INSTRUCTION MANUAL

EC4100

DIGITAL INDICATING CONTROLLER

HXPEC4100A01E

HXPEC4100A01E 頁 1/17葉

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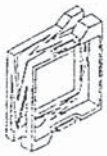
Thank you for buying TYPE EC4100 digital indicating controller.
Please read this manual closely for its proper operation.

Contents

1. When the instrument has arrived

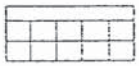
a. Checking accessories

Make sure the following accessories are furnished with the equipment.



Attachment

Instruction manual (this book)



Unit seal (1 set)

CT (In case of heater element break alarm is presented)

b. Checking instrument specifications

The type code is printed in the nameplate on the case side.

Make sure the instrument conforms to the order.

EC41 □ □ A □ 00

Scale group
- 1: TC
- 2: Pt100/JPt100
- 3: 1～5V

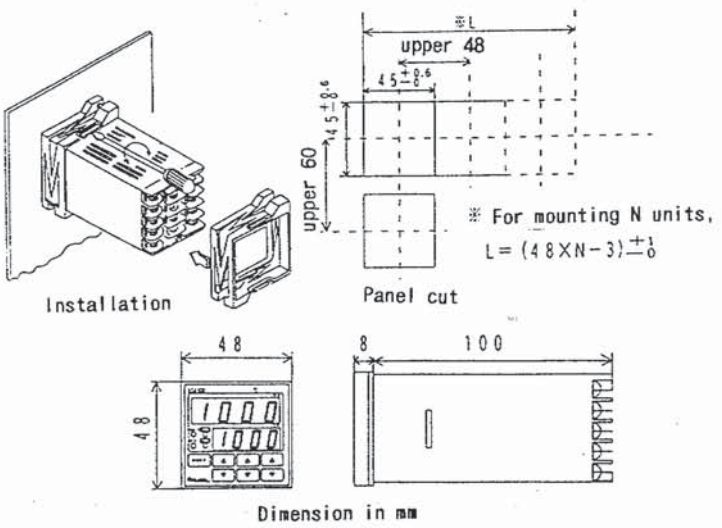
Output
- 1: Relay
- 2: SSR drive
- 5: 4～20mA

Alarm (*)
- 0: None
- 3: ALM1 + ALM2
- 6: ALM1 + ALM2 + Heater element break alarm (with CT)

* When relay output or SSR drive output is selected, heater element break alarm can be selected.

2. Mounting

Cut out the panel according to the panel cutout diagram and fix the instrument by the furnished attachment.



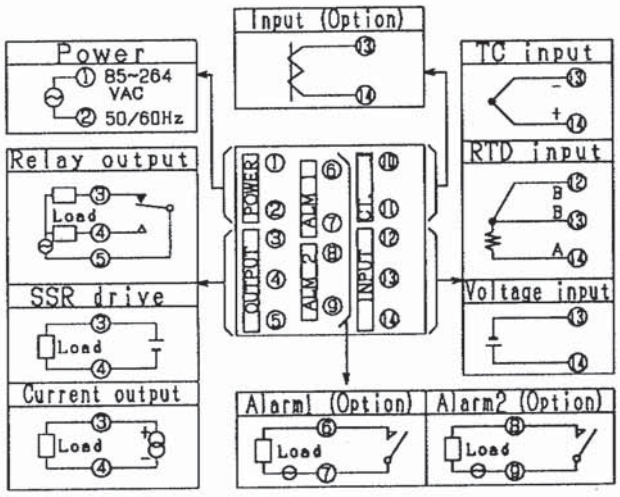
Caution when mounting

Refrain from mounting the instrument in place exposed to :

* Corrosive gases
* Excessive vibration or shock
* Dust
* Heat
* Intense high frequence
* Splashed water

3. Wiring

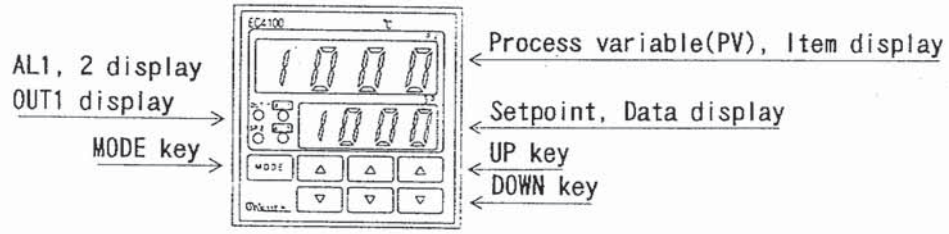
Carry out wiring referring to the connection diagram.



