

# MAC3 SERIES

## Digital controller Instruction Manual

### (Excerpt Edition)

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This instruction manual is an excerpt edition. Please visit our web or contact our agent in details.

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## Preface

This instruction manual is intended for those who will be involved in wiring, installation, operation and routine maintenance of the MAC3. This manual describes the care, installation, wiring, function, and proper procedures regarding the operation of MAC3. Keep this manual on hand while using this device. Please follow the provided guidance.

## 1. Matters regarding safety

For matters regarding safety, potential damage to equipment and/or facilities and additional instructions are indicated as follows:

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

### ⚠ "WARNING"

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

### ⚠ "CAUTION"

⊙ This mark indicates additional instructions and/or notes.

### NOTE

### ⚠ "WARNING"

MAC3 is designed for controlling temperature, humidity, and other physical subjects in general industrial facilities. 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 this instrument, 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.

### ⚠ "WARNING"

- 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 this 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. Use a switch or breaker, which meets the requirements of IEC127.
- 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 IEC127
- 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 shorten the life of the product and/or result in problems with the product.
- Voltage/current that differs from input specification should not be connected to the input terminal. It may shorten the life of the product and/or result in problems with the product.
- Input, output of voltage pulse, and output of electric current are not insulated. Therefore, do not ground an adjusted power terminal when a ground sensor is employed.
- A signal wire's common mode voltage to ground (signal wires other than contact output including power supply and event) should be less than 30V rms, 42.4V peak, and 60 VDC.

### ⚠ "CAUTION"

- All the wires for the interior distribution, except for communication and contact output (including power supply and event), should be less than 30m in length. When the wire's length is 30m or more, or in the case of outdoor wiring, the suitable measure against a lightning surge is required.
- EMC standard (IEC61326) classifies MAC3 into Class A apparatus. Electromagnetic interference may occur when MAC3 is used at a business district or in the home. Please use after taking sufficient measures.

## 2. Introduction

### 2-1. Check before use

Before using MAC3, please check the model code, the exterior appearance and accessories. Also, make sure that there are no errors, impairs and shortages. Confirmation of model code: Check that the product you ordered is being delivered properly.

Check the model code of the main body case against the following code table.

Example of model code

MAC3A-	M	C	F-	E	C-	D	H	T	R	N
1	2	3	4	5	6	7	8	9	10	11

Item

- |   |   |
|---|---|
| 1. Series   | MAC3A-: 96×96mm size digital controller<br>MAC3B-: 48×96mm size digital controller  |
| 2. Input  | M: multi, V: voltage, I: current  |
| 3. Control Output 1                                       | C: contact, S: voltage pulse, I: current (4~20mA),<br>V: Voltage (0~10V)  |
| 4. Power Supply   | F-: 90 - 264V AC, L-: 21.6 - 26.4V DC/AC  |
| 5. Event Output   | N: none, E: Event Output 1·2 (two points)   |
| 6. Control Output 2·Event Output·Optional Selection of DI | N-: none, C-: contact, S-: voltage pulse,<br>I-: current (4~20mA), V: Voltage (0~10V)<br>E-: Event Output 3(one point),<br>D-: external control input (DI4) one point |
| 7. DI   | N: none, D: external control input (DI 1,2,3) three points  |
| 8. CT Input   | N: none, H: CT Input two points   |
| 9. Analog Output  | N: none, T: current (4~20mA) V: voltage (0~5V)  |
| 10. Communication   | N: none, R: RS485   |
| 11. Program Function                                      | N: none, P: equipped  |

Example of model code

MAC3D-	M	C	F-	E	C-	D	T	N
1	2	3	4	5	6	7	8	9

Item

- |   |  |
|---|--|
| 1. Series   | MAC3C: 72×72mm size digital controller<br>MAC3D-: 48×48mm size digital controller  |
| 2. Input  | M: multi, V: voltage, I: current   |
| 3. Control Output 1                                       | C: contact, S: voltage pulse, I: current (4~20mA)<br>V: Voltage (0~10V),   |
| 4. Power Supply   | F-: 90 - 264V AC, L-: 21.6 - 26.4V DC/AC   |
| 5. Event Output   | N: none, E: Event Output 1·2 (two points)  |
| 6. Control Output 2·Event Output·Optional Selection of DI | N-: none, C-: contact, S-: voltage pulse,<br>I-: current (4~20mA) V: Voltage (0~10V)<br>E-: Event Output 3(one point),<br>D-: external control input (DI4) one point |
| 7. DI·CT Input  | N: none, D: external control input (DI1,2,3) three points,<br>H: CT Input two points   |
| 8. Analog Output·Communication                            | N: none, T: current (4~20mA),<br>V: Voltage (0~5V), R: RS485   |
| 9. Program Function                                       | N: none, P: equipped   |

Check of accessories

Instruction manual: 1 set. 1 unit label 1 set

「NOTE」: Please contact our agencies or business offices if you have any problem.  
We welcome any kind of inquiry such as defect of the product, shortage of accessory and so on.

### 2-2. Caution for use

- (1) Do not operate the front panel keys with hard or sharp objects.  
Do not fail to touch keys lightly with a fingertip.
- (2) Wipe gently with a dry rag and avoid using solvents such as thinner.

## 3. Installation and wiring

### 3-1. Installation site (environmental conditions)

### ⚠ "CAUTION"

Do not use this product under the following conditions. Otherwise, failure, damage and fire may occur.

- (1) Where flammable gas, corrosive gas, oil mist or dust generate or grow rife.
- (2) Where the temperature is below -10°C or above 55°C
- (3) Where the humidity is over 90%RH or where condensation occurs.
- (4) Where high vibration or impact occurs
- (5) Where inductive interference may easily affect the operation.  
Or, in the region of strong electric circuit area.
- (6) Where waterdrops or direct sunlight exists.
- (7) Where the altitude is above 2,000m.

