

COTEK Electronic Ind. Co., Ltd.

No. 33Sec. 2, Renhe Rd., Daxi Township, Taoyuan County 33548, Taiwan, R.O.C.
TEL:+886(3) 389-1999 FAX:+886(3) 380-2333 E-mail: jenny@cotek.com.tw

COTEK SMPS Application Notes

6.1 Input FUSE

There is fuse to protect power supply. When fuse is open, abnormal conditions may occur. Please contact your local distributor for further assistance.

6.2 Safety

The peak working voltage within power supplies is between 200V to 800V. Do NOT touch the components in power supplies while it is working. Please contact your local distributor for assistance if the power supply works abnormally.

6.3 Grounding

Use thick gauge/short wire to connect the FG terminal of power supplies and the enclosure of system in which the power supplies are used. By doing this, it will avoid electronic shock and prevent noise and leakage current from happening.

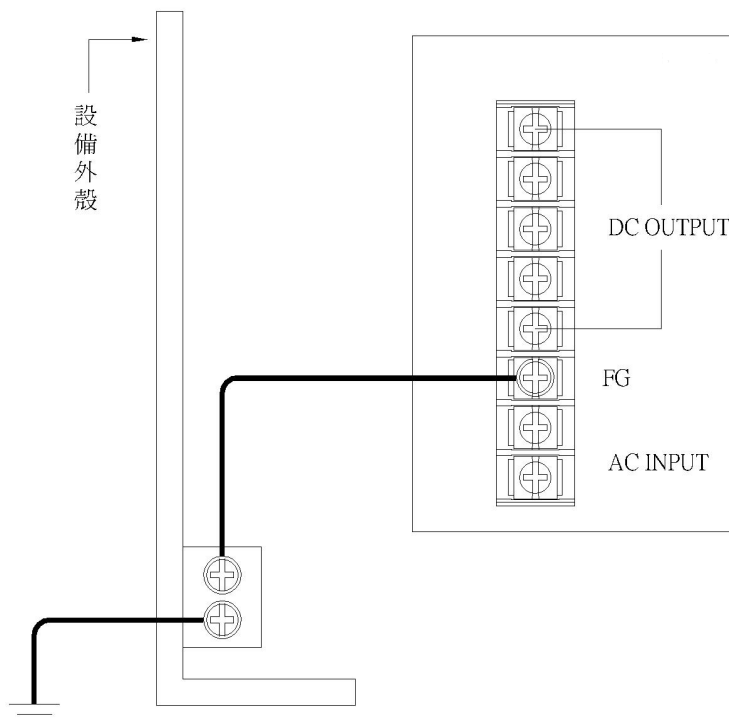


Fig. 6-1 Diagram showing how FG could be connected to the device enclosure to prevent noise and leakage current

6.4 Output and Input wiring

1. Be sure to separate input and output wiring by xxx, to avoid the cross interference of input surge current or output ripple noise.
2. Be sure to use thick gauge wire for output wiring, and must withstand output current. Suggest to add one small capacitor to eliminate noise.
3. During installation, make sure to use appropriate ring terminal, wire and crimp tool.
4. AC input FG means the Frame Ground of power supplies, which is different from DC output ground (-V/COM).

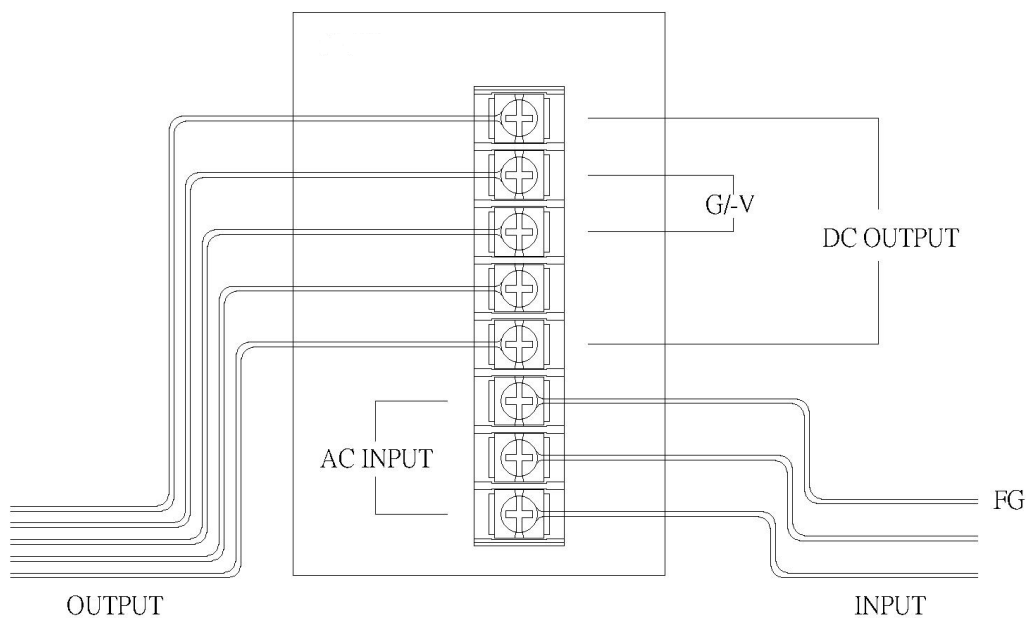


Fig. 6-2 input and output wiring diagram

6.5 Radiating

1. Every unit should be installed with proper ventilation.
2. Correct installation direction and location (e.g. Air vent in the upward position).
3. Every unit should be installed with proper heat conduction (e.g. Models using case for heat dissipation, case should be laid flat to system case surface).
4. When two or more units are connected for use, make sure to have enough space between each unit (Distance between each unit should be 5~15 cm based on SMPS output).
5. Forced air convection improves heat dissipation effectively (e.g. To add an additional fan and set suction under system and exhaust above system).

