Resin Pressure Digital Controller

HA430/HA930

Operation Manual

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of the 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 explanation purpose.

- 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

- To prevent injury to persons, damage to the instrument and the equipment, a suitable external protection device shall be required.

- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to the instrument and the equipment.

- This instrument must be used in accordance with the specifications to prevent fire or damage to the instrument and the 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 may 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 plant.)

- 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 to operating personnel.

- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.

- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

- 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 as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.

- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.

- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.

- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.

- For proper operation of this instrument, provide adequate ventilation for heat dissipation.

- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.

- 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 may occur. Use a soft, dry cloth to remove stains from the instrument.

- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

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.

DOCUMENT CONFIGURATION

There are seven 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 the official RKC website.

Manual	Manual Number	Remarks
HA430/HA930 Instruction Manual [1]	IMR01N11-E□	This manual is enclosed with instrument. This manual explains the mounting and wiring, front panel name, and the operation mode outline.
HA430/HA930 Operation Manual [1]	**IMR01N12-E7**	This Manual. This manual explains the method of the mounting and wiring, the operation of various functions, and troubleshooting.
HA430/HA930 Communication Instruction Manual [1, 2] [RKC communication/MODBUS]	IMR01N13-E□	This manual explains RKC communication protocol, Modbus, and relating to the communication parameters setting.
HA430/HA930 Communication Instruction Manual [1, 2] [PROFIBUS]	IMR01N14-E□	This manual explains PROFIBUS communication connection and configuration.
HA430/HA930 Communication Instruction Manual [1, 2] [DeviceNet]	IMR01N15-E□	This manual explains DeviceNet communication connection and node address setting.
HA430/HA930 Communication Instruction Manual [1, 2] [CC-Link]	IMR01N21-E□	This manual explains CC-Link communication connection and relating to the communication parameters setting.
HA430/HA930 Quick Operation Manual [1, 2]	IMR01N16-E□	Describes procedures from initial settings (zero/full scale adjustment, PI constant setting, etc.) necessary for performing pressure control to operation.
Infrared Communication Software **RKCIR** for HA Series Controller PDA INSTALL GUIDE	IMT01C01-E□	This manual describes downloading of the "RKCIR infrared communication software" and installation of this software to the PDA.

[1] The above manuals can be downloaded from the official RKC website:
   http://www.rkcinst.com/english/manual_load.htm.

[2] Optional function

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

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	D (d)	E	F	G	H	I	J	K	L
A	b	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	V
m	n	o	P	q	r	S	T	t	U	u	V

W	X	Y	Z	Degree	
u	Y	y	Z	o	_

● **Character LED lighting state:**

⯊ : Dim lighting

⯊ : Bright lighting

⯊ : Flashing

● **Pressure units (conversion)**
1 MPa = 10 bar = 10.1972 kgf/cm^2 = 145.038 psi

CONTENTS

MEMO

1. OUTLINE

This chapter describes features, package contents and model code, etc. The HA430/930 Series controllers are ideal to control resin pressure with its standard strain gauge input and 24 V DC transmitter power supply.

The resin pressure digital controller of this high performance type has the following features:

■ **High-speed sampling time (25 ms)**

Suitable for fast responding control systems.

■ **Pressure and Temperature control with a single instrument**

The HA430/930 provide dual loop control with a single instrument. The first loop is assigned to a strain gauge input and the second loop to a temperature input (TC, RTD, Voltage, or Current).

■ **Easy zero and full scale adjustments**

Zero and full scale adjustments of the pressure measured value are available from the front panel.

■ **Direct function keys**

Three Direct function keys on the front panel are provided for one-key operation to switch Auto/Manual, Remote/Local, and RUN/STOP.

■ **Up to 16 memory areas or Ramp/Soak control**

HA430/930 can store up to 16 sets of control parameters. Ramp/Soak control is available by using the memory area function.

■ **Waterproof/Dustproof (standard)**

The front panel has a waterproof, dustproof construction equivalent to IP65.

■ **Communication port (optional)**

Communication function can be selected from serial communication (RS-232C, RS-422A, RS-485) and Open Network (PROFIBUS, DeviceNet, CC-Link).

■ **Sensor power supply (optional)**

Sensor power supply is used to supply power to pressure sensor with amplifier or 2-wire pressure transmitter (however, the number of output points is limited).

1.1 Checking the Product

Before using this product, check each of the following:
● Model code
● Check that there are no scratch 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 brackets	Each 2	HA930: each 4	
☐ Instruction Manual (IMR01N11-E☐)	1	Enclosed with instrument	
☐ Operation Manual (IMR01N12-E7)	1	This Manual (sold separately)	This manual can be downloaded from the official RKC website: http://www.rkcinst.com/english /manual_load.htm.
☐ Quick Operation Manual (IMR01N16-E☐)	1	_____	
☐ Communication Instruction Manual (IMR01N13-E☐) [RKC communication/Modbus]	1	Optional (sold separately)	
☐ Communication Instruction Manual (IMR01N14-E☐) [PROFIBUS]	1	Optional With PROFIBUS	
☐ Communication Instruction Manual (IMR01N15-E☐) [DeviceNet]	1	Optional With DeviceNet	
☐ Communication Instruction Manual (IMR01N21-E☐) [CC-Link]	1	Optional With CC-Link	
☐ PDA Install Guide (IMT01C01-E☐)	1	Infrared communication software "RKCIR"	

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

1.2 Model Code

Check whether the delivered product is as 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.

HA430
HA930   **Y**

(1) (2)   (3) (4)   (5)   (6) (7)   (8) (9)   (10) (11)

(1) Input 1 type

H : Resin pressure sensor CZ-100P, CZ-200P (RKC product)

X : Resin pressure sensor (Strain gauge type) [1] other than RKC product

3 : Voltage (low) input group (0 to 10 mV, 0 to 100 mV, 0 to 1 V, ±10 mV, ±100 mV) [Factory set value: 0 to 1 V] [2]

6 : Voltage (high) input group (0 to 5 V, 1 to 5 V, 0 to 10 V, ±1 V, ±5 V, ±10 V)   [Factory set value: 1 to 5 V] [2]

8 : Current input group   (0 to 20 mA, 4 to 20 mA)   [Factory set value: 4 to 20 mA] [2]

[1] Rated output: 0.500 to 4.000 mV/V   Maximum supply voltage: More than 8 V DC

[2] To change the input type, refer to **8. ENGINEERING MODE. (P. 50)**

(2) Input 2 type

0: None

K : K thermocouple   J : J thermocouple   T : T thermocouple   S : S thermocouple   R : R thermocouple

A : PLII thermocouple N : N thermocouple   E : E thermocouple   B : B thermocouple   W : W5Re/W26Re

D : RTD (3-wire)   [Factory set value: Pt100]

3 : Voltage (low) input group (0 to 10 mV, 0 to 100 mV, 0 to 1 V, ±10 mV, ±100 mV) [Factory set value: 0 to 1 V] *

6 : Voltage (high) input group (0 to 5 V, 1 to 5 V, 0 to 10 V, ±1 V, ±5 V, ±10 V)   [Factory set value: 1 to 5 V] *

8 : Current input group   (0 to 20 mA, 4 to 20 mA)   [Factory set value: 4 to 20 mA] *

 Non-isolated type (for remote input)

 G : Voltage (low) input group (0 to 10 mV, 0 to 100 mV, 0 to 1 V, ±10 mV, ±100 mV) [Factory set value: 0 to 1 V] *

 V : Voltage (high) input group (0 to 5 V, 1 to 5 V, 0 to 10 V, ±1 V, ±5 V, ±10 V)   [Factory set value: 1 to 5 V] *

 Y : Current input group   (0 to 20 mA, 4 to 20 mA)   [Factory set value: 4 to 20 mA] *

 * To change the input type, refer to **8. ENGINEERING MODE. (P. 50)**

(3) Output 1 (OUT1)

N : None   T : Triac output   6 : Voltage output (1 to 5 V DC)

M : Relay contact output   4 : Voltage output (0 to 5 V DC) 7 : Current output (0 to 20 mA DC)

V : Voltage pulse output   5 : Voltage output (0 to 10 V DC) 8 : Current output (4 to 20 mA DC)

(4) Output 2 (OUT2)

N : None	T : Triac output	6 : Voltage output (1 to 5 V DC)
M : Relay contact output	4 : Voltage output (0 to 5 V DC)	7 : Current output (0 to 20 mA DC)
V : Voltage pulse output	5 : Voltage output (0 to 10 V DC)	8 : Current output (4 to 20 mA DC)

(5) Power supply voltage

3 : 24 V AC/DC	4 : 100 to 240 V AC

(6) Output 3 (OUT3)

N : None	T : Triac output	6 : Voltage output (1 to 5 V DC)
M : Relay contact output	4 : Voltage output (0 to 5 V DC)	7 : Current output (0 to 20 mA DC)
V : Voltage pulse output	5 : Voltage output (0 to 10 V DC)	8 : Current output (4 to 20 mA DC)
P : Sensor power supply *		

* If Sensor power supply is specified, OUT4 and OUT5 code becomes "N."

(7) Output 4 (OUT4)/Output 5 (OUT5) *

N : None
1 : OUT4 (Relay contact output)   OUT5 (No output)
2 : OUT4 (Relay contact output)   OUT5 (Relay contact output)

* If Sensor power supply is specified, OUT4 and OUT5 code becomes "N."

(8) Event input (optional)

N : None
1 : Event input [Dry contact input (5 points): for Memory area selection, Operation mode transfer, etc.]

(9) Communication (optional)

N : None	6 : RS-485 (Modbus)	A : DeviceNet
1 : RS-232C (RKC communication)	7 : RS-422A (Modbus)	B : PROFIBUS
4 : RS-422A (RKC communication)	8 : RS-232C (Modbus)	C: CC-Link
5 : RS-485 (RKC communication)		

(10) Case color

N : White	A : Black

(11) Instrument version

Y : Version symbol (Infrared communication function included)

1.3 Input/Output Functions

This section describes the input/output functions of the instrument. To learn how to set each function, refer to the respective page.

■ INPUT   In addition to measured input, 2 optional input functions are available.

Measured input:
- Input 1 can be used for pressure sensor input or voltage/current input. (Specify when ordering)
- Input 2 can be used for temperature input or voltage/current input. (Specify when ordering)

Input 1	Pressure sensor input	Resin pressure sensor (0.0 to 250.0 MPa)
Input 2	Thermocouple *	K J T S R E B PLII N W5Re/W26Re
	RTD *	Pt100 JPt100 [Factory set value: Pt100]
Input 1 Input 2	Voltage (low) *	0 to 100 mV DC, 0 to 10 mV DC, 0 to 1 V DC, ±10 mV DC, ±100 mV DC [Factory set value: 0 to 1 V DC]
	Voltage (High) *	0 to 5 V DC, 1 to 5 V DC, DC 0 to 10 V DC, ±1 V DC, ±5 V DC, ±10 V DC [Factory set value: 1 to 5 V DC]
	Current *	0 to 20 mA DC, 4 to 20 mA DC [Factory set value: 4 to 20 mA DC]

＊To change the input type, refer to **8. ENGINEERING MODE. (P. 50)**

- The second measured input can be used as non-isolated remote input.

Event input:
- Optional Event input hardware is necessary. (Specify when ordering)
- Event input can be used for the following functions. (Refer to P. 73.)

Memory area selection (Number of areas: 1 to 16 or 1 to 8),
Operation mode transfer (RUN/STOP, Remote/Local, Auto/Manual.),
Hold reset, Interlock release,
Manual output up/down (Motor RPM up/down), Manual output 0 % reset (Motor RPM reset)

Remote input (non-isolated type):
- Remote input is to change a control setpoint by using current or voltage input from an external device.
- Remote input is available with Input 2. (Specify when ordering)
- Any one of the following input types can be selected. (Refer to P. 66.)

Voltage (low)	0 to 100 mV DC, 0 to 10 mV DC, 0 to 1 V DC, ±10 mV DC, ±100 mV DC
Voltage (High)	0 to 5 V DC, 1 to 5 V DC, DC 0 to 10 V DC, ±1 V DC, ±5 V DC, ±10 V DC
Current	0 to 20 mA DC, 4 to 20 mA DC

■ **OUTPUT** Up to five outputs are available. They may be used as Control output, Event output or Transmission output by specifying the output type or by activating the output logic function (output logic selection).

Output1 to 3 (OUT1 to OUT3):

- Control output, Event output, or Transmission output can be allocated to output 1 to 3. (Refer to P. 76 to 84.)
- Number of outputs and output types must be specified when ordering.
- Output types available for OUT1 to OUT3 are shown in the table below.

Relay contact output	250 V AC, 3A (Resistive load), 1a contact
Voltage pulse output	0/12 V DC (Load resistance: 600 Ω or more)
Triac output	0.4 A (Allowable load current)
Voltage output	0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC (Load resistance: 1 kΩ or more)
Current output	0 to 20 mA DC, 4 to 20 mA DC (Load resistance: 600 Ω or less)

- OUT3 is isolated from both OUT1 and OUT2.
- OUT1 and OUT2 are not isolated from each other except for relay or triac output.
  When relay or triac output is used, there is isolation between outputs.
- There is isolation between input and output.
- There is isolation between output and power supply terminals.
- OUT3 can be selected for Sensor power supply. (Specify when ordering)

Output 4 to 5 (OUT4 to OUT5):

- The output type for OUT4 and OUT5 is relay only. OUT4 and OUT5 can be used for Allowable load vent output. (Refer to P. 76 to 84.)

  Relay contact output   250 V AC, 1A (Resistive load), 1a contact

- If the sensor power supply is selected for OUT3, OUT4 and OUT5 cannot be used.

Event output function (EV1 to EV4)

- The following event types can be selected for EV1 to EV4.

Deviation high	Band	SV high	———
Deviation low	Process high	SV low	———
Deviation high/low	Process low	LBA (Only EV3 and EV4 can be selected)	

- The maximum number of Event output is four.
- Output allocation is necessary to output the event state from output terminals.
  (Refer to P. 76.)

Transmission output 1 to 3 (AO1 to AO3):

- Maximum three transmission output can be allocated to OUT1, OUT2, and OUT3. Maximum number of output available for transmission output varies by other output use for control output and event output. Parameter values shown in the following table can be output by transmission output. (Refer to P. 79.)

Input 1 side	Measured value (PV), Set value (SV), Manipulated output value (MV), Deviation (PV−SV)
Input 2 side	Measured value (PV), Set value (SV), Manipulated output value (MV), Deviation (PV−SV)

Output logic function:

Output logic function allocates output functions to output terminals. Logic output such as *OR/AND* is available for event output. The following signals are allocated by output logic function. Transmission output needs to be allocated separately. (Refer to P. 73 to 76.)

Input	Analog signal: Control output value (max. 2 points)
	Digital signal: Event action state (4 points), Contact input state (max. 5 points), Control area number (4 points) Operation state (3 points): LOC/MAN/REM
Output	Computed output from OUT1 to OUT5. ALM LED (1 point)

■ **COMMUNICATION**

Communication (optional):

Communication port is available to communicate with a computer or programmable controller. The protocols available for a port is shown in the table below.

Interface *	RS-485, RS-232C, or RS-422A
Protocol *	RKC communication, Modbus
Open Network *	PROFIBUS, DeviceNet, or CC-Link

* Specify when ordering.

Infrared communication:

Infrared communication can be used when sending and receiving data between this controller and the PDA installed with the RKCIR software.

1.4 Parts Description

This section describes various display units and the key functions.

HA430

- Upper display
- Area display
- Infrared port
- Lower display
- Output/Alarm lamp
- Bar gragh display
- Direct keys
- Operation keys

PV1 PV2 MAN REM AT
AREA PV2 SV MAN AT
OUT1 OUT2 OUT3 OUT4 OUT5 ALM
(A/M) (R/L) (R/S)
SET MODE

HA930

- Upper display
- Area display
- Infrared port
- Lower display
- Output/Alarm lamp
- Bar gragh display
- Direct keys
- Operation keys

PV1 PV2 MAN REM AT
AREA PV2 SV MAN AT
OUT1 OUT2 OUT3 OUT4 OUT5 ALM
(A/M) (R/L) (R/S)
SET MODE

● **Upper display**

Measured value 1 (PV1) lamp	[Green]	Lights when measured value 1 is displayed on the PV1/PV2 display unit.
Measured value 2 (PV2) lamp *	[Green]	Lights when measured value 2 is displayed on the PV1/PV2 display unit.
Manual (MAN) mode lamp	[Green]	Lights when operated in manual mode.
Remote (REM) mode lamp	[Green]	Lights when remote setting function is activated.
Autotuning (AT) lamp	[Green]	Flashes when autotuning is activated. (After autotuning is completed: AT lamp will go out)
Measured value (PV1/PV2) display		Displays PV1, PV2 or various parameters' symbols.

* This lamp is activated only with 2-input controller.

● **Lower display**

Measured value 2 (PV2) lamp *	[Green]	Lights when measured value 2 is displayed on the SV display unit.
Set value (SV) lamp	[Green]	Lights when Set value (SV) is displayed on the SV display unit.
Manual (MAN) mode lamp *	[Green]	Lights when operated in manual mode.
Autotuning (AT) lamp *	[Green]	Flashes when autotuning is activated. (After autotuning is completed: AT lamp will go out)
Set value (SV) display		Displays SV, PV2 or various parameters' set values.

* This lamp is activated only with 2-input controller.

● **Area display**

Area (AREA) lamp	[Green]	Lights when memory area number is displayed.
Memory area display		Displays memory area number (1 to 16).
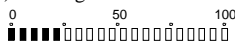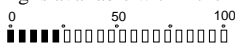
● **Output/Alarm lamp**

Output (OUT1 to OUT5) lamp	[Green]	Lights when the output corresponding to each lamp is ON.
Alarm (ALM) lamp	[Red]	Lights when alarm (Event function) is turned on. The type of alarm which is on can be checked on the event monitor display.

📖 These lamps works with outputs (control, alarm, retransmission) which are assigned to OUT1 through OUT5. For assignment of outputs to OUT1 through OUT5, refer to Output Logic Selection. (P. 76)

● **Bar graph display [Green] ***

One of the displays shown in the table below can be selected for the bar graph.

Manipulated output value (MV) display	Displays the Manipulated output value (MV). When Manipulated output value (MV) is at 0 % or less, the left-end dot of the bar-graph flashes. When MV exceeds 100 %, the right-end dot flashes. [Example] 0 50 100
Measured value display	Displays the Measured value (PV). Scaling is available within the input range. [Example] 0 50 100
Set value display	Displays the Set value (SV). Scaling is available within the input range. [Example] 0 50 100
Deviation display	Displays the deviation between the Measured value (PV) and the Set value (SV). When the Deviation display is selected, the dots at both ends of bar-graph light. [Example] − 0 +

* The number of dots: 10 dots (HA430)   20 dots (HA930)

📖 Bar graph display can be selected in the Engineering mode. Refer to selecting the bar graph display (P. 63).

● **Direct keys**

(A/M)	Auto/Manual transfer key	Switching the Auto/Manual control mode between Auto (PID control) mode and Manual mode.
(R/L)	Remote/Local transfer key	Switching the Remote/Local control mode between Remote control and Local control.
(R/S)	RUN/STOP transfer key	Switching the RUN/STOP mode between RUN and STOP.

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

📖 For the Auto/Manual transfer key, it is possible to select among Auto/Manual transfer for (1) Input 1, (2) Input 2, or (3) both Input 1 and Input 2. (Refer to P. 65)

📖 Use/Unuse of Direct key functions are programmable. (Refer to P. 65)

● **Operation keys**

SET	Set (SET) key	Used for calling up parameters and set value registration.
◀MODE	Shift key	Shifts digits when settings are changed. Used to selection operation between modes.
▼	Down key	Decreases numerals.
▲	Up key	Increases numerals.

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

● **Infrared port**

Used when sending and receiving data between this controller and the PDA installed with the RKCIR software.

2. MOUNTING

This chapter describes installation environment, mounting cautions, dimensions and mounting procedures.

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

2. 1 Mounting Cautions

(1) This instrument is intended to be used under the following environmental conditions. **(IEC 61010-1)**
   [OVERVOLTAGE CATEGORY II, POLLUTION DEGREE 2]

(2) Use this instrument within the following environment conditions:
   - Allowable ambient temperature: −10 to +50 °C
   - Allowable ambient humidity: 5 to 95 %RH
       (Absolute humidity: MAX. W. C 29 g/m^3 dry air at 101.3 kPa)
   - Installation environment conditions: Indoor use
       Altitude up to 2000 m

(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 the equipment that generates large amount of heat (heaters, transformers, semi-conductor functional devices, large-wattage resistors).
   - If the ambient temperature rises above 50 °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.
   - Mount this instrument in the horizontal direction for panel. If you did installation except a horizontal direction, this causes malfunction.

(5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

2.2 Dimensions

■ HA430

(Unit: mm)

Individual mounting

25 45 $^{+0.6}_{0}$

92 $^{+0.8}_{0}$

30

Close mounting[*2, *3]

L $^{+0.6}_{0}$

92 $^{+0.8}_{0}$
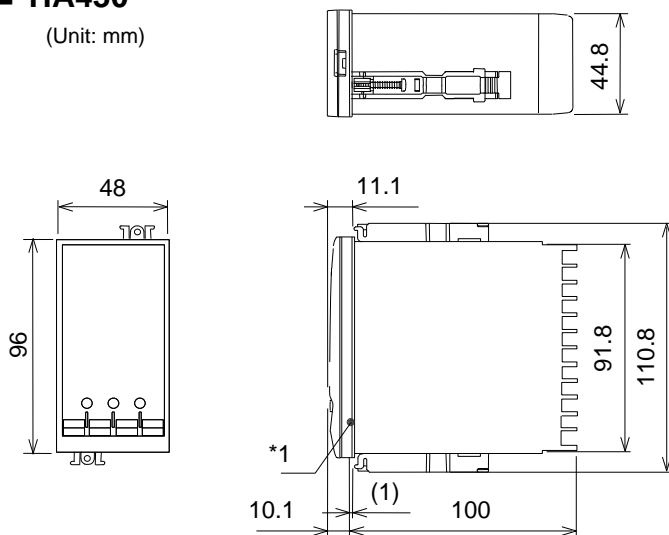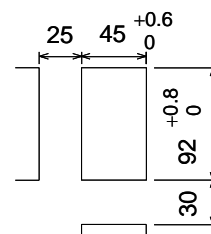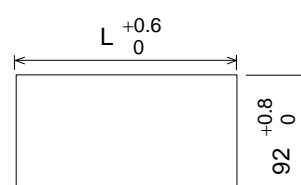
L = 48× n   3   n: Number of units (2 to 6)

■ HA930

(Unit: mm)

Individual mounting

25   92 $^{+0.8}_{0}$

92 $^{+0.8}_{0}$

30

Close mounting[*2, *3]

L $^{+0.8}_{0}$

92 $^{+0.8}_{0}$
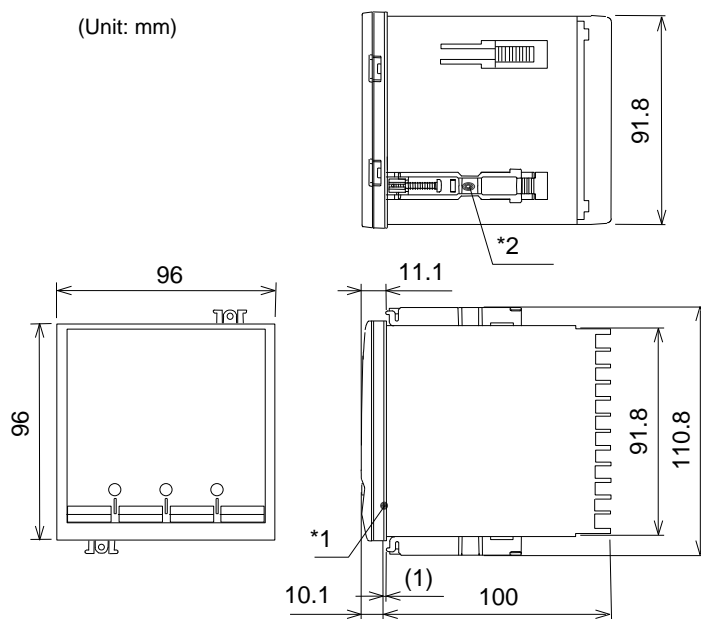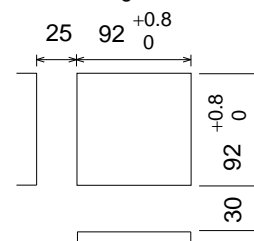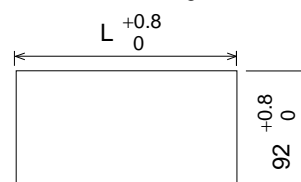
L = 96× n   4   n: Number of units (2 to 6)

*1 Rubber gasket
*2 If the HA430s or HA930s have waterproof/dustproof, protection will be compromised and not meet IP65 by close mounting.
*3 When controllers are closely mounted, ambient temperature must not exceed 50 °C (122°F).
For mounting of the HA430 or HA930, panel thickness must be between 1 to 10 mm. When mounting multiple HA430s or HA930s close together, the panel strength should be checked to ensure proper support.

2.3 Procedures of Mounting and Removing

■ Mounting procedures

1. Prepare the panel cutout as specified in **2.2 Dimensions**.
(Panel thickness: 1 to 10 mm)

2. Insert the instrument through the panel cutout.

3. Insert the mounting bracket into the mounting groove of the instrument.
Do not push the mounting bracket forward. (Fig. 1)

4. Secure the bracket to the instrument by tightening the screw.
Take care to refrain from moving the bracket forward.

5. Only turn about one full revolution after the screw touches the panel. (Fig. 2)

   If the screw has been rotated too tight, the screw may turn idle.
   In such a case, loosen the screw once and tighten it again until
   the instrument is firmly fixed.

6. The other mounting bracket should be installed in the same way as
described in *3.* to *5.*
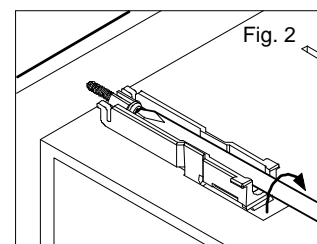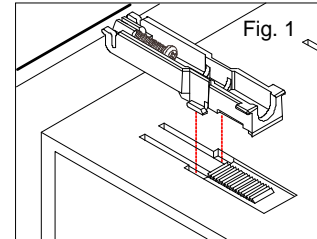
   When the instrument is mounted, always secure with two mounting brackets so that upper and lower
   mounting brackets are positioned diagonally.

   The waterproof/dustproof (supplied as standard) on the front of the instrument conforms to IP65 when
   mounted on the panel. Checked and confirmed its compliance through the internal test at RKC. For
   effective waterproof/dustproof, the gasket must be securely placed between the instrument and the panel
   without any gap. If the gasket is damaged, please contact RKC sales office or the agent.

■ Removal procedures

1. Turn the power OFF.

2. Remove the wiring.

3. Loosen the screw of the mounting bracket.

4. Hold the mounting bracket by the edge (①) and tilt it (②) to remove from
the case. (Fig. 3)

5. The other mounting bracket should be removed in the same way as
described in *3.* and *4.*

6. Pull out the instrument from the mounting cutout while holding the front
panel frame of this instrument. (Fig. 4)
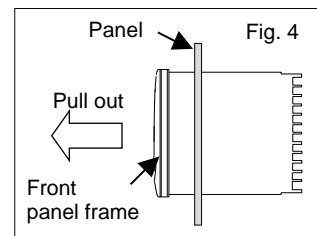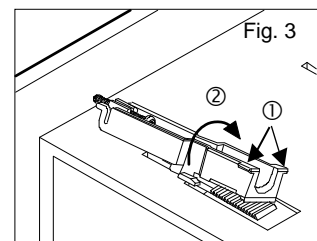
   When pulling out only the internal assembly from the instrument case
   after being wired, refer to **12. REMOVING THE INTERNAL ASSEMBLY (P. 126).**

3. WIRING

This chapter describes wiring cautions, wiring layout and wiring of terminals.

⚠ **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.

3.1 Wiring Cautions

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- Use a special shielded cable for connection with the pressure sensor.
  When using our CZ-100P or CZ-200P:
  The rated output value (mV/V) of pressure sensor is when the cable is at a length of 5 m. If the cable is extended, correct the rated output value using the following equation. Set the correction value thus calculated to "Gain setting (GAIn)" on page 67.

Correction equation:	$e1 = e2 (1 + K \cdot L)$ $\longrightarrow$ $e2 = \dfrac{e1}{1 + K \cdot L}$

  e1: Rated output in standard-cable length 5 m (mV/V is described on the nameplate of the sensor)
  e2: Rated output after extension
  K: Correction factor* 1.96×10^{-4}/m [Non-explosionproof specification type],
  1.40×10^{-4}/m [Explosionproof specification type]
  * When using 0.5 mm$^2 \times$ 4-core shielded cable (standard-cable) or equal.
  L: Extended cable length (m)

- 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.
- Allow approximately 5 seconds for contact output when 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.
- This instrument is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as a fuse) with adequate breaking capacity close to the instrument.
  - Fuse type: Time-lag fuse (Approved fuse according IEC 60127-2 and/or UL 248-14)
  - Fuse rating: Rated current: 1.0 A
- For an instrument with 24 V power supply input, supply power from a "SELV" circuit defined as IEC 60950-1.
- 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).
- Use the solderless terminal appropriate to the screw size.
  Screw size: M3 × 6 (With 5.8 × 8 square washer)
  Recommended tightening torque:
          0.4 N m (4 kgf cm)
  Specified solderless terminals:
          With isolation
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm^2

  Recommended dimension:

  5.9 mm MAX
  3.2 mm MIN
  6 mm

- Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.
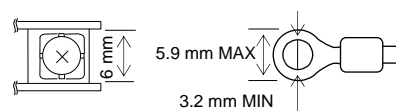
3.2 Terminal Layout

The terminal layout is as follows.

■ HA430

Power supply voltage
100 to 240 V AC
24 V AC
24 V DC

Output 5 (OUT5) [2]

Output 4 (OUT4) [2]

Output 3 (OUT3) [1]

Output 2 (OUT2)

Output 1 (OUT1)

1	25	13
2	26	14
3	27	15
4	28	16
5	29	17
6	30	18
7	31	19
8	32	20
9	33	21
10	34	22
11	35	23
12	36	24

Optional
Communication
(RKC communication/Modbus/PROFIBUS/
DeviceNet/CC-Link)

Input 1 (pressure sensor input)
Calibration input (CAL)
Sensor power supply (EXC)

Input 2/Remote input
Input 2 (thermocouple/RTD/voltage/current)
Remote input (non-isolated type)

Input 1
Pressure sensor input [Sensor signal input (SIG)]
Voltage input
Current input

Optional
Event input (DI1 to DI4, DI5)

Unused terminal numbers: 13, 22

[1] OUT3 can be used for Sensor power supply (optional) [Specify when ordering]
[2] If OUT3 is selected for Sensor power supply, OUT4 and OUT5 cannot be used.

■ HA930

Power supply voltage
100 to 240 V AC
24 V AC
24 V DC

Output 5 (OUT5) [2]

Output 4 (OUT4) [2]

Output 3 (OUT3) [1]

Output 2 (OUT2)

Output 1 (OUT1)

1	49	37	25	13
2	50	38	26	14
3	51	39	27	15
4	52	40	28	16
5	53	41	29	17
6	54	42	30	18
7	55	43	31	19
8	56	44	32	20
9	57	45	33	21
10	58	46	34	22
11	59	47	35	23
12	60	48	36	24

Optional
Communication
(RKC communication/Modbus/PROFIBUS/
DeviceNet/CC-Link)

Input 1 (pressure sensor input)
Calibration input (CAL)
Sensor power supply (EXC)

Input 2/Remote input
Input 2 (thermocouple/RTD/voltage/current)
Remote input (non-isolated type)

Input 1
Pressure sensor input
[Sensor signal input (SIG)]
Voltage input
Current input

Optional
Event input (DI1 to DI4, DI5)

Unused terminal numbers: 13, 22, and 37 to 60

[1] OUT3 can be used for Sensor power supply (optional) [Specify when ordering]
[2] If OUT3 is selected for Sensor power supply, OUT4 and OUT5 cannot be used.

3.3 Wiring of Each Terminal

Prior to conducting wiring, always check the polarity of each terminal.

📖 The terminal nameplate of this instrument and its descriptions are shown in the following.

[Example]

Thermocouple | Instrument inside | Relay contact output

Symbols on the input terminal block correspond to the type of external input connected to the instrument

Symbols on the output terminal block correspond to the type (state) of output sent from the instrument.

+ TC −   Relay   NO
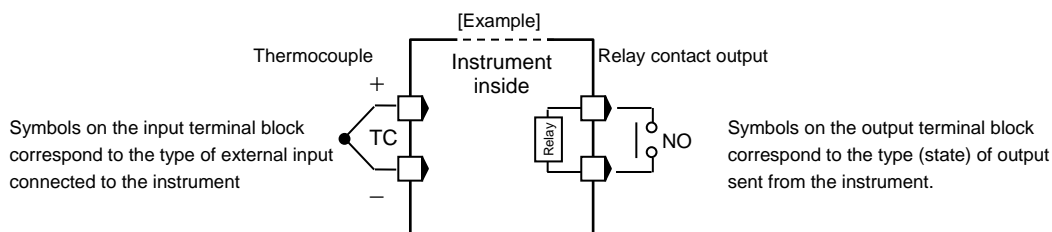
■ Power supply

- Connect the power to terminal numbers 1 and 2.

L — [1]   L — [1]   + — [1]
100-240 V AC   24 V AC   24 V DC
N — [2]   N — [2]   − — [2]
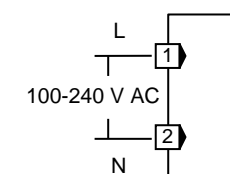
100 to 240 V AC power supply type   24 V AC power supply type   24 V DC power supply type
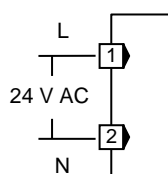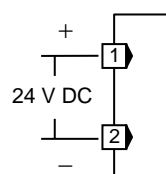
- The power supply types must be specified when ordering. Power supply voltage for the controller must be within the range shown below for the controller to satisfy the control accuracy in the specifications.

Power supply type	Power consumption
90 to 264 V AC [Including power supply voltage variation] (Rating 100 to 240 V AC), 50/60 Hz	HA430: 16.5 VA max. (at 100 V AC), 22.5 VA max. (at 240 V AC) HA930: 17.5 VA max. (at 100 V AC), 24.0 VA max. (at 240 V AC)
21.6 to 26.4 V AC [Including power supply voltage variation] (Rating 24 V AC), 50/60 Hz	HA430: 15.0 VA max. (at 24 V AC) HA930: 16.0 VA max. (at 24 V AC)
21.6 to 26.4 V DC [Including power supply voltage variation] (Rating 24 V DC)	HA430: 430 mA max. (at 24 V DC) HA930: 470 mA max. (at 24 V DC)

- 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.
- This instrument is not provided with an overcurrent protection device. For safety install an overcurrent protection device (such as a fuse) with adequate breaking capacity close to the instrument.
  - Fuse type: Time-lag fuse (Approved fuse according IEC 60127-2 and/or UL 248-14)
  - Fuse rating: Rated current: 1.0 A
- For an instrument with 24 V power supply input, supply power from a "SELV" circuit defined as IEC 60950-1.
- 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).

■ Output 1 to 3 (OUT1 to OUT3)

- Terminal 11 and 12 are for output 1 (OUT1); Terminal 9 and 10 are for output 2 (OUT2); and Terminal 7 and 8 are for output 3 (OUT3).

- Connect an appropriate load according to the output type.

Relay contact output:

Triac output

Voltage pulse output/Voltage output/Current output

Example of wiring is as follows:
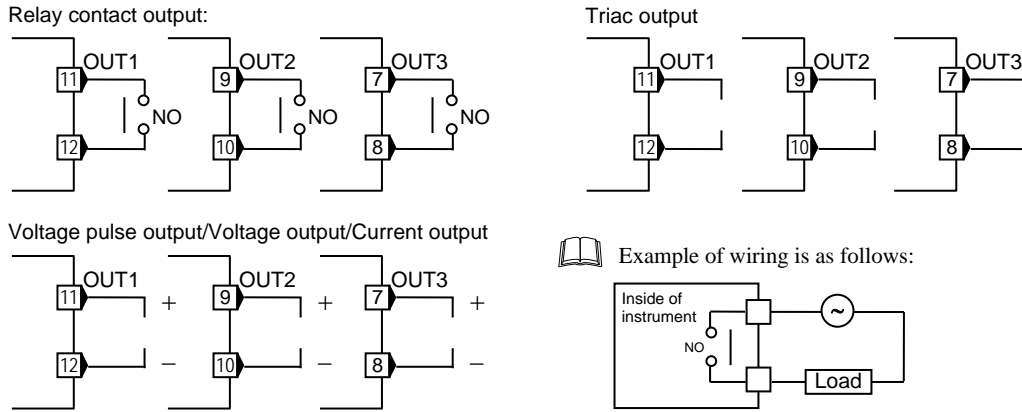
- Number of outputs and output types must be specified when ordering.
  Control output, Event output, or Transmission output can be allocated to output 1 to 3. The specifications of each output are as follows.

Output type	Specifications
Relay contact output	250 V AC, 3A (Resistive load), 1a contact Electrical life 300,000 times or more (Rated load)
Voltage pulse output	0/12 V DC (Load resistance: 600 Ω or more)
Triac output	0.4 A (Allowable load current)
Voltage output	0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC (Load resistance: 1 kΩ or more) Output resolution: 11 bits or more
Current output	0 to 20 mA DC, 4 to 20 mA DC (Load resistance: 600 Ω or less) Output resolution: 11 bits or more

- OUT3 is isolated from both OUT1 and OUT2.
- OUT1 and OUT2 are not isolated from each other except for relay or triac output. When relay or triac output is used, there is isolation between outputs.
- There is isolation between input and output.
- There is isolation between output and power supply terminals.

☞ If OUT3 is used for the Sensor power supply, refer to **Sensor power supply (optional)** on page 20.

■ Output 4 to 5 (OUT4 to OUT5)

- Terminal 5 and 6 are for output 4 (OUT4); and Terminal 3 and 4 are for output 5 (OUT5).

- Output type is only relay contact output.

Relay contact output   250 V AC, 1A (Resistive load), 1a contact   Electrical life 300,000 times or more (Rated load)
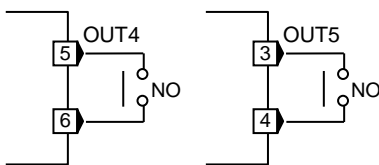
- OUT4 and OUT5 can be used for Event output.

- If OUT3 is selected for the Sensor power supply, OUT4 and OUT5 cannot be used.

■ Input 1 (pressure sensor input)

- Input 1 can be used for the pressure sensor input. (Specify when ordering)
- The strain gauge type of pressure sensor is only connectable.
- The pressure sensor types must be specified when ordering. The relevant pressure sensors are as follows.

  Our CZ-100P or CZ-200P

  Resin pressure sensor (Strain gauge type)* other than RKC product

  * Rated output: 0.500 to 4.000 mV/V   Maximum supply voltage: More than 8 V DC

- Directly connect the pressure sensor (without amplifier) connection cable to terminal numbers 14 to 18, 23 and 24. As for the sensor cable connection, refer to the instruction manual for Pressure sensor used.

Wiring example: Connection to our CZ-100P or CZ200P

HA430/930

Terminal	Label	Description
14		*
15		
16	SHD	Shield
17	EXC+	Sensor power supply +
18	EXC−	Sensor power supply −
23	SIG+	Sensor signal input +
24	SIG−	Sensor signal input −

Shield
Red
Brown
Blue
Black

* Terminal numbers 14 and 15 are not used.

Cable color

Pin number

F A
E B
D G C
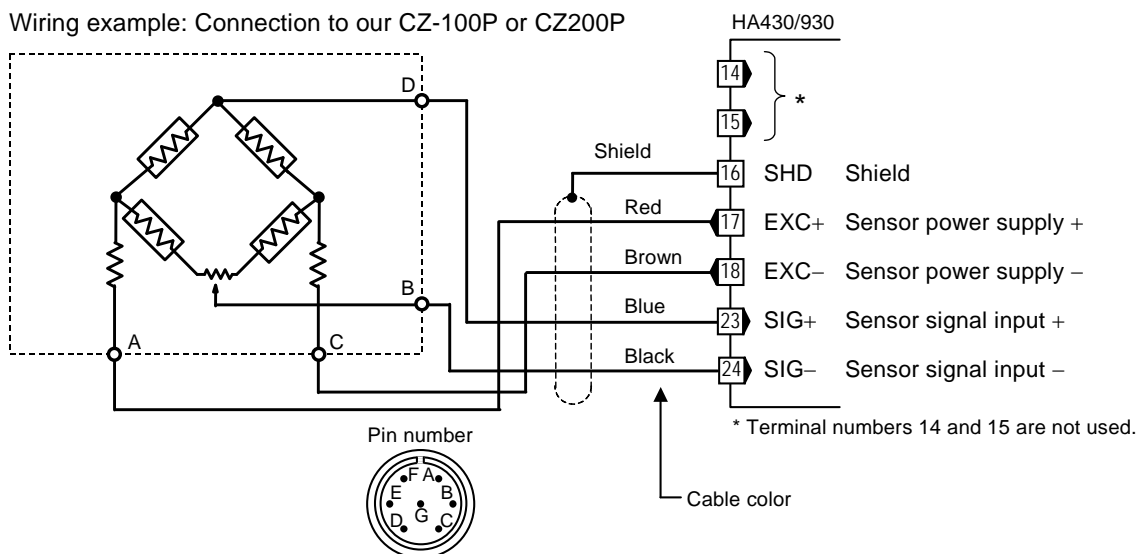
■ Input 1 (voltage and current inputs)

- Input 1 can be used for the voltage or current input. (Specify when ordering)

Voltage (low)	0 to 100 mV DC, 0 to 10 mV DC, 0 to 1 V DC, ±10 mV DC, ±100 mV DC	[Factory set value: 0 to 1 V DC]
Voltage (high)	0 to 5 V DC, 1 to 5 V DC, DC 0 to 10 V DC, ±1 V DC, ±5 V DC, ±10 V DC	[Factory set value: 1 to 5 V DC]
Current	0 to 20 mA DC, 4 to 20 mA DC	[Factory set value: 4 to 20 mA DC]

- The pressure sensor types must be specified when ordering. The relevant pressure sensors are as follows.

  Resin pressure sensor (Strain gauge type) other than RKC product

- The sensor power supply can be allocated to the input terminal numbers 23 and 24.
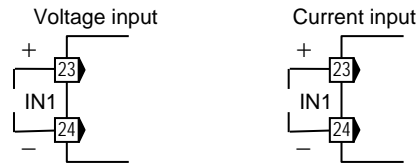
Wiring example 1:
When the resin pressure sensor of 0 to 5 V or 0 to 10 V DC (with amplifier) output type is connected
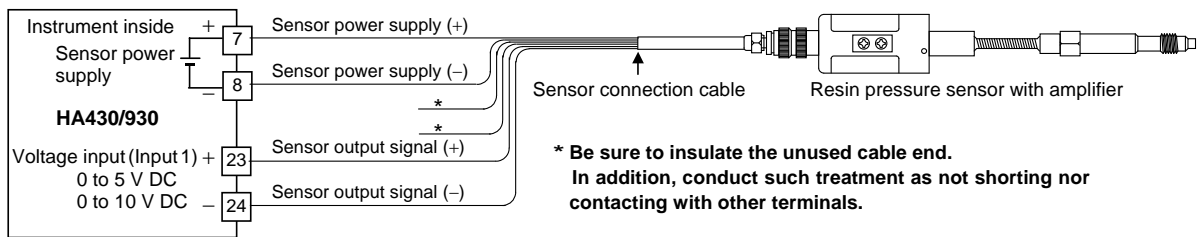
Wiring example 2:
When the resin pressure sensor of 4 to 20 mA DC (with amplifier) output type is connected
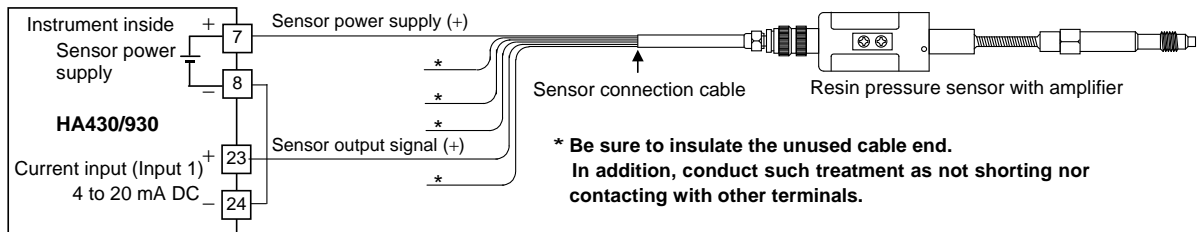
Wiring example 3: Connection to 2-wire pressure transmitter (4 to 20 mA DC type)
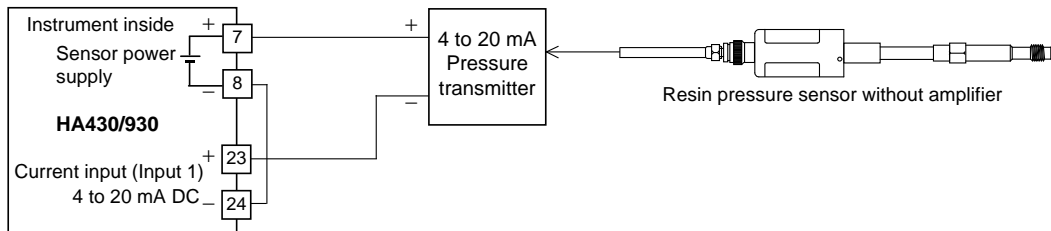
■ Input 2 (thermocouple, RTD, voltage, and current inputs)

- Input 2 can be used for the thermocouple, RTD, voltage, or current input.
- For the Input 2, terminals 19 to 21 are allocated to the measured input.
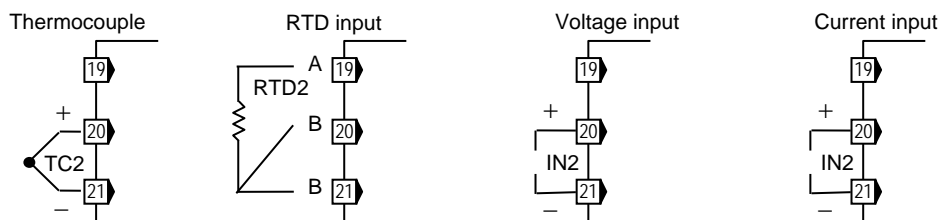
- The input types needs to be specified when ordering. The input types are as follows.

Thermocouple:	K, J, T, S, R, E, B, PLII, N, W5Re/W26Re	Voltage (low):	0 to 100 mV DC, 0 to 10 mV DC, 0 to 1 V DC, ±10 mV DC, ±100 mV DC
		Voltage (high):	0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, ±1 V DC, ±5 V DC, ±10 V DC
RTD:	Pt100, JPt100	Current:	0 to 20 mA DC, 4 to 20 mA DC

- For thermocouple input, use an appropriate compensation wire. For RTD input, use the same low resistance lead wires for all connections.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- If Input 2 is for voltage input or current input and the sensor power supply is specified to OUT3, terminal numbers 20 and 21 can be used as sensor signal input terminals for the pressure sensor (with amplifier).

  ☞ Refer to ■ **Sensor power supply (P. 20)**

■ Remote input (optional)

- With non-isolated remote input, terminals 19 to 20 are allocated to Remote input.
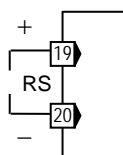
Any one of the following input types can be selected.

