CME240P-24
Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT

Be sure to read the following precautions thoroughly before using this product.
Pay attention to all warnings and cautions before using. 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 this product is operating, keep your hands and face away from it; an accident may injure you.
- Do not use 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 this product at the condition of condensation. It may cause fire and electric shock.

⚠ CAUTION

- This product 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.
- This product might be broken down by accident or unexpected situation. For application equipment, which requires very high reliability (nuclear related equipment, traffic control 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 product at the condition of condensation. In such case, waterproof treatment is necessary.
- Do not operate this unit after it falls down.
- The output power of this product is considered to be a hazardous energy level, and must not be accessible to an operator.

DWG NO. : B022-04-01C		
APPD	CHK	DWG
N. Uesono 13/Jul/11	K. Suzuki 12. Jul. '11	R. Sugihara 12. Jul. '11

Important safety instructions

Servicing

This product is not customer serviceable. Repairs may only be carried out by TDK-Lambda Corporation or their authorized agents. This product is not authorized 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

This product is 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

1) This product is 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.

2) This product is IPX0, and therefore chemicals/solvents, cleaning agents and other liquids must not be used.

3) 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

1) This product is 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.

2) This product is not suitable for use in the presence of flammable anaesthetic mixtures with air or with oxygen or with nitrous oxide.

3) This product is classed as ordinary equipment according to IEC/EN/UL60601-1 and are NOT protected against the ingress of water.

4) Connect only apparatus complying with IEC/EN/UL60601-1 to the signal ports.

5) Except for permanently installed equipment as defined in Clause 57.6 of IEC/EN/UL60601-1 the overall equipment in which this product is installed must have double pole fusing on the input mains supply. The product itself has single pole fusing in the live line.

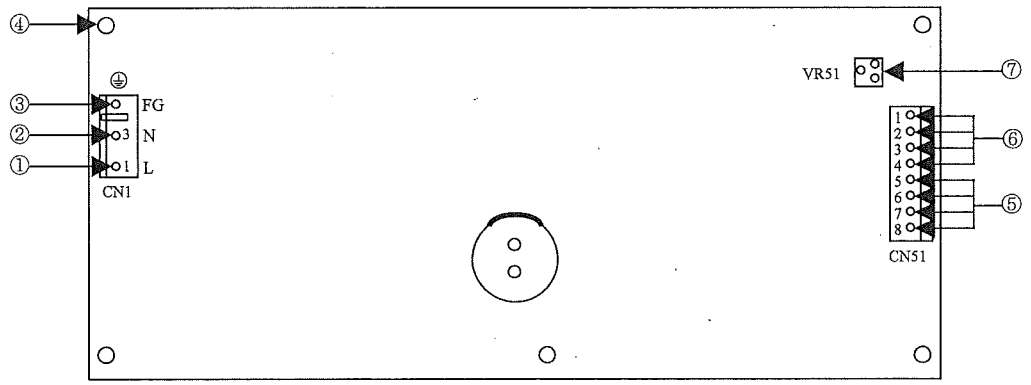
6) This product provides reinforced insulation between mains and output, with reference to IEC/EN/UL60601-1.

7) Reference should be made to local regulations concerning the disposal of this product at the of their useful life.

8) This product has not been assessed to IEC/EN60601-1-2 (EMC) but EMC test data is available from TDK-Lambda Corporation.