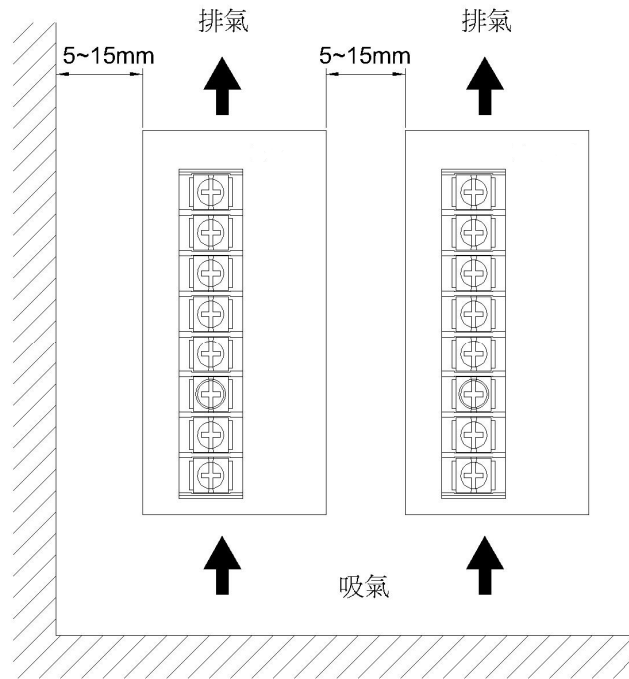


Fig. 6-3 Leave ventilation space for multiple units use

6.6 Wiring for Remote On/Off Control and Remote Detection

1. Remote On/Off Control

1-1. N, P & U Series

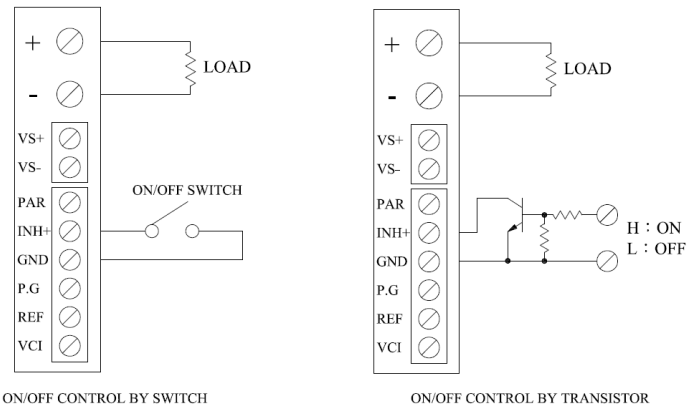
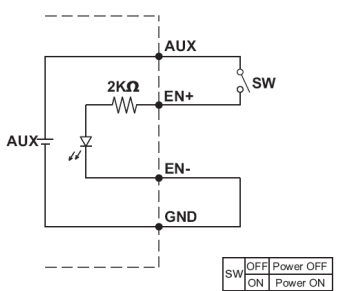


Fig. 6-4 Remote on/off control and detection diagram

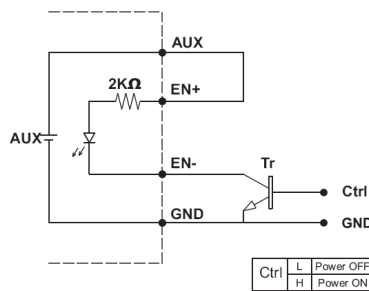
1-2. For AK, AE & ME Series

(A) Default Setting



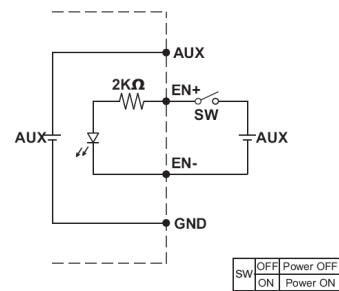
(A) Using internal 5V auxiliary source

(B)



(B) ON / OFF Control by NPN transistor

(C)



(C) Using external voltage source

2. Remote Detection

Connecting VS+ & VS- terminals to load can compensate line voltage drop. Make sure to have enough wire diameter, as line voltage drop could be compensated around 0.3~0.5V.

