Power Supply
Technical Information

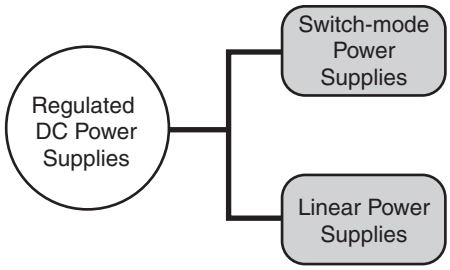
Power Supply Overview

■What is a Power Supply?

Commercial AC power distributed from power plants cannot be supplied directly to the ICs and other electronic components built into electronic devices in automated office and factory equipment without destroying the components due to the high voltage of commercial AC power. Devices called power supplies or regulated DC power supplies are therefore required to convert commercial AC power into regulated DC power to drive ICs and other electronic components.

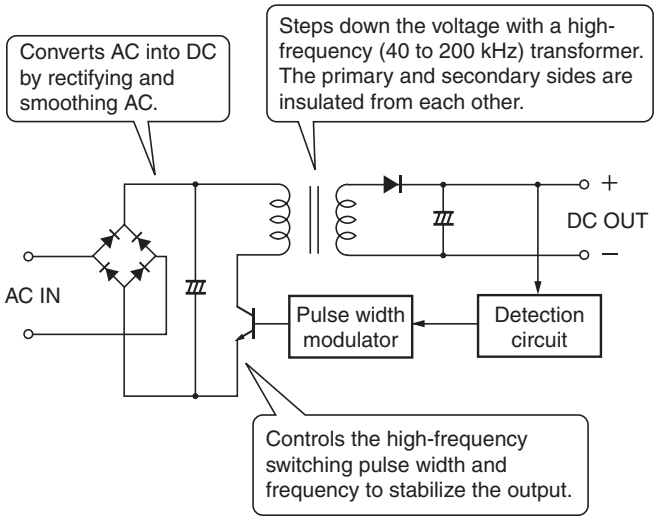
■Regulated DC Power Supplies

The methods for controlling Regulated DC Power Supplies can be largely classified into the following two types. Switch-mode power supplies and linear power supplies are generally referred to as power supplies. Currently, switch-mode power supplies are the most prevalent.



● Switch-mode Power Supplies

Switch-mode power supplies convert commercial AC power into the required high-frequency DC power using the high-speed switching of semiconductors. Switch-mode power supplies are so compact, light, and efficient that they are used as power supplies by most electronic devices.



Advantages

- Highly efficient.
- Compact, and light.
- A wide input voltage range.

Disadvantages

- Switching noise is generated.
- Large inrush current on primary side.

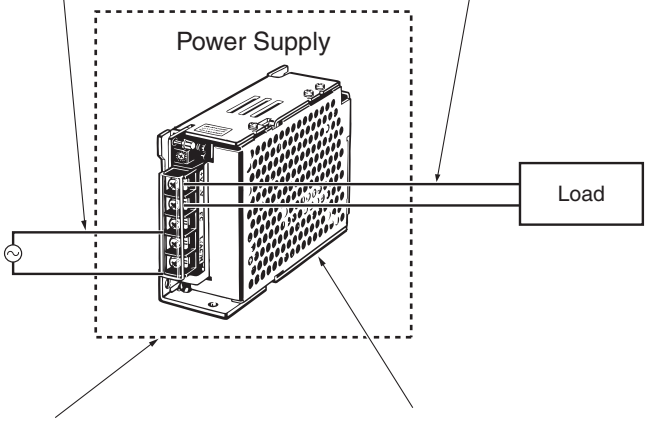
■Power Supply Selection

● Basic Selection Points

Factors to consider when selecting a Power Supply are provided in the following diagram.

(1) Input Voltage
Each Power Supply has an input voltage range. Select the Power Supply according to the available input voltage.

(2) Output Capacity (Voltage × Current)
The maximum load capacity must be less than the maximum output capacity of the Power Supply.



(3) Safety Standards
Power Supplies with UL, CSA, or VDE approval, or CE Marking are available.

(4) Shape and Mounting Method
Power Supplies of various shapes are available. Use the most suitable Power Supply according to the application. Various mounting brackets are also available.

Glossary

Item		Description	Details
Efficiency (%)		The output power divided by the effective input power. The higher the efficiency, the smaller the internal power loss of the Power Supply.	---
Input condition	**Voltage range**	The voltage applied to the AC input terminals. The voltage fluctuation range is indicated in parentheses.	---
	Frequency	The frequency of the voltage applied to the AC input terminals.	---
	Current	The current value flowing to the AC input terminals. This value is the stationary current and will fluctuate depending on the load.	Refer to *Input Current* on page 2.
	Power factor	The effective input power divided by apparent power	---
	Harmonic current	The harmonic current component excluding the fundamental wave included in the current waveform.	Refer to *Harmonic Current Suppression* on page 8.
	Leakage current	The current leaking to the ground from the input lines through the casing of the Power Supply.	Refer to *Leakage Current* on page 3.
	Inrush current	The peak current that flows when the input is turned ON.	Refer to *Inrush Current* on page 3.
Output characteristics	**Voltage adjustment range**	The range in which the output voltage can be adjusted using the Output Voltage Adjuster (V.ADJ).	Refer to *Voltage Adjustment Range* on page 3.
	Ripple noise voltage	The compound value of the ripple that appears between the output terminals and high-frequency noise. This value is expressed as a peak to peak (p-p).	Refer to *Ripple and Noise* on page 3.
	Input variation influence	The variation in the output voltage when the input voltage gradually varies within the input voltage fluctuation range.	Refer to *Input Variation Influence* on page 4.
	Load variation influence (rated input voltage)	The variation influence in the output voltage when the output current gradually varies within the specified load range.	Refer to *Load Variation Influence* on page 4.
	Startup time	The time from when the input voltage is turned ON until the output voltage reaches 90% of the rated output voltage.	---
	Output hold time	The time after the input voltage is shut off during which the output voltage maintains the constant-voltage precision range.	---
Functions	**Overload protection**	Prevents damage to the Power Supply if the output current exceeds the rated current (including output short-circuits).	Refer to *Overcurrent Protection* on page 4.
	Overvoltage protection	Detects excessive voltage between output terminals and turns OFF outputs.	Refer to *Overvoltage Protection* on page 5.
	Parallel operation	Increases capacity through parallel connection of multiple Power Supplies.	Refer to *Parallel Operation* on page 6.
	Serial operation	Increases output voltage through serial connection of multiple Power Supplies.	Refer to *Series Operation* on page 7.
Other	**Ambient operating temperature**	The allowable range for the ambient temperature in which continued operation is possible. The ambient temperature is the temperature not affected by the heat generated by the Power Supply itself. (See note.)	Refer to *Precautions Common to all Power Supplies* on CD.
	Storage temperature	The allowable range for the ambient temperature in which performance will not deteriorate due to long-term storage. The Power Supply itself is in a non-operational state.	Refer to *Precautions Common to all Power Supplies* on CD.
	Ambient operating humidity	The allowable ambient humidity range in which the product can be used continuously.	Refer to *Precautions Common to all Power Supplies* on CD.
	Dielectric strength	Test for confirming the insulation strength by applying a specified voltage between two specified points for a specified length of time.	Refer to *Dielectric Strength* on page 4.
	Insulation resistance	DC resistance indicating insulation characteristics between two specified points.	Refer to *Insulation Resistance Test* on page 4.
	Vibration resistance	The vibration resistance characteristics.	---
	Shock resistance	The shock resistance characteristics.	---
	Conducted emission	Noise voltage that is generated in the Power Supply's AC input terminals.	---

Note. As a general rule, the ambient temperature is measured at 50 mm from the Power Supply.

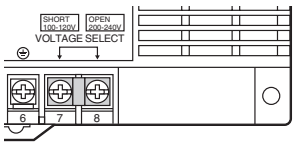
● Input Voltage

The input voltage is the input voltage and corresponding frequency range at which the rated operations and performance can be maintained. The AC input voltages shown are effective values. An input voltage of 100 VAC is input when the input voltage selector terminals are shorted with a short bar and an input voltage 200 VAC is input when these terminals are open.

Main applicable models: S82K (90 W, 100 W), S82J (300 W, 600 W)

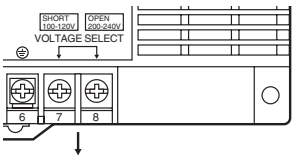
Note. Models equipped with 100/200 VAC selection are delivered set to 200-VAC input. Therefore, be sure to thoroughly check the input voltage selector terminals before use. Using the incorrect voltage, whether 200 VAC or 100 VAC, will cause the Power Supply to malfunction.

100 V



Terminals short-circuited using the short bar.

200 V



Short bar removed and terminals open.

