

AC Input

Conformity to RoHS Directive

Single Output, General-Purpose, UL/C-UL/TÜV Approved

R Series RKE(1.5kW)

This is an ultra-compact, large capacity front end power supply that is half the size and weight of the RKW series. The unit conforms to the SEMI F47-0200 standard that prescribes the voltage sag immunity for semiconductor processing devices. Additionally, these are advanced lead-free models that are made entirely of components that are compatible with the environmental assessment program.

FEATURES

- Built-In, wide-range variable output function from 6.0 to 55.0V (When using 36V output and RV).
- Conforms to regulations for high harmonic currents.
- Exclusively for 200V
- Approved by safety standards (UL, C-UL and TÜV). Conforms to the Electrical Appliance and Material Safety Law(Application will be made for 36V output).
- Conforms to standards for noise terminal voltage VCCI-B and EN55022-B, and for immunity EN50082-2.
- 5-year limited warrantee
- Provides an input instantaneous break operation that conforms to the SEMI standard.
- It is a product conforming to RoHS directive.

APPLICATIONS

- Semiconductor fabrication equipment
- Communication devices
- Information processing devices

PART NUMBERS AND RATINGS

Output voltage(V)	1500W	
	Current(A)	Part No.
24	50	RKE24-50R
36	42	RKE36-42R
48	32	RKE48-32R



• 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.

• All specifications are subject to change without notice.

RKE1500W Type

SPECIFICATIONS AND STANDARDS

Part No.		RKE24-50R	RKE36-42R	RKE48-32R
Rated output voltage and current*1		24V • 50A	36V • 42A	48V • 32A
Maximum output power	W	1200	1512	1536
Input conditions				
Input voltage Eac	V	85 to 265[Rated: 100-240]		
Input frequency	Hz	47 to 66[Rated: 50-60](Single phase)		
Input current	A	12max./8max.[AC.100/240V]	13max./10max.[AC.100/240V]	13max./10max.[AC.100/240V]
Fuse rating	A	25[Built-in]		
Surge current	A	20max./40max.[AC.100/240V, 1st surge current, reset after 30s minimum.]		
Leakage current	mA	0.65max./0.75max.[AC.100(Electrical Appliance and Material Safety Law)/240V(UL, IEC)]		
Power factor		0.95typ.		
Efficiency	%	100V	81typ.	81typ.
	%	200V	86typ.	86typ.
Output characteristics				
Output voltage Edc	V	24	36	48
Voltage variable range Edc	V	16.8 to 31.2	25.2 to 55.0 (RV operating: 6.0 to 55.0)	33.6 to 55.0
Maximum output current	A	50	42	32
Minimum output current	A	0	0	0
Overvoltage threshold	V	32 to 36.4	56 to 60	56 to 60
Overcurrent threshold(A)	Input AC.85 to 90V	31 to 57.5	22.3 to 36.8	17 to 36.8
	Input AC. 90 to 170V	36 to 57.5	26 to 48.3	20 to 36.8
	Input AC. 170 to 265V	52.5 to 57.5	44.1 to 48.3	33.6 to 36.8
Voltage stability	Source effect	%	0.2max.(0.1typ.)[Within the input voltage range]	
	Load effect	%	2.0max.(1.0typ.)[0 to 100% load]	
	Temperature effect	%	1.0max.(0.5typ.)[Ambient temperature: -10 to +65°C]	
	Drift(Time effect)	%	0.5max.(0.2typ.)[25°C, input and output ratings, after input voltage ON for 30min to 8h]	
Recovery	%	±4max.[50 to 100% sudden load change, tr, tf ≥ 50μs]		
Ripple Ep-p	mV	200max.	300max.	300max.
Ripple noise Ep-p	mV	300max.	400max.	400max.
Start up time	ms	400max.(250typ.)		
Hold up time	ms	20min.(30typ.)/14min.(20typ.) [AC.100/200V]	12min.(17typ.)/7min.(10typ.) [AC.100/200V]	12min.(17typ.)/7min.(10typ.) [AC.100/200V]
Maximum load capacitor	μF	100000(The starting time will change.)		
Auxiliary functions				
Indicator display		LED(Green) indicates when voltage output is ON.		
Overvoltage protection		Voltage shut-down type, recover upon reset or RC reset.		
Output low voltage detection		Yes(The output voltage is cut off when the output voltage falls to 60% or less of the designated voltage (less than 5V for 36V) for 30 seconds. Can be recovered by re-applying the input or by using the RC reset function.)		
Overcurrent protection		Rectangular type, automatic recovery (The output voltage will be cut off after 30 seconds. The unit may operate intermittently if the input voltage is AC.170V or lower).		
Overheat protection		Voltage shut-down type, recover upon reset.		
Remote ON-OFF*2		Yes		
Remote sensing		No		
Parallel operation		Possible		
Series operation		Possible		
Current balance		Yes		
Synchronous operation		Impossible		
Output voltage external variable function*3		Yes		
Master slave operation		Yes		
Alarm signal		Yes(Power failure signal)		
Standards				
Safety standards		UL60950, CSA C22.2 No.60950(C-UL), EN60950(TÜV) approved, Electrical Appliance and Material Safety Law ("DENAN") (Compliant with creepage surface and air clearance in Attachment 8) meet.(Application will be made for 36V output)		
Noise terminal voltage		FCC-Class B, VCCI-Class B, EN55011-B, EN55022-B meet.		
Immunity		EN50082-2, EN50082-2, EN61000-4-2, 3, 4, 5, 6, 8, 11 meet.		
Input harmonics current requirement		EN61000-3-2 meet.		
Radiation field intensity		FCC-Class B, VCCI-Class B, EN55011-B, EN55022-B meet.		
Constructions				
External dimensions	mm	92×120×237[H×W×L]		
Weight	kg	3.0max.		
Mounting method		Can be attached to 3 sides		
Case material		Frame and cover: Iron, circuit board: CEM-3		

