OPERATION MANUAL

# PMC-A SERIES

## REGULATED DC POWER SUPPLY

PMC18-1A
PMC18-2A
PMC18-3A
PMC35-0.5A
PMC35-1A
PMC35-2A

## IMPORTANT

This instrument cannot be controlled by using KIKUSUI's PIA3200 (GPIB interface), if its ROM version number is elder than 1.03. Please order your KIKUSUI agent for ROM version-up, if you need it.



KIKUSUI PART No. Z1-000-582 IA000791

PMC-A

PLEASE READ BEFORE USING

# Request to Users

## ■ Operations

- This products must be used only by qualified personnel who understand the contents of this operation manual. If it is handled by disqualified personnels. Electrical hazards may result. Be sure to handle it under supervision of qualified personnel (those who have electrical knowledge) .
- If any abnormality or failure was detected in the products. Stop using it immediately and contact Kikusui or Kikusui agent.
- Make sure the AC input voltage setting and the fuse ratings are satisfied and that there is no abnormality in the AC power cable.

Be sure to unplug the power cable before checking the voltage setting, fuse ratings and AC cable.

Do not remove the cover.

## ■ Installation

- Be sure the environmental condition where the products to be installed meets all requirements listed in the operation manual.
- Connect the ground terminal ⏚ to electrical ground (safety ground) .
- When supplying power to the products from a switchboard, be sure work is performed by a qualified and licensed electrician or is conducted under the direction of such a person.
- Be sure to use the input power cable that is included along with this products from factory. Consult Kikusui or Kikusui agent if other cable than included is to be used by some reason.

## Maintenance and inspection

- To prevent electric shock, be absolutely sure to unplug the power cable before perform maintenance or inspection.
- Do not remove the cover when performing maintenance or inspection. Consult Kikusui or Kikusui agent before uncover the products in case if it is so necessary.
- To maintain performance and safe operation of the product, it is recommend to conduct a periodic maintenance, inspection, cleaning, and calibration.

## Relocation

- Disconnect all cables when relocate the product.
- Use two or more persons when relocate the product which weights more than 20 kg. The weight of the products can be found in this operation manual.
- Be careful of harming protruded parts of the products such as output terminals, terminal boards or heatsinks when moving.
- Use extra precautions such as using more people when relocating into or out of present locations including inclines or steps. Also handle carefully when relocating tall products as they can fall over easily.
- Be sure the operation manual are included whenever the product is moved, relocated or possession is passed to another party.

your have any questions, contact Kikusui or Kikusui agent.

KIKUSUI

# SAFETY SUMMARY

Following warnings and cautions must be observed during all phases of the operation of this instrument.

*WARNING*

◎ Ground this instrument to prevent electric shock.

- Be sure to ground the GND terminal ⏚ of the rear panel.
- Incorrect grounding can cause serious personal injury.

◎ Do not remove the cover.

- Do not touch the inside this instrument.

◎ Do not use in explosive atmosphere.

- Do not operate this instrument in explosive or flammable atmosphere.

*Caution*

◎ Do not exceed the input power ratings.

◎ Use a proper fuse.

◎ Do not use a failed instrument.

- Disconnect the power cable of the damaged or defective instrument from the AC outlet.
- Do not use the Power Supply until it is repaired.

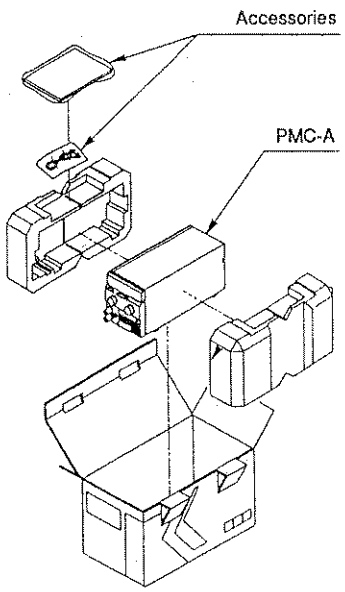
## Warning, caution and other safety symbols shown in this operation manual and on this instrument

Following symbols are shown in positions where special attention is called for handling this instrument.

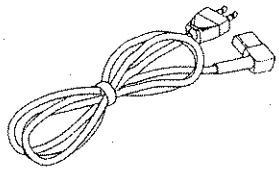
| This instrument | Operation manual | Description |
|---|---|---|
| **WARNING** | *WARNING* | Indicates a possibility of personnel hazard.<br>• Never fail to follow the operating procedure. Incorrect operating procedures may result in personal injury.<br>• Do not proceed beyond the WARNING sign until the indicated conditions are fully understood and met. |
| **CAUTION** | *Caution* | Indicates a possibility of damage to the Power Supply.<br>• Never fail to follow the operating procedure. Incorrect operating procedures may damage the Power Supply or other equipment.<br>• Do not proceed beyond the CAUTION sign until the indicated conditions are fully understood and met. |
| ⚠ | | Operation manual reference symbol<br>• This mark means that you should refer to the relevant section of this operation manual. |
| ⏚ | | Grounding terminal |
| | < Note > | Supplementary description |

## CHECK AT UNPACKING

This instrument was carefully tested and inspected both mechanically and electrically before shipment, to ensure its normal operation.
This instrument should be checked upon receipt for damage that might have occurred during transportation.
When you receive the Power Supply, check it for any obvious damage that may have occurred during shipment.



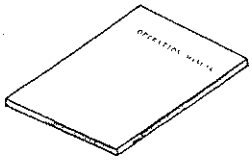

**Accessories**



• Input power supply cable (one)

• Contacts for analog control (ten)

• Fuse (one)



• Operation manual (one copy)

## PACKING FOR RE-SHIPMENT

To re-shipment this instrument, use the packing materials in which it was delivered. See the above illustration when you pack it.

- Disconnect the input power cable, load cables and control connector.
- If you have discarded the packing materials, please order your KIKUSUI agent for new ones.

# CONTENTS

# Chapter 1 GENERAL DESCRIPTION

The PMC-A series Regulated DC Power Supply is an automatic constant voltage/constant current shift type. It employs a series regulator system and delivers a stable output with low noise.

