KEPCO®
THE POWER SUPPLIER™

APPLICATION NOTE

COTEK MODELS
AE-800
AE-1500
AE-3000
AEK-3000
AEK-3000 ORingFET
AEK-3000HV
AEK-3000HV Oring Diode

NOTE: The following appplication notes are for the Cotek models distibuted by Kepco, Inc. that are listed above.

1. RS 232 Communication is only possible using the CT Series adapters listed below. (Pins 23 and 24 of CN2 are not connected and do not function.) See CT Series User Guide (free download) for details.

www.kepcopower.com/support/opmanls.htm#ae

2. Computer control is also possible using the I^2C interface. Refer to the Cotek I^2C and RS 232/RS 485 Communication Protocol Manual (free download) for details.

www.kepcopower.com/support/opmanls.htm#ae

CT-201 - Used to control a single power supply from a PC via RS 232. Includes one (1) CT Series cable (Cotek P/N 47-0124-0001) to connect CT-201 to power supply and one 5-pin connector (ECH350R-05P) used for remote sense connections. Requires RS 232 cable to connect CT-201 DB-9F connector to computer RS 232 port (not supplied). See CT Series User Guide for details.

CT-204 - Used to control up to four (4) power supplies configured in series from a PC via RS 232; maximum output voltage: <500V d-c. Includes four (4) CT Series cables (Cotek P/N 47-0124-0001) to connect CT-201 to power supplies. Optional 5-pin connector(s) (Dinkle P/N ECH350R-05P) used for remote sense connections are not supplied. Requires RS 232 cable to connect CT-201 DB-9F connector to computer RS 232 port (not supplied).See CT Series User Guide for details.

NOTE: More than four (4) power supplies may be connected in series and controlled via RS 232 by the use of multiple CT-204 modules and the optional CT-204 to CT-204 series cable (Cotek P/N 47-0103-0028); <500V d-c max still applies.

CT-251 - Used to provide parallel control of multiple power supplies. Connecting a total of (N) power supplies in parallel requires (N-1) CT-251 modules plus one (1) CT-551 module which provides the RS 232/PC communication path. Each CT-251 and CT-551 module requires a CT series cable to connect to the associated power supply (supplied).See CT Series User Guide for details.

CT-551 - Used to provide parallel control of multiple power supplies. Connecting a total of (N) power supplies in parallel requires (N-1) CT-251 modules plus one (1) CT-551 module which provides the RS 232/PC communication path. Each CT-251 and CT-551 module requires a CT series cable to connect to the associated power supply (supplied). See CT Series User Guide for details.

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COTEK

3000W Programmable Single Output AEK-3000 ORingFET series

Features:

- Universal AC input / Full range
- Programmable output Voltage (0% ~ 105%)
- Programmable output Current (0% ~ 105%)
- Built-in ORingFET
- Built-in IC to isolate communication
- Forced current sharing at parallel operation (Refer to pg. 5 for connection diagram)
- Constant current limit
- Selectable +5V / 0.5A or +9V / 0.3A auxiliary output
- Global control via UART (5V TTL)
- Remote setting multiple PSU via UART (5V TTL), I²C & RS485 (Optional)
- Power OK signal
- Remote ON / OFF, Remote sense function
- Protection: OVP, OLP, OTP, Fan failure
- Built-in active PFC Function