Caution when wiring

* Use compression terminals for 3.5mm.
* For signal lines, use shield wires. Get them as away from the power line as possible.
* For thermocouple input, use specified compensating lead cable.
* For RTD input, the lead resistance must be 5Ω or less.
* In case of relay contact output, frequent operations shorten the life. Use an auxiliary relay.

4. Names and functions of each part



1000 (Upper display) A measurement or Item is indicated.
1000 (Lower display) Setpoint or Data is indicated.
○ AL1, AL2 The lamp is lit when an alarm is generated.
○ OUT1 The lamp is lit when an output is ON.(Relay output, SSR drive output)
MODE Display/Item change key.
△ ▽ Data change key.

5. Operation

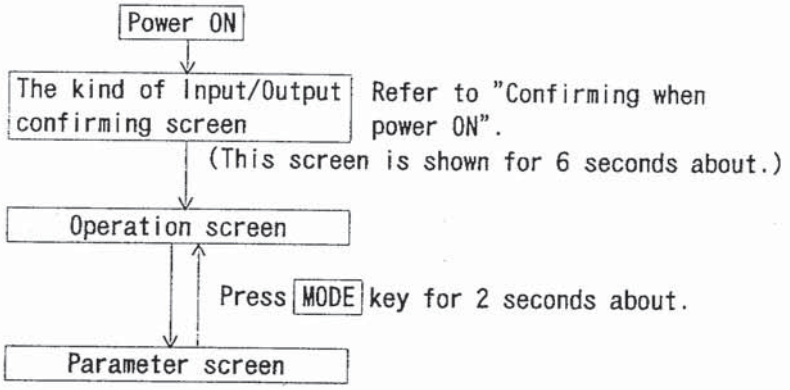
a. Screen calling procedure

The controller has mainly 2 screens.

① Operation screen : Indicates PV, SP, output value, Automatic tuning execution, alarm or other operation items necessary for running.

② Parameter screen : In this screen, set the kind of each function, present or not. If these data are set once, its will be not need to set.

The following illustrates how to call each screen.



Confirming when power ON

○ When power is started ON, the kind of Input/Output screen such as [_I ⌐o / 00_P] will be displayed for 6 seconds about.
The kind of Input/Output will be refered to the list of these kinds and it will be displayed at the bottom of display. Please confirm if its value is your requested one or not.

○ The kind of input, except 1～5V input, can be set on the 6 of parameter screen. Confirm the scaling values after set of the input. When power is started ON, the kind of input will be displayed.

○ Then, after the kind of Input/Output confirming screen, PV at the upper display with 4 digits and SP at the bottom display with 4 digits will be displayed. And when [MODE] key is pressed, all data of operation are displayed in alphabetical order such as shown "c. Selecting item in screen".

[Confirm the kind of Input/Output]

[_I ⌐o / ※＊_★] Initial message

※＊	Kind of input	Factory setting
00	K thermocouple	Thermocouple input 00
01	J thermocouple	
02	E thermocouple	
03	T thermocouple	
04	R thermocouple	
05	S thermocouple	
06	N thermocouple	
07	WRe5-26	
10	Pt100	RTD input 10
11	JPt100	
20	1～5V	20

★	Kind of control output	Factory setting
⌐	Relay contact	Depend output unit
P	SSR drive	
}	Current	

＊ Note: Select your requested thermocouple or Pt100 ohm from initial setting value and set it. But in case of voltage input or control output, initial value cannot be changed because of factory setting before shipping.

