

INSTRUCTION MANUAL (EXCERPT) Digital Indicating Controller **ACS-13A-□/□/□**
(For Use with the Infrared Temperature Sensor)

No.ACS11AE4 2020.12

The digital indicating controller ACS-13A-□/□/□ is an exclusive instrument for use with the infrared temperature sensor RD-500 series or RD-715-HA. For detailed usage and options, refer to the full Instruction manual for the ACS-13A (standard product). Please download the full Instruction manual for ACS-13A at [http://www.shinko-technos.co.jp/e/Support & Downloads → Downloads → Manuals](http://www.shinko-technos.co.jp/e/Support%20&%20Downloads%20-%20Downloads%20-%20Manuals)

The ACS-13A (standard product) has no infrared emissivity setting function, and its input types are different.

Thank you for purchasing our digital indicating controller ACS-13A-□/□/□. This manual contains instructions for the mounting, functions, operations and notes when operating the ACS-13A-□/□/□. To prevent accidents arising from the misuse of this 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".

⚠ 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 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 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 protective 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. Proper periodic maintenance is also 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. Model

ACS - 1 3 A - □ / A □ , □ □ □		Series name: ACS-13A-□/□/□ (W48 x H48 x D62 mm)	
Control action	3	PID	
A1	A	Alarm type can be selected by keypad. *1	
Control output (OUT1)	R	Relay contact: 1a	
	S	Non-contact voltage (for SSR drive): 12 V DC ± 15%	
	A	Direct current: 4 to 20 mA DC	
Input	A	Direct current: 4 to 20 mA DC *2	
Power supply voltage		100 to 240 V AC (standard)	
	1	24 V AC/DC *3	
Option (Multiple options are selectable.)	A2	Alarm 2 output (A2) *1	
	W(20A)	Heater burnout alarm	CT rated current: 20 A (Single-phase)
	W(50A)		CT rated current: 50 A (Single-phase)
	W3(20A)		CT rated current: 20 A (3-phase)
	W3(50A)		CT rated current: 50 A (3-phase)
	DR	Heating/Cooling control, Control output (OUT2)	Relay contact: 1a
	DS		Non-contact voltage: 12 V DC ± 15%
	C5	Serial communication (RS-485)	
SM	Set value memory external selection		

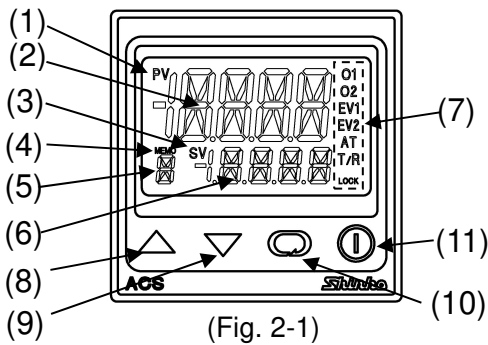
*1 Alarm types (9 types and No alarm action) and Energized/De-energized can be selected by keypad.

2 Infrared temperature sensor RD-500 series or RD-715-HA is used for an input. Temperature range for the sensor (0.0 to 250.0°C, 0.0 to 500.0°C, 32.0 to 482.0°F, 32.0 to 932.0°F*) is selectable by keypad.

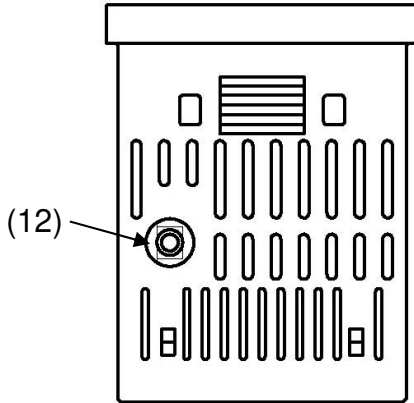
* For the RD-715-HA, ranges 0.0 to 500.0°C and 32.0 to 932.0°F are available.

*3 Power supply voltage 100 to 240 V AC is standard. When ordering 24 V AC/DC, enter "1" after the input code.

