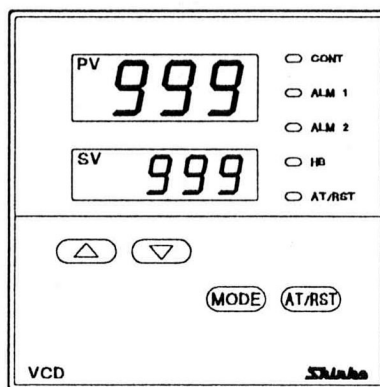


INSTRUCTION MANUAL
FOR
MICROCOMPUTER BASED
TEMPERATURE INDICATING CONTROLLER

VCD-100 SERIES



Thank you for your purchase of our Microcomputer based Temperature Indicating Controller VCD-100 series.

This controller is delivered after its production and inspection on the basis of severe quality control in our factory.

Further to your confirmation of the model and specifications of the controller, peruse this instruction manual before starting operation.

Note:

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



Warning

Turn the power supplied to the instrument OFF before wiring or checking.
If working on the power ON status, there is possibility of Electric Shock
which can cause severe injury or death.

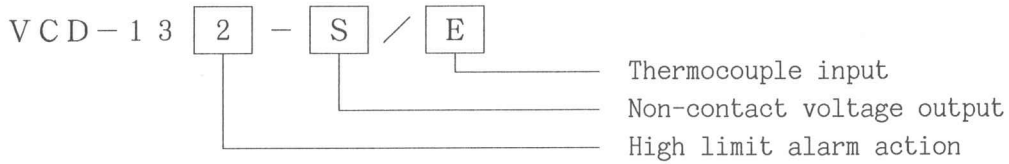
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1. Models referred to in this manual

1.1 Explanations of model names

Discribed mark "□" in this manual such as R/□ or □/□ means an alphanumerical character which shows various functions or the kinds. (e.g. R/E or S/R)



(1) Standard model

VCD-13 □-□/□		Series name: VCD-100 series
Control action	3	PID action
Temperature alarm action	0	No temperature alarm
	2	High limit alarm
	3	Low limit alarm
	4	High/Low limit alarm
	6	High/Low limit range alarm
	8	Process value alarm
Output	R	Relay contact
	S	Non-contact voltage
	A	DC Current
Input	E	Thermocouple, K or J
	R	RTD, Pt100, JPt100

(2) Optional specifications

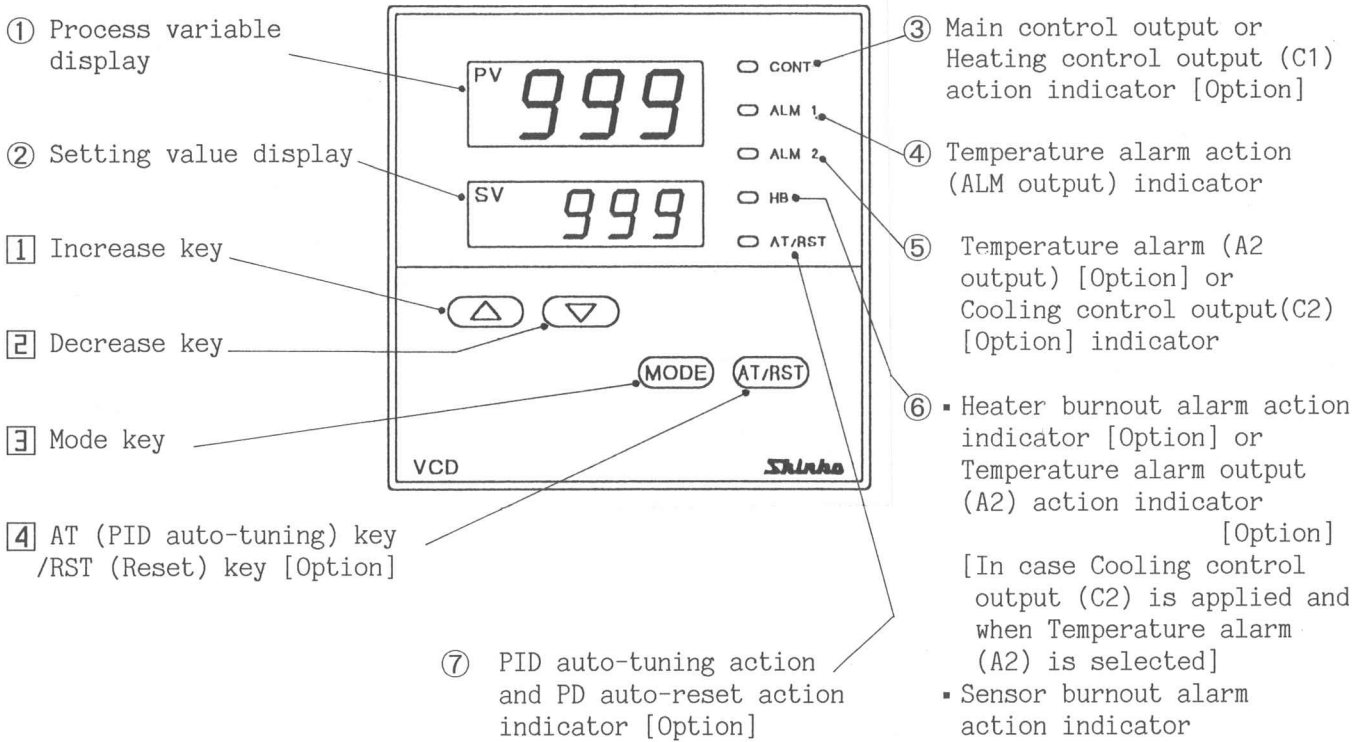
- Temperature alarm with standby function (ALM output) : code [H] (-132-□/□,H to -134-□/□,H)
 - Temperature alarm (A2 output) : code [AL□] (AL2 to AL8)
 - Temperature alarm with standby function (A2 output) : code [AL□,H] (AL2,H to AL4,H)
 - Heater burnout alarm : code [W]
 - Cooling control action : code [CM]
 - Function selection : code [F]
 - Specified dead band : code [SK]
 - Controlling method (PD action, w/auto-reset) : code [PD]
 - Heating and Cooling control output action : code [D□] (DR [Relay contact] DS [Non-contact voltage])
- In case Heating and Cooling control output action is applied, the option temperature alarm [AL□] cannot be applied together with heater burnout alarm [W]. Select whichever of them.
- Color Black : code [BK] Front frame: Dark gray
Case: Black

1.2 How to indicate model nameplate

		Model nameplate	[Example]
Standard model name		1 3 0 - R / E	
Option codes, Special order number, etc.	{	F	... Function selection
		W (1 0 A)	... Heater burnout alarm 10A
Instrument number (Indicated ... only on inner equipment.)		N O .	

- Notes: 1. Optional specifications are specified with above optional code besides the model name. When two or more functions are specified, delimit with comma.
2. In optional specification, as to Heater burnout alarm function W, the specified current value is to be indicated following to the option code in (A).

2. Names and functions of the sections



2.1 Explanations of display

- ① Displays actual temperature (Sensor measuring temperature). (Red LED)
- ② Displays setting value. (Green LED)
- ③ Green LED lights when control output ON, or Heating control output (C1) [Option] ON.
- ④ Red LED lights when temperature alarm [ALM] output ON. (Disables for the type-130-□/□.)
- ⑤ Red LED lights when temperature alarm (A2) output [Option] ON, or Cooling control (C2) output [Option] ON.
- ⑥ Red LED lights when heater burnout alarm output [Option] ON, or Temperature alarm output (A2) [Option] ON. (In case cooling control output (C2) is applied and when Temperature alarm (A2) is selected.) and when sensor burns out.
- ⑦ Yellow LED blinks when PID auto-tuning is performing or when PD auto-reset function (Offset correction) [Option] is performing.

2.2 Explanations of key functions

- 1 (▲) Increase key: Increases the numerical value on setting value display.
(If this key is held, causes setting value to change faster.)

* 1. Sub-setting mode

If (MODE) key is pressed while this key is being pressed, the mode turns to Sub-setting mode.

In Sub-setting mode, following values are settable.

Proportional band,	Integral time,
Derivative time,	ARW value,
Proportional cycle,	Temperature alarm,
Heater burnout alarm value [Option]	

2. Control output off function

If (MODE) key is pressed while this key is being pressed, the mode turns to Sub-setting mode (Proportional band setting mode), and if keep pressing both of the keys for not less than 3 seconds, the Control output off function will work and it stops the control.

The same key operation will release the control output off function.

[If the system is left without key operation for approx. 30sec., the mode will return to controlling mode (PV/SV display) and the values will be registered.]

- 2 (▼) Decrease key: Decreases the numerical value on setting value display.
(If this key is held, causes setting value to change faster.)

If (MODE) key is pressed for approx. 3sec. while this key is being pressed the mode turns to Auxiliary function setting mode.

- * In Auxiliary function setting mode, following values are settable.

Setting value lock designation
Sensor designation [Option]
Scaling range high limit setting
Scaling range low limit setting
Output high limit setting
Output low limit setting
Sensor correction setting
Control mode designation [Option]
Temperature alarm action designation [Option]
Differential (dead band) setting [Option]

[If the system is left without key operation for approx. 30sec., the mode will return to controlling mode (PV/SV display) and the values will be registered.]

