

Thank you for purchasing our temperature indicating controller FCL. This manual contains instructions for the mounting, functions, operations and notes when operating the FCL. To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

**Characters used in this manual**

Indication	-1	0	1	2	3	4	5	6	7	8	9	℃	℉
Number, °C/°F	-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

**Notes**

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow the warnings, cautions and notices. Not doing so could cause serious injury or malfunction.
- Specifications of the FCL and 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 through a control panel. If it is not, measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos CO., LTD. is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.

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

The safety precautions are classified into 2 categories: "Warning" and "Caution". Depending on the circumstances, procedures indicated by ⚠ Caution may be linked to serious results, so be sure to follow the directions for usage.

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

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

**⚠ Warning**

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

**⚠ Safety precautions**

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

**Caution with respect to Export Trade Control Ordinance**

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

# 1. Installation precautions



## Caution

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

Ensure the mounting location corresponds to the following conditions:

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

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

# 2. Wiring precautions



## Caution

- Do not leave bits of wire in the instrument, because they could cause a fire or malfunction.
- Use a solderless terminal with an insulation sleeve in which an M3 screw fits when wiring the FCL.
- Tighten the terminal screw to within the specified torque. If excessive force is applied to the screw when tightening, the terminal screw or case may be damaged.
- This instrument does not have a built-in power switch, circuit breaker or fuse.  
It is necessary to install them near the controller.  
(Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).
- Do not apply a commercial power source to the sensor which is connected to the input terminal nor allow the power source to come into contact with the sensor.
- Use a thermocouple and compensating lead wire that correspond to the sensor input specification of this controller.
- Use a 3-wire RTD system according to the sensor input specifications of this controller.
- When using a relay contact output type, externally use a relay according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires to avoid external interference.

# 3. Operation and maintenance precautions



## Caution

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

# 1. Model

## 1.1 FCL-130

F C L - 1 3 0 - □ / E □ □, □ □ □ □ □ □		FCL-130 (W48 x H24 x D98.5mm)	
Alarm	0		No alarm action
Control output (OUT)	R		Relay contact
	S		Non-contact voltage (for SSR drive)
	A		DC current (4 to 20mA DC)
Input	E		TC multi-range input, TC K input
Option	TC		Terminal cover
	BK		Color, black
Range (user specified)		0 to 400°C	Specify a range only for TC K input. (Changeable by the keypad operation.)
		0.0 to 400.0°C	
		0 to 750°F	
		0.0 to 750.0°F	

Alarm action is not standard for the FCL-130 type.

There are 2 input types for the FCL-130; TC (thermocouple) multi-range input and TC (thermocouple) K input. When the input type is TC K input, specify a range when ordering.

The options applicable to the FCL-130 are [TC] and [BK].

## 1.2 FCL-13A

F C L - 1 3 A - □ / □ □ □ □ □, □ □ □ □ □ □		FCL-13A (W48 x H24 x D98.5mm)	
Alarm	A		Alarm action added
Control output (OUT)	R		Relay contact
	S		Non-contact voltage (for SSR drive)
	A		DC current (4 to 20mA DC)
Input	M		Multi-range input
	E		TC K input
Option	C5		Serial communication
	W( 5A)		Heater burnout alarm
	W(10A)		
	W(20A)		
	W(50A)		
	SM		Set value memory (external selection)
	TC		Terminal cover
BK		Color, black	
Range (user specified)		0 to 400°C	Specify a range only for TC K input. (Changeable by the keypad operation.)
		0.0 to 400.0°C	
		0 to 750°F	
		0.0 to 750.0°F	

There are 2 input types for the FCL-13A; Multi-range input and TC (thermocouple) K input.

When the input type is TC K input, specify a range when ordering.

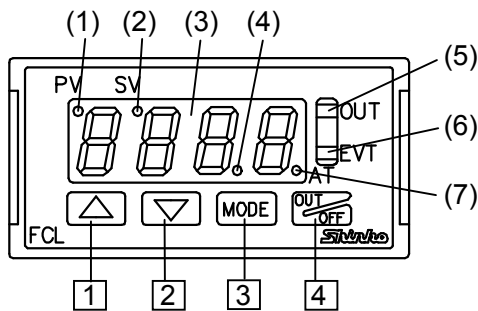
[C5], [W] and [SM] options cannot be added together. (Only one option can be added.)

## 1.3 How to read the model label

Model labels are attached at the bottom of the case and the upper side of the internal assembly.

	[Model label]	[Example]
Model	FCL-13A-R/M	→ Relay contact output, Multi-range input
Option	W (20A)	→ Heater burnout alarm output (CT rated current is written in the bracket)
	BK	→ Color, black
Serial No.	No.	

## 2. Name and functions of sections



- 1 Increase key:  
Increases the numeric value
  - 2 Decrease key:  
Decreases the numeric value.
  - 3 MODE key:  
Selects the setting mode.
  - 4 OUT/OFF key:  
Turns the control output (OUT) ON or OFF.
- 
- (1) PV indicator (Red):  
Lights while PV (process variable) is being indicated on the PV/SV display.
  - (2) SV indicator (Red) :  
Lights while SV (desired value) is indicated on the PV/SV display.  
Flashes while controlled with the SV2 (desired value 2).
  - (3) PV/SV display (Red):  
Indicates PV (process variable), SV (desired value), MV (manipulated variable) and characters.
  - (4) Decimal point indicator (Red):  
Lights for the set values with a decimal point.  
Flashes when MV (manipulated variable) is indicated.
  - (5) OUT indicator (Green):  
Lights when the control output (OUT) is ON.  
For DC current type, flashes corresponding to the manipulated variable in 0.125 second cycles.)
  - (6) EVT indicator (Red):  
Lights when the Alarm, Loop break alarm or Heater burnout alarm output is ON.
  - (7) AT indicator (Red):  
Flashes while Auto-tuning (AT) or Auto-reset is performing.

# 3. Mounting to the control panel

## 3.1 Site selection

### Caution

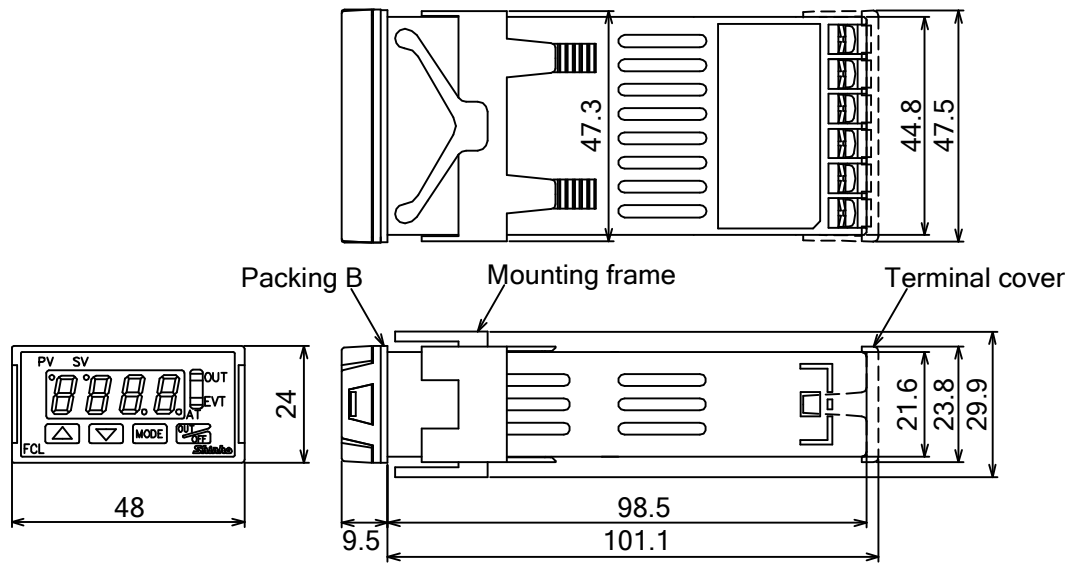
This instrument is intended to be used under the following environmental conditions  
**(IEC61010-1): Overvoltage category II, Pollution degree 2**

Ensure the mounting location corresponds to the following conditions:

- A minimum of dust, and an absence of corrosive gases
- No flammable, explosive gases
- Few mechanical vibrations or shocks
- No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) 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
- If the FCL is installed through the control panel, the ambient temperature of the FCL must be kept to under 50°C. Otherwise the life of electronic parts (especially electrolytic capacitors) of the FCL will be shortened.

