*Temperature Controller*

# *GZ400/GZ900*

## *Instruction Manual*
*[Part1: Hardware]*

RKC INSTRUMENT INC. IMR03D04-E5

# NOTICE

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

  ~ : Alternating current

  ⎓ : Both direct and alternating current

  ⧈ : Reinforced insulation

  ⚠ : Safety precaution

  This symbol is used where the instruction manual needs to be consulted for the safety of both the operator and the equipment. Carefully read the cautions in this manual before using the instrument.

- Windows is a trademark of Microsoft Corporation.
- Modbus is a registered trademark of Schneider Electric.
- Company names and product names used in this manual are the trademarks or registered trademarks of the respective companies.

# Safety Precautions

## ■ Pictorial Symbols (safety symbols)

Various pictorial symbols are used in this manual to ensure safe use of the product, to protect you and other people from harm, and to prevent damage to property. The symbols are described below.
Be sure you thoroughly understand the meaning of the symbols before reading this manual.

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

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

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

## ⚠ WARNING

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

# ⚠ CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. (It is not designed for use with medical equipment and nuclear energy plant.)
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation. Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- Be sure to provide an appropriate surge control circuit respectively for the following:
  - If input/output or signal lines within the building are longer than 30 meters.
  - If input/output or signal lines leave the building, regardless the length.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock to operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- All wiring must be in accordance with local codes and regulations.
- To prevent instrument damage as a result of failure, protect the power line and the input/output lines from high currents with a suitable overcurrent protection device with adequate breaking capacity such as a fuse, circuit breaker, etc.
- A malfunction in this product may occasionally make control operations impossible or prevent alarm outputs, resulting in a possible hazard. Take appropriate measures in the end use to prevent hazards in the event of malfunction.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- For proper operation of this instrument, provide adequate ventilation for heat dissipation.
- Do not connect wires to unused terminals as this will interfere with proper operation of the instrument.
- Turn off the power supply before cleaning the instrument.
- Do not use a volatile solvent such as paint thinner to clean the instrument. Deformation or discoloration may occur. Use a soft, dry cloth to remove stains from the instrument.
- To avoid damage to the instrument display, do not rub with an abrasive material or push the front panel with a hard object.

# For Proper Disposal

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

# Symbols

## ■ Pictorial Symbols (safety symbols)

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

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

: This mark indicates where additional information may be located.

## ■ Character Symbols

11-segment character

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

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

| L | M | N | n | O (o) | P | Q | R | S | T | t | U |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |  |

| u | V | W | X | Y | Z | Degree | ／ | Prime | ✱ (Asterisk) | → |
|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |  |  |

7-segment character

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

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

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

| V | W | X | Y | Z | Degree | ／ | Prime | ✱ (Asterisk) |
|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |  |  |

## ■ Abbreviation symbols

These abbreviations are used in this manual:

| Abbreviation symbols | Name | Abbreviation symbols | Name |
|---|---|---|---|
| PV | Measured value | TC (input) | Thermocouple (input) |
| SV | Set value | RTD (input) | Resistance temperature detector (input) |
| MV | Manipulated output value | V (input) | Voltage (input) |
| AT | Autotuning | I (input) | Current (input) |
| ST | Startup tuning | HBA (1, 2) | Heater break alarm (1, 2) |
| OUT (1 to 3) | Output (1 to 3) | CT (1, 2) | Current transformer (1, 2) |
| DI (1 to 6) | Digital input (1 to 6) | LBA | Control loop break alarm |
| DO (1 to 4) | Digital output (1 to 4) | LBD | LBA deadband |

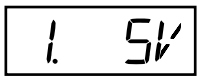
## ■ Screens used in this manual

It should be noted that this manual describes various screens of GZ400/900 according to the following rules.

GZ400/900 are available in two types: single input type and dual input type.
The dual input type is further categorized into two types: Dual PV type and PV + Remote setting type. For a dual input model, the same parameter may exist in both Input 1 and Input 2. "***1.***" or "***2.***" is added to the top of the parameters for identification. "***1.***" is not added to the top of the parameters list for the single input type.

[Display example of the dual input type]

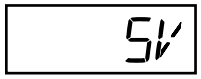
Input 1_Set value (SV)




Input 2_Set value (SV)


[Display example of a single input type]

Set value (SV)



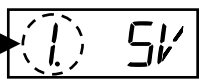

This manual uses the dual inputs for explanation. For other types such as a single input type, ignore the first character "***1.***" at the top of the parameter.

The parameters used only on the dual input type are displayed in the colored background.

[Notation in this manual]

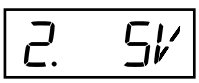
Input 1_Set value (SV)

This part is not displayed on the single input type.




Input 2_Set value (SV)

Parameter shown only on the dual input type



# Document Configuration

There are seven manuals pertaining to this product. Please be sure to read all manuals specific to your application requirements.

The following manuals can be downloaded from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

| Manual | Manual Number | Remarks |
|---|---|---|
| GZ400/GZ900 Installation Manual | IMR03D01-E☐ | This manual is enclosed with instrument.<br>This manual explains the mounting and wiring. |
| GZ400/GZ900 Quick Operation Manual | IMR03D02-E☐ | This manual is enclosed with instrument.<br>This manual explains the basic key operation, mode menu, and data setting. |
| GZ400/GZ900 Parameter List | IMR03D03-E☐ | This manual is enclosed with instrument.<br>This list is a compilation of the parameter data of each mode. |
| GZ400/GZ900 Instruction Manual<br>[Part 1: Hardware] | **IMR03D04-E5** | This manual you are reading now.<br>This manual describes installation, wiring, troubleshooting and product specification. |
| GZ400/GZ900 Instruction Manual<br>[Part 2: Parameters/Functions] | IMR03D05-E☐ | Parameters:<br>This manual describes how to switch the operation modes and parameters, the range of parameters, and initialization/automatic conversion associated with the change of settings.<br>Functions:<br>This manual describes how to set up and each function. |
| GZ400/GZ900 Instruction Manual<br>[Host Communication] | IMR03D07-E☐ | This manual explains RKC communication protocol (ANSI X3.28-1976) and Modbus relating to communication parameters setting. |
| GZ400/GZ900 Instruction Manual<br>[PLC Communication] | IMR03D08-E☐ | This manual describes how to set up the instrument for communication with a programmable controller (PLC). |

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

# About This Manual

This manual consists of the following 7 chapters and index; Parts description, Model code, Mounting, Wiring and other basic handling of the instrument. If you are looking for basic handling information, you may be able to find one in the following table of contents.

**[This manual (Part1: Hardware)]**

| | What do you want to do? | See the following section for more details |
|---|---|---|
| ☐ | I want to check the features, the instrument, and the model code. | 1. OUTLINE |
| ☐ | I want to check the mounting caution and how to mount and remove. | 2. MOUNTING * |
| ☐ | I want to check the external dimensions and the panel cutout details | 2. MOUNTING * |
| ☐ | I want to check wiring caution, terminal layout, wiring to each terminal, etc. | 3. WIRING * |
| ☐ | I want to check the connection information of the loader communication. | 3. WIRING * |
| ☐ | I want to check how to use terminal covers (optional). | 3. WIRING |
| ☐ | I want to check the front appearance. | 4. PARTS DESCRIPTION AND BASIC OPERATION * |
| ☐ | I want to check the modes available. | |
| ☐ | I want to know the basic operation such as setting a set value. | |
| ☐ | I want to know what to do when I use the instrument for the first time. | 5. OPERATION * |
| ☐ | I want to know the error indications and the error codes. | 6. TROUBLESHOOTING * |
| ☐ | I want to know what actions I should take in case of errors. | 6. TROUBLESHOOTING |
| ☐ | I want to check the instrument information (ROM version, model code, instrument number). | 6. TROUBLESHOOTING |
| ☐ | I want to know the specification of the instrument. | 7. SPECIFICATIONS * |
| ☐ | I want to know how to replace a waterproof/dustproof gasket (optional) | A. APPENDIX |
| ☐ | I want to know the external dimension of the current transformer (CT). | A. APPENDIX |

* Checking is possible using a concise manual supplied with the product.

**[Major topics contained in other manuals]**

| | What do you want to do? | See the following section for more details |
|---|---|---|
| ☐ | I want to know the functions and how to use them. | [Part 2: Parameters/Functions] |
| ☐ | I want to check the parameter names and their setting range. | [Part 2: Parameters/Functions]<br>Parameter List (This manual is enclosed with instrument.) |
| ☐ | I want to know how to connect this instrument to a host computer. | [Host Communication] |
| ☐ | I want to know how to connect this instrument to a programmable logic controller (PLC). | [PLC Communication] |

# Contents

Page

# 3. WIRING ..... 3-1

Chapter 3 describes wiring cautions, wiring layout and wiring of terminals.

Page

# 1 OUTLINE

This chapter describes features, package contents, model code, etc.

# 1.1 Features

This high performance digital controller has the following features:

## Cope with various control applications

- PID control (Reverse action) [1]
- PID control (Direct action) [1]
- Heat/Cool PID control (for Extruder [air cooling]) [1]
- Heat/Cool PID control (for Extruder [water cooling]) [1]
- Heat/Cool PID control (Cooling linear type) [1]
- ON/OFF action [2]
- Manual control [3]

[1] Specify when ordering

[2] Proportional band [heat-side] must be set to zero.

[3] Switch the mode to Manual mode using Auto/Manual transfer

## Dual loop control is available (optional)

The following control types are available.

- Remote setting input *
- 2-loop control *
- Differential temperature control *
- Control with PV select *

* For details, refer to the separate manual **[Part 2]**.

## Can handle various external disturbances

- Suppresses overshoot at startup (at power on, STOP to RUN), set value (SV) change, and occurrence of external disturbances *
- Suppresses overshoot during the transition from ramp to soak when Setting change rate limiter is used *
- Suppresses the bottom at the occurrence of external disturbances caused by Feedforward *

* For details, refer to the separate manual **[Part 2]**.

## Freely assignable outputs

Output signal (control output, retransmission output, logic calculation output, and instrument status output) is freely assignable to each output of GZ400/900 (OUT: max. 3, DO: max. 4). *

* For details, refer to the separate manual **[Part 2]**.

## Versatile memory area function

Main settings such as PID, event, and control related settings can be stored in up to 16 areas (Memory area function).
The use of this function offers:

- Simple ramp/soak control *
- Simple sequence operation *
- Control using Level PID *

* For details, refer to the separate manual **[Part 2]**.

## Improved operatability

### Function assignable key (FUNC key) *

GZ400/900 are supplied with a FUNC key to which a specific function can be assigned. Assigning a function to the FUNC key realizes a direct access.

### Desired screens can be grouped for easy access *

Up to 16 desired screens can be registered as one mode (Parameter select function).

* For details, refer to the separate manual **[Part 2]**.

## Communication

- Loader communication connector is supplied as standard on the front panel (GZ400/900). Using our USB communication converter (COM-K2 or COM-KG) and our communication tool (PROTEM2)*, the loader communication is possible to easily store and copy the set values.
  * Download the software from the official RKC website.

- When Communication interface [1] and communication protocol [2] are specified at the time of order, any one of the following communication functions is possible.
  - Host communication to an upper system [3]
  - PLC communication to MITSUBISHI MELSEC series [4]

[1] RS-485, RS-422A

[2] RKC communication (ANSI X3.28-1976), Modbus-RTU, MITSUBISHI MELSEC series special protocol (QnA-compatibl-E4C frame format 4)

[3] For details, refer to the separate manual **[Host Communication]**.

[4] For details, refer to the separate manual **[PLC Communication]**.

## 1.2 Checking the Product

Before using this product, check each of the following:

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

| Accessories | Q'TY | Remarks | |
|---|---|---|---|
| ☐ Instrument | 1 | ——— | |
| ☐ Mounting bracket (with screw) | 2 | GZ900 Waterproof/Dustproof type: 4 | |
| ☐ GZ400/GZ900 Installation Manual (IMR03D01-E☐) | 1 | Enclosed with instrument | |
| ☐ GZ400/GZ900 Quick Operation Manual (IMR03D02-E☐) | 1 | Enclosed with instrument | |
| ☐ GZ400/GZ900 Parameter List (IMR03D03-E☐) | 1 | Enclosed with instrument | |
| ☐ **GZ400/GZ900 Instruction Manual [Part 1: Hardware] (IMR03D04-E5)** | 1 | This manual (sold separately) | This manual can be downloaded from the official RKC website. |
| ☐ GZ400/GZ900 Instruction Manual [Part 2: Parameters/Functions] (IMR03D05-E☐) | 1 | Sold separately | |
| ☐ GZ400/GZ900 Instruction Manual [Host Communication] (IMR03D07-E☐) | 1 | Sold separately | |
| ☐ GZ400/GZ900 Instruction Manual [PLC Communication] (IMR03D08-E☐) | 1 | Sold separately | |
| ☐ Gasket<br>KFB400-36 (GZ400)<br>KFB900-36 (GZ900) | 1 | Optional (Waterproof/Dustproof type) | |
| ☐ Terminal cover<br>KFB400-58 (GZ400/900) | Depending on the order quantity | Optional (sold separately) | |
| ☐ Front cover<br>KRB400-36 (GZ400)<br>KRB900-36 (GZ900) | Depending on the order quantity | Optional (sold separately) | |
| ☐ CT (Current transformer for heater break alarm)<br>CTL-6-P-Z [for 0.0 to 10.0 A]<br>CTL-6-P-N [for 0.0 to 30.0 A]<br>CTL-12-S56-10L-N [for 0.0 to 100.0 A] | Depending on the order quantity | Optional (sold separately) | |

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

# 1.3 Model Code

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

## 1.3.1 Suffix code

**GZ400**
**GZ900** □ □□□ − □ □ □ ∗ □ □ □ □ □ □ / □
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

| Specification | | Suffix code | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| Control method | PID control with AT (Reverse action) | F | | | | | | | | | | | |
| | PID control with AT (Direct action) | D | | | | | | | | | | | |
| | Heat/Cool PID control with AT | G | | | | | | | | | | | |
| | Heat/Cool PID control with AT (for Extruder [air cooling]) | A | | | | | | | | | | | |
| | Heat/Cool PID control with AT (for Extruder [water cooling]) | W | | | | | | | | | | | |
| Measured input and Range | See Range Code Table (P. 1-8) | | □□□ | | | | | | | | | | |
| Output 1 (OUT1) [1] | None | | | N | | | | | | | | | |
| | Relay contact output | | | M | | | | | | | | | |
| | Voltage pulse output (0/12 V DC) | | | V | | | | | | | | | |
| | Continuous voltage output (0 to 5 V DC) | | | 4 | | | | | | | | | |
| | Continuous voltage output (0 to 10 V DC) | | | 5 | | | | | | | | | |
| | Continuous voltage output (1 to 5 V DC) | | | 6 | | | | | | | | | |
| | Current output (0 to 20 mA DC) | | | 7 | | | | | | | | | |
| | Current output (4 to 20 mA DC) | | | 8 | | | | | | | | | |
| | Transistor output | | | B | | | | | | | | | |
| Output 2 (OUT2) [1] | None | | | | N | | | | | | | | |
| | Relay contact output | | | | M | | | | | | | | |
| | Voltage pulse output (0/12 V DC) | | | | V | | | | | | | | |
| | Continuous voltage output (0 to 5 V DC) | | | | 4 | | | | | | | | |
| | Continuous voltage output (0 to 10 V DC) | | | | 5 | | | | | | | | |
| | Continuous voltage output (1 to 5 V DC) | | | | 6 | | | | | | | | |
| | Current output (0 to 20 mA DC) | | | | 7 | | | | | | | | |
| | Current output (4 to 20 mA DC) | | | | 8 | | | | | | | | |
| | Transistor output | | | | B | | | | | | | | |
| Power supply voltage | 24 V AC/DC | | | | | 3 | | | | | | | |
| | 100 to 240 V AC | | | | | 4 | | | | | | | |
| Digital output (DO) [1] | Digital output [1 point] (DO1) | | | | | | 1 | | | | | | |
| | Digital output [4 points] (DO1 to DO4) | | | | | | 4 | | | | | | |
| Option 1 [2] | None | | | | | | | N | | | | | |
| | CT input [2 points] (CT1, CT2) [CTL-6-P-N] | | | | | | | T | | | | | |
| | CT input [2 points] (CT1, CT2) [CTL-12-S56-10L-N] | | | | | | | U | | | | | |
| | CT input [2 points] (CT1, CT2) [CTL-6-P-Z] | | | | | | | V | | | | | |
| Option 2 [3] | None | | | | | | | | N | | | | |
| | Output 3 (OUT3) | | | | | | | | A | | | | |
| | Digital input [6 points] (DI1 to DI6) | | | | | | | | B | | | | |
| | Communication (RS-422A) | | | | | | | | C | | | | |
| | Communication (RS-485) | | | | | | | | D | | | | |
| | Output 3 (OUT3) + Digital input [6 points] (DI1 to DI6) | | | | | | | | E | | | | |
| | Output 3 (OUT3) + Communication (RS-422A) | | | | | | | | F | | | | |
| | Output 3 (OUT3) + Communication (RS-485) | | | | | | | | G | | | | |
| | Output 3 (OUT3) + Digital input [4 points] (DI1 to DI4) + Communication (RS-422A) | | | | | | | | H | | | | |
| | Output 3 (OUT3) + Digital input [6 points] (DI1 to DI6) + Communication (RS-485) | | | | | | | | J | | | | |
| Option 3 [4, 5] | None | | | | | | | | | N | | | |
| | Remote setting input | | | | | | | | | 1 | | | |
| | Measured input 2 | | | | | | | | | 2 | | | |
| Display color | Green (standard) | | | | | | | | | | N | | |
| | White | | | | | | | | | | 1 | | |
| Waterproof/ Dustproof (optional) | None | | | | | | | | | | | N | |
| | Waterproof/Dustproof (IP65) | | | | | | | | | | | 1 | |
| Quick start code [1] | Quick start code not specified | | | | | | | | | | | | N |
| | Specify quick start code | | | | | | | | | | | | 1 |

[1] The factory set values of Output 1 (OUT1), Output 2 (OUT2), and Digital output will be as follows depending on the suffix code and the initial setting code.

| (3) Output 1 (OUT1) Suffix code | (12) Quick start code Suffix code | Factory set value | Remarks |
|---|---|---|---|
| N: None | N: Quick start code not specified | No output assignment to OUT1 | – |
| | 1: Specify quick start code | | – |
| Other than N | N: Quick start code not specified | Input 1_Control output (Heat/Cool PID control: Heat-side) | To be shipped with the output assignment code "1" in the Initial setting code (P. 1-6) |
| | 1: Specify quick start code | | Depends on the output assignment code in the Initial setting code (P. 1-6) |

| (4) Output 2 (OUT2) Suffix code | (12) Quick start code Suffix code | Factory set value | Remarks |
|---|---|---|---|
| N: None | N: Quick start code not specified | No output assignment to OUT2 | – |
| | 1: Specify quick start code | | – |
| Other than N | N: Quick start code not specified | Heater break alarm 1 (HBA1) output Heater break alarm 2 (HBA2) output (*) | To be shipped with the output assignment code "1" in the Initial setting code (P. 1-6) |
| | 1: Specify quick start code | | Depends on the output assignment code in the Initial setting code (P. 1-6) |

**(*)** The content of the assignment depends on the control action and the selection of Option 3. (See P. 1-7)

| (6) Digital output (DO) Suffix code | (12) Quick start code Suffix code | Factory set value | Remarks |
|---|---|---|---|
| 1: Digital output [1 point] (DO1) | N: Quick start code not specified | DO1: Event 1 DO2 to DO4: No assignment | To be shipped with the output assignment code "1" in the Initial setting code (P. 1-6) |
| | 1: Specify quick start code | | Depends on the output assignment code in the Initial setting code (P. 1-6) |
| 4: Digital output [4 points] (DO1 to DO4) | N: Quick start code not specified | DO1: Event 1 DO2: Event 2 DO3: Event 3 DO4: Event 4 | To be shipped with the output assignment code "1" in the Initial setting code (P. 1-6) |
| | 1: Specify quick start code | | Depends on the output assignment code in the Initial setting code (P. 1-6) |

[2] When "CT input [2 points] (CT1, CT2)" is specified at Option 1, the instrument will be shipped configured as follows.
CT1 assignment: Output 1 (OUT1)
CT2 assignment: Depends on the control action type.
PID control (without Measured input 2): Output 1 (OUT1) Heat/Cool PID control: Output 2 (OUT2)
PID control (with Measured input 2): Output 2 (OUT2)

[3] Depending on the designation of the suffix code, the factory set values of Output3 (OUT3), Digital input, and Communication in Option 2 will be as follows.

| (8) Option 2 | Factory set value | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Suffix code | DI1 | DI2 | DI3 | DI4 | DI5 | DI6 | OUT3 | Communication |
| N: None | – | – | – | – | – | – | – | – |
| A: Output 3 (OUT3) | – | – | – | – | – | – | (NOTE 1) | – |
| B: Digital input [6 inputs] (DI1 to DI6) | Area 8 points (**) | Area 8 points (**) | Area 8 points (**) | RUN/STOP transfer * | Auto/Manual transfer ** | Interlock release | – | – |
| C: Communication (RS-422A) | – | – | – | – | – | – | – | (NOTE 2) |
| D: Communication (RS-485) | – | – | – | – | – | – | – | (NOTE 2) |
| E: Output 3 (OUT3) + Digital input [6 inputs] (DI1 to DI6) | Area 8 points (**) | Area 8 points (**) | Area 8 points (**) | RUN/STOP transfer * | Auto/Manual transfer ** | Interlock release | (NOTE 1) | – |
| F: Output 3 (OUT3) + Communication (RS-422A) | – | – | – | – | – | – | (NOTE 1) | (NOTE 2) |
| G: Output 3 (OUT3) + Communication (RS-485) | – | – | – | – | – | – | (NOTE 1) | (NOTE 2) |
| H: Output 3 (OUT3) + Digital input [4 inputs] (DI1 to DI4) + Communication (RS-422A) | Area 8 points (**) | Area 8 points (**) | Area 8 points (**) | RUN/STOP transfer * | – | – | (NOTE 1) | (NOTE 2) |
| J: Output 3 (OUT3) + Digital input [6 inputs] (DI1 to DI6) + Communication (RS-485) | Area 8 points (**) | Area 8 points (**) | Area 8 points (**) | RUN/STOP transfer * | Auto/Manual transfer ** | Interlock release | (NOTE 1) | (NOTE 2) |

(**): Without area set signal

* When "1: Remote setting input" is specified at Option 3, this will be configured to "Remote/Local transfer".

** When "2: Measured input 2" is specified at Option 3, "Auto/Manual transfer" will be assigned to Input 1 and Input 2.

(NOTE 1) Output 3 (OUT3) will be factory preset as follows.
Universal output type selection (OUT3) (UNI o): Current output (4 to 20 mA DC)
OUT3 function selection (oSL3): Retransmission output
Retransmission output 3 type (Ro3): Input 1_Measured value (PV)

(NOTE 2) When "N: Quick start code not specified" is specified in the Initial setting code, the protocol of "Communication (RS-422A)" and "Communication (RS-485)" at Option 2 type will be factory preset to RKC communication (ANSI X3.28-1976). The digit of the communication data depends on the Input range code.

[4] When Heat/Cool PID control is specified at Control action, "2: Measured input 2" in the Specification code is not selectable.

[5] When "Remote setting input" or "Measured input 2" is specified at OUT3 the instrument will be shipped configured as follows.
Remote setting input: The factory set value of the Remote setting input depends on the designation at "Remote setting input type" in the Initial setting code. When "N: Quick start code not specified" is specified in the Initial setting code, the Remote setting input type will be factory preset to "0 to 10V DC" (Input range is the same as Measured input 1).
Measured input 2: Select function for input 2 (2PV) will be shipped configured as "2-loop control."
The default value of the Input range and the Control action will be the same as Measured input 1.

## 1.3.2 Quick start code (Initial setting code)

Quick start code tells the factory to ship with each parameter preset to the values detailed as specified by the customer. Quick start code is not necessarily specified when ordering, unless the preset is requested.
These parameters are software selectable items and can be re-programmed in the field following procedures found in the manual.

□ □–□ □ □ □–□
(1) (2) (3) (4) (5) (6) (7)

| Specification | | Initial setting code | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| Output assignment | OUT1, OUT2, DO1 to DO4 [See Output Assignment Code Table (P. 1-7)] | □ | | | | | | |
| Remote setting input type [a] | None | | N | | | | | |
| | Voltage input (0 to 1 V DC) | | 3 | | | | | |
| | Voltage input (0 to 5 V DC) | | 4 | | | | | |
| | Voltage input (0 to 10 V DC) | | 5 | | | | | |
| | Voltage input (1 to 5 V DC) | | 6 | | | | | |
| | Current input (0 to 20 mA DC) | | 7 | | | | | |
| | Current input (4 to 20 mA DC) | | 8 | | | | | |
| | Voltage input (−5 to +5 V DC) | | 9 | | | | | |
| | Voltage input (−10 to +10 V DC) | | A | | | | | |
| Event 1 type [b, c] | None | | | N | | | | |
| | Deviation high | | | A | | | | |
| | Deviation low | | | B | | | | |
| | Deviation high/low | | | C | | | | |
| | Band | | | D | | | | |
| | Deviation high with hold action | | | E | | | | |
| | Deviation low with hold action | | | F | | | | |
| | Deviation high/low with hold action | | | G | | | | |
| | Process high | | | H | | | | |
| | Process low | | | J | | | | |
| | Process high with hold action | | | K | | | | |
| | Process low with hold action | | | L | | | | |
| | Deviation high with re-hold action | | | Q | | | | |
| | Deviation low with re-hold action | | | R | | | | |
| | Deviation high/low with re-hold action | | | T | | | | |
| | Band (High/low individual setting) | | | U | | | | |
| | SV high | | | V | | | | |
| | SV low | | | W | | | | |
| | Deviation high/low (High/low individual setting) | | | X | | | | |
| | Deviation high/low with hold action (High/low individual setting) | | | Y | | | | |
| | Deviation high/low with re-hold action (High/low individual setting) | | | Z | | | | |
| | MV high | | | 1 | | | | |
| | MV low | | | 2 | | | | |
| | MV high (Cool-side) | | | 3 | | | | |
| | MV low (Cool-side) | | | 4 | | | | |
| Event 2 type [b, c] | None | | | | N | | | |
| | Event 2 type (The code is same as Event 1 type) | | | | □ | | | |
| Event 3 type [b, c] | None | | | | | N | | |
| | Event 3 type (The code is same as Event 1 type) | | | | | □ | | |
| Event 4 type [b, c] | None | | | | | | N | |
| | Event 4 type (The code is same as Event 1 type) | | | | | | □ | |
| Communication protocol [d] | None | | | | | | | N |
| | RKC communication (ANSI X3.28-1976) | | | | | | | 1 |
| | Modbus | | | | | | | 2 |
| | PLC communication: MITSUBISHI MELSEC series special protocol (QnA-compatibl-E4C frame format 4) | | | | | | | 3 |

[a] When “Remote setting input” is not specified as an option, only “N: None” is selectable.
[b] When the designation in the Initial setting code is “N: Quick start code not specified,” the instrument will be shipped with the configuration of “A: Deviation high.”
[c] The input assignment of the event will be configured as “Input 1.”
[d] When “Communication” is not specified as an option, only “N: None” is selectable as the communication protocol.

Output Assignment Code Table

| Code | OUT1 | OUT2 * | DO1 | DO2 | DO3 | DO4 |
|---|---|---|---|---|---|---|
| 1 | MV1 | HBA1/HBA2 | EV1 | EV2 | EV3 | EV4 |
| 2 | MV1 | HBA1/HBA2 | EV1 | LBA1/LBA2 | EV3 | EV4 |
| 3 | MV1 | FAIL | EV1 | HBA1/HBA2 | EV3 | LBA1/LBA2 |
| 4 | MV1 | HBA1/HBA2 | EV1 | FAIL | EV3 | EV4 |
| 5 | MV1 | EV1 | LBA1/LBA2 | HBA1/HBA2 | EV3 | EV4 |
| 6 | MV1 | HBA1/HBA2 | LBA1/LBA2 | FAIL | EV3 | EV4 |
| 7 | MV1 | EV1 | HBA1/HBA2 | FAIL | EV3 | EV4 |
| 8 | MV1 | EV2/EV4 | EV1/EV3 | HBA1/HBA2 | LBA1/LBA2 | FAIL |

MV1: Input 1_Control output (Heat/Cool PID control: Heat-side)
HBA1: Heater break alarm 1 (HBA1) output
HBA2: Heater break alarm 2 (HBA2) output
LBA1: Control loop break alarm 1 (LBA1) output
LBA2: Control loop break alarm 2 (LBA2) output
FAIL: FAIL output
EV1: Event 1 output
EV2: Event 2 output
EV3: Event 3 output
EV4: Event 4 output

If two or more items are assigned to the same output, the resultant output is *OR*.

* OUT2 assignment

The output assignment depends on the Control action and the selection of Option 3.

| Control action | Option 3 | OUT2 assignment |
|---|---|---|
| PID control | Option 3: None or Remote setting input | One item from the above Output Assignment Code Table. |
| | Measured input 2 | Input 2_Control output |
| Heat/Cool PID control | Option 3: None or Remote setting input | Input 1_Control output 〔 Heat/Cool PID control: Cool-side 〕 |

## 1.3.3 Range Code Table

The input range can be changed later within the range of the input range table* even if the input range is specified at the time of order.

***** Refer to the separate manual **[Part 2: Parameters/Functions]**.

● Thermocouple (TC) input

| Input type | Code | Range | See Note |
|---|---|---|---|
| K | K01 | 0 to 200 °C | 5 |
| | K02 | 0 to 400 °C | 5 |
| | K03 | 0 to 600 °C | 5 |
| | K04 | 0 to 800 °C | 5 |
| | K06 | 0 to 1200 °C | 5 |
| | K07 | 0 to 1372 °C | 5 |
| | K08 | −199.9 to +300.0 °C | 5 |
| | K09 | 0.0 to 400.0 °C | 5 |
| | K10 | 0.0 to 800.0 °C | 5 |
| | K14 | 0 to 300 °C | 5 |
| | K41 | −200 to +1372 °C | 5 |
| | K42 | −200.0 to +1372.0 °C | 5 |
| | KA1 | 0 to 800 °F | 5 |
| | KA2 | 0 to 1600 °F | 5 |
| | KA3 | 0 to 2502 °F | 5 |
| J | J01 | 0 to 200 °C | 5 |
| | J02 | 0 to 400 °C | 5 |
| | J03 | 0 to 600 °C | 5 |
| | J04 | 0 to 800 °C | 5 |
| | J08 | 0.0 to 400.0 °C | 5 |
| | J29 | −200.0 to +1200.0 °C | 5 |
| | JA1 | 0 to 800 °F | 5 |
| | JA3 | 0 to 2192 °F | 5 |
| | JA6 | 0 to 400 °F | 5 |

| Input type | Code | Range | See Note |
|---|---|---|---|
| T | T01 | −199.9 to +400.0 °C | 5 |
| | T02 | −199.9 to +100.0 °C | 5 |
| | T03 | −100.0 to +200.0 °C | 5 |
| | T19 | −200.0 to +400.0 °C | 5 |
| R | R01 | 0 to 1600 °C | 5 |
| | R07 | −50 to +1768 °C | 5 |
| | R08 | −50.0 to +1768.0 °C | 5 |
| | R09 | 0.0 to 1600.0 °C | 5 |
| S | S06 | −50 to +1768 °C | 5 |
| | S07 | −50.0 to +1768.0 °C | 5 |
| B | B03 | 0 to 1800 °C | 5 |
| | B04 | 0.0 to 1800.0 °C | 5 |
| E | E01 | 0 to 800 °C | 5 |
| | E23 | 0.0 to 800.0 °C | 5 |
| N | N02 | 0 to 1300 °C | 5 |
| | N05 | 0.0 to 1300.0 °C | 5 |
| W5Re/ W26Re | W03 | 0 to 2300 °C | 5 |
| PL II | A01 | 0 to 1300 °C | 5 |
| | A05 | 0.0 to 1300.0 °C | 5 |
| U | U01 | −199.9 to +600.0 °C | 5 |
| L | L04 | 0.0 to 900.0 °C | 5 |
| PR40-20 | F02 | 0 to 1800 °C | 5 |
| | FA2 | 0 to 3200 °F | 5 |

● RTD input

| Input type | Code | Range | See Note |
|---|---|---|---|
| Pt100 | D01 | −199.9 to +649.0 °C | 5 |
| | D04 | −100.0 to +100.0 °C | 5 |
| | D05 | −100.0 to +200.0 °C | 5 |
| | D06 | 0.0 to 50.0 °C | 5 |
| | D07 | 0.0 to 100.0 °C | 5 |
| | D08 | 0.0 to 200.0 °C | 5 |
| | D09 | 0.0 to 300.0 °C | 5 |
| | D10 | 0.0 to 500.0 °C | 5 |
| | D12 | −199.9 to +600.0 °C | 5 |
| | D21 | −200.0 to +200.0 °C | 5 |

| Input type | Code | Range | See Note |
|---|---|---|---|
| Pt100 | D27 | 0.00 to 50.00 °C | 5 |
| | D34 | −100.00 to +100.00 °C | 5 |
| | D35 | −200.0 to +850.0 °C | 5 |
| | D48 | −100.00 to +850.00 °C | 5 |
| | DA1 | −199.9 to +999.9 °F | 5 |
| | DA9 | 0.0 to 500.0 °F | 5 |
| JPt100 | P08 | 0.0 to 200.0 °C | 5 |
| | P29 | −100.00 to +100.00 °C | 5 |
| | P30 | −200.0 to +640.0 °C | 5 |
| | P36 | −100.00 to +640.00 °C | 5 |

● Voltage/Current input

| Input type | Code | Range | See Note |
|---|---|---|---|
| 0 to 10 mV DC | 101 | Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0) | 5 |
| 0 to 100 mV DC | 201 | | 5 |
| 0 to 1 V DC | 301 | | 5 |
| 0 to 5 V DC | 401 | | 5 |
| 0 to 10 V DC | 501 | | 5 |

| Input type | Code | Range | See Note |
|---|---|---|---|
| 1 to 5 V DC | 601 | Programmable range −19999 to +99999 (Factory set value 0.0 to 100.0) | 5 |
| 0 to 20 mA DC | 701 | | 5 |
| 4 to 20 mA DC | 801 | | 5 |
| −10 to +10 V DC | 904 | | 5 |
| −5 to +5 V DC | 905 | | 5 |

Note The number of displayed digits of the measured value.

# 2 MOUNTING

This chapter describes mounting cautions, dimensions and mounting procedures.

## 2.1 Mounting Cautions

**⚠ WARNING**

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

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

(2) Use this instrument within the following environment conditions:
- Allowable ambient temperature: −10 to +55 °C
- Allowable ambient humidity: 5 to 95 %RH
  (Absolute humidity: MAX.W.C 29 g/m$^3$ dry air at 101.3 kPa)
- Installation environment conditions: Indoor use
  Altitude up to 2000 m
  Short-term temporary overvoltage: 1440 V
  Long-term temporary overvoltage: 490 V

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

(4) Mount this instrument in the panel considering the following conditions:
- Provide adequate ventilation space so that heat does not build up.
- Ensure at least 50 mm space on top and bottom of the instrument for maintenance and environmental reasons.
- Do not mount this instrument directly above the equipment that generates large amount of heat (heaters, transformers, thyristor units, large-wattage resistors.)
- If the ambient temperature rises above 55 °C, cool this instrument with a forced air cooling fan, cooling unit, etc. Cooled air should not blow directly on this instrument.
- In order to improve safety and the immunity to withstand noise, mount this instrument as far away as possible from high voltage equipment, power lines, and rotating machinery.
  High voltage equipment: Do not mount within the same panel.
  Power lines: Separate at least 200 mm.
  Rotating machinery: Separate as far as possible.
- For correct functioning mount this instrument in a horizontal position.

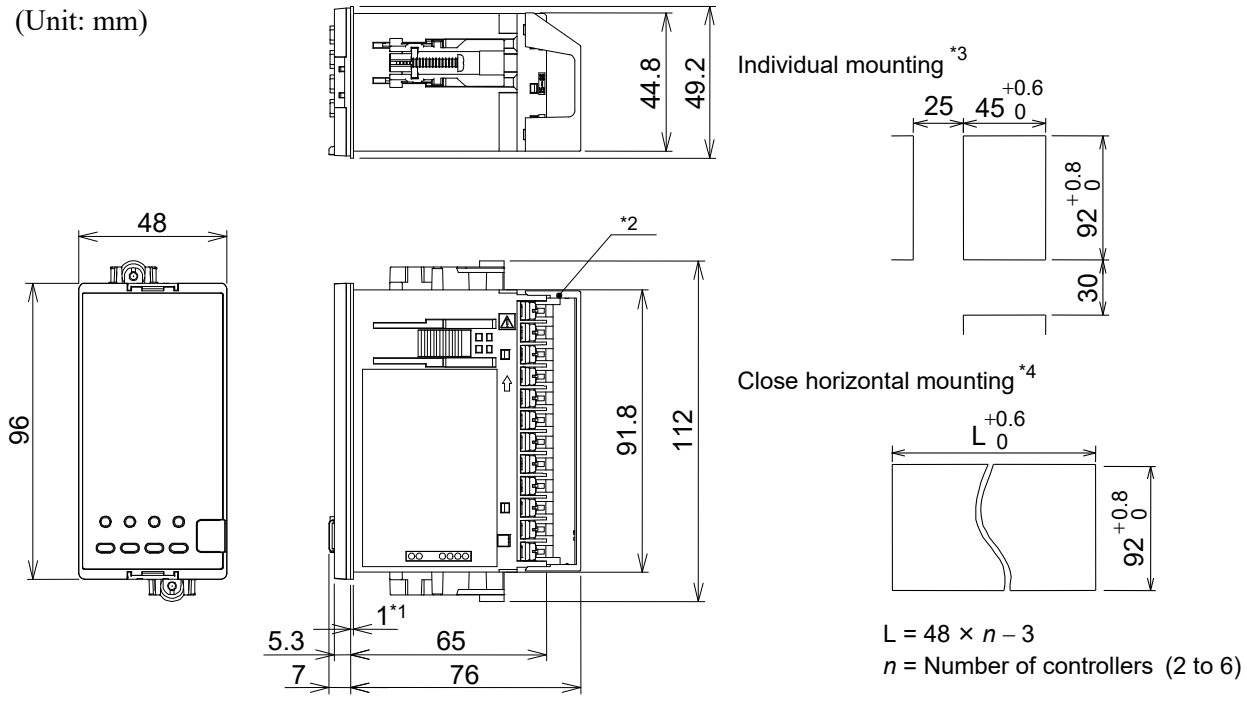
(5) In case this instrument is connected to a supply by means of a permanent connection, a switch or circuit-breaker shall be included in the installation. This shall be in close proximity to the equipment and within easy reach of the operator. It shall be marked as the disconnecting device for the equipment.

# 2.2 Dimensions

Panel thickness: 1 to 10 mm
(When mounting multiple GZ400/900 controllers close together, the panel strength should be checked to ensure proper support.)

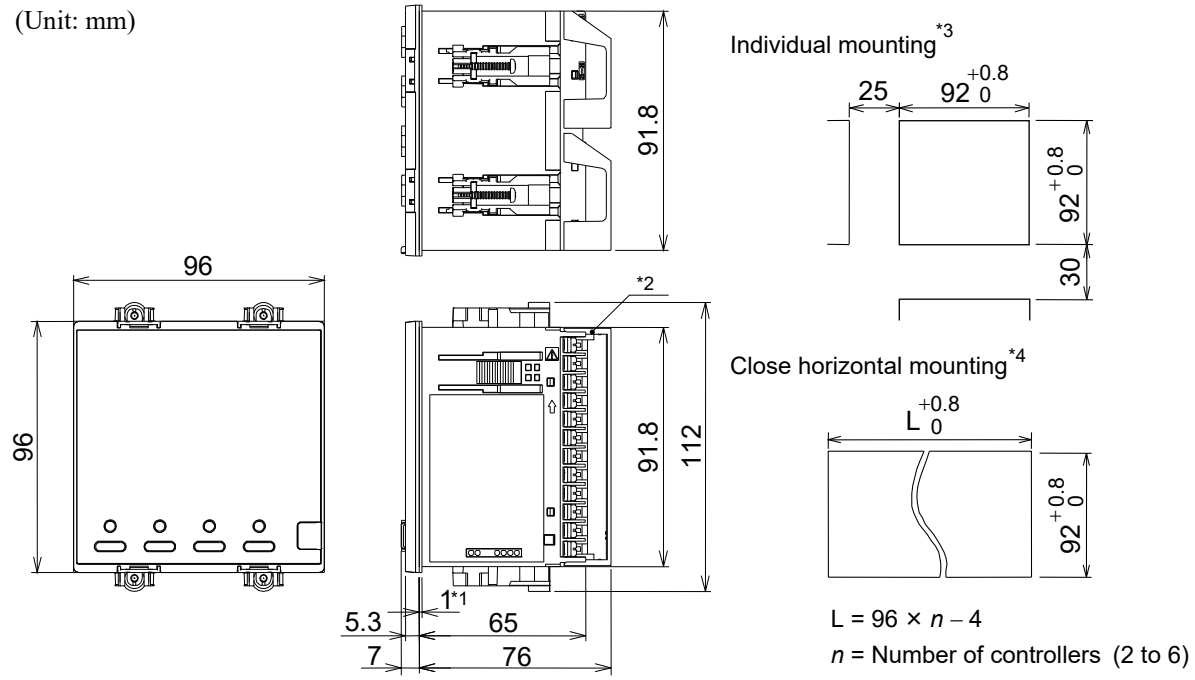
## ■ GZ400

(Unit: mm)




## ■ GZ900

(Unit: mm)

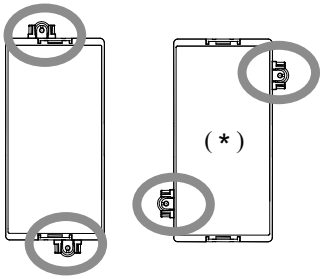
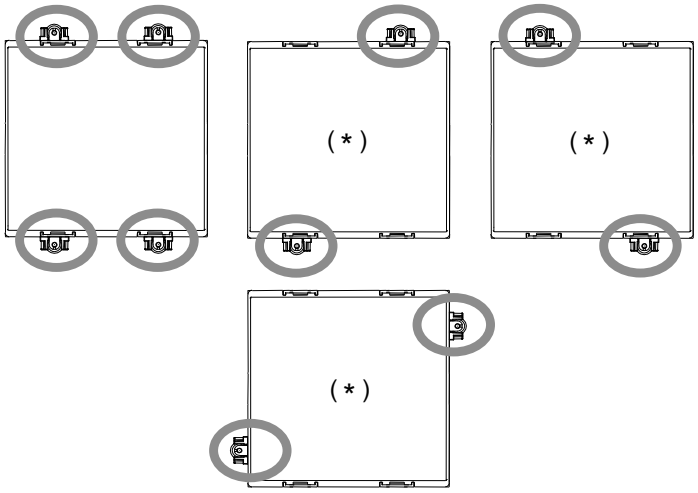



*1 Gasket (optional)
*2 Terminal cover (optional) [sold separately]
*3 To keep the instrument as waterproof as possible, make sure that the panel surface has no burr or distortion where the hole is to be cut out.
*4 Remove the gasket. When the GZ900 is mounted closely protection will be compromised and they will not meet IP65 standards.

