

KWS5A-25A Series

Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT

Be sure to read this instruction manual thoroughly before using this product. Pay attention to all cautions and warnings before using this product. Incorrect usage could lead to an electrical shock, damage to the unit or a fire hazard.

DANGER

Never use this product in locations where flammable gas or ignitable substances are present. There are risks of igniting these substances and exploding by an arcing.

WARNING

- Do not touch this product or its internal components while circuit in operation, or shortly after shutdown. There may be high voltage or high temperature present and you may receive an electric shock or burn.
- While this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- Do not make unauthorized changes to this product, otherwise you may receive an electric shock and void your warranty.
- Do not drop or insert anything into this product. It might cause a failure, fire and electric shock.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc. It might lead to fire and electric shock. In such cases, please contact us. Do not attempt repair by yourself, as it is dangerous for the user.
- Do not operate these products in the presence of condensation. It might lead fire and electric shock.

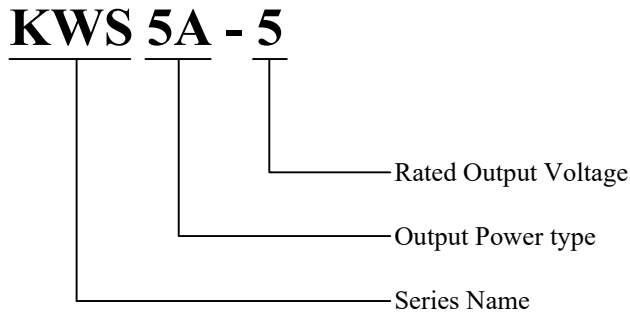
CAUTION

- This power supply is designed and manufactured for use within an end product such that it is accessible to SERVICE ENGINEERS only.
- Confirm connections to input/output terminals are correct as indicated in the instruction manual before switching on.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged.
- Do not operate and store this product in an environment where condensation might occur. In such case, waterproof treatment is necessary.
- Do not use this product in environment with a strong electromagnetic field, corrosive gas or conductive substances.
- For applications, which require very high reliability (Nuclear related equipment, medical equipment, traffic control equipment, etc.), it is necessary to provide a fail-safe mechanism in the end equipment.
- Do not inject abnormal voltages into the output or signal of this product. The injection of reverse voltage or over voltage exceeding nominal output voltage into the output or signal terminals might cause damage to internal components.
- Never operate the product under over current or short-circuit conditions for more than 30 seconds, or outside its specified Input Voltage Range. Insulation failure, smoking, burning or other damage may occur.
- No part of this document may be copied or reproduced in any form without prior written consent of TDK-Lambda.
- This product has used Power Thermistor to protect the circuit from Inrush Current. Frequent repetition of input might cause damage to internal components because of generating surge current.

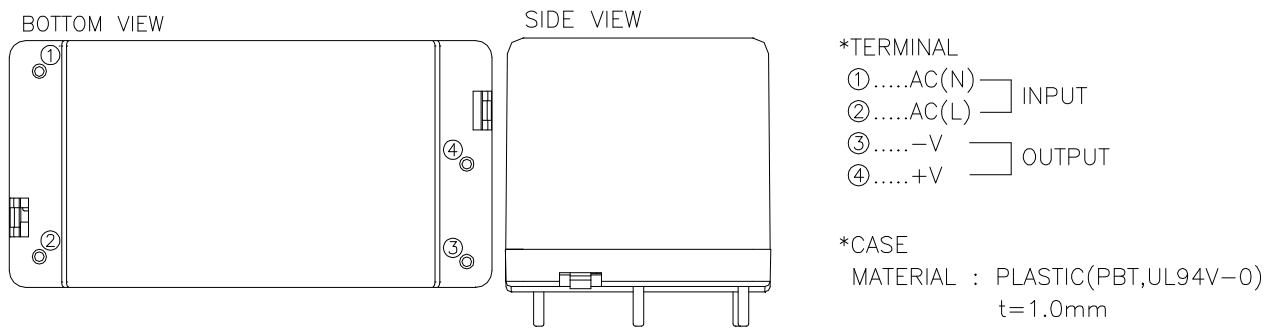
Note : CE MARKING

CE Marking when applied to a product covered by this handbook indicates compliance with the low voltage directive (2006/95/EC) in that it complies with EN60950-1 and RoHS compliance(2011/65/EU).

