Product Registration

Thank you for purchasing YOKOGAWA products.

YOKOGAWA provides registered users with a variety of information and services. Please allow us to serve you best by completing the product registration form accessible from our homepage.

http://www.yokogawa.com/ns/reg/
Introduction

Thank you for purchasing the UT55A/UT52A digital indicating controller (hereinafter referred to as UT55A/UT52A).

This manual describes how to use UT55A/UT52A functions other than UT55A/UT52A’s communication function and ladder sequence function. Please read through this user’s manual carefully before using the product.

Note that the manuals for the UT55A/UT52A comprise the following six documents:

- **Printed manual**
  - UT55A/UT52A Operation Guide
    - Manual Name: UT55A/UT52A Operation Guide
    - Manual Number: IM 05P01C31-11EN
    - Description: This manual describes the basic operation method. It is also contained in the provided CD-ROM.

- **Electronic manuals contained in the provided CD-ROM**
  - UT55A/UT52A Operation Guide
    - Manual Name: UT55A/UT52A Operation Guide
    - Manual Number: IM 05P01C31-11EN
    - Description: This is identical to the printed manual.
  - UT55A/UT52A User’s Manual
    - Manual Number: IM 05P01C31-01EN
    - Description: This manual. It describes the usage of all functions except the ladder sequence and communication functions.
    - Manual Number: IM 05P07A01-01EN
    - Description: This manual describes how to use UT55A/UT52A in Ethernet and serial communications. For communication wiring, see the Operation Guide or User’s Manual.
    - Manual Number: IM 05P07A01-02EN
    - Description: This manual describes how to use UT55A/UT52A in PROFIBUS-DP communications. For communication wiring, see the Operation Guide or User’s Manual.
  - LL50A Parameter Setting Software Installation Manual
    - Manual Number: IM 05P05A01-01EN
    - Description: This manual describes how to install and uninstall the LL50A.
  - LL50A Parameter Setting Software User’s Manual
    - Manual Number: IM 05P05A01-02EN
    - Description: This manual describes how to use the LL50A, ladder sequence function, and peer-to-peer communication.

Target Readers

This guide is intended for the following personnel:

- Engineers responsible for installation, wiring, and maintenance of the equipment.
- Personnel responsible for normal daily operation of the equipment.

Notice

- The contents of this manual are subject to change without notice as a result of continuing improvements to the instrument’s performance and functions.
- Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform Yokogawa Electric’s sales office or sales representative.
- Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.
Trademarks

- Our product names or brand names mentioned in this manual are the trademarks or registered trademarks of Yokogawa Electric Corporation (hereinafter referred to as YOKOGAWA).
- Microsoft, MS-DOS, Windows, Windows XP, and Windows Vista are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.
- Adobe, Acrobat, and Postscript are either registered trademarks or trademarks of Adobe Systems Incorporated.
- Ethernet is a registered trademark of XEROX Corporation in the United States.
- We do not use the TM or ® mark to indicate these trademarks or registered trademarks in this user’s manual.
- All other product names mentioned in this user’s manual are trademarks or registered trademarks of their respective companies.

Safety Precautions

This instrument is a product of Installation Category II of IEC/EN/CSA/UL61010-1 Safety Standards and Class A of EN61326-1, EN55011 (EMC Standards).

**CAUTION**

This instrument is an EMC class A product. In a domestic environment, this product may cause radio interference in which case the user needs to take adequate measures.

The instrument is a product rated Measurement Category I (CAT.I).

* Measurement Category I (CAT.I)
  This category applies to electric equipment that measures a circuit connected to a low-voltage facility and receives power from stationary equipment such as electric switchboards.

To use the instrument properly and safely, observe the safety precautions described in this user’s manual when operating it. Use of the instrument in a manner not prescribed herein may compromise protection features inherent in the device. We assume no liability for or warranty on a fault caused by users’ failure to observe these instructions.

This instrument is designed to be used within the scope of Measurement Category I (CAT. I) and is dedicated for indoor use.

**Notes on the User’s Manual**

- This user’s manual should be readily accessible to the end users so it can be referred to easily. It should be kept in a safe place.
- Read the information contained in this manual thoroughly before operating the product.
- The purpose of this user’s manual is not to warrant that the product is well suited to any particular purpose, but rather to describe the functional details of the product.
Safety, Protection, and Modification of the Product

The following symbols are used in the product and user’s manuals to indicate safety precautions:

⚠️ “Handle with Care” (This symbol is attached to the part(s) of the product to indicate that the user’s manual should be referred to in order to protect the operator and the instrument from harm.)

_VOLTAGE

AC

AC/DC

The equipment wholly protected by double insulation or reinforced insulation.

Grounding terminal (Do not use this terminal as a protective grounding terminal.)

• In order to protect the system controlled by this product and the product itself, and to ensure safe operation, observe the safety precautions described in this user’s manual. Use of the instrument in a manner not prescribed herein may compromise the product’s functions and the protection features inherent in the device. We assume no liability for safety, or responsibility for the product’s quality, performance or functionality should users fail to observe these instructions when operating the product.

• Installation of protection and/or safety circuits with respect to a lightning protector; protective equipment for the system controlled by the product and the product itself; foolproof or failsafe design of a process or line using the system controlled by the product or the product itself; and/or the design and installation of other protective and safety circuits are to be appropriately implemented as the customer deems necessary.

• Be sure to use the spare parts approved by YOKOGAWA when replacing parts or consumables.

• This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user’s responsibility to include in the system additional equipment and devices that ensure personnel safety.

• Modification of the product is strictly prohibited.

⚠️ WARNING

• Power Supply

Ensure that the instrument’s supply voltage matches the voltage of the power supply before turning ON the power.

• Do Not Use in an Explosive Atmosphere

Do not operate the instrument in locations with combustible or explosive gases or steam. Operation in such environments constitutes an extreme safety hazard. Use of the instrument in environments with high concentrations of corrosive gas (H₂S, SOₓ, etc.) for extended periods of time may cause a failure.

• Do Not Remove Internal Unit

The internal unit should not be removed by anyone other than YOKOGAWA’s service personnel. There are dangerous high voltage parts inside.

• Damage to the Protective Construction

Operation of the instrument in a manner not specified in this user’s manual may damage its protective construction.
**Warning and Disclaimer**

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- The product is provided on an “as is” basis. YOKOGAWA assumes no liability to any person or entity for any loss or damage, direct or indirect, arising from the use of the product or from any unpredictable defect of the product.

**Notes on Software**

- YOKOGAWA makes no warranties, either expressed or implied, with respect to the software’s merchantability or suitability for any particular purpose, except as specified in the terms of the separately provided warranty.
- This software may be used on one specific machine only.
- To use the software on another machine, the software must be purchased again separately.
- It is strictly prohibited to reproduce the product except for backup purposes.
- Store the software CD-ROM (the original medium) in a safe place.
- All reverse-engineering operations, such as reverse compilation or the reverse assembly of the product are strictly prohibited.
- No part of the product’s software may be transferred, converted, or sublet for use by any third party, without prior written consent from YOKOGAWA.

**Handling Precautions for the Main Unit**

- The instrument comprises many plastic components. To clean it, wipe it with a soft, dry cloth. Do not use organic solvents such as benzene or thinner for cleaning, as discoloration or deformation may result.
- Keep electrically charged objects away from the signal terminals. Not doing so may cause the instrument to fail.
- Do not apply volatile chemicals to the display area, operation keys, etc. Do not leave the instrument in contact with rubber or PVC products for extended periods. Doing so may result in failure.
- If the equipment emits smoke or abnormal smells or makes unusual noises, turn OFF the instrument’s power immediately and unplug the device. In such an event, contact your sales representative.

**Checking the Contents of the Package**

Unpack the box and check the contents before using the product. If the product is different from that which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact your sales representative.

**UT55A/52A Main Unit**

The UT55A/UT52A main units have nameplates affixed to the side of the case. Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered.

**No. (Instrument number)**

When contacting your sales representative, inform them of this number, too.
## Model and Suffix Codes of UT55A

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT55A</td>
<td>-0</td>
<td></td>
<td>Digital Indicating Controller (provided with retransmission output or 15 V DC loop power supply, 3 DIs, and 3 DOs) (Power supply: 100-240 V AC)</td>
</tr>
</tbody>
</table>

### Type 1: Basic control

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT55A</td>
<td>-0</td>
<td></td>
<td>Standard type</td>
</tr>
<tr>
<td>UT55A</td>
<td>-1</td>
<td></td>
<td>Position proportional type</td>
</tr>
<tr>
<td>UT55A</td>
<td>-2</td>
<td></td>
<td>Heating/cooling type</td>
</tr>
</tbody>
</table>

### Type 2: Functions (*1)

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT55A</td>
<td>0</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>UT55A</td>
<td>1</td>
<td></td>
<td>Remote (1 additional aux. analog) input, 6 additional DIs, 5 additional DOs, and RS-485 communication (Max.19.2 kbps, 2-wire/4-wire) (*2)</td>
</tr>
<tr>
<td>UT55A</td>
<td>2</td>
<td></td>
<td>Remote (1 additional aux. analog) input, 1 additional DI, and RS-485 communication (Max.19.2 kbps, 2-wire/4-wire) (*2)</td>
</tr>
<tr>
<td>UT55A</td>
<td>3</td>
<td></td>
<td>5 additional DIs and 5 additional DOs</td>
</tr>
<tr>
<td>UT55A</td>
<td>4</td>
<td></td>
<td>Remote (1 additional aux. analog) input and 1 additional DI</td>
</tr>
<tr>
<td>UT55A</td>
<td>5</td>
<td></td>
<td>Remote (1 additional aux. analog) input, 6 additional DIs, and 5 additional DOs</td>
</tr>
<tr>
<td>UT55A</td>
<td>6</td>
<td></td>
<td>5 additional DIs and 15 additional DOs</td>
</tr>
<tr>
<td>UT55A</td>
<td>7</td>
<td></td>
<td>3 additional aux. analog inputs and 3 additional DIs</td>
</tr>
</tbody>
</table>

### Type 3: Open networks

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT55A</td>
<td>0</td>
<td></td>
<td>None</td>
</tr>
</tbody>
</table>
| UT55A          | 1           |                      | RS-485 communication (Max.38.4 kbps, 2-wire/4-wire) *
| UT55A          | 2           |                      | Ethernet communication (with serial gateway function) |
| UT55A          | 4           |                      | PROFIBUS-DP communication                |

### Display language (*3)

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT55A</td>
<td>-10</td>
<td></td>
<td>English</td>
</tr>
<tr>
<td>UT55A</td>
<td>-20</td>
<td></td>
<td>German</td>
</tr>
<tr>
<td>UT55A</td>
<td>-30</td>
<td></td>
<td>French</td>
</tr>
<tr>
<td>UT55A</td>
<td>-40</td>
<td></td>
<td>Spanish</td>
</tr>
</tbody>
</table>

### Fixed code

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT55A</td>
<td>-00</td>
<td></td>
<td>Always <em>-00</em></td>
</tr>
</tbody>
</table>

### Optional suffix codes

- /DR: Additional direct input (TC and 3-wire/4-wire RTD) and current input to Remote (1 additional aux. analog) input, 1 DI to be deleted (*4)
- /LP: 24 V DC loop power supply (*5)
- /HA: Heater break alarm (*6)
- /DC: Power supply 24 V AC/DC
- /CT: Coating (*7)

---

*1: When “1” or “6” is specified for the Type 2 code, only “0” can be specified for the Type 3 code.
*2: When the /LP option is specified, the RS-485 communication for “1” or “2” of the Type 2 code is 2-wire system.
*3: English, German, French, and Spanish can be displayed as the guide display.
*4: When any of “1,” “2,” “4,” “5,” or “7” is specified for the Type 2 code, the /DR option can be specified.
*5: The /LP option can be specified in the combination of Type 2 code (any of “0,” “2,” “3,” or “4”) and Type 3 code (any of “0” or “1”). Additionally, the /LP option can be specified in the combination of Type 2 code “1” and Type 3 code “0”.
*6: When “-0” is specified for the Type 1 code, the /HA option can be specified.
*7: When the /CT option is specified, the UT55A does not conform to the safety standards (UL and CSA) and CE marking.
## Model and Suffix Codes of UT52A

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UT52A</td>
<td></td>
<td></td>
<td>Digital Indicating Controller (provided with retransmission output or 15 V DC loop power supply, 3 DIs, and 3 DOs) (Power supply: 100-240 V AC)</td>
</tr>
<tr>
<td>Type 1:</td>
<td>-0</td>
<td></td>
<td>Basic control -0: Standard type</td>
</tr>
<tr>
<td></td>
<td>-1</td>
<td></td>
<td>Position proportional type</td>
</tr>
<tr>
<td></td>
<td>-2</td>
<td></td>
<td>Heating/cooling type</td>
</tr>
<tr>
<td>Type 2:</td>
<td>0</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>Functions</td>
<td>1</td>
<td></td>
<td>Remote (1 additional aux. analog) input, 1 additional DI, and RS-485 communication (Max. 38.4 kbps, 2-wire)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
<td>Remote (1 additional aux. analog) input and 1 additional DI</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
<td>2 additional DIs and 2 additional DOs</td>
</tr>
<tr>
<td>Type 3:</td>
<td>0</td>
<td></td>
<td>None</td>
</tr>
<tr>
<td>Open networks</td>
<td></td>
<td></td>
<td>Display language (*1)</td>
</tr>
<tr>
<td></td>
<td>-10</td>
<td></td>
<td>English</td>
</tr>
<tr>
<td></td>
<td>-20</td>
<td></td>
<td>German</td>
</tr>
<tr>
<td></td>
<td>-30</td>
<td></td>
<td>French</td>
</tr>
<tr>
<td></td>
<td>-40</td>
<td></td>
<td>Spanish</td>
</tr>
<tr>
<td>Fixed code</td>
<td>-00</td>
<td></td>
<td>Always &quot;-00&quot;</td>
</tr>
<tr>
<td>Optional suffix codes</td>
<td></td>
<td></td>
<td>/DR  Additional direct input (TC and 3-wire/4-wire RTD) and current input to Remote (1 additional aux. analog) input, 1 DI to be deleted (*2)</td>
</tr>
<tr>
<td></td>
<td>/LP</td>
<td></td>
<td>24 V DC loop power supply (*3)</td>
</tr>
<tr>
<td></td>
<td>/HA</td>
<td></td>
<td>Heater break alarm (*4)</td>
</tr>
<tr>
<td></td>
<td>/DC</td>
<td></td>
<td>Power supply 24 V AC/DC</td>
</tr>
<tr>
<td></td>
<td>/CT</td>
<td></td>
<td>Coating (*5)</td>
</tr>
</tbody>
</table>

*1: English, German, French, and Spanish can be displayed as the guide display.
*2: When "2" is specified for the Type 2 code, the /DR option can be specified.
*3: The /LP option can be specified in the combination of Type 1 code (any of "-0" or "-1") and Type 2 code "0."
*4: When "-0" is specified for the Type 1 code, the /HA option can be specified.
*5: When the /CT option is specified, the UT52A does not conform to the safety standards (UL and CSA) and CE marking.

### Coating Treatment

1. **HumiSeal coating treatment**
   - Apply HumiSeal coating to the printed circuit board assembly.
   - Do not apply HumiSeal coating to the following parts: connector, gold-plated contact area, relay part, RJC device, and in the vicinity of the push switch/LED lamp.

2. **Apply terminal coating to the gold-plated contact area on the printed circuit board.**

### Notes

- There are two treatments as described above, but we do not guarantee their effectiveness.
- We do not supply any test data on these treatments.
- Do not apply any treatment to the screw terminal area on the back side of the instrument.
Accessories

The product is provided with the following accessories according to the model and suffix codes. Check that none of them are missing or damaged.

<table>
<thead>
<tr>
<th>No.</th>
<th>Product Name</th>
<th>Quantity</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Brackets</td>
<td>2</td>
<td>For fixing the upper and lower parts</td>
</tr>
<tr>
<td>2</td>
<td>Terminal cover</td>
<td>1</td>
<td>For UT55A: L4502XP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>For UT52A: L4502XQ</td>
</tr>
<tr>
<td>3</td>
<td>Unit label</td>
<td>1</td>
<td>Part number: L4502VZ</td>
</tr>
<tr>
<td>4</td>
<td>Tag label</td>
<td>1</td>
<td>Part number: L4502VE</td>
</tr>
<tr>
<td>5</td>
<td>Operation Guide</td>
<td>1</td>
<td>Single-loop control (A3 size, x6)</td>
</tr>
<tr>
<td>6</td>
<td>User’s Manual (CD-ROM)</td>
<td>1</td>
<td>Contains all manuals</td>
</tr>
</tbody>
</table>

Accessory (sold separately)

The following lists an accessory sold separately.

- LL50A Parameter Setting Software

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL50A</td>
<td>-00</td>
<td>Parameter Setting Software with Ladder Program Building Function</td>
</tr>
</tbody>
</table>
Symbols Used in This Manual

This symbol is used on the instrument. It indicates the possibility of injury to the user or damage to the instrument, and signifies that the user must refer to the user’s manual for special instructions. The same symbol is used in the user’s manual on pages that the user needs to refer to, together with the term “WARNING” or “CAUTION.”

**WARNING**

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.

**CAUTION**

Calls attention to actions or conditions that could cause injury to the user or damage to the instrument or property and indicates precautions that should be taken to prevent such occurrences.

**Note**

Identifies important information required to operate the instrument.

Indicates related operations or explanations for the user’s reference.

[ ]

Indicates a character string displayed on the display.

**Setting Display**

Indicates a setting display and describes the keystrokes required to display the relevant setting display.

**Setting Details**

Provides the descriptions of settings.

**Description**

Describes restrictions etc. regarding a relevant operation.

How to Open an Electronic Manual

The provided CD-ROM contains PDF files of the manuals. Place this CD-ROM in the PC’s CD-ROM drive; the Startup Window appears. Click on the relevant manual name to open the selected manual.

If the Startup Window does not appear, select My Computer and double click on UT_manual to open the manual concerned in the English directory.
How to Use This Manual

For the ladder sequence and communication functions, see the respective manuals. This user’s manual is organized into Chapters 1 to 19 as shown below. This manual mainly uses the illustrations of the UT55A for describing the operations and functions. The basic operations are the same for the UT52A, so please read them in the same way.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to Functions</td>
</tr>
<tr>
<td></td>
<td>Describes the main functions of the UT55A/UT52A.</td>
</tr>
<tr>
<td>2</td>
<td>UT55A/UT52A Operating Procedures</td>
</tr>
<tr>
<td></td>
<td>Describes the flow from unpacking to regular operations.</td>
</tr>
<tr>
<td>3</td>
<td>Part Names</td>
</tr>
<tr>
<td></td>
<td>Describes part names and functions on the front panel.</td>
</tr>
<tr>
<td>4</td>
<td>Basic Operation</td>
</tr>
<tr>
<td></td>
<td>Describes basic operation of the UT55A/UT52A.</td>
</tr>
<tr>
<td>5</td>
<td>Quick Setting Function</td>
</tr>
<tr>
<td></td>
<td>Describes the minimum necessary settings for operation.</td>
</tr>
<tr>
<td>6</td>
<td>Monitoring and Control of Regular Operations</td>
</tr>
<tr>
<td></td>
<td>Describes monitoring displays of regular operations and operation.</td>
</tr>
<tr>
<td>7</td>
<td>Input (PV, Remote, and Auxiliary Analog) Functions</td>
</tr>
<tr>
<td></td>
<td>Describes PV input, remote input, and advanced secondary control input.</td>
</tr>
<tr>
<td>8</td>
<td>Control Functions</td>
</tr>
<tr>
<td></td>
<td>Describes basic control and advanced control.</td>
</tr>
<tr>
<td>9</td>
<td>Auxiliary Control Functions</td>
</tr>
<tr>
<td></td>
<td>Describes auxiliary control functions</td>
</tr>
<tr>
<td>10</td>
<td>Output (Control and Retransmission) Functions</td>
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<tr>
<td></td>
<td>Describes output functions.</td>
</tr>
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<td>11</td>
<td>Alarm Functions</td>
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<tr>
<td></td>
<td>Describes alarm output and status output.</td>
</tr>
<tr>
<td>12</td>
<td>Contact Input/Output Functions</td>
</tr>
<tr>
<td></td>
<td>Describes contact input/output functions.</td>
</tr>
<tr>
<td>13</td>
<td>Display, Key, and Security Functions</td>
</tr>
<tr>
<td></td>
<td>Describes display, user function key and security functions.</td>
</tr>
<tr>
<td>14</td>
<td>Parameter Initialization</td>
</tr>
<tr>
<td></td>
<td>Describes the initialization to factory default values and to user default values.</td>
</tr>
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<td>15</td>
<td>Power Failure Recovery Processing/Power Frequency Setting/Other Settings</td>
</tr>
<tr>
<td></td>
<td>Describes operations performed after momentary power interruption and power failures.</td>
</tr>
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<td>16</td>
<td>Troubleshooting, Maintenance, and Inspections</td>
</tr>
<tr>
<td></td>
<td>Describes troubleshooting, maintenance, periodic inspections, and disposal.</td>
</tr>
<tr>
<td>17</td>
<td>Installation and Wiring</td>
</tr>
<tr>
<td></td>
<td>Describes installation and wiring.</td>
</tr>
<tr>
<td>18</td>
<td>Parameters</td>
</tr>
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  Appendix 1 Input and Output Table of Standard Model and Suffix Codes ......................... App-1

Revision Information
1.1 Quick Setting Function

The Quick setting function is a function to easily set the basic function of the controller.

Q: What should I do to perform control immediately?
First, I want to set the input and output.

A: Use the Quick setting function to perform the setup easily.
Quick setting function: Chapter 5

Q: How do I determine the PID?

A: Use Auto-tuning to perform the tuning easily.
Auto-tuning: Section 6.3
1.2 Input/Output Function

PV Input (equipped as standard)
PV input is a universal input to arbitrarily set the type and range for the thermocouple (TC), resistance-temperature detector (RTD), and DC voltage/current.

Control Output (equipped as standard)
Control output (OUT) is a universal output to arbitrarily set the type for the current, voltage pulse, and relay. Heating/cooling control and Position proportional control are possible by specifying the suffix code for the control.

Remote Input (suffix code: Type 2=1, 2, 4, 5, or 7)
Remote input (RSP) is external analog signal used for remote setpoint.

Add direct input (optional suffix code /DR) to the remote input to use the 4-wire RTD as PV input. The LL50A Parameter Setting Software is required.
Auxiliary Analog Input (suffix code: Type 2=7)
Two auxiliary analog inputs can be used separately from PV input (PV) and remote input (RSP).
► Chapter 7 Input (PV, Remote, and Auxiliary Analog) Functions

Retransmission Output (equipped as standard)
Retransmission output outputs a PV input value (PV), target setpoint (SP), control output value (OUT) and the like as an analog signal to, for example, the recorder.
► Chapter 10 Output (Control and Retransmission) Functions

Contact Input (suffix code: Type 2=6)
Up to 8 contact inputs can be incorporated. The operation modes can be switched. PID control and sequence control can be performed simultaneously using the ladder sequence function.
The contact input can be specified with other suffix codes. For details, see the table of Model and Suffix Codes.
► Chapter 12 Contact Input/Output Functions

Contact Output (suffix code: Type 2=6)
Up to 18 contact outputs can be incorporated. Contact output can output events such as alarms.
PID control and sequence control can be performed simultaneously using the ladder sequence function.
The contact output can be specified with other suffix codes. For details, see the table of Model and Suffix Codes.
► Chapter 11 Alarm Functions

24 V DC Loop Power Supply (optional suffix code: /LP)
24 V DC loop power supply can be supplied to 2-wire transmitter.
► 17.4.10 24 V DC Loop Power Supply Wiring
## 1.3 Control Functions

### Control Mode

The UT55A/UT52A are controllers equipped with 8 control modes. Some control modes require a remote input (RSP) terminal. For the auxiliary functions of control modes, see the respective sections.

<table>
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<tr>
<th>Control mode schematic diagram</th>
<th>Description</th>
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| Single-loop control | “Single-loop control” provides the basic control function having one control computation unit.  
| Cascade primary-loop control | “Cascade primary-loop control” sets up a controller as the primary-loop controller when two controllers are used for Cascade control. It is used in connection with “Cascade secondary-loop control.” It provides the output tracking function and FAIL output to the secondary-loop controller. Remote input (RSP) terminal is required for output tracking input.  
- 8.1.2 Cascade Primary-loop Control |
| Cascade secondary-loop control | “Cascade secondary-loop control” sets up a controller as the secondary-loop controller when two controllers are used for Cascade control. It is used in connection with “Cascade primary-loop control.” It provides the target setpoint output function and tracking signal output function to the primary-loop controller. Remote input (RSP) terminal is required for cascade input.  
- 8.1.3 Cascade Secondary-loop Control, Cascade Secondary-loop Heating/cooling Control, and Cascade Secondary-loop Position Proportional Control |
## 1.3 Control Functions

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<th>Control mode schematic diagram</th>
<th>Description</th>
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<tr>
<td><strong>Cascade control</strong>&lt;br&gt;<img src="#" alt="Cascade Control Schematic" />&lt;br&gt; PV1 PV2 (RSP)&lt;br&gt; PID1&lt;br&gt; PID2&lt;br&gt; OUT&lt;br&gt;</td>
<td>“Cascade control” uses two control computation units and permits cascade control using just a single controller. Remote input (RSP) terminal is required for Loop-2 PV input. ► 8.1.4 Cascade Control, Cascade Heating/cooling Control, and Cascade Position Proportional Control</td>
</tr>
<tr>
<td><strong>Loop control for backup</strong>&lt;br&gt;<img src="#" alt="Loop Control for Backup Schematic" />&lt;br&gt; PV&lt;br&gt; OUT from host (RSP)&lt;br&gt; PID&lt;br&gt; DI&lt;br&gt; OUT&lt;br&gt;</td>
<td>“Loop control for backup” allows control in connection with host control equipment (such as another controller or programmable controller (PLC)). If the host control equipment breaks down and the controller receives the FIAL signal, the controller performs backup control operations. Remote input (RSP) terminal is required for output tracking input. ► 8.1.5 Loop Control for Backup, Heating/cooling Loop Control for Backup, and Position Proportional Loop Control for Backup</td>
</tr>
<tr>
<td><strong>Loop control with PV switching</strong>&lt;br&gt;<img src="#" alt="Loop Control with PV Switching Schematic" />&lt;br&gt; PV1 PV2 (RSP)&lt;br&gt; DI&lt;br&gt; OUT&lt;br&gt;</td>
<td>“Loop control with PV switching” uses two PV inputs, which are switched according to input contact signals or measurement ranges. Remote input (RSP) terminal is required for Loop-2 PV input. ► 8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching</td>
</tr>
<tr>
<td><strong>Loop control with PV auto-selector</strong>&lt;br&gt;<img src="#" alt="Loop Control with PV Auto-selector Schematic" />&lt;br&gt; PV2 PV3 PV4&lt;br&gt; PV1 (RSP)(AIN2)(AIN4)&lt;br&gt; SELECT&lt;br&gt; PID&lt;br&gt; OUT&lt;br&gt;</td>
<td>“Loop control with PV auto-selector” automatically selects or calculates the larger, the smaller, the average, or difference (of PV1 and PV2) of two to four PV inputs. Remote input (RSP) terminal and auxiliary analog input terminal are required for the inputs 2, 3, and 4. ► 8.1.7 Loop Control with PV Auto-selector, Heating/cooling Loop Control with PV Auto-selector, and Position Proportional Loop Control with PV Auto-selector</td>
</tr>
<tr>
<td><strong>Loop control with PV-hold function</strong>&lt;br&gt;<img src="#" alt="Loop Control with PV-hold Function Schematic" />&lt;br&gt; PV&lt;br&gt; HOLD&lt;br&gt; PID&lt;br&gt; OUT&lt;br&gt;</td>
<td>“Loop control with PV-hold function” holds the PV input value and control output value according to the input contact signals. ► 8.1.8 Loop Control with PV-hold Function, Heating/cooling Loop Control with PV-hold Function, and Position Proportional Loop Control with PV-hold Function</td>
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1.3 Control Functions

**PID Control**

PID control is a general control using the PID control-related parameters.

► 8.2.1 PID Control

**Heating/cooling Control (suffix code: Type 1 = -2)**

Heating/cooling control is available only for Heating/cooling type. In Heating/cooling control, the controller outputs the result of control computation after splitting it into heating-purpose and cooling-purpose signals.

► 8.2.3 Heating/cooling Control

**Position Proportional Control (suffix code: Type 1 = -1)**

Position proportional control is available only for Position proportional type. It is used exclusively for the motor-operated valve.

► 10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)
### Two-position Two-level Control (suffix code: Type 1 = -2)

Two-position two-level control has two target setpoints to control ON and OFF respectively.

- **ON**
  - Initial value: Reverse
  - Sub-SP (offset from main SP)
  - Hysteresis

- **OFF**
  - Initial value: Direct
  - Hysteresis

![Diagram showing Two-position Two-level Control](image)

#### Sample PI Control

Sample PI control is useful for processes with long dead times where the results of the control output are not quickly reflected on the PV.

- **8.2.6 Sample PI Control**

#### Batch PID Control

Batch PID control is useful for cases where control is performed causing the PV to settle to a SP as quickly as possible without overshooting.

- **8.2.7 Batch PID Control**

#### Feedforward Control

Feedforward control cancels the disturbance before the effects of the disturbance appear in the controlled system by applying a signal – to correct for the disturbance – directly to the controller.

- **8.2.8 Feedforward Control**
1.4 Display and Key Functions

Employing a 14-segment, active color LCD greatly increases the monitoring and operating capabilities.

**Active Color PV Display (display color change)**

The active color PV display function changes the PV display color (red or white) when abnormality occurs in PV etc.

► 13.1.1 Setting Active Color PV Display Function

![Active Color PV Display](image)

**Guide Display**

The guide is displayed on PV display when setting parameters. This guide can be turned on/off with the Fn key.

![Guide Display](image)

**Multilingual Guide Display**

English, German, French, or Spanish can be displayed in Guide display.

► 13.1.12 Switching Guide Display Language

**Parameter Display Level**

To intended use of the operator, the display level of the parameter can be set.

► Chapter 18 Parameters

**User Function Keys**

The UT55A has user function keys (F1, F2, and Fn).
The UT52A has a user function key (Fn).
Assign a function to a user function key to use it as an exclusive key.

► 13.2 Assigning Function to User Function Key and A/M Key
1.5 Ladder Sequence Function

To use the ladder sequence function, it is necessary to create a ladder program using LL50A Parameter Setting Software and download it to a controller.

► Ladder sequence function: LL50A Parameter Setting Software User’s Manual
1.6 Communication Functions

The UT55A/UT52A can use RS-485 communication, Ethernet communication, and PROFIBUS-DP communication by specifying the suffix code and optional suffix code for each communication.


RS-485 Communication (Modbus communication, PC link communication, and Ladder communication)

The UT55A/UT52A can communicate with PCs, PLCs, touch panels, and other devices.

Model: ML2 of YOKOGAWA is recommended. RS-485/RS-232C converter

Up to 31 connected slaves with a maximum length of 1200m

Ethernet Communication (Modbus/TCP)

The UT55A can be connected to IEEE802.3-compliant network (10BASE-T/100BASE-TX). A serial gateway function can increase the number of connected controllers.

Distance from hub to controller: Within 100 m
Number of cascade connections on hub:
Max. 4 stages (10BASE-T)
Max. 2 stages (100BASE-TX)

Serial gateway function
RS-485 communication
Up to 31 connected slaves with a maximum length of 1200m
### PROFIBUS-DP Communication

The UT55A can be used as the slave devices for PROFIBUS-DP communication. Readout of PV, operation or alarm status, and SP setting can be done by accessing the remote I/O on the master unit of PROFIBUS-DP.

**PLC**

![PROFIBUS-DP Master](image)

**PROFIBUS-DP communication**

![PROFIBUS-DP Slave / Modbus Master](image)

**Modbus/RTU communication**

Max. 1200 m, number of connected slaves: 31

![Modbus Slave](image)

![Modbus Slave](image)

![Modbus Slave](image)

![Modbus Slave](image)

### Peer-to-peer Communication

In Peer-to-peer communication, controllers send and receive process data each other and share data. However, ladder program creation using LL50A Parameter Setting Software is necessary.


Controller No. 1 to 4 can transmit and receive data. Controller No. 5 to 32 can only receive data.

![Controller Diagram](image)

Max. 32 controllers

### Coordinated Operation

A system of coordinated operation is configured with a master controller and a number of slave controllers. The slave controllers are set to operate in the same way as the master controller. Therefore you do not have to create a communication program.

![Slave Diagram](image)

Up to 31 connected slaves with a maximum length of 1200m
1.6 Communication Functions

Light-loader Communication

Use the LL50A to set parameters and create ladder programs. Attach the adapter to the front of the controller to communicate.


Maintenance Port Communication (Power supply is not required for the UT55A/UT52A)

Maintenance port is used to connect with the dedicated cable when using LL50A Parameter Setting Software (sold separately). The parameters can be set without supplying power to the UT55A/UT52A.

CAUTION

When using the maintenance port, do not supply power to the controller. Otherwise, the controller does not work normally.

If power is supplied to the controller while the cable is connected, or the cable is connected to the controller already turned on, unplug the cable and turn on the controller again. The controller returns to the normal condition.
1.7 Definition of Main Symbols and Terms

Main Symbol

PV: Measured input value
SP: Target setpoint
OUT: Control output value
RSP: Remote setpoint

A/M: AUTO/MAN
C/A/M: CAS/AUTO/MAN
AUTO: Automatic
MAN: Manual
CASCADE, CAS: Cascade
REMOTE, REM: Remote
LOCAL, LCL: Local

E1, E2, E3, and E4: Terminal areas

► 17.4 Wiring

Engineering Units

Input range (scale): the PV range low limit is set to 0%, and the high limit is set to 100% for conversion.
Input range (scale) span: the PV range span is set to 100% for conversion.

In this manual, the parameter setting range is described as the “input range” and “input range span.” This means that engineering units are required to be set. Set a temperature for temperature input.

The following describes a conversion example.
When the PV input range is 100 to 600°C, 0% of the PV range is equivalent to 100°C, 50% of the PV range is equivalent to 350°C, and 100% of the PV range is equivalent to 600°C.
100% of the PV range span is equivalent to 500°C.
20% of the PV range span is equivalent to 100°C.

![Graph showing PV input range and conversion example]

The above applies to the scale for voltage and current input.
2.1 UT55A/UT52A Operating Procedures

Install and wire a controller.

Installation and Wiring: Chapter 17

Quick setting function:

Chapter 5

Monitoring and control of regular operations

Regular operations: Chapter 6

Set the other parameters as necessary.

Adjust PID using auto-tuning or manually in PID control.

Tuning: 6.3 Performing/Canceling Auto-tuning
6.4 Adjusting PID Manually

Monitoring and control of regular operations

Regular operations: Chapter 6
3.1 Names and Functions of Display Parts

See the next page.
3.1 Names and Functions of Display Parts

**UT55A**

- (9) Deviation indicator
- (1) PV display
- (2) Group display
- (4) Data display
- (3) Symbol display
- (10) Status indicator
- (5) Bar-graph display
- (11) Security indicator
- (6) Event indicator
- (12) Ladder operation indicator
- (7) Key navigation indicator
- (13) Loop 2 indicator
- (8) Parameter display level indicator

(2) + (3) + (4) : Setpoint display

**UT52A**

- (2) Group display
- (1) PV display
- (8) Parameter display level indicator
- (3) Symbol display
- (12) Ladder operation indicator
- (4) Data display
- (10) Status indicator
- (5) Bar-graph display
- (11) Security indicator
- (6) Event indicator
- (13) Loop 2 indicator
- (7) Key navigation indicator

(2) + (3) + (4) : Setpoint display
<table>
<thead>
<tr>
<th>No. in figure</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>PV display (white or red)</td>
<td>Displays PV. Displays an error code if an error occurs. Displays the scrolling guide in the Menu Display and Parameter Setting Display when the guide display ON/OFF is set to ON.</td>
</tr>
<tr>
<td>(2)</td>
<td>Group display (green)</td>
<td>Displays a group number (1 to 8, or R) and terminal area (E1 to E4). 1 to 8 represent SP numbers in the Operation Display. R and E1 to E4 are displayed in the Parameter Setting Display.</td>
</tr>
<tr>
<td>(3)</td>
<td>Symbol display (orange)</td>
<td>Displays a parameter symbol.</td>
</tr>
<tr>
<td>(4)</td>
<td>Data display (orange)</td>
<td>Displays control output value (OUT) and measured input value (PV). The data to be displayed can be set by the parameter. Initial value: upper bar (deviation), lower bar (control output, internal computed value in Position proportional control); in Heating/cooling control, upper bar (heating-side control output), lower bar (cooling-side control output)</td>
</tr>
<tr>
<td>(5)</td>
<td>Bar-graph display (orange and white)</td>
<td>Displays a parameter setpoint and menu symbol.</td>
</tr>
<tr>
<td>(6)</td>
<td>Event indicator (orange)</td>
<td>UT55A: Lit when the alarms 1 to 8 occur. (Initial value: 1 to 4) UT52A: Lit when the alarms 1 to 4 occur. Event displays other than alarms can be set by the parameter.</td>
</tr>
<tr>
<td>(7)</td>
<td>Key navigation indicator (green)</td>
<td>Lit or blinks when the Up/Down or Left/Right arrow key operation is possible.</td>
</tr>
<tr>
<td>(8)</td>
<td>Parameter display level indicator (green)</td>
<td>Displays the setting conditions of the parameter display level function.</td>
</tr>
<tr>
<td>(9)</td>
<td>Deviation indicator (for UT55A only) (green)</td>
<td>Displays the status of a deviation (PV - SP). ▲: Lit if a deviation exceeds the deviation display band. ▼: Lit when a deviation is within the deviation display band. ◄: Lit if a deviation falls below the deviation display band. The deviation indicator is lit if the Displays other than the Operation Display or SELECT Display are shown. Deviation display band can be set by the parameter.</td>
</tr>
<tr>
<td>(10)</td>
<td>Status indicator (green and red)</td>
<td>Displays the operating conditions and control status.</td>
</tr>
<tr>
<td>(11)</td>
<td>Security indicator (red)</td>
<td>Lit if a password is set. The setup parameter settings are locked.</td>
</tr>
<tr>
<td>(12)</td>
<td>Ladder operation indicator (green)</td>
<td>Lit while the ladder operation is executed.</td>
</tr>
<tr>
<td>(13)</td>
<td>Loop 2 indicator (LP2 lamp) (green)</td>
<td>Lit when the control mode is Cascade control. In the Operation Display, the LP2 lamp is lit while the Loop-2 data is displayed in the Operation Display. In the Parameter Setting Display, the LP2 lamp indicates the loop of displayed menu symbol or parameter symbol. The LP2 lamp is lit while the Loop-2 menu symbol or parameter symbol is displayed.</td>
</tr>
</tbody>
</table>
3.2 Names and Functions of Keys

UT55A

(1) DISPLAY key
(2) PARAMETER key
(3) SET/ENTER key
Up/Down/Left/Right arrow keys

(4) Light-loader interface
(5) A/M key
(6) User function keys

UT52A

(1) DISP key
(2) PARA key
(3) SET/ENTER key
Up/Down/Left/Right arrow keys

(4) Light-loader interface
(5) A/M key
(6) User function keys
### 3.2 Names and Functions of Keys

<table>
<thead>
<tr>
<th>No. in figure</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>
| (1)           | UT55A: DISPLAY key  
               UT52A: DISP key | Used to switch the Operation Displays. Press the key in the Operation Display to switch the provided Operation Displays. Press the key in the Menu Display or Parameter Setting Display to return to the Operation Display. |
| (2)           | UT55A: PARAMETER key  
               UT52A: PARA key | Hold down the key for 3 seconds to move to the Operation Parameter Setting Display. Hold down the key and the Left arrow key simultaneously for 3 seconds to move to the Setup Parameter Setting Display. Press the key in the Parameter Setting Display to return to the Menu Display. Press the key once to cancel the parameter setting (setpoint is blinking). |
| (3)           | SET/ENTER key  
               Up/Down/Left/Right arrow keys | SET/ENTER key  
Press the key in the Menu Display to move to the Parameter Setting Display of the Menu. Press the key in the Parameter Setting Display to transfer to the parameter setting mode (setpoint is blinking), and the parameter can be changed. Press the key during parameter setting mode to register the setpoint.  
Up/Down/Left/Right arrow keys  
Press the Left/Right arrow keys in the Menu Display to switch the Displays. Press the Up/Down/Left/Right arrow keys in the Parameter Setting Display to switch the Displays. Press the Up/Down arrow keys during parameter setting mode (setpoint is blinking) to change a setpoint. Press the Left/Right arrow keys during parameter setting mode (setpoint is blinking) to move between digits according to the parameter. |
| (4)           | Light-loader interface | It is the communication interface to the adapter cable when setting and storing parameters via PC. The LL50A Parameter Setting Software (sold separately) is required. |
| (5)           | A/M key | Used to switch between AUTO and MAN modes. The setting is switched between AUTO and MAN each time the key is pressed. The user can assign a function key. |
| (6)           | User function keys | The UT55A has F1, F2, and Fn keys. The UT52A has only the Fn key. The user can assign a function to the key. The function is set by the parameter. |
3.2 Names and Functions of Keys

Maintenance Port (Power supply is not required for the UT55A/UT52A).
The maintenance port is used to connect with the dedicated cable when using LL50A Parameter Setting Software (sold separately). The parameters can be set without supplying power to the UT55A/UT52A.

CAUTION

When using the maintenance port, do not supply power to the controller. Otherwise, the controller does not work normally.
If power is supplied to the controller while the cable is connected, or the cable is connected to the controller already turned on, unplug the cable and turn on the controller again. The controller returns to the normal condition.
### 3.3 List of Display Symbols

The following shows the parameter symbols, menu symbols, alphanumeric of guide, and symbols which are displayed on the UT55A/UT52A.

Figure (common to all display area)

```
0  1  2  3  4  5  6  7  8  9
```

**PV display (14 segments): Alphabet**

```
A B C D E F
A B C D E F
G H I J K L
G H I J K L
M N O P Q R
M N O P Q R
S T U V W X
S T U V W X
Y Z
Y Z
```

**Symbol display and Data display (11 segments): Alphabet**

```
A B C D E F
A b c d e f
```

**C (lower-case)**

```
c
c
G H I J K L
G H I J K L
M N O P Q R
M N O P Q R
S T U V W X
S T U V W X
Y Z
Y Z
```
3.3 List of Display Symbols

Group display (7 segments): Alphabet

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
<th>K</th>
<th>L</th>
</tr>
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<tbody>
<tr>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M</th>
<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
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<td>☑</td>
<td>☑</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>S</th>
<th>T</th>
<th>U</th>
<th>V</th>
<th>W</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E</th>
<th>U</th>
<th>B</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

None

PV display (14 segments): Symbol

<table>
<thead>
<tr>
<th>Space</th>
<th>-</th>
<th>/</th>
<th>'</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>-</th>
<th>/</th>
<th>'</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td>☑</td>
<td>☑</td>
</tr>
</tbody>
</table>
3.4 Brief Description of Setting Details (Parameters)

This manual describes the Setting Details as follows in addition to the functional Description.

### Setting Details

(Example)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 to A8</td>
<td>Alarm-1 to -8 setpoint</td>
<td>EASY</td>
<td>Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.</td>
<td>SP Ope</td>
</tr>
</tbody>
</table>

(1) Parameter symbol: Symbol displayed on Symbol display on the front panel.

(2) Name: Parameter name

(3) Display level: Indicates the parameter display level.

(4) Setting range: Parameter setting range

(5) Menu symbol: Indicates the menu to which the parameter belongs.

<table>
<thead>
<tr>
<th>Display level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EASY</td>
<td>Easy setting mode: The minimum necessary parameters are displayed. Corresponding parameters are displayed in all modes.</td>
</tr>
<tr>
<td>STD</td>
<td>Standard setting mode: The wider range of parameters than those shown in Easy setting mode are displayed. Parameter display level indicators &quot;EASY&quot; and &quot;PRO&quot; are unlit in Standard setting mode. &quot;*: &quot;STD&quot; is the symbol used in this manual only.</td>
</tr>
<tr>
<td>PRO</td>
<td>Professional setting mode: All parameters are displayed. Corresponding parameters are displayed only in Professional setting mode.</td>
</tr>
</tbody>
</table>

**Note**

For more intelligible display operation of parameters and the references, see Chapter 18, "Parameter Map."
Chapter 4 Basic Operation

4.1 Overview of Display Switch and Operation Keys

The following shows the transition of Operation Display, Operation Parameter Setting Display, and Setup Parameter Setting Display. The “Operation Parameter Setting Display” has the parameters for setting the functions necessary for the operation. The “Setup Parameter Setting Display” has the parameters for setting the basic functions of the controller.

![Diagram showing transition of displays](image-url)
The display pattern of the UT55A/UT52A is as follows; the Menu Display and Parameter Setting Display.
For the Operation Display, see Chapter 6, “Monitoring and Control of Regular Operations.”

<table>
<thead>
<tr>
<th>Display</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Menu Display</strong></td>
<td>The Menu Display is segmented by the function and optional terminal position. The scrolling guide for the menu is displayed on PV display. The guide display can be turned on/off with the Fn key.</td>
</tr>
<tr>
<td></td>
<td><strong>Menu Display of Operation Parameter</strong></td>
</tr>
<tr>
<td></td>
<td>The scrolling guide for the menu is displayed.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Menu Display of Operation Parameter" /></td>
</tr>
<tr>
<td></td>
<td><strong>Menu Display of Setup Parameter</strong></td>
</tr>
<tr>
<td></td>
<td>The scrolling guide for the menu is displayed.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Menu Display of Setup Parameter" /></td>
</tr>
<tr>
<td><strong>Parameter Setting Display</strong></td>
<td>The following is the Display for displaying and setting a parameter. The parameters have three types of display levels; Easy setting mode, Standard setting mode, and Professional setting mode. The parameters to be displayed can be limited according to the setting of the parameter display level. The scrolling guide for the parameter is displayed on PV display. The guide display can be turned on/off with the Fn key.</td>
</tr>
<tr>
<td></td>
<td><strong>Parameter Setting Display (Example of Operation Parameter Setting Display)</strong></td>
</tr>
<tr>
<td></td>
<td>The scrolling guide for the parameter is displayed.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Parameter Setting Display" /></td>
</tr>
</tbody>
</table>
Display Shown at the End (the Lowest Level) of the Parameter Setting Display
As shown in the figure below, the END Display is shown to indicate the end of the Menu Display and Parameter Setting Display. There are no setting items.

Basic Key Operation Sequence

- **To move to the Setup Parameter Setting Display**
  Hold down the PARAMETER (or PARA) key and the Left arrow key simultaneously for 3 seconds.

- **To move to the Operation Parameter Setting Display**
  Hold down the PARAMETER (or PARA) key for 3 seconds.

- **To move to the Operation Display**
  Press the DISPLAY (or DISP) key once.
4.2 How to Set Parameters

The following operating procedure describes an example of setting alarm setpoint (A1).

**Operation**

1. Hold down the **PARAMETER** key for 3 seconds in the Operation Display to call up the **[MODE]** Menu Display.

2. Press the **Right arrow** key to display the **[SP]** Menu Display.

3. Press the **SET/ENTER** key to display the **[SP]** Parameter Setting Display.

4. Press the **Down arrow** key to display the **[A1]** Parameter Setting Display.
5. Press the SET/ENTER key to blink the setpoint.

6. Press the Up or Down arrow key to change the setpoint.

7. Press the SET/ENTER key to register the setpoint (the setpoint stops blinking).

8. Press the PARAMETER key once to return to the Menu Display. Press the DISPLAY key once to return to the Operation Display.

This completes the setting procedure.

How to Cancel Parameter Setting
To cancel parameter setting when a parameter is being set (setpoint is blinking), press the PARAMETER key once.
4.2 How to Set Parameters

How to Set Parameter Setpoint

Numeric Value Setting

1. Display the Parameter Setting Display.
2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).
3. Press the Left arrow key to move one digit to the left. (Press the Right arrow key to move one digit to the right.)
4. Press the Up or Down arrow key to change the setpoint. Press the Up arrow key when 9 is displayed to move one digit to the left. Press the Down arrow key when 0 is displayed to move one digit to the right.
5. Press the SET/ENTER key to register the setpoint.

Selection Data Setting

1. Display the Parameter Setting Display.
2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).
3. Press the Up arrow key to change the setpoint (press the Down arrow key to change the setpoint).
4. Press the SET/ENTER key to register the setpoint.
4.2 How to Set Parameters

Time (minute.second) Setting

Example of 17 minutes 59 seconds

1. Display the Parameter Setting Display.

2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).

3. Press the Left arrow key to move one digit to the left. (press the Right arrow key to move one digit to the right.)

4. Press the Up or Down arrow key to change the setpoint. Press the Up arrow key when 5 is displayed to move one digit to the left. Press the Down arrow key when 0 is displayed to move one digit to the right.

5. Press the SET/ENTER key to register the setpoint.
5.1 Setting Using Quick Setting Function

**Description**

The Quick setting function is a function to easily set the basic function of the controller. The Quick setting function starts when the power is turned on after wiring.

The Quick setting function can be used only when the control mode is Single-loop control. In other control modes, set the functions without using the Quick setting function.

The following lists the items to set using the Quick setting function.

1. Control type (PID control, Heating/cooling control, etc.)
2. Input function (PV input, range, scale (at voltage/current input), etc.)
3. Output function (control output type and cycle time)
5.1 Setting Using Quick Setting Function

Flowchart of Quick Setting Function

1. **Power ON**
   - Decide whether or not to use the Quick setting function.
   - Press the UP or Down arrow key to select YES.
   - Press the SET/ENTER key to start the Quick setting function.
   - Press the UP or Down arrow key to select NO.
   - Press the SET/ENTER key not to start the Quick setting function.
   - The Operation Display is displayed.

2. **Select YES. Press the SET/ENTER key.**
   - The Quick setting function is started.
   - The parameter CNT (control type) is displayed first.

   **Setting Method**
   1. Press the Up or Down arrow key to display a parameter to set.
   2. Press the SET/ENTER key. (The setpoint blinks).
   3. Press the UP or Down arrow key to change a setpoint.
   4. Press the SET/ENTER key to register the setpoint. (The setpoint stops blinking.)

3. **Each parameter is displayed in turn. See Setting Details described later.**
   - Finally EXIT is displayed.
   - Select YES and press the SET/ENTER key to complete the setup of basic functions.
   - The Operation Display is displayed.
   - Select NO to continue the Quick setting function.

4. **NO**
   - **Select NO. Press the SET/ENTER key.**
   - *If NO is selected and the parameter IN (PV input type) is set to OFF, the Quick setting function starts when the power is turned on again.*

5. **Operation Display**
   - PV is displayed.
   - SP is displayed.
5.1 Setting Using Quick Setting Function

Setting Example
Set the following parameters to set to PID control, thermocouple Type K (range: 0.0 to 500.0°C), and current control output. No need to change the parameters other than the following parameters.

Set QSM = YES to enter the quick setting mode.

1. Set CNT = PID.
2. Set IN = K1.
3. Set UNIT = C (initial value).
4. Set RH = 500.0.
5. Set RL = 0.0.
6. Set OT = 00.02

Set EXIT = YES to quit the quick setting mode.
The Operation Display is shown.

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| CNT          | Control type     | EASY       | PID: PID control
ONOF: ON/OFF control (1 point of hysteresis)
ONOF2: ON/OFF control (2 points of hysteresis)
2P2L: Two-position two-level control
H/C: Heating/cooling control
S-PI: Sample PI control
BATCH: Batch PID control
FFPID: Feedforward control |

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

► Control type: 8.2 Setting Control Type (CNT)
### 5.1 Setting Using Quick Setting Function

#### Input Function

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| IN               | PV input type | EASY | OFF: Disable  
K1: -270.0 to 1370.0 °C / -450.0 to 2500.0 °F  
K2: -270.0 to 1000.0 °C / -450.0 to 2000.0 °F  
K3: -200.0 to 500.0 °C / -300.0 to 1000.0 °F  
L: -200.0 to 1200.0 °C / -300.0 to 2300.0 °F  
T1: -270.0 to 400.0 °C / -450.0 to 750.0 °F  
T2: 0.0 to 400.0 °C / -200.0 to 750.0 °F  
B: 0.0 to 1800.0 °C / 32 to 3300 °F  
S: 0.0 to 1700.0 °C / 32 to 3100 °F  
R: 0.0 to 1700.0 °C / 32 to 3100 °F  
N: -200.0 to 1300.0 °C / -300.0 to 2400.0 °F  
E: -270.0 to 1000.0 °C / -450.0 to 1800.0 °F  
L: -200.0 to 900.0 °C / -300.0 to 1600.0 °F  
U1: -200.0 to 400.0 °C / -300.0 to 750.0 °F  
U2: 0.0 to 400.0 °C / -200.0 to 1000.0 °F  
W: 0.0 to 2300.0 °C / 32 to 4200 °F  
PL2: 0.0 to 1390.0 °C / 32.0 to 2500.0 °F  
P2040: 0.0 to 1900.0 °C / 32 to 3400 °F  
WRE: 0.0 to 2000.0 °C / 32 to 3600 °F  
JPT1: -200.0 to 500.0 °C / -300.0 to 1000.0 °F  
JPT2: -150.0 to 150.0 °C / -200.0 to 300.0 °F  
PT1: -200.0 to 850.0 °C / -300.0 to 1500.0 °F  
PT2: -200.0 to 500.0 °C / -300.0 to 1000.0 °F  
PT3: -150.00 to 150.00 °C / -200.0 to 300.0 °F  
0.4-2V: 0.400 to 2.000 V  
1-5V: 1.000 to 5.000 V  
4-20: 4.00 to 20.00 mA  
0-2V: 0.000 to 2.000 V  
0-10V: 0.000 to 10.00 V  
0-20: 0.00 to 20.00 mA  
-1020: -10.00 to 20.00 mV  
0-100: 0.0 to 100.0 mV | PV Set |
| UNIT             | PV input unit | EASY | -: No unit  
C: Degree Celsius  
- -: No unit  
- - -: No unit  
F: Degree Fahrenheit |  |
| RH               | Maximum value of PV input range | EASY | Depends on the input type.  
- For temperature input -  
Set the temperature range that is actually controlled. (RL<RH)  
- For voltage / current input -  
Set the range of a voltage / current signal that is applied.  
The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL=RH.) |  |
| RL               | Minimum value of PV input range | EASY |  |

Note1: W: W-5% Re/W-26% Re (Hoskins Mfg. Co.). ASTM E988  
WRE: W97Re3-W75Re25
## 5.1 Setting Using Quick Setting Function

### Input Function (Continued)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDP</td>
<td>PV input scale decimal point position</td>
<td>EASY</td>
<td>0: No decimal place  1: One decimal place  2: Two decimal places  3: Three decimal places  4: Four decimal places</td>
<td>PV Set</td>
</tr>
<tr>
<td>SH</td>
<td>Maximum value of PV input scale</td>
<td>EASY</td>
<td>-19999 to 30000, (</td>
<td>SH - SL</td>
</tr>
<tr>
<td>SL</td>
<td>Minimum value of PV input scale</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

► Input setting: 7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

### Output Function

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| OT               | Output type selection                     | EASY          | Control output or Heating-side control output (Lower two digits)  00: OFF  01: OUT terminals (voltage pulse)  02: OUT terminals (current)  03: OUT terminals (relay)  04: OUT2 terminals (voltage pulse)  05: OUT2 terminals (current)  06: OUT2 terminals (relay)  
Cooling-side control output (Upper two digits)  00: OFF  01: OUT terminals (voltage pulse)  02: OUT terminals (current)  03: OUT terminals (relay)  04: OUT2 terminals (voltage pulse)  05: OUT2 terminals (current)  06: OUT2 terminals (relay) | OUT Set     |
| CT               | Control output cycle time Heating-side control output cycle time (in Heating/cooling control) | EASY          | 0.5 to 1000.0 s                                    |             |
| CTc              | Cooling-side control output cycle time    | EASY          |                                                   |             |

► Output type: 10.1 Setting Control Output Type
► Cycle time: 10.2 Setting Control Output Cycle Time
5.2 Restarting Quick Setting Function

Once functions have been built using the Quick setting function, the Quick setting function does not start even when the power is turned on. The following methods can be used to restart the Quick setting function.

- Set the parameter QSM (Quick setting mode) to ON and turn on the power again.
- Set the parameter IN (PV input type) to OFF and turn on the power again.

---

**CAUTION**

The parameters related to the range or scale such as alarm setpoints are initialized if the control type is changed. Changing the control mode (CTLM) allows you to restart the Quick setting function. However, be careful because some parameters will be initialized.

---

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| IN               | PV input type     | EASY          | OFF: Disable        | PV  
| QSM              | Quick setting mode| EASY          | OFF: Disable, ON: Enable | SYS  

---
6.1 Monitoring and Control of Operation Displays

6.1.1 Operation Display Transitions in Single-loop Control, Cascade Primary-loop Control, Cascade Secondary-loop Control, Loop Control for Backup, and Loop Control with PV-hold Function.

(The displays only for the Standard type are displayed in Cascade primary-loop control.)

- Display/Non-display of Operation Display: 13.3.5 Setting Display/Non-display of Operation Display
- Registration of SELECT Display: 13.1.3 Registering SELECT Display (Up to 5 displays)

Standard Type

- SP Display (SP can be changed.)
- OUT Display (OUT can be changed in MAN mode.)
- PID Number Display (display only) (Factory default: non-display)
- Heater Break Alarm-1 Current Display (display only) (Only for Heater break alarm option)
- Heater Break Alarm-2 Current Display (display only) (Only for Heater break alarm option)
- SELECT Displays 1 to 5 (Displayed only when SELECT Display is registered. (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
6.1 Monitoring and Control of Operation Displays

Position Proportional Type

SP Display (SP can be changed.)

Valve Position Display (display only)

Position Proportional Computation Output Display
(Factory default: non-display)

PID Number Display (display only)
(Factory default: non-display)

SELECT Displays 1 to 5
(Displayed only when SELECT Display is registered.)
(The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
6.1 Monitoring and Control of Operation Displays

Heating/cooling Type

SP Display (SP can be changed.)

Heating/cooling OUT Display (OUT can be changed in MAN mode.)
C: cooling-side output, H: heating-side output

PID Number Display (display only)
(Factory default: non-display)

SELECT Displays 1 to 5
(Displayed only when SELECT Display is registered.)
(The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
6.1 Monitoring and Control of Operation Displays

Single-loop Two-position two-level control

- **SP Display** (SP can be changed.)
- **OUT Display** (Main setting-side OUT can be changed in MAN mode.)
- **OUT Display** (Sub-setting-side OUT can be changed in MAN mode.)
- **PID Number Display** (display only) (Factory default: non-display)
- **Heater Break Alarm-1 Current Display** (display only) (Only for Heater break alarm option)
- **Heater Break Alarm-2 Current Display** (display only) (Only for Heater break alarm option)
- **SELECT Displays 1 to 5** (Displayed only when SELECT Display is registered.) (The figure on the left is the example of the parameter A1 (alarm-1 setpoint)).
6.1.2 Operation Display Transitions in Loop Control with PV Switching and Loop Control with PV Auto-selector

- Display/non-display of Operation Display: 13.3.5 Setting Display/Non-display of Operation Display
- Registration of SELECT Display: 13.1.3 Registering SELECT Display (Up to 5 Displays)

**Standard Type**

![Diagram of display transitions]

- **SP Display** (SP can be changed.)
- **OUT Display** (OUT can be changed in MAN mode.)
- **PID Number Display** (display only) (Factory default: non-display)
- **Heater Break Alarm-1 Current Display** (display only) (Only for Heater break alarm option)
- **Heater Break Alarm-2 Current Display** (display only) (Only for Heater break alarm option)
- **Analog Input Displays** (display only)
  - PV: PV analog input
  - RSP: RSP analog input (E1-terminal area)
  - AIN2: AIN2 analog input (E2-terminal area)
  - AIN4: AIN4 analog input (E4-terminal area)
- **SELECT Displays 1 to 5** (Displayed only when SELECT Display is registered.) (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
6.1 Monitoring and Control of Operation Displays

Position Proportional Type

- **SP Display**: (SP can be changed.)
- **Valve Position Display**: (display only)
- **Position Proportional Computation Output Display**: (Factory default: non-display)
- **PID Number Display**: (display only) (Factory default: non-display)
- **Analog Input Displays**: (display only)
  - PV: PV analog input
  - RSP: RSP analog input (E1-terminal area)
  - AIN2: AIN2 analog input (E2-terminal area)
  - AIN4: AIN4 analog input (E4-terminal area)
- **SELECT Displays 1 to 5**: (Displayed only when SELECT Display is registered.) (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
6.1 Monitoring and Control of Operation Displays

Heating/cooling Type

- **SP Display (SP can be changed.)**
- **Heating/cooling OUT Display (OUT can be changed in MAN mode.)**
  - C: cooling-side output, H: heating-side output
- **PID Number Display (display only)**
  - Factory default: non-display
- **Analog Input Displays (display only)**
  - PV: PV analog input,
  - RSP: RSP analog input (E1-terminal area),
  - AIN2: AIN2 analog input (E2-terminal area),
  - AIN4: AIN4 analog input (E4-terminal area)
- **SELECT Displays 1 to 5**
  - Displayed only when SELECT Display is registered.
  - The figure on the left is the example of the parameter A1 (alarm-1 setpoint).
6.1.3 Operation Display Transitions in Cascade Control

- Display/non-display of Operation Display: 13.3.5 Setting Display/Non-Display of Operation Display
- Registration of SELECT Display: 13.1.3 Registering SELECT Display (Up to 5 Displays)

**Standard Type**

When the operation mode is Cascade:

1. **Loop-1 SP Display** (SP can be changed.)
   - PV display: Loop-1 PV

2. **Loop-2 OUT Display** (display only)
   - PV display: Loop-1 PV
   - LP2 lamp is lit.

3. **Loop-1 OUT Display** (display only)
   - (Factory default: non-display)
   - PV display: Loop-1 PV
   - Setpoint display: Loop-1 OUT

4. **Loop-1 PID Number Display** (display only)
   - (Factory default: non-display)
   - PV display: Loop-1 PV

5. **Heater Break Alarm-1 Current Display** (display only)
   - (Only for Heater break alarm option)
   - PV display: Loop-1 PV

6. **Heater Break Alarm-2 Current Display** (display only)
   - (Only for Heater break alarm option)
   - PV display: Loop-1 PV

7. **Loop-1/Loop-2 PV Display** (display only)
   - PV display: Loop-1 PV
   - Setpoint display: Loop-2 PV
   - LP2 lamp is lit.

8. **SELECT Displays 1 to 5**
   - (Displayed only when SELECT Display is registered.)
   - (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
   - PV display: Loop-1 PV
When the operation mode is AUTO or MAN:

- **Loop-2 SP Display** (SP can be changed.)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- **Loop-2 OUT Display** (OUT can be changed.)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- **Loop-1 PID Number Display** (display only)
  - (Factory default: non-display)
  - PV display: Loop-2 PV

- **Heater Break Alarm-1 Current Display** (display only)
  - (Only for Heater break alarm option)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- **Heater Break Alarm-2 Current Display** (display only)
  - (Only for Heater break alarm option)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- **Loop-2/Loop-1 PV Display** (display only)
  - PV display: Loop-2 PV
  - Setpoint display: Loop-1 PV

- **SELECT Displays 1 to 5**
  - (Displayed only when SELECT Display is registered.)
  - (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
  - PV display: Loop-2 PV
6.1 Monitoring and Control of Operation Displays

Position Proportional Type

When the operation mode is Cascade:

- Loop-1 SP Display (SP can be changed.)
  PV display: Loop-1 PV

- Valve Position Display (display only)
  PV display: Loop-1 PV
  LP2 lamp is lit.

- Position Proportional Computation Output Display
  (Factory default: non-display)
  PV display: Loop-1 PV
  LP2 lamp is lit.

- Loop-1 OUT Display (display only)
  (Factory default: non-display)
  PV display: Loop-1 PV
  Setpoint display: Loop-1 OUT

- Loop-1 PID Number Display (display only)
  (Factory default: non-display)
  PV display: Loop-1 PV

- Loop-1/Loop-2 PV Display (display only)
  PV display: Loop-1 PV
  Setpoint display: Loop-2 PV, LP2 lamp is lit.

- SELECT Displays 1 to 5
  (Displayed only when SELECT Display is registered.)
  (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
  PV display: Loop-1 PV
6.1 Monitoring and Control of Operation Displays

When the operation mode is AUTO or MAN:

- Loop-2 SP Display (SP can be changed.)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- Valve Position Display (display only)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- Position Proportional Computation Output Display
  - (Factory default: non-display)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- Loop-1 PID Number Display (display only)
  - (Factory default: non-display)
  - PV display: Loop-2 PV

- Loop-2 PID Number Display (display only)
  - (Factory default: non-display)
  - PV display: Loop-2 PV
  - LP2 lamp is lit.

- Loop-2/Loop-1 PV Display (display only)
  - PV display: Loop-2 PV
  - Setpoint display: Loop-1 PV

- SELECT Displays 1 to 5
  - (Displayed only when SELECT Display is registered.)
  - (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
  - PV display: Loop-2 PV
6.1 Monitoring and Control of Operation Displays

**Heating/cooling Type**

When the operation mode is Cascade:

- Loop-1 SP Display (SP can be changed.)
  - PV display: Loop-1 PV

- Loop-2 Heating/cooling OUT Display (OUT can be changed.)
  - PV display: Loop-1 PV
  - C: cooling-side OUT, H: heating-side OUT
  - LP2 lamp is lit.

- Loop-1 Heating-side OUT Display (display only)
  - (Factory default: non-display)
  - PV display: Loop-1 PV
  - Setpoint display: Loop-1 OUT

- Loop-1 PID Number Display (display only)
  - (Factory default: non-display)
  - PV display: Loop-1 PV

- Loop-1/Loop-2 PV Display (display only)
  - PV display: Loop-1 PV
  - LP2 lamp is lit.

- SELECT Displays 1 to 5
  - (Displayed only when SELECT Display is registered.)
  - (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
  - PV display: Loop-1 PV
When the operation mode is AUTO or MAN:

**Loop-2 SP Display** (SP can be changed.)
- PV display: Loop-2 PV
- LP2 lamp is lit.

**Loop-2 Heating/cooling OUT Display** (OUT can be changed.)
- PV display: Loop-2 PV
- C: cooling-side OUT, H: heating-side OUT
- LP2 lamp is lit.

**Loop-1 PID Number Display** (display only)
- (Factory default: non-display)
- PV display: Loop-2 PV

**Loop-2 PID Number Display** (display only)
- (Factory default: non-display)
- PV display: Loop-2 PV
- LP2 lamp is lit.

**Loop-2/Loop-1 PV Display** (display only)
- PV display: Loop-2 PV

**SELECT Displays 1 to 5**
- (Displayed only when SELECT Display is registered.)
- (The figure on the left is the example of the parameter A1 (alarm-1 setpoint).)
- PV display: Loop-2 PV
# 6.1 Monitoring and Control of Operation Displays

## Details of the Operation Display

The following is the Operation Display types and each display and operation description.

<table>
<thead>
<tr>
<th>Operation Display</th>
<th>Display and operation description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV display</td>
<td>Displays measured input value (PV).</td>
</tr>
<tr>
<td>Setpoint display</td>
<td></td>
</tr>
</tbody>
</table>

The Display is switched to the SP Display if the operation mode is switched to AUTO, CAS, LCL, or REM when other Operation Display is shown.

**[SP Change Operation]**

1. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).
2. Use the Left or Right arrow key to move between digits (the setpoint blinks).
3. Use the UP or Down arrow key to change the value (the setpoint blinks).
4. Press the SET/ENTER key to register the setpoint. (the setpoint stops blinking).

* Only Up or Down arrow key operation is also possible.

When the operation mode is remote (REM lamp is lit):

When the control mode is Cascade secondary-loop control and the operation mode is cascade (CAS lamp is lit):

When the control mode is Cascade secondary-loop control and the operation mode is AUTO or MAN, the Loop-2 SP is displayed.
## 6.1 Monitoring and Control of Operation Displays

(Continued)

<table>
<thead>
<tr>
<th>Operation Display</th>
<th>Display and operation description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV display: Displays measured input value (PV).</td>
<td>Setpoint display: Displays control output value and changes control output value in MAN mode.</td>
</tr>
</tbody>
</table>

### OUT Display

**Valve Position Display**

Displays the valve’s feedback input value (at 0 to 100% valve opening) in Position proportional control.

The Display is switched to the OUT Display if the operation mode is switched to MAN when other Operation Display is shown.

The Display is switched to the OUT Display while auto-tuning is performed.

Sub-setting-side output in Two-position two-level control is displayed as below. Main setting-side output is displayed as above.

#### [OUT Change Operation]

The control output value can be changed with the Up or Down arrow key in MAN mode (MAN lamp is lit).

The control output value is changed by direct operation (without pressing the SET/ENTER key), and cannot be changed by moving between digits using the Left and Right arrow keys.

In Position proportional control and in MAN mode, the valve opens as long as the Up arrow key is being pressed, and closes as long as the Down arrow key is being pressed.

In Two-position two-level control, main setting-side output and sub-setting-side output can be manipulated individually.

When in STOP mode (STOP lamp is lit):

In Two-position two-level control (STOP lamp is lit):

Preset output value is displayed in STOP mode.

