

**INSTRUCTION MANUAL  
FOR  
THYRISTOR TYPE POWER CONTROLLER  
PA-200 series**

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Thank you for your purchase of our Thyristor type Power Controller PA-200 series. This manual contains instructions for Wiring connection, checking and Trouble shooting of the PA-200 series.  
To utilize the performance of the PA-200 series, peruse and understand this instruction manual before starting operation.

— < Warning > —

- Do not touch the terminal parts in case the power is ON when checking, or there is a possibility of Electric Shock which can cause severe injury or death.
- Do not disassemble the PA-200, or it will cause troubles.

Please arrange to give this manual into the hands of the operator who actually uses our product.

1. Outline

- ① The PA-200 is phase control type power controller, thyristor used.
- ② Available to various type of control such as automatic control by signal from external temperature controller or manual control by variable resistor. PA-200 allows power control continuously corresponding the signal.
- ③ Quick action fuse is available by built-in type for the types 60A or greater.

2. Notes when using

- ① Selection of voltmeter and ammeter  
Generally, the voltage and current of AC circuit is indicated in the effective value. With this equipment, effective value is not indicated by the measuring instrument which applies the sine wave such as rectifier type or tester because of phase control. Use the instrument such as moving-iron type or effective value indicating meter in digital type.
- ② Rush current of load  
When using for the lamp load such as incandescent lamp, halogen lamp or far infrared lamp, or the load of which resistance is changed by temperature such as tungsten, molybdenum, SILCONIT, the PA-200 may be damaged by large current exceeding the rated value. Use the type with constant current [Option] in such a case.
- ③ Noise generation and the corrective action  
PA-200 is adjusting the electric power by phase control, therefore, it generates the noise including wideband high frequency factor. This high frequency noise sometimes affects a bad influence upon the other electronic equipment around it.
- ④ Protection for short-circuit of load  
Use quick action fuse in case there is a possibility of short-circuit owing to the environment or characteristic of the load. Quick action fuse is applicable as built-in type for the type 60A or greater.  
Quick action fuse and fuse holder are provided (sold separately) for the types 15 and 30A.
- ⑤ Minimum load current  
PA-200 cannot adjust the output at no load. Use the PA-200 under connecting the load of which the minimum load current (0.1A or greater) flows. Especially, be careful when small inductive load (small capacity motor, various magnetic coil, etc.) are used. In this case, connect the dummy resistance (approx. 0.1A of current flows) in parallel with the load.
- ⑥ Leakage current of the PA-200  
When the input signal is OFF, power is not supplied to the load. However, a little leakage current flows. Owing to this leakage current, when the load is in open status, voltage comes out at the output even if no input signal.
- ⑦ Load capacity and input current  
PA-200 is different from transformer, and the values of input and output current are the same without reference to the ratio of input and output voltage.  
Take care to the supply capacity when installing the equipment.
- ⑧ Generated heating value  
The generated heating values are as follows. Take care enough to better ventilation in the control panel.

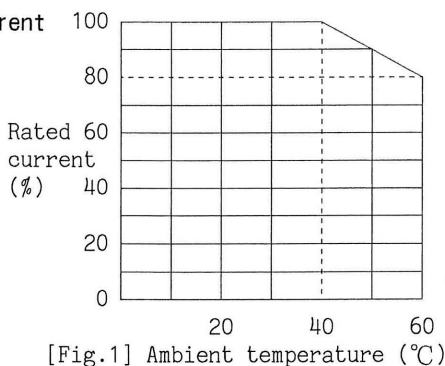
[Single phase]

15A	30A	60A	100A	150A
22W	36W	61W	100W	175W

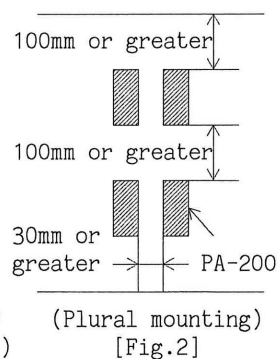
[3-phase]

15A	30A	60A	100A	150A
75W	114W	186W	300W	430W

- ⑨ Ambient temperature and output current  
Rated current can be used in the range 0 to 40°C of ambient temperature. In the range 40 to 60°C, reduce the load current referring [Fig.1].



