INSTRUCTION MANUAL

DIN RAIL MOUNTED INDICATING CONTROLLER DCL-33A

No.DCL31E10 2008.07

Preface

Thank you for purchasing of our DIN rail mounted indicating controller DCL-33A.
This manual contains instructions for the mounting, functions, operations and notes when operating the DCL-33A. To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- The contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- This instrument is designed to be installed on a DIN rail within a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

Safety precautions **(Be sure to read these precautions before using our products.)**

The safety precautions are classified into categories: “Warning” and “Caution”. Depending on circumstances, procedures indicated by ⚠ Caution may be linked to serious results, so be sure to follow the directions for usage.

⚠ Warning Procedures which may lead to dangerous conditions and cause death or serious injury, if not carried out properly.

⚠ Caution Procedures which may lead to dangerous conditions and cause superficial to medium injury or physical damage or may degrade or damage the product, if not carried out properly.

⚠ Warning

- To prevent an electric shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

⚠ Safety precautions

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after consulting the purpose of use with our agency or main office. (Never use this instrument for medical purposes with which human lives are involved.)
- External protection devices such as protection equipment against excessive temperature rise, etc. must be installed, as malfunction of this product could result in serious damage to the system or injury to personnel. Also proper periodic maintenance is required.
- This instrument must be used under the conditions and environment described in this manual. Shinko Technos Co., Ltd. does not accept liability for any injury, loss of life or damage occurring due to the instrument being used under conditions not otherwise stated in this manual.

Caution with respect to Export Trade Control Ordinance

To avoid this instrument from being used as a component in, or as being utilized in the manufacture of weapons of mass destruction (i.e. military applications, military equipment, etc.), please investigate the end users and the final use of this instrument. In the case of resale, ensure that this instrument is not illegally exported.

1. Installation precautions

⚠ Caution

This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category Ⅱ, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- No mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) that does not change rapidly, and no icing
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing.
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit
- Take note that ambient temperature of this unit must not exceed 50℃(122℉) if mounted within the control panel. Otherwise the life of electronic components (especially electrolytic capacitors) may be shortened.

Note: Avoid setting this instrument directly on or near flammable material even though the case of this instrument is made of flame-resistant resin.

2. Wiring precautions

⚠ Caution

- Do not leave bits of wire in the instrument, because they could cause a fire or malfunction.
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.
- Insert the connecting cable into the designated connector securely. Not doing so could cause malfunction due to imperfect contact.
- Connect the AC power to the designated terminal as is written in this instruction manual. Otherwise it may burn or damage the DCL-33A.
- Use correct fitting ferrules with an insulation sleeve for the terminal screw when wiring the DCL-33A.
- Tighten the terminal screw to within the specified torque. If excessive force is applied to the screw when tightening, the terminal screw or case may be damaged.
- For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).
- This instrument does not have a built-in power switch, circuit breaker or fuse. It is necessary to install them near the controller. (Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)

3. Running and maintenance precautions

⚠ Caution

- It is recommended that PID auto-tuning be performed on the trial run.
- Do not touch live terminals. This may cause electric shock or problems in operation.
- Turn the power supply to the instrument OFF when retightening the terminal or cleaning. Working or touching the terminal with the power switched ON may result in severe injury or death due to Electric Shock.
- Use a soft, dry cloth when cleaning the instrument. (Alcohol based substances may tarnish or deface the unit.)
- As the display section is vulnerable, do not strike or scratch it with a hard object or press hard on it.

Characters used in this manual

Indication	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Number,℃/℉	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Indication	A	b	c	d	E	F	G	H	I	J	K	L	M
Alphabet	A	B	C	D	E	F	G	H	I	J	K	L	M
Indication	n	o	P	q	r	S	T	U	V	W	X	Y	Z
Alphabet	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

1. Model

1.1 Model

DCL - 3 3 A - □/□ □, □ □ □						Series name: DCL-300 (W22.5 x H75 x D100mm)	
Control action	3					PID	
Alarm		A				Selectable by keypad *1	
OUT (Control output)			R			Relay contact: 1a	
			S			Non-contact voltage (for SSR): 12^{+2}_{-0}V DC	
			A			DC current: 4 to 20mA DC	
Input				M		Multi-range *2	
Supply voltage						100 to 240V AC (standard)	
					1	24V AC/DC *3	
Option					W (5A)	Heater burnout alarm	CT rated current: 5A
					W (10A)		CT rated current: 10A
					W (20A)		CT rated current: 20A
					W (50A)		CT rated current: 50A
					C5	Serial communication	EIA RS-485

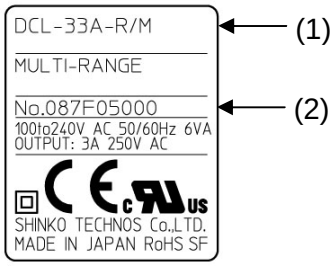
*1: Alarm type (9 types and No alarm) and status Energized/De-energized can be selected by keypad.

*2: Thermocouple, RTD, DC current and DC voltage can be selected by keypad.

*3: Standard supply voltage is 100 to 240V AC. Enter "1" after the input code only when ordering 24V AC/DC.

1.2 How to read the model label

The model label is attached to the left side of the case.
For Heater burnout alarm output, CT rated current value is written in the bracket ( ).



(1) Model, Supply voltage (Enter "1" only for 24V AC/DC), Option
(e.g.) Relay contact output, Multi-range input
(2) Serial number

(Fig. 1.2-1)

2. Name and functions of the sections

(1) EVT indicator
The red LED lights when Event output (Alarm, Loop break alarm or the Heater burnout alarm option) is ON.

(2) OUT indicator
The green LED lights when OUT (control output) is ON.
For DC current output type, this flashes in 0.25 second cycles corresponding to the output MV (manipulated variable).

(3) T/R indicator
The yellow LED flashes during serial communication TX output (transmission).

(4) AT (auto-tuning) indicator
The yellow LED flashes while auto-tuning is being performed.

(5) PV display: Indicates the PV (process variable) or setting characters (in each setting mode) with a Red LED.

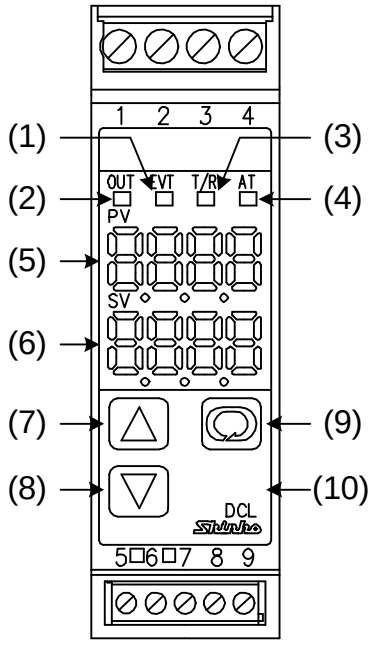
(6) SV display: Indicates the SV (desired value), MV (manipulated variable) or each set value (in each setting mode) with a Green LED.

(7) Increase key (△): Increases the numeric value.

(8) Decrease key (▽): Decreases the numeric value.

(9) Mode key (⟲):Switches the setting mode or registers set values.
[Registers set values by pressing the Mode (⟲) key.]

(10) Sub-mode key (unmarked)
Retrieves Auxiliary function setting mode 2 in combination with the Mode (⟲) key.



(Fig. 2-1)

⚠ Caution

When setting the specifications and functions of this controller, connect terminals 1 and 2 for power source first, then set them referring to "5. Setup" before performing "3. Mounting to the control panel" and "4. Wiring".

3. Mounting to the control panel

3.1 Site selection

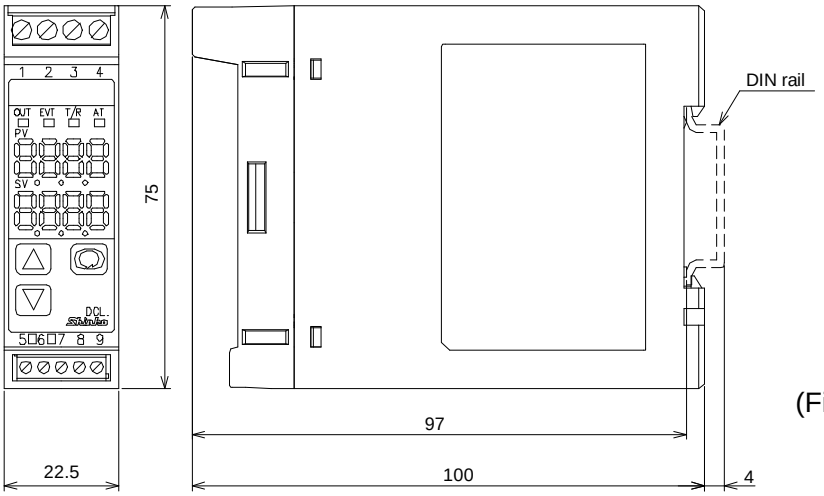
This instrument is intended to be used under the following environmental conditions (IEC61010-1): Overvoltage category Ⅱ, Pollution degree 2

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- Few mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) without rapid change, and no icing
- An ambient non-condensing humidity of 35 to 85%RH
- No large capacity electromagnetic switches or cables through which large current is flowing
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller
- Take note that ambient temperature of this unit as well as the control panel must not exceed 50℃(122℉) if mounted within the control panel. Otherwise the life of electronic components (especially electrolytic capacitors) may be shortened.

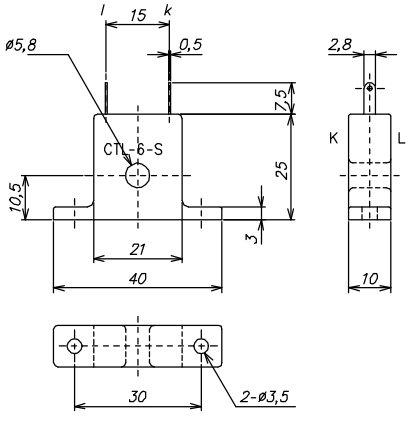
3.2 External dimensions

(Scale: mm)

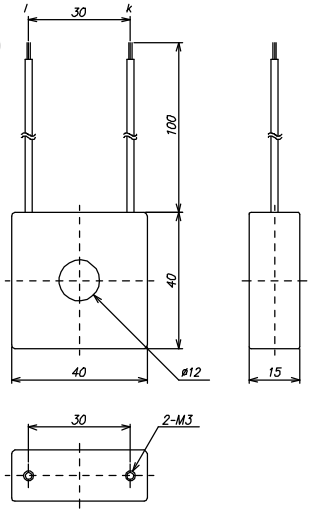


(Fig. 3.2-1)

3.3 CT (Current transformer) external dimensions (Scale: mm)



CTL-6S (for 20A)



CTL-12-S36-10L1U (for 50A)

(Fig. 3.3-1)

3.4 Mounting to and removal from the DIN rail

⚠ Caution

- Mount the DIN rail horizontally.
  When the DIN rail is mounted vertically, be sure to use commercially available fastening plates at both ends of the DCL-33A series.
  However, if the DIN rail is mounted horizontally in a position susceptible to vibration or shock, the fastening plates must be used as well.
- To remove this instrument, a flat blade screwdriver is required for pulling down the lever.
  Never turn the screwdriver when inserting it into the release lever.
  If excessive power is applied to the lever, it may break.