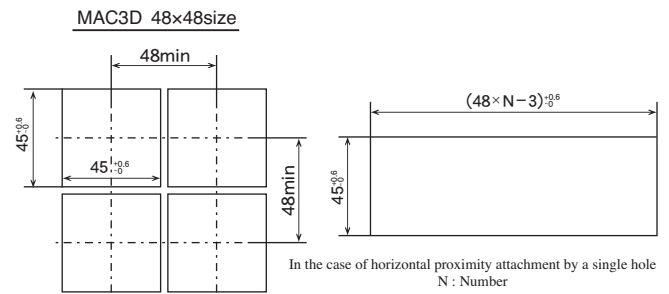
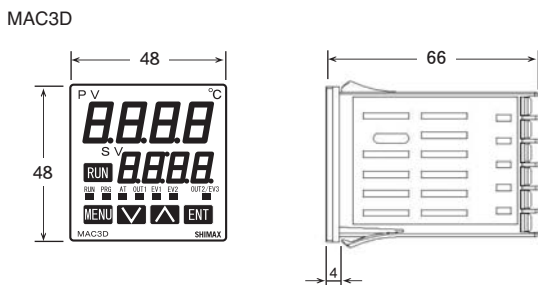
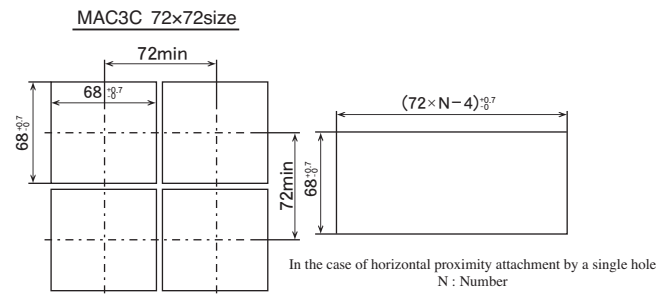
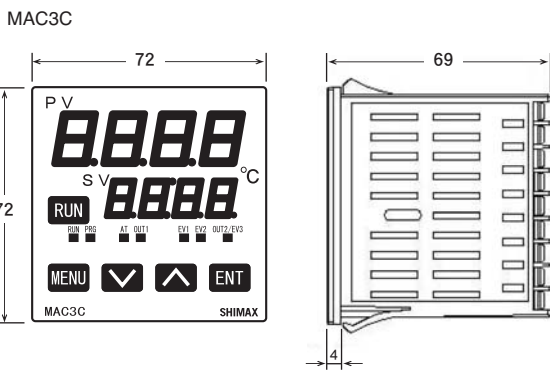
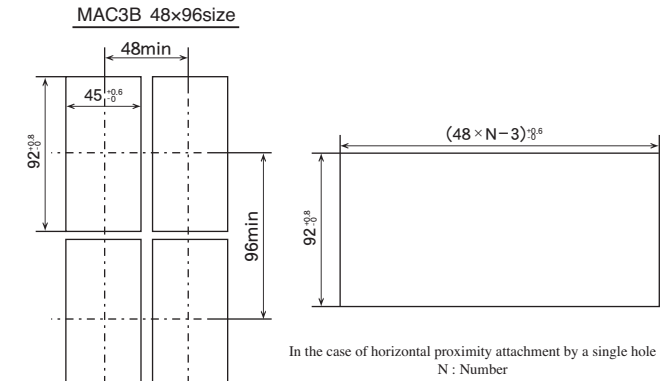
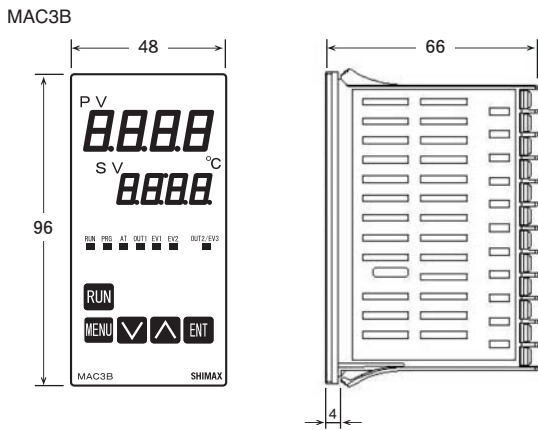
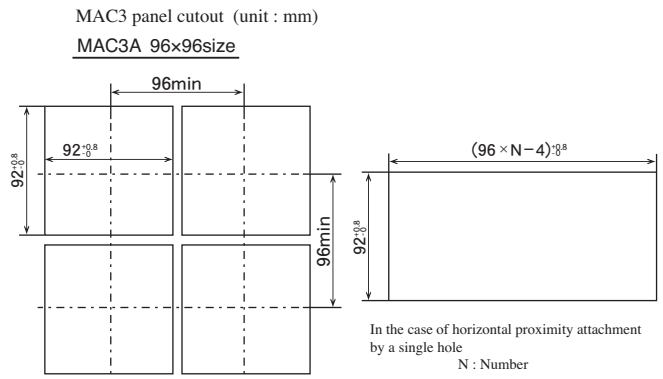
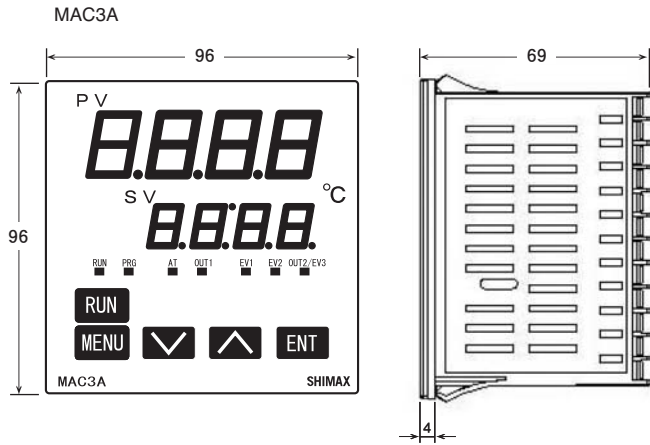
「NOTE」: The environmental conditions comply with the IEC664. Installation category is II and the pollution degree is 2.

### 3-2. Mounting

- (1) Machine the mounting hole by referring to the panel-cut illustration in Section 3-3.
- (2) Applicable thickness of the mounting panel is 1.2 ~ 2.8mm.
- (3) As this product provides mounting fixture, insert the product into the panel.