*1 Current rating(maximum output current) is determined for -10 to +65°C. Derating is required when used outside this temperature range or when used with a 100V system.

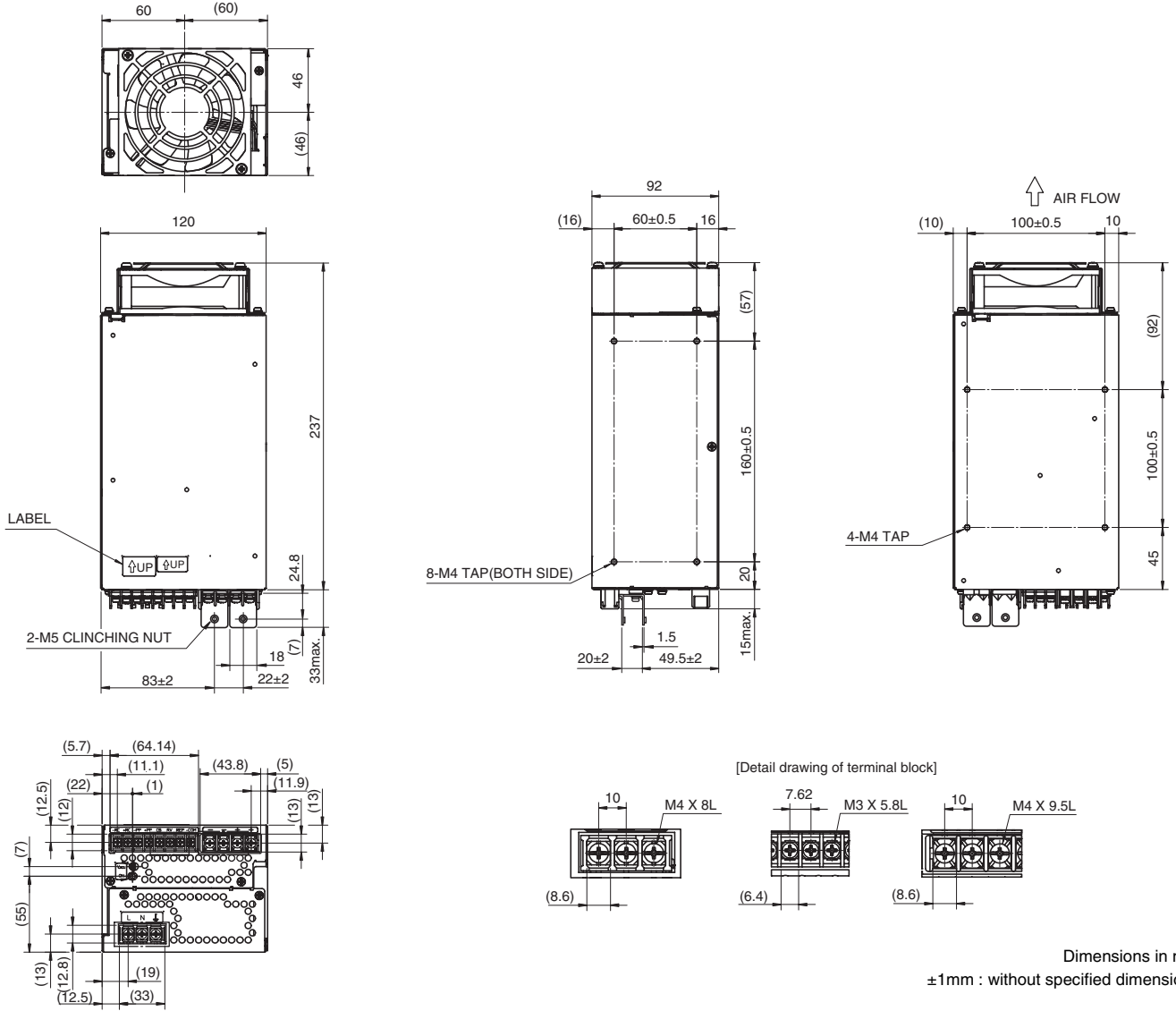
*2 Short +RC and -RC when not using Remote control.

