THYRISTOR UNIT
3()PHB SERIES
INSTRUCTION MANUAL

IMTHYCO18-E2

<INTRODUCTION>

Thank you very much purchasing our '3( )PHB series.
This manual describes how to use '3( )PHB series instruments. Please read this manual carefully before using the instruments.
Also keep this manual with much care for future reference.

⚠ WARNING

*** Wiring precautions**

1. If failure or error of this instrument could result in a critical accident of the system, install an external protection circuit to prevent such an accident.
2. In order to prevent instrument damage or failure, protect the power line and the input/output lines from high currents by using fuses with appropriate ratings.

*** Power supply**

1. In order to prevent instrument damage or failure, supply power of the specified rating.
2. In order to prevent electric shock or instrument failure, do not turn on the power supply until all of the wiring is completed.

*** Never use the instrument near inflammable gases.**

1. In order to prevent fire, explosion or instrument damage, never use this instrument at a location where inflammable or explosive gases or exist.

*** Never touch the inside of the instrument.**

1. In order to prevent electric shock or burns, never touch the inside of the instrument. Only RKC service engineers can touch the inside of the instrument to check the circuit or to replace parts.
   High voltage and high temperature sections inside the instrument are extremely dangerous.

*** Never modify the instrument.**

1. In order to prevent accident or instrument failure, never modify the instrument.

*** Maintenance**

1. In order to prevent electric shock, burns or instrument failure, only RKC service engineers may replace parts.
2. In order to use this instrument continuously and safely, conduct periodic maintenance. Some parts used this instrument have a limited service life and may deteriorate over time.

RKC INSTRUMENT INC.

CONTENTS

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1. BEFORE READING THIS MANUAL

1.1 USERS OF THIS MANUALS

This manual is prepared for all personnel who use '3( )PHB type'. This manual is also written especially for readers who have a fundamental knowledge of electrical engineering, control engineering or communication.

1.2 CAUTIONS

1. The contents of this manual may subject to change without prior notice.
2. Examples of figures, diagrams and numeric values used in this manual are for a better understanding of the text, but not for assuring the resultant operation.
3. '3 ( ) PHB TYPE' and this manual are manufactured and prepared under strict quality control before delivery. However, if any problems arise, please contact us directly or your nearest our sales agent.
4. RKC assumes no responsibility for any of the following damages which the user or third party may suffer.
   5.1 Damage incurred as a result of using this product
   5.2 Damage caused by product failure which cannot be predicted by RKC
   5.3 Other indirect damages

1.3 For safe operation of '3 ( ) PHB series'

1. '3 ( ) PHB series must be used under the following conditions.
   '3 ( ) PHB series is a component type and is used after mounting on an Instrument panel. It is thus manufactured as a component destined for the final product, so its high-voltage blocks such as the power terminals are uncovered. Therefore, after it is installed on the final product, the final product supplier must take the necessary measures for the user to prevent touching directly the high-voltage blocks.
2. For correct and safe operation of '3( )PHB series', always observe the safety precautions described in this manual when performing operations, maintenance and repair work. RKC neither assures responsibility nor provides warranty for problems or accidents occuring if these precautions are not observed.

1.4 For safe operation of '3( )PHB series', ' Signal Words' and 'Symbol Marks' are used in this manual.

(Signal Words)

WARNING : Where there are possible dangers such as electric shock, fire(burns), etc. which could cause loss of life or injury, precautions to avoid such dangers are described.

CAUTION : These describe precautions to be taken if unit damage may result if operating procedures are not strictly followed.

NOTE : Extra notes or precautions are added to operating procedures and explanations.

(Symbol Marks)

 : Electrical shock

 : High temperature

 : This mark is used when great care is needed especially for surety

* : This mark is used to add extra notes, precautions or supllementary explanations to table and figures.

