NEMIC-LAMBDA

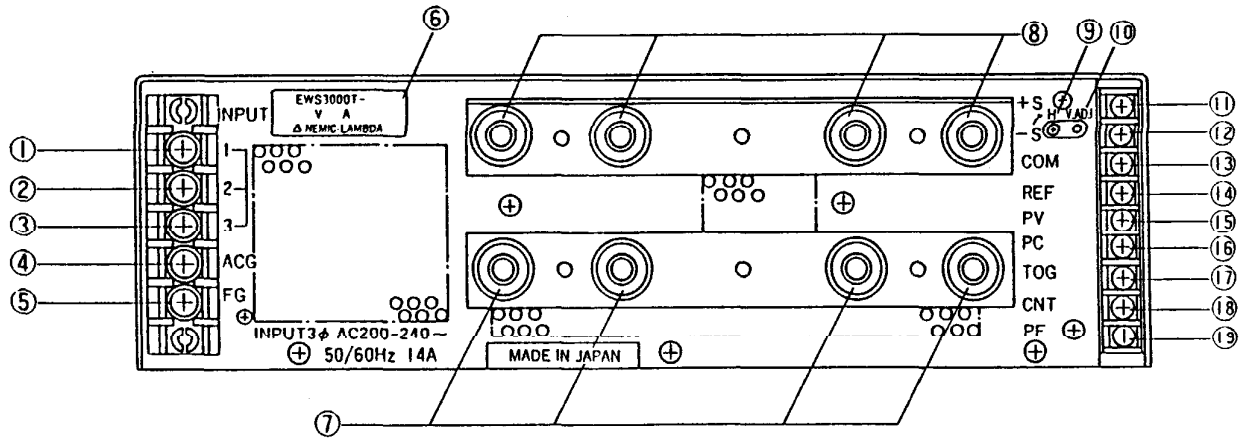
Single Output

EWS3000T SERIES OPERATION MANUAL

1. PREPARATION BEFORE USE

- Make sure that connections with the input/output terminals are properly made as shown in this manual.
- The input voltage is 200 VAC (170 to 265 VAC), 3-phase.
- Make sure that the remote sensing terminals and ON/OFF control terminals are properly connected.
- Do not tamper with the voltage control (V.ADJ) on the front panel unless absolutely necessary. It has been factory set to a specified value prior to shipment.

2. DESCRIPTION OF THE PANEL



①②③ Three-phase AC input terminals (INPUT "1", "2", "3")

④ Line filter ground terminal (ACG)

This terminal is connected with the ground midpoint of the line filter incorporated in the power unit.

⑤ Frame ground terminal (FG· ⏚)

This ground terminal is connected with the power unit case.

⑥ Type marking

⑦ Output terminal (−) (M8 bolt×4)

⑧ Output terminal (+) (M8 bolt×4)

⑨ Output voltage control (V.ADJ)

Turning this control clockwise increases the output voltage.

⑩ Output indicator lamp (green LED)

This LED glows green when the output is normal.

⑪⑫ Remote sensing terminals (+S, −S)

These terminals are used to compensate for a voltage drop between the power unit output terminal and the load terminal.

⑬⑮ Output voltage control terminals (COM, PV)

These terminals are used to control the output voltage by an external signal. (The ground for the PV terminal ⑮ is the COM terminal ⑬.)

⑭ Reference terminal (REF)

This terminal, a reference voltage point for output voltage control, is used for output voltage control or master-slave operation.

When a fixed output voltage power source is to be used, connect this terminal with the PV terminal ⑮, using the short piece supplied. (The ground for the REF terminal ⑭ is the COM terminal ⑬.)

⑯ Current balance terminal (PC)

This terminal is used to keep the balance of the power output currents during parallel operation.

⑰⑱ ON/OFF control terminals (TOG, CNT)