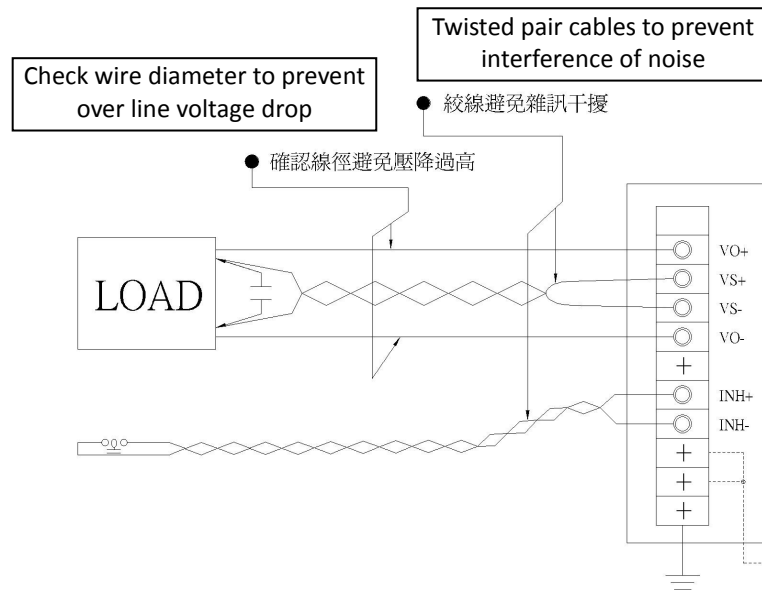


Fig. 6-6 Remote On/Off and detection wiring diagram

6.7 Parallel Connection

Parallel connection use can increase output current or add back-up function. In parallel connection use, make sure to adjust output voltage deviation to less than 2%.

1. PSU Supporting parallel connection function

Make sure to connect the PAR pins of All PSU and parallel connect the output pins/terminals before connecting the power supply to load.

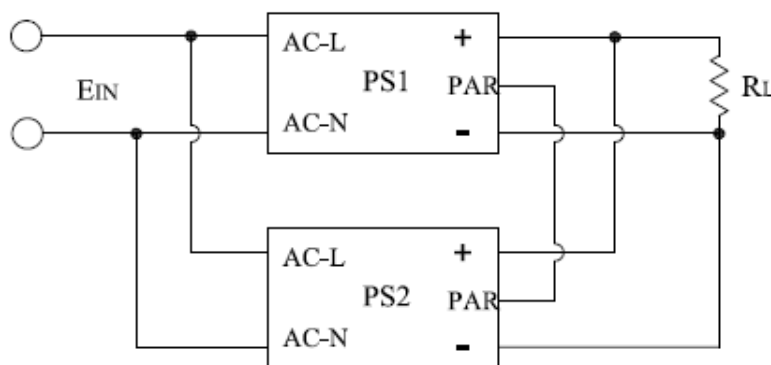


Fig. 6-7 Parallel connection diagram

Notes for parallel connection :

- ① Adjust output voltage deviation to be as close as possible (deviation should be less than 2%).
- ② Each unit should be connected with short thick gauge wire before connecting the load.
- ③ Total output is the summation of each unit's output wattage (For N series, it is 90% of summation of each unit's output wattage).

- ④ Output instability can be improved with connection to VS+ & VS- on Control Connector 5. Please make sure to note the following when doing parallel connection:

If customer will use ACI/VCI control with parallel connection, please make sure the sink current is sufficient to fulfill each power supply. Sink current of AK Series: CN9 Pin 13(VCI), Pin 16(ACI) is 0.25mA (e.g. if parallel 10pcs AK-1000, sink current must be 2.5mA = 10 x 0.25; if parallel connection 20pcs AK-1000, sink current must be 5mA, and so on).

This applies to all the COTEK programmable power supplies, including AE/AEK/AK Series, ME-1200 and future programmable power supply supporting ACI/VCI control function.

2. PSU without parallel connection function

Add a diode to the positive output of each unit (Shown as Fig. 6-8). (Choose schottky diode if withstand voltage is allowable). The diode's withstand current should be greater than the output current, and make sure to add proper heat sink.

This is only suitable for back up use and user requires to test its suitability.

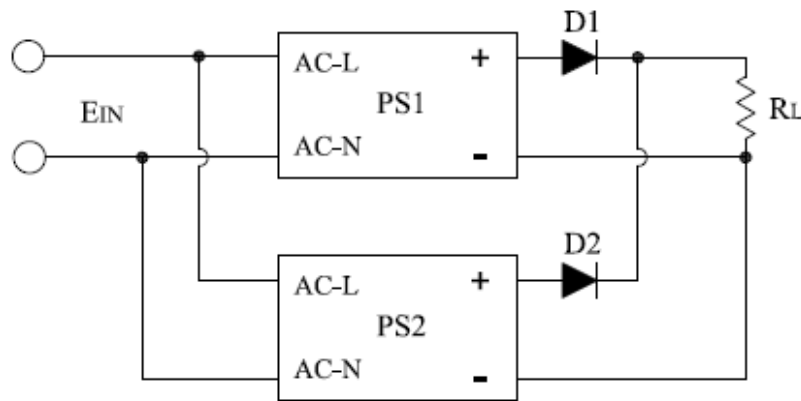


Fig. 6-8 Parallel connection using Schottky diode

- ② Add resistor to the positive output of each unit. Recommend to use resistor value around 0.1Ω(100mΩ). Make sure to consider heat dissipation of resistance and loss.