Voltage (low):	0 to 100 mV DC, 0 to 10 mV DC, 0 to 1 V DC, ±10 mV DC, ±100 mV DC
Voltage (high):	0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, ±1 V DC, ±5 V DC, ±10 V DC
Current:	0 to 20 mA DC, 4 to 20 mA DC

- Measured input is not isolated from Remote input (non-isolated type).

■ Event input (optional)

With Event input, terminals 30 to 36 are allocated to Event input. Event input must be specified when ordering.
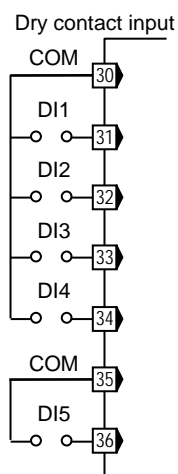
Contact input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should have meet the specifications below.

Contact specifications: At OFF (contact open): 500 kΩ or more
At ON (contact closed) 10 Ω or less

The following functions can be assigned to event inputs.

Memory area selection, RUN/STOP transfer, Remote/Local transfer, Auto/Manual transfer, Hold reset, Interlock release, Manual output up/down (Motor RPM up/down), Manual output 0 % reset (Motor RPM reset)

☞ To assign functions to event inputs, refer to **8. ENGINEERING MODE. (P. 50)**

When CC-Link function is specified for Communication function, terminal Nos.30 to 36 are not available for Event input.

■ Sensor power supply (optional)

- The Sensor power supply is used to supply power to pressure sensor with amplifier or 2-wire pressure transmitter. (Specify when ordering)
- The Sensor power supply can be allocated to the output terminal numbers 7 and 8.

Rated voltage: 24 V DC ± 5 %
Rated current: 24 mA max.

OUT3
7 +
24 V DC
8 −

Wiring example 1:
When the resin pressure sensor of 0 to 5 V or 0 to 10 V DC (with amplifier) output type is connected

Instrument inside +
Sensor power supply
7   Sensor power supply (+)
8   Sensor power supply (−)
HA430/930
Voltage input (Input 2) +   Sensor output signal (+)
0 to 5 V DC   20
0 to 10 V DC − 21   Sensor output signal (−)

Sensor connection cable

Resin pressure sensor with amplifier

* Be sure to insulate the unused cable end.
In addition, conduct such treatment as not shorting nor contacting with other terminals.

Wiring example 2:
When the resin pressure sensor of 4 to 20 mA DC (with amplifier) output type is connected

Instrument inside +
Sensor power supply
7   Sensor power supply (+)
− 8
HA430/930
Current input (Input 2) +   20   Sensor output signal (+)
4 to 20 mA DC − 21

Sensor connection cable

Resin pressure sensor with amplifier

* Be sure to insulate the unused cable end.
In addition, conduct such treatment as not shorting nor contacting with other terminals.

Wiring example 3: Connection to 2-wire pressure transmitter (4 to 20 mA DC type)

Instrument inside +
Sensor power supply
7   +
− 8
HA430/930
Current input (Input 2) +   20
4 to 20 mA DC − 21

4 to 20 mA Pressure transmitter

Resin pressure sensor without amplifier

- OUT4 and OUT5 cannot be used if the Sensor power supply is specified. The number of output points which can correspond to control output, event output and transmission output becomes 2 maximum (OUT1 and OUT2).

■ Communication (optional)

- With Communication function, terminals 25 to 29 are allocated to Communication.
- Conduct wiring to the relevant terminals meeting the specified communication interface. For details of wiring, refer to **Communication Instruction Manual (IMR01N13-E□)**. *

  * Refer to **Communication Instruction Manual (IMR01N14-E□)** for PROFIBUS, **Communication Instruction Manual (IMR01N15-E□)** for DeviceNet, and **Communication Instruction Manual (IMR01N21-E□)** for CC-Link.

IMR01N12-E7

Continued from the previous page.

RS-232C	RS-485	RS-422A	DeviceNet	PROFIBUS	CC-Link
SG 25	SG 25	SG 25	V+ 25	VP 25	DA 25
SD 26	T/R (A) 26	T (A) 26	CAN-H 26	RxD/TxD-P 26	DB 26
RD 27	T/R (B) 27	T (B) 27	Drain 27	RxD/TxD-N 27	DG 27
		R (A) 28	CAN-L 28	DGND 28	SLD 28
		R (B) 29	V− 29		FG 29
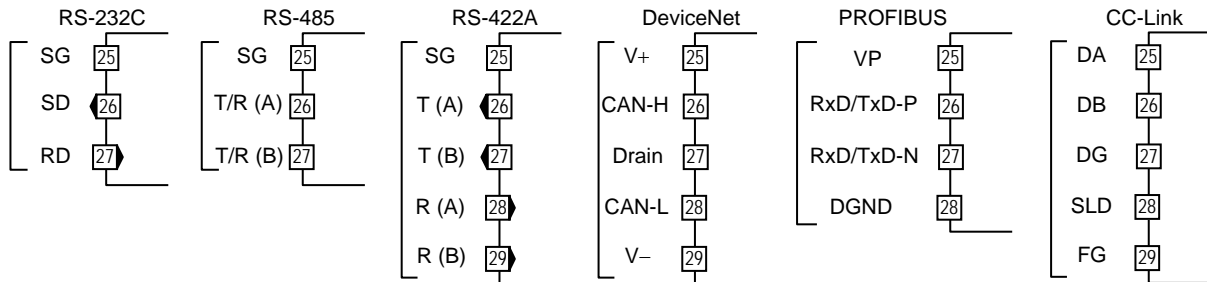
Example 1: Connection to the RS-232C port of the host computer (master)

Number of connection: 1 instrument

* Short RS and CS within connector.
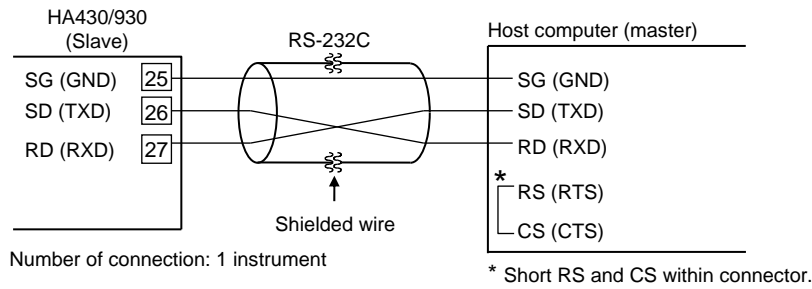
Example 2: Connection to the RS-485 port of the host computer (master)

*R: Termination resistors (Example: 120Ω 1/2 W)

Maximum connections: 32 instruments maximum including a host computer
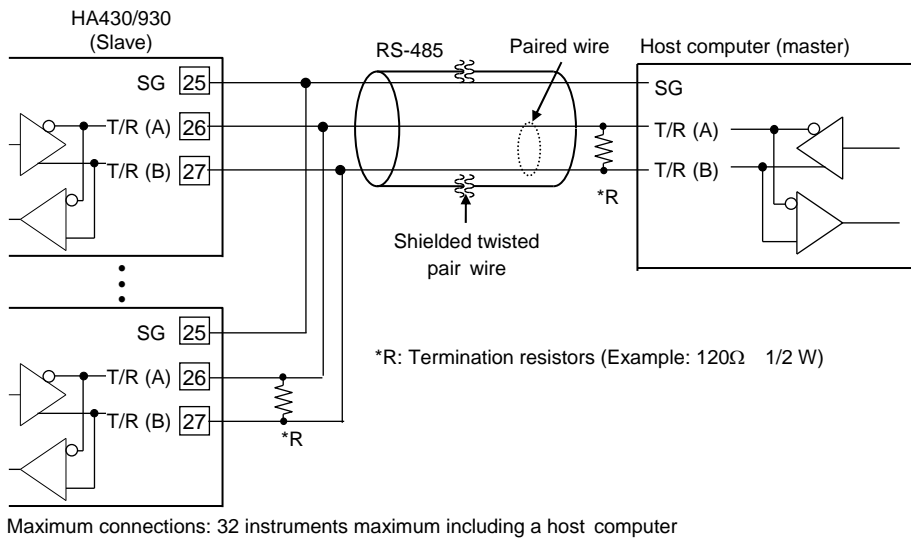
Example 3: Connection to the RS-422A port of the host computer (master)

Maximum connections: 32 instruments maximum including a host computer
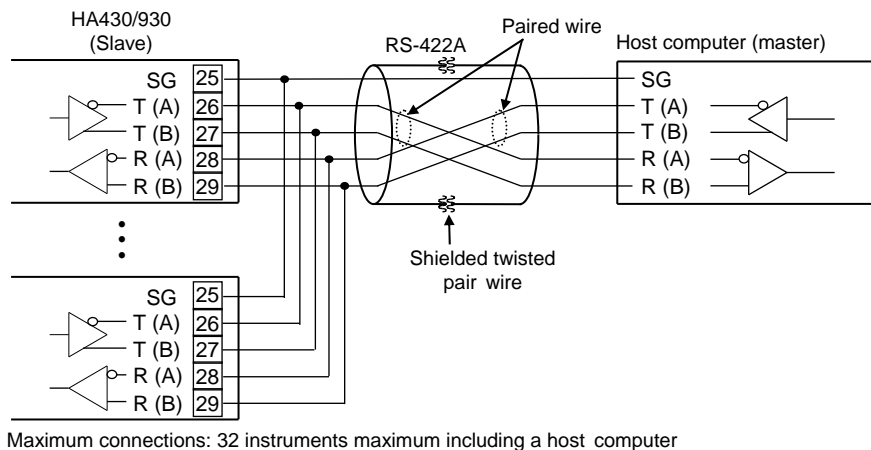
4. SETTING

This chapter describes procedures to set operating conditions of a customer and parameter of various setting modes.

4.1 Setting Procedure to Operation

Conduct necessary setting before operation according to the procedure described below.

```
┌─────────────────────────┐
│  Mounting and Wiring    │
└─────────────────────────┘
        │
        │  ☞  When installing the instrument,        ┌─────────────────────────┐
        │      refer to 2. MOUNTING (P. 10) and      │   Entry to data sheet   │
        │      3. WIRING. (P. 13)                    └─────────────────────────┘
        │                                             Use the sheet of Appendix C, and
        │◄────────────────────────────────────────   make record of setting data of a
        │                                             customer.
        ▼
┌─────────────────────────┐
│        Power ON         │
└─────────────────────────┘
        │
        ▼
┌─────────────────────────┐
│  Change from RUN to STOP│
└─────────────────────────┘
```

Factory set value: RUN (Control start)

Press the direct key (R/S) to change the RUN/STOP status from RUN mode to STOP mode.

📖 **The parameters in Engineering mode which should be set according to the application are settable only when the controller is in STOP mode.**

```
┌─────────────────────────────┐
│ Setting of operating condition│
└─────────────────────────────┘
```

📖 **The parameters for controller's basic functions in Engineering mode should be changed according to the application before setting the parameters related to operation.**

Be sure to check the parameters for the following settings and change them according to the application if necessary. Other parameters should be also changed according to the application.

- Input 1:
  Input type, Gain setting *, Presser input range, Linearize type *, and Shunt resistance output value
- Input 2 type (RTD input/voltage input/current input specified when the instrument is ordered)
- Power frequency (50 Hz or 60 Hz) [Factory set value: 50 Hz]
- Control action (Direct action or Reverse action) [Factory set value: Reverse action]
- Output logic selection (Output function assignment from OUT1 to OUT5)
  [Factory set value: 1-input controller: 3, 2-input controller: 5]
  * Our CZ-100P or CZ-200P

☞ For details of the Engineering mode, refer to **8. ENGINEERING MODE. (P. 50)**

```
┌─────────────────────────┐
│   Setup data setting    │
└─────────────────────────┘
```

Set parameters in Setup setting mode:

- Auto-zero [1, 2]
- Auto calibration [2]
- PV bias, PV digital filter, PV ratio, PV low input cut-off
- Proportional cycle time for control output (Expect voltage and current output)
- Communication (optional)
[1] Our CZ-100P or CZ-200P
[2] Before execution, it is necessary to rise the temperature of equipment installed with the pressure sensor.

☞ For details of the Setup setting mode, refer to **7. SETUP SETTING MODE. (P. 42)**

```
        ▼
      ┌───┐
      │ A │
      └───┘
```

```
        ┌───┐
        │ A │
        └─┬─┘
          │
┌─────────▼──────────┐                    To use Ramp/Soak function
│ Parameter data     ├──────────────────────────────────────────────────┐
│ setting            │                                                   │
└─────────┬──────────┘                                                   │
          │                                                              │
          │   Set parameters in Parameter setting mode:                  │
          │                                                  ┌───────────▼──────────────┐
          │       • Event output/Event input function       │ Set the Setting change   │
          │       • PID and control response, etc.           │ rate limiter, Area soak  │
          │                                                  │ time and Link area       │
          │    Up to 16 individual sets of parameters in     │ number.                  │
          │    Parameter setting mode and SVs can be         └───────────┬──────────────┘
          │    stored and used in Multi-memory area                      │
          │    function.                                                 │
          │                                                              │
          │    For details of the parameter setting mode,                │
          │    refer to 6. PARAMETER SETTING MODE. (P. 32)               │
          │                                                              │
          │◄─────────────────────────────────────────────────────────────┘
┌─────────▼──────────┐
│ Set value (SV)     │
│ setting            │
└─────────┬──────────┘
          │   Set the control set value (SV) which is target value of the control. (Refer to P. 30.)
          │
          │    The Set value (SV) can be stored up to 16 areas in Multi-memory area function as well as
          │    parameters in Parameter setting mode.
          │
       ┌──▼──┐
      ╱       ╲                      No
     ╱ Is Multi-╲──────────────────────────────────────────────────────────┐
    ╱ memory area╲                                                          │
    ╲ function    ╱   * Factory shipment: Memory area 1                     │
     ╲ used?     ╱                                                          │
      ╲         ╱                                                           │
       └───┬───┘                                                           │
         Yes                                                               │
┌─────────▼──────────┐                                                     │
│ Control Memory     │                                                     │
│ area selection     │                                                     │
└─────────┬──────────┘                                                     │
          │   Select the Memory area in SV setting & Monitor mode.         │
          │                                                                │
          │    For details of Memory area selection, refer to             │
          │    9.7 Control Area Transfer. (P. 114)                        │
          │                                                                │
          │◄───────────────────────────────────────────────────────────────┘
┌─────────▼──────────┐
│ Change from STOP   │
│ to RUN             │
└─────────┬──────────┘
          │   Press the direct key (R/S) to change the RUN/STOP status from STOP mode to RUN mode.
          │
          │    For details of RUN/STOP transfer, refer to
          │    9.6 RUN/STOP Transfer. (P. 112)
          │
   ┌──────▼───────┐
   │ Operation    │
   │ start        │
   └──────────────┘
```

4.2 Operation Menu

The controller has five different setting modes. All settable parameters belong to one of them. The following chart shows how to access different setting mode.

☞ For the details of key operation, refer to **4.3 Key Operation. (P. 26)**

Power ON
↓

Input type/Input range Display

📖 This instrument returns to the PV1/SV1 monitor screen if no key operation is performed within 1 minute.

📖 Any parameter which is not used in the controller will not be displayed except for parameters in Engineering mode.

SV setting & Monitor mode

- Set or change Set value (SV).
- Monitor parameters such as PV, SV and MV.
- Conduct operation in this mode.

(Refer to P. 30)

Press and hold the shift key for 1 second

Operation mode *

- Change Operation status/mode such as PID/AT, Auto/Manual, and Remote/Local.

(Refer to P. 101)

Press and hold the SET key for 2 seconds

Press the shift key while pressing the SET key

Parameter setting mode *

- Change parameters related to control such as PID values.
- Up to 16 individual sets of parameters in Parameter setting mode and SVs can be stored and used in Multi-memory area function.

(Refer to P. 32)

Press the shift key while pressing the SET key

Engineering mode

- Change basic control functions such as Input/Output assignment.

(Refer to P. 50)

Press the shift key while pressing the SET key for 2 seconds

Press and hold the SET key for 2 seconds

Setup setting mode

Set setting items not being in the Memory area, and Lock levels.

(Refer to P. 42)

📖 **The parameters in Engineering mode which should be set according to the application are settable only when the controller is in STOP mode.**

∗ From the Operation mode and the Parameter setting mode, the display is returned to the SV setting & Monitor mode by pressing the shift key while pressing the SET key.

■ Input type and input range display

This instrument immediately confirms inputs type symbol and input range following power ON.

Example: When sensor type of Input 1 is pressure input, and sensor type of Input 2 is K thermocouple
(2-input controller)

Power ON

Input 1

PV1

$$I \ n \ P$$
$$\bar{n}P \ \ 5\Gamma$$

← Symbol

Unit for input and SV display (MP: MPa, br: bar, kg: kgf/cm², PS: psi)

Pressure sensor type symbol
(ST: Strain gauge type of pressure sensor) *

Automatically (in 1 sec)
[1-input controller: in 2 sec]

PV1

$$50.0$$
$$0.0$$

← Pressuer input range high *
(Input scale high: 50.0)

← Pressuer input range low *
(Input scale low: 0.0)

Automatically (in 1 sec)
[1-input controller: in 2 sec]

Input 2

(These displays are not displayed for the 1-input controller.)

PV2

$$I \ n \ P$$
$$°C \ \ \unicode{x2B7}$$

Unit for input and SV display
(Celsius: °C, Fahrenheit: °F,
Voltage/Current input: no
character shown)

Input type symbol *

Automatically
(in 1 sec)

PV2

$$1372.0$$
$$-200.0$$

← Input range high *

Input range low *

Automatically
(in 1 sec)

SV setting & Monitor mode

(PV1/SV1 monitor)

PV1   MAN

$$0.0$$

AREA
$$I \qquad 0.0$$

After the input type symbol and the input range are displayed on the display unit, the PV1/SV1 monitor screen (SV setting & Monitor mode) is displayed.

* Input Type Symbol Table

Symbol	Input type	Input range
ビ	K	−200.0 to +1372.0 °C, −328.0 to +2501.6 °F
⅃	J	−200.0 to +1200.0 °C, −328.0 to +2192.0 °F
Γ	T	−200.0 to +400.0 °C, −328.0 to +752.0 °F
5	S	−50.0 to +1768.0 °C, −58.0 to +3214.4 °F
┌	R	−50.0 to +1768.0 °C, −58.0 to +3214.4 °F
P	PLII	0.0 to 1390.0 °C, 32.0 to 2534.0 °F
⊓	N	0.0 to 1300.0 °C, 32.0 to 2372.0 °F
⊔	W5Re/W26Re	0.0 to 2300.0 °C, 32.0 to 4172.0 °F
E	E	−200.0 to +1000.0 °C, −328.0 to +1832.0 °F
b	B	0.0 to 1800.0 °C, 32.0 to 3272.0 °F
Pr3	Pt100 (3-wire system)	−200.0 to +850.0 °C, −328.0 to +1562.0 °F
JP3	JPt100 (3-wire system)	−200.0 to +600.0 °C, −328.0 to +1112.0 °F
⅄	Voltage (mV, V)	Programmable range
I	Current (mA)	(−19999 to +99999)
5⌐	Pressure (MPa)	0.0 to 250.0 MPa

4.3 Key Operation

Basic key operations common to each mode (set item change, set value change and registration) and Data lock function are described in the following.

∎ Scrolling through parameters

- Press to scroll through parameters in the same mode/area.
- To go back to the first parameter, keep pressing SET keys until it is displayed again.

  Example: When the SV setting & Monitor mode is selected (2-input controller)
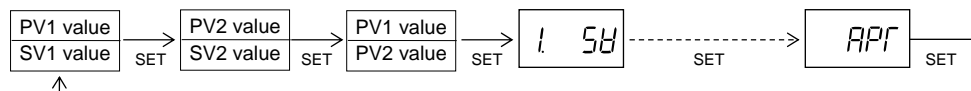
∎ Changing Set value (SV)

- The high-lighted digit indicates which digit can be set. Press Shift key to go to a different digit. Every time the shift key is pressed, the high-lighted digit moves as follows.
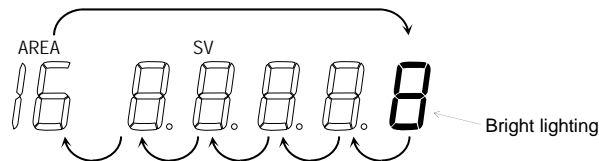
📖   The following is also available when changing the set value.

- ● Increase SV1 from 199.9 MPa to 200.0 MPa:
- *1.* Press the shift key to light brightly the tenths place (first digit from the right).
- *2.* Press the UP key to change to 0.
  The display changes to 200.0.
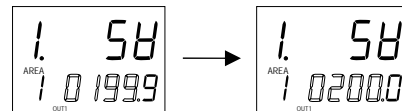
- ● Decrease SV1 from 200.0 MPa to 190.0 MPa:
- *1.* Press the shift key to light brightly the tens place.
- *2.* Press the DOWN key to change to 9.
  The display changes to 190.0.
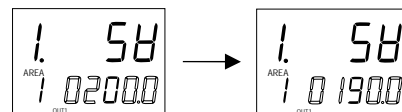
- ● Decrease SV2 from 200.0 °C to −100.0 °C:
- *1.* Press the shift key to light brightly the hundreds place.
- *2.* Press the DOWN key (three times) to change to −1.
  The display changes to −100.0.
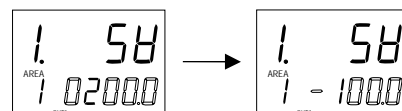
- **To store a new value for the parameter, always press the SET key.** The display changes to the next parameter and the new value will be stored.

📖   A new value will not be stored without pressing SET key after the new value is displayed on the display.

📖   After a new value has been displayed by using the UP and DOWN keys, the SET key must be pressed within 1 minute, or the new value is not stored and the display will return to the PV1/SV1 monitor screen.

■ Data lock function

- The Data lock function limits access of unauthorized personnel to the parameters and prevents parameter change by mistake.

- There are 8 set data lock levels. The set data lock level can be set in Setup setting mode.

Character display	Parameters which can be changed	Set value
LCK 00000	All parameters [Factory set value]	00000
	SV, EV1 to EV4, Memory area selection, Parameters in F10 to F91	00001
	All parameters except for EV1 to EV4	00010
	SV	00011
	All parameters except for SV	00100
	EV1 to EV4	00101
	All parameters except for SV and EV1 to EV4	00110
	No parameter (All Locked)	00111

- Data lock level can be changed in both RUN and STOP mode.

- Parameters protected by Data lock function are still displayed for monitoring.

■ How to restrict operation of the direct keys

Three Direct function keys on the front panel are provided for one-key operation to switch Auto/Manual, Remote/Local, and RUN/STOP. Use/Unuse of Direct keys is settable in Engineering mode. (Refer to P. 65.)

4.4 Changing Parameter Settings

Procedures to change parameter settings are shown below.

■ Change Settings

Example: Change the Set value 1 (SV1) of Input 1 from 0.0 MPa to 200.0 MPa

1. **Go to the mode in which the parameter is displayed**

If the current mode is not SV setting & Monitor mode, press the shift key while pressing the SET key to return to the SV setting & Monitor mode.
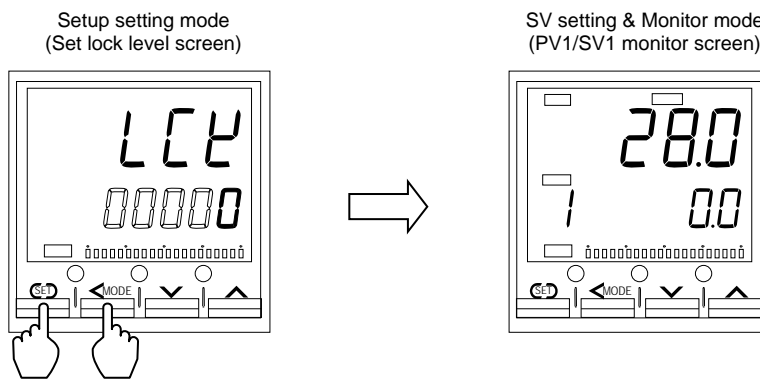
☞ For the mode transfer, refer to **4.2 Operation Menu. (P. 24)**

2. **Select the parameter**

Press the SET key until "1. SV" (Input 1_SV1 setting screen) is displayed. To go to the next parameter, press SET key. To go back to the first parameter, keep pressing SET keys until it is displayed again.
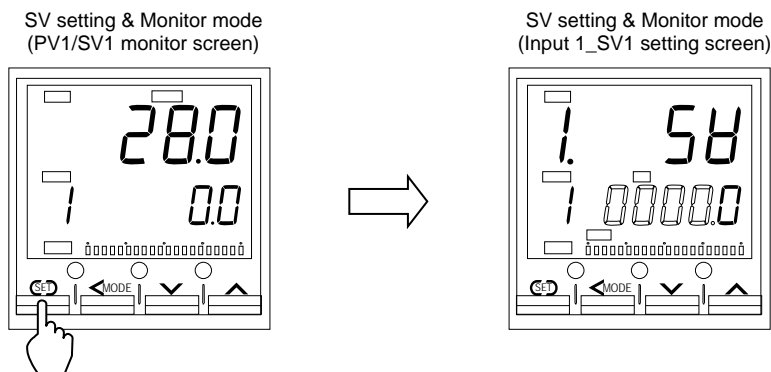
3. Shift the high-lighted digit

The high-lighted digit indicates which digit can be set. Press the shift key to high-light the hundreds digit.
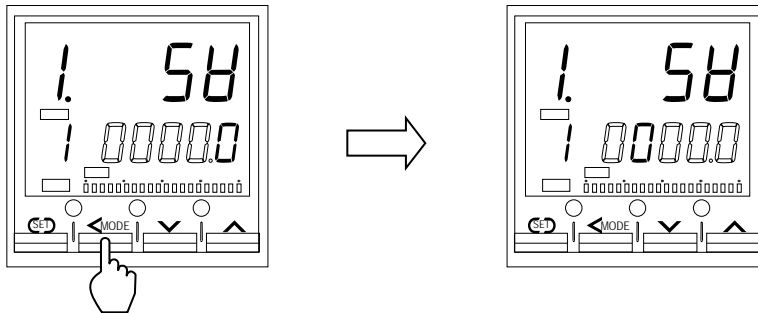
4. Change the set value

Press the UP key to change the number to 2.
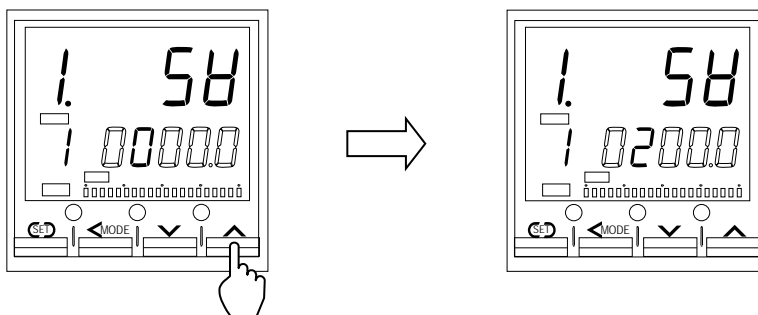
5. Store the set value

Press the SET key to store the new set value. The display goes to the next parameter.

SV setting & Monitor mode
(Input 1_SV1 setting screen)

SV setting & Monitor mode
(Input 1_MV1 monitor screen)
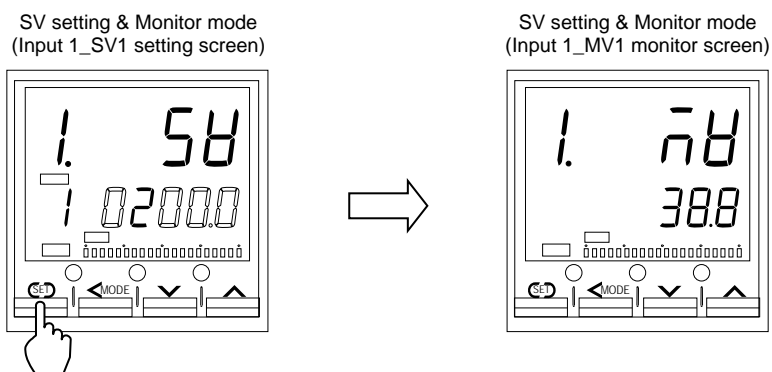
5. SV SETTING & MONITOR MODE

5.1 Display Sequence

In SV setting & Monitor mode, the following operations are possible.
- Change the Set value (SV)
- Change Memory Area
- Monitor the Measured value (PV) and the Manipulated value (MV), etc.

When the power is turned on, the controller goes to this mode after self-diagnostics. Use this mode during normal operation. To return to this mode from the Operation mode or the Parameter setting mode, press the shift key while pressing the SET key.

```
┌───────────┐   ┌──────────────────────────────────────────────────────────────────────┐
│ Power ON  │   │ Parameter setting mode, Setup setting mode, Operation mode, Engineering mode │
└───────────┘   └──────────────────────────────────────────────────────────────────────┘
                                    Press the shift key while pressing the SET key.
```

(#) PV1 MAN 0.0 / AREA 1 0.0
Input 1_measured value (PV1)/ set value (SV1) monitor
— Measured value 1 (PV1)
— Set value 1 (SV1) *
Remote state:
The remote set value is displayed.
Local state:
The set value is displayed.
Manual operation:
Manipulated output value (MV1) of Input 1 can be set. An MV scaling value (motor RPM) is displayed in the monitor state.

(#) PV2 28.3 / AREA 1 SV 0.0
Input 2_measured value (PV2)/ set value (SV2) monitor
— Measured value 2 (PV2)
— Set value 2 (SV2) *
Manual operation:
Manipulated output value (MV2) of Input 2 can be set.

(#) PV1 0.0 / AREA 1 PV2 28.3
Input 1_measured value (PV1)/ Input 2_measured value (PV2) monitor
— Measured value 1 (PV1)
— Measured value 2 (PV2)

1. SV AREA 1 0000.0
Input 1_set value (SV1)
Setting range:
Input 1_setting limiter low to Input 1_setting limiter high

2. SV AREA 1 0000.0
Input 2_set value (SV2)
Setting range:
Input 2_setting limiter low to Input 2_setting limiter high

SVr 0.0
Remote input value monitor
Displays the remote set value which is the control target value in the Remote (REM) mode. Displayed only when the remote input function is provided.
Display range:
Input 1_setting limiter low to Input 1_setting limiter high

A

1.PHLd 0.0
PV1 peak hold value monitor
The maximum PV1 value (peak value) of Input 1 is held and displayed.
Display range:
Input 1_input scale low to Input 1_input scale high

1.bHLd 0.0
PV1 bottom hold value monitor
The minimum PV1 value (bottom value) of Input 1 is held and displayed.
Display range:
Input 1_input scale low to Input 1_input scale high

1.HLdr
PV1 hold reset
PV1 hold value is reset when the UP and DOWN keys a simultaneously pressed.

2.PHLd 0.0
PV2 peak hold value monitor
The maximum PV2 value (peak value) of input 2 is held and displayed.
Display range:
Input 2_input scale low to Input 2_input scale high

2.bHLd 0.0
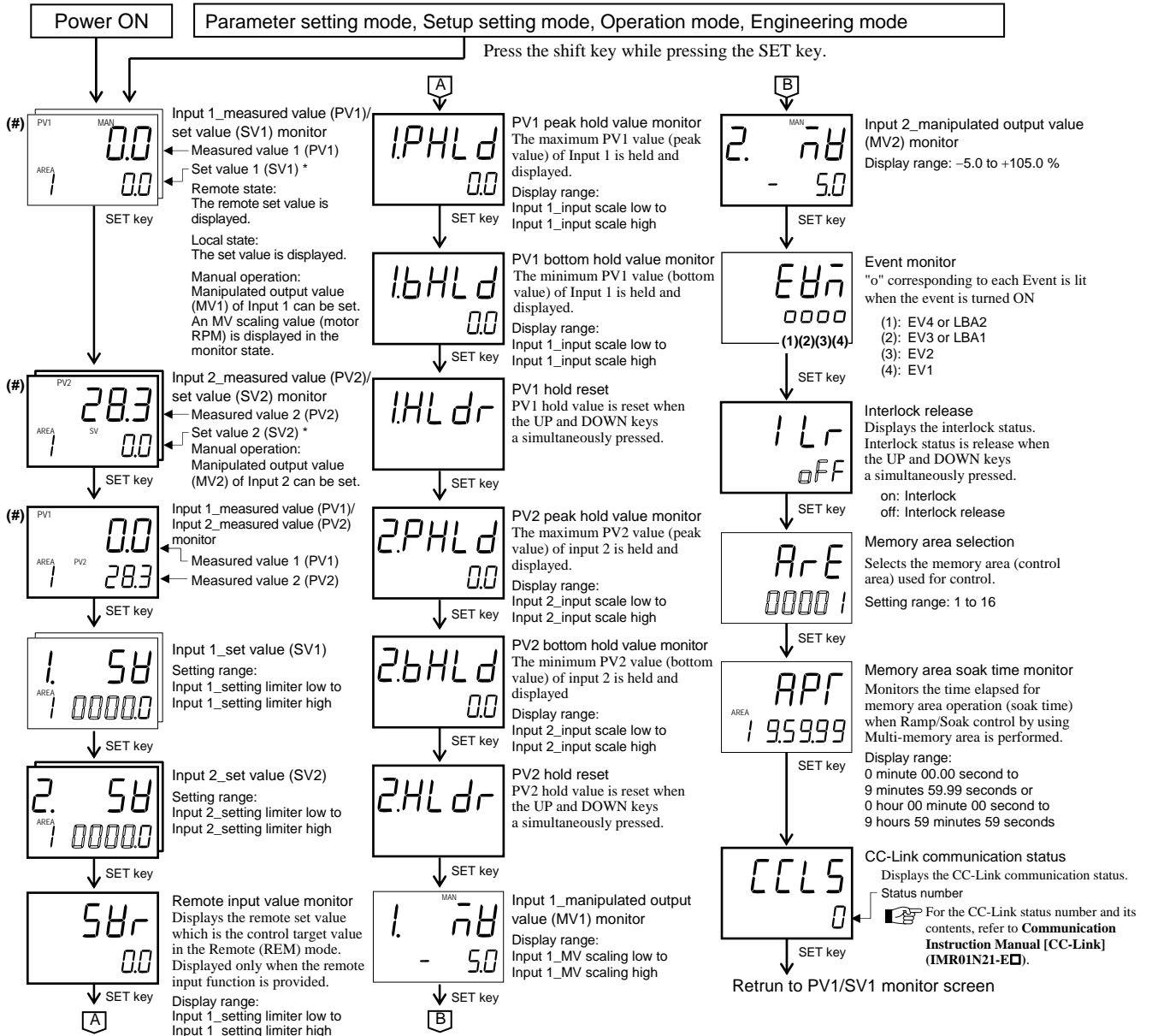PV2 bottom hold value monitor
The minimum PV2 value (bottom value) of input 2 is held and displayed.
Display range:
Input 2_input scale low to Input 2_input scale high

2.HLdr
PV2 hold reset
PV2 hold value is reset when the UP and DOWN keys a simultaneously pressed.

MAN 1. nV - 5.0
Input 1_manipulated output value (MV1) monitor
Display range:
Input 1_MV scaling low to Input 1_MV scaling high

B

2. nV MAN - 5.0
Input 2_manipulated output value (MV2) monitor
Display range: −5.0 to +105.0 %

EVn oooo **(1)(2)(3)(4)**
Event monitor
"o" corresponding to each Event is lit when the event is turned ON
(1): EV4 or LBA2
(2): EV3 or LBA1
(3): EV2
(4): EV1

I Lr oFF
Interlock release
Displays the interlock status.
Interlock status is release when the UP and DOWN keys a simultaneously pressed.
on: Interlock
off: Interlock release

ArE 00001
Memory area selection
Selects the memory area (control area) used for control.
Setting range: 1 to 16

APr AREA 1 9.59.99
Memory area soak time monitor
Monitors the time elapsed for memory area operation (soak time) when Ramp/Soak control by using Multi-memory area is performed.
Display range:
0 minute 00.00 second to 9 minutes 59.99 seconds or
0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds

CCLS 0
CC-Link communication status
Displays the CC-Link communication status.
Status number
☞ For the CC-Link status number and its contents, refer to **Communication Instruction Manual [CC-Link] (IMR01N21-E□)**.

Retrun to PV1/SV1 monitor screen

---

* With the Setting change rate limiter when the set value is changed, the displayed set value changes according to the ramp-up/down rate.

☐ : Parameters related to multi-memory area function   ☐☐ : Parameters displayed when function is specified.

📖 Parameters which are not related to existing functions on the controller are not displayed.

📖 This instrument returns to the PV1/SV1 monitor screen if no key operation is performed within 1 minute. [Exempts, screen of (#) mark]

☞ For the monitor screen, refer to **9.3 Monitoring Display in Operation. (P. 102)**

☞ For the memory area selection, refer to **9.7 Control Area Transfer. (P. 114)**

5.2 Procedure for Set Value (SV) Setting

Up to 16 individual sets of SVs and parameters in Parameter setting mode can be stored and used in Multi-memory area function. Some examples of changing the Set value (SV) described in the following. The same setting procedure applies when parameters corresponding to the Multi-memory area function are also set.
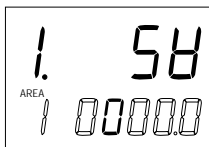
● **Change the Set value (SV)**

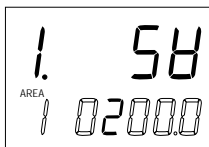Change SV1 of Input 1 from 0.0 MPa to 200.0 MPa:

1. Press the SET key several times at PV1/SV1 monitor screen until Input1_SV1 setting screen is displayed.
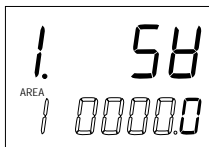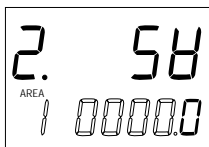
2. Press the shift key to high-light the hundreds digit. The high-light digit indicates which digit can be set.

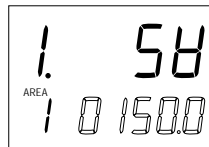*3.* Press the UP key to change the number to 2.

4. Press the SET key to store the new value. The display goes to the next parameter.
(Example: Input 2_SV2 setting screen)

● **Change the Set value (SV) of another Memory area which is not selected for ongoing control**

While Memory area 1 is selected for ongoing control, change SV1 of Input 1 in Memory area 3 from 150.0 MPa to 100.0 MPa:

1. Go to Input 1_SV1 setting screen. Press the shift key until the Memory area display unit is high-lighted. The high-lighted digit indicates which digit can be set.

2. Press the UP key to change to 3. The SV display shows the Set value (SV1) of Input 1 of the Memory area 3, and the number in AREA (Area number) display flashes.

3. Press the shift key to high-light the tens digit. The Area number is flashing.
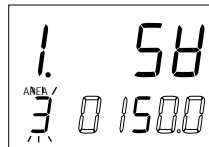
4. Press the DOWN key to change the number to 0 in the tens digit.
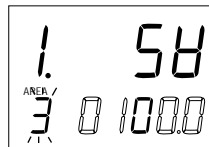
5. Press the SET key to store the new value. The display goes to the next parameter.
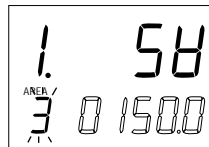(Example: Input 2_SV2 setting screen)
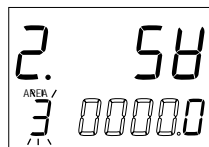
6. PARAMETER SETTING MODE

6.1 Display Sequence

In Parameter setting mode, the following operations are possible. Set parameters relating to control such as PID constants, Event set values, and the Setting change rate limiter. To go to Parameter setting mode, press and hold the SET key for 2 seconds at SV setting & Monitor mode or Setup setting mode. Up to 16 individual sets of SVs and parameters in Parameter setting mode can be stored and used in Multi-memory area function. Ramp/Soak control is possible by using Area soak time, Link area number and Setting change rate limiter (up/down) in Parameter setting mode.
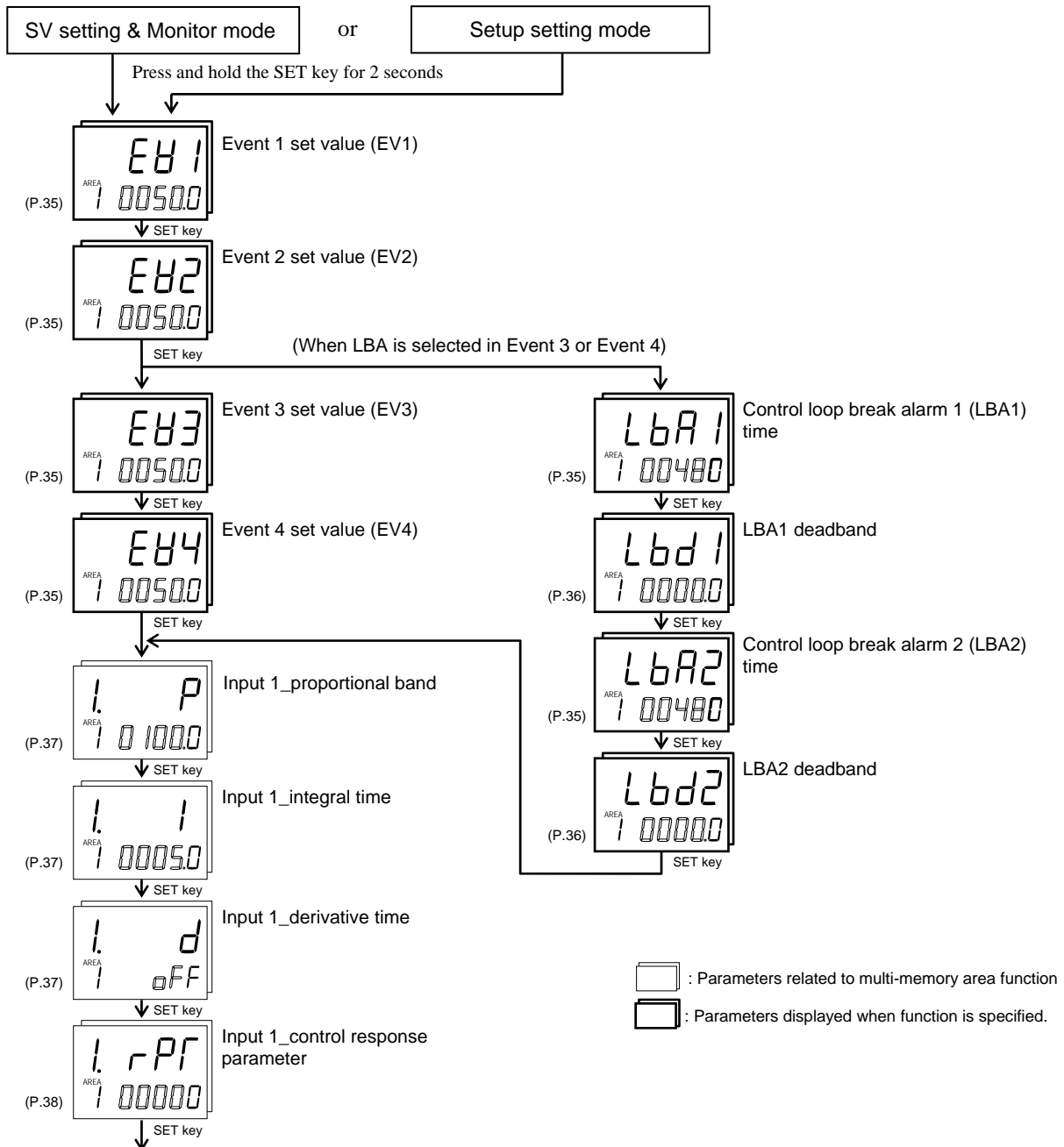
Continued on the next page *

*For 1-input controller: To Input 1_setting change rate limiter (up) screen
For 2-input controller: To Input 2_proportional band screen

IMR01N12-E7

From Input 1_control response parameter setting screen

↓ SET key

2. P
AREA
1 0030.0
(P.37)

Input 2_proportional band

↓ SET key

2. I
AREA
1 0240.0
(P.37)

Input 2_integral time

↓ SET key

2. d
AREA
1 0060.0
(P.37)

Input 2_derivative time

↓ SET key

2. rPr
AREA
1 00000
(P.38)

Input 2_control response parameter

↓ SET key

1.SUrU
AREA
1 oFF
(P.38)

Input 1_setting change rate limiter (up)

↓ SET key

1.SUrd
AREA
1 oFF
(P.39)

Input 1_setting change rate limiter (down)

↓ SET key

2.SUrU
AREA
1 oFF
(P.38)

Input 2_setting change rate limiter (up)

↓ SET key

2.SUrd
AREA
1 oFF
(P.39)

Input 2_setting change rate limiter (down)

↓ SET key

ASr
AREA
1 00000
(P.40)

Area soak time

↓ SET key

LnUA
AREA
1 oFF
(P.41)

Link area number

↓ SET key

Return to first parameter setting item of Parameter setting mode

📖 Multi-memory area function:

- Multi-memory area function can store up to 16 individual sets of SVs and parameters in Parameter setting mode.
  One of the Areas is used for control, and the currently selected area is "Control Area".

Memory Area   16 15 2 1

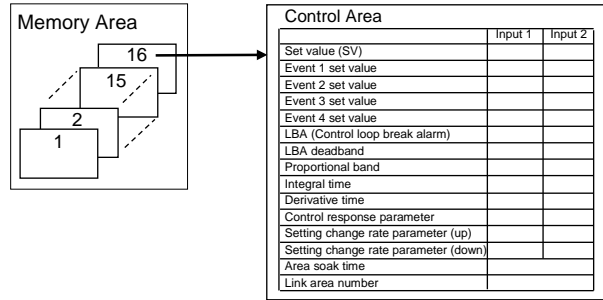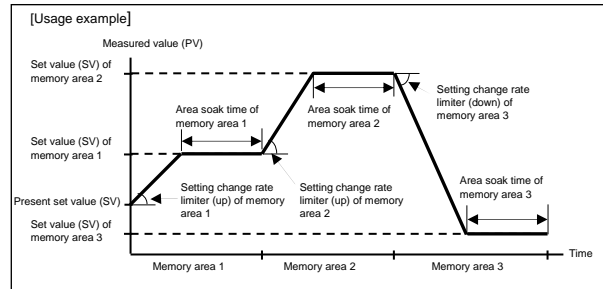| Control Area	Input 1	Input 2
Set value (SV)		
Event 1 set value		
Event 2 set value		
Event 3 set value		
Event 4 set value		
LBA (Control loop break alarm)		
LBA deadband		
Proportional band		
Integral time		
Derivative time		
Control response parameter		
Setting change rate parameter (up)		
Setting change rate parameter (down)		
Area soak time		
Link area number		

- Ramp/Soak control is possible by using Area soak time, Link area number and Setting change rate limiter (up/down) in Parameter setting mode.

[Usage example]

Measured value (PV)
Set value (SV) of memory area 2
Area soak time of memory area 1
Area soak time of memory area 2
Setting change rate limiter (down) of memory area 3
Set value (SV) of memory area 1
Setting change rate limiter (up) of memory area 1
Setting change rate limiter (up) of memory area 2
Area soak time of memory area 3
Present set value (SV)
Set value (SV) of memory area 3
Time
Memory area 1   Memory area 2   Memory area 3

⬚ : Parameters related to multi-memory area function

⬚ : Parameters displayed when function is specified.

📖   Parameters which are not related to existing functions on the controller are not displayed.

📖   To return the SV setting & Monitor mode, press and hold the SET key for 2 seconds, or press the shift key while pressing the SET key.

📖   This instrument returns to the PV1/SV1 monitor screen if no key operation is performed within 1 minute.