b. Data changing procedure

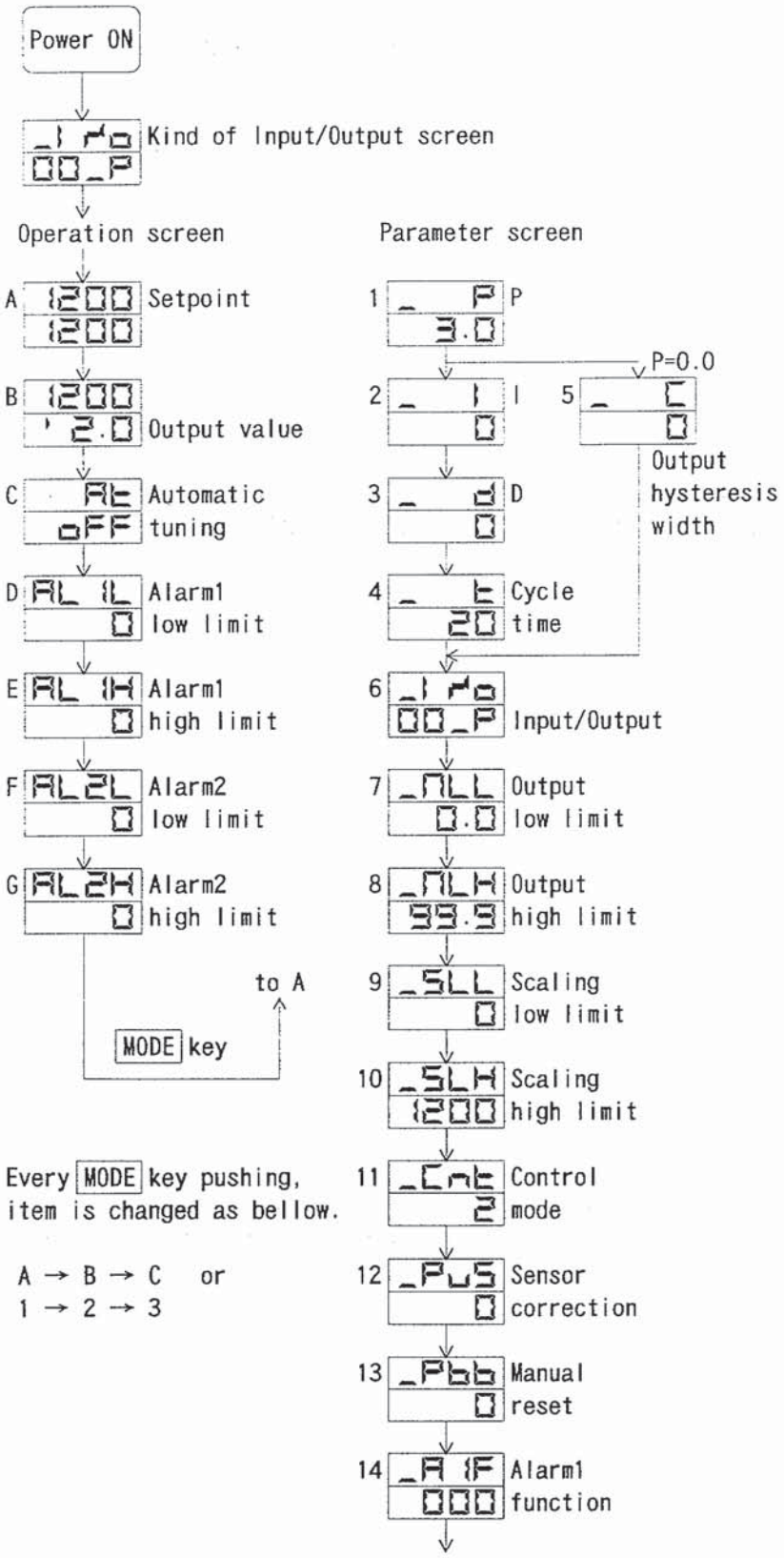
In [c. Selecting item in screen], select a item to change and press UP/DOWN key.
Numeric data ····· UP/DOWN key of settable range.
Character data ··· UP/DOWN key of 1 digit.

Caution when setting data

If [MODE] key is pressed for 2 seconds at parameter screen, operation screen is immediately started.
Set data will be effective when press [MODE] key or 2 seconds later after setting.