2. Names and Functions



(Fig. 2-1)



(Fig. 2-2)

- (1) **PV indicator:** Lights up when PV is indicated in PV/SV Display Mode.
- (2) **PV Display:** Indicates the PV (process variable) or setting characters during setting mode.
- (3) **SV indicator:** Lights up when SV is indicated in PV/SV Display Mode.
- (4) **MEMO indicator:** Lights up when the Set value memory external selection (SM option) is ordered.
- (5) **MEMO display:** Indicates the set value memory number.
- (6) **SV Display:** Indicates the SV (desired value), MV (manipulated variable) or each set value during setting mode.
- (7) **Action indicators**
 - O1 (OUT1):** Lights up when control output (OUT1) is ON. For Direct current output type, flashes corresponding to the MV in 250 ms cycles.
 - O2 (OUT2):** Lights up when control output (OUT2) (D□ option) is ON.
 - EV1:** Lights up when Alarm 1 output is ON.
 - EV2:** Lights up when Alarm 2 output (A2 option) is ON or when Heater burnout alarm (W, W3 option) is ON.
 - AT:** Flashes while AT (auto-tuning) or auto-reset is performing.
 - T/R:** Lights up during Serial communication (C5 option) (TX output).
 - LOCK:** Lights up when Lock 1, Lock 2 or Lock 3 is selected.
- (8) **UP key:** Increases the numeric value.
- (9) **DOWN key:** Decreases the numeric value.
- (10) **Mode key:** Switches the setting mode, or registers the set value. To register the set value (or selection), press this key.
- (11) **OUT/OFF key:** Switches control output ON/OFF or Auto/Manual control.

(12) **Console connector:** By connecting to the USB communication cable (CMA, sold separately), the following operations can be conducted from an external computer using the Console software SWS-ACS01M.

- ① Reading and setting of SV, PID, various set values
- ② Reading of PV and action status
- ③ Function change

3. Mounting to the Control Panel

3.1 Site Selection

⚠ Caution

Use within the following temperature and humidity ranges.

Temperature: 0 to 50°C (32 to 122°F), Humidity: 35 to 85 %RH (No icing and non-condensing)

If this unit is installed through the face of a control panel, the ambient temperature of the unit - not the ambient temperature of the control panel - must be kept under 50°C. Otherwise the life of electronic parts (especially electrolytic capacitors) of this unit will be shortened.

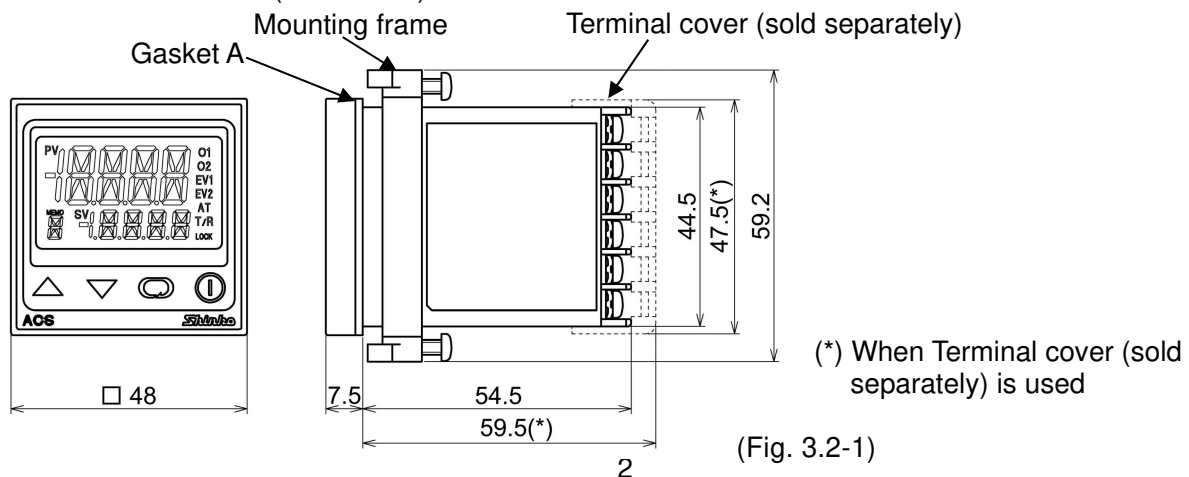
This instrument is intended to be used under the following environmental conditions (IEC61010-1):

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°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 the vapors of these substances can come into direct contact with the controller

3.2 External Dimensions (Scale: mm)



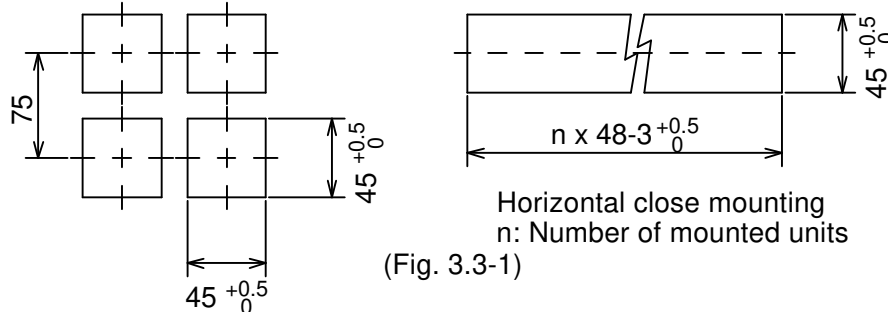
(Fig. 3.2-1)

3.3 Panel Cutout (Scale: mm)



Caution

If horizontal close mounting is used for the controller, IP66 specifications (Drip-proof/Dust-proof) may be compromised, and all warranties will be invalidated.



