RDS-A Series (24, 48VDC Input) Instruction Manual

BEFORE USING THE POWER SUPPLY UNIT (Common)

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.

⚠ INSTALLATION WARNING

- When installing, ensure that work is done in accordance with the instruction manual. When installation is improper, there is risk of electric shock and fire.
- Installation shall be done by Service personnel with necessary and appropriate technical training and experience. There is a risk of electric shock and fire.
- Do not cover the product with cloth or paper etc. Do not place anything flammable around. This might cause damage, electric shock or fire.

⚠ WARNING on USE

- Do not touch this product or its internal components while circuit in operation, or shortly after shutdown. You may receive a burn.
- While this product is operating, keep your hands and face away from it as you may be injured by an unexpected situation.
- There are cases where high voltage charge remains inside the product. Therefore, do not touch even if they are not in operation as you might get injured due to high voltage and high temperature.
  You might also get electric shock or burn.
- Do not make unauthorized changes to this product nor remove the cover as you might get an electric shock or might damage the product. We will not be held responsible after the product has been modified, changed or disassembled.
- Do not use this product under unusual condition such as emission of smoke or abnormal smell and sound etc. Please stop using it immediately and shut off the product. 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 and store these products in environments where condensation occurs due to moisture and humidity. It might lead fire and electric shock.
- Do not drop or apply shock to this product. It might cause failure. Do not operate these products mechanical stress is applied.

⚠ CAUTION on MOUNTING

- Confirm connections to input/output terminals are correct as indicated in the instruction manual before switching on.
- Input/output line, please use the wires as short and thick as possible.
- Do not use this product in special environment with strong electromagnetic field, corrosive gas or conductive substances and direct sunlight, or places where product is exposed to water or rain.
- Mount this product properly in accordance with the instruction manual, mounting direction and shall be properly be ventilated.
- Please shut down the input when connecting input and output of the product.
- When installing in environment where conductive foreign, dust and liquid may be present, please consider penetration of above foreign material in the power supply by installing filter, to prevent trouble or malfunction.

⚠ CAUTION on USE

- Product individual notes are shown in the instruction manual. If there is any difference with common notes individual notes shall have priority.
- Before using this product, be sure to read the catalog and instruction manual. There is risk of electric shock or damage to the product or fire due to improper use.
- Input voltage, Output current, Output power, ambient temperature and ambient humidity should be kept within specifications, otherwise the product will be damaged, or cause electric shock or fire.
- If the built-in fuse is blown, do not use the product even after replacing the fuse as there is risk of abnormality inside. Be sure to request repair to our company.
- For products without built-in protection circuit (element, fuse, etc.), insert fuse at the input to prevent smoke, fire during abnormal operation.
  As for products with building protection circuit, depending on usage conditions, built-in protection circuit might not work. It is recommended to provide separate proper protection circuit.
- For externally mounted fuse do not use other fuses aside from our specified and recommended fuse.
- This product was made for general purpose electronic equipment use and is not designed for applications requiring high safety (such as extremely high reliability and safety requirements. Even though high reliability and safety are not required, this product should not be used directly for applications that have serious risk for life and physical safety. Take sufficient consideration in fail-safe design (such as providing protective circuit or protective device inside the system, providing redundant circuit to ensure no instability when single device failure occurs).
- When used in environments with strong electromagnetic field, there is possibility of product damage due to malfunction.
- When used in environment with corrosive gas (hydrogen sulfide, sulfur dioxide, etc.) , there is possibility that they might penetrate the product and lead to failure.
- When used in environments where there is conductive foreign matter or dust, there is possibility of product failure or malfunction.
- Provide countermeasure for prevention of lightning surge voltage as there is risk of damage due to abnormal voltage.
- Connect together the frame ground terminal of the product and the ground terminal of the equipment for safety and noise reduction. If these ground is not connected together, there is risk of electric shock.
- Parts with lifetime specifications (electrolytic capacitor) are required to be replaced periodically.
  Set the overhaul period depending on the environment of usage and perform maintenance.
  Also, note that there are cases when EOL products cannot be overhauled.
- Take care not to apply external abnormal voltage to the output. Especially, applying reverse voltage or overvoltage more than the rated voltage to the output might cause failure, electric shock or fire.
- This product have possibility that hazardous voltage may occur in output terminal depending on failure mode. The output of these products must be protected in the end use equipment to maintain ES1.

⚠ Note

- Take note that traces of sheet metal processing be left in our power supplies.
- When disposing product, follow disposal laws of each municipality.
- Published EMI (CE, RE) or immunity is the result when measured in our standard measurement conditions and might not satisfy specification when mounted and wired inside end-user equipment.
  Use the product after sufficiently evaluating at actual end-user equipment.
- When exporting our products, apply for necessary permissions as required by rules and regulations of Foreign Exchange and Foreign Trade Control Act.
- Catalogue, contents of the instruction manual may be changed without a prior notice. Refer to latest catalogue or instruction manual.
- Reproduction or reprinting the instruction manual or its portion is forbidden without our permission.

⚠ LONG-TERM STORAGE METHOD AND LONG-TERM STORAGE PERIOD

- Please keep the product in carton box.
- Please do not apply excessive vibration, shock or mechanical stress applied directly to the product.
- Please keep away from direct sunlight.
- For long-term storage temperature and humidity, the following conditions shall be used as a guideline :
  Temperature range : 5℃～30℃
  Humidity range : 40%～60%RH
  Please keep away from the places where temperature and humidity can change drastically.
  It can cause condensation on the product or deterioration.
- For long-term storage period, we recommend to use within 2 years after receiving the product.
  There is tendency that the leakage current of an aluminum electrolytic capacitor may increase when stored without using for a long time.
  This phenomenon can be improved by applying voltage to the aluminum electrolytic capacitor to reduce the increased leakage current through the self-recovery effect of the electrolyte.
  For reference, before using products that have been stored for a very long time, please warm-up first for 30 minutes or more without taking load.