Preset output values cannot be changed by OUT change operation.
6.1 Monitoring and Control of Operation Displays

(Continued)

<table>
<thead>
<tr>
<th>Operation Display</th>
<th>Display and operation description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV display: Displays measured input value (PV). Setpoint display: Displays heating-side and cooling-side control output value and changes control output value in MAN mode.</td>
<td></td>
</tr>
<tr>
<td><img src="image_url" alt="Digital Display Diagram" /></td>
<td></td>
</tr>
<tr>
<td>Heating-side control output</td>
<td></td>
</tr>
<tr>
<td>Symbol of heating side</td>
<td></td>
</tr>
<tr>
<td>Cooling-side control output</td>
<td></td>
</tr>
<tr>
<td>Symbol of cooling side</td>
<td></td>
</tr>
<tr>
<td>Target setpoint (SP) number</td>
<td></td>
</tr>
</tbody>
</table>

When the control output value is less than 100%, one digit is displayed to the right of the decimal point. When the control output value is equal to or more than 100%, no digits are displayed to the right of the decimal point. The display is switched to the Heating/cooling OUT Display if the operation mode is switched to MAN when other Operation Display is shown. An interruption is displayed while auto-tuning is performed.

[OUT Change Operation]
In MAN mode (MAN lamp is lit) pressing the Up arrow key causes the cooling-side output to decrease, and the heating-side output to increase. Pressing the Down arrow key causes the cooling-side output to increase, and the heating-side output to decrease. The control output value is changed by direct operation (without pressing the SET/ENTER key), and cannot be changed by moving between digits using the Left and Right arrow keys.

When in STOP mode (STOP lamp is lit):

![Digital Display Diagram](image_url) |
| Heating-side preset output |
| Symbol of STOP |
| Cooling-side preset output |
| Target setpoint (SP) number |

Heating-side or cooling-side preset output value is displayed in STOP mode. Preset output values cannot be changed by OUT change operation. Loop-2 output value is always displayed in Cascade control.
### 6.1 Monitoring and Control of Operation Displays

#### (Continued)

<table>
<thead>
<tr>
<th>Operation Display</th>
<th>Display and operation description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PID Number Display</strong></td>
<td>PV display: Displays measured input value (PV). Setpoint display: Displays PID number currently being used. Loop-1 PID number is displayed when the control mode is Cascade control and the operation mode is cascade. Loop-2 PID number is displayed when the control mode is Cascade control and the operation mode is AUTO or MAN.</td>
</tr>
<tr>
<td><strong>PV1/PV2 Display</strong></td>
<td>The following is the Display shown when the control mode is cascade. PV display and Setpoint display: Displays Loop-1 PV input and Loop-2 PV input. When the control mode is Cascade control and the operation mode is cascade (CAS lamp is lit): Loop-1 PV input Target setpoint (SP) number PV2 Symbol</td>
</tr>
</tbody>
</table>
### 6.1 Monitoring and Control of Operation Displays

(Continued)

<table>
<thead>
<tr>
<th>Operation Display</th>
<th>Display and operation description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analog Input Display</strong></td>
<td>PV display: Displays measured input value (PV). Setpoint display: Displays PV, RSP, AIN2, or AIN4 analog input value. AIN2 auxiliary analog input value</td>
</tr>
<tr>
<td><img src="image" alt="AIN2 Display" /></td>
<td>Symbol AIN2 input Target setpoint (SP) number</td>
</tr>
<tr>
<td>AIN4 auxiliary analog input value</td>
<td><img src="image" alt="AIN4 Display" /> Symbol AIN4 input Target setpoint (SP) number</td>
</tr>
<tr>
<td><strong>Position Proportional Computation Output Display</strong></td>
<td>PV display: Displays measured input value (PV). Setpoint display: Displays position proportional computation output value (internal computed value). Can be changed in MAN mode. The valve opens or closes so that the valve’s feedback input value reaches the setpoint.</td>
</tr>
<tr>
<td><img src="image" alt="Position Display" /></td>
<td>Symbol Internal computed value Target setpoint (SP) number</td>
</tr>
<tr>
<td><strong>Heater Break Alarm Current Display</strong></td>
<td>PV display: Displays measured input value (PV). Setpoint display: Displays measured heater current.</td>
</tr>
<tr>
<td><img src="image" alt="Heater Display" /></td>
<td>Symbol Heater break current measured value Target setpoint (SP) number</td>
</tr>
<tr>
<td><strong>SELECT Display</strong></td>
<td>SELECT Display is for registering frequently-used parameters from Parameter Setting Display, and for displaying them on Operation Display so that the parameter settings can be easily changed in normal operation. PV display: Displays measured input value (PV). Setpoint display: Displays and changes the registered parameter. The following is the display example when the parameter A1 (alarm-1 setpoint) is registered.</td>
</tr>
<tr>
<td><img src="image" alt="SELECT Display" /></td>
<td>Symbol Alarm setpoint Target setpoint (SP) number</td>
</tr>
</tbody>
</table>
6.2 Setting Target Setpoint

Operation in the Operation Display

1. Bring the SP Display into view.

2. Press the SET/ENTER key to move to the setting mode (the setpoint blinks).

3. Press the Left arrow key to move one digit to the left. (Press the Right arrow key to move one digit to the right.

4. Press the Up or Down arrow key to change a setpoint. Press the Up arrow key when 9 is displayed to move one digit to the left. Press the Down arrow key when 0 is displayed to move one digit to the right.

5. Press the SET/ENTER key to register the setpoint. Control with the new setpoint.
6.2 Setting Target Setpoint

Operation in Parameter Setting Display

**Setting Display**

Parameter Setting Display

- Operation Display > **PARAMETER** or **PARA** key for 3 seconds (to [MODE] Menu Display) > Right arrow key (to [SP] Menu Display) > **SET/ENTER** key (The setting parameter is displayed.)

- Press the Right arrow key until the [SP] Menu Display appears.

- In the Setting Display for the target setpoint parameter, pressing the Left or Right arrow keys changes the group. (The group number is displayed on Group display.)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SP</strong></td>
<td>Target setpoint</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)</td>
<td><strong>SP</strong> Gpe</td>
</tr>
<tr>
<td><strong>SPGR.</strong></td>
<td>Number of SP groups</td>
<td>STD</td>
<td>1 to 8</td>
<td><strong>CTL</strong> Set</td>
</tr>
</tbody>
</table>

**Note1:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note2:** If the SP limiter is set, the setting can be made within the range of the SP limiter.

**Description**

The controller has eight target setpoints (SP).

- In Cascade control, both Loop1 and Loop 2 have eight target setpoints.

- **SP limiter:** 9.1 Setting SP Limiter
- **SELECT parameter:** 13.1.5 Registering SELECT Parameter Display (Up to 10 Displays)
6.3 Performing and Canceling Auto-tuning

Setting Display

Operation Display > PARAMETER or PARA key for 3 seconds (to [MODE] Menu Display) > SET/ENTER key (The operation mode is displayed.) > Down arrow key (The operation mode is displayed.)

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| AT               | AUTO-tuning switch       | EASY          | OFF: Disable  
1: Perform auto-tuning. Tuning result is stored in the PID of group 1. 
2: Perform auto-tuning. Tuning result is stored in the PID of group 2. 
3: Perform auto-tuning. Tuning result is stored in the PID of group 3. 
4: Perform auto-tuning. Tuning result is stored in the PID of group 4. 
5: Perform auto-tuning. Tuning result is stored in the PID of group 5. 
6: Perform auto-tuning. Tuning result is stored in the PID of group 6. 
7: Perform auto-tuning. Tuning result is stored in the PID of group 7. 
8: Perform auto-tuning. Tuning result is stored in the PID of group 8. 
R: Tuning result is stored in the PID for reference deviation. | MODE Ope |

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**CAUTION**

Set the operation mode to AUTO and RUN to perform auto-tuning.
6.3 Performing and Canceling Auto-tuning

**Lamp Status**

<table>
<thead>
<tr>
<th>Status</th>
<th>STOP lamp</th>
<th>CAS lamp</th>
<th>MAN lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>During auto-tuning</td>
<td>Unlit</td>
<td>Unlit</td>
<td>Blinking</td>
</tr>
</tbody>
</table>

In Cascade control, perform Loop-2 auto-tuning in AUTO and RUN modes, then Loop-1 auto-tuning in Cascade and RUN modes.

**Lamp Status**

<table>
<thead>
<tr>
<th>Status</th>
<th>STOP lamp</th>
<th>CAS lamp</th>
<th>MAN lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>During auto-tuning of Loop-2</td>
<td>Unlit</td>
<td>Unlit</td>
<td>Blinking</td>
</tr>
<tr>
<td>During auto-tuning of Loop-1</td>
<td>Unlit</td>
<td>Lit</td>
<td>Blinking</td>
</tr>
</tbody>
</table>

**Description**

Auto-tuning is a function with which the controller automatically measures the process characteristics and sets PID constants, which are control-related parameters, to optimum values for the setpoint. Auto-tuning temporarily executes ON/OFF control, calculates appropriate PID constants from response data obtained, and sets these constants.

**CAUTION**

Do not perform auto-tuning for the following processes.

- Tune PID manually.
- Processes with fast response such as flow rate control and pressure control.
- Processes which do not allow the output to be turned on and off even temporarily.
- Processes which prohibit output changes at control valves (or other actuators).
- Processes in which product quality can be adversely affected if PV values fluctuate beyond their allowable ranges.
6.3 Performing and Canceling Auto-tuning

### Tuning Point and Storage Location of Tuning Results

The tuning point when performing auto-tuning is the target setpoint that is currently used for control computation.

PID constants after the tuning are stored in the PID group that is specified when performing auto-tuning.

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>AT setpoint</th>
<th>Tuning point</th>
<th>Storage location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local</td>
<td>1 to 8, R</td>
<td>Setpoint that is currently used</td>
<td>P, I, and D of the PID group specified in AT. In Heating/cooling control: P, I, D, Pc, Ic, and Dc</td>
</tr>
<tr>
<td>Remote</td>
<td>1 to 8, R</td>
<td>Remote setpoint</td>
<td>P, I, and D of the PID group specified in AT. In Heating/cooling control: P, I, D, Pc, Ic, and Dc</td>
</tr>
</tbody>
</table>

When the setpoint of AT is “R,” the AT result is stored in the PID group for reference deviation.

Auto-tuning cannot be performed when the control type (CNT) is as follows.
- ON/OFF control (1 point of hysteresis)
- ON/OFF control (2 points of hysteresis)
- Two-position two-level control
- Sample PI control

In addition, auto-tuning cannot be performed in the following cases (no error indication).
- Input error occurs. (Input burnout, ADC error, etc.)
- The operation mode is STOP.
- The operation mode is MAN.
- Output limiter setpoint at auto-tuning: AT.OL ≥ AT.OH

### Start and Stop of Auto-tuning

Start and stop of auto-tuning can be set by parameter setting, communication, or contact input.

Auto-tuning is stopped in the following cases.
- Switch to MAN
- Switch to STOP
- The parameter AT is set to OFF.
- Power failure
- Auto-tuning is not finished even after the time-out detection time is elapsed.

The time-out detection time is about 24 hours.

When the auto-tuning error occurs, the error code is shown in the Operation Display. Press any key to erase it.

► Auto-tuning time output limiter and auto-tuning execution time shortening: 8.8 Adjusting Auto-tuning Operation
6.4 Adjusting PID Manually

### Setting Display

Parameter Setting Display

Operation Display > PARAMETER or PARA key for 3 seconds (to [MODE] Menu Display) > Right arrow key (to [PID] Menu Display) > SET/ENTER key (The setting parameter is displayed.) > Down arrow key (The setting parameter is displayed.)

In the Setting Display for the PID parameters, Displays can be arbitrarily switched using the Up, Down, Left or Right arrow key. Pressing the Left or Right arrow key changes the group. (The group number is displayed on Group display.)

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Proportional band Heating-side proportional band (in Heating/cooling control)</td>
<td>EASY</td>
<td>0.0 to 999.9% When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>Integral time Heating-side integral time (in Heating/cooling control)</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td>PID Op</td>
</tr>
<tr>
<td>D</td>
<td>Derivative time Heating-side derivative time (in Heating/cooling control)</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>Pc</td>
<td>Cooling-side proportional band</td>
<td>EASY</td>
<td>0.0 to 999.9% Cooling-side ON/OFF control applies when 0.0% in Heating/cooling control</td>
<td></td>
</tr>
<tr>
<td>Ic</td>
<td>Cooling-side integral time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>Dc</td>
<td>Cooling-side derivative time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Op</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
There are eight groups of PID parameters. In Cascade control, both Loop 1 and Loop 2 have eight groups.

The PID parameters can be selected by using the following two methods:

(1) **SP group number selection**

The PID group which is set in the PID number selection (PIDN) of each SP group is used.

<table>
<thead>
<tr>
<th>SP number (SPNO)</th>
<th>Target setpoint (SP)</th>
<th>Setting range of PID number selection (PIDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>2</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>3</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>4</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>5</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>6</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>7</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>8</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
</tbody>
</table>

When the SP parameter is displayed, the SP number is shown on Group display. When the PID parameters are displayed, the PID number is shown on Group display.

- Selection by keystroke: 6.6 Selecting Target Setpoint Number (SPNO)
- Selection by contact input: 12.1 Setting Contact Input Function

(2) **Zone PID selection**

- Selection by each Zone: 8.4 Switching PID
Description and Tuning of Proportional Band

The proportional band is defined as the amount of change in input (or deviation), as a percent of span, required to cause the control output to change from 0% to 100%. Because a narrower proportional band gives greater output change for any given deviation, it therefore also makes the control performance more susceptible to oscillation. At the same time, a narrower proportional band reduces the offset. Reducing the proportional band to its smallest limit (proportional band = 0%) results in ON/OFF control.

\[
\text{Output} = \frac{100}{P} e
\]

(Example of reverse action)

To fine-tune a proportional band obtained using auto-tuning, or to manually tune the proportional band:

- Work from larger to smaller numbers (wider to narrower).
- If cycling appears, that means that the proportional band is too narrow.
- Proportional band tuning cannot cancel an offset.

If \( P \) is too small, oscillation will appear in the measured temperature.

Offset: 10.8 Canceling Offset of PV and SP (Manual Reset)
Description and Tuning of Integral Time

The integral action (I action) is a function that will automatically diminish the offset (steady-state deviation) that is inherently unavoidable with proportional action alone. The integral action continuously increases or decreases the output in proportion to the time integral of the deviation (the product of the deviation and the time that the deviation continues.)

The integral action is normally used together with proportional action as proportional-plus-integral action (PI action).

The integral time (I) is defined as the time required to develop, when a stepwise change in deviation is imposed, an output change due to integral action that is exactly equal to the change due to proportional action. The longer the integral time set, the slower the change in output; the smaller the time, the faster the output changes.

\[
\text{Output} = \frac{100}{P} \left( e + \frac{1}{T_1} \int e \, dt \right)
\]

\(P\) : Deviation
\(T_1\) : Integral time

To manually tune the integral time

- The main goal is to reduce the offset.
- Adjust from longer time to shorter time.
- If you see an oscillation at a longer period than that seen when the proportional band is too narrow, then you have made the integral time too short.

If I is too short, long-period oscillation will appear in the measured temperature.

Use the manual reset (MR) to cancel an offset when the integral action is disabled.

Manual reset: 10.8 Canceling Offset of PV and SP (Manual Reset)
6.4 Adjusting PID Manually

Description and Tuning of Derivative Time

If the control object has a large time constant or dead time, the corrective action will be too slow with proportional action or proportional-plus-integral action alone, causing overshoot. However, even just sensing whether the deviation is on an increasing or a decreasing trend and adding some early corrective action can improve the controllability. Thus the derivative action (D action) is action that changes the output in proportion to the deviation derivative value (rate-of-change).

The derivative time is defined as the time required with PD action to develop, when a constant-slope change in deviation is imposed, an output change due to derivative action that is exactly equal to the change due to proportional action.

\[
\text{Output} = \frac{100}{P} \left( e + \frac{d}{dt} \left( e \right) \right) \\
\]

\( P = 100\% \)

\( e \): Deviation

\( \frac{d}{dt} \): Derivative time

To manually tune the derivative time
• Adjust from shorter time to longer time.
• If you see a short-period oscillation, the time is too long.

The longer the derivative time set, the stronger the corrective action, and the more likely the output will become oscillatory. Oscillations due to derivative action are characterized by a short period.

D = OFF should always be used when controlling fast-responding inputs such as pressure and flow rate, or inputs characterized by rapid fluctuation, such as optical sensors.

\[ \text{Temperature} \]

If D is too large, short-period oscillation will appear in the measured temperature.
6.4 Adjusting PID Manually

Manual PID Tuning Procedure

(1) In principle, auto-tuning must be used.
(2) Tune PID parameters in the order of P, I, and D. Adjust a numeric slowly by observing the result, and keep notes of what the progress is.
(3) Gradually reduce P from a larger value. When the PV value begins to oscillate, stop tuning and increase the value somewhat.
(4) Also gradually reduce I from a larger value. When the PV value begins to oscillate (with long period), stop tuning and increase the value somewhat.
(5) Gradually increase D from a smaller value. When the PV value begins to oscillate (with short period), stop tuning and lower the value slightly.

Reference Values for Manual Tuning of Temperature, Pressure, and Flow Rate

<table>
<thead>
<tr>
<th></th>
<th>Setting range (reference)</th>
<th>Initial value for tuning (reference)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pressure</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>100 to 300%</td>
<td>200%</td>
</tr>
<tr>
<td>I</td>
<td>5 to 30 s</td>
<td>15 s</td>
</tr>
<tr>
<td>D</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td><strong>Flow rate</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>100 to 240%</td>
<td>150%</td>
</tr>
<tr>
<td>I</td>
<td>8 to 30 s</td>
<td>20 s</td>
</tr>
<tr>
<td>D</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td><strong>Temperature</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(electric furnace)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>1 to 20%</td>
<td>5%</td>
</tr>
<tr>
<td>I</td>
<td>180 to 600 s</td>
<td>240 s</td>
</tr>
<tr>
<td>D</td>
<td>1/4 to 1/6 of I</td>
<td>60 s</td>
</tr>
</tbody>
</table>
6.5 Setting Alarm Setpoint

Setting Display

Parameter Setting Display

Operation Display > PARAMETER or PARA key for 3 seconds (to [MODE] Menu Display) > Right arrow key (to [SP] Menu Display) > SET/ENTER key (The setting parameter is displayed.) > Down arrow key (The setting parameter is displayed.)

In the setting Display for the alarm parameters, Displays can be arbitrarily switched using the Up, Down, Left or Right arrow key. Pressing the Left or Right arrow key changes the group. (The group number is displayed on Group display.)

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 to A8</td>
<td>Alarm-1 to -8 setpoint</td>
<td>EASY</td>
<td>Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.)</td>
<td>SP</td>
</tr>
<tr>
<td>ALNO.</td>
<td>Number of alarms</td>
<td>PRO</td>
<td>1 to 8</td>
<td>CTL</td>
</tr>
</tbody>
</table>

Note1: When the alarm setpoint parameter is displayed, the group number is shown on Group display.
Note2: The initial value of the parameter ALNO. is "4." Four alarm setpoint parameters are displayed for each SP group.
Note3: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Description

Each alarm type has eight alarm setpoints.
In Cascade control, each alarm type has eight setpoints for Loop 1 and Loop 2, respectively.
Specifying the SP number (SPNO) determines the alarm setpoint to be used.

<table>
<thead>
<tr>
<th>Alarm-related parameter</th>
<th>Number of settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm type</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>PV velocity alarm time setpoint</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>Alarm hysteresis</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>Alarm delay timer</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>Alarm setpoint</td>
<td>8 (number of settings) x 2 (number of loops) x 8 (number of groups)</td>
</tr>
</tbody>
</table>

► Alarm type: Chapter 11 Alarm Functions
### 6.6 Selecting Target Setpoint Number (SPNO)

#### Setting Display

Parameter Setting Display

Operation Display > `PARAMETER` or `PARA` key for 3 seconds (to `[MODE]` Menu Display) > `SET/ENTER` key (The setting parameter is displayed.) > `Down arrow` key (The setting parameter is displayed.)

#### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNO.</td>
<td>SP number selection</td>
<td>EASY</td>
<td>1 to 8 (Depends on the setup parameter SPGR. setting.)</td>
<td>MODE Open</td>
</tr>
<tr>
<td>SPGR.</td>
<td>Number of SP groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

#### Description

The SP number (SPNO) selection can be used when the parameter ZON (zone PID selection) is set to “SP group number selection.”

**SP Group Number Selection**

The PID group which is set in the PID number selection (PIDN) of each SP group is used.

<table>
<thead>
<tr>
<th>SP number (SPNO)</th>
<th>Target setpoint (SP)</th>
<th>Setting range of PID number selection (PIDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>2</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>3</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>4</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>5</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>6</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>7</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
<tr>
<td>8</td>
<td>SP</td>
<td>1 to 8</td>
</tr>
</tbody>
</table>

When the SP parameter is displayed, the SP number is shown on Group display.

> Selection by contact input: 12.1 Setting Contact Input Function
6.7 Switching Operation Modes

6.7.1 Switching between AUTO and MAN

Direct Operation by A/M Key

**Operation**

MAN lamp is lit in MAN mode.

Each time you press the A/M key, AUTO and MAN is switched alternately.

**Description**

AUTO/MAN switching can be performed by any of the following:

1. A/M key
2. Contact input (status or edge)
3. Communication
4. User function key

When the contact input (status) is ON, operation cannot be performed by keystroke or communication.

When the contact input is OFF, and the setting is switched by keystroke or communication, the last switching operation is performed.

► Switch by contact input: 12.1 Setting Contact Input Function
► Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

<table>
<thead>
<tr>
<th>Switch</th>
<th>Output action</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO→MAN</td>
<td>Holds the control output value from AUTO mode.</td>
</tr>
<tr>
<td></td>
<td>The control output value can be bump to the manual preset output value by the</td>
</tr>
<tr>
<td></td>
<td>setting of parameter MPO.</td>
</tr>
<tr>
<td></td>
<td>The output value can be changed in manual mode.</td>
</tr>
<tr>
<td>MAN→AUTO</td>
<td>The control output value does not bump (bumpless). Does not work when integral time (I) = OFF.</td>
</tr>
</tbody>
</table>

► Switch from AUTO to MAN, and MPON: 10.12.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)
6.7 Switching Operation Modes

Operation Display in AUTO and MAN Modes
"OUT" is displayed on Symbol display and "Output value" is displayed on Data display in MAN mode. (The OUT Display is shown.)

Sub-setting-side OUT Display is shown in Two-position two-level control.

SP Display is shown in AUTO mode.

Operation Display in AUTO and MAN Modes in Heating/cooling Control
In MAN mode, the Display is as follows. Symbol "C" represents the cooling side and "H" represents the heating side. The value on the right of each symbol is the output value.

Lamp Status

<table>
<thead>
<tr>
<th>Status</th>
<th>MAN lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic operation (AUTO)</td>
<td>Unlit</td>
</tr>
<tr>
<td>Manual operation (MAN)</td>
<td>Lit</td>
</tr>
</tbody>
</table>
6.7 Switching Operation Modes

6.7.2 Switching between CAS (Cascade), AUTO, and MAN

**Setting Display**

Operation Mode Setting Display

Operation Display > PARAMETER or PARA key for 3 seconds (to [MODE] Menu Display) > SET/ENTER key (The operation mode is displayed.) > Down arrow key (The operation mode is displayed.)

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.A.M</td>
<td>CAS/AUTO/MAN switch</td>
<td>EASY</td>
<td>CAS: Cascade mode</td>
<td>MODE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>AUTO: Automatic mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>MAN: Manual mode</td>
<td></td>
</tr>
</tbody>
</table>

**Description**

CAS (Cascade), AUTO, and MAN can be switched when the control mode is Cascade secondary-loop control or Cascade control.

CAS/AUTO/MAN switching can be performed by any of the following.

1. A/M key (MAN → AUTO → CAS → MAN •••)
2. Parameter
3. Contact input
4. Communication
5. User function key

For the switching operation by using the above, the last switching operation is performed. Operation by user function key is different. See the descriptions in the following.

- A/M key function: 13.2 Assigning Function to User Function Key and A/M key
- Switch by contact input: 12.1 Setting Contact Input Function
- Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key
### 6.7 Switching Operation Modes

#### Output Action in CAS/AUTO/MAN Switch

<table>
<thead>
<tr>
<th>Switch</th>
<th>Output action</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS→AUTO</td>
<td>The control output value does not bump (bumpless).</td>
</tr>
<tr>
<td>CAS→MAN</td>
<td>The control output value bumps to the manual preset output value. Or holds the control output value from CAS mode.</td>
</tr>
<tr>
<td>AUTO→CAS</td>
<td>The control output value does not bump (bumpless).</td>
</tr>
<tr>
<td>AUTO→MAN</td>
<td>The control output value bumps to the manual preset output value. Or holds the control output from AUTO mode.</td>
</tr>
<tr>
<td>MAN→AUTO</td>
<td>The control output value does not bump (bumpless).</td>
</tr>
<tr>
<td>MAN→CAS</td>
<td>The control output value does not bump (bumpless).</td>
</tr>
</tbody>
</table>

► Switch from AUTO to MAN: 10.12.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)

#### Secondary-side SP in CAS/AUTO/MAN Switch

<table>
<thead>
<tr>
<th>Switch</th>
<th>Secondary SP after switching</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAS→AUTO</td>
<td>Sets the target setpoint specified in SP number selection (SPNO.).</td>
</tr>
<tr>
<td>CAS→MAN</td>
<td>Sets the primary-side control output value as target setpoint.</td>
</tr>
<tr>
<td>AUTO→CAS</td>
<td>Sets the target setpoint specified in SP number selection (SPNO.).</td>
</tr>
<tr>
<td>AUTO→MAN</td>
<td>Sets the target setpoint specified in SP number selection (SPNO.).</td>
</tr>
<tr>
<td>MAN→AUTO</td>
<td>Sets the primary-side control output as target setpoint.</td>
</tr>
<tr>
<td>MAN→CAS</td>
<td>Sets the primary-side control output as target setpoint.</td>
</tr>
</tbody>
</table>

#### Output specification after switching from CAS or AUTO to MAN

The control output can be manipulated by keystroke or via communication in MAN mode.

#### Lamp Status

<table>
<thead>
<tr>
<th>Status</th>
<th>MAN lamp</th>
<th>CAS lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cascade (CAS)</td>
<td>Unlit</td>
<td>Lit</td>
</tr>
<tr>
<td>Automatic operation (AUTO)</td>
<td>Unlit</td>
<td>Unlit</td>
</tr>
<tr>
<td>Manual operation (MAN)</td>
<td>Lit</td>
<td>Unlit</td>
</tr>
</tbody>
</table>
6.7.3 Switching between STOP and RUN

**Setting Display**

Operation Display > **PARAMETER** or **PARA** key for 3 seconds (to [MODE] Menu Display) > **SET/ENTER** key (The operation mode is displayed.) > **Down arrow** key (The operation mode is displayed.)

Factory default: The parameter S.R is not displayed because STOP/RUN switch is assigned to the contact input. To display the parameter, disable the STOP/RUN switch assigned to the contact input.

► Switch by contact input: 12.1 Setting Contact Input Function

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.R</td>
<td>STOP/RUN switch</td>
<td>EASY</td>
<td>STOP: Stop mode RUN: Run mode</td>
<td>MODE</td>
</tr>
</tbody>
</table>

**Description**

STOP/RUN switching can be performed by any of the following:

1. Contact input (status or edge)
2. Parameter
3. Communication
4. User function key

When the contact input (status) is ON, operation cannot be performed by parameter, communication, or keystroke.

When the contact input is OFF, and the setting is switched by parameter, communication, or keystroke, the last switching operation is performed.

► Switch by contact input: 12.1 Setting Contact Input Function
► Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

<table>
<thead>
<tr>
<th>Switch</th>
<th>Output action</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN→STOP</td>
<td>The control output bumps.</td>
</tr>
<tr>
<td>STOP→RUN</td>
<td>The control output does not bump (bumpless).</td>
</tr>
</tbody>
</table>

► Preset output value: 10.12.1 Setting Output Value in STOP Mode (Preset Output)
Operation Display in STOP and RUN Modes

“STOP” is displayed on Symbol display and “Output value” is displayed on Data display in STOP mode. Preset output value is displayed.

In Two-position two-level control

The display at operation start differs depending on AUTO or MAN mode. SP Display is shown in AUTO mode and OUT Display is shown in MAN mode.

Operation Display in STOP and RUN Modes in Heating/cooling Control

In STOP mode in Heating/cooling control, the display is as follows. The cooling-side preset output is displayed on the left of the symbol “ST” and heating-side preset output is displayed on the right.

The display at operation start differs depending on AUTO or MAN mode. SP Display is shown in AUTO mode and Heat/cool OUT Display is shown in MAN mode.

Lamp Status

<table>
<thead>
<tr>
<th>Status</th>
<th>STOP lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation start (RUN)</td>
<td>Unlit</td>
</tr>
<tr>
<td>Operation Stop (STOP)</td>
<td>Lit</td>
</tr>
</tbody>
</table>
6.7.4 Switching between REM (Remote) and LCL (Local)

Setting Display

Operation Mode Setting Display

Operation Display > PARAMETER or PARA key for 3 seconds (to [MODE] Menu Display) > SET/ENTER key
(The operation mode is displayed.) > Down arrow key (The operation mode is displayed.)

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.L</td>
<td>REMOTE/LOCAL switch</td>
<td>EASY</td>
<td>LCL: Local mode</td>
<td>MODE Open</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>REM: Remote mode</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Description

REMOTE/LOCAL switching can be performed by any of the following:

1. Contact input (status or edge)
2. Parameter
3. Communication
4. User function key

When the contact input (status) is ON, operation cannot be performed by parameter, communication, or keystroke.

When the contact input is OFF, and the setting is switched by parameter, communication, or keystroke, the last switching operation is performed.

The last switching operation is performed for all methods, when the action of contact input is detected as rising edge.

- Switch by contact input: 12.1 Setting Contact Input Function
- Switch by user function key: 13.2 Assigning Function to User Function Key and A/M key

The PID group corresponding to the local SP number is used as PID in REM mode.
### 6.7 Switching Operation Modes

#### SP Action in REM/LCL Switch

<table>
<thead>
<tr>
<th>Switch</th>
<th>SP action</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCL→REM</td>
<td>The local target setpoint bumps to the remote target setpoint.</td>
</tr>
<tr>
<td>REM→LCL</td>
<td>The remote target setpoint bumps to the local target setpoint. Or forces the local target setpoint to track the remote target setpoint.</td>
</tr>
</tbody>
</table>

- **Tracking:** 9.4 Forcing SP to Track Remote Input (SP Tracking)

#### Lamp Status

<table>
<thead>
<tr>
<th>Status</th>
<th>REM lamp</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local (LCL)</td>
<td>Unlit</td>
</tr>
<tr>
<td>Remote (REM)</td>
<td>Lit</td>
</tr>
</tbody>
</table>
### 6.8 Manipulating Control Output during Manual Operation

#### Operation

![Image of control panel with MAN lamp lit.](image)

Press the Up arrow key to increase control output. Press the Down arrow key to decrease control output.

In Heating/cooling control, press the Up arrow key to decrease cooling-side control output and to increase heating-side control output; press the Down arrow key to increase cooling-side control output and to decrease heating-side control output.

#### Description

In MAN mode, the control output is manipulated by direct key operation. (The value changed using the Up or Down arrow key is output as is.) Manipulation of the control output is not possible in STOP mode (the STOP lamp is lit). Output manipulation differs depending on the ON or OFF setting of the control output limiter (OH, OL).

- **10.4 Disabling Output Limiter in MAN mode**

#### OUT Display

**Internal computed value is displayed in Position proportional control.**

Sub-setting-side OUT Display in Two-position two-level control.

In Two-position two-level control, main setting-side output can be manipulated individually. Control output limiter is disabled as well as a case of ON/OFF control.

**Heating/cooling OUT Display**

The heating/cooling control output is manipulated simultaneously on both the heating and cooling sides.

In MAN mode, the display is as follows. The symbol “C” represents the cooling side, and “H” the heating side. The value on the right of each symbol is the output value.

When the control output low limit is set to “SD” while the control output type is 4 to 20 mA, the control output value can be lowered down to 0 mA.

- **10.6 Reducing 4-20 mA Current Output to 0 mA (Tight Shut Function)**
6.9 Releasing On-State (Latch) of Alarm Output

**Description**

Alarm latch can be released by any of the following.

1. User function key
2. Communication
3. Contact input

For the switching operation by using the above, the last switching operation is performed.

Releasing the alarm latch function releases all of the latched alarm outputs. By factory default, the function is not assigned to the user function key and contact input. Assign and use the function in accordance with the reference sections below.

- Release by user function key: 13.2 Assigning Function to User Function Key and A/M key
- Release by contact input: 12.1 Setting Contact Input Function
7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

7.1.1 Setting Input Type, Unit, Range, Scale, and Decimal Point Position

**Description**

The figure below describes the case of PV input. The remote input and auxiliary analog input can be set in the same way.

**Example of Temperature Input**
The figure below is an example of setting Type K thermocouple and a measurement range of 0.0 to 800.0 °C.

![Diagram of Temperature Input](image)

Minimum value of PV input range: -270.0°C

Maximum value of PV input range: 1370.0°C

**Example of Voltage and Current Inputs**
The figure below is an example of setting 2-4 V DC and a scale of 0.0 to 50.0 m³/h.

![Diagram of Voltage and Current Inputs](image)

Minimum value of PV input scale: 1 V

Maximum value of PV input scale: 5 V (input signal)

When using 1-5 V DC signal as is, set RH = 5.000 V, RL = 1.000 V, SDP=1, and SH = 50.0, and SL=0.0.
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PV input type</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td></td>
<td></td>
<td>-200.0 to 1700.0 ºC / -300.0 to 3100 ºF</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td>-200.0 to 1700.0 ºC / -300.0 to 3100 ºF</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td></td>
<td></td>
<td>-200.0 to 1300.0 ºC / -300.0 to 2400.0 ºF</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td>-270.0 to 1000.0 ºC / -450.0 to 1800.0 ºF</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td></td>
<td></td>
<td>-200.0 to 900.0 ºC / -300.0 to 1600.0 ºF</td>
<td></td>
</tr>
<tr>
<td>U1</td>
<td></td>
<td></td>
<td>-200.0 to 400.0 ºC / -300.0 to 750.0 ºF</td>
<td></td>
</tr>
<tr>
<td>U2</td>
<td></td>
<td></td>
<td>-200.0 to 400.0 ºC / -300.0 to 750.0 ºF</td>
<td></td>
</tr>
<tr>
<td>W</td>
<td></td>
<td></td>
<td>-200.0 to 2300.0 ºC / 32.0 to 4200 ºF</td>
<td></td>
</tr>
<tr>
<td>PL2</td>
<td></td>
<td></td>
<td>0.0 to 1390.0 ºC / 32.0 to 2500.0 ºF</td>
<td></td>
</tr>
<tr>
<td>P2040</td>
<td></td>
<td></td>
<td>0.0 to 1900.0 ºC / 32.0 to 3400.0 ºF</td>
<td></td>
</tr>
<tr>
<td>WRE</td>
<td></td>
<td></td>
<td>0.0 to 2000.0 ºC / 32.0 to 3600.0 ºF</td>
<td></td>
</tr>
<tr>
<td>JPT1</td>
<td></td>
<td></td>
<td>-200.0 to 500.0 ºC / -300.0 to 1000.0 ºF</td>
<td></td>
</tr>
<tr>
<td>JPT2</td>
<td></td>
<td></td>
<td>-150.0 to 150.0 ºC / -200.0 to 300.0 ºF</td>
<td></td>
</tr>
<tr>
<td>PT1</td>
<td></td>
<td></td>
<td>-200.0 to 850.0 ºC / -300.0 to 1500.0 ºF</td>
<td></td>
</tr>
<tr>
<td>PT2</td>
<td></td>
<td></td>
<td>-200.0 to 500.0 ºC / -300.0 to 1000.0 ºF</td>
<td></td>
</tr>
<tr>
<td>PT3</td>
<td></td>
<td></td>
<td>-150.00 to 150.00 ºC / -200.0 to 300.0 ºF</td>
<td></td>
</tr>
<tr>
<td>0.4-2V</td>
<td></td>
<td></td>
<td>0.400 to 2.000 V</td>
<td></td>
</tr>
<tr>
<td>1-5V</td>
<td></td>
<td></td>
<td>1.000 to 5.000 V</td>
<td></td>
</tr>
<tr>
<td>0-2V</td>
<td></td>
<td></td>
<td>0.000 to 2.000 V</td>
<td></td>
</tr>
<tr>
<td>0-10V</td>
<td></td>
<td></td>
<td>0.000 to 10.00 V</td>
<td></td>
</tr>
<tr>
<td>0-20</td>
<td></td>
<td></td>
<td>0.000 to 20.00 mA</td>
<td></td>
</tr>
<tr>
<td>0-100</td>
<td></td>
<td></td>
<td>0.000 to 100.0 mV</td>
<td></td>
</tr>
</tbody>
</table>

**Note1:** W: -5% Re/W-26% Re (Hoskins Mfg. Co.), ASTM E988
WRE: W97Re3-W75Re25

**Note2:** For remote input with the optional suffix code /DR, RSP remote input type is same as PV input type.
### 7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

#### (Continued)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>RH (Physical quantity)</td>
<td>Maximum value of PV input range</td>
<td>EASY</td>
<td>Depends on the input type. - For temperature input - Set the temperature range that is actually controlled. (RL&lt; RH) - For voltage / current input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)</td>
<td>PV Set</td>
</tr>
<tr>
<td></td>
<td>Maximum value of RSP remote input range</td>
<td>EASY</td>
<td>Depends on the input type. Set the range of a voltage signal that is applied. The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)</td>
<td>RSP Set</td>
</tr>
<tr>
<td></td>
<td>Maximum value of AIN2 aux. analog input range</td>
<td>EASY</td>
<td>Same as RH</td>
<td>AIN2 Set</td>
</tr>
<tr>
<td></td>
<td>Maximum value of AIN4 aux. analog input range</td>
<td>EASY</td>
<td>Same as RH</td>
<td>AIN4 Set</td>
</tr>
<tr>
<td>RL (Physical quantity)</td>
<td>Minimum value of PV input range</td>
<td>EASY</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>PV Set</td>
</tr>
<tr>
<td></td>
<td>Minimum value of RSP remote input range</td>
<td>EASY</td>
<td>Same as RH</td>
<td>RSP Set</td>
</tr>
<tr>
<td></td>
<td>Minimum value of AIN2 aux. analog input range</td>
<td>EASY</td>
<td>Same as RH</td>
<td>AIN2 Set</td>
</tr>
<tr>
<td></td>
<td>Minimum value of AIN4 aux. analog input range</td>
<td>EASY</td>
<td>Same as RH</td>
<td>AIN4 Set</td>
</tr>
<tr>
<td>SDP (Scaling)</td>
<td>PV input scale decimal point position</td>
<td>EASY</td>
<td>PV Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSP remote input scale decimal point position</td>
<td>EASY</td>
<td>RSP Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN2 aux. analog input scale decimal point position</td>
<td>EASY</td>
<td>AIN2 Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN4 aux. analog input scale decimal point position</td>
<td>EASY</td>
<td>AIN4 Set</td>
<td></td>
</tr>
<tr>
<td>SH (Scaling)</td>
<td>Maximum value of PV input scale</td>
<td>EASY</td>
<td>-19999 to 30000, (SL&lt;SH),</td>
<td>PV Set</td>
</tr>
<tr>
<td></td>
<td>Maximum value of RSP remote input scale</td>
<td>EASY</td>
<td>RSP Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum value of AIN2 aux. analog input scale</td>
<td>EASY</td>
<td>AIN2 Set</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum value of AIN4 aux. analog input scale</td>
<td>EASY</td>
<td>AIN4 Set</td>
<td></td>
</tr>
</tbody>
</table>
7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL (Scaling)</td>
<td>Minimum value of PV input scale</td>
<td>EASY</td>
<td>-19999 to 30000, (SL&lt;SH),</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum value of RSP remote input range</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum value of AIN2 aux. analog input scale</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimum value of AIN4 aux. analog input scale</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

Note 2: For remote input with the optional suffix code /DR, setting range for RSP remote input type is same as that for PV input type.

Note 3: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.

PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
UT52A suffix code: Type 2=1 or 2
AIN2 and AIN4: Suffix code Type 2=7 (for UT55A only)

IN, UNIT, RH, and RL described above are the parameters to be used for processing before the input ladder calculation program.

The following parameters are used for processing after the input ladder calculation program.

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.UNI</td>
<td>Control PV input unit</td>
<td>STD</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>MPV Set</td>
</tr>
<tr>
<td>P.DP</td>
<td>Control PV input decimal point position</td>
<td>STD</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>MPV Set</td>
</tr>
<tr>
<td>P.RH</td>
<td>Maximum value of control PV input range</td>
<td>STD</td>
<td>-19999 to 30000, (P.RL&lt;P.RH),</td>
<td></td>
</tr>
<tr>
<td>P.RL</td>
<td>Minimum value of control PV input range</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
### Description

The input value when input burnout occurs can be determined. The input value is 105.0% of the input range when the upscale is set, and -5.0% of the input range when the downscale is set. Burnout detection is activated for TC, RTD, and standard signal (0.4–2 V or 1–5 V). For standard signal, burnout is determined to have occurred if it is 0.1 V or less for the range of 0.4–2 V and 1–5V, or if it is 0.4 mA or less for the range of 4–20 mA.

When input burnout occurs, the error preset output (EPO) is output as control output.

#### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSL</td>
<td>PV input burnout action</td>
<td>STD</td>
<td></td>
<td>PV Set</td>
</tr>
<tr>
<td></td>
<td>RSP remote input burnout action</td>
<td>STD</td>
<td>OFF: Disable</td>
<td>RSP Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>UP: Upscale</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DOWN: Downscale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN2 aux. analog input burnout action</td>
<td>STD</td>
<td></td>
<td>AIN2 Set</td>
</tr>
<tr>
<td></td>
<td>AIN4 aux. analog input burnout action</td>
<td>STD</td>
<td></td>
<td>AIN4 Set</td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.
- PV: Equipped as standard
- RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
- UT52A suffix code: Type 2=1 or 2
- AIN2 and AIN4: Suffix code: Type 2=7 (for UT55A only)
7.1.3 Setting Reference Junction Compensation (RJC) or External Reference Junction Compensation (ERJC)

**Description**

**Reference Junction Compensation (RJC)**
When TC input is selected, presence/absence of input reference junction compensation can be set. Usually input values are compensated with the RJC function provided for the controller. However, if it is necessary to rigorously compensate the values with a device other than the function of the controller, for example with a zero-compensator, the RJC function of the controller can be turned off.

**External Reference Junction Compensation (ERJC)**
For TC input, a temperature compensation value for external device can be set. The external RJC can be used only when RJC = OFF.

---

Example:
- Setting parameters: RJC = OFF, ERJC = 25.0°C
- Installed in an area where ambient temperature is fixed to 25°C.
- Set the temperature in the area using ERJC parameter.
7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PV input reference junction compensation</td>
<td>PRO</td>
<td>OFF: RJC OFF</td>
<td>PV</td>
</tr>
<tr>
<td></td>
<td>RSP remote input reference junction</td>
<td>PRO</td>
<td>ON: RJC ON</td>
<td>RSP</td>
</tr>
<tr>
<td></td>
<td>setpoint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERJC</td>
<td>PV input external RJC setpoint</td>
<td>PRO</td>
<td>-10.0 to 60.0°C</td>
<td>PV</td>
</tr>
<tr>
<td></td>
<td>RSP remote input external RJC setpoint</td>
<td>PRO</td>
<td></td>
<td>RSP</td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.
PV: Equipped as standard
RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7 and with the optional suffix code /DR
   UT52A suffix code: Type 2=1 or 2 and with the optional suffix code /DR
7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

7.1.4 Correcting Input Value

(1) Setting Bias and Filter

**PV Input Bias**
The PV input bias allows bias to be summed with input to develop a measured value for display and control use inside the controller.
This function can also be used for fine adjustment to compensate for small inter-instrument differences in measurement reading that can occur even if all are within the specified instrument accuracies.

PV input bias is used for normal operation.

\[
\text{PV input value} + \text{PV input bias} = \text{PV value inside the controller}
\]

**PV Input Filter**
If input noise or variations cause the low-order display digits to fluctuate so that the displayed value is difficult to read, a digital filter can be inserted to smooth operation.

This filter provides a first-order lag calculation, which can remove more noise the larger the time constant becomes. However, an excessively large time constant will distort the waveform.

PV input filter is used for normal operation.

**Analog Input Bias**
Analog input bias is used to correct sensor-input characteristics, compensating lead wire errors, and so on.

**Analog Input Filter**
The analog input filter is used to remove noise from an input signal. This filter provides a first-order lag calculation, which can remove more noise the larger the time constant becomes. However, an excessively large time constant will distort the waveform.
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>PV input bias</td>
<td>EASY</td>
<td>-100.0 to 100.0% of PV input range span (EUS)</td>
<td>PVS</td>
</tr>
<tr>
<td>FL</td>
<td>PV input filter</td>
<td>EASY</td>
<td>OFF, 1 to 120 s</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.BS</td>
<td>PV analog input bias</td>
<td>PRO</td>
<td>-100.0 to 100.0% of each input range span (EUS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSP analog input bias</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN2 aux. analog input bias</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN4 aux. analog input bias</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.FL</td>
<td>PV analog input filter</td>
<td>PRO</td>
<td>OFF, 1 to 120 s</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RSP analog input filter</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN2 aux. analog input filter</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>AIN4 aux. analog input filter</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

Note 2: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Each menu is displayed in the following cases.

- PV: Equipped as standard
- RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
  - UT52A suffix code: Type 2=1 or 2
- AIN2 and AIN4: Suffix code: Type 2=7 (for UT55A only)
(2) Setting Square Root Extraction and Low Signal Cutoff Point

**Description**

This calculation is used to convert, for example, a differential pressure signal from a throttling flow meter such as an orifice and nozzle into a flow-rate signal. There is no hysteresis for low signal cutoff point.

![Graph showing square root extraction and low signal cutoff point]

The slope equals “1” at levels below the low signal cutoff point (A.SR=1).

The slope equals “0” at levels below the low signal cutoff point (A.SR=2).

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A.SR</strong></td>
<td>PV analog input square root extraction</td>
<td>PRO</td>
<td>OFF: No square root extraction.</td>
<td>PV Set</td>
</tr>
<tr>
<td></td>
<td>RSP analog input square root extraction</td>
<td>PRO</td>
<td>1: Compute the square root.</td>
<td>RSP Set</td>
</tr>
<tr>
<td></td>
<td>AIN2 aux. analog input square root extraction</td>
<td>PRO</td>
<td>(The slope equals “1.”)</td>
<td>AIN2 Set</td>
</tr>
<tr>
<td></td>
<td>AIN4 aux. analog input square root extraction</td>
<td>PRO</td>
<td>2: Compute the square root.</td>
<td>AIN4 Set</td>
</tr>
<tr>
<td><strong>A.LC</strong></td>
<td>PV analog input low signal cutoff</td>
<td>PRO</td>
<td>0.0 to 5.0%</td>
<td>PV Set</td>
</tr>
<tr>
<td></td>
<td>RSP analog input low signal cutoff</td>
<td>PRO</td>
<td></td>
<td>RSP Set</td>
</tr>
<tr>
<td></td>
<td>AIN2 aux. analog input low signal cutoff</td>
<td>PRO</td>
<td></td>
<td>AIN2 Set</td>
</tr>
<tr>
<td></td>
<td>AIN4 aux. analog input low signal cutoff</td>
<td>PRO</td>
<td></td>
<td>AIN4 Set</td>
</tr>
</tbody>
</table>

**Note 1:** In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note 2:** When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

**Note 3:** Each parameter is displayed when the input type is voltage or current.

Each menu is displayed in the following cases.

- PV: Equipped as standard
- RSP: UT55A suffix code: Type 2=1, 2, 4, 5, or 7
- UT52A suffix code: Type 2=1 or 2
- AIN2 and AIN4: Suffix code: Type 2=7 (for UT55A only)
7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

(3) Setting 10-segment Linearizer

**Description**

A total of up to four 10-segment linearizers can be used for the input unit and output unit. For the position used by a ten-segment linearizer, see the function block diagram.

- Function block diagram: 8.1 Setting Control Mode (CTLM)
- Output Linearizer: 10.13 Setting 10-segment Linearizer for Output

**10-segment Linearizer Bias**

This function is used to correct an input signal affected by sensor deterioration. The corrected values are obtained by adding the corresponding bias values to each of the 11 points of optionally set input values.

When 10-segment linearizer input is A1 or less, B1 is to be added. When 10-segment linearizer input is A11 or more, B11 is to be added.

**10-segment Linearizer Approximation**

This function is used when the input signal and the required measurement signal have a non-linear relationship, for example, when trying to obtain the volume from a sphere tank level. As shown in the figure below, the output values can be optionally set to 11 points of the optionally set input values.

When the 10-segment linearizer input is A1 or less, the value of extended line between B1 and B2 is output. Moreover, when the input is A11 or more, the value of extended line between B10 and B11 is output.
## Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PYS</td>
<td>10-segment linearizer selection</td>
<td>Group 1, 2: STD</td>
<td>OFF: Disable PV: PV analog input RSP: RSP analog input</td>
<td>PYS1 PYS2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3, 4: PRO</td>
<td>AIN2: AIN2 analog input AIN4: AIN4 analog input PVIN: PV input OUT: OUT analog output OUT2: OUT2 analog output RET: RET analog output</td>
<td>PYS3 PYS4</td>
</tr>
<tr>
<td>A1 to A11</td>
<td>10-segment linearizer input</td>
<td>Group 1, 2: STD</td>
<td>-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%</td>
<td>PYS1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3, 4: PRO</td>
<td></td>
<td>PYS2</td>
</tr>
<tr>
<td>B1 to B11</td>
<td>10-segment linearizer output</td>
<td>Group 1, 2: STD</td>
<td>10-segment linearizer bias: -66.7 to 105.0% of input range span (EUS)</td>
<td>PYS3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3, 4: PRO</td>
<td>10-segment linearizer approximation: -66.7 to 105.0% of input range (EU)</td>
<td>PYS4</td>
</tr>
<tr>
<td>PMD</td>
<td>10-segment linearizer mode</td>
<td>Group 1, 2: STD</td>
<td>0: 10-segment linearizer bias 1: 10-segment linearizer approximation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Group 3, 4: PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note1:** When each parameter is displayed, the group number (1 to 4) is displayed on Group display.

Parameters are set in the following order.

1. **PYS:** Specifies where the 10-segment linearizer function is used.
   - Setpoints PV, RSP, AIN2, and AIN4 function before the input ladder calculation section.
   - Setpoint PVIN functions after the input ladder calculation section.
   - Where the 10-segment linearizer function is used; Function block diagrams in 8.1 Setting Control Mode (CTLM)

2. **PMD:** Specifies whether to use it as a 10-segment linearizer bias or a 10-segment linearizer approximation.

3. **A1 to A11, B1 to B11:** Sets the 10-segment linearizer input and 10-segment linearizer output.
   - For the input range and input range span, the range varies depending on where the 10-segment linearizer is used.
   - PV input and PV analog input: PV input range or PV input range span
   - RSP analog input: RSP remote input range or RSP remote input range span
   - AIN2 auxiliary analog input: AIN2 auxiliary analog input range or AIN2 auxiliary analog input range span
   - AIN4 auxiliary analog input: AIN4 auxiliary analog input range or AIN4 auxiliary analog input range span

**Note**

- Set the 10-segment linearizer so that it increases monotonically.
- If the same setpoint is set for the two or more parameters of 10-segment linearizer selection (PYS), a smaller group number is used.
7.1 Setting Functions of PV Input, Remote Input, and Auxiliary Analog Input

Initial value of each control mode

<table>
<thead>
<tr>
<th>Control mode</th>
<th>Group-1 PYS</th>
<th>Group-2 PYS</th>
<th>Group-3 and -4 PYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-loop control</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Cascade primary-loop control</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Cascade secondary-loop control</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Cascade control</td>
<td>PV</td>
<td>RSP</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control for backup</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control with PV switching</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control with PV auto-selector</td>
<td>PVIN</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control with PV-hold function</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

7.1.5 Setting Ratio bias/filter

**Description**

Ratio bias computing performs ratio computation and bias addition for remote setpoints.

\[ SP = \text{Remote input} \times \text{Remote input ratio (RT)} + \text{Remote input bias (RBS)} \]

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>RT</td>
<td>Remote input ratio</td>
<td>STD</td>
<td>0.001 to 9.999</td>
<td>SPS, Opn</td>
</tr>
<tr>
<td>RBS</td>
<td>Remote input bias</td>
<td>STD</td>
<td>100.0 to 100.0% of PV input range span (EUS)</td>
<td>SP, Opn</td>
</tr>
<tr>
<td>RFL</td>
<td>Remote input filter</td>
<td>STD</td>
<td>OFF, 1 to 120 s</td>
<td>SP, Opn</td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, PV input terminal is for Loop 1 and RSP remote input terminal is for Loop 2. The LP2 lamp is lit while the Loop-2 parameter is displayed.
### 7.2 Setting Input Sampling Period (Control Period)

#### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMP</td>
<td>Input sampling period (control period)</td>
<td>STD</td>
<td>50: 50 ms</td>
<td>CTL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>100: 100 ms</td>
<td>Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>200: 200 ms</td>
<td></td>
</tr>
</tbody>
</table>

Note: 50 ms; Available when the control mode is not Cascade control (CTLM≠CAS) and the following functions are not used: "SUPER" function, "SUPER 2" function.
7.3 Using 4-wire RTD as PV Input

**Description**

To use the 4-wire RTD, the optional suffix code /DR is required for remote input (UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2).

Normally, PV terminal input is used as PV. When RSP terminal is used as PV, use the ladder program of LL50A Parameter Setting Software (sold separately) to switch the functions of the PV terminal and RSP terminal.


**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTD.S</td>
<td>RTD wiring system</td>
<td>STD</td>
<td>3-W: 3-wire system, 4-W: 4-wire system</td>
<td>RSP Set</td>
</tr>
</tbody>
</table>
7.4 Using Larger, Smaller, Average, or Difference of Two to Four Inputs as PV

**Description**

Loop control with PV auto-selector function automatically selects or calculates the larger, smaller, average, or difference of multiple (two to four) inputs and uses the result as PV.

The larger, smaller, and average are automatically computed based on the specified number of inputs. For the input difference, the difference between input 1 and input 2 is computed.

Input 1: PV terminal input
Input 2: RSP terminal input
Input 3: AIN2 auxiliary analog input (for UT55A only)
Input 4: AIN4 auxiliary analog input (for UT55A only)

► Function block diagram for Loop control with PV auto-selector; 8.1.7 Loop Control with PV Auto-selector, Heating/cooling Loop Control with PV Auto-selector, and Position Proportional Loop Control with PV Auto-selector

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV.AS</td>
<td>Input computation selection</td>
<td>STD</td>
<td>0: Max. value 1: Min. value 2: Ave. value 3: Input 1 - Input 2 4: Input 2 - Input 1</td>
<td>MPV Set</td>
</tr>
<tr>
<td>PV.NU</td>
<td>Number of inputs</td>
<td>STD</td>
<td>2: Use Input 1 and Input 2 3: Use Input 1, Input 2, and Input 3 4: Use 4 inputs</td>
<td></td>
</tr>
</tbody>
</table>
7.5 Setting Remote Input Method

**Description**

There are two methods for remote input: analog input and communication. Decide which to use among two methods in advance.

Analog input: Remote setting using external analog signal (RSP terminal)
Communication: Remote setting via external communication.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS</td>
<td>Remote input method</td>
<td>STD</td>
<td>RSP: Via remote (auxiliary analog) input&lt;br&gt;COM: Via communication</td>
<td>SPS [Open]</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

RSP is not displayed when the remote (auxiliary analog) input is not provided.
COM is not displayed when communication is not provided.
The parameter is not displayed when the remote (auxiliary analog) input and communication are not provided.
7.6 Adjusting PV Range for Loop Control with PV Switching or Loop Control with PV Auto-selector

**Description**

Loop control with PV switching and Loop control with PV auto-selector need to determine the PV range for control if the measurement ranges of two input signals are different.

The figure below is an example of setting PV input range of 0 to 200°C, RSP terminal input of 100 to 800°C, and control PV range of 0 to 800°C.

► Block diagram of Loop control with PV switching: 8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching

![Diagram of Loop control with PV switching]

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.UNI</td>
<td>Control PV input unit</td>
<td>STD</td>
<td>-: No unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C: Degree Celsius</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-: No unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- -: No unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>F: Degree Fahrenheit</td>
<td></td>
</tr>
<tr>
<td>P.DP</td>
<td>Control PV input decimal point position</td>
<td>STD</td>
<td>0: No decimal place</td>
<td>MPV Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: One decimal place</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: Two decimal places</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3: Three decimal places</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4: Four decimal places</td>
<td></td>
</tr>
<tr>
<td>P.RH</td>
<td>Maximum value of control PV input range</td>
<td>STD</td>
<td>-19999 to 30000, (P.RL&lt;P.RH),</td>
<td></td>
</tr>
<tr>
<td>P.RL</td>
<td>Minimum value of control PV input range</td>
<td>STD</td>
<td></td>
<td>P.RH - P.RL</td>
</tr>
</tbody>
</table>

**Note1:** Set the input ranges for two inputs consecutively. Set the control PV ranges (P.RL, P.RH) within the actual input range.
7.7 Setting PV Switching Methods of Loop Control with PV Switching

**Description**

PV switching method of Loop control with PV switching can be set when the control mode is Loop control with PV switching.

- Block diagram of Loop control with PV switching: 8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching

Input 1: PV terminal input
Input 2: RSP input terminal

**Switching within the Temperature Range (Low-temperature side) (Parameter PV.2C=0)**

This method automatically switches PV within the range of input switching PV high limit and low limit. It should be selected in case where a sudden change in PV must be avoided.

** PV rising process**

When input 1 ≤ PV.LL, PV=Input 1.

When PV.LL < Input 1 < PV.HL

\[
PV = \left(1 - \frac{\text{Input 1} - \text{PV.LL}}{\text{PV.HL} - \text{PV.LL}}\right) \times \text{Input 1} + \left(\frac{\text{Input 1} - \text{PV.LL}}{\text{PV.HL} - \text{PV.LL}}\right) \times \text{Input 2}
\]

When PV.HL ≤ Input 1, PV=Input 2.
Switching within the Temperature Range (High-temperature side) (Parameter PV.2C=3)

This method automatically switches PV within the range of input switching PV high limit and low limit. It should be selected in case where a sudden change in PV must be avoided.

When input 2 ≤ PV.LL, PV=Input 1.

When PV.LL < Input 2 < PV.HL

\[ PV = \left( 1 - \frac{Input\ 2 - PV.LL}{PV.HL - PV.LL} \right) \times Input\ 1 + \left( \frac{Input\ 2 - PV.LL}{PV.HL - PV.LL} \right) \times Input\ 2 \]

When PV.HL ≤ Input 2, PV=Input 2.
Switching at the Input Switching PV High Limit (Parameter PV.2C=1)
This method automatically switches two inputs at switching point (input switching PV high limit).
It should be selected in case where a sudden change in PV is allowed.
Control output will change smoothly (i.e., without any bumps) when PV switches.
Hysteresis (0.5% of PV range span) is provided around the switching point.

When input 1 < PV.HL – 0.5% of PV input range span, PV = Input 1.
When PV.HL ≤ Input 1, PV = Input 2.
7.7 Setting PV Switching Methods of Loop Control with PV Switching

Switching by Contact Input (Parameter PV.2C=2)
This method switches two inputs by contact input ON/OFF.
When the contact input is OFF, PV = Input 1 (low-temperature side).
When the contact input is ON, PV = Input 2 (high-temperature side).

The function is assigned to DI16 for the factory default when switched by DI.
Control output will change smoothly (i.e., without any bumps) when PV switches.

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV.2C</td>
<td>Input switching action (in Loop control with PV switching)</td>
<td>STD</td>
<td>0: Switch based on low limit of temperature range 1: Switch using the parameter PV.HL 2: Switch using DI 3: Switch based on high limit of temperature range</td>
<td>MPV Set</td>
</tr>
<tr>
<td>PV.HL</td>
<td>Input switching PV high limit (in Loop control with PV switching)</td>
<td>STD</td>
<td>0.0 to 100.0% of control PV input range (EU), (PV.HL&gt;PV.LL)</td>
<td></td>
</tr>
<tr>
<td>PV.LL</td>
<td>Input switching PV low limit (in Loop control with PV switching)</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 8.1 Setting Control Mode (CTLM)


##### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
</table>
| CTLM             | Control mode  | STD           | SGL: Single-loop control
|                  |               |               | CAS1: Cascade primary-loop control
|                  |               |               | CAS2: Cascade secondary-loop control
|                  |               |               | CAS: Cascade control
|                  |               |               | BUM: Loop control for backup
|                  |               |               | PVSW: Loop control with PV switching
|                  |               |               | PVSEL: Loop control with PV auto-selector
|                  |               |               | PVHD: Loop control with PV-hold function

**CAUTION**

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

##### Description

These control modes provide the basic control function having one control computation unit.

Single-loop control can be used for Standard type or Heating/cooling type controller. Single-loop heating/cooling control can be used for Heating/cooling type controller. Single-loop position proportional control can be used for Position proportional type controller. Single-loop two-position two-level control can be used for Heating/cooling type controller.

- PID control, Heating/cooling control, and Two-position two-level control: 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- Contact input assignment: 12.1 Setting Contact Input Function
- Contact output assignment: 12.2 Setting Contact Output Function
- Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
- Analog output range change: 10.14 Changing Current Output Range
Control Functions

Target setpoints 1 to 8

COM

Anaolog input

*1

Output limiter

Manual operation

Manual preset output

Control Function Block Diagram

When sensor burnout occurs

Preset output

Input error preset output

Output limiter

PMD

DI1

DI2

DI3

A/M

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

Remote input filter

PV input bias

PV input filter

Ratio bias computation

Output limiter

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias
Control Functions

8.1 Setting Control Mode (CTLM)

- **Manual preset output**: MPON
- **Manual operation**: MAN

### Control Computation
- **Manual output is prioritized even if sensor burnout occurs in MAN.**

### Heating/Cooling Computation

#### Input Error Preset Output
- **EPO**

#### Heating-side Output Limiter
- Normal

#### Cooling-side Output Limiter
- Normal

#### Heating-side Preset Output
- PO

#### Cooling-side Preset Output
- POc

#### RUN (ON)/STOP (OFF) switch

### Output Terminal Assignment
- **OT**

### Output Ladder Calculation Program

#### Heating-side Output
- OUT

#### Cooling-side Output
- OUT2

### For ladder program, see the LL50A Parameter Setting Software User's Manual.

### Communication
- RS-485, Ethernet, PROFIBUS-DP

### Manual output is prioritized even if sensor burnout occurs in MAN.
**Single-loop Position Proportional Control Function Block Diagram**

Remote input can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Feedforward input can be used when UT55A suffix code: Type 2 = 7.

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

---

### Equipped as standard

**PV input**

- **Input type:** IN
- **Input unit:** UNIT
- **Input range/scale:** RH, RL, SDP, SR, SL
- **Analog input bias:** A.BS
- **Square root extraction:** A.SR, A.LC
- **Analog input filter:** A.FL
- **10-seg. linearizer approx./bias:** PMD, An, Bn

---

### Remote input

- **Input type:** IN
- **Input unit:** UNIT
- **Input range/scale:** RH, RL, SDP, SH, SL
- **Analog input bias:** A.BS
- **Square root extraction:** A.SR, A.LC
- **Analog input filter:** A.FL
- **10-seg. linearizer approx./bias:** PMD, An, Bn

---

### Communication

- **Remote input:** *1: RS-485, Ethernet, PROFIBUS-DP

---

### Feedforward input

- **Input type:** IN
- **Input unit:** UNIT
- **Input range/scale:** RH, RL, SDP, SH, SL
- **Analog input bias:** A.BS
- **Square root extraction:** A.SR, A.LC
- **Analog input filter:** A.FL
- **10-seg. linearizer approx./bias:** PMD, An, Bn

---

### PV display

- **Control computation:** CNT, ALG

---

### SP display

- **Ratio bias computation:** RT, RBS
- **SP limiter:** SP, SPL
- **SP ramp rate:** SPR, SFL, TMU

---

### Manual operation

- **Input error preset output:** PRE
- **Preset output:** PM

---

### Output limiter

- **EPO:** OH, OL
- **PO:** S/R

---

### Signal comparison

- **Feedback input Direct/reverse signal:** FBIN, M

---

### Motor-operated valve

- **Relay output:** VALV

---

### Relay output

- **Filter:** FLG
- **Gain, bias:** FGN
- **FBO**

---

### Terminal Parameter Function

- **Analog signal:** Contact signal, Front panel key

---

### Legend

- **PV display:** SP display
- **Remote input filter:** RFL
- **Remote (ON)/Local (OFF) switch:** COM

---

### Communication

- **DI1, D12, D13, D16**

---

### Manual operation

- **Output limiter does not work.**

---

### Alarm

- **Alarm 1** (PV high limit)
- **Alarm 2** (PV low limit)
- **Alarm 3** (PV high limit)

---

### For ladder program, see the LL50A Parameter Setting Software User’s Manual.

---

### Equipment

- **Current Loop**
- **24 V loop power supply**

---

### Parameter Setting Software

- **Optional suffix code /LP**
In Estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the △ or ▼ key is pressed. Output limiter does not work.

Position Proportional Computation Output cannot be calculated by ladder program.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply

LPS

In Manual operation, the relay turns on while the △ or ▼ key is pressed. Output limiter does not work.

Position Proportional Computation Output cannot be calculated by ladder program.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply

LPS

In Manual operation, the relay turns on while the △ or ▼ key is pressed. Output limiter does not work.

Position Proportional Computation Output cannot be calculated by ladder program.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply

LPS
Single-loop Two-position Two-level Control Function Block Diagram

Equipped as standard
PV input

Target setpoints 1 to 8
Sub-target setpoint = SP + SUB

Remote input can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Communication
1: RS-485, Ethernet, PROFIBUS-DP

Contact inputs

Remote input

Input type
IN
Input unit
UNIT
Input range/scale
RH, RL, SDP, SH, SL
Square root extraction
A.SR, A.LC
Analog input filter
A.FL

Sub-target setpoint = SP + SUB

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

PV display
Main setting control computation
OFF (0%) or ON (100%)

SP display

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Communication

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Contact inputs

DI1
DI2
DI3
DI16

No function is assigned to DI3.

PV display
SP display

Main setting control computation
OFF (0%) or ON (100%)

Sub-setting control computation

Sub-target setpoint = SP + SUB

Sub-target setpoint = SP + SUB

PV display
Sub-setting control computation
OFF (0%) or ON (100%)

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.2 Cascade Primary-loop Control

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTLM</td>
<td>Control mode</td>
<td>STD</td>
<td>SGL: Single-loop control&lt;br&gt;CAS1: Cascade primary-loop control&lt;br&gt;CAS2: Cascade secondary-loop control&lt;br&gt;CAS: Cascade control&lt;br&gt;BUM: Loop control for backup&lt;br&gt;PVSW: Loop control with PV switching&lt;br&gt;PVSEL: Loop control with PV auto-selector&lt;br&gt;PVHD: Loop control with PV-hold function</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

**CAUTION**

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

Description

Cascade primary-loop control sets up a controller as the primary-loop controller when two controllers are used for Cascade control. It provides the output tracking function and FAIL output to the secondary-loop controller.

Cascade primary-loop control can be used for Standard type or Heating/cooling type controller.

- **PID control**: 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- **Contact input assignment**: 12.1 Setting Contact Input Function
- **Contact output assignment**: 12.2 Setting Contact Output Function
- **Contact output assignment to retransmission output terminal**: 10.1 Setting Control Output Type
- **Analog output range change**: 10.14 Changing Current Output Range
Cascade Primary-loop Control Function Block Diagram

**Terminal Parameter Function**

- **Analog signal Contact signal Front panel key**

**Legend**
- **Alarm 1** (PV high limit)
- **Alarm 2** (PV low limit)
- **FAIL**

**Input ladder calculation program** (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Output ladder calculation program** (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Remote input can be used when**
- UT55A suffix code: Type 2 = 7
- UT52A suffix code: Type 2 = 1 or 2

**Aux. analog (remote) input**

**Communication**
- *1: RS-485, Ethernet, PROFIBUS-DP

**Contact inputs**
- No function is assigned to DI3.

**DI1 to DI3 are equipped as standard.**
- DI16 is equipped when
- UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
- UT52A suffix code: Type 2 = 1 or 2.