- The PMC-A series, which has two bright 3-1/2digit LED display meters, displays the output voltage and the output current or their settings.
- The potentiometers for the output voltage and current setting are 10 turns wire wound type, allowing high-resolution setting and stable output.
- The output switch is an electronic switch. It causes no chattering or noise. It can be controlled from the panel or from a remote place.
- The output voltage and current can be remote-controlled by an external analog signal (voltage or resistor). The PMC-A series can be used as a system component of an automation system with GPIB interface such as KIKUSUI's PIA 3200.

The PMC-A series can be used in a wide application field from use in a laboratory for experiment to that on a production line for testing.

# Chapter 2 PRECAUTIONS AND PREPARATION FOR USE

## 2.1 Inrush Current

- When the power switch is turned on, an inrush current of 20-30A peak current and a half-amplitude period of 5ms may flow.
  The cause is magnetic saturation of the power transformer. Theoretically, when the switch is turned on to the AC line voltage waveform at phase zero(zero crossing), the core of the transformer is saturated, its impedance becomes close to the impedance of the air-core coil, and a large input current flows. If the switch is turned on at phase 90 degrees, no transient phenomena (inrush current) occurs. Other factors which affect the peak current are the direction of the remaining magnetic flux of the core material, the line impedance, and the line voltage.
- Pay attention to the inrush current especially when you turn on a multiple units of power supplies at the same time.
- Use an input fuse of S.B (slow blowing type).

## 2.2 Environment

Do not install the Power Supply in the following locations.

### ◎ Flammable atmosphere

Do not operate the Power Supply in flammable or explosive atmosphere, to prevent fire and explosion hazards.

### ◎ High temperature

Do not expose the Power Supply to a source of heat, such as direct sunlight (near a window), a space heater, etc. Avoid a place where temperature may change rapidly.

- Operating temperature range: 0 to 40°C

### ◎ High humidity

Do not expose the Power Supply to high humidity. Do not place it near a water heater, a humidifier, water faucet or a bath.

- Operating humidity range: 10 to 80%

### ◎ Corrosive atmosphere

Do not expose the Power Supply to corrosive atmosphere such as sulfuric acid mist.

### ◎ Dusty place

### ◎ Blocked ventilation air flow

Cooling method of the Power Supply is the unforced air cooling. Do not block the ventilation holes of the bottom and upper panels.

- Do not install the Power Supply upside-down or with its side facing up.
- Do not place heat-sensitive articles upper the Power Supply.
- Do not stack up two or more Power Supplies.

### ◎ Unstable place

Install the Power Supply in a place where is free from tilt or vibration.

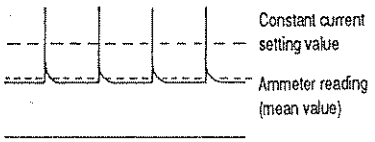
### ◎ Strong electric or magnetic field

## 2.3 Type of Load

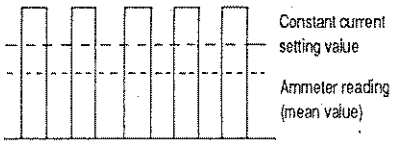
Note that the output may become unstable depending on the characteristics of the load.

(1) Load current with peak or load current of pulse waveform

Because the ammeter is of a mean value indication type, even when the ammeter reading is not higher than the setting value, the peak values may exceed the setting value and the operation may driven instantaneously into the constant current domain and the output voltage may fall. Observing carefully, it can be seen that the constant current indicator lamp becomes dim.




Load current with peaks

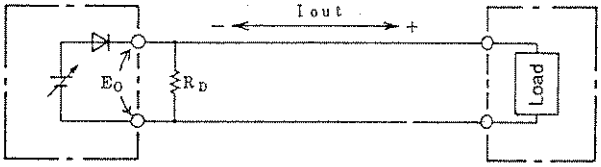



Load current of pulse wave

In this case, the current setting value should be raised or the current rating should be increased.

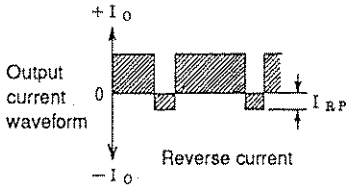
(2) Regenerative load

When a regenerative load (such as inverter, converter, or transformer) is connected to the power supply, as it cannot absorb the reverse current fed from the load, the output voltage increases and becomes unstable.




Equivalent circuit of series-controlled power supply

Regenerateve load




- In this case, connect a bypass resistor to absorb the reverse current. The resistance of the bypass resistor can be calculated as follows.

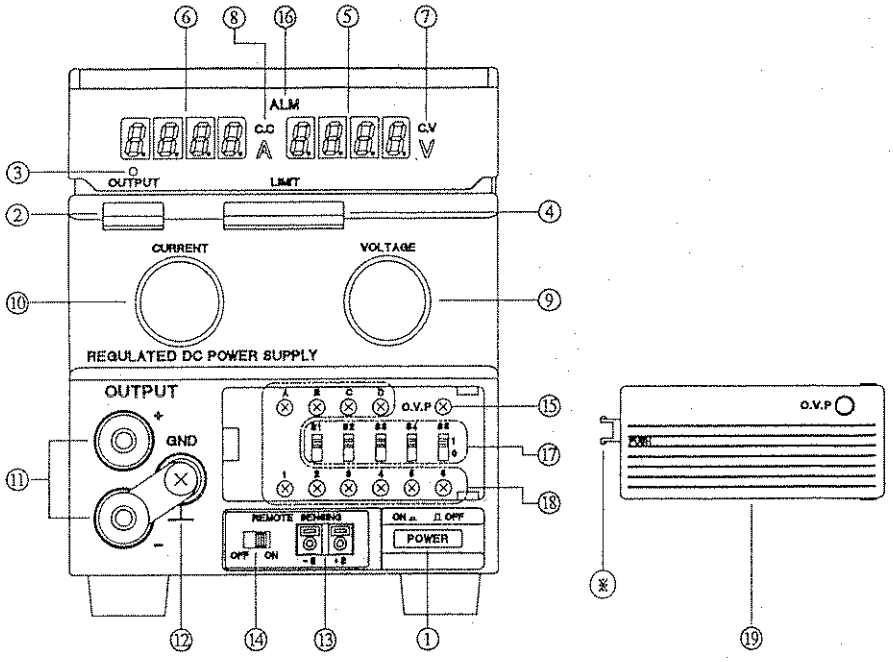
$$R_D\ [\Omega] \leqq \frac{E_O\ [V]}{I_{RP}\ [A]}$$

Here

$R_D$: Dummy load which reverse current is bypassed
$E_O$: Output voltage
$I_{RP}$: Maximum reverse current value

# Chapter 3 PANEL DESCRIPTION

## 3.1 Front Panel




① POWER Power switch: Turns the power of the Power Supply on and off.