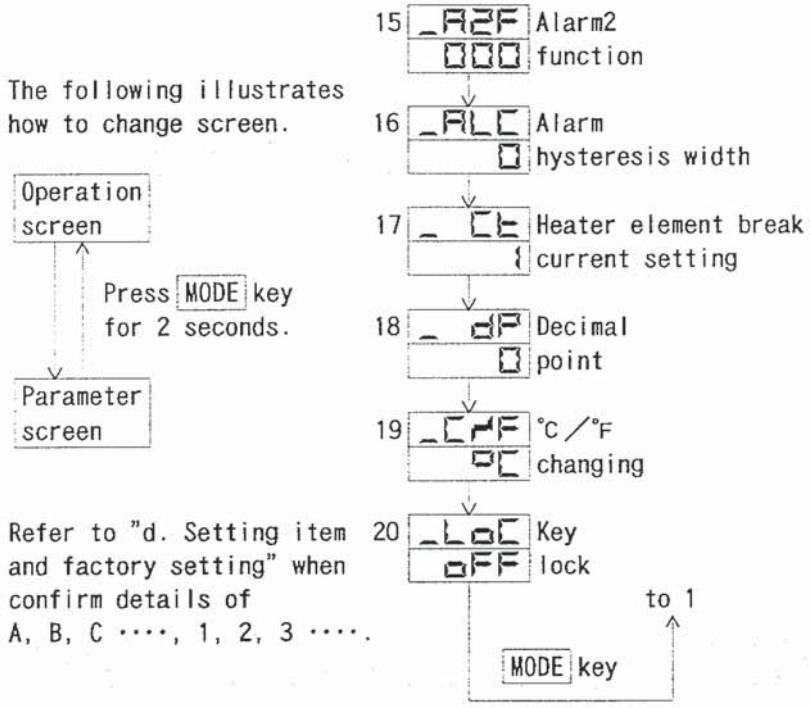
c. Selecting item in screen

You can call by MODE key until display adequate item for changing, confirming. (But item of non-mounted option is not displayed.)



Every MODE key pushing, item is changed as bellow.

A → B → C or
1 → 2 → 3



Other displays

PV ---- Input is exceeding high limit of display range. Thermocouple, or A terminal of RTD is broken. (Input is abormal.)

PV ---- Input is exceeding low limit of display range. A-B of RTD is in electric-short, or 1～5V input is broken. (Input is abnormal.)

SP LoC Parameter was changed during locked condition.

SP AE AT and normal display will be displayed alternately in AT operation.

PV Err0 Memory error. After power-source is connected again (power ON), when error is displayed once more, repair is required.

PV Err 1 A/D converter error. After power-source is connected again (power ON), when error is displayed once more, repair is required.

Note : When PV display is showing ---- or ----, on any control, output will be low limit value of output limit.

d. Setting item and factory setting

(1) Operation screen

	Display/ Item	Description	Factory setting
A	Setpoint	Settable range SLL~SLH	0 or 0.0
B	Output	(Only monitor) PV 0.0	
C	Automatic tuning	Display when P>0.0. Pushing UP/DOWN key at 1 digit for 2 seconds, Automatic tuning is starting or releasing. AT is ON AT on, OFF AT oFF. Normal display and AT are displayed alternately when AT is ON.	
D	AL 1L Alarm1 low limit setting	Display when AL1 is mounted and PV low limit alarm is set. Settable range -1999~9999 or -199.9~999.9 (PV alarm) Settable range 0~9999 or 0.0~999.9 (Deviation alarm)	0 or 0.0
E	AL 1H Alarm1 high limit setting	Display when AL1 is mounted and PV high limit alarm is set. Settable range -1999~9999 or -199.9~999.9 (PV alarm) Settable range 0~9999 or 0.0~999.9 (Deviation alarm)	0 or 0.0
F	AL2L Alarm2 low limit setting	Display when AL2 is mounted and PV low limit alarm is set. Settable range -1999~9999 or -199.9~999.9 (PV alarm) Settable range 0~9999 or 0.0~999.9 (Deviation alarm)	0 or 0.0
G	AL2H Alarm2 high limit setting	Display when AL2 is mounted and PV low limit alarm is set. Settable range -1999~9999 or -199.9~999.9 (PV alarm) Settable range 0~9999 or 0.0~999.9 (Deviation alarm)	0 or 0.0

