

MA 1 1 Series

Digital controller

Instruction Manual

Thank you for purchasing the Shimax MA11 Series. Please check that the Delivered product is the correct item you ordered. Please do not begin Operating this product until you have read this instruction manual Thoroughly and understand its contents.

“ Notice ”

Please ensure that this instruction manual is given to the final user of the instrument.

Preface

This instruction manual is meant for those who will be involved in the wiring, installation, operation and routine maintenance of the MA11 series.

This manual describes the care, installation, wiring, function, and proper procedures for the operation of MA11 series. Keep this manual at the work site during operation of the MA11 series. While using this instrument. You should always follow the guidance provided herein.

1. Matters regarding safety

For matters regarding safety, potential damage to equipment and/or facilities, additional instructions are indicated by the following headings:

「 ⚠ WARNING 」


Exercise extreme caution as indicated. This heading indicates hazardous conditions that could cause injury or death of personnel

「 ⚠ CAUTION 」

Exercise extreme caution as indicated. This heading indicates hazardous conditions that could cause damage to equipment and/or facilities.

「 NOTE 」

This heading indicates additional instructions and/or notes.

The mark  designates a protective conductor terminal. Make sure to properly ground it.



「 ⚠ WARNING 」

MA11 series is designed for controlling temperature, humidity and other physical subjects. It must not be used in any way that may adversely affect safety, health, or working conditions.

「 ⚠ CAUTION 」

To avoid damage to the connected equipment, facilities or the product itself due to a fault of the product, safety countermeasures must be taken before usage, such as proper installation of the fuse and the overheating protection device. No warranty, expressed or implied, is valid in the case of usage without having implemented proper safety countermeasures.

「 ⚠ CAUTION 」

The  mark on the plate affixed to the instrument: On the terminal nameplate affixed to the case of your instrument, the  mark is printed. This is to warn you of the risk of electrical shock which may result if the charger is touched while it is energized.

The external power circuit connected to the power terminal of the instrument must have a means of turning off the power, such as a switch or breaker. Install the switch or breaker adjacent to the instrument in a position which allows it to be operated with ease, and with an indication that it is a means of turning off the power. The switch or breaker should meet the requirements of IEC 947.

Fuse: Since the instrument does not have a built-in fuse, do not forget to install a fuse in the power circuit to be connected to the power terminal.

The fuse should be positioned between the switch or breaker and the instrument and should be attached to the L side of the power terminal.

Fuse Rating: 250V AC 0.5A/medium lagged or lagged type.

Use a fuse which meets the requirements of IEC 127.

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「 ⚠ CAUTION 」

Load voltage/current to be connected to the output terminal and the alarm terminal should be within the rated range. Otherwise, the temperature will rise and reduce the life of the product and/or result in problems with the product. The output terminal should be connected to a device which meets the requirements of IEC1010.

- Voltage different from that of the input specification should not be connected to the input terminal. It may reduce the life of the product and/or result in problems with the product. When input type is voltage, the input terminal should be connected to a device which meets the requirement of IEC1010.
- This instrument is provided with a vent for heat discharge. Take care to prevent metal or other foreign matter from obstructing it. Failure to do so may result in problems with the product and may even result in fire.
- Do not block the vent or allow dust to accumulate. The rise in temperature or insulation failure caused by blocking the vent may result in shortening the life of the product and/or problems with the product.
- Repeated tolerance tests against voltage, noise, surge, etc., may lead to deterioration of the instrument.
- No modification or irregular usage is allowed.

2 . Introduction

2-1. Check before use

This product has been fully checked for quality assurance prior to shipment.

However, you are requested to check the model code, the external view of the product and the accessories to make sure that there is no error, damage, or shortage of delivered items.

Confirmation of model code: Check the model code on the case of the product to ascertain that the delivered item is what you ordered by referring to the following code table.

