Digital Indicator
(4-channel Type)

AF110

Instruction Manual

RKC INSTRUMENT INC.

IMR02K02-E2

Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

NOTICE

- This manual assumes that the reader has a fundamental knowledge of the principles of electricity, process control, computer technology and communications.
- The figures, diagrams and numeric values used in this manual are only for purpose of illustration.
- RKC is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- RKC is not responsible for any damage and/or injury resulting from the use of instruments made by imitating this instrument.
- Periodic maintenance is required for safe and proper operation of this instrument. Some components have a limited service life, or characteristics that change over time.
- Every effort has been made to ensure accuracy of all information contained herein. RKC makes no warranty expressed or implied, with respect to the accuracy of the information. The information in this manual is subject to change without prior notice.
- No portion of this document may be reprinted, modified, copied, transmitted, digitized, stored, processed or retrieved through any mechanical, electronic, optical or other means without prior written approval from RKC.

⚠ WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be in accordance with local codes and regulations.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
  The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- To prevent instrument damage or failure, protect the power line and the input/output lines from high currents with a protection device such as fuse, circuit breaker, etc.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dispensation.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration will occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to instrument display, do not rub with an abrasive material or push front panel with a hard object.
- When high alarm with hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.

FOR PROPER DISPOSAL

- When disposing of each part used for this instrument, always follows the procedure for disposing of industrial wastes stipulated by the respective local community.

SYMBOLS

Safety Symbols:

WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.

CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

 : This mark indicates that all precautions should be taken for safe usage.

 : This mark indicates important information on installation, handling and operating procedures.

 : This mark indicates supplemental information on installation, handling and operating procedures.

 : This mark indicates where additional information may be located.

Character Symbols:

0	1	2	3	4	5	6	7	8	9	Minus	Period
0	1	2	3	4	5	6	7	8	9	-	.

A	B (b)	C	c	D (d)	E	F	G	H	I	J	K
A	b	C	c	d	E	F	G	H	I	J	K

L	M	N (n)	O (o)	P	Q (q)	R (r)	S	T	t	U	u
L	M	n	o	P	q	r	S	T	t	U	u

V	W	X	Y	Z	_
V	W	X	Y	Z	_

8.	Flashing
8.	Lighting

■ Abbreviation symbols

These abbreviations are used in this manual:

Abbreviation symbols	Name
PV	Measured value (PV)
AL1	Alarm 1 set value
AL2	Alarm 2 set value
ALM1	Alarm 1 output
ALM2	Alarm 2 output
CH	Channel

DOCUMENT CONFIGURATION

There are 2 manuals pertaining to this product. Please be sure to read all manuals specific to your application requirements. If you do not have a necessary manual, please contact RKC sales office, the agent, or download from our website.

The following manuals can be downloaded from our website:

URL: http://www.rkcinst.com/english/manual_load.htm

Manual	Manual Number	Remarks
AF110 Quick Installation Manual	IMR02K01-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring, parts description, basic key operations and specifications.
AF110 **Instruction Manual**	**IMR02K02-E2**	This manual This manual explains the method of the mounting and wiring, operation of various functions, parameters, and troubleshooting. [Download free or purchase hard copy]

Read this manual carefully before operating the instrument. Please place the manual in a convenient location for easy reference.

CONTENTS

1. OUTLINE

1.1 Features

This Digital Indicator (4-channel Type) has the following features:

- **Simple wiring by using the e-CON connector.**
  Wiring by using the industry standard e-CON connecter instead of terminals saves countless man-hours. Simply connect the plug to the e-CON connector by using pliers. Avoid stripping off the wire covering.
- **Up to 4 points of input**
- **2 points of alarm for each channel (standard)**
- **Adding a Zero-point adjustment (Auto-zero) function**
- **Adding a Data lock function**
- **IP66 waterproof and dustproof protection for severe environments (optional)**

1.2 Checking the Product

Before using this product, check each of the following:

- Model code
- Check that there are no scratches or breakage in external appearance (case, front panel, or terminal, etc.)
- Check that all of the items delivered are complete. (Refer to below)

Accessories	Q'TY	Remarks
☐ Instrument	1	————
☐ Mounting bracket (KCA100-526)	1	————
☐ Quick Instruction Manual (IMR02K01-E☐)	1	Enclosed with instrument
☐ Instruction Manual (IMR02K02-E2)	1	This manual. (Sold separately.) This manual can be downloaded from our website: URL: http://www.rkcinst.com/english/manual_load.htm

📖 If any of the products are missing, damaged, or if your manual is incomplete, please contact RKC sales office or the agent.

1.3 Model Code

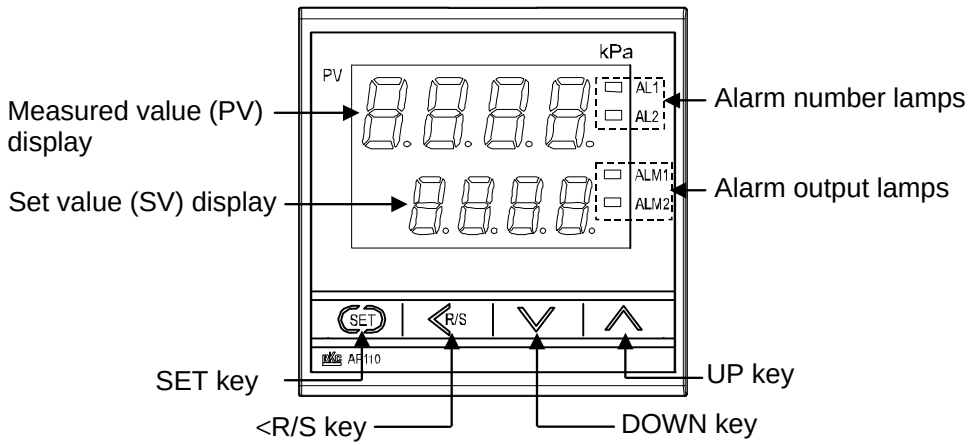
Check that the product received is correctly specified by referring to the following model code list:
If the product is not identical to the specifications, please contact RKC sales office or the agent.

■ Suffix code

AF110-4☐-3✱8D/☐
(1) (2) (3) (4) (5)

Specifications		Suffix code				
		(1)	(2)	(3)	(4)	(5)
Type	4-channel type	4				
Input type (common to all channels) Programmable range –1999 to +9999 [The decimal point position is selectable] (Factory set value: 0.0 to 100.0)	Voltage input (0 to 5 V DC)		4			
	Voltage input (0 to 10 V DC)		5			
	Voltage input (1 to 5 V DC)		6			
	Current input (0 to 20 mA DC)		7			
	Current input (4 to 20 mA DC)		8			
Power supply voltage	24 V DC			3		
Alarm output (DO1 to DO8) [Open collector output]	8 points (2 points/Input channel, Fixed)				8D	
Waterproof/Dustproof	None					No code
	Waterproof/Dustproof (IP66)					1

1.4 Parts Description



- **Display units/Indication lamps**

Measured value (PV) display [Green]	For monitor	Displays Measured value (PV) and alarm state.
	For data setting	Displays channel number and various parameter symbols of setting items.
Set value (SV) display [Orange]	For monitor	Displays channel number and parameter symbols of monitor items.
	For data setting	Displays various parameters' set values.
Alarm number lamps [Green] AL1, AL2	The lamp corresponding to the currently used alarm number (AL1 or AL2) lights. AL1: Alarm 1 AL2: Alarm 2	
Alarm output lamps [Orange] ALM1, ALM2	Lights when alarm output is turned on. (Logical *OR* of all channels) ALM1: Alarm 1 output ALM1: Alarm 2 output	

- **Operation keys**

∧	UP key	Use to increase a numerical value. Use to change to the next channel. Holding down the UP key rapidly advances the value.
∨	DOWN key	Use to decrease a numerical value. Use to change back to the previous channel. Holding down the DOWN key rapidly advances the value.
R/S	<R/S key (Shift key)	Use to start changing settings. Use to move to a different digit when changing a setting. Used to switch monitor items and modes.
SET	SET key	Used for parameter calling up and set value registration.

To avoid damage to the instrument, never use a sharp object to press keys.

2. MOUNTING

2.1 Mounting Cautions

⚠ WARNING

To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.

(1) This instrument is intended to be used under the following environmental conditions. **(IEC61010-1)** [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

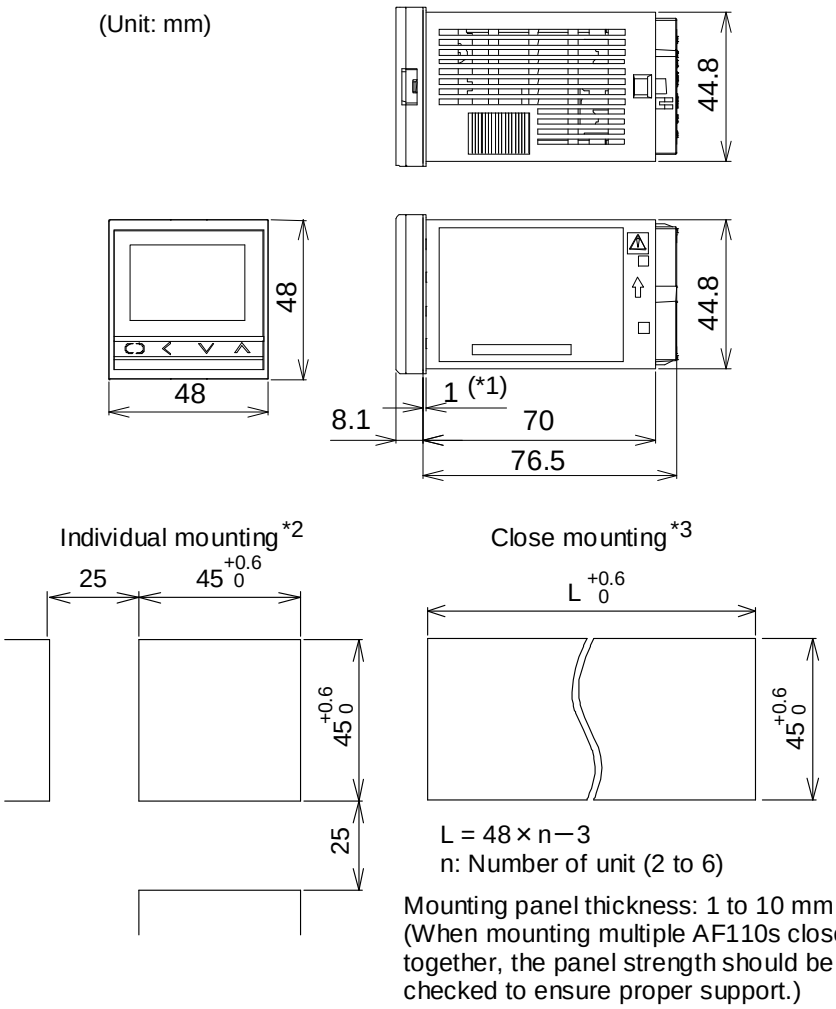
(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: 0 to 40 °C
- Allowable ambient humidity: 10 to 90 %RH
  (Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3kPa)

(3) Avoid the following conditions when selecting the mounting location:
- Rapid changes in ambient temperature which may cause condensation.
- Corrosive or inflammable gases.
- Direct vibration or shock to the mainframe.
- Water, oil, chemicals, vapor or steam splashes.
- Excessive dust, salt or iron particles.
- Excessive induction noise, static electricity, magnetic fields or noise.
- Direct air flow from an air conditioner.
- Exposure to direct sunlight.
- Excessive heat accumulation.

(4) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Do not mount this instrument directly above equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors.)
- If the ambient temperature rises above 40 °C, cool this instrument with a forced air fan, cooler, etc. Cooled air should not blow directly on this instrument.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
  High voltage equipment: Do not mount within the same panel.
  Power lines: Separate at least 200 mm.
  Rotating machinery: Separate as far as possible.

(5) If this instrument is permanently connected to equipment, it is important to include a switch or circuit-breaker into the installation. This should be in close proximity to the equipment and within easy reach of the operator. It should be marked as the disconnecting device for the equipment.

2.2 Dimensions



*1 Case rubber packing (optional) [Waterproof/Dustproof (specify when ordering)]

*2 To keep the instrument as Waterproof as possible, make sure that the panel surface has no burr or distortion where the hole is to be cut out.

*3 When the AF110 is mounted closely protection will be compromised and they will not meet IP66 standards.

Installation Conditions:

The display cannot be seen from the outside of the view angle. The view angle of AF110 is 40° to the upper side, and 30° to the lower side from the center of the display vertically.

2.3 Procedures of Mounting and Removing

■ Mounting procedures

1. Prepare the panel cutout as specified in **2.2 Dimensions.**

2. Insert the AF110 through the panel cutout.

3. Insert the mounting bracket into the mounting from the rear of the AF110 (Fig. 2.1).

4. Push the mounting bracket forward until the frame is firmly secured to the panel (Fig. 2.2).

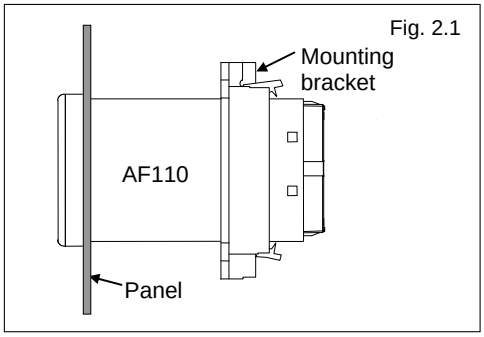


Fig. 2.1

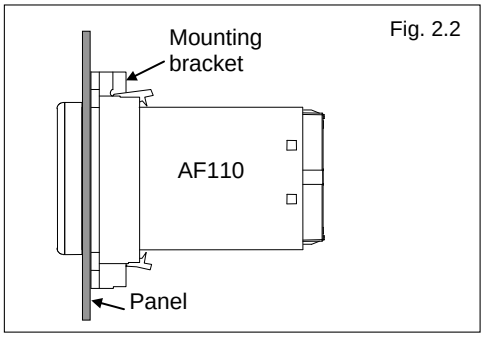
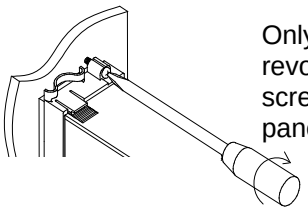


Fig. 2.2

When using the mounting screws



Only turn one full revolution after the screw touches the panel.

■ Removal procedures

1. Turn the power OFF.

2. Remove the wiring.

3. Pull the mounting bracket (②) while releasing the hooks upward or downward (①) to remove the mounting bracket (Fig. 2.3).

4. Pull out the instrument from the mounting cutout while holding the front panel frame of this instrument (Fig. 2.4).

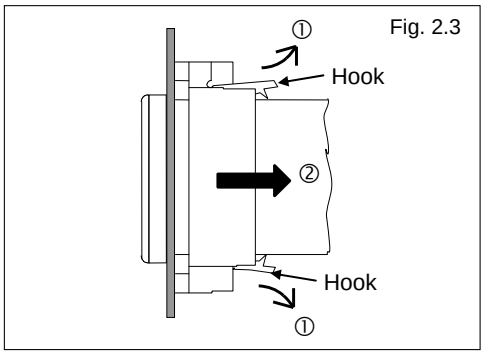


Fig. 2.3

It is possible to pull the AF110 out with the front panel frame while releasing the hooks upward or downward.

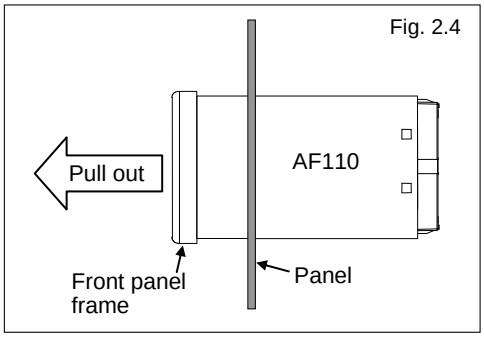


Fig. 2.4

The front of the instrument conforms to **IP66** [Specify when ordering] when mounted on the panel. For effective Waterproof/Dustproof, the rubber packing must be securely placed between instrument and panel without any gap. If rubber packing is damaged, please contact RKC sales office or the agent.