1.Terminal Explanation

■ CME240P-24



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

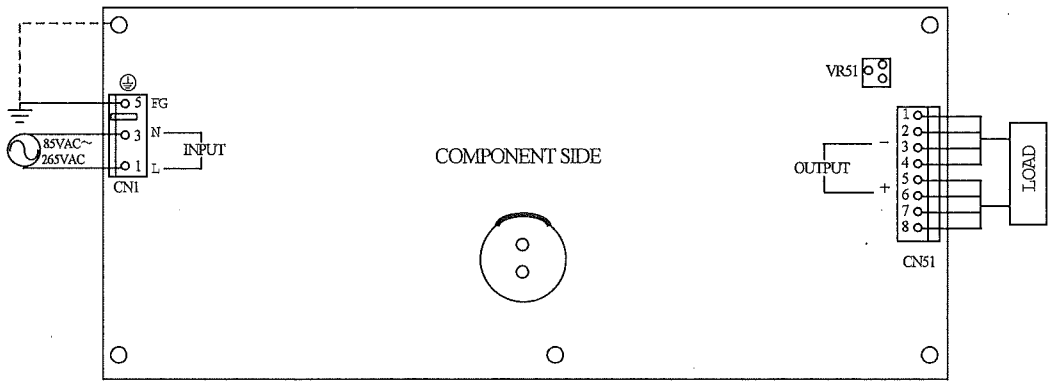
⑦ V.ADJ: Output voltage adjust trimmer.
(The output voltage rises when a trimmer is turned clockwise.)

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.

■ CME240P-24



* Input & Output Connector (J.S.T)

	CME240P-24		
	Connector	Housing	Terminal Pin
Input: CN1	B3P5-VH	VHR-5N	SVH-21T-P1.1
Output: CN51	B8P-VH	VHR-8N	SVH-21T-P1.1

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

3. Explanation of Functions and Precautions

3-1. Input Voltage Range

Input voltage range is single phase 85 - 265VAC (47 - 63Hz). 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).

3-2. 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 ±10% 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 excessively.

3-3. Inrush Current

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

3-4. Over Voltage Protection (OVP)

The OVP function (Inverter shut down method, manual reset type) is provided. OVP function operates within 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 recovery of the output. OVP setting shall be fixed and not to be adjusted externally.

3-5. Over Current Protection (OCP)

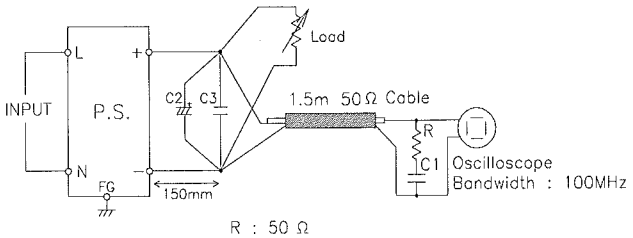
Constant current limiting, hiccup, automatic recovery. OCP function operates when the output current exceeds 205% of maximum output current of specification. The output will be automatically recovered when the overload condition is removed. Do not operate overload or dead short conditions for more than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

3-6. Over Temperature Protection (OTP)

This function operates and shuts down the output when ambient temperature or internal temperature of power supply abnormally rises. Note OTP function may trigger if natural convection is not enough. Operating temperature of thermal sensor (TS1) is 110±5℃. As a reference, heatsink temperature around TS1 should be maintained 85°C or less. If electrolytic capacitor lifetime is taken into consideration, further derating is required. When OTP operates, output can be recovered by turning input line off and then turning it on again after cools enough.

3-7. Output Ripple & Noise

The standard specification for maximum ripple value is measured according to measurement circuit 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.

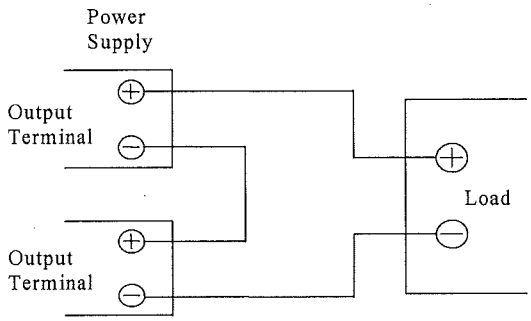


R : 50 Ω
C1: 4700pF Film Capacitor
C2: 100uF Electric Capacitor
C3: 0.1uF Film Capacitor