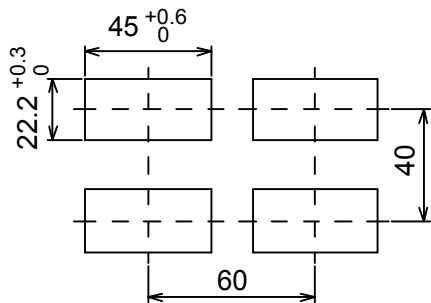
Note: Avoid setting this instrument directly on or near flammable material even though the case of this instrument is made of flame-resistant resin.

## 3.2 External dimensions (Scale: mm)



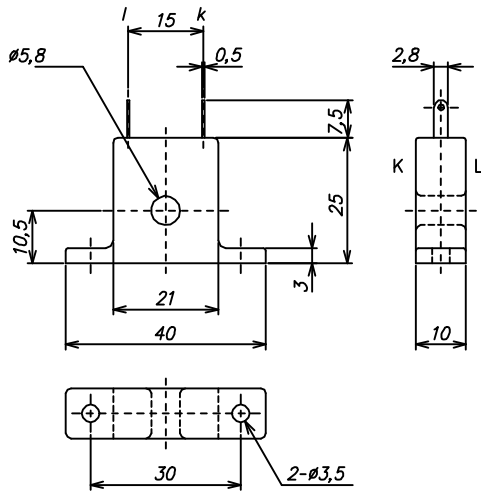
(Fig. 3.2-1)

## 3.3 Panel cutout (Scale: mm)

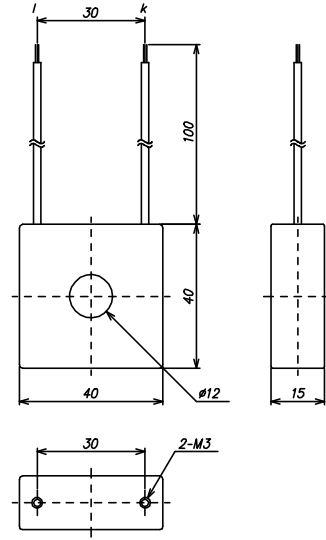


(Fig. 3.3-1)

### 3.4 CT (Current transformer) external dimensions (Scale: mm)



CTL-6S (for 5A, 10A, 20A)



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

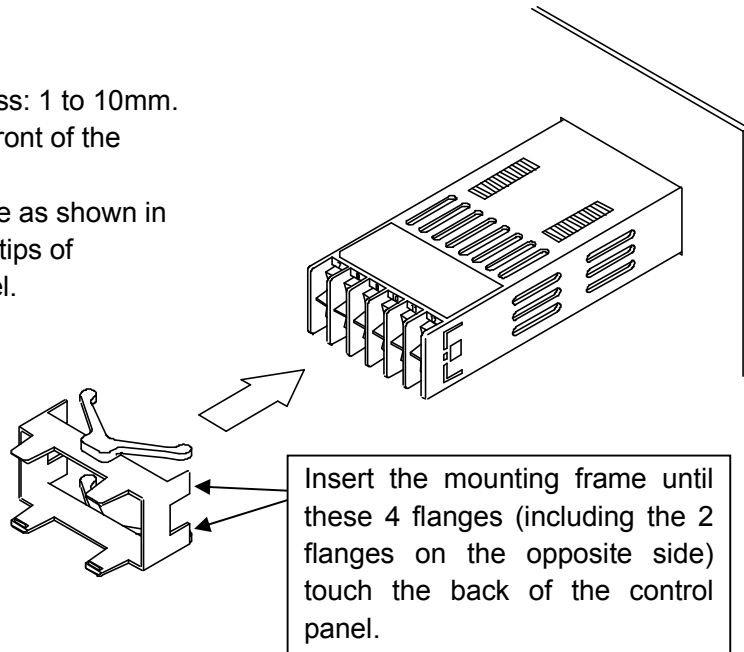
(Fig. 3.4-1)

### 3.5 Mounting

Mountable panel thickness: 1 to 10mm.

Insert the FCL from the front of the panel.

Insert the mounting frame as shown in (Fig. 3.5-1) until the four tips of the frame touch the panel.



Insert the mounting frame until these 4 flanges (including the 2 flanges on the opposite side) touch the back of the control panel.

(Fig. 3.5-1)

# 4. Wiring

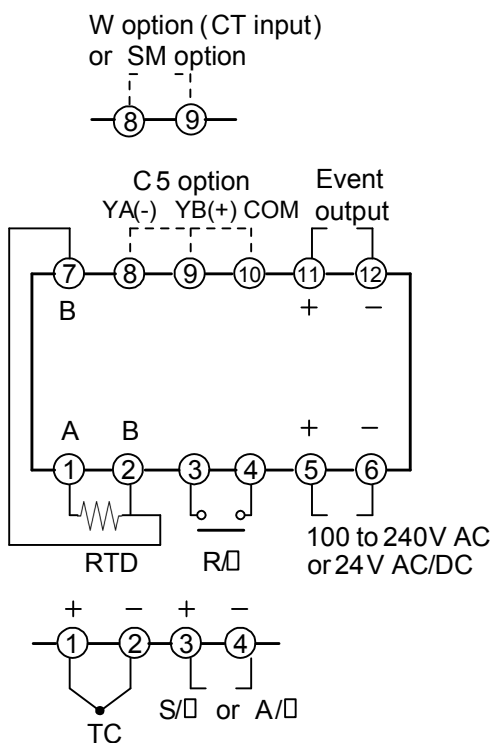
## Warning

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

## Caution

- Do not leave bits of wire in the instrument, because they could cause fire, malfunction or other problems.
- Use a solderless terminal with an insulation sleeve in which an M3 screw fits when wiring the FCL.
- Tighten the terminal screw within the specified torque.  
If excessive force is applied to the screw when tightening, the screw or case may be damaged.
- This controller does not have a built-in power switch, circuit breaker or fuse. Therefore, it is necessary to install them in the circuit near the controller.  
(Recommended fuse: Time-lag fuse, rated voltage 250V AC, rated current 2A)
- For a 24V AC/DC power source, do not confuse polarity when using direct current (DC).
- 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.
- Use a thermocouple and compensating lead wire that correspond to the sensor input specification of this controller.
- Use a 3-wire RTD which corresponds to the sensor input specification of this controller.
- When using a relay contact output type, use a relay externally, according to the capacity of the load, to protect the built-in relay contact.
- When wiring, keep input wires (thermocouple, RTD, etc.) away from AC sources or load wires to avoid external interference.

### 4.1 Terminal arrangement



TC : Thermocouple input  
 RTD: RTD input  
 R/□: Relay contact output  
 S/□: Non-contact voltage output  
 A/□: DC current output  
 W : Heater burnout alarm  
 SM : Set value memory (external selection)  
 C5 : Serial communication (RS-485)  
 Event output: Alarm, Loop break alarm or Heater burnout alarm output

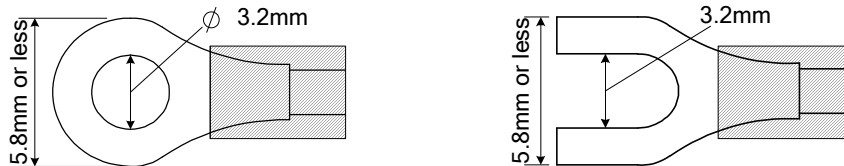
Dotted lines are optional. (Terminals are provided when options are specified.)

(Fig. 4.1-1)

## 4.2 Lead wire solderless terminal

Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below. The torque should be 0.63N•m.

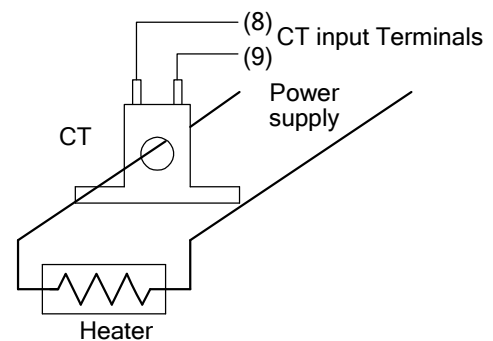
Solderless terminal	Manufacturer	Model	Torque
Y type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25Y-3	0.63N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	TMEV1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	



(Fig. 4.2-1)

## 4.3 Heater burnout alarm option

- (1) **This alarm is not usable for detecting heater current under phase control.**
- (2) Use the current transformer (CT) provided, and pass one lead wire of the heater circuit into the hole of the CT.
- (3) When wiring, keep the CT wire away from AC sources or load wires to avoid the external interference.



