INSTRUCTION MANUAL

DIN RAIL MOUNTING TYPE INDICATING CONTROLLER **DCL-33A**

No.DCL31E5 2004.08

To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

⚠ 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 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.

⚠ Caution

- This instrument should be used in accordance with the specifications described in this manual. If it is not used according to the specifications, it may malfunction or breakdown.
- Be sure to follow the warnings and cautions. Otherwise serious injury or accidents 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 in a control panel. If not, measures must be taken to ensure that the operator can not touch power terminals or other high voltage sections.
- Be sure to check that the power is turned off before cleaning this instrument.
- Use a soft and dry cloth when cleaning the instrument. (Alcohol based substances may cause tarnishing or defacement of the unit)
- As the display section is vulnerable, do not strike or scratch it with a hard object.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

1. Model name

1.1 Model name

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					1		Supply voltage 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	Based on EIA RS-485

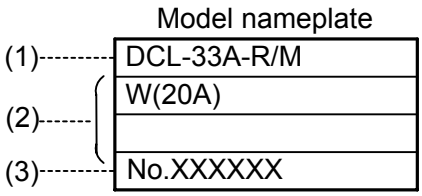
*1: Alarm action (9 types and No alarm) and Energized/Deenergized can be selected by keypad.

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

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

1.2 How to read the model name label

Model name labels are attached to the right side of the case and the inner assembly.
For Heater burnout alarm output, CT rated current value is written in the bracket ( ).



(example)
Relay contact output/ Multi-range input
Heater burnout alarm output

(1) Model name
(2) Option, supply voltage (Enter “1” only for 24V AC/DC)
(3) Serial number (only on the inner assembly)

2. Name and functions of the sections

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

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

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

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

(5) PV display
Indicates the PV (input value) with a Red LED.

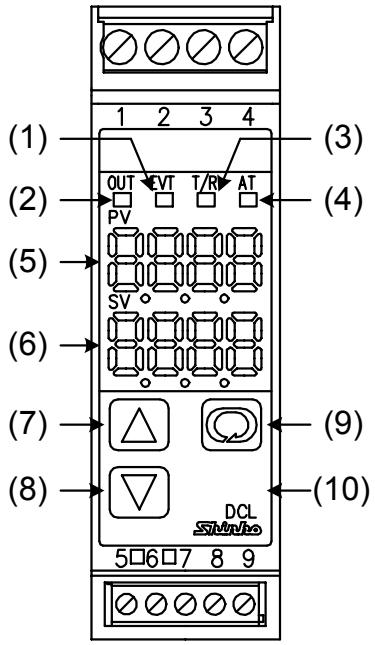
(6) SV display
Indicates the SV (setting value) with a Green LED.

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

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

(9) Mode key (⟲)
Changes the setting mode or registers the setting value.
[Registers the setting value by pressing the Mode (⟲) key.]

(10) Sub-mode key
Brings up 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”.

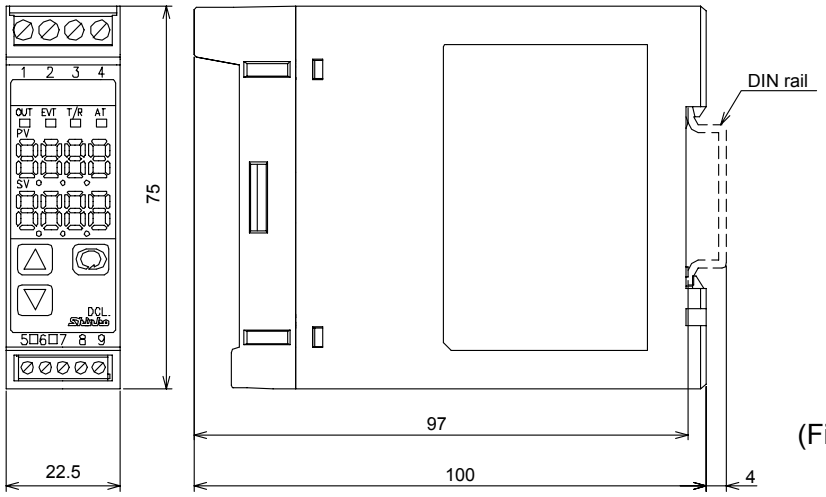
3. Mounting to the control panel

3.1 Site selection

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

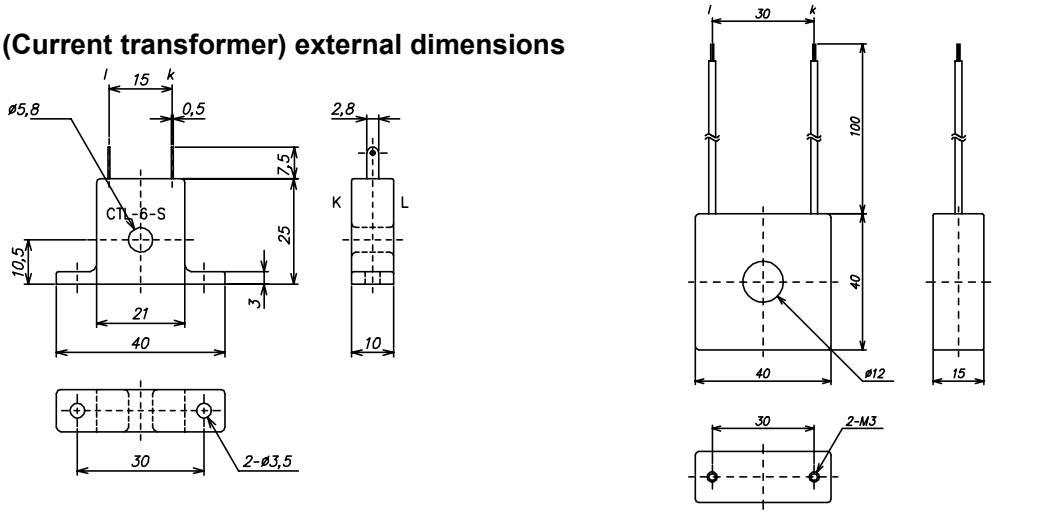
Mount the controller in a place with:
- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- Few mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50℃ (32 to 122℉) without rapid change
- An ambient non-condensing humidity 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