## 2.3 Procedures of Mounting and Removing

### ■ The mounting position of the mounting brackets

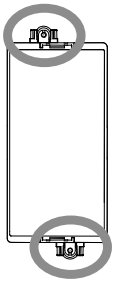
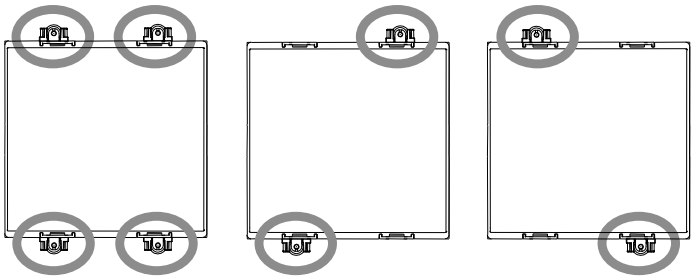
#### ● Mounting positions for a single controller

| GZ400 | GZ900 |
|---|---|
|  |  |



(*) GZ400 with mounting brackets attached on the side and GZ900 mounted with two mounting brackets do not provide water and dustproof protection.

#### ● Mounting positions for close mounting

| GZ400 | GZ900 |
|---|---|
|  |  |

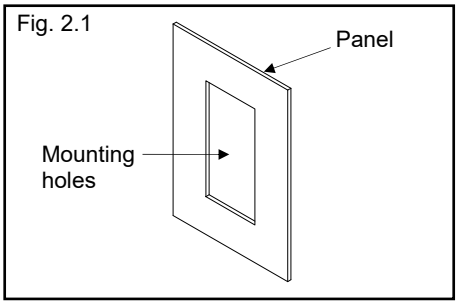
When mounted closely, the controllers are not waterproof or dustproof.

## ■ Mounting procedures (Standard type)

*1.* Prepare the panel cutout as specified in Fig. 2.1.
(Panel thickness: 1 to 10 mm)

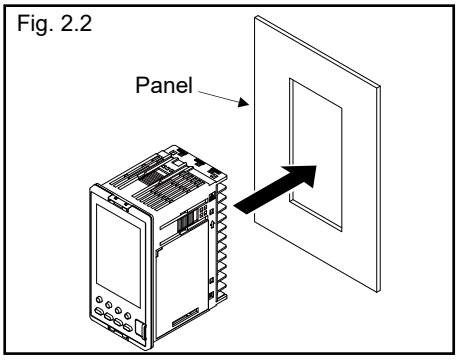
☞ See **2.2 Dimensions (P. 2-3)**.

Fig. 2.1



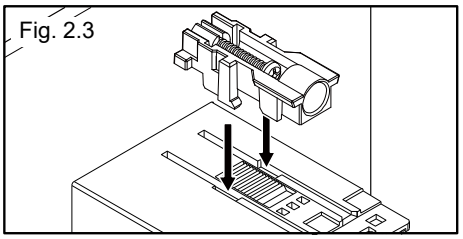

*2.* Insert the instrument through the panel cutout. (Fig. 2.2)

Fig. 2.2



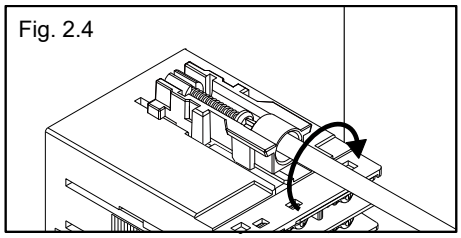

*3.* Insert the mounting bracket into the mounting groove of the instrument. (Fig. 2.3)
Do not push the bracket forcibly forward.

Fig. 2.3



*4.* Tighten up the screw for the mounting bracket with a Phillips screwdriver so that the mounting bracket is firmly secured in place. (Fig. 2.4)
Give the screw another turn when the tip of the screw touches the panel.

Fig. 2.4



Do not overtighten the screw. It may turn idle.
In case the screw has been overtightened to turn idle, loosen the screw, then tighten the screw again until the instrument is firmly fixed.

*5.* The other mounting bracket(s) should be installed in the same way as described in ***3*** and ***4***.

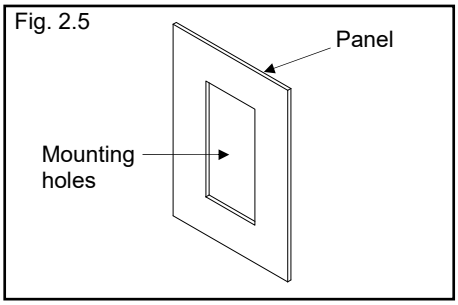
## ■ Mounting procedures (Waterproof/Dustproof type)

The front of the instrument conforms to **IP65** [Specify when ordering] when mounted on the panel. For effective Waterproof/Dustproof, the gasket must be securely placed between the instrument and the panel without any gap. If a gasket is damaged, please contact RKC sales office or the agent.

*1.* Prepare the panel cutout as specified in Fig. 2.5.
(Panel thickness: 1 to 10 mm)

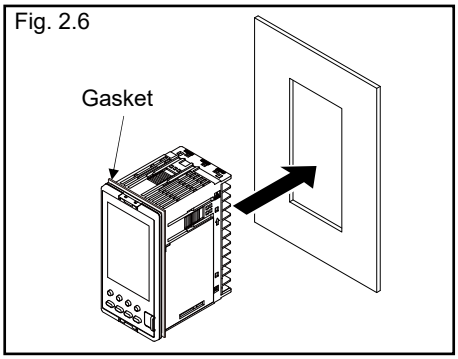
☞ See **2.2 Dimensions (P. 2-3)**.

Fig. 2.5




*2.* Set the waterproof/dustproof gasket (optional) on the case from the back side of the instrument as shown in Fig. 2.6.
Insert the instrument through the panel cutout.

Fig. 2.6

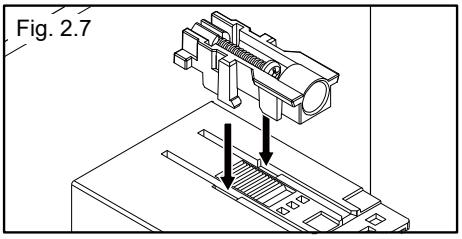



*3.* Insert the mounting bracket into the mounting groove of the instrument. (Fig. 2.7)
Do not push the bracket forcibly forward.

**NOTE**

**For waterproof and dustproof protection, two mounting brackets (P. 2-4) must be placed on the top and the bottom side of the instrument. If the mounting brackets are placed on the sides of the controller, waterproof and dustproof protection will not be guaranteed.**

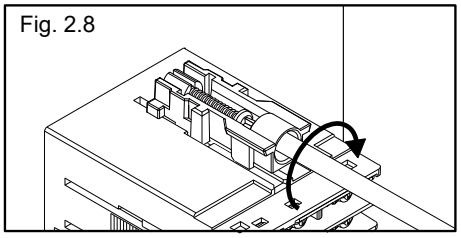
Fig. 2.7



*4.* Tighten up the screw for the mounting bracket with a Phillips screwdriver so that the mounting bracket is firmly secured in place. (Fig. 2.8)
Give the screw another turn when the tip of the screw touches the panel.

Do not overtighten the screw. It may turn idle.
In case the screw has been overtightened to turn idle, loosen the screw, then tighten the screw again until the instrument is firmly fixed.

Fig. 2.8



*5.* The other mounting bracket(s) should be installed in the same way as described in ***3*** and ***4***.

☞ For replacing of the gasket, see **APPENDIX A.1 Replacing the Waterproof/Dustproof Gasket (P. A-2)**.

## ■ Removal procedures

*1.* Turn the power OFF.

*2.* Remove the wiring.

*3.* Loosen the screw of the mounting bracket.

*4.* Hold the rear of the mounting bracket (Fig.2.9), and lift up one side to remove it from the case. (Fig. 2.10)

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

Fig. 2.9

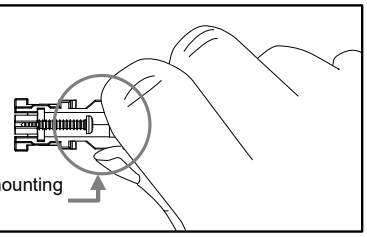
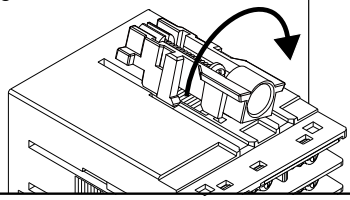
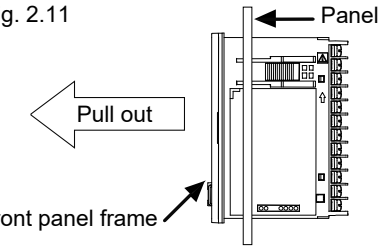



Fig. 2.10

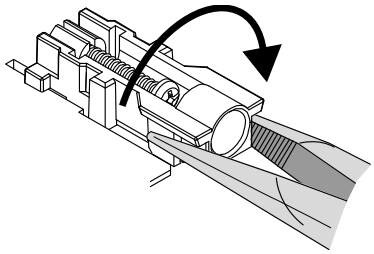


*6.* Pull out the instrument from the mounting cutout while holding the front panel frame of this instrument. (Fig. 2.11)

Fig. 2.11




Use long-nose pliers to remove mounting brackets from the instrument that is installed in a narrow place or installed tightly in a vertical position.



## *MEMO*

# 3 WIRING

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

## 3.1 Wiring Cautions

**⚠ WARNING**

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

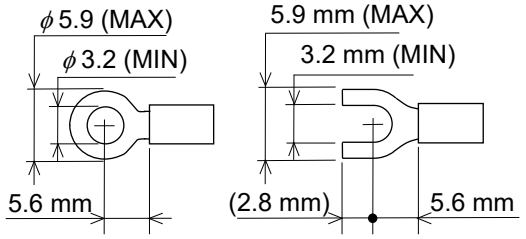
- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as "SELV" circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
  - Shorten the distance between the twisted power supply wire pitches to achieve the most effective noise reduction.
  - Always install the noise filter on a grounded panel. Minimize the wiring distance between the noise filter output and the instrument power supply terminals to achieve the most effective noise reduction.
  - Do not connect fuses or switches to the noise filter output wiring as this will reduce the effectiveness of the noise filter.
- Allow approximately 5 seconds for contact output when the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from a "SELV" circuit defined as IEC 60950-1.
- This instrument is not provided with an overcurrent protection device. For safety, install an overcurrent protection device (such as a fuse) with adequate breaking capacity close to the instrument.

  Fuse type: Time-lag fuse (Approved fuse according IEC 60127-2 and/or UL 248-14)
  Fuse rating: Rated voltage 250 V AC
  Rated current 0.5 A (24 V AC/DC type)
  1 A (100 to 240 V AC type)

- Use the solderless terminal appropriate to the screw size.

  Screw size: M3 × 7 (with 5.8 × 5.8 square washer)
  Recommended tightening torque:
  0.4 N·m (4 kgf·cm)
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 $mm^2$
  Specified dimension: See Fig. 3.1
  Specified solderless terminal:
  Circular terminal with isolation
  V1.25–MS3
  Manufactured by J.S.T MFG CO., LTD.

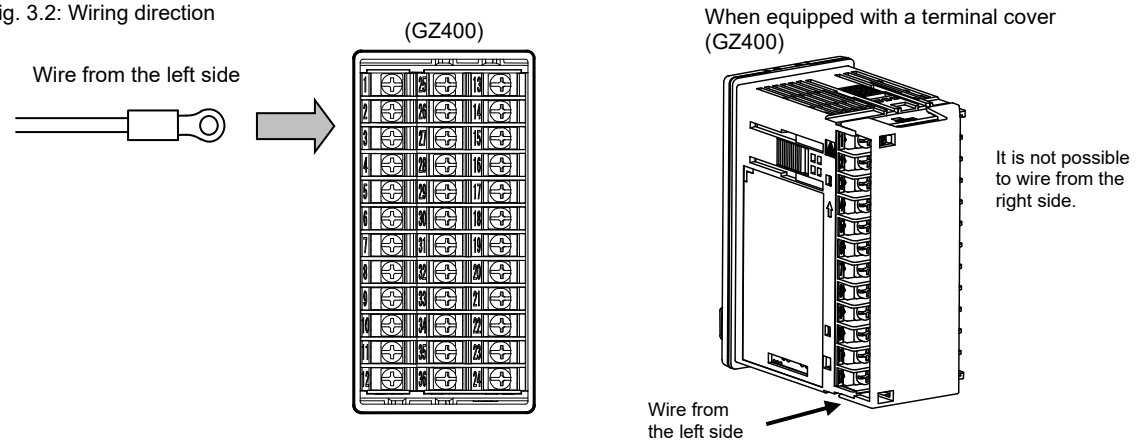
Fig. 3.1




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

- When wiring GZ400/900, wire from the left direction toward the backside terminals as shown in Fig. 3.2. When using the terminal cover (Figs. 3.2, 3.4), it is not possible to wire from the right side. When wiring from the left and right with a close mounting, there are cases where adjacent instruments cannot be wired.

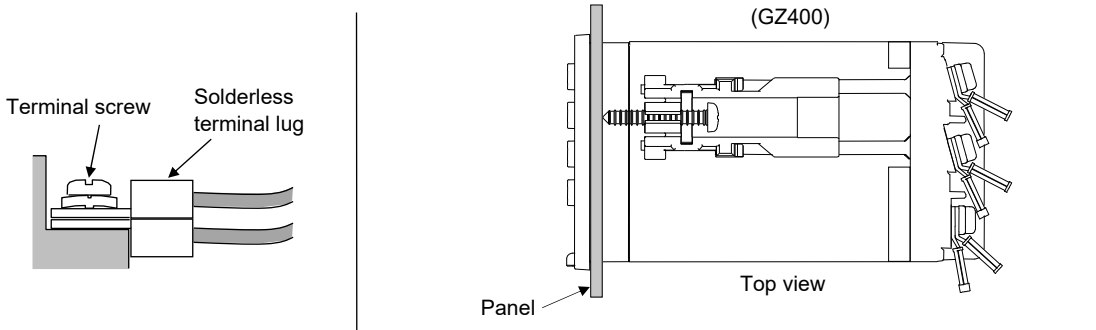
Fig. 3.2: Wiring direction




(GZ400 is used in the example shown, but the wiring directions are the same for GZ900.)

- Up to two solderless terminal lugs can be connected to one terminal screw. **The requirements of reinforced insulation can be still complied with in this condition.** When actually doing this, place one solderless terminal lug over the other as illustrated below.

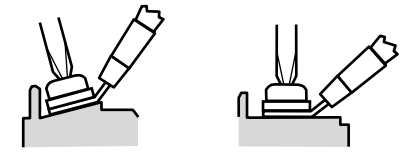
Fig. 3.3: Two solderless terminals are used overlapped




(GZ400 is used in the example shown, but restrictions for crossover wiring are the same for GZ900.)

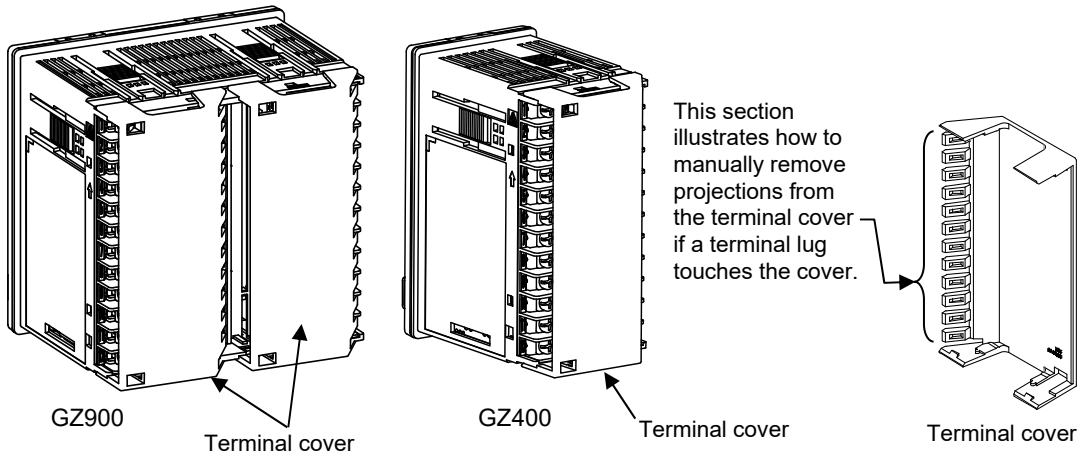
If solderless terminal lugs other than the recommended dimensions are used, terminal screws may not be tightened. In that case, bend each solderless terminal lug before wiring. If the terminal screw is forcibly tightened, it may be damaged.

When tightening a screw of the instrument, make sure to fit the screwdriver properly into the screw head mounted tilted or flat as shown in the right figure. Tightening the screw with excessive torque may damage the screw thread.



- Caution for using the terminal cover:
  - To prevent electric shock or instrument failure, always turn off the power before mounting or removing the terminal cover.
  - When mounting and removing the terminal cover, apply pressure very carefully to avoid damage to the terminal cover.
  - If a solderless terminal lug touches the GZ400/900 common terminal cover, remove the projection from the terminal cover by manually bending it back and forth until it breaks off. (Fig. 3.4)

Fig.3.4: Image of how to close the terminal board with the terminal cover and to remove projections



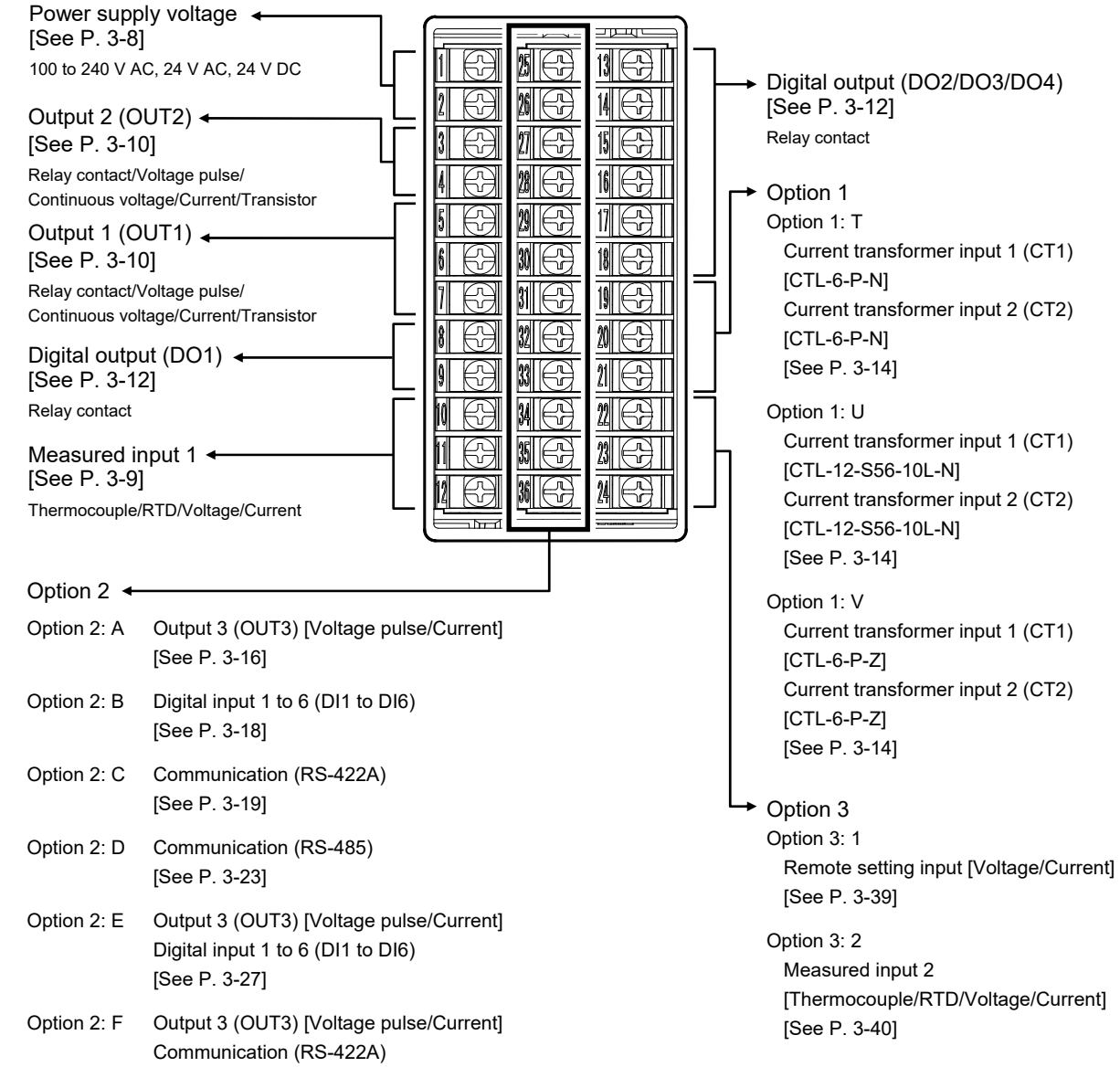

☞ For the mounting and removing of the terminal cover, see **3.5 Handling of the Terminal Cover [Optional] (P. 3-44)**.

# 3.2 Terminal Layout

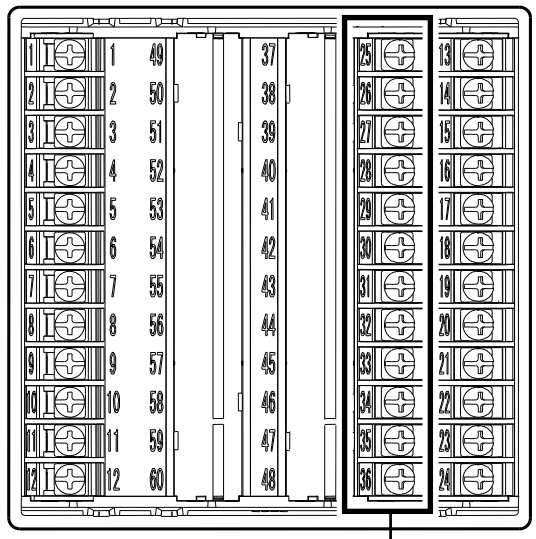
The terminal layout is as follows.

To prevent malfunctioning, do not connect wires to unused terminals.

## ■ GZ400



## ■ GZ900



Power supply voltage
[See P. 3-8]
100 to 240 V AC, 24 V AC, 24 V DC

Output 2 (OUT2)
[See P. 3-10]
Relay contact/Voltage pulse/
Continuous voltage/Current/Transistor

Output 1 (OUT1)
[See P. 3-10]
Relay contact/Voltage pulse/
Continuous voltage/Current/Transistor

Digital output (DO1)
[See P. 3-12]
Relay contact

Measured input 1
[See P. 3-9]
Thermocouple/RTD/Voltage/Current

Digital output
(DO2/DO3/DO4)
[See P. 3-12]
Relay contact

Option 1
Option 1: T
Current transformer input 1 (CT1)
[CTL-6-P-N]
Current transformer input 2 (CT2)
[CTL-6-P-N]
[See P. 3-14]

Option 1: U
Current transformer input 1 (CT1)
[CTL-12-S56-10L-N]
Current transformer input 2 (CT2)
[CTL-12-S56-10L-N]
[See P. 3-14]

Option 1: V
Current transformer input 1 (CT1)
[CTL-6-P-Z]
Current transformer input 2 (CT2)
[CTL-6-P-Z]
[See P. 3-14]

Option 2

Option 2: A Output 3 (OUT3) [Voltage pulse/Current]
[See P. 3-16]

Option 2: B Digital input 1 to 6 (DI1 to DI6)
[See P. 3-18]

Option 2: C Communication (RS-422A)
[See P. 3-19]

Option 2: D Communication (RS-485)
[See P. 3-23]

Option 2: E Output 3 (OUT3) [Voltage pulse/Current]
Digital input 1 to 6 (DI1 to DI6)
[See P. 3-27]

Option 2: F Output 3 (OUT3) [Voltage pulse/Current]
Communication (RS-422A)
[See P. 3-29]

Option 2: G Output 3 (OUT3) [Voltage pulse/Current]
Communication (RS-485)
[See P. 3-31]

Option 2: H Output 3 (OUT3) [Voltage pulse/Current]
Digital input 1 to 4 (DI1 to DI4)
Communication (RS-422A)
[See P. 3-33]

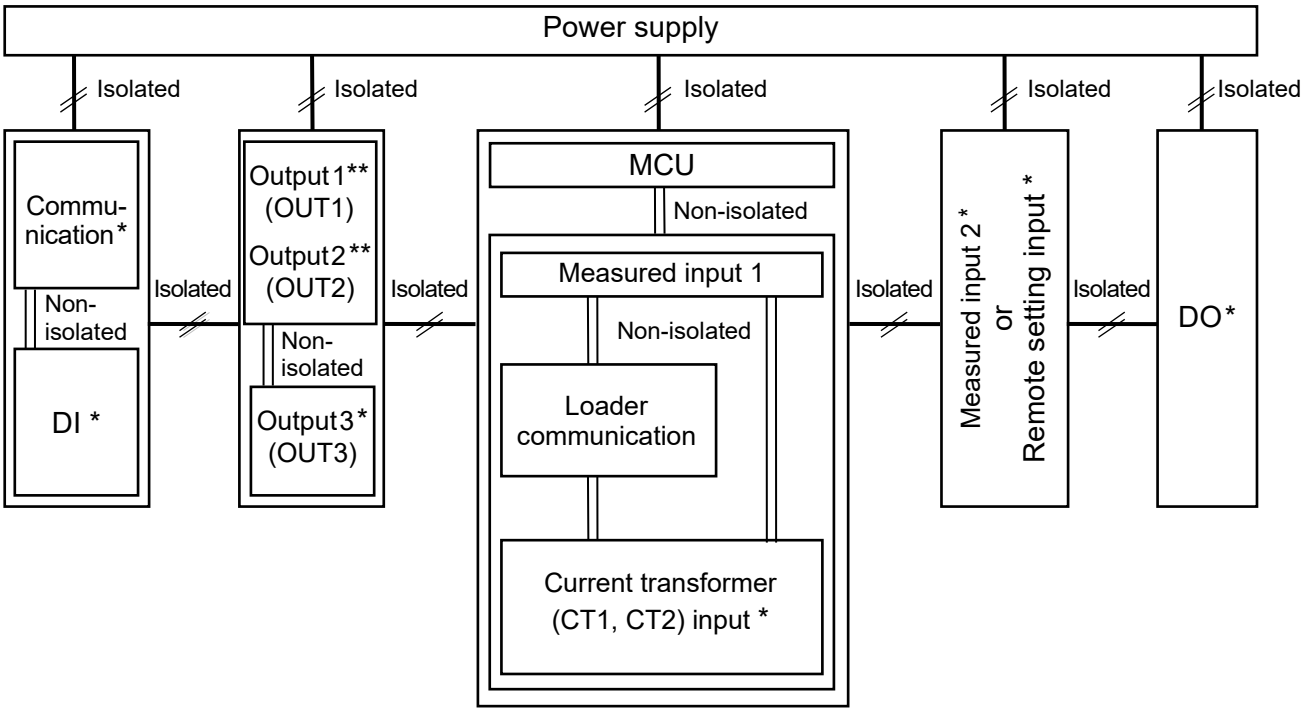
Option 2: J Output 3 (OUT3) [Voltage pulse/Current]
Digital input 1 to 6 (DI1 to DI6)
Communication (RS-485)
[See P. 3-36]

Option 3
Option 3: 1
Remote setting input
[Voltage/Current]
[See P. 3-39]

Option 3: 2
Measured input 2
[Thermocouple/RTD/Voltage/
Current]
[See P. 3-40]

## ■ Isolations of input and output

For the Input/Output isolation block of this instrument, see the following:




* Option

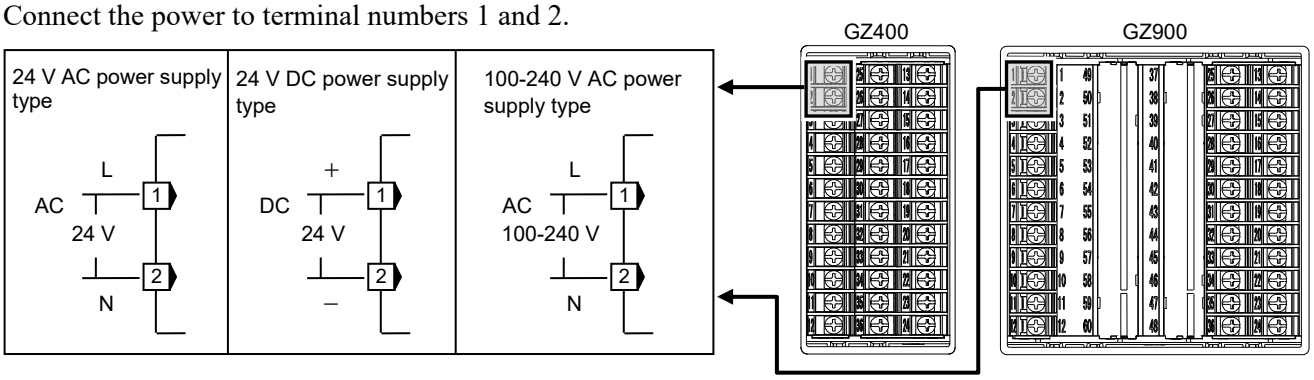
** Outputs are isolated if either OUT1 or OUT2 is “relay contact output.”
If both outputs are not “relay contact output,” outputs are not isolated.

# 3.3 Wiring of Each Terminal

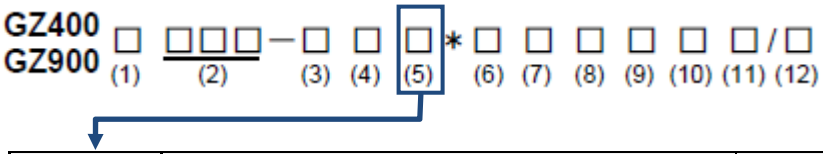
Always check the polarity of each terminal prior to wiring.

## 3.3.1 Power supply

- Connect the power to terminal numbers 1 and 2.




- Power supply voltage for the controller must be within the range shown below.

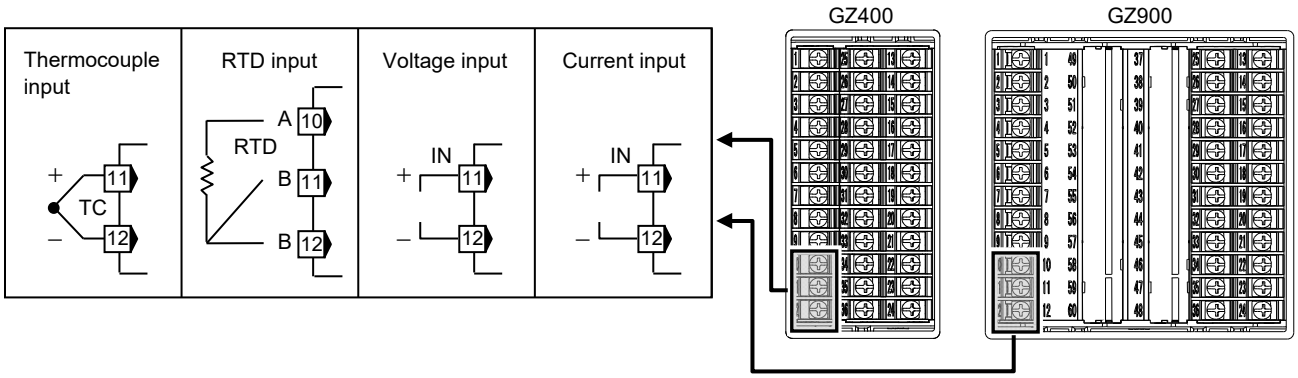



| Suffix code | Power supply type | Power consumption | Rush current |
|---|---|---|---|
| 3 | 20.4 to 26.4 V AC<br>[Including power supply voltage variation]<br>(Rated: 24 V AC)<br>Power supply frequency: 50/60 Hz<br>Frequency variation: 50 Hz (–10 to +5 %)<br>60 Hz (–10 to +5 %) | GZ400: 6.9 VA max. (at 24 V AC)<br>GZ900: 7.4 VA max. (at 24 V AC) | 16.3 A or less<br>(at 24 V AC) |
| 3 | 20.4 to 26.4 V DC<br>[Including power supply voltage variation]<br>(Rated: 24 V DC) | GZ400: 175 mA max. (at 24 V DC)<br>GZ900: 190 mA max. (at 24 V DC) | 11.5 A or less<br>(at 24 V DC) |
| 4 | 85 to 264 V AC<br>[Including power supply voltage variation]<br>(Rated: 100 to 240 V AC)<br>Power supply frequency: 50/60 Hz<br>Frequency variation: 50 Hz (–10 to +5 %)<br>60 Hz (–10 to +5 %) | GZ400: 6.8 VA max. (at 100 V AC)<br>10.1 VA max. (at 240 V AC)<br>GZ900: 7.4 VA max. (at 100 V AC)<br>10.9 VA max. (at 240 V AC) | 5.6 A or less<br>(at 100 V AC)<br>13.3 A or less<br>(at 240 V AC) |

- If there is electrical noise in the vicinity of the instrument that could affect operation, use a noise filter.
- Power supply wiring must be twisted and have a low voltage drop.
- For an instrument with 24 V power supply input, supply power from a “SELV” circuit defined as IEC 60950-1.
- This instrument is not provided with an overcurrent protection device. For safety, install an overcurrent protection device (such as a fuse) with adequate breaking close to the instrument.
  Fuse type: Time-lag fuse (IEC 60127-2, UL 248-14)
  Fuse rating: Rated voltage 250 V AC
  Rated current 0.5 A (24 V AC/DC type)
  1 A (100 to 240 V AC type)

## 3.3.2 Measured input 1 (Thermocouple/RTD/Voltage/Current)

- For the measured input type, terminals 10 through 12 are allocated to the measured input.




- The input types (input group) are as follows.

GZ400
GZ900 □ (1) □□□ (2) — □ (3) □ (4) □ (5) ∗ □ (6) □ (7) □ (8) □ (9) □ (10) □/□ (11) (12)

| Suffix code | Input group | Input type |
|---|---|---|
| See Range Code Table (P. 1-8) | Thermocouple (TC) input | K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00) |
| | RTD input | Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981) |
| | Low voltage input | 0 to 10 mV DC, 0 to 100 mV DC |
| | High voltage input | 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, −5 to +5 V DC, −10 to +10 V DC |
| | Current input | 0 to 20 mA DC, 4 to 20 mA DC |

**NOTE**

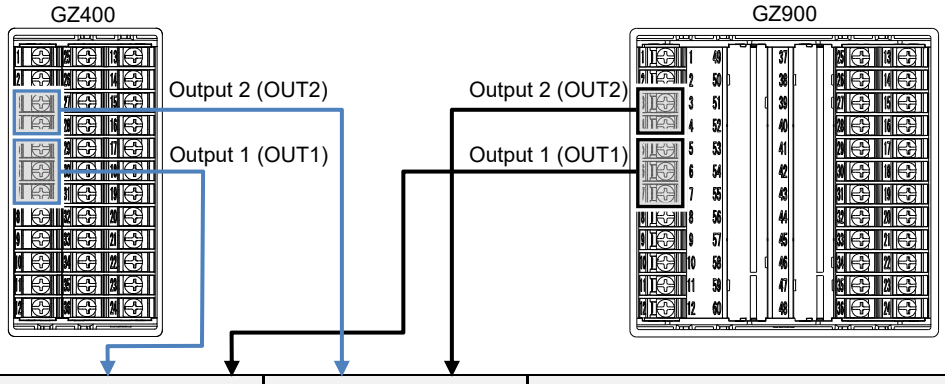
**When the input type is changed from current or high voltage input to TC, RTD or low voltage input, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.**

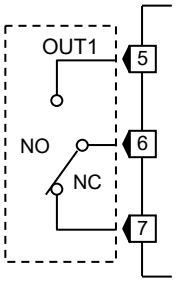
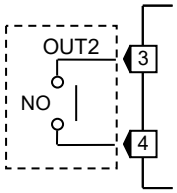
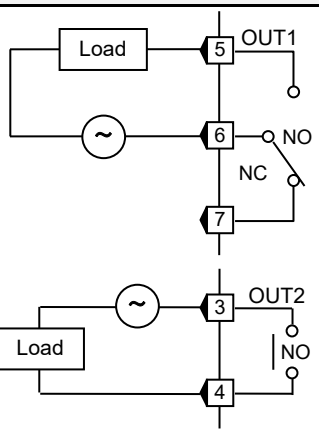
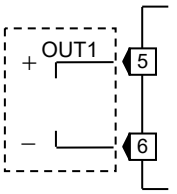
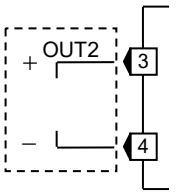
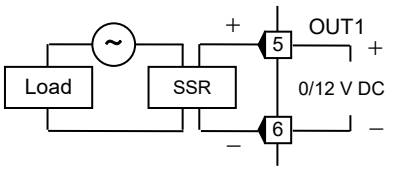
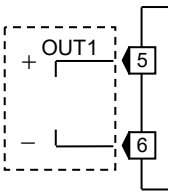
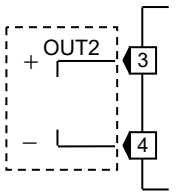
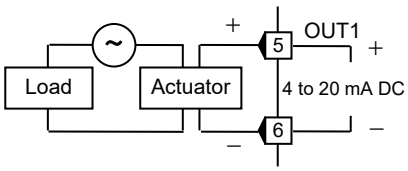
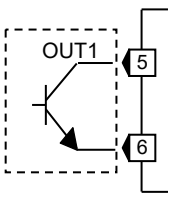
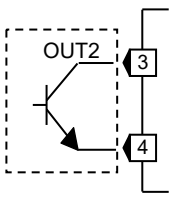
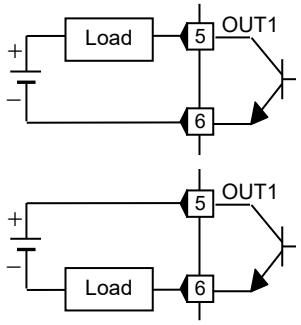
☞ For details on changing the Input type, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.

## 3.3.3 Output 1 (OUT1)/Output 2 (OUT2)

- Terminals 5 through 7 are used for Output 1 (OUT1); and Terminal 3 and 4 are used for Output 2 (OUT2).
- Connect an appropriate load according to the output type of Output 1 (OUT1) and Output 2 (OUT2). (Specify when ordering)




| | Output 1 (OUT1) | Output 2 (OUT2) | Wiring example |
|---|---|---|---|
| Relay contact output |  |  |  |
| ★ Voltage pulse output |  |  |  |
| ★ Continuous voltage output Current output |  |  |  |
| ★ Transistor output |  |  |  |

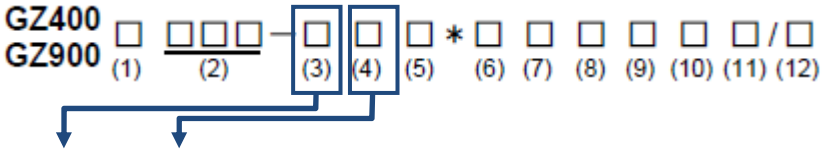
NO: Normally open NC: Normally close

★: To prevent malfunctioning, do not connect wires to unused terminals (terminal No. 7).

: The dotted box diagram describes the output state inside the instrument.

Continued on the next page.

- Outputs are isolated if Output 1 (OUT1) or Output 2 (OUT2) is relay contact output. If both outputs are not relay contact output, outputs are not isolated.
- Number of outputs and output types must be specified when ordering. The specifications of each output are as follows.




| Suffix code | | Output type | Specifications |
|---|---|---|---|
| Output 1 (OUT1) | Output 2 (OUT2) | | |
| N | N | None | |
| M | M | Relay contact output | Contact type: c contact (OUT1)<br>a contact (OUT2)<br>Contact rating (Resistive load): 250 V AC 3 A, 30 V DC 1 A<br>Electrical life: 300,000 times or more (Rated load)<br>Mechanical life: 50 million times or more (Switching: 180 times/min) |
| V | V | Voltage pulse output | 0/12 V DC (Allowable load resistance: 500 Ω or more) |
| 4 | 4 | Continuous voltage output | 0 to 5 V DC (Allowable load resistance: 1 kΩ or more) |
| 5 | 5 | | 0 to 10 V DC (Allowable load resistance: 1 kΩ or more) |
| 6 | 6 | | 1 to 5 V DC (Allowable load resistance: 1 kΩ or more) |
| 7 | 7 | Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |
| 8 | 8 | | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) |
| B | B | Transistor output | Allowable load current: 100 mA<br>Load voltage: 30 V DC or less<br>Voltage drop at ON: 2 V or less (at allowable load current)<br>Leakage current at OFF: 0.1 mA or less |

- Output signals (function) can be assigned to each output (OUT, OUT2). Output signal (function) assignment is available either Initial setting code at the time of order or reconfiguration in the Engineering mode.