2. Caution for mounting (Avoid the following when selecting the mounting location)

- Should be used indoors where the system is not exposed to direct sunlights.
- Ambient humidity of less than 45 % or more than 85 % RH. Water, oil, chemical, vapor or steam splashes.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Excessive induction noise, static electricity, magnetic fields or noise.

3. Model code

3 □ P H B − □ □ □ − □

Option − 1 : Aotomatic/Manual transfer or gradient setting
− 4 : Fuse burnout alarm (Only for the type with fuse)
− 5 : High-Low control
− F : With first blow fuse
− T : Optional power supply voltage
(240V AC should be specified)

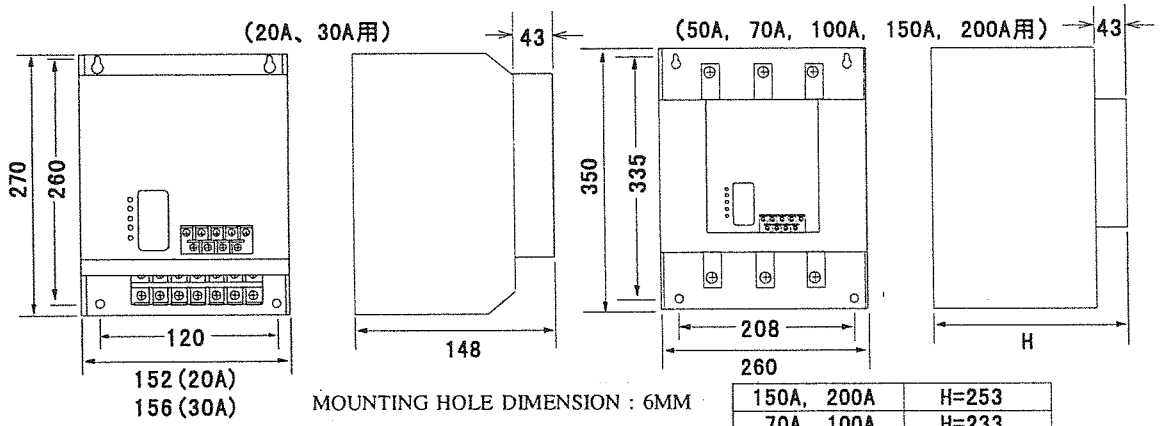
Input 6 : 1 to 5V DC, 8 : 4 to 20mA DC

R : Resistive load, L : Inductive load

Maximum load current, 020 : 20A, 030 : 30A, 050 : 050A, 070 : 070A
100 : 100A, 150 : 150A, 200 : 200A

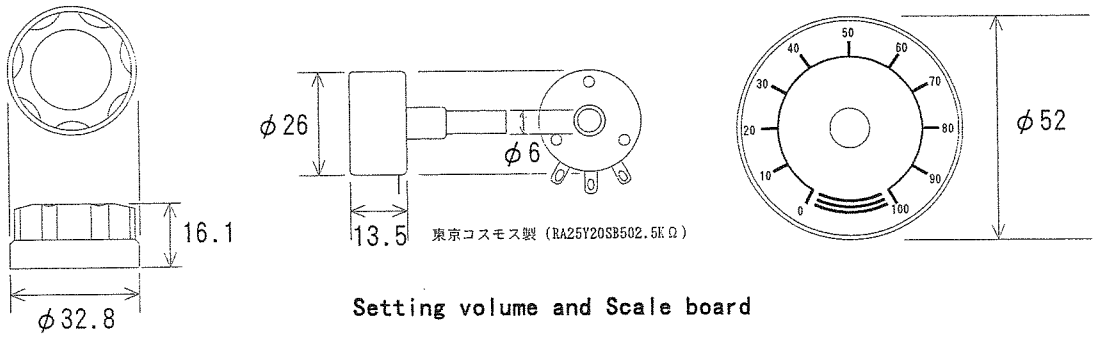
Power supply voltage 2 : 200VAC or 220VAC(Either of specify)
3 : 380VAC
4 : 400V AC or 440VAC(Either of specify)