< Criterion of warm up voltage condition >

(1)Implementation period : 1 year or above after the delivery

(2)Electrical continuity condition

Input voltage : Rating
Load : 0A
Ambient temperature : Normal temperature
Time : 30 minutes or more

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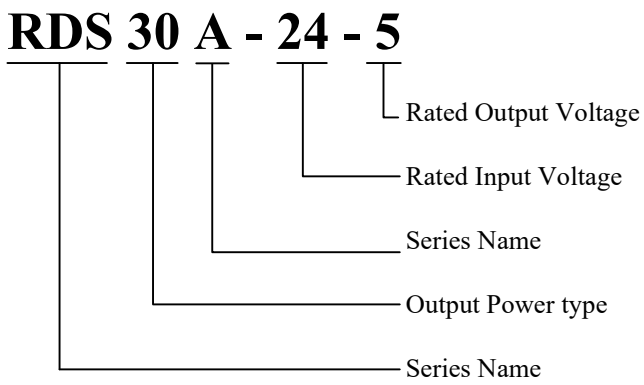
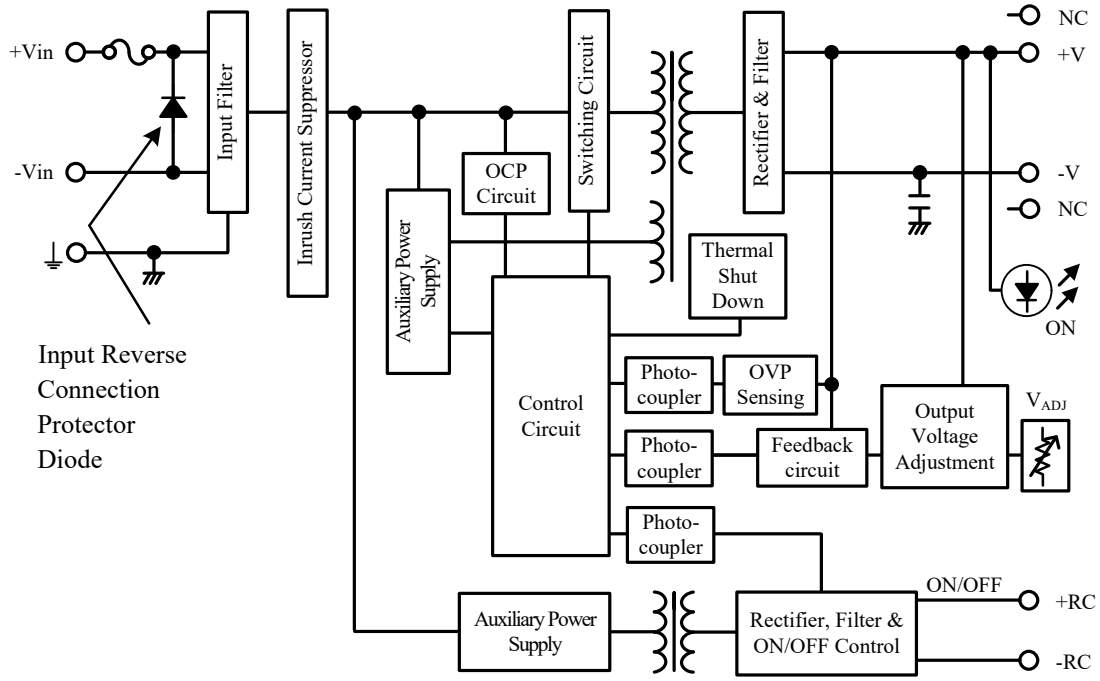
1.Model Name Identification