Example of model code : MA11-CA0

Item

1. Series	MA11-
2. Control output	CA : contact SB : SSR drive voltage
3. Remarks	0 : without 9 : with

Check of accessories

Instruction manual: 1set, Unit decal: 1sheet

NOTE: Contact our representative or our local office concerning any problems with the product and accessories, or for any inquiry.

2-2. Caution for use

- (1) Avoid operating the front panel keys with hard or sharp objects. Touch the keys lightly with finger tips.
- (2) To clean, wipe gently with a dry cloth. Avoid using solvents such as thinner.

3. Installation and wiring

3-1. Installation site (environmental conditions)

「 ⚠ CAUTION 」

Do not use this instrument under the following conditions. Otherwise, the likelihood of fire and/or other dangerous situations are considerable.

- (1) Where flammable gas, corrosive gas, oil mist or dust that can deteriorate electrical insulation is generated or is abundant.
- (2) Where the temperature is below 0°C or above 50°C.
- (3) Where the relative humidity is 90%RH or below dew point.
- (4) Where highly intense vibration or impact is generated or transferred.
- (5) Near high voltage power lines or where inductive interference can affect the operation of the product.
- (6) Where there are waterdrops or direct sun light.
- (7) Where the altitude is above 2,000m.

NOTE: The environmental conditions here comply with the installation category II and the pollution degree 2 set by IEC664.

3-2. Mounting

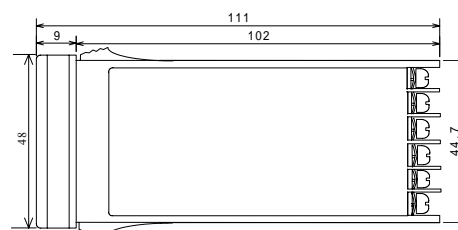
- (1) Machine the mounting hole by referring to the panel cutout in section 3-3.
- (2) Applicable thickness of the mounting panel is 1.0~4.0mm.
- (3) As this product provides mounting fixture, insert the product into the panel

NOTE: MA11 series controller is a panel set-up type.

Please use the product after setting up to the panel.

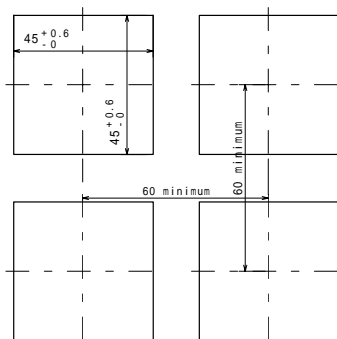
3-3. External dimensions and panel cutout

MA11 external dimensions (unit: mm)



MA11F-1AE March-02

MA11 Panel cutout (unit: mm)



3-4. Wiring

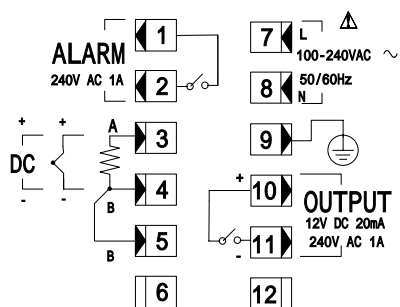
⚠ WARNING

- ⊙To prevent electrical shock, turn off electricity during wiring operation.
- ⊙Make sure to ground the protective conductor terminal (⊕) properly. Otherwise, a serious electric shock may result.
- ⊙Avoid touching the wired terminals and charged devices while supplying power.

- (1) Wiring operation should be done according to the instruction of the terminal arrangement plan in section 3-5 and the terminal arrangement table in section 3-6.
- (2) Crimp terminal should accommodate the M3 screw and should have a width of less than 6mm.
- (3) In case of thermocouple input, select the compensation wire suitable to the thermocouple type.
- (4) In case of R.T.D. input, leads should be less than 5Ω in resistance and three leads should have the same resistance.
- (5) Input signal line should not be laid in the same wire or duct as that of the high voltage line.
- (6) Should wiring(single point grounding) is effective for static induction noise.
- (7) Short interval twisted pair wire for input signal is effective for electromagnetic induction noise.
- (8) When wiring, use 600V Grade Polyvinyl Chloride insulated wires (1mm² minimum in sectional area) or equivalent wires which have the same ratings.
- (9) Each grounding should be performed with earth resistance less than 100Ω and with wires thicker than 2 mm².
- (10) Screw the terminal tightly.

