

Instruction Manual

MODEL DHOP series



Matsusada Precision



For Safe Use

◆ Introduction

This product generates high voltage and energy.

In order to use the product safely and prior to using the product, please read the instruction manual to the end before use in order to use the product safely, because there is a danger of death or serious injury due to electric shock. Please use the product after fully understanding how to use the product properly. We are not responsible for any damages incurred by not observing the warnings and procedures stated in the instructions, so be forewarned.

Keep the instruction manual carefully so that you can view it whenever you need.

◆ Symbols

In order to use the product safely, the following symbols are displayed in the instruction manual and on the product. Understand the meaning of the symbols and observe each item. Depending on the product, some symbols may not be used.



WARNING

Indicates content that could cause death or serious injury.



Frame or chassis terminal



CAUTION

Indicates content that could cause injury or damage to property.



High temperature attention
Touching it carelessly may cause burns.



Indicates danger / warning / caution. Refer to the instruction manual when using the part with this symbol.



Power On



Indicates where high voltage is handled. Touching it may cause electric shock and result in death or serious injury.



Power Off



This symbol means "Prohibited".



Power standby
The product will not be completely disconnected from the power supply even if it is set to standby.



Indicates that it must be performed in order to demonstrate the performance of the product.



Bistable push button switch on



Protective earth terminal
(ground terminal for electric shock prevention)



Bistable push button switch off



Ground terminal



Alternative Current



◆ **Understand the risk.**

Products generate high voltage and energy.

An electrician or equivalent knowledge must read the instruction manual to the end and familiarize yourself with the proper use and danger of the product.

If you want the product to be handled by another person, limit it to those with knowledge of electricity, and have people who are familiar with correct use and danger of the product conduct education and training before handling it, or handle the product under the supervision of those who are familiar with the proper use and danger of the product. Persons, with the exception of the above, must not handle the product.

◆ **Do not open the product case and panel.**

Do not disassemble, remodel, or repair by opening the product case and panel yourself. There is a high voltage area inside, which may possibly cause electric shock and fire.

Never remove the case and panel of the product, since the safety and function of the product will not be guaranteed.

◆ **It is not suitable for use in places where there is a possibility of a child being present.**

The product is designed assuming that it will be used in places where there are only adults, such as factories and laboratories. Do not use it where there is a possibility of a child being present.

◆ **Ensure that the product is handled only by a limited number of people.**

Only those who are familiar with the proper use and danger of the product, or those who are educated and trained by them should install the product. Any other person handling the product may cause electric shock, burns and injuries.

◆ **Ground it.**

When the product has a protective ground terminal or GND terminal, connect it to the ground.

If the input terminal of the product is an inlet type, connect to the power outlet with the ground using the supplied power cable or a power cable suitable for the area to be used. If it is not connected to the ground, there is a risk of electric shock and fire, which is extremely dangerous.

◆ **About power supply cable**

If there is a power supply cable attached to the package or product, it cannot be used for other products. In the case of a product that does not include a power supply cable, you must purchase an optional power supply cable suitable for the operating environment and the area, or you must prepare it yourself.

◆ **About the connection of the power supply cable**

Connection of the power cable should be done by an electrician or someone who has equivalent knowledge and is familiar with the correct usage and danger of the product. Refer to the page about connection of the input cable in the instruction manual and carry out work. For products that have acquired safety standards, also refer to the page that describing overvoltage categories.

◆ **About input voltage**

For the input voltage of the product, refer to the page describing the input terminal of the product and the input voltage in the instruction manual. Do not supply input exceeding the specifications of the product.

◆ **About the fuse**

The product contains a protective fuse. In the case of a product in which a fuse holder is arranged externally, it is possible to replace the fuse. For the replacement method, refer to the instruction manual.

If the product does not have a fuse holder externally, the user cannot replace the fuse. If the fuse blows out, do not open the case or panel. Please contact our sales representative.

◆ **Do not modify or damage the cable.**

It may cause electric shock and fire.

◆ **Designed for indoor use**

Use the product indoors. Do not use it outdoors or indoors where there is a possibility of water leakage, flooding, or crown.