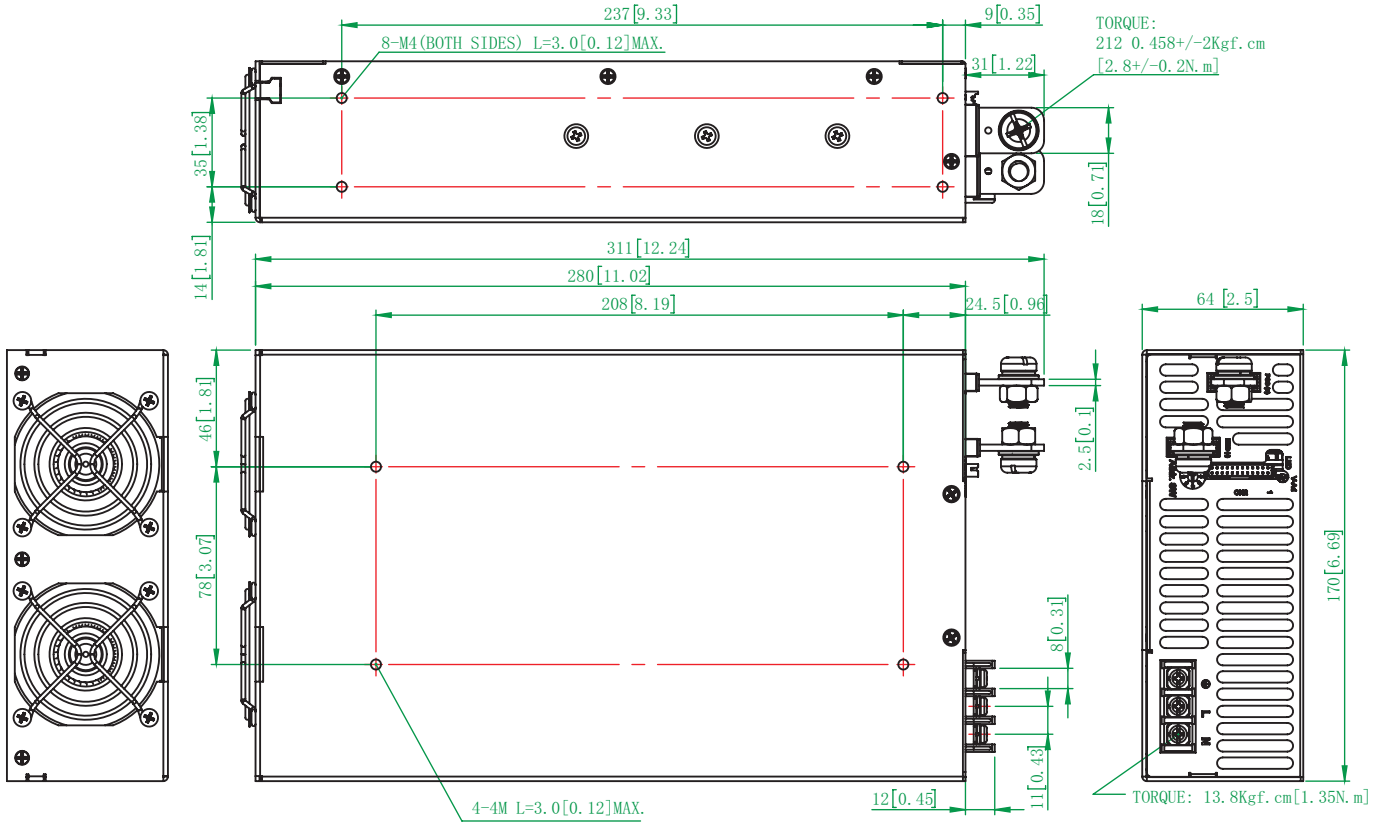
IEC62368-1

MODEL		AEK-3000-12 Oring	AEK-3000-15 ORing	AEK-3000-24 ORing	AEK-3000-30 ORing	AEK-3000-36 ORing	AEK-3000-48 ORing	AEK-3000-60 ORing
Output	DC Voltage Rated	12V	15V	24V	30V	36V	48V	60V
	Rated Current	200A	160A	125A	100A	83.5A	62.5A	50A
	Current Range	0~200A	0~160A	0~125A	0 ~ 100A	0 ~ 83.5A	0 ~ 62.5A	0 ~ 50A
	Rated Power	2400W	2400W	3000W	3000W	3006W	3000W	3000W
	Ripple & Noise (Max.) Note.2	150mVp-p	150mVp-p	240mVp-p	300mVp-p	360mVp-p	480mVp-p	600mVp-p
	Voltage Adj. Range	±5.0% Typical adjustment by potentiometer. (Via V-Adj from PSU front panel)						
	Voltage Tolerance Note.3	±2.0% (rated output voltage of single unit)						
	Current Tolerance	±3.0% (rated output current of single unit)						
	Line Regulation	±1.0%						
	Load Regulation	±1.0%						
	Setup, Rise Time	800ms, 100ms at full load						
	Hold Up Time (Typ.)	14ms / 230VAC at full load						
Input	Voltage Range Note.4	90 ~ 264VAC, 127 ~ 370VDC (Refer to de-rating curve)						
	Frequency Range	47 ~ 63Hz						
	Power Factor (Typ.)	0.95 / 230VAC, 0.98 / 115VAC at full load						
	Efficiency (Max.)	86%	89%	90%	91%	91%	92%	92%
	AC Current (Max.)	19.7A / 115VAC (2000W), 16.5A / 230VAC (3000W)						
	Inrush Current (Typ.)	33A / 115VAC, 65A / 230VAC						
	Leakage Current	< 3.5mA (240VAC)						
Protection	Over Load	105% rated output power						
		Protection type: Constant current limit						
	Over Voltage	Variable OVP Refer to VCI VS OVP curve.(OVP Tolerance ±7%)						
		Protection type: Latch-style (Recovery after reset AC power ON or inhibit)						
	Over Temperature	85 ±5°C detect on NTC, Protection type: Auto recovery after temperature goes down						
Function	Auxiliary Power	Selectable +5V / 0.5A or +9V / 0.3A auxiliary output						
	Remote ON / OFF Control	By external switch						
	Power OK Signal	Open drain signal low when PSU turns on, Max. sink current: 20mA, Max. drain voltage: 40V.						
	Output Voltage Trim	Adjustment of output voltage is between 0 ~ 105% of rated output						
	Output Current Trim	Adjustment of output current is between 0 ~ 105% of rated output						
	Parallel (Current Sharing) Note.5	Please refer to page 5						
Environment	Working Temp.	-20 ~ +60°C (Refer to de-rating curve)						
	Working Humidity	20 ~ 90% RH non-condensing						
	Storage Temp. & Humidity	-40 ~ +85°C, 10 ~ 95% RH						
	Temp. Coefficient	±0.02% / °C (0 ~ 50°C)						
	Vibration	10 ~ 500Hz, 2G 10min. / 1cycle, period for 60min. each along X, Y, Z axes Compliance to IEC 60068-2-6, IEC 60068-2-64						
Safety & EMC	Safety Standards	Certified UL 62368-1; EN 62368-1						
	Withstand Voltage Note.7	I/P-O/P: 3KVAC (4242VDC), I/P-FG: 1.5KVAC (2121VDC), O/P-FG: 0.5KVAC (707VDC)						
	Isolation Resistance	I/P-O/P, I/P-FG, O/P-FG: 100M Ohms / 500VDC (25°C/70%PH)						
	EMI Conduction & Radiation	Certified EN 55032						
	Power Harmonic & Voltage Fluctuation and Flicker	Certified EN 61000-3-2; EN 61000-3-3						
Note.6	EMS Immunity	Certified EN 55035: 2017 / A11: 2020; IEC 61000-4-2,3,4,5,6,8,11						
Others	MTBF	90.6K HRS Certified MIL-HDBK-217F						
	Cooling	Load and temperature control fan						
	Dimension (WxHxD)	170x64x280 mm / 6.69x2.52x11.02 inch						
	Packing	3.9kg; 6pcs / 25.9kg / 2.48CUFT						