☞ For the details of Output signals (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Outputs (OUT1, OUT2) and Output signals (function)

(✓: Assignable)

| Output signal (function) | OUT1 [1] | | | | | OUT2 [1] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Relay contact | Voltage pulse | Current | Continuous voltage | Transistor | Relay contact | Voltage pulse | Current | Continuous voltage | Transistor |
| Input 1_Control output (Heat-side) [2] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Input 1_Control output (Cool-side) [2] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Logic calculation output (Event output) [2, 4] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) [2, 4] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) [2, 4] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| RUN state output [3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Output of the communication monitoring result [3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Manual mode state output [3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Remote mode state output [3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| AT state output [3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Output while Set value (SV) is changing [3] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| FAIL output [2] | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Retransmission output [3] | | | ✓ | ✓ | | | | ✓ | ✓ | |

[1] The following table shows factory set values of Output signals (function) which are assigned to OUT1 and OUT2 when the suffix code other than "N" is specified.

| Control action | Option 3 [Suffix code (9)] | Factory set value | |
|---|---|---|---|
| PID control | N: None or 1: Remote setting input | OUT1: Input 1_Control output | OUT2: Heater break alarm 1 (HBA1) output Heater break alarm 2 (HBA2) output |
| | 2: Measured input 2 | OUT1: Input 1_Control output | OUT2: Input 2_Control output |
| Heat/Cool PID control | N: None or 1: Remote setting input | OUT1: Input 1_Control output (Heat-side) | OUT2: Input 1_Control output (Cool-side) |

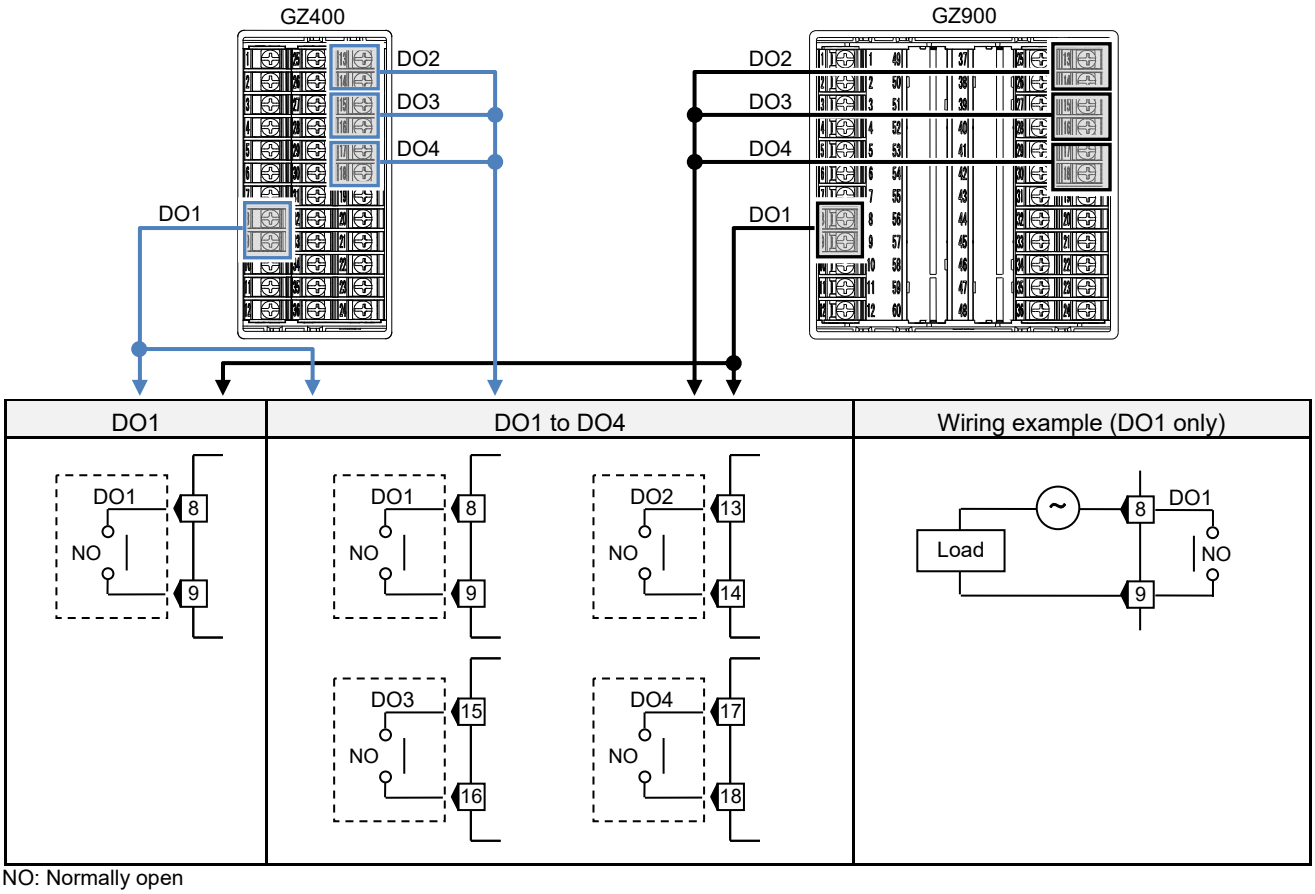
[2] Factory preset is available by specifying the Initial setting code at the time of order. [1.3.2 Quick start code (Initial setting code) (P. 1-6)]

[3] Configurable at "OUT1 function selection" and "OUT2 function selection" in the Engineering mode.

[4] Multiple functions can be specified for "OUT1 logic calculation selection" and "OUT2 logic calculation selection" in the Engineering mode. (*OR-output*)

## 3.3.4 Digital output (DO1/DO2/DO3/DO4)

- Terminal 8 and 9 are used for DO1; and Terminals 13 through 18 are used for DO2 to DO4.
- Connect the load(s) according to the number of output (specify when ordering) of Digital outputs (DO1 to DO4).

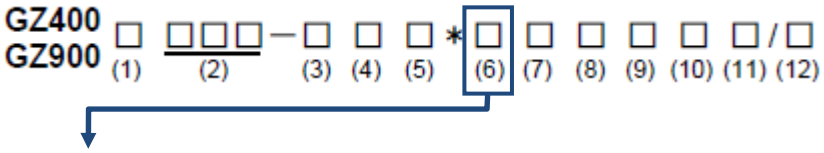



NO: Normally open

: The dotted box diagram describes the output state inside the instrument.

Continued on the next page.

- Output type is only relay contact output.




| Suffix code | Number of output | Specifications | |
|---|---|---|---|
| 1 | Digital output [1 point] (DO1) | Contact type: | a contact |
| | | Contact rating (Resistive load): | 250 V AC 1 A, 30 V DC 0.5 A |
| 4 | Digital output [4 points] (DO1 to DO4) | Electrical life: | 150,000 times or more (Rated load) |
| | | Mechanical life: | 20 million times or more (Switching: 300 times/min) |

- Output signals (function) can be assigned to each Digital output (DO1 to DO4). Output signal (function) assignment is available either Initial setting code at the time of order or reconfiguration in the Engineering mode.

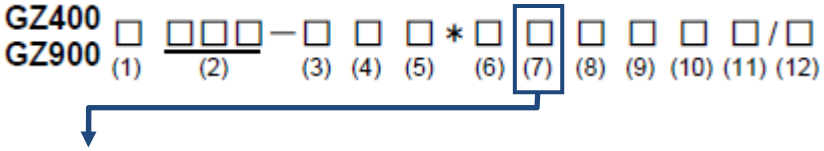
  ☞ For the details of Output signals (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Digital outputs (DO1 to DO4) and Output signals (function) (✓: Assignable)

| Output signals (function) | DO1 [1] | DO2 [1] | DO3 [1] | DO4 [1] | Remarks |
|---|---|---|---|---|---|
| Logic calculation output (Event output) [2, 4] | ✓ | ✓ | ✓ | ✓ | [1] Factory set values of Output signals (function) assigned to DO1 to DO4 are as follows.<br>Digital output 1point (DO1):<br>DO1: Event 1, DO2 to DO4: No assignment<br>Digital output points (DO1 to DO4):<br>DO1: Event 1<br>DO2: Event 2<br>DO3: Event 3<br>DO4: Event 4<br>[2] Factory preset is available by specifying the Initial setting code at the time of order. [1.3.2 Quick start code (Initial setting code) (P. 1-6)]<br>[3] Configurable at "DO1 function selection" to "DO4 function selection" in the Engineering mode.<br>[4] Multiple functions can be specified for "DO1 logic calculation selection" to "DO4 logic calculation selection" in the Engineering mode. (*OR-output*) |
| Logic calculation output (Control loop break alarm (LBA) output) [2, 4] | ✓ | ✓ | ✓ | ✓ | |
| Logic calculation output (Heater break alarm (HBA) output) [2, 4] | ✓ | ✓ | ✓ | ✓ | |
| RUN state output [3] | ✓ | ✓ | ✓ | ✓ | |
| Output of the communication monitoring result [3] | ✓ | ✓ | ✓ | ✓ | |
| Manual mode state output [3] | ✓ | ✓ | ✓ | ✓ | |
| Remote mode state output [3] | ✓ | ✓ | ✓ | ✓ | |
| AT state output [3] | ✓ | ✓ | ✓ | ✓ | |
| Output while Set value (SV) is changing [3] | ✓ | ✓ | ✓ | ✓ | |
| FAIL output [2] | ✓ | ✓ | ✓ | ✓ | |

## 3.3.5 Option 1

- Terminal Nos. 19 to 21 are for Option 1.
- The Option 1 types are as follows.

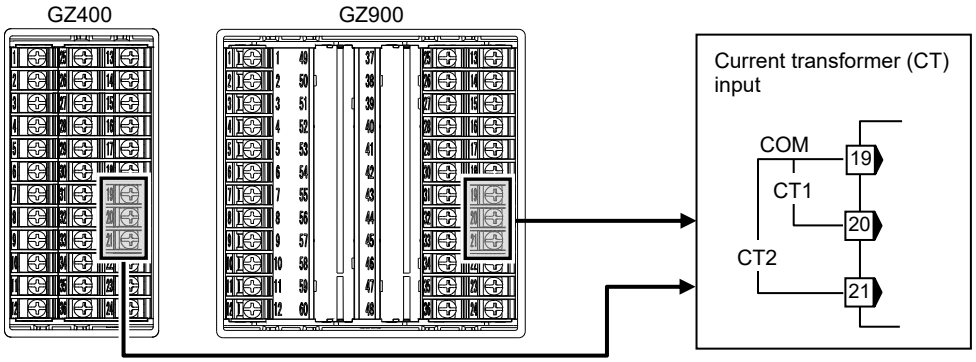



| Suffix code | Contents of Option 1 | See page |
|---|---|---|
| N | None | |
| T | CT input [2 points] (CT1, CT2) [CTL-6-P-N] | P. 3-14 to 3-15 |
| U | CT input [2 points] (CT1, CT2) [CTL-12-S56-10L-N] | P. 3-14 to 3-15 |
| V | CT input [2 points] (CT1, CT2) [CTL-6-P-Z] | P. 3-14 to 3-15 |

### ■ Option 1: T, U, V [Current transformer input 1 (CT1), Current transformer input 2 (CT2)]

- Terminal 19 and 20 are used for Current transformer input 1 (CT1); and Terminal 19 and 21 are used for Current transformer input 2 (CT2).
  Connect the current transformer (CT) specified at the time of order to the relevant terminal.

  Current transformer model code:
  When Option "T" is specified: CTL-6-P-N
  [Measurable current range: 0.0 to 30.0 A] (sold separately)
  When Option "U" is specified: CTL-12-S56-10L-N
  [Measurable current range: 0.0 to 100.0 A] (sold separately)
  When Option "V" is specified: CTL-6-P-Z
  [Measurable current range: 0.0 to 10.0 A] (sold separately)

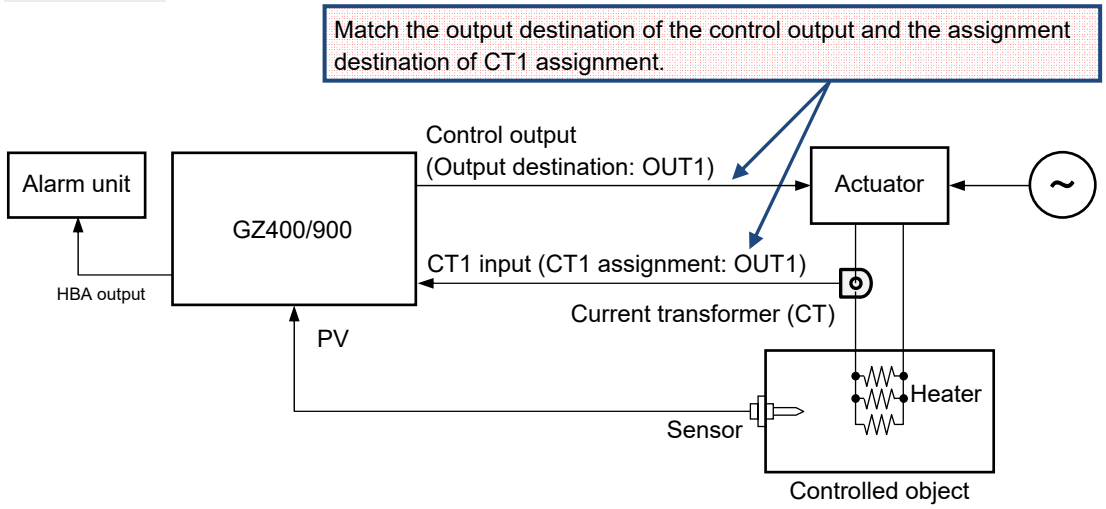



- Current transformer input 1 (CT1) and Current transformer input 2 (CT 2) is not isolated from the Measured input 1.
- Even after the delivery of the instrument, the type of the current transformer 1 (CT1) and the current transformer 2 (CT2) can be changed at "CT1 type" and "CT2 type" in the Engineering mode.

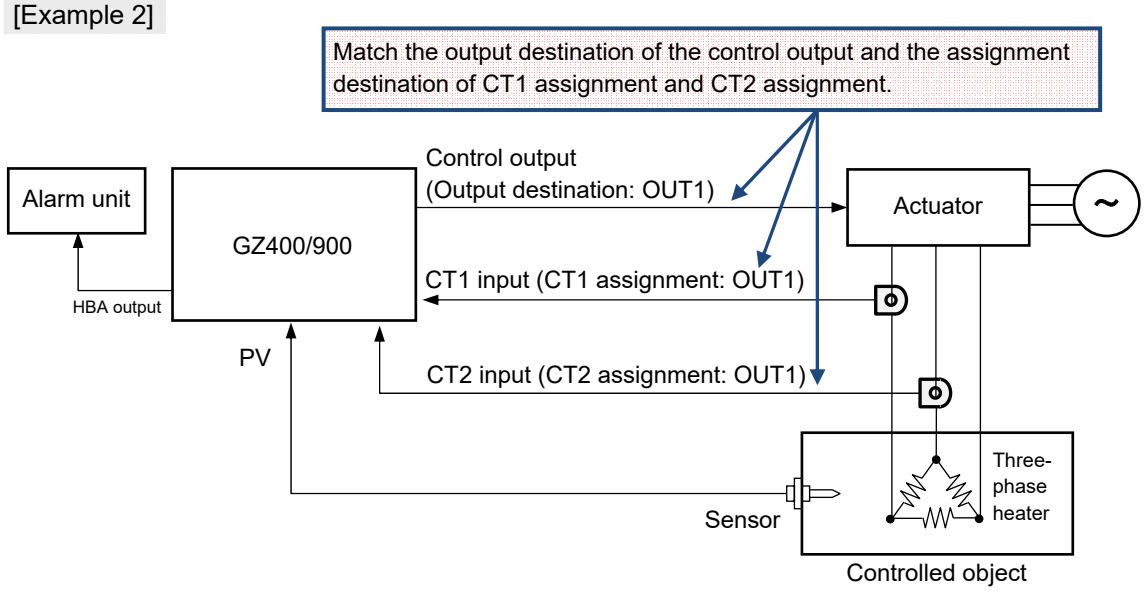
  ☞ For details on changing the CT type, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- When using Heater break alarm (HBA), set the same output for the control output detected by the current transformer (CT) [to be configured at “CT1 assignment,” “CT2 assignment”] and the control output of the instrument. “CT1 assignment” and “CT2 assignment” can be done in the Engineering mode.

[Example 1]



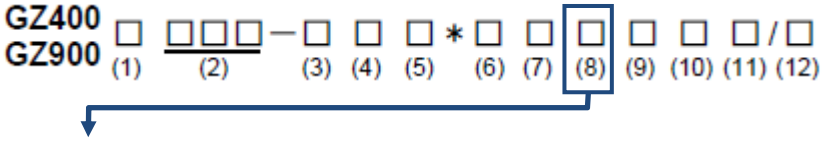

[Example 2]




☞ For the Heater break alarm (HBA) function, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## 3.3.6 Option 2

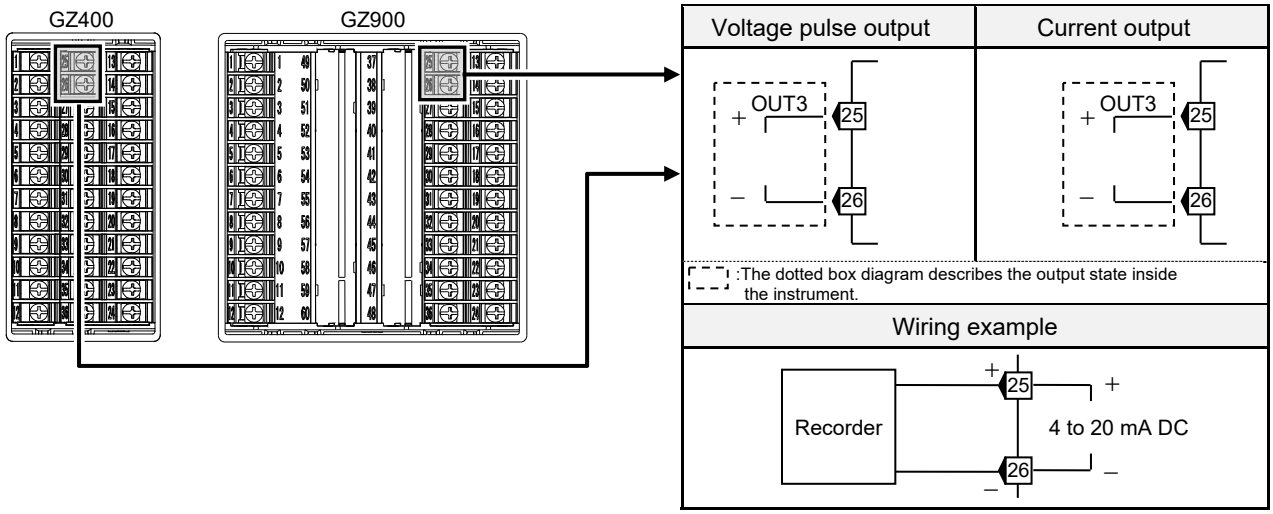
- Terminal Nos. 25 to 36 are for Option 2.
- The Option 2 types are as follows.




| Suffix code | Contents of Option 2 | See page |
|---|---|---|
| N | None | |
| A | Output 3 (OUT3) | P. 3-16 to 3-17 |
| B | Digital input [6 points] (DI1 to DI6) | P. 3-18 |
| C | Communication (RS-422A) | P. 3-19 to 3-22 |
| D | Communication (RS-485) | P. 3-23 to 3-26 |
| E | Output 3 (OUT3)+Digital input [6 points] (DI1 to DI6) | P. 3-27 to 3-28 |
| F | Output 3 (OUT3)+Communication (RS-422A) | P. 3-29 to 3-30 |
| G | Output 3 (OUT3)+Communication (RS-485) | P. 3-31 to 3-32 |
| H | Output 3 (OUT3)+Digital input [4 points] (DI1 to DI4)+Communication (RS-422A) | P. 3-33 to 3-35 |
| J | Output 3 (OUT3)+Digital input [6 points] (DI1 to DI6)+Communication (RS-485) | P. 3-36 to 3-38 |

### ■ Option 2: A [Output 3 (OUT3)]

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).




- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at "Universal output type selection (OUT3)" in the Engineering mode.

  ☞ For the details of changing the Output 3 (OUT3), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

| OUT3 type | Specifications |
|---|---|
| Voltage pulse output | 0/14 V DC (Allowable load resistance: 600 Ω or more) |
| Current output | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value] |
| Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |

Continued on the next page.

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

  ☞ For the details of Output signal (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

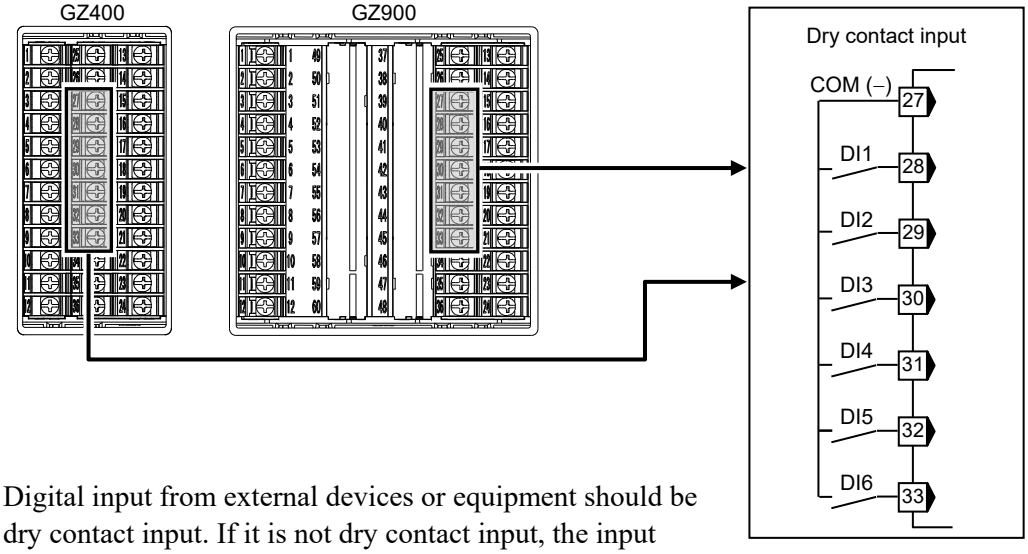
Output 3 (OUT3) and Output signals (function) (✓: Assignable)

| Output signals (function) | OUT3 | | Output signals (function) | OUT3 | |
|---|---|---|---|---|---|
| | Voltage pulse | Current | | Voltage pulse | Current |
| Input 1_Control output (Heat-side) | ✓ | ✓ | Output of the communication monitoring result | ✓ | ✓ |
| Input 1_Control output (Cool-side) | ✓ | ✓ | Manual mode state output | ✓ | ✓ |
| Logic calculation output (Event output) | ✓ | ✓ | Remote mode state output | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | AT state output | ✓ | ✓ |
| | | | FAIL output | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | Output while Set value (SV) is changing | ✓ | ✓ |
| | | | Retransmission output * | | ✓ |
| RUN state output | ✓ | ✓ | | | |

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

## ■ Option 2: B [Digital input 1 to 6 (DI1 to DI6)]

- Terminals 27 through 33 are used for Digital inputs 1 to 6 (DI1 to DI6).




- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

  Contact specifications:
  At OFF (contact open): 50 kΩ or more
  At ON (contact closed): 1 kΩ or less
  Contact current: 3.3 mA DC or less
  Capture judgment time: Within 50 ms

- The following functions can be assigned to Digital inputs 1 to 6 (DI1 to DI6). Function assignment of Digital inputs 1 to 6 (DI1 to DI6) can be done in the Engineering mode.

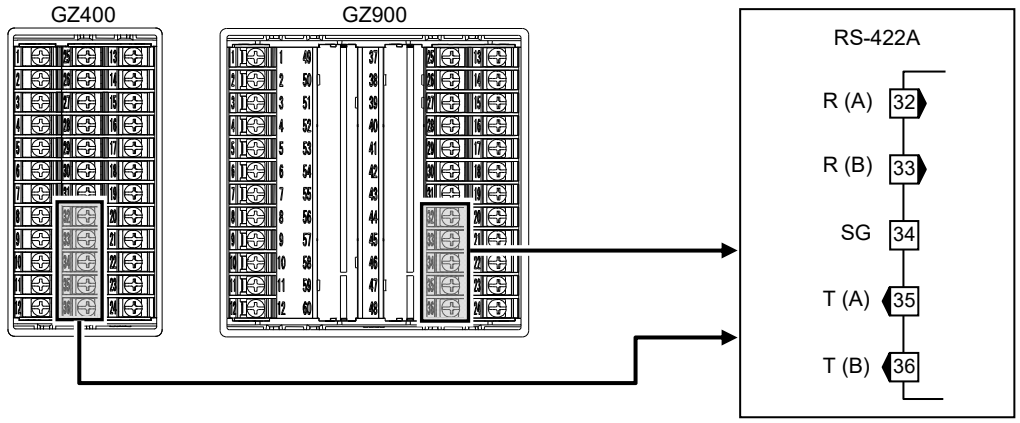
  – RUN/STOP transfer
  – Auto/Manual transfer
  – Remote/Local transfer
  – PV select transfer
  – 2-loop control/Differential temperature control
  – Interlock release
  – Peak/Bottom holds release
  – Autotuning (AT) ON/OFF
  – Set data Unlock/Lock
  – Direct/Reverse action transfer
  – Memory area transfer 2 points (Without area set signal) *
  – Memory area transfer 8 points (Without area set signal) *
  – Memory area transfer 8 points (With area set signal) *
  – Memory area transfer 16 points (Without area set signal) *
  – Memory area transfer 16 points (With area set signal) *
  – Area jump *

  * Settable only at DI1 function selection in the Engineering mode

☞ For the details of function assignment of Digital inputs 1 to 6 (DI1 to DI6), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Option 2: C [Communication (RS-422A)]

- Terminals 32 through 36 are used for Communication (RS-422A).




- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

GZ400 GZ900 □ □□□ – □ □ □ ✱ □ □ C □ □ □ / 1
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ □ – □ □ □ □ – □
(1) (2) (3) (4) (5) (6) (7)

| Code | Communication protocol | Wiring example |
|---|---|---|
| N | None | |
| 1 | RKC communication (ANSI X3.28-1976) * | P. 3-20 to 3-21 |
| 2 | Modbus | P. 3-20 to 3-21 |
| 3 | PLC communication:<br>MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4) | P. 3-22 |

* Factory set value when the Initial setting code (12) is "N: None."

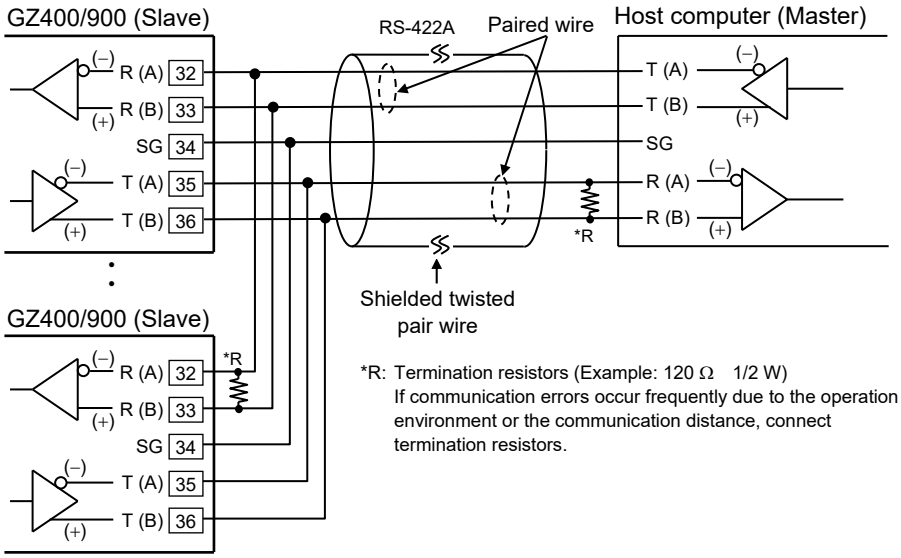
☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

**GZ400/GZ900 Instruction Manual [Host Communication]**
**GZ400/GZ900 Instruction Manual [PLC Communication]**

Continued on the next page.

- **Wiring example 1**

  Connection to the RS-422A port of the host computer (master)

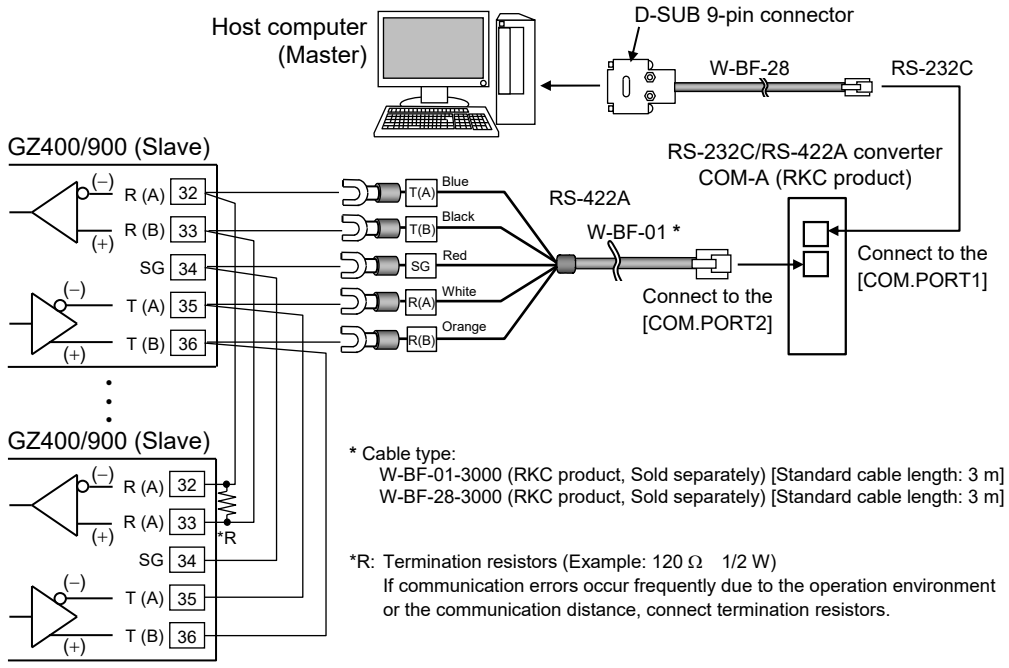



Maximum connections: Up to 31 GZ400/900s

The communication cable and termination resistor(s) must be provided by the customer.

- **Wiring example 2**

  Connection to the RS-232C port of the host computer (master)



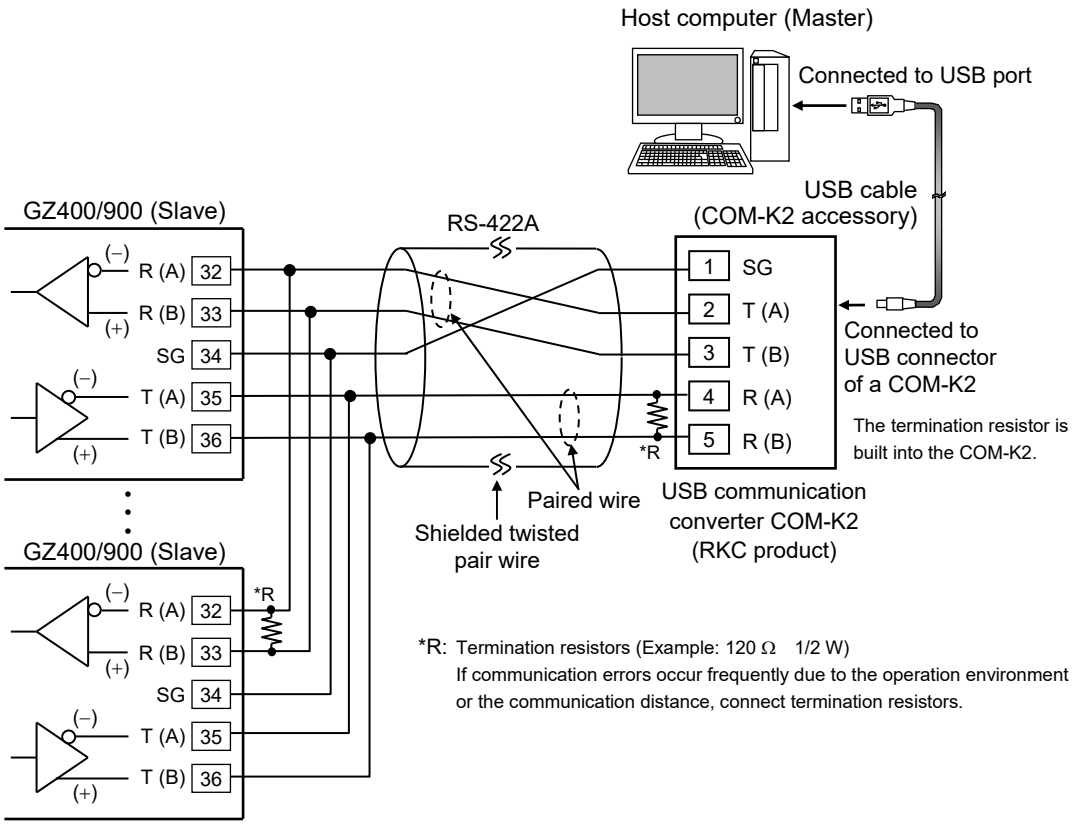

Maximum connections: Up to 31 GZ400/900s

The communication cable and termination resistor(s) must be provided by the customer.

W-BF-01 or W-BF-28 communication cable (RKC product) can be used as communication cable (sold separately). If noise is a factor, customer should use a twisted pair cable (not included) or something to that effect.

Recommended RS-232C/RS-422A converter: **COM-A** (RKC product)
For the COM-A, refer to the **COM-A/COM-B Instruction Manual**.

- **Wiring example 3**
  Connection to the USB of the host computer (master)




The communication cable and termination resistor(s) must be provided by the customer.

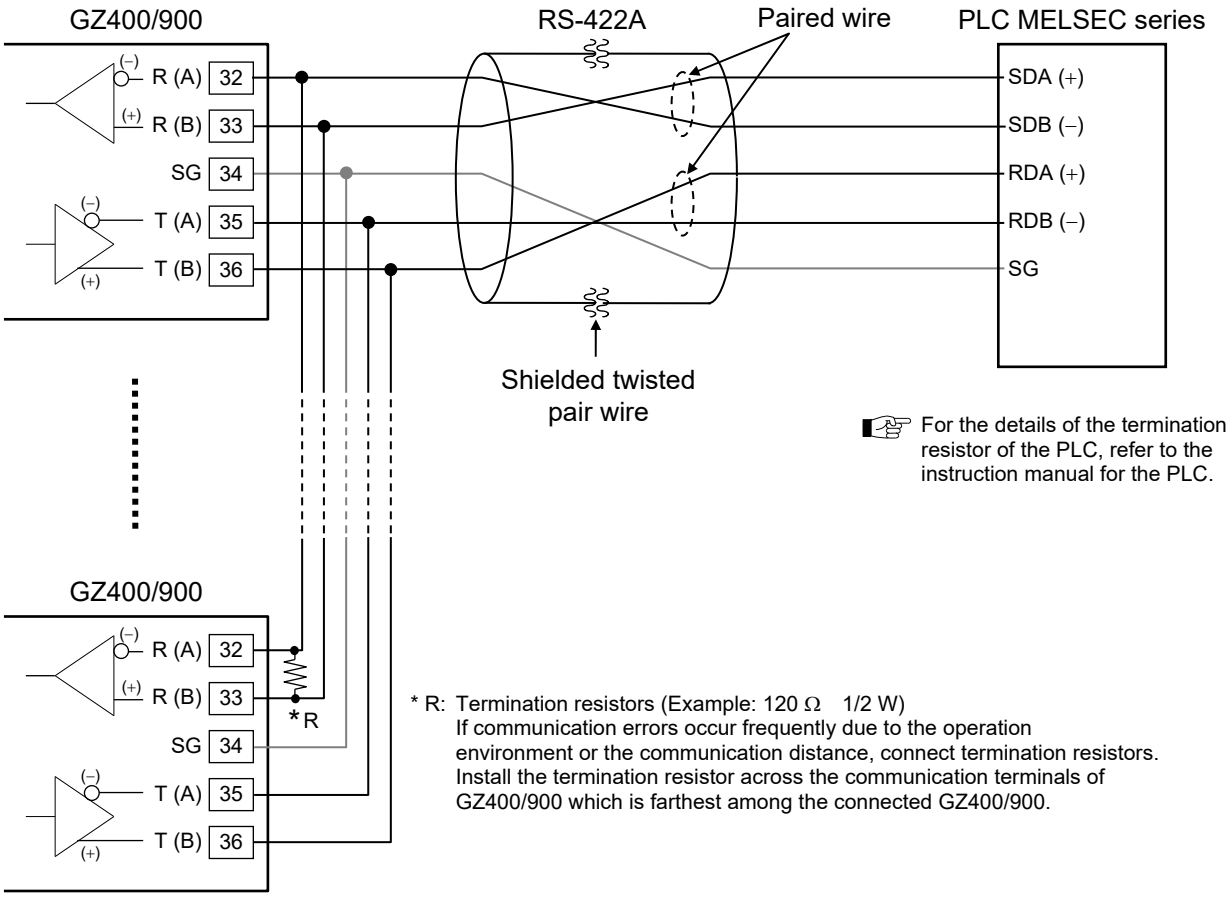
Recommended USB communication converter: **COM-K2 or COM-KG** (RKC product)
For the COM-K2, refer to the **COM-K2 Instruction Manual**.
For the COM-KG, refer to the **COM-KG Instruction Manual**.

- **Wiring example 4**
  When the PLC to be connected is MITSUBISHI MELSEC series

**NOTE**

**Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the GZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A.**

| GZ400/900 | | PLC MELSEC series | |
|---|---|---|---|
| Receive data (–) | R (A) | SDA | Send data (+) |
| Receive data (+) | R (B) | SDB | Send data (–) |
| Signal ground | SG | RDA | Receive data (+) |
| Send data (–) | T (A) | RDB | Receive data (–) |
| Send data (+) | T (B) | SG | Signal ground |

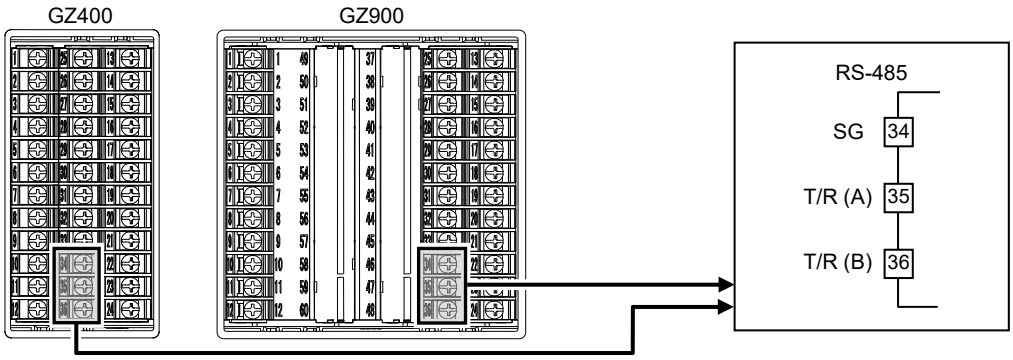



* R: Termination resistors (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors. Install the termination resistor across the communication terminals of GZ400/900 which is farthest among the connected GZ400/900.

Maximum connections: Up to 31 GZ400/900s

## ■ Option 2: D [Communication (RS-485)]

- Terminals 34 through 36 are used for Communication (RS-485).




- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

GZ400 GZ900 □ (1) □□□ (2) – □ (3) □ (4) □ (5) * □ (6) □ (7) D (8) □ (9) □ (10) □ (11) / 1 (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ (1) □ (2) – □ (3) □ (4) □ (5) □ (6) – □ (7)

| Code | Communication protocol | Wiring example |
|---|---|---|
| N | None | |
| 1 | RKC communication (ANSI X3.28-1976) * | P. 3-24 to 3-25 |
| 2 | Modbus | P. 3-24 to 3-25 |
| 3 | PLC communication:<br>MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4) | P. 3-26 |

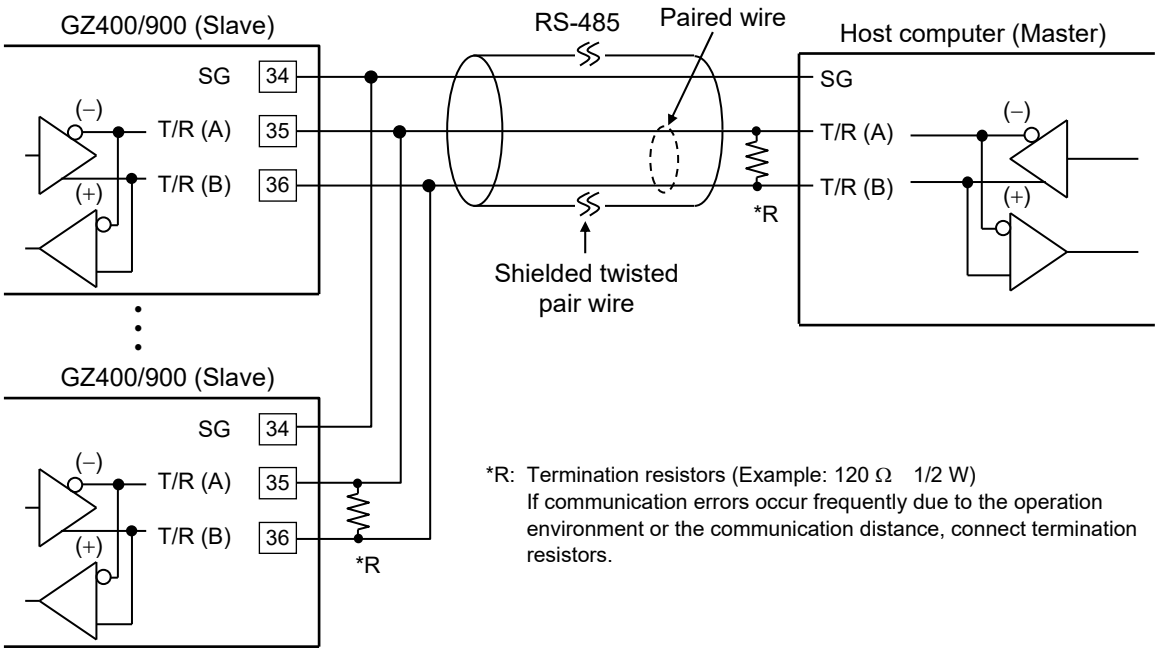
* Factory set value when the Initial setting code (12) is "N: None."

☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

**GZ400/GZ900 Instruction Manual [Host Communication]**
**GZ400/GZ900 Instruction Manual [PLC Communication]**

Continued on the next page.

- **Wiring example 1**
  Connection to the RS-485 port of the host computer (master)

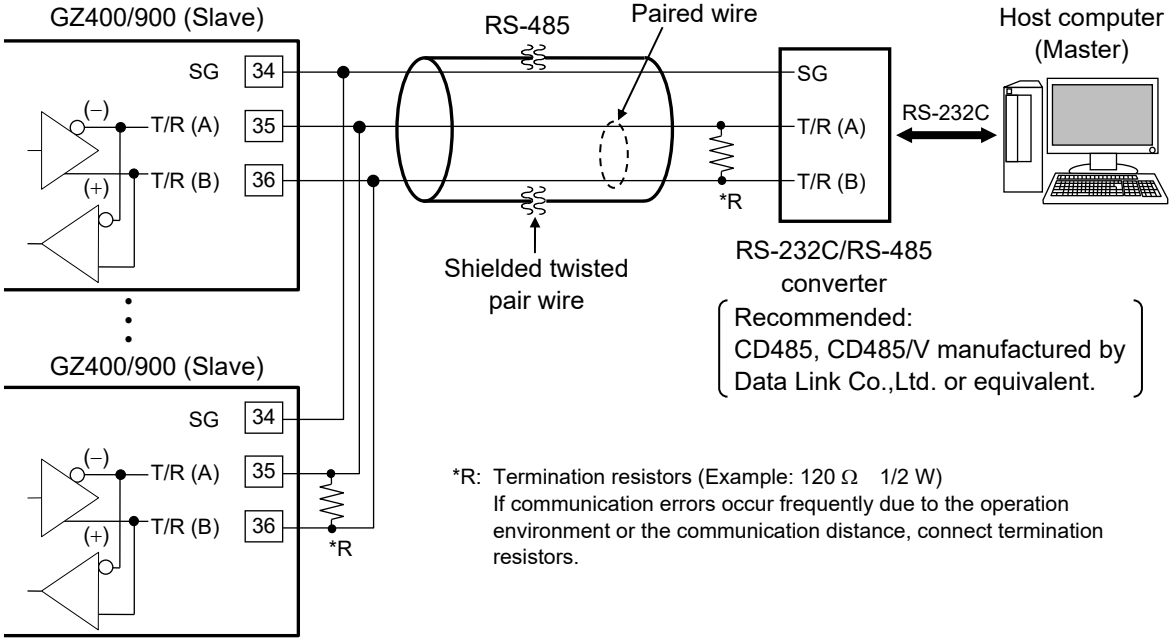



*R: Termination resistors (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.

