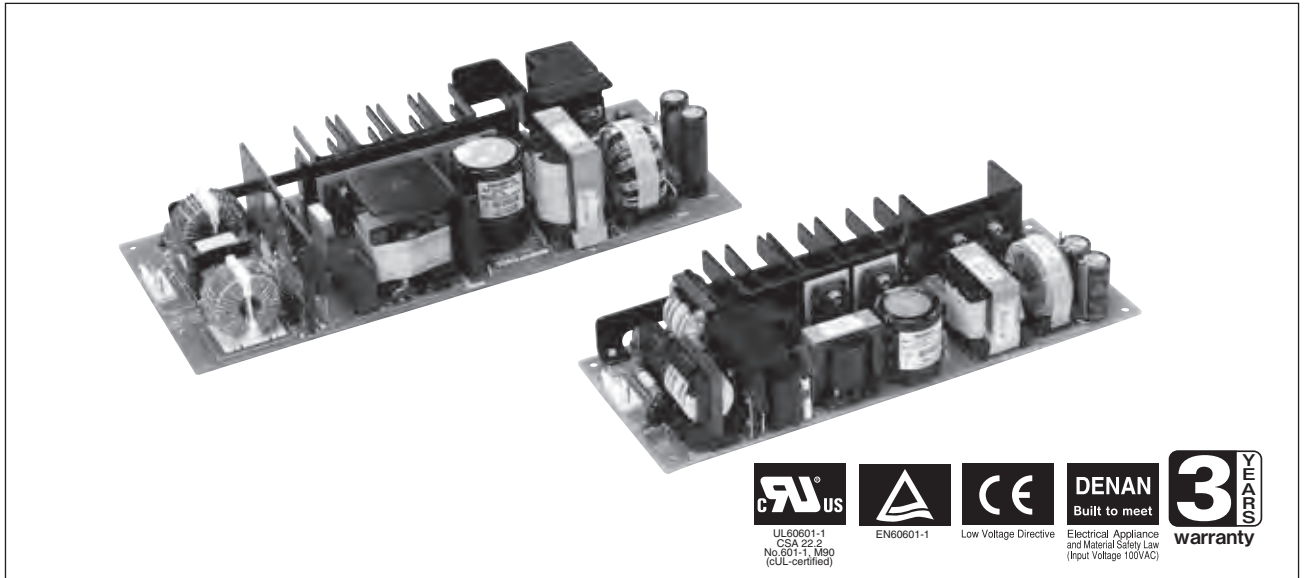


CME SERIES

Single Output 150W - 240W



■ Features

- Medical safety standard (IEC60601-1) approved.
- Leakage current 0.3mA or less (at 265VAC)
- EMI class B approved.

■ Conformity to RoHS Directive

This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

■ Applications



MED

■ Product line up

Model	CME150-24	CME240P-24
Output voltage	24V	24V
Max output current	6.3A	10A
Max output power	151.2W	240W
Peak output current	7.5A	20A
Peak output Power	180W	480W

Specifications

ITEMS/UNITS		MODEL	CME150-24	CME240P-24	
Input	Voltage Range	(*3) V	AC85 - 265		
	Frequency	(*3) Hz	47-63		
	Power Factor (100/200VAC)(Typ)(*2)		0.99 / 0.95		
	Efficiency (Typ)	(*2) %	82	80	
	Current (100/200VAC)(Typ)(*2)	A	2.0 / 1.0	3.2 / 1.6	
	Inrush Current (100/200VAC)(Typ)(*4)	A	14 at 100VAC, 28 at 200VAC, Ta=25°C, Cold Start		
	Leakage Current (265VAC) (*10)	mA	Less than 0.3	Less than 0.22	
Output	Nominal Voltage	VDC	24		
	Maximum Current	A	6.3	10	
	Maximum Peak Current	(*1) A	7.5	20	
	Maximum Power	W	151.2	240	
	Maximum Peak Power	(*1) W	180	480	
	Maximum Line Regulation(*5,*6)	mV	96		
	Maximum Load Regulation(*5,*7)	mV	150	192	
	Temperature Coefficient		Less than 0.02% / °C		
	Maximum Ripple & Noise 0<Ta<60°C(*5)	mVp-p	150	240	
	Maximum Ripple & Noise -10<Ta<0°C(*5)	mVp-p	180	360	
	Hold-up Time (Typ)	(*2) ms	20		
	Voltage Adjustable Range (*10)	VDC	21.6-26.4	21.6-28.8	
	Function	Over Current Protection	(*8) A	7.87 -	20.5 -
Over Voltage Protection		(*9) VDC	27.6 - 32.4	30.0 - 35.0	
Remote ON/OFF Control			-		
Parallel Operation			-		
	Series Operation		Possible		
Environment	Operating Temperature	(*11) °C	-10 to +60°C (-10 to +50°C:100%, +60°C:80%)	-10 to +60°C (-10 to +45°C:100%, +60°C:60%)	
	Storage Temperature	°C	-30 to +85°C		
	Operating Humidity	%RH	30 - 90 (No dewdrop)		
	Storage Humidity	%RH	10 - 95 (No dewdrop)		
	Vibration		At no operating, 10-55Hz (Sweep for 1min.) 19.6m/s ² Constant, X,Y,Z 1hour each		
	Shock (In package)		Less than 196.1m/s ²		
	Cooling		Convection Cooling		
Isolation	Withstand Voltage		Input - FG : 2kVAC (20mA), Input - Output : 4kVAC (20mA) Output - FG : 500VAC (100mA) for 1min.		
	Isolation Resistance		More than 100MΩ at 25°C and 70%RH, Output - FG : 500VDC		
Standards	Safety Standards	(*12)	Approved by UL60601-1,EN60601-1 Built to meet UL60950-1,CSA60950-1,EN60950-1, and DENAN		
	PFHC		Built to meet EN61000-3-2		
	EMI	(*13)	Built to meet EN55011 / EN55022-B, FCC-ClassB, VCCI-B		
	Immunity		Built to meet EN61000-4-2, -3, -4, -5, -6, -8, -11		
Mechanical	Weight (Typ.)	g	500	800	
	Size (W×H×D)	mm	80 x 40 x 208 (Refer to Outline Drawing)	105 x 50 x 242 (Refer to Outline Drawing)	

