	COM	6 A
	7	COM	6 A
	8	COM	6 A
	9	COM	6 A
	10	-12V	0.5A
	11	+5VSB	2 A
	12	+3.3V	6 A
	13	+3.3V	6 A
	14	+12V	6 A
	15	+5V	6 A
	16	+5V	6 A
	17	COM	6 A
	18	COM	6 A
	19	COM	6 A
	20	COM	6 A
	21	PWR_OK	10 mA
	22	PS_ON	10 mA
MAIN2	1	+5V	6 A
	2	+3.3V	6 A

CN Name	PIN No.	FUNCTION	MAX. CURRENT
12V	1	COM	6 A
	2	COM	6 A
	3	COM	6 A
	4	COM	6 A
	5	+12V	6 A
	6	+12V	6 A
	7	+12V	6 A
	8	+12V	6 A
HD	1	+3.3V	6 A
	2	+5V	6 A
	3	COM	6 A
	4	COM	6 A
	5	+12V	6 A
	6	+3.3V	6 A
	7	+5V	6 A
	8	COM	6 A
	9	COM	6 A
	10	+12V	6 A
SIG	1	NC	–
	2	NC	–
	3	NC	–
	4	FAN_C	–
	5	FAN_M	5 mA
	6	PS_ON	10 mA
	7	COM	2 A
	8	+3.3V SE	–
	9	NC	–
	10	+5VSB	2 A

Options (Sold separately)

Detachable output harness

Model	Length and type of connector	Output port allocation
Main harness MAIN		
WH-M2022-500	MAIN 500±10 20Pin	
WH-M2022-300	MAIN 300±10 20Pin	
WH-M2422-500	MAIN 500±15 24Pin	
12V harness 12V		
WH-V0808-500	12V 500±15 12V 8Pin	
WH-V0408-500	12V 500±15 12V 4Pin	
WH-VG208-500	12V 500±15 12V 4Pin / PCI-E 6Pin	
WH-VV208-500-02	12V 500±10 12V 8Pin / 12V 8Pin	
WH-VG208-500-02	12V 500±10 12V 8Pin / PCI-E 6Pin	
HD harness HD		
WH-PP610-850	HD 550±15, 150±15, 150±15	Peripheral (HD)
WH-PS610-850	HD 550±15, 150±15, 150±15	FD
WH-PS710-850	HD 550±15, 150±15, 150±15, 850±15	S-ATA
WH-PS810-1000	HD 550±15, 150±15, 150±15, 150±15	
SIG harness SIG		
WH-S0610-500	SIG 500±15 SIG-1	
WH-S0610-500-01	SIG 500±15 SIG-2	
WH-S0310-500	SIG 500±15 SIG-3	



Acceptable cables

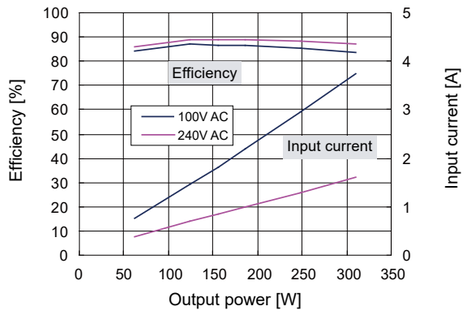
MAIN	12V	HD	SIG
1 model	1 model	1 model	1 model

Cable

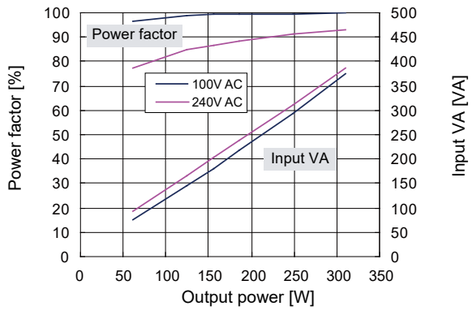
Photos	Model	Category	Description
	WH2753-02	AC power cord	125VAC 12V (tracking resistance type) [PSE]

Characteristics Data (Examples of actual measurement)