◆ **About operating temperature and humidity**

Use within the range of operating temperature and humidity stated in the instruction manual.

Do not use it in a place where the ambient temperature becomes higher than the operation temperature of the product or in a narrow closed place.

◆ **Do not install in places that cause condensation.**

Do not install it in places that cause condensation, where it is exposed to steam or water vapor.

Insulation deteriorates, causing breakdown, electric shock, or fire.

◆ **Do not place anything on top of the product.**

Falling or collapsing is dangerous.

◆ **Do not put any objects on or in the product.**

Do not put any objects such as metal or liquid in the product through the inlet etc. Failure, electric shock, fire may result.

◆ **Operate the product with your right hand.**

In case of electric shock when manipulating the product, in order to reduce the risk of current flowing through important organs of the body. Keep your left hand off from the product and operate with your right hand.

◆ **Do not touch the wiring or load connected to the output terminal or output terminal during operation or immediately after output stop.**

Very high voltage is applied to the terminals during normal operation and trial operation.

Touching it will result in electric shock.

In addition, since a capacitor is connected to the terminal, high voltage remains on the terminal even immediately after stopping the output. To avoid electric shock, do not touch the terminals.

◆ **Turn off the power when touching the terminal.**

Before touching the terminals of the product, turn off the power and check that the power has actually turned off.

There is a capacitor at the terminal, and it is particularly dangerous to touch it immediately after turning off the power supply. Be careful of the electric charge of these capacitors and connect it to earth to discharge it completely. Remove input line (AC line) during work.



CAUTION

◆ **Install horizontally.**

Do not install the product in the reverse direction and the lateral direction. Internal heat dissipation becomes insufficient, parts deteriorate, there is a risk of smoke and fire.

◆ **Do not install in the place where cool air blows directly.**

There is a danger of condensation, leakage current and burnout.

◆ **Do not install the product in places around corrosive gas or liquid and places where chemicals handled.**

There is a danger of parts being deteriorated, smoking and burning.

◆ **Avoid using it in a place with much dust.**

If dust accumulates in the air inlet, remove it promptly.

If dust accumulates in the air inlet, cooling of the product is hindered and it may cause malfunction.

◆ **Do not block intake port and exhaust port.**

Secure more than 30cm space on the front and back of the product.

If the intake port and exhaust port are blocked, the specified performance of the product cannot be demonstrated and parts are deteriorate, which may cause smoke and fire.

◆ **When work such as welding is conducted near the product, disconnect all the wires from the product.**

◆ **Do not wipe with chemicals (thinner etc.) or wet cloth.**

There is a danger of electric shock, electric leakage, burnout from chemicals or water entering the inside of the product.

◆ **About fan replacement**

In the case of products with air-cooling fans, the fan has a lifetime part. As wear, deterioration, etc. progress with the lapse of use time, operation may become unstable. Also note that the lifetime of fan varies greatly depending on the environment where it is used (temperature, humidity, dust, etc.). In order to use the product for a longer time, it is necessary to replace the fan periodically. For replacement, please contact our sales office (replacement require separate repair charges). Do not exchange fans with other users because there is a danger of electric shock, etc.

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1 Introduction

1-1 Introduction

Thank you very much for your purchase of our product.

We have done our best for the quality control of our products. Please handle this unit properly according to this instruction manual so that you can use the full performance of this unit safely for long. We have carefully prepared this instruction manual, but if you find any doubtful or unclear point or any omission, please kindly contact us shortly.

1-2 Unpacking

When unpacked the box, check the following accessories are enclosed with the unit.

〈Accessories〉

- AC input cord (1 pc.)
- Instruction manual
- D-sub15 pin

1-3 Environmental Requirements

- Place and use the unit horizontally.
- Never place anything on the unit.
- Secure a space around the unit for good ventilation.
- Do not expose the unit for overly aggressive environment, such as salt mist, corrosive or explosive gases, steam, or dirt.

1-4 Points to be Careful About in Handling.