- 3 (MODE) Mode key : Switches the setting mode.

- 4 (AT/RST) PID auto-tuning key : Performs or cancels the PID auto-tuning.
During PID auto-tuning, yellow LED indicator (AT/RST) will blink.

- PD auto-reset key : When the controlling value is within the proportional band, it starts to correct the offset if this key is pressed for 1sec. or greater.
During offset correction, yellow LED indicator (AT/RST) will blink for approx. 10 minutes (depending on the version, it is 4 minutes).

- * Reset key functions only when option [PD] is designated. If the option is not designated, it functions as PID auto-tuning key.

The diagram is on page 10, 5.1 "Setting items diagram".

3. Mounting to control panel

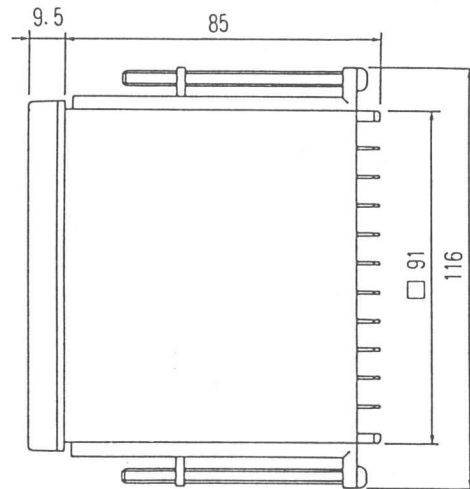
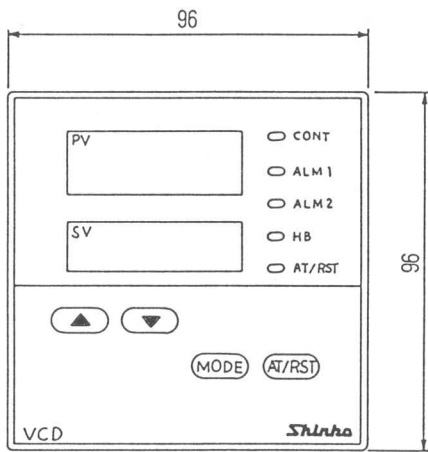
3.1 Site selection

Mount the controller in a place with:

- (1) A minimum of dust.
- (2) An absence of corrosive gases.
- (3) No mechanical vibrations or shocks.
- (4) No exposure to direct sunlight, ambient temperature within 0°C (32°F) to 50°C (122°F) and it does not change suddenly.
- (5) Ambient humidity 85%RH or less and non-condensing.
- (6) The controller should be away from the electromagnetic switch of large capacity or cables through which large current flows.
- (7) No water or oil and their vapor directly splash.

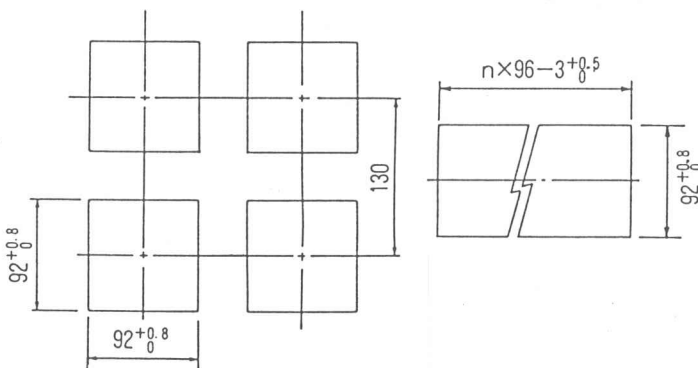
3.2 External dimension drawing

* Screw type mounting bracket
(Mounting panel thickness 1 to 8mm)



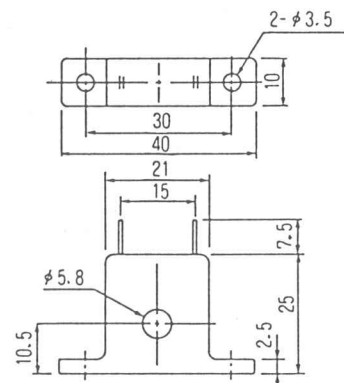
[Note] Do not screw with excessive force, or the case may be bent, since it is made of resin.

3.3 Panel cutout



Lateral close mounting
n: Number of units installed

[Optional accessory]



Dimension drawing of Current transformer for [Heater burnout alarm]



Warning

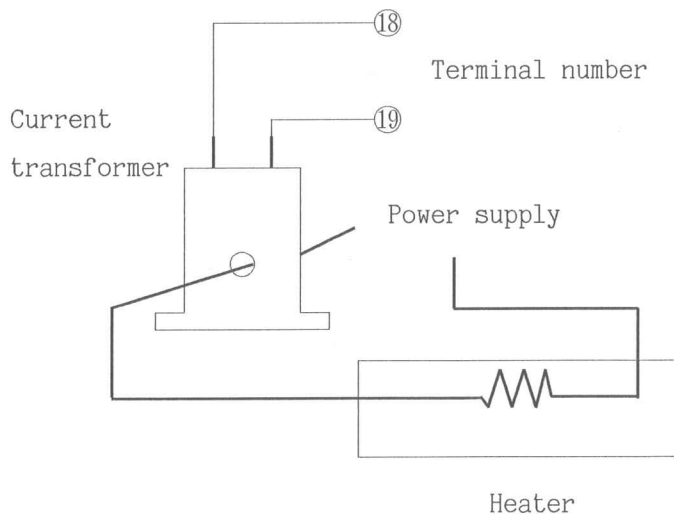
Turn the power supplied to the instrument OFF before wiring or checking. If working on the power ON status, there is possibility of Electric Shock which can cause severe injury or death.

Notes:

- ① With the product of which the supply voltage is 24V, the voltage is indicated as 24V. Do not apply other voltage without failure.
- ② Use a thermocouple and compensating lead wire applicable to the input specifications (K, J, etc.) of this controller.
- ③ Use a 3-wire system of RTD applicable to the input specifications (Pt100) of this controller.
- ④ Check the specified voltage indicated on the voltage nameplate. This controller has no built-in power switch nor fuse. It is therefore recommended that these units be provided in the circuit near the external controller.
- ⑤ When wiring, keep input wire (Thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.
- ⑥ With relay output type controller, it is recommended to provide auxiliary relay to protect the built-in relay contact, even if the load capacity is smaller than the built-in contact capacity.

[In case, Heater burnout alarm function (Option code: W) is applied.]

- ① This alarm is not available for detecting current under phase control.
- ② When using Current transformer, select an accessory one.
- ③ Pass a lead wire of heater circuit into the hole of current transformer.
- ④ When wiring, keep current transformer wire away from AC source and load wire to avoid external interference.