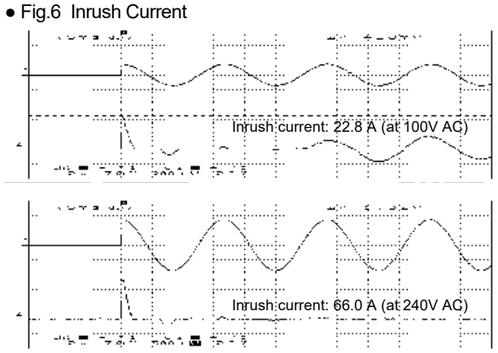
● Fig.4 Efficiency/Input Current vs. Output Power



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



● Fig.6 Inrush Current



● Fig.7 Leakage Current

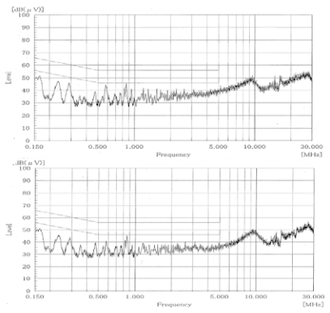
Input : 100, 200, 240V AC
Load : Rated load and Min. load
Measurement conditions: IEC60950 compliant

	Rated load	Min. load
100V AC	0.053mA	0.041mA
200V AC	0.061mA	0.047mA
240V AC	0.065mA	0.050mA

● Fig.8 Conducted Emission at 100V AC

Input : 100V AC
Load : Rated
Mode : Peak

VCCI Class B



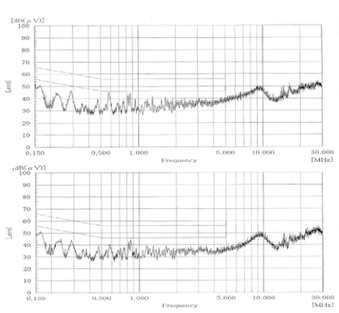
Measuring point: N-FG

Measuring point: L-FG

● Fig.9 Conducted Emission at 230V AC

Input : 230V AC
Load : Rated
Mode : Peak

VCCI Class B

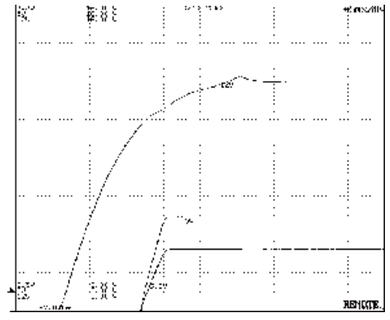


Measuring point: N-FG

Measuring point: L-FG

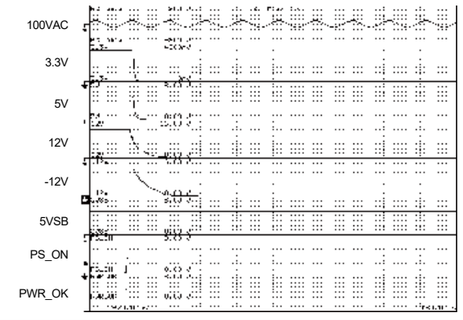
● Fig.10 Rising Characteristics at 100V AC

Input : 100V AC
Load : Rated
Time axis : 5 ms/DIV



● Fig.11 Falling Characteristics at 100V AC (at remote OFF)

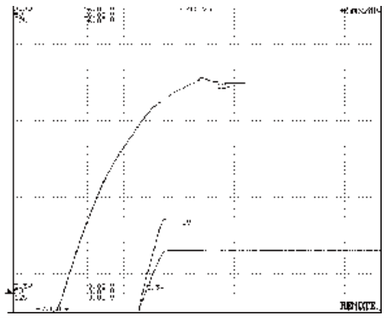
Input : 100V AC
Load : Rated
Time axis : 20 ms/DIV



Characteristics Data (Examples of actual measurement)

