

2019 January

Power Supply for Desktop PC

HPCSF-400P series



HPCSF-400P-X2S1



mHPCSF-400P-X2S1
(Medical standard)

SFX Power Supply

CONTINUOUS MAX.: 310 W

PEAK POWER: 400 W

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



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

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 200VAC input



Supports backup for instantaneous power failure and blackout model

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 package can be embedded in the PC housing, it can be more space-saving than common UPS.



Medical standard IEC60601-1 Ed.3.1 (MOOP) approved 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 approved with the medical standard.



Output specification X2S1 X2B Medical

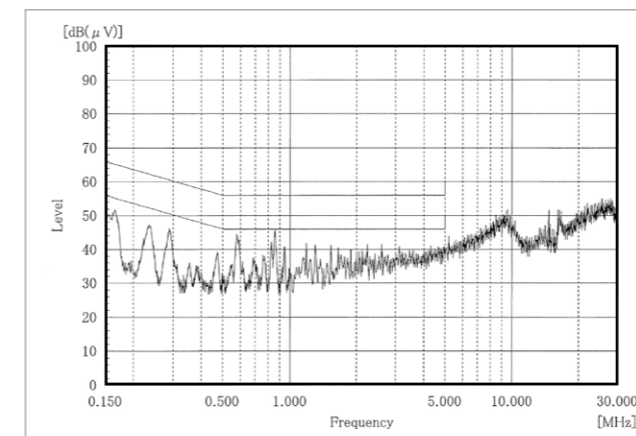
Output voltage	+3.3V	+5V	+12V	-12V	+5VSB
Continuous maximum current/power	16A	16A	25A	0.5A	2A
	90W		300W	6W	10W
	310W				
Peak current/power (within 5s)	20A	20A	30A	0.5A	3A
	120W		360W	6W	15W
	385W				
Minimum current	0A		400W		
	0A	0A	0A	0A	0A

Low noise, low leakage current X2S1 X2B Medical

The conducted emission for the power supply unit alone clears VCCI Class B. It reduced leakage current to 0.05mA at 100VAC and 0.06mA at 240VAC. Since an external noise filter is not necessary, it contributes to reduction of cost and workload.

Conducted emission

[At 100VAC rated load]
*an example of measurement



Leakage current

*an example of measurement

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

Standby power

*an example of measurement

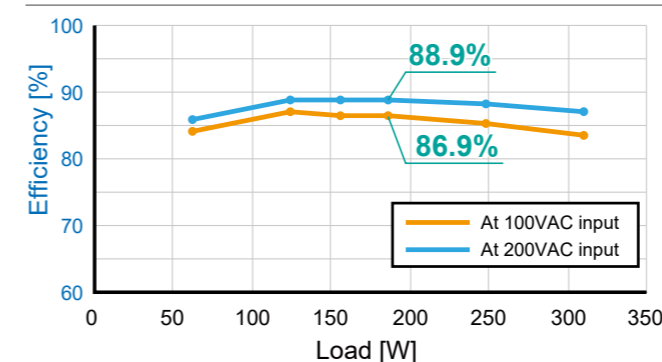
It achieved standby power 0.5W or less and supports ErP directive.

Input voltage	100VAC	240VAC
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 of measurement)



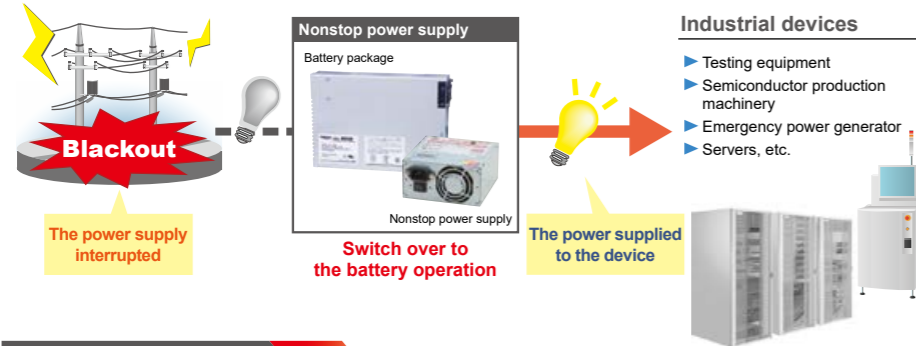
Other features X2S1 X2B Medical

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

What is Nonstop power supply? **X2B**

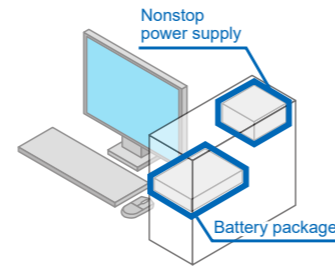
Nonstop PSU enables a secure backup system even with a blackout.

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

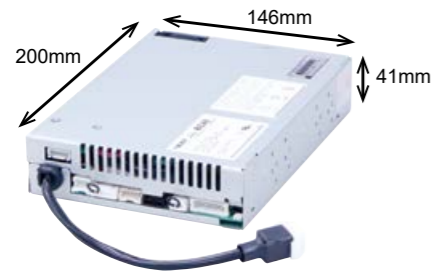
Because the battery package can be contained in the PC housing, more space can be saved compared to commonly found external UPS.



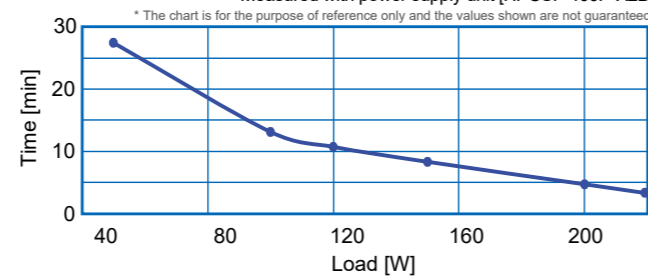
Compatible battery pack **X2B**

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]



Battery features **X2B**

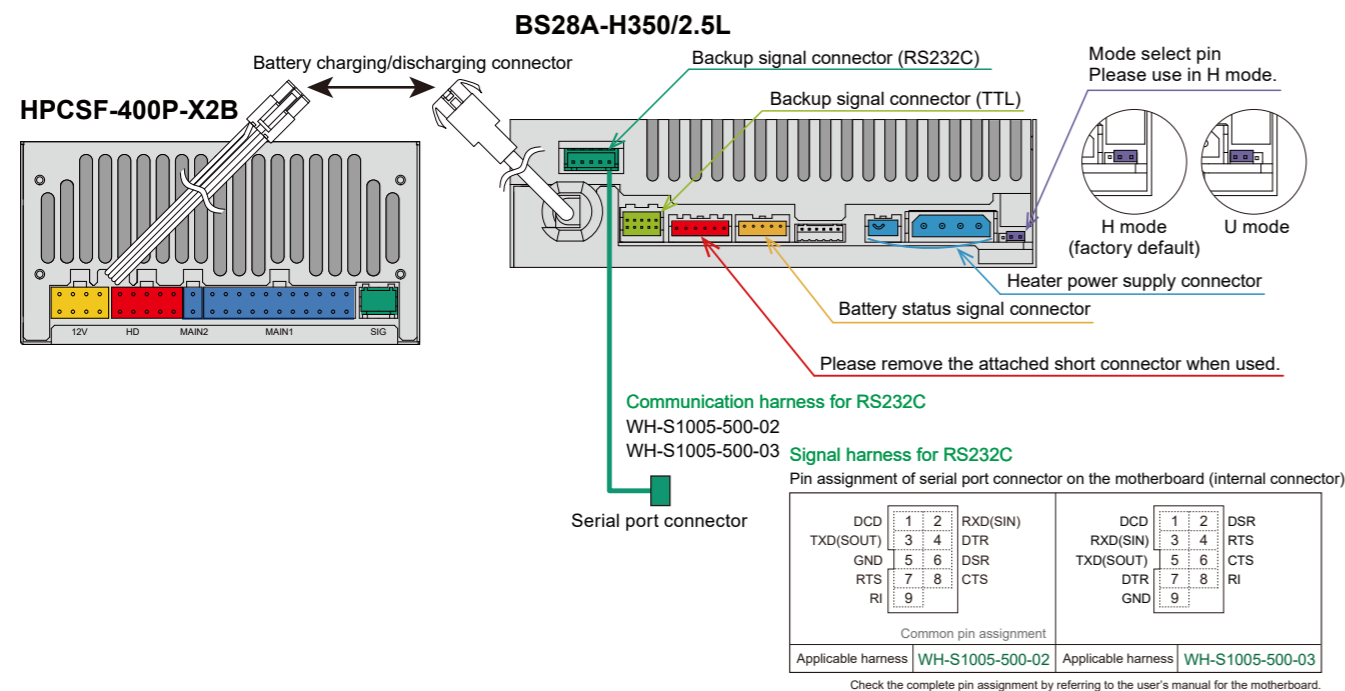
- ▶ Adoption of a nickel metal-hydrate battery
- ▶ Prevents the drop in the capacity at low temperature with a built-in heater
- ▶ Status outputs (remaining capacity/battery life notification) available for the battery package

▶ Low standby power consumption

Measured with power supply unit [HPCSF-400P-X2B]
*an example of measurement

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

Conceptual connection diagram **X2B**



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

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

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.

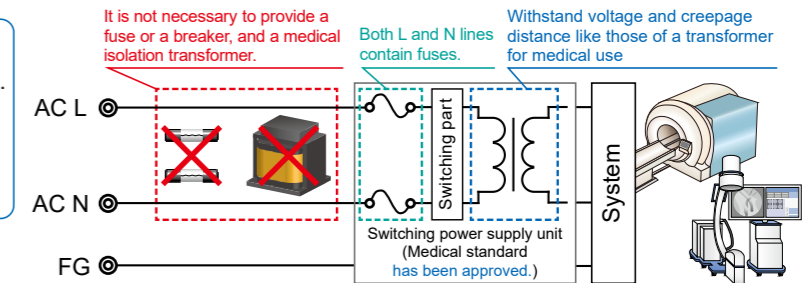
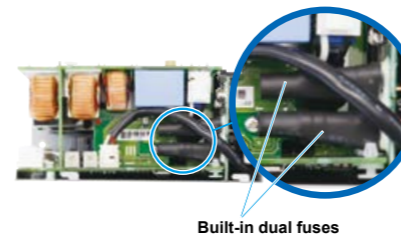
Achieve low-cost, secure, and safe medical electrical equipment

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 approved 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.

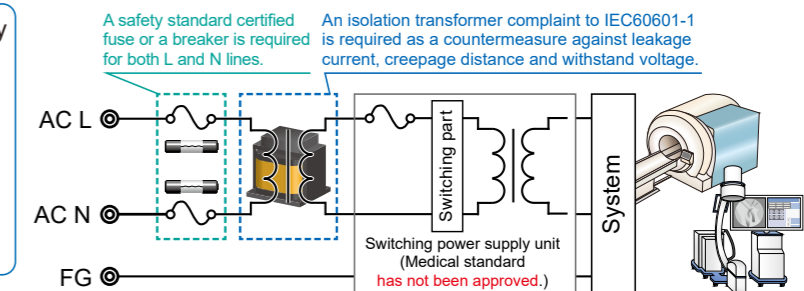
The system becomes miniaturized and less expensive.