WHEN TOUCHING LOAD AFTER TURNING OFF THE OUTPUT

1. Make the setting of an output voltage to zero (0). Turn off the OUTPUT ON/OFF switch.
2. Check and confirm that the voltage is zero at an output voltmeter of this unit.
3. Turn off the POWER ON/OFF switch.
4. Earth an output for more than 10 seconds, check and confirm that the voltage is zero with another high voltage meter. It is especially dangerous that the load is capacitive or a long cable is used.
5. Make it a rule to touch load with right hand.

FOR SAFE OPERATION

1. Lay an insulation sheet which can withstand the voltage to be used on the floor on which an operator stands, carry out the operation.
2. When operating the unit and load, do so with right hand and keep left hand putting in the pocket, taking care not to touch other objects.
3. After turning off the voltage (even if a long time has passed after turning off), if you touch load, be sure to earth the output longer than 10 seconds.

1-5 What to do Before Calling for Service

In case of no output

1. Check whether or not a specified voltage has been inputted.
Input voltage: 100 - 240VAC, +/-10%, 50/60Hz, single phase
2. Check whether or not properly wired.

1-6 Characteristics of Bipolar Amplifier

Capacitive load

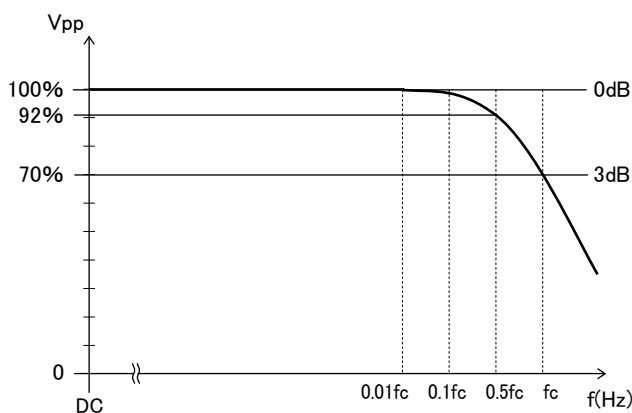
A capacitive load may cause oscillation when it is more than 100pF. In such a case, insert a power resistance with 1Ω ($10\mu\text{F}$) $\sim 1\text{k}\Omega$ (1000pF) in series with the output. Be careful that the frequency bandwidth is limited depending on the resistance inserted in series and the capacity of the capacitive load.

Inductive load

Some inductance value of an inductive load may cause resonance in CC mode. In such a case, connect a C-R series circuit between the output terminals to prevent resonance.

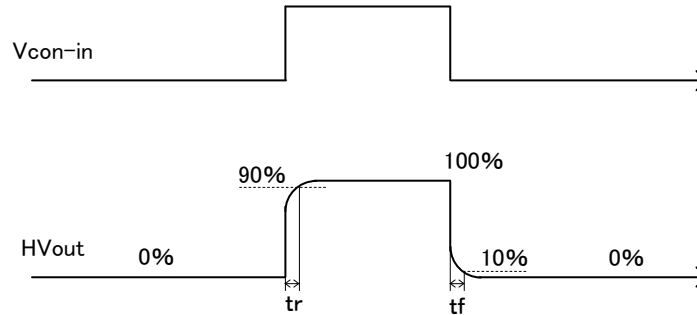
Response speed

When accurate output waveform is required, select a bipolar amplifier operating with a higher enough frequency than the used frequency. In case of using in sine waves, 3 to 5 times wider frequency bandwidth is required and around 10 times wider one is required in case of using in square waves in general. Inadequate bandwidth causes not only decrease in the output amplitude but much difference between the input and output phases. Therefore, use the unit while monitoring the output waveform.



Rise time

The responsiveness is sometimes expressed by a rise time (as shown in the drawing below). The rise time of a bipolar amplifier at a response speed of ($=$ frequency bandwidth) f_c [Hz] is generally acquired by “ $t_r = \text{approx. } 0.35/f_c$ ”
The fall time t_f equals to t_r .