3.2 External dimensions



(Fig. 3.2-1)

3.3 CT (Current transformer) external dimensions



CTL-6S (for 20A) **CTL-12-S36-10L1 (for 50A)**

(Fig. 3.3-1)

3.4 Mounting to DIN rail

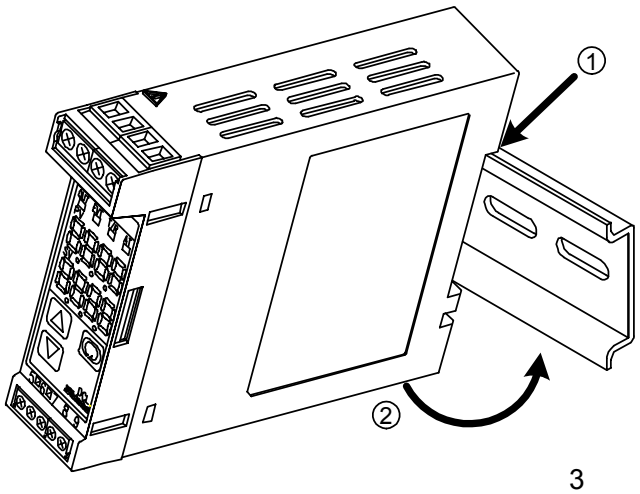
> **⚠ Caution**
>
> **Mount the DIN rail horizontally.**
> **When DIN rail is mounted vertically, be sure to use commercially available fastening plates at the end of DCL-33A series. Mount the DCL-33A series to the DIN rail so that the DCL-33A series may be fixed. However, if the DIN rail is mounted horizontally in a position susceptible to vibration or shock, the fastening plates must be used as well.**

- **Recommended fastening plate**

Omron corporation	End plate	PEP-M
IDEC corporation	Fastening plate	BNL6P, BNL8P
Matsushita electric works, LTD.	Fastening plate	ATA4806

(1) Hook ① of the DCL-33A on the upper side of the DIN rail. (Fig. 3.4-1)

(2) 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. (Fig.3.4-1)



(Fig. 3.4-1)

4. Wiring

⚠ Warning

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

⚠ Caution

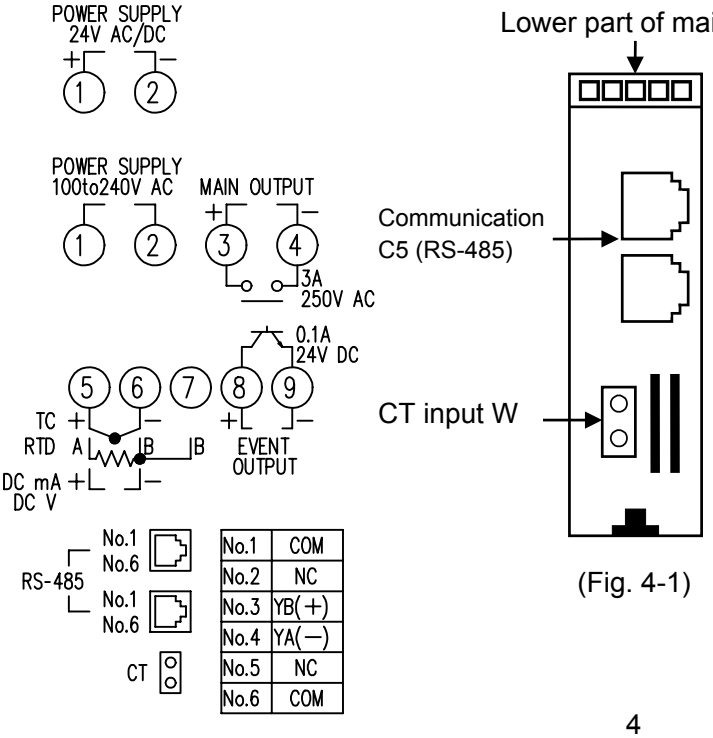
- Do not leave wire chips into the DCL-33A when wiring, because they could cause fire, malfunction and trouble.
- Insert the connecting cable into the designated connector securely. Not doing so could cause malfunction due to imperfect contact.
- Connect the AC power to the designated terminal as is 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 the polarity when wiring.
- **When using a 24V AC/DC for the power source, do not confuse the polarity when using a 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 the unexpected level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.
- This unit does not have built-in power switch, circuit breaker or fuse. Therfore 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	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

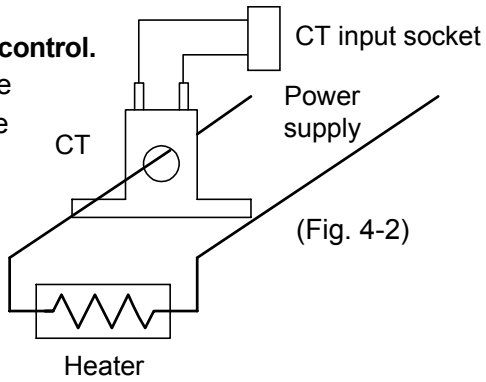
(Fig. 4-1)

- 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

• **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 actual temperature on the PV display and setting value on the SV display.

(Table 5-1)

Input	Scale 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.

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

5.1 Operation flowchart

Outline of operation procedure

Operation before running

[Step 1 Initial setting] : Set an Input type, Alarm action type, control action, etc. in Auxiliary function setting mode 2.

↓

[Step 2 Main setting mode]: Set SV (desired value) in the Main setting mode.

↓

[Step 3 Sub setting mode]: Set PID values and Alarm setting value in the Sub setting mode.

↓

[Step 4 Auxiliary function setting mode 1]: Set Setting value Lock in Auxiliary function setting mode 1. (If Step 3 is not necessary, skip this step.)

↓

Running

Alarm setting procedure [Numbers (1) to (6) are indicated on the flowchart.]