5. Explanations of operation

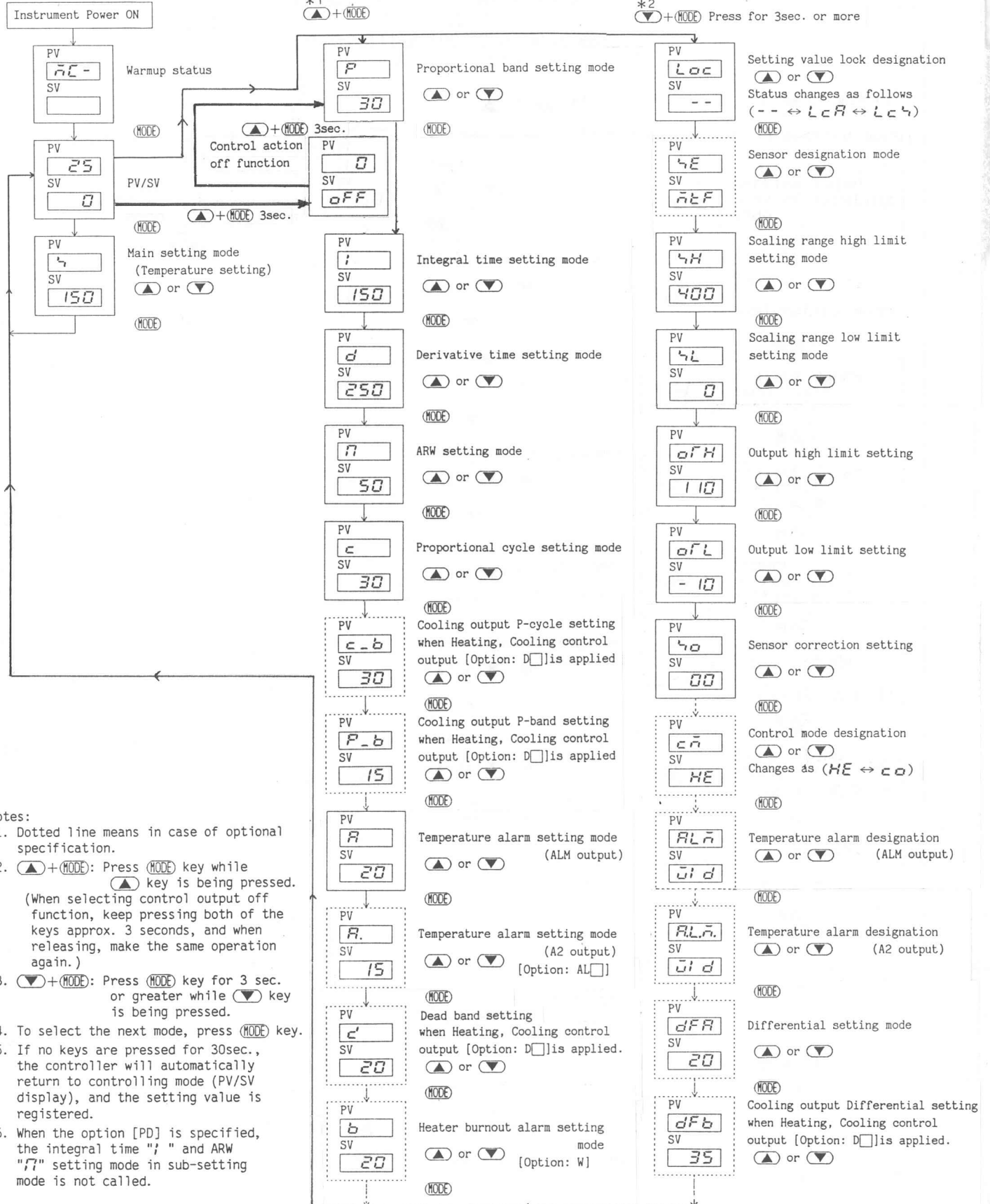
5.1 Setting items diagram

Key operations

• Main setting mode

• Sub-setting mode

• Auxiliary function setting mode



Notes:

1. In any mode, if "(AT/RST) key" is pressed, auto-tuning will be started. However, if lock function is specified in Setting value lock designating mode (in Auxiliary function setting mode), auto-tuning cannot work.
2. The values set with (▲) or (▼) keys and displayed are registered after pressing (MODE) key. If the key operations are finished with the numeric values set, the system is automatically turned to controlling (PV/SV display mode) after approx. 30 seconds, and the values are registered.

5.2 Basic operations

Process variable display (PV) indicates "rE -" for approx. 8 seconds after the power ON. During this time, all outputs, digital displays and LED indicators are in their off status. After that, displays actual temperature on the PV display and setting value on the SV display, and starts control.

(While "rE -" is displayed, do not operate the keys. Further, do not turn the power ON while the key is operated.)

(1) PV/SV display mode

A mode to display the control status.

PV display	SV display	No contents of setting item nor setting values can be changed.
Actual temperature	Main setting value	

(2) Main setting mode



A mode to set a Main control setting value. In PV/SV display mode, if (MODE) key is pressed, Main setting mode is selected showing "r" on PV display.

Setting range is from scaling low limit setting value to scaling high limit setting value, the values are set in advance respectively.

To register the setting value, it is registered when the (MODE) key is pressed or if no keys are pressed for approx. 30 seconds, and the controller automatically returns to controlling mode (PV/SV display mode).

PV display	SV display	Change of setting value
r	Main setting value	Increase or decrease the numerical value operating (▲) and (▼) keys.

(3) Sub-setting mode

In PV/SV display mode, if (MODE) key is pressed while (▲) key is held, the mode is switched to Sub-setting mode showing "F" on PV display and Proportional band setting mode is selected.

Further, each pressing the (MODE) key ((▲) key is not pressed), the mode will be changed. Then, the setting value can be set for the required mode.

① **P** Proportional band setting mode

A mode to set a proportional band of main control.
 Settable from 0.1 to 99.9% of scaling range full scale. (Factory adjusted as 2.5%)

Setting the proportional band to 0.0 causes the instrument to act as an ON/OFF controller. If option "F" is specified, differential value (dead band) is settable in differential setting mode.

PV display	SV display	Change of setting value
P	Proportional band setting value	Increase or decrease the numerical value operating (▲) and (▼) keys.

② **OFF** Control output off function

A mode to stop the control output.

PV display	SV display	Change of the function
0	OFF	When proportional band "P" is selected, if (MODE) key is pressed for approx. 3sec. while (▲) key is being pressed, control output off function works, and it stops the control output. To release the function, it returns to proportional band setting mode "P" with the same key operation as above.

③ **I** Integral time setting mode

A mode to set an integral time.
 Settable from 1 to 999 seconds. (Factory adjusted as 200sec.)
 Setting the integral to 0 disables the function.

PV display	SV display	Change of setting value
I	Integral time setting value	Increase or decrease the numerical value operating (▲) and (▼) keys.

④ **d** Derivative time setting mode

A mode to set a derivative time.
 Settable from 1 to 999 seconds. (Factory adjusted as 50sec.)
 Setting the derivative to 0 disables the function.

PV display	SV display	Change of setting value
d	Derivative time setting value	Increase or decrease the numerical value operating (▲) and (▼) keys.

⑤ 7 Anti-reset windup (ARW) setting mode

A mode to set an ARW value.
 Settable from 0 to 100%. (Factory adjusted as 50%)

PV display	SV display	Change of setting value
7	ARW value	Increase or decrease the numerical value operating ▲ and ▼ keys.

* As for PID auto-tuning, refer to 5.3 PID auto-tuning performance.

[Explanation of ARW]

ARW prevents overshoot caused due to the integral action. It is set automatically using PID auto-tuning. If operating by manual, duty factor of load for the setting is of standard value, to fix controlling aim.
 The less ARW value is, the less excess integral action becomes at transition status, however, it needs time till stabilized.

⑥ C Proportional cycle setting mode

A mode to set a proportional cycle. (Inapplicable to current output type A/□)
 Settable from 1 to 120 seconds. (Factory adjusted as 30sec.for R/□, 3sec.for S/□.)

PV display	SV display	Change of setting value
C	Proportional cycle setting value	Increase or decrease the numerical value operating ▲ and ▼ keys.

⑦ R Temperature alarm setting mode (ALM output)

A mode to set a temperature alarm setting value. (If no temperature alarm specified, [VCD-130-], this mode is not available.)
 Setting range is as follows. (Setting ranges are different from the alarm action correspond to the models. Factory adjusted as 0 °C[°F].)

1. High limit alarm (-132-□/□): -100 to 100°C (-199 to 200°F)
2. Low limit alarm (-133-□/□): -100 to 100°C (-199 to 200°F)
3. High/Low limit alarm*(-134-□/□): ±(1 to 100)°C (1 to 200°F, -1 to -199°F)
4. High/Low limit range*(-136-□/□): ±(1 to 100)°C (1 to 200°F, -1 to -199°F) alarm
5. Process value alarm (-138-□/□): Scaling low to high limit setting value

○ In case the input is RTD and the decimal point is applied.

1. High limit alarm (-132-□/□/□): -19.9 to 99.9°C (-19.9 to 99.9°F)
2. Low limit alarm (-133-□/□/□): -19.9 to 99.9°C (-19.9 to 99.9°F)
3. High/Low limit alarm*(-134-□/□/□): ±(1.0 to 99.9)°C** [±(1.0 to 99.9)°F]
4. High/Low limit range*(-136-□/□/□): ±(0.1 to 99.9)°C [±(0.1 to 99.9)°F] alarm
5. Process value alarm (-138-□/□/□): Scaling low to high limit setting value

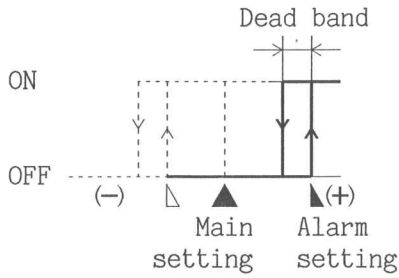
*: Both(+) and (-) values will be simultaneously set when applied only value.

** : Avoid setting the value 0.9 or less, Since it prevents proper action related to the dead band.

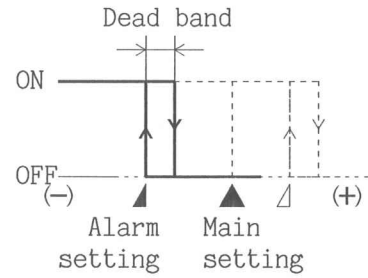
Note: Setting the value to 0 (0.0) disables the function.
 [Excepting Process value alarm (VCD-138-) setting.]

* Explanations of alarm action

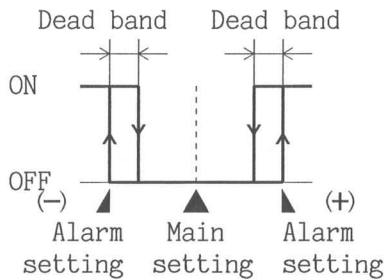
1. High limit alarm (VCD-132-)



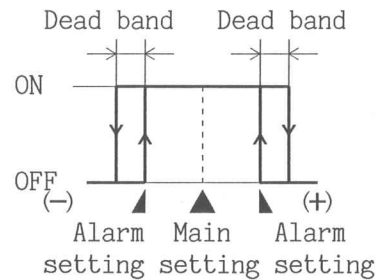
2. Low limit alarm (VCD-133-)



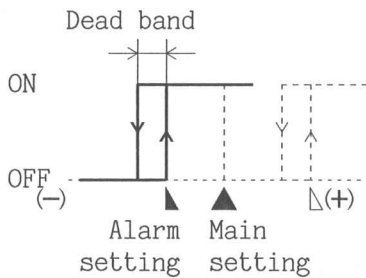
3. High/Low limit alarm (VCD-134-)



4. High/Low limit range alarm (VCD-136-)



5. Process value alarm (VCD-138-)



Note: Unit of Dead band is °C (°F).