3.4 Mounting to and Removal from the Control Panel

3.4.1 How to Mount the ACS-13A-□/A

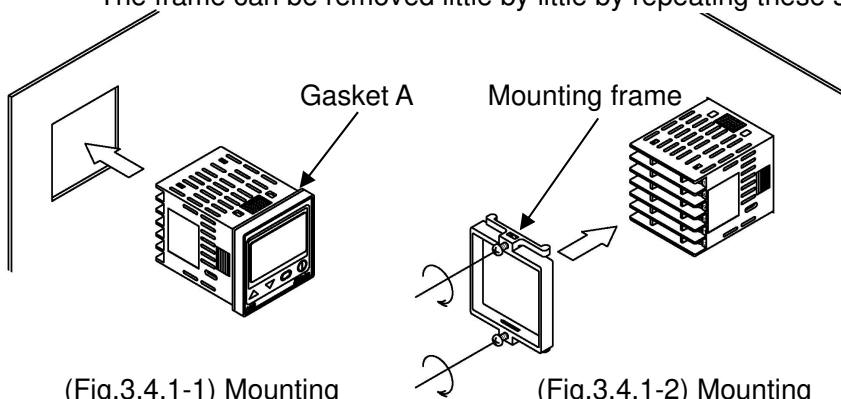
Mount the controller vertically to the flat, rigid panel to ensure it adheres to the Drip-proof/Dust-proof specifications (IP66).

Mountable panel thickness: 1 to 5 mm

- (1) Insert the controller from the front side of the panel. (Fig.3.4.1-1)
- (2) Insert the mounting frame until it comes into contact with the panel, and fasten with screws. Tighten screws with one rotation upon the screw tips touching the panel. (Fig.3.4.1-2)
The torque is 0.05 to 0.06 N•m.

3.4.2 How to Remove the Mounting Frame and Unit (Fig. 3.4.2-1)

- (1) Turn the power to the unit OFF, and disconnect all wires before removing the mounting frame.
- (2) Insert a flat blade screwdriver between the mounting (screw) frame and unit ①.
- (3) Slowly push the frame upward using the screwdriver ②, while pushing the unit toward the panel ③.
- (4) Repeat step (2) and slowly push the frame downward using the screwdriver for the other side.
The frame can be removed little by little by repeating these steps.



(Fig.3.4.1-1) Mounting

(Fig.3.4.1-2) Mounting

(Fig.3.4.2-1) Removal

4. Wiring



Warning

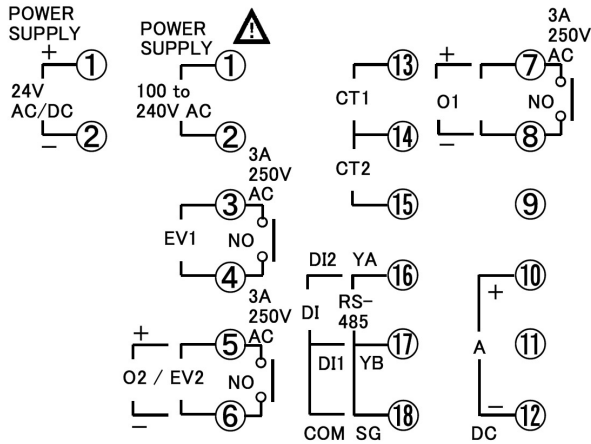
Turn the power supply to the instrument off before wiring or checking. Working on or touching the terminal with the power switched on may result in severe injury or death due to electrical shock.



Caution

- The terminal block of this instrument is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw. The torque should be 0.63 N•m.
- This instrument does not have a built-in power switch, circuit breaker and fuse. It is necessary to install a power switch, circuit breaker and fuse near the controller. (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- For a 24 V AC/DC power source, do not confuse polarity when using direct current (DC).
- For the input, use the infrared temperature sensor RD-500 series or RD-715-HA.
- When using a relay contact output type, externally use a relay according to the capacity of the load.
- When wiring, keep input wires away from AC sources or load wires.