User requires to test its suitability (only suitable for the models with low output current).

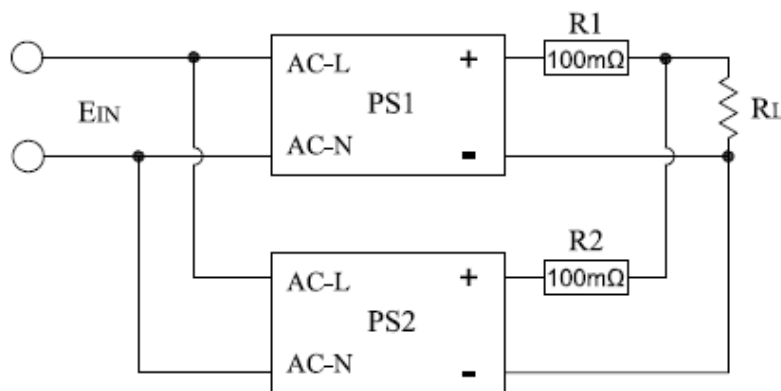


Fig. 6-9 Parallel connection method with resistance

- ③ When multiple SMPS are connected in parallel, higher leakage current is expected.

Make sure to prevent people from electric shock. Please consult to dealer if there's such a

requirement.

6.8 PSU connect in Series

Diagram to show you how to connect multiple PSU in Series :

1. Positive/ negative voltage connection shown as Fig. 6-10.

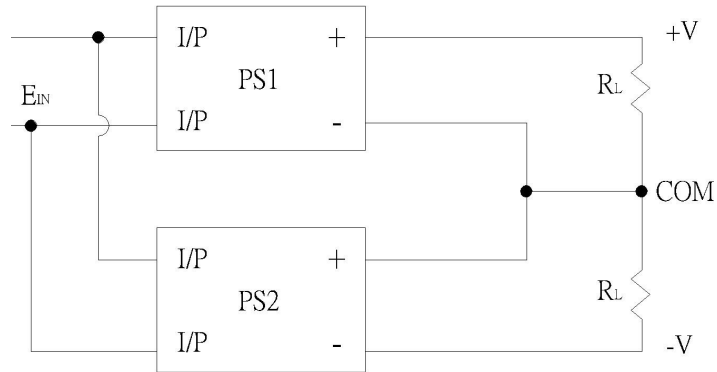


Fig. 6-10 Direct Positive / Negative voltage connection

2. To increase the output voltage (output current remains the same). Make sure to add reverse diodes to prevent the SMPS damage during startup. Withstand voltage of the diodes should be higher than V_1+V_2 (shown as Fig. 6-11).

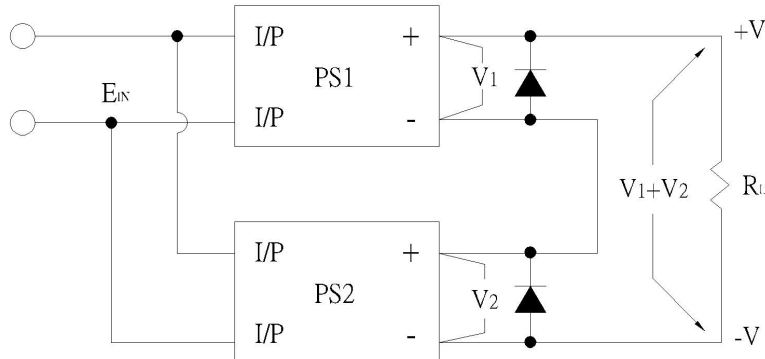
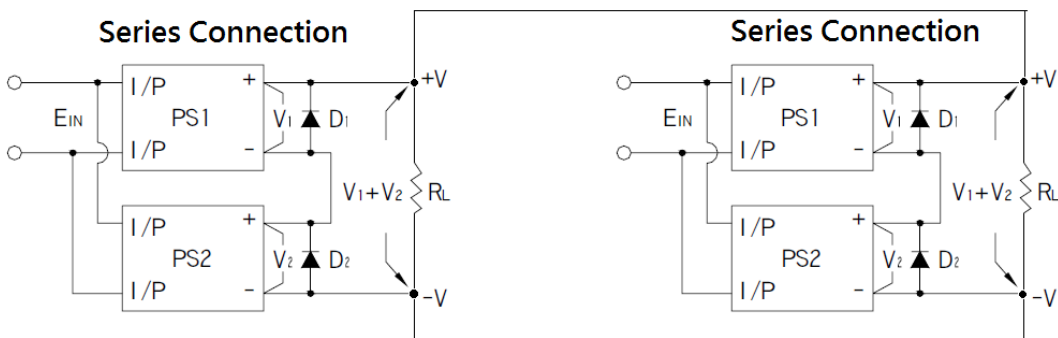


Fig. 6-11 Add Diode to the output side

NOTE : When connect PSU in Series, make sure the total output voltage must not exceed 500VDC.