4. External dimension (Unit : mm)



MOUNTING HOLE DIMENSION : 6MM

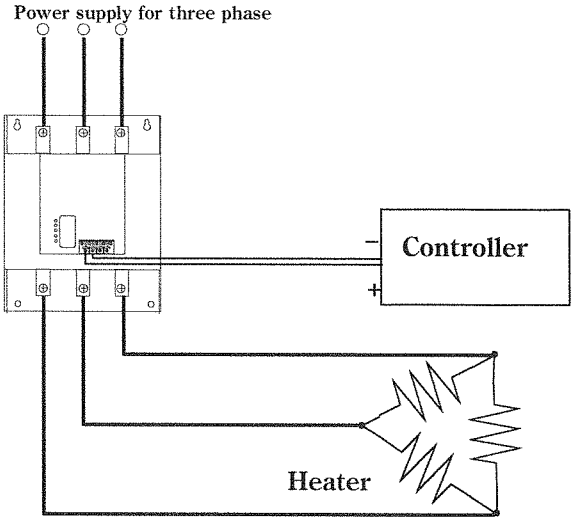
150A, 200A	H=253
70A, 100A	H=233
50A	H=193

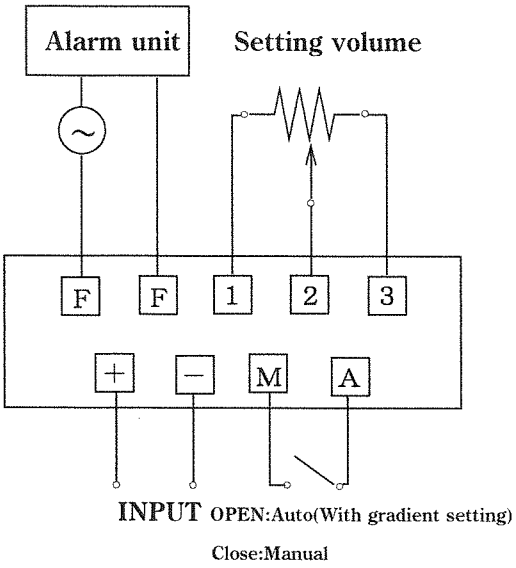


Setting volume and Scale board

5. External wiring

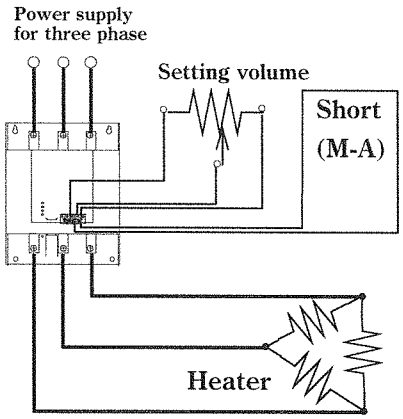
5-1. Auto mode





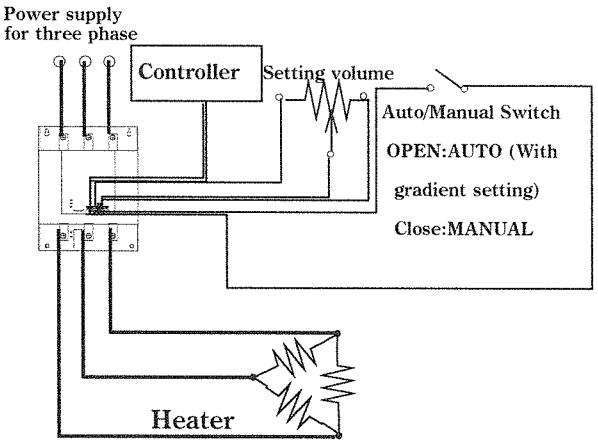
5-2. Manual mode

For the type with the optional added, (Cord: -1), its output can be manually adjusted by connecting the attached variable resistor.