*3 Short REV and RV when not using variable output voltage.

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RKE1500W Type

SHAPES AND DIMENSIONS



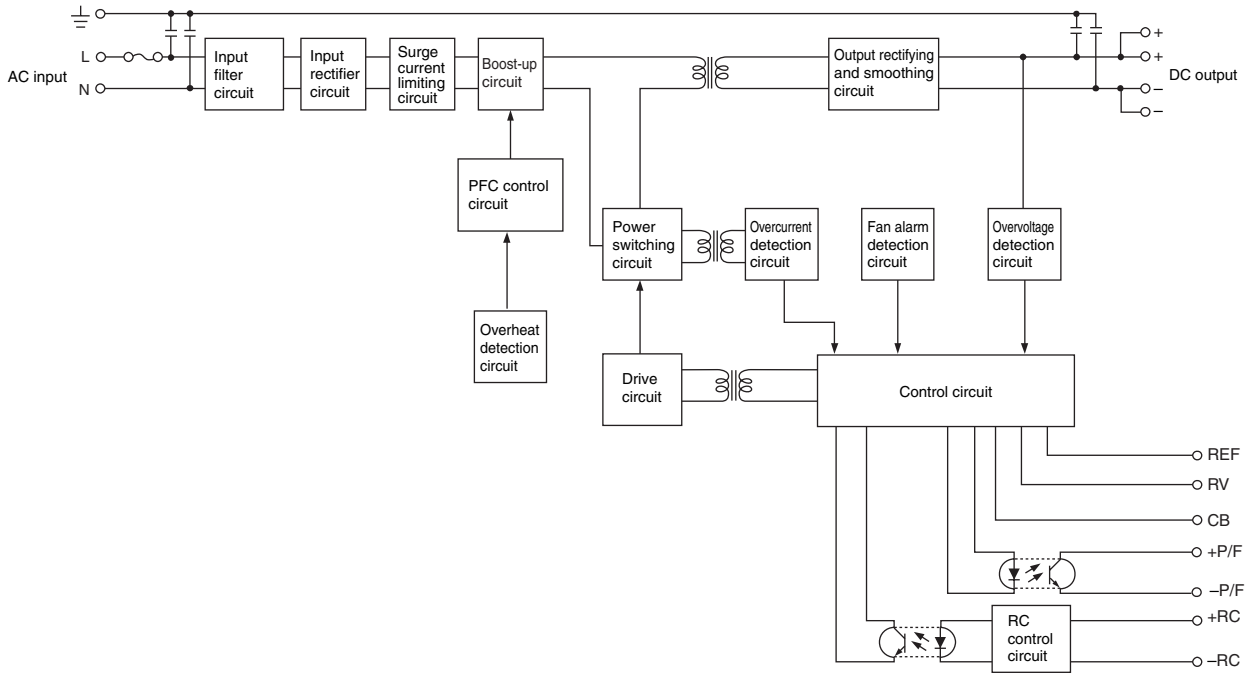
Dimensions in mm
±1mm : without specified dimensions