### 3-3. External dimension and panel cutout

MAC3 external dimensions (unit : mm)



「NOTE」: Proximity attachment by a single hole is possible only in the case of horizontal direction.  
When an apparatus that was attached in vertical direction is removed, a dedicated detachment tool is required.

### 3-4. Wiring

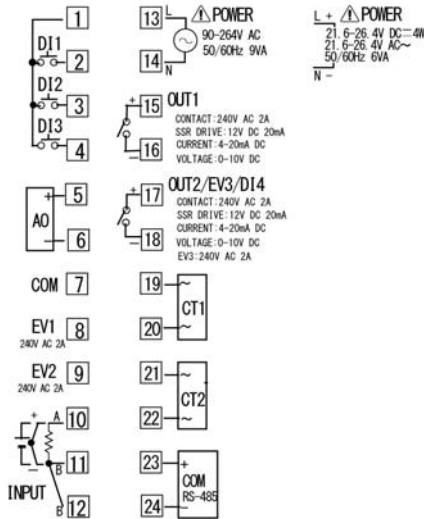
#### ⚠ "WARNING"

- Ⓞ Do not turn on electricity while wiring to avoid an electric shock.
- Ⓞ Do not touch a terminal or live part while turning on electricity.

- (1) Make sure that wiring operation is properly done in line with a terminal wire diagram of section 3-5.
- (2) Choose a suitable compensation lead wire in the case of thermocouple input.
- (3) In the case of resistance bulb input, resistance value of each lead wire must be less than 5Ω and that of three lead wires must be equal.
- (4) Do not wire an input signal line inside of an electric wire pipe or a duct same with the high voltage line.
- (5) Shield wiring (single point grounding) is effective against static induction noise.
- (6) Wiring twisted at equal short intervals is effective against electromagnetic induction noise.

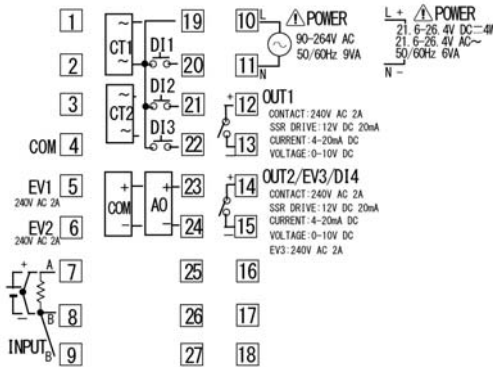
### 3-5. Terminal arrangement diagram

3-5. Terminal arrangement plan of MAC3A and MAC3B



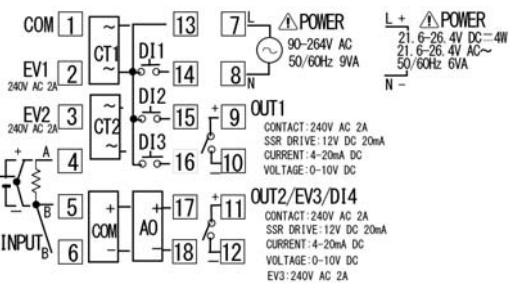
「NOTE」: If input type is thermocouple or voltage, errors may occur when terminal 11 and terminal 12 terminal are short-circuited

Terminal arrangement plan of MAC3C



「NOTE」: If input type is thermocouple or voltage, errors may occur when terminal 8 and terminal 9 terminal are short-circuited

Terminal arrangement plan of MAC3D



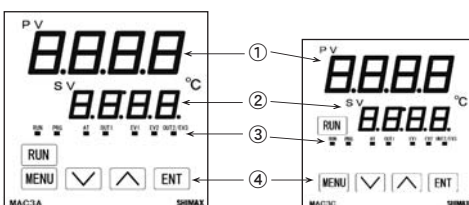
「NOTE」: If input type is thermocouple or voltage, errors may occur when terminal 5 and terminal 6 terminal are short-circuited