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

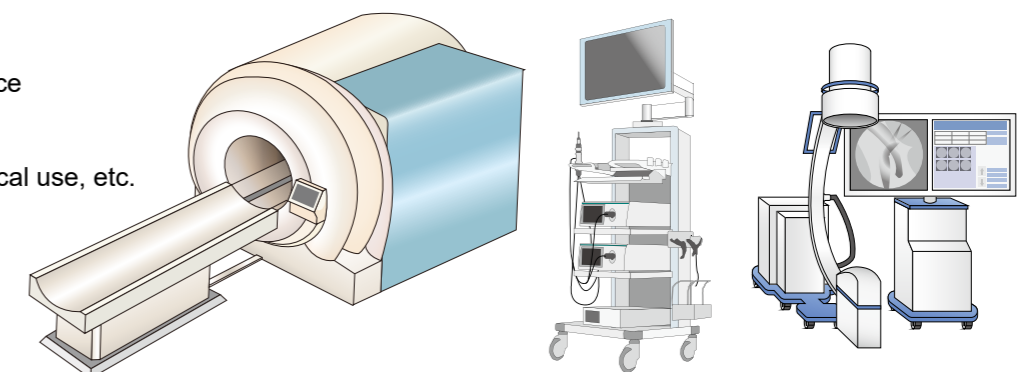
It is necessary to provide separately a fuse, a transformer, etc.
A fuse and a transformer shall be installed separately from a power supply unit.

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

Energy saving and high efficiency SFX power supply!



HPCSF-400P-X2S1

**RoHS
Directive**

SFX
Continuous **310W** Peak **400W**

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

Model Name Coding	① Series name	② Output power	③ Peak power available	④ ATX output	⑤ +3.3V output equipped	⑥ S: Standard	⑦ 1: AC power cord retention clamp attachable
HPCSF-400P-X2**							
① ② ③ ④ ⑤ ⑥ ⑦							

Features

- 80PLUS BRONZE approved SFX power supply
- Double-sided through hole PCB suitable for industrial use.
- High efficiency with synchronous rectification circuit
- Min. load current is 0A for all outputs.
- Safety standard approved (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 standard	UL	CSA	EN	CE	CCC
Reliability grade	HFA	FA	HOA	QA	

Function



Input

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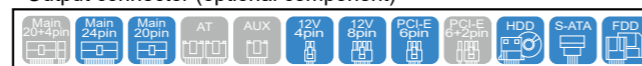
Output

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

Dimension

W×H×D (mm)	125×63.5×125 (SFX APPENDIX C mounting surface size)
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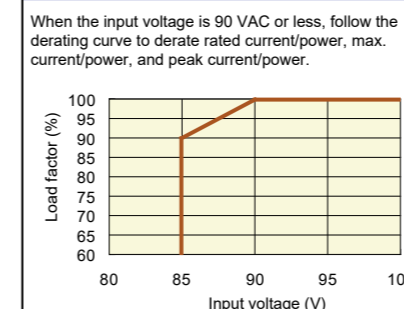
Output connector (optional component)



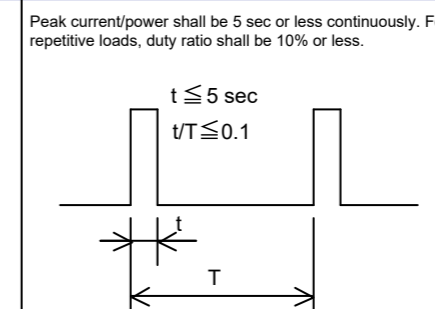
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

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 (AC100V), 1.6A typ (AC240V) *Characteristic data: Fig.4			
Output	Rated Voltage	+3.3V +5V +12V -12V +5VSB	Reference value at measurement of input/output characteristics. Max. output power 310W Peak output power 400W Time: 5 sec or less Duty ratio of repetitive load: 10% or less		
	Rated Current	8A 8A 19A 0.5A 2A			
	Max. Current / Power	16A 16A 25A 0.5A 2A 90W max. 300W 6W 300W max. 10W 310W max.			
	Peak Current / Power	20A 20A 30A 0.5A 3A 120W max. 360W 6W 385W max. 15W 400W max.			
	Min. Current	0A 0A 0A 0A 0A			
	Total Voltage Accuracy (%)	±5 max. ±5 max. ±5 max. ±5 max. ±5 max.			
	Max. Ripple Voltage (mVp-p)	50 max. 50 max. 120 max. 120 max. 50 max.			
	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. Method All outputs except +5VSB are shut down. Recovery Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'	Short protection Hold down current limiting All outputs shut down Automatic recovery
		Over Voltage Protection		OVP point (V) 3.76-4.3 5.74-7.0 13.4-15.6 Method All outputs except +5VSB are shut down. Recovery Reclosing AC input, or switching PS_ON# signal from 'H' to 'L'	7.0 Zener Clamp 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	
Insulation	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		
	Dielectric Strength	AC input - FG/DC output: 1500 VAC 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			
Others	Conducted Emmission	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		
Safety Standard	Safety Standard	UL60950, CSA60950 (c-UL), CCC (S&E) approved, PSE (Ordinance item 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 PWBs with through holes)	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.			

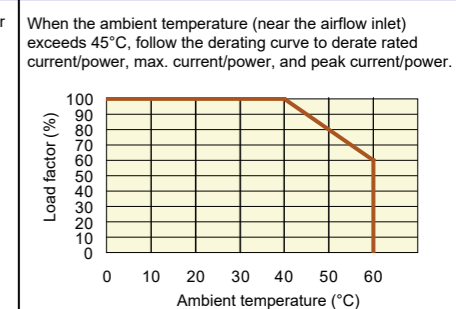
<Fig.1> Low input voltage derating



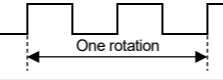
<Fig.2> Duty Ratio

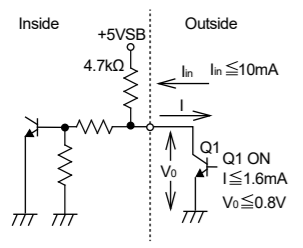
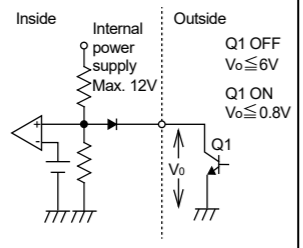
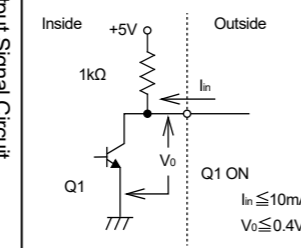
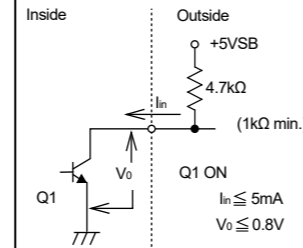