**UT55A suffix code:** Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2

**For optional suffix code /HA**
- Heater break alarm
- Heater break alarm 1
- Heater break alarm 2

**For optional suffix code /LP**
- Loop-2 controller
- LPS 24 V loop power supply

**UT55A suffix code:** Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2

**For optional suffix code /LA**
- Power output

**Equipped as standard**
- PV input
- Aux. analog (remote) input
- Output tracking input (from Loop-2 controller)

**DI1 to DI3 are equipped as standard.**
- DI16 is equipped when
- UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
- UT52A suffix code: Type 2 = 1 or 2.
Control Functions

Target setpoints 1 to 8

1. **COM**
2. **Aux. input**
3. **Output limiter**
4. **Manual operation**
5. **Manual preset output**
6. **Input error preset output**
7. **Preset output**
8. **Output tracking input**
9. **Output tracking switch (Tracking at ON)**
10. **AUTO (ON)/MAN (OFF) switch**
11. **STOP (ON)/RUN (OFF) switch**

**Legend**
- Terminal
- Parameter
- Function
- Analog signal
- Contact signal
- Front panel key

**Note**
- When sensor burnout occurs
- For optional suffix code /HA
- UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7
- UT52A suffix code: Type 2 = 1 or 2
- No function is assigned to DI3.
- DI1 to DI3 are equipped as standard.
- DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.3 Cascade Secondary-loop Control, Cascade Secondary-loop Heating/cooling Control, and Cascade Secondary-loop Position Proportional Control

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTLM</td>
<td>Control mode</td>
<td>STD</td>
<td>SGL: Single-loop control&lt;br&gt;CAS1: Cascade primary-loop control&lt;br&gt;CAS2: Cascade secondary-loop control&lt;br&gt;CAS: Cascade control&lt;br&gt;BUM: Loop control for backup&lt;br&gt;PVSW: Loop control with PV switching&lt;br&gt;PVSEL: Loop control with PV auto-selector&lt;br&gt;PVHD: Loop control with PV-hold function</td>
</tr>
</tbody>
</table>

**CAUTION**

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

### Description

These control modes set up a controller as the secondary-loop controller when two controllers are used for Cascade control. They provide the target setpoint output function and tracking signal output function to the primary-loop controller.

Cascade secondary-loop control can be used for Standard type or Heating/cooling type controller.
Cascade secondary-loop heating/cooling control can be used for Heating/cooling type controller.
Cascade secondary-loop position proportional control can be used for Position proportional type controller.

- PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- Contact input assignment: 12.1 Setting Contact Input Function
- Contact output assignment: 12.2 Setting Contact Output Function
- Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
- Analog output range change: 10.14 Changing Current Output Range
Cascade Secondary-loop Control Function Block Diagram

Cascade input can be used when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Cascade input
(from Loop-1 controller)

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Legend

Alarm 1 (PV high limit)
Alarm 2 (PV low limit)

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

Switch from CAS (contact ON) to AUTO (contact OFF) at FAIL of Loop-1 controller

PV display
SP display

Control computation

DI1 to DI3 are equipped as standard.
DI16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

D11 to D13 are equipped as standard.
D116 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.
Control Functions

Cascade Secondary-loop Control Function Block Diagram

Target setpoints 1 to 8
Output limiter
Manual operation
Manual preset output
Input error preset output
Preset output

When sensor burnout occurs

AUTO, MANCAS

AUTO
When sensor
burnout occurs

MAN

RUN
STOP

Output terminal assignment

Output retransmission output

Target setpoint output
Alarm
Tracking switch

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP
24 V loop power supply

LPS

24 V loop power supply

OUT

OUT

Relay
Current or voltage pulse
(Current when retransmission output)

For optional suffix code /HA
Heater break alarm

HAL1
HAL2

Heater break alarm

For optional suffix code /LP
PMD
An, Bn

10-seg. linearizer approx./bias
Split computation

10-seg. linearizer approx./bias
Split computation

(ON in AUT, MAN, and STOP)

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

Legend

Terminal
Parameter
Function

Analog signal
Contact signal
Front panel key
Cascade Secondary-loop Heating/cooling Control Function Block Diagram

- Cascade input can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.
- Cascade input (from Loop-1 controller)

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

PV display

Control computation

SP display

Remote input filter

Ratio bias computation

CAS

AUTO, MAN

Target setpoints 1 to 8

SP

SPH, SPL

SP limit

SP ramp rate

UPR, DDR, TMU

Switch from CAS (contact ON) to AUTO (contact OFF) at FAIL of Loop-1 controller

PV display

SP display

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

DI1
DI2
DI3
DI16

Contact inputs

Cascade OFF → ON

Automatic OFF → ON

Manual OFF → ON

Equipped as standard

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

PV input (from Loop-1 controller)

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

DI1
DI2
DI3
DI16

Contact inputs

Cascade OFF → ON

Automatic OFF → ON

Manual OFF → ON

Equipped as standard

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

PV input (from Loop-1 controller)

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

DI1
DI2
DI3
DI16

Contact inputs

Cascade OFF → ON

Automatic OFF → ON

Manual OFF → ON

Equipped as standard

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

PV input (from Loop-1 controller)

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

DI1
DI2
DI3
DI16

Contact inputs

Cascade OFF → ON

Automatic OFF → ON

Manual OFF → ON

Equipped as standard

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

PV input (from Loop-1 controller)

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

DI1
DI2
DI3
DI16

Contact inputs

Cascade OFF → ON

Automatic OFF → ON

Manual OFF → ON

Equipped as standard

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.
Control Functions

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Control Functions

Cascade	Secondary-loop	Heating/cooling	Control	Function	Block	Diagram

Target setpoints 1 to 8

AUTO, MANCAS

SP ramp rate

SP limiter

DI16

PV

RSP

Input type

Input unit

Input range/scale

Analog input bias

Square root extraction

Analog input filter

10-seg. linearizer approx./bias

PV input bias

PV input filter

A.BS

A.FL

BS

FL

PMD

An, Bn

A.SR

A.LC

UNIT

IN

RH, RL

SDP

SH, SL

A.BS

A.FL

A.SR

A.LC

UNIT

IN

RH, RL

SDP

SH, SL

Control computation

Ratio bias computation

Remote input filter

RFL

Manual operation

Manual preset output

Manual preset output

Man, Bn

Input error preset output

Input error preset output

Heating-side preset output

Cooling-side preset output

Stop

EPO

MPON

ON in AUTO, MAN, and STOP

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Manual operation

Manual preset output

Manual preset output

Man, Bn

Input error preset output

Input error preset output

Heating-side preset output

Cooling-side preset output

Stop

EPO

MPON

ON in AUTO, MAN, and STOP

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Output terminal assignment

For optional suffix code /LP

24 V loop power supply

LPS

FOR

OUT

OUT

OUT2

OUT2

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

10-seg. linearizer approx./bias

Split computation

Split computation

Split computation

PMD

PMD

PMD

An, Bn

An, Bn

An, Bn

O2H

O2L

O2H

O2L

O2H

O2L

Current or voltage pulse

Current or voltage pulse

Current or voltage pulse

(when retransmission output)

(when retransmission output)

(when retransmission output)
Cascade Secondary-loop Position Proportional Control Function Block Diagram

Equipped as standard

- PV input
  - Input type: IN
  - Input unit: UNIT
  - Input range/scale: RH, RL, SDP, SH, SL
  - Analog input bias: A.BS
  - Square root extraction: A.SR, A.LC
  - Analog input filter: A.FL
  - 10-seg. linearizer approx./bias: PMD, An, Bn

Cascade input can be used when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

- Cascade input
  - (from Loop-1 controller)
  - RSP
    - Input type: IN
    - Input unit: UNIT
    - Input range/scale: RH, RL, SDP, SH, SL
    - Analog input bias: A.BS
    - Square root extraction: A.SR, A.LC
    - Analog input filter: A.FL
    - 10-seg. linearizer approx./bias: PMD, An, Bn

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

- Remote input filter: RFL
- Static bias computation: RT, RBS
- CAS → AUTO, MAN
  - Target setpoints 1 to 8: SPNO, SP
- Switch from CAS (contact ON) to AUTO (contact OFF) at FAIL of Loop-1 controller

Cascade (OFF → ON)
Automatic (OFF → ON)
Manual (OFF → ON)

DI1 to DI3 are equipped as standard.
DI16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

DI1 to DI3 are equipped as standard.
DI16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

- PV display
- SP display
- Control computation: CNT, ALG

In Estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the key is pressed. Output limiter does not work.
Control Functions

8.1 Setting Control Mode (CTLM)

In Estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the Δ or ▼ key is pressed. Output limiter does not work.

Position Proportional Computation Output cannot be calculated by ladder program.

Legend

- Terminal
- Parameter
- Function

8-21IM 05P01C31-01EN
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.4 Cascade Control, Cascade Heating/cooling Control, and Cascade Position Proportional Control

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| CTLM             | Control mode  | STD           | SGL: Single-loop control
CAS1: Cascade primary-loop control
CAS2: Cascade secondary-loop control
CAS: Cascade control
BUM: Loop control for backup
PVSW: Loop control with PV switching
PVSEL: Loop control with PV auto-selector
PVHD: Loop control with PV-hold function | CTL Set       |

**CAUTION**

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

**Description**

These control modes use two control computation units and permits Cascade control using just a single controller.

Cascade control can be used for Standard type or Heating/cooling type controller. Cascade heating/cooling control can be used for Heating/cooling type controller. Cascade position proportional control can be used for Position proportional type controller.

- **PID control and Heating/cooling control:** Chapter 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- **Contact input assignment:** Chapter 12.1 Setting Contact Input Function
- **Contact output assignment:** Chapter 12.2 Setting Contact Output Function
- **Contact output assignment to retransmission output terminal:** Chapter 10.1 Setting Control Output Type
- **Analog output range change:** Chapter 10.14 Changing Current Output Range
Cascade Control Function Block Diagram

Equipped as standard
Loop-1 PV input

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

Communication

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area)
can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR.
UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
However, DI16 is to be deleted.

*1: RS-485, Ethernet, PROFIBUS-DP

Loop-2 PV input

Contact inputs

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

Analog signal Contact signal Front panel key

Legend

PV display

SP display

Target setpoints 1 to 8

SP limiter

SP ramp rate

Switch to AUTO when Loop-1 PV input burnout or A/D error occurs.

* Loop-2 target setpoints

An external analog signal can be used for Loop-2 SP. Use the ladder program of LL50A Parameter Setting Software to build the function.

Setting Control Mode (CTLM)

8.1
**Control Functions**

**Cascade Control Function Block Diagram**

- **Target setpoints 1 to 8**
- **Output limiter**
- **Manual operation**
- **Manual preset output**
- **Input error preset output**
- **Preset output**

**When Loop-2 sensor burnout occurs**

- **Normal**
- **MAN**
- **RUN**
- **STOP**

**SP ramp rate**

**SP limiter**

**DI1 to DI3**

**DI16**

**PV**

**RSP**

**Input type**

**Input unit**

**Input range/scale**

**Analog input bias**

**Square root extraction**

**Analog input filter**

**10-seg. linearizer approx./bias**

**PV input bias**

**PV input filter**

**BS**

**FL**

**PMD**

**A.BS**

**A.FL**

**A.SR**

**A.LC**

**UNIT**

**IN**

**RH, RL**

**SDP**

**SH, SL**

**AIN2**

**PMD**

**An, Bn**

**A.BS**

**A.FL**

**A.SR**

**A.LC**

**UNIT**

**IN**

**RH, RL**

**SDP**

**SH, SL**

**EPO**

**OH, OL**

**OLMT**

**PO**

**Tracking signal (Tracking when not in Cascade)**

- **AUTO, MAN**
- **AUTO, MAN**
- **CAS**
- **CAS**
- **CAS, AUTO**

**Loop-2 target setpoints**

**Output limiter**

**OH, OL**

**SP ramp rate**

**SP limiter**

**When Loop-1 sensor burnout occurs**

- **Normal**
- **RUN**
- **STOP**

**Input error preset output**

- **EPO**

**OH, OL**

**OH, OL**

**OLMT**

**PO**

**R/L**

**RMS**

**SPH, SPL**

**C/A/M**

**SPNO**

**UPR, DNR**

**TMU**

**SPNO**

**UPR, DNR**

**C/A/M**

**R/L**

**RMS**

**SPH, SPL**

**C/A/M**

**S/R**

**OT**

**MPON**

**Tracking signal (Tracking when not in Cascade)**

- **AUTO, MAN**
- **AUTO, MAN**
- **CAS**
- **CAS**
- **CAS, AUTO**

**Loop-2 PV input**

**Contact inputs**

**For optional suffix code /HA:**

- **Heater break alarm 1**
- **Heater break alarm 2**

**24 V loop power supply**

- **LPS**

**Relay**

- **Current or voltage pulse**
  - **(Current when retransmission output)**

**For optional suffix code /LP:**

- **24 V loop power supply**

**Output terminal assignment**

- **OT**

**OUT retransmission output**

**RET retransmission output**

**Alarm**

**Output ladder calculation program (signal goes to the output as is when without ladder program).**

- **For ladder program, see the LL50A Parameter Setting Software User’s Manual.**

**Output ladder calculation program (signal goes to the output as is when without ladder program).**

- **For ladder program, see the LL50A Parameter Setting Software User’s Manual.**

**Terminal Parameter Function**

- **Analog signal**
- **Contact signal**
- **Front panel key**

**Legend**

- **Terminal**
- **Parameter**
- **Function**

* The LP2 lamp is lit while the Loop-2 parameter is displayed.
8.1 Setting Control Mode (CTLM)

Cascade Heating/cooling Control Function Block Diagram

For the model with optional suffix code /DR: Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR.
UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
However, DI16 is to be deleted.

For optional suffix code /LP

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
**Control Functions**

**Cascade Heating/cooling Control Function Block Diagram**

- **DI1 to DI3** are equipped as standard.
- Remote input can be used when UT55A suffix code: Type 2 = 7.
- Equipped as standard.
- **Aux. analog (remote) input**

**Communication Loop-2 PV input**

- **Contact inputs**
- For the model with optional suffix code /DR:
  - Remote input with direct input (E1-terminal area)

**Input type**

- **IN**
- **UNIT**
- **RH, RL**
- **SH, SL**
- **A.BS**
- **A.SR**
- **Square root extraction**
- **A.FL**
- **PMD**

**Alarm**

- **AL1**
- **AL2**
- **AL3**

**Output terminal assignment**

- **OUT retransmission output**
- **OUT2 retransmission output**
- **RET retransmission output**
- **Alarm**

**Output ladder calculation program** (signal goes to the output as is when without ladder program).

- **For ladder program, see the LL50A Parameter Setting Software User’s Manual.**

**Legend**

- **Terminal**
- **Parameter**
- **Function**
- **Analog signal**
- **Contact signal**
- **Front panel key**

**Heating-side output**

- **Relay**
- **Current or voltage pulse**
- **(Current when retransmission output)**

**Cooling-side output**

- **Relay**
- **Current or voltage pulse**
- **(Current when retransmission output)**

**Output terminal assignment**

- **STOP (ON) / RUN (OFF) switch**

**Output ladder calculation program** (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Input ladder calculation program** (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

- *The LP2 lamp is lit while the Loop-2 parameter is displayed.*

---

**8.1 Setting Control Mode (CTLM)**

- Manual preset output **MPON**
- Manual operation

- **STOP (ON) / RUN (OFF) switch**

- **SP limiter**
- **SP**
- **SP limiter**
- **SPH, SPL**
- **UPR, DNR**
- **SP ramp rate**

---

**Output terminal assignment**

- **OUT retransmission output**
- **OUT2 retransmission output**
- **RET retransmission output**
- **Alarm**

**Output ladder calculation program** (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Legend**

- **Terminal**
- **Parameter**
- **Function**
- **Analog signal**
- **Contact signal**
- **Front panel key**

For optional suffix code /LP

**24 V loop power supply**

**Heating-side output**

- **Relay**
- **Current or voltage pulse**
- **(Current when retransmission output)**

**Cooling-side output**

- **Relay**
- **Current or voltage pulse**
- **(Current when retransmission output)**

---

8.1 Setting Control Mode (CTLM)

**Control Functions**

- **Cascade Heating/cooling Control Function Block Diagram**

- **DI1 to DI3** are equipped as standard.
- Remote input can be used when UT55A suffix code: Type 2 = 7.
- Equipped as standard.
- **Aux. analog (remote) input**

**Communication Loop-2 PV input**

- **Contact inputs**
- For the model with optional suffix code /DR:
  - Remote input with direct input (E1-terminal area)

**Input type**

- **IN**
- **UNIT**
- **RH, RL**
- **SH, SL**
- **A.BS**
- **A.SR**
- **Square root extraction**
- **A.FL**
- **PMD**

**Alarm**

- **AL1**
- **AL2**
- **AL3**

**Output terminal assignment**

- **OUT retransmission output**
- **OUT2 retransmission output**
- **RET retransmission output**
- **Alarm**

**Output ladder calculation program** (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Input ladder calculation program** (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

- *The LP2 lamp is lit while the Loop-2 parameter is displayed.*

---

8.1 Setting Control Mode (CTLM)
Cascade Position Proportional Control Function Block Diagram

- Remote input can be used when UT55A suffix code: Type 2 = 7.
- Input error preset output: EPO
- Loop-1 control computation
  - AUTO, MAN
  - When Loop-1 sensor burnout occurs
    - Normal
    - STOP
  - SP limiter
  - SP ramp rate
  - Loop-1 SP display

- Loop-2 control computation
  - AUTO, MAN
  - Loop-2 target setpoints
    - SPNO
  - SP limiter
  - SP ramp rate
  - Loop-2 SP display

- Communication
  - RS-485, Ethernet, PROFIBUS-DP
  - Loop-1 PV input
  - Loop-2 PV input

- UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; DI1 to DI3 are equipped as standard.
- DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7.
- DI16 is to be deleted.

- DI1 to DI3 are equipped as standard.
- DI16 is equipped when UT55A suffix code: Type 2 = 1 or 2.
- DI16 is to be deleted.

- Remote input filter: RFL
- PV display

- Input type/IN
- Input unit/UNIT
- Input range/scale
- Analog input bias
- Square root extraction
- Analog input filter
- 10-seg. linearizer approx./bias: PMD (An, Bn)

- Loop-2 PV input
  - Input type/IN
  - Input unit/UNIT
  - Input range/scale
  - Analog input bias
  - Square root extraction
  - Analog input filter
  - 10-seg. linearizer approx./bias: PMD (An, Bn)

- Loop-2 target setpoints
  - SPNO
  - SP
  - Switch to AUTO when Loop-1 PV input burnout or A/D error occurs.

- PV input filter
- PV input bias
- PV display
- SP display

- Loop-1 PV input
  - PV display
  - SP display
  - Loop-1 control computation
  - AUTO, MAN
  - Normal
  - SP limiter
  - SP ramp rate
  - Output limiter
  - OH, OL
  - Output preset signal output: EPO
  - Remote input filter: RFL

- Signal comparison
- Terminal Parameter Function
- Analog signal/Contact signal/Front panel key

- Communication
  - RS-485, Ethernet, PROFIBUS-DP

- Loop-1 target setpoints
  - 1 to 8

- Loop-2 target setpoints
  - 1 to 8

- Loop-1 parameter settings
  - Loop-2 parameter settings

- Communication
  - RS-485, Ethernet, PROFIBUS-DP

- Remote input can be used when UT55A suffix code: Type 2 = 7.
- Input error preset output: EPO
- Loop-1 control computation
  - AUTO, MAN
  - When Loop-1 sensor burnout occurs
    - Normal
    - STOP
  - SP limiter
  - SP ramp rate
  - Loop-1 SP display

- Loop-2 control computation
  - AUTO, MAN
  - Loop-2 target setpoints
    - SPNO
  - SP limiter
  - SP ramp rate
  - Loop-2 SP display

- Remote input filter: RFL
- PV display

- Input type/IN
- Input unit/UNIT
- Input range/scale
- Analog input bias
- Square root extraction
- Analog input filter
- 10-seg. linearizer approx./bias: PMD (An, Bn)
In Estimating-type position proportional control, the limiter function does not work on output operation.
The reverse-signal relay turns on when being limited by low limit.
The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the ▲ or ▼ key is pressed.
Output limiter does not work.

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply
LPS

24 V loop power supply

Input error preset output
EPO

Output ladder calculation program (signal goes to the output as is when without ladder program).
For ladder program, see the LL50A Parameter Setting Software User’s Manual.
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.5 Loop Control for Backup, Heating/cooling Loop Control for Backup, and Position Proportional Loop Control for Backup

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTLM</td>
<td>Control mode</td>
<td>STD</td>
<td>SGL: Single-loop control&lt;br&gt;CAS1: Cascade primary-loop control&lt;br&gt;CAS2: Cascade secondary-loop control&lt;br&gt;CAS: Cascade control&lt;br&gt;BUM: Loop control for backup&lt;br&gt;PVSW: Loop control with PV switching&lt;br&gt;PVSEL: Loop control with PV auto-selector&lt;br&gt;PVHD: Loop control with PV-hold function</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

### CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

### Description

These control modes allow control in connection with host control equipment (such as another controller or programmable controller (PLC)). If the host control equipment breaks down and the controller receives the FIAL signal, the controller performs backup control operations.

Loop control for backup can be used for Standard type or Heating/cooling type controller. Heating/cooling loop control for backup can be used for Heating/cooling type controller. Position proportional loop control for backup can be used for Position proportional type controller.

- PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- Contact input assignment: 12.1 Setting Contact Input Function
- Contact output assignment: 12.2 Setting Contact Output Function
- Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
- Analog output range change: 10.14 Changing Current Output Range
Loop Control for Backup Function Block Diagram

Equipped as standard

PV input

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

Communication

Communication type: RS-485, Ethernet, PROFIBUS-DP

Output tracking input

(Manipulated output from host)

Output limiter

Manual preset output

Input error preset output

Target setpoints 1 to 8

DI1 to DI3 are equipped as standard.

For optional suffix code /LP

Output terminal assignment

Equipment as standard

For optional suffix code /HA

DI16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Legend

Alarm 1 (PV high limit)

Alarm 2 (PV low limit)

FAIL

PV display

SP display

Control computation

Remote input

Aux. input

Ratio bias computation

Target setpoints 1 to 8

PV input

SP limiter

SP high limit

SP low limit

SP ramp rate

SPN, SP

Retransmission output

Current or voltage pulse

PV input

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

Input type

Input unit

Input range/scale

Analog input bias

Square root extraction

Analog input filter

10-segment linearizer approx./bias

PV input bias

PV input filter

Remote input

Aux. input

Ratio bias computation

Target setpoints 1 to 8

PV display

SP display

Control computation

Remote input filter

PV input bias

PV input filter
Heating/cooling Loop Control for Backup Function Block Diagram

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

Communication
*1: RS-485, Ethernet, PROFINET-DP

Output tracking input
(Manipulated output from host)

Contact inputs
No function is assigned to DI3.

PV input

Input type
UNIT
Input unit
PV

Input range/scale
RH, RL
Input range/scale
SDP, SH, SL

Analog input bias
A.BS
Analog input bias
A.BS

Square root extraction
A.SR
Square root extraction
A.SR

Analog input filter
A.LC
Analog input filter
A.LC

10-seg. linearizer approx./bias
PMD (An, Bn)
10-seg. linearizer approx./bias
PMD (An, Bn)

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Manual output is prioritized even if sensor burnout occurs in MAN.

Remote input can be used when UT55A suffix code: Type 2 = 7
Aux. analog (remote) input

DI1 to DI3 are equipped as standard.
DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

No function is assigned to DI3.
Position Proportional Loop Control for Backup Function Block Diagram

Equipped as standard

PV input

Remote input can be used when UT55A suffix code: Type 2 = 7 Aux. analog (remote) input

Communication

*1: RS-485, Ethernet, PROFIBUS-DP

Analog signal Contact signal Front panel key

Legend

Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
FAIL

PV display SP display

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

In Estimating-type position proportional control, the limiter function does not work on output operation.

The reverse-signal relay turns on when being limited by low limit.

The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the key is pressed. Output limiter does not work.

H relay ( key)
L relay ( key)

Terminal Parameter Function

Analog signal Contact signal Front panel key

Alarm

Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
FAIL

PV display SP display

Control computation

REMOTE LOCAL

Target setpoints 1 to 8

PV display

SP display

Control computation

A/B S

Input type

Input unit

Input range/scale

Analog input bias

Square root extraction

Analog input filter

10-seg. linearizer approx./bias

PV input

PV input bias

PV input filter

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Remote input filter

Aux. input

Ratio bias computation

Remote input can be used when UT55A suffix code: Type 2 = 7

UT52A suffix code: Type 2 = 1 or 2

DI1 to DI3 are equipped as standard.

DI16 is equipped when

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.
In Estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the Δ or V key is pressed. Output limiter does not work.

When sensor burnout occurs

Output limiter

When sensor burnout occurs

Output limiter

Output tracking input

Output tracking switch (Tracking at ON)

Output limiter

Output limiter

Output tracking input

Output tracking switch (Tracking at ON)

Position Proportional Computation Output cannot be calculated by ladder program.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Remote input can be used when UT55A suffix code: Type 2 = 7

Aux. analog (remote) input

No function is assigned to DI3.

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

In Manual operation, the relay turns on while the Δ or V key is pressed. Output limiter does not work.
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.6 Loop Control with PV Switching, Heating/cooling Loop Control with PV Switching, and Position Proportional Loop Control with PV Switching

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTLM</td>
<td>Control mode</td>
<td>STD</td>
<td>SGL: Single-loop control&lt;br&gt;CAS1: Cascade primary-loop control&lt;br&gt;CAS2: Cascade secondary-loop control&lt;br&gt;CAS: Cascade control&lt;br&gt;BUM: Loop control for backup&lt;br&gt;PVSW: Loop control with PV switching&lt;br&gt;PVSEL: Loop control with PV auto-selector&lt;br&gt;PVHD: Loop control with PV-hold function</td>
</tr>
</tbody>
</table>

**CAUTION**

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

**Description**

Description

These control modes use two PV inputs, which are switched according to input contact signals or measurement ranges.

Loop control with PV switching can be used for Standard type or Heating/cooling type controller.
Heating/cooling loop control with PV switching can be used for Heating/cooling type controller.
Position proportional loop control with PV switching can be used for Position proportional type controller.

- PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

Description about Loop control with PV switching

- PV range: 7.6 Adjusting PV Range for Loop Control with PV Switching
- Switching action: 7.7 Setting PV Switching Methods of Loop Control with PV Switching

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions.
Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- Contact input assignment: 12.1 Setting Contact Input Function
- Contact output assignment: 12.2 Setting Contact Output Function
- Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
- Analog output range change: 10.14 Changing Current Output Range
Loop Control with PV Switching Function Block Diagram

Target setpoints 1 to 8

COM

Aux. input

Remote input filter

PV switching

PV display

SP display

Control computation

PV input 1

PV input 2

RSP

Input type

IN

Input unit

UNIT

Input range/scale

RH, RL, SDP, SH, SL

Analog input bias

A.BS, A.LC

Square root extraction

A.SR

10-seg. linearizer approx./bias

PMD, An, Bn

PV input bias

BS

PV input filter

FL

PV: C, PVL, PVH, PVL

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

RSP terminal input (ON)/PV terminal input (OFF) switch

Remote input can be used when UT55A suffix code: Type 2 = 7

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR;
UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
However, D16 is to be deleted.

PV switching

PMD, An, Bn

10-seg. linearizer approx./bias

PV input bias

BS

PV input filter

FL

RSP terminal input

Remote input

Remote input can be used when UT55A suffix code: Type 2 = 7

Aux. analog (remote) input

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

D11 to D13 are equipped as standard.
D16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

D11 to D13 are equipped as standard.
D16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

No function is assigned to D13.
Control Functions

Loop Control with PV Switching Function Block Diagram

Target setpoints 1 to 8

COM

Aux. input

Output limiter

Manual operation

Manual preset output

Input error preset output

Preset output

AUTO (ON)/MAN (OFF) switch

STOP (ON)/RUN (OFF) switch

LOCAL REMOTE

AUTO

MAN

RUN STOP

SP ramp rate

SP limiter

PV input 1 PV input 2

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

PV display SP display

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /HA

Heater break alarm 1

Heater break alarm 2

LPS

24 V loop power supply

For optional suffix code /LP

Out retransmission output

Current or voltage pulse

(Current when retransmission output)

Alarm

OUT

OUT

Relay

Current

Current or voltage pulse

(On retransmission output)

Legend

Terminal

Parameter

Function

Analog signal

Contact signal

Front panel key

Equipped as standard

Equipped as standard

Equipped as standard

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

Sensor burnout occurs when PV or RSP input burnout occurs. However, burnout is not detected if input is not connected.
Heating/cooling Loop Control with PV Switching Function Block Diagram

Equipped as standard
PV input 1

Aux. analog (remote) input (E1-terminal area)
PV input 2

PV
Input type
IN
Input unit
UNIT
Input range/scale
RH, RL
Analog input bias
ABS
Square root extraction
ASR
10-seg. linearizer approx./bias
PMD (An, Bn)

RSP
Input type
IN
Input unit
UNIT
Input range/scale
RH, RL
Analog input bias
ABS
Square root extraction
ASR
10-seg. linearizer approx./bias
PMD (An, Bn)

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

PV switching

RSP terminal input (ON)/PV terminal input (OFF) switch

Remote input filter

Remote input can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, D16 is to be deleted.

DI1 to DI3 are equipped as standard. D16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Contact inputs

No function is assigned to DI3.

PV display
SP display

Control computation

Target setpoints 1 to 8
SPNO
SP
SP limiter
SPR, SPL
SP ramp rate
SPR, SPL, TMU

REMOTE
LOCAL

COM  +1: RS-485, Ethernet, PROFIBUS-DP

Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)

Alarm equipped as standard

Current or voltage pulse
Relay
LPS
24 V loop power supply

Current or voltage pulse
Relay
OUT
OUT2
RET

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

PMD
OU.H
OU.L
OU2.H
OU2.L

For optional suffix code /LP

Output terminal assignment

PMD
An, Bn

Split computation

10-seg. linearizer approx./bias

PV display
SP display

Control computation

Digital input (DI) 1 to 3

DI1
DI2
DI3
DI16

No function

Equipped as standard

PV input 1

Aux. analog (remote) input (E1-terminal area)

PV input 2

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, D16 is to be deleted.

DI1 to DI3 are equipped as standard. D16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Contact inputs

No function is assigned to DI3.

PV display
SP display

Control computation

Target setpoints 1 to 8
SPNO
SP
SP limiter
SPR, SPL
SP ramp rate
SPR, SPL, TMU

REMOTE
LOCAL

COM  +1: RS-485, Ethernet, PROFIBUS-DP

Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)

Alarm equipped as standard

Current or voltage pulse
Relay
LPS
24 V loop power supply

Current or voltage pulse
Relay
OUT
OUT2
RET

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

PMD
OU.H
OU.L
OU2.H
OU2.L

For optional suffix code /LP

Output terminal assignment

PMD
An, Bn

Split computation

10-seg. linearizer approx./bias

PV display
SP display

Control computation

Digital input (DI) 1 to 3

DI1
DI2
DI3
DI16

No function

Equipped as standard

PV input 1

Aux. analog (remote) input (E1-terminal area)

PV input 2

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, D16 is to be deleted.

DI1 to DI3 are equipped as standard. D16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Contact inputs

No function is assigned to DI3.

PV display
SP display

Control computation

Target setpoints 1 to 8
SPNO
SP
SP limiter
SPR, SPL
SP ramp rate
SPR, SPL, TMU

REMOTE
LOCAL

COM  +1: RS-485, Ethernet, PROFIBUS-DP

Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)

Alarm equipped as standard

Current or voltage pulse
Relay
LPS
24 V loop power supply

Current or voltage pulse
Relay
OUT
OUT2
RET

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

PMD
OU.H
OU.L
OU2.H
OU2.L

For optional suffix code /LP

Output terminal assignment

PMD
An, Bn

Split computation

10-seg. linearizer approx./bias

PV display
SP display

Control computation

Digital input (DI) 1 to 3

DI1
DI2
DI3
DI16

No function

Equipped as standard

PV input 1

Aux. analog (remote) input (E1-terminal area)

PV input 2

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, D16 is to be deleted.

DI1 to DI3 are equipped as standard. D16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

Contact inputs

No function is assigned to DI3.

PV display
SP display

Control computation

Target setpoints 1 to 8
SPNO
SP
SP limiter
SPR, SPL
SP ramp rate
SPR, SPL, TMU

REMOTE
LOCAL

COM  +1: RS-485, Ethernet, PROFIBUS-DP

Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)

Alarm equipped as standard

Current or voltage pulse
Relay
LPS
24 V loop power supply

Current or voltage pulse
Relay
OUT
OUT2
RET

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.
Position Proportional Loop Control with PV Switching Function

- **UT55A suffix code**: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2
- **Remote input can be used when UT55A suffix code**: Type 2 = 7
- **Aux. analog (remote) input**

**Input ladder calculation program** (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**PV display**

**Control computation**

**Remote input filter**

**RSP terminal input (ON)/PV terminal input (OFF) switch**

**COM**

1: RS-485, Ethernet, PROFINET-DP

**Alarm**

1. PV high limit
2. PV low limit
3. PV high limit

**Terminal Parameter Function**

- **Analog signal**
- **Contact signal**
- **Front panel key**

**Legend**

For the model with optional suffix code /DR:

- Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR.
- UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
- However, DI16 is to be deleted.
Control Functions

- **Position Proportional Loop Control with PV Switching Function Block Diagram**

  - Target setpoints 1 to 8
  - COM
  - Aux. input
  - LOCAL/REMOTE
  - SP ramp rate
  - SP limiter
  - DI16
  - PV
  - Input type
  - Input unit
  - Input range/scale
  - Analog input bias
  - Square root extraction
  - Analog input filter
  - 10-seg. linearizer approx./bias
  - Remote input filter
  - PV input bias
  - PV input filter
  - Ratio bias computation
  - PV switching
  - A.BS
  - A.FL
  - BS
  - FL
  - PMD
  - An, Bn
  - 10-seg. linearizer approx./bias
  - PMD
  - An, Bn
  - PV.2C
  - PV.HL
  - PV.LL
  - P.UNI
  - P.DP
  - P.RH, P.RL
  - CNT
  - ALG
  - UPR, DNR
  - TMU
  - SPNO
  - SP
  - R/L
  - RMS
  - SPH, SPL
  - RFL
  - A.SR
  - A.LC
  - UNIT
  - IN
  - RH, RL
  - SDP
  - SH, SL
  - RSP
  - Input type
  - Input unit
  - Input range/scale
  - Analog input bias
  - Square root extraction
  - Analog input filter
  - 10-seg. linearizer approx./bias
  - PMD
  - An, Bn
  - AIN2
  - A.BS
  - A.FL
  - A.SR
  - A.LC
  - UNIT
  - IN
  - RH, RL
  - SDP
  - SH, SL
  - RET
  - A.SR
  - A.LC
  - UNIT
  - IN
  - RH, RL
  - SDP
  - SH, SL
  - AL1
  - AL2
  - AL3
  - Alarm

- **Output ladder calculation program** (signal goes to the output as is when without ladder program)

- **Terminal Parameter Function**

  - For optional suffix code /LP:
    - 24 V loop power supply
      - LPS
    - Feedback input
      - FBIN
    - Output ladder calculation program (signal goes to the control computation as is when without ladder program)
      - For ladder program, see the LL50A Parameter Setting Software User’s Manual.

- **In Estimating-type position proportional control, the limiter function does not work on output operation.**
  - The reverse-signal relay turns on when being limited by low limit.
  - The direct-signal relay turns on when being limited by high limit.

- **In Manual operation, the relay turns on while the △ or ◀ key is pressed. Output limiter does not work.**

- **Manual operation**

- **Preset output**

- **Output limiter**

- **STOP (ON)/RUN (OFF) switch**

- **AUTO (ON)/MAN (OFF) switch**

- **Input error preset output**

- **EPO**

- **When sensor burnout occurs**

- **For the model with optional suffix code /DR:**
  - Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

- **However, DI16 is to be deleted.**

- **For optional suffix code /LP:**
  - 24 V loop power supply
    - LPS
  - Feedback input
    - FBIN
  - Valve position sliding resistor or current
    - M
  - Relay output
    - Direct/reverse signal
    - Motor-operated valve
    - VAlV
  - Split computation
    - PMD (An, Bn)
    - 10-seg. linearizer approx./bias
  - Signal comparison
    - HYS
    - DB
    - L relay (key)
    - H relay (key)
  - For ladder program, see the LL50A Parameter Setting Software User’s Manual.

- **Alarm**

- **Alarm 1 (PV high limit)**

- **Alarm 2 (PV low limit)**

- **Alarm 3 (PV high limit)**

- **Terminal Parameter Function**

- **Legend**

  - Terminal
  - Parameter
  - Function

  - Analog signal
  - Contact signal
  - Front panel key
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.7 Loop Control with PV Auto-selector, Heating/cooling Loop Control with PV Auto-selector, and Position Proportional Loop Control with PV Auto-selector

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| CTLM             | Control mode | STD           | SGL: Single-loop control  
CAS1: Cascade primary-loop control  
CAS2: Cascade secondary-loop control  
CAS: Cascade control  
BUM: Loop control for backup  
PVSW: Loop control with PV switching  
PVSEL: Loop control with PV auto-selector  
PVHD: Loop control with PV-hold function | CTL Set  |

**CAUTION**

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

### Description

These control modes automatically select or calculate the larger, the smaller, the average, or difference of multiple (two to four) PV inputs for control.

Loop control with PV auto-selector can be used for Standard type or Heating/cooling type controller.

Heating/cooling loop control with auto-selector can be used for Heating/cooling type controller.

Position proportional loop control with auto-selector can be used for Position proportional type controller.

- PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

Description about Loop control with PV auto-selector

- Input selection: 7.4 Using Larger, Smaller, Average, or Difference of Two to Four Inputs as PV

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- Contact input assignment: 12.1 Setting Contact Input Function
- Contact output assignment: 12.2 Setting Contact Output Function
- Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
- Analog output range change: 10.14 Changing Current Output Range
Loop Control with PV Auto-selector (2 inputs) Function Block Diagram

Equipped as standard
PV input 1

Aux. analog (remote) input (E1-terminal area)
PV input 2

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR;
UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
However, DI16 is to be deleted.

DI1 to DI3 are equipped as standard.
DI16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
UT52A suffix code: Type 2 = 1 or 2.

Input type
IN
Input unit
UNIT
Input range/scale
RH, RL, SH, SL
Analog input bias
ABS
Square root extraction
ARS, ALC
Analog input filter
AFL
10-seg. linearizer approx./bias
PMD, A, Bn
PV display

SP display

Control computation
CNT, ALG

Ratio bias computation
REMOTE, LOCAL
Target setpoints 1 to 8
SPND, SP

SP limiter
SPH, SPL
SP ramp rate
URP, DNR, TMU

*1: RS-485, Ethernet, PROFIBUS-DP

PV auto-selector (Max., Min., Ave., Diff.)
PV input 1

PV auto-selector (Max., Min., Ave., Diff.)
PV input 2

Input type
IN
Input unit
UNIT
Input range/scale
RH, RL, SH, SL
Analog input bias
ABS
Square root extraction
ARS, ALC
Analog input filter
AFL
10-seg. linearizer approx./bias
PMD, A, Bn
PV display

PV input bias
BS
PV input filter
FL

Contact inputs
DI1 DI2 DI3 DI16
No function is assigned to DI3 and DI16.

Legend

PV display SP display

Input type
IN
Input unit
UNIT
Input range/scale
RH, RL, SH, SL
Analog input bias
ABS
Square root extraction
ARS, ALC
Analog input filter
AFL
10-seg. linearizer approx./bias
PMD, A, Bn
PV display

PV input bias
BS
PV input filter
FL

Control computation
CNT, ALG

Ratio bias computation
REMOTE, LOCAL
Target setpoints 1 to 8
SPND, SP

SP limiter
SPH, SPL
SP ramp rate
URP, DNR, TMU

*1: RS-485, Ethernet, PROFIBUS-DP

PV auto-selector (Max., Min., Ave., Diff.)
PV input 1

PV auto-selector (Max., Min., Ave., Diff.)
PV input 2

Input type
IN
Input unit
UNIT
Input range/scale
RH, RL, SH, SL
Analog input bias
ABS
Square root extraction
ARS, ALC
Analog input filter
AFL
10-seg. linearizer approx./bias
PMD, A, Bn
PV display

PV input bias
BS
PV input filter
FL

Control computation
CNT, ALG

Ratio bias computation
REMOTE, LOCAL
Target setpoints 1 to 8
SPND, SP

SP limiter
SPH, SPL
SP ramp rate
URP, DNR, TMU

*1: RS-485, Ethernet, PROFIBUS-DP
Control Functions

Loop Control with PV Auto-selector (2 inputs)

Function Block Diagram

Target setpoints 1 to 8

Output limiter

Manual operation

Manual preset output

Preset output

AUTO (ON)/MAN (OFF) switch

STOP (ON)/RUN (OFF) switch

Output terminal assignment

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP

24 V loop power supply

LPS

Relay

Current or voltage pulse (Current when retransmission output)

Current

For optional suffix code /NA

Heater break alarm

Heater break alarm 1

Heater break alarm 2

Legend

Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

Sensor burnout occurs when PV or RSP input burnout occurs. However, burnout is not detected if input is not connected.

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

*1: RS-485, Ethernet, PROFIBUS-DP

8.1 Setting Control Mode (CTLM)

Equipped as standard

Equipped as standard

Out retransmission output

OUT retransmission output

OUT retransmission output

Alarm

Legend

Terminal
Parameter
Function
Analog signal
Contact signal
Front panel key

PV input 1 PV input 2

Aux. analog (remote) input (E1-terminal area)

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;

UT52A suffix code: Type 2 = 1 or 2

Contact inputs

Equipped as standard

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, DI16 is to be deleted.

For the model with optional suffix code /DR:

Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, DI16 is to be deleted.

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

*1: RS-485, Ethernet, PROFIBUS-DP

8.1 Setting Control Mode (CTLM)
Heating/cooling Loop Control with PV Auto-selector (2 inputs) Function Block Diagram

**Equipped as standard**
- PV input 1
- PV input 2

**Aux. analog (remote) input (E1-terminal area)**
- PV input 1
- PV input 2

**PV auto-selector (Max., Min., Ave., Diff.)**
- Input type: IN
- Input unit: UNIT
- Input range/scale: IN, BS, SH, SL
- Analog input bias: PMD, A, B, C
- Analog input filter: A, FL

**Target setpoints 1 to 8**
- SP ramp rate
- SP limiter
- SP ramp rate

**Ratio bias computation**
- Remote
- Local

**Target setpoints 1 to 8**
- SPNO, SP

**Control computation**
- CNT, ALG

**Input ladder calculation program**
- Signal goes to the control computation as is when without ladder program.
- For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Contact inputs**
- DI1
- DI2
- DI3
- DI16

**Output ladder calculation program**
- Signal goes to the output as is when without ladder program.
- For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Manual output**
- Prioritized even if sensor burnout occurs in MAN.

**Sensor burnout**
- PV or RSP input burnout.
- However, burnout is not detected if input is not connected.

**Alarm 1**
- PV high limit

**Alarm 2**
- PV low limit

**Alarm 3**
- PV high limit

**Alarm**
- Equipped as standard

**For the model with optional suffix code /DR:**
- Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR;
- UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
- However, DI16 is to be deleted.

**DI1 to DI3 are equipped as standard.**
- DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7;
- UT52A suffix code: Type 2 = 1 or 2.
Control Functions

Heating/cooling Loop Control with PV Auto-selector (2 inputs) Function Block Diagram

Target setpoints 1 to 8

COM
LOCAL REMOTE

SP ramp rate
SP limiter

Input type
Input unit
Input range/scale
Analog input bias
Square root extraction
Analog input filter
10-seg. linearizer approx./bias
PV input bias
PV input filter
Ratio bias computation
PV auto-selector (Max., Min., Ave., Diff.)

A.BS
A.FL
BS
FL
PMD
An, Bn

10-seg. linearizer approx./bias
PMD
An, Bn

A.SR
A.LC
UNIT
IN
RH, RL
SDP
SH, SL

R/L
SPH, SPL

SPNO
SP

RSP

Manual operation
MPON

Output terminal assignment

Auto (ON)/MAN (OFF) switch

STOP (ON)/RUN (OFF) switch

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.

Manual preset output
MPON

Manual output is prioritized even if sensor burnout occurs in MAN.

Input error preset output

When sensor burnout occurs

Heating-side preset output
PO

Cooling-side preset output
POc

Output terminal assignment

Alarm

Alarm 1
(PV high limit)
Alarm 2
(PV low limit)
Alarm 3
(PV high limit)

For optional suffix code /LP
24 V loop power supply

Heating-side output
OUT

Current or voltage pulse
(Current when retransmission output)

Relay

For the model with optional suffix code /DR:
Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.

However, DI16 is to be deleted.

Sensor burnout occurs when PV or RSP input burnout occurs. However, burnout is not detected if input is not connected.

For optional suffix code /LP
24 V loop power supply
### Position Proportional Control with PV Auto-selector (2 inputs) Function Block Diagram

**PV Input 1**
- PV display
- Control computation
- Input ladder calculation program
- Terminal Parameter Function

**PV Input 2**
- PV display
- Control computation
- Input ladder calculation program
- Terminal Parameter Function

**Input Ladder Calculation Program**
- Signal goes to the control computation as is when without ladder program.
- For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Output Ladder Calculation Program**
- Signal goes to the output as is when without ladder program.
- For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Position Proportional Computation**
- Output cannot be calculated by ladder program.

---

### Terminal Parameter Function

<table>
<thead>
<tr>
<th>Analog signal</th>
<th>Contact signal</th>
<th>Front panel key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legend</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PV Display**
- PV display
- Control computation
- Input ladder calculation program
- Terminal Parameter Function

**SP Display**
- SP display
- Control computation
- Input ladder calculation program
- Terminal Parameter Function

---

### Contact Inputs

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

For the model with optional suffix code /DR:
- Remote input with direct input (E1-terminal area) can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 and with optional suffix code /DR; UT52A suffix code: Type 2 = 1 or 2 and with optional suffix code /DR.
- However, DI16 is to be deleted.

---

### Alarm Settings

**Alarm 1**
- (PV high limit)

**Alarm 2**
- (PV low limit)

**Alarm 3**
- (PV high limit)

---

### Analog Input Bias

- Analog input bias
- Square root extraction
- Analog input filter
- 10-seg. linearizer approx./bias
- PV input bias
- PV input filter
- Ratio bias computation

---

### Input Type

- Input type
- Input unit
- Input range/scale
- Analog input bias
- Square root extraction
- Analog input filter
- 10-seg. linearizer approx./bias
- PV input bias
- PV input filter
- Ratio bias computation

---

### DI Inputs

DI1 to DI3 are equipped as standard. DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

---

### Feedback Input Direct/reverse signal

- Valve position sliding
- Resistor or current
- Motor-operated valve
- Relay output

---

### Loop Power Supply

- 24 V loop power supply
- LPS
- Current

---

### Output Limiters

- EPO
- OH, OL
- PO
- S/R

---

### Signal Comparison

- Feedback input
- Direct/reverse signal
- Valve position sliding resistor or current
- Motor-operated valve
- Relay output

---

### Alarm Specifications

- Alarm 1
- (PV high limit)
- Alarm 2
- (PV low limit)
- Alarm 3
- (PV high limit)

---

### Limiters

- Output limiter
- EPO
- OH, OL
- PO
- S/R

---

### Key Switches

- RUN/STOP
- AUTO (ON)/MAN (OFF)
- MANUAL (ON)/AUTO (OFF)

---

### Relay Outputs

- RTS
- HYS
- DB

---

### Retransmission Outputs

- RB
- OH
- OL
- PO
- S/R

---

### Alarm Outputs

- Alarm 1
- (PV high limit)
- Alarm 2
- (PV low limit)
- Alarm 3
- (PV high limit)

---

### Parameter Setting Software

- UT50A suffix code: Type 2 = 1, 2, 4, 5, or 7
- UT52A suffix code: Type 2 = 1 or 2

---

### Optional Features

- Current
- Current
- LPS
- 24 V loop power supply
- Current
- Current

---

### Optional Suffix Code

- /DR
- /LP
- /AL3
- /AL2
- /AL1

---

### Setting Control Mode (CTLM)

- Setting Control Mode
- CTLM

---

### Communication Interfaces

- RS-485
- Ethernet
- PROFIBUS-DP
In Estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

Sensor burnout occurs when PV or RSP input burnout occurs. However, burnout is not detected if input is not connected.

**Legend**
- Terminal
- Parameter
- Function
- Analog signal
- Contact signal
- Front panel key
Loop Control with PV Auto-selector (4 inputs) Function Block Diagram (only for UT55A)

UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7 is necessary.

For the model with optional suffix code /DR:
Refer to the function block diagram of Loop control with PV auto-selector (2 inputs).
Aux. analog input (E1-terminal area)
PV input 1

PV input 2

PV display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Target setpoints 1 to 8

DI1 to DI3 are equipped as standard.
DI6 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7.

Necessary for Loop control with PV auto-selector for 3 inputs or 4 inputs

When UT55A suffix code: Type 2 = 7

Aux. analog input (E2-terminal area)
PV input 3

PV input 4

Sensor burnout occurs when PV, RSP, AIN2, or AIN4 input burnout occurs.
However, burnout is not detected if input is not connected.

* After the control output terminal is specified by the parameter OT, other current output terminals can be used as retransmission output.

Alarm 1 (PV high limit)
Alarm 2 (PV low limit)
Alarm 3 (PV high limit)

Current or voltage pulse Relay
LPS 24 V loop power supply

Current OUT
OUT RET
OUT AL3
AL2 AL1

For optional suffix code /HA
Heater break alarm
HAL2 HAL1
Heater break alarm 1
Heater break alarm 2

For optional suffix code /LP
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn

16-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn

Split computation
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn
10-seg. linearizer approx./bias
PMD An, Bn

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.

PV display

SP display

Control computation

PV auto-selector (Max., Min., Ave., Diff.)

Can be used when UT55A suffix code: Type 2 = 7 and not in Loop control with PV auto-selector for 4 inputs. However, use the LL50A to set remote input.
Control Functions

Loop Control with PV Auto-selector (4 inputs) Function Block Diagram (only for UT55A)

- Target setpoints 1 to 8
- COM
- Output limiter
- Manual operation
- Manual preset output
- Error preset output
- Preset output
- AUTO (ON)/MAN (OFF) switch
- STOP (ON)/RUN (OFF) switch

When sensor burnout occurs
- Normal
- AUTO
- RUN
- STOP

SP ramp rate
- SP limiter

Input type
- Input unit
- Input range/scale
- Analog input bias
- Square root extraction
- Analog input filter
- 10-seg. linearizer approx./bias
- PV input bias
- PV input filter
- Ratio bias computation
- PV auto-selector (Max., Min., Ave., Diff.)

Output limiter
- A.BS
- A.FL
- BS
- FL
- PMD
- An, Bn

PV input bias
- PV input filter
- 10-seg. linearizer approx./bias
- PMD
- An, Bn

Output terminal assignment
- OT
- OUT retransmission output
- O1RS
- RET retransmission output
- RTS

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

For optional suffix code /LP
- 24 V loop power supply

For optional suffix code /HA
- Heater break alarm

Legend
- Terminal
- Parameter
- Function
- Analog signal
- Contact signal
- Front panel key
Position Proportional Loop Control with PV Auto-selector (4 inputs) Function Block Diagram (only for UT55A)

- **UT55A suffix code**: Type 2 = 1, 2, 4, 5, or 7 is necessary.
- **Loop control with PV auto-selector (2 inputs)**: Refer to the function block diagram of Loop control with PV auto-selector (2 inputs).
- **Aux. analog (remote) input (E1-terminal area)**: Required for Loop control with PV auto-selector for 3 inputs or 4 inputs.

### Input ladder calculation program
- (signal goes to the control computation as is when without ladder program)
- For ladder program, see the LL50A Parameter Setting Software User's Manual.

- **PV display**: SP display
- **Input type**: UNIT
- **Input unit**: SOP, SH, SL
- **Input range/scale**: A.BS, A.SR, A.LC
- **Analog input bias**: PVMD, An, Bn
- **Square root extraction**: PVMD, An
- **Analog input filter**: P.MD, An, Bn
- **10-seg. linearizer approx./bias**: PMD, An, Bn

### Control computation
- **Ratio bias computation**: PMD, An, Bn
- **SP limiter**: P.MD, An, Bn
- **SP ramp rate**: P.MD, An, Bn

### PV display
- **Control computation**: CNT, ALG

### Alarm
- **Alarm 1**: PV high limit
- **Alarm 2**: PV low limit
- **Alarm 3**: PV high limit

### Output ladder calculation program
- (signal goes to the output as is when without ladder program)
- For ladder program, see the LL50A Parameter Setting Software User’s Manual.

### Terminal Parameter Function
- **Legend**
- **PV auto-selector (Max., Min., Ave., Diff.)**
- **A.BS**
- **A.FL**
- **A.SR**
- **A.LC**
- **PMD**
- **An, Bn**
- **10-seg. linearizer approx./bias**
- **PVMD**
- **An, Bn**

### Loop control with PV auto-selector
- **Target setpoints 1 to 8**
- **COM**
- **LOCAL**
- **REMOTE**
- **R/L**
- **SP**
- **SP limiter**: (SPH, SPL)
- **SP ramp rate**: (SPR, DNR, TMU)
- **PV input bias**: BS
- **PV input filter**: FL
- **DI1 to DI3 are equipped as standard.**
- **DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7.**

---

**Diagram Notes**
- **No function is assigned to DI23, DI26, and DI46.**
- **When sensor burnout occurs**
- In Estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.
- **Burnout is not detected if input is not connected.**

---

**Function Block Diagram**
- **PV input 1**
- **PV input 2**
- **PV input 3**
- **PV input 4**
- **AIN2**
- **AIN4**
- **AIN3**
- **AIN1**
- **DI1 to DI3**
- **DI16**

---

**User Notes**
- **When UT55A suffix code: Type 2 = 7**
- 

---

**Specifications**
- **UT55A suffix code**: Type 2 = 1, 2, 4, 5, or 7 is necessary.
- **Aux. analog (remote) input (E1-terminal area)**
- **Aux. analog input (E2-terminal area)**
- **Aux. analog input (E4-terminal area)**
Control Functions

Position Proportional Loop Control with PV Auto-selector (4 inputs)

Function Block Diagram (only for UT55A)

Target setpoints 1 to 8

SP ramp rate

SP limiter

DI26

DI46

PV

AIN2

Input type

Input unit

Input range/scale

Analog input bias

Square root extraction

Analog input filter

10-seg. linearizer approx./bias

PV input bias

PV input filter

Ratio bias computation

PV auto-selector (Max., Min., Ave., Diff.)

A.BS

A.FL

BS

FL

PMD

An, Bn

10-seg. linearizer approx./bias

PV.AS

P.UNI

P.DP

P.RH, P.RL

CNT

ALG

UPR, DNR

TMU

SPNO

SP

R/L

SPH, SPL

A.SR

A.LC

UNIT

IN

RH, RL

SDP

SH, SL

RSP

A.BS

A.FL

A.SR

A.LC

UNIT

IN

RH, RL

SDP

SH, SL

For optional suffix code /LP

24 V loop power supply

LPS

For the model with optional suffix code /DR: Refer to the function block diagram of Loop control with PV auto-selector (2 inputs).

Di 1 to Di 3 are equipped as standard. Di 16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7.

In Manual operation, the relay turns on while the △ or ▼ key is pressed. Output limiter does not work.

In Estimating-type position proportional control, the limiter function does not work on output operation.

The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

Sensor burnout occurs when PV, RSP, AIN2, or AIN4 input burnout occurs. However, burnout is not detected if input is not connected.

Position Proportional Computation Output cannot be calculated by ladder program.

Output ladder calculation program (signal goes to the output as it is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User's Manual.

Legend

Terminal

Parameter

Function

Analog signal

Contact signal

Front panel key

8.1 Setting Control Mode (CTLM)
8.1 Setting Control Mode (CTLM)

Intentionally blank
8.1.8 Loop Control with PV-hold Function, Heating/cooling Loop Control with PV-hold Function, and Position Proportional Loop Control with PV-hold Function

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTLM</td>
<td>Control mode</td>
<td>STD</td>
<td>SGL: Single-loop control&lt;br&gt;CAS1: Cascade primary-loop control&lt;br&gt;CAS2: Cascade secondary-loop control&lt;br&gt;CAS: Cascade control&lt;br&gt;BUM: Loop control for backup&lt;br&gt;PVSW: Loop control with PV switching&lt;br&gt;PVSEL: Loop control with PV auto-selector&lt;br&gt;PVHD: Loop control with PV-hold function</td>
</tr>
</tbody>
</table>

### CAUTION

- Some parameters will be initialized if the control mode (CTLM) is changed.
- When using the ladder program, the control mode cannot be changed.

### Description

These control modes hold the PV input value and control output value by switching the external sensor using contact input.

Loop control with PV-hold function can be used for Standard type or Heating/cooling type controller.
Heating/cooling loop control with PV-hold function can be used for Heating/cooling type controller.
Position proportional loop control with PV-hold function can be used for Position proportional type controller.

- PID control and Heating/cooling control: 8.2 Setting Control Type (CNT)

Up to four 10-segment linearizer approximation/10-segment linearizer biases can be used for the input unit or output unit.

The Function block diagram describes only the basic functions. Parameter symbols in the Function block diagram describe representative parameters.

For the functions and parameters which are not described in Function block diagram, see the following.

- Contact input assignment: 12.1 Setting Contact Input Function
- Contact output assignment: 12.2 Setting Contact Output Function
- Contact output assignment to retransmission output terminal: 10.1 Setting Control Output Type
- Analog output range change: 10.14 Changing Current Output Range
### Loop Control with PV-hold Function Block Diagram

**Remote input** can be used when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

**Feedforward input** can be used when UT55A suffix code: Type 2 = 7.

**PV display**

**SP display**

**Control computation**

**PV input**

**PV input bias**

**PV input filter**

**10-seg. linearizer approx./bias**

**PV-hold function**

**10-seg. linearizer approx./bias**

**Remote input filter**

**Aux. input**

**Ratio bias computation**

**SP limiter**

**SP ramp rate**

**Filter**

**Gain, bias**

**Control parameter**

**Communication**

1: RS-485, Ethernet, PROFIBUS-DP

**Output ladder calculation program** (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

**Input ladder calculation program**

**D11 to D13 are equipped as standard.**

**DI16 is equipped when UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.**

**No function is assigned to DI3.**
Control Functions

8.1 Setting Control Mode (CTLM)

Control Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTO (ON)</td>
<td>PV hold, MAN (OFF) switch</td>
</tr>
<tr>
<td>MAN (OFF)</td>
<td>AUTO (ON)/PV hold, MAN (OFF) switch</td>
</tr>
<tr>
<td>LOCAL (OFF)</td>
<td>AUTO (ON)/PV hold, MAN (OFF) switch</td>
</tr>
<tr>
<td>REMOTE (ON)</td>
<td>AUTO (ON)/PV hold, MAN (OFF) switch</td>
</tr>
</tbody>
</table>

Output terminal assignment

- OT: Control output terminal
- RET: Retransmission output

Terminal Parameter Function

- Analog signal: Output signal (Current when retransmission output)
- Contact signal: Alarm signal (PV high limit, PV low limit)
- Front panel key: Control computation

Legend

- Terminal
- Parameter
- Function

Communication

- RS-485
- Ethernet
- PROFIBUS-DP

Equipped as standard

- DI1 to DI3
- DI16 (UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2)

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Input ladder calculation program (signal goes to the control computation as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User’s Manual.

Filter

- Gain, bias
- FLG
- FGN
- FBI
- FBO

Feedforward input

- Feedforward input can be used when UT55A suffix code: Type 2 = 7.

Alarm 1

- Alarm 1 (PV high limit)
- Alarm 2 (PV low limit)
- Alarm 3 (PV high limit)

For optional suffix code /HA

- Heater break alarm 1
- Heater break alarm 2

For optional suffix code /LP

- Heater break alarm

24 V loop power supply

- LPS

Current or voltage pulse

- (Current when retransmission output)
Position Proportional Loop Control with PV-hold Function Block Diagram

Equipped as standard
PV input

Input type IN
Input unit UNIT
Input range/scale RH, RL, SDP, SH, SL
Analog input bias A.BS
Square root extraction A.SR, ALC
Analog input filter A.FL
10-seg. linearizer approx./bias PMD, An, Bn

PV display SP display

Control computation

Remote input

Remote input

Remote input

RSP

Input type IN
Input unit UNIT
Input range/scale RH, RL, SDP, SH, SL
Analog input bias A.BS
Square root extraction A.SR, ALC
Analog input filter A.FL
10-seg. linearizer approx./bias PMD, An, Bn

SP display

SP limiter

SP ramp rate

Target setpoints 1 to 8

R/L

REMOTE LOCAL

REMOTE (ON)/LOCAL (OFF) switch

Filter

Gain, bias

Communication

*1: RS-485, Ethernet, PROFINET

Feedforward input

Feedforward input

Feedforward input

AIN2

Input type IN
Input unit UNIT
Input range/scale RH, RL, SDP, SH, SL
Analog input bias A.BS
Square root extraction A.SR, ALC
Analog input filter A.FL
10-seg. linearizer approx./bias PMD, An, Bn

DI1 to DI3 are equipped as standard. DI16 is equipped when
UT55A suffix code: Type 2 = 1, 2, 4, 5, or 7; UT52A suffix code: Type 2 = 1 or 2.

DI1 DI2 DI3 DI16

No function is assigned to DI3.

Contact inputs

STOP (ON)/RUN (OFF) switch

Normal

MAN

RUNSTOP

Output limiter

EPO

OH, OL

PO

S/R

Signal comparison

Feedback input Direct/reverse signal

Valve position sliding resistor or current

Motor-operated valve

Relay output

VALV

FBIN

M

Equipped as standard Equipped as standard Equipped as standard

Current

LPS

24 V loop power supply

Current

OUT

OUT retransmission output

O1RS

RET retransmission output

RTS

Alarm

A/M

Alarm 1 (PV high limit)

Alarm 2 (PV low limit)

Alarm 3 (PV high limit)

Terminal Parameter Function

Analog signal Contact signal Front panel key

Legend

PV display SP display

Output ladder calculation program (signal goes to the output as is when without ladder program). For ladder program, see the LL50A Parameter Setting Software User's Manual.

Input ladder calculation program (signal goes to the control computation as is when without ladder program).
In estimating-type position proportional control, the limiter function does not work on output operation. The reverse-signal relay turns on when being limited by low limit. The direct-signal relay turns on when being limited by high limit.

In Manual operation, the relay turns on while the △ or ▽ key is pressed. Output limiter does not work.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Parameter</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog signal</td>
<td>Contact signal</td>
<td>Front panel key</td>
</tr>
</tbody>
</table>

**Position Proportional Computation**

Output cannot be calculated by ladder program.

For optional suffix code /LP

24 V loop power supply: LPS

Preset output: PO

FOR (ON)/LOCAL (OFF) switch

AUTO (ON)/PV hold, MAN (OFF) switch

STOP (ON)/RUN (OFF) switch

Output limiter

Input error preset output: EPO

When sensor burnout occurs

IN

Output ladder calculation program (signal goes to the output as is when without ladder program).

For ladder program, see the LL50A Parameter Setting Software User's Manual.

**Legend**

- Terminal
- Parameter
- Function
## 8.2 Setting Control Type (CNT)

The following table shows combination of Standard type, Heating/cooling type, Position proportional type and control type (CNT).

<table>
<thead>
<tr>
<th>Control type</th>
<th>Suffix code: Type 1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard type</td>
</tr>
<tr>
<td>PID control</td>
<td>√</td>
</tr>
<tr>
<td>ON/OFF control (1 point of hysteresis)</td>
<td>√</td>
</tr>
<tr>
<td>ON/OFF control (2 points of hysteresis)</td>
<td>√</td>
</tr>
<tr>
<td>Two-position two-level control</td>
<td>N/A</td>
</tr>
<tr>
<td>Heating/cooling control</td>
<td>N/A</td>
</tr>
<tr>
<td>Sample PI control</td>
<td>√</td>
</tr>
<tr>
<td>Batch PID control</td>
<td>√</td>
</tr>
<tr>
<td>Feedforward control</td>
<td>√</td>
</tr>
</tbody>
</table>

*: Available, N/A: Not available

The following table shows combination of control type (CNT) and control mode (CTLM).

<table>
<thead>
<tr>
<th>Control type</th>
<th>Control mode (CTLM)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SGL</td>
</tr>
<tr>
<td>PID control</td>
<td>√</td>
</tr>
<tr>
<td>ON/OFF control (1 point of hysteresis)</td>
<td>√</td>
</tr>
<tr>
<td>ON/OFF control (2 points of hysteresis)</td>
<td>√</td>
</tr>
<tr>
<td>Two-position two-level control</td>
<td>√</td>
</tr>
<tr>
<td>Heating/cooling control</td>
<td>√</td>
</tr>
<tr>
<td>Sample PI control</td>
<td>√</td>
</tr>
<tr>
<td>Batch PID control</td>
<td>√</td>
</tr>
<tr>
<td>Feedforward control</td>
<td>√</td>
</tr>
</tbody>
</table>

*: Available, N/A: Not available

*1: Cannot be selected for Position proportional type.
*2: Can be selected only for Heating/cooling type.

The following table shows combination of control type (CNT) and output type.

<table>
<thead>
<tr>
<th>Control type</th>
<th>Output type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Current output</td>
</tr>
<tr>
<td>PID control</td>
<td>√</td>
</tr>
<tr>
<td>ON/OFF control (1 point of hysteresis)</td>
<td>√</td>
</tr>
<tr>
<td>ON/OFF control (2 points of hysteresis)</td>
<td>√</td>
</tr>
<tr>
<td>Two-position two-level control</td>
<td>√</td>
</tr>
<tr>
<td>Heating/cooling control</td>
<td>√</td>
</tr>
<tr>
<td>Sample PI control</td>
<td>√</td>
</tr>
<tr>
<td>Batch PID control</td>
<td>√</td>
</tr>
<tr>
<td>Feedforward control</td>
<td>√</td>
</tr>
</tbody>
</table>

*: Available, N/A: Not available

► Output type: 10.1 Setting Control Output Type
## 8.2.1 PID Control

### Description

PID control is a general control using control-related parameters PID. When PID control is selected, PID should be obtained by auto-tuning after setting SP or PID should be set manually.

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| CNT              | Control type | EASY          | PID: PID control  
ONOF: ON/OFF control (1 point of hysteresis)  
ONOF2: ON/OFF control (2 points of hysteresis)  
2P2L: Two-position two-level control  
H/C: Heating/cooling control  
S-PI: Sample PI control  
BATCH: Batch PID control  
FFPID: Feedforward control | CTL Set |
| P                | Proportional band  
Heating-side proportional band (in Heating/cooling control) | EASY | 0.0 to 999.9%  
When 0.0% is set, it operates as 0.1%. Heating-side ON/OFF control applies when 0.0% in Heating/cooling control. | PID On |
| I                | Integral time  
Heating-side integral time (in Heating/cooling control) | EASY | OFF: Disable  
1 to 6000 s |
| D                | Derivative time  
Heating-side derivative time (in Heating/cooling control) | EASY | OFF: Disable  
1 to 6000 s |
| Pc               | Cooling-side proportional band | EASY | 0.0 to 999.9%  
Cooling-side ON/OFF control applies when 0.0% in Heating/cooling control. |
| Ic               | Cooling-side integral time | EASY | OFF: Disable  
1 to 6000 s |
| Dc               | Cooling-side derivative time | EASY | OFF: Disable  
1 to 6000 s |
| MR               | Manual reset | EASY | -5.0 to 105.0% |
| PIDN             | PID number selection | EASY | 1 to 8 |
| PIDG.            | Number of PID groups | STD | 1 to 8 |

Note 1: The PID number (1 to 8, or R) is displayed on Group display while the parameter P, I, D, Pc, Ic, Dc, or MR is displayed.

Note 2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note 3: The parameter CNT of Loop 2 displays PID and H/C.

### Note

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.2 Setting Control Type (CNT)

8.2.2 ON/OFF Control (1 point of hysteresis / 2 points of hysteresis)

**Description**

ON/OFF control compares the SP and PV and outputs an on or off signal according to the positive or negative deviation (PV – SP). Hysteresis can be set in the vicinity of the on/off output operating point.

If the SP and PV become close and the polarity of the deviation reverses frequently, the on/off output will cycle repeatedly. The life of the output relay will therefore be dramatically shortened.

In such a case, set a wider hysteresis so that the relay’s frequent on/off output (chattering) will not occur.

When the control type (CNT) is set to “ONOF,” one point of hysteresis can be set to the operating point.

When the control type (CNT) is set to “ONOF2,” two points of hysteresis (deviation positive hysteresis and deviation negative hysteresis) can be set to the operating point.

**1 point of hysteresis**

![Diagram of 1 point of hysteresis]

**2 points of hysteresis**

![Diagram of 2 points of hysteresis]
## Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control type</td>
<td>EASY</td>
<td>PID: PID control ONOF: ON/OFF control (1 point of hysteresis) ONOF2: ON/OFF control (2 points of hysteresis) 2P2L: Two-position two-level control H/C: Heating/cooling control S-Pi: Sample PI control BATCH: Batch PID control FF:PID: Feedforward control</td>
<td>CTL Set</td>
</tr>
<tr>
<td></td>
<td>Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)</td>
<td>EASY</td>
<td>In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%</td>
<td>PID Oper</td>
</tr>
<tr>
<td>HY. UP</td>
<td>Upper-side hysteresis (in ON/OFF control)</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>PID Oper</td>
</tr>
<tr>
<td>HY.LO</td>
<td>Lower-side hysteresis (in ON/OFF control)</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Oper</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>Set a number of PID groups to use. 1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

Note1: The PID number (1 to 8, or R) is displayed on Group display while the parameter HYS, HY.UP or HY.LO is displayed.

Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.2.3 Heating/cooling Control

Description

Heating/cooling control can be used only for Heating/cooling type. In Heating/cooling control, the controller outputs the result of computation after splitting it into heating-purpose and cooling-purpose signals. PID control or ON/OFF control can be selected for each of the heating side and the cooling side. Set the heating-side proportional band to “0” to perform ON/OFF control on the heating side. Set the cooling-side proportional band to “0” to perform ON/OFF control on the cooling side.