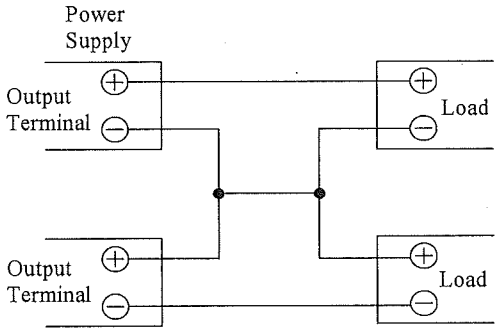
3-8. Series Operation

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

Method (A)

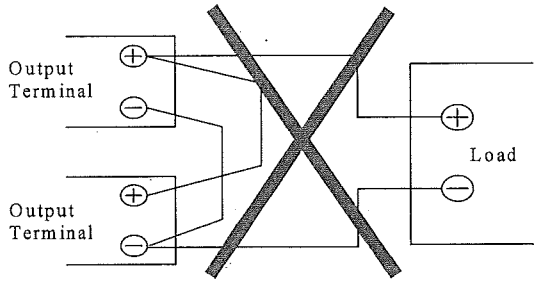


Method (B)



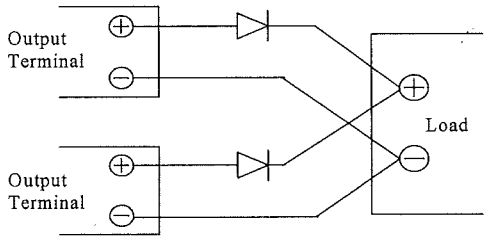
3-9. Parallel Operation

(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 output power.



3-10. Peak Output Current

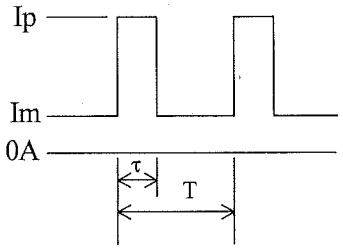
For CME240P-24, the peak output current should satisfy the conditions below:

1)Should not exceed the rated peak current in the specifications.

2)Duty cycle of the peak output current should be ≤ 35%(at input voltage < 95V : ≤ 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°C, the following operating period for peak current is recommended.

Ambient Temperature (°C)	Peak current operating time
-10 ~ +45°C	within 10 seconds
+45°C onwards	within 5 seconds

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



Ip = Peak output current
Im = Minimum output current
D = Duty cycle, τ/T
τ = Peak output current operating time
T = Period
Io = Maximum allowable average output current of specifications (Io should be average load after derating at various mounting and ambient temperature)

Formula:

At input voltage < 95V

$$Io^2 \geq Ip^2 \times D + Im^2 \times (1-D) \text{ (Duty} \leq 20\%)$$

At input voltage ≥ 95V

$$1.5 \times Io^2 \geq Ip^2 \times D + Im^2 \times (1-D) \text{ (Duty} \leq 35\%)$$

Example I : For CME240P-24 at Ta =60°C, Mounting A, Input Voltage =100V, Max Io =6A (after 60% Derating)

(A): In case of Im =0, Ip =20A,
D ≤ 13.5%

(B): In case of Im =4A, Ip =20A,
D ≤ 9.9%

Example II : Following table illustrate some peak load operation examples for CME240P-24 at input voltage 100V. Please note that the actual Io in peak load operation is low.

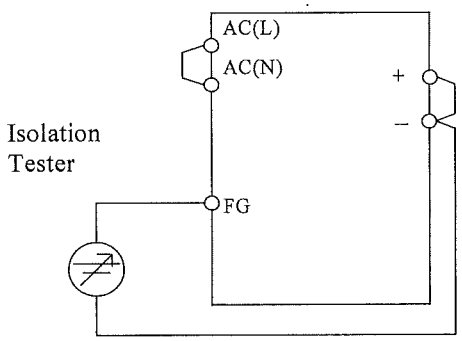
Max allowable average load after derating by various Mounting and Ta :		Examples of peak load derating, calculated by above formula			Actual Io
Average Load(%)	Io(A)	Ip(A)max	D max	Im(A)	Io(A)
100	10	20	35.0%	3.92	9.55
90	9	20	30.4%	0	6.08
80	8	20	24.0%	0	4.80
70	7	20	18.4%	0	3.68
60	6	20	13.5%	0	2.70
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, ≤ 0.35 at input voltage ≥ 95V) is possible after establish of output voltage. Please avoid peak current operation during startup.