1. Model name identification method



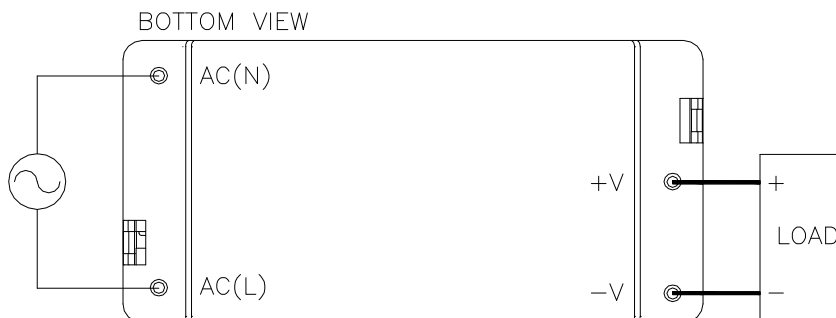
2. Terminal Explanation



3. Connecting 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 connections.



4. Explanation of Functions and Precautions

4-1. Input Voltage Range

Input voltage range is single phase 85-265VAC (47-440Hz) or 120-370VDC.

Input voltage, which is out of specification, might lead unit damage. For cases where conformance to various safeties required, described as 100-240VAC (50-60Hz).

4-2. Inrush Current

Power thermistor is used for limiting the inrush current.

Power thermistor method is used for these models. Higher current will flow at higher ambient temperature or input turn on condition. Please select input switch or external fuse carefully. The inrush current value specified in the specification is under cold start condition (at 25°C).

4-3. Over Voltage Protection (OVP)

The over voltage protection (OVP) circuit with zener diode clamp system is built in. Over 115% of nominal voltage will clamp the output. If the output voltage is lowered due to the over voltage application, the output will not resume. Replacement of the power supply unit is necessary.

4-4. Over Current Protection (OCP)

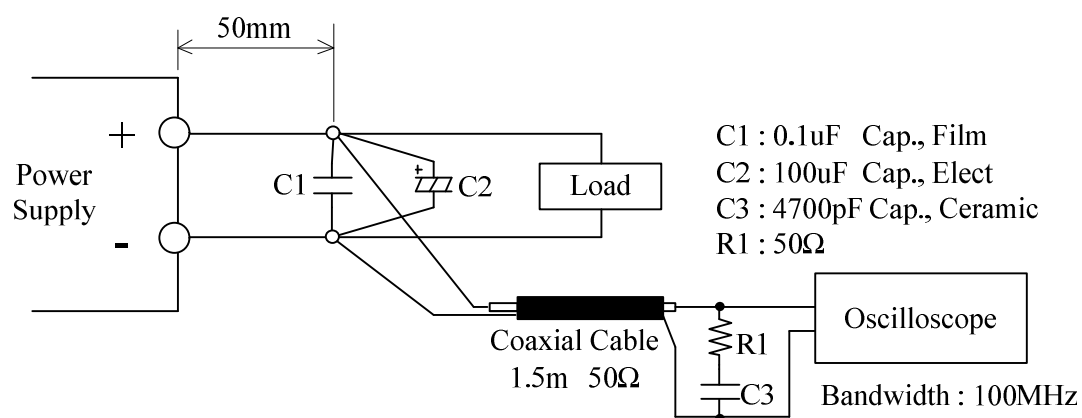
Fold back limit and Hiccup mode with automatic recovery. These products provide the Hiccup mode with automatic recovery. OCP function operates when the output current exceeds 105% of maximum DC output current of specification. The outputs will be automatically recovered when the overload condition is canceled. Never operate the unit under over current or shorted conditions, which may leads unit. OCP setting is fixed and not to be adjusted externally.

4-5. Output Ripple & Noise

The standard specification for maximum ripple value is measured according to measurement circuit specified by JEITA-RC9131B. When load lines are longer, ripple will becomes larger. In this case, electrolytic capacitor, film capacitor, etc. might be necessary to use across the load terminal.

