

# **NMP650 / 1K2 Instruction Manual**

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## 0. Safety Guidelines

- ⊙ Risk of electrical shock and energy hazard, please do not remove the case from the power supply unit. The output module configurations should only be changed by a trained professional.
- ⊙ This unit is cooled by forced-air cooling, so fans and ventilation holes must be kept free from any obstructions. A minimum clearance of 10cm is recommended.
- ⊙ Please do not perform hot-swap of modules during operation, otherwise there will be risk of damaging the power supply unit and electrical shock hazard.
- ⊙ Please do not change any components of the unit or make any kind of modifications to the unit.
- ⊙ Please do not install the unit in places with high moisture, high ambient temperature or under direct sunlight.
- ⊙ The input voltage range is 100-240Vac (50/60Hz), please do not input voltage that is over or less than 10% of this range.
- ⊙ The safety protection level of this unit is Class I. The "Frame Ground" (≡) on the power supply unit must be well connected to PE (Protective Earth).

## 1. Product Description

### 1.1 Description

NMP is MEAN WELL's new generation intelligent modular power supply, bringing forth the state-of-the-art Front-End and NMS-240/NMD-240 output module designs. This family offers output module configurability, intelligent control functions, and 1U low profile form factor. The NMP family also complies with both ITE and medical safety standards, offering the best flexibility for various types of applications. The end user will be able to fully customize the output voltages by choosing single output modules of 5V, 12V, 24V and 48V and dual output of 36V, which have wide voltage range and adjustment capability that fully covers 3~55V.

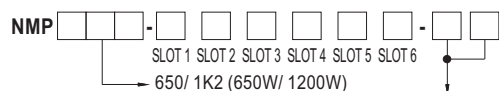
### 1.2 Features

- ⊙ UL/EN60601-1(3rd Edition) Medical safety approval (2x MOPP), 4KVAC Isolation
- ⊙ UL/EN/IEC62368-1 IT safety approval
- ⊙ 2018 Taiwan Excellence Award (NMP1K2)
- ⊙ Low leakage current < 400uA/ 264VAC, touch current < 100uA/ 264VAC
- ⊙ Efficiency up to 91%
- ⊙ 1U low profile mechanical design
- ⊙ Universal AC input/ full range
- ⊙ Built-in active PFC function
- ⊙ Built-in active current sharing and parallel control capabilities
- ⊙ Output voltage programmable (PV, NMS-240 only)
- ⊙ Constant current level programmable (PC, NMS-240 only)
- ⊙ Global or Local ON/OFF control
- ⊙ Remote sense for output module (NMS-240 only)
- ⊙ DC-OK signal and LED indicator for output module
- ⊙ Over-temperature protection and T-Alarm on Front-End
- ⊙ Built-in 5V auxiliary power for both Front-End and NMS-240 modules (NMS-240 only)
- ⊙ Forced air cooling by built-in DC fan(s) with fans speed control function
- ⊙ Protections: Short circuit/ Overload/ Over voltage/ Over temperature for all output modules
- ⊙ Surge protection levels that meet industrial standard
- ⊙ 5-years warranty



## 2. Order Information

### 2.1 Output Configuration Guide



※650W (4 SLOTS) 、 1200W(6 SLOTS) Parallel or option code (See Table 1.)

Example: NMP1K2-C-E-H-K-#-D- [ ] [ ]

- SLOT 1 O/P: 5V@36A
- SLOT 2 O/P: 12V@20A
- SLOT 3 O/P: 24V@10A
- SLOT 4 O/P: 48V@5A
- SLOT 5 Blank slot (with BLANK-NMS240)
- SLOT 6 O/P: V1 30V@5A  
V2 30V@5A  
(Combined 240W max.)

Table 1. Parallel or option code

Code	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5	SLOT 6
00	----	----	----	----	----	----
01	○	○	----	----	----	----
02	----	○	○	----	----	----
03	----	----	○	○	----	----
04	----	----	----	○	○	----
05	----	----	----	----	○	○
06	○	○	○	----	----	----
07	----	○	○	○	----	----
08	----	----	○	○	○	----
09	----	----	----	○	○	○
10	○	○	○	○	----	----
11	----	○	○	○	○	----
12	----	----	○	○	○	○
13	○	○	○	○	○	----
14	----	○	○	○	○	○
15	○	○	○	○	○	○
16	○	○	○	○	----	----
17	----	○	○	○	○	----
18	----	----	○	○	○	○
19	○	○	----	○	○	----
20	○	○	----	----	○	○
21	----	○	○	----	○	○
22	○	○	○	○	○	○
23	○	○	○	○	○	----
24	○	○	----	○	○	○
25	----	○	○	○	○	○
26	○	○	○	○	○	----
27	○	○	○	----	○	○
28	----	○	○	○	○	○
29	○	○	○	○	○	○
30	○	○	○	○	○	○
31	○	○	○	○	○	○

※Code 00, 01, 02, 03, 06, 07, 10, 16 for NMP650/NMP1K2

※Code 00~31 for NMP1K2

## 2.2 Notes on Output Configuration

- ⊙ Modules to be in parallel or series connection should be placed in adjacent slots.
- ⊙ The combined operation output power of all modules must be less than the Front-End's rated maximum output power: 1200W for NMP1K2 and 650W for NMP650.

## 2.3 Label Marking

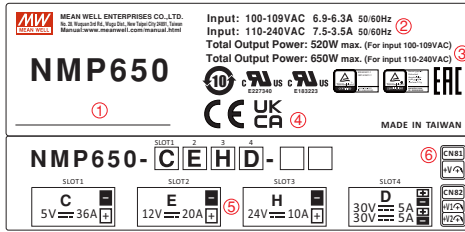


Figure 2-1. NMP650 Product Label

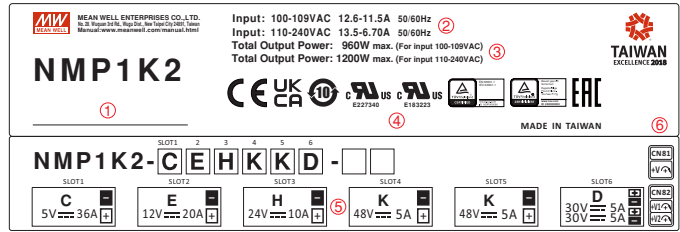


Figure 2-2. NMP1K2 Product Label

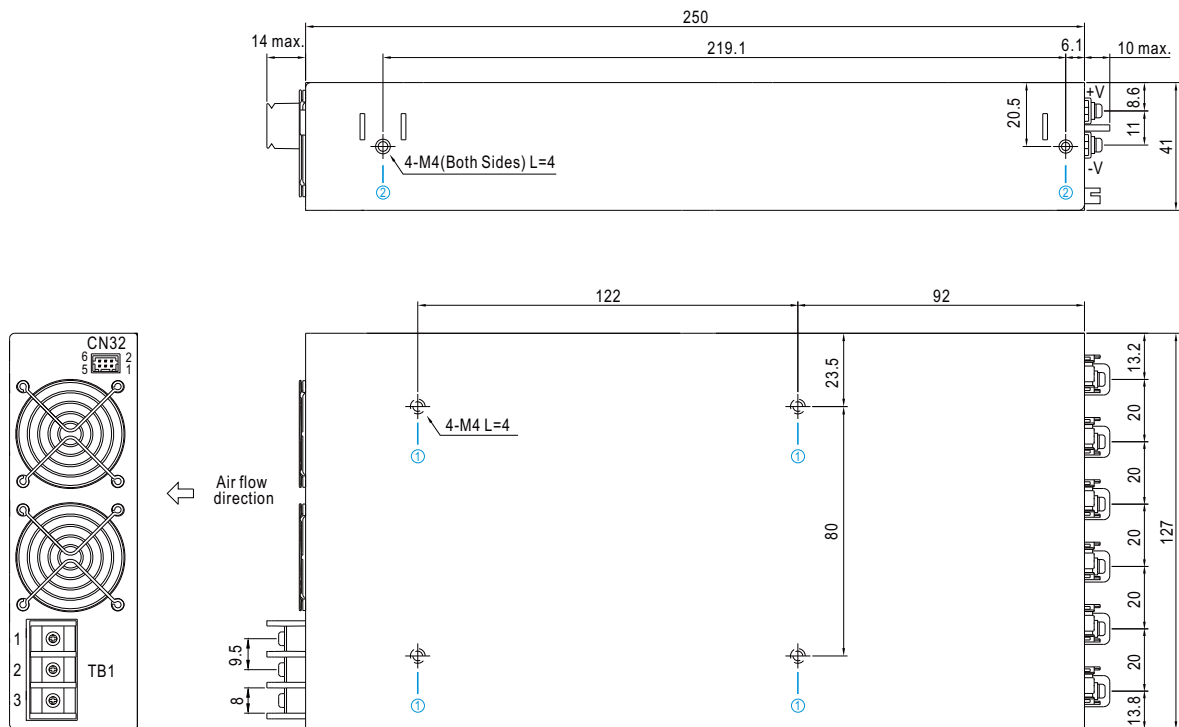
- ① Serial Number.
- ② Input Rating.
- ③ Maximum Output Rating.
- ④ Safety Marks.
- ⑤ Output Encoding.
- ⑥ Output Module Terminal Diagram.

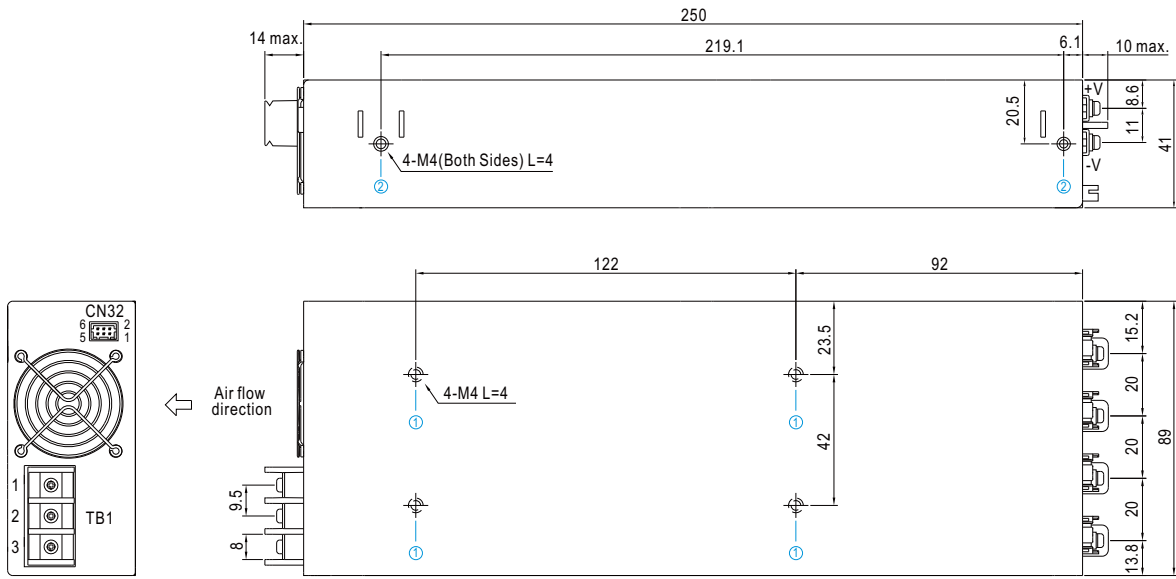
## 3. Mechanical Specifications and Input/Output Terminals