• **Recommended fastening plate**

Manufacturer	Model	
Omron corporation	End plate	PFP-M
IDEC corporation	Fastening plate	BNL6
Matsushita electric works, LTD.	Fastening plate	ATA4806

Mounting to the DIN rail (Fig. 3.4-1)

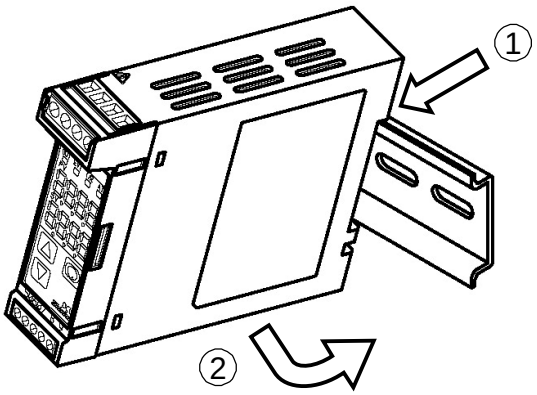
First, hook ① of the DCL-33A on the upper side of the DIN rail.

Second, making ① part of the DCL-33A as a support, fit the lower part ② of the DCL-33A to the DIN rail. DCL-33A will be completely fixed to DIN rail with a “Click” sound.

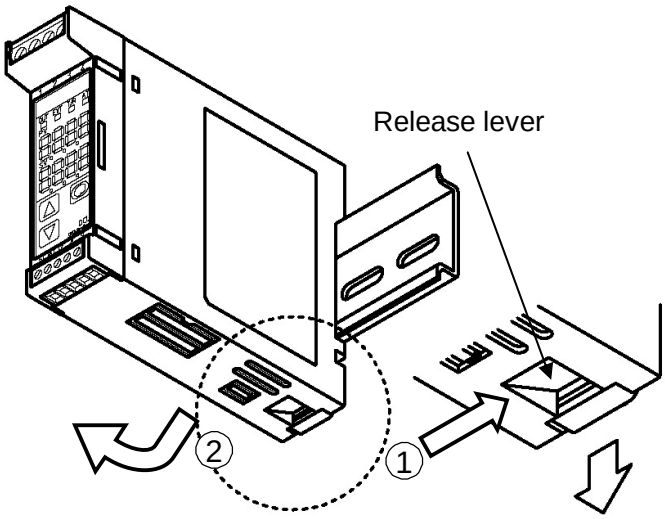
Removal from the DIN rail (Fig. 3.4-2)

① Insert a flat blade screwdriver into the release lever, and pull it down.

② The lock to the DIN rail will be released, then remove the unit from the DIN rail.
Be sure to hold onto the unit or it will drop to the ground.



(Fig. 3.4-1) Mounting



(Fig. 3.4-2) Removal

4. Wiring

⚠ Warning

Turn the power supply to the instrument OFF before wiring or checking.
Working or touching the terminal with the power switched ON may result in severe injury or death due to Electric Shock.

⚠ Caution

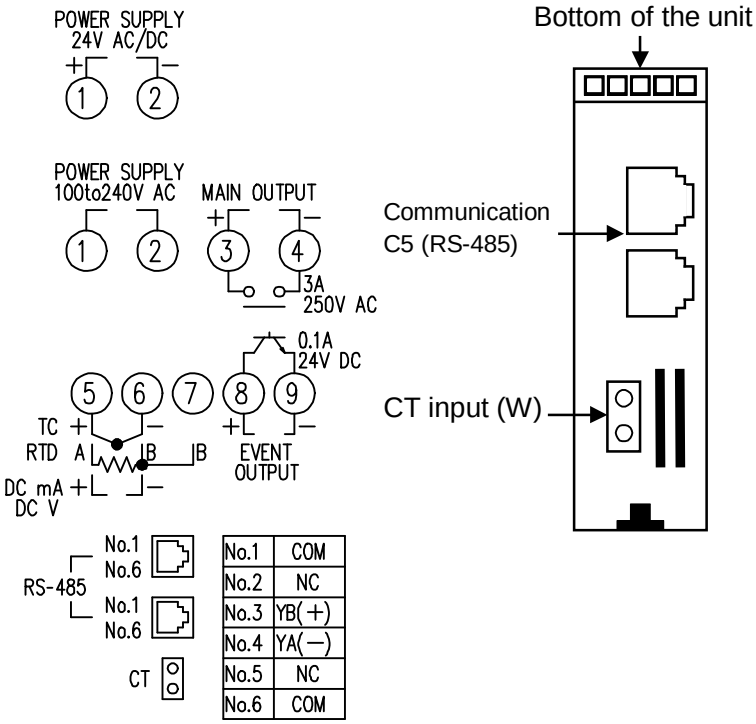
- Do not leave bits of wire in the DCL-33A when wiring, because they could cause fire or malfunction.
- Insert the connecting cable into the designated connector securely. Not doing so could cause malfunction due to imperfect contact.
- Connect the AC power to the designated terminal as is written in this instruction manual. Otherwise it may burn and damage the DCL-33A.
- Tighten the terminal screw with the specified torque. Excessive force could damage the terminal screw and deface the case.
- Use a thermocouple and compensating lead wire that corresponds to the sensor input specification of this unit.
- Use the 3-wire RTD that corresponds to the sensor input specification of this unit.
- When using DC voltage and current inputs, be careful not to confuse polarity when wiring.
- For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).
- Keep input wires (Thermocouple, RTD, etc.) away from power source and load wires when wiring.
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.
- To prevent the unit from harmful effects of unexpected level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.
- This unit does not have a built-in power switch, circuit breaker or fuse. Therefore it is necessary to install them in the circuit near the external unit.
  (Recommended fuse: Time-lag fuse, Rated voltage 250V AC, Rated current 2A)

When using ferrules, use the following ferrules and crimping pliers made by Phoenix Contact GMBH &CO.

• Recommended ferrules and tightening torque

Terminal number	Terminal screw	Ferrules with insulation sleeve	Conductor cross sections	Tightening torque	Crimping pliers
1 to 4	M2.6	AI 0.25-8 YE	0.2 to 0.25mm^2	0.5 to 0.6N•m	CRIMPFOX ZA3 CRIMPFOX UD6
		AI 0.34-8 TQ	0.25 to 0.34mm^2		
		AI 0.5-8 WH	0.34 to 0.5mm^2		
		AI 0.75-8 GY	0.5 to 0.75mm^2		
		AI 1.0-8 RD	0.75 to 1.0mm^2		
		AI 1.5-8 BK	1.0 to 1.5mm^2		
5 to 9	M2.0	AI 0.25-8 YE	0.2 to 0.25mm^2	0.22 to 0.25N•m	
		AI 0.34-8 TQ	0.25 to 0.34mm^2		
		AI 0.5-8 WH	0.34 to 0.5mm^2		

• Terminal arrangement



No.1	COM
No.2	NC
No.3	YB(+)
No.4	YA(−)
No.5	NC
No.6	COM

(Fig. 4-1)

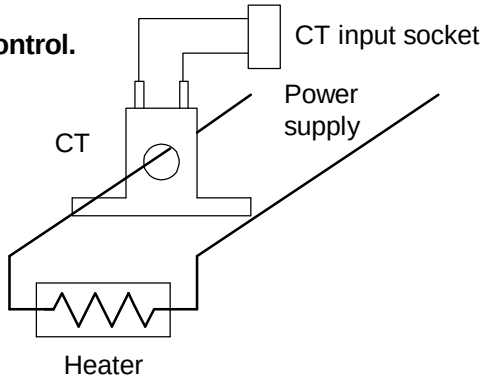
- MAIN OUTPUT: Control output
- EVENT OUTPUT: Outputs when Alarm, Loop break alarm or Heater burnout alarm (option) is activated.
- RS-485: Serial communication
- TC : Thermocouple
- RTD : Resistance temperature detector
- DC : DC current or DC voltage

For DC current input, 50Ω shunt resistor must be connected between input terminals.

• Option: Heater burnout alarm

This alarm is not available for detecting current under phase control.

Use the current transformer (CT) provided, and pass a lead wire of the heater circuit into a hole of the CT. When wiring, keep the CT wire away from any AC source or load wires to avoid the external interference.



(Fig. 4-2)

5. Setup

The sensor input character and temperature unit are indicated on the PV display for approx. 3 seconds after the power is turned on, and the input range high limit value is indicated on the SV display. (Table 5-1) (If any other value is set during the Scaling high limit setting, it is indicated on the SV display.)
During this time all outputs and the LED indicators are in OFF status. After that, the control starts indicating PV (process variable) on the PV display, and SV (desired value) on the SV display.