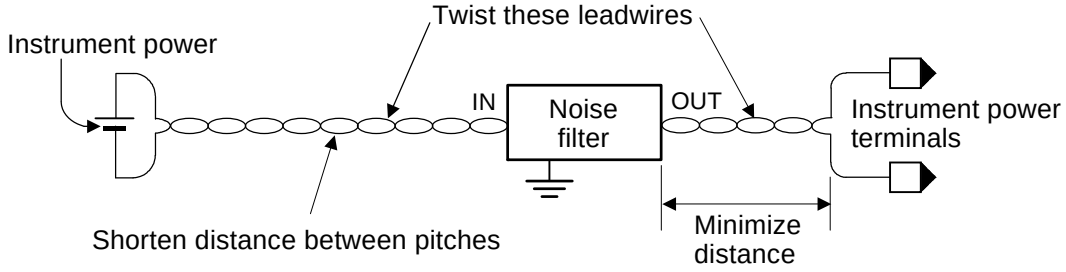
3. WIRING

3.1 Wiring Cautions

⚠ WARNING

To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.

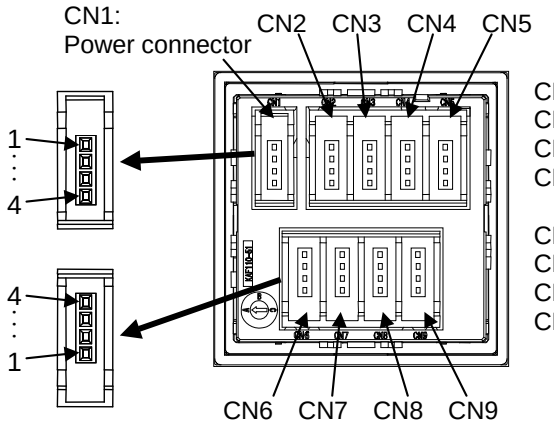
- To avoid noise induction, keep communication signal wire away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.



- About 6 seconds are required as preparation time for output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).
- This instrument is not provided with a power supply switch or fuse. Therefore, a fuse and power supply switch are required, install close to the instrument.

  Recommended fuse rating: Rated current: 0.5 A
  Fuse type: Time-lag fuse
  (Approved fuse according IEC 60127-2 and/or UL 248-14 and min. interrupting rating 8 A at 24 V DC)
- All wiring must be in accordance with local codes and regulations.

3.2 Connector Configuration



CN2: Sensor input 1 connector
CN3: Sensor input 2 connector
CN4: Sensor input 3 connector
CN5: Sensor input 4 connector

CN6: Alarm output DO1/DO2 connector
CN7: Alarm output DO3/DO4 connector
CN8: Alarm output DO5/DO6 connector
CN9: Alarm output DO7/DO8 connector

The Power connector (CN1) is half covered with a sticker to prevent misinsertion. Remove the sticker when connecting the plug for power supply.

The plug and cable must be provided by the customer.

Recommended plug (e-CON compliant plug):

Mini-Clamp Plug, Wiremount (Positions: 4)
3M product or equivalent
[Applicable cable size: 0.14 to 0.50 mm^2 (AWG No. 22 to 26)]

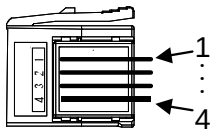
Connector used (e-CON compliant socket):

Mini-Clamp Socket, Boardmount, Straight Solder Tails
Single row style: 37204-62A3-004PL
4 row style: 37216-62M3-004PL
3M product or equivalent

■ Connecting cautions

- Connect connectors correctly in the right position. If it is forcibly pushed in with pins in the wrong positions, the pins may be bent resulting in instrument failure.
- When connecting or disconnecting the connectors, do not force it too far to right and left or up and down, but move it on the straight. Otherwise, the connector pins may be bent, causing instrument failure.
- When disconnecting a connector, hold it by the connector itself. Disconnecting connectors by yanking on their cables can cause breakdowns.
- To prevent malfunction, never touch the contact section of a connector with bare hands or with hands soiled with oil or the like.

■ Power connector (CN1)



Plug

Pin No.	CN1
1	+
2	NC
3	24 V DC –
4	*

* Pin Nos. 3 and 4 are shorted in the instrument inside.

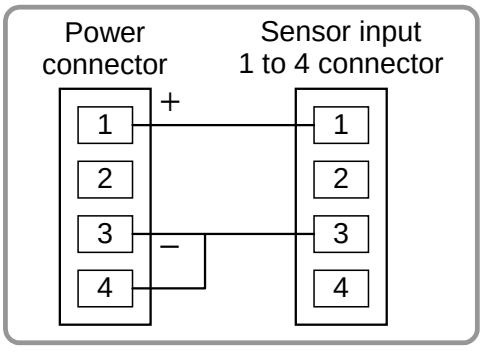
Be sure to wire the power correctly and use the correct polarity.

The Power connector (CN1) is half covered with a sticker to prevent misinsertion.
Remove the sticker when connecting the plug for power supply.

- Power supply voltage for the indicator must be within the range shown below to assure control accuracy.

Power supply voltage	Power consumption	
21.6 to 26.4 V DC [Including power supply voltage variation] (Rating 24 V DC)	Instrument	Maximum 65 mA (at 24 V DC) Rush current: 11 A or less
	Sensor power supply	Maximum 200 mA (total of 4 channels)

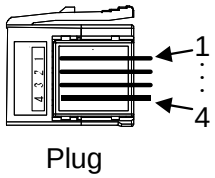
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply, supply power from a SELV circuit.
- A suitable power supply should be considered in end-use equipment. The power supply must be in compliance with a limited-energy circuits (maximum available current of 8 A).
- Be sure to wire the power correctly and use the correct polarity.
  Power connector and Sensor input connector from 1 to 4 are connected in the instrument inside.
  Damage to the instrument and sensor will result from reversing polarity.



■ Sensor input connector (CN2 to CN5: Sensor input 1 to 4)

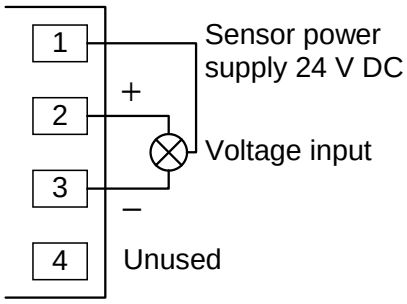
For the measured input type, Sensor input connectors are allocated to the measured input.

- **Voltage input**



Pin No.	CN2	CN3	CN4	CN5
1	Sensor power supply 24 V DC	Sensor power supply 24 V DC	Sensor power supply 24 V DC	Sensor power supply 24 V DC
2	+ IN1 (CH1)	+ IN2 (CH2)	+ IN3 (CH3)	+ IN4 (CH4)
3	−	−	−	−
4	Unused	Unused	Unused	Unused

Wiring example:



Measured input value may not display properly when using sensor power supply at voltage input because of the electric power consumption of sensor or wiring impedance. Conduct Auto-zero to adjust the zero point to display the measured input value properly.

For the Auto-zero, refer to the **5.5 Conduct Auto-zero (P. 35)**.

- The voltage input types are as follows (specify when ordering).

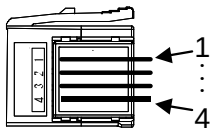
Model code	Input type	Input impedance
4	Voltage input 0 to 5 V DC	Approx. 1 MΩ
5	Voltage input 0 to 10 V DC	
6	Voltage input 1 to 5 V DC	

- To avoid noise induction, keep communication signal wire away from instrument power line, load lines and power lines of other electric equipment.
- The Sensor power supply 24 V DC is as follows.

  Output voltage: 24 V±10% DC

  Allowable load current: 200 mA (total of 4 channels)

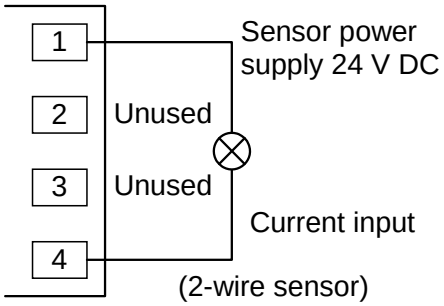
- **Current input**



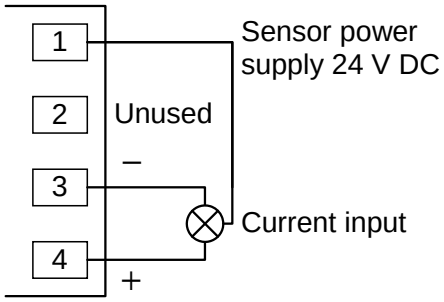
Plug

Pin No.	CN2	CN3	CN4	CN5
1	Sensor power supply 24 V DC	Sensor power supply 24 V DC	Sensor power supply 24 V DC	Sensor power supply 24 V DC
2	Unused	Unused	Unused	Unused
3	− IN1 (CH1)	− IN2 (CH2)	− IN3 (CH3)	− IN4 (CH4)
4	+	+	+	+

Wiring example 1:



Wiring example 2:



- The Current input types are as follows (specify when ordering).

Model code	Input type	Input impedance
7	Current input 0 to 20 mA DC	Approx. 50 Ω
8	Current input 4 to 20 mA DC	

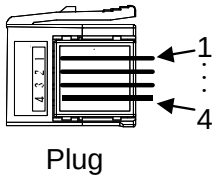
- To avoid noise induction, keep communication signal wire away from instrument power line, load lines and power lines of other electric equipment.
- The Sensor power supply 24 V DC is as follows.

  Output voltage: 24 V±10% DC

  Allowable load current: 200 mA (total of 4 channels)

■ Alarm output connector (CN6 to CN9: DO1 to DO8)

Connect an appropriate load.

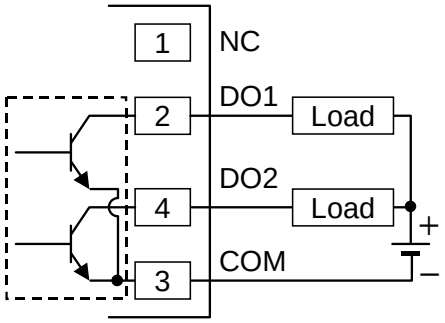


Plug

Open collector output

Pin No.	CN6	CN7	CN8	CN9
1	NC	NC	NC	NC
2	DO1	DO3	DO5	DO7
3	COM	COM	COM	COM
4	DO2	DO4	DO6	DO8

Wiring example:



- The Output assignment is as follows (fixed).

Input	CH1	CH2	CH3	CH4
Output	DO1 (ALM1) DO2 (ALM2) [CN6]	DO3 (ALM1) DO4 (ALM2) [CN7]	DO5 (ALM1) DO6 (ALM2) [CN8]	DO7 (ALM1) DO8 (ALM2) [CN9]

ALM1: Alarm 1 output ALM2: Alarm 2 output

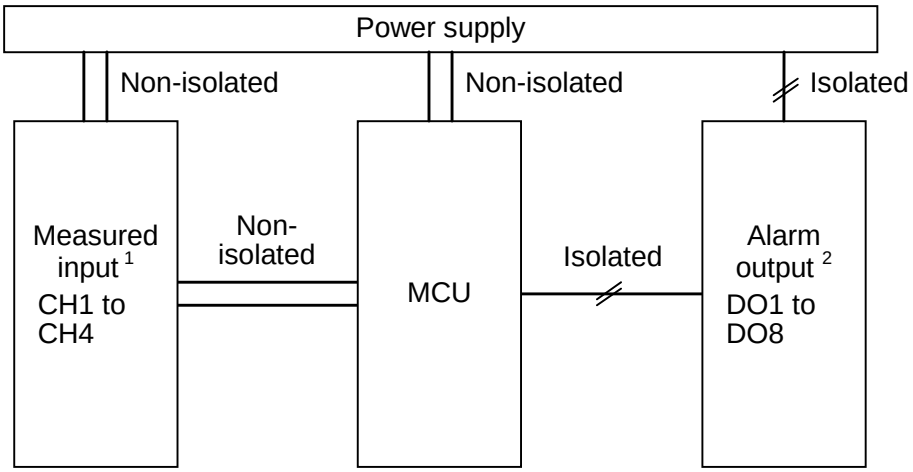
- Output type is Open collector output.

Open collector output	Output method:	Sink type
	Allowable load current:	100 mA
	Load voltage:	30 V DC or less
	Minimum load current:	0.1 mA
	ON voltage:	2 V or less (at maximum load current)
	Leakage current at OFF:	0.1 mA or less

- Alarm outputs (DO1 to DO8) are not mutually isolated.

■ Isolations of input and output

For isolated device input/output blocks, refer to the following:



[1] Measured inputs (CH1 to CH4) are not mutually isolated.

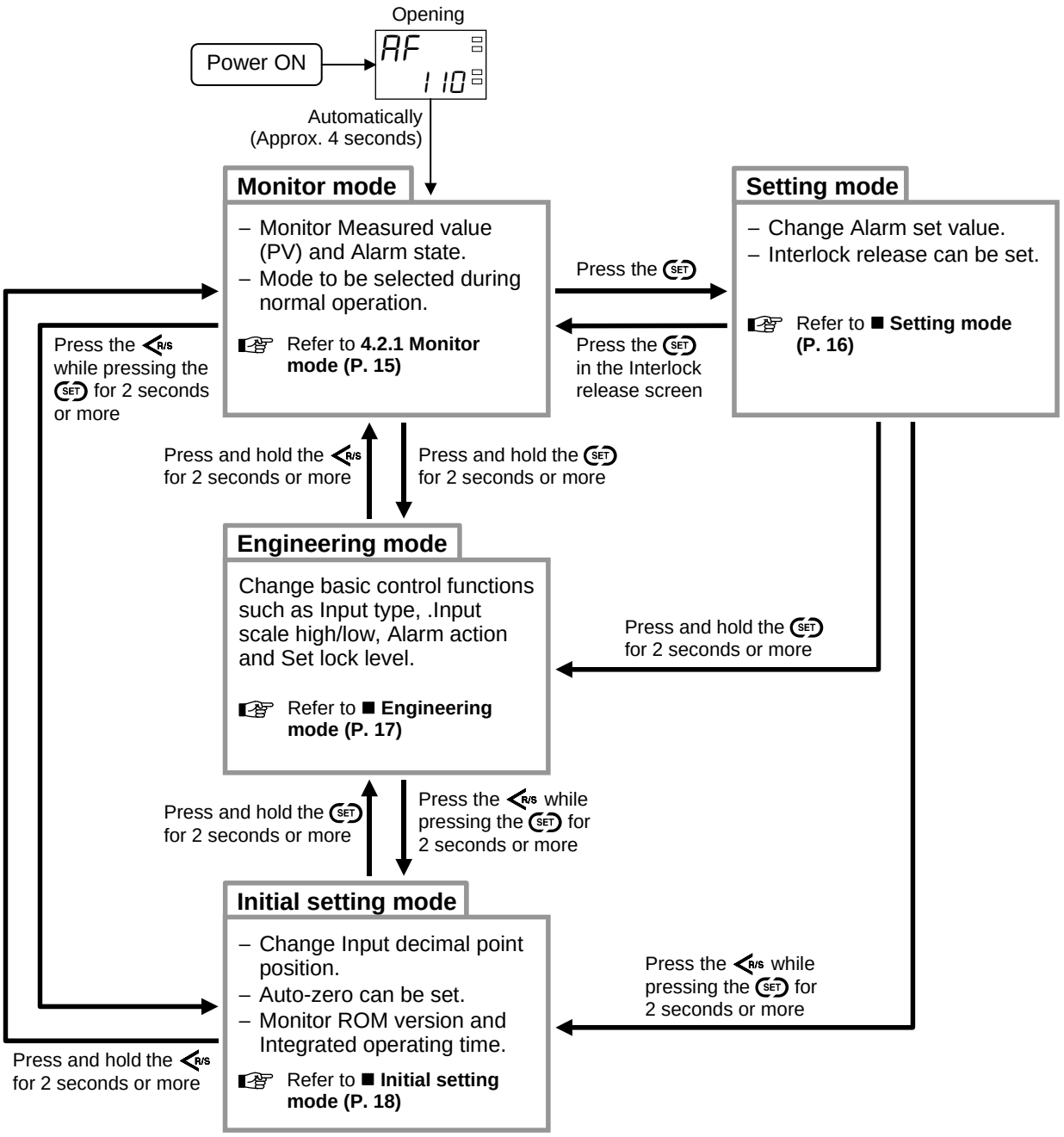
[2] Alarm outputs (DO1 to DO8) are not mutually isolated.

4. BASIC OPERATION

4.1 Operation Menu

The AF110 has 4 different modes. All settable parameters belong to one of them.
The following chart show how to access different mode.

Display returns to the Measured value (PV) monitor screen if no key operation is performed within 1 minute or when going back to the Monitor mode from the other modes.