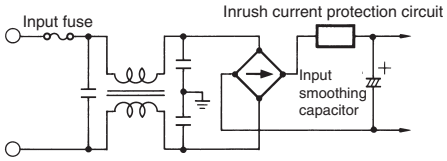
● Input Current

Standard Switch-mode Power Supplies rectify AC input current. Usually, rectification is achieved using capacitor inputs and a smoothing capacitor through which a reactive current is allowed to flow. Therefore, the input current depends on the output power, input voltage, power factor, and efficiency, as follows:

$$\text{Input current} = \frac{\text{Output voltage}}{\text{Input voltage} \times \text{Power factor} \times \text{Efficiency}}$$

The power factor of a Switch-mode Power Supply is usually between 0.4 and 0.6. For details on efficiency, refer to the information in the datasheet for each model.

Input Rectifier/Smoothing Circuit

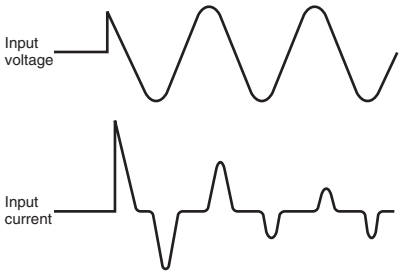


● Internal Fuse

If the internal fuse has blown, it is very likely that internal circuits of the Power Supply have been damaged and that parts other than the fuse will also need to be replaced. If the fuse has blown, consult your OMRON representative.
If the fuse has blown, short-circuit current will not continue to flow on the primary side (i.e., the external side) of the Power Supply. There is, however, no protection function for the input power lines.

● Inrush Current

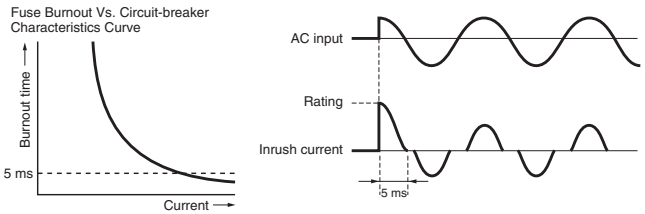
When a Switch-mode Power Supply is turned on, a surge of current flows into the input smoothing capacitor to charge the capacitor. This current surge is called the "inrush current." The inrush current varies depending on the application timing and the presence of an inrush current protection circuit, but is usually several to several tens of times greater than the steady-state input current.



Inrush current (at cold start)

When two or more Switch-mode Power Supplies are connected to the same input, the total current is the sum of the currents for each Power Supply. Therefore, check the fusing characteristics of fuses and operating characteristics of breakers making sure that the external fuses will not burn out and the circuit breakers will not be activated by the inrush current. The inrush current pulse width can be considered to be about 5 ms. (Refer to the following diagram.)
In particular, models with 100-to-240 VAC input have higher inrush current energy than models with single rated inputs or models with switching inputs. Therefore, consider the coordination with the breaker.
The following table provides guidelines for fuse and breaker selection.

Selection points	External fuses	Circuit breakers
Rated voltage	Sufficient for the input voltage of the Power Supply	
Rated current	Same as that of internal fuses	Sufficient for the rated current of the Power Supply
Inrush current	Must not be burnt or tripped at the Power Supply inrush current (pulse width: approx. 5 ms).	
Fuse type	Normal burning or semi-time lag.	---

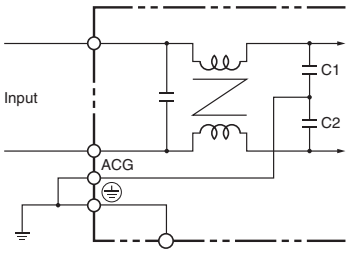


Note. The duration of the inrush current is 5 ms max. Therefore, the fusing characteristics require the inrush current to flow sufficiently for up to 5 ms.

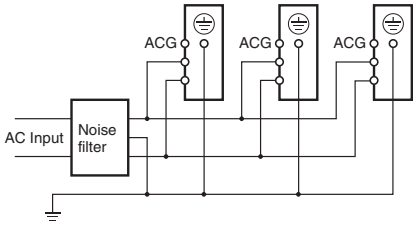
● Leakage Current

Switch-mode Power Supplies have an internal noise filter circuit that prevents switching noise from being fed back to the input lines and protects the internal circuit from external noise.
Leakage current is largely due to the current that flows through the capacitors (C_1 or C_2) of the input filter circuit.
Depending on the Power Supply's configuration, leakage current can be reduced by incorporating an internal filter circuit.

Model with ACG Terminals

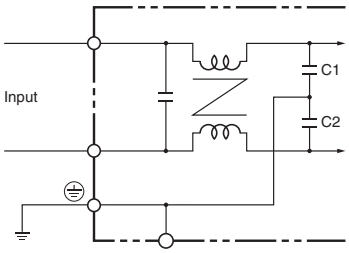


The ACG terminal on the S82W Power Supply, which is connected between capacitors C_1 and C_2 of the filter circuit, is short-circuited to the ⏚ terminal by the short bar. Leakage current can be reduced by removing the short bar.
When the leakage current poses a problem, such as when using more than one Power Supply, remove the short bar from each Power Supply.
To prevent electric shock, however, be sure to ground the ⏚ terminal.
In this case, however, the input filter cannot function effectively, resulting in greater output ripple noise and feedback noise. To suppress this noise, connect an external noise filter circuit as shown below.



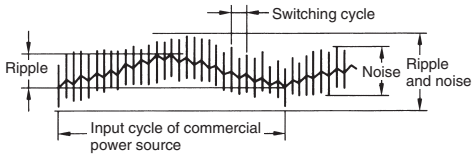
Leakage current cannot be reduced in Power Supplies without an ACG terminal due to the filter circuit configuration.

Model without ACG Terminals



● Ripple and Noise

Since Switch-mode Power Supplies operate at high frequencies (i.e., as high as 20 kHz or more), the DC output will contain ripple and noise. The following figure shows a representative waveform for ripple and noise.



Since ripple and noise contain high-frequency components, the ground line of the oscilloscope must be shortened when making measurements. If the ground line is too long, it acts as an antenna which is influenced by radian waves and, consequently, the correct values of ripple and noise cannot be measured.

● Voltage Adjustment Range

The range over which the output voltage can be adjusted while maintaining specific output characteristics.

Note 1. The output voltage can effectively be converted to a value above the specified range. When adjusting the voltage, however, check the actual output voltage and make sure it is within the specified output voltage range.

Note 2. Make sure that the output voltage × output current does not exceed the rated output capacity and that the output current does not exceed the rated output current.

Note 3. Do not apply unnecessarily strong force to the Output Voltage Adjuster (V.ADJ). Doing so may damage the V.ADJ.

● Input Variation Influence

The variation in the output voltage occurring when only the input voltage is changed slowly over the input range while maintaining constant output conditions.

● Load Variation Influence

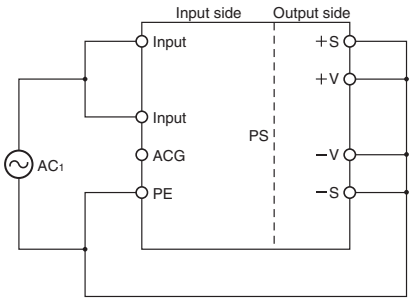
The variation in the output voltage occurring when the output current is changed slowly over a specified range while maintaining constant input conditions.

● Temperature Variation Influence

The variation in the output voltage occurring when only the ambient operating temperature is changed.

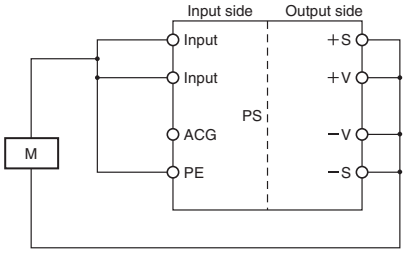
● Dielectric Strength

When a high voltage is applied between the input terminals and the case (PE terminal), electric energy builds up across the inductor L and capacitor C of the internal noise filter. This energy may generate a voltage surge when a high voltage is applied to the Power Supply by a switch or timer, and as a result, the internal components of the Power Supply may be damaged. To prevent voltage impulses when testing, decrease the applied voltage using the variable resistor on the dielectric strength testing equipment, or apply the voltage so that it crosses the zero point when it rises or falls.
Some models of OMRON Switch-mode Power Supplies have surge absorbers between the input lines and between the input terminals and the ACG terminal. When testing the dielectric strength of these models, remove the short bar from the PE and ACG terminals. With the short bar attached to the terminals, the applied voltage may be cut off by the testing equipment.
(See following diagram.)



● Insulation Resistance Test

To protect the Power Supply from an input voltage surge, surge absorbers are inserted between the input lines and between the input terminals and the ACG terminal. When testing the insulation resistance of the Power Supply, remove the short bar between the PE and ACG terminals on the front panel. Otherwise, the measured resistance will be lower than the actual value. (See following diagram.)