(Fig. 4.3-1)

## 5. Setup

The PV/SV display indicates the characters of the sensor type and temperature unit °C/°F for approx. 2 seconds after power-on. During this time, all outputs and the LED indicators are in OFF status. Refer to (Table 5-1) and (Table 5-2).

Control will then start indicating the PV (process variable) or SV (desired value) on the PV/SV display. If PV display is selected during PV/SV display switching, the PV (process variable) will be indicated. If SV display is selected, the SV (desired value) will be indicated.

(Table 5-1)

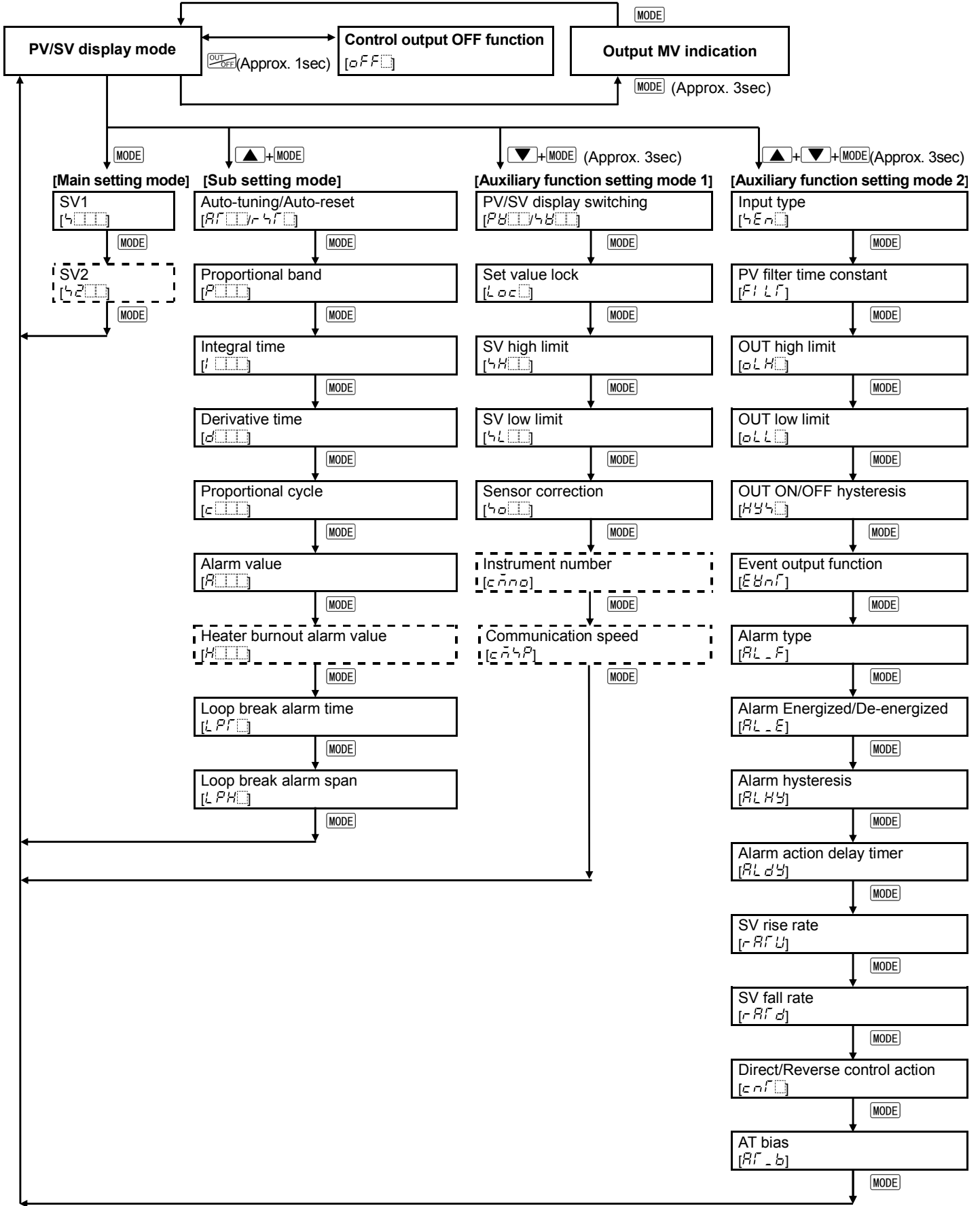
Input	PV/SV display	
	°C	°F
K	E00C	E00F
J	J00C	J00F
PL-II	PL2C	PL2F
N	n00C	n00F
E	E00C	E00F
Pt100 (With decimal point)	PT.C	PT.F
JPt100 (With decimal point)	JPT.C	JPT.F
Pt100	PTC	PTF
JPt100	JPTC	JPTF

(Table 5-2)

TC K input	PV/SV display	
	°C	°F
K 0 to 400°C 0 to 750°F	E04C	E04F
K 0.0 to 400.0°C 0.0 to 750.0°F	E04C	E04F



## 5.1 Operation flowchart



- ↓ **MODE**: If the **MODE** key is pressed, the set value is saved, and the controller proceeds to the next setting item.
- ▲+**MODE**: Press the **MODE** key while holding down the ▲ key.
- ▼+**MODE** (Approx. 3sec): Press the **MODE** key for 3 seconds while holding down the ▼ key.
- ▲+▼+**MODE** (Approx. 3sec): Press the **MODE** key for 3 seconds while holding down the ▲ and ▼ keys.
- To revert to the PV/SV display mode, press the **MODE** key for approx. 3sec during setting mode. The unit will revert to the PV/SV display mode from any mode.
- 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
4000	<b>SV1</b> <ul style="list-style-type: none"> <li>Sets SV1 (desired value 1) of control.</li> <li>Setting range: SV low limit value to SV high limit value</li> </ul>	0°C (°F)
4200	<b>SV2</b> <ul style="list-style-type: none"> <li>Sets SV2 (desired value 2) of control.</li> <li>Available only when the [SM] option is added.</li> <li>Setting range: SV low limit value to SV high limit value</li> </ul>	0°C (°F)

## 5.3 Sub setting mode

Character	Name, Description, Setting range	Default
AT00 ----- r4f0	<b>Auto-tuning/Auto-reset</b> <ul style="list-style-type: none"> <li>Sets auto-tuning (AT) or auto-reset.</li> <li>Auto-reset will be canceled automatically in approx. 4 minutes.</li> <li>-----/----- : Auto-tuning/Auto-reset Perform</li> <li>AT00/r4f0 : Auto-tuning/Auto-reset Cancel</li> </ul>	----
P000	<b>Proportional band</b> <ul style="list-style-type: none"> <li>Sets the proportional band of control output (OUT).</li> <li>ON/OFF action when set to 0 or 0.0</li> <li>Setting range: 0 (0.0) to Input range high limit value</li> </ul>	10°C (20°F)
I000	<b>Integral time</b> <ul style="list-style-type: none"> <li>Sets the integral time of control output (OUT).</li> <li>Setting the value to 0 disables the function.</li> <li>With PD action (I=0), auto-reset can be performed.</li> <li>Setting range: 0 to 3600 seconds</li> </ul>	200sec
d000	<b>Derivative time</b> <ul style="list-style-type: none"> <li>Sets the derivative time of control output (OUT).</li> <li>Setting the value to 0 disables the function.</li> <li>Setting range: 0 to 3600 seconds</li> </ul>	50sec
c000	<b>Proportional cycle</b> <ul style="list-style-type: none"> <li>Sets the proportional cycle value of control output (OUT)..</li> <li>Not available for ON/OFF action or DC current output type</li> <li>Setting range: 1 to 120 seconds</li> </ul>	R/□: 30sec S/□: 3sec
A000	<b>Alarm value</b> <ul style="list-style-type: none"> <li>Sets the action point of the alarm output.</li> <li><b>Setting the value to 0 or 0.0 disables the function.</b></li> <li><b>(Excluding process high alarm and process low alarm)</b></li> <li>Not available for the FCL-130.</li> <li>Not available if No alarm action is selected during Alarm type selection.</li> <li>Not available if the "Alarm" is not selected during Event output function selection.</li> <li>However, available when [C5] option is added.</li> <li>Refer to (Table 5.3-1).</li> </ul>	0°C (°F)
H000	<b>Heater burnout alarm value</b> <ul style="list-style-type: none"> <li>Sets the current value of Heater burnout alarm.</li> <li>Available only when the [W] option is added.</li> <li>Available only when the "Heater burnout alarm" is selected during Event output function selection.</li> <li>Upon returning to set limits, the alarm will stop.</li> <li>Setting range:  Rated current 5A: 0.0 to 5.0A  Rated current 10A: 0.0 to 10.0A  Rated current 20A: 0.0 to 20.0A  Rated current 50A: 0.0 to 50.0A</li> </ul>	0.0A