Tightening torque: 0.9N·m (9kgf·cm)

3-5. Terminal arrangement plan



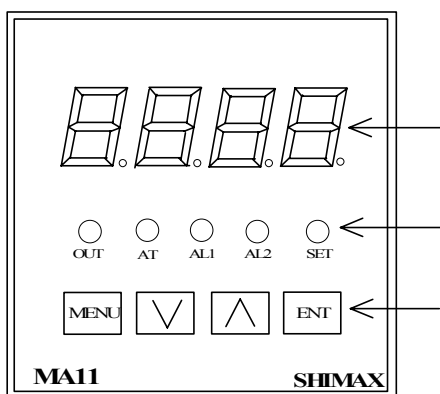
3-6. Terminal arrangement table

Name of terminal	Description	Terminal number
Power supply	100-240V AC: L	7
	100-240V AC: N	8
Protective grounding	⊕	9
Input	R.T.D.:A, Thermocouple·Voltage : +	3
	R.T.D.:B, Thermocouple·Voltage : -	4
	R.T.D.:B,	5
Control output	Contact:NO, SSR Drive voltage: +	10
	Contact:NO, SSR Drive voltage: -	11
Alarm output	Contact:NO	1
	Contact:NO	2

NOTE: When input type is thermocouple or voltage, a short circuit between B and B terminals causes measurement errors.

4 .Description of front panel

4-1. Drawing and the name of parts.



4-2. Description of parts on the front panel

- : Display section (red)
 - (1) Measured value (PV) is displayed on the basic screen.
 - (2) Type of setting and set value are alternately displayed on each parameter setting screen.
- : Monitor LED section
 - (1) Control output monitor LED OUT(green)
LED lights up when contact or SSR drive voltage output turns ON, and LED turns off when the output turns OFF
 - (2) Alarm output monitor LED AL1,AL2 (red)
LED lights up when assigned alarm output turns ON
 - (3) Auto tuning action monitor LED AT (green)
Select ON by pressing **▲** key on the AT action control screen, and press **ENT** key to execute AT. LED blinks while AT is operating, and turns off when AT is cancelled or automatically completed.
 - (4) SET monitor LED SET (orange)
LED lights up if the display section does not show the basic screen. (The basic screen shows the measured value.)