<Fig.3> Temperature Derating

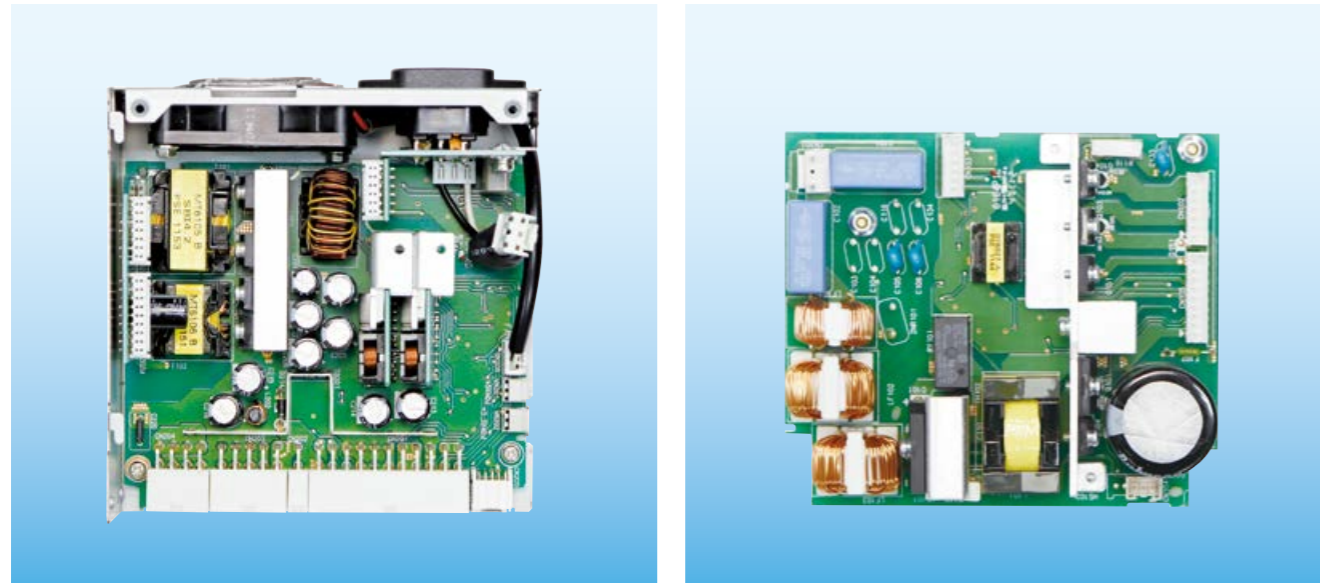


Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

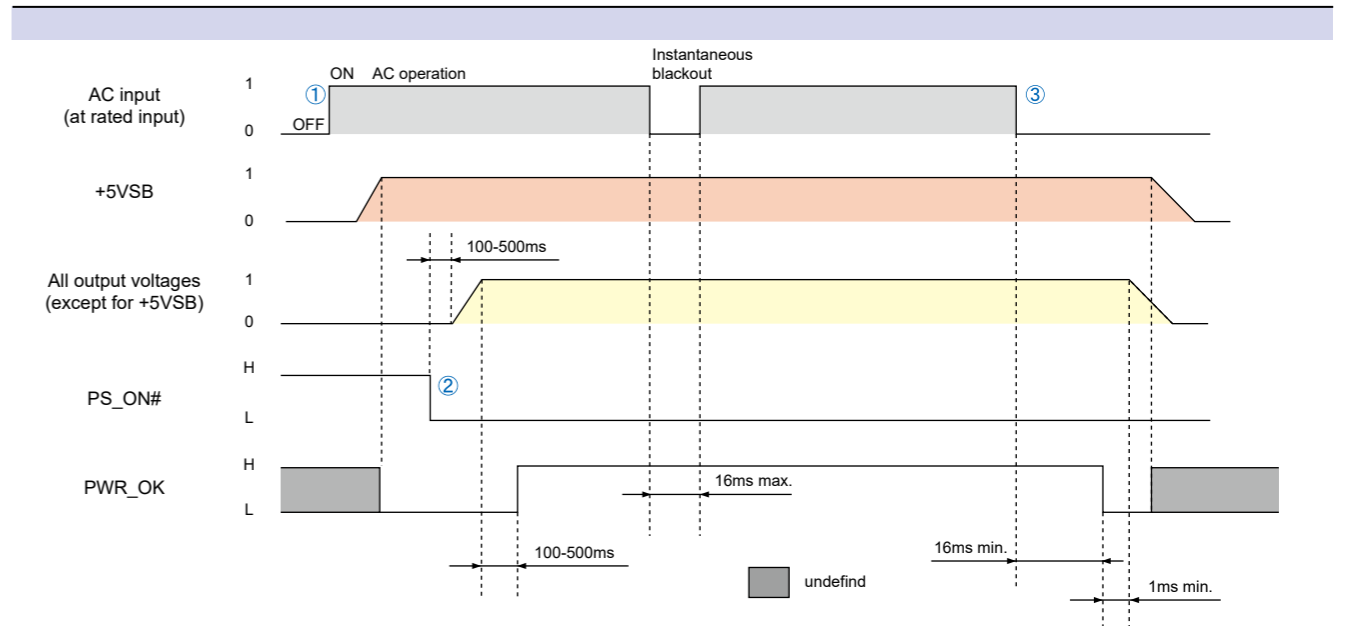
Items	Specification	Note
Input Signal		
Output ON/OFF control signal (PS_ON#)	+3.3V, +5V, +12V and -12V outputs are delivered with 'L' input. +3.3V, +5V, +12V and -12V outputs shutdown with 'H' or 'OPEN' input.	MAIN1 connector 22 pin
+3.3V SENSE	The input terminal to detect the voltage of +3.3V output; 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
	 <p>Inside: +5VSB, 4.7kΩ, $I_{in} \leq 10\text{mA}$, Q1 ON, $I \leq 1.6\text{mA}$, $V_o \leq 0.8\text{V}$</p>	 <p>Inside: Internal power supply, Max. 12V, Q1 OFF, $V_o \leq 6\text{V}$, Q1 ON, $V_o \leq 0.8\text{V}$</p>	 <p>Inside: +5V, 1kΩ, I_{in}, Q1 ON, $I_{in} \leq 10\text{mA}$, $V_o \leq 0.4\text{V}$</p>
			 <p>Inside: +5VSB, 4.7kΩ, (1kΩ min.), Q1 ON, $I_{in} \leq 5\text{mA}$, $V_o \leq 0.8\text{V}$</p>

Internal structure (HPCSF-400P-X2S)



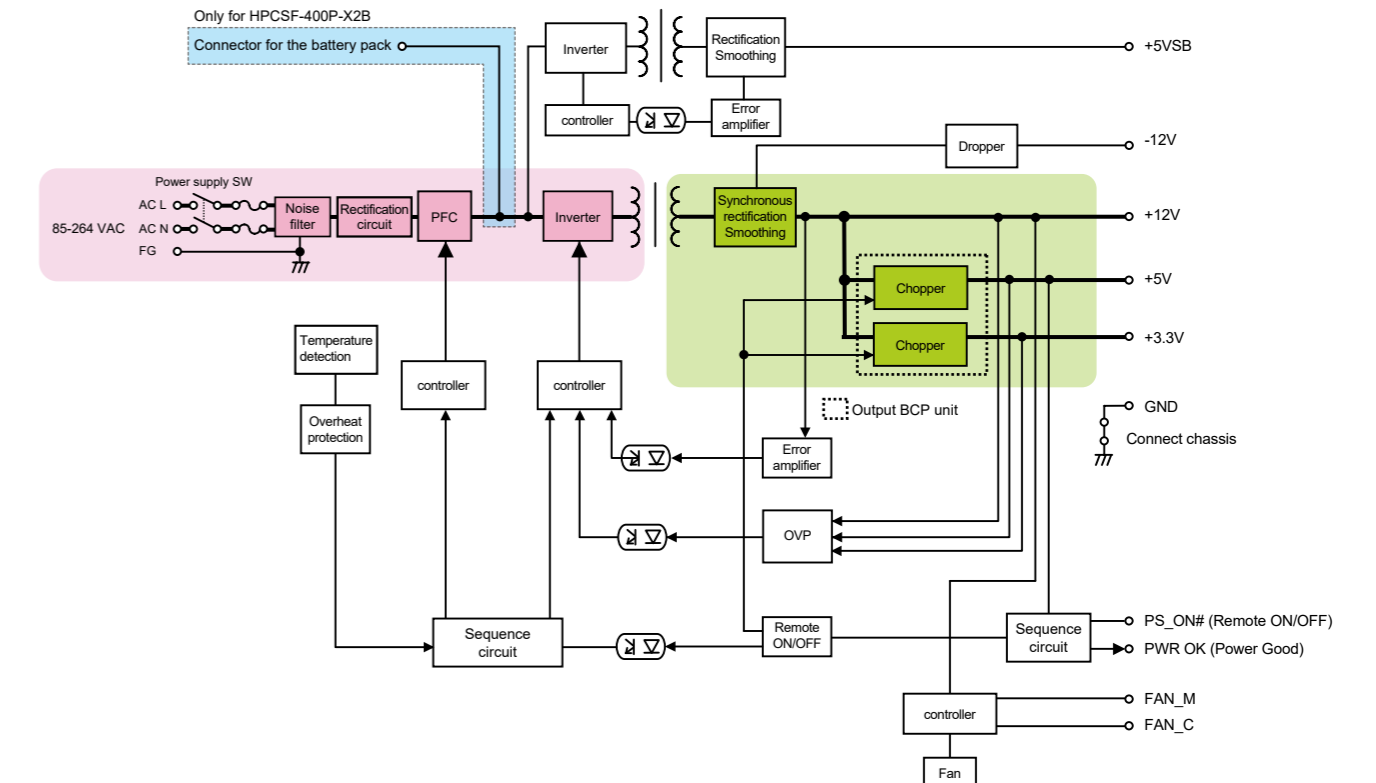
Sequence Timing Chart



- (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)

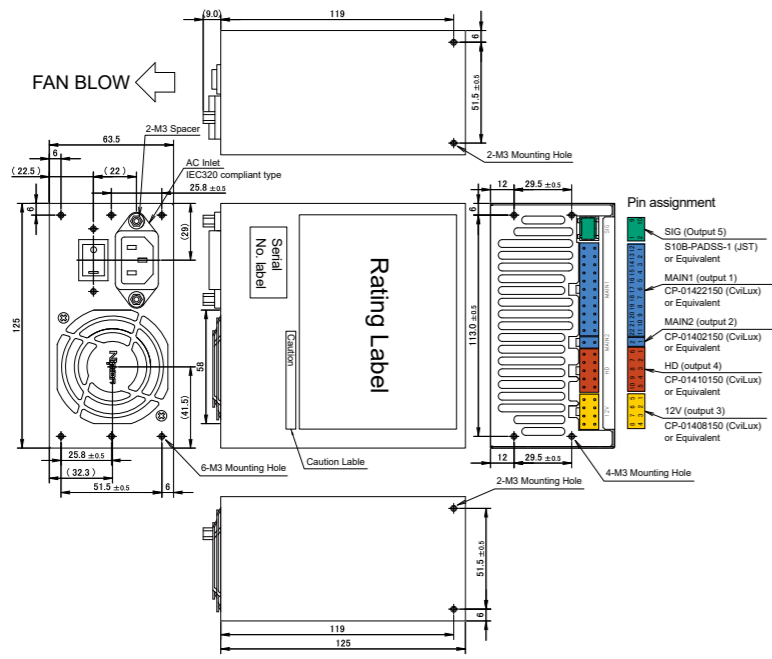
Block Diagram



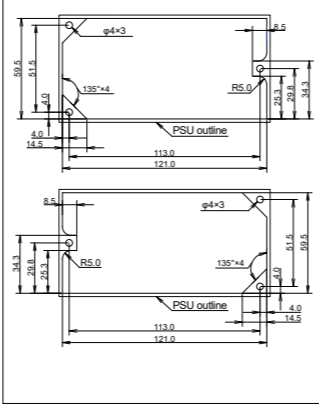
HPCSF-400P-X2S1

Q'ty	Part No.	FUNCTION	MAX. CURRENT
1	+3.3V	6A	-
2	+3.3V SE	-	-
3	+12V	6A	-
4	+5V	6A	-
5	+5V	6A	-
6	COM	6A	-
7	COM	6A	-
8	COM	6A	-
9	COM	6A	-
10	-12V	0.5A	-
11	+5VSB	2A	-
12	+3.3V	6A	-
13	+3.3V	6A	-
14	+12V	6A	-
15	+5V	6A	-
16	+5V	6A	-
17	COM	6A	-
18	COM	6A	-
19	COM	6A	-
20	COM	6A	-
21	PS OK	10 mA	-
22	PS ON	10 mA	-
1	+5V	6A	-
2	+3.3V	6A	-

Q'ty	Part No.	FUNCTION	MAX. CURRENT
1	COM	6A	-
2	COM	6A	-
3	COM	6A	-
4	COM	6A	-
5	+12V	6A	-
6	+12V	6A	-
7	+12V	6A	-
8	+12V	6A	-
1	+3.3V	6A	-
2	+5V	6A	-
3	COM	6A	-
4	COM	6A	-
5	+12V	6A	-
6	+3.3V	6A	-
7	+5V	6A	-
8	COM	6A	-
9	COM	6A	-
10	+12V	6A	-
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)



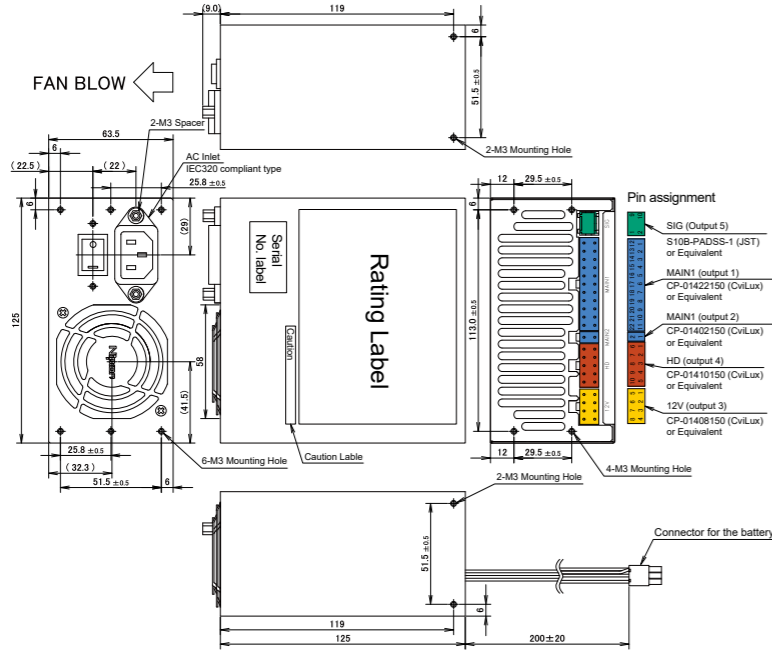
Installation direction
The unit can be installed in any directions.

