Digital Controller

REX-F400/F900

Operation Manual

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

**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.
- **NOTE**: Extra notes or precaution are added to operating procedures and explanations.
- !: This mark indicates that all precautions should be taken for safe usage.
- *: This mark is used to add extra notes, precautions or supplementary explanations to table and figures.

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**WARNING**

- To prevent injury to persons, damage to instrument and 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 instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- RKC is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

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All Rights Reserved. Copyright © 1993, RKC INSTRUMENT INC.
This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy.)

This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.

This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.

Be sure to provide an appropriate surge control circuit respectively for the following:
- If input/output or signal lines within the building are longer than 30 meters.
- If input/output or signal lines leave the building, regardless the length.

This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.

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

All wiring must be in accordance with local codes and regulations.

All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.

The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.

To prevent instrument damage 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.

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 dispensation.

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

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

When high alarm with hold action is used for Alarm function, alarm does not turn on while hold action is in operation. Take measures to prevent overheating which may occur if the control device fails.
NOTICE

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

1.1 Handling procedure

Conduct necessary work according to the following procedures:

1. Check of product delivered → See "1.2 Check of product delivered" on page 8.
2. Check of model codes → See "1.3 Check of model codes" on page 10.
   See "5.6 Contact input usage" on page 56.
5. Check of input range → See "5.1 Calling-up procedure of each status" on page 32.
6. Set-value (SV) setting → See "5.3 Set (SET) status" on page 40.
7. Each parameter setting → See "5.3 Set (SET) status" on page 40.
   See "7. ENGINEER LEVEL" on page 69.
8. Operation → See "6. CAUTIONS FOR OPERATION" on page 64.

CAUTIONS

1. Connect the input signal wiring, and then turn ON the power. If the input signal wiring opens, the controller judges that input is disconnected to cause the upscale or downscale of measured-value (PV) display.
   Upscale ...................... For TC or RTD input
   Downscale ................... For TC (To be specified when ordering), voltage or current input

2. For position proportioning PID action, it is recommended that feedback resistance be adjusted prior to operation.
   For the feedback resistance adjustment, see "5.7 Feedback resistance adjustment" on page 60.
1.2 Check of product delivered

Check that the following items are delivered without damage.

- REX-F900 or REX-F400
- Mounting brackets (2 pcs.)
- Operation manual [IM900F21-E□]
Example of engineering unit seal affixing

Use an engineering seal meeting the controlled object. Also use a blank seal with any comments entered.
1.3 Check of model codes

Check the model code from the following list to determine if the product delivered is as desired.

- Model code
  
  **REX- F900 F400** model code

  | F900 | □ □ □ - □ □ ∗ □ □ - □ □ □ - □ □ /CE |
  | F400 | 1  2  3  4  5  6  7  8  9  10 11 12 13 |

① Control action
A : ON/OFF action *1
F : PID action with AT
V : Heating/cooling PID action
B : Heating/cooling PID action with AT for extruder (air cooling)
W : Heating/cooling PID action with AT for extruder (water cooling)
Y : Position proportioning PID action *2

② Input type
See input range table "Model code" on page 96

③ Input range
See input range table "Mode code" on page 96

④ First control output [OUT1]
M : Relay contact
V : Voltage pulse
G : Trigger (for triac driving)
4 : Continuous voltage
5 : Continuous voltage
0 to 5V DC
6 : Continuous voltage
0 to 10V DC
7 : Current 0 to 20mA DC
8 : Current 4 to 20mA DC

⑤ Second control output [OUT2]
No symbol : When control action is A, F or Y
Specified for heating/cooling PID action (V) and heating/cooling PID action with AT for extruder (B, W). The symbol is the same as that in item ④.

However, no trigger output (G) can be specified.

⑥ First alarm
A : Deviation high alarm *3
B : Deviation low alarm *3
C : Deviation high/low alarm *3
D : Band alarm
E : Deviation high alarm *4
F : Deviation low alarm *4
G : Deviation high/low alarm *4
H : Process high alarm *3
J : Process low alarm *3
K : Process high alarm *4
L : Process low alarm *4
M : FAIL alarm
N : No first alarm
Second alarm
A: Deviation high alarm  *3
B: Deviation low alarm  *3
C: Deviation high/low alarm  *3
D: Band alarm
E: Deviation high alarm  *4
F: Deviation low alarm  *4
G: Deviation high/low alarm  *4
H: Process low alarm  *3
J: Process low alarm  *4
K: Process high alarm  *4
L: Process low alarm  *4
M: FAIL alarm
P: Heater break alarm
CTL-6-P-N  *5
S: Heater break alarm
CTL-12-S56-10L-N  *5
N: No second alarm

Remote input  *5
1: Voltage 0 to 10 mV
2: Voltage 0 to 100 mV
3: Voltage 0 to 1 V DC
4: Voltage 0 to 5 V DC
5: Voltage 0 to 10 V DC
6: Voltage 1 to 5 V DC
7: Current 0 to 20 mA DC
8: Current 4 to 20 mA DC
N: No remote input

Contact input  *6
1: Memory area transfer
2: AUTO/MAN transfer  *9
3: REM/LOC transfer
4: COMP/LOC transfer  *7
5: Memory area transfer and AUTO/MAN transfer  *7, *9
6: Memory area transfer and REM/LOC transfer  *7
7: Memory area transfer and COMP/LOC transfer  *7
N: No contact input

Analog output  *8
1: Voltage 0 to 10 mV
2: Voltage 0 to 100 mV
3: Voltage 0 to 1 V DC
4: Voltage 0 to 5 V DC
5: Voltage 0 to 10 V DC
6: Voltage 1 to 5 V DC
7: Current 0 to 20 mA DC
8: Current 4 to 20 mA DC
N: No analog output

Communication  *6
1: RS-232C
4: RS-422A
5: RS-485
N: No communication

Front sheet color
N: Standard color [Blue base]
A: Black base

Safety standard
When you specify the models with CE mark, UL and cUL certification, please add the suffix of “/CE” to model code.
The following standards do not apply to Trigger output for triac driving.
CE, UL and cUL

*1 For ON/OFF action, only the [M, V and G] can be specified as control outputs.
*2 For position proportioning PID action, only the [M] can be specified as control outputs.
*3 Without hold action
*4 With hold action
*5 No common use of heater break alarm and remote input is available.
*6 For REX-F400, no common use of communication function and contact input is available.
*7 For REX-F400, cannot be specified.
*8 For REX-F400, specify “N.”
*9 Cannot specified for ON/OFF action (A), heating/cooling PID action (V) and heating/cooling PID action with AT for extruder (B, W).
2. MOUNTING

2.1 Cautions for mounting

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

2. Use this instrument within the following environment conditions:
   - Allowable ambient temperature: 0 to 50 °C
   - Allowable ambient humidity: 20 to 95 % RH
     (Absolute humidity: MAX. W. C 29.3 g/m³ 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 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.
   - For correct functioning mount this instrument in a horizontal position.

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.

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

- REX-F900

Unit: mm (inch)

*Dimensions in inches are shown for reference.
Unit: mm (inch)

Panel cutout

*Dimensions in inches are shown for reference.
2.3 Mounting procedures

1. Mount the panel cutout corresponding to the number of units on the panel by referring to panel cutout dimensions.
2. Insert the instrument into the panel from the front side.
3. Engage each mounting bracket with the bracket insertion slots (Fig. 1).
4. Then tighten the mounting bracket setscrew from the rear with a Phillips screwdriver (Fig. 2). Do not overtighten the bracket setscrew.
5. Engage the other bracket with the slots in the same way as in items 3 and 4.
3. WIRING

![WARNING]

- To prevent electric shock or instrument failure, do not turn on the power until all wiring is completed. Make sure that the wiring is correct before applying power to the instrument.
- To prevent injury to persons, damage to instrument and equipment, a suitable external protection device shall be required.
- 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.

3.1 Cautions for wiring
(1) For thermocouple input, use the appropriate compensation wire.
(2) For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
(3) To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
(4) Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
(5) When a shielded lead is used, ground the shield as follows to prevent noise generated by both stray capacitance between the shield and each conductor, and by the shield potential difference with the earth.
• When signal source is grounded, ground the shield to the signal source side.

• When signal source is not grounded, ground the shield to the instrument side.

(6) 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.
(7) For wiring, use electric wires conforming to the domestic standard of each country.

- For power supply wires, use 600 V Polyvinyl chloride insulated wires (JIS C3307).
- Ground the instrument to the earth through the shortest route possible using an electric wire with a nominal conductor cross section of 2.0 mm² or larger. [Grounding resistance: Less than 100 Ω]

(8) Allow approximately 3 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.

(9) Power supply wiring must be twisted and have a low voltage drop.

(10) This instrument with 24 V power supply is not provided with an overcurrent protection device.

For safety install an overcurrent protection device (such as fuse) with adequate breaking capacity close to the instrument.

- Fuse type: Time-lag fuse (Approved fuse according IEC60127-2 and/or UL248-14)
- Fuse rating: Rated current: 0.63 A

(11) For an instrument with 24 V power supply input, supply power from “SELV” circuit defined as IEC 60950-1.

(12) 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).

(13) Display accuracy of current transformer (CT) input value at heater break alarm is within ±5 % of input value or ±2 A, whichever is greater.

Therefore, when a heater break alarm is used, set load current flowing through the current transformer (CT) at a value to be sufficiently large.

(14) Use the solderless terminal appropriate to the screw size.

- Screw size: M3 x 8
- Recommended tightening torque: 0.4 N·m [4 kgf·cm]
- Specified solderless terminals: With isolation
- Applicable wire: Solid/twisted wire of 2 mm² or less

(15) Make sure that during field wiring parts of conductors cannot come into contact with adjacent conductive parts.
3.2 Circuit configuration

The following diagram shows the REX-F900 (or REX-F400) circuit configuration. Since the inside output circuit, inside input circuit, and MCU section and input circuit, and the communications and contact input sections are not isolated, exercise care in wiring.

For REX-F400:
*1 . . . No common use of communication function and contact input is available.
*2 . . . Feedback resistance input is not provided when communication function is attached.
3.3 Rear terminals

Conduct wiring by referring to following diagrams.