② OUTPUT Turns the output on and off. It is turned on at pushed.

③ OUTPUT ON LED
This is lit at output ON.

④ LIMIT A voltage and current setting values are displayed. The ammeter displays a constant current set value and the voltmeter displays a constant voltage set value while this is pressed.

⑤ Voltmeter

⑥ Ammeter

⑦ C.V Constant voltage mode indicator Green LED

⑧ C.C Constant current mode indicator Red LED

⑨ VOLTAGE Voltage setting knob (10 turns)

⑩ CURRENT Current setting knob (10 turns)

⑪ OUTPUT Output terminals
Red :+ terminal White :- terminal
Normally, either one of the output terminals is connected to the GND terminal with the shorting bar.

⑫ GND Ground terminal

⑬ REMOTE SENSING

Remote sensing terminals: To compensate for the voltage drop caused by load cable resistance and for the output fluctuation caused by contact resistance.

⑭ Remote sensing switch

To use the remote sensing function, turn the switch on.

*Caution* When you do not use the remote sensing, be sure to turn off the switch. Tightly connect the remote sensing wires and the load cables so that they do not taken off.

⑮ OVP OVP potentiometer: Specifies the trip voltage of the overvoltage protection circuit.

⑯ ALM LED to indicate an alarm: When the overvoltage or overheat protection circuit has tripped, the LED lights up.

⑰ Switches for analog remote control and Master/Slave controlled parallel operation

When the analog remote control is used, the S1-S4 switches are changed. (Refer to 4.2.2)
The S5 switch is changed for Master/Slave controlled parallel operation. (Refer to 4.2.4)

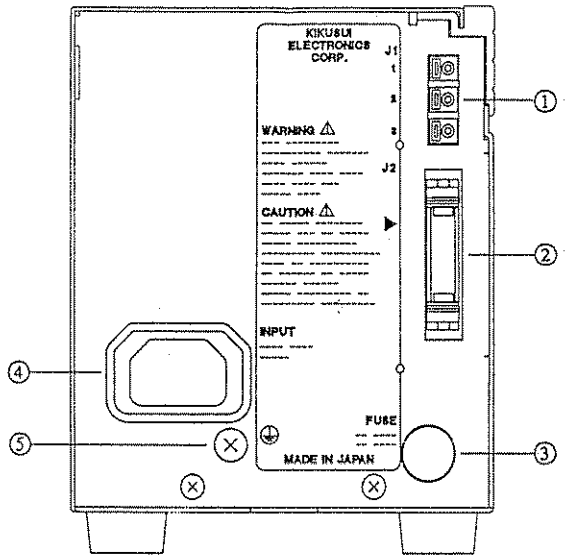
⑱ Potentiometer for calibration

Potentiometer used for calibration of output voltage or meter (Refer to 5.2)

⑲ Front sub-panel cover

The cover is opened by pressing the part indicated as PUSH. The cover is removed from the panel by pulling the opened part forward. Because the cover can be set even if the claw (part ※ ) breaks, use it as is.

## 3.2 Rear Panel




① J1 Input/output terminals for Master/Slave controlled parallel operation (Refer to 4.2.4)

② J2 Analog remote control terminals (Refer to 4.2.2)

③ Input fuse holder
The AC input fuse (S.B type) is put in this.

④ INPUT AC input terminal

⑤ GND Ground terminal

# Chapter 4 OPERATING METHOD

## 4.1 Basic Operation

### 4.1.1 Turning the POWER switch on/off

After checking the OUTPUT switch status, turn on the POWER switch.
As you turn the POWER switch is on (when the OUTPUT switch has been turned on), the voltage or the current, which has been set, is delivered to the load.

### 4.1.2 Setting the output voltage or current, and turning the output on/off

#### (1) LIMIT switch

The voltage or current setting value is displayed during pressing.

#### (2) OUTPUT switch

Turns the output on and off.
When the OUTPUT switch is turned off, the output circuit is a high impedance (several kΩ). The OUTPUT switch is push-in switch with a lock.
When this is pushed-in, the output is turned on.

### 4.1.3 OVP trip voltage setting

The OVP protects the load against an unexpected, excessive voltages. When the OVP has tripped, the ALM (alarm) is lit. To reset from the alarm status turned off the POWER switch once and, then turned it on again.

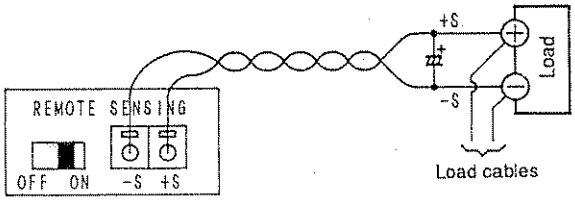
Setting procedure: Let the Power Supply deliver the OVP trip voltage, with the OVP potentiometer set at sufficiently CW. Turn the OVP potentiometer CCW to the point where the OVP trips.

*Caution* The OVP detects the voltage between following terminals depending on the remote sensing switch setting.
Remote sensing switch OFF : Between output terminals of this instrument
Remote sensing switch ON : Between sensing terminals (+S and –S)
If sensing wires are removed when the remote sensing is used, the OVP cannot operate correctly.

## 4.2 Applied Operation

### 4.2.1 Remote sensing

This function makes the output voltage stabilized at the load terminal.
Connect a good frequency response electrolytic capacitor at the sensing point.



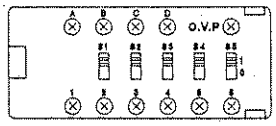

*Caution* When you do not use the remote sensing, be sure to turn off the switch. Tightly connect the remote sensing wires (Refer to 15 page) and the load cables so that they do not taken off.