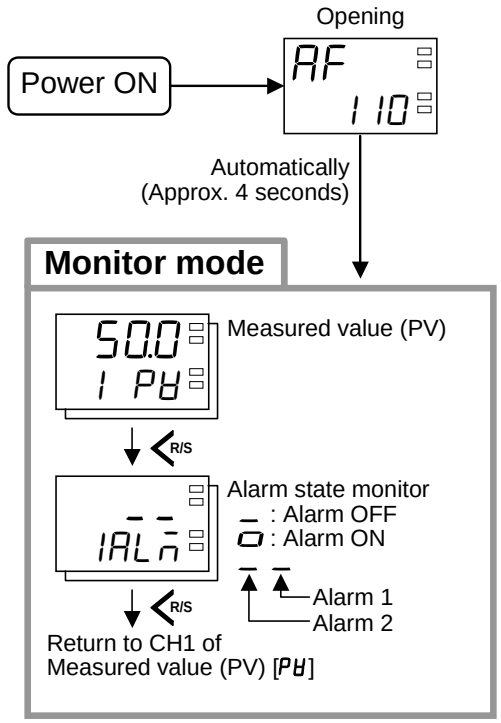


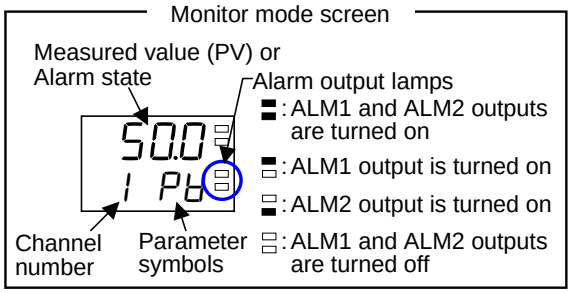
4.2 Scrolling Through Parameters

Display returns to the Measured value (PV) screen if no key operation is performed within 1 minute.

4.2.1 Monitor mode

In Monitor mode, the Measured value (PV) and Alarm state monitor are possible. Mode to be selected during normal operation.

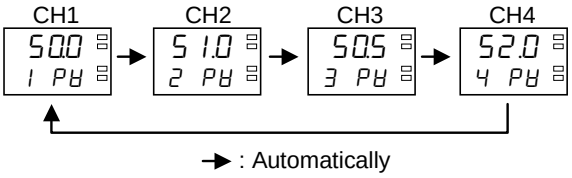




: Parameters for each channel
Pressing the ∧ or ∨ key enables channel selection.

When a scan interval time (SCn) [Refer to P. 20] in Engineering mode is set, the channel changes automatically each time the set interval elapses. (Factory set value: 2 seconds)

Example: Measured value (PV)



■ Parameter description

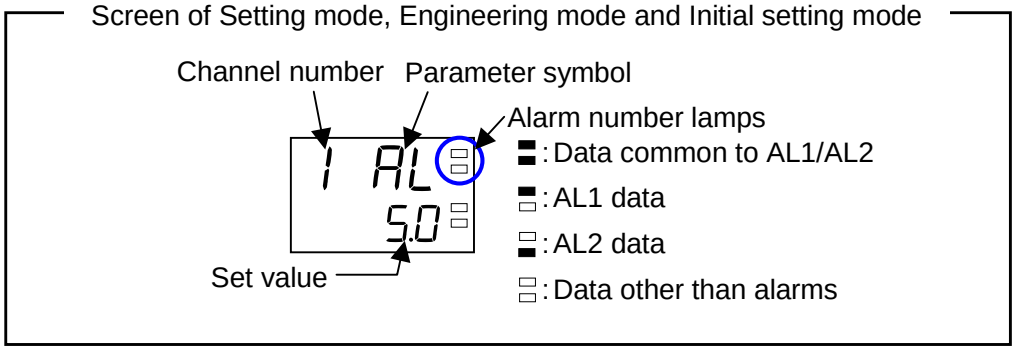
- **Monitor mode**

CH : Data for each channel

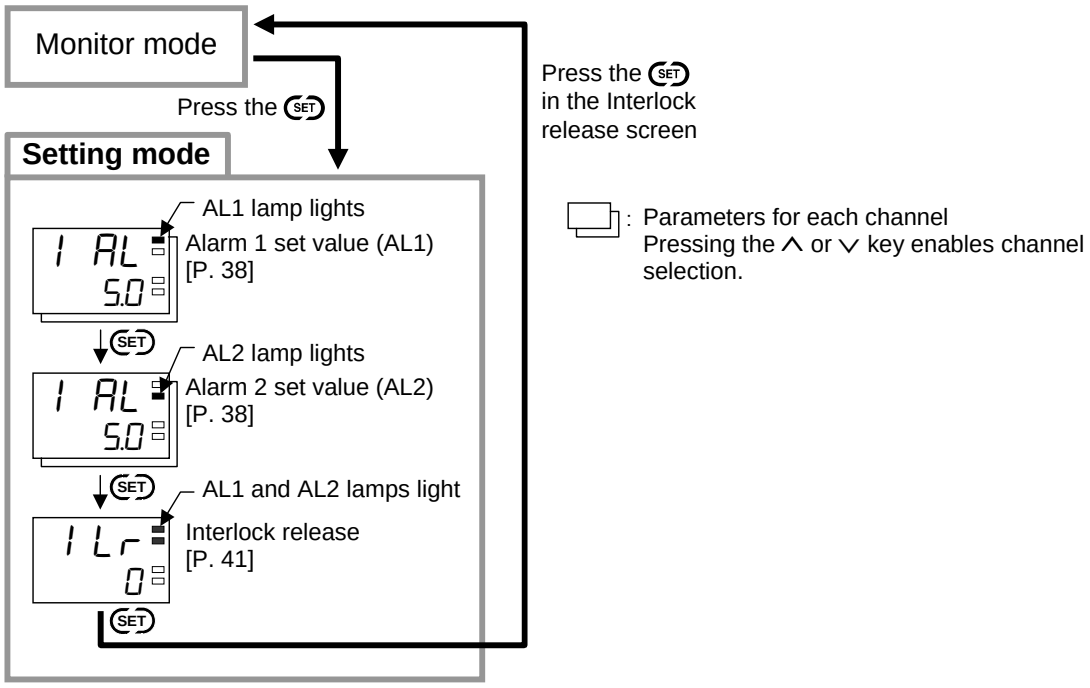
Symbol	Name	Data range	Description
PV (PV)	Measured value (PV) CH	Input scale low to Input scale high	Display the measured value (PV).
ALn (ALM)	Alarm state monitor CH Alarm 1 Alarm 2	: Alarm OFF : Alarm ON	Display the alarm state.

For the Input scale high and Input scale low, refer to the **5.3 Parameter Setting for Input (P. 27)**.

4.2.2 Setting mode, Engineering mode, Initial setting mode



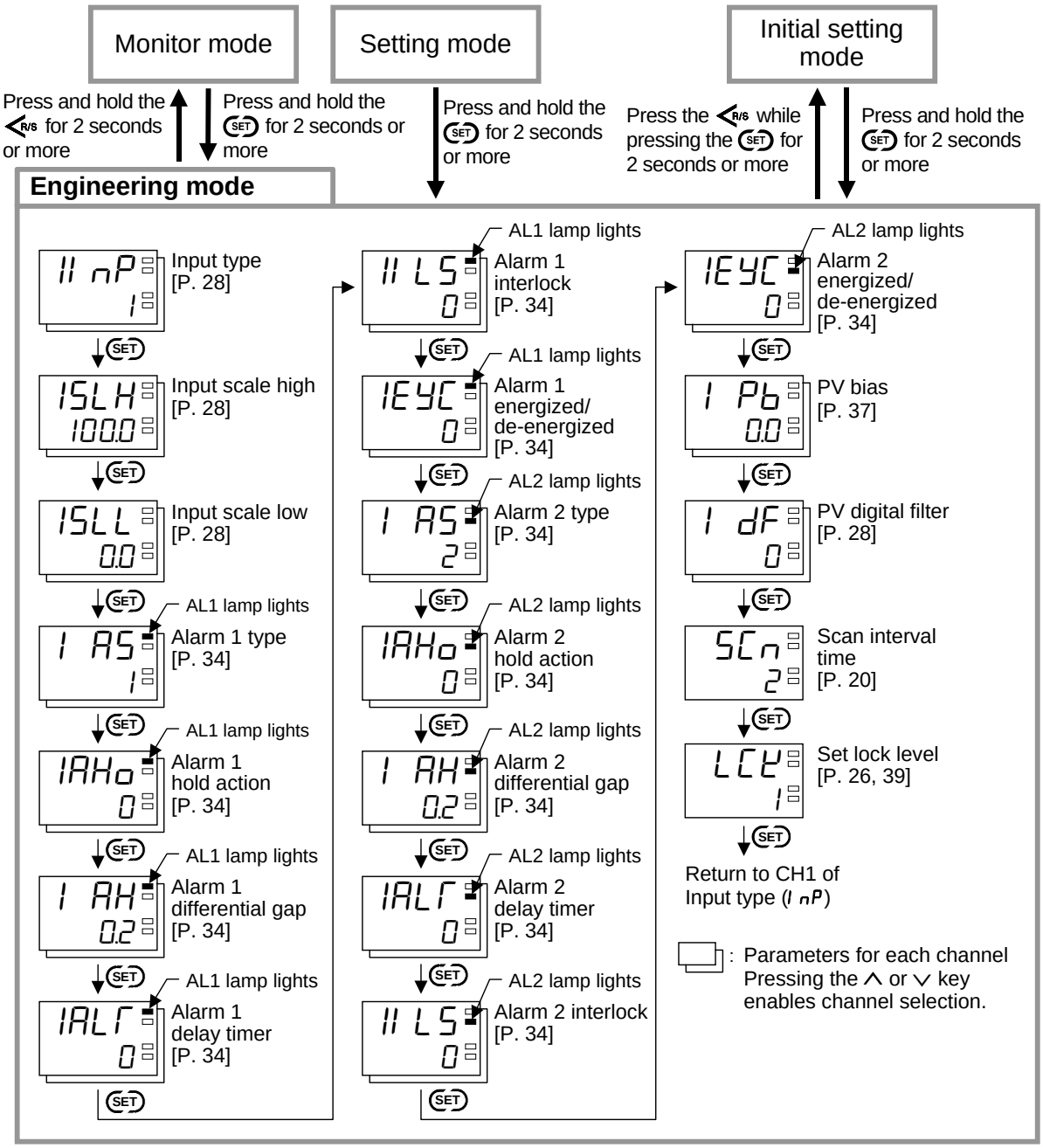
■ Setting mode



■ Engineering mode

WARNING

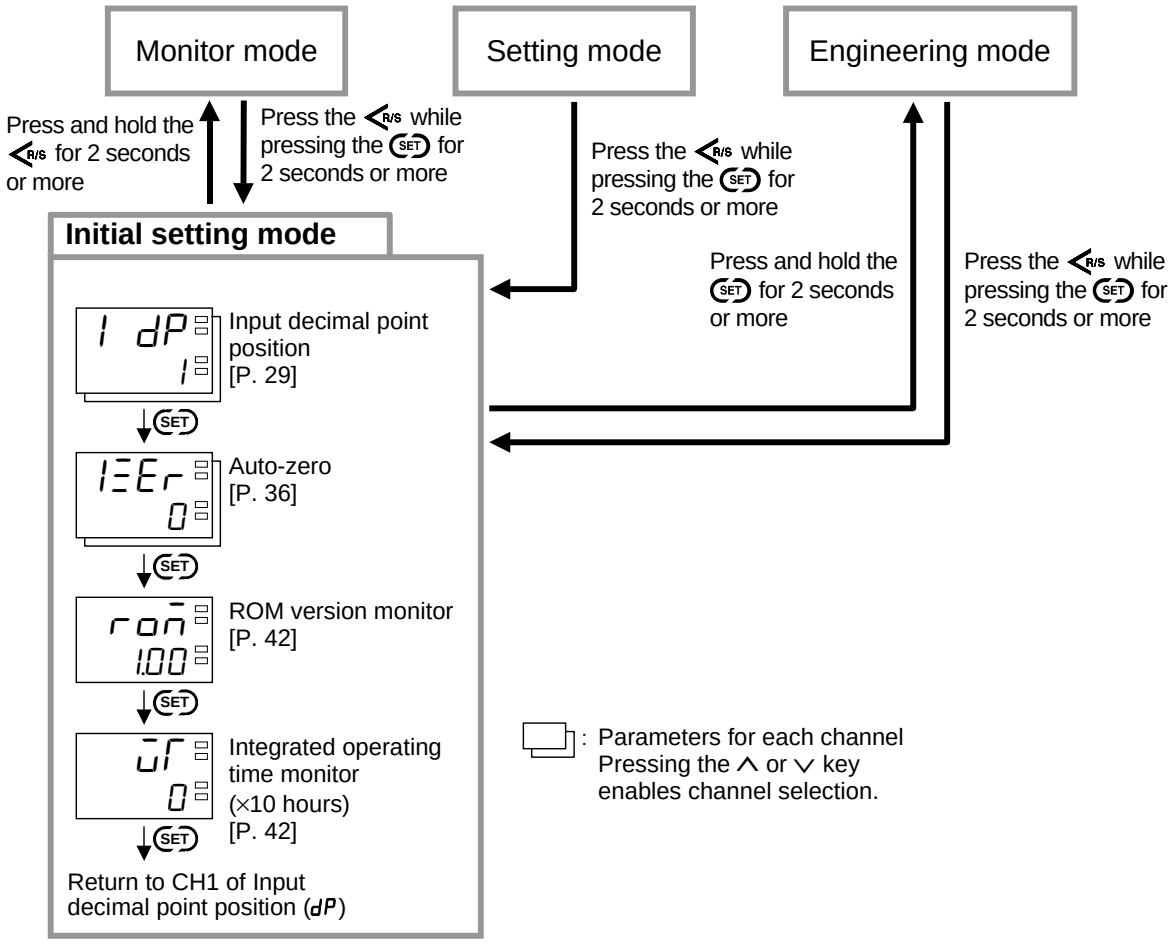
Parameters in the Engineering mode should be set according to the application before setting any parameter related to operation. Once the parameters in the Engineering mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions.
If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.



■ Initial setting mode

⚠ WARNING

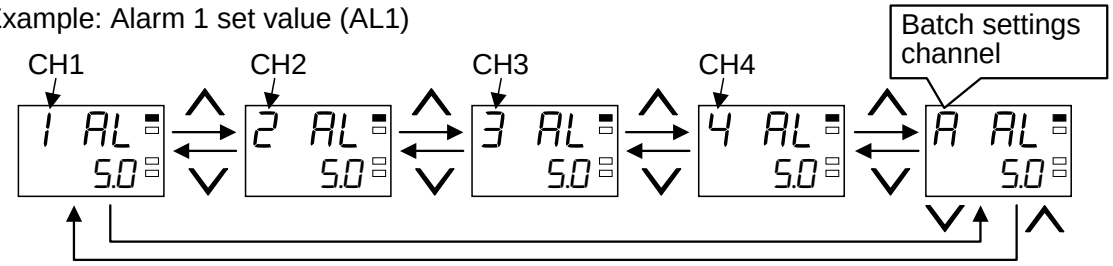
Parameters in the Initial setting mode should be set according to the application before setting any parameter related to operation. Once the parameters in the Initial setting mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions.
If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Initial setting mode.



4.3 Channel Selection

For parameter for each channel, pressing the ∧ or ∨ key enables channel selection. When the ∧ key or ∨ key is pressed repeatedly in the Setting mode, Engineering mode and Initial setting mode parameters (only data for each channel), the Batch settings channel (A) will appear after the last channel (CH4).

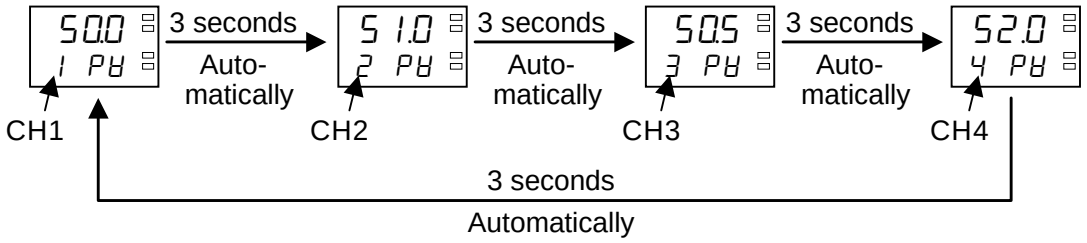
Example: Alarm 1 set value (AL1)



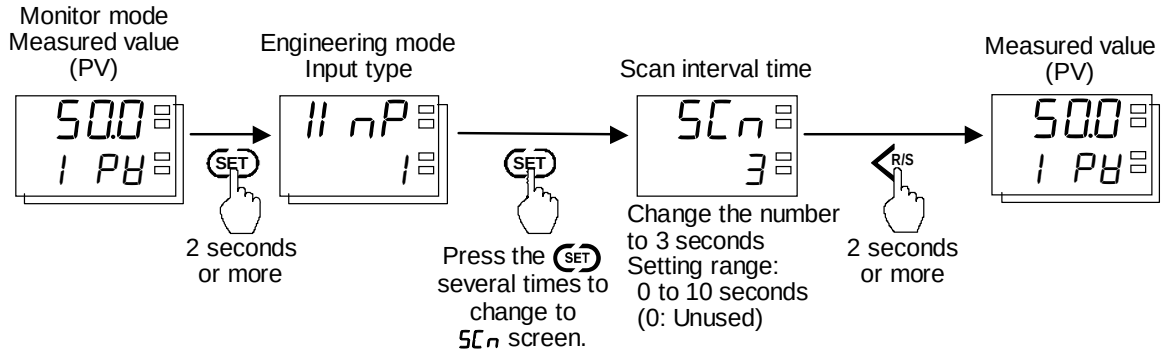
■ Setting of Scan interval time

When a Scan interval time in Engineering mode is set, the channel of parameter in Monitor mode changes automatically each time the set interval elapses.