## 4. Description of front panel

### 4-1. Names of front panel.

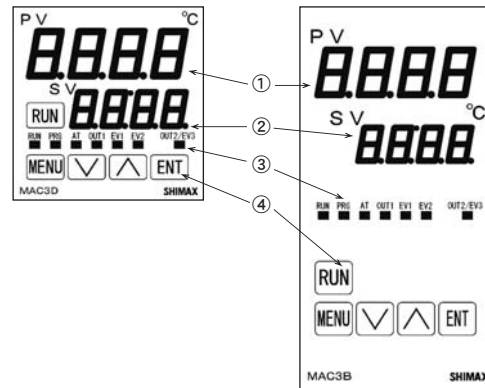
MAC3A 96×96size front

MAC3C 72×72size front



MAC3D 48×48size front

MAC3B 48×96size front



### 4-2. Explanation of front panel section

- ① : Display of measured value (PV) (red)  
Measured value (PV) and type of setting is displayed on each setting screen.
- ② : Display of target value (SV) (green)  
Target value and set value are displayed on each setting screen.
- ③ : Monitor LED
  - (1) RUN monitor LED RUN (green)  
If RUN is performed with RUN key, operation mode 1 screen, external control input (DI), and communication, it lights up, and put out by standby (reset). It blinks, if a manual output is chosen in output monitoring screen or external control input (DI).
  - (2) Program functional monitor LED PRG (green)  
Lights up at the time of program control's standby or flat part control. Puts out at the time of FIX control selection.
  - (3) Auto tuning operation monitor LED AT (green)  
If AT is chosen in ON or external control input (DI), blinks during AT execution. Lights up when AT is on standby, and puts out with AT automatic termination or release.
  - (4) control out put 1 monitor LED OUT1 (green)  
At the time of a contact or a voltage pulse output, the it lights up with ON and lights off with OFF. Lights off with 0% power output, and lights up with 100% power.  
And blinks in intermediate ratio.
  - (5) Event output monitors LED EV1 and EV2 (yellow)  
Lights up when the allotted event output turns to ON.
  - (6) Control out put 2/event output 3 monitors LED OUT2/EV3 (yellow)  
When control output 2 is chosen, it operates like control output 1 monitor LED does.  
When event output 3 is chosen, it operates like event output monitor LED does.
- ④ : Key-switch section
  - (1) [MENU] (MENU) key  
Press this key to move onto the next screen among the screens.  
Press [MENU] key for three seconds on the basic screen, then it jumps to the lead screen of Mode 1. Press [MENU] key for three seconds on the lead screen of each Mode screens, then it jumps to the basic screen. Press [MENU] key for three seconds on the lead screen of FIX or PROG, then it jumps to the basic screen. When a program control option is added, press [MENU] key for three seconds on the screen of operation mode 2, then it jumps to the screen of operation Mode 1.
  - (2) [DOWN] (DOWN) key  
Press [DOWN] key one time, and the shown value decreases by one numerical value.  
One time press of [DOWN] key decreases by one numerical value. By pressing the key continuously, the value as well consecutively decreases. A decimal point of the smallest digit blinks at this time. This shows that a setting change is in progress. In PROG, used as a shift key between each step setting screens (Steps 1-25), lead screen. Also used as a shift key between lead screen in each mode screens.
  - (3) [UP] (UP) key  
Press [UP] key one time, and the shown value increases by one numerical value.  
By pressing continuously, the value By pressing the key continuously, the value consecutively increases. A decimal point of the smallest digit blinks at this time. This shows that a setting change is in progress. In PROG, used as a shift key between each step setting screens (Steps 1-25), lead screen. Also used as a shift key between lead screen in each mode screens. (1~40step will be added from ver1.3)
  - (4) [ENT] (ENTRY/REGISTER) key  
The setting data changed on each screen is determined (the decimal point of the minimum digit is also lighted off).  
When a program control option is added, press [ENT] (ENT) key for three seconds on the screen of operation mode 1, then it jumps to the screen of operation Mode 2.  
Press [ENT] key for 3 seconds on the output monitoring screen, then the shift between manual output and automatic output is carried out.  
Press the key for 3 seconds on the basic screen, then it shifts to FIX or PROG head screen.  
Push at FIX-PROG and each mode screens' lead screen, then shifts to setting screen.
  - (5) [RUN] (RUN OPERATION/STOP) key  
Push for 3 seconds at STBY (control stop), then FIX or PROG control starts.  
Push for 3 seconds while FIX or PROG is in operation, then control is stopped.

## 5. Description of screens

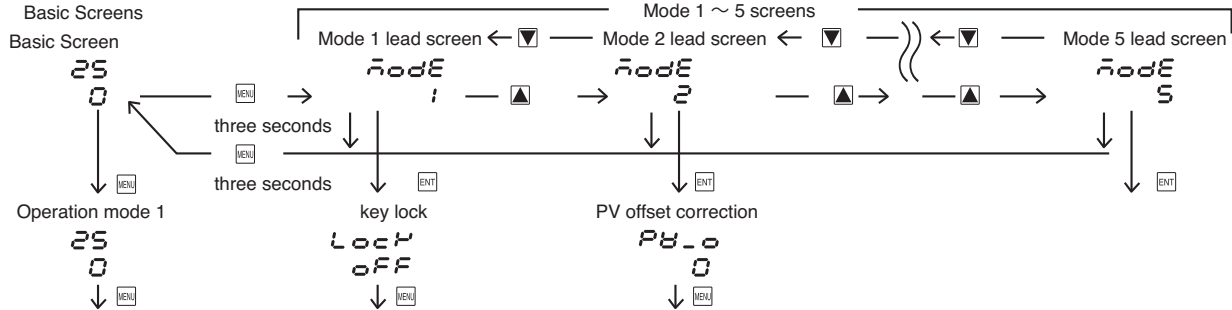
### 5-1. How to move to another screen

Basic Screen

25 — [ENT] 3 seconds → F C 4 (constant value control) lead screen of setting screens or P r o C (Program control) lead screen of setting screens  
 0 ← [MENU] 3 seconds ← S E t

Press the [ENT] key for 3 seconds on a basic screen, then it shifts to the lead screen of F C 4 (constant value control) setting screens, or to the lead screen of P r o C (program control) setting screens.

Press the [MENU] key for 3 seconds on F C 4 or P r o C the lead screen of setting screens, then it shifts to the basic screen. The shift is also possible when the program option is added and F C 4 is chosen on the operation mode 2 screen.



Every time you press the [MENU] key on a basic screen, it shifts to each screen of the basic screens.

Press the [MENU] key for 3 seconds on a basic screen, then it shifts to the lead screen of mode 1 screens.

Press the [▲] key on the lead screen of mode 1 screens, then it further advances to mode 2, and mode 3. (Notes: If no corresponding option is found, the mode 4 - 9 is skipped)

Press the [▼] key on the lead screen of mode 1 screens, then it further advances to mode 9, and mode 8. (Notes: If no corresponding option is found, the mode 4 - 9 is skipped)

Press the [ENT] key for 3 seconds on the lead screen of mode 1~9 screens, then it shifts to the basic screen.

Press the [ENT] key on the lead screen of mode 1~9 screens, then it shifts to the first setting screen of each screens.

Press the [MENU] key on the first setting screen of each screens, then it shifts to the next screen. Every time you press the [MENU] key, it shifts to the next setting screen.

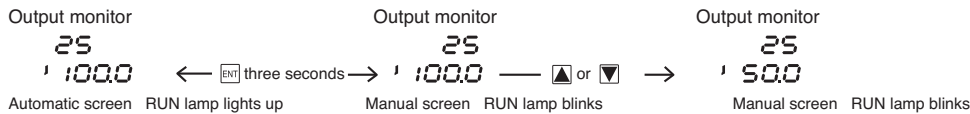
### 5-2. Setting Method

To change settings, display an appropriate screen and change the setting (value or function) by pressing [▲] or [▼] key.

On the output monitor screen of basic screens, you can change the control output from "Automatic" to "manual", and save its change of setting. Display the output monitor screen, and then press [ENT] key for three seconds to shift from Automatic to Manual. Then by pressing [▲] or [▼] key, you can adjust to the desirable output value. In this case, no need to press [ENT] key in order to determine the change of setting.