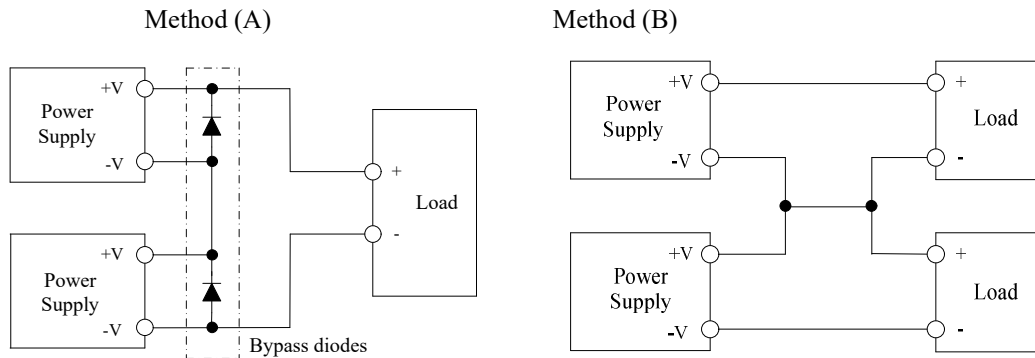
The output ripple cannot be measure accurately if the probe ground lead of oscilloscope is too long.

For start up at low temperature ambient, that is no overshoot at start up and output ripple noise specification can be met after one minute.



4-6. Series Operation

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



Note : In case of method (A), connect bypass diodes. If not, the unit might cause damage.

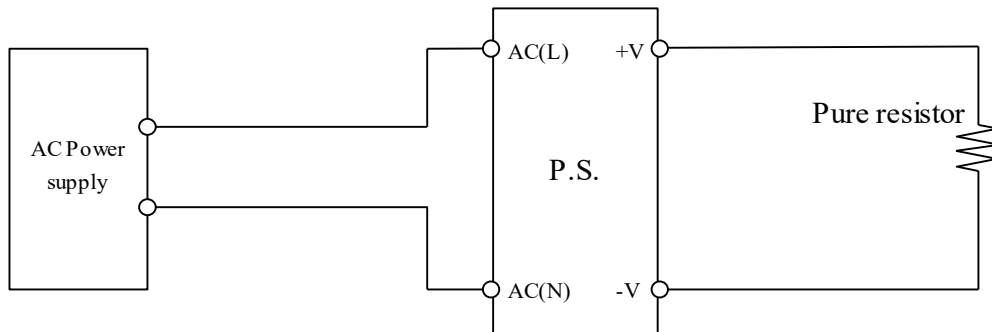
Please select a bypass diode with maximum forward current rating more than output load current.
 And maximum reverse voltage must withstand each power supply output voltage.

4-7. Conducted Emission & Radiated Emission

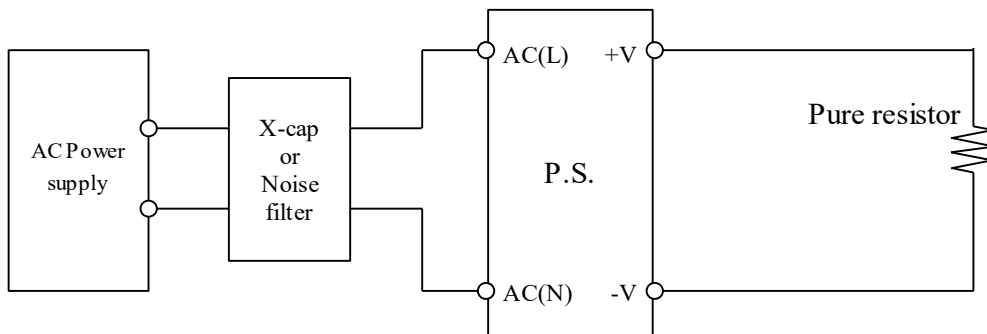
These products can meet EN55011/EN55022-A, FCC-A, VCCI-A without any external parts.

If needs to meet EN55011/EN55022-B, FCC-B, VCCI-B, need to add external parts.