4.1 Terminal Arrangement



- EV1: Alarm 1 output
- EV2: Alarm 2 output (A2 option) or Heater burnout alarm output (W, W3 option)
- O2: Control output (OUT2) (D□ option)
- O1: Control output (OUT1)
- DC: Direct current input (Infrared temperature sensor RD-500 series, or RD-715-HA)
- CT1: Current transformer input 1 (W, W3 option)
- CT2: Current transformer input 2 (W3 option)
- DI: Contact input (SM option)
- RS-485: Serial communication (C5 option)

(Fig. 4.1-1)

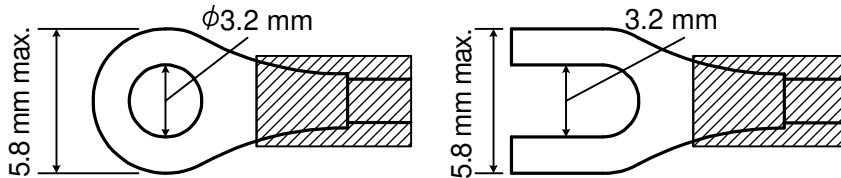
4.2 Lead Wire Solderless Terminal

Use a solderless terminal with an insulation sleeve in which an M3 screw fits as shown below. (Fig. 4.2-1) The torque should be 0.63 N·m.

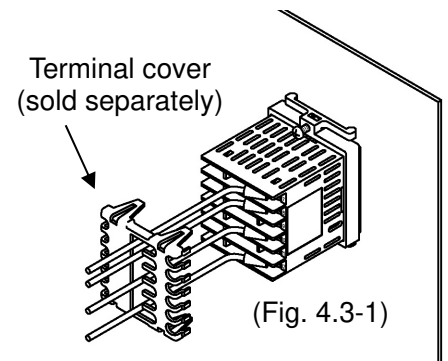
4.3 When Using a Terminal Cover

When using a terminal cover (sold separately), pass terminal wires numbered 7 to 12 into the holes of the terminal cover. (Fig. 4.3-1)

Solderless terminal	Manufacturer	Model	Tightening torque
Y-type	Nichifu Terminal Industries CO., LTD.	TMEV1.25Y-3	0.63 N·m
	Japan Solderless Terminal MFG CO., LTD.	VD1.25-B3A	
Ring-type	Nichifu Terminal Industries CO., LTD.	TMEV1.25-3	
	Japan Solderless Terminal MFG CO., LTD.	V1.25-3	



(Fig. 4.2-1)



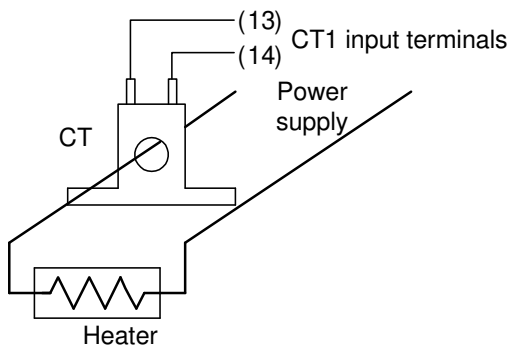
(Fig. 4.3-1)

4.4 Heater Burnout Alarm (W, W3 option) Wiring

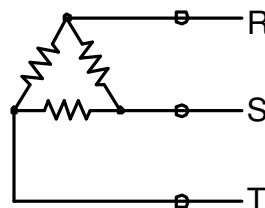
This alarm is not usable for detecting heater current under phase control.

Use the CT (current transformer) provided, and pass one lead wire of the heater circuit into the hole of the CT. (Fig. 4.4-1). When wiring, keep the CT wire away from AC sources or load wires to avoid external interference.

In the case of 3-phase (W3 option), pass any 2 lead wires of R, S, T into the CT, and connect them to CT1 (13, 14) and CT2 terminals (14, 15). (Fig. 4.4-2)



(Fig. 4.4-1)