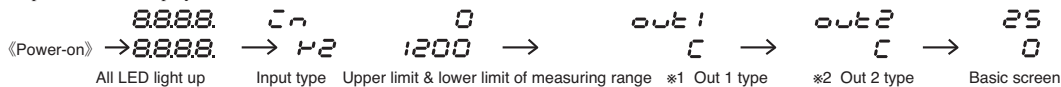
Press [ENT] key for three seconds as well to shift back to Automatic. Excluding when a keylock is OFF, Automatic⇔Manual switchover does not work while STBY<RST> and AT are in operation.

In the case of two-output type, the switchover between automatic and manual is operatable through output 1 and output 2. The setting is altered simultaneously.



### 5-3. Power-on and initial screen display

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



C : Contact S : Voltage pulse C : Current B : Voltage \*1 \*2 This is the display when C : contact is chosen.  
 \*2 Output 2 Displays only optional addition.

### 5-4. Explanation of each screen

#### (1) Basic Screens

Basic Screen

25 Executed SV initial value: Sensor input 0  
 0 Linear input Lower limit of scaring range  
 Setting range: Sensor input Within measuring range  
 Linear input With in scaring range  
 Within SV limiter besides  
 Targeted value (PV) is displayed on the upper row as four-digit, and target d value (SV) is displayed on the lower row also as four-digit. (Notes: hereinafter, measured value and targeted value are referred to as "PV" and "SV")  
 At the time of FIX, execution SV is displayed and change of setting is possible.  
 PROG's SV is just displayed, and change of setting is impossible.

Action Mode 1 screen

25 Initial value: S t b y (stanby) (Initial value at the time of constant value control)  
 S t b y (reset) (Initial value at the time of program control)  
 Setting range: S t b y (r S t) Control stop [Output OFF (0%)] operation  
 r u n conduct of control operation  
 Choose r u n (RUN) by [▲] key. Decide by [ENT] key, then Monitor LED's RUN lights up to start control operation.

Choose S t b y (r S t) by [▼] key. Decide by [ENT] key, then Monitor LED's RUN lights off and becomes control stop [Output OFF (0%)] conducting.  
 Priority is given to DI when RUN is allotted to external control input. DI Key operation cannot be performed unless allotment is canceled.  
 When measuring range, a unit, scaling, and output characteristics are changed it is initialized a S t b y (r S t) is displayed.

Output 1 monitoring screen

25 manual output setting range : 0.0-100.0% (within output limiter)  
 100.0 At the time of automatic output, monitor display only.  
 Refer to Item 5-2 about automatic ⇔ manual switchover, and setting method at the time of manual operation.  
 A manual output is canceled when an operation mode is made into S t b y (r S t).  
 When a power source is intercepted and re-switched on, it returns to the condition just before intercepting.

PID No. monitoring screen

**P2-1**  
 Chosen PID No. is displayed when FIX is in operation.  
 PID No. chosen at each step and on-going step No. are displayed by tums when PROG is in operation.  
 PID No. of output 1 is displayed in the first digital, and PID No. of output 2 is displayed in the third digital. The third digital is shown as **\_** when there is no output 2 option.  
 This screen is not displayed in the state of STBY (RST).

Execution SV setting screen

**F-58** Initial value: **!**  
 Setting range: **1, 2, 3, 4**

AT (Auto Tuning) execution screen

**At** Initial value: **OFF**  
 Setting range: **OFF, ON**  
 AT is performed by ON selection, and canceled by OFF selection. Not displayed at the time of STBY (RST), a manual output, and P (proportional band) =OFF.  
 Except in the setting of keylock OFF, AT is unable to perform in scale over. (At the time of DI allotment, execution of AT by DI can be performed.)  
 Even in such a case, halfway release is performed on this screen. Release of AT, STBY (RST), EV operating point, setting of keylock, and mode 5 ~ 9screen are operateable with key.  
 Except in th setting of AT normal end, execution of AT is canceled compulsorily at the time of STBY (RST) selection and AT release setup.

EV1 (event 1) operating-point setting screen

**EB1** Initial value: upper limit absolute value measuring range Scaling upper lower limit absolute value measuring range Scaling lower limit  
**1200**  
 upper limit deviation **2000**  
 lower limit deviation **-1999**  
 within deviation **0**  
 outside deviation **2000**  
 CT1 or CT2 **00**  
 guarantee **0**  
 Setting range: upper limit absolute value within measuring range within scaling lower limit absolute value within measuring range within scaling limit  
 upper limit deviation **-1999~2000** unit  
 lower limit deviation **-1999~2000** unit  
 within upper-lower limit deviation **0~2000** unit  
 outside upper-lower limit deviation **0~2000** unit  
 The operating point of the alarm type allotted to EV1 is set up. No option, No display when **non, So, run, StP, P.E, End, Hold, Prog, d\_SL, and u\_SL** are allotted to EV1.  
 The operation mode of each deviation alarm is **run**. Effective at the time of automatic output.  
 Each deviation alarm serves as PV's deviation to Execution SV.  
 Event operation other than each deviation alarm is always effective.

EV2 (event 2) operating-point setting screen

**EB2** Initial value, setting range, contents are the same with EV1  
**0**

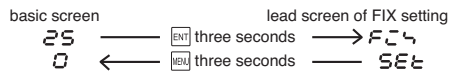
Latching release screen

**LAct** Initial value: **rSt 1**  
**rSt 1** Setting range: **rSt 1** release EV1  
**rSt 2** release EV2  
**rSt 3** release EV3  
**ALL** release all EVs at a time  
 On the latching setting screen of each EV mode, **rSt** and **ALL** which chose **on** are displayed. If latching is **on** once EV is outputted, EV output state is maintained even if EV is in the state of OFF. When EV is in a latching state, decimal point of the minimum digit blinks, and it shows that release of EV is possible. If **ENT** key is pressed, EV is released and a decimal point lights off.  
 However, release is impossible when a state is in EV power range.

Return to basic screen

**(2) FIX (constant value control) setting screens**

At the time of no program option and with program option and **F24** is chosen on Action mode2 screen of basic screens, lead screen of FIX setting screens is displayed when **ENT** key is pressed for 3 seconds.  
 If **ENT** key is pressed for 3 seconds on lead screen, it returns to basic screen.