- **REX-F900**

  - Alarm 1 or FAIL output
  - Alarm 2, Heater break alarm or FAIL output

  - **Power terminals**
    - AC L
    - DC +
    - 24V
    - 24V
    - 100 to 240V

  - **Output terminals**
    - NO: Normally open
    - NC: Normally closed

- **Trigger output for triac driving**
  - OUT
  - T2
  - T1
  - G

- **Relay contact output**
  - OUT
  - OUT
  - NO
  - NC

- **Voltage pulse/Continuous voltage, Current output**
  - OUT(1)
  - OUT(2)

- **A, F type**
  - V, B, W type
  - V, B, W, Y type

  - A: ON/OFF action
  - F: PID action with AT
  - V: Heating/cooling PID action
  - B: Heating/cooling PID action with AT for extruder (air cooling)
  - W: Heating/cooling PID action with AT for extruder (water cooling)
  - Y: Position proportioning PID action

  - OUT(1): Heating-side (V, B, W), Open (Y)
  - OUT(2): Cooling-side (V, B, W), Closed (Y)
CAUTIONS

1. Terminals which are not used according to the controller type are all removed.

2. Do not excessively tighten the terminal screws.
   - Recommended tighten torque: 0.4N·m (4kgf·cm)
   - Maximum allowance tighten torque: 1.0N·m (10kgf·cm)

3. Crimp-style terminal lug
   Therefore, use the lug suitable for a screw of M3.

6.2mm (0.24 inch) or less

Voltage (low) input: 0 to 10mV, 0 to 100mV, 0 to 1V
Voltage (high) input: 0 to 5V, 0 to 10V, 1 to 5V
**CAUTIONS**

1. Terminals which are not used according to the controller type are all removed.

2. Do not excessively tighten the terminal screws.
   - Recommended tighten torque: 0.4N\(\cdot\)m (4kgf\(\cdot\)cm)
   - Maximum allowance tighten torque: 1.0N\(\cdot\)m (10kgf\(\cdot\)cm)

3. Crimp-style terminal lug
   Therefore, use the lug suitable for a screw of M3.

   ![6.2mm (0.24 inch) or less](image)

Voltage (low) input: 0 to 10mV, 0 to 100mV, 0 to 1V
Voltage (high) input: 0 to 5V, 0 to 10V, 1 to 5V
3.4 Wiring example

Heating/Cooling PID action type

F900V□□-MM*AP-N61-4□

- Diagram showing connections and components such as power supply, magnet switch, CR circuit, alarmer, controlled object, host computer, COM-104C, converter, RS-232C, RS-422A, recorder, dry contact input (control area selection), and dry contact input (mode selection).

*Heater break alarm
Position proportioning PID action type

F900Y□□-M*AM-651-5□

- Power supply
- Alarmer
- Host computer (RS-232C)
- COM-103C
- Converter (RS-485)
- Recorder
- Input signal wire
- Control motor
- Fluid
- TC

*FAIL alarm

Remote setting input
1 to 5V
Program setter

Dry contact input
Dry contact selection

Control area

Controlled object
4. NAME OF PARTS

**REX-F900**

- PV
- AREA
- SV
- MV
- AT
- COMP
- REM
- MAN
- EXT
- ALM1
- ALM2
- FAIL

**REX-F400**

- PV
- AREA
- SV
- MV
- COMP
- REM
- MAN
- EXT
- ALM1
- ALM2
- FAIL

- OUT1
- OUT2
Display unit

1. Measured-value (PV) display unit [Green]
   - Displays measured-value (PV).
   - Displays various characters depending on the instrument status.

2. Set-value (SV) display unit [Orange]
   - Displays set-value (SV).
   - Displays each parameter set-value.
   - Displays input value, output value and various characters depending on the instrument status.

3. Memory area display unit [Orange]
   - Displays memory area No. used for control.
   - Displays memory area No. at which the setting is changed for operator level 1 and 2.

4. Bar-graph display unit [Green]
   - Manipulated output value (MV) or deviation of measured-value (PV) from set-value (SV) is displayed on 20-dot LEDs. (REX-F400; 10-dot LEDs)
   - Displays feedback resistance or deviation for position proportioning PID action.

Indication lamps

5. Manipulated output (MV) lamp [Orange]
   - Flashes when manipulated output value (MV) is displayed on the set-value (SV) display unit.

6. Auto-tuning (AT) lamp [Green]
   - Flashes during auto-tuning execution.

7. Computer (COMP) mode lamp [Green]
   - Lights in the computer mode (during communication).

8. Remote (REM) mode lamp [Green]
   - Lights in the remote mode.

   - Lights in the manual mode.

10. External (EXT) mode lamp [Green]
    - Lights in the external mode (at control area external selection).

11. First alarm (ALM1) lamp [Red]
    - Lights with the first alarm turned ON.

12. Second alarm (ALM2) lamp [Red]
    - Lights with the second alarm turned ON.
    - When heater break alarm (HBA) is selected as the second alarm, this lamps lights at heater break.

13. Failure (FAIL) lamp [Red]
    - Lights in the fail status.

14. First control output (OUT1) lamp [Green]
    - Lights with the first control output turned ON.
      - Heating/cooling PID action type: Heating-side (including "with AT for extruder")
      - Position proportioning PID action: Open-side

15. Second control output (OUT2) lamp [Green]
    - Lights with the second control output turned ON.
      - Heating/cooling PID action type: Cooling-side (including "with AT for extruder")
      - Position proportioning PID action: Close-side
Operation keys

16. Mode (MODE) key
- Used when the instrument is set to the mode status and each display is selected in the mode status.

17. Monitoring (MONI) key
- Used when the instrument is set to the monitoring status and each monitoring display is selected.

18. Area (AREA) key
- Used when the instrument is set to the area status.

19. Set (SET) key
- Used when the instrument is set to the set status (Operator level 1, operator level 2 and engineer level).

20. Setting digit shift key
- Used when the cursor (brightly lit) is moved to the digit whose numeric value needs to be changed for set-value change.

21. Set-value decrement key
- Used when the numeric value needs to be decreased for set-value change.
- Used for operation mode transfer in the mode status.

22. Set-value increment key
- Used when the numeric value needs to be increased for set-value change.
- Used for operation mode transfer in the mode status.

Bar-graph display

With the respect to bar-graph displays, both the manipulated output value (MV) and deviation display are available.
(See "7.10 Bar-graph section" on page 81.)

Manipulated output value (MV) display
[Display example]

\[
\begin{array}{c}
\text{< REX-F900 >} \\
0 & 50 & 100
\end{array}
\]

\[
\begin{array}{c}
\text{< REX-F400 >} \\
0 & 50 & 100
\end{array}
\]

When manipulated output value (MV) becomes 0% or less, the dot at the left end of the bar-graph flashes and when it exceeds 100%, that at the right end flashes.
For heating/cooling PID action
(Including "with AT for extruder")
When the output indication lamp "OUT1" at the left side of bar-graph lights, the bar-graph displays heating output and when "OUT2" lights, the bar-graph displays cooling output.
When both "OUT1" and "OUT2" light, this means overlapping, but in this case the bar-graph displays only the heating output.

For position proportioning PID action
The bar-graph indicates feedback resistance input value (POS).

Deviation display
[Display example]

\[
\begin{array}{c}
\text{\langle REX-F900 \rangle} \\
- \quad 0 \quad +
\end{array}
\]

\[
\begin{array}{c}
\text{\langle REX-F400 \rangle} \\
- \quad 0 \quad +
\end{array}
\]

The deviation between the set-value (SV) and measured-value (PV) is displayed.
The dots at both ends of bar-graph light to indicate deviation display. Both dots light at 0 deviation only.
5.1 Calling-up procedure of each status

Broadly, the following four statuses are available for this instrument.

- Monitoring (MONI) status: Status in which each input/output monitoring and checking are performed
- Set (SET) status: Status in which set-value (SV) and various parameters are set and checked
- Area (AREA) status: Status in which the memory area used for control (control area) is transferred
- Mode (MODE) status: Status in which each operation mode is transferred

The calling-up procedure of each status is shown in the next page.

--- Description of *1, *2 or *3 in the next page ---

*1 For transfer from the SET status to the MONI status, basically press the MONI key. However, if the instrument is set to the operator level 1 in the SET status, it is set to the MONI status even if the SET key is pressed.

*2 When the control area is changed in the AREA status, the instrument is set to the MONI status automatically. Also, when the control area is not changed, the instrument is set to the MONI status even if either the MONI or SET key is pressed.

*3 It is impossible to set the SET status directly from the AREA status.

NOTE

The instrument is set to the MONI status automatically if key operation is not performed for more than 1 min.
Power-ON

Input type/
Input range
display

Display changes
automatically

Monitoring(MONI) status [P. 36]
- Display of measured-value (PV), set-value (SV), etc.
- Manipulated output value (MV) change in manual mode

Mode (MODE) status [P. 51]
- Operation mode change (AUTO/MAN, LOC/REM, etc.)
- Auto-tuning execution
- Set data lock execution
- Others

Set (SET) status [P. 40]
- Set-value (SV) change (Operator level 1)
- Change in alarm set-value, PID constants, etc. (Operator level 2)
- Other setting change (Engineer level)

Area (AREA) status [P. 50]
- Control area change

MONI: Press the monitoring (MONI) key.
SET: Press the set (SET) key.
AREA: Press the area (AREA) key.
MODE: Press the mode (MODE) key.
Input type/input range display

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

1. Input type display
   - PV: Display for (approx. 2 sec)
   - SV
   - MV

2. Input range display
   - PV: Display for (approx. 2 sec)
   - SV
   - MV

Monitoring (MONI) status
[P. 36]
1. Input type display (Display for approx. 2 sec)
   a: Input display character (InP)
   b: Unit

<table>
<thead>
<tr>
<th>Display</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>°C</td>
</tr>
<tr>
<td>°F</td>
<td>°F</td>
</tr>
<tr>
<td>None</td>
<td>%</td>
</tr>
</tbody>
</table>

c: Input type

<table>
<thead>
<tr>
<th>Display</th>
<th>K</th>
<th>J</th>
<th>R</th>
<th>S</th>
<th>B</th>
<th>E</th>
<th>T</th>
<th>N</th>
<th>PLII</th>
<th>W5Re/W26Re</th>
<th>U</th>
<th>L</th>
<th>JPt 100</th>
<th>Pt 100</th>
<th>Voltage input</th>
<th>Current input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input type</td>
<td>TC</td>
<td>RTD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2 Monitoring (MONI) status

This is the status to monitor and check each input/output. Each monitoring display is shown in the following. Display in the MONI status is changed by the MONI key.

A. Measured-value (PV)/set-value (SV) displays
[Displayed during auto (AUTO) mode operation]
In the remote (REM) mode, the display unit displays the remote setting input value (RS).
Display range: Same as the input range

B. Measured-value (PV)/manipulated output value (MV) displays
[Displayed during manual (MAN) mode operation]
The point above the manipulated output value (MV) decimal-point (between the lower first and second digits) flashes to indicate that the display unit shows the manipulated output value (MV).
Display range: Same as the input range (Measured-value (PV))
-5.0 to +105.0% (Manipulated output value (MV))

Set-value (SV) display during setting change
Display set-value (SV) which changes every moment by a setting change rate limit function when the set-value (SV) is changed. This display becomes the same as
A set-value (SV) display with the setting change rate limit function turned OFF (Setting “0.0”).
Display range: Within setting limit range
Manipulated output value (MV) display during output change
Displays manipulated output value (MV) actually output from the instrument.
Therefore, when the output change rate limit function is set, displays manipulated output value (MV) via that function.
Display range: Within output limit range [%]
(For heating/cooling PID action (including "with AT for extruder"), displays manipulated output value (MV) on the heating-side.)