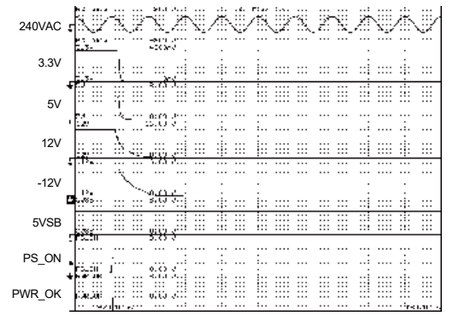
● Fig.12 Rising Characteristics at 240V AC

Input : 240V AC
Load : Rated
Time axis : 5 ms/DIV



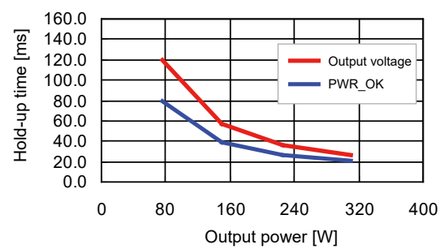
● Fig.13 Falling Characteristics at 240V AC (at remote OFF)

Input : 240V AC
Load : Rated
Time axis : 20 ms/DIV



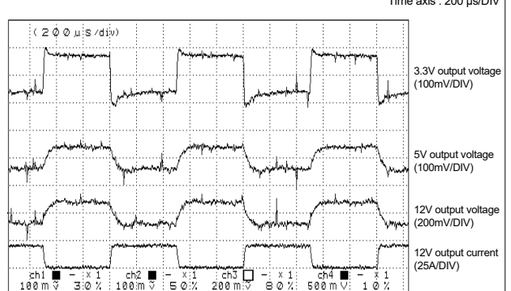
● Fig.14 Output Hold-up Time vs. Output power

Output voltage: the point that output voltage fails down to 95%.
PWR_OK: the pont that PWR_OK signal "L" is delivered.



● Fig.15 Dynamic Load Fluctuation Characteristics at 1 kHz

Input : 100V AC
Load : Rated
Time axis : 200 µs/DIV



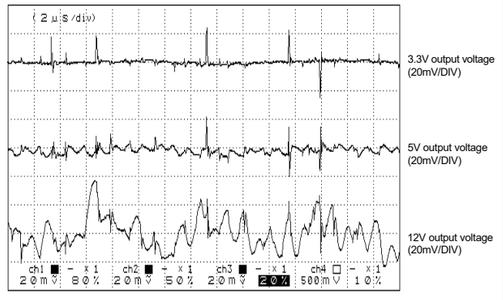
● Fig.16 Output Voltage Regulation (Load Fluctuation)

Output	Min. load	Rated load	Peak load
12V output	0A	19A	30A
5V output	0A	8A	20A
3.3V output	0A	8A	20A

AC input	85V	100V	240V	264V
3.3V output (min.)	3.405V	3.405V	3.405V	3.405V
3.3V output (rated)	3.388V	3.388V	3.387V	3.387V
3.3V output (peak)	3.385V	3.383V	3.385V	3.385V
5V output (min.)	5.101V	5.101V	5.100V	5.100V
5V output (rated)	5.066V	5.066V	5.065V	5.065V
5V output (peak)	5.047V	5.046V	5.046V	5.046V
12V output (min.)	12.066V	12.066V	12.066V	12.065V
12V output (rated)	12.059V	12.059V	12.058V	12.059V
12V output (peak)	11.924V	12.057V	12.059V	12.058V

● Fig.17 Ripple and Spike Voltage

Input : 100V AC
Load : Rated
Time axis : 2 µs/DIV



● Fig.18 Ambient Temperature vs. Lifetime Expectancy

■Electrolytic capacitors

Input : 100V AC
Load : Rated
Operating time: 24 consecutive hours

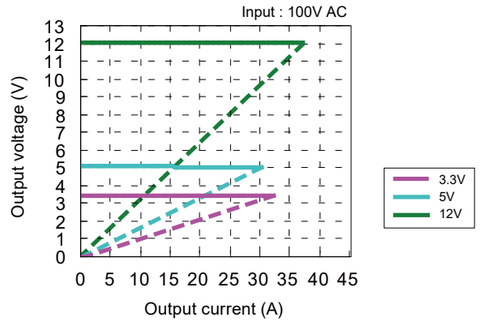
Power supply intake temperature	20°C	30°C	40°C
Lifetime expectancy (about)	104 years	52.3 years	26.2 years

