

# Nipron eNSP3-450P-C20-H0V/H1V/H2V/H6V Specifications

Date of issue: June 25, 2010

## General specifications

### AC input

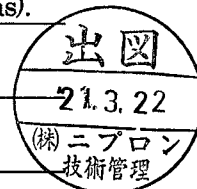
	Specification	Conditions
Nominal input voltage	100 V to 240 V AC	Universal input range. Maximum DC output is derated from 100% to 90% according to AC input voltage from 90 V to 85 V (see output specifications.) Minimum startup voltage: 80 V $\pm$ 10 V AC
Input voltage range	85 V to 264 V AC	
Input frequency	50 Hz or 60 Hz	Allowable frequency range: 47 Hz to 63 Hz
Inrush current	$\leq$ 31 A peak at 100 V AC $\leq$ 75 A peak at 240 V AC	At rated output and cold start (25°C)
Input power	$\leq$ 513 VA at 100 V AC $\leq$ 487 VA at 240 V AC	At rated input and maximum continuous output
	$\leq$ 679 VA at 100 V AC $\leq$ 643 VA at 240 V AC	At rated input and peak output
Efficiency	73% typ. at 100 V AC, 77% typ. at 240 V AC	At rated output
Power factor	99% typ. at 100 V AC, 97% typ. at 240 V AC	At rated output

### DC input

	Specification	Conditions
Nominal input voltage	24 V DC	Conformable to specified battery pack
Battery "end of discharge" voltage	17 V typ. (battery input is shut off.)	
Efficiency	73% typ.	At rated input and output

### Operating/storage environment

	Specification	Conditions
Operating temperature	0°C to 60°C	Excludes battery pack. Temperature gradient: $\leq$ 15°C/hr Output power is derated from 100% to 70% according to temperature from 45°C to 60°C (refer to output specifications).
Storage temperature	-25°C to 70°C	Temperature gradient: $\leq$ 15°C/hr
Humidity	10% to 90% RH for operation, 10% to 95% RH for standby	At no condensation



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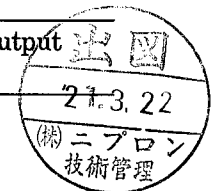
	mode and storage.	
Vibration	Withstands for 45 minutes at amplitude of 0.075 mm, frequencies from 10 Hz to 55 Hz and 10 repetitive sweep cycles for each of orthogonal X, Y and Z directions.	At no operation. According to JIS-C-60068-2-6
Mechanical shock	No failure is detected by the test that one side of bottom is lifted up (to slant the unit) and, for each of 4 sides, let it fall down 3 times from the height of 50 mm.	At no operation. According to JIS-C-60068-2-31

### Electrical insulation


	Specification	Conditions
Hi-Pot	1500 V AC for 1 minute, between AC input and interconnected DC input, DC output and FG.	(FG: Frame Ground)
Insulation resistance	≥ 50 MΩ between AC input and interconnected DC input, DC output and FG	At 500 V DC
Leakage current	≤ 0.5 mA at 100 V AC, ≤ 1 mA at 200 V AC	Tested with YEW 3226 or equivalent (1 kΩ).

### Other specifications

	Specification	Conditions
Electrostatic discharge (ESD)	Contact discharge: ± 6 kV, 10 times	IEC61004-4-2 (Test level 3). No failure and no operating error.
Line noise immunity	± 2000 V for 10 minutes at a pulse width of 100 ns/1000 ns, frequencies from 30 Hz to 100 Hz, positive/negative polarity, normal/common mode pulse.	Measured with INS-410. No variance in DC output voltage and no operating error.
Surge voltage	5 repetitive tests with a common mode pulse of ± 2 kV, a normal mode pulse of ± 1 kV and pulse width of 1.2 × 50μs.	IEC61000-4-5 (Installation environment class 3). No failure and no operating error.
EMI	EN55022 class B (CISPR22), VCCI class B and FCC class B	Measured for power supply unit only.
Line frequency harmonic current	IEC 61000-3-2 (Ver. 2.1) class D and EN61000-3-2 (A14) class D	At rated input and output