Manipulated output value (MV) display during output change (Cooling-side)
[Displayed only during heating/cooling PID action (including "with AT for extruder")]
For heating/cooling PID action (including "with AT for extruder"), displays manipulated output value (MV) on the cooling-side.
Display range: Within output limit range [%]

Feedback resistance input value (POS) display
[Displayed only during position proportioning PID action]
Displays feedback resistance input value (POS) for position proportioning PID action.
Display range: 0.0 to 100.0%
A. Remote setting input value (RS) display
[Displayed only when the remote setting input function is provided]
Displays remote setting input value (RS) which is the controlled target value in the remote (REM) mode.
Display range: Within setting limit range

B. Current transformer input value (CT) display
[Displayed only when the heater break alarm (HBA) function is provided]
Displays the input value of the current transformer used when the instrument is provided with the heater break alarm (HBA) function.
Display range: 0.0 to 105.0 A

NOTE
① is displayed when the power is turned ON or the instrument is transferred from the other status.
Manipulated output value (MV) setting in the manual (MAN) mode

Manipulated output value (MV) in the manual (MAN) mode can be manually set in the monitoring (MONI) status.

[Display example]

- Press the MONI key to display “Measured-value (PV)/manipulated output value (MV) displays” (① B display).
- Press the ▲ key at this time increments manipulated output value (MV) and pressing the ▼ key decrements the same value.
  Keeping pressing the ▲ or ▼ key makes numeric value change faster.
5.3 Set (SET) status

(1) Set (SET) status outline

[Display flow example]
1 **Operator level 1**
- Pressing the SET key in the monitoring or mode status sets the instrument to the operator level 1.
- The operator level 1 enables a change in the control target set-value (SV).
- No. of memory areas: 8 [REX-F900]
  2 [REX-F400]

(One set-value (SV): 1 memory)
Setting range: Same as input range
Initial value prior to shipment: 0 (Decimal-point position varies with input type.)

2 **Operator level 2**
- Pressing the SET key for approx. 5 sec sets the instrument to the operator level 2.
- The operator level 2 enables changes in parameters such as alarm setting values, PID constants, etc.
- Pressing the SET key changes each parameter in the operator level 2 in due order.
- No. of memory areas: 8 [REX-F900]
  2 [REX-F400]

(All operator level 2 items: 1 memory)
*For the details of the operator level 2, see "(2) Description of each parameter" on page 42.

3 **Engineer level**
- The engineer level enables the setting of control action, input/output, alarm and additional function operation selection, and the presence or absence of function. Therefore, this setting is not frequently used.
  *For the engineer level, see "7. ENGINEER LEVEL" on page 69.
However, if the setting content in the engineer level is changed, the specification may change.
(2) Description of each parameter (Operator level 2)

Each parameter in the operator level 2 status is shown in the following. Every time the SET key is pressed, each parameter changes in the following order. (The first parameter appears after one cycle is finished.)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1</td>
<td><strong>AL1</strong></td>
<td>First alarm</td>
<td>• Deviation alarm&lt;br&gt;- High alarm, low alarm: (−span or −1999) to (+span or +9999)&lt;br&gt;- High and low alarm, band alarm: 0 to (+span or +9999)</td>
<td>50.0 or 500</td>
</tr>
<tr>
<td></td>
<td>AL1</td>
<td>First alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2</td>
<td><strong>AL2</strong></td>
<td>Second alarm</td>
<td>• Process alarm&lt;br&gt;- Same as input range&lt;br&gt;- Decimal-point position varies with input type</td>
<td>50.0, 500, −50.0 or −500</td>
</tr>
<tr>
<td></td>
<td>AL2</td>
<td>Second alarm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td><strong>P</strong></td>
<td>(Heating-side) Proportional band</td>
<td>0.1 to 999.9% of span (&lt;&quot;0.0&quot; cannot be set.)</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>(Heating-side) Proportional band</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td><strong>I</strong></td>
<td>Integral time</td>
<td>1 to 3600 sec (&lt;&quot;0&quot; cannot be set.)</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>I</td>
<td>Integral time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td><strong>D</strong></td>
<td>Derivative time</td>
<td>0 to 3600 sec (&lt;&quot;0&quot; setting: Derivative action OFF)</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>Derivative time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Setting</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------</td>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>rPT</td>
<td>Control response designation parameter</td>
<td>0: Slow 1: Medium 2: Fast</td>
<td>Response required due to set-point change in PID control is specified.</td>
<td></td>
</tr>
<tr>
<td>PC</td>
<td>Cooling-side proportional band</td>
<td>0.1 to 999.9% of span (“0.0” cannot be set.)</td>
<td>Sets cooling-side proportional band when heating/cooling PID action (including “with AT for extruder”) is performed.</td>
<td></td>
</tr>
<tr>
<td>db</td>
<td>Dead band</td>
<td>-10.0 to +10.0% of span</td>
<td>Sets control dead band between heating-side and cooling-side proportional bands. Minus (-) setting results in overlap.</td>
<td></td>
</tr>
<tr>
<td>Surl</td>
<td>Setting change rate limit</td>
<td>0.0 to 100.0%/min (“0.0” setting: Setting change rate limit OFF)</td>
<td>Setting amount of set-value (SV) change per one minute when the set-value (SV) is changed.</td>
<td></td>
</tr>
</tbody>
</table>

*1 Dose not display when no alarm is provided and/or FAIL is selected for the first alarm.

*2 Dose not display when no alarm is provided, there is only one alarm output, FAIL is selected for the second alarm and/or heater break alarm function is provided.

*3 No display is made for ON/OFF action.

*4 Displayed only for heating/cooling PID action (including "with AT for extruder").
(3) Setting change procedure

(a) When set-value (SV) is changed

[Example] When the set-value (SV) is changed to 200.0°C

① Set the instrument to the operator level 1 status.

[Diagram of instrument showing "100.0" on the display]

Press the SET key to set the instrument to the operator level 1 status.
The least significant digit on the set-value (SV) display unit lights up brightly, and other digits and the memory area display unit light up dimly. The brightly lit digit can be set.
* For REX-F400, the memory area display unit does not light up dimly.

② Shift of brightly lit digit

[Diagram of instrument showing "100.0" on the display]

Press the ← key to move the brightly lit digit up to the most significant digit. Every time the ← key is pressed, each brightly lit digit moves as follows.

[Diagram showing digit movement with "1-1-0-0-0"]
3) Numeric value change

Press the ↑ key to set "2".
Pressing the ↑ key increments numeric value, and pressing the ↓ key decrements the value.

4) Set-value (SV) registration

After the displayed value is changed, press the SET key.
All digits corresponding to set-value and memory area No. display are brightly lit. Thus, the instrument is set to the monitoring status to register the set-value.
(b) When another area set-value (SV) is changed without changing control area

[Example] When memory area No. 2 set-value (SV) is changed to 100.0°C with control area set to memory area No. 1

Press the SET key to set the instrument to the operator level 1.

Press the ñ key to move the brightly lit digit up to the memory area No. display.

Press the A key to set memory area No. to “2”. The set-value (SV) display unit displays memory area No. 2 set-value (SV). Also, the memory area No. display flashes in order to indicate that the memory area now displayed differs from the control area.
Press the \( \leftarrow \) key again to move the brightly lit digit up to the most significant digit.

Press the \( \uparrow \) key to set the digit to "1".

After the displayed value is changed, press the SET key. Thus, instrument status changes to the monitoring status and also the display is for the control area. At this time, the changed memory area No. 2 set-value (SV) is registered.
(c) When each parameter set-value is changed
[Example]

Operator level 1
- PV: 200.00
- Area: 1
- SV: 200.00
- MV: 200.00
- Mode: ON
- Mon.
- Area: 1
- V: 05.00
- Ext.
- ALM1
- ALM2
- Fail.

Approx. 5 sec

Operator level 2
- PV: A11
- Area: 1
- SV: 05.00
- MV: 05.00
- Mode: ON
- Mon.
- Area: 1
- V: 05.00
- Ext.
- ALM1
- ALM2
- Fail.

- Press the SET key for approx. 5 sec to set the instrument to the operator level 2.
- Press the SET key once each time until the parameter symbol whose setting needs to be changed is displayed.
- In the same way as in items (2) to (4) on page 44, change the setting.
- For the operator level 2, pressing the SET key at the time of setting registration moves the display to the next parameter.

(d) When parameter set-value in another area is changed without changing control area
- Press the SET key for approx. 5 sec to set the instrument to the operator level 2.
- Press the SET key once each time to display the parameter symbol whose setting needs to be changed.
- In the same way as in item (b) on page 46, display the memory area No. to be changed to change the set-value.
- After the displayed value is changed, pressing the SET key registers the changed value and moves the display to the next parameter.

However, the memory area No. remains with the status changed (memory area No. display flashing). Press the MONI key when the display needs to be returned to the control area display.
The following is also available when changing the set-value

**Set-value increase or decrease**  Example: When a temperature of 199°C is changed to 200°C.
Press the \( < \) key to shift the digit brightly lit to the least significant digit. Press the \( \Delta \) key to change "9" to "0", thereby obtaining 200°C. The same applies to set-value decrease.

**Minus (-) value setting**  Example: For changing 200 to -100.
Press the \( < \) key to shift the digit brightly lit to the hundreds digit. Press the \( \psi \) key to decrement figures in order of 1 \( \rightarrow \) 0 \( \rightarrow \) -1.

---

⚠️ **Key operation cautions**

- This instrument cannot register the setting just changed. The value can be registered for the first time after it is changed and then the SET key is pressed.
- If the instrument is not set to the operator level 1 even when the SET key is pressed or the set-value does not light brightly even when set to the operator level 2, the set data lock may be activated. In this case press the MODE key to set the instrument to the mode status to confirm whether the instrument is set to the unlock status by "Set data unlock/lock transfer" (see page 52).
- This instrument returns to the monitoring status automatically if key operation is not performed for more than 1 min.
5.4 Area (AREA) status

The AREA status is for changing memory area (control area) used for control. Control area changing procedure is described in the following.

[Example] When the control area is changed from memory area No. 1 to No. 2.

1. Press the AREA key to set the instrument to the AREA status. The measured-value (PV) display unit displays "RaE!" (ArE) to indicate that the instrument is in the AREA status. The set-value (SV) display unit also shows control area No.

2. Press the ▲ key to display "2" on the set-value (SV) display unit. At this time, the control area is not as yet changed. The No. displayed on the memory area display unit corresponds to the control area.

3. Press the SET key to change the control area. The instrument is set to the monitoring status.

NOTE

This instrument returns to the monitoring status automatically if key operation is not performed for more than 1 min.
5.5 Mode (MODE) status

(1) Display flowsheet

The MODE status is for each operation mode transfer, a display flowsheet in the MODE status is shown in the following. Display in the MODE status is changed by the MODE key.