*Read instruction manual carefully, before using the power supply unit.

(*1) Operating period at peak output current is less than 10sec.

Input voltage < 95V : Duty < 0.2

Input voltage > 95V : Duty < 0.35

(Average output power and current is less than Maximum output power and current)

For peak load derating method, please refer to the instruction manual for details.

(*2) At 100/200VAC, Ta=25°C and maximum output power.

(*3) For cases where conformance to various safety specs (UL,CSA,EN) are required, to be described as 100 - 240VAC, 50/60Hz on name plate.

(*4) Not applicable for the in-rush current to Noise Filter for less than 0.2ms.

(*5) Please refer to Fig. A for measurement of line & load regulation and ripple voltage.(Measure with JEITA RC-9131 probe)

(*6) 85 - 265VAC , constant load.

(*7) No load - Full load (maximum power), constant input voltage.

(*8) Constant current limit and hiccup with automatic recovery. Avoid to operate at overload or dead short condition for more than 30 seconds.

(*9) OVP circuit will shut down output, manual reset.(Line recycle)

(*10) Measured by the each measuring method of IEC, UL, CSA, EN and DENAN(at 63Hz).

(*11) At standard mounting.

- Load (%) is percent of maximum output power or maximum output current, whichever is greater.

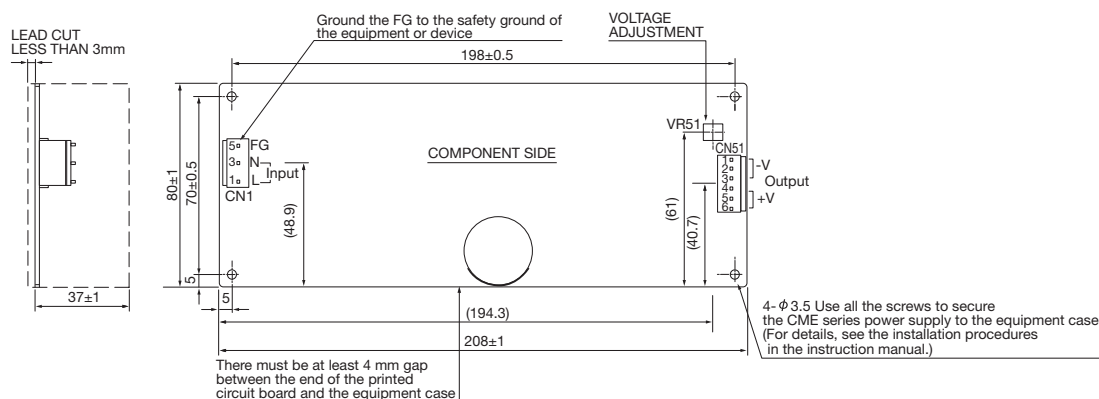
- For other mountings, refer to derating curve.

(*12) As for DENAN, built to meet at 100VAC.