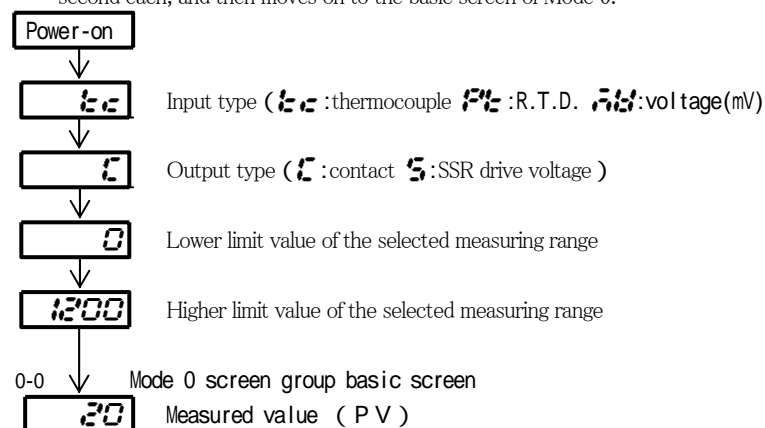
: Key-switch section

- (1) MENU key
Press MENU key on any screen of Mode 0 or Mode 1 to move on to the next screen.
Press MENU key for three seconds to jump to the lead screens between Mode 0 and Mode 1.
- (2) **▼** (DOWN) key
Press **▼** key on the basic screen to shift to the target-value setting screen. SET LED lights up. Press the key again and a dot beside the least decimal place will blink. Pressing the key can reduce the target-value.
By pressing **▼** key on any screen other than the basic screen, a dot beside the least decimal place blinks and the set value is reduced or the selected code is backed.
- (3) **▲** (UP) key
Press **▲** key on the basic screen to shift to the target-value setting screen. SET LED lights up. Press the key again and a dot beside the least decimal place will blink. Pressing the key can increase the target-value.
By pressing **▲** key on any screen other than the basic screen, a dot beside the least decimal place blinks and the set value is increased or the selected code is forwarded.
- (4) **ENT** (ENTRY) key
 - Press **ENT** key to register the setting changed by **▲** or **▼** key. (A dot beside the least decimal place stops blinking.)
 - Press **ENT** key on the control output screen for three seconds to select between automatic output and manual output.

5 .Description of screens

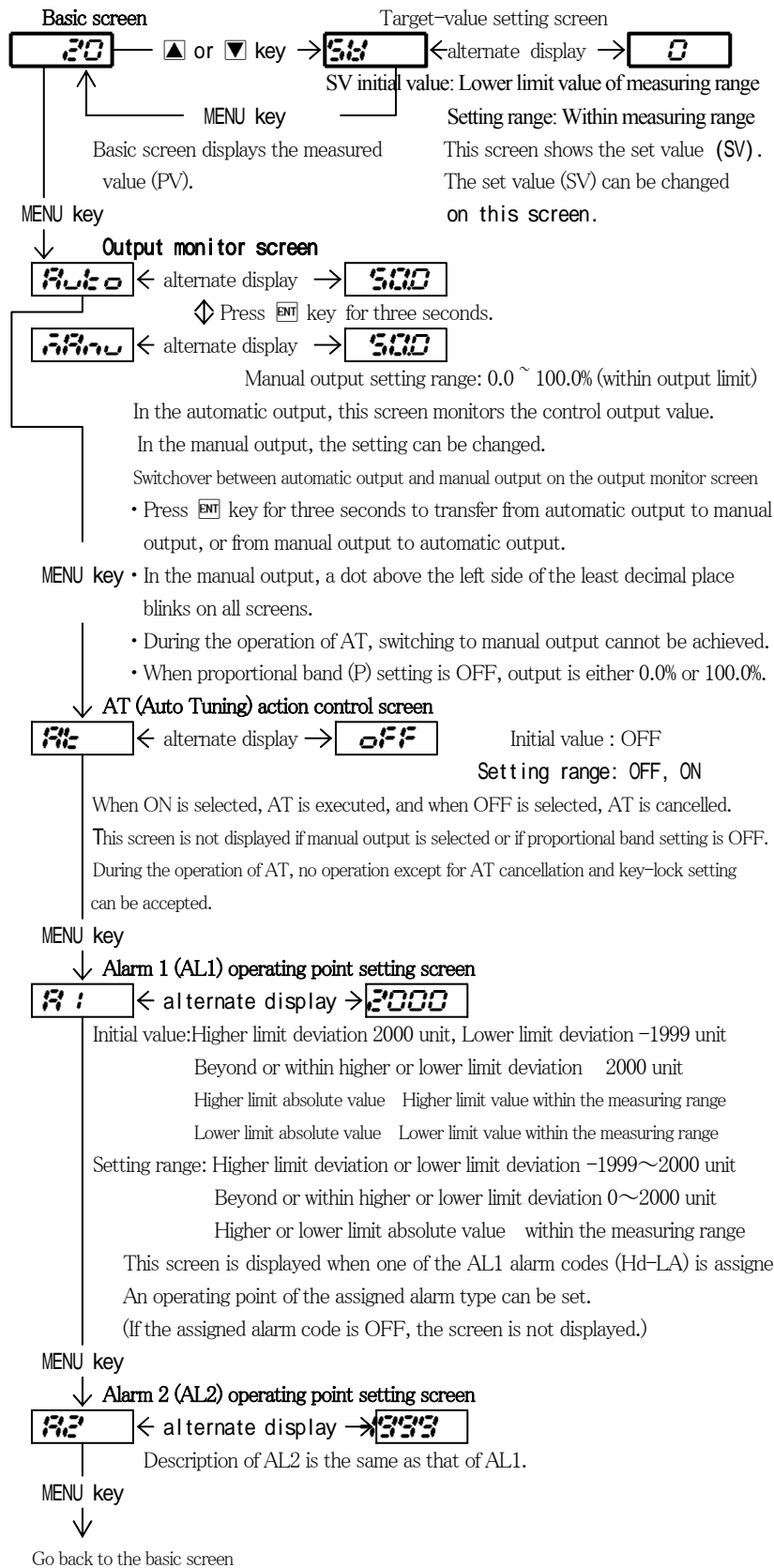
5-1. Power-on and initial screen display