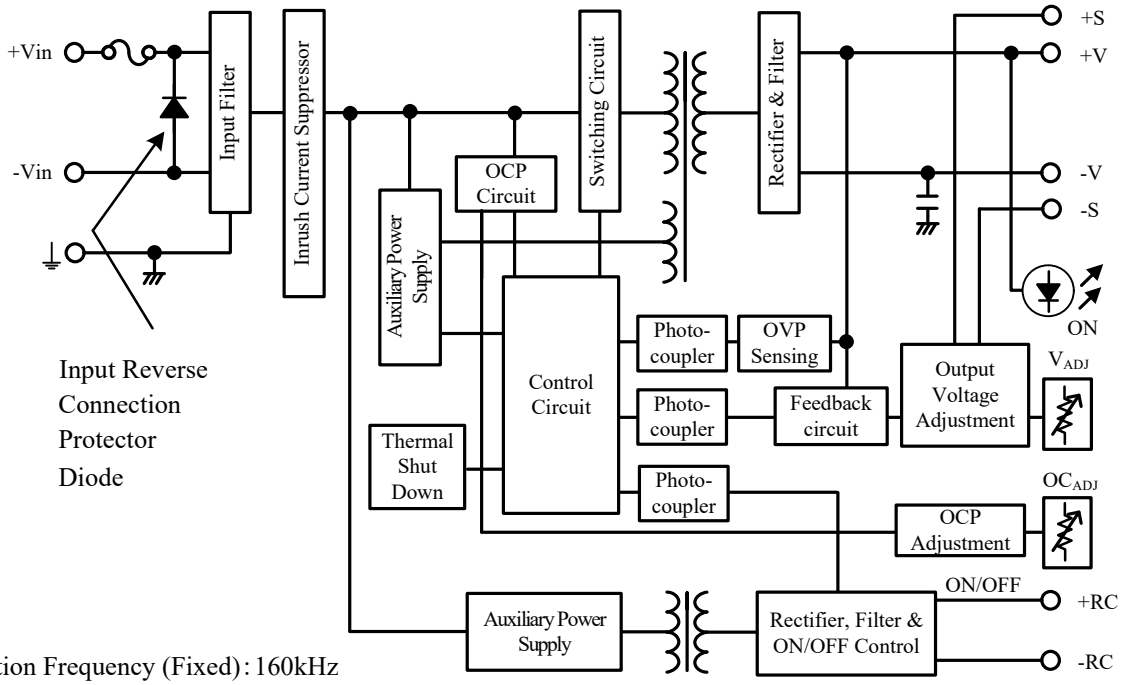
2.Block Diagram

【RDS30A RDS60A】



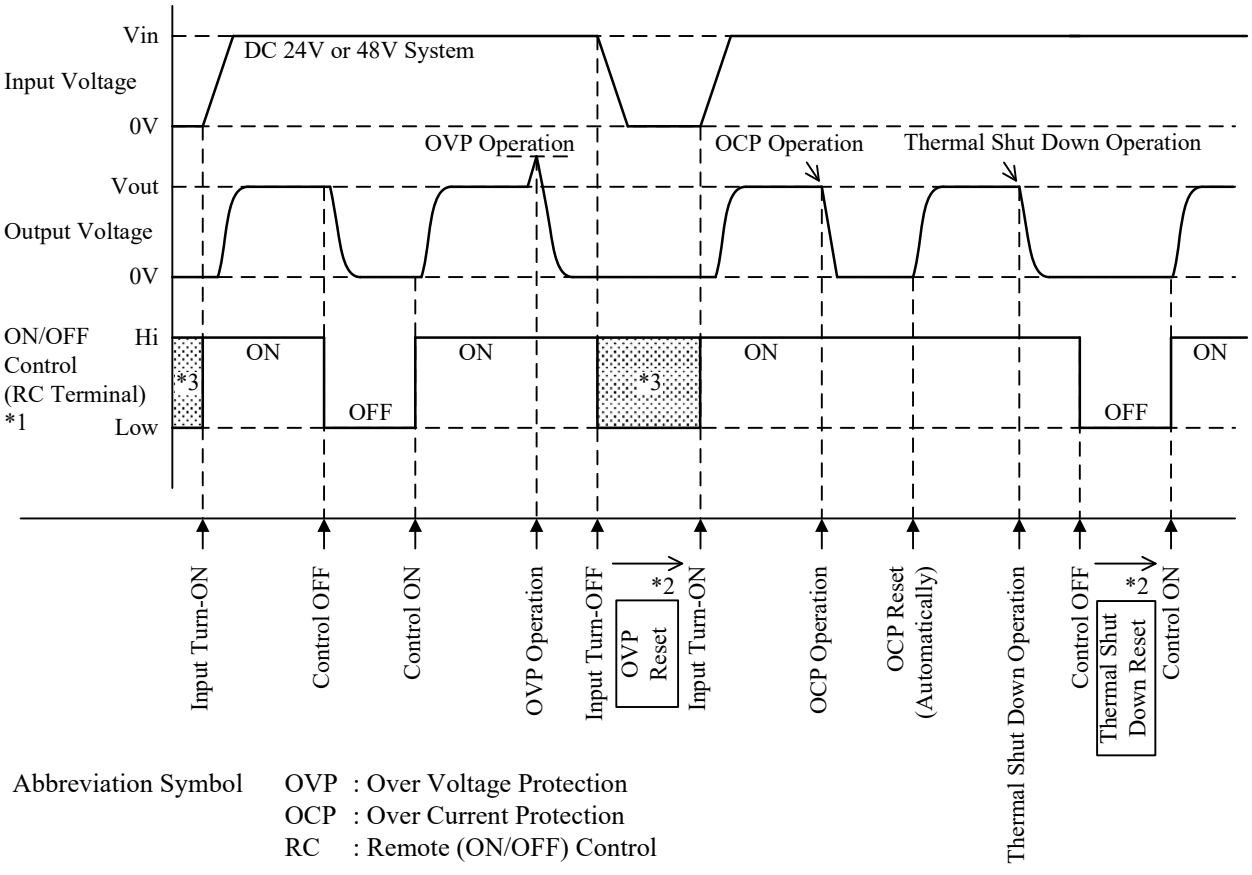
Operation Frequency (Fixed)：308kHz

【RDS100A RDS180A】



Operation Frequency (Fixed): 160kHz

3.Sequence Timing Chart

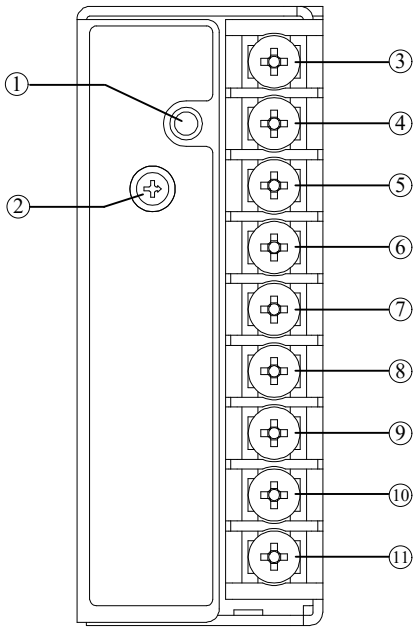


Abbreviation Symbol
OVP : Over Voltage Protection
OCP : Over Current Protection
RC : Remote (ON/OFF) Control

Note) *1 +RC/-RC terminal are isolated from other terminal.(Floating)
Control-ON : Open the +RC/-RC terminal or apply external voltage 1.5-5V.
Control-OFF : Short the +RC/-RC terminal or apply external voltage 0-0.4V.
*2 Please turn off the input or use Remote OFF once to reset OVP or Thermal shut down.
*3 When turning ON by +RC/-RC terminal opening, this terminal voltage will be lost if input is turned off.

4.Terminal Layout Description

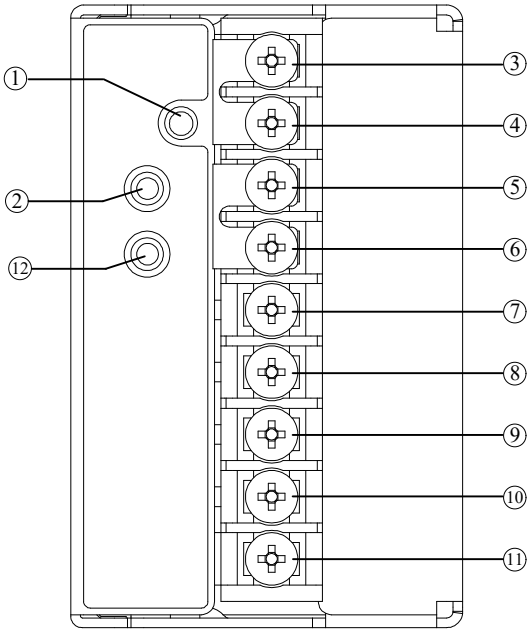
【RDS30A RDS60A】



RDS30A, RDS60A Terminal & Function

① ON : Output indicator (Green LED lights up when output is ON)
② V.ADJ : Output Voltage Adjustment (Output Voltage increases by turning the VR in CW* direction)
③ NC : No Connection
④ ＋V : + Output terminal
⑤ －V : - Output terminal
⑥ NC : No Connection
⑦ ＋RC : + Remote ON/OFF｜Open the⑦ &⑧ to turn ON
⑧ －RC : - Remote ON/OFF｜Short the⑦ &⑧ to turn OFF
⑨ ＋Vin : + Input terminal (Internal Fuse line)
⑩ －Vin : - Input terminal
⑪ ⏚ : Protective bonding terminal

