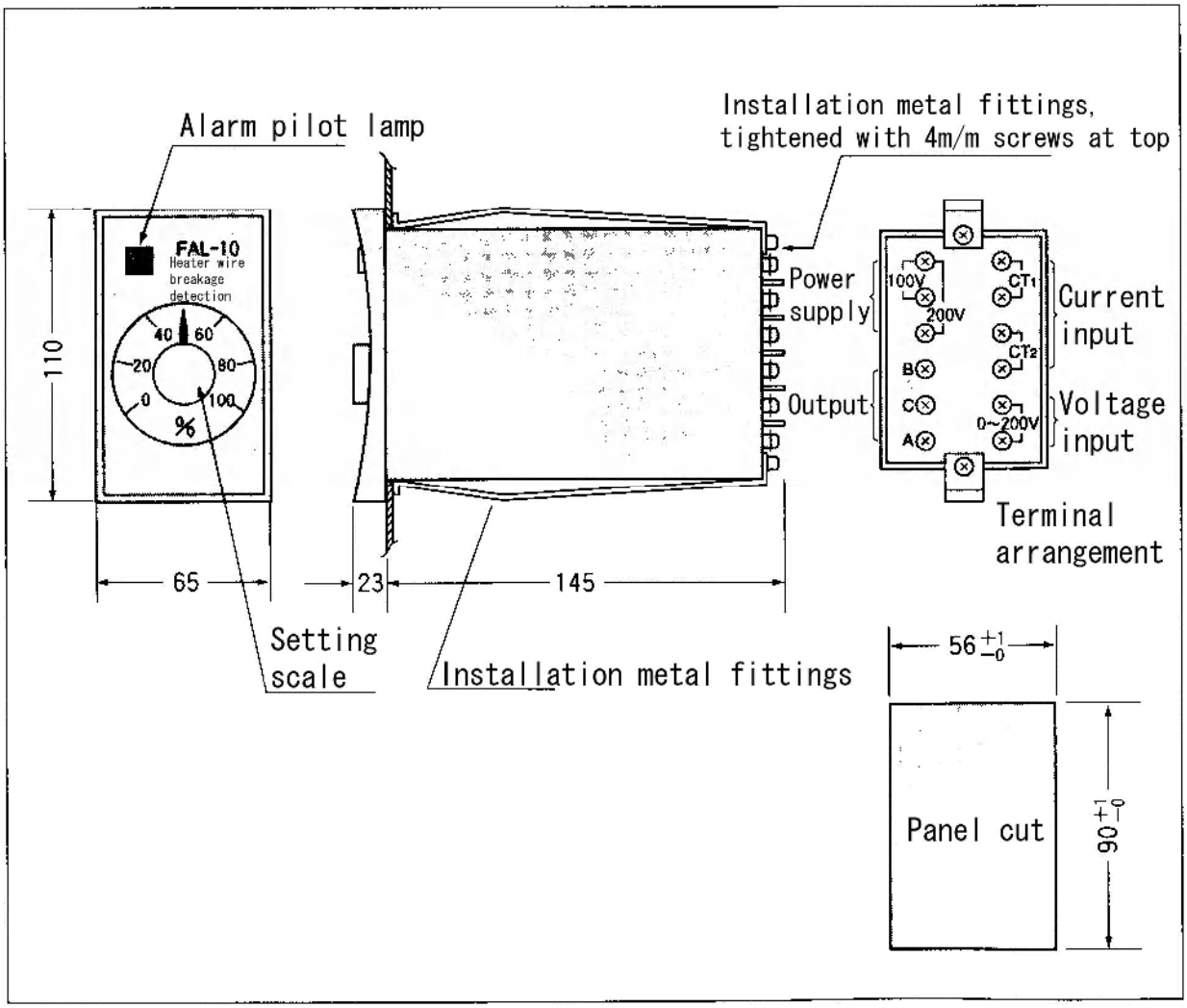
HEATER OPEN ALARM

FAL-10 (Single phase, three phase concurrently)

Instruction Manual

Forest Co.,Ltd.