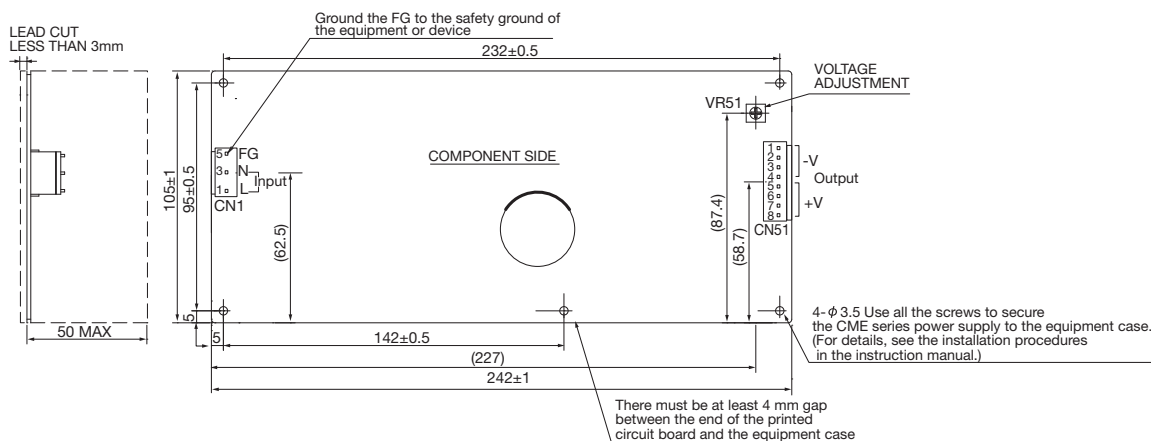
(*13) No load - Full load (maximum power), constant current and input voltage.

Outline Drawing

CME150



CME240P



CONNECTOR USED

PART DESCRIPTION	PART NAME		MANUFACT	QTY
	CME150	CME240P		
PIN HEADER (INPUT SIDE CN1)	B3P5-VH		J.S.T.	1
PIN HEADER (OUTPUT SIDE CN51)	B6P-VH	B8P-VH	J.S.T.	1

* OUTPUT CURRENT OF EACH CONNECTOR PIN MUST BE LESS THAN 5A.

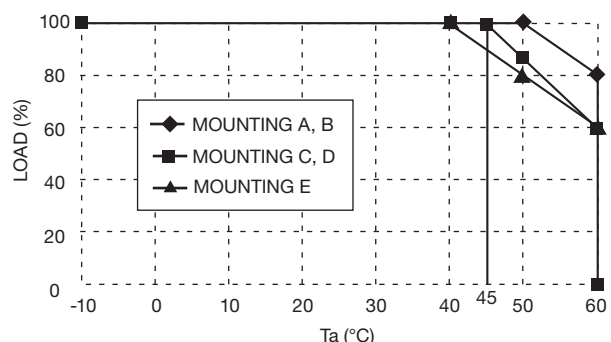
MATCHING HOUSINGS & PIN. (*NOT INCLUDED WITH THE PRODUCT.)

PART DESCRIPTION	PART NAME		MANUFACT	QTY	
	CME150	CME240P		CME150	CME240P
SOCKET HOUSING (CN1)	VHR-5N		J.S.T.	1	
SOCKET HOUSING (CN51)	VHR-6N	VHR-8N	J.S.T.	1	
TERMINAL PINS (CN1, CN51)	SVH- 1T-P1.1		J.S.T.	9	11

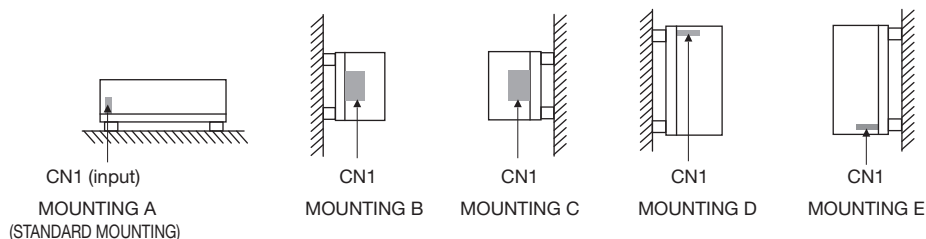
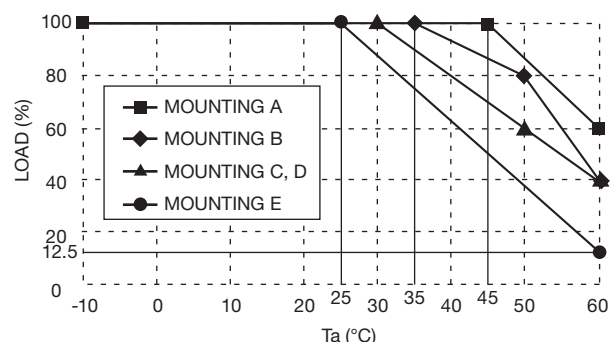
HAND CRIMPING TOOL: YC-160R (MANUFACTURER : J.S.T.)

Output Derating

CME150



CME240P



CME Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT

Be sure to read the following precautions thoroughly before using this power supply unit.

Pay attention to all warnings and cautions before using the unit. Incorrect usage could lead to an electrical shock, damage or a fire hazard.