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

■FAN

FAN ambient temperature	20°C	30°C	40°C
Lifetime expectancy (about)	26 years	17 years	11 years

●Fig.19 Overcurrent Protection Characteristics (V - I Characteristics)



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URL: http://www.nipron.com/

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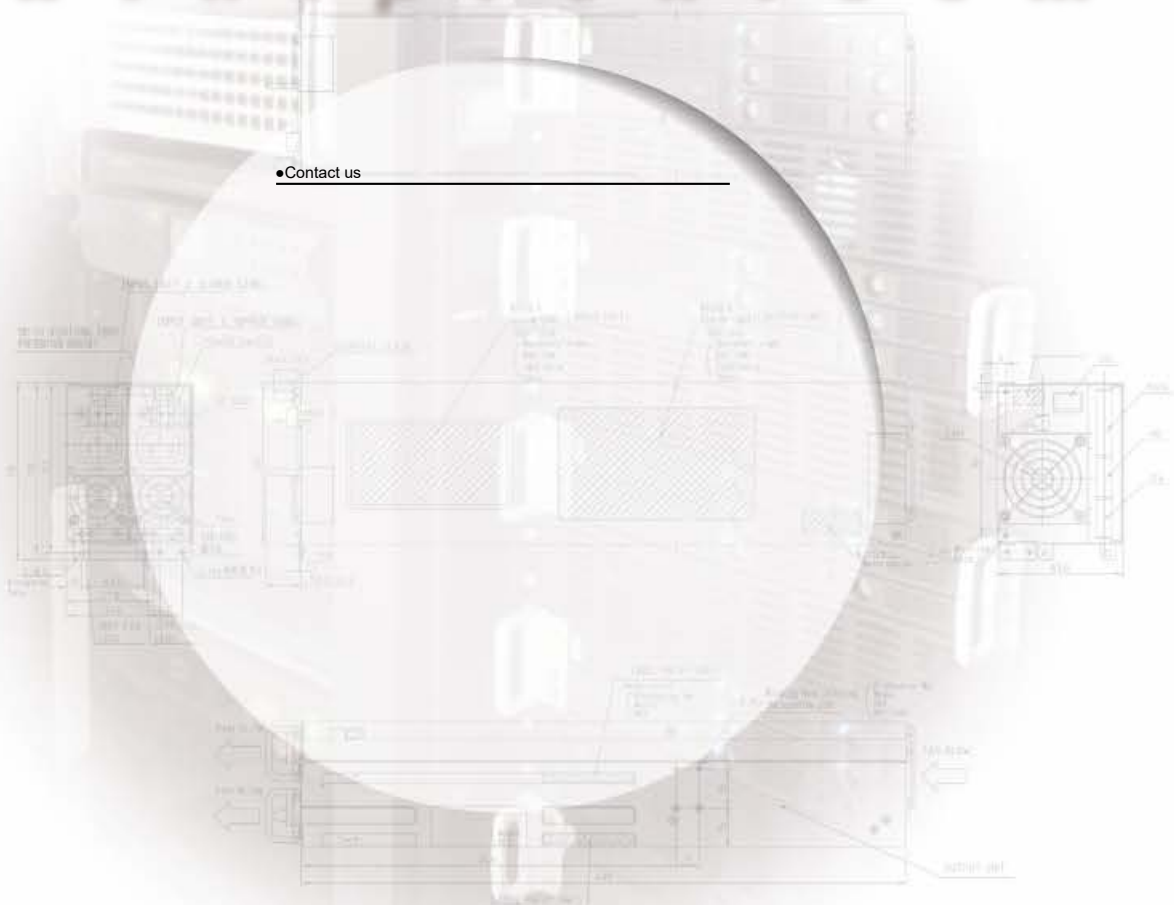
●Contact us



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