1-7 Connection Precaution

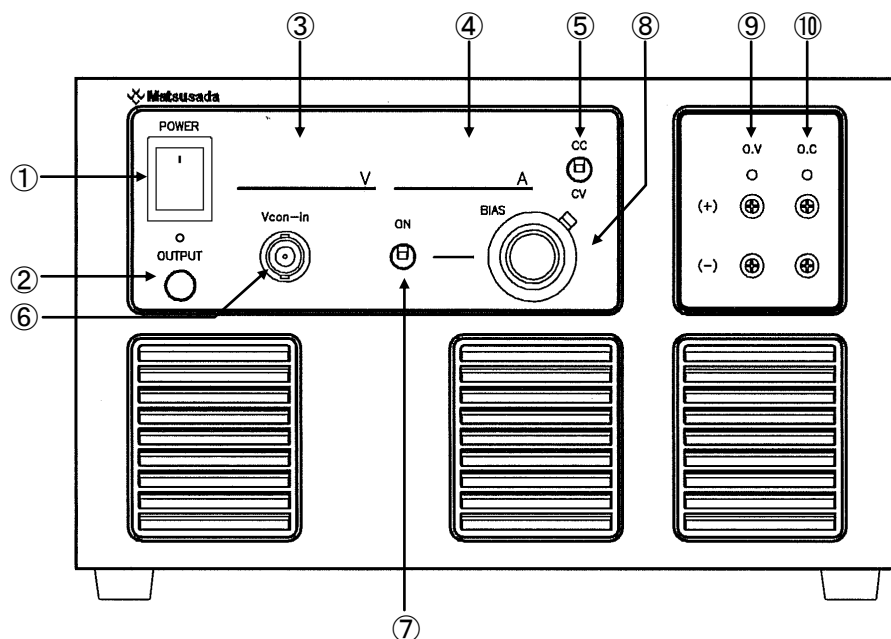
- Since minus and common are internally connected, use the negative common.

2 Products Lineup

Model	Output voltage (rms) [V]	Output current (rms) [A]	Frequency response [kHz] (-3dB)	Size W×H×D [mm]	Weight. [kg] (typ.)
DHOP20-12	±20 (14)	±12 (8.4)	CV : DC to 100 CC : DC to 10	210x132x500	7.0
DHOP45-5	±45 (31.5)	±5 (3.5)			