(1) [Alarm action selection]: Select an alarm type.
[If an alarm type except for ---- is selected, items (2) to (6) are indicated and they can be set if required.]
(2) [Alarm action Energized/Deenergized selection]: Select Alarm contact output ON (Energized: noñL) or OFF (Deenergized: rEVS).
(3) [Alarm HOLD function selection]: Select the output HOLD or not.
(4) [Alarm hysteresis setting]: Set Alarm hysteresis.
(5) [Alarm action delayed timer setting]: Set Alarm action delayed time. (If input enters alarm action range and setting time has passed, the alarm is activated.)
(6) [Alarm setting]: Set an action point of Alarm output.

[Note] If an alarm action is changed, the alarm setting value becomes 0 (0.0). Therefore it is necessary to reset it.

PV/SV display

Press the key. ← **Output MV (manipulated variable) indication** → Press the key for approx. 3s.

Press the key. **[Main setting mode]**

SV (Desired value)	
PV S	SV Set value

↓

Reverts to PV/SV display.

Press the key while holding down the key. **[Sub setting mode]**

AT setting PV AT / SV Selected value	• If AT is cancelled during the process, PID values revert to previous value.
OUT proportional band setting PV P / SV Set value	• Set the value with keys. • ON/OFF action when set to 0 or 0.0
Integral time setting PV I / SV Set value	• Set the value with keys. • PD action when set to 0, and auto-reset can be performed.
Derivative time setting PV d / SV Set value	• Set the value with keys. • Setting the value to 0 disables the function.
ARW setting PV n / SV Set value	• Set the value with keys. • Available for PID action
OUT proportional cycle setting PV c / SV Set value	• Set the value with keys. • Not available for DC current output or when OUT is ON/OFF action
Manual reset setting PV rSET / SV Set value	• Set the value with keys. • Not available when OUT2 is ON/OFF action
(6) Alarm setting PV A1 / SV Set value	• Set the value with keys. • Not available if ---- is selected during Alarm action selection
Heater burnout alarm PV H□.□ / SV Set value	• Set the value with keys. • Setting the value to 0.0 disables the function.
Loop break alarm time setting PV LP_T / SV Set value	• Set the value with keys. • Setting the value to 0 disables the function.
Loop break alarm span setting PV LP_H / SV Set value	• Set the value with keys. • Setting the value to 0 disables the function.

↓

Reverts to PV/SV display.

Press for approx. 3s while holding down . **[Auxiliary function setting mode 1]**

Setting value lock designation PV Lock / SV Selected value	• Make a selection with keys. • If Lock 1 or Lock2 is designated, AT or Auto-reset does not work. • Be sure to designate Lock 3 when using Serial communication.
Sensor correction PV So / SV Set value	• Set the value with keys.
Communication protocol PV cHL / SV Selected value	• Make a selection with keys. • Not available for noñL indication
Instrument number PV cno / SV Set value	• Set the value with keys.
Communication speed PV cSP / SV Selected value	• Make a selection with keys.
Parity selection PV cPr / SV Selected value	• Make a selection with keys. • Not available if noñL is selected during Communication protocol selection
Stop bit selection PV cSt / SV Selected value	• Make a selection with keys. • Not available if noñL is selected during Communication protocol selection

↓

Reverts to the PV/SV display.

Explanation of key

↓ : This means that if is pressed, the set value is saved, and the controller proceeds to the next setting item.

Setting items with dotted lines are optional and they appear only when the options are added.

5.2 Main setting mode

Character	Name, Description, Setting range	Default value
SV	**SV** • Sets the SV for controlled object. • 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, when PID auto-tuning does not finish after 4 hours, PID auto-tuning will be automatically shut down. • PID auto-tuning cancellation : ---- PID auto-tuning performance: AT	----
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
n	**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 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 when No alarm action is selected during Alarm action selection. • See (Table 5.3-1). (For DC input, the placement of the decimal point follows the selection.)	0℃
H□□□ and □XX.X are indicated in turn.	**Heater burnout alarm setting** • Sets the heater current value for Heater burnout alarm. • Setting the value to 0.0 disables this function. • Self-holding is not available for the alarm output. When Alarm and Loop break alarm are applied together, they utilize common output terminals. • Available only when Heater burnout alarm is added. • Rating 5A : 0.0 to 5.0A Rating 10A: 0.0 to10.0A Rating 20A: 0.0 to 20.0A Rating 50A: 0.0 to 50.0A	0.0A

Input type (character indication) and range

K	–200 to 1370℃: E C		K	–320 to 2500 ℉: E F	
	–199.9 to 400.0℃: E .C			–199.9 to 750.0℉: E .F	
J	–200 to 1000 ℃: J C		J	–320 to 1800 ℉: J F	
R	0 to 1760 ℃: r C		R	0 to 3200 ℉: r F	
S	0 to 1760 ℃: S C		S	0 to 3200 ℉: S F	
B	0 to 1820 ℃: b C		B	0 to 3300 ℉: b F	
E	–200 to 800 ℃: E C		E	–320 to 1500 ℉: E F	
T	–199.9 to 400.0℃: T .C		T	–199.9 to 750.0℉: T .F	
N	–200 to 1300 ℃: n C		N	–320 to 2300 ℉: n F	
PL-Ⅱ	0 to 1390 ℃: PL2C		PL-Ⅱ	0 to 2500 ℉: PL2F	
C(W/Re5-26)	0 to 2315 ℃: c C		C(W/Re5-26)	0 to 4200 ℉: c F	
Pt100	–199.9 to 850.0℃: Pt .C		Pt100	–199.9 to 999.9℉: Pt .F	
JPt100	–199.9 to 500.0 ℃: JPt.C		JPt100	–199.9 to 900.0℉: JPt.F	
Pt100	–200 to 850 ℃: Pt C		Pt100	–300 to 1500℉: Pt F	
JPt100	–200 to 500 ℃: JPtC		JPt100	–300 to 900℉: JPtF	
4 to 20mA DC	–1999 to 9999: 420A				
0 to 20mA DC	–1999 to 9999: 020A				
0 to 1V DC	–1999 to 9999: 0 1V				
0 to 5V DC	–1999 to 9999: 0 5V				
1 to 5V DC	–1999 to 9999: 1 5V				
0 to 10V DC	–1999 to 9999: 0 10V				