Auto (AUTO)/manual (MAN) transfer

[Displayed only when the manual mode is provided]
Selected when control is performed in either the automatic or manual mode.

*The manual mode is provided for the following cases:
• For PID action with auto-tuning (F), and voltage input or current input.
• For position proportioning PID action.

*The manual setting of manipulated output (MV) in the manual mode is mode in the monitoring status. (see page 39).

Local (LOC)/remote (REM) transfer

[Display only when the instrument is provided with the remote setting input function]
Selected when either data within the instrument (local) is used as set-value (SV) or external (remote) setting input data is used.

Control area internal (local)/external transfer

[Displayed only when the instrument is provided with the control area external contact input function]
Selected when control area is selected either by key operation (local) or external contact input (external).

*See “5.6 Contact input usage” on page 56.
PID/auto-tuning (AT) transfer
[Displayed only when the instrument is provided with the auto-tuning (AT) function]
Selected when either PID control or auto-tuning (AT) is performed. The selection of auto-tuning immediately starts the auto-tuning function. After this function is completed, the controller is transferred automatically to PID action.

Set data unlock/lock transfer
Selected when either the set data lock function is invalidated (unlock) or validated (lock).
*Details of set data lock are set by engineer level in set status.
("7.16 Data lock section" on page 92.)

Operation execution (RUN)/STOP transfer
Selected when operation is either executed (RUN) or stopped (STOP).
*When set to STOP, the set-value (SV) display unit shows “STOP” in the monitoring status.
*If the instrument is transferred to execution (RUN) from STOP, it performs the same operation (see page 34) as the power-ON.
Local (LOC)/computer (COMP) transfer
[Displayed only when the instrument is provided with the communication function]
Selected when either control by key operation (local) is performed or control via communication (computer) is performed.

NOTES
1. Normally, when the instrument is set to the MODE status, first ① is displayed, but ⑦ is first displayed when control via communication is performed. Also ⑥ is first displayed in the operation STOP status.
2. This instrument returns to the monitoring status automatically if key operation is not performed for more than 1 min.
(2) Operation mode transfer procedure

[Example] When operation is changed from execution (RUN) to STOP

1. Press the MODE key to set the instrument to the MODE status.
   Usually, "AUTO/MAN transfer" is displayed first, but during communication "LOC/COMP transfer" is displayed first.

2. Press the MODE key to display "Operation execution (RUN)/STOP transfer".
   The display selected is brightly lit.
Press the ▼ key to change the instrument from RUN to STOP.
For operation mode transfer, mode transfer becomes valid at this time.
Press the • key changes the display on the set-value (SV) display unit to that on the measured-value (PV) display unit. Pressing the ▼ key changes the above display unit in reverse order.
*If the instrument is transferred to RUN from STOP, it performs the same operation (see page 36) as the power-ON.

After the above transfer is finished, press any key of MONI, SET and AREA to set the instrument to the desired status. (The figure at above shows the monitoring status.)
5.6 Contact input usage

In this instrument, the control area and each operation mode can be transferred by the front keys and also by contact input. (Optional)

For REX-F900, both control area transfer and operation mode transfer can be selected. However for REX-F400, only one from among control area transfer, operation mode auto/manual transfer and local/remote transfer can be selected. (To be specified when ordering)

(1) Control area transfer

# REX-F900

The control area can be transferred according to the open/close status of rear terminals Nos. 22 to 25.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Control area</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 22-23</td>
<td></td>
<td>×</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 22-24</td>
<td></td>
<td></td>
<td>×</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>No. 22-25</td>
<td></td>
<td></td>
<td></td>
<td>×</td>
<td></td>
<td>×</td>
<td></td>
<td>×</td>
<td></td>
</tr>
</tbody>
</table>

- : Open   × : Closed

# NOTES

1. When the control area is transferred by contact input, set the instrument to the external mode (E\text{ui}) according to the MODE status "Control area internal (local)/external transfer" (see page 51).

2. In this instrument, the control area is transferred approx. 2 sec after the rear terminal (Nos. 22 to 25) open/close status is changed.
The control area can be transferred according to the open/close status of rear terminals Nos. 12 and 13.

<table>
<thead>
<tr>
<th>Control area transfer</th>
<th>Front key mode selection</th>
<th>Status of rear terminal Nos. 12 and 13</th>
<th>Control area No.</th>
<th>Memory area display unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>External</td>
<td>Open</td>
<td>1</td>
<td>Lighting of &quot;1&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Closed</td>
<td>2</td>
<td>Lighting of &quot;2&quot;</td>
</tr>
<tr>
<td>Local</td>
<td></td>
<td><em>1</em></td>
<td>1 or 2 <em>2</em></td>
<td>Lights area No. selected by front key</td>
</tr>
</tbody>
</table>

*1 . . . . Any terminal status is acceptable, since the control area is transferred by the front key (local).
*2 . . . . Either one of the control area Nos. selected by the front key.

**NOTES**

1. When the control area is transferred by contact input, set the instrument to the external mode (E U F) according to the MODE status "Control area internal (local)/external transfer" (see page 51).

2. In this instrument, the control area is transferred approx. 1 sec after the rear terminal (Nos. 12 and 13) open/close status is changed.
(2) Operation mode transfer

**REX-F900**

The operation mode can be transferred according to the open/close status of the rear terminal Nos. 12 and 13. The operation mode transferred by contact input is any one of AUTO/MAN, LOC/REM and LOC/COMP. (To be specified when ordering)

The operation mode transfer status by contact input is shown in the following.

<table>
<thead>
<tr>
<th>Front key mode selection</th>
<th>Status of rear terminal Nos. 12 and 13</th>
<th>Actual operation mode</th>
<th>Lamp status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto/ manual transfer</td>
<td>Closed</td>
<td>Auto</td>
<td>MAN (Manual mode lamp) OFF</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Manual</td>
<td>MAN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ON</td>
</tr>
<tr>
<td>Local/remote transfer</td>
<td>Closed</td>
<td>Remote</td>
<td>REM (Remote mode lamp) ON</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Local</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flashing</td>
</tr>
<tr>
<td>Local/computer transfer</td>
<td>Closed</td>
<td>Computer</td>
<td>COMP (Computer mode lamp) ON</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Local</td>
<td>COMP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flashing</td>
</tr>
</tbody>
</table>

* The open or close status of rear terminal Nos. 12 and 13 is acceptable.

**NOTE**

In this instrument, the operation mode is transferred approx. 1 sec after the rear terminal (Nos. 12 and 13) open/close status is changed.
### REX-F400

The operation mode can be transferred according to the open/close status of the rear terminal Nos. 12 and 13. The operation mode transfer status by contact input is shown in the following.

<table>
<thead>
<tr>
<th>Front key mode selection</th>
<th>Status of rear terminal Nos. 12 and 13</th>
<th>Actual operation mode</th>
<th>Lamp status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto/manual transfer</td>
<td>Closed</td>
<td>Auto</td>
<td>MAN</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Manual</td>
<td>OFF MAN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flashing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ON MAN</td>
</tr>
<tr>
<td>Local/remote transfer</td>
<td>Closed</td>
<td>Remote</td>
<td>REM</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>Local</td>
<td>OFF REM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flashing</td>
</tr>
</tbody>
</table>

* * * * * The open or close status of rear terminal Nos. 12 and 13 is acceptable.

### NOTE

In this instrument, the operation mode is transferred approx. 1 sec after the rear terminal (Nos. 12 and 13) open/close status is changed.
5.7 Feedback resistance adjustment

Prior to shipment, this instrument has already been adjusted so as to match feedback resistance specified by the customer. However for its more accurate control, adjust it according to the following. When this instrument adjusting, confirm that the wiring is correct and control motor load is activated.

First connect wiring as shown in the following:
Next, perform operations in accordance with the following flowsheet:

1. **Input type display**
   The Figure at the left is for thermocouple input K and unit °C.

2. **Input range display**
   The Figure at the left is for the range of −199.9 to +300.0.

3. **Monitoring status**
   The Figure at the left is for measured-value (PV)/set-value (SV) display.

Press the MODE key.
From ①

Press the MODE key. (The number of pressing times varies with the specification.)

Press the  key.

Press the MODE key for approx. 5 sec.

Feedback resistance adjustment mode

- Mode status
  The Figure at the left is for auto/manual transfer display.

- Operation execution (RUN)/STOP transfer display
  Under operation execution (RUN)

- Operation execution (RUN)/STOP transfer display
  Operation stop
From ②

**POS**

Press the SET key.
(adjustment start)

**OPn**

The display changes automatically.

**CLS**

The display changes automatically.

**POS**

(Adjustment end)

Press the MODE key for approx. 5 sec.

**run**

← Dim lighting

**STOP**

- Operation execution (RUN)/STOP transfer display
- Operation stop

Feedback resistance adjustment mode
6. CAUTIONS FOR OPERATION

6.1 Operation execution (RUN)/STOP

Since there is no power switch on this instrument, the instrument starts operation immediately following initial power-ON.

However, there are some setting items which cause inconvenience when changed during RUN. For these settings, stop instrument operation at "Operation execution (RUN)/STOP transfer" (see page 52) in the MODE status.
Since parameters which are set in the operation STOP status belong to the engineer level in the SET status, see "7. ENGINEER LEVEL" (page 69) for details.
The start status when executed from operation stop becomes that selected in "6.3 (1) Hot/cold start selection" (page 67).
*"Operation execution (RUN)/STOP transfer" prior to shipment is set to "execution (RUN)".

- Operation under operation execution (RUN)
  - For needing a change in the details of display in the monitoring status, see "5.2 Monitoring (MONI) status" (page 36).
  - When needing a change in the set-value (SV) or each parameter, see "5.3 Set (SET) status" (page 40).
    Also if any parameter to be changed is in the engineer level, refer to the "7. ENGINEER LEVEL" (page 69) in addition to the above section.
  - When needing a change in the control area, see "5.4 Area (AREA) status" (page 50).
  - When needing a change in the operation mode, see "5.5 Mode (MODE) status" (page 51).
  - When needing control area transfer by contact input or operation mode transfer, see "5.6 Contact input usage" (page 56).
  - When needing activation of the auto-tuning (AT) function, see "6.2 Requirements for auto-tuning (AT)" (page 65).
    * For calling of each status, see "5.1 Calling-up procedure of each status" (page 32).
6.2 Requirements for auto-tuning (AT)

Auto-tuning (AT) is the function of automatically measuring, computing and setting the optimum PID constants. The requirements for auto-tuning (AT) start and suspension are described in the following.

Auto-tuning (AT) is started/stopped by "PID/auto-tuning (AT) transfer" in the MODE status (see page 52).