- Do not insert M4 tap installation screws more than 6mm into the power supply.



Characteristics, Functions, and Applications

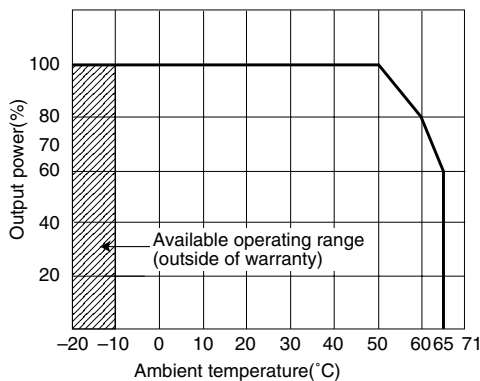
BLOCK DIAGRAM



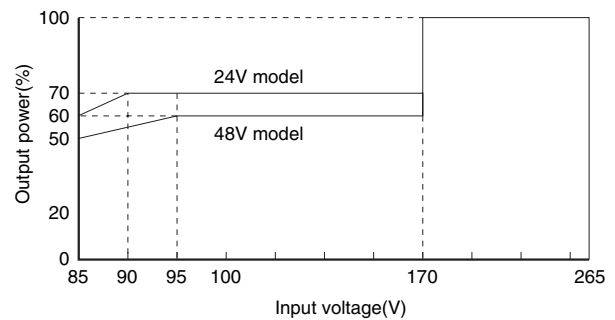
COMMON SPECIFICATIONS

Temperature and humidity		
Temperature range	Operating(°C)	-10 to +65
	Operating available(°C)	-20 to -10
	Storage(°C)	-30 to +75
Humidity range	Operating(%)RH	10 to 95[Maximum wet-bulb temperature: 35°C, without dewing]
	Storage(%)RH	
Vibration and shock		
Vibration	5 to 10Hz	All amplitude 10mm[3 directions, each 1h, sweep time 10min, non-operation]
	10 to 200Hz	Acceleration 19.6m/s ² (2G)[3 directions, each 1h, sweep time 10min, non-operation]
Shock	Acceleration	294m/s ² (30G)[3 directions, each 3 times, non-operation]
	Pulse duration	11±5ms
Withstand voltage and insulation resistance		
Withstand voltage	Input terminal to ground(G)	Eac: 2.0kV, 1min[Normal temperature, normal humidity, cutout current 20mA]
	Input terminal to output terminal	Eac: 3.0kV, 1min[Normal temperature, normal humidity, cutout current 20mA]
	Output terminal to ground(G)	Eac: 500V, 1min[Normal temperature, normal humidity, cutout current 100mA]
Insulation resistance	Input terminal to ground(G)	Edc: 500V, 100MΩ min. [Normal temperature, normal humidity]
	Input terminal to output terminal	
	Output terminal to ground(G)	