(Table 5-1)

Input	Input range		Resolution
K	–200 to 1370 ℃	–320 to 2500 ℉	1℃ (℉)
	–199.9 to 400.0℃	–199.9 to 750.0℉	0.1℃ (℉)
J	–200 to1000 ℃	–320 to1800 ℉	1℃ (℉)
R	0 to 1760 ℃	0 to 3200 ℉	1℃ (℉)
S	0 to 1760 ℃	0 to 3200 ℉	1℃ (℉)
B	0 to 1820 ℃	0 to 3300 ℉	1℃ (℉)
E	–200 to 800 ℃	–320 to 1500 ℉	1℃ (℉)
T	–199.9 to 400.0℃	–199.9 to 750.0℉	0.1℃ (℉)
N	–200 to 1300 ℃	–320 to 2300 ℉	1℃ (℉)
PL-Ⅱ	0 to 1390 ℃	0 to 2500 ℉	1℃ (℉)
C (W/Re5-26)	0 to 2315 ℃	0 to 4200 ℉	1℃ (℉)
Pt100	–199.9 to 850.0 ℃	–199.9 to 999.9℉	0.1℃ (℉)
	–200 to 850 ℃	–300 to 1500 ℉	1℃ (℉)
JPt100	–199.9 to 500.0 ℃	–199.9 to 900.0℉	0.1℃ (℉)
	–200 to 500 ℃	–300 to 900 ℉	1℃ (℉)
4 to 20mA DC	–1999 to 9999 *1, *2		1
0 to 20mA DC	–1999 to 9999 *1, *2		1
0 to 1V DC	–1999 to 9999 *1		1
0 to 5V DC	–1999 to 9999 *1		1
1 to 5V DC	–1999 to 9999 *1		1
0 to 10V DC	–1999 to 9999 *1		1

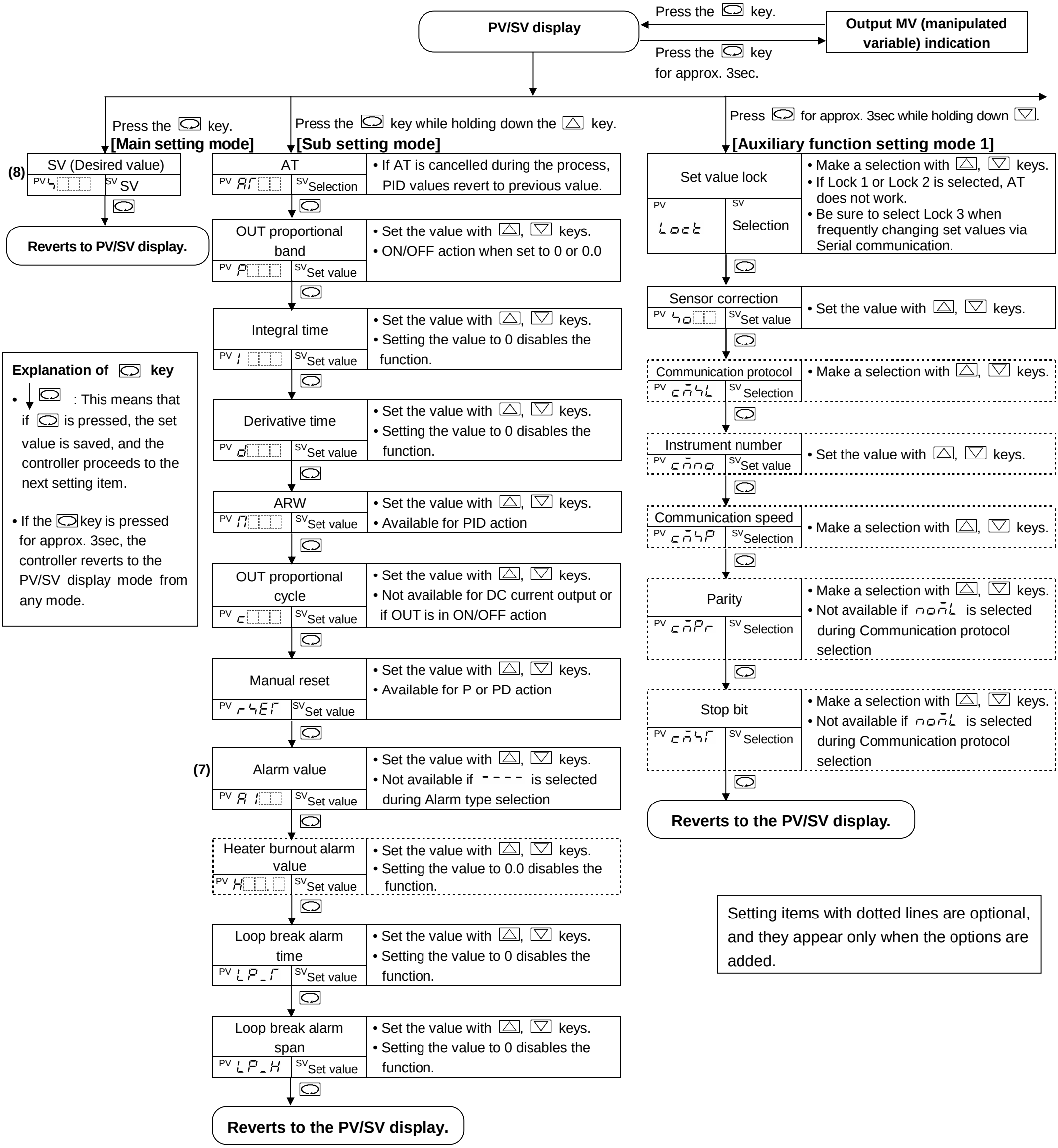
*1: Input range and decimal point place can be changed.
*2: 50Ω shunt resistor (sold separately) must be connected between the input terminals.

5.1 Operation flowchart

Outline of operation procedure

Set Input type, Alarm (type, value, etc.) and SV (desired value), following the procedures below. Setting item numbers (1) to (8) are indicated on the flowchart.

[Step 1 Operation before run]	Turn the load circuit power OFF, and turn the power supply to the DCL-33A ON.
[Step 2 Auxiliary function setting mode 2]	Set Input type and Alarm type, etc. in Auxiliary function setting mode 2. **(1) Input type**: Select an input type. Refer to "Input type (character indication) and range" on page 10. **(2) Alarm type**: Select an alarm type. Refer to "Alarm type" on page 10. [If an alarm type except for "- - - -" is selected, items (3) to (6) will be indicated and they can be set if necessary.] **Note: If an alarm type is changed, the alarm set value becomes 0 (0.0). Therefore it is necessary to set it again.** **(3) Alarm action Energized/De-energized**: Select Alarm action Energized or De-energized. **(4) Alarm HOLD function**: Select either Alarm Not holding or Alarm Holding. **(5) Alarm hysteresis**: Set Alarm hysteresis. **(6) Alarm action delayed timer**: Set Alarm action delayed timer.
[Step 3 Sub setting mode]	**(7) Alarm value**: Set alarm action point in the Sub setting mode.
[Step 4 Main setting mode]	**(8) SV**: Set SV (Desired value) in the Main setting mode.
[Step 5 Run]	Turn the load circuit power ON. Control action starts so as to keep the control target at the SV (Desired value).



5.2 Main setting mode

Character	Name, Description, Setting range	Default value
SV	**SV setting** • Sets the SV for control target. • Scaling low limit value to scaling high limit value (For DC input, the placement of the decimal point follows the selection)	0℃

5.3 Sub setting mode

Character	Name, Description, Setting range	Default value
AT	**AT setting** • Performs PID auto-tuning. However, if PID auto-tuning does not finish after 4 hours, it will be automatically shut down. • ----: PID auto-tuning Cancel AT: PID auto-tuning Perform	----
P	**OUT proportional band setting** • Sets the proportional band. • The control action becomes ON/OFF when set to 0.0 • Setting range: 0.0 to 110.0%	2.5%
I	**Integral time setting** • Sets the integral time. • Setting the value to 0 disables this function. • Not available for ON/OFF action. • Setting range: 0 to 1000 seconds	200 seconds
d	**Derivative time setting** • Sets the derivative time. • Setting the value to 0 disables this function. • Not available for ON/OFF action. • Setting range: 0 to 300 seconds	50 seconds
ARW	**ARW (Anti-reset windup) setting** • Sets anti-reset windup. • Available only for PID action. • Setting range: 0 to 100%	50%
c	**OUT proportional cycle setting** • Sets the proportional cycle value for the control output (OUT). • Not available for ON/OFF action or DC current output. • Setting range: 1 to 120 seconds	30 seconds or 3 seconds
rSET	**Manual reset setting** • Sets the reset value manually. • Available only for P and PD action. • ±Proportional band converted value (For DC input, the placement of the decimal point follows the selection)	0.0
A1	**Alarm value setting** • Sets the action point for the alarm output. • **Setting the value to 0 or 0.0 disables this function (excluding Process high and Process low alarms).** When Loop break alarm and Heater burnout alarm are applied together, they utilize common output terminals. • Not available if No alarm action is selected during Alarm type selection. • See (Table 5.3-1) (p.11). (For DC input, the placement of the decimal point follows the selection.)	0℃
H and XX.X alternating display	**Heater burnout alarm setting** • Sets the heater current value for Heater burnout alarm. • Setting the value to 0.0 disables this function. • Upon returning to set limits, the alarm will stop. When Alarm and Loop break alarm are applied together, they utilize common output terminals. • Available only when Heater burnout alarm is added. • Rated current 5A : 0.0 to 5.0A Rated current 10A: 0.0 to10.0A Rated current 20A: 0.0 to 20.0A Rated current 50A: 0.0 to 50.0A	0.0A

Input type (character indication) and range

tC: K	–200 to 1370℃	tF: K	–320 to 2500℉
t .C	–199.9 to 400.0℃	t .F	–199.9 to 750.0℉
JC: J	–200 to 1000℃	JF: J	–320 to 1800℉
rC: R	0 to 1760℃	rF: R	0 to 3200℉
SC: S	0 to 1760℃	SF: S	0 to 3200℉
bC: B	0 to 1820℃	bF: B	0 to 3300℉
EC: E	–200 to 800℃	EF: E	–320 to 1500℉
T .C: T	–199.9 to 400.0℃	T .F: T	–199.9 to 750.0℉
nC: N	–200 to 1300℃	nF: N	–320 to 2300℉
PL2C: PL-Ⅱ	0 to 1390℃	PL2F: PL-Ⅱ	0 to 2500℉
cC: C(W/Re5-26)	0 to 2315℃	cF: C(W/Re5-26)	0 to 4200℉
Pt .C: Pt100	–199.9 to 850.0℃	Pt .F: Pt100	–199.9 to 999.9℉
JPt.C: JPt100	–199.9 to 500.0℃	JPt.F: JPt100	–199.9 to 900.0℉
PtC: Pt100	–200 to 850℃	PtF: Pt100	–300 to 1500℉
JPtC: JPt100	–200 to 500℃	JPtF: JPt100	–300 to 900℉
4-20A: 4 to 20mA DC	–1999 to 9999		
0-20A: 0 to 20mA DC	–1999 to 9999		
0-1V: 0 to 1V DC	–1999 to 9999		
0-5V: 0 to 5V DC	–1999 to 9999		
1-5V: 1 to 5V DC	–1999 to 9999		
0-10V: 0 to 10V DC	–1999 to 9999		

Alarm type

H□□□ (High limit alarm): The alarm action is ±deviation setting from the SV. The alarm is activated if the input value reaches the high limit set value.

L□□□ (Low limit alarm): The alarm action is ±deviation setting from the SV. The alarm is activated if the input value goes under the low limit set value.

HL□□ (High/Low limits alarm): Combines High limit and Low limit alarm actions. When input value reaches high limit set value or goes under the low limit set value, the alarm is activated.

Jd□□ (High/Low limit range alarm): When input value is between the high limit set value and low limit set value, the alarm is activated.

R5□□ (Process high alarm), r-R5□ (Process low alarm): Within the scale range of the controller, alarm action points can be set at random and if the input reaches the randomly set action point, the alarm is activated.