Temperature alarm with Standby function (Option code: H)

The alarm output is halted until the deviation reaches in the alarm setting range after power turned on, or when the main setting value is changed in the running, and in the case deviation becomes larger than the alarm set range.

High limit alarm

with standby function (-132-□/□,H): -100 to 100°C (-199 to 200°F)

Low limit alarm

with standby function (-133-□/□,H): -100 to 100°C (-199 to 200°F)

High/Low limit alarm

with standby function *(-134-□/□,H): ±(1 to 100)°C (1 to 200°F, -1 to -199°F)

○ In case the input is RTD and the decimal point is applied.

High limit alarm

with standby function (-132-□/□,H): -19.9 to 99.9°C (-19.9 to 99.9°F)

Low limit alarm

with standby function (-133-□/□,H): -19.9 to 99.9°C (-19.9 to 99.9°F)

High/Low limit alarm

with standby function *(-134-□/□,H): ±(1.0 to 99.9)°C** [±(1.0 to 99.9)°F]

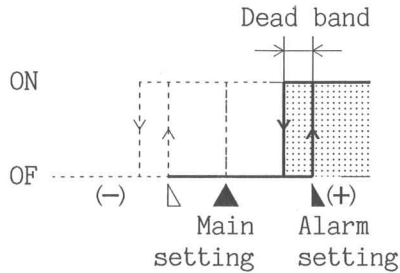
*: Both(+) and (-) values will be simultaneously set when applied only value.

** : Avoid setting the value 0.9 or less, Since it prevents proper action related to the dead band.

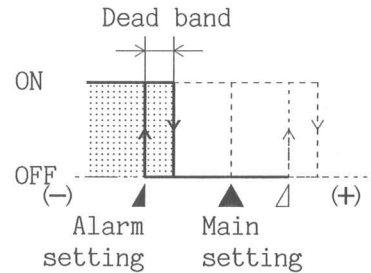
Note: Setting the value to 0 (0.0) disables the function.

* Explanations of alarm action with standby function

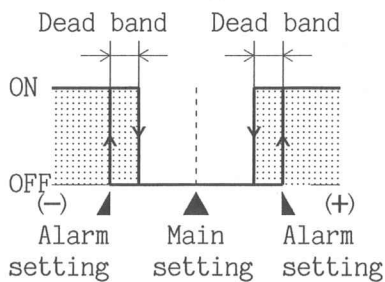
1. High limit alarm (VCD-132-□/□,H) with standby function



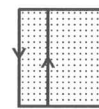
2. Low limit alarm (VCD-133-□/□,H) with standby function



3. High/Low limit alarm with standby function (VCD-134-□/□,H)



Note: Reticulated range indicates Standby function.



• Unit of dead band is °C(°F).

PV display	SV display	Change of setting value
A	Temperature alarm setting value	Increase or decrease the numerical value operating and keys.

Temperature alarm (A2 output) [Option code: AL□]

⑧ A. Temperature alarm setting mode (A2 output) [Option]

A mode when Temperature alarm (A2 output) is applied as option.
(Setting methods [ranges and functions] are the same as ALM output.)

Setting ranges are as follows.

(Setting ranges are different from the alarm action correspond to the models.)

Factory adjusted as 0°C[°F].)

1. High limit alarm (-13□-□/□ ,AL2): -100 to 100°C (-199 to 200°F)
2. Low limit alarm (-13□-□/□ ,AL3): -100 to 100°C (-199 to 200°F)
3. High/Low limit *(-13□-□/□ ,AL4): ±(1 to 100)°C (1, to 200°F, -1 to -199°F) alarm
4. High/Low limit *(-13□-□/□ ,AL6): ±(1 to 100)°C (1 to 200°F, -1 to -199°F) range alarm
5. Process value (-13□-□/□ ,AL8): Scaling low to high limit setting value alarm

○ In case the input is RTD and the decimal point is applied.

1. High limit alarm (-13□-□/□,AL2): -19.9 to 99.9°C (-19.9 to 99.9°F)
2. Low limit alarm (-13□-□/□,AL3): -19.9 to 99.9°C (-19.9 to 99.9°F)
3. High/Low limit *(-13□-□/□,AL4): ±(1.0 to 99.9)°C** [±(1.0 to 99.9)°F) alarm
4. High/Low limit *(-13□-□/□,AL6): ±(0.1 to 99.9)°C [±(0.1 to 99.9)°F) range alarm

*: Both(+) and (-) values will be simultaneously set when applied only value.

** : Avoid setting the value 0.9 or less, Since it prevents proper action related to the dead band.

Note: Setting the value to 0 (0.0) disables the function.

[Excepting Process value alarm (VCD-138-) setting.]

Temperature alarm (A2 output) with standby function [Option code: AL□,H]

The alarm output is halted until the deviation reaches in the alarm setting range after power turned on, or when the main setting value is changed in the running, and in the case deviation becomes larger than the alarm set range.

High limit alarm with standby function (-13□-□/□,AL2,H): -100 to 100°C (-199 to 200°F)

Low limit alarm with standby function (-13□-□/□,AL3,H): -100 to 100°C (-199 to 200°F)

High/Low limit alarm with standby function *(-13□-□/□,AL4,H): ±(1 to 100)°C (1 to 200°F, -1 to -199°F)

○ In case the input is RTD and the decimal point is applied.

High limit alarm with standby function (-13□-□/□,AL2,H): -19.9 to 99.9°C (-19.9 to 99.9°F)

Low limit alarm with standby function (-13□-□/□,AL3,H): -19.9 to 99.9°C (-19.9 to 99.9°F)

High/Low limit alarm with standby function *(-13□-□/□,AL4,H): ±(1.0 to 99.9)°C** [±(1.0 to 99.9)°F]

*: Both(+) and (-) values will be simultaneously set when applied only value.

** : Avoid setting the value 0.9 or less, Since it prevents proper action related to Note: Setting the value to 0 (0.0) disables the function.

PV display	SV display	Change of setting value
A.	Temperature alarm setting value	Increase or decrease the numerical value operating (▲) and (▼) keys.

Heater burnout alarm [Option code: W] (including Sensor burnout alarm)

⑨ b Heater burnout alarm setting mode [Option]

A mode to set the heater current and is applied when heater burnout alarm output [W] is specified. This option is not available to the type Current output A/□.

$$[\text{Action point (Setting value) \%}] = \frac{\text{Heater current}}{\text{Rated current}} \times 100\%$$

Heater current: Maximum during operation, Rated current: 5A, 10A, 20A, specified

Notes: 1. Setting value (= action point) can be calculated with above mentioned, however, making allowance for voltage regulation, it is recommended to set the value 80% of action point. Settable from 0 to 100%. (Factory adjusted as 0%)

Once alarm action operates, the output is held. Setting the value to 0 disable the function, and if the alarm output is maintained, it will be cancelled.

2. When the option Heating and Cooling control action is applied, the option Temperature alarm [Code: AL□] cannot be applied together with this mode [Code: W].

PV display	SV display	Change of setting value
b	Heater current setting value	Increase or decrease the numerical value operating (▲) and (▼) keys.

Heating and Cooling control output [Option code: D□]

- ⑩ c_b Cooling control Proportional cycle setting mode [Option]
- ⑪ P_b Cooling control Proportional band setting mode [Option]
- ⑫ c' Overlap or Dead band setting mode [Option]

This mode is applied when Heating and Cooling control output [Option code: D□] is specified, and it performs Heating and Cooling control with Main control (C1) [Heating] and Sub-control (C2) [Cooling] output.

When Heating and Cooling control output is specified, only one of the option, the auxiliary temperature alarm [code: AL□] or heater burnout alarm [code: W] can be applied. The option specified one is applied at our factory.

Cooling control (Sub-control) Proportional cycle: 1 to 120sec. (Factory adjusted as 30sec. -R/□ or 3sec. -S/□)

Cooling control (Sub-control) Proportional band : 0.1 to 10 times of Heating control (Main control) P-band

Overlap, Dead band setting range: -10.0 to 10.0% of scaling range full scale. (+) setting for dead band, and (-) setting for overlap (Factory adjusted as 0.0%)

The value for Integral time and Derivative time follow the setting values of main control action.

*** Example to set Sub (C2) proportional band**

- In the case, rated scale is 0 to 400°C and Main (C1) proportional band is 10.0% (40°C), the sub (C2) proportional band should be set as follows.

[Example] If 8°C is desired for Sub (C2) proportional band, the Sub (C2) proportional band multiplying factor should be 1/5 (0.2), therefore, set the Sub (C2) proportional band setting value to -5. (Refer to below table.)