WARNING

- Do not make unauthorized changes to power supply unit, otherwise you may have electric shock and void warranty.
- Do not touch the internal components, they may have high voltage or high temperature. You may get electrical shock or burned.
- When the unit is operating, keep your hands and face away from it; an accident may injure you.
- Do not use unit under unusual condition such as emission of smoke or abnormal smell and sound etc. It might cause fire and electric shock.
In such case, please contact us; do not repair by yourself, as it is dangerous for the user.
- Do not drop or insert anything into unit. It might cause failure and fire, when using the unit under such condition.
- Do not operate these units at the condition of condensation. It may cause fire and electric shock.

CAUTION

- This power supply is primarily designed and manufactured to use and enclose in other equipment.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be within specifications, otherwise the unit will be damaged.
- The unit might be broken down by accident or unexpected situation. For application equipment, which requires very high reliability (nuclear related equipment, traffic control equipment, medical equipment, etc.), please provide fail safety function in the equipment.
- Do not make an improper wiring to input and output terminals. It may cause damage.
- Do not use in environment such as strong electromagnetic field, erosive gas etc, or any environment where conductive foreign substance may enter.
- Do not operate and store this unit at the condition of condensation. In such case, waterproof treatment is necessary.
- Do not operate this unit after it falls down.
- The output voltage of this power supply is considered to be a hazardous energy level, and must not be accessible to an operator.

Important safety instructions

Servicing

These products are not customer serviceable. Repairs may only be carried out by TDK-Lambda Corporation or their authorised agents. These products are not authorised for use as critical components in nuclear control systems, life support systems or equipment for use in hazardous environments without the express written approval of the Managing Director of TDK-LAMBDA Corporation.

Safety Class of Protection

These products are designed for the following parameters : Material Group IIIa, Pollution Degree 2, Over voltage Category II, Class I (earthed), Indoor use as part of an overall equipment such that the product is accessible to service engineers only.

Input markings and symbols

Caution refer to supplementary documents

EMC performance

Immunity

Test	Standard	Passed	Comments
Electrostatic discharge	IEC61000-4-2	Level 3	Air discharge 8kV Contact discharge 6kV
Electromagnetic field	IEC61000-4-3	Level 3	10V/m
Fast / burst transient	IEC61000-4-4	Level 3	Tested to 2kV
Surge immunity	IEC61000-4-5	Level 3, 4	Common mode to 4.0kV Differential mode 2.0kV
Conducted RF immunity	IEC61000-4-6	Level 3	10V
Power frequency magnetic field	IEC61000-4-8	Level 4	30A/m
Voltage dips, variations, interruptions	IEC61000-4-11	Pass	-

Emissions

Test	Standard	Comments
Radiated electric field	EN55022	Class B (as per CISPR 22)
Conducted emissions	EN55022	Class B (as per CISPR 22)
Conducted harmonics	IEC61000-3-2	Compliant
Flicker	IEC61000-3-3	Compliant

General installation instructions

- These products are Class I and must therefore be reliably earthed and professionally installed in accordance with the prevailing electrical wiring regulations and the safety standards covered herein.

- These products are IPX0, and therefore chemicals/solvents, cleaning agents and other liquids must not be used.
- The first protective earth connection in the final installation must be marked with the protective earth symbol.

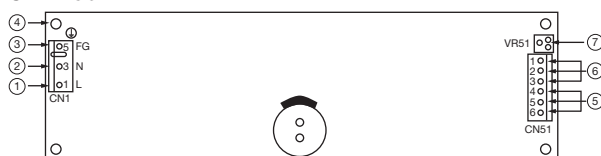
Special Instructions for IEC/EN/UL/ 60601-1

- These products are designed for continuous operation within an overall enclosure, and must be mounted such that access to the mains terminals is restricted. See Clause 16, IEC/EN/UL60601-1.
- These products are NOT suitable for use in the presence of flammable anaesthetic mixtures with air or with oxygen or with nitrous oxide.
- These products are classed as ordinary equipment according to IEC/EN/UL60601-1 and are NOT protected against the ingress of water.
- Connect only apparatus complying with IEC/EN/UL60601-1 to the signal ports.

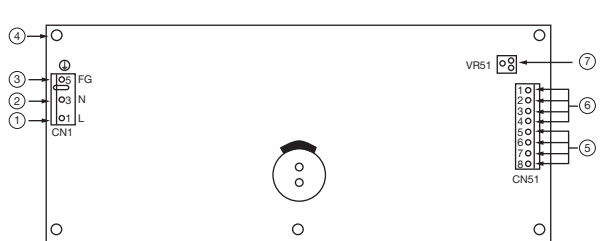
- Except for permanently installed equipment as defined in Clause 57.6 of IEC/EN/UL60601-1 the overall equipment in which these products are installed must have double pole fusing on the input mains supply. The products themselves have single pole fusing in the live line.
- These products provide reinforced insulation between mains and output, with reference to IEC/EN/UL60601-1.
- Reference should be made to local regulations concerning the disposal of these products at the of their useful life.
- These products have not been assessed to IEC/EN60601-1-2 (EMC) but EMC test data is available from TDK-LAMBDA Corporation.