6.9 How to connect Series bank in Parallel



NOTE : Please refer to parallel and Series connection NOTES (Section 6.7 & 6.8).

6.10 Small load output wiring

In case if one PSU need to provide 2 different loads, please add fuse at the smaller load to prevent short circuit.

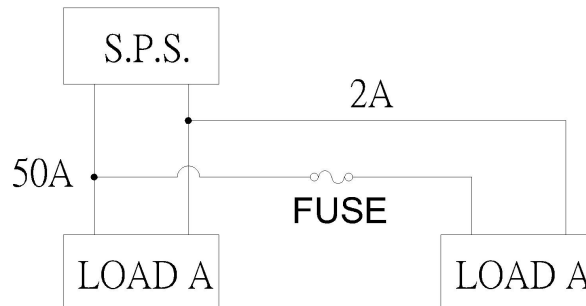


圖 6-12 輸出配線

Fig. 6-12 output wiring diagram

6.11 Minimum load requirement

To have stable sub-output (Ch2) in the multi-outputs SMPS, make sure to add minimum load at main output (Ch1). For example, MP60-05F provides 2 outputs (5V/5A and 12V/2A). In case the SMPS two outputs are 5V/0A and 12V/2A, 12V output side will be lower than 12V. To solve this condition, make sure to add 0.5A load at 5V side, in order to increase the 12V output to the rated level within the tolerance range.

6.12 Lower temperature condition

PSU has thermal resister to prevent inrush current, and there are some components which could be easily affected by temperature, causing PSU not starting up at low temperature. Here are three methods to start up PSU:

- ① Switch output ON/OFF after AC power ON.
- ② Use heater to increase the environment temperature.
- ③ Reduce the load.

In case the temperature range indication is $-10^{\circ}\text{C}\sim+50^{\circ}\text{C}$, but user wish to use the PSU at -20°C , make sure to note the following:

- ① Low humidity is required to avoid ice crystals.
- ② High output ripple noise is expected.
- ③ There are thermal resistors in the power unit and it may cause longer startup time or startup failure.
- ④ We are unable to guarantee the performance when using the PSU over spec.

6.13 High temperature or high temperature difference environment

Make sure there is no condensation inside the PSU before startup. It's easy to have condensation inside the PSU when moving the PSU from low temperature to high temperature. Please contact local

Distributor for technical advice if needed. For example, add conformal coating may help to reduce power supply damage in high humidity condition.

6.14 Special load

1. Capacitive load :

In case if the power supply is connected to capacitive load (such as light), the power unit may result in delay startup or startup failure. We suggest using PSU with constant current limit function.

2. Inductive load :

When connecting the PSU output to the inductive load (such as motor, solenoid valve), instant large current may cause PSU damage. In this case, user may consider to connecting suitable capacitor or diode to prevent this condition.

3. Dynamic Load :

When connection PSU output to the dynamic Load (such as LED display), output current expect to change fast and higher ripple or audible frequency is expected. To solve this condition, we suggest to connecting suitable capacitor.

6.15 For Battery charging application

To ensure the charging efficiency and battery lifetime, make sure to select power supply with constant voltage and current function.

When using power supply in battery application, please make sure to connect ORing Diode on the output side of the power supply. As when the output voltage of the battery is higher than power supply, the power supply could be damaged.

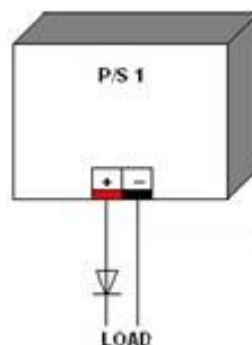


Fig. 6-13 ORing Diode connection diagram

6.16 Inrush current suppression circuit

When connecting multiple PSU, inrush current expect to increase, and often may over the stated spec. Delay circuit diagram below could effectively inhibit the inrush current when connecting multiple PSU.

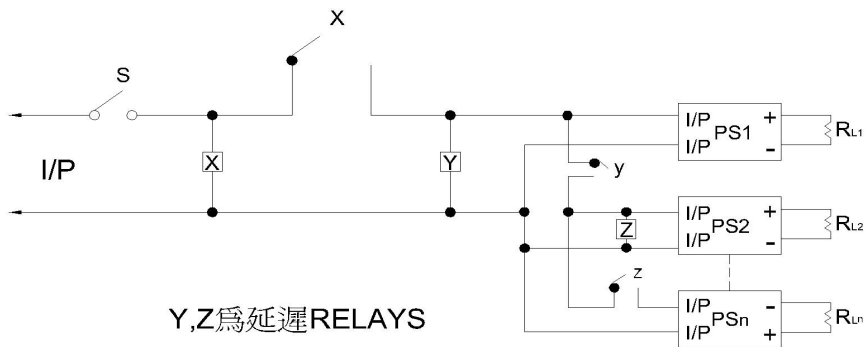


Fig. 6-14 Connection diagram for inrush current suppression circuit

6.17 Input surge and lightning suppression

1. Input surge

To avoid input surge damaging the PSU, please add surge absorber in between AC/L and AC/N.