(2) Parameter screen

	Display/ Item	Description	Factory setting
1	_ P Proportional band	Settable range 0.0～200.0 (SLL～SLH) Unit % ON/OFF control when P=0.0	3.0
2	_ I Reset time	Display when P≠0.0. Settable range 0～3600 Unit second I action is OFF when I=0	0
3	_ d Rate time	Display when P≠0.0. Settable range 0～3600 Unit second D action is OFF when D=0	0
4	_ t Cycle time	Display when control is "time proportional control". Settable range 1～120 Unit second	20
5	_ C Hysteresys width	Display when P=0.0 (ON/OFF control) Settable range 0～10.0% (SLL～SLH) Unit TC 1℃ RTD 0.1℃ Voltage 1 digit	0 or 0.0
6	_I Po Input/ Output	Selectable when it is in case of TC or RTD for input. Output is only displayed.	
7	_OLL Output low limit	Display when P≠0.0 Settable range 0.0(-10.0)～OLH Unit % () means that it is in case of current output.	0.0
8	_OLH output high limit	Display when P≠0.0 Settable range OLL～100.0(110.0) Unit % () means that it is in case of current output.	100.0
9	_SLL Scaling low limit	Settable range TC Full scale range low limit ～ (SLH-50)	0
		RTD Full scale range low limit ～ (SLH-5.0)	-100.0
		Voltage -1999～SLH-50 (no D.P.) -199.9～SLH-5.0 (with D.P.)	-1000
10	_SLH Scaling high limit	Settable range TC (SLL+50) ～ Full scale range high limit	1200
		RTD (SLL+5.0) ～ Full scale range high limit	500.0
		Voltage (SLL+50) ～9999 (no D.P.) (SLL+5.0) ～999.9 (with D.P.)	9000

11	_Cnt Control mode	_Cnt * * Control mode 1 TYPE B(direct) 2 TYPE B(reverse) 3 TYPE A(direct) 4 TYPE A(reverse) TYPE A is usually PID operation. TYPE B suppresses overshoot, it is Anti-overshoot control.	2
12	_PuS Sensor correc-tion	Display at all occasion. Settable range ±10% (SLL~SLH) Unit TC 1℃ RTD 0.1℃ Voltage 1 digit	0 or 0.0
13	_Pbb Manual reset	Display when P≠0.0 Settable range 0.0~100.0% Unit %	0.0

14	AL1F Alarm 1 function	Display when alarm 1 is mounted. AL1F *** Additional function □ None { Alarm hold Ⅲ Pause Ⅲ{ Alarm hold + Pause Only □, { are settable when PV alarm mode is □. PV alarm mode □ None { Deviation high and low limit alarm Ⅱ Deviation high limit alarm Ⅲ Deviation low limit alarm Ⅰ Deviation high and low limit range alarm (Alarm occurs when deviation is within the range.) Ⅱ{ PV high and low limit alarm Ⅱ PV high limit alarm Ⅰ{ PV low limit alarm Ⅰ PV high and low limit range alarm (Alarm occurs when PV is within the range.) Abnormal alarm mode (Only □, { are settable when CT input is nothing.) □ None { PV abnormal alarm Ⅱ Heater element break alarm Ⅲ PV abnormal alarm + Heater element break alarm	000

15	_A2F Alarm1 function	Display when alarm 2 is mounted. _A2F ※※※ Additional function 0 None 1 Alarm hold 2 Pause 3 Alarm hold + Pause Only 0, 1 are settable when PV alarm mode is 0. PV alarm mode 0 None 1 Deviation high and low limit alarm 2 Deviation high limit alarm 3 Deviation low limit alarm 4 Deviation high and low limit range alarm (Alarm occurs when deviation is within the range.) 5 PV high and low limit alarm 6 PV high limit alarm 7 PV low limit alarm 8 PV high and low limit range alarm (Alarm occurs when PV is within the range.) Abnormal alarm mode (Only 0, 1 are settable when CT input is nothing.) 0 None 1 PV abnormal alarm 2 Heater element break alarm 3 PV abnormal alarm + Heater element break alarm	000
16	ALC Alarm hystere-sys width	Display when AL1 or AL2 is PV alarm. Settable range 0～10% (SLL～SLH) Unit TC 1℃ RTD 0.1℃ Voltage 1 digit	0 or 0.0

17	_ CT Heater element break current	Settable when CT input is mounted and heater element break alarm is presented. Settable range 1～30 Unit A	1
18	_ dP Decimal point	Display when voltage or RTD input. _ dP 0 or _ dP 0.0 Settable by 1 digit.	voltege 0 RTD 0.0
19	_CnF ℃／℉ changing	Display when TC or RTD input. _CnF °C or _CnF °F Settable by 1 digit.	℃
20	_LoC Key lock	_LoC OFF Lock off _LoC ALL Lock all _LoC P-A Lock parameter screen Settable by 1 digit.	OFF

6. Specifications and functions

1) Input (Select 1～3 when ordering.)