Maximum connections: Up to 31 GZ400/900s

The communication cable and termination resistor(s) must be provided by the customer.

- **Wiring example 2**
  Connection to the RS-232C port of the host computer (master)

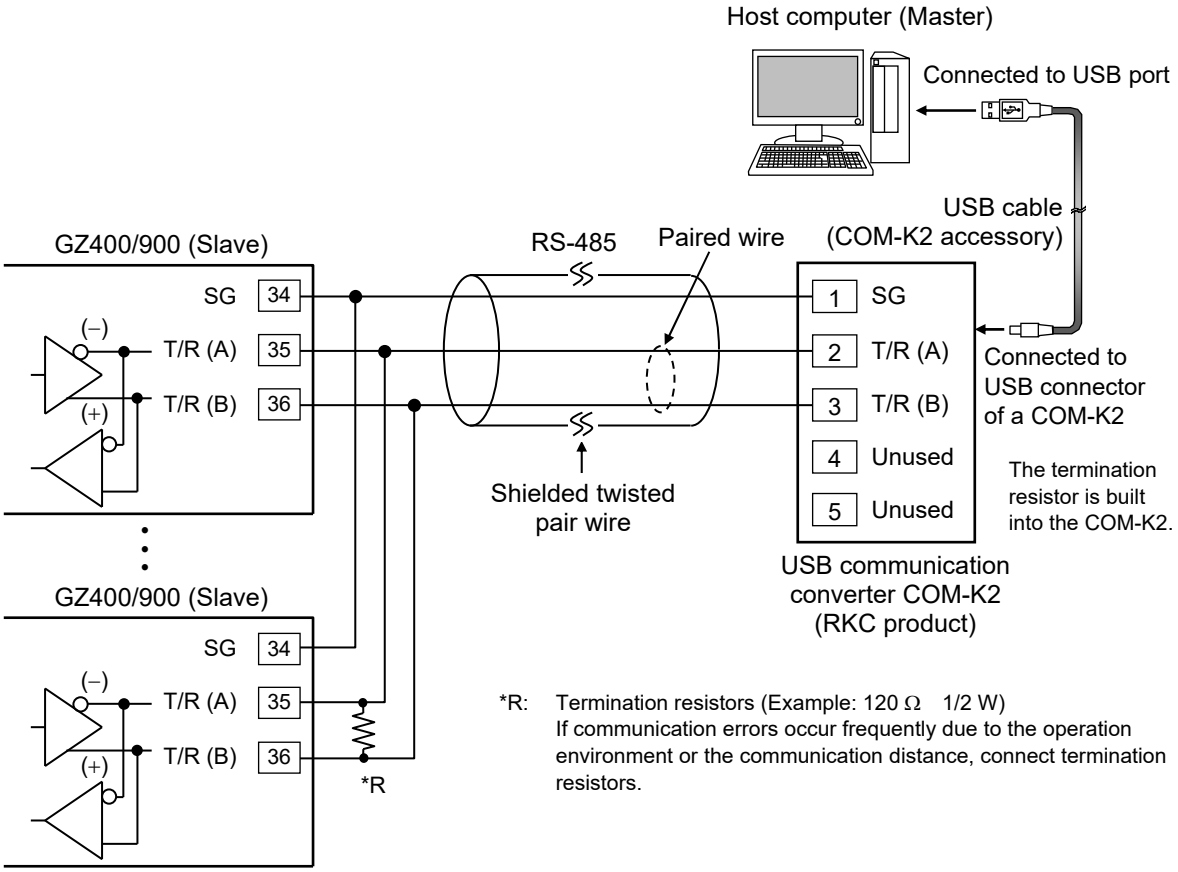



*R: Termination resistors (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors.

Maximum connections: Up to 31 GZ400/900s

The communication cable and termination resistor(s) must be provided by the customer.

- **Wiring example 3**
  Connection to the USB of the host computer (master)




The communication cable and termination resistor(s) must be provided by the customer.

Recommended USB communication converter: **COM-K2 or COM-KG** (RKC product)
For the COM-K2, refer to the **COM-K2 Instruction Manual**.
For the COM-KG, refer to the **COM-KG Instruction Manual**.

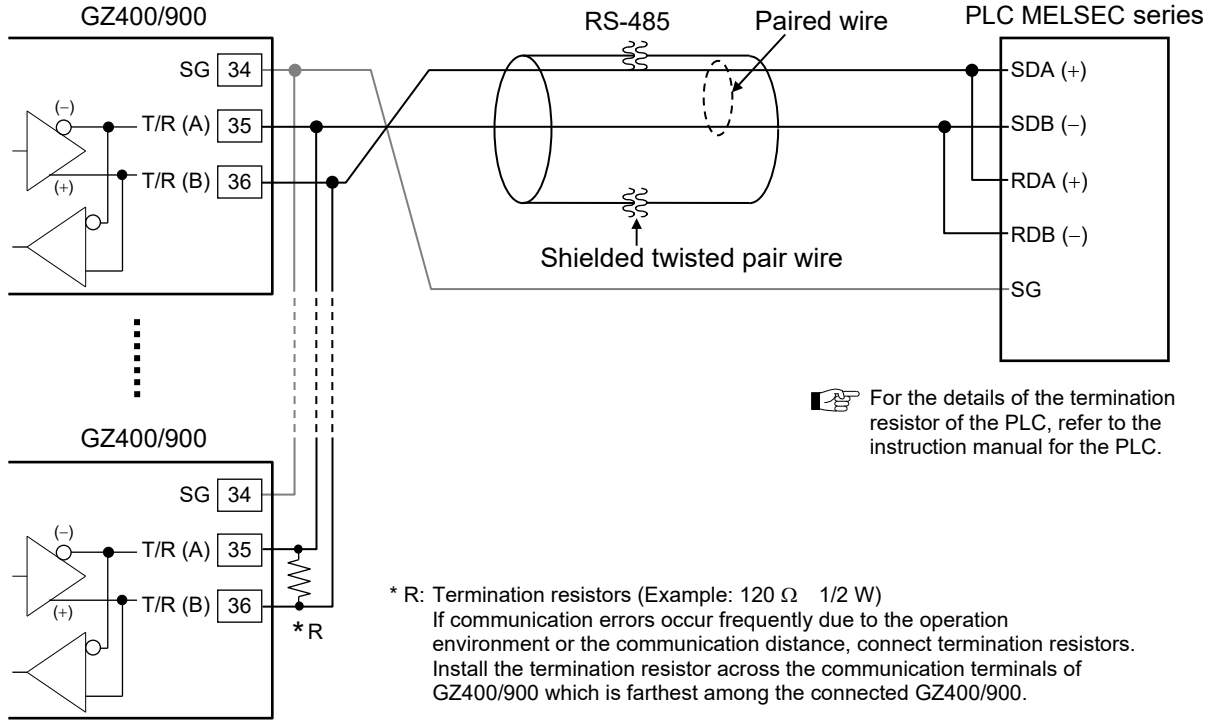
- **Wiring example 4**
  When the PLC to be connected is MITSUBISHI MELSEC series

**NOTE**

**Note that the signal polarity symbols (A and B) are opposite to each other between the PLC (MELSEC series) and the GZ series controller. Normally A is connected to A and B to B. However, in this case, A must be connected to B, and B must be connected to A.**

| GZ400/900 | |
|---|---|
| Signal ground | SG |
| Send data/Receive data (–) | T/R (A) |
| Send data/Receive data (+) | T/R (B) |

| PLC MELSEC series | |
|---|---|
| SDA | Send data (+) |
| SDB | Send data (–) |
| RDA | Receive data (+) |
| RDB | Receive data (–) |
| SG | Signal ground |




For the details of the termination resistor of the PLC, refer to the instruction manual for the PLC.

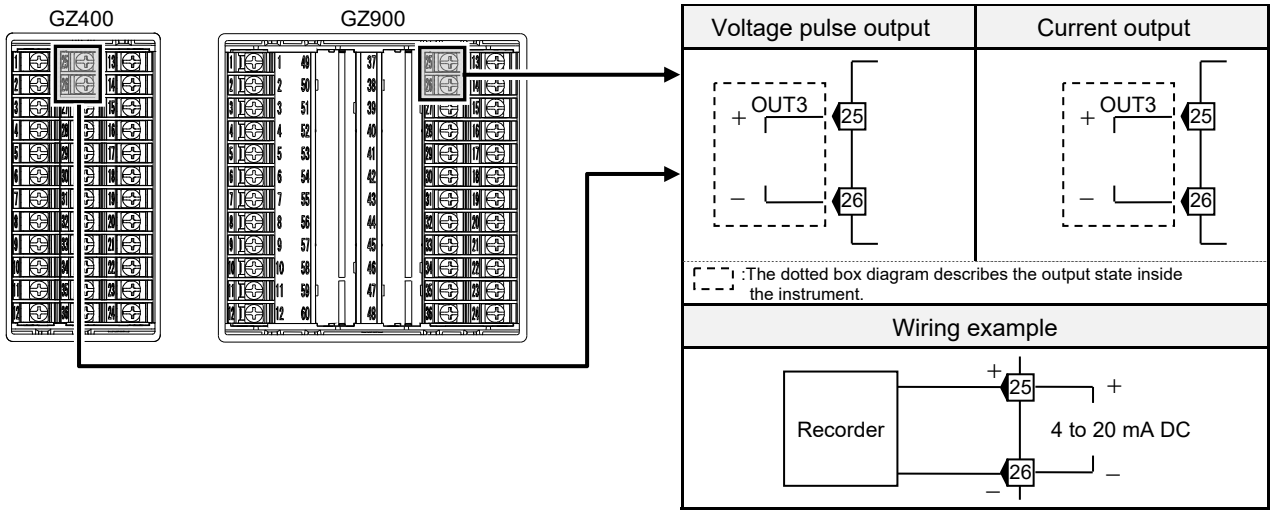
* R: Termination resistors (Example: 120 Ω 1/2 W)
If communication errors occur frequently due to the operation environment or the communication distance, connect termination resistors. Install the termination resistor across the communication terminals of GZ400/900 which is farthest among the connected GZ400/900.

Maximum connections: Up to 31 GZ400/900s

## ■ Option 2: E [Output 3 (OUT3), Digital input 1 to 6 (DI1 to DI6)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).




- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at "Universal output type selection (OUT3)" in the Engineering mode.

  ☞ For the details of changing the Output 3 (OUT3), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

| OUT3 type | Specifications |
|---|---|
| Voltage pulse output | 0/14 V DC (Allowable load resistance: 600 Ω or more) |
| Current output | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value] |
| Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

  ☞ For the details of Output signal (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function) (✓: Assignable)

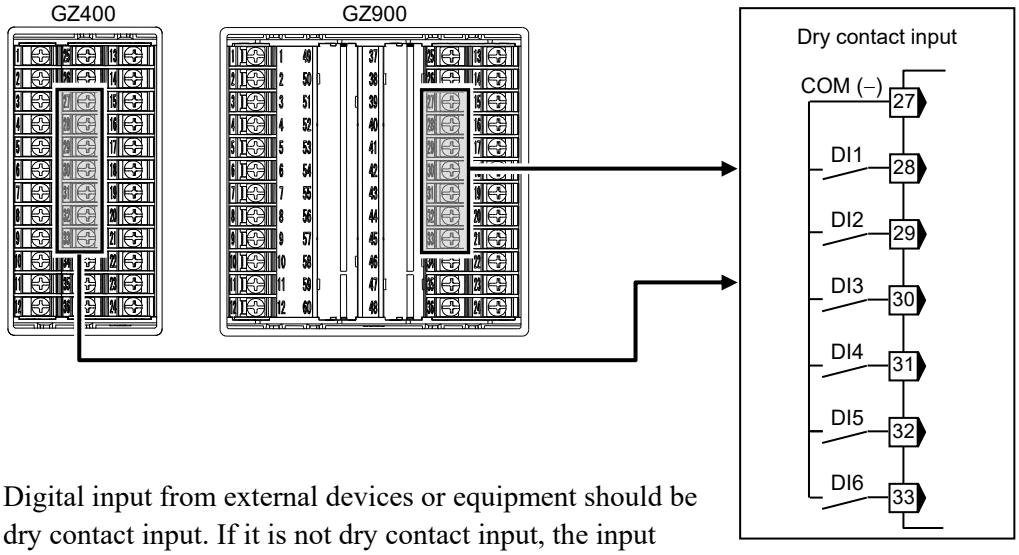
| Output signals (function) | OUT3 | | Output signals (function) | OUT3 | |
|---|---|---|---|---|---|
| | Voltage pulse | Current | | Voltage pulse | Current |
| Input 1_Control output (Heat-side) | ✓ | ✓ | Output of the communication monitoring result | ✓ | ✓ |
| Input 1_Control output (Cool-side) | ✓ | ✓ | Manual mode state output | ✓ | ✓ |
| Logic calculation output (Event output) | ✓ | ✓ | Remote mode state output | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | AT state output | ✓ | ✓ |
| | | | FAIL output | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | Output while Set value (SV) is changing | ✓ | ✓ |
| | | | Retransmission output * | | ✓ |
| RUN state output | ✓ | ✓ | | | |

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

## Digital input 1 to 6 (DI1 to DI6):

- Terminals 27 through 33 are used for Digital inputs 1 to 6 (DI1 to DI6).




- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

  Contact specifications:
  At OFF (contact open): 50 kΩ or more
  At ON (contact closed): 1 kΩ or less
  Contact current: 3.3 mA DC or less
  Capture judgment time: Within 50 ms

- The following functions can be assigned to Digital inputs 1 to 6 (DI1 to DI6). Function assignment of Digital inputs 1 to 6 (DI1 to DI6) can be done in the Engineering mode.

  – RUN/STOP transfer
  – Auto/Manual transfer
  – Remote/Local transfer
  – PV select transfer
  – 2-loop control/Differential temperature control
  – Interlock release
  – Peak/Bottom holds release
  – Autotuning (AT) ON/OFF
  – Set data Unlock/Lock
  – Direct/Reverse action transfer
  – Memory area transfer 2 points (Without area set signal) *
  – Memory area transfer 8 points (Without area set signal) *
  – Memory area transfer 8 points (With area set signal) *
  – Memory area transfer 16 points (Without area set signal) *
  – Memory area transfer 16 points (With area set signal) *
  – Area jump *

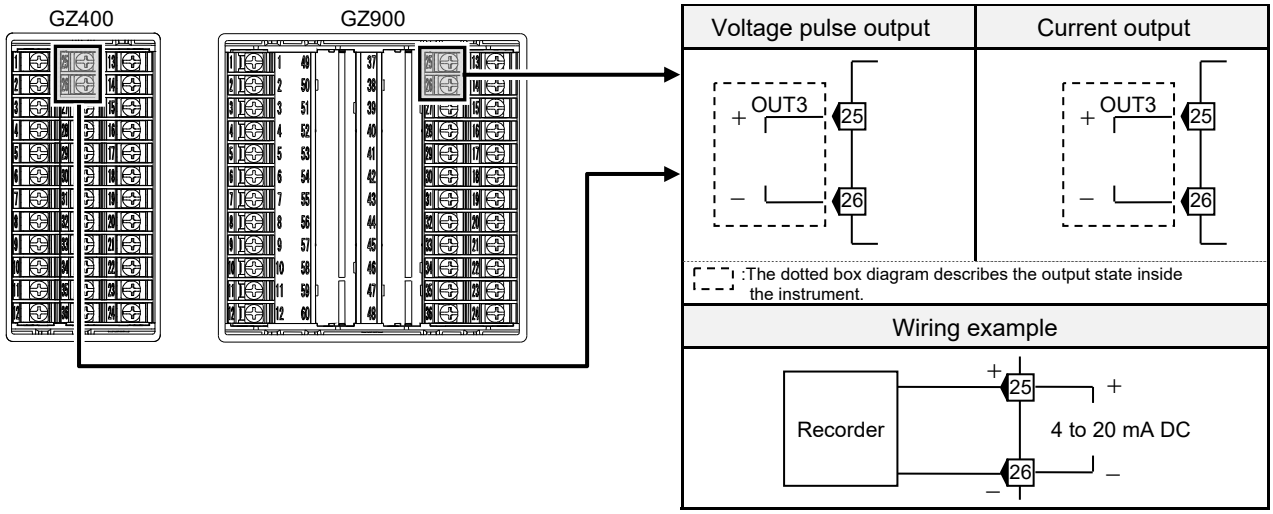
  * Settable only at DI1 function selection in the Engineering mode

  ☞ For the details of function assignment of Digital inputs 1 to 6 (DI1 to DI6), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Option 2: F [Output 3 (OUT3), Communication (RS-422A)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).




- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at "Universal output type selection (OUT3)" in the Engineering mode.

  ☞ For the details of changing the Output 3 (OUT3), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

| OUT3 type | Specifications |
|---|---|
| Voltage pulse output | 0/14 V DC (Allowable load resistance: 600 Ω or more) |
| Current output | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value] |
| Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

  ☞ For the details of Output signal (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function) (✓: Assignable)

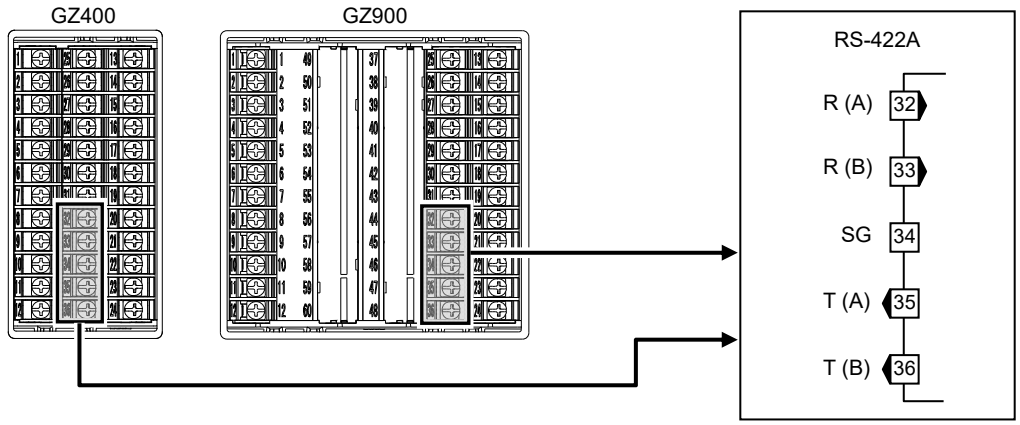
| Output signals (function) | OUT3 | | Output signals (function) | OUT3 | |
|---|---|---|---|---|---|
| | Voltage pulse | Current | | Voltage pulse | Current |
| Input 1_Control output (Heat-side) | ✓ | ✓ | Output of the communication monitoring result | ✓ | ✓ |
| Input 1_Control output (Cool-side) | ✓ | ✓ | Manual mode state output | ✓ | ✓ |
| Logic calculation output (Event output) | ✓ | ✓ | Remote mode state output | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | AT state output | ✓ | ✓ |
| | | | FAIL output | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | Output while Set value (SV) is changing | ✓ | ✓ |
| | | | Retransmission output * | | ✓ |
| RUN state output | ✓ | ✓ | | | |

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

## Communication (RS-422A):

- Terminals 32 through 36 are used for Communication (RS-422A).




- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

GZ400 GZ900 □ (1) □□□ (2) — □ (3) □ (4) □ (5) * □ (6) □ (7) F (8) □ (9) □ (10) □ (11) / 1 (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ (1) □ (2) — □ (3) □ (4) □ (5) □ (6) — □ (7)

| Code | Communication protocol | Wiring example |
|---|---|---|
| N | None | |
| 1 | RKC communication (ANSI X3.28-1976) * | P. 3-20 to 3-21 |
| 2 | Modbus | P. 3-20 to 3-21 |
| 3 | PLC communication:<br>MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4) | P. 3-22 |

* Factory set value when the Initial setting code (12) is "N: None."

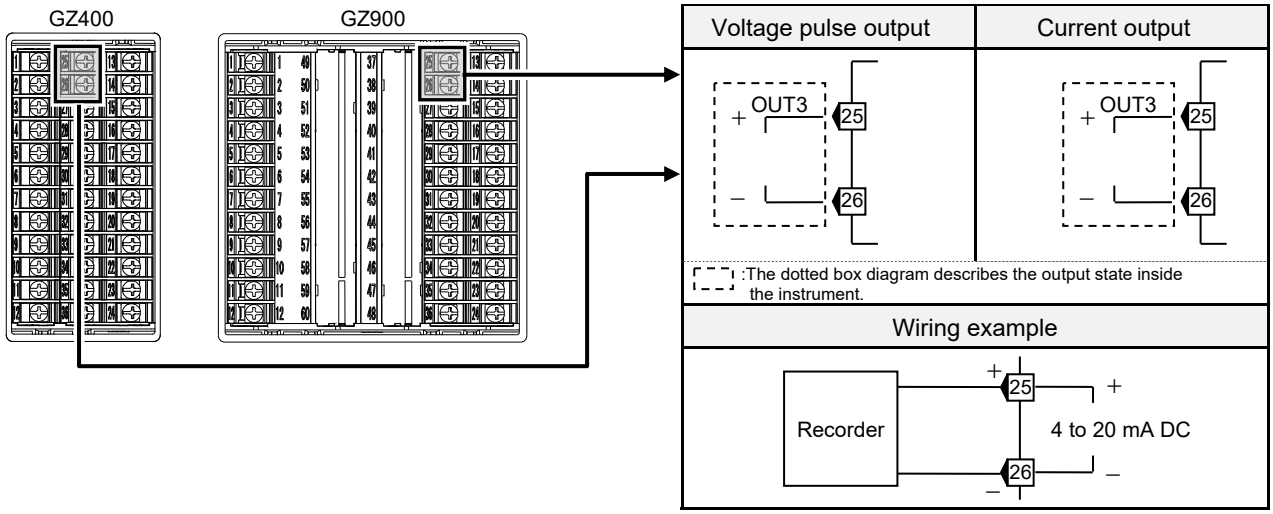
☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

**GZ400/GZ900 Instruction Manual [Host Communication]**
**GZ400/GZ900 Instruction Manual [PLC Communication]**

## ■ Option 2: G [Output 3 (OUT3), Communication (RS-485)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).




- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at "Universal output type selection (OUT3)" in the Engineering mode.

  ☞ For the details of changing the Output 3 (OUT3), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

| OUT3 type | Specifications |
|---|---|
| Voltage pulse output | 0/14 V DC (Allowable load resistance: 600 Ω or more) |
| Current output | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value] |
| Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

  ☞ For the details of Output signal (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function) (✓: Assignable)

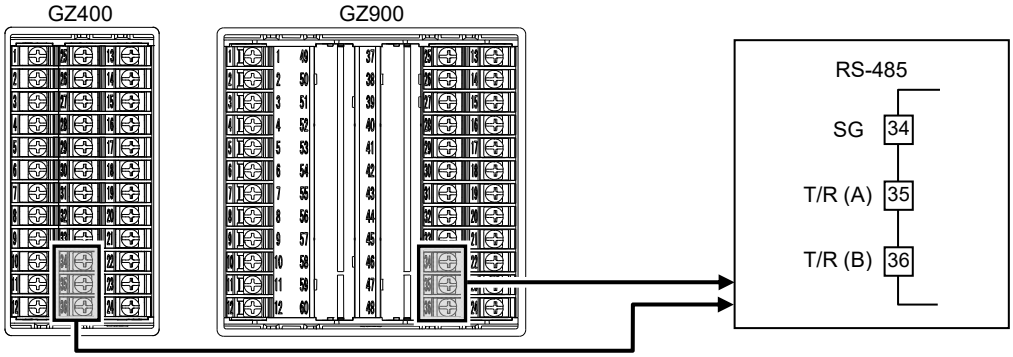
| Output signals (function) | OUT3 | | Output signals (function) | OUT3 | |
|---|---|---|---|---|---|
| | Voltage pulse | Current | | Voltage pulse | Current |
| Input 1_Control output (Heat-side) | ✓ | ✓ | Output of the communication monitoring result | ✓ | ✓ |
| Input 1_Control output (Cool-side) | ✓ | ✓ | Manual mode state output | ✓ | ✓ |
| Logic calculation output (Event output) | ✓ | ✓ | Remote mode state output | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | AT state output | ✓ | ✓ |
| | | | FAIL output | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | Output while Set value (SV) is changing | ✓ | ✓ |
| | | | Retransmission output * | | ✓ |
| RUN state output | ✓ | ✓ | | | |

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

## Communication (RS-485):

- Terminals 34 through 36 are used for Communication (RS-485).




- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

GZ400
GZ900 □ □□□ – □ □ □ * □ □ G □ □ □ / 1
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ □ – □ □ □ □ – □
(1) (2) (3) (4) (5) (6) (7)

| Code | Communication protocol | Wiring example |
|---|---|---|
| N | None | |
| 1 | RKC communication (ANSI X3.28-1976) * | P. 3-24 to 3-25 |
| 2 | Modbus | P. 3-24 to 3-25 |
| 3 | PLC communication:<br>MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4) | P. 3-26 |

* Factory set value when the Initial setting code (12) is "N: None."

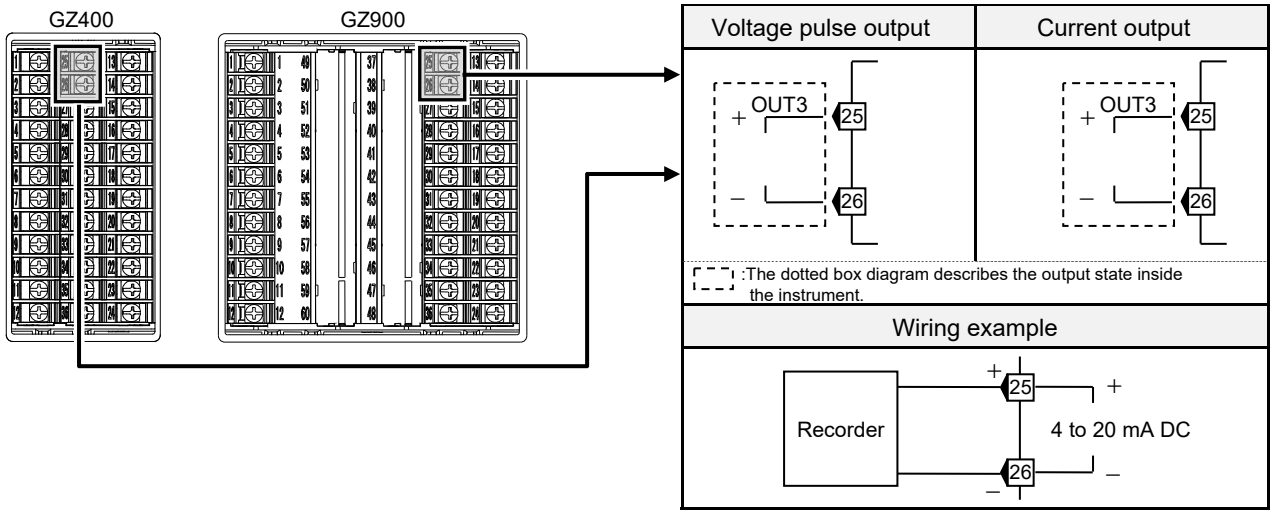
☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

**GZ400/GZ900 Instruction Manual [Host Communication]**
**GZ400/GZ900 Instruction Manual [PLC Communication]**

## ■ Option 2: H
## [Output 3 (OUT3), Digital input 1 to 4 (DI1 to DI4), Communication (RS-422A)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).




- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at "Universal output type selection (OUT3)" in the Engineering mode.

  ☞ For the details of changing the Output 3 (OUT3), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

| OUT3 type | Specifications |
|---|---|
| Voltage pulse output | 0/14 V DC (Allowable load resistance: 600 Ω or more) |
| Current output | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value] |
| Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

  ☞ For the details of Output signal (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function) (✓: Assignable)

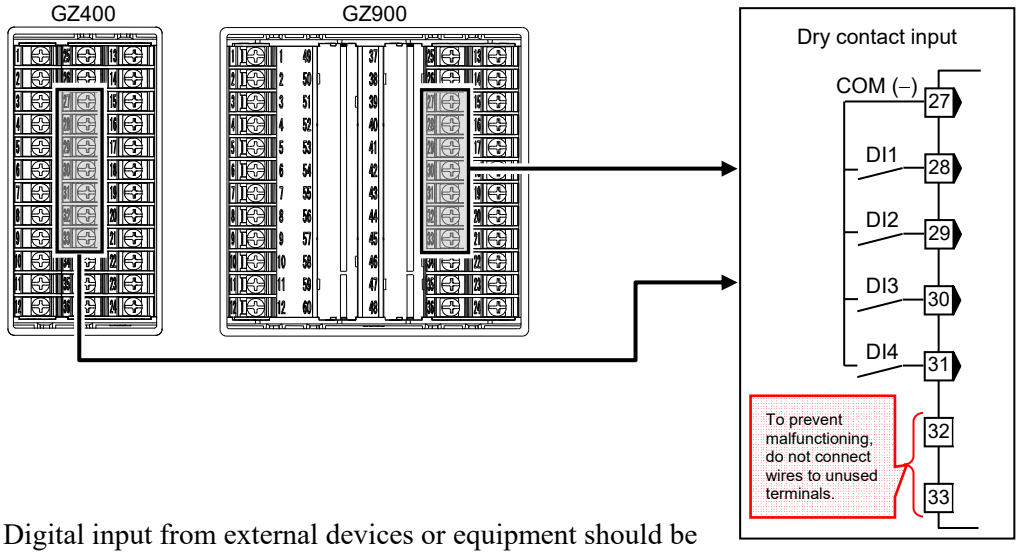
| Output signals (function) | OUT3 | | Output signals (function) | OUT3 | |
|---|---|---|---|---|---|
| | Voltage pulse | Current | | Voltage pulse | Current |
| Input 1_Control output (Heat-side) | ✓ | ✓ | Output of the communication monitoring result | ✓ | ✓ |
| Input 1_Control output (Cool-side) | ✓ | ✓ | Manual mode state output | ✓ | ✓ |
| Logic calculation output (Event output) | ✓ | ✓ | Remote mode state output | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | AT state output | ✓ | ✓ |
| | | | FAIL output | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | Output while Set value (SV) is changing | ✓ | ✓ |
| | | | Retransmission output * | | ✓ |
| RUN state output | ✓ | ✓ | | | |

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

## Digital input 1 to 4 (DI1 to DI4):

- Terminals 27 through 31 are used for Digital inputs 1 to 4 (DI1 to DI4).




- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

  Contact specifications:
  At OFF (contact open): 50 kΩ or more
  At ON (contact closed): 1 kΩ or less
  Contact current: 3.3 mA DC or less
  Capture judgment time: Within 50 ms

- The following functions can be assigned to Digital inputs 1 to 4 (DI1 to DI4). Function assignment of Digital inputs 1 to 4 (DI1 to DI4) can be done in the Engineering mode.

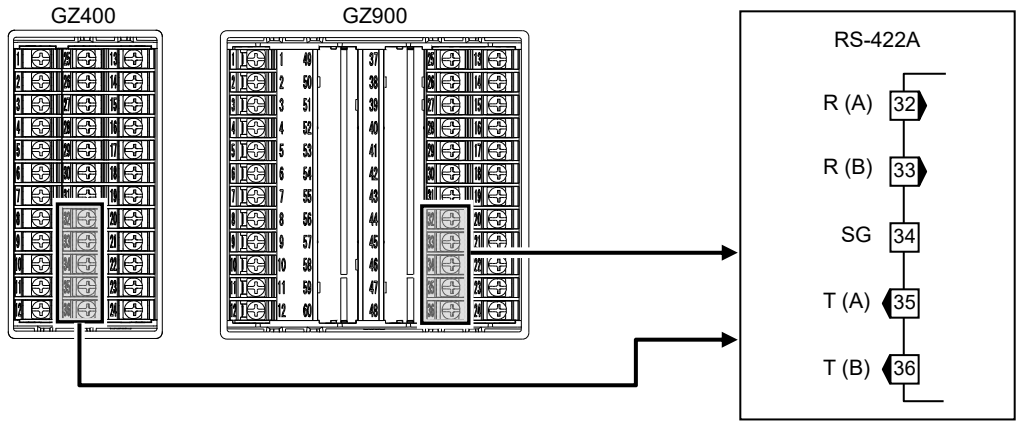
  – RUN/STOP transfer
  – Auto/Manual transfer
  – Remote/Local transfer
  – PV select transfer
  – 2-loop control/Differential temperature control
  – Interlock release
  – Peak/Bottom holds release
  – Autotuning (AT) ON/OFF
  – Set data Unlock/Lock
  – Direct/Reverse action transfer
  – Memory area transfer 2 points (Without area set signal) *
  – Memory area transfer 8 points (Without area set signal) *
  – Memory area transfer 8 points (With area set signal) *
  – Memory area transfer 16 points (Without area set signal) *
  – Area jump *

  * Settable only at DI1 function selection in the Engineering mode

☞ For the details of function assignment of Digital inputs 1 to 4 (DI1 to DI4), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## Communication (RS-422A):

- Terminals 32 through 36 are used for Communication (RS-422A).




- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

GZ400 GZ900 □ (1) □□□ (2) — □ (3) □ (4) □ (5) * □ (6) □ (7) H (8) □ (9) □ (10) □ (11) / 1 (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ (1) □ (2) — □ (3) □ (4) □ (5) □ (6) — □ (7)

| Code | Communication protocol | Wiring example |
|---|---|---|
| N | None | |
| 1 | RKC communication (ANSI X3.28-1976) * | P. 3-20 to 3-21 |
| 2 | Modbus | P. 3-20 to 3-21 |
| 3 | PLC communication:<br>MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4) | P. 3-22 |

* Factory set value when the Initial setting code (12) is "N: None."

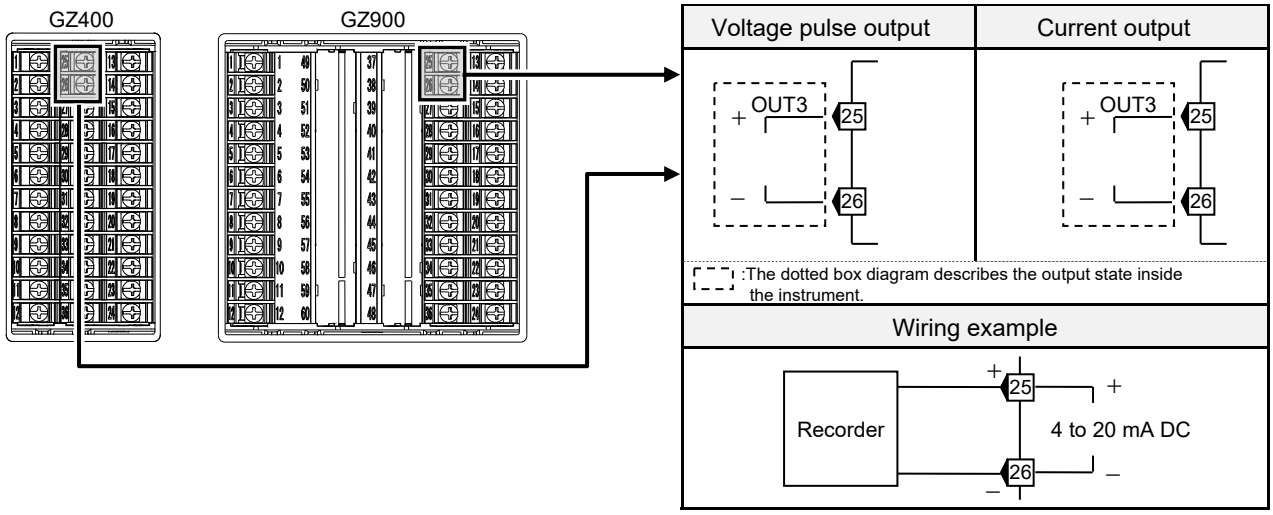
☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

**GZ400/GZ900 Instruction Manual [Host Communication]**
**GZ400/GZ900 Instruction Manual [PLC Communication]**

## ■ Option 2: J
## [Output 3 (OUT3), Digital input 1 to 6 (DI1 to DI6), Communication (RS-485)]

Output 3 (OUT3):

- Terminal 25 and 26 are used for Output 3 (OUT3).
- Connect a recorder, a load, etc according to the Output type of Output 3 (OUT3).




- Output 3 (OUT3) is a universal output. Even after the delivery of the instrument, the output type (see the table below) can be changed at "Universal output type selection (OUT3)" in the Engineering mode.

  ☞ For the details of changing the Output 3 (OUT3), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

| OUT3 type | Specifications |
|---|---|
| Voltage pulse output | 0/14 V DC (Allowable load resistance: 600 Ω or more) |
| Current output | 4 to 20 mA DC (Allowable load resistance: 500 Ω or less) [Factory set value] |
| Current output | 0 to 20 mA DC (Allowable load resistance: 500 Ω or less) |

- Output signal (function) can be assigned to Output 3 (OUT3). Output signal (function) assignment is available in the Engineering mode.

  ☞ For the details of Output signal (function) assignment, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Output 3 (OUT3) and Output signals (function) (✓: Assignable)

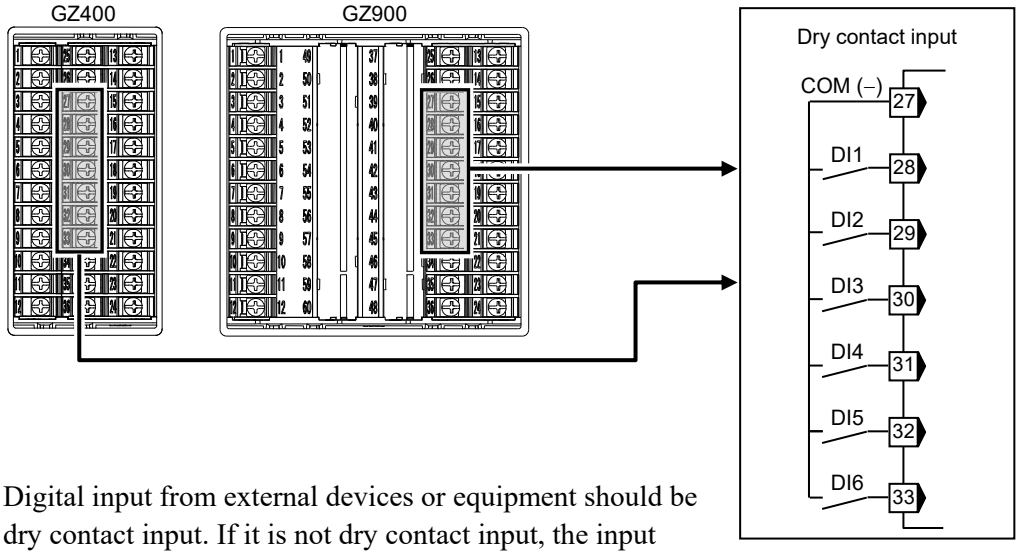
| Output signals (function) | OUT3 | | Output signals (function) | OUT3 | |
|---|---|---|---|---|---|
| | Voltage pulse | Current | | Voltage pulse | Current |
| Input 1_Control output (Heat-side) | ✓ | ✓ | Output of the communication monitoring result | ✓ | ✓ |
| Input 1_Control output (Cool-side) | ✓ | ✓ | Manual mode state output | ✓ | ✓ |
| Logic calculation output (Event output) | ✓ | ✓ | Remote mode state output | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | AT state output | ✓ | ✓ |
| | | | FAIL output | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | Output while Set value (SV) is changing | ✓ | ✓ |
| | | | Retransmission output * | | ✓ |
| RUN state output | ✓ | ✓ | | | |

* Factory set value of the output signal (function) assigned to OUT3. The retransmission output of OUT3 corresponds to Retransmission output 3.

Continued on the next page.

## Digital input 1 to 6 (DI1 to DI6):

- Terminals 27 through 33 are used for Digital inputs 1 to 6 (DI1 to DI6).




- Digital input from external devices or equipment should be dry contact input. If it is not dry contact input, the input should meet the specifications below.

  Contact specifications:
  At OFF (contact open): 50 kΩ or more
  At ON (contact closed): 1 kΩ or less
  Contact current: 3.3 mA DC or less
  Capture judgment time: Within 50 ms

- The following functions can be assigned to Digital inputs 1 to 6 (DI1 to DI6). Function assignment of Digital inputs 1 to 6 (DI1 to DI6) can be done in the Engineering mode.

  – RUN/STOP transfer
  – Auto/Manual transfer
  – Remote/Local transfer
  – PV select transfer
  –2-loop control/Differential temperature control
  – Interlock release
  – Peak/Bottom holds release
  – Autotuning (AT) ON/OFF
  – Set data Unlock/Lock
  – Direct/Reverse action transfer
  – Memory area transfer 2 points (Without area set signal) *
  – Memory area transfer 8 points (Without area set signal) *
  – Memory area transfer 8 points (With area set signal) *
  – Memory area transfer 16 points (Without area set signal) *
  – Memory area transfer 16 points (With area set signal) *
  – Area jump *

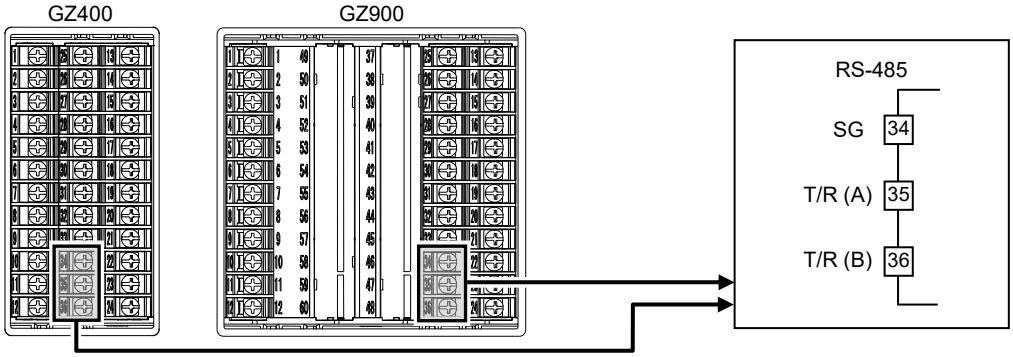
  * Settable only at DI1 function selection in the Engineering mode

  ☞ For the details of function assignment of Digital inputs 1 to 6 (DI1 to DI6), refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.

## Communication (RS-485):

- Terminals 34 through 36 are used for Communication (RS-485).