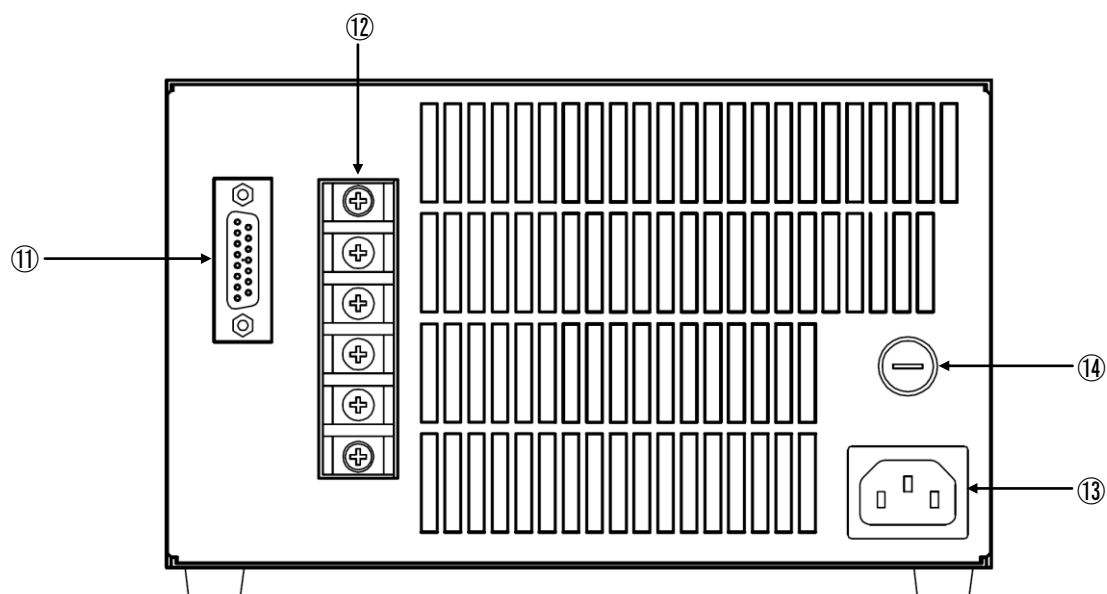
3 Exterior View Diagrams

3-1 Front Panel



- | | |
|--------------------------|--------------------------|
| ① POWER ON/OFF switch | ② OUTPUT ON/OFF switch |
| ③ Voltage meter | ④ Current meter |
| ⑤ CV/CC select switch | ⑥ Vcon-in terminal |
| ⑦ Bias ON/OFF switch | ⑧ Bias setting dial |
| ⑨ Output voltage limiter | ⑩ Output current limiter |

3-2 Rear Panel



- | |
|-----------------------------------|
| ⑪ Control connector |
| ⑫ Output terminal |
| ⑬ AC input connector (100 - 240V) |
| ⑭ FUSE (10A) |

4 Instructions for Handling

4-1 Overview

This product is a bipolar amplifier operating on the constant voltage mode in the constant voltage control, and on the constant current mode in the constant current control, following the input control voltage waveform.

4-2 Wiring

- Wire proper electric wire to the load as short as possible.
- Use PVC wires (105°C) withstanding the working voltage
- Consider the current capacity of wires for the load and the length limitation of the output wires for sensing. Refer to the table below to determine the wire thickness.

AWG	mm ²	Peak current [A]
18	1.1	2
16	1.3	7
14	2.1	11
12	3.3	18
10	5.3	23
8	8.4	39

4-3 Operations

1. For your safety, always check the wiring between the unit and load, especially grounding.
2. Turn on the power switch. Digital display lights up.
3. Turn on the OUTPUT ON/OFF switch. The red indicator lights up to indicate that output voltage and current set with the Vcon-in or the BIAS setting dial is output.
4. The Vcon-in input controls the output voltage on the CV mode and the output current on the CC mode. The input impedance is 10k Ω .
5. Voltage monitor
Output 0 to $\pm 10V$ to the rated output voltage. Output impedance is 1k Ω .
6. Current monitor
Output 0 to $\pm 10V$ to the rated output current. Output impedance is 1k Ω .

4-4 Select CV/CC setting

Use the CV /CC select switch.

	CC mode	CV mode
Vcon	Output current	Output voltage
- 10V	- rating	- rating
0V	0A	0V
+ 10V	+ rating	+ rating

4-5 Using BIAS

Switching the bias voltage ON/OFF switch to the ON position makes it possible to adjust the bias voltage using the BIAS dial. The bias for the output voltage can be controlled on the CV mode and bias for the output current on the CC mode.

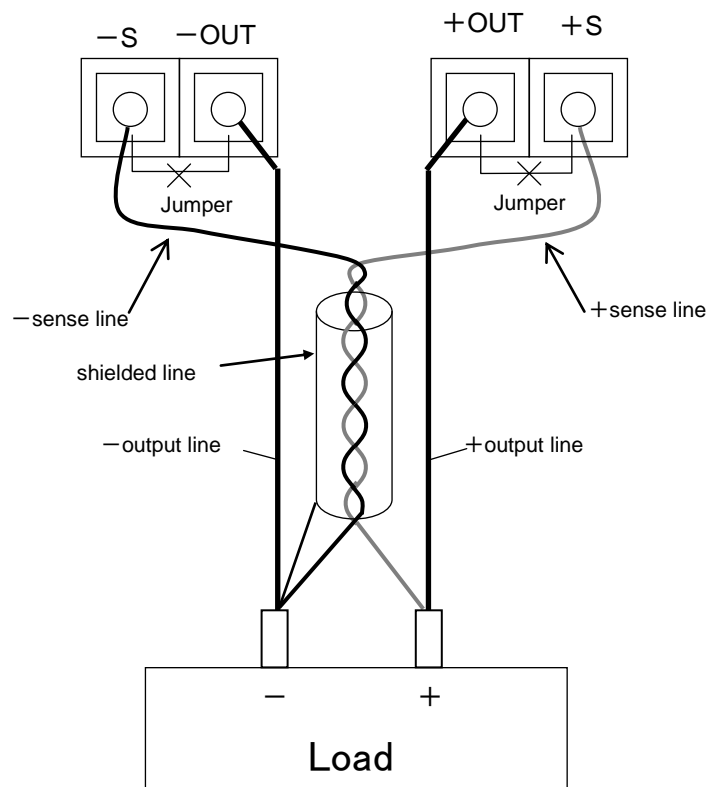
	CC mode	CV mode
Reading	Output current	Output voltage
000 (ccw)	- rating	- rating
500	0A	0V
1000 (cw)	+ rating	+ rating