1･･･Thermo-couple	K, J, E, T, R, S, N, WRe5-26 (settable with front key operation) Allowable signal source resistance : Up to 100Ω Input resistance : 1MΩ (standard) At a time of input broken : OVER display
2･･･RTD	Pt100, JPt100 (settable with front key operation) Allowable wiring resistance : Up to 5Ω (per 1 wire) At a time of input broken : OVER display (A, B, B)
3･･･Voltage	1～5V DC Input resistance : 500kΩ (standard) At a time of input broken : UNDER display

2) Setting of Input/Display range list

Input of thermo-couple		Settable range	Display range	Input of thermo-couple		Setting range	Display range
K	℃	0～1200	-40～1326	N	℃	0～1300	0～1335
	℉	0～2200	-40～2420		℉	32～2350	32～2435
J	℃	0～ 800	-31～ 850	WRe5-26	℃	0～2300	0～2336
	℉	0～1450	-24～1563		℉	32～4200	32～4236
E	℃	0～ 800	-27～ 833	R	℃	0～1700	0～1755
	℉	0～1450	-16～1531		℉	32～3100	32～3192
T	℃	-200～400	-231～407	S	℃	0～1700	0～1730
	℉	-330～750	-385～765		℉	32～3100	32～3146

RTD input		Settable range	Display range
Pt100	℃	-199.9～500.0	-199.9～539.1
	℉	-199,9～950.0	-199.9～999.9
JPt100	℃	-199.9～500.0	-199.9～529.1
	℉	-199.9～950.0	-199.9～984.4

Voltage input	Settable range	Display range
1～5V DC	-1999～9999 or -199.9～999.9	Within settable range, SLL-12% about ～ SLH+12% about

SLL=Scaling Low Limit, SLH=Scaling High Limit

3) Input sampling time ····· 0.5 second

4) Setting and display accuracy

Thermocouple	±0.3% of full span ± 1 digit, reference junction compensation error ±1℃(2℉). But in minas area of T, it is ±0.5% of full span ±1 digit, reference junction compensation error ±1℃(2℉).
RTD	±0.3% of full span ± 1 digit
Voltage	±0.3% of full span ± 1 digit

5) Control (Presented Automatic tuning, Anti-overshoot)
Control period ····· 0.5 second

Proportional band (P)	0.1～200.0% of scaling width (ON/OFF operation at 0.0).
Reset time (I)	1～3600second(s) (I operation OFF at 0)
Rate time (D)	1～3600second(s) (D operation OFF at 0)
Cycle time	1～120second(s) ※
Hysteresis width of output	Maximum 10% of scaling width but setting is designated unit (at ON/OFF).

※ Time proportional control is executed when relay or SSR drive output and P≠0.0.

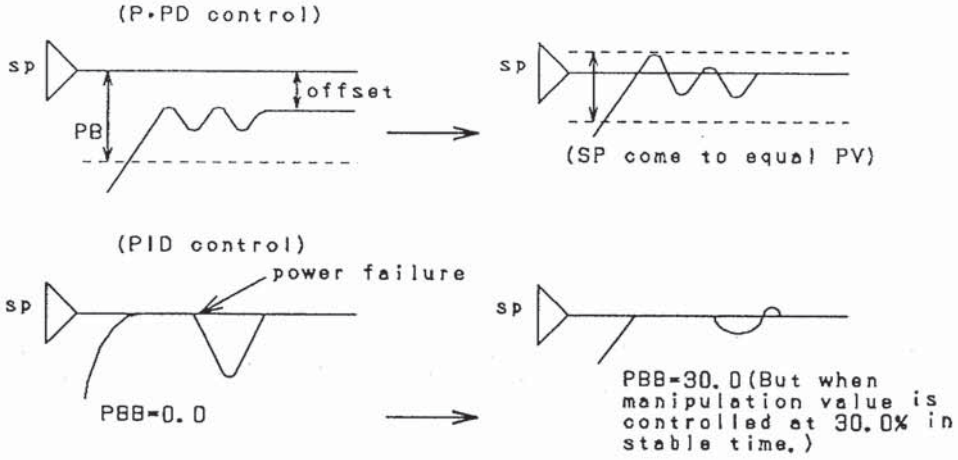
6) Control output (Designate any one when ordering.)

