

8.3 FAQ on PX series Temperature controller

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Chapter 1 : Input

Q1.1 Customer has controller with Pt 100 Ω input type. Is it possible to change the input type to TC?

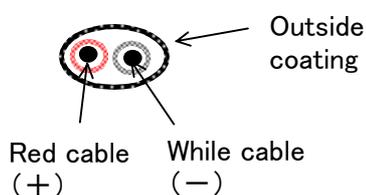
A1.1 Yes. Input type of Pt100 Ω and TC can be easily switched just by changing the setting of parameter P-n2 in the 2nd block parameters.

Q1.2 After 7 years use of controller, it became faulty. So, it need to be replaced, but, the customer is not sure the type of TC or RTD. Is it possible to find out the type of temp. sensors?

(Hint : Two wires are used for connection between the controller and the sensor.)

A1.2 As two wires are used for the connection between the controller and the sensor, the type of the sensor should be TC.

In case of TC, it is always be found there is a pair of Red and White thermocouple compensation cable covered by coating in various color. The type of TC can also be distinguished by the color of outside coating.



a pair of thermocouple compensation cable

Color of Coating	Type of TC	Measuring Range
Yellow	J (IC)	0 to 800 deg. C
Blue	K (CA)	0 to 1200 deg. C
Black	R (PR)	0 to 1600 deg. C
Brown	T (CC)	-199 to 400 deg. C
Purple	E (CRC)	-199 to 800 deg. C

Q1.3 As the displayed PV seemed to be not correct, the input terminals were short-circuited.

Then PV showed -13 deg.C, while the actual temp. was 20 deg.C.

(Parameter setting : Input type=B type TC, Range=0to1600deg.C)

Is this controller faulty?

A1.3 No. It is not possible to confirm that the controller become faulty in above checking procedure.

In PX series controller, the accuracy is defined as follows.

$\pm 5\%FS \pm 1 \text{ digit} \pm 1 \text{ deg. C}$ at 0to500deg. C.

In above case, then, the guaranteed accuracy is calculated as follows.

Full scale(FS):1600deg. C x 0.05 $\pm 1 \pm 1$ =-82 to +82deg. C

Therefore, if the actual temp. around the input terminal is 20deg. C, the controller may show PV=-62 to +102 deg. C.

Under the circumstance, the actual cause of wrong indication of PV is suspected that the sensor has some problem.

In addition, for the checking of the controller, when the input terminals are short-circuited, it is also recommended that the parameter of input type is set to "J" or "K" instead of "B".

With this setting, the actual temp. should be shown on PV display.

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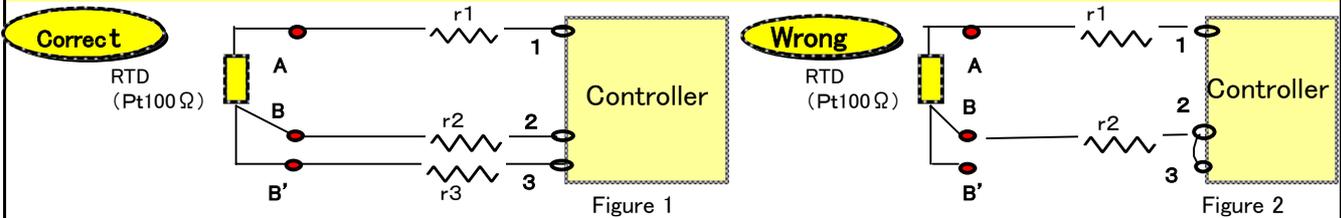
Q1.4 When the sensor is RTD (Pt100Ω), as the PV display seems to be Not Correct, a customer tried to short-circuit the input terminals and checked if the actual temp. around the terminals is to be shown on the controllers.

A1.4 No. This is NOT correct procedure.
 As RTD does not have any cold junction compensation function, the correct temp. is not shown when the input terminals are short-circuited.
 As the measured value become out of range, PV display shows "LLLL".
 For correct checking, please set the input type parameter to TC type "J" or "K" and then short-circuit the input terminal.
 After the checking, do not forget to set the input type parameter once again to RTD.