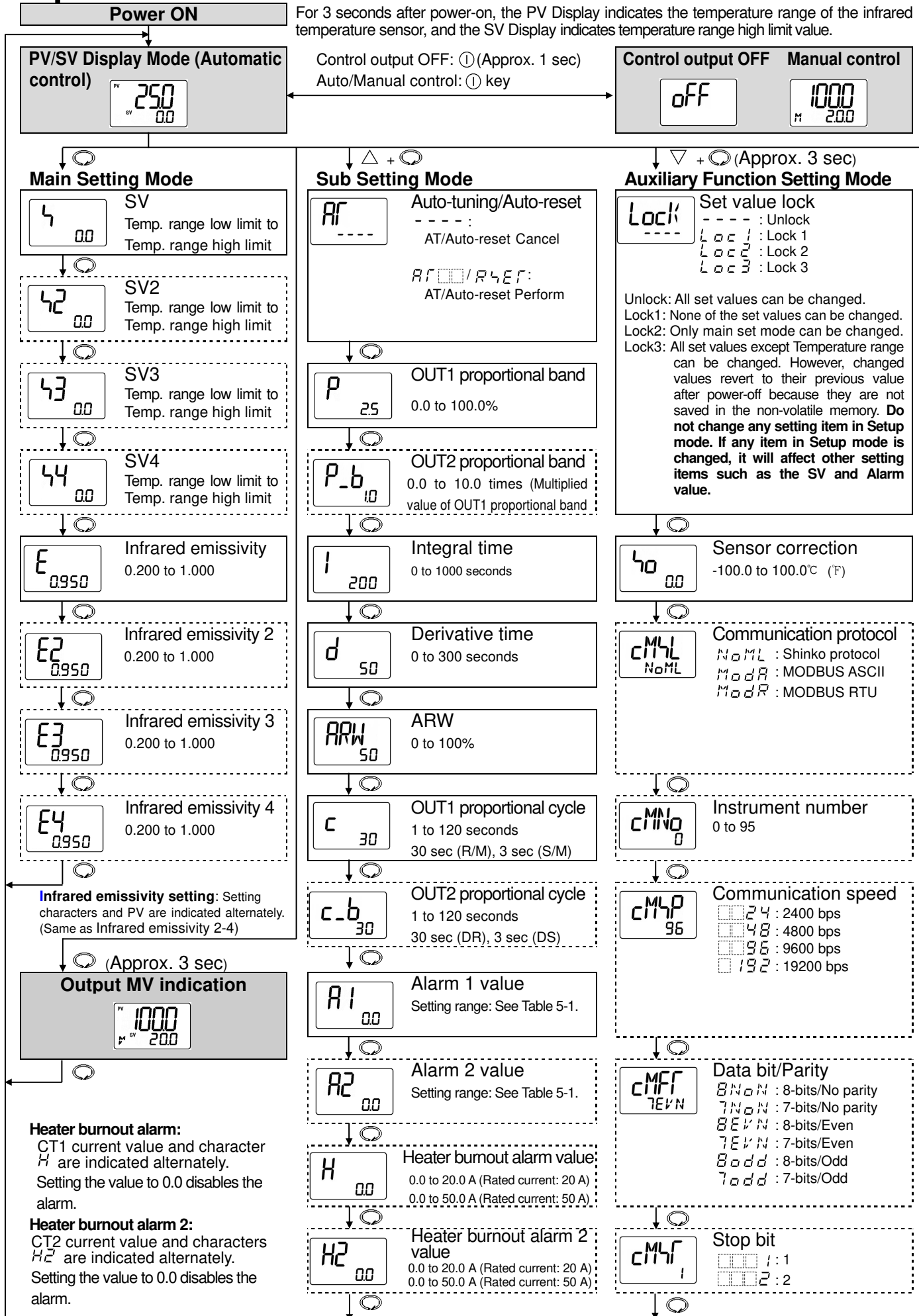


Pass any 2 wires of R, S and T into CT.

(Fig. 4.4-2)

5. Operation Flowchart

Abbreviation: Temp.: Temperature



Characters Used in this Manual:

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

[Infrared Emissivity Setting]

If the surface temperature and controller indication value do not match in the high temperature range, control can be performed by adjusting the temperature to the desired level via the infrared emissivity setting.

- Setting range: 0.200 to 1.000 (Factory default: 0.950)

[Emissivity]

Emissivity is the ratio between the energy amount radiated from the black body (or an object which has a perfect radiation) at a certain temperature and the energy amount radiated from any object at the same temperature. Therefore, the easier the infrared ray is to be radiated, the higher the emissivity value becomes. The more difficult the infrared ray is to be radiated, the lower the emissivity value.

For objects such as organic substances or ceramics, emissivity is so high that high accuracy measurement and control are possible. On the contrary, for the highly lustrous metals or other objects with low emissivity, its emissivity is greatly affected by reflection. In this case, by attaching black body tape to the surface of those objects, the emissivity can be increased, from which high accuracy measurement and control can be derived.