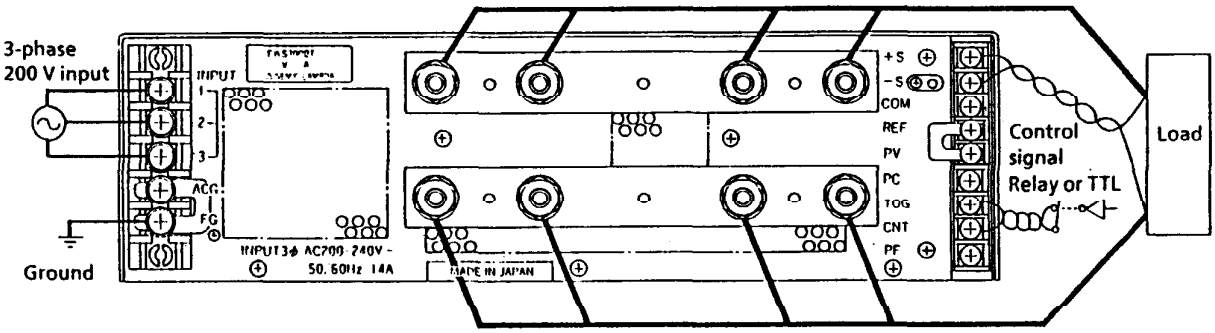
These terminals are used when the power output is to be turned on or off by an external signal. (The ground for the CNT terminal ⑱ is the TOG terminal ⑰.)

⑲ PF signal output terminal (PF)

If the output voltage drops, the open collector output becomes an "H" signal. (The ground for the PF terminal ⑲ is the TOG terminal ⑰.)

3. TERMINAL CONNECTIONS

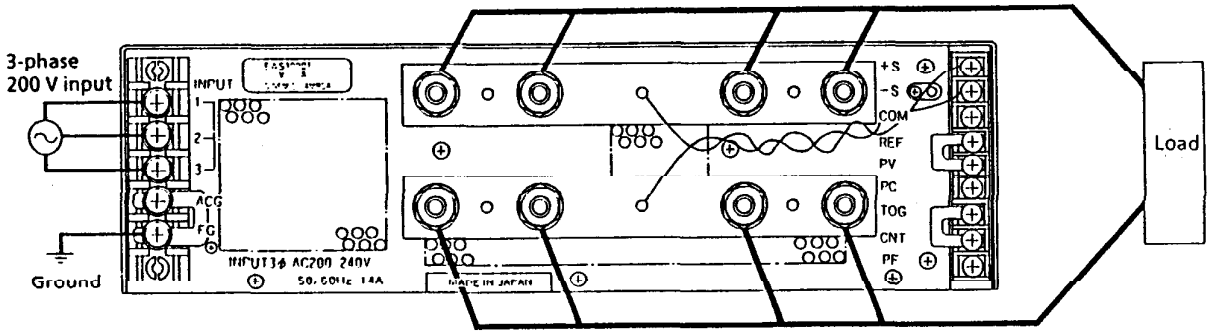
3-1 When Remote Sensing and ON/OFF Control Are to Be Used



* When a fixed-voltage power supply is to be used, the REF and PV terminals should be shorted together using the short piece supplied.
(A short piece has been inserted between the REF and PV terminals prior to shipment.)

3-2 When Remote Sensing and ON/OFF Control Are Not to Be Used

When no remote sensing is needed, short the +S terminal with the + output terminal, and the −S terminal with the − output terminal respectively, using the twisted wires supplied.



When no ON/OFF control is needed, short the TOG terminal with the CNT terminal, using the short piece supplied.

* Be sure to connect the remote sensing terminals. Otherwise, the overvoltage protection circuit activates to shut off the output.
* When a fixed-voltage power supply is to be used, short the REF and PV terminals together, using the short piece supplied.
(A short piece has been inserted between the REF and PV terminals prior to shipment.)

4. DESCRIPTION OF THE FUNCTIONS AND PRECAUTIONS

4-1 Output Voltage Adjusting Procedure

The output voltage setting can be changed by adjusting the output voltage trimmer pot (V.ADJ) on the front panel. Turning the trimmer clockwise increases the output voltage. The output voltage setting should be within ±20% of the rated output voltage value.

4-2 Remote Sensing Function

This function is used to compensate for a voltage drop (line drop) due to the wiring between the power output terminal and the load terminal. The line drop compensation voltage should be within ±20% of the rated output voltage value and be lower than the maximum output power value given in the power supply output power specification. As to the remote sensing wires, use shielded wires or twisted-pair wires.

When the remote sensing function is not to be used, short the +S terminal with the + output terminal, and the −S terminal with the − output terminal respectively, using the sensing wires supplied.

4-3 ON/OFF Control Function

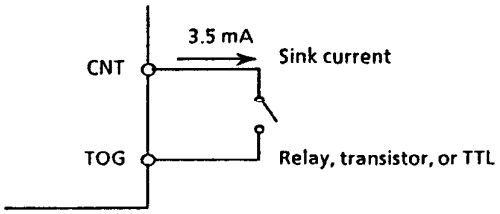
The output voltage can be turned on or off by an external signal without turning on or off the input power. Shorting the TOG and CNT terminals together turns the output on, and opening these terminals turns off the output. When this function is not to be used, short the terminals together using the short piece supplied.