H□□S (High limit alarm with standby), L□□S (Low limit alarm with standby),

HL□S (High/Low limits alarm with standby):

After the power supply to the instrument is turned on, even if the input enters the alarm action range, the alarm is not activated. If SV is changed while the controller is running, the alarm is not activated even if input is in the alarm action range.

(If the controller is allowed to keep running, once the input exceeds the alarm action point, the standby function will be released.)

Press the key for approx. 3sec while holding down the key.

[Auxiliary function setting mode 2]

(1) Input type — PV: SEn5 / SV: Selection
- Make a selection with △, ▽ keys.
- Default value: tC

Scaling high limit — PV: SCLH / SV: Set value
- Set the value with △, ▽ keys.

Scaling low limit — PV: SCLL / SV: Set value
- Set the value with △, ▽ keys.

Decimal point place — PV: dP□□ / SV: Selection
- Make a selection with △, ▽ keys.
- Available for DC current, DC voltage input

PV filter time constant — PV: FILT / SV: Set value
- Set the value with △, ▽ keys.

OUT high limit — PV: oLH□ / SV: Set value
- Set the value with △, ▽ keys.
- Not available for ON/OFF action

OUT low limit — PV: oLL□ / SV: Set value
- Set the value with △, ▽ keys.
- Not available for ON/OFF action

OUT ON/OFF action hysteresis — PV: HY5□ / SV: Set value
- Set the value with △, ▽ keys.
- Available for ON/OFF action

(2) Alarm type — PV: AL 1F / SV: Selection
- Make a selection with △, ▽ keys.
- Default value: ----

(3) Alarm action Energized/Deenergized — PV: A 1LA / SV: Selection
- Make a selection with △, ▽ keys.
- Not available if ---- is selected during Alarm type selection

(4) Alarm HOLD function — PV: AHLd / SV: Selection
- Make a selection with △, ▽ keys.
- Not available if ---- is selected during Alarm type selection

(5) Alarm hysteresis — PV: A 1HY / SV: Set value
- Set the value with △, ▽ keys.
- Not available if ---- is selected during Alarm type selection

(6) Alarm action delayed timer — PV: A 1dY / SV: Set value
- Set the value with △, ▽ keys.
- Not available if ---- is selected during Alarm type selection

Direct/Reverse control — PV: conF / SV: Selection
- Make a selection with △, ▽ keys.
- Default value: HEAT

AT bias — PV: AT_b / SV: Set value
- Set the value with △, ▽ keys.
- Available for thermocouple, RTD input

SVTC bias — PV: SU_b / SV: Set value
- Set the value with △, ▽ keys.

Output status selection when input abnormal — PV: EoUT / SV: Selection
- Make a selection with △, ▽ keys.
- Available only when input is DC current and DC voltage with DC current output

Controller/Converter — PV: FUnc / SV: Selection
- Make a selection with △, ▽ keys.
- Available for DC current output

Reverts to the PV/SV display.

LP_T	**Loop break alarm time setting** • Sets the action time to assess the Loop break alarm. • Setting the value to 0 disables this function. • When Alarm and Heater burnout alarm are applied together, they utilize common output terminals. • Setting range: 0 to 200 minutes	0 minutes
LP_H	**Loop break alarm span setting** • Sets the action span to assess the Loop break alarm. • Setting the value to 0 disables this function. • When Alarm and Heater burnout alarm are applied together, they utilize common output terminals. • Thermocouple, RTD input: 0 to 150℃ (℉) or 0.0 to 150.0℃ (℉) DC input: 0 to 1500 (The placement of the decimal point follows the selection)	0℃

(Table 5.3-1)

Alarm type	Setting range
High limit alarm	–(Scaling span) to scaling span
Low limit alarm	–(Scaling span) to scaling span
High/Low limits alarm	0 to scaling span
High/Low limit range alarm	0 to scaling span
Process high alarm	Scaling low limit value to scaling high limit value
Process low alarm	Scaling low limit value to scaling high limit value
High limit alarm with standby	–(Scaling span) to scaling span
Low limit alarm with standby	–(Scaling span) to scaling span
High/Low limits with standby	0 to scaling span

Minimum negative value: –199.9 or –1999

Maximum positive value: 999.9 or 9999

5.4 Auxiliary function setting mode 1

Character	Name, Description, Setting range	Default value
Lock	**Set value lock selection** • Locks set values to prevent setting errors. The setting item to be locked is dependent on the selection. • Auto-tuning cannot be carried out if Lock 1 or Lock 2 is selected. • **Be sure to select Lock 3 when changing the set values frequently via communication function** considering the life of non-volatile memory. • ---- (Unlock): All set values can be changed. Loc 1 (Lock 1): None of the set values can be changed. Loc2 (Lock 2): Only main setting mode can be changed. Loc3 (Lock 3): All set values except Input type and Controller/Converter function can be changed. However, changed values revert to their previous values after power-off because they are not saved in the non-volatile memory. **Do not change any setting item in Auxiliary function setting mode 2. If any item in Auxiliary function setting mode 2 is changed, it will affect other setting items such as the SV and Alarm value.**	Unlock
so□□	**Sensor correction setting** • Sets the sensor correction value of the sensor. • Thermocouple and RTD input: –100.0 to 100.0℃ (℉) DC input: –1000 to 1000 (The placement of the decimal point follows the selection.)	0.0℃
cnvL	**Communication protocol selection** • Selects communication protocol. • Available only when the C5 option is added. • nonL: Shinko protocol, modA: Modbus ASCII mode, modr: Modbus RTU mode	Shinko protocol
cnno	**Instrument number setting** • Sets an individual instrument number to each DCL-33A when connecting plural DCL-33A units in serial communication. • Available only when the C5 option is added. • Setting range: 0 to 95	0
cnvP	**Communication speed selection** • Selects the speed in accordance with the host computer. • Available only when the C5 option is added. • □□24: 2400bps, □□48: 4800bps, □□96: 9600bps, □192: 19200bps	9600bps

cnPr	**Parity selection** • Selects the parity. • Not available if the C5 option is not added, or if Shinko protocol is selected during Communication protocol selection • nonE: No parity, EvEn: Even, odd□: Odd	Even
cnSt	**Stop bit selection** • Selects the stop bit. • Not available if the C5 option is not added, or if Shinko protocol is selected during Communication protocol selection • Setting range: 1 or 2	1

5.5 Auxiliary function setting mode 2

Character	Name, Description, Setting range	Default value
InTy	**Input type selection** • Selects a sensor type and temperature unit from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 types). • When changing input type from DC voltage input to the others, detach the sensor connected to this unit before changing. Input circuit will break down if input type is changed while the sensor is connected.	K (–200 to 1370℃)

K□□C	K	–200	to	1370℃	K□□F	K	–320	to	2500℉
K□ .C		–199.9	to	400.0℃	K□ .F		–199.9	to	750.0℉
J□□C	J	–200	to	1000℃	J□□F	J	–320	to	1800℉
r□□C	R	0	to	1760℃	r□□F	R	0	to	3200℉
S□□C	S	0	to	1760℃	S□□F	S	0	to	3200℉
b□□C	B	0	to	1820℃	b□□F	B	0	to	3300℉
E□□C	E	–200	to	800℃	E□□F	E	–320	to	1500℉
T□ .C	T	–199.9	to	400.0℃	T□ .F	T	–199.9	to	750.0℉
n□□C	N	–200	to	1300℃	n□□F	N	–320	to	2300℉
PL2C	PL-Ⅱ	0	to	1390℃	PL2F	PL-Ⅱ	0	to	2500℉
C□□C	C (W/Re5-26)	0	to	2315℃	C□□F	C (W/Re5-26)	0	to	4200℉
Pt .C	Pt100	–199.9	to	850.0℃	Pt .F	Pt100	–199.9	to	999.9℉
JPt.C	JPt100	–199.9	to	500.0℃	JPt.F	JPt100	–199.9	to	900.0℉
Pt□C	Pt100	–200	to	850℃	Pt□F	Pt100	–300	to	1500℉
JPtC	JPt100	–200	to	500℃	JPtF	JPt100	–300	to	900℉

420A	4 to 20mA	–1999 to 9999
020A	0 to 20mA	–1999 to 9999
0□1V	0 to 1V	–1999 to 9999
0□5V	0 to 5V	–1999 to 9999
1□5V	1 to 5V	–1999 to 9999
0 10V	0 to 10V	–1999 to 9999

SrLH	**Scaling high limit setting** • Sets the scaling high limit value. • Scaling low limit value to Input range high limit value (For DC input, the placement of the decimal point follows the selection.)	1370℃
SrLL	**Scaling low limit setting** • Sets the scaling low limit value. • Input range low limit value to scaling high limit value (For DC input, the placement of the decimal point follows the selection.)	–200℃
dP□□	**Decimal point place selection** • Selects the decimal point place. However, not available if thermocouple or RTD input is selected during the input type selection. • □□□0: No decimal point, □□0.0: 1 digit after decimal point, □0.00: 2 digits after decimal point, 0.000: 3 digits after decimal point	No decimal point
FILT	**PV filter time constant setting** • Sets the PV filter time constant. If the set value is too large, it affects control result due to the response delay. • Setting range: 0.0 to 10.0 seconds	0.0 seconds

oLH□	**OUT high limit setting** • Sets the OUT high limit value. • Not available for ON/OFF action. • Setting range: OUT low limit value to 100% (DC current output type: OUT low limit value to 105%)	100%
oLL□	**OUT low limit setting** • Sets the OUT low limit value. • Not available for ON/OFF action. • Setting range: 0% to OUT high limit value (DC current output type: –5% to OUT high limit value)	0%
HY5□	**OUT ON/OFF action hysteresis setting** • Sets the ON/OFF action hysteresis for the OUT (control output). • Available only for ON/OFF action (P=0). • Thermocouple and RTD input: 0.1 to 100.0℃(℉) DC input: 1 to 1000 (The placement of the decimal point follows the selection)	1.0℃
AL 1F	**Alarm type selection** • Selects an alarm type. **Note: If an alarm type is changed, the alarm set value becomes 0 (0.0).** ----: No alarm action H□□□: High limit alarm L□□□: Low limit alarm HL□□: High/Low limits alarm Ol d□: High/Low limit range alarm A5□□: Process high alarm rA5□: Process low alarm H□□ō: High limit alarm with standby L□□ō: Low limit alarm with standby HL□ō: High/Low limits alarm with standby	No alarm action
A 1LA	**Alarm action Energized/De-energized** • Selects the alarm action Energized/De-energized. • Not available if No alarm action is selected during Alarm type selection. • nonL: Energized, rEV5: De-energized	Energized
AHLd	**Alarm HOLD function selection** • Selects either Alarm Not holding or Alarm Holding. When set to “Alarm Holding”, once alarm is activated, the alarm output remains ON until the power is turned off. • Not available if No alarm action is selected during Alarm type selection. • nonE: Alarm Not holding, HoLd: Alarm Holding	Alarm Not holding
A 1HY	**Alarm hysteresis setting** • Sets the alarm hysteresis. • Not available if No alarm action is selected during Alarm type selection. • Thermocouple and RTD input : 0.1 to 100.0℃(℉) DC input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃
A 1dY	**Alarm action delayed timer setting** • Sets the alarm action delayed time. The alarm is activated when the setting time has elapsed after the input enters alarm output range. • Not available if No alarm action is selected during Alarm type selection. • Setting range: 0 to 9999 seconds	0 seconds
conF	**Direct/Reverse control action selection** • Selects either reverse (heating) or direct (cooling) control action. • HEAT: Reverse (Heating) action cooL: Direct (Cooling) action	Reverse (Heating) action
AT_b	**AT bias setting** • Set the auto-tuning bias value. • Not available if DC voltage or current input is selected during Input type selection, or if control action is not PID, either. • Setting range: 0 to 50℃(0 to 100℉) or 0.0 to 50.0℃(0.0 to 100.0℉)	20℃
SV_b	**SVTC bias setting** • Control desired value adds SVTC bias value to the value received by the SVTC command. • Available only when the C5 option is added. • Setting range: Converted value of ±20% of the scaling span	0