Q1.5 It is not possible to set SV=800deg.C. (The SV can not be set over 400 deg. C.) Why?

A1.5 Unless otherwise specified, in case of TC input type, Fuji always ship the PX series controllers with the following setting.
 "K type, 0to400deg.C".
 Therefore, in case of 800deg. C, it is necessary to modify the parameter setting of "Upper Range Limit:URL".
 Please refer to the instruction/operation manual for the details.

Q1.6 When looking at the following diagrams for PT100Ω input (Figure 1), there are three terminals A, B and B' for resistance bulb. And these terminals are connected by three cables with the controller. As B and B' comes from same place, is it O.K. to use only two cables (one for A and one for B) and short-circuit B and B'? (Figure 2) If No, why three cables are necessary?



Connection diagram in Figure 1 looks OK to be modified to Figure 2.

A1.6 No, the connection in Figure 2 is not O.K.

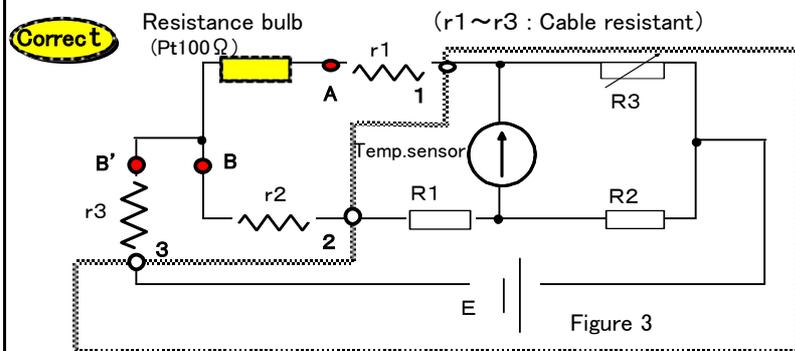


Figure 3 shows basic principle of temp. measurement for Figure1. (Correct connection)
 As cable resistance r1 and r2 are denied each other, there is no influence to temp. measurement.

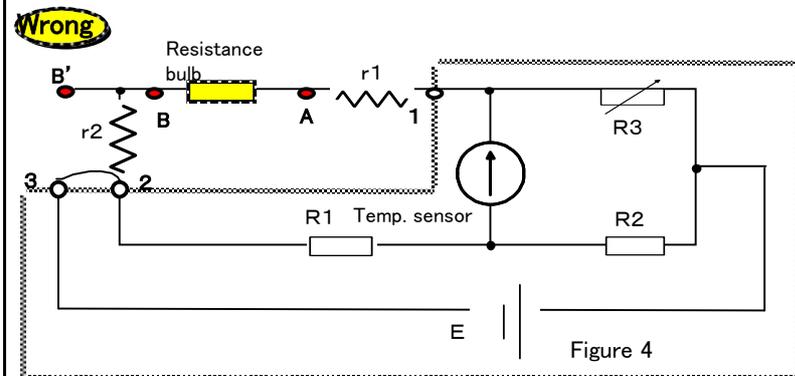


Figure 4 is the same for Figure 2. (Wrong connection)

As the cable resistance is added at resistance bulb side only, the temperature is indicated higher than actual by the sum of r1+r2.

Important
 The length of cables are always the same, so that r1=r2.

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Q1.7. Have PX controller for RTD input type. Would like to use it with TC input. Is it possible?

A1.7. Yes, by changing parameter setting, it is possible.

Please refer to the following table to setting codes.

(Note : It is not possible to change TC/RTD input type to 4-20mA/1-5V input type.)

Model	PXR4	PXW5/9
Parameter block		
2nd Block	P-n2	P-n2
	↓	↓
Input type	code	code
JPt100	0	0
Pt100	1	1
J	2	2
K	3	3
R	4	4
B	5	5
S	6	6
T	7	7
E	8	8
N	12	12
PL-II	13	13

Q1.8. Would like to change SV to 150°C, but unsuccessful over 100°C. Why?

