

JS/JT SERIES THYRISTOR REGULATORS



MODELS

JS (SINGLE-PHASE THYRISTOR REGULATORS)

JT (THREE-PHASE THYRISTOR REGULATORS)

The J-Series thyristor regulators are designed for single-phase and three-phase load applications, and each of the units has a built-in firing unit. Since the thyristor regulators feature compactness and lightweight, high density of mounting in an instrumentation panel is possible.

The control systems available in the thyristor regulators are three kinds of phase control system, frequency division control system by zero-cross switching and $\Delta\Sigma$ modulation type frequency division control system by zero-cross switching (for single-phase loads only). The thyristor regulators based on the phase control system are available with voltage feedback, current feedback, or power feedback, or without feedback, so that an ideal thyristor regulator can be selected according to the particular characteristics of the heating element in an electric furnace.

Also, connection of options (setting units) to the thyristor regulators allows gradient setting of outputs, elevation setting for the minimum output voltage, and other setting operations. Various options including a gradient setting function, an auto-manual mode selector switch, and an output indicating meter are available.

The input signals are current signals of 4 to 20mADC or 1 to 5mADC and ON-OFF contact signals.

■ FEATURES

• Compact and lightweight

The compact and lightweight designs of the thyristor regulators facilitate their mounting and wiring.

• Suited for high-density Instrumentation

All types of i-Series thyristor regulators have a slim construction to allow high-density mounting in an instrumentation panel. The 30~250A (130~200A: Three-phase type) types, in particular, are ideal for high-density instrumentation, since the mounting pitches have been unified into 300mm to allow multiple-unit mount in one panel.

• A wide selection of current ratings

Fourteen types of current ratings, ranging from 10A to 1000A, are available to suit the particular load requirements.

• Optimal model selection according to the characteristics of the heating element

To ensure enhanced input and output characteristics, partial feedback of outputs (voltage, current, or power) is provided with the phase control system. The optimal thyristor regulators can be selected according to the particular characteristics of the heating element (nichrome wire, silicone carbide, or other materials).

Single-phase thyristor regulation



• Types 10A and 20A



• Types 30A, 50A and 75A

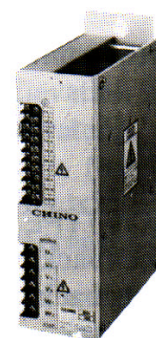


• Types 100A, 150A, 200A and 250A

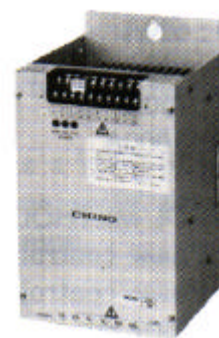


• Types 300A, 400A and 500A

Three-phase thyristor regulation



• Types 10A and 20A



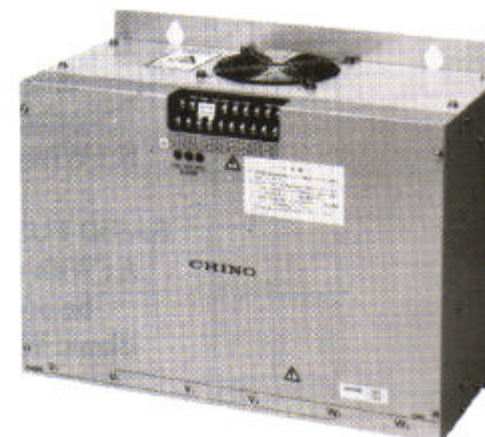
• Types 30A and 50A



• Types 75A and 100A



• Types 300A, 400A and 500A



• Types 150A, 200A and 250A

• Various types of protection functions

A thyristor gate turn-off circuit for over-current protection, a fuse unit that rapidly blows out in the event of short circuit, and various other circuit protectors are provided as standard.

• A wide variety of accessories

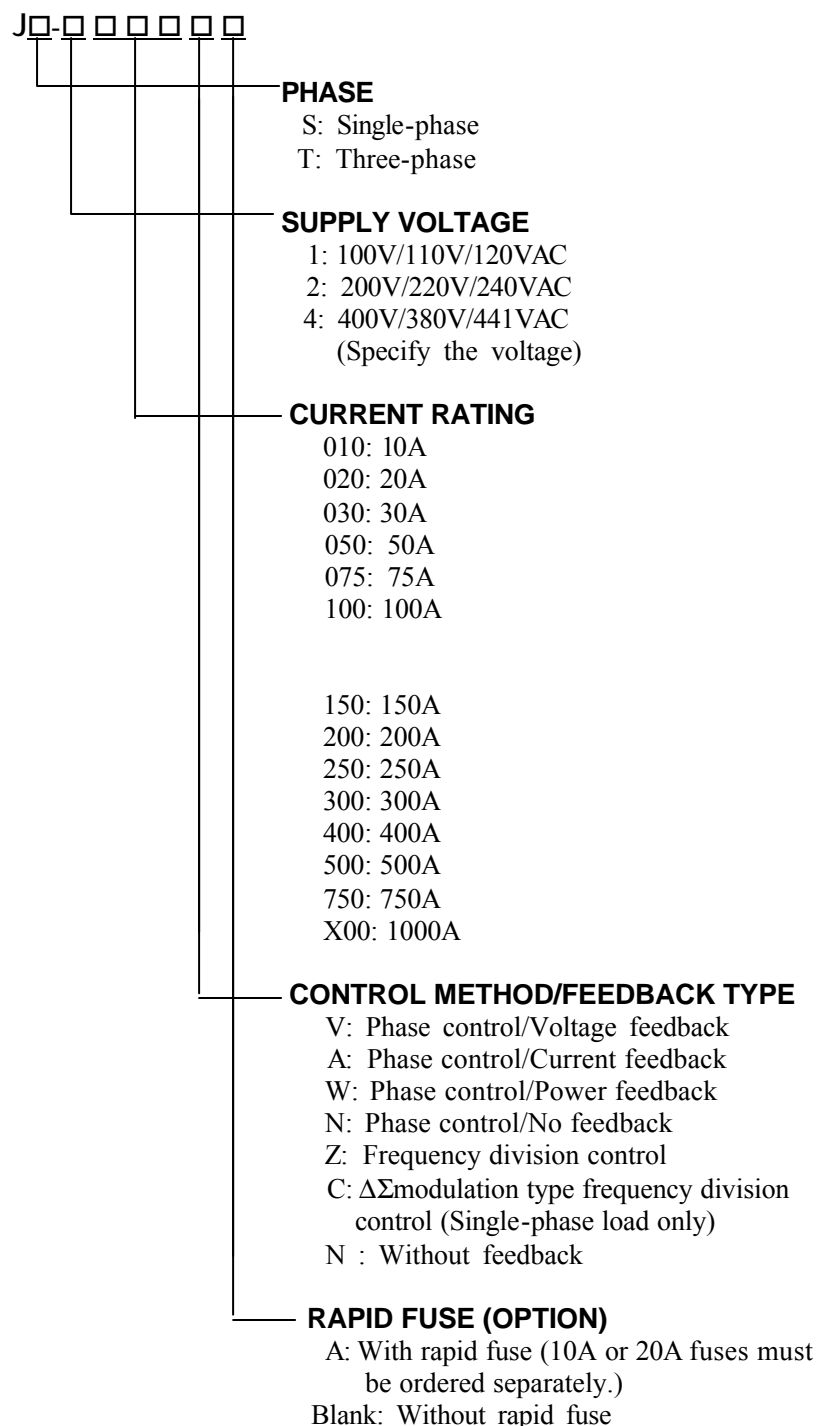
The optimum control system can be built by combining various types of accessories including a gradient setting unit, an upper-limit setting unit, a lower-limit setting unit, a manual setting unit and an elevation setting unit.

• New frequency division control system (For single-phase loads only)

On Model JS, the new frequency control system with $\Delta\Sigma$ modulation is available for sensitive power control. It can be used under high frequency regulation by zero-crossing switching.

• A terminal board cover for preventing an electrical shock is provided as an option.

■ MODELS



■ GENERAL SPECIFICATIONS

VOLTAGE RATING:
100/110/120VAC, 200/220/240VAC, or 380/400/440VAC

FREQUENCY: 50/60Hz (terminal-selectable)

CURRENT RATING:
10A, 20A, 30A, 50A, 75A, 100A, 150A, 200A, 250A, 300A, 400A,
500A, 750A or 1000A
(all based on an ambient temperature of 50°C)

INPUT SIGNAL:
4 to 20mA DC, 1 to 5mA DC and ON-OFF contact signals
(terminal-selectable)

INPUT RESISTANCE:
4 to 20mA DC — 100Ω or less
1 to 5mA DC — 400Ω or less

OUTPUT RANGE:

Phase control system

- Voltage feedback — 0 to 98% (95%) of the voltage rating
- Current feedback — 0 to 100% of the current rating
(However, the maximum output voltage is 98% (95%) of the voltage rating.)
- Power feedback — [0 to 98% (95%) of the voltage rating] × [0 to 100% of the current rating]
- No-feedback — 0 to 98% (95%) of the voltage rating

Frequency division control system

- 0 to 100% of the voltage rating
- Frequency division rate: 1.5 sec.
- (): In case of three-phase

OUTPUT SETTING RANGE:

On condition that optional setting units are provided

- Current Inputs — Gradient setting
0 to 100% of the output range
Elevation setting
0 to 100% of the output range
- ON-OFF contact inputs — Upper-limit setting
0 to 100% of the maximum output
Lower-limit setting
0 to 100% of the upper-limit setting

APPLICABLE LOAD:

Resistive load or inductive load (transformer primary side control)
For frequency division control system, resistive loads only can be used.