Control computation

0 to 100%

Heating/cooling computation

0 to 50%

50 to 100%

Cooling-side output limiter

50 to 100%

Heating-side output limiter

PV  SP  COM

Manual control output

Heating-side control output

0 to 100%

Cooling-side control output

0 to 100%

Details of Heating/cooling Control

In Heating/cooling control, PID control or ON/OFF control can be selected for each of the heating side and the cooling side. Set the proportional band to “0” to perform ON/OFF control. The following describes the combination of heating side and cooling side.

When Both the Heating Side and Cooling Side are in PID Control

The following shows the formula and operation example.

HOUT = ( OUT – \(\frac{DB}{2}\) – 50% ) × 2

COUT = ( 50% – OUT – \(\frac{DB}{2}\) ) × 2 × \(\frac{P}{Pc}\)

8.2 Setting Control Type (CNT)

**Positive Dead Band**

- Cooling-side control output (%)
- Heating-side control output (%)

**Negative Dead Band**

- Cooling-side control output (%)
- Heating-side control output (%)

---

**CAUTION**

- Set the ratio of the heating-side proportional band (P) to the cooling-side proportional band (Pc) to within 1 to 5.
- Setting the heating-side or cooling-side integral time (I or Ic) to "OFF" results in the integral time of both sides being set to "OFF."
When the Heating Side is in ON/OFF Control and the Cooling Side is in PID Control:
The following shows the formula and operation example.

Output turns on when
\[ HOUT = OUT > \left( 50\% + \frac{DB}{2} + \frac{HYS}{2} \right) \]

Other than this case, maintain current state.
\[ COUT = \left( 50\% - OUT - \frac{DB}{2} \right) \times 2 \]

*: OUT: control output, HOUT: heating-side control output,
COUT: cooling-side control output, DB: dead band, and
HYS: heating-side hysteresis
When the Heating Side is in PID Control and the Cooling Side is in ON/OFF Control:
The following shows the formula and operation example.

\[ HOUT = (OUT - \frac{DB}{2} - 50\%) \times 2 \]

Output turns on when
\[ COUT = OUT < (50\% - \frac{DB}{2} - \frac{HYSc}{2}) \]

Output turns off when
\[ OUT > (50\% + \frac{DB}{2} + \frac{HYSc}{2}) \]

Other than these cases, maintain current state.


**Positive Dead Band**

**Negative Dead Band**
8.2 Setting Control Type (CNT)

When both the Heating Side and Cooling Side are in ON/OFF Control:
The following shows the operation example.

![Diagram showing operation example](image)

**Dead Band (DB)**
In Heating/cooling control, the positive dead band denotes the zone where none of the heating-side and cooling-side outputs are presented. The negative dead band denotes the zone where both of the heating-side and cooling-side outputs are presented.

![Diagram showing dead band](image)

Value of control output before split into heating- and cooling-side outputs

Value of control output before split into heating- and cooling-side outputs
## Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CNT</strong></td>
<td>Control type</td>
<td>EASY</td>
<td>PID: PID control</td>
<td>CTL Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ONOF: ON/OFF control (1 point of hysteresis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ONOF2: ON/OFF control (2 points of hysteresis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2P2L: Two-position two-level control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>H/C: Heating/cooling control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S-PI: Sample PI control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BATCH: Batch PID control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FFPID: Feedforward control</td>
<td></td>
</tr>
<tr>
<td><strong>HYS</strong></td>
<td>Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control)</td>
<td>EASY</td>
<td>In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS)</td>
<td>PID Ope</td>
</tr>
<tr>
<td></td>
<td>Heating-side ON/OFF control hysteresis (in Heating/cooling control)</td>
<td></td>
<td>In Heating/cooling control or Position proportional control: 0.0 to 100.0%</td>
<td></td>
</tr>
<tr>
<td><strong>HYSc</strong></td>
<td>Cooling-side ON/OFF control hysteresis</td>
<td>EASY</td>
<td>0.0 to 100.0%</td>
<td></td>
</tr>
<tr>
<td><strong>DB</strong></td>
<td>Output dead band</td>
<td>EASY</td>
<td>In Heating/cooling control: -100.0 to 50.0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(in Heating/cooling control or Position proportional control)</td>
<td></td>
<td>In Position proportional control: 1.0 to 10.0%</td>
<td></td>
</tr>
<tr>
<td><strong>PIDN</strong></td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Ope</td>
</tr>
<tr>
<td><strong>PIDG.</strong></td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

Note 1: The PID number (1 to 8, or R) is displayed on Group display while the parameter HYS, HYSc, or DB is displayed.

Note 2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.2.4 Two-position Two-level Control

**Description**

Two-position two-level control outputs the ON signal and OFF signal for the target setpoint (SP) of the main setting and the sub-target setpoint (SP + SUB) of the sub-setting.

The sub-setting is set as a deviation from the main setting.

Hysteresis can be set in the vicinity of the on/off output operating point.


**Main setting=Direct and Sub-setting=Direct**

**Main setting=Reverse and Sub-setting=Direct**

**Main setting=Direct and Sub-setting=Reverse**

**Main setting=Reverse and Sub-setting=Reverse**
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| **CNT** | Control type | EASY | PID: PID control  
ONOF: ON/OFF control (1 point of hysteresis)  
ONOF2: ON/OFF control (2 points of hysteresis)  
2P2L: Two-position two-level control  
H/C: Heating/cooling control  
S-PI: Sample PI control  
BATCH: Batch PID control  
FFPID: Feedforward control | **CTL**<br>Set |
| **SP** | Target setpoint | EASY | 0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH) | **SP**<br>Op |
| **SUB** | Sub-target setpoint  
(in Two-position two-level control) | EASY | Set the offset from SP.  
-100.0 to 100.0% of PV input range span (EUS) | **SP**<br>Op |
| **HYS** | Hysteresis  
(in ON/OFF control, Position proportional control, or Two-position two-level control)  
Heating-side ON/OFF control hysteresis (in Heating/cooling control) | EASY | In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS)  
In Heating/cooling control or Position proportional control: 0.0 to 100.0% | **PID**<br>Op |
| **SU.HY** | Sub-hysteresis (in Two-position two-level control) | EASY | 0.0 to 100.0% of PV input range span (EUS) | **PID**<br>Op |
| **DR** | Direct/reverse action switch | STD | **R**<br>V S: Reverse action  
**DIR**: Direct action | |
| **SU.DR** | Sub-direct/reverse action switch (in Two-position two-level control) | STD | **R**<br>V S: Reverse action  
**DIR**: Direct action | |
| **PIDN** | PID number selection | EASY | 1 to 8 | **SP**<br>Op |
| **PIDG.** | Number of PID groups | STD | 1 to 8 | **CTL**<br>Set |

Note 1: The PID number (1 to 8, R) is displayed on Group display while the parameter SP, SUB, HYS, SU.HY, DR, or SU.DR is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.2 Setting Control Type (CNT)

8.2.5 PD Control (Stable Control in Which a Setpoint is not Exceeded)

**Description**

This control type performs control in which integral action (I action) is excluded from PID action.
Set the integral time (I or Ic) to OFF.
It is useful when stable control in which a setpoint is not exceeded is desired for integral processes in which constant flows are delivered.
The following shows the PID control computation formula.

\[
OUT = \frac{100}{P} \left( e + Td \frac{d}{dt} \Delta PV \right) + MR
\]

where OUT: control output, \( e \): deviation (PV-SP), \( P \): proportional band, \( Td \): derivative time, \( \Delta PV \): \( PV_n - PV_{n-1} \) (n-1: value before one control period), and MR: manual reset

The following table shows combination of PD control and control mode (CTLM).

<table>
<thead>
<tr>
<th>Control mode (CTLM)</th>
<th>SGL</th>
<th>CAS1</th>
<th>CAS2</th>
<th>CAS</th>
<th>BUM</th>
<th>PVSW</th>
<th>PVSEL</th>
<th>PVHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD control</td>
<td>√</td>
<td>N/A</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>

\( \sqrt{} \): Available, N/A: Not available

The following table shows combination of PD control and output method.

<table>
<thead>
<tr>
<th>Output method</th>
<th>Current output</th>
<th>Time proportional output</th>
<th>ON/OFF output</th>
<th>Position proportional output</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD control</td>
<td>√</td>
<td>√</td>
<td>N/A</td>
<td>√</td>
</tr>
</tbody>
</table>

\( \sqrt{} \): Available, N/A: Not available

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Proportional band</td>
<td>EASY</td>
<td>0.0 to 999.9% When 0.0% is set, it operates as 0.1%</td>
<td>PID</td>
</tr>
<tr>
<td>D</td>
<td>Derivative time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>MR</td>
<td>Manual reset</td>
<td>EASY</td>
<td>-5.0 to 105.0%</td>
<td></td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL</td>
</tr>
</tbody>
</table>

Note1: The PID number (1 to 8, or R) is displayed on Group display while the parameter P, D, or MR is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
Sample PI control performs PI control for a sample PI sampled time (STM) only during the first sample PI control time span (SWD). It subsequently holds a control output when that time elapses. This control is useful for processes with long dead times where the results of the control output are not quickly reflected on PV.

**Description**

where OUT: control output, SP: target setpoint, and PV: measured input

**Action of Sample PI Control (S-PI)**

To reduce overshoots, it is better to lengthen the sample PI sampled time (STM). This results however in the settling time becoming longer. If the shortest cycle (TN) of the main disturbance imposed on process is smaller than the sample PI sampled time (STM), that disturbance cannot be controlled. A guideline is approximately \( STM \leq TN/5 \).

STM is reset by control start (AUTO and RUN.)

Control starts from the point A when:

- Operation mode is switched from STOP to RUN,
- Operation mode is switched from MAN to AUTO,
- Input has recovered from burnout,
- Output tracking flag is switched from ON to OFF. (Ladder program used), or
- Power is turned on.

* If the sample PI sampled time (STM) or sample PI control time span (SWD) is changed, the operation is continued by the changed value immediately.
### 8.2 Setting Control Type (CNT)

#### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNT</td>
<td>Control type</td>
<td>EASY</td>
<td>PID: PID control&lt;br&gt;ONOF: ON/OFF control (1 point of hysteresis)&lt;br&gt;ONOF2: ON/OFF control (2 points of hysteresis)&lt;br&gt;2P2L: Two-position two-level control&lt;br&gt;H/C: Heating/cooling control&lt;br&gt;S-PI: Sample PI control&lt;br&gt;BATCH: Batch PID control&lt;br&gt;FFPID: Feedforward control</td>
<td>CTL Set</td>
</tr>
<tr>
<td>P</td>
<td>Proportional band</td>
<td>EASY</td>
<td>0.0 to 999.9%&lt;br&gt;When 0.0% is set, it operates as 0.1%.</td>
<td>PID Op</td>
</tr>
<tr>
<td>I</td>
<td>Integral time</td>
<td>EASY</td>
<td>OFF: Disable&lt;br&gt;1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Op</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td></td>
</tr>
<tr>
<td>STM</td>
<td>Sample PI sampled time</td>
<td>EASY</td>
<td>0 to 9999 s</td>
<td>TUNE Op</td>
</tr>
<tr>
<td>SWD</td>
<td>Sample PI control time span</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** Even if the parameter D (derivative time) is set, the setting is invalid.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

A guideline for STM is $LM + TM \times (2 \text{ to } 3)$.
A guideline for SWD is $STM / 10$.
Control is not executed when $SWD = 0$.
PI control is always executed when $SWD (\neq 0) \geq STM$. 
8.2.7 Batch PID Control (Performing Control with Rapidly Settling Setpoints)

**Description**

Batch PID control is useful for cases where control is performed causing the PV to settle to a target setpoint (SP) as quickly as possible without overshooting.

If a deviation (E) exceeding a batch PID deviation setpoint (BD) occurs, the controller outputs the control output high limit (OH) to quickly bring the PV to the SP (in the case of reverse action).

If a deviation (E) falls within the batch PID deviation setpoint (BD), the controller determines that the process is in a steady state and changes to PID control.

Upon changing to PID control, the controller starts to output from

\[ \text{OUT} = \text{OH} - \text{BB} \]

to avoid an overshoot in the PV.

where batch PID bias (BB): Amount of output pulled back

If the deviation (E) exceeds the batch PID deviation setpoint (BD) after the controller has switched to PID control (steady state), no control output high limit (OH) will be output unless the deviation exceeds the batch PID lock-up width (BL).

Moreover, in the case of direct action, the controller outputs the control output low limit (OL) instead of the control output high limit (OH), making the batch PID bias (BB) act in the positive direction.

The following shows the action in Batch PID control.

![Diagram showing Batch PID control](image)

where OUT: control output, OH: output high limit, SP: target setpoint, and PV: measured input
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CNT</strong></td>
<td>Control type</td>
<td>EASY</td>
<td>PID: PID control</td>
<td>CTL Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ONOF: ON/OFF control (1 point of hysteresis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ONOF2: ON/OFF control (2 points of hysteresis)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2P2L: Two-position two-level control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>H/C: Heating/cooling control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S-PI: Sample PI control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BATCH: Batch PID control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FFPID: Feedforward control</td>
<td></td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>Proportional band</td>
<td>EASY</td>
<td>0.0 to 999.9% When 0.0% is set, it operates as 0.1%.</td>
<td>PID Ope</td>
</tr>
<tr>
<td><strong>I</strong></td>
<td>Integral time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Derivative time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td>PID Ope</td>
</tr>
<tr>
<td><strong>PIDN</strong></td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Ope</td>
</tr>
<tr>
<td><strong>PIDG.</strong></td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
<tr>
<td><strong>BD</strong></td>
<td>Batch PID deviation setpoint</td>
<td>PRO</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>TUNE Ope</td>
</tr>
<tr>
<td><strong>BB</strong></td>
<td>Batch PID bias</td>
<td>PRO</td>
<td>0.0 to 100.0%</td>
<td></td>
</tr>
<tr>
<td><strong>BL</strong></td>
<td>Batch PID lock-up width</td>
<td>PRO</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
### 8.2.8 Feedforward Control

**Description**

Using only the feedback control results in a delay in recovery of the control target to normal status because PID action occurs only when the effects of disturbance appear on a PV.

If disturbance can be measured, a correction signal with respect to the disturbance can be applied in advance to the controller’s output (OUT) to cancel out the disturbance before it affects the control target.

This is called feedforward control.

**Improving heat exchanger controllability**

For simple heat exchanger control, the addition of feedforward control enables compensation to be made for variations in the inflow rate.

![Diagram of heat exchanger control system](image)

**Note**

For Feedforward control, it is necessary to use the controller (UT55A-x7) equipped with AIN2 aux. analog input or to build the function by LL50A Parameter Setting Software with unused aux. analog input.

► Controller with AIN2 aux. analog input: 8.1 Setting Control Mode (CTLM), Function Block Diagram
8.2 Setting Control Type (CNT)

**Operation Description**

The parameters that perform gain operation (feedforward gain (FGN)) and bias operation (feedforward input bias (FBI) and feedforward output bias (FBO)) for a disturbance measurement input signal (feedforward input (FF_CTL)) are provided.

FIN is within the range of -100.0 to 100.0%. FF_CTL is within the range of -5.0 to 105.0%

\[
\text{OUT} = \text{OUT}_c + \text{FIN} \\
\text{FIN} = \text{FGN} \left( \frac{1}{1 + \text{FLG} \cdot s} \right) \cdot \text{FF_CTL} + \text{FBI} + \text{FBO}
\]

where OUT: control output, OUTc: feedback control output, s: Laplacian operator, FF_CTL: feedforward input, and FLG: feedforward first-order lag time constant

Feedforward input can be confirmed using LL50A Parameter Setting Software.

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNT</td>
<td>Control type</td>
<td>EASY</td>
<td>PID: PID control, ONOF: ON/OFF control (1 point of hysteresis), ONOF2: ON/OFF control (2 points of hysteresis), 2P2L: Two-position two-level control, H/C: Heating/cooling control, S-Pi: Sample PI control, BATCH: Batch PID control, FFPID: Feedforward control</td>
<td>CTL Set</td>
</tr>
<tr>
<td>P</td>
<td>Proportional band</td>
<td>EASY</td>
<td>0.0 to 999.9% When 0.0% is set, it operates as 0.1%, Heating-side ON/OFF control applies when 0.0% in Heating/cooling control.</td>
<td>PID Ope</td>
</tr>
<tr>
<td>I</td>
<td>Integral time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Derivative time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Ope</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
<tr>
<td>FLG</td>
<td>Feedforward first-order lag time constant</td>
<td>PRO</td>
<td>OFF, 1 to 120 s</td>
<td>TUNE Ope</td>
</tr>
<tr>
<td>FGN</td>
<td>Feedforward gain</td>
<td>PRO</td>
<td>-9.999 to 9.999</td>
<td></td>
</tr>
<tr>
<td>FBI</td>
<td>Feedforward input bias</td>
<td>PRO</td>
<td>-100.0 to 100.0%</td>
<td></td>
</tr>
<tr>
<td>FBO</td>
<td>Feedforward output bias</td>
<td>PRO</td>
<td>-999.9 to 999.9%</td>
<td></td>
</tr>
</tbody>
</table>

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.3 Setting PID Control Mode (ALG)

Description

There are two PID control modes: standard PID control mode and fixed-point control mode. Select a PID control computation formula shown in the following table according to the control mode or operation mode.

Single-loop Control, Loop Control for Backup, Loop Control with PV Switching, Loop Control with PV Auto-selector, and Loop Control with PV-hold Function.

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>AUTO+Local</th>
<th>AUTO+Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard PID control mode</td>
<td>PV derivative type (output bump at SP change)</td>
<td>Deviation derivative type</td>
</tr>
<tr>
<td>Fixed-point control mode</td>
<td>PV derivative type (output bumpless at SP change)</td>
<td>PV derivative type (output bump at SP change)</td>
</tr>
</tbody>
</table>

Cascade Primary-loop Control

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Cascade+Local</th>
<th>Cascade+Remote</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard PID control mode</td>
<td>PV derivative type (output bump at SP change)</td>
<td>Deviation derivative type</td>
</tr>
<tr>
<td>Fixed-point control mode</td>
<td>PV derivative type (output bump at SP change)</td>
<td>PV derivative type (output bump at SP change)</td>
</tr>
</tbody>
</table>

Cascade Secondary-loop Control

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>AUTO+Local</th>
<th>AUTO+Remote</th>
<th>Cascade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard PID control mode</td>
<td>PV derivative type (output bump at SP change)</td>
<td>Deviation derivative type</td>
<td>Deviation derivative type</td>
</tr>
<tr>
<td>Fixed-point control mode</td>
<td>PV derivative type (output bumpless at SP change)</td>
<td>PV derivative type (output bump at SP change)</td>
<td>PV derivative type (output bump at SP change)</td>
</tr>
</tbody>
</table>

PV Derivative Type PID

This is a PID control method in which the derivative action works only on the PV. It can also eliminate output bump due to SP changing operation in Local mode. The following shows the PV derivative type PID control computation formula.

\[
\text{OUT} = \frac{100}{P} \left( e + \frac{1}{T_i} \int e \, dt + T_d \frac{d}{dt} \Delta PV \right)
\]

where OUT: control output, e: deviation (PV-SP), P: proportional band, Ti: integral time, Td: derivative time, and \( \Delta PV \): PVn-PVn-1 (n-1: value before one control period)

PV Derivative Type PID (output bump at SP change)
PV Derivative Type PID (output bumpless at SP change)

SP → PV → OUT

**Deviation Derivative Type PID**

The PID control method in which derivative action works for the deviation value = PV – SP.

The derivative action works for a SP change, so this method is useful for cases like Cascade secondary-loop control where the SP-following capability is important.

The following shows the deviation derivative type PID control computation formula.

\[
\text{OUT} = \frac{100}{P} \left( e + \frac{1}{Ti} \int e \cdot dt + Td \frac{d}{dt} \cdot e \right)
\]

where OUT: control output, e: deviation (PV-SP), P: proportional band, Ti: integral time, and Td: derivative time

---

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALG</td>
<td>PID control mode</td>
<td>PRO</td>
<td>0: Standard PID control mode 1: Fixed-point control mode</td>
<td>CTL, Set</td>
</tr>
</tbody>
</table>
8.4 Switching PID

8.4.1 Switching PID According to Target Setpoint Number (SPNO)

**Description**

The SP group number selection selects a group of target setpoint (SP) and PID parameters by switching the SP number (SPNO).

The PID number selection (PIDN) can be set for each SP group.

<table>
<thead>
<tr>
<th>SP number (SPNO)</th>
<th>SP</th>
<th>PID parameter group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SP of group 1</td>
<td>Specify using the parameter PIDN of group 1</td>
</tr>
<tr>
<td>2</td>
<td>SP of group 2</td>
<td>Specify using the parameter PIDN of group 2</td>
</tr>
<tr>
<td>3</td>
<td>SP of group 3</td>
<td>Specify using the parameter PIDN of group 3</td>
</tr>
<tr>
<td>4</td>
<td>SP of group 4</td>
<td>Specify using the parameter PIDN of group 4</td>
</tr>
<tr>
<td>5</td>
<td>SP of group 5</td>
<td>Specify using the parameter PIDN of group 5</td>
</tr>
<tr>
<td>6</td>
<td>SP of group 6</td>
<td>Specify using the parameter PIDN of group 6</td>
</tr>
<tr>
<td>7</td>
<td>SP of group 7</td>
<td>Specify using the parameter PIDN of group 7</td>
</tr>
<tr>
<td>8</td>
<td>SP of group 8</td>
<td>Specify using the parameter PIDN of group 8</td>
</tr>
</tbody>
</table>

When ZON=0 (SP group number selection 1): In coordinated operation, slaves operate with the same PID number as that of the master. The setpoint in the PID number selection (PIDN) within the SP group is ignored.

When ZON=3 (SP group number selection 2): In coordinated operation, slaves operate with the setpoint in the PID number selection (PIDN) within the SP group.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZON</td>
<td>Zone PID selection</td>
<td>STD</td>
<td>0: SP group number selection 1</td>
<td>CTL Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: Zone PID selection (selection by PV)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: Zone PID selection (selection by target SP)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3: SP group number selection 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4: Zone PID selection (selection by SP)</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8 (Depends on the setup parameter PIDG. setting.)</td>
<td>SP Ope</td>
</tr>
<tr>
<td>PID</td>
<td>PID number (display only)</td>
<td>EASY</td>
<td>1 to 8</td>
<td>MODE Ope</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

Note1: The initial values for PIDN of the eight groups are same as SP number selection (SPNO.). Set a PID number to use as necessary.

Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note3: A currently-used PID number is displayed for the parameter PID.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.4.2 Switching PID According to PV

The PID switching according to PV is a function that switches between the groups of PID parameters according to the PV. The maximum number of PID groups to be switched is 8. (Set RP1 to RP7.) This function is useful for reactors in which the chemical reaction gain changes depending on the temperature.

The figure below shows an example of dividing the PV input range from the maximum value to the minimum value into seven zones by reference points 1 to 6. (Set RP1 to RP6.)

If the PV is currently positioned at this point, control is based on the PID of group 6.

The PV input range can be divided into the number of zones that is set in the reference point.

- Hysteresis at the time of zone switch can be set.
  - Setpoint PD: 8.4.6 Setting Hysteresis at Time of Zone Switch

Reference deviation can be set at the same time.
  - Reference deviation: 8.4.5 Switching PID according to Deviation (Reference Deviation)
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| ZON              | Zone PID selection    | STD           | 0: SP group number selection 1  
1: Zone PID selection (selection by PV)  
2: Zone PID selection (selection by target SP)  
3: SP group number selection 2  
4: Zone PID selection (selection by SP) | CTL Set       |
| RP1 to RP7       | Reference point 1 to 7| STD           | 0.0 to 100.0% of PV input range (EU)  
(RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7) | ZONE Operate |
| PIDG.            | Number of PID groups  | STD           | 1 to 8  
(RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7) | CTL Set       |
| PID              | PID number (display only) | EASY         | 1 to 8, R: PID group for reference deviation | MODE Operate  |

**Note**

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.  
Note2: A currently-used PID number is displayed for the parameter PID.

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
### 8.4.3 Switching PID According to SP

**Description**

The zone PID selection by SP switches between the groups of PID parameters according to the SP.

The maximum number of PID groups to be switched is 8. (Set RP1 to RP7)

The figure below shows the example of switching the group of PID parameters according to the SP. It shows an example of dividing the PV input range from the maximum value to the minimum value into five zones by reference points 1 to 4. (Set RP1 to RP4.)

The PV input range can be divided into the number of zones that is set in the reference point.

Reference deviation can be set at the same time.

- **Reference deviation**: 8.4.5 Switching PID according to Deviation (Reference Deviation)
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| ZON              | Zone PID selection          | STD           | 0: SP group number selection 1  
1: Zone PID selection (selection by PV)  
2: Zone PID selection (selection by target SP)  
3: SP group number selection 2  
4: Zone PID selection (selection by SP) | CTL          |
| RP1 to RP7       | Reference point 1 to 7      | STD           | 0.0 to 100.0% of PV input range (EU)  
(RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7) | ZONE        |
| PIDG.            | Number of PID groups        | STD           | 1 to 8                                                                        | CTL         |
| PID              | PID number (display only)   | EASY          | 1 to 8, R: PID group for reference deviation                                | MODE        |

**Note1:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note2:** A currently-used PID number is displayed for the parameter PID.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
The zone PID selection by target SP switches between the groups of PID parameters according to the target SP.

The figure below shows the example of switching the group of PID parameters according to the target SP. It shows an example of dividing the PV input range from the maximum value to the minimum value into five zones by reference points 1 to 4. (Set RP1 to RP4.)

The PV input range can be divided into the number of zones that is set in the reference point.

Reference deviation can be set at the same time.

- Reference deviation: 8.4.5 Switching PID according to Deviation (Reference Deviation)
### 8.4 Switching PID

#### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| ZON              | Zone PID selection          | STD           | 0: SP group number selection 1  
1: Zone PID selection (selection by PV)  
2: Zone PID selection (selection by target SP)  
3: SP group number selection 2  
4: Zone PID selection (selection by SP) | CTL Set      |
| RP1 to RP7       | Reference point 1 to 7      | STD           | 0.0 to 100.0% of PV input range (EU)  
(RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7) | ZONE Op      |
| PIDG.            | Number of PID groups        | STD           | 1 to 8                                                                       | CTL Set     |
| PID              | PID number (display number) | EASY          | 1 to 8, R: PID group for reference deviation                                 | MODE Op     |

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Note2: A currently-used PID number is displayed for the parameter PID.

*Note*

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
8.4.5 Switching PID According to Deviation (Reference Deviation)

**Description**

The zone PID selection by deviation switches between the groups of PID parameters according to the amount of deviation. This function is called “reference deviation.” In the fixed point control, if the actual amount of deviation exceeds the setpoint of the reference deviation, the controller automatically changes to the PID parameter group (PID of group R) set for the zone. If the actual amount of deviation becomes smaller than the setpoint of reference deviation, the controller changes to the PID parameter group appropriate for the zone.

For example, if the deviation is large, PV can be reached more rapidly to SP by increasing the proportional gain (i.e., narrowing the proportional band). Switching PID according to deviation is effective when ZON is set to 1, 2, 4. The zone PID selection by reference deviation has priority over other zone PID selections.

![Diagram of PID control and reference deviation](image)

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZON</td>
<td>Zone PID selection</td>
<td>STD</td>
<td>0: SP group number selection 1 1: Zone PID selection (selection by PV) 2: Zone PID selection (selection by target SP) 3: SP group number selection 2 4: Zone PID selection (selection by SP)</td>
<td>CTL Set</td>
</tr>
<tr>
<td>RDV</td>
<td>Reference deviation</td>
<td>STD</td>
<td>OFF: Disable 0.0 + 1 digit to 100.0% of PV input range span (EUS)</td>
<td>ZONE Ope</td>
</tr>
<tr>
<td>PID</td>
<td>PID number (display only)</td>
<td>EASY</td>
<td>1 to 8, R: PID group for reference deviation</td>
<td>MODE Ope</td>
</tr>
</tbody>
</table>

**Note1:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note2:** A currently-used PID number is displayed for the parameter PID.
8.4.6 Setting Hysteresis at Time of PID Switch

Description

When the zone PID selection is selected, hysteresis at time of each zone switch can be set.
The following shows the operation example of hysteresis at time of zone switch.

![Diagram showing setting of hysteresis at time of PID switch]

Reference point 1

PV

0.5% of PV input range span

PID of group 1

PID of group 2

PID of group 1

PID of group 2

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>RHY</td>
<td>Zone PID switching hysteresis</td>
<td>STD</td>
<td>0.0 to 10.0% of PV input range span (EUS)</td>
<td>ZONE Opk</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
The Super function monitors the deviation for evidence that there is a danger of overshoot, and on sensing such danger automatically changes the setpoint temporarily to a somewhat lower value (sub-SP). Once the danger of overshoot appears diminished, the function returns the effective SP gradually to the true SP. "Fuzzy ratiocination" techniques are employed in the algorithms used to change the SP to the lower temporary value, and to return it gradually to the true SP.

Operation Diagram

Control System Block Diagram
8.5 Suppressing Overshoot (Super Function)

**Example of Overshoot Suppression Control for Setpoint Changes**

![Graph showing temperature over time with and without Super function](image)

**Example of Overshoot Suppression Control for Ramp-to-soak Transition**

![Graph showing temperature over time with and without Super function](image)

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| SC               | Super function | EASY          | OFF: Disable  
1: Overshoot suppressing function (normal mode)  
2: Hunting suppressing function (stable mode)  
3: Hunting suppressing function (response mode)  
4: Overshoot suppressing function (strong suppressing mode) | TUNE        |

Note 1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

The setting SC=4 is effective compared with SC=1. However, the hunting may occur until the PV reaches SP. Use it as usage.

Do not use the Super function for the Sample PI control.
8.6 Suppressing Hunting (Super2 Function)

Description

The Super2 function suppresses the hunting effect of the controller without re-tuning the PID parameters.
Hunting means the PV becomes unstable and oscillates around SP.

- In hunting condition, the Super2 function selects the output from process model as PV signal.
- The process model removes a factor of dead time from the actual process.
- The real process is under the open-loop condition.
- After hunting is suppressed, the Super2 function selects real PV signal, and carry out the standard feedback control.
8.6 Suppressing Hunting (Super2 Function)

Effects of Super2

**Load change**

![Diagram showing load change with Super2 function enabled.]

**Temperature change**

![Diagram showing temperature change with Super2 function enabled.]

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>Super function</td>
<td>EASY</td>
<td>OFF: Disable</td>
<td>TUNE</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: Overshoot suppressing function (normal mode)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: Hunting suppressing function (stable mode)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3: Hunting suppressing function (response mode)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4: Overshoot suppressing function (strong suppressing mode)</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

Set SC=2 when there are a lot of disturbances, and much hunting occurs.
Set SC=3 when SP is changed frequently. Hunting suppressing effect is smaller than that of SC=2, however, responsiveness is good.

Do not use the Super function for the Sample PI control.
The Super function does not work in direct action.
8.7 Suppressing Integral Action (Anti-reset Wind-up)

Description

Where there is a large deviation at the start of the control operation, for example, integral outputs are accumulated and the PV exceeds the SP, thereby causing the output to overshoot. To avoid this, the controller provides an anti-reset wind-up function for suppressing an extreme integral output by stopping PID computations. Same applies to the case of undershoot.

\[
\text{Deviation band (AR):} \quad \frac{|\text{PV} - \text{SP}|}{\text{Proportional band}} \times 100 \%
\]

The parameter AR sets the point (by deviation band (%)) to restart the PID computation that is suspended by the controller's anti-reset windup function. PID computation restarts when the deviation band has decreased to the AR setpoint. When the parameter AR is set to AUTO, the controller automatically determines the point at which to restart the PID computation.

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>Anti-reset windup</td>
<td>STD</td>
<td>AUTO, 50.0 to 200.0%</td>
<td>TUNE Op</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
8.8 Performing Non-linear PID Control

**Description**

If a deviation \(E\) is smaller than the non-linear control gap width \(GW\), it is computed as a proportional added the non-linear control gain \(GG\).

\[
\text{Proportional Band (CPB) = Proportional Band (P) / GG} \quad (*) \quad |E| \leq GW / 2
\]

However, CPB is limited by 0.1 to 999.9%.

Control output will change smoothly (i.e., without any bumps) when CPB switches.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>GW</td>
<td>Non-linear control gap width</td>
<td>PRO</td>
<td>OFF, 0.0%+1digit to 50.0% of PV input range span (EUS)</td>
<td>TUNE</td>
</tr>
<tr>
<td>GG</td>
<td>Non-linear control gain</td>
<td>PRO</td>
<td>0.000 to 1.000</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
8.9 Adjusting Auto-tuning Operation

Description

Auto-tuning Type
“Normal” of auto-tuning type requires a rapidly rising PID constant. This type is useful for processes that allow some overshooting.
On the other hand, “stable” of auto-tuning type requires a slowly rising PID constant.

Auto-tuning Output Limiter
When executing auto-tuning, the control output high and low limits can be set.
When the control output low limit > AT.OL, or AT.OH < control output high limit, auto-tuning is limited by the control output low or high limit.
In Heating/cooling control, AT.OH and AT.OL do not work.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT.TY</td>
<td>Auto-tuning type</td>
<td>STD</td>
<td>0: Normal 1: Stability</td>
<td>TUNE</td>
</tr>
<tr>
<td>AT.OH</td>
<td>Output high limit in auto-tuning</td>
<td>PRO</td>
<td>-5.0 to 105.0% (Disabled in Heating/cooling control)</td>
<td></td>
</tr>
<tr>
<td>AT.OL</td>
<td>Output low limit in auto-tuning</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
### 9.1 Setting SP Limiter

**Description**

The SP high and low limits can be set to restrict the SP to the range between those limits whether in REM (remote) or LCL (local) mode. They work to the SP of all SP groups. In Cascade control, the SP high and low limits can be set for both Loop 1 and Loop 2.

![Diagram showing SP limits and range](image)

- **SP group:** 6.2 Setting Target Setpoint

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPH</td>
<td>SP high limit</td>
<td>STD</td>
<td>0.0 to 100.0% of PV input range (EU), (SPL&lt;SPH)</td>
<td>MPV Set</td>
</tr>
<tr>
<td>SPL</td>
<td>SP low limit</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
9.2 Changing SP at a Fixed Rate (SP Ramp-Rate Setting Function)

Description

SP ramp-rate setting function forces SP to change at a fixed rate when SP is changed in order to prevent abrupt changes in SP. Velocity (rate-of-change) can be set for both the SP ramp-up rate (UPR) and SP ramp-down rate (DNR). Set the ramp–rate time unit (TMU) per hour or minute.

The SP ramp-rate setting function works when:
1. SP is changed.
2. SP is changed by switching SP number (SPNO).
3. Power is turned on or has recovered from a failure (PV tracking=ON); or
4. Operation mode is switched from MAN to AUTO (PV tracking=ON).

SP ramp-rate setting action starts from PV when the PV tracking function is used.

- When SP is changed
- When SP No. (SPNO) is switched
- When power is turned on or has recovered
- When operation mode is switched from MAN to AUTO
### 9.2 Changing SP at a Fixed Rate (SP Ramp-Rate Setting Function)

The diagram illustrates the change in temperature over time with SP ramp-rate time and temperature difference. The SP of group 1 is set to 500°C, and the SP of group 2 is set to 640°C, resulting in a temperature difference of 140°C.

The calculation for the UPR (SP ramp-rate) is shown as follows:

\[
UPR = \frac{\text{Temperature difference (°C)}}{\text{Time (min)}} = \frac{140°C}{2 \text{ min}} = 70 (°C/\text{min})
\]

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPR</td>
<td>SP ramp-up rate</td>
<td>EASY</td>
<td>OFF, 0.0 + 1 digit to 100.0% of PV input range span (EUS)</td>
<td></td>
</tr>
<tr>
<td>DNR</td>
<td>SP ramp-down rate</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMU</td>
<td>SP ramp-rate time unit</td>
<td>EASY</td>
<td>HOUR: Ramp-up rate or ramp-down rate per hour MIN: Ramp-up rate or ramp-down rate per minute</td>
<td>SPS Open</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
PV tracking function is used to prevent abrupt PV changes. With PV tracking, SP is first aligned with PV and then changed to its original SP at the SP ramp rate.

- SP ramp-rate setting function: 9.2 Changing SP at a Fixed Rate (SP Ramp-Rate Setting Function)

PV tracking function works when:
1. Power is turned on or has recovered from a failure,
2. SP number (SPNO) is changed,
3. Operation mode is switched from STOP to RUN,
4. Operation mode is switched from MAN to AUTO,
5. Operation mode is switched from MAN to CAS (in Cascade control); or
6. Output tracking flag is switched from ON to OFF (in Cascade primary-loop control or Loop control for backup)

PV tracking enabled
PV tracking disabled

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVT</td>
<td>PV tracking selection</td>
<td>STD</td>
<td>OFF, ON</td>
<td>SPS</td>
</tr>
</tbody>
</table>

Note 1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
9.4 Forcing SP to Track Remote Input (SP Tracking)

**Description**

SP tracking function is the function to force the local setpoint (SP) to track the remote setpoint (RSP) when the operation mode is switched from REM (remote) to LCL (local) mode.

The function is effective to prevent abrupt PV changes.

![Diagram of SP tracking enabled and disabled](image)

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPT</td>
<td>SP tracking selection</td>
<td>STD</td>
<td>OFF, ON</td>
<td>SPS</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
9.5 Setting Controller Action at Power ON (Restart Mode)

**Description**

For details, see Chapter 15, "Power Failure Recovery Processing."

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.MD</td>
<td>Restart Mode</td>
<td>STD</td>
<td>Set how the controller should recover from a power failure of 5 seconds or more. CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.</td>
<td>SYS Set</td>
</tr>
</tbody>
</table>

The preset output (PO) is output in MAN or AUTO mode.
9.6 Setting Time between Powering on Controller and Starting Control (Restart Timer)

**Description**

The time between power on and the instant where controller starts control computation can be set.

Operation start time = Operating time of controller initialization after power on.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.TM</td>
<td>Restart Timer</td>
<td>STD</td>
<td>0 to 10 s</td>
<td>SYS Set</td>
</tr>
</tbody>
</table>
10.1 Setting Control Output Type

**Description**

**Time Proportional Relay Output/ Time Proportional Voltage Pulse Output**

In time proportional output, the control computation result is output in the form of an on/off signal pulse width proportional to the time. The pulse width is calculated as follows with the cycle time (control output cycle) at 100%.

\[ \text{Control output pulse width} = \frac{\text{Control output} \times \text{Cycle time}}{100} \]

The output type is selected as either the relay output or the voltage pulse output.

![Time Proportional Relay Output Diagram](image)

**Current Output**

In current output, the control computation result is output as a current signal. (Example of 4 to 20 mA)

![Current Output Diagram](image)

**ON/OFF Output**

ON/OFF control compares the SP and PV and outputs an on or off signal according to the positive or negative deviation (PV – SP).
Position Proportional Output
Position proportional output is equipped only with Position proportional type (Suffix code: Type 1 = 1).
In position proportional output, valve opening is made proportional to the control computation results. The controller outputs direct and reverse signals (relay) to control motor movement and valve opening.

Feedback-type Position Proportional Output
In feedback-type position proportional output, the controller obtains a valve position signal from a feedback slide-wire resistor (overall resistance: 100 Ω to 2.5 kΩ) attached to a valve or feedback current input (4 to 20 mA). The following shows an example using feedback slide-wire resistor.

When current is used for feedback input, only wiring is different
► Wiring for current: 17.4.5 Valve Position Output and Feedback Input Wiring

Estimating-type Position Proportional Output
In estimating-type position proportional output, set the operating time required for a valve to change from the fully-closed position to the fully-open position beforehand. With the preset operating time, the controller controls the valve by estimating its position. Estimating-type position proportional output is used when feedback input signal cannot be obtained. (Feedback input wiring is not necessary.)
Note: When the control output is: upper limit=direct signal, lower limit=reverse signal.

Heating/cooling Output
Heating/cooling output is equipped only with Heating/cooling type (Suffix code: Type 1 = -2).
► Heating/cooling output: 8.2.3 Heating/cooling Control
Two-position Two-level Control Output

Two-position Two-level Control is equipped only with Heating/cooling type (Suffix code: Type 1 = -2).


► Two-position two-level control: 8.2.4  Two-position Two-level Control

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OT</td>
<td>Output type selection</td>
<td>EASY</td>
<td>Control output or Heating-side control output (Lower two digits)</td>
<td>OUT Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>00: OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>01: OUT terminals (voltage pulse)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02: OUT terminals (current)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>03: OUT terminals (relay)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>04: OUT2 terminals (voltage pulse)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>05: OUT2 terminals (current)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>06: OUT2 terminals (relay)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cooling-side control output (Upper two digits)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>00: OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>01: OUT terminals (voltage pulse)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>02: OUT terminals (current)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>03: OUT terminals (relay)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>04: OUT2 terminals (voltage pulse)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>05: OUT2 terminals (current)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>06: OUT2 terminals (relay)</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**CAUTION**

No output is generated even if the terminal which is not provided is selected. Confirm that the terminal to be selected is provided.

For each output terminal number, see 17.4, “Wiring.”

Set a control mode, control type, and an input type before setting an output type.

► Control mode: 8.1  Setting Control Mode (CTLM)

► Control type: 8.2  Setting Control Type (CNT)

► Input type: 7.1.1  Setting Input Type, Unit, Range, Scale, and Decimal Point Position

**Control Output (PID Control, ON/OFF Control, Sample PI Control, Batch PID Control, or Feedforward Control) of Standard type**

The figure below shows an example of setting the current output of the OUT terminal to the control output terminal and type. Set “02” to lower two digits and “00” to upper two digits.

![Control output terminal and type](image)
10.1 Setting Control Output Type

Heating/cooling Control Output of Heating/cooling Type
The figure below shows an example of setting the current output of the OUT terminal to the heating-side control output terminal and type, and setting the relay output of the OUT2 terminal to the cooling-side control output terminal and type.
Heating side: Set “02” to lower two digits. Cooling side: Set “06” to upper two digits.

```
Symbol
                Heating-side control output terminal and type
Cooling-side control output terminal and type
```

Two-position Two-level Control Output (for Heating/cooling Type Only)
The figure below shows an example of setting the relay output of the OUT terminal to the control output terminal and type of main setting, and setting the relay output of the OUT2 terminal to the control output terminal and type of sub-setting.
Main setting side: Set “03” to lower two digits. Sub-setting side: Set “06” to upper two digits.

```
Symbol
                Main setting side control output terminal and type
Sub-setting side control output terminal and type
```

Position Proportional Output (for Position Proportional Type Only)
When Position proportional type is specified, the output form is fixed to the position proportional output and setting is not necessary. Adjustment of the valve position is necessary.
► Valve position adjustment: 10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)
10.2 Setting Control Output Cycle Time

**Description**

Cycle time is the basic cycle period for a signal full cycle of ON/OFF operation for a relay or voltage pulse output. Reducing cycle time results in faster cycling and finer control. In contrast, reducing the ON/OFF period also reduces relay life. For relay output, set the control output cycle time to 30 to 200 seconds according to the process speed.

**Comparison of operations for the same control output (50%)**

<table>
<thead>
<tr>
<th>Cycle time</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 sec</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>20 sec</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>40 sec</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT</td>
<td>Control output cycle time Heating-side control output cycle time (in Heating/cooling control)</td>
<td>EASY</td>
<td>0.5 to 1000.0 s</td>
<td>OUT Set</td>
</tr>
<tr>
<td>CTc</td>
<td>Cooling-side control output cycle time</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10.3 Setting Limiter to Control Output

**Description**

Control output high and low limits can be set to restrict the control output to the operation range between those limits. The output limiter is prepared for each PID group, and works according to the selected PID group. This, however, excludes preset output in STOP mode.

- **PID group: 6.4 Adjusting PID Manually**

![Graph showing control output limits and actual output range](image)

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH</td>
<td>Control output high limit Heating-side control output high limit (in Heating/cooling control)</td>
<td>EASY</td>
<td>-4.9 to 105.0%, (OL&lt;OH) In Heating/cooling control: 0.1 to 105.0% (OL&lt;OH)</td>
<td>PID Ope</td>
</tr>
<tr>
<td>OL</td>
<td>Control output low limit Heating-side control output low limit (in Heating/cooling control)</td>
<td>EASY</td>
<td>-5.0 to 104.9%, (OL&lt;OH), SD: Tight shut In Heating/cooling control: 0.0 to 104.9% (OL&lt;OH)</td>
<td></td>
</tr>
<tr>
<td>OHc</td>
<td>Cooling-side control output high limit</td>
<td>EASY</td>
<td>0.1 to 105.0%, (OLc&lt;OHc)</td>
<td></td>
</tr>
<tr>
<td>OLc</td>
<td>Cooling-side control output low limit</td>
<td>EASY</td>
<td>0.0 to 104.9%, (OLc&lt;OHc)</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Ope</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

**Note**

1. The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
2. In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
3. When the setting is low limit ≥ high limit, the controller operates as low limit = high limit - 1 digit.

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
10.4 Disabling Output Limiter in MAN mode

Description

Output limiter can be released when in MAN mode. However, cannot be released when in Heating/cooling control. Note that the output bump is caused if the operation mode is changed from AUTO to MAN or STOP to RUN while the control output is out of the range between the control output high limit (OH) and control output low limit (OL). Control output bumps to OH in MAN mode when it is larger than OH. Moreover, it bumps to OL when smaller than OL.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OLMT</td>
<td>Output limiter switch</td>
<td>PRO</td>
<td>OFF: Disable output limiter in MAN mode</td>
<td>TUNE OPa</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ON: Enable output limiter in MAN mode</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
10.5 Setting Velocity Limiter to Control Output

Description

Output velocity limiter prevents the control output signal from changing suddenly in order to protect the control valves (or other actuators) and controlled process. The output velocity limiter does not work in MAN or STOP mode or when input burnout or A/D error occurs. Note that setting an output velocity limit may cancel the effects of derivative action. The following shows the operation example of output velocity limiter.

In Heating/cooling control, the output velocity limiter can be set to the control computation result before split into heating-and cooling-side outputs. In ON/OFF control or Two-position two-level control, the setting is invalid even if the output velocity limiter is set.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPR</td>
<td>Output velocity limiter</td>
<td>STD</td>
<td>OFF: Disable 0.1 to 100.0%/s</td>
<td>TUNE Ope</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
10.6 Reducing 4-20 mA Current Output to 0 mA (Tight Shut Function)

**Description**

Tight shut function fully closes the control valve (or other actuators) (i.e., so that output is zero) beyond its positioner dead band. When the output low limit is set to “SD,” the output is as follows in MAN or AUTO mode.

- **In MAN mode**
  When the output is reduced with the Down arrow key and “SD” is displayed as the output value, the output level reaches tight shut level. The control output delivers a tight shut signal (about 0.0 mA).

- **In AUTO mode**
  The output is limited by the output low limit (OL). It does not decrease to 0.0 mA.

![Graph showing control output levels]

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OL</td>
<td>Control output low limit Heating-side control output low limit (in Heating/cooling control)</td>
<td>EASY</td>
<td>-5.0 to 104.9%, (OL&lt;OH), SD: Tight shut (0 mA output in MAN mode) In Heating/cooling control: 0.0 to 104.9% (OL&lt;OH)</td>
<td>PID Ope</td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Ope</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

**Note**

- Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.
- Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
10.7 Setting ON/OFF Control Hysteresis

Description
In ON/OFF control, since the only two possible output states are ON and OFF, the control output cycles are as shown in the figure below. ON/OFF becomes quite narrow, so that if relay output is used, chattering occurs. In this case, the hysteresis should be set wider to prevent relay chattering and for the service life of the relay.

One Point of Hysteresis
For one point of hysteresis, set one point of hysteresis. In Heating/cooling control, set heating-side ON/OFF control hysteresis and cooling-side ON/OFF control hysteresis.

Two Points of Hysteresis
For two points of hysteresis, set two points of hysteresis (upper-side hysteresis and lower-side hysteresis).
Two points of hysteresis cannot be used for Heating/cooling control and Two-position two-level control.
# Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYS</td>
<td>Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)</td>
<td>EASY</td>
<td>In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%</td>
<td>PID OP/EN</td>
</tr>
<tr>
<td>HY.UP</td>
<td>Upper-side hysteresis (in ON/OFF control)</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td></td>
</tr>
<tr>
<td>HY.LO</td>
<td>Lower-side hysteresis (in ON/OFF control)</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP OP/EN</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL SET</td>
</tr>
</tbody>
</table>

Note1: The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.

Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
10.8 Canceling Offset of PV and SP (Manual Reset)

**Description**

Manual reset can be used when the integral action is disabled.
When the integral action is disabled, there will be an offset of PV and SP. Manual reset cancels this offset.
The manual reset value equals the output value when PV = SP is true.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>MR</td>
<td>Manual reset</td>
<td>EASY</td>
<td>-5.0 to 105.0%</td>
<td>PID</td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL</td>
</tr>
</tbody>
</table>

Note1: The PID number (1 to 8, or R) is displayed on Group display while each parameter is displayed.
Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
10.9 Setting Hysteresis and Dead Band for Heating/cooling Control Output

**Description**

In Heating/cooling control, the positive dead band denotes the zone where none of the heating-side and cooling-side outputs are presented. The negative dead band denotes the zone where both of the heating-side and cooling-side outputs are presented.

The following shows the case when both the heating side and cooling side are ON/OFF control.

![Diagram showing ON/OFF control](image1)

The following shows the case when both the heating side and cooling side are PID control.

![Diagram showing PID control](image2)
### 10.9 Setting Hysteresis and Dead Band for Heating/cooling Control Output

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYS</td>
<td>Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)</td>
<td>EASY</td>
<td>In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%</td>
<td>PID (Set)</td>
</tr>
<tr>
<td>HYSc</td>
<td>Cooling-side ON/OFF control hysteresis</td>
<td>EASY</td>
<td>0.0 to 100.0%</td>
<td></td>
</tr>
<tr>
<td>DB</td>
<td>Output dead band (in Heating/cooling control or Position proportional control)</td>
<td>EASY</td>
<td>In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP (Set)</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL (Set)</td>
</tr>
</tbody>
</table>

---

**Note**

- The PID number (1 to 8, or R) is displayed on Group display while each parameter is displayed.
- In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.
10.10 Setting Hysteresis and Dead Band for Position Proportional Control Output

**Description**

To prevent excessively frequent operation of the motor and relays, a dead band is provided between two relay output operating points, and hysteresis is provided for each relay output.

If position signal differs from the control computation output by less than the dead band value, neither the “direct” nor “reverse” relay turns ON. If the difference is large enough on the plus side, the direct relay turns ON; if on the minus side, the reverse relay turns ON (in reverse action).

![Diagram showing position proportional output relay hysteresis and direct/reverse output](image)

(Control computation output value – Position signal)

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>HYS</td>
<td>Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)</td>
<td>EASY</td>
<td>In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%</td>
<td>PID</td>
</tr>
<tr>
<td>DB</td>
<td>Output dead band (in Heating/cooling control or Position proportional control)</td>
<td>EASY</td>
<td>In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%</td>
<td>PIDN</td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL</td>
</tr>
</tbody>
</table>

**Note**

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

**Note1:** The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.

**Note2:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
10.11 Setting Retransmission Output Terminal, Type, and Scales

**Description**

The retransmission output can be used when the control output is not assigned to the analog output terminal. Confirm the output type selection (OT) before setting the retransmission output. The range can be changed.

- Control output terminal: 10.1 Setting Control Output Type
- Current output range: 10.14 Changing Current Output Range

Minimum value of PV input range: 0.0°C  
Maximum value of PV input range: 200.0°C

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| RTS              | Retransmission out type of RET | EASY          | OFF: Disable  
PV1: PV  
SP1: SP  
OUT1: OUT (Valve opening: 0 to 100 % in Position proportional control)  
LPS: 15 V DC loop power supply  
PV2: Loop-2 PV  
SP2: Loop-2 SP  
OUT2: Loop-2 OUT  
TSP1: Target SP  
HOUT1: Heating-side OUT  
COUT1: Cooling-side OUT  
MV1: Position proportional output (internal computed value)  
TSP2: Loop-2 target SP  
HOUT2: Loop-2 heating-side OUT  
COUT2: Loop-2 cooling-side OUT  
MV2: Loop-2 position proportional output (internal computed value)  
PV: PV terminals analog input  
RSP: RSP terminals analog input  
AIN2: AIN2 terminals analog input  
AIN4: AIN4 terminals analog input |
|                  |                  |               |                                                                                | OUT Set     |
### 10.11 Setting Retransmission Output Terminal, Type, and Scales

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTH</td>
<td>Maximum value of retransmission output scale of RET</td>
<td>STD</td>
<td>When RTH = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, RTL + 1 digit to 30000 -19999 to RTH - 1 digit</td>
</tr>
<tr>
<td>RTL</td>
<td>Minimum value of retransmission output scale of RET</td>
<td>STD</td>
<td>Decimal point position: When RTH = PV1, SP1, or TSP1, decimal point position is same as that of PV input. When RTH = PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When RTH = PV, decimal point position is same as that of PV input scale. When RTH = RSP, decimal point position is same as that of RSP input scale. When RTH = AIN2, decimal point position is same as that of AIN2 scale. When RTH = AIN4, decimal point position is same as that of AIN4 scale.</td>
</tr>
<tr>
<td>O1RS</td>
<td>Retransmission output type of OUT current output</td>
<td>STD</td>
<td>Same as RTS</td>
</tr>
<tr>
<td>O1RH</td>
<td>Maximum value of retransmission output scale of OUT current output</td>
<td>STD</td>
<td>When O1RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, O1RL + 1 digit to 30000 -19999 to O1RH - 1 digit</td>
</tr>
</tbody>
</table>
### 10.11 Setting Retransmission Output Terminal, Type, and Scales

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>O2RS</td>
<td>Retransmission output type of OUT2 current output</td>
<td>STD</td>
<td>Same as RTS</td>
<td></td>
</tr>
<tr>
<td>O2RH</td>
<td>Maximum value of retransmission output scale of OUT2 current output</td>
<td>STD</td>
<td>When O2RS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, O2RL + 1 digit to 30000, -19999 to O2RH - 1 digit</td>
<td></td>
</tr>
<tr>
<td>O2RL</td>
<td>Minimum value of retransmission output scale of OUT2 current output</td>
<td>STD</td>
<td>When O2RS=PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O2RS =PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O2RS =PV, decimal point position is same as that of PV input scale. When O2RS =RSP, decimal point position is same as that of RSP input scale. When O2RS =AIN2, decimal point position is same as that of AIN2 scale. When O2RS =AIN4, decimal point position is same as that of AIN4 scale.</td>
<td></td>
</tr>
</tbody>
</table>

Setpoints PV2, SP2 and OUT2: Can be used in Cascade control.
Setpoints HOUT1 and COUT1: Can be used in Heating/cooling control.
Setpoint MV1: Can be used in Position proportional control. (When opening or closing a valve by key operation in manual mode operation, the transmission output becomes ±5.0 %.)
Setpoint TSP2: Can be used in Cascade control.
Setpoints HOUT2 and COUT2: Can be used in Cascade control of Heating/cooling type.
Setpoint MV2: Can be used in Cascade control of Position proportional type. (When opening or closing a valve by key operation in manual mode operation, the transmission output becomes ±5.0 %.)
Setpoint RSP: Can be used when equipped with remote input.
Setpoints AIN2 and AIN4: Can be used when the UT55A suffix code: Type 2 = 7.

### Parameters and Corresponding Terminals

<table>
<thead>
<tr>
<th>RTS, RTH, RTL</th>
<th>RET terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1RS, O1RH, O1RL</td>
<td>OUT terminal</td>
</tr>
<tr>
<td>O2RS, O2RH, O2RL</td>
<td>OUT2 terminal</td>
</tr>
</tbody>
</table>
10.12 Setting Preset Output Value

10.12.1 Setting Output Value in STOP Mode (Preset Output)

**Description**

Preset output becomes the output when the operation mode is switched from RUN to STOP.

The preset output is not limited by the output high and low limits. The preset output is prepared for each PID parameter group, and works according to the selected PID parameter group.

Preset output becomes the output when the operation mode is switched from RUN to STOP. The preset output is not limited by the output high and low limits. The preset output is prepared for each PID parameter group, and works according to the selected PID parameter group.

Control output

Control output obtained by computation based on deviation between SP and PV.

The preset output (fixed) applies according to the preset output.

Preset Output in Heating/cooling Control

The preset output can be set for both of the heating and cooling sides. The computation starts from the value of 50% of internal computed value (value before split into heating- and cooling-side outputs) when the operation mode is switched from STOP to RUN.

► Output limiter: 10.3 Setting Limiter to Control Output
### 10.12 Setting Preset Output Value

#### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO</td>
<td>Preset output Heating-side preset output (in Heating/cooling control)</td>
<td>EASY</td>
<td>In STOP mode, fixed control output can be generated. In Position proportional control, Valve opening can be set: -5.0 to 105.0%</td>
<td>PID Ope</td>
</tr>
<tr>
<td>POc</td>
<td>Cooling-side preset output</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SU.PO</td>
<td>Sub-preset output (in Two-position two-level control)</td>
<td>EASY</td>
<td>In STOP mode, fixed sub-control output can be generated. 0%, 100%</td>
<td></td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8</td>
<td>SP Ope</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

**Note 1:** The PID number (1 to 8, R) is displayed on Group display while each parameter is displayed.

**Note 2:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

When changing the setpoint of the parameter PIDG., if the setpoint of the parameter PIDN which belongs to the SP menu is larger than that of the parameter PIDG., the PIDN setpoint is changed to the PIDG. setpoint.

For ON/OFF output (ON/OFF output or ON/OFF output in Two-position two-level control or Heating/cooling control), 0.0% is output when the setting value is 0.0% or less and 100.0% is output when 0.1% or more.
10.12 Setting Preset Output Value

10.12.2 Setting Output Value When Switched to MAN Mode (Manual Preset Output)

**Description**

When the operation mode is switched from AUTO to MAN, each of the following can be selected.

- The control output takes over the control output as is.
- The control output bumps to the manual preset output.

When the manual preset output is output, the manual operation is possible after the bump.

Manual preset output is limited by the output high and low limits. (when Output limiter switch (OLMT) = ON)

When the operation mode is switched from MAN to AUTO, transferred without bump from the manual output to the control output.

- Output limiter: 10.3 Setting Limiter to Control Output
- Output limiter switch: 10.4 Disabling Output Limiter in MAN mode
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MPON</strong></td>
<td>Manual preset output number selection</td>
<td>STD</td>
<td>OFF: Hold the control output in AUTO mode (bumpless)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: Use manual preset output 1 (output bump)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: Use manual preset output 2 (output bump)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3: Use manual preset output 3 (output bump)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4: Use manual preset output 4 (output bump)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5: Use manual preset output 5 (output bump)</td>
<td></td>
</tr>
<tr>
<td><strong>MPO1 to MPO5</strong></td>
<td>Manual preset output 1 to 5</td>
<td>STD</td>
<td>-5.0 to 105.0%</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
10.12 Setting Preset Output Value

10.12.3 Setting Output Value When Error Occurs (Input Error Preset Output)

**Description**

The 0% control output, 100% control output, or input preset output can be selected and output as input error preset output in the following conditions.

- The input burnout occurs during operation in AUTO or CAS mode and RUN mode.
- The ADC error occurs during operation in AUTO or CAS mode and RUN mode.

However, the manual output becomes the output when the input burnout occurs in MAN mode and RUN mode.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPO</td>
<td>Input error preset output</td>
<td>STD</td>
<td>0: Preset output</td>
<td>SYS</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: 0% output</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: 100% output</td>
<td>Set</td>
</tr>
</tbody>
</table>
A total of up to four 10-segment linearizers can be used for the input unit and output unit. For the position used by a 10-segment linearizer, see the function block diagram.

- Function block diagram: 8.1 Setting Control Mode (CTLM)
- 10-segment linearizer input: 7.1.4 (3) Setting 10-segment Linearizer

10-segment Linearizer Biasing
This function is used to correct the control output by adding the corresponding bias values to each of the 11 points of optionally set input values. When the 10-segment linearizer input is A1 or less, B1 is added. Moreover, the input is A11 or more, B11 is added.

10-segment Linearizer Approximation
This function is used to correct the control output. As shown in the figure below, the output values can be optionally set to 11 points of the optionally set input values. When the 10-segment linearizer input is A1 or less, the value of extended line between B1 and B2 is output. Moreover, when the input is A11 or more, the value of extended line between B10 and B11 is output.
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PYS</td>
<td>10-segment linearizer selection</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>OFF: Disable PV: PV analog input RSP: RSP analog input AIN2: AIN2 analog input AIN4: AIN4 analog input PVIN: PV input OUT: OUT analog output OUT2: OUT2 analog output RET: RET analog output</td>
<td>PYS1 PYS2 PYS3 PYS4</td>
</tr>
<tr>
<td>A1 to A11</td>
<td>10-segment linearizer input 1</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%</td>
<td>PYS1 PYS2 PYS3 PYS4</td>
</tr>
<tr>
<td>B1 to B11</td>
<td>10-segment linearizer output 1</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>10-segment linearizer bias: -66.7 to 105.0% of input range (EUS) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%</td>
<td>PYS1 PYS2 PYS3 PYS4</td>
</tr>
<tr>
<td>PMD</td>
<td>10-segment linearizer mode</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>0: 10-segment linearizer bias 1: 10-segment linearizer approximation</td>
<td>PYS1 PYS2 PYS3 PYS4</td>
</tr>
</tbody>
</table>

**Note:** The group number (1 to 4) is displayed on Group display while each parameter is displayed.

Set it in the following orders.

1. **PYS:** Specifies where the 10-segment linearizer function is used.
   - Setpoint OUT functions before output to OUT terminal.
   - Setpoint OUT2 functions before output to OUT2 terminal. (for Heating/cooling type only)
   - Setpoint RET functions before output to RET terminal.
2. **PMD:** Specifies whether to use it as a 10-segment linearizer bias or a 10-segment linearizer approximation.
3. **A1 to A11, B1 to B11:** Sets the 10-segment linearizer input and 10-segment linearizer output.

**Note**
- Set the 10-segment linearizer so that it increases monotonically.
- If the same setpoint is set for the two or more parameters of 10-segment linearizer selection (PYS), a smaller group number is used.
10.14 Changing Current Output Range

**Description**

The analog output type can be selected from among 4 to 20, 0 to 20, 20 to 4, or 20 to 0 mA.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OU.A</td>
<td>OUT current output range</td>
<td>STD</td>
<td>4-20: 4 to 20 mA, 0-20: 0 to 20 mA, 20-4: 20 to 4 mA, 20-0: 20 to 0 mA</td>
<td>OUT Set</td>
</tr>
<tr>
<td>OU2.A</td>
<td>OUT2 current output range</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RET.A</td>
<td>RET current output range</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Parameters and Corresponding Terminals**

| OU.A             | OUT terminal               |
| OU2.A            | OUT2 terminal              |
| RET.A            | RET terminal               |
10.15 Setting Split Computation Output Function

**Description**

Split computation output is useful for the case where multiple (up to 3) operating units for switching, for example, hot and cool water are linked for control. There are two characteristics of split computations: V-mode characteristics and Parallel-mode characteristics. The current output range can be changed.

► Current output range: 10.14 Changing Current Output Range

**V-mode Characteristics**

The following explains an example of letting OUT terminal and RET terminal present the V-mode characteristics of split computations.

**Setting Example**

<table>
<thead>
<tr>
<th>Control output type/Retransmission output type</th>
<th>OUT terminal</th>
<th>RET terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>OT = 00.02 (current)</td>
<td>RET=PV1</td>
<td></td>
</tr>
<tr>
<td>Current output 100% segmental point</td>
<td>OU.H=100.0%</td>
<td></td>
</tr>
<tr>
<td>Current output 0% segmental point</td>
<td>RET.H=0.0%</td>
<td></td>
</tr>
<tr>
<td>Current output range</td>
<td>OU.A=4-20</td>
<td></td>
</tr>
</tbody>
</table>

![Graph showing V-mode characteristics](image-url)
Parallel-mode Characteristics

The following explains an example of letting OUT terminal and RET terminal present the Parallel-mode characteristics of split computations.

### Setting Example

<table>
<thead>
<tr>
<th>Setting Details</th>
<th>OUT terminal</th>
<th>RET terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control output type/Retransmission output type</td>
<td>OT = 00.02 (current)</td>
<td>RTS = PV1</td>
</tr>
<tr>
<td>Current output 100% segmental point</td>
<td>OU.H = 100.0%</td>
<td>OU.L = 25.0%</td>
</tr>
<tr>
<td>Current output 0% segmental point</td>
<td>RET.H = 75.0%</td>
<td>RET.L = 0.0%</td>
</tr>
<tr>
<td>Current output range</td>
<td>OU.A = 4-20</td>
<td>RET.A = 4-20</td>
</tr>
</tbody>
</table>

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OU.H</td>
<td>100% segmental point of OUT current output</td>
<td>PRO</td>
<td>-100.0 to 200.0%</td>
<td>OUT  Set</td>
</tr>
<tr>
<td>OU.L</td>
<td>0% segmental point of OUT current output</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OU2.H</td>
<td>100% segmental point of OUT2 current output</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OU2.L</td>
<td>0% segmental point of OUT2 current output</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RET.H</td>
<td>100% segmental point of RET current output</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RET.L</td>
<td>0% segmental point of RET current output</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Parameters and Corresponding Terminals

- OU.H, OU.L: OUT terminal
- OU2.H, OU2.L: OUT2 terminal
- RET.H, RET.L: RET terminal
10.16 Adjusting Motor-operated Valve Position
(Position Proportional Output)

When performing control using the motor-operated valve position, adjustment of the valve position is necessary.

Start of valve position adjustment.

- Use the feedback input.

  - YES
  - Move to the estimating type if a feedback input burnout occurs.

    - YES
      - V.MOD = 1
        - Control by estimating type at feedback input error.
      - V.MOD = 2
        - Control by estimating type at feedback input error.
      - V.MOD = 0
        - Control with feedback input

    - NO
      - V.MOD = 3
        - Adjust a valve position automatically.

- VAT

  - YES
    - V.MOD = 1
      - Control by valve position estimating type.
  - NO
    - V.MOD = 0
      - Control by valve position estimating type.

End

When controlling by estimating type, set TR.T corresponding to the valve characteristic.
### 10.16.1 Setting Valve Operation Mode

**Description**

Position proportional control monitors the control output signals and the feedback signals from the control valve and regulates to keep the valve opening and the control output signal in agreement. Position proportional control (output) operation mode has feedback type and estimating type.

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.MOD</td>
<td>Valve adjusting mode</td>
<td>STD</td>
<td>0: Valve position feedback type&lt;br&gt;1: Valve position feedback type (moves to the estimating type if a feedback input error or break occurs.)&lt;br&gt;2: Valve position estimating type</td>
<td>OUT Set</td>
</tr>
</tbody>
</table>

### 10.16.2 Adjusting Valve Position Automatically

**Description**

The fully-closed and fully-opened positions of a valve can be set automatically by the feedback input signal from a valve. The following describes the procedure of adjusting the valve position automatically.

1. Verify that the wirings are correct.
2. Set the operation mode to MAN.
3. Set the automatic valve position adjustment (V.AT) to ON. (V.AT blinks during the automatic adjustment.)
4. When the adjustment is completed, V.AT returns to OFF. When the adjustment fails, VAT.E appears on PV display.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.AT</td>
<td>Automatic valve position adjustment</td>
<td>EASY</td>
<td>OFF: Stop automatic adjustment&lt;br&gt;ON: Start automatic adjustment</td>
<td>OUT Set</td>
</tr>
</tbody>
</table>
10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)

10.16.3 Adjusting Valve Position Manually

**Description**

The following procedure describes how to adjust valve position manually.

1. Verify that the wirings are correct.
2. Set the operation mode to MAN.
3. Reset the valve position (Set V.RS=ON).
4. Display the fully-closed valve position setting (V.L), determine the fully-closed position while holding down the Down arrow (\(\nabla\)) key, and press the SET/ENTER key.
5. Display the fully-opened valve position setting (V.H), determine the fully-opened position while holding down the Up arrow (\(\triangleup\)) key, and press the SET/ENTER key.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>V.RS</td>
<td>Valve position setting reset</td>
<td>EASY</td>
<td>Setting V.RS to ON resets the valve adjustment settings and causes the indication “V.RS” to blink.</td>
<td></td>
</tr>
<tr>
<td>V.L</td>
<td>Fully-closed valve position setting</td>
<td>EASY</td>
<td>Pressing the SET/ENTER key with valve position set to the fully-closed position by Down arrow key causes the adjusted value to be stored. When V.L adjustment is complete, V.L stops blinking.</td>
<td>OUT Set</td>
</tr>
<tr>
<td>V.H</td>
<td>Fully-opened valve position setting</td>
<td>EASY</td>
<td>Pressing the SET/ENTER key with valve position set to the fully-opened position by Up arrow key causes the adjusted value to be stored. When V.H adjustment is complete, V.H stops blinking.</td>
<td></td>
</tr>
</tbody>
</table>
10.16 Adjusting Motor-operated Valve Position (Position Proportional Output)

10.16.4 Setting Valve Traveling Time (Estimating Type)

**Description**
In the estimating type, a traveling time required to fully open the valve from its fully-closed position is set and valve positions are estimated according to the time consumed for valve operation.