### 3.1 Mechanism of Front-End

- ⊙ NMP1K2

Case No.260A Unit:mm



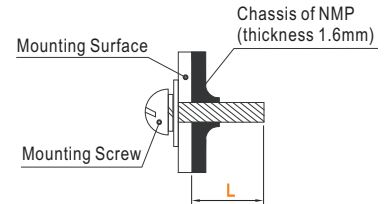


※ Mounting Instructions

Hole No.	Recommended Screw Size	MAX. Penetration Depth L	Recommended mounting torque
①	M4	4mm	7~10Kgf-cm
②	M4	4mm	7~10Kgf-cm

※ AC Input Terminal Pin No. Assignment

Pin No.	Assignment	Diagram	Screw Size	Maximum mounting torque
1	FG $\perp$		M3.5	12Kgf-cm
2	AC/N			
3	AC/L			

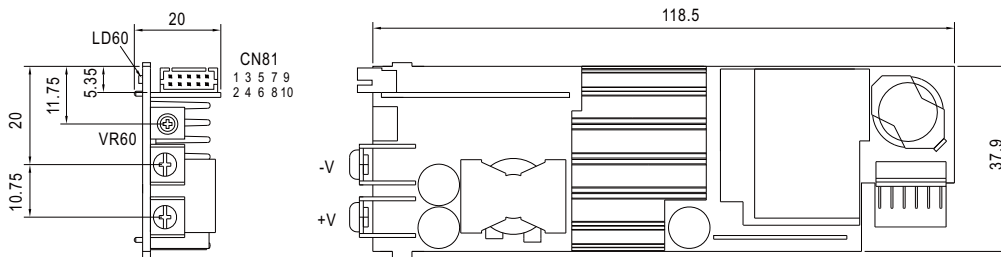


■ Function Description of CN32

Pin No.	Function	Description
1,2	+5V-AUX_P	Auxiliary voltage output, 4.5~5.5V, referenced to pin 3 & 4 (GND-P). The maximum load current is 2A (NMP1K2) or 1.5A (NMP650).
3,4	GND-P	Ground.
5	T-Alarm	TTL signal output for over temperature alarm. The maximum sourcing current is 10mA. High (4.5~5.5V): When the internal temperature exceeds the limit & "safe limit" of temperature alarm. Low (0~0.5V): When the internal temperature is normal.
6	RC1	Turns the output on and off by electrical or dry contact between pin 6 (RC1) and pin 3 & 4 (GND-P). Short: Power ON; Open: Power OFF.

3.2 Mechanism of Output Modules

©NMS-240 Output Module



※Blank slot

Blank slot should be assembled with BLANK-NMS240, please contact MEAN WELL for details.

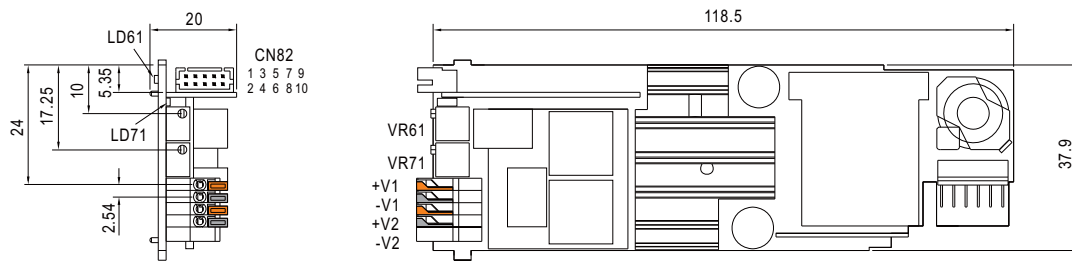
※DC Output Terminal Pin No. Assignment

Assignment	Diagram	Maximum mounting torque	Recommended screw size	MAX. Penetration Depth L
+V, -V		10Kgf-cm	M3.5	10mm

## ■ Function Description of CN81(NMS-240)

Pin No.	Function	Description
1	GND	Ground.
2	GND	Ground.
3	RC2	Turns the output on and off by electrical or dry contact between pin 3(RC2) and pin 1&2(GND). Open: Power ON; Short: Power OFF.
4	Vcc 2	Auxiliary voltage output, 4.5~5.5V, referenced to pin 1&2 (GND).The maximum load current is 10mA.
5	DC OK	"DC OK" signal is a TTL level, referenced to pin 1&2 (GND). Output modules turn on=4.5~5.5V, turn off=0~0.5V. The maximum sourcing current is 10mA (4.5~5.5V).
6	CS	Current sharing signal. When units are connected in parallel, the CS pins of the units should be connected to allow for current balance between units. Referenced to pin 1&2 (GND)
7	PC	Connection for output current programming, referenced to pin 1&2 (GND)
8	PV	Connection for output voltage programming, referenced to pin 1&2 (GND)
9	+S	Positive sensing for remote sense.
10	-S	Negative sensing for remote sense.

## ◎NMD-240 Output Module



Output number	Output voltage adjustable by SVR	LED display
V1	3~30V by VR61	LD61
V2	3~30V by VR71	LD71

## ※ DC Output Terminal Pin No. Assignment

Assignment	Color	Diagram	Wire range	Wire strip length
+V1	Orange		20~26AWG	10mm
-V1	Gray			
+V2	Orange			
-V2	Gray			

## ■ Function Description of CN82(NMD-240)

Pin No.	Function	Description
1	GND1	Ground(-V1).
2	GND2	Ground(-V2).
3	RC2	Turns the output V1 on and off by electrical or dry contact between pin 3 (RC2) and pin 1 (GND1). Open: Power ON; Short: Power OFF.
4	RC3	Turns the output V2 on and off by electrical or dry contact between pin 4 (RC3) and pin 2 (GND2). Open: Power ON; Short: Power OFF.
5	DC OK1	"DC OK1" signal is a TTL level, referenced to pin 1 (GND1). Output modules V1 turn on=4.5~5.5V, turn off=0~0.5V. The maximum sourcing current is 10mA (4.5~5.5V).
6	DC OK2	"DC OK2" signal is a TTL level, referenced to pin 2 (GND2). Output modules V2 turn on=4.5~5.5V, turn off=0~0.5V. The maximum sourcing current is 10mA (4.5~5.5V).
7,8,9,10	NC	-----

## 4. Product Specifications

### 4.1 Front-End Specification

MODEL		NMP650 (4 Slots)	NMP1K2 (6 Slots)	
INPUT	VOLTAGE RANGE <small>Note.6</small>	90 ~ 264VAC 120 ~ 370VDC		
	FREQUENCY RANGE	47 ~ 63Hz		
	POWER FACTOR	PF>0.95/230VAC PF>0.98/115VAC at full load		
	EFFICIENCY(Typ.) <small>Note.4</small>	91%, full case load with H / K module at nominal 24V / 48V only 90.5%, full case load with H / K module at nominal 24V / 48V only 88.5%, full case load with each type of module at nominal voltage		
	AC CURRENT	3.5A/230VAC 7.5A/115VAC	6.7A/230VAC 13.5A/115VAC	
	INRUSH CURRENT	40A/230VAC 25A/115VAC	40A/230VAC 25A/115VAC	
	LEAKAGE CURRENT	Earth leakage current <400uA / 264VAC, Touch current <100uA/264VAC		
OUTPUT	TOTAL OUTPUT POWER	650W max.	1200W max.	
PROTECTION	OVER TEMPERATURE	Shut down o/p voltage, recovers automatically after temperature goes down		
FUNCTION	REMOTE CONTROL	RC+/RC-: Short, Power ON RC+/RC-: Open, Power OFF		
	ALARM SIGNAL	TTL signal output for over temperature alarm. Please refer to the Function Manual.		
	AUXILIARY POWER(AUX)	5V @ 1.5A; tolerance ±10%; ripple: 50mVp-p (max.)	5V @ 2A; tolerance ±10%; ripple: 50mVp-p(max.)	
ENVIRONMENT	WORKING TEMP.	-30 ~ +70°C (Derate at 50°C, refer to "Derating Curve")		
	WORKING HUMIDITY	20 ~ 90% RH non-condensing		
	STORAGE TEMP., HUMIDITY	-40 ~ +85°C, 10 ~ 95% RH non-condensing		
	TEMP. COEFFICIENT	±0.03%/°C (0 ~ 50°C)		
	VIBRATION	10~500Hz, 2G 10min./1 cycle, 60 min. each along X, Y, Z axes.		
SAFETY & EMC <small>(Note 5)</small>	SAFETY STANDARDS	ANSI/AAMI ES60601-1, Ed. 3.1,UL62368-1; TUV BS EN/EN60601-1, Ed. 3.1, TUV BS EN/EN62368-1; IEC 60601-1, Ed. 3.1, IEC 62368-1, IEC60950-1; EAC TP TC 004 approved		
	ISOLATION LEVEL	Primary-Secondary: 2x MOPP, Primary-Earth: 1x MOPP		
	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC I/P-FG: 2KVAC O/P-FG: 0.5KVAC		
	ISOLATION RESISTANCE	I/P-O/P, I/P-FG, O/P-FG: 100M Ohms / 500VDC / 25°C / 70% RH		
	EMC EMISSION	Parameter	Standard	Test Level / Note
		Conducted	BS EN/EN55032 (CISPR32) / BS EN/EN55011 (CISPR11)	Class B
		Radiated	BS EN/EN55032 (CISPR32) / BS EN/EN55011 (CISPR11)	Class B
		Harmonic Current	BS EN/EN61000-3-2	Class A
		Voltage Flicker	BS EN/EN61000-3-3	-----
	EMC IMMUNITY	BS EN/EN60601-1-2, BS EN/EN55035, SEMI F47		
		Parameter	Standard	Test Level / Note
		ESD	BS EN/EN61000-4-2	Level 4, 15KV air; Level 4, 8KV contact
		RF field	BS EN/EN61000-4-3	Level 3, 10V/m
		EFT/ Burst	BS EN/EN61000-4-4	Level 3, 2KV
		Surge	BS EN/EN61000-4-5	Level 4, 4KV/Line-FG; 2KV/Line-Line
Conducted		BS EN/EN61000-4-6	Level 2, 3V	
Magnetic Field		BS EN/EN61000-4-8	Level 4, 30A/m	
Voltage Dips and Interruptions	BS EN/EN61000-4-11	100% dip 1 periods, 30% dip 25 periods, 100% interruptions 250 periods		
OTHERS	MTBF	1314.6K hrs min. Telcordia SR-332 (Bellcore) ; 128.2K hrs min. MIL-HDBK-217F (25°C) (NMP650) 1275.4K hrs min. Telcordia SR-332 (Bellcore) ; 124.5K hrs min. MIL-HDBK-217F (25°C) (NMP1K2)		
	DIMENSION	250*89*41mm (L*W*H)	250*127*41mm (L*W*H)	
	PACKING	1.45Kg (typ.); 9pcs / 14Kg / 0.98CUFT	2Kg (typ.); 6pcs / 13Kg / 0.88CUFT	