ALLOWABLE VOLTAGE FLUCTUATION:

(+)10 to (-)15% of the voltage rating

OPERATING TEMPERATURE RANGE:

Performance guarantee range
0 to 50°C
For allowable current corresponding to temperature
exceeding 50°C, see the section on ambient temperatures
and allowable current.
Operation guarantee temperature (-) 10 to 55°C

COOLING METHOD:

Current rating of 150A (75A) or less:
Self-cooling
Current rating of 200A (100A) or more:
Cooling fan is provided as standard.
(): In case of three-phase

OVERCURRENT PROTECTION:

Alarm: Over current alarm (with current transformer for current detector [separate purchase is requested])
Rapid fuse melt (more than 30A)
Cooling fan abnormal (more than 200A)...
Contact output and lamp display
Load short alarm... Lamp display (New frequency division control system only) (10A and 20A no lamp display)
Contact capacity... 200 VAC, 0.5A(Resistance load)

INSULATION RESISTANCE:

Between power terminals and protective ground terminal
50M Ω at 500VDC

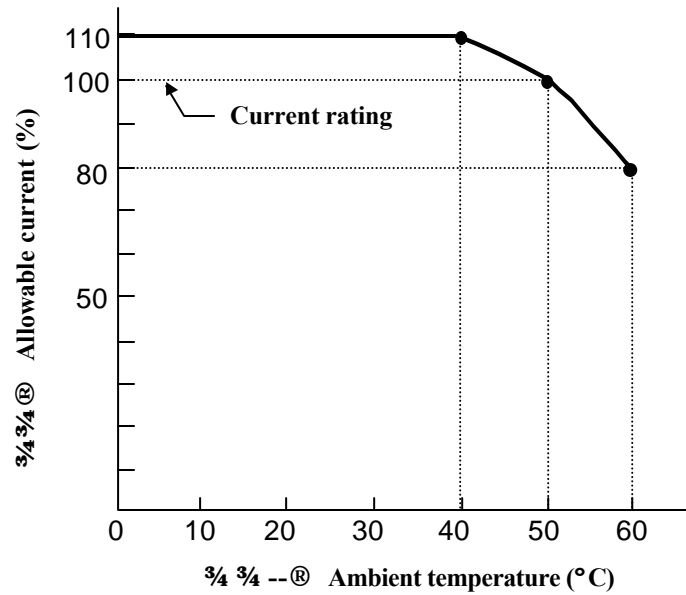
WITHSTAND VOLTAGE:

Between power terminals and protective ground terminal
2000VAC, 1 minute (for 100/200V)
2500VAC, 1 minute (for 400V)

■ CHARACTERISTICS AND FUNCTIONS

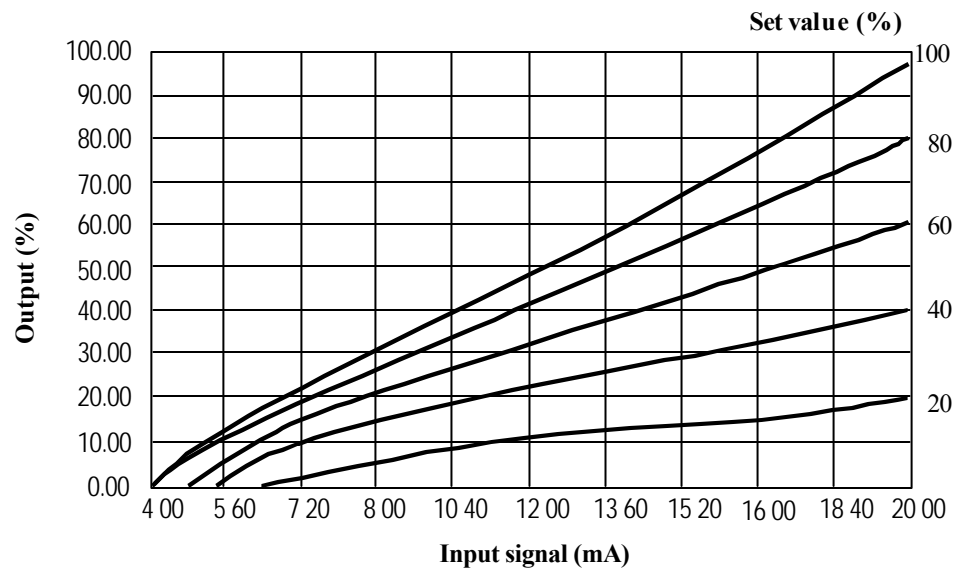
• Ambient temperature and allowable current

The current rating of the thyristor regulator is an allowable current value at an ambient temperature of 50°C. At the ambient temperature above 50°C, the allowable current value decreases.



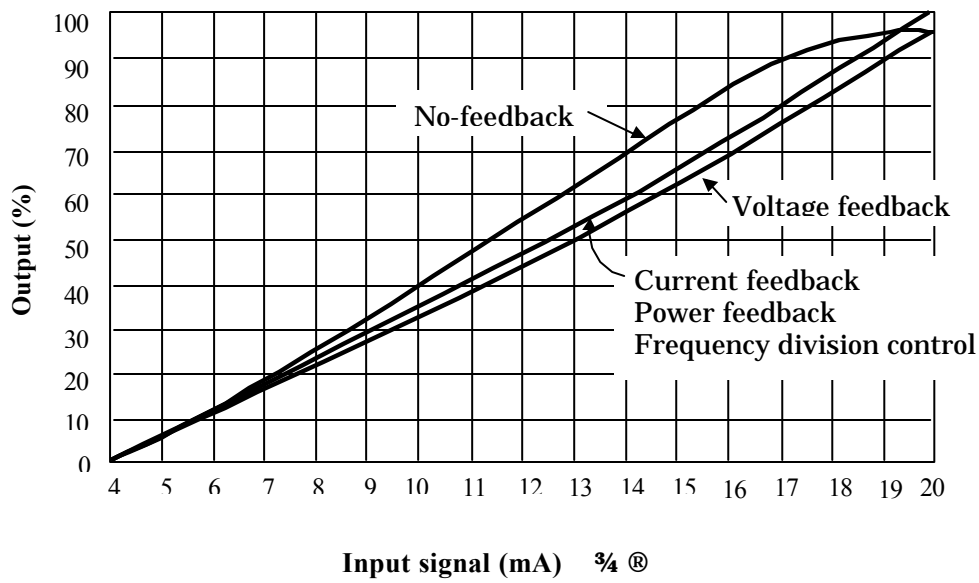
• Gradient setting

Gradient setting can be done by connecting a setting unit (10KΩ). This function is useful for an electric furnace with three zone controls, in which three thyristor regulators are operated by one controller.



• Input/output characteristics

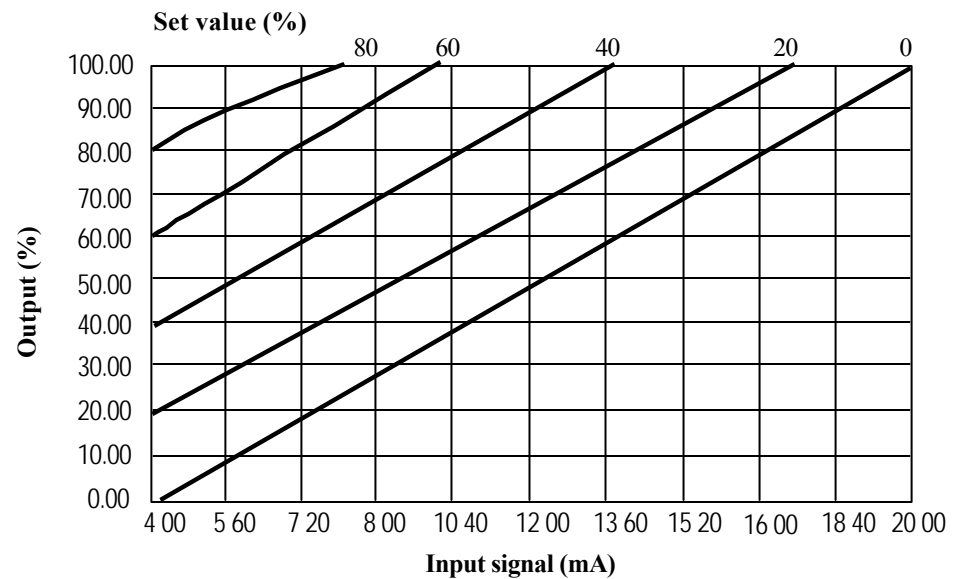
Compared with no-feedback type, improved input/output characteristics and stable outputs can be obtained with feedback type.



• Elevation Setting

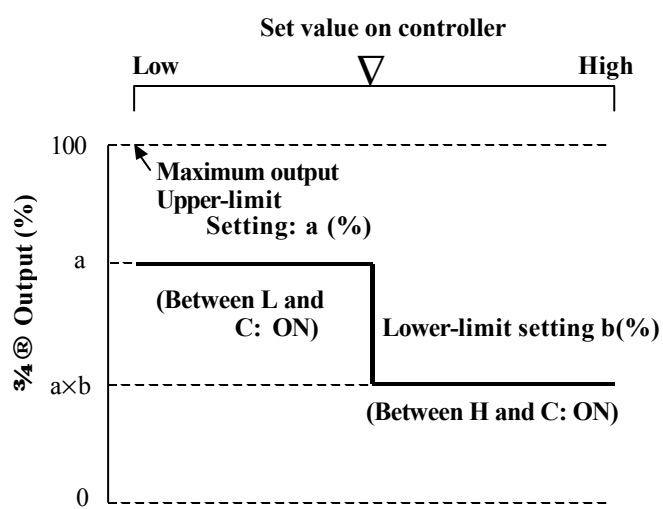
Elevation setting can be done by connecting a setting unit (2 kΩ rated).

This function keeps a level-of-power being applied to an electric furnace constantly, even if the controller output decreases to its minimum.