How can it be change to 150°C?

A1.8. By changing parameter "P-SU":Upper limit of measuring range, it is possible to change range of PV and SV.

(Note: This range always has to be set within sensor's range limit. e.g.)Pt100 : Max. 850°C)

Model	PXR4	PXW4~9
2nd block Parameter	P-SU	P-SU
3rd block Parameter	SV-L	
(*Note)	SV-H	

(*Note) SV can be set within the range between SV-L and SV-H.

(SV-L and SV-H can be set within the range between P-SL and P-SU.)

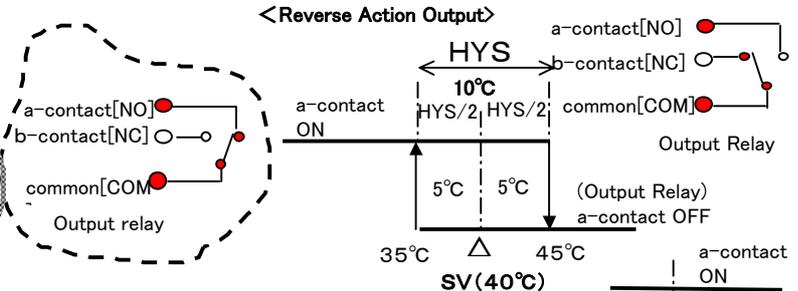
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Chapter 2 : Control

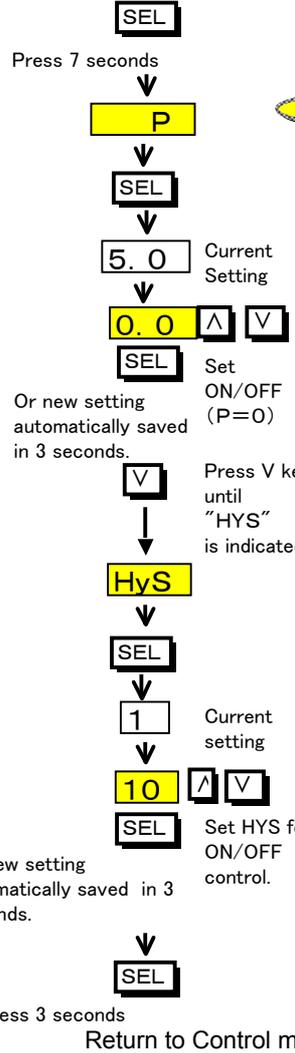
Q2.1. How would it be possible to set "Heater off at 45°C, and Heater on at 35°C"?

A2.1. Unless otherwise specified, the controller is initially set for PID control mode with temporarily P.I.D. values.
In case On-Off control is required, set parameter "P" = "0.0".
 No need to change "I" and "D". The Hysteresis between On and Off can be set by parameter "HYS".
 Please use a-contact and common for relay contact output relay.

P=0.0
 HYS=10
 SV=40°C
 As shown in the diagram on the right,
 Heater become OFF at 45°C, and
 ON at 35°C.
 (SV+5°C: OFF, SV-5°C : ON)

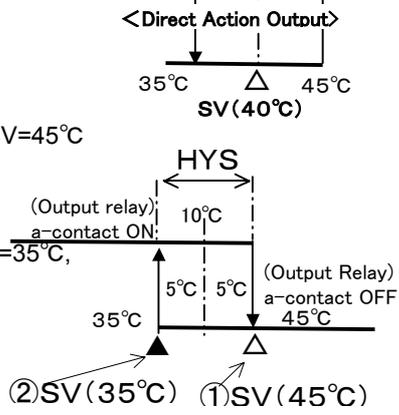


[PXW, PXV]