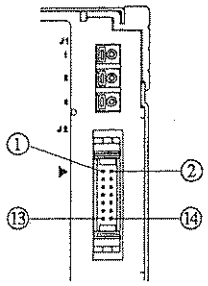
### 4.2.2 Analog remote control

The output voltage or the output current can be remote controlled by an analog signal.
The output can be turned on and off by using an external switch. When shipped from the factory, the Power Supply was calibrated based on use in the local control mode (operation from the front panel).
Even when in the remote control with an analog signal, the Power Supply can be calibrated from the front panel. Refer to the paragraph of the calibration for details.

**Analog remote control terminals (J2)**

**Setting at factory shipment**



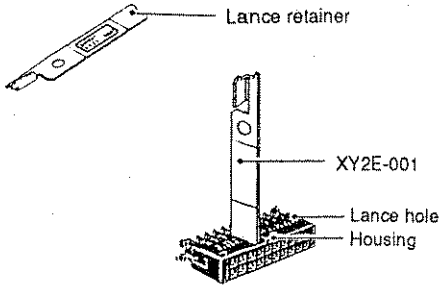
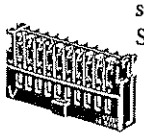

① CV EXT VOLTAGE CONTROL
② CV EXT RESISTOR CONTROL 2
③ A.COMMON (analog common)
④ CV EXT RESISTOR CONTROL 1
⑤ CC EXT RESISTOR CONTROL 1
⑥ NO CONNECTION
⑦ CC EXT RESISTOR CONTROL 2
⑧ NO CONNECTION
⑨ CC EXT VOLTAGE CONTROL
⑩ NO CONNECTION
⑪ A.COMMON (analog common)
⑫ NO CONNECTION
⑬ OUTPUT ON/OFF
⑭ D.COMMON (digital common)

When using the terminal J2, insert the contacts (supplied) in the socket which is attached to the terminal.

*Caution*

- A.COMMON and D.COMMON are ordinarily connected to a minus output (-S terminal at the remote sensing). Pay attention to ground the output or other line because the common line of the control voltage is connected to A.COMMON.
- Before making connection to the analog remote control terminal, be certain that the POWER switch is off.
- Each time when you are going to operate the Power Supply in a different control mode, you must re-calibrate the Power Supply. That is you must re-calibrate it when you want to operate it in the local control mode (control from the front panel) after operating it calibrated for the analog remote control, or when you want to operate it in other remote control mode.

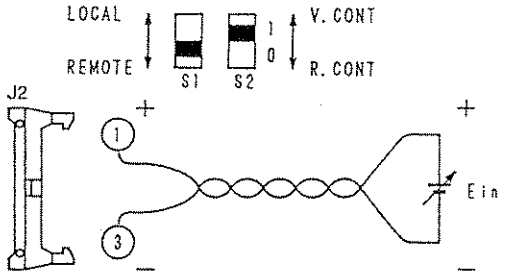
## Tool for crimping connector

| Manufacturer number and tool name | Description |
|---|---|
| XY2B-7006<br>(OMRON corp.)<br>Simplified crimping tool | • Refer to the tool instruction sheet for the crimping method.<br>• Use the tool to secure the reliability of crimping.<br>  |
| XY2E-0001<br>(OMRON corp.)<br>Contact remover |  |
| XG5M-1432-N<br>(For AWG24)<br>XG5M-1435-N<br>(For AWG26 and 28)<br>(OMRON corp.)<br>Suitable connector | • If the optional semi-cover is used, it secures the contact pins.<br>Semi-cover: XG5S-0701<br>(two)<br>  |

### (1) Control of output voltage by external voltage

The output voltage can be controlled by an external voltage of 0-approx. 10V.
Set S1 to 0 (REMOTE) and S2 to 1 (V.CONT) on the front panel, and apply an external voltage to J2 on the rear panel with the polarity as shown below.

Front panel switches



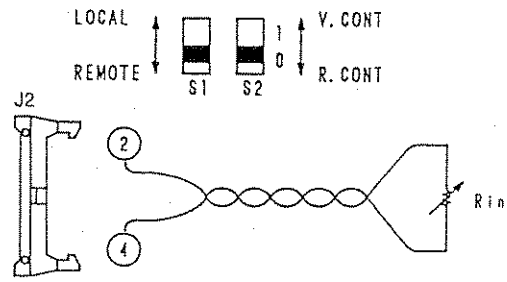

Eo=Em•Ein/10
Eo : Output voltage (V)
Em : Rated output voltage (V)
Ein : External voltage (V)
0 ≦ Ein ≦ approx. 10V

< Note >
- The input impedance between ① and ③ of J2 is approx. 10kΩ.
- Use Ein with less noise and excellent stability.

### (2) Control of output voltage with external resistor

The output voltage can be controlled with an external resistor of 0-approx. 10kΩ.
Set S1 to 0 (REMOTE) and S2 to 0 (R.CONT) on the front panel, and connect the external resistor to J2 on the rear panel as shown below.

Front panel switches




Eo=Em•Rin/10
Eo : Output voltage (V)
Em : Rated output voltage (V)
Rin : External resistor (kΩ)
0 ≦ Rin ≦ approx. 10kΩ

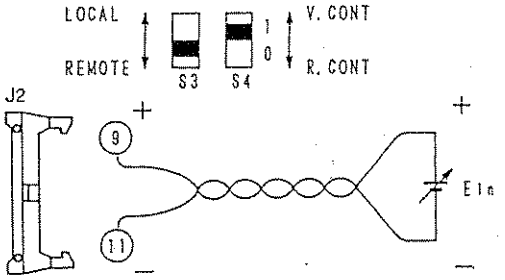
*Caution*
- The output voltage will become abnormally high if the external control resistance circuit is made open. Be sure to securely connect the control resistor Rin.

< Note >
- A current of approx. 1mA constantly flows in Rin.
- Use a metal film resistor or a wire wound resistor of 1/2W or more for Rin. The resistor must have an excellent stability against temperature change and aging.

### (3) Control of output current by external voltage

The output current can be controlled by an external voltage of 0-approx. 10V.
Set S3 to 0 (REMOTE) and S4 to 1 (V.CONT) on the front panel, and connect an external voltage to J2 on the rear panel with the polarity as shown below.