Emissivity of Main Objects

Object	Emissivity	Object	Emissivity	Object	Emissivity
Concrete	0.94	Brick (Red)	0.93 to 0.96	Painted lacquer	0.80 to 0.95
Water	0.92 to 0.96	Fabric (Black)	0.98	Painted lacquer (Lusterless black)	0.97
Ice	0.92 to 0.98	Human skin	0.98	Rubber (Black)	0.94
Paper	0.70 to 0.94	Iron oxide	0.78 to 0.82	Plastic	0.85

(Table 5-1) Alarm 1, 2 Values Setting Range

Alarm Type	Setting Range
High limit alarm	-(Temperature span) to temperature span°C (°F)
Low limit alarm	-(Temperature span) to temperature span°C (°F)
High/Low limits alarm	0 to temperature span°C (°F)
High/Low limit range alarm	0 to temperature span°C (°F)
Process high alarm	Temp. range low limit to temp. range high limit
Process low alarm	Temp. range low limit to temp. range high limit
High limit with standby alarm	-(Temperature span) to temperature span°C (°F)
Low limit with standby alarm	-(Temperature span) to temperature span°C (°F)
High/Low limits with standby alarm	0 to temperature span°C (°F)

Setting the value to 0 or 0.0 disables the alarm. (Except Process high alarm and Process low alarm)

Abbreviation:
Temp: Temperature

(Table 5-2) Alarm 1 Type [AL IF] (Factory default: - - - - : No alarm action)

	H [] High limit alarm	L [] Low limit alarm	HL [] High/Low limits alarm
Alarm action			
	HL [] High/Low limit range alarm	RA [] Process high alarm	RL [] Process low alarm
Alarm action			
	H [] High limit with standby alarm	L [] Low limit with standby alarm	HL [] High/Low limits with standby alarm
Alarm action			