【RDS100A】

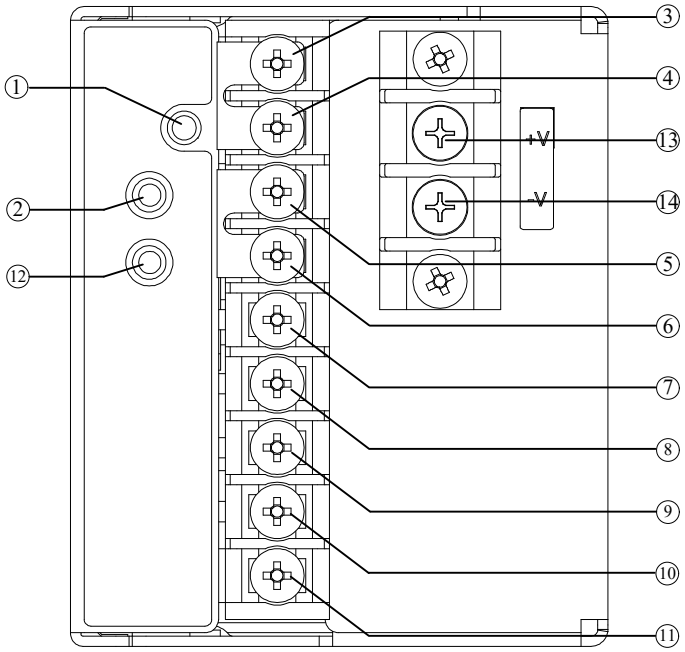


RDS100A Terminal & Function

① ON : Output indicator (Green LED lights up when output is ON)
② V.ADJ : Output Voltage Adjustment (Output Voltage increases by turning the VR in CW* direction)
③ ＋S : + Remote sensing
④ ＋V : + Output terminal
⑤ －V : - Output terminal
⑥ －S : - Remote sensing
⑦ ＋RC : + Remote ON/OFF｜Open the⑦ & ⑧ to turn ON
⑧ －RC : - Remote ON/OFF｜Short the⑦ & ⑧ to turn OFF
⑨ ＋Vin : + Input terminal (Internal Fuse line)
⑩ －Vin : - Input terminal
⑪ ⏚ : Protective bonding terminal
⑫ OC.ADJ : OCP Adjustment (OCP setting value decrease by turning the VR in CCW** direction)

Abbreviation note) *CW : Clock Wise
**CCW : Counter Clock Wise

【RDS180A】



RDS180A Terminal & Function

①	ON	: Output indicator (Green LED lights up when output is ON)
②	V.ADJ	: Output Voltage Adjustment (Output Voltage increases by turning the VR in CW* direction)
③	＋S	: + Remote sensing
④ ,⑬	＋V	: + Output terminal
⑤ ,⑭	－V	: - Output terminal
⑥	－S	: - Remote sensing
⑦	＋RC	: + Remote ON/OFF ｜ Open the ⑦ & ⑧ to turn ON
⑧	－RC	: - Remote ON/OFF ｜ Short the ⑦ & ⑧ to turn OFF
⑨	＋Vin	: + Input terminal (Internal Fuse line)
⑩	－Vin	: - Input terminal
⑪	⏚	: Protective bonding terminal
⑫	OC.ADJ	: OCP Adjustment (OCP setting value decrease by turning the VR in CCW** direction)

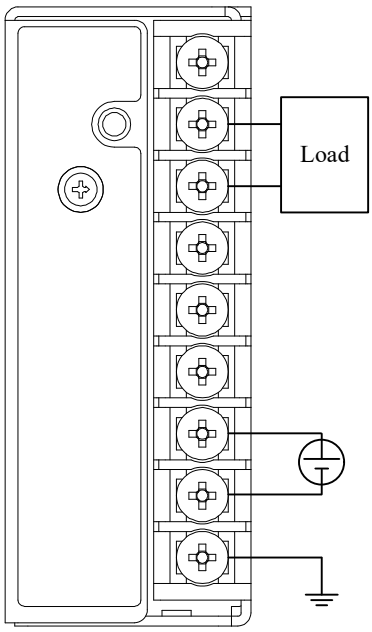
Abbreviation note) *CW : Clock Wise
**CCW : Counter Clock Wise

5.How to Wiring for Terminal

Take enough caution when wring the input line. Improper connection would cause damage to supply unit.

- Be sure that the input is cut off when wiring each terminal.
- When applying Protection Ground, use the terminal with the symbol '⏚' or use fixing screw of the (sheet-metal) chassis.
- When wiring, separate input & output line to improve immunity for switching noise.
- Current rating is 25A maximum for the each terminal, but use within the maximum current rating of each model.

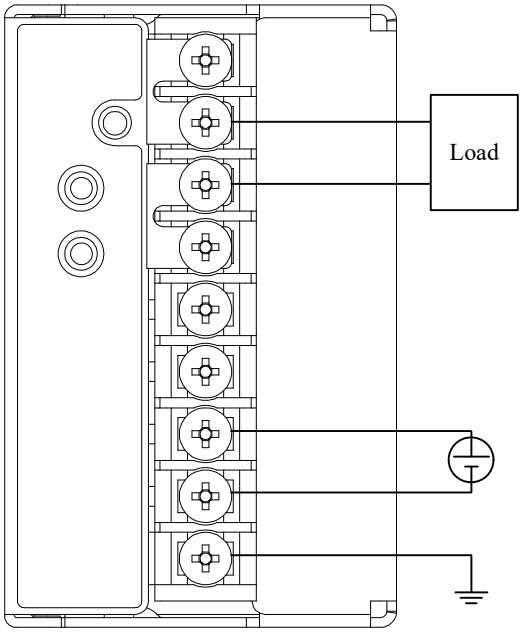
【RDS30A RDS60A】



RDS30A &RDS60A have the same terminal layout.
RDS60A is shown here as a representative.

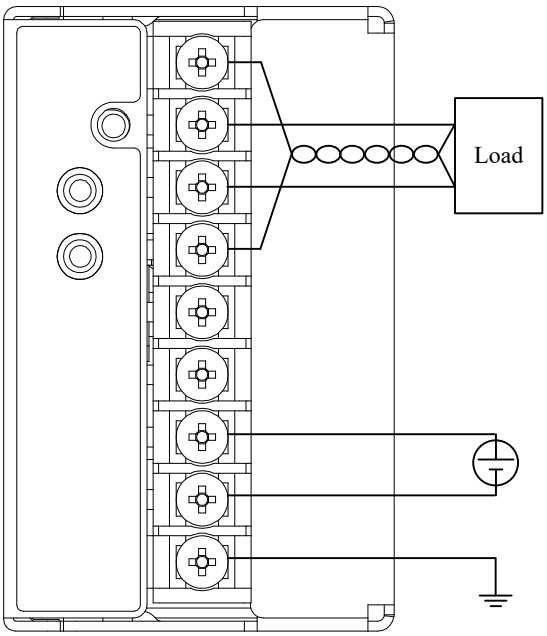
【RDS100A】

・Basic connection (Local sensing)
Connect “+S” terminal to “+V” terminal and “-S” terminal to “-V” terminal with the attached short pieces.
(Short pieces are mounted at time of shipment.)