Note that the terminals have been shorted by a short piece prior to shipment.

– Specifications and Functions –

1. It is TTL compatible. The maximum voltage applied to the CNT terminal shall be less than 30 V and the reverse voltage be less than -0.7 V. The control signal driver sink current shall be less than 3.5 mA.

CNT level with reference to TOG	Power output
"H" (2.0 V or more)	OFF
"L" (0.8 V or less)	ON



2. Control can also be exercised by opening or closing the contacts (switch, relay) or by turning the transistor on or off. (TOG-CNT shorted: Output ON, TOG-CNT opened: Output OFF)
3. Since the circuit is isolated from the input/output circuit by a photocoupler, control can be easily performed, independent of whether the power output is positive or negative. The TOG terminal should be connected with the GND of the control circuit.

4-4 Overcurrent Protection (Delay Shutdown OCP)

If an overload or shorted condition occurs and continues for more than five seconds, the output is shut off to protect the power supply and the load. To restore the output, it is necessary to shut off the input momentarily and, then turn on the input again. (As for the overcurrent detection time, the PF signal duration is detected.)
If the unit leaves the overload condition within the specified time interval, the output automatically restores to normal.

4-5 Overvoltage Protection (Tracking OVP)

This unit incorporates an output shut-off manual reset type overvoltage protection function. If the output voltage exceeds the specified voltage value, this overvoltage protection function is performed to shut off the output. To restore the output, it is necessary to shut off the input momentarily and, then turn on the input again.
Since an automatic tracking system is employed, the overvoltage protection detection point follows the set output voltage so as to perform a protection, according to the output voltage, at all times. It should be noted that the overvoltage protection detection point is fixed and cannot be changed. The α value of the specified voltage "Vo + α" (5 V type: 5 V + 1.0 to 2.0, OVP value: 6.0 to 7.0 V for 5 V output) is fixed. When the set output voltage is V_1, "$V_1 + \alpha$" is automatically set as the OVP detection point.

4-6 Over Temperature Protection

This unit incorporates an output shut-off manual reset type over temperature protection function. If the ambient temperature or the temperature inside the power supply exceeds a certain limit (detection temperature: 120°C ± 10%), this function is performed to shut off the output. To restore the output after it is shut off by the over temperature protection, it is necessary to shut off the input and, after the

temperature falls, turn on the input again. When the output is shut off, a PF signal is indicated.

4-7 Built-in Fan Stop Detection

The three cooling fans incorporated in the power supply are monitored for proper operation. If even one of the fans stops, the power output is shut off. At the same time, a PF signal is indicated.

4-8 Low Input Voltage Detection

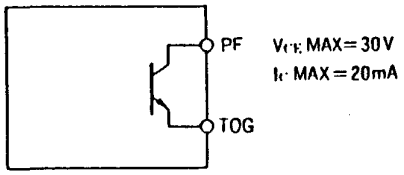
If the input voltage lowers to 140-165 VAC, the output is shut off. When the input voltage restores to normal, the output automatically recovers.

4-9 Low Output Voltage Detection

If the output voltage lowers to 75% to 80% of the set voltage value due to an input voltage drop, instantaneous power failure, or output overcurrent protection, the PF (power fail) signal goes to the "H" level to indicate the occurrence of an output abnormality.

Since an automatic tracking system is employed, the low output voltage detection point follows the set output voltage so that a detection point suited to the output voltage may be set at all times. The detection point is fixed and cannot be changed. The specified value "Vo×75% to 80%" is fixed. If the set output voltage is V_1, "V_1×75% to 80%" is automatically set as the detection point.

The PF signal is an open collector output, and it is isolated from the input/output circuit by an photocoupler.



4-10 Input Open Phase Detection

If one of the 3-phase input lines becomes open, or if one phase voltage falls below 160 VAC, the output will be shut off in about five seconds.

To restore the output to normal, once shut off the input and, after a while, apply a normal input line voltage again.