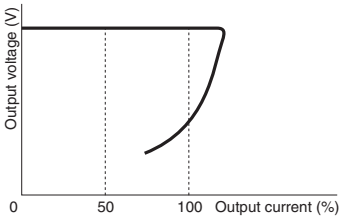
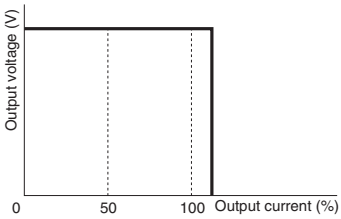
(M: Insulation resistance meter)

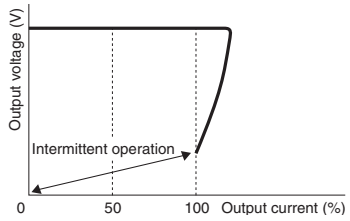
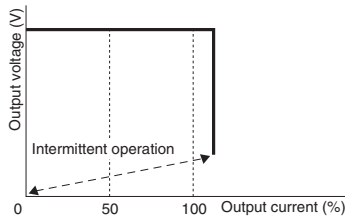
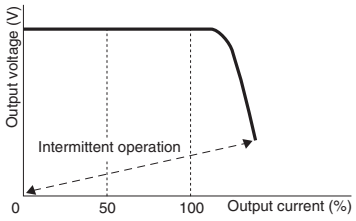
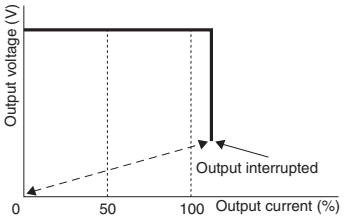
● Overcurrent Protection

Applicable Models: All Models

This protection function prevents damage to the Power Supply itself due to overcurrent (including output short-circuits). The protection function is activated and the output current is limited when the load current is greater than the overcurrent detection value (this value depends on the model).
The output voltage will also drop according to the overload (load impedance).
The drop level depends on the overload conditions and load line impedance.
The following table shows the six types of output voltage drop characteristics for main models when the overcurrent protection function is operating.

These drop characteristics can be seen as indicating the limit on the output current that can be supplied to the load effectively in the process in which the output voltage starts when the AC input turns ON. When connecting a load (with built-in DC-DC converter) that starts operating from a low voltage or a capacitive load in which inrush current can flow easily, consider the trend in overcurrent protection drop characteristics and the startup characteristics on the load side when selecting the Power Supply.
Generally, an inverted L voltage drop is considered favorable at startup.

Overcurrent drop characteristics	Relationship between output voltage and output current	Trend	Main models
Gradual current/ voltage drop		When a voltage drop occurs, the output current also gradually drops, and the output returns to the normal level automatically (automatic recovery) when the overcurrent status is cleared.	S82K 3 W, 7.5 W, 15 W S8VS 15 W
Inverted L voltage drop		When a voltage drop occurs, the output current remains essentially constant. The output returns to the normal level automatically (automatic recovery) when the overcurrent status is cleared.	S82J 100 W (5 V, 12 V, 15 V), 150 W, 300 W S82K 90 W, 100 W S8TS S8T-DCBU-02 S8VS 240 W S8VM 50 W, 100 W, 150 W (12, 15, 24 V)

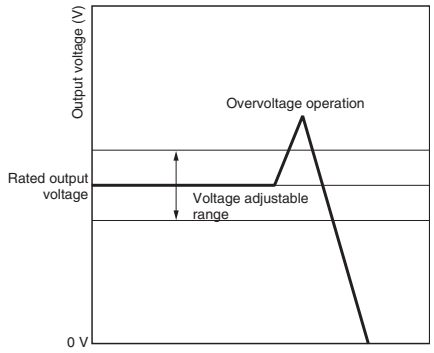
Overcurrent drop characteristics	Relationship between output voltage and output current	Trend	Main models
Voltage/current drop Intermittent operation		When a voltage drop occurs, the output current also gradually drops, and the load of the Power Supply itself is reduced (automatic recovery) using intermittent output when the voltage drops to a certain level or lower.	S82J 10 W, 25 W
Inverted L voltage drop Intermittent operation		When a voltage drop occurs, the output current remains essentially constant. The load of the Power Supply itself is reduced (automatic recovery) using intermittent output when the voltage drops to a certain level or lower.	S8VS 30 W, 60 W, 90 W, 120 W, 180 W S8VM 50 W, 100 W, 150 W (5 V)
Gradual current increase/ voltage drop Intermittent operation		When a voltage drop occurs, the output current increases as the voltage drops, maintaining constant power, and the load of the Power Supply itself is reduced (automatic recovery) using intermittent output when the voltage drops to a certain level or lower.	S82J 50 W, 100 W (24 V) S82K 30 W, 50 W S8VM 15 W, 30 W
Inverted L voltage drop Shut off		When a voltage drop occurs, the output current remains essentially constant. If, however, the overcurrent status continues for longer than a fixed time, the output will be interrupted and the power will need to be turned ON again to recover.	S82J 600W

Note 1. Loads with built-in DC-DC converters (PLCs, digital panel meters and other electronic devices) and capacitive loads are connected, the overcurrent protection function will be activated at startup, which may prevent the Power Supply's output from turning ON.
Note 2. Continuing to use the Power Supply with an output short-circuit or in overcurrent status may cause the internal parts to be deteriorated or damaged.
Note 3. If a load short-circuit occurs, the actual drop in voltage depends on the impedance of the load lines being used.
Note 4. Even if the inclination of the drop characteristics is the same, the actual characteristics (output current/voltage, etc.) depend on the model.
Note 5. Specific precautions apply to some models. For details, refer to the separate information in the datasheet for each model.

● Overvoltage Protection

Main applicable models: S82J (100 W/5 V, 24 V output, 300 W, 600 W), S8TS, S8VM, S8VS, S8T-DCBU-02

This protection function detects overvoltage and interrupts output to prevent sensors or other loads from being subjected to excessive voltage due to failure of the Power Supply's internal recovery circuit.
To resume operation, turn OFF the input power, and wait for a fixed period of time before turning ON the input power again.

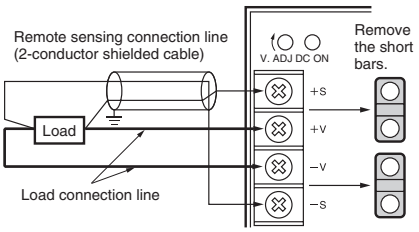


Note 1. When the overvoltage protection circuit operates, the Power Supply itself may be malfunctioning. When restarting the input power after the overvoltage protection circuit has operated, turn the input power ON with the load line disconnected and check the output voltage.
Note 2. The overvoltage protection circuit may operate if surge or other external overvoltage (e.g., from the load) is applied to the output side.

Models with the Zener-diode clamp system do not restart after the protection circuit operates. Send the product for repair.
* For further details, refer to the datasheet for individual models.

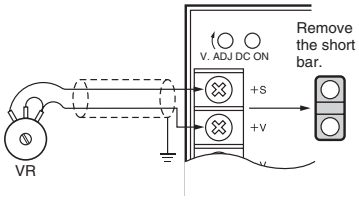
● Remote Sensing Function

Remote sensing can be used to compensate for a voltage drop on the load lines. (The compensation range is ±10% of the rated output voltage.)
To use remote sensing, remove the short bars from the remote sensing terminals (short-circuited in standard shipments) and wire as shown in the following diagram.
Make sure that the remote sensing screws are not loose. Loose screws will prevent output of the output voltage.
To ensure stable operation, it is advisable to thicken the load connection line and compensate for the amount of voltage drop using the Power Supply's voltage adjuster (V.ADJ).



Note 1. When the voltage drop in the load lines is large, the overvoltage protection function may activate due to the increase in voltage to correct the voltage drop, so be sure to use as thick as a wire as possible.
Note 2. Be sure that $V_{OUT} \times I_{OUT}$ does not exceed the rating of the Power Supply.

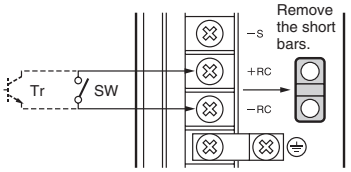
The output voltage of the Power Supply can be varied using an external variable resistor connected between terminals +V and +S (except for S8VM).



The output voltage variable range is ±10%.

● Remote Control Function

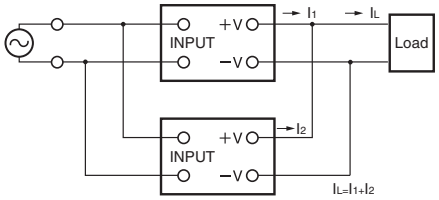
The output voltage of the Power Supply can be turned ON and OFF from an external signal while the input voltage is being applied to the Power Supply. To use this function, remove the short bars from the remote control terminals (short-circuited in standard shipments) and connect the switch or transistor as shown in the following diagram. The output voltage will stop when the remote control terminals are open.
If the remote control screws become loose, output voltage may not be produced. Make sure that the screws are tight.



When a transistor is used, make sure that the collector-emitter voltage V_{CE} of the transistor is 20 V or higher and that the collector current I_C is 5 mA or higher.

