INSTRUCTION MANUAL

DIN Rail Mounted Digital Indicating Limit Controller **DCL-33A-R/M T7887**

DCL33T7887E1 2017.05

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

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 result in serious consequences, 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 electrical shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electrical shock, fire or damage to the instrument, parts replacement may only be undertaken by our 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 purpose-of-use consultation 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. We do 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 according to the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. Not doing so could cause serious injury or malfunction.
- Specifications of the DCL-33A and the contents of this instruction manual are subject to change without notice.
- This instrument is designed to be installed on a DIN rail. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Be sure to turn the power supply to the instrument OFF before cleaning this instrument.
- 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.
- 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 damages.

1. Model

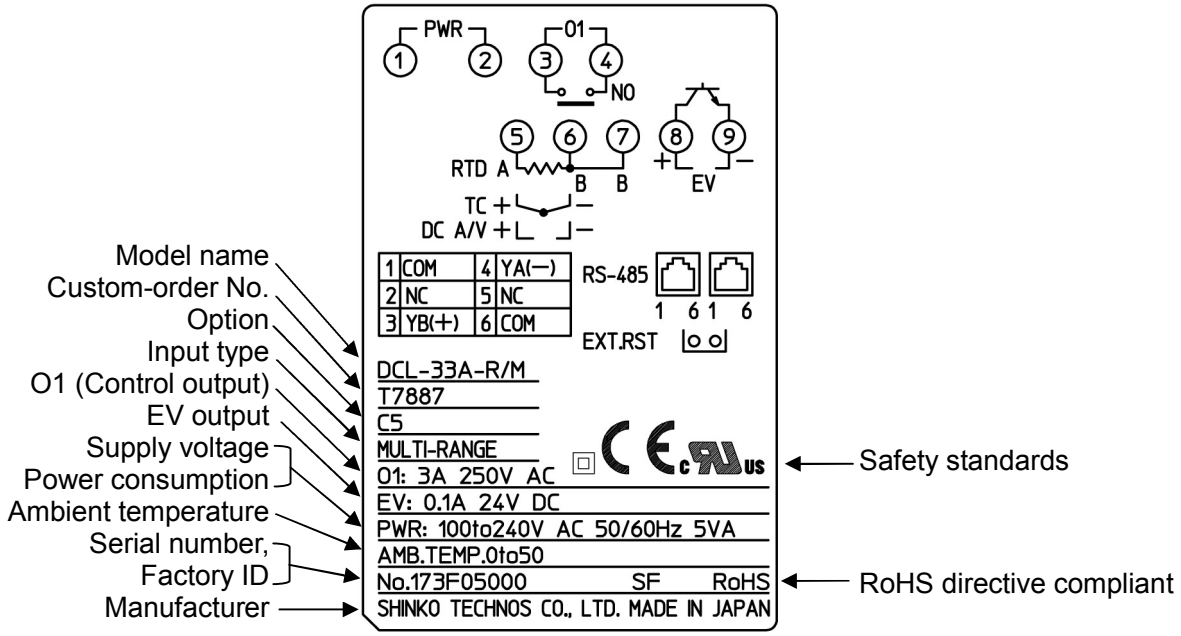
1.1 Model

DCL–33A–R/M T7887, □ □□						W22.5 x H75 x D100mm
Alarm	A					Alarm output (Alarm type is selectable by keypad) *1
Control output		R				Limit control output (Relay contact, 1a)
Input			M			Multi-range *2
Control action				T7887		High limit, Low limit control action
Supply voltage						100 to 240V AC (standard)
					1	24V AC/DC *3
Options					C5	Serial communication (RS-485)
					DI	External reset input

*1: Alarm types (9 types and No alarm action) and Energized/De-energized can be selected by keypad.
*2: Thermocouple, RTD, Direct current, and DC voltage can be selected by keypad.
*3: Supply voltage 100 to 240V AC is standard. When ordering 24V AC/DC, enter "1" after the input code.

1.2 How to Read the Model Label

The model label is attached to the right side of the case.



(Fig. 1.2-1)

2. Name and Functions

(1) RST (RESET) indicator (Green):
Lights when Main output NO contact (terminals 3 and 4) is OFF.

(2) EVT (EVENT) indicator (Red): Lights when the Alarm output is ON.

(3) AUTO indicator (Yellow): Lights for auto start of the limit action.

(4) PV display (Red):
Indicates the PV (process variable) or setting characters in the setting mode. PV flashes in PV/SV display mode under the following conditions (EXCEEDED indication).
High limit action: Flashes when PV≧SV
Low limit action: Flashes when PV≦SV

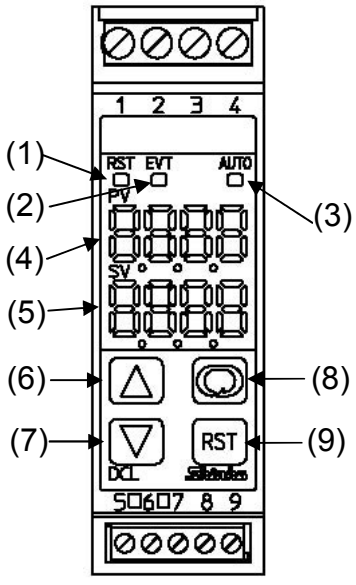
(5) SV display (Green): Indicates the SV (desired value), or each set value in setting mode.

(6) UP key (△): Increases the numeric value.

(7) DOWN key (▽): Decreases the numeric value.

(8) Mode key (◯): Selects the setting mode, or registers the set (selected) value. To register the set (selected) value, press this key.

(9) Reset key (RST): Resets the control output.



⚠ Caution

When setting the specifications and functions of this controller, connect mains power cable to terminals 1 and 2 first, then set them referring to “5. Settings” before performing “3. Mounting to the control panel” and “4. Wiring”.