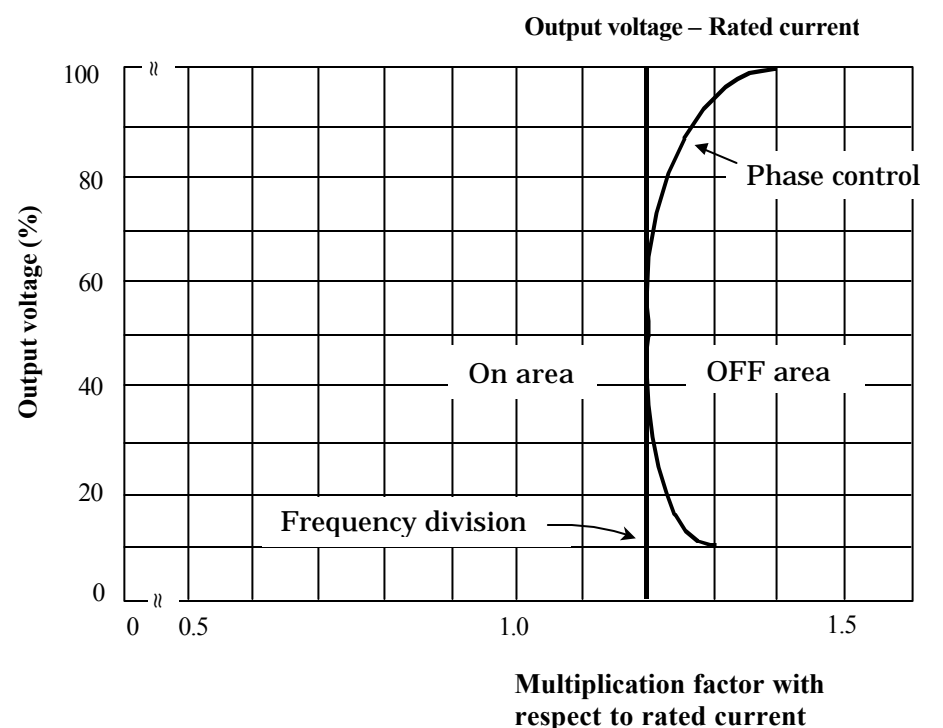
• Upper-limit setting and lower-limit setting - ON-OFF contact type

The upper-limit can be set to within the range from 0 to 100% of the rated value, and the lower-limit can be set to within the range from 0 to 100% of the upper-limit setting. If the upper-limit and lower-limit settings are taken to be a% and b%, respectively, then the actual lower-limit output achieved can be expressed as $a \times b$ (%).



• Over current gate turn-off characteristics

If the over current with 1.2 times of the rated current flows, the gate of thyristor will be turned off, and the thyristor then will be protected from the over current. (at 30 to 70% of the output voltage in the phase control system)



■ ACCESSORIES

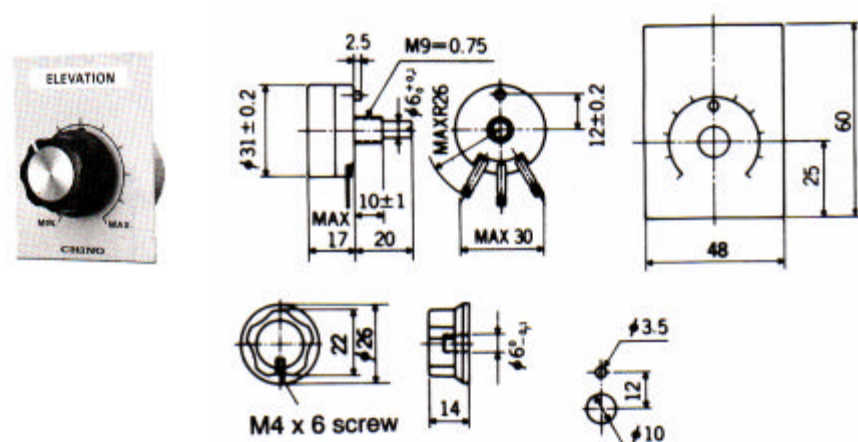
The following accessories are available:

- **Setting units**

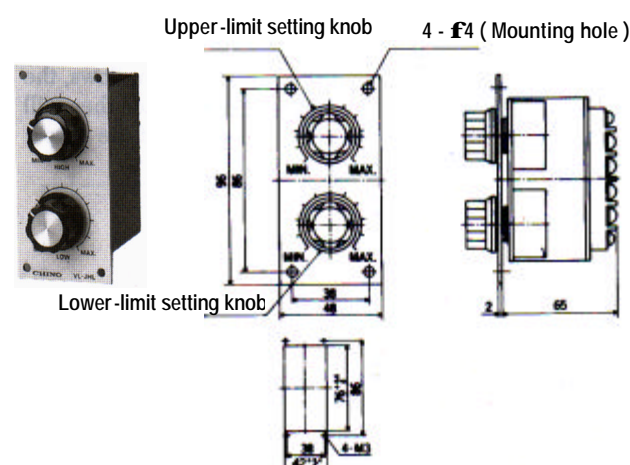
Model	Applications	Specifications
VI-JAL	Gradient setting or lower-limit setting	Variable resistance of 10kΩ
VL-JM H	Manual setting , upper-limit setting or elevation setting	Variable resistance of 2kΩ
VL-JHL	Upper-limit setting and lower limit setting	Variable resistance of 2kΩ and 10kΩ
VL-JAM	Gradient/manual setting. output indicating meter and auto-manual mode selector switch provided.	1:Voltage indicator 0 to 150V (Single-phase only) 2:Voltage indicator 0 to 250V 3:Voltage indicator 0 to 500V 4: Output setting range 0 to 100% (Frequency division control system only) (Variable resistance 2kΩ, 10kΩ)

Both the VL-JAL and the VL-JMH consist of a variable resistor, a scale plate, and a setting knob.

- VL-JAL, VL-JMH



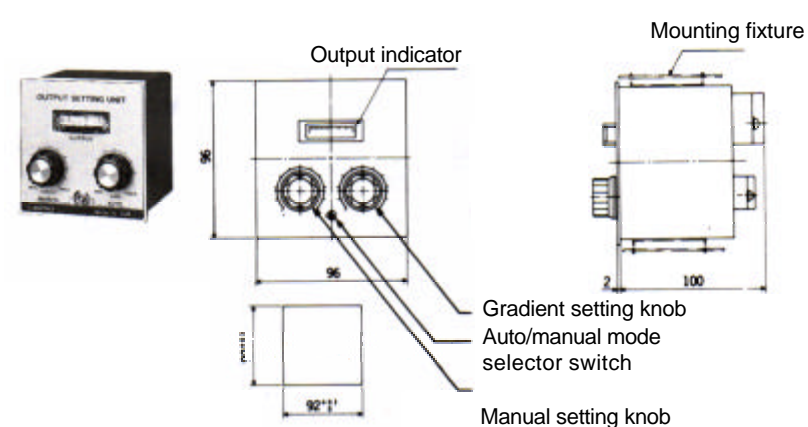
- VLJHL



- **VLU-JAM**□

 CURRENT RATING

- 1: 100VAC line (Single-phase only)
2: 200VAC line
4: 400VAC line
(Z: For frequency division control system)



- **Current transformers**

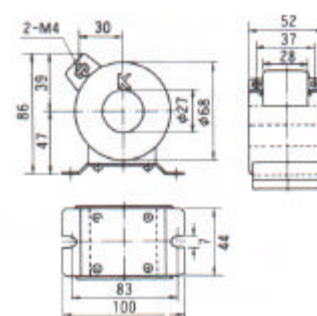
Current transformers

For a power feedback or a current feedback type unit, a current transformer is required for load current and over current detection. On the three-phase thyristor regulator, two current transformers are required.

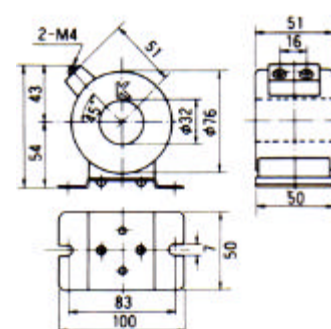
Model	Current rating	Coil
CTJ010A	10A	10
CTJ020A	20A	5
CTJ030A	30A	5
CTJ050A	50A	2
CTJ075A	75A	2
CTJ100A	100A	1
CTJ150A	150A	1
CTJ200A	200A	1
CTJ300A	300A	1
CTJ400A	400A	1
CTJ500A	500A	1
CTJ750A*	750A	1
CTJX00A*	1000A	1

When models marked with an asterisk (*) is used, a CTJ005A is required.

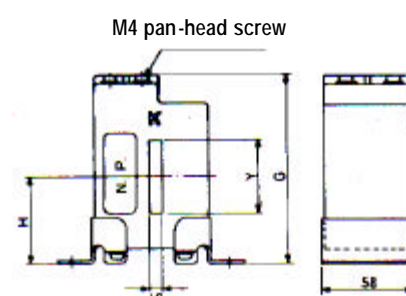
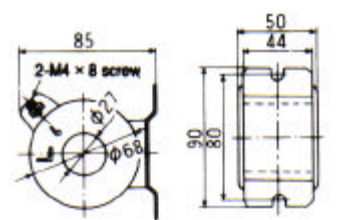
- 10 to 300A



- **400A, 500A**



- **750A, 1000A**



Unit: mm

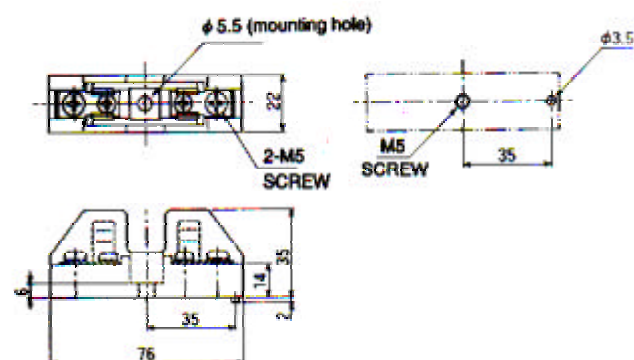
MODEL	H	G	V
C1J750A	61	121	55
CTJX00A	73	153	78