● Parallel Operation

- **Connect Power Supplies in parallel to increase the output current if sufficient output current for the load cannot be obtained from one Power Supply.**



List of Connection Methods and Main Models that Support Parallel Operation of Outputs

Model	Connection method
S82K-10024 S8T-DCBU-02	Only connect the +V and −V outputs in parallel
S82K (100 W (- P type only) S82J (300, 600 W)	Connect the +V and −V outputs in parallel and set the parallel operation selection switch to PARALLEL.
S8TS (12 V, 24 V)	Connect the bus line connector.

- Up to two of the same model can be connected in parallel for the S82K (100 W), up to four of the same model can be connected in parallel for the S8TS and S8T-DCBU-02, and up to five of the same model can be connected for the S82J (300, 600 W).
- The above table lists the main models for which parallel connection is possible. Refer to the datasheet for each model for details.
  Attempting parallel connection for models that do not support it may result in an unbalanced load current, possibly causing the rated output current to be exceeded, so the parallel connection is not possible.
- Use the same length and thickness of load connection line to ensure that the voltage drop between each Power Supply and load is the same.

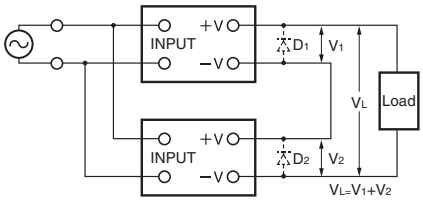
● N+1 Redundant Operation

Applicable Models: S8TS

Redundant operation is used in parallel connections of N Power Supplies (single operation when N = 1) of the same model, where a redundant Power Supply is added to the number of Power Supplies (N) in parallel operation (N+1), thereby improving the reliability of the system.

● Series Operation

- **Connect the Power Supplies in series to increase the output voltage.**



List of Main Models that Support Series Connection of Outputs

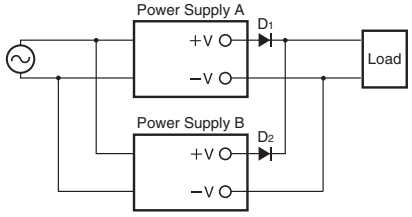
Model	Power ratings	Rated output voltage
S82K	90, 100 W	24 VDC
S82J	100 W	5, 12, 15, 24 VDC
	50, 150, 300, 600 W	24 VDC
S8TS	25, 30, 60 W	5, 12, 24 V
S8VS	15, 30, 60, 90, 120, 180, 240 W	24 VDC
S8VM	15, 30, 50, 100, 150 W	5, 12, 15, 24 VDC

- The above table lists the main models for which series connection is possible. Refer to the datasheet for each model for details.
  If models that do not support series connection are used, one of the Power Supplies may not operate when the AC Power Supply is turned on, possibly damaging internal circuits over a period of time.
- If models with different power ratings or rated voltages are wired in series, keep the current flowing to the load below the rated output current for the Power Supply with the lowest power rating.
- If the load is short-circuited when using an S82J-05024□□, S82J-10024□□, S8VM, S8VS, or S8TS-02505□, reverse voltage will occur inside the Power Supply, which may cause Power Supply deterioration or damage. It is recommended to connect the diodes (D_1 and D_2) as shown in the above diagram.
  Guidelines for the type, dielectric strength, and forward current of the diodes are as follows:

- Type: Schottky barrier diodes.
- Dielectric strength (V_{RRM}): Twice the rated output voltage of the Power Supply or higher.
- Forward current (I_F): Twice the rated output current of the Power Supply or higher.

● Backup Operation

- **Two Power Supplies can be wired in parallel even though each has a sufficient power rating. This can be done to ensure (back up) Power Supply even if one of the Power Supplies fails.**
  (Backup operation is possible for all Power Supplies with single outputs.)



Use the same model of Power Supply for A and B.

- Select the Power Supplies A and B so that either has a sufficient power rating for the load.
- Be sure to connect diodes to both Power Supplies A and B, as shown in the diagram, so that the Power Supply backing up the faulty Power Supply is not affected.

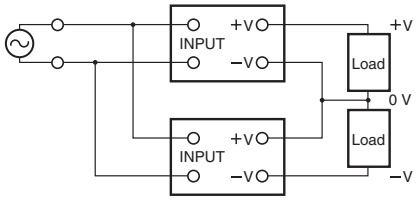
Guidelines for the type, dielectric strength, and forward current of the diodes are as follows:

- Type: Schottky barrier diodes.
- Dielectric strength (V_{RRM}): The rated output voltage of the Power Supply or higher.
- Forward current (I_F): Twice the rated output current of the Power Supply or higher.

- Increase the output voltage settings of Power Supplies A and B just enough to allow for the voltage drop (V_F) on diodes D_1 and D_2.
  Also, make sure that the diodes are sufficiently cooled so that their temperatures remain below the catalog value.
  This is necessary to control the power loss (output current of Power Supply I_{OUT} × diode forward voltage V_F) resulting across the diodes.
- Some power loss to the load will occur due to the load power and diodes. Therefore, do not exceed the rated power (rated output voltage × rated output current) of the Power Supply.

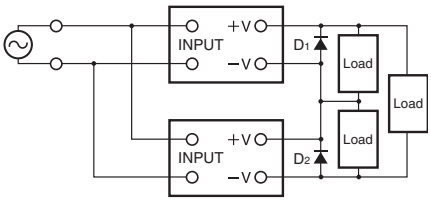
● Creating ± (Positive/Negative) Outputs

- The floating output (the primary and secondary circuits are separated) enables creating ±outputs using two Power Supplies. To create ±outputs, connect two of the same model of Power Supply as shown in the diagram.



- All models of Power Supply can be used to create ± outputs. If there is the possibility that another load is wired in series, such as a Servomotor or operation amplifier, as shown in the diagram, connect bypass diodes D_1 and D_2 as shown in the diagram. Without these diodes, the Power Supplies may not start when power is turned ON, possibly damaging internal circuits over a period of time.

No diodes are required for models that support series operation.



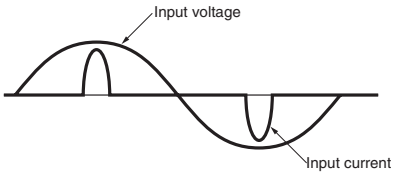
- Guidelines for the type, dielectric strength, and forward current of the diodes are as follows:

- Type: Schottky barrier diodes.
- Dielectric strength (V_{RRM}): Twice the rated output voltage of the Power Supply or higher.
- Forward current (I_F): Twice the rated output current of the Power Supply or higher.

■Harmonic Current Suppression

● What is Harmonic Current?

Most switch-mode power supplies incorporate capacitors. As a result, the input voltage sine wave is transformed into steep input current pulses.



If this current is provided to the power-receiving equipment of factories or buildings, the equipment will generate excessive heat that may damage the equipment itself, while also consuming unnecessary energy. This has become a public problem as well.

● Harmonic Current Control

As an international standard, IEC555-2 was enacted for the limitation of harmonic current emission. IEC1000-3-2, as a revised standard replacing IEC555-2, was established in 1994. In conformance with the IEC1000-3-2, EN61000-3-2 was established and will come into effect in European countries in January 2001 Power Supplies with a capacity of 75 W or higher. In Japan, the Ministry of International Trade and Industry provided some guidelines for the suppression of harmonics generated from electrical household appliances and electrical equipment. Japanese manufacturers have been voluntarily issuing and abiding by the guidelines.

- Main Applicable Models
  S82K-P□□□24 (200-V Series only)
  S8TS
  S8VS
  S8VM

Note. Buzzing Noise when Turning ON Input
A noise may occur when turning ON the input of models incorporating harmonic current suppression circuits. This is a transient noise that occurs only until the internal voltage has stabilized and does not indicate any problem in the product.
Main Applicable Models: S8TS
S8VS (120, 180, 240 W)
S8VM (50, 100, 150 W)

■Life Expectancy

The life of a Power Supply is determined by conducting a temperature rise test of the built-in aluminum electrolytical capacitors, when using the Power Supply in a standard installation at the rated input voltage under an ambient temperature of 40°C and a load rate of 50%. The calculated life expectancy functions as a guide only is not a guaranteed value. Use this information as reference for performing maintenance and replacement.

Note. The life expectancy of the fan in models with fans is not included.

(Main Models)
Eight years or longer: S82K
Ten years or longer: S82J, S8TS, S8VS, S8VM

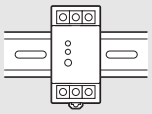
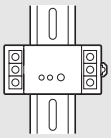
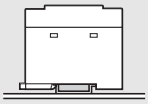
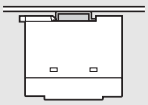
Power Supply Precautions for Correct Use

■Installation

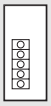
● Mounting Methods

The standard mounting methods should be used to ensure proper heat dissipation. If other mounting methods must be used, the ambient temperature must be lowered or the load rate must be reduced to prevent temperature increase inside the Power Supply caused by poor heat dissipation. Refer to the information in the table on the right.