[Formula] Main proportional band value × Sub proportional band setting value = Sub proportional band value

$$40^{\circ}\text{C} [\text{Main proportional band value}] \times 1/5 (0.2) [-5 (*1) \text{ Sub proportional band setting value}] = 8^{\circ}\text{C}$$

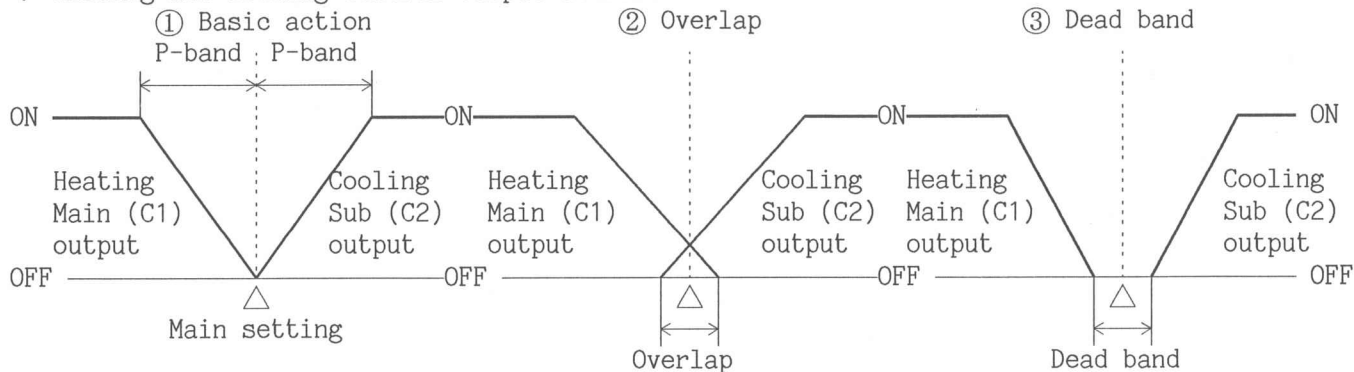
Note (*1): Sub (C2) proportional band multiplying factor of Sub (C2) proportional band setting value -5 is 1/5 [0.2].

Sub control Proportional band setting value	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0
Sub control Proportional band multiplying factor	1/10	1/9	1/8	1/7	1/6	1/5	1/4	1/3	1/2	1/1	0
Sub control Proportional band value (°C) [e.g.]	4.0	4.4	5.0	5.7	6.7	8.0	10.0	13.3	20.0	40.0	0

Sub control Proportional band setting value	0	1	2	3	4	5	6	7	8	9	10
Sub control Proportional band multiplying factor	0	1	2	3	4	5	6	7	8	9	10
Sub control Proportional band value (°C) [e.g.]	0	40	80	120	160	200	240	280	320	360	400

PV display	SV display	Change of setting value
c_b	Cooling control, proportional cycle setting value	Increase or decrease the numerical value operating \blacktriangle or \blacktriangledown keys.
P_b	Cooling control, proportional band setting value	Increase or decrease the numerical value operating \blacktriangle or \blacktriangledown keys.
c'	Overlap or dead band setting value	Increase or decrease the numerical value operating \blacktriangle or \blacktriangledown keys.

* Heating and Cooling control output actions



(4) Auxiliary functions setting mode

In PV/SV display mode, if **MODE** key is pressed for approx. 3 seconds while \blacktriangledown key is held, the mode is switched to Auxiliary function setting mode and Setting value lock designation mode will be selected. Each pressing the **MODE** key (\blacktriangledown key is not pressed) the mode will be changed. The setting value desired can be set for each mode.

① **Loc** Setting value lock designating mode

A mode to designate a lock function of setting value, and the functions are different from the designating status.

Character	Description
--	Lock cancelled status. All setting values can be changed.
LcA	Lock status for the all setting values in Main and Sub setting mode. No values in Main and Sub setting mode can be changed.
Lc4	Lock status excepting Main setting value. Only main setting value is changeable, and others are unchangeable.

[Factory adjusted as Lock cancelled status (--).]

Note: **LcA** **Lc4** : In lock status, PID auto-tuning cannot be operated.

PV display	SV display	Change of the status	
Loc	--	With \blacktriangle key With \blacktriangledown key	
	LcA		-- \Rightarrow LcA \Rightarrow Lc4
	Lc4		Lc4 \Rightarrow LcA \Rightarrow --

Function selection [Option code: F]

② 4E Sensor designating mode [Option]

A mode applied when option F is specified, and 4 kinds of input -□/E (thermocouple) and 8 kinds of input -□/R (RTD) can be changed according to the designating status.

Character		Kind of sensor		Scaling range
PV display	SV display			
4E	$\bar{n}t$	K	-□/E (Thermocouple)	0 to 999°C
	$\bar{n}tF$	K		0 to 999°F
	$\bar{n}J$	J		0 to 800°C
	$\bar{n}JF$	J		0 to 999°F
	PJ	JPt100 (JIS' 81)	-□/R (RTD)	-199 to 400°C
	PJF	JPt100 (JIS' 81)		-199 to 999°F
	Pd	Pt100 (JIS' 89,IEC)		-199 to 400°C
	PdF	Pt100 (JIS' 89,IEC)		-199 to 999°F
	$PJc.$	JPt100 (JIS' 81)		-19.9 to 99.9°C
	$PJF.$	JPt100 (JIS' 81)		-19.9 to 99.9°F
	$Pdc.$	Pt100 (JIS' 89,IEC)		-19.9 to 99.9°C
	$PdF.$	Pt100 (JIS' 89,IEC)		-19.9 to 99.9°F

Note: Avoid designation, from -□/E type to RTD type and from -□/R type to thermocouple type.

PV display	SV display	Change of sensor designation
4E	$\bar{n}t$	Sensor designations are changed as follows. with \blacktriangle key $\bar{n}t \Rightarrow \bar{n}tF \Rightarrow \bar{n}J \Rightarrow \bar{n}JF \Rightarrow$ $\Rightarrow PJ \Rightarrow PJF \Rightarrow Pd \Rightarrow PdF \Rightarrow$ $\Rightarrow PJc. \Rightarrow PJF. \Rightarrow Pdc. \Rightarrow PdF.$ with \blacktriangledown key $PdF. \Rightarrow Pdc. \Rightarrow PJF. \Rightarrow PJc. \Rightarrow$ $\Rightarrow PdF. \Rightarrow Pd. \Rightarrow PJF. \Rightarrow PJ. \Rightarrow$ $\Rightarrow \bar{n}JF. \Rightarrow \bar{n}J. \Rightarrow \bar{n}tF. \Rightarrow \bar{n}t.$
	$\bar{n}tF$	
	$\bar{n}J$	
	$\bar{n}JF$	
	PJ	
	PJF	
	Pd	
	PdF	
	$PJc.$	
	$PJF.$	
	$Pdc.$	
	$PdF.$	

③ **cñ** Control mode designating mode [Option]

A mode applied when option F is specified, and designates the mode of control mode (Heating [reverse] action or Cooling [direct] action).

PV display	SV display	Control mode	Change of mode
cñ	HE	Heating action (Reverse)	Heating (Reverse) action with ▲ key
	CO	Cooling action (Direct)	Cooling (Direct) action with ▼ key

④ **ALñ** Temperature alarm action designating mode (ALM output) [Option]

A mode applied when option F is specified, and temperature alarm actions undermentioned are changeable by the designation.

Character	Temperature alarm action	Setting range
--	No alarm action	None
H	High limit alarm action	-100 to 100°C (-199 to 200°F)
L	Low limit alarm action	-100 to 100°C (-199 to 200°F)
HL	High/Low limit alarm action	±(1 to 100)°C (1 to 200°F, -1 to -199°F) Both (+) and (-) sides are set together.
ūī d	High/Low limit range alarm action	±(1 to 100)°C (1 to 200°F, -1 to -199°F) Both (+) and (-) sides are set together.
Hū	High limit alarm action with standby function	-100 to 100°C (-199 to 200°F)
Lū	Low limit alarm action with standby function	-100 to 100°C (-199 to 200°F)
HLū	High/Low limit alarm with standby function	±(1 to 100)°C (1 to 200°F, -1 to -199°F) Both (+) and (-) sides are set together.
Ab4	Process value alarm action	Scaling low to high limit setting value

Note: Setting the value to 0 disables the function.
(However, in case of Process value alarm, it functions even if the value is 0.)

PV display	SV display	Change of alarm action	
ALñ	--	With ▲ key, ⇒	-- ⇒ H ⇒ L ⇒
	H		HL ⇒ ūī d ⇒ Hū ⇒
	L		Lū ⇒ HLū ⇒ Ab4 ⇒
	HL		
	ūī d	With ▼ key, ⇒	Ab4 ⇒ HLū ⇒ Lū ⇒
	Hū		Hū ⇒ ūī d ⇒ HL ⇒
	Lū		L ⇒ H ⇒ -- ⇒
	HLū		
Ab4			

⑤ **ALñ** Temperature alarm action designating mode (A2 output)[Option]

A mode applied when option F is specified, and to designate the A2 output temperature alarm action. The setting methods (range, function) are the same as ALM output temperature alarm action designation mode.