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

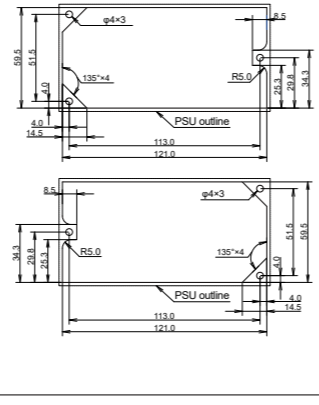
HPCSF-400P-X2B

Q'ty	Part No.	FUNCTION	MAX. CURRENT
1	+3.3V	6A	-
2	+3.3V SE	-	-
3	+12V	6A	-
4	+5V	6A	-
5	+5V	6A	-
6	COM	6A	-
7	COM	6A	-
8	COM	6A	-
9	COM	6A	-
10	-12V	0.5A	-
11	+5VSB	2A	-
12	+3.3V	6A	-
13	+3.3V	6A	-
14	+12V	6A	-
15	+5V	6A	-
16	+5V	6A	-
17	COM	6A	-
18	COM	6A	-
19	COM	6A	-
20	COM	6A	-
21	PS OK	10 mA	-
22	PS ON	10 mA	-
1	+5V	6A	-
2	+3.3V	6A	-

Q'ty	Part No.	FUNCTION	MAX. CURRENT
1	COM	6A	-
2	COM	6A	-
3	COM	6A	-
4	COM	6A	-
5	+12V	6A	-
6	+12V	6A	-
7	+12V	6A	-
8	+12V	6A	-
1	+3.3V	6A	-
2	+5V	6A	-
3	COM	6A	-
4	COM	6A	-
5	+12V	6A	-
6	+3.3V	6A	-
7	+5V	6A	-
8	COM	6A	-
9	COM	6A	-
10	+12V	6A	-
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	-



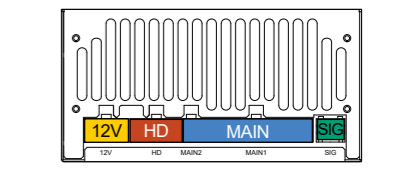
How to process the mounting holes (Recommended)



Installation direction
The unit can be installed in any directions.

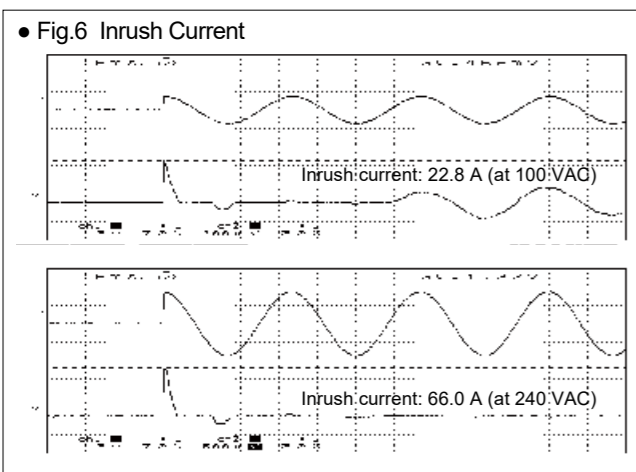
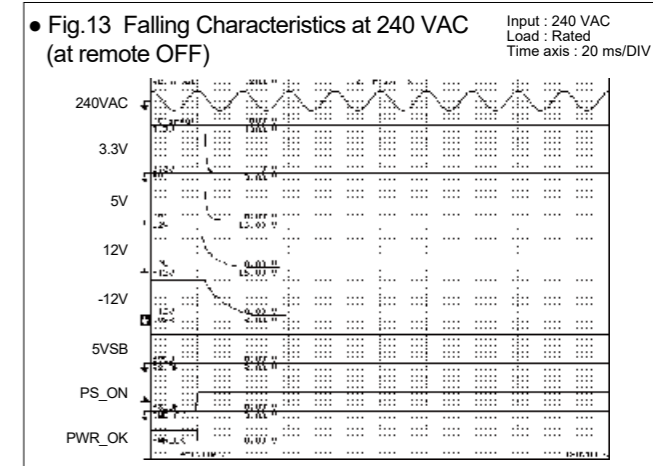
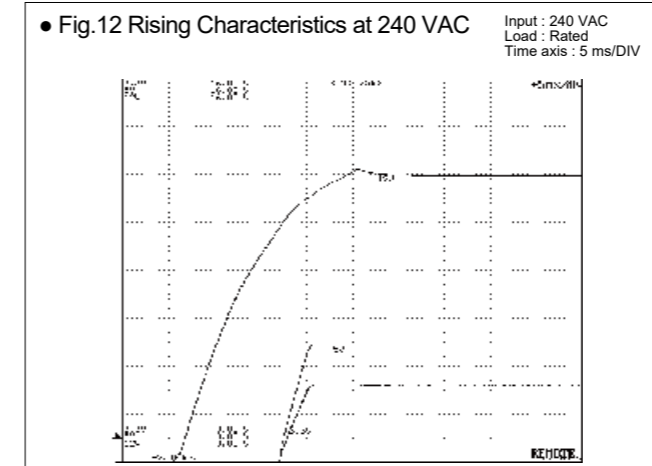
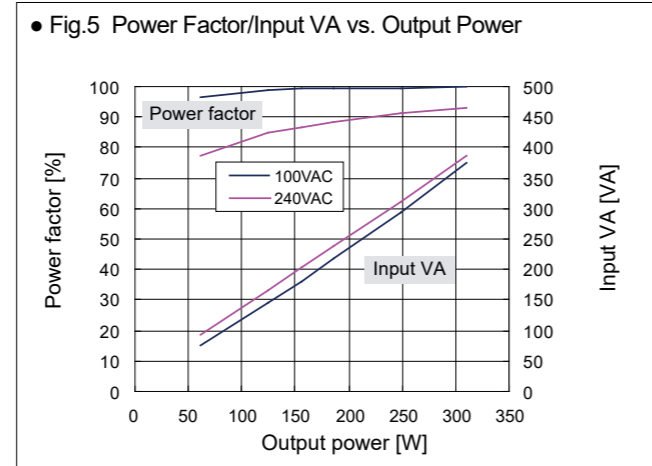
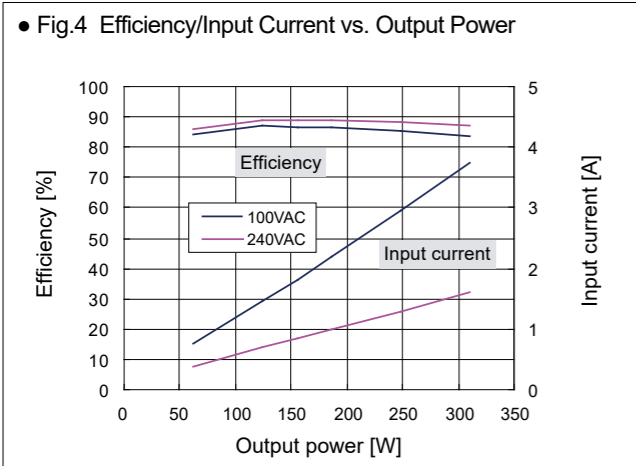
*1 Dimensional tolerance shall be ± 1mm unless otherwise specified.
*2 The screw depth of penetration into PSU is 6mm max.

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



Acceptable cables
1 model 1 model 1 model 1 model

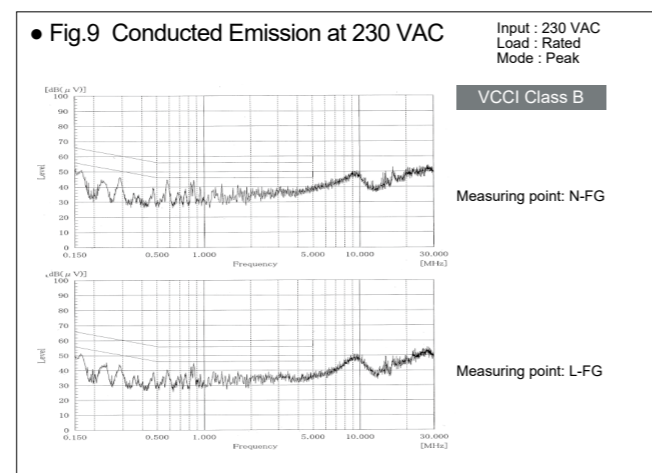
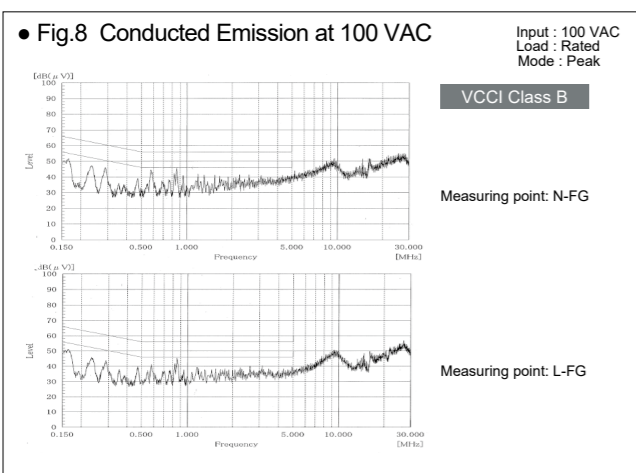
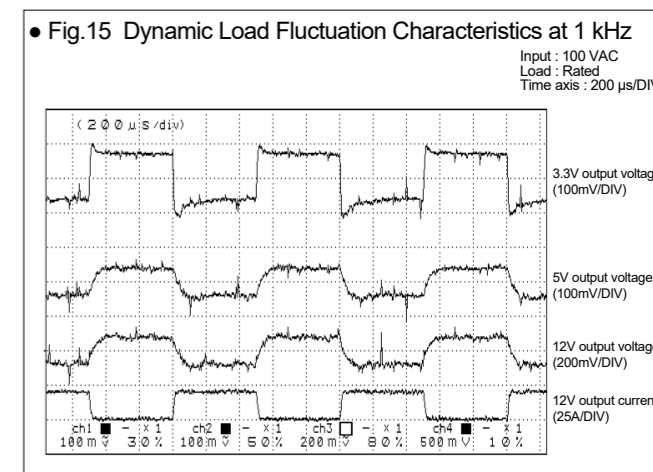
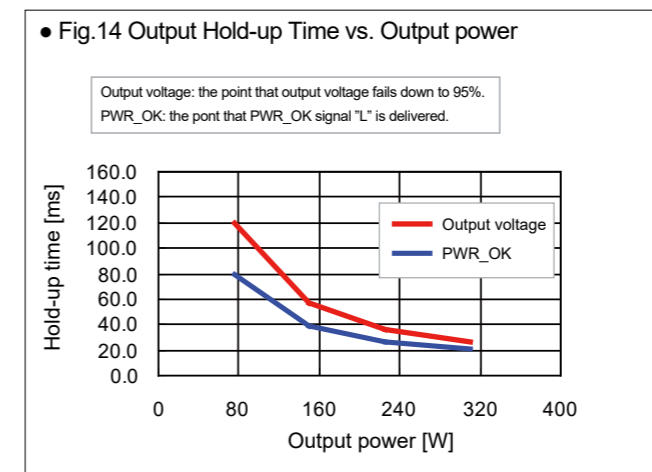
Cable Photos	Model	Category	Description
	WH2753-02	AC power cord	125VAC 12V (tracking resistance type) [PSE]
	WH-S1005-500-02	Harness for RS232C communication	Harness for automatically shut down at blackout Connect to battery package (BS28A-H350/2.5L).
	WH-S1005-500-03	Harness for RS232C communication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