1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25°C of ambient temperature.
2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1uF & 47uF parallel capacitor.
3. Tolerance: includes setup time tolerance, line regulation and load regulation.
4. De-rating may apply in low input voltage. Please check the de-rating curve for more details.
5. In parallel connection only one unit will operate if the total output load is less than 5% of the rated power.
6. The power supply is considered a component which will be installed into a final equipment. The final equipment must be re-confirmed that it still meets EMC directives.
7. This test is done without enclosure: I/P-O/P 4242VDC. If with enclosure: I/P-O/P 2121VDC,I/P-FG:2121VDC, O/P-FG: 707VDC

Mechanical Drawings:

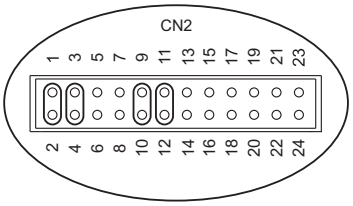
Unit:mm / inch



Recommended screw length is measured from the power supply surface

AC Input Terminal Pin No. Assignment

Pin No.	Assignment
L	ACL
N	ACN
⏚	⏚



CN2 Function Description:

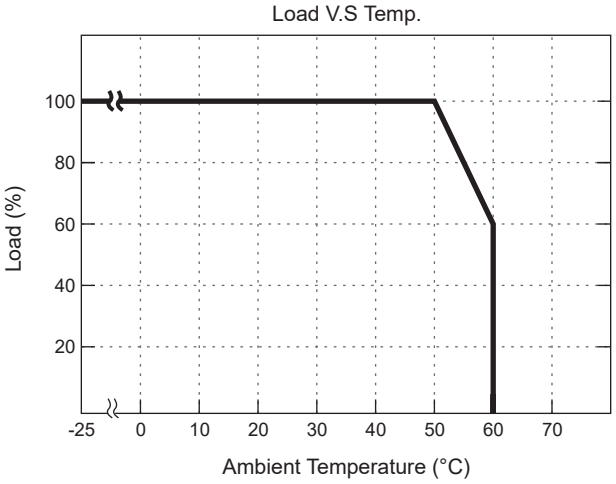
Pin No.	Function	Description	Pin No.	Function	Description	Mating Housing / Contact	
1	VS+	Remote sense (+)	13	ACI	I Program	JST PHDR-24VS or equivalent	JST SPHD-002T-P0.5 or equivalent
2	VO+	Positive output voltage	14	GND	Ground		
3	VS-	Remote sense (-)	15	VCI	V Program		
4	VO-	Negative output voltage	16	GND	Ground		
5	POK	Power OK	17	AUX	+5V / 0.5A or +9V / 0.3A Auxiliary power		
6	GND	Ground	18	GND	Ground		
7	PAR	Parallel operation current share	19	SCL	Serial Clock used in the I²C interface		
8	VSET	Aux output setting	20	SDA	Serial Data used in the I²C interface		
9	EN-	Inhibit ON/OFF (-)	21	+5VC	+5V power supply, needs to be used with GND1		
10	GND	Ground	22	GND1	Ground 1, needs to be used with +5VC		
11	EN+	Inhibit ON/OFF (+)	23	RX	For UART (5V TTL) Receiver function		
12	AUX	+5V / 0.5A or +9V / 0.3A Auxiliary power	24	TX	For UART (5V TTL) Transmission function		

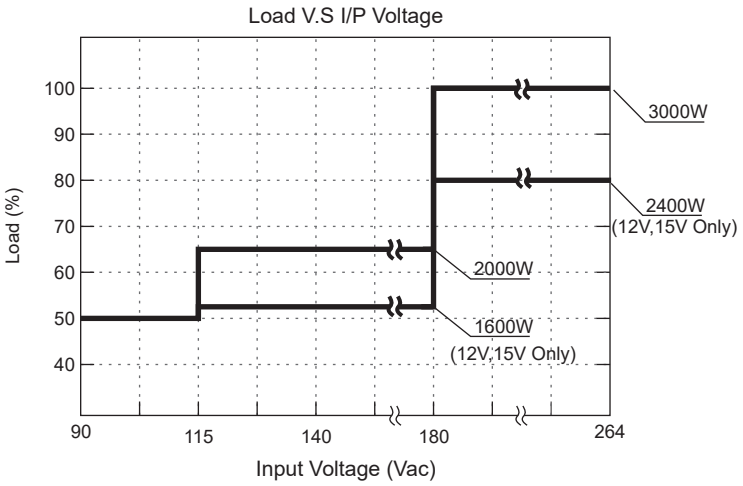
LED Status:

LED	LED Signal	Status
Solid(Green)		Power OK (Local mode)
Solid(Orange)		Power OK (Remote mode)
Slow Blink(Green)		Power Standby (Local mode)
Slow Blink(Orange)		Power Standby (Remote mode)
Fast Blink(Red)		Over Voltage Protection (OVP)
Solid(Red)		Over Load Protection (OLP)
Slow Blink(Red)		Over Temperature Protection (OTP)
Intermittent Blink(Red)		Fan Failure
Interlace Blink(Red)		Power Failure

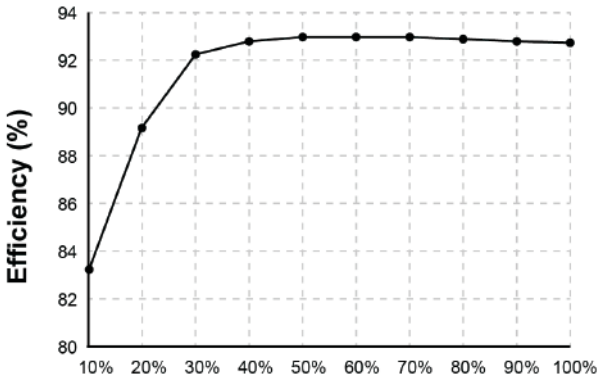
*Local mode : Use ACI/VCI to control output current and voltage.
Remote mode : Use RS-232 or I^2C command to control output current and voltage.

De-rating Curve:



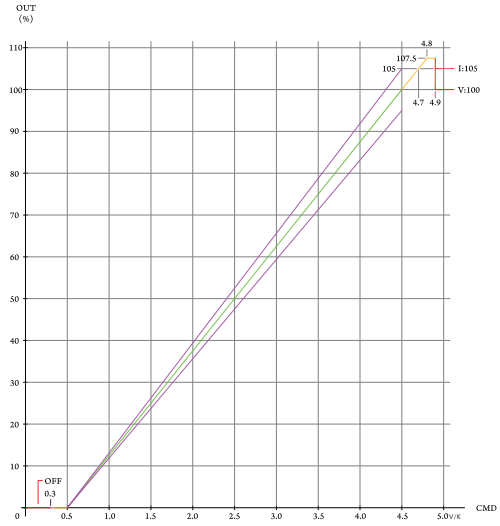


Efficiency Curve (60V Model):



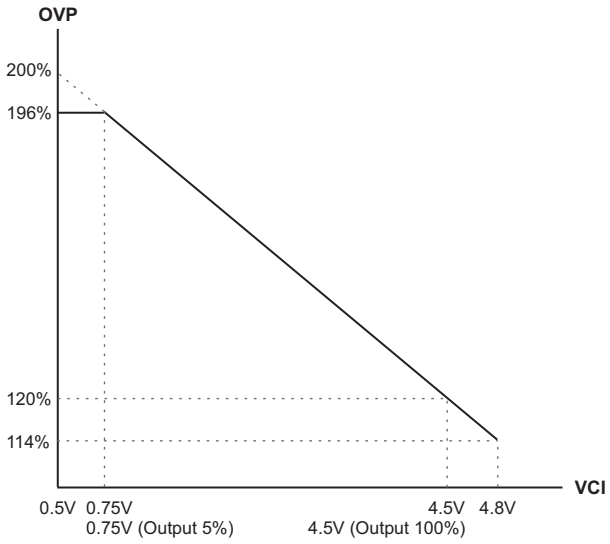
The curve above is measured at 230Vac
(Ambient temperature @ 25°C)

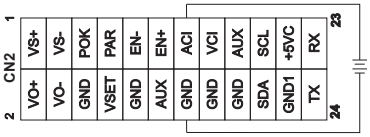
CMD VS Output Curve:



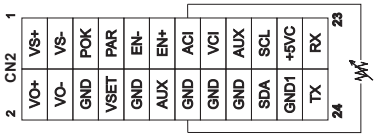
To ensure the power supply output voltage and current could be accurately adjusted, please make sure to adjust the output voltage and current > 10% vs. the rated voltage and current. (e.g. for a 24V unit, please adjust the DC output voltage above 2.4V to ensure accuracy; same applies to the output current)

VCI VS OVP Curve:



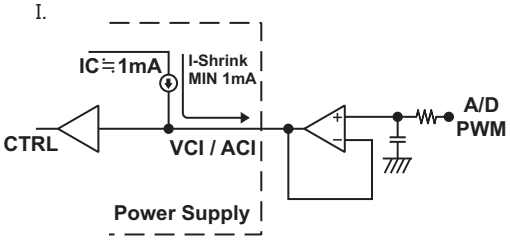


Extemal Voltage（VDC）

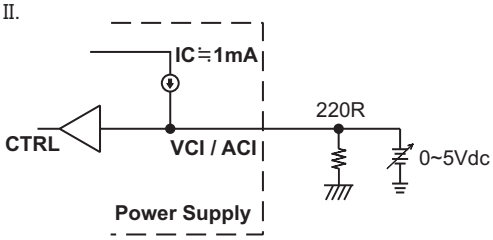


Extemal Resistor（KΩ）

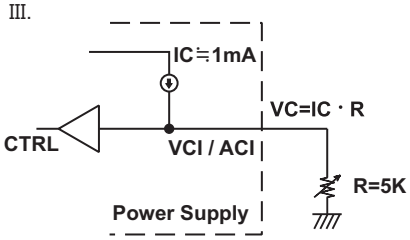
I.