- ⑩ Mounting  
Mount the PA-200 vertically.  
When plural PA-200s are mounted side by side, the mounting space must be as shown [Fig.2].

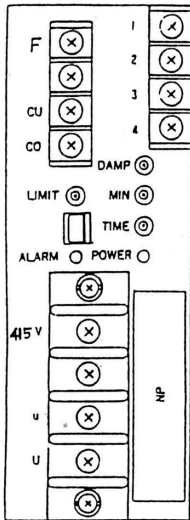


3. Wiring connection

3.1 Panel arrangement and the functions

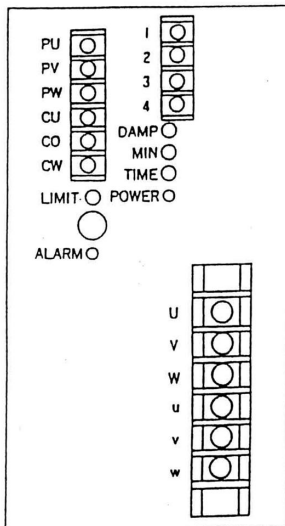
- Panel arrangement (Options full applied)
- Functions for Single phase (Options full applied)

[Single phase]



- Panel arrangement (Options full applied)

[3-phase]



Input and output terminals of the types 60A or greater are on the radiator side.

Code	Specification
F	Voltage detecting input.
CU, CO	Current detecting input. The secondary side of the external CT for the type 60A or greater is connected.
LIMIT	Voltage limiter for Constant current [Option], current limiter for Constant voltage [Option] are adjustable. Factory adjusted as the voltage limiter to maximum, and the current limiter to 105% of rated current.
ALARM	Alarm indication when over-current. Alarm output with Triac is also available by option.
415V	Control power supply terminal. Connect the power supply.
U, u	Input and output current terminals. U: Power, u: Load
1, 2, 3, 4	Control signal terminals. (1): Common, (2): 4 to 20mA current signal input, converted to 0.8 to 4V at input impedance 200Ω, (3): Control signal input 0.8 to 4V, corresponds to 0 to 98% output, (4): Reference voltage output for control, it outputs 5.6V at no load. Inner impedance is 390Ω, and when connecting 1kΩ manual setting potentiometer, the voltage is approximately 4.2V.
DAMP	Output gain corresponding to input signal is adjustable. (0 to 100%)
MIN	Output voltage at input signal low limit is adjustable. When using in 60Hz area, do not turn it excepting when necessary to adjust the low limit voltage.
TIME	Soft up time is settable.
POWER	Indication of the power ON.

- Functions for 3-phase (Options full applied)

Code	Specification
PU, PV, PW	Voltage detecting input. Usually, it is not used.
CU, CO, CW	Current detecting input. The secondary side of the external CT for the type 60A or greater is connected.
LIMIT	The same as Single phase.
ALARM	The same as Single phase.
U, V, W	Input power supply terminals. Connect the power supply.
u, v, w	Output terminals. Connect the load.
1, 2, 3, 4	The same as Single phase.
DAMP	The same as Single phase.
MIN	Output voltage at input signal low limit is adjustable. When using in 60Hz area, in case external manual setting is used, some dead zone is caused on variable resistor. It can be adjusted turning the MIN to the right to set low limit (the DAMP to the left to set high limit). However, the MIN must be the left end when current signal setting, or it will cause malfunction.
TIME	The same as Single phase.
POWER	The same as Single phase.

3.2 Main circuit wiring

Use the wire to input and output terminals (U, V, W and u, v, w) greater than below table in thickness.