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Safety regulation		UL60950, CSA C22.2 No. 60950, EN62368-1 and CCC, CE marking(IEC62368-1) 	
Cooling	Forced air cooling	Fan motor speed is controlled by a thermo sensor, which detects temperature inside the unit.	Note: During the standby mode of operation controlled by PS_ON# signal, the fan operates slowly only when the detected temperature is high.
	Fan speed mode	Slow and Fast modes are selectable by a switch on the top panel.	Set to Slow mode when shipped from factory. Fast mode fixes the fan speed.
Product reliability grade		FA (Factory Automation grade)	Nipron's quality criteria
Warranty		3-year return-to-Nipron repair or replacement with new one after delivery to customer.	Warranty is applied to the use under specified operating conditions.
Weight (mass)		1.8 kg typ.	

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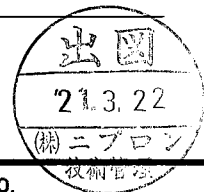


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## DC Output specifications

### DC output ratings

		CH1	CH2	SH3	CH4	CH5	Conditions	
Voltage rating		3.3 V	5 V	12 V	-12 V	5 VSB		
Minimum current required		0A	0 A	0 A	0 A	0 A	The minimum output current required for accurate voltage regulation.	
Current rating		11.5 A	16 A	18 A	0.5 A	2 A	Total output power rating 350 W	
Output power rating		38 W	80 W	216 W	6 W	10 W		
Maximum continuous output*1	Current	20 A	22 A	22 A	0.5 A	2 A	Maximum total continuous output power 350 W	
	Power	160 W		264 W	6 W	10 W		
Peak output*1 (≤ 5 s)	Current	30 A	33 A	30 A	0.5 A	2.5 A	Total peak output power 450.5 W for the duration within 5 s. (See Note 2 for repetitive peak output.)	
	Power	200 W		360 W	6 W	12.5 W		
		432 W						
Voltage accuracy		± 4%	± 4%	± 5%	± 5%	± 5%	See Note 3.	
Maximum ripple voltage (p-p)		50 mV	50 mV	120 mV	120 mV	50 mV	See Note 4.	
Maximum spike voltage (p-p)		100 mV	100 mV	170 mV	170 mV	100 mV		
Rise time (Tr)		0.1 ms ≤ Tr ≤ 70 ms					Rise time from 10% to 95% of final voltage.	
Over-current protection	OCP point	≥ 31 A	≥ 34 A	≥ 28 A (≥ 31 A*5)	≥ 105% of rated peak current		At rated input. (Note 5: The OCP point in parenthesis applies when total output power for 3.3 V, 5 V and 12 V is less than max peak power.)	
	Limiter characteristics	All outputs except for CH5 are disabled. All outputs are disabled in case of battery backup operation.			Fold back type	Same as CH1 to CH3		
	Recovery (AC input)	Re-entry of AC input or PS_ON# signal going to L from H			Automatic			
	Recovery (DC input)	Re-entry of AC input			Auto-matic	Same as CH1 to CH3		
Over-Voltage protection	OVP point	3.76 V to 4.3 V	5.74 V to 7.0 V	13.4 V to 15.6 V	NA			



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Limiter characteristics	All outputs except for CH5 are disabled. All outputs are disabled in case of battery backup operation.	NA	
Recovery (AC input)	Re-entry of AC input or PS_ON# signal going to L from H	NA	
Recovery (DC input)	Re-entry of AC input	NA	

Note 1: Output power is derated depending on ambient temperature as shown in Figure 1.

When AC input voltage is below 90 V, the output power should be derated as shown in Figure 2.

Note 2: The duty ratio of repetitive peak output is less than 10% (1:9) as shown in Figure 3.