・Remote sensing connection
1) Remove the attached short pieces.
2) Connect “+S” terminal to “+” terminal of load with wires.
3) Connect “-S” terminal to “-” terminal of load with wires.

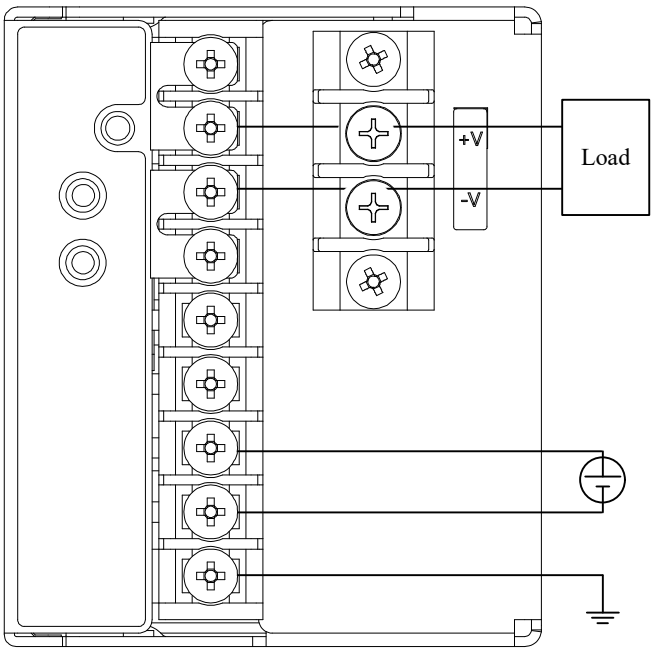
* If remote sensing terminals are opened, the output will rise and shut down.



【RDS180A】

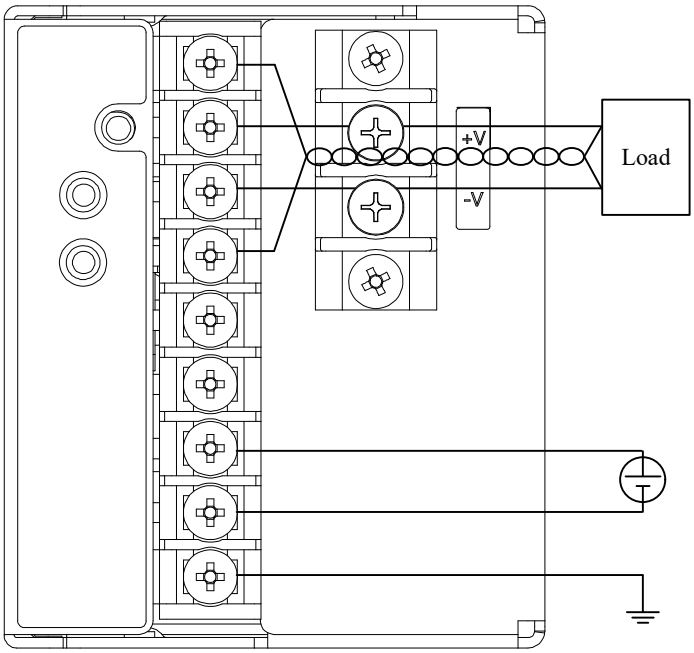
・Basic connection (Local sensing)

Connect “+S” terminal to “+V” terminal and “-S” terminal to “-V” terminal with the attached short pieces.
(Short pieces are mounted at time of shipment.)
For the output terminal, connect the 2P terminal and the 9P terminal in consideration of the current balance.
(Current rating 2P terminal：30A、9P terminal：25A)



・Remote sensing connection

1) Remove the attached short pieces.
2) Connect “+S” terminal to “+” terminal of load with wires.
3) Connect “-S” terminal to “-” terminal of load with wires.
* If remote sensing terminals are opened, the output will rise and shut down.



6.Function & Precautions

6-1.Input Voltage

Input voltage range is as shown below. Take note that product will be damaged especially when input voltage exceeds maximum rating.

- RDS30A-24, RDS60A-24, RDS100A-24, RDS180A-24 :18～32VDC
- RDS30A-48, RDS60A-48 :36～63VDC

6-2.Output Voltage Range

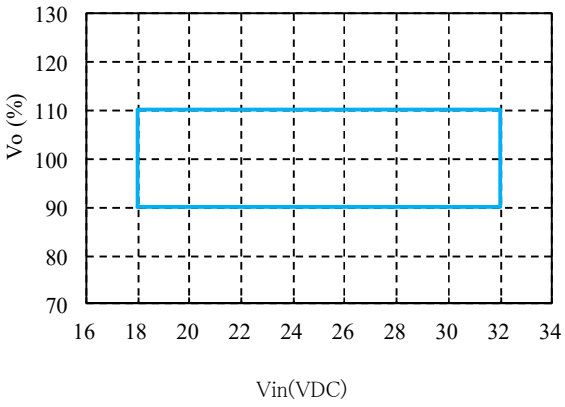
Output voltage is adjusted to the center of rated value during shipment. Output voltage can be adjusted by the rotating VR of 'V.ADJ'. Adjustment range of output voltage is as shown on the graphs below. Output voltage increases when rotating VR in CW* direction.

Please note that output will shutdown due OVP activation when output voltage is adjusted too high.

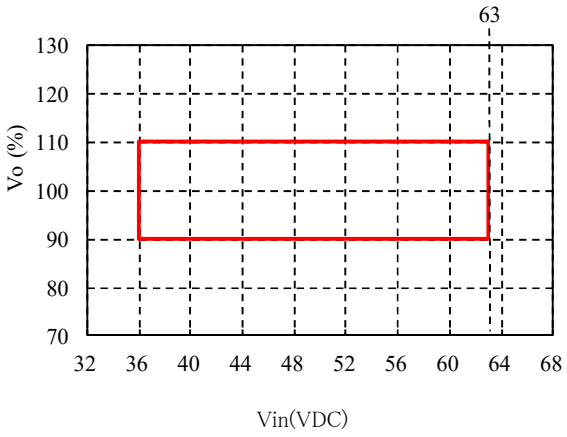
Also, when output voltage is set higher than the typical rated setting, use within maximum output power rating.