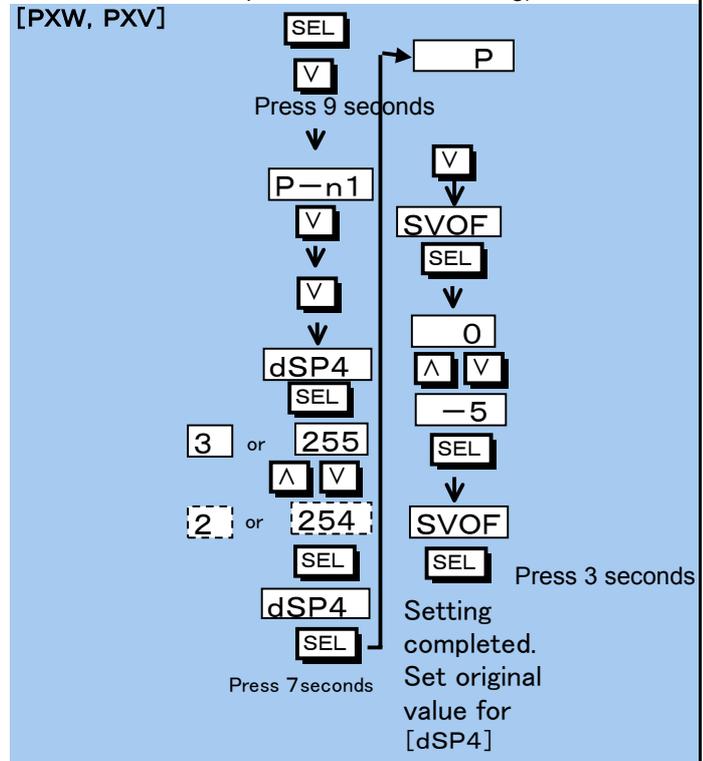


Alternative Setting

- ① In case, Relay contact = OFF at SV=45°C (Δ in the figure shown on the right)
 Set parameter [SVOF] = "-5"
 (ON at 35°C) * 1
- ② In case, Relay contact = ON at SV=35°C, (▲ in the figure shown on the right)
 Set parameter [SVOF] = "5"



*** 1 How to set "SVOF" = "-5"**
 (「SVOF」is masked parameter in initial setting)



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dSP	Parameter Display
SEL	Parameter
▲ V	data change

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Q2.2 Set SV=35°C, but the heater does not become ON until the PV goes down to 27°C. How should it be set if required the heater ON at PV=32°C?

A2.2 Unless otherwise requested, Initial PID setting for PX series controller is as follows.
 P=5. 0%, I=240 seconds and D=60 seconds
 These setting values have to be modified to suitable values depending on the customer's requirement. In this case, it needs ON/OFF (P=0%) control with HYS=6°C. Then, the heater become On at 32°C and off at 38°C.
 In case the more precise control is required, execute "Autotuning", so that the appropriate PID values are chosen automatically. (Please refer to the instruction manual for the details.)

Q2.3. Replaced old controller with new one (PX series). After execution of "Autotuning", the control performance seems to be better than before. But, the machine operator found that the On/Off timing of the magnet switches are different compared to the old controller. Would it be better to use ON/OFF control as it used to be?

A2.3. Output timing is different between PID control and ON/OFF control. For accurate control, Fuji generally recommend stay with PID control.

Q2.4. In "Control Mode Table", there is a column of "Burnt-out direction" described as "Upper limit" or "Lower limit". What do they mean?

A2.4. "Burnt-out function" : When the thermocouple become defect, or temp. compensation wire is disconnected, the controller indicates the trouble by displaying error message in PV value.

When this function is ON, the control output status is as shown in the following table.