6.2 Parameter List

Parameter		Page
Event 1 set value	*EV1* (EV1)	P. 35
Event 2 set value	*EV2* (EV2)	P. 35
Event 3 set value	*EV3* (EV3)	P. 35
Event 4 set value	*EV4* (EV4)	P. 35
Control loop break alarm 1 (LBA1) time	*LbA1* (LbA1)	P. 35
LBA1 deadband	*Lbd1* (Lbd1)	P. 36
Control loop break alarm 2 (LBA2) time	*LbA2* (LbA2)	P. 35
LBA2 deadband	*Lbd2* (Lbd2)	P. 36
Input 1_proportional band	*1. P* (1. P)	P. 37
Input 1_integral time	*1. I* (1. I)	P. 37
Input 1_derivative time	*1. d* (1. d)	P. 37
Input 1_control response parameter	*1. rPT* (1. rPT)	P. 38
Input 2_proportional band	*2. P* (2. P)	P. 37
Input 2_integral time	*2. I* (2. I)	P. 37
Input 2_derivative time	*2. d* (2. d)	P. 37
Input 2_control response parameter	*2. rPT* (2. rPT)	P. 38

Parameter		Page
Input 1_setting change rate limiter (up)	*1SVrU* (1.SVrU)	P. 38
Input 1_setting change rate limiter (down)	*1SVrd* (1.SVrd)	P. 39
Input 2_setting change rate limiter (up)	*2SVrU* (2. SVrU)	P. 38
Input 2_setting change rate limiter (down)	*2SVrd* (2.SVrd)	P. 39
Area soak time	*AST* (AST)	P. 40
Link area number	*LnKA* (LnKA)	P. 41

6.3 Description of Each Parameter

■ Event 1 set value (EV1)   Event 2 set value (EV2)
Event 3 set value (EV3)   Event 4 set value (EV4)

EV1 to EV4 are set values of the Event action.

Data range: Deviation: −Input span to +Input span

Process: Input scale low to Input scale high
SV: Input scale low to Input scale high

Factory set value: 50.0

📖   For the 2-input controller, EVs have to be allocated to either Input 1 or Input 2 (Factory set value: allocated to Input 1). Refer to "Event assignment" in F41 to F44 of the Engineering mode (P. 84).

■ Control loop break alarm (LBA) time (LbA1, LbA2)

The LBA time sets the time required for the LBA function to determine there is a loop failure. When the LBA is output (under alarm status), the LBA function still monitors the Measured value (PV) variation at an interval of the LBA time.

Data range: OFF (Unused), 1 to 7200 seconds

Factory set value: 480

📖   For the 2-input controller, LBAs have to be allocated to either Input 1 or Input 2 (Factory set value: allocated to Input 1). Refer to "Event assignment" in F41 t to F44 of the Engineering mode (P. 84).

LBA Function: The Control loop break alarm (LBA) function is used to detect a load (heater) break or a failure in the external actuator (power controller, magnet relay, etc.), or a failure in the control loop caused by an input (sensor) break. The LBA function is activated when control output reaches 0 % (low limit with output limit function) or 100 % (high limit with output limit function). LBA monitors variation of the Measured value (PV) for the length of LBA time. When the LBA time has elapsed and the PV is still within the alarm determination range, the LBA will be ON.

[Alarm action]
LBA determination range:
  TC/RTD input: 2 °C [2 °F] (fixed)
  Pressure sensor input and Voltage/Current input: 0.2 % of input span (fixed)
- **When the output reaches 0 % (low limit with output limit function)**
For direct action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.
For reverse action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.
- **When the output exceeds 100 % (high limit with output limit function)**
For direct action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.
For reverse action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.

📖   If the Autotuning function is used, the LBA time is automatically set twice as large as the Integral time. The LBA setting time will not be changed even if the Integral time is changed.

## ■ LBA deadband (Lbd1, Lbd2)

The LBA deadband gives a neutral zone to prevent the Control loop break alarm (LBA) from malfunctioning caused by disturbance.

Data range: 0.0 to Input span
                     (Varies with the setting of the Decimal point position)

Factory set value: 0.0

LBA Deadband function:

The LBA may malfunction due to external disturbances. To prevent malfunctioning due to external disturbance, LBA deadband (LBD) sets a neutral zone in which LBA is not activated. When the Measured value (PV) is within the LBD area, LBA will not be activated. If the LBD setting is not correct, the LBA will not work correctly.
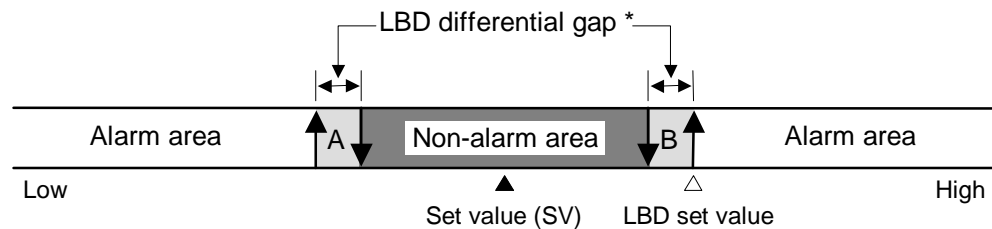
* TC/RTD input: 0.8 °C [°F] (fixed)
  Pressure sensor input and Voltage/Current input: 0.8 % of input span (fixed)

A: During temperature rise: Alarm area
   During temperature fall: Non-alarm area
B: During temperature rise: Non-alarm area
   During temperature fall: Alarm area

📖   If the LBA function detects an error occurring in the control loop, but cannot specify the location, a check of the control loop in order. The LBA function does not detect a location which causes alarm status. If LBA alarm is ON, check each device or wiring of the control loop.

📖   LBA function is not operative when:
- AT function is activated.
- The controller is in STOP mode.
- LBA function is set to "OFF."
- LBA function is not assigned to Event (ES3) or Event 4 (ES4).

📖   If the LBA time is too short or does not match the controlled object requirements, LBA may turn ON or OFF at inappropriate time or remain OFF. Change the LBA time based on the malfunction.

📖   While the LBA is ON (under alarm status), the following conditions cancel the alarm status and LBA will be OFF:
- The Measured value (PV) rises beyond (or falls below) the LBA determination range within the LBA time.
- The Measured value (PV) enter within the LBA deadband.

■ Proportional band (1. P, 2. P) for PI/PID control

Data range: Pressure sensor input: 0.0 to 1000.0 % of input span

TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F])

(Varies with the setting of the Decimal point position)

Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span

0 (0.0, 0.00): ON/OFF action

Factory set value: Input 1_proportional band (1. P): 100.0

Input 2_proportional band (2. P): 30.0

Related parameters: ON/OFF action differential gap (upper/lower) (P. 88)

■ Integral time (1. I, 2. I) for PI/PID control

Integral action is to eliminate offset between SV and PV by proportional action. The degree of Integral action is set by time in seconds.

Data range: OFF (PD action),

1 to 3600 seconds, 0.1 to 3600.0 seconds, or 0.01 to 360.00 seconds

(Varies with the setting of the Integral/Derivative time decimal point position selection)

Factory set value: Input 1_integral time (1. I): 5.00

Input 2_integral time (2. I): 240.00

Related parameters: Integral/Derivative time decimal point position selection (P. 87)

■ Derivative time (1. d, 2. d) for PID control

Derivative action is to prevent rippling and make control stable by monitoring output change. The degree of Derivative action is set by time in seconds.

Data range: OFF (PI action),

1 to 3600 seconds, 0.1 to 3600.0 seconds, or 0.01 to 360.00 seconds

(Varies with the setting of the Integral/Derivative time decimal point position selection)

Factory set value: Input 1_derivative time (1. d): OFF (PI action)

Input 2_derivative time (2. d): 60.00

Related parameters: Integral/Derivative time decimal point position selection (P. 87)

■ Control response parameter (1. rPT, 2. rPT)

The control response for the Set value (SV) change can be selected among Slow, Medium, and Fast.

Data range: 0: Slow
1: Medium
2: Fast

Factory set value: Input 1_control response parameter (1. rPT): 0
Input 2_control response parameter (2. rPT): 0

Control Response: The control response for the Set value (SV) change can be selected among Slow, Medium, and Fast. If a fast response is required, Fast is chosen. Fast may cause overshoot. If overshoot is critical, Slow is chosen.
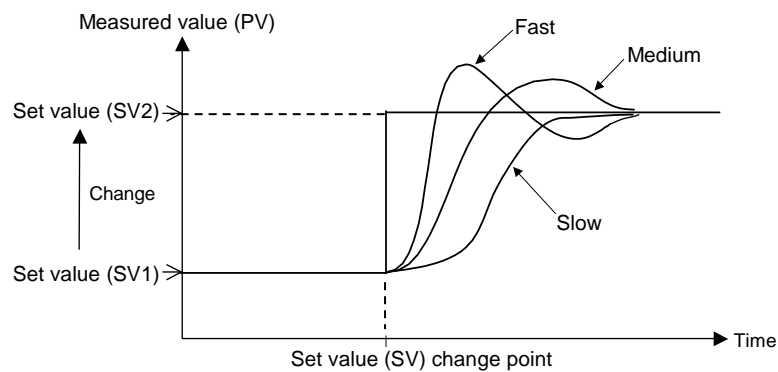
■ Setting change rate limiter (up) (1.SVrU, 2.SVrU)

This function is to allow the Set value (SV) to be automatically changed at specific rates when a new Set value (SV). SVrU is used when the SV is changed to a higher SV.

Data range: OFF (Unused)
0.1 to Input span/unit time
(Varies with the setting of the Decimal point position)

Factory set value: Input 1_setting change rate limiter (up) (1.SVrU): OFF
Input 2_setting change rate limiter (up) (2.SVrU): OFF

📖 The unit time can be changed by the Setting change rate limiter unit time in the Engineering mode (P. 97). (Factory set value: 60 seconds)
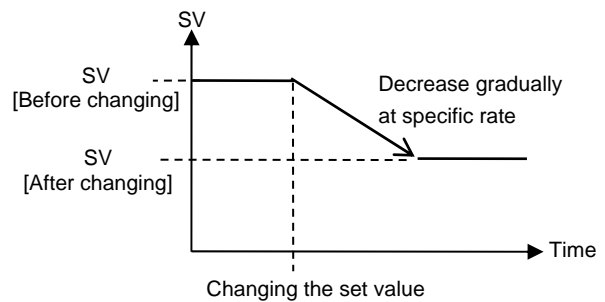
■ Setting change rate limiter (down) (1.SVrd, 2.SVrd)

This function is to allow the Set value (SV) to be automatically changed at specific rates when a new Set value (SV). SVrd is used when the SV is changed to a lower SV.

Data range: OFF (Unused)
                     0.1 to Input span/unit time
                     (Varies with the setting of the Decimal point position)
Factory set value: Input 1_setting change rate limiter (down) (1.SVrd): OFF
                     Input 2_setting change rate limiter (down) (2.SVrd): OFF

📖   The unit time can be changed by the Setting change rate limiter unit time in the Engineering mode
        (P. 97). (Factory set value: 60 seconds)

Setting change rate limiter:

   Application examples of setting change rate limiter:

   ● Increasing the SV to a higher value   ● Decreasing the SV to a lower value
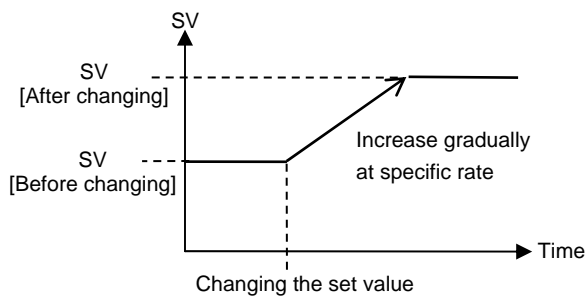
📖   When the Setting change rate limiter is used, the SV will also ramp up or ramp down by the function
        at power-on and operation mode change from STOP to RUN.

📖   If the Autotuning (AT) function is activated while the SV is ramping up or ramping down by the
        Setting change rate limiter, AT will starts after the SV finishes ramp-up or ramp-down by the limiter,
        and the controller is in PID control mode until AT starts.

📖   When the value of Setting change rate limiter is changed during normal operation, the ramp-up or
        ramp-down rate will be changed unless the SV already has finished ramp-up or ramp-down by the
        function.

📖   If the rate of Setting change limiter is set to any value other than "OFF (Unused)," the Event re-hold
        action to be taken by a Set value (SV) change becomes invalid.

■ Area soak time (AST)

Area soak time is used for Ramp/Soak control function in conjunction with Link area number and Setting change rate limiter (up/down).

Data range: 0 hour 00.00 second to 9 minutes 59.99 seconds or
                     0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds
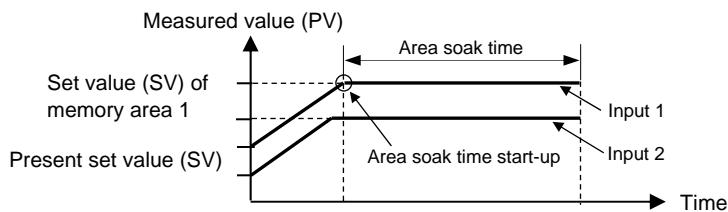
Factory set value: 0.00.00 (0 minute 00.00 second)

Related parameters: Setting change rate limiter (up) (P. 38), Setting change rate limiter (down) (P. 39),
                     Link area number (P. 41), Memory area soak time monitor (P. 107)

📖   The unit time can be changed by the Soak time unit selection in the Engineering mode. (P. 97).
     (Factory set value: 0 minute 00.00 second to 9 minutes 59.99 seconds)

📖   The Area soak time can be changed during normal operation with Ramp/Soak control function, but
     Read the following example carefully how the time change affects Ramp/Soak control time. For
     example, the memory area which has 5-minute soak time is executed. When 3 minutes passed, the
     Area soak time is changed from 5 minutes to 10 minutes. The remaining time of the currently
     executed Memory area is calculated as follows.
     (The new soak time 10 minutes) – (lapsed time 3 minutes) = (remaining time 7 minutes)
     The old soak time does not have any effect on remaining time.
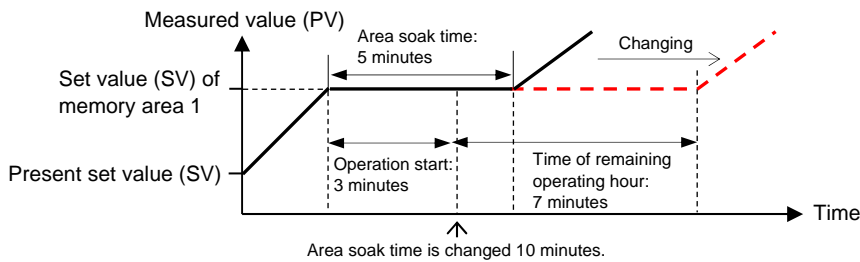
📖   For the instrument with the 2-input specification, its area soaking starts based on the arrival at the
     memory area set value of Input 1 or that of Input 2, whichever later.

■ Link area number (LnKA)

Link area number is used for Ramp/Soak control function in conjunction with Area soak time and Setting change rate limiter (up/down).

Data range: OFF (No link)

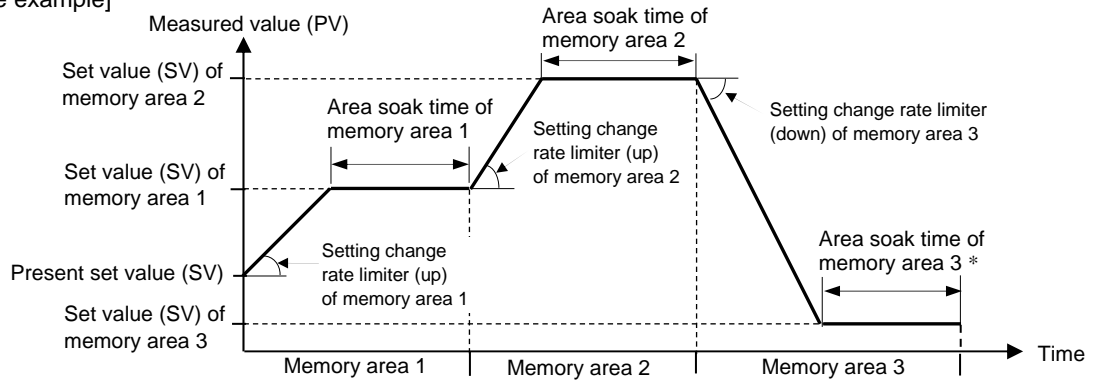   1 to 16

Factory set value: OFF

Related parameters: Setting change rate limiter (up) (P. 38), Setting change rate limiter (down) (P. 39),
                     Area soak time (P. 40), Memory area soak time monitor (P. 107)

Ramp/Soak Control Function:

      Ramp/Soak control is possible by using Area soak time, Link area number and Setting change rate limiter (up/down) in Parameter setting mode.

[Usage example]

* The Area soak time for the memory area linked last becomes invalid to continue the state of the Set value (SV) reached.
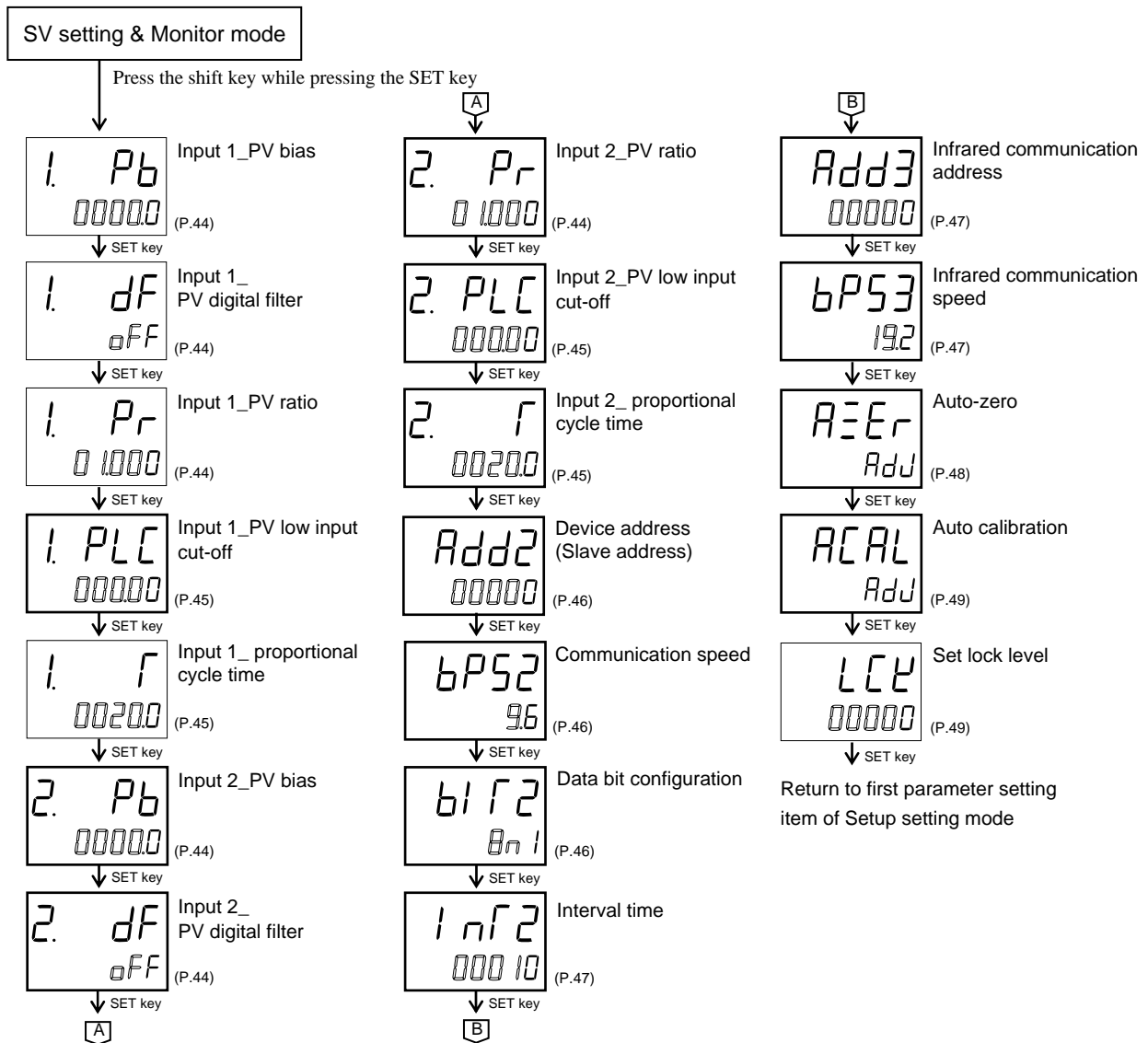
7. SETUP SETTING MODE

7.1 Display Sequence

In Setup setting mode, the following operations are possible.

Change other operation/control related parameters
Change Communication parameters
Change Data lock level

To go to Setup setting mode from SV setting & Monitor mode, press the shift key while pressing the SET key.

```
┌─────────────────────────┐
│ SV setting & Monitor mode│
└─────────────────────────┘
   │  Press the shift key while pressing the SET key
   ▼                                  A                                  B
```

1. Pb / 0000.0 — Input 1_PV bias (P.44)	**2. Pr** / 0 1.000 — Input 2_PV ratio (P.44)	**Add3** / 00000 — Infrared communication address (P.47)
↓ SET key	↓ SET key	↓ SET key
1. dF / oFF — Input 1_ PV digital filter (P.44)	**2. PLC** / 000.00 — Input 2_PV low input cut-off (P.45)	**bPS3** / 19.2 — Infrared communication speed (P.47)
↓ SET key	↓ SET key	↓ SET key
1. Pr / 0 1.000 — Input 1_PV ratio (P.44)	**2. Γ** / 0020.0 — Input 2_ proportional cycle time (P.45)	**A=Er** / AdJ — Auto-zero (P.48)
↓ SET key	↓ SET key	↓ SET key
1. PLC / 000.00 — Input 1_PV low input cut-off (P.45)	**Add2** / 00000 — Device address (Slave address) (P.46)	**ACAL** / AdJ — Auto calibration (P.49)
↓ SET key	↓ SET key	↓ SET key
1. Γ / 0020.0 — Input 1_ proportional cycle time (P.45)	**bPS2** / 9.6 — Communication speed (P.46)	**LCK** / 00000 — Set lock level (P.49)
↓ SET key	↓ SET key	↓ SET key
2. Pb / 0000.0 — Input 2_PV bias (P.44)	**bIΓ2** / 8n 1 — Data bit configuration (P.46)	Return to first parameter setting item of Setup setting mode
↓ SET key	↓ SET key	
2. dF / oFF — Input 2_ PV digital filter (P.44)	**InΓ2** / 000 10 — Interval time (P.47)	
↓ SET key	↓ SET key	
A	B	

[ ] : Parameters displayed when function is specified.

📖 Parameters which are not related to existing functions on the controller are not displayed.

📖 To return the SV setting & Monitor mode, press the shift key while pressing the SET key.

📖 This instrument returns to the PV1/SV1 monitor screen if no key operation is performed within 1 minute.

7.2 Parameter List

Parameter		Page
Input 1_PV bias	*1. Pb* (1. Pb)	P. 44
Input 1_PV digital filter	*1. dF* (1. dF)	P. 44
Input 1_PV ratio	*1. Pr* (1. Pr)	P. 44
Input 1_PV low input cut-off	*1. PLC* (1. PLC)	P. 45
Input 1_ proportional cycle time	*1. T* (1. T)	P. 45
Input 2_PV bias	*2. Pb* (2. Pb)	P. 44
Input 2_PV digital filter	*2. dF* (2. dF)	P. 44
Input 2_PV ratio	*2. Pr* (2. Pr)	P. 44
Input 2_PV low input cut-off	*2. PLC* (2. PLC)	P. 45
Input 2_ proportional cycle time	*2. T* (2. T)	P. 45
Device address (Slave address)	*Add2* (Add2)	P. 46
Communication speed	*bPS2* (bPS2)	P. 46
Data bit configuration	*bIT2* (bIT2)	P. 46
Interval time	*InT2* (InT2)	P. 47
Infrared communication address	*Add3* (Add3)	P. 47
Infrared communication speed	*bPS3* (bPS3)	P. 47

Parameter		Page
Auto-zero	*AZEr* (AZEr)	P. 48
Auto calibration	*ACAL* (ACAL)	P. 49
Set lock level	*LCK* (LCK)	P. 49

7.3 Description of Each Parameter

■ PV bias (1. Pb, 2. Pb)

PV bias adds bias to the Measured value (PV). The PV bias is used to compensate the individual variations of the sensors or correct the difference between the Measured value (PV) of other instruments.

Data range: −Input span to +Input span

Factory set value: Input 1_PV bias (1. Pb): 0
                        Input 2_PV bias (2. Pb): 0

Related parameter: Auto-zero (P. 48)

> 📖 The Input 1_PV bias (1. Pb) value is also reflected to the result of Auto-zero adjustment. Manual zero adjustment can be performed by changing this PV bias value.*
> * Relevant pressure sensors: Our CZ-100P or CZ-200P

■ PV digital filter (1. dF, 2. dF)

This item is the time of the first-order lag filter eliminate noise against the measured input.

Data range: OFF (Unused)
                        0.01 to 10.00 seconds

Factory set value: Input 1_PV digital filter (1. dF): OFF
                        Input 2_PV digital filter (2. dF): OFF

■ PV ratio (1. Pr, 2. Pr)

PV ratio is a multiplier to be applied to the Measured value (PV). The PV ratio is used to compensate the individual variations of the sensors or correct the difference between the Measured value (PV) of other instruments.

Data range: 0.500 to 1.500

Factory set value: Input 1_PV ratio (1. Pr): 1.000
                        Input 2_PV ratio (2. Pr): 1.000

Related parameter: Auto calibration (P. 49)

> 📖 When using our CZ-100P or CZ-200P:
> • Explosionproof specification type:
>   Set the desired correction factor of our safety barrier RZB-001 to the Input 1_PV ratio (1. Pr). Thus, an indicated error caused by the use of the safety barrier is corrected. The correction factor is described in the nameplate attached to the safety barrier (RZB-001).
> • Non-explosionproof specification type:
>   As the Input 1_PV ratio (1. Pr), use a factory set value of "1.000" with this value left intact.

> 📖 When using the strain gauge type sensors other than RKC product:
> The result obtained by Auto calibration is reflected to the Input 1_PV ratio (1. Pr).
> Manual full scale adjustment can be performed by changing this PV ratio value.

■ PV low input cut-off (1. PLC, 2. PLC)

PV low input cut-off is used with Square root extraction function. The measured value less than the PV low input cut-off is ignored to prevent control disturbance caused by input variation at low measured value range.

Data range: 0.00 to 25.00 % of input span
Factory set value: Input 1_PV low input cut-off: (1. PLC): 0.00
                      Input 2_PV low input cut-off: (2. PLC): 0.00
Related parameters: Square root extraction selection (P. 72)
PV low input cut-off function:

> When input signal square root extraction is used for in flow control, etc., the Square root extraction result varies widely at the low measured value range. The measured value less than the PV low input cut-off is ignored to calculate control output in order to prevent control disturbance caused by input variation at low measured value range.
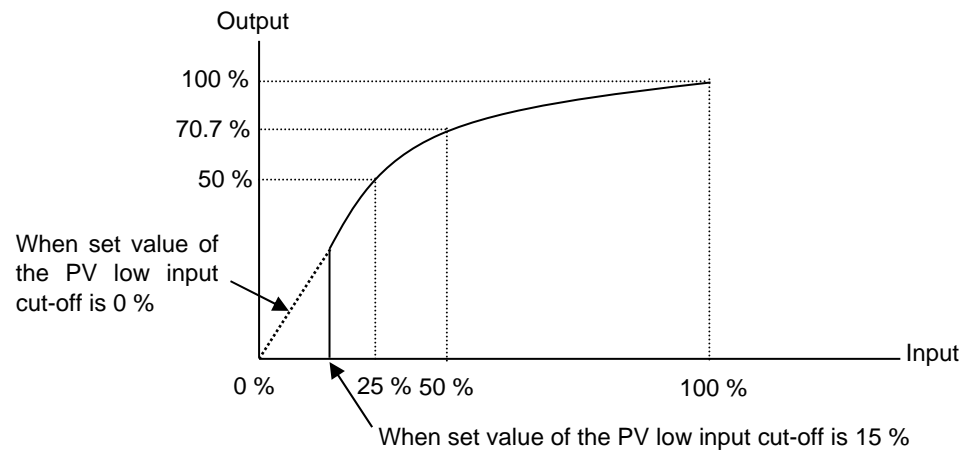
■ Proportional cycle time (1. T, 2. T)

Proportional cycle time is to set control cycle time for time based control output such as voltage pulse for SSR, triac and relay output.

Data range: 0.1 to 100.0 seconds
Factory set value: Input 1_proportional cycle time (1. T):
                      Relay contact output: 20.0 seconds
                      Voltage pulse output and triac output: 2.0 seconds

                     Input 2_proportional cycle time (2. T):
                      Relay contact output: 20.0 seconds
                      Voltage pulse output and triac output: 2.0 seconds

📖   The Proportional cycle time becomes invalid when the Voltage/Current output is selected as control output type.

■ Device address (Slave address) (Add2)

Device address is used to set the Slave address of the controller for Communication function (optional).

Data range:　　　　0 to 99 　(RKC communication, Modbus)
　　　　　　　　　　0 to 63 　(DeviceNet)
　　　　　　　　　　0 to 64 　(CC-Link: 1 station occupied 1 time, 1 station occupied 4 times, 1 station occupied 8 times)
　　　　　　　　　　0 to 126 (PROFIBUS)
　　　　　　　　　　1 to 61 　(CC-Link: 4 stations occupied 1 time)

Factory set value: 0

> 📖 **Do not use the same device address for more than one controller in multi-drop connection. Each controller must have a unique address in multi-drop connection.**

> 📖 **In Modbus and PROFIBUS and CC-Link communications, two-way communications are not possible when the addresses are 0.**

■ Communication speed (bPS2)

Communication speed is to set communication speed for Communication function (optional).

Data range:　2.4:　2400 bps　　　　125: 125 kbps [1]　　　156:　156 kbps [2]
　　　　　　　4.8:　4800 bps　　　　250: 250 kbps [1]　　　625:　625 kbps [2]
　　　　　　　9.6:　9600 bps　　　　500: 500 kbps [1]　　　2500: 2.5 Mbps [2]
　　　　　　　19.2: 19200 bps　　　　　　　　　　　　　　5000:　5 Mbps [2]
　　　　　　　38.4: 38400 bps　　　　　　　　　　　　　　10000: 10 Mbps [2]

[1] A communication speed of 125 to 500 kbps can be selected for DeviceNet.

[2] A communication speed of 156 kbps, 625 kbps, and 2.5 to 10 Mbps can be selected for CC-Link.

Factory set value:　9.6 (RKC communication, Modbus)
　　　　　　　　　　125 (DeviceNet)
　　　　　　　　　　156 (CC-Link)

> 📖 **Set the same communication speed for both the HA430/930 (slave) and the host computer (master).**

> 📖 Communication speed is not necessary to be selected for PROFIBUS.

■ Data bit configuration (bIT2)

This item is Data bit configuration of Communication function (optional).

Data range:　Refer to below

[Data bit configuration table]

Set value	Data bit	Parity bit	Stop bit
8n1 (8n1)	8	Without	1
8n2 (8n2)	8	Without	2
8E1 (8E1)	8	Even	1
8E2 (8E2)	8	Even	2
8o1 (8o1)	8	Odd	1
8o2 (8o2)	8	Odd	2
7n1 (7n1) *	7	Without	1
7n2 (7n2) *	7	Without	2
7E1 (7E1) *	7	Even	1
7E2 (7E2) *	7	Even	2
7o1 (7o1) *	7	Odd	1
7o2 (7o2) *	7	Odd	2

Setting range of Modbus: 8n1 to 8o2
Setting range of RKC communication: 8n1 to 7o2
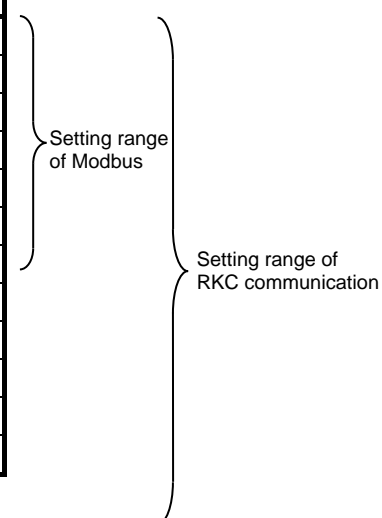
* When the Modbus communication protocol selected, this setting becomes invalid.

Factory set value:　8n1 (Data bit: 8, Parity bit: Without, Stop bit: 1)

> 📖 Data bit configuration is not necessary to be selected for PROFIBUS, DeviceNet and CC-Link.

■ Interval time (InT2)

This item is Interval time of Communication function (optional).

Data range:　　　　　0 to 250 ms

Factory set value:　　10

Interval Time function:　The interval time for the HA430/930 should be set to provide a time for host computer to finish sending all data including stop bit and switch the line to receive status for the host.

If the Interval time between the two is too short, the HA430/930 may send data before the host computer is ready to receive it. In this case, communication transmission cannot be conducted correctly. For a successful communication sequence to occur, the HA430's or HA930's interval time must match the specifications of the host computer.

■ Infrared communication address (Add3)

Infrared communication address is used to set the device address of the controller for Infrared communication function.

Data range:　　　0 to 99

Factory set value:　0

■ Infrared communication speed (bPS3)

This item is communication speed of the Infrared communication function.

Data range:　　　9.6:　9600 bps

　　　　　　　　　19.2: 19200 bps

Factory set value:　19.2

The factory set value of the Infrared communication speed of your PDA's [*] is 19200 bps.

Data bit, Stop bit and Parity bit on this controller under Infrared communication are fixed to the following settings. The relevant bits on the PDA* are fixed to the same settings as on this controller prior to factory set value. Therefore do not change them at the site.

- Data bit:　7-bit
- Parity bit: Even
- Stop bit:　1-bit

　* The PDA being used is necessary to be installed with the infrared communication software RKCIR.

■ **Auto-zero (AZEr)**

Adjust the zero point of the Measured value (PV1) on the Input 1 side.

Factory set value: —

Related parameters: PV bias (P. 44)

Adjustment procedure:

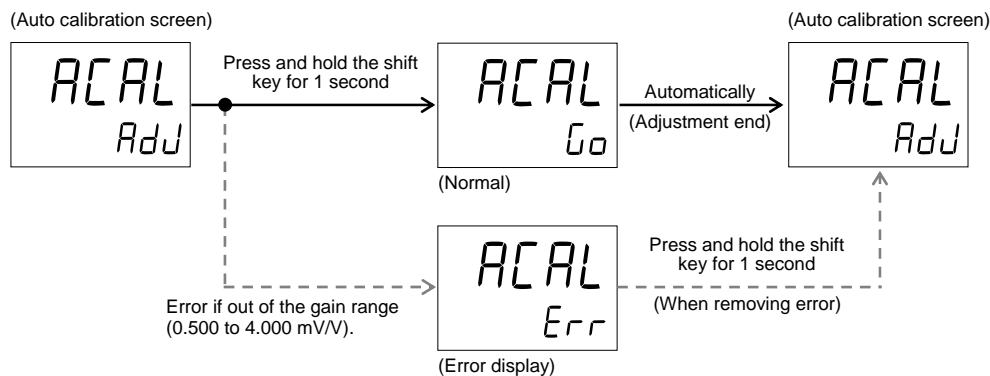*1.* Make sure that the pressure sensor * is installed on the equipment.

☞ **3. Wiring (P. 13)**

 * Relevant pressure sensors: Our CZ-100P or CZ-200P

2. Rise the temperature of the equipment installed with the pressure sensor up to the temperature during operation.

3. Set the pressure sensor to the no-load state.

4. Change the operation state to the control STOP.

5. Pressing the shift key for 1 second while displaying the Auto-zero screen automatically starts Auto-zero operation.

If this Auto-zero operation normally end, the screen returns to the Auto-zero screen.
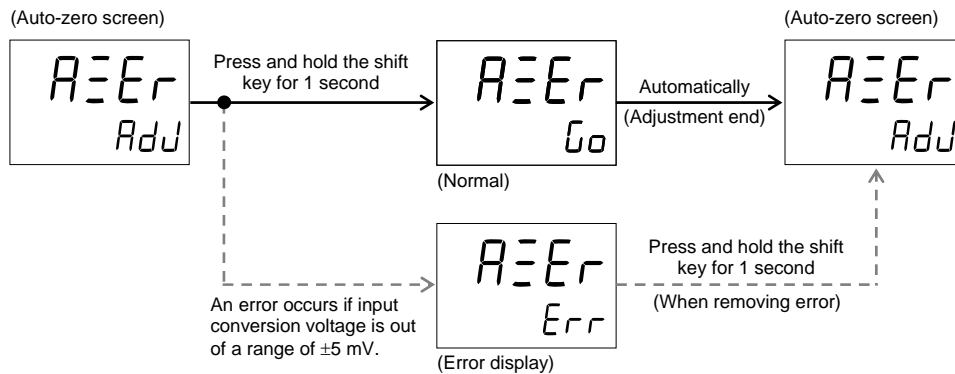
📖   The result of Auto-zero adjustment is also reflected to the Input 1_PV bias (1. Pb) value.

Manual zero point adjustment can be performed by changing this PV bias value.

■ Auto calibration (ACAL)

Adjust the full scale point of the Measured value (PV1) on the Input 1 side.

Factory set value: —
Related parameters: PV ratio (P. 44), Shunt resistance output value (P. 68)
Adjustment procedure:

1. Make sure that the pressure sensor * is installed on the equipment.

☞ **3. Wiring (P. 13)**

* Relevant pressure sensors: The strain gauge type sensors other than RKC product

2. Rise the temperature of the equipment installed with the pressure sensor up to the temperature during operation.

3. Change the operation state to the control STOP.

4. Pressing the shift key for 1 second while displaying the Auto calibration screen automatically starts Auto calibration operation. If this Auto calibration operation normally end, the screen returns to the Auto calibration screen.

📖 For this product, in order to generate the R-cal output it is not necessary to short the cables (blue and orange) on the pressure sensor side.

(Auto calibration screen)   (Auto calibration screen)

ACAL AdJ — Press and hold the shift key for 1 second → ACAL Go (Normal) — Automatically (Adjustment end) → ACAL AdJ

Error if out of the gain range (0.500 to 4.000 mV/V).

ACAL Err (Error display) — Press and hold the shift key for 1 second (When removing error)

📖 The result obtained by Auto calibration is reflected to the Input 1_PV ratio (1. Pr) value.
Manual full scale point adjustment can be performed by changing this PV ratio value.

■ Set lock level (LCK)

The Set lock level restricts parameter setting changes by key operation (Set data lock function).
This function prevents the operator from making errors during operation.

LCK 00000
(5) (4) (3) (2) (1)
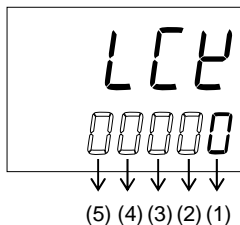
Data range:
(1) Parameters other than Set value (SV) and Event set value (EV1 to EV4):
   0: Unlock   1: Lock
(2) Event set value (EV1 to EV4)
   0: Unlock   1: Lock
(3) Set value (SV)
   0: Unlock   1: Lock
(4) **"0" Fixed (No setting)**
(5) **"0" Fixed (No setting)**

Factory set value: 00000

📖 In the Set lock level, Data lock is not possible for the following parameters.

• Memory area selection (SV setting & Monitor mode),
• Parameters of function block number F10 to F91 (Engineering mode)

📖 Set lock level can be changed in both RUN and STOP mode.

📖 Parameters protected by Data lock function are still displayed for monitoring.
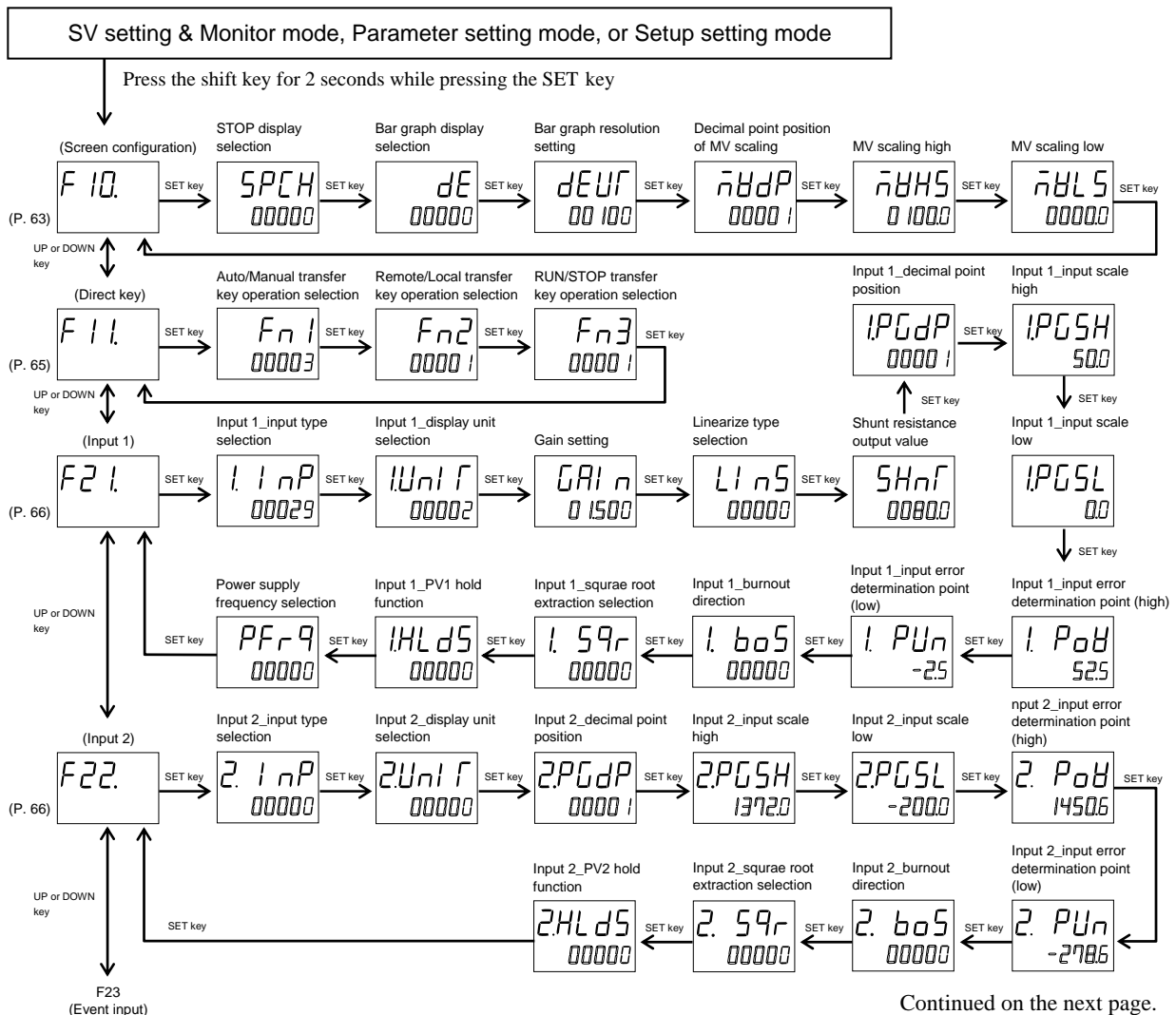
8. ENGINEERING MODE

> ⚠ **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.

📖 **Parameters in Engineering mode are settable only when the controller is in STOP mode.**

📖 **Function blocks and setting items which do not exist in the HA430/930 are displayed on the screen of the shaded section. For these functions blocks and setting items, use their factory set values with these values left intact.**

📖 All parameters of the engineering mode are displayed regardless of the instrument specification.

8.1 Display Sequence

To go to Engineering mode, press the shift key for 2 seconds while pressing the SET key at SV setting & Monitor mode, Parameter setting mode, or Setup setting mode.
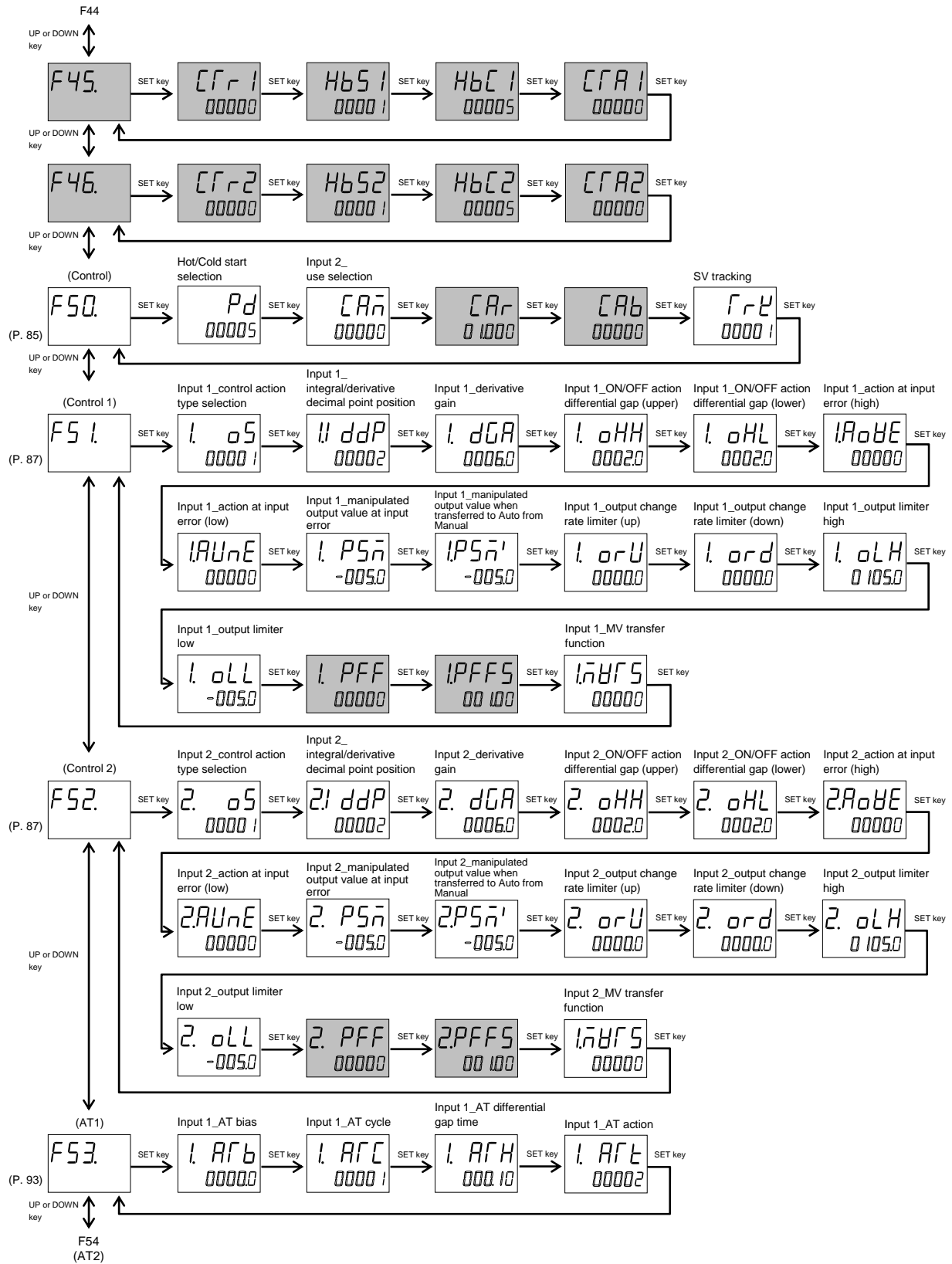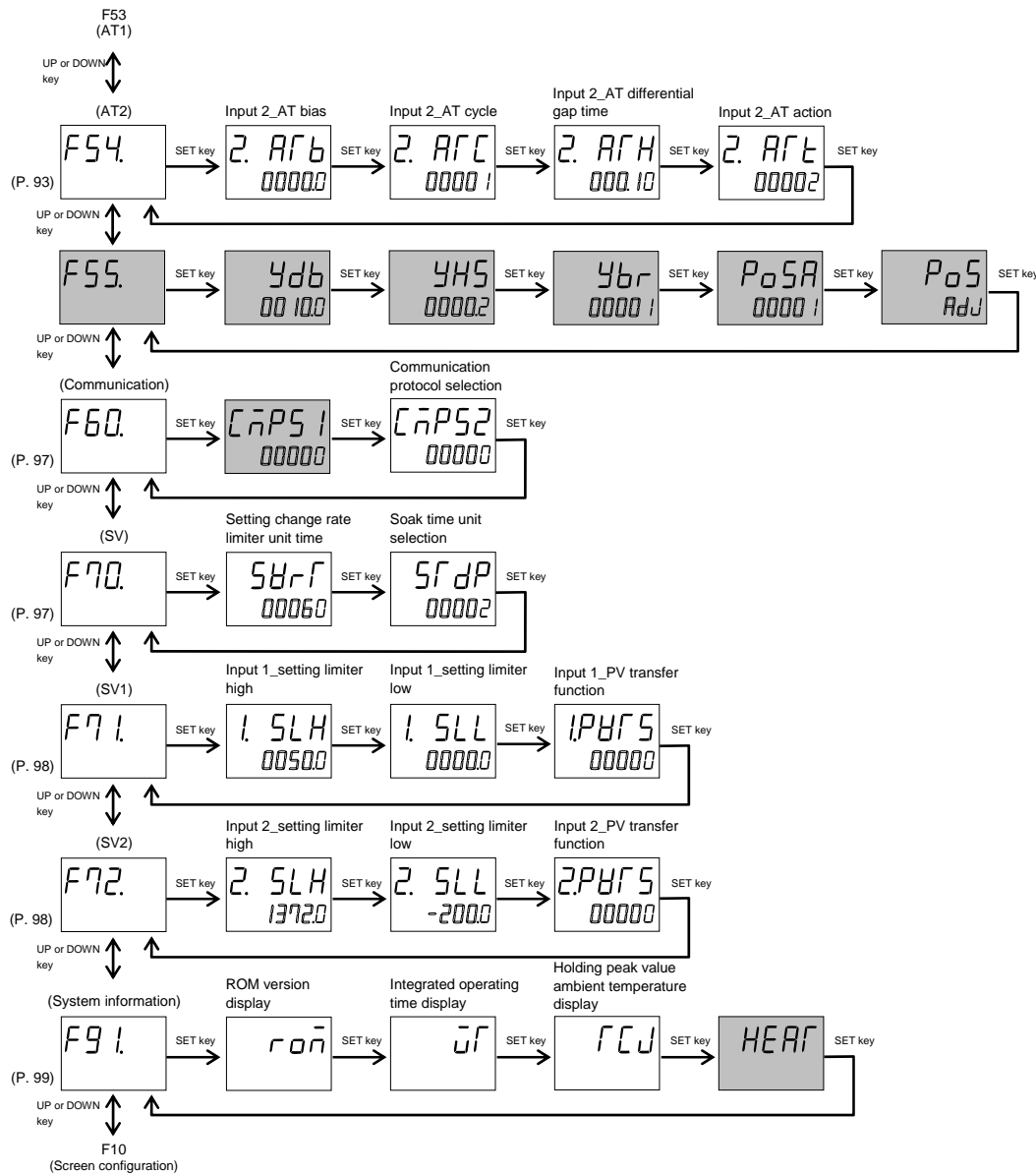
Continued from the previous page.