Abbreviation note) *CW : Clock Wise

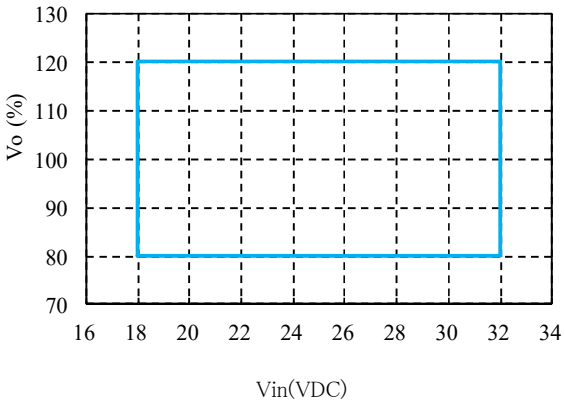
RDS30A-24、RDS60A-24



RDS30A-48、RDS60A-48



RDS100A-24、RDS180A-24



6-3.Inrush Current

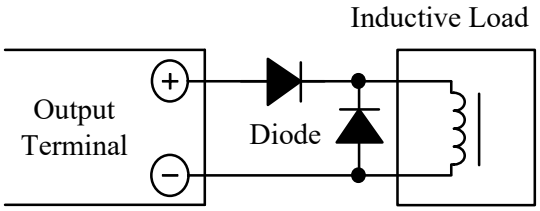
RDS-A have inrush current suppressor inside. The value in the data sheet is specified at 25℃ ambient temperature. Inrush current increase during input recycling once the power supply has commenced operation. Take caution when selecting external input switch or input fuse.

6-4.Over Voltage Protection (OVP)

OVP method is "Output Shutdown (latch)/Manual Reset". OVP operates 120-150% of rated output voltage and shuts down output. After OVP operation, please turn off the input once and wait about 1 minute, or use Remote OFF once to reset OVP latch. then turn on input again or use Remote ON.

The OVP setting level is fixed and cannot be adjusted externally.

Be careful when applying external voltage directly to output higher than nominal as this might lead to damage of the RDS-A unit, When using inductive load, such as a motor or a relay, connect diode to output line as below.



6-5.Over Current Protection (OCP)

OCP operates if output current exceeds more than 105% of rated 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 for more than 30 seconds, as this might to lead damage or failure.

- RDS30A, RDS60A : Constant Current Limit and Hiccup with automatic recovery.
  OCP setting is fixed and cannot be adjusted externally.
- RDS100A, RDS180A : Constant Current Limit with automatic recovery.
  Can be adjusted by the volume (OC. ADJ) .
  OCP setting value decrease by turning the VR in CCW* direction.
  The lower limit of the OCP setting is approximately 30% of the rated output current.

Abbreviation note) *CCW : Counter Clock Wise

6-6.Thermal Shut Down

The output will be shut down when abnormal rise of temperature for ambient internal of the RDS-A unit is detected. When thermal shut down operation, please turn off input or use remote OFF once, and turn on again after the temperature sufficiently dropped down to reset level.

Thermal shut down function operates at out of the specification area.

This function may not activate or cannot avoid power supply damage depending on the situation.

6-7.Remote Control ON/OFF Function

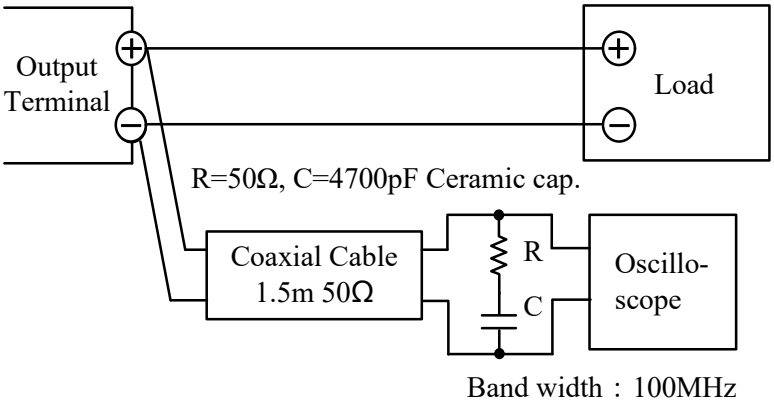
Remote ON/OFF function is available inside. By using this function, ON/OFF control can be done according to the table below even with input voltage applied.

This circuit is isolated from the input and output circuits.

Between ＋RC/－RC terminal	Output Condition
Open or Apply 1.5 to 5V	ON
Short or Apply 0 to 0.4V	OFF

6-8.Output Ripple & Noise

The specification for maximum ripple & noise value are measured according to measurement circuit specified by JEITA-RC9141B. Output Ripple & Noise level will be large when a load line is long. In such case, it might be necessary to connect electrolytic or film capacitor across the load terminal. The output ripple cannot be measured accurately if the probe ground lead of oscilloscope is too long.



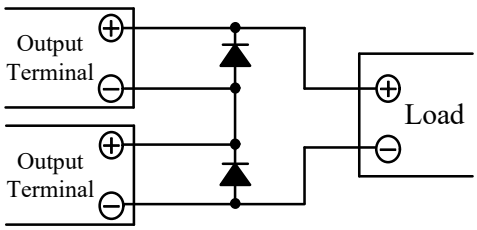
6-9. Remote Sensing Function

Remote Sensing function is provided only RDS100A & RDS180A.
This function compensates voltage drop of wiring from output terminals to load terminals.
Connect "+S" terminal to "+" terminal of load and "S" terminal to "-" terminal of load with sensing wires.
The total line voltage drop shall be less than 0.3V. In case that sensing line is too long,
it is recommended to connect electrolytic capacitor in Across the load terminal.
Connect “+S” terminal to “+V” terminal and “-S” terminal to “-V” terminal with the attached short Pieces when remote sensing function is not used.
If disconnected, OVP function may trigger and voltage will be shut down.

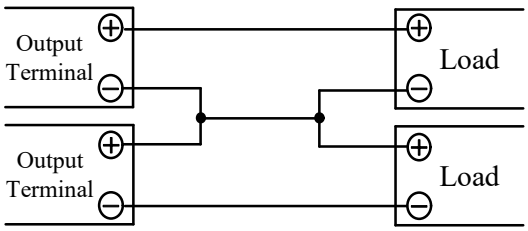
6-10.Series Operation

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

(A)Series Operation RDS-A to One Load



(B)Series Operation both RDS-A & Load



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

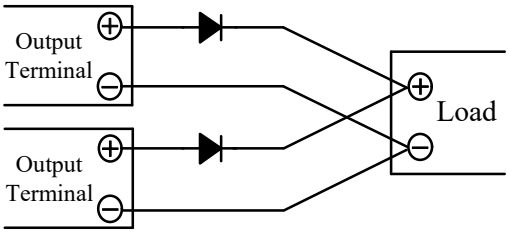
6-11. Parallel Operation

RDS30A and RDS60A can be operated in parallel as (A) backup power supply.