• Fuse Units

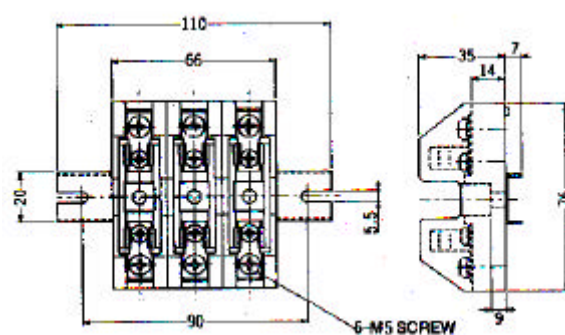
Model	Current rating
FU-J010□	10A
FU-J020□	20A

Blank : Single-phase loads
T : Three-phase loads

Single-phase loads



Three-phase loads



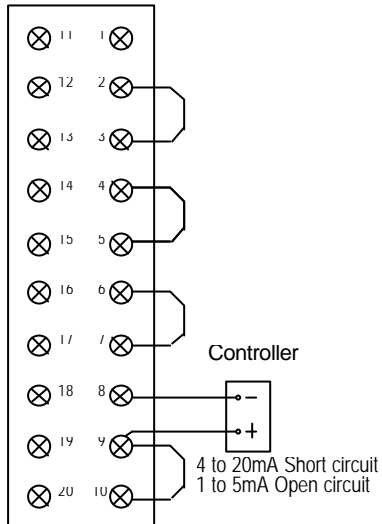
Unit: mm

INPUT SETTING CIRCUITS

• Current input

4 to 20mA ADC or 1 to 5mA ADC

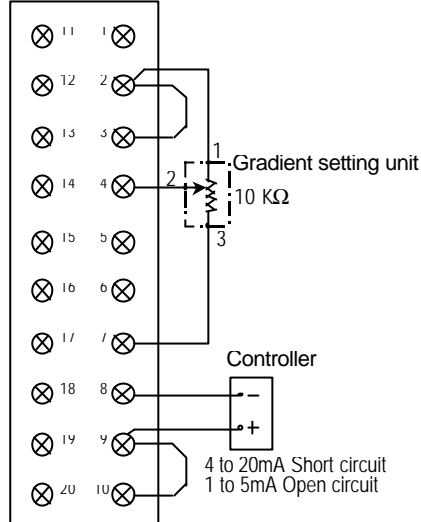
Selling terminals



• Current input

With gradient setting unit

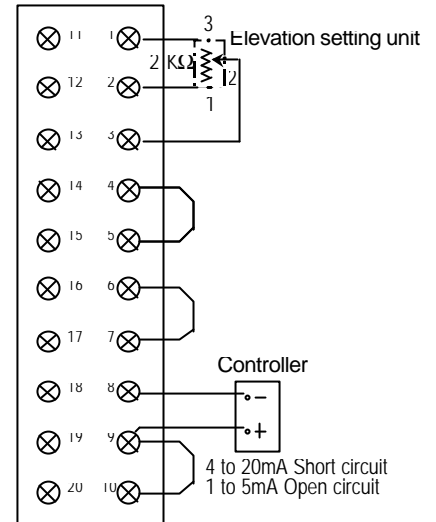
Selling terminals



• Current input

With elevation setting unit

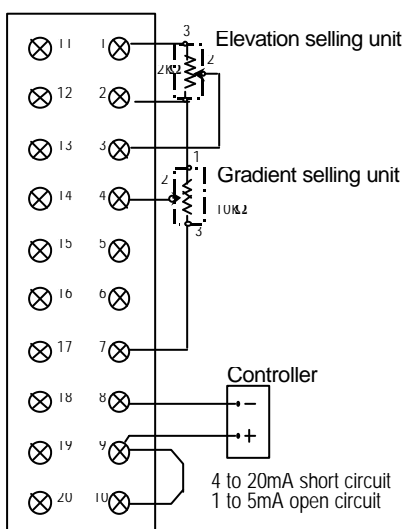
Selling terminals



• Current input

With gradient setting unit and elevation setting unit

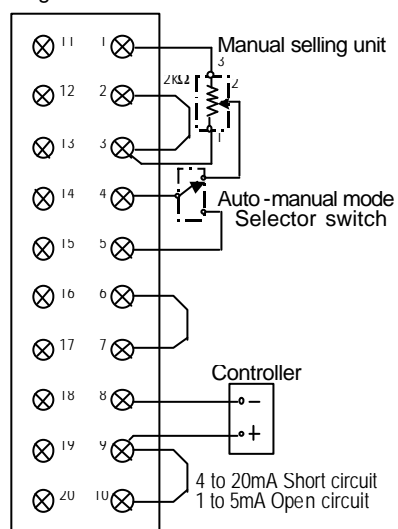
Selling terminals



• Current input

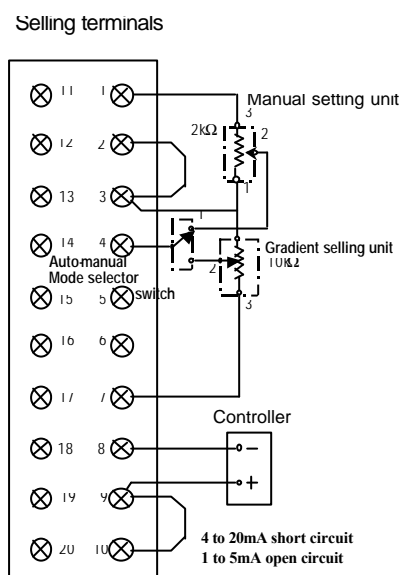
With manual setting unit and auto-manual mode selector switch

Selling terminals



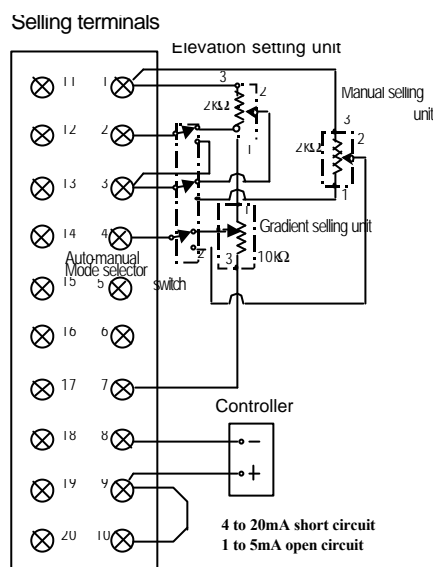
● **Current input**

With gradient setting unit, manual setting unit, and auto-manual mode selector switch



● **Current input**

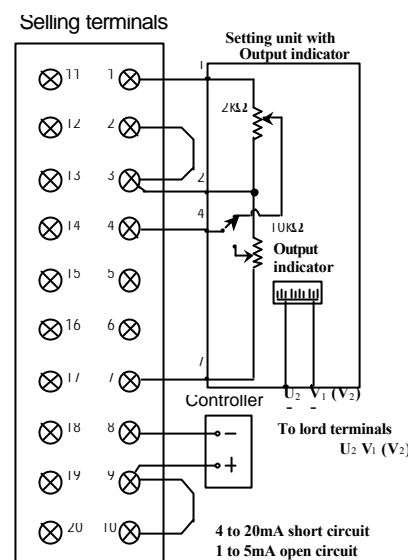
With gradient setting unit, elevation setting unit, manual setting unit and auto-manual mode selector switch



● **Current input**

Setting unit with output indicator (with gradient setting, manual setting, auto-manual mode selector switch and output indicator)

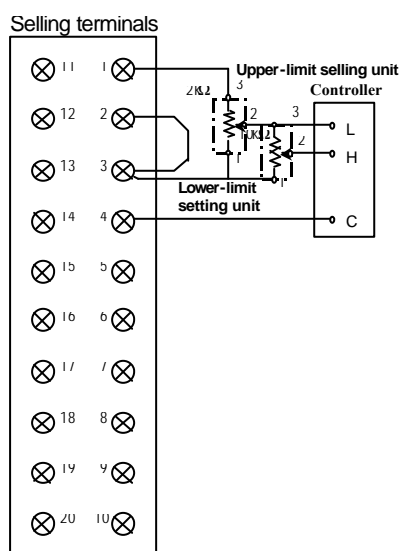
This unit can not be used for the frequency division control system.