Continued from the previous page.

F44

UP or DOWN key

| F45. | SET key → | CCr1 00000 | SET key → | HbS1 00001 | SET key → | HbC1 00005 | SET key → | CCA1 00000 | SET key |

UP or DOWN key

| F46. | SET key → | CCr2 00000 | SET key → | HbS2 00001 | SET key → | HbC2 00005 | SET key → | CCA2 00000 | SET key |

UP or DOWN key

(Control)

| | | Hot/Cold start selection | | Input 2_ use selection | | | | | | SV tracking | |
| F50. (P. 85) | SET key → | Pd 00005 | SET key → | CAn 00000 | SET key → | CAr 01000 | SET key → | CAb 00000 | SET key → | rtt 00001 | SET key |

UP or DOWN key

(Control 1)

| | | Input 1_control action type selection | | Input 1_ integral/derivative decimal point position | | Input 1_derivative gain | | Input 1_ON/OFF action differential gap (upper) | | Input 1_ON/OFF action differential gap (lower) | | Input 1_action at input error (high) | |
| F51. (P. 87) | SET key → | 1. oS 00001 | SET key → | 1.I ddP 00002 | SET key → | 1. dGA 0006.0 | SET key → | 1. oHH 0002.0 | SET key → | 1. oHL 0002.0 | SET key → | 1.AoHE 00000 | SET key |

| | Input 1_action at input error (low) | | Input 1_manipulated output value at input error | | Input 1_manipulated output value when transferred to Auto from Manual | | Input 1_output change rate limiter (up) | | Input 1_output change rate limiter (down) | | Input 1_output limiter high | |
| → | 1.AUnE 00000 | SET key → | 1. PSn -005.0 | SET key → | 1.PSn' -005.0 | SET key → | 1. orU 0000.0 | SET key → | 1. ord 0000.0 | SET key → | 1. oLH 0105.0 | SET key |

| | Input 1_output limiter low | | | | Input 1_MV transfer function | |
| → | 1. oLL -005.0 | SET key → | 1. PFF 00000 | SET key → | 1.PFFS 00100 | SET key → | 1.nWrS 00000 | SET key |

UP or DOWN key

(Control 2)

| | | Input 2_control action type selection | | Input 2_ integral/derivative decimal point position | | Input 2_derivative gain | | Input 2_ON/OFF action differential gap (upper) | | Input 2_ON/OFF action differential gap (lower) | | Input 2_action at input error (high) | |
| F52. (P. 87) | SET key → | 2. oS 00001 | SET key → | 2.I ddP 00002 | SET key → | 2. dGA 0006.0 | SET key → | 2. oHH 0002.0 | SET key → | 2. oHL 0002.0 | SET key → | 2.AoHE 00000 | SET key |

| | Input 2_action at input error (low) | | Input 2_manipulated output value at input error | | Input 2_manipulated output value when transferred to Auto from Manual | | Input 2_output change rate limiter (up) | | Input 2_output change rate limiter (down) | | Input 2_output limiter high | |
| → | 2.AUnE 00000 | SET key → | 2. PSn -005.0 | SET key → | 2.PSn' -005.0 | SET key → | 2. orU 0000.0 | SET key → | 2. ord 0000.0 | SET key → | 2. oLH 0105.0 | SET key |

| | Input 2_output limiter low | | | | Input 2_MV transfer function | |
| → | 2. oLL -005.0 | SET key → | 2. PFF 00000 | SET key → | 2.PFFS 00100 | SET key → | 1.nWrS 00000 | SET key |

UP or DOWN key

(AT1)

| | | Input 1_AT bias | | Input 1_AT cycle | | Input 1_AT differential gap time | | Input 1_AT action | |
| F53. (P. 93) | SET key → | 1. ACb 0000.0 | SET key → | 1. ACC 00001 | SET key → | 1. ACH 000.10 | SET key → | 1. ACt 00002 | SET key |

UP or DOWN key

F54 (AT2)

Continued from the previous page.

F53
(AT1)

UP or DOWN key

(AT2)

| (P. 93) | F54. | SET key → | Input 2_AT bias
2. ARb
0000.0 | SET key → | Input 2_AT cycle
2. ARC
00001 | SET key → | Input 2_AT differential
gap time
2. ARH
000.10 | SET key → | Input 2_AT action
2. ARt
00002 | SET key |

UP or DOWN key

| F55. | SET key → | Ydb
00 10.0 | SET key → | YHS
0000.2 | SET key → | Ybr
00001 | SET key → | PoSA
00001 | SET key → | PoS
AdJ | SET key |

UP or DOWN key

(Communication)

| (P. 97) | F60. | SET key → | CnPS1
00000 | SET key → | Communication
protocol selection
CnPS2
00000 | SET key |

UP or DOWN key

(SV)

| (P. 97) | F70. | SET key → | Setting change rate
limiter unit time
SUrt
00060 | SET key → | Soak time unit
selection
SrdP
00002 | SET key |

UP or DOWN key

(SV1)

| (P. 98) | F71. | SET key → | Input 1_setting limiter
high
1. SLH
0050.0 | SET key → | Input 1_setting limiter
low
1. SLL
0000.0 | SET key → | Input 1_PV transfer
function
1.PUrS
00000 | SET key |

UP or DOWN key

(SV2)

| (P. 98) | F72. | SET key → | Input 2_setting limiter
high
2. SLH
1372.0 | SET key → | Input 2_setting limiter
low
2. SLL
-200.0 | SET key → | Input 2_PV transfer
function
2.PUrS
00000 | SET key |

UP or DOWN key

(System information)

| (P. 99) | F91. | SET key → | ROM version
display
ron
SET key → | Integrated operating
time display
uT
SET key → | Holding peak value
ambient temperature
display
rCJ
SET key → | HEAr | SET key |

UP or DOWN key

F10
(Screen configuration)

📖 To return to the SV setting & Monitor mode, press and hold the SET key for 2 seconds, or press the shift key while pressing the SET key.

📖 If the key is not pressed within 1 minute, the display will automatically return to the SV setting & Monitor mode.

8.2 Parameter List

Function block		Parameter		Page
$F\,I0.$ (F10.)	Screen configuration	STOP display selection	$5PCH$ (SPCH)	P. 63
		Bar graph display selection	dE (dE)	
		Bar graph resolution setting	$dEU\Gamma$ (dEUT)	P. 64
		Decimal point position of MV scaling	$\bar{n}HdP$ (MVdP)	
		MV scaling high	$\bar{n}HH5$ (MVHS)	
		MV scaling low	$\bar{n}HL5$ (MVLS)	P. 65
$F\,II.$ (F11.)	Direct key	Auto/Manual transfer key operation selection	$Fn\,I$ (Fn1)	P. 65
		Remote/Local transfer key operation selection	$Fn2$ (Fn2)	
		RUN/STOP transfer key operation selection	$Fn3$ (Fn3)	
$F2\,I.$ (F21.)	Input 1	Input 1_input type selection	$I.\,InP$ (1. InP)	P. 66
		Input 1_display unit selection	$I.Un\,I\Gamma$ (1. UnIT)	P. 67
		Gain setting	$GAI\,n$ (GAIn)	
		Linearize type selection	$LI\,n5$ (LInS)	P. 68
		Shunt resistance output value	$5Hn\Gamma$ (SHnT)	
		Input 1_decimal point position	$I.PGdP$ (1.PGdP)	P. 69
		Input 1_input scale high	$I.PG5H$ (1.PGSH)	
		Input 1_input scale low	$I.PG5L$ (1.PGSL)	P. 70
		Input 1_input error determination point (high)	$I.\,PoH$ (1. PoV)	
		Input 1_input error determination point (low)	$I.\,PUn$ (1. PUn)	P 71
		Input 1_burnout direction	$I.\,bo5$ (1.boS)	
		Input 1_square root extraction selection	$I.\,59r$ (1. SQr)	P 72
		Input 1_PV1 hold function	$I.HLd5$ (1. HLdS)	
		Power supply frequency selection	$PF\,r9$ (PFrQ)	
$F22.$ (F22.)	Input 2	Input 2_input type selection	$2.\,InP$ (2. InP)	P. 66
		Input 2_display unit selection	$2.Un\,I\Gamma$ (2. UnIT)	P. 67
		Input 2_decimal point position	$2.PGdP$ (2.PGdP)	P. 69
		Input 2_input scale high	$2.PG5H$ (2.PGSH)	
		Input 2_input scale low	$2.PG5L$ (2.PGSL)	P. 70
		Input 2_input error determination point (high)	$2.\,PoH$ (2. PoV)	
		Input 2_input error determination point (low)	$2.\,PUn$ (2. PUn)	P. 71
		Input 2_burnout direction	$2.\,bo5$ (2.boS)	
		Input 2_square root extraction selection	$2.\,59r$ (2. SQr)	P. 72
		Input 2_PV2 hold function	$2.HLd5$ (2. HLdS)	

Continued from the previous page.

Function block		Parameter			Page
F23. (F23.)	Event input	Event input logic selection	*dI 5L* (dISL)		P. 73
F30. (F30.)	Output	Output logic selection	*LoGC* (LoGC)		P. 76
		Output 1 timer setting	*oTT 1* (oTT1)		P. 77
		Output 2 timer setting	*oTT 2* (oTT2)		
		Output 3 timer setting	*oTT 3* (oTT3)		
		Output 4 timer setting	*oTT 4* (oTT4)		
		Output 5 timer setting	*oTT 5* (oTT5)		
		Alarm lamp lighting condition setting 1	*ALC 1* (ALC1)		
		This item is not used for the HA430/930.	*ALC2* (ALC2)		—
		Interlock function	*oTIL* (oTIL)		P. 78
F31. (F31.)	Transmission output 1	Transmission output 1 type selection	*Ao 1* (Ao1)		P. 79
		Transmission output 1 scale high	*AHS 1* (AHS1)		
		Transmission output 1 scale low	*ALS 1* (ALS1)		
F32. (F32.)	Transmission output 2	Transmission output 2 type selection	*Ao2* (Ao2)		P. 79
		Transmission output 2 scale high	*AHS2* (AHS2)		
		Transmission output 2 scale low	*ALS2* (ALS2)		
F33. (F33.)	Transmission output 3	Transmission output 3 type selection	*Ao3* (Ao3)		P. 79
		Transmission output 3 scale high	*AHS3* (AHS3)		
		Transmission output 3 scale low	*ALS3* (ALS3)		
F41. (F41.)	Event 1	Event 1 type selection	*ES 1* (ES1)		P. 80
		Event 1 hold action	*EHo 1* (EHo1)		P. 82
		Event 1 differential gap	*EH 1* (EH1)		P. 83
		Event 1 action at input error	*EEo 1* (EEo1)		P. 84
		Event 1 assignment	*EVA 1* (EVA1)		
F42. (F42.)	Event 2	Event 2 type selection	*ES2* (ES2)		P. 80
		Event 2 hold action	*EHo2* (EHo2)		P. 82
		Event 2 differential gap	*EH2* (EH2)		P. 83
		Event 2 action at input error	*EEo2* (EEo2)		P. 84
		Event 2 assignment	*EVA2* (EVA2)		
F43. (F43.)	Event 3	Event 3 type selection	*ES3* (ES3)		P. 80
		Event 3 hold action	*EHo3* (EHo3)		P. 82
		Event 3 differential gap	*EH3* (EH3)		P. 83
		Event 3 action at input error	*EEo3* (EEo3)		P. 84
		Event 3 assignment	*EVA3* (EVA3)		

Continued from the previous page.

Function block		Parameter			Page
$F44$ (F44.)	Event 4	Event 4 type selection	$E54$	(ES4)	P. 80
		Event 4 hold action	$EHo4$	(EHo4)	P. 82
		Event 4 differential gap	$EH4$	(EH4)	P. 83
		Event 4 action at input error	$EEo4$	(EEo4)	P. 84
		Event 4 assignment	$EHA4$	(EVA4)	
$F45.$ (F45.)	**These are function blocks unused in the HA430/930.** **(Their settings are invalid)**				
$F46.$ (F46.)	**These are function blocks unused in the HA430/930.** **(Their settings are invalid)**				
$F50.$ (F50.)	Control	Hot/Cold start selection	Pd	(Pd)	P. 85
		Input 2_use selection	CAm	(CAM)	
		These items are not used for the HA430/930.	CAr	(CAr)	—
			CAb	(CAb)	—
		SV tracking	TrK	(TrK)	P. 86
$F51.$ (F51.)	Control 1	Input 1_control action type selection	$1. oS$	(1. oS)	P. 87
		Input 1_integral/derivative decimal point position	$1I ddP$	(1.IddP)	
		Input 1_derivative gain	$1. dGA$	(1. dGA)	
		Input 1_ON/OFF action differential gap (upper)	$1. oHH$	(1. oHH)	P. 88
		Input 1_ON/OFF action differential gap (lower)	$1. oHL$	(1. oHL)	
		Input 1_action at input error (high)	$1.AoVE$	(1.AoVE)	P. 89
		Input 1_action at input error (low)	$1.AUnE$	(1.AUnE)	
		Input 1_manipulated output value at input error	$1. PSM$	(1. PSM)	P. 90
		Input 1_manipulated output value when transferred to Auto from Manual	$1.PSM'$	(1.PSM')	
		Input 1_output change rate limiter (up)	$1. orU$	(1. orU)	
		Input 1_output change rate limiter (down)	$1. ord$	(1. ord)	P. 91
		Input 1_output limiter high	$1. oLH$	(1. oLH)	P. 92
		Input 1_output limiter low	$1. oLL$	(1. oLL)	
		These items are not used for the HA430/930.	$1. PFF$	(1. PFF)	—
			$1.PFFS$	(1.PFFS)	—
		Input 1_MV transfer function	$1.mVTS$	(1.MVTS)	P. 92
$F52.$ (F52.)	Control 2	Input 2_control action type selection	$2. oS$	(2. oS)	P. 87
		Input 2_integral/derivative decimal point position	$2I ddP$	(2.IddP)	
		Input 2_derivative gain	$2. dGA$	(2. dGA)	
		Input 2_ON/OFF action differential gap (upper)	$2. oHH$	(2. oHH)	P. 88
		Input 2_ON/OFF action differential gap (lower)	$2. oHL$	(2. oHL)	
		Input 2_action at input error (high)	$2.AoVE$	(2.AoVE)	P. 89

Continued from the previous page.

Function block		Parameter			Page
$F52.$ (F52.)	Control 2	Input 2_action at input error (low)	$2.AUnE$	(2.AUnE)	P. 89
		Input 2_manipulated output value at input error	$2.PSM$	(2. PSM)	P. 90
		Input 2_manipulated output value when transferred to Auto from Manual	$2.PSM'$	(2.PSM')	
		Input 2_output change rate limiter (up)	$2. orU$	(2. orU)	
		Input 2_output change rate limiter (down)	$2. ord$	(2. ord)	P. 91
		Input 2_output limiter high	$2. oLH$	(2. oLH)	P. 92
		Input 2_output limiter low	$2. oLL$	(2. oLL)	
		These items are not used for the HA430/930.	$2. PFF$	(2. PFF)	—
			$2.PFFS$	(2.PFFS)	—
		Input 2_MV transfer function	$2.MVTS$	(2.MVTS)	P. 92
$F53.$ (F53.)	Autotuning 1 (AT1)	Input 1_AT bias	$1. ATb$	(1. ATb)	P. 93
		Input 1_AT cycle	$1. ATC$	(1. ATC)	P. 94
		Input 1_AT differential gap time	$1. ATH$	(1. ATH)	P. 95
		Input 1_AT action	$1. ATt$	(1. ATt)	P. 96
$F54.$ (F54.)	Autotuning 2 (AT2)	Input 2_AT bias	$2. ATb$	(2. ATb)	P. 93
		Input 2_AT cycle	$2. ATC$	(2. ATC)	P. 94
		Input 2_AT differential gap time	$2. ATH$	(2. ATH)	P. 95
		Input 2_AT action	$2. ATt$	(2. ATt)	P. 96
$F55.$ (F55.)	**These are function blocks unused in the HA430/930.** **(Their settings are invalid)**				
$F60.$ (F60.)	Communication	**This item is not used for the HA430/930.**	$CMPS1$	(CMPS1)	—
		Communication protocol selection	$CMPS2$	(CMPS2)	P. 97
$F70.$ (F70.)	Set value (SV)	Setting change rate limiter unit time	$SVrT$	(SVrT)	P. 97
		Soak time unit selection	$STdP$	(STdP)	
$F71.$ (F71.)	Set value 1 (SV1)	Input 1_setting limiter high	$1. SLH$	(1. SLH)	P. 98
		Input 1_setting limiter low	$1. SLL$	(1. SLL)	
		Input 1_PV transfer function	$1.PVTS$	(1.PVTS)	
$F72.$ (F72.)	Set value 2 (SV2)	Input 2_setting limiter high	$2. SLH$	(2. SLH)	P. 98
		Input 2_setting limiter low	$2. SLL$	(2. SLL)	
		Input 2_PV transfer function	$2.PVTS$	(2.PVTS)	
$F91.$ (F91.)	System information	ROM version display	RoM	(RoM)	P. 99
		Integrated operating time display	WT	(WT)	
		Holding peak value ambient temperature display	TCJ	(TCJ)	
		This item is not used for the HA430/930.	$HEAT$	(HEAT)	—

8.3 Precaution Against Parameter Change

If any of the following parameters is changed, the set values of relevant parameters are initialized or is automatically converted according to the new setting. It may result in malfunction or failure of the instrument.

- **Input Type Selection of Input 1 (1. InP)**
- **Input Type Selection of Input 2 (2. InP)**
- **Engineering Display Unit Selection of Input 1 (1.UnIT)**
- **Engineering Display Unit Selection of Input 2 (2.UnIT)**
- **Input 1_Decimal Point Position (1.PGdP)**
- **Input 2_Decimal Point Position (2.PGdP)**
- **Event 1 Type Selection (ES1)**
- **Event 2 Type Selection (ES2)**
- **Event 3 Type Selection (ES3)**
- **Event 4 Type Selection (ES4)**
- **Transmission Output 1 Type Selection (Ao1)**
- **Transmission Output 2 Type Selection (Ao2)**
- **Transmission Output 3 Type Selection (Ao3)**

📖 **Before changing any parameter setting on the above list, always record all parameter settings in SV setting & Monitor mode, Setup setting mode, Parameter setting mode and Engineering mode. And after the change, always check all parameter settings in SV setting & Monitor mode, Setup setting mode, Parameter setting mode and Engineering mode by comparing them with the record taken before the change.**

When any one of the following parameters' settings are changed,

- **Input Type Selection of Input 1 (1. InP)**
- **Input Type Selection of Input 2 (2. InP)**
- **Engineering Display Unit Selection of Input 1 (1.UnIT)**
- **Engineering Display Unit Selection of Input 2 (2.UnIT)**

all parameter settings shown in the table below will be changed to Factory Default Values according to the new setting. They must be changed according to the application.

Mode	Description	Default value			
		Pressure sensor input	TC input	RTD input	Voltage/ current input
Engineering mode	Decimal point position	1 (One decimal place)			
	Input scale high	Maximum value of input range			100.0
	Input scale low	Minimum value of input range			0.0
	Input error determination point (high)	Maximum value of input range + (5 % of input span)			
	Input error determination point (low)	Minimum value of input range − (5 % of input span)			
	Burnout direction	0 (Upscale)			
	Transmission output 1 scale high	Measured value (PV) and Set value (SV): Input scale high			
	Transmission output 2 scale high	Manipulated output value (MV): 100.0			
	Transmission output 3 scale high	Deviation: +Input span			

Continued from the previous page.

Mode	Description	Default value			
		Pressure sensor input	TC input	RTD input	Voltage/current input
Engineering mode	Transmission output 1 scale low	Measured value (PV) and Set value (SV): Input scale low Manipulated output value (MV): 0.0 Deviation: −Input span			
	Transmission output 2 scale low				
	Transmission output 3 scale low				
	Event 1 hold action	0 (Without hold action)			
	Event 2 hold action				
	Event 3 hold action				
	Event 4 hold action				
	Event 1 differential gap	2.0 MPa	2.0 °C [°F]		0.2 % of input span
	Event 2 differential gap				
	Event 3 differential gap				
	Event 4 differential gap				
	ON/OFF action differential gap (upper)	1.0 MPa	1.0 °C [°F]		0.1 % of input span
	ON/OFF action differential gap (lower)				
	AT bias	0			
	Setting limiter high	Input scale high			
	Setting limiter low	Input scale low			
Setup setting mode	PV bias	0			
	PV ratio	1.000			
	PV low input cut-off	0.00 %			
Parameter setting mode	Event 1 set value	50			
	Event 2 set value				
	Event 3 set value				
	Event 4 set value				
	Control loop break alarm1 (LBA1) time	480 seconds			
	Control loop break alarm2 (LBA2) time				
	LBA1 deadband	0.0			
	LBA2 deadband				
	Proportional band	30			
	Integral time	240.0 seconds			
	Derivative time	60.0 seconds			
	Control response parameter	0 (Slow)			
	Setting change rate limiter (up)	OFF (Unused)			
	Setting change rate limiter (down)				
SV setting & Monitor mode	Set value (SV)	0.0 MPa	0.0 °C [°F]		0.0 %

When any one of the following parameters' settings are changed,

- **Event 1 Type Selection (ES1)**
- **Event 2 Type Selection (ES2)**
- **Event 3 Type Selection (ES3)**
- **Event 4 Type Selection (ES4)**

all parameter settings shown in the table below will be changed to Factory Default Values according to the new setting. They must be changed according to the application.

Mode	Description	Default value			
		Pressure sensor input	TC input	RTD input	Voltage/ current input
Engineering mode	Event 1 hold action	0 (Without hold action)			
	Event 2 hold action				
	Event 3 hold action				
	Event 4 hold action				
	Event 1 differential gap	2.0 MPa	2.0 °C [°F]		0.2 % of input span
	Event 2 differential gap				
	Event 3 differential gap				
	Event 4 differential gap				
Parameter setting mode	Event 1 set value	50			
	Event 1 set value				
	Event 1 set value				
	Event 1 set value				
	Control loop break alarm1 (LBA1) time (Event 3 only)	480 seconds			
	Control loop break alarm2 (LBA2) time (Event 4 only)	480 seconds			
	LBA1 deadband (Event 3 only)	0.0			
	LBA2 deadband (Event 4 only)	0.0			

When any one of the following parameters' settings are changed,

- **Transmission Output 1 Type Selection (Ao1)**
- **Transmission Output 2 Type Selection (Ao2)**
- **Transmission Output 3 Type Selection (Ao3)**

all parameter settings shown in the table below will be changed to Factory Default Values according to the new setting. They must be changed according to the application.

Mode	Description	Default value			
		Pressure sensor input	TC input	RTD input	Voltage/ current input
Engineering mode	Transmission output 1 scale high	Measured value (PV) and Set value (SV): Input scale high Manipulated output value (MV): 100.0 Deviation: +Input span			
	Transmission output 2 scale high				
	Transmission output 3 scale high				
	Transmission output 1 scale low	Measured value (PV) and Set value (SV): Input scale low Manipulated output value (MV): 0.0 Deviation: −Input span			
	Transmission output 2 scale low				
	Transmission output 3 scale low				

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When any one of the following parameters' settings are changed,

- **Input 1_Decimal Point Position (1.PGdP)**
- **Input 2_Decimal Point Position (2.PGdP)**

all parameter settings shown in the table below will be automatically converted into the a values to match the new decimal point position as long as the converted values are in the acceptable range of each parameter. They must be check and changed if necessary according to the application

Mode	Description
Engineering mode	Input scale high
	Input scale low
	Input error determination point (high)
	Input error determination point (low)
	Transmission output 1 scale high
	Transmission output 2 scale high
	Transmission output 3 scale high
	Transmission output 1 scale low
	Transmission output 2 scale low
	Transmission output 3 scale low
	Event 1 hold action
	Event 2 hold action
	Event 3 hold action
	Event 4 hold action
	ON/OFF action differential gap (upper)
	ON/OFF action differential gap (lower)
	Setting limiter high
	Setting limiter low
Setup setting mode	PV bias
Parameter setting mode	Event 1 set value
	Event 2 set value
	Event 3 set value
	Event 4 set value
	LBA deadband
	Proportional band
	Setting change rate limiter (up)
	Setting change rate limiter (down)
SV setting & Monitor mode	Set value (SV)

Continued from the previous page.

Precaution and Example of automatic conversion

- Decimal point position moves in accordance with the setting change.

Example: When the setting of the decimal point position is changed from 0 (no decimal place) to 1 (the first decimal place) with Input scale high (1.PGSH) set to 250 MPa:

(1.PGSH)   (1.PGSH)

```
 1.PGSH      →      1.PGSH
    250               250.0
```
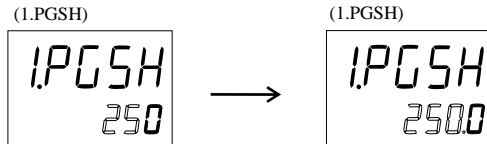
The display will change from 250 to 250.0.

- The displayed range of the controller is between −19999 and +99999 regardless of the decimal point position.

Example: When RTD input is selected for Input 2, and Input Scale Low (2.PGSL) is −200 °C, the decimal point position is changed from 0 to 2:

(2.PGSL)   (2.PGSL)

```
 2.PGSL      →      2.PGSL
   -200.            -199.99
```
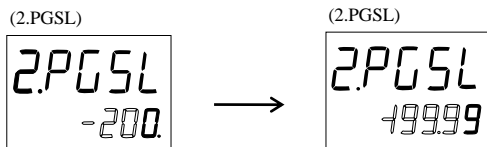
(Input scale low becomes −199.99, because −200.00 is out of the display range.)

- When a number of decimal place for the set value is reduced due to the decimal point change, the set value is rounded off to the first decimal place and will be displayed without any decimal place.

Example: When the decimal point position is changed from 2 (two decimal places) to 0 (no decimal place) and Input scale high (1.PGSH) is 85.99:

(1.PGSH)   (1.PGSH)

```
 1.PGSH      →      1.PGSH
   085.99            00086
```
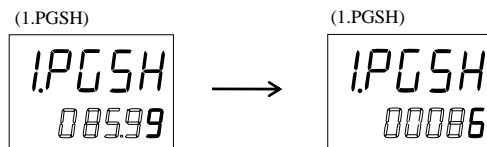
(The figure is rounded off to the first decimal place, and the Input Scale High 1.PGSH becomes 86.)

📖 In the above example, if the decimal point position is changed back to 2 from 0, "1.PGSH" becomes 86.00.

8.4 Screen Configuration (F10)

■ STOP display selection (SPCH)

STOP message for control STOP mode can be displayed either on the upper display or the lower display.

SPCH is to select the display to show the STOP message.

Data range: 0: Displays on the Measured value (PV1/PV2) unit (TYPE 1)

                     1: Displays on the Set value (SV) unit (TYPE 2)

Factory set value: 0

📖 There are three different characters for STOP mode depending on how to be transfered from RUN to STOP.
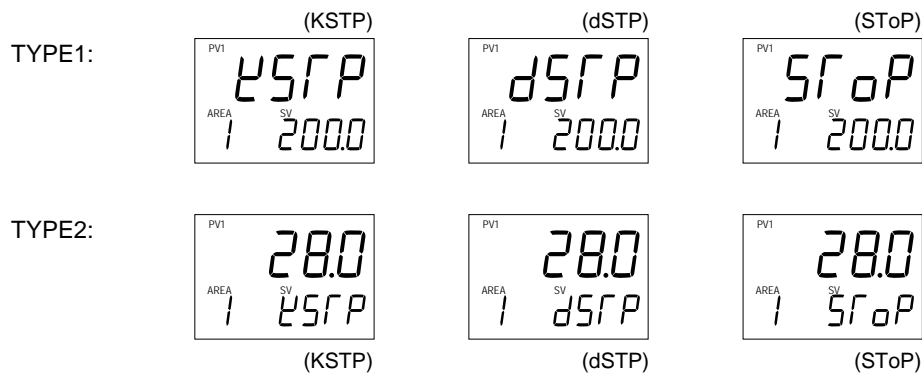
Display explanations:

		RUN/STOP with Event input	
		RUN (Contact closed)	STOP (Contact open)
RUN/STOP with key operation	RUN	RUN	STOP
		STOP is not displayed	*dSCP* (dSTP)
	STOP	STOP	STOP
		kSCP (KSTP)	*SCoP* (SToP)

■ Bar graph display selection (dE)

Use to select the contents of the bar graph display.

Data range: 0: No display

                1: Input 1_manipulated output value (MV)

                2: Input 1_measured value (PV)

                3: Input 1_set value (SV)

                4: Input 1_deviation value

                5: Unused (Not available)

                6: Input 2_manipulated output value (MV)

                7: Input 2_measured value (PV)

                8: Input 2_set value (SV)

                9: Input 2_deviation value

Factory set value: 0
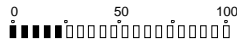
Related parameters: Bar graph resolution setting (P. 64)

Continued from the previous page.

📖　Bar graph display explanation:

Manipulated output value (MV) display	Displays the Manipulated output value (MV). When Manipulated output value (MV) is at 0 % or less, the left-end dot of the bar-graph flashes. When MV exceeds 100 %, the right-end dot flashes. [Display example]　0　　50　　100
Measured value (PV) display	Scaling is available within the input range. [Display example]　0　　50　　100
Set value (SV) display	Displays the Set value (SV). Scaling is available within the input range. [Display example]　0　　50　　100
Deviation value display	Displays the deviation between the Measured value (PV) and the Set value (SV). When the Deviation display is selected, the dots at both ends of bar-graph light. A display resolution per dot is settable from 1 to 100. [Display example]　−　　0　　+

The number of dot points: 10 dots (HA430)　　20 dots (HA930)

■ Bar graph resolution setting (dEUT)

Use to set the bar graph display resolution for the deviation display. Set several digits per 1 dot of the bar graph.

Data range:　　　　　1 to 100 digit/dot
Factory set value:　　100
Related parameters: Bar graph display selection (P. 63)

■ Decimal point position of MV scaling (MVdP)

Use to select the decimal point position of the MV scaling function.

Data range:　　　　　0: No decimal place
　　　　　　　　　　　1: One decimal place
　　　　　　　　　　　2: Two decimal places
　　　　　　　　　　　3: Three decimal places
　　　　　　　　　　　4: Four decimal places
Factory set value:　　1
Related parameters: MV scaling high (P. 64), MV scaling low (P. 65)
MV scaling function: The MV scaling function is used to make scaling of Manipulated output value 1 (MV1) from 0 to 100 % between the high and low MV scaling limits as the RPM of extruder's main motor.

■ MV scaling high (MVHS)

This value is to set the high limit value of MV scaling monitor value. Set the motor RPM when MV1 = 100 %.

Data range:　　　　　−1999.9 to +9999.9

Factory set value:　　100.0

Related parameters: Decimal point position of MV scaling (P. 64), MV scaling low (P. 65)

📖　MV scaling monitor value is displayed on the SV of PV1/SV1 monitor screen (P. 102).

■ MV scaling low (MVLS)

This value is to set the low limit value of MV scaling monitor value. Set the motor RPM when MV1 = 0 %.

Data range: −1999.9 to +9999.9

Factory set value: 0.0

Related parameters: Decimal point position of MV scaling (P. 64), MV scaling high (P. 64)

📖   MV scaling monitor value is displayed on the SV of PV1/SV1 monitor screen (P. 102).

[Example] If the motor RPM is set to 80.0 rpm when MV1 = 100 %.

Display (motor RPM)

```
80.0 rpm ┤        ╱│
         │      ╱  │          Decimal point position of MV scaling:      One decimal place
         │    ╱    │          Input 1_MV scaling low (MV1 = 0.0 %):       0.0 rpm
         │  ╱      │          Input 1_MV scaling high (MV1 = 100.0 %):    80.0 rpm
 0.0 rpm ┤╱_____│___ MV1
         0.0 %    100.0 %
```
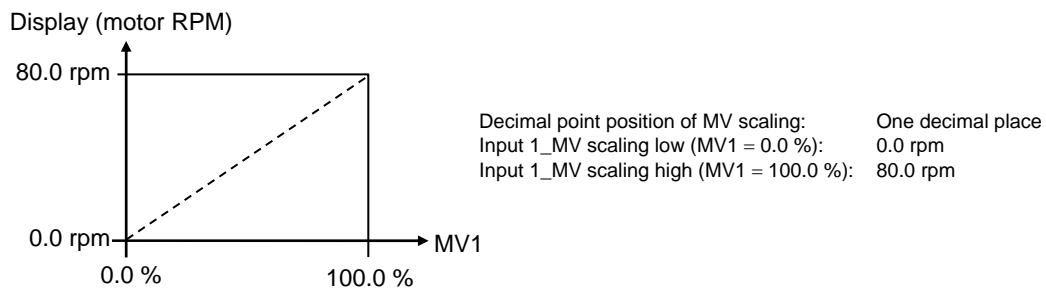
8.5 Direct Key (F11)

■ Auto/Manual transfer key operation selection (Fn1)

Use to select Use/Unuse of Auto/Manual transfer key (A/M).

Data range: 0: Unused
                   1: Auto/Manual transfer for Input 1
                   2: Auto/Manual transfer for Input 2
                   3: Common Auto/Manual transfer for Input 1 and Input 2

Factory set value: 3

■ Remote/Local transfer key operation selection (Fn2)

Use to select Use/Unuse of Remote/Local transfer key (R/L).

Data range: 0: Unused
                   1: Remote/Local transfer

Factory set value: 1

■ RUN/STOP transfer key operation selection (Fn3)

Use to select Use/Unuse of RUN/STOP transfer key (R/S).

Data range: 0: Unused
                   1: RUN/STOP transfer

Factory set value: 1

8.6 Input 1 (F21)
Input 2 (F22)

■ Input type selection (1. InP, 2. InP)

Data range:

Input 1_input type selection (1. InP): 14 to 29 (22, 23: Not available)
[Input Range Table]

Set value	Input type		Input range	Hardware
19	Voltage (Low) input	0 to 1 V		Voltage (Low) input group
20		0 to 100 mV		
21		0 to 10 mV		
24		±100 mV		
25		±10 mV		
14	Current input	0 to 20 mA	Programmable range (−19999 to +99999)	
15		4 to 20 mA		
16	Voltage (High) input	0 to 10 V		Voltage (High) input group
17		0 to 5 V		
18		1 to 5 V		
26		±10 V		
27		±5 V		
28		±1 V		
29	Pressure sensor input	Resin Pressure Sensor	0.0 to 250.0 MPa	Pressure group
22	Unused (Not available)			
23				

Input 2_input type selection (2. InP): 0 to 28 (22, 23: Not available)
[Input Range Table]

Set value	Input type		Input range	Hardware
0	TC input	K	−200 to +1372 °C or −328.0 to +2501.6 °F	Voltage (Low) input group
1		J	−200 to +1200 °C or −328.0 to +2192.0 °F	
2		R	−50 to +1768 °C or −58.0 to +3214.4 °F	
3		S	−50 to +1768 °C or −58.0 to +3214.4 °F	
4		B	0 to 1800 °C or 32.0 to 3272.0 °F	
5		E	−200 to +1000 °C or −328.0 to +1832.0 °F	
6		N	0 to 1300 °C or 32.0 to 2372.0 °F	
7		T	−200 to +400 °C or −328.0 to +752.0 °F	
8		W5Re/W26Re	0 to 2300 °C or 32.0 to 4172.0 °F	
9		PLII	0 to 1390 °C or 32.0 to 2534.0 °F	
12	RTD input	3-wire system Pt100	−200 to +850 °C or −328.0 to +1562.0 °F	
13		3-wire system JPt100	−200 to +600 °C or −328.0 to +1112.0 °F	
22	Unused (Not available)			
23				
19	Voltage (Low) input	0 to 1 V		Voltage (Low) input group
20		0 to 100 mV		
21		0 to 10 mV		
24		±100 mV		
25		±10 mV	Programmable range (−19999 to +99999)	
14	Current input	0 to 20 mA		
15		4 to 20 mA		
16	Voltage (High) input	0 to 10 V		Voltage (High) input group
17		0 to 5 V		
18		1 to 5 V		
26		±10 V		
27		±5 V		
28		±1 V		

Continued from the previous page.

📖 **An input type change may only be made within the hardware groups as shown above.**

📖 **Do not set to any number (including 10 and 11) and Input 1 range number (22 or 23) which is not described in the input range table above. This may cause malfunctioning.**

📖 **Refer to the above input range table to select input type of the Remote input. Input range 0 to 13, 22 or 23 cannot be selected for the Remote input.**

Factory set value: Input 1_input type selection (1. InP): Based on model code.

(When not specifying: Pressure sensor input)

Input 2_input type selection (2. InP): Based on model code. (When not specifying: Type K)

Related parameters: Display unit selection (P. 67), Decimal point position (P. 69), Input scale high (P. 69), Input scale low (P. 70)

■ Display unit selection (1. UnIT, 2. UnIT)

These are the units of display for Input 1 and Input 2.

Data range: Input 1_display unit selection (1. UnIT): 2: MPa 3: bar 4: kgf/cm^2 5: psi

Input 2_display unit selection (2. UnIT): 0: °C 1: °F

Factory set value: Input 1_display unit selection (1. UnIT): Pressure sensor input: 2

Voltage (V)/Current (I) inputs: 0

Input 2_display unit selection (2. UnIT): 0

📖 The display unit selection becomes invalid when the Voltage/Current input is selected as input type.

■ Gain setting (GAIn) [F21]

Use to set the gain of the pressure sensor.

Data range: 0.500 to 4.000 mV/V
Factory set value: CZ-100P, CZ-200P: 1.500 mV/V
Setting procedure:

● **CZ-100P, CZ-200P:**

Set the rated output value (mV/V) engraved on the rated nameplate attached to the pressure sensor housing.
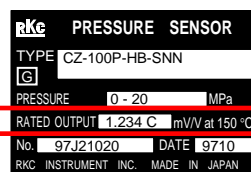
RKC **PRESSURE SENSOR**	
TYPE	CZ-100P-HB-SNN
G	
PRESSURE	0 - 20 MPa
RATED OUTPUT	1.234 C mV/V at 150 °C	← Rated output value 1.234 mV/V
No. 97J21020	DATE 9710
RKC INSTRUMENT INC. MADE IN JAPAN	

(Example of the rated nameplate)

📖 The rated output value (mV/V) of the CZ-100P/CZ-200P is when the cable is at a length of 5 m. If the cable is extended, correct the rated output value using the following equation. Set the correction value thus calculated to "Gain setting (GAIn)."

Correction equation: $e1 = e2\,(1 + K \cdot L)$ ⟶ $e2 = \dfrac{e1}{1 + K \cdot L}$

e1: Rated output in standard-cable length 5 m (mV/V is described on the nameplate of the sensor)
e2: Rated output after extension
K: Correction factor* 1.96×10^{-4}/m [Non-explosionproof specification type],
  1.40×10^{-4}/m [Explosionproof specification type]
  * When using 0.5 mm$^2 \times$ 4-core shielded cable (standard-cable) or equal.
L: Extended cable length (m)

● **The strain gauge type sensor other than RKC product:**

Set the rated output value (mV/V). The rated output value depends on the sensors, refer to the instruction manual for each sensor being used.

■ Linearize type selection (LInS) [F21]

Use to select the linearizing type of our pressure sensor CZ-100P/CZ-200P.

Data range: 0:   Unused

1 to 20: Used

[Linearizing type selection table]

Set value	Linearzing type symbol	Set value	Linearzing type symbol	Set value	Linearzing type symbol
0	No symbol	7	J	14	S
1	C	8	K	15	T
2	D	9	L	16	U
3	E	10	M	17	V
4	F	11	P	18	W
5	G	12	Q	19	X
6	H	13	R	20	Y

Factory set value: 0

Setting procedure: Select the linearizing type symbol engraved on the rated nameplate attached to the CZ-100P or CZ-200P housing.

PRESSURE SENSOR
TYPE CZ-100P-HB-SNN
G
PRESSURE 0 - 20 MPa
RATED OUTPUT 1.234 C mV/V at 150 °C
No. 97J21020 DATE 9710
RKC INSTRUMENT INC. MADE IN JAPAN
(Example of the rated nameplate)
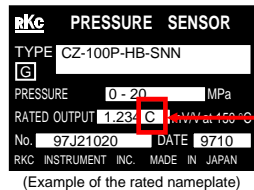
The symbol described at the end of the rated output value denotes the linearizing type.
In the example at the left, "C" is the symbol of denoting the linearizing type.

This setting does not used to the strain gauge type sensors other than RKC product. Set it to "0" fixed.

■ Shunt resistance output value (SHnT) [F21]

When the strain gauge type sensor other than RKC product is used, it is set "What percentage of the rated output" is output when the full scale point of the Input 1_measured value (PV1) is adjusted by Auto calibration.

Data range: 40.0 to 100.0 %
Factory set value: 80.0

For details of the shunt resistance output value, refer to Instruction Manual for each sensor being used.

■ Decimal point position (1. PGdP, 2. PGdP)

Use to select the decimal point position of the input range.

Data range:

0: No decimal place	3: Three decimal places
1: One decimal place	4: Four decimal places
2: Two decimal places	

Input 1_decimal point position (1. PGdP):

Pressure sensor input:
Less than 1 MPa (Rated pressure):   0 to 4
Less than 10 MPa (Rated pressure): 0 to 3
Less than 100 MPa (Rated pressure):0 to 2
100 MPa or more (Rated pressure):   0 or 1

Voltage (V)/Current (I) inputs: 0 to 4

Input 2_decimal point position (2. PGdP):
TC input: 0 or 1
RTD input: 0 to 2
Voltage (V)/Current (I) inputs: 0 to 4

Factory set value: Input 1_decimal point position (1. PGdP):   1

Input 2_decimal point position (2. PGdP):   1

Related parameters: Input type selection (P. 66), Input scale high (P. 69), Input scale low (P. 70)

■ Input scale high (1. PGSH, 2. PGSH)

This value is high limit of the input scale range.

Data range:

Pressure sensor input: Input scale low to Maximum value of the selected input range
TC/RTD inputs: Input scale low to Maximum value of the selected input range
Voltage (V)/Current (I) inputs:
-19999 to $+99999$
(Varies with the setting of the decimal point position)

Factory set value: Input 1_input scale high (1.PGSH):
Pressure sensor input: 50.0
Voltage (V)/Current (I) inputs: 100.0

Input 2_input scale high (2.PGSH):
TC/RTD inputs: Maximum value of the selected input range
Voltage (V)/Current (I) inputs: 100.0

Related parameters: Input type selection (P. 66), Decimal point position (P. 69), Input scale low (P. 70)

Input Scale High function:

The input scale range can be easily set by setting the input scale high limit/low limit.

When a Voltage/Current input type is selected, the input scale high limit can be set lower than the input scale low limit. (Input scale high limit < Input scale low limit)

■ Input scale low (1. PGSL, 2. PGSL)

This value is to set the low limit of the input scale range.

Data range:	Pressure sensor input:	Minimum value of the selected input range to Input scale high
	TC/RTD inputs:	Minimum value of the selected input range to Input scale high
	Voltage (V)/Current (I) inputs:	
		-19999 to $+99999$
		(Varies with the setting of the decimal point position)

Factory set value: Input 1_input scale low (1.PGSL):

      Pressure sensor input: 0.0

      Voltage (V)/Current (I) inputs: 0.0

    Input 2_input scale low (2.PGSL):

      TC/RTD inputs: Minimum value of the selected input range

      Voltage (V)/Current (I) inputs: 0.0

Related parameters: Input type selection (P. 66), Decimal point position (P. 69), Input scale high (P. 67)

Input Scale Low function:

      The input scale range can be easily set by setting the Input scale high/low.

    When a Voltage/Current input type is selected, the Input scale high can be set lower than the Input scale low. (Input scale high < Input scale low)

■ Input error determination point (high)   (1. PoV, 2. PoV)

Use to set Input error determination point (high). Input error determination function is activated when a measured value reaches the limit, and control output value selected by Action at input error will be output.

Data range: Input scale low − (5 % of input span) to Input scale high + (5 % of input span)

Factory set value: Input 1_input error determination point (high) (1. PoV):

      Pressure sensor input: Input scale high + (5 % of input span)

      Voltage (V)/Current (I) inputs: 105.0

    Input 2_input error determination point (high) (2. PoV):

      TC/RTD inputs: Input scale high + (5 % of input span)

      Voltage (V)/Current (I) inputs: 105.0

Related parameters: Input error determination point (low) (P. 71), Action at input error (high) (P. 89),

      Action at input error (low) (P. 89), Manipulated output value at input error (P. 90)

■ Input error determination point (low)   (1. PUn, 2. PUn)

Use to set Input error determination point (low). Input error determination function is activated when a measured value reaches the limit, and control output value selected by Action at input error will be output.