1) Requirements for auto-tuning (AT) start

   Start auto-tuning (AT) when all the following conditions are satisfied:

1. In the MODE status
   - AUTO/MAN transfer → Auto mode
   - LOC/REM transfer → Local mode
   - PID/auto-tuning (AT) transfer → PID control
   - Operation execution (RUN)/STOP transfer → execution (RUN)

2. Input value should not be abnormal. (According to the input abnormality determination point)

3. The high output limiter value should be 0.1% or more and the low output limiter value, 99.9% or less
(2) Requirements for auto-tuning (AT) suspension

- When set-value (SV) is changed
- When the control area is changed
- When high or low output limiter value is changed
- When PV bias and/or PV digital filter are changed
- When AT bias is changed
- When the instrument is transferred to the manual mode by “AUTO/MAN transfer”
- When the instrument is transferred to the remote mode by “LOC/REM transfer”
- When the instrument is transferred to PID control by “PID/AT transfer”
- When operation is stopped by “Operation execution (RUN)/STOP transfer”
- When input value becomes abnormal. (According to the input abnormality determination point)
- When power failure occurs
- When the instrument is in the FAIL status

NOTES

1. When auto-tuning (AT) suspension requirements are established, the instrument immediately suspends auto-tuning (AT) function to transfer the above function to PID control. PID constants at that time are left as they were before auto-tuning (AT) starts.

2. If the output change late limit (see "7.5 Output section" on page 74) is set, the optimum PID constants may not be obtained even with the auto-tuning (AT) function activated.
6.3 Action during power failure

(1) Hot/cold start selection

Instrument action is not influenced by instantaneous power failure. Also power recovery action after extended power failure can be selected from the following 3 items. Selection is made in the engineer level (see "7.13 Control section" on page 86).

<table>
<thead>
<tr>
<th></th>
<th>Operation mode at power recovery</th>
<th>Output value at power recovery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot start 1</td>
<td>Same as that before power failure</td>
<td>Same as that before power failure</td>
</tr>
<tr>
<td>Hot start 2</td>
<td>Same as that before power failure</td>
<td>MAN mode Low output limiter value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>AUTO mode Value as a result of control computation</td>
</tr>
<tr>
<td>Cold start</td>
<td>MAN mode</td>
<td>Low output limiter value</td>
</tr>
</tbody>
</table>

*The result of control computation varies with the control designation parameter. (For setting status and operator level 2, see page 42.)
(2) Start determination point setting

Apart from hot/cold start selection, a start determination point is set for the above start. Start determination point becomes set-value (SV) deviation setting.

The start status is determined according to the measured-value (PV) level (deviation from set-value (SV)) at power recovery. When the measured-value (PV) is between the + (plus) and − (minus) side determination points, start power recovery always becomes "Hot start 1". When the measured-value (PV) is outside the determination points, operation starts in the start status selected by hot/cold start selection.

The start determination point is set by the engineer level in the setting status (see "7.13 Control section" on page 86).

NOTES

1. Even when the instrument is transferred from operation STOP to RUN, the same start as that at the time of power recovery is attained.
2. No cold start can be selected when there is no manual mode.
3. In this instrument, instantaneous power failure action is guaranteed for power failure of 50 msec or less.
Engineer level is one of setting levels in the set status and in this level parameters not frequently changed under normal operation are collected. In addition a parameter group (PG) is formed for each related parameter.

7.1 Engineer level calling procedure

[Example] Calling from monitoring status

*For calling in any status other than the monitoring status, see "5.1 Calling-up procedure in each status" (page 32).
7.2 Parameter list

Operator level 2

Press the SET key for approx. 5 sec.

[ ] [ ] [ ] [ ]

PV section RS section Output section AT section Alarm section

PG10 PG11 PG12 PG13 PG14 PG15 PG16

Pb \( \sigma \) \( r \)

\( dF_1 \) \( r_b \)

PLC \( dF_2 \)

Returns to PG10

Returns to PG11

Returns to PG12

Returns to PG13

Returns to PG14

Returns to PG15

Returns to PG16

\( \sigma_\text{LH} \) \( \sigma_\text{LL} \) \( \sigma_\text{P} \) \( \sigma_f \) \( \sigma_\text{HL} \) \( \sigma_\text{L} \) \( \sigma_\text{N} \)

\( \text{AT}_b \)

\( \text{AH}_1 \) \( \text{AH}_2 \)

\( \text{AHS} \) \( \text{ALS} \)

\( \text{RH}_1 \) \( \text{RH}_2 \)

\( \text{RL}_1 \) \( \text{RL}_2 \)

\( \text{Ao} \) \( \text{db} \)

\( \text{db} \) \( \text{YHS} \) \( \text{Ybr} \)

Returns to PG10

Returns to PG11

Returns to PG12

Returns to PG13

Returns to PG14

Returns to PG15

Returns to PG16

\( \sigma_{\text{P}} \)

\( \sigma_{\text{L}} \)

\( \sigma_{\text{HL}} \)

\( \sigma_{\text{N}} \)

\( \text{AT}_b \)

\( \text{AH}_1 \) \( \text{AH}_2 \)

\( \text{AHS} \) \( \text{ALS} \)

\( \text{RH}_1 \) \( \text{RH}_2 \)

\( \text{RL}_1 \) \( \text{RL}_2 \)

\( \text{Ao} \) \( \text{db} \)

\( \text{db} \) \( \text{YHS} \) \( \text{Ybr} \)

: Press the SET key

: Press the \( \uparrow \) key or \( \downarrow \) key

PG : Means parameter group
1. There may be items not displayed depending on the specification.
2. Numeric value setting procedure is the same as "5.3 (3) Setting change procedure" (page 44).
3. Parameters from PG20 to PG24 can be changed only when the instrument is set to the STOP status by "Operation execution (RUN)/STOP transfer" in the MODE status. (Within "")
### 7.3 PV (measured-value) section [Parameter group (PG) 10]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 10</td>
<td>Parameter group 10</td>
<td></td>
<td>The first characters of parameter group (PG) 10. They are also displayed first when the instrument is set to engineer level.</td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>PV bias</td>
<td>-5.00 to +5.00% of span</td>
<td>Sensor correction is made by adding bias value to measured-value (PV).</td>
<td>0.00</td>
</tr>
<tr>
<td>dF 1</td>
<td>PV digital filter</td>
<td>0 to 100 sec (&quot;0&quot; setting: PV digital filter OFF)</td>
<td>Noise in measured-value (PV) input is reduced by the employment of first-order lag filter.</td>
<td>0</td>
</tr>
<tr>
<td>PLC</td>
<td>PV low input cut-off</td>
<td>0.00 to 25.00% of span</td>
<td>As a result of square root extraction, low input value with large variation is cut.</td>
<td>1.00</td>
</tr>
</tbody>
</table>

*Displayed only when "Square root extraction provided" (PG20) is selected for voltage and current inputs.*
### 7.4 RS (remote setting input) section [Parameter group (PG) 11]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PG 1</strong></td>
<td>Parameter group 11</td>
<td></td>
<td>The first characters of parameter group (PG) 11.</td>
<td></td>
</tr>
<tr>
<td><strong>PG 11</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>rr</em></td>
<td>RS ratio</td>
<td>0.001 to 9.999 of remote set-value (RS) (&quot;0.000&quot; cannot be set.)</td>
<td>Multiplying factor is set to remote set-value (RS) to adjust input gradient.</td>
<td>1.000</td>
</tr>
<tr>
<td><em>rb</em></td>
<td>RS bias</td>
<td>−19.99 to +50.00% of span</td>
<td>Input correction is made by adding bias value to remote set-value (RS).</td>
<td>0.00</td>
</tr>
<tr>
<td><em>dF 2</em></td>
<td>RS digital filter</td>
<td>0 to 100 sec (&quot;0&quot; setting: RS digital filter OFF)</td>
<td>Noise in remote set-value (RS) input is reduced by the employment of first-order lag filter.</td>
<td>0</td>
</tr>
</tbody>
</table>

*Not displayed when there is no remote setting input function.*
### 7.5 Output section [Parameter group (PG) 12]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG12</td>
<td>Parameter group 12</td>
<td></td>
<td>The first characters of parameter group (PG) 12.</td>
<td></td>
</tr>
<tr>
<td>PG12</td>
<td>Output limit (high limit)</td>
<td>-5.0 to + 105.0% of manipulated output</td>
<td>High limit of manipulated output value (MV). For heating/cooling PID action (including &quot;with AT for extruder&quot;): Output limit (high limit) on the heating-side output.</td>
<td>105.0</td>
</tr>
<tr>
<td>oLL</td>
<td>Output limit (low limit)</td>
<td></td>
<td>Low limit of manipulated output value (MV). For heating/cooling PID action (including &quot;with AT for extruder&quot;): Output limit (low limit) on the cooling-side output.</td>
<td>-5.0 (For heating/cooling PID action including &quot;with AT for extruder&quot;); 105.0</td>
</tr>
<tr>
<td>oLL</td>
<td>Shortest cooling output ON time</td>
<td>0.0 to 1.0 sec (Time proportional output at fixed cycle when set to &quot;0.0&quot;)</td>
<td>When cooling output is turned ON for an extremely short time and its load factor is set to the action in which the shortest cooling output ON time is set and the output cycle is varied. Valid only for heating/cooling PID action with AT for extruder. (Except for current/continuous voltage output)</td>
<td>0.0</td>
</tr>
<tr>
<td>orU</td>
<td>Increase in output change rate limit</td>
<td>0.0 to 100.0%/sec of span &quot;0.0&quot; setting: output change rate limit OFF</td>
<td>Sets gradient when output needs to be gradually increased.</td>
<td>0.0</td>
</tr>
</tbody>
</table>

To “orU”
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>ord</code></td>
<td>Decrease in output change rate limit</td>
<td>0.0 to 100.0%/sec of span [&quot;0.0&quot; setting: output change rate limit OFF]</td>
<td>Sets gradient when output needs to be gradually decreased.</td>
<td>0.0</td>
</tr>
<tr>
<td><code>oHH</code></td>
<td>Upper ON/OFF action differential gap</td>
<td>0.0 to 10.00% of span</td>
<td>Sets differential gap above ON/OFF action set-value (SV).</td>
<td>0.02</td>
</tr>
<tr>
<td><code>oHL</code></td>
<td>Lower ON/OFF action differential gap</td>
<td>0.0 to 10.00% of span</td>
<td>Sets differential gap below ON/OFF action set-value (SV).</td>
<td>0.02</td>
</tr>
<tr>
<td><code>PSn</code></td>
<td>Manual output at abnormality</td>
<td>−5.0 to +105.0% of manipulated output (For heating/cooling PID action (including &quot;with AT for extruder&quot;): −105.0 to +105.0% of manipulated output)</td>
<td>Sets manual output value output when measured-value (PV) input exceeds input abnormality determination point.</td>
<td>0.0</td>
</tr>
</tbody>
</table>

*1 ............. The low limit on the heating and cooling sides for heating/cooling PID action (including "with AT for extruder") is fixed to "−5.0%".