Note 3: Includes the dependence on temperature, input voltage and load variances.

Note 4: Ripple and spike voltages are defined as measured voltages across a 10μF electrolytic capacitor and a 0.1μF ceramic capacitor connected in parallel between the output connector and circuit common.

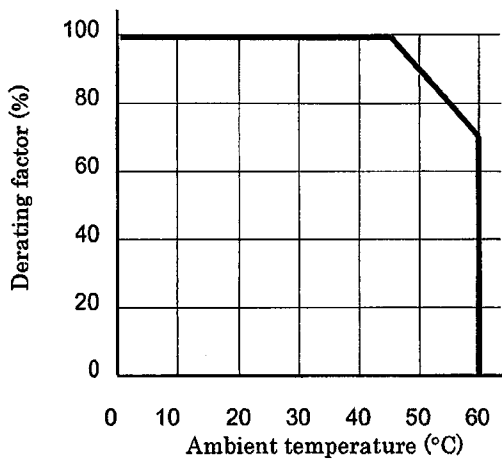


Figure 1. Output power derating vs. ambient temperature

When ambient temperature exceeds 45°C, derate (decrease) the maximum continuous/peak output current and power in accordance with Figure 1. (Multiply the output current/power by the derating factor.)

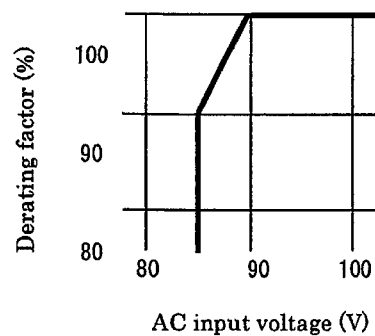


Figure 2. Output power derating vs. AC input voltage

When the AC input voltage is below 90 V, derate the maximum continuous/peak output current and power in accordance with Figure 2.

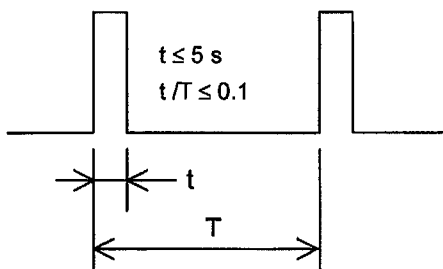


Figure 3. Duty ratio of repetitive peak output current and power



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### Battery charge output

	Battery type		Specification	Conditions
Charge output	Ni-MH battery	Charge voltage	35 V max	See Note 1.
		Charge current	0.7 A max	See Note 2.
	Lead-acid battery	Charge voltage	27.3 V typ.	At 25°C, full charge, and with temperature compensation.
		Charge current	0.5 A ± 0.2 A DC	At a battery voltage of 24 V.

Note 1: Charge voltage is automatically set to appropriate voltage for the specified Ni-MH battery pack.

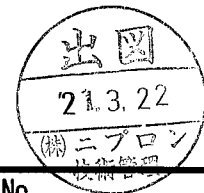
Note 2: The specified battery pack has a battery charge control function managed by a micro-controller chip.

### Available battery packs and battery backup time

Battery type	Battery pack model number	Conversion cable	Power supply output power in battery backup operation						Safety *Note 2
			≤150 W	≤200 W	≤250 W	≤300 W	≤350 W	≤450 W	
Lead-acid	BS05A-P24/2.2L (5 inch bay)	Required	5 min	3 min	2 min	NA	NA	NA	NA
	RBS01A-P24/2.2L (Removable)	Required	5 min	3 min	2 min	NA	NA	NA	NA
	BS11A-P24/2.3L (5 inch bay)	NA	5 min	3 min	2 min	1 min	In seconds	NA	Approved
	RBS02A-P24/2.3L (Removable)	NA	5 min	3 min	2 min	1 min	In seconds	NA	Approved
	BS12A-P24/5.0L	NA	20 min	13 min	9 min	6.5 min	5 min	In seconds	Approved
Ni-MH	BS08A-H24/2.0L	Required	3 min	NA	NA	NA	NA	NA	NA
	BS06A-H24/2.5L (5 inch bay)	Required	9 min	6 min	NA	NA	NA	NA	NA
	BS06B-H24/2.5L (5 inch bay)	Required	9 min	6 min	NA	NA	NA	NA	NA
	BS10A-H24/2.0L (5 inch bay)	NA	9 min	6 min	4.5 min	3.5 min	In seconds	NA	Approved