1. Terminal Explanation

CME150



CME240P



- (1) L: AC input terminal (pin 1 of CN1)
Live line (fuse in line)
- (2) N: AC input terminal (pin 3 of CN1)
Neutral line
- (3) FG: Input terminal FG (pin 5 of CN1)
Safety earth (Frame Ground) Connect to safety ground of apparatus or equipment.
- (4) FG: Frame Ground (Connected to pin 5 of CN1)
Must be connected to electrically safety ground of apparatus or equipment by electrically conductive spacers. For the way of mounting, refer to 4-2
- (5) + : + Output terminal
- (6) - : - Output terminal
- (7) V.ADJ: Output voltage adjust trimmer.
(The output voltage rises when a trimmer is turned clockwise.)

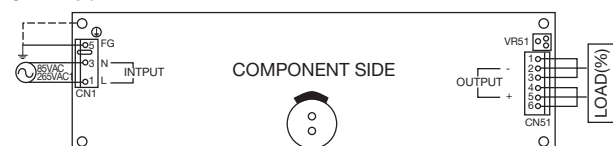
2. Terminal Connection Method

Pay attention to the input wiring. If it is connected to wrong terminal, the power supply will be damaged.

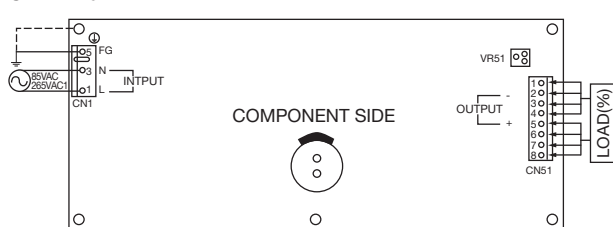
- Input must be off when making connection.
- Connect FG terminal to ground terminal of the equipment.

- Output current of each terminal pin must be less than 5A.
- The output load line and input line shall be separated and twisted to improve noise sensitivity.
- When connecting or removing connector, do not apply stress to PCB.
- Use the input/output connector specified in outline drawing. Also, use recommended crimping tool. Connector is not included with this product.

CME150



CME240



Input & Output Connector (J.S.T)

	Connector	Housing		Terminal Pin
		CME150	CME240P	
Input: CN1	B3P5-VH	VHR-5N		SVH-1T-P1.1
Output: CN51	B6P-VH	VHR-6N	VHR-8N	SVH-1T-P1.1

Hand Crimping Tool : YC-160R(J.S.T)

3. Explanation of Functions and Precautions

1 Input Voltage Range

Input voltage range is single phase 85 - 265VAC (47 - 63Hz) or 120 - 370VDC. Input voltage which is out of specification may cause unit damage. For cases where conformance to various safety specs(IEC,UL,CSA,EN) are required, input voltage range will be 100 - 240VAC(50/60Hz).

2 Output Voltage Range

V.ADJ trimmer(VR51) that is nearly output connector can adjust the output voltage within the range. Output voltage range is within CME150 : ±10%, CME240P : -10% +20% of nominal output voltage. To turn the trimmer clockwise, the output voltage will be increased. Note over voltage protection (OVP) function may trigger if the output voltage is increased ex-cessively.

3 Inrush Current

This model has used Power Thermistor to pro-tect the circuit from Inrush Current. Please carefully select input switch and fuse in cases of the high temperature and re-input the power.

4 Over Voltage Protection (OVP)

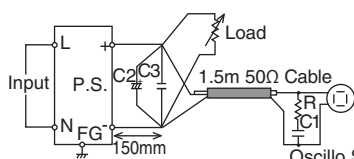
The OVP function (Inverter shut down method, manual reset type) is provided. OVP function operates within CME150: 115-135%, CME240P:125-145% of nominal output voltage. When OVP triggers, the output will be shut down. The input shall be removed for a few minutes, and then re-input for re-covery of the output. OVP setting shall be fixed and not to be adjusted externally.

5 Over Current Protection (OCP)

Constant current limiting, automatic recovery. OCP function operates when the output current exceeds CME150:125%, CME240P:205% of maximum output current of specification. The output will be automatically recovered when the overload condition is re-moved. Do not operate overload or dead short conditions for more than 30 seconds, which could result in damage or insulation failure.

6 Output Ripple & Noise

The standard specification for maximum ripple value is measured according to measurement cir-cuit specified by JEITA-RC9131. When load lines are longer, ripple becomes larger. In this case, electrolytic capacitor, film capacitor, etc., might be necessary to use across the load terminal. The output ripple cannot be measured accurately if the probe ground lead of oscilloscope is too long.