4-11 Output Ripple

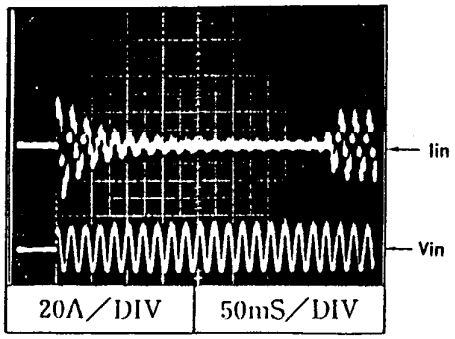
The maximum ripple voltage (including noise) given in the specification is the value at the power supply output terminals. If the load wire is long, the ripple at the load end may be excessive unless an electrolytic/film capacitor is connected to the load end. It should also be noted that an accurate measurement cannot be made if the ground lead of the oscilloscope probe is too long.

4-12 Input Surge Current Suppressing Function

This unit incorporates a thyristor-based input surge current suppressing circuit. If the input power is removed and reapplied within five seconds, this function will not be performed due to the retention characteristics of the thyristor.

When two or more power supplies are to be used, the setting of the input switch and the selection of an external fuse should be carefully made. For information on the input surge current suppressing circuit, switch, etc., refer to the Nemic-Lambda general catalog.

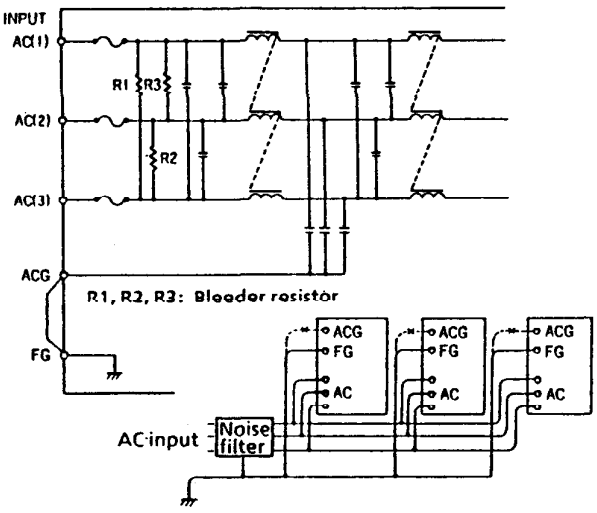
EWS 3000 Input Surge Current Waveform
(Input: 200 VAC, input phase angle: 90°, load: 100%, ambient temperature: 25°C)



4-13 Line Filter Ground Terminal (ACG Terminal)

The ACG terminal on the front panel is connected with the ground midpoint of the line filter circuit incorporated in the power supply. When the power supply is to be used as a single unit, short the ACG terminal with the FG terminal, using the short piece supplied.

When two or more power supplies are used, the leakage current increases accordingly. To reduce the leakage current, remove the short piece between the ACG and FG terminals. Further, to minimize noise, install a noise filter on the input line side.



4-14 Parallel Connection

Parallel connection of units can be used either (A) to increase the output current or (B) to use one unit as a back-up power supply.

(A) To increase the output current:

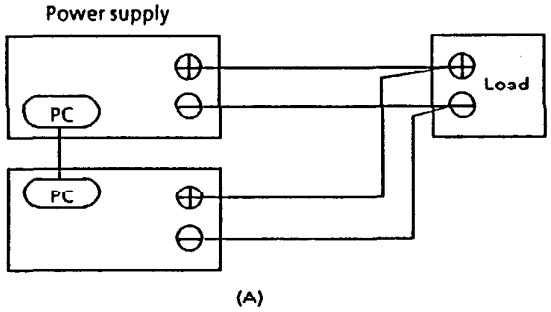
This power supply is provided with a current sharing function. With this function, up to five units can be operated to provide nearly uniform output currents, while monitoring each other's output currents.

(a) To use the current sharing function, connect the PC terminals of the power supplies with each other.

(b) Set the same output voltage.

(c) Use the same output load wires.

(d) For each unit, the output current should not be more than 80% of its rated output current value.



(A)

(B) To use one unit as a back-up power supply:

Two supplies (one being a back-up) can be used for one load to improve the reliability of the system.

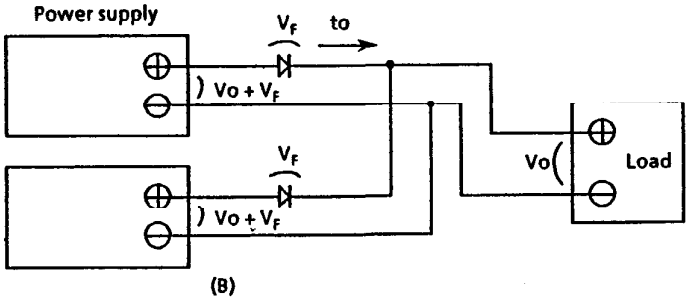
(a) Set the same output voltage.