Note 1: The battery backup time is approximate time in initial use of battery and is not specified (The backup time is not guaranteed.) Unit of time: in minutes.

Note 2: Compliance with safety regulations.



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## Input/Output signal specifications

### Input/Output signals

	Signal	Function
Input signal	Output On/Off control (PS_ON#)	High or OPEN input disables all DC outputs on CH1 to CH5
	+3.3 V SENSE	Input terminal for detecting CH1 (+3.3 V) output voltage. Connecting this input to the load allows +3.3 V output voltage to be compensated for line drop (the voltage drop on circuit common line is not compensated).
	TTL-Battery input shut down (SHUT_DOWN_T)	Low input ( $\geq 60$ ms) shuts off the backup battery. Valid in backup operation only.
	RS232C Battery input shut down (SHUT_DOWN_R) [Model H1V only]	Positive input ( $\geq 2.4$ V, $\geq 60$ ms) shuts off the backup battery. Valid in backup operation only.
Output signal	Output Normal (PWR_OK)	Outputs TTL High level when all DC outputs are normal (Voltage detection time: 100 ms to 500 ms)
	TTL-AC Power Fail (AC FAIL_T)	Outputs TTL High level when AC input voltage is too low or interrupted. Detection threshold voltage is 75 V AC typ. and detection delay time is 20 ms to 40 ms after AC input shuts off.
	RS232C-AC Power Fail (AC FAIL_R) [Model H1V only]	Outputs Negative voltage ( $-9$ V typ.) when AC input voltage is too low or interrupted. Detection threshold voltage is 75 V AC typ. and detection delay time is 20 ms to 40 ms after AC input shuts off.
	USB AC Power Fail (AC FAIL_U) [Model H6V only]	Outputs a data corresponding to Negative AC FAIL_R signal when AC input voltage is too low or interrupted. Detection threshold voltage is 75 V AC typ. and detection delay time is 20 ms to 40 ms after AC input shuts off.
	TTL Battery Voltage Low (BATT_LOW_T)	Outputs TTL High level when battery terminal voltage is too low ( $\leq 19$ V typ.). Outputs TTL Low level when backup battery is not connected.
	RS232C Battery Voltage Low (BATT_LOW_R) [Model H1V only]	Outputs Negative voltage ( $-9$ V typ.) when battery terminal voltage is too low ( $\leq 19$ V typ.). Outputs Positive voltage (9 V typ.) when backup battery is not connected.



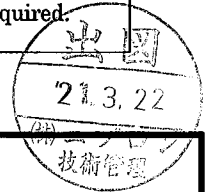
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	USB Battery Voltage Low (BATT LOW_U) [Model H6V only]	Outputs a data corresponding to Negative BATT LOW_R signal when battery terminal voltage is too low ( $\leq 19$ V typ.). Outputs a data corresponding to Positive BATT LOW_R signal when backup battery is not connected.
	Buzzer [Model H2V only]	Generates buzzer when AC input is interrupted. Buzzer level is variable. (See note 1)
	Fan monitor (FAN M)	Outputs a square wave signal at the rate of 2 pulses per 1 turn of fan motor operation.

Note 1: Buzzer may operate for a few seconds when AC input is turned on or off.