2. Lightning suppression

Add surge absorber in between AC/L & AC/N, AC/L & FG and AC/N & FG could prevent power supply damage from lightning.

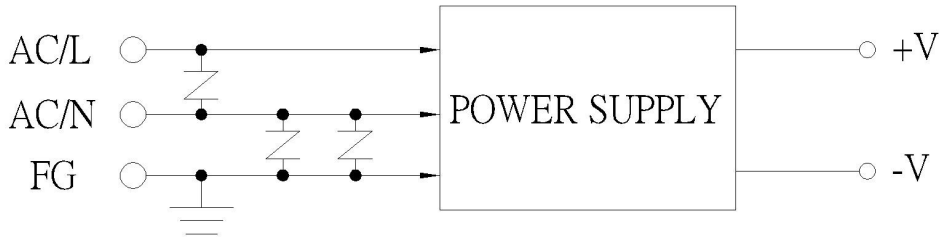


Fig. 6-15 Connection diagram for input surge and lightning suppression

6.18 Output Ripple noise suppression

1. Differential mode noise suppression

Please refer to diagram 6.15. By adding C1~C4 could effectively reduce the noise level .

Capacitor spec. suggestion:

C1, C3 spec.: 47uF~100uF; C2, C4 spec.: 0.01uF~0.1uF. Normally, add C3 and C4 is sufficient to reduce noise level.

2. Common mode noise suppression

Add L1, C5 and C6 could effectively reduce noise level. C5, and C6 recommend to use high frequency capacitor.

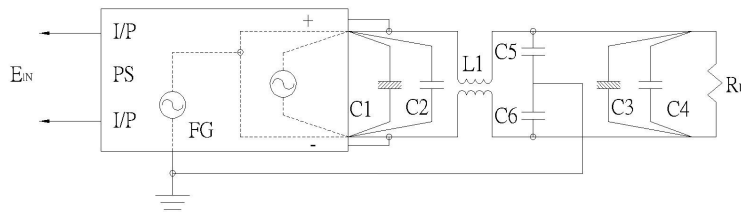


Fig. 6-16 Diagram for Ripple & noise suppression

6.19 Series connection and control

1. Add external voltage 0~5V to adjust the output voltage and current in series connection:

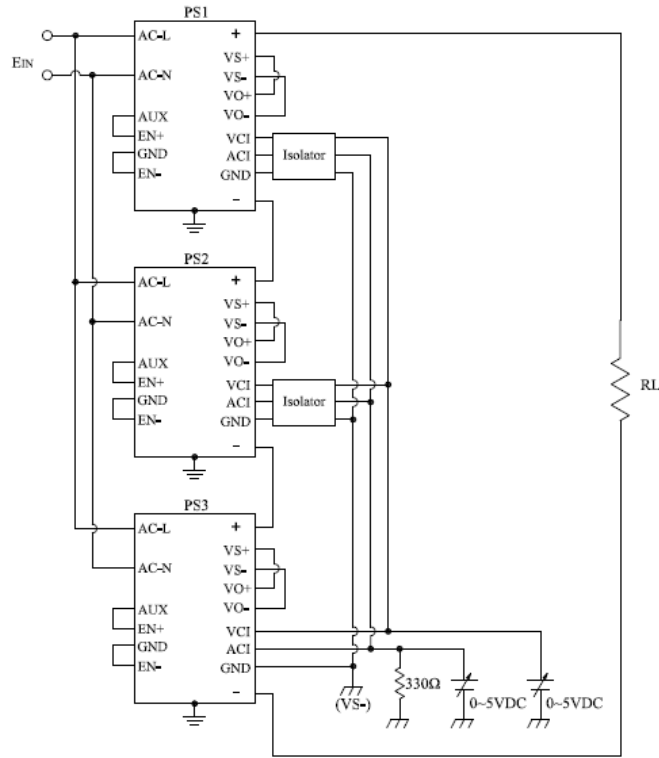


Fig. 6-17 Connection diagram to add external 0~5VDC to adjustment the O/P Voltage and Current in Series connection

2. I²C

Adjust the output voltage and current through I²C

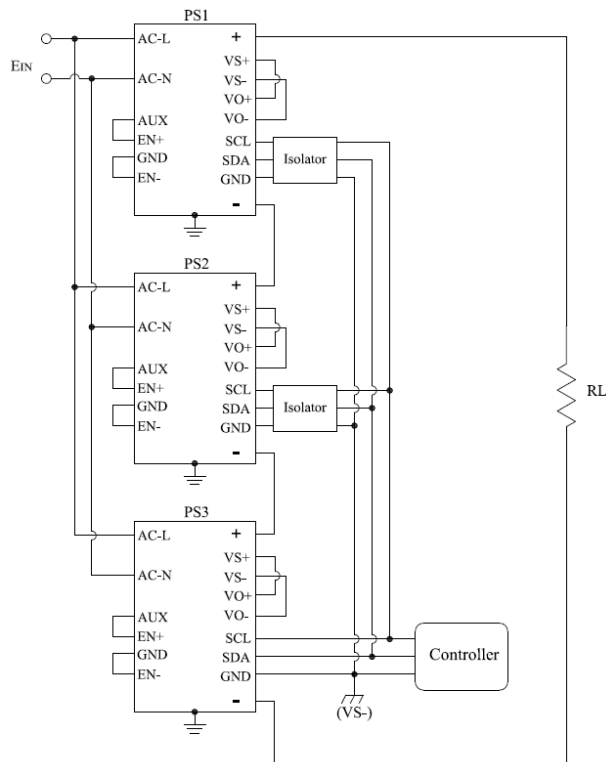


Fig. 6-18 Connection Diagram to adjust the O/P voltage and current via I²C

3. Adjust output voltage and current through RS-232

If you wish to control power supply through RS-232/485, COTEK CT-xxx (RS232/485 controller board) optional kit is available.