(b) Use the same output load wires.

(c) The power supply output voltage should be increased in consideration of the diode forward voltage drop (V_F).

(d) The power supply output voltage and output power should be within the specifications.

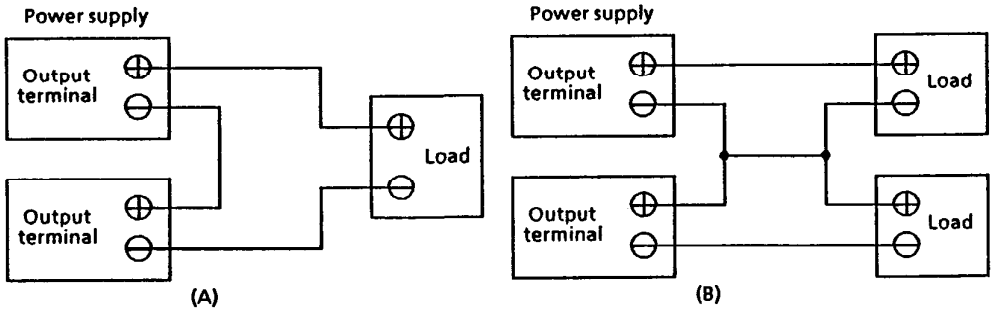
Output power (W) = (Vo + V_F) × Io



(B)

4-15 Series Connection

Series connection of units can be used either (A) to increase the output voltage or (B) to use them as ± power supplies.



(A) (B)

4-16 Master-Slave Operation

Two or more power supplies can be connected in parallel so that one unit (master power supply) may control the output voltages of the other units (slave power supplies).

This function can be used only when the power supplies are of the same type (up to five units).

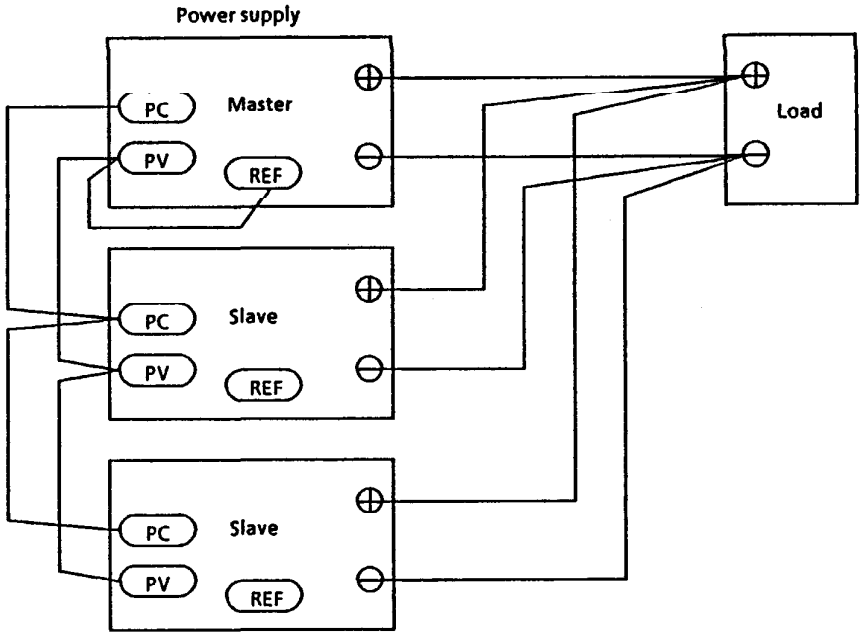
(a) To use the current sharing function, connect the PC terminals of the power supplies with each other.

(b) Connect the PV terminals of the power supplies with each other.

(c) Connect the REF and PV terminals of the master power supply.

(d) Use the same output load wires.

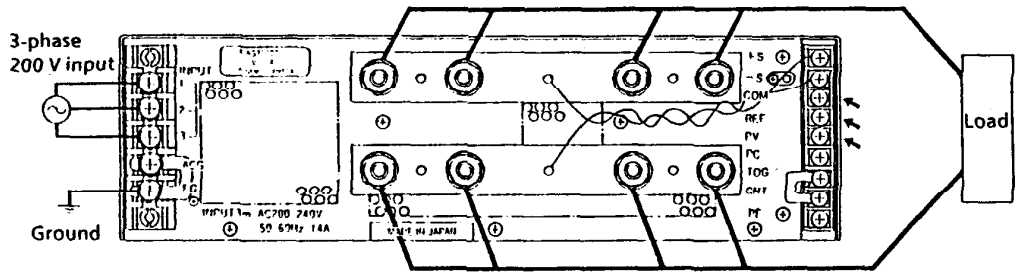
(e) For each unit, the output current should not be more than 80% of its rated output current value.