3. Mounting to the Control Panel

3.1 Site Selection

⚠ Caution

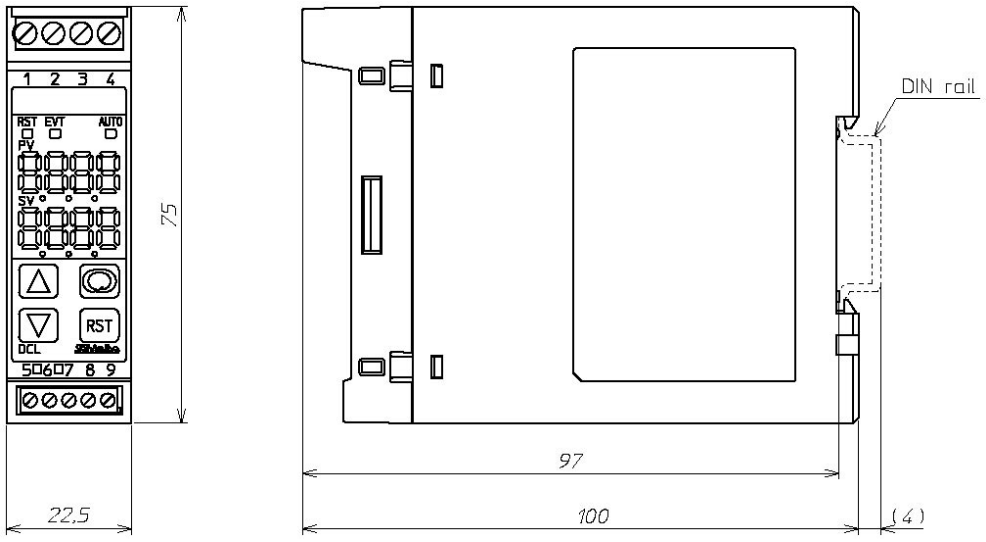
- Use within the following temperature and humidity ranges.
  Temperature: 0 to 50℃ (32 to 122℉), Humidity: 35 to 85%RH (Non-condensing, no icing)
- When this unit is installed on a DIN rail within a control panel, the ambient temperature of this unit – not the ambient temperature of the control panel – must be kept to under 50℃ (122℉). Otherwise the life of electronic components (especially electrolytic capacitors) will be shortened.

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℉) 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 flows
- No water, oil or chemicals or where the vapors of these substances can come into direct contact with the controller

3.2 External Dimensions (Scale: mm)



(Fig. 3.2-1)

3.3 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.
  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. 3.3-1)

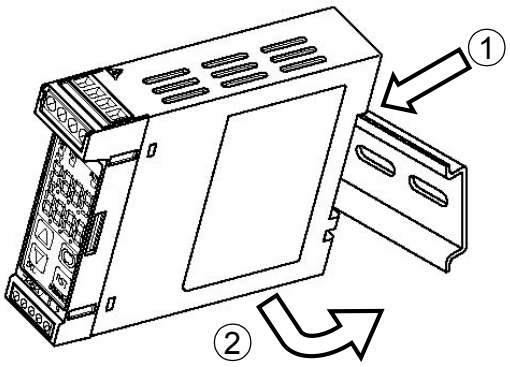
First, hook ① of the DCL-33A on the upper side of the DIN rail.

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 the DIN rail with a “Click” sound.

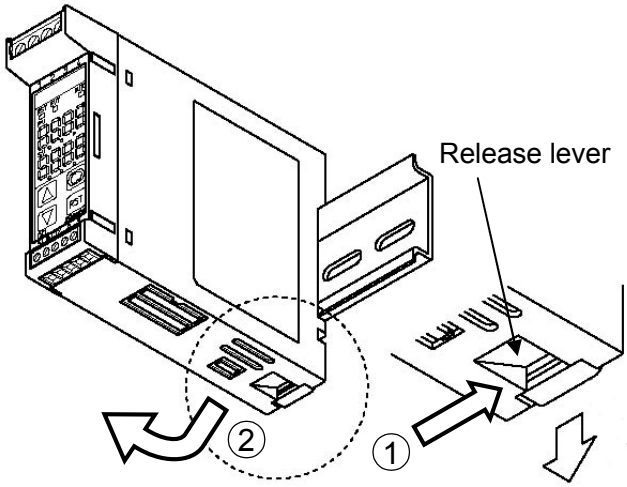
Removal from the DIN rail (Fig. 3.3-2)

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. 3.3-1) Mounting



(Fig. 3.3-2) Removal

4. Wiring

⚠ Warning

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

⚠ Caution

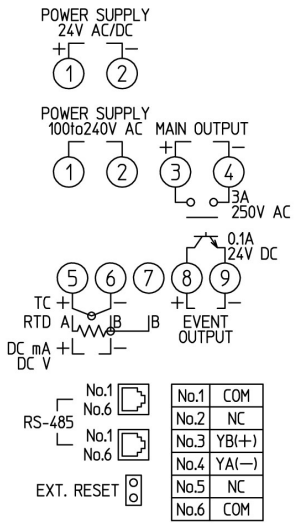
- Do not leave bits of wire in the DCL-33A when wiring, because they could cause a fire or malfunction.
- Insert the connecting cable into the designated connector securely. Not doing so could cause malfunction due to imperfect contact.
- Connect the AC power to the designated terminal as is written in this instruction manual. Otherwise it may burn or damage the DCL-33A.
- Tighten the terminal screw using 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 specifications 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 and fuse. Therefore it is necessary to install a power switch, circuit breaker and fuse in the circuit near the external unit.
  (Recommended fuse: Time-lag fuse, Rated voltage 250V AC, Rated current 2A)

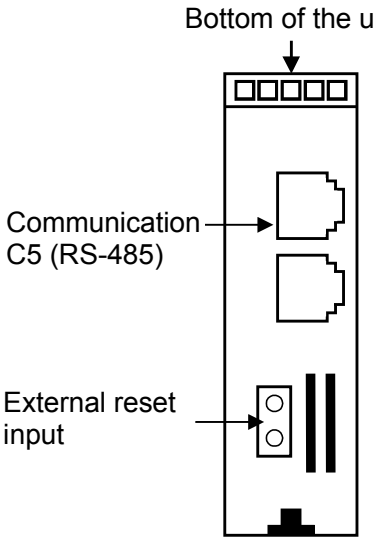
When using ferrules, use the following ferrules and crimping pliers made by Phoenix Contact GMBH &CO.

• 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





- MAIN OUTPUT: Limit control output
- EVENT OUTPUT: Alarm output
- RS-485: Serial communication (C5 option)
- TC: Thermocouple input
- RTD: RTD input
- DC: DC voltage, current input
  For Direct current input, 50Ω shunt resistor must be connected between input terminals.
- EXT. RESET: External reset input (DI option)

(Fig. 4-1)