At power-on, the display section shows four initial screens successively for one second each, and then moves on to the basic screen of Mode 0.

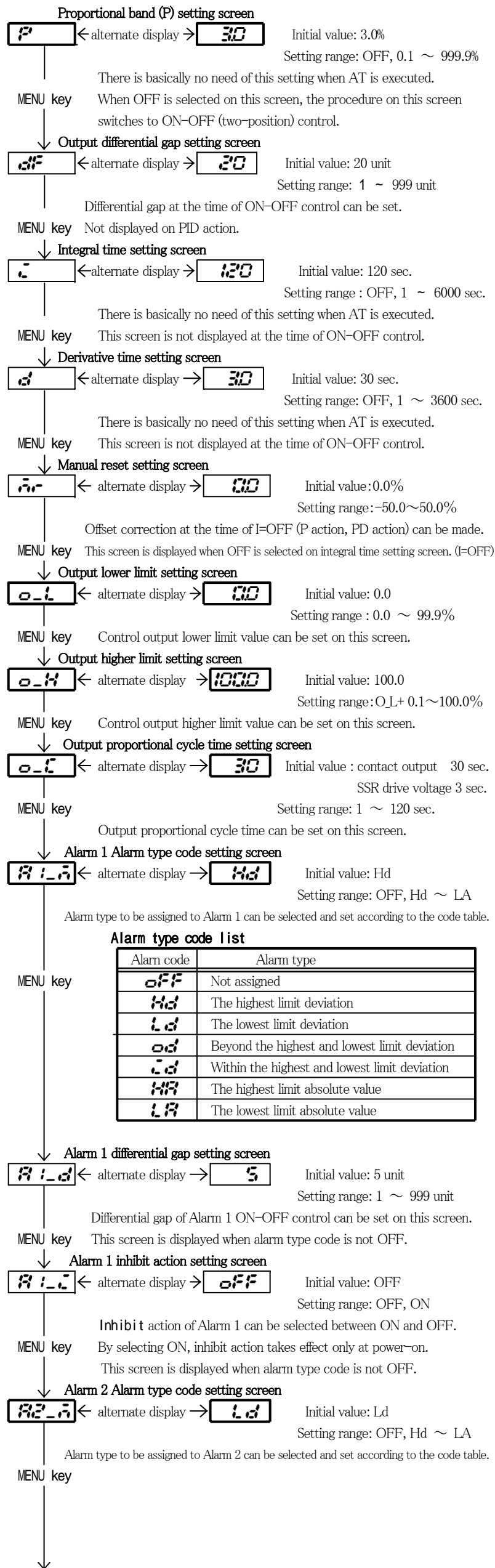
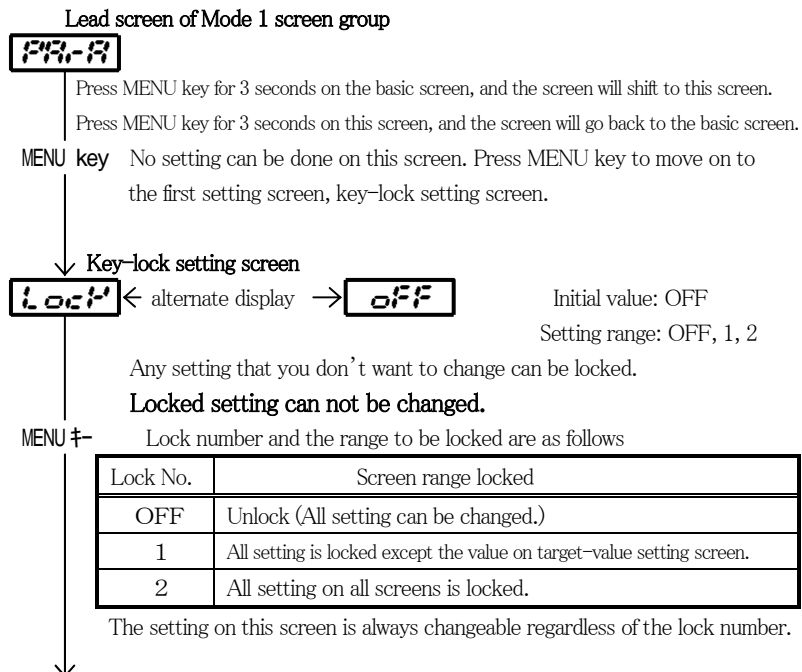