■External appearance drawing



Principle of operation

(1) Line current of load is detected by the current detector (CT) to convert the detected current into the voltage, which is then input to the divide circuit.

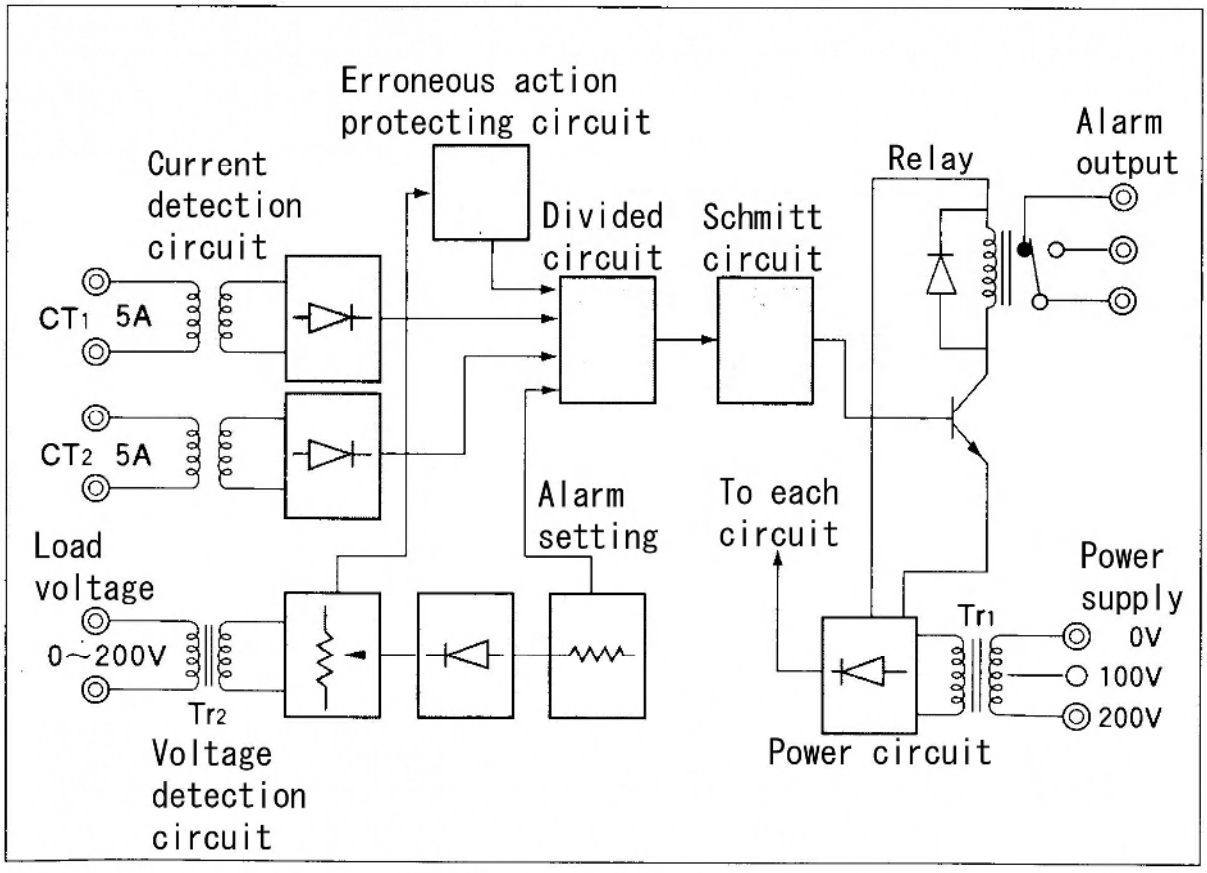
(2) Line voltage of load is detected by the voltage detector (Tr2) and the detected voltage is then input to the divide circuit through the current setting device and alarm setting device.

(3) Both inputs are compared and divided in the divide circuit, and the relay is driven through the schmitt circuit, and alarm signal is output.

(4) Because the voltage and the current are detected, even if the power source varies both the voltage and the current increase or decrease at the same ratio. If the power source variation causes the current to decrease, no alarm is issued. Therefore, power supply which is under thyristor phase control, or the like can also be adapted to this detector.