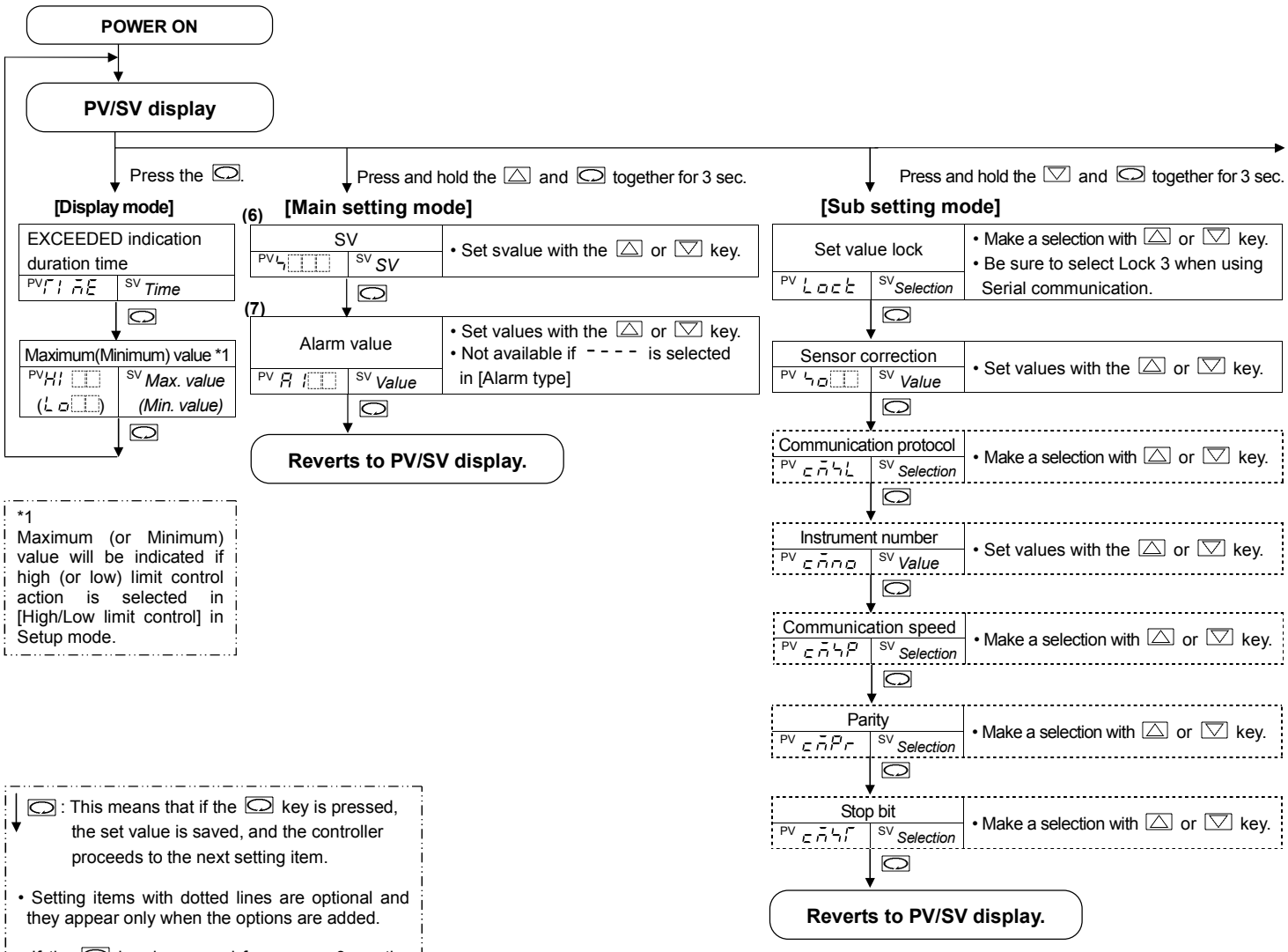
5. Settings

5.1 Operation Flowchart

Outline of Operation Procedure

Set Input type, Alarm (type, value, etc.) and SV (desired value), following the procedure below. Setting item numbers (1) to (7) 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 Setup mode]	Set Input type, Alarm type, etc. in Setup mode. **(1) Input type**: Select an input type. Refer to "Input type (character indication) and range" on page 7. **(2) Alarm type**: Select an alarm type. Refer to "Alarm type" on page 7. [If an alarm type except for [- - - -] is selected, items (3) to (5) 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 hysteresis**: Set Alarm hysteresis. **(5) Alarm action delay time**: Set Alarm action delay time.
[Step 3 Main setting mode]	**(6) SV**: Set SV (desired value) in Main setting mode.
	(7) Alarm value: Set action point of Alarm output in Main setting mode.
[Step 4 Run]	Turn the load circuit power ON. Limit control action starts.



*1
Maximum (or Minimum) value will be indicated if high (or low) limit control action is selected in [High/Low limit control] in Setup mode.

: This means that if the key 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.
- If the key is pressed for approx. 3sec, the controller reverts to PV/SV display mode from any mode.

Input type (character indication) and range			
tc K: K	-200 to 1370℃	tF K: K	-320 to 2500℉
tc J: J	-200 to 1000℃	tF J: J	-320 to 1800℉
tc r: R	0 to 1760℃	tF r: R	0 to 3200℉
tc S: S	0 to 1760℃	tF S: S	0 to 3200℉
tc b: B	0 to 1820℃	tF b: B	0 to 3300℉
tc E: E	-200 to 800℃	tF E: E	-320 to 1500℉
tc T: T	-199.9 to 400.0℃	tF T: T	-199.9 to 750.0℉
tc n: N	-200 to 1300℃	tF n: N	-320 to 2300℉
PLSC: PL-Ⅱ	0 to 1390℃	PLSF: PL-Ⅱ	0 to 2500℉
tc C: C(W/Re5-26)	0 to 2315℃	tF C: 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 DC	-1999 to 9999		
020A: 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: 1 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 PV (process variable) 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 PV (process variable) goes under the low limit set value.
HL (High/Low limits alarm)	: Combines High limit and Low limit alarm actions. When PV (process variable) reaches high limit set value or goes under the low limit set value, the alarm is activated.
oI d (High/Low limit range alarm)	: When PV (process variable) is between the high limit set value and low limit set value, the alarm is activated. If PV exceeds the high limit set value or goes under the low limit set value, the alarm output is turned off.
RH (Process high alarm) rRH (Process low alarm)	Within the scale range of the controller, alarm action points can be set at random and if the PV (process variable) reaches the randomly set action point, the alarm is activated.
H c (High limit with standby alarm) L c (Low limit with standby alarm) HL c (High/Low limits with standby)	When the power to the controller is turned on, even if the PV (process variable) enters the alarm action range, the alarm is not activated. Even if the PV enters the alarm action range due to SV change during operation, the alarm is not activated, either. If the controller is allowed to keep running, once the input exceeds the alarm action point, the standby function will be released.

Press and hold the △, ▽ and ⟲ (in that order) together for 3 sec.

[Setup mode]

(1) Input type — PV SEnS / SV *Selection*
- Make a selection with the △ or ▽ key.
- Default: tc

⟲

Scaling high limit — PV SCLH / SV *Value*
- Set values with the △ or ▽ key.

⟲

Scaling low limit — PV SCLL / SV *Value*
- Set values with the △ or ▽ key.

⟲

Decimal point place — PV dP / SV *Selection*
- Make a selection with the △ or ▽ key.
- Available for DC voltage, current input

⟲

PV filter time constant — PV FILT / SV *Value*
- Set values with the △ or ▽ key.

⟲

(2) Alarm type — PV AL 1F / SV *Selection*
- Make a selection with the △ or ▽ key.
- Default: ----

⟲

(3) Alarm action Energized/De-energized — PV A 1LA / SV *Selection*
- Make a selection with the △ or ▽ key.
- Not available if ---- is selected in [Alarm type]

⟲

(4) Alarm hysteresis — PV A 1HY / SV *Value*
- Set values with the △ or ▽ key.
- Not available if ---- is selected in [Alarm type]

⟲

(5) Alarm action delay time — PV A 1dY / SV *Value*
- Set values with the △ or ▽ key.
- Not available if ---- is selected in [Alarm type]

⟲

High/Low limit control — PV HI Lo / SV *Selection*
- Make a selection with the △ or ▽ key.
- Default: HI LA

⟲

Limit control output hysteresis — PV HYS / SV *Value*
- Set values with the △ or ▽ key.