DIN-rail Mounting Models: Main Models

Mounting direction / Model	Standard	Horizontal	Face-up	Face-down
				
S82K	OK	No	Conditional	No
S8TS	OK	No	No	No
S8VS(15, 30W)	OK	No	OK	No
S8VS (60, 90, 120, 180, 240 W)	OK	No	No	No
S8T-DCBU-01	OK	No	No	No
S8T-DCBU-02	OK	No	No	No
S8VM	OK	No	No	No

Screw Mounting Models: Main Models

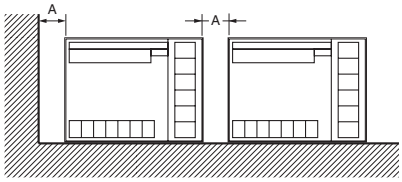
Mounting direction / Model	Standard	Horizontal	Face-up	Face-down	Horizontal
					
S82J	Yes	Yes *1	Conditional *2	Conditional *2	No
S8VM	Yes	Yes	Yes	No	No

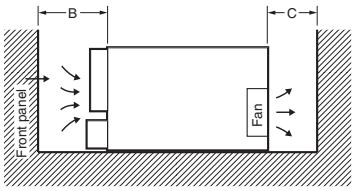
*1. The 300-W model can be used under given conditions.
*2. The 600-W model can be used.

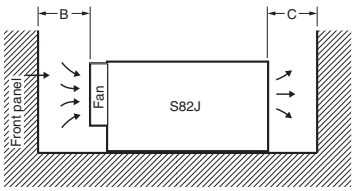
Yes: Can be used
No: Cannot be used.
Conditional: Can be used at an ambient temperature of 50°C (up to 50% of load rate).

● Installation Space

When mounting two or more Power Supplies side by side, be sure to provide spacing between them as indicated in the table on the right or greater.







Note. Be sure to provide an installation space that allows for shielding (including ducts).

Spacing Required Between Power Supplies **(Unit: mm)**

Model	Dimension A	Dimension B	Dimension C
S82J	20	20 (300, 600 W)	20 (300, 600 W)
S82K	10	---	---
S8VS	20	---	---
S8VM	20	---	---

* Ambient temperature of 50°C: 100 mm

● Extending the Operating Life

- The life of a Power Supply is determined by the life of the electrolytical capacitors used inside. Here, Arrhenius' Law applies, i.e., the life will be halved for each rise of 10° C and will be doubled for each drop of 10° C. As a result, the life of the Power Supply can be increased by reducing its internal temperature.
- Internal Temperature Reduction
  The temperature inside a Power Supply will remain constant when the heat generation is equal to the heat dissipated. The internal temperature will rise if not enough heat is dissipated, i.e., the Power Supply must be mounted to allow proper heat dissipation.
  Due consideration must be given so that the operating ambient temperature of the Power Supply falls within the range specified by the derating curves.

Heat Dissipation with Natural Air Cooling

- Provide air holes and an ambient atmosphere that allows air convection
- Use a metal plate as the mounting panel.
- It is recommended that forced cooling be used as much as possible.
- The calorific (heating) value of the Power Supply can be expressed in the following equation.

$$\text{Calorific value (W)} = \text{Input power} - \text{Output power}$$

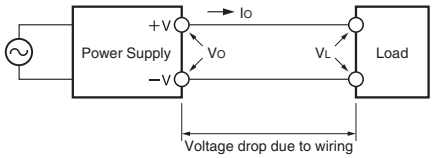
$$= \frac{\text{Output power}}{\text{Efficiency}} - \text{Output power}$$

● Maintenance

Slits are provided in the Power Supply case to allow heat generated internally to dissipate externally. It is thus possible for foreign matter and dirt to enter the Power Supply and reduce or interrupt the output. When performing periodic maintenance, always vacuum away any foreign matter and dirt from inside the Power Supply.

● Wiring in Consideration of Voltage Drop

Make the input and output wiring as thick and short as possible to minimize voltage drop.



(1)Select a wire diameter suitable for the load current Io.
(2)Make sure that the Power Supply's output voltage Vo does not exceed the specified output fluctuation range.
(3)Consider the allowable current for load short-circuits (guideline: 1.6 times the Power Supply's rated output current or higher).

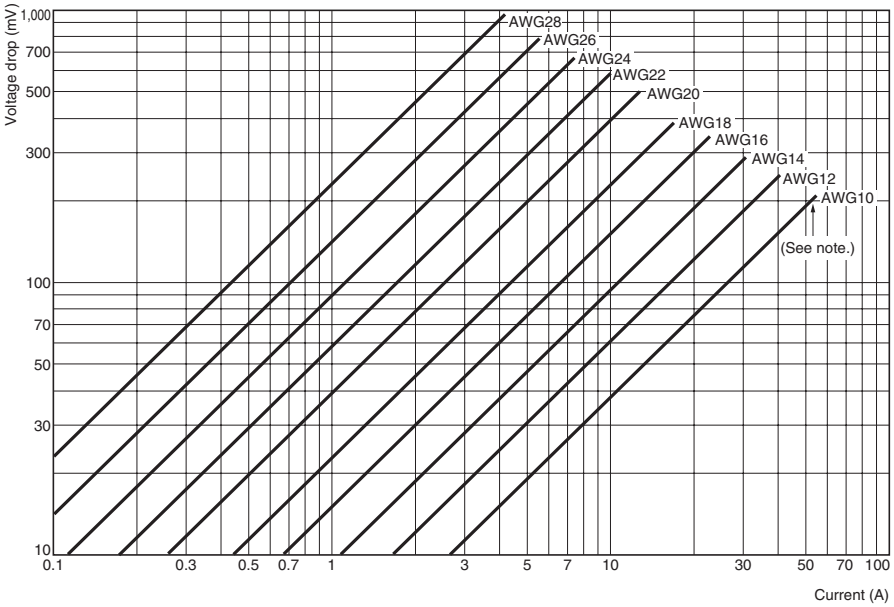
Selection of Wires

Select wires for the Power Supply carefully. Refer to this table when selecting the wires.

AWG No.	Cross-sectional area (mm^2)	Configuration (number of conductors/mm)	Voltage drop per 1 A (mV/meter)	Recommended maximum current (A)	
				UL1007 (300 V 80° C)	UL1015 (600 V 105° C)
30	0.051	7/0.102	358	0.12	---
28	0.081	7/0.127	222	0.15	0.2
26	0.129	7/0.16	140	0.35	0.5
24	0.205	11/0.16	88.9	0.7	1.0
22	0.326	17/0.16	57.5	1.4	2.0
20	0.517	26/0.16	37.6	2.8	4.0
18	0.823	43/0.16	22.8	4.2	6.0
16	1.309	54/0.18	14.9	5.6	8.0
14	2.081	41/0.26	9.5	---	12.0
12	3.309	65/0.26	6.0	---	22.0
10	5.262	104/0.26	3.8	---	35.0

Recommended Maximum Current: Current The table is applicable to wires with 1 to 4 conductors. Keep the current value to within 80% of the values shown in this table when using wires having 5 or more conductors. The following chart shows the voltage drop per meter in terms of the relationship between the current and conductor diameter. Make sure that the current value does not exceed the recommended maximum current value.

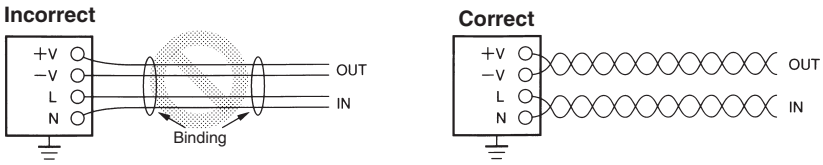
Voltage Drop per Meter (UL1015 Vinyl-sheathed Wires for Heat-resistant Equipment)



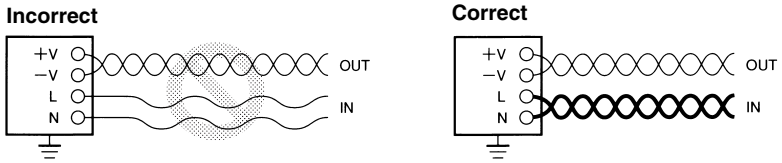
Note. The current indicates the allowable current. In practice, application must be below the recommended current values.

● Wiring to Prevent Noise Interference

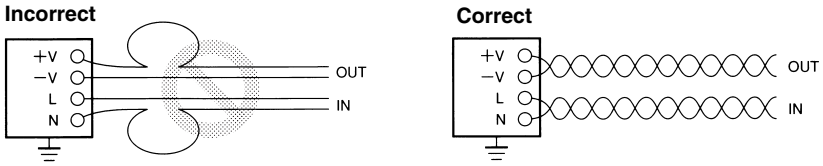
- Separate input lines and output lines, and use twisted cables.
  Noise will be induced on the output lines if they are laid together with or close to input lines.