- The Communication protocol is either specified by Quick start code (Initial setting code) when the order is placed, or set in Engineering mode.

GZ400
GZ900 □ □□□ – □ □ □ * □ □ J □ □ □ / 1
(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ □ – □ □ □ □ – □
(1) (2) (3) (4) (5) (6) (7)

| Code | Communication protocol | Wiring example |
|---|---|---|
| N | None | |
| 1 | RKC communication (ANSI X3.28-1976) * | P. 3-24 to 3-25 |
| 2 | Modbus | P. 3-24 to 3-25 |
| 3 | PLC communication:<br>MITSUBISHI MELSEC series special protocol (QnA-compatible 3C frame format 4) | P. 3-26 |

* Factory set value when the Initial setting code (12) is "N: None."

☞ For the details of communication (For example, protocol setting in the Engineering mode), refer to the following manuals.

**GZ400/GZ900 Instruction Manual [Host Communication]**
**GZ400/GZ900 Instruction Manual [PLC Communication]**

## 3.3.7 Option 3

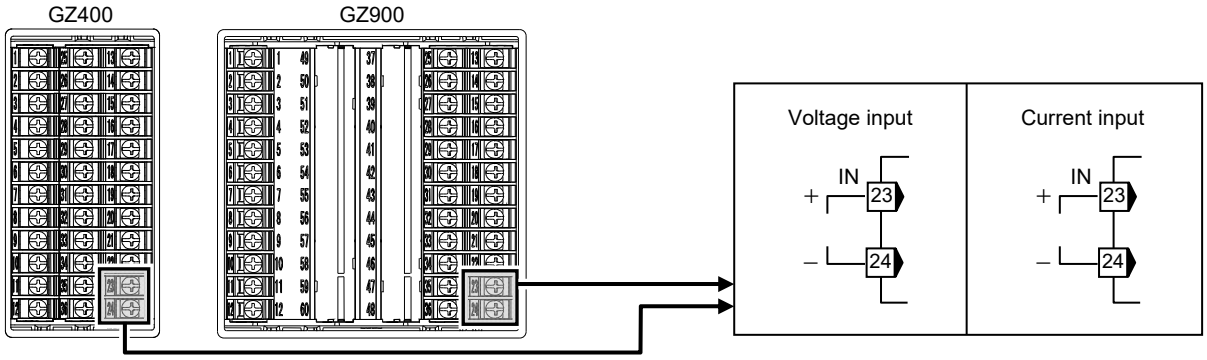
- Terminal Nos. 22 to 24 are for Option 3.
- The Option 3 types are as follows.

GZ400 GZ900 □ (1) □□□ (2) – □ (3) □ (4) □ (5) * □ (6) □ (7) □ (8) □ (9) □ (10) □/□ (11) (12)

| Suffix code | Contents of Option 3 | See page |
|---|---|---|
| N | None | |
| 1 | Remote setting input | P. 3-39 |
| 2 | Measured input 2 | P. 3-40 to 3-41 |

### ■ Option 3: 1 [Remote setting input]

- Terminal 23 and 24 are used for Remote setting input.
- Connect an appropriate input to terminals 23 and 24 according to the specification of the Remote setting input.




- Remote setting input type must be specified when ordering.

GZ400 GZ900 □ (1) □□□ (2) – □ (3) □ (4) □ (5) * □ (6) □ (7) □ (8) 1 (9) □ (10) □ (11) /1 (12)

The designation of the initial setting code must be "1: Specify quick start code."

**[Quick start code (Initial setting code)]**

□ (1) □ (2) – □ (3) □ (4) □ (5) □ (6) – □ (7)

| Code | Input type | Code | Input type |
|---|---|---|---|
| N | None | 7 | Current input (0 to 20 mA DC) |
| 3 | Voltage input (0 to 1 V DC) | 8 | Current input (4 to 20 mA DC) |
| 4 | Voltage input (0 to 5 V DC) | 9 | Voltage input (–5 to +5 V DC) |
| 5 | Voltage input (0 to 10 V DC) * | A | Voltage input (–10 to +10 V DC) |
| 6 | Voltage input (1 to 5 V DC) | | |

* Factory set value when the Initial setting code (12) is "N: None."

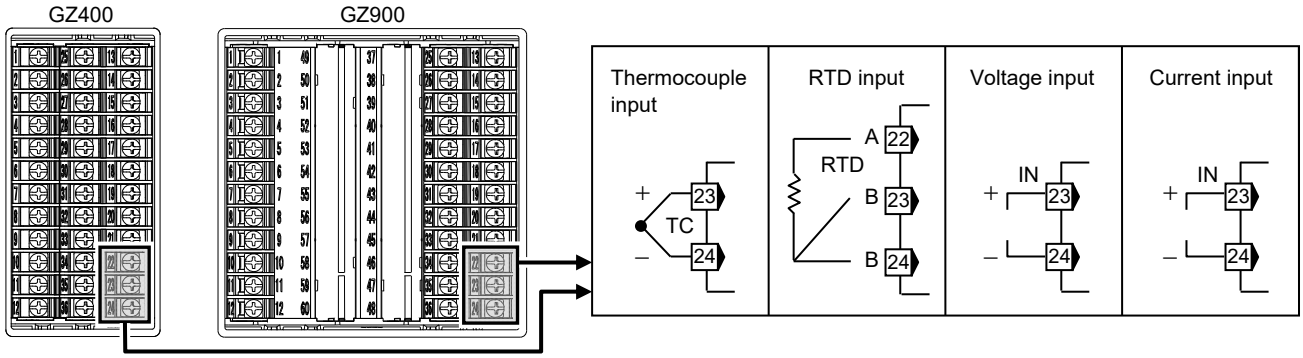
To select voltage input (0 to 100 mV DC or 0 to 10 mV DC) for Remote setting input, go to "Input 2_Input type" in the Engineering mode. To actually enable this change, the suffix code must be designated as "1: Remote setting input" and the Initial setting code must be designated other than as "N: None."

☞ For the Input 2_Input type, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

- Remote setting input is isolated from the Measured input 1.

## ■ Option 3: 2 [Measured input 2]

- Terminals 22 through 24 are used for Measured input 2.
- Connect an appropriate input to terminals 22 through 24 according to the specification of the input.




- The input range code specified at the time of order will be the factory set value of the Measured input 2 (same as the factory set value of Measured input 1).

GZ400 GZ900 □ (1) □□□ (2) – □ (3) □ (4) □ (5) * □ (6) □ (7) □ (8) 2 (9) □ (10) □/□ (11) (12)

This suffix code is the factory set value of the Measured input 2.

| Suffix code | Input group | Input type |
|---|---|---|
| See Range Code Table (P. 1-8) | Thermocouple (TC) input | K, J, T, S, R, E, B, N (JIS C1602-1995), PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002]), U, L (DIN43710-1985), PR40-20 (ASTM-E1751-00) |
| | RTD input | Pt100 (JIS C1604-1997), JPt100 (JIS C1604-1997, Pt100 of JIS C1604-1981) |
| | Low voltage input | 0 to 10 mV DC, 0 to 100 mV DC |
| | High voltage input | 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, −5 to +5 V DC, −10 to +10 V DC |
| | Current input | 0 to 20 mA DC, 4 to 20 mA DC |

**NOTE**

**When the input type is changed from current or high voltage input to TC, RTD or low voltage input, remove the wirings of the measured input before attempting the input change. Changing the input type with the signal applied to the instrument may lead to a failure of the instrument.**

☞ For details on changing the Input type, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

When "Measured input 2" is specified at Option 3 type, thermocouple input or RTD input can be specified as Remote setting input. To use thermocouple input or RTD input as Remote setting input, set the Remote setting input at "Select function for input 2" in the Engineering mode.

☞ For the Select function for input 2, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

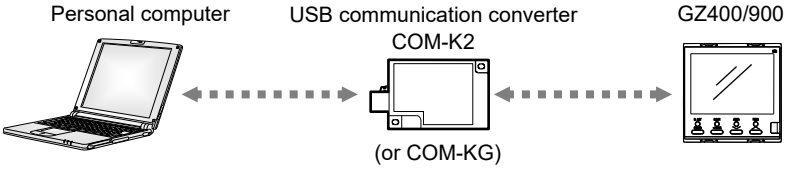
When "Remote setting input" is specified at Option 3 type, thermocouple input and RTD input cannot be selected as Remote setting input.

Continued on the next page.

- For thermocouple input, use the appropriate compensation wire.
- For RTD input, use low resistance lead wire with no difference in resistance between the three lead wires.
- Signal connected to Voltage input and Current input shall be low voltage defined as “SELV” circuit per IEC 60950-1.
- To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
- Measured input 2 is isolated from the Measured input 1.

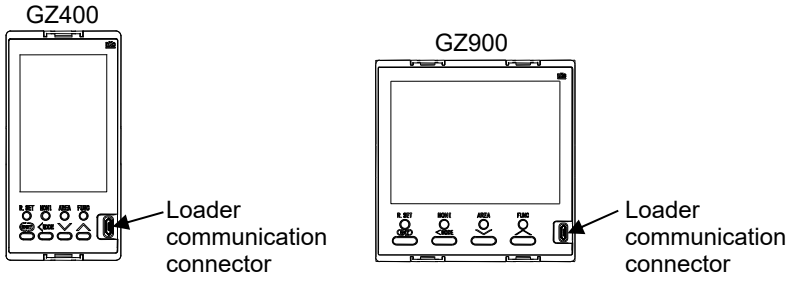
# 3.4 Connections for Loader Communication

The data of the instrument (GZ400/900) can be set via the loader communication using our "Communication tool PROTEM2." To connect the instrument to the personal computer, the USB communication converter COM-K2 or COM-KG (RKC product, sold separately), the loader communication cable and the USB cable are required.




## ■ Position of loader communication connector

The loader communication connector can be found on the front of the instrument. In the following picture the connector cover is open.

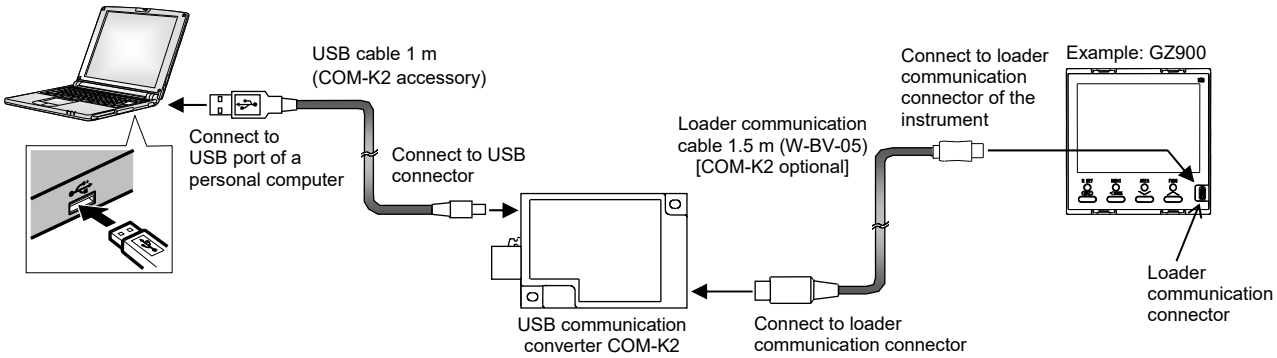



## ■ Wiring method

Connect the GZ400/900, COM-K2 (or COM-KG), and personal computer using a USB cable and a loader communication cable. Make sure the connectors are oriented correctly when connecting.

**NOTE**

**The Loader port is only for parameter setup. Not used for data logging during operation.**




Connection example of loader communication

- Communication Tool
  PROTEM2
  Software operation environment:
  Consult the manual that you downloaded
- Communication settings on the computer
  (The following values are all fixed)
  Communication speed: 38400 bps
  Start bit: 1
  Data bit: 8
  Parity bit: None
  Stop bit: 1
- Communication port of host computer
  USB port: Based on USB Ver. 2.0

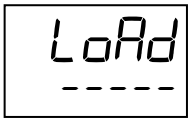
- The device address of the loader communication is fixed at "0." The setting of the device address is disregarded.
- The loader communication corresponds to the RKC communication protocol "Based on ANSI X3.28-1976 subcategories 2.5 and A4."
- Loader communication can be used on a GZ400/900 even when the Communication function (optional) is not installed.

For the COM-K2, refer to the **COM-K2 Instruction Manual**.
For the COM-KG, refer to the **COM-KG Instruction Manual**.

When using the loader communication, USB driver for COM-K2 must be installed on the personal computer. The USB driver can be downloaded the official RKC website. Installation of the USB driver is not necessary when the COM-KG is used on Windows 10.

When the instrument is powered off, power can be supplied to the instrument from COM-K2 or COM-KG. This function is exclusive for parameter setting, and the instrument functions as follows.

- Control is stopped (Output is off, relay remains open).
- Host communication is stopped.
- The PV/SV monitor shows "LoAd" for the Measured value (PV) display and "-----" for the Set value (SV) display. The LCD backlight is partially turned off.




While the instrument is powered by COM-K2 or COM-KG, if power is applied to the instrument, the instrument will be reset and starts for normal operation.

When the instrument is normally powered, the host communication can be used simultaneously.

## 3.5 Handling of the Terminal Cover [Optional]

When mounting and removing the terminal cover, take the following steps:

**⚠ WARNING**

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

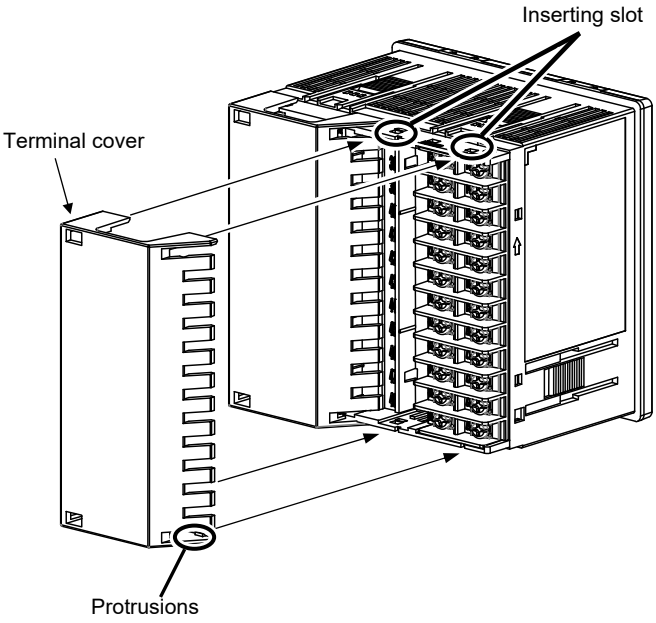
**NOTE**

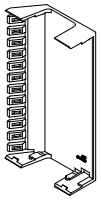
**When mounting and removing the terminal cover, apply pressure very carefully to avoid damage to the terminal cover.**

### ■ Mounting procedures

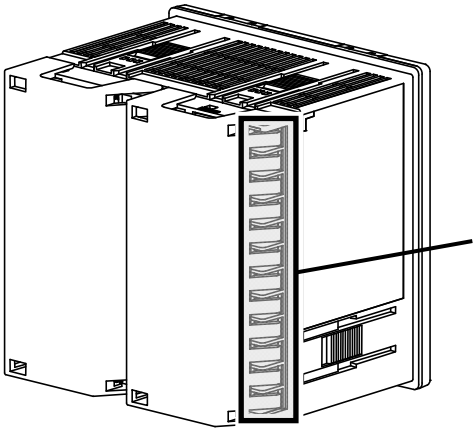
*1.* Check the mounting direction of the terminal cover.

*2.* Push the protrusions of terminal cover into the insertion slots for mounting the terminal cover.



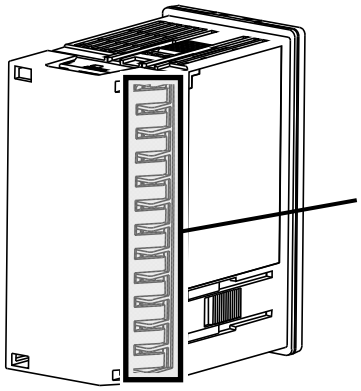
GZ400/900 common terminal cover



This section of GZ400/900 terminal cover can be removed by bending it.
Remove unnecessary part(s) depending on the wiring condition.

GZ900 is used in the explanatory drawing. The above mounting procedures in the example shown are the same for GZ400.

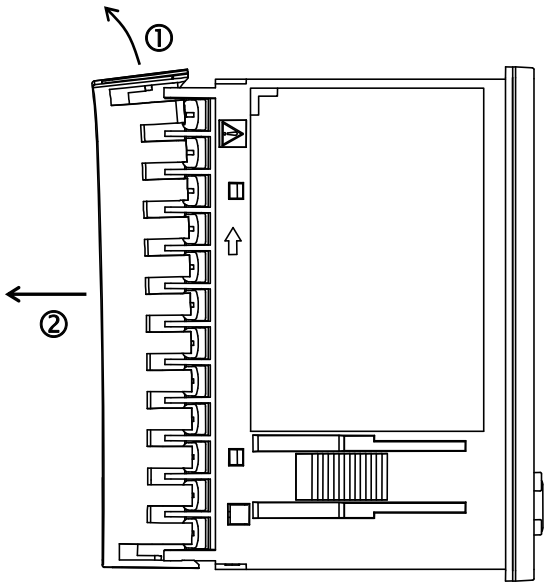
Drawing of GZ400 with terminal cover



This section of GZ400/900 terminal cover can be removed by bending it. Remove unnecessary part(s) depending on the wiring condition.

## ■ Removal procedures

Release the protrusions of terminal cover from the insertion slots (①) shown in the following figure, and then pull the terminal cover (②) to remove it from the case.



## *MEMO*

# PARTS DESCRIPTION AND BASIC OPERATION

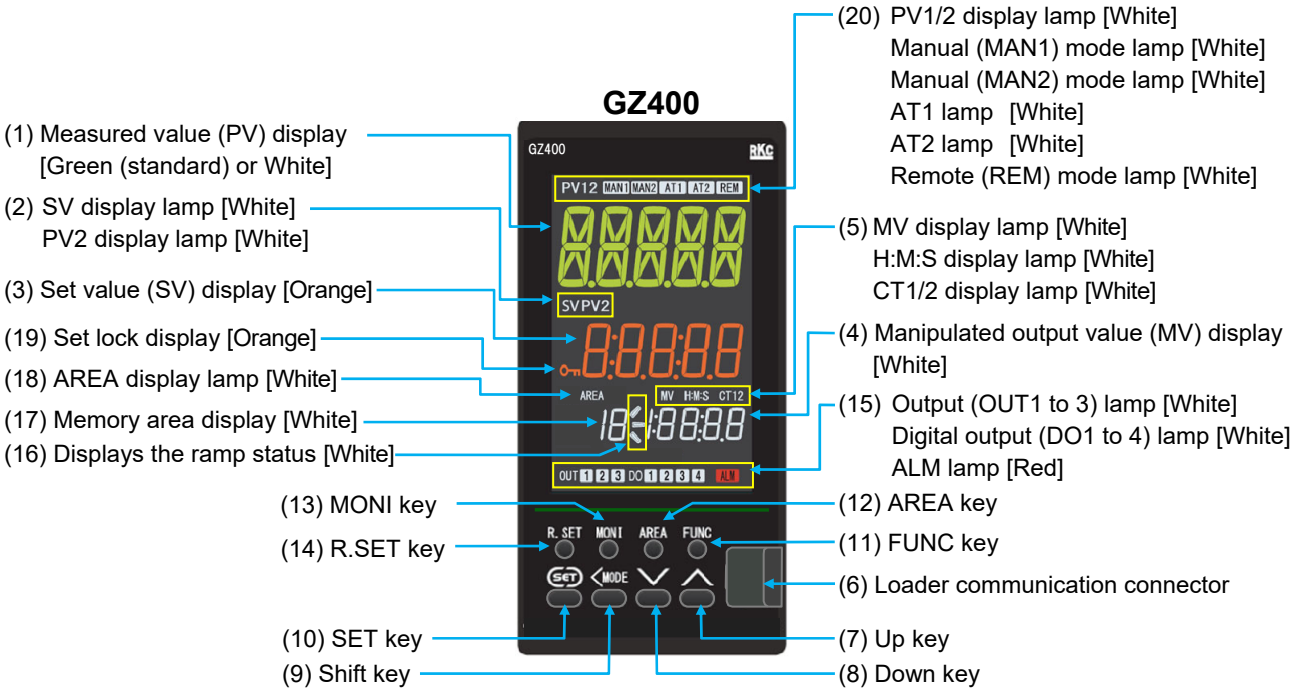
# 4

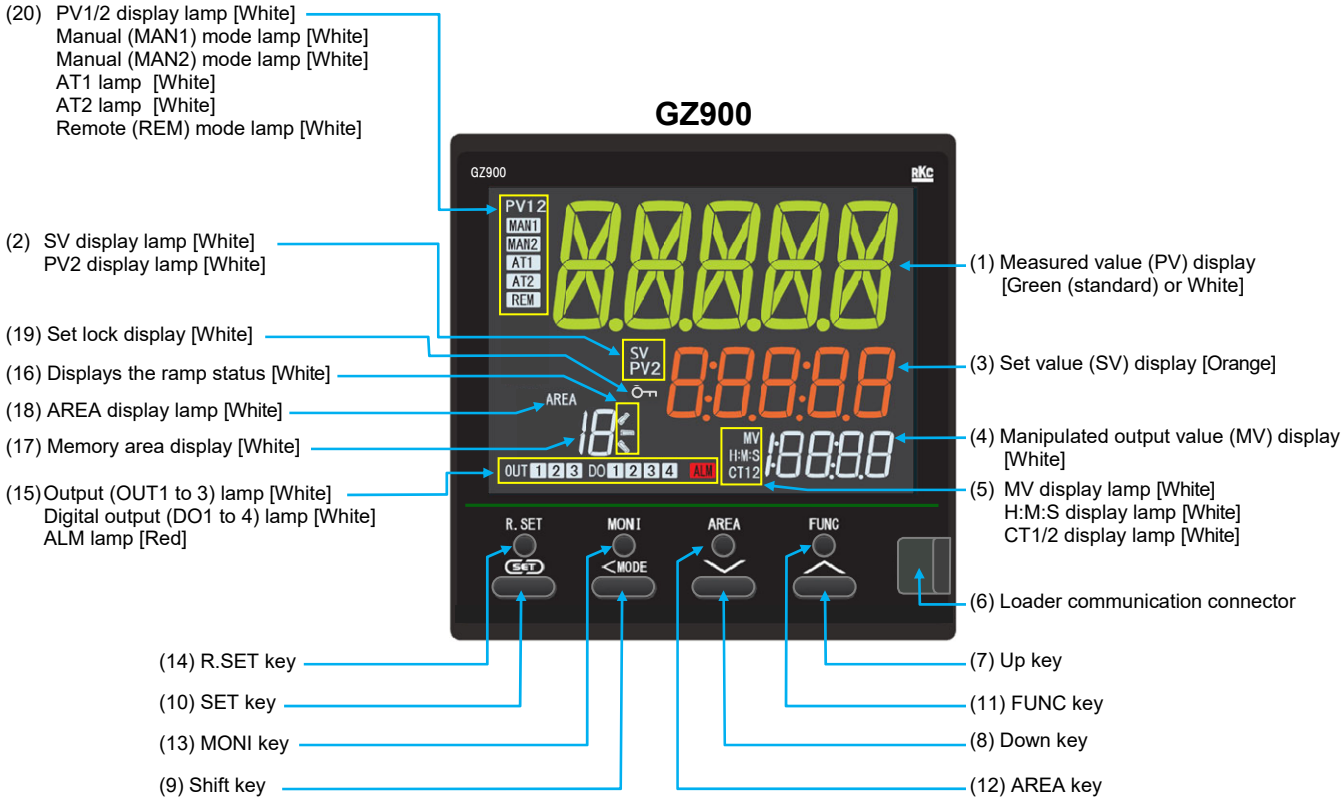
This chapter describes name of parts, switching modes, setting and modifying values and other basic operations.

# 4.1 Parts Description

This section describes various display units and the key functions.

## ■ Front panel view




**NOTE**

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

| | | |
|---|---|---|
| (1) | Measured value (PV) display [Green (standard) or White] | Displays Measured value (PV) or various parameter symbols. |
| (2) | SV display lamp [White] | Lights when the SV display unit shows a Set value (SV). |
| | PV2 display lamp [White] | PV2 Lights when the Input 2_Measured value (PV) is displayed on the SV display unit. |
| (3) | Set value (SV) display [Orange] | Displays Set value (SV) or various parameter set values. |
| (4) | Manipulated output value (MV) display [White] | Displays one of the following 3 [1]:<br>Manipulated output value (MV), Memory area soak time, or Current transformer (CT) input value. |
| (5) | MV display lamp [White] | Lights when Manipulated output value (MV) is displayed on the MV display. |
| | H:M:S display lamp [White] | Lights when time (hour:minute:second) is displayed on the MV display. |
| | CT1/2 display lamp [White] | • CT1 lights when the Current transformer 1 (CT1) input value is displayed on the MV display.<br>• CT2 lights when the Current transformer 2 (CT2) input value is displayed on the MV display. |
| (6) | Loader communication connector | Setting and monitoring on a computer (PC) is possible if the controller is connected with our cable to a PC via our USB communication converter COM-K2 or COM-KG (sold separately) [a]. Our communication software [b] must be installed on the PC.<br>[a] For the COM-K2 or COM-KG, refer to the official RKC website.<br>[b] Only available as a download from the official RKC website. |
| (7) |  Up key | Increases numerals. |
| (8) |  Down key | Decreases numerals. |
| (9) |  Shift key | Shifts digits when settings are changed. Used to switch the modes. |
| (10) |  SET key | Used for calling up parameters and set value registration. |
| (11) |  FUNC key | The selected function can be assigned* to this key for a direct access to it. |
| (12) |  AREA key | When the AREA key is pressed, the screen is switched to the Memory area transfer screen. |
| (13) |  MONI key | Used to switch screens. When the MONI key is pressed while any screen other than Monitor & SV setting mode is displayed, the screen returns the PV/SV Monitor. Pressing the MONI key somewhere in the Parameter select mode will bring you back to the top screen of the Parameter select mode. |
| (14) |  R.SET key | The parameters can be scrolled backwards. |
| (15) | OUT1 to 3 lamp [White] | Lights when Outputs 1 to 3 (OUT1 to 3)[2] are turned on. |
| | DO1 to 4 lamp [White] | Lights when Digital outputs 1 to 4 (DO1 to 4)[2] are turned on. |
| | ALM lamp [Red] | Lights when any of the following occurs.<br>• Event 1 to 4<br>• Heater break alarm (HBA) 1 or 2<br>• Control loop break alarm (LBA) 1 or 2<br>• Input error of input 1 or 2 |
| (16) | Displays the ramp status [White] | SV ramp status is displayed; (rise, soak, fall)<br>Rise:  Soak:  Fall:  |
| (17) | Memory area display [White] | Displays the memory area No. (1 to 16). |

[1] Functions are configured in the Engineering mode. For detailed, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

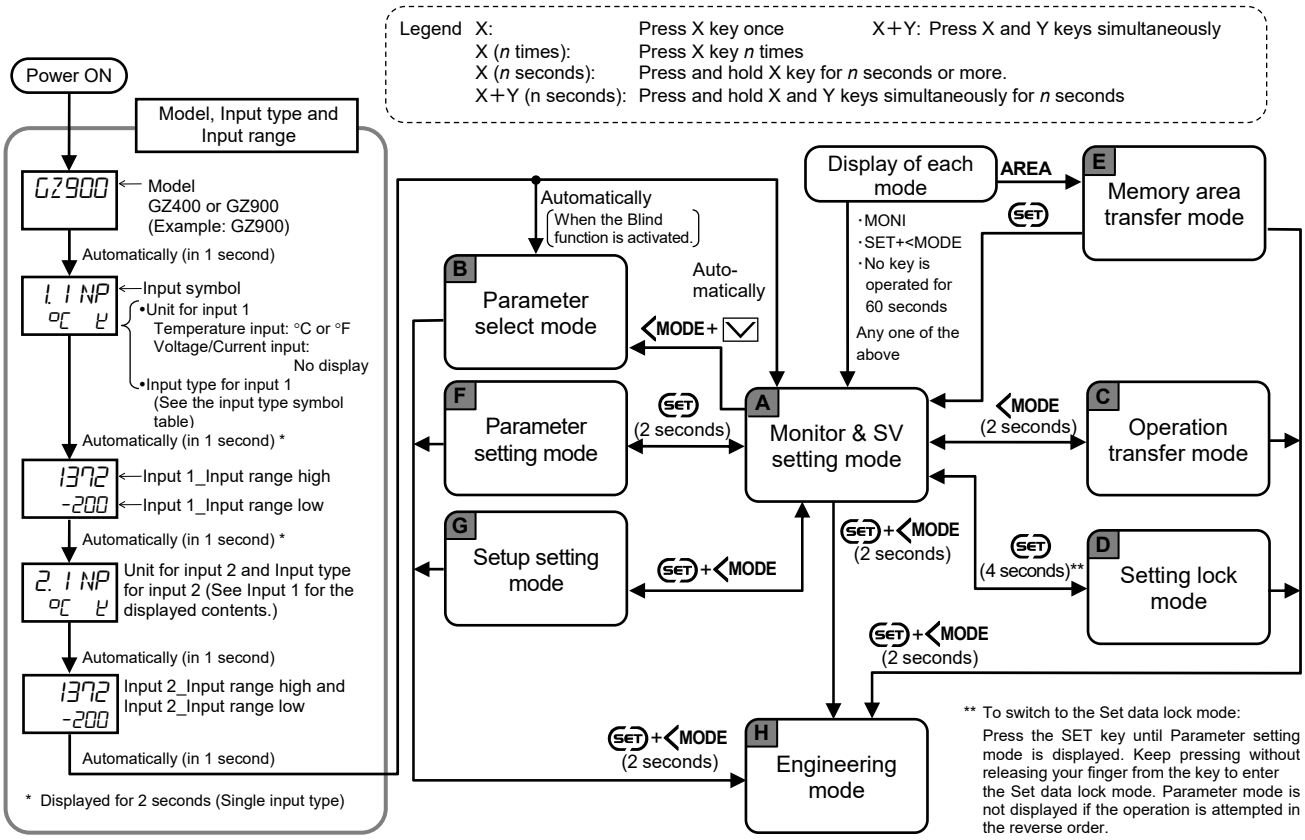
[2] Outputs, such as control output, retransmission output, event output, are assigned to Outputs 1 to 3 (OUT1 to 3) and Digital outputs 1 to 4 (DO1 to 4). (Control output can be assigned to OUT1 to 3 only.)
Outputs are assigned in Engineering mode. For detailed, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.

| | | |
|---|---|---|
| (18) | AREA display lamp [White] | Lights when Memory area is displayed. |
| (19) | Set lock display<br>[GZ400: Orange GZ900: White] | Lights when the settings are locked or when “Parameter select direct registration” is on. |
| (20) | PV1/2 display lamp [White] | PV1 Lights when the Input 1_Measured value (PV) is displayed on the PV display unit.<br>PV2 Lights when the Input 2_Measured value (PV) is displayed on the PV display unit. |
| | Manual (MAN1) mode lamp [White] | Lights when Input 1 is in Manual (MAN) mode.<br>When lit, the SV display unit shows an Input 1_Manual manipulated output value. |
| | Manual (MAN2) mode lamp [White] | Lights when Input 2 is in Manual (MAN) mode.<br>When lit, the SV display unit shows an Input 2_Manual manipulated output value. |
| | AT1 lamp [White] | • Flashes when Autotuning (AT) is activated on Input 1.<br>(After AT is completed: AT lamp will go out)<br>• Lights when Startup tuning (ST) is activated on Input 1.<br>(After ST is completed: AT lamp will go out) |
| | AT2 lamp [White] | • Flashes when Autotuning (AT) is activated on Input 2.<br>(After AT is completed: AT lamp will go out)<br>• Lights when Startup tuning (ST) is activated on Input 2.<br>(After ST is completed: AT lamp will go out) |
| | Remote (REM) mode lamp [White] | Lights in Remote (REM) mode.<br>When lit, the SV display unit shows a remote setting input value. |

# 4.2 Mode Switching

The instrument has eight different modes for operation and setting. Modes can be switched through the key operation of (SET) and <MODE keys.




| | | |
|---|---|---|
| A | Monitor & SV setting mode | In this mode, setting of SV (control target value) and monitoring of PV, SV, and MV can be conducted. Conduct operation in this mode. |
| B | Parameter select mode | Only desired screens can be grouped for display. When the Blind function is valid, unnecessary modes can be hidden. |
| C | Operation transfer mode | In this mode, switching between RUN/STOP, Auto/Manual, and Remote/Local can be done as well as conducting AT and ST. |
| D | Setting lock mode | Set data lock can be set to prevent accidental key operations. Parameter select mode can be set up to group desired screens for display. |
| E | Memory area transfer mode | The memory area to be used for control (control area) can be switched in this mode. |
| F | Parameter setting mode | Parameters related to the control can be set. Parameters in this mode can be used in the memory area function, and up to 16 areas can be set. |
| G | Setup setting mode | Control related parameters not available in Memory area can be set up here. |
| H | Engineering mode | The instrument can be configured to the user's requirements (input, output, control mode, etc). |

Input type symbol

| Symbol | K | J | T | S | R | E | B | N | PLII |
|---|---|---|---|---|---|---|---|---|---|
| Input type | Thermocouple (TC) input | | | | | | | | |

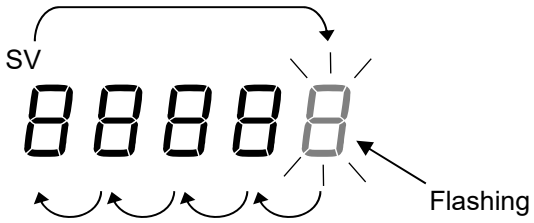
| Symbol | W5Re/W26Re | U | L | PR40-20 | Pt100 | JPt100 | Voltage | Current | |
|---|---|---|---|---|---|---|---|---|---|
| Input type | Thermocouple (TC) input | | | | RTD input | | | | |

☞ For the details of the parameters from A Monitor & SV setting mode to the parameters in the H Engineering mode, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

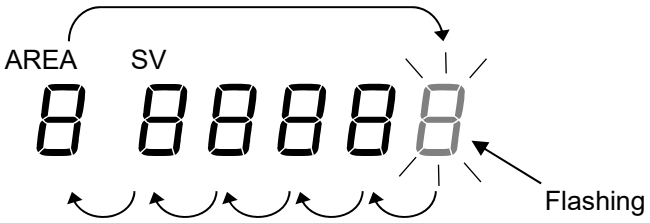
## 4.3 Changing Set Value

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

All modes except SV setting mode and Parameter setting mode

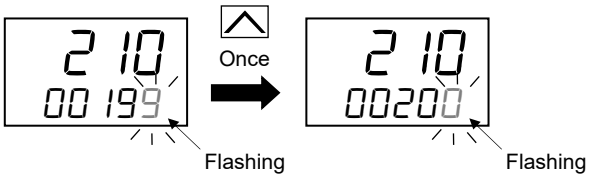



A : SV setting mode
F : Para meter setting mode

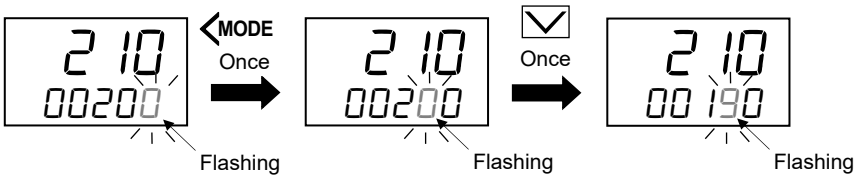



- The following is also available when changing the set value.

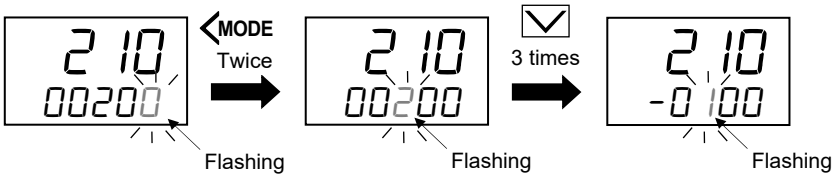
**Increase SV from 199 °C to 200 °C:**




**Decrease SV from 200 °C to 190 °C:**




**Decrease SV from 200 °C to –100 °C:**




- **To store a new value for the parameter, always press the SET key**. The display changes to the next parameter and the new value will be stored.
  The modified data will not be stored only by operating the ∧ and ∨ keys. In the Operation transfer mode, however, the selected mode will be valid only by the operations of these keys.

  In case of the Set value (SV), the instrument can be configured in the H Engineering mode so that the modified set value will be adopted 2 seconds after the change without pressing the SET key.

- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to A Monitor & SV setting mode. The modified data will not be registered in this case.

# 4.4 Operation of the Direct Key (FUNC key)

GZ400/900 has a FUNC key which allows a specified function to be assigned to it. The action of the FUNC key can be also set (Press once or Press and hold). Function assignment to the FUNC key and the key operation method can be configured at “FUNC key assignment” and “FUNC key operation selection” in the Engineering mode.

☞ For the details of Function assignment to the FUNC key and the key operation method, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.


## ■ Functions assignable to the FUNC key

| Function | * |
|---|---|
| RUN/STOP transfer (Factory set value) | A |
| Autotuning (AT) (Common to Input 1 and 2) | B |
| Input 1_Autotuning (AT) | B |
| Input 2_Autotuning (AT) | B |
| Auto/Manual transfer (Common to Input 1 and 2) | A |
| Input 1_Auto/Manual transfer | A |
| Input 2_Auto/Manual transfer | A |
| Remote/Local transfer ( PV select transfer, 2-loop control/Differential temperature control) | A |
| Control area Local/External transfer | A |
| Interlock release | C |
| Hold reset (Common to Input 1 and 2) | C |
| Input 1_Hold reset | C |
| Input 2_Hold reset | C |
| Set data unlock/lock transfer | A |
| Area jump | D |

* Explanation of key action
A: Mode is changed for every press of the key.
B: Function is turned on and off for every press of the key.
C: Function is released or reset by pressing the key.
D: Pressing the key switches the memory area to the preset area set in the Link area number in the Parameter setting mode.
When the Link area number is not specified, a memory area with the number of the current control area number +1 will be used.

📖 The function assigned to the FUNC key is accessible even when the Set data lock is used.

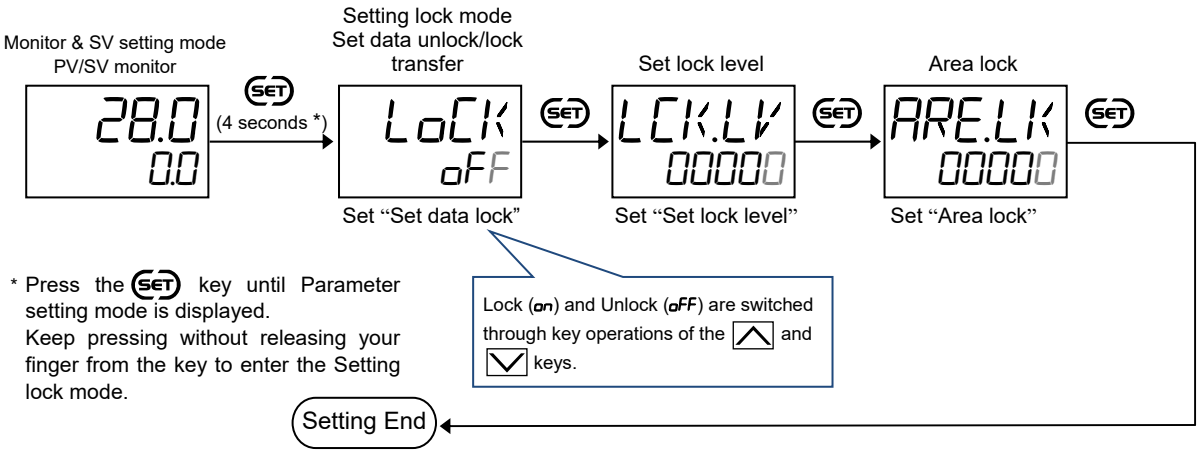
📖 The parameter fixed at Fix parameter setting is disabled even if any function is assigned to the FUNC key.

# 4.5 Protecting Setting Data

The Set data lock function limits access of unauthorized personnel to the parameters and prevents parameter change by mistake. The Set data lock function enables the restriction of setting changes for each mode (Setting lock level). The Area lock restricts switching the Memory areas. Both functions can be configured in the Setting lock mode.

☞ For details on the Set data lock function, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Setting procedure




- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (The **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)

| | |
|---|---|
| Setting lock mode<br>Set data unlock/lock transfer<br>LoCK oFF<br>Factory set value: oFF | The items locked in "Set lock level" and "Area lock" can be switched between lock and unlock.<br>Set value:<br>oFF: Unlock state<br>on: Lock state *<br>* A key symbol (Set lock display) appears on the front display. |
| Setting lock mode<br>Set lock level<br>LCK.LV 00000<br>Factory set value: 00000 | Select the operation mode to lock. The Set lock level can be changed even after the set data lock has been set.<br>00000 Set value:<br>0: Unlock<br>1: Lock<br>SV setting mode * + Parameter select mode<br>* Set value (SV) and Interlock release<br>Operation select mode<br>Parameter setting mode<br>Setup setting mode<br>Engineering mode |

| | |
|---|---|
| Setting lock mode<br>Area lock<br>  <br><br>Factory set value: 00000 | For GZ400/900, select to enable/disable the Memory area switching.<br>  <br><br>Set value:<br>0: Memory area is adjustable when the setting data is locked.<br>1: Memory area is not adjustable when the setting data is locked.<br>(Memory area transfer mode is not displayed) |

- Switching the Set data lock is available anytime irrespective or RUN or STOP state.
- Parameter switching is available during the Set data lock state for checking the data. When the SV setting mode is locked, the Set value (SV) setting screen in the SV setting mode will not be displayed.
- Even during the Set data lock state, setting through the communication (optional function) and selection of functions by the FUNC key is possible. It should be noted that when the parameters in the Engineering mode are changed, the instrument must be stopped (or stay in the STOP mode).

# *MEMO*

# 5 OPERATION

This chapter describes caution for first time use, parameter setting required before operation, and others.

# 5.1 Operating Precautions

Before starting the operation, check the following items.

## ■ Power ON

As soon as the instrument is powered up, operation is started after the display of the input type and the input range. [Factory set value: RUN]

## ■ Action at input error

The measures for input errors can be selected from Input burnout direction, Input error determination point, Manipulated output value at input error, PV flashing display at input error, and Input error status output. When this instrument has an input error, actions and outputs are provided according to the setting.

☞ For details on the action at input error, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Checking power supply frequency (50/60Hz)

Set the power supply frequency of the power supply that is actually supplied to this instrument. Power Supply Frequency is a parameter that cannot be changed during the operation (parameter in the Engineering mode). When changing the set value, set the instrument to STOP (Control stop) mode before starting the setting.