LPT	<p><b>Loop break alarm time</b></p> <ul style="list-style-type: none"> <li>• Sets the time it takes to assess the Loop break alarm.</li> <li>• Not available for the FCL-130.</li> <li>• Not available if the “Loop break alarm” is not selected during Event output function selection.</li> </ul> <p>However, available when the [C5] option is added.</p> <ul style="list-style-type: none"> <li>• Setting range: 0 to 200 minutes</li> </ul>	0 min.
LPH	<p><b>Loop break alarm span</b></p> <ul style="list-style-type: none"> <li>• Sets the span to assess the Loop break alarm.</li> <li>• Not available for the FCL-130.</li> <li>• Not available if the “Loop break alarm” is not selected during Event output function selection.</li> </ul> <p>However, available when the [C5] option is added.</p> <ul style="list-style-type: none"> <li>• Setting range: 0 to 150°C (°F), or 0.0 to 150.0°C (°F)</li> </ul>	0°C (°F)

(Table 5.3-1)

Alarm type	Setting range	Setting range (with decimal point)
High limit alarm	-(Input span) to input span	-199.9 to input span
Low limit alarm	-(Input span) to input span	-199.9 to input span
High/Low limits alarm	0 to input span	0.0 to input span
High/Low limit range alarm	0 to input span	0.0 to input span
Process high alarm	Input range low limit to input range high limit	Input range low limit to input range high limit
Process low alarm	Input range low limit to input range high limit	Input range low limit to input range high limit
High limit alarm with standby	-(Input span) to input span	-199.9 to input span
Low limit alarm with standby	-(Input span) to input span	-199.9 to input span
High/Low limits with standby	0 to input span	0.0 to input span
High/Low limit range with standby	0 to input span	0.0 to input span
Process high alarm with standby	Input range low limit to input range high limit	Input range low limit to input range high limit
Process low alarm with standby	Input range low limit to input range high limit	Input range low limit to input range high limit

## 5.4 Auxiliary function setting mode 1

Character	Name, Description, Setting range	Default
P <sub>H</sub> □□	<b>PV/SV display switching</b> <ul style="list-style-type: none"> <li>Switches the PV (process variable) or SV (desired value) display.</li> <li>P<sub>H</sub>□□: PV display</li> <li>S<sub>H</sub>□□: SV display</li> </ul>	PV display
L <sub>o</sub> c□	<b>Set value lock</b> <ul style="list-style-type: none"> <li>Locks the set values to prevent setting errors.</li> <li>The setting item to be locked depends on the selection.</li> <li>Auto-tuning or auto-reset will not function if Lock 1 or Lock 2 is selected.</li> <li>---- (Unlock): All set values can be changed.</li> <li>L<sub>c</sub>1□ (Lock 1): None of the set values can be changed.</li> <li>L<sub>c</sub>2□ (Lock 2): Only SV (desired value) can be changed.</li> <li>L<sub>c</sub>3□ (Lock 3): All set values except the input type can be changed, however, they revert to their previous values after the power is turned off because they are not saved in the non-volatile memory.</li> </ul> <p>Do not change any setting item in Auxiliary function setting mode 2. If any item in the mode is changed, it will affect other setting items such as the SV and alarm value.</p>	Unlock
S <sub>H</sub> □□	<b>SV high limit</b> <ul style="list-style-type: none"> <li>Sets the SV high limit value.</li> <li>Setting range: SV low limit to input range high limit</li> </ul>	Multi-range input (TC multi-range input): 1370°C TC K input: 400°C
S <sub>L</sub> □□	<b>SV low limit</b> <ul style="list-style-type: none"> <li>Sets the SV low limit value.</li> <li>Setting range: Input range low limit to SV high limit</li> </ul>	0°C
S <sub>c</sub> □□	<b>Sensor correction</b> <ul style="list-style-type: none"> <li>Sets sensor correction value.</li> <li>Setting range: -100.0 to 100.0°C (°F)</li> </ul>	0.0°C (°F)
C <sub>N</sub> □□	<b>Instrument number</b> <ul style="list-style-type: none"> <li>Sets the Instrument number individually to each instrument when communicating by connecting multiple instruments in serial communication.</li> <li>Available only when the [C5] option is added.</li> <li>Setting range: 0 to 95</li> </ul>	0
C <sub>N</sub> S <sub>P</sub>	<b>Communication speed</b> <ul style="list-style-type: none"> <li>Selects the communication speed equal to that of the host computer.</li> <li>Available only when the [C5] option is added.</li> <li>□□24: 2400bps</li> <li>□□48: 4800bps</li> <li>□□96: 9600bps</li> <li>□192: 19200bps</li> </ul>	9600bps