The valve position estimating type is used when the feedback input of valve positions cannot be obtained.

(Wiring for feedback input is not necessary.)

The fully-opened side relay keeps ON-state when the output is 100%, and the fully-closed side relay keeps ON-state when the output is 0%.

**Operating Principles**
In the estimating type, the valve position is obtained by calculating the virtual feedback input based on the valve traveling time.

However, the virtual feedback input starts calculation from 50% at power-on.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR.T</td>
<td>Valve traveling time</td>
<td>STD</td>
<td>5 to 300 s</td>
<td>OUT SET</td>
</tr>
</tbody>
</table>

10.16.5 Selecting Feedback Input (Resistor/Current)

**Description**
Only the wiring for resistor or current is necessary for feedback input. There is no setting.

► Wiring: 17.4.5 Valve Position Output and Feedback Input Wiring
10.17 Using 15 V DC Loop Power Supply

**Description**

The 15 V DC loop power supply is a function to supply DC power (14.5 to 18.0 V DC (21 mA DC)) to a 2-wire transmitter.

The loop power supply block is isolated from the controller's internal circuitry. In addition, the block is equipped with a current limiting circuit. Therefore, accidental short-circuits that may occur in the field do not adversely affect the rest of the controller's internal circuitry.

Note that the loop power supply function cannot be used for digital communication where the supply voltage is superposed on the signal line.

The following shows the examples of loop power supply connection to a 2-wire transmitter.
## Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| RTS              | Retransmission output type of RET         | EASY          | OFF: Disable  
PV1: PV  
SP1: SP  
OUT1: OUT (Valve opening: 0 to 100 % in Position proportional control)  
LPS: 15 V DC loop power supply  
PV2: Loop-2 PV  
SP2: Loop-2 SP  
OUT2: Loop-2 OUT  
TSP1: Target SP  
HOUT1: Heating-side OUT  
COUT1: Cooling-side OUT  
MV1: Position proportional output (internal computed value)  
TSP2: Loop-2 target SP  
HOUT2: Loop-2 heating-side OUT  
COUT2: Loop-2 cooling-side OUT  
MV2: Loop-2 position proportional output (internal computed value)  
PV: PV terminals analog input  
RSP: RSP terminals analog input  
AIN2: AIN2 terminals analog input  
AIN4: AIN4 terminals analog input | OUT Set |
| O1RS             | Retransmission output type of OUT current output | EASY          |                                                                                                        |             |
| O2RS             | Retransmission output type of OUT2 current output | EASY          |                                                                                                        |             |

### Parameters and Corresponding Terminals

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Corresponding Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTS</td>
<td>RET terminal</td>
</tr>
<tr>
<td>O1RS</td>
<td>OUT terminal</td>
</tr>
<tr>
<td>O2RS</td>
<td>OUT2 terminal</td>
</tr>
</tbody>
</table>
Chapter 11 Alarm Functions

11.1 Setting Alarm Type

The alarm-related parameters consist of the alarm type (type, stand-by action, energized/de-energized, and latch function), PV velocity alarm time setpoint, alarm hysteresis, alarm (On-/Off-) delay timer, and alarm setpoint.

In Cascade control, both of Loop 1 and Loop 2 have these parameters.

<table>
<thead>
<tr>
<th>Alarm-related parameter</th>
<th>Number of settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm type</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>PV velocity alarm time setpoint</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>Alarm hysteresis</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>Alarm (on-/off-) delay timer</td>
<td>8 (number of settings) x 2 (number of loops)</td>
</tr>
<tr>
<td>Alarm setpoint</td>
<td>8 (number of settings) x 8 (number of groups) x 2 (number of loops)</td>
</tr>
</tbody>
</table>

- Alarm hysteresis: 11.3 Setting Hysteresis to Alarm Operation
- Alarm delay timer: 11.4 Delaying Alarm Output (Alarm Delay Timer)
- Alarm setpoint: 6.5 Setting Alarm Setpoint

Both of Loop-1 and Loop-2 have eight groups of alarms. The alarms are assigned to the terminals for each control mode (parameter CTLM).

Factory default: Only four groups of alarm-related parameters are displayed.

- Terminal function: 17.4.7 Contact Output Wiring

Alarm output can be assigned to the unused control relay output or contact output.

- Control relay output: 11.5 Setting Alarm Output to Control Relay Terminal
- Contact output: 12.2.1 Setting Function of Contact Output

Energized/de-energized of alarm output can be changed.

- Energized/de-energized: 12.2.2 Changing Contact Type of Contact Output

To read the conditions of alarms, outputs, or latches via communication, see Communication Interface User's Manual.

* The above figure shows the case of single-loop control mode.
* See "Appendix 1 Input and Output Table of Standard Model and Suffix Codes" for presence/absence of the terminals DO11 to DO15, DO21 to DO25, and DO31 to DO35.
* OUT1 and OUT2 can be used for alarm output when the relay outputs are not used for control output.
11.1 Setting Alarm Type

### PV High Limit Alarm and PV Low Limit Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

### SP High Limit Alarm and SP Low Limit Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
11.1 Setting Alarm Type

Deviation High Limit Alarm and Deviation Low Limit Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Deviation High and Low Limits Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Deviation within High and Low Limits Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
11.1 Setting Alarm Type

**Target SP High Limit Alarm and Target SP Low Limit Alarm**

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

**Target SP Deviation High Limit Alarm and Target SP Deviation Low Limit Alarm**

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

* Target SP: a set target setpoint. When the ramp-rate is set, it becomes a final target setpoint.
11.1 Setting Alarm Type

Target SP Deviation High and Low Limits Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Target SP Deviation within High and Low Limits Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
Control Output High Limit Alarm and Control Output Low Limit Alarm

In Heating/cooling control, alarms are heating-side control output high limit alarm and heating-side control output low limit alarm.

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Cooling-side Control Output High Limit Alarm and Cooling-side Control Output Low Limit Alarm

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
11.1 Setting Alarm Type

Analog Input PV High Limit Alarm and Analog Input PV Low Limit Alarm
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Analog Input RSP High limit Alarm and Analog Input RSP Low Limit Alarm
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
11.1 Setting Alarm Type

Analog Input AIN2 High Limit Alarm and Analog Input AIN2 Low Limit Alarm
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.

Analog input AIN2 high limit alarm output

Analog input AIN2 high limit alarm setpoint

Alarm hysteresis

Aux. analog (AIN2) input

Analog input AIN2 low limit alarm output

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Analog Input AIN4 High Limit Alarm and Analog Input AIN4 Low Limit Alarm
These alarms monitor the input value after the analog input computation process (entrance to the input ladder calculation) is completed.

Analog input AIN4 high limit alarm output

Analog input AIN4 high limit alarm setpoint

Alarm hysteresis

Aux. analog (AIN4) input

Analog input AIN4 low limit alarm output

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
Feedback Input High Limit Alarm and Feedback Input Low Limit Alarm
These alarms can be used only for Position proportional type.
These alarms monitor the feedback input (resistance or current) value.
The setting range for these alarms is 0.0 to 100.0%.
However, the setting range varies depending on whether the feedback input is a current value (4 to 20 mA) or resistance value (100 Ω to 2.5 kΩ).
Current value: 4 mA corresponds to 0.0%, and 20 mA to 100.0%.
Resistance value (e.g., 1 kΩ): The resistance value when the valve is fully closed after the valve position adjustment corresponds to 0.0%, and the resistance value when the valve is fully opened corresponds to 100.0%. 0 Ω does not correspond to 0.0%, and 1 kΩ does not correspond to 100.0%.

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

PV Velocity Alarm
Monitors the variation of the measured value for 2 points by the time interval set in VT.
An alarm occurs if the velocity exceeds this inclination.

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
The PV velocity alarm function does not work the alarm hysteresis, the stand-by action and the alarm delay timer functions.
11.1 Setting Alarm Type

Fault diagnosis Alarm
The function outputs an alarm signal in the following cases.
The corresponding event (EV) lamp is lit and the contact output turns on (when the contact type is CLS (energized)).
• Burnout of PV input, RSP remote input, or auxiliary analog input
• ADC failure of PV input, RSP remote input, or auxiliary analog input
• Reference junction compensation (RJC) error of PV input, RSP remote input

FAIL output
When the FAIL condition is caused (faulty MCU or system data error), DO (alarm output) turned off regardless of contact type.

Stand-by Action
The stand-by action is a function for ignoring the alarm condition and keeps the alarm off until the alarm condition is removed. Once the alarm condition is removed, the stand-by action is cancelled.
It is effective in the following cases where;
• The power is turned on
• SP is changed
• SP number is switched (however, except for remote setpoint) (The SP must be changed.)
• The alarm type is changed
• Forced stand-by via communication or contact input

The following shows the behavior of an alarm with the stand-by action at power ON.

![Diagram showing the behavior of an alarm with the stand-by action at power ON.](attachment:image.png)
**Alarm Latch Function**

The alarm latch function is a function for keeping the alarm output (keeping the alarm output on) after entering the alarm condition (alarm output is turned on) until an order to release the alarm latch is received.

The alarm latch function has the following four types of action.

**Latch 1**
- Cancels the alarm output when an order to release the alarm latch is received. (Alarm output OFF.)
- However, an order to release the alarm latch is ignored if the order is received during alarm condition.

**Latch 2**
- Always forces cancelling of the alarm output when an order to release the alarm latch is received. (Alarm output OFF)

**Latch 3**
- Cancels the alarm output when an order to release the alarm latch is received or when the alarm condition is removed. (Alarm output OFF.)

**Latch 4**
- Cancels the alarm output when an order to release the alarm latch is received. (Alarm output OFF.)
- However, cancels the alarm output for the duration of the sampling period (control period) if an order to release the alarm latch is received during alarm condition. (Alarm output OFF)

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).
Release of Alarm Latch

The alarm latch function can be cancelled by the user function key, via communication/ladder program, or by contact input.

Cancelling the alarm latch function cancels all latched alarm outputs.

- Release by user function key: 13.2 Assigning Function to User Function Key and A/M key
- Release by contact input: 12.1.1 Setting Contact Input Function

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

Operation of Alarm Output and Display Lamp (EV)

The contact output and display lamp (EV) are usually output and displayed according to the setpoint of the alarm type. However, the alarm conditions (operations) of the normal action, and latch action can be assigned to the contact output and display lamp (EV), regardless of the setpoint of the alarm type. (Two operations can be assigned simultaneously.)

- Display lamp action: 13.1 Setting Display Functions
- Contact output action: 12.2.1 Setting Function of Contact Output
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1 to AL8</td>
<td>Alarm-1 to -8 type</td>
<td>EASY</td>
<td>See the table below.</td>
<td>ALRM</td>
</tr>
<tr>
<td>VT1 to VT8</td>
<td>PV velocity alarm time setpoint 1 to 8</td>
<td>EASY</td>
<td>00.01 to 99.59 (minute.second)</td>
<td>ALRM</td>
</tr>
</tbody>
</table>

Note1: The initial values of the parameters AL1 to AL8 and VT1 to VT8 are “4”. Only AL1 to AL4 and VT1 to VT4 are displayed. The number of alarms can be changed using the parameter ALNO.

Note2: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
The following shows the example of setting PV high limit (01), With stand-by action (1), De-energized (1), and Latch 1 action (1).

<table>
<thead>
<tr>
<th>Name</th>
<th>Latch action (Note)</th>
<th>Energized (0) / de-energized (1)</th>
<th>Stand-by action Without (0) / with (1)</th>
<th>Alarm type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>00</td>
</tr>
<tr>
<td>PV high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>01</td>
</tr>
<tr>
<td>PV low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>02</td>
</tr>
<tr>
<td>SP high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>03</td>
</tr>
<tr>
<td>SP low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>04</td>
</tr>
<tr>
<td>Deviation high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>05</td>
</tr>
<tr>
<td>Deviation low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>06</td>
</tr>
<tr>
<td>Deviation high and low limits</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>07</td>
</tr>
<tr>
<td>Deviation within high and low limits</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>08</td>
</tr>
<tr>
<td>Target SP high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>09</td>
</tr>
<tr>
<td>Target SP low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>10</td>
</tr>
<tr>
<td>Target SP deviation high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>11</td>
</tr>
<tr>
<td>Target SP deviation low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>12</td>
</tr>
<tr>
<td>Target SP deviation high and low limits</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>13</td>
</tr>
<tr>
<td>Target SP deviation within high and low limits</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>14</td>
</tr>
<tr>
<td>Control output high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>15</td>
</tr>
<tr>
<td>Control output low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>16</td>
</tr>
<tr>
<td>Cooling-side Control output high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>17</td>
</tr>
<tr>
<td>Cooling-side Control output low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>18</td>
</tr>
<tr>
<td>Analog input PV high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>19</td>
</tr>
<tr>
<td>Analog input PV low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>20</td>
</tr>
<tr>
<td>Analog input RSP high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>21</td>
</tr>
<tr>
<td>Analog input RSP low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>22</td>
</tr>
<tr>
<td>Analog input AIN2 high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>23</td>
</tr>
<tr>
<td>Analog input AIN2 low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>24</td>
</tr>
<tr>
<td>Analog input AIN4 high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>25</td>
</tr>
<tr>
<td>Analog input AIN4 low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>26</td>
</tr>
<tr>
<td>Feedback input high limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>27</td>
</tr>
<tr>
<td>Feedback input low limit</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>28</td>
</tr>
<tr>
<td>PV velocity</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>29</td>
</tr>
<tr>
<td>Fault diagnosis</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>30</td>
</tr>
<tr>
<td>FAIL</td>
<td>0 / 1 / 2 / 3 / 4</td>
<td>0 / 1</td>
<td>0 / 1</td>
<td>31</td>
</tr>
</tbody>
</table>

Note: 0: No latch function, 1: Latch 1, 2: Latch 2, 3: Latch 3, 4: Latch 4
### 11.2 Setting Number of Alarm Groups to Use

**Description**

Up to eight alarm groups of alarm type, alarm hysteresis, alarm (On-/Off-) delay timer, and alarm setpoint are available. Unused alarm parameters can be hidden and their functions can be turned off. The initial value of parameter ALNO. is “4.”

When ALNO. = 4, for example, only the four groups of alarm type, PV velocity alarm time setpoint, alarm hysteresis, alarm delay timer, and alarm setpoint are displayed.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALNO.</td>
<td>Number of alarm groups</td>
<td>PRO</td>
<td>1 to 8</td>
<td>CTL Set</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
11.3 Setting Hysteresis to Alarm Operation

**Description**

If the On/Off switch of the alarm output is too busy, you can alleviate the busyness by increasing the alarm hysteresis.

**Hysteresis for PV High Limit Alarm**

![Diagram of Hysteresis for PV High Limit Alarm]

**When Setting Hysteresis of 5°C and 15°C for PV High Limit Alarm**

- **Alarm ON**
  - **Closed (ON)**
  - **Open**
  - **Alarm setpoint: 100°C (example)**
  - **HYS: 5°C (example)**
  - **HYS: 15°C (example)**

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>HY1 to HY8</td>
<td>Alarm-1 to -8 hysteresis</td>
<td>EASY</td>
<td>Sets the hysteresis setpoint as a display value. -19999 to 30000 (set it within the input range) The decimal point position depends on the input type.</td>
<td>ALRM</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
11.4 Delaying Alarm Output (Alarm Delay Timer)

Description

The alarm on-delay timer is a function for turning on the alarm when the alarm condition occurs, and the timer starts and the set time elapses. The timer is reset if the alarm condition is removed while the timer is running. No alarm is generated.

The figure below shows the example of the On-delay timer.

![Diagram of On-delay timer](image)

Contact type in the figure above: Energized (CLS) when an event occurs (factory default).

The alarm Off-delay timer is a function for turning off the alarm when the alarm condition is removed (normal condition), and the timer starts and the set time elapses. The timer is reset if the alarm condition occurs again while the timer is running. The alarm is not cancelled.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DYN1 to DYN8</td>
<td>Alarm-1 to -8 On-delay timer</td>
<td>STD</td>
<td>0.00 to 99.59 (minute.second)</td>
<td>ALRM</td>
</tr>
<tr>
<td>DYFT1 to DYFT8</td>
<td>Alarm-1 to -8 Off-delay timer</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
11.5 Setting Alarm Output to Control Relay Terminal

**Description**

The control relay terminal can be used for alarm output when it is not used for control output.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR.S</td>
<td>OUT relay function selection</td>
<td>STD</td>
<td>Same as the setpoint for the contact output function. See 12.2.1, “Setting Function of Contact Output.”</td>
<td></td>
</tr>
<tr>
<td>OR.D</td>
<td>OUT relay contact type</td>
<td>PRO</td>
<td>CLS: Closes the contact when an event occurs</td>
<td>ALM Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>OPN: Opens the contact when an event occurs</td>
<td></td>
</tr>
<tr>
<td>OR2.S</td>
<td>OUT2 relay function selection</td>
<td>STD</td>
<td>Same as OR.S.</td>
<td></td>
</tr>
<tr>
<td>OR2.D</td>
<td>OUT2 relay contact type</td>
<td>PRO</td>
<td>Same as OR.D</td>
<td></td>
</tr>
</tbody>
</table>

**Parameters and Corresponding Terminals**

- OR.S, OR.D: OUT terminal
- OR2.S, OR2.D: OUT2 terminal
11.6 Setting Alarm Action According to Operation Mode

Description
The alarm action usually functions regardless of operation modes. Setting the alarm mode allows the alarm action to be disabled in STOP or in STOP or MAN mode.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMD</td>
<td>Alarm mode</td>
<td>STD</td>
<td>0: Always active</td>
<td>ALRM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1: Not active in STOP mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2: Not active in STOP or MAN mode</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
11.7 Setting Heater Break Alarm

**Description**

Either of heater break alarm function or heater current measurement function can be selected.

**Heater Break Alarm Function**

The heater break alarm function measures the heater current, and outputs the heater break alarm if the current is less than the heater break detecting point. The heater break alarm function can be used only for ON/OFF output (relay output) or for time proportional output (relay output, voltage pulse output). It cannot be used for current output.

Timing which detects the heater break alarm is as follows.
- For ON/OFF output:
  - Heater break is detected when control output is in On-state. (Heater break is not detected when control output is in Off-state.)
- For time proportional output:
  - When On-state time of control output is 130 ms or longer, heater break is detected. Heater break is detected between 20 ms and 120 ms after control output turns on. Heater current value is detected every 200 ms while control output turns on.

Heater break detecting point
Set a detecting point (setpoint) of heater break alarm.
The heater break alarm is output if the measured current is less than the detecting point (setpoint).

Current Transformer Winding Number Ratio
The coil winding number ratio of current transformer (CT ratio) can be set.
Example: Set the CT ratio "800" for the CTL-6-S-H manufactured by U.R.D. Co., Ltd.
11.7 Setting Heater Break Alarm

Heater Current Measured Value
A measured heater current value can be confirmed by a displayed value on operation display.
► Heater current measured value: 6.1 Monitoring and Control of Operation Displays

Heater Break Alarm Delay Timer
The delay timer (On-delay timer, Off-delay timer) can be set for the heater break alarm function.
► Delay timer: 11.4 Delaying Alarm Output (Alarm Delay Timer)

Heater Break Alarm Output Contact Type
The heater break alarm output contact type sets an action direction of contact output (ON/OFF) when an event occurs.

---

Using a single-phase heater

Temperature input

CT1

Control output

CTL-6-S-H (Current sensor)

SSR

TC

Single-phase heater

Electric furnace

---

Using a three-phase heater

Temperature input

CT1

CT2

Control output

CTL-6-S-H (Current sensor)

SSR

R S T

Three-phase heater

Electric furnace
11.7 Setting Heater Break Alarm

Heater Current Measurement Function

The heater current value can be confirmed by a displayed value on operation display.

► Heater current measured value: 6.1 Monitoring and Control of Operation Displays

The heater break alarm function can be used only for ON/OFF output (relay output), for time proportional output (relay output, voltage pulse output) or for current output.

Heater current value is detected every 200 ms.

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB1.S, HB2.S</td>
<td>Heater break alarm function selection</td>
<td>EASY</td>
<td>0: Heater current measurement 1: Heater break alarm</td>
<td></td>
</tr>
<tr>
<td>HB1, HB2</td>
<td>Heater break alarm current setpoint</td>
<td>EASY</td>
<td>OFF, 0.1 to 300.0 Arms</td>
<td></td>
</tr>
<tr>
<td>CT1.T, CT2.T</td>
<td>CT coil winding number ratio</td>
<td>EASY</td>
<td>1 to 3300</td>
<td></td>
</tr>
<tr>
<td>HDN1, HDN2</td>
<td>Heater break alarm On-delay timer</td>
<td>STD</td>
<td>0.00 to 99.59 (minute.second)</td>
<td></td>
</tr>
<tr>
<td>HDF1, HDF2</td>
<td>Heater break alarm Off-delay timer</td>
<td>PRO</td>
<td>CLS: When the event occurs, the contact is closed. OPN: When the event occurs, the contact is opened.</td>
<td></td>
</tr>
<tr>
<td>HB1.D, HB2.D</td>
<td>Heater break alarm contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: In cases where the current transformer manufactured by U.R.D Co., Ltd. are used, set the following value for the CT coil winding number ratio.
- CTL-6-S-H: 800
- CTL-12L-30: 3000
12.1 Setting Contact Input Function

12.1.1 Setting Contact Input Function

Description

The contact input function works by setting the contact input number (I relay) to functions such as the operation mode. This explanation assumes that the contact type is energized (CLS). (The function is executed when the contact is turned on)

AUTO/MAN Switch (A/M)

AUTO/MAN mode can be switched using contact input. (Status switch)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON AUTO</td>
<td>AUTO</td>
<td>Switch by keystroke or via communication is disabled.</td>
</tr>
<tr>
<td>OFF MAN</td>
<td>MAN</td>
<td>Switch by keystroke or via communication is enabled.</td>
</tr>
</tbody>
</table>

AUTO/MAN switch is disabled in Cascade control or Cascade secondary-loop control.

REMOTE/LOCAL Switch (R/L)

REMOTE/LOCAL mode can be switched using contact input. (Status switch)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON REMOTE</td>
<td>REMOTE</td>
<td>Switch by keystroke or via communication is disabled.</td>
</tr>
<tr>
<td>OFF LOCAL</td>
<td>LOCAL</td>
<td>Switch by keystroke or via communication is enabled.</td>
</tr>
</tbody>
</table>

In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

STOP/RUN Switch (S/R)

STOP/RUN mode can be switched using contact input. (Status switch)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON STOP</td>
<td>STOP</td>
<td>When the STOP/RUN switch is assigned (S/R ≠ 0), switch by keystroke or via communication is disabled.</td>
</tr>
<tr>
<td>OFF RUN</td>
<td>RUN</td>
<td>–</td>
</tr>
</tbody>
</table>

Switch to Cascade (CAS)

In Cascade control, the mode can be switched to CAS (cascade) using contact input. (Switch by the rising edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Switch to CAS (cascade)</td>
<td>–</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Maintains the current operation status</td>
<td>–</td>
</tr>
</tbody>
</table>

Switch to AUTO (AUTO)

In Cascade control, the mode can be switched to AUTO using contact input. (Switch by the rising edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Switch to AUTO</td>
<td>–</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Maintains the current operation status</td>
<td>–</td>
</tr>
</tbody>
</table>
12.1 Setting Contact Input Function

**Switch to MAN (MAN)**

The mode can be switched to MAN using contact input. (Switch by the rising edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Switch to MAN</td>
<td>–</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Maintains the current operation status</td>
<td>–</td>
</tr>
</tbody>
</table>

**Switch to REMOTE (REM)**

The mode can be switched to REMOTE using contact input. (Switch by the rising edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Switch to REMOTE</td>
<td>–</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Maintains the current operation status</td>
<td>–</td>
</tr>
</tbody>
</table>

In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Switch to LOCAL (LCL)**

The mode can be switched to LOCAL using contact input. (Switch by the rising edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Switch to LOCAL</td>
<td>–</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Maintains the current operation status</td>
<td>–</td>
</tr>
</tbody>
</table>

In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.

**Auto-tuning START/STOP Switch (AT)**

Auto-tuning START/STOP can be switched using contact input.

Auto-tuning is executed to the PID group currently specified. (Switch by the rising edge and the falling edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Starts auto-tuning</td>
<td>–</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Stops auto-tuning</td>
<td>–</td>
</tr>
</tbody>
</table>

**Output Tracking Switch (TRK)**

Output tracking can be switched using contact input. (Status switch)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Turns the output tracking on</td>
<td>–</td>
</tr>
<tr>
<td>OFF</td>
<td>Turns the output tracking off</td>
<td>–</td>
</tr>
</tbody>
</table>

Can be used in Cascade primary-loop control or Loop control for backup.

**PV Switch (SW)**

Two PV inputs can be switched using contact input. (Status switch)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Switches to input 2</td>
<td>–</td>
</tr>
<tr>
<td>OFF</td>
<td>Switches to input 1</td>
<td>–</td>
</tr>
</tbody>
</table>

Can be used in Loop control with PV switching.
### PV Hold (PVHD)

PV can be held using contact input. (Status switch)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Switches to MAN, holds PV</td>
<td>AUTO/MAN switch by keystroke or via communication is disabled. Holds the PV status.</td>
</tr>
<tr>
<td>OFF</td>
<td>Switches to AUTO</td>
<td>AUTO/MAN switch by keystroke or via communication is enabled.</td>
</tr>
</tbody>
</table>

Can be used in Loop control with PV-hold function.

### Latch Release (LAT)

Latch can be released using contact input. (Switch by the rising edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Releases the latch</td>
<td>The latch release by keystroke or via communication is disabled.</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Maintains the current operation status</td>
<td>The latch release by keystroke or via communication is enabled.</td>
</tr>
</tbody>
</table>

Releasing the latch function releases all latched contact (alarm) outputs.

### LCD Backlight ON/OFF Switch (LCD)

LCD backlight ON/OFF can be switched using contact input. (Switch by the rising edge and the falling edge)

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Turns off the LCD backlight</td>
<td>-</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Turns on the LCD backlight</td>
<td>-</td>
</tr>
</tbody>
</table>

### CAS to AUTO Switch (CTOA)

The mode is switched from CAS to AUTO when the primary-side controller fails. (Status switch) CAS to AUTO Switch can be set when the control mode (CTLM) is Cascade secondary-loop control.

<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Does not work.</td>
<td>-</td>
</tr>
<tr>
<td>OFF</td>
<td>Switches to AUTO when the operation mode is CAS (cascade).</td>
<td>AUTO/MAN switch by keystroke or via communication is enabled.</td>
</tr>
</tbody>
</table>

### Message Display Interruption 1 to 4 (MG 1 to 4)

The message set using LL50A Parameter Setting Software can be interrupt-displayed on PV display using contact input. The messages are limited to 20 alphanumeric characters. A maximum of four displays can be registered. (Switch by the rising edge)


<table>
<thead>
<tr>
<th>Contact status</th>
<th>Operation</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF→ON</td>
<td>Interrupt-displays the message</td>
<td>Pressing the DISPLAY key erases the message.</td>
</tr>
<tr>
<td>ON→OFF</td>
<td>Displays the current PV</td>
<td>-</td>
</tr>
</tbody>
</table>
12.1 Setting Contact Input Function

Bit-0 to Bit-3 of SP Number (SP.B0 to SP.B03)

The SP number can be switched using contact input. There are two methods to specify SP number.

- Status switch 1 (Operation by keystroke or via communication is enabled depending on the conditions.)

<table>
<thead>
<tr>
<th>SP number</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SP.B3</td>
</tr>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>6</td>
<td>OFF</td>
</tr>
<tr>
<td>7</td>
<td>OFF</td>
</tr>
<tr>
<td>8</td>
<td>ON</td>
</tr>
</tbody>
</table>

*1: “1” when the contact input is turned on and “0” when turned off.
*2: SP number can be switched by keystroke or via communication when all contact inputs of SP.B0 to SP.B3 are turned off.
*3: SP number cannot be switched by keystroke or via communication when any contact input of SP.B0 to SP.B3 is turned on.
*4: The contact input is turned off when the bit of SP number is not assigned to the contact input.
*5: The immediately preceding SP number is held when all contact inputs are turned off.

- Status switch 2 (Operation by keystroke or via communication is disabled.)

<table>
<thead>
<tr>
<th>SP number</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SP.B2</td>
</tr>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>8</td>
<td>ON</td>
</tr>
</tbody>
</table>

*1: “1” when the contact input is turned on and “0” when turned off.
*2: SP number cannot be switched by keystroke or via communication when the contact input is assigned to any of SP.B0 to SP.B3.
*3: Contact input is turned off when the bit of SP number is not assigned to the contact input.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| SP.BC            | Bit changing method of SP number | PRO           | 0: Status switch 1
|                  |                             |               | 1: Status switch 2             | DI.NU Set   |
12.1 Setting Contact Input Function

Bit-0 to Bit-3 of PID Number (PN.B0 to PN.B03)

The PID number can be switched using contact input. There are two methods to specify a PID number.

- Status switch 1 (Operation by keystroke or via communication is enabled depending on the conditions.)

<table>
<thead>
<tr>
<th>PID number</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN.B3</td>
<td>PN.B2</td>
</tr>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>OFF</td>
</tr>
<tr>
<td>6</td>
<td>OFF</td>
</tr>
<tr>
<td>7</td>
<td>OFF</td>
</tr>
<tr>
<td>8</td>
<td>ON</td>
</tr>
</tbody>
</table>

*1: “1” when the contact input is turned on and “0” when turned off.
*2: PID number cannot be switched by keystroke or via communication when any contact input of PN.B0 to PN.B3 is turned on.
*3: Contact input is turned off when the bit of PID number is not assigned to the contact input.

- Status switch 2 (Operation by keystroke or via communication is disabled.)

<table>
<thead>
<tr>
<th>PID number</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN.B2</td>
<td>PN.B1</td>
</tr>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>ON</td>
</tr>
<tr>
<td>6</td>
<td>ON</td>
</tr>
<tr>
<td>7</td>
<td>ON</td>
</tr>
<tr>
<td>8</td>
<td>ON</td>
</tr>
</tbody>
</table>

*1: “1” when the contact input is turned on and “0” when turned off.
*2: PID number cannot be switched by keystroke or via communication when any contact input of PN.B0 to PN.B3 is turned on.
*3: Contact input is turned off when the bit of PID number is not assigned to the contact input.

In Cascade control, PID number selection is only for Loop 1.

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PN.BC</td>
<td>Bit changing method of PID number</td>
<td>PRO</td>
<td>0: Status switch 1 1: Status switch 2</td>
<td>DI.NU Set</td>
</tr>
</tbody>
</table>
12.1 Setting Contact Input Function

Bit-0 to Bit-2 of Manual Preset Output Number (MP.B0 to MP.B02)

The manual preset output number can be switched using contact input. There are two methods to specify a manual preset output number.

• Status switch 1 (Operation by keystroke or via communication is enabled depending on the conditions.)

<table>
<thead>
<tr>
<th>Manual preset output number</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MP.B2</td>
</tr>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>ON</td>
</tr>
<tr>
<td>5</td>
<td>ON</td>
</tr>
</tbody>
</table>

*1: "1" when contact input is turned on and "0" when turned off.
*2: Manual preset output number cannot be switched by keystroke or via communication when contact input is assigned to any of MP.B0 to MP.B2.
*3: Manual preset output number can be switched by keystroke or via communication when contact input is not assigned to all of MP.B0 to MP.B2.
*4: The contact input is turned off when the bit of manual preset output number is not assigned to the contact input.

• Status Switch 2 (Operation by keystroke or via communication is disabled.)

<table>
<thead>
<tr>
<th>Manual preset output number</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MP.B2</td>
</tr>
<tr>
<td>1</td>
<td>OFF</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
</tr>
<tr>
<td>3</td>
<td>OFF</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
</tr>
<tr>
<td>5</td>
<td>ON</td>
</tr>
</tbody>
</table>

*1: "1" when contact input is turned on and "0" when turned off.
*2: Manual preset output number cannot be switched by keystroke or via communication when contact input is assigned to any of MP.B0 to MP.B2.
*3: Manual preset output number can be switched by keystroke or via communication when contact input is not assigned to all of MP.B0 to MP.B2.
*4: The contact input is turned off when the bit of manual preset output number is not assigned to the contact input.

In Cascade control, the manual preset output number selection is only for Loop 2.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP.BC</td>
<td>Bit changing method of manual preset output number</td>
<td>PRO</td>
<td>0: Status switch 1 1: Status switch 2</td>
<td>Di.NU Set</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
### 12.1 Setting Contact Input Function

<table>
<thead>
<tr>
<th>Type</th>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
<td></td>
<td>Receiving a contact input signal changes the status to the specified operation, and a release changes the status back to the original action.</td>
</tr>
<tr>
<td>Rising edge</td>
<td></td>
<td>Receiving an OFF-to-ON contact input signal changes the status to the specified operation. The minimum detection time is the control period + 50 ms. Pulse width is 50 ms or more.</td>
</tr>
<tr>
<td>Falling edge</td>
<td></td>
<td>Receiving an ON-to-OFF contact input signal changes the status to the specified operation. The minimum detection time is the control period + 50 ms. Pulse width is 50 ms or more.</td>
</tr>
</tbody>
</table>
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/M</td>
<td>AUTO/MAN switch</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R/L</td>
<td>REMOTE/LOCAL switch</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S/R</td>
<td>STOP/RUN switch</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS</td>
<td>Switch to CAS</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AUTO</td>
<td>Switch to AUTO</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAN</td>
<td>Switch to MAN</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REM</td>
<td>Switch to REMOTE</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCL</td>
<td>Switch to LOCAL</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT</td>
<td>Auto-tuning START/STOP switch</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRK</td>
<td>Output tracking switch</td>
<td>PRO</td>
<td></td>
<td>DI.SL</td>
</tr>
<tr>
<td>SW</td>
<td>PV switch</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVHD</td>
<td>PV hold</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTOA</td>
<td>CAS to AUTO switch</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAT</td>
<td>Latch release</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LCD</td>
<td>LCD backlight ON/OFF switch</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG1</td>
<td>Message display interruption 1</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG2</td>
<td>Message display interruption 2</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG3</td>
<td>Message display interruption 3</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MG4</td>
<td>Message display interruption 4</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP.B0</td>
<td>Bit-0 of SP number</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP.B1</td>
<td>Bit-1 of SP number</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP.B2</td>
<td>Bit-2 of SP number</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP.B3</td>
<td>Bit-3 of SP number</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PN.B0</td>
<td>Bit-0 of PID number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PN.B1</td>
<td>Bit-1 of PID number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PN.B2</td>
<td>Bit-2 of PID number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PN.B3</td>
<td>Bit-3 of PID number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP.B0</td>
<td>Bit-0 of manual preset output number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP.B1</td>
<td>Bit-1 of manual preset output number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MP.B2</td>
<td>Bit-2 of manual preset output number</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See the following section, "UT55A DI and Setpoint" or "UT52A DI and Setpoint".
### 12.1 Setting Contact Input Function

#### UT55A DI and Setpoint (I relay number)
DI equipped as standard

<table>
<thead>
<tr>
<th>DI symbol</th>
<th>Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1</td>
<td>5025</td>
</tr>
<tr>
<td>DI2</td>
<td>5026</td>
</tr>
<tr>
<td>DI3</td>
<td>5027</td>
</tr>
</tbody>
</table>

Additional DI

<table>
<thead>
<tr>
<th>DI symbol</th>
<th>Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI11</td>
<td>5041</td>
</tr>
<tr>
<td>DI12</td>
<td>5042</td>
</tr>
<tr>
<td>DI13</td>
<td>5043</td>
</tr>
<tr>
<td>DI14</td>
<td>5044</td>
</tr>
<tr>
<td>DI15</td>
<td>5045</td>
</tr>
<tr>
<td>DI16</td>
<td>5046</td>
</tr>
</tbody>
</table>

DI16 can be used when the suffix code: Type 2 = 1, 2, 4, 5, or 7, and without the optional suffix code /DR.

#### UT52A DI and Setpoint (I relay number)
DI equipped as standard

<table>
<thead>
<tr>
<th>DI symbol</th>
<th>Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1</td>
<td>5025</td>
</tr>
<tr>
<td>DI2</td>
<td>5026</td>
</tr>
<tr>
<td>DI3</td>
<td>5027</td>
</tr>
</tbody>
</table>

Additional DI

<table>
<thead>
<tr>
<th>DI symbol</th>
<th>Setpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI11</td>
<td>5041</td>
</tr>
<tr>
<td>DI12</td>
<td>5042</td>
</tr>
<tr>
<td>DI16</td>
<td>5046</td>
</tr>
</tbody>
</table>

DI16 can be used when the suffix code: Type 2 = 1, 2, or 3, and without the optional suffix code /DR.
### 12.1 Setting Contact Input Function

#### 12.1.2 Changing Contact Type of Contact Input

**Description**

The contact type can set the action direction of contact input assigned to the function.

**Setting Details**

**Contact Input Equipped as Standard**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1.D</td>
<td>DI1 contact type</td>
<td>PRO</td>
<td>CLS: The assigned function is enabled when the contact input is closed.</td>
<td></td>
</tr>
<tr>
<td>DI2.D</td>
<td>DI2 contact type</td>
<td>PRO</td>
<td>OPN: The assigned function is enabled when the contact input is opened.</td>
<td></td>
</tr>
<tr>
<td>DI3.D</td>
<td>DI3 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional Contact Input**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1.D</td>
<td>DIn1 contact type</td>
<td>PRO</td>
<td>CLS: The assigned function is enabled when the contact input is closed.</td>
<td></td>
</tr>
<tr>
<td>DI2.D</td>
<td>DIn2 contact type</td>
<td>PRO</td>
<td>OPN: The assigned function is enabled when the contact input is opened.</td>
<td></td>
</tr>
<tr>
<td>DI3.D</td>
<td>DIn3 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI4.D</td>
<td>DIn4 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI5.D</td>
<td>DIn5 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI6.D</td>
<td>DIn6 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: Nothing is displayed on Group display when each parameter is displayed.

**Terminal area**

Refer to the table below for presence/absence of UT55A contact input.

<table>
<thead>
<tr>
<th>Terminal area</th>
<th>Suffix code: Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1-terminal area</td>
<td>0 1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>E2-terminal area</td>
<td>– D16 D16 D11 to D15 D16 D16 – D16</td>
</tr>
<tr>
<td>E3-terminal area</td>
<td>– D31 to D35 – – – – D31 to D35 –</td>
</tr>
<tr>
<td>E4-terminal area</td>
<td>– – – – – D41 to D45 D41 to D45 D46</td>
</tr>
</tbody>
</table>

DI16 of E1-terminal area can be used when the suffix code: Type 2 = 1, 2, 4, 5, or 7, and without the optional suffix code /DR.

Refer to the table below for presence/absence of UT52A contact input.

<table>
<thead>
<tr>
<th>Terminal area</th>
<th>Suffix code: Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1-terminal area</td>
<td>0 1 2 3</td>
</tr>
<tr>
<td>E2-terminal area</td>
<td>– D16 D16 D11 to D12</td>
</tr>
</tbody>
</table>

DI16 of E1-terminal area can be used when the suffix code: Type 2 = 1, 2, or 3, and without the optional suffix code /DR.

► Terminal arrangement: 17.4 Wiring
12.2 Setting Contact Output Function

12.2.1 Setting Function of Contact Output

**Description**

The contact output function works by setting a status such as an alarm to the contact output.
This explanation assumes that the contact type is energized (CLS). (The contact is turned on when an event occurs.)

**Setting Details**

### Contact Output Equipped as Standard

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1.S</td>
<td>AL1 function selection</td>
<td>STD</td>
<td></td>
<td>ALM Set</td>
</tr>
<tr>
<td>AL2.S</td>
<td>AL2 function selection</td>
<td>STD</td>
<td>See the following section.</td>
<td></td>
</tr>
<tr>
<td>AL3.S</td>
<td>AL3 function selection</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: Nothing is displayed on Group display when each parameter is displayed.

### Additional Contact Output

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO1.S</td>
<td>DOn1 function selection</td>
<td>STD</td>
<td></td>
<td>DO Set</td>
</tr>
<tr>
<td>DO2.S</td>
<td>DOn2 function selection</td>
<td>STD</td>
<td>See the following section.</td>
<td></td>
</tr>
<tr>
<td>DO3.S</td>
<td>DOn3 function selection</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO4.S</td>
<td>DOn4 function selection</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO5.S</td>
<td>DOn5 function selection</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code. “n” denotes the position of the terminal area. (n = 1 to 4)

### Contact Output for Control

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR.S</td>
<td>OUT relay function selection</td>
<td>STD</td>
<td>See the following section.</td>
<td>ALM Set</td>
</tr>
<tr>
<td>OR2.S</td>
<td>OUT2 relay function selection</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: Nothing is displayed on Group display when each parameter is displayed.
Note2: OR.S and OR2.S can be used as status output when they are not used as control output. OR2.S can be used for Heating/cooling type.
12.2 Setting Contact Output Function

Alarm Status
The alarm status can be output to the contact output. (The setpoints below are I relay numbers.)


<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Alarm status</th>
<th>Alarm output status</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>4321</td>
<td>4353</td>
<td>Alarm 1</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4322</td>
<td>4354</td>
<td>Alarm 2</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4323</td>
<td>4355</td>
<td>Alarm 3</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4325</td>
<td>4357</td>
<td>Alarm 4</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4326</td>
<td>4358</td>
<td>Alarm 5</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4327</td>
<td>4359</td>
<td>Alarm 6</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4329</td>
<td>4361</td>
<td>Alarm 7</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4330</td>
<td>4362</td>
<td>Alarm 8</td>
<td>Alarm status</td>
</tr>
<tr>
<td>4337</td>
<td>4369</td>
<td>Loop-2 alarm 1 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4338</td>
<td>4370</td>
<td>Loop-2 alarm 2 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4339</td>
<td>4371</td>
<td>Loop-2 alarm 3 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4341</td>
<td>4373</td>
<td>Loop-2 alarm 4 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4342</td>
<td>4374</td>
<td>Loop-2 alarm 5 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4343</td>
<td>4375</td>
<td>Loop-2 alarm 6 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4345</td>
<td>4377</td>
<td>Loop-2 alarm 7 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
<tr>
<td>4346</td>
<td>4378</td>
<td>Loop-2 alarm 8 (in Cascade control)</td>
<td>Alarm output status</td>
</tr>
</tbody>
</table>

- Alarm status: The internal alarm status is turned on when an alarm occurs and turned off in normal condition
- Alarm output status: Contact output status when an alarm occurs (ON in alarm condition and OFF in normal condition)

However, the output status depends on the settings of energized/de-energized of alarm, latch action, and contact type.

The above assumes that the contact type is energized (CLS). (Then contact is turned on when an event occurs.) To output the normal alarm to the contact output, assign the alarm output status.

$\Rightarrow$ Alarm action: 11.1 Setting Alarm Type
12.2 Setting Contact Output Function

Alarm Latch Status
The alarm latch status can be output to another contact output irrespective of the setting of alarm-1 to -8 type (AL1 to AL8). (The setpoints below are 1 relay numbers.)

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm output latch 1 status</td>
<td>4385</td>
</tr>
<tr>
<td>Alarm output latch 2 status</td>
<td>4386</td>
</tr>
<tr>
<td>Alarm output latch 3 status</td>
<td>4387</td>
</tr>
<tr>
<td>Alarm output latch 4 status</td>
<td>4389</td>
</tr>
<tr>
<td></td>
<td>4390</td>
</tr>
<tr>
<td></td>
<td>4391</td>
</tr>
<tr>
<td></td>
<td>4393</td>
</tr>
<tr>
<td></td>
<td>4394</td>
</tr>
<tr>
<td></td>
<td>4401</td>
</tr>
<tr>
<td></td>
<td>4402</td>
</tr>
<tr>
<td></td>
<td>4403</td>
</tr>
<tr>
<td></td>
<td>4405</td>
</tr>
<tr>
<td></td>
<td>4406</td>
</tr>
<tr>
<td></td>
<td>4407</td>
</tr>
<tr>
<td></td>
<td>4409</td>
</tr>
<tr>
<td></td>
<td>4410</td>
</tr>
</tbody>
</table>

- Alarm output latch 1, 2, 3, and 4 status: ON in the latch status of the contact output when an alarm occurs and OFF in the latch release status of the contact output in normal condition

However, the output status depends on the settings of contact type.

► Alarm latch action: 11.1 Setting Alarm Type
### Key and Display Status

The key and display status can be output to the contact output. (The setpoints below are relay numbers.)

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4705</td>
<td>PARAMETER key</td>
<td></td>
</tr>
<tr>
<td>4706</td>
<td>DISPLAY key</td>
<td></td>
</tr>
<tr>
<td>4707</td>
<td>Right arrow key</td>
<td></td>
</tr>
<tr>
<td>4708</td>
<td>Down arrow key</td>
<td></td>
</tr>
<tr>
<td>4709</td>
<td>SET/ENTER key</td>
<td>Key is pressed, Key is not pressed</td>
</tr>
<tr>
<td>4710</td>
<td>Up arrow key</td>
<td></td>
</tr>
<tr>
<td>4711</td>
<td>Left key</td>
<td></td>
</tr>
<tr>
<td>4712</td>
<td>F2 key</td>
<td></td>
</tr>
<tr>
<td>4713</td>
<td>F1 key</td>
<td></td>
</tr>
<tr>
<td>4714</td>
<td>A/M key</td>
<td></td>
</tr>
<tr>
<td>4715</td>
<td>Fn key</td>
<td></td>
</tr>
</tbody>
</table>

### Operation Mode and Status

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4193</td>
<td>AUTO/MAN</td>
<td>MAN, AUTO</td>
</tr>
<tr>
<td>4194</td>
<td>Remote/Local</td>
<td>Remote, Local</td>
</tr>
<tr>
<td>4226</td>
<td>Remote/Local (Loop 2)</td>
<td>Remote, Local</td>
</tr>
<tr>
<td>4195</td>
<td>STOP/RUN</td>
<td>STOP, RUN</td>
</tr>
<tr>
<td>4197</td>
<td>Cascade (in Cascade control)</td>
<td>Cascade (OFF→ON), AUTO or MAN</td>
</tr>
<tr>
<td>4198</td>
<td>AUTO (in Cascade control)</td>
<td>AUTO (OFF→ON), Cascade or MAN</td>
</tr>
<tr>
<td>4199</td>
<td>MAN (in Cascade control)</td>
<td>MAN (OFF→ON), Cascade or AUTO</td>
</tr>
<tr>
<td>4201</td>
<td>Output tracking status</td>
<td>Tracking ON, Tracking OFF</td>
</tr>
<tr>
<td>4207</td>
<td>During auto-tuning</td>
<td>During AT, –</td>
</tr>
<tr>
<td>4239</td>
<td>During auto-tuning (Loop 2)</td>
<td>During AT, –</td>
</tr>
<tr>
<td>4209</td>
<td>During automatic valve adjustment</td>
<td>During adjustment, –</td>
</tr>
<tr>
<td>4210</td>
<td>During operation by the valve position estimating type</td>
<td>During operation by estimating type, During operation by feedback input</td>
</tr>
<tr>
<td>4213</td>
<td>Valve is open</td>
<td>Open, –</td>
</tr>
<tr>
<td>4214</td>
<td>Valve is closed</td>
<td>Closed, –</td>
</tr>
<tr>
<td>4256</td>
<td>FAIL output</td>
<td>Normal status, FAIL status</td>
</tr>
</tbody>
</table>

### System Error Status

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4529</td>
<td>Heater break alarm 1 status</td>
<td>Alarm occurs, Normal</td>
</tr>
<tr>
<td>4530</td>
<td>Heater break alarm 2 status</td>
<td>Alarm occurs, Normal</td>
</tr>
<tr>
<td>4769</td>
<td>Message display interruption 1 status</td>
<td>With interruption, Without interruption</td>
</tr>
<tr>
<td>4770</td>
<td>Message display interruption 2 status</td>
<td>With interruption, Without interruption</td>
</tr>
<tr>
<td>4771</td>
<td>Message display interruption 3 status</td>
<td>With interruption, Without interruption</td>
</tr>
<tr>
<td>4773</td>
<td>Message display interruption 4 status</td>
<td>With interruption, Without interruption</td>
</tr>
<tr>
<td>5457</td>
<td>Power ON → Initialization status</td>
<td>During operation, Initializing the system</td>
</tr>
</tbody>
</table>
## Error Status

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4065</td>
<td>PV input ADC error</td>
<td></td>
</tr>
<tr>
<td>4066</td>
<td>RSP input (E1-terminal area) ADC error</td>
<td></td>
</tr>
<tr>
<td>4067</td>
<td>AIN2 input (E2-terminal area) ADC error</td>
<td></td>
</tr>
<tr>
<td>4069</td>
<td>AIN4 input (E4-terminal area) ADC error</td>
<td></td>
</tr>
<tr>
<td>4073</td>
<td>PV input burnout error</td>
<td></td>
</tr>
<tr>
<td>4074</td>
<td>RSP input (E1-terminal area) burnout error</td>
<td></td>
</tr>
<tr>
<td>4075</td>
<td>AIN2 input (E2-terminal area) burnout error</td>
<td></td>
</tr>
<tr>
<td>4077</td>
<td>AIN4 input (E4-terminal area) burnout error</td>
<td></td>
</tr>
<tr>
<td>4070</td>
<td>PV input RJC error</td>
<td></td>
</tr>
<tr>
<td>4071</td>
<td>RSP input RJC error</td>
<td></td>
</tr>
<tr>
<td>4081</td>
<td>Feedback resistance/current burnout</td>
<td></td>
</tr>
<tr>
<td>4082</td>
<td>Automatic valve position adjustment error</td>
<td></td>
</tr>
<tr>
<td>4097</td>
<td>PV input burnout error (Loop 1)</td>
<td></td>
</tr>
<tr>
<td>4098</td>
<td>RSP input burnout error (Loop 1)</td>
<td></td>
</tr>
<tr>
<td>4101</td>
<td>PV input over-scale (Loop 1)</td>
<td></td>
</tr>
<tr>
<td>4102</td>
<td>PV input under-scale (Loop 1)</td>
<td></td>
</tr>
<tr>
<td>4111</td>
<td>Auto-tuning time out (Loop 1)</td>
<td></td>
</tr>
<tr>
<td>4113</td>
<td>PV input burnout (Loop 2)</td>
<td></td>
</tr>
<tr>
<td>4114</td>
<td>RSP input burnout (Loop 2)</td>
<td></td>
</tr>
<tr>
<td>4117</td>
<td>PV input over-scale (Loop 2)</td>
<td></td>
</tr>
<tr>
<td>4118</td>
<td>PV input under-scale (Loop 2)</td>
<td></td>
</tr>
<tr>
<td>4127</td>
<td>Auto-tuning time out (Loop 2)</td>
<td></td>
</tr>
</tbody>
</table>
### System Error Status

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
<th>Contact status</th>
</tr>
</thead>
<tbody>
<tr>
<td>4001</td>
<td>System data error</td>
<td></td>
</tr>
<tr>
<td>4002</td>
<td>Calibration value error</td>
<td></td>
</tr>
<tr>
<td>4003</td>
<td>User (parameter) default value error</td>
<td></td>
</tr>
<tr>
<td>4005</td>
<td>Setup parameter error</td>
<td></td>
</tr>
<tr>
<td>4006</td>
<td>Operation parameter error</td>
<td></td>
</tr>
<tr>
<td>4017</td>
<td>Corrupted ladder program</td>
<td></td>
</tr>
<tr>
<td>4018</td>
<td>Ladder calculation overflow</td>
<td></td>
</tr>
<tr>
<td>4019</td>
<td>Ladder program error</td>
<td></td>
</tr>
<tr>
<td>4021</td>
<td>Load factor over 100%</td>
<td></td>
</tr>
<tr>
<td>4022</td>
<td>Load factor over 200%</td>
<td></td>
</tr>
<tr>
<td>4009</td>
<td>Faulty FRAM</td>
<td></td>
</tr>
</tbody>
</table>

Error occurs | Normal
12.2.2 Changing Contact Type of Contact Output

**Description**

The contact type can set the action direction of contact output assigned to the function.

**Setting Details**

**Contact Output Equipped as Standard**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range Description</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1.D</td>
<td>AL1 contact type</td>
<td>PRO</td>
<td>CLS: When the event of assigned function occurs, the contact output is closed.</td>
<td>ALM Set</td>
</tr>
<tr>
<td>AL2.D</td>
<td>AL2 contact type</td>
<td>PRO</td>
<td>OPN: When the event of assigned function occurs, the contact output is opened.</td>
<td></td>
</tr>
<tr>
<td>AL3.D</td>
<td>AL3 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: Nothing is displayed on Group display when each parameter is displayed.

**Additional Contact Output**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range Description</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>D01.D</td>
<td>DOn1 contact type</td>
<td>PRO</td>
<td>CLS: When the event of assigned function occurs, the contact output is closed.</td>
<td>DO Set</td>
</tr>
<tr>
<td>D02.D</td>
<td>DOn2 contact type</td>
<td>PRO</td>
<td>OPN: When the event of assigned function occurs, the contact output is opened.</td>
<td></td>
</tr>
<tr>
<td>D03.D</td>
<td>DOn3 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D04.D</td>
<td>DOn4 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D05.D</td>
<td>DOn5 contact type</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code. “n” denotes the position of the terminal area. (n = 1 to 4)

Refer to the table below for presence/absence of UT55A contact output.

<table>
<thead>
<tr>
<th>Terminal area</th>
<th>Suffix code: Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0  1  2  3  4  5  6  7</td>
</tr>
<tr>
<td>E1-terminal area</td>
<td>– – – – – DO11 to DO15 –</td>
</tr>
<tr>
<td>E2-terminal area</td>
<td>– DO21 to DO25 – DO21 to DO25 – DO21 to DO25 DO21 to DO25 –</td>
</tr>
<tr>
<td>E3-terminal area</td>
<td>– – – – – DO31 to DO35 –</td>
</tr>
<tr>
<td>E4-terminal area</td>
<td>– – – – – – – –</td>
</tr>
</tbody>
</table>

Refer to the table below for presence/absence of UT52A contact output.

<table>
<thead>
<tr>
<th>Terminal area</th>
<th>Suffix code: Type 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0  1  2  3</td>
</tr>
<tr>
<td>E1-terminal area</td>
<td>– – – DO11 to DO12</td>
</tr>
</tbody>
</table>
12.2 Setting Contact Output Function

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR.D</td>
<td>OUT relay contact type</td>
<td>PRO</td>
<td>CLS: When the event of assigned function occurs, the contact output is closed.</td>
<td></td>
</tr>
<tr>
<td>OR2.D</td>
<td>OUT2 relay contact type</td>
<td>PRO</td>
<td>OPN: When the event of assigned function occurs, the contact output is opened.</td>
<td>ALM Set</td>
</tr>
</tbody>
</table>

Note1: Nothing is displayed on Group display when each parameter is displayed.
Note2: OR.D and OR2.D can be used as status output when they are not used as control output. OR2.D can be used for Heating/cooling type.

► Terminal arrangement: 17.4 Wiring
► Contact type of Heater break alarm output: 11.7 Setting Heater Break Alarm
13.1 Setting Display Functions

13.1.1 Setting Active Color PV Display Function

The active color PV display function changes the PV display color when an event occurs.

**Description**

**Link to Alarm**

The PV display color changes by linking to the alarm 1 or alarm 2.

The following is an example of operation linking to alarm 1.

Set the alarm-1 type to “PV high limit alarm” and alarm-1 setpoint to “80°C.”
When the active color PV display switch is set to “2,” PV display color changes from white to red if PV exceeds the alarm-1 setpoint.
The red-to-white switching action can be set.

**Change by Deviation**

The PV display color changes by deviation (PV – SP).

Set the PV color change high limit to “10°C” and the PV color change low limit to “5°C” as deviation band for the current target setpoint “50°C.” PV display color changes from white to red if PV is out of the deviation.
The red-to-white switching action can be set. There is no hysteresis.
13.1 Setting Display Functions

**Link to PV**

The PV display color changes by linking to PV.

Set the PV color change high limit to “70°C” and the PV color change low limit to “20°C.” PV display color changes from white to red if PV is out of the range. The red-to-white switching action can be set. There is no hysteresis.

![Temperature Graph](image)

**Parameter “PCH” (PV color change high limit) = 70°C**
**Parameter “PCL” (PV color change low limit) = 20°C**

**Use in Fixed Color**

PV display color can be fixed in red. It can also be fixed in white.

![Fixed Color Display](image)

PV color: red
SP color: orange (SP color cannot be changed.)
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| PCMD             | Active color PV display switch | EASY          | 0: Fixed in white  
1: Fixed in red  
2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red)  
3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white)  
4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red)  
5: Link to alarm 1 or 2 (Alarm OFF: red, Alarm ON: white)  
6: PV limit (Within range: white, Out of range: red)  
7: PV limit (Within range: red, Out of range: white)  
8: SP deviation (Within deviation: white, Out of deviation: red)  
9: SP deviation (Within deviation: red, Out of deviation: white) |
|                  |      |               | DISP          |

| PCH              | PV color change high limit | EASY          | Set a display value when in PV limit or SP deviation. |
| PCL              | PV color change low limit  | EASY          | -19999 to 30000 (Set a value within the input range.)  
Decimal point position depends on the input type. |

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
13.1 Setting Display Functions

13.1.2 Masking Arbitrary Display Value in Operation Display

**Description**
Display/non-display of the PV display, Setpoint display, and Status display in the Operation Display can be set. Items that you do not want to display can be set to non-display. For example, when the Setpoint display is set to non-display, SP of the SP Display and OUT of the OUT Display are not displayed.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV.D</td>
<td>PV display area ON/OFF</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP.D</td>
<td>Setpoint display area ON/OFF</td>
<td>PRO</td>
<td>OFF: Nondisplay</td>
<td>DISP Set</td>
</tr>
<tr>
<td>STS.D</td>
<td>Status display area ON/OFF</td>
<td>PRO</td>
<td>ON: Display</td>
<td></td>
</tr>
</tbody>
</table>
13.1.3 Registering SELECT Display (Up to 5 Displays)

**Description**

Registering frequently changed-operation parameters (except for the operation mode) in the SELECT Display of the Operation Displays will allow you to change parameter settings easily. A maximum of five Displays can be registered.

Set the D register number of the parameter you wish to register for the registration to the SELECT Display.

However, the parameters in the following menu cannot be set:

- MODE, CTL, PV, RSP, AIN2, AIN4, MPV, OUT, HBA, R485, ETHR, PROF, KEY, DISP, CSEL, KLOC, MLOC, DI, SL, DI, NU, DI, D, ALM, DO, I/O, SYS, INIT, VER, and LVL.

When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 to CS5</td>
<td>SELECT Display-1 to -5 registration</td>
<td>STD</td>
<td>OFF: No registration, D register number (2501 to 5000)</td>
<td>CSEL Set</td>
</tr>
</tbody>
</table>

For D register numbers, see sections 6.4.3 to 6.4.6 in the UT Advanced Series Communication Interface User’s Manual.

<table>
<thead>
<tr>
<th>Resistor Number</th>
<th>Category</th>
<th>Description</th>
<th>Reference in Communication Interface User’s Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>D2501 to D2700</td>
<td>Loop-1 Operation Parameters</td>
<td>SP and alarm setpoint setting</td>
<td>Section 6.4.3</td>
</tr>
<tr>
<td>D2701 to D2800</td>
<td></td>
<td>SP-related settings</td>
<td></td>
</tr>
<tr>
<td>D2801 to D2900</td>
<td></td>
<td>Alarm function settings</td>
<td></td>
</tr>
<tr>
<td>D2901 to D3000</td>
<td></td>
<td>PV-related settings</td>
<td></td>
</tr>
<tr>
<td>D3001 to D3500</td>
<td></td>
<td>PID settings</td>
<td></td>
</tr>
<tr>
<td>D3501 to D3600</td>
<td></td>
<td>Control action-related settings</td>
<td></td>
</tr>
<tr>
<td>D3601 to D3800</td>
<td>Loop-2 Operation Parameters</td>
<td>SP and alarm setpoint setting</td>
<td>Section 6.4.4</td>
</tr>
<tr>
<td>D3801 to D3900</td>
<td></td>
<td>SP-related settings</td>
<td></td>
</tr>
<tr>
<td>D3901 to D4000</td>
<td></td>
<td>Alarm function settings</td>
<td></td>
</tr>
<tr>
<td>D4001 to D4100</td>
<td></td>
<td>PV-related settings</td>
<td></td>
</tr>
<tr>
<td>D4101 to D4600</td>
<td></td>
<td>PID settings</td>
<td></td>
</tr>
<tr>
<td>D4601 to D4700</td>
<td></td>
<td>Control action-related settings</td>
<td></td>
</tr>
<tr>
<td>D4701 to D4800</td>
<td>P Parameters</td>
<td>P parameters</td>
<td>Section 6.4.5</td>
</tr>
<tr>
<td>D4801 to D5000</td>
<td>10-segment Linealizer Setting Parameters</td>
<td>10-segment linealizer settings</td>
<td>Section 6.4.6</td>
</tr>
</tbody>
</table>
13.1 Setting Display Functions

13.1.4 Changing Event Display

**Description**

The UT55A has eight event (EV) lamps. The UT52A has four event (EV) lamps. The default values are assigned to EV1 to EV8 lamps on the front of the controller according to each control mode. The alarms 1 to 8 are assigned to EV1 to EV8 in the control modes other than Cascade control. The alarms 1 to 8 are assigned to EV1 to EV 8 of Loop1, and the Loop-2 alarms 1 to 8 are assigned to EV1 to EV8 of Loop 2 (the LP2 lamp is lit) in Cascade control. Loop-2 EV lamps are lit when the control mode is cascade and the operation mode is automatic or manual.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV1 to EV8</td>
<td>EV1 to EV8 display</td>
<td>PRO</td>
<td>Setting range: 4001 to 6304</td>
<td></td>
</tr>
<tr>
<td></td>
<td>condition registration</td>
<td></td>
<td>OFF: Disable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4321: Link to alarm 1 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4322: Link to alarm 2 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4323: Link to alarm 3 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4325: Link to alarm 4 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4326: Link to alarm 5 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4327: Link to alarm 6 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4329: Link to alarm 7 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4330: Link to alarm 8 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4337: Link to Loop-2 alarm 1 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4338: Link to Loop-2 alarm 2 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4339: Link to Loop-2 alarm 3 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4341: Link to Loop-2 alarm 4 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4342: Link to Loop-2 alarm 5 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4343: Link to Loop-2 alarm 6 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4345: Link to Loop-2 alarm 7 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4346: Link to Loop-2 alarm 8 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4529: Heater break alarm 1 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4530: Heater break alarm 2 (Lit when the alarm occurs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5025 to 5027: Link to DI1-DI3 (Lit when the contact is closed)</td>
<td>DISP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5041 to 5046: Link to DI11-DI16 (E1-terminal area) (Lit when the contact is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5062: Link to DI26 (E2-terminal area) (Lit when the contact is closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5073 to 5077: Link to DI31-DI35 (E3-terminal area) (Lit when the contact is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5089 to 5094: Link to DI41-DI46 (E4-terminal area) (Lit when the contact is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5153 to 5155: Link to AL1-AL3 (Lit when the contact is closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5169 to 5173: Link to DO11-DO15 (E1-terminal area) (Lit when the contact is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5185 to 5189: Link to DO21-DO25 (E2-terminal area) (Lit when the contact is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>closed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5201 to 5205: Link to DO31-DO35 (E3-terminal area) (Lit when the contact is</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>closed)</td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
### Relay Number | Description | Reference in Communication Interface User's Manual |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4001 to 4064</td>
<td>System error</td>
<td>Section 7.3.1</td>
</tr>
<tr>
<td>4065 to 4128</td>
<td>Input error</td>
<td></td>
</tr>
<tr>
<td>4129 to 4192</td>
<td>Free area</td>
<td></td>
</tr>
<tr>
<td>4193 to 4256</td>
<td>Operation mode</td>
<td></td>
</tr>
<tr>
<td>4257 to 4320</td>
<td>Free area</td>
<td></td>
</tr>
<tr>
<td>4321 to 4384</td>
<td>Alarm</td>
<td></td>
</tr>
<tr>
<td>4385 to 4528</td>
<td>Alarm latch</td>
<td></td>
</tr>
<tr>
<td>4529 to 4576</td>
<td>Heater break alarm</td>
<td></td>
</tr>
<tr>
<td>4577 to 4640</td>
<td>SP number and PID number</td>
<td></td>
</tr>
<tr>
<td>4641 to 4704</td>
<td>Free area</td>
<td></td>
</tr>
<tr>
<td>4705 to 4768</td>
<td>Key</td>
<td></td>
</tr>
<tr>
<td>4769 to 4832</td>
<td>Display</td>
<td></td>
</tr>
<tr>
<td>4833 to 4896</td>
<td>Event lamp/Bar-graph display</td>
<td></td>
</tr>
<tr>
<td>4897 to 5024</td>
<td>Free area</td>
<td></td>
</tr>
<tr>
<td>5025 to 5152</td>
<td>Input relay</td>
<td></td>
</tr>
<tr>
<td>5153 to 5280</td>
<td>Output relay</td>
<td></td>
</tr>
<tr>
<td>5281 to 5408</td>
<td>Control computation output</td>
<td></td>
</tr>
<tr>
<td>5409 to 5472</td>
<td>Special relay</td>
<td></td>
</tr>
<tr>
<td>5473 to 5536</td>
<td>Free area</td>
<td></td>
</tr>
<tr>
<td>5537 to 5792</td>
<td>Internal relay</td>
<td></td>
</tr>
<tr>
<td>5793 to 6048</td>
<td>Free area</td>
<td></td>
</tr>
<tr>
<td>6305 to 6432</td>
<td>DI terminals</td>
<td></td>
</tr>
<tr>
<td>6433 to 6560</td>
<td>DO terminals</td>
<td></td>
</tr>
</tbody>
</table>

13.1 Setting Display Functions
13.1 Setting Display Functions

13.1.5 Registering SELECT Parameter Display (Up to 10 Displays)

Description

Registering frequently changed operation parameters (change frequency is lower than SELECT Display) in the SELECT Parameter Display will allow you to change parameter settings easily. A maximum of ten Displays can be registered.

Set the D register number of the parameter you wish to register for the registration to the SELECT Parameter Display.

However, the parameters in the following menus cannot be set:

MODE, CTL, PV, RSP, AIN2, AIN4, MPV, OUT, HBA, R485, ETHR, PROF, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, DO, I/O, SYS, INIT, VER, and LVL.

When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Ordinary Operation Display

CS Menu is not displayed if SELECT parameter is not registered.

Registered SELECT Parameter Display
13.1 Setting Display Functions

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS10 to CS19</td>
<td>SELECT parameter-10 to -19 registration</td>
<td>PRO</td>
<td>OFF: No registration D register number (2501 to 5000)</td>
<td>CSEL SEL</td>
</tr>
</tbody>
</table>

For D register numbers, see sections 6.4.3 to 6.4.6 of UT Advanced Series Communication Interface User’s Manual.

<table>
<thead>
<tr>
<th>D Resistor Number</th>
<th>Category</th>
<th>Description</th>
<th>Reference in Communication Interface User’s Manual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2501 to 2700</td>
<td>Loop-1 Operation Parameters</td>
<td>SPs and alarm setpoints setting</td>
<td>Section 6.4.3</td>
</tr>
<tr>
<td>2701 to 2800</td>
<td></td>
<td>SP-related settings</td>
<td></td>
</tr>
<tr>
<td>2801 to 2900</td>
<td></td>
<td>Alarm function settings</td>
<td></td>
</tr>
<tr>
<td>2901 to 3000</td>
<td></td>
<td>PV-related settings</td>
<td></td>
</tr>
<tr>
<td>3001 to 3500</td>
<td></td>
<td>PID settings</td>
<td></td>
</tr>
<tr>
<td>3501 to 3600</td>
<td></td>
<td>Control action-related settings</td>
<td></td>
</tr>
<tr>
<td>3601 to 3800</td>
<td></td>
<td>SPs and alarm setpoints setting</td>
<td>Section 6.4.4</td>
</tr>
<tr>
<td>3801 to 3900</td>
<td></td>
<td>SP-related settings</td>
<td></td>
</tr>
<tr>
<td>3901 to 4000</td>
<td>Loop-2 Operation Parameters</td>
<td>Alarm function settings</td>
<td>Section 6.4.5</td>
</tr>
<tr>
<td>4001 to 4100</td>
<td></td>
<td>PV-related settings</td>
<td></td>
</tr>
<tr>
<td>4101 to 4600</td>
<td></td>
<td>PID settings</td>
<td></td>
</tr>
<tr>
<td>4601 to 4700</td>
<td></td>
<td>Control action-related settings</td>
<td></td>
</tr>
<tr>
<td>4701 to 4800</td>
<td>P Parameters</td>
<td>P parameters</td>
<td>Section 6.4.5</td>
</tr>
<tr>
<td>4801 to 5000</td>
<td>10-segment Linearizer Setting Parameters</td>
<td>10-segment linearizer settings</td>
<td>Section 6.4.6</td>
</tr>
</tbody>
</table>

For D register numbers, see sections 6.4.3 to 6.4.6 of UT Advanced Series Communication Interface User’s Manual.
13.1.6 Setting Bar-graph Display Function

**Description**

The upper and lower bar-graph displays are provided on the front of the controller. PV or OUT can be displayed. Data which can be displayed on Bar-graph display are as follows.

**OUT, Output**

- Displayed by 10% increment of output
- Less than 0% to More than 100%

For relay, OFF is equivalent to 0% and ON is equivalent to 100%.