OUTPUT POWER-AMBIENT TEMPERATURE(DERATINGS)



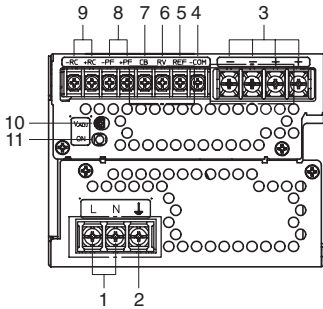
INPUT VOLTAGE DERATING



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Characteristics, Functions, and Applications

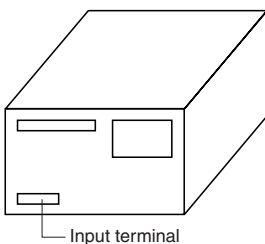
TERMINAL DESIGNATIONS AND FUNCTIONS



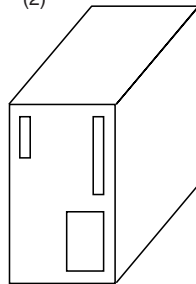
Terminal No.	Designations and functions	
1	AC input terminals(L, N)	Connect to AC.100 to 120V or AC. 200 to 240V input line.
2	Frame ground terminal(G)	Connect to earth ground. This is connected to the case.
3	DC output terminals(+, -)	Connect to load.
4	Signal common terminal(-COM)	
5	Output voltage reference terminal (REF)	This terminal is for a reference voltage for controlling an output voltage and used for a master-slave operation or when using an output voltage adjustment function. Normally it is shorted with a metal bar to an RV terminal.
6	Output voltage adjustment terminal(RV)	This terminal is used for controlling output voltage from outside.
7	Current balance terminal(CB)	This terminal is used when several power supplies are connected in parallel to connect the respective CB and -S terminals in parallel.
8	Power failure terminal (PF)	These terminals output an open mode signal if an output voltage drops to 60 % or lower of a set voltage. They also output the signal if an output voltage is shut down due to an operation of an error detecting circuit for over output voltage protection, fan alarm overheat protection, or overcurrent protection.
9	Remote ON-OFF terminals(+RC, -RC)	Output is turned ON-OFF by disconnecting-connecting the RC terminals (output ON when open). RC terminals are floating. Normally, ±RC terminals are shorted with a metal bar.
10	Output voltage adjustment trim(V.ADJ)	Adjusts output voltage.
11	Operation indicator LED(Green)	This Green LED becomes indicated when voltage is output.

INSTALLATIONS

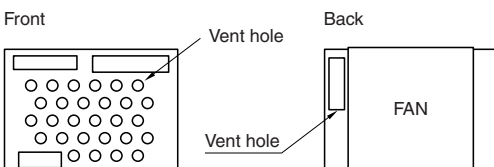
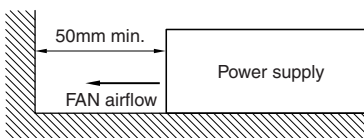
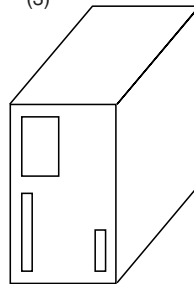
(1) Standard installation



(2)



(3)



Distance the fan surface at least 50 mm away from other components. And install so as to provide heat-outside air exchange.
Make sure not to obstruct the vent on the front panel.