## 5.5 Auxiliary function setting mode 2

Character	Name, Description, Setting range	Default			
4En□	<p><b>Input type</b></p> <ul style="list-style-type: none"> <li>• With multi-range input, 5 thermocouple and 4 RTD input types and unit (°C or °F) can be selected.</li> <li>• With TC multi-range input, 5 thermocouple input types and unit (°C or °F) can be selected.</li> <li>• With TC K input, 2 ranges and unit (°C or °F) are selectable.</li> </ul>	K			
	<table border="0"> <tr> <td style="vertical-align: top;"> <p><b>[Multi-range input]</b></p> <p>t□□□ : K      0 to 1370°C</p> <p>J□□□ : J      0 to 1000°C</p> <p>PL2□ : PL-II   0 to 1390°C</p> <p>n□□□ : N      0 to 1300°C</p> <p>E□□□ : E      0 to 800°C</p> <p>Pt□□ : Pt100   -199.9 to 850.0°C</p> <p>JPt□□ : JPt100 -199.9 to 500.0°C</p> <p>Pt□□ : Pt100   -200 to 850°C</p> <p>JPt□□ : JPt100 -200 to 500°C</p> <p>t□□F : K      0 to 2500°F</p> <p>J□□F : J      0 to 1800°F</p> <p>PL2F : PL-II   0 to 2500°F</p> <p>n□□F : N      0 to 2300°F</p> <p>E□□F : E      0 to 1500°F</p> <p>Pt□F : Pt100   -199.9 to 999.9°F</p> <p>JPt□F : JPt100 -199.9 to 900.0°F</p> <p>Pt□F : Pt100   -300 to 1500°F</p> <p>JPt□F : JPt100 -300 to 900°F</p> </td> <td style="vertical-align: top;"> <p><b>[TC multi-range input]</b></p> <p>t□□□ : K      0 to 1370°C</p> <p>J□□□ : J      0 to 1000°C</p> <p>PL2□ : PL-II   0 to 1390°C</p> <p>n□□□ : N      0 to 1300°C</p> <p>E□□□ : E      0 to 800°C</p> <p>t□□F : K      0 to 2500°F</p> <p>J□□F : J      0 to 1800°F</p> <p>PL2F : PL-II   0 to 2500°F</p> <p>n□□F : N      0 to 2300°F</p> <p>E□□F : E      0 to 1500°F</p> </td> <td style="vertical-align: top;"> <p><b>[TC K input]</b></p> <p>t□4□ : K      0 to 400°C</p> <p>t□4□ : K      0.0 to 400.0°C</p> <p>t□4F : K      0 to 750°F</p> <p>t□4F : K      0.0 to 750.0°F</p> </td> </tr> </table>	<p><b>[Multi-range input]</b></p> <p>t□□□ : K      0 to 1370°C</p> <p>J□□□ : J      0 to 1000°C</p> <p>PL2□ : PL-II   0 to 1390°C</p> <p>n□□□ : N      0 to 1300°C</p> <p>E□□□ : E      0 to 800°C</p> <p>Pt□□ : Pt100   -199.9 to 850.0°C</p> <p>JPt□□ : JPt100 -199.9 to 500.0°C</p> <p>Pt□□ : Pt100   -200 to 850°C</p> <p>JPt□□ : JPt100 -200 to 500°C</p> <p>t□□F : K      0 to 2500°F</p> <p>J□□F : J      0 to 1800°F</p> <p>PL2F : PL-II   0 to 2500°F</p> <p>n□□F : N      0 to 2300°F</p> <p>E□□F : E      0 to 1500°F</p> <p>Pt□F : Pt100   -199.9 to 999.9°F</p> <p>JPt□F : JPt100 -199.9 to 900.0°F</p> <p>Pt□F : Pt100   -300 to 1500°F</p> <p>JPt□F : JPt100 -300 to 900°F</p>	<p><b>[TC multi-range input]</b></p> <p>t□□□ : K      0 to 1370°C</p> <p>J□□□ : J      0 to 1000°C</p> <p>PL2□ : PL-II   0 to 1390°C</p> <p>n□□□ : N      0 to 1300°C</p> <p>E□□□ : E      0 to 800°C</p> <p>t□□F : K      0 to 2500°F</p> <p>J□□F : J      0 to 1800°F</p> <p>PL2F : PL-II   0 to 2500°F</p> <p>n□□F : N      0 to 2300°F</p> <p>E□□F : E      0 to 1500°F</p>	<p><b>[TC K input]</b></p> <p>t□4□ : K      0 to 400°C</p> <p>t□4□ : K      0.0 to 400.0°C</p> <p>t□4F : K      0 to 750°F</p> <p>t□4F : K      0.0 to 750.0°F</p>	
<p><b>[Multi-range input]</b></p> <p>t□□□ : K      0 to 1370°C</p> <p>J□□□ : J      0 to 1000°C</p> <p>PL2□ : PL-II   0 to 1390°C</p> <p>n□□□ : N      0 to 1300°C</p> <p>E□□□ : E      0 to 800°C</p> <p>Pt□□ : Pt100   -199.9 to 850.0°C</p> <p>JPt□□ : JPt100 -199.9 to 500.0°C</p> <p>Pt□□ : Pt100   -200 to 850°C</p> <p>JPt□□ : JPt100 -200 to 500°C</p> <p>t□□F : K      0 to 2500°F</p> <p>J□□F : J      0 to 1800°F</p> <p>PL2F : PL-II   0 to 2500°F</p> <p>n□□F : N      0 to 2300°F</p> <p>E□□F : E      0 to 1500°F</p> <p>Pt□F : Pt100   -199.9 to 999.9°F</p> <p>JPt□F : JPt100 -199.9 to 900.0°F</p> <p>Pt□F : Pt100   -300 to 1500°F</p> <p>JPt□F : JPt100 -300 to 900°F</p>	<p><b>[TC multi-range input]</b></p> <p>t□□□ : K      0 to 1370°C</p> <p>J□□□ : J      0 to 1000°C</p> <p>PL2□ : PL-II   0 to 1390°C</p> <p>n□□□ : N      0 to 1300°C</p> <p>E□□□ : E      0 to 800°C</p> <p>t□□F : K      0 to 2500°F</p> <p>J□□F : J      0 to 1800°F</p> <p>PL2F : PL-II   0 to 2500°F</p> <p>n□□F : N      0 to 2300°F</p> <p>E□□F : E      0 to 1500°F</p>	<p><b>[TC K input]</b></p> <p>t□4□ : K      0 to 400°C</p> <p>t□4□ : K      0.0 to 400.0°C</p> <p>t□4F : K      0 to 750°F</p> <p>t□4F : K      0.0 to 750.0°F</p>			
FILF	<p><b>PV filter time constant</b></p> <ul style="list-style-type: none"> <li>• Sets PV filter time constant value.</li> <li>• If the value is set too large, it affects control result due to the delay of response.</li> <li>• Setting range: 0.0 to 10.0 seconds.</li> </ul>	0.0sec			
oLH□	<p><b>OUT high limit</b></p> <ul style="list-style-type: none"> <li>• Sets control output (OUT) high limit value.</li> <li>• Not available for the ON/OFF action.</li> <li>• Setting range: OUT low limit to 100%</li> </ul> <p style="text-align: center;">DC current output type: OUT low limit to 105%)</p>	100%			
oLL□	<p><b>OUT low limit</b></p> <ul style="list-style-type: none"> <li>• Sets control output (OUT) low limit value.</li> <li>• Not available for the ON/OFF action.</li> <li>• Setting range: 0% to OUT high limit</li> </ul> <p style="text-align: center;">DC current output type: -5% to OUT high limit)</p>	0%			
H44□	<p><b>Output ON/OFF action hysteresis</b></p> <ul style="list-style-type: none"> <li>• Sets ON/OFF action hysteresis of control output (OUT).</li> <li>• Available only for the ON/OFF action.</li> <li>• Setting range: 0.1 to 100.0°C</li> </ul>	1.0°C			
EbnF	<p><b>Event output function</b></p> <ul style="list-style-type: none"> <li>• Selects Alarm, Loop break alarm or Heater burnout alarm output as an Event output function.</li> <li>• Not available for the FCL-130.</li> <li>• Heater burnout alarm is selectable only when [W] option is added.</li> <li>• ALn□: Alarm</li> <li>• LP□□: Loop break alarm</li> <li>• Hb□□: Heater burnout alarm (W option)</li> </ul>	ALn□			

<i>AL_F</i>	<p><b>Alarm type</b></p> <ul style="list-style-type: none"> <li>• Selects an alarm type.</li> <li>• <b>If an alarm type is changed, the alarm set value becomes 0 (0.0).</b></li> <li>• Not available for the FCL-130.</li> <li>• <i>----</i> : No alarm action</li> <li>• <i>H000</i> : High limit alarm</li> <li>• <i>H000</i> : High limit alarm with standby</li> <li>• <i>L000</i> : Low limit alarm</li> <li>• <i>L000</i> : Low limit alarm with standby</li> <li>• <i>HL00</i> : High/Low limits alarm</li> <li>• <i>HL00</i> : High/Low limits alarm with standby</li> <li>• <i>01d0</i> : High/Low limit range alarm</li> <li>• <i>01d0</i> : High/Low limit range alarm with standby</li> <li>• <i>R400</i> : Process high alarm</li> <li>• <i>R400</i> : Process high alarm with standby</li> <li>• <i>rR40</i> : Process low alarm</li> <li>• <i>rR40</i> : Process low alarm with standby</li> </ul>	No alarm action
<i>AL_E</i>	<p><b>Alarm Energized/De-energized</b></p> <ul style="list-style-type: none"> <li>• Selects the alarm action Energized or De-energized.</li> <li>• Not available for the FCL-130.</li> <li>• Not available if No alarm action is selected during Alarm type selection.</li> <li>• Not available if Alarm is not selected during Event output function selection.</li> <li>• However, available when the [C5] option is added.</li> <li>• <i>non0</i> : Energized, <i>rEb0</i> : De-energized</li> </ul>	Energized
<i>ALHY</i>	<p><b>Alarm hysteresis</b></p> <ul style="list-style-type: none"> <li>• Sets the alarm hysteresis.</li> <li>• Not available for the FCL-130.</li> <li>• Not available if No alarm action is selected during Alarm type selection.</li> <li>• Not available if Alarm is not selected during Event output function selection.</li> <li>• However, available when the [C5] option is added.</li> <li>• Setting range: 0.1 to 100.0°C (°F)</li> </ul>	1.0°C (°F)
<i>ALdy</i>	<p><b>Alarm action delay timer</b></p> <ul style="list-style-type: none"> <li>• Sets the alarm action delay timer.</li> <li>• When setting time has elapsed after the input enters the alarm output range, the alarm is activated.</li> <li>• Not available for the FCL-130.</li> <li>• Not available if No alarm action is selected during Alarm type selection.</li> <li>• Not available if Alarm is not selected during Event output function selection.</li> <li>• However, available when the [C5] option is added.</li> <li>• Setting range: 0 to 9999 seconds</li> </ul>	0sec
<i>rRVU</i>	<p><b>SV rise rate</b></p> <ul style="list-style-type: none"> <li>• Sets the SV rise rate (Rising value per minute).</li> <li>• Setting range: 0 to 9999°C/min (°F/min), 0.0 to 999.9°C/min (°F/min)</li> </ul>	0°C/min
<i>rRVd</i>	<p><b>SV fall rate</b></p> <ul style="list-style-type: none"> <li>• Sets the SV fall rate (Falling value per minute).</li> <li>• Setting range: 0 to 9999°C/min (°F/min), 0.0 to 999.9°C/min (°F/min)</li> </ul>	0°C/min
<i>cnf0</i>	<p><b>Direct/Reverse control action</b></p> <ul style="list-style-type: none"> <li>• Selects the Reverse (Heating) or Direct (Cooling) control action.</li> <li>• <i>HEAT</i> : Reverse (Heating) action, <i>COOL</i> : Direct (Cooling) action</li> </ul>	Reverse (Heating) action
<i>RV_b</i>	<p><b>AT bias</b></p> <ul style="list-style-type: none"> <li>• Sets auto-tuning bias value.</li> <li>• Setting range: 0 to 50°C (0 to 100°F) 0.0 to 50.0°C (0.0 to 100.0°F)</li> </ul>	20°C (40°F)

