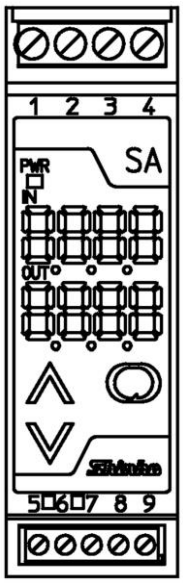
PULSE ISOLATOR

SAF SERIES

SAFI

INSTRUCTION MANUAL



Shinko

Preface

Thank you for purchasing our Pulse Isolator SAFI. This manual contains instructions for the mounting, functions, operations and notes when operating the SAFI. To prevent accidents arising from the misuse of this instrument, please ensure the operator receives this manual.

Notes

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

SAFETY PRECAUTIONS (Be sure to read these precautions before using our products.)

The safety precautions are classified into categories: “Warning” and “Caution”.
Depending on the 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 electric shock or fire, only Shinko or other qualified service personnel may handle the inner assembly.
- To prevent an electric shock, fire or damage to the instrument, parts replacement may only be undertaken by Shinko or other qualified service personnel.

⚠ Safety Precautions

- To ensure safe and correct use, thoroughly read and understand this manual before using this instrument.
- This instrument is intended to be used for industrial machinery, machine tools and measuring equipment. Verify correct usage after 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. 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 -5 to 55℃ (23 to 131℉) 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
- When installing this unit within a control panel, please note that ambient temperature of this unit – not the ambient temperature of the control panel – must not exceed 55℃ (131℉). Otherwise the life of electronic components (especially electrolytic capacitor) 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, as they could cause a fire and malfunction.
- When wiring terminals, use ferrules with an insulation sleeve and crimping pliers made by Phoenix Contact GMBH & CO. applicable to terminals.
- Tighten the terminal screw using the specified torque. If excessive force is applied to the screw when tightening, the screw or case may be damaged.
- This instrument has no built-in power switch, circuit breaker and fuse. It is necessary to install a power switch, circuit breaker and fuse. It is necessary to install them near the instrument.
  (Recommended fuse: Time-lag fuse, rated voltage 250 V AC, rated current 2 A)
- For wiring of AC power source, be sure to use exclusive terminals as described in this manual. If AC power source is connected to incorrect terminals, the unit will burn out.
- For a 24 V DC power source, do not confuse polarity 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, as the input circuit may burn out.
- Keep the input/output wires and power line separate.

3. Operation and Maintenance Precautions

⚠ Caution

- Do not touch live terminals. This may cause electrical shock or problems in operation.
- Turn the power supply to the instrument OFF when retightening the terminal and cleaning. Working on or touching the terminal with the power switched ON may result in severe injury or death due to electrical 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, be careful not to put pressure on, scratch or strike it with a hard object.

Characters used in this manual

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

☐ means that no character is indicated (unlit) on the display.

CONTENTS

1. Model

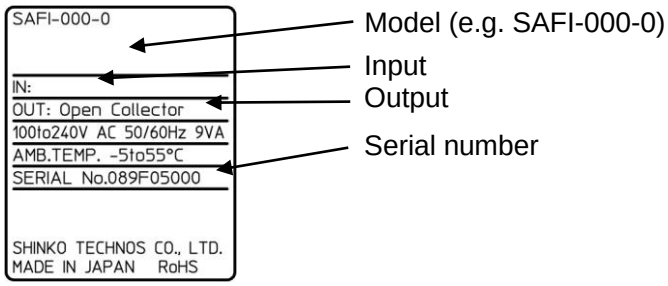
1.1 Model

SAFI - 0 □	□ - □	Series name: SAF
Input 0		Open collector
Input 1		Voltage pulse
Input 2		Line driver
Input 3		Contact switch
Output 0		Open collector
Output 1		5 V voltage pulse
Output 2		12 V voltage pulse
Power supply 0		100 to 240 V AC
Power supply 1		24 V AC/DC

(Example) SAFI-000-0 Input frequency: 800 Hz, Scaling: 0 to 800
Factory default: Input frequency: 9999 Hz
Scaling: 0 to 800

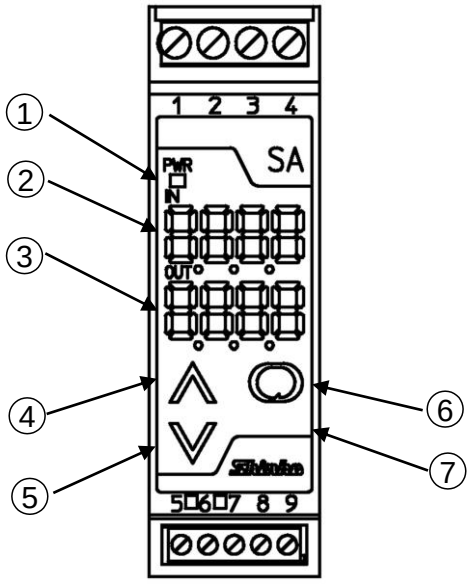
1.2 How to Read the Model Label

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



(Fig. 1.2-1)

2. Name and Functions



(Fig.2.1)

①**Power indicator** (Green)
Lights when the power to the instrument is turned on.