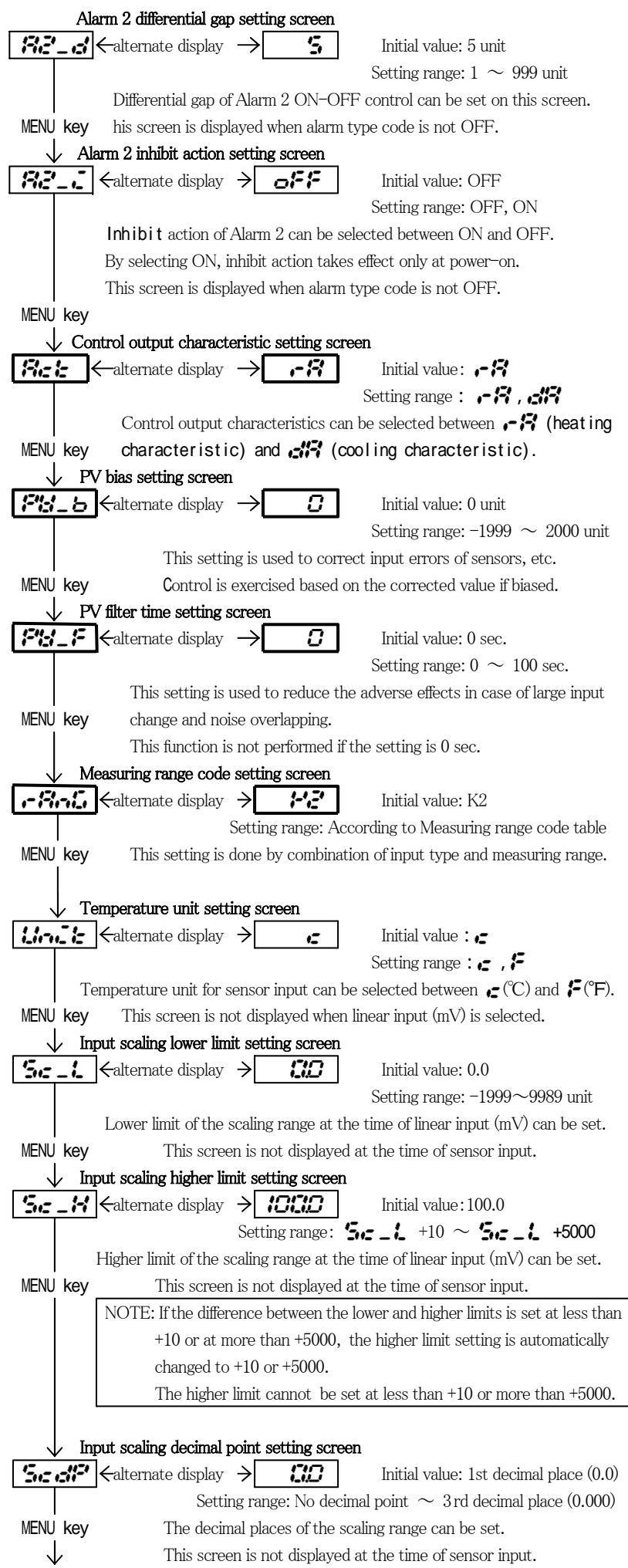
5-2. Description of screens of Mode 0 group and Mode 1 group