### Sensor correction function

This corrects the input value from the sensor. When a sensor cannot be set at the exact location where control is desired, the sensor measured temperature may deviate from the temperature in the controlled location. When controlling with plural controllers, sometimes the measured temperatures do not concur due to differences in sensor accuracy or dispersion of load capacities. In such a case, the control can be set at the desired temperature by adjusting the input value of sensors.

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

PV after sensor correction = Current PV + (Sensor correction value)

### Loop break alarm

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

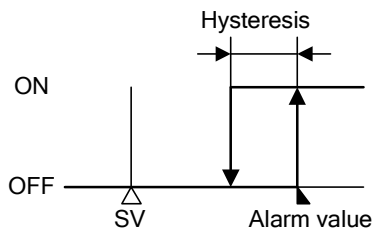
The alarm will also be activated when the process variable (PV) does not **fall** as much as the span or more within the time it takes to assess the loop break alarm after the manipulated variable has reached 0% or the output low limit value.

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

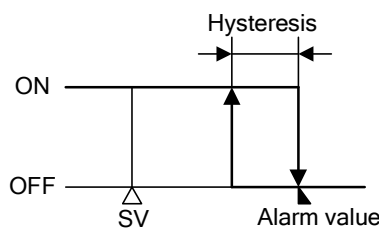
### Energized/De-energized

When the alarm action Energized is selected, event output (between terminals 11 and 12) is conducted (ON) while the event output indicator is lit. Event output is not conducted (OFF) while the event output indicator is not lit.

When the alarm action De-energized is selected, event output (between terminals 11 and 12) is not conducted (OFF) while the event output indicator is lit. Event output is conducted (ON) while the event 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)

### Set value memory

If the SM option is added, the Set value memory number can be selected by external operation. (However, only No. 2 is selectable.)

- To select the Set value memory number 2, connect terminals 8 and 9.
- Memory number cannot be changed during setting mode and auto-tuning.

### 5.6 Control output OFF function

Character	Name, Description
OFF	<p><b>Control output OFF function</b></p> <ul style="list-style-type: none"> <li>• A function to pause the control action or turn the control output of the unused instrument of the plural units OFF even if the power to the instrument is supplied. [OFF] is indicated on the PV/SV display while the function is working.</li> <li>• This function can be selected from any mode or any setting item by pressing the  key for approx. 1 second.</li> <li>• Once the control output OFF function is enabled, the function cannot be released even if the power to the instrument is turned OFF and ON again. To cancel the function, press the  key again for approx. 1 second.</li> </ul>

## 5.7 Output MV (manipulated variable) display

Name, Description
<b>Output MV (manipulated variable) indication</b> <ul style="list-style-type: none"><li>• In the PV/SV display mode, press the <b>MODE</b> key for approx. 3 seconds. The display will be changed to Main setting mode during the process, however, keep pressing until the output MV is indicated. (MV is indicated on the PV/SV display with the decimal point flashing.) If the <b>MODE</b> key is pressed again, the mode will revert to the PV/SV display.</li></ul>

## 6. Unit operation

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

### (1) Turn the power supply to the FCL ON

- For approx. 2 seconds after the power is switched ON, the PV/SV display indicates the sensor input characters. Refer to (Table 5-1) and (Table 5-2).  
During this time, all outputs and LED indicators are in OFF status.
- After that, the PV/SV display indicates PV (process variable).  
If SV display is selected during "PV/SV display switching", the SV will be indicated.
- While the Control output OFF function is working, the PV/SV display indicates "OFF".

### (2) Input each set value

Input each set value, referring to "5. Setup".

### (3) Turn the load circuit power ON.

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

## 7. Other functions

### 7.1 Input burnout

[Overscale]

When the thermocouple or RTD is burnt out, or if the input value exceeds the [Input range high limit value + 50°C (100°F)] or more, the control output (OUT) is turned off (for DC current output type, OUT low limit value), and [ ] flashes on the PV/SV display.

However, when the input range high limit value is 999.9, if the input value exceeds 999.9, [ ] flashes on the PV/SV display, and the control is performed until [999.9 + 1% of input span].

[Underscale]

For thermocouple input, if the input value drops to -50°C (-100°F) or less, the control output (OUT) is turned off (for DC current output type, OUT low limit value), and [ ] flashes on the PV/SV display.

For RTD input, if the input value drops to [Input range low limit value - 1% of input span] or less, the control output (OUT) is turned off, and [ ] flashes on the PV/SV display.

However, when the Input range low limit value is -199.9, if the input value drops below -199.9, [ ] flashes on the PV/SV display, and the control is performed until [-199.9 - 1% of input span].

Even in SV display mode, the indication of overscale [ ] and underscale [ ] have priority over all displays.

### 7.2 Self-diagnostic function

The CPU is monitored by a watchdog timer, and when an abnormal status is found on the CPU, the controller is switched to warm-up status.

### 7.3 Automatic cold junction temperature compensation (thermocouple input type)

This detects the temperature at the connecting terminal between the thermocouple and the instrument, and always maintains at the same status as if the reference junction is located at 0°C (32°F).



# 8. Action explanations

## 8.1 Standard action

Action	Heating (reverse) action	Cooling (direct) action
Control action		
Relay contact output	<p>Cycle action according to deviation</p>	<p>Cycle action according to deviation</p>
Non-contact voltage output	<p>Cycle action according to deviation</p>	<p>Cycle action according to deviation</p>
DC current output	<p>Changes continuously according to deviation</p>	<p>Changes continuously according to deviation</p>
Indicator (OUT) Green		

part: Acts ON or OFF.

## 8.2 ON/OFF action

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

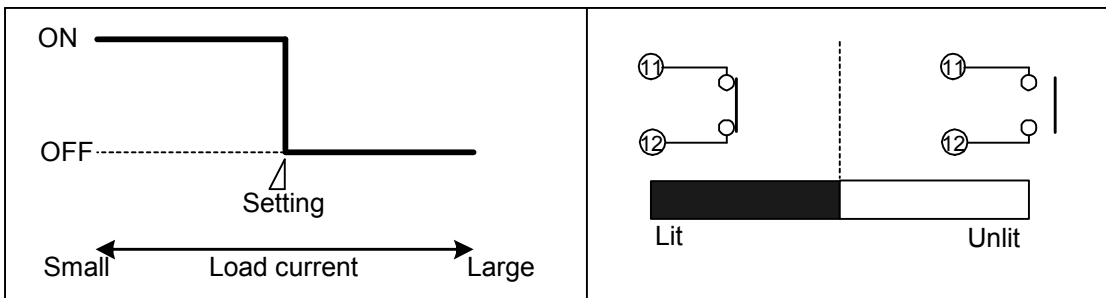
part: Acts ON or OFF.

### 8.3 Alarm action

	High limit alarm action	Low limit alarm action	High/Low limits alarm action
Alarm action			
Output			
Indicator			
	High/Low limit range alarm action	Process high alarm action	Process low alarm action
Alarm action			
Output			
Indicator			
	High limit alarm with standby	Low limit alarm with standby	High/Low limits alarm with standby
Alarm action			
Output			
Indicator			
	High/Low limit range alarm with standby	Process high alarm with standby	Process low alarm with standby
Alarm action			
Output			
Indicator			

: Acts ON or OFF.  
 : The standby functions.