RDS100A and RDS180A are capable of both (A) parallel operation as a backup power supply and (B) parallel operation to increase the output current.

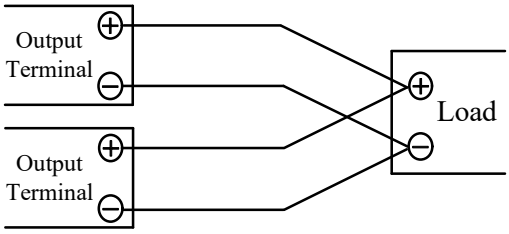
(A)To use as Back-up Power Supply

1.Adjust the output voltage higher by the value of forward voltage drop (VF) of the diode.
2.Adjust each power supply output voltage to be same.
3.Output voltage and output power should be used within specifications.
4.Use protective diode to prevent reverse current. Diode current rating must be more than output load current.



(B)To increase the output current

1.Use same length and type of wires for all load lines.
2.Adjust each power supply output voltage to be same value within 1%.
Recommend to set the same voltage as much as possible.
3.Adjust the OCP less than 90% of the rated output current.
4.There is a possibility that output voltage dips at dynamic load change.
5.The rising waveform of the output voltage may have a step.
6.Parallel operation is possible for up to 2 units of the same model of RDS-A.

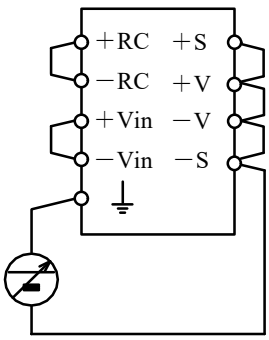


6-12. Isolation Resistance Test

Isolation resistance is more than 100MΩ at 500VDC between Output & ⏚ (Protective Earth), and 10MΩ at 100VDC between output & (+/－)RC. For safety operation, voltage setting of DC isolation resistance tester must be done before the test. Ensure that the unit is fully discharged after the test.

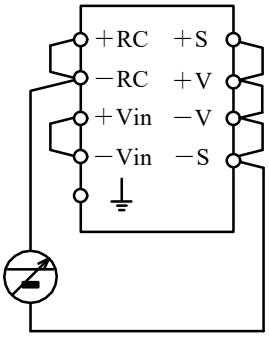
• Output - ⏚ (Protective Earth) :

More than 100MΩ at 500VDC



• Output - (+/－)RC :

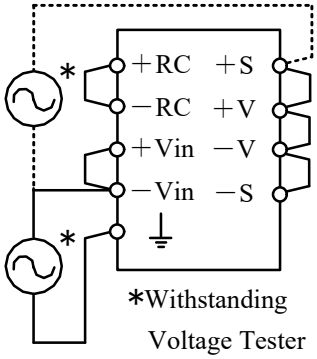
More than 10MΩ at 100VDC



6-13. Withstanding Voltage Test

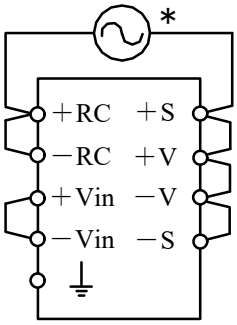
When testing withstand voltage, connect each input and output, or +RC and -RC terminal as follows. RDS-A is designed to withstand 2.0kVAC between input & output, input & ⏚(Protective Earth), and 100VAC between output & (+/−)RC each for 1 minute. When testing, set current limit of the withstanding voltage tester to 10mA (For output & (+/−)RC:100mA). The applied voltage must be gradually increased from zero to the testing value during testing and then gradually decrease after test. When timer is used, the power supply may be damaged by high impulse voltage generated during timer switch on and off.

Input - Output as dot line
and
Input - ⏚(Protective Earth)
as solid line
2.0kVAC, 1minutewith
10mA Limit



*Withstanding
Voltage Tester

Output - (+/−)RC
100VAC, 1minute
with 100mA Limit



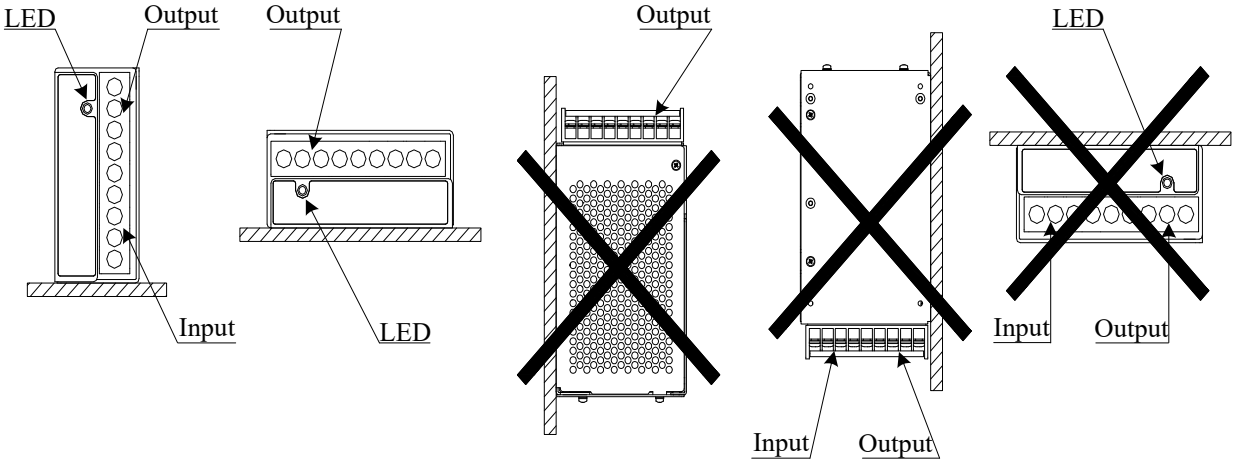
*Withstanding
Voltage Tester

7. Mounting Method

7-1.Mounting Method

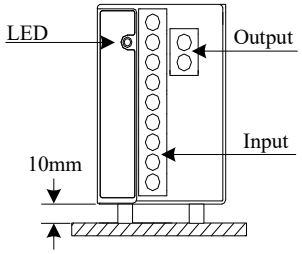
Mounting direction for RDS-A are as shown below. Standard mounting is (A). However, laid mounting as (B) is also available. Do not mount using (C) - (E) method. Use RDS-A according to the derating curve area by mounting direction and ambient temperature. Derating curve limitations are determined by 100% of the rating output power of RDS-A series. For mounting method aside from the following, please contact TDK-Lambda.