(): In case of three-phase

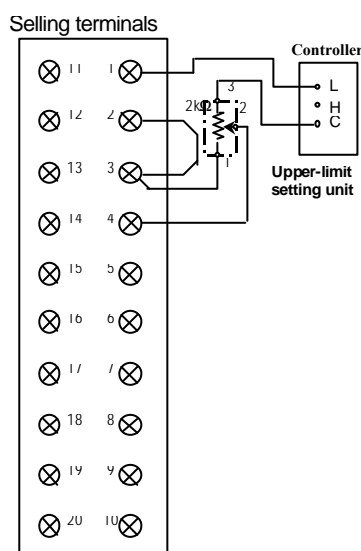
● **ON-OFF contact input**

With gradient setting unit and lower-limit setting unit



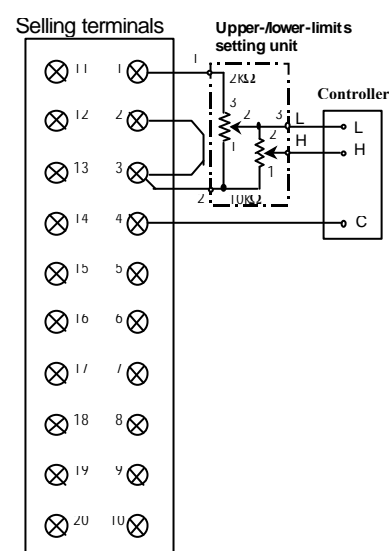
● **ON-OFF contact input**

With upper-limit setting unit



● **ON-OFF contact input**

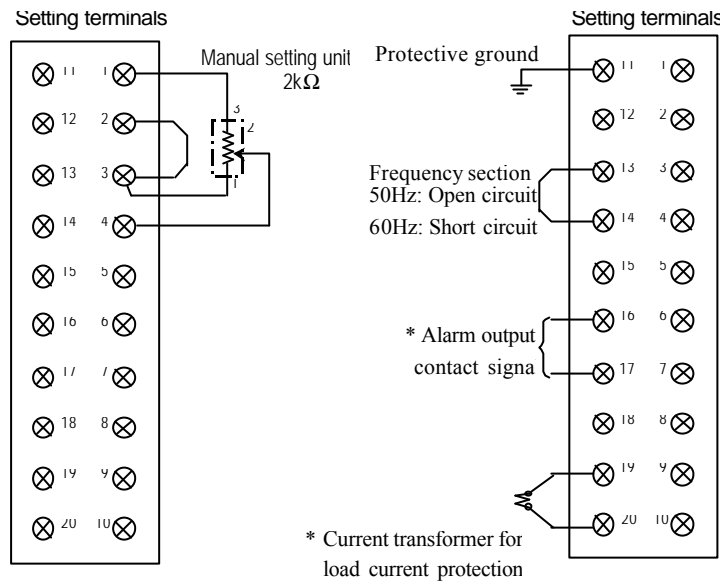
With upper-/lower-limit setting unit



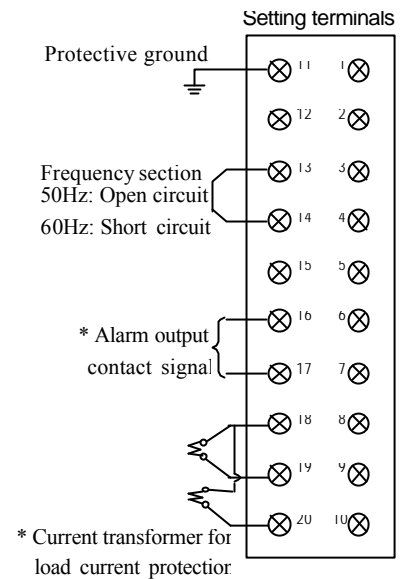
- Manual setting only
With manual setting unit

- Terminals numbered 11 through 20
For frequency selection, alarm output, and current transformer

Single-phase loads

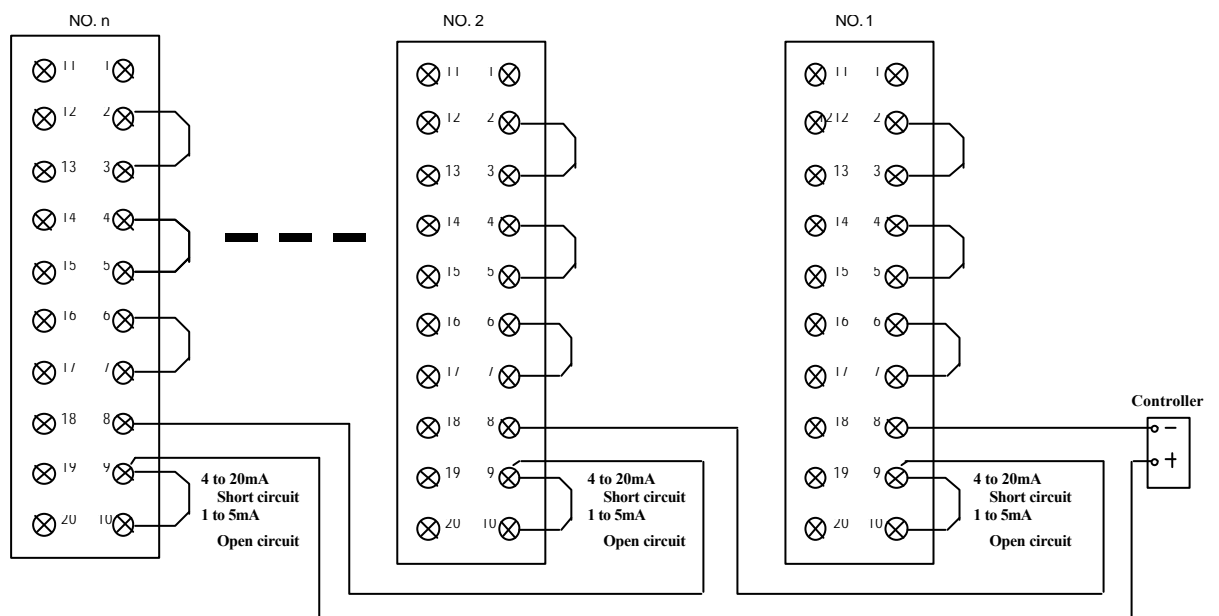


Three-phase loads



* This function is not included with the phase control system without feedback

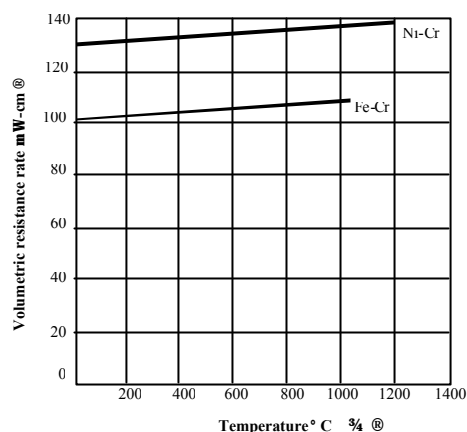
- Current input
With gradient setting unit and elevation setting unit



EQUIPMENT CONFIGURATION AND WIRING

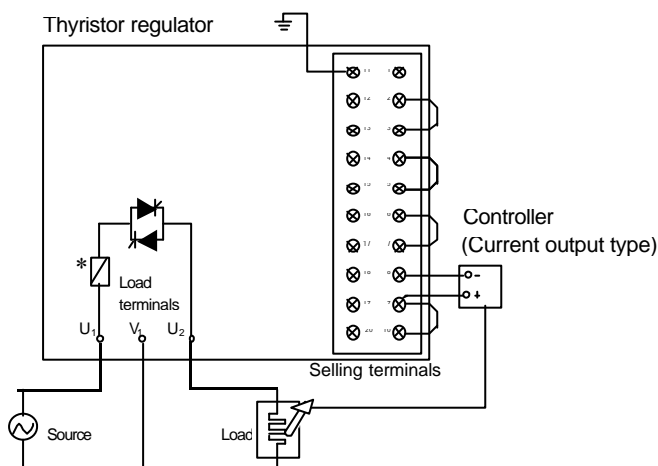
- Phase control system with voltage feedback
- Phase control system without feedback

In case an electric furnace heater is a Fe-Cr wire, a Ni-Cr wire or any other heating element which has a small temperature coefficient of its electrical resistance, keeping the heater voltage feedback can detect the heater voltage and feed back its value to ensure linear and stable output to the heater.



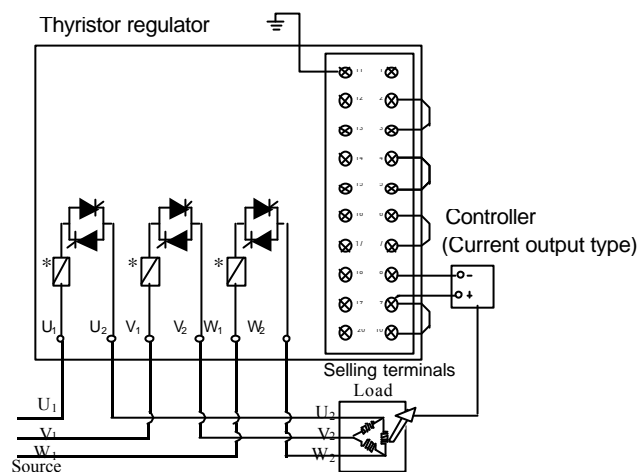
Single-phase loads

- Current input

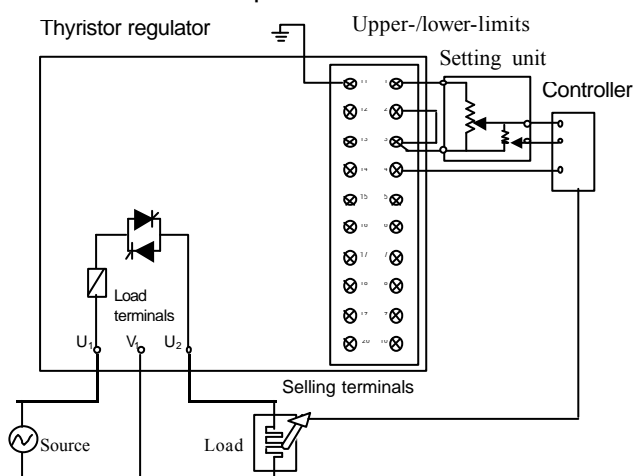


Three-phase loads

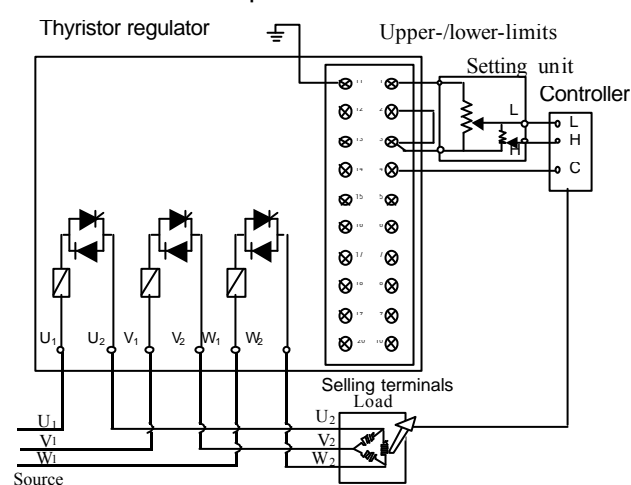
- Current input



- ON-OFF contact input



- ON-OFF contact input

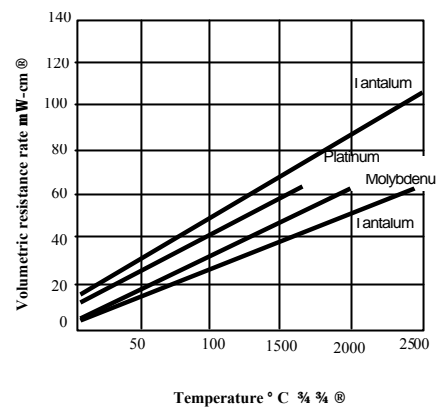


*Rapid fuse (Option)

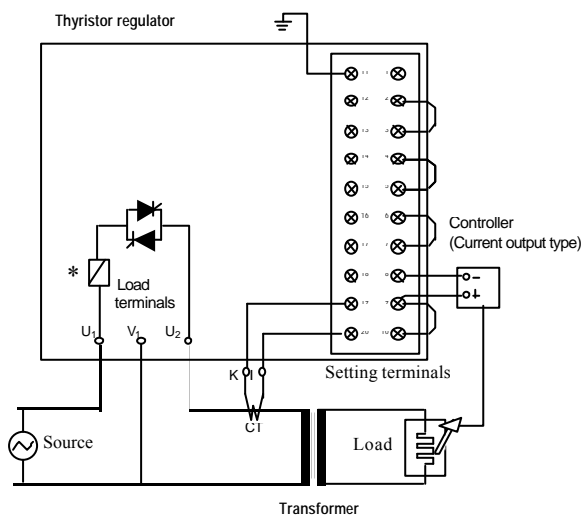
10A or 20A fuses must be ordered separately.