⟲

Auto/Manual start — PV SrAr / SV *Selection*
- Make a selection with the △ or ▽ key.
- Default: AUTo

⟲

EXCEEDED indication duration time unit — PV A_S / SV *Selection*
- Make a selection with the △ or ▽ key.
- Default: Ai n

⟲

Reverts to PV/SV display.

After the power is turned on, the sensor input characters and temperature unit are indicated on the PV display, and the input range high limit value is indicated on the SV display for approximately 3 seconds. See (Table 5.1-1).
(If any other value is set in [Scaling high limit], the value is indicated on the SV display)
During this time, all outputs and the LED indicators are in OFF status.
Limit control will then start, indicating the PV (process variable) on the PV display, and SV (desired value) on the SV display.

(Table 5.1-1)

Sensor input	℃		℉	
	PV display	SV display	PV display	SV display
K	K □□C	1370	K □□F	2500
	K □ .C	400.0	K □ .F	750.0
J	J □□C	1000	J □□F	1800
R	r □□C	1760	r □□F	3200
S	S □□C	1760	S □□F	3200
B	b □□C	1820	b □□F	3300
E	E □□C	800	E □□F	1500
T	T □ .C	400.0	T □ .F	750.0
N	n □□C	1300	n □□F	2300
PL-Ⅱ	PL2C	1390	PL2F	2500
C (W/Re5-26)	C □□C	2315	C □□F	4200
Pt100	Pt .C	850.0	Pt .F	999.9
	Pt □C	□850	Pt □F	1500
JPt100	JPt.C	500.0	JPt.F	900.0
	JPtC	□500	JPtF	□900
4 to 20mA DC	4.20A	Scaling high limit value		
0 to 20mA DC	0.20A			
0 to 1V DC	0 □ 1V			
0 to 5V DC	0 □ 5V			
1 to 5V DC	1 □ 5V			
0 to 10V DC	0 10V			

5.2 Display Mode

Selects an item to be indicated on the PV and SV display.

Use the ⟲ key for switching the indication. When power is turned on, the PV/SV display is indicated.

Character	Name, Function, Setting range	Default value
	PV/SV display The PV display indicates PV (process variable), and the SV display indicates SV (desired value).	
ᴱˣᵀᴹ	**EXCEEDED indication duration time** The PV display indicates ᴱˣᵀᴹ, and the SV display indicates "EXCEEDED indication duration time". • Measurement range: 0.00 to 99.59 (The time unit can be selected in [EXCEEDED indication duration time unit] in Setup mode.) • Reverts to the default value (0.00 Hours.Minutes/Minutes.Seconds) if the RST key is pressed, or if the External reset input terminals are closed.	
ᴴᴵ □□ (ᴸᵒ□□)	**Maximum (Minimum) value indication** • During EXCEEDED indication, the PV display indicates ᴴᴵ □□ or ᴸᵒ□□, and the SV display indicates the maximum or minimum value. If High limit control action is selected in [High/Low Limit control] in Setup mode, the maximum value is indicated, and if Low limit control action is selected, the minimum value is indicated. • Reverts to the current PV (process variable) if the RST key is pressed, or if the External reset input terminals are closed.	

5.3 Main Setting Mode

Sets SV and Alarm value.

In PV/SV display mode, press and hold the △ and ⟲ keys (in that order) together for 3 seconds. The unit enters Main setting mode.

To set values, use the △ or ▽ key.

To register the value, use the ⟲ key.

Character	Name, Function, Setting range	Default value
ˢ□□□	**SV** • Sets SV (desired value). • Setting range: Scaling low limit to Scaling high limit	0℃
ᴬ¹□□	**Alarm value** • Sets the action point of Alarm output. • Not available if No alarm is selected in [Alarm type]. • Setting range: Refer to (Table 5.3-1).	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 with standby alarm	– (Scaling span) to Scaling span℃(℉)
Low limit with standby alarm	– (Scaling span) to Scaling span℃(℉)
High/Low limits with standby alarm	0 to Scaling span℃(℉)

• When input has a decimal point, the negative low limit value is –199.9, and the positive high limit value is 999.9.

• All alarm actions except process alarm are ±deviation setting from the SV (desired value).

5.4 Sub Setting Mode

Sets Set value lock, Sensor correction value, Communication parameters (when C5 option is added), etc.
In PV/SV display mode, press and hold the ▽ and ◎ keys (in that order) together for approx. 3 sec.
The unit enters Sub setting mode.
To set values, use the △ or ▽ key.
To register the value, use the ◎ key.

Character	Name, Function, Setting range	Default value
Lock	**Set value lock** • Locks the set values to prevent setting errors. The setting item to be locked depends on the selection. • Selection item: ---- (Unlock): All set values can be changed. Loc 1 (Lock 1): None of the set values can be changed. Loc2 (Lock 2): Only SV (desired value) can be changed. Loc3 (Lock 3): All set values except input type can be changed temporarily. However, do not change any setting item in Setup mode. Changed values revert to their previous value after power is turned off because they are not saved in the non-volatile memory.	Unlock
Sn□□	**Sensor correction** • Sets the correction value for the sensor. PV= Current PV + Sensor correction value • Setting range: –100.0 to 100.0℃ (℉), DC input: –1000 to 1000 (The placement of the decimal point follows the selection.)	0.0℃
cnnL	**Communication protocol** • Selects the communication protocol. • Available only when the C5 option is ordered. • Selection item: nonL: Shinko protocol nodA: Modbus ASCII mode nodr: Modbus RTU mode	Shinko protocol
cnno	**Instrument number** • Sets the individual instrument number to each instrument when communicating by connecting multiple instruments in serial communication. • Available only when the C5 option is added. • Setting range: 0 to 95	0
cnnP	**Communication speed** • Selects a communication speed equal to that of the host computer. • Available only when the C5 option is added. • Selection item: □□24: 2400bps □□48: 4800bps □□96: 9600bps □192: 19200bps	9600bps
cnPr	**Parity** • Selects the parity. • Available only when the C5 option is added. Not available if Shinko protocol is selected in [Communication protocol]. • Selection item: nonE: No parity EvEn: Even odd□: Odd	Even
cnnr	**Stop bit** • Selects the stop bit. • Available only when the C5 option is added. Not available if Shinko protocol is selected in [Communication protocol]. • Selection item: □□□1: 1 □□□2: 2	1

5.5 Setup Mode

Sets input type, Alarm type, High/Low limit control action, etc.
In PV/SV display mode, press the △, ▽ and ⟲ keys (in that order) together for approx. 3 seconds.
The unit enters Setup mode.
To set values, use the △ or ▽ key.
To register the value, use the ⟲ key.