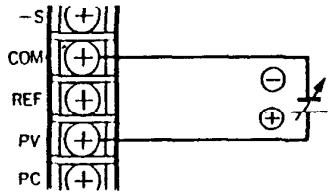
5. OUTPUT VOLTAGE CONTROL FUNCTION (EXTERNAL CONTROL)

The EWS3000T can be used not only as a fixed output voltage power supply, but also as an externally controllable variable output voltage power supply.

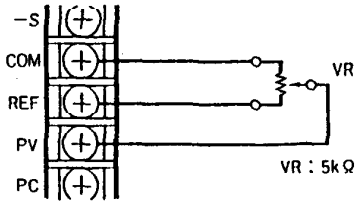
5-1 Terminal Connections Procedure



* Remove the short piece between the PV and REF terminals.
* As to control wires, use twisted-pair wires or shielded wires.



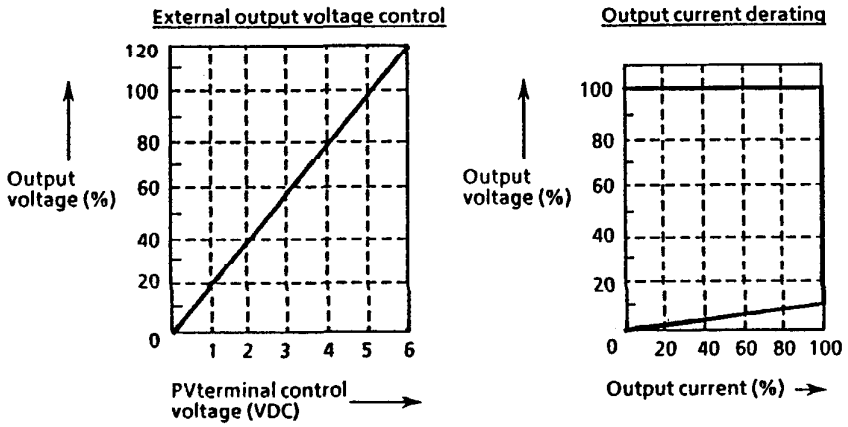
(A) Control by an external voltage



(B) Control by an external variable resistor

5-2 Control by an External Voltage

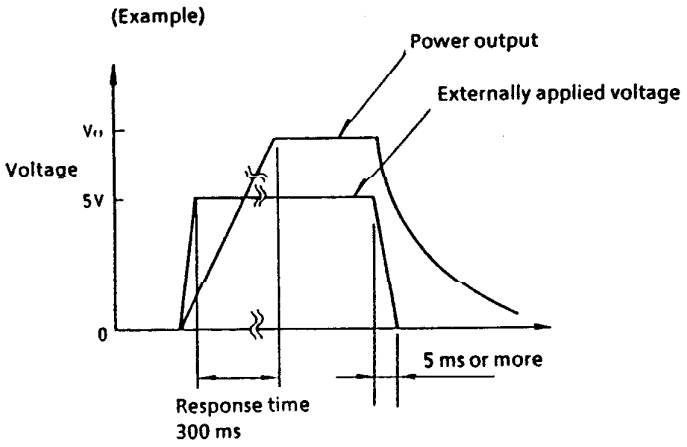
The output voltage can be externally controlled over the range between zero and the rated output voltage (100%) by applying an external control voltage to the PV terminal over the range between zero and 5 VDC (external control voltage ground: COM terminal). If external control is required up to 120% of the rated output voltage, apply a voltage between zero and 6 VDC to the PV terminal, and the output voltage can be controlled over the range between zero and its rated output voltage x 120%. Under external control, the output voltage setting accuracy is within ±2%. When the output voltage is less than 10% of the rated output voltage value, the allowable output current is within the derating range shown next page. For use at a voltage higher than the rated output voltage, the current value is such that the maximum output power may not be exceeded.



* Response characteristics by external voltage application

When the output voltage is set from zero to the rated value by applying an external control voltage, the response time is between 200 ms and 300 ms. The response time varies greatly with the load connected to the power supply, and it takes a certain period of time (response time) for the output voltage to rise.

The external control voltage change with time should be 1 V/ms or less, taken in connection with the overvoltage protection follow-up time.