●Phase control system without feedback

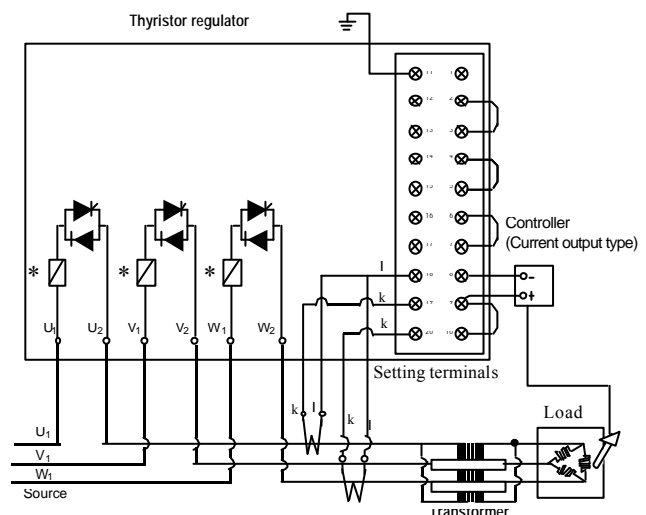
In case an electric furnace heater is a platinum wire, molybdenum wire or any other heating element of which electrical resistance is very low at low temperature and increases its value to 6 to 12 times at high temperature, the heater current will change with temperature, even if the heater voltage is constant. In particular, large current will flow in the heater at low temperature. As the thyristor regulators with current feedback can detect the heater current and feeds back its value, if the maximum output of the thyristor regulator is preadjusted to the maximum rating current of the electric furnace, the current output is in proportion to the input signal, not related to any changes in the heater resistance, and the highly stable control can be provided without the maximum rating value being exceeded.



Single-phase loads



Three-phase loads

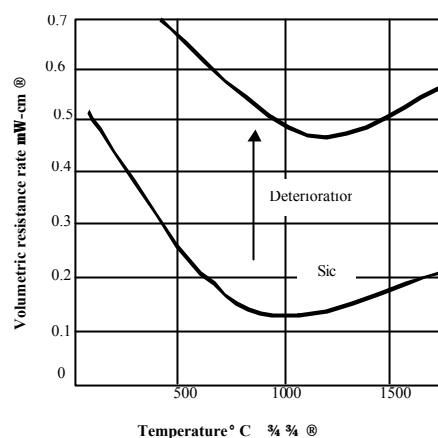


* Rapid fuse (Option)

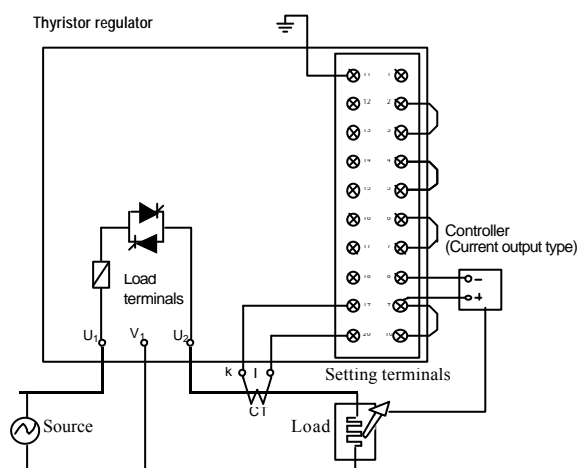
10A or 20A fuses must be ordered separately.

● **Phase control system with power feedback**

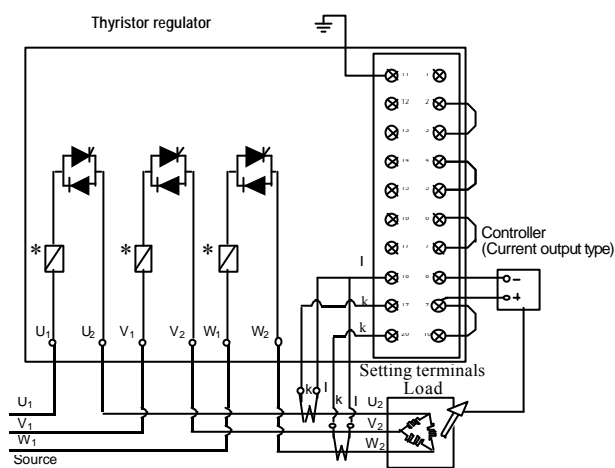
In case an electric furnace heater is a silicone carbide (SiC) based or any other heating element, of which electrical resistance changes by its heating temperature and deteriorates to about 4 times of the initial value on long term use, the heater power changes with temperature and further changes on long term use, even if the heater voltage is kept constant. As the thyristor regulators with power feedback can detect both voltage and current of the heater and feed back its multiplied value, the power output is in proportion to the input signal, not related to any changes in the heater resistance, and any changes of the power due to deterioration of the heater will be compensated automatically.



Single-phase loads



Three-phase loads



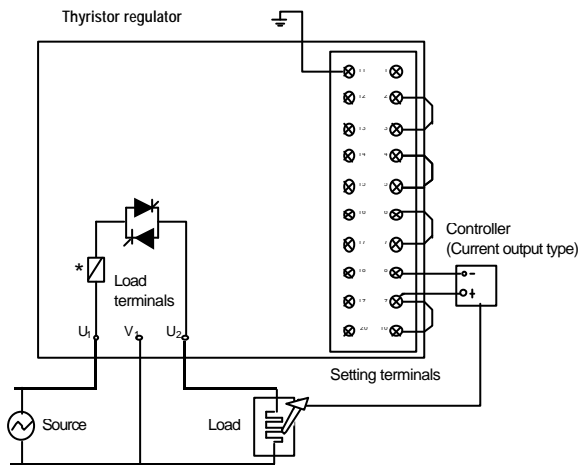
* Rapid fuse (Option)

10A or 20A fuses must be ordered separately.

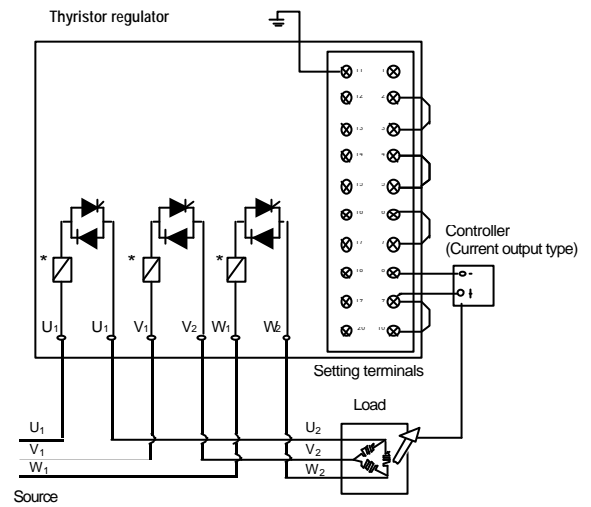
● **Frequency division control system (Zero-cross switching)**

As the frequency division control system (Zero-cross switching) turns on and off the thyristor near the zero point of the power supply, high-frequency noise is not generated, and the thyristor can be powered from the same power supply as that of digital equipment having low noise immunity. Since this system can change the ON time and OFF time of the power supply within a constant time, it is suited for use in electric furnaces with large heat capacity. $\Delta\Sigma$ modulation type frequency division control system by zero-cross switching (single-phase loads only) is also available for sensitive power control.