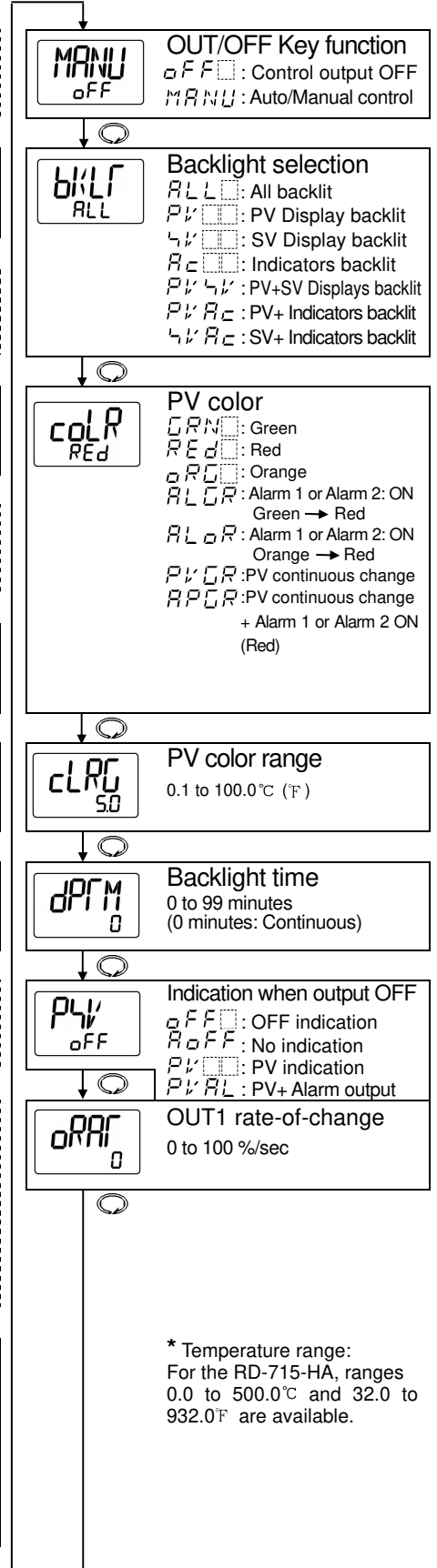
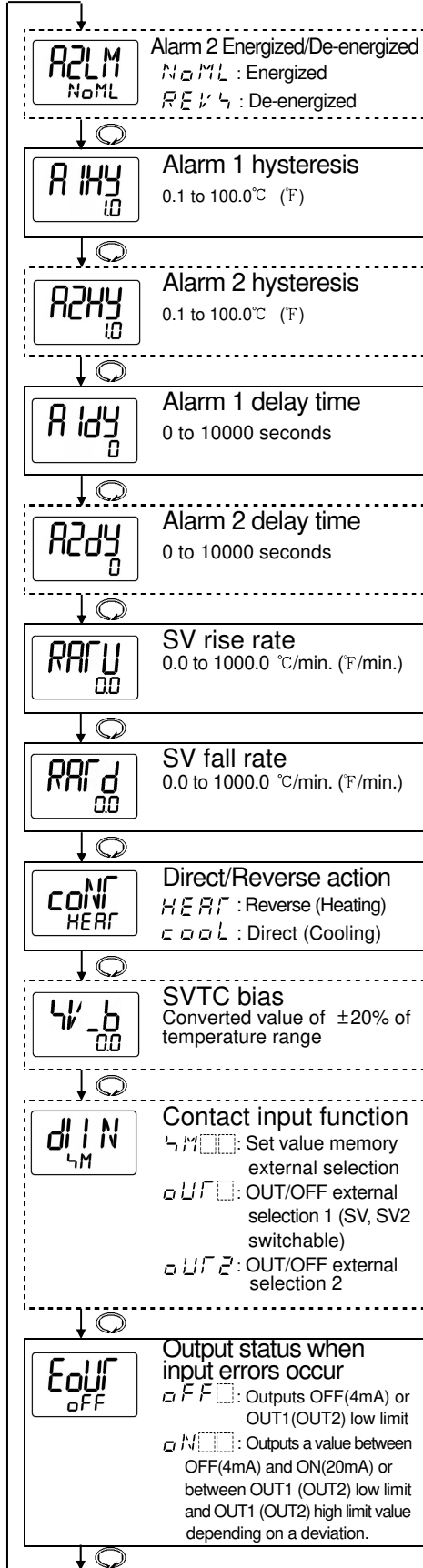
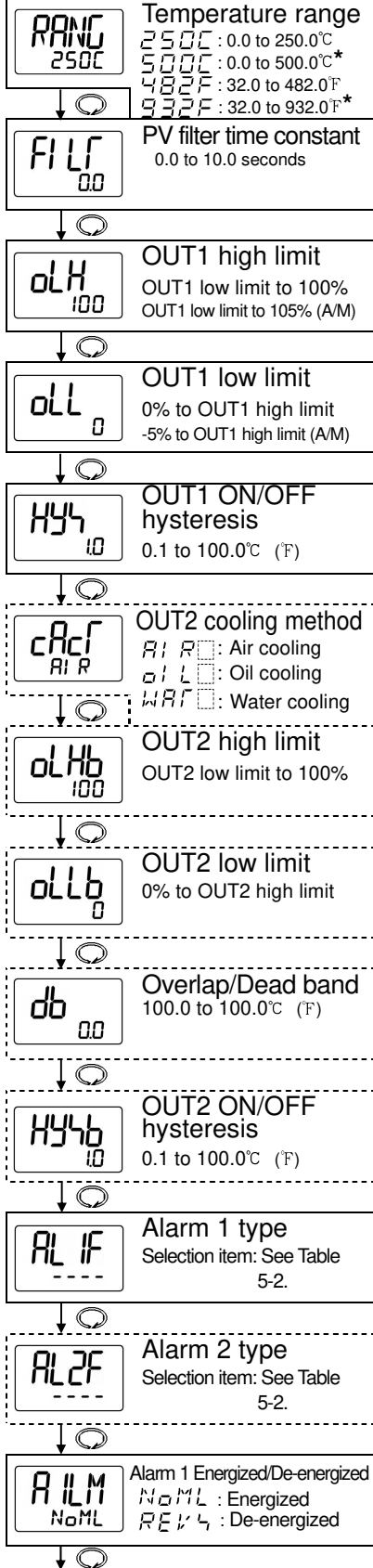
: Alarm output is in standby.

“A1” means Alarm 1. For Alarm 2, read “A2” for “A1”.

- PV Display indicates setting item characters, and SV Display indicates factory default.
- Setting items with dotted lines are optional, and they appear only when the corresponding option is ordered.
- **Key operation** (Use the Δ or ∇ key to set or select each setting item.)
- If the \odot key is held down for 3 seconds at any setting mode, the unit will return to PV/SV Display Mode.
- $\downarrow \odot$: This means that if the \odot key is pressed, the unit proceeds to the next mode, illustrated by an arrow.
- $\Delta + \odot$: Press the Δ and \odot keys (in that order) together.
- $\nabla + \odot$ (Approx. 3 sec): Press and hold the ∇ and \odot keys (in that order) together for 3 seconds.
- $\Delta + \nabla$ (Approx. 3 sec): Press and hold the Δ and ∇ keys (in that order) together for 3 seconds.