(5) If the voltage of the load is less than 15% (15V for a rated voltage of 100V, and 30V for 200V), the erroneous action protecting circuit is activated and no alarm is output.

■ Block diagram



Specifications

Type:	FAL-10
Gauge power source:	AC 100/200 ±10%; 50/60Hz
Load current:	0.3～5A (Use external CT when 5A or over)
Load voltage:	0～100V/0～200V
Heater capacity:	0.5kW for AC 100V, 1∅ 1.0kW for AC 200V, 1∅ 1.7kW for AC 200V, 3∅ (Direct coupling for smaller capacity (below 5A of line current) CT is used for heater capacities higher than the above.
Application load:	Nichrome, Steel-Nichrome, Graphite, Kantal A
Alarm setting range:	3～100%
Setting Accuracy:	±1.5% (Full scale)
Detection Sensitivity:	0.5% (Full scale)
Input:	Phase control
Detection method:	Load current and load voltage.
Alarm output:	Relay contact 1c, (Rating 200V, 0.1A resistor load)
Shape:	panel embedded type
Insulation resistance:	20MΩ or more (DC 500V meg ohm meter) between I/O terminals
Dielectric strength:	AC 1500V/minute between I/O terminals
Ambient condition for gauge:	Ambient temperature… -10～50℃ Ambient humidity… 30～85%RH
Painting:	Muncell 10 YR 7/2
Weight:	700 g

Setting method

①The setting device is calibrated in "%".

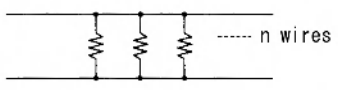
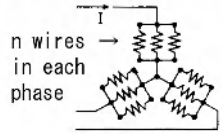
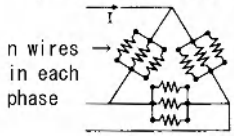
②Calibrations 0 to 100% correspond to 0 to 5A of the line current of load (heater).

③When the heater capacity is AC 100V, 1∅, 0.5kW or AC 200V, 1∅, 1kW or AC 200V, 3∅, 1.7kW, the line current becomes 5A. Therefore, the setting calibrations 0 to 100%, as they are correspond to 0 to 5A.

④If the heater capacity is smaller than those shown in Item ③ above, the following is applicable:
If the heater capacity is, say, AC 200V, 1∅, 0.5kW, the line current will be 2.5A and correspond to a setting calibration of 50%. Therefore, use a setting of 0 to 50%. (If you set to 51% and over, an alarm will be sounded simultaneously with power turn ON.)
If you want that the alarm will be sounded when 1/10 of the total heaters have wire breakage, set to "50 × 9/10 = 45% ∴45～50%".

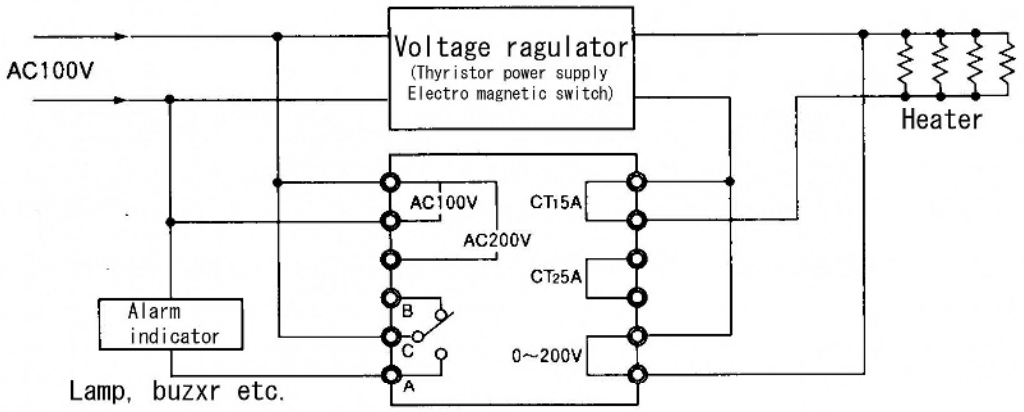
⑤If the heater capacity is larger than those shown in Item ③ above, the following is applicable:
If the heater capacity is, say, AC 200V, 3∅, 10kW (delta connection), the line current will become 87A and CT will be used. If CT of 100/5A is used, the secondary side of CT will become 4.35A with respect to a line current of 87A, which corresponds to a setting calibration of 87%. Therefore, use a setting of 0 to 87%. (If you set to 88% and over, an alarm will be sounded simultaneously with power turn ON.)
If you want that the alarm will be sounded when 1/9 of the total heaters have wire breakage, set to "73～87%".