Character	Name, Function, Setting range	Default value
INTY	**Input type** • The input type can be selected from thermocouple (10 types), RTD (2 types), DC current (2 types) and DC voltage (4 types), and the unit ℃/℉ can be selected as well. • When changing the input from DC voltage to other inputs, remove the sensor connected to this controller first, then change the input. If the input is changed with the sensor connected, the input circuit may break. • Selection item:	K (–200 to 1370℃)
	K: -200 to 1370℃ / -320 to 2500℉ K: -199.9 to 400.0℃ / -199.9 to 750.0℉ J: -200 to 1000℃ / -320 to 1800℉ R: 0 to 1760℃ / 0 to 3200℉ S: 0 to 1760℃ / 0 to 3200℉ B: 0 to 1820℃ / 0 to 3300℉ E: -200 to 800℃ / -320 to 1500℉ T: -199.9 to 400.0℃ / -199.9 to 750.0℉ N: -200 to 1300℃ / -320 to 2300℉ PL-Ⅱ: 0 to 1390℃ / 0 to 2500℉ C(W/Re5-26): 0 to 2315℃ / 0 to 4200℉ Pt100: -199.9 to 850.0℃ / -199.9 to 999.9℉ JPt100: -199.9 to 500.0℃ / -199.9 to 900.0℉ Pt100: -200 to 850℃ / -300 to 1500℉ JPt100: -200 to 500℃ / -300 to 900℉ 4-20mA DC: -1999 to 9999 0-20mA DC: -1999 to 9999 0-1V DC: -1999 to 9999 0-5V DC: -1999 to 9999 1-5V DC: -1999 to 9999 0-10V DC: -1999 to 9999	
SCLH	**Scaling high limit** • Sets scaling high limit value. • Setting range: Scaling low limit to input range high limit	1370℃
SCLL	**Scaling low limit** • Sets scaling low limit value. • Setting range: Input range low limit to scaling high limit	–200℃
DP	**Decimal point place** • Selects decimal point place. • Available only for DC input • Selection item: 0000: No decimal point 000.0: 1 digit after decimal point 00.00: 2 digits after decimal point 0.000: 3 digits after decimal point	No decimal point
FILT	**PV filter time constant** • Sets PV filter time constant. (If the value is set too large, it affects control result due to the delay of response.) • Setting range: 0.0 to 10.0 seconds	0.0 seconds

AL 1F	**Alarm type** • Selects an alarm action type. • Selection item: ----: No alarm action H□□□: High limit alarm L□□□: Low limit alarm HL□□: High/Low limits alarm oId□: High/Low limit range alarm R5□□: Process high alarm rR5□: Process low alarm H□□o: High limit with standby alarm L□□o: Low limit with standby alarm HL□o: High/Low limits with standby alarm	No alarm action
A1LA	**Alarm action Energized/De-energized** • Selects Alarm action Energized/De-energized. • Not available if No alarm action is selected in [Alarm type] • Selection item: nonL: Energized rEV5: De-energized	Energized
A1HY	**Alarm hysteresis** • Sets Alarm hysteresis. • Not available if No alarm action is selected in [Alarm type] • Setting range: 0.1 to 100.0℃(℉), DC input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃
A1dY	**Alarm action delay time** • Sets Alarm action delay time. When setting time has elapsed after the input enters the alarm output range, the alarm is activated. • Not available if No alarm action is selected in [Alarm type] • Setting range: 0 to 9999 seconds	0 seconds
HILo	**High/Low limit control action** • Selects either High limit or Low limit control action. • Selection item: HILn: High limit control action LoLn: Low limit control action	High limit control action
HY5□	**Limit control output hysteresis** • Sets Limit control output hysteresis. • Setting range: 0.1 to 100.0℃(℉), DC input: 1 to 1000 (The placement of the decimal point follows the selection.)	1.0℃
5rAr	**Auto/Manual start** • Selects either auto or manual start of the limit control action. (Refer to Section 7.3) • Selection item: AUTo: Auto start nAnU: Manual start	Auto start
n_5□	**EXCEEDED indication duration time unit** • Selects the unit of “EXCEEDED indication duration time”. • Selection item: nIn□: Hours.Minutes 5Ec□: Minutes.Seconds	Hours.Minutes

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 using multiple controllers, sometimes the measured temperatures (PV) do not match due to differences in sensor accuracy or dispersion of load capacities.

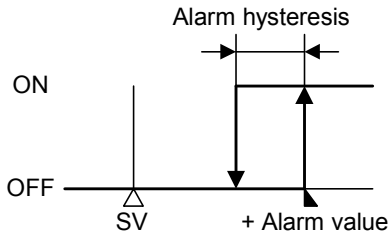
In such a case, the control can be set at the desired temperature by adjusting the input value of sensors.

Energized/De-energized

When Alarm Energized is selected, the Alarm output (terminals 8, 9) is conducted (ON) while the Alarm output indicator is lit.
The Alarm output is not conducted (OFF) while the Alarm output indicator is not lit.

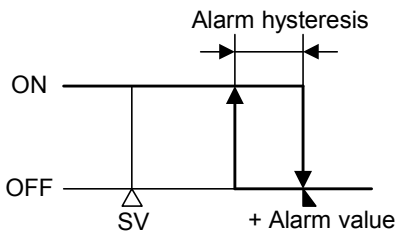
When Alarm De-energized is selected, the Alarm output (terminals 8, 9) is not conducted (OFF) while the Alarm output indicator is lit.
The Alarm output is conducted (ON) while the Alarm output indicator is not lit.

High limit alarm (when Energized is set)



(Fig. 5.5-1)

High limit alarm (when De-energized is set)



(Fig. 5.5-2)

6. Operation

After the unit is mounted to the control panel and wiring is completed, operate the unit following the procedure below.

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

Switch power supply to the DCL-33A ON.

- For approx. 3 sec after the power is switched ON, the sensor input characters and the temperature unit are indicated on the PV display, and input range high limit value is indicated on the SV display. See (Table 5-1). (If any other value has been set in [Scaling high limit], the value is indicated on the SV display.). During this time, all outputs and LED indicators are in OFF status.
- After that, limit control starts, indicating PV (process variable) on the PV display, and SV (desired value) on the SV display.

(2) Enter each set value.

Enter each set value. Refer to Section “5. Settings”.