Single-phase loads



Three-phase loads

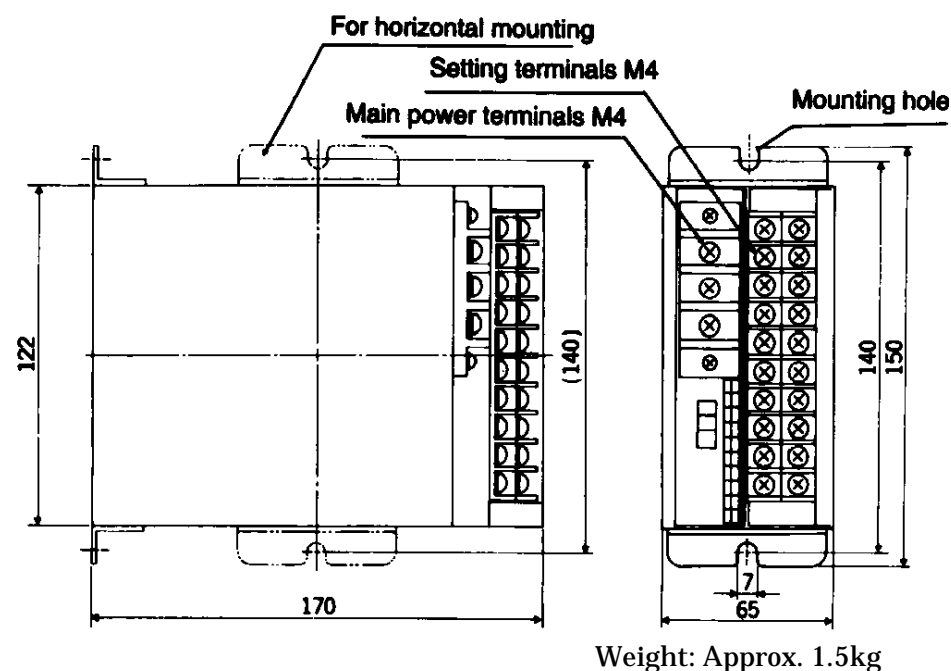


* **Rapid fuse (Option)**

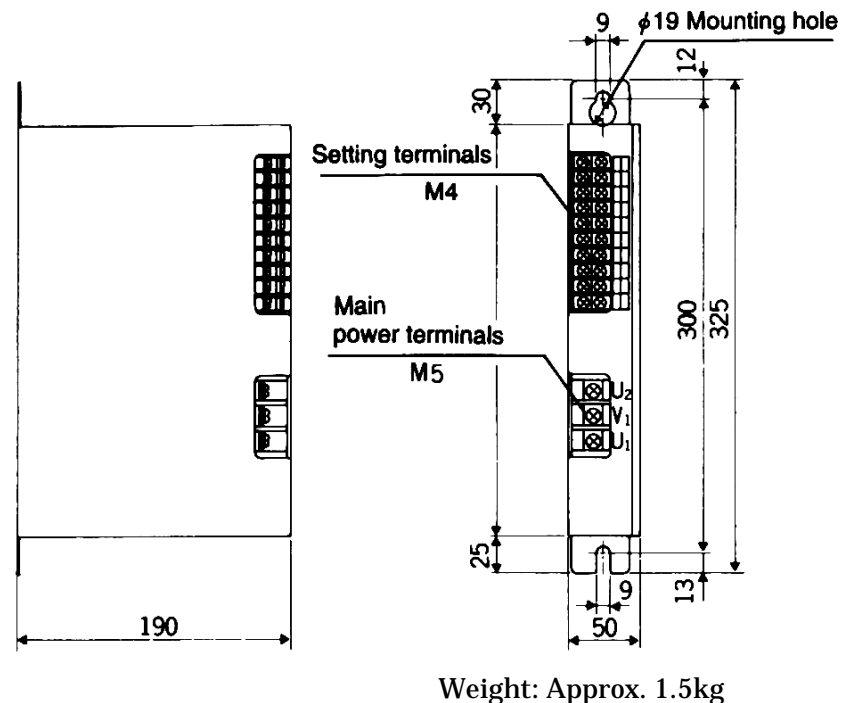
10A or 20A fuse must be ordered separately.

■ OUTSIDE DIMENSIONS (FOR SINGLE-PHASE LOADS)