Front panel switches



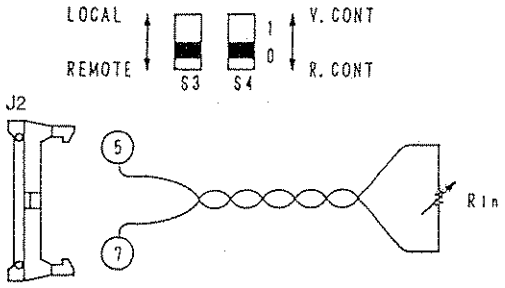

Io=Im•Ein/10
Io : Output current (A)
Im : Rated output current (A)
Ein : External voltage (V)
0 ≦ Ein ≦ approx. 10V

< Note > • The input impedance between ⑨ of J2 and ⑪ is approx. 10kΩ.
• Use Ein with few noises and excellent stability.

### (4) Control of output current with external resistor

The output current can be controlled with an external resistor of 0-approx. 10kΩ.
Set S3 to 0 (REMOTE) and S4 to 0 (R.CONT) on the front panel, and connect the external resistor to J2 on the rear panel as shown below.

Front panel switches



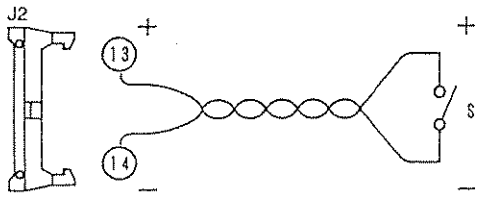

Io=Em•Rin/10
Io : Output current (A)
Im : Rated output current (A)
Rin : External resistor (kΩ)
0 ≦ Rin ≦ approx. 10kΩ

*Caution* • The output voltage will become abnormally high if the external control resistance circuit is made open. Be sure to securely connect the control resistor Rin.

< Note > • A current of approx. 1mA constantly flows in Rin.
• Use a metal film resistor or a wire wound resistor of 1/2W or more for Rin. The resistor must have an excellent stability against temperature change and aging.

### (5) Turning the output on/off

The output can be turned on/off with an external switch. When an external switch is made, the output is turned off.



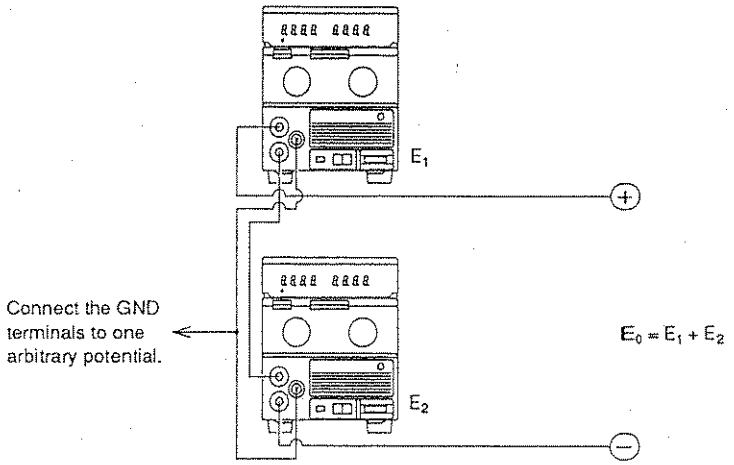

< Note > • ⑬ is pulled up to +5V internally by using 10kΩ.
• ⑭ is D.COMMON.
• As for ON/OFF of the output, priority is given to OFF. Therefore, unless the OUTPUT switch of the front panel is set to on, the output cannot be turned on with the external switch.

## 4.2.3 Series operation and parallel operation

### (1) Series operation

*WARNING* • The electric shock with 40VDC or more can result in serious injury to human body. When you use two or more Power Supplies connected in series, provide appropriate means to guard against electric shocks.

The output voltage can be increased by operating two or more Power Supplies in series. When operating the Power Supplies in this mode, set the POWER switches and OUTPUT switches of all Power Supplies in the ON state.
Turn on the POWER switch and the OUTPUT switch of each Power Supply.

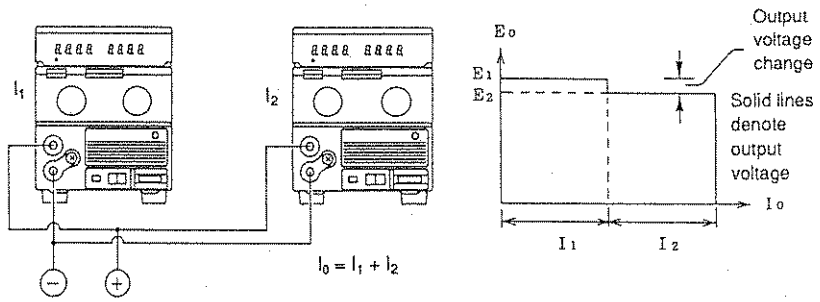


Caution
- The number of Power Supplies that can be connected in series is limited by the voltage that appears between the chassis and the output terminal. This limiting voltage is 250V.

  For example) For 35V 250/35=7.14··· Up to seven
- To eliminate the potential difference among chassises of power supplies, remove the GND shorting bars of power supplies and connect the GND terminals to one arbitrary potential.
- The remote sensing cannot be used.

## (2) Parallel operation

The output current can be increased by operating two or more Power Supplies in parallel.




- When you operate the Power Supplies in the constant voltage mode, make uniform the output voltages of all Power Supplies.
  The Power Supply whose output voltage is the highest, will first deliver the output current. When the current has increased and the Power Supply is transferred into its constant current mode, another Power Supply whose output voltage is the second highest also will start delivering its output current. In this manner the third and further Power Supplies also, if any, are brought into operation. The differences of the output voltages of individual Power Supplies are reflected onto the output voltage change.
- When you operate the Power Supplies in the constant current mode, set individual Power Supplies in the constant current mode.
  The total output current is the sum of the output currents of individual Power Supplies.

Caution
- Pay attention so that no voltage higher than the rated voltage is applied to the output of each power supply.

< Note >
- A current of several mA flows in reverse to the power supply whose output voltage is low.
- When you use the remote sensing, connect the sensing lines of all power supplies to the same sensing point.