II.

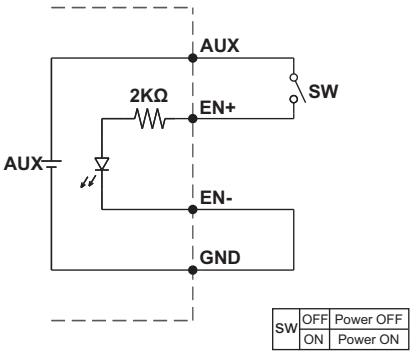


III.



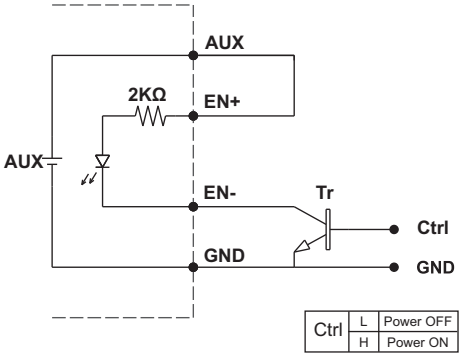
Remote ON/OFF:

(A) Default Setting



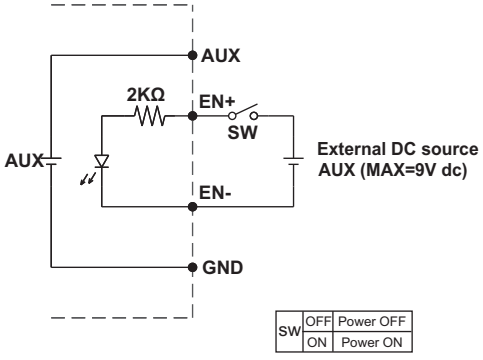
(A) Using internal 5V auxiliary source

(B)



(B) ON / OFF Control by NPN transistor

(C)



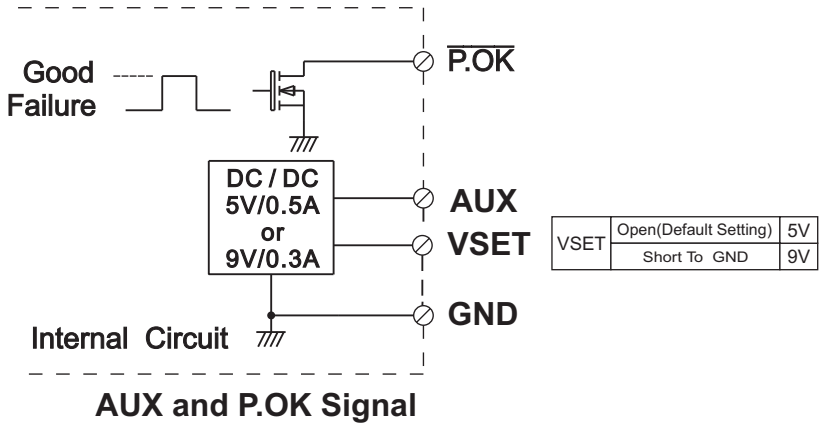
(C) Using external voltage source

GND shown in above diagram is referring to the GND of CN2, not the Grounding from main power(NEG-).

Power OK Signal & Auxiliary Power Setting:

*The grounding of "AUX" power and P.OK signal should be connected to "GND" port. If " VO-" is connected as Grounding, make sure to short the GND and VO- ports.

Open drain signal low when PSU turns on, Max. P.OK sink current: 20mA, Max. drain voltage: 40V.

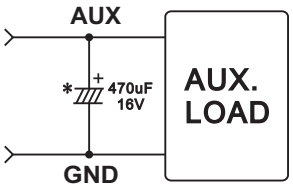


VSET	Open(Default Setting)	5V
	Short To GND	9V

AUX and P.OK Signal

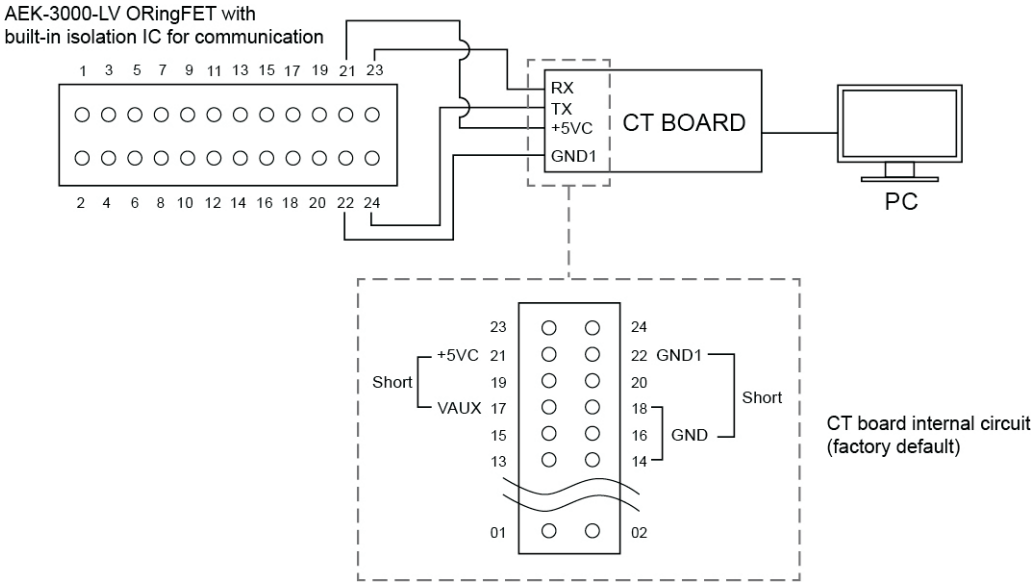
GND shown in above diagram is referring to the GND of CN2, not the Grounding from main power(NEG-).