• Fig.7 Leakage Current

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

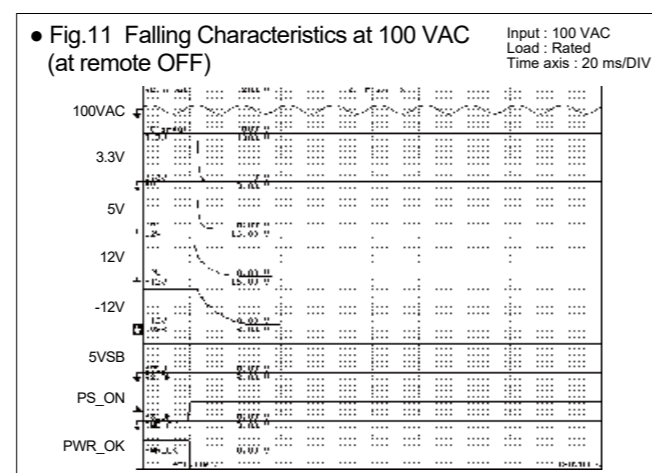
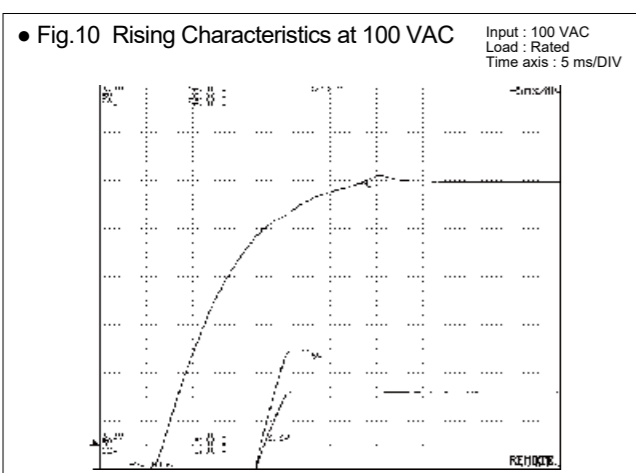
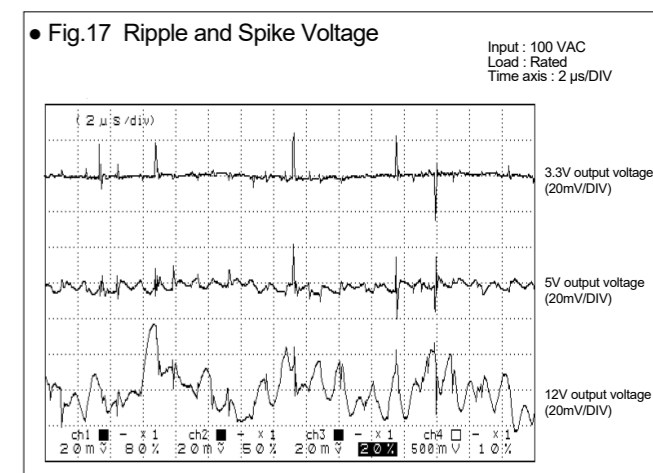
	Rated load	Min. load
100 VAC	0.053mA	0.041mA
200 VAC	0.061mA	0.047mA
240 VAC	0.065mA	0.050mA



• Fig.16 Output Voltage Regulation (Load Fluctuation)

	Output	Min. load	Rated load	Peak load
12V output	0A	10A	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.18 Ambient Temperature vs. Lifetime Expectancy

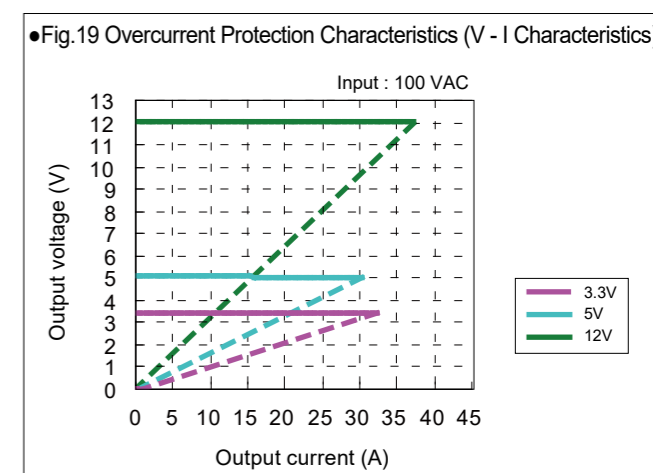
■ Electrolytic capacitors

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



Battery Package BS28A-H350/2.5L

BS28A-H350/2.5L

5 inch bay fixed type Ni-MH battery

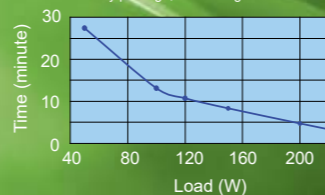
Lead Ni-Cd **Ni-MH** other

RoHS Directive



BS28A-H350 / 2.5L

Battery backup discharge characteristics
(Be aware that it is a reference value at initial use of the battery package; it is not a guaranteed value.)



Model	Description
BS28A-H350 / 2.5L	—
■ Model name coding	① Series name ④ Output voltage ② Modification ⑤ Capacity ③ Ni-MH ⑥ Long life battery
BS28 A - H 350 / 2.5 L	
① ② ③ ④ ⑤ ⑥	

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

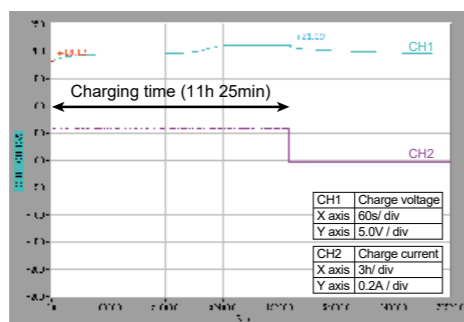
Used with HPCSF-400P-X2B

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

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

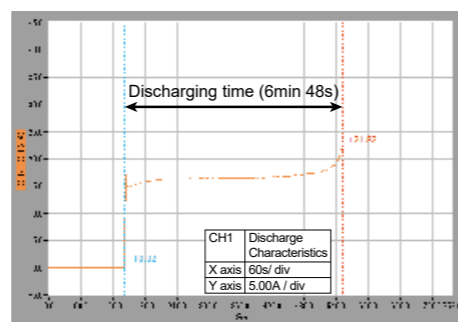
[Charge Characteristics]

Temperature: 20°C
load condition: Rated load



[Discharge Characteristics]

Temperature: 20°C
load condition: Rated load

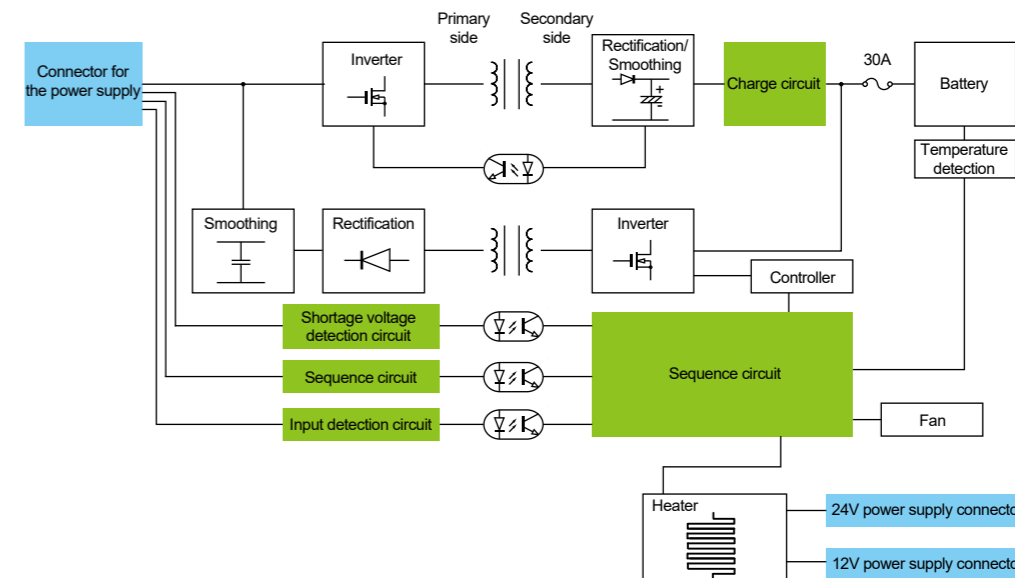


General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

Items	Specification	Measurement condition, etc.
Battery	16.8V 2.5Ah	Sealed nickel hydride battery
Nominal Battery Power Voltage	16.8V	
Rated Capacity	2.5Ah	10 hour 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	27 VDC 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.
Storage Temp./Humidity	-20-65°C, 20-90%	Internal heater will operate at 20°C typ. or less.
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	Left one bottom edge of the unit 50mm high with the opposite edge placed on the test bench, and let it fall. Number of bumps: 3 each of 4 edges. There shall be no malfunction observed.	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.