### 4.2.4 Master/Slave controlled parallel operation

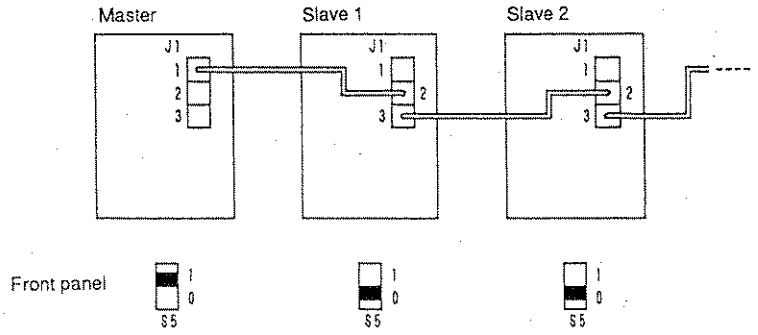
All of the parallel-connected Power Supplies can be controlled by controlling the master Power Supply only.

Caution • The number of the power supplies which can be controlled is limited to four including the master power supply.

Setting method: Setting of master Power Supply
Connect the signal cable from J1-1 on the rear panel of the master Power Supply to the slave Power Supply.
Set the OUTPUT switch to off.

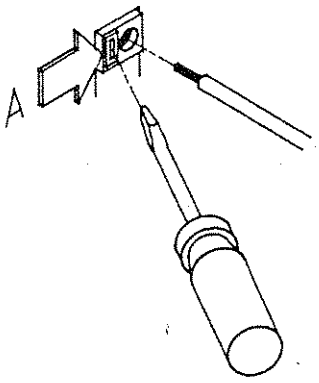
Setting of slave Power Supply
Set S5 on the front panel at 0.
Connect the signal cable that runs from the master Power Supply to J1-2 on the rear panel of the slave Power Supply.
Connect the signal cable from J1-3 on the rear panel of this slave Power Supply to J1-2 of other slave Power Supply.
Turn CV/CC set knobs of the slave Power Supplies fully CW.
Turn off the OUTPUT switch.

Operation : Turn on the POWER switches of the master and slave Power Supplies.
Turn on the OUTPUT switches of the slave Power Supplies.
Confirm the voltage and current setting value of the master Power Supply and turn on the OUTPUT switch.



## Using connector

Remove the coating of electric wire and insert the wire pressing the part A of the terminal with a screwdriver.




Allowable electric wire: Solid wire; ø0.4 ~ ø1.0 (AWG26~18)
Twisted wire; 0.3mm² ~ 0.75mm² (AWG22~20)
Wire diameter; ø0.18 over

Standard length of the removed coating : 10mm

*Caution*

- Check the electric wire is not removed after the electric wire is inserted.
- The part of removed coating should not touch a chassis, near terminals and other wires.

# Chapter 5 MAINTENANCE AND CALIBRATION

Maintenance, checking, and calibration should be periodically performed to keep an initial performance of the Power Supply for a long term.

## 5.1 Maintenance and Checking

### Front panel

When the panel becomes dirty, apply a watery neutral detergent to a soft cloth and lightly wipe dirt off.

*Caution*

- Do not use detergent such as benzene or thinner. If you do, discoloration of the surface, erasure of the printed characters, cloudiness of the display, etc. may result.

### Input power cable

Check for tear of the sheath, crack of the plug, etc.

### Overhaul

Electrolytic capacitors used in the Power Supply are wearable parts. It is recommended to overhaul the Power Supply once per approximately 10000 run hours (It differs depending on the situation of use). Please order your KIKUSUI agent for overhaul.

## 5.2 Calibration

The Power Supply was properly calibrated at the factory before shipment. Yet, re-calibration is needed to guard against errors that could be introduced due to aging in long time operation or due to change in environments. For analog control mode of operation, calibrate the Power Supply for each of the control items.

*Caution*

- Each time when you are going to operate the Power Supply in a different control mode, you must re-calibrate the Power Supply. That is you must re-calibrate it when you want to operate it in the local control mode (control from the front panel) after operating it calibrated for the analog remote control, or when you want to operate it in other remote control mode.

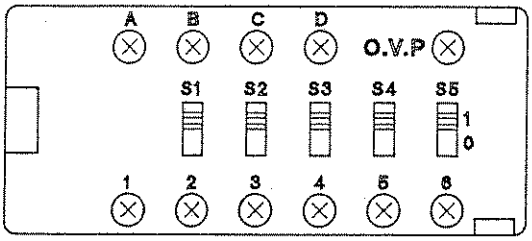
### 5.2.1 Preparation

To minimize the calibration inaccuracy that could be caused by initial drift, warm up the Power Supply for about 30 minutes or more before starting calibration.
Use potentiometers "A-D" and "1-5" on the front panel for the calibration.

< Note >

- Do not touch potentiometer "6" because it is not used in the calibration allowed by operators.

### Setting at factory before shipment




A : Vout MAX
B : Iout MAX
C : Vout OFFSET
D : Iout OFFSET
1 : V METER FULL SCALE
2 : I METER FULL SCALE
3 : I METER OFFSET
4 : V LIMIT FULL SCALE
5 : I LIMIT FULL SCALE

## 5.2.2 Test equipment required

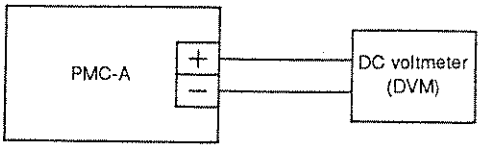
The following measuring equipment is necessary for the calibration.

- DC voltmeter (DVM), measuring accuracy 0.02% or better
- Shunt resistor, accuracy 0.1%

## 5.2.3 Calibration setup

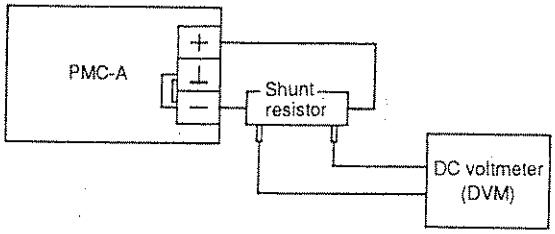
The calibration setup differs between voltage calibration and the current calibration.

### Voltage calibration




### Current calibration

Current is calculated from the voltage detected with the shunt resistor.




*Caution*

- The cables used for the calibration setup must have a sufficient capacity for the rated current of the Power Supply.