Characteristics, Functions, and Applications

OUTPUT VOLTAGE EXTERNAL VARIABLE FUNCTION (RV)

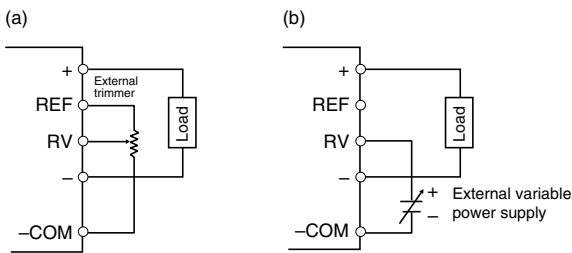
The output voltage setting can be adjusted by attaching an external trimmer or an external voltage to the RV terminal.

When using this function, use a twisted wire or a shielded wire (shield wire for -COM) for the wiring from the REF, RV, and -COM terminals (A recommended length is 2m max.). Care must be taken to make sure that the wires are not disconnected or miswired.

Voltage model (V)	RV voltage (V)	Output voltage variable range (%)
24	3.5 to 6.5	70 to 130
36	0 to 5.75	17 to 153
48	3.5 to 5.75	70 to 115

HOW TO USE THE FUNCTION

- Remove a short plate between the REF and RV terminals.
- For adjusting output voltage with external trimmer
Rotate V.ADJ full clockwise and connect the external trimmer (5k Ω) to the REF, RV, and -COM terminals as shown in the diagram (a) below.
- For adjusting output voltage with external voltage
As shown in the diagram (b) in the right side, connect the external variable power supply at the + end to the RV terminal and at - end to the -COM terminal.



CURRENT BALANCE (CB TERMINAL)

This terminal has a monitoring function to control and equalize the output current of power supplies connected in parallel by mutually connecting the respective CB terminals and the -COM terminals of each power supply. Voltage almost proportional to the output current can be obtained between the CB and -COM terminals.

(1) Conditions for current balance

The variation in output voltage between the respective power supplies cannot exceed 2%

$(\text{Highest voltage} - \text{lowest voltage}) \div \text{rated voltage} = 2\% \text{ max.}$

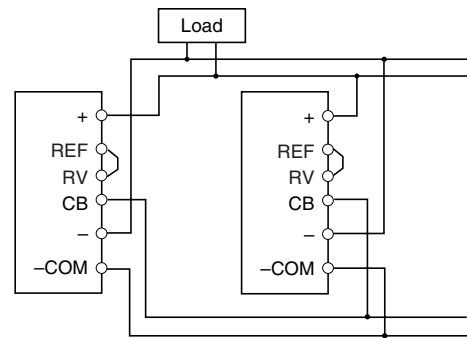
The output current is 20 to 90% of the total output rated current.

(2) Uniform performance (for two power supplies)

The variation in output current between the respective power supplies does not exceed 10%

$(\text{Highest current} - \text{lowest current}) \div (\text{rated voltage} \times \text{the number of power supplies in parallel}) = 10\% \text{ max.}$

(3) CB terminal connection diagram



Equalize the impedance of the load wires coming from each power supply. Use a twisted wire or a shielded wire for the wiring from CB and -COM (shield wire for -COM). The maximum four power supplies are connected in parallel.

REMOTE ON-OFF

Power supply output voltage can be turned on/off externally at the Remote On-Off terminals (+RC, -RC) by activating one of the following signals:

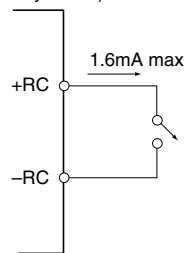
Output voltage is turned off when the level is high between the +RC and -RC terminals (open or external voltage application of 2.4 to 24V: incoming current 1.0mA max.).

Output voltage is turned on when the level is low between the +RC and -RC terminals (short or terminal voltage of 0 to 0.4V: outgoing current 1.6mA max.).

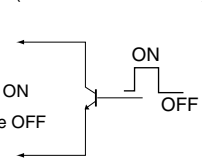
\pm RC terminals are insulated from AC input terminals and the DC output terminals.

Insulation between the \pm RC terminals and the output conforms to the common specifications (Output to case). Withstand voltage between AC input terminals and \pm RC terminals conforms to the common specifications (Input to case).