Data range: Input scale low − (5 % of input span) to Input scale high + (5 % of input span)
Factory set value: Input 1_input error determination point (low) (1. PUn):

Pressure sensor input:	Input scale low − (5 % of input span)
Voltage (V)/Current (I) inputs:	−5.0

Input 2_input error determination point (low) (1. PUn):

TC/RTD inputs:	Input scale low − (5 % of input span)
Voltage (V)/Current (I) inputs:	−5.0

Related parameters: Input error determination point (high) (P. 70), Action at input error (high) (P. 89),
Action at input error (low) (P. 89), Manipulated output value at input error (P. 90)

[Example]   When the input scale is 0.0 to 250.0:
Input span: 250.0, 5 % of input span: 12.5, Setting range: −12.5 to +262.5
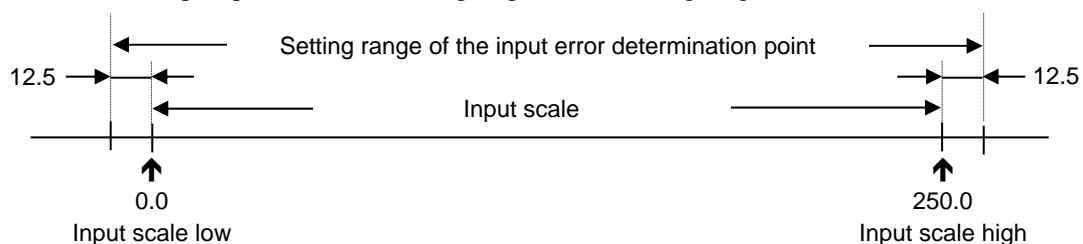
■ Burnout direction (1. boS, 2. boS)

Use to select Burnout direction in input break. When input break is detected by the controller, the measured value go either Upscale or Downscale according to the Burnout direction setting.

Data range:

Pressure sensor input [Input 1]:	0 (Upscale), 1 (Downscale)
TC input [Input 2]:	0 (Upscale), 1 (Downscale)
RTD input [Input 2]:	0 (Upscale)
Voltage (low) input [Input 1, Input 2]:	0 (Upscale), 1 (Downscale)
Voltage (high) input [Input 1, Input 2]:	1 (Downscale)
Current (I) input [Input 1, Input 2]:	1 (Downscale)

Factory set value:

Input 1_burnout direction (1. boS):	0 (Upscale)
Input 2_burnout direction (2. boS):	0 (Upscale)

For the following types of input, the action when an input break occurs is fixed, regardless of the Burnout direction setting.
- **RTD input:** **Upscale**
- **Voltage (high) input:** **Downscale (Indicates value near 0 V.)**
- **Current (I) input:** **Downscale (Indicates value near 0 mA.)**

■ **Square root extraction selection (1. SQr, 2. SQr)**

Use to select Use/Unuse of the Square root extraction for the measured value.

Data range: 0: Unused
                     1: Used
Factory set value: Input 1_square root extraction selection (1. SQr): 0
                     Input 2_square root extraction selection (2. SQr): 0
Related parameters: PV low input cut-off (P. 45)
Square Root Extraction function:
                     The controller can receive the input signal directly from a differential pressure type flow
                     transmitter by using Square root extraction function without using a square root extractor.

■ **PV hold function (1. HLdS, 2. HLdS)**

Use to select Use/Unuse of the peak hold/bottom hold function for a Measured value (PV).

Data range: 0: Unused
                     1: Used
Factory set value: Input 1_PV1 hold function (1. HLdS): 0
                     Input 2_PV2 hold function (2. HLdS): 0
Related parameters: PV1 peak hold value monitor (P. 103), PV1 bottom hold value monitor (P. 104),
                     PV1 hold reset (P. 105), PV2 peak hold value monitor (P. 105),
                     PV2 bottom hold value monitor (P. 105), PV2 hold reset (P. 105)

■ **Power supply frequency selection (PFrQ)**

Use to select the power supply frequency of the controller suited to the application.

Data range: 0: 50 Hz
                     1: 60 Hz
Factory set value: 0

8.7 Event Input (F23)

■ Event input logic selection (dISL)

Use to assign the function (memory area, operation mode) for the Event inputs (DI 1 to DI 5).

Data range: 0 to 15 (Refer to the following table)

[Function Assignment Table]

Set value	DI 1 Terminal No. 30-31	DI 2 Terminal No. 30-32	DI 3 Terminal No. 30-33	DI 4 Terminal No. 30-34	DI 5 Terminal No. 35-36
0	Unused (No function assignment)				
1	Memory area number selection (1 to 16)				Memory area set
2	Memory area number selection (1 to 16)				Memory area set
3	Memory area number selection (1 to 16)				Memory area set
4	Memory area number selection (1 to 8)			Memory area set	RUN/STOP transfer
5	Memory area number selection (1 to 8)			Memory area set	Remote/Local transfer
6	Memory area number selection (1 to 8)			Memory area set	Auto/Manual transfer
7	Memory area number selection (1 to 8)			Memory area set	Hold reset
8	Memory area number selection (1 to 8)			Memory area set	Interlock release
9	Memory area number selection (1 to 4)		Memory area set	RUN/STOP transfer	Auto/Manual transfer
10	Memory area number selection (1 to 4)		Memory area set	RUN/STOP transfer	Remote/Local transfer
11	Memory area number selection (1 to 4)		Memory area set	Remote/Local transfer	Auto/Manual transfer
12	Memory area number selection (1 to 4)		Memory area set	Hold reset	Interlock release
13	Auto/Manual transfer	RUN/STOP transfer	Remote/Local transfer	Hold reset	Interlock release
14	Auto/Manual transfer	Input 1_ manual output down (motor RPM down)	Input 1_ manual output up (motor RPM up)	Input 1_ manual output 0 % reset (motor RPM reset)	RUN/STOP transfer
15	Auto/Manual transfer	Input 2_ manual output down (motor RPM down)	Input 2_ manual output up (motor RPM up)	Input 2_ manual output 0 % reset (motor RPM reset)	RUN/STOP transfer

📖 Event input terminals:
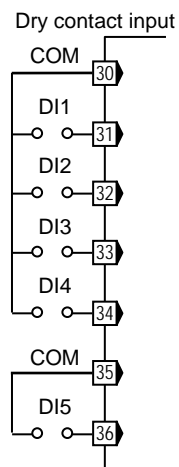
Contact input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should have meet the specifications below.

Contact specifications: At OFF (contact open) 500 kΩ or more
At ON (contact closed) 10 Ω or less

Factory set value: 1
Event Input function: Refer to the next page.

Continued from the previous page.

● **Contact status of memory area number selection**

📖 **To store a new Memory area number as the Control area, close the DI for Memory area set.**

Event input	Memory area number															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DI 1	×	−	×	−	×	−	×	−	×	−	×	−	×	−	×	−
DI 2	×	×	−	−	×	×	−	−	×	×	−	−	×	×	−	−
DI 3	×	×	×	×	−	−	−	−	×	×	×	×	−	−	−	−
DI 4	×	×	×	×	×	×	×	×	−	−	−	−	−	−	−	−

×: Contact open   −: Contact closed

Transfer timing of memory area number:

[Example]   Change the memory area number to 6
              (when "4" is selected in "Event input logic selection")

First, close the contacts between DI1 and DI3 and the common terminal. Next, open the contact between DI2 and the common. Then, close the contact between DI4 and the common from open status, the memory area in the controller will change to "6".
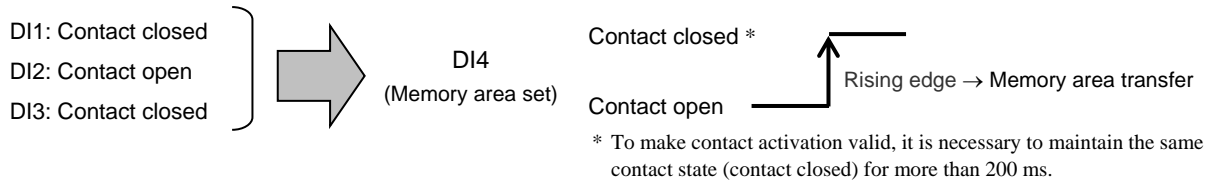
DI1: Contact closed
DI2: Contact open
DI3: Contact closed

DI4
(Memory area set)

Contact closed *

Contact open

Rising edge → Memory area transfer

* To make contact activation valid, it is necessary to maintain the same contact state (contact closed) for more than 200 ms.

● **Relationship between contact state and each operation state**

	Contact closed	Contact open	No event input or not selected
RUN/STOP transfer	RUN (Control RUN)	STOP (Control STOP)	RUN (Control RUN)
Auto/Manual transfer	Auto	Manual	Auto
Remote/Local transfer	Remote or cascade control	Local	Local
Hold reset	Hold reset execution	—	By key operation
Interlock release	Interlock release execution	—	
Manual output down (Motor RPM down) [1]	Manual output down (Motor RPM down)	—	
Manual output up (Motor RPM up) [2]	Manual output up (Motor RPM up)	—	
Manual output 0 % reset (Motor RPM reset) [3]	Manual output 0 % reset (Motor RPM reset)	—	—

[1] Decreases manipulated output value (motor RPM) under Manual control with contacts closed. (It takes about 25 seconds to 1000 digits.)

[2] Increases manipulated output value (motor RPM) under Manual control with contacts closed. (It takes about 25 seconds to 1000 digits.)

[3] The manipulated output value (motor RPM) is reset to 0 % based on the edge discrimination of "open" to "closed."
  In addition, switched to "Manual Control" regardless of Auto/Manual transfer setting.

Continued from the previous page.

● **RUN/STOP transfer**

Mode select from front key or communication	Status of event input (DI)	Actual operation mode	STOP display
RUN (Control RUN)	Contact closed	RUN (Control RUN)	STOP is not displayed
	Contact open	STOP (Control STOP)	*dSᴦP*
STOP (Control STOP)	Contact closed		*ᵁSᴦP*
	Contact open		*SᴦoP*

● **Auto/Manual transfer**

Mode select from front key or communication	Status of event input (DI)	Actual operation mode	Display lamp
Auto	Contact closed	Auto	MAN mode lamp ON
	Contact open	Manual	MAN mode lamp OFF
Manual	Contact closed		
	Contact open		

● **Remote/Local transfer**

Mode select from front key or communication	Status of event input (DI)	Actual operation mode	Display lamp
Remote	Contact closed	Remote	REM mode lamp ON
	Contact open	Local	REM mode lamp OFF
Local	Contact closed		
	Contact open		

Transfer timing of RUN/STOP, Auto/Manual, and Remote/Local:

The selection operation is taken when DI contact is closed from the open condition (Rising edge).
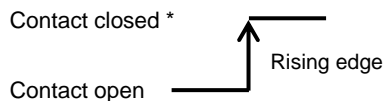
Contact closed *

Rising edge

Contact open

* To make contact activation valid, it is necessary to maintain the same contact state (contact closed) for more than 200 ms.

8.8 Output (F30)

■ Output logic selection (LoGC)

This is used to assign the output function (control output, event, etc.) for the output (OUT1 to OUT5).

Data range: 1 to 11 (Refer to the following table)

　　　　　　　1, 2, 9 and 10: Unused (Not available)

[Output Assignment Table]　　　(M: Relay contact output, V: Voltage pulse output, R: Current output, E: Voltage output, T: Triac output)

Set value	OUT1 (M/V/R/E/T)	OUT2 (M/V/R/E/T)	OUT3 (M/V/R/E/T)	OUT4 (M)	OUT5 (M)	Remarks
1	This set value is not used for the HA430/930.					—
2	This set value is not used for the HA430/930.					—
3	MV1	EV3 (Energized) or EV4 (Energized)	EV2 (Energized)	EV1 (Energized)	FAIL (De-energized)	Energized alarm corresponding to FAIL output
4	MV1	EV3 (De-energized) or EV4 (De-energized)	EV2 (De-energized)	EV1 (De-energized)	FAIL (De-energized)	De-energized alarm corresponding to FAIL output
5	MV1	MV2	EV4 (Energized)	EV3 (Energized)	EV1 (Energized) or EV2 (Energized)	Energized alarm corresponding to two loops control
6	MV1	MV2	EV4 (De-energized)	EV3 (De-energized)	EV1 (De-energized) or EV2 (De-energized)	De-energized alarm corresponding to two loops control
7	MV1	MV2	EV3 (Energized) or EV4 (Energized)	EV2 (Energized)	EV1 (Energized)	Energized alarm corresponding to two loops control
8	MV1	MV2	EV3 (De-energized) or EV4 (De-energized)	EV2 (De-energized)	EV1 (De-energized)	De-energized alarm corresponding to two loops control
9	This set value is not used for the HA430/930.					—
10	This set value is not used for the HA430/930.					—
11	MV1	EV4 (Energized)	EV 3 (Energized)	EV 2 (Energized)	EV 1 (Energized)	Energized alarm

MV 1 = Manipulated output value of Input 1, MV 2 = Manipulated output value of Input 2,
EV 1 = Output of Event 1, EV 2 = Output of Event 2, EV 3 = Output of Event 3, EV 4 = Output of Event 4, FAIL = FAIL output

📖　　An output logic becomes *OR* output when two or more output functions are assigned to one output.

📖　　When three transmission outputs are selected, the transmission outputs are automatically assigned to OUT1 through OUT3 and it has priority over the Output logic selection (LoGC). To select Manipulated output value of Input 1 or Input 2 as output type of OUT1, OUT2 or OUT3, select "1. MV: Input 1_manipulated output value (MV)" or "2. MV: Input 2_manipulated output value (MV)" at the parameters of Transmission output type selection.

📖　　The OUT3 output terminals (No. 7 and 8) are used when any sensor power supply is specified. The use of this function disables the use of OUT3 to OUT5 as control output, event output and transmission output. In addition, the number of transmission output points becomes 2 maximum.

Factory set value:　　For 1-input controller: 3
　　　　　　　　　　　For 2-input controller: 5
Related parameters: Output timer setting (P. 77), Alarm lamp lighting condition setting (P. 77),
　　　　　　　　　　Event type selection　(P. 80), Transmission output type selection (P. 79)

■ Output timer setting (oTT1 to oTT5)

Output timer setting is to set an output delay time for event outputs.

Data range:　　　　　0.0 to 600.0 seconds
Factory set value:　　 0.0
Related parameters: Output logic selection (P. 76), Alarm lamp lighting condition setting (P. 77),
　　　　　　　　　 Event type selection (P. 80)
Output Timer Setting function:
　　　　　　When an event condition becomes ON status, the output is suppressed until the Output
　　　　　　Timer set time elapses. After the time is up, if the event output is still ON status, the
　　　　　　output will be produced.
　　　　Example:　When set the event timer to 100.0 seconds.
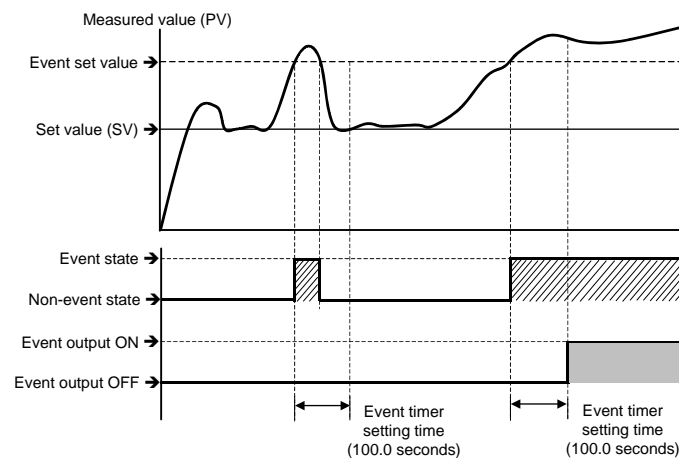
■ Alarm lamp lighting condition setting (ALC1, ALC2)

Use to set an alarm (ALM) lamp lighting conditions to Event 1 to Event 4.
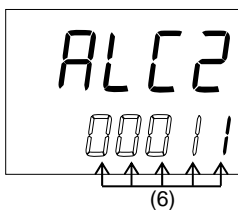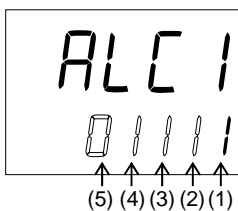
Data range:
[ALC1 screen]
(1) Event 1
　 0: ALM lamp is not lit　 1: ALM lamp is lit
(2) Event 2
　 0: ALM lamp is not lit　 1: ALM lamp is lit
(3) Event 3
　 0: ALM lamp is not lit　 1: ALM lamp is lit
(4) Event 4
　 0: ALM lamp is not lit　 1: ALM lamp is lit
(5) **"0" fixed (No setting)**

[ALC2 screen]
(6) **As this screen is not used for
the HA430/930, do not change
the setting.**

Factory set value:　　 Event 1 to Event 4: 1 (ALM lamp is lit)
Related parameters: Output logic selection (P. 76), Output timer setting (P. 77),
　　　　　　　　　 Event type selection (P. 80)

　　📖　**The alarm lamp is lit through the *OR* operation of Event 1 to Event 4 each of which is set to
　　"1: ALM lamp is lit."**

■ Interlock function (oTIL)

Use to select the Interlock function to output 1 (OUT1) to output 5 (OUT5).
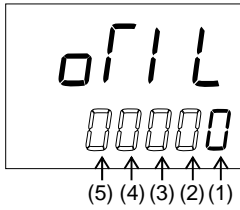
Data range:

(1) Output 1 (OUT1)		(4) Output 4 (OUT4)
0: Unused	1: Used	0: Unused 1: Used
(2) Output 2 (OUT2)		(5) Output 5 (OUT5)
0: Unused	1: Used	0: Unused 1: Used
(3) Output 3 (OUT3)		
0: Unused	1: Used	

Factory set value: 00000

Related parameters: Output logic selection (P. 76), Event type selection (P. 80), Interlock release (P. 106)

Interlock function:

The Interlock action holds the event state even if the measured value is out of the event zone after it enters the event zone once.

This interlock is released through key operation, Event input (optional), or Communication (optional).

[Example] Process high:
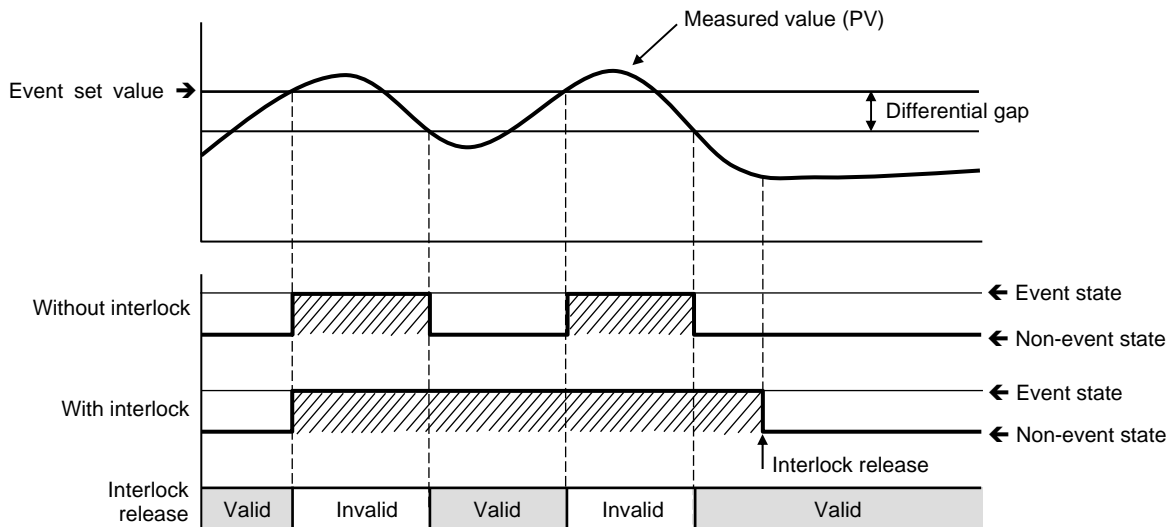
📖 The Interlock function is released for any of the following.
- When the power is turn on. (However, the Interlock function becomes ON when set to the event state simultaneously with the control started.)
- When the control is stopped.

📖 Burnout results in the event state and also activating the Interlock function.

8.9 Transmission Output 1 (F31)
Transmission Output 2 (F32)
Transmission Output 3 (F33)

■ Transmission output type selection (Ao1, Ao2, Ao3)

Use to select the transmission output type.

Data range: - - - - - :   None   *2. PЬ* (2. PV): Input 2_measured value (PV)

            1. PЬ (1. PV): Input 1_measured value (PV)   *2. SЬ* (2. SV): Input 2_set value (SV)

            1. SЬ (1. SV): Input 1_set value (SV)   *2. dEЬ* (2.dEV): Input 2_deviation value

            1. dEЬ (1.dEV): Input 1_deviation value   *2. ōЬ* (2. MV): Input 2_manipulated output

            1. ōЬ (1. MV): Input 1_manipulated output   value (MV)

                           value (MV)   *PōS* (PoS):   Unused (Not available)

Factory set value: - - - - - (None)

Related parameters: Transmission output scale high (P. 79), Transmission output scale low (P. 79)

  📖   Specify the output type of the transmission output when ordering.

  📖   When transmission outputs are selected and used, the outputs are allocated as follows.
- Transmission output 1: output 1 (OUT1)
- Transmission output 2: output 2 (OUT2)
- Transmission output 3: output 3 (OUT3)

  📖   The transmission has priority over the Output logic selection (LoGC).

■ Transmission output scale high (AHS1, AHS2, AHS3)

Use to set a scale high limit value of the transmission output.

Data range: Measured value (PV) and Set value (SV): Input scale low to Input scale high
                      Manipulated output value (MV):   −5.0 to +105.0 %
                      Deviation: −Input span to +Input span

Factory set value: Measured value (PV) and Set value (SV): Input scale high
                      Manipulated output value (MV):   100.0
                      Deviation: +Input span

Related parameters: Transmission output type selection (P. 79), Transmission output scale low (P. 79)

■ Transmission output scale low (ALS1, ALS2, ALS3)

Use to set a scale low limit value of the transmission output.

Data range: Measured value (PV) and Set value (SV): Input scale low to Input scale high
                      Manipulated output value (MV):   −5.0 to +105.0 %
                      Deviation: −Input span to +Input span

Factory set value: Measured value (PV) and Set value (SV): Input scale low
                      Manipulated output value (MV):   0.0
                      Deviation: −Input span

Related parameters: Transmission output type selection (P. 79), Transmission output scale high (P. 79)

8.10 Event 1 (F41)   Event 3 (F43)
Event 2 (F42)   Event 4 (F44)

■ Event type selection (ES1, ES2, ES3, ES4)

Use to select a type of the event 1, 2, 3 and 4.

Data range:

0: None	5: Process high [1]
1: Deviation high [1]	6: Process low [1]
2: Deviation low [1]	7: SV high
3: Deviation high/low [1]	8: SV low
4: Band [1]	9: Control loop break alarm (LBA) [2]

[1] Event hold action is available.

[2] "9: Control loop break alarm (LBA)" can be selected only for Event 3 and Event 4.

Factory set value: 0

Related parameters: Output logic selection (P. 76), Output timer setting (P. 77),
Alarm lamp lighting condition setting (P. 77), Event hold action (P. 82),
Event differential gap (P. 83), Event assignment (P. 84),
Event action at input error (P. 84), Event set value (P. 35),
Control loop break alarm (LBA) time (P. 35), LBA deadband (P. 36)

● Event action type

(▲: Set value (SV)   △ : Event set value   : Event differential gap)

Deviation high:
(Event set value is greater than 0.)   (Event set value is less than 0.)

Deviation low:
(Event set value is greater than 0.)   (Event set value is less than 0.)

Deviation high/low: Band:

Process high: Process low:

SV high: SV low:
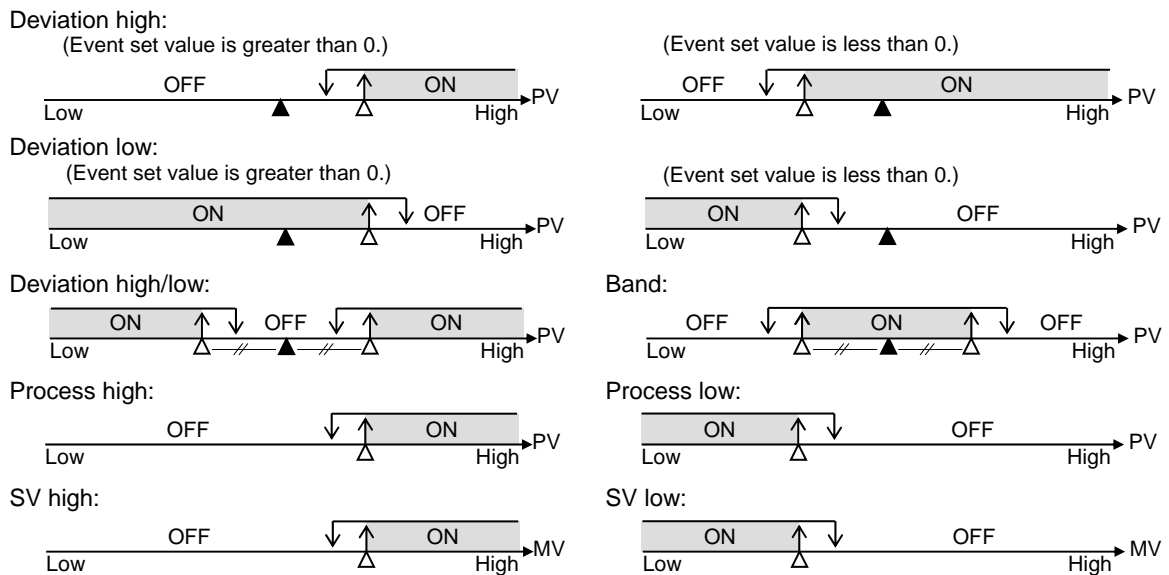
Continued from the previous page.

● **Control loop break alarm (LBA)**

The Control loop break alarm (LBA) function is used to detect a load (heater) break or a failure in the external actuator (magnet relay, etc.), or a failure in the control loop caused by an input (sensor) break. The LBA function is activated when control output reaches 0 % (low limit with output limit function) or 100 % (high limit with output limit function). LBA monitors variation of the Measured value (PV) for the length of LBA time. When the LBA time has elapsed and the PV is still within the alarm determination range, the LBA will be ON.

The LBA function produces the alarm when any of the following conditions occurs.

LBA determination range: TC/RTD input: 2 °C [2 °F] (fixed)

Pressure sensor input and Voltage/Current input:

0.2 % of input span (fixed)

- **When the control output reaches 0 % (low limit with output limit function)**

For direct action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.

For reverse action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.

- **When the output exceeds 100 % (low limit with output high function)**

For direct action: When the LBA time has passed and the PV has not fallen below the alarm determination range, the alarm will be turned on.

For reverse action: When the LBA time has passed and the PV has not risen beyond the alarm determination range, the alarm will be turned on.

📖   If the Autotuning function is used, the LBA time is automatically set twice as large as the Integral time. The LBA setting time will not be changed even if the Integral time is changed.

📖   LBA function is not operative when:
- AT function is activated.
- The controller is in STOP mode.
- LBA function is set to "OFF."
- LBA function is not assigned to Event (ES3) or Event 4 (ES4).

📖   The LBA function does not detect a location which causes alarm status. If LBA alarm is ON, check each device or wiring of the control loop.

📖   While the LBA is ON (under alarm status), the following conditions cancel the alarm status and LBA will be OFF:
- The Measured value (PV) rises beyond (or falls below) the LBA determination range within the LBA setting time.
- The Measured value (PV) enters within the LBA deadband.

■ Event hold action (EHo1, EHo2, EHo3, EHo4)

Use to set a event hold action for the Event 1, 2, 3 or 4.

📖 **When high alarm with Hold/Re-hold action is used for Event 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.**

Data range: 0: OFF
                           1: ON
                           2: Re-hold action ON
Factory set value: 0
Related parameters: Event type selection (P. 80), Event differential gap (P. 83), Event assignment (P. 84),

                           Event action at input error (P. 84), Event set value (P. 35)

● Hold action
When Hold action is ON, the event action is suppressed at start-up or STOP to RUN until the measured value has entered the non-event range.
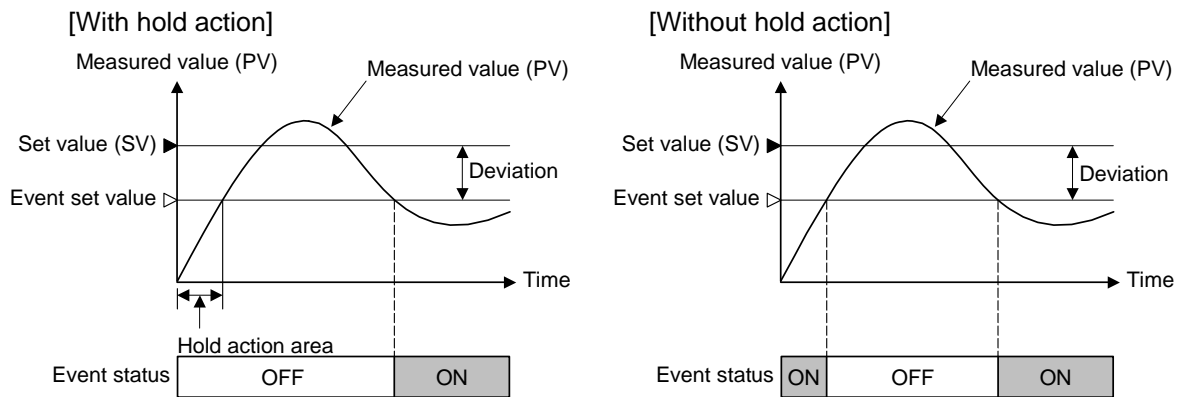
● Re-hold action
When Re-hold action is ON, the event action is also suppressed at the control set value change until the Measured value has entered the non-event range.

Action condition	1: Hold action ON (Only Hold action)	2: Re-hold action ON (Hold and Re-hold actions)
When the power is turned on	Hold action	Hold action
When transferred from STOP (control STOP) to RUN (control RUN)	Hold action	Hold action
When the Set value (SV) is changed	Without Hold and Re-hold actions	Re-hold action

📖 **The Re-hold action is invalid for any of the following. However, the Hold action is valid.**

- **When Setting change rate limiter other than "OFF (Unused)" are set**
- **When Remote/Local transfer is the remote mode**

Continued from the previous page.

[Example] When Event 1 type is the deviation low:

When Re-hold action is OFF and event output type is deviation, the event output is produced due to the Set value change. The Re-hold action suppresses the alarm output until the Measured value has entered the non-event range again.
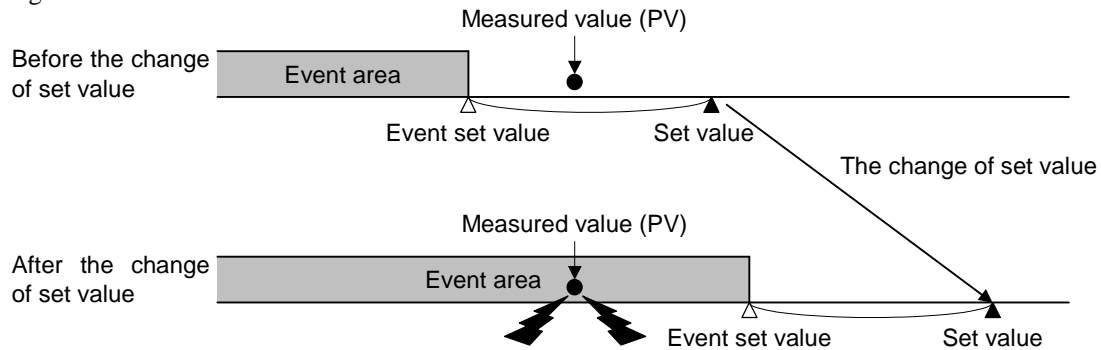
■ **Event differential gap (EH1, EH2, EH3, EH4)**

Use to set a differential gap of the Event 1, 2, 3 or 4.

Data range: 0 to Input span
                   (Varies with the setting of the Decimal point position)

Factory set value: Pressure sensor input [Input 1]:   2.0 MPa
                   TC/RTD inputs [Input 2]:   2.0 °C [°F]
                   Voltage (V)/Current (I) inputs [Input 1, Input 2]: 0.2 % of input span

Related parameters: Event type selection (P. 80), Event hold action (P. 82), Event assignment (P. 84),
                   Event action at input error (P. 84), Event set value (P. 35)

Event differential gap function:
                   It prevents chattering of event output due to the measured value fluctuation around the
                   Event set value.

■ Event action at input error (EEo1, EEo2, EEo3, EEo4)

Event action at input error is to select the Event action when the measured value reaches the Input error determination point (high or low limit).

Data range: 0: Normal processing
                      1: Turn the event output ON

Factory set value: 0
Related parameters: Input error determination point (high) (P. 70),
                    Input error determination point (low) (P. 71)

Event action at input error:

Example: Input range: 0 to 250.0 MPa
          Input error determination point (high): 240.0 MPa
          Input error determination point (low): 5.0 MPa

[1] The event output is forcibly turned on regardless of the event action status when the input is abnormal.

[2] The event output is produced depending on the selected event action status even if the input is abnormal.

■ Event assignment (EVA1, EVA2, EVA3, EVA4)

Use to assign event outputs to either Input 1 or Input 2.

Data range: 1: For Input 1
                      2: For Input 2

Factory set value: 1
Related parameters: Event type selection (P. 80), Event hold action (P. 82), Event differential gap (P. 83),
                    Event action at input error (P. 84), Event set value (P. 35)

8.11 Control (F50)

■ Hot/Cold start selection (Pd)

Use to select the start mode at power recovery.

Data range: Refer to the following table

Set value	Power failure less than 3 seconds	Power failure 3 seconds or more
0	Hot start 1	Hot start 1
1	Hot start 1	Hot start 2
2	Hot start 1	Cold start
3	Hot start 2	Hot start 2
4	Hot start 2	Cold start
5	Cold start	Cold start
6	Hot start 1	Stop start
7	Hot start 2	Stop start
8	Stop start	Stop start

Factory set value: 5

Hot/Cold start function:

After the power failure, when power is back to the controller,

Hot start 1: the controller will return to the same operation mode and the same manipulated value which were used or calculated by the controller before power failure.

Hot start 2: the controller will return to the same operation mode which was used by the controller before power failure.

In the Manual mode, the output value will be at the low output limit value.
In the Auto mode, the controller will calculate the manipulated output value regardless that before power failure. So, the manipulated output varies.

Cold start: the controller will automatically go to Manual mode and output the low output limit value.

Stop start: Started in the control stop (STOP) state regardless of the RUN mode (Auto/Manual) before power failure. Set to the RUN mode before power failure when changed to RUN from STOP by RUN/STOP selection.

■ Input 2_use selection (CAM)

Use to select the usage of Input 2.

Data range: 0: Single loop control
1: Remote input

Factory set value: 0

📖 **The setting items "CAr" and "CAb" displayed hereafter are not used in the HA430/930.**

■ SV tracking (TrK)

To select Use/Unuse of SV tracking.

Data range: 0: Unused

                       1: Used

Factory set value: 1

SV Tracking function:

               With SV Tracking function, when Remote/Local mode is transferred from Remote to Local, the set value used in Remote mode before the mode transfer will be kept using in Local mode to prevent rapid set value change.

Operation mode:	Local ⟶	Remote ⟶	Local
Set value used	Local set value	Remote set value	Local set value
SV tracking used	Local set value ≠ Remote set value	Local set value = Remote set value	Local set value = Remote set value
SV tracking unused	Local set value ≠ Remote set value	Local set value ≠ Remote set value	Local set value ≠ Remote set value

Remote/Local transferred point
(SV tracking used)

Remote/Local transferred point
(SV tracking unused)
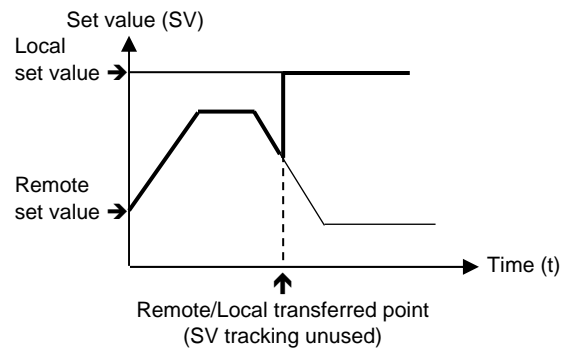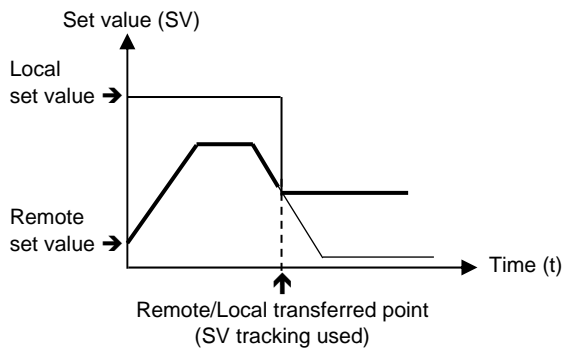
8.12 Control 1 (F51)
Control 2 (F52)

■ Control action type selection (1. oS, 2. oS)

Use to select Direct action/Reverse action.

Data range: 0: Direct action
                     1: Reverse action
Factory set value: Input 1_control action type selection (1. oS): 1
                     Input 2_control action type selection (2. oS): 1
Control action type: Direct action: The Manipulated output value (MV) increases as the Measured value (PV)
                                      increases. This action is used generally for cool control.
                     Reverse action: The Manipulated output value (MV) decreases as the Measured value (PV)
                                      increases. This action is used generally for heat control.

MV   MV

Direct action   Reverse action
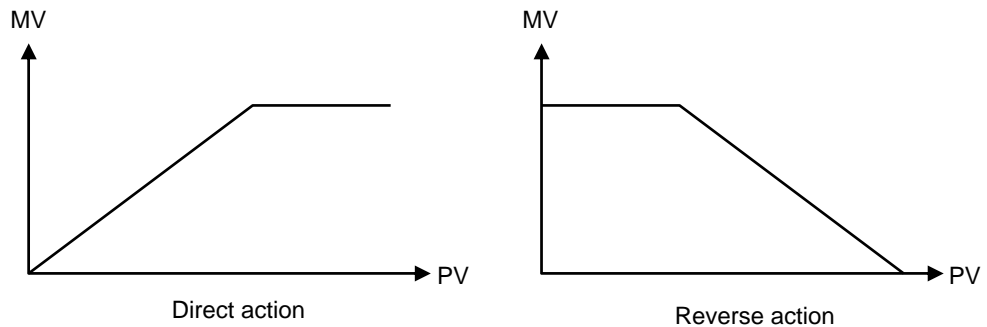
■ Integral/Derivative time decimal point position selection (1.IddP, 2.IddP)

Use to select a decimal point position of Integral time and Derivative time in PID control.

Data range: 0: No decimal place
                     1: One decimal place
                     2: Two decimal places
Factory set value: Input 1_integral/derivative time decimal point position selection (1.IddP): 2
                     Input 2_integral/derivative time decimal point position selection (2.IddP): 2
Related parameters: Integral time (P. 37), Derivative time (P. 37)

■ Derivative gain (1. dGA, 2. dGA)

Use to set a gain used for derivative action in PID control. Derivative gain should not be changed under ordinary operation.

Data range: 0.1 to 10.0
Factory set value: Input 1_derivative gain (1. dGA): 6.0
                     Input 2_derivative gain (2. dGA): 6.0

📖   Under ordinary operation, it is not necessary to change Derivative gain set value.

■ ON/OFF action differential gap (upper) (1. oHH, 2. oHH)

Use to set the ON/OFF control differential gap (upper).

Data range: 0 to Input span
                      (Varies with the setting of the Decimal point position)

Factory set value: Input 1_ON/OFF action differential gap (upper) (1. oHH):
                          Pressure sensor input: 1.0 MPa
                          Voltage (V)/Current (I) inputs: 0.1 % of input span

                      Input 2_ON/OFF action differential gap (upper) (2. oHH):
                          TC/RTD inputs: 1.0 °C [°F]
                          Voltage (V)/Current (I) inputs: 0.1 % of input span

Related parameters: ON/OFF action differential gap (lower) (P. 88)

ON/OFF Action Differential Gap:

> ON/OFF control is possible when the Proportional band is set to "0" or "0.0." In ON/OFF control with Reverse action, when the Measured value (PV) is smaller than the Set value (SV), the Manipulated output (MV) is 100 % or ON. When the PV is higher than the SV, the MV is 0 % or OFF. Differential gap setting prevents control output from repeating ON and OFF too frequently.
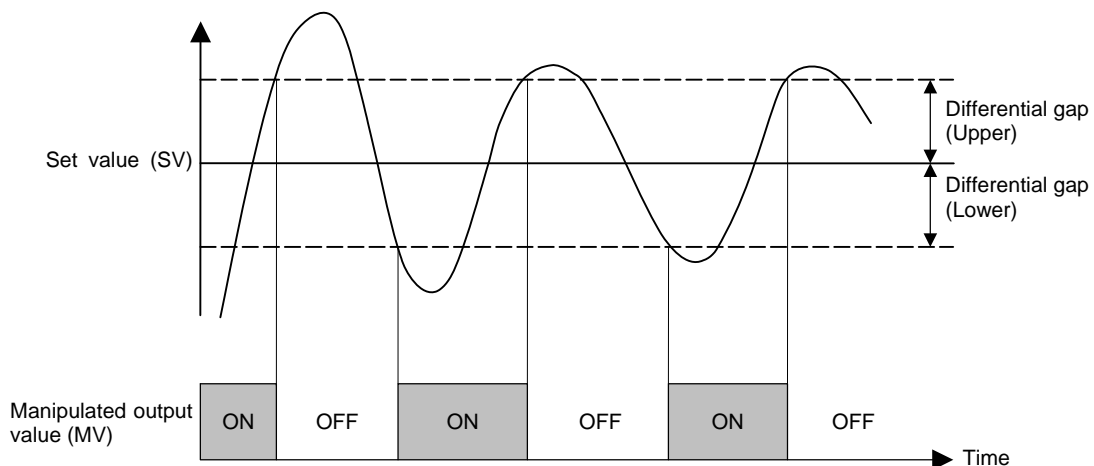
■ ON/OFF action differential gap (lower) (1. oHL, 2. oHL)

Use to set the ON/OFF control differential gap (lower).

Data range: 0 to Input span
                      (Varies with the setting of the Decimal point position)

Factory set value: Input 1_ON/OFF action differential gap (lower) (1. oHL):
                          Pressure sensor input: 1.0 MPa
                          Voltage (V)/Current (I) inputs: 0.1 % of input span

                      Input 2_ON/OFF action differential gap (lower) (2. oHL):
                          TC/RTD inputs: 1.0 °C [°F]
                          Voltage (V)/Current (I) inputs: 0.1 % of input span

Related parameters: ON/OFF action differential gap (upper) (P. 88)

Description of function: Refer to **ON/OFF action differential gap (upper)**.

■ Action at input error (high) (1. AoVE, 2. AoVE)

Use to select the action when the measured value reaches the Input error determination point (high).

Data range:	0: Normal control
	1: Manipulated output value at input error (PSM)
Factory set value:	Input 1_action at input error (high) (1. AoVE): 0
	Input 2_action at input error (high) (2. AoVE): 0
Related parameters:	Input error determination point (high) (P. 70),
	Manipulated output value at input error (P. 90)

Input Error Determination:

Example: Input range: 0.0 to 250.0 MPa
Input error determination point (high): 240.0 MPa
Input error determination point (low): 5.0 MPa
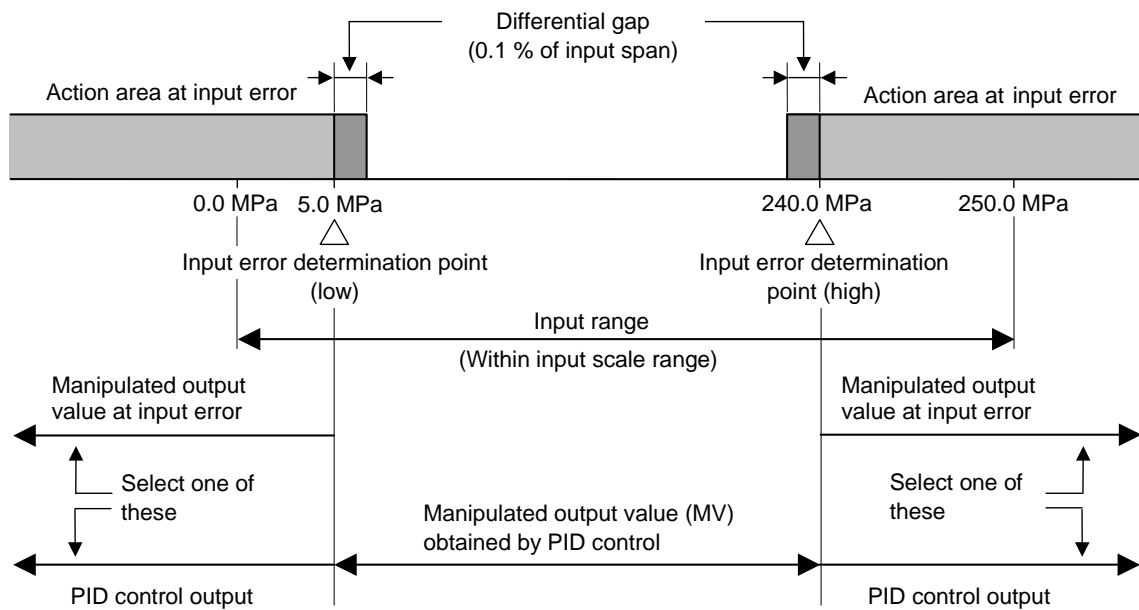
■ Action at input error (low) (1. AUnE, 2. AUnE)

Use to select the action when the measured value reaches the Input error determination point (low).

Data range:	0: Normal control
	1: Manipulated output value at input error (PSM)
Factory set value:	Input 1_action at input error (low) (1. AUnE): 0
	Input 2_action at input error (low) (2. AUnE): 0
Related parameters:	Input error determination point (low) (P. 71),
	Manipulated output value at input error (P. 90)
Description of function:	Refer to **Action at input error (high)**.

■ Manipulated output value at input error (1. PSM, 2. PSM)

When the measured value reaches Input error determination point and Action at input error is set to "1", this manipulated value is output.

Data range: −5.0 to +105.0 %

Factory set value: Input 1_manipulated output value at input error (1. PSM): −5.0
                     Input 2_manipulated output value at input error (2. PSM): −5.0

Related parameters: Input error determination point (high) (P. 70), Input error determination point (low) (P. 71), Action at input error (high) (P. 89), Action at input error (low) (P. 89)

■ Manipulated output value when transferred to Auto from Manual (1. PSM', 2. PSM')

This is the final Manipulated output value used under Manual control when the control mode is transferred to Auto control from Manual control.

Data range: −5.0 to +105.0 %

Factory set value: —

Related parameters: MV transfer function (P. 92)

> 📖   This manipulated output value is used as a manipulated output value under Manual control when transferred to Manual control from Auto control for event input with "MV transfer function: 1 (Used)" selected.

■ Output change rate limiter (up) (1. orU, 2. orU)

Use to set the Output change rate limiter (up) to limit of the variation of output is set.