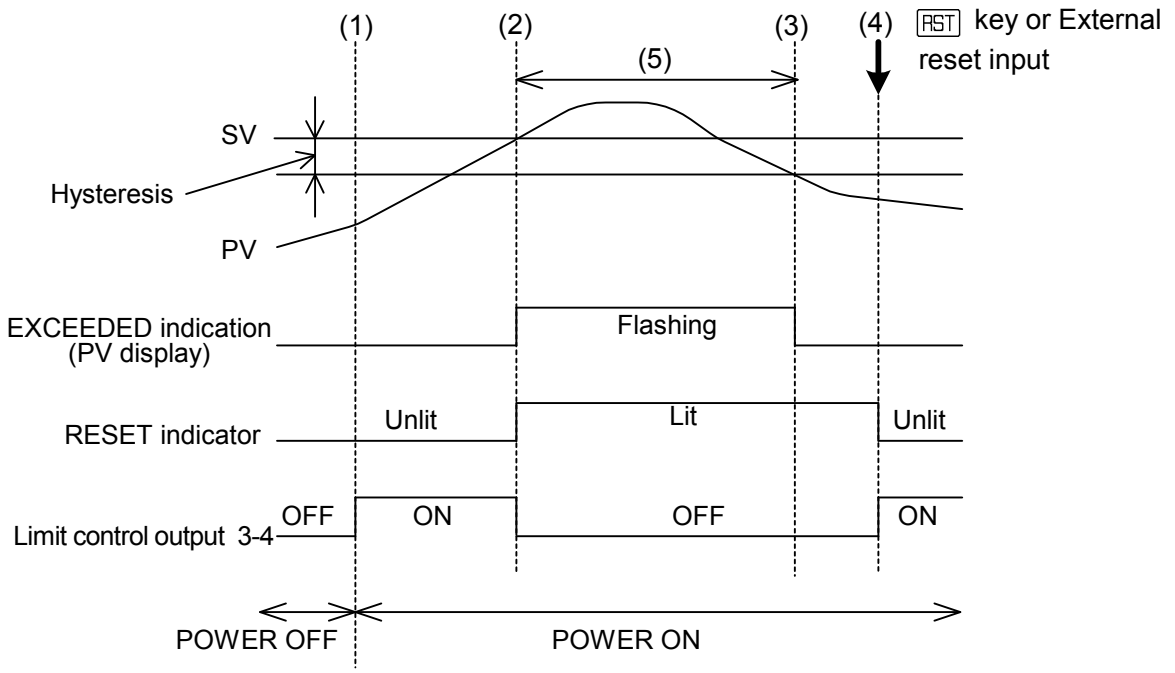
(3) Turn the load circuit power ON.

Limit control action starts.

7. Action Explanation

7.1 High Limit Control Action (Fig. 7.1-1)

Auto start will be used for purposes of explanation of the High limit control action. (Refer to Section 7.3)



(Fig. 7.1-1)

(1) Limit control action will initiate after power supply to the controller is turned on.

(2) If PV exceeds SV, the PV in PV/SV display mode flashes (EXCEEDED indication) and the RESET indicator lights.
Limit control output (terminals 3, 4) is turned OFF.

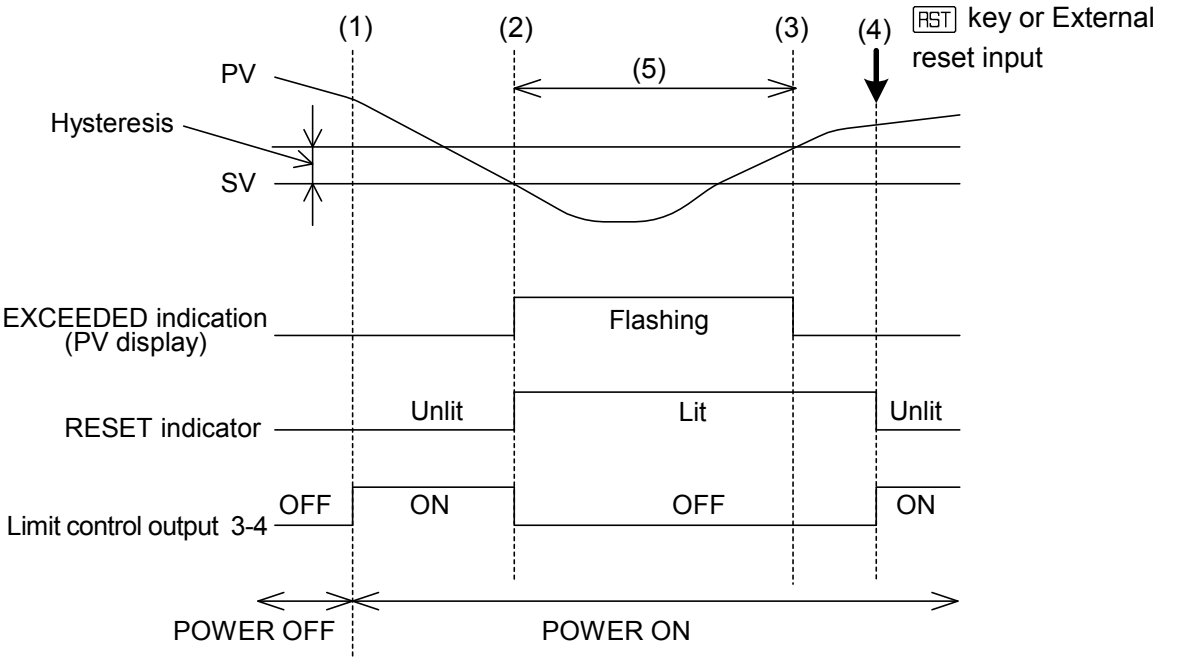
(3) If PV drops below [SV-Hysteresis], the EXCEEDED indication stops.
At this time, the RESET indicator is lit, and Limit control output (terminals 3, 4) is in OFF status.

(4) If the RST key is pressed, or if External reset input terminals are closed, the RESET indicator is turned OFF, Limit control output (terminals 3, 4) is turned ON, and limit control action initiates again.

(5) While the EXCEEDED indication continues, even if the RST key is pressed or if External reset input terminals are closed, limit control action does not initiate.

7.2 Low Limit Control Action (Fig. 7.2-1)

Auto start will be used for purposes of explanation of the Low limit control action. (Refer to Section 7.3)



(Fig. 7.2-1)

(1) Limit control action will initiate after power supply to the controller is turned on.

(2) If PV drops below SV, the PV in PV/SV display mode flashes (EXCEEDED indication) and the RESET indicator lights, and Limit control output NO contact (terminals 3, 4) is turned OFF.

(3) If PV exceeds [SV+ Hysteresis], the EXCEEDED indication stops.
At this time, the RESET indicator is lit, and Limit control output (terminals 3, 4) is in OFF status.

(4) If the RST key is pressed, or if External reset input terminals are closed, the RESET indicator is turned off, Limit control output (terminals 3, 4) is turned ON, and limit control action initiates again.

(5) While the EXCEEDED indication continues, even if the RST key is pressed, or even if External reset input terminals are closed, limit control action does not initiate.