Example: Status of Measured value (PV) when Scan interval time is set to 3 seconds



Example: Change the Scan interval time to 3 seconds



☞ For the data setting, refer to **4.4 Changing Data (P. 21)**.

- **Parameter description**

  Alarm number lamps:
  □□ : Data other than alarms

Engineering mode

Symbol	Name	Data range	Description	Factory set value
SCn □□ (SCn)	Scan interval time	0 to 10 seconds (0: Unused)	Use to set the time until changed to the next channel of parameter of Monitor mode automatically.	2

4.4 Changing Data

This section describes the setting procedure of data.

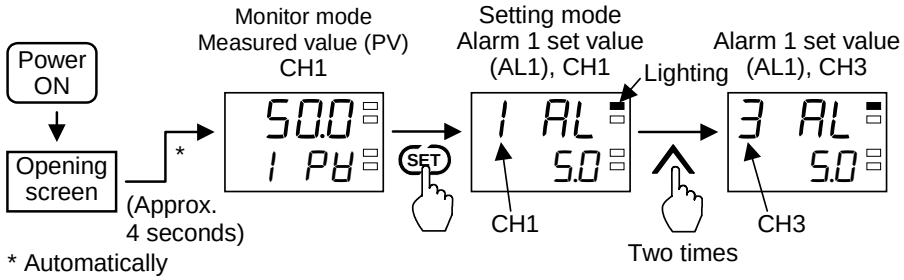
Set value change and registration

- The blinking digit indicates which digit can be set. The blinking digit can be moved by pressing the R/S key.
- However, the changed data is not stored by the operation of the ∧ and ∨ keys alone. In order for the new parameter value to be stored, the SET key must be pressed within 20 seconds after the new value is displayed. The new value will then be saved.

■ Changing data settings (setting for each channel)

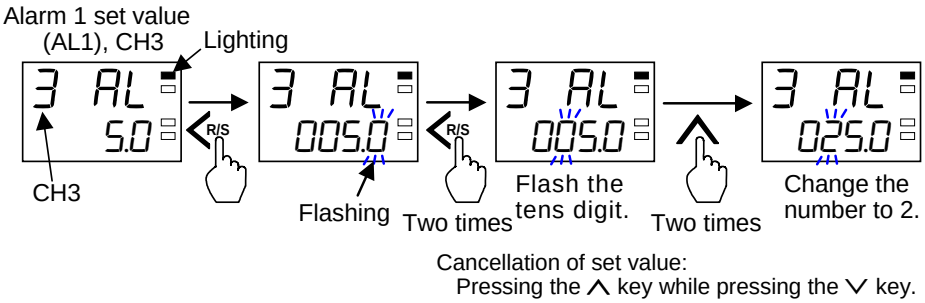
Example: Changing the CH 3 Alarm 1 set value (AL1) to 25.0 kPa.

1. **Select the CH3 of Alarm 1 set value (AL1)**

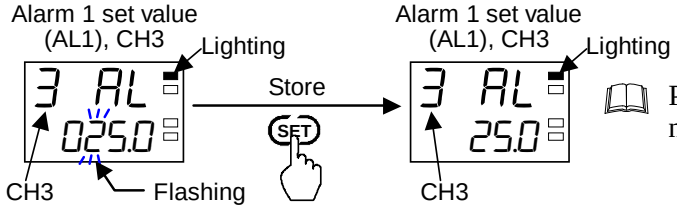


2. **Change the Alarm 1 set value (AL1) of CH3 to 25.0 kPa**

Pressing the R/S key to flash the least significant digit (first digit from the right) and start changing settings. The flashed digit indicates which digit can be set.



3. **Store the Alarm 1 set value (AL1) of CH3**



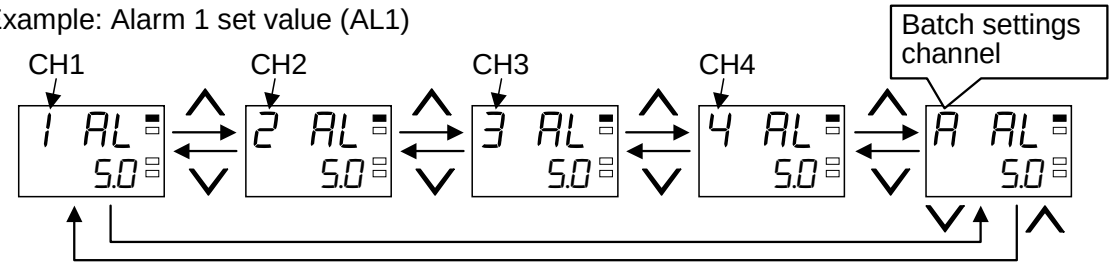
Press the SET key to go to the next parameter of channel 1.

Other data can also be set by the same procedures as described in steps ***1*** to ***3***.

■ Data batch setting (for all channels)

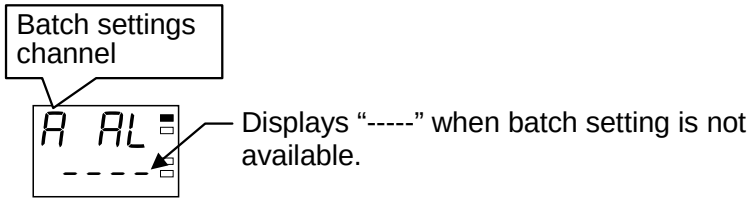
This setting lets you apply data set for Batch setting channel (A) to all channels.
When the ∧ key or ∨ key is pressed repeatedly in the Setting mode, Engineering mode and Initial setting mode parameters (only data for each channel), the Batch settings channel (A) will appear after the last channel (CH4).

Example: Alarm 1 set value (AL1)



Batch setting is not available when Input decimal point position (DP) is different among channels. Displays "----" at the SV display (except for Input decimal point position).

Example: Alarm 1 set value (AL1)



If an Out-of input scale range error occurs while saving set value (by using the SET key), the set value is canceled and the previous set value remains and flashes (for 3 seconds).

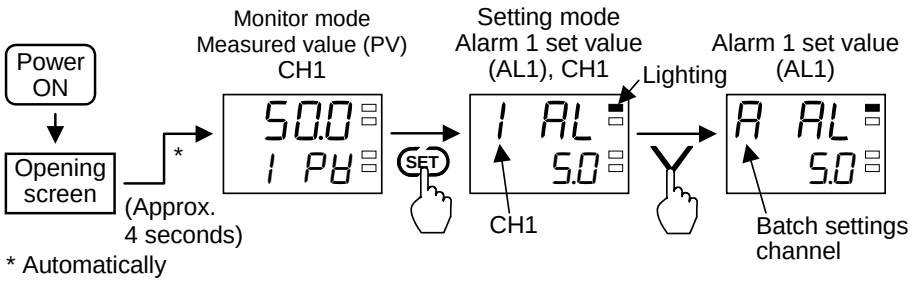
Out-of input scale range error occurs in the following parameters:

Alarm 1 set value (AL1) [AL]	Input scale high (SLH)	Alarm 1 differential gap (AH)
Alarm 2 set value (AL2) [AL]	Input scale low (SLL)	Alarm 2 differential gap (AH)
PV bias (Pb)		

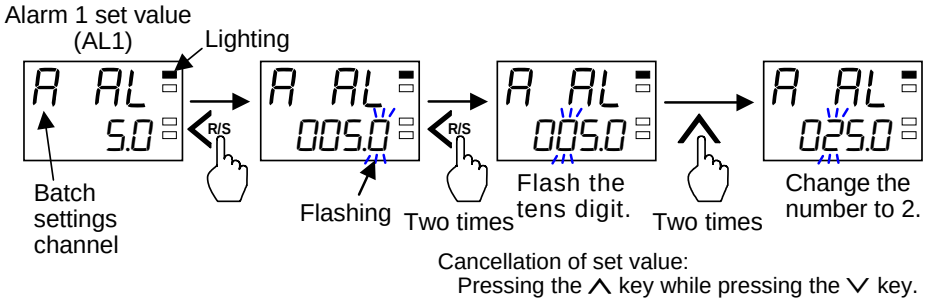
Displays the set value of channel 1 when changing to the Batch settings channel (A).

Example: Changing the Alarm 1 set value (AL1) of all channel to 25.0 kPa.

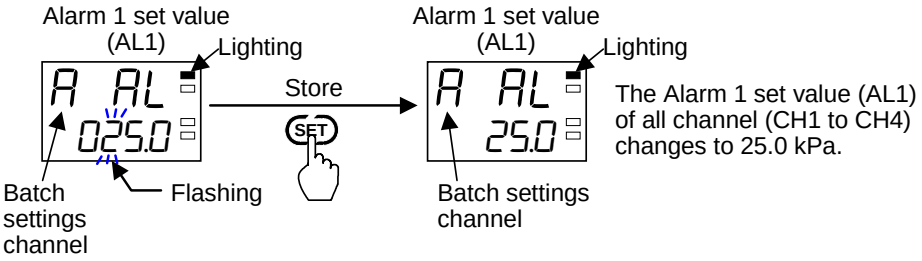
1. **Select the Batch settings channel (A) of Alarm 1 set value (AL1)**



2. Change the Alarm 1 set value (AL1) of Batch settings channel (A) to 25.0 kPa



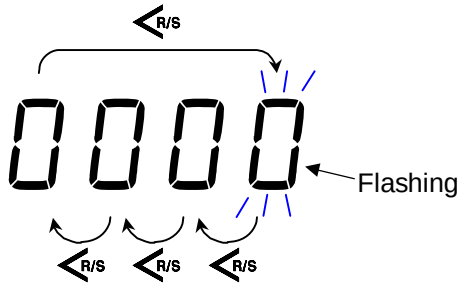
3. Store the Alarm 1 set value (AL1) of Batch settings channel (A)



Other data can also be set by the same procedures as described in steps ***1*** to ***3***.

■ Moving flashing digit and changing set value

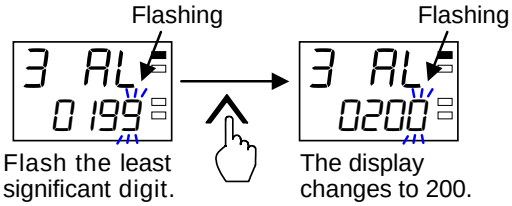
- The flashing digit indicates which digit can be set. Press R/S key to go to a different digit. Every time the shift key is pressed, the flashing digit moves as follows.



- The following is also available when changing the set value

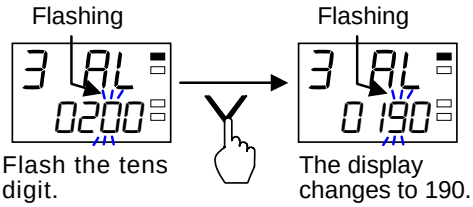
Increase set value from 199 to 200:

1. Press the R/S key to flash the least significant digit (first digit from the right).
2. Press the ∧ key to change to 0. The display changes to 200.



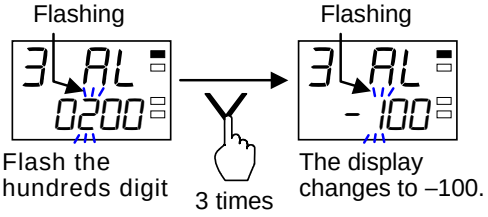
Decrease set value from 200 to 190:

1. Press the R/S key to flash the tens digit.
2. Press the ∨ key to change to 9. The display changes to 190.



Decrease SV from 200 to –100:

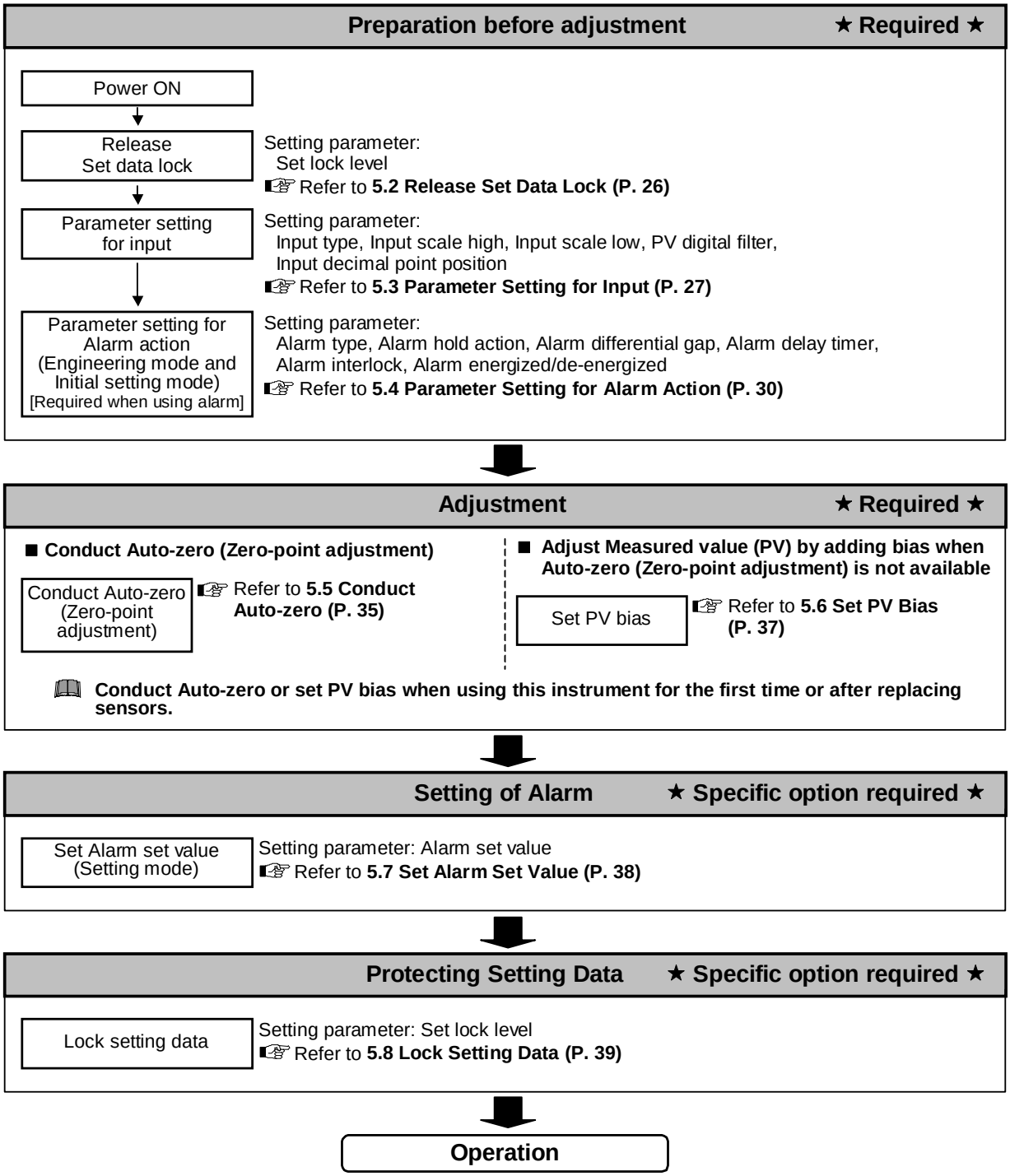
1. Press the R/S key to flash the hundreds digit.
2. Press the ∨ key (three times) to change to –1. The display changes to –100.