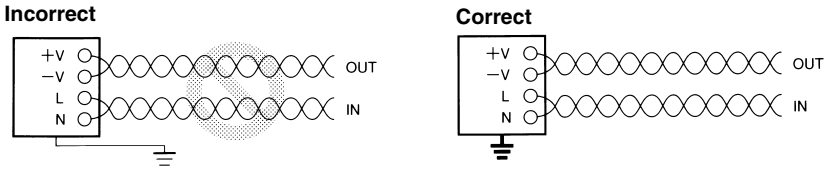
- Use short, thick input lines.
  Input lines radiate noise, and must therefore be as short and thick as possible.



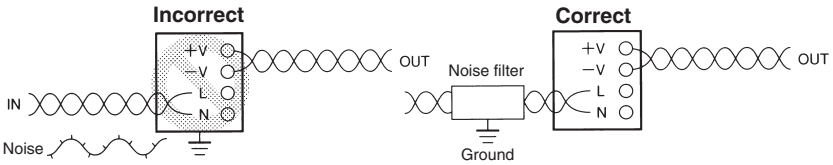
- Do not loop input or output lines.
  Loops in lines can radiate noise to other devices or can function as antennas inducing high-frequency noise.



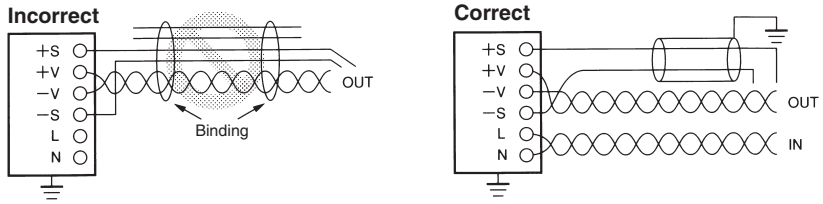
- Use short, thick ground wires.
  The damping effect of the noise filter built into the Power Supply will be reduced if a long ground wire is used. Always make ground wires as short and as thick as possible.



- Connect a noise filter.
  Include a noise filter on the input side of the Power Supply if faulty operation in electric circuits connected to the output from the Power Supply are being caused by sources of surge on the AC input line, such as large magnetic relays.
  Ground the noise filter with a thick, short wire.



- Use shielded cables for the remote sensing and remote control signal lines.
  Remote sensing and remote control signal lines must always be wired separately using shielded cables to prevent faulty operation caused by the induction of noise. Noise can be induced when these signal lines are laid together with input lines or power lines, which often carry noise.

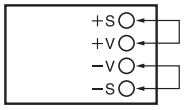
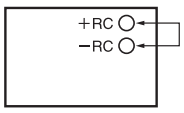


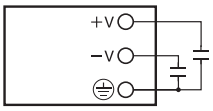
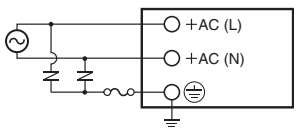
Power Supply Troubleshooting

Read the operation manual provided with the Product, and check the following points, as applicable.

When	Check point	Details
Purchasing	External appearance	After purchase, make sure that the product and packaging have no dents or marks. Any internal damage may result in overvoltage depending on the location of the damage. (Stop using the product if dents, marks, or deformation is evident.)
	Model and specifications	Make sure that the input voltage, output voltage, and output current of the Power Supply purchased meet the requirements. (The I/O specifications are provided on the model label.)
Installing	Installation conditions	Be sure to use mounting screws of the specified length. Using longer screws may cause damage to the PCB, or short-circuit the internal circuits.
	Installation location	Be sure to provide sufficient space around the Product when installing it to allow for heat dissipation.
	Operating environment	Make sure that the ambient temperature, and vibration in the installation environment satisfy the specified levels for each product being used. (Be sure to install the Product as far as possible away from contactors, which will subject the Product to vibration and shock if it is located in their vicinity.) Install the Product in a location in which liquid or foreign particles will not enter the Product.
Wiring	Input voltage selector terminals	Before turning ON the power, make sure that the voltage specifications are the same as the voltage of the device. The Product is shipped with the input voltage selector terminals open (i.e., set to 200 VAC).
	Input terminals	Wire the Power Supply inputs correctly. Connecting the AC input wires to the output terminals or voltage selector terminals will cause damage to the internal circuits.
	Terminal wiring	Do not subject the terminals to excessive stress by using excessive force when tightening the terminal screws. After tightening the screws to the specified torque, make sure that none of the screws is loose. Make sure that the end of the screwdriver used to tighten the screws does not mark or damage the PCB or internal parts.
		Connect the ground terminal to prevent electric shock.
	Remote sensing terminals	Check whether remote sensing is securely connected. If remote sensing is not to be used, short-circuit using the short bar. (At shipment, these terminals are short-circuited with the short bar.)
	Remote control terminals	Check whether the remote control terminals are securely connected. If remote control is not to be used, short-circuit using the short bar. (At shipment, these terminals are short-circuited with the short bar.)
	Series, parallel, and ± output operation	Check whether series, parallel, or ±operation is supported. Refer to the wiring information in this guide.
Adjusting the output voltage	Output Voltage Adjuster	Do not apply unnecessarily strong force on the Output Voltage Adjuster (V.ADJ). Doing so may damage the V.ADJ. Make sure that the end of the screwdriver used to adjust the setting does not mark or damage the PCB.

Be sure to check the following points if the Power Supply is not operating properly before requesting repairs.
If the Power Supply still does not operate normally, contact your OMRON representative.

Location	Problem	Details	Countermeasures
Dielectric strength inspection	The result of dielectric strength test is NG.	Impulse occurred damaging the Power Supply when the dielectric strength was applied or shut off using a switch or other means.	Either gradually change the applied dielectric strength using a variable resistor or apply voltage at zero cross (applied from 0 V).
		Dielectric strength has been applied to the incorrect location.	The voltage value depends on the location at which dielectric strength is applied. Test using the dielectric strength value specific to each Product.
		Inspection was conducted with the short bar connected between the ACG and PE terminals.	Remove the short bar from between the ACG and PE terminals (on applicable models), and then test the dielectric strength and insulation resistance.
Turning ON the power for the first time	The output does not turn ON. • Output voltage is low. • Output indicator is not lit. • Output indicator is dim.	The overcurrent protection function has been activated by the startup current of the load that is connected to the Power Supply, even if the current was within the Power Supply's capacity when stationary.	Use inverse L overcurrent protection characteristics or consider raising the Power Supply's capacity by one rank.
		The Power Supply's load has exceeded the ratings, thereby activating the overcurrent protection function.	Select a Power Supply capacity that is sufficient for the load current.
		The Power Supply's outputs are short-circuited.	Remove the cause of the output short-circuit.
	A buzzing noise is heard when the input turns ON.	A buzzing noise can be heard when turning ON the input of models equipped with harmonic current suppression circuits due to the internal inrush current.	Models with harmonic current suppression circuits generate a noise when the input is turned ON but this is a transient noise that occurs until the internal voltage is stabilized, and does not indicate that any problem in the product.
	An output delay occurs in the output turning ON.	If a capacitive load (capacitor) is connected to the Power Supply's load, the inrush current on the load side will cause the output to enter the protection range when it turns ON.	If inrush current flows to the load, consider selecting a capacity that allows for the inrush current.
	The output voltage is high.	The adjuster setting is high.	Adjust the output voltage using the Output Voltage Adjuster (V.ADJ).
	The output voltage is high (caused damage to the load).	The damage to the internal parts has prevented the feedback control from performing properly.	The internal circuits are possibly damaged. Consult your OMRON representative.
	The output indicator lights but turns OFF quickly (overvoltage protection is provided)	The remote sensing terminals are open.	When not using remote sensing, short-circuit terminals +V and +S, and also terminals −V and −S. The overvoltage protection function will operate, so turn OFF the input power and then turn it back ON again. 
		The internal control circuit has malfunctioned, thereby activating the overvoltage protection function.	Turn OFF the input power and then turn it back ON again. If the problem reoccurs, the internal circuits are possibly damaged. Consult your OMRON representative.
	An electric shock is felt when touching the Power Supply.	The casing may not be properly grounded.	Connect the ground terminal to the ground.
	The input breaker is operating. The external fuse is broken.	The Power Supply's inrush current has tripped the breaker.	Check the inrush current of each Product in the system and make sure that the fuse and breaker ratings are sufficient. (The inrush current of the Power Supply is several times to several tens of times the normal current.)
	The Power Supply's fuse is broken.	The internal circuit has short-circuited due to wire clippings, or other foreign particles, or mounting screws.	The internal circuits are possibly damaged. Consult your OMRON representative.
	White smoke was emitted from the Power Supply.	The incorrect input power is being applied. The white smoke indicates the vaporization of the electrolytic fluid in the internal electrolytic capacitor due to overvoltage.	Check the power input location and input voltage again. This problem indicates that the internal circuits are damaged. Replace the Power Supply.
	There is no output.	A load is connected to the remote sensing terminals.	The output current cannot be received from the remote sensing terminals +S and −S. Connect the load lines to the output terminals +V and −V. Alternatively, the overvoltage protection function is operating, so turn OFF the input power and then turn it ON again.
		The remote control terminals are open.	When not using remote control, short-circuit the terminals +RC and −RC. 