## 4.2 Single Output Module Specification

OUTPUT (NMS-240)	MODEL	NMS-240-05	NMS-240-12	NMS-240-24	NMS-240-48
	CONFIGURATION CODE	C	E	H	K
	DC VOLTAGE	5V	12V	24V	48V
	RATED CURRENT	36A	20A	10A	5A
	CURRENT RANGE	0 ~ 36A	0 ~ 20A	0 ~ 10A	0 ~ 5A
	RATED POWER	180W	240W	240W	240W
	RIPPLE & NOISE (max.) Note.2	100mVp-p	150mVp-p	150mVp-p	250mVp-p
	VOLTAGE ADJ. RANGE	3 ~ 6V	6~15V	15~30V	30~55V
	VOLTAGE TOLERANCE Note.3	±2.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±0.5%	±0.3%	±0.2%	±0.2%
	LOAD REGULATION	±1.0%	±0.5%	±0.5%	±0.5%
SETUP, RISE TIME	1500ms, 60ms at full load				
HOLD UP TIME (Typ.)	16ms/230VAC @ 75% total output power    10ms/230VAC @ total output power				
PROTECTION	OVERLOAD	105 ~ 125% rated output power Protection type: constant current limiting protection			
	OVER VOLTAGE	6.3 ~ 8V	15.5 ~ 20V	31 ~ 37V	57 ~ 66V
		Protection type : Shut down o/p voltage, re-power on to recover			
	OVER TEMPERATURE	Shut down o/p voltage, recovers automatically after temperature goes down			
FUNCTION	REMOTE ON/OFF CONTROL	RC+/RC-: Open, Power ON    RC+/RC-: Short, Power OFF			
	REMOTE SENSE	Compensate voltage drop on the load wiring up to 0.5V.			
	OUTPUT VOLTAGE PROGRAMMABLE(PV)	3 ~ 6V	6 ~ 15V	15 ~ 30V	30 ~ 55V
		Adjustment of output voltage is allowable. Please refer to the Function Manual.			
	OUTPUT CURRENT PROGRAMMABLE(PC)	Adjustment of constant current level is allowable. Please refer to the Function Manual.			
	AUXILIARY POWER(AUX)	5V@10mA; tolerance ±10%, ripple: 50mVp-p (max.)			
	CURRENT SHARING(CS)	Please refer to the Function Manual.			
	DC OK SIGNAL	Output modules turn on=4.5 ~ 5.5V, turn off=0 ~ 0.5V. Please refer to the Function Manual.			
OTHERS	DIMENSION	118.5*37.9*18mm (L*W*H)			
	PACKING	0.142Kg (typ.); 72pcs / 11.2Kg / 1.04CUFT			
NOTE	<p>1. All parameters NOT specifically mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.</p> <p>2. Ripple &amp; noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf &amp; 47uf parallel capacitor.</p> <p>3. Tolerance: includes set up tolerance, line regulation and load regulation.</p> <p>4. NMP650: The efficiency changes by installing different output modules. The following combination is chosen when fitting different types of module: 5V (Voltage code C)*1, 12V (Voltage code E)*1, 24V (Voltage code H)*1, 48V (Voltage code K)*1. (650W max.) NMP1K2: The efficiency changes by installing different output modules. The following combination is chosen when fitting different types of module: 5V (Voltage code C)*1, 12V (Voltage code E)*1, 24V (Voltage code H)*2, 48V (Voltage code K)*2. (1200W max.) The hold up time of the combination above is 16ms/230vac @ 75% total output power · 10ms/230VAC @ total output power.</p> <p>5. The power supply is considered a component which will be installed into a final equipment. All the EMC tests have been executed by mounting the unit on a 360mm*720mm metal plate with 1mm of thickness. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies." (as available on <a href="http://www.meanwell.com">http://www.meanwell.com</a>)</p> <p>6. De-rating may be needed under low input voltages. Please check the derating curve for more details.</p> <p>7. Under parallel operation ripple of the output voltage may be higher than the SPEC at light load condition.</p> <p>8. The ambient temperature derating of 3.5°C/1000m with fanless models and of 5°C/1000m with fan models for operating altitude higher than 2000m (6500ft).</p> <p>※ Product Liability Disclaimer : For detailed information, please refer to <a href="https://www.meanwell.com/serviceDisclaimer.aspx">https://www.meanwell.com/serviceDisclaimer.aspx</a></p>				

### 4.3 Dual Output Module Specification

OUTPUT (NMD-240)	MODEL	NMD-240	
	CONFIGURATION CODE	D	
	OUTPUT NUMBER	V1	V2
	DC VOLTAGE	30V	30V
	RATED CURRENT (max.)	5A	5A
	CURRENT RANGE	0 ~ 5A	0 ~ 5A
	RATED POWER (max.)	150W	150W
	COMBINED POWER (max.)	240W	
	RIPPLE & NOISE (max.) Note.2	250mVp-p	250mVp-p
	VOLTAGE ADJ. RANGE	3 ~ 30V	3 ~ 30V
	VOLTAGE TOLERANCE (max.) Note.3	±2.0%	±2.0%
	LINE REGULATION	±0.5%	±0.5%
	LOAD REGULATION	±1.0%	±1.0%
	SETUP, RISE TIME	1500ms, 60ms at full load	
	HOLD UP TIME (Typ.)	16ms/230VAC @ 75% total output power    10ms/230VAC @ total output power	
PROTECTION	OVERLOAD(V1,V2)	105 ~ 125% rated output power Protection type: constant current limiting protection	
	OVER VOLTAGE(V1,V2)	31 ~ 37V	31 ~ 37V Protection type : Shut down o/p voltage, re-power on to recover
	OVER TEMPERATURE(V1,V2)	Shut down o/p voltage, recovers automatically after temperature goes down	
FUNCTION	REMOTE ON/OFF CONTROL(V1,V2)	RC+/RC-: Open, Power ON    RC+/RC-: Short, Power OFF	
	DC OK SIGNAL(V1,V2)	Output modules turn on=4.5 ~ 5.5V, turn off=0 ~ 0.5V. Please refer to the Function Manual.	
OTHERS	DIMENSION	118.5*37.9*18mm (L*W*H)	
	PACKING	0.152Kg (typ.); 72pcs / 11.9Kg / 1.04CUFT	
NOTE	<p>1. All parameters NOT specifically mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.</p> <p>2. Ripple &amp; noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uf &amp; 47uf parallel capacitor.</p> <p>3. Tolerance: includes set up tolerance, line regulation and load regulation.</p> <p>4. NMP650: The efficiency changes by installing different output modules. The following combination is chosen when fitting different types of module: 5V (Voltage code C)*1, 12V (Voltage code E)*1, 24V (Voltage code H)*1, 48V (Voltage code K)*1. (650W max.) NMP1K2: The efficiency changes by installing different output modules. The following combination is chosen when fitting different types of module: 5V (Voltage code C)*1, 12V (Voltage code E)*1, 24V (Voltage code H)*2, 48V (Voltage code K)*2. (1200W max.) The hold up time of the combination above is 16ms/230vac @ 75% total output power · 10ms/230VAC @ total output power.</p> <p>5. The power supply is considered a component which will be installed into a final equipment. All the EMC tests have been executed by mounting the unit on a 360mm*720mm metal plate with 1mm of thickness. The final equipment must be re-confirmed that it still meets EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies." (as available on <a href="http://www.meanwell.com">http://www.meanwell.com</a>)</p> <p>6. De-rating may be needed under low input voltages. Please check the derating curve for more details.</p> <p>7. Under parallel operation ripple of the output voltage may be higher than the SPEC at light load condition.</p> <p>8. The ambient temperature derating of 3.5°C/1000m with fanless models and of 5°C/1000m with fan models for operating altitude higher than 2000m (6500ft).</p> <p>※ Product Liability Disclaimer : For detailed information, please refer to <a href="https://www.meanwell.com/serviceDisclaimer.aspx">https://www.meanwell.com/serviceDisclaimer.aspx</a></p>		

## 5.Functions

### 5.1 Input Voltage

- ⊙ Input voltage range is 90~264VAC or 120~370VDC.
- ⊙ To ensure proper operation, input voltage must be within the specified range. An incorrect input voltage may cause the unit operate improperly, lose PFC function, or even damaged in worst case scenario.
- ⊙ The efficiency will be lower at low input voltage range, so the output power needs to be de-rated for input less than 110VAC. Please refer to Section 7.3 De-rating for more information.

### 5.2 Inrush Current Limiting

- ⊙ This unit has built-in inrush current limiting circuit.
- ⊙ If adding an external switch (relay/ circuit breaker) at the input side is required, choose switches that are able to withstand inrush current of the units.
- ⊙ Since the inrush limiting circuit mainly consists of thermistors and a relay, inrush current will be much higher than the specified value if input thermistor is not allowed sufficient time to cool down. After turning off the AC input power, a 10 seconds cool down period is recommended before turning it on again.

### 5.3 Output Voltage / Current Adjustment

#### 5.3.1 Output Voltage Adjustment via SVR

- ⊙ The output voltage of each module may be trimmed by turning potentiometer: VR60 for NMS-240 and VR61/71 for NMD-240, near the output terminals. Turning the potentiometers clockwise increases the voltage, and turning the potentiometer counter-clockwise reduces the voltage.
- ⊙ When increasing the output voltage, the load current needs to be reduced accordingly to avoid exceeding the maximum output power.
- ⊙ When reducing the output voltage, the load current cannot exceed the maximum rated output current.

#### 5.3.2 Output Voltage Programming (PV, NMS-240 only)

- ⊙ Connect the external DC source to PV (PIN8) and GND (PIN 1 or 2) on CN81, as shown in Figure 5-1(left).
- ⊙ Relationship between the output voltage and the external DC voltage is shown in Figure 5-1(right).
- ⊙ When increasing the output voltage, the load current needs to be reduced accordingly to avoid exceeding the maximum output power.

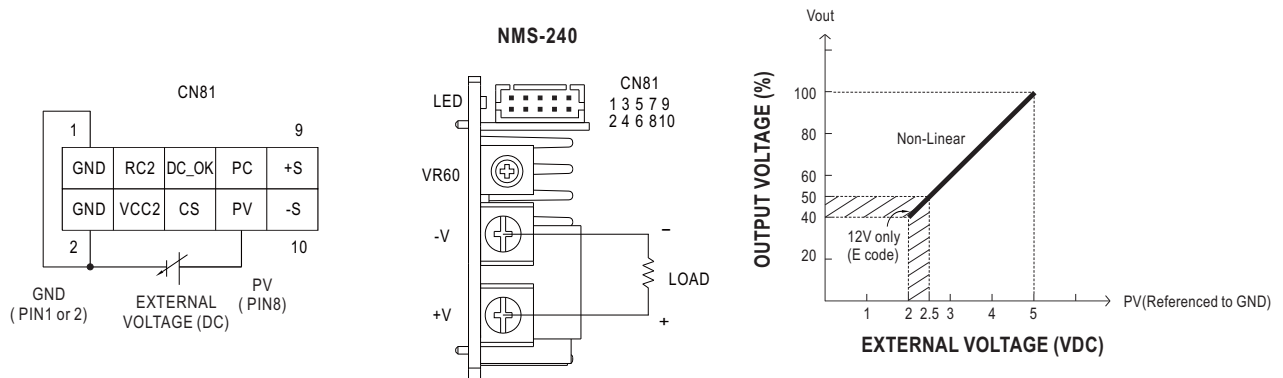


Figure 5-1

#### 5.3.3 Constant Current Level Programming (PC, NMS-240 only)

- ⊙ The constant current level can be trimmed to 40~100% of the rated current by applying external DC voltage. Connection diagram and relationship curve are shown in Figure 5-2.