EoUT	**Output status selection when input abnormal** • Selects whether the OUT (control output) is turned OFF or not when DC input is in overscale or underscale. • Available only for DC current output with DC input. • oFF: OFF(4mA) or outputs OUT low limit value. on: Outputs a value between OFF (4mA) and ON (20mA) or between OUT low limit value and OUT high limit value, depending on deviation.	Output OFF
FUnc	**Controller/Converter function selection** • Selects either controller or converter function. • Available only when the control output is DC current output type. • cnTr: Controller function, cnVT: Converter function	Controller function

Sensor correction function

This corrects the input value from the sensor. When a sensor cannot be set at the exact location where control is desired, the sensor measured temperature may deviate from the temperature in the controlled location.

When controlling with plural controllers, sometimes the measured temperatures (input value) do not concur due to differences in sensor accuracy or dispersion of load capacities.

In such a case, the control can be set at the desired temperature by adjusting the input value of sensors.

However, it is effective within the input rated range regardless of the sensor correction value.

PV after sensor correction=Current PV + Sensor correction value

Loop break alarm

The alarm will be activated when the PV (process variable) does not **rise** as much value as the span or more within the time it takes to assess the Loop break alarm after the manipulated variable has reached 100% or the output high limit value. The alarm will also be activated when the PV (process variable) does not **fall** as much value as the span or more within the time it takes to assess the Loop break alarm after the manipulated variable has reached 0% or the output low limit value.

When the control action is Direct (Cooling), read "**fall**" for "**rise**" and vice versa.

Energized/De-energized function

[If alarm action Energized is selected]

When the alarm output indicator is lit, the alarm output (between terminal 8 and 9) is conducted (ON).

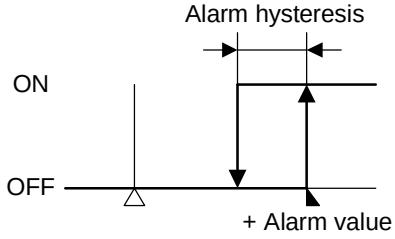
When the alarm output indicator is unlit, the alarm output is not conducted (OFF).

[If alarm action De-energized is selected]

When the alarm output indicator is lit, the alarm output (between terminal 8 and 9) is not conducted (OFF).

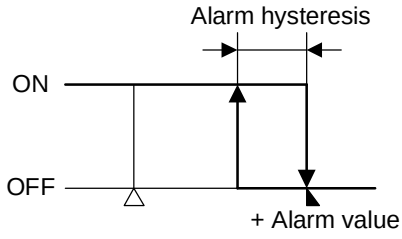
When the alarm output indicator is unlit, the alarm output is conducted (ON).

High limit alarm (Energized setting)



(Fig. 5.5-1)

High limit alarm (De-energized setting)



(Fig. 5.5-2)

5.6 Control output MV (manipulated variable) indication

Name, Description
Control output MV (manipulated variable) indication **Press the ⟲ key for approx. 3 seconds during PV/SV display mode.** Keep pressing the ⟲ key until the output manipulated variable appears, though the main setting mode appears during the process. (The control output manipulated variable is indicated on the SV display and the 1st decimal point from the right flashes in 0.5 second cycles on the SV display.) Pressing the ⟲ key again, the instrument reverts to the PV/SV display mode.

6. Simplified converter function

⚠ Caution

- When using this controller as a converter, take 1 second into consideration since input/output response time is approx. 1 second.
- When switching from converter function to controller function, the control parameter and values set by converter function are held even if the function is switched to controller function. So, correct the control parameter and values which have been set by converter function to the values necessary for the controller function after switching to the controller function.

The converter function of this instrument converts each input (thermocouple, RTD, DC voltage and DC current inputs) value to “4 to 20mA DC” using the control parameter of the controller, and outputs it.

When this instrument is used as a converter, follow steps (1) to (7) described below.
After steps (1) to (7) are finished, this instrument can be used as a converter.

(1) Wire this unit (Power supply, Input and Output).
(2) Turn the power supply of this unit ON.
(3) Bring up “Auxiliary function setting mode 2” by pressing the and key (for approx. 3sec).
(4) Select the sensor type from “Input type selection (SEnS)”.
(5) Set the high limit of the value to be converted during “Scaling high limit setting (SCLH)”.
(6) Set the low limit of the value to be converted during “Scaling low limit setting (SCLL)”.
(7) Select converter (cnVT) from “Controller/Converter function selection (FUnc)”.

• To activate the alarm action by Converter function, set the alarm type to Process alarm.

If converter function is selected during “Controller/Converter function selection” in Auxiliary function setting mode 2, parameters below are automatically set. (Table 6-1)
However, this is applicable only to the DC current output.

(Table 6-1)

Setting item	Set value	Setting item	Set value
SV	Scaling low limit	Alarm value	0
Proportional band	100.0%	Loop break alarm time	0 seconds
Integral time	0 seconds	Loop break alarm span	0
Derivative time	0 seconds	Direct/Reverse control action	Direct action
Manual reset	0.0		

6.1 Fine adjustment method of converter output (4 to 20mA DC)

“4 to 20mA DC” is outputted from the input of scaling low to high limit value.
Fine adjustment rate is 1/1000 of the scaling span.

Fine adjustment method

Be sure to adjust the zero side first. Then adjust the span side.
Adjust zero at the setting item “Manual reset (rSET)”, and span at “Proportional band (P□□□)”.

(1) Zero adjustment

① Input the value so that the PV display can indicate the same value as the scaling low limit value.
② Press the key while pressing the key. The unit proceeds to the Sub setting mode.
③ Press the key several times until “Manual reset (rSET)” appears.
④ Adjust the converter output value so that it can become 4mA DC by increasing and decreasing the value with and keys.
Pressing the key increases the value, and the key decreases it.
⑤ Revert to the PV/SV display mode by pressing the key several times.

(2) Span adjustment

① Input the value so that the PV display can indicate the same value as the scaling high limit value.
② Press the key while pressing the key. The unit proceeds to the Sub setting mode.
③ Proceed to the “Proportional band (P□□□)” by pressing the key.
④ Adjust the converter output value so that it can become 20mA DC by increasing and decreasing the value with the and keys.
Pressing the key increases the value, and the key decreases it.
⑤ Revert to the PV/SV display mode by pressing the key several times.

(3) Repeat steps (1) and (2) several times.

6.2 Converter setting example

6.2.1 Inputs other than 4 to 20mA DC

Desired value

Input : 6 to 14mA DC (Indication: 30.0 to 130.0)
Output : 4 to 20mA DC

Setting method

(1) Calculating Scaling high and low limit value of 4 to 20mA DC

Indication value per mA DC: (130.0–30.0)÷(14–6)=100÷8=12.5
Scaling high limit value : 130.0+(20–14) x 12.5=205.0
Scaling low limit value : 30.0–(6–4) x 12.5=5.0

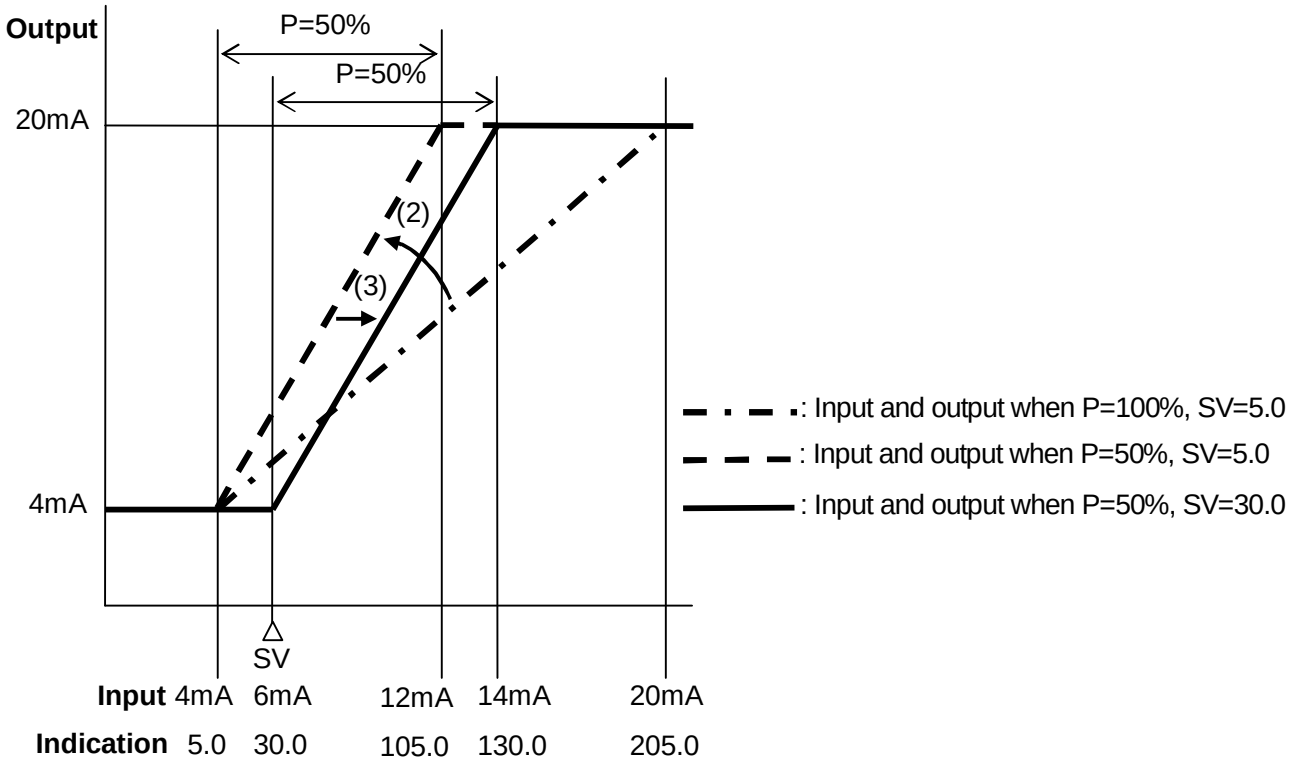
(2) Calculating P (Proportional band) value of 6 to 14mA DC

P={(14–6)÷(20–4)} x 100=0.5 x 100=50(%)

(3) Calculating SV so that output can become 4mA DC from 6mA DC input (Parallel shift setting)

SV={(6–4) x 12.5}+5.0 (Scaling low limit)=30.0

Input, output and indication



(Fig.6.2-1)

7. Running

After the unit is mounted to the control panel (DIN rail) and wiring is completed, operate the unit following the procedures below.