Relay	250V, 3A AC(resistive load), 1c contact
SSR drive	0－12V DC (more than 600Ω of load resistance.)
Current	4～20mA DC (less than 600Ω of load resistance.)

7) Standard function (Settable with front key operation.)

Scaling	Minimum 50 or 5.0 within each input's scaling range.
Output limiter	-10.0～110.0% (but it is 0.0～100.0% for relay and SSR drive output.)
Manual reset	0.0～100.0%
PV correction	-10.0%～+10.0% of scaling range (but setting is designated unit.)
℃／℉ changing	Only TC, RTD.
Sensor selection	Only TC, RTD.
Direct/Reverse changing	Presented
Output display	-10.0～110.0% (but it is 0.0～100.0% for relay and SSR output.)
Key lock	3 modes, OFF / ALL / Parameter
Decimal point remove	When voltage input is set, it is available with 2 digits.(But in case of RTD, only PV is changeable 1↔0.1[℃／℉] display.)
Control mode	PID type A (direct, reverse) PID type B (direct, reverse) ON/OFF (direct, reverse)

○ What is manual reset ?
(Setting of PBB[Proportional Band Bias])
It is effective against following cases.
- To do offset to zero on P or PD control operation.
- To minimize a disturbance of control when controller was reset due to the instant power failure, in spite of the condition that the control is operated in a stable at PI or PID control.



8) Self-check
- Data check by EEPROM
- A/D converter operation check
- Watch-dog timer

9) Option
(a) Selectable option

	Specifications	select
Alarm1	250V/0.5A AC, 120V/1A AC (relay, 1a contact output)	○
Alarm2	250V/0.5A AC, 120V/1A AC (relay, 1a contact output)	○
Heater element break	Up to 1A～30A AC, ON and OFF time are more than 300 ms ±5% respectively (CT input).	※

○··· Possible
※··· Possible when Alarm1 and Alarm2 are selected.

○ Heater element break alarm
It can be detecting for heater element break or welded contact of output magnet switch or SSR.
Set a half of maximum heater current.
- When the heater current is less than set value and output is ON, alarm will be ON. (It is judged that heater element is broken.)
- When the heater current is more than set value and output is OFF, alarm will be ON. (It is judged that contact is welded.)

(This alarm is functional when relay output or SSR drive output.)

(b) Alarm

Mode ※	Deviation high and low limit	(Pause, Hold)
	Deviation high limit	(Pause, Hold)
	Deviation low limit	(Pause, Hold)
	Deviation range	(Pause, Hold)
	PV high and low limit	(Pause, Hold)
	PV high limit	(Pause, Hold)
	PV low limit	(Pause, Hold)
	PV range	(Pause, Hold)
	Input abnormal alarm	(Hold)
	Heater element break alarm	(Hold)
	All round alarm	(Input abnormal + Heater element break)
Settable range	PV	-1999～9999 or -199.9～999.9
	Deviation	0～9999 or 0.0～999.9
Alarm hysteresis width	Maximum 10% of scaling range. (But setting is designated unit.)	

※ Mode: (PV 8 modes) and (Element break 3 modes) can be conbinated.

10) General specifications

Memory element	EEPROM
Isolation	Output part(control, alarm) and input part(measuring, CPU, CT input) are isolated separately.
Power supply	85～264V AC, 50/60Hz
Power consumption	Less than 10VA (264V AC)
Operation condition	0～55℃, 35～85%RH (not dew)
Storage condition	-20～65℃, 35～85%RH (not dew)
Dimension / weight	48(W)×48(H)×100(D)mm / less than 170g