### Signal input/output circuit configuration

	PS_ON#	SHUT DOWN_T	SHUT DOWN_R (H1V only)	
Signal input circuit	<p>(<math>L \leq 0.8</math> V, <math>2.0</math> V <math>\leq</math> H)</p>	<p>(<math>L \leq 0.4</math> V, <math>2.4</math> V <math>\leq</math> H)</p>	Analog Devices ADM232AARN or equivalent is used.	
	PWR_OK	AC FAIL_T, FAN M, BATT LOW_T	AC FAIL_R, BATT LOW_R (H1V only)	AC FAIL_U, BATT LOW_U (H3V only)
Signal output circuit	<p>(<math>L &lt; 0.4</math> V)</p>	<p>(<math>L &lt; 0.4</math> V)</p>	Analog Devices ADM232AARN or equivalent is used.	
			Complies with USB1.1 (B type connector)  Note: Installation of USB to RS232C conversion driver software is required.	

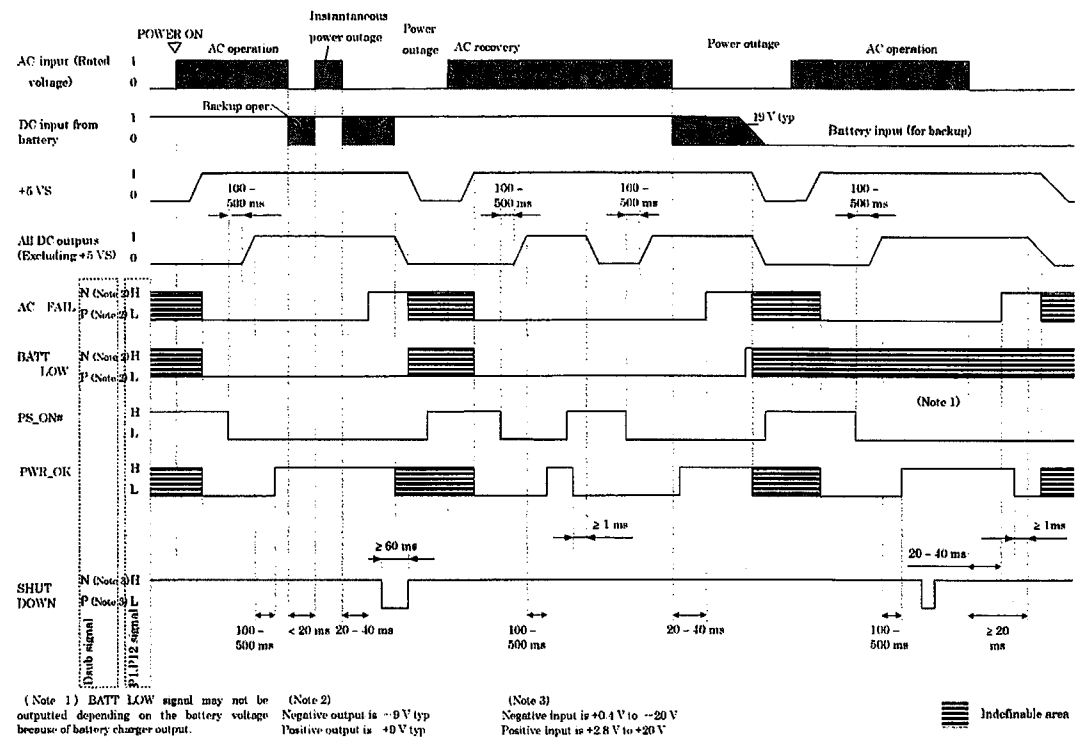


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# Timing Diagram

(Timing of signals for the eNSP3-450P-C20-H1V with the SU-RS installed and backup battery connected.)



Note: When auto shutdown is performed in Windows 2000/XP environment, do not use the shutdown signal. Use the Remote OFF control signal supported by APM or ACPI function after OS ends.