3-11. Isolation Test

Isolation resistance between output and FG (chassis) shall be more than 100MΩ 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.

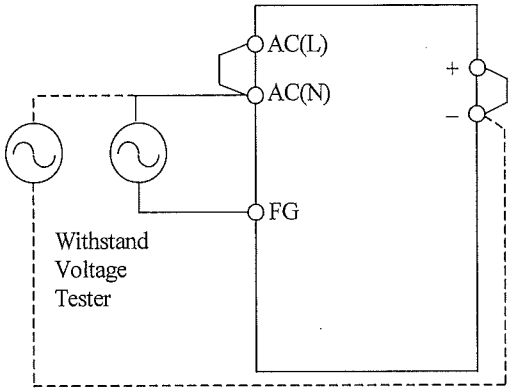
Output - FG (chassis)
500VDC 100MΩ or more



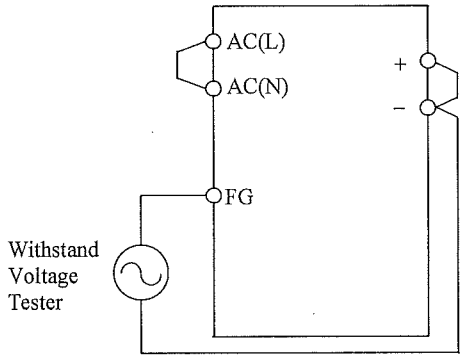
3-12. Withstand Voltage

This model is designed to withstand 4.0kVAC between input and output, 2.0kVAC between input 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)



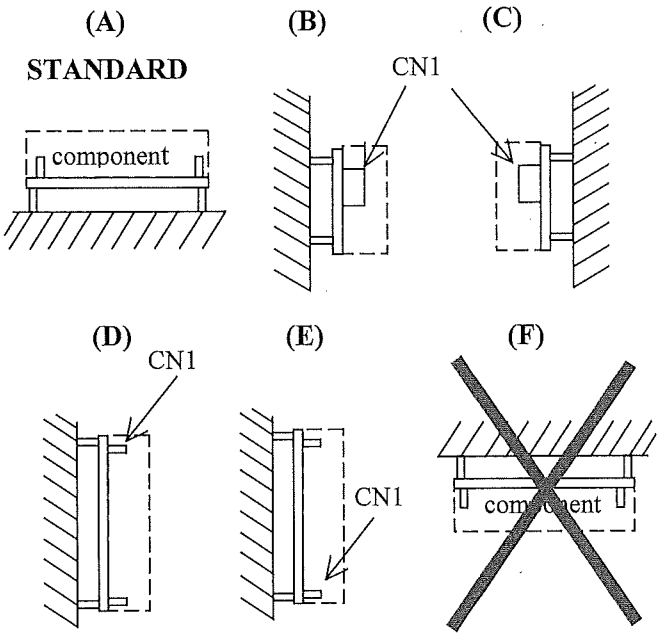
Output - FG(chassis)
500VAC 1min. (100mA)



4. Mounting Directions

4-1. Output Derating according to the Mounting Directions

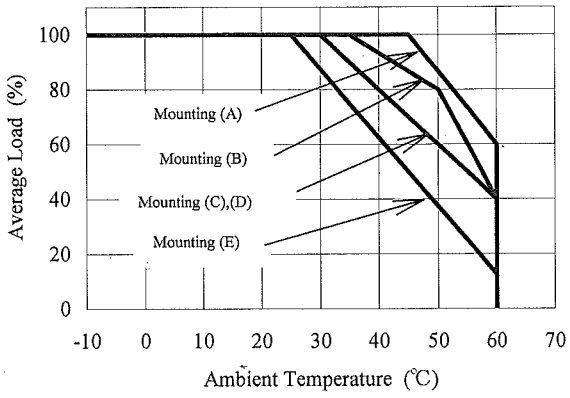
Recommended standard mounting method is (A). Method (B), (C), (D), and (E) are also possible. Refer to the derating below. In the following derating curve, the average output current is considered to be 100%.