(1) Turn the power supply to the DCL-33A ON.

For approx. 3 seconds after power-on, characters of the sensor type and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display. See (Table 5-1). (If any other value is set during the scaling high limit value setting, SV display indicates it.)
During this time, all outputs and LED indicators are in OFF status.
After that, PV display indicates PV (process variable), and SV display indicates SV (desired value).

(2) Input each set value.

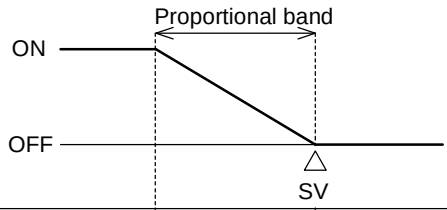
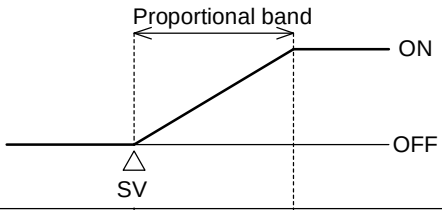
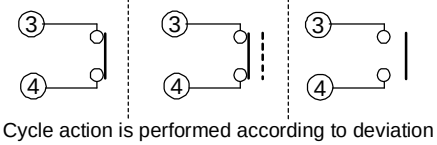
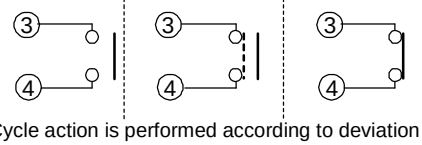
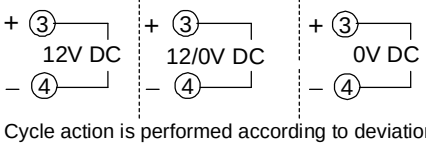
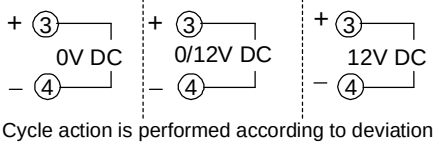
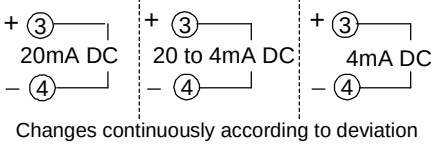
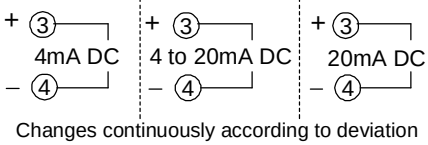
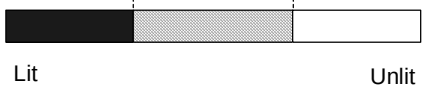
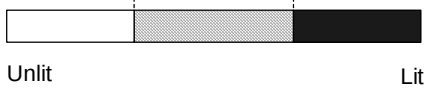
Input each set value referring to “5. Setup”.

(3) Turn the load circuit power ON.

Control action starts so as to keep the control target at the SV (desired value).

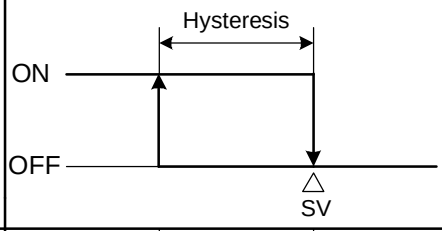
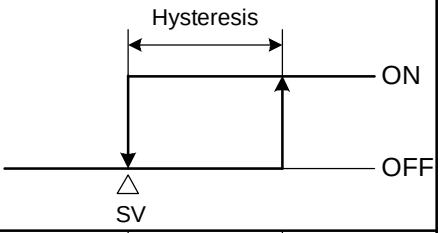
8. Action explanations

8.1 OUT action

	Heating (Reverse) action	Cooling (Direct) action
Control action		
Relay contact output	 Cycle action is performed according to deviation	 Cycle action is performed according to deviation
Non-contact voltage output	 Cycle action is performed according to deviation	 Cycle action is performed according to deviation
DC current output	 Changes continuously according to deviation	 Changes continuously according to deviation
Indicator (OUT) Green		

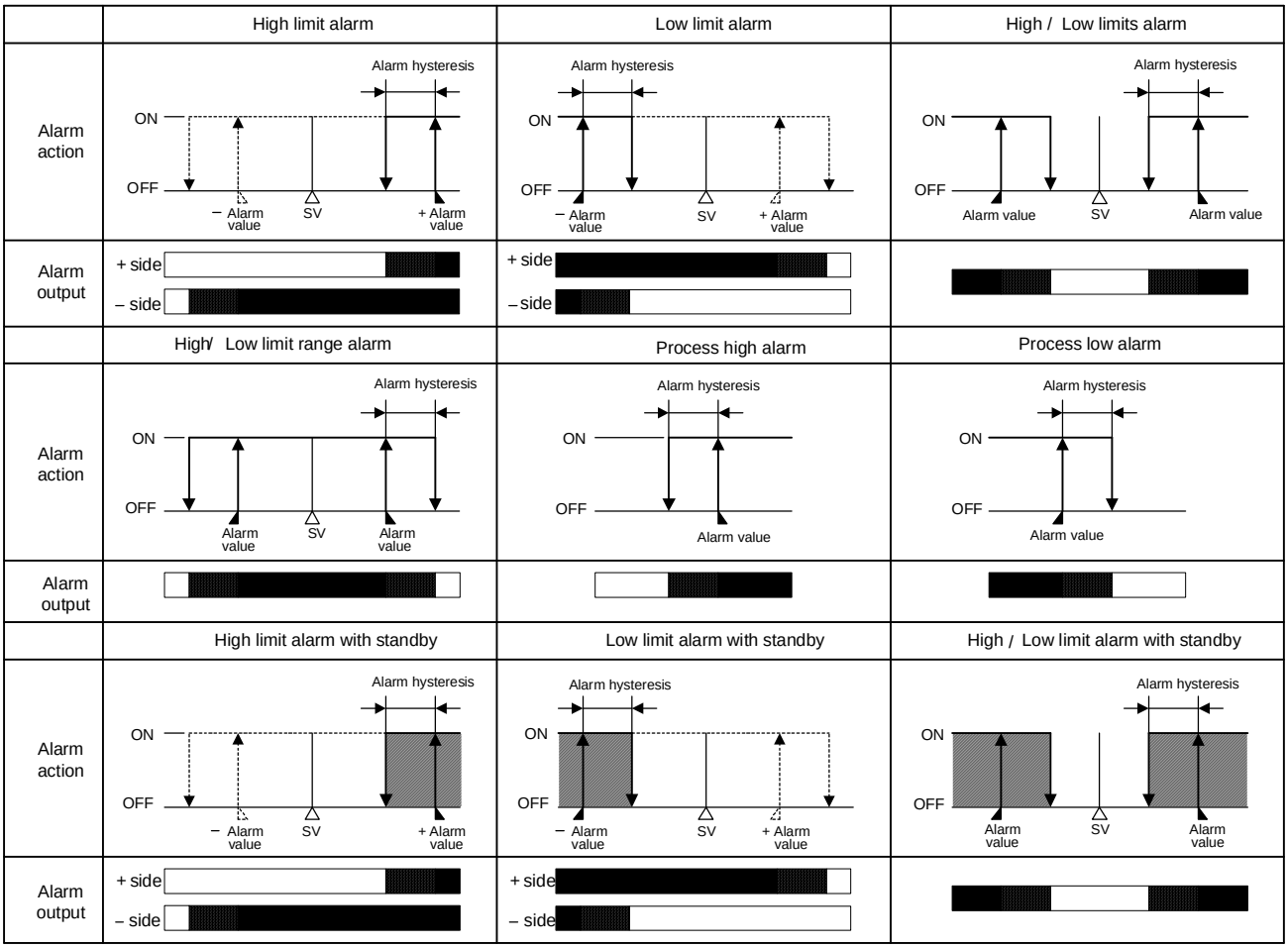
part : Acts ON or OFF.

8.2 OUT ON/OFF action

	Heating (reverse) action	Cooling (direct) action
Control action		
Relay contact output		
Non-contact voltage output		
DC current output		
Indicator (OUT) Green		

part: Acts ON or OFF.

8.3 EVT (Alarm) action



: Event (EVT) output terminals 8 and 9 are connected (ON).

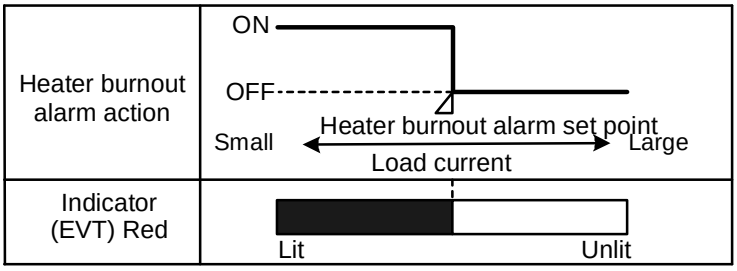
: Event (EVT) output terminals 8 and 9 are connected (ON) or disconnected (OFF).

: Event (EVT) output terminals 8 and 9 are disconnected (OFF).

: Standby functions in this section.

Event (EVT) output indicator lights when output terminals 8 and 9 are connected (ON), and goes off when they are disconnected (OFF).

8.4 EVT (Heater burnout alarm) action



: Event (EVT) output terminals 8 and 9 are connected (ON).

: Event (EVT) output terminals 8 and 9 are disconnected (OFF).