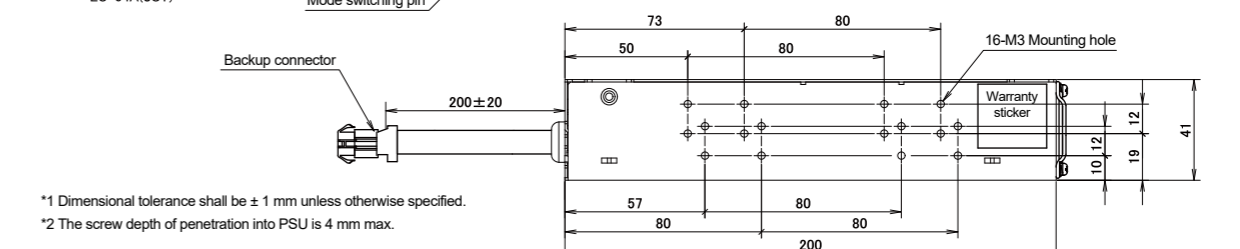
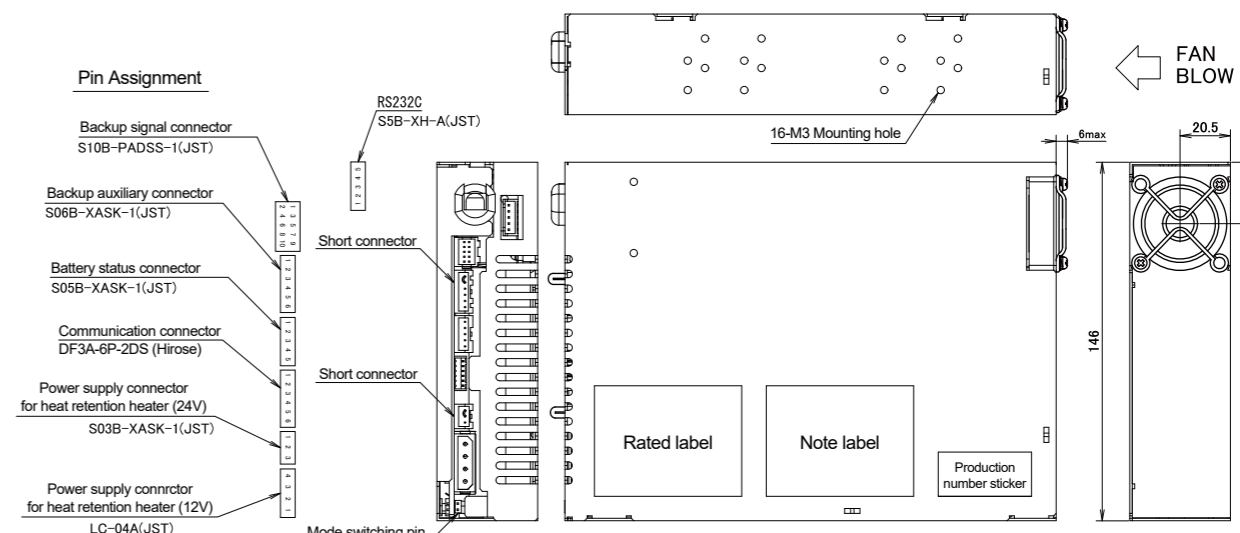
*Life expectancy is a reference value. It is not a guaranteed value.

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

Medical standard approved & ErP Directive Compliant.
Energy saving and high efficiency SFX power supply!



mHPCSF-400P-X2S1

RoHS Directive

SFX
Continuous 310W Peak 400W

Model	Description
mHPCSF-400P-X2S1	-

Model Name Coding
mHPCSF-400P-X2S1
 ① ② ③ ④ ⑤ ⑥ ⑦

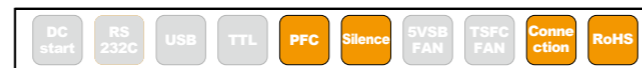
① Series name ④ ATX output ⑦ AC power cord retention clamp attachable
 ② Output power ⑤ +3.3V output equipped
 ③ Peak power available ⑥ Standard

Features

- Medical standard IEC60601-1 Ed.3.1 (MOOP) approved
- Double-sided through hole PCB 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



Input

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

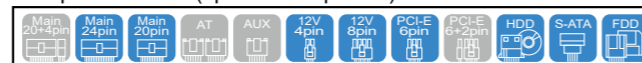
Output

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

Dimension

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

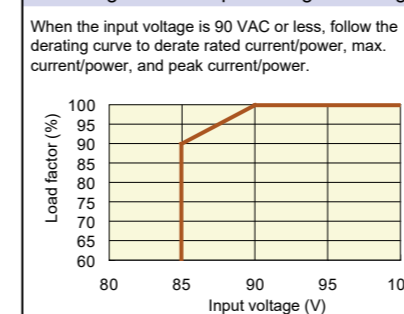
Output connector (optional component)



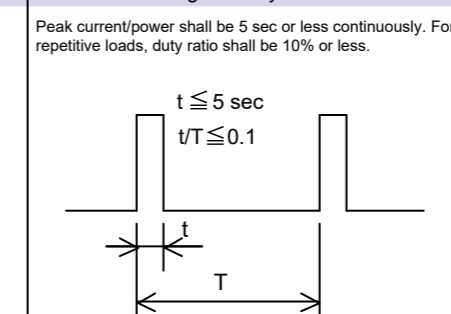
General Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

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 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	Reference value at measurement of input/output characteristics. Max. output power 310W Peak output power 400W Time: 5 sec or less Duty ratio of repetitive load: 10% or less	
	Rated Current	8A 8A 19A 0.5A 2A		
	Max. Current / Power	16A 16A 25A 0.5A 2A		
		90W max. 300W max. 310W max. 6W 10W		
		300W max. 310W max. 310W max. 6W 10W		
	Peak Current / Power	20A 20A 30A 0.5A 3A		
		120W max. 360W max. 385W max. 6W 15W		
		400W max. 400W max. 400W max. 6W 15W		
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: 1500 VAC 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 Emission	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 Standard	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 PWBs with through holes)	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.		

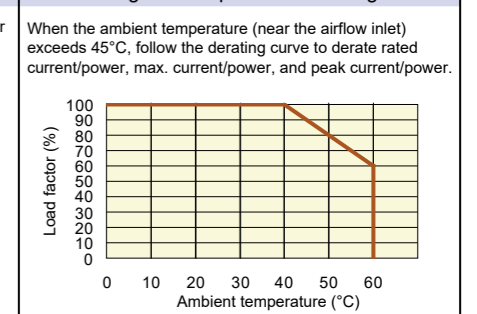
<Fig.1> Low input voltage derating



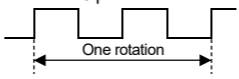
<Fig.2> Duty Ratio

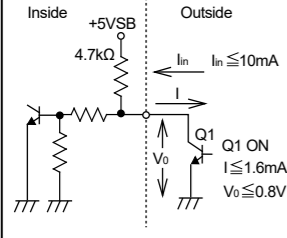
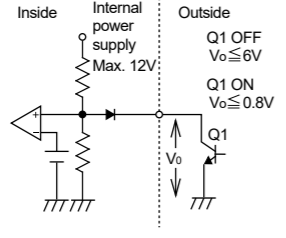
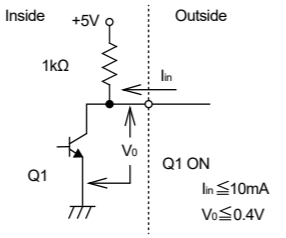
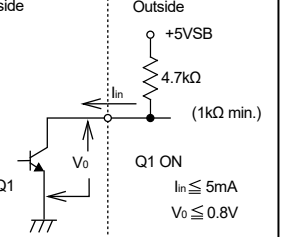


<Fig.3> Temperature Derating

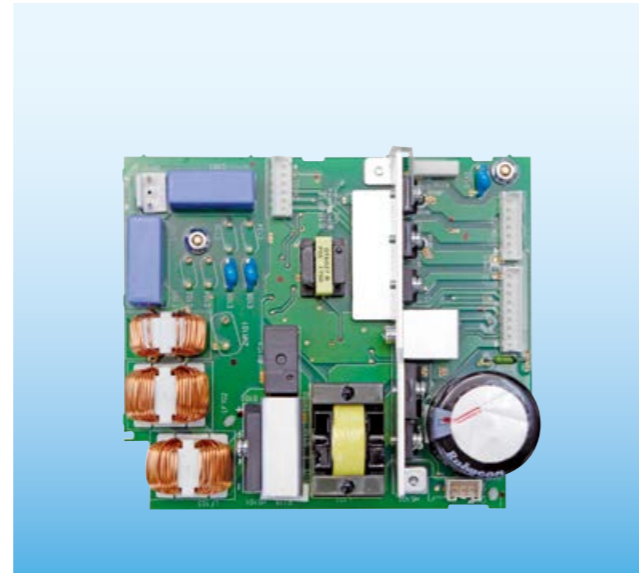
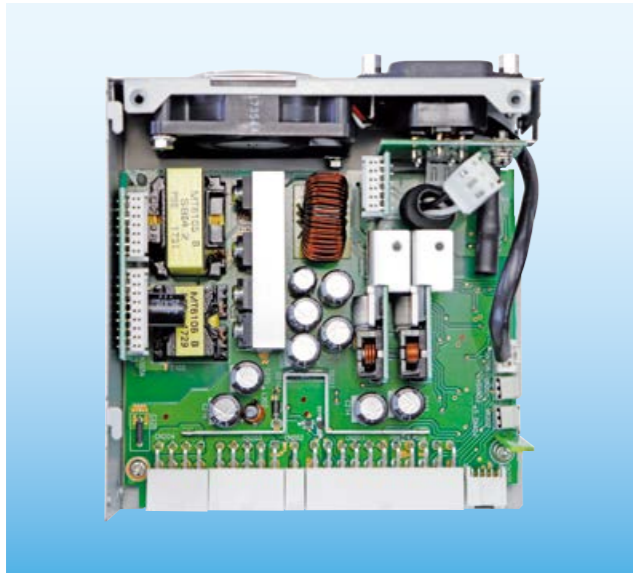


Signal Input/Output Specification (Items are provided at normal temperature and humidity unless otherwise specified.)

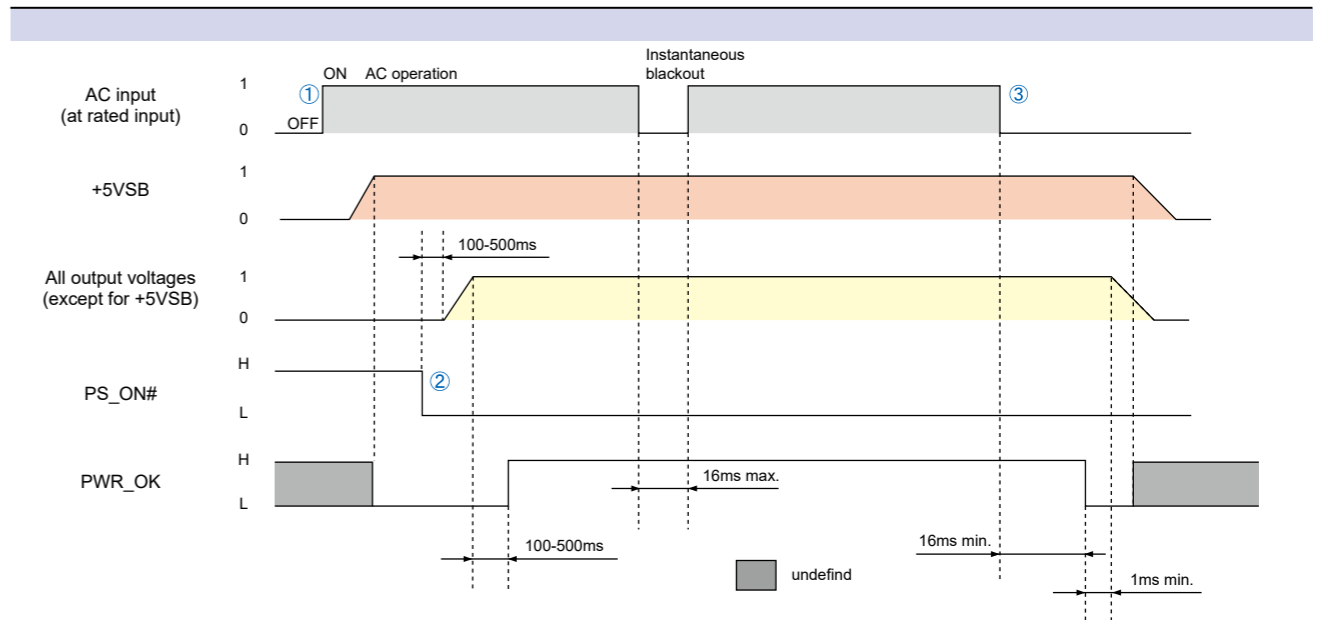
Items	Specification	Note
Input Signal	Output ON/OFF control signal (PS_ON#) +3.3V, +5V, +12V and -12V outputs are delivered with 'L' input. +3.3V, +5V, +12V and -12V outputs shutdown with 'H' or 'OPEN' input.	MAIN1 connector 22 pin
	+3.3V SENSE The input terminal to detect the voltage of +3.3V output; 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		Output Signal Circuit	
(PS_ON#)	(FAN_C)	(PWR_OK)	(FAN_M)
			