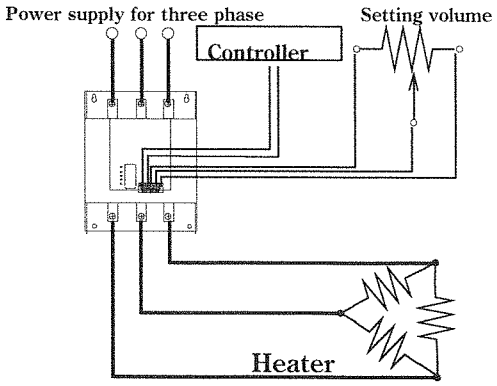
5-3. Auto (With gradient setting) /Manual mode

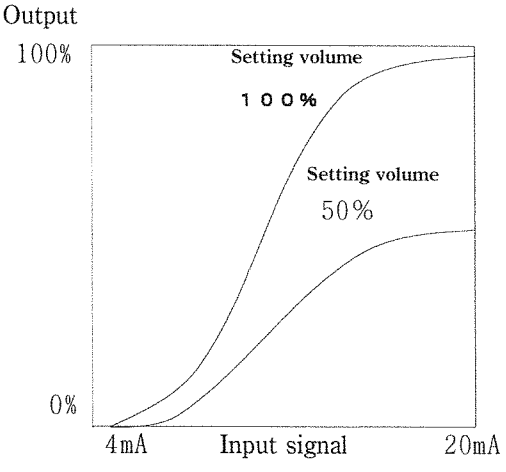
For the type with the optional added, (Cord:-1), it is possible to switch between automatic and manual by using the attached variable resistor and a selector switch. (Selector switch to be supplied by the user.)



5-4. Gradient setting

The output can be restricted by connecting the attached variable resistor as a gradient setter.





Input-output relation

5-5. 50/60Hz selection

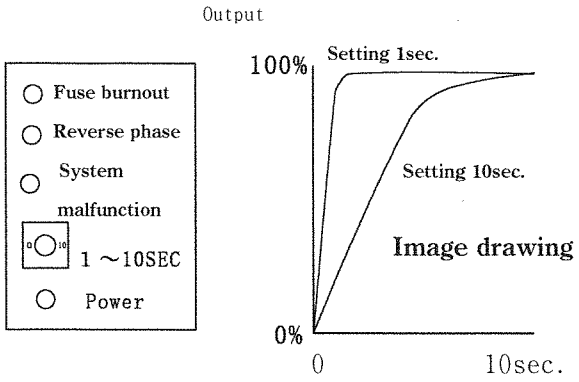
Power supply frequency of 50 or 60 Hz can be automatically judged and controlled by the thyristor unit.

5-6. Soft start

This adjuster is provided with a variable type soft start time function of approx. 1 to 10 sec. such as standard. As this time is set to the minimumu value (1 sec side) prior to factory shipment, when soft start is required, set the desired time by turning the setting variable resistor.

⚠ The indicated time corresponds to that until the maximum output is generated on the voltage waveform.

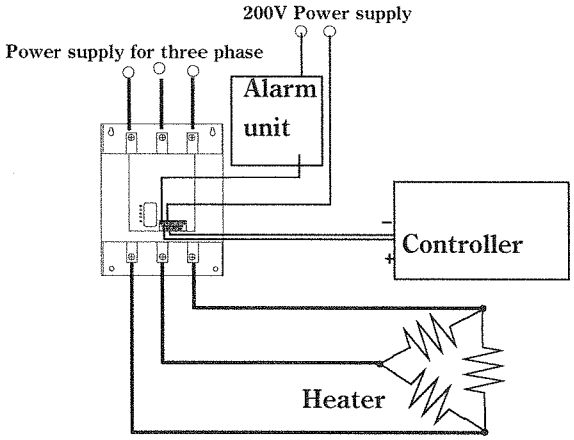
Therfore, it may become shorter than that which is actually set.