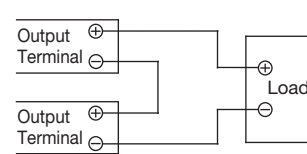
R : 50Ω
C1: 4700pF film capacitor

C2: 100μF electrolytic capacitor
C3: 0.1μF film capacitor

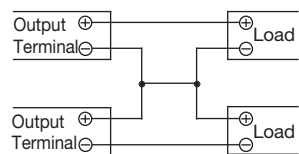
7 Series Operation

For series operation, either method (A) or (B) is possible.

Method (A)

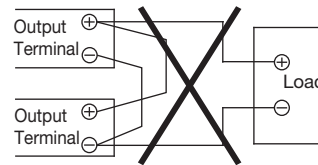


Method (B)



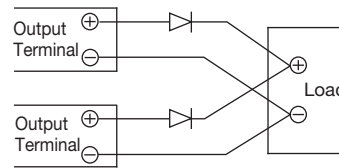
8 Parallel Operation

(A) To increase the output current is not possible.



(B) To use as Back-up Power Supply

1. Set power supply output voltage higher by the forward voltage drop(V_F) of diode.
2. Adjust the output voltage of each power supply to be the same.
3. Use within the specifications for output voltage and out-put power.

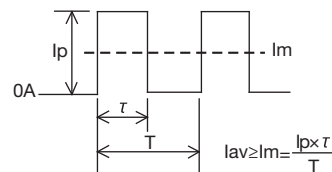


9 Peak Output Current

CME150

For CME150-24, relation with average output current and peak output current must satisfy formulas below. Also operating time at peak output is less than 10sec.

When using pulse load, audible noise can be heard from power supply unit.



Ip : Peak output current (A)

lav : Average output current

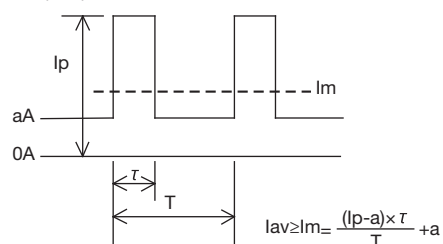
(Maximum output current of Specification (A))

Im : Average output current (A)

τ : Pulse width of peak output current (sec)

(Operating time at peak output)

T : Period (sec)



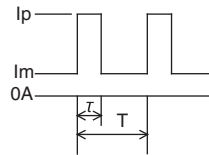
CME240P

For CME240P-24, the peak output current should satisfy the conditions below:

- (1) Should not exceed the rated peak current in the specifications.
- (2) Duty cycle of the peak output current should be $\leq 35\%$ (at input voltage $< 95V : \leq 20\%$), and operating time of peak output current is less than 10 seconds. If the power supply is operated under convection cooling, and ambient exceeds $45^{\circ}C$, the following operating period for peak current is recommended.

Ambient Temperature ($^{\circ}C$)	Peak current operating time
-10 -+45 $^{\circ}C$	within 10 seconds
+45 $^{\circ}C$ onwards	within 5 seconds

- (3) The relation between peak output current with average output current is defined as below:



- I_p : Peak output current (A)
- I_m : Minimum output current (A)
- D : Duty cycle, τ/T
- τ : Peak output current operating time (sec)
- T : Period (sec)
- I_o : Maximum allowable average output current of specifications (I_o should be average load after derating at various mounting and ambient temperature) (A)

Formula:

At input voltage $< 95V$

$$I_o^2 \geq I_p^2 D + I_m^2 (1-D) \quad (\text{Duty} \leq 20\%)$$

At input voltage $\geq 95V$

$$1.5 I_o^2 \geq I_p^2 D + I_m^2 (1-D) \quad (\text{Duty} \leq 35\%)$$

Example 1 : For CME240P-24 at $T_a = 60^{\circ}C$, Mounting A, Input

Voltage =100V, Max $I_o = 6A$ (after 60% Derating)

(A): In case of $I_m = 0, I_p = 20A,$
 $D \leq 13.5\%$

(B): In case of $I_m = 4A, I_p = 20A,$
 $D \leq 9.9\%$

Example 2 : Following table illustrate some peak load operation examples for CME240P-24 at input voltage 100V.

Please note that the actual I_o in peak load operation is low.

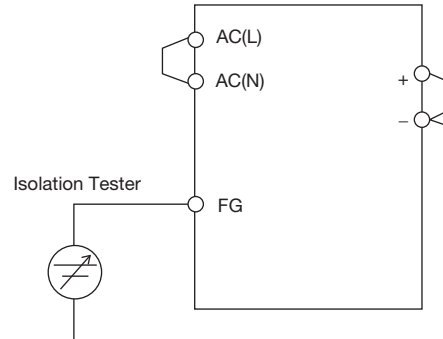
Max allowable average load after derating by various Mounting and T_a :		Examples of peak load derating, calculated by above formula			Actual I_o
Average Load(%)	$I_o(A)$	$I_p(A)$ max	D max	$I_m(A)$	$I_o(A)$
100	10	20	35.0%	3.92	9.55
90	9	20	30.4%	0	6.08
80	8	20	24.0%	0	4.80
70	7	20	18.4%	0	3.68
60	6	20	13.5%	0	2.70
50	5	20	9.4%	0	1.88
40	4	20	6.0%	0	1.20
30	3	20	3.4%	0	0.68
20	2	20	1.5%	0	0.30
10	1	20	0.4%	0	0.08

- (4) Peak output current operation (Maximum 10 seconds, Duty : ≤ 0.2 at input voltage $< 95V, \leq 0.35$ at input voltage $\geq 95V$) is possible after establishment of output voltage. Please avoid peak current operation during startup.