②**Input Display** (Red)
Indicates the input value during Run mode.
Indicates setting item characters during Setup mode.

③**Output Display** (Green)
Unlit.
Indicates set values during Setup mode.

④**UP key** (∧)
Increases the numeric value, or switches the selection items.

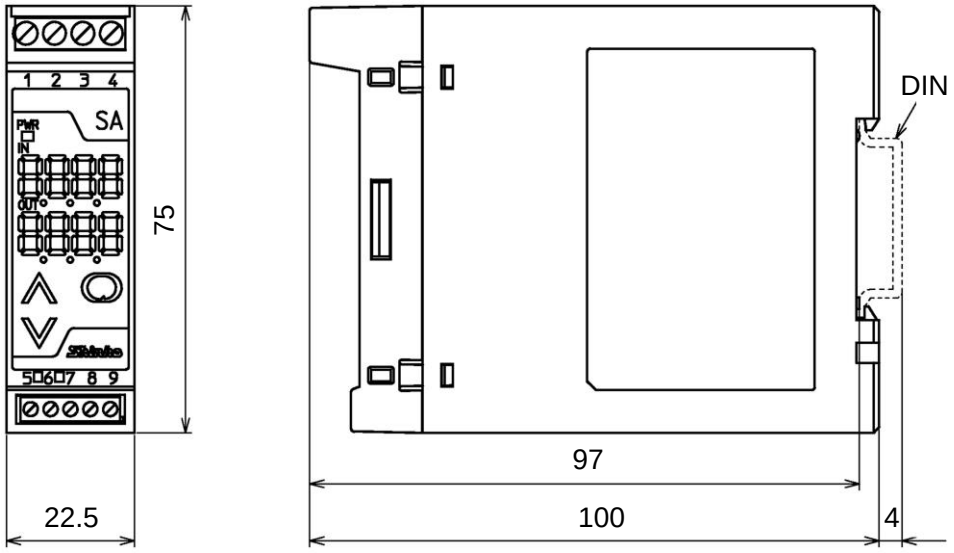
⑤**DOWN key** (∨)
Decreases the numeric value, or switches the selection items.

⑥**MODE key** (○)
Switches the setting mode, and registers the set value (or selection).

⑦**SUB-MODE key (Unmarked)**
If the MODE key is pressed while holding down this key, the unit proceeds to Setup mode.

3. Mounting

3.1 External Dimensions (Scale: mm)



(Fig. 3.1-1)

3.2 Mounting to and Removal from the DIN Rail

⚠ Caution

- **Mount the DIN rail horizontally.**
- **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.
- **Be sure to use commercially available fastening plates at both ends of the unit if it is in a position susceptible to vibration or shock.**

Recommended fastening plate

Manufacturer	Model
Omron Corporation	End plate PFP-M
IDEC Corporation	Fastening plate BNL6
Panasonic Electric Works Co., Ltd.	Fastening plate ATA4806

Mounting to the DIN rail (Fig. 3.2-1)

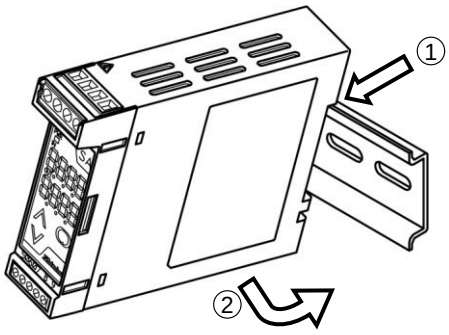
First, hook ① of the instrument on the upper side of the DIN rail.

Second, making ① part of the instrument as a support, fit the lower part ② of the instrument to the DIN rail.
The unit will be completely fixed to the DIN rail when a “Click” sound is heard.

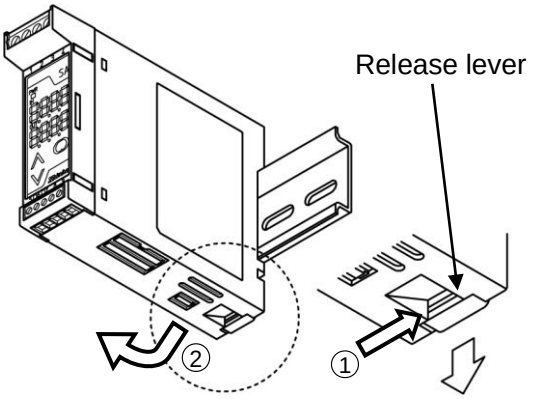
Removal from the DIN rail (Fig.3.2-2)

First, insert a flat blade screwdriver into the Release lever (①).