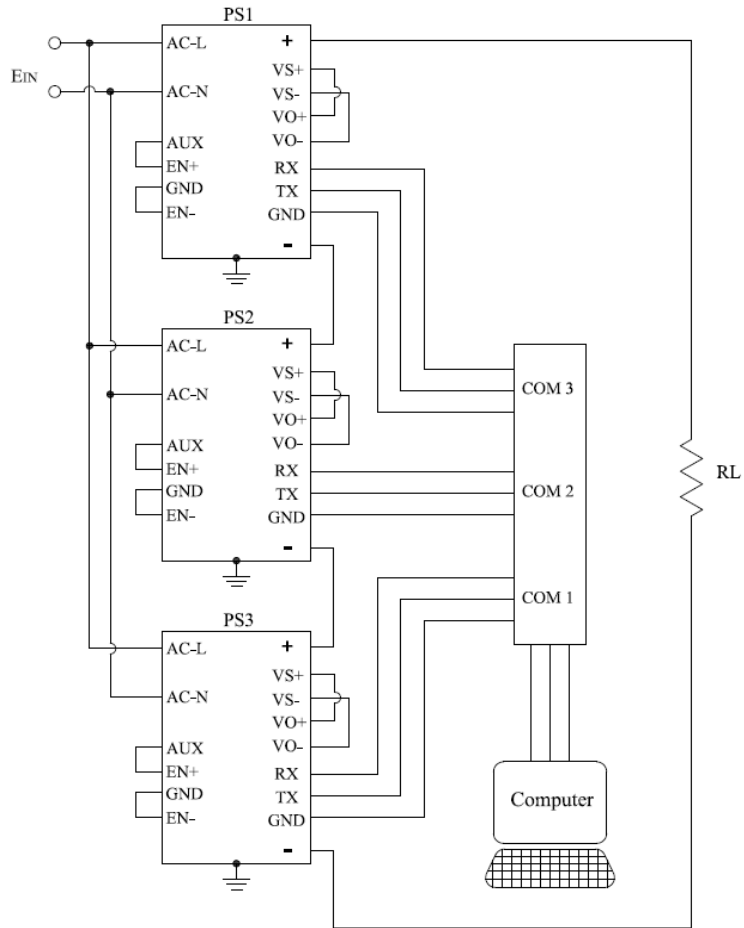


Fig. 6-19 Connection Diagram for RS-232/485 connection

6.20 Parallel connection and control diagram

1. Single-phase parallel connection diagram

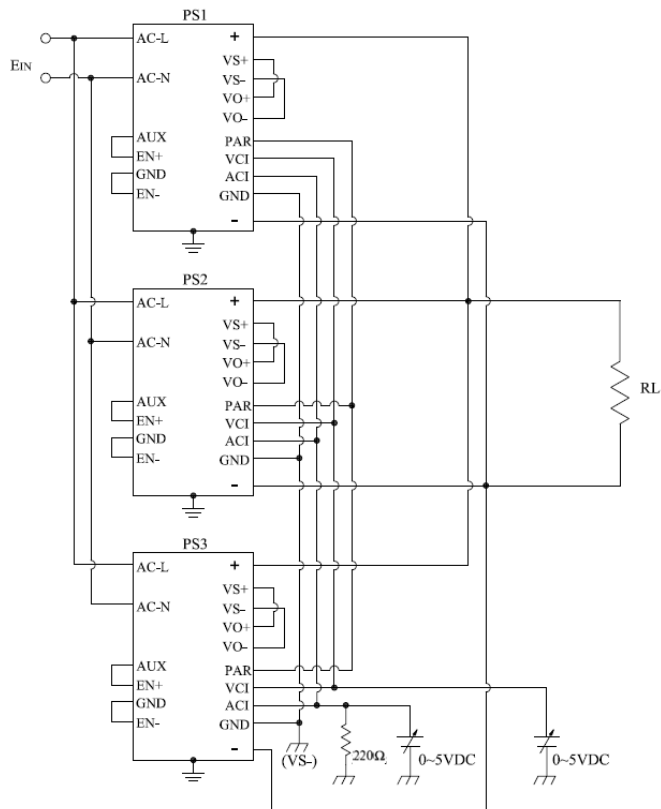


Fig. 6-20 Connection Diagram showing parallel connection and control

2. 3 phase 4 Wire parallel connection diagram (AC input 220/380Vac)