*Place an additional capacitor to have a better performance of auxiliary power operation.



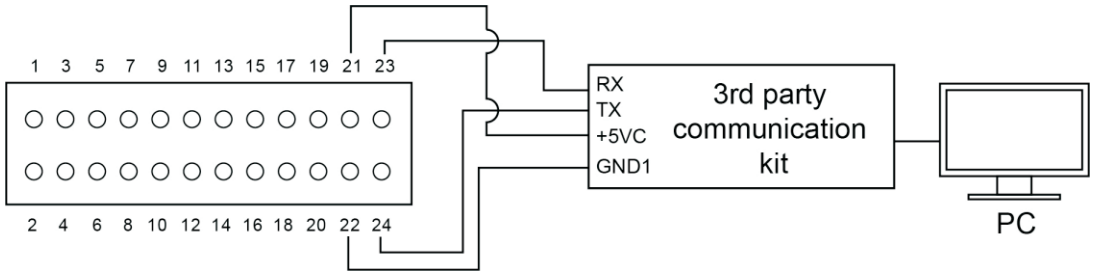
Do NOT exceed 5V/0.5A or 9V/0.3A

RS232 communication diagram



CT board internal circuit (factory default)

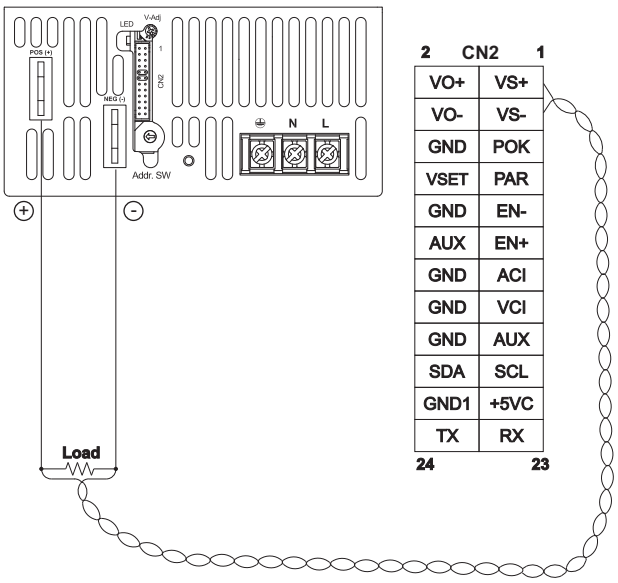
*CT board does have communication isolation IC, no need to isolate communication in this application



*As AEK-3000-LV ORing have built-in isolation IC, when select 3rd party communication kit, no need to use the communication kit with built-in isolation IC.

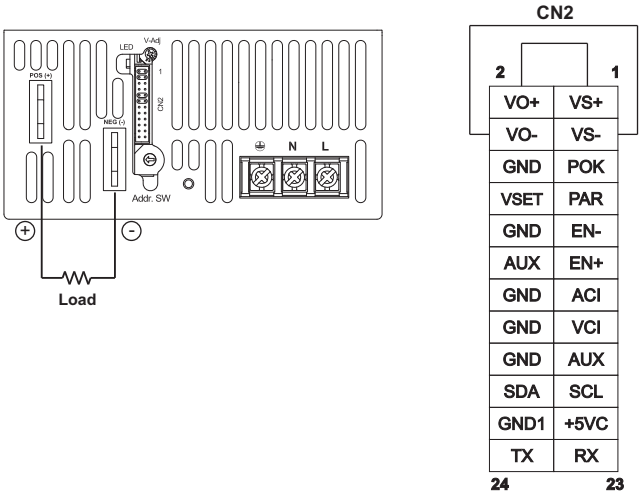
*Make sure to connect +5VC (pin21) and GND1 (pin 22) when using 3rd party communication kit