Second, remove the instrument from the DIN rail by pulling down the lever (②).



(Fig. 3.2-1) Mounting



(Fig. 3.2-2) Removal

4. Wiring

⚠ Warning

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

4.1 Recommended Ferrules

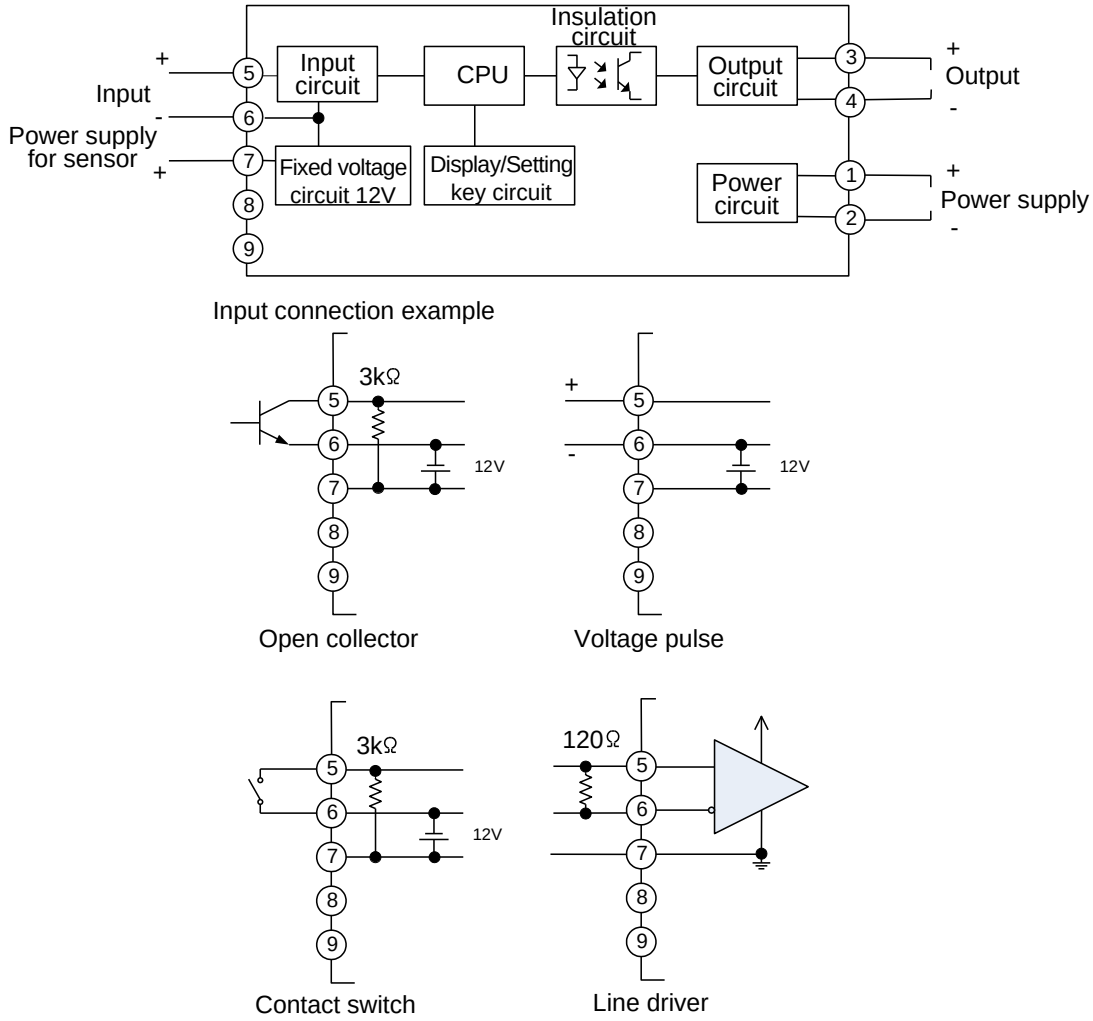
When using ferrules, use the following recommended ferrules and crimping pliers made by Phoenix Contact GMBH &CO. See (Table 4.1-1) on p.8.

Please note that screw size and tightening torque differ depending on the terminal number.