⑥ dFA Differential setting mode (Main control output C1) [Option]





⑦ dFb Differential setting mode (Sub-control output C2) [Option]

"dFA" is applied to the option "F" of main control output (C1) and "dFb" is applied to the option "D□" of sub-control output (C2).

When the instrument acts as an ON/OFF controller, differential (dead band of ON and OFF for control action) is settable.

Settable from 0.1 to 10.0°C (0.1 to 20.0°F). (Factory adjusted as 1.0°C[°F])

This action is effective only when controlling by ON/OFF action (Prop.band = 0%).

PV display	SV display	Change of setting value
dFA	Differential setting value for Main control output(C1)	Increase or decrease the numerical value operating  and  keys.
dFb	Differential setting value for Sub-control output (C2)	Increase or decrease the numerical value operating  and  keys.

Note: Differential designation [Option: SK] different from Option F can be specified.

Option SK is set in factory as specified differential value.



If the control action is ON/OFF action, differential (dead band of ON and OFF for control action) can be specified. [Factory adjusted as ordered.]

Designating range is from 0.0 to 10.0°C (0.0 to 20.0°F).

⑧ 4H Scaling high limit setting mode

A mode to set a high limit of scaling value.



Setting range differs from the kind of sensor. (Factory adjusted as specified)

PV display	SV display	Change of setting value
4H	Scaling high limit value	Increase or decrease the numerical value operating  and  keys.

⑨ 4L Scaling low limit setting mode

A mode to set a low limit of scaling value.

Setting range differs from the kind of sensor. (Factory adjusted as specified)



PV display	SV display	Change of setting value
4L	Scaling low limit value	Increase or decrease the numerical value operating  and  keys.

Note: Scaling range is settable at will within scaling high and low limit setting, however, when setting the scaling range narrower than the minimum span, the accuracy cannot be warranted.

[Thermocouple (K, J): Minimum span 300°C(600°F). RTD (Pt100): 100°C(200°F)]



⑩ oFH Output high limit setting mode

A mode to set a high limit value of control output.
 Setting range is from output low limit value to 110%
 (Only to Current output type, settable for more than 100%, Factory adjusted as 100%)

PV display	SV display	Change of setting value
oFH	Scaling high limit value	Increase or decrease the numerical value operating  and  keys.



⑪ oFL Output low limit setting mode

A mode to set a low limit value of control output.
 Setting range is from -10% to output high limit value.
 (Only to Current output type, settable for less than 0%, Factory adjusted as 0%)

PV display	SV display	Change of setting value
oFL	Scaling low limit value	Increase or decrease the numerical value operating  and  keys.

⑫ 4o Sensor correction setting mode

A mode to set a sensor correction value
 Settable from -19.9 to +30.0°C (-19.9 to 50.0°F) (Factory adjusted as 0.0°C)

PV display	SV display	Change of setting value
4o	Sensor correction value	Increase or decrease the numerical value operating  and  keys.

[Explanation of sensor correction function]

It corrects the input value from the sensor. When a sensor cannot be set at a location where control is desired, the sensor measuring temperature may deviate from the temperature in the controlled location. When controlling with plural controllers, the accuracy of sensors have an influence on the control. Therefore, sometimes measuring temperature (input value) does not accord with the same setting value. In such a case, the control can be accorded with desired temperature by correcting the input value of sensor.

5.3 Performance of PID auto-tuning

PID auto-tuning is started by pressing the AT/RST key in PV/SV display mode (control performing), Main setting mode, Sub-setting mode or Auxiliary function setting mode. During auto-tuning is operated, auto-tuning indicator blinks and MODE key turns into ineffective and other settings cannot be set in this status. When the auto-tuning ends, the indicator will go off and PV/SV display mode will be selected. Now, other settings are settable.

If AT/RST key is pressed again during auto-tuning, the auto-tuning will be cancelled and starts the control. After the auto-tuning is terminated, Proportional band (P), Integral time (I), Derivative time (D) and ARW value correspond to the controlling process are set automatically. However, if the PID auto-tuning is cancelled on its halfway, proper PID parameters cannot be set, but returns to their former parameters.

Each setting value, the Proportional band (P), the Integral time (I), the Derivative time (D) and the ARW value can be confirmed in Sub-setting mode. Auto-tuning does not function when lock mode is selected in Setting value lock designating mode (Auxiliary function setting mode).

5.4 Explanations of PID

(1) Proportional band (P)

Proportional action is the action of which the control output varies in proportion to the deviation of setting value and processing temperature. If the proportional band is narrowed, the output changes even by a slight variation of the processing temperature, and better control may be maintained as the offset decreases. However, when the proportional band is extremely far too narrowed, it may cause variation in the processing temperature even by slight disturbance, and turns into controls such as ON/OFF action of the so called hunting phenomenon. Therefore, when the processing temperature comes to the balanced position near the setting value and a constant temperature is maintained, the most suitable value is selected by gradually narrowing the proportional band while observing the control results.

(2) Integral time (I)

Integral action is to eliminate the offset. When the integral time is shortened, the returning speed to the setting point is quickened, but the cycle of the vibration is also quickened and the stability becomes unfavorable.

(3) Derivative time (D)

Derivative action is to restore the change of processing temperature according to the changing rate. It reduces overshoot and vibration width. If the derivative time is shortened, restoring value comes small, and if the derivative time is adjusted longer, a phenomenon of returning too much may occur and the control system may vibrate.

(4) Anti-reset windup (ARW)

ARW prevents overshoot caused due to the integral action. It is set automatically using PID auto-tuning. If operating by manual, duty factor of load for the setting is of standard value, to fix controlling aim.

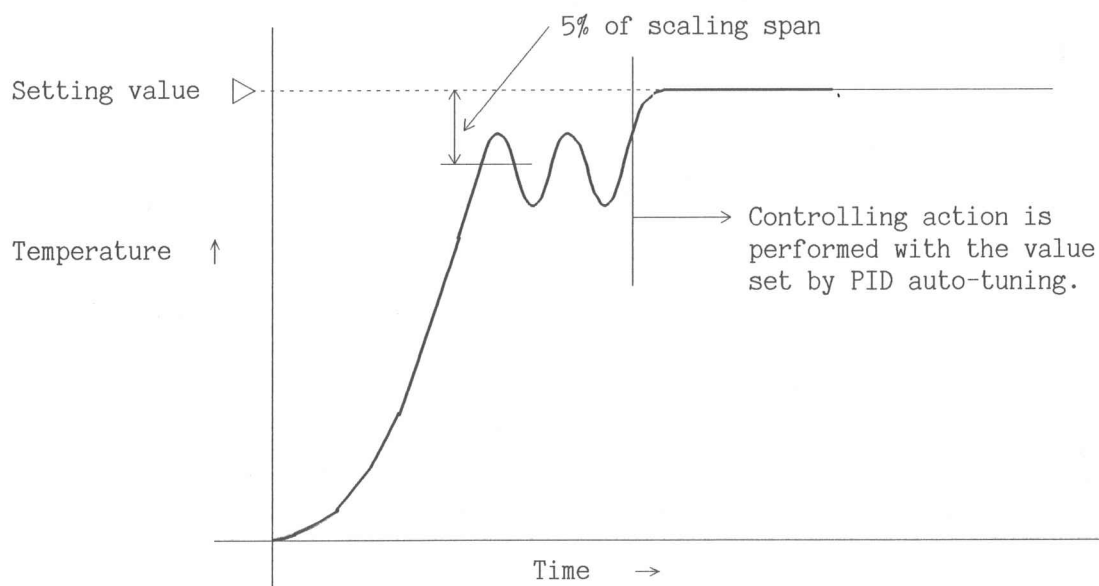
The less ARW value is, the less excess integral action becomes at transition status, however, it needs time till stabilized.

5.5 Explanations of PID auto-tuning

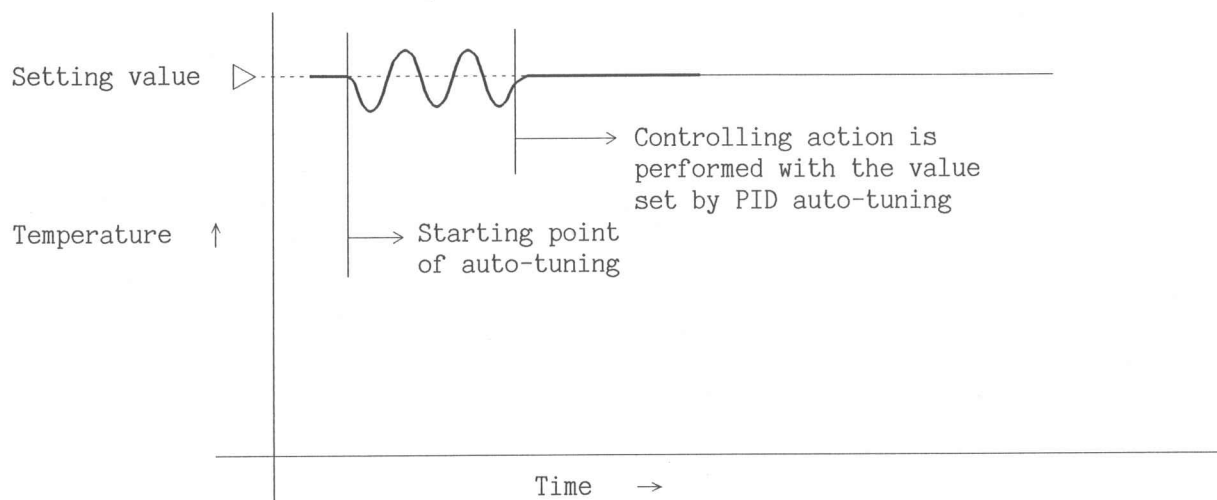
In order to set the each value of P,I,D and ARW automatically, this system gives the fluctuation to the control object by force. Three kinds of undermentioned system are selected automatically to prevent from the fluctuation.