Location	Problem	Details	Countermeasures
Operation	The Power Supply's fuse is broken.	Foreign particles, liquids, condensation, or dust from the operating environment has entered the Product and damaged the internal circuits.	Many holes are provided on the Product to assist with heat dissipation. Therefore, do not install the product in an environment where foreign particles, liquid, or other substance can enter the Product. In this case, the internal circuits are damaged. Replace the Power Supply.
	The Power Supply is generating high heat.	The Power Supply's installation space is too confined and does not allow sufficient heat dissipation. The Power Supply's load exceeds the ratings. The ambient temperature is too high.	The Power Supply handles a large amount of power, so heat generation occurs even with normal use. Check the installation space, Power Supply load, and ambient temperature again. Particularly if the load current exceeds the ratings for the Power Supply, change so that the load current is within the ratings. Continuing to use as is may damage the Power Supply.
	The Power Supply is emitting a noise.	The load has exceeded the ratings, activating the overcurrent protection circuit and the internal oscillatory frequency is within audible range.	When the protection circuit is operating, a vibrating sound emitting from the Power Supply may be audible. Even during normal operation, slight sound is generated by the Power Supply circuit due to the oscillator. If the oscillating sound is too loud compared with that of the same Product, the internal circuits may be damaged. Consult your OMRON representative.
	The connected Sensor is always ON. The display on the Digital Panel Meter is erratic. The analog sensor data is erratic.	The connected Sensor has malfunctioned due to noise from the Power Supply (noise between the outputs and ground).	The Power Supply has an internal oscillator that generates noise even during normal operation. Therefore, malfunction may result depending on the Sensor used. If the Sensor malfunctions, connect a film capacitor with a capacitance of approximately 0.1 μF and a dielectric strength of 500 VDC minimum between the output terminal (+V or −V) and the ground terminal (⏚). 
	Output from the Power Supply has stopped (lightning occurred)	Overvoltage is being applied to the Power Supply due to inductive impulse from the lightning. (Output may also have stopped due to the overvoltage protection function being activated.)	If overload protection is operating, turn OFF the input power and then turn it back ON again. If the output still does not recover, the internal components are possibly damaged due to the overvoltage. Replace the Power Supply.
	The output voltage is unstable.	Load fluctuation has activated the overcurrent protection function.	Select a Power Supply capacity that takes the load fluctuation into consideration so that the rated output current will not be exceeded.
		Sufficient load current cannot be supplied due to low input voltage, thereby activating the overcurrent protection function.	Use an input voltage within the allowable range.
	The voltage applied to the load is unstable.	The Power Supply's output voltage has dropped due to the load's inrush current.	If an inrush current is flowing to the load, consider selecting a capacity that allows for the inrush current.
	The voltage applied to the load is low.	The load lines are either too thin or too long, causing a voltage drop.	Use load lines with wire diameters that are suitable for the rated output current.
	Output from the Power Supply has stopped.	Surge or other overvoltage has been applied externally (e.g., load) to the output side, activating overvoltage protection.	Add a varistor and diode to the source of the surge, and make sure that overvoltage is not applied to the Power Supply's outputs.
		The incorrect input voltage (applying 100 V when the setting is 200 V) has been applied. (If 100 V is applied when the voltage is set to 200 V, although damage will not occur immediately, damage will occur if use is continued.)	Make sure that the input voltage is the same as the voltage set using the selector terminals. The internal circuits may be damaged. Replace the Power Supply.
	Output from the Power Supply has stopped (close to source of vibration or shock).	Cracks have occurred in the internal soldering due to vibration in the operating environment, preventing electrical conduction. (The vibration and shock are particularly close to the contactor.)	If vibration occurs during operation, check the installation location and reduce vibration or consider inserting vibration-proof rubber between the Power Supply and its mounting surface.
	Output from the Power Supply has stopped (close to source of strong, high-frequency noise).	Damage has occurred due to impulse from the input line.	If impulse occurs in the input line, separate the Power Supply's input line from the source of the impulse. If separation is not possible, connect a varistor either to the source of the noise or to the Power Supply's input terminals. Also incorporate a fuse that will provide protection if the varistor is short-circuited and damaged. 
Long-term use	Output from the Power Supply has stopped (the fan has stopped).	The fan's life has expired, preventing forced cooling, and the internal temperature has risen activating overheating protection.	Perform periodic maintenance on the forced cooling fan and replace the fan promptly if any fault in the fan is found.
		The fan bearings have been worn down due to the operating environment (e.g., dust or dirt).	Perform periodic maintenance on the forced cooling fan and make sure that there is no dust or dirt present in the operating environment.
	The output is unstable.	The terminals have become loose.	Retighten the terminals to the specified torque.
	The output drops.	The life of the internal components has expired.	The service life of the Power Supply's built-in electrolytic capacitor depends on the ambient temperature and load rate, and its structural life depends on the operating environment (vibration, shock). Replace the Power Supply together with other Power Supplies that were purchased at the same time.
	Ripple noise has increased.		

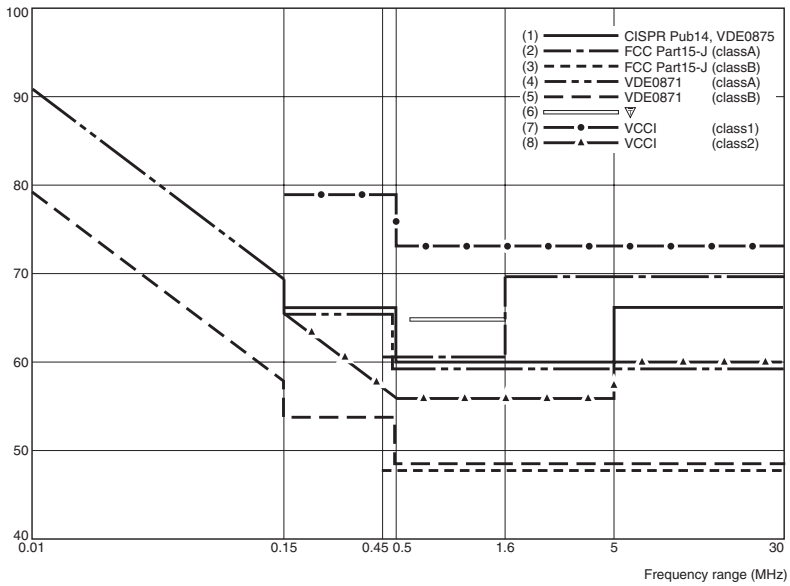
Power Supply Reference Information

■Typical Safety Standards for Noise

<table>
<tr><th></th><th>Japan</th><th colspan="2">Europe</th><th>U.S.A</th></tr>
<tr><th>Applicable law</th><th>Electric components regulation</th><th>CISPR Pub. 14 (for office equipment)</th><th>VDE0871 (for high-frequency applied equipment)</th><th>FCC Part 15 (for computers)</th></tr>
<tr><td>Permissible noise (noise terminal voltage)</td>
<td>
<table>
<tr><th>Frequency range (MHz)</th><th>Voltage dB (μV)</th></tr>
<tr><td>0.525 to 1.605</td><td>65</td></tr>
</table>
(max. value between one line and ground)
(equipment operating on 1 kW max.)
</td>
<td>
<table>
<tr><th>Frequency range (MHz)</th><th>Voltage dB (μV)</th></tr>
<tr><td>0.15 to 0.5
0.5 to 5
5 to 30</td><td>66
60
66</td></tr>
</table>
(max. value between one line and ground)
</td>
<td>
Class A
<table>
<tr><th>Frequency range (MHz)</th><th>Voltage dB (μV)</th></tr>
<tr><td>0.01 to 0.15
0.15 to 0.5
0.5 to 30</td><td>91 to 69.5
66
60</td></tr>
</table>
Class B
<table>
<tr><th>Frequency range (MHz)</th><th>Voltage dB (μV)</th></tr>
<tr><td>0.01 to 0.15
0.15 to 0.5
0.5 to 30</td><td>79 to 57.5
54
48</td></tr>
</table>
(max. value between one line and ground)
</td>
<td>
Class A
<table>
<tr><th>Frequency range (MHz)</th><th>Voltage dB (μV)</th></tr>
<tr><td>0.45 to 1.6
1.6 to 30</td><td>60
69.5</td></tr>
</table>
Class B
<table>
<tr><th>Frequency range (MHz)</th><th>Voltage dB (μV)</th></tr>
<tr><td>0.45 to 1.6
1.6 to 30</td><td>48
48</td></tr>
</table>
(max. value between one line and ground)
</td></tr>
</table>