(Table 4.1-1)

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 0.6 N•m	CRIMPFOX ZA 3 CRIMPFOX UD 6
		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 0.25 N•m	
		AI 0.34-8 TQ	0.25 to 0.34mm^2		
		AI 0.5-8 WH	0.34 to 0.5mm^2		

4.2 Terminal Arrangement and Circuit Configuration



(Fig. 4.2-1)

4.3 Wiring of Terminals

⚠ Warning

- For 100 to 240 V AC, if AC power source is connected to incorrect terminals, this instrument will burn out.
- For a 24 V DC power source, do not confuse polarity when wiring.

4.3.1 Power Source Wiring

Use terminals ①(+) and ②(-) for the power supply to the instrument.

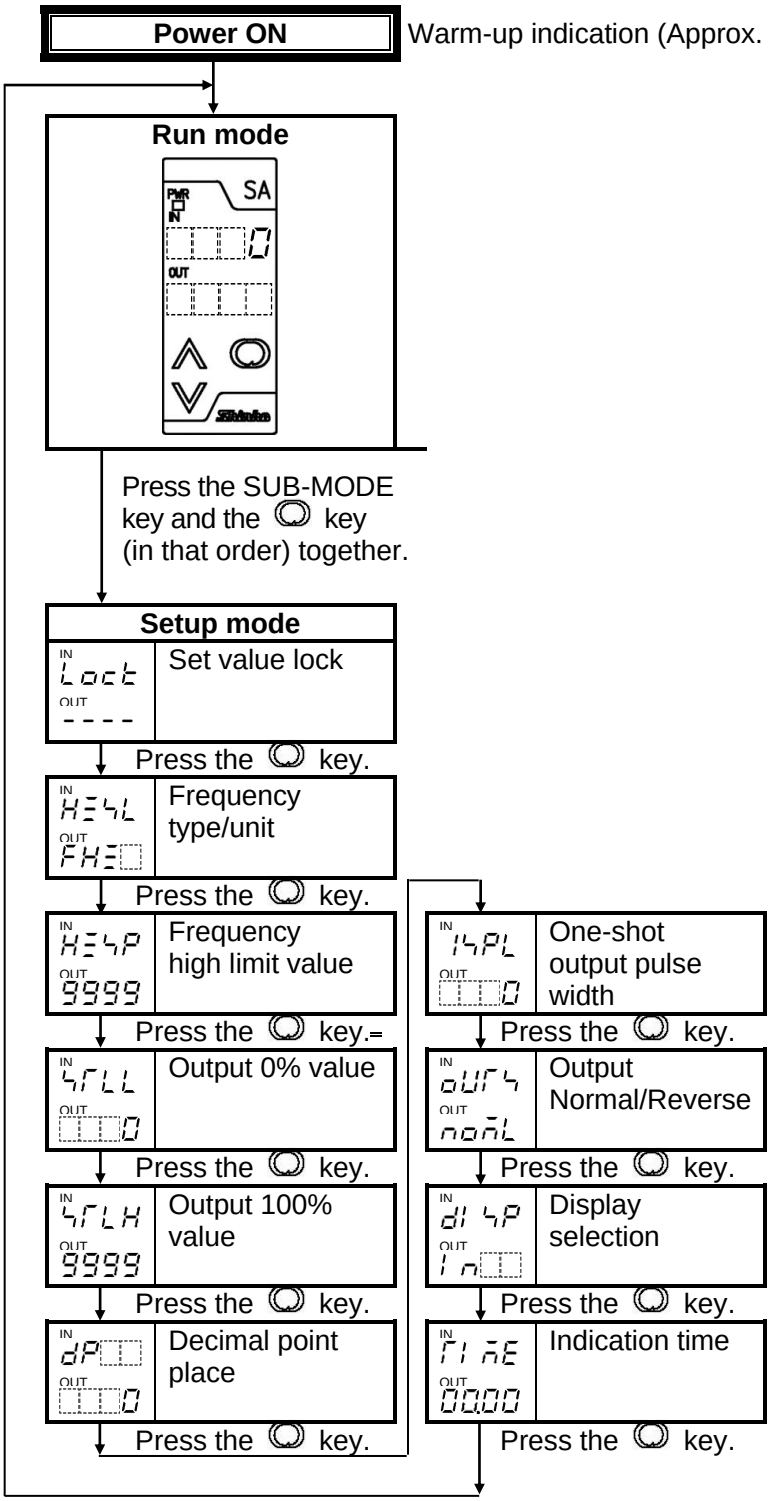
4.3.2 Output Wiring

Use terminals ③(+) and ④(-) for the output wiring.

4.3.3 Input Wiring

Terminals for wiring differs depending on the input specifications. See (Fig. 4.2-1).