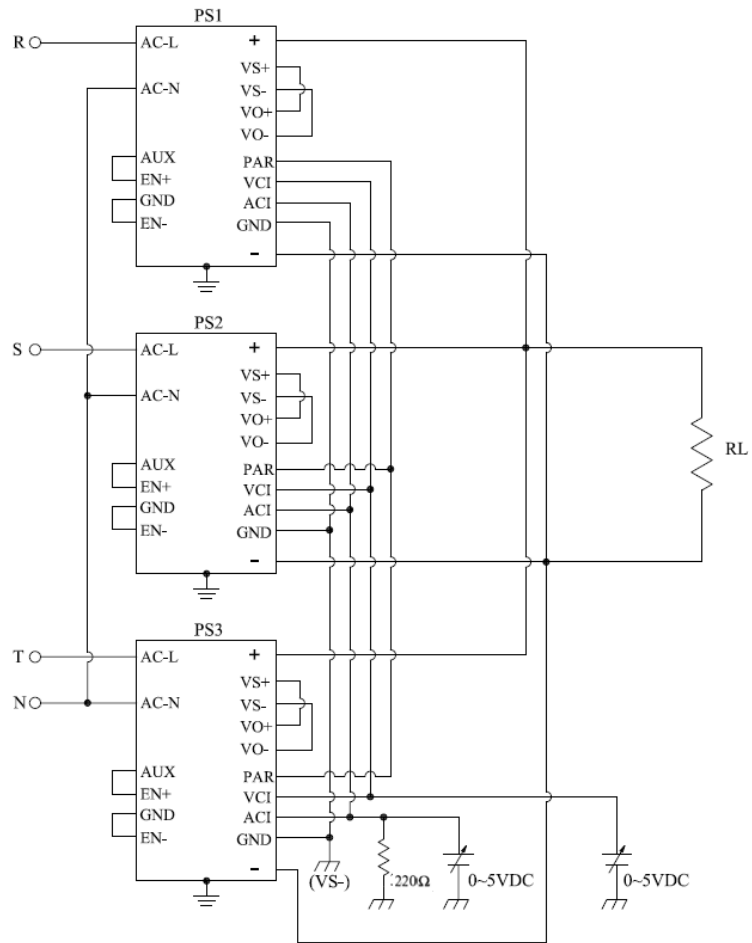
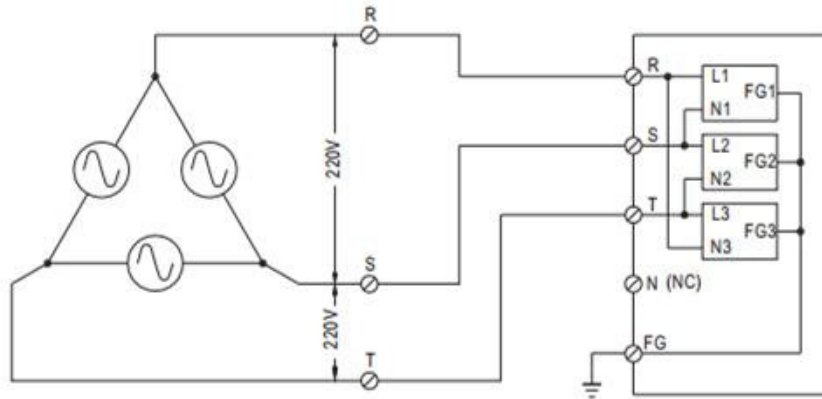


Fig. 6-21 Diagram for 3 Phase 4 Wire parallel connection diagram

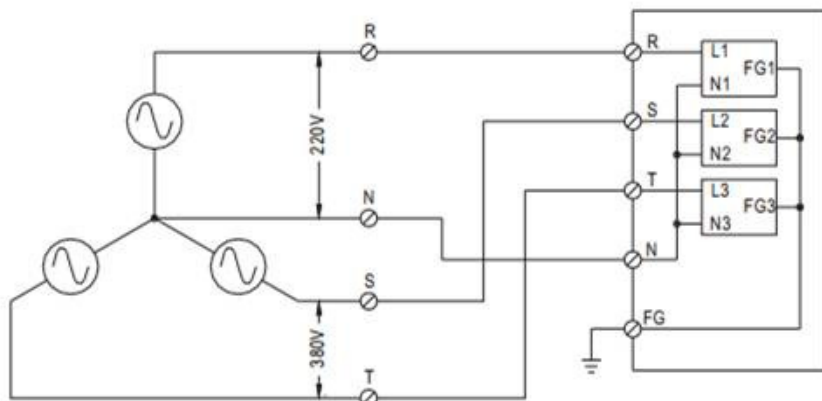
Note: Note: For Parallel connection, please make sure to connect the PAR pins of all the PSU and parallel connect the output pins/terminals .

6. Three Phase Connect

■ FIG. A: 3 ϕ 3W 220VAC SYSTEM (STANDARD MODEL FOR STOCK)



■ FIG. B: 3 ϕ 4W 220/380VAC SYSTEM



■ FIG. C: 3 ϕ 4W 190/110VAC SYSTEM