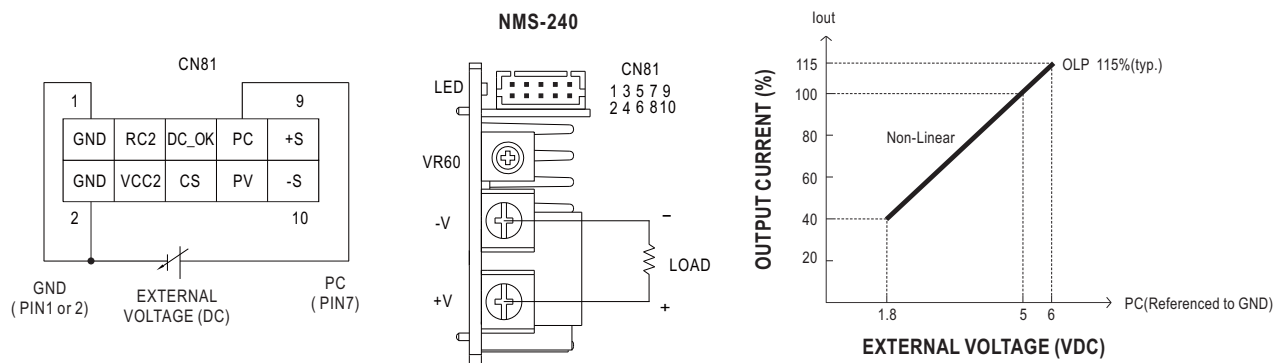


Figure 5-2

### 5.4 Short-Circuit and Over Current Protection

- Output modules have built-in short circuit and over current protections. The protection activates when the output is short-circuited or the output current exceeds  $115\% \pm 10\%$  of the rated output current. The output will automatically recover when the fault condition is removed.

### 5.5 Over Voltage Protection

- Each output module has built-in over voltage protection.
- The OVP trigger points vary depending on the different output modules. Please refer to 4.2 NMS-240 Single Output Module Specification or 4.3 NMD-240 Dual Output Module Specification for more details.
- Once OVP is triggered, leave the units off for 10 seconds before recycling AC power to power on the unit.

### 5.6 Over Temperature Protection (OTP) and T-Alarm

- The Front-End has built-in thermal detection circuit. Once the internal temperature exceeds a preset value, there will be a "HIGH" signal (4.5~5.5V) sent out through T-ALARM for end system to respond. If the internal temperature continues to increase and exceeds the "safe limit" value, then the output will shut down automatically. Please switch off the AC input, remove all possible causes, and then leave the unit to cool down to a normal working temperature (approximately 10 minutes ~ 1 hour) before re-power on.
- When the internal temperature is within a normal value, the T-Alarm signal will be a "LOW" signal (-0.1~0.5V).
- T-Alarm's maximum sourcing current is 10mA.
- Figure 5-3 shows T-Alarm (CN32 PIN5) and GND-PC (CN32 PIN3 or 4) connection diagram.

T-Alarm Signal Voltage	Internal Temperature (U702)	Output Status
0~0.5V	The internal temperature is normal	ON
4.5~5.5V	Exceeds the limit of T-Alarm	ON
4.5~5.5V	Exceeds the "safe limit"	OFF

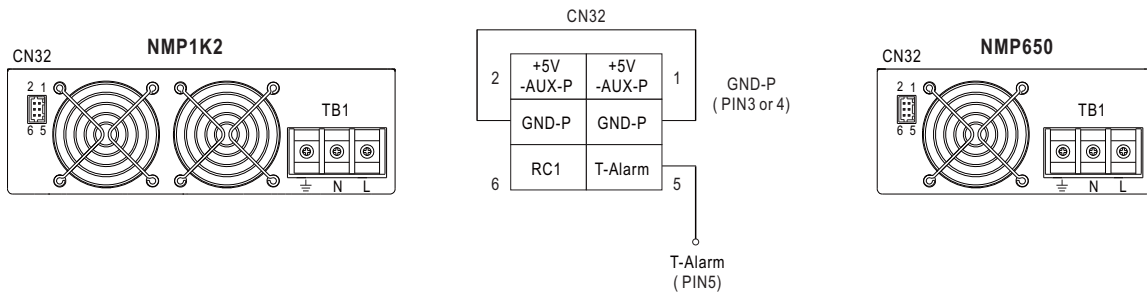


Figure 5-3

### 5.7 Fan-lock Protection

- There is a built-in fan-lock protection circuit. The output of all modules will shut off when the DC fan stops operating (fan-lock, loose connector, or broken wires). Please turn off the AC power and remove the conditions causing fan-lock. If there are no observable causes for fan-lock, please remove the unit from your system and send back to our local distributor or MEAN WELL for repair.

### 5.8 Remote Control

- There are built-in remote ON/OFF controls for Front-End and individual output modules.
- Connection diagram and control logics are shown below.
- Figure 5-4 shows RC1 (CN32 PIN6) and GND-P (CN32 PIN3) connection diagram.

#### 5.8.1 Global ON / OFF

Connection Status	Output Status
Short (SW ON)	ON
Open (SW OFF)	OFF

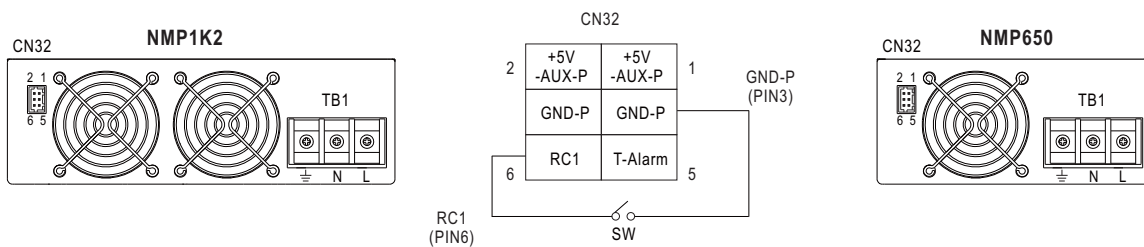


Figure 5-4

### 5.8.2 Single Output Module ON/OFF

- ◎ The NMS-240 modules can be turned ON/OFF individually by using the "ON/OFF" function.
- ◎ Figure 5-5 shows RC2 (CN81 PIN3) and GND (CN81 PIN1 or 2) connection diagram.

Connection Status	Output Module Status
Open (SW OFF)	ON
Short (SW ON)	OFF

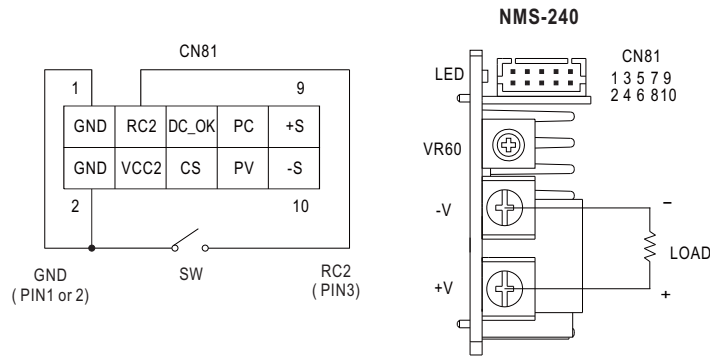


Figure 5-5

※ The CN32 connection accessory (included in packaging) must be connected when using the local ON/OFF function.

### 5.8.3 Dual Output Module ON/OFF

- ◎ The two channels of NMD-240 modules can be turned ON/OFF individually.
- ◎ Figure 5-6 shows RC2 (CN82 PIN3) to GND1 (CN82 PIN1) and RC3 (CN82 PIN4) to GND2 (CN82 PIN2) connection diagram.

Between RC2 (CN82-PIN3) and GND1 (CN82-PIN1)	Output Modules Status (V1)
SW2 OFF (open)	Output V1 ON
SW2 ON (short)	Output V1 OFF

Between RC3 (CN82-PIN4) and GND1 (CN82-PIN2)	Output Modules Status (V2)
SW3 OFF (open)	Output V2 ON
SW3 ON (short)	Output V2 OFF

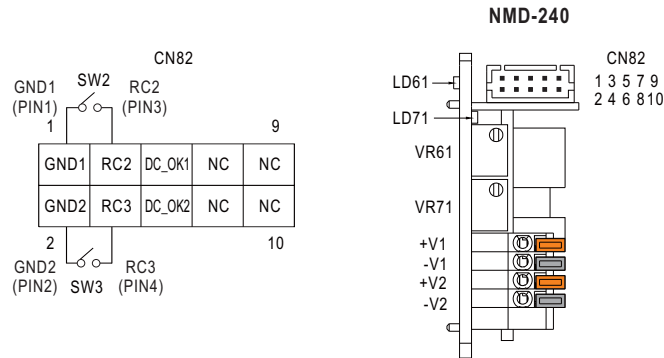


Figure 5-6

### 5.9 Output Module Remote Sense(NMS-240 only)

- ⊙ Built-in remote sense circuit that is able to compensate voltage drop up to 0.5V.
- ⊙ When using this function, the sensing wires should either be twisted or shielded to prevent external noise interference (refer to Figure 5-7).
- ⊙ When not using this function, leave the connection open circuit, or connect +S to +V and -S to -V at the output.
- ⊙ Voltage drop across the output wires must be limited to less than 0.5V. Also wires with adequate current rating should be used between +V, -V and the loads. Please firmly connect the output wires to prevent them from loosening, or the power supply may be out of order.

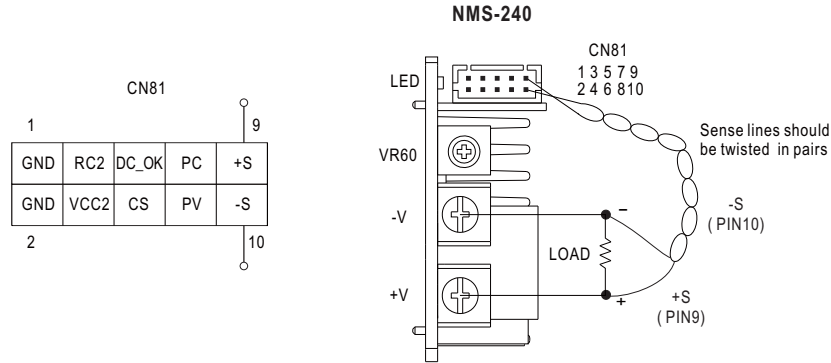


Figure 5-7 Connection diagram when using remote sense function

### 5.10 Auxiliary Power(NMS-240 only)

- ⊙ Front-End and NMS-240 modules have auxiliary power for control circuitry and low power peripherals.
- ※ Front-End: + 5V- Aux- P is 5V/ 2A (NMP1K2) or 5V/ 1.5A (NMP650) auxiliary output, referenced to GND- P.