Event (EVT) output indicator lights when output terminals 8 and 9 are connected (ON), and goes off when they are disconnected (OFF).

9. Auto-tuning

In order to decide each value of P, I, D and ARW automatically, the auto-tuning process should be made to fluctuate to obtain an optimal value.

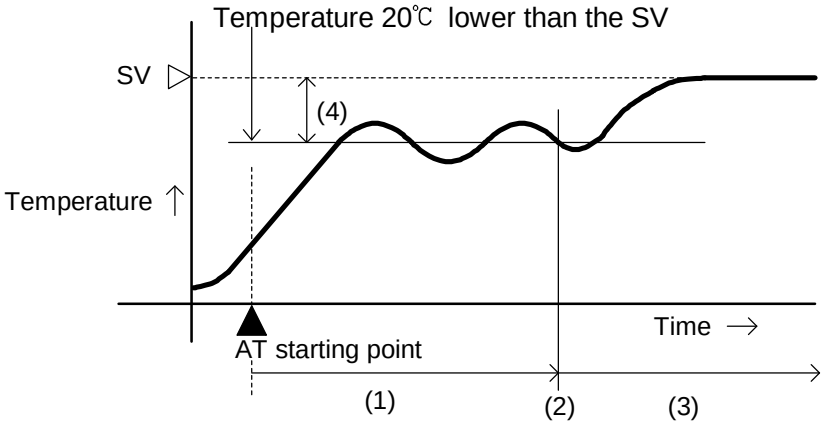
1 of 3 types of fluctuation below is automatically selected.

For DC input, the AT process will fluctuate around the SV for conditions of (A), (B) and (C).

Sometimes the auto-tuning process will not fluctuate if auto-tuning is performed at or near room temperature. Therefore auto-tuning might not finish normally.

(A) In the case of a large difference between the SV and processing temperature as the temperature is rising

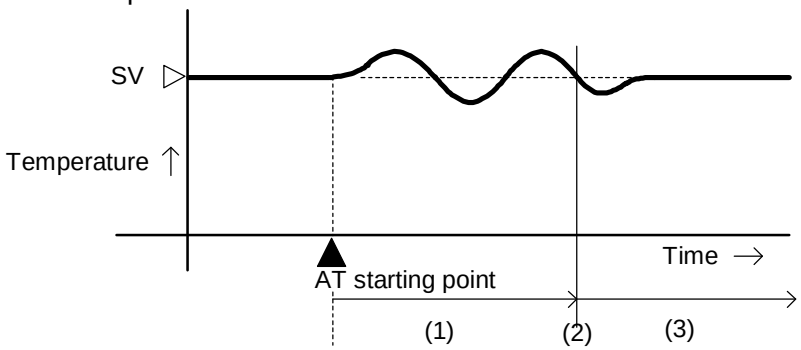
When AT bias is set to 20℃, the AT process will fluctuate at the temperature 20℃ lower than the SV.



(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning
(4) AT bias value

(B) When control is stable

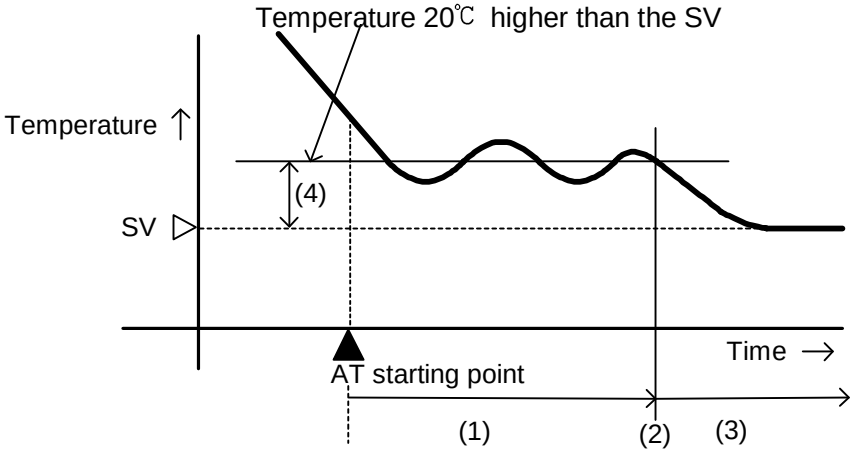
The AT process will fluctuate around the SV.



(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning

(C) In the case of a large difference between the SV and processing temperature as the temperature is falling

When AT bias is set to 20℃, the AT process will fluctuate at the temperature 20℃ higher than the SV.



(1) Calculating PID constant
(2) PID constant calculated
(3) Controlled by the PID constant set by auto-tuning
(4) AT bias value

10. Specifications

10.1 Standard specifications

Model : DIN rail mounted indicating controller
Mounting : DIN rail
Setting : Input system using membrane sheet key
Display
PV display : Red LED 4 digits, character size 7.4 x 4mm (H x W)
SV display : Green LED 4 digits, character size 7.4 x 4mm (H x W)
Input
Thermocouple : K, J, R, S, B, E, T, N, PL-Ⅱ, C (W/Re5-26) External resistance: 100Ω or less
However, for thermocouple B, external resistance, 40Ω or less
RTD : Pt100, JPt100, 3-wire system
Allowable input lead wire resistance (10Ω or less per wire)
DC current : 0 to 20mA DC, 4 to 20mA DC, input impedance 50Ω
Connect 50Ω shunt resistor (sold separately) between input terminals 5 and 6.
Allowable input current: 50mA or less
DC voltage :

	0 to 1V DC	0 to 5V DC, 1 to 5V DC, 0 to 10V DC
Input impedance	1MΩ or more	100kΩ or more
Allowable input voltage	5V or less	15V or less
Allowable signal source resistance	2kΩ or less	100Ω or less

Accuracy (Setting and Indication)
Thermocouple : Within ±0.2% of input span ±1 digit, or within ±2℃ (4℉) whichever is greater
R, S inputs, 0 to 200℃ (0 to 400℉): Within ±6℃ (12℉)
B input, 0 to 300℃ (0 to 600℉): Accuracy is not guaranteed.
K, J, E, T, N input, less than 0℃ (32℉): Within ±0.4% of input span ±1 digit
RTD : Within ±0.1% of input span ±1 digit, or within ±1℃ (2℉) whichever is greater
DC voltage : Within ±0.2% of input span ±1 digit
DC current : Within ±0.2% of input span ±1 digit
Input sampling period : 0.25 seconds
Control
Control action
- PID action (with auto-tuning function)
- PI action: When derivative time is set to 0
- PD action (with manual reset function): When integral time is set to 0
- P action (with manual reset function): When derivative and integral times are set to 0
- ON/OFF action: When proportional band is set to 0

OUT proportional band : 0.0 to 110.0% (ON/OFF action when set to 0.0)
Integral time : 0 to 1000 seconds (Off when set to 0)
Derivative time : 0 to 300 seconds (Off when set to 0)
OUT proportional cycle : 1 to 120 seconds
ARW : 0 to 100%
Manual reset : ±Proportional band converted value
Output limit : 0 to 100% (DC current output type: –5 to 105%)
(Not available for ON/OFF action)
ON/OFF hysteresis : Thermocouple, RTD input: 0.1 to 100.0℃ (℉)
DC voltage, current input : 1 to 1000
(The placement of the decimal point follows the selection)

Control output (OUT)
- Relay contact: 1a, Control capacity 3A 250V AC (Resistive load)
  1A 250V AC (Inductive load cosø =0.4)
  Electrical life, 100,000 cycles
- Non-contact voltage (for SSR drive): 12^{+2}_{-0}V DC Max. 40mA (Short circuit protected)
- DC current: 4 to 20mA DC, Load resistance: Max. 550Ω
  Output accuracy: Within ±0.3% of output span
  Resolution : 12000

EVT output
- Alarm output [Common output with Loop break alarm and Heater burnout alarm (option)]
  The alarm action point is set by ± deviation from the SV (excluding Process alarm) and when input goes outside the range, alarm (EVT) is turned ON or OFF (High/Low limit range alarm).
  When De-energized is selected during the Energized/De-energized selection, alarm (EVT) is activated conversely.
  Setting accuracy : The same as indication accuracy
  Action : ON/OFF action

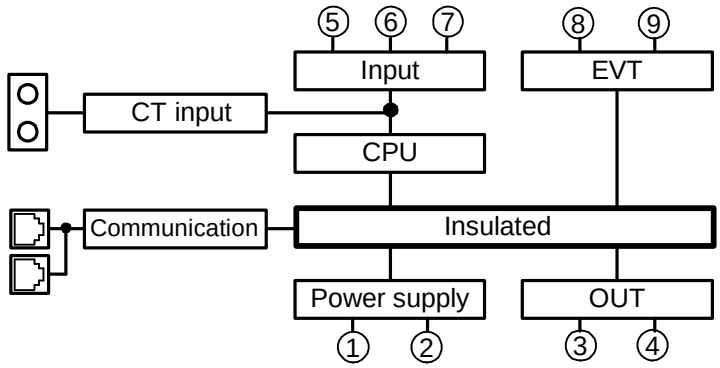
Hysteresis : Thermocouple, RTD input: 0.1 to 100.0℃(℉)
DC voltage, current input: 1 to 1000 (The placement of the decimal point follows the selection)
Output : Open collector, Control capacity, 0.1A (Max.) 24V DC
Alarm output action : One alarm action can be selected from below by front keypad operation: High limit, Low limit, High/Low limits, High/Low limit range, Process high, Process low, High limit with standby, Low limit with standby, High/Low limits with standby and No alarm action.
Energized/De-energized: Alarm (EVT) output Energized/De-energized can be selected.

	Energized	De-energized
Red (EVT) LED	Lights	Lights
EVT output	ON	OFF

Alarm HOLD function selection: Once the alarm is activated, alarm output is maintained until the power is turned off.

• Loop break alarm output (Common output with Alarm and Heater burnout alarm [Option])
Detects heater burnout, sensor burnout and actuator trouble.
Setting range: Loop break alarm time setting: 0 to 200 minutes
Loop break alarm span setting
Thermocouple, RTD input: 0 to 150℃(℉) or 0.0 to 150.0℃(℉)
DC voltage, current input : 0 to 1500
(The placement of the decimal point follows the selection)
Output: Open collector, Control capacity, 24V DC 0.1A (Max.)