*1, *2 .......... Not displayed for ON/OFF action.

*3 ............. Displayed only for ON/OFF action.

*4 ............. Displayed only for heating/cooling PID action with AT for extruder. However, not displayed for current/continuous voltage output.
### 7.6 AT (auto-tuning) section [Parameter group (PG) 13]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG13</td>
<td>Parameter group 13</td>
<td></td>
<td>The first characters of parameter group (PG) 13.</td>
<td></td>
</tr>
<tr>
<td>PG13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARb</td>
<td>Auto-tuning (AT) bias</td>
<td>−span to +span %</td>
<td>Adds bias to set-value (SV) when auto-tuning (AT) is performed.</td>
<td>0.0</td>
</tr>
<tr>
<td>ATb</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Displayed only when the auto-tuning (AT) function is provided. However, not displayed for heating/cooling PID action with AT for extruder.
### 7.7 Alarm section 1 [Parameter group (PG) 14]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 14</td>
<td>Parameter group 14</td>
<td></td>
<td>The first characters of parameter group (PG) 14.</td>
<td></td>
</tr>
<tr>
<td>AH 1</td>
<td>First alarm differential gap</td>
<td>0.00 to 10.00% of span</td>
<td>Sets first alarm differential gap.</td>
<td>0.10</td>
</tr>
<tr>
<td>ALT 1</td>
<td>First alarm timer setting</td>
<td>0 to 600 sec</td>
<td>Sets time until alarm is turned ON after measured-value (PV) enters first alarm area.</td>
<td>0</td>
</tr>
<tr>
<td>HbA</td>
<td>Heater break alarm</td>
<td>0.0 to 100.0A</td>
<td>Set by referring to current transformer input value (CT) in the monitoring status.</td>
<td>0.0</td>
</tr>
<tr>
<td>AH 2</td>
<td>Second alarm differential gap</td>
<td>0.00 to 10.00% of span</td>
<td>Sets second alarm differential gap.</td>
<td>0.10</td>
</tr>
<tr>
<td>ALT 2</td>
<td>Second alarm timer setting</td>
<td>0 to 600 sec</td>
<td>Sets timer until alarm is turned ON after measured-value (PV) enters second alarm area.</td>
<td>0 (*A)</td>
</tr>
</tbody>
</table>
*1 ........... Not displayed when there is no alarm or FAIL is selected as first alarm.
*2 ........... ● Displayed only when heater break alarm is selected as second alarm.
              ● Set heater break alarm set value to a value about 85% current transformer input value (CT). However, when power supply variations are large, set the alarm to a slightly smaller value. In addition, when two or more heaters are connected in parallel, set the alarm to a slightly larger value so that it is activated even with only one heater is broken (However, within the value of CT).
              ● When the heater break alarm set value is set to “0.0” or the current transformer is not connected, the heater break alarm is turned ON.
              ● CT input specifications
                Measured current: 0 to 30 A (CTL-6-P-N)
                                0 to 100 A (CTL-12-S56-10L-N)
                Input rating: Maximum current: 120 mA
                                Input impedance: 7.5 Ω
*3 ........... Not displayed when there is no alarm, alarm output is one point, of FAIL or heater break alarm is selected as second alarm.
*4 ........... Not displayed when there is no alarm, of alarm output is one point or FAIL is selected as second alarm.
*A ........... When a heater break alarm is selected as second alarm: 3 seconds
### 7.8 Analog output section [Parameter group (PG) 15]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>*1 PG15</td>
<td>Parameter group 15</td>
<td></td>
<td>The first characters of parameter group (PG) 15.</td>
<td></td>
</tr>
</tbody>
</table>
| PG15   | An analog output specification selection | 0: Measured-value (PV)  
1: Deviation between measured-value (PV) and set-value (SV)  
2: Set-value (SV)  
3: Remote set-value (RS)  
4: Manipulated output 1 (heating-side)  
5: Manipulated output 2 (cooling-side)  
6: Feedback resistance input (POS) | Selects analog output type.                                                   | 0                               |
| Ao     | High limit analog output range | Specification selection  
0, 2, 3: Within input range  
1: \(-\text{span} \to +\text{span}\)  
4, 5, 6: 100.0 (Fixed) | Sets high limit of analog output range.                                       | Temperature input: High input limit Voltage/current input: 100.0           |
| AHS    | Low limit analog output range | Specification selection  
0, 2, 3: Within input range  
1: \(-\text{span} \to +\text{span}\)  
4, 5, 6: 0.0 (Fixed) | Sets low limit of analog output range.                                       | Temperature input: Low input limit Voltage/current input: 0.0              |
| ALS    | An analog output specification selection | 0, 2, 3: Within input range  
1: \(-\text{span} \to +\text{span}\)  
4, 5, 6: 0.0 (Fixed) |                                                |                                  |

*1 . . . . . Since the REX-F400 has no items to be set in the parameter group (PG) 15, only this display is shown.

*2 . . . . . Not displayed when there is no analog output function.
# 7.9 Position proportioning PID action section [Parameter group (PG) 16]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG 16</td>
<td>Parameter group 16</td>
<td></td>
<td>The first characters of parameter group (PG) 16.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PG 16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* db</td>
<td>Neutral zone</td>
<td>0.1 to 10.0% of output (&quot;0.0&quot; cannot be set.)</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>* db</td>
<td></td>
<td>Sets output OFF status between open-side and closed-side outputs.</td>
<td></td>
</tr>
<tr>
<td>* YHS</td>
<td>Open/close output differential gap</td>
<td>0.1 to 5.0% of output (&quot;0.0&quot; cannot be set.)</td>
<td>Sets differential gap of open-side and closed-side outputs.</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>YHS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Ybr</td>
<td>Action selection at feedback resistance (FBR) break</td>
<td>0: Open-side output OFF, closed-side output OFF 1: Open-side output OFF, closed-side output ON 2: Open-side output ON, closed-side output OFF</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ybr</td>
<td></td>
<td>Selects action at feedback resistance (FBR) break.</td>
<td></td>
</tr>
</tbody>
</table>

*Displayed only for position proportioning PID action.*
### 7.10 Bar-graph section [Parameter group (PG) 17]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG IN</td>
<td>Parameter group 17</td>
<td></td>
<td>The first characters of parameter group (PG) 17.</td>
<td></td>
</tr>
<tr>
<td>PG 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dE</td>
<td>Bar-graph display selection</td>
<td>0: Manipulated output value (MV) display 1 to 100 (digit/dot): Display of deviation between measured-value (PV) and set-value (SV).</td>
<td>Selects the details of bar-graph display</td>
<td>0</td>
</tr>
</tbody>
</table>

* For manipulated output value (MV) display: 5%/bar-graph dot (REX-F900) 10%/bar-graph dot (REX-F400)

* For deviation display: Sets deviation corresponding to one dot at the specified number of digits regardless of decimal-point.

* For position proportioning PID action: At “0” setting; feedback resistance input value (POS) display.
### 7.11 Input section [Parameter group (PG) 20]

In this parameter group (PG), neither setting nor change can be made if the instrument is not set to the STOP status at "Operation execution (RUN)/STOP transfer" in the MODE status.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PG20</strong></td>
<td>Parameter group 20</td>
<td></td>
<td>The first characters of parameter group (PG) 20.</td>
<td></td>
</tr>
</tbody>
</table>
| *1     | Aove                                      |                                 | Selects action when measured-value (PV) exceeds high limit of input abnormality determination point. | 0: Control output (under normal control);
|        |                                            |                                 |                                                                             | 1: Outputs manual output at abnormality. |

To "RUNE"
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUne</td>
<td>Low limit of action selection at input abnormality</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0: Control output (under normal control)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Outputs manual output at abnormality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selects action when measured-value (PV) falls below low limit of input</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>abnormality determination point.</td>
<td></td>
</tr>
<tr>
<td>Pgsh</td>
<td>High limit of input programmable range</td>
<td>1000</td>
</tr>
<tr>
<td>Pgsh</td>
<td>Sets high limit of voltage/current input scale.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1999 to +9999</td>
<td></td>
</tr>
<tr>
<td>Pgl</td>
<td>Low limit of input programmable range</td>
<td>0</td>
</tr>
<tr>
<td>Pgl</td>
<td>Sets low limit of voltage/current input scale.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1999 to +9999</td>
<td></td>
</tr>
<tr>
<td>PgdP</td>
<td>Decimal-point position selection</td>
<td>1</td>
</tr>
<tr>
<td>PgdP</td>
<td>0: No digit below decimal-point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: 1 digit below decimal-point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: 2 digits below decimal-point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: 3 digits below decimal-point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sets decimal-point position on voltage/current input scale.</td>
<td></td>
</tr>
<tr>
<td>Sqr</td>
<td>Square root extraction selection</td>
<td>0</td>
</tr>
<tr>
<td>Sqr</td>
<td>0: Not provided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Provided</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Selects the presence or absence of square root extraction function.</td>
<td></td>
</tr>
</tbody>
</table>

*1 Not displayed for ON/OFF action.

*2 Displayed only for voltage/current input.

# Changing this item also changes the "Model code" (on page 10). If it is changed, please enter the new Model code in space of the Model code seals stuck inside and outside the instrument.
### Setting section [Parameter group (PG) 21]

In this parameter group (PG), neither setting nor change can be made if the instrument is not set to the STOP status at "Operation execution (RUN)/STOP transfer" in the MODE status.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG21</td>
<td>Parameter group 21</td>
<td></td>
<td>The first characters of parameter group (PG) 21.</td>
<td></td>
</tr>
<tr>
<td>SLH</td>
<td>Setting limit (high limit)</td>
<td>Within input range</td>
<td>Sets high limit of setting range.</td>
<td>Temperature input: High</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>input limit Voltage/current input: 100.0</td>
</tr>
<tr>
<td>SLL</td>
<td>Setting limit (low limit)</td>
<td></td>
<td>Sets low limit of setting range.</td>
<td>Temperature input: Low</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>input limit Voltage/current input: 0.0</td>
</tr>
<tr>
<td>r1nP</td>
<td>Remote setting (RS) input type</td>
<td>See *A</td>
<td>Selects remote setting (RS) input type.</td>
<td>To be specified when ordering</td>
</tr>
<tr>
<td></td>
<td>selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TrK</td>
<td>SV tracking selection</td>
<td>0: Not provided</td>
<td>Selects the presence or absence of SV tracking in which local set-value (SV) follows remote set-value (RS).</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: Provided</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Not displayed when there is no remote setting input function.