☞ For details on the RUN/STOP transfer and the power supply frequency, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Checking each parameter

The settings for the Set value (SV) and all parameters should be appropriate for the controlled system. There are parameters in Engineering mode which cannot be changed when the controller is in RUN mode. Change the RUN/STOP mode from RUN to STOP when a change for the parameters in Engineering mode is necessary.

☞ For details on the RUN/STOP transfer and the each parameter, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Operation at power failure

A power failure of 20 ms (24 V DC type: 5 ms) or less will not affect the control action. When a power failure of more than 20 ms (24 V DC type: 5 ms) occurs the instrument assumes that the power has been turned off. When the power returns, the operation of instrument will be re-starts in accordance with the content selected by Hot/Cold start.

☞ For details on the Hot/Cold start, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

## ■ Event hold action

- The event hold action is activated when the power is turned on or when transferred from STOP mode to RUN mode.
- The event re-hold action is activated when not only the SV is changed, but also the power is turned on or when transferred from STOP mode to RUN mode.

☞ For details on the event hold action, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

# 5.2 Setup Procedures

Set up the instrument prior to operating it referring to the following operating procedure.
See the following setup example.

**Setup example 1**

**Model code: GZ900 F K02−M N 4∗1 N N N N / N**

| | |
|---|---|
| Input: | Thermocouple (K), 0 to 400 °C |
| Control: | PID control with AT (reverse action) |
| Output: | Control output: Uses OUT1 |
| | Event output: Uses DO1 |
| Event: | Number of event points: 1 point (Uses Event 1) |
| | Deviation high * |
| | →Change the event action to Deviation high/low with hold function. |
| | Event timer: 0.0 second * |
| | Without interlock function * |
| Control set value: | 200 °C |
| Event 1 set value: | 10 °C |
| PID constants: | Automatic setting by Autotuning (AT) |

* Factory set value

: Values to be set in the Initial setting

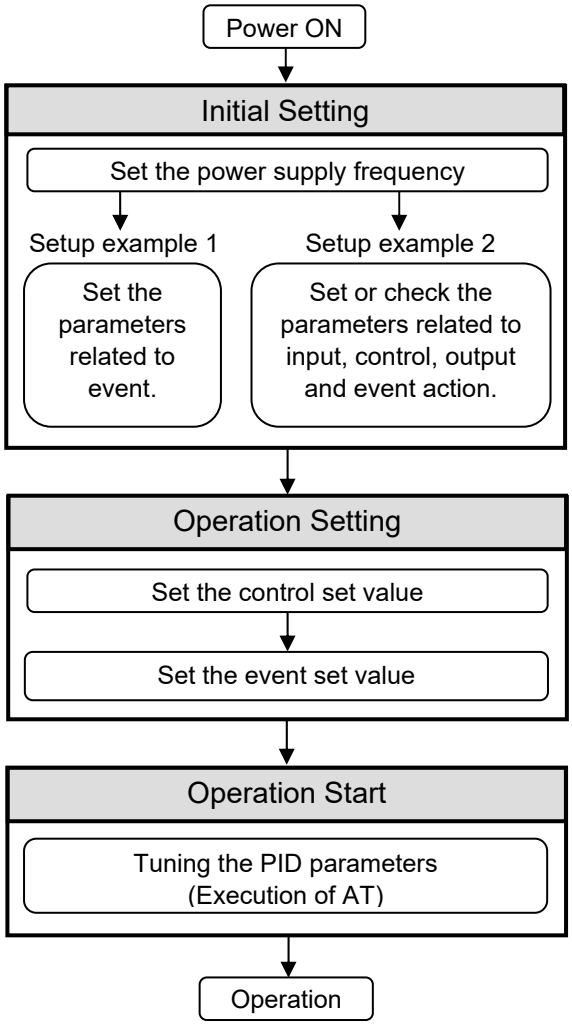
**Setup example 2**

**Model code: GZ900 A D35−M M 4∗4 N N N N / N**

| | |
|---|---|
| Input: | RTD (Pt100), −200.0 to +850.0 °C * |
| | →Change the input range to −200.0 to +400.0 °C |
| Control: | Heat/Cool PID control with AT (air cooling) |
| Output: | Control output: Heat-side: Uses OUT1 |
| | Cool-side: Uses OUT2 |
| | Event output: Uses DO1 and DO2 |
| Event: | Number of event points: 2 points (Uses Event 1 and 2) |
| | Event 1, 2: Deviation high * |
| | →Change the Event 2 to Deviation low. |
| | Event timer: 0.0 second * |
| | Without interlock function * |
| | →Change to “with Interlock function.” |
| Control set value: | 100.0 °C |
| Event set value: | Event 1: 10.0 °C, Event 2: −10.0 °C |
| PID constants: | Automatic setting by Autotuning (AT) |

* Factory set value

: Values to be set or checked in the Initial setting




☞ For operation in initial setting (Engineering mode), see **5.3 Initial Setup Before Operation (P. 5-4)**.

☞ For operation setting, see the following:
- **5.4 Setting the Control Set Value [Set value (SV)] (P. 5-11)**
- **5.5 Setting the Event Set Value (P. 5-12)**

☞ For starting the operation, see **5.6 Tuning the PID Parameters (Execution of AT) (P. 5-14)**.

## 5.3 Initial Setup Before Operation

Before starting the operation, confirm that the set value of the parameter matches the model code as specified when ordered. Parameters which were not specified when ordered must be set before use.
Some functions may need to be set in the Engineering mode. Read the following part before attempting the setting.

**⚠ WARNING**

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

**NOTE**
**Parameters in Engineering mode are settable only when the controller is in STOP mode. However, only checking can be made even in the RUN state.**

### ■ Set value change and registration

- The flashing digit indicates which digit can be set. Every time the MODE key is pressed, the flashing digit moves.
- **To store a new value for the parameter, always press the SET key**. The display changes to the next parameter and the new value will be stored.

  The modified data will not be stored only by operating the ∧ and ∨ keys. In the Operation transfer mode, however, the selected mode will be valid only by the operations of these keys.

  In case of the Set value (SV), the instrument can be configured in the H Engineering mode so that the modified set value will be adopted 2 seconds after the change without pressing the SET key.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to A Monitor & SV setting mode. The modified data will not be registered in this case.

## 5.3.1 Setting Power Supply Frequency

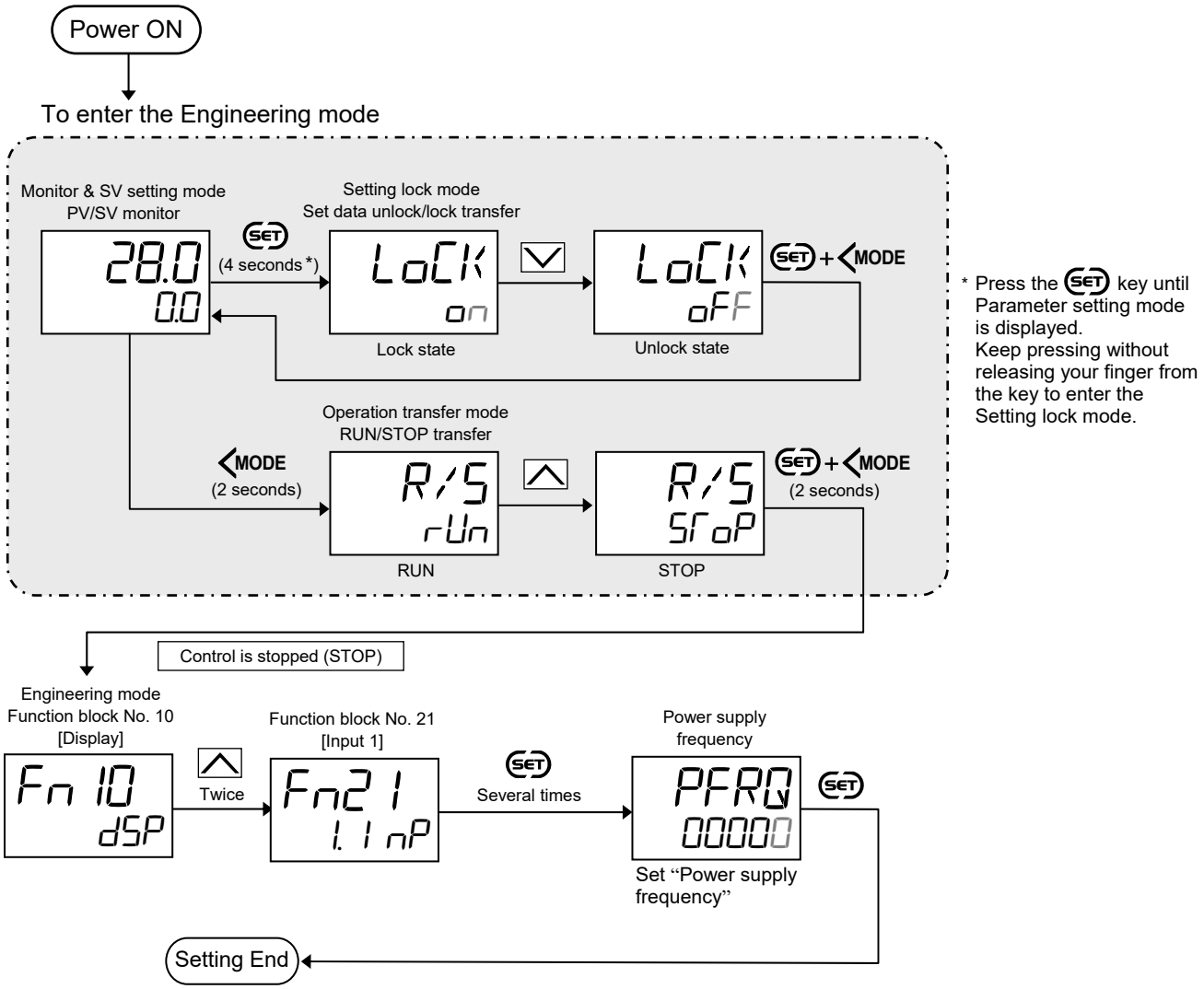
To prevent malfunction and instrument failure, setting Power supply frequency (50/60Hz) is required.
Set the power supply frequency of the power supply that is actually supplied to this instrument.

### ■ Parameter setting

● **Power supply frequency**
**[Engineering mode: Function block No**. 21 (Fn2 1)]

| Parameter symbol | Data range | Factory set value |
|---|---|---|
| PFRQ | 0: 50 Hz<br>1: 60 Hz | 0 |

### ■ Setting procedure

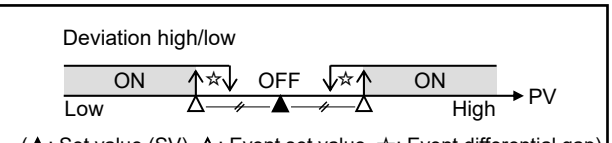



- Next parameter is displayed.
- Press (SET) and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (The **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

## 5.3.2 Initial setting of setup example 1 (Setting parameters related to the event)

In the Setup example 1 (see P. 5-3), all default factory set values except event related parameters can be used in actual applications without any changes.
This section describes the Initial setting of the alarm related operation used in the Setup example 1.

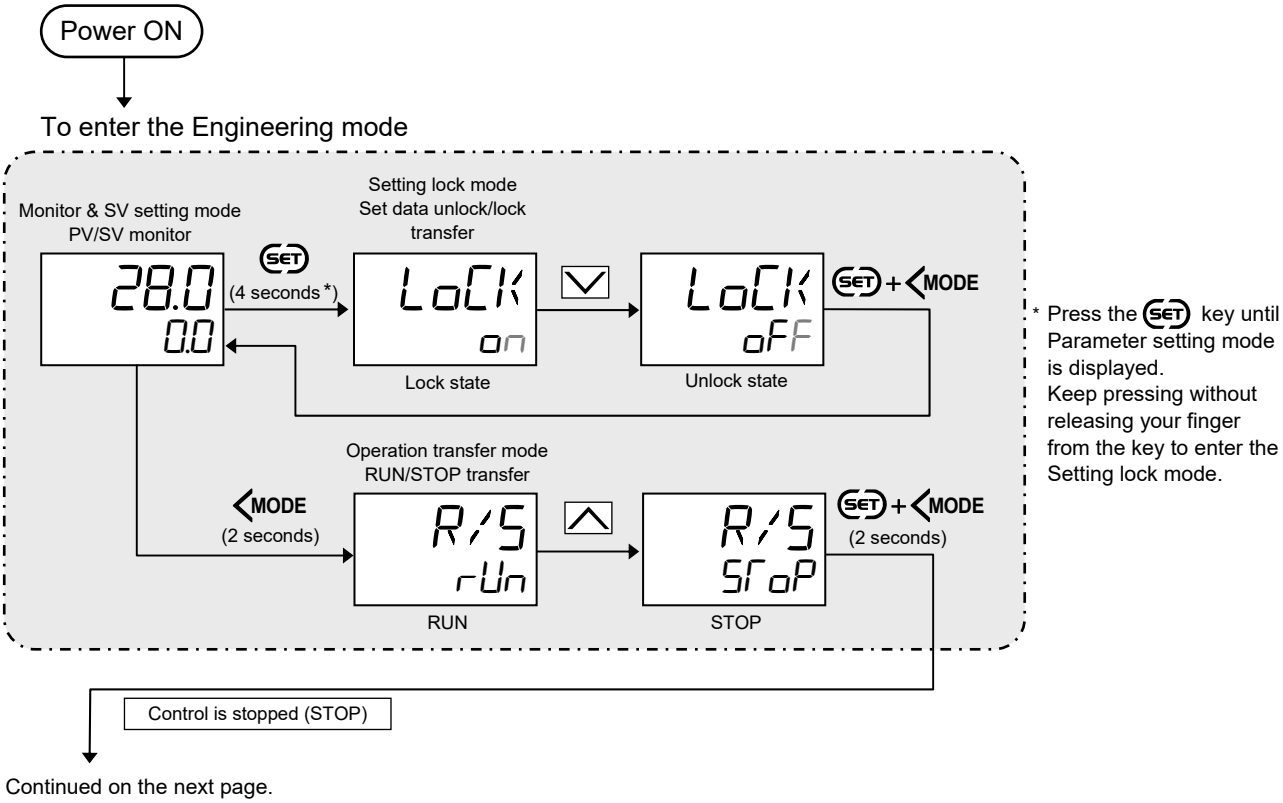
Setup example 1:
Model code: GZ900 F K02−M N 4 ∗ 1 N N N N / N
Event: Number of event points: 1 point (Uses Event 1)
Deviation high (Factory set value)
→Change the event action to Deviation high/low with hold function.
Without interlock function (Factory set value)




Parameters to be set (Engineering mode):

- Mandatory setting items:
  Function block No. 41 (Fn4 1): Event 1 type (E5 1), Event 1 hold action (EHo 1)
- Related setting items (Set only when necessary):
  Function block No. 41 (Fn4 1): Event 1 differential gap (EH 1), Event 1 timer (EVT 1)
- Items unnecessary to set (Used with factory setting):
  Function block No. 34 (Fn34): DO1 function selection (doSL 1), DO1 logic calculation selection (doLG 1)
  Function block No. 30 (Fn30): Energized/De-energized selection (ExC), Interlock selection (ILS), Output action at control stop (SS)

### ■ Setting procedure

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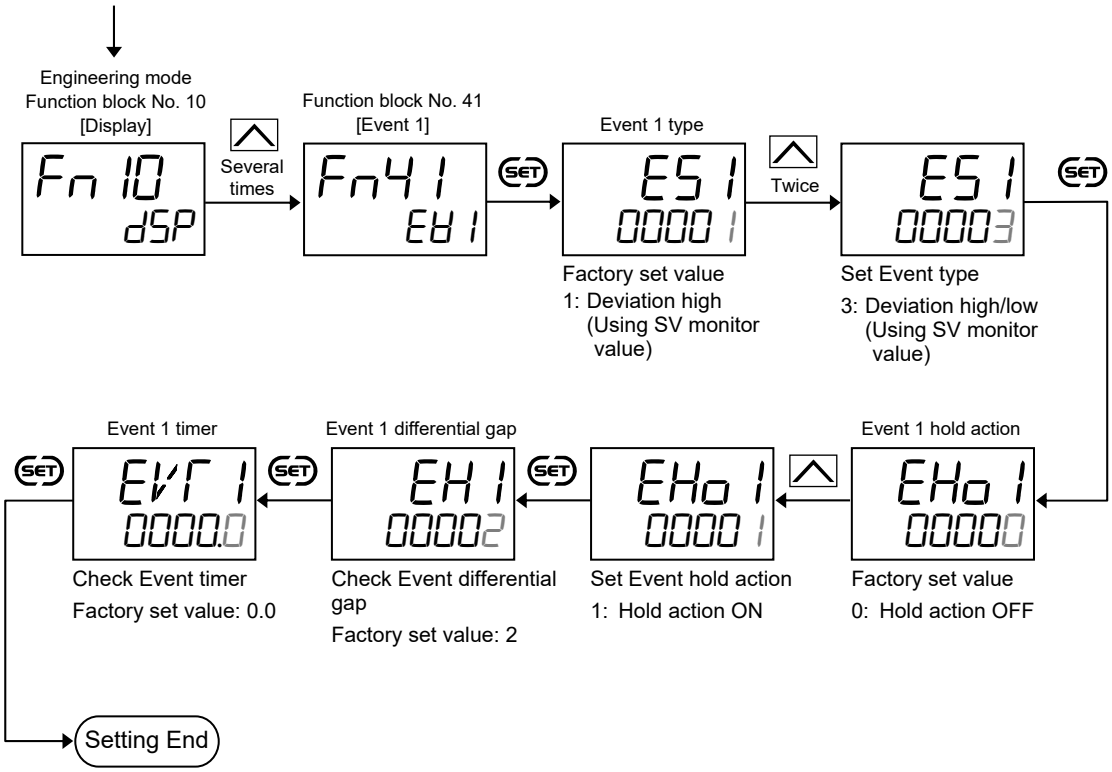


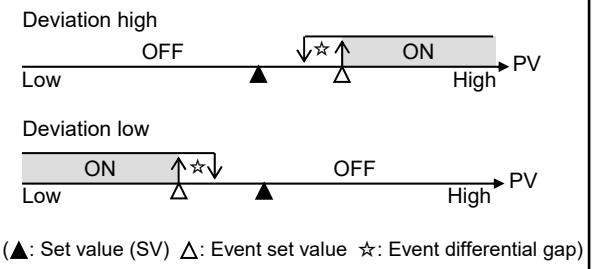

- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (The **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor.)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

## 5.3.3 Initial setting of setup example 2 (Setting parameters related to the input, control, output and event)

The setup example 2 (see P. 5-3) describes the initial setting of input, control, output and event action.

Setup example 2:
Model code: GZ900 A D35−M M 4 ∗ 4 N N N N / N

Input: RTD (Pt100),
–200.0 to +850.0 °C (Factory set value)
→Change the input range –200.0 to +400.0 °C
Control: Heat/Cool PID control with AT (air cooling)
Output: Control output: Heat-side: Uses OUT1
Cool-side: Uses OUT2
Event output: Uses DO1 and DO2
Event: Number of event points: 2 points
(Uses Event 1 and 2)
Event 1, 2: Deviation high (Factory set value)
→Change the Event 2 to Deviation low.
Event timer: 0.0 second (Factory set value)
Without interlock function (Factory set value)
→Change to “with Interlock function.”




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

Parameters to be set (Engineering mode):

- Mandatory setting items:

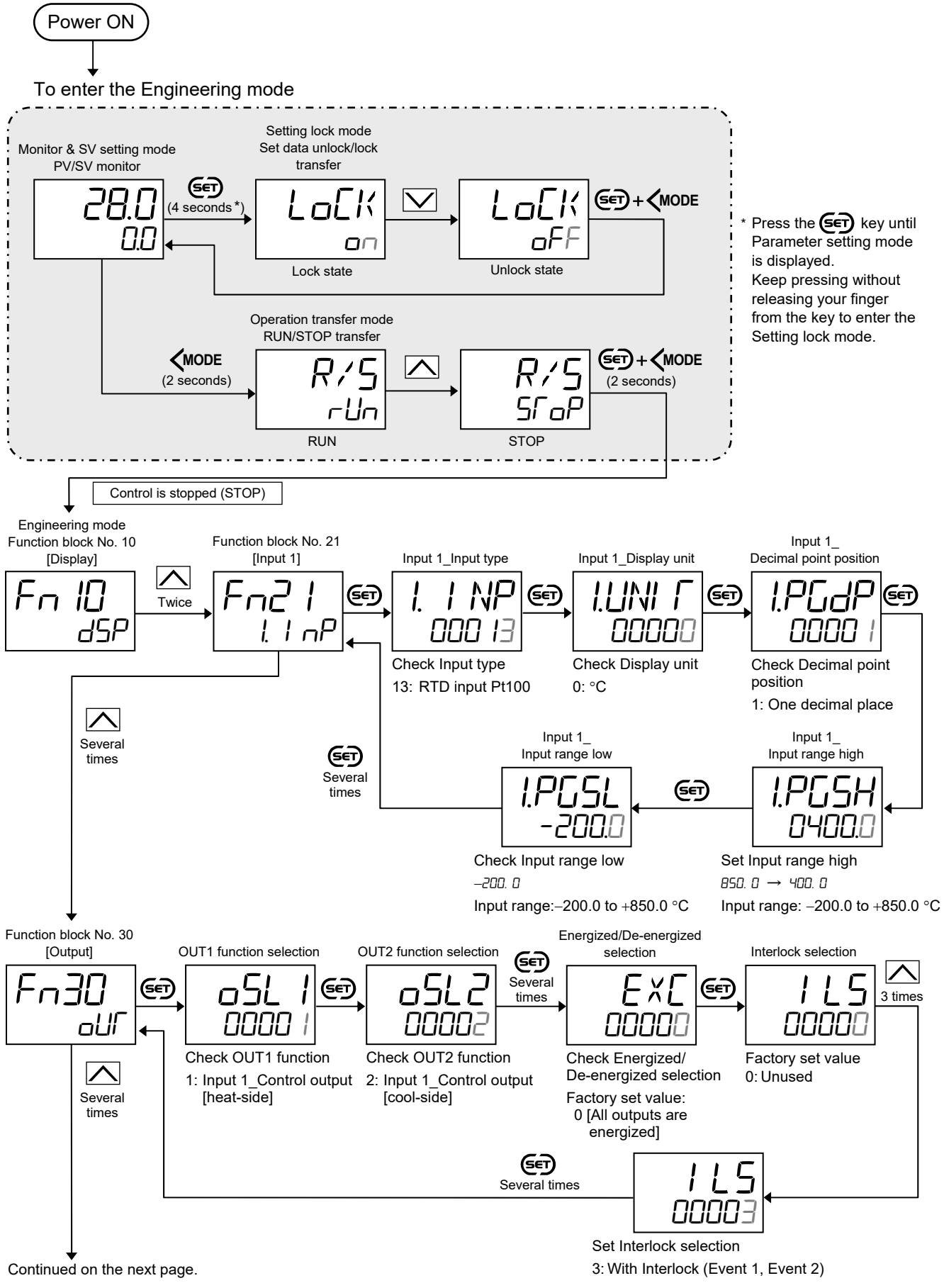
Function block No. 21 (Fn21): Input 1_Input type ( I.1NP),
Input 1_Display unit ( I.UNIT),
Input 1_Decimal point position ( I.PGdP),
Input 1_Input range high ( I.PGSH),
Input 1_Input range low ( I.PGSL)
Function block No. 30 (Fn30): OUT1 function selection (oSL1),
OUT2 function selection (oSL2),
Interlock selection (ILS)
Function block No. 34 (Fn34): DO1 function selection (doSL1),
DO2 function selection (doSL2),
DO1 logic calculation selection (doLG1),
DO2 logic calculation selection (doLG2)
Function block No. 41 (Fn41): Event 1 type (ES1)
Function block No. 42 (Fn42): Event 2 type (ES2)
Function block No. 51 (Fn51): Input 1_Control action ( I. oS)

- Related setting items (Set only when necessary):

Function block No. 30 (Fn30): Energized/De-energized selection (ExC)
Function block No. 41 (Fn41): Event 1 differential gap (EH1),
Event 1 timer (EVT1)
Function block No. 42 (Fn42): Event 2 differential gap (EH2),
Event 2 timer (EVT2)
Function block No. 71 (Fn71): Input 1_Setting limiter high ( I. SLH),
Input 1_Setting limiter low ( I. SLL)

Continued on the next page.

## ■ Setting procedure



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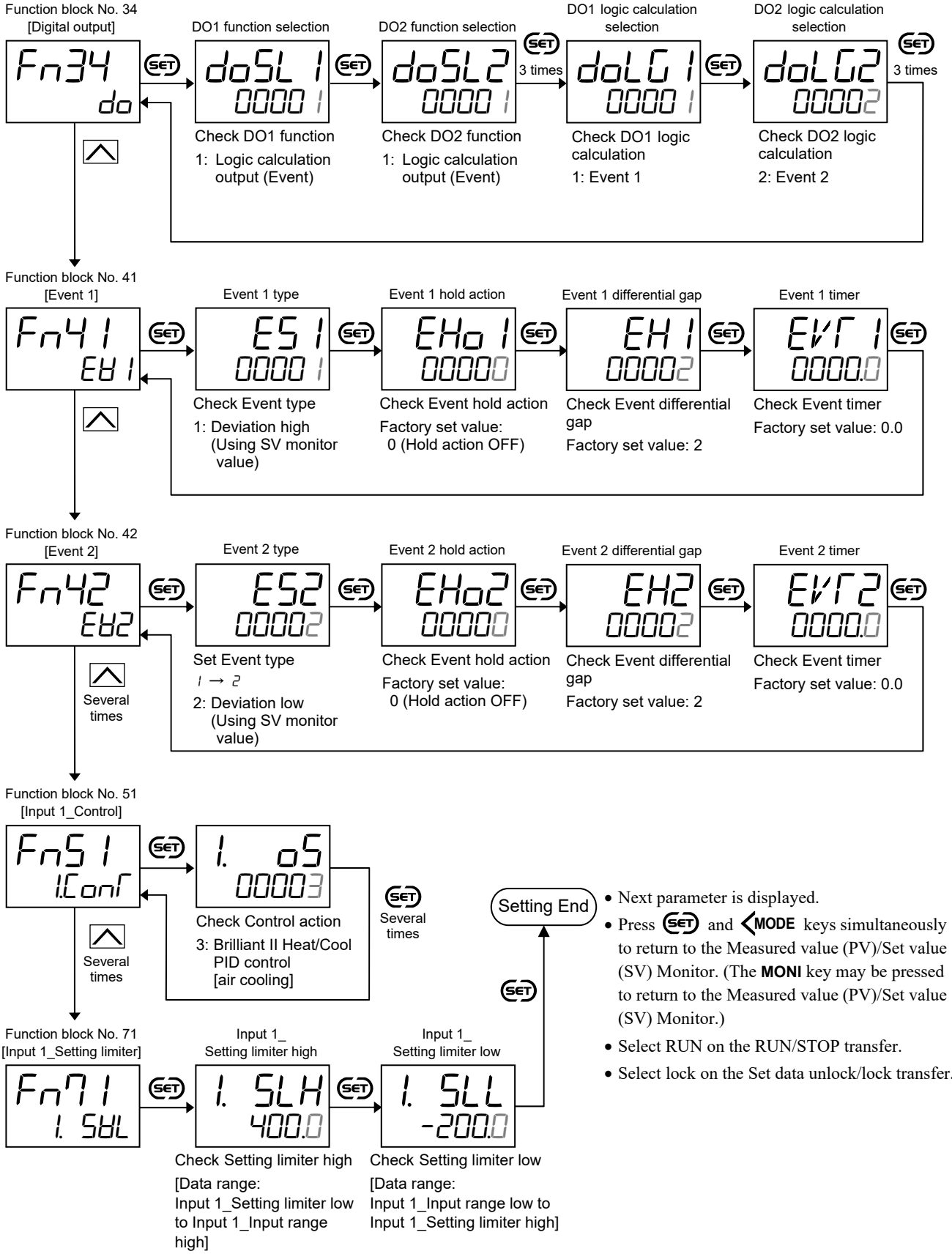



- Next parameter is displayed.
- Press SET and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (The **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor.)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

# 5.4 Setting the Control Set Value [Set value (SV)]

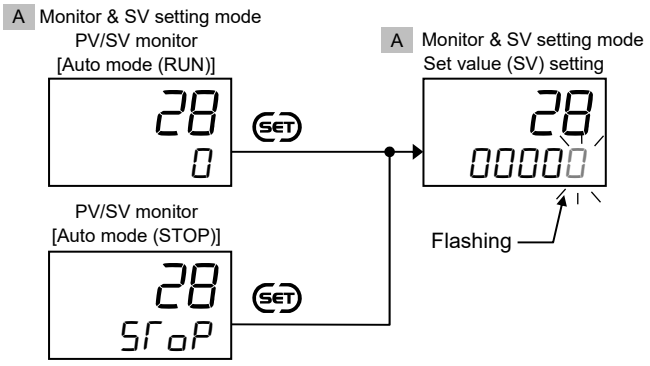
After finishing the initial settings, set the control target value, SV.

[Setting example: Set Input 1_Set value (SV) to 200 °C]

## 1. Switch the display to the Set value (SV) setting mode

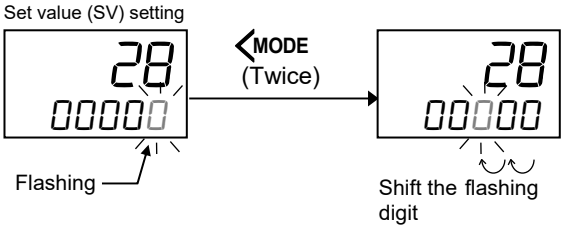
Press the SET key (or ∧ ∨ key)* to switch the display to the SV setting screen from the PV/SV monitor of Input 1.

* Valid only when "Direct registration" is set in "Data registration" in Fn11 in the Engineering mode.
When the instrument is set to "Direct registration" method and no key is operated for 2 seconds on the Set value (SV) setting screen, the screen will return to the PV/SV monitor.




## 2. Shift the flashing digit to the hundreds digit

Press MODE key to shift the flashing digit to the hundreds digit.
The flashing digit indicates which digit can be set.

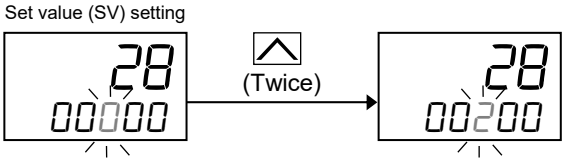



## 3. Change the numerical value from "0" to "2"

Press the ∧ key twice to change the numerical value from "0" to "2."

**Setting range:**
Input 1_Setting limiter low to
Input 1_Setting limiter high
Varies with the setting of the Decimal point position.

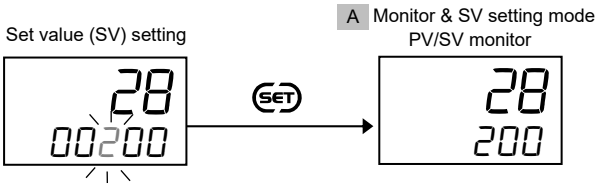
**Factory set value:** 0




## 4. Store the set value (SV)

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

The parameter displayed after the set value (SV) varies depends on the product specifications.




**Set value change and registration**

- The flashing digit indicates which digit can be set. Every time the MODE key is pressed, the flashing digit moves.
- To store a new value for the parameter, always press the SET key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating the ∧ and ∨ keys.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to A Monitor & SV setting mode. The modified data will not be registered in this case.

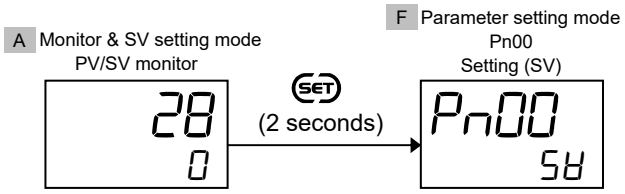
## 5.5 Setting the Event Set Value

After finishing the initial settings, set the event set values if they are used.

[Setting example: Set the Event 1 set value (EV1) to 20 °C]

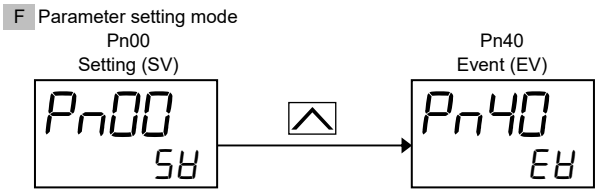
### 1. Switch the mode to the Parameter setting mode

Press and hold the SET key for 2 seconds or more on the PV/SV monitor screen of Input 1 until the first screen (Parameter group No. 00 [Pn00]) in the Parameter setting mode is displayed.



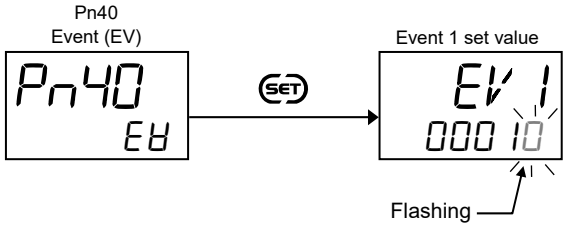

### 2. Switch the display to Parameter group No. 40

Press the ∧ key to switch the display to the Parameter group No. 40 [Pn40] screen from the Parameter group No. 00 [Pn00] screen.



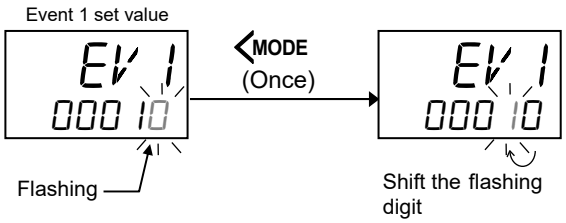

### 3. Switch the screen to Event 1 set value (EV1)

Press the SET key to switch the display to the Event 1 set value (EV1) screen from the Parameter group No. 40 [Pn40] screen.



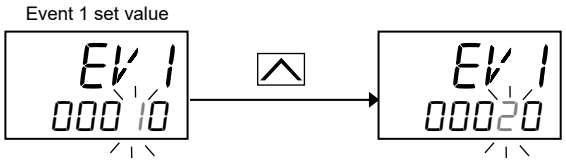

### 4. Shift the flashing digit to the tens digit

Press MODE key to shift the flashing digit to the tens digit. The flashing digit indicates which digit can be set.




### 5. Change the numerical value from "1" to "2"

Press the ∧ key to change the numerical value from "1" to "2."




**Setting range:**

**Deviation (When assigned to Input 1 or Differential temperature input):**

−(Input 1_Input span) to +(Input 1_Input span)

Varies with the setting of the Decimal point position.

**Factory set value:**

10 (at TC/RTD inputs)

☞ For more details of the setting range and the factory set values other than the above, refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

Continued on the next page.

## 6. Store the Event 1 set value

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


The parameter displayed after the Event 1 set value (EV1) varies depends on the product specifications.

### Set value change and registration

- The flashing digit indicates which digit can be set. Every time the MODE key is pressed, the flashing digit moves.
- To store a new value for the parameter, always press the SET key. The display changes to the next parameter and the new value will be stored. The modified data will not be stored only by operating the ∧ and ∨ keys.
- In case no operation is performed within 60 seconds after the change of the setting, the mode will return to A Monitor & SV setting mode. The modified data will not be registered in this case.

# 5.6 Tuning the PID Parameters (Execution of AT)

Suitable PID values are automatically calculated by Autotuning (AT) function.
The Autotuning (AT) function automatically measures, computes and sets the optimum PID values.

📖 Before starting the Autotuning, make sure that all required conditions to start the AT are satisfied.

## ● Requirements for Autotuning (AT) start

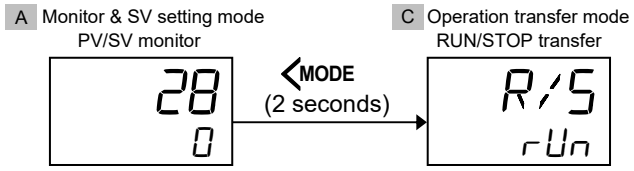
To start Autotuning (AT), go to C Operation transfer mode.

| | | |
|---|---|---|
| Operation state | RUN/STOP transfer | RUN |
| | Auto/Manual transfer | Auto mode |
| | Remote /Local transfer | Local mode |
| | Autotuning (AT) setting | PID control (State before starting AT) |
| Parameter setting | PID control of Input 1 | Input 1_Output limiter high [heat-side] > 0 %<br>Input 1_Output limiter low [heat-side] < 100 % |
| | PID control of Input 2 | Input 2_Output limiter high > 0 %<br>Input 2_Output limiter low < 100 % |
| | Heat/Cool PID control | Input 1_Output limiter high [heat-side] > 0 %<br>Input 1_Output limiter low [heat-side] < 100 %<br>Input 1_Output limiter high [cool-side] > 0 %<br>Input 1_Output limiter low [cool-side] < 100 % |
| Input value state | The Measured value (PV) is not inside the Input error range.<br>[Input error range: Input error determination point (high) ≥ Measured value (PV),<br>Input error determination point (low) ≤ Measured value (PV)] | |

☞ For the details of the "Caution for using the Autotuning (AT)" and "Requirements for Autotuning (AT) cancellation," refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]**.

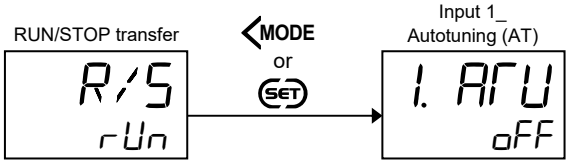
### *1.* Switch the mode to the Operation transfer mode

Press and hold the MODE key for 2 seconds or more on the PV/SV monitor screen of Input 1 until the Operation transfer mode is displayed.
The first screen in the Operation transfer mode is RUN/STOP transfer screen.




### *2.* Switch the display to the Autotuning (AT)

Press the MODE or the SET key on the RUN/STOP transfer screen to select the Input 1_Autotuning (AT) screen.

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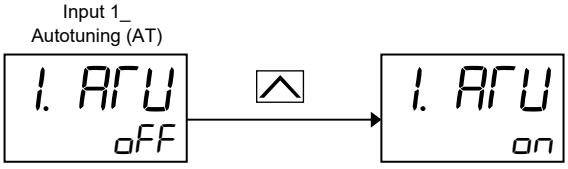
### 3. Start the Autotuning (AT)

Press the [△] key to switch from "oFF" to "on" to start the Autotuning (AT).

The AT1 (AT1) lamp starts flashing.

**Setting range:** oFF: PID control
on: Start Autotuning (AT)

**Factory set value:** oFF




To return to the PV/SV monitor screen during the AT, press and hold the MODE key for 2 seconds or more, or press the MODE key while pressing and holding the SET key.

### 4. Finish the Autotuning (AT)

When the Autotuning (AT) is finished, the control will automatically return to "oFF: PID control" and AT1 (AT1) lamp turns off.

The Autotuning (AT) can be started by Digital input (DI). Refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/Functions]** for more information on assigning Digital input (DI).

The Autotuning (AT) can be started by a key operation of the direct key (FUNC key). For "FUNC key assignment," refer to the separate **GZ400/GZ900 Instruction Manual [Parts 2: Parameters/ Functions]**.

## *MEMO*

# 6 TROUBLE SHOOTING

This chapter describes error displays and countermeasures for errors.

# 6.1 Error Displays

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

## ■ Input error displays

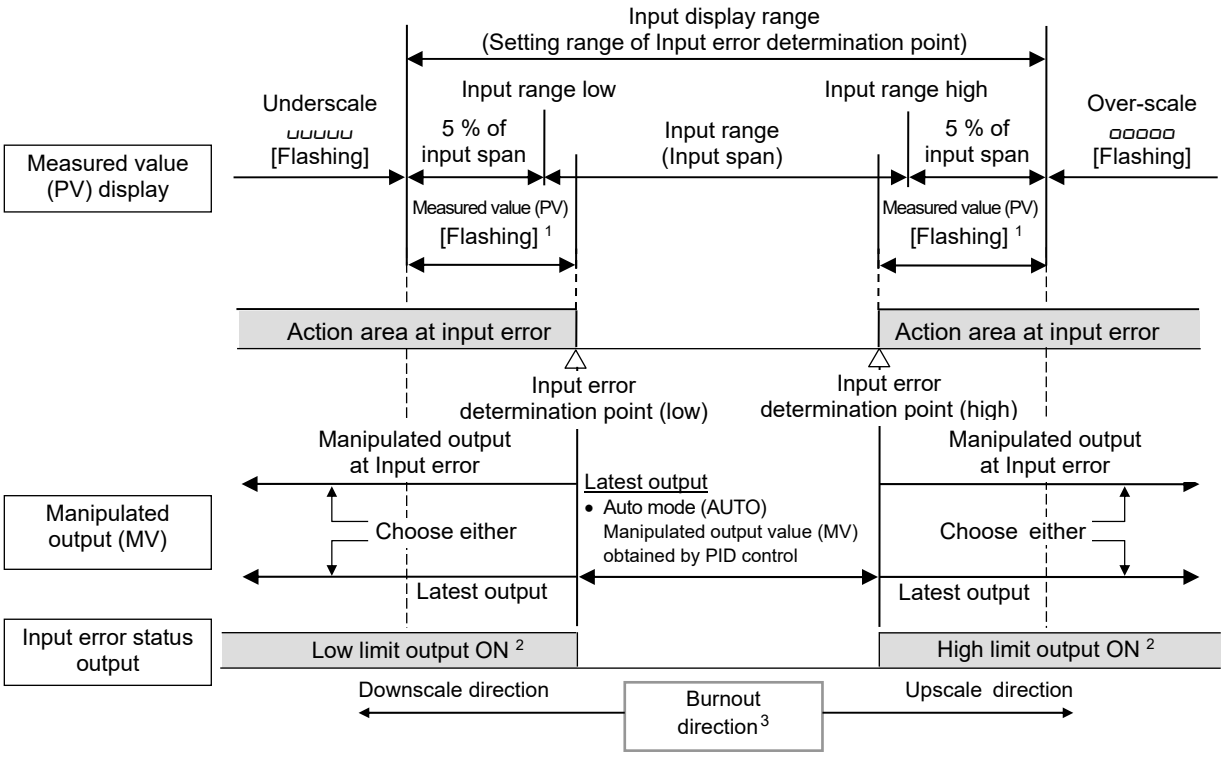
The table below shows displays, description, actions and solutions when the measured value (PV) exceeds the display range.