7.3 Auto/Manual Start of the Limit Control

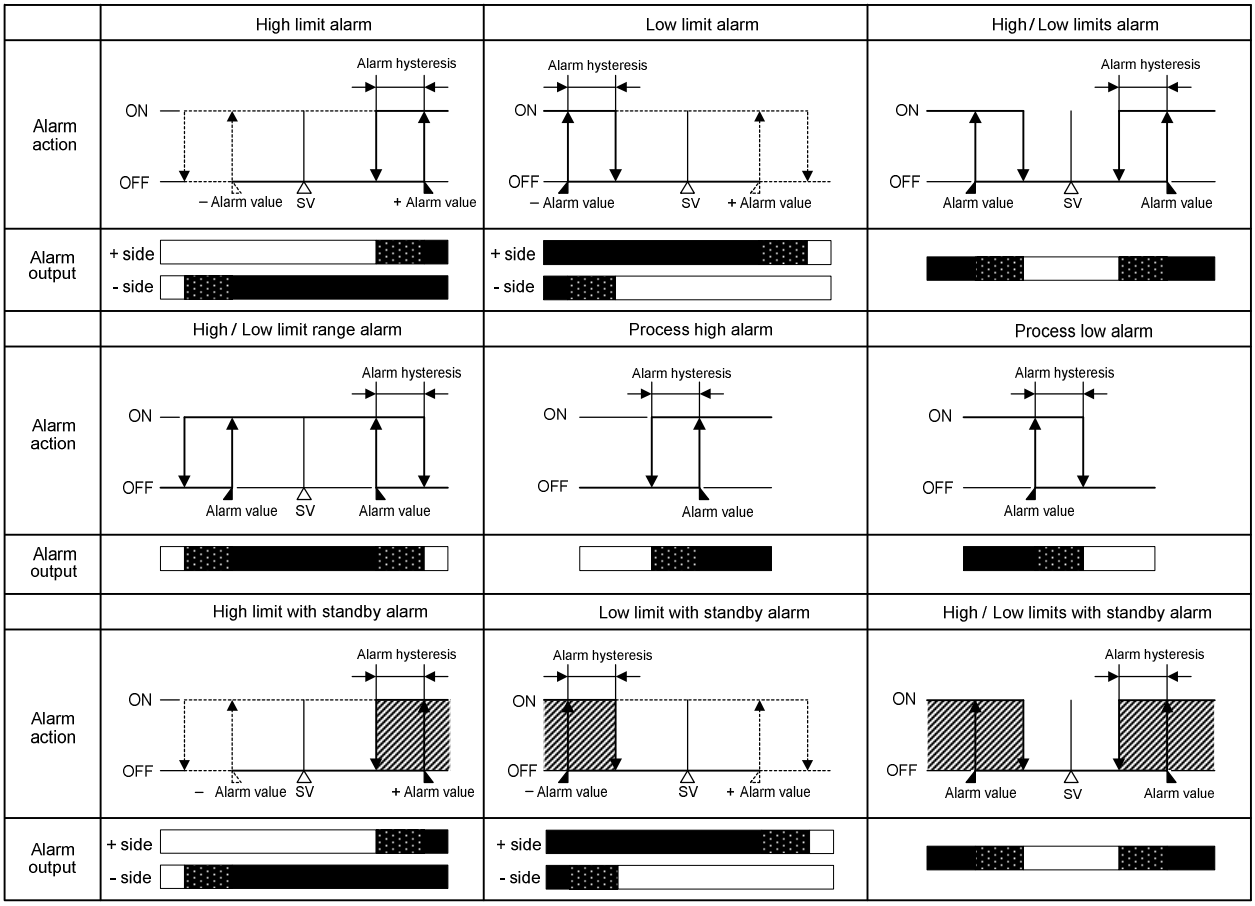
Auto start

When the power supply is turned on, or after the power is restored, the AUTO indicator lights, limit control output (terminals 3, 4) is automatically turned ON, and limit control starts even though the RST key has not been pressed or even though External reset input terminals are not closed. While the EXCEEDED indication continues, limit control action does not initiate.

Manual start

When the power supply is turned on, or after the power is restored, the RESET indicator lights, and Limit control output (terminals 3, 4) is turned OFF.
Press the RST key, or close the External reset input terminals. Limit control action will initiate. However, while the EXCEEDED indication continues, limit control action does not initiate.

7.4 Alarm Action



: Alarm output terminals 8, 9: ON
: Alarm output terminals 8, 9: ON or OFF
: Alarm output terminals 8, 9: OFF
: Alarm output is in standby.

• EVT indicator lights when alarm output terminals 8 and 9 are ON, and turns OFF when alarm output terminals 8 and 9 are OFF.

10. Specifications

10.1 Standard Specifications

Model: DIN rail mounted digital indicating limit controller
Mounting: DIN rail
Setting: Input system using membrane sheet key
Display PV display: Red LED 4 digits, character size 7.4 x 4.0mm (H x W)
SV display: Green LED 4 digits, character size 7.4 x 4.0mm (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)

Direct 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
Direct current: Within ±0.2% of input span±1 digit

Input sampling period: 0.25 seconds

Limit control output

Relay contact: 1a, Control capacity: 3A 250V AC (resistive load)
1A 250V AC (inductive load cosϕ=0.4)
Electrical life: 100,000 cycles

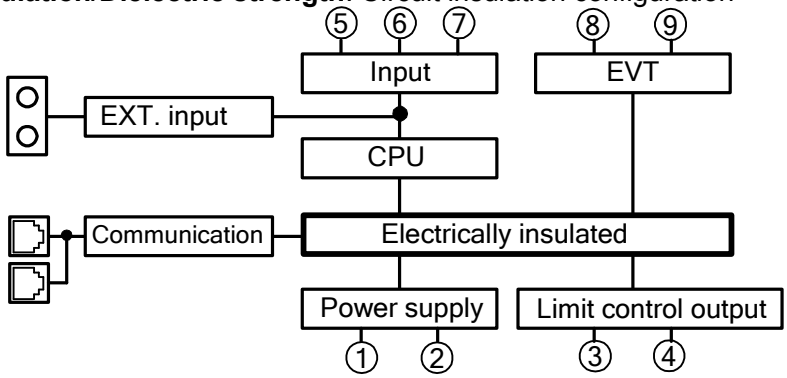
Alarm output

Action: ON/OFF action
Hysteresis: 0.1 to 100.0℃ (℉), DC input: 1 to 1000 (The placement of the decimal point follows the selection.)
Output: Open collector
Control capacity: 0.1A 24V DC

Limit control action

High limit control action, Low limit control action
Limit control output hysteresis: 0.1 to 100.0℃ (℉), or 1 to 1000

Insulation/Dielectric strength: Circuit insulation configuration



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: 100 to 240V AC: Approx. 5VA, 24V AC: Approx. 4VA, 24V DC: Approx. 4W
Ambient temperature: 0 to 50℃ (32 to 122℉)
Ambient humidity: 35 to 85%RH (Non-condensing)
Weight: Approx.100g
External dimensions: 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 if an abnormal status is found on the CPU, the controller is switched to warm-up status, turning all outputs OFF.