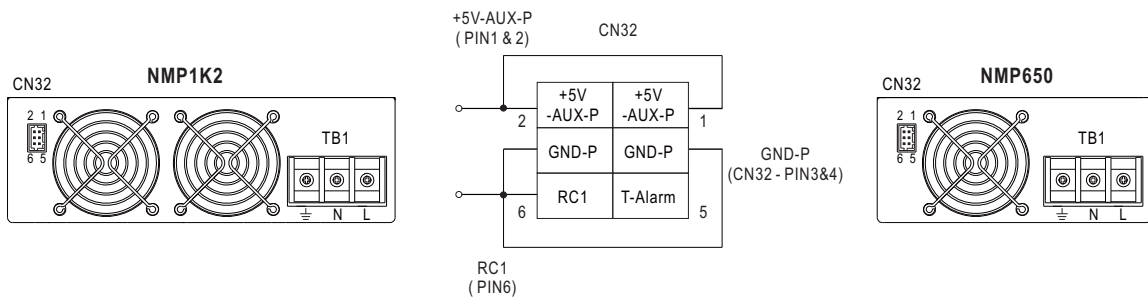


Figure 5-8

- ※ NMS-240 module: VCC2 is 5V/ 10mA auxiliary output, referenced to GND.

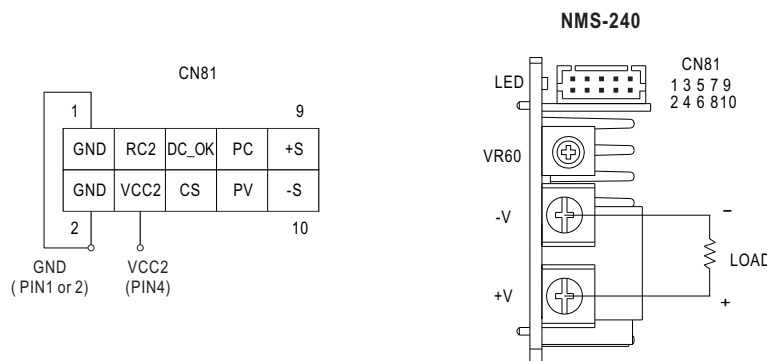


Figure 5-9

### 5.11 DC-OK Signal and LED Indicator

- DC-OK signal and LED indicator are both used to indicate operation status of the output module. When the output module is operating properly, the DC-OK signal is "HIGH" (4.5~5.5V) and the LED indicator is lit, otherwise, the logics are reversed.
- DC-OK is a TTL signal, and the maximum source current is 10mA (4.5~5.5V).

#### ◎NMS-240

Between DC OK (PIN5) and GND (PIN1 or 2)	Output Modules Status (NMS-240)
4.5~5.5V	ON
0~0.5V	OFF

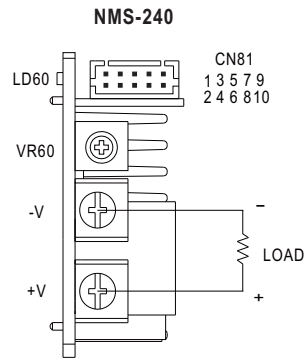
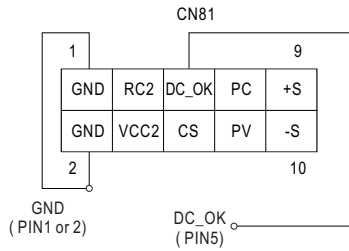


Figure 5-10

#### ◎NMD-240

Between DC OK1 (PIN5) and GND1 (PIN1)	Output Modules Status (V1)
4.5~5.5V	Output V1 ON
0~0.5V	Output V1 OFF

Between DC OK2 (PIN6) and GND2 (PIN2)	Output Modules Status (V2)
4.5~5.5V	Output V2 ON
0~0.5V	Output V2 OFF

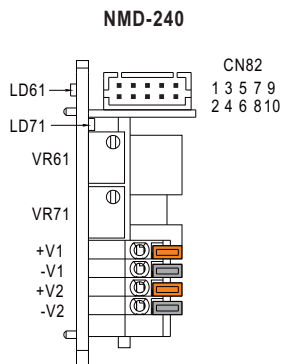
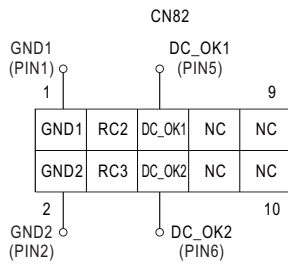


Figure 5-11

### 5.12 Parallel Operation(NMS-240 only)

- ⊙ Up to 4 (NMP650) or 6 (NMP1K2) modules of the same output voltage rating may be connected in parallel.
- ⊙ Before making the parallel connection, adjust the voltage of each module individually to the desired voltage, and ensure the difference in voltage is less than 0.2V.
- ⊙ The combined operation output power of all modules must be less than the Front-End's rated maximum output power (NMP650: 650W; NMP1K2: 1200W).
- ⊙ In parallel operation, the parallel accessory (copper plate) should be used to connect the +V and -V of all modules in parallel. Refer to A1.1 for more details.
- ⊙ In parallel operation, CS and GND pins of CN81 of all modules need to be connected in parallel as shown in Figure 5-12. Refer to A1.2 for more details on the connection accessory.
- ⊙ In parallel connection maybe only one NMS-240(master) operates if the total output load is less than 10% of rated load condition. The other NMS-240(slaves) may go into standby mode.
- ⊙ The short protection of C module (5V) or E module (12V) during current sharing is Hiccup mode or constant current limiting.
- ⊙ Remote control shall simultaneously turn ON/OFF all power modules that are in parallel. Per the same control logic, LED and DC OK signal of power modules in parallel shall turn ON/OFF simultaneously as well.
- ⊙ When power modules are in parallel, output current programmable (PC) function shall NOT be in use.
- ⊙ Under parallel operation, there may be a single NMS-240 (the master) that will provide output while the rest of the modules (the slaves) will enter standby mode when the total output load is less than 10% of the rated wattage.

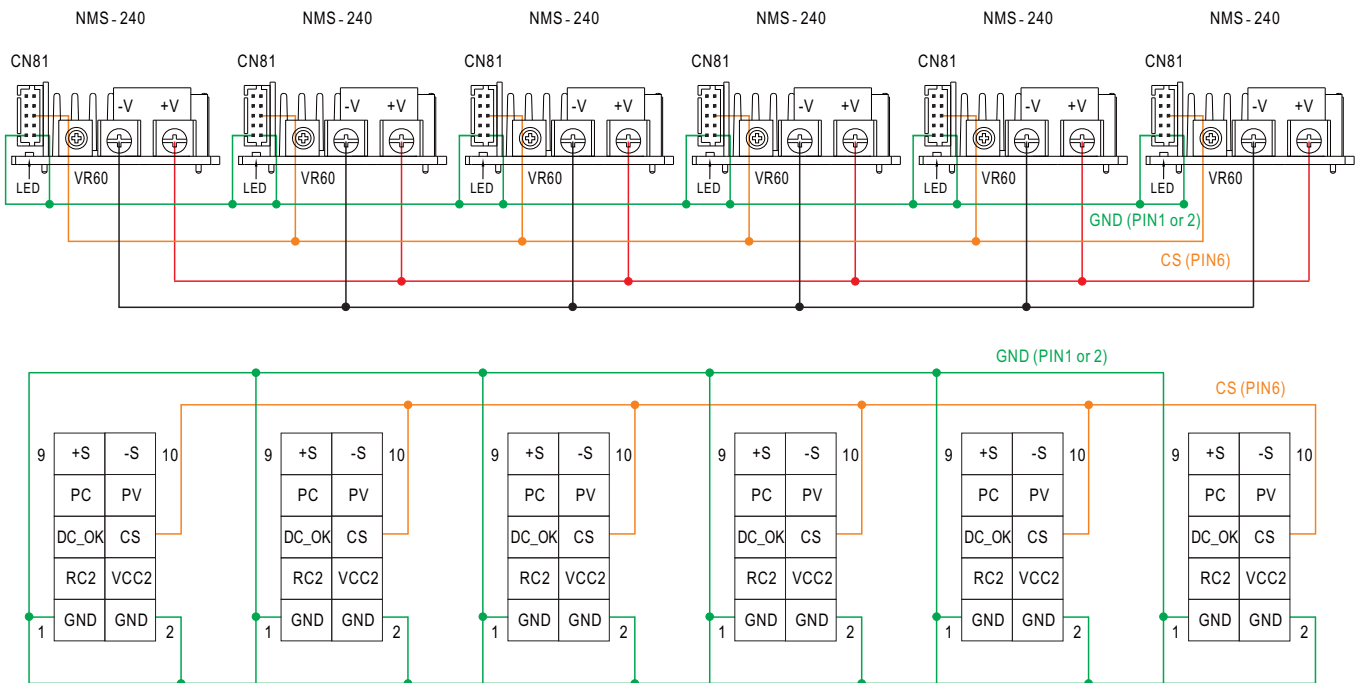


Figure 5-12

### 5.13 Series Operation

- ⊙ Higher output voltage can be acquired by connecting output modules in series.
- ⊙ Total output current should not exceed the current rating of the lowest rated module that is connected in series.
- ⊙ Difference of rise time in each module may lead to step/ stair shape output voltage waveform during turn on.
- ⊙ The series voltage should be less than 60V in order to satisfy IEC60950-1 SELV (Safety Extra Low Voltage) requirement.



## 6.Assembly

### 6.1 Assembly Procedures

#### STEP 1:

- ⦿ For first time assembly, please remove the Front-End from packaging and proceed to STEP 2.
- ⦿ If the NMP unit has been configured and assembled previously, please turn off the unit and remove all input/ output connections.
- ⦿ The power supply unit may remain hot after power off, please leave the unit to cool for at least 5 minutes before assembly.

#### STEP 2:

- ⦿ Remove 2 screws each from left and right sides. For reconfiguration, please remove screws from top cover (NMP650: 4 screws; NMP1K2: 6 screws). Before lifting top cover, make sure all screws have been removed.