Alarm action type

High limit alarm: The alarm action is ±deviation setting from the SV. The alarm is activated if the input value reaches the high limit setting value. Character indication: H

Low limit alarm: The alarm action is ±deviation setting to the SV. The alarm is activated if the input value goes under the low limit setting value. Character indication: L

High/Low limits alarm: Combines High limit and Low limit alarm actions. When input value reaches high limit setting value or goes under the low limit setting value, the alarm is activated. Character indication: HL

High/Low limit range alarm: When input value is between the high limit setting value and low limit setting value, the alarm is activated. Character indication: oUtd

Process value 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.
Character indication: Process high alarm AH, Process low alarm rAH

Alarm with standby function: When the power to the controller is turned on, even if the input enters the alarm action range, the alarm is not activated. (If the controller is allowed to keep running, once the input exceeds the alarm action point, the standby function will be released.)
Character indication:
High limit alarm with standby : H oU
Low limit alarm with standby : L oU
High/Low limits alarm with standby : HL oU

Press the ⟲ key for approx. 3s while holding down the ⬭ key.

[Auxiliary function setting mode 2]

Input type selection
PV: InPt | SV: Selected value
- Make a selection with △, ▽ keys.
- Default value: t C

Scaling high limit
PV: SCLH | SV: Set value
- Set the value with △, ▽ keys.
- Available for DC current, DC voltage input

Scaling low limit
PV: SCLL | SV: Set value
- Set the value with △, ▽ keys.
- Available for DC current, DC voltage input

Decimal point place
PV: dP | SV: Selected value
- Make a selection with △, ▽ keys.
- Available for DC current, DC voltage input

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

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

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

OUT ON/OFF action hysteresis setting
PV: HYS | SV: Set value
- Set the value with △, ▽ keys.
- Available for ON/OFF action

(1) **Alarm action selection**
PV: AL 1F | SV: Selected value
- Make a selection with △, ▽ keys.
- Default value: ----

(2) **Alarm action Energized/Deenergized**
PV: A 1LA | SV: Selected value
- Make a selection with △, ▽ keys.
- Not available if ---- is selected in Alarm action selection

(3) **Alarm HOLD function**
PV: AHLd | SV: Selected value
- Make a selection with △, ▽ keys.
- Not available if ---- is selected in Alarm action selection

(4) **Alarm hysteresis**
PV: A 1HY | SV: Set value
- Set the value with △, ▽ keys.
- Not available if ---- is selected in Alarm action selection

(5) **Alarm action delayed timer setting**
PV: A 1dY | SV: Set value
- Set the value with △, ▽ keys.
- Not available if ---- is selected in Alarm action selection

Direct/Reverse control
PV: conT | SV: Selected value
- Make a selection with △, ▽ keys.
- Default value: HEAT

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

SVTC bias setting
PV: SU_b | SV: Set value
- Set the value with △, ▽ keys.
- Available only when option C5 is applied.

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

Controller/Converter
PV: FUnc | SV: Selected value
- Make a selection with △, ▽ keys.

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 action 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 setting value: –199.9 or –1999

Maximum positive setting value: 999.9 or 9999

5.4 Auxiliary function setting mode 1

Character	Name, Description, Setting range	Default value
Lock	**Setting value Lock selection** • Locks the setting value to prevent setting errors. The setting item to be locked is dependent on the designation. • PID auto-tuning cannot be carried out when Lock1 or Lock2 is selected. • Be sure to select Lock 3 when changing the setting value frequently via communication function considering the life of non-volatile memory. • ---- (Unlock): All setting values can be changed. Loc 1 (Lock 1): None of setting values can be changed. Loc2 (Lock 2): Only main setting mode can be changed. Loc3 (Lock 3): All setting values can be changed. However, changed data reverts to their former value after power is turned 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 SV and Alarm setting.**	Unlock
to	**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℃
cMtL	**Communication protocol selection** • Selects communication protocol. • Available only when the option C5 is added. • Shinko protocol: MonL, Modbus ASCII mode: ModA, Modbus RTU mode: Modr	Shinko protocol
cMno	**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 option C5 is added. • Setting range: 0 to 95	0
cMtP	**Communication speed selection** • Selects a speed in accordance with the host computer. • Available only when the option C5 is added. • 2400bps: 24, 4800bps: 48, 9600bps: 96, 19200bps: 192	9600bps
cMPr	**Parity selection** • Selects the parity. • Not available when the option C5 is not added or when Shinko protocol is selected in Communication protocol selection • None: nonE, Even: EvEn, Odd: odd	Even

cnsr	**Stop bit selection** • Selects the stop bit. • Not available when the option C5 is not added or when 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
sEns	**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 –200 to 1370℃: tC –199.9 to 400.0℃: t.C J –200 to 1000 ℃: JC R 0 to 1760 ℃: rC S 0 to 1760 ℃: sC B 0 to 1820 ℃: bC E –200 to 800 ℃: EC T –199.9 to 400.0℃: r.C N –200 to 1300 ℃: nC PL-Ⅱ 0 to 1390 ℃: PL2C C (W/Re5-26) 0 to 2315 ℃: cC Pt100 –199.9 to 850.0℃: Pr.C JPt100 –199.9 to 500.0℃: JPr.C Pt100 –200 to 850 ℃: PrC JPt100 –200 to 500 ℃: JPrC 4 to 20mA DC –1999 to 9999: 420A 0 to 20mA DC –1999 to 9999: 020A 0 to 1V DC –1999 to 9999: 0 1V 0 to 5V DC –1999 to 9999: 0 5V 1 to 5V DC –1999 to 9999: 1 5V 0 to 10V DC –1999 to 9999: 0 10V	K 320 to 2500 ℉: tF –199.9 to 750.0℉: t.F J –320 to 1800 ℉: JF R 0 to 3200 ℉: rF S 0 to 3200 ℉: sF B 0 to 3300 ℉: bF E –320 to 1500 ℉: EF T –199.9 to 750.0℉: r.F N –320 to 2300 ℉: nF PL-Ⅱ 0 to 2500 ℉: PL2F C (W/Re5-26) 0 to 4200 ℉: cF Pt100 –199.9 to 999.9℉: Pr.F JPt100 –199.9 to 900.0℉: JPr.F Pt100 –300 to 1500℉: PrF JPt100 –300 to 900 ℉: JPrF	
srLH	**Scaling high limit setting** • Sets the scaling high limit value. • Scaling low limit setting 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 setting value (For DC inputs, 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. • No decimal point : 0000 2 digits after decimal point: 00.00 1 digit after decimal point: 000.0 3 digits after decimal point: 0.000	No decimal point
FILr	**PV filter time constant setting** • Sets the PV filter time constant. If the setting 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 105% Setting greater than 100% is effective to DC current output type.	100%