5-7. Fuse burnout alarm (Option)

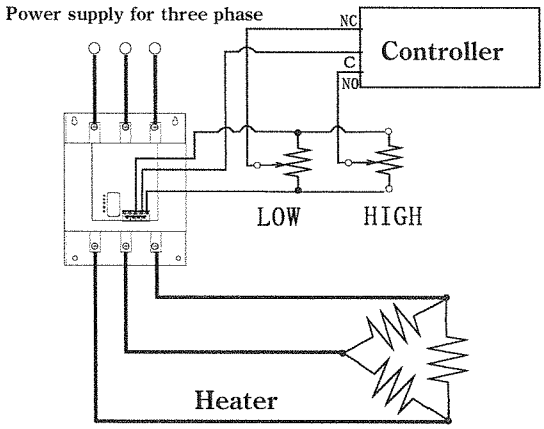
If the built-in fast blow fuse buirns out, fuse burnout alarm relay is turned on,and so an alarm lamp and buzzer can be activated.

⚠ However, note that the fuse burnout alarm output contact capacity is 1A at 250V AC max. even for the thyristor unit in the 300V or 400V line



5-8. H-L control (Option)

ON/OFF control which restricts the maximum output/minimum output can be performed by selecting the variable resistor on the HIGH or LOW side by the relay contact signal.

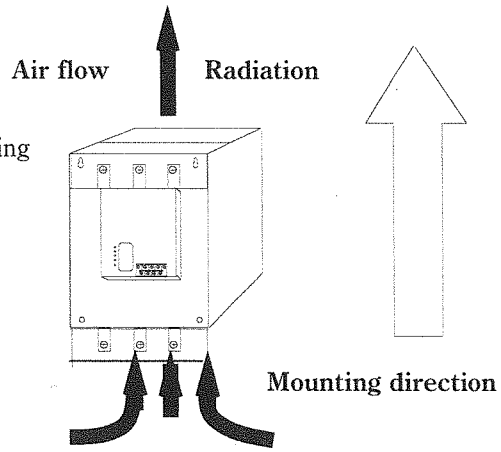


6 . Mounting precautions

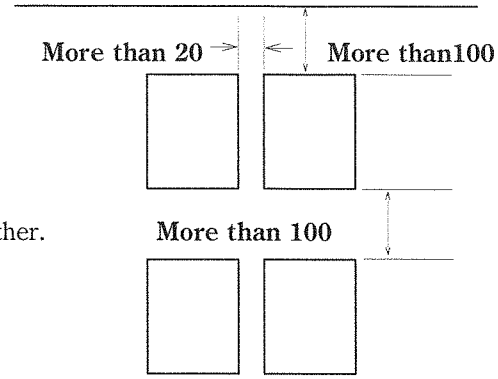
① When mounting the adjuster, check its top and bottom then mount it on the wall in the specified orientation.

As this adjuster generates much heat, it is cooled by circulating heated air by convection.

Therfore, if it is not mounted as specified such as the wrong wayt up or mounted on the floor, an accident or fault with the adjuster may result.



② When two or more adjusters are mounted together, make the space between each adjuster as specified the diagram on the right
If the adjusterts are closely mounted, an accident or fault may result from heat geneartion



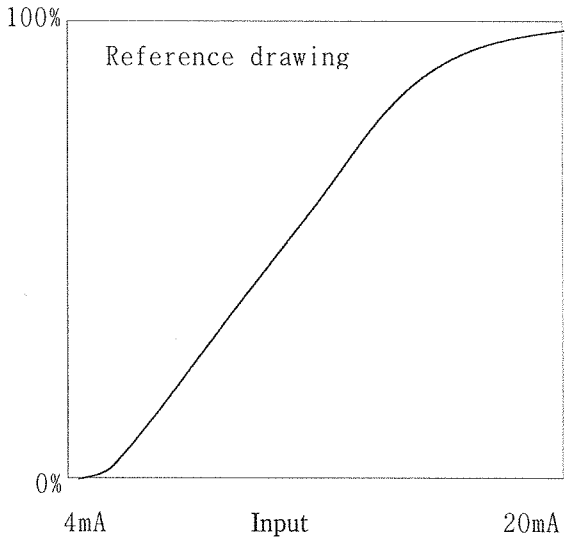
Do not mount these adjusters too close together.