5-3 Control by an External Variable Resistor

The procedure for using the PV and COM terminals is the same as that described in Section 5-2 Control by an External Voltage. However, a control voltage should be supplied from the REF terminal. Connect a variable resistor between the REF and COM terminals, and connect the midpoint of the variable resistor with the PV terminal.

When the output voltage is less than 10% of the rated output voltage value, the available output current is within the derating range shown in the previous section.
The upper voltage limit in this control mode is the rated output voltage (100%).
If external control is required up to 120% of its rated output voltage, perform the following steps.

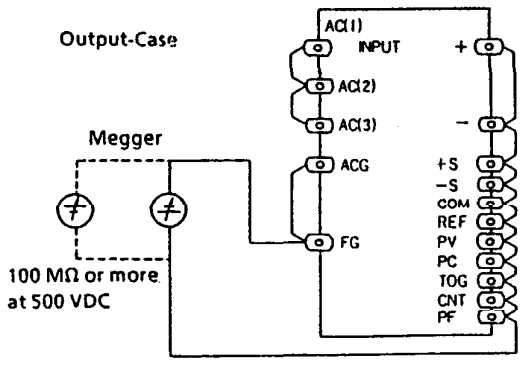
(1) Short the PV and REF terminals together, using the short piece supplied.
(2) Set the front panel voltage control to 120% of the rated output voltage.
(3) Shut off the input, and then remove the short piece between the PV and REF terminals.
(4) Connect the variable resistor between the REF and COM terminals, and connect the midpoint of the variable resistor with the PV terminal.
(5) Reapply AC input power

When the unit is used at a voltage higher than the rated output voltage, the current value is such that the maximum output power may not be exceeded.

6. INSULATION AND HI-POT TESTS

6-1 Insulation Test

For measurement between the output and case, use a DC megger (500 V maximum).
The insulation resistance is not lower than 100 MΩ at 500 VDC, 20°C, and 70% RH.
It should be noted that a high-voltage pulse may be generated when the test voltage is changed, depending on the type of megger. After testing, perform sufficient discharging with a resistor for safety.

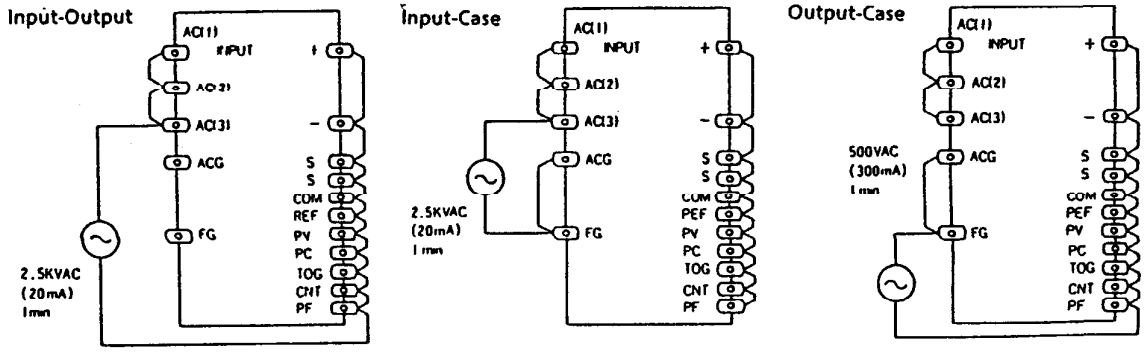


6-2 HI-POT Test

This unit is designed and constructed to withstand the following voltages applied between the input and case, between the input and output, and between the output and case. To perform a Hi-pot test at incoming inspection or on any other occasion, set an appropriate tester measuring current limit, and gradually increase the test voltage from zero. In a shut-off condition, also decrease the voltage gradually.

With a timer-incorporating tester, an impulse several times greater in level than the applied voltage may be produced to destroy the power supply, at the moment the switch is turned off by the timer. If using such a tester, avoid using the timer.

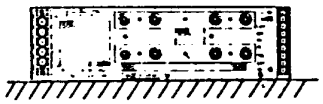
Voltage Application	Withstand Voltage	Current Limit
Input-output	2.5KVAC (for 1 min)	20 mA
Input-case	2.5KVAC (for 1 min)	20 mA
Output-case	500 VAC (for 1 min)	300 mA



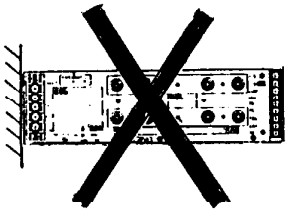
7. INSTALLING PROCEDURES

To install the power supply to the equipment, it is recommended to use the standard mounting (A). The mounting method (B) or (C) may also be used. However, in all cases, the power supply should be used within the output derating ranges shown below. Use of the mounting method (D) should be avoided because the power supply is not suited for such installation because of its mechanical design.