(A) Standard Mount (B) Laid Mount (C) Do not use (D) Do not use (E) Do not use



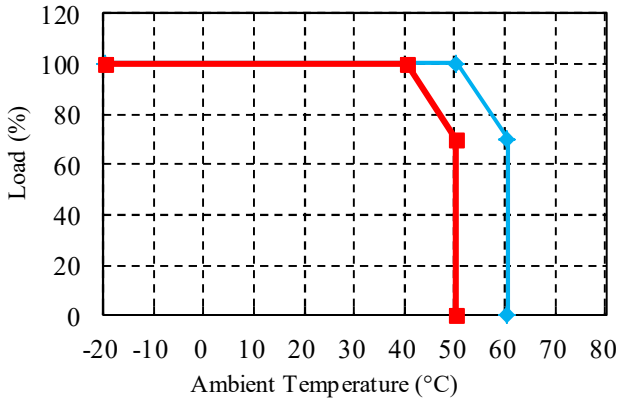
For RDS180A with the output more than 150W, use floating mount as shown below.

(A) Standard Mount (RDS180A)



7-2.Output Derating

Natural Convection Cooling



Mount (A)
Mount (B)

Ambient Temperature (°C)	Load (%)	
	Mount (A)	Mount (B)
-20 - +40	100	100
50	100	70
60	70	-

7-3.Precaution for Mounting

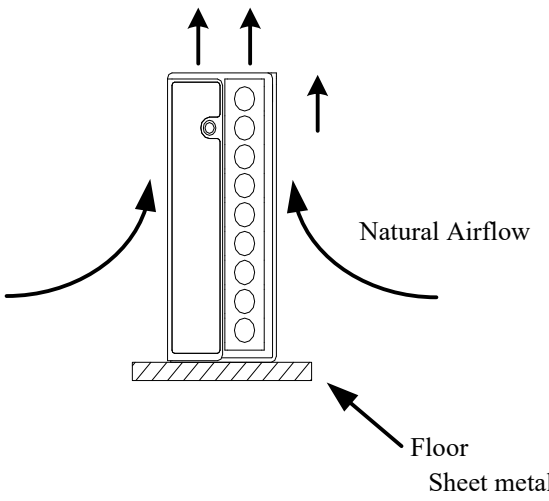
(1) RDS-A Cooling method is natural convection. Keep a space more than 15mm each around RDS-A unit to avoid hot air from accumulation. By providing a make natural air flow path by convection cooling.
And same application is needed when using multiple RDS-A units.

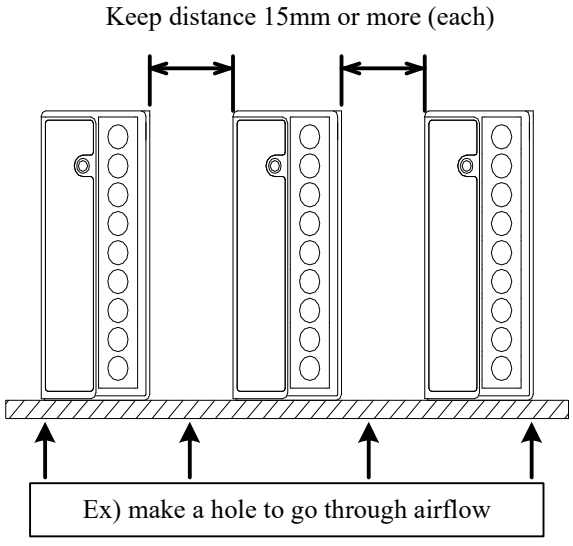
(2) Connect Protective Earth Terminal (⏚) to the Ground of the application equipment. Otherwise, noise* will get worse.
(*Input conducted emission noise, radiated emission, or output noise)

(3) Insert stroke length of a fixing screw is less than 7mm. Avoid inserting failed screw.

(4) Recommended fastening torque for fixing.

M4 type screw : 1.27N·m(13.0kgf·cm) ~ 1.6N·m(16.3kgf·cm)





8. Wiring Method

(1) Separate wire for input & output (load) line. Further, by twisting wire for each input & output to improve switching noise.
(2) Use short length and thick wires for input & output line in order to lower down line impedance.
(3) Switching noise will decrease by adding capacitor to load terminal.
(4) Connect protective earth terminal (⏚) to ground of the equipment by using thick wires.

9. External Fuse Rating

Please refer to the following fuse rating when selecting the external fuses that are to be used on input line. Surge current flows when line turns on. Fuse rating is considered by inrush current value at line turn on. Do not select the fuse according to input average current value under the actual load condition. RDS-A unit has same rating fuse inside (＋Vin Line).

RDS30A-24：F5AL	RDS60A-24：F6.3AL	RDS100A-24：F16A	RDS180A-24：F25A
RDS30A-48：F3.15AL	RDS60A-48：F4AL		

10. Before Thinking that the Unit is Failure

(1) Check if the rated input voltage is applied.
(2) Check if the wiring of input or output line is correct.
(3) Check if the terminal screw is fastened with specified torque certainly.
(4) Check if the wire thickness is enough.
(5) Check if the output current and output power does not exceed specification.
(6) Check if the output voltage setting (V.ADJ) is properly adjusted. OVP might be triggered and output will be shut down.
(7) Check if remote ON/OFF (＋/－RC) terminal is shorted or not. Output turns off if the terminal is shorted.
(8) Audible noise can be heard depending on frequency or current change rate condition during Dynamic-Load operation.
(9) Check if the OCP setting VR (OC.ADJ) is properly adjusted. OCP might be triggered and output will drop.
(10) Check if remote sensing wire opened or not. OVP might be triggered and output will shut down.

11. Warranty Description

This product is warranted for a period of 5 years from the date of shipment.
For damages occurring at normal operation within this warranty period, repair is free of charge.
Please read the “Important Notes for TDK-Lambda products” before using the products.

12. CE MARKING/UKCA MARKING

CE MARKING
CE Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Low Voltage Directive, EMC Directive and RoHS Directive.

UKCA MARKING
UKCA Marking, when applied to a product or packing material for a product covered by this handbook, indicates compliance with the Electrical Equipment (Safety) Regulations, Electromagnetic Compatibility Regulations and Restriction of the Use of Certain Hazardous Substances in Electrical & Electronic Equipment Regulations.