## 5.2.4 Calibration procedure

### (1) Voltage calibration procedure

For voltage calibration, calibrate following four items.

- Offset of output voltage
- Full scale of output voltage
- Full scale of voltmeter
- Full scale of voltage setting value display

After checking the setup, perform the following calibration.

(a) Offset of output voltage

- Set the output to 0V. (For local control (control from the front panel), turn the output voltage setting knob fully CCW. For remote control, set the control signal to 0V or 0Ω)
- Turn on the output and turn the output current setting knob CW.
- After checking that the constant voltage mode indicator (green LED) is lit, adjust the offset with potentiometer "C".

(b) Full scale of output voltage

- After the calibration of (a) has been performed, set the output setting to the maximum output voltage. (For local control (control from the front panel), turn the output voltage setting knob fully CW. For remote control, set the control signal to 10V or 10kΩ)
- Adjust potentiometer "A" for the output of the rated voltage.

*Caution* • Do not adjust to a voltage higher than 105% of the rated output voltage.

(c) Full scale of voltmeter

- Let the Power Supply deliver its rated output voltage. Adjust potentiometer "1" so that the voltmeter reading of the Power Supply is the rated output voltage.

(d) Full scale of voltage set value display

- Let the Power Supply deliver its rated output voltage. Adjust potentiometer "4" so that the voltmeter reading is the rated output voltage when the LIMIT switch is pressed.

## (2) Current calibration procedure

For the current calibration, Calibrate the following five items.

- Offset of output current
- Offset of ammeter
- Full scale of output current
- Full scale of ammeter
- Full scale of current set value display

After checking the setup, perform the following calibration.

(a) Offset of output current

- Set the output at 0A. (For local control (control from the front panel), turn the output current setting knob fully CCW. For remote control, set the control signal to 0V or 0Ω)
- Turn on the output and turn the output voltage set knob CW.
- After checking that the constant current mode indicator (red LED) is lit, adjust the offset with potentiometer "D".

(b) Offset of ammeter

- After the calibration of (a) has been performed, adjust potentiometer "3" so that the ammeter reading is 0.

(c) Full scale of output current

- After the adjustment of both (a) and (b) has been performed, set the output setting to the rated current. (For local control (control from the front panel), turn the output current setting knob fully CW. For remote control, set the control signal to 10V or 10kΩ)
- Adjust potentiometer "B" for the output of the rated current.

*Caution* • Do not adjust to a current larger than the rated output current.

(d) Full scale of ammeter

- Let the Power Supply deliver its rated output current. Adjust potentiometer "2" so that the ammeter reading of the Power Supply is the rated output current.

(e) Full scale of current set value display

- Let the Power Supply deliver its rated output current. Adjust potentiometer "5" so that the ammeter reading is the rated output current when the LIMIT switch is pressed.

# Chapter 6 SPECIFICATIONS

## 6.1 Electrical Specifications

The specifications assume the following conditions unless otherwise specified.

- The load is a pure resistive load.
- The negative output is connected to the chassis ground with the shorting bar attached to the Power Supply.
- 23°C±5°C and 80%RH or less, after 30 minutes warm up time (with current flowing).
- The TYP value, standard value and theoretical value are not the values for which the performance is guaranteed. They are only for information.

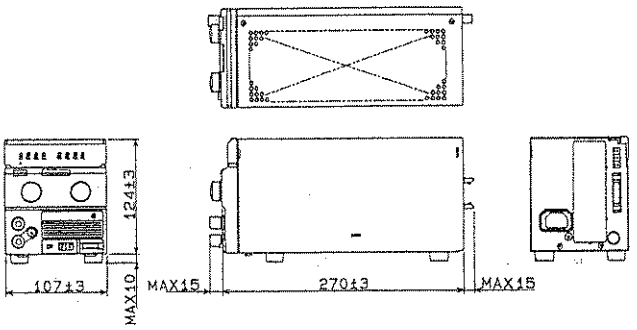
| Item/Model name | | PMC18-1A | PMC18-2A | PMC18-3A | PMC35-0.5A | PMC35-1A | PMC35-2A |
|---|---|---|---|---|---|---|---|
| Input | | | | | | | |
| | Input voltage and frequency | 100VAC±10% 50/60Hz 1φ (117,200,217,234V are factory option). | | | | | |
| | Power consumption (at 100VAC, with rated load) | approx. 50VA | approx. 100VA | approx. 160VA | approx. 50VA | approx. 95VA | approx. 190VA |
| Output | | | | | | | |
| | Output voltage | 0 - 18V | 0 - 18V | 0 - 18V | 0 - 35V | 0 - 35V | 0 - 35V |
| | Resolution (theoretical value) | 3.3mV | 3.3mV | 3.3mV | 6.3mV | 6.3mV | 6.3mV |
| | Number of turns of setting knob | 10 turns | | | | | |
| | Output current | 0 - 1A | 0 - 2A | 0 - 3A | 0 - 0.5A | 0 - 1A | 0 - 2A |
| | Resolution (theoretical value) | 180μA | 360μA | 540μA | 90μA | 180μA | 360μA |
| | Number of turns of setting knob | 10 turns | | | | | |
| Constant voltage characteristics | | | | | | | |
| | Ripple noise (5Hz-1MHz), RMS | 500μV | 500μV | 500μV | 500μV | 500μV | 500μV |
| | Source effect (against ±10% change of the AC input voltage). | 1mV | 1mV | 1mV | 3mV | 3mV | 3mV |
| | Load effect (against 0-approx.100% change of the output current). | 2mV | 2mV | 4mV | 3mV | 3mV | 3mV |
| | Transient response, standard value (10-100%) *1 | 50μS | 50μS | 50μS | 50μS | 50μS | 50μS |
| | Temperature coefficient, standard value | 100ppm/°C(TYP.) | | | | | |
| Constant current characteristics | | | | | | | |
| | Ripple noise (5Hz-1MHz), RMS | 1mA | 1mA | 1mA | 1mA | 1mA | 1mA |
| | Source effect (against ±10% change of the AC input voltage). | 10mA | 10mA | 10mA | 10mA | 10mA | 10mA |
| | Load effect (against approx. 1V-100% change of the output voltage). | 5mA | 5mA | 5mA | 5mA | 5mA | 5mA |
| | Temperature coefficient, standard value | 200ppm/°C(TYP.) | | | | | |

*1: Time the output voltage takes to recover to within 0.05%+10mV of the rated value after the output current is changed from 10% to 100% of the rated current.