FIX lead screen

**F24**  
**SEt** No setting on this screen.  
 Press **ENT** key, then it shifts to the first setting screen SV1 setting screen.

SV1 setting screen

**SB 1** Initial value : At the time of sensor input 0  
**0** linear input time scaling lower limit  
 Setting range: sensor input time within measuring range linear input time within scaling range  
 Moreover, within limit of SV limiter.  
 When SV1 is Execution SV, being reflected in basic screen. Being initialized when measuring range, unit, and scaling are changed.

SV1 output1 PID No. setting screen

**10 1P** Initial value : 1  
**!** Setting range : 1, 2, 3  
 When SV1 is Execution SV, PID No. that will be used for control of output 1 is chosen from 1~3.

SV1 output2 PID No. setting screen

**10 2P** Initial value : 1  
**!** Setting range : 1, 2, 3  
 When SV1 is Execution SV, PID No. that will be used for control of output 2 is chosen from 1~3.  
 Displayed when output 2 option is added.

Return to FIX lead screen

**(3) Mode 1 screens key lock and SV limiter Setting**

Mode 1 lead screen

**mode** Press **ENT** key for 3 seconds on basic screen, then displayed  
**!** No setting on this screen. Press the **ENT** key, then it shifts to the first setting screen, keylock setting screen.

Keylock setting screen

**LOCK** Initial value : **OFF**  
**OFF** Setting range : **OFF, 1, 2, 3, 4**  
**1** Only change of Execution SV (basic screen) and keylock is possible.  
**2** Possible to change numerical value value manually, and key lock level  
**3** Only change of a keylock is possible.  
**4** Only change of a keylock is possible It can be locked **ENT** key

Notes : Even when keylock is set as 1 and 2, manual output value is possible to change.

SV limiter lower limit setting screen

**SB-L** Initial value : measuring range lower limit  
**0** Setting range : measuring range lower limit value~measuring range upper limit value-1 and **BLP** (SV display turn off)  
 Lower limit value of target value is set.  
 When upper limit value is smaller than lower limit value, the value compulsorily becomes lower limit value +1.

When you choose **BLP** pressing **ENT** at lower limit value, the SV display turn off at basic screen. But it will turn on at the setting screen.

SV limiter upper limit value setting screen

**SB-H** Initial value : measuring range upper limit  
**1200** Setting range : SV limiter lower limit value +1~ measuring range upper limit value  
 Setting upper limit value of target value is set.

Return to mode1 lead screen.

#### (4) Mode 2 screens Scale and PV setting

Mode 2 lead screen

**Mode** Press **▲** key in mode1 lead screen, or press **▼** key in mode3 lead screen, then being displayed.

**ENT** key If **ENT** key is pressed, it shifts to the first setting screen PV offset correction screen.

PV offset correction (PV bias) setting screen

**PV\_o** Initial value : 0  
Setting range : -500~500 Digits

**ENT** key Used for correction of input errors such as sensor. If offset correction is performed, control is also performed with the corrected value.

PV gain correction setting screen

**PV\_G** Initial value : 0.00  
Setting range : ±5.00%

**ENT** key Maximum input value is corrected within limit of ±5.00% of measuring range. If corrected, inclination of spang changes in straight line which connects zero point and correction maximum value.

PV filter setting screen

**PV\_F** Initial value : 0  
Setting range : 0 ~ 9999 seconds

**ENT** key When input change is violent or noise is overlapped, used in order to ease the influences. In 0 second setting, filter does not function.

Measuring range setting screen

**RRR** Initial value: multi **H2**, voltage **B 1**, current **AA 1**  
Setting range: Chosen from 5-5.measuring range code table.  
**ENT** key Combination of input type and measuring range is set by code.

Temperature unit setting screen

**URTE** Initial value : **C**  
Setting range : **C**, **F**

**ENT** key The temperature unit at the time of a sensor input is set up from **C** (°C) , **F** (°F). Not displayed when the linear input is chosen.

Input scaling lower limit value setting screen

**Sc\_L** Initial value : 0.0  
Setting range : -1999 ~ 9989 digits

**ENT** key Scaling lower limit value at the time of linear input is set up.

Input scaling upper limit value setting screen

**Sc\_H** Initial value : 100.0  
Setting range : -1989 ~ 9999 digits

**ENT** key Scaling upper limit value at the time of linear input is set up.

**NOTE:** Suppose that the difference between a lower limit value and upper limit value is 10 or less, or over 10,000. In this setting, upper limit value is compulsorily changed into that of +10 or ± 10000 digits. Upper limit value cannot be set as lower limit value of +10 digits or less, or that of over 10,000 digits.

Input scaling Decimal point position Setting screen

**dP** Initial value : the first place after decimal point (0.0)  
Setting range : no decimal point 0~the third place after decimal point (0.000)

**ENT** key Decimal point position of input scaling is set .

**NOTE:** The screen of input scaling serves as a monitor at the time of a sensor input. Setting change cannot be performed.

Return to mode 2 lead screen.

#### (5) Mode 3 screen Out 1 setting

Mode 3 lead screen

**Mode** No setup  
If **ENT** key is pressed, it shift to the first setting screen, output 1 proportional band setting screen. In this screens, PID which can be used in output 1, 1~3 related Items and soft start of output 1, and proportional period output characteristics are set up.

Output 1 PID1 proportional-band (P) setting screen

**I\_P 1** Initial value : 3.0%  
Setting range : OFF, 0.1 ~ 999.9%

**ENT** key When performing auto tuning, no necessity for a setting basically. If OFF is chosen, it becomes ON-OFF (two positions) operation.

Output 1 PID1 Integral time (I) setting screen

**I\_I 1** Initial value : 120 seconds  
Setting range : OFF, 1 ~ 6000 seconds

**ENT** key When performing auto tuning, no necessity for a setting basically. This screen is not displayed at the time of ON-OFF operation. Becomes P operation or PD operation in I=OFF setting.

Output 1 PID1 Derivative time (D) setting screen

**I\_d 1** Initial value : 30 second  
Setting range : OFF, 1 ~ 3600 seconds

**ENT** key When performing auto tuning, no necessity for a setting basically. This screen is not displayed at the time of ON-OFF operation. Becomes P operation or PI operation in D=OFF setting.