The table below shows the current reduction rate when one heater is disconnected in cases where more than one heater is connected in parallel under balanced load. Use it as reference for alarm setting.

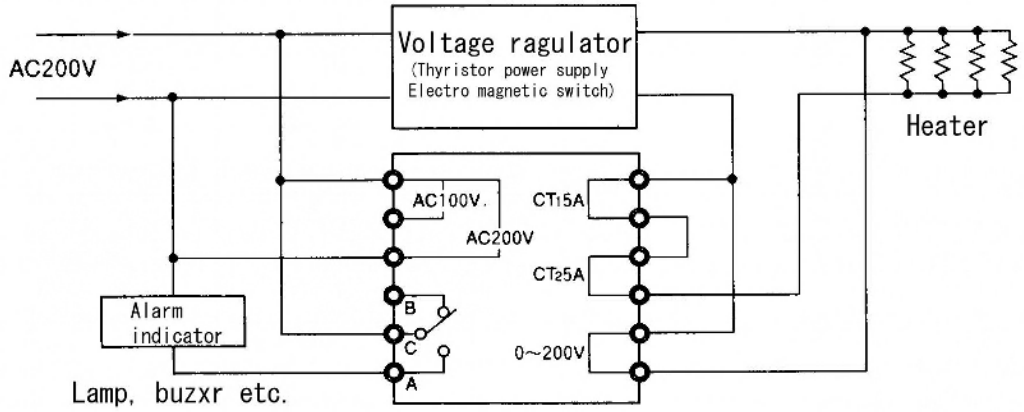
Method for connection		n=1	n=2	n=3
1 ϕ 		100%	50%	33%
3 ϕ star connection 	Current reduction rate of disconnected phase	100%	40%	25%
	Current reduction rate of other two phases	13%	8%	5%
3 ϕ delta connection 	Current reduction rate of the two phases connected to the disconnected heater	42%	23%	16%
	Current reduction rate of other phases	0%	0%	0%