<table>
<tr><th>Applicable law</th><th>Electric components regulation (Table 8)</th><th>IEC 380 (for office equipment)</th><th>UL114 (for office equipment)</th></tr>
<tr><td>Leakage current</td>
<td>1 mA max. (measured at resistance of 1 kΩ)</td>
<td>
<table>
<tr><td>Class I (stationary type)</td><td>3.5 mA max.</td></tr>
<tr><td>Class I (portable type)</td><td>0.75 mA max.</td></tr>
<tr><td>Class II</td><td>0.2 5 mA max.</td></tr>
</table>
(measured at resistance of 1.5 kΩ and at 0.15 μF) (input: 106%)
</td>
<td>
<table>
<tr><td>general</td><td>5 mA max.</td></tr>
<tr><td>Double insulation</td><td>0.25 mA max.</td></tr>
</table>
(measured at resistance of 1.5 kΩ and at 0.15 μF) (input: 110%)
</td></tr>
<tr><td>Dielectric strength</td>
<td>
● General
• Between current-carrying parts and non-current-carrying metal parts
<table>
<tr><td>Up to 150 V</td><td>1,000 V</td></tr>
<tr><td>Over 150 V</td><td>1,500 V</td></tr>
</table>
• Between current-carrying parts 2.3 × rated voltage (AC, for 1 min)
● Double insulation: between current carrying parts and non-current-carrying metal parts
<table>
<tr><th></th><th>Up to 150 V</th><th>Over 150 V</th></tr>
<tr><td>Function insulation</td><td>1,000 V</td><td>1,500 V</td></tr>
<tr><td>Protection insulation</td><td>1,500 V</td><td>2,500 V</td></tr>
<tr><td>Reinforced insulation</td><td>2,500 V</td><td>4,000 V</td></tr>
</table>
(AC, 1 min)
</td>
<td>
● Between current-carrying parts and surface of insulated part
<table>
<tr><th></th><th>Class I</th><th>Class II</th></tr>
<tr><td>Function insulation</td><td>1,250 V</td><td>---</td></tr>
<tr><td>Reinforced insulation</td><td>1,250 V</td><td>1,250 V</td></tr>
</table>
(AC, for 1 min)
● Between current-carrying parts: 1,250 V (AC, for 1 min)
● Capacitor: (VDE0565)
• Evaporative X capacitor: 4.3 x rated voltage (DC, for 1 min)
• Film Y capacitor: 1,500 V (AC, for 1 min)
</td>
<td>
● Between primary non-current-carrying parts and across-the-line capacitor terminals
<table>
<tr><td>Up to 250 V</td><td>1,000 V</td></tr>
<tr><td>Over 250 V</td><td>1,000 V+2 U</td></tr>
</table>
(AC, for 1 min)
U: maximum indicated voltage
</td></tr>
</table>

Values Stipulated for Conducted Emissions in Each Country



	Frequency range (MHz)	Voltage dB (μV)
(1)	0.15 to 0.5, 0.5 to 5, 5 to 30	66, 60, 66
(2)	0.45 to 1.6, 1.6 to 30	60, 69.5
(3)	0.45 to 1.6, 1.6 to 30	48, 48
(4)	0.01 to 0.15, 0.15 to 0.5, 0.5 to 30	91 to 69.5, 66, 60
(5)	0.01 to 0.15, 0.15 to 0.5, 0.5 to 30	79 to 57.5, 5, 54, 48
(6)	0.525 to 1.605	65
(7)	0.15 to 0.5, 0.5 to 30	79, 73
(8)	0.15 to 0.5, 0.5 to 5, 5 to 30	66, 56, 60

CISPR: Applied to office equipment.
FCC: Noise regulation in U.S.A.
Class A: industrial equipment
Class B: household appliance and information equipment including communications equipment.
VDE: Noise regulation in Europe (European version of the FCC used in U.S.A)
▽ Japan Electric components regulations: regulations applied to household and industrial electric equipment in Japan
VCCI: Applied to data processing devices in Japan.

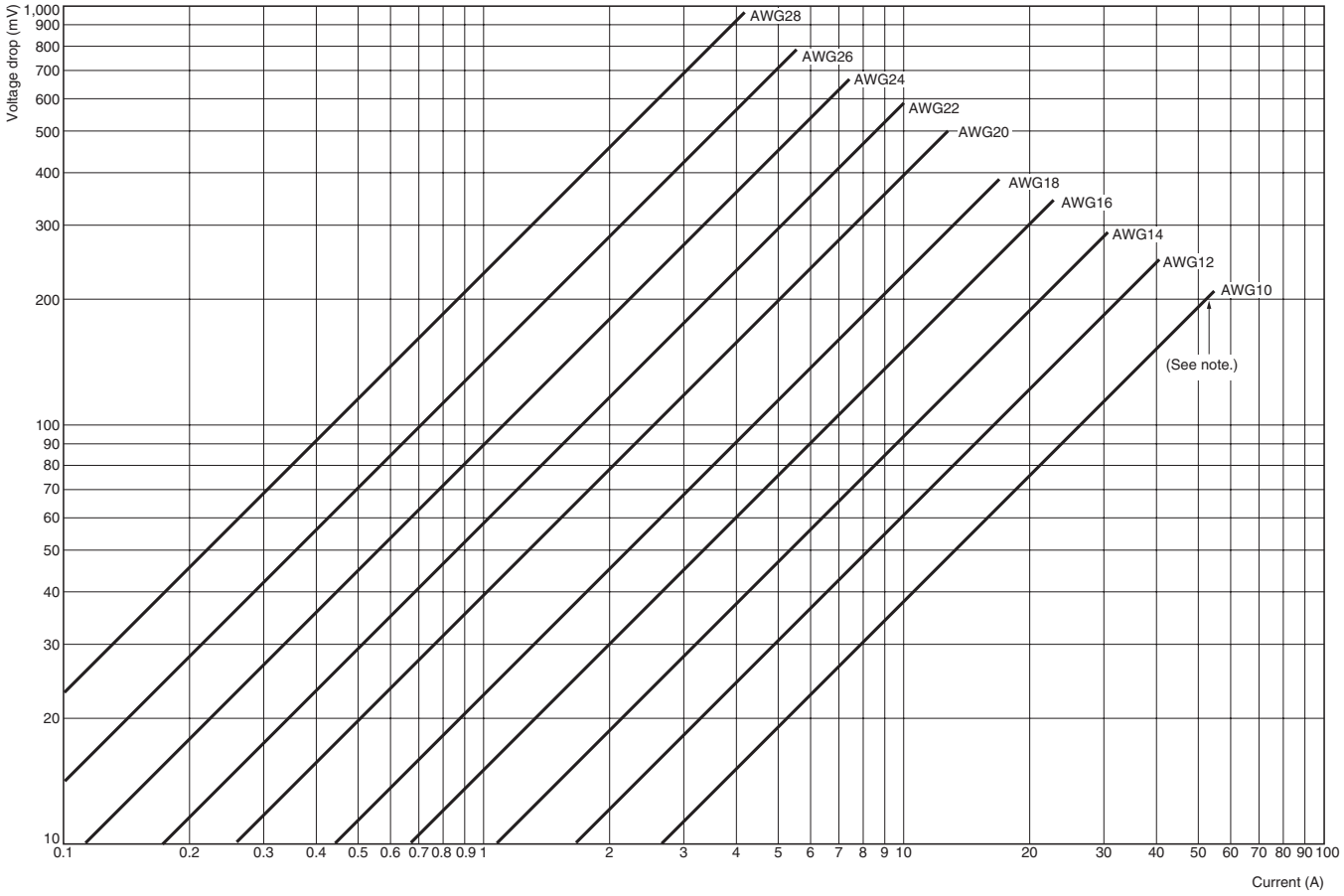
■Selection of Wires

Wires for the Power Supply should must be carefully selected. Refer to this table when selecting the wires.

AWG No.	Cross-sectional area (mm^2)	Configuration (number of conductors/mm)	Voltage drop per 1 A (mV/meter)	Recommended maximum current (A)	
				UL1007 (300 V 80°C)	UL1015 (600 V 105°C)
30	0.051	7/0.102	358	0.12	---
28	0.081	7/0.127	222	0.15	0.2
26	0.129	7/0.16	140	0.35	0.5
24	0.205	11/0.16	88.9	0.7	1.0
22	0.326	17/0.16	57.5	1.4	2.0
20	0.517	26/0.16	37.6	2.8	4.0
18	0.823	43/0.16	22.8	4.2	6.0
16	1.309	54/0.18	14.9	5.6	8.0
14	2.081	41/0.26	9.5	---	12.0
12	3.309	65/0.26	6.0	---	22.0
10	5.262	104/0.26	3.8	---	35.0

Recommended Maximum Current: The table is applicable to wires with 1 to 4 conductors. Keep the current value to within 80% of the values shown in this table when using wires having 5 or more conductors. The following chart shows the voltage drop per meter in terms of the relationship between the current and conductor diameter. Make sure that the current value does not exceed the recommended maximum current value.

Voltage Drop per Meter (UL1015 Vinyl-sheathed Wires for Heat-resistant Equipment)



Note. The current indicates the allowable current. In practice, application must be below the recommended current values.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. T901-E1-01A In the interest of product improvement, specifications are subject to change without notice.