5. Key Operation Flowchart



6. Setup

Setup should occur before using this unit according to the user's specifications (setting the Frequency type/unit, Frequency high limit value, Output 0% value, Output 100% value, One-shot output pulse width, output Normal/Reverse, etc.).

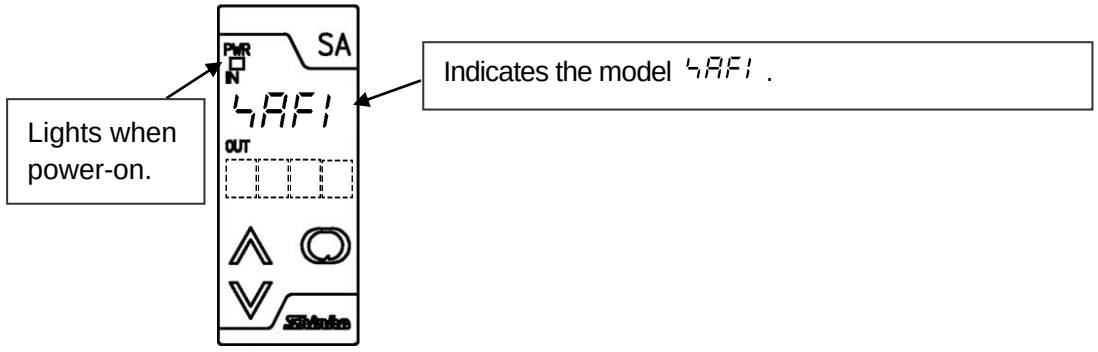
If the user's specifications are the same as the default value of this instrument, or if setup has already been completed, it is not necessary to set up the instrument. Proceed to Section "7. Unit Operation".

(Table 6-1)

Setting item	Factory default value
Set value lock	Unlock
Frequency type/unit	Frequency measurement Hz
Frequency high limit value	9999 Hz
Output 0% value	0
Output 100% value	9999
Decimal point place	No decimal point
One-shot output pulse width	0 ms
Output Normal/Reverse	Normal
Display selection	Input indication
Indication time	00.00 (Continuous)

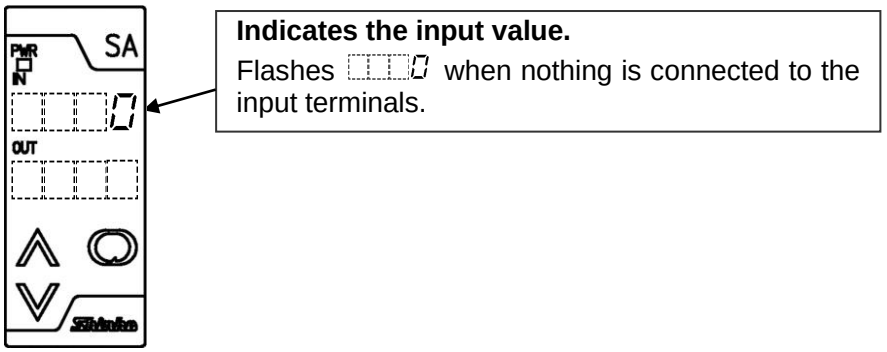
6.1 Indication after Power-on

After power-on, warm-up status below (Fig. 6.1-1) is indicated for approx. 2 seconds.



(Fig. 6.1-1)

After that, the unit switches to Run mode as shown below (Fig. 6.1-2).



(Fig. 6.1-2)

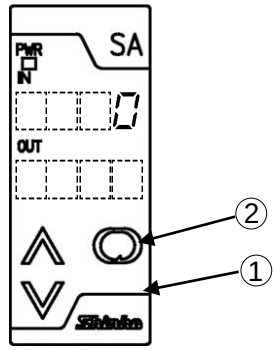
6.2 Basic Operation of Setup

Setup is conducted in Setup mode.

To enter Setup mode, press the SUB-MODE key and ◎ key (in that order) together in Run mode. (Fig. 6.2-1)

To set (select) each item, use the ∧ or ∨ key, and register the value with the ◎ key. (Fig. 6.2-2)

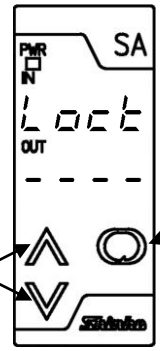
(1) Run mode



To enter Setup mode, press the SUB-MODE key ① and ◎ key ② (in that order) together in Run mode.

(Fig. 6.2-1)

(2) Setup mode



To set (or select) each item, use these keys.

To proceed to each setting item and to register the set (selected) value, use this key.

(Fig. 6.2-2)

6.3 Setup of the Unit

The following shows all setup items. Set up the unit referring to the explanation of each item.