### 8.4 Heater burnout alarm



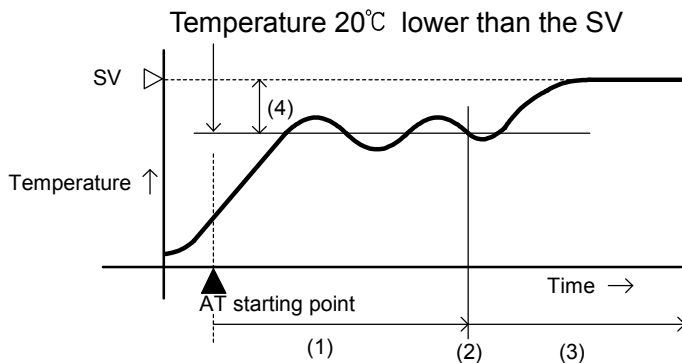
# 9. Auto-tuning of this controller

In order to set each value of P, I, D and ARW automatically, the auto-tuning process should be made to fluctuate to obtain an optimal value. One of 3 types of fluctuation below is automatically selected.

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

**(A) In the case of a large difference between the SV (desired value) and PV (process variable) as the temperature is rising**

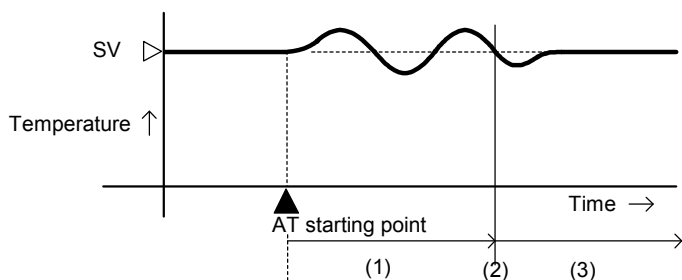
When AT bias is set to 20°C, the AT process will fluctuate at the temperature 20°C lower than the SV.



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

**(B) When the control is stable**

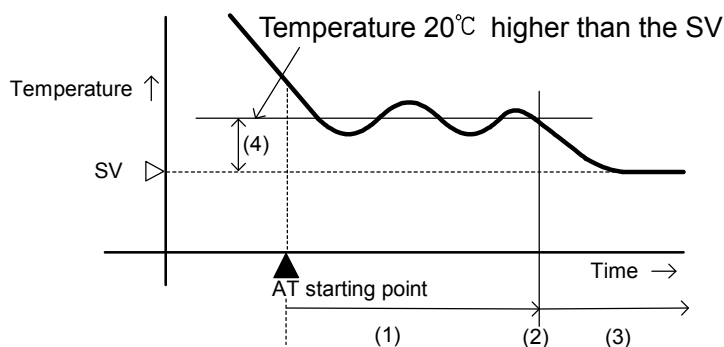
The AT process will fluctuate around the SV.



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

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

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



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

# 10. Specifications

## 10.1 Standard specifications

**Mounting** : Flush  
**Setting** : Input system using membrane sheet key  
**Display**  
PV/SV display : Red LED display 4 digits, size, 8(H) x 4(W)mm

### Accuracy (Setting, indication)

Thermocouple : Within  $\pm 0.3\%$  of each input span  $\pm 1$  digit, or  $2^{\circ}\text{C}$  ( $4^{\circ}\text{F}$ ), whichever is greater  
RTD : Within  $\pm 0.2\%$  of each input span  $\pm 1$  digit

### Input range

[Multi-range input], [TC multi-range input]:

K : 0 to  $1370^{\circ}\text{C}$  (0 to  $2500^{\circ}\text{F}$ )

J : 0 to  $1000^{\circ}\text{C}$  (0 to  $1800^{\circ}\text{F}$ )

E : 0 to  $800^{\circ}\text{C}$  (0 to  $1500^{\circ}\text{F}$ )

PL-II : 0 to  $1390^{\circ}\text{C}$  (0 to  $2500^{\circ}\text{F}$ )

N : 0 to  $1300^{\circ}\text{C}$  (0 to  $2300^{\circ}\text{F}$ )

\*Pt100 :  $-199.9$  to  $850.0^{\circ}\text{C}$  ( $-199.9$  to  $999.9^{\circ}\text{F}$ ),  $-200$  to  $850^{\circ}\text{C}$  ( $-300$  to  $1500^{\circ}\text{F}$ )

\*JPt100 :  $-199.9$  to  $500.0^{\circ}\text{C}$  ( $-199.9$  to  $900.0^{\circ}\text{F}$ ),  $-200$  to  $500^{\circ}\text{C}$  ( $-300$  to  $900^{\circ}\text{F}$ )

**\* Pt100 and JPt100 are not included in TC multi-range input type.**

[TC K input]:

K : 0 to  $400^{\circ}\text{C}$  (0 to  $750^{\circ}\text{F}$ )

0.0 to  $400.0^{\circ}\text{C}$  (0.0 to  $750.0^{\circ}\text{F}$ )

**Input sampling period:** 0.25 seconds

### Input

Thermocouple : K, J, E, PL-II, N  
External resistance:  $100\Omega$  or less  
When input is burnt out: Overscale  
RTD : Pt100, JPt100, 3-wire system  
Allowable input lead wire resistance:  $10\Omega$  or less per wire  
When input is burnt out: Overscale

### Control output (OUT)

Relay contact : 1a  
Control capacity,  
3A 250V AC (resistive load)  
1A 250V AC (inductive load  $\cos\phi=0.4$ )  
Non-contact voltage: For SSR drive  
 $12^{\pm 2}\text{V}$  DC, Maximum 40mA (short circuit protected)  
DC current : 4 to 20mA DC  
Load resistance, maximum  $550\Omega$

**Supply voltage** : 100 to 240V AC, 50/60Hz, 24V AC/DC, 50/60Hz

### Allowable voltage fluctuation:

100 to 240V AC: 85 to 264V AC  
24V AC/DC : 20 to 28V AC/DC

### Alarm output

When alarm action is set as Energized, the alarm action point is set by  $\pm$  deviation from the SV (desired value) (except Process alarm).

When the input is out of the range, the output turns ON or OFF (in the case of High/Low limit range alarm).

When the alarm action is set as De-energized, the output acts conversely.

#### • Setting accuracy

Thermocouple : Within  $\pm 0.3\%$  of each input span  $\pm 1$  digit, or  $\pm 2^{\circ}\text{C}$  ( $4^{\circ}\text{F}$ ), whichever is greater

RTD : Within  $\pm 0.2\%$  of each input span  $\pm 1$  digit

• Action : ON/OFF action, Hysteresis,  $0.1$  to  $100.0^{\circ}\text{C}$  ( $^{\circ}\text{F}$ )

• Output : Open collector, Control capacity, 24V DC 0.1A (maximum)

### Loop break alarm output

When MV (manipulated variable) is maximum or minimum and when the PV does not change as much as the preset span within the Loop break alarm assessment time, the alarm is activated.

Detects the breaking status on the loop such as heater burnout, sensor burnout or actuator trouble.

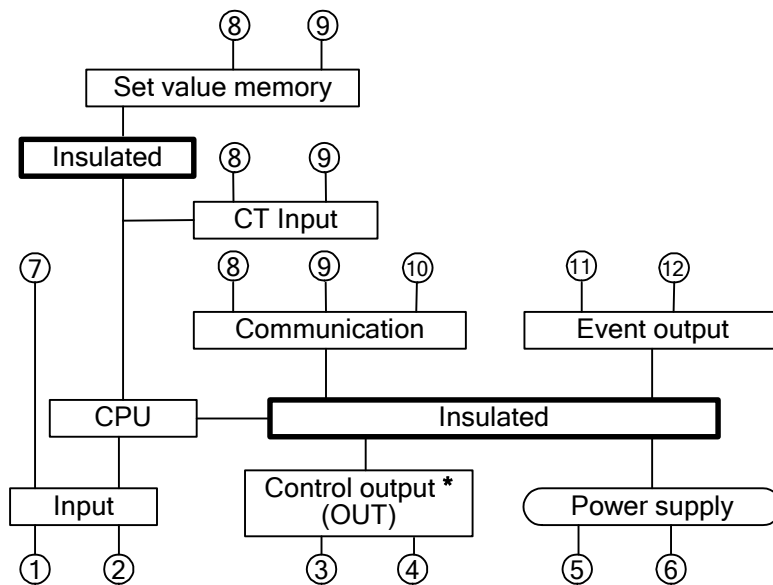
Output: Open collector

Control capacity, 24V DC 0.1A (maximum)

## Control action

PID action (with auto-tuning function)  
PD action (with auto-reset function) (When I value is set to 0.)  
P action (with auto-reset function) (When I and D values are set to 0.)  
ON/OFF action (When P value is set to 0 or 0.0.)  
Proportional band : 0 (0.0) to Input range high limit value  
Integral time : 0 to 3600sec (off when set to 0)  
Derivative time : 0 to 3600sec (off when set to 0)  
Proportional cycle : 1 to 120sec  
ARW : Automatic  
Output limit : 0 to 100% (DC current output type: -5 to 105%)  
Hysteresis : 0.1 to 100.0°C (°F)

## Circuit insulation configuration



\* If the control output (OUT) is DC current output or non-contact voltage output type, Control output (OUT) is not insulated from Communication.