10 Isolation Test

Isolation resistance between output and FG (chassis) shall be more than $100M\Omega$ at 500VDC. For safety operation, voltage setting of DC isolation tester must be done before the test. Ensure that it is fully discharged after the test

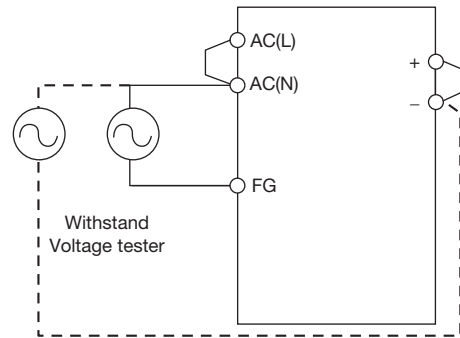
Output - FG (chassis)
 500VDC $100M\Omega$ or more



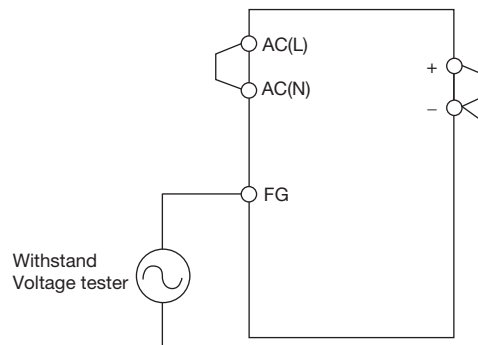
11 Withstand Voltage

This model is designed to withstand 4.0kVAC between input and output, 2.0kVAC between in-put and FG (chassis), and 500VAC between output and FG (chassis), each for 1 minute. When testing withstand voltage, set current limit of withstand voltage test equipment at 20mA (Output-FG (chassis) : 100mA). The applied voltage must be gradually increased from zero to testing value and then gradually decreased for shut down. When timer is used, the power supply may be damaged by high impulse voltage at timer switch on and off. Connect input and output as follows.

Input - Output (dotted line) 4kVAC 1min. (20mA)
 Input - FG (chassis)(solid line) 2kVAC 1min. (20mA)



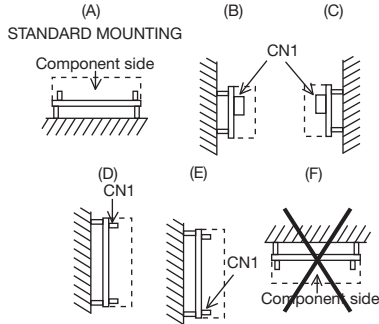
Output - FG (chassis) 500VAC 1min. (100mA)



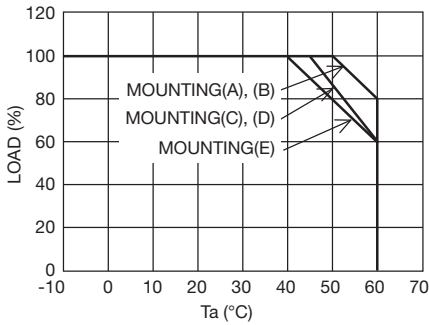
4. Mounting Directions

1 Output Derating according to the Mounting Directions

Recommended standard mounting method is (A). Method (B), (C), (D), and (E) are also possible. Refer to the derating below. In the following derating curve, the average output current is considered to be 100%.

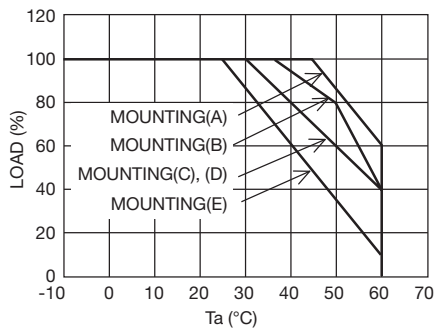


Output Derating (Convection cooling) CME150



Mounting	LOAD (%)				
	A	B	C	D	E
-10 - +40 °C	100	100	100	100	100
+45 °C	100	100	100	100	90
+50 °C	100	100	87	87	80
+55 °C	90	90	73	73	70
+60 °C	80	80	60	60	60