Data range: 0.0 to 1000.0 %/second of manipulated output
                     0.0: Unused

Factory set value: Input 1_output change rate limiter (up) (1. orU): 0.0
                     Input 2_output change rate limiter (up) (2. orU): 0.0

Related parameters: Output change rate limiter (down) (P. 91), Output limiter high (P. 92), Output limiter low (P. 92)

Output Change Rate Limiter:

        The Output change rate limiter limits the variation of Manipulated output (MV) per second. This function is suitable for an application in which a sudden MV change is not acceptable.

Continued from the previous page.

[Example]

The Output change rate limiter is effective.

- The MV reaches 100 % when the power is turned on to the controller and such a sudden output change is not acceptable in the application.

- A sudden output change occurs at the SV change and it is not acceptable in the application.
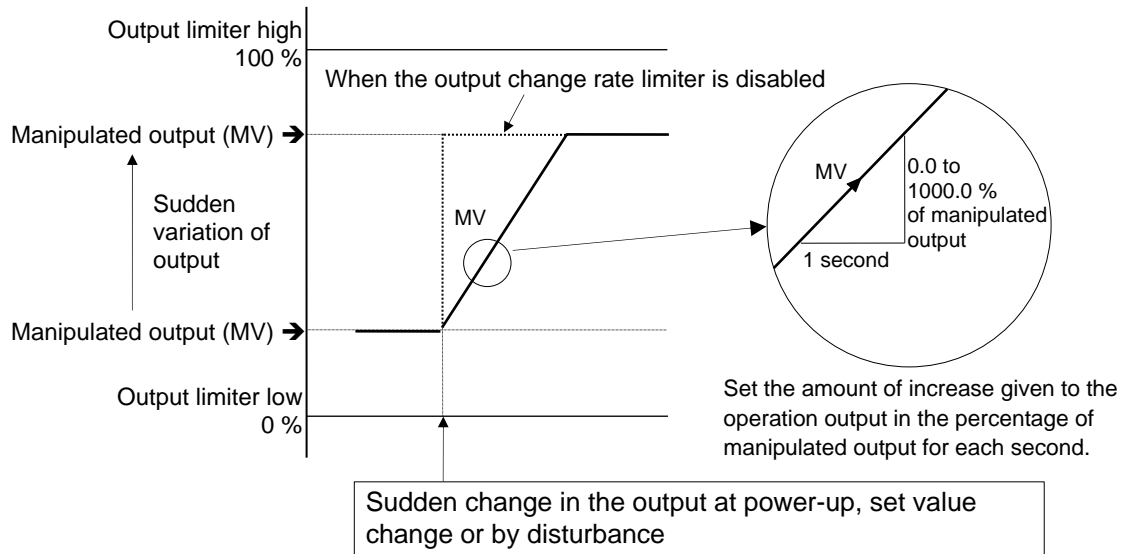
The output changes at specific rates set by Output change rate limiter (up) even under the situations where a sudden output change would occur without Output change rate limiter function. There is also independent Output change rate limiter (down).

📖   If the Output change rate is set smaller, it will cause slow control response and affect Derivative action.

📖   When the Output change rate limiter is used, you may not be able to obtain appropriate PID constants by Autotuning.

📖   The Output change rate limiter is particularly effective when a sudden MV change may create uncontrollable situation cause a large current flow. Also, it is very effective current output or voltage output is used as control output.

■ Output change rate limiter (down) (1. ord, 2. ord)

Use to set the Output change rate limiter (down).

Data range: 0.0 to 1000.0 %/second of manipulated output
                          0.0: Unused

Factory set value: Input 1_output change rate limiter (down) (1. ord): 0.0
                          Input 2_output change rate limiter (down) (2. ord): 0.0

Related parameters: Output change rate limiter (up) (P. 90), Output limiter high (P. 92),
                          Output limiter low (P. 92)

Description of function: Refer to **Output change rate limiter (up)**.

■ Output limiter high (1. oLH, 2. oLH)

Use to set the high limit value of manipulated output.

Data range:	Output limiter low to 105.0 %
Factory set value:	Input 1_output limiter high (1. oLH): 105.0
	Input 2_output limiter high (2. oLH): 105.0
Related parameters:	Output change rate limiter (up) (P. 90), Output change rate limiter (down) (P. 91),
	Output limiter low (P. 92)

Output Limiter:

This is the function which restricts the high and low limits of Manipulated output values (MV).
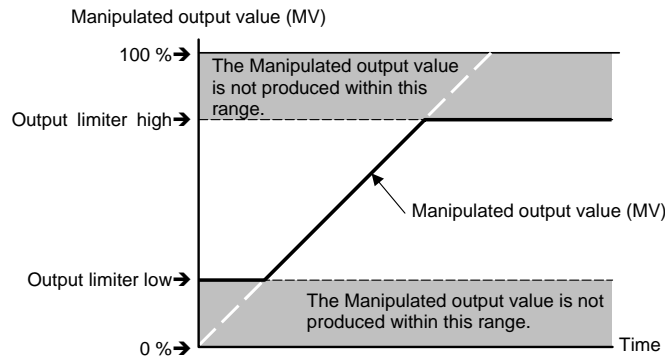
Output limiter is available for ON/OFF action.

■ Output limiter low (1. oLL, 2. oLL)

Use to set the low limit value of manipulated output.

Data range:	−5.0 % to Output limiter high
Factory set value:	Input 1_output limiter low (1. oLL): −5.0
	Input 2_output limiter low (2. oLL): −5.0
Related parameters:	Output change rate limiter (up) (P. 90), Output change rate limiter (down) (P. 91),
	Output limiter high (P. 92)
Description of function:	Refer to **Output limiter high**.

The setting items "1. PFF", "1. PFFS", "2. PFF" and "2. PFFS" displayed hereafter are not used in the HA430/930.

■ MV transfer function (1. MVTS, 2. MVTS)

The final Manipulated output value (MV) used under Manual control with the control mode transferred to Auto control from Manual control is stored to the Manipulated output value (□PSM') when transferred to Auto control from Manual control. It is selected whether or not this Manipulated output value (MV) is used only as a Manipulated output value (MV) under Manual control when transferred to Manual control from Auto control for event input (DI).

Data range:	0: Unused
	1: Used
Factory set value:	Input 1_MV transfer function (1. MVTS): 0
	Input 2_MV transfer function (2. MVTS): 0
Related parameters:	Manipulated output value when transferred to Auto from Manual (P. 90),
	Auto/Manual transfer (P. 108)

This function does not act as an original function when transferred to Manual control from Auto control through transfer operation by the direct key or on the operation mode screen.

8.13 Autotuning 1 (AT1) (F53)
Autotuning 2 (AT2) (F54)

■ AT bias (1. ATb, 2. ATb)

Use to set a bias to move the set value only when Autotuning (AT) is activated.

Data range: −Input span to +Input span
Factory set value: Input 1_AT bias (1. ATb): 0
                             Input 2_AT bias (2. ATb): 0
Related parameters: PID/AT transfer (P. 101), AT action (P. 96)
Functional description:

The AT bias is used to prevent overshoot during Autotuning in the application which does not allow overshoot even during Autotuning. RKC Autotuning method uses ON/OFF control at the set value to calculate the PID values. However, if overshoot is a concern during Autotuning, the desired AT bias should be set to lower the set point during Autotuning so that overshoot is prevented.

Example: When AT bias is set to the minus (−) side.
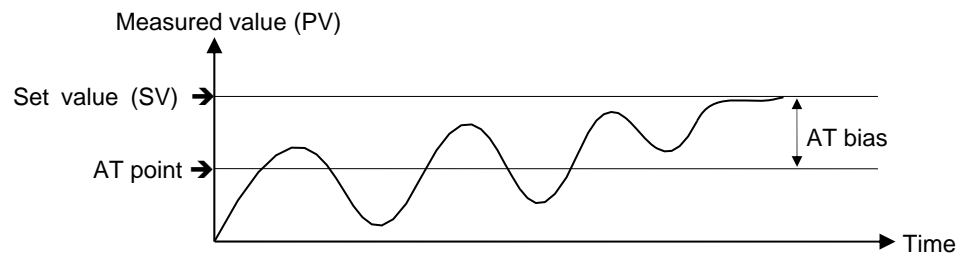
■ AT cycle (1. ATC, 2. ATC)

The number of ON/OFF cycles is selected when the Autotuning (AT) function is executed.

Data range: 0: 1.5 cycles
                     1: 2.0 cycles
                     2: 2.5 cycles
                     3: 3.0 cycles
Factory set value: Input 1_AT cycle (1. ATC): 1

                     Input 2_AT cycle (2. ATC): 1
Related parameters: PID/AT transfer (P. 101), AT action (P. 96)

Example: When the AT cycle is set to 1.5 cycle and the Autotuning (AT) function is executed just after the power is turned on.
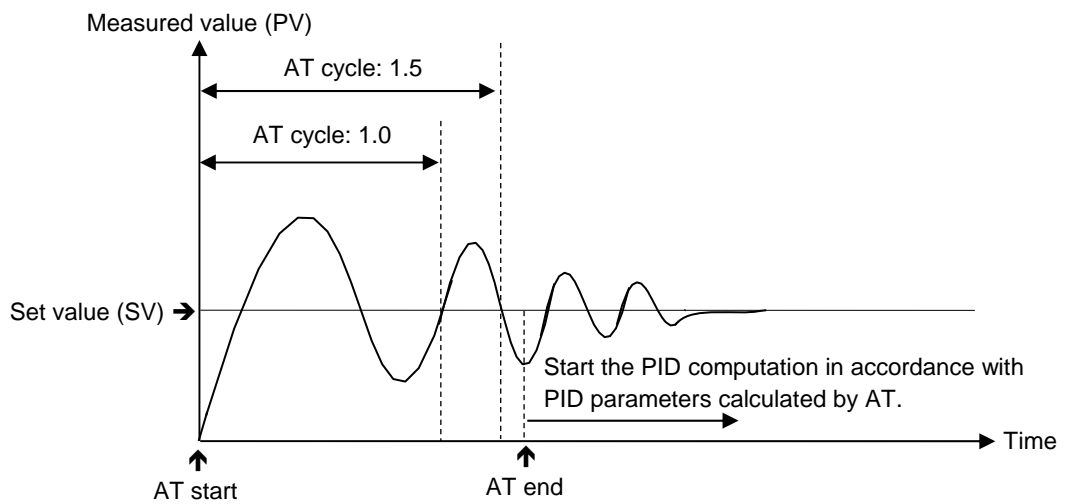
■ AT differential gap time (1. ATH, 2. ATH)

Use to set an ON/OFF action differential gap time for Autotuning (AT). This function prevents the AT function from malfunctioning caused by noise.

Data range:　　　　　0.00 to 50.00 seconds

Factory set value:　　Input 1_AT differential gap time (1. ATH): 0.10
　　　　　　　　　　Input 2_AT differential gap time (2. ATH): 0.10

Related parameters: PID/AT transfer (P. 101), AT action (P. 96)

Functional description:

In order to prevent the output from chattering due to the fluctuation of a Measured value (PV) caused by noise during Autotuning, the output on or off state is held until AT differential gap time has passed after the output on/off state is changed to the other. Set AT differential gap time to "$1/100 \times$ Time required for temperature rise."

Example:

A: AT cycle time the AT differential gap time set to 0.00 second
The output chatters due to the fluctuation of the Measured value (PV) caused by noise, and Autotuning (AT) function is not able to monitor appropriate cycles to compute suitable PID values.

B: AT cycle time when the AT differential gap time is set to "Time corresponding to 0.25 cycles." The fluctuation of a Measured value (PV) caused by noise is ignored and as a result Autotuning (AT) function is able to monitor appropriate cycles to compute suitable PID values.
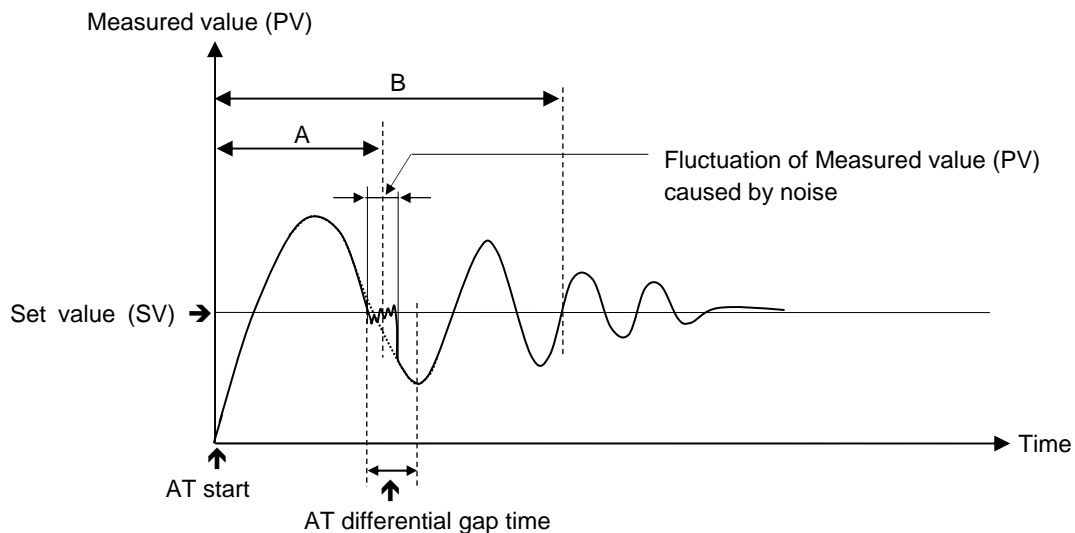
The factory set value of the AT cycle is 2 cycles.

Function block F55 (Including setting item) displayed hereafter is not used in the HA430/930.

■ AT action (1. ATt, 2. ATt)

Use to select the Autotuning (AT) function.

Data range: 0: AT function (PID)
                (AT result is reflected to derivative time.)
         1: AT function (PI)
                (No AT result is reflected to derivative time.)
         2: No AT function

Factory set value: Input 1_AT action (1. ATt): 2
                Input 2_AT action (2. ATt): 2

Related parameters: PID/AT transfer (P. 101)

Autotuning (AT) function:

Autotuning (AT) automatically measures, calculates and sets the optimum PID (PI) constants. The following conditions are necessary to carry out autotuning and the conditions which will cause the autotuning to stop.

■ AT start

First, select the AT function type on the AT action selecting screen. Next, check that all of the following conditions are satisfied. The autotuning (AT) is executed on the PID/AT transfer screen in RUN mode. (Refer to P. 101)

- Operation mode conditions are as follows:
  - Auto/Manual transfer   Auto mode
  - Remote/Local transfer   Local mode
  - PID/AT transfer   PID control
  - RUN/STOP transfer   Control RUN
- The Measured value (PV) is without input error range [Input error determination point (high) > Measured value (PV) > Input error determination point (low)].
- The Output limiter high is 0.1 % or higher and the Output limiter low is 99.9 % or less.

   When the Autotuning is finished, the controller will automatically returns to PID (PI) control.

■ AT cancellation

The Autotuning is canceled if any of the following conditions exist.
- When the Temperature set value (SV) is changed.
- When the Output limiter high or the Output limiter low is changed.
- When the PV bias, the PV digital filter, or the PV ratio is changed.
- When the Auto/Manual mode is changed to the Manual mode.
- When the Remote/Local mode is changed to the Remote mode.
- When the Measured value (PV) goes to input error range [Measured value (PV) $\geq$ Input error determination point (high) or Input error determination point (low) $\geq$ Measured value (PV)].
- When the power failure occurs.
- When the instrument is in the FAIL state.
- When the PID/AT transfer is changed to the PID control.
- When the RUN/STOP mode is changed to the control STOP.

   If the AT is canceled, the controller immediately changes to PID (PI) control. The PID (PI) values will be the same as before AT was activated.

8.14 Communication Function (F60)

📖 **The setting items "Car" and "Cab" displayed hereafter are not used in the HA430/930.**

■ Communication protocol selection (CMPS2)

Use to select the protocol of Communication.

Data range:
    0: RKC communication
    1: Modbus 1 (Data transfer: In order of low-order word from high-order word)
    2: Modbus 2 (Data transfer: In order of high-order word from low-order word)
    10: CC-Link (1 station occupied 1 time)
    11: CC-Link (1 station occupied 4 times)
    12: CC-Link (1 station occupied 8 times)
    13: CC-Link (4 stations occupied 1 time)

Factory set value: 0 (RKC communication), 2 (Modbus)

Related parameters: Device address (P. 46), Communication speed (P. 46), Data bit configuration (P. 46),
                     Interval time (P. 47)

📖 Communication (optional) must be specified when ordering.

📖 If the Communication function is for PROFIBUS or DeviceNet, the selection of the Communication
    protocol (CMPS2) becomes invalid.

☞ For the details of communication functions (RKC communication/Modbus),
    refer to the **Communication Instruction Manual (IMR01N13-E☐)**. *

    * Refer to **Communication Instruction Manual (IMR01N14-E☐)** for PROFIBUS, **Communication Instruction Manual
    (IMR01N15-E☐)** for DeviceNet, and **Communication Instruction Manual (IMR01N21-E☐)** for CC-Link.

8.15 Set Value (SV) (F70)

■ Setting change rate limiter unit time (SVrT)

Set the time unit for Setting change rate limiter (up/down).

Data range: 1 to 3600 seconds

Factory set value: 60

Related parameters: Setting change rate limiter (up) (P. 38), Setting change rate limiter (down) (P. 39)

■ Soak time unit selection (STdP)

Use to select the time unit for Area soak time.

Data range: 0: 0 hour 00 minutes 00 second to 9 hours 59 minutes 59 seconds
                      2: 0 minutes 00.00 seconds to 9 minutes 59.99 seconds

Factory set value: 2

Related parameters: Area soak time (P. 40)

8.16 Set Value 1 (SV1) (F71)
Set Value 2 (SV2) (F72)

■ Setting limiter high (1. SLH, 2. SLH)

Use to set a high limit of the set value.

Data range:	Setting limiter low to Input scale high
Factory set value:	Input 1_setting limiter high [1.SLH]: Input 1_input scale high
	Input 2_setting limiter high [2.SLH]: Input 2_input scale high
Related parameters:	Decimal point position (P. 69), Input scale high (P. 69), Setting limiter low (P. 98)
Setting Limiter:	Setting limiter is to set the range of the Set value (SV).

Example: The input range (input scale range) is from 0.0 to 250.0 MPa, the Setting limiter high is 200.0 MPa, and the Setting limiter low is 20.0 MPa.
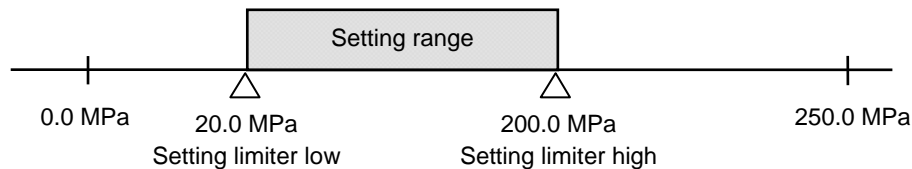
■ Setting limiter low   (1. SLL, 2. SLL)

Use to set a low limit of the set value.

Data range:	Input scale low to Setting limiter high
Factory set value:	Input 1_setting limiter low [1.SLL]: Input 1_input scale low
	Input 2_setting limiter low [2.SLL]: Input 2_input scale low
Related parameters:	Decimal point position (P. 69), Input scale low (P. 70), Setting limiter high (P. 98)
Description of function:	Refer to **Setting limiter high.**

■ PV transfer function (1. PVTS, 2. PVTS)

It is selected whether or not PV with the control mode transferred to Auto control from Manual control is used as SV. It is possible to prevent a Manipulated output value (MV) from its sudden change by substituting PV for SV.

Data range:	0: Unused
	1: Used
Factory set value:	Input 1_PV transfer function (1. PVTS): 0
	Input 2_PV transfer function (2. PVTS): 0
Related parameters:	Auto/Manual transfer (P. 108)

8.17 System Information Display (F91)

System information (refer to below) can be checked on Function block F91.

Upper display: Character of the parameter
Lower display: value

Function block F91

Press the SET key

ROM version display (RoM)

Displays the version of loaded software.

Press the SET key

Integrated operating time display (WT)

Displays the integrated total operating time of the controller.
Display range: 0 to 99999 hours

Press the SET key

Holding peak value ambient temperature display (TCJ)

Displays the maximum ambient temperature of the instrument.
Display range: −10.0 to +100.0 °C

Press the SET key

This screen is displayed but not used for the HA430/930.

Press the SET key

9. OPERATION

9.1 Control RUN and STOP

There is no power switch on this instrument, and the instrument starts operation immediately following initial power-ON (Factory set value: RUN).

There are parameters in Engineering mode which cannot be changed when the controller is in RUN mode. Press the direct key (R/S) to change the RUN/STOP mode from RUN to STOP when a change for the parameters in Engineering mode is necessary. Refer to **8. ENGINEERING MODE (P. 50)** for details. When RUN/STOP mode is changed from STOP to RUN, the controller starts control in the way set in **Hot/Cold start selection** of the Engineering mode (P. 85).

☞ For detail of RUN/STOP transfer, refer to **9.6 RUN/STOP Transfer (P. 112)**.

■ Operation under control RUN mode

- To change display contents in the monitoring state, go to SV setting & Monitor mode.
   ☞ **5. SV SETTING & MONITOR MODE (P. 30), 9.3 Monitoring Display in Operation (P. 102)**

- To change the Set value (SV), go to SV setting & Monitor mode.
   ☞ **5. SV SETTING & MONITOR MODE (P. 30)**

- To change parameters related to control, go to the Parameter setting mode.
   ☞ **6. PARAMETER SETTING MODE (P. 32), 7. SETUP SETTING MODE (P. 42)**

- To change the control Memory area, go to SV setting & Monitor mode.
   ☞ **5. SV SETTING & MONITOR MODE (P. 30)**

- To activate Autotuning (AT), go to the Operation mode.
   ☞ **AT action (P. 96), 9.2 Configuration of Operation Mode (P. 101)**

- To switch Auto/Manual, go to the Operation mode, or press the direct key (A/M).
   ☞ **9.2 Configuration of Operation Mode (P. 101), 9.4 Auto/Manual Transfer (P. 108)**

- To switch Remote/Local, go to the Operation mode, or press the direct key (R/L).
   ☞ **9.2 Configuration of Operation Mode (P. 101), 9.5 Remote/Local Transfer (P. 111)**

■ Display at control STOP

The STOP character is displayed on the Measured value (PV1/PV2) display unit while being stopped.

The display unit to display the STOP character is selectable.

Go to **"STOP display selection"** in the Engineering mode (P. 63).
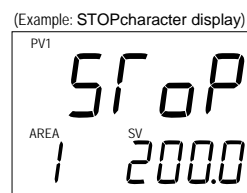
9.2 Configuration of Operation Mode

■ Display Sequence

The operation mode is used to selects the operation modes (PID/AT, Auto/Manual, Remote/Local, RUN/STOP) of the instrument. Every time the SET key or the shift key is pressed, the display goes to the next parameters.
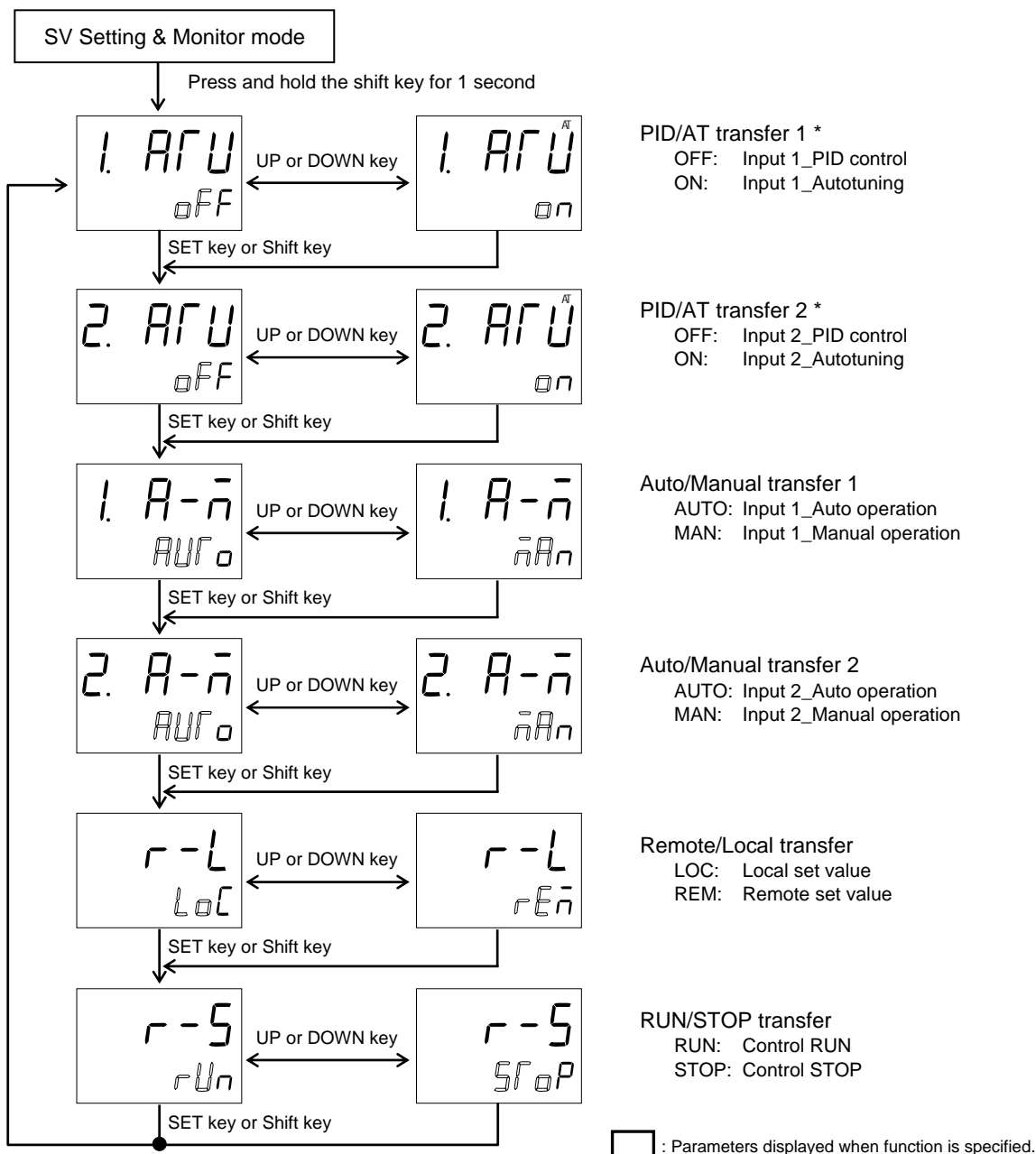
* No PID/AT transfer is valid prior to factory shipment. The transfer becomes valid only when "1: AT function (PI)" or "0: AT function (PID)" is selected in AT action selection. Refer to P. 96.

📖   Auto/Manual, Remote/Local, RUN/STOP transfer is possible via respective Direct key.

📖   To return the SV setting & Monitor mode, press and hold the shift key for 1 second, or press the shift key while pressing the SET key.

📖   If the key is not pressed within 1 minute, the display will automatically return to the SV setting & Monitor mode.

9.3 Monitoring Display in Operation

In SV setting & Monitor mode, the following operations are possible.
　　Change the Set value (SV)
　　Change Memory area
　　Monitor the Measured value (PV) and the Manipulated value (MV), etc.
Use this mode during normal operation.

■ Display Sequence

| Power ON | Parameter setting mode, Setup setting mode, Operation mode, Engineering mode |

Press the shift key while pressing the SET key.
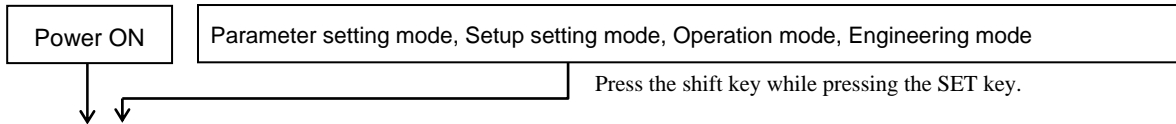
Input 1_measured value (PV1)/set value (SV1) monitor
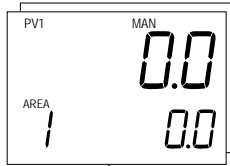
Measured value 1 (PV1)

Set value 1 (SV1)
One of set value, Input 1_manipulated output value (MV1) or remote set value can be displayed.
Local state: 　　　The set value is displayed.
Remote state: 　　The remote set value is displayed.
Manual operation: The Manipulated output value (MV1) of Input 1 can be set.
　　　　　　　　　Setting range: Input 1_output limiter low to Input 1_output limiter high

　　　　　　　　　An MV scaling value (motor RPM) is displayed in the monitor state.
　　　　　　　　　It is also possible to manually charge the MV scaling value.

　　　　　　　　　Display range: MV scaling low to MV scaling high

SET key

📖 MV scaling function
Scaling of an Input 1_manipulated output value (MV1) is conducted in Engineering mode.
• F10_Decimal point position of MV scaling (MVdP)　　• F10_MV scaling low (MVLS)
• F10_MV scaling high (MVHS)

Example: When scaling of an input 1_manipulated output value (MV1) is conducted to obtain the number of motor revolutions from 0.0 to 80.0 rpm
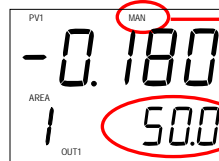
MAN lamp ON
Decimal point position of MV scaling: 　　　　　One decimal place
Input 1_MV scaling low (MV1 = 0.0 %): 　　　　0.0 rpm
Input 1_MV scaling high (MV1 = 100.0 %): 80.0 rpm

Displays any value obtained after scaling of a Manipulated output value (MV1).

In addition, any value obtained after scaling of a Manipulated output value (MV1) can be changed.
The number of motor revolutions is increased from 50.0 to 60.0 rpm.
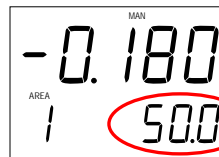
Keep pressing the UP key until a value of 60.0 is attained.
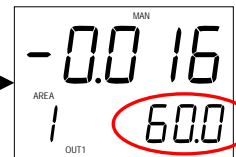
📖 When the Setting change rate limiter is set and the SV is changed, the SV changes at specific rates in the display.
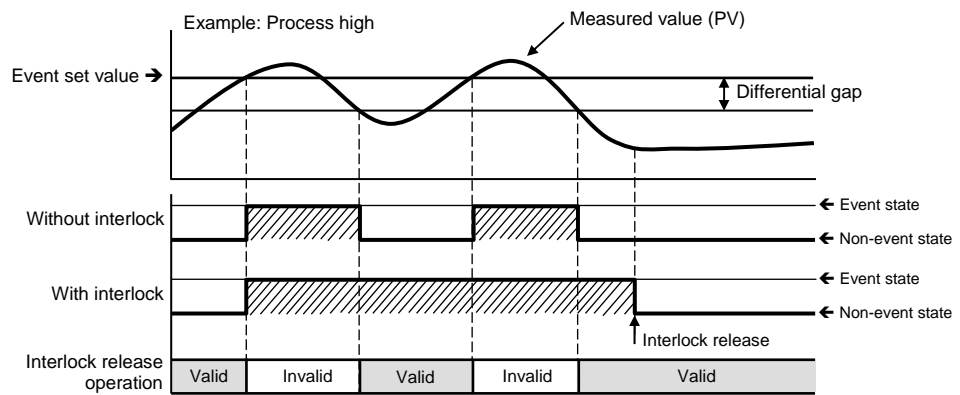
| | : Parameters related to multi-memory area function |
| | : Parameters displayed when function is specified |

A

Continued on the next page.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　IMR01N12-E7

Continued from the previous page.

A

Input 2_measured value (PV2)/set value (SV2) monitor

PV2 **28.3**
AREA SV
1 **0.0**
OUT1
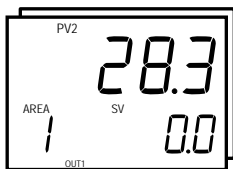
◄──── Measured value 2 (PV2)

◄──── Set value 2 (SV2)
In the Manual operation, the Manipulated output value (MV2) of Input 2 can be set.
Setting range: Input 2_output limiter low to Input 2_output limiter high

SET key

📖 When the Setting change rate limiter is set and the SV is changed, the SV changes at specific rates in the display.

Input 1_measured value (PV1)/Input 2_measured value (PV2) monitor

PV1 **0.0**
AREA PV2
1 **28.3**
OUT1

◄──── Measured value 1 (PV1)

◄──── Measured value 2 (PV2)

SET key

┌─────────────────────────────────────┐
│ 1. **SV** ──SET key──► 2. **SV** │
│ AREA AREA │
│ 1 **0000.0** 1 **0000.0** │
│ OUT1 OUT1 │
│ Input 1_set value (SV1) Input 2_set value (SV2) │
│ setting screen setting screen │
└─────────────────────────────────────┘
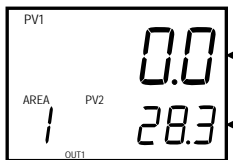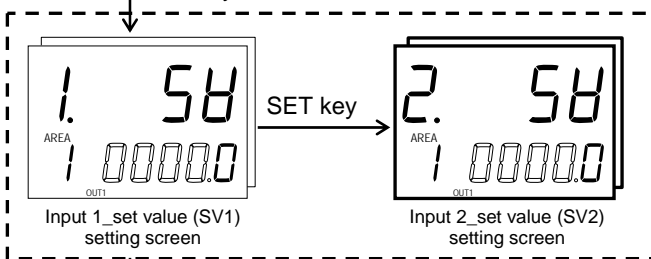
SET key

Remote input value monitor
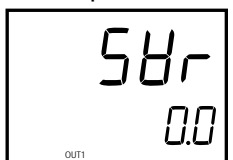
SVr

0.0
OUT1

Displays the remote set value which is the control target value in the Remote (REM) mode. Displayed only when the Remote input function is provided.

Display range: Input 1_setting limiter low to Input 1_setting limiter high

SET key

PV1 peak hold value monitor

1.PHLd

0.0

The maximum PV value (peak value) of Input 1 is held and displayed. Displayed only when the hold function provided.

Display range: Input 1_input scale low to Input 1_input scale high
Peak hold function: Refer to the next page.

SET key

☐ : Parameters related to multi-memory area function

☐☐ : Parameters displayed when function is specified.

B

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B

Peak hold function:
The Peak hold function is used to store (hold) the maximum (peak) measured value (PV). The peak hold value is updated regardless of the STOP or RUN state if the power to this controller is turned on. Each of this value is updated when the Measured value (PV) becomes more than the value now being held. However, if the following operation is performed, the value now being held is reset and as a result the Measured value (PV) just when reset becomes the peak hold value.

- When the power is turned on or it is turned on again
- When operation mode is changed from STOP to RUN
- When hold reset
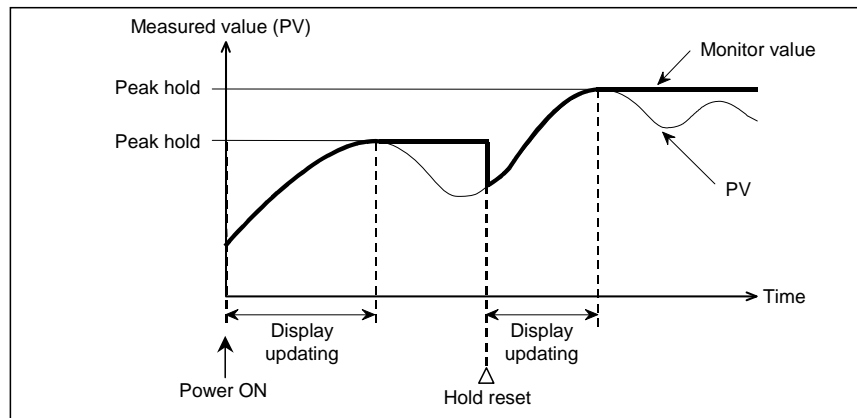
Peak hold value is not backed up.

PV1 bottom hold value monitor

```
I.bHLd
    0.0
```
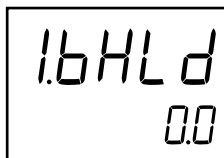
SET key

The minimum PV value (bottom value) of Input 1 is held and displayed. Displayed only when the hold function is provided.

Display range: Input 1_input scale low to Input 1_input scale high

Bottom hold function:
The Bottom hold function is used to store (hold) the minimum (bottom) measured value (PV). The bottom hold value is updated regardless of the STOP or RUN state if the power to this controller is turned on. Each of this value is updated when the Measured value (PV) becomes less than the value now being held. However, if the following operation is performed, the value now being held is reset and as a result the Measured value (PV) just when reset becomes the bottom hold value.

- When the power is turned on or it is turned on again
- When operation mode is changed from STOP to RUN
- When hold reset

▢ : Parameters related to multi-memory area function

▢▢ : Parameters displayed when function is specified.

C

Continued on the next page.

Continued from the previous page.

C

Measured value (PV)

PV

Bottom hold

Monitor value

Bottom hold

Time

Power ON

Display
updating
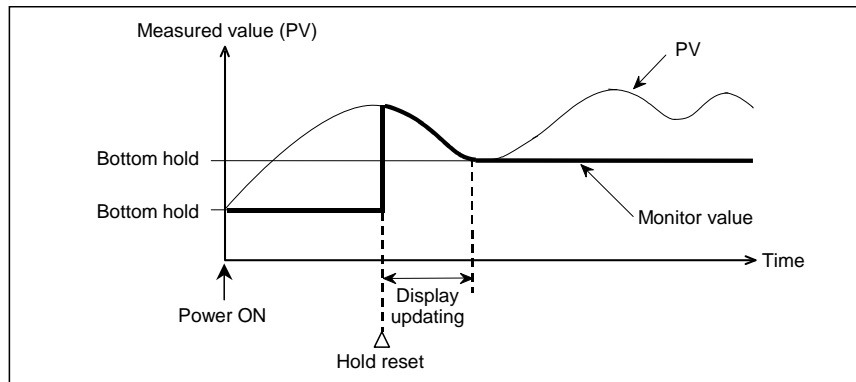
Hold reset

📖 Bottom hold value is not backed up.

PV1 hold reset

1.HL dr

Input 1_peak and bottom hold value is reset when the UP and DOWN keys a simultaneously pressed. Displayed only when the Hold function is provided.

📖 Hold reset can be made by Event input (optional). Hold resetting by Event input is set by selecting the **Event input logic selection** within the Engineering mode on page 73.

SET key

PV2 peak hold value monitor

2.PHL d

0.0

The maximum PV value (peak value) of Input 2 is held and displayed. Displayed only when the Hold function is provided.

Display range: Input 2_input scale low to Input 2_input scale high

Peak hold function: Refer to **PV1 peak hold value monitor (P. 104)**

SET key

PV2 bottom hold value monitor

2.bHL d

0.0

The minimum PV value (bottom value) of Input 2 is held and displayed. Displayed only when the Hold function is provided.

Display range: Input 2_input scale low to Input 2_input scale high

Bottom hold function: Refer to **PV1 bottom hold value monitor (P. 104)**

SET key

PV2 hold reset

2.HL dr

Input 2_peak and bottom hold value is reset when the UP and DOWN keys a simultaneously pressed. Displayed only when the Hold function is provided.

📖 Hold reset can be made by Event input (optional). Hold resetting by Event input is set by selecting the **Event input logic selection** within the Engineering mode on page 73.

SET key

☐ : Parameters related to multi-memory area function

☐☐ : Parameters displayed when function is specified.

D

Continued from the previous page.

D

Input 1_manipulated output value (MV1) monitor

```
 |.  ⁻n̄H
    - 5.0
```
MAN
OUT1
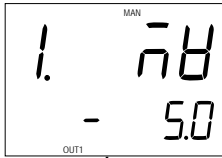
Input 1_manipulated output value (MV1) of 0 to 100 % is displayed as a value which is made scaling to the motor RPM.

Display range:　　　　MV scaling low to MV scaling high

Related parameters:　Decimal point position of MV scaling (P. 64),
　　　　　　　　　　　MV scaling low (P. 64), MV scaling high (P. 65)

SET key

📖　　When at a high MV scaling limit value of 100.0 and at a low MV scaling limit value of 0.0, MV1 is displayed.

　　　When set to "high MV scaling limit value = low MV scaling limit value", the zero value is displayed.

Input 2_manipulated output value (MV2) monitor

```
 ᒯ.  ⁻n̄H
    - 5.0
```
MAN
OUT1
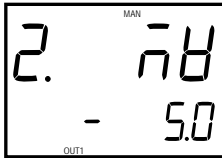
Displays Input 2_manipulated output value (MV2).

Displayed only when the Input 2_manipulated output value (MV2) function is provided.

Display range: −5.0 to +105.0 %

SET key

Event monitor

```
 EH̄n̄
 □□□□
 ↑ ↑ ↑ ↑
```
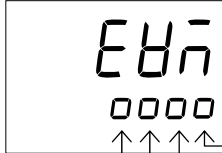
"o" corresponding to each Event is lit when the event is turned ON.

Event 1 (EV1)
Event 2 (EV2)
Event 3 (EV3) or Control loop break alarm 1 (LBA1)
Event 4 (EV4) or Control loop break alarm 2 (LBA2)

SET key

Interlock release

```
 | L r
   □FF
```
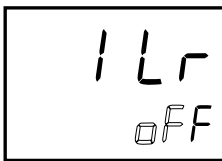
Displays the interlock status. Displayed only when the hold interlock is provided. Interlock status is release when the UP and DOWN keys a simultaneously pressed.

on: Interlock
off: Interlock release

SET key

Inerlock function:

The Interlock action holds the event state even if the measured value is out of the event zone after it enters the event zone once.

☐ : Parameters related to multi-memory area function

☐☐ : Parameters displayed when function is specified.

E

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　IMR01N12-E7

Continued from the previous page.

E

Example: Process high

Measured value (PV)

Event set value →

Differential gap

Without interlock
← Event state
← Non-event state

With interlock
← Event state
← Non-event state

Interlock release

Interlock release operation	Valid	Invalid	Valid	Invalid	Valid

📖 Interlock release can be made by Event input (optional). Interlock resetting by Event input is set by selecting the **Event input logic selection** within the Engineering mode on page 73.

Memory area selection

```
ArE
   00001
```
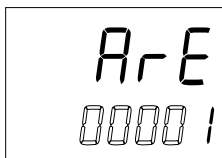
Selects the Memory area (control area) used for control.

Setting range: 1 to 16

📖 The Memory area selection can be made by Event input (optional).

☞ **9.7 Control Area Transfer (P. 114)**

SET key

Memory area soak time monitor
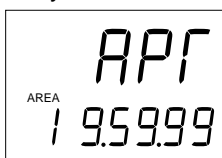
```
APr
AREA
1 9.59.99
```

Monitors the time elapsed for memory area operation (soak time) when Ramp/Soak control by using Multi-memory area is performed.

Display range: 0 minute 00.00 second to 9 minutes 59.99 seconds or
0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds

📖 Monitoring Example:

Measured value (PV)

Start of monitoring the area soak time for Memory area 2.

End of monitoring Memory area 2. Control area is changed to Memory area 3 and the time displayed on the monitor screen is reset.

Area soak time 4 minutes

SV of memory area 2

Area soak time 2 minutes

SV of memory area 1

End of monitoring Memory area 1. Control area is changed to Memory area 2 and the time displayed on the monitor screen is reset.

As the area soak time for memory area linked last becomes invalid, no area soak time is monitored.

Present set value (SV)

Start of monitoring the area soak time for Memory area 1

SV of memory area 3

Area soak time 3 minutes

Memory area 1   Memory area 2   Memory area 3   Time

SET key

CC-Link communication status

```
CLLS
     0
```

Displays the CC-Link communication status.

Status number

☞ For the CC-Link status number and its contents, refer to **Communication Instruction Manual [CC-Link] (IMR01N21-E□)**.

SET key

Retrun to Input 1_measured value (PV1)/set value (SV1) monitor screen

☐ : Parameters related to multi-memory area function

☐☐ : Parameters displayed when function is specified.

9.4 Auto/Manual Transfer

The Auto/Manual transfer can be made by Event input (optional) or Communication (optional) other than the key operation. For details of Auto/Manual transfer by communication, refer to the **Communication Instruction Manual (IMR01N13-E□)**.*

* Refer to **Communication Instruction Manual (IMR01N14-E□)** for PROFIBUS, **Communication Instruction Manual (IMR01N15-E□)** for DeviceNet, and **Communication Instruction Manual (IMR01N21-E□)** for CC-Link.

■ Auto/Manual transfer by Front key operation

Every time the UP key or the DOWN key is pressed, the Auto mode is changed to the Manual mode alternately.

Auto mode   Manual mode

(The above figure is an image of Auto/Manual transfer of Input 1.)

📖 When Auto/Manual mode is changed from Auto to Manual or from Manual to Auto, the balanceless-bumpless function is activated to prevent control disturbance caused by a sudden output change.

Manipulated output value (MV)
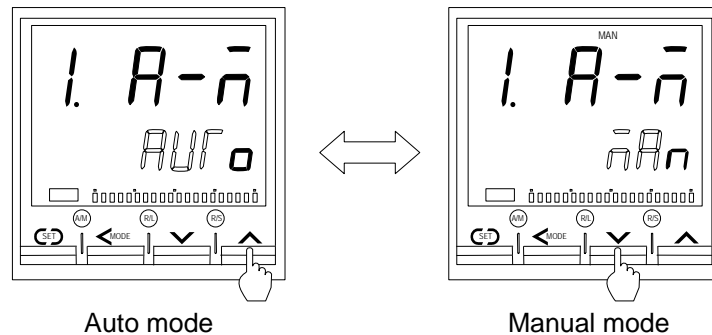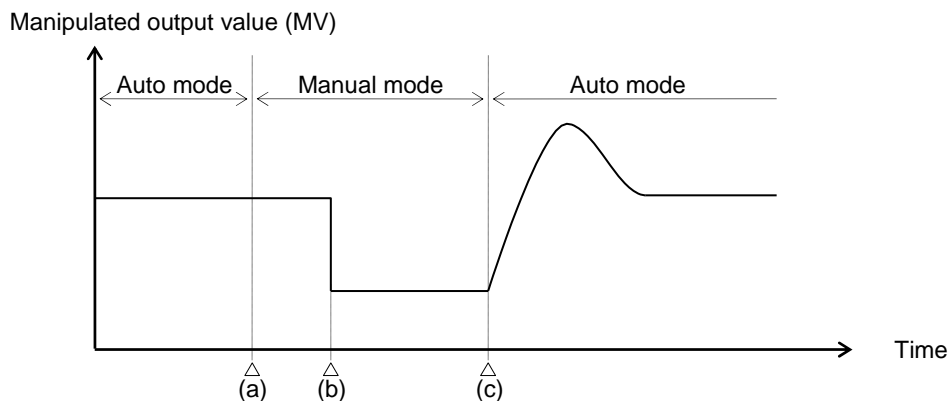
(a) Transfer from Auto mode to Manual mode.
    However, when the mode is transferred to Manual mode, the Manipulated output value used in Auto mode will be used as the Manual output value in Manual mode.
(b) The Manipulated output value is changed (Manual mode function)
(c) Transfer from Manual mode to Auto mode.
    When the mode is transferred to Auto mode, the controller starts PID control based on the MV used in Manual mode.

☞ For the Operation mode, refer to **9.2 Configuration of Operation Mode (P. 101)**.