4-6 Remote Sensing (Effective in DC operation only)



+S and -S shall be connected with output terminals (+sense → +OUTPUT terminal, -sense → -OUTPUT terminal), when remote sensing function is not used (or when the unit is connected in parallel or series). If the unit is operated without connecting those terminals, it can cause failure.

- The remote sensing function allows the unit to move the voltage detection point to another point such as the load or other points from the output terminal.
- The voltage drop of the lead wires is compensated up to 0.5V.
- Use twisted or shielded wires as the lead wires for the remote sensing.
- The sense terminals are located on the rear panel. Make connections as described below:
 1. Turn off the unit. Check that there is no voltage on the output terminal, and remove the jumpers between +S and +OUTPUT terminals, and -S and -OUTPUT terminals.
 2. Wire the remote sensing wires as shown below.
 3. Ground the shield at one point: the unit side or load side.
 4. Turn on the unit.



4-7 Other Features

a) Output Voltage Limiter

The upper limit value of the output voltage is adjusted from 0% up to 110% with the OVP setting volume on the front panel.

Follow the procedures below to set it.

1. Turn off the unit. Check the output voltage. If no voltage, remove the load.
2. Set the BIAS and OUTPUT switches to OFF. Set the CV/CC select switch to CV.
3. Turn on the unit. Set the OUTPUT switch to ON. Apply 12Vdc to the Vcon-in. The upper limit voltage set currently will be output. (Approx. 110% of the rated voltage set at the factory.)
4. Turn the OVP setting volume to set your desired value.

b) Output Current Limiter

The upper limit value of the output current is adjusted from 0% up to 110% with the OCP setting volume on the front panel.

Follow the procedures below to set it.

1. Turn off the unit. Check the output voltage. If no voltage, remove the load.
Short-circuit the +OUT and -OUT of the output terminal.
※ Select a proper electric wire for the short-circuit.
2. Set BIAS and OUTPUT switches to OFF. Set the CV/CC select switch to CC.
Set the BIAS dial to 5.0.
3. Turn on the unit. Set the OUTPUT and BIAS switches to ON.
Slowly turn the BIAS dial clockwise until the output current limit works (until the output current does not increase). (Approx. 110% of the rated current set at the factory.)
4. Turn the OCP setting volume to set your desired value.

c) Power outage protection

The unit equips the function not to turn on the output automatically after recovery from a power outage. To reset it, turn off and the OUTPUT switch.

4-8 Overcurrent Protection

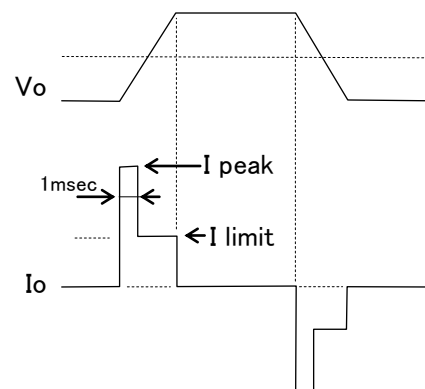
The unit equips two types of overcurrent protection.

The previously mentioned output current limiter limits a steady current and the response speed is approx. 1 [ms].

Another one is a high-speed response type to protect amplifier elements in the units and limits pulse current at rectangular waveform or when capacitive load is connected, but the limit value is two times higher than the rated current.