CLASS A



CLASS B



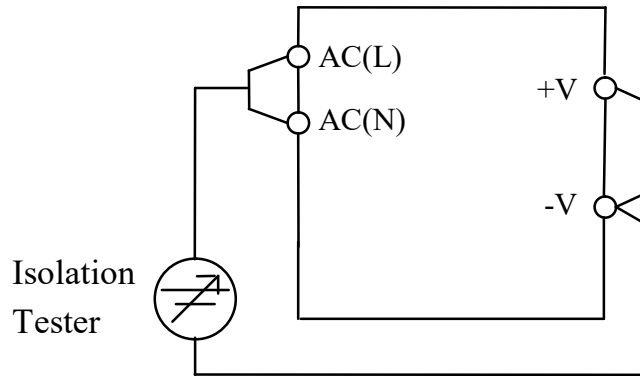
X-cap recommended : ECQU3A104MG(PANASONIC) or CTX104K310VP10 (CHENG TUNG).

Noise filter recommended : RSEG-2001 (TDK-Lambda).

4-8. Isolation Test

Isolation resistance between Input – Output is more than $100M\Omega$ at 500VDC. For safety operation, voltage setting of DC isolation tester must be done before the test. Ensure that the unit is fully discharged after the test.

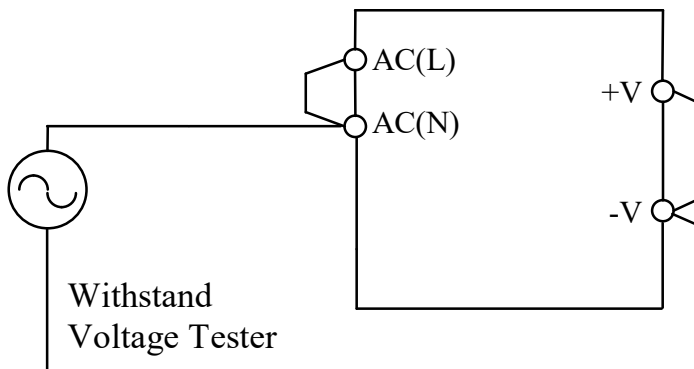
- Input – Output : 500VDC More than $100M\Omega$



4-9. Withstand Voltage

This series is designed to withstand 3.0kVAC between input and output for 1 minute. When testing withstand voltage, set current limit of withstand voltage test equipment at 20mA. 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 switch on and off timing. Connect input and output as follows.

- Input – Output : 3.0kVAC, 1min (20mA)



5. Mounting Method

5-1. Mounting Method

(1) Mounting Holes on PCB

The mounting hole position is in Fig.5-1.

- (2) To ensure conformance to various safety standards, creepage distance and clearance between the primary and the secondary of the PWB for power module mounting shall be considered.
 Keep creepage distance and clearance between the primary and the secondary needs more than 6 mm.