7 . Reference

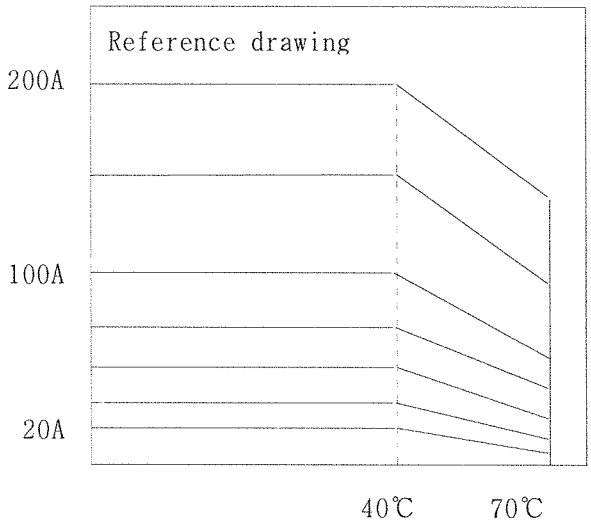
7-1. Main parts

	Thyristor element		Fast fuse	
	200V type	300/400V type	200V type	300/400V type
20A	PD 25F-80	PD 25F-160	250FH-25	600FH-25
30A	PD 25F-80	PD 25F-160	250FH-35	600FH-35
50A	PD 55F-80	PD 55F-160	250FH-60	600FH-75
70A	PD 70F-80	PD 70F-160	250FH-100	600FH-100
100A	PD 90F-80	PD 90F-160	250FH-125	600FH-125
150A	PD130F-80	PD130F-160	250FH-200	600FH-200
200A	PD160F-80	PD160F-160	250FH-300	600FH-300

7-2. Input-output relation



7-3. Load current -Temperature relation



8. Inspection, maintenance and troubleshooting

In order to keep this adjuster always working in the best condition, perform the following inspection and maintenance.

8-1. Inspection

(1) Before turning on the power after completing the wiring, re-check the load wiring.
(2) Check that the detecting lamp for reverse phase is not light up.
(3) After turning on the power, check that normal power adjustment is performed.

8-2. Maintenance

(1) If the screws on the power connection terminals are loose, heat generation may result. First, check that the power is not applied to the adjuster, then check that the screws are not loose.
(2) This adjuster uses parts with limited life span such as electrolytic capacitors, cooling fan etc. Periodic inspection should be conducted every several years.

8-3. Troubleshooting

Most general adjuster faults, cause and remedies are described in the following. Please refer to these for maintenance and inspection. If you have any query concerning this adjuster, please contact our sales office or agent from where you bought it giving the Model No. and specifications.

(1) No output is generated.
- * No normal load voltage is applied. (Example : The adjuster in the 400V line is used in the 200V line.)
- * The plus(+) and minus(−) sides of the current input signal are opposite.
- * The fuse is burnt out..
- * (For manual setting) : The No. M terminals is not shorted with the (+) terminal.
- * (For gradient setting control) : The variable resistor in the gradient setter is left set to zero.
- * (For H-L control) : The variable resistor on the HIGH side is left set to zero.
- * Failure inside the adjuster (Thyristor element damage cause by load shorting) → Must be repaired.