Internal structure



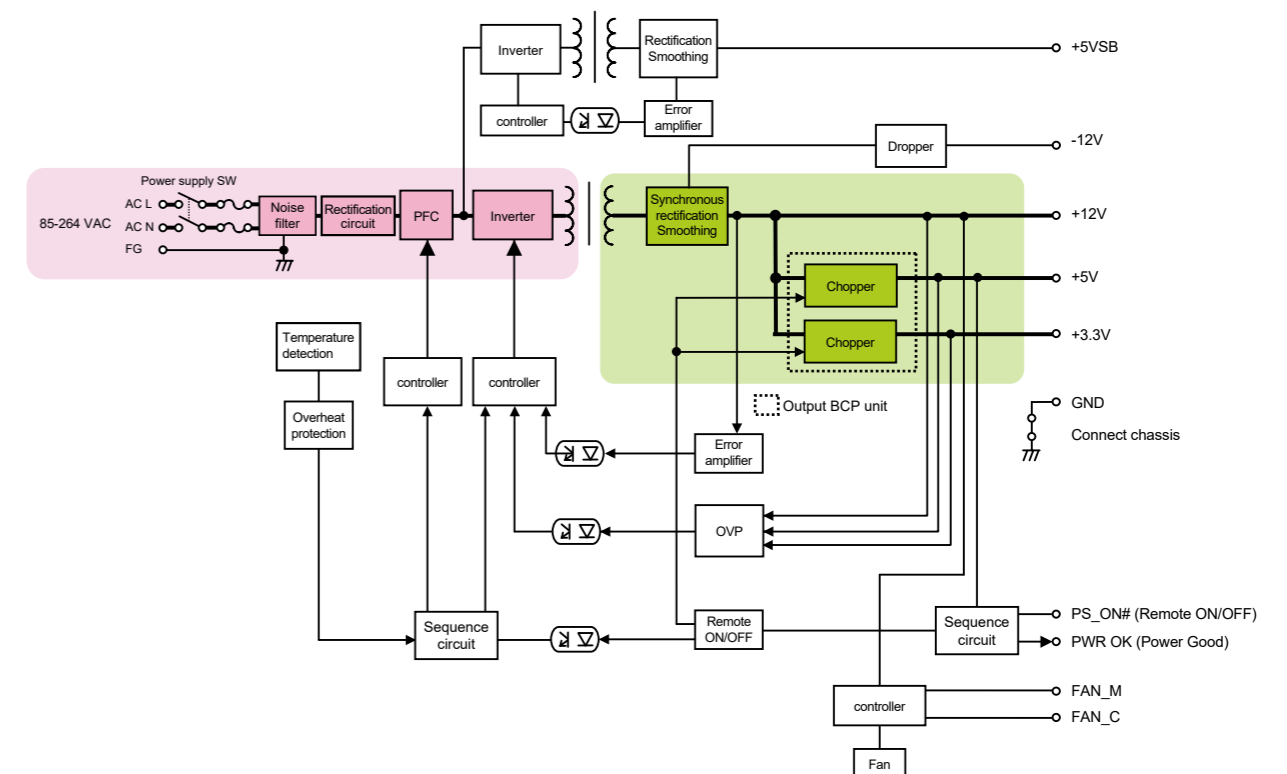
Sequence Timing Chart

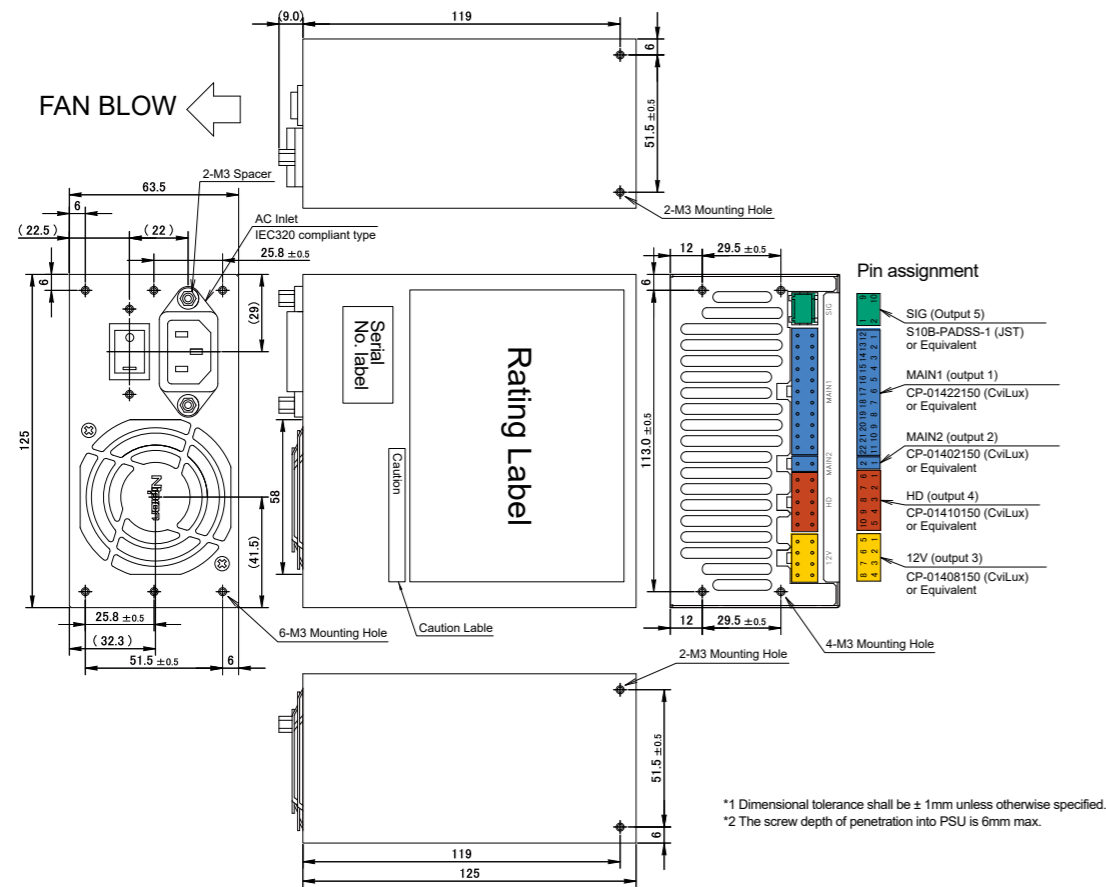


- (1) Only +5VSB output starts up by supplying AC input while PS_ON# is "H" status.
- (2) All outputs start up by inputting PS_ON# "L". PWR_OK 'H' is delivered at 100-500 ms after +5V output starts up.
- (3) At blackout, PWR_OK 'L' is delivered after 16ms or more. After that, all outputs (except +5VSB)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

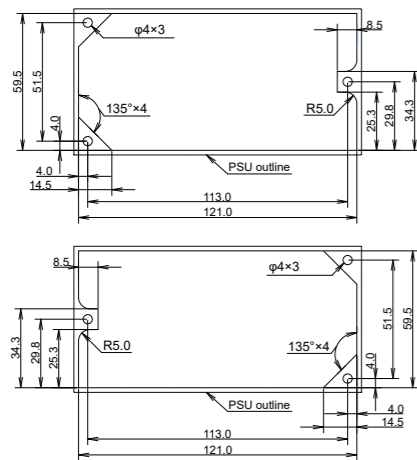
- Rise time difference among outputs shall be 50ms max.
- The output voltage level at rising of +12V shall be higher than that of +3.3V.
- Also, difference in output voltage level between +5V and +3.3V shall be from -0.6V to 2.25V inclusive.
- The order and difference in level of output voltage for each 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





How to process the mounting holes (Recommended)

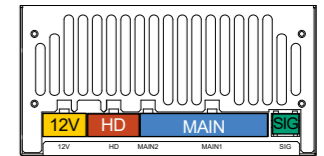


Installation direction
The unit can be installed in any directions.

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

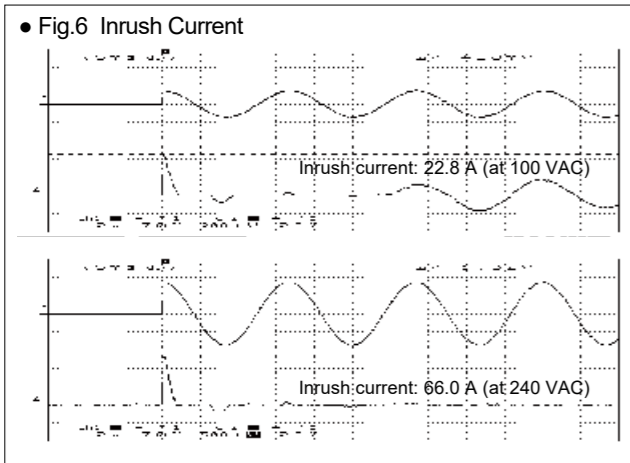
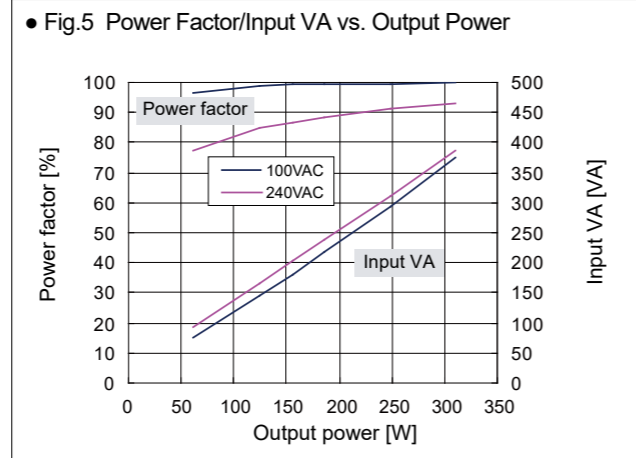
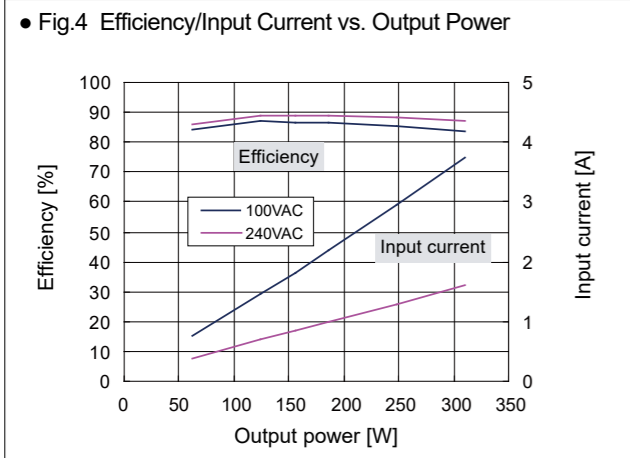
CN Name	PIN No.	FUNCTION	MAX. CURRENT
12V	1	COM	6 A
	2	COM	6 A
	3	COM	6 A
	4	COM	6 A
HD	5	+12V	6 A
	6	+12V	6 A
	7	+12V	6 A
	8	+12V	6 A
	1	+3.3V	6 A
	2	+5V	6 A
	3	COM	6 A
	4	COM	6 A
SIG	5	+12V	6 A
	6	+3.3V	6 A
	7	+5V	6 A
	8	COM	6 A
	9	COM	6 A
	10	+12V	6 A
	1	NC	-
	2	NC	-
	3	NC	-
	4	FAN C	-
5	FAN M	5 mA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