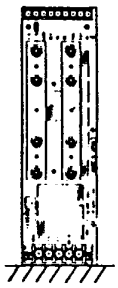
(A) Standard installation



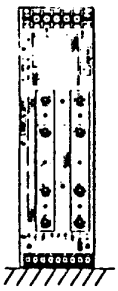
(D)



(B)



(C)

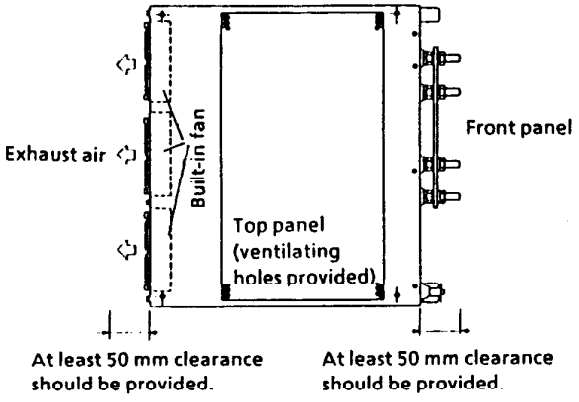


Output Derating by mounting direction

Model	EWS3000T		
Ambient temperature	Mounting Method		
	A	B	C
40°C	100%	100%	100%
50°C	100%	100%	100%
60°C	70%	70%	70%

* In the table, 100% represents the maximum rated output.
* Two or more units may be used with the side panels close to each other.

The power supply is so constructed that the ambient air may circulate through its front, top, and rear panels to cool the inside of it. When using the power supply, allow as much clearance between the panels and the other instruments as possible.



8. WIRING PROCEDURES

- Be sure to isolate the output load wires and ON/OFF control wires from the input line. Further, to improve the noise susceptibility twist these wires.
- For wiring, use as short and thick wires as possible.
- To reduce noise more effectively, it is recommended to connect a small capacitor to the load end.
- To ensure safe operation and protect the unit against noise, connect the FG terminal with the ground terminal of the equipment.
- The input/output terminal screws should be tightened with the following torques.
  Signal terminals (M4 screws) : 13 kg·cm
  Input terminal (M5 screws) : 25.5 kg·cm
  Output terminal (M8 bolts) : 110 kg·cm

9. RATED FUSE CURRENT

When a fuse is to be installed outside the power supply, use a fuse that has the same capacity as the one installed in the power supply. When using such a fuse, it is necessary to take into consideration not only the input current during operation but also the input surge current at power-on.
For information on the fuse and input surge current, refer to the Nemic-Lambda general catalog.
Current rating of the fuse for the EWS3000T: 30 A

10. BEFORE CONCLUDING THAT THE UNIT IS AT FAULT...

Before concluding that the unit is at fault, make the following checks.

1) No output voltage appears, or the output voltage is excessively low.
   - Check if the specified 3-phase input voltages are connected (input terminals "1", "2", "3").
   - Check if the remote sensing terminals (+ S, − S) are correctly connected.
     If the + S and − S terminals are open, the overvoltage protection function is performed to shut off the output.)
   - Check if the ON/OFF control terminals (TOG, CNT) are correctly connected.
     If the CNT terminal is open, no output is produced.
   - Check if the REF and PV terminals are correctly connected.
   - Check if the output voltage control (V.ADJ) is properly adjusted.

2) Excessive load/input reguration

- Check if the specified 3-phase input voltages are connected (input terminals "1", "2", "3").
- Check if the regulation measurement is made at the correct points.
  Local sensing: Output terminals " + ", " – "
  Remote sensing: Load terminals
- Check if excessively thin wires are used as the input/output wires.
- Check if the terminal screws are tightened to the specified torques.

For more details on check items, refer to the Nemic-Lambda general catalog.

11. EWS3000T FULL OPTION MODEL

An EWS3000T full option model, which incorporates more abundant functions than the standard model, is also available. With these functions, a very high power system can be easily designed and constructed from the single power unit.

Functions available: Fan alarm signal output, overvoltage detection signal output, overvoltage protection detection point setting, PF signal detection point setting, overcurrent detection signal output, output voltage monitor signal output, ON/OFF control, external output voltage control, input lack detection signal, etc.iik