[Automatic cold junction temperature compensation] (Only thermocouple input)

Detects the temperature at the connection terminal between the thermocouple and the instrument and always maintains the same status as if the reference junction location temperature were at 0℃ (32℉).

[Burnout]

When the thermocouple or RTD input is burnt out, PV becomes its maximum value, and the PV display flashes [ ].

[Input error indication]

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℉)]

Contents and Indication	Output status Terminals 3, 4
Overscale: Measured value has exceeded Indication range high limit value. [‾ ‾ ‾ ‾] flashes.	Open
Underscale: Measured value has dropped below Indication range low limit value. [_ _ _ _] flashes.	Open

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, the 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.

[Warm-up indication]

After the power supply to the instrument is turned on, the PV display indicates input type, and the SV display indicates scaling high limit value for 3 seconds.

[Peak (or Bottom) value hold function]

While the EXCEEDED indication (the PV display flashes) continues, the peak value is maintained during high limit action, or Bottom (the lowest) value is maintained during low limit action. Present measured value will be initialized after reset using the RESET key or the external reset input function.

[EXCEEDED indication duration time]

EXCEEDED indication duration time (the PV display flashes) can be measured and indicated by pressing the Mode (◁▷) key in PV/SV display mode.
Measurement range: 0:00 to 99:59 (Hours:Minutes, Minutes:Seconds)
Duration time will be initialized to 0:00 after reset using the RESET key or the external reset input function.

Accessories included: Instruction manual: 1 copy
Wire harness 3m: 1 length (When the DI option is added)

Accessories sold separately: 50Ω shunt resistor for Direct current input: 1 piece

10.2 Optional Specifications

Serial Communication (Option code: C5)

The following operations are performed from an 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
Synchronization method: Start-stop synchronization
Communication speed: 2400/4800/9600/19200bps (Selectable by keypad)
Parity: Even/Odd/No parity (Selectable by keypad)
Stop bit: 1 or 2 (Selectable by keypad)
Communication protocol: Shinko protocol/Modbus RTU/Modbus ASCII (Selectable by keypad)

Data format

Communication protocol	Shinko protocol	Modbus ASCII	Modbus RTU
Start bit	1	1	1
Data bit	7	7	8
Parity	Even	Selection (Even)	Selection (No parity)
Stop bit	1	Selection (1)	Selection (1)

Data bit is automatically switched upon selecting the communication protocol.
( ): Basic set value

Number of connectable units: A maximum of 31 units per host computer
Communication error detection : Dual detection by the parity and checksum

External reset input (Option code: DI)

If External reset input is closed while the RESET indicator is lit, the RESET indicator is turned off, limit control output (terminals 3, 4) is turned ON, and limit control action initiates.
Reset is impossible for the following conditions:
SV≦PV for High limit action
SV≧PV for Low limit action

However, while the EXCEEDED indication continues, limit control action does not initiate even though External reset input is closed.

External reset input Open: Reset OFF

External reset input Closed : Reset ON

Circuit current when closed: 1mA

If the DI option is added, UL will not be approved.

9. Troubleshooting

If any malfunctions occur, refer to the following items after checking that power is being supplied to the controller.

9.1 Indication

Problem	Possible Cause and Solution
[ᴱˣ ᵀᴵᴹᴱ] is indicated on the PV display.	• The controller is in the EXCEEDED indication duration time mode. Press the ⟲ key twice to revert to the PV/SV display mode.
[ᴴᴵ ▯▯] or [ᴸᵒ ▯▯] is indicated on the PV display.	• Maximum (or Minimum) value is indicated. Press the ⟲ key once to revert to the PV/SV display mode.
[‾ ‾ ‾ ‾] is flashing on the PV display.	• Burnout of thermocouple, RTD or disconnection of DC voltage (0 to 1V DC) 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 of 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 input terminals. Connect the sensor terminals to the instrument input terminals securely.
[- - - -] is flashing on the PV display.	• Check whether input signal wire for DC voltage (1 to 5V DC) or Direct current (4 to 20mA DC) is disconnected. **How to check whether the input signal wire is disconnected** [DC voltage (1 to 5V DC)] If the input to the input terminals of the instrument is 1V DC and if a scaling low limit value is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. [Direct current (4 to 20mA DC)] If the input to the input terminals of the instrument is 4mA DC 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 input signal wire for DC voltage (1 to 5V DC) or direct current (4 to 20mA DC) is securely connected to the instrument input terminals. • Check if polarity of thermocouple or compensating lead wire is correct. • Check whether codes (A, B, B) of RTD agree with the instrument terminals.
The indication of PV display is irregular or unstable.	• Check whether sensor input or temperature unit (℃ or ℉) is correct. Select the sensor input and temperature unit (℃ or ℉) properly. • Sensor correcting value is unsuitable. Set it to a suitable value. • Check whether the specification of the sensor is correct. • 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 the instrument clear of any potentially disruptive equipment.

The PV display keeps indicating the value which was set in [Scaling low limit].	• Check whether the input signal wire for DC voltage (0 to 5V DC, 0 to 10V DC) and Direct current (0 to 20mA DC) is disconnected. **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 terminals of the instrument is 1V DC and if a value (converted value from Scaling high, low limit setting) corresponding to 1V DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. [Direct current (0 to 20mA DC)] If the input to the input terminals of the instrument is 4mA DC and if a value (converted value from Scaling high, low limit setting) corresponding to 4mA DC is indicated, the instrument is likely to be operating normally, however, the signal wire may be disconnected. • Check whether the input terminals for DC voltage (0 to 5V DC, 0 to 10V DC) or Direct current (0 to 20mA DC) are securely connected to the instrument input terminals.
[Err 1] is indicated on the PV display.	• Internal memory is defective. Contact our agency or us.

9.2 Key Operation

Problem	Possible Cause and Solution
• Unable to set the SV, Alarm value, etc. • The values do not change by △, ▽ keys.	• Set value lock (Lock 1 or Lock 2) is selected. Release the lock.
The setting indication does not change within the input range even if the △, ▽ keys are pressed, and new values are unable to be set.	• Scaling high or low limit value in Setup mode may be set at the point where the value does not change. Set it to a suitable value while in Setup mode.

9.3 Control

Problem	Possible Cause and Solution
Temperature does not rise.	• Sensor is out of order. Replace the sensor. • Check whether the sensor or control output terminals are securely mounted to the instrument input terminals. Ensure that the sensor or control output terminals are connected to the instrument input terminals securely. • Check whether the wiring of sensor or control output terminals is correct.

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

SHINKO TECHNOS CO., LTD.
OVERSEAS DIVISION
Head Office : 2-5-1, Senbahigashi, Minoo, Osaka, Japan
URL: http://www.shinko-technos.co.jp/e/ Tel : +81-72-727-6100
E-mail: overseas@shinko-technos.co.jp Fax: +81-72-727-7006