**NOTE**

**Before replacing the sensor, always turn OFF the power of the GZ400/900 or switch the mode to STOP with RUN/STOP transfer.**

| Display | Description | Action (Output) | Solution |
|---|---|---|---|
| Measured value (PV) [Flashing] | Measured value (PV) exceeded the input error determination point or the input range. Display does not flash when "Non-flashing display" is set. | • Action at input error: Output depending on the action at Input error (high/low limit)<br>• Event output: Output depending on the event action at input error | Check input type, input range, sensor connection and sensor break. |
| ▫▫▫▫▫ [Flashing] | Over-scale<br>Measured value (PV) exceeded the high limit of display range. | | |
| ␣␣␣␣␣ [Flashing] | Underscale<br>Measured value (PV) exceeded the low limit of display range. | | |

### ● Input error determination point is set within the input range

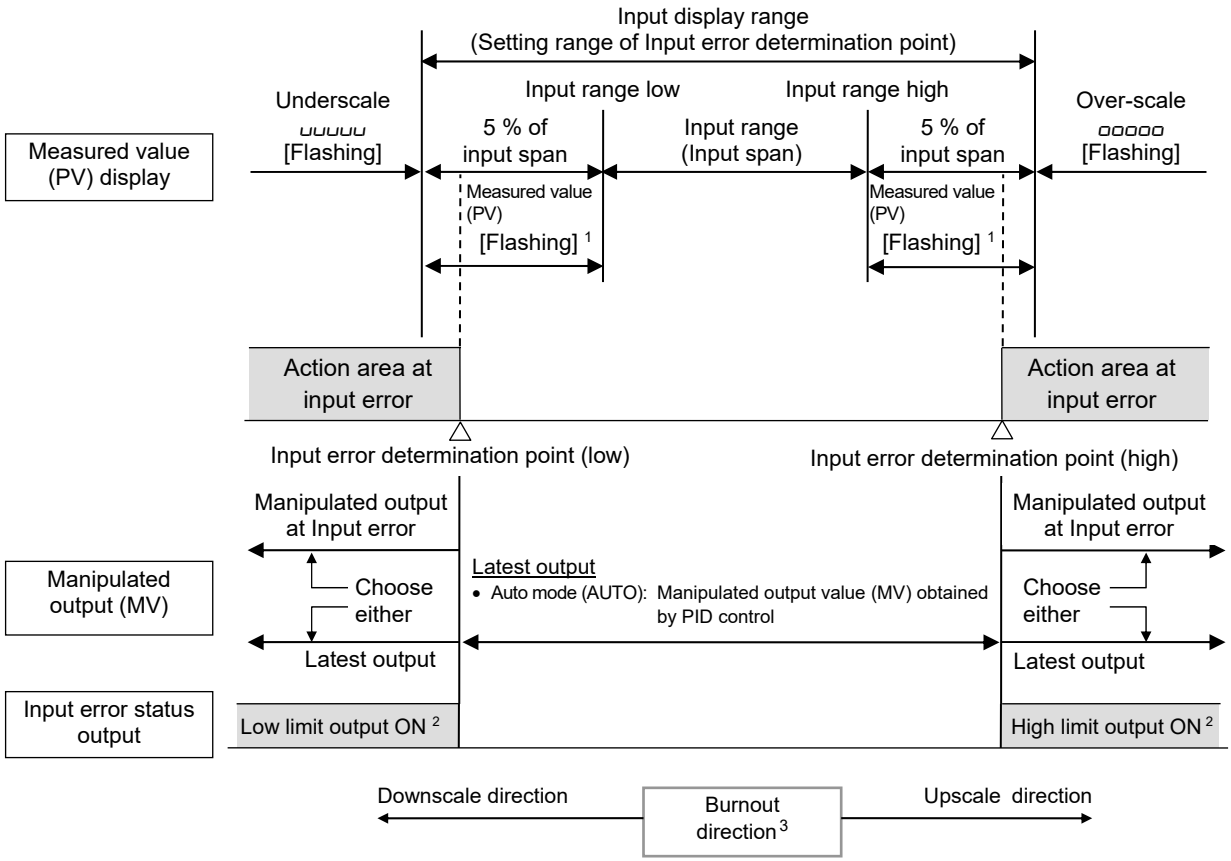



[1] Flashing can be suppressed by setting "PV flashing display at input error" (Function block No. 10 in the Engineering mode).

[2] For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (Separate manual [Part 2: Parameters/Functions].**

[3] Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.
RTD input: Upscale
High voltage/Current inputs: Downscale (Indicates value near 0)

## ● Input error determination point is set outside the input range



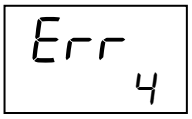

[1] Flashing can be suppressed by setting “PV flashing display at input error” (Function block No. 10 in the Engineering mode).

[2] For Input error status output, refer to ● **Details of OUT1 to 3 as well as DO1 to 4 logic calculation selection (Separate manual [Part 2: Parameters/Functions].**

[3] Setting Burnout direction is valid for thermocouple input and low voltage input (0 to 10 mV DC, 0 to 100 mV DC). Actions of other input types are fixed as follows.
RTD input: Upscale
High voltage/Current inputs: Downscale (Indicates value near 0)

## ■ Self-diagnostic error

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

| Error code | Description | Action | Solution |
|---|---|---|---|
| 1 | Adjustment data error<br>• Adjusted data range is abnormal. | Display:<br>Error code display<br>Output:<br>All the outputs are OFF<br>Communication:<br>Relevant error code to be sent<br><br>< Example of error display><br>  <br> | Turn off the power once.<br>If the GZ400/900 is restored to normal after the power is turned on again, then probable cause may be external noise source affecting the control system. Check for the external noise source.<br>If an error is repeated after the power is turned on again, the GZ400/900 may need to be repaired or replaced. Please contact RKC sales office or the agent. |
| 2 | Data back-up error<br>• Back-up action is abnormal.<br>• Data write failure | | |
| 4 | A/D conversion error<br>• Error in A/D conversion circuit is detected.<br>Temperature compensation error<br>• Out of the temperature measurement range | | |

If any of the following errors occur, all actions of the GZ400/900 are stopped.
In this case the error code is not displayed.

| Error code | Description | Action | Solution |
|---|---|---|---|
| No error display | Watchdog timer error<br>• Part of the internal program stops running. | Display:<br>All displays are OFF<br>Output:<br>All outputs are OFF<br>Communication:<br>Stopped | Turn off the power once.<br>If an error is repeated after the power is turned on again, the GZ400/900 may need to be repaired or replaced. Please contact RKC sales office or the agent. |
| | Power supply voltage is abnormal (power supply voltage monitoring)<br>• Decrease of power supply voltage | Display:<br>All displays are OFF<br>Output:<br>All outputs are OFF<br>Communication:<br>Stopped | |
| | Display units error | Display:<br>All displays are OFF<br>Output:<br>All outputs are OFF<br>Communication:<br>Sends error code 64 | |

## 6.2 Solutions for Problems

This section explains possible causes and solutions of the errors. For any inquiries or to confirm the specifications of the product, please contact RKC sales office or the agent.

If the instrument needs to replaced, always strictly observe the warnings below.

### ⚠ WARNING

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

### ⚠ CAUTION

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

## ■ Display related errors

| Problem | Possible cause | Solution |
|---|---|---|
| No display appears | The internal assembly is not inserted into the case correctly. | Insert the internal assembly into the case correctly. |
| | Power supply terminal connection is not correct. | Connect power supply correctly by referring to **3.3 Wiring of Each Terminal (P. 3-8)**. |
| | Power supply terminal contact failure. | Retighten the terminal screws. |
| | Supply voltage is not correct. | Apply proper power supply voltage by referring to ■ **General specifications (P. 7-19)**. |
| Display is unstable | Noise source is present near the instrument. | Separate the noise source from the instrument. |
| | | Set the appropriate value at Digital filter according to the input response. |
| | The terminal block of the instrument (with thermocouple input) is directly exposed to the air flow from an air conditioner. | Do not directly expose the terminal block to the air from the air conditioner. |
| Measured value (PV) display differs from the actual value | Wrong sensor is used. | Check the instrument specification and use a proper sensor. |
| | Input type setting is wrong. | Make proper setting by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| | Connection between the sensor (thermocouple) and the instrument is made with a cable other than compensating wire. | Be sure to use a compensating wire. |
| | For RTD input, leadwire resistance in three wires between the sensor and the instrument is different from one another. | Use a leadwire with the same resistance among three leadwires. |
| | PV bias is set. | Set PV bias to "0" by referring to the separate manual **[Part 2: Parameters/Functions]**. However, this is limited only to when the PV bias setting can be changed. |
| | PV ratio is set. | Change the PV ratio setting by referring to the separate manual **[Part 2: Parameters/ Functions]**. However, this is limited only to when the PV ratio setting can be changed. |

How to check the input

- When the input is configured as Thermocouple input:

Short the input terminals*, and if a temperature around the ambient temperature of the input terminals is displayed, the controller is working properly.

* Measured input 1 terminals 11-12, Measured input 2 terminals 23-24 (optional)

- When the input is configured as RTD input:

Insert a 100 Ω resistor across Input terminals A-B.[1] Short terminals between B-B.[2]
If temperature around 0 °C is displayed, the instrument is working fine.

[1] Measured input 1 terminals 10-11, Measured input 2 terminals 22-23 (optional)
[2] Measured input 1 terminals 11-12, Measured input 2 terminals 23-24 (optional)

- When the input is configured as Voltage/Current input:

Input* a certain voltage or current from a voltage/current generator to the controller. If the controller shows the equivalent input value, the input setting and function of the controller is working correctly.

* Measured input 1 terminals 11-12, Measured input 2 terminals 23-24 (optional)

## ■ Control related errors

| Problem | Possible cause | Solution |
|---|---|---|
| Control is abnormal | Supply voltage is not correct. | Apply proper power supply voltage by referring to ■ **General specifications (P. 7-19)**. |
| | Power supply frequency is not properly set. | Set the Power supply frequency of the power supply that is actually supplied to this instrument by referring to **5.3.1 Setting Power Supply Frequency (P.5-5)**. |
| | Disconnection of sensor or sensor wire. | Turn off the power or STOP the operation by "RUN/STOP transfer" and repair the sensor or replace it. |
| | The sensor is not wired correctly. | Conduct correct wiring of sensor by referring to **3.3 Wiring of Each Terminal (P. 3-8)**. |
| | Wrong sensor is used. | Check the instrument specification and use a proper sensor. |
| | Input type setting is wrong. | Make proper setting by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| | Sensor insertion depth is insufficient. | Check the sensor insertion. If insertion is loose, firmly insert the sensor. |
| | Sensor insertion position is wrong. | Insert the sensor at the specified location. |
| | Input signal wires are not separated from instrument power and/or load wires. | Separate input signal wires from instrument power and load wires |
| | Noise source is present near the instrument. | Separate the noise source from the instrument. |
| | Inappropriate PID constants. | Set appropriate PID constants. |
| Startup tuning (ST) cannot be activated | Startup tuning (ST) mode is "oFF (ST unused)." (Factory set value: oFF) | Refer to the separate manual **[Part 2: Parameters/Functions]**. |
| | Requirements for performing the Startup tuning (ST) are not satisfied. | Satisfy the requirements for performing the Startup tuning (ST) by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| Autotuning (AT) cannot be activated | Requirements for performing the Autotuning (AT) are not satisfied. | Satisfy the requirements for performing the Autotuning (AT) by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| | Control is fixed to PID control at Fix parameter setting. | Set the Autotuning (AT) to adjustable at Fix parameter setting by referring to the separate volume of this manual **[Part 2: Parameters/Functions]**. |
| Autotuning (AT) aborted | Requirements for aborting the Autotuning (AT) are established. | Identify causes for Autotuning (AT) abort by referring to the separate manual **[Part 2: Parameters/Functions]** and then remove them. Then, execute Autotuning (AT) again. |
| Optimum PID values cannot be obtained by Autotuning (AT) | Autotuning (AT) does not match the characteristics of the controlled object. | Set PID constants manually by referring to the separate manual **[Part 2: Parameters/ Functions]**. |

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| Problem | Possible cause | Solution |
|---|---|---|
| Autotuning (AT) cannot be finished normally | Temperature change of the process is too slow (1 °C or less per minute for temperature rise and fall). | Set PID constants manually by referring to the separate manual **[Part 2: Parameters/ Functions]**. |
| | Autotuning (AT) was executed around the ambient temperature or close to the maximum temperature achieved by the load. | |
| Measured value (PV) overshoots or undershoots | Proportional band is narrow.<br>Proportional (P) constant is small. | Increase Proportional (P) value within the acceptable limit of response delay. |
| | Integral time is short.<br>Integral (I) constant is small. | Increase Integral (I) value within the acceptable limit of response delay. |
| | Derivative time is short.<br>Derivative (D) constant is small. | Increase Derivative (D) value within the acceptable limit of process stability. |
| | The instrument is configured for ON/OFF control. | Change the control mode to Proportional control or PID control. |
| No stepwise output change | Output change rate limiter is set. | Set the Output change rate limiter to “0.0: OFF” by referring to the separate manual **[Part 2: Parameters/Functions]**.<br>However, this is limited only to when the Output change rate limiter setting can be changed. |
| Output does not rise over (or goes below) a certain value | Output limiter is set. | Change the Output limiter setting by referring to the separate manual **[Part 2: Parameters/ Functions]**. However, this is limited only to when the Output limiter setting can be changed. |

## ■ Operation related errors

| Problem | Possible cause | Solution |
|---|---|---|
| No setting change can be made by key operation | Set data is locked. | Release the Set data lock by referring to the separate manual **[Part 2: Parameters/ Functions]**. |
| A set value (SV) above (or below) a certain limit cannot be set | Setting limiter is set. | Change the Setting limiter setting by referring to the separate manual **[Part 2: Parameters/ Functions]**. However, this is limited only to when the Setting limiter setting can be changed. |
| Set value (SV) does not change immediately when the Set value (SV) is changed | Setting change rate limiter is set. | Set the Setting change rate limiter to "0: No function" by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| Remote setting input value display differs from the actual value | RS bias is set. | Set the RS bias to "0" by referring to the separate manual **[Part 2: Parameters/Functions]**. However, this is limited only to when the RS bias setting can be changed. |
| | RS ratio is set. | Change the RS ratio setting by referring to the separate manual **[Part 2: Parameters/ Functions]**. However, this is limited only to when the RS ratio setting can be changed. |
| For Voltage/Current input types, the displayed value for the input voltage or the input current is inverted. | Invert setting is done. | Set the Inverting input to "0: Unused" by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| Unable to select the 2-loop control (except Remote setting input) such as 2-loop control, Differential temperature control, Control with PV select, or Input circuit error alarm). | "Remote setting input" is selected at Option 3 type at the time of order. | Check the specification code of Option 3 type. When "Measured input 2" is not specified, switching to 2-loop control (2-loop control, Differential temperature control, Control with PV select, or Input circuit error alarm) is not possible. |
| Unable to switch to the RUN mode from the STOP mode. | The terminal to which the RUN/STOP transfer of the Digital input (DI) function is assigned may be open. * | Close the applicable terminal. Alternatively, deactivate the digital input (DI) function, referring to the separate manual **[Part 2: Parameters/Functions]**. |
| Unable to switch to the Auto mode from the Manual mode. | The terminal to which the Auto/Manual transfer of the Digital input (DI) function is assigned may be open. * | |
| Unable to switch to the Manual mode from the Auto mode. | Control is fixed to Auto mode at Fix parameter setting. | Set the Auto/Manual transfer to adjustable at Fix parameter setting by referring to the separate volume of this manual **[Part 2: Parameters/Functions]**. |

* When "Digital input (DI)" is specified at the time of ordering, functions like "RUN/STOP transfer" or "Auto/Manual transfer" will be automatically assigned to the Digital input (DI) terminal. To check the assignment of the Digital input (DI) configured at the time of ordering, see **P. 1-5**.

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| Problem | Possible cause | Solution |
|---|---|---|
| Unable to switch to the Remote mode from the Local mode. | Control is fixed to Local mode at Fix parameter setting. | Set the Remote/Local transfer to adjustable at Fix parameter setting, referring to the separate volume of this manual **[Part 2: Parameters/Functions]**. |
| Unable to switch the Control response parameter from Slow to Medium or Fast. | The control response parameter is fixed to Slow at Fix parameter setting. | Set the Control response parameter to adjustable at Fix parameter setting, referring to the separate volume of this manual **[Part 2: Parameters/Functions]**. |
| Unable to switch the starting action from Hot start 2 to the other action (Hot start1, STOP start or Cold start) | Control is fixed to Hot start 2 at Fix parameter setting. | Set the Hot/Cold start to adjustable at Fix parameter setting, referring to the separate volume of this manual **[Part 2: Parameters/Functions]**. |

## ■ Event related errors

| Problem | Possible cause | Solution |
|---|---|---|
| Event function is abnormal | Event function is different from the specification. | Change the Event action type by referring to the separate manual **[Part 2: Parameters/ Functions]** after the instrument specification is confirmed. |
| | Event output relay contact action Energized/De-energized is reversed. | Check the setting details by referring to the separate manual **[Part 2: Parameters/ Functions]**. |
| | Setting of Event differential gap is not appropriate. | Set the appropriate Event differential gap by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| No output of the Event function is turned on | Event is not assigned to the output. | Check the contents of Output assignment by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| Event hold action is not activated | Setting change rate limiter is set. | Set the Setting change rate limiter to "0: No function" by referring to the separate manual **[Part 2: Parameters/Functions]**. However, this is limited only to when the Setting limiter setting can be changed. |

## ■ Control loop break alarm (LBA) related errors

| Problem | Possible cause | Solution |
|---|---|---|
| Control loop break alarm (LBA) is not generated under the alarm condition | LBA time setting is not appropriate. | Set an appropriate value by referring to the separate manual **[Part 2: Parameters/ Functions]**. |
| | LBA deadband (LBD) setting is not appropriate. | |
| | Autotuning (AT) is in execution. | Wait for Autotuning (AT) to finish or abort Autotuning (AT). |
| | The instrument stays in control stop (STOP). | Switch the mode to RUN (control) by referring to the separate manual **[Part 2: Parameters/ Functions]**. Attempt this only when the mode is allowed to be transferred to RUN (control start). |
| | LBA is not assigned to the output. | Check the contents of Output assignment by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| | LBA does not match the characteristics of the process (controlled object). | Try another type of alarm. |
| Control loop break alarm (LBA) is generated under the no alarm condition | LBA time setting is not appropriate. | Refer to the separate manual **[Part 2: Parameters/Functions],** and set a suitable value. |
| | LBA deadband (LBD) setting is not appropriate. | |
| | LBA does not match the characteristics of the process (controlled object). | Try another type of alarm. |

## ■ Heater break alarm (HBA) related errors

| Problem | Possible cause | Solution |
|---|---|---|
| No heater break can be detected | Setting of Heater break alarm (HBA) is not appropriate. | Set the appropriate Heater break alarm value by referring to the separate manual **[Part 2: Parameters/Functions]**. |
| | CT is not connected. | Connect the CT by referring to **3.3 Wiring of Each Terminal (P. 3-8)**. |
| CT input value is abnormal | Proper CT is not used. | Change the CT type by referring to the separate manual **[Part 2: Parameters/Functions]** after the instrument specification is confirmed. |
| | The heater is broken. | Check the heater. |
| | CT wiring improperly. | Conduct CT wiring correctly by referring to **3.3 Wiring of Each Terminal (P. 3-8)**. |
| | Input terminal contact defect. | Retighten the terminal screws. |
| No output of the Heater break alarm (HBA) is turned on | HBA is not assigned to the output. | Check the contents of Output assignment by referring to the separate manual **[Part 2: Parameters/Functions]**. |

## ■ Communication related errors

### ● RKC communication

| Problem | Possible cause | Solution |
|---|---|---|
| No response | Wrong connection, no connection or disconnection of the communication cable | Check connection and connect cable properly. |
| | Disconnection, contact failure, or wrong connection of communication cable | Check wiring and connector.<br>Repair or replace, if necessary. |
| | Communication setting (communication speed, data bit configuration) is different from a host computer | Check setting and make a proper setting. |
| | Address setting is wrong | |
| | Data format is wrong | Review communication program |
| | Transmission line is not set to the receive state after data send (for RS-485) | |
| | Communication protocol setting is wrong | Refer to the separate manual **[Host communication],** and set Communication protocol to "0: RKC communication." |
| EOT return | Invalid communication identifiers | Check if communication identifiers are correct and if there are any unsupported identifiers. |
| | Data format is wrong | Review communication program |
| NAK return | Communication error occurred (parity error, framing error, etc.) | Identify the error and take necessary actions (e.g. check of transmitted data, retransmission) |
| | BCC error occurred | |
| | Data is out of the setting range | Check the setting range and correct the data. |
| | Invalid communication identifiers | Check if communication identifiers are correct and if there are any unsupported identifiers. |

### ● Modbus

| Problem | Possible cause | Solution |
|---|---|---|
| No response | Wrong connection, no connection or disconnection of the communication cable | Check connection and connect cable properly. |
| | Disconnection, contact failure, or wrong connection of communication cable | Check wiring and connector.<br>Repair or replace, if necessary. |
| | Communication setting (communication speed, data bit configuration) is different from a host computer | Check setting and make a proper setting. |
| | Address setting is wrong | |
| | Transmission error detected. (Overrun error, framing error, parity error, or CRC-16 error) | Retransmit after time-out or<br>Review program on master side |
| | Time interval between the data that composes a message is more than 24-bit time. | |

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| Problem | Possible cause | Solution |
|---|---|---|
| No response | Communication protocol setting is wrong | Set Communication protocol to "1" or "2" by referring to the separate manual **[Host communication]**.<br>1: Modbus<br>(Order of data transfer: upper word to lower word)<br>2: Modbus<br>(Order of data transfer: lower word to upper word) |
| Error code: 1 | Function cod error<br>(Specifying nonexistent function code) | Confirm the function code |
| Error code: 2 | When the mismatched address is specified | Confirm the address of holding register |
| Error code: 3 | When the specified number of data items in the query message exceeds the maximum number of data items available | Confirm the setting data |
| Error code: 4 | Self-diagnostic error | Turn off the power to the instrument.<br>If the same error occurs when the power is turned back on, please contact RKC sales office or the agent. |

## ● PLC communication (MAPMAN)

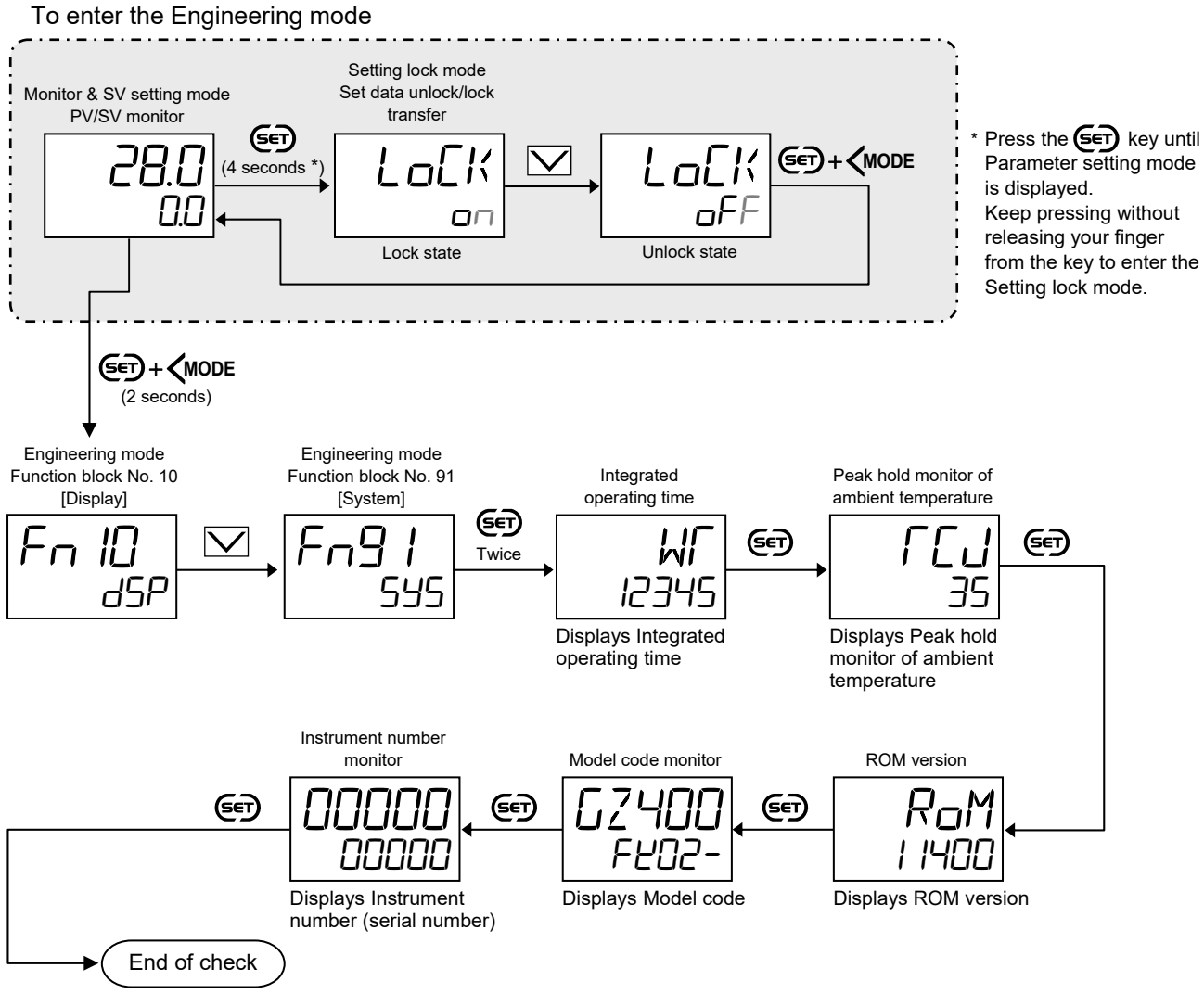
| Problem | Possible cause | Solution |
|---|---|---|
| • Even if "1" is set to the sitting request bit or monitor request bit in request command, transfer is not finished. Request command does not return to "0"<br>• It looks like communication is done properly, but the monitor values are not sent to the PLC.<br>• No response | Wrong connection, no connection or disconnection of the communication cable | Confirm the connection method or condition and connect correctly |
| | Breakage, wrong wiring, or imperfect contact of the communication cable | Confirm the wiring or connector and repair or replace the wrong one |
| | Mismatch of the setting data of communication speed, data bit configuration and protocol with those of the PLC | Confirm the communication settings of the controller and set them correctly |
| | Wrong setting of PLC communication data | Confirm the PLC communication settings and set them correctly |
| | | Setting of termination resistor in accordance with PLC or the insertion is done |
| | Setting of PLC becomes write inhibit | Setting of PLC is turned into write enable (Write enable in RUN, shift to monitor mode, etc.) |
| | Access outside the range of memory address of PLC (wrong setting of address) | Confirm the PLC communication environment setting and set them correctly |
| If two or more controllers are connected, no units after the second unit are recognized | Instrument link recognition time is short | Set the Instrument link recognition time * longer.<br>* Set the Instrument link recognition time only for a master controller (address 0). |
| When the setting request command of request command is set in "1," setting error is become | Data rang error | Confirm the setting range of the set value and set them correctly |

# 6.3 Verifying Instrument Information

When error occurs and when you contact us, you are requested to provide us with the information on the instrument model code and specification. You can check the ROM version, model code and serial number of the instrument on the instrument display. The Integrated operating time and the maximum ambient temperature (Peak hold monitor of the ambient temperature).

## ■ How to display the information

ROM version, Model code monitor and Serial number monitor can be set at Fn91 in the Engineering mode.

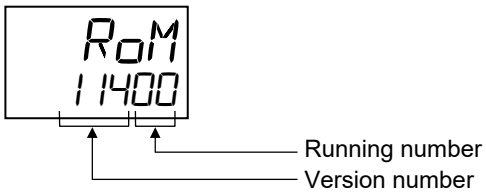



- Next parameter is displayed.
- Press (SET) and MODE keys simultaneously to return to the Measured value (PV)/Set value (SV) Monitor. (The **MONI** key may be pressed to return to the Measured value (PV)/Set value (SV) Monitor.)
- Select RUN on the RUN/STOP transfer.
- Select lock on the Set data unlock/lock transfer.

## ■ How to check

### ● ROM Version

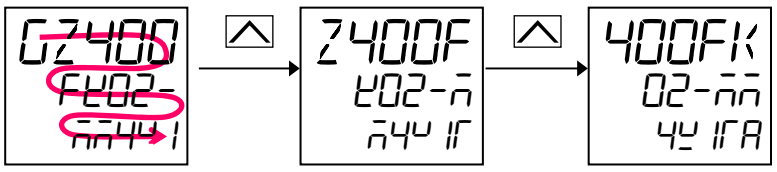
[Example]




### ● Model code monitor

Displays the model code of the instrument. As the Model code is too long to be displayed on a single screen, it can be scrolled left and right with ⋀ and ⋁ keys.

Example: Model code is GZ400FK02-MM4∗1TA2NN/1



| GZ400<br>FK02-<br>MM4∗1 | Z400F<br>K02-M<br>M4∗1T | 400FK<br>02-MM<br>4∗1TA |
|---|---|---|
| The model code scrolls from the PV display to the SV display continuously over two displays screens. | The Up key was pressed once.<br>The model code was scrolled one digit left. | The Up key was pressed once more.<br>The displayed characters were scrolled one more digit to the left. |

### ● Instrument number monitor

Displays the serial number of the instrument.

📖 To read the displayed characters, see "**Character Symbols**" **(P. i-3)**.

📖 Alternatively, you can check the model code (MODEL), serial number (S/N) and suffix code (CODE) on the label on the side of the instrument if you are unable to check the information on the display.

### ● Integrated operating time

As soon as the instrument is powered, "1" is added. Thereafter, "1" is accumulated for each hour.

### ● Peak hold monitor of ambient temperature

Temperature around the rear terminal is measured and the maximum value is stored.

📖 The Integrated operating time and the Peak hold monitor of the ambient temperature (maximum ambient temperature) cannot be reset.

# *MEMO*

# 7

# SPECIFICATIONS

This chapter describes Specifications.

## ■ Measured input

**Number of input:** 1 point + 1 point (optional) (Isolated between each input)

**Input type:** Thermocouple (TC) input:
K, J, T, S, R, E, B, N (JIS-C1602-1995)
PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002])
U, L (DIN43710-1985)
PR40-20 (ASTM-E1751-00)
RTD input: Pt100 (JIS-C1604-1997)
JPt100 (JIS-C1604-1997, Pt100 of JIS-C1604-1981)
3-wire system
Low voltage input: 0 to 10 mV DC, 0 to 100 mV DC
High voltage input: 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, −5 to +5 V DC, −10 to +10 V DC
Current input: 0 to 20 mA DC, 4 to 20 mA DC

**Input range:**

**Thermocouple (TC) input**

| Input type | Measured range |
|---|---|
| K | −200.0 to +400.0 °C (−328.0 to +752.0 °F)<br>−200.0 to +1372.0 °C (−328.0 to +2502.0 °F) |
| J | −200.0 to +400.0 °C (−328.0 to +752.0 °F)<br>−200.0 to +1200.0 °C (−328.0 to +2192.0 °F) |
| T | −200.0 to +400.0 °C (−328.0 to +752.0 °F) |
| S | −50.0 to +1768.0 °C (−58.0 to +3214.0 °F) * |
| R | −50.0 to +1768.0 °C (−58.0 to +3214.0 °F) * |
| E | −200.0 to +1000.0 °C (−328.0 to +1832.0 °F) * |
| B | 0.0 to 1800.0 °C (0.0 to 3272.0 °F) * |
| N | 0.0 to 1300.0 °C (0.0 to 2372.0 °F) * |
| PLII | 0.0 to 1390.0 °C (0.0 to 2534.0 °F) * |
| W5Re/W26Re | 0 to 2300 °C (0 to 4200 °F) |
| U | −200.0 to +600.0 °C (−328.0 to +1112.0 °F) |
| L | 0.0 to 900.0 °C (0.0 to 1652.0 °F) |
| PR40-20 | 0 to 1800 °C (0 to 3200 °F) |

* The least significant digit (LSD) may flicker when the display resolution is set to 0.1°C (0.1°F).

**RTD input**

| Input type | Measured range |
|---|---|
| Pt100 | −200.0 to +850.0 °C (−328.0 to +1562.0 °F)<br>−100.00 to +850.00 °C (−148.00 to +999.99 °F)<br>0.00 to 50.00 °C (32.00 to 122.00 °F) |
| JPt100 | −200.0 to +640.0 °C (−328.0 to +1184.0 °F)<br>−100.00 to +640.00 °C (−148.00 to +999.99 °F)<br>0.00 to 50.00 °C (32.00 to 122.00 °F) |

**Voltage/Current input**

| Input type | Measured range |
|---|---|
| Low voltage | 0 to 10 mV DC, 0 to 100 mV DC |
| High voltage | 0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC,<br>−5 to +5 V DC, −10 to +10 V DC |
| Current | 0 to 20 mA DC, 4 to 20 mA DC |

**Sampling cycle:** 10 ms

**Influence of signal source resistance (TC input):**
Approx. 0.18 μV/Ω (Converted depending on TC types)

**Influence of input lead (RTD input):**
Approx. 0.006 %/Ω of span (100 Ω or less per wire)
If the resistance is 100 Ω or more, the measuring range may be limited.

**Input impedance (Voltage/Current input):**
Low voltage input: 1 MΩ or more
High voltage input: 1 MΩ or more
Current input: Approx. 50 Ω

**Measured current (RTD input):** Approx. 1 mA

**Action at input break:**
TC input: Upscale or Downscale (selectable)
RTD input: Upscale
Low voltage input: Upscale or Downscale (selectable)
High voltage input: Downscale (Indicates value near 0)
Current input: Downscale (Indicates value near 0)

**Action at input short circuit (RTD input):**
Downscale (Measured range: except 0.00 to 50.00 °C [32.00 to 122.00 °F] range)
Upscale (Measured range: 0.00 to 50.00 °C [32.00 to 122.00 °F])

**Action at input error:**
- Input error determination point (high), Input error determination point (low)
  Input range low − (5 % of input span) to
  Input range high + (5 % of input span)
  When the input type is Pt100 or JPt100, the low limit value cannot be −5 %.
  Low limit of Pt100: –245.5 °C (–409.8 °F), corresponding to approximately 2 Ω
  Low limit of JPt100: –237.6 °C (–395.7 °F), corresponding to approximately 2 Ω
  It is also used as Input error determination of the Event action.
- Action (high) input error, Action (low) input error
  "Control continues" or "Manipulated output value at input error" (selectable)
- Manipulated output value at input error
  PID control: −5.0 to +105.0 %
  Heat/Cool PID control: −105.0 to +105.0 %
  Actual output value is limited by the Output limiter.
- PV flashing display at input error
  Flashing display or Non-flashing display (selectable)

**Measured input correction:**
PV bias: −Input span to +Input span
PV ratio: 0.500 to 1.500
PV digital filter (First order lag digital filter):
0.00 to 10.00 seconds (0.00: Filter OFF)

**Allowable input range:**
−1.0 to +3.0 V (TC input/RTD input/Low voltage input)
−12 to +12 V (High voltage input)
−20.0 to +30.0 mA (Current input)

**Square root extraction function (Voltage/Current input):**
Calculation method: Measured value = $\sqrt{\text{(Input value)}} \times$ PV ratio + PV bias
PV low input cut-off: 0.00 to 25.00 % of input span

## ■ Remote setting input

**Number of input:** 1 point (Isolated from PV)

**Input type:** Thermocouple (TC) input
(Select from the list below when Measured input 2 is selected):
K, J, T, S, R, E, B, N (JIS-C1602-1995)
PLII (NBS), W5Re/W26Re (ASTM-E988-96 [Reapproved 2002])
U, L (DIN43710-1985)
PR40-20 (ASTM-E1751-00)
RTD input (Select from the list below when Measured input 2 is selected):
Pt100 (JIS-C1604-1997)
JPt100 (JIS-C1604-1997, Pt100 of JIS-C1604-1981)
3-wire system
Low voltage input:
0 to 10 mV DC, 0 to 100 mV DC
High voltage input:
0 to 1 V DC, 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC, −5 to +5 V DC, −10 to +10 V DC
Current input:
0 to 20 mA DC, 4 to 20 mA DC

**Input range:** Programmable range

**Sampling cycle:** 10 ms

**Input impedance:**

| | |
|---|---|
| Low voltage input: | 1 MΩ or more |
| High voltage input: | 1 MΩ or more |
| Current input: | Approx. 50 Ω |

**Action at input break:**

| | |
|---|---|
| TC input: | Upscale or Downscale (selectable) |
| RTD input: | Upscale |
| Low voltage input: | Upscale or Downscale (selectable) |
| High voltage input: | Downscale (Indicates value near 0) |
| Current input: | Downscale (Indicates value near 0) |

**Remote input correction:**

| | |
|---|---|
| RS bias: | −Input span to +Input span |
| RS ratio: | 0.001 to 9.999 |

RS digital filter (First order lag digital filter):
0.00 to 10.00 seconds (0.00: Filter OFF)

**Allowable input range:** −1.0 to +3.0 V (TC input/RTD input/Low voltage input)
−12 to +12 V (High voltage input)
−20.0 to +30.0 mA (Current input)

## ■ Current transformer (CT) input

**Number of input:** 2 points

**CT type:** CTL-6-P-Z, CTL-6-P-N or CTL-12-S56-10L-N (Sold separately)

**Input range:** 0.0 to 0.1 Arms

**Measurable current range:**

| | |
|---|---|
| CTL-6-P-Z: | 0.0 to 10.0 A (high accurate type) |
| CTL-6-P-N: | 0.0 to 30.0 A |
| CTL-12-S56-10L-N: | 0.0 to 100.0 A |

**Sampling cycle:** 0.5 seconds

**Voltage of through current:** 300 V or less

## ■ Digital input (DI)

**Number of input:** Up to 6 points (DI1 to DI6)

**Input method:** Dry contact input
OFF (Open state): 50 kΩ or more
ON (Close state): 1 kΩ or less
Contact current: 3.3 mA DC or less
Voltage at open: Approx. 5 V DC

**Capture judgment time:** Within 50 ms

## ■ Output

**Assign output:** Number of output:
Output (OUT): 3 points (OUT1 to OUT3)
Event output (DO): 4 points (DO1 to DO4)
Output assignment: See Output assignment list

**Output assignment list**

| Output specification | OUT1, OUT2 | | | | | OUT3 | | DO |
|---|---|---|---|---|---|---|---|---|
| | (Note) | Voltage pulse (1) | Current | Continuous voltage | Transistor | Voltage pulse (2) | Current | Relay contact (3) |
| Control output (Heat-side) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Control output (Cool-side) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Logic calculation output (Event output) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Logic calculation output (Control loop break alarm (LBA) output) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Logic calculation output (Heater break alarm (HBA) output) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| RUN state output | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Output of the communication monitoring result | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Manual mode state output | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Remote mode state output | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| AT state output | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Output while Set value (SV) is changing | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| FAIL output | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Retransmission output | | | ✓ | ✓ | | | ✓ | |

(Note) OUT1: Relay contact (1), OUT2: Relay contact (2)

**Output type:**

- **Relay contact output (1) [OUT1]**
  Contact type: c contact
  Contact rating (Resistive load):
  250 V AC 3 A, 30 V DC 1 A
  Electrical life: 300,000 times or more (Rated load)
  Mechanical life: 50 million times or more (Switching: 180 times/min)
  Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• **Relay contact output (2) [OUT2]**

Contact type: a contact
Contact rating (Resistive load):
250 V AC 3 A, 30 V DC 1 A
Electrical life: 300,000 times or more (Rated load)
Mechanical life: 50 million times or more (Switching: 180 times/min)
Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• **Relay contact output (3) [DO1 to DO4]**

Contact type: a contact
Contact rating (Resistive load):
250 V AC 1 A, 30 V DC 0.5 A
Electrical life: 150,000 times or more (Rated load)
Mechanical life: 20 million times or more (Switching: 300 times/min)

• **Voltage pulse output (1) [OUT1 and OUT2]**

Output voltage: 0/12 V DC (Rated)
ON voltage: 10 to 13 V
OFF voltage: 0.5 V or less
Allowable load resistance: 500 Ω or more
Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• **Voltage pulse output (2) [OUT3]**

Output voltage: 0/14 V DC (Rated)
ON voltage: 12 to 17 V
OFF voltage: 0.5 V or less
Allowable load resistance: 600 Ω or more
Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

• **Current output [OUT1, OUT2 and OUT3]**

Output current: 4 to 20 mA DC, 0 to 20 mA DC
Output range: 3.2 to 20.8 mA DC, 0 to 21 mA DC
Allowable load resistance: 500 Ω or less

• **Continuous voltage output [OUT1 and OUT2]**

Output voltage: 0 to 5 V DC, 1 to 5 V DC, 0 to 10 V DC
Output range: 0 to 5.25 V DC, 0.8 to 5.2 V DC, 0 to 10.5 V DC
Allowable load resistance: 1 kΩ or more

• **Transistor output [OUT1 and OUT2]**

Allowable load current: 100 mA
Load voltage: 30 V DC or less
Voltage drop at ON: 2 V or less (at allowable load current)
Leakage current at OFF: 0. 1 mA or less
Proportional cycle time: 0.1 to 100.0 seconds (When configured for control output)

**Related function:**

• **Output logic selection**

Energized/De-energized is selectable.
FAIL output functions as “De-energized” even if it is set to “Energized.”

• **Universal output type selection (OUT3)**

Output type is selectable.

## ■ Performance

**Reference performance (Performance under the standard performance condition)**

**• Measured input (PV):** Accuracy:

| Input type | Input range | Accuracy |
|---|---|---|
| K, J, T, E, U, L (Accuracy is not guaranteed for less than −100 °C) | Less than −100 °C | ±1.0 °C (Approximate value) |
| | −100 °C or more, Less than +500 °C | ±0.5 °C |
| | 500 °C or more | ±(0.1 % of Reading) |
| N, S, R, PLII, W5Re/W26Re (Accuracy is not guaranteed for less than 400 °C for input type S, R and W5Re/W26Re) | Less than 0 °C | ±2.0 °C |
| | 0 °C or more, Less than 1000 °C | ±1.0 °C |
| | 1000 °C or more | ±0.1 % of Reading |
| B (Accuracy is not guaranteed for less than 400 °C) | Less than 400 °C | ±70 °C (Approximate value) |
| | 400 °C or more, Less than 1000 °C | ±1.4 °C |
| | 1000 °C or more | ±0.1 % of Reading |
| PR40-20 (Accuracy is not guaranteed for less than 400 °C) | Less than 400 °C | ±20 °C (Approximate value) |
| | 400 °C or more, Less than 1000 °C | ±10 °C |
| | 1000 °C or more | ±0.1 % of Reading |
| Pt100, JPt100 | Less than 200 °C | ±0.2 °C |
| | 200 °C or more | ±0.1 % of Reading |
| | 0.00 to 50.00 °C | ±0.10 °C |
| Voltage/Current input | | ±0.1 % of span |

Display accuracy:
Is equal to the above accuracy with the value below the minimum resolution rounded up.

Noise elimination ratio: Series mode: 60 dB or more (50/60 Hz)
Common mode: 120 dB or more (50/60 Hz)
Power supply frequency needs to be set.