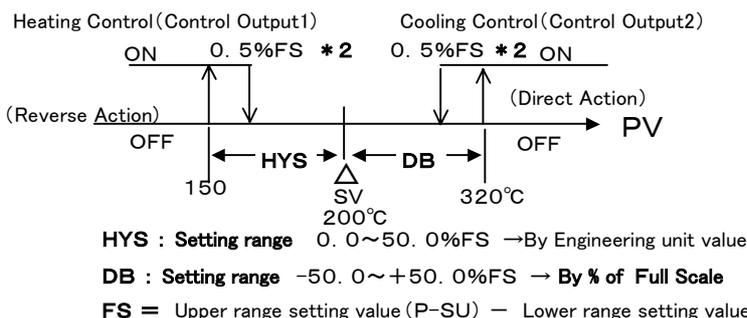
Burnt-out direction	Control Output Status			
	Relay contact	SSR-d/SSC-d	4-20mA	
"Upper Limit"	ON	15~30V	Over 20mA	 Heater:ON  Heater:OFF
"Lower Limit"	OFF	0.5V or less	4mA or less	

In case the temp. control (Heating control) is in operation by Heater(ON/OFF), when the measured value (PV) become below Setting value (SV), the Relay contact become ON (in case of SSR-d/SSC-d: 15to30V, in case of 4-20mA : towards 20mA), then the process is heated.

On the other hand, when PV become over SV, the relay contact become OFF. Normally, when the Burnt-out function is ON, actual process temperature become unknown, so, it is strongly recommended to set the burnt-out direction = Lower Limit, considering the safety of the machine operation, so that the heater become OFF.

Q2.5. For dual control output type, (Heating/Cooling), is it possible to set the control mode as ON/OFF for both Control Output 1 and 2?

A2.5. Yes, by setting parameters "P" and "PC, COOL" as "0.0", it is possible.
 Control output 1 become ON at SV-HYS (Hysteresis).
 Control output 2 become ON at SV+DB (Dead Band).



(EXAMPLE)

When FS = 400°C (P-SU) - 0°C (P-SL) = 400°C
 Necessary parameter setting will be as follows.
HYS = 200°C - 150°C = 50°C .
DB = (320 - 200) × 100 / 400 = 30 (%)
*** 2 ON/OFF band: (0.5 × 400) / 100 = 2 °C**

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Q2.6. Using controller for diecasting , but the temperature fluctuation is not satisfactory.
How would it be improved? (Control output type is Relay contact)

- A2.6.** ①Please execute "Autotuning function" at first.
②After the Autotuning is completed successfully, then set the control mode= "Fuzzy".
③If the temp. still fluctuates a lot, change "TC" cycle shorter. (Initial setting 30sec.)
e.g. "20 sec, 15sec,.....10sec."
Note : If the cycle is too short, it influence lifetime for the Relay Contact and manipulator
(Magnet switch and etc.).
④In case "TC" has to be set as "1 or 2 seconds", it is recommended to change the manipulator to
SSR or SSC.
In this case, it is also necessary to change the controller to SSR-d/SSC-d output type.

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Chapter 3 : Output

Q3.1. For 4-20mA output type, how many load resistance can be connected in parallel?

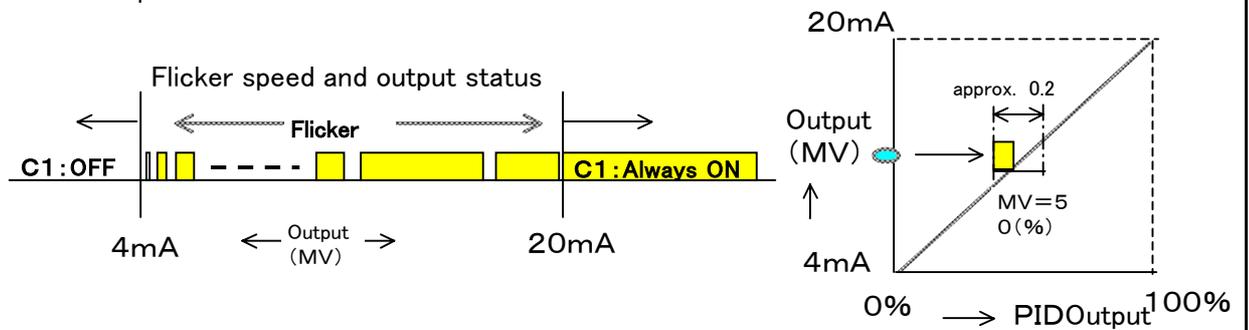
A3.1. It is not possible to connect the load resistances in parallel. Please connect in series.
Max. load resistance is 600 Ω .