oLL	**OUT low limit setting** • Sets the OUT low limit value. • Not available for ON/OFF action. • Setting range: –5% to OUT high limit value Setting less than 0% is effective to DC current output type.	0%
HYS	**OUT ON/OFF action hysteresis setting** • Sets the ON/OFF action hysteresis for the OUT. • 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 action selection** • Selects an alarm action type. No alarm action : ---- High limit alarm : H Low limit alarm : L High/Low limits alarm : HL High/Low limit range alarm : oI d Process high alarm : AH Process low alarm : rAH High limit alarm with standby : H o Low limit alarm with standby : L o High/Low limits alarm with standby: HL o	No alarm action
A 1LA	**Alarm action Energized/Deenergized** • Selects the alarm action Energized/Deenergized. • Not available when No alarm action is selected during Alarm action selection. • Energized: nonL, Deenergized: rEbS	Energized
AHLd	**Alarm HOLD function selection** • Selects either Alarm Not holding or Alarm Holding. If alarm HOLD function is set to “Alarm Holding”, once alarm is activated, the alarm output remains until the power is turned off. • Not available when No alarm action is selected during Alarm action selection. • Alarm Not holding: nonE, Alarm Holding: HoLd	Alarm Not holding
A 1HY	**Alarm hysteresis setting** • Sets the alarm hysteresis. • Not available when No alarm action is selected during Alarm action 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 passed after the input enters alarm output range. • Not available when No alarm action is selected during Alarm action selection. • Setting range: 0 to 9999 seconds	0 seconds
conF	**Direct/Reverse selection** • Selects reverse (heating) or direct (cooling) control action. • Reverse (Heating) action : HEAT Direct (Cooling) action : cooL	Reverse (Heating) action
AT_b	**AT bias setting** • Set the PID auto-tuning bias value. • Not available when DC voltage or current input is selected during Input type selection, or when 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 option C5 is added.	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 (Output OFF), on (Output ON)	Output OFF
FUnc	**Controller/Converter function selection** • Selects controller or converter function. • Available only when the control output is DC current output type. • Controller function: cnTr, Converter function: cnVT	Controller function

Sensor correction function

This 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 multiple controllers, the accuracy of the sensors or dispersion of load capacity has influence on the control.
Therefore, sometimes the measured temperature (input value) does not concur with the same setting value. In such a case the control can be set at the desired temperature by correcting the input value of the sensors.

Loop break alarm

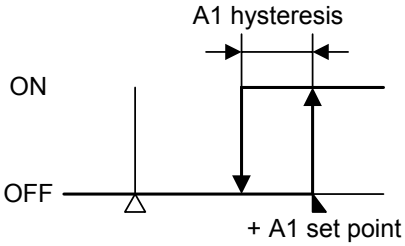
The alarm will be activated when the process variable (PV) does not **rise** as much value as the span or greater within the time it takes to assess the Loop break alarm after the manipulated variable has reached 100% or the output high limit value. The alarm will also be activated when the process variable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

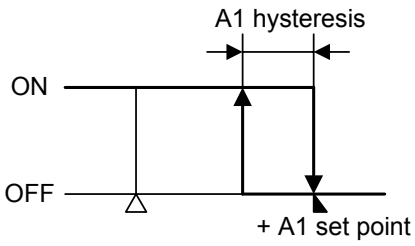
[If alarm action Deenergized is selected]
When the alarm output indicator is lit, the alarm output (between terminal 8 and 9) is not conducted (OFF).
When the alarm output indicator is unlit, the alarm output is conducted (ON).

High limit alarm (Energized setting)



(Fig. 5.5-1)

High limit alarm (Deenergized setting)



(Fig. 5.5-2)

5.6 Control output manipulated variable indication

Name, Description
Control output 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 a 0.5 second cycle on the SV display. Pressing the ⟲ key again, the instrument reverts to the PV/SV display mode.

6. 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 has 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 controller (Power supply, Input and Output).
(2) Turn the power of this controller ON.
(3) Bring up "Auxiliary function setting mode 2" by pressing the ⬭ and ⟲ key (for approx. 3s).
(4) Select the sensor type from "Input type selection (SEnS)".
(5) Set the high limit of the value that is going to be converted during "Scaling high limit setting (SCLH)".
(6) Set the low limit of the value that is going 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 action to Process value alarm action.

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

(Table 6-1)

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

7. Running

When mounting and wiring to the control panel (DIN rail) are finished, start the operation by following the procedures below.

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

For approx. 3s after power on, character 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 at 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 actual temperature and SV display indicates the main setting value.

(2) Input the setting value.