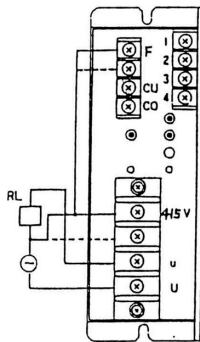
Rated current (A)	15	30	60	100	150
Wire thickness (mm <sup>2</sup> )	2	5.5	14	30	50

Rated voltage  
 Single phase: 110/220Vac  
 Three-phase : 220Vac

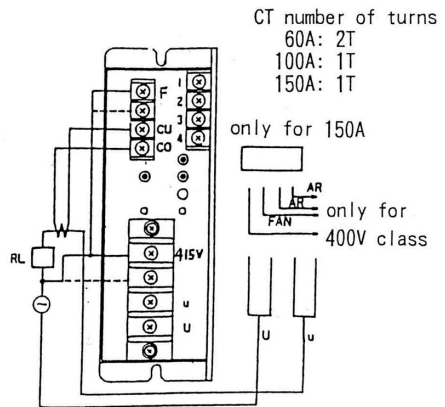
- Diameter M4 are used for all terminal screws of the 15 and 30A types. For the types 60A or greater, M8 copper bars are used.
- Terminal AR of the 150A type outputs the alarm (b contact) when the thyristor overheat. Use the terminal for the alarm circuit if necessary.
- With the 150A F type, the power terminal FAN for radiator cooling fan must be applied the voltage 200 or 220V.
- Current detecting CT is built-in for the types 15 and 30A with option, either Constant current or Constant voltage applied. Do not wire to the terminals CU, CO and CW.
- Quick action fuse for the types 60A or greater should be mounted after removing the copper bars fitted to u, v and w terminals.

[Single phase]

15A, 30A (Constant current and Constant voltage type)

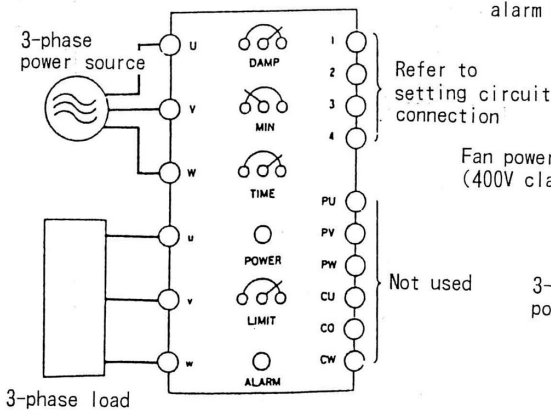


60A, 100A, 150A (Constant current and Constant voltage type)

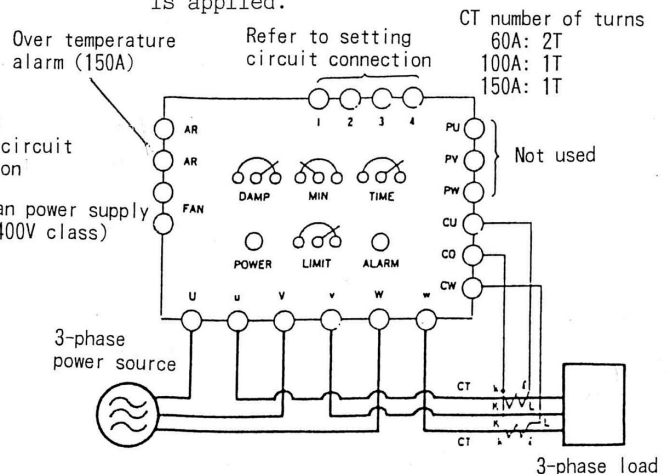


[3-phase]

15A, 30A  
 The same connection for the type of which options are applied.



60A, 100A, 150A  
 CT is connected when the option CC or CV is applied.

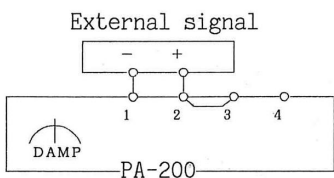




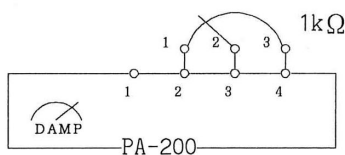
### 3.3 Setting circuit connection

Use the wire twisted or shielded, and the wire should not be run adjacent to an AC power supply. Terminals between ② and ③ is connected with short bar, the bar must be removed in case it is not necessary to the setting circuit. The current flowed through the setting circuit is approximately 10mA of slight current. Use the contact not to cause improper connection.