5. OPERATIONS

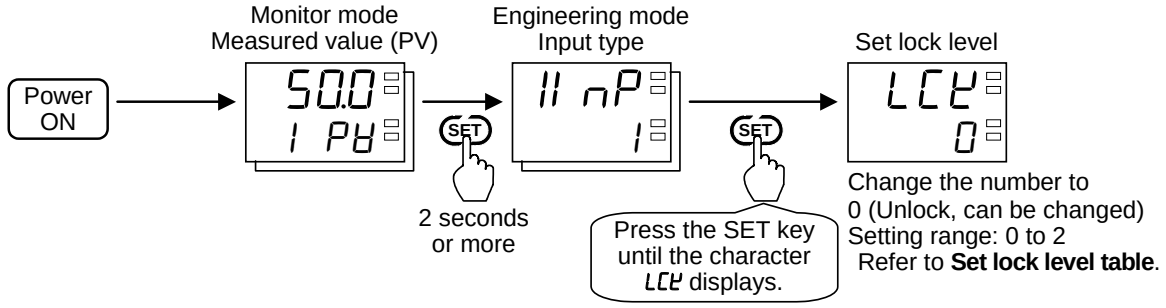
5.1 Setup Procedures Prior to Running the Instrument

After completing installation and wiring, set parameters for application and conduct adjustment procedure.



5.2 Release Set Data Lock

Set lock level is preset to "1 (factory set value)" to avoid accidental change in setting data. To change setting of parameter, release Set data lock by setting "0 (All parameters are changeable)" to Set lock level.



☞ For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Parameter description

Alarm number lamps:
□□ : Data other than alarms

● **Engineering mode**

Symbol	Name	Data range	Description	Factory set value
LCK □□ (LCK)	Set lock level	0 to 2 Refer to **Set lock level table**.	The set lock level restricts parameter setting changes by key operation (Set data lock function).	1

Set lock level table

Set value	Parameters of Setting mode	Parameters of Engineering mode	Parameters of Initial setting mode
0	Unlock (Can be changed)		
1	Unlock (Can be changed)	Lock	Lock
2	Lock [Excluding the Interlock release]	Lock	Lock

Comply with the warning below when changing parameters in the Engineering mode and the Initial setting mode.

⚠ WARNING

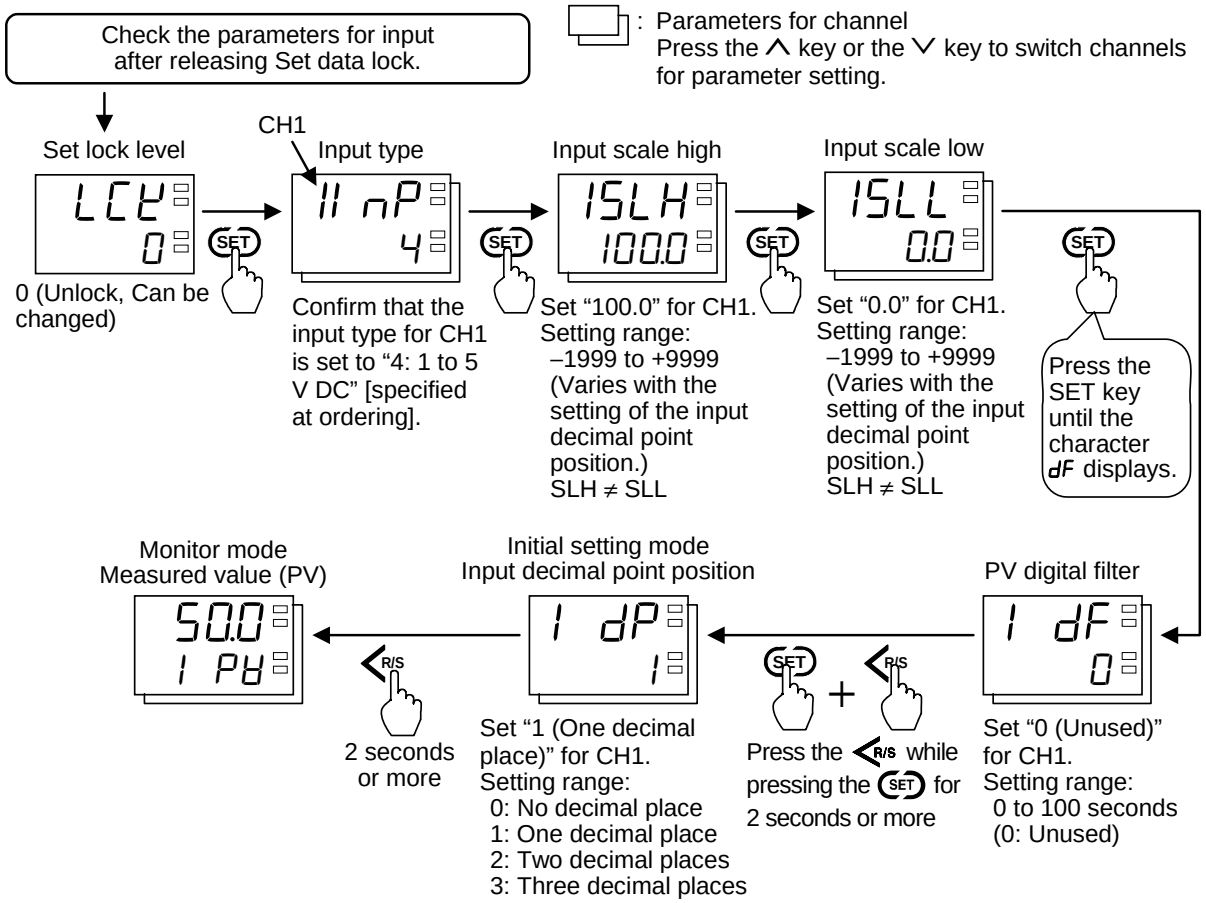
Parameters in the Engineering and Initial setting mode should be set according to the application before setting any parameter related to operation. Once the parameters in the Engineering and Initial setting mode are set correctly, no further changes need to be made to parameters for the same application under normal conditions. If they are changed unnecessarily, it may result in malfunction or failure of the instrument. RKC will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering and Initial setting mode.

5.3 Parameter Setting for Input

Set parameters required for input in the Engineering mode or the Initial setting mode, including those not specified when ordered

Example: Parameter setting for input (Input of CH 1)

Input type:	1 to 5 V DC
Input scale high:	100.0
Input scale low:	0.0
PV digital filter:	Unused
Input decimal point position:	One decimal place

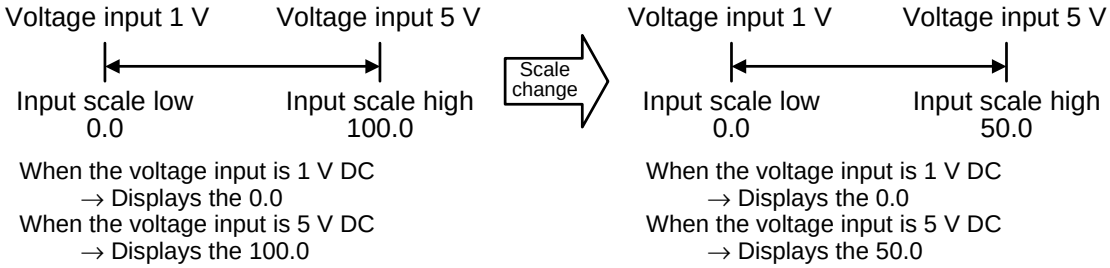


☞ For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Input scale high/low

Display scaling can be made in the range of −1999 to +9999.

Example: When the display scale is changed to “0.0 to 50.0” from “0.0 to 100.0” at a voltage input of 1 to 5 V DC.



PV display flashes when the Measured value (PV) is outside of the input scale range. Set Alarm set value within the Input scale.

■ Parameter description

Alarm number lamps:
□□ : Data other than alarms

CH : Data for each channel

● Engineering mode

Symbol	Name	Data range	Description	Factory set value
InP (InP) □□	Input type **CH**	Current input 0: 0 to 20 mA DC 1: 4 to 20 mA DC Voltage input 2: 0 to 5 V DC 3: 0 to 10 V DC 4: 1 to 5 V DC	Use to select the input type.	Depends on model code.
SLH (SLH) □□	Input scale high **CH**	−1999 to +9999 (Varies with the setting of the input decimal point position.) SLH ≠ SLL	Use to set the high limit of the input scale range.	100.0
SLL (SLL) □□	Input scale low **CH**	−1999 to +9999 (Varies with the setting of the input decimal point position.) SLH ≠ SLL	Use to set the low limit of the input scale range.	0.0
dF (dF) □□	PV digital filter **CH**	0 to 100 seconds (0: Unused)	This item is the time of the first-order lag filter eliminate noise against the measured input.	0

- **Initial setting mode**

Symbol	Name	Data range	Description	Factory set value
dP □□ (dP)	Input decimal point position **CH**	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	Use to select the decimal point position of the Measured value (PV).	1

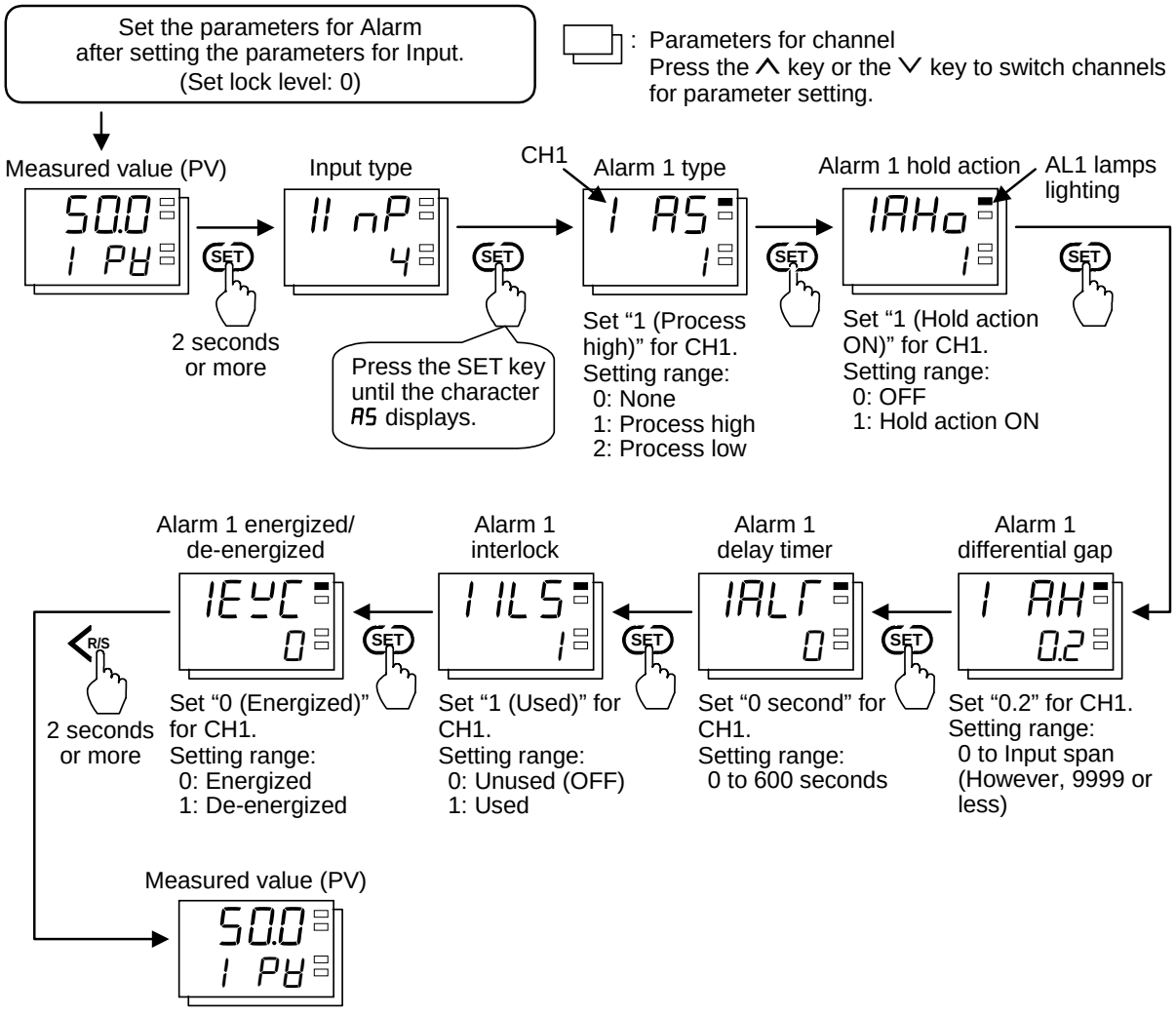
5.4 Parameter Setting for Alarm Action

Set parameters for Alarm action in the Engineering mode or the Initial setting mode.

Example: Parameter setting for Alarm action (Alarm 1 of CH1)

Alarm 1 type:	Process high
Alarm 1 hold action:	Hold action ON
Alarm 1 differential gap:	0.2
Alarm 1 delay timer:	0 second
Alarm 1 interlock:	Used
Alarm 1 energized/de-energized:	Energized (Alarm output is turned on during the alarm)

Set the parameters for Alarm 2 using the same setting procedure as Alarm 1.



For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Alarm type

● Input value action (High, Low)

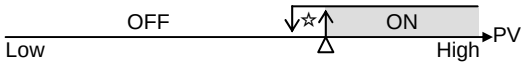
When the Measured value (PV) reaches the Alarm set value, alarm ON occurs.
Diagrams of the input value action type are shown in the following.

ON: Alarm action turned on

OFF: Alarm action turned off (△: Alarm set value ☆: Alarm differential gap)

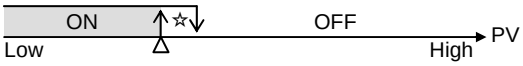
Process high

When the Measured value (PV) is more than the Alarm set value, the alarm ON occurs.



Process low

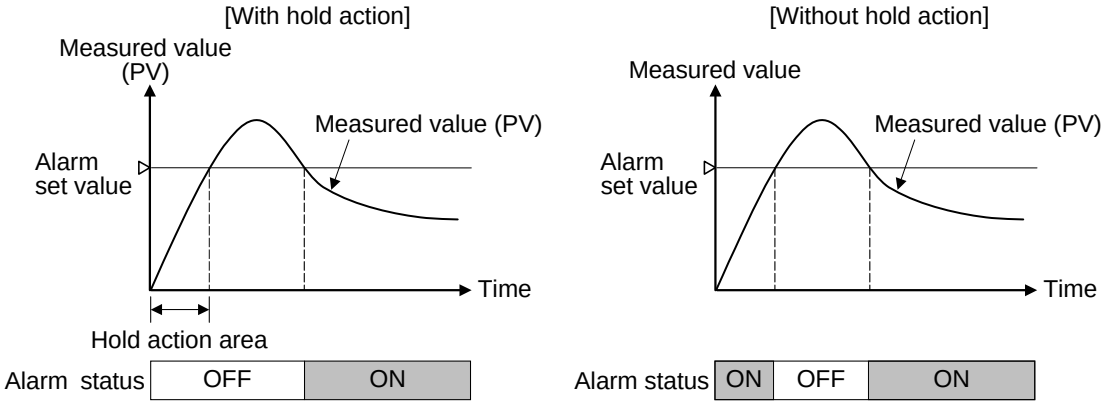
When the Measured value (PV) is less than the Alarm set value, the alarm ON occurs.



■ Alarm hold action

When hold action is ON, the alarm action is suppressed at start-up (Power ON) until the Measured value (PV) has entered the non-alarm range.

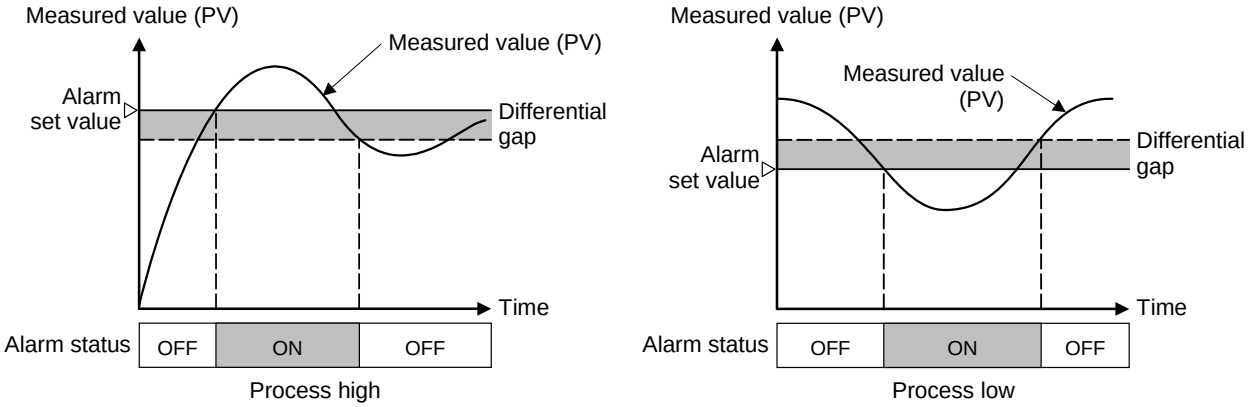
Example: When the Alarm hold action function is used for Process low



When high alarm with hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Use in combination with a high alarm without hold action in order to prevent overheating which may occur by failure of control devices, such as welding of relays.