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### Current ratings of output connector pins

The maximum allowable continuous current for each of output connector pins is shown in Table 1.

The sum of the shared currents for the same output must be less than the maximum current specified for each output.

Table 1. Output connector current ratings

Connector	Pin	Output	Max. current
MAIN	1	+3.3 V SENSE	10 mA
	2	+ 3.3 V	6.0 A
	3	GND	6.0 A
	4	+5 V	6.0 A
	5	GND	6.0 A
	6	+5 V	6.0 A
	7	GND	6.0 A
	8	PWR_OK	5 mA
	9	+5 VSB	2.5 A
	10	+12 V	6.0 A
	11	+12 V	6.0 A
	12	+3.3 V	6.0 A
	13	+3.3 V	6.0 A
	14	-12 V	0.5 A
	15	GND	6.0 A
	16	PS_ON#	1 mA
	17	GND	6.0 A
	18	GND	6.0 A
	19	GND	6.0 A
	20	NC	-
	21	+5 V	6.0 A
	22	+5 V	6.0 A
	23	+5 V	6.0 A
	24	GND	6.0 A

Connector	Pin	Output	Max. current	
12 V	1	GND	7.0 A	
	2	GND	7.0 A	
	3	GND	7.0 A	
	4	GND	7.0 A	
	5	+12 V	7.0 A	
	6	+12 V	7.0 A	
	7	+12 V	7.0 A	
	8	+12 V	7.0 A	
	HD	1	+3.3 V	7.0 A
		2	+5 V	7.0 A
3		GND	7.0 A	
4		GND	7.0 A	
5		+12 V	7.0 A	
6		+3.3 V	7.0 A	
7		+5 V	7.0 A	
8		GND	7.0 A	
9		GND	7.0 A	
10		+12 V	7.0 A	
SIG	1	AC FAIL_T	5 mA	
	2	SHUT	1 mA	
	3	BATT LOW_T	5 mA	
	4	NC	-	
	5	FAN M	5 mA	
	6	PS_ON#	1 mA	
	7	GND	2.0 A	
	8	+3.3 V SENSE	10 mA	
	9	NC	-	
	10	+5 VSB	2.0 A	

Note: +3.3 V SENSE input signal at pin 8 of SIG connector is detected prior to the same signal at pin 1 of MAIN connector when both inputs are used. When the pin 8 of SIG connector is not used, the signal status at pin 1 of MAIN connector is detected.



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## Warnings and Cautions on operation

### 1. WARNING: Grounding

This power supply is designed as safety class I apparatus. For operator safety, be sure to ground the power supply by connecting the Earth terminal to earth ground.

### 2. WARNING: Electrical shock hazards

High potentials exist inside the power supply. When integrating the power supply into an instrument or system, use appropriate safe procedure to avoid electrical shock hazards.

### 3. CAUTION: Do not short DC outputs

Do not short the DC outputs of the power supply. Shorting the outputs makes internal capacitors quickly discharge and cause dangerous spark and heat generation that may result in serious accident such as fire. Furthermore, it will shorten the operating life of power supply.

### 4. CAUTION: Power on procedure to prevent harmful inrush current

To restrict the surge current into smoothing capacitor, a power thermistor is used inside the unit. If AC input is re-entered soon without allowing the power thermistor to cool down after the AC input was disconnected before, an excessive surge current may flow into the power supply. Be sure to allow at least 60 seconds before the re-entry of AC input.

### 5. CAUTION: Hold the main unit for carrying the power supply

Do not grasp the output cables to hang the unit when carrying the power supply. Doing so will damage the output cables and connectors. Hold the main unit when carrying the power supply.

### 6. NOTE: Audible power-on noise

There is possibility that, when the power supply starts up, it generates audible noise for a moment. This noise is caused by a low frequency transient vibration of choking inductor (used for harmonic current suppression) or of another component. The noise does not affect the operating characteristics and operating life of the power supply.



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