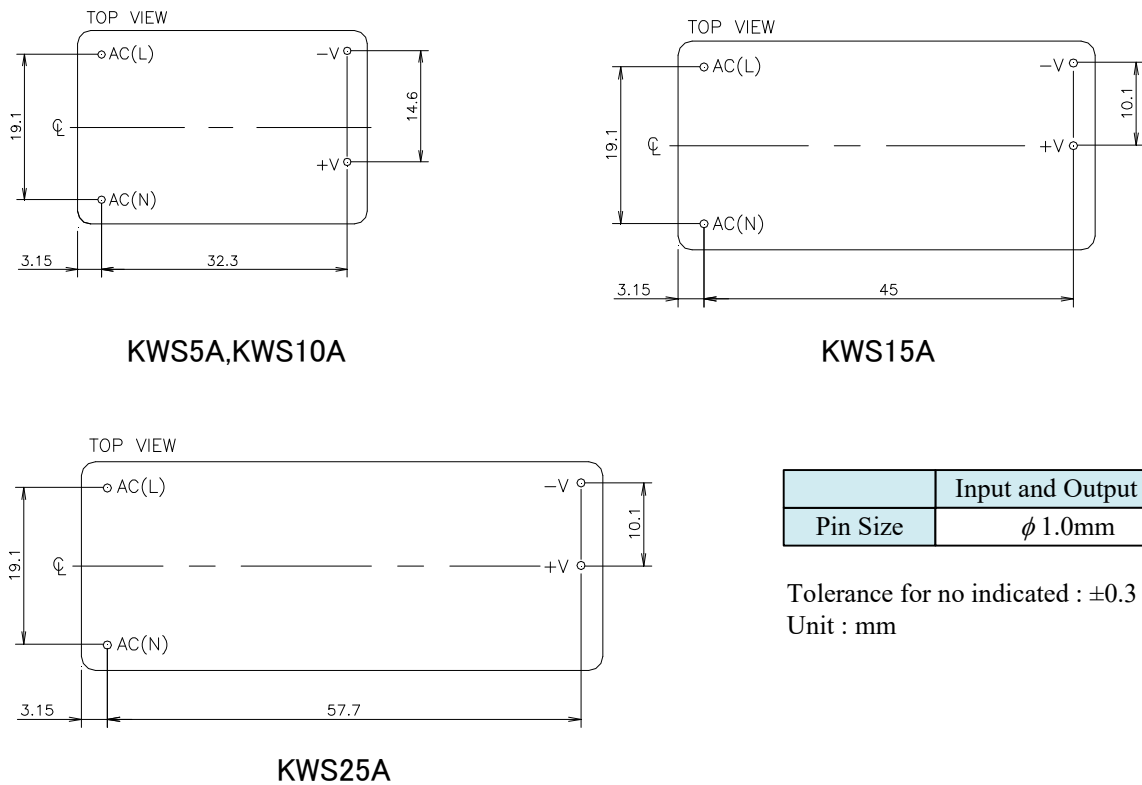


Fig.5-1 The mounting hole position

(3) Stress to the pins

- Do not apply excessive stress to the power module input and output pins, it will easily cause internal connections broken.
- Do not pull or bend pins strongly in order to avoid risk of solder crack.

5-2. Recommended Soldering Condition

Recommended soldering conditions are as follows.

(1) Soldering Dip

Dip condition : 260°C within 10 seconds.

Pre-heat condition : 110°C for 30 - 40 seconds.

(2) Soldering Iron

350°C within 3 seconds.

Note) Soldering time changes according to heat capacity of soldering iron, pattern on printed circuit board etc.
 Please confirm actual performance.

5-3. Recommended Cleaning Condition

Recommended cleaning condition after soldering are as follows.

(1) Cleaning Solvent

IPA (isopropyl alcohol)

(2) Cleaning Procedure

Use brush and dry the solvent completely before use.

5-4. Output Derating according to the Mounting Directions

The standard mounting is direction (A). Direction (B), (C), (D) and (E) are also possible.

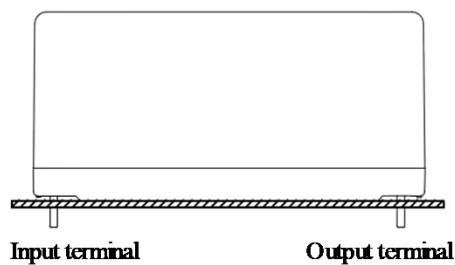
Direction (A)~(E) are same derating. Direction (F) is not recommended for using.

There should be enough consideration for airflow so that heat does not accumulate around the power supply vicinity. Please contact us for other mounting directions.

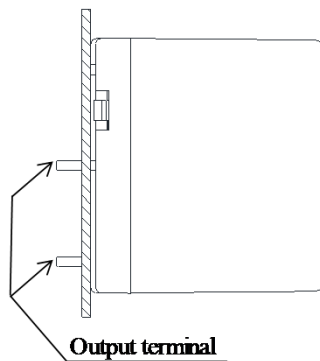
Refer to the output derating below, load (%) is percent of maximum output current value in a rated output voltage.

■ Mounting direction

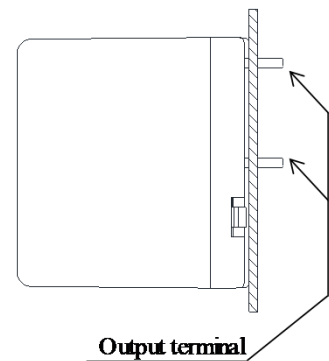
(A) Standard Mounting



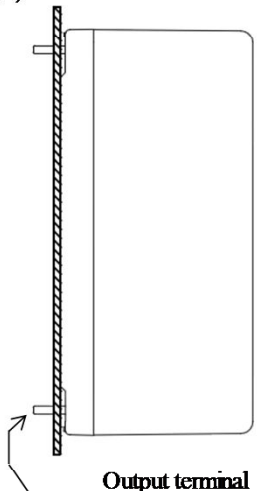
(B)