- (1) In case the difference between setting value and processing temperature is large when the temperature rises.

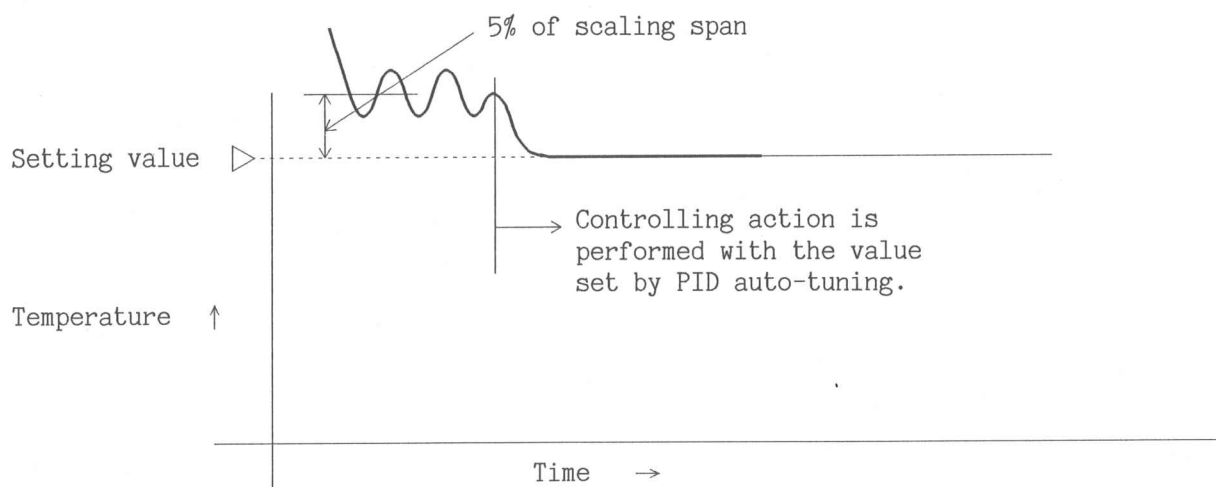
Fluctuation is given at the temperature 5% of scaling span less than the setting value.



- (2) In case of the stable situation during control or when control temperature is within $\pm 10\%$ of scaling span, the fluctuation is given at the setting value.



- (3) When the control temperature is 10% of scaling span more than setting value, the fluctuation is given at the temperature 5% of scaling span higher than the setting value.



Methods (1) to (3) are automatically selected by the relation between control temperature and setting value. However, according to the process, if selected the timing to start auto-tuning, the merits mentioned below is applicable effectively.

- *The method (1) prevents control temperature from exceeding setting value during auto-tuning. This method is suitable to the system high process gain (process high rise rate) or the process short lagged time.
- *The method (2) is possible to measure with small fluctuation. Specially it is suitable to the process long lagged time.
- *The method (3) is suitable to be used as cooling (direct) action. It has no objection using to heating (reverse) action, but hunting may often occur according to the process.

6. Other functions

(1) Tamper-proof function mechanism

In any mode except PV/SV display mode, if no keys are pressed for 30 seconds the controller will automatically return to control performing mode (PV/SV display).

(2) Burnout alarm (Upscale)

If thermocouple or RTD (between A and B) burnout, or if input value exceeds 1.125 times of 999 or 99.9, the controller displays " - - - " blinking on PV display and HB indicator lights. At this time, main control output turns OFF.

If the input value exceeds 999 or 99.9 and when it is less than 1.125 times of them, the controller displays 3 digits of the numeral on PV display flashing.

In case Temperature alarm function [specified] or Heater burnout alarm function [Option] is applied, the alarm output turns ON along with above mentioned action.

(3) Self-diagnostic function

Watches the CPU by watchdog timer, and when abnormal status has happened, makes the controller to initial status making the all output off.

(4) Automatic cold junction temperature compensation (-□/E)

Detecting the temperature at the thermocouple connecting terminal of the instrument, it always makes the instrument be provided the same thermocouple input as if the cold junction is located at 0°C (32°F).

(5) Power failure countermeasure

In case power failure time exceeds 20ms, the data are kept with non-volatile IC memory. If the power failure time is less than 20ms, the controller continues the control.

(6) Control output off function

Stops the control action making the control output off.

* Supplementary description of Option function

(7) PD control system (code: PD)

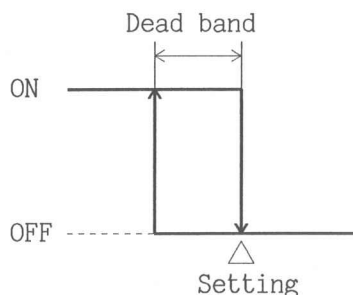
Main control acts proportional (P) and derivative (D) actions.
(PD auto-reset function is applied)

Proportional band (P): 0.1 to 99.9% (Factory adjusted as 2.5%)
[ON/OFF action when set to 0.0]

Derivative time (D): 1 to 999sec. (Factory adjusted as 50sec.)
[off when set to 0]

Proportional cycle : 1 to 120sec. (Factory adjusted as 3sec. -S/□, 30sec. -R/□
and not available to -A/□)

- ON/OFF action (In case the value proportional band is set to "0".)



7. Running

After completion of the mounting to the control panel and wiring connections, start running in the following manner.

- (1) Turn the power supplied to this instrument ON.
(Do not turn the power while pressing the key, or the specification contents of the instrument may be changed.)
- (2) Instrument (warmup status)

For approx. 8 seconds after power on, "AL - " is indicated on process variable display. During this time, all output, digital display and LED indicators are in their OFF status. After that, starts the control displaying actual temperature on PV display and setting value on SV display.

- Notes: 1. Key operations must not be executed during this time, or the specification of the instrument will have a possible to change.)
2. In case the running is terminated applying the control output off function, release the function when running again.

- (3) Input the setting value referring to " 5. Explanation of operation ".
- (4) Turn the control circuit power ON.
- (5) The controller starts the control action so as to maintain the controlled object at the setting value.

8. Explanatory drawing for each action

8.1 Heating (reverse) action and Cooling (direct) action

Action		Heating (reverse) action			Cooling (direct) action		
Main control action							
Relay contact	Output	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦	H ⑤ C ⑥ L ⑦
	Indication	Lit ----- Unlit			Unlit ----- Lit		
Non-contact voltage	output	+⑥ DC15V -⑦	+⑥ DC0 to 15V -⑦	+⑥ DCCV -⑦	+⑥ DCCV -⑦	+⑥ DC0 to 15V -⑦	+⑥ DC15V -⑦
	Indication	Lit ----- Unlit			Unlit ----- Lit		
Current	Output	+⑥ DC20mA -⑦	+⑥ DC0 to 20mA -⑦	+⑥ DC4mA -⑦	+⑥ DC4mA -⑦	+⑥ DC0 to 20mA -⑦	+⑥ DC20mA -⑦
	Indication	Lit -----			Lit -----		

8.2 Burnout alarm action [Option]

Alarm action	
Output	
Indication	Red Lit ----- Unlit

8.3 Temperature alarm action

Temperature alarm	High limit alarm (-132-)	Low limit alarm (-133-)	High/Low limit alarm (-134-)	High/Low limit range alarm (-136-)
Temperature alarm action				
Output	⑫ ⑬	⑫ ⑬	⑫ ⑬	⑫ ⑬
Indication	Red Unlit ----- Lit	-Lit ----- Unlit	-Lit ----- Unlit ----- Lit	Unlit ----- Lit ----- Unlit
Temperature alarm	High limit alarm with standby (-132-.H)	Low limit alarm with standby (-133-.H)	High/Low limit alarm with standby (-134-.H)	Process value alarm (-138-)
Temperature alarm action				
Output	⑫ ⑬	⑫ ⑬	⑫ ⑬	⑫ ⑬
Indication	Red Unlit ----- Lit	-Lit ----- Unlit	-Lit ----- Unlit ----- Lit	Unlit ----- Lit

In parts, the standby function operates.