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



Acceptable cables
1 model 1 model 1 model 1 model

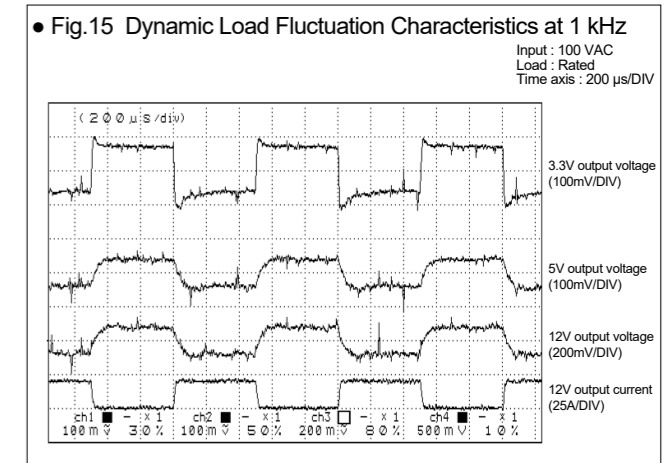
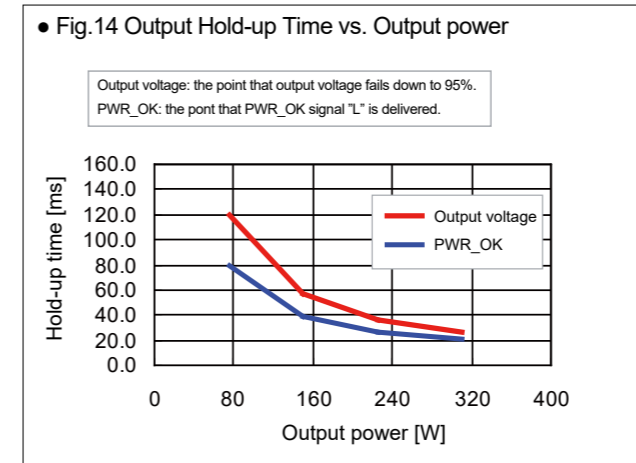
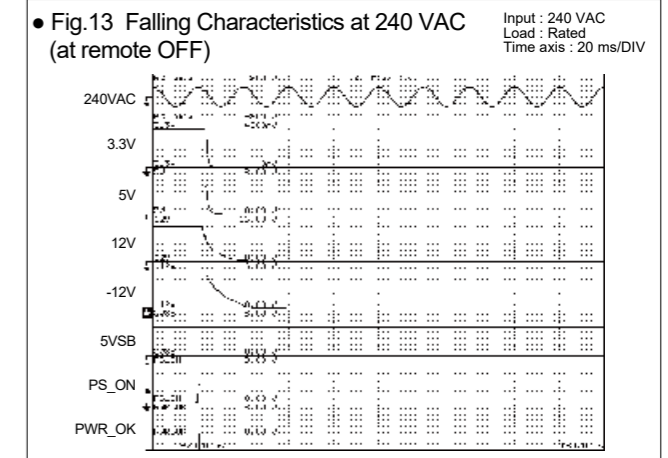
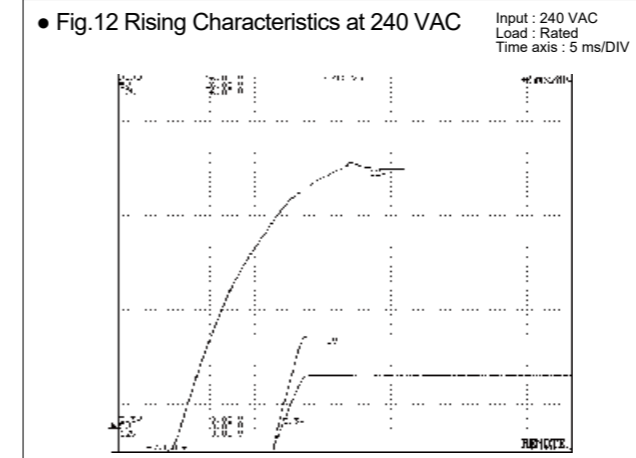
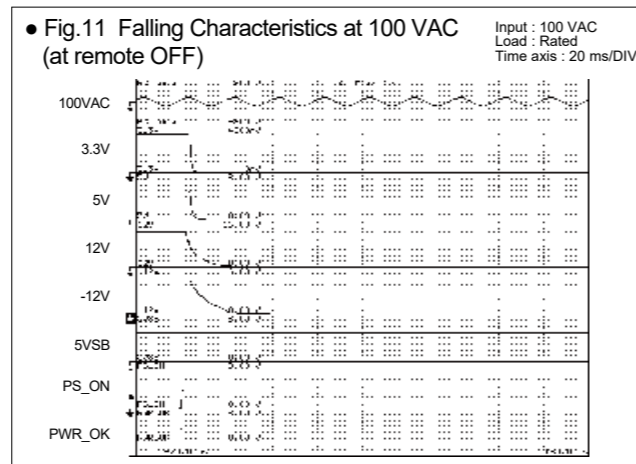
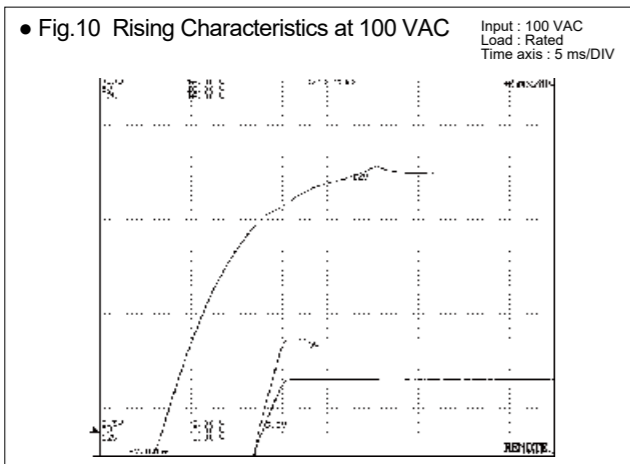
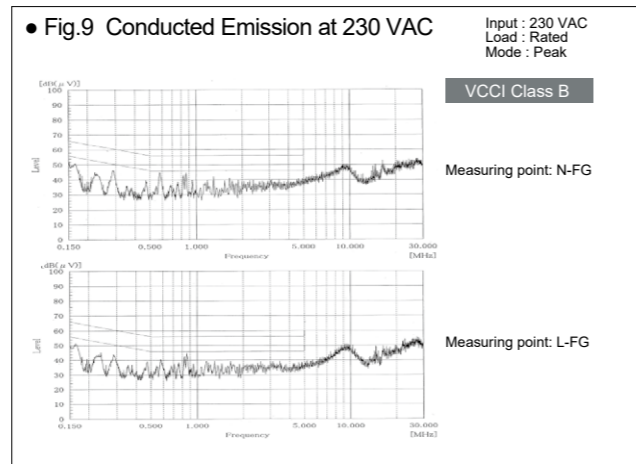
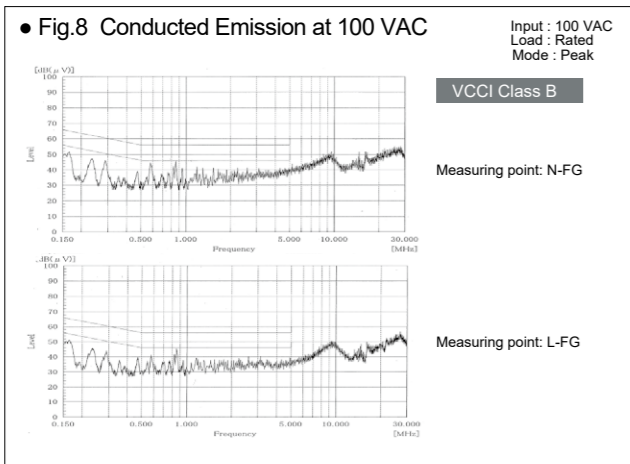
Photos	Model	Category	Description
	WH2753-02	AC power cord	125VAC 12V (tracking resistance type) [PSE]



• Fig.7 Leakage Current

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

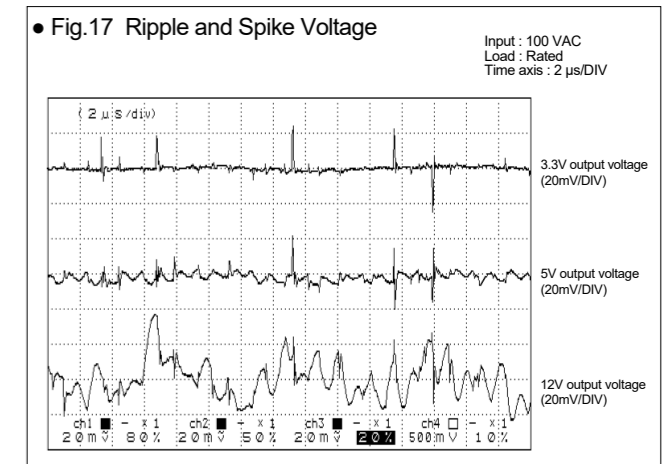
	Rated load	Min. load
100 VAC	0.053mA	0.041mA
200 VAC	0.061mA	0.047mA
240 VAC	0.065mA	0.050mA



• 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





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