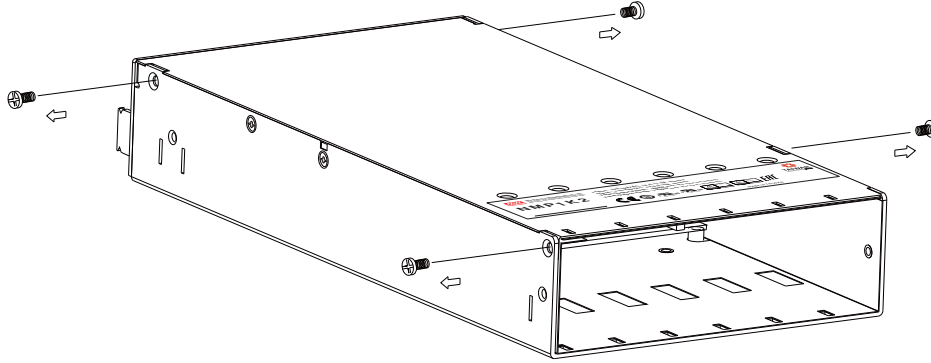


Figure 6-1 First time assembly

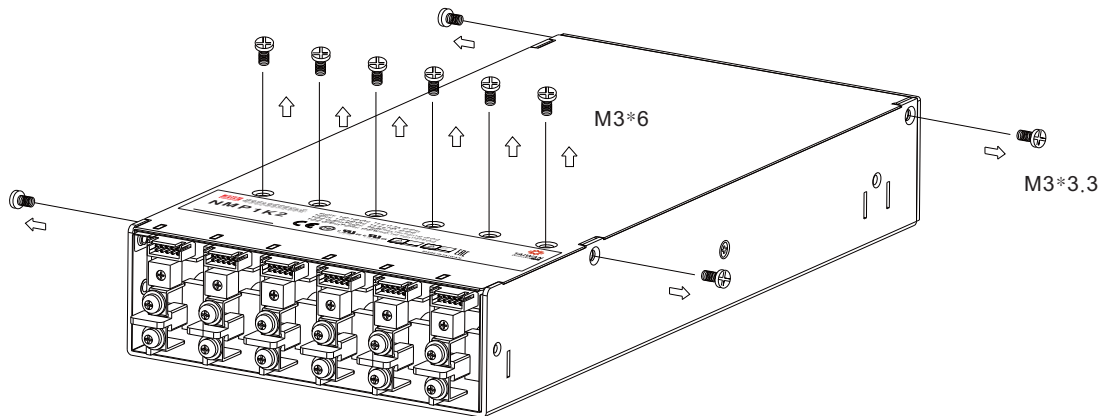
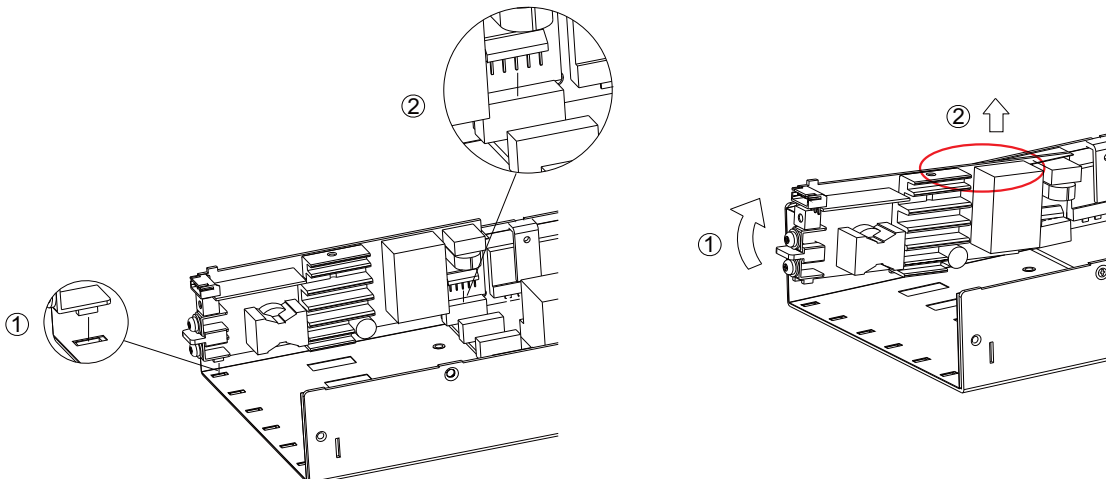


Figure 6-2 Reconfiguration - assembled previously

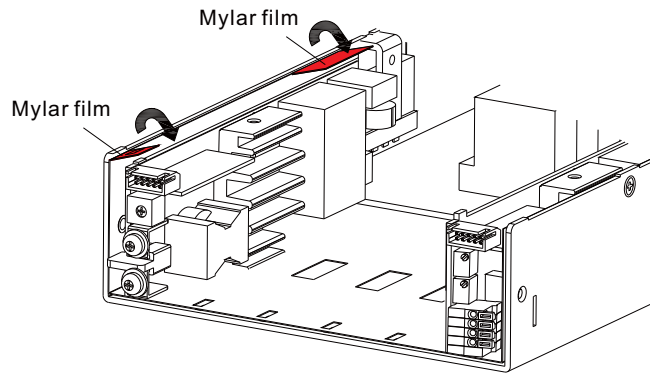
#### STEP 3:

- ⦿ After removing the top cover, output modules may be installed or removed. Please refer to diagrams below for installation and removal instructions. For first time assembly, it is recommended to install in order from right to left, starting with slot 4 (NMP650) or slot 6 (NMP1K2). When installing a module, make sure all 6 pins of the connectors are inserted into the correct sockets. For modules that are installed in the left most and right most slots, ensure the insulation Mylar films are positioned correctly. For empty slot(s), blank module(s) (BLANK-NMS240) must be installed to ensure proper airflow throughout the unit.



Install: ① Insert each module in a straight and leveled manner.  
② All 6 pins must be inserted into the correct sockets.

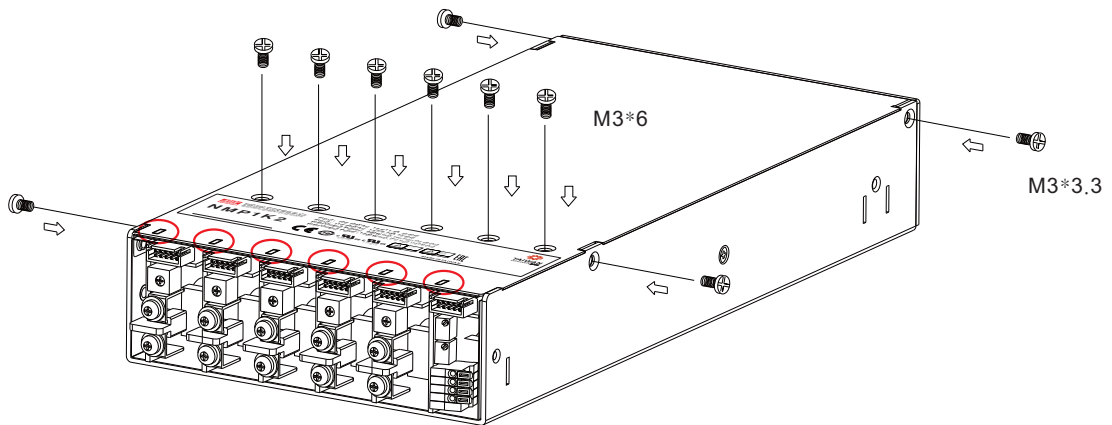
Remove: ① Lift output module slightly.  
② Grab the circled location and lift module



Note : Mylar films need to fold over the modules

**STEP 4:**

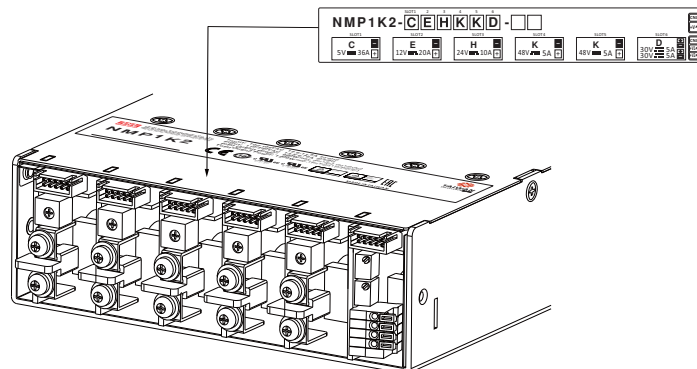
- Once all modules have been installed or reconfigured, place the top cover back and secure with screws as shown below. While securing the top cover, ensure all modules are held secure by the notches and screws. Please set the electric screw driver's torque setting to 6kgf-cm.



Note: Make sure all modules are slotted into the notches circled in red

**STEP 5:**

- Apply corresponding output module label stickers to the Front-End top cover.

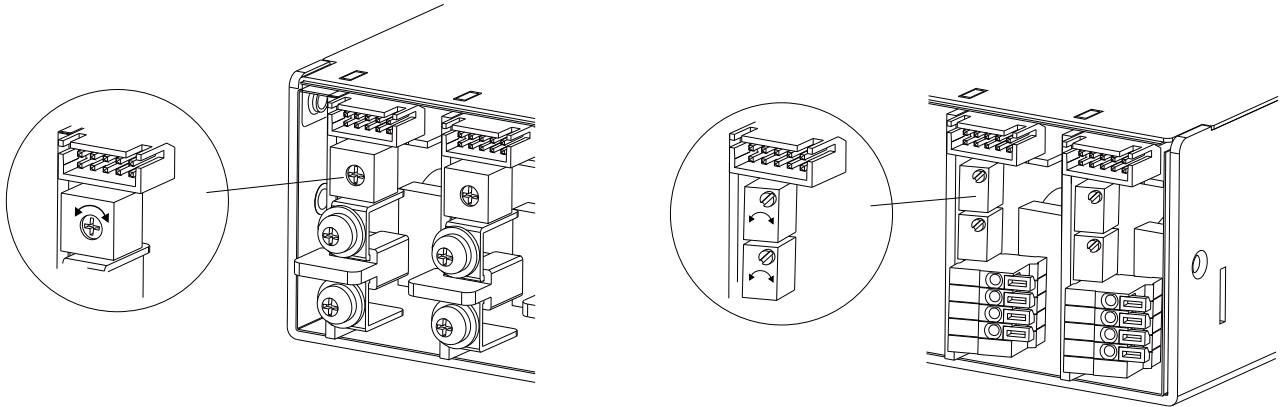


**STEP 6:**

- ⊙ Connect AC power to the NMP unit and test each module to ensure proper operation. The green LED indicator on module should light up.
- ⊙ Measure the output voltage of each module and make sure it is within the specified output voltage tolerance range. If the load requires a different voltage that is within the specified voltage adjustment range, adjust the voltage by turning the SVR as shown below. Turning the SVR clockwise will increase the voltage, and turning the SVR counter-clockwise will decrease the voltage. Once the output voltages of all modules have been tested and adjusted to the desired values, the output configuration is done.

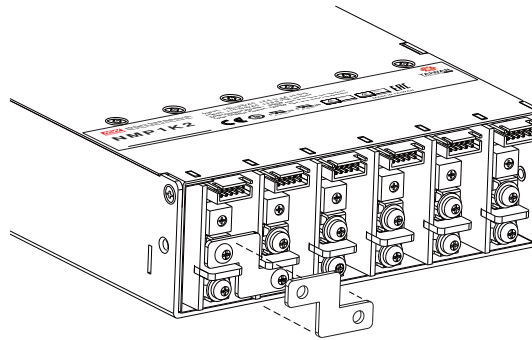
NMS-240

NMD-240



**Output Module in Series Connection(NMS-240 only)**

Higher output voltage can be acquired by connecting adjacent output modules in series. Example: if a load requires 60V to power, then two NMS-240-24 can be connected in series for this requirement. First, follow assembly steps STEP 1-STEP 6 and install the two NMS-240-24 modules in slot 1 and slot 2. Second, adjust the output voltage of each module to 30V via SVR. Finally, use the FAS-005 series connection accessory to connect the -V terminal of slot 1 to the +V terminal of slot 2. Measure and verify that the voltage across +V terminal of slot 1 and -V terminal of slot 2 is 60V.