Output1 PID1 manual reset setting screen

**I\_r 1** Initial value : 0.0  
Setting range : -50.0~50.0%

**ENT** key The offset correction at the time of I = OFF ( P operation, PD operation) is performed. This screen is not displayed at the time of ON-OFF operation.

Output 1 PID1 differential-gap setting screen

**I\_d F 1** Initial value : 5  
Setting range : 1 ~ 999 unit

**ENT** key The differential gap at the time of ON-OFF operation is set. Displayed at the time of P=OFF ( ON-OFF operation) setup.

Output1 PID1 minimum limiter setting screen

**I\_o L 1** Initial value : 0.0  
Setting range : 0.0 ~ 99.9%

**ENT** key Output lower limit value of output 1 PID1 is set up.

**NOTE:** At the time of STBY (RST) and scale over output, limiter value is disregarded.

Output 1 PID1 maximum limiter setting screen

**I\_o H 1** Initial value : 100.0  
Setting range : output limiter lower limiter values +0.1~100.0%

**ENT** key Upper limit value of output 1 PID1 is set .

Output 1 PID2 proportional band (P) setting screen

**I\_P 2** Initial value : 3.0%  
Setting range : OFF, 0.1 ~ 999.9%

**ENT** key Content is the same with output 1 PID1.

Output 1 PID2 integral-time (I) setting screen

**I\_I 2** Initial value : 120 seconds  
Setting range : OFF, 1~6000 seconds

**ENT** key Contents is the same with output 1 PID1.

Output 1 PID2 derivative-time (D) setting screen

**I\_d 2** Initial value : 30 seconds  
Setting range : OFF, 1~ 3600 seconds

**ENT** key Contents is the same with output 1 PID1.

Output 1 PID2 manual reset setting screen

**I\_r 2** Initial value : 0.0  
Setting range : -50.0~50.0%

**ENT** key Contents is the same with output 1 PID1.

Output 1 PID2 differential gap setting screen

**iDF2** Initial value : 5  
**S** Setting range : 5~999 unit  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID2 minimum limiter setting screen

**ioL2** Initial value : 0.0  
**00** Setting range : 0.0~99.9%  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID2 maximum limiter setting screen

**ioH2** Initial value : 100.00  
**1000** Setting range : output limiter lower limit value +0.1~100.0%  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 proportional band (P) setting screen

**i\_P3** Initial value : 3.0%  
**30** Setting range : OFF, 0.1~ 999.9%  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 integral-time (I) setting screen

**i\_I3** Initial value: 120 seconds  
**120** Setting range: OFF, 1 ~ 6000 seconds  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 derivative time (D) setting screen

**i\_d3** Initial value : 30 seconds  
**30** Setting range : OFF, 1~3600 seconds  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 manual reset setting screen

**i\_r3** Initial value : 0.0  
**00** Setting range : -50.0~50.0%  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 differential gap setting screen

**iDF3** Initial value : 5  
**S** Setting range : 1~999 unit  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 minimum limiter setting screen

**ioL3** Initial value : 0.0  
**00** Setting range : 0.0~99.9%  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 PID3 maximum limiter setting screen

**ioH3** Initial value : 100.0  
**1000** Setting range : output limiter lower limit values +0.1~100.0%  
 [MENU] key Contents is the same with output 1 PID1.

Output 1 soft starting time setting screen

**iSoF** Initial value : OFF  
**oFF** Setting range : OFF, 0.5~120.0 seconds (setting resolution 0.5 second)  
 This is the function that eases change of output at the time of a power-on and startup.  
 [MENU] key Does not function at the time of OFF setup.

Output 1 proportional periodic time setting screen

**i\_oC** Initial value: Contact output 30.0 seconds  
**300** Voltage pulse output 3.0 seconds  
 [MENU] key Setting range: 0.5~120.0 seconds (setting resolution 0.5 second)  
 Proportional periodic time of output 1 is set.  
 Not displayed when output 1 is current.

Output 1 characteristics setting screen

**iAcE** Initial value: rA  
**rA** Setting range: rA, dA  
 [MENU] key Characteristics of control output is chosen from rA (heating characteristics) and dA (cooling characteristics)

Return to mode 3 lead screen

(6) Mode 5 screens EVENT setting

Mode 5 screens is the setup screens of event option. Not displayed when option is not added.

Mode 5 lead screen

**noDE** No setup.  
**S** Press [ENT] key, it shifts to the first setting screen, event 1 operation-mode setting screen.  
 [MENU] key

Event 1 operation-mode setting screen

**E 1\_n** Initial value : non  
**non** Setting range : Chosen from event type character table.  
 [MENU] key Event type allotted to event 1 is chosen from character table.  
 Event type character table

Character	Type	Character	Type
non	No allotment	ct2	Control loop alarm 2
HA	Upper limit absolute value alarm	StP	Step signal
LA	Lower limit absolute value alarm	P_E	Pattern termination signal
So	Scale over alarm	End	Program termination signal
Hd	Maximum deviation alarm	Hold	Hold signal
Ld	Minimum deviation alarm	ProG	Program signal
cd	Within deviation alarm	u_SL	Up slope signal
od	Without deviation alarm	d_SL	Down slope signal
run	RUN signal	GuR	Guarantee signal
ct1	Control loop alarm 1		

\* Being initialized if measuring range, scaling, and unit are changed.  
 \* Deviation alarm is possible to output at the time of RUN+AUTO.  
 In other events, output is always possible.

Event 1 differential-gap setting screen

**E 1\_d** Initial value : 5Digits  
**S** Setting range : 1~999 Digits  
 ON-OFF differential gap of event 1 is set.  
 [MENU] key Not displayed, when the event 1 mode are as follows. non, So, run, StP, P\_E, Hold, ProG, u\_SL, d\_SL.  
 Change in measuring range, scaling, unit, and the event 1 mode make it initialize.