"A . . . . Setting range

<table>
<thead>
<tr>
<th>Type</th>
<th>Set-value</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC voltage input</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Low)</td>
<td>0</td>
<td>0 to 10mV</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>0 to 100mV</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>0 to 1 V</td>
</tr>
<tr>
<td>DC voltage input</td>
<td>3</td>
<td>0 to 5 V</td>
</tr>
<tr>
<td>(High)</td>
<td>4</td>
<td>1 to 5 V</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0 to 10 V</td>
</tr>
<tr>
<td>DC current input</td>
<td>6</td>
<td>0 to 20mA</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>4 to -20mA</td>
</tr>
</tbody>
</table>

Hardware is different for ①, ② and ③. Therefore only setting meeting the specification can be used.
For example, for current input, only "6" or "7" can be set.

# . . . . Changing this item also changes the "Model code" (on page 10). If it is changed, please enter the new Model code in space of the Model code seals stuck inside and outside the instrument.
### 7.13 Control section [Parameter group (PG) 22]

In this parameter group (PG), neither setting nor change can be made if the instrument is not set to the STOP status at "Operation execution (RUN)/STOP transfer" in the MODE status.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG22</td>
<td>Parameter group 22</td>
<td></td>
<td>The first characters of parameter group (PG) 22.</td>
<td></td>
</tr>
<tr>
<td>PG 22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1 CY 1</td>
<td>Proportioning cycle</td>
<td>1 to 100 sec (&quot;0&quot; cannot be set)</td>
<td>Set control output cycle. For heating/cooling PID (including &quot;with AT for extruder&quot;): Heating-side proportioning cycle.</td>
<td>20 (*A)</td>
</tr>
<tr>
<td>CY 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2 CY 2</td>
<td>Cooling-side proportioning cycle</td>
<td></td>
<td>Sets cooling-side output cycle for heating/cooling PID action (including &quot;with AT for extruder&quot;).</td>
<td>20 (For voltage pulse output: 2)</td>
</tr>
<tr>
<td>CY 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*3 oS 1</td>
<td>Direct/reverse action selection</td>
<td>0: Direct action, 1: Reverse action</td>
<td>Selects direct or reverse control action.</td>
<td>1</td>
</tr>
<tr>
<td>oS 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*4 Pd</td>
<td>Hot/cold start selection</td>
<td>0: Hot start 1, 1: Hot start 2, 2: Cold start</td>
<td>Selects action after power recovery.</td>
<td>0 (For heating/cooling PID action (including &quot;with AT for extruder&quot;): 1)</td>
</tr>
<tr>
<td>Pd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*4 PdA</td>
<td>Start determination point</td>
<td>0.1 to 100.0% of span (&quot;0.0&quot; cannot be set)</td>
<td>Setting of deviation form set-value (SV).</td>
<td>3.0</td>
</tr>
<tr>
<td>PdA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
*1 .......... Not display for ON/OFF action, position proportioning PID action and current/continuous voltage output.
*2 .......... Displayed only for heating/cooling PID action (including "with AT for extruder"), but not displayed for current/continuous voltage output.
*3 .......... Not displayed for heating/cooling PID action (including "with AT for extruder").
*4 .......... Not displayed for ON/OFF action.
            For details, see "6.3 Action during power failure" on page 67.
*A .......... For voltage pulse output or trigger for triac driving output: 2 sec
7.14 Alarm section 2 [Parameter group (PG) 23]

In this parameter group (PG), neither setting nor change can be made if the instrument is not set to the STOP status at "Operation execution (RUN)/STOP transfer" in the MODE status.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG23</td>
<td>Parameter group 23</td>
<td></td>
<td>The first character of parameter group (PG) 23.</td>
<td></td>
</tr>
<tr>
<td>PG 23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1</td>
<td>AS1</td>
<td>See *A</td>
<td>Selects first alarm action.</td>
<td>To be specified when ordering.</td>
</tr>
<tr>
<td></td>
<td>AS 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2</td>
<td>Exc1</td>
<td></td>
<td>Selects whether first alarm is set to energized alarm or de-energized alarm.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>EXC 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2</td>
<td>AeO1</td>
<td>See *B</td>
<td>Selects first alarm action when measured-value (PV) exceeds input abnormality determination point.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>AEO 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2</td>
<td>AHo1</td>
<td>See *C</td>
<td>Selects the first alarm hold action.</td>
<td>To be specified when ordering.</td>
</tr>
<tr>
<td></td>
<td>AHO 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*3</td>
<td>AS2</td>
<td>See *A</td>
<td>Selects second alarm action.</td>
<td>To be specified when ordering.</td>
</tr>
<tr>
<td></td>
<td>AS 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To "EUC2"
| *4 | **EY2** | Second alarm energized/de-energized selection | 0: Energized alarm 1: De-energized alarm | Selects whether second alarm is set to energized alarm or de-energized alarm. | 0 |
| *4 | **AEO2** | Second alarm action selection at input abnormality | See *B* | Selects second alarm action when measured-value (PV) exceeds input abnormality determination point. | 0 |
| *4 | **AHO2** | Second alarm hold action selection | See *C* | Selects the second alarm hold action. | To be specified when ordering. |

*1, *2 Not displayed when there is no alarm
*2 Not displayed if "6" (FAIL) is selected in "First alarm action selection".
*3, *4 Not displayed when there is no alarm or alarm output is 1 point.
*4 Not displayed when "6" (FAIL) or "7" (heater break alarm) is selected in "Second alarm action selection".
*A 0: Process alarm (High limit) 5: Band alarm 1: Process alarm (Low limit) 6: FAIL 2: Deviation alarm (High limit) 7: Heater break alarm (Displayed only for second alarm action selection) 3: Deviation alarm (Low limit) Not displayed when there is no heater break alarm function.
*A 4: Deviation high/low alarm

*B 0: No alarm action 1: Alarm ON when measured-value (PV) is out of high or low limit of input abnormality determination point. 2: Alarm ON when measured-value (PV) exceeds high limit of input abnormality determination point. 3: Alarm ON when measured-value (PV) falls below low limit of input abnormality determination point.

*C 0: No hold action 1: Hold action 1: Hold action is valid when the instrument is power-ON or transferred operation mode from STOP to execution (RUN). 2: Hold action 2: Hold action is valid when the instrument is power-ON, transferred operation mode from STOP to execution (RUN) or changed the set-value (SV).

# Changing this item also changes the "Model code" (on page 10). If it is changed, please enter the new Model code in space of the Model code seals stuck inside and outside the instrument.
7.15 Communication section [Parameter group (PG) 24]

In this parameter group (PG), neither setting nor change can be made if the instrument is not set to the STOP status at “Operation execution (RUN)/STOP transfer” in the MODE status.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG24</td>
<td>Parameter group 24</td>
<td></td>
<td>The first characters of parameter group (PG) 24.</td>
<td></td>
</tr>
<tr>
<td>PG 24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1</td>
<td>bIT</td>
<td>Communication data bit configuration</td>
<td>See *A</td>
<td>Selects data bit configuration during communication.</td>
</tr>
<tr>
<td>bIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1</td>
<td>Add</td>
<td>Device address</td>
<td>0 to 99</td>
<td>Sets device address of this instrument.</td>
</tr>
<tr>
<td>Add</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1</td>
<td>bPS</td>
<td>Communication speed</td>
<td>0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps</td>
<td>Selects communication speed.</td>
</tr>
<tr>
<td>bPS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*1</td>
<td>lnT</td>
<td>Interval time</td>
<td>0 to 250msec</td>
<td>Sets interval time to match timing during data send and receive.</td>
</tr>
<tr>
<td>lnT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>*2</td>
<td>KEY</td>
<td>Key entry valid/invalid during communication</td>
<td>0: Invalid 1: Valid</td>
<td>Selects whether key entry is valid or not during communication.</td>
</tr>
<tr>
<td>KEY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
*1, *2 . . Not displayed when there is no communication function.
*2 . . . . The setting of "1" is valid only for setting changes at operator levels 1 and 2. Also each setting by key operation can be confirmed regardless of validity or invalidity.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parity bit</th>
<th>Data bit [bit]</th>
<th>Stop bit [bit]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Even</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Even</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Odd</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Odd</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>None</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>None</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Even</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Even</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>Odd</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Odd</td>
<td>7</td>
<td>2</td>
</tr>
</tbody>
</table>
### 7.16 Data lock section [Parameter group (PG) 40]

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Name</th>
<th>Setting range</th>
<th>Description</th>
<th>Initial value prior to shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PG40</strong></td>
<td>Parameter group 40</td>
<td></td>
<td>The first characters of parameter group (PG) 40.</td>
<td></td>
</tr>
<tr>
<td>PG 40</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>LCK</strong></td>
<td>Set data lock level</td>
<td>0: All settings locked</td>
<td>Set level which enables set data lock.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: Only set-value (SV) can be changed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2: Engineer level lock</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ar E</strong></td>
<td>Area lock</td>
<td>0: Enable of memory area change when set data locked.</td>
<td>Selects enable/disable of memory area change when set data is locked.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1: Disable of memory area change when set data locked.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>STOP</strong></td>
<td>Operation RUN/STOP display lock</td>
<td>0: Not displayed “Operation execution (RUN)/STOP transfer”</td>
<td>Selects the presence or absence of “Operation execution (RUN)/STOP transfer” display in MODE status.</td>
<td>1</td>
</tr>
<tr>
<td>SToP</td>
<td></td>
<td>1: Displayed “Operation execution (RUN)/STOP transfer”</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*..... If “0” (not displayed) is selected after the operation is stopped by the “Operation execution (RUN)/STOP transfer” in the MODE status, the operation may not be executed (RUN).
8. DISPLAY AT ERROR OCCURRENCE

- For input abnormality

<table>
<thead>
<tr>
<th>Display</th>
<th>Details</th>
<th>Action (output)</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured-value (PV)</td>
<td>Input abnormality</td>
<td>• Action at input abnormality</td>
<td>• WARNING!</td>
</tr>
<tr>
<td>Flashing</td>
<td>(Measured-value (PV) exceeds the high limit of input abnormality determination point or less than the low limit of input abnormality determination point.)</td>
<td>(Outputs manual output value at abnormality.)</td>
<td>In order to prevent electric shock, prior to replacing the sensor, always turn OFF the power.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• However, only when the action at input abnormality selected.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Alarm output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Outputs by alarm action selection at input abnormality.)</td>
<td></td>
</tr>
<tr>
<td>00000</td>
<td>Overscale</td>
<td></td>
<td>Check input type, range, sensor and sensor connection. When replace the sensor, turn OFF the power or stop the operation by &quot;Operation execution/stop transfer&quot; in the MODE status.</td>
</tr>
<tr>
<td>Flashing</td>
<td>(Measured-value (PV) is beyond the effective input range.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Underscale</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Measured-value (PV) is below the effective input range.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The input abnormality determination point, action selection at input abnormality, manual output value at abnormality and alarm action selection at input abnormality are set in the engineer level.
Each status at input abnormality is shown in the following:

Differential gap (0.1% of span)

Input abnormality action area

Input abnormality determination point (Low)

Input normality determination point (High)

Input range

Effective input range

*1 Within 5% of span

Measured-value (PV) display unit

Underscale

Measured-value (PV) flashing display

Measured-value (PV) display

Overscale

Manipulated output

Manual output at abnormal

Select any one of *2 or *3.