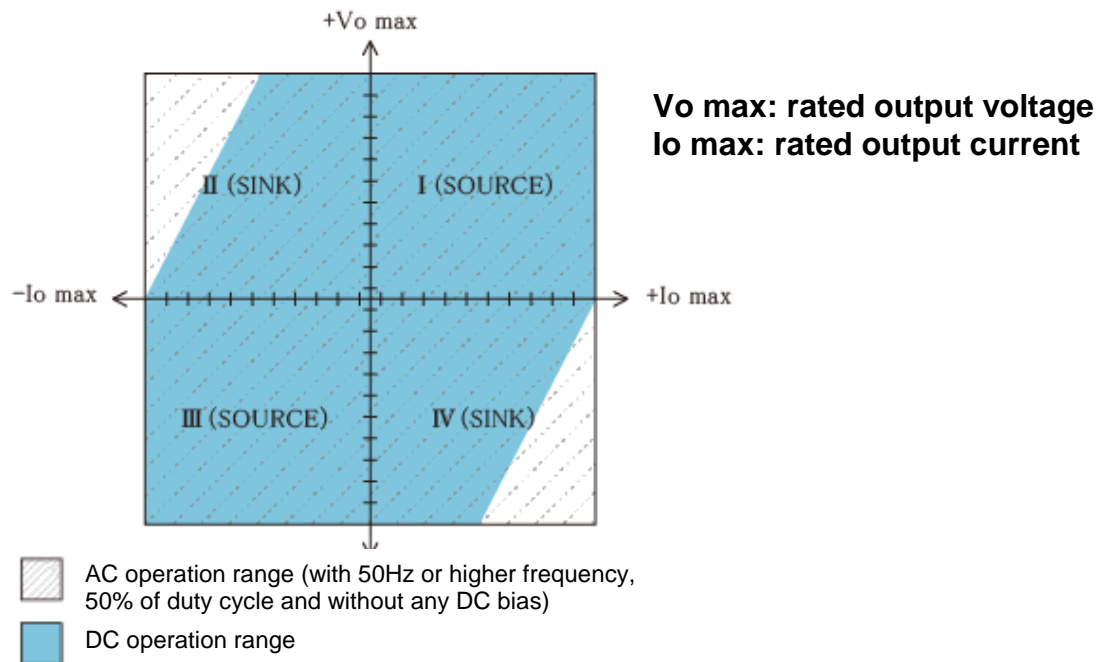
When such a condition is repeated, that means two times the rated current always flows, it can result in malfunction or deterioration.

In that case, lower the frequency or insert a resistor in series to the load.



4-9 Output Range

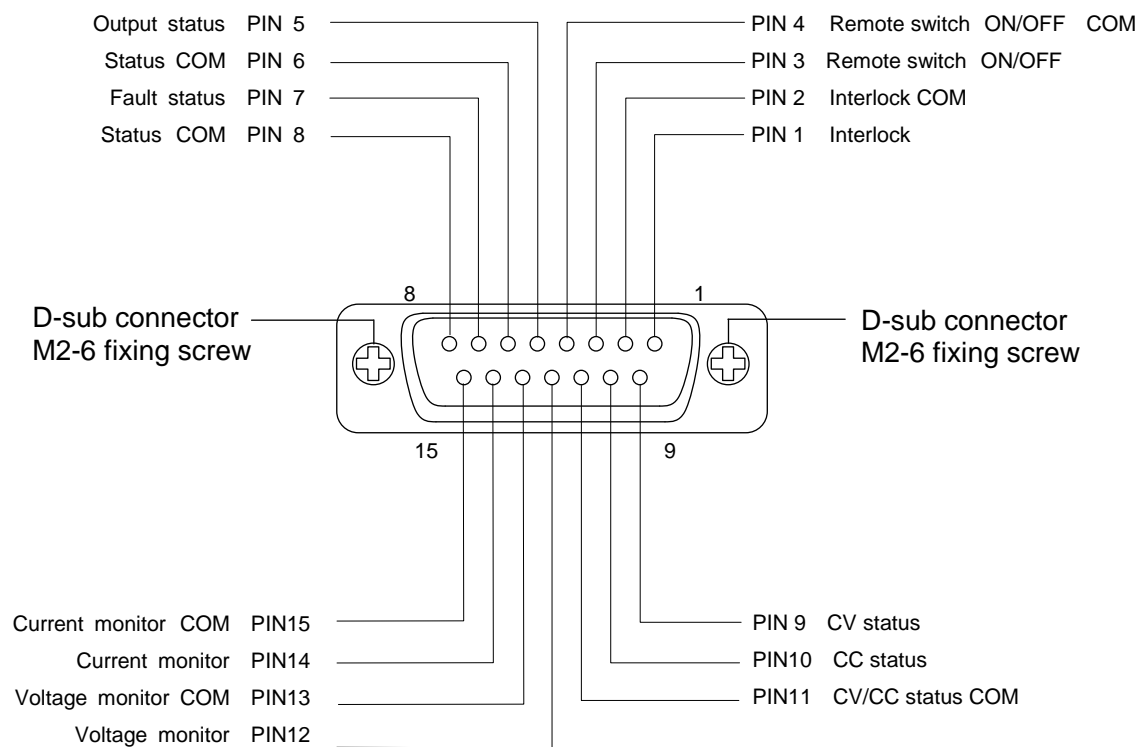
This amplifier is operatable in the four-quadrant output range (unipolar type is operated in the two-quadrant range), but when it is operated in DC mode or in low frequency, derate the output as per the following diagram.