(1) Mode 0 screen group



(2) Mode 1 screen group





Go back to the lead screen of Mode 1 screen group

5-3. Measuring range code table

Input type	Measuring range code	Measuring range	
		Unit code C	Unit code F
Thermocouple R	R1	0 ~ 1700	0 ~ 3100 ℉
Thermocouple K	K1	-199.9 ~ 400.0	-300 ~ 750 ℉
	K2	0 ~ 1200	0 ~ 2200 ℉
Thermocouple J	J1	0 ~ 600	0 ~ 1100 ℉
R. T. D. Pt100	P1	-200 ~ 600	-300 ~ 1100 ℉
	P2	-100.0 ~ 200.0	-150.0 ~ 400.0 ℉
	P3	0.0 ~ 100.0	0.0 ~ 200.0 ℉
0 ~ 10mV DC	A1	Scaling range: -1999 ~ 9999 count	
0 ~ 100mV DC	A2	Span: 10 ~ 5000 count decimal point changable	

6. Specification

- Display
 - Digital display: 7-segment red LED 4 digits 1 column (Character height 10mm)
 - Display accuracy: $\pm(0.5\%FS+1 \text{ digit})$ excluding cold junction temperature compensation accuracy in the case of thermocouple input
 - Display accuracy range: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ (18 ~ 28 $^{\circ}\text{C}$)
 - Display resolution: Depending on measuring range (0.001, 0.01, 0.1, 1)
 - Measured value display range: -10% ~ 110% of measuring range
(-240~680 $^{\circ}\text{C}$ in case of the measuring range of -200~600 $^{\circ}\text{C}$ under Pt100 Ω)
 - Sampling cycle: 0.5sec.
 - Action display/color: Control output (OUT), Auto tuning (AT) / Green
Alarm output (AL1, AL2) / Red
Set mode (SET) / Orange
- Setting
 - Setting: Four key-switches on the front panel
 - Setting range: Same as measuring range
- Input
 - Input type: Multiple input (thermocouple, R.T.D., voltage mV)
 - Thermocouple: R, K, J Input impedance : 500k Ω min.
External resistance range: 100 Ω max.
Burnout: Standard feature (upscale)
Cold junction temperature: $\pm 1^{\circ}\text{C}$ {within the continued accuracy range ($23 \pm 5^{\circ}\text{C}$)}
Compensation accuracy: $\pm 2^{\circ}\text{C}$ (ambient temperature of 0 ~ 50 $^{\circ}\text{C}$ range)
 $\pm 1.0\%FS$ (the index value of K thermocouple is below -100 $^{\circ}\text{C}$)
 - R.T.D.: Pt100 3-wire type Amperage: 0.25 mA
Lead wire tolerable resistance: 5 Ω max. / wire (The 3 lead wires should have the same resistance.)
 - Voltage mV: 0~10, 0~100 mV DC Input impedance : 500k Ω min.
 - Input scaling: Voltage (mV) Scaling is practicable in inputting.
Scaling range: -1999 ~ 9999 count Span : 10 ~ 5000 count
Number of decimal places: No decimal point, 1st decimal place, 2nd decimal place, 3rd decimal place
 - Sampling cycle: 0.5 sec.
 - PV bias: ± 200 unit
 - PV filter: 0 ~ 100 sec.
 - Isolation: Not insulated between input and system, all the other parts insulated.
- Control
 - Control mode: Auto tuning PID / ON-OFF control
 - Control type / rating: Contact / 1 a 240V AC 1A (resistive load)
SSR drive voltage / 12V \pm 2V DC (load current: 20mA max.)
 - Control output
 - Proportional band (P): OFF, 0.1 ~ 999.9% (OFF setting : ON-OFF control)
 - Integral time (I): OFF, 1 ~ 6000 sec. (OFF setting : P or PD action)
 - Derivative time (D): OFF, 1 ~ 3600 sec. (OFF setting : P or PI action)
 - ON-OFF differential gap: 1 ~ 999 unit (effective in P-OFF setting)
 - Manual reset: -50.0 ~ 50.0% (effective in I-OFF setting)
 - Output limit: lower limit 0.0~99.9% higher limit 0.1~100.0% (lower limit < higher limit)
 - Proportional cycle: 1 ~ 120 sec.
 - Manual control
 - Output setting range: 0.0 ~ 100.0%
 - Setting resolution: 0.1%
 - Manual \leftrightarrow automatic transfer: Balanceless bumpless transfer (within the proportional band range)
 - AT point: SV value
 - Control output characteristics: RA / DA selectable by the front panel key
 - Isolation: All isolated
- Alarm output
 - Number of output points: Two (AL1 and AL2)
In the case of output relay 1a OR output only
 - Alarm type: Selectable from the following 7 types for both AL1 and AL2