**PV, SP, and Analog Input**

- Displayed by 10% increment of analog input/PV input range
- Less than 0% to More than 100%

**Deviation**

When the deviation display band (BDV) is 10%:

- Deviation negative side
- Deviation positive side

Deviation is more than -60%.

Deviation negative side and deviation positive side are displayed by 10% increment of deviation. Indication is unlit when SP – (deviation display band (BDV)) ≤ PV ≤ SP + (deviation display band (BDV)).

\[ \text{IN} = \text{TC Type K} -270.0 \text{ to } 1370.0 \degree \text{C} \]

\[ \text{BDV} = 82 \degree \text{C} (5\%), \ \text{SP} = 500.0 \degree \text{C}, \ \text{PV} = 800.0 \degree \text{C} \]

Deviation negative side

- 992.1\degree C or more
- 910.1 to 992.0\degree C
- 828.1 to 910.0\degree C
- 746.1 to 828.0\degree C
- 664.1 to 746.0\degree C
- 582.1 to 664.0\degree C
- 356.0 to 417.9\degree C
- 254.0 to 355.9\degree C
- 172.0 to 253.9\degree C
- 90.0 to 171.9\degree C
- 8.0 to 89.9\degree C
- to 7.9\degree C

Deviation positive side

All indications are unlit when the deviation is 418 ≤ PV ≤ 582\degree C.

**Valve Opening**

- Displayed by 10% increment of valve opening.
- L side to H side
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAR2</td>
<td>Lower bar-graph display registration</td>
<td>STD</td>
<td>0 to 100.0% of PV input range span (EUS)</td>
<td></td>
</tr>
<tr>
<td>BDV</td>
<td>Bar-graph deviation display band</td>
<td>STD</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td></td>
</tr>
</tbody>
</table>

**Note1:** The bar-graph deviation display band (BDV) is enabled when the deviation is set to the BAR1 or BAR2.

**Note2:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
13.1.7 Masking Least Significant Digit of PV Display

**Description**

With and without least significant digit of the PV in the Operation Display can be set. When without least significant digit is set, the value of the least significant digit is truncated and not displayed. The internal value is not changed depending on whether with or without least significant digit (the value is for display only). This parameter does not function for the PV without decimal point.

<table>
<thead>
<tr>
<th>Least significant digit is displayed.</th>
<th>Least significant digit is not displayed.</th>
</tr>
</thead>
</table>

The following shows the example of with and without least significant digit

<table>
<thead>
<tr>
<th>PV display</th>
</tr>
</thead>
<tbody>
<tr>
<td>With least significant digit</td>
</tr>
<tr>
<td>1.4999</td>
</tr>
<tr>
<td>1.5000</td>
</tr>
<tr>
<td>1.9999</td>
</tr>
<tr>
<td>2.0000</td>
</tr>
<tr>
<td>3000.0</td>
</tr>
<tr>
<td>3000.9</td>
</tr>
<tr>
<td>3001.0</td>
</tr>
</tbody>
</table>

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>MLSD</td>
<td>Least significant digital mask of PV display</td>
<td>STD</td>
<td>OFF: With least significant digit ON: Without least significant digit</td>
<td>DISP Set</td>
</tr>
</tbody>
</table>
13.1.8 Changing Deviation Display Lamp Action

**Description**

The deviation display shows the condition of (PV – SP). The deviation display is only for the UT55A.

- Lit when exceeding SP + (deviation display band).
- Lit when within (Deviation display band).
- Lit when exceeding SP – (deviation display band).

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVB</td>
<td>Deviation display band</td>
<td>STD</td>
<td>0.0 to 100.0% of PV input range span (EUS).</td>
<td>DISP Set</td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
13.1.9 Setting Economy Mode

**Description**

The LCD backlight ON/OFF can be set in the following methods. Setting the LCD backlight to OFF saves energy.

**User Function Keys**

The LCD backlight ON/OFF switch can be assigned to the user function key.

- **User function key:** 13.2 Assigning Function to User Function Key and A/M Key

**Backlight OFF timer**

The backlight OFF timer sets the economy mode parameter to ON. If no keys are pressed for 30 minutes, the LCD backlight goes off automatically. The backlight OFF can be set to turn off the backlight for the whole display or a display other than the PV display. To turn on the LCD backlight, press any key.

**Contact Input**

The LCD backlight ON/OFF switch can be assigned to the contact input.

- **Contact input:** 12.1 Setting Contact Input Function

In the following cases, the LCD backlight does not go off.

- when an alarm occurs
- when an error at power-on occurs

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
</table>
| ECO              | Economy mode | STD           | OFF: Disable
1. Economy mode ON (All indications except PV display OFF)
2. Economy mode ON (All indications OFF)
3. Brightness 10% (all indications) | DISP        |
### 13.1.10 Selecting the Initial Operation Display that Appears at Power ON

**Description**

The initial Operation Display that appears when the power is turned on can be set.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
</table>
| HOME             | HOME Operation Display setting | PRO | SP1: SP Display  
SP2: Loop-2 SP Display  
OUT1: OUT Display  
OUT2: Loop-2 OUT Display  
HCO: Heating/cooling OUT Display  
VP: Valve Position Display  
MV: Position Proportional Computation Output Display  
PID1: PID Number Display  
PID2: Loop-2 PID Number Display  
HC1: Heater Break Alarm-1 Current Display  
HC2: Heater Break Alarm-2 Current Display  
PV1: PV2/PV1 Display  
PV2: PV1/PV2 Display  
PV: PV Analog Input Display  
RSP: RSP Analog Input Display  
AIN2: AIN2 Analog Input Display  
AIN4: AIN4 Analog Input Display  
CS1 to CS5: SELECT Display 1 to 5 |

[Menu symbol: DISP Set]
13.1 Setting Display Functions

13.1.11 Setting Message Function

**Description**

Using the message function and turning the contact input on/off, the message registered beforehand can be displayed on PV display by interrupt. The message is registered using LL50A Parameter Setting Software. The messages are limited to 20 alphanumeric characters. A maximum of four messages can be registered.

If a number of messages occur simultaneously, the priority is as follows:

(high) MG1>MG2>MG3>MG4 (low)

► Message registration: LL50A Parameter Setting Software User’s Manual
► Registration of contact input: 12.1.1 Setting Contact Input Function
► Registration symbols: 3.3 List of Display Symbols

**Operation Display**

When the contact input is turned on, the scrolling message registered beforehand is displayed on PV Display.

13.1.12 Switching Guide Display Language

**Description**

The guide display language that appears when the parameter or the menu is displayed can be switched.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>LANG</td>
<td>Guide display language</td>
<td>EASY</td>
<td>ENG: English</td>
<td>SYS Set</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FRA: French</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>GER: German</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SPA: Spanish</td>
<td></td>
</tr>
</tbody>
</table>
13.1.13 Changing Guide Scroll Speed

**Description**

The scroll speed can be changed when the guide for the parameter or menu is displayed.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPD</td>
<td>Scroll speed</td>
<td>PRO</td>
<td>(Slow) 1 to 8 (Quick)</td>
<td>DISP Set</td>
</tr>
</tbody>
</table>

13.1.14 Turning Guide Display ON/OFF

**Description**

The guide display that appears when the parameter or the menu is displayed can be switched.
The guide display can be turned on and off by the Fn key in the Menu Display and Parameter Setting Display.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUID</td>
<td>Guide display ON/OFF</td>
<td>STD</td>
<td>OFF: Nondisplay ON: Display</td>
<td>DISP Set</td>
</tr>
</tbody>
</table>

13.1.15 Setting Automatic Return to Operation Display

**Description**

The Display will automatically revert to the Operation Display if no keys are pressed for 5 minutes in Menu Display or Parameter Setting Display.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP.JP</td>
<td>Automatic return to Operation Display</td>
<td>PRO</td>
<td>ON: Automatically returned to the Operation Display. OFF: Not automatically returned to the Operation Display. OFF, ON</td>
<td>DISP Set</td>
</tr>
</tbody>
</table>
### Description

The brightness and contrast for PV, Setpoint, Bar-graph, and Status indicator can be adjusted. Brightness ranges for each display can be set. The LCD has a characteristic that the display action becomes late at the low temperature. This can be solved by adjusting the display update cycle (D.CYC).

### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BRI</strong></td>
<td>Brightness</td>
<td>EASY</td>
<td>(Dark) 1 to 5 (Bright)</td>
</tr>
<tr>
<td><strong>B.PVW</strong></td>
<td>White brightness adjustment of PV display</td>
<td>PRO</td>
<td>Adjusts the white brightness of PV display. (Dark) -4 to 4 (Bright)</td>
</tr>
<tr>
<td><strong>B.PVR</strong></td>
<td>Red brightness adjustment of PV display</td>
<td>PRO</td>
<td>Adjusts the red brightness of PV display. (Dark) -4 to 4 (Bright)</td>
</tr>
<tr>
<td><strong>BSP</strong></td>
<td>Brightness adjustment of Setpoint display</td>
<td>PRO</td>
<td>Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)</td>
</tr>
<tr>
<td><strong>B.BAR</strong></td>
<td>Brightness adjustment of Bar-graph display</td>
<td>PRO</td>
<td>Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)</td>
</tr>
<tr>
<td><strong>B.STS</strong></td>
<td>Brightness adjustment of Status indicator</td>
<td>PRO</td>
<td>Adjusts the brightness of Status indicator. (Dark) -4 to 4 (Bright)</td>
</tr>
<tr>
<td><strong>CTRS</strong></td>
<td>Contrast</td>
<td>PRO</td>
<td>(Low) 1 to 6 (High)</td>
</tr>
<tr>
<td><strong>D.CYC</strong></td>
<td>Display update cycle</td>
<td>PRO</td>
<td>1: 100 ms 2: 200 ms 3: 500 ms 4: 1 s 5: 2 s</td>
</tr>
</tbody>
</table>
13.2 Assigning Function to User Function Key and A/M Key

**Description**

The UT55A has three user function keys on the front panel. The UT52A has one user function key. Various functions (operation mode switch etc.) can be assigned to the user function key. Press the user function key to perform the assigned function.
### Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 to Fn</td>
<td>User function key action setting</td>
<td>EASY</td>
<td>See the table below</td>
<td>KEY</td>
</tr>
<tr>
<td>A/M</td>
<td>A/M key action setting</td>
<td>PRO</td>
<td></td>
<td>KEY</td>
</tr>
</tbody>
</table>

#### Setpoint Function Action

<table>
<thead>
<tr>
<th>Function</th>
<th>Action</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>Unassigned</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>A/M</td>
<td>AUTO/MAN switch: AUTO and MAN switches every time the user function key is pressed.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>C/A/M</td>
<td>CAS/AUTO/MAN switch: MAN→AUTO→Cascade is repeated every time the user function key is pressed.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>R/L1</td>
<td>REM/LCL switch: Remote and Local switches every time the user function key is pressed.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>R/L2</td>
<td>Loop-2 REM/LCL switch: Remote and Local of Loop 2 switches every time the user function key is pressed.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>S/R</td>
<td>STOP/RUN switch: STOP and START switches every time the user function key is pressed.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>CAS</td>
<td>Switch to CAS: Pressing the user function key switches to Cascade.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>AUTO</td>
<td>Switch to AUTO: Pressing the user function key switches to AUTO.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>MAN</td>
<td>Switch to MAN: Pressing the user function key switches to MAN.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>REM1</td>
<td>Switch to REM: Pressing the user function key switches to Remote.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>LCL1</td>
<td>Switch to LCL: Pressing the user function key switches to Local.</td>
<td>✓ ✓ ✓ ✓</td>
</tr>
<tr>
<td>REM2</td>
<td>Switch to Loop-2 REM: Pressing the user function key switches to Loop-2 Remote.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>LCL2</td>
<td>Switch to Loop-2 LCL: Pressing the user function key switches to Loop-2 Local.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>STOP</td>
<td>Switch to STOP: Pressing the user function key stops the operation.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>RUN</td>
<td>Switch to RUN: Pressing the user function key starts the operation.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>AT</td>
<td>Auto-tuning: Pressing the user function key executes auto-tuning</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>LTUP</td>
<td>LCD brightness UP: The current brightness gradually increases every time the function key is pressed.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>LTDN</td>
<td>LCD brightness DOWN: The current brightness gradually decreases every time the function key is pressed.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>BRI</td>
<td>Adjust LCD brightness: The current brightness gradually increases every time the function key is pressed. Pressing the function key after reaching the maximum brightness changes to the minimum brightness. Thereafter, minimum brightness→maximum brightness→maximum brightness is repeated.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
<tr>
<td>LCD</td>
<td>LCD Backlight ON/OFF switch: The LCD backlight turns on and off every time the user function key is pressed.</td>
<td>✓ ✓ ✓ ☞</td>
</tr>
</tbody>
</table>
### 13.2 Assigning Function to User Function Key and A/M Key

<table>
<thead>
<tr>
<th>Setpoint</th>
<th>Function</th>
<th>Action</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAT</td>
<td>Latch release</td>
<td>Latch 1 to latch 4 are released every time the user function key is pressed.</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>–</td>
</tr>
<tr>
<td>PID</td>
<td>PID Tuning switch</td>
<td>Pressing the function key during operation displays the first parameter (proportional band) of the currently selected PID parameter group and enables the setting to be changed. As with the operation to change the parameter setpoint, the sequence is P→I→D→…→P→…. Pressing the function key again, or pressing the DISPLAY key or DISP key returns to the initial Operation Display. The PARAMETER key or PARA key does not switch to the Menu Display.</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>–</td>
</tr>
</tbody>
</table>

**Note 1:** √ indicates available, – indicates unavailable, and √√ indicates initial value.

**Note 2:** The initial value of the A/M key is CAS/AUTO/MAN switch when the control mode (CTLM) is Cascade control, and AUTO/MAN switch when CTLM is other than Cascade control.

#### Status of user function key

The status of the user function key can be identified by communication.

1. User function key 0 ↔ 1 toggles
   - 0 or 1 can be read every time the user function key is pressed. (Initial value: 0)

2. User function key status
   - “1” can be read while the user function key is held down, and “0” can be read when the user function key is released. (Initial value: 0)

   ► Reading via communication: UTAdvanced Series Communication Interface User’s Manual

#### Fn key operation in the Parameter Setting Display

In the Menu Display and Parameter Setting Display, the guide is displayed on PV display. At this time, use the Fn key to turn on and off the guide display on PV display. A measured input value (PV) is displayed in the ON state.
13.3 Setting Security Functions

13.3.1 Setting a Password

**Description**

The password function can prevent inadvertent changes to the parameter settings. If a password is set, the checking is required when moving to the Setup Parameter Setting Display. When the password is verified,can be changed to the Setup Parameter Setting Display. The parameters in the following menus can be set only when the password is verified.

CTL, PV, RSP, AIN2, AIN4, MPV, OUT, HBA, R485, ETHR, PROF, KEY, DISP, CSEL, KLOC, MLOC, DI.SL, DI.NU, DI.D, ALM, DO, I/O, SYS, INIT, VER, and LVL.

When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Always remember your password when using the password function.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>Password setting</td>
<td>EASY</td>
<td>0 (No password) to 65535</td>
<td>SYS</td>
</tr>
</tbody>
</table>

13.3.2 Setting Parameter Display Level

**Description**

Parameter display level can be set according to the setting level.

- Parameter display level: Chapter 18 Parameters

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVL</td>
<td>Parameter display level</td>
<td>EASY</td>
<td>EASY: Easy setting mode STD: Standard setting mode PRO: Professional setting mode</td>
<td>LVL</td>
</tr>
</tbody>
</table>
13.3 Setting Security Functions

13.3.3 Locking (Hiding) Parameter Menu Display

**Description**

The parameter menu display lock function hides the following Parameter Menu Displays.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTL</td>
<td>[CTL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>[PV] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSP</td>
<td>[RSP] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIN2</td>
<td>[AIN2] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIN4</td>
<td>[AIN4] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPV</td>
<td>[MPV] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT</td>
<td>[OUT] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBA</td>
<td>[HBA] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R485</td>
<td>[R485] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETHR</td>
<td>[ETHR] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF</td>
<td>[PRO] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEY</td>
<td>[KEY] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISP</td>
<td>[DISP] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CSEL</td>
<td>[CSEL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KLOC</td>
<td>[KLOC] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI.SL</td>
<td>[DI.SL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI.NU</td>
<td>[DI.NU] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DLD</td>
<td>[DI.D] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALM</td>
<td>[ALM] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO</td>
<td>[DO] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O</td>
<td>[I/O] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYS</td>
<td>[SYS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INIT</td>
<td>[INIT] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VER</td>
<td>[VER] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LVL</td>
<td>[LVL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.
### 13.3 Setting Security Functions

![Parameter symbol] | Name                  | Display level | Setting range | Menu symbol |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE</td>
<td>[MODE] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>[CS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>[SP] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPS</td>
<td>[SPS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALRM</td>
<td>[ALRM] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVS</td>
<td>[PVS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID</td>
<td>[PID] menu lock</td>
<td>PRO</td>
<td>OFF: Display ON: Nondisplay</td>
<td>MLOC Set</td>
</tr>
<tr>
<td>TUNE</td>
<td>[TUNE] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZONE</td>
<td>[ZONE] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPAR</td>
<td>[PPAR] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS1</td>
<td>[PYS1] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS2</td>
<td>[PYS2] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS3</td>
<td>[PYS3] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS4</td>
<td>[PYS4] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note 1:** When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

**Note 2:** In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
13.3 Setting Security Functions

13.3.4 Key Lock

**Description**

The key lock function locks the key on the front panel to prohibit key operation. It can prohibit the operation mode switch or parameter setting change.

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA</td>
<td>Front panel parameter data key lock</td>
<td>STD</td>
<td>OFF: Unlock ON: Lock</td>
<td>KLOCK Set</td>
</tr>
<tr>
<td>A/M</td>
<td>Front panel A/M key lock</td>
<td>STD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13.3.5 Setting Display/Non-display of Operation Display

**Description**

Display/non-display of the Operation Display can be set.

- Operation Display: Chapter 6 Monitoring and Control of Regular Operations

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.SP</td>
<td>SP Display lock</td>
<td>PRO</td>
<td>OFF: Display ON: Nondisplay</td>
<td>KLOC Set</td>
</tr>
<tr>
<td>U.OUT</td>
<td>OUT Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.HCO</td>
<td>Heating/cooling OUT Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.VP</td>
<td>Valve Position Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.MV</td>
<td>Position Proportional Computation Output Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.PID</td>
<td>PID Number Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.HC</td>
<td>Heater Break Alarm Current Value Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.PV1</td>
<td>PV2/PV1 Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.PV2</td>
<td>PV1/PV2 Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.PV</td>
<td>PV Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.RSP</td>
<td>RSP Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.AI2</td>
<td>AIN2 Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U.AI4</td>
<td>AIN4 Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note1: In Cascade control, the LP2 lamp is lit while the Loop-2 parameter is displayed.
13.3 Setting Security Functions

13.3.6 Prohibiting Writing via Communication

**Description**
Writing data to each register via all communication methods can be permitted or prohibited. However, writing data via light-loader (front) or maintenance port (upper) is possible using LL50A Parameter Setting Software.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM.W</td>
<td>Communication write enable/disable</td>
<td>STD</td>
<td>OFF: Enable ON: Disable</td>
<td>KLOC Set</td>
</tr>
</tbody>
</table>
13.4 Confirmation of Key and I/O Condition and Version

13.4.1 Confirmation of Key and I/O Condition

**Description**

Can be confirm the Key and I/O condition.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY</td>
<td>Key status</td>
<td>PRO</td>
<td>Read only.</td>
<td>I/O Set</td>
</tr>
<tr>
<td>X000</td>
<td>DI1-DI3 status (equipped as standard)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>X100</td>
<td>DI11-DI16 status (E1-terminal area)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>X300</td>
<td>DI31-DI35 status (E3-terminal area)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>X400</td>
<td>DI41-DI46 status (E4-terminal area)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y000</td>
<td>AL1-AL3 status (equipped as standard)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y100</td>
<td>DO11-DO15 status (E1-terminal area)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y200</td>
<td>DO21-DO25 status (E2-terminal area)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y300</td>
<td>DO31-DO35 status (E3-terminal area)</td>
<td>PRO</td>
<td>PRO</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display according to the suffix code and optional suffix code.

Key confirmation parameters are displayed in hexadecimal. When the error occurs, "1" is set on the bit of corresponding error, and the bit data is displayed in hexadecimal.
### Parameter KEY

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>PARAMETER (or PARA) key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>DISPLAY (or DISP) key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>RIGHT arrow key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>DOWN arrow key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>2nd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>SET/ENTER key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>UP arrow key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>LEFT arrow key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>F2 key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>F1 key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>A/M key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Fn key (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>3rd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>–</td>
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<tr>
<td>4th digit</td>
<td></td>
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</tr>
<tr>
<td>Parameter X000</td>
<td></td>
<td></td>
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<td>Displayed digit</td>
<td>bit</td>
<td>Description</td>
</tr>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>DI1 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>DI2 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>DI3 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>2nd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>–</td>
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<tr>
<td>4th digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parameter X100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Displayed digit</td>
<td>bit</td>
<td>Description</td>
</tr>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>DI11 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>DI12 status (0: OFF, 1: ON)</td>
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<tr>
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<td>2</td>
<td>DI13 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>DI14 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>DI15 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>DI16 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>6</td>
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<td>–</td>
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<td>3rd digit</td>
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<td>11</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>4th digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td>13</td>
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<td>–</td>
</tr>
<tr>
<td>15</td>
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</tr>
</tbody>
</table>
## 13.4 Confirmation of Key and I/O Condition and Version

### Parameter X300

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td>0</td>
<td>DI31 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>DI32 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>DI33 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>DI34 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>2nd digit</td>
<td>4</td>
<td>DI35 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>5</td>
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<tr>
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<td>6</td>
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<tr>
<td>3rd digit</td>
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<tr>
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<td>9</td>
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<tr>
<td></td>
<td>10</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>4th digit</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>13</td>
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### Parameter X400

<table>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
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<td>0</td>
<td>DI41 status (0: OFF, 1: ON)</td>
</tr>
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<td></td>
<td>1</td>
<td>DI42 status (0: OFF, 1: ON)</td>
</tr>
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<td>2</td>
<td>DI43 status (0: OFF, 1: ON)</td>
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<td>3</td>
<td>DI44 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>2nd digit</td>
<td>4</td>
<td>DI45 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>DI46 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>–</td>
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<td>7</td>
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<tr>
<td>3rd digit</td>
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<td>4th digit</td>
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### Parameter Y000

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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
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<td>AL1 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>AL2 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>AL3 status (0: OFF, 1: ON)</td>
</tr>
<tr>
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<td>3</td>
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<tr>
<td>2nd digit</td>
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<td>3rd digit</td>
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<tr>
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</tr>
<tr>
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</table>
## 13.4 Confirmation of Key and I/O Condition and Version

### Parameter Y100

<table>
<thead>
<tr>
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<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td><strong>1st digit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>DO11 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>DO12 status (0: OFF, 1: ON)</td>
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<tr>
<td>2</td>
<td>2</td>
<td>DO13 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>DO14 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td><strong>2nd digit</strong></td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>DO15 status (0: OFF, 1: ON)</td>
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<td>5</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td><strong>3rd digit</strong></td>
<td></td>
<td></td>
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<tr>
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<td>8</td>
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<tr>
<td><strong>4th digit</strong></td>
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</tbody>
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### Parameter Y300

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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1st digit</strong></td>
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<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>DO31 status (0: OFF, 1: ON)</td>
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<tr>
<td>1</td>
<td>1</td>
<td>DO32 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>DO33 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>DO34 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td><strong>2nd digit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>DO35 status (0: OFF, 1: ON)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td><strong>3rd digit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td><strong>4th digit</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>-</td>
</tr>
</tbody>
</table>
13.4 Confirmation of Key and I/O Condition and Version

13.4.2 Confirmation of Version

Description

Can be confirm the version of the controller.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCU</td>
<td>MCU version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCU</td>
<td>DCU version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECU1</td>
<td>ECU-1 version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECU2</td>
<td>ECU-2 version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECU3</td>
<td>ECU-3 version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ECU4</td>
<td>ECU-4 version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PARA</td>
<td>Parameter version</td>
<td>EASY</td>
<td>Read only.</td>
<td>VER Set</td>
</tr>
<tr>
<td>H.VER</td>
<td>Product version</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SER1</td>
<td>Serial number 1</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SER2</td>
<td>Serial number 2</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC1</td>
<td>MAC address 1</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC2</td>
<td>MAC address 2</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC3</td>
<td>MAC address 3</td>
<td>EASY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chapter 14 Parameter Initialization

14.1 Initializing Parameter Settings to Factory Default Values

Description

Parameter settings can be initialized to the factory default values. The ladder program is also initialized to the factory default. Use the key or LL50A Parameter Setting Software to execute it.

Note

The user setting values (defaults) are not initialized even if the parameter setting values are initialized to the factory default values.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.DEF</td>
<td>Initialization to factory default value</td>
<td>PRO</td>
<td>-12345: Initialization, automatically returned to &quot;0&quot; after initialization.</td>
<td>INIT Set</td>
</tr>
</tbody>
</table>
14.2 Registering and Initializing User Default Values

14.2.1 Registering as User Setting (Default) Values

**Description**

The user default values can be registered as parameter default values. The ladder program cannot be registered as user default values. Use the LL50A Parameter Setting Software to register user setting (default) values.

**CAUTION**

Before registering the user default value, make sure that the user setting value is set to the parameter.

14.2.2 Initializing to User Setting (Default) Values

**Description**

Parameter settings can be initialized to the user setting (default) values. The ladder program is not initialized to the factory default. Use the LL50A Parameter Setting Software to execute it.

**Setting Details**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.DEF</td>
<td>Initialization to user default value</td>
<td>PRO</td>
<td>12345: Initialization, automatically returned to &quot;0&quot; after initialization.</td>
<td>INIT Set</td>
</tr>
</tbody>
</table>
15.1 Remedies if Power Failure Occurs during Operations

Description

The operation status and remedies after a power failure differ with the length of power failure time:

- 100–240 V AC: Instantaneous power failure of 20 ms or less
- 24 V AC/DC: Instantaneous power failure of 1 ms
  A power failure is not detected. Normal operation continues.

- Power failure of about less than 5 seconds
  The following shows effects caused in “settings” and “operation status.”

<table>
<thead>
<tr>
<th>Alarm action</th>
<th>Does not continue. Alarm with stand-by function will enter stand-by status.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting parameter</td>
<td>Set contents of each parameter are retained.</td>
</tr>
<tr>
<td>Auto-tuning</td>
<td>Cancelled.</td>
</tr>
<tr>
<td>Control action</td>
<td>Action before power failure continues.</td>
</tr>
<tr>
<td>Timer, counter (ladder program)</td>
<td>Initialized.</td>
</tr>
</tbody>
</table>

- Power failure of about 5 seconds or more
  The following shows effects caused in “settings” and “operation status.”

<table>
<thead>
<tr>
<th>Alarm action</th>
<th>Does not continue. Alarm with stand-by function will enter stand-by status.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting parameter</td>
<td>Set contents of each parameter are retained.</td>
</tr>
<tr>
<td>Auto-tuning</td>
<td>Cancelled.</td>
</tr>
<tr>
<td>Control action</td>
<td>Differs with setting of the parameter “R.MD” (restart mode).</td>
</tr>
<tr>
<td>R.MD setting</td>
<td>Control action after recovery from power failure</td>
</tr>
<tr>
<td>CONT</td>
<td>Continues action before power failure. (Factory default)</td>
</tr>
<tr>
<td>MAN (*)</td>
<td>Outputs the preset output value (PO) of the PID group used as control output and continues action in MAN mode.</td>
</tr>
<tr>
<td>AUTO (*)</td>
<td>The control computation is executed in AUTO mode based on the preset output value (PO) of the PID group used as control output.</td>
</tr>
<tr>
<td>Timer, counter (ladder program)</td>
<td>Initialized.</td>
</tr>
</tbody>
</table>

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.MD</td>
<td>Restart mode</td>
<td>STD</td>
<td>CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.</td>
<td>SYS Set</td>
</tr>
</tbody>
</table>
15.2 Power Frequency Setting

Description

The power frequency can be set by automatic detection or manually. However, when the /DC option is specified, only manual setting is available.

Setting Details

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Menu symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREQ</td>
<td>Power frequency</td>
<td>EASY</td>
<td>AUTO 60: 60 Hz 50: 50 Hz</td>
<td>SYS Set</td>
</tr>
</tbody>
</table>
16.1 Troubleshooting

16.1.1 Troubleshooting Flowchart

If the Operation Display does not appear after turning on the controller’s power, follow the measures in the procedure below. If a problem appears complicated, contact our sales representative.

- **Is the controller defective?**
  - Yes: Contact us for repair.
  - No: Proceed to the next step.

- **Completely inactive?**
  - Yes: Check wiring on the power terminals.
  - No: Proceed to the next step.

- **Key operation failure?**
  - Yes: Check the key lock setting.
  - No: Proceed to the next step.

- **Display failure?**
  - Yes: Turn off power, and then turn it on again.
  - No: Proceed to the next step.

- **I/O signal failure?**
  - Yes: Check the specifications of the controller.
  - No: Proceed to the next step.

- **Communication failure?**
  - Yes: Check the specifications of communication devices.
  - No: Proceed to the next step.

- **Communication capability**
  - Yes: Check the communication-related parameters.
  - No: Check the communication wiring.

- **Display failure: The LCD (a liquid crystal display) is used for a display portion of this product. The LCD has a characteristic that the display action becomes late at the low temperature. Additionally, the luminance and contrast degradation are caused due to aged deterioration. However, the control function is not affected.**

*Contact us for repair: Problem solved.*
### 16.1.2 Errors at Power On

The errors shown below may occur in the fault diagnosis when the power is turned on.

<table>
<thead>
<tr>
<th>PV display (Operation Display)</th>
<th>Setpoint display (Operation Display)</th>
<th>Status indicator (Operation Display)</th>
<th>Parameter that displays error details</th>
<th>Error description</th>
<th>Cause and diagnosis</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indication off</td>
<td>Indication off</td>
<td>–</td>
<td>Faulty MCU RAM / MCU ROM</td>
<td>MCU RAM / MCU ROM are failed.</td>
<td>Faulty. Contact us for repair.</td>
<td></td>
</tr>
<tr>
<td>ERR</td>
<td>SYS -----</td>
<td>–</td>
<td>System data error</td>
<td>System data is corrupted.</td>
<td>Faulty. Contact us for repair.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAR 0004 (for user default value error only)</td>
<td>–</td>
<td>User (parameter) default value error</td>
<td>User parameter is corrupted, Initialized to factory default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAR 0010 (for setup parameter error only)</td>
<td>–</td>
<td>Setup parameter error</td>
<td>Setup parameter data is corrupted. Initialized to factory default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAR 0020 (for operation parameter error only)</td>
<td>–</td>
<td>Operation parameter error</td>
<td>Operation parameter data is corrupted. Initialized to user default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PAR 0400</td>
<td>–</td>
<td>Control parameter (operation mode, output) error</td>
<td>Control parameter data is corrupted. Initialized to user default value.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SLOT 0017 (0017: Error occurs to all hardware of E1 to E4-terminal areas.)</td>
<td>–</td>
<td>Non responding hardware of extended function (E1 to E4-terminal areas)</td>
<td>Inconsistence of system data and hardware of extended function. Non responding communication between hardware of extended function (E1 to E4-terminal areas).</td>
<td>Faulty. Contact us for repair.</td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>Normal indication</td>
<td>Rightmost decimal point on PV display blinks.</td>
<td>Calibration value error</td>
<td>Initialized to calibrated default value because of corrupted factory default value.</td>
<td>Faulty. Contact us for repair.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Setup parameter (PA.ER)</td>
<td>Faulty FRAM</td>
<td>Writing (storing) data to FRAM is impossible.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>Normal indication</td>
<td>LADDER lamp blinks.</td>
<td>Corrupted ladder program</td>
<td>Ladder program is corrupted. Operates without ladder program.</td>
<td>Download the ladder program again.</td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>0.000 00000 (Decimal point on the left of the Symbol display blinks)</td>
<td>–</td>
<td>User profile error (PROFIBUS-DP communication)</td>
<td>User profile is corrupted.</td>
<td>Download the user profile again.</td>
<td></td>
</tr>
</tbody>
</table>
## Troubleshooting, Maintenance, and Inspections

### Errors at Power On (Input/output Action)

<table>
<thead>
<tr>
<th>Error description</th>
<th>PV input, RSP input, and aux. analog input</th>
<th>Ladder calculation</th>
<th>Control computation</th>
<th>Control output</th>
<th>Retransmission output</th>
<th>Alarm action</th>
<th>Analog output (control output, re-transmission output)</th>
<th>Voltage pulse output (control output)</th>
<th>Relay output (control output, position proportional output)</th>
<th>Feedback input (for Position proportional type)</th>
<th>Contact input</th>
<th>Contact (alarm) output</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty MCU RAM</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>Undefined</td>
<td>Stopped</td>
<td>0% or less</td>
<td>OFF</td>
<td>OFF</td>
<td>Undefined</td>
<td>OFF</td>
<td>OFF</td>
<td>Stopped</td>
<td>Normal action</td>
</tr>
<tr>
<td>Faulty MCU ROM</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>Undefined</td>
<td>Stopped</td>
<td>0% or less</td>
<td>OFF</td>
<td>OFF</td>
<td>Undefined</td>
<td>OFF</td>
<td>OFF</td>
<td>Stopped</td>
<td>Normal action</td>
</tr>
<tr>
<td>System data error</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>Undefined</td>
<td>Stopped</td>
<td>0% or less</td>
<td>OFF</td>
<td>OFF</td>
<td>Undefined</td>
<td>OFF</td>
<td>OFF</td>
<td>Stopped</td>
<td>Normal action</td>
</tr>
<tr>
<td>User (parameter) default value error</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Setup parameter error</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Operation parameter error</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Control parameter error</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Non responding hardware of extended function (E1 to E4-terminal areas)</td>
<td>Undefined</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Calibration value error</td>
<td>Normal action (out of accuracy)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action (out of accuracy)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Faulty FRAM</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Corrupted ladder program</td>
<td>Normal action (without ladder program)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>User profile error (PROFIBUS-DP communication)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>PROFIBUS-DP communication disabled</td>
</tr>
</tbody>
</table>
### 16.1.3 Errors during Operation

**Errors during Operation (1)**

The errors shown below may occur during operation.

<table>
<thead>
<tr>
<th>PV display (Operation Display)</th>
<th>Setpoint display (Operation Display)</th>
<th>Status indicator (Operation Display)</th>
<th>Parameter that displays error details</th>
<th>Error description</th>
<th>Cause and diagnosis</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD.ERR</td>
<td>Normal indication (Note)</td>
<td>–</td>
<td>Setup parameter (AD1.E)</td>
<td>Analog input terminal ADC error</td>
<td>Analog input terminal AD value error</td>
<td>Faulty Contact us for repair.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PV input</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RSP input (E1-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AIN2 input (E2-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AIN4 input (E4-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RJC.E (Displays RJC.E and PV alternately.)</td>
<td>Normal indication (Note)</td>
<td>–</td>
<td>Setup parameter (AD1.E)</td>
<td>Universal input terminal RJC error</td>
<td>Universal input terminal RJC error</td>
<td>Faulty Contact us for repair. Set the parameter RJC to OFF to erase error indication.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PV input</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RSP input (E1-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.OUT</td>
<td>Normal indication (Note)</td>
<td>–</td>
<td>Setup parameter (AD1.E)</td>
<td>Analog input terminal burnout error</td>
<td>Analog input terminal sensor burnout</td>
<td>Check wiring and sensor. Error indication is erased in normal operation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PV input</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>RSP input (E1-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AIN2 input (E2-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AIN4 input (E4-terminal area)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Setup parameter (PV1.E/PV2.E)</td>
<td>PV input burnout error (Loop1, Loop2)</td>
<td>Burnout of analog input connected to PV</td>
<td>Check wiring and sensor of connected analog input terminal. Error indication is erased in normal operation.</td>
</tr>
<tr>
<td>OVER -OVER</td>
<td>Normal indication (Note)</td>
<td>–</td>
<td>Setup parameter (PV1.E/PV2.E)</td>
<td>PV input over-scale PV input under-scale (PV values out of -5 to 105%) (Loop1, Loop 2)</td>
<td>PV input is out of -5 to 105%. Also occurs when the data out of range which is the ladder computation result is input.</td>
<td>Check analog input value or ladder program.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PV input (PV values out of -5 to 105%) (Loop1, Loop 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>Normal indication (Note)</td>
<td>–</td>
<td>Setup parameter (PV1.E/PV2.E)</td>
<td>RSP input burnout error (Loop 1, Loop 2)</td>
<td>Burnout of analog input connected to RSP</td>
<td>Check wiring and sensor. Error indication is erased in normal operation.</td>
</tr>
</tbody>
</table>

**Note:** When an error occurs in input shown in Analog input display (Operation display). Setpoint display shows the same symbol as the PV display.
## Troubleshooting, Maintenance, and Inspections

### Errors during Operation (Input/output Action)

<table>
<thead>
<tr>
<th>Error description</th>
<th>PV input, RSP input, and aux. analog input</th>
<th>Ladder calculation</th>
<th>Control computation</th>
<th>Control output</th>
<th>Retransmission output</th>
<th>Alarm action</th>
<th>Analog output (control output, retransmission output)</th>
<th>Voltage pulse output (control output)</th>
<th>Relay output (control output, position proportional output)</th>
<th>Feedback input (for Position proportional type)</th>
<th>Contact input</th>
<th>Contact (alarm) output</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input terminal ADC error • PV input • RSP input (E1-terminal area) • AIN2 input (E2-terminal area) • AIN4 input (E4-terminal area)</td>
<td>105%</td>
<td>Normal action</td>
<td>Normal action</td>
<td>When in AUTO and RUN modes: Error preset output</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Universal input terminal RJC error • PV input • RSP input (E1-terminal area)</td>
<td>Normal action (without reference junction compensation)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Analog input terminal burnout error • PV input • RSP input (E1-terminal area) • AIN2 input (E2-terminal area) • AIN4 input (E4-terminal area)</td>
<td>Depends on the parameter BSL. Upscale: 105% Downscale: -5%</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>PV input burnout error (Loop 1, Loop 2)</td>
<td>Depends on the setting of the parameter BSL of the analog terminal connected to the PV where the error occurs. Upscale: 105% Downscale: -5%</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>PV input over-scale PV input under-scale (PV values out of -5 to 105%) (Loop 1, Loop 2)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>RSP input burnout error (Loop 1, Loop 2)</td>
<td>Depends on the setting of the parameter BSL of the analog terminal connected to the RSP where the error occurs. Upscale: 105% Downscale: -5%</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
</tbody>
</table>
# Errors during Operation (2)

The errors shown below may occur during operation.

<table>
<thead>
<tr>
<th>PV display (Operation Display)</th>
<th>Setpoint display (Operation Display)</th>
<th>Status indicator (Operation Display)</th>
<th>Parameter that displays error details</th>
<th>Error description</th>
<th>Cause and diagnosis</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal indication</td>
<td>RSP B.OUT</td>
<td>–</td>
<td>Setup parameter (PV1.E/PV2.E)</td>
<td>Burnout error when RSP input is used for control (Loop 1, Loop 2)</td>
<td>Burnout error of analog input connected to RSP when RSP is used for control computation</td>
<td>Check wiring and sensor. Error indication is erased in normal operation.</td>
</tr>
<tr>
<td>Normal indication</td>
<td>OUT -----</td>
<td>–</td>
<td>Setup parameter (AD2.E)</td>
<td>Feedback input resistor/current burnout</td>
<td>Feedback input burnout</td>
<td>Check wiring of feedback input resistor/current. Error indication is erased in normal operation.</td>
</tr>
<tr>
<td>Normal indication</td>
<td>Normal indication</td>
<td>LADDER lamp blinks</td>
<td>Setup parameter (LA.ER)</td>
<td>Ladder calculation overflow</td>
<td>Floating point computation in ladder calculation is infinite.</td>
<td>Check the ladder program.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Load factor over 100%</td>
<td>Computation does not end within the control period (load factor is 100% or more and less than 200%).</td>
<td>Change the control period or reduce the number of steps for the ladder program.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Load factor over 200%, (Forced end)</td>
<td>Computation does not end within the control period (load factor is 200% or more).</td>
<td>Change the control period or reduce the number of steps for the ladder program.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ladder program error</td>
<td>Ladder program is corrupted.</td>
<td>Download the ladder program again. If the error indication is still not erased, there is a fault. Contact us for repair.</td>
</tr>
<tr>
<td>Error description</td>
<td>PV input, RSP input, and aux. analog input</td>
<td>Ladder calculation</td>
<td>Control computation</td>
<td>Control output</td>
<td>Retransmission output</td>
<td>Alarm action</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>-------------------------------------------</td>
<td>-------------------</td>
<td>--------------------</td>
<td>----------------</td>
<td>----------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Burnout error when RSP input is used for control (Loop 1, Loop 2)</td>
<td>Depends on the setting of the parameter BSL of the analog terminal connected to the RSP where the error occurs. Upscale: 105% Downscale: -5%</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Feedback input resistor/current burnout</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Ladder calculation overflow</td>
<td>Normal action</td>
<td>Undefined (calculation with max. value)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Load factor is over 100%</td>
<td>Normal action</td>
<td>Does not work according to the control period</td>
<td>Does not work according to the control period</td>
<td>Does not work according to the control period</td>
<td>Does not work according to the control period</td>
<td>Normal action</td>
</tr>
<tr>
<td>Load factor is over 200%. (Forced termination)</td>
<td>Normal action</td>
<td>Forced end at 200%</td>
<td>Does not work according to the control period</td>
<td>Does not work according to the control period</td>
<td>Does not work according to the control period</td>
<td>Normal action</td>
</tr>
<tr>
<td>Ladder program error</td>
<td>Normal action</td>
<td>Undefined (Stopped at the error detection)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
</tbody>
</table>

Troubleshooting, Maintenance, and Inspections
## Errors during Operation (3)

The errors shown below may occur during operation.

<table>
<thead>
<tr>
<th>Parameter that displays error details</th>
<th>Error description</th>
<th>Cause and diagnosis</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV display (Operation Display)</td>
<td>0.000 00000</td>
<td>Peer-to-peer communication error</td>
<td>Check that the target devices are connected correctly. Recovery at normal receipt.</td>
</tr>
<tr>
<td>Setpoint display (Operation Display)</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Status indicator (Operation Display)</td>
<td>–</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Setup parameter (OP.ER)</td>
<td></td>
<td>Peer-to-peer communication error</td>
<td></td>
</tr>
<tr>
<td>AT,E</td>
<td>Normal indication</td>
<td>Auto-tuning time-out (Loop 1, Loop 2)</td>
<td>Check the process. Hold down any key to erase the error indication.</td>
</tr>
<tr>
<td>VAT,E</td>
<td>Normal indication</td>
<td>Automatic valve position adjustment error</td>
<td>Check wiring and valve. Hold down any key to erase the error indication.</td>
</tr>
<tr>
<td>Parameter that displays error details</td>
<td>Setup parameter (PV1.E/PV2.E)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication error (RS-485 communication)</td>
<td></td>
<td>Framing parity error Buffer overflow Inter-character time-out Checksum error (PC link communication with checksum) CRC check error (Modbus/RTU) LRC check error (Modbus/ASCII)</td>
<td>Check the communication parameters. Recovery at normal receipt. Hold down any key to stop blinking.</td>
</tr>
<tr>
<td>Normal indication</td>
<td>0.000 00000 (Decimal point on the left of the Symbol display blinks)</td>
<td>Communication error (coordinated operation)</td>
<td>Check the communication parameters. Recovery at normal receipt. Change from remote to local mode to stop blinking. When the mode is changed from remote to local, SP tracking does not work even if it is set to ON.</td>
</tr>
<tr>
<td>Setup parameter (OP.ER)</td>
<td></td>
<td>Inconsistency of loop between coordinated master and slaves Communication from coordinated master is interrupted for 2 seconds.</td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>0.000 00000 (Decimal point on the left of the Symbol display blinks)</td>
<td>Communication error (coordinated operation)</td>
<td></td>
</tr>
<tr>
<td>Setup parameter (OP.ER)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>0.000 00000 (Decimal point on the left of the Symbol display blinks)</td>
<td>User profile error (PROFIBUS-DP communication)</td>
<td>Download the user profile again.</td>
</tr>
<tr>
<td>Setup parameter (OP.ER)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal indication</td>
<td>Normal indication</td>
<td>Faulty FRAM Writing (storing) data to FRAM is impossible.</td>
<td>Faulty. Contact us for repair.</td>
</tr>
<tr>
<td>Rightmost decimal point on Symbol display blinks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error description</td>
<td>PV input, RSP input, and aux. analog input</td>
<td>Ladder calculation</td>
<td>Control computation</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Peer-to-peer communication error</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Auto-tuning time-out (Loop 1, Loop 2)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Automatic valve position adjustment error</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Communication error (RS485 communication)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Communication error (coordinated operation)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Communication error (coordinated operation)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Communication error (coordinated operation)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>User profile error (PROFIBUS-DP communication)</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
<tr>
<td>Faulty FRAM</td>
<td>Normal action</td>
<td>Normal action</td>
<td>Normal action</td>
</tr>
</tbody>
</table>
Errors during Operation (4)

The errors shown below may occur during operation.

<table>
<thead>
<tr>
<th>PV display (Operation Display)</th>
<th>Data display (Operation Display)</th>
<th>Status indicator (Operation Display)</th>
<th>Parameter that displays error details</th>
<th>Error description</th>
<th>Cause and diagnosis</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undefined</td>
<td>Undefined</td>
<td>-</td>
<td>-</td>
<td>Faulty MCU</td>
<td>MCU is corrupted.</td>
<td>Faulty Contact us for repair.</td>
</tr>
<tr>
<td>Undefined</td>
<td>Undefined</td>
<td>-</td>
<td>-</td>
<td>Faulty DCU (ROM/RAM error, corrupted)</td>
<td>DCU is corrupted.</td>
<td>Faulty Contact us for repair.</td>
</tr>
</tbody>
</table>

Errors during Operation On (Input/output Action)

<table>
<thead>
<tr>
<th>Error description</th>
<th>PV input, RSP input, and aux. analog input</th>
<th>Ladder calculation</th>
<th>Control computation</th>
<th>Control output</th>
<th>Retransmission output</th>
<th>Alarm action</th>
<th>Analog output (control output, retransmission output)</th>
<th>Voltage pulse output (control output)</th>
<th>Relay output (control output, position proportional output)</th>
<th>Feedback input (for Position proportional type)</th>
<th>Contact input</th>
<th>Contact (alarm) output</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty MCU</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>0% or less</td>
<td>OFF</td>
<td>OFF</td>
<td>Undefined</td>
<td>OFF</td>
<td>OFF</td>
<td>Stopped</td>
</tr>
<tr>
<td>Faulty DCU (ROM/RAM error, corrupted)</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>Undefined</td>
<td>Stopped</td>
<td>Stopped</td>
<td>0% or less</td>
<td>OFF</td>
<td>OFF</td>
<td>Undefined</td>
<td>OFF</td>
<td>OFF</td>
<td>Stopped</td>
</tr>
</tbody>
</table>
Hexadecimal Display on Setpoint Display (Operation Display)

Some error codes are displayed in hexadecimal. When the error occurs, "1" is set on the bit of corresponding error, and the bit data is displayed in hexadecimal.

If the setup parameter error or the operation parameter errors occur, it is displayed as follows:

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td>0</td>
<td>System data error</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Calibration value error</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>User (parameter) default value error</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2nd digit</td>
<td>4</td>
<td>Setup parameter error</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Operation parameter error</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>3rd digit</td>
<td>8</td>
<td>Faulty FRAM</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Control parameter error</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4th digit</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

If the hardware in E1-terminal area does not respond, it is displayed as follows:

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td>0</td>
<td>Non responding hardware in E1-terminal area</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Non responding hardware in E2-terminal area</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Non responding hardware in E3-terminal area</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2nd digit</td>
<td>4</td>
<td>Non responding hardware in E4-terminal area</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>3rd digit</td>
<td>8</td>
<td>Communication error in E1-terminal area</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Communication error in E3-terminal area</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4th digit</td>
<td>12</td>
<td>Communication error in E4-terminal area</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
Hexadecimal Display of the Parameter which Shows the Error Details

Error confirmation parameters are displayed in hexadecimal. When the error occurs, "1" is set on the bit of corresponding error.

### Parameter PA.ER

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td>0</td>
<td>System data error</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Calibration value error</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>User (parameter) default value error</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>2nd digit</td>
<td>4</td>
<td>Setup parameter error</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Operation parameter error</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>3rd digit</td>
<td>8</td>
<td>Faulty FRAM</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Control parameter error</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>4th digit</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>–</td>
</tr>
</tbody>
</table>

### Parameter LA.ER

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td>0</td>
<td>Ladder program corruption</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Ladder calculation overflow</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Ladder program error</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>2nd digit</td>
<td>4</td>
<td>Load factor over 100%</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Load factor over 200%</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>3rd digit</td>
<td>8</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>4th digit</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>–</td>
</tr>
<tr>
<td></td>
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### Parameter OP.ER

<table>
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<tr>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>Non responding hardware in E1-terminal area</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Non responding hardware in E2-terminal area</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Non responding hardware in E3-terminal area</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2nd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Non responding hardware in E4-terminal area</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>3rd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>Communication error in E1-terminal area</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>Communication error in E3-terminal area</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4th digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>Communication error in E4-terminal area</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

### Parameter AD1.E

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>ADC error of PV input</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>ADC error of RSP input (E1-terminal area)</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>ADC error of AIN2 input (E2-terminal area)</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2nd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>ADC error of AIN4 input (E4-terminal area)</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>RJC error of PV input</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>RJC error of RSP input</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>3rd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>PV input burnout error</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>RSP input (E1-terminal area) burnout error</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>AIN2 input (E2-terminal area) burnout error</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4th digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td>AIN4 input (E4-terminal area) burnout error</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
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</tr>
<tr>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td></td>
</tr>
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</table>

### Parameter AD2.E

<table>
<thead>
<tr>
<th>Displayed digit</th>
<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>Feedback input resistor/current burnout</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Automatic valve position adjustment error</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>2nd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>3rd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>4th digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>13</td>
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<td>14</td>
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<td></td>
</tr>
<tr>
<td>15</td>
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</tr>
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</table>
### 16.1 Troubleshooting

#### Parameter PV1.E

<table>
<thead>
<tr>
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<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>Loop-1 PV input burnout error</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Loop-1 RSP input burnout error</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Burnout error when Loop-1 RSP input is used for control</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>2nd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Loop-1 PV input over-scale</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Loop-1 PV input under-scale</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>3rd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>–</td>
</tr>
<tr>
<td>9</td>
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<td>–</td>
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<tr>
<td>10</td>
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<td>–</td>
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<tr>
<td>11</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>4th digit</td>
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<tr>
<td>13</td>
<td>13</td>
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</tr>
<tr>
<td>14</td>
<td>14</td>
<td>Loop-1 auto-tuning time-out</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>–</td>
</tr>
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#### Parameter AD2.E

<table>
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<tr>
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<th>bit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>Loop-2 PV input burnout error</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Loop-2 RSP input burnout error</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Burnout error when Loop-2 RSP input is used for control</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>–</td>
</tr>
<tr>
<td>2nd digit</td>
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<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Loop-2 PV input over-scale</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Loop-2 PV input under-scale</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>–</td>
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<tr>
<td>7</td>
<td>7</td>
<td>–</td>
</tr>
<tr>
<td>3rd digit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>8</td>
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</tr>
<tr>
<td>9</td>
<td>9</td>
<td>–</td>
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<tr>
<td>10</td>
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<td>–</td>
</tr>
<tr>
<td>11</td>
<td>11</td>
<td>–</td>
</tr>
<tr>
<td>4th digit</td>
<td></td>
<td></td>
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<tr>
<td>12</td>
<td>12</td>
<td>–</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>–</td>
</tr>
<tr>
<td>14</td>
<td>14</td>
<td>Loop-2 auto-tuning time-out</td>
</tr>
<tr>
<td>15</td>
<td>15</td>
<td>–</td>
</tr>
</tbody>
</table>
16.2 Maintenance

16.2.1 Cleaning
The front panel and operation keys should be gently wiped with a cloth soaked with water and squeezed firmly.

**CAUTION**
In order to prevent LCD from static electricity damage, do not wipe with dry cloth.
(When LCD is electrified, it returns to normal in several minutes.)
Do not use alcohol, benzene, or any other solvents.

16.2.2 Packaging when Shipping the Product for Repair
Should the instrument break down and need to be shipped to our sales representative for repair, handle it as noted below:

**CAUTION**
Write down the settings of parameters for a repair request.

**WARNING**
Prior to shipping the instrument, put it into an antistatic bag and repackage it using the original internal packaging materials and packaging container.

16.2.3 Replacing Parts
Do not replace any parts inside the unit.
16.3 Periodic Maintenance

Check the operating condition periodically to use this instrument with good condition.
16.4 Disposal

When disposing of this instrument, arrange for appropriate disposal as industrial waste according to the rules of a country, the area, or a local government.
17.1 Installation Location

The instrument should be installed in indoor locations meeting the following conditions:

• Instrumented panel
  This instrument is designed to be mounted in an instrumented panel. Mount the instrument in a location where its terminals will not inadvertently be touched.

• Well ventilated locations
  Mount the instrument in well ventilated locations to prevent the instrument’s internal temperature from rising. However, make sure that the terminal portions are not exposed to wind. Exposure to wind may cause the temperature sensor accuracy to deteriorate. To mount multiple indicating controllers, see the external dimensions/panel cutout dimensions which follow. If mounting other instruments adjacent to the instrument, comply with these panel cutout dimensions to provide sufficient clearance between the instruments.

• Locations with little mechanical vibration
  Install the instrument in a location subject to little mechanical vibration.

• Horizontal location
  Mount the instrument horizontally and ensure that it is level, with no inclination to the right or left.

**Note**

If the instrument is moved from a location with low temperature and low humidity to a place with high temperature and high humidity, or if the temperature changes rapidly, condensation will result. Moreover, in the case of thermocouple inputs, measurement errors will result. To avoid such a situation, leave the instrument in the new environment under ambient conditions for more than 1 hour prior to using it.
17.1 Installation Location

Do not mount the instrument in the following locations:

- Outdoors

- Locations subject to direct sunlight, ultrared rays, ultraviolet rays, or close to a heater
  Install the instrument in a location with stable temperatures that remain close to an
  average temperature of 23°C. Do not mount it in locations subject to direct sunlight or
  close to a heater. Doing so adversely affects the instrument and LCD.

- Locations with substantial amounts of oily fumes, steam, moisture, dust, or corrosive
  gases
  The presence of oily fumes, steam, moisture, dust, or corrosive gases adversely
  affects the instrument. Do not mount the instrument in locations subject to any of
  these substances.

- Areas near electromagnetic field generating sources
  Do not place magnets or tools that generate magnetism near the instrument. If the
  instrument is used in locations close to a strong electromagnetic field generating
  source, the magnetic field may cause measurement errors.

- Locations where the display is difficult to see
  The instrument uses an LCD for the display unit, and this can be difficult to see from
  extremely oblique angles. Mount the instrument in a location where it can be seen as
  much as possible from the front.

- Areas close to flammable articles
  Absolutely do not place the instrument directly on flammable surfaces. If such a
  circumstance is unavoidable and the instrument must be placed close to a flammable
  item, provide a shield for it made of 1.43 mm thick plated steel or 1.6 mm thick
  unplated steel with a space of at least 150 mm between it and the instrument on the
  top, bottom and sides.

- Areas subject to being splashed with water

\[
\begin{array}{c}
\text{150 mm} \\
\text{150 mm} \\
\text{150 mm} \\
\text{150 mm} \\
\end{array}
\]
17.2 Mounting Method

**WARNING**

Be sure to turn OFF the power supply to the controller before installing it on the panel to avoid an electric shock.

**Mounting the Instrument Main Unit**

Provide an instrumented panel steel sheet of 1 to 10 mm thickness.

After opening the mounting hole on the panel, follow the procedures below to install the controller:

1. Insert the controller into the opening from the front of the panel so that the terminal board on the rear is at the far side.
2. Set the brackets in place on the top and bottom of the controller as shown in the figure below, then tighten the screws of the brackets. Take care not to overtighten them.

To uninstall the controller, perform the procedure in the reverse order.

**CAUTION**

1) Tighten the screws with appropriate tightening torque within 0.25 N·m. Otherwise it may cause the case deformation or the bracket damage.
2) Make sure that foreign materials do not enter the inside of the instrument through the case’s slit holes.
17.3 **External Dimensions and Panel Cutout Dimensions**

**UT55A**

**General mounting**

- 96 (3.78) mm
- (25) mm (0.98)

**Side-by-side close mounting**

- \([N-1] \times 48 + 45\) + 0.6
- \([(N-1) \times 1.89 + 1.77]\) + 0.02

*"N" stands for the number of controllers to be installed. However, the measured value applies if N≥5.*

**Normal tolerance:** ±(value of JIS B 0401-1999 tolerance class IT18)/2

**UT52A**

**General mounting**

- 48 (1.89) mm
- (25) mm (0.98)

**Side-by-side close mounting**

- \([(N-1) \times 96 + 92]\) + 0.8
- \([(N-1) \times 3.78 + 3.62]\) + 0.03

*"N" stands for the number of controllers to be installed. However, the measured value applies if N≥5.*

**Normal tolerance:** ±(value of JIS B 0401-1999 tolerance class IT18)/2
17.4 Wiring

17.4.1 Important Information on Wiring

WARNING

1) Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.

2) Wiring work must be carried out by a person with basic electrical knowledge and practical experience.

3) When the open network is provided, do not touch the screw in location (a) shown in the wiring diagrams. It is an essential part of the structure of the UT55A. Loosening or tightening it may cause a malfunction or failure of the unit.

UT55A Terminal Block Diagram

UT52A Terminal Block Diagram

E4-terminal area  E1-terminal area

E3-terminal area  E2-terminal area
CAUTION

Do not use an unassigned terminal as the relay terminal.

Recommended Crimp-on Terminal Lugs

Recommended tightening torque: 0.6 N·m
Applicable wire size: Power supply wiring 1.25 mm² or more

<table>
<thead>
<tr>
<th>Applicable terminal lug</th>
<th>Applicable wire size mm² (AWG#)</th>
<th>(ed)</th>
<th>(A)</th>
<th>(F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3</td>
<td>0.25 to 1.65 (22 to 16)</td>
<td>3.3</td>
<td>5.5</td>
<td>4.2</td>
</tr>
</tbody>
</table>

Cable Specifications

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Name and Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply, relay contact output</td>
<td>600 V Grade heat-resistant PVC insulated wires, JIS C 3317(HIV), 0.9 to 2.0 mm²</td>
</tr>
<tr>
<td>Thermocouple</td>
<td>Shielded compensating lead wire JISC1610</td>
</tr>
<tr>
<td>RTD</td>
<td>Shielded wire (three/four conductors) UL2482 (Hitachi Cable)</td>
</tr>
<tr>
<td>Other signals (other than contact input/output)</td>
<td>Shielded wires</td>
</tr>
<tr>
<td>Other signals (contact input/output)</td>
<td>Non shielded wires</td>
</tr>
<tr>
<td>RS485 communication</td>
<td>Shielded wires</td>
</tr>
<tr>
<td>Ethernet communication</td>
<td>100 BASE-TX (CAT-5) / 10 BASE-T</td>
</tr>
<tr>
<td>PROFIBUS-DP communication</td>
<td>Dedicated cable for PROFIBUS-DP (Shielded two-wires)</td>
</tr>
</tbody>
</table>

PROFIBUS-DP Connector (wiring side) (Part number: A1987JT)
Recommended tightening torque: 0.5 to 0.6 N·m
Applicable wire size: 0.2 to 2.5 mm² (AWG24 to 12)

Note
Communication wires of cross-sectional area less than or equal to 0.34 mm² may not be secured firmly to the terminals.
Check that the wire is firmly connected to the terminal by folding the conductor of the wire connected to the crimp-on lug.
Recommended length of the stripped wire: 7 mm

Note
Terminating registers are separately needed for the PROFIBUS-DP communication wiring, and these are to be prepared by users. (390 Ω: 2 pcs. 220 Ω: 1 pc.)
17.4.2 PV Input Wiring

**CAUTION**

1) Be careful of polarity when wiring inputs. Reversed polarity can damage the UT.
2) Keep the PV input signal line as far away as possible from the power supply circuit and ground circuit.
3) For TC input, use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

<table>
<thead>
<tr>
<th>UT55A/UT52A</th>
<th>TC Input</th>
<th>RTD Input (3-wire system)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class D grounding (grounding resistance of 100 Ω or less)</td>
<td>Shield +</td>
<td>A</td>
</tr>
<tr>
<td>+</td>
<td>202</td>
<td>B</td>
</tr>
<tr>
<td>–</td>
<td>202</td>
<td>B</td>
</tr>
<tr>
<td>Compensating lead wire</td>
<td>Shield</td>
<td>Lead wire resistance per wire of 10 Ω or less. Make the resistance of the three wires equal.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC Voltage (mV, V) Input</th>
<th>DC Current (mA) Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Shield</td>
</tr>
<tr>
<td>–</td>
<td>203</td>
</tr>
<tr>
<td>Class D grounding (grounding resistance of 100 Ω or less)</td>
<td>+</td>
</tr>
<tr>
<td>DC current</td>
<td>–</td>
</tr>
<tr>
<td>–</td>
<td>203</td>
</tr>
</tbody>
</table>

**Use**

In Single-loop control, Cascade primary-loop control, Cascade secondary-loop control, Loop control for backup, or Loop control with PV-hold function, PV input is used for PV input.

In Loop control with PV switching or Loop control with PV auto-selector, PV input is used for PV input 1. Remote input (E1-terminal area) is used for PV input 2. In Loop control with PV auto-selector for 3 inputs or 4 inputs, auxiliary analog inputs are used for PV input 3 and PV input 4.

In Cascade control, PV input is used for Loop-1 PV input. Remote input (E1-terminal area) is used for Loop-2 PV input.
17.4 Wiring

17.4.3 Remote (Auxiliary Analog) Input Wiring

**CAUTION**

1) Be careful of polarity when wiring inputs. Reversed polarity can damage the UT.
2) Keep the remote (auxiliary analog) input signal line as far away as possible from the power supply circuit and ground circuit.
3) For TC input (remote input with direct input), use shielded compensating lead wires for wiring. For RTD input, use shielded wires that have low conductor resistance and cause no significant differences in resistance between the three wires.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

**UT55A/UT52A**

Remote input (E1-terminal area)

```
+ 305
|  
|  
|  
|  
DC voltage
Shield
RSP
RSP
306
306
Class D grounding
(grounding resistance of 100 Ω or less)
```

**UT55A**

<table>
<thead>
<tr>
<th>Auxiliary analog input (E2-terminal area)</th>
<th>Auxiliary analog input (E4-terminal area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ 311</td>
<td>+ 505</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>DC voltage</td>
<td>DC voltage</td>
</tr>
<tr>
<td>Shield</td>
<td>Shield</td>
</tr>
<tr>
<td>313</td>
<td>506</td>
</tr>
<tr>
<td>(grounding resistance of 100 Ω or less)</td>
<td>(grounding resistance of 100 Ω or less)</td>
</tr>
</tbody>
</table>

**Use**

**RSP Remote Input (E1-terminal area)**

- In Single-loop control or Loop control with PV-hold function, used for remote input.
- In Cascade primary-loop control, remote input is used for output tracking input.
- In Cascade secondary-loop control, remote input is used for cascade input.
- In Cascade control, remote input is used for Loop-2 PV input.
- In Loop control for backup, remote input is used for output tracking input.
- In Loop control with PV switching or Loop control with PV auto-selector, remote input is used for PV input 2.

**AIN2 Auxiliary Analog Input (E2-terminal area)**

- In Loop control with PV auto-selector for 3 inputs or 4 inputs, auxiliary analog input (E-2 terminal area) is used for PV input 3.
**AIN4 Auxiliary Analog Input (E4-terminal area)**

In Loop control with PV auto-selector for 4 inputs, auxiliary analog input (E4-terminal area) is used for PV input 4.

In Single-loop control or Single-loop position proportional control, auxiliary analog input (E4-terminal area) is used for feedforward input.

---

**UT55A/UT52A**

Remote Input with Direct Input (Optional suffix code /DR) (E1-terminal area)

---

**TC input**

- Compensating lead wire
- Class D grounding (grounding resistance of 100 Ω or less)

---

**RTD input (3-wire system)**

- Class D grounding (grounding resistance of 100 Ω or less)
- Lead wire resistance per wire of 150 Ω or less. Make the resistance of the three wires equal.

---

**RTD input (4-wire system)**

- Class D grounding (grounding resistance of 100 Ω or less)
- Lead wire resistance per wire of 150 Ω or less.

---

**DC voltage (mV, V) input**

- Class D grounding (grounding resistance of 100 Ω or less)

---

**DC current (mA) input**

- Class D grounding (grounding resistance of 100 Ω or less)
17.4.4 Control Output (Relay, Current, and Voltage Pulse) Wiring

**CAUTION**

1) The use of inductance (L) loads such as auxiliary relays, motors and solenoid valves causes malfunction or relay failure; always insert a CR filter for use with alternating current or a diode for use with direct current, as a spark-removal surge suppression circuit, into the line in parallel with the load.
2) If there is a risk of external lightning surges, use a lightning arrester etc.
3) Relays cannot be used for a small load of 10 mA or less.

---

**DC Relay Wiring**

UT55A/UT52A

- External DC power supply
- Relay
- UT's contact
- Diode (Mount it directly to the relay coil terminal (socket).)

**AC Relay Wiring**

UT55A/UT52A

- External AC power supply
- Relay
- UT's contact
- CR filter (Mount it directly to the relay coil terminal (socket).)
### UT55A/UT52A Relay Output

**Standard type output (UT55A, UT52A) or Heating/cooling type heating-side output (UT55A)**

<table>
<thead>
<tr>
<th>NC</th>
<th>101</th>
<th>OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>103</td>
<td></td>
</tr>
</tbody>
</table>

Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

### Heating/cooling type cooling-side output (UT55A)

<table>
<thead>
<tr>
<th>NC</th>
<th>607</th>
<th>OUT2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>608</td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>609</td>
<td></td>
</tr>
</tbody>
</table>

Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

### Heating/cooling type heating/cooling output (UT52A)

<table>
<thead>
<tr>
<th>Heating-side NO1</th>
<th>101</th>
<th>OUT/OUT2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating-side NO2</td>
<td>102</td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>103</td>
<td></td>
</tr>
</tbody>
</table>

Contact rating: 250 V AC, 3 A
30 V DC, 3 A (resistance load)

**Note:** Cannot be used for a small load of 10 mA or less.

### UT55A/UT52A Current and Voltage Pulse Output

#### Standard type or Heating/cooling type heating-side output (UT55A/UT52A)

- **Control valves (or other actuators)**
- **Shield**
- **Class D grounding** (grounding resistance of 100 Ω or less)

**Current:**
- 4 to 20 mA DC or 0 to 20 mA DC (resistance load: 600 Ω or less)

**Voltage pulse:**
- On-voltage: 12 V DC or more
- Off-voltage: 0.1 V DC or less

#### Heating/cooling type cooling-side output (UT55A)

- **Control valves (or other actuators)**
- **Shield**
- **Class D grounding** (grounding resistance of 100 Ω or less)

**Current:**
- 4 to 20 mA DC or 0 to 20 mA DC (resistance load: 600 Ω or less)

**Voltage pulse:**
- On-voltage: 12 V DC or more (load resistance: 600 Ω or more)
- Off-voltage: 0.1 V DC or less

#### Heating/cooling type cooling-side output (UT52A)

- **Control valves (or other actuators)**
- **Shield**
- **Class D grounding** (grounding resistance of 100 Ω or less)

**Current:**
- 4 to 20 mA DC or 0 to 20 mA DC (resistance load: 600 Ω or less)

**Voltage pulse:**
- On-voltage: 12 V DC or more (load resistance: 600 Ω or more)
- Off-voltage: 0.1 V DC or less
17.4 Wiring

Use
When current/voltage pulse output is not used for control output, it can be used for retransmission output.

When retransmission output terminal is not used for retransmission output, it can be used for optional control output. The current output range can be changed.

For control output setting, set the control mode (CTLM) and the control type (CNT), then set the output terminal and output type in the output type selection (OT).

► Control output type: 10.1 Setting Control Output Type
17.4.5 Valve Position Output and Feedback Input Wiring

**CAUTION**

1) Use an auxiliary relay for load-switching if the contact rating is exceeded.
2) Keep the relay output wires and the feedback input wires at least 30 cm apart.
3) The output relay has a limited service life. Be sure to connect a CR filter (for AC) or diode (for DC) to the load.
4) If there is a risk of external lightning surges, use a lightning arrester etc.
5) Relays cannot be used for a small load of 10 mA or less.

► When using auxiliary relay: 17.4.4 Control Output (Relay, Current, and Voltage Pulse) Wiring

---

**Relay contact output (UT55A)**

<table>
<thead>
<tr>
<th>Relay contact output (UT52A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH (direct)</td>
</tr>
<tr>
<td>LOW (reverse)</td>
</tr>
<tr>
<td>COM</td>
</tr>
<tr>
<td>507</td>
</tr>
<tr>
<td>508</td>
</tr>
<tr>
<td>509</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Contact rating: 250 V AC, 3 A</td>
</tr>
<tr>
<td>30 V DC, 3 A (resistance load)</td>
</tr>
</tbody>
</table>

Note: Cannot be used for a small load of 10 mA or less.