(Relay circuit)



(Semiconductor circuit)



POWER FAILURE SIGNAL

This function delivers a signal when an output voltage drops to 60% or lower of a set voltage (less than 5V for 36V).

If the power supply protection function operates, however, an output is shut down and a power failure signal is delivered.

Characteristics, Functions, and Applications

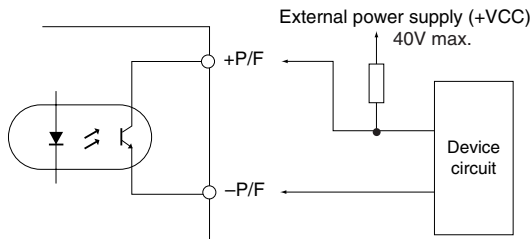
OUTPUT FORMAT

Sink current: 50mA max.

Collector emitter voltage: 40V max.

\pm P/F terminals are insulated from AC input terminals and the DC output terminals.

Insulation between the \pm P/F terminals and the output conforms to an insulation resistance for an output to the ground of the common specifications. Insulation between AC input terminals and \pm P/F terminals conforms to an insulation resistance for an input terminal to an output terminal of the common specifications.



P/F signal

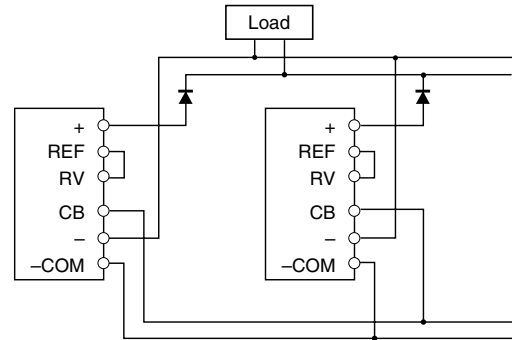
- High-impedance at error detection
- Maximum collector current: 50mA
(Collector emitter saturation voltage: 0.4V max.)
- Maximum collector emitter voltage: 40V

POWER SUPPLY PROTECTION

Protective function	Operation
OV Output overvoltage protection	Output is shut down and the fan stops upon detection of an abnormal output voltage rise. The output recovers after removing the cause upon setting the remote ON-OFF terminal to a high level and then to a low level or upon an input shutdown and a reset after 40s interval.
UV Output under-voltage protection	Output is shut down when the output voltage drops to 60% or lower of the rated output voltage (36V: approx. 5V) and the condition continues for approx. 20s on over current protection and others. The output recovers after removing the cause upon input shutdown and a reset after a 40s minimum interval.
FAN Fan alarm	Output is shut down when the fan rotation stops. The output recovers in the same manner as for the OV in the above. In case of an abnormal fan rotation, the output cannot recover.
TH Overheat protection	Output is shut down and the fan stops when the internal temperature of the power supply rises abnormally. The output recovers upon an input shutdown and a reset after 40s interval. Unless the internal temperature drops, the output cannot recover.

REDUNDANT (N+1) OPERATION

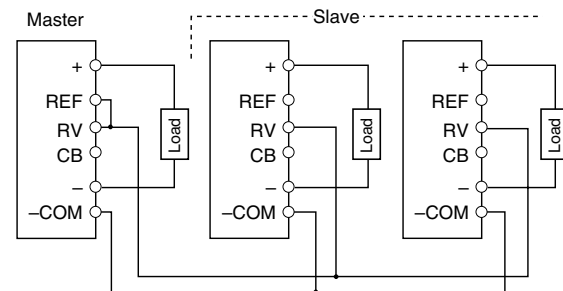
Connect diodes to output terminals of the power supplies before their redundant operation. Equalize the impedance of the load wires coming from each power supply. Use a twisted wire or a shielded wire for the wiring from CB and -COM (shield wire for -COM). The maximum four power supplies are connected in parallel.