Display	Name, Function, Setting range	Factory default value
IN Lock OUT - - - -	**Set value lock**	Unlock
	Locks the set values to prevent setting errors. - - - -: Unlock Lock: Lock (None of the set values can be changed.)	
IN HzL OUT FHz□	**Frequency type/unit**	Frequency measurement Hz
	Sets input frequency type (Low pulse/Frequency) and unit [mHz/Hz(Low pulse)/Hz/kHz]. PmHz: Pulse measurement mHz (Low pulse) PHz□: Pulse measurement Hz (Low pulse) FHz□: Frequency measurement Hz FkHz: Frequency measurement kHz	
IN HzH OUT 9999	**Frequency high limit value**	9999 Hz
	Sets input frequency high limit value. (Frequency low limit value is fixed) Pulse measurement mHz (Low pulse): 10 to 9999 mHz Pulse measurement Hz (Low pulse): 1 to 100 Hz Frequency measurement Hz: 50 to 9999 Hz Frequency measurement kHz: 1 to 15 kHz	

4rLL OUT □□□0	**Output 0% value**	0
	Sets the value (indicated on the Input Display) at 0% output. Setting range: -1999 to Output 100% value	
IN 4rLH OUT 9999	**Output 100% value**	9999
	Sets the value (indicated on the Input Display) at 100% output. Setting range: Output 0% value to 9999	
IN dP□□ OUT □□□0	**Decimal point place**	No decimal point
	Selects the decimal point place. □□□0: No decimal point □□0.0: 1 digit after decimal point □0.00: 2 digits after decimal point 0.000: 3 digits after decimal point	
IN 14PL OUT □□□0	**One-shot output pulse width**	0 ms
	If a pulse is entered, outputs “one-shot output pulse” during one-shot output pulse width setting time. (Fig. 6.3-1) Not available when setting to 0. Setting range: 0 to 400 ms	
IN oUr4 OUT norL	**Output Normal/Reverse**	Normal
	Selects either Normal mode (0.0 to 100.0%) or Reverse mode (100.0 to 0.0%) for output status. (Fig. 6.3-1) norL: Normal rEV4: Reverse	
IN dI 4P OUT I n□□	**Display selection**	Input indication
	Selects an indication type on the display. I n□□: Input indication nonE: No indication (Only the power indicator is lit.)	
IN rI nE OUT 00.00	**Indication time**	00.00 (Continuous)
	Sets the indication time of the display after the final key operation. Not available if No indication (Only the power indicator is lit) is selected in [Display selection] After the indication time has elapsed, the displays turns off (Only the power indicator is lit.). If power is turned on again, or if any of the ∧, ∨, ◎ or SUB-MODE key is pressed while displays are unlit, the displays will light again. Setting range: 00.00: Continuous 00.01 (1 second) to 60.00 (60 minutes) [Minutes.Seconds]	

6.3.1 When Using This Unit as a Standard Pulse Isolator

Select ‘Normal’ in [Output Normal/Reverse]. (Fig. 6.3-1)

6.3.2 When Using the Reverse Function

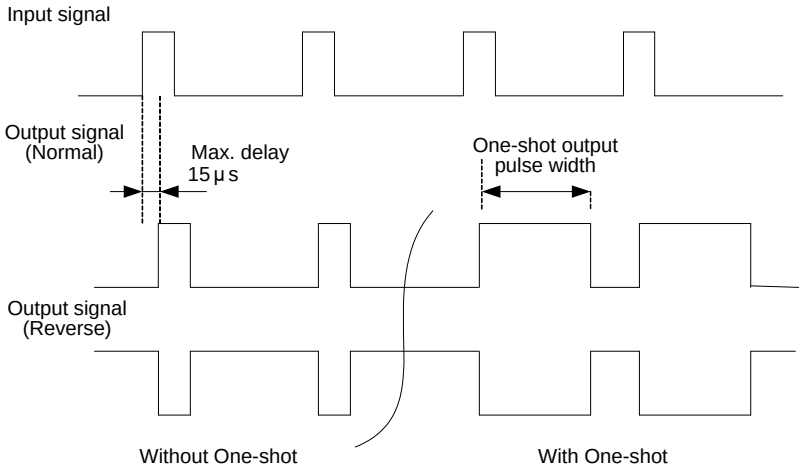
This function reverses the output (100 to 0%) that corresponds to the input (0 to 100%).
Select ‘Reverse’ in [Output Normal/Reverse]. (Fig. 6.3-1)

Output waveform

If One-shot output pulse width is set to 0 ms, input and output will be the same pulse width. Output signal delay is maximum 15 μs.

When One-shot output pulse width is set to a value (1 to 400 ms), and if a pulse is entered, outputs “one-shot output pulse” during one-shot output pulse width setting time.