*3 Manipulated output value (MV) obtained by control-computing a measured-value (PV) input

Alarm status at input abnormality

*2 Manual output at abnormal

Select any one of *2 or *3.
1. Set input abnormality determination point (high/low limit) setting, action (high/low limit) selection at input abnormality and manual output setting at abnormality using the engineer level (see "7. ENGINEER LEVEL" on page 69) in the SET status.
2. Even when there is no manual mode, manual output at abnormality is valid.
3. For ON/OFF action, there is no manual output at abnormality.

<table>
<thead>
<tr>
<th>Display</th>
<th>Details</th>
<th>Action (output)</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err1</td>
<td>Auto-tuning error (Auto-tuning did not end normally)</td>
<td>As usual</td>
<td>Pressing any key erases error display to display each status.</td>
</tr>
<tr>
<td></td>
<td>Lights</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Err2</td>
<td>Input value error</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flashing (Others extinguish)</td>
<td></td>
<td></td>
<td>Turn the power-OFF once. If the instrument resets to error status after power-ON, contact your nearest RKC's agent or our sales office.</td>
</tr>
<tr>
<td>Err3</td>
<td>RAM error</td>
<td>All outputs: OFF (When FAIL is selected for the first or second alarm: FAIL output; Contact open)</td>
<td></td>
</tr>
<tr>
<td>Flashing (Others extinguish)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAIL lamp lights (Others extinguish)</td>
<td>ROM error</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CPU power supply error</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Watch-dog timer error</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# 9. INPUT RANGE TABLE

<table>
<thead>
<tr>
<th>Group</th>
<th>Input type</th>
<th>Model code</th>
<th>Setting code</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>K ($\ell'$)</td>
<td>08</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>-199.9 to 300.0°C</td>
<td>09</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>0.0 to 400.0°C</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>0.0 to 800.0°C</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>0 to 1300 °C</td>
<td>A4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>0.0 to 800.0°F</td>
<td>A5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>0 to 2400 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>J ((\ell))</td>
<td>07</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>-199.9 to 300.0°C</td>
<td>08</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>0.0 to 400.0°C</td>
<td>09</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>0.0 to 800.0°C</td>
<td>06</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>0 to 1200 °C</td>
<td>A4</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>0.0 to 700.0°F</td>
<td>A5</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>0 to 2100 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>R ((\rho))</td>
<td>03</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>0 to 1700 °C</td>
<td>A1</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>0 to 3200 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>S ((\Sigma))</td>
<td>03</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>0 to 1700 °C</td>
<td>A1</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>0 to 3200 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>B ((\beta))</td>
<td>03</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>0 to 1800 °C</td>
<td>A3</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>0 to 3300 °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC</td>
<td>E ((\varepsilon))</td>
<td>03</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>0.0 to 700.0°C</td>
<td>02</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>0 to 1000 °C</td>
<td>A3</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>0 to 1800 °F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Accuracy in the range of 0 to 400°C (0 to 800°F): Not guaranteed.*
<table>
<thead>
<tr>
<th>Group</th>
<th>Input type</th>
<th>Model code</th>
<th>Setting code</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>$T (,{\text{\textdegree}C})$</td>
<td>$T$</td>
<td>05</td>
</tr>
<tr>
<td></td>
<td>$T (,{\text{\textdegree}F})$</td>
<td>$T$</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>$-199.9$ to $300.0 ,{\text{\textdegree}C}$</td>
<td>$0.0$ to $400.0 ,{\text{\textdegree}C}$</td>
<td>$0.0$ to $700.0 ,{\text{\textdegree}F}$</td>
</tr>
<tr>
<td></td>
<td>$-199.9$ to $400.0 ,{\text{\textdegree}F}$</td>
<td>$A6$</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>$0.0$ to $700.0 ,{\text{\textdegree}F}$</td>
<td>$A7$</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>$N (,{\text{\textdegree}C})$</td>
<td>$N$</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>$N (,{\text{\textdegree}F})$</td>
<td>$N$</td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>$0$ to $1300$ $,{\text{\textdegree}C}$</td>
<td>$0$ to $2300$ $,{\text{\textdegree}F}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$0$ to $2300$ $,{\text{\textdegree}F}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$PL\Pi (\bar{P})$</td>
<td>$A$</td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>$A$</td>
<td>03</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>$0$ to $1300$ $,{\text{\textdegree}C}$</td>
<td>$0$ to $2300$ $,{\text{\textdegree}F}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$W5Re/W26Re (\bar{\omega})$</td>
<td>$W$</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>$W$</td>
<td>A2</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>$0$ to $2300$ $,{\text{\textdegree}C}$</td>
<td>$0$ to $4200$ $,{\text{\textdegree}F}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$U (\bar{U})$</td>
<td>$U$</td>
<td>04</td>
</tr>
<tr>
<td></td>
<td>$U$</td>
<td>A4</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>$0.0$ to $600.0 ,{\text{\textdegree}C}$</td>
<td>$0.0$ to $1100 ,{\text{\textdegree}F}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$L (\bar{L})$</td>
<td>$L$</td>
<td>03</td>
</tr>
<tr>
<td></td>
<td>$L$</td>
<td>A2</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>$0.0$ to $400.0 ,{\text{\textdegree}C}$</td>
<td>$0.0$ to $900.0 ,{\text{\textdegree}F}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-100.0$ to $100.0 ,{\text{\textdegree}C}$</td>
<td>$-100.0$ to $100.0 ,{\text{\textdegree}C}$</td>
<td>$-199.9$ to $500.0 ,{\text{\textdegree}C}$</td>
</tr>
<tr>
<td></td>
<td>$JPt 100 (\bar{U} P)$</td>
<td>$P$</td>
<td>04</td>
</tr>
<tr>
<td></td>
<td>$P$</td>
<td>11</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>$-199.9$ to $500.0 ,{\text{\textdegree}C}$</td>
<td>$-150.0$ to $200.0 ,{\text{\textdegree}F}$</td>
<td>$-199.9$ to $900.0 ,{\text{\textdegree}F}$</td>
</tr>
<tr>
<td></td>
<td>$-150.0$ to $200.0 ,{\text{\textdegree}F}$</td>
<td>$B1$</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>$-199.9$ to $900.0 ,{\text{\textdegree}F}$</td>
<td>$B2$</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>$Pt 100 (\bar{P} \bar{P})$</td>
<td>$D$</td>
<td>04</td>
</tr>
<tr>
<td></td>
<td>$D$</td>
<td>12</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>$-100.0$ to $100.0 ,{\text{\textdegree}C}$</td>
<td>$-199.9$ to $600.0 ,{\text{\textdegree}C}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$-199.9$ to $600.0 ,{\text{\textdegree}C}$</td>
<td>$B1$</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>$-150.0$ to $200.0 ,{\text{\textdegree}F}$</td>
<td>$B3$</td>
<td>57</td>
</tr>
</tbody>
</table>
### Input Type Table

<table>
<thead>
<tr>
<th>Group</th>
<th>Input Type</th>
<th>Model Code</th>
<th>Setting Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage input</td>
<td>mV, V (V)</td>
<td>0 to 10mV</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 100mV</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 1 V</td>
<td>3</td>
</tr>
<tr>
<td>Voltage input (High)</td>
<td>V (V)</td>
<td>0 to 5 V</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 to 5 V</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 10 V</td>
<td></td>
</tr>
<tr>
<td>Current input</td>
<td>mA (/)</td>
<td>0 to 20mA</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 to 20mA</td>
<td>8</td>
</tr>
</tbody>
</table>

Input types which can be changed by the engineering level (parameter group 20) are shown in the following. Combinations other than the following are not available due to the use of different hardware.

### Changeable Input Types

<table>
<thead>
<tr>
<th>Input type before shipment</th>
<th>Changeable input type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC</td>
<td>TC, RTD</td>
</tr>
<tr>
<td>RTD</td>
<td></td>
</tr>
<tr>
<td>Voltage (Low)</td>
<td>Voltage (Low), Voltage (High)</td>
</tr>
<tr>
<td>Voltage (High)</td>
<td></td>
</tr>
<tr>
<td>Current</td>
<td>Current, Voltage (Low)</td>
</tr>
</tbody>
</table>

### NOTE

If the controller is shipped at current input, it can be changed to voltage (Low) input. However, if it is shipped at voltage (Low) input, it cannot be changed to current input.
10. SPECIFICATIONS

■ Input
Input type:
Thermocouple: K, J, R, S, B, E, T, N, Pt, Pt100, W5Re/W26Re, U, L
Input impedance: 1 MΩ or more
RTD: Pt100, JPt100
Voltage: 0 to 5 V DC, 0 to 10 V DC, 1 to 5 V DC
Current: 0 to 20 mA DC, 4 to 20 mA DC
Input impedance: Approx. 50 Ω

■ Control output
Relay contact output:
250 V AC, 3 A (Resistive load)
Electrical life: 300,000 times or more (Rated load)
Voltage pulse output:
0/12 V DC (Load resistance 600 Ω or more)
Voltage continuous output:
0 to 5 V DC, 0 to 10 V DC, 1 to 5 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)
Trigger output for triac driving *:
Zero cross method
Execution ON current: 50 mA (at 50 °C), 70 mA (at 25 °C)
* The following standards do not apply to Trigger output for triac driving:
CE, UL and cUL

■ Alarm output
Relay contact output: 250 V AC, 1 A (Resistive load)
Electrical life: 50,000 times or more (Rated load)

■ Analog output (only REX-F900)
Voltage: 0 to 10 mV DC, 0 to 100 mV DC, 0 to 1 V DC
Current: 0 to 20 mA DC, 4 to 20 mA DC

■ Power
Power supply voltage:
85 to 264 V AC (Including power supply voltage variation),
50/60 Hz Rating: 100 to 240 V AC
21.6 to 26.4 V AC (Including power supply voltage variation),
50/60 Hz Rating: 24 V AC
21.6 to 26.4 V DC (Including power supply voltage variation)
Rating: 24 V DC
Power consumption:
100 to 240 V AC: 11 VA max. (at 240 V AC) [REX-F400]
8 VA max. (at 100 V AC) [REX-F400]
24 V AC: 6 VA max. (at 24 V AC) [REX-F400]
8 VA max. (at 24 V AC) [REX-F900]
24 V DC: 10 VA max. (at 24 V DC) [REX-F400]
180 mA max. (at 24 V DC) [REX-F400]
250 mA max. (at 24 V DC) [REX-F900]

■ Weight
REX-F400: Approx. 310 g
REX-F900: Approx. 450 g

The first edition: DEC. 1993
The fourth edition: JUL. 2013 [IMQ00]