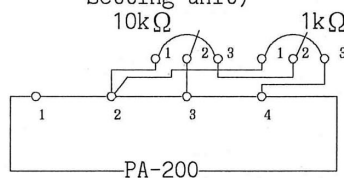
- Current signal (4 to 20mA dc input)



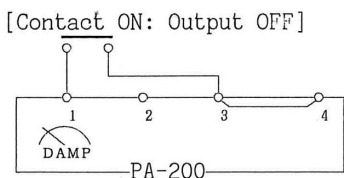
- Manual setting (with external setting unit)



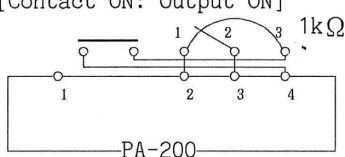
- Manual setting (with external gain setting unit)



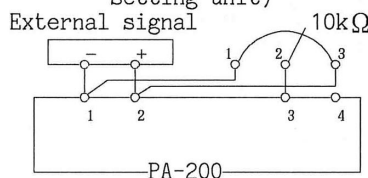
- ON/OFF non-voltage contact input (built-in DAMP is used)



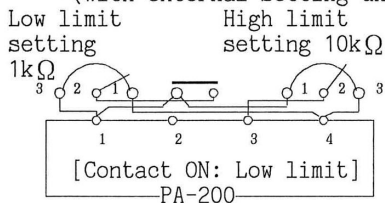
- ON/OFF non-voltage contact input (with external high limit setting unit)



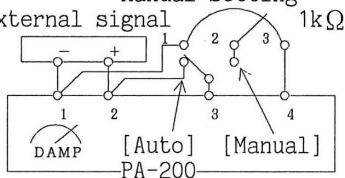
- Current signal 4 to 20mA (with external gain setting unit)



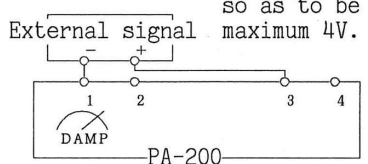
- Two-position control (with external setting unit)



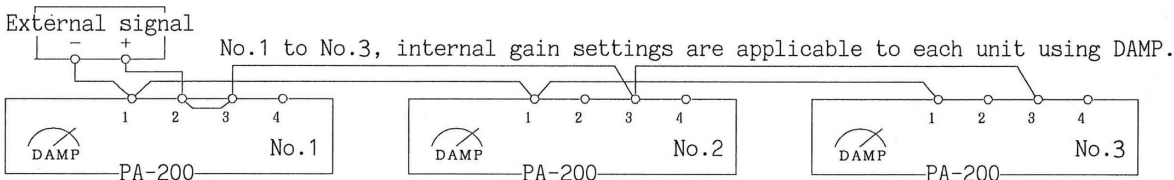
- Manual-Current signal switching (4 to 20mA)



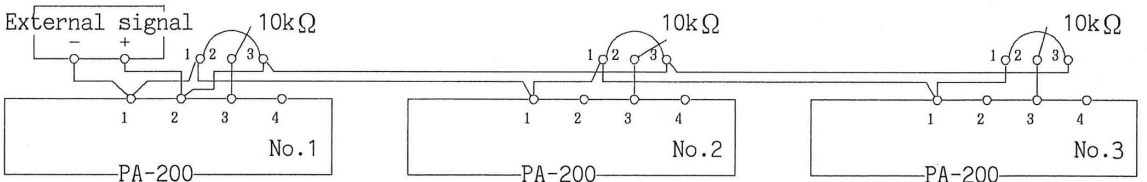
- Voltage signal input (0.8 to 4V)
- Adjust ①-③ (impedance 100kΩ) so as to be External signal maximum 4V.



- Current signal input (4 to 20mA) plural control ... Connectable maximum 12 controllers
- Using 3 controllers of single phase, it is usable to 3-phase open delta control.



- Current signal input (4 to 20mA) plural control ..... When connecting units are increased, (External gain setting unit is applied to each unit) the high limit may goes lower.



## 4. Checking

- ① If there is dust on the parts, it causes lowering on the performance or trouble.  
Remove the dust by vacuum cleaner or compressed air.
- ② Check the PA-200 periodically.
- ③ Take care to the Electric Shock since the checking of the function is carried out in the status the power is turned ON.