Pulse width accuracy: 1 ms

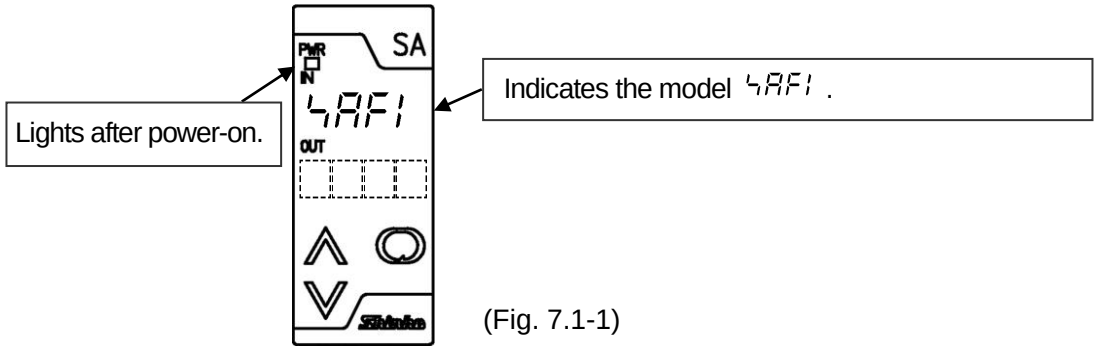


(Fig. 6.3-1)

7. Unit Operation

7.1 Indication after Power-on

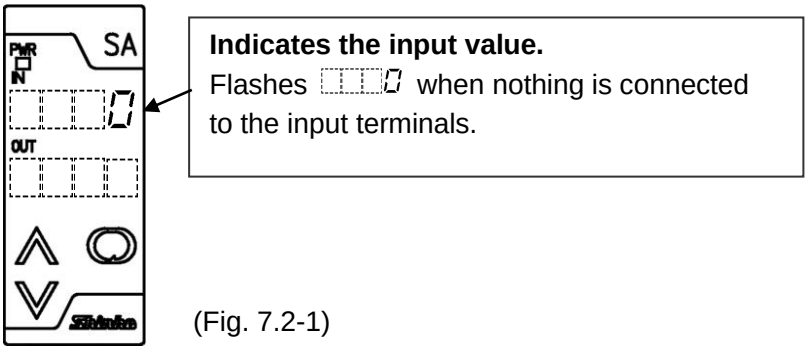
After power-on, the following warm-up status is indicated for 2 seconds (Fig. 7.1-1).



(Fig. 7.1-1)

7.2 Unit Operation

The unit enters Run mode after approx. 2-second warm-up as shown in (Fig. 7.2-1). Outputs the same pulse width as an input signal, or outputs during one-shot output pulse width setting time.



(Fig. 7.2-1)

• **Indication when input value is 10000 or more**
When DC current or voltage input is selected: For the indication of 10000 or more, the lower 4 digits of input value are flashing.
(e.g.) Indication of 10020

• **Indication when pulse is absent**
When pulse is absent, 0 (zero) flashes.

• **Overrange indication**
In the case of overrange (1.1 times frequency high limit value), [- - - -] flashes on the Input Display.

• **Indication time setting**
If indication time is set, the displays will turn off after the indication time has elapsed. (Only the power indicator is lit.)
If power is turned on again, or if any of the ∧, ∨, ◎ or SUB-MODE key is pressed while displays are unlit, the displays will light again.

8. Specifications

Input Specifications

Input method: Pulse frequency or cycle measurement

Open collector

Frequency range:	0.001 Hz to15 kHz
Minimum pulse width:	5 μs or more (for ON and OFF)
Input detection voltage/current :	ON: Max. 30 mA (30 V or less)
	OFF: Residual voltage, 0.5 V or less
Action input conditions:	ON: 200 Ω or less
	OFF: 100 kΩ or more
Max rated input frequency:	20 kHz

Voltage pulse

Frequency range:	0.001 Hz to 15 kHz
Minimum pulse width:	5μs or more (for High and Low)
Waveform:	Rectangular wave, sine waveform or similar
Detection level:	Low: 1 V DC or less
	High: 2 V DC or more
Input impedance:	100 kΩ or more
Input amplitude:	2 to 50 V_{p-p}
Max rated input frequency:	20 kHz

Line driver

AM26LS31 or equivalent

Receiver:	AM26LS32 or equivalent
Terminator:	120 Ω

Contact switch

Frequency range:	0.001 to 10 Hz
Minimum pulse width:	10 ms or more (for ON and OFF)
Action input conditions:	ON: 200 Ω or less
	OFF: 100 kΩ or more

Output Specifications

Open collector

Output rating:	12 V DC/30 mA
Max. frequency:	15 kHz

Voltage pulse

Output rating:	5 V, 12 V DC±10%
Allowable load resistance:	500 Ω or more
Max. frequency:	15 kHz

Performance

Reference accuracy: **Within ±0.1% (At 23℃ of ambient temperature)**

Display accuracy: Within Reference accuracy±1 digit

Response time: 15μs or less (For open collector output, rising time delays depend on load.)