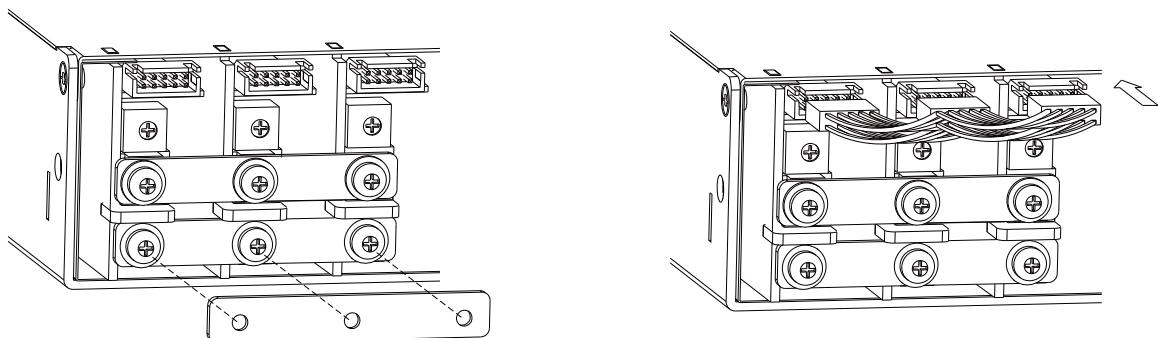
Recommended torque setting for output terminal screws is 6kgf-cm

**NOTE:**

- ⊙ Total output current should not exceed the current rating of the lowest rated module that is connected in series.
- ⊙ Difference of rise time in each module may lead to step/ stair shape output voltage waveform during turn on.
- ⊙ The series voltage should be less than 60V in order to satisfy IEC60950-1 SELV (Safety Extra Low Voltage) requirement.
- ⊙ Series connection accessory: FAS-005.

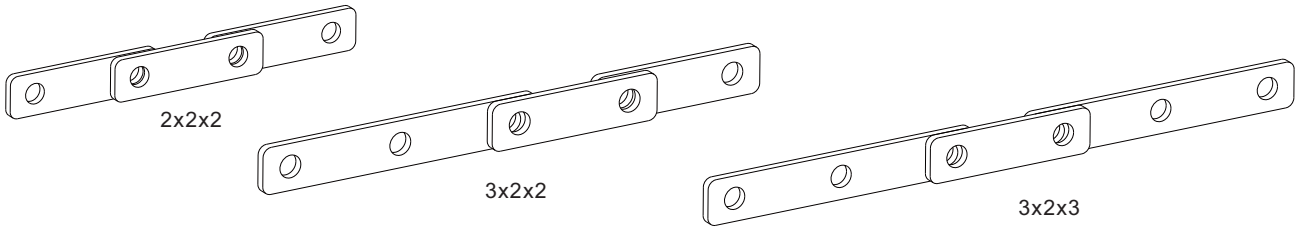
**Output Module in Parallel Connection(NMS-240 only)**

Higher output current can be acquired by connecting adjacent output modules in parallel. Example: connecting three NMS-240-12 in parallel. First, follow assembly steps STEP 1-STEP 6 and install the three NMS-240-12 modules in slot 1, slot 2, and slot 3. Second, measure and adjust the voltage of each module to be within 0.2V. Finally, use two 3-unit parallel accessory (FAP-010) to connect the +V and -V terminals of the three modules (left figure). The CS and GND pins of CN81 also need to be connected together using accessory NMS-240-P3 (right figure), as shown below.



Recommended torque setting for output terminal screws is 6kgf-cm

If 4, 5 or 6 units need to be connected in parallel, please use the configurations shown below.



**NOTE:**

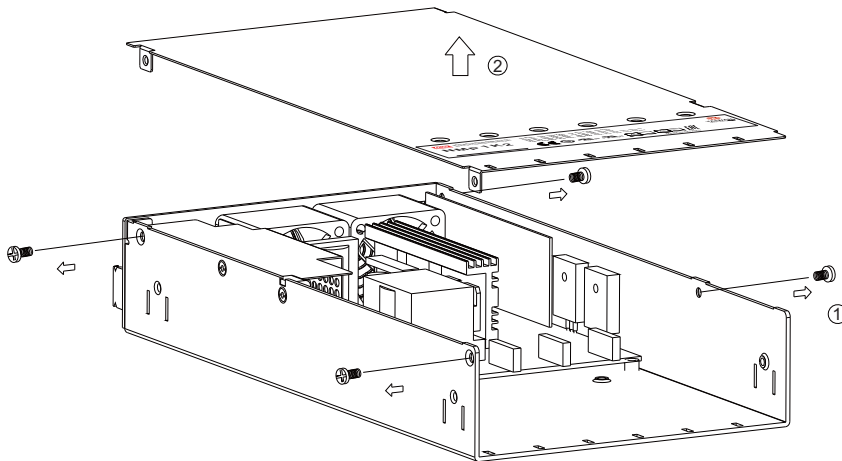
- ⦿ Up to 4 (NMP650) or 6 (NMP1K2) modules of the same output voltage rating may be connected in parallel.
- ⦿ Before making the parallel connection, adjust the voltage of each modules individually to the desired voltage, and ensure the difference in voltages is less than 0.2V.
- ⦿ The combined operation output power of all modules must be less than the Front-End's rated maximum output power (NMP650: 650W; NMP1K2: 1200W).
- ⦿ In parallel operation, the parallel accessory (copper plate) should be used to connect the +V and -V of all modules in parallel, 2-unit parallel accessory: FAP-009, 3-unit parallel accessory: FAP-010.
- ⦿ In parallel operation, CS and GND pins of CN81 of all modules need to be connected in parallel. MEAN WELL offers connection accessories for 2 units (NMS-240-P2), 3 units (NMS-240-P3), 4 units (NMS-240-P4), 5 units (NMS-240-P5), and 6 units (NMS-240-P6).
- ⦿ The overload protection of C module (5V) during current sharing is Hiccup mode.

**6.2 Assembly Example**

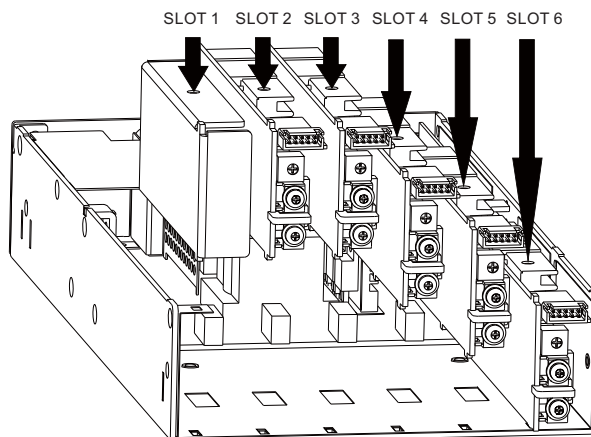
NMP1K2-#HHCEK-01

Slots	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5	SLOT 6
Models	Blank	24V @ 10A	24V @ 10A	5V @ 36A	12V @ 20A	48V @ 5A
Parallel	-----	⊙-----⊙	-----	-----	-----	-----

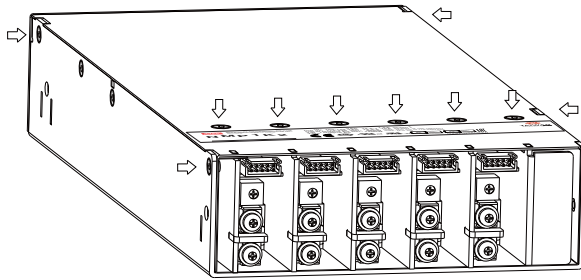
a. Remove NMP1K2 from the packaging. Since this is first time assembly, all slots are empty. Remove the 2 screws each from left and right sides, and remove the top cover.



b. Install modules to the NMP1K2 Front-End in order from right to left, NMS-240-48, NMS-240-12, NMS-240-5, two NMS-240-24, and the blank module.

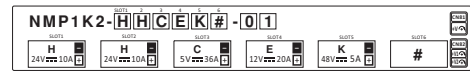
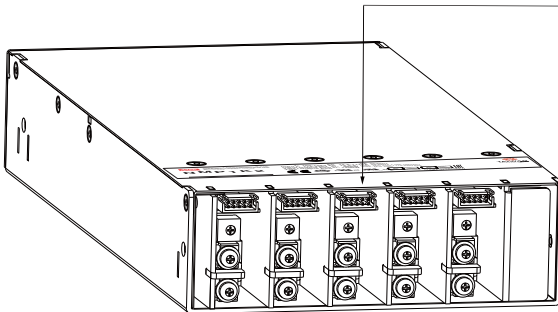


c. Place the top cover and secure with screws.

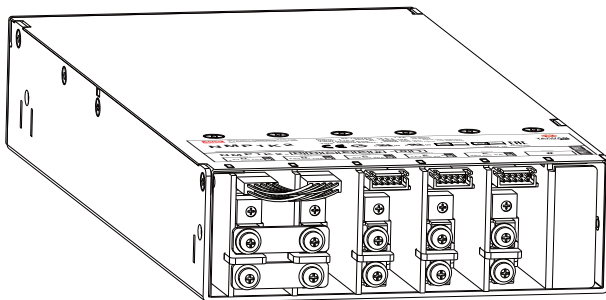


Note: ① Screws each from left and right: M3\*3.3  
 ② Top cove screws: M3\*6

d. Apply the corresponding product model label to the Front-End top cover.



e. Apply AC power to the NMP unit, and measure the output voltages to ensure each module is functioning properly. Also, make sure the output voltage difference between slot 1 and slot 2 is less than 0.2V.  
 Use two 2-unit parallel copper plates accessory, FAP-009, to connect the +V and -V terminals of slot 1 and slot 2, and use accessory, and GND pins of CN81 in parallel.



### 6.3 Assembly Suggestion

In order to obtain an optimized heat dissipation performance, it is suggested that install the NMS/NMD modules from right to left sequentially, starting from the far right slot, that is slot 6 for NMP1K2 and slot 4 for NMP650. After installation, if there are empty slots left, filling them with blank modules of Blank-NMS-240.

## 7. Notes on Operation

### 7.1 Front-End Mounting

- ⊙ The length L of the mounting screw must be less than 4mm when measured from the case of the NMP, as shown in Figure 7-1.

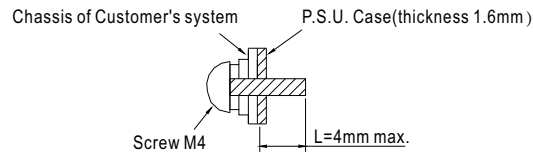


Figure 7-1 Mounting Screw

### 7.2 Output Wiring Guidelines

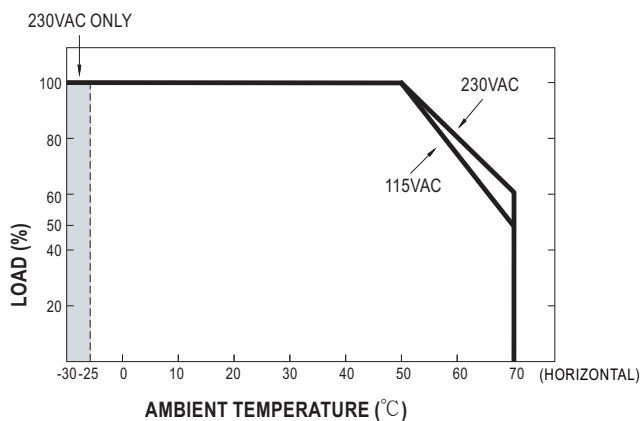
Output wire gauge should be appropriately sized based on the output current of each module. The table below shows the minimum wire gauge required for the corresponding current. It is recommended to use red wire for +V and black wire for -V.