o f f	Not assigned	l d	Within higher and lower limit deviation
H d	Higher limit deviation	H R	Higher limit absolute value
L d	Lower limit deviation	L R	Lower limit absolute value
o d	Beyond higher and lower limit deviations		
 - Alarm setting range: Absolute value (the higher limit and lower limit) within measuring range
Deviation (the higher limit and lower limit) -1999 ~ 2000 unit
Higher and lower limit deviation (within and beyond) 0 ~ 2000 unit
 - Alarm action: ON-OFF control
 - Differential gap: 1 ~ 999 unit
 - Inhibit action: Selectable only at power-on
 - Output type / rating: Contact / 240V AC 1A (resistive load)
 - Output sampling cycle: 0.5 sec.

■ General specifications

- Data storage: Non-volatile memory (EEPROM)
- Use environment
 - Temperature / humidity: 0 ~ 50°C / below 90%RH (no condensation)
 - Altitude: 2000 m above sea level max. Category: II Pollution degree: 2
- Storage temperature: -20 ~ 65°C
- Supply voltage: 100-240V AC ±10% 50/60Hz
- Power consumption: Approx. 6VA
- Ratio of input noise rejection: Normal mode 60dB min. (50/60Hz)
Common mode 130dB min. (50/60Hz)
- Applicable standard Safety: IEC1010 and EN61010-1: 1992
EMC: EN61326/1997

- Insulation resistance: Between input/output terminal and power supply terminal
500V DC 20MΩ min.
Between input/output terminal and protective conductor terminal
500V DC 20MΩ min.
- Dielectric strength: Between input/output terminal and power supply terminal
2300V AC per minute
Between input/output terminal and protective conductor terminal
1500V AC per minute
- Protective structure: Only front panel has dust-proof and drip-proof structure.

- Case material: PPO resin molding (equivalent to UL94V-1)
- External detention: H48×W48×D111mm (The depth detention of panel inside 102mm)
- Mounting: Push-in panel (one-touch mount)
- Panel thickness: 1.0 ~ 4.0mm
- Panel cutout: H45×W45mm
- Weight: Approx. 130g

The contents of this instruction are subject to change without notice.

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