9. Specifications

Mounting	: Flush
Setting	: Input system using membrane sheet key switch
Display	: Process variable display Red LED 3 digits Size 14.3(H)×8(W)mm Setting value display Green LED 3 digits Size 10(H)×5.5(W)mm
Standard scale	: Thermocouple K, J 0 to 400°C, 0 to 800°C, 0 to 800°F, 0 to 999°F K 0 to 999°C RTD Pt100, JPt100 -19.9 to 99.9°C, -199 to 400°C, -199 to 999°F Resolution is 1°C(1°F), however, for -19.9 to 99.9°C, it is 0.1°C.
Accuracy	-□/E: Within±0.3% of scaling range full scale ±1 digit or within±2°C (±4°F) [Whichever is greater] -□/R: Within±0.3% of scaling range full scale ±1 digit or within±1°C (±2°F) [Whichever is greater]
Input	-□/E: Thermocouple K, J 100Ω or less -□/R: RTD Pt100, JPt100 3-wire system (resistance per wire, 4Ω or less)
Output	-R/□: Relay contact 1c 220Vac 3A (resistive load) 220Vac 1A (inductive load, cos φ=0.4) -S/□: Non-contact voltage (for SSR drive) 15Vdc±3V (at load resistance 1.5kΩ) 20mAdc (short circuit protected) -A/□: DC current 4 to 20mAdc (Isolation type) load resistance max.600Ω
Control system	: PID action (with auto-tuning function) Proportional band (P): 0.1 to 99.9%(Setting the proportional band to 0.0 causes the instrument to act as an ON/OFF controller.) Integral time (I): 1 to 999sec.(Setting the integral to 0 disables the function.) Derivative time (D): 1 to 999sec.(Setting the derivative to 0 disables the function.) Anti-reset windup : 0 to 100% Proportional cycle : 1 to 120sec.(Factory adjusted as 3sec.-S/□, 30sec.-R/□)
Temperature alarm	Setting accuracy : Within±0.5% of full scale±1 digit Action : ON/OFF action, dead band 1°C(°F) Output : Relay contact 1a 220Vac 0.5A (resistive load) 220Vac 0.2A (inductive load, cos φ=0.4)
Supply voltage	: 85 to 264Vac or 24Vac, 50/60Hz, 24Vdc
Ambient temperature	: 0 to 50°C (32 to 122°F)
Ambient humidity	: 35 to 85%RH (non-condensing)
Power consumption	: Approx. 2.2W
Weight	: Approx. 250g
Attached functions	: Scaling function (scaling high and low limit setting) Sensor correcting function Setting value lock function Power failure back-up (data back-up by non-volatile IC memory) Self-diagnostic function (watchdog timer, instrument power source abnormal watch and RAM check) Automatic cold junction temperature compensation (-□/E) Burnout function (upscale) Output limiting function Control output off function
Accessories	: Mounting brackets 1 set Instruction manual 1 copy Current transformer: Model CTL-6-S (for option: W) 1 set

* Optional specification

Optional name	Code	Description
Temperature alarm with standby function (ALM output)	H	The function to hold alarm action just after the power turned on or when main setting value has been changed. (Applicable to High limit, Low limit and High/Low limit alarm)
Temperature alarm (A2 output)	AL□	The same temperature alarm besides the standard alarm (ALM output).
Temperature alarm with standby function (A2 output)	AL□H	The same temperature alarm (A2 output) besides the alarm with standby function (ALM output).
Heater burnout alarm	W	Watches heater current through current transformer, and when it falls lower than setting current, it gives alarm.
Cooling control action	CM	Turns OFF in the range in which the input value is lower than the setting value, and turns ON in the range higher than that.
Function selection	F	The function settable the Sensor, Temperature scale, Control mode, Temperature alarm action and Differential (dead band) value.
Specified dead band	SK	Differential (dead band) value is specified.
Control system (PD)	PD	Main control acts PD action
Heating and Cooling control output	D□	Performs Heating (Main output) and Cooling (Sub-output) control. [Relay contact: DR, Non-contact voltage: DS]
Color Black	BK	Face plate: Dark gray. Base and Case: Black

Heater burnout alarm output [Option code: W]

Setting : 0 to 100% (Current value: 5A, 10A and 20A [specified])
 Setting accuracy: ±5%
 Action : ON/OFF action
 Output : Relay contact 1a 220Vac 0.5A (resistive load)
 220Vac 0.2A (inductive load, cos φ=0.4)

Heating and Cooling control output [Option code: D□]

Output : Relay contact 1a 220Vac 0.5A (resistive load)
 220Vac 0.2A (inductive load, cos φ=0.4)
 Non-contact voltage (for SSR drive)
 15Vdc ±3V (at load resistance 1.5kΩ)
 20mAdc (short circuit protected)
 Cooling (Sub-) Proportional cycle : 1 to 120sec.
 Cooling (Sub-) Proportional band : 0.1 to 10 times of Heating (Main) proportional band
 Overlap and Dead band setting value: -10.0 to 10.0% of scaling range FS.
 Integral time and Derivative time follow the setting value of main control.

10. Maintenance and checking

- Main external causes when standard controller acts faulty are as follows:

Phenomenon	Status of instrument		Presumption of faulty part
	Digital indication	Indicator	
Temperature does not rise.	Indicates far above the setting value.	CONT unlit	Burnout of thermocouple, compensating lead wire or RTD. Improper connection at input terminal.
	Indicates the room temperature.	CONT lit	Heater burnout or improper connection. Trouble on electromagnetic switch or control device such as a trigger.
Temperature rises too much.	Indicates minus (-) or near the zero (0) position.	CONT lit	Short circuit of thermocouple or RTD circuit. Improper mounting (insertion) of thermocouple or RTD. Reverse polarity of thermocouple or compensating lead wire. Improper (low) specification of RTD.
-----	Fluctuated.	Unstable	Influence of inductive fault or noise. AC leaks into thermometer detector. Improper connection at terminals.

* If occurred unclear phenomenon other than above mentioned, make inquiries at our agent or your shop where purchased about the matters.

11. Character table

• Standard specification

Character	Description
<i>̄C-</i>	Warmup status
<i>4</i>	Main setting mode
<i>P</i>	Proportional band setting mode
<i>I</i>	Integral time setting mode
<i>d</i>	Derivative time setting mode
<i>n</i>	ARW setting mode
<i>c</i>	Proportional cycle setting
<i>A</i>	Temperature alarm setting mode (ALM output)
<i>4H</i>	Scaling high limit setting
<i>4L</i>	Scaling low limit setting mode
<i>4o</i>	Sensor correction setting mode
<i>Loc</i>	Setting value lock designation
<i>LcA *</i>	All setting value lock
<i>Lc4 *</i>	Lock except main setting value
<i>-- *</i>	Setting value lock is not designated
<i>oFH</i>	Output high limit setting mode
<i>oFL</i>	Output low limit setting mode
<i>oFF *</i>	Control output off

• Following characters are indicated on SV display when option "F" is used.

Character	Description
<i>-- *</i>	No alarm action
<i>H *</i>	High limit alarm action
<i>L *</i>	Low limit alarm action
<i>HL *</i>	High/Low limit alarm action
<i>̄id *</i>	High/Low limit range alarm action
<i>Ab4 *</i>	Process value alarm action

• Optional specification

Character	Description
<i>A.</i>	Temperature alarm setting mode (A2 output)
<i>b</i>	Heater burnout alarm setting
<i>4E</i>	Sensor designation mode
<i>̄t *</i>	K 0 to 999°C
<i>̄tF *</i>	K 0 to 999°F
<i>̄J *</i>	J 0 to 800°C
<i>̄JF *</i>	J 0 to 999°F
<i>PJ *</i>	Pt100(Old JIS) -199 to 400°C
<i>PJF *</i>	Pt100(Old JIS) -199 to 999°F
<i>Pd *</i>	Pt100(DIN) -199 to 400°C
<i>PdF *</i>	Pt100(DIN) -199 to 999°F
<i>PJc. *</i>	Pt100(Old JIS) -19.9 to 99.9°C
<i>PJF. *</i>	Pt100(Old JIS) -19.9 to 99.9°F
<i>Pdc. *</i>	Pt100(DIN) -19.9 to 99.9°C
<i>PdF. *</i>	Pt100(DIN) -19.9 to 99.9°F
<i>c̄</i>	Control mode designation mode
<i>HE *</i>	Heating (reverse) action
<i>co *</i>	Cooling (direct) action
<i>AL̄</i>	Temperature alarm designation setting mode (ALM output)
<i>AL̄.</i>	Temperature alarm designation setting mode (A2 output)
<i>H̄ *</i>	High limit alarm action with standby function
<i>L̄ *</i>	Low limit alarm action with standby function
<i>HL̄ *</i>	High/Low limit alarm action with standby function
<i>dFA</i>	Differential setting mode
<i>c_b</i>	Cooling P-cycle setting mode
<i>P_b</i>	Cooling P-band setting mode
<i>d'</i>	Overlap and dead band setting
<i>dFb</i>	Cooling differential setting

• Characters marked by * are indicated on SV display (Green), and others are on the PV display (Red).

. . . Inquiry . . .

For any inquiry of this controller, after checking the following as to the controller, please contact your shop where purchased, or our agent.

[Example]

- Model VCD-134-R/E
- Temperature specification 0 to 999°C
- Type of input K

In addition to the above, let us know the details of malfunction, if any, and the operating conditions specifically on job site.

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