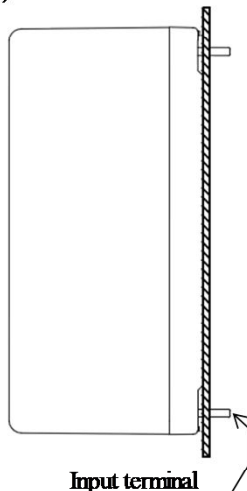
(C)



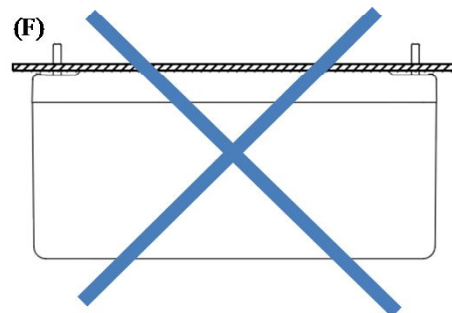
(D)



(E)

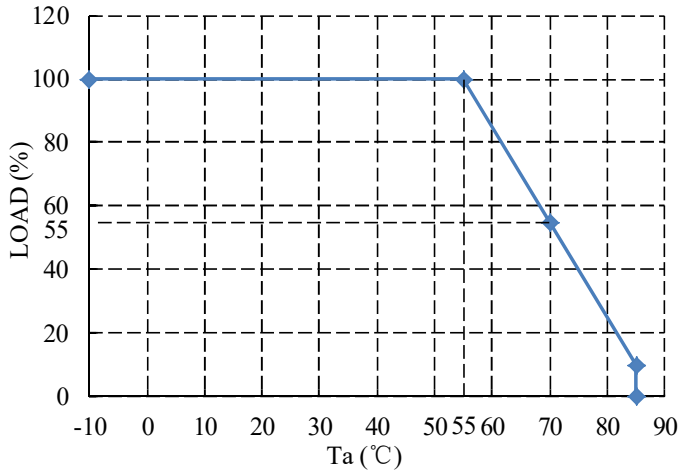


(F)



■ Output Derating

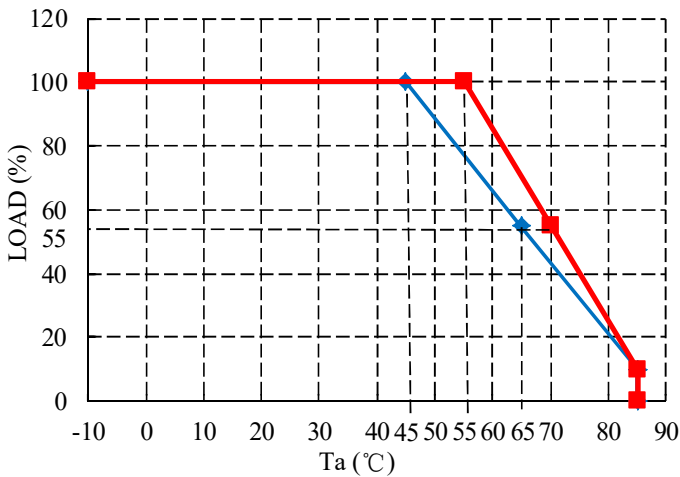
KWS5A



— 5V,12V,15V,24V

| 5V,12V,15V,24V | |
|----------------|---------|
| Ta(°C) | Load(%) |
| -10 | 100 |
| 55 | 100 |
| 70 | 55 |
| 85 | 10 |