■ Alarm differential gap

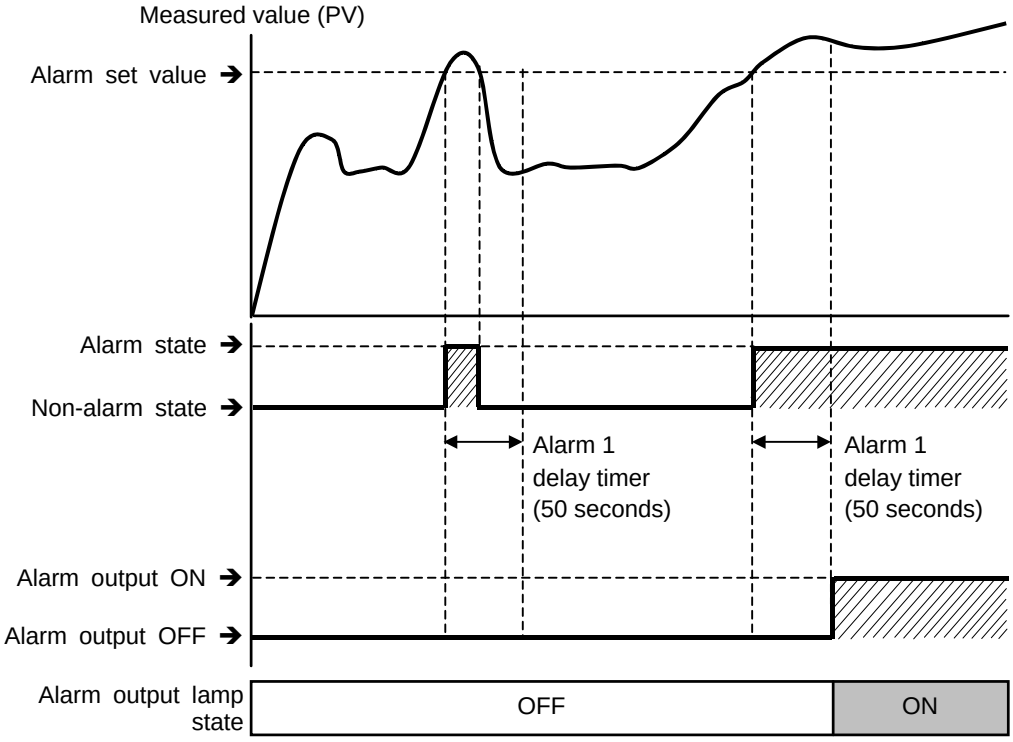
It prevents chattering of alarm output due to the Measured value (PV) fluctuation around the Alarm set value.



■ Alarm delay timer

When an alarm condition becomes ON, the output is suppressed until the Delay timer set time elapses. If the alarm output is still ON after time is up, the output will resume.

Example: When the setting of Alarm 1 delay timer is 50 seconds



The Alarm delay timer is also activated for the following reasons:

- When set to the alarm state simultaneously with power turned on

In the alarm wait state, no alarm output is turned on even after the Alarm delay timer preset time has elapsed.

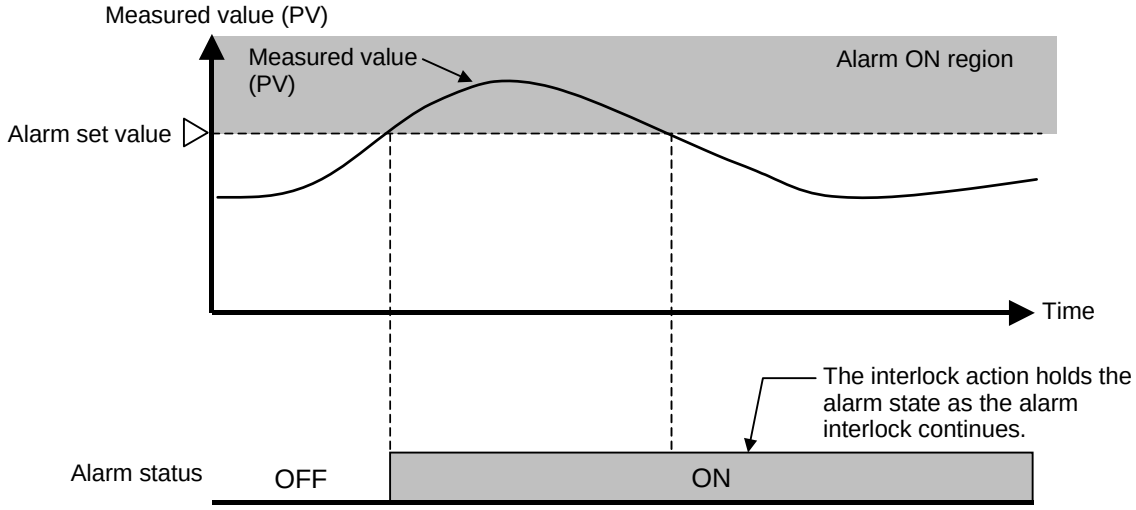
The Alarm delay timer is reset for the following reasons:

- When power failure occurs while the Alarm delay timer is being activated

■ Alarm interlock

The Alarm interlock function is used to hold the alarm state.

Example: When the Alarm interlock function is used for Process high



[Without Alarm hold action]

For the interlock release, refer to the **5.9 Interlock Release (P. 40)**.

■ Alarm energized/de-energized

Table for explaining operation (At power-ON)

	Alarm status	**Non-alarm status**
Energized	Alarm output ON (Transistor ON)	Alarm output OFF (Transistor OFF)
De-energized	Alarm output OFF (Transistor OFF)	Alarm output ON (Transistor ON))

■ Parameter description

Alarm number lamps:
▪□: Alarm 1 (AL1) data
□▪: Alarm 2 (AL2) data

CH : Data for each channel

● Engineering mode

Symbol	Name	Data range	Description	Factory set value
AS (AS) ▪□	Alarm 1 type **CH**	0: None 1: Process high 2: Process low	Use to select the action type of the alarm.	1
AHo (AHo) ▪□	Alarm 1 hold action **CH**	0: OFF 1: Hold action ON	Use to select the hold action for the alarm.	0
AH (AH) ▪□	Alarm 1 differential gap **CH**	0 to Input span (However, 9999 or less)	Use to set a differential gap of the alarm.	0.2 % of Input span
ALT (ALT) ▪□	Alarm 1 delay timer **CH**	0 to 600 seconds	Alarm delay timer is to set an output delay time for alarm outputs	0
ILS (ILS) ▪□	Alarm 1 interlock **CH**	0: Unused (OFF) 1: Used	Use to select the interlock function for the alarm.	0
EXC (EXC) ▪□	Alarm 1 energized/ de-energized **CH**	0: Energized 1: De-energized	Use to select the alarm energized or de-energized.	0
AS (AS) □▪	Alarm 2 type **CH**	0: None 1: Process high 2: Process low	Use to select the action type of the alarm.	2
AHo (AHo) □▪	Alarm 2 hold action **CH**	0: OFF 1: Hold action ON	Use to select the hold action for the alarm.	0
AH (AH) □▪	Alarm 2 differential gap **CH**	0 to Input span (However, 9999 or less)	Use to set a differential gap of the alarm.	0.2 % of Input span
ALT (ALT) □▪	Alarm 2 delay timer **CH**	0 to 600 seconds	Alarm delay timer is to set an output delay time for alarm outputs	0
ILS (ILS) □▪	Alarm 2 interlock **CH**	0: Unused (OFF) 1: Used	Use to select the interlock function for the alarm.	0
EXC (EXC) □▪	Alarm 2 energized/ de-energized **CH**	0: Energized 1: De-energized	Use to select the alarm energized or de-energized.	0

When high alarm with hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Use in combination with a high alarm without hold action in order to prevent overheating which may occur by failure of control devices, such as welding of relays.

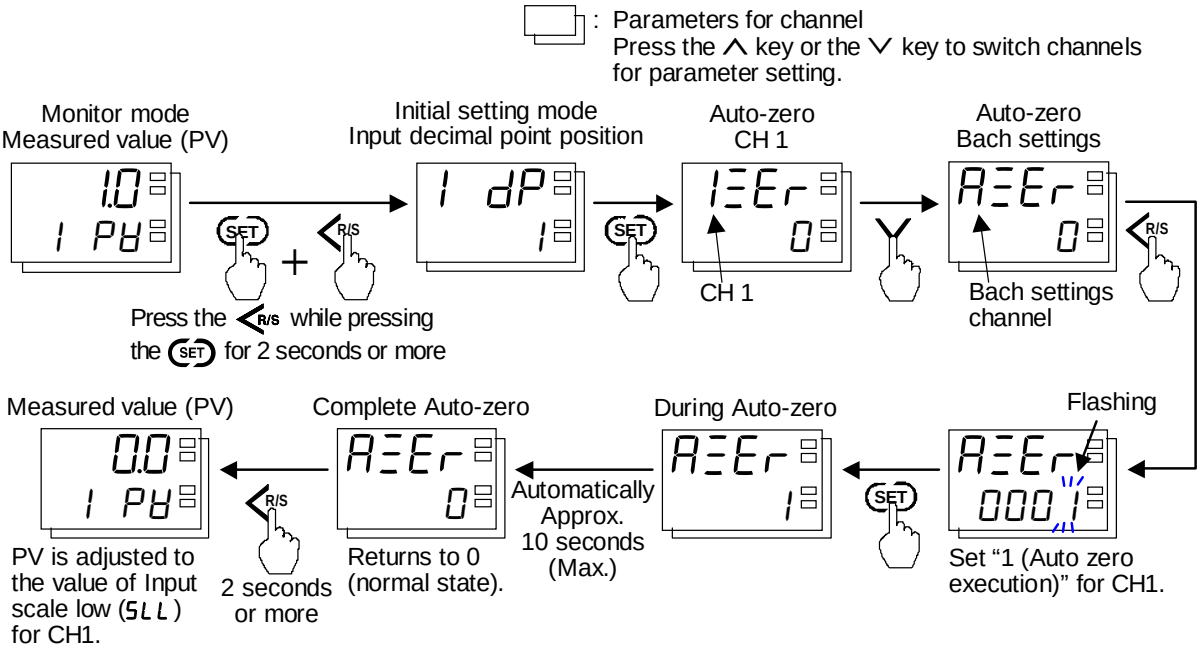
5.5 Conduct Auto-zero (Zero-point adjustment)

Conduct Auto-zero (Zero-point adjustment) to set PV bias (Pb) automatically [refer to P. 37] and then to adjust Measured value (PV) of the pressure sensor in no-load condition to the value of Input scale low (SLL) [factory set value: 0.0]. It takes approximately 10 seconds maximum for Auto-zero.

Auto-zero is required for sensors such as the pressure to adjust Measured value (PV) to Input scale low (SLL). For temperature sensor, adjust Measured value (PV) by setting PV bias (Pb) [refer to P. 37]. Auto-zero is not required.

1. Check the wiring between the AF110 and the pressure sensor.
2. Raise temperature of machine (molding machine etc.) where the pressure sensor is mounted until it reaches temperature at operation.
3. Make the pressure sensor no-load condition.
4. Set "1" at the Auto-zero screen to start Auto-zero. The display returns to "0" when Auto-zero completes.

Example: Conduct Auto-zero for all channels by Butch setting.



📖 Displays “2: Error” when error occurs during Auto-zero. (Error message remains at power OFF). To release the error, set to “0: Normal state.”
The error message “2: Error” occurs when conducting Auto-zero in the following occasion:
- When Measured value (PV) displays “oooo” (Over-scale) or “uuuu” (Underscale).
- When the result of Auto-zero exceeds the setting range of the PV bias.
- During Self-diagnostic error (Err)

📖 The adjusted result of Auto-zero affects PV bias (Pb) [refer to P. 37]. To adjust zero point manually, change the value of PV bias.

☞ For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Parameter description

Alarm number lamps:
□: Data other than alarms

CH : Data for each channel

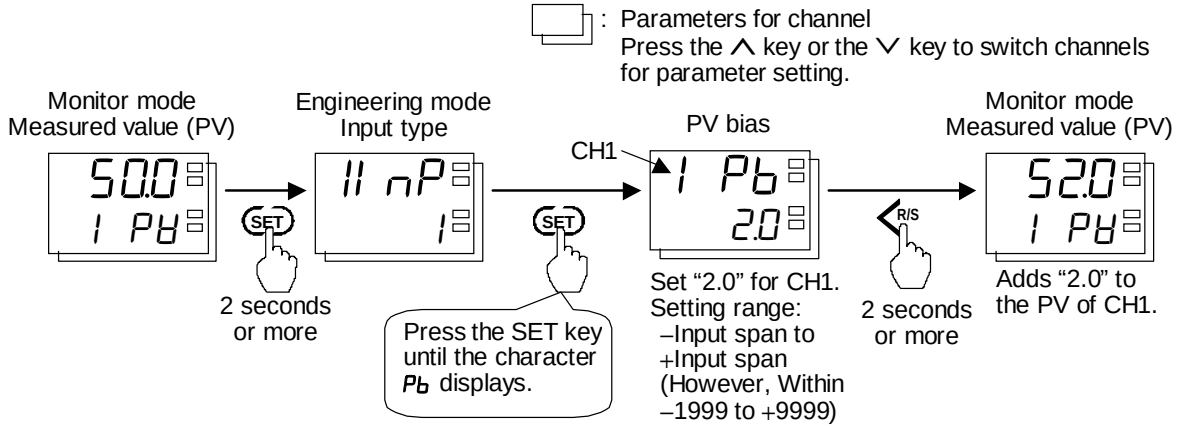
● Initial setting mode

Symbol	Name	Data range	Description	Factory set value
ΞEr □□ (AZEr)	Auto-zero (Zero-point adjustment) **CH**	0: Normal state 1: Auto zero execution When “1” is written, auto zero starts. When done, the value reverts to “0.” 2: Error (monitor) When “0” is written, returns to a normal state.	Adjust the zero point of the Measured value (PV).	0

5.6 Set PV Bias

Adjust Measured value (PV) by setting PV bias (Pb). The PV bias is used to compensate the individual variations of the sensors or correct the difference between the Masured value (PV) of other instruments.

Example: Adjust Measured value (PV) by setting "+2.0" to PV bias of the channel 1 when replacing sensor.



☞ For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Parameter description

Alarm number lamps:
□: Data other than alarms

CH : Data for each channel

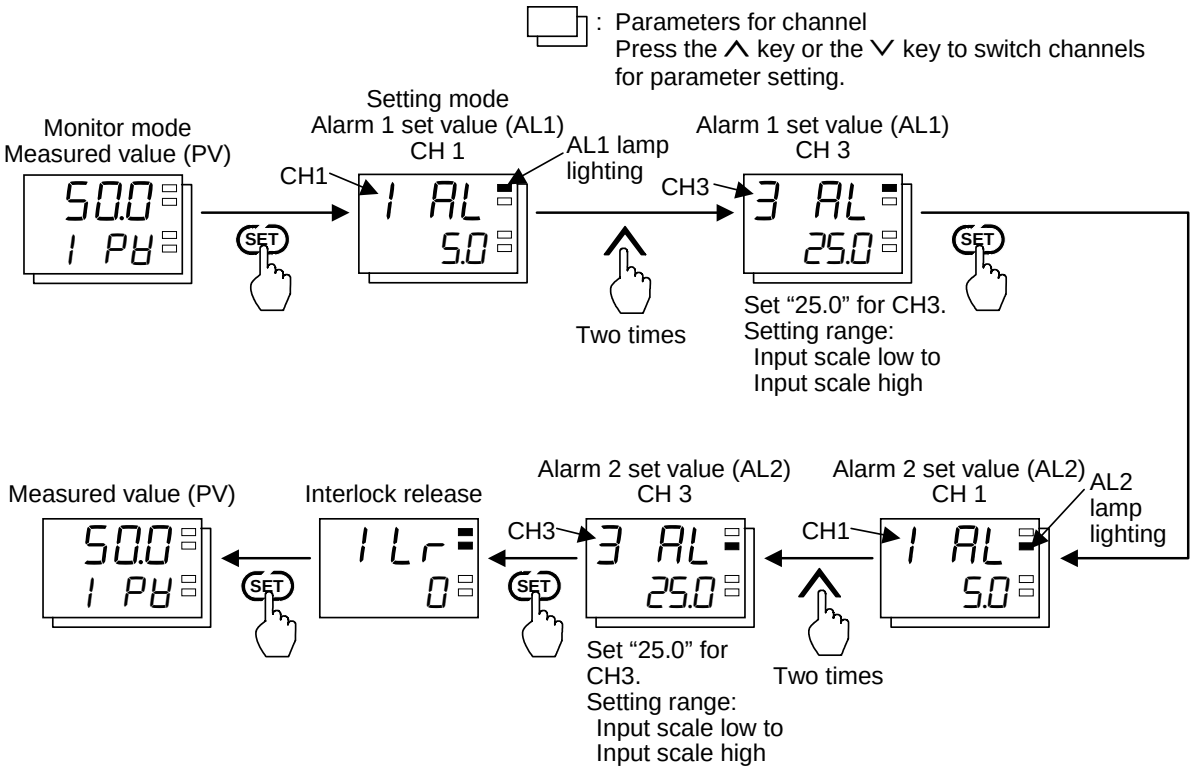
● Engineering mode

Symbol	Name	Data range	Description	Factory set value
Pb □ (Pb)	PV bias **CH**	–Input span to +Input span (However, Within –1999 to +9999)	PV bias adds bias to the Measured value (PV). Manual zero adjustment can be performed.	0.0

5.7 Set Alarm Set Value

Set Alarm set value for operation.