1. Remote Sense

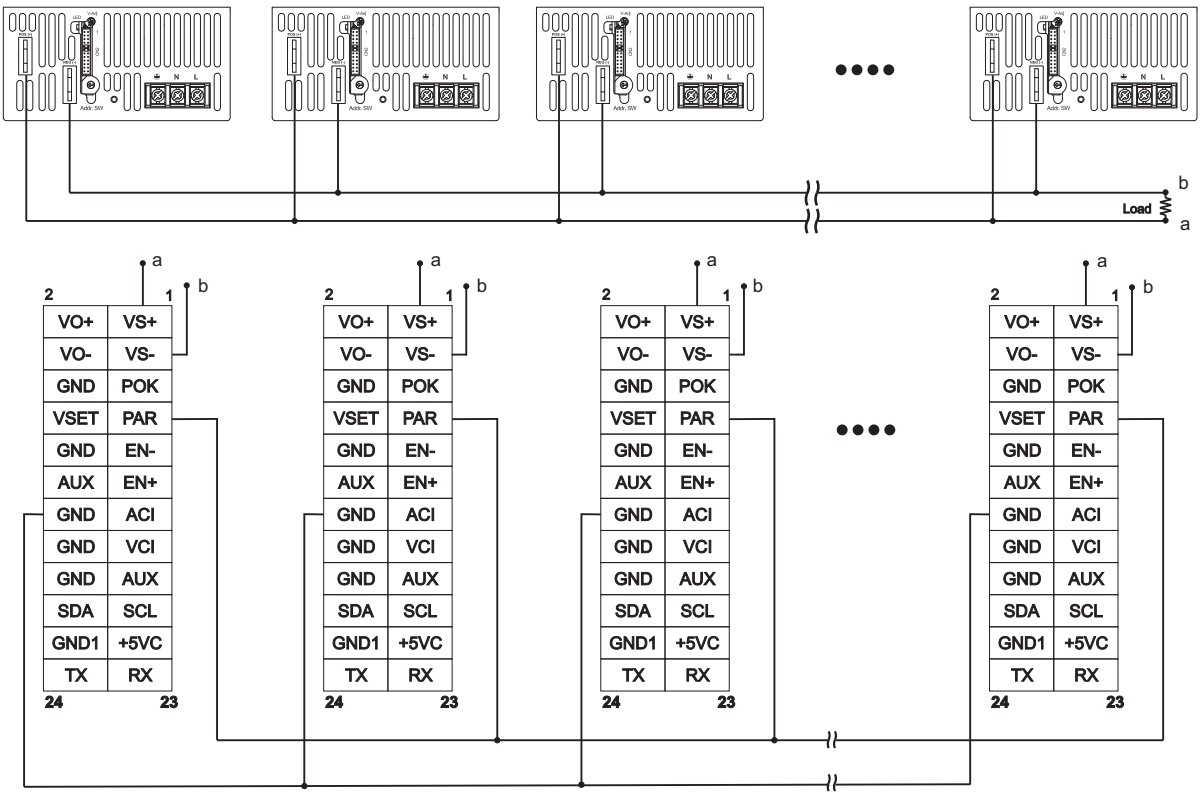


VS-,VS+ Compensation Voltage < 0.5V

2. Local Sense (Default setting)

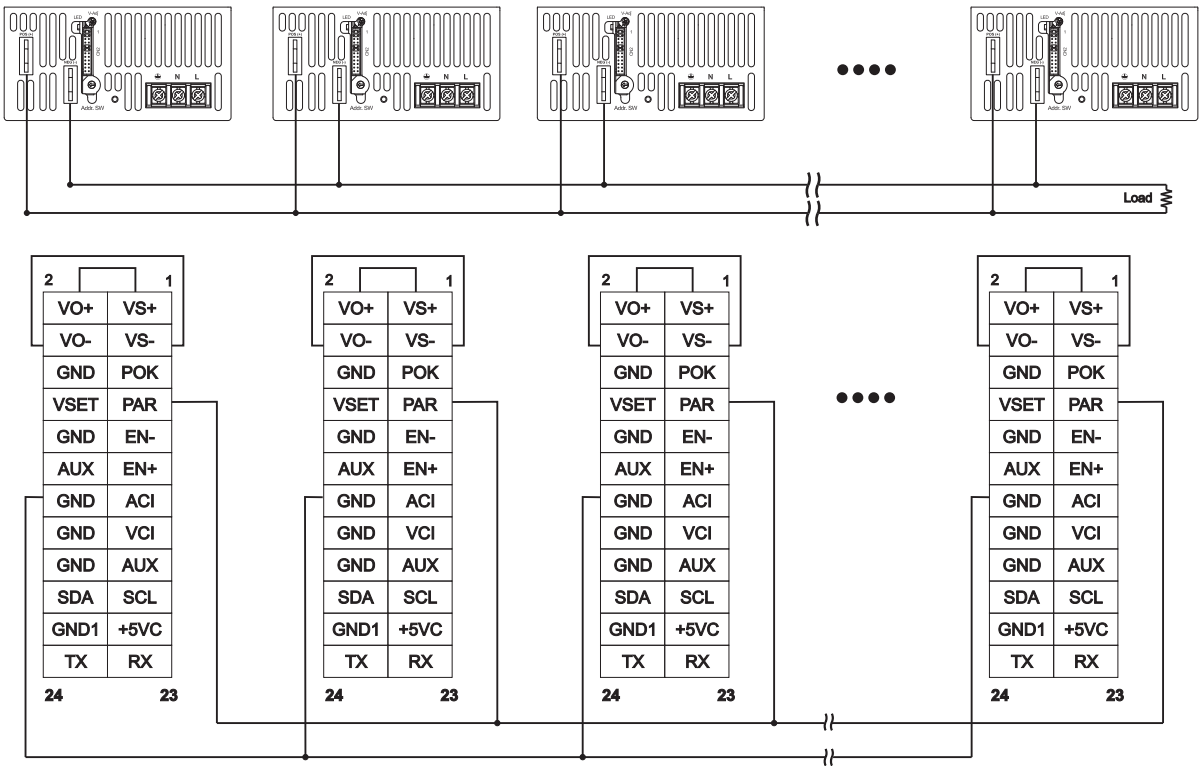


3. Current Sharing with Remote Sensing(Parallel Connection)



Please connect PAR pins together for current sharing function
For Series connection, make sure to isolate CN2 control signals

4. Current Sharing with Local Sensing



Please connect PAR pins together for current sharing function

NOTE : AEK-3000-LV ORingFET has built-in active current sharing function to support max. of 8pcs connected in parallel condition to support higher output power.