Q3.2. For 4-20mA output type, output circuit has been short-circuited by mistake.
Is it necessary to repair it?

A3.2. It stands within 600 Ω , when short-circuited.

Q3.3. For current output(4-20mA) control output type, why does the "C1 lamp" become ON (Flickers)?
"C1 lamp" should be used only for Relay contact output type.

A3.3. Flickering of "C1 lamp" indicates status of current output. When the lamp is OFF, it means that the current output is at 4mA.
On the other hand, when the output current become over 20mA, the lamp is always ON. In between, the flicker speed becomes as shown below.



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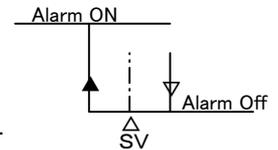
Chapter 4 : Alarm

Q4.1. Have controller without Alarm output. Would it be possible to have alarm output by using control output?

A4.1. Absolute value alarm (without HOLD function) can be supported by use of control output, by the following setting.
(Operation is different from original alarm output option)

- ① Set "P"="0. 0%", (Control mode : ON/OFF control)
- ② In case of "Upper limit absolute alarm", choose "Direct action",
in case of "Lower limit absolute alarm", choose "Reverse action".
- ③ Alarm set value is set as SV. (Alarm set value is middle of ON and OFF point.)
The actual alarm set point is based on the following formula. $[SV - 0.5 \times HYS]$
- ④ ON-OFF band for alarm is set by parameter "HYS": Hysteresis at On/Off control.

ex) Lower absolute alarm

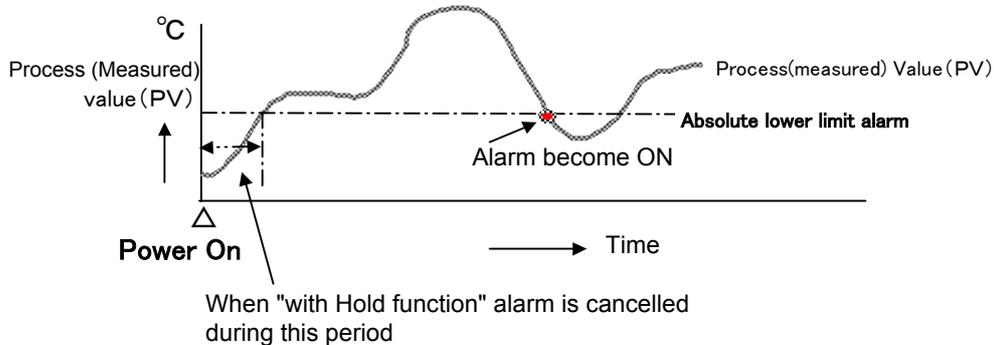


Q4.2. In case of SSR-d/SSC-d control output type, "Heater burnt-out Alarm" is not available. Why?

A4.2. "Heater burnt-out Alarm" need a certain period of time for calculation for checking current at heater when the control output is on. In case of SSR-d/SSC-d output type, "TC" value is usually set as approx. 1 to 2 seconds, and this is too short for such calculation.
Of course "Heater burnt-out alarm" is available if it is possible to set TC=20 or 30 seconds, in this case, controllability is too slow. Therefore, we strongly recommend that the heater burnout alarm is prepared as a separate equipment.

Q4.3. In "Alarm type table", there are description of "with Hold function" (e.g. "Absolute Upper limit Alarm with Hold function".) How does the "Hold function" works?

A4.3. When "with Hold function" is chosen, when power on the controller, alarm is cancelled until the PV once become normal operation condition (over the lower limit set point or become under limit set point) .



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Q4.4. Without setting alarm function, Alarm output become ON
Why?