Please avoid continuous use in high frequency.
 It increases internal loss and leads to being in failure.

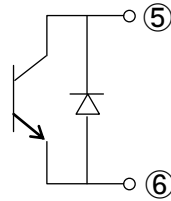
5 Standard Functions

5-1 Control connector



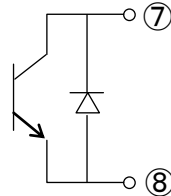
5-2 Output Status

While output switch is turned ON,
a short-circuit between ⑤ and ⑥ occurs.
(About 100Ω)



5-3 Fault Status

When temperature fault occurs,
a short-circuit between ⑦—⑧ occurs.
(About 100Ω)



5-4 CV Status

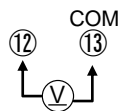
Operating in CV mode, the voltage between ⑨ and ⑪ should be 5V.
Current limiting resistance is 330Ω.

5-5 CC Status

Operating in CC mode, the voltage between ⑩ and ⑪ should be 5V.
Current limiting resistance is 330Ω.

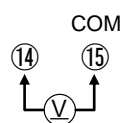
5-6 Voltage Monitor

Output 0 to +/-10V to the rated output voltage. The output impedance is 1kΩ.



5-7 Current Monitor

Output 0 to +/-10V to the rated output current. The output impedance is 1kΩ.



6 Optional Features

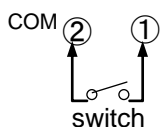
6-1 Interlock (LD)

The output can be turned off with Interlock.

For safety reason, once cut off, Interlock cannot be used to resume the operation.

Turn off the OUTPUT ON/OFF switch to reset the condition.

Interlock action
with switch



Interlock ACTION

Short Output ON
Open Output OFF

Interlock action by open collector.

Note 1

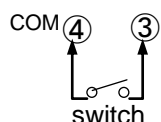


An open collector is also usable.

6-2 Remote ON/OFF Switch (LS)

The output can be turned on and off with remote switch.

Remote switch action
with switch



REMOTE SWITCH ACTION

Short Output ON
Open Output OFF

Remote switch action with an open collector.

Note 1

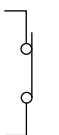
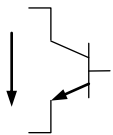

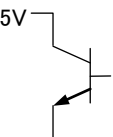


An open collector is also usable.

※ Note1: Precautions for use of an open collector

When an open collector is used for the Remote ON/OFF function, follow the requirements below.

DEFINITION OF OPEN COLLECTOR

OUTPUT	SWITCH	OPEN COLLECTOR
ON	 Short	 VCE 0.4V or less (10mA)
OFF	 Open	 VCE 2V or more (Open 5V)

6-3 Disable Power Outage Protection (LN)

Power outage protection is installed in standard (see.4-7-c), but this function can be disabled with this option. That means the unit will automatically start and output voltage after recovery of the power outage.



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