When performing parallel connection, make sure to note the followings:

A. Please connect PAR pins together for current sharing function

B. Among the parallel connection units, output voltage difference of each PSU should be <0.2VDC (This can be set via V-adj from the PSU front panel VR)

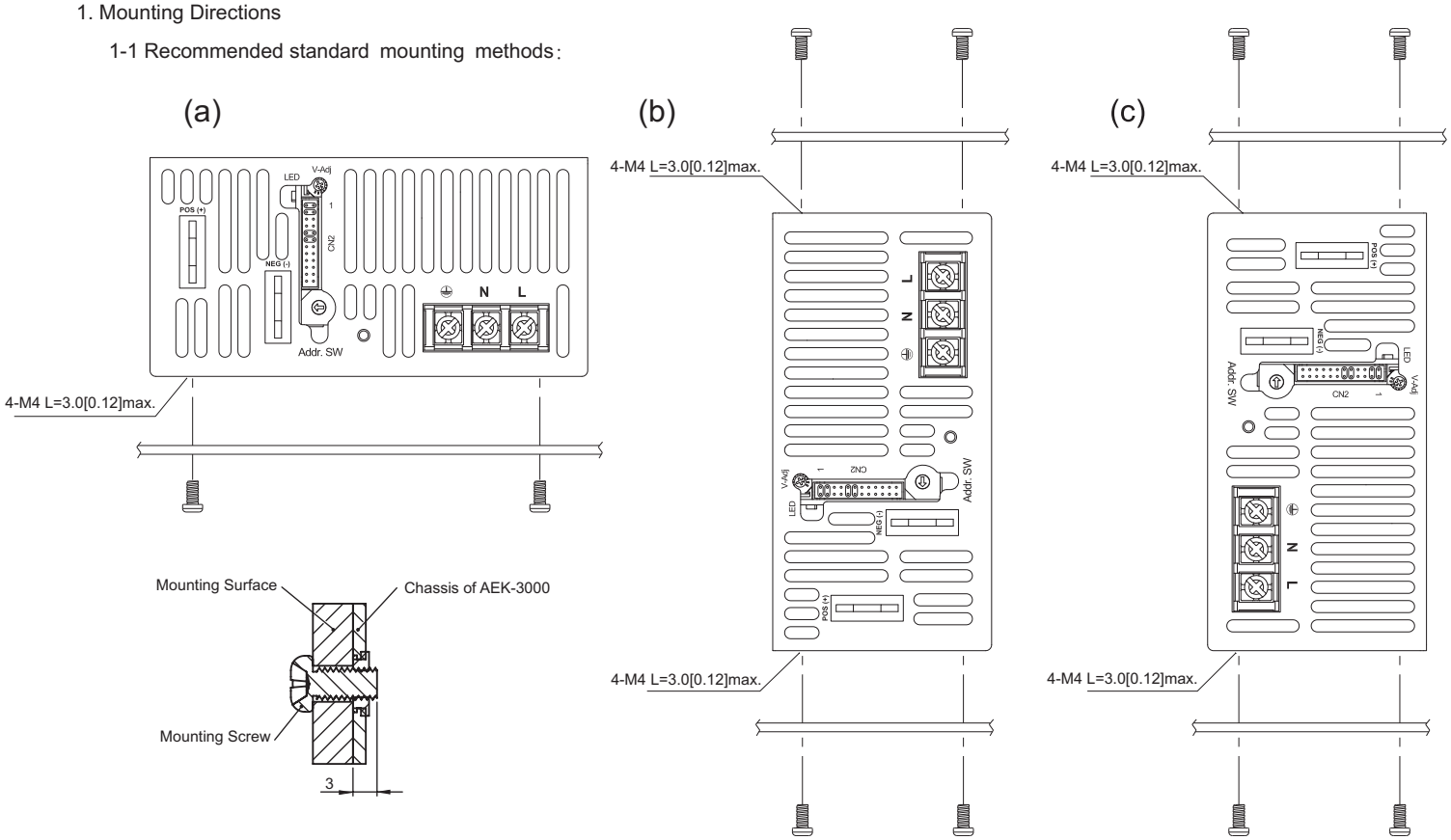
C. Total output current must not exceed 90% of the rated power in parallel condition
Maximum output current at parallel condition = rated current per unit x number of unit x 0.9

D. To ensure current share balance, output current of each unit must be >10% vs. the rated output current

Installation Instruction:

1. Mounting Directions

1-1 Recommended standard mounting methods:



Recommended screw length is measured from the power supply surface

2. Mounting Method

2-1 There are ventilating holes on the front and back side panels, do not obstruct; allow 50mm at least for air flow.

2-2 Recommended the torque of mounting screw:
M4 screw: 1.27N • m (13.0kgf • cm)