Converter function: See "6. Converter function"
Insulation/Dielectric strength: Circuit insulation configuration



*** When OUT is Non-contact voltage or DC current output, OUT is not insulated from Communication.**

Insulation resistance: 10MΩ or more, at 500V DC
Dielectric strength : 1.5kV AC for 1 minute between input terminal and power terminal
1.5kV AC for 1 minute between output terminal and power terminal

Power supply : 100 to 240V AC 50/60Hz, 24V AC/DC 50/60Hz
Allowable voltage fluctuation range: 100 to 240V AC: 85 to 264V AC, 24V AC/DC: 20 to 28V AC
Power consumption : Approx. 6VA
Ambient temperature: 0 to 50℃
Ambient humidity : 35 to 85%RH (no condensation)
Weight : Approx.120g
External dimension : 22.5 x 75 x 100mm (W x H x D)
Material : Flame-resistant resin (Case)
Color : Light gray (Case)
Attached function

[Set value lock]
[Sensor correction]
[Power failure countermeasure]
The setting data is backed up in non-volatile IC memory.
[Self diagnosis]
The CPU is monitored by a watchdog timer, and when an abnormal status is found on the CPU, the controller is switched to warm-up status with all outputs turned off.
[Automatic cold junction temperature compensation] (Only thermocouple input)
This detects the temperature at the connection terminal between the thermocouple and the instrument and always maintains it in the same status as if the reference junction is located at 0℃ (32℉).
[Burnout]
When the thermocouple or RTD input is burnt out, OUT is turned OFF and PV display flashes "- - - -" (for DC current output, OUT low limit value).

[Input abnormality indication]

Output status selection when input abnormal	Contents and Indication	Controller/Converter function selection			
		Output status			
		Controller		Converter	
		OUT		OUT	
		Direct action	Reverse action	Direct action	Reverse action
on□□	Overscale Measured value has exceeded Indication range high limit value. "- - - -" flashes.	***1** ON (20mA) or OUT high limit value	OFF(4mA) or OUT low limit value	ON (20mA) or OUT high limit value	OFF (4mA) or OUT low limit value
oFF□		OFF (4mA) or OUT low limit value			
on□□	Underscale Measured value has dropped below Indication range low limit value. "- - - -" flashes.	OFF (4mA) or OUT low limit value	***1** ON (20mA) or OUT high limit value	OFF(4mA) or OUT low limit value	ON (20mA) or OUT high limit value
oFF□			OFF(4mA) or OUT low limit value		

[Output status selection when input abnormal] is available only for DC input and DC current output. For other inputs and outputs except for DC input and DC current output, the output status will be the same as when OFF is selected during [Output status selection when input abnormal].

***1:** Outputs a value between OFF (4mA) and ON (20mA) or between OUT low limit value and OUT high limit value, depending on deviation.

Thermocouple, RTD input

Input	Input range	Indication range	Control range
K, T	–199.9 to 400.0℃	–199.9 to 450.0℃	–205.0 to 450.0℃
	–199.9 to 750.0℉	–199.9 to 850.0℉	–209.0 to 850.0℉
Pt100	–199.9 to 850.0℃	–199.9 to 900.0℃	–210.0 to 900.0℃
	–200 to 850℃	–210 to 900℃	–210 to 900℃
	–199.9 to 999.9℉	–199.9 to 999.9℉	–211.0 to 1099.9℉
	–300 to 1500℉	–318 to 1600℉	–318 to 1600℉
JPt100	–199.9 to 500.0℃	–199.9 to 550.0℃	–206.0 to 550.0℃
	–200 to 500℃	–207 to 550℃	–207 to 550℃
	–199.9 to 900.0℉	–199.9 to 999.9℉	–211.0 to 999.9℉
	–300 to 900℉	–312 to 1000℉	–312 to 1000℉

Indication range and Control range for thermocouple inputs except above:
Input range low limit value–50℃ (100℉) to input range high limit value+50℃ (100℉)

DC input

Indication range : [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value + Scaling span x 10%]
However, if the input value is out of the range –1999 to 9999, the PV display flashes "- - - -" or "- - - -".

Control range : [Scaling low limit value – Scaling span x 1%] to [Scaling high limit value + Scaling span x 10%]

DC input disconnection: When DC input is burnt out, PV display flashes "- - - -" for 4 to 20mA DC and 1 to 5V DC inputs, and " " for 0 to 1V DC input.
For 0 to 20mA DC, 0 to 5V DC and 0 to 10V DC inputs, the PV display indicates the value corresponding to 0mA or 0V input.

Accessories included: Instruction manual 1 copy
When the Heater burnout alarm option is added: Wire harness 3m, 1 length
When the Heater burnout alarm option is added:
For rating 5A, 10A, 20A CT (CTL-6S) 1 piece
For rating 50A CT (CTL-12-S36-10L1U) 1 piece

Accessories sold separately: 50Ω shunt resistor for DC current input 1 piece
120Ω terminator for serial communication: RES-T01-120

10.2 Optional specifications

Heater burnout alarm (Option code: W)

Watches the heater current with CT (Current transformer) and detects the burnout.
Heater burnout alarm, Alarm and Loop break alarm utilize common output terminals.
This option cannot be applied to DC current output type.
This alarm is also activated when indication is overscale and underscale.
Rating : 5A [W (5A)], 10A [W (10A)], 20A [W (20A)], 50A [W (50A)] (Must be specified)

Setting range : 5A [W (5A)], 0.0 to 5.0A (Off when set to 0.0)
10A [W (10A)], 0.0 to 10.0A (Off when set to 0.0)
20A [W (20A)], 0.0 to 20.0A (Off when set to 0.0)
50A [W (50A)], 0.0 to 50.0A (Off when set to 0.0)
Setting accuracy: ±5% of the rated value
Action : ON/OFF action
Output : Open collector, Control capacity, 0.1A (Max.) 24V DC

Serial communication (Option code: C5)

The following operations are performed from external computer.
(1) Reading and setting of the SV, PID and other various set values
(2) Reading of the PV and action status (3) Function change

Cable length : Maximum 1,200m, Cable resistance: Within 50Ω
Communication interface : EIA RS-485
Communication method : Half-duplex communication
Communication speed : 2400/4800/9600/19200bps (Selectable by keypad)
Synchronization method : Start-stop synchronization
Parity : Even/Odd/No (Selectable by keypad)
Stop bit : 1 or 2 (Selectable by keypad)
Communication protocol : Shinko protocol/Modbus RTU/Modbus ASCII (Selectable by keypad)
Number of connectable units : A maximum of 31 units per host computer
Communication error detection : Dual detection by the parity and checksum
Digital external setting : SV of the programmable controller (with SVTC option) can be digitally transmitted to the DCL-33A (with C5 option) by combining the programmable controller with the DCL-33A.
When data from the programmable controller is larger than SV high limit or smaller than SV low limit, DCL-33A ignores the value and controls with the previous value. The control desired value adds SVTC bias value to the value received by the SVTC command.

11. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power supply to the controller.

11.1 Indication

Problem	Presumed cause and solution
[- - - -] is flashing on the PV display.	• The thermocouple, RTD and DC voltage (0 to 1V DC) input may be burnt out. Replace each sensor. **How to check whether the sensor is burnt out** [Thermocouple] If the input terminals of the instrument are shorted, and if a value around room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [RTD] If approx. 100Ω resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if a value around 0℃(32℉) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [DC voltage (0 to 1V DC)] If the input terminals of the instrument are shorted, and if a scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input terminals of thermocouple, RTD or DC voltage(0 to 1V DC) are securely mounted to the instrument terminal. Connect the sensor terminals to the instrument terminals securely.
[- - - -] is flashing on the PV display.	• The input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) may be disconnected. Replace each input signal wire. **How to check whether the input signal wire is disconnected** [DC voltage (1 to 5V DC)] If the input to the input terminals of this controller is 1V DC, and if a scaling low limit value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected. [DC current (4 to 20mA DC)] If the input to the input terminals of this controller is 4mA DC, and if a scaling low limit value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input signal wire for DC voltage (1 to 5V DC) or DC current (4 to 20mA DC) is securely connected to the input terminal of this controller. • Check whether the polarity of thermocouple or compensating lead wire is correct. • Check whether codes (A, B, B) of the RTD agree with the controller input terminals.

The value set during the Scaling low limit setting remains on the PV display.	• Check whether the input signal wire for DC voltage (0 to 5V DC, 0 to 10V DC) or DC current (0 to 20mA DC) is disconnected. Replace each input signal wire. **How to check whether the input signal wire is disconnected** [DC voltage (0 to 5V DC, 0 to 10V DC)] If the input to the input terminal of this controller is 0V DC, and if a scaling low limit value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected. [DC current (0 to 20mA DC)] If the input to the input terminal of this controller is 0mA DC, and if a scaling low limit value is indicated, the controller is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input signal wire for DC voltage (0 to 5V DC, 0 to10V DC) and DC current (0 to 20mA DC) is securely connected to the input terminal of this controller. Connect the signal wire to the controller terminal securely.
The indication of the PV display is abnormal or unstable.	• Check whether the sensor input or temperature unit (°C or °F) is correct. Set the sensor input and the temperature unit properly. • Sensor correcting value is unsuitable. Set it to a suitable value. • Check whether the sensor specification is correct. Set the sensor specification properly. • AC leaks into the sensor circuit. Use an ungrounded type sensor. • There may be equipment that interferes with or makes noise near the controller. Keep equipment that interferes with or makes noise away from the controller.
[Err 1] is indicated on the PV display.	• The internal memory is defective. Please contact our main office or dealers.

11.2 Key operation

Problem	Presumed cause and solution
Settings (SV, P, I, D, proportional cycle, alarm, etc.) are impossible. The values do not change by the △, ▽ keys.	• Set value lock (Lock 1 or Lock 2) is selected. Release the lock selection. • During auto-tuning Cancel auto-tuning if required.
The setting indication does not change within the rated input range even if the △, ▽ keys are pressed, and new values are unable to be set.	• Scaling high limit or low limit may be set at the point where the value does not change. Set it to a suitable value while in Auxiliary function setting mode 2.

11.3 Control

Problem	Presumed cause and solution
Process variable (temperature) does not rise.	• The sensor is out of order. Replace the sensor. • Check whether the sensor is securely mounted to the instrument input terminal, or control output terminal is not securely mounted to the actuator input terminal. Mount the sensor or control output terminal securely. • Ensure that wiring of sensor terminals or control output terminals is correct.
The control output remains in an ON status.	• OUT low limit value is set to 100% or higher in Auxiliary function setting mode 2. Set it to a suitable value.
The control output remains in an OFF status.	• OUT high limit value is set to 0% or less in Auxiliary function setting mode 2. Set it to a suitable value.

For all other malfunctions, please contact our main office or dealers.

SHINKO TECHNOS CO.,LTD.
OVERSEAS DIVISION

Reg. Office : 2-5-1, Senbahigashi, Minoo, Osaka, Japan
URL : http://www.shinko-technos.co.jp Tel : 81-72-727-6100
E-mail : overseas@shinko-technos.co.jp Fax: 81-72-727-7006