Resolution:

| Input type | | Input Resolution |
|---|---|---|
| K, J, T, E, U, L, N, S, R, PLII, W5Re/W26Re | | 1/200000 |
| PR40-20, B | | 1/100000 |
| Pt100, JPt100 | −200 to +850 °C | 1/200000 |
| | −100.00 to +850.00 °C | |
| | 0.00 to 50.00 °C | 1/60000 |
| Low voltage input | 0 to 10 mV DC | 1/120000 |
| | 0 to 100 mV DC | 1/200000 |
| High voltage input | 0 to 1 V DC | 1/200000 |
| | 0 to 5 V DC | |
| | 1 to 5 V DC | |
| | 0 to 10 V DC | |
| | −5 to +5 V DC | |
| | −10 to +10 V DC | |
| Current input | 0 to 20 mA DC | 1/200000 |
| | 4 to 20 mA DC | |

Cold-junction temperature compensation error:
±0.5 °C
(range of the standard performance condition: 23 °C±2 °C)
±1.5 °C (Between −10 to +55 °C)

Close horizontal mounting error:
Close horizontal mounting: Within ±1.5 °C
Close vertical mounting: Within ±3.0 °C

**• Remote setting input:**
Accuracy:
Noise elimination ratio:
Resolution:
Cold-junction temperature compensation error:
} Same as "**• Measured input (PV)**" (See 7-7)

**• Current transformer (CT) input:**
Accuracy: 0.0 to 10.0 A (high accurate type): ±0.3 A
0.0 to 30.0 A, 0.0 to 100.0 A: ±(5 % of Reading) or ±2.0 A (whichever is larger)
Resolution: 100 counts/mA or more

**• Current output [OUT1 and OUT2]:**
Accuracy: ±0.1 % of span
Resolution: Approx. 1/10000

**• Current output [OUT3]:** Accuracy: ±0.1 % of span
Resolution: Approx. 1/25000

**• Voltage output:** Accuracy: ±0.1 % of span
Resolution: Approx. 1/10000

**Operating influence (Variation under the operating condition)**

**• Influence ambient temperature:**

| | | |
|---|---|---|
| Input: | TC input: | ±0.006 %/°C of span |
| | RTD input: | ±0.006 %/°C of span |
| | Voltage/Current input: | ±0.006 %/°C of span |
| Output: | Voltage/Current output: | ±0.015 %/°C of span |

**• Influence of physical orientation:**

| | | |
|---|---|---|
| Input: | TC input: | ±0.3 % of span or ±3 °C or less |
| | RTD input: | ±0.5 °C or less |
| | Voltage/Current input: | Less than ±0.1 % of span |
| Output: | Voltage/Current output: | Less than ±0.3 % of span |

## ■ Display

**Measured input display (PV1, PV2):** 5-digit 11-segment LCD [Green (standard) or White]

Display range: Input range low – (5 % of input span) to
Input range high + (5 % of input span)

When the input type is Pt100 or JPt100, the low limit value cannot be –5 %

Low limit of Pt100: –245.5 °C (–409.8 °F),
corresponding to approximately 2 Ω

Low limit of JPt100: –237.6 °C (–395.7 °F),
corresponding to approximately 2 Ω

The display starts flashing when the Input range or the Input error determination point has been exceeded
The display starts flashing "ooooo" when the input exceeds the display range.
The display starts flashing "uuuuu" when the input goes below the display range.

**Setting display, PV2 display (SV, PV2):**
5-digit 7-segment LCD (Orange)

**Output value, Time, CT value displays (MV, TIME, CT1, CT2):**
4-1/2 digit 7-segment LCD (White)

**Memory area display:** 1-1/2 digit 7-segment LCD (White)

**Output display (OUT1 to OUT3):** Action indicator LCD (White) × 3 points

**Manual display (MAN):** Action indicator LCD (White)

**Remote display (REM):** Action indicator LCD (White)

**Autotuning display (AT):**
Action indicator LCD (White)

**Alarm display (ALM):** Action indicator LCD (Red)

**Event output display (DO):** Action indicator LCD (White) × 4 points

**Set lock display:** Action indicator LCD (GZ400: Orange GZ900: White)

**Ramp state display:** Action indicator LCD (White) × 3 points

## ■ Operation keys

**Select items/Set parameters:** 4 keys (SET, MODE, ∨, ∧)

**Reverse set:** key (**R.SET**)

**Display/Setting mode selector:** key (**MONI**)

**Memory area transfer:** key (**AREA**)

**Direct access key:** key (**FUNC**)
A desired function can be assigned to the FUNC key.

## ■ Control

### ● Brilliant II PID control

**Overshoot suppression function:** Reset feedback (RFB) method

**Proportional band:**
- TC/RTD inputs:
  0 (0.0, 0.00) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
  0.0 to 1000.0 % of input span

0 (0.0, 0.00): ON/OFF action

**Integral time:** 0 to 3600 seconds, 0.0 to 3600.0 seconds, 0.00 to 360.00 seconds or 0.000 to 36.000 seconds
0 (0.0, 0.00, 0.000): PD action
Output is 50 % when the deviation is zero.

**Derivative time:** 0 to 3600 seconds, 0.0 to 3600.0 seconds, 0.00 to 360.00 seconds or 0.000 to 36.000 seconds
0 (0.0, 0.00, 0.000): PI action

**Control response parameter:** Slow, Medium and Fast (3-step selection)

**Proportional cycle time:** 0.1 to 100.0 seconds

**ON/OFF action differential gap:** High/Low individual setting
- TC/RTD inputs:
  0 (0.0, 0.00) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
  0.0 to 100.0 % of input span

**Output limiter high:** Output limiter low to +105.0 % *

**Output limiter low:** −5.0 % to Output limiter high *

* Output limiter low ≤ Output limiter high

**Output change rate limiter (up/down):** 0.0 to 1000.0 %/seconds of manipulated output
0.0: Output change rate limiter OFF

**Manipulated output value at STOP:** −5.0 to +105.0 %

**Direct action /Reverse action transfer:** Selectable

### ● Brilliant II Heat/Cool PID control (Water cooling/Air cooling/Cooling linear type)

**Overshoot suppression function:** Reset feedback (RFB) method

**Proportional band [heat-side]:**
- TC/RTD inputs:
  0 (0.0, 0.00) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
  0.0 to 1000.0 % of input span

0 (0.0, 0.00): Heat-side and Cool-side are both ON/OFF action

**Integral time [heat-side]:** 0 to 3600 seconds, 0.0 to 3600.0 seconds, 0.00 to 360.00 seconds or 0.000 to 36.000 seconds
0 (0.0, 0.00, 0.000): PD action
Output is 0 % when the deviation is zero.

**Derivative time [heat-side]:** 0 to 3600 seconds, 0.0 to 3600.0 seconds, 0.00 to 360.00 seconds or 0.000 to 36.000 seconds
0 (0.0, 0.00, 0.000): PI action

**Proportional band [cool-side]:**
- TC/RTD inputs:
  1 (0.1, 0.01) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
  0.1 to 1000.0 % of input span

This setting is disabled by setting the Proportional band [heat-side] to zero.
ON/OFF action of cool-side only is not possible.

**Integral time [cool-side]:**
0 to 3600 seconds, 0.0 to 3600.0 seconds, 0.00 to 360.00 seconds or 0.000 to 36.000 seconds
0 (0.0, 0.00, 0.000): PD action
Output is 0 % when the deviation is zero.

**Derivative time [cool-side]:**
0 to 3600 seconds, 0.0 to 3600.0 seconds, 0.00 to 360.00 seconds or 0.000 to 36.000 seconds
0 (0.0, 0.00, 0.000): PI action

**Overlap/Deadband:**
- TC/RTD inputs:
  −Input span to +Input span (Unit: °C, °F)
- Voltage/Current inputs:
  −100.0 to +100.0 % of input span

Minus (−) setting results in overlap.
However, the overlapping range is within the proportional range.

**Control response parameter:**
Slow, Medium and Fast (3-step selection)

**Proportional cycle time [heat-side]:**
0.1 to 100.0 seconds

**Proportional cycle time [cool-side]:**
0.1 to 100.0 seconds

**ON/OFF action differential gap:**
High/Low individual setting
- TC/RTD inputs:
  0 (0.0, 0.00) to Input span (Unit: °C, °F)
- Voltage/Current inputs:
  0.0 to 100.0 % of input span

**Output limiter high [heat-side]:**
Output limiter low [heat-side] to +105.0 % *

**Output limiter low [heat-side]:**
−5.0 % to Output limiter high [heat-side] *

* Output limiter low [heat-side] ≤ Output limiter high [heat-side]

**Output limiter high [cool-side]:**
Output limiter low [cool-side] to +105.0 % **

**Output limiter low [cool-side]:**
−5.0 % to Output limiter high [cool-side] **

** Output limiter low [cool-side] ≤ Output limiter high [cool-side]

**Output change rate limiter (up/down) [heat-side]:**
0.0 to 1000.0 %/seconds of manipulated output
0.0: Output change rate limiter OFF

**Output change rate limiter (up/down) [cool-side]:**
0.0 to 1000.0 %/seconds of manipulated output
0.0: Output change rate limiter OFF

**Manipulated output value at STOP [heat-side]:**
−5.0 to +105.0 %

**Manipulated output value at STOP [cool-side]:**
−5.0 to +105.0 %

**Undershoot suppression factor:**
0.000 to 1.000
When the contro action is changed, this parameter is initialized to the following value.
Water cooling: 0.100, Air cooling: 0.250, Cooling linear type: 1.000

**Overlap/Deadband reference point:**
0.0 to 1.0
(0.0: Proportional band on heat-side, 1.0: Proportional band on cool-side, 0.5: Midpoint)

## ● Manual control

**Setting range of Manual manipulated output value:**

- PID control: Output limiter low to Output limiter high
- Heat/Cool PID control: −Output limiter high [cool-side] to +Output limiter high [heat-side]

## ● Mode switching

**Auto/Manual transfer:** Bidirectional bumpless Auto/Manual transfer (switching between PID control output and manual output).
Bumpless transfer can be disabled at the time of transfer from Auto to Manual.

**Remote/Local transfer:** For selection of functions that can be switched by Select function for Input 2.

- Remote/Local transfer
  Switching between Remote input (set value) and Local set value inside the instrument.
- PV select transfer
  Selection of PV for control from Input 1 or Input 2.
- Differential temperature control/2-loop control
  Switching between Differential temperature control and 2-loop control.

**RUN/STOP transfer:** Used to switch the mode between RUN and STOP.
When switching the mode from STOP to RUN, the action is the same as that at power on.

RUN: Performs PID control or Manual control.
STOP: PID control, Manual control and Event function are deactivated, and the output is set to the minimum.

## ● Control action transfer

PID control (Selectable on both Input 1 and Input 2),
Heat/Cool PID control (Selectable only on Input 1),
Input 1 side and Input 2 side can be operated simultaneously.

## ● Autotuning (AT)

**Tuning method:** Computed by Limit cycle system

**AT bias:** −Input span to +Input span

**AT remaining time monitor:** 0 hours 00 minutes to 48 hours 00 minutes

## ● Startup tuning (ST)

**Startup tuning (ST):** Input 1 and Input 2, independently adjustable.
0: ST OFF
1: Execute once
2: Execute always

**ST start condition:** 0: Activate the ST function when the power is turned on; when transferred from STOP to RUN; or when the Set value (SV) is changed.
1: Activate the ST function when the power is turned on; or when transferred from STOP to RUN.
2: Activate the ST function when the Set value (SV) is changed.

## ● Proactive function

**Proactive intensity:** 0 to 4 (0: No function) *

**FF amount:** −100.0 to +100.0 % *

**FF amount learning:** 0 to 3
(0: No learning, +1: Learn Input 1, +2: Learn Input 2)

**Determination point of external disturbance:**
−Input span to +Input span *

**Bottom suppression function:** 0: No function
1: FF amount is added by level
2: FF amount is forcibly added

* Input 1 and Input 2, independently adjustable.

## ● Level PID

8 types of PID parameters are selectable according to the position of the Set value (SV) or the Measured value (PV).

**Number of levels:** 8 levels (PID memory group 1 to 8)

**Level setting range:** Input range low to Input range high

The values of the Level PID must always have the following relation.
(Level PID setting 1 ≤ Level PID setting 2 ≤ Level PID setting 3 ≤
Level PID setting 4 ≤ Level PID setting 5 ≤ Level PID setting 6 ≤
Level PID setting 7)

**Level:** When the setting of PID memory group 1 is used:
Input range low limit ≤ Set value (SV) or Measured value (PV) ≤ Level PID setting 1

When the setting of PID memory group 2 is used:
Level PID setting 1 < Set value (SV) or Measured value (PV) ≤ Level PID setting 2

When the setting of PID memory group 3 is used:
Level PID setting 2 < Set value (SV) or Measured value (PV) ≤ Level PID setting 3

When the setting of PID memory group 4 is used:
Level PID setting 3 < Set value (SV) or Measured value (PV) ≤ Level PID setting 4

When the setting of PID memory group 5 is used:
Level PID setting 4 < Set value (SV) or Measured value (PV) ≤ Level PID setting 5

When the setting of PID memory group 6 is used:
Level PID setting 5 < Set value (SV) or Measured value (PV) ≤ Level PID setting 6

When the setting of PID memory group 7 is used:
Level PID setting 6 < Set value (SV) or Measured value (PV) ≤ Level PID setting 7

When the setting of PID memory group 8 is used:
Level PID setting 7 < Set value (SV) or Measured value (PV) ≤ Input range high limit

When the same value is set to two or more Levels, the setting in the PID memory group with the smallest number will be used.

**PID memory group setting:**

**Group number:** 1 to 8

**Items to be set:** Proportional band [heat-side], Integral time [heat-side], Derivative time [heat-side], Control response parameter, Proportional band [cool-side], Integral time [cool-side], Derivative time [cool-side], Overlap/Deadband, Manual reset, Proactive intensity, FF amount, Control loop break alarm (LBA) time, LBA deadband (LBD), Output limiter high [heat-side], Output limiter low [heat-side], Output limiter high [cool-side], Output limiter low [cool-side]

## ■ Event function

**Number of event**: 4 points (Output selection is possible)

**Event type:**

Deviation high (Using SV monitor value) [1]
Deviation low (Using SV monitor value) [1]
Deviation high/low (Using SV monitor value) [1]
Band (Using SV monitor value) [1]
Deviation high/low (Using SV monitor value) [High/Low individual setting] [1]
Band (Using SV monitor value) [High/Low individual setting] [1]
SV high (Using SV monitor value)
SV low (Using SV monitor value)
Process high [2]
Process low [2]
Deviation high (Using local SV) [1]
Deviation low (Using local SV) [1]
Deviation high/low (Using local SV) [1]
Band (Using local SV) [1]
Deviation high/low (Using local SV) [High/Low individual setting] [1]
Band (Using local SV) [High/Low individual setting] [1]
SV high (Using local SV)
SV low (Using local SV)
MV high [heat-side] [2]
MV low [heat-side] [2]
MV high [cool-side] [2]
MV low [cool-side] [2]
Process high/low [High/Low individual setting] [2]
Process band [High/Low individual setting] [2]

[1] Event hold and re-hold action is available.
[2] Event hold action is available.

**Setting range:**

a) Deviation
- Event setting: –Input span to +Input span
- Differential gap: 0 to Input span

b) Process and SV
- Event setting: Same as measured range (When Control with PV select: –Input span to +Input span)
- Differential gap: 0 to Input span

c) MV
- Event setting: –5.0 to +105.0 %
- Differential gap: 0.0 to 110.0 %

**Additional function:**

Hold action:
a) Hold action OFF
b) Hold action ON
c) Re-hold action ON

Event timer: 0.0 to 600.0 seconds

Interlock selection: 0 to 4095 [a]
Interlock release: on (Interlock state), oFF (Interlock release)
ALM lamp lighting condition:
0 to 4095 [a]
Logic calculation selection (OUT1 to 3, DO1 to 4):
0 to 4095 [a]
Event assignment: Input 1, Input 2, or Differential temperature input is assignable.
Output action at control stop:
0 to 7 [b]

[a] *OR*-selectable from Event 1 to 4, HBA1, HBA2, LBA1, LBA2, Input error high, or Input error low.

[b] *OR*-selectable from Logic calculation output (continue control), Retransmission output (continue control), Instrument status output (continue control).

## ■ Control loop break alarm (LBA)

**Control loop break alarm (LBA) time:**
0 to 7200 seconds (0: No function)

**LBA deadband (LBD):** 0 to Input span

## ■ Heater break alarm (HBA) [for time-proportional control output]

**Number of HBA:** 2 points (1 point per CT input)

**Setting range:** 0.0 to 100.0 A (0.0: HBA function OFF [Current value monitoring is still available])
CT does not detect current value when the control output ON time or control output OFF time is less than 250 ms.

**Number of heater break alarm (HBA) times:**
0 to 255 times

**CT assignment:** 0 (None), 1 (OUT1), 2 (OUT2), 3 (OUT3)
(0: HBA function OFF)

## ■ Retransmission output

**Output type:** Mesured value (PV), Local SV, SV monitor value, Deviation,
Manipulated output value [heat-side] [1], Manipulated output value [cool-side] [2],
Remote setting input value, Current transformer (CT) input value,
Measured value (PV) of differential temperature input

[1] Heat/Cool PID control: Output value [heat-side]
[2] Output value [cool-side] in Heat/Cool PID control

**Output scaling:** High/Low individual setting (High limit > Low limit)

| | |
|---|---|
| Mesured value (PV): | Same as measured range |
| Local SV: | Same as measured range |
| SV monitor value: | Same as measured range |
| Deviation: | –Input span to +Input span |
| Manipulated output value [heat-side]: | –5.0 to +105.0 % |
| Manipulated output value [cool-side]: | –5.0 to +105.0 % |
| Remote setting input value: | Same as measured range |
| Current transformer (CT) input value: | 0.0 to 100.0 % |
| Measured value (PV) of differential temperature input: | –(Input 1_Input span) to +(Input 1_Input span) |

## ■ Multi-memory area

### ● Memory area function

**Number of areas:** 16 points

**Stored parameters:** Set value (SV), Set value (SV) of differential temperature input,
Event set value (or Event set value [high]), Event set value [low],
Proportional band [heat-side], Integral time [heat-side], Derivative time [heat-side],
Control response parameter, Proactive intensity, Manual reset, FF amount,
Output limiter high [heat-side], Output limiter low [heat-side],
Control loop break alarm (LBA) time, LBA deadband (LBD),
Proportional band [cool-side], Integral time [cool-side], Derivative time [cool-side],
Overlap/Deadband, Output limiter high [cool-side], Output limiter low [cool-side],
Select Trigger type for Memory area transfer, Area soak time, Link area number,
Setting change rate limiter (up), Setting change rate limiter (down),
Manipulated output value (Area), Auto/Manual transfer selection (Area),
Remote/Local transfer selection (Area),
Number of knee point, Knee point input value, Knee point correction value

**Method of area transfer:** Memory area transfer can be carried out
a) through key operations.
b) through the communication function.
c) through external contact signal.
d) through the set area soak time.
e) through the event function.

### ● Memory area link function

**Area soak time:** 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds
0 hours 00 minutes to 99 hours 59 minutes
0 minutes 00 seconds to 199 minutes 59 seconds
0.00 seconds to 59.99 seconds (Calculation is performed every 50ms.)
Accuracy: ±0.01 % of set value +1 sampling time

**Soak time unit:** 0: 0 hours 00 minutes to 99 hours 59 minutes
1: 0 minutes 00 seconds to 199 minutes 59 seconds
2: 0 hours 00 minutes 00 seconds to 9 hours 59 minutes 59 seconds
3: 0.00 seconds to 59.99 seconds

**Link area number:** 0 to 16 (0: No link)

## ■ Communication

### ● Host communication

**Interface:** Based on RS-485, EIA standard
Based on RS-422A, EIA standard

**Protocol:** RKC communication (ANSI X3.28-1976 subcategories 2.5 and A4)
Modbus-RTU
PLC communication (MAPMAN)

### ● Loader communication

**Protocol:** For RKC communication protocol only
(ANSI X3.28-1976 subcategories 2.5 and A4)

**Synchronous method:** Start/Stop synchronous type

**Communication speed:** 38400 bps

**Data format:** Start bit: 1
Data bit: 8
Parity bit: None
Stop bit: 1
Number of data digit: 7-digit (fixed)

**Maximum connections:** 1 point

**Connection method:** Exclusive cable
(not complying with the USB standard)

**Interval time:** 10 ms

**Other:**
① The instrument can be powered from the COM-K2 or COM-KG (our USB communication converter)
This power supply is designed for setting up the internal set values. Control is stopped (output off, relay open) and host communication is also stopped. The PV/SV monitor shows "LoAd" for the Measured value (PV) display and "-----" for the Set value (SV) display. The LCD backlight is partially turned off.

② While the instrument is powered by COM-K2 or COM-KG, if power is applied to the instrument, the instrument will be reset and starts for normal operation.

③ When the instrument is normally powered, the host communication can be used simultaneously.

## ■ Self-diagnostic function

**Control stop (Error number is displayed):**
Adjustment data error (Err 1)
Data back-up error (Err 2)
A/D conversion error (Err 4)
Temperature compensation error (Err 4)
Display units error (Err 64)

**Action stop (Error number is not displayed):**
Power supply voltage is abnormal
Watchdog timer error

## ■ General specifications

**Power supply voltage:** 100 to 240 V AC type:
85 to 264 V AC [Including power supply voltage variation], 50/60 Hz
(Rated: 100 to 240 V AC)
Frequency variation: 50 Hz (−10 to +5 %), 60 Hz (−10 to +5 %)

24 V AC type:
20.4 to 26.4 V AC [Including power supply voltage variation], 50/60 Hz
(Rated: 24 V AC)
Frequency variation 50 Hz (−10 to +5 %), 60 Hz (−10 to +5 %)

24 V DC type:
20.4 to 26.4 V DC [Including power supply voltage variation]
(Rated: 24 V DC)

**Power consumption (at maximum load):**

GZ400: 6.8 VA max. (at 100 V AC)
10.1 VA max. (at 240 V AC)
6.9 VA max. (at 24 V AC)
175 mA max. (at 24 V DC)

GZ900: 7.4 VA max. (at 100 V AC)
10.9 VA max. (at 240 V AC)
7.4 VA max. (at 24 V AC)
190 mA max. (at 24 V DC)

**Rush current:** 5.6 A or less (at 100 V AC)
13.3 A or less (at 240 V AC)
16.3 A or less (at 24 V AC)
11.5 A or less (at 24 V DC)

**Insulation resistance:**

| | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
|---|---|---|---|---|---|---|---|
| ①Grounding | | | | | | | |
| ②Power supply terminal | 20 MΩ or more at 500 V DC | | | | | | |
| ③Measured input terminal 1/ CT | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | | | | | |
| ④Measured input terminal 2 | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | | | | |
| ⑤Output terminal (Relay) | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | | | |
| ⑥Output terminal (other than Relay) | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | | | |
| ⑦DO terminal (Relay) | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | |
| ⑧Communication, Digital input terminal | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC | 20 MΩ or more at 500 V DC |

Grounding is done on the control panel.

**Withstand voltage:**

| Time: 1 min. | ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
|---|---|---|---|---|---|---|---|
| ①Grounding | | | | | | | |
| ②Power supply terminal | 1500 V AC | | | | | | |
| ③Measured input terminal 1/ CT | 1500 V AC | 3000 V AC | | | | | |
| ④Measured input terminal 2 | 1500 V AC | 3000 V AC | 1000 V AC | | | | |
| ⑤Output terminal (Relay) | 1500 V AC | 3000 V AC | 3000 V AC | 3000 V AC | | | |
| ⑥Output terminal (other than Relay) | 1500 V AC | 3000 V AC | 1000 V AC | 1500 V AC | | | |
| ⑦DO terminal (Relay) | 1500 V AC | 3000 V AC | 3000 V AC | 3000 V AC | 3000 V AC | 3000 V AC | |
| ⑧Communication, Digital input terminal | 1500 V AC | 3000 V AC | 1000 V AC | 1000 V AC | 3000 V AC | 1500 V AC | 3000 V AC |

Withstand voltage values may vary depending on the model.

**Power failure handling:**

**Power failure:** 100 to 240 V AC type/24 V AC type:
A power failure of 20 ms or less will not affect the control action
24 V DC type:
A power failure of 5 ms or less will not affect the control action

**Memory backup:**
Backed up by non-volatile memory
Number of writing: Approx. One trillion ($10^{12}$) times (FRAM)
Data storage period: Approx. 10 years (FRAM)

**Power failure recovery:**
Hot/Cold start:
a) Hot start 1
Operation is resumed from the state before the power failure and from the output before the failure.
b) Hot start 2
Operation is resumed from the state before the power failure. In case of Manual mode, the operation starts from the Output limiter low.
c) Cold start
Operation starts in Manual mode, irrespective of the mode before the power failure. The operation starts from the Output limiter low.
d) STOP start
The operation starts from the STOP state irrespective of the mode before the power failure.

Selectable from a) to d)

Start determination point:
0 to Input span
(0: Action conforms to the Hot/Cold start)
Unit: same as the reading

## ■ Environment Condition

### ● Operating environmental conditions

**Ambient temperature:** −10 to +55 °C

**Ambient humidity:** 5 to 95 %RH (Absolute humidity: MAX.W.C 29 g/m$^3$ dry air at 101.3 kPa)

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

**Shock:** Free fall from 50 mm in height
Each direction of XYZ axes (In non-energization)

### ● Reference operating conditions

**Reference temperature:** 23 °C±2 °C
Temperature variation: ±5 °C/h

**Reference humidity:** 50 %RH ± 10 %RH

**Magnetic field:** Geomagnetism

**Power supply voltage:** Alternating current, Direct current: Reference value ± 1 %

### ● Transportation and Storage environment conditions

**Vibration:**

| Number of vibration [Hz] | Level | | Attenuation slope [dB/oct] |
|---|---|---|---|
| | (m/s$^2$)$^2$/Hz | [g$^2$(1)/Hz] | |
| 3 | 0.048 | (0.0005) | — |
| 3 to 6 | — | — | +13.75 |
| 6 to 18 | 1.15 | (0.012) | — |
| 18 to 40 | — | — | –9.34 |
| 40 | 0.096 | (0.001) | — |
| 40 to 200 | — | — | –1.29 |
| 200 | 0.048 | (0.0005) | — |

The effective value of the acceleration is 5.8 m/s$^2$ [0.59 g (1)] within the number of vibration.

NOTE: (1) g = 9.806658 m/s$^2$

**Shock:** Height 40 cm or less

**Temperature:** –40 to +70 °C

**Humidity:** 5 to 95 %RH (Non condensing)
Absolute humidity: MAX.W.C 35 g/m$^3$ dry air at 101.3 kPa

## ■ Mounting and Structure

**Mounting method:** Panel-mounted
Close horizontal mounting, Close vertical mounting

**Mounting orientation:** Datum plane ± 90°

**Case color:** Black

**Case material:** PC (Flame retardancy: UL94 V-0)

**Front panel material:** PC (Flame retardancy: UL94 V-0)

**Terminal block material:** PPE (Flame retardancy: UL94 V-1)

**Filter material:** PC

**Panel sealing**: Based on IP65 (IEC 60529)
[Front panel (when the front loader connector cover is installed)] *
* When the front loader connector cover is not installed: IP00

**Weight:** GZ400: Approx. 221 g
GZ900: Approx. 291 g

**Dimensions:** GZ400: 48 mm × 96 mm × 65 mm (W × H × Depth behind the panel)
GZ900: 96 mm × 96 mm × 65 mm (W × H × Depth behind the panel)

## ■ Standard

### ● Safety standards

**UL:** UL 61010-1

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

### ● Other approved standards

**CE/UKCA marking:** Electrical Safety: EN61010-1
EMC: EN61326-1
RoHS: EN IEC 63000

**RCM:** EN55011

### ● Environment Condition

**Protection against electric shock:**
Class II (Reinforced insulation)

**Overvoltage category:** OVERVOLTAGE CATEGORY II

**Pollution degree:** POLLUTION DEGREE 2

**Altitude:** Altitude up to 2000 m (Indoor use)

**Recommended fuse:** Fuse type: Time-lag fuse (Approved fuse according IEC 60127-2 and/or UL 248-14)
Fuse rating: Rated voltage 250 V AC
Rated current 0.5 A (for 24 V AC/DC type)
1 A (for 100 to 240 V AC type)

# APPENDIX A

# A.1 Replacing the Waterproof/Dustproof Gasket [Optional]

GZ400/900 can be equipped with an optional water- and dust-proof structure, which has to be specified at the time of ordering. This waterproof and dustproof construction uses rubber gaskets. If the waterproof and dustproof gasket deteriorates, please contact RKC sales office or the agent.
To replace the gasket, take the following steps:

## ⚠ WARNING

- In order to prevent electric shock and instrument failure, always turn off the power supply before replacing the gasket.
- In order to prevent electric shock and instrument failure, always turn off the power supply before pulling out the internal chassis.
- In order to prevent injury or instrument failure, do not touch the internal printed wiring board.

### ■ Replacement of the gasket for the case

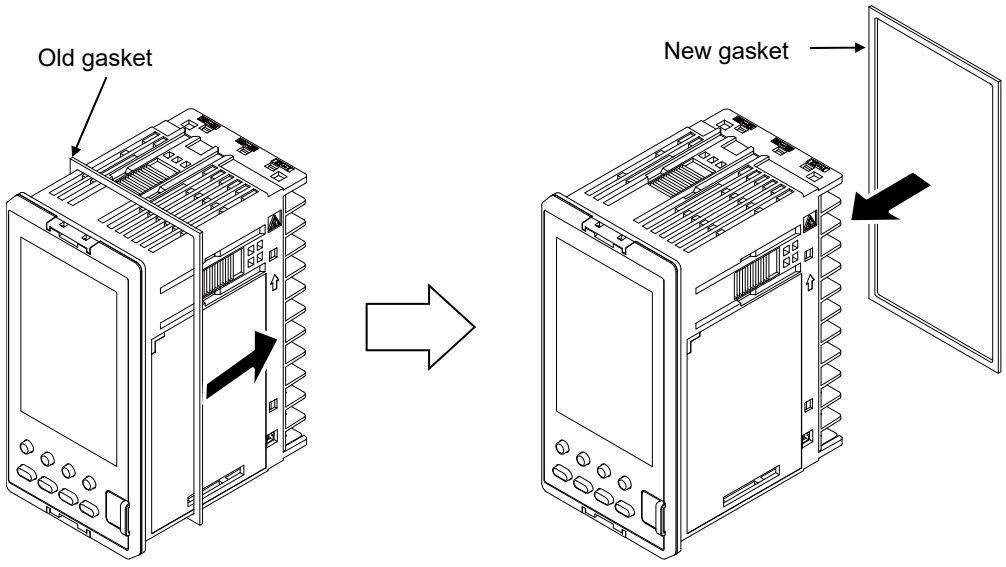
*1.* Turn the power OFF.

*2.* Remove the wiring.

*3.* Remove the mounting bracket, and then remove the instrument from the control panel.

☞ See **2.3 Procedures of Mounting and Removing (P. 2-4)**.

*4.* Remove the old gasket, and then replace the old gasket with a new one.

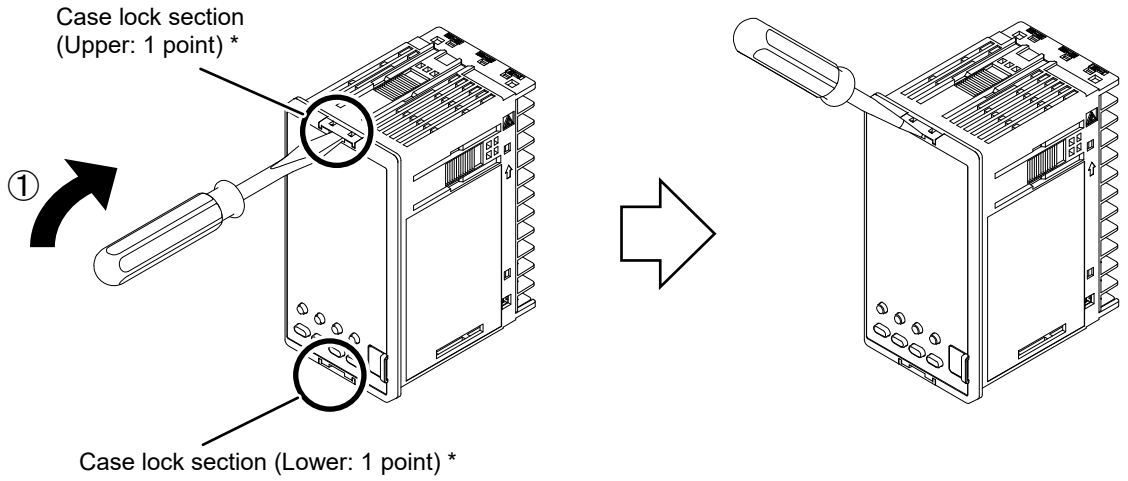



Gasket for the case: GZ400: KFB400-36
GZ900: KFB900-36

## ■ Replacing the gasket for the front frame

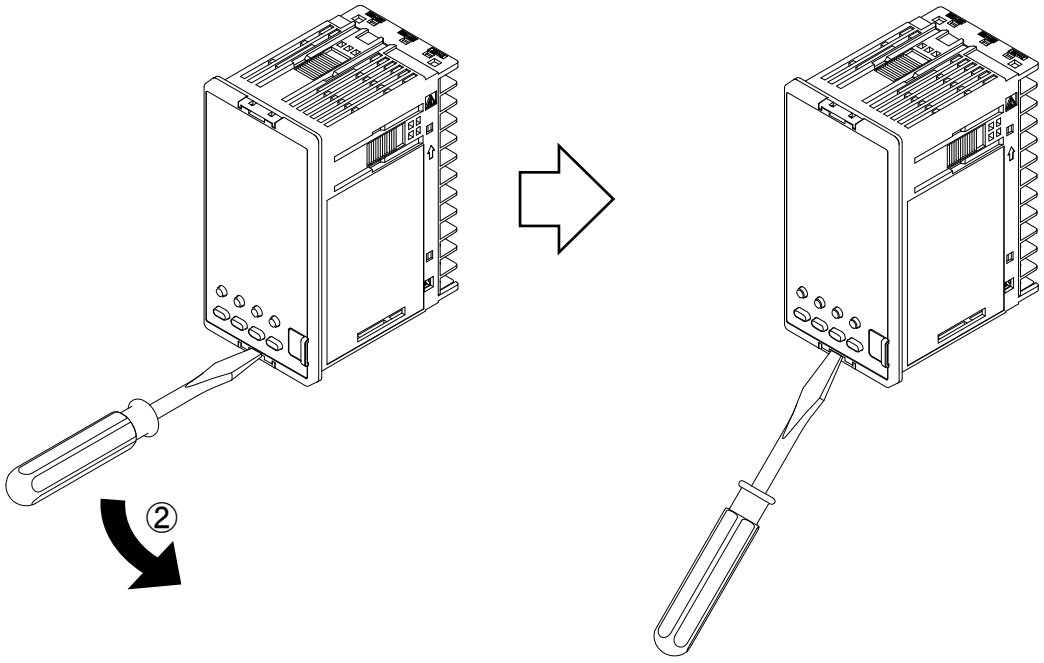
*1.* Turn the power OFF.

*2.* Wedge the slotted screwdriver into the upper case lock section, and lift the grip slowly (①). The case lock is released.

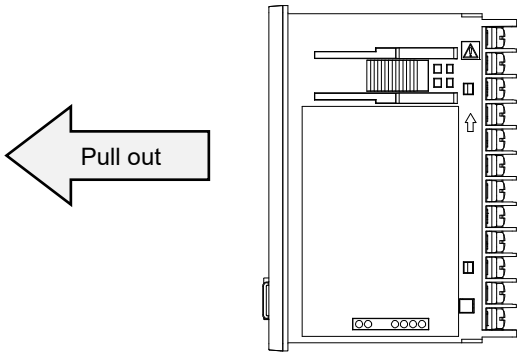



* There are two locks on each side of the case (upper/lower) for the GZ900.

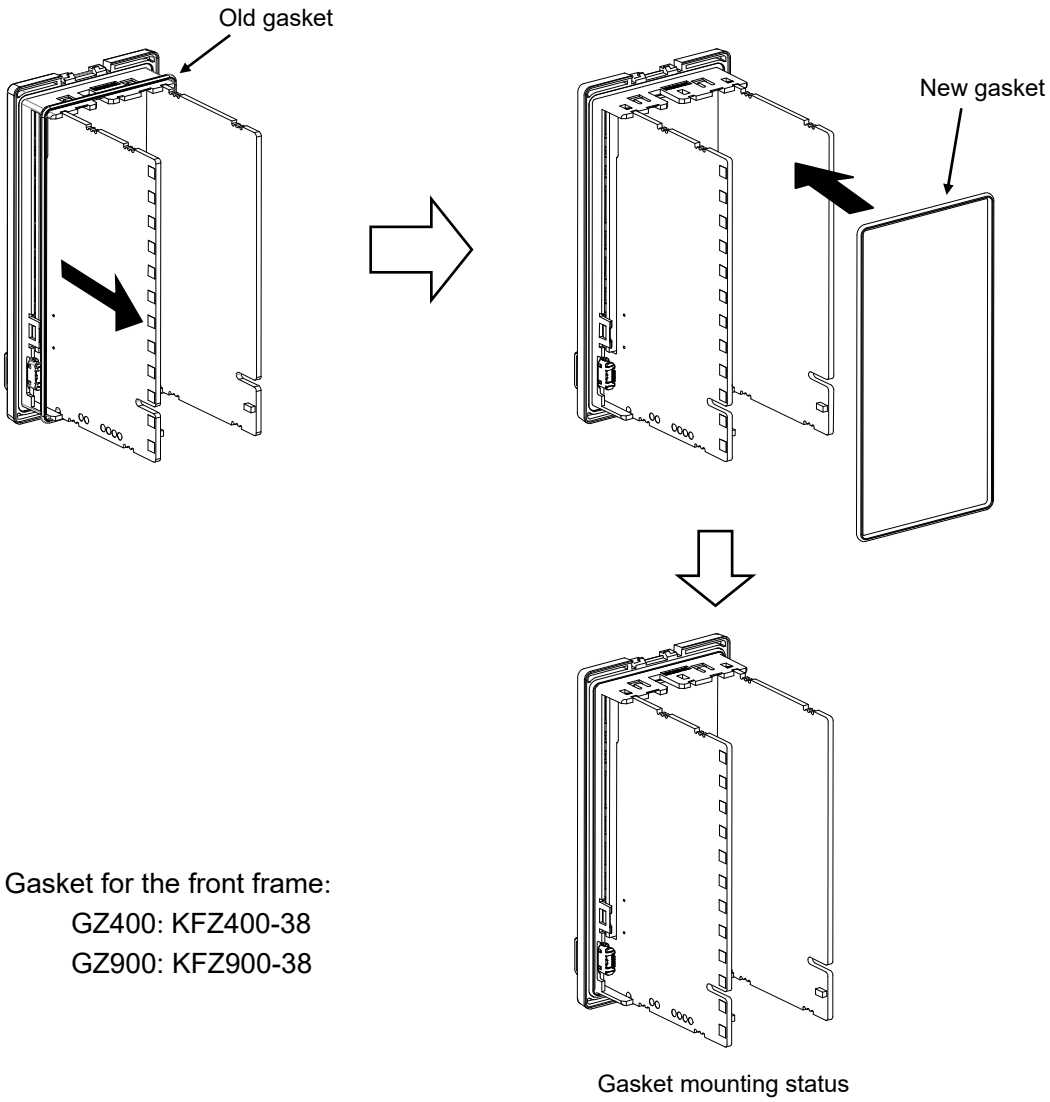
*3.* Wedge the slotted screwdriver into the lower case lock section, and hold down the grip slowly (②). The case lock is released.



***4.*** As the internal unit slightly comes out of the case, pull it out toward you.




***5.*** Remove the old gasket, and then replace the old gasket with a new one.




Gasket for the front frame:
GZ400: KFZ400-38
GZ900: KFZ900-38

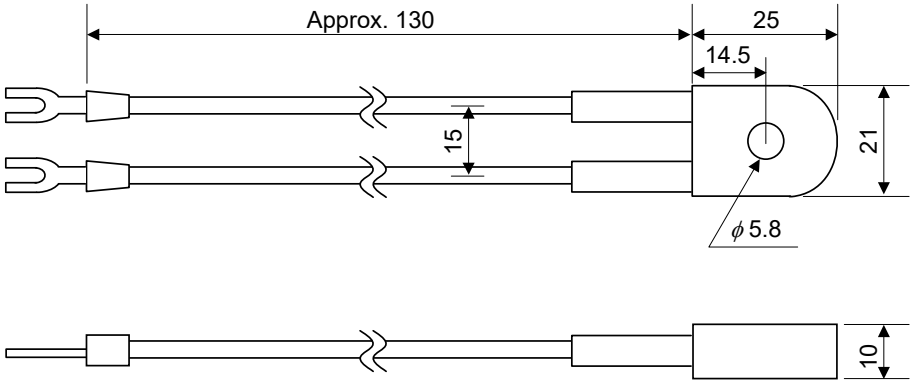
Gasket mounting status

***6.*** Insert the internal assembly in the case.

# A.2 Current Transformer (CT) Dimensions [Optional]

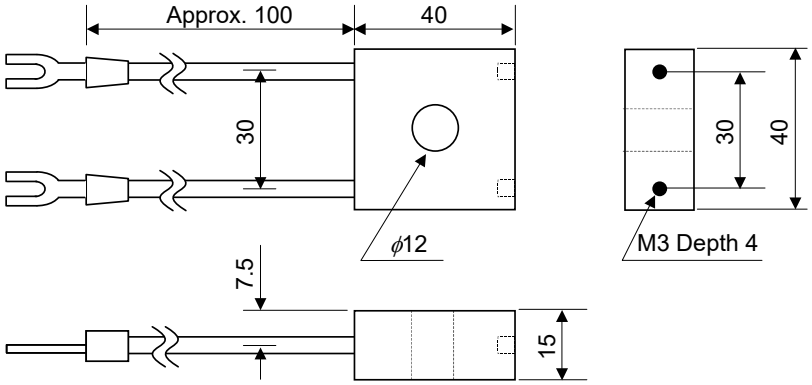
## ■ CTL-6-P-N (For 0 to 30 A)

(Unit: mm)




## ■ CTL-12-S56-10L-N (For 0 to 100 A)

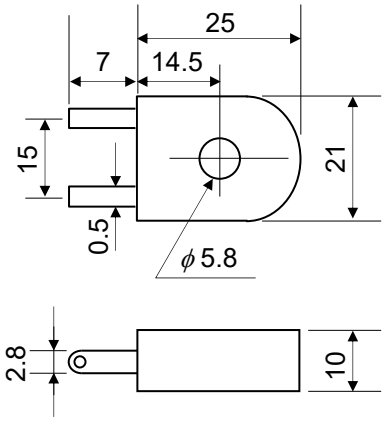
(Unit: mm)




## ■ CTL-6-P-Z (For 0 to 10 A) *

* A product of U.R.D.Co., LTD.

(Unit: mm)



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