■ Auto/Manual transfer by Direct key (A/M) operation

Every time the Auto/Manual (A/M) transfer key is pressed, the Auto mode is changed to the Manual mode alternately.
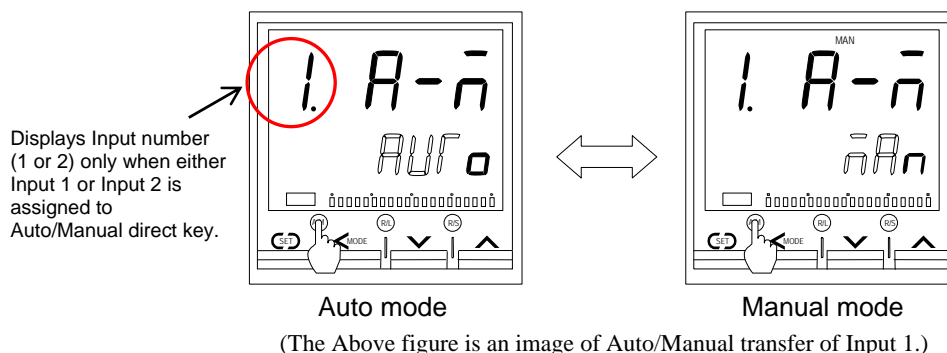
Displays Input number (1 or 2) only when either Input 1 or Input 2 is assigned to Auto/Manual direct key.

Auto mode   Manual mode

(The Above figure is an image of Auto/Manual transfer of Input 1.)

📖   When Auto/Manual mode is changed from Auto to Manual or from Manual to Auto, the balanceless-bumpless function is activated to prevent control disturbance caused by a sudden output change.

☞   Direct key operation setting can be changed in Engineering mode. For details, refer to **8.5 Direct Keys (F11)** on page 65.

■ Auto/Manual transfer by Event input

Auto/Manual transfer by the Event input is possible with the **Event input logic selection (P. 73)** of the Engineering mode. The table below shows the actual operation modes and lamp status under different combinations of settings by front key, communication and Event input.

Mode select from front key or communication	Event input state	Actual operation mode	Lamp state
Auto	Contact closed	Auto	MAN mode lamp OFF
	Contact open	Manual	MAN mode lamp ON
Manual	Contact closed		
	Contact open		

📖   **When the Event input is used for the setting change and the contact is closed, it takes approx. 0.5 seconds until the new setting is taken by the controller.**

📖   When Auto/Manual mode is changed from Auto to Manual or from Manual to Auto, the balanceless-bumpless function is activated to prevent control disturbance caused by a sudden output change.

■ Procedure for setting the Manipulated output value (MV) in Manual mode

When the controller is in Manual mode, the Manipulated output value (MV) can be manually set.

● **Setting procedure**
   1. Make sure the Manual (MAN) mode lamp is lit.
   2. Go to the "Input 1_PV1/SV1 monitor" screen in the SV setting & Monitor mode. Change the value by the UP and DOWN keys and then press the SET key to store the new setting.

[Display example]

PV1/SV1 monitor screen
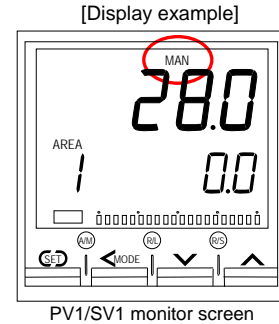
■ Manipulated output value (MV) under Manual control is changed by Event input

Any of the Event inputs (DI2 to DI4) enables the operation of Auto/Manual transfer, decrease/increase in Manipulated output value (motor RPM) under Manual control and resetting (manipulated output value = 0 %).
The manipulation of these output values by the Event input is set by changing the **Event input logic selection (P. 73)** of the Engineering mode. The relationship between the event input contact state and the operation state is shown in the following.

● **Relationship between contact state and each operation state**

	Contact closed	Contact open	Key operation (equivalent)
Manual output down (Motor RPM down) [1]	Manual output down (Motor RPM down)	—	DOWN key
Manual output up (Motor RPM up) [2]	Manual output up (Motor RPM up)	—	UP key
Manual output 0 % reset (Motor RPM reset) [3]	Manual output 0 % reset (Motor RPM reset)	—	—

[1] Decreases Manipulated output value (motor RPM) under Manual control with contacts closed. (It takes about 25 seconds to 1000 digits.)
[2] Increases Manipulated output value (motor RPM) under Manual control with contacts closed. (It takes about 25 seconds to 1000 digits.)
[3] The Manipulated output value (motor RPM) is reset to 0 % based on the edge discrimination of "open" to "closed."
  In addition, switched to "Manual Control" regardless of Auto/Manual transfer setting.

📖 **When the Event input is used for the setting change and the contact is closed, it takes approx. 0.5 seconds until the new setting is taken by the controller.**

9.5 Remote/Local Transfer

The Remote/Local transfer can be made by Event input (optional) or Communication (optional) other than the key operation. For details of the Remote/Local transfer by communication, refer to the **Communication Instruction Manual (IMR01N13-E□).***

* Refer to **Communication Instruction Manual (IMR01N14-E□)** for PROFIBUS, **Communication Instruction Manual (IMR01N15-E□)** for DeviceNet, and **Communication Instruction Manual (IMR01N21-E□)** for CC-Link.

■ Remote/Local transfer by Front key operation

Every time the UP key or the DOWN key is pressed, the Remote mode is changed to the Local mode alternately.

Remote mode   Local mode

☞   For the Operation mode, refer to **9.2 Configuration of Operation Mode (P. 101)**.

■ Remote/Local transfer by Direct key (R/L) operation

Every time the Remote/Local (R/L) transfer key is pressed, the Remote mode is changed to the Local mode alternately.

Remote mode   Local mode

☞   Direct key operation setting can be changed in Engineering mode. For details, refer to **8.5 Direct Keys (F11)** on page 65.

■ Remote/Local transfer by Event input

Remote/Local transfer by the Event input is possible with the **Event input logic selection (P. 73)** of the Engineering mode. The table below shows the actual operation modes and lamp status under different combinations of settings by front key, communication and Event input.

Mode select from front key or communication	Event input state	Actual operation mode	Lamp state
Remote	Contact closed	Remote	REM mode lamp ON
	Contact open	Local	REM mode lamp OFF
Local	Contact closed		
	Contact open		

📖 **When the Event input is used for the setting change and the contact is closed, it takes approx. 0.5 seconds until the new setting is taken by the controller.**

9.6 RUN/STOP Transfer

The RUN/STOP transfer can be made by Event input (optional) or Communication (optional) other than the key operation. For details of the RUN/STOP transfer by communication, refer to the **Communication Instruction Manual (IMR01N13-E□).***

* Refer to **Communication Instruction Manual (IMR01N14-E□)** for PROFIBUS, **Communication Instruction Manual (IMR01N15-E□)** for DeviceNet, and **Communication Instruction Manual (IMR01N21-E□)** for CC-Link.

- **If the controller is transferred to STOP mode from RUN mode, the controller status is the same as the Power-off. However for the specification with current output (other than 0 to 20 mA) or voltage output, an output of -5 % is fed when at STOP.**

- **Operation when transferred to RUN from STOP is in accordance with the Hot/Cold start selection* setting.**

   * Cold start (factory shipment): The controller will automatically go to Manual mode and output from the low output limit value (factory set value: -5.0 %).

■ RUN/STOP transfer by Front key operation

Every time the UP key or the DOWN key is pressed, the RUN mode is changed to the STOP mode alternately.
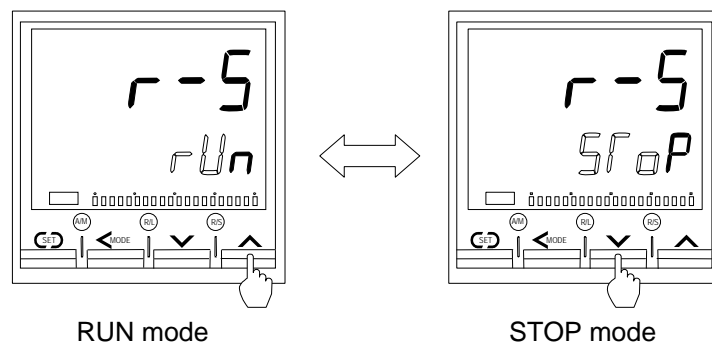
RUN mode   STOP mode

☞ For the Operation mode, refer to **9.2 Configuration of Operation Mode (P. 101)**.

■ RUN/STOP transfer by Direct key (R/S) operation

Every time the RUN/STOP (R/S) transfer key is pressed, the RUN mode is changed to the STOP mode alternately.

| RUN mode | STOP mode |
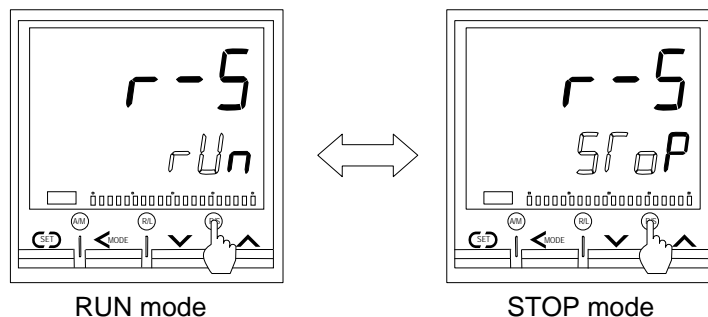
☞ Direct key operation setting can be changed in Engineering mode. For details, refer to **9.5 Direct Keys (F11)** on page 65.

■ RUN/STOP transfer by Event input

RUN/STOP transfer by the Event input is possible with the **Event input logic selection (P. 73)** of the Engineering mode. The table below shows the actual operation modes and displays under different combinations of settings by front key, communication and Event input.

Mode select from front key or communication	Event input state	Actual operation mode	State of STOP character display
RUN (Control RUN)	Contact closed	RUN	STOP is not displayed
	Contact open		*dSToP*
STOP (Control STOP)	Contact closed	STOP	*tSToP*
	Contact open		*SToP*

📖 **When the Event output is used for the setting change and the contact is closed, it takes approx. 0.5 seconds until the new setting is taken by the controller.**

📖 If the controller does not have Event input function, only "STOP" is displayed.

9.7 Control Area Transfer

The control area transfer can be made by Event input (optional) or Communication (optional) other than the key operation. For details of transfer by communication, refer to the **Communication Instruction Manual (IMR01N13-E□).***

* Refer to **Communication Instruction Manual (IMR01N14-E□)** for PROFIBUS, **Communication Instruction Manual (IMR01N15-E□)** for DeviceNet, and **Communication Instruction Manual (IMR01N21-E□)** for CC-Link.

■ Control area transfer by Front key operation

Press the UP key or the DOWN key to change the desired memory area number used for this control. Press the SET key to store the new setting.

[Display example]
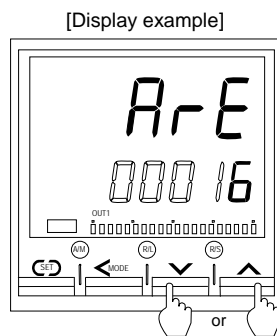
📖 The Memory area number stored at last is taken as Control area.

📖 The Memory area number (control area) can be changed at either RUN or STOP.

☞ For the SV setting & Monitor mode, refer to **5. SV SETTING & MONITOR MODE (P. 30)**.

■ Control area transfer by Event input

Memory area (control area) transfer by the Event input is possible with the **Event input logic selection (P. 73)** of the Engineering mode. The table below shows the Event input status and selected memory numbers for Control area transfer.

Event input	Memory area number															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DI 1	×	–	×	–	×	–	×	–	×	–	×	–	×	–	×	–
DI 2	×	×	–	–	×	×	–	–	×	×	–	–	×	×	–	–
DI 3	×	×	×	×	–	–	–	–	×	×	×	×	–	–	–	–
DI 4	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–

×: Contact open   –: Contact closed

📖 **To store a new Memory area number as the Control area, close the DI for Memory area set.**

9.8 Start Action at Recovering Power Failure

The operation of this instrument is not affected by a power failure of 20 ms or less. The control start mode at power recovery after more than 20 ms power failure can be selected as follows.

Power failure less than 3 seconds	Power failure 3 seconds or more
Hot start 1	Hot start 1
	Hot start 2
	Cold start
	Stop start
Hot start 2	Hot start 2
	Cold start
	Stop start
Cold start	Cold start
Stop start	Stop start

(Factory set value: Less than 3 seconds…Cold start, 3 seconds or more…Cold start)

● **Each start state is shown below.**

Hot start 1:   the controller will return to the same operation mode and the same manipulated value which were used or calculated by the controller before power failure.

Hot start 2:   the controller will return to the same operation mode which was used by the controller before power failure.

- In the Manual mode, the output value will be at the low output limit value.

- In the Auto mode, the controller will calculate the manipulated output value regardless that before power failure. So, the manipulated output varies.

Cold start: the controller will automatically go to Manual mode and output from the low output limit value.

Stop start: Started in the control stop (STOP) state regardless of the RUN mode (Auto/Manual) before power failure. Set to the RUN mode before power failure when changed to RUN from STOP by RUN/STOP selection.

📖   Control start mode when the controller recovers from power failure can be selected in Engineering mode. For details, refer to **8.11 Control (F50)** on page 85.

9.9 Ramp/Soak Control

Ramp/Soak control is possible by using Area soak time, Link area number and Setting change rate limiter (up/down) in Parameter setting mode (P. 31). The operating procedure is described in the following.

Example: Ramp/Soak control by linking Memory area 1 to 3

	Area 1	Area 2	Area 3
Set value (SV)	150.0 °C	200.0 °C	50.0 °C
Setting change rate limiter (up) (a, b)	5.0 MPa/min.	5.0 MPa/min.	OFF
Setting change rate limiter (down) (c)	OFF	OFF	3.0 MPa/min.
Area soak time	6 min.	6 min.	9 min. *
Link area number	2	3	OFF

The following is based on assumptions described below.

- 1-Input controller (measured input: 1 point)
- Present operating condition: Control STOP
- Control area before operation start: Memory area 1
- Setting of operation related parameters:
  All parameters other than the following items have been set to each of Memory areas 1, 2 and 3.
  SV, Setting change rate limiter, Area soak time, and Link area number

📖 The unit time can be changed by the Setting change rate limiter and the Soak time unit selection in the Engineering mode. (P.97)

* In this example, the Area soak time for Memory area 3 is set. However, as the Area soak time for the memory area linked last becomes invalid, the state of SV3 reached continues.

Step 1:
Set the Setting change rate limiter, Area soak time and Link area number to each of Memory area 1, 2 and 3.

1. Press the SET key several times at Parameter setting mode until Input 1_setting change rate limiter (up) setting screen is displayed.

Memory area No. 1 →

Factory set value: OFF (Unused)
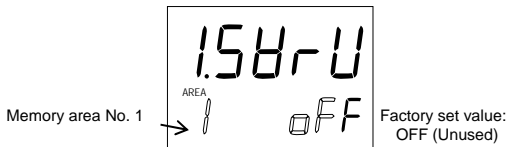
2. Press the UP key to change the number to 5.0.

3. Press the SET key to store the new value. The display goes to the next parameter. Check that this screen is set to OFF.

Factory set value: OFF (Unused)

Input 1_setting change rate limiter (down) setting screen

4. Press the SET key until Area soak time setting screen is displayed.

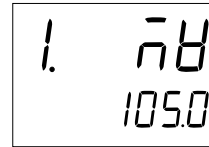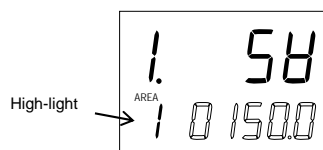Factory set value: 0.00.00 (0 min.00.00 sec)
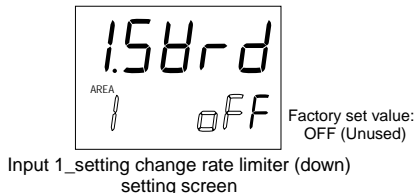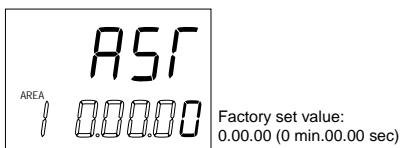
5. Press the shift key to high-light the most significant digit.
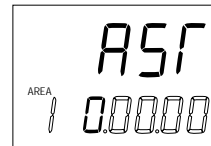
6. Press the UP key to change the number to 6.
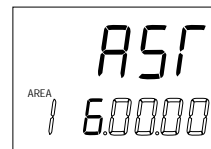
7. Press the SET key to store the new value. The display goes to the next parameter.
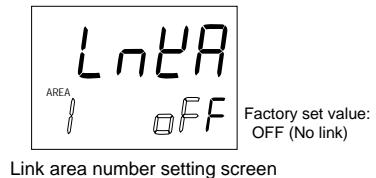
Factory set value: OFF (No link)

Link area number setting screen

8. Press the UP key to change the number to 2.

9. Press the SET key to store the new value. The display goes to the next parameter.

```
  EU 1
AREA
 1  0050.0
```

(Example: Event 1 set value setting screen)

10. Set the Memory area 2.
Press the SET key several times until Input 1_setting change rate limiter (up) setting screen is displayed.

```
  1.SUr U
AREA
 1  0005.0
```

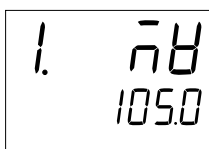11. Press the shift key until the memory area display unit is high-lighted.
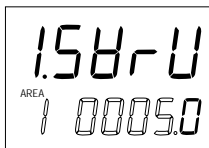
High-light →
```
  1.SUr U
AREA
 1  0005.0
```
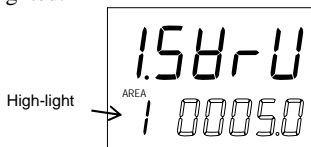
12. Press the UP key to change to 2. Area number display flashes.

Memory area No. 2 →
```
  1.SUr U
AREA
 2   oFF
```
Factory set value: OFF (Unused)
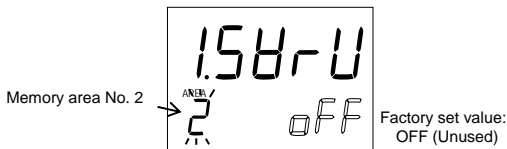
13. Press the shift key to high-light the least significant digit.
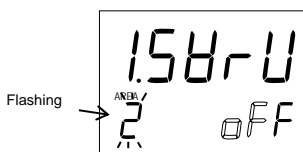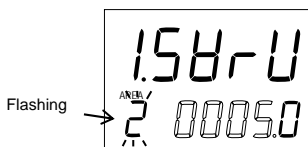
Flashing →
```
  1.SUr U
AREA
 2   oFF
```

14. Press the UP key to change the number to 5.0.

Flashing →
```
  1.SUr U
AREA
 2  0005.0
```

15. Press the SET key to store the new value. The display goes to the next parameter. Check that this screen is set to OFF.

Flashing →
```
  1.SUr d
AREA
 2    oFF
```
Factory set value: OFF (Unused)
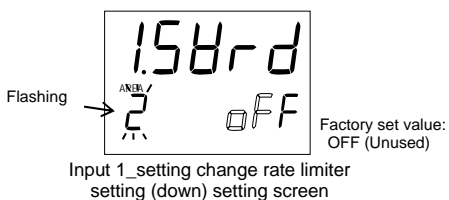
Input 1_setting change rate limiter setting (down) setting screen

16. Press the SET key until Area soak time setting screen is displayed.
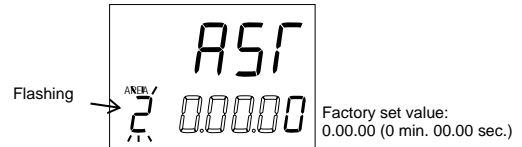
Flashing →
```
  ASr
AREA
 2  0.00.00
```
Factory set value: 0.00.00 (0 min. 00.00 sec.)

17. Press the shift key to high-light the most significant digit.

Flashing →
```
  ASr
AREA
 2  0.00.00
```

18. Press the UP key to change the number to 6.

Flashing →
```
  ASr
AREA
 2  6.00.00
```

19. Press the SET key to store the new value. The display goes to the next parameter.

Flashing →
```
  LnUA
AREA
 2    oFF
```
High-light

Factory set value: OFF (No link)
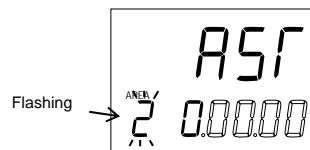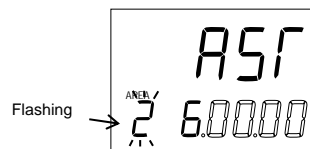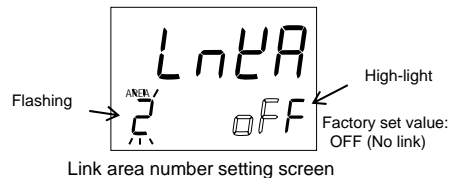
Link area number setting screen

20. Press the UP key to change the number to 3.
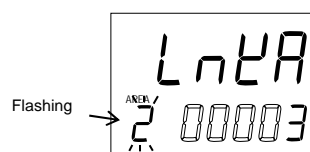
Flashing →
```
  LnUA
AREA
 2  00003
```

21. Press the SET key to store the new value. The display goes to the next parameter.

Flashing →
```
  EU 1
AREA
 2  0050.0
```
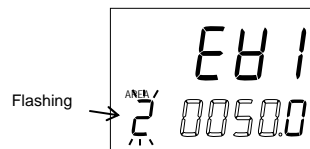
(Example: Event 1 set value setting screen)

22. Set the Memory area 3.
Press the SET key several times until Input 1_setting change rate limiter (up) setting screen is displayed.

Flashing →
```
  1.SUr U
AREA
 2  0005.0
```
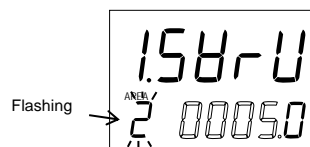
Continued on the next page.

23. Press the UP key to change the number to 3. Check that this screen is set to OFF.
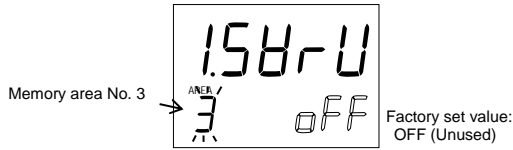
Memory area No. 3 →

Factory set value:
OFF (Unused)

24. Press the SET key to store the new value. The display goes to the next parameter.

Flashing →

Factory set value:
OFF (Unused)

Setting change rate limiter (down) setting screen

25. Press the UP key to change the number to 3.0.

Flashing →

26. Press the SET key to store the new value. The display goes to the next parameter.

Flashing →

Factory set value:
0.00.00 (0 min. 00.00 sec.)

Area soak time setting screen

27. Press the shift key to high-light the most significant digit.

Flashing →

28. Press the UP key to change the number to 9.

Flashing →

29. Press the SET key to store the new value. The display goes to the next parameter. Check that this screen is set to OFF.

Flashing →

High-light

Factory set value:
OFF (No link)

Link area number setting screen
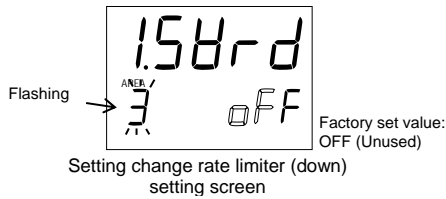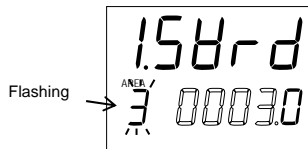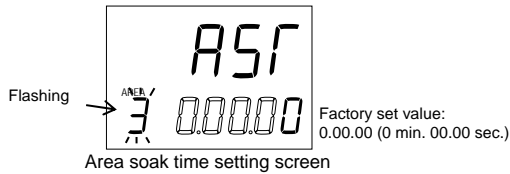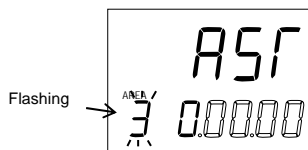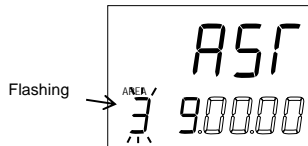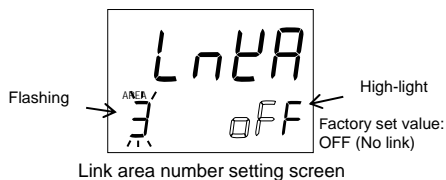
STEP 2:
Set the SV to each of Memory area 1, 2 and 3.

1. Press and hold the SET key for 2 seconds to change the mode from the Parameter Setting mode to SV setting & Monitor mode. PV1/SV1 monitor screen is displayed.

Memory area No. 1 →

← Present SV

PV1/SV1 monitor screen
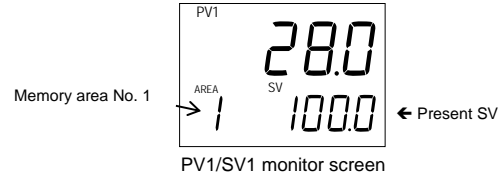
2. Press the SET key until Input 1_set value (SV1) setting screen is displayed.
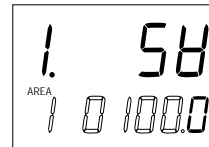
3. Press the shift key to high-light the tens digit.
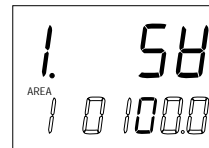
4. Press the UP key to change the number to 5.
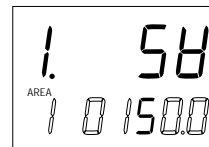
5. Press the SET key to store the new value. The display goes to the next parameter.

Example: Input 1_MV1 monitor screen

6. Set the Set value (SV) of Memory area 2.
Press the SET key several times until Input 1_set value (SV1) setting screen is displayed.

7. Press the shift key until the memory area display unit is displayed.

High-light → [1. SV / AREA / 1 0 150.0]
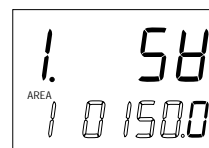
8. Press the UP key to change the number to 2. The number in AREA (Area number) display flashes.
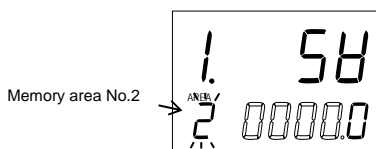
Memory area No.2 → [1. SV / AREA / 2 0000.0]

9. Press the shift key to high-light the hundreds digit.

Flashing → [1. SV / AREA / 2 0000.0]

10. Press the UP key to change the number to 2.

Flashing → [1. SV / AREA / 2 0200.0]
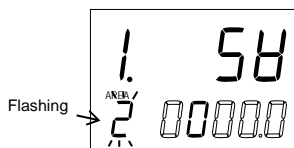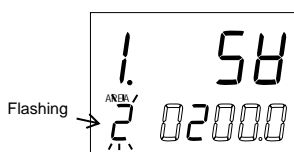
11. Press the SET key to store the new value. The display goes to the next parameter.

[1. MV / 105.0]

Example: Input 1_MV1 monitor screen

12. Set the Set value (SV) of Memory area 3.
Press the SET key several times until Input 1_set value (SV1) setting screen is displayed.

[1. SV / AREA / 1 0 150.0]

13. Press the shift key until the memory area display unit is displayed.

High-light → [1. SV / AREA / 1 0 150.0]
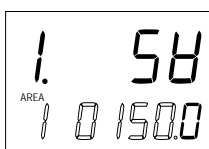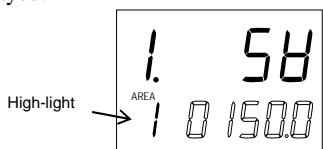
14. Press the UP key to change the number to 3. The number in AREA (Area number) display flashes.
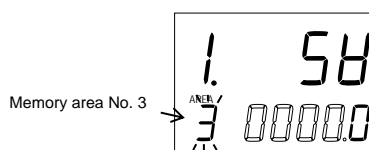
Memory area No. 3 → [1. SV / AREA / 3 0000.0]

15. Press the shift key to high-light the tens digit.

Flashing → [1. SV / AREA / 3 0000.0]

16. Press the UP key to change the number to 5.

Flashing → [1. SV / AREA / 3 0050.0]
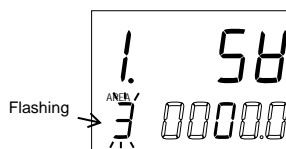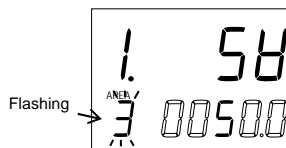
17. Press the SET key to store the new value. The display goes to the next parameter. The SV setting is finished.

[1. MV / 105.0]
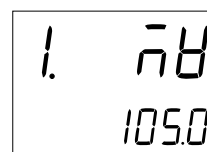
(Example: Input 1_MV1 monitor screen)

STEP 3:
Check the control area number.

Press the SET key several times at SV setting & Monitor mode until Memory area selection setting screen is displayed. Check that the memory area at the time of operation start corresponds to Memory area 1.

[ArE / 00001] ← Memory area 1
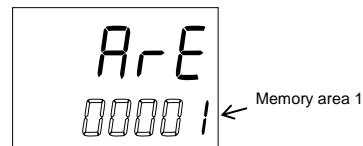
STEP 4:
Change from STOP mode to RUN mode

Operation starts if turned from STOP mode to RUN mode by pressing the RUN/STOP (R/S) transfer key.

10. ERROR DISPLAY

10.1 Over-scale and Underscale

The table below shows displays, description, control actions and solutions when the Measured value (PV) exceeds the display range.

Display	Description	Action (Output)	Solution
Measured value (PV) [Flashing]	Input error Measured value (PV) exceeds the input error determination point (high /low limit).	Action at input error: Output depending on the action at input error (high /low limit)	Check input type, input range, sensor and sensor connection.
⊡⊡⊡⊡⊡ [Flashing]	Over-scale Measured value (PV) is above the display range limit high (or 99999).	Event output: Output depending on the Event action at input error	
⊔⊔⊔⊔⊔ [Flashing]	Underscale Measured value (PV) is below the display range limit low (or −19999).		

📖 **Prior to replacing the sensor, always turn OFF the power or change to STOP with RUN/STOP transfer. As for care which should be taken when replacing the pressure sensor, refer to the instruction manual for "Pressure sensor used."**
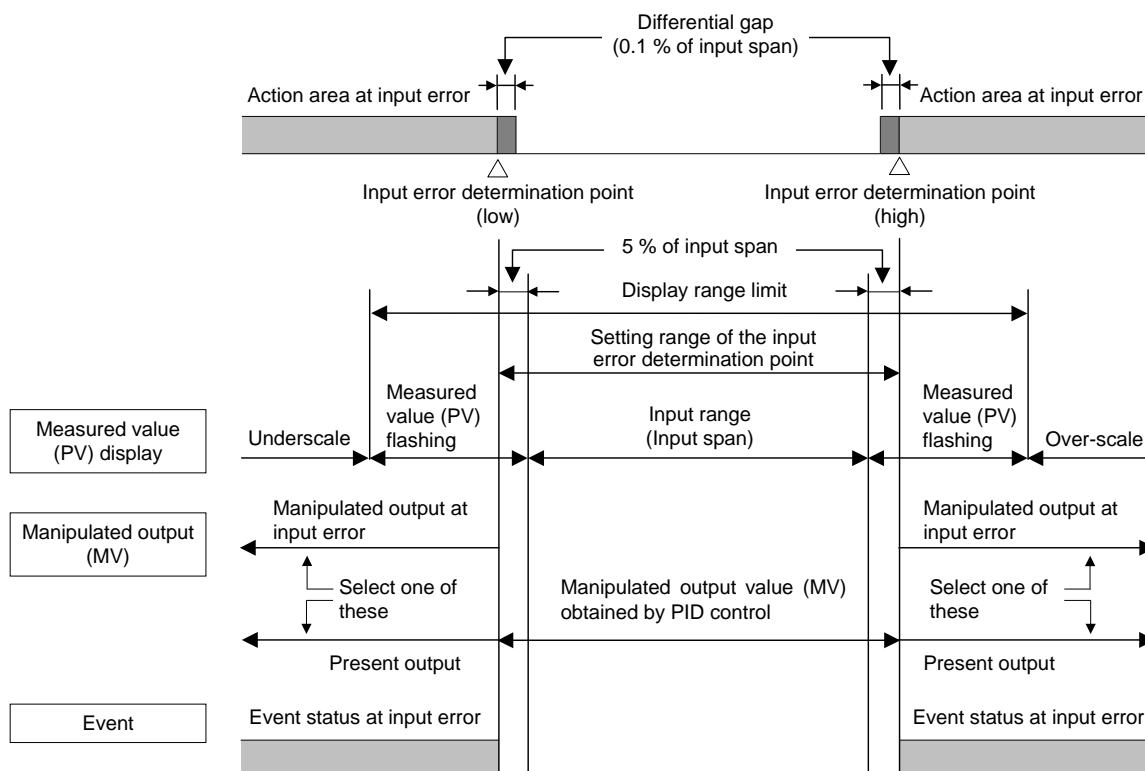
10.2 Self-diagnostic Error

Displays and description of self-diagnostics are described in the following table:

Upper display	Lower display	Description	Action	Solution
Err	*1* (1)	Adjusted data error • Adjusted data range is abnormal.	Display: Error display Output: OFF Communication: 　　Possible	Turn off the power at once. If an error occurs after the power is turned on again, please contact RKC sales office or the agent.
	2 (2)	EEPROM error • Response signal from EEPROM is abnormal. • Data write failure	Display: Error display Output: OFF Communication: 　　Possible	
	4 (4)	A/D conversion error • Response signal from A/D converter is abnormal. • A/D conversion count value is out of the specified range.	Display: Error display Output: OFF Communication: 　　Possible	
	8 (8)	RAM check error	Display: All display is OFF Output: OFF Communication: 　　No response	
	16 (16)	Hardware configuration error • Hardware is abnormal except A/D conversion circuit.	Display: Error display Output: OFF Communication: 　　Possible	
	32 (32)	Software configuration error • There is an abnormality on download data and it cannot execute.	Display: Error display Output: OFF Communication: 　　Possible	
	128 (128)	Watchdog timer error • The part of an internal task stops the action.	Display: Error display Output: OFF Communication: 　　Possible	
	2048 (2048)	Program busy • Could not finish an internal program in a specified time.	Display: Error display Output: OFF Communication: 　　Possible	

📖 When two or more errors occur simultaneously, the error code numbers are totaled and displayed as one number.

11. TROUBLESHOOTING

This section explains possible 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.

11.1 Display

Problem	Possible cause	Solution
No display appears	The internal assembly is not inserted into the case correctly.	Insert the internal assembly into the case correctly.
	Power supply terminal connection not correct	Connect the terminals correctly by referring to **3.3 Wiring of Each Terminal (P. 15)**.
	Power supply terminal contact defect	Retighten the terminals
	Proper power supply voltage is not being supplied.	Apply the normal power supply by referring to **B. Specifications (A-27)**.
Display is abnormal	Noise source is present near the instrument.	Separate the noise source from the instrument.
	Remote setting signal is input in parallel to two or more this instruments which use grounding type thermocouples.	Insert an isolator to enable isolated remote setting signal input for each instrument.

Continued from the previous page.

Problem	Possible cause	Solution
Measured value (PV) display differs from the actual value	PV bias is set	Set the PV bias to "OFF" by referring to ■ **PV bias (P. 44)**. However, this is limited only to when the PV bias setting can be changed.

📖 How to check if the input function of the controller is working correctly.
- When the controller is configured as Thermocouple input:
  Short the input terminals No. 23 and No. 24 for 1-input controller type (2-input controller type: No. 23 and No. 24 [TC1], No. 20 and No. 21 [TC2]). If the controller shows a Measured value around the ambient temperature of the input terminals, the input function of the controller is working correctly.
- When the controller is configured as RTD input:
  Connect a 100 Ω resister between the input terminals No. 22 and No. 23 for 1-input controller type (2-input controller type: No. 22 and No. 23 [RTD1], No. 19 and No. 20 [RTD2]) and short the input terminals No. 23 and No. 24 (2-input controller type: No. 23 and No. 24 [RTD1], No. 20 and No. 21 [RTD2]). If the controller shows Measured value around 0 °C (32 °F), the input function of the controller is working correctly.
- When the controller is configured as Voltage/Current input:
  Input a certain voltage or current from a voltage/current generator to the controller. If the controller shows the equivalent input value, the input setting and function of the controller is working correctly.

11.2 Control

Problem	Possible cause	Solution
Control is abnormal	The power supply is not correct.	Apply the normal power supply by referring to **B. Specifications (A-32)**.
	Sensor or input lead wires break.	Turn off the power or STOP the operation by "RUN/STOP transfer" and repair the sensor or replace it.
	Proper sensor is not used.	Use the specified sensor.
	The sensor is not wired correctly.	Conduct sensor wiring correctly by referring to **3.3 Wiring of Each Terminal (P. 15)**.
	Sensor insertion depth is insufficient	Check whether sensor is inserted too loosely. If so, fully insert the sensor.
	Sensor insertion position is not appropriate	Insert the sensor at the specified location.
	Input signal wires are not separated from instrument power and/or load wires	Separate each wire.
	Noise source is present near the wiring	Separate the noise source from the wiring.
	Inappropriate PID constants	Set the correct PID constants.

Problem	Possible cause	Solution
Autotuning (AT) function not activated	Requirements for performing the Autotuning (AT) function are not satisfied	Satisfy the requirements for performing the Autotuning (AT) function by referring to **AT action (P. 96)**.
	"2: No AT function" is selected as the AT action.	Set the AT action to "1: AT function (PI)" or "0: AT function (PID)" by referring to **AT action (P. 96)**. However, this is limited only to when the AT action can be changed.
Autotuning (AT) suspended	Requirements for suspending the Autotuning (AT) function are established	Identify causes for Autotuning (AT) suspension by referring to **AT action (P. 96)** and then remove them. Then, execute the autotuning (AT) function again.
Acceptable PID values cannot be calculated by Autotuning (AT)	The Autotuning (AT) function does not appropriately much the characteristics of the controlled object	Set PID constants manually.
	The Output change rate limiter is set	Set PID constants manually.
No output change in step	The Output change rate limiter is set	Set the Output change rate limiter to "0.0: OFF" by referring to **8.12 Control 1/Control 2 (P. 87)**. However, this is limited only to when the Output change rate limiter setting can be changed.

11.3 Operation

Problem	Possible cause	Solution
Output does not become more than (or less than) a specific value	The Output limiter is set	Change the Output limiter setting by referring to **8.12 Control 1/Control 2 (P. 87).** However, this is limited only to when the Output limiter setting can be changed.
No setting change can be made by key operation	Set data is locked	Release the set data lock by referring to ■ **Set lock level (P. 49)**.

Continued from the previous page.

Problem	Possible cause	Solution
Set value (SV) does not become more than (or less than) a specific value	The Setting limiter is set	Change the Setting limiter setting by referring to **8.16 Set Value 1 (SV1)/Set Value 2 (SV2) (P. 98)**. However, this is limited only to when the Setting limiter setting can be changed.
Set value (SV) does not change immediately when the Set value (SV) is changed	The Setting change rate limiter is set	Set the Setting change rate limiter to "OFF" by referring to ■ **Setting change rate limiter [up] (P. 38)**, ■ **Setting change rate limiter [down] (P. 39)**.

11.4 Other

Problem	Possible cause	Solution
Event action is abnormal	Event action is different from the specification.	Change the action by referring to **8.10 Event 1/Event 2/Event 3 /Event 4 (P. 80)** after the specification is confirmed.
	Event output relay contact energized/de-energized is reversed	Confirm the selection of output logic calculation by referring to **8.8 Output (P. 76)**.
	Event differential gap setting is inappropriate	Set the appropriate differential gap by referring to **8.10 Event 1/Event 2/ Event 3/Event 4 (P. 80)**.

12. REMOVING THE INTERNAL ASSEMBLY

Removing the internal assembly from the case is rarely required. Should you remove the internal assembly without disconnecting the external wiring, take the following steps:

⚠ **WARNING**

● To prevent electric shock or instrument failure, only qualified personnel should be allowed to pull out the internal assembly.

● To prevent electric shock or instrument failure, always turn off the power before pulling out the internal assembly.

● To prevent injury or instrument failure, do not touch the internal printed wiring board.

📖 **Apply pressure very carefully when removing internal assembly to avoid damage to the frame.**

📖 To conform to **IEC 61010-1** requirements for protection from electric shock, the internal assembly of this instrument can only be removed with an appropriate tool.

■ Procedures

Lock (Upper: 2 places)

Recommended tool: Slotted screwdriver
Tip width: 6 mm or less

Unlock using such a slotted screwdriver. Gently press down on handle for the upper lock and lift up for the lower lock.
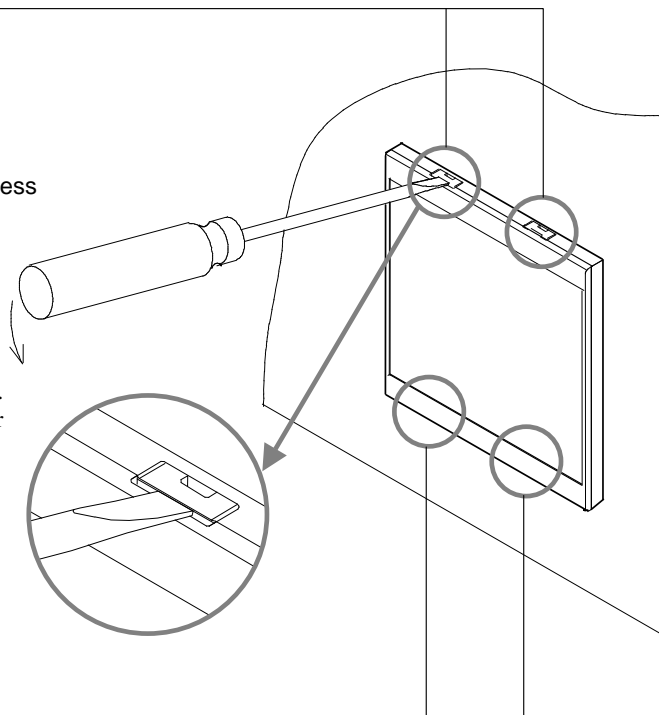
Lock (Lower: 2 places)

APPENDIX

A. Setting Data List
A-1. SV setting & Monitor mode

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_ measured value (PV1)/ set value (SV1) monitor	—	The upper section: Displays Input 1_PV1 The lower section: Displays Input 1_SV1	—		P. 30 P. 102
Input 2_ measured value (PV2)/ set value (SV2) monitor	—	The upper section: Displays Input 2_PV2 The lower section: Displays Input 2_SV2	—		P. 30 P. 103
Input 1_ measured value (PV1)/ Input 2_measured value (PV2) monitor	—	The upper section: Displays Input 1_PV1 The lower section: Displays Input 2_PV2	—		P. 30 P. 103
Input 1_set value (SV1)	(1. SV)	Input 1_setting limiter low to Input 1_setting limiter high	0.0		P. 30
Input 2_set value (SV2)	(2. SV)	Input 2_setting limiter low to Input 2_setting limiter high	0.0		P. 30
Remote input value monitor	(SVr)	Input 1_setting limiter low to Input 1 _setting limiter high	—		P. 30 P. 103
PV1 peak hold value monitor	(1.PHLd)	The maximum PV1 value (peak value) of Input 1 is held and displayed.	—		P. 30 P. 103
PV1 bottom hold value monitor	(1.bHLd)	The minimum PV1 value (bottom value) of Input 1 is held and displayed.	—		P. 30 P. 104
PV1 hold reset	(1.HLdr)	PV1_hold value is reset when the UP and DOWN keys a simultaneously pressed.	—		P. 30 P. 105
PV2 peak hold value monitor	(2.PHLd)	The maximum PV2 value (peak value) of Input 2 is held and displayed.	—		P. 30 P. 105
PV2 bottom hold value monitor	(2.bHLd)	The minimum PV2 value (bottom value) of Input 2 is held and displayed.	—		P. 30 P. 105
PV2 hold reset	(2.HLdr)	PV2_hold value is reset when the UP and DOWN keys a simultaneously pressed.	—		P. 30 P. 105
Input 1_manipulated output value (MV1) monitor	(1. MV)	Input 1_MV scaling low to Input 1_MV scaling high	—		P. 30 P. 106
Input 2_manipulated output value (MV2) monitor	(2. MV)	−5.0 to +105.0 %	—		P. 30 P. 106
Event monitor	(EVM)	SV thousands digits: EV4 (LBA2) SV hundreds digits: EV3 (LBA1) SV tens digits: EV2 SV units digits: EV1	—		P. 30 P. 106

Continued from the previous page.

Name	Parameter	Data range	Factory set value	User set value	Page
Interlock release	Ilr (ILr)	• Displays the interlock status. • Interlock status is release when the UP and Down keys a simultaneously pressed.	—		P. 30 P. 106
Memory area selection	ArE (ArE)	1 to 16	1		P. 30 P. 107
Memory area soak time monitor	APT (APT)	0 minute 00.00 second to 9 minutes 59.99 seconds or 0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds	—		P. 30 P. 107
CC-Link communication status	$CCLS$ (CCLS)	Displays the status number.	—		P. 30 P. 107

A-2. Setup setting mode

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_PV bias	$1. Pb$ (1. Pb)	−Input span to +Input span	0		P. 44
Input 1_PV digital filter	$1. dF$ (1. dF)	OFF (Unused) 0.01 to 10.00 seconds	OFF		P. 44
Input 1_PV ratio	$1. Pr$ (1. Pr)	0.500 to 1.500	1.000		P. 44
Input 1_PV low input cut-off	$1. PLC$ (1. PLC)	0.00 to 25.00 % of input span	0.00		P. 45
Input 1_proportional cycle time	$1. T$ (1. T)	0.1 to 100.0 seconds Other outputs: Voltage pulse output and Triac output	Relay contact output: 20.0 Other outputs: 2.0		P. 45
Input 2_PV bias	$2. Pb$ (2. Pb)	−Input span to +Input span	0		P. 44
Input 2_PV digital filter	$2. dF$ (2. dF)	OFF (Unused) 0.01 to 10.00 seconds	OFF		P. 44
Input 2_PV ratio	$2. Pr$ (2. Pr)	0.500 to 1.500	1.000		P. 44
Input 2_PV low input cut-off	$2. PLC$ (2. PLC)	0.00 to 25.00 % of input span	0.00		P. 45
Input 2_proportional cycle time	$2. T$ (2. T)	0.1 to 100.0 seconds Other outputs: Voltage pulse output and Triac output	Relay contact output: 20.0 Other outputs: 2.0		P. 45

Continued from the previous page.

Name	Parameter	Data range	Factory set value	User set value	Page
Device address (Slave address)	*Add2* (Add2)	0 to 99 (RKC communication, Modbus) 0 to 63 (DeviceNet) 0 to 126 (PROFIBUS) 0 to 64 (CC-Link: 1 station occupied 1 time, 1 station occupied 4 times, 1 station occupied 8 times) 1 to 61 (CC-Link: 4 stations occupied 1 time)	0		P. 46
Communication speed	*bPS2* (bPS2)	2.4: 2400 bps 156: 156 kbps [2] 4.8: 4800 bps 625: 625 kbps [2] 9.6: 9600 bps 2500: 2.5 kbps [2] 19.2: 19200 bps 5000: 5 Mbps [2] 38.4: 38400 bps 10000: 10 Mbps [2] 125: 125 kbps [1] 250: 250 kbps [1] 500: 500 kbps [1] [1] DeviceNet only [2] CC-Link only	RKC communication, Modbus: 9.6 DeviceNet: 125 CC-Link: 156		P. 46
Data bit configuration	*bIT2* (bIT2)	Refer to Data bit configuration on the next page.	8n1		P. 46
Interval time	*InT2* (InT2)	0 to 250 ms	10		P. 47
Infrared communication address	*Add3* (Add3)	0 to 99	0		P. 47
Infrared communication speed	*bPS3* (bPS3)	9.6: 9600 bps 19.2: 19200 bps	19.2		P. 47
Auto-zero (Input 1)	*AZEr* (AZEr)	Adjust the zero point of the Measured value (PV1) on the Input 1 side. Relevant pressure sensors: CZ-100P, CZ-200P	—		P. 48
Auto calibration (Input 1)	*ACAL* (ACAL)	Adjust the full scale point of the Measured value (PV1) on the Input 1 side.	—		P. 49
Set lock level	*LCK* (LCK)	Refer to Set lock level list on the next page.	00000		P. 49

Continued from the previous page.