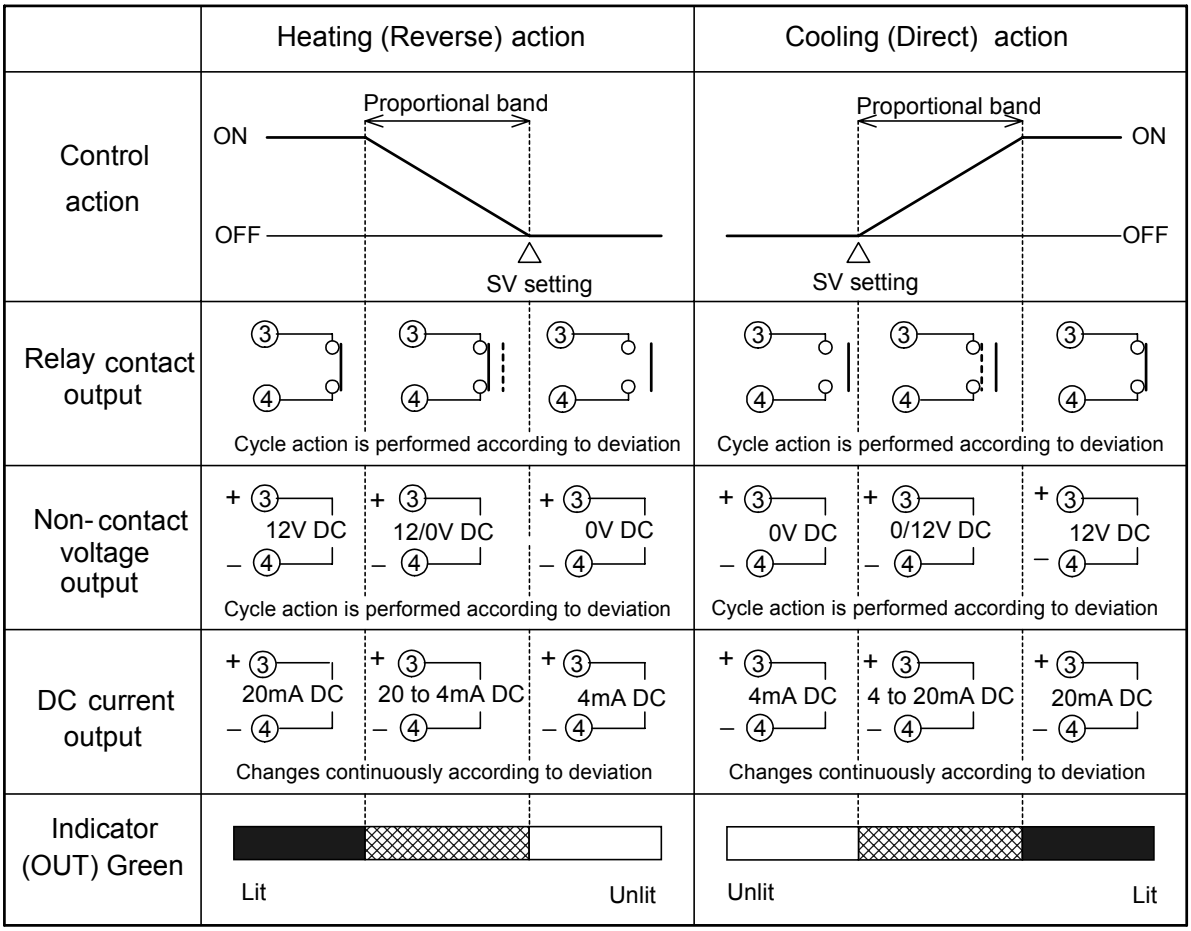
Input each setting value referring to “5. Setup”.

(3) Turn the load circuit power ON.

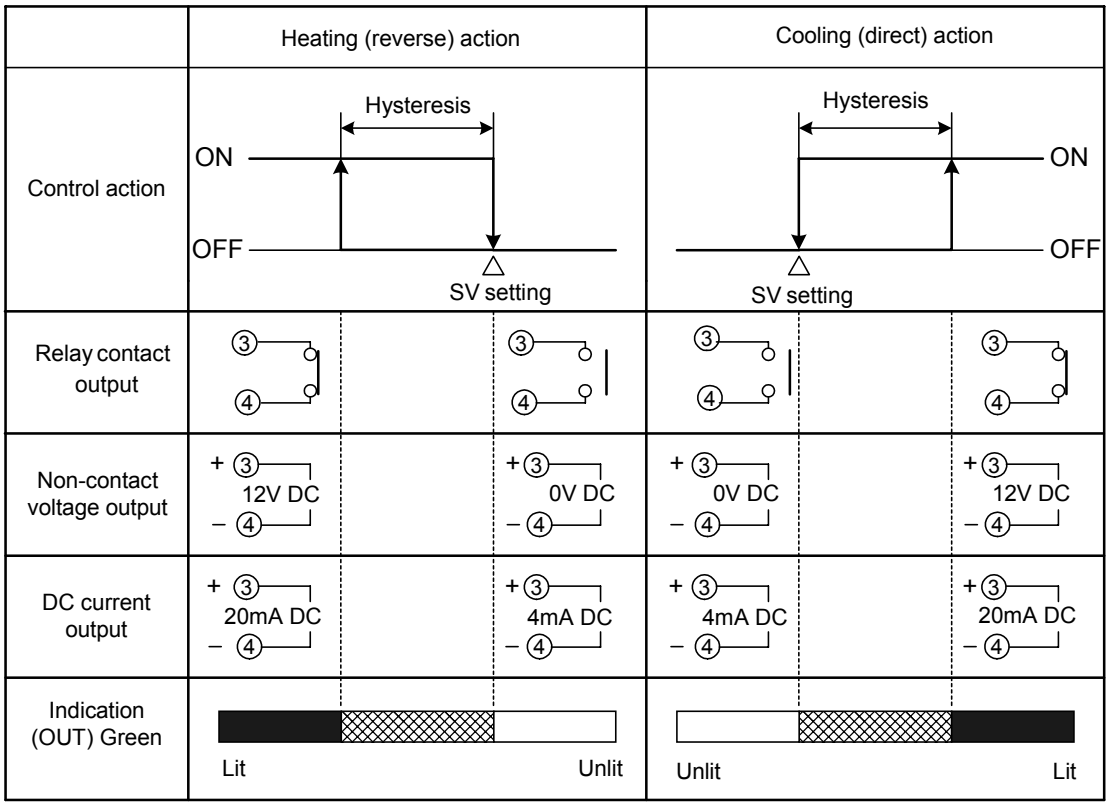
Starts control action so as to keep temperature of the controlled object at the main setting value.