Example: Change the Alarm 1 set value (AL1) and Alarm 2 set value (AL2) of channel 3 to 25.0 kPa.



Invalidates Alarm set value when "0: None" is selected for Alarm type (AS1 and AS2) in the Engineering mode.

For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Parameter description

Alarm number lamps:
- : Alarm 1 (AL1) data
- : Alarm 2 (AL2) data

CH : Data for each channel

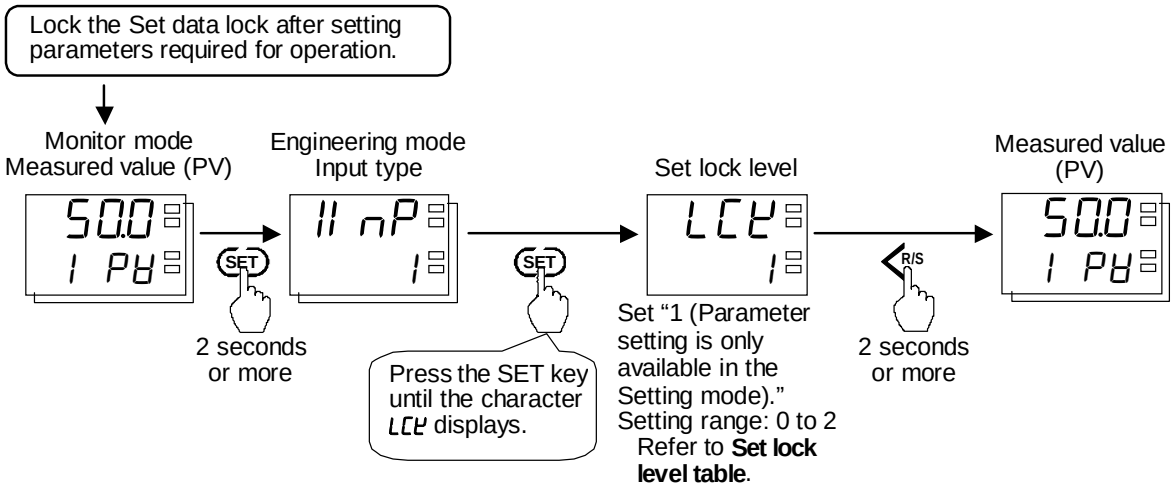
● Setting mode

Symbol	Name	Data range	Description	Factory set value
AL (AL)	Alarm 1 set value (AL1) **CH**	Input scale low to Input scale high	Use to set the set value of the alarm action. Signals are output from the alarm outputs (ALM1 to ALM2) if exceeding the alarm set value. When the alarm type of channel is none, Alarm set value is invalid.	5 % of Input span
AL (AL)	Alarm 2 set value (AL2) **CH**			5 % of Input span

5.8 Lock Setting Data

To avoid accidental change in setting data, lock the data by setting “1” or “2” to Set lock level.

Example: Set “1 (Parameter setting is only available in the Setting mode)” to Set lock level.



☞ For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Parameter description

Alarm number lamps:
□ : Data other than alarms

- **Engineering mode**

Symbol	Name	Data range	Description	Factory set value
LCK (LCK)	Set lock level	0 to 2 Refer to **Set lock level table**.	The set lock level restricts parameter setting changes by key operation (Set data lock function).	1

Set lock level table

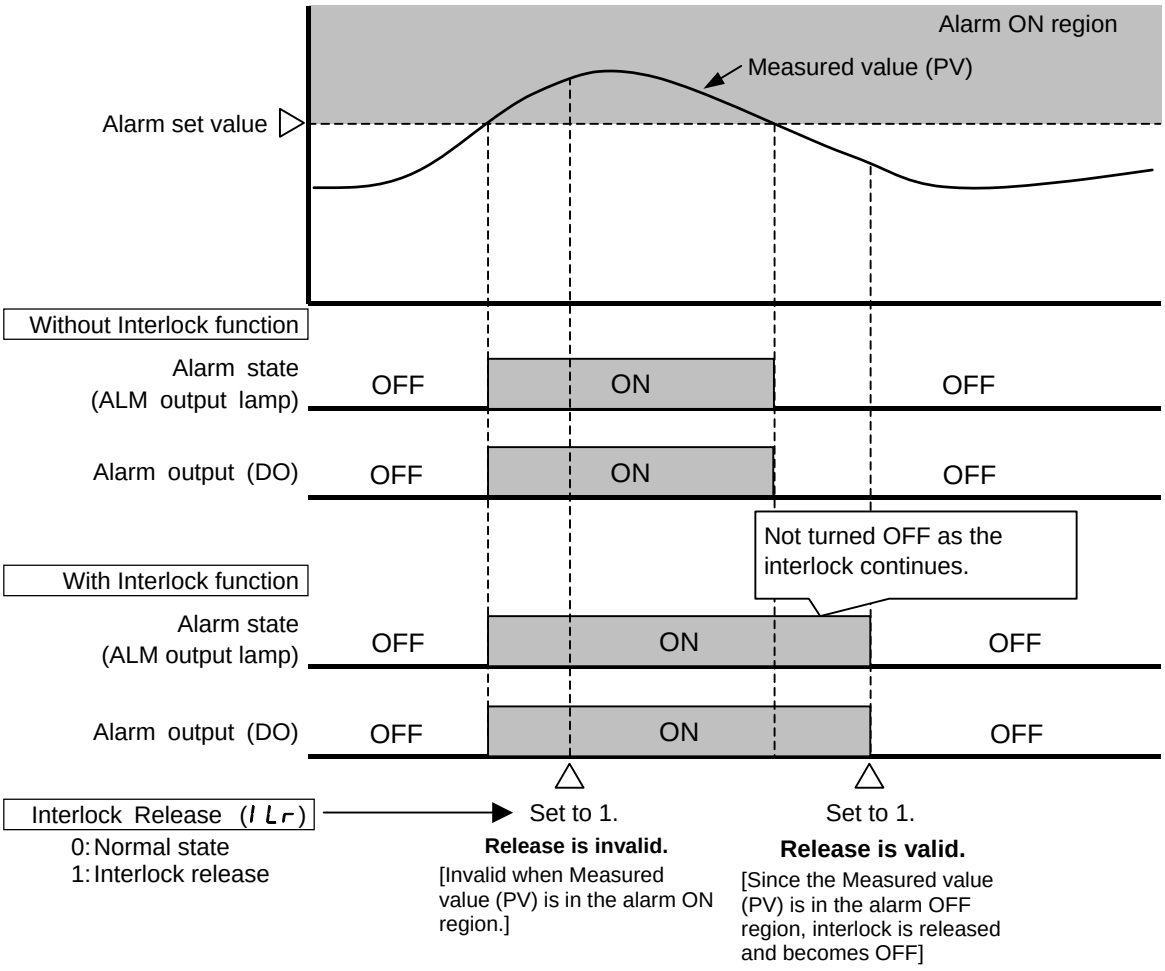
Set value	Parameters of Setting mode	Parameters of Engineering mode	Parameters of Initial setting mode
0	Unlock (Can be changed)		
1	Unlock (Can be changed)	Lock	Lock
2	Lock [Excluding the Interlock release]	Lock	Lock

5.9 Interlock Release

The alarm interlock action holds the alarm state even if the Measured value (PV) is out of the alarm zone after it enters the alarm zone once. (Refer to the Alarm state at "With Interlock function" in the figure below.)
It is possible to release Alarm ON state at Interlock release (*I Lr*) in the Setting mode.

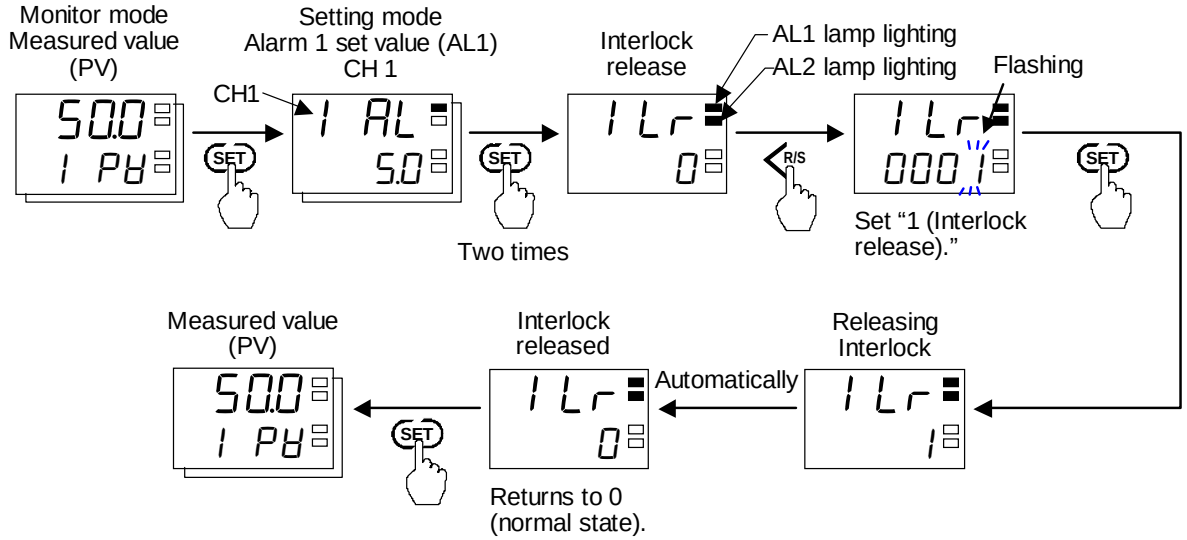
No alarm interlock can be released when in the alarm state. Release the alarm interlock after the cause of the alarm is cleared up.

The following example shows how the interlock is released Alarm type: Process high



To validate the Interlock function, it is necessary to set Alarm interlock (*I LS*) to "1: Used" in Engineering mode (refer to P. 34).

Example: Release Alarm interlock.



No alarm interlock can be released when in the alarm state. Release the alarm interlock after the cause of the event is cleared up.

For the data setting, refer to **4.4 Changing Data (P. 21)**.

■ Parameter description

Alarm number lamps:

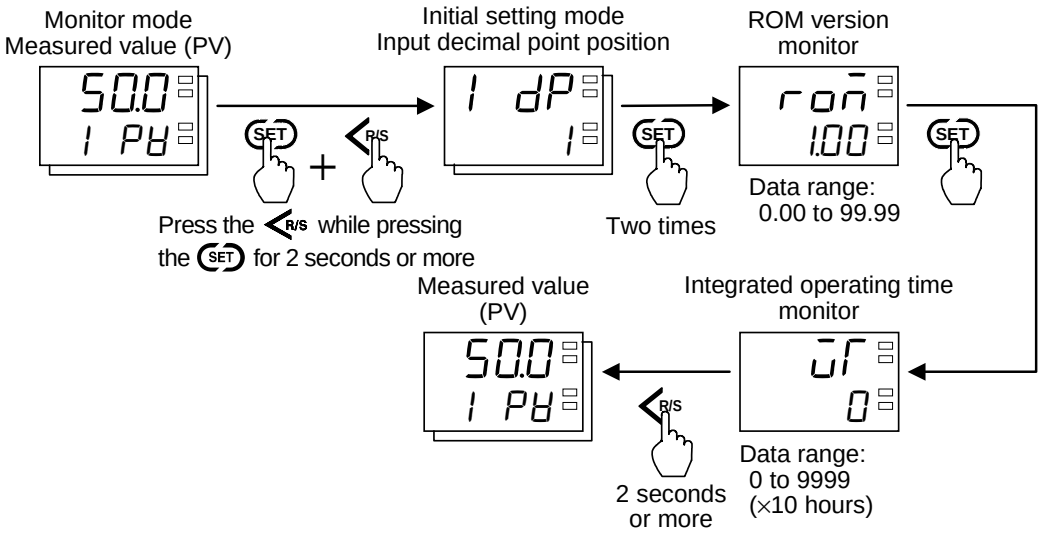
▬ : Data common to Alarm 1 (AL1)/ Alarm 2 (AL2)

● Setting mode

Symbol	Name	Data range	Description	Factory set value
ILr ▬ (ILr)	Interlock release	0: Normal state 1: Interlock release When "1 is written, the interlock is released. When done, the value reverts to "0"	If the alarm state is interlocked, interlock can be released. The interlock states of all alarms are released. No alarm interlock can be released when in the alarm state. Release the alarm interlock after the cause of the alarm is cleared up. When the alarm interlock of channel is unused (OFF), Interlock release is invalid.	0

5.10 Display AF110 Hardware Information

In the Initial setting mode, it is possible to display hardware information in ROM version and Integrated operating time.



■ Parameter description

Alarm number lamps:
□□ : Data other than alarms

● Initial setting mode

Symbol	Name	Data range	Description	Factory set value
roM (roM) □□	ROM version monitor	0.00 to 99.99	Displays the version of the ROM on the instrument.	—
WT (WT) □□	Integrated operating time monitor	0 to 9999 (×10 hours)	Displays the integrated total operating time of the instrument. Values are displayed in units of 10 hours.	—

6. TROUBLESHOOTING

6.1 Error Displays

This Section describes error display when the Measured value (PV) exceeds the Display range and the self-diagnostic error.

■ Display when input error occurs

The table below shows Displays, Description, Alarm outputs and Solutions when the Measured value (PV) exceeds the Display range.

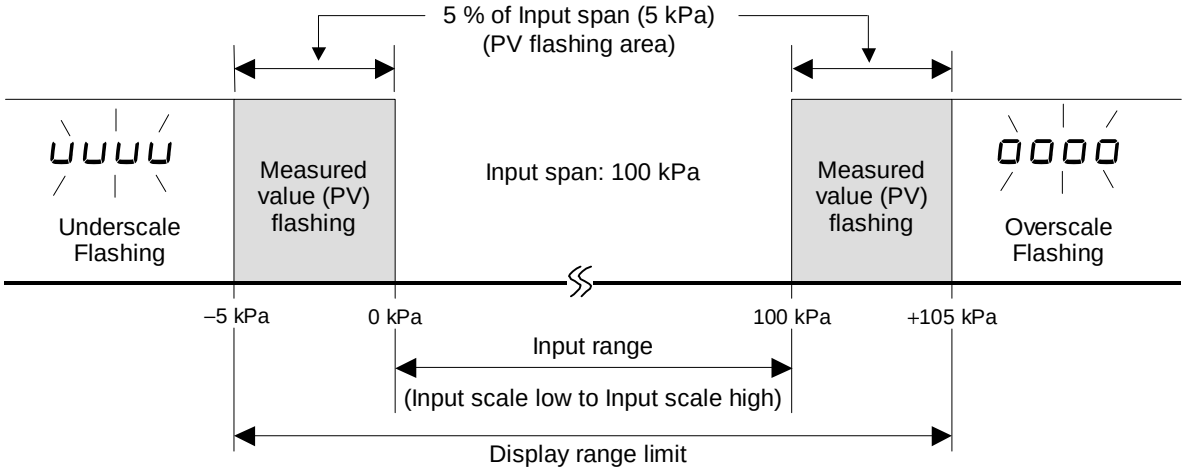
Prior to replacing the sensor, always turn OFF the power.