■ Terminal wiring diagram

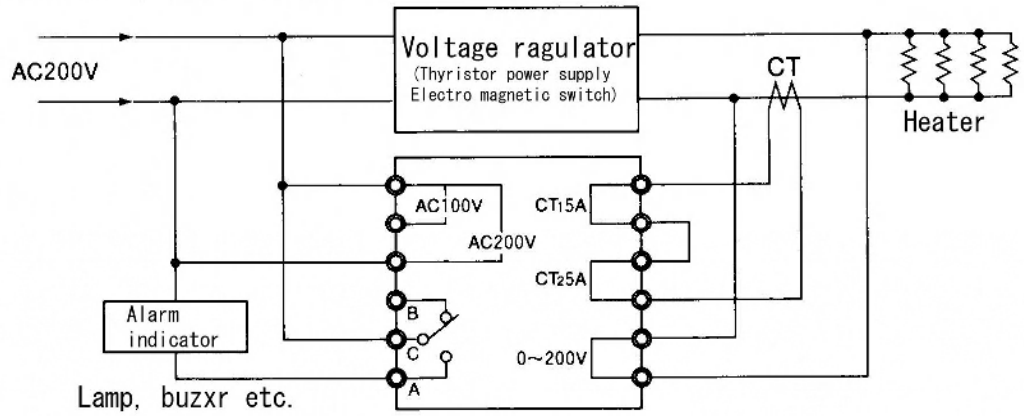
〈**AC100V 1φ 0.5kW** or less 〉



〈**AC200V 1φ 1kW** or less 〉

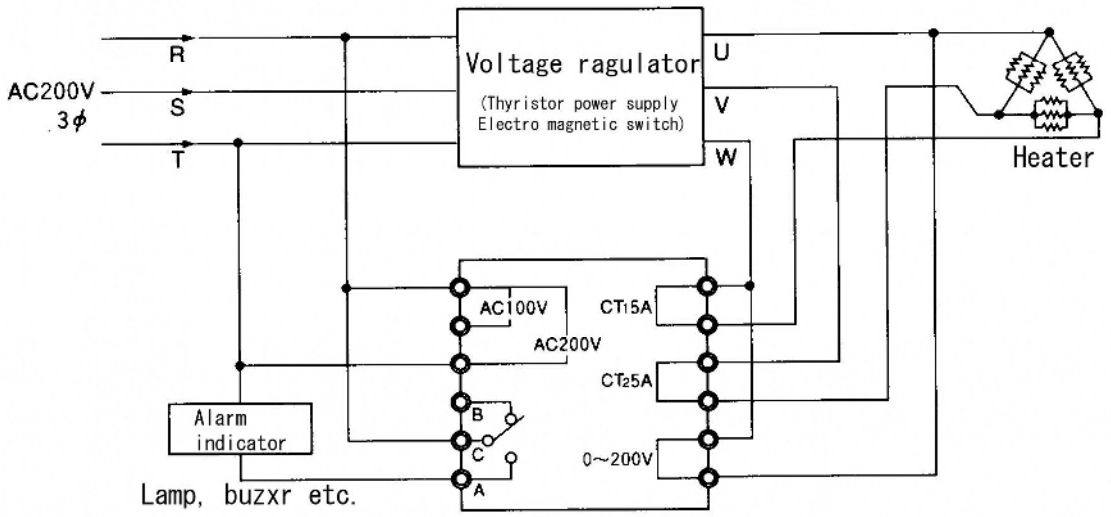


〈**AC200V 1φ 1kW** or more 〉

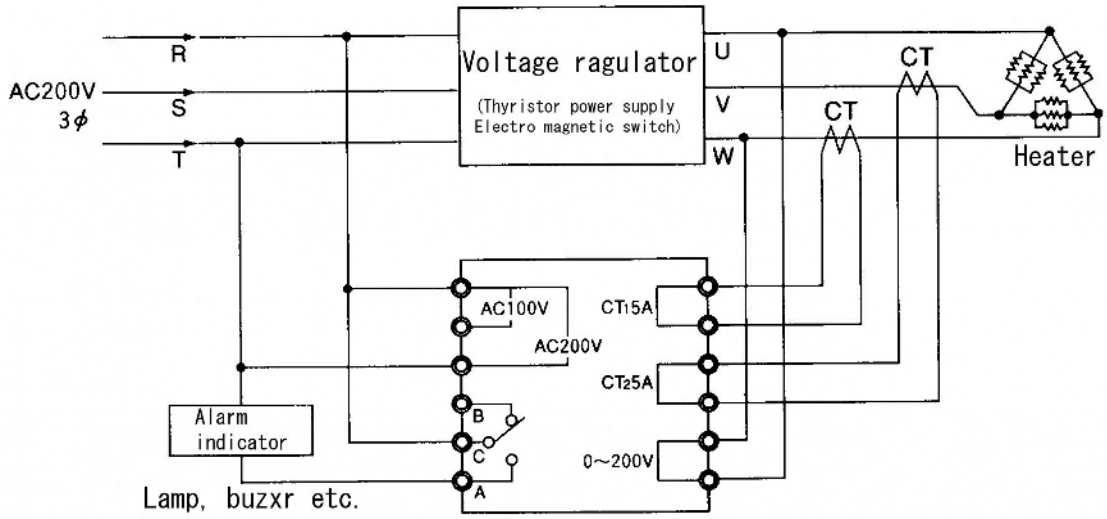


■ Terminal wiring diagram

〈AC200V 3φ 1.7kW or less 〉



〈AC200V 3φ 1.7kW or more 〉



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