(2) Output continues to be generated.
- * No load is connected to this adjuster, but it is directly connected to the power.(Incorrect wiring)
- * Manual setting continues.(When the manual setting variable resistor is set to 100 %)
- * (For H-L control) : The variable resistor on the LOW side is left set to 100 %.
- * The input signal from the controller is left at the maximum.→ Controller failure
- * The adjuster is used at a power frequency of 60 Hz although the adjuster is set to 50 Hz.
- * Failure inside the adjuster (Thyristor element damage caused by load shorting) → Must be repaired.

(3) No normal output is generated.
- * No normal load voltage is applied.(No rated voltage is applied.)
- * The adjuster output does not match the controller output. (Example : An output of 4 to 20mA is connected to an output of 1 to 5V.)
- * For gradient setting control : The variable resistor in the gradient setter is left set to zero.
- * For H-L control : The variable resistors on the HIGH and LOW sides are not correctly set.
- * The adjuster is used at a power frequency of 50 Hz although the adjuster is set to 60 Hz.
- * The selection of resistive load (R load)/inductive load (L load) is incorrect.
- * Failure inside the adjuster caused by deteriorated parts, etc.→ Must be repaired.

9. Specifications

Maximum load current	:	AC ; 20A, AC : 30A, AC ; 50A, AC ; 70A AC ; 100A, AC ; 150A, or ac ; 200A(At40 ℃)
Control method	:	Phase control method
Applicable method	:	Resistive (R) load or inductive (L) load
Load open/close element	:	Thyrister module
Minimum load current	:	Less than 0.3A
Output control range	:	0 to 98 % of primary power supply voltage
Starting method	:	Soft start provided as standard ; Approx. 1 to 10 sec. (Time to reach an output of 98 %)
Input	:	For Cord "6" ; 1 to 5V DC (Input impedance, Approx. 10k Ω) For Cord "8" ; 4 to 20mA DC (Input impedance, Approx. 150 Ω)
Output protection	:	None [Can meet this protection by the use of fast blow use fuse(Option).]
Power supply voltage	:	200V,220V,380V,400V or 440V AC
Power frequency	:	50 Hz or 60 Hz (Auto selection by main unit)
Allowable voltage variation	:	Within ±10 % of rated value
Cooling method	:	Self-cooling (For 20A,30A,50A,or 70A) or forced-cooling (For 100A, 150A OR 200A)
Allowable ambient temperature	:	0 to 40 ℃ (Maximum load current falls when the ambient temperature is between 40 and 70 ℃. See Fig.7-3 on p.6.)
Allowable relative humidity	:	45 to 85 % RH
Environment	:	Corrosive gases, dust or vibration shall not exist.
Dielectric strength	:	For 1 min. at 1500V AC between the power terminal and frame
Insulation resistance	:	More than 50M Ω between the power terminal and frame (Using 500V DC meager)
Power consumption	:	For 20A ; 2.4 VA, For 30A ; 2.4 VA, For 50A ; 2.4 VA, For 70A ; 2.4 VA, For 100A ; 11.4 VA, For 150A ; 20.4 VA, or for 200A ; 20.4 VA
Shape	:	For vertical mounting
Dimensions	:	See 'Dimensional outline drawing' on P3.
Weight	:	For 20A ; Approx.3.0kg, for 30A ; Approx.3.6kg, for 50A ; Approx.8.8kg for 70A ; Approx.10.8kg, for 100A ; Approx.11.4kg for 150A ; Approx.14.3kg for 200A ; Approx.14.3kg
Option	:	− 1 ; Automatic/manual transfer or gradient setting − 4 ; Fuse burnout alarm (Only for the type with fuse : Can be specified.) − 5 ; H-L control − F ; With fast blow use − T ; Optional power supply voltage (To be specified ; Max 440V AC)
Cautions	:	(1) Input/output characteristics become non-linear curves. (2) Close mounting is not permitted. (3) Cannot be used for capacitive loads such as capacitors.

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