Output Derating (Convection cooling)

- Convection cooling

CME240P-24



CME240P-24 Output Derating

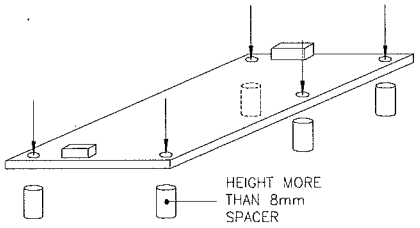
Mounting / Ta	Average Load (%) A	B	C	D	E
-10 to +25℃	100	100	100	100	100
+30℃	100	100	100	100	87.5
+35℃	100	100	90	90	75
+40℃	100	93.3	80	80	62.5
+45℃	100	86.7	70	70	50
+50℃	86.7	80	60	60	37.5
+55℃	73.3	60	50	50	25
+60℃	60	40	40	40	12.5

4-2. Mounting Method

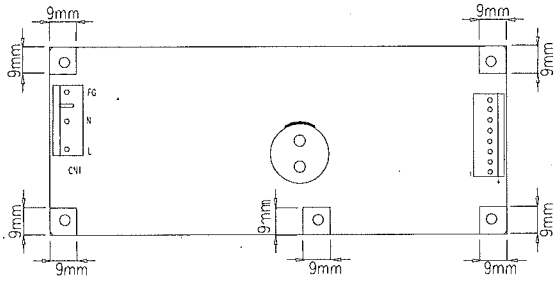
Please use the mounting hole as:

CME240P-24: 5 holes of ϕ 3.5

And insert the spacer (MAX ϕ 8mm) of height over 8mm to lift the unit. Also use all 5 mounting holes for the unit installation. The vibration spec. is the value taken when this product is raised by 8mm spacers.



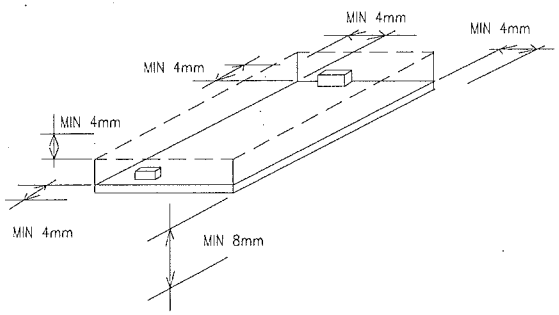
And allowable area by metal pieces is 9mm from each PCB corners. Refer to figure below.



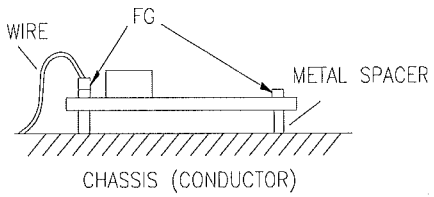
When mounting this product into host equipment, please leave 4mm minimum spacing between all parts of the PCB assembly except solder side and the earthed chassis of the host equipment.

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.



This product is convection cooling type. Please provide enough space around power supply to allow enough natural convection.

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 this product is mounted on.
- Recommended screw torque is 0.49N·m (5kgf·cm).
- Select the wire materials to adapt the connector as follows.

INPUT : CME240P-24---AWG#22-#18
OUTPUT : CME240P-24---AWG#22-#18

6. External Fuse Rating

Refer to the following fuse rating and use high-braking 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-lug 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.

CME240P-24 : 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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