The electrical specifications (continued).

| Item/Model name | | | PMC18-1A | PMC18-2A | PMC18-3A | PMC35-0.5A | PMC35-1A | PMC35-2A |
|---|---|---|---|---|---|---|---|---|
| Indication of constant voltage operation | | | C.V with green LED | | | | | |
| Indication of constant current operation | | | C.C with red LED | | | | | |
| Operation ambient temperature and humidity range | | | 0-40°C/10%-80%RH (no dew condensation) | | | | | |
| Storage temperature and humidity range | | | -10-60°C/70%RH or less (no dew condensation) | | | | | |
| Cooling system | | | Unforced air cooling | | | | | |
| Output polarity | | | Positive or negative can be grounded. | | | | | |
| Insulation resistance | | | | | | | | |
| | Between chassis and input | | 30MΩ or more (measured with 500VDC tester, at ambient humidity 70% or less). | | | | | |
| | Between chassis and output terminals | | 20MΩ or more (measured with 500VDC tester, at ambient humidity 70% or less). | | | | | |
| Meter display error | | | | | | | | |
| | Output voltage | Display error | ±(0.5%rdg+2digits)at 23°C±5°C(TYP.) | | | | | |
| | | Temperature coefficient | 300ppm/°C(TYP.) | | | | | |
| | Output current | Display error | ±(1%rdg+5digits)at 23°C±5°C(TYP.) | | | | | |
| | | Temperature coefficient | 400ppm/°C(TYP.) | | | | | |
| Remote sensing | | | Approx. 0.6V can be corrected in one way. | | | | | |
| Remote control | | | | | | | | |
| | Output voltage/control voltage ratio | | 18V/ approx. 10V | 18V/ approx. 10V | 18V/ approx. 10V | 35V/ approx. 10V | 35V/ approx. 10V | 35V/ approx. 10V |
| | Output voltage/control resistor ratio | | 18V/ approx. 10kΩ | 18V/ approx. 10kΩ | 18V/ approx. 10kΩ | 35V/ approx. 10kΩ | 35V/ approx. 10kΩ | 35V/ approx. 10kΩ |
| | Output current/control voltage ratio | | 1A/ approx. 10V | 2A/ approx. 10V | 3A/ approx. 10V | 0.5A/ approx. 10V | 1A/ approx. 10V | 2A/ approx. 10V |
| | Output current/control resistor ratio | | 1A/ approx. 10kΩ | 2A/ approx. 10kΩ | 3A/ approx. 10kΩ | 0.5A/ approx. 10kΩ | 1A/ approx. 10kΩ | 2A/ approx. 10kΩ |
| Protection circuit | | | | | | | | |
| | Output overvoltage protection (OVP) | | Setting range:When OVP is operated with 5%-105% of the rated output voltage, ALM LED is lit. OVP is reset by turning off the POWER switch. | | | | | |
| | Input fuse | | 2A(S.B) | 3A(S.B) | 4A(S.B) | 2A(S.B) | 3A(S.B) | 4A(S.B) |
| | Thermal fuse | | 130°C built into the power transformer. | | | | | |
| Weight | | | approx. 3.5kg (7.7lb) | approx. 4.0kg (8.8lb) | approx. 5.0kg (11lb) | approx. 3.5kg (7.7lb) | approx. 4.0kg (8.8lb) | approx. 5.0kg (11lb) |
| Accessories | | | | | | | | |
| | Power supply cable(one), instruction manual(one copy), analog remote control terminal(one)×10, and fuse(one) | | | | | | | |

## 6.2 Dimensions



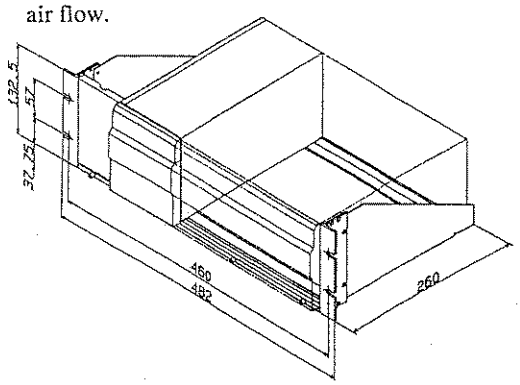

Unit:mm

## 6.3 Option

### Rack mount brackets

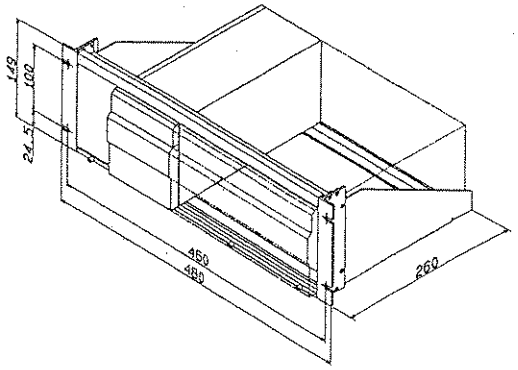
*Caution*

- When you mount the power supplies on the rack, pay attention to ventilation air flow.



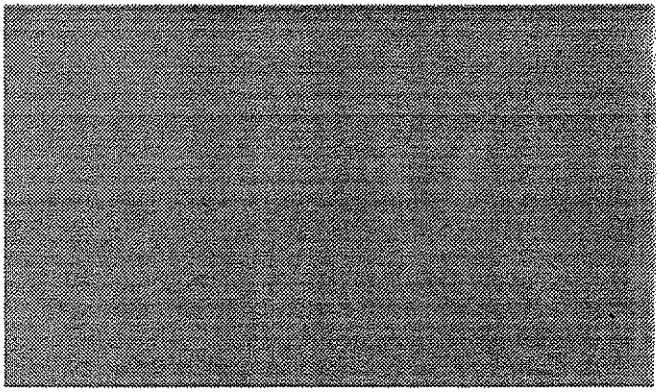

Unit:mm

**KRA3 (for EIA rack)**




Unit:mm

**KRA150 (for JIS rack)**



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