AWG	Cross Section Area (mm <sup>2</sup> )	Maximum Current (A) UL1015 (600V 105°C)
24	0.205	1
22	0.326	2
20	0.517	4
18	0.823	6
16	1.309	8
14	2.1	12
12	3.3	22
10	5.3	35
8	10	45

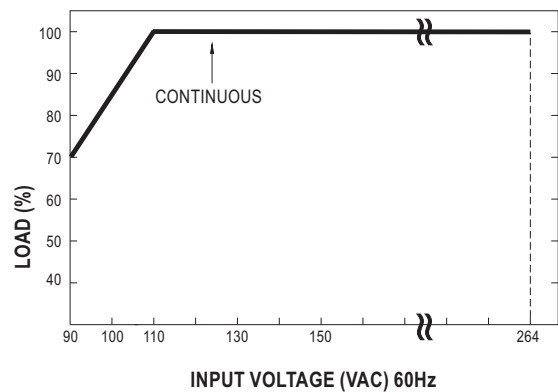
### 7.3 De-rating

- ⊙ Make sure all modules are operating within their electrical specifications, and the combined operation output power must be less than the Front-End's maximum output rating: (1200W for NMP1K2; 650W for NMP650).
- ⊙ When the ambient temperature is high or input AC voltage is low, the power supply needs to be de-rated according to curves shown below.

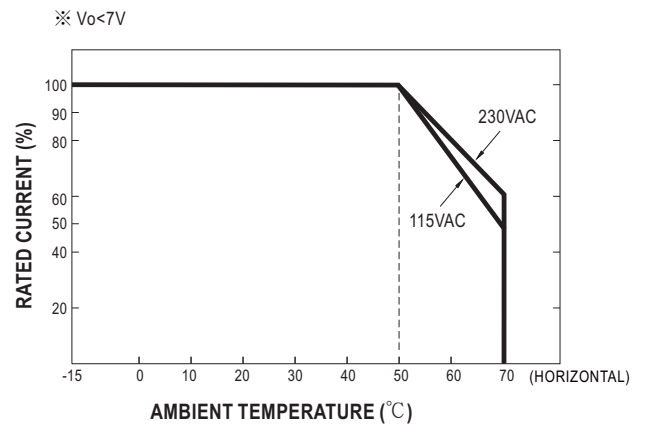
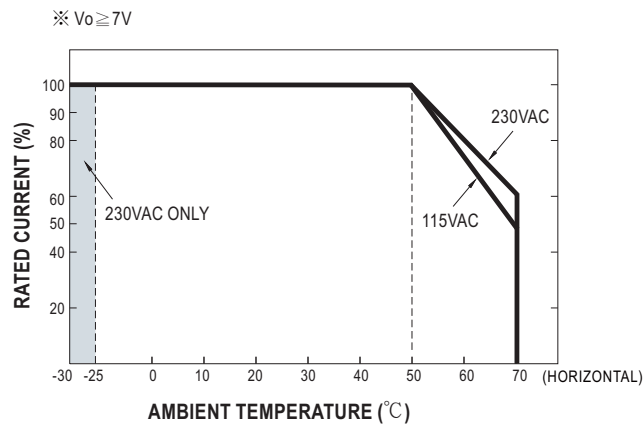
#### ■ Derating Curve (NMP1K2, NMP650, NMS-240)



#### ■ Static Characteristics



## Derating Curve (NMD-240)



### 7.4 Hi-pot Test

Hi-pot safety verification can only be passed by configurations in the table below.

Front-End	Modules
NMP1K2	NMS-240 $\geq 2$ pcs
	NMD-240 $\geq 2$ pcs
NMP650	NMS-240 $\geq 3$ pcs
	NMD-240 $\geq 2$ pcs



### 7.5 Warranty

- © When operated under normal conditions, the NMP has a 5-year global warranty. Please do not change components or make modifications to the product, otherwise the warranty shall be void.

# A. Appendix

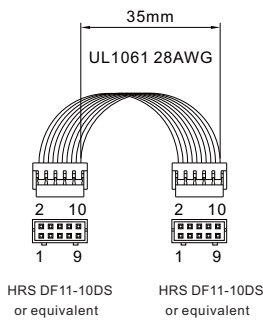
## A1 Accessories

### A1.1 ( $\pm V$ ) Parallel Connection Accessories

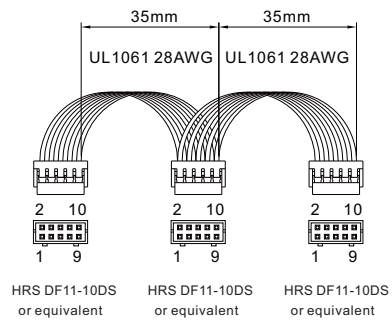
Parallel Connection Accessory	
FAP-009 (For NMS-240, 2 units)	
FAP-010 (For NMS-240, 3 units)	

### A1.2 Parallel Connection Accessories (CN81)

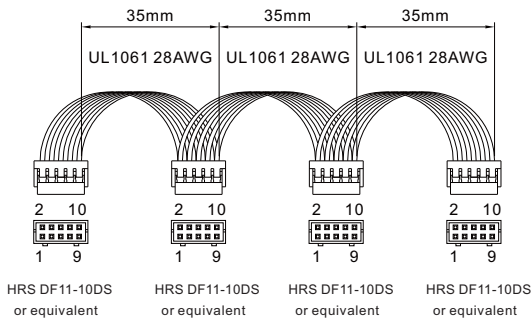
NMS-240-P2  
(For NMS-240, 2 units)



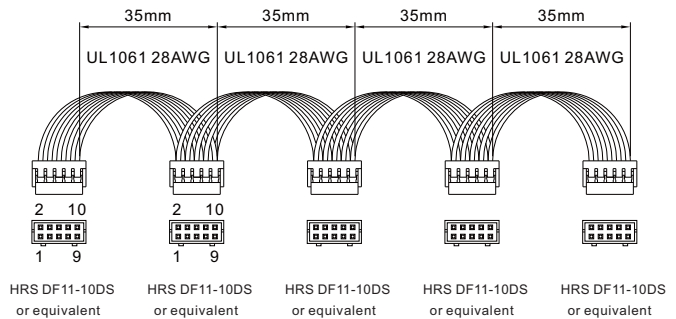
NMS-240-P3  
(For NMS-240, 3 units)



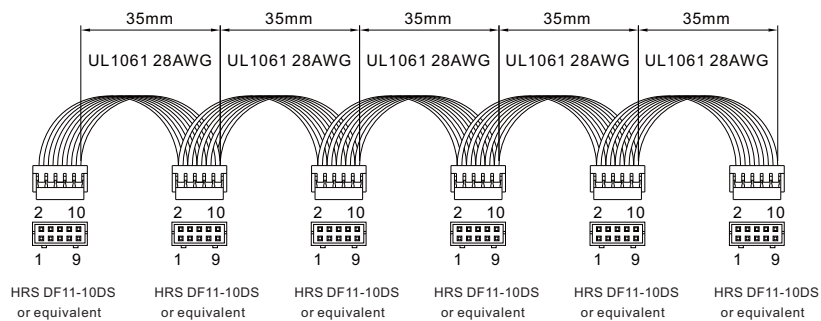
NMS-240-P4  
(For NMS-240, 4 units)



NMS-240-P5  
(For NMS-240, 5 units)



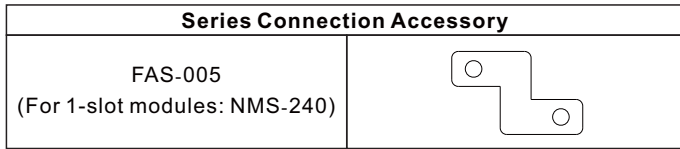
NMS-240-P6  
(For NMS-240, 6 units)



HRS DF11-10DS PIN NO.	1	2	3	4	5	6	7	8	9	10
Wire color	Black	Black	Yellow	Red	White	Orange	Purple	Green	Blue	Brown
Assignment	GND	GND	RC2	VCC2	DC-OK	CS	PC	PV	+S	-S

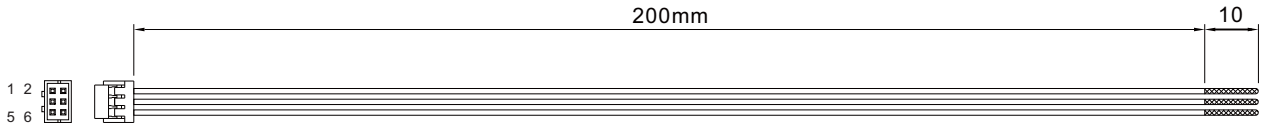


### A1.3 ( $\pm V$ ) Series Connection Accessory



### A1.4 Front-End Accessory

NMP-CN32  
(For NMP650/ 1K2, Front-End)



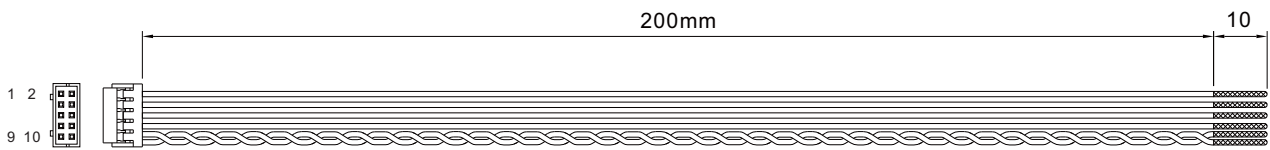
HRS DF11-06DS  
or equivalent

UL1007 24AWG

HRS DF11-06DS PIN NO.	1	2	3	4	5	6
Wire color	Red	Red	Black	Black	Blue	Gray
Assignment	+5V -AUX-P	+5V -AUX-P	GND-P	GND-P	RC1	T-Alarm

### A1.5 Modules Accessory

NMS-240-CN81  
(For NMS-240, modules)

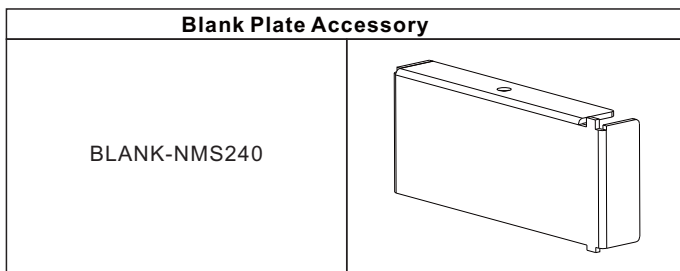


HRS DF11-10DS  
or equivalent

UL1007 24AWG

HRS DF11-10DS PIN NO.	1	2	3	4	5	6	7	8	9	10
Wire color	Black	Black	Yellow	Red	White	Orange	Purple	Green	Blue	Brown
Assignment (NMS-240)	GND	GND	RC2	VCC2	DC-OK	CS	PC	PV	+S	-S
Assignment (NMD-240)	GND1	GND2	RC2	RC3	DC-OK1	DC-OK2	NC	NC	NC	NC

### A1.6 Blank Module



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