Insulation resistance: Input – Output – Power: 10 MΩ or more, at 500 V DC

Dielectric strength: Input – Output – Power: 2.0 kV AC for 1 minute

General Structure

Case: Flame-resistant resin, Color: Light gray

Front panel: Membrane sheet

Setting: By the front keypad

Displays, indicator: Input Display: 7 segments Red LED display 4 digits
Character size: 7.4 x 4.0 mm (H x W)
Output Display: 7 segments Green LED display 4 digits
Character size: 7.4 x 4.0 mm (H x W)
Power indicator: Green LED

Installation Specifications

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

Allowable voltage range: 85 to 264 V AC, 20 to 28 V AC/DC

Power consumption: Approx. 9 VA

Power supply for sensor: 12 V DC±5%, 25 mA

Ambient temperature: -5 to 55℃ (23 to 131℉)

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

Altitude 2,000 m or less

Weight: Approx. 120 g

Mounting: DIN rail

External dimensions: W22.5 x H75 x D100 mm

Attached Functions

- Power failure countermeasure: The setting data is backed up in the non-volatile IC memory.
- Self-diagnosis: The CPU is monitored by a watchdog timer, and if an abnormal status occurs, the unit is switched to warm-up status, turning all outputs off.
- Detecting unconnected sensor:
  If pulse is not detected for a constant period (Low pulse: 1000 sec or 100 sec, Frequency: 1 sec), the unit will revert to the initial status (0 Hz).

9. Troubleshooting

9.1 Indication

Problem	Possible Cause and Solution
The Input Display is flashing [‾ ‾ ‾ ‾].	• Check whether the input exceeds 1.1 times frequency high limit value. Confirm the input signal source. • Check whether the sensor is securely connected to the input terminals of this instrument. Connect the sensor terminals to the input terminals of this instrument. • Check whether the signal source is normal. Check the input signal source.
Input value 0 (zero) is flashing.	• Check if pulse is absent. Confirm the input signal source.
The indication of the Input Display is irregular or unstable.	• AC leaks into the sensor circuit. Use an ungrounded type sensor. • There may be equipment that interferes with or makes noise near the instrument. Keep the instrument clear of any potentially disruptive equipment. • Check if input exceeds maximum rated input frequency. Use the input within the frequency range.

9.2 Key Operation

Problem	Possible Cause and Solution
Settings are not possible.	• 'Lock' is selected in [Set value lock]. Select 'Unlock'.

9.3 Unit Operation

Problem	Possible Cause and Solution
Input value does not change.	• The sensor may be out of order. Replace the sensor. • Check whether input and output wires are securely connected to the I/O terminals of the instrument. Ensure that input and output wires are securely connected to the I/O terminals of the instrument. • Check whether the wiring of input and output is correct.
No output	• Check whether Output 100% and Output 0% value have been set to suitable values. • Check whether Output Normal/Reverse have been selected correctly in [Output Normal/Reverse].

10. Character Table

All setting items are indicated in the following table, however, some items will not be indicated depending on the specifications.

Setup mode

Display	Setting item	Factory default value	Data
LocK	Set value lock	Unlock	
HSEL	Frequency type/unit	Frequency measurement: Hz	
HSHP	Frequency high limit value	9999 Hz	
SPLL	Output 0% value	0	
SPLH	Output 100% value	9999	
dP□	Decimal point place	No decimal point	
1SPL	One-shot output pulse width	0 ms	
oUPS	Output Normal/Reverse	Normal	
dISP	Display selection	Input indication	
TIME	Indication time	00.00 (Continuous)	

******* Inquiries *******

For any inquiries about this unit, please contact our agency or the vendor where you purchased the unit after checking the following.

(e.g.)

- Model ..... SAFI-0□□-□
- Serial number ..... No. xxxxxx

In addition to the above, please let us know the details of malfunction, or discrepancy, and the operating conditions.

SHINKO TECHNOS CO., LTD.

OVERSEAS DIVISION

Head Office: 2-5-1, Senbahigashi, Minoo, Osaka, 562-0035, Japan

[URL] https://shinko-technos.co.jp/e/ Tel: +81-72-727-6100

[E-mail] overseas@shinko-technos.co.jp Fax: +81-72-727-7006

No.SA73E3 2024.10