KWS10A,KWS15A,KWS25A



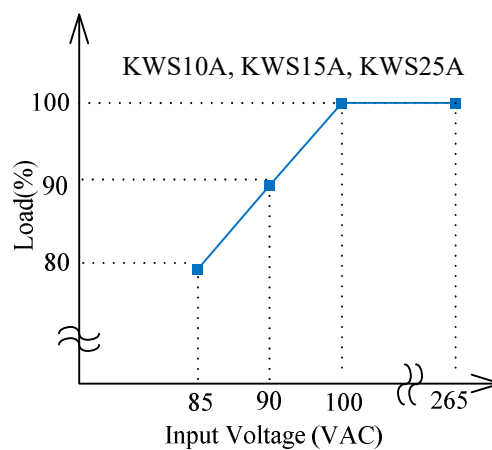
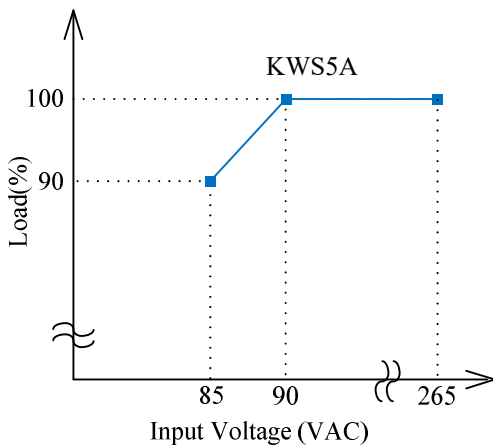
— 5V
 — 12V,15V,24V

| 5V | |
|--------|---------|
| Ta(°C) | Load(%) |
| -10 | 100 |
| 45 | 100 |
| 65 | 55 |
| 85 | 10 |

| 12V,15V,24V | |
|-------------|---------|
| Ta(°C) | Load(%) |
| -10 | 100 |
| 55 | 100 |
| 70 | 55 |
| 85 | 10 |

5-5. Output Derating according to the Input Voltage

Load (%) is percent of maximum output current value in a rated output voltage.



6. External Fuse Rating

Refer to the following fuse rating when selecting the external input fuse.
 Surge current flows when input turn on. Use slow-blow fuse or time-lag fuse. Fast-blow fuse can not be used.
 Fuse rating is specified by inrush current value at input turn on.
 Do not select the fuse according to actual input current (rms.) values.

KWS5A, KWS10A : 1.0A
 KWS15A : 2.0A
 KWS25A : 3.15A

7. Before concluding that the unit is at fault...

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

- (1) Check if the rated input voltage is connected.
- (2) Check if the PCB pattern thickness is enough.
- (3) Check if the output current and output power does not over specifications.
- (4) Audible noise can be heard when input voltage waveform is not sinusoidal wave.
- (5) Audible noise can be heard during Dynamic-Load operation.
- (6) Ensure that large capacitor is not connected on the output side.

Please use within maximum capacitance shown below.

If connecting more than the following capacitance value is required, please contact us for details.

| Maximum external capacitance | | | | |
|------------------------------|---------|-------|-------|-------|
| MODEL | 5V | 12V | 15V | 24V |
| KWS5A | 2,000uF | 820uF | 820uF | 330uF |

| Maximum external capacitance | | | | |
|------------------------------|---------|---------|---------|---------------|
| MODEL | 5V | 12V | 15V | 24V |
| KWS10A | 2,000uF | 1,000uF | 1,000uF | 390uF(150uF)* |

| Maximum external capacitance | | | | |
|------------------------------|---------|---------|---------|-------|
| MODEL | 5V | 12V | 15V | 24V |
| KWS15A | 2,000uF | 1,000uF | 1,000uF | 560uF |

| Maximum external capacitance | | | | |
|------------------------------|---------|---------|---------|-----------------|
| MODEL | 5V | 12V | 15V | 24V |
| KWS25A | 4,700uF | 2,200uF | 2,200uF | 1,500uF(680uF)* |

* : The value in parentheses " () " is the external capacity of the constant current load.

8. The life expectancy

The life of the power supply depends on the life of the built-in aluminum electrolytic capacitor.

The life is described in reliability data.

The life of the aluminum electrolytic capacitor varies depending on the method of mounting the power supply, the load current, and the ambient temperature.

Please refer to "Electrolytic Capacitor Lifetime".

Please do not use the product which passed over the life expectancy.

There is a risk of unexpected output shutdown and specifications may not be satisfied.

Please contact us for maintenance or exchange the product which passed over the life expectancy.

9. Warranty Period

This product is warranted for a period of 3 years from the date of shipment.

For damages occurring at normal operation within this warranty period, repair is free of charge.