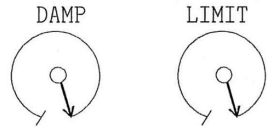
## 1. Mounting and appearance

Checking item	Action
Check the mounting screws of the PA-200 whether they are securely fastened or not.	Fasten the mounting screws securely if they are not secure.
Check the cover, parts, etc. whether they are nearly off or not.	Remount the cover, parts, etc. and tighten them if they are loose.
Check the terminals of input, output and signal whether they are loosened or not.	Tighten the terminals if they are loosened.
Check the appearance whether deformed, damaged or burned or not.	Request repair.

2. Check the functions by following procedure after the power supply to the input terminals U, V, and W are applied.

Checking item	Confirmation
POWER lamp.	It indicates that the power supply is ON to the PA-200.
Setting circuit signal.	Confirm the signals that they are 4 to 20mAdc or 1 to 5Vdc using the variable resistor (1k $\Omega$ ). Refer to page 5.
Feedback signal.	Confirm the feedback signal from Current transformer at CU and CO terminals. It is 5Aac when rated current flows. Feedback signal from Power transformer is 10Vac when rated voltage is applied. (The power transformer is built-in type.)
Output characteristic	Confirm the changing range and output accuracy of the output voltage by changing the setting signal. (However, to confirm the accuracy, input power supply and load should be changed.)

5. Trouble shooting

Problem	Cause	Checking part	Action
Output is not generated.	Power is not applied.	POWER lamp is not lit. Voltage between U, V and W are 0V (3-phase), or between U and 415V is 0V (single phase).	Check the wiring on the terminals.
	Fusing.	POWER lamp is lit. Voltage between U, V and W are applied (3-phase), or between U and 415V is applied (single phase).	Check the fusing. (Change the fuse specified or equivalent.)
	Open phase on 3-phase.	Check the voltage between U, V and W.	Check the power source side.
	Setting signal is not applied	Check the connection of the setting circuit and confirm the voltage between setting terminals. ① to ④: 4 to 5.6Vdc ① to ③: 0.8 to 4.0Vdc ① to ②: 0.8 to 4.0Vdc when 4 to 20mA signal	Check the signal source such as temperature controller.
	Panel setting is wrong.	Check the position of the DAMP and LIMIT.	
	Over-current protecting circuit works.	ALARM lamp is lit.	Check the load side (Overload or short-circuit) and LIMIT current setting value.
	Short-bar of control terminal is off.	Check the mounting of the short-bar.	Refer to page 5.
Output voltage does not change.	Setting signal does not change from maximum value.	Terminal voltage of the setting signal. ① to ③: 4Vdc when variable resistor 1 to 5Vdc ① to ②: 4Vdc when signal is 4 to 20mA	Check the signal source such as temperature controller. If one side of the signal line is taken off, and the output turns to 0, the PA-200 is normal.
	No feedback signal when constant voltage or constant current is working.	Feedback signal • from current transformer 5Aac when rated current • from power transformer 10Vac when rated voltage	Output detecting transformer burnout. Request repair.

Problem	Cause	Checking part	Action
Output voltage does not change.	Thyristor is broken.	When checking, power supply must be turned OFF. Remove the wiring of input and output. Measure the resistant value between U-u, V-v and W-w. If the value is several 10Ω or less, the thyristor is broken.	Thyristor must be changed. Request repair.
Protecting circuit works. (ALARM lamp lit)	Over-load.	Check over-load or short-circuit on load.	Check the load and keep the rated load.
	Leakage from load.	Check the insulation resistant value of load.	Repair the load.
	When the load is transformer	Positive side and negative side of the output voltage is asymmetric.	Control section printed circuit board or thyristor is required to change. Request repair.
	Malfunction on protection circuit.	Magnet-relay is provided on main circuit, control circuit or alarm circuit.	Connect the CR absorber to each coil in parallel.

When troubled by some factor during operation, confirm the above items.

In case it does not restore to normal operation after confirmation and action, or if there is obscure matter on operation, contact us with following items.

- (-) Model name and the lot number
- (-) Method of application (Load, Setting system)
- (-) Status of abnormality or trouble

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