Actually need to have alarm when the temp. become 7°C or higher. How can it be set?

A4.4. Unless otherwise requested, initial alarm setting is as follows

Alarm 1(Upper limit alarm)=Upper deviation alarm by 1°C

Alarm 2(Lower limit alarm)=Lower deviation alarm by 1°C with Hold function

Therefore, if the temperature become higher or lower by 1°C from SV, the alarm output become ON.

In order to have the alarm output at SV=70°C or higher, please set the parameters as follows.

①In 2nd block parameters, Set "P-AH"(Alarm 1)="1".

②In 1st block parameters, Set "AH"(Upper limit alarm)="70".

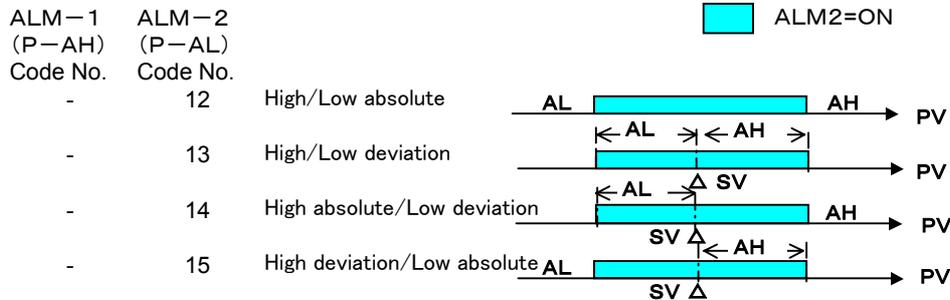
③In 2nd block parameter, Set "P-AL"(Alarm 2)="0".

④In 1st block parameters, Set "AL"(Lower Alarm)="0".

Then, the setting is completed (③&④ are setting for canceling lower limit alarm).

Q4.5. When "High/Low deviation" is chosen, Alarm output is performed at ALM2. Why not at ALM1

A4.5. The following types of alarms are always performed at ALM2



note ①When code No. is set at "P-AL", "P-AH" is automatically canceled. (No necessity for setting "P-AH")

②On front face of controller, "L" lamp is ON, and "H" lamp is OFF

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Q4.6. When alarm type is set as "High/Low deviation", alarm output is performed both Upper limit and Lower limit. Why?

A4.6. "High/Low deviation" means that the alarm become ON when the difference between Upper limit and Lower limit becomes larger than the set point. In the instruction manual, it is described both ALM1 and ALM2 operation in one figure, and so, may cause confusion. Please refer to the following additional explanation.

ALM-1 (P-AH) Code No.	ALM-2 (P-AL) Code No.	AH: Upper limit difference alarm(PV-SV) AL: Lower limit difference alarm(SV-PV)
0 (No alarm setting)	7	<p>* 1 ①High/Low deviation</p>
7	0 (No alarm setting)	<p>* 2 ②High/Low deviation</p>
7	7	<p>* 3 ③High/Low deviation</p>

* 1 ①When ALM2 ("P-A L") ="7", ALM2 become ON at Upper limit or Lower limit.
(Alarm 2 ON when PV become over SV+AL or lower SV-AL)

* 2 ②When ALM1 ("P-A H") ="7", ALM1 become ON at Upper limit or Lower limit.
(Alarm 1 ON when PV become over SV+AH or lower SV-AH)

* 3 ③When ALM2 ("P-A L") ="7"and also ALM1(P-AH)="7", ALM2 and/or ALM2 become ON at Upper limit or Lower limit.
(Alarm 2 ON when PV become over SV+AL or lower SV-AL)
(Alarm ON when PV become over SV+AH or lower SV-AH)

On the front face of the controller, "H" lamp is ON when "AH" is active and "L" lamp is ON when "AL" is active.