Data bit configuration

Set value		Data bit	Parity bit	Stop bit
$8n1$	(8n1)	8	None	1
$8n2$	(8n2)	8	None	2
$8E1$	(8E1)	8	Odd	1
$8E2$	(8E2)	8	Even	2
$8o1$	(8o1)	8	Odd	1
$8o2$	(8o2)	8	Even	2
$7n1$	(7n1)	7	None	1
$7n2$	(7n2)	7	None	2
$7E1$	(7E1)	7	Odd	1
$7E2$	(7E2)	7	Odd	2
$7o1$	(7o1)	7	Even	1
$7o2$	(7o2)	7	Even	2

(7n1 to 7o2: Invalid for Modbus)

Set lock level list

Set value	Parameters which can be changed
00000	All parameters [Factory set value]
00001	SV, EV1 to EV4, Memory area selection, Parameters in F10 to F91
00010	All parameters except for EV1 to EV4
00011	SV
00100	All parameters except for SV
00101	EV1 to EV4
00110	All parameters except for SV and EV1 to EV4
00111	No parameter (All Locked)

A-3. Parameter setting mode

Name	Parameter	Data range	Factory set value	User set value	Page
Event 1 set value	*EV1* (EV1)	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high	50.0		P. 35
Event 2 set value	*EV2* (EV2)	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high	50.0		P. 35
Event 3 set value	*EV3* (EV3)	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high	50.0		P. 35
Control loop break alarm 1 (LBA1) time	*LbA1* (LbA1)	OFF (Unused) 1 to 7200 seconds	480		P. 35
LBA1 deadband	*Lbd1* (Lbd1)	0.0 to Input span (Varies with the setting of the Decimal point position)	0.0		P. 36
Event 4 set value	*EV4* (EV4)	Deviation: −Input span to +Input span Process/SV: Input scale low to Input scale high	50.0		P. 35
Control loop break alarm 2 (LBA2) time	*LbA2* (LbA2)	OFF (Unused) 1 to 7200 seconds	480		P. 35
LBA2 deadband	*Lbd2* (Lbd2)	0.0 to Input span (Varies with the setting of the Decimal point position)	0.0		P. 36
Input 1_proportional band	*1. P* (1. P)	0.0 to 1000.0 % of input span 0.0: ON/OFF action	100.0		P. 37
Input 1_integral time	*1. I* (1. I)	OFF (PD action) 1 to 3600 seconds, 0.1 to 3600.0 seconds, or 0.01 to 360.00 seconds (Varies with the setting of the Integral/Derivative time decimal point position selection)	5.00		P. 37
Input 1_derivative time	*1. d* (1. d)	OFF (PI action) 1 to 3600 seconds, 0.1 to 3600.0 seconds, or 0.01 to 360.00 seconds (Varies with the setting of the Integral/Derivative time decimal point position selection)	OFF		P. 37

Continued from the previous page.

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_control response parameter	*1. rPt* (1. rPt)	0: Slow 1: Medium 2: Fast	0		P. 38
Input 2_proportional band	*2. P* (2. P)	TC/RTD inputs: 0 (0.0, 0.00) to Input span (Unit: °C [°F]) (Varies with the setting of the Decimal point position) Voltage (V)/Current (I) inputs: 0.0 to 1000.0 % of input span 0 (0.0, 0.00): ON/OFF action	30.0		P. 37
Input 2_integral time	*2. I* (2. I)	OFF (PD action) 1 to 3600 seconds, 0.1 to 3600.0 seconds, or 0.01 to 360.00 seconds (Varies with the setting of the Integral/Derivative time decimal point position selection)	240.00		P. 37
Input 2_derivative time	*2. d* (2. d)	OFF (PI action) 1 to 3600 seconds, 0.1 to 3600.0 seconds, or 0.01 to 360.00 seconds (Varies with the setting of the Integral/Derivative time decimal point position selection)	60.00		P. 37
Input 2_control response parameter	*2. rPt* (2. rPt)	0: Slow 1: Medium 2: Fast	0		P. 38
Input 1_setting change rate limiter (up)	*1.SVrU* (1.SVrU)	OFF (Unused) 0.1 to Input span/unit time *	OFF		P. 38
Input 1_setting change rate limiter (down)	*1.SVrd* (1.SVrd)	(Varies with the setting of the Decimal point position)	OFF		P. 39
Input 2_setting change rate limiter (up)	*2.SVrU* (2. SVrU)		OFF		P. 38
Input 2_setting change rate limiter (down)	*2.SVrd* (2.SVrd)	* Unit time: 60 seconds (factory set value)	OFF		P. 39
Area soak time	*AST* (AST)	0 minute 00.00 second to 9 minutes 59.99 seconds or 0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds	0.00.00		P. 40
Link area number	*LnKA* (LnKA)	OFF (No link) 1 to 16	OFF		P. 41

A-4. Engineering mode (F10 to F91)

📖 **In Engineering mode, the function blocks (F45, F46 and F55) and setting items which do not exist in the HA430/930 are also displayed. For these function blocks and setting items, use their factory set values with these values left intact.**

■ Function block F10: Screen configuration

Name	Parameter	Data range	Factory set value	User set value	Page
STOP display selection	$5PLH$ (SPCH)	0: Displays on the Measured value (PV1/PV2) unit 1: Displays on the Set value (SV) unit	0		P. 63
Bar graph display selection	dE (dE)	0: No display 1: Input 1_manipulated output value (MV) 2: Input 1_measured value (PV) 3: Input 1_set value (SV) 4: Input 1_deviation value 5: Unused (Not available) 6: Input 2_manipulated output value (MV) 7: Input 2_measured value (PV) 8: Input 2_set value (SV) 9: Input 2_deviation value	0		P. 63
Bar graph resolution setting	$dEUL$ (dEUT)	1 to 100 digit/dot	100		P. 64
Decimal point position of MV scaling	$\bar{n}HdP$ (MVdP)	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1		P. 64
Input 1_MV scaling high	$\bar{n}HHS$ (MVHS)	–1999.9 to +9999.9	100.0		P. 64
Input 1_MV scaling low	$\bar{n}HLS$ (MVLS)	–1999.9 to +9999.9	0.0		P. 65

■ Function block F11: Direct key

Name	Parameter	Data range	Factory set value	User set value	Page
Auto/Manual transfer key operation selection (A/M)	$Fn1$ (Fn1)	0: Unused 1: Auto/Manual transfer for Input 1 2: Auto/Manual transfer for Input 2 3: Auto/Manual transfer for Input 1 and Input 2	3		P. 65
Remote/Local transfer key operation selection (R/L)	$Fn2$ (Fn2)	0: Unused 1: Remote/Local transfer	1		P. 65
RUN/STOP transfer key operation selection (R/S)	$Fn3$ (Fn3)	0: Unused 1: RUN/STOP transfer	1		P. 65

■ Function block F21: Input 1

Name	Parameter	Data range	Factory set value	User set value	Page

Input 1_input type selection	⌐⌐ ⌐P (1. InP)	Voltage (V)/Current (I) inputs −19999 to +99999
		
		14: 0 to 20 mA DC 24: ± 100 mV DC
		15: 4 to 20 mA DC 25: ± 10 mV DC
		16: 0 to 10 V DC 26: ± 10 V DC
		17: 0 to 5 V DC 27: ± 5 V DC
		18: 1 to 5 V DC 28: ± 1 V DC
		19: 0 to 1 V DC
		20: 0 to 100 mV DC
		21: 0 to 10 mV DC
		
		Pressure sensor input
		   0.0 to 250.0 MPa
		29: Resin pressure sensor
		Relevant pressure sensors:
		   CZ-100P, CZ-200P
		
		22, 23: Unused (Not available)
			Based on model code.
			
			When not specifying: Pressure sensor input
					P. 66

Input 1_display unit selection	⌐⌐⌐ ⌐ (1.UnIT)	2: MPa 3: bar 4: kgf/cm^2 5: psi The display unit selection becomes invalidated when the Voltage (V)/ Current (I) input is selected as input type.	Pressure sensor input: 2 V/I: 0		P. 67
Gain setting	⌐Я⌐ ⌐ (GAIn)	0.500 to 4.000 mV/V Relevant pressure sensors: CZ-100P, CZ-200P	CZ-100P, CZ-200P: 1.500		P. 67
Linearize type selection	⌐⌐ ⌐⌐ (LInS)	0: Unused 1 to 20: Used [*] Relevant pressure sensors: CZ-100P, CZ-200P	0		P. 68
Shunt resistance output value	⌐Н⌐⌐ (SHnT)	40.0 to 100.0 %	80.0		P. 68

[*] Linearizing type:

Set value	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Symbol	C	D	E	F	G	H	J	K	L	M	P	Q	R	S	T	U	V	W	X	Y

Continued from the previous page.

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_decimal point position	*IPGdP* (1.PGdP)	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places Less than 1 MPa (Rated pressure): Decimal point position 0 to 4 Less than 10 MPa (Rated pressure): Decimal point position 0 to 3 Less than 100 MPa (Rated pressure): Decimal point position 0 to 2 100 MPa or more (Rated pressure): Decimal point position 0 or 1 Voltage (V)/Current (I) inputs: Decimal point position 0 to 4	1		P. 69
Input 1_input scale high	*IPGSH* (1.PGSH)	Pressure sensor input: Input scale low to Maximum value of the selected input range Voltage (V)/Current (I) inputs: −19999 to +99999 (Varies with the setting of the Decimal point position)	Pressure sensor input: 50.0 V/I: 100.0		P. 69
Input 1_input scale low	*IPGSL* (1.PGSL)	Pressure sensor input: Minimum value of the selected input range to Input scale high Voltage (V)/Current (I) inputs: −19999 to +99999 (Varies with the setting of the Decimal point position)	Pressure sensor input: 0.0 V/I: 0.0		P. 70
Input 1_input error determination point (high)	*I. PoV* (1. PoV)	Input scale low − (5 % of input span) to Input scale high + (5 % of input span)	Pressure sensor input: Input scale high + (5 % of input span) V/I: 105.0		P. 70
Input 1_input error determination point (low)	*I. PUn* (1. PUn)		Pressure sensor input: Input scale low − (5 % of input span) V/I: −5.0		P. 71
Input 1_burnout direction	*I. boS* (1. boS)	0: Upscale 1: Downscale	0		P. 71
Input 1_square root extraction selection	*I. SQr* (1. SQr)	0: Unused 1: Used	0		P. 72
Input 1_PV1 hold function	*IHLdS* (1.HLdS)	0: Unused 1: Used	0		P. 72
Power supply frequency selection	*PFrQ* (PFrQ)	0: 50 Hz 1: 60 Hz	0		P. 72

■ Function block F22: Input 2

Name	Parameter	Data range	Factory set value	User set value	Page
Input 2_input type selection	*2. InP* (2. InP)	TC input 0: K −200 to +1372 °C −328.0 to +2501.6 °F 1: J −200 to +1200 °C −328.0 to +2192.0 °F 2: R −50 to +1768 °C −58.0 to +3214.4 °F 3: S −50 to +1768 °C −58.0 to +3214.4 °F 4: B 0 to 1800 °C 32.0 to 3272.0 °F 5: E −200 to +1000 °C −328.0 to +1832.0 °F 6: N 0 to 1300 °C 32.0 to 2372.0 °F 7: T −200 to +400 °C −328.0 to +752.0 °F 8: W5Re/W26Re 0 to 2300 °C 32.0 to 4172.0 °F 9: PLII 0 to 1390 °C 32.0 to 2534.0 °F RTD input (3-wire system) 12: Pt100 −200 to +850 °C −328.0 to +1562.0 °F 13: JPt100 −200 to +600 °C −328.0 to +1112.0 °F Voltage (V)/Current (I) inputs −19999 to +99999 14: 0 to 20 mA DC 24: ± 100 mV DC 15: 4 to 20 mA DC 25: ± 10 mV DC 16: 0 to 10 V DC 26: ± 10 V DC 17: 0 to 5 V DC 27: ± 5 V DC 18: 1 to 5 V DC 28: ± 1 V DC 19: 0 to 1 V DC 20: 0 to 100 mV DC 21: 0 to 10 mV DC 22, 23: Unused (Not available)	Based on model code. When not specifying: Type K		P. 66
Input 2_display unit selection	*2.UnIT* (2.UnIT)	0: °C 1: °F The display unit selection becomes invalidated when the Voltage (V)/Current (I) input is selected as input type.	0		P. 67

Continued from the previous page.

Name	Parameter	Data range	Factory set value	User set value	Page
Input 2_decimal point position	*2PGdP* (2.PGdP)	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places	1		P. 69
Input 2_input scale high	*2PGSH* (2.PGSH)	TC/RTD inputs: Input scale low to Maximum value of the selected input range Voltage (V)/Current (I) inputs: −19999 to +99999 (Varies with the setting of the Decimal point position)	TC/RTD: Maximum value of the selected input range V/I: 100.0		P. 69
Input 2_input scale low	*2PGSL* (2.PGSL)	TC/RTD inputs: Minimum value of the selected input range to Input scale high Voltage (V)/Current (I) inputs: −19999 to +99999 (Varies with the setting of the Decimal point position)	TC/RTD: Minimum value of the selected input range V/I: 0.0		P. 70
Input 2_input error determination point (high)	*2. PoH* (2. PoV)	Input scale low − (5 % of input span) to Input scale high + (5 % of input span)	TC/RTD: Input scale high + (5 % of input span) V/I: 105.0		P. 70
Input 2_input error determination point (low)	*2. PUn* (2. PUn)		TC/RTD: Input scale low − (5 % of input span) V/I: −5.0		P. 71
Input 2_burnout direction	*2. boS* (2. boS)	0: Upscale 1: Downscale	0		P. 71
Input 2_square root extraction selection	*2. SQr* (2. SQr)	0: Unused 1: Used	0		P. 72
Input 2_PV2 hold function	*2HLdS* (2.HLdS)	0: Unused 1: Used	0		P. 72

■ Function block F23: Event input

Name	Parameter	Data range	Factory set value	User set value	Page
Event input logic selection	*dI SL* (dISL)	0 to 15 (Refer to the following table.)	1		P. 73

Event input logic selection

Set value	DI 1 Terminal No. 30-31	DI 2 Terminal No. 30-32	DI 3 Terminal No. 30-33	DI 4 Terminal No. 30-34	DI 5 Terminal No. 35-36
0	Unused (No function assignment)				
1	Memory area number selection (1 to 16)				Memory area set
2	Memory area number selection (1 to 16)				Memory area set
3	Memory area number selection (1 to 16)				Memory area set
4	Memory area number selection (1 to 8)			Memory area set	RUN/STOP transfer
5	Memory area number selection (1 to 8)			Memory area set	Remote/Local transfer
6	Memory area number selection (1 to 8)			Memory area set	Auto/Manual transfer
7	Memory area number selection (1 to 8)			Memory area set	Hold reset
8	Memory area number selection (1 to 8)			Memory area set	Interlock release
9	Memory area number selection (1 to 4)		Memory area set	RUN/STOP transfer	Auto/Manual transfer
10	Memory area number selection (1 to 4)		Memory area set	RUN/STOP transfer	Remote/Local transfer
11	Memory area number selection (1 to 4)		Memory area set	Remote/Local transfer	Auto/Manual transfer
12	Memory area number selection (1 to 4)		Memory area set	Hold reset	Interlock release
13	Auto/Manual transfer	RUN/STOP transfer	Remote/Local transfer	Hold reset	Interlock release
14	Auto/Manual transfer	Input 1_ manual output down (motor RPM down) [1]	Input 1_ manual output up (motor RPM up) [2]	Input 1_manual output 0 % reset (motor RPM reset) [3]	RUN/STOP transfer
15	Auto/Manual transfer	Input 2_ manual output down (motor RPM down) [1]	Input 2_ manual output up (motor RPM up) [2]	Input 2_manual output 0 % reset (motor RPM reset) [3]	RUN/STOP transfer

[1] Decreases manipulated output value (motor RPM) under Manual control with contacts closed.

[2] Increases manipulated output value (motor RPM) under Manual control with contacts closed.

[3] Manipulated output value (motor RPM) is reset to 0 % based on the edge discrimination of "open" to "closed."

📖 With Event input, terminals 30 to 36 are allocated to Event input. Event input must be specified when ordering.

Dry contact input

COM — 30
DI1 — 31
DI2 — 32
DI3 — 33
DI4 — 34
COM — 35
DI5 — 36
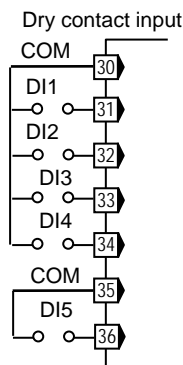
Contact input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should have meet the specifications below.

Contact specifications: At OFF (contact open): 500 kΩ or more
At ON (contact closed) 10 Ω or less

■ Function block F30: Output

Name	Parameter	Data range	Factory set value	User set value	Page
Output logic selection	*LoGC* (LoGC)	1 to 11 (Refer to the following table.) 1, 2, 9 and 10: Unused	1-input: 3 2-input: 5		P. 76
Output 1 timer setting	*oTT1* (oTT1)	0.0 to 600.0 seconds	0.0		P. 77
Output 2 timer setting	*oTT2* (oTT2)		0.0		P. 77
Output 3 timer setting	*oTT3* (oTT3)		0.0		P. 77
Output 4 timer setting	*oTT4* (oTT4)		0.0		P. 77
Output 5 timer setting	*oTT5* (oTT5)		0.0		P. 77
Alarm lamp lighting condition setting	*ALC1* (ALC1)	SV ten thousand digits: "0" Fixed SV thousands digits: 0 or 1 (Event 4) SV hundreds digits: 0 or 1 (Event 3) SV tens digits: 0 or 1 (Event 2) SV units digits: 0 or 1 (Event 1)	01111 (0: ALM lamp isn't lit 1: ALM lamp is lit)		P. 77
Unused *	*ALC2* (ALC2)	—	00011	—	—
Interlock function	*oTIL* (oTIL)	SV ten thousands digits: 0 or 1 (OUT5) SV thousands digits: 0 or 1 (OUT4) SV hundreds digits: 0 or 1 (OUT3) SV tens digits 0 or 1 (OUT2) SV units digits: 0 or 1 (OUT1)	00000 (0: Unused 1: Used)		P. 78

* This item is not used for the HA430/930.

Output logic selection

Set value	OUT1	OUT2	OUT3	OUT4	OUT5
1	This set value is not used for the HA430/930.				
2	This set value is not used for the HA430/930.				
3	MV1	EV3 or EV4 (Energized)	EV2 (Energized)	EV1 (Energized)	FAIL (De-energized)
4	MV1	EV3 or EV4 (De-energized)	EV2 (De-energized)	EV1 (De-energized)	FAIL (De-energized)
5	MV1	MV2	EV4 (Energized)	EV3 (Energized)	EV1 or EV2 (Energized)
6	MV1	MV2	EV4 (De-energized)	EV3 (De-energized)	EV1 or EV2 (De-energized)
7	MV1	MV2	EV3 or EV4 (Energized)	EV2 (Energized)	EV1 (Energized)
8	MV1	MV2	EV3 or 4 (De-energized)	EV2 (De-energized)	EV1 (De-energized)
9	This set value is not used for the HA430/930.				
10	This set value is not used for the HA430/930.				
11	MV1	EV4 (Energized)	EV3 (Energized)	EV2 (Energized)	EV1 (Energized)

■ Function block F31: Transmission output 1

Name	Parameter	Data range	Factory set value	User set value	Page
Transmission output 1_ type selection	*Ao1* (Ao1)	-----: None 1. PV: Input 1_ measured value (PV) 1. SV: Input 1_set value (SV) 1.dEV: Input 1_deviation value 1. MV: Input 1_manipulated output value (MV) 2. PV: Input 2_ measured value (PV) 2. SV: Input 2_set value (SV) 2.dEV: Input 2_deviation value 2. MV: Input 2_manipulated output value (MV) PoS: Unused (Not available)	-----: None		P. 79
Transmission output 1_ scale high	*AHS1* (AHS1)	Measured value (PV) and Set value (SV): Input scale low to Input scale high Manipulated output value (MV): −5.0 to +105.0 %	PV/SV: Input scale high MV: 100.0 Deviation: +Input span		P. 79
Transmission output 1_ scale low	*ALS1* (ALS1)	Deviation: −Input span to +Input span	PV/SV: Input scale low MV: 0.0 Deviation: −Input span		P. 79

■ Function block F32: Transmission output 2

Name	Parameter	Data range	Factory set value	User set value	Page
Transmission output 2_ type selection	$Ao2$ (Ao2)	-----: None 1. PV: Input 1_ measured value (PV) 1. SV: Input 1_set value (SV) 1.dEV: Input 1_deviation value 1. MV: Input 1_manipulated output value (MV) 2. PV: Input 2_ measured value (PV) 2. SV: Input 2_set value (SV) 2.dEV: Input 2_deviation value 2. MV: Input 2_manipulated output value (MV) PoS: Unused (Not available)	-----: None		P. 79
Transmission output 2_ scale high	$AHS2$ (AHS2)	Measured value (PV) and Set value (SV): Input scale low to Input scale high Manipulated output value (MV): −5.0 to +105.0 % Deviation: −Input span to +Input span	PV/SV: Input scale high MV: 100.0 Deviation: +Input span		P. 79
Transmission output 2_ scale low	$ALS2$ (ALS2)		PV/SV: Input scale low MV: 0.0 Deviation: −Input span		P. 79

■ Function block F33: Transmission output 3

Name	Parameter	Data range	Factory set value	User set value	Page
Transmission output 3_ type selection	$Ao3$ (Ao3)	-----: None 1. PV: Input 1_ measured value (PV) 1. SV: Input 1_set value (SV) 1.dEV: Input 1_deviation value 1. MV: Input 1_manipulated output value (MV) 2. PV: Input 2_ measured value (PV) 2. SV: Input 2_set value (SV) 2.dEV: Input 2_deviation value 2. MV: Input 2_manipulated output value (MV) PoS: Unused (Not available)	-----: None		P. 79
Transmission output 3_ scale high	$AHS3$ (AHS3)	Measured value (PV) and Set value (SV): Input scale low to Input scale high Manipulated output value (MV): −5.0 to +105.0 %	PV/SV: Input scale high MV: 100.0 Deviation: +Input span		P. 79
Transmission output 3_ scale low	$AL53$ (ALS3)	Deviation: −Input span to +Input span	PV/SV: Input scale low MV: 0.0 Deviation: −Input span		P. 79

■ Function block F41: Event 1

Name	Parameter	Data range	Factory set value	User set value	Page
Event 1 type selection	*ES1* (ES1)	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low	0		P. 80
Event 1 hold action	*EHo1* (EHo1)	0: OFF 1: ON 2: Re-hold action ON	0		P. 82

Event 1 differential gap	*EH1* (EH1)	0 to Input span
		(Varies with the setting of the Decimal point position)
			Pressure sensor input: 2.0 MPa
			TC/RTD:
			  2.0 °C [°F]
			V/I: 0.2 % of
			  input span
					P. 83

Event 1 action at input error	*EEo1* (EEo1)	0: Normal processing 1: Turn the event output ON	0		P. 84
Event 1 assignment	*EVA1* (EVA1)	1: For Input 1 2: For Input 2	1		P. 84

■ Function block F42: Event 2

Name	Parameter	Data range	Factory set value	User set value	Page
Event 2 type selection	*ES2* (ES2)	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low	0		P. 80
Event 2 hold action	*EHo2* (EHo2)	0: OFF 1: ON 2: Re-hold action ON	0		P. 82

Event 2 differential gap	*EH2* (EH2)	0 to Input span
		(Varies with the setting of the Decimal point position)
			Pressure sensor input: 2.0 MPa
			TC/RTD:
			  2.0 °C [°F]
			V/I: 0.2 % of
			  input span
					P. 83

Continued from the previous page.

Name	Parameter	Data range	Factory set value	User set value	Page
Event 2 action at input error	EEo2 (EEo2)	0: Normal processing 1: Turn the event output ON	0		P. 84
Event 2 assignment	EVA2 (EVA2)	1: For Input 1 2: For Input 2	1		P. 84

■ Function block F43: Event 3

Name	Parameter	Data range	Factory set value	User set value	Page
Event 3 type selection	ES3 (ES3)	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low 9: Control loop break (LBA)	0		P. 80
Event 3 hold action	EHo3 (EHo3)	0: OFF 1: ON 2: Re-hold action ON	0		P. 82
Event 3 differential gap	EH3 (EH3)	0 to Input span (Varies with the setting of the Decimal point position)	Pressure sensor input: 2.0 MPa TC/RTD: 2.0 °C [°F] V/I: 0.2 % of input span		P. 83
Event 3 action at input error	EEo3 (EEo3)	0: Normal processing 1: Turn the event output ON	0		P. 84
Event 3 assignment	EVA3 (EVA3)	1: For Input 1 2: For Input 2	1		P. 84

■ Function block F44: Event 4

Name	Parameter	Data range	Factory set value	User set value	Page
Event 4 type selection	*ES4* (ES4)	0: None 1: Deviation high 2: Deviation low 3: Deviation high/low 4: Band 5: Process high 6: Process low 7: SV high 8: SV low 9: Control loop break (LBA)	0		P. 80
Event 4 hold action	*EHo4* (EHo4)	0: OFF 1: ON 2: Re-hold action ON	0		P. 82
Event 4 differential gap	*EH4* (EH4)	0 to Input span (Varies with the setting of the Decimal point position)	Pressure sensor input: 2.0 MPa TC/RTD: 2.0 °C [°F] V/I: 0.2 % of input span		P. 83
Event 4 action at input error	*EEo4* (EEo4)	0: Normal processing 1: Turn the event output ON	0		P. 84
Event 4 assignment	*EVA4* (EVA4)	1: For Input 1 2: For Input 2	1		P. 84

■ Function block F50: Control

Name	Parameter	Data range	Factory set value	User set value	Page
Hot/Cold start selection	*Pd* (Pd)	Power failure less than 3 seconds: 0: Hot 1 5: Cold 1: Hot 1 6: Hot 1 2: Hot 1 7: Hot 2 3: Hot 2 8: Stop 4: Hot 2 Power failure 3 seconds or more: 0: Hot 1 5: Cold 1: Hot 2 6: Stop 2: Cold 7: Stop 3: Hot 2 8: Stop 4: Cold	5		P. 85
Input 2_use selection	*CAM* (CAM)	0: Single loop control 1: Remote input	0		P. 85
Unused *	*CAr* (CAr)	—	1.0000	—	—
Unused *	*CAb* (CAb)	—	0.0	—	—
SV tracking	*TrK* (TrK)	0: Unused 1: Used	1		P. 86

* These items are not used for the HA430/930.

■ Function block F51: Control 1

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_control action type selection	`I oS` (1. oS)	0: Direct action 1: Reverse action	1		P. 87
Input 1_ integral/derivative time decimal point position selection	`II ddP` (1.I ddP)	0: No decimal place 1: One decimal place 2: Two decimal places	2		P. 87
Input 1_derivative gain	`I dGA` (1. dGA)	0.1 to 10.0	6.0		P. 87
Input 1_ON/OFF action differential gap (upper)	`I oHH` (1. oHH)	0 to Input span (Varies with the setting of the Decimal point position)	Pressure sensor input: 1.0 MPa V/I: 0.1 % of input span		P. 88
Input 1_ON/OFF action differential gap (lower)	`I oHL` (1. oHL)		Pressure sensor input: 1.0 MPa V/I: 0.1 % of input span		P. 88
Input 1_action at input error (high)	`IAoHE` (1.AoVE)	0: Normal control 1: Manipulated output value at input error	0		P. 89
Input 1_action at input error (low)	`IAUnE` (1.AUnE)		0		P. 89
Input 1_manipulated output value at input error	`I PSM` (1. PSM)	−5.0 to +105.0 %	−5.0		P. 90
Input 1_manipulated output value when transferred to Auto from Manual	`IPSM'` (1. PSM′)	−5.0 to +105.0 %	—		P. 90
Input 1_output change rate limiter (up)	`I orU` (1. orU)	0.0 to 1000.0 %/second of manipulated output (0.0: Unused)	0.0		P. 90
Input 1_output change rate limiter (down)	`I ord` (1. ord)		0.0		P. 91
Input 1_output limiter high	`I oLH` (1. oLH)	Input 1_output limiter low to 105.0 %	105.0		P. 92
Input 1_output limiter low	`I oLL` (1. oLL)	−5.0 % to Input 1_output limiter high	−5.0		P. 92
Unused *	`I PFF` (1. PFF)	—	0 or 1	—	—
Unused *	`IPFFS` (1.PFFS)	—	1.00	—	—
Input 1_MV transfer function	`IMVTS` (1.MVTS)	0: Unused 1: Used	0		P. 92

* These items are not used for the HA430/930.

APPENDIX

■ Function block F52: Control 2

Name	Parameter	Data range	Factory set value	User set value	Page
Input 2_control action type selection	2. oS (2. oS)	0: Direct action 1: Reverse action	1		P. 87
Input 2_integral/derivative time decimal point position selection	2I ddP (2.I ddP)	0: No decimal place 1: One decimal place 2: Two decimal places	2		P. 87
Input 2_derivative gain	2. dGA (1. dGA)	0.1 to 10.0	6.0		P. 87
Input 2_ON/OFF action differential gap (upper)	2. oHH (2. oHH)	0 to Input span (Varies with the setting of the Decimal point position)	TC/RTD: 1.0 °C [°F] V/I: 0.1 % of input span		P. 88
Input 2_ON/OFF action differential gap (lower)	2. oHL (2. oHL)		TC/RTD: 1.0 °C [°F] V/I: 0.1 % of input span		P. 88
Input 2_action at input error (high)	2AoUE (2.AoVE)	0: Normal control 1: Manipulated output value at input error	0		P. 89
Input 2_action at input error (low)	2AUnE (2.AUnE)		0		P. 89
Input 2_manipulated output value at input error	2. PSM (2. PSM)	−5.0 to +105.0 %	−5.0		P. 90
Input 2_manipulated output value when transferred to Auto from Manual	2PSM' (2. PSM')	−5.0 to +105.0 %	—		P. 90
Input 2_output change rate limiter (up)	2. orU (2. orU)	0.0 to 1000.0 %/second of manipulated output (0.0: Unused)	0.0		P. 90
Input 2_output change rate limiter (down)	2. ord (2. ord)		0.0		P. 91
Input 2_output limiter high	2. oLH (2. oLH)	Input 2_output limiter low to 105.0 %	105.0		P. 92
Input 2_output limiter low	2. oLL (2. oLL)	−5.0 % to Input 2_output limiter high	−5.0		P. 92
Unused *	2. PFF (2. PFF)	—	0 or 1	—	—
Unused *	2PFFS (2.PFFS)	—	1.00	—	—
Input 2_MV transfer function	2MVTS (2.MVTS)	0: Unused 1: Used	0		P. 92

* These items are not used for the HA430/930.

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■ Function block F53: Autotuning 1 (AT1)

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_AT bias	*1. ATb* (1. ATb)	−Input span to +Input span	0		P. 93
Input 1_AT cycle	*1. ATC* (1. ATC)	0: 1.5 cycles 2: 2.5 cycles 1: 2.0 cycles 3: 3.0 cycles	1		P. 94
Input 1_AT differential gap time	*1. ATH* (1. ATH)	0.00 to 50.00 seconds	0.10		P. 95
Input 1_AT action	*1. ATt* (1. ATt)	0: AT function (PID) 1: AT function (PI) 2: No AT function	2		P. 96

■ Function block F54: Autotuning 2 (AT2)

Name	Parameter	Data range	Factory set value	User set value	Page
Input 2_AT bias	*2. ATb* (2. ATb)	−Input span to +Input span	0		P. 92
Input 2_AT cycle	*2. ATC* (2. ATC)	0: 1.5 cycles 2: 2.5 cycles 1: 2.0 cycles 3: 3.0 cycles	1		P. 94
Input 2_AT differential gap time	*2. ATH* (2. ATH)	0.00 to 50.00 seconds	0.10		P. 95
Input 2_AT action	*2. ATt* (2. ATt)	0: AT function (PID) 1: AT function (PI) 2: No AT function	2		P. 96

■ Function block F60: Communication function

Name	Parameter	Data range	Factory set value	User set value	Page
Unused *	*CMPS1* (CMPS1)	—	0	—	—

Communication protocol selection	*CMPS2*
	(CMPS2)
		0: RKC communication
		1: Modbus 1
		2: Modbus 2
		10: CC-Link
		    (1 station occupied 1 time)
		11: CC-Link
		    (1 station occupied 4 times)
		12: CC-Link
		    (1 station occupied 8 times)
		13: CC-Link
		    (4 stations occupied 1 time)
			RKC communication: 0
			Modbus: 2
			CC-Link: 10
					P. 97

* This item is not used for the HA430/930.

■ Function block F70: Set value (SV)

Name	Parameter	Data range	Factory set value	User set value	Page
Setting change rate limiter unit time	5ᴜ-ᴦ (SVrT)	1 to 3600 seconds	60		P. 97
Soak time unit selection	5ᴦ dP (STdP)	0: 0 hour 00 minutes 00 second to 9 hours 59 minutes 59 seconds 2: 0 minutes 00.00 seconds to 9 minutes 59.99 seconds	2		P. 97

■ Function block F71: Set value 1 (SV1)

Name	Parameter	Data range	Factory set value	User set value	Page
Input 1_setting limiter high	I. 5LH (1. SLH)	Input 1_setting limiter low to Input 1_input scale high	Input scale high		P. 98
Input 1_setting limiter low	I. 5LL (1. SLL)	Input 1_input scale low to Input 1_setting limiter high	Input scale low		P. 98
Input 1_PV transfer function	IPᴜᴦ5 (1.PVTS)	0: Unused 1: Used	0		P. 98

■ Function block F72: Set value 2 (SV2)

Name	Parameter	Data range	Factory set value	User set value	Page
Input 2_setting limiter high	2. 5LH (2. SLH)	Input 2_setting limiter low to Input 2_input scale high	Input scale high		P. 98
Input 2_setting limiter low	2. 5LL (2. SLL)	Input 2_input scale low to Input 2_setting limiter high	Input scale low		P. 98
Input 2_PV transfer function	2Pᴜᴦ5 (2.PVTS)	0: Unused 1: Used	0		P. 98

■ Function block F91: System information display

Name	Parameter	Data range	Factory set value	User set value	Page
ROM version display	ᴦoᴍ (roM)	Displays the version of loaded software.	—		P. 99
Integrated operating time display	ᴜᴦ (WT)	0 to 99999 hours	—		P. 99
Holding peak value ambient temperature display	ᴦCᴜ (TCJ)	−10.0 to +100.0 °C Displays the maximum ambient temperature of the instrument.	—		P. 99
Unused *	HEAᴦ (HEAT)	—	—	—	—

* This item is not used for the HA430/930.

B. Specifications

■ Measured input

Pressure sensor input (Input 1):

Specify when ordering

Corresponding sensor: Strain gauge type of pressure sensor

Temperature input (Input 2): Specify when ordering

TC:	K, J, T, S, R, E, B, N (JIS-C1602-1995)
	PL II (NBS), W5Re/W26Re (ASTM-E988-96)
RTD:	Pt100 (JIS-C1604-1997)
	JPt100 (JIS-C1604-1989, JIS-C1604-1981 of Pt100)
	3-wire system

Voltage and Current inputs (Input 1/Input 2):

Specify when ordering

Voltage (low) group

Voltage: 0 to 1 V, 0 to 10 mV, 0 to 100 mV, ±10 mV, ±100 mV

Current: 0 to 20 mA, 4 to 20 mA

Input impedance: 50 Ω

Voltage (high) group

Voltage: 0 to 5 V, 1 to 5 V, 0 to 10 V, ±1 V, ±5 V, ±10 V

Input range: Refer to **Input range table (P. 25)**

Sampling cycle: 25 ms

Influence of external resistance:

0.25 μV/Ω (TC input)

Influence of input lead: 0.01 °C/Ω or less   10 Ω or less per wire (RTD input)

RTD sensor current: Approx. 1 mA

Digital filter First order lag digital filter

Time constant: 0.00 to 10.00 seconds (0.00: OFF)

PV bias: ±Input span

PV ratio: 0.500 to 1.500

Zero-point calibration range (Pressure sensor):   −5.0 to +5.0 mV (Input conversion)

Gain setting range (Pressure sensor):   0.500 to 4.000 mV/V

Action at input beak:

Pressure sensor:	Upscale or Downscale
TC:	Upscale or Downscale
RTD:	Upscale
Voltage (low):	Upscale or Downscale
Voltage (high):	Downscale (Indicates value near 0 V)
Current:	Downscale (Indicates value near 0 mA)

Action at input short circuit: Downscale (RTD input)

Square root extraction function:

Calculation method: Measured value = $\sqrt{}$ (Input value × PV ratio + PV bias)

Low level cutoff: 0.00 to 25.00 % of input span

■ Non-isolated remote input (Optional) *

*Non-isolated remote input is not available with 2-input controller (Temperature or voltage input type).

Input type:

a) 0 to 1 V, 0 to 10 mV, 0 to 100 mV, ±10 mV, ±100 mV

b) 0 to 5 V, 1 to 5 V, 0 to 10 V, ±1 V, ±5 V, ±10 V

c) 0 to 20 mA, 4 to 20 mA

a) to c): Specify when ordering

Sampling cycle: 75 ms

Accuracy: ± 0.1 % of input span

■ Event input (Optional)

Number of inputs: Up to 5 points
Input method: Dry contact input
        OPEN (OFF) state: 500 kΩ or more
        CLOSE (ON) state: 10 Ω or less
Functions: Memory area selection, RUN/STOP transfer, Remote/Local transfer,
    Auto/Manual transfer, Hold reset, Interlock release,
    Manual output up/down (Motor RPM up/down),
    Manual output 0 % reset (Motor RPM reset)

■ Control action

Number of control points: Up to 2 points
Control method: Brilliant PID control
    Direct action or Reverse action is available
    With Autotuning, Output limiter and Output change rate limiter

■ Control loop break alarm (LBA)

LBA time: 0 to 7200 seconds (0: OFF)
LBA deadband: 0 to Input span

■ Output

● Sensor power supply (Optional)

Rated voltage: 24 V DC $\pm$ 5 %
Rated current: 24 mA max.
    Sensor power supply is isolated from both OUT1 and OUT2
    OUT3 to OUT5: Not available

● Power supply for strain gauge type of pressure sensor

Rated voltage: 8 V DC $\pm$ 3 %
Temperature drift: 80 ppm/°C
Rated current: 30 mA max.

● OUT1 to OUT3 (Used for control output, event output or transmission output)

Number of outputs: Up to 3 points (Specify when ordering)
    OUT3 is isolated from both OUT1 and OUT2.
    OUT1 and OUT2 are not isolated from each other except for relay or triac output.
    When relay or triac output is used, there is isolation between outputs.
    There is isolation between input and output.
    There is isolation between output and power supply terminals.
    If the Sensor power supply (optional) is specified, OUT3 cannot be used.

Output type: **Relay contact output**
    Contact type: 1a contact
    Rating: 250 V AC, 3A (Resistive load)
    Electrical life: 300,000 or more (Rated load)
    Voltage pulse output
    Output voltage: 0/12 V DC
    Allowable load resistance: 600 Ω or more
    Current output
    Output current: 0 to 20 mA DC, 4 to 20 mA DC (Specify when ordering)
    Allowable load resistance: 600 Ω or less
    Voltage output
    Output type: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
        (Specify when ordering)
    Allowable load resistance: 1 kΩ or more

Triac output
Output method: AC output (Zero-cross method)
Allowable load current: 0.4 A (Ambient temperature 40 °C or less)
Ambient temperature 50 °C: 0.3 A
Load voltage: 75 to 250 V AC
Minimum load current: 30 mA
ON voltage: 1.6 V or less (at maximum load current)

● **OUT4, OUT5 (Used for event output)**
Number of outputs: Up to 2 points (Specify when ordering)
If OUT3 is selected for the Sensor power supply (optional), OUT4 and OUT5 cannot be used.
Output type: **Relay contact output**
Contact type: 1a contact
Rating: 250 V AC, 1A (Resistive load)
Electrical life: 300,000 or more (Rated load)

● **Transmission output**
Number of outputs: Up to 3 points (Varies depending on the Output logic selection setting and Output type)
Output contents: Measured value, Set value, Manipulated output value and Deviation
Scaling range: Measured value/Set value: Same as input range
Manipulated output value: −50 to +105.0 %
Deviation: ±Input span

■ Performance

Display accuracy (At the ambient temperature 23 °C ±2 °C)**:**

Pressure sensor input (Strain gauge type pressure sensor)
±0.1 % of span
±0.5 % of span (When combined with pressure sensor)
TC input (K, J, T, PL II, E)
Less than −100 °C [−148 °F]: ±1.0 °C [±2.0 °F]
Less than −100 to +500 °C [−148 to +932 °F]: ±0.5 °C [±1.0 °F]
500 °C [932 °F] or more: ±(0.1 % of reading+1digit)
TC input (S, R, N, W5Re, W26Re)
Less than −100 °C [−148 °F]: ±2.0 °C [±4 °F]
Less than −100 °C to +1000 °C [−148 to +1832 °F]: ±1.0 °C [±2.0 °F]
1000 °C [1832 °F] or more: ±(0.1 % of reading+1digit)
TC input (B)
Less than 400 °C [752 °F]: ±70.0 °C [±130 °F]
Less than 400 °C to 1000 °C [752 to 1832 °F]: ±1.0 °C [±2.0 °F]
1000 °C [1832 °F] or more: ±(0.1 % of reading+1digit)
RTD input
Less than 200 °C [392 °F]: ±0.2 °C [±0.4 °F]
200 °C [392 °F] or more: ±(0.1 % of reading+1digit)
Voltage input ±0.1 % of span
Current input ±0.1 % of span

Cold-junction temperature compensation error: ±1.0 °C (At the ambient temperature 23 °C ±2 °C)
±1.5 °C (At the ambient temperature −10 to +50 °C)

Minimum indication resolution:
Pressure sensor input:
Rated pressure: Less than 1 MPa: 0.0001 MPa
Less than 10 MPa: 0.001 MPa
Less than 100 MPa: 0.01 MPa
100 MPa or more: 0.1 MPa
TC input: 0.1 °C [°F]
(The decimal point position of the input range is selectable.)
RTD input: 0.01 °C [°F]
(The decimal point position of the input range is selectable.)
Voltage/Current input: 1 to 0.0001 (Programmable)

■ Hold function
Hold type: Peak hold, Bottom hold

■ Event output function
Number of calculations: 4 points
Event type: Deviation high, Deviation low, Deviation high/low, Band, Process high,
Process low, SV high, SV low, Control loop break alarm (LBA)
Additional function: Hold action (Effective only when deviation or process action is selected)
Event action at input error selection
Setting range: Deviation: −Input span to +Input span
Process: Input scale low to +Input scale high
SV: Input scale low to + Input scale high
Differential gap: 0 to Input span

■ Multi-memory area function
Number of multi-memory areas: 16 areas
Setting item for multi-memory area function:
Set value (SV), Event 1 setting, Event 2 setting, Event 3 setting,
Event 4 setting, Proportional band setting, Integral time setting,
Derivative time setting, Control response parameter,
Setting change rate limiter (up/down), Area soak time setting,
Link area number

■ Communication function (Optional)
Interface: Based on RS-232C, EIA standard
Based on RS-422A, EIA standard
Based on RS-485, EIA standard
  Specify when ordering
Protocol: RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4)
Modbus
PROFIBUS-DP (EN50170)
DeviceNet
CC-Link
  Specify when ordering

■ Infrared communication function
Communication method: Half-duplex two-way communication
Communication speed: 9600 bps, 19200 bps
Protocol: RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4)

■ Self-diagnostic function
Check items: CPU power supply voltage monitoring, Adjusted data error,
EEPROM error, A/D conversion error, RAM check error,
Hardware configuration error, Software configuration error,
Watchdog timer error, Program busy

Action at self-diagnostic error: For CPU power supply voltage monitoring, RAM check error
and Software configuration error
Display: All the display is OFF (Operation is impossible)
Output: All the output is OFF
Communication: No response
Other than the above:
Display: Error display (Operation is possible)
Output: All the output is OFF
Communication: Possible

■ **Power**

Power supply voltage: 90 to 264 V AC [Including power supply voltage variation]
(Rating 100 to 240 V AC), 50/60 Hz

24 V AC ±10 % [Including power supply voltage variation]
(Rating 24 V AC), 50/60 Hz

24 V DC ±10 % [Including power supply voltage variation]
(Rating 24 V DC)
 Specify when ordering

Power consumption: HA430: 16.5 VA max. (at 100 V AC) 22.5 VA max. (240 V AC)
  15.0 VA max. (at 24 V AC) 430 mA max. (24 V DC)

HA930: 17.5 VA max. (at 100 V AC) 24.0 VA max. (240 V AC
  16.0 VA max. (at 24 V AC) 470 mA max. (24 V DC)

■ **General specifications**

Insulation resistance: Between measuring terminal and grounding: 20 MΩ or more at 500 V DC
Between power terminal and grounding: 20 MΩ or more at 500 V DC
Between measuring terminal and power terminal:20 MΩ or more at 500 V DC

Withstand voltage: Between measuring terminal and grounding: 1 minute at 1000 V AC
Between power terminal and grounding: 1 minute at 1500 V AC
Between power and measuring terminals: 1 minute at 2300 V AC

Power failure: A power failure of 20 ms or less will not affect the control action.
If power failure of more than 20 ms occurs, controller will reset.
HOT start (1, 2) or COLD start (selectable).

Memory backup: Backed up by non-volatile memory (EEPROM)
Number of writing: Approx. 100,000 times
Data retaining period: Approx. 10 years
 Depending on storage and operating conditions.

Allowable ambient temperature: −10 to +50 °C (14 to 122 °F)

Allowable ambient humidity: 5 to 95 %RH
Absolute humidity: MAX.W.C 29 g/m^3 dry air at 101.3 kPa

Ambient atmosphere: There should be neither corrosive gases nor much dust.

Dimensions: HA430: 48 (W) × 96 (H) × 100 (D) mm
HA930: 96 (W) × 96 (H) × 100 (D) mm

Weight: HA430: Approx. 360 g
HA930: Approx. 460 g

■ **Standard**

Safety standards: UL: UL61010-1
cUL: CAN/CSA-C22.2 No.61010-1

CE marking: LVD: EN61010-1
OVERVOLTAGE CATEGORYII,
POLLUTION DEGREE 2,
Class II (Reinforced insulation)
EMC: EN61326-1

RCM: EN55011

Panel sealing: IP65

C. Memory Area Data List (Copy this sheet for its use.)

Sheet No.			Memory area No.		Date		Name	

Display		Item	Set value	Memo
Input 1	_I_ _SU_	Set value 1 (SV1)		
	_I_ _P_	Proportional band 1		
	_I_ _I_	Integral time 1		
	_I_ _d_	Derivative time 1		
	_I_ _rPr_	Control response parameter 1		
	ISUr-U	Set value 1 (SV1) change rate limiter (up)		
	ISUr-d	Set value 1 (SV1) change rate limiter (down)		
Input 2	_2_ _SU_	Set value 2 (SV2)		
	_2_ _P_	Proportional band 2		
	_2_ _I_	Integral time 2		
	_2_ _d_	Derivative time 2		
	_2_ _rPr_	Control response parameter 2		
	2SUr-U	Set value 2 (SV2) change rate limiter (up)		
	2SUr-d	Set value 2 (SV2) change rate limiter (down)		
Common	_EU I_	Event 1		
	_EU2_	Event 2		
	_EU3_	Event 3 (Including LBA and LBD)		
	_EU4_	Event 4 (Including LBA and LBD)		
	ASr	Area soak time		
	LnUA	Link area number		

Easy program operation	1	2	3	4	5	6	7	8
Link area number								
Area soak time								
Setting change rate limiter (up)								
Setting change rate limiter (down)								

A 1 to 3: Soak time
B 1 to 3: Setting change rate limiter

MEMO

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◆ Required operations and functions ◆

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