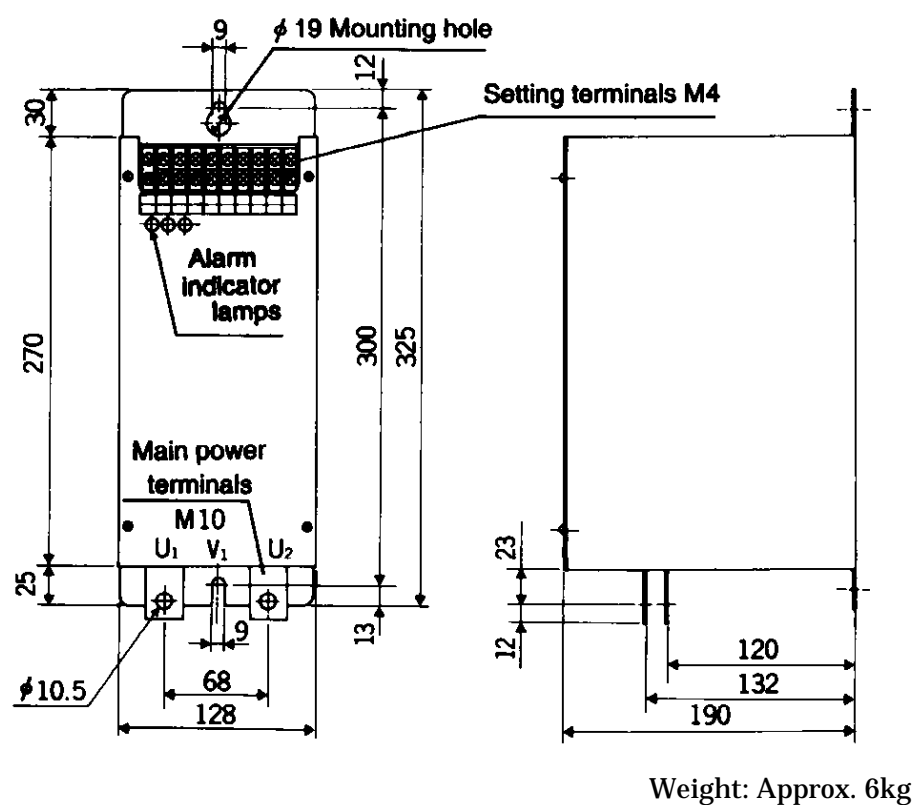
- Types 10A and 20A



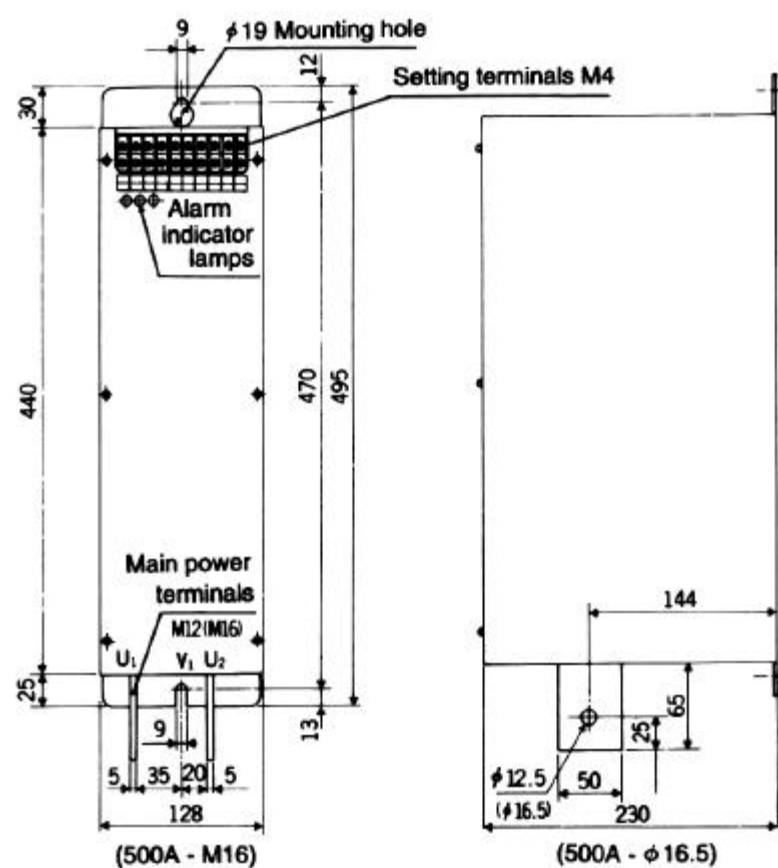
- Types 30A, 50A and 75A



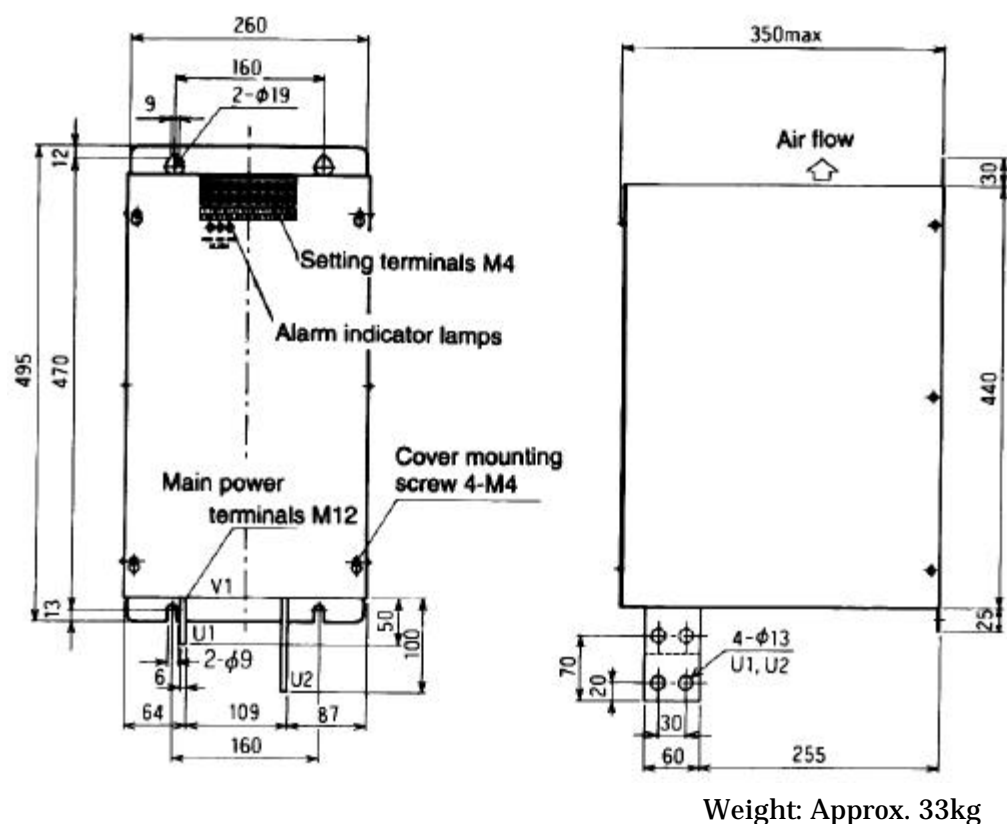
- Types 100A, 150A, 200A and 250A



- Types 300A, 400A and 500A



- Types 750A and 1000A

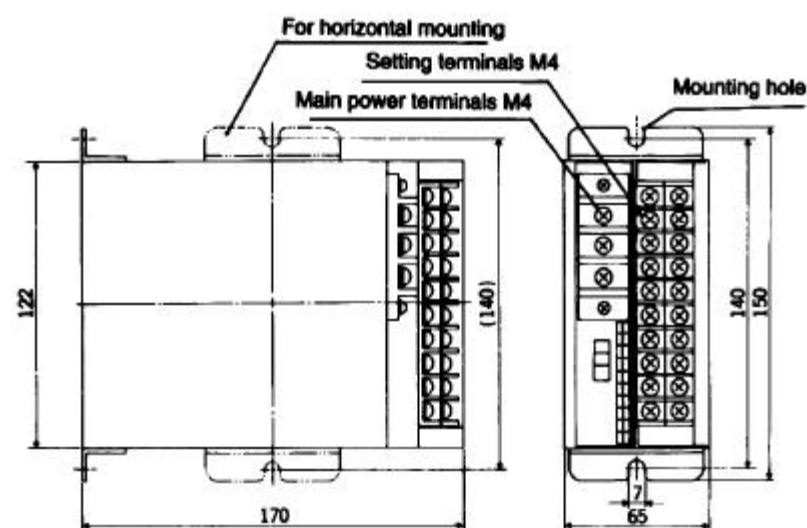


Weight: Approx. 11kg

Unit: mm

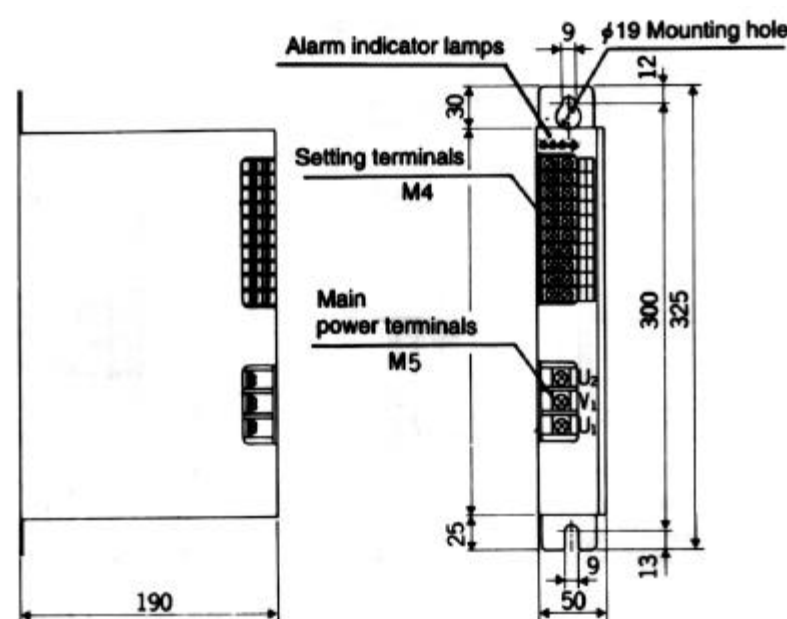
■ OUTSIDE DIMENSIONS (FOR SINGLE-PHASE LOADS) (DS MODULATION TYPE FREQUENCY DIVISION CONTROL SYSTEM ONLY)

• Types 10A and 20A



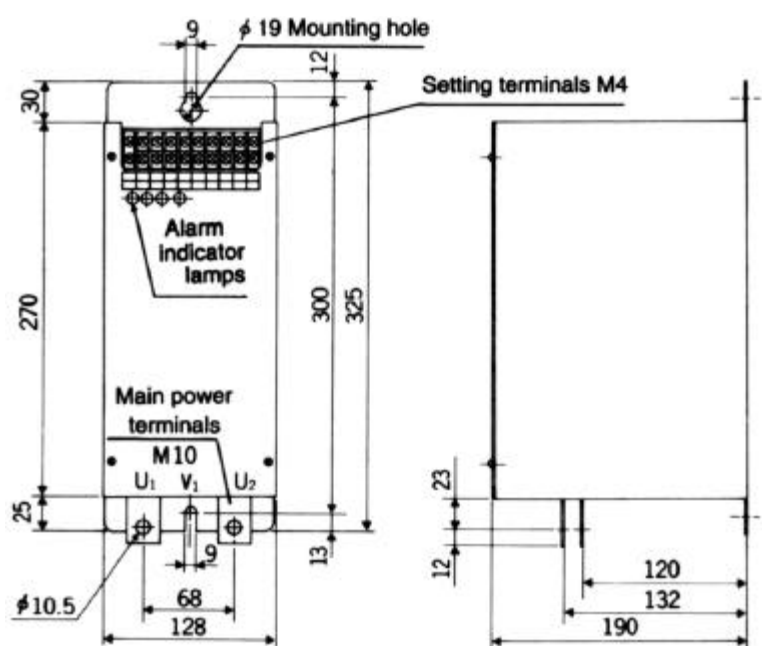
Weight: Approx. 1.5kg

• Types 30A, 50A and 75A



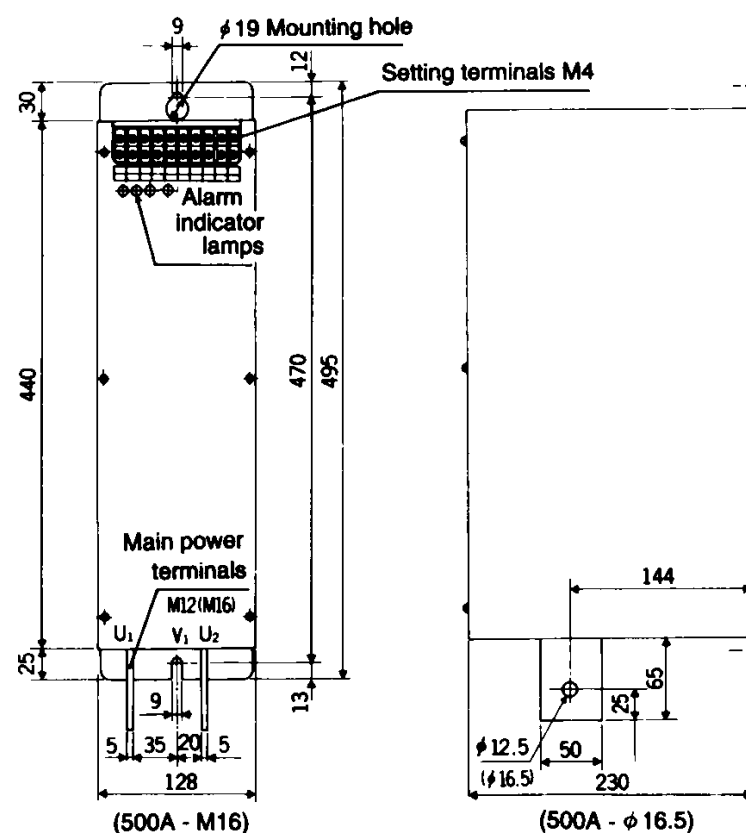
Weight: Approx. 2.5kg

• Types 100A 150A, 200A and 250A



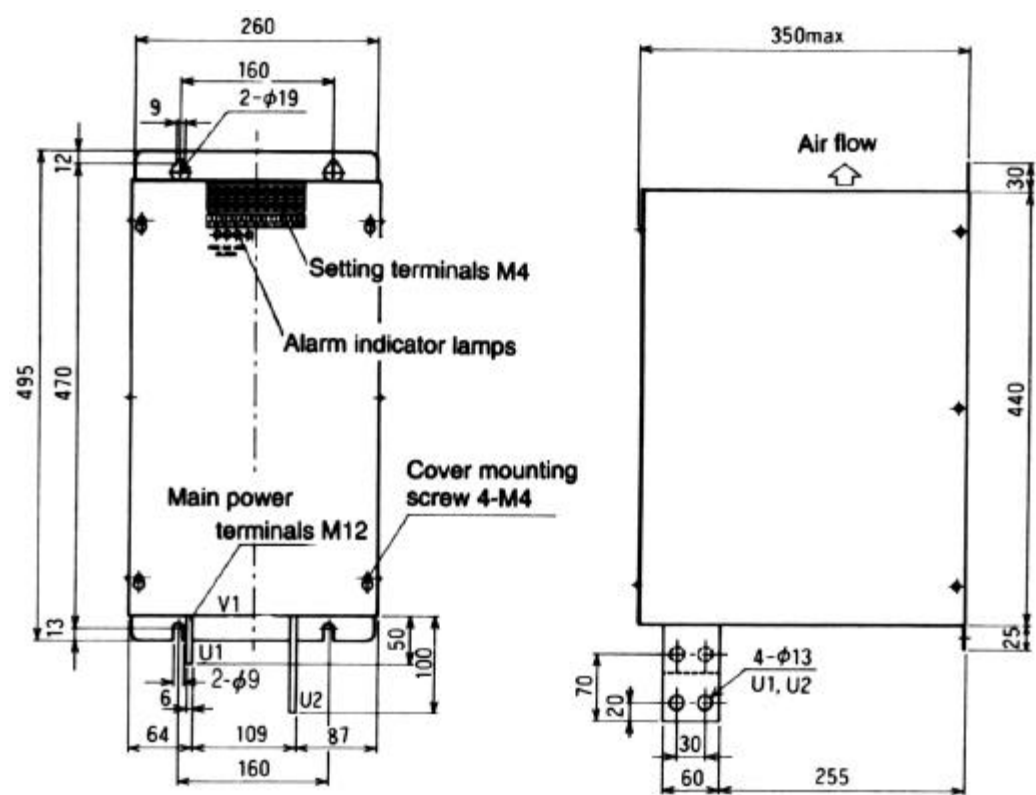
Weight: Approx. 6kg

• Types 300A, 400A and 500A



Weight: Approx. 11kg

• Types 750A and 1000A



Weight: Approx. 33kg

Unit: mm

Specifications subject to change without notice. Original 2002

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