**Feedback input (resistor) (UT55A)**

<table>
<thead>
<tr>
<th>Feedback input (resistor) (UT52A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shield</td>
</tr>
<tr>
<td>511</td>
</tr>
<tr>
<td>512</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Resistance: 100 Ω to 2.5 kΩ</td>
</tr>
<tr>
<td>100%</td>
</tr>
<tr>
<td>0%</td>
</tr>
</tbody>
</table>

Class D grounding (grounding resistance of 100 Ω or less)

**Feedback input (current) (UT55A)**

<table>
<thead>
<tr>
<th>Feedback input (current) (UT52A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shield</td>
</tr>
<tr>
<td>510</td>
</tr>
<tr>
<td>512</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>4 to 20 mA DC</td>
</tr>
</tbody>
</table>

*: Always set the terminal 511 in open state.

Class D grounding

Class D grounding

*: Always set the terminal 311 in open state.
17.4 Wiring

17.4.6 Contact Input Wiring

**CAUTION**

1) Use a no-voltage contact (relay contact etc.) for external contacts.
2) Use a no-voltage contact which has ample switching capacity for the terminal’s OFF voltage (approx. 5V) and ON current (approx 1mA).
3) When using a transistor contact, the voltage at both terminals must be 2 V or less when the contact is ON and the leakage current must be 100 µA or less when it is OFF.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

**UT55A/UT52A**

Contact Input Equipped as Standard

<table>
<thead>
<tr>
<th>No-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram of No-voltage contact" /></td>
<td><img src="image2" alt="Diagram of Transistor contact" /></td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>
**Additional Contact Input According to the UT55A Suffix Codes**

**UT55A suffix codes: Type 2=1, 2, 4, 5 or 7; however, without optional suffix code /DR**

<table>
<thead>
<tr>
<th>Non-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSP</td>
<td>RSP</td>
</tr>
<tr>
<td>COM</td>
<td>COM</td>
</tr>
<tr>
<td>DI16</td>
<td>+5 V</td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>

**UT55A suffix code: Type 2=3**

<table>
<thead>
<tr>
<th>Non-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td>DI11, DI12, DI13, DI14, DI15</td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>

**UT55A suffix code: Type 2=7**

<table>
<thead>
<tr>
<th>Non-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td>AIN2</td>
</tr>
<tr>
<td>DI26</td>
<td>COM</td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>

**UT55A suffix code: Type 2=1**

<table>
<thead>
<tr>
<th>Non-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>COM</td>
<td>DI31, DI32, DI33, DI34, DI35</td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>
### 17.4 Wiring

**UT55A suffix code: Type 2=7**

<table>
<thead>
<tr>
<th>No-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="DI46" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="AIN4" /></td>
<td><img src="#" alt="AIN4" /></td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>

**UT55A suffix code: Type 2=5 or 6**

<table>
<thead>
<tr>
<th>No-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="DI41" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="DI42" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="DI43" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="DI44" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="DI45" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>

**Additional Contact Input According to the UT52A Suffix Codes**

**UT52A suffix code: Type 2=1 or 2**

(However, when Type2=2, applicable when without optional suffix code /DR)

<table>
<thead>
<tr>
<th>No-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="RSP" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="DI16" /></td>
<td><img src="#" alt="DI16" /></td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>

**UT52A suffix code: Type 2=3**

<table>
<thead>
<tr>
<th>No-voltage contact</th>
<th>Transistor contact</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="#" alt="DI" /></td>
<td><img src="#" alt="+5 V" /></td>
</tr>
<tr>
<td><img src="#" alt="DI11" /></td>
<td><img src="#" alt="DI11" /></td>
</tr>
<tr>
<td><img src="#" alt="DI12" /></td>
<td><img src="#" alt="DI12" /></td>
</tr>
<tr>
<td>Contact rating: 12 V DC, 10 mA or more</td>
<td>Contact rating: 12 V DC, 10 mA or more</td>
</tr>
</tbody>
</table>
The following table shows the initial status for each control mode and control type. No function is assigned to contact inputs other than those listed below. 

► Contact input function registration: 12.1 Setting Contact Input Function

<table>
<thead>
<tr>
<th>Control mode and control type</th>
<th>DI1</th>
<th>DI2</th>
<th>DI3</th>
<th>DI16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-loop Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-loop Heating/cooling Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-loop Position Proportional Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-loop Two-position Two-level Control Loop Control with PV Auto-selector (4 inputs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating/cooling Loop Control with PV Auto-selector (4 inputs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV Auto-selector (4 inputs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop Control with PV-hold Function Heating/cooling Loop Control with PV-hold Function</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV-hold Function</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Primary-loop Control Loop Control for Backup</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating/cooling Loop Control for Backup Position Proportional Loop Control for Backup</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Secondary-loop Control</td>
<td>Cascade (OFF→ON) switch</td>
<td>Auto (OFF→ON) switch</td>
<td>Man (OFF→ON) switch</td>
<td>Cascade switches to AUTO in the event of FAIL of Loop 1 controller</td>
</tr>
<tr>
<td>Cascade Secondary-loop Heating/cooling Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Secondary-loop Position Proportional Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Control</td>
<td>Cascade (OFF→ON) switch</td>
<td>Auto (OFF→ON) switch</td>
<td>Man (OFF→ON) switch</td>
<td>STOP (ON)/RUN (OFF) switch</td>
</tr>
<tr>
<td>Cascade Heating/cooling Control</td>
<td>Cascade (OFF→ON) switch</td>
<td>Auto (OFF→ON) switch</td>
<td>Man (OFF→ON) switch</td>
<td>STOP (ON)/RUN (OFF) switch</td>
</tr>
<tr>
<td>Cascade Position Proportional Control</td>
<td>Cascade (OFF→ON) switch</td>
<td>Auto (OFF→ON) switch</td>
<td>Man (OFF→ON) switch</td>
<td>STOP (ON)/RUN (OFF) switch</td>
</tr>
<tr>
<td>Loop Control with PV Switching Heating/cooling Loop Control with PV Switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV Switching</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop Control with PV Auto-selector (2 inputs) Heating/cooling Loop Control with PV Auto-selector (2 inputs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV Auto-selector (2 inputs)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
17.4.7 Contact Output Wiring

---

**CAUTION**

1) Use an auxiliary relay for load-switching if the contact rating is exceeded.
2) Connect a bleeder resistor when a small current is used, so that a current exceeding 10 mA can be supplied.
3) The output relay has a limited service life. Be sure to connect a CR filter (for AC) or diode (for DC) to the load.
4) If there is a risk of external lightning surges, use a lightning arrester etc.

---

When using auxiliary relay: 17.4.4 Control Output (Relay, Current, and Voltage Pulse) Wiring

**UT55A/UT52A**

Contact Output Equipped as Standard

<table>
<thead>
<tr>
<th>Relay contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL3 104</td>
</tr>
<tr>
<td>COM 105</td>
</tr>
<tr>
<td>AL2 106</td>
</tr>
<tr>
<td>COM 107</td>
</tr>
<tr>
<td>AL1 108</td>
</tr>
<tr>
<td>COM 109</td>
</tr>
</tbody>
</table>

Contact rating: 240 V AC, 1 A
30 V DC, 1 A (resistance load)

**Additional Contact Output According to the UT55A Suffix Codes**

<table>
<thead>
<tr>
<th>UT55A suffix code: Type 2=6</th>
<th>UT55A suffix codes: Type 2=1, 3, 5 or 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO15 301</td>
<td>DO25 307</td>
</tr>
<tr>
<td>DO14 302</td>
<td>DO24 308</td>
</tr>
<tr>
<td>DO13 303</td>
<td>DO23 309</td>
</tr>
<tr>
<td>DO12 304</td>
<td>DO22 310</td>
</tr>
<tr>
<td>DO11 305</td>
<td>DO21 311</td>
</tr>
<tr>
<td>COM 306</td>
<td>COM 312</td>
</tr>
</tbody>
</table>

Transistor contact rating: 24 V DC, 50 mA

Factory default: Function is not assigned to the additional contact outputs (DO11 to DO15).
Additional Contact Output According to the UT55A Suffix Codes

**UT55A suffix code: Type 2=6**

Factory default: Function is not assigned to the additional contact outputs.

► Contact output function registration: 12.2 Setting Contact Output Function

Additional Contact Output According to the UT52A suffix codes

**UT52A suffix code: Type 2=3**

Factory default: Function is not assigned to the additional contact outputs.

► Contact output function registration: 12.2 Setting Contact Output Function
The following table shows the initial status for each control mode and control type.

<table>
<thead>
<tr>
<th>Control mode and control type</th>
<th>AL1 terminal</th>
<th>AL2 terminal</th>
<th>AL3 terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-loop Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-loop Heating/cooling Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-loop Position Proportional Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-loop Two-position Two-level Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop Control with PV Switching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating/cooling Loop Control with PV Switching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV Switching</td>
<td>Alarm 1 (PV high limit)</td>
<td>Alarm 2 (PV low limit)</td>
<td>Alarm 3 (PV high limit)</td>
</tr>
<tr>
<td>Loop Control with PV Auto-selector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating/cooling Loop Control with PV Auto-selector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV Auto-selector</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop Control with PV-hold Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heating/cooling Loop Control with PV-hold Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control with PV-hold Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Primary-loop Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loop Control for Backup</td>
<td>Alarm 1 (PV high limit)</td>
<td>Alarm 2 (PV low limit)</td>
<td>FAIL</td>
</tr>
<tr>
<td>Heating/cooling Loop Control for Backup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position Proportional Loop Control for Backup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Secondary-loop Control</td>
<td>Alarm 1 (PV high limit)</td>
<td>Alarm 2 (PV low limit)</td>
<td>Tracking switch (to Loop-1 controller)</td>
</tr>
<tr>
<td>Cascade Secondary-loop Heating/cooling Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Secondary-loop Position Proportional Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Control</td>
<td>Alarm 1 (Loop-1 PV high limit)</td>
<td>Alarm 2 (Loop-1 PV low limit)</td>
<td>Alarm 3 (Loop-1 PV high limit)</td>
</tr>
<tr>
<td>Cascade Heating/cooling Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cascade Position Proportional Control</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When the suffix code: Type 2 = 1, 3, 5, or 6, the following function is assigned to DO21 to DO25. However, alarms 5 to 8 are not displayed for the factory default.

- DO21: Alarm 4 (PV low limit)
- DO22: Alarm 5 (PV high limit)
- DO23: Alarm 6 (PV low limit)
- DO24: Alarm 7 (PV high limit)
- DO25: Alarm 8 (PV low limit)

### 17.4.8 Retransmission Output Wiring

When retransmission output is not used for retransmission output, it can be used for 15 V DC loop power supply.

The current output range can be changed.

![Retransmission Output Wiring Diagram](chart.png)
17.4.9 15 V DC Loop Power Supply Wiring
This can be used when it is not used for retransmission output or control output. The controller is equipped with a non-isolated loop power supply (14.5 to 18.0 V DC) for connecting a 2-wire transmitter.

![Diagram of 15 V DC Loop Power Supply Wiring]

OUT terminal and OUT2 terminal also can be used.

17.4.10 24 V DC Loop Power Supply Wiring
This can be used when the optional suffix code /LP is specified. The controller with the optional suffix code /LP is equipped with an isolated loop power supply (21.6 to 28.0 V DC) for connecting a 2-wire transmitter.
### 17.4.11 Heater Break Alarm Wiring

Heater break alarm can be used for the UT55A with the optional suffix code /HA.

<table>
<thead>
<tr>
<th>Heater break alarm</th>
<th>Heater break detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAL1 507</td>
<td>Shield CT1 510</td>
</tr>
<tr>
<td>HAL2 508</td>
<td>Class D grounding</td>
</tr>
<tr>
<td>COM 509</td>
<td>grounding resistance of 100 Ω or less</td>
</tr>
<tr>
<td>Contact raging: 24 V DC, 50 mA</td>
<td></td>
</tr>
</tbody>
</table>

Heater break alarm can be used for the UT52A with the optional suffix code /HA.

<table>
<thead>
<tr>
<th>Heater break alarm</th>
<th>Heater break detection</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAL1 307</td>
<td>Shield CT1 310</td>
</tr>
<tr>
<td>HAL2 308</td>
<td>Class D grounding</td>
</tr>
<tr>
<td>COM 309</td>
<td>grounding resistance of 100 Ω or less</td>
</tr>
<tr>
<td>Contact raging: 24 V DC, 50 mA</td>
<td></td>
</tr>
</tbody>
</table>
17.4.12 RS-485 Communication Interface Wiring

Wire as follows for Modbus communication, PC link communication, or ladder communication.
Always connect a terminating resistor to the station at the end of the communication line.


4-wire Wiring (for UT55A only)

![Diagram of 4-wire Wiring for UT55A]

- PC
- RS-232C Straight cable
- ML2-□
- UT
- Communication cable
- Class D grounding (grounding resistance of 100 Ω or less)
- Class D grounding (grounding resistance of 100 Ω or less)
- Class D grounding (grounding resistance of 100 Ω or less)

2-wire Wiring of 4-wire Terminal (for UT55A only)

![Diagram of 2-wire Wiring of 4-wire Terminal for UT55A]

- PC
- RS-232C Straight cable
- ML2-□
- UT
- Communication cable
- Class D grounding (grounding resistance of 100 Ω or less)
- Class D grounding (grounding resistance of 100 Ω or less)
- Class D grounding (grounding resistance of 100 Ω or less)

UT55A

<table>
<thead>
<tr>
<th>Terminal symbol above.</th>
<th>Applicable to suffix code: Type 3 = 1; however, Type 2 = 1 or 6 excluded</th>
<th>Applicable to suffix code: Type 2 = 1 or 2; however, without optional suffix code /LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>410</td>
<td>504</td>
</tr>
<tr>
<td>B</td>
<td>411</td>
<td>505</td>
</tr>
<tr>
<td>C</td>
<td>407</td>
<td>501</td>
</tr>
<tr>
<td>D</td>
<td>408</td>
<td>502</td>
</tr>
<tr>
<td>E</td>
<td>409</td>
<td>503</td>
</tr>
</tbody>
</table>
2-wire Wiring

Class D grounding (grounding resistance of 100 Ω or less)

PC

RS-232C Straight cable

(External) Terminating resistor 220 Ω

UTML2-□

UT

UT

RSB (+)

RSA(–)

Communication cable

Communication cable

Terminal symbol above.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>UT55A</th>
<th>UT52A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>501</td>
<td>301</td>
</tr>
<tr>
<td>B</td>
<td>502</td>
<td>302</td>
</tr>
<tr>
<td>C</td>
<td>503</td>
<td>303</td>
</tr>
</tbody>
</table>

Note

ML2-□ indicates a converter of YOKOGAWA. Other than this, RS232C/RS485 converters can also be used. If another converter is to be used, check the electrical specifications of the converter before using it.
17.4.13 Coordinated Operation Wiring

4-wire Wiring (for UT55A only)

UT (Master)

(Slave)

(Slave)

(External) Terminating resistor 220 Ω

Communication cable

Communication cable

Class D grounding (grounding resistance of 100 Ω or less)

Class D grounding (grounding resistance of 100 Ω or less)

2-wire Wiring of 4-wire Terminal (for UT55A only)

UT (Master)

UT (Slave)

UT (Slave)

(External) Terminating resistor 220 Ω

Communication cable

Communication cable

Class D grounding (grounding resistance of 100 Ω or less)

Class D grounding (grounding resistance of 100 Ω or less)

<table>
<thead>
<tr>
<th>Terminal symbol above.</th>
<th>Applicable to suffix code: Type 3 = 1; however, Type 2 = 1 or 6 excluded</th>
<th>Applicable to suffix code: Type 2 = 1 or 2; however, without optional suffix code /LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>410</td>
<td>504</td>
</tr>
<tr>
<td>B</td>
<td>411</td>
<td>505</td>
</tr>
<tr>
<td>C</td>
<td>407</td>
<td>501</td>
</tr>
<tr>
<td>D</td>
<td>408</td>
<td>502</td>
</tr>
<tr>
<td>E</td>
<td>409</td>
<td>503</td>
</tr>
</tbody>
</table>
## 17.4 Wiring

### 2-wire Wiring

![Diagram of 2-wire Wiring]

- **UT (Master)**
  - RSB (+)
  - RSA (–)
  - SG

- **UT (Slave)**
  - RSB (+)
  - RSA (–)
  - SG

**External Terminating Resistor:** 220 Ω

- **Communication cable**

**Class D grounding** (grounding resistance of 100 Ω or less)

<table>
<thead>
<tr>
<th>Terminal symbol above.</th>
<th>UT55A</th>
<th>UT52A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>501</td>
<td>301</td>
</tr>
<tr>
<td>B</td>
<td>502</td>
<td>302</td>
</tr>
<tr>
<td>E</td>
<td>503</td>
<td>303</td>
</tr>
</tbody>
</table>

**Applicable to suffix code:**

- UT55A: Type 2=1 or 2, and with optional suffix code /LP
- UT52A: Type 2=1
17.4.14 Peer-to-peer Communication Wiring

Peer-to-peer communication can be used on ladder program of UT55A/UT52A.

2-wire Wiring of 4-wire Terminal (for UT55A only)

<table>
<thead>
<tr>
<th>Terminal symbol above.</th>
<th>Applicable to suffix code: Type 3=1; however, Type 2=1 or 6 excluded</th>
<th>Applicable to suffix code: Type 2=1 or 2; however, without optional suffix code /LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>410</td>
<td>504</td>
</tr>
<tr>
<td>B</td>
<td>411</td>
<td>505</td>
</tr>
<tr>
<td>C</td>
<td>407</td>
<td>501</td>
</tr>
<tr>
<td>D</td>
<td>408</td>
<td>502</td>
</tr>
<tr>
<td>E</td>
<td>409</td>
<td>503</td>
</tr>
</tbody>
</table>
2-wire Wiring

<table>
<thead>
<tr>
<th>Terminal symbol above</th>
<th>UT55A</th>
<th>UT52A</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>501</td>
<td>301</td>
</tr>
<tr>
<td>B</td>
<td>502</td>
<td>302</td>
</tr>
<tr>
<td>E</td>
<td>503</td>
<td>303</td>
</tr>
</tbody>
</table>

- Details of Peer-to-peer communication: LL50A Parameter Setting Software User's Manual
17.4.15 Ethernet Communication Interface Wiring

**CAUTION**

Be sure to connect a lightning arrester for Ethernet (100BASE-TX/10BASE-T) in an environment where a surge voltage may be induced by a lightning discharge.
RS-485 communication wiring for the serial gateway function is as follows.

### 2-wire Wiring of 4-wire Terminal (for UT55A only)

#### Serial gateway

- **RSB (+)**
- **RSA (–)**
- **SDB (+)**
- **SDA (–)**
- **RDB (+)**
- **RDA (–)**

#### Communication cable

- (External)
- Terminating resistor 220 Ω

#### Class D grounding

- (grounding resistance of 100 Ω or less)

#### UT Serial gateway UT

- **RSB (+)**
- **RSA (–)**

#### Communication cable

- (External)
- Terminating resistor 220 Ω

#### Class D grounding

- (grounding resistance of 100 Ω or less)

### Terminal symbol above

<table>
<thead>
<tr>
<th>Terminal symbol above.</th>
<th>Applicable to suffix code: Type 3=1; however, Type 2 = 1 or 6 excluded</th>
<th>Applicable to suffix code: Type 2=1 or 2; however, without optional suffix code /LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>410</td>
<td>504</td>
</tr>
<tr>
<td>B</td>
<td>411</td>
<td>505</td>
</tr>
<tr>
<td>C</td>
<td>407</td>
<td>501</td>
</tr>
<tr>
<td>D</td>
<td>408</td>
<td>502</td>
</tr>
<tr>
<td>E</td>
<td>409</td>
<td>503</td>
</tr>
</tbody>
</table>

### 2-wire Wiring

#### Serial gateway

- **RSB (+)**
- **RSA (–)**

#### Communication cable

- (External)
- Terminating resistor 220 Ω

#### Class D grounding

- (grounding resistance of 100 Ω or less)

#### UT Serial gateway UT

- **RSB (+)**
- **RSA (–)**

#### Communication cable

- (External)
- Terminating resistor 220 Ω

#### Class D grounding

- (grounding resistance of 100 Ω or less)

### Terminal symbol above

<table>
<thead>
<tr>
<th>Terminal symbol above.</th>
<th>Applicable to suffix code: Type 2 = 1 or 2, and with optional suffix code /LP</th>
<th>UT52A Applicable to suffix code: Type 2=1</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>501</td>
<td>301</td>
</tr>
<tr>
<td>B</td>
<td>502</td>
<td>302</td>
</tr>
<tr>
<td>C</td>
<td>503</td>
<td>303</td>
</tr>
</tbody>
</table>
17.4.16 PROFIBUS-DP Communication Interface Wiring

(1) Remove the terminal block
Hold both ends of the terminal block and pull straight.

(2) Connect the wires

Applicable wire size
0.2 to 2.5 mm² (AWG24 to 12)
Recommended length of stripped wire: 7mm

(3) Connect the terminal block
Hold both ends of the terminal block, align with the connector on the UT side, and push the terminal block into the connector.
### 17.4 Wiring

<table>
<thead>
<tr>
<th>Number of Pin</th>
<th>Signal name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VP</td>
<td>+5V bus power</td>
</tr>
<tr>
<td>2</td>
<td>Rx/Tx-P</td>
<td>Data signal (positive data receive/transmit)</td>
</tr>
<tr>
<td>3</td>
<td>Rx/Tx-N</td>
<td>Data signal (negative data receive/transmit)</td>
</tr>
<tr>
<td>4</td>
<td>DGND</td>
<td>Signal ground</td>
</tr>
<tr>
<td>5</td>
<td>SHIELD</td>
<td>Shield ground</td>
</tr>
</tbody>
</table>

#### Terminating Resistor of Bus

- VP: 390Ω
- Data line Rx/Tx-P: 220Ω
- Data line Rx/Tx-N: 390Ω
- DGND

#### PROFIBUS-DP communication connector and LED

- CHK (red)
- RDY (green)
- ERR (red)

<table>
<thead>
<tr>
<th>LED</th>
<th>Lit</th>
<th>Unlit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHK (red)</td>
<td>User profile error</td>
<td>Normal</td>
</tr>
<tr>
<td>RDY (green)</td>
<td>Normal, Communicating successfully.</td>
<td>No electricity, or Communication failure</td>
</tr>
<tr>
<td>ERR (red)</td>
<td>Communication failure; however, flashing in trial.</td>
<td>Normal</td>
</tr>
</tbody>
</table>

**Modbus slave wiring**

Modbus slave wiring is same as RS-485 communication wiring for Ethernet-serial gateway function.
17.4.17 Power Supply Wiring

**WARNING**

1) Wiring work must be carried out by a person with basic electrical knowledge and practical experience.

2) Be sure to turn OFF the power supply to the controller before wiring to avoid an electric shock. Use a tester or similar device to ensure that no power is being supplied to a cable to be connected.

3) As a safety measure, always install a circuit breaker (an IEC 60947-compatible product, 5 A, 100 V or 220 V AC) in an easily accessible location near the instrument. Moreover, provide indication that the switch is a device for turning off the power to the instrument.

4) Install the power cable keeping a distance of more than 1 cm from other signal wires.

5) The power cable is required to meet the IEC standards concerned or the requirements of the area in which the instrument is being installed.

6) Wiring should be installed to conform to NEC (National Electrical Code: ANSI/NFPA-70) or the wiring construction standards in countries or regions where wiring will be installed.

7) Be sure to use a heat-resistant cable for control output, alarm output, and power wiring.

**CAUTION**

1) Provide electricity from a single-phase power supply. If the power is noisy, install an isolation transformer on the primary side, and use a line filter on the secondary side. When measures against noise are taken, do not install the primary and secondary power cables close to each other.

2) If there is a risk of external lightning surges, use a lightning arrester etc.
17.5 Attaching and Detaching Terminal Cover

After completing the wiring, the terminal cover is recommended to use for the instrument.

Attaching Method

(1) Attach the terminal cover to the rear panel of the main unit horizontally.

(2) The following figure is a mounting image.

When Ethernet communication is specified, cut and use a terminal cover as follows. Cut the cover carefully using nippers etc. so that sharp edge does not remain.

Detaching Method

(1) Slide the terminal cover to the direction of the printed arrow.
### 18.1 Parameter Map

#### Brief Description of Parameter Map

**Group Display**

“E1 to E4” and “1 to 8, R” appearing in the parameter map are displayed on Group display (7 segments, 2 digits) while the menu or parameter is displayed.

- **E1**: indicates the parameter in E1-terminal area
- **E2**: indicates the parameter in E2-terminal area
- **E3**: indicates the parameter in E3-terminal area
- **E4**: indicates the parameter in E4-terminal area
- **1 to 8, R**: indicate the group numbers

► E1 to E4: Terminal assignments in 17.4 Wiring

**Loop-2 Display**

“LP2” appearing in the parameter map indicates that the LP2 lamp (green) is lit.

- **LP2**: indicates that the parameter is for Loop 2. Loop 2 is used when the control mode is Cascade control.

#### Parameter Display Level

The marks below appearing next to the menu symbol and parameter symbol in the parameter map indicate the display/non-display level.

<table>
<thead>
<tr>
<th>Mark</th>
<th>Display</th>
<th>Display level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>EASY</td>
<td>Easy setting mode: Displays the minimum parameters.</td>
<td>Corresponding parameters are displayed in all modes.</td>
</tr>
<tr>
<td>S</td>
<td>STD</td>
<td>Standard setting mode: Displays a wider range of parameters than displayed in the Easy setting mode.</td>
<td>Corresponding parameters are displayed only in Standard setting mode and Professional setting mode. Parameter display level indicators “EASY” and “PRO” are unlit in Standard setting mode. “*: &quot;STD&quot; is the symbol used in this manual only.</td>
</tr>
<tr>
<td>P</td>
<td>PRO</td>
<td>Professional setting mode: Displays all parameters.</td>
<td>Corresponding parameters are displayed only in Professional setting mode.</td>
</tr>
</tbody>
</table>

► Display level: 13.3.2 Setting Parameter Display Level
18.1 Parameter Map

Function of Each Menu

<table>
<thead>
<tr>
<th>Menu symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE</td>
<td>Operation mode (STOP/RUN switch, REMOTE/LOCAL switch, Auto-tuning switch, SP number selection, etc.)</td>
</tr>
</tbody>
</table>

The parameters in the menu of the following table indicate the parameters to set the functions necessary for operation. The symbol in parentheses are shown on Group display.

<table>
<thead>
<tr>
<th>Menu symbol</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>SELECT parameter</td>
</tr>
<tr>
<td>SP</td>
<td>SP and alarm setpoint</td>
</tr>
<tr>
<td>SPS</td>
<td>SP-related function</td>
</tr>
<tr>
<td>ALRM</td>
<td>Alarm function</td>
</tr>
<tr>
<td>PVS</td>
<td>PV-related function</td>
</tr>
<tr>
<td>PID</td>
<td>PID setting</td>
</tr>
<tr>
<td>TUNE</td>
<td>Super, Super 2, Sample PI control, non-linear PID control, Feedforward control, anti-reset windup, output velocity limiter, and manual preset output</td>
</tr>
<tr>
<td>ZONE</td>
<td>Zone control</td>
</tr>
<tr>
<td>SP (LP2)</td>
<td>SP and alarm setpoint (Loop 2)</td>
</tr>
<tr>
<td>SPS (LP2)</td>
<td>SP-related function (Loop 2)</td>
</tr>
<tr>
<td>ALRM (LP2)</td>
<td>Alarm function (Loop 2)</td>
</tr>
<tr>
<td>PVS (LP2)</td>
<td>PV-related function (Loop 2)</td>
</tr>
<tr>
<td>PID (LP2)</td>
<td>PID setting (Loop 2)</td>
</tr>
<tr>
<td>TUNE (LP2)</td>
<td>Super, Super 2, non-linear PID control, anti-reset windup, output velocity limiter, manual preset output (Loop 2)</td>
</tr>
<tr>
<td>ZONE (LP2)</td>
<td>Zone control (Loop 2)</td>
</tr>
<tr>
<td>PPAR</td>
<td>P parameter (for ladder program)</td>
</tr>
<tr>
<td>PYS1 (1)</td>
<td>10-segment linearizer 1</td>
</tr>
<tr>
<td>PYS2 (2)</td>
<td>10-segment linearizer 2</td>
</tr>
<tr>
<td>PYS3 (3)</td>
<td>10-segment linearizer 3</td>
</tr>
<tr>
<td>PYS4 (4)</td>
<td>10-segment linearizer 4</td>
</tr>
</tbody>
</table>
The parameters in the menu of the following table indicate parameters to set the basic functions of the controller. The symbol in parentheses are shown on Group display.

<table>
<thead>
<tr>
<th>Menu symbol</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>PASS</td>
<td>Password setting (Displayed only when the password has been sent.)</td>
</tr>
<tr>
<td>CTL</td>
<td>Control mode, control type, sampling period, number of SP groups, number of PID groups, etc.</td>
</tr>
<tr>
<td>PV</td>
<td>PV input type, range, scale, etc.</td>
</tr>
<tr>
<td>RSP</td>
<td>RSP remote input type, scale, etc.</td>
</tr>
<tr>
<td>AIN2</td>
<td>AIN2 aux. analog input type, scale, etc.</td>
</tr>
<tr>
<td>AIN4</td>
<td>AIN4 aux. analog input type, scale, etc.</td>
</tr>
<tr>
<td>MPV</td>
<td>Input function in Loop control with PV switching and Loop control with PV auto-selector, SP limiters, etc.</td>
</tr>
<tr>
<td>MPV (LP2)</td>
<td>Loop-2 input function, SP limiters (Loop 2), etc in Cascade control.</td>
</tr>
<tr>
<td>OUT</td>
<td>Control output type, valve position adjustment, retransmission output, etc.</td>
</tr>
<tr>
<td>HBA</td>
<td>Heater break alarm</td>
</tr>
<tr>
<td>R485 (E1)</td>
<td>RS-485 communication (E1-terminal area)</td>
</tr>
<tr>
<td>R485 (E3)</td>
<td>RS-485 communication (E3-terminal area)</td>
</tr>
<tr>
<td>R485 (E4)</td>
<td>RS-485 communication (E4-terminal area)</td>
</tr>
<tr>
<td>ETHR (E3)</td>
<td>Ethernet communication, gateway setting, IP access restriction, etc. (E3-terminal area)</td>
</tr>
<tr>
<td>PROF (E3)</td>
<td>PROFI BUS-DP communication (E3-terminal area)</td>
</tr>
<tr>
<td>KEY</td>
<td>Function of User function key</td>
</tr>
<tr>
<td>DISP</td>
<td>Display functions</td>
</tr>
<tr>
<td>CSEL</td>
<td>SELECT Display, SELECT parameter registration</td>
</tr>
<tr>
<td>KLOC</td>
<td>Key lock</td>
</tr>
<tr>
<td>MLOC</td>
<td>Parameter menu lock</td>
</tr>
<tr>
<td>DI.SL</td>
<td>Contact input function</td>
</tr>
<tr>
<td>DI.NU</td>
<td>Contact input function (bit selection)</td>
</tr>
<tr>
<td>DI.D (E1)</td>
<td>Contact input type (equipped as standard)</td>
</tr>
<tr>
<td>DI.D (E3)</td>
<td>Contact input type (E3-terminal area)</td>
</tr>
<tr>
<td>DI.D (E4)</td>
<td>Contact input type (E4-terminal area)</td>
</tr>
<tr>
<td>ALM</td>
<td>Alarm output function, contact output type (equipped as standard)</td>
</tr>
<tr>
<td>DO (E1)</td>
<td>Contact output function, contact output type (E1-terminal area)</td>
</tr>
<tr>
<td>DO (E2)</td>
<td>Contact output function, contact output type (E3-terminal area)</td>
</tr>
<tr>
<td>DO (E3)</td>
<td>Contact output function, contact output type (E4-terminal area)</td>
</tr>
<tr>
<td>I/O</td>
<td>Input / output data display</td>
</tr>
<tr>
<td>SYS</td>
<td>Action setting when recovering from a power failure, guide display language, password setting, etc.</td>
</tr>
<tr>
<td>INIT</td>
<td>Initialization of parameter</td>
</tr>
<tr>
<td>VER</td>
<td>Error status, version, MAC address, etc.</td>
</tr>
<tr>
<td>LVL</td>
<td>Parameter display level</td>
</tr>
</tbody>
</table>

**Note**

Some parameters are not displayed according to the setting such as control mode, control type, or input and output.
## 18.1 Parameter Map

Setting parameters for the functions necessary for operations.

---

<table>
<thead>
<tr>
<th>Operation display</th>
<th>CS menu is displayed when the SELECT parameter has been registered.</th>
</tr>
</thead>
<tbody>
<tr>
<td>END</td>
<td></td>
</tr>
<tr>
<td>MODE</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td></td>
</tr>
<tr>
<td>SPS</td>
<td></td>
</tr>
<tr>
<td>ALRM</td>
<td></td>
</tr>
<tr>
<td>LP2</td>
<td></td>
</tr>
</tbody>
</table>

---

### Parameter Map

- **CS:**
  - CS10
  - CS11
  - CS12
  - CS13
  - CS14
  - CS15
  - CS16
  - CS17
  - CS18
  - CS19
  - **END**

- **SP:**
  - SP1
  - SP2
  - SP3
  - **END**

- **SPS:**
  - SPS1
  - SPS2
  - **END**

- **ALRM:**
  - ALRM1
  - ALRM2
  - ALRM3
  - **END**

---

- **SP1:**
  - PIDN(1)
  - A1(1)
  - A2(1)
  - A3(1)
  - A4(1)
  - A5(1)
  - A6(1)
  - A7(1)
  - A8(1)
  - **END**

- **SP2:**
  - PIDN(8)
  - A8(8)
  - A7(8)
  - A6(8)
  - A5(8)
  - A4(8)
  - A3(8)
  - A2(8)
  - A1(8)
  - **END**

- **SP3:**
  - PIDN(1)
  - A1(1)
  - A2(1)
  - A3(1)
  - A4(1)
  - A5(1)
  - A6(1)
  - A7(1)
  - A8(1)
  - **END**

- **RMS:**
  - RFL(1)
  - RT(1)
  - RBS(1)
  - UPR(1)
  - DNR(1)
  - TMU(1)
  - SPT(1)
  - **END**

- **BS:**
  - FL(1)
  - **END**

- **P1:**
  - I(1)
  - D(1)
  - OH(1)
  - OL(1)
  - MR(1)
  - HY(1)
  - DR(1)
  - **END**

- **P2:**
  - I(8)
  - D(8)
  - OH(8)
  - OL(8)
  - MR(8)
  - HY(8)
  - DR(8)
  - **END**

- **P3:**
  - **END**

---

- **AL1:**
  - AL2
  - AL3
  - AL4
  - AL5
  - AL6
  - AL7
  - AL8
  - **END**

- **AL2:**
  - **END**

- **AL3:**
  - **END**

- **AL4:**
  - **END**

- **AL5:**
  - **END**

- **AL6:**
  - **END**

- **AL7:**
  - **END**

- **AL8:**
  - **END**

---

- **VT1:**
  - **END**

- **HY1:**
  - **END**

- **HY8:**
  - **END**

- **RMS:**
  - **END**

- **ALRM:**
  - **END**

---

**Note:** The diagram shows the flow of parameters and their relationships. Parameters such as PID, RFL, RT, RBS, and UPR are displayed when specific conditions are met, as indicated by the arrows and connections. The parameter map is designed to guide users through the selection and configuration of various settings for specific functions.
has been set.

Displayed
### 18.2 List of Parameters

#### 18.2.1 Operation Parameters

**Operaiton Mode Menu (Menu: MODE)**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.A.M</td>
<td>CAS/AUTO/MAN</td>
<td>EASY</td>
<td>CAS: Cascade mode AUTO: Automatic mode MAN: Manual mode&lt;br&gt;• Parameter C.A.M is displayed when the control mode is Cascade control or Cascade secondary-loop control.</td>
<td>MAN</td>
</tr>
<tr>
<td></td>
<td>switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.R</td>
<td>STOP/RUN switch</td>
<td>EASY</td>
<td>STOP: Stop mode RUN: Run mode&lt;br&gt;Preset output (PO) is generated in STOP mode.&lt;br&gt;Default: Not displayed. STOP/RUN switch is assigned to contact input.</td>
<td>RUN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R.L</td>
<td>REMOTE/LOCAL</td>
<td>EASY</td>
<td>LCL: Local mode REM: Remote mode&lt;br&gt;Select a remote input method for acquiring the target setpoint from remote input, program operation, or communication using the parameter RMS.</td>
<td>LCL</td>
</tr>
<tr>
<td></td>
<td>switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AT</td>
<td>Auto-tuning</td>
<td>EASY</td>
<td>OFF: Disable&lt;br&gt;1 to 8: Perform auto-tuning. Tuning result is stored in the specified numbered PID.&lt;br&gt;R: Tuning result is stored in the PID for reference deviation.</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPNO.</td>
<td>SP number</td>
<td>EASY</td>
<td>1 to 8 (Depends on the setup parameter SPGR. setting.)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>selection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID</td>
<td>PID number</td>
<td>EASY</td>
<td>The PID group number being selected is displayed.&lt;br&gt;1 to 8, R: PID group for reference deviation</td>
<td>1</td>
</tr>
</tbody>
</table>

In Cascade control, the following operation modes are also displayed for secondary loop. (the LP2 lamp is lit)<br>• Operaiton mode: R.L, AT, PID
### 18.2 List of Parameters

**SELECT Parameter Menu (Menu: CS)**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS10 to CS19</td>
<td>SELECT parameter</td>
<td>EASY</td>
<td>Setting range of a registered parameter.</td>
<td>0</td>
</tr>
</tbody>
</table>

**SP and Alarm Setpoint Setting Menu (Menu: SP)**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP</td>
<td>Target setpoint</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range (EU) (Setting range: SPL to SPH)</td>
<td>SPL</td>
</tr>
<tr>
<td>SUB</td>
<td>Sub-target setpoint (in Two-position two-level control)</td>
<td>EASY</td>
<td>Set the offset from SP. -100.0 to 100.0% of PV input range span (EUS)</td>
<td>0.0 % of PV input range span</td>
</tr>
<tr>
<td>PIDN</td>
<td>PID number selection</td>
<td>EASY</td>
<td>1 to 8 (Depends on the PIDG. setting)</td>
<td>Same as SP number.</td>
</tr>
<tr>
<td>A1 to A8</td>
<td>Alarm-1 to -8 setpoint</td>
<td>EASY</td>
<td>Set a display value of setpoint of PV alarm, SP alarm, deviation alarm, output alarm, or velocity alarm. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.</td>
<td>0</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter: SP, SUB, PIDN, A1 to A8

**SP-related Setting Menu (Menu: SPS)**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS</td>
<td>Remote input method</td>
<td>STD</td>
<td>RSP: Via remote (aux. analog) input COM: Via communication</td>
<td>RSP</td>
</tr>
<tr>
<td>RFL</td>
<td>Remote input filter</td>
<td>STD</td>
<td>OFF, 1 to 120 s</td>
<td>OFF</td>
</tr>
<tr>
<td>RT</td>
<td>Remote input ratio</td>
<td>STD</td>
<td>0.001 to 9.999</td>
<td>1.000</td>
</tr>
<tr>
<td>RBS</td>
<td>Remote input bias</td>
<td>STD</td>
<td>-100.0 to 100.0% of PV input range span (EUS)</td>
<td>0.0 % of PV input range span</td>
</tr>
<tr>
<td>UPR</td>
<td>SP ramp-up rate</td>
<td>EASY</td>
<td>OFF, 0.0 + 1 digit to 100.0% of PV input range span (EUS)</td>
<td>OFF</td>
</tr>
<tr>
<td>DNR</td>
<td>SP ramp-down rate</td>
<td>EASY</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>TMU</td>
<td>SP ramp-rate time unit</td>
<td>EASY</td>
<td>HOUR: Ramp-up rate or ramp-down rate per hour MIN: Ramp-up rate or ramp-down rate per minute</td>
<td>HOUR</td>
</tr>
<tr>
<td>SPT</td>
<td>SP tracking selection</td>
<td>STD</td>
<td>OFF, ON</td>
<td>ON</td>
</tr>
<tr>
<td>PVT</td>
<td>PV tracking selection</td>
<td>STD</td>
<td>OFF, ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter: RMS, RFL, RT, RBS, UPR, DNR, TMU, SPT, PVT
### 18.2 List of Parameters

#### Alarm Function Setting Menu (Menu: ALRM)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1 to AL8</td>
<td>Alarm-1 to -8 type</td>
<td>EASY</td>
<td>Set a 5-digit value in the following order. [Alarm type: 2 digits (see below)] + [Without (0) or With (1) Stand-by action] + [Energized (0) or De-energized (1)] + [Latch action (0/1/2/3/4)] For latch action, see chapter 11.</td>
<td>AL1, AL3: PV high limit (01) Without Stand-by action (0) Energized (0) Latch action (0)</td>
</tr>
<tr>
<td>VT1 to VT8</td>
<td>PV velocity alarm time setpoint 1 to 8</td>
<td>EASY</td>
<td>0.01 to 99.59 (minute.second)</td>
<td>1.00</td>
</tr>
<tr>
<td>HY1 to HY8</td>
<td>Alarm-1 to -8 hysteresis</td>
<td>EASY</td>
<td>Set a display value of setpoint of hysteresis. -19999 to 30000 (Set a value within the input range.) Decimal point position depends on the input type.</td>
<td>10</td>
</tr>
<tr>
<td>DYN1 to DYN8</td>
<td>Alarm-1 to -8 On-delay timer</td>
<td>STD</td>
<td>0.00 to 99.59 (minute.second)</td>
<td>0.00</td>
</tr>
<tr>
<td>DYF1 to DYF8</td>
<td>Alarm-1 to -8 Off-delay timer</td>
<td>PRO</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>AMD</td>
<td>Alarm mode</td>
<td>STD</td>
<td>0: Always active 1: Not active in STOP mode 2: Not active in STOP or MAN mode</td>
<td>0</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

- Parameter: AL1 to AL8, VT1 to VT8 HY1 to HY8, DYN1 to DYN8, DYF1 to DYF8, AMD
### PV-related Setting Menu (Menu: PVS)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BS</td>
<td>PV input bias</td>
<td>EASY</td>
<td>-100.0 to 100.0% of PV input range span (EUS)</td>
<td>0.0 % of PV input range span</td>
</tr>
<tr>
<td>FL</td>
<td>PV input filter</td>
<td>EASY</td>
<td>OFF, 1 to 120 s</td>
<td>OFF</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
Parameter: BS, FL

### PID Setting Menu (Menu: PID)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Proportional band Heating-side proportional band (in Heating/cooling control)</td>
<td>EASY</td>
<td>0.0 to 999.9%, When 0.0% is set, it operates as 0.1%, Heating-side ON/OFF control applies when 0.0% in Heating/cooling control</td>
<td>5.0%</td>
</tr>
<tr>
<td>I</td>
<td>Integral time Heating-side integral time (in Heating/cooling control)</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td>240 s</td>
</tr>
<tr>
<td>D</td>
<td>Derivative time Heating-side derivative time (in Heating/cooling control)</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td>60 s</td>
</tr>
<tr>
<td>OH</td>
<td>Control output high limit Heating-side control output high limit (in Heating/cooling control)</td>
<td>EASY</td>
<td>-4.9 to 105.0%, (OL&lt;OH) In Heating/cooling control: 0.1 to 105.0% (OL&lt;OH)</td>
<td>100.0%</td>
</tr>
<tr>
<td>OL</td>
<td>Control output low limit Heating-side control output low limit (in Heating/cooling control)</td>
<td>EASY</td>
<td>-5.0 to 104.9%, (OL&lt;OH), SD: Tight shut In Heating/cooling control: 0.0 to 104.9% (OL&lt;OH)</td>
<td>0.0%</td>
</tr>
<tr>
<td>MR</td>
<td>Manual reset</td>
<td>EASY</td>
<td>Enabled when integral time is OFF. The manual reset value equals the output value when PV = SP. -5.0 to 105.0%</td>
<td>50.0%</td>
</tr>
<tr>
<td>HYS</td>
<td>Hysteresis (in ON/OFF control, Position proportional control, or Two-position two-level control) Heating-side ON/OFF control hysteresis (in Heating/cooling control)</td>
<td>EASY</td>
<td>In ON/OFF control or Two-position two-level control: 0.0 to 100.0% of PV input range span (EUS) In Heating/cooling control or Position proportional control: 0.0 to 100.0%</td>
<td>In ON/OFF control or Two-position two-level control: 0.5 % of PV input range span In Heating/cooling control or Position proportional control: 0.5 %</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter: P, I, D, OH, OL, MR, HYS
### PID Setting Menu (Menu: PID) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SU.HY</td>
<td>Sub-hysteresis (in Two-position two-level control)</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>0.5 % of PV input range span</td>
</tr>
<tr>
<td>HY.UP</td>
<td>Upper-side hysteresis (in ON/OFF control)</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>0.5 % of PV input range span</td>
</tr>
<tr>
<td>HY.LO</td>
<td>Lower-side hysteresis (in ON/OFF control)</td>
<td>EASY</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>0.5 % of PV input range span</td>
</tr>
<tr>
<td>DR</td>
<td>Direct/reverse action switch</td>
<td>STD</td>
<td>RVS: Reverse action, DIR: Direct action</td>
<td>RVS</td>
</tr>
<tr>
<td>SU.DR</td>
<td>Sub-direct/reverse action switch (in Two-position two-level control)</td>
<td>STD</td>
<td>RVS: Reverse action, DIR: Direct action</td>
<td>RVS</td>
</tr>
<tr>
<td>Pc</td>
<td>Cooling-side proportional band</td>
<td>EASY</td>
<td>0.0 to 999.9% (Cooling-side ON/OFF control applies when 0.0% in Heating/cooling control)</td>
<td>5.0%</td>
</tr>
<tr>
<td>Ic</td>
<td>Cooling-side integral time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td>240 s</td>
</tr>
<tr>
<td>Dc</td>
<td>Cooling-side derivative time</td>
<td>EASY</td>
<td>OFF: Disable 1 to 6000 s</td>
<td>60 s</td>
</tr>
<tr>
<td>OHc</td>
<td>Cooling-side control output high limit</td>
<td>EASY</td>
<td>0.1 to 105.0%, (OLc&lt;OHc)</td>
<td>100.0%</td>
</tr>
<tr>
<td>OLc</td>
<td>Cooling-side control output low limit</td>
<td>EASY</td>
<td>0.0 to 104.9%, (OLc&lt;OHc)</td>
<td>0.0%</td>
</tr>
<tr>
<td>HYSc</td>
<td>Cooling-side ON/OFF control hysteresis</td>
<td>EASY</td>
<td>0.0 to 100.0%</td>
<td>0.5%</td>
</tr>
<tr>
<td>DB</td>
<td>Output dead band (in Heating/cooling control or Position proportional control)</td>
<td>EASY</td>
<td>In Heating/cooling control: -100.0 to 50.0% In Position proportional control: 1.0 to 10.0%</td>
<td>3.0%</td>
</tr>
<tr>
<td>PO</td>
<td>Preset output Heating-side preset output (in Heating/cooling control)</td>
<td>EASY</td>
<td>-5.0 to 105.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>SU.PO</td>
<td>Sub-preset output (in Two-position two-level control)</td>
<td>EASY</td>
<td>0%, 100%</td>
<td>0%</td>
</tr>
<tr>
<td>POc</td>
<td>Cooling-side preset output</td>
<td>EASY</td>
<td>-5.0 to 105.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter: DR, Pc, Ic, Dc, OHc, OLc, HYSc, DB, PO, POc
### 18.2 List of Parameters

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC</td>
<td>Super function</td>
<td>EASY</td>
<td>OFF: Disable 1: Overshoot suppressing function (normal mode) 2: Hunting suppressing function (stable mode) Enables to answer the wider characteristic changes compared with response mode. 3: Hunting suppressing function (response mode) Enables quick follow-up and short converging time of PV for the changed SP. 4: Overshoot suppressing function (strong suppressing mode)</td>
<td></td>
</tr>
<tr>
<td>AT.TY</td>
<td>Auto-tuning type</td>
<td>STD</td>
<td>0: Normal 1: Stability</td>
<td>0</td>
</tr>
<tr>
<td>AT.OH</td>
<td>Output high limit in auto-tuning</td>
<td>PRO</td>
<td>-5.0 to 105.0% (Disabled in Heating/cooling control)</td>
<td>100.0%</td>
</tr>
<tr>
<td>AT.OL</td>
<td>Output low limit in auto-tuning</td>
<td>PRO</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>STM</td>
<td>Sample PI sampled time</td>
<td>EASY</td>
<td>0 to 9999 s</td>
<td>60 s</td>
</tr>
<tr>
<td>SWD</td>
<td>Sample PI control time span</td>
<td>EASY</td>
<td>0 to 9999 s</td>
<td>30 s</td>
</tr>
<tr>
<td>GW</td>
<td>Non-linear control gap width</td>
<td>PRO</td>
<td>OFF, 0.0%+1digit to 50.0% of PV input range span (EUS)</td>
<td>OFF</td>
</tr>
<tr>
<td>GG</td>
<td>Non-linear control gain</td>
<td>PRO</td>
<td>0.000 to 1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>BD</td>
<td>Batch PID deviation setpoint</td>
<td>PRO</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>0.0% of PV input range span</td>
</tr>
<tr>
<td>BB</td>
<td>Batch PID bias</td>
<td>PRO</td>
<td>0.0 to 100.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>BL</td>
<td>Batch PID lock-up width</td>
<td>PRO</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>0.0% of PV input range span</td>
</tr>
<tr>
<td>FLG</td>
<td>Feedforward first-order lag time constant</td>
<td>PRO</td>
<td>OFF, 1 to 120 s</td>
<td>OFF</td>
</tr>
<tr>
<td>FGN</td>
<td>Feedforward gain</td>
<td>PRO</td>
<td>-9.999 to 9.999</td>
<td>1.000</td>
</tr>
<tr>
<td>FBI</td>
<td>Feedforward input bias</td>
<td>PRO</td>
<td>-100.0 to 100.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>FBO</td>
<td>Feedforward output bias</td>
<td>PRO</td>
<td>-999.9 to 999.9%</td>
<td>0.0%</td>
</tr>
<tr>
<td>AR</td>
<td>Anti-reset windup (excess integration prevention)</td>
<td>STD</td>
<td>AUTO, 50.0 to 200.0%</td>
<td>AUTO</td>
</tr>
<tr>
<td>OPR</td>
<td>Output velocity limiter</td>
<td>STD</td>
<td>OFF: Disable 0.1 to 100.0%/s</td>
<td>OFF</td>
</tr>
<tr>
<td>OLMT</td>
<td>Output limiter switch</td>
<td>PRO</td>
<td>OFF: Disable output limiter in MAN mode ON: Enable output limiter in MAN mode</td>
<td>ON</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
* Parameter: SC, AT.TY, AT.OH, AT.OL, GW, GG, AR, OPR, OLMT
### 18.2 List of Parameters

#### Tuning Menu (Menu: TUNE) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPO1 to MPO5</td>
<td>Manual preset output 1 to 5</td>
<td>STD</td>
<td>-5.0 to 105.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

- Parameter: MPON, MPO1 to MPO5

#### Zone Control Menu (Menu: ZONE)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP1 to RP7</td>
<td>Reference point 1 to 7</td>
<td>STD</td>
<td>0.0 to 100.0% of PV input range (EU) (RP1 ≤ RP2 ≤ RP3 ≤ RP4 ≤ RP5 ≤ RP6 ≤ RP7)</td>
<td>100.0 % of PV input range</td>
</tr>
<tr>
<td>RHY</td>
<td>Zone PID switching hysteresis</td>
<td>STD</td>
<td>0.0 to 10.0% of PV input range span (EUS)</td>
<td>0.5 % of PV input range span</td>
</tr>
<tr>
<td>RDV</td>
<td>Reference deviation</td>
<td>STD</td>
<td>OFF: Disable 0.0 + 1 digit to 100.0% of PV input range span (EUS)</td>
<td>OFF</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

- Parameter: RP1 to RP7, RHY, RDV

#### P Parameter Menu (Menu: PPAR)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>P01 to P10</td>
<td>P01 to P10 parameter</td>
<td>STD</td>
<td>-19999 to 30000 (Set a decimal point position using LL50A Parameter Setting Software.)</td>
<td>0</td>
</tr>
</tbody>
</table>
### 18.2 List of Parameters

#### 10-segment Linearizer Setting Menu (Menu: PYS1 to PYS4)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A1 to A11</strong></td>
<td>10-segment linearizer input 1 to 11</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>-66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>B1 to B11</strong></td>
<td>10-segment linearizer output 1 to 11</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>10-segment linearizer bias: -66.7 to 105.0% of input range span (EUS) 10-segment linearizer approximation: -66.7 to 105.0% of input range (EU) Output linearizer: -5.0 to 105.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>PMD</strong></td>
<td>10-segment linearizer mode</td>
<td>Group 1, 2: STD Group 3, 4: PRO</td>
<td>0: 10-segment linearizer bias 1: 10-segment linearizer approximation</td>
<td>0</td>
</tr>
</tbody>
</table>

10-segment linearizer parameters are four groups, the group number (1 to 4) is displayed on Group display.

#### Initial value of each control mode

<table>
<thead>
<tr>
<th>Control mode</th>
<th>Group-1 PYS</th>
<th>Group-2 PYS</th>
<th>Group-3 and -4 PYS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-loop control</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Cascade primary-loop control</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Cascade secondary-loop control</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Cascade control</td>
<td>PV</td>
<td>RSP</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control for backup</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control with PV switching</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control with PV auto-selector</td>
<td>PVIN</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Loop control with PV-hold function</td>
<td>PV</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>
## 18.2 List of Parameters

### 18.2.2 Setup Parameters

#### Control Function Setting Menu (Menu: CTL)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTLM</td>
<td>Control mode</td>
<td>STD</td>
<td>SGL: Single-loop control&lt;br&gt;CAS1: Cascade primary-loop control&lt;br&gt;CAS2: Cascade secondary-loop control&lt;br&gt;CAS: Cascade control&lt;br&gt;BUM: Loop control for backup&lt;br&gt;PVSW: Loop control with PV switching&lt;br&gt;PVSEL: Loop control with PV auto-selector&lt;br&gt;PVHD: Loop control with PV-hold function&lt;br&gt;* When using the ladder program, the control mode cannot be changed.</td>
<td>SGL</td>
</tr>
<tr>
<td>CNT</td>
<td>Control type</td>
<td>EASY</td>
<td>PID: PID control&lt;br&gt;ONOF: ON/OFF control (1 point of hysteresis)&lt;br&gt;ONOF2: ON/OFF control (2 points of hysteresis)&lt;br&gt;2P2L: Two-position two-level control&lt;br&gt;H/C: Heating/cooling control&lt;br&gt;S-PI: Sample PI control&lt;br&gt;BATCH: Batch PID control&lt;br&gt;FFPID: Feedforward control</td>
<td>PID</td>
</tr>
<tr>
<td>ALG</td>
<td>PID control mode</td>
<td>PRO</td>
<td>0: Standard PID control mode&lt;br&gt;1: Fixed-point control mode</td>
<td>0</td>
</tr>
<tr>
<td>SPGR.</td>
<td>Number of SP groups</td>
<td>PRO</td>
<td>1 to 8</td>
<td>8</td>
</tr>
<tr>
<td>ALNO.</td>
<td>Number of alarms</td>
<td>PRO</td>
<td>1 to 8</td>
<td>4</td>
</tr>
<tr>
<td>ZON</td>
<td>Zone PID selection</td>
<td>STD</td>
<td>0: SP group number selection 1&lt;br&gt;1: Zone PID selection (selection by PV)&lt;br&gt;2: Zone PID selection (selection by target SP)&lt;br&gt;3: SP group number selection 2&lt;br&gt;4: Zone PID selection (selection by SP)</td>
<td>0</td>
</tr>
<tr>
<td>PIDG.</td>
<td>Number of PID groups</td>
<td>STD</td>
<td>1 to 8</td>
<td>8</td>
</tr>
<tr>
<td>SMP</td>
<td>Input sampling period (control period)</td>
<td>STD</td>
<td>50: 50 ms (Note)&lt;br&gt;100: 100 ms&lt;br&gt;200: 200 ms</td>
<td>100</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter: CNT, ALG, ALNO.
The parameter CNT of Loop 2 displays PID and H/C.

Note: Available when the control mode is not Cascade control (CTLM≠CAS) and the following functions are not used: "SUPER" function, "SUPER 2" function.
### 18.2 List of Parameters

**PV Input Setting Menu (Menu: PV)**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>PV input type</td>
<td>EASY</td>
<td>OFF: Disable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>K1: -270.0 to 1370.0 (°C) / -450.0 to 2500.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>K2: -270.0 to 1000.0 (°C) / -450.0 to 2300.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>K3: -200.0 to 500.0 (°C) / -200.0 to 1000.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>J: -200.0 to 1200.0 (°C) / -300.0 to 2300.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T1: -270.0 to 400.0 (°C) / -450.0 to 750.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T2: 0.0 to 400.0 (°C) / -200.0 to 750.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>B: 0.0 to 1800.0 (°C) / 32 to 3300 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>S: 0.0 to 1700.0 (°C) / 32 to 3100 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>R: 0.0 to 1700.0 (°C) / 32 to 3100 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>N: -200.0 to 1300.0 (°C) / -300.0 to 2400.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E: -270.0 to 1000.0 (°C) / -450.0 to 1800.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L: -200.0 to 900.0 (°C) / -300.0 to 1600.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>U1: -200.0 to 400.0 (°C) / -300.0 to 750.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>U2: 0.0 to 400.0 (°C) / -200.0 to 1000.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>W: 0.0 to 2300.0 (°C) / 32 to 4200 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PL2: 0.0 to 1390.0 (°C) / 32.0 to 2500.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P2040: 0.0 to 1900.0 (°C) / 32 to 3400 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WRE: 0.0 to 2000.0 (°C) / 32 to 3600 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>JPT1: -200.0 to 500.0 (°C) / -300.0 to 1000.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>JPT2: -150.00 to 150.00 (°C) / -200.0 to 300.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PT1: -200.0 to 850.0 (°C) / -300.0 to 1500.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PT2: -200.0 to 500.0 (°C) / -300.0 to 1000.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>PT3: -150.00 to 150.00 (°C) / -200.0 to 300.0 (°F)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.4-2V: 0.400 to 2.000 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1-5V: 1.000 to 5.000 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>4-20: 4.00 to 20.00 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-2V: 0.000 to 2.000 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-10V: 0.00 to 10.00 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-20: 0.00 to 20.00 mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-1020: -10.00 to 20.00 mV</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-100: 0.0 to 100.0 mV</td>
<td></td>
</tr>
</tbody>
</table>

**UNIT**

<table>
<thead>
<tr>
<th>PV input unit</th>
<th>PV input unit</th>
<th>EASY</th>
<th>-: No unit</th>
<th>C: Degree Celsius</th>
<th>-.: No unit</th>
<th>--: No unit</th>
<th>---: No unit</th>
<th>F: Degree Fahrenheit</th>
<th>C</th>
</tr>
</thead>
</table>

**RH**

| Maximum value of PV input range | Maximum value of PV input range | EASY | Depends on the input type. | Depends on the input type | |
|--------------------------------|--------------------------------|------|---------------------------|---------------------------| |
|                                |                                |      | - For temperature input  | - For temperature input  | |
|                                |                                |      |  - Set the temperature range that is actually |  - Set the temperature range that is actually | |
|                                |                                |      | controlled. (RL=RH)      | controlled. (RL=RH)      | |
|                                |                                |      | - For voltage / current input | - For voltage / current input | |
|                                |                                |      |  - Set the range of a voltage / current signal |  - Set the range of a voltage / current signal | |
|                                |                                |      | that is applied.         | that is applied.         | |
|                                |                                |      | The scale across which the voltage / current | The scale across which the voltage / current | |
|                                |                                |      | signal is actually controlled should be set | signal is actually controlled should be set | |
|                                |                                |      | using the maximum value of input scale (SH)  | using the maximum value of input scale (SH)  | |
|                                |                                |      | and minimum value of input scale (SL).       | and minimum value of input scale (SL).       | |
|                                |                                |      | (Input is always 0% when RL = RH.)            | (Input is always 0% when RL = RH.)            | |

**RL**

| Minimum value of PV input range | Minimum value of PV input range | EASY | Depends on the input type | Depends on the input type | |
|--------------------------------|--------------------------------|------|---------------------------|---------------------------| |
|                                |                                |      | - For temperature input  | - For temperature input  | |
|                                |                                |      |  - Set the temperature range that is actually |  - Set the temperature range that is actually | |
|                                |                                |      | controlled. (RL=RH)      | controlled. (RL=RH)      | |
|                                |                                |      | - For voltage / current input | - For voltage / current input | |
|                                |                                |      |  - Set the range of a voltage / current signal |  - Set the range of a voltage / current signal | |
|                                |                                |      | that is applied.         | that is applied.         | |
|                                |                                |      | The scale across which the voltage / current | The scale across which the voltage / current | |
|                                |                                |      | signal is actually controlled should be set | signal is actually controlled should be set | |
|                                |                                |      | using the maximum value of input scale (SH)  | using the maximum value of input scale (SH)  | |
|                                |                                |      | and minimum value of input scale (SL).       | and minimum value of input scale (SL).       | |
|                                |                                |      | (Input is always 0% when RL = RH.)            | (Input is always 0% when RL = RH.)            | |
### 18.2 List of Parameters

#### PV Input Setting Menu (Menu: PV) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
</table>
| SDP              | PV input scale decimal point position | EASY | 0: No decimal place  
1: One decimal place  
2: Two decimal places  
3: Three decimal places  
4: Four decimal places | Depends on the input type |
| SH               | Maximum value of PV input scale | EASY | -19999 to 30000, (SL<SH), | SH - SL ≤ 30000 | Depends on the input type |
| SL               | Minimum value of PV input scale | EASY | 30000 | Depends on the input type |
| BSL              | PV input burnout action | STD | OFF: Disable  
UP: Upscale  
DOWN: Downscale | Depends on the input type |
| RJC              | PV input reference junction compensation | PRO | OFF: RJC OFF  
ON: RJC ON | ON |
| ERJC             | PV input external RJC setpoint | PRO | -10.0 to 60.0 (°C) | 0.0 |
| A.BS             | PV analog input bias | PRO | -100.0 to 100.0% of PV input range span (EUS) | 0.0% of PV input range span |
| A.FL             | PV analog input filter | PRO | OFF, 1 to 120 s | OFF |
| A.SR             | PV analog input square root extraction | PRO | OFF: No square root extraction.  
1: Compute the square root. (The slope equals "1.")  
2: Compute the square root. (The slope equals "0.") | OFF |
| A.LC             | PV analog input low signal cutoff | PRO | 0.0 to 5.0% | 1.0% |
**18.2 List of Parameters**

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>RSP remote input type</td>
<td>EASY</td>
<td>0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V For option /DR, RSP remote input type is same as PV input type.</td>
<td>1-5V</td>
</tr>
<tr>
<td>UNIT</td>
<td>RSP remote input unit</td>
<td>EASY</td>
<td>#: No unit C: Degree Celsius #: No unit #: No unit ---#: No unit F: Degree Fahrenheit</td>
<td>C</td>
</tr>
<tr>
<td>RH</td>
<td>Maximum value of RSP remote input range</td>
<td>EASY</td>
<td>Depends on the input type. - For temperature input (with /DR option) - Set the temperature range that is actually controlled. (RL&lt;RH) - For voltage / current (with /DR option) input - Set the range of a voltage / current signal that is applied. The scale across which the voltage / current signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>RL</td>
<td>Minimum value of RSP remote input range</td>
<td>EASY</td>
<td>Depends on the input type</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>SDP</td>
<td>RSP remote input scale decimal point position</td>
<td>EASY</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>SH</td>
<td>Maximum value of RSP remote input scale</td>
<td>EASY</td>
<td>-19999 to 30000, (SL&lt;SH),</td>
<td>SH -</td>
</tr>
<tr>
<td>SL</td>
<td>Minimum value of RSP remote input scale</td>
<td>EASY</td>
<td>SL</td>
<td>≤ 30000</td>
</tr>
<tr>
<td>BSL</td>
<td>RSP remote input burnout action</td>
<td>STD</td>
<td>OFF: Disable UP: Upscale DOWN: Downscale</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>RJC</td>
<td>RSP remote input reference junction compensation (for /DR option)</td>
<td>PRO</td>
<td>OFF: RJC OFF ON: RJC ON</td>
<td>ON</td>
</tr>
<tr>
<td>ERJC</td>
<td>RSP remote input external RJC setpoint (for /DR option)</td>
<td>PRO</td>
<td>-10.0 to 60.0 (°C)</td>
<td>0.0</td>
</tr>
<tr>
<td>RTD.S</td>
<td>RTD wiring system</td>
<td>STD</td>
<td>3-W: 3-wire system 4-W: 4-wire system</td>
<td>3-W</td>
</tr>
</tbody>
</table>

When each parameter is displayed, the terminal area (E1) is displayed on Group display.
## RSP Input Setting Menu (Menu: RSP) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.BS</td>
<td>RSP aux. analog input bias</td>
<td>PRO</td>
<td>-100.0 to 100.0% of RSP input range span (EUS)</td>
<td>0.0 % of RSP input range span</td>
</tr>
<tr>
<td>A.FL</td>
<td>RSP aux. analog input filter</td>
<td>PRO</td>
<td>OFF, 1 to 120 s</td>
<td>OFF</td>
</tr>
</tbody>
</table>
| A.SR             | RSP aux. analog input square root extraction | PRO       | OFF: No square root extraction.  
1: Compute the square root. (The slope equals “1.”)  
2: Compute the square root. (The slope equals “0.”) | OFF           |
| A.LC             | RSP aux. analog input low signal cutoff    | PRO           | 0.0 to 5.0%                                                                  | 1.0%          |
| DI6.D            | DI16 contact type                         | PRO           | CLS: The assigned function is enabled when the contact is closed.  
OPN: The assigned function is enabled when the contact is opened. | CLS           |

When each parameter is displayed, the terminal area (E1) is displayed on Group display.
### AIN2 Aux. Analog Input Setting Menu (Menu: AIN2) (E2 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>AIN2 aux. analog input type</td>
<td>EASY</td>
<td>0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.00 to 10.00 V 0-125: 0.000 to 1.250 V</td>
<td>1-5V</td>
</tr>
<tr>
<td>UNIT</td>
<td>AIN2 aux. analog input unit</td>
<td>EASY</td>
<td>-: No unit C: Degree Celsius -: No unit --: No unit F: Degree Fahrenheit</td>
<td>C</td>
</tr>
<tr>
<td>RH</td>
<td>Maximum value of AIN2 aux. analog input range</td>
<td>EASY</td>
<td>Depends on the input type. Set the range of a voltage signal that is applied.</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>RL</td>
<td>Minimum value of AIN2 aux. analog input range</td>
<td>EASY</td>
<td>The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>SDP</td>
<td>AIN2 aux. analog input scale decimal point position</td>
<td>EASY</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>SH</td>
<td>Maximum value of AIN2 aux. analog input scale</td>
<td>EASY</td>
<td>-19999 to 30000, (SL&lt;SH),</td>
<td>SH - SL</td>
</tr>
<tr>
<td>SL</td>
<td>Minimum value of AIN2 aux. analog input scale</td>
<td>EASY</td>
<td>Depends on the input type</td>
<td></td>
</tr>
<tr>
<td>BSL</td>
<td>AIN2 aux. analog input burnout action</td>
<td>STD</td>
<td>OFF: Disable UP: Upscale DOWN: Downscale</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>A.BS</td>
<td>AIN2 aux. analog input bias</td>
<td>PRO</td>
<td>-100.0 to 100.0% of AIN2 input range span (EUS)</td>
<td>0.0 % of AIN2 input range span</td>
</tr>
<tr>
<td>A.FL</td>
<td>AIN2 aux. analog input filter</td>
<td>PRO</td>
<td>OFF, 1 to 120 s</td>
<td>OFF</td>
</tr>
<tr>
<td>A.SR</td>
<td>AIN2 aux. analog input square root extraction</td>
<td>PRO</td>
<td>OFF: No square root extraction. 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)</td>
<td>OFF</td>
</tr>
<tr>
<td>A.LC</td>
<td>AIN2 aux. analog input low signal cutoff</td>
<td>PRO</td>
<td>0.0 to 5.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>DI6.D</td>
<td>DI26 contact type</td>
<td>PRO</td>
<td>CLS: The assigned function is enabled when the contact is closed. OPN: The assigned function is enabled when the contact is opened.</td>
<td>CLS</td>
</tr>
</tbody>
</table>