Event 1 standby operation setting screen

**E 1\_S** oFF Initial value: oFF  
**oFF** Setting range: oFF, 1, 2  
 oFF : No standby operation, 1 : standby-operation only at the time of a power-on.  
 2 : Standby-operation in the following cases. ; At the time of power-on.  
 When each alarm's operating point is changed,  
 When deviation alarm's SV is performed,  
 When RUN/STBY (RST) is switched,  
 When AUTO/MAN is switched.  
 [MENU] key Not displayed, when the event 1 mode are as follows. ; non, So, run, StP, P\_E, Hold, ProG, u\_SL, u\_SL.  
 Change in measuring range, scaling, unit, and the event 1 mode make it initialize.

Event 1 latching setting screen

**E 1\_L** Initial value : oFF  
**oFF** Setting range : oFF, on  
 [MENU] key When latching is set as on once event is output, even if event is OFF state event output state is held. Not displayed when event 1 mode is non.  
 Being initialized if measuring range, scaling, and unit are changed.

Event 1 output characteristics setting screen

**E 1\_A** Initial value : no  
**no** Setting range : no, nc  
 [MENU] key Output characteristics event 1 is chosen from no : normal open, nc : normal closing.  
 Not displayed when event 1 mode is non.

NOTE: If nc is chosen, relay turns to ON about 1.8 seconds later when power source is switched on, and turns to OFF in event output range.

Event 2 mode setting screen

**E 2\_n** Initial value : non  
**non** Setting range : Chosen from event type character table.  
 [MENU] key Type allotted to event 2 should be chosen from character table.  
 Change in measuring range, scaling, unit, and the event 1 mode make it initialize.

Event 2 differential-gap setting screen

**E2\_d** Initial value: 5digit  
**S** Setting range: 1~999 digit  
 [MENU] key Contents is the same with output 1 PID1.  
 The same as event 1.

Event 2 standby operation setting screen

**E2\_S** Initial value: **OFF**  
**OFF** Setting range: **OFF, 1, 2**  
 [MENU] key The same as event 1.

Event 2 latching setting screen

**E2\_L** Initial value: **OFF**  
**OFF** Setting range: **OFF, ON**  
 [MENU] key The same as event 1.

Event 2 output characteristics setting screen

**E2\_R** Initial value: **no**  
**no** Setting range: **no, nc**  
 [MENU] key The same as event 1.

Return to mode 5 lead screen

5-5. Measuring range code table

Input Type	Code	Measuring Range		
		Unit Code <b>C</b> (°C)	Unit Code <b>F</b> (°F)	
Thermo Couple	R	0 ~ 1700	0 ~ 3100	
	K	-199.9 ~ 400.0	-300 ~ 700	
	K	0 ~ 1200	0 ~ 2200	
	K	0.0 ~ 300.0	0 ~ 600	
	K	0.0 ~ 800.0	0 ~ 1500	
	J	0 ~ 600	0 ~ 1100	
	J	0.0 ~ 600.0	0 ~ 1100	
	T	-199.9 ~ 200.0	-300 ~ 400	
	E	0 ~ 700	0 ~ 1300	
	S	0 ~ 1700	0 ~ 3100	
	*5 U	-199.9 ~ 200.0	-300 ~ 400	
	N	0 ~ 1300	0 ~ 2300	
	*1 B	0 ~ 1800	0 ~ 3300	
	*3 Wre5-26	0 ~ 2300	0 ~ 4200	
*4 PLII	0 ~ 1300	0 ~ 2300		
Resistance Bulb Pt100	P1	-200 ~ 600	-300 ~ 1100	
	P2	-100.0 ~ 200.0	-150.0 ~ 400.0	
	*6 P3	0.0 ~ 100.0	0.0 ~ 200.0	
	*6 P4	-50.0 ~ 50.0	-60.0 ~ 120.0	
	P5	-100.0 ~ 300.0	-150.0 ~ 600.0	
	P6	-199.9 ~ 300.0	-300 ~ 600	
	P7	-199.9 ~ 600.0	-300 ~ 1100	
	P8	0 ~ 250	0 ~ 500	
	*6 JP1	-200 ~ 500	-300 ~ 900	
	*6 JP2	-100.0 ~ 200.0	-150.0 ~ 400.0	
	JP3	0.0 ~ 100.0	0.0 ~ 200.0	
	JP4	-50.0 ~ 50.0	-60.0 ~ 120.0	
	JP5	-100.0 ~ 300.0	-150.0 ~ 600.0	
	JP6	-199.9 ~ 300.0	-300 ~ 600	
	JP7	-199.9 ~ 500.0	-300 ~ 900	
	JP8	0 ~ 250	0 ~ 500	
	Volatage(mV)*7	0 ~ 10	A1	Scaling Range : -1999~9999 Digit Span : 10~10000Digit Change of decimal point's position is possible (no decimal pont, 0.1, 0.01, 0.001)
		0 ~ 100	A2	
*7 -10 ~ 10		A3		
0 ~ 20		A4		
0 ~ 50		A5		
Voltage(V)	1 ~ 5	B1		
	0 ~ 5	B2		
	-1 ~ 1	B3		
	0 ~ 1	B4		
	0 ~ 2	B5		
	0 ~ 10	B6		
Current(mA)	4 ~ 20	CA1		
	0 ~ 20	CA2		

thermo couple B, R, S, K, E, J, T, N : JIS/IEC

resistance bulb Pt100 : JIS/IEC

JPt100 : former JIS

\*1 thermo couple Accuracy is not guaranteed below B:400°C (752°F).

\*2 thermo couple In K, T, U, accuracy is ± 0.5%FS for 0~100°C (-148°F) and ± 1.0%FS if it is below -100°C

\*3 thermo couple Wre 5-26 : Product of Hoskins Mfg. co.,

\*4 thermo couple PLII : Platinel

\*5 thermo couple U : DIN43710

\*6 resistance bulb accuracy of Pt/JPt ± 50.0°C, 0.0~100.0°C is ± 0.3%FS.

\*7 voltage(mV) 0~10mV, accuracy of 0~10mV is ± 0.3% of input range.

\*Setup of factory shipment is Multi input : thermo couple **K2** 0-1200°C

Voltage input : 1-5V **A1** ; 0.0-100.0

Current input : 4-20mA **CA1** ; 0.0-100.0

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