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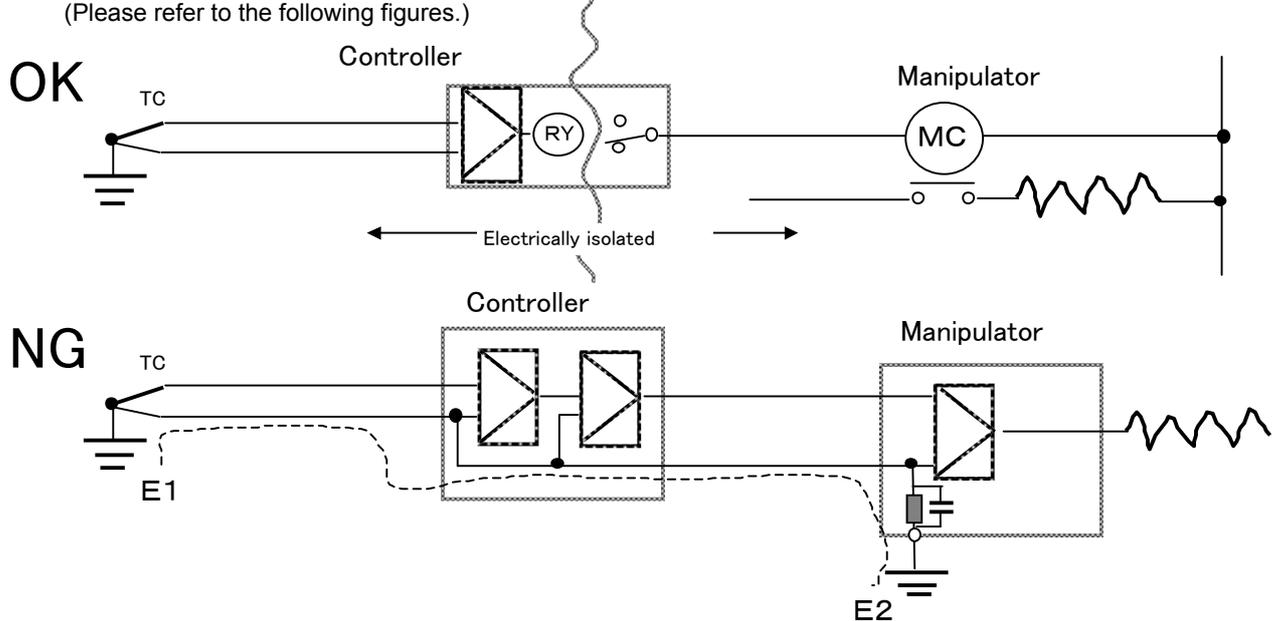
Chapter 5 : Wiring

Q5.1. By checking power consumption, it is defined as 10VA or less (AC85-245V) and so, put 0.1A fuse at power supply circuit.
But it went off shortly. Why?

A5.1. It is necessary to use 250V 1A fuse to withstand the surge current input at power on.
(Please refer to the instruction manual for the details.)

Q5.2. Why the input signal should not be grounded?

A5.2. Except for the control output is Relay contact, signals inside the controller and control output is not isolated.
Therefore, in case the control output signal cable is grounded, there are double grounding at input side and output side.
This may influence the control.
In case, Ground type TC is used, and the control output type is NOT relay contact, please check if the input to the manipulator is grounded appropriately.
(Please refer to the following figures.)



Difference between E1 and E2 influence the controller due to noise.

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Chapter 6 : Model selection

Q6.1. For relay contact output type, there are two types (Reverse action and Direct action).
For heater ON/OFF control (Heating control), which type should be chosen?

A6.1. Please choose "Reverse action".

In reverse action, when PV become lower than SV, the contact become closed, then the heater become ON.
(For reference)

In case of SSR-d/SSC-d output type, reverse action means that the output become on (DC15-30V) when PV become lower than SV, and the heater become ON.

In case of 4-20mA output type, reverse action means that the output current is increased toward 20mA when PV become lower than SV.

If APR is used, when the output current is increased toward 20mA, the AC current to the heater is also increased and the heater temp. goes up.

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