When each parameter is displayed, the terminal area (E2) is displayed on Group display.
### AIN4 Aux. Analog Input Setting Menu (Menu: AIN4) (E4 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>AIN4 aux. analog input type</td>
<td>EASY</td>
<td>0.4-2V: 0.400 to 2.000 V 1-5V: 1.000 to 5.000 V 0-2V: 0.000 to 2.000 V 0-10V: 0.000 to 10.000 V 0-125: 0.000 to 1.250 V</td>
<td>1-5V</td>
</tr>
<tr>
<td>UNIT</td>
<td>AIN4 aux. analog input unit</td>
<td>EASY</td>
<td>#: No unit C: Degree Celsius #: No unit #: No unit #: No unit F: Degree Fahrenheit</td>
<td>C</td>
</tr>
<tr>
<td>RH</td>
<td>Maximum value of AIN4 aux. analog input range</td>
<td>EASY</td>
<td>Depends on the input type. Set the range of a voltage signal that is applied.</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>RL</td>
<td>Minimum value of AIN4 aux. analog input range</td>
<td>EASY</td>
<td>The scale across which the voltage signal is actually controlled should be set using the maximum value of input scale (SH) and minimum value of input scale (SL). (Input is always 0% when RL = RH.)</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>SDP</td>
<td>AIN4 aux. analog input scale decimal point position</td>
<td>EASY</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>SH</td>
<td>Maximum value of AIN4 aux. analog input scale</td>
<td>EASY</td>
<td>-19999 to 30000, (SL&lt;SH),</td>
<td>SH - SL</td>
</tr>
<tr>
<td>SL</td>
<td>Minimum value of AIN4 aux. analog input scale</td>
<td>EASY</td>
<td>0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>BSL</td>
<td>AIN4 aux. analog input burnout action</td>
<td>STD</td>
<td>OFF: Disable UP: Upscale DOWN: Downsacle</td>
<td>Depends on the input type</td>
</tr>
<tr>
<td>A.BS</td>
<td>AIN4 aux. analog input bias</td>
<td>PRO</td>
<td>-100.0 to 100.0% of AIN4 input range span (EUS)</td>
<td>0.0 % of AIN4 input range span</td>
</tr>
<tr>
<td>A.FL</td>
<td>AIN4 aux. analog input filter</td>
<td>PRO</td>
<td>OFF, 1 to 120 s</td>
<td>OFF</td>
</tr>
<tr>
<td>A.SR</td>
<td>AIN4 aux. analog input square root extraction</td>
<td>PRO</td>
<td>OFF: No square root extraction. 1: Compute the square root. (The slope equals “1.”) 2: Compute the square root. (The slope equals “0.”)</td>
<td>OFF</td>
</tr>
<tr>
<td>A.LC</td>
<td>AIN4 aux. analog input low signal cutoff</td>
<td>PRO</td>
<td>0.0 to 5.0%</td>
<td>1.0%</td>
</tr>
<tr>
<td>DI6.D</td>
<td>DI46 contact type</td>
<td>PRO</td>
<td>CLS: The assigned function is enabled when the contact is closed. OPN: The assigned function is enabled when the contact is opened.</td>
<td>CLS</td>
</tr>
</tbody>
</table>

When each parameter is displayed, the terminal area (E4) is displayed on Group display.
## List of Parameters

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
</table>
| **P.UNI** | Control PV input unit | STD | -: No unit  
C: Degree Celsius  
 -: No unit  
 --: No unit  
 ---: No unit  
 F: Degree Fahrenheit | Same as PV input unit |
| **P.DP** | Control PV input decimal point position | STD | 0: No decimal place  
1: One decimal place  
2: Two decimal places  
3: Three decimal places  
4: Four decimal places | 1 |
| **P.RH** | Maximum value of control PV input range | STD | -19999 to 30000, \(| P.RH < P.RL \) \| P.RH - P.RL \| \leq 30000 \) | Depends on the input type |
| **P.RL** | Minimum value of control PV input range | STD | Depends on the input type |
| **PV.HL** | Input switching PV high limit (in Loop control with PV switching) | STD | 0.0 to 100.0% of control PV input range (EU), \((PV.HL > PV.LL)\) | 100.0% of control PV input range |
| **PV.LL** | Input switching PV low limit (in Loop control with PV switching) | STD | Depends on the input type |
| **PV.2C** | Input switching action (in Loop control with PV switching) | STD | 0: Switch based on low limit of temperature range  
1: Switch using the parameter PV.HL  
2: Switch using DI  
3: Switch based on high limit of temperature range | 0 |
| **PV.AS** | Input computation selection (in Loop control with PV auto-selector) | STD | 0: Max. value  
1: Min. value  
2: Ave. value  
3: Input 1 - Input 2  
4: Input 2 - Input 1 | 0 |
| **PV.NU** | Number of inputs (in Loop control with PV auto-selector) | STD | 2: Use Input 1 and Input 2  
3: Use Input 1, Input 2, and Input 3  
4: Use 4 inputs | 2 |
| **SPH** | SP high limit | STD | 0.0 to 100.0% of PV input range (EU), \((SPH < SPL)\) | 100.0% of PV input range |
| **SPL** | SP low limit | STD | 0.0% of PV input range | 0.0% of PV input range |

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

- Parameter: P.UNI, P.DP, P.RH, P.RL, SPH, SPL
### 18.2 List of Parameters

#### Output Setting Menu (Menu: OUT)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OT</td>
<td>Output type selection</td>
<td>EASY</td>
<td>Control output or Heating-side control output (Lower two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) 07: RET terminals (voltage pulse) Cooling-side control output (Upper two digits) 00: OFF 01: OUT terminals (voltage pulse) 02: OUT terminals (current) 03: OUT terminals (relay) 04: OUT2 terminals (voltage pulse) 05: OUT2 terminals (current) 06: OUT2 terminals (relay) 07: RET terminals (voltage pulse)</td>
<td>Standard type: 00.03 Heating/cooling type: 06.03</td>
</tr>
<tr>
<td>CT</td>
<td>Control output cycle time Heating-side control output cycle time (in Heating/cooling control)</td>
<td>EASY</td>
<td>0.5 to 1000.0 s</td>
<td>30.0 s</td>
</tr>
<tr>
<td>CTc</td>
<td>Cooling-side control output cycle time</td>
<td>EASY</td>
<td>OFF</td>
<td>30.0 s</td>
</tr>
<tr>
<td>VAT</td>
<td>Automatic valve position adjustment</td>
<td>EASY</td>
<td>OFF: Stop automatic adjustment ON: Start automatic adjustment</td>
<td>OFF</td>
</tr>
<tr>
<td>V.RS</td>
<td>Valve position setting reset</td>
<td>EASY</td>
<td>Setting V.RS to ON resets the valve adjustment settings and causes the indication “V.RS” to blink.</td>
<td>OFF</td>
</tr>
<tr>
<td>V.L</td>
<td>Fully-closed valve position setting</td>
<td>EASY</td>
<td>Pressing the SET/ENTER key with valve position set to the fully-closed position by Down arrow key causes the adjusted value to be stored. When V.L adjustment is complete, V.L stops blinking.</td>
<td>-</td>
</tr>
<tr>
<td>V.H</td>
<td>Fully-open valve position setting</td>
<td>EASY</td>
<td>Pressing the SET/ENTER key with valve position set to the fully-opened position by Up arrow key causes the adjusted value to be stored. When V.H adjustment is complete, V.H stops blinking.</td>
<td>-</td>
</tr>
<tr>
<td>TR.T</td>
<td>Valve traveling time</td>
<td>STD</td>
<td>5 to 300 s</td>
<td>60 s</td>
</tr>
<tr>
<td>V.MOD</td>
<td>Valve adjusting mode</td>
<td>STD</td>
<td>0: Valve position feedback type 1: Valve position feedback type (moves to the estimating type if a feedback input error or break occurs.) 2: Valve position estimating type</td>
<td>0</td>
</tr>
</tbody>
</table>
### Parameters

#### Output Setting Menu (Menu: OUT) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTS</td>
<td>Retransmission output type of RET</td>
</tr>
<tr>
<td>RTH</td>
<td>Maximum value of retransmission output scale of RET</td>
</tr>
<tr>
<td>RTL</td>
<td>Minimum value of retransmission output scale of RET</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTS</td>
<td>EASY</td>
<td>OFF: Disable&lt;br&gt;PV1: PV&lt;br&gt;SP1: SP&lt;br&gt;OUT1: OUT (Valve opening: 0 to 100 % in Position proportional control)&lt;br&gt;LPS: 15 V DC loop power supply&lt;br&gt;PV2: Loop-2 PV&lt;br&gt;SP2: Loop-2 SP&lt;br&gt;OUT2: Loop-2 OUT&lt;br&gt;TSP1: Target SP&lt;br&gt;HOUT1: Heating-side OUT&lt;br&gt;COUT1: Cooling-side OUT&lt;br&gt;MV1: Position proportional output internal computed value&lt;br&gt;TSP2: Loop-2 target SP&lt;br&gt;HOUT2: Loop-2 heating-side OUT&lt;br&gt;COUT2: Loop-2 cooling-side OUT&lt;br&gt;MV2: Loop-2 position proportional output (internal computed value)&lt;br&gt;PV: PV terminals analog input&lt;br&gt;RSP: RSP terminals analog input&lt;br&gt;AIN2: AIN2 terminals analog input&lt;br&gt;AIN4: AIN4 terminals analog input&lt;br&gt;Loop-2 setting values are unavailable in Single-loop control.</td>
<td>PV1</td>
</tr>
<tr>
<td>RTH</td>
<td>STD</td>
<td>When RTS = PV1, SP1, PV2, SP2, TSP1, TSP2, PV, RSP, AIN2, or AIN4, 100 % of PV input range</td>
<td>100 % of PV input range</td>
</tr>
<tr>
<td>RTL</td>
<td>STD</td>
<td>When RTS = PV1, SP1, or TSP1, decimal point position is same as that of PV input.&lt;br&gt;When RTS = PV2, SP2, or TSP2, decimal point position is same as that of RSP input.&lt;br&gt;When RTS = PV, decimal point position is same as that of PV input scale.&lt;br&gt;When RTS = RSP, decimal point position is same as that of RSP input scale.&lt;br&gt;When RTS = AIN2, decimal point position is same as that of AIN2 scale.&lt;br&gt;When RTS = AIN4, decimal point position is same as that of AIN4 scale.</td>
<td>0 % of PV input range</td>
</tr>
</tbody>
</table>
### 18.2 List of Parameters

#### Output Setting Menu (Menu: OUT) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>O1RS</td>
<td>Retransmission output type of OUT current output</td>
<td>STD</td>
<td>Same as RTS</td>
<td>OFF</td>
</tr>
<tr>
<td>O1RH</td>
<td>Maximum value of retransmission output scale of OUT current output</td>
<td>STD</td>
<td>When O1RS = PV1, SP1, PV2, SP2, TSP1, PV, RSP, AIN2, or AIN4, O1RL + 1 digit to 30000 -19999 to O1RH - 1 digit</td>
<td>-</td>
</tr>
<tr>
<td>O1RL</td>
<td>Minimum value of retransmission output scale of OUT current output</td>
<td>STD</td>
<td>Decimal point position: When O1RS = PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O1RS = PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O1RS = PV, decimal point position is same as that of PV input scale. When O1RS = RSP, decimal point position is same as that of RSP input scale. When O1RS = AIN2, decimal point position is same as that of AIN2 scale. When O1RS = AIN4, decimal point position is same as that of AIN4 scale.</td>
<td>-</td>
</tr>
<tr>
<td>O2RS</td>
<td>Retransmission output type of OUT2 current output</td>
<td>STD</td>
<td>Same as RTS</td>
<td>OFF</td>
</tr>
<tr>
<td>O2RH</td>
<td>Maximum value of retransmission output scale of OUT2 current output</td>
<td>STD</td>
<td>When O2RS = PV1, SP1, PV2, SP2, TSP2, PV, RSP, AIN2, or AIN4, O2RL + 1 digit to 30000 -19999 to O2RH - 1 digit</td>
<td>-</td>
</tr>
<tr>
<td>O2RL</td>
<td>Minimum value of retransmission output scale of OUT2 current output</td>
<td>STD</td>
<td>Decimal point position: When O2RS = PV1, SP1, or TSP1, decimal point position is same as that of PV input. When O2RS = PV2, SP2, or TSP2, decimal point position is same as that of RSP input. When O2RS = PV, decimal point position is same as that of PV input scale. When O2RS = RSP, decimal point position is same as that of RSP input scale. When O2RS = AIN2, decimal point position is same as that of AIN2 scale. When O2RS = AIN4, decimal point position is same as that of AIN4 scale.</td>
<td>-</td>
</tr>
</tbody>
</table>
### Output Setting Menu (Menu: OUT) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OU.H</td>
<td>100% segmental point of OUT current output</td>
<td>PRO</td>
<td>-100.0 to 200.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>OU.L</td>
<td>0% segmental point of OUT current output</td>
<td>PRO</td>
<td>PRO</td>
<td>0.0%</td>
</tr>
<tr>
<td>OU2.H</td>
<td>100% segmental point of OUT2 current output</td>
<td>PRO</td>
<td>PRO</td>
<td>100.0%</td>
</tr>
<tr>
<td>OU2.L</td>
<td>0% segmental point of OUT2 current output</td>
<td>PRO</td>
<td>PRO</td>
<td>0.0%</td>
</tr>
<tr>
<td>RET.H</td>
<td>100% segmental point of RET current output</td>
<td>PRO</td>
<td>PRO</td>
<td>100.0%</td>
</tr>
<tr>
<td>RET.L</td>
<td>0% segmental point of RET current output</td>
<td>PRO</td>
<td>PRO</td>
<td>0.0%</td>
</tr>
<tr>
<td>OU.A</td>
<td>OUT current output range</td>
<td>PRO</td>
<td>4-20: 4 to 20 mA</td>
<td>4-20</td>
</tr>
<tr>
<td>OU2.A</td>
<td>OUT2 current output range</td>
<td>PRO</td>
<td>0-20: 0 to 20 mA</td>
<td>4-20</td>
</tr>
<tr>
<td>RET.A</td>
<td>RET current output range</td>
<td>PRO</td>
<td>20-0: 0 to 4 mA</td>
<td>4-20</td>
</tr>
</tbody>
</table>

### Heater Break Alarm Setting Menu (Menu: HBA)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB1.S, HB2.S</td>
<td>Heater break alarm-1, -2 function selection</td>
<td>EASY</td>
<td>0: Heater current measurement</td>
<td>1</td>
</tr>
<tr>
<td>HB1, HB2</td>
<td>Heater break alarm-1, -2 current setpoint</td>
<td>EASY</td>
<td>OFF, 0.1 to 300.0 Arms</td>
<td>OFF</td>
</tr>
<tr>
<td>CT1.T, CT2.T</td>
<td>CT1, CT2 coil winding number ratio</td>
<td>EASY</td>
<td>1 to 3300</td>
<td>800</td>
</tr>
<tr>
<td>HDN1, HDN2</td>
<td>Heater break alarm-1, -2 On-delay timer</td>
<td>STD</td>
<td>0.00 to 99.59 (minute.second)</td>
<td>0.00</td>
</tr>
<tr>
<td>HDF1, HDF2</td>
<td>Heater break alarm-1, -2 Off-delay timer</td>
<td>PRO</td>
<td>PRO</td>
<td>CLS</td>
</tr>
<tr>
<td>HB1.D, HB2.D</td>
<td>Heater break alarm-1, -2 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td>CLS</td>
</tr>
</tbody>
</table>
# 18.2 List of Parameters

## RS-485 Communication Setting Menu (Menu: R485) (E1, E3 and E4 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSL</td>
<td>Protocol selection</td>
<td>EASY</td>
<td>PCL: PC link communication PCLSM: PC link communication (with checksum) LADR: Ladder communication CO-M: Coordinated master station CO-S: Coordinated slave station MBASC: Modbus (ASCII) MBRTU: Modbus (RTU) CO-S1: Coordinated slave station (Loop-1 mode) CO-S2: Coordinated slave station (Loop-2 mode) P-P: Peer-to-peer communication</td>
<td>MBRTU</td>
</tr>
<tr>
<td>BPS</td>
<td>Baud rate</td>
<td>EASY</td>
<td>600: 600 bps 1200: 1200 bps 2400: 2400 bps 4800: 4800 bps 9600: 9600 bps 19200: 19.2k bps 38400: 38.4k bps (except for communication of E4 terminal area)</td>
<td>19200</td>
</tr>
<tr>
<td>PRI</td>
<td>Parity</td>
<td>EASY</td>
<td>NONE: None EVEN: Even ODD: Odd</td>
<td>EVEN</td>
</tr>
<tr>
<td>STP</td>
<td>Stop bit</td>
<td>EASY</td>
<td>1: 1 bit, 2: 2 bits</td>
<td>1</td>
</tr>
<tr>
<td>DLN</td>
<td>Data length</td>
<td>EASY</td>
<td>7: 7 bits, 8: 8 bits</td>
<td>8</td>
</tr>
<tr>
<td>ADR</td>
<td>Address</td>
<td>EASY</td>
<td>1 to 99</td>
<td>1</td>
</tr>
<tr>
<td>RP.T</td>
<td>Minimum response time</td>
<td>PRO</td>
<td>0 to 10 (x10ms)</td>
<td>0</td>
</tr>
</tbody>
</table>

When each parameter is displayed, the terminal area (E1, E2 or E4) is displayed on Group display.

- Parameter: PSL, BPS, STP, DLN, ADR, RP.T
# 18.2 List of Parameters

## Ethernet Communication Setting Menu (Menu: ETHR) (E3 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSR</td>
<td>High-speed response mode</td>
<td>EASY</td>
<td>OFF, 1 to 8</td>
<td>1</td>
</tr>
<tr>
<td>BPS</td>
<td>Baud rate</td>
<td>EASY</td>
<td>9600: 9600 bps</td>
<td>38400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19200: 19.2k bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>38400: 38.4k bps</td>
<td></td>
</tr>
<tr>
<td>PRI</td>
<td>Parity</td>
<td>EASY</td>
<td>NONE: None</td>
<td>EVEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EVEN: Even</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ODD: Odd</td>
<td></td>
</tr>
<tr>
<td>IP1 to IP4</td>
<td>IP address 1 to 4</td>
<td>EASY</td>
<td>0 to 255</td>
<td>See left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial value: 192.168.1.1</td>
<td></td>
</tr>
<tr>
<td>SM1 to SM4</td>
<td>Subnet mask 1 to 4</td>
<td>EASY</td>
<td>0 to 255</td>
<td>See left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial value: 255.255.255.0</td>
<td></td>
</tr>
<tr>
<td>DG1 to DG4</td>
<td>Default gateway 1 to 4</td>
<td>EASY</td>
<td>0 to 255</td>
<td>See left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial value: 0.0.0.0</td>
<td></td>
</tr>
<tr>
<td>PRT</td>
<td>Port number</td>
<td>EASY</td>
<td>502, 1024 to 65535</td>
<td>502</td>
</tr>
<tr>
<td>IPAR</td>
<td>IP access restriction</td>
<td>EASY</td>
<td>OFF: Disable, ON: Enable</td>
<td>OFF</td>
</tr>
<tr>
<td>1.IP1 to 1.IP4</td>
<td>Permitted IP address 1-1 to 1-4</td>
<td>EASY</td>
<td>0 to 255</td>
<td>See left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial value: 255.255.255.255</td>
<td></td>
</tr>
<tr>
<td>2.IP1 to 2.IP4</td>
<td>Permitted IP address 2-1 to 2-4</td>
<td>EASY</td>
<td>0 to 255</td>
<td>See left</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Initial value: 255.255.255.255</td>
<td></td>
</tr>
<tr>
<td>ESW</td>
<td>Ethernet setting switch</td>
<td>EASY</td>
<td>OFF, ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

When each parameter is displayed, the terminal area (E3) is displayed on Group display.

## PROFIBUS-DP Communication Setting Menu (Menu: PROF) (E3 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR</td>
<td>Baud rate</td>
<td>STD</td>
<td>9.6K: 9.6k bps</td>
<td>AUTO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19.2K: 19.2k bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>93.75K: 93.75k bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>187.5K: 187.5k bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.5M: 0.5M bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.5M: 1.5M bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3M: 3M bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>6M: 6M bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12M: 12M bps</td>
<td>AUTO</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>45.45K: 45.45k bps</td>
<td></td>
</tr>
<tr>
<td>ADR</td>
<td>Address</td>
<td>STD</td>
<td>0 to 125</td>
<td>3</td>
</tr>
<tr>
<td>BPS</td>
<td>Baud rate</td>
<td>STD</td>
<td>9600: 9600 bps</td>
<td>38400</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>19200: 19.2k bps</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>38400: 38.4k bps</td>
<td></td>
</tr>
<tr>
<td>FILE</td>
<td>Profile number</td>
<td>STD</td>
<td>0 to 5</td>
<td>0</td>
</tr>
<tr>
<td>SCAN</td>
<td>Automatic rescan time</td>
<td>STD</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1M: 1 minute</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10M: 10 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30M: 30 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60M: 60 minutes</td>
<td></td>
</tr>
</tbody>
</table>

When each parameter is displayed, the terminal area (E3) is displayed on Group display.
## 18.2 List of Parameters

### Key Action Setting Menu (Menu: KEY)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 to F2</td>
<td>User function key-1,-2 action setting</td>
<td>EASY</td>
<td>OFF: Disable A/M: AUTO/MAN switch C/I/A/M: CAS/AUTO/MAN switch R/L1: REM/LCL switch R/L2: Loop-2 REM/LCL switch S/R: STOP/RUN switch CAS: Switch to CAS AUTO: Switch to AUTO MAN: Switch to MAN REM1: Switch to REM LCL1: Switch to LCL REM2: Switch to Loop-2 REM LCL2: Switch to Loop-2 LCL STOP: Switch to STOP RUN: Switch to RUN AT: Auto-tuning LTUP: LCD brightness UP LTDN: LCD brightness DOWN BRI: Adjust LCD brightness LCD: LCD backlight ON/OFF switch LAT: Latch release PID: PID tuning switch Loop-2 setting values are unavailable in Single-loop control.</td>
<td>OFF</td>
</tr>
<tr>
<td>Fn</td>
<td>User function key-n action setting</td>
<td>EASY</td>
<td>OFF: Disable A/M: AUTO/MAN switch C/I/A/M: CAS/AUTO/MAN switch R/L1: REM/LCL switch R/L2: Loop-2 REM/LCL switch S/R: STOP/RUN switch CAS: Switch to CAS AUTO: Switch to AUTO MAN: Switch to MAN</td>
<td>PID</td>
</tr>
<tr>
<td>A/M</td>
<td>A/M key action setting</td>
<td>PRO</td>
<td>OFF: Disable A/M: AUTO/MAN switch C/I/A/M: CAS/AUTO/MAN switch R/L1: REM/LCL switch R/L2: Loop-2 REM/LCL switch S/R: STOP/RUN switch CAS: Switch to CAS AUTO: Switch to AUTO MAN: Switch to MAN</td>
<td>A/M</td>
</tr>
<tr>
<td>Parameter symbol</td>
<td>Name</td>
<td>Display level</td>
<td>Setting range</td>
<td>Initial value</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>DVB</td>
<td>Deviation display band</td>
<td>STD</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>1.0 % of PV input range span</td>
</tr>
</tbody>
</table>
| PCMD             | Active color PV display switch    | EASY          | 0: Fixed in white  
1: Fixed in red  
2: Link to alarm 1 (Alarm OFF: white, Alarm ON: red)  
3: Link to alarm 1 (Alarm OFF: red, Alarm ON: white)  
4: Link to alarm 1 or 2 (Alarm OFF: white, Alarm ON: red)  
5: Link to alarm 1 or 2 (Alarm OFF: red, Alarm ON: white)  
6: PV limit (Within range: white, Out of range: red)  
7: PV limit (Within range: red, Out of range: white)  
8: SP deviation (Within deviation: white, Out of deviation: red)  
9: SP deviation (Within deviation: red, Out of deviation: white) | 0             |
| PCH              | PV color change high limit        | EASY          | Set a display value when in PV limit or SP deviation.                           | 0             |
| PCL              | PV color change low limit         | EASY          | -19999 to 30000 (Set a value within the input range.)  
Decimal point position depends on the input type. |
| BAR1             | Upper bar-graph display registration | STD           | 0: Disable  
1: OUT, Heating-side OUT, Internal value in Position proportional control  
2: Cooling-side OUT  
3: PV  
4: SP  
5: Deviation  
6: Loop-2 OUT, Loop-2 heating-side OUT  
7: Loop-2 cooling-side OUT  
8: Loop-2 PV  
9: Loop-2 SP  
10: Loop-2 deviation  
11 to 16: Disable  
17: Feedback input (valve opening)  
18: PV terminals analog input  
19: RSP terminals analog input  
20: AIN2 terminals analog input  
21: AIN4 terminals analog input  
22: Segment progression of program pattern operation | 5 (Heating/cooling type: 1) |
| BAR2             | Lower bar-graph display registration | STD           | 1 (Heating/cooling type: 2)  
(Position proportional type: 17) | 1             |

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)  
- Parameter:DVB, PCMD, PCH, PCL
## 18.2 List of Parameters

### Display Function Setting Menu (Menu: DISP) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDV</td>
<td>Bar-graph deviation display band</td>
<td>STD</td>
<td>0.0 to 100.0% of PV input range span (EUS)</td>
<td>10.0% of PV input range span</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV1 to EV8</td>
<td>EV1 to EV8 display condition registration</td>
<td>PRO</td>
<td>Setting range: 4001 to 6304</td>
<td>OFF: Disable</td>
</tr>
</tbody>
</table>

#### Loop 1
- EV1: 4321
- EV2: 4322
- EV3: 4323
- EV4: 4325
- EV5: 4326
- EV6: 4327
- EV7: 4329
- EV8: 4330

#### Loop 2
- EV1: 4337
- EV2: 4338
- EV3: 4339
- EV4: 4341
- EV5: 4342
- EV6: 4343
- EV7: 4345
- EV8: 4346

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

- Parameter: BDV, EV1 to EV8

For other functions, see the UTAdvanced Series Communication Interface User’s Manual.
### 18.2 List of Parameters

#### Display Function Setting Menu (Menu: DISP) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV.D</td>
<td>PV display area ON/OFF</td>
<td>PRO</td>
<td>OFF: Nondisplay, ON: Display</td>
<td>ON</td>
</tr>
<tr>
<td>SP.D</td>
<td>Setpoint display area ON/OFF</td>
<td>PRO</td>
<td>OFF: Nondisplay, ON: Display</td>
<td>ON</td>
</tr>
<tr>
<td>STS.D</td>
<td>Status display area ON/OFF</td>
<td>PRO</td>
<td>OFF: Nondisplay</td>
<td>ON</td>
</tr>
<tr>
<td>SPD</td>
<td>Scroll speed</td>
<td>PRO</td>
<td>(Slow) 1 to 8 (Quick)</td>
<td>4</td>
</tr>
<tr>
<td>GUID</td>
<td>Guide display ON/OFF</td>
<td>STD</td>
<td>OFF: Nondisplay</td>
<td>ON</td>
</tr>
<tr>
<td>ECO</td>
<td>Economy mode</td>
<td>STD</td>
<td>OFF: Disable, 1: Economy mode ON (All indications except PV display OFF), 2: Economy mode ON (All indications OFF), 3: Brightness 10 % (All indications)</td>
<td>OFF</td>
</tr>
<tr>
<td>BRI</td>
<td>Brightness</td>
<td>EASY</td>
<td>(Dark) 1 to 5 (Bright)</td>
<td>3</td>
</tr>
<tr>
<td>B.PVW</td>
<td>White brightness adjustment of PV display</td>
<td>PRO</td>
<td>Adjusts the white brightness of PV display. Dark) -4 to 4 (Bright)</td>
<td>0</td>
</tr>
<tr>
<td>B.PVR</td>
<td>Red brightness adjustment of PV display</td>
<td>PRO</td>
<td>Adjusts the red brightness of PV display. (Dark) -4 to 4 (Bright)</td>
<td>0</td>
</tr>
<tr>
<td>B.SP</td>
<td>Brightness adjustment of SP display</td>
<td>PRO</td>
<td>Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)</td>
<td>0</td>
</tr>
<tr>
<td>B.BAR</td>
<td>Brightness adjustment of Bar-graph display</td>
<td>PRO</td>
<td>Adjusts the brightness of SP display. (Dark) -4 to 4 (Bright)</td>
<td>0</td>
</tr>
<tr>
<td>B.STS</td>
<td>Brightness adjustment of Status indicator</td>
<td>PRO</td>
<td>Adjusts the brightness of Status indicator. (Dark) -4 to 4 (Bright)</td>
<td>0</td>
</tr>
<tr>
<td>CTRS</td>
<td>Contrast</td>
<td>PRO</td>
<td>(Low) 1 to 6 (High)</td>
<td>6</td>
</tr>
<tr>
<td>D.CYC</td>
<td>Display update cycle</td>
<td>PRO</td>
<td>1: 100 ms, 2: 200 ms, 3: 500 ms, 4: 1 s, 5: 2 s</td>
<td>2</td>
</tr>
</tbody>
</table>
### Display Function Setting Menu (Menu: DISP) (Continued from previous page)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP.JP</td>
<td>Autoreturn to operation display</td>
<td>PRO</td>
<td>Automatically returned to the Operation Display when there has been no keystroke operation for 5 minutes. OFF, ON</td>
<td>ON</td>
</tr>
<tr>
<td>MLSD</td>
<td>Least significant digital mask of PV display</td>
<td>STD</td>
<td>OFF: With least significant digit ON: Without least significant digit</td>
<td>OFF</td>
</tr>
</tbody>
</table>

### SELECT Display Setting Menu (Menu: CSEL)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS1 to CS5</td>
<td>SELECT Display-1 to -5 registration</td>
<td>STD</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>CS10 to CS19</td>
<td>SELECT parameter-10 to -19 registration</td>
<td>PRO, 2501 to 5000</td>
<td></td>
<td>OFF</td>
</tr>
</tbody>
</table>

### Key Lock Setting Menu (Menu: KLOC)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.SP</td>
<td>SP Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.OUT</td>
<td>OUT Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF (Position proportional type: ON)</td>
</tr>
<tr>
<td>U.HCO</td>
<td>Heating/cooling OUT Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF (Heating/cooling type: ON)</td>
</tr>
<tr>
<td>U.VP</td>
<td>Valve Position Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.MV</td>
<td>Position Proportional Computation Output Display lock</td>
<td>PRO</td>
<td>OFF: Display ON: Nondisplay</td>
<td>ON</td>
</tr>
<tr>
<td>U.PID</td>
<td>PID Number Display lock</td>
<td>PRO</td>
<td></td>
<td>ON</td>
</tr>
<tr>
<td>U.HC</td>
<td>Heater Break Alarm Current Value Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.PV1</td>
<td>PV2/PV1 Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.PV2</td>
<td>PV1/PV2 Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.PV</td>
<td>PV Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.RSP</td>
<td>RSP Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.AI2</td>
<td>AIN2 Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>U.AI4</td>
<td>AIN4 Analog Input Display lock</td>
<td>PRO</td>
<td></td>
<td>OFF</td>
</tr>
<tr>
<td>COM.W</td>
<td>Communication write enable/disable</td>
<td>STD</td>
<td>Enable, ON: Disable</td>
<td>OFF</td>
</tr>
<tr>
<td>DATA</td>
<td>Front panel parameter data key lock</td>
<td>STD</td>
<td>Unlock ON: Lock</td>
<td>OFF</td>
</tr>
<tr>
<td>A/M</td>
<td>Front panel A/M key lock</td>
<td>STD</td>
<td></td>
<td>OFF</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

### Menus Lock Setting Menu (Menu: MLOC)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTL</td>
<td>[CTL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PV</td>
<td>[PV] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RSP</td>
<td>[RSP] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIN2</td>
<td>[AIN2] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIN4</td>
<td>[AIN4] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPV</td>
<td>[MPV] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OUT</td>
<td>[OUT] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBA</td>
<td>[HBA] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R485</td>
<td>[R485] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ETHR</td>
<td>[ETHR] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROF</td>
<td>[PROF] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KEY</td>
<td>[KEY] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DISP</td>
<td>[DISP] menu lock</td>
<td>PRO</td>
<td></td>
<td>OFF: Display ON: Nondisplay</td>
</tr>
<tr>
<td>CSEL</td>
<td>[CSEL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KLOC</td>
<td>[KLOC] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI.DL</td>
<td>[DI.DL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI.DU</td>
<td>[DI.DU] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DI.D</td>
<td>[DI.D] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALM</td>
<td>[ALM] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DO</td>
<td>[DO] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I/O</td>
<td>[I/O] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYS</td>
<td>[SYS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INIT</td>
<td>[INIT] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VER</td>
<td>[VER] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LVL</td>
<td>[LVL] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MODE</td>
<td>[MODE] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>[CS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP</td>
<td>[SP] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SPS</td>
<td>[SPS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALRM</td>
<td>[ALRM] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVS</td>
<td>[PVS] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PID</td>
<td>[PID] menu lock</td>
<td>PRO</td>
<td></td>
<td>OFF: Display ON: Nondisplay</td>
</tr>
<tr>
<td>TUNE</td>
<td>[TUNE] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZONE</td>
<td>[ZONE] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPAR</td>
<td>[PPAR] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS1</td>
<td>[PYS1] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS2</td>
<td>[PYS2] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS3</td>
<td>[PYS3] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PYS4</td>
<td>[PYS4] menu lock</td>
<td>PRO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter: MPV, SP, SPS, ALRM, PVS, PID, TUNE, ZONE

When each parameter is displayed, the terminal area (E1 to E4) is displayed on Group display.
- Parameter: RSP, AIN2, AIN4, R485, ETHR, DI.D, DO
### 18.2 List of Parameters

#### DI Function Registration Menu (Menu: DI.SL)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/M</td>
<td>AUTO/MAN switch</td>
<td>STD</td>
<td></td>
<td>5025</td>
</tr>
<tr>
<td>R/L</td>
<td>REMOTE/LOCAL switch</td>
<td>STD</td>
<td></td>
<td>5046</td>
</tr>
<tr>
<td>S/R</td>
<td>STOP/RUN switch</td>
<td>STD</td>
<td></td>
<td>5026</td>
</tr>
<tr>
<td>CAS</td>
<td>Switch to CAS</td>
<td>STD</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>AUTO</td>
<td>Switch to AUTO</td>
<td>STD</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>MAN</td>
<td>Switch to MAN</td>
<td>STD</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>REM</td>
<td>Switch to REMOTE</td>
<td>STD</td>
<td>Standard terminals</td>
<td>0</td>
</tr>
<tr>
<td>LCL</td>
<td>Switch to LOCAL</td>
<td>STD</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>AT</td>
<td>Auto-tuning START/STOP switch</td>
<td>STD</td>
<td>Standard terminals</td>
<td>0</td>
</tr>
<tr>
<td>TRK</td>
<td>Output tracking switch</td>
<td>PRO</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>SW</td>
<td>PV switch</td>
<td>PRO</td>
<td>E2-terminal area</td>
<td>0</td>
</tr>
<tr>
<td>PVHD</td>
<td>PV hold</td>
<td>PRO</td>
<td>DI26: 5062</td>
<td>0</td>
</tr>
<tr>
<td>CTOA</td>
<td>CAS to AUTO switch</td>
<td>PRO</td>
<td>E3-terminal area</td>
<td>0</td>
</tr>
<tr>
<td>LAT</td>
<td>Latch release</td>
<td>STD</td>
<td>D131: 5073, D132: 5074, D133: 5075, D134: 5076, D135: 5077</td>
<td>0</td>
</tr>
<tr>
<td>LCD</td>
<td>LCD backlight ON/OFF switch</td>
<td>STD</td>
<td>E4-terminal area</td>
<td>0</td>
</tr>
<tr>
<td>MG1</td>
<td>Message display interruption 1</td>
<td>PRO</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>MG2</td>
<td>Message display interruption 2</td>
<td>PRO</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>MG3</td>
<td>Message display interruption 3</td>
<td>PRO</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>MG4</td>
<td>Message display interruption 4</td>
<td>PRO</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)

- Parameter: R/L, REM, LCL
### 18.2 List of Parameters

#### DI Function Numbering Menu (Menu: DI.NU)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP.B0</td>
<td>Bit-0 of SP number</td>
<td>EASY</td>
<td>Set an I relay number of contact input.</td>
<td>0</td>
</tr>
<tr>
<td>SP.B1</td>
<td>Bit-1 of SP number</td>
<td>EASY</td>
<td>Set “0” to disable the function.</td>
<td>0</td>
</tr>
<tr>
<td>SP.B2</td>
<td>Bit-2 of SP number</td>
<td>EASY</td>
<td>Standard terminals</td>
<td>0</td>
</tr>
<tr>
<td>SP.B3</td>
<td>Bit-3 of SP number</td>
<td>EASY</td>
<td>E1-terminal area</td>
<td>0</td>
</tr>
<tr>
<td>PN.B0</td>
<td>Bit-0 of PID number</td>
<td>STD</td>
<td>DI1: 5025, DI2: 5026, DI3: 5027</td>
<td>0</td>
</tr>
<tr>
<td>PN.B2</td>
<td>Bit-2 of PID number</td>
<td>STD</td>
<td>E2-terminal area</td>
<td>0</td>
</tr>
<tr>
<td>PN.B3</td>
<td>Bit-3 of PID number</td>
<td>STD</td>
<td>E3-terminal area</td>
<td>0</td>
</tr>
<tr>
<td>MP.B0</td>
<td>Bit-0 of manual preset output number</td>
<td>STD</td>
<td>DI26: 5062, DI31: 5073, DI32: 5074, DI33: 5075, DI34: 5076, DI35: 5077</td>
<td>0</td>
</tr>
<tr>
<td>MP.B1</td>
<td>Bit-1 of manual preset output number</td>
<td>STD</td>
<td>DI41: 5089, DI42: 5090, DI43: 5091, DI44: 5092, DI45: 5093, DI46: 5094</td>
<td>0</td>
</tr>
<tr>
<td>MP.B2</td>
<td>Bit-2 of manual preset output number</td>
<td>STD</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>SP.BC</td>
<td>Bit changing method of SP number</td>
<td>PRO</td>
<td>0: Status switch 1 1: Status switch 2</td>
<td>0</td>
</tr>
<tr>
<td>PN.BC</td>
<td>Bit changing method of PID number</td>
<td>PRO</td>
<td>0: Status switch 1 1: Status switch 2</td>
<td>0</td>
</tr>
<tr>
<td>MP.BC</td>
<td>Bit changing method of manual preset output number</td>
<td>PRO</td>
<td>0: Status switch 1 1: Status switch 2</td>
<td>0</td>
</tr>
</tbody>
</table>

In Cascade control, the following parameters are also displayed for secondary loop. (the LP2 lamp is lit)
- Parameter MP.B0, MP.B1, MP.B2, MP.BC

#### DI1-DI3 Contact Type Setting Menu (Menu: DI.D)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1.D</td>
<td>DI1 contact type</td>
<td>PRO</td>
<td>CLS: The assigned function is enabled when the contact input is closed.</td>
<td>CLS</td>
</tr>
<tr>
<td>DI2.D</td>
<td>DI2 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td></td>
</tr>
<tr>
<td>DI3.D</td>
<td>DI3 contact type</td>
<td>PRO</td>
<td>OPN: The assigned function is enabled when the contact input is opened.</td>
<td>CLS</td>
</tr>
</tbody>
</table>

#### DI Setting Menu (Menu: DI.D) (E1, E3 and E4 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DI1.D</td>
<td>DIN1 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td></td>
</tr>
<tr>
<td>DI2.D</td>
<td>DIN2 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td></td>
</tr>
<tr>
<td>DI3.D</td>
<td>DIN3 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td></td>
</tr>
<tr>
<td>DI4.D</td>
<td>DIN4 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td></td>
</tr>
<tr>
<td>DI5.D</td>
<td>DIN5 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td></td>
</tr>
</tbody>
</table>

n: Terminal area number (1, 3 or 4)
### AL1-AL3 Function Registration Menu (Menu: ALM)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1.S</td>
<td>AL1 function selection</td>
<td>STD</td>
<td>Set an I relay number. Setting range: 4001 to 6000</td>
<td>4353</td>
</tr>
<tr>
<td>AL2.S</td>
<td>AL2 function selection</td>
<td>STD</td>
<td>No function: 0</td>
<td>4354</td>
</tr>
<tr>
<td>AL3.S</td>
<td>AL3 function selection</td>
<td>STD</td>
<td>Alarm 1: 4353&lt;br&gt;Alarm 2: 4354</td>
<td>4355</td>
</tr>
<tr>
<td>OR.S</td>
<td>OUT relay function selection</td>
<td>STD</td>
<td>Alarm 3: 4355&lt;br&gt;Alarm 4: 4357&lt;br&gt;Alarm 5: 4358&lt;br&gt;Alarm 6: 4359&lt;br&gt;Alarm 7: 4361&lt;br&gt;Alarm 8: 4362&lt;br&gt;AUTO (ON) / MAN (OFF) status: 4193&lt;br&gt;REM (ON) / LCL (OFF) status: 4194&lt;br&gt;STOP (ON) / RUN (OFF) status: 4195&lt;br&gt;Output tracking (ON) switching signal: 4201&lt;br&gt;FAIL (Normally ON) output: 4256</td>
<td>0</td>
</tr>
<tr>
<td>OR2.S</td>
<td>OUT2 relay function selection</td>
<td>STD</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL1.D</td>
<td>AL1 contact type</td>
<td>PRO</td>
<td>CLS: When the event of assigned function occurs, the contact output is closed.</td>
<td>CLS</td>
</tr>
<tr>
<td>AL2.D</td>
<td>AL2 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td>CLS</td>
</tr>
<tr>
<td>AL3.D</td>
<td>AL3 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td>CLS</td>
</tr>
<tr>
<td>OR.D</td>
<td>OUT relay contact type</td>
<td>PRO</td>
<td>OPN: When the event of assigned function occurs, the contact output is opened.</td>
<td>CLS</td>
</tr>
<tr>
<td>OR2.D</td>
<td>OUT2 relay contact type</td>
<td>PRO</td>
<td></td>
<td>CLS</td>
</tr>
</tbody>
</table>

### DO Setting Menu (Menu: DO) (E1 to E3 terminal area)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>DO1.S</td>
<td>DON1 function selection</td>
<td>STD</td>
<td>Same as AL1.S.</td>
<td>See left</td>
</tr>
<tr>
<td>DO2.S</td>
<td>DON2 function selection</td>
<td>STD</td>
<td>Initial value of E1 and E3 terminal area</td>
<td>See left</td>
</tr>
<tr>
<td>DO3.S</td>
<td>DON3 function selection</td>
<td>STD</td>
<td>All DO settings are 0.</td>
<td>See left</td>
</tr>
<tr>
<td>DO5.S</td>
<td>DON5 function selection</td>
<td>STD</td>
<td></td>
<td>See left</td>
</tr>
<tr>
<td>DO1.D</td>
<td>DON1 contact type</td>
<td>PRO</td>
<td>CLS: When the event of assigned function occurs, the contact output is closed.</td>
<td>CLS</td>
</tr>
<tr>
<td>DO2.D</td>
<td>DON2 contact type</td>
<td>PRO</td>
<td>CLS</td>
<td>CLS</td>
</tr>
<tr>
<td>DO3.D</td>
<td>DON3 contact type</td>
<td>PRO</td>
<td>OPN: When the event of assigned function occurs, the contact output is opened.</td>
<td>CLS</td>
</tr>
<tr>
<td>DO4.D</td>
<td>DON4 contact type</td>
<td>PRO</td>
<td></td>
<td>CLS</td>
</tr>
<tr>
<td>DO5.D</td>
<td>DON5 contact type</td>
<td>PRO</td>
<td></td>
<td>CLS</td>
</tr>
</tbody>
</table>

n: Terminal area number (1, 2 or 3)
### 18.2 List of Parameters

#### I/O Display Menu (Menu: I/O)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Read only</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEY</td>
<td>Key status</td>
<td>PRO</td>
<td>PRO</td>
</tr>
<tr>
<td>X000</td>
<td>DI1-DI3 status (equipped as standard)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>X100</td>
<td>DI11-DI16 status (E1-terminal area)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>X300</td>
<td>DI31-DI35 status (E3-terminal area)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>X400</td>
<td>DI41-DI46 status (E4-terminal area)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y000</td>
<td>AL1-AL3 status (equipped as standard)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y100</td>
<td>DO11-DO15 status (E1-terminal area)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y200</td>
<td>DO21-DO25 status (E2-terminal area)</td>
<td>PRO</td>
<td></td>
</tr>
<tr>
<td>Y300</td>
<td>DO31-DO35 status (E3-terminal area)</td>
<td>PRO</td>
<td></td>
</tr>
</tbody>
</table>

See Chapter 13.

#### System Setting Menu (Menu: SYS)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.MD</td>
<td>Restart mode</td>
<td>STD</td>
<td>CONT: Continue action set before power failure. MAN: Start from MAN. AUTO: Start from AUTO.</td>
<td>CONT</td>
</tr>
<tr>
<td>R.TM</td>
<td>Restart timer</td>
<td>STD</td>
<td>0 to 10 s</td>
<td>0</td>
</tr>
<tr>
<td>EPO</td>
<td>Input error preset output</td>
<td>STD</td>
<td>0: Preset output 1: 0% output 2: 100% output</td>
<td>0</td>
</tr>
<tr>
<td>C.GRN</td>
<td>Response as GREEN Series</td>
<td>PRO</td>
<td>OFF: Works as UT55A/UT52A in communication of device information response or broadcasting. ON: Works as GREEN Series in communication of device information response or broadcasting.</td>
<td>OFF</td>
</tr>
<tr>
<td>FREQ</td>
<td>Power frequency</td>
<td>EASY</td>
<td>AUTO, 60: 60 Hz, 50: 50 Hz</td>
<td>AUTO</td>
</tr>
<tr>
<td>QSM</td>
<td>Quick setting mode</td>
<td>EASY</td>
<td>OFF: Disable ON: Enable</td>
<td>ON</td>
</tr>
<tr>
<td>LANG</td>
<td>Guide display language</td>
<td>EASY</td>
<td>ENG: English FRA: French GER: German SPA: Spanish ITA: Italian Depends on the Model and Suffix Codes</td>
<td></td>
</tr>
<tr>
<td>PASS</td>
<td>Password setting</td>
<td>EASY</td>
<td>0 (No password) to 65535 Once a password is set, you can no longer choose not to set a password.</td>
<td>0</td>
</tr>
</tbody>
</table>
### Initialization Menu (Menu: INIT)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.DEF</td>
<td>Initialization to user default value</td>
<td>PRO</td>
<td>12345: Initialization, automatically returned to &quot;0&quot; after initialization.</td>
<td>0</td>
</tr>
<tr>
<td>F.DEF</td>
<td>Initialization to factory default value</td>
<td>PRO</td>
<td>-12345: Initialization, automatically returned to &quot;0&quot; after initialization.</td>
<td>0</td>
</tr>
</tbody>
</table>

### Error and Version Confirmation Menu (Menu: VER)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Read only</th>
</tr>
</thead>
<tbody>
<tr>
<td>PA.ER</td>
<td>Parameter error status</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>OP.ER</td>
<td>Option error status</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>AD1.E</td>
<td>A/D converter error status 1</td>
<td>EASY</td>
<td>See Chapter 16.</td>
</tr>
<tr>
<td>AD2.E</td>
<td>A/D converter error status 2</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>PV1.E</td>
<td>Loop-1 PV input error status</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>PV2.E</td>
<td>Loop-2 PV input error status</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>LA.ER</td>
<td>Ladder error status</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>MCU</td>
<td>MCU version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>DCU</td>
<td>DCU version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>ECU1</td>
<td>ECU-1 version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>ECU2</td>
<td>ECU-2 version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>ECU3</td>
<td>ECU-3 version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>ECU4</td>
<td>ECU-4 version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>PARA</td>
<td>Parameter version</td>
<td>EASY</td>
<td>See Chapter 13.</td>
</tr>
<tr>
<td>H.VER</td>
<td>Product version</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>SER1</td>
<td>Serial number 1</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>SER2</td>
<td>Serial number 2</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>MAC1</td>
<td>MAC address 1</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>MAC2</td>
<td>MAC address 2</td>
<td>EASY</td>
<td></td>
</tr>
<tr>
<td>MAC3</td>
<td>MAC address 3</td>
<td>EASY</td>
<td></td>
</tr>
</tbody>
</table>

When the following parameters are displayed, the terminal area (E1 to E4) is displayed on Group display.
- Parameter: ECU1, ECU2, ECU3, MAC1, MAC2 and MAC3

### Parameter Display Level Menu (Menu: LVL)

<table>
<thead>
<tr>
<th>Parameter symbol</th>
<th>Name</th>
<th>Display level</th>
<th>Setting range</th>
<th>Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEVL</td>
<td>Parameter display level</td>
<td>EASY</td>
<td>EASY: Easy setting mode STD: Standard setting mode PRO: Professional setting mode</td>
<td>STD</td>
</tr>
</tbody>
</table>
19.1 Hardware Specifications

**WARNING**

This instrument is for Measurement Category I (CAT.I). Do not use it for measurements in locations falling under Measurement Categories II, III, and IV.

<table>
<thead>
<tr>
<th>Category</th>
<th>Measurement category</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>CAT.I</td>
<td>For measurements performed on circuits not directly connected to MAINS.</td>
<td>-</td>
</tr>
<tr>
<td>II</td>
<td>CAT.II</td>
<td>For measurements performed on circuits directly connected to the low-voltage installation.</td>
<td>Appliances, portable equipments, etc.</td>
</tr>
<tr>
<td>III</td>
<td>CAT.III</td>
<td>For measurements performed in the building installation.</td>
<td>Distribution board, circuit breaker, etc.</td>
</tr>
<tr>
<td>IV</td>
<td>CAT.IV</td>
<td>For measurements performed at the source of the low-voltage installation.</td>
<td>Overhead wire, cable systems, etc.</td>
</tr>
</tbody>
</table>
19.1 Hardware Specifications

19.1.1 Input Specifications

**Universal Input**
- Number of inputs: 1
- Input type, instrument range, and measurement accuracy: See the table below.

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Instrument Range (°C)</th>
<th>Instrument Range (°F)</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thermocouple</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>-270.0 to 1370.0°C</td>
<td>-450.0 to 2500.0°F</td>
<td>±0.1% of instrument range ±1 digit for 0°C or more</td>
</tr>
<tr>
<td></td>
<td>-270.0 to 1000.0°C</td>
<td>-450.0 to 2300.0°F</td>
<td>±0.2% of instrument range ±1 digit for less than 0°C</td>
</tr>
<tr>
<td></td>
<td>-270.0 to 500.0°C</td>
<td>-200.0 to 1000.0°F</td>
<td>±2% of instrument range ±1 digit for less than -200.0°C of thermocouple K</td>
</tr>
<tr>
<td>J</td>
<td>-200.0 to 1200.0°C</td>
<td>-300.0 to 2300.0°F</td>
<td>±1% of instrument range ±1 digit for less than -200.0°C of thermocouple T</td>
</tr>
<tr>
<td>T</td>
<td>-270.0 to 400.0°C</td>
<td>-450.0 to 750.0°F</td>
<td>±0.15% of instrument range ±1 digit for 400°C or more</td>
</tr>
<tr>
<td></td>
<td>0.0 to 400.0°C</td>
<td>-200.0 to 750.0°F</td>
<td>±5% of instrument range ±1 digit for less than 400°C</td>
</tr>
<tr>
<td>B</td>
<td>0.0 to 1800.0°C</td>
<td>32 to 3300°F</td>
<td>±0.15% of instrument range ±1 digit</td>
</tr>
<tr>
<td>S</td>
<td>0.0 to 1700.0°C</td>
<td>32 to 3100°F</td>
<td>±0.15% of instrument range ±1 digit</td>
</tr>
<tr>
<td>R</td>
<td>0.0 to 1700.0°C</td>
<td>32 to 3100°F</td>
<td>±0.15% of instrument range ±1 digit</td>
</tr>
<tr>
<td>N</td>
<td>-200.0 to 1300.0°C</td>
<td>-300.0 to 2400.0°F</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td>E</td>
<td>-270.0 to 1000.0°C</td>
<td>-450.0 to 1800.0°F</td>
<td>±0.1% of instrument range ±1 digit for 0°C or more</td>
</tr>
<tr>
<td>L</td>
<td>-200.0 to 900.0°C</td>
<td>-300.0 to 1600.0°F</td>
<td>±0.2% of instrument range ±1 digit for less than 0°C</td>
</tr>
<tr>
<td>U</td>
<td>-200.0 to 400.0°C</td>
<td>-300.0 to 750.0°F</td>
<td>±1.5% of instrument range ±1 digit for less than -200.0°C of thermocouple E</td>
</tr>
<tr>
<td>W</td>
<td>0.0 to 2300.0°C</td>
<td>32 to 4200°F</td>
<td>±0.2% of instrument range ±1 digit (Note 2)</td>
</tr>
<tr>
<td>Platinel 2</td>
<td>0.0 to 1390.0°C</td>
<td>32.0 to 2500.0°F</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td>PR20-40</td>
<td>0.0 to 1900.0°C</td>
<td>32 to 3400°F</td>
<td>±0.5% of instrument range ±1 digit for 800°C or more</td>
</tr>
<tr>
<td>W97Re3-2W75Re25</td>
<td>0.0 to 2000.0°C</td>
<td>32 to 3600°F</td>
<td>±0.2% of instrument range ±1 digit</td>
</tr>
<tr>
<td><strong>RTD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>JP100</td>
<td>-200.0 to 500.0°C</td>
<td>-300.0 to 1000.0°F</td>
<td>±0.1% of instrument range ±1 digit (Note 1)</td>
</tr>
<tr>
<td></td>
<td>-150.00 to 150.00°C</td>
<td>-200.0 to 300.0°F</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td>Pt100</td>
<td>-200.0 to 850.0°C</td>
<td>-300.0 to 1560.0°F</td>
<td>±0.1% of instrument range ±1 digit (Note 1)</td>
</tr>
<tr>
<td></td>
<td>-200.0 to 500.0°C</td>
<td>-300.0 to 1000.0°F</td>
<td>±0.1% of instrument range ±1 digit (Note 1)</td>
</tr>
<tr>
<td></td>
<td>-150.00 to 150.00°C</td>
<td>-200.0 to 300.0°F</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td><strong>Standard signal</strong></td>
<td>0.400 to 2.000 V</td>
<td>1.000 to 5.000 V</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td></td>
<td>4.00 to 20.00 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>DC voltage/current</strong></td>
<td>0.000 to 2.000 V</td>
<td>0.00 to 10.00 V</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td></td>
<td>0.00 to 20.00 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-1.00 to 20.00 mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0 to 100.0 mV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.  
Note 1: ±0.3°C ±1 digit in the range between 0 and 100°C, ±0.5°C ±1 digit in the range between -100 and 200°C.  
Note 2: W: W-5% Re/W-26% Re(Hoskins Mfg,Co.). ASTM E988
• Input sampling (control) period: Select from among 50, 100, and 200 ms
• Burnout detection:
  Functions at TC, RTD, and standard signal
  Upscale, downscale, and off can be specified.
  For standard signal, burnout is determined to have occurred if it is 0.1 V or 0.4 mA
  or less.
• Input bias current: 0.05 µA (for TC or RTD)
• Measurement current (RTD): About 0.16 mA
• Input resistance:
  TC or mV input: 1 MΩ or more
  V input: About 1 MΩ
  mA input: About 250 Ω
• Allowable signal source resistance:
  TC or mV input: 250 Ω or less
  Effects of signal source resistance: 0.1 µV/Ω or less
  DC voltage input: 2 kΩ or less
  Effects of signal source resistance: About 0.01%/100 Ω
• Allowable wiring resistance:
  RTD input: Max. 150 Ω/wire (The conductor resistance between the three wires
  shall be equal.)
  Wiring resistance effect: ±0.1ºC/10 Ω
• Allowable input voltage/current:
  TC, mV, mA or RTD input: ±10 V DC
  V input: ±20 V DC
  mA input: ±40 mA
• Noise rejection ratio:
  Normal mode: 40 dB or more (50/60 Hz)
  Common mode: 120 dB or more (50/60 Hz)
  For 100-240 V AC, the power frequency can be set manually. Automatic detection
  is also available.
  For 24 V AC/DC, the power frequency can be set manually.
• Reference junction compensation error:
  ±1.0ºC (15 to 35ºC)
  ±1.5ºC (-10 to 15ºC, 35 to 50ºC)
• Applicable standards: JIS/IEC/DIN (ITS-90) for TC and RTD

Auxiliary Analog Input

• Use: Remote setpoint setting, external compensating input, auxiliary input for
  computation, etc.
• Number of inputs: See the table of Model and Suffix Codes
• Input type, instrument range, and measurement accuracy: See the table below.

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Instrument Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Signal</td>
<td>0.400 to 2.000 V</td>
<td>±0.2% of instrument range ±1 digit</td>
</tr>
<tr>
<td></td>
<td>1.000 to 5.000 V</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td>DC Voltage</td>
<td>0.000 to 2.000 V</td>
<td>±0.2% of instrument range ±1 digit</td>
</tr>
<tr>
<td></td>
<td>0.00 to 10.00 V</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
<tr>
<td>DC voltage for high-input impedance</td>
<td>0.000 to 1.250 V</td>
<td>±0.1% of instrument range ±1 digit</td>
</tr>
</tbody>
</table>

• Input sampling (control) period: Same as universal input
• Input resistance: About 1 MΩ
  However, 10 MΩ or more for DC voltage for high-input impedance range
Remote Input with Direct Input

- Number of inputs: See the table of Model and Suffix Codes.
- Input type, instrument range, and measurement accuracy: Same as universal input except the table below.

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Instrument Range (°C)</th>
<th>Instrument Range (°F)</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-wire RTD</td>
<td>JPt100</td>
<td>-200.0 to 500.0°C</td>
<td>-300.0 to 1000.0°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-150.00 to 150.00°C</td>
<td>-200.0 to 300.0°F</td>
</tr>
<tr>
<td></td>
<td>Pt100</td>
<td>-200.0 to 850.0°C</td>
<td>-300.0 to 1560.0°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-150.00 to 150.00°C</td>
<td>-200.0 to 300.0°F</td>
</tr>
</tbody>
</table>

Note 1: ±0.5°C ±1 digit in the range between -200.0 and 500.0°C/-300.0 and 1000.0°F.

- Input sampling (control) period: Same as universal input

19.1.2 Analog Output Specifications

- Number of outputs:
  - Control output: 1
  - Cooling-side control output of Heating/cooling type: 1
- Output type: Current output or voltage pulse output
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/load resistance of 600 Ω or less
- Current output accuracy: ±0.1% of span (±5% of span for 1 mA or less.)
  - The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.
- Voltage pulse output:
  - Use: Time proportional output
  - On-voltage: 12 V or more/load resistance of 600 Ω or more
  - Off-voltage: 0.1 V DC or less
  - Time resolution: 10 ms or 0.1% of output, whichever is larger

19.1.3 Step Response Time Specifications

Within 500 ms (when the control period is 50 ms or 100 ms)
Within 1 s (when the control period is 200 ms)
(63% of analog output response time when a step change of 10 to 90% of input span is applied)

19.1.4 Relay Contact Output Specifications

- Contact type and number of outputs:
  - Control output: contact point 1c; 1 point
  - Cooling-side control output of Heating/cooling type: contact point 1c; 1 point (for UT55A only)
  - For UT52A, contact point 1a; 2 points for both heating and cooling sides
  - Alarm output: contact point 1a; 3 points (common is independent)
- Contact rating:
  - Contact point 1c (control output): 250 V AC, 3 A or 30 V DC, 3A (resistance load)
  - Contact point 2a (control output): 240 V AC, 3A or 30 V DC, 3A (resistance load) (for UT52A only)
  - Contact point 1a (alarm output): 240 V AC, 1A or 30 V DC, 1 A (resistance load)
- Use: Time proportional output, alarm output, FAIL output, etc.
- Time resolution of control output: 10 ms or 0.1% of output, whichever is larger
  - Note: Cannot be used for a small load of 10 mA or less.
19.1.5 Position Proportional Output Specifications

- Position signal input:
  - Slide resistance: 100 Ω to 2.5 kΩ of total resistance
  - 100% side and slide line: with disconnection detection
  - 0% side: without disconnection detection
  - Current input: 4 to 20 mA (with disconnection detection)
- Sampling period: 50 ms
- Measurement resolution: 0.1% of input span
- Position proportional relay output:
  - UT55A: contact point 1a; 2 points, 250 V AC, 3 A or 30 V DC, 3 A (resistance load)
  - UT52A: contact point 1a; 2 points, 240 V AC, 3 A or 30 V DC, 3 A (resistance load)

Note: Cannot be used for a small load of 10 mA or less.

19.1.6 Retransmission Output Specifications

- Number of outputs: Retransmission output; 1, shared with 15 V DC loop power supply
- Current output: 4 to 20 mA DC or 0 to 20 mA DC/ load resistance of 600 Ω or less
- Current output accuracy: ±0.1% of span (±5% of span for 1 mA or less.)
  The accuracy is that in the standard operating conditions: 23±2°C, 55±10%RH, and power frequency at 50/60 Hz.

19.1.7 15 V DC Loop Power Supply Specifications

(Shared with retransmission output)

- Power supply: 14.5 to 18.0 V DC
- Maximum power supply: About 21 mA (with short-circuit current limiting circuit)

19.1.8 Contact Input Specifications

- Number of inputs: See the table of Model and Suffix Codes.
- Input type: No-voltage contact input or transistor contact input
- Input contact rating: 12 V DC, 10 mA or more
  Use a contact of a minimum on-current of 1 mA or more
- ON/OFF detection:
  - No-voltage contact input:
    - Contact resistance of 1 kΩ or less is determined as “ON” and contact resistance
      of 50 kΩ or more as “OFF.”
  - Transistor contact input:
    - Input voltage of 2 V or less is determined as “ON” and leakage current must not
      exceed 100 µA when “OFF.”
- Minimum status detection hold time: Control period +50 ms
- Use: SP switch, operation mode switch, and event input

19.1.9 Transistor Contact Output Specifications

- Number of outputs: See the table of Model and Suffix Codes.
- Output type: Open collector (SINK current)
- Output contact rating: Max. 24 V DC, 50 mA
- Output time resolution: Min. 50 ms
19.1.10 Heater Break Alarm Specifications

- Number of inputs: 2
- Number of outputs: 2 (transistor contact output)
- Use: Measures the heater current using an external current transformer (CT) and generates a heater break alarm when the measured value is less than the break detection value.
- Current transformer input resistance: About 9.4 Ω
- Current transformer input range: 0.0 to 0.1 Arms (0.12 Arms or more cannot be applied.)
- Heater current setting range: OFF, 0.1 to 300.0 Arms
  - Heater current measured value display range: 0.0 to 360.0 Arms
  - Note: The CT ratio can be set. CT ratio setting range: 1 to 3300
- Recommended CT: CT from U.R.D., Ltd.
  - CTL-6-S-H: CT ratio 800, measurable current range: 0.1 to 80.0 Arms
  - CTL-12L-30: CT ratio 3000, measurable current range: 0.1 to 180.0 Arms
- Heater current measurement period: 200 ms
- Heater current measurement accuracy: ±5% of current transformer input range span ±1 digit (CT error is not included.)
  - Ex.: CTL-12L-30
    - 0.1 (Max. of current transformer input range) × 3000 (CT ratio) × ±0.05 (±5%) ±1 digit = ±15 Arms ± 1 digit
- Heater current detection resolution: Within 1/250 of current transformer input range span
  - Ex.: CTL-12L-30
    - 0.1 (Max. of current transformer input range) × 3000 (CT ratio) / 250 = 1.2 Arms
- Break detection On-time: Min. 0.2 second. (for time proportional output)

19.1.11 24 V DC Loop Power Supply Specifications

- Use: Power is supplied to a 2-wire transmitter.
- Power supply: 21.6 to 28.0 V DC
- Rated current: 4 to 20 mA DC
- Maximum power supply: About 30 mA (with short circuit current limiting circuit)

19.1.12 Safety and EMC Standards

- Safety: Compliant with IEC/EN61010-1 (CE), approved by CAN/CSA C22.2 No.61010-1 (CSA). UL61010-1 is now under application.
  - Installation category: CAT. II Pollution degree: 2
  - Measurement category: I (CAT. I)
  - Rated measurement input voltage: Max. 10 V DC
  - Rated transient overvoltage: 1500 V (Note)
  - Note: This is a reference safety standard value for Measurement Category I of IEC/EN/CSA/UL61010-1. This value is not necessarily a guarantee of instrument performance.

- EMC Conformity standards:
  - CE marking
    - EN61326-1 Class A, Table 2 (For use in industrial locations)
    - EN61326-2-3
    - EN 55011 Class A, Group1
    - EN 61000-3-2 Class A
    - EN 61000-3-3
  - C-tick mark
    - EN 55011 Class A, Group1
  - The instrument continues to operate at a measurement accuracy of within ±20% of the range during testing
19.1.13 Construction, Installation, and Wiring

- Dust-proof and drip-proof: IP56 (for front panel) (Not available for side-by-side close mounting.)
- Material: Polycarbonate (Flame retardancy: UL94V-0)
- Case color: Light gray
- Weight: 0.5 kg or less
- External dimensions (mm):
  - UT55A: 96 (W) × 96 (H) × 65 (depth from the panel face)
  - UT52A: 48 (W) × 96 (H) × 65 (depth from the panel face)
  (Depth except the projection on the rear panel)
- Installation: Direct panel mounting; mounting bracket, one each for upper and lower mounting
- Panel cutout dimensions (mm):
  - UT55A: 92\(^{±0.8/0}\) (W) × 92\(^{±0.8/0}\) (H)
  - UT52A: 45\(^{±0.6/0}\) (W) × 92\(^{±0.8/0}\) (H)
- Mounting attitude: Up to 30 degrees above the horizontal. No downward titling allowed.
- Wiring: M3.0 screw terminal with square washer (for signal wiring and power wiring)
19.1.14 Power Supply Specifications and Isolation

- Power supply:
  - Rated voltage: 100 – 240 V AC (+10%/-15%), 50/60 Hz
  - 24 V AC/DC (+10%/-15%) (for /DC option)
- Power consumption:
  - UT55A: 18 VA (DC:9 VA, AC: 14 VA if /DC option is specified)
  - UT52A: 15 VA (DC:7 VA, AC: 11 VA if /DC option is specified)
- Data backup: Nonvolatile memory
- Power holdup time: 20 ms (for 100 V AC drive)
- Withstanding voltage
  - Between primary terminals and secondary terminals: 2300 V AC for 1 minute
  - Between primary terminals: 1500 V AC for 1 minute
  - Between secondary terminals: 500 V AC for 1 minute
    (Primary terminals: Power (*) and relay output terminals; Secondary terminals: Analog I/O signal terminals, contact input terminals, communication terminals, and functional grounding terminals.)
  - (*) : Power terminals for 24V AC/DC models are the secondary terminals.

- Isolation specifications

<table>
<thead>
<tr>
<th>Internal circuits</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV (universal) input terminals</td>
<td></td>
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<tr>
<td>Remote (universal) input terminals with direct input</td>
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<tr>
<td>Remote input terminals / Aux. analog input terminals</td>
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<tr>
<td>Control, retransmission (analog) output terminals (not isolated between the analog output terminals)</td>
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<tr>
<td>Valve position (feedback) input terminals</td>
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<tr>
<td>Control relay (contact point c) output terminals</td>
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<td>Alarm-3 relay (contact point a) output terminals</td>
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<td>Position proportional relay output terminals</td>
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<td>Contact input terminals</td>
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<td>RS-485 communication terminals</td>
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<td>24 V DC loop power supply terminals</td>
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<td>Contact output (transistor) terminals</td>
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<tr>
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<td>PROFIBUS-DP communication terminals</td>
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<tr>
<td>Current transformer input terminals</td>
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</table>

The circuits divided by lines are insulated mutually.
19.1.15 Environmental Conditions

Normal Operating Conditions

- Ambient temperature: -10 to 50°C (-10 to 40°C for side-by-side close mounting)
- Ambient humidity: 20 to 90% RH (no condensation allowed)
- Magnetic field: 400 A/m or less
- Continuous vibration at 5 to 9 Hz: Half amplitude of 1.5 mm or less, 1oct/min for 90 minutes each in the three axis directions
  - Continuous vibration at 9 to 150 Hz: 4.9 m/s² or less, 1oct/min for 90 minutes each in the three axis directions
- Short-period vibration: 14.7 m/s², 15 seconds or less
- Shock: 98 m/s² or less, 11 ms
- Altitude: 2000 m or less above sea level
- Warm-up time: 30 minutes or more after the power is turned on
- Startup time: Within 10 seconds

*: The LCD (a liquid crystal display) is used for a display portion of this product.
  The LCD has a characteristic that the display action becomes late at the low temperature.
  However, the control function is not affected.

Transportation and Storage Conditions

- Temperature: -25 to 70°C
- Temperature change rate: 20°C/h or less
- Humidity: 5 to 95% RH (no condensation allowed)

Effects of Operating Conditions

- Effect of ambient temperature:
  - Voltage or TC input: ±1 µV/°C or ±0.01% of F.S./°C, whichever is larger
  - Current input: ±0.01% of F.S./°C
  - RTD input: ±0.05°C/°C (ambient temperature) or less
  - Analog output: ±0.02% of F.S./°C or less
- Effect of power supply voltage fluctuation
  - Analog input: ±0.05% of F.S. or less
  - Analog output: ±0.05% of F.S. or less
  (Each within rated voltage range)
Appendix 1

Input and Output Table of Standard Model and Suffix Codes

See the next page.
### UT55A Standard Model and Suffix Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>INPUT</th>
<th>OUTPUT</th>
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</table>

- : Equipped
- ♦: If the /DR option is additionally specified to the remote input, RSP terminal can be used as universal input. However, DI16 is deleted.

### UT52A Standard Model and Suffix Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Suffix code</th>
<th>Optional suffix code</th>
<th>INPUT</th>
<th>OUTPUT</th>
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- : Equipped
- ♦: If the /DR option is additionally specified to the remote input, RSP terminal can be used as universal input. However, DI16 is deleted.
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