## Insulation resistance

10MΩ or more, at 500V DC

Insulation test must not be carried out between Control output (OUT) and Communication, because Control output (OUT) is not insulated from Communication.

## Dielectric strength

Between input terminal and ground ----- 1.5kV AC for 1 minute  
Between input terminal and power terminal ----- 1.5kV AC for 1 minute  
Between power terminal and ground ----- 1.5kV AC for 1 minute  
Between output terminal and ground ----- 1.5kV AC for 1 minute  
Between output terminal and power terminal ----- 1.5kV AC for 1 minute

**Power consumption** : Approx. 5VA

**Ambient temperature**: 0 to 50°C (32 to 122°F)

**Ambient humidity** : 35 to 85%RH (non-condensing)

**Weight** : Approx. 100g

**External dimensions** : 48 x 24 x 98.5mm (W x H x D)

**Material** : Base, case: Flame-resistant resin

**Color** : Base, case: Light gray

**Dust-proof/Drip-proof**: IP65

**Attached functions** : Power failure countermeasure

Self-diagnosis

Automatic cold junction temperature compensation

Input burnout (overscale, underscale)

**Accessories** : Mounting frame ----- 1 piece

Instruction manual ----- 1 copy

Terminal cover ----- 1 piece [When TC option is added.]

CT (Current transformer) ---- 1 piece

CTL-6S [When W (5A, 10A, 20A) option is added.]

CTL-12-S36-10L1U [When W (50A) option is added.]

## 10.2 Optional functions

### Serial communication [Option code: C5]

When this option is added, all setting items for the Alarm and Loop break alarm can be operated. However, for Event output, the output function selected during Event output function selection has priority.

The [C5] option cannot be added to the FCL-130.

When the [SM] or [W] option is added, the [C5] option cannot be added together.

The following operations can be carried out from the external computer.

(1) Reading and setting of the SV, PID values and various set values

(2) Reading of the PV and action status

(3) Function change

Communication line : EIA RS-485

Communication method : Half-duplex communication

Synchronization method: Start-stop synchronization

Communication speed : 2400, 4800, 9600 and 19200bps (selectable by keypad)

Data format : Start bit 1

Data bit 7

Parity Even

Stop bit 1

### Heater burnout alarm [Option code: W]

Watches the heater current with CT (current transformer), and detects the heater burnout.

[W] option cannot be added to the FCL-130.

If [SM] or [C5] option is added, the [W] option cannot be added together.

[W] option cannot be added to DC current output type.

Rated current : 5A [W(5A) option]

10A [W(10A) option]

20A [W(20A) option]

50A [W(50A) option]

Setting range : Rated current 5A : 0.0 to 5.0A (off when set to 0.0)

Rated current 10A : 0.0 to 10.0A (off when set to 0.0)

Rated current 20A : 0.0 to 20.0A (off when set to 0.0)

Rated current 50A : 0.0 to 50.0A (off when set to 0.0)

Setting accuracy:  $\pm 5\%$

Input resolution : 1/200 of each rated current

Action : ON/OFF action

Output : Open collector

Control capacity, 24V DC 0.1A (maximum)

### Set value memory (external selection) [Option code: SM]

If this option is added, SV1 (desired value 1) or SV2 (desired value 2) can be switched by the external contact.

The [SM] option cannot be added to the FCL-130.

When the [W] or [C5] option is added, the [SM] option cannot be added together.

Between terminals 8-9 Open : SV1 (desired value 1)

Between terminals 8-9 Closed : SV2 (desired value 2)

### Color black [Option code: BK]

Front panel : Dark gray

Base, case : Black

### Terminal cover [Option code: TC]

Electrical shock protection terminal cover

### User specified

Input range : Shipped as specified input range.

Alarm type : Shipped as specified alarm type.

Event output : Shipped as specified event output.

Control action : Shipped as specified PD, ON/OFF or cooling action.


Hysteresis : Shipped as specified hysteresis.

Default value : Shipped as specified default value.





# 11. Troubleshooting

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

## 11.1 Indication

Problem	Presumed cause and the action
The PV/SV display is indicating [FF]	<ul style="list-style-type: none"> <li>Control output OFF function is working.</li> </ul> Press the  key for approx. 1sec to release the function.
[---] is flashing on the PV/SV display	<ul style="list-style-type: none"> <li>Thermocouple or RTD may be burnt out.</li> </ul> <b>How to check whether the sensor is burnt out</b> [Thermocouple] If the input terminals of the instrument are shorted, and if a value around room temperature is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out. [RTD] If approx. 100Ω resistance is connected to the input terminals between A-B of the instrument and between B-B is shorted, and if a value around 0°C (32°F) is indicated, the instrument is likely to be operating normally, however, the sensor may be burnt out.
[- - -] is flashing on the PV/SV display	<ul style="list-style-type: none"> <li>Check whether the polarity of thermocouple or compensating lead wire is correct.</li> <li>Check whether codes (A, B, B) of the RTD agree with the controller terminals.</li> </ul> Ensure that they are wired properly.
The indication of the PV/SV display is irregular or unstable.	<ul style="list-style-type: none"> <li>Check whether the sensor input and temperature unit (°C or °F) setting are correct.</li> <li>Set the sensor input and the temperature unit properly.</li> <li>Sensor correction value is unsuitable.</li> <li>Set it to a suitable value.</li> <li>Sensor specification is improper.</li> <li>Set the sensor specification properly.</li> <li>AC may be leaking into the sensor circuit.</li> <li>There may be equipment that interferes with or makes noise near the controller.</li> </ul> Keep equipment that interferes with or makes noise away from the controller.

## 11.2 Key operation

Problem	Presumed cause and the action
Settings (SV, P, I, D, proportional cycle, alarm, etc.) are impossible. The values do not change by the  or  key.	<ul style="list-style-type: none"> <li>Set value lock (Lock 1 or Lock 2) is selected.</li> <li>Release the lock selection.</li> <li>During auto-tuning or auto-reset.</li> <li>Cancel auto-tuning.</li> <li>Auto-reset ends in 4 minutes after it has started.</li> </ul>
The setting indication does not change within the input range even if the  or  key is pressed, and new values are unable to be set.	<ul style="list-style-type: none"> <li>SV high limit or SV low limit may be set at the point where the value does not change.</li> <li>Set it to a suitable value during Auxiliary function setting mode 1.</li> </ul>

### 11.3 Control

<b>Problem</b>	<b>Presumed cause and the action</b>
Process variable (temperature) does not rise.	<ul style="list-style-type: none"><li>• Thermocouple or RTD may be burnt out. Replace the sensor.</li><li>• Check whether Thermocouple or RTD lead wire is securely connected to the instrument terminals.</li><li>• Ensure that the wiring of control output terminals is correct.</li></ul>
The control output (OUT) remains in an ON status.	<ul style="list-style-type: none"><li>• OUT low limit value is set to 100% or higher in Auxiliary function setting mode 2. Set it to a suitable value.</li></ul>
The control output (OUT) remains in an OFF status.	<ul style="list-style-type: none"><li>• OUT high limit value is set to 0% or less in Auxiliary function setting mode 2. Set it to a suitable value.</li></ul>

For all other malfunctions, please make inquiries at our agency or us.

## **SHINKO TECHNOS CO.,LTD. OVERSEAS DIVISION**

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