MASTER SLAVE FUNCTION

A use of the REF terminal and RV terminal enables the master slave operation. Connect the REF terminal of a power supply selected as a master, the RV terminals of slave power supplies, and respective -COM terminals as shown in the diagram below. Then, output voltages of all the power supplies can be simultaneously adjusted with following V_{ADJ} of the master power supply. The maximum four power supplies are connected in parallel.

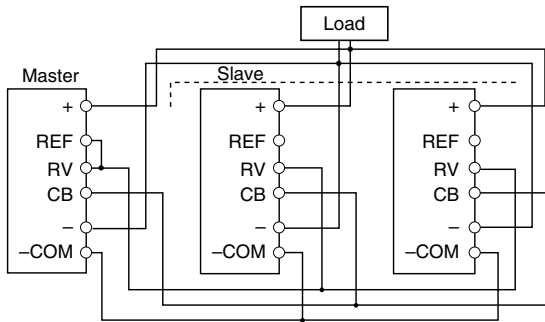
- For two or more output loads
Use a twisted wire or a shielded wire for the wiring from RV and -COM (shield wire for -COM).



Characteristics, Functions, and Applications

- For a single output load

Equalize the impedance of the load wires coming from each power supply. Use a twisted wire or a shielded wire for the wiring from RV and -COM (shield wire for -COM).



INSULATION AND WITHSTAND VOLTAGE TESTS

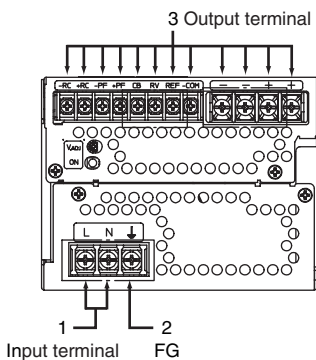
The insulation and withstand voltage tests may cause deterioration. Care must be taken for execution of the tests. The potential must be equal among input, output, and FG (frame ground) terminals.

It is preferable to use testers which gently start up at the test-ON and automatically discharge charging energy at the test-OFF. Manual discharging after the tests should be through a resistor around 100k Ω to 1M Ω (Do not perform discharging at low impedance. It may cause deterioration.)

In any case, take full countermeasures for electric-shock prevention.

POWER SUPPLY TERMINAL CONNECTION AT INSULATION AND WITHSTAND VOLTAGE TESTS

Short output or input terminals.



CONNECTIONS BETWEEN TESTERS AND POWER SUPPLY AT INSULATION AND WITHSTAND VOLTAGE TESTS

For connections between the testers and the power supply body, couple the tester terminals at the corresponding locations listed below before executing the tests.

Test conditions	Withstand voltage tester		Insulation tester	
	+ terminal	-terminal	+ terminal	-terminal
Input-to-output withstand voltage	1	3	—	—
Input-to-FG withstand voltage	1	2	—	—
Output-to-FG withstand voltage	3	2	—	—
Input-to-FG insulation	—	—	1	2
Input-to-output insulation	—	—	1	3
Output-to-FG insulation	—	—	3	2

PRECAUTIONS

- When using this unit, make sure that the ambient temperature of the power supply is within the operating temperature range. The "ambient temperature of the power supply" refers to the temperature near the power supply inside the device in which the unit is installed.
- Install space at least 10 mm away from other components on sides.
- Make sure to choose input/output wiring and noise filters that can safely accommodate their respective current capacities.
- If the power supply is not used for extended periods of time, we recommend that you apply input voltage for about one hour every two years to maintain the capacitor's performance.
- When power supplies are used serially, the rated current will be limited by the power supply with the lowest rated current. Also make sure to connect a reverse voltage protection diode (Withstand voltage: twice that of the combined output voltage. Forward current: twice that of the output current. Forward voltage drop: as small as possible) to prevent damage to the interior components caused by reverse voltage.
- The materials used in these products are free of designated bromine flameproof materials (PBDPEs and PBBs).
- Specific ODS has not been used in the production of these products.