CME240P



Mounting	LOAD (%)				
	A	B	C	D	E
-10 - +25 °C	100	100	100	100	100
+30 °C	100	100	100	100	87.5
+35 °C	100	100	90	90	75
+40 °C	100	93.3	80	80	62.5
+45 °C	100	86.7	70	70	50
+50 °C	86.7	80	60	60	37.5
+55 °C	73.3	60	50	50	25
+60 °C	60	40	40	40	12.5

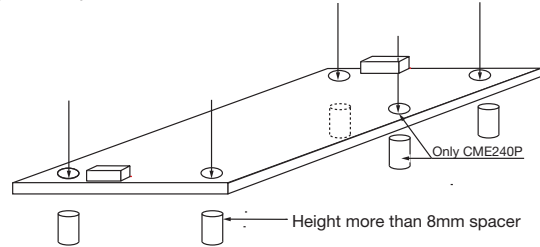
2 Mounting Method

Please use the mounting hole as:

CME150 : 4 holes of $\phi 3.5$

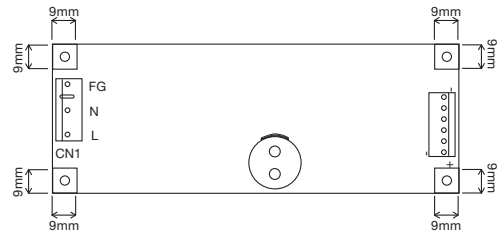
CME240P : 5 holes of $\phi 3.5$

And insert the spacer (MAX $\phi 8\text{mm}$) of height over 8mm to lift the unit. Also use all 4 mounting holes for the unit installation. The vibration spec. is the value taken when the unit is raised by 8mm spacers.

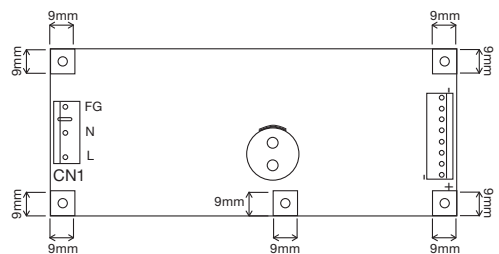


And allowable area by metal pieces is 9mm from each PCB corners. Refer to figure below.

CME150

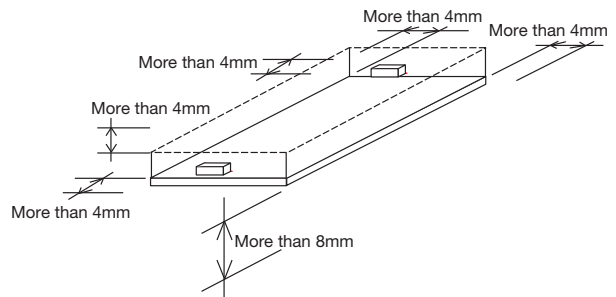


CME240P

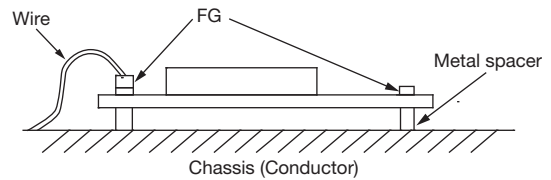


When mounting this power supply into host equipment, please leave 4mm minimum spacing between all parts of the PCB assembly except solder side and the earthed chassis of the host equipment.

For solder side, please leave 8mm minimum spacing. Otherwise, the insulation of medical requirement and withstand will not be satisfied.



FG should be connected to the earth terminal of the apparatus. If not, the conducted noise and output noise will increase.



5. Wiring Method

- The output load line and input line shall be separated and twisted to improve noise sensitivity.
- Use all lines as thick and short as possible to make lower impedance.
- Noise can be eliminated by attaching a capacitor to the load terminals.
- For safety and EMI considerations, connect FG to ground terminal of equipment where power supply is mounted on.
- Recommended screw torque is 0.49N·m (5kgf·cm).
- Select the wire materials to adapt the connector as follows.

INPUT : AWG#22-#18

OUTPUT : AWG#22-#18

6. External Fuse Rating

Refer to the following fuse rating and use high-breaking capacity fuse when selecting the external fuses that are to be used on input line. Surge current flows when line turns on. Therefore use slow-blow fuse or time-lag fuse. Do not use fast-blow fuse. Fuse rating is specified by in-rush current value at line turn-on. Do not select the fuse according to input current (rms.) values under the actual load condition.

CME150 : 5.0A

CME240P : 6.3A

7. Before concluding that the unit is at fault

Before concluding that this product is at fault, make the following checks.

- Check if the rated input voltage is connected.
- Check if the wiring of input and output is correct.
- Check if the wire material is not too thin.
- Check if the output voltage control (V.ADJ) is properly adjusted.
- Check if the output current and output wattage is not over specification.
- Audible noise can be heard during dynamic-load operation.
- Audible noise can be heard when input voltage waveform is not sinusoidal wave.

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