$\Delta + \nabla$ (Approx. 3 sec)

Setup Mode



* Temperature range:
For the RD-715-HA, ranges
0.0 to 500.0°C and 32.0 to
932.0°F are available.



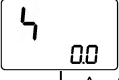


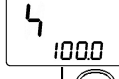


6. Operation

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

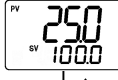


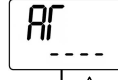


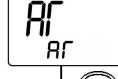


- (1) **Turn the power supply to the ACS-13A-□/A ON.**
- (2) **Set up the unit.** (Refer to "5. Operation Flowchart".) Setup (setting the Temperature range, Alarm type, Direct/Reverse action, etc.) should be done in Setup mode before using this controller. If the user's specifications are the same as the factory default of the instrument, it is not necessary to set up the controller. Proceed to Step (3).
- (3) **Input each set value.** Input each set value. Refer to "5. Operation Flowchart" and "7. Basic Settings".
- (4) **Turn the load circuit power ON.** Control action starts so as to keep the control target at the SV.

7. Basic Settings

● Main Setting Mode (When setting SV to 100.0°C)

- (1)  **Proceed to Main setting mode.**
Press the  key in PV/SV Display Mode. The unit proceeds to Main setting mode.
- (2)  **Set SV.**
Set SV with the  or  key.
- (3)  **Register the SV.**
Register the SV by pressing the  key. The unit reverts to PV/SV Display Mode.
- (4)  **Control starts.**
Control starts so as to keep the measuring temperature at 100.0°C.

● Auto-tuning Perform/Cancel (PID control)

- (1)  **Proceed to Sub setting mode.**
Press the ,  keys (in that order) together in PV/SV Display Mode. The unit proceeds to Sub setting mode.
- (2)  **Select AT Perform/Cancel.**
Select AT Perform with the  key, or select AT Cancel with the  key.
- (3)  **Confirm AT Perform/Cancel.**
Press the  key. The unit reverts to PV/SV Display Mode.
- (4)  **AT Perform/Cancel**
While AT is performing, the AT indicator flashes, and it turns off if AT is cancelled.

- In order to decide each P, I, D and ARW values automatically, the auto-tuning process has been made to fluctuate to get an optimal value.
- 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.
- Auto-reset is available for P or PD action. Auto-reset is cancelled in approx. 4 minutes. It cannot be released while performing this function.

8. Specifications

Power supply voltage: 100 to 240 V AC 50/60 Hz, 24 V AC/DC 50/60 Hz

Allowable voltage fluctuation: 100 to 240 V AC: 85 to 264 V AC, 24 V AC/DC: 20 to 28 V AC/DC

Accuracy (Setting, Indication): Within $\pm 0.2\%$ of temperature span ± 1 digit

Control output (OUT1):

Relay contact 1a, Control capacity: 3 A 250 V AC (resistive load)

1 A 250 V AC (inductive load $\cos\phi=0.4$), Electrical life: 100,000 cycles

Non-contact voltage (for SSR drive): 12 V DC $\pm 15\%$, Max. 40 mA DC (short circuit protected)

Direct current: 4 to 20 mA DC, Load resistance: Max. 550 Ω

Alarm 1, Alarm 2 (A2 option), Heater burnout alarm output (W, W3 option):

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

Control output (OUT2) (D□ option):

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

Non-contact voltage (for SSR drive): 12 V DC $\pm 15\%$, Max. 40 mA DC (short circuit protected)

Contact input: Circuit current when closed: Approx. 12 mA

Power consumption: Approx. 8 VA

Ambient temperature: 0 to 50°C (32 to 122°F) (No icing)

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

Weight: Approx. 120 g

Accessories included: Instruction manual: 1 copy, Mounting frame: 1 piece

Gasket A (Front mounted to the ACS-13A-□/A): 1 piece

CT (Current transformer):

CTL-6S: 1 piece [W (20A) option], 2 pieces [W3 (20A) option]

CTL-12-S36-10L1U: 1 piece [W (50A) option], 2 pieces [W3 (50A) option]

Accessories sold separately: Terminal cover

SHINKO TECHNOS CO., LTD. OVERSEAS DIVISION

Head Office: 2-5-1, Senbahigashi, Minoo, Osaka, Japan

URL: <http://www.shinko-technos.co.jp/e/>

E-mail: overseas@shinko-technos.co.jp

Tel: +81-72-727-6100

Fax: +81-72-727-7006