8. Action explanations

8.1 OUT action

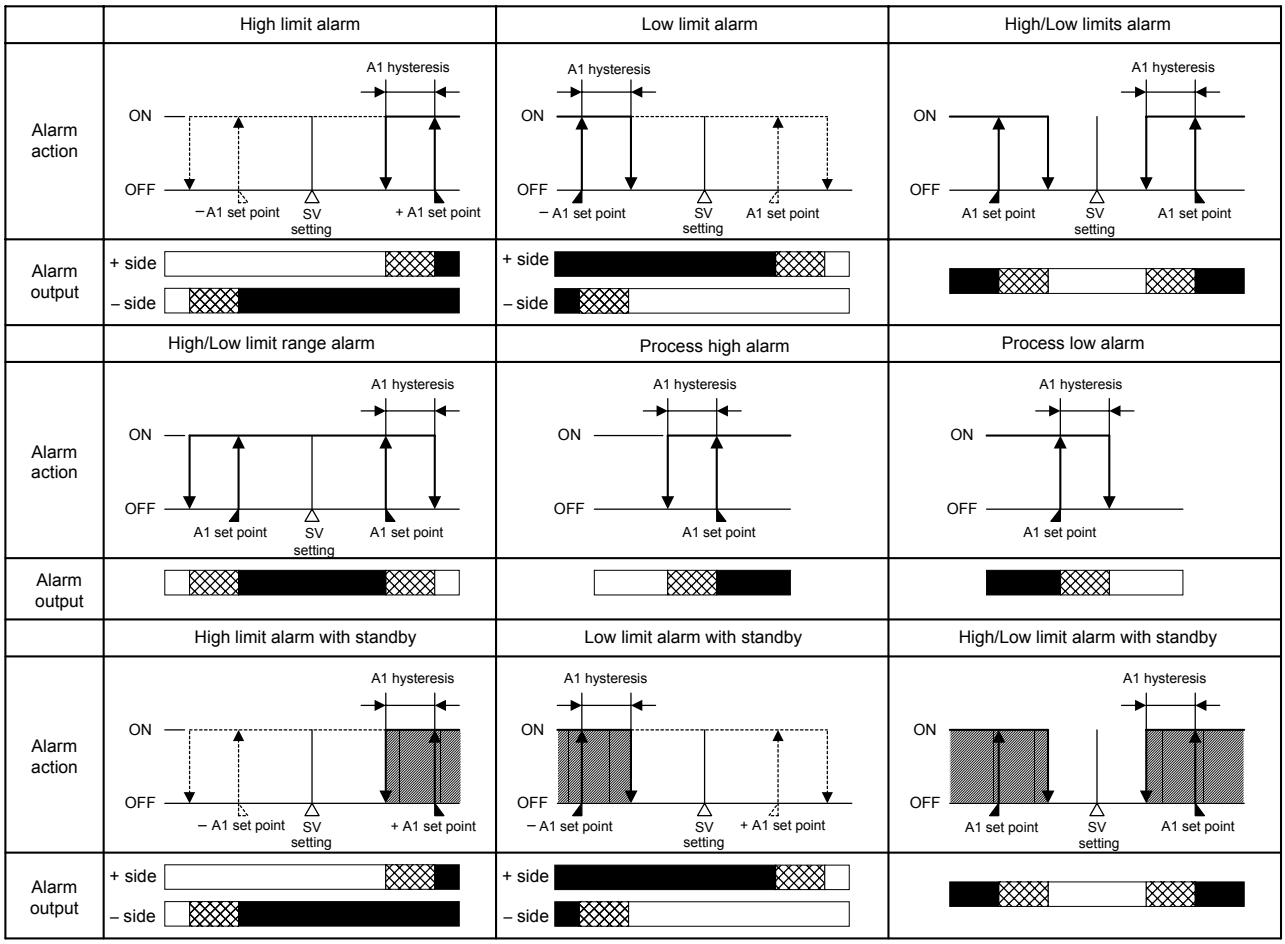


8.2 OUT ON/OFF action



part: Acts ON or OFF.

8.3 EVT (Alarm) action



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

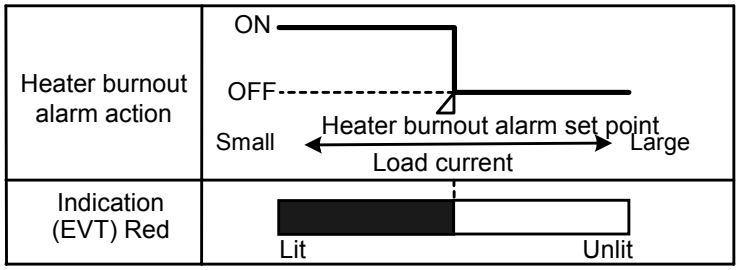
: Event (EVT) output terminals 8 and 9 are connected (ON) or disconnected (OFF).

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

: Standby functions in this section.

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

8.4 EVT (Heater burnout alarm) action



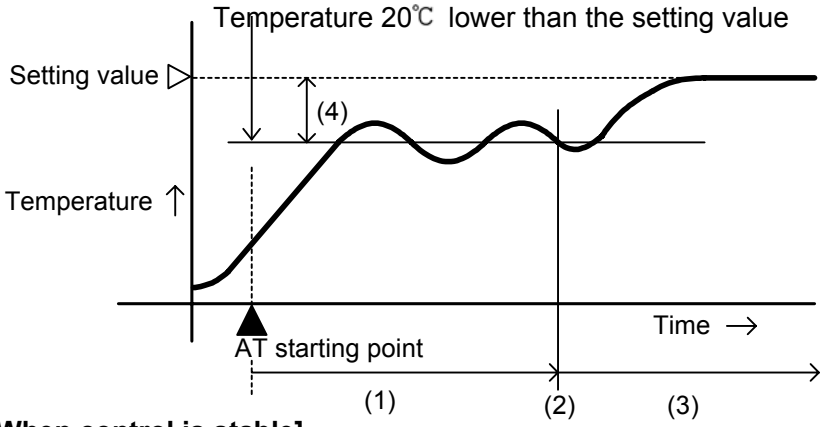
■ : Event (EVT) output terminals 8 and 9 are connected (ON).
□ : Event (EVT) output terminals 8 and 9 are disconnected (OFF).
Event (EVT) output indicator lights up when output terminals 8 and 9 are connected (ON), and goes out when they are disconnected (OFF).

9. PID auto-tuning of the DCL-33A

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.