Display	Description	Alarm output	Solution
Measured value (PV) [Flashing]	PV exceeds the Input scale high/low.	Output depending on the alarm action	Check Input type, Input range and connecting state of sensor. Confirm that the sensor or wire is not broken.
oooo [Flashing]	Over-scale •PV is above the Input scale high + (5 % of Input span). •PV is above the +9999		
uuuu [Flashing]	Underscale •PV is below the Input scale low − (5 % of Input span) •PV is below the −1999		

Example: Set the Input scale high/low as follows.

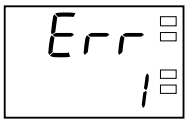
Input scale low: 0 kPa

Input scale high: 100 kPa



■ Self-diagnostic error

In an error is detected by the self-diagnostic function, the PV display shows " Err," and the SV display shows the error code. If two or more errors occur simultaneously, the total summation of these error codes is displayed.

SV display	Description	Action	Solution
1	Adjustment data error • Adjusted data range is abnormal.	• Display: Error display Example of error display  • Alarm output: OFF	Turn off the power at once. If the AF110 is restored to normal after the power is turned on again, then probable cause may be external noise source affecting the control system. Check for the external noise source. If an error occurs after the power is turned on again, the AF110 must be repaired or replaced. Please contact RKC sales office or the agent.
2	Back-up error • Back-up action is abnormal. • Data write failure		
4	A/D conversion error • Response signal from A/D converter is abnormal.		
8	EEPROM error • EEPROM action is abnormal		
All display is OFF	Power supply voltage is abnormal (power supply voltage monitoring)	• Display: All display is OFF • Alarm output: OFF	The AF110 must be repaired or replaced. Please contact RKC sales office or the agent.
	Watchdog timer • The part of an internal program stops the action.		

6.2 Solutions for Problems

This section explains probable causes and solutions if any abnormality occurs in the instrument. For any inquiries or to confirm the specifications of the product, please contact RKC sales office or the agent.

If it is necessary to replace a device, always strictly observe the warnings below.

⚠ WARNING

- To prevent electric shock or instrument failure, always turn off the system power before replacing the instrument.
- To prevent electric shock or instrument failure, always turn off the power before mounting or removing the instrument.
- To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.
- To prevent electric shock or instrument failure, do not touch the inside of the instrument.
- All wiring must be performed by authorized personnel with electrical experience in this type of work.

CAUTION

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action. The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

■ Display

Problem	Probable cause	Solution
No display appears	Power supply connection not correct.	Connect the connector correctly by referring to **3.2 Connector Configuration (P. 8)**.
	Power supply connector contact defect.	Connect the connector correctly.
	Proper power supply voltage is not being supplied.	Apply the normal power supply by referring to **7. SPECIFICATIONS (P. 48)**.
Display is abnormal	Noise source is present near the instrument.	Separate the noise source from the instrument.
		Set the appropriate digital filter according to the responding control systems.
	Input signal wires are not separated from instrument power and/or load wires.	Allow space among the input signal wire, the power line for this instrument and the load line.
Measured value (PV) display differs from the actual value	Proper sensor is not being used.	Use the specified sensor.
	The PV bias is set.	Set the PV bias to “0” by referring to **5. Set PV Bias (P. 37)**. However, this is limited only to when the PV bias setting can be changed.
	Zero point is not adjusted properly.	Refer to **5.5 Conduct Auto-zero (P. 35)** to adjust zero point.

■ Operation

Problem	Probable cause	Solution
No setting change can be made by key operation.	Set data is locked.	Release the set data lock by referring to **5.2 Release Set Data Lock (P. 26)**.
Not available to adjust zero point (Auto-zero).	The sensor is not wired correctly.	Conduct sensor wiring correctly by referring to **3.2 Connector Configuration (P. 8)**.

■ Alarm function

Problem	Probable cause	Solution
Alarm function is abnormal	Alarm function is different from the specification.	Change the Alarm action type by referring to **Alarm type (P. 34)** after the instrument specification is confirmed.
	Alarm output (DO) Energized/De-energized is reversed.	Check the setting details by referring to **Alarm energized/De-energized (P. 34)**.
	Setting of Alarm differential gap is not appropriate.	Set the appropriate Alarm differential gap by referring to **Alarm differential gap (P. 34)**.

7. SPECIFICATIONS

■ Input

Input type: Input type and range

Input type		Input impedance
Voltage input	0 to 5 V DC	Approx. 1 MΩ
	0 to 10 V DC	
	1 to 5 V DC	
Current input	0 to 20 mA DC	Approx. 50 Ω
	4 to 20 mA DC	

Range (Input span): −1999 to +9999 (No decimal place)
[The input decimal point position is selectable to decimal three places]
Scaling by Input scale low and Input scale high is possible.
(Factory set value: 0.0 to 100.0)

Decimal point position: No decimal place, One decimal place, Two decimal places, Three decimal places

Number of input: 4 points

Sampling cycle: 1 second

Action at input beak: Downscale or indicates the value near 0

Measured input correction:
- PV bias: −Input span to +Input span (within −1999 to+9999)
- First order lag digital filter:
  0 to 100 seconds (0: OFF)
- Auto-zero (zero-point adjustment):
  Adjust the zero point of the Measured value (PV).
  Auto-zero is used to automatically set the PV bias (Pb) so that the Measured value (PV) will be 0.

■ Output

Alarm output (DO1 to DO8)

Number of output: 8 points (2 points/Input channel, Fixed)

Output type: Open collector output

Output method: Sink type

Allowable load current: 100 mA

Load voltage: 30 V DC or less

Minimum load current: 0.1 mA

ON voltage: 2 V or less (at maximum load current)

Leakage current at OFF: 0.1 mA or less

Sensor power supply 24 V

Output voltage: 24 V±10% DC

Allowable load current: 200 mA (total of 4 channels)

■ Performance
(at the ambient temperature 23 ± 2 °C and the mounting angle: ± 3 °)

Measured input accuracy

Accuracy: ±(0.2 % of input span+1 digit)

Noise rejection: Normal mode: 60 dB or more (50/60Hz)
Common mode: 120 dB or more (50/60Hz)

Input resolution: 20000 or more

Influence

Influence ambient temperature (0 to 40 °C):
Voltage/Current inputs: ±0.01 %/°C of span

Influence of physical orientation (± 90° all orientations):
Voltage/Current inputs: Less than ±0.2 % of span
Input error is added to the accuracy.

Display updating cycle: 0.1 seconds

■ Alarm function

Number of alarms: Up to 8 points

Alarm type: Process high, Process low

Alarm setting range Input scale low to Input scale high

Additional function: Hold action, Interlock, Energized/De-energized
Delay timer: 0 to 600 seconds
Differential gap: 0 to Input span (9999 or less)

Output method: Assignable to digital output (DO1 to DO8)

Output assignment (Fixed)

Input	CH1	CH2	CH3	CH4
Output	DO1 (ALM1) DO2 (ALM2)	DO3 (ALM1) DO4 (ALM2)	DO5 (ALM1) DO6 (ALM2)	DO7 (ALM1) DO8 (ALM2)

ALM1: Alarm 1 output ALM2: Alarm 2 output

■ Self-diagnostic function

Control stop (Error number is displayed [Operation: Possible]):
Adjustment data error (Err 1)
Data back-up error (Err 2)
A/D conversion error (Err 4)
EEPROM error (Err 8)

Action stop (Error number is not displayed [Operation: Impossible]):
Power supply voltage is abnormal
Watchdog timer

■ General specifications

Power supply voltage: 21.6 to 26.4 V DC [Including power supply voltage variation]
(Rating 24 V DC)

Power consumption: Instrument: Maximum 65 mA (at 24 V DC)
Rush current: 11 A or less
Sensor power supply: Maximum 200 mA (total of 4 channels)

Insulation resistance: Between measuring terminal and grounding:
20 MΩ or more at 500 V DC
Between power supply terminal and grounding:
20 MΩ or more at 500 V DC
When grounding is not provided: Between panels

Withstand voltage:

Time: 1 min	①	②	③
① Grounding terminal			
② Power terminal	1500 V AC		
③ Measured input terminals	1000 V AC		
④ Alarm output terminal (Open collector output)	1000 V AC	750 V AC	750 V AC

Power failure: A power failure of 25 ms or less will not affect the control action.

Memory backup: Backed up by non-volatile memory
Number of writing: 1,000,000 times
Depending on storage and operating conditions.
Data storage period: Approx. 10 years

Allowable ambient temperature:
0 to 40 °C

Allowable ambient humidity:
10 to 90 %RH
(Absolute humidity: MAX.W.C 29.3 g/m^3 dry air at 101.3kPa)

Vibration: Frequency range: 10 to 150 Hz
Maximum displacement: 0.075 mm
Maximum acceleration: 9.8 m/s^2
Each direction of XYZ axes

Shock: Drop this instrument with a lean of 30 ° (free fall).
Each direction of XYZ axes (de-energized state)

Transportation and Storage environment conditions:

Vibration: Random vibration based on 7.3.1 item of JIS Z0232

Random vibration (JIS Z 0232)

Number of vibration Hz	Level		Cant dB/oct
	$(m/s^2)^2/Hz$	$[g^2/Hz]$	
3	0.048	(0.0005)	—
3 to 6	—	—	+13.75
6 to 18	1.15	(0.012)	—
18 to 40	—	—	–9.34
40	1.096	(0.001)	—
40 to 200	—	—	–1.29
200	0.048	(0.0005)	—

The effective value of the acceleration is 5.8 m/s^2 [0.59 g] within the number of vibration (g = 9.806658 m/s^2).

Vibration: Height 600 mm or less

Temperature: −10 to +60 °C (Transportation and Storage)

Humidity: Less than 10 to 90 %RH (Non condensing)

Storage period: 12 months

Mounting and structure:

Mounting method: Panel-mounted

Mounting orientation: ± 90 °

Case color: Black basic tone

Front panel material: PC [Flame retardancy: UL94 V-2]

Panel sheet material: PET [Flame retardancy: UL VTM-2]

Mounting bracket material: POM [Flame retardancy: UL94 HB]

Weight: Approx. 100 g

Dimensions: 48 × 48 × 70 mm (W × H × D)

■ Standard

Safety standards:

UL: UL61010-1

cUL: CAN/CSA-C22.2 No.61010-1

CE marking:

LVD: EN61010-1
OVERVOLTAGE CATEGORYII,
POLLUTION DEGREE 2

EMC: EN61326-1

RCM: EN55011

Panel sealing: IP66 (IEC60529)
[Front panel (if specified in the model code)]

APPENDIX

A. The parameters which will be initialized or changed, if the parameters are changed

Before changing any parameter setting, always record all parameter settings in setting mode, Engineering mode and Initial setting mode. And after the change, always check all parameter settings in setting mode, Engineering mode and Initial setting mode by comparing them with the record taken before the change.

■ The parameters which will be initialized if the Alarm type is changed

● When Alarm 1 type/Alarm 2 type (AS) are changed

The following parameter will be changed to factory default values according to the new setting.

Name	Symbol	Factory set value
Alarm 1 set value Alarm 2 set value	AL	5 % of Input span
Alarm 1 hold action Alarm 2 hold action	AHo	0 (OFF)
Alarm 1 differential gap Alarm 2 differential gap	AH	0.2 % of Input span
Alarm 1 delay timer Alarm 2 delay timer	ALT	0 second
Alarm 1 interlock Alarm 2 interlock	ILS	0 (Unused, OFF)
Alarm 1 energized/de-energized Alarm 2 energized/de-energized	EXC	0 (Energized)

■ The parameters which will be initialized if the Input scale high/low are changed

● When Input scale high (SLH)/ Input scale low (SLL) are changed

The following parameter will be changed to factory default values according to the new setting.

Name	Symbol	Factory set value
PV bias	Pb	0.0
Alarm 1 set value Alarm 2 set value	AL	5 % of Input span
Alarm 1 differential gap Alarm 2 differential gap	AH	0.2 % of Input span

■ The parameters which will be automatically converted if the Input decimal point position are changed

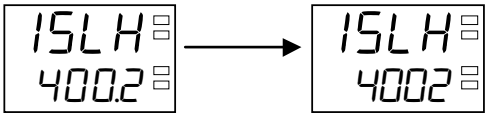
The following parameters will automatically converted when changing Input decimal point position (dP).

Name	Symbol
Measured value (PV)	PV
Input scale high	SLH
Input scale low	SLL
PV bias	Pb
Alarm 1 set value Alarm 2 set value	AL
Alarm 1 differential gap Alarm 2 differential gap	AH

Example: Change Input decimal point position (dP) from 1 (one decimal place) to 0 (no decimal place) when Input scale high (SLH) is 400.2.

The decimal point position of Input scale high (SLH) conforms to the set value of Input decimal point position (dP).

Input scale high

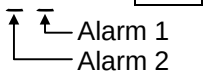


B. Parameter List

Alarm number lamps:
- : Data common to Alarm 1 (AL1)/ Alarm 2 (AL2)
- : Alarm 1 (AL1) data
- : Alarm 2 (AL2) data
- : Data other than alarms

CH : Data for each channel

■ Monitor mode

Symbol	Name	Data range	Page
50.0 PV (PV)	Measured value (PV) CH	Input scale low to Input scale high	15
ALM (ALM)	Alarm state monitor CH 	: Alarm OFF : Alarm ON	15

■ Setting mode

Symbol	Name	Data range	Factory set value	Page
AL (AL)	Alarm 1 set value (AL1) CH	Input scale low to Input scale high	5 % of Input span	38
AL (AL)	Alarm 2 set value (AL2) CH		5 % of Input span	38
ILr (ILr)	Interlock release	0: Normal state 1: Interlock release When “1 is written, the interlock is released. When done, the value reverts to “0”	0	41

■ Engineering mode

Symbol	Name	Data range	Factory set value	Page
InP (InP)	Input type CH	Current input 0: 0 to 20 mA DC 1: 4 to 20 mA DC Voltage input 2: 0 to 5 V DC 3: 0 to 10 V DC 4: 1 to 5 V DC	Depends on model code.	28
SLH (SLH)	Input scale high CH	–1999 to +9999 (Varies with the setting of the input decimal point position.) SLH ≠ SLL	100.0	28
SLL (SLL)	Input scale low CH	–1999 to +9999 (Varies with the setting of the input decimal point position.) SLH ≠ SLL	0.0	28
AS (AS)	Alarm 1 type CH	0: None 1: Process high 2: Process low	1	34
AHo (AHo)	Alarm 1 hold action CH	0: OFF 1: Hold action ON	0	34
AH (AH)	Alarm 1 differential gap CH	0 to Input span (However, 9999 or less)	0.2 % of Input span	34
ALT (ALT)	Alarm 1 delay timer CH	0 to 600 seconds	0	34
ILS (ILS)	Alarm 1 interlock CH	0: Unused (OFF) 1: Used	0	34
EXC (EXC)	Alarm 1 energized/ de-energized CH	0: Energized 1: De-energized	0	34
AS (AS)	Alarm 2 type CH	0: None 1: Process high 2: Process low	2	34
AHo (AHo)	Alarm 2 hold action CH	0: OFF 1: Hold action ON	0	34
AH (AH)	Alarm 2 differential gap CH	0 to Input span (However, 9999 or less)	0.2 % of Input span	34
ALT (ALT)	Alarm 2 delay timer CH	0 to 600 seconds	0	34

Symbol	Name	Data range	Factory set value	Page
ILS (ILS)	Alarm 2 interlock CH	0: Unused (OFF) 1: Used	0	34
EXC (EXC)	Alarm 2 energized/ de-energized CH	0: Energized 1: De-energized	0	34
Pb (Pb)	PV bias CH	–Input span to +Input span (However, Within –1999 to +9999)	0.0	37
dF (dF)	PV digital filter CH	0 to 100 seconds (0: Unused)	0	28
SCn (SCn)	Scan interval time	0 to 10 seconds (0: Unused)	2	20
LCK (LCK)	Set lock level	0 to 2 Refer to **Set lock level table**.	1	26, 39

Set lock level table

Set value	Parameters of Setting mode	Parameters of Engineering mode	Parameters of Initial setting mode
0	Unlock (Can be changed)		
1	Unlock (Can be changed)	Lock	Lock
2	Lock [Excluding the Interlock release]	Lock	Lock

■ Initial setting mode

Symbol	Name	Data range	Factory set value	Page
dP (dP)	Input decimal point position CH	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places	1	29
AZEr (AZEr)	Auto-zero (Zero-point adjustment) CH	0: Normal state 1: Auto zero execution When “1” is written, auto zero starts. When done, the value reverts to “0.” 2: Error (monitor) When “0” is written, returns to a normal state.	0	36
roM (roM)	ROM version monitor	0.00 to 99.99	—	42
WT (WT)	Integrated operating time monitor	0 to 9999 (×10 hours)	—	42

The first edition: NOV. 2009 [IMQ01]
The second edition: NOV. 2015 [IMQ00]

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IMR02K02-E2 **NOV. 2015**