[In the case of a large difference between the setting value and processing temperature as the temperature is rising]

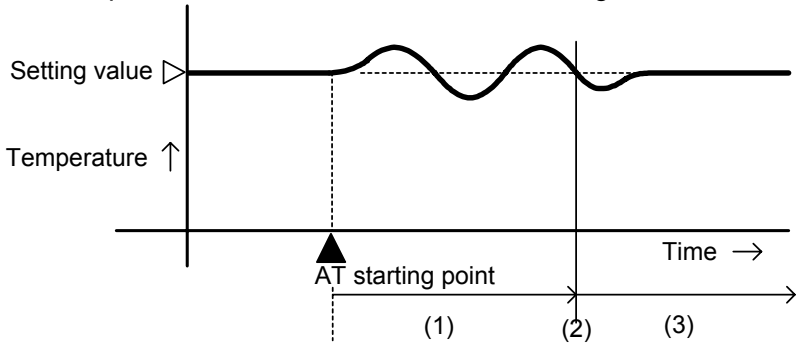
When AT bias is set to 20℃, the AT process will fluctuate at the temperature 20℃ lower than the setting value.



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

[When control is stable]

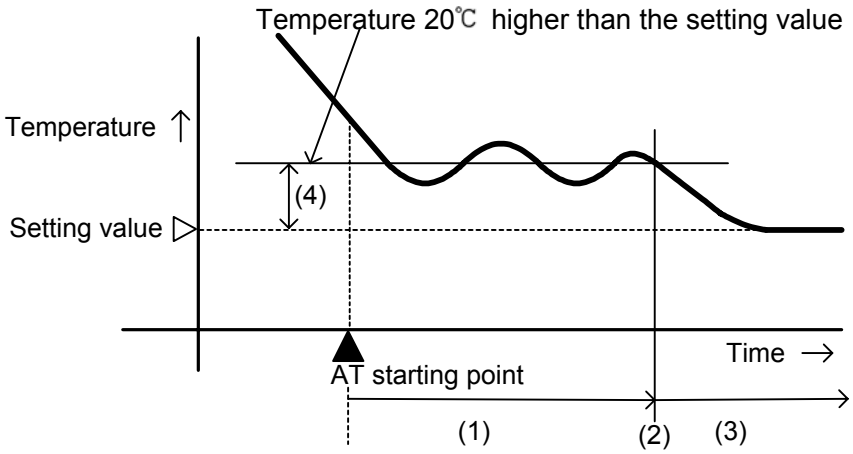
The AT process will fluctuate around the setting value.



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

[In the case of a large difference between the setting value 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 setting value.



(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 name : DIN rail mounting type indicating controller
Mounting method : DIN rail mounting method
Setting method : 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)
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 times
• 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 value alarm) and when input exceeds the range, alarm (EVT) is turned ON or OFF (High/Low limit range alarm).
When Deenergized is selected during the Energized/Deenergized 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/Deenergized: Alarm (EVT) output Energized/Deenergized can be selected.

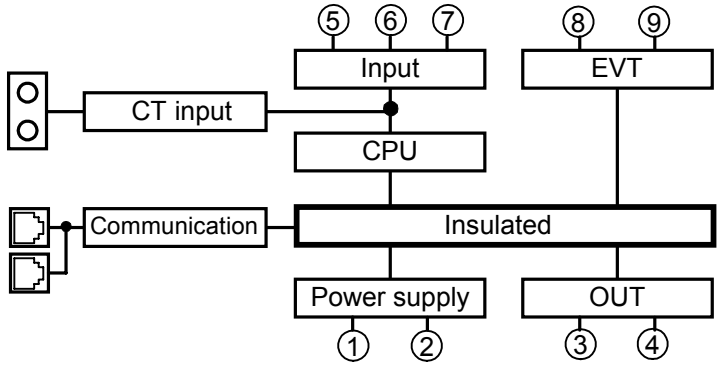
	Energized	Deenergized
Red (EVT) LED	Lights	Lights
EVT output	ON	OFF

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

[Setting 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 any 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 keeps it on the same status as when 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 blinks "- - - -" (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 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 corresponding value for which 0mA or 0V is inputted.

Accessories included: Instruction manual 1 copy
When the option Heater burnout alarm is added: Wire harness 3m, 1 length
When the option Heater burnout alarm is added:
For rating 5A, 10A, 20A CT (CTL-6S) 1 piece
For rating 50A CT (CTL-12-S36-10L1) 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.
This option utilizes common output terminals with Alarm and Loop break alarm.
This option cannot be applied to DC current output.
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 main setting value, PID and other various setting values
(2) Reading of the input value and action status (3) Function change

Cable length : Maximum 1,200m, Cable resistance: Within 50Ω
Communication interface : Based on EIA RS-485
Communication method : Half-duplex communication start-stop synchronous
Communication speed : 2400/4800/9600/19200bps (Selectable by keypad)
Parity : Even/Odd/No (Selectable by keypad)
Stop bit : 1 or 2 (Selectable by keypad)
Communication protocol : Shinko/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 option SVTC) can be transmitted digitally to the DCL-33A (with option C5) by combining the programmable controller with the DCL-33A. [Setting value Lock of the DCL-33A must be set to Lock 3.] 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 former value. Control desired value is the value that is added SVTC bias value to the received value by 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 terminal of the instrument is shorted, and if approximate 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 terminal of the instrument is 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 terminal of thermocouple, RTD or DC voltage(0 to 1V DC) is securely mounted to the instrument terminal. Connect the sensor terminal to the instrument terminal 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 terminal 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 terminal 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 1V DC, and if a corresponding 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 1mA DC, and if a corresponding 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.	• Designation of the sensor input or temperature unit (℃ or ℉) is improper. Set the sensor input and the temperature unit properly. • Sensor correcting value is unsuitable. Set it to a suitable value. • Sensor specification is improper. Set the sensor specification properly. • AC may be leaking into the sensor circuit. Change the sensor for the ungrounded type. • 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.	• Setting value lock (Lock 1 or Lock 2) is designated. Release the lock designation. • During PID 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 unable to set the value.	• Scaling high limit or low limit may be set at the point where the value does not change. Set it again 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 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 more 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.

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