172-65711M-06 (SC-F71 Communication) 23 August 2023

Instruction Manual

Multi-Purpose Controller

SC-F71

Communication

Contents

Introduction

Thank you for purchasing the TLV multi-purpose controller.

This product has been thoroughly inspected before being shipped from the factory. When the product is delivered, before doing anything else, check the specifications and external appearance to make sure nothing is out of the ordinary. Also be sure to read this manual carefully before use and follow the instructions to be sure of using the product properly.

If detailed instructions for special order specifications or options not contained in this manual are required, please contact TLV for full details.

This instruction manual is intended for use with the model(s) listed on the front cover. It is necessary not only for installation but for subsequent maintenance, disassembly/reassembly and troubleshooting. Please keep it in a safe place for future reference.

Safety Considerations

- Read this section carefully before use and be sure to follow the instructions.
- Installation, inspection, maintenance, repairs, disassembly, adjustment and valve opening/closing should be carried out only by trained maintenance personnel.
- The precautions listed in this manual are designed to ensure safety and prevent equipment damage and personal injury. For situations that may occur as a result of erroneous handling, three different types of cautionary items are used to indicate the degree of urgency and the scale of potential damage and danger: DANGER, WARNING and CAUTION.
- The three types of cautionary items above are very important for safety: be sure to observe all of them as they relate to installation, use, maintenance, and repair. Furthermore, TLV accepts no responsibility for any accidents or damage occurring as a result of failure to observe these precautions.

Symbols

	**Indicates a DANGER, WARNING or CAUTION item.**
DANGER	Indicates an urgent situation which poses a threat of death or serious injury
WARNING	Indicates that there is a potential threat of death, serious injury or the risk of electrocution, burns or other situations which pose a danger to the life or health of the user
CAUTION	Indicates that there is a possibility of injury or equipment/product damage

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. • TLV 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.

Continued on the next page

⚠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.

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.
- TLV is not responsible for any damage or injury that is caused as a result of using this instrument, instrument failure or indirect damage.
- TLV 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. TLV 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 TLV.
- Various symbols are used on the equipment, and they have the following meaning.

  : Alternating current

  : Direct 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.

Notice Regarding the Export Trade Control Order (Japan)

The intended application and end user should be checked to make sure this product will not be used in weapons of mass destruction, military applications or military equipment etc.
Take precautions not to allow this product to be illegally exported, even in the case of reselling or distribution.

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)

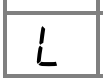
 **NOTE**	This icon indicates important information on installation, handling and operating procedures.
	This icon indicates supplemental information on installation, handling and operating procedures.
	This icon indicates where additional information may be located.

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
											

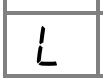
L	M	N	n	O (o)	P	Q	R	S	T	t	U
											

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		
AT	Autotuning	V (input)	Voltage (input)
ST	Startup tuning	I (input)	Current (input)
OUT (1 to 3)	Output (1 to 3)	HBA (1, 2)	Heater break alarm (1, 2)
DI (1 to 6)	Digital input (1 to 6)	CT (1, 2)	Current transformer (1, 2)
DO (1 to 4)	Digital output (1 to 4)	LBA	Control loop break alarm
FBR	Feedback resistance	LBD	LBA deadband

Screens used in this manual

The SC-F71 has two inputs. The following input type is available by setting parameters: Dual PV (PV + PV) type or PV + Remote setting type. The input type is set to PV + Remote setting type when shipped from the factory.

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.

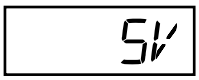
Display example of the dual input type:

Input 1_Set value (SV)

Input 2_Set value (SV)

Display example of a single input type:

Set value (SV)



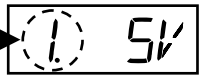
This manual uses the dual inputs for explanation. For other types such as a single input type, ignore the first character " 1. " at the top of the parameter.

The parameters used only for the dual input type are displayed with 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 requested from TLV or your local TLV representative.

Manual	Document Number	Remarks
Multi-purpose Controller SC-F71 Quick Start Guide	172-65706M	This manual is enclosed with instrument. This manual explains the basic key operation, mode menu, and data setting.
Multi-purpose Controller SC-F71 Installation Manual	172-65707M	This manual is enclosed with instrument. This manual explains the mounting and wiring.
Multi-purpose Controller SC-F71 Parameter List	172-65708M	This manual is enclosed with instrument. This list is a compilation of the parameter data of each mode.
Multi-purpose Controller SC-F71 Instruction Manual [Hardware]	172-65709M	This manual describes installation, wiring, troubleshooting and product specification.
Multi-purpose Controller SC-F71 Instruction Manual [Parameters/Functions]	172-65710M	Parameters: 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. Functions: This manual describes how to set up and each function.
Multi-purpose Controller SC-F71 Instruction Manual [Host Communication]	**172-65711M**	**The manual you are reading now. This manual explains original communication protocol and Modbus relating to communication parameters setting.**
Multi-purpose Controller SC-F71 Instruction Manual [PLC Communication]	172-65712M	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 keep the manual in a convenient location for easy reference.

About this Manual

This manual consists of the following 7 chapters and index; Parts description, Product identification 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 [Hardware]:

	What do you want to do?	See the following section for more details
☐	I want to know the features of the host communication	1 Outline
☐	I want to know how to connect to the host computer	2. Wiring
☐	I want to know how to connect to the loader communication device	2. Wiring
☐	I want to know how to set up the communication parameters	3. Parameter Setting
☐	I want to know the content of the original communication protocol	4. Original Communication Protocol
☐	I want to know the content of Modbus protocol	5. Modbus Protocol
☐	I want to know how to use Modbus data mapping	5. Modbus Protocol
☐	I want to know how to use Memory area data	5. Modbus Protocol
☐	I want to check the data map structure	6. Communication Data List
☐	I want to know how to read the table	6. Communication Data List
☐	I want to check the original communication/Modbus (double word) [data register address, data attribute, data range and factory set values]	6. Communication Data List
☐	I want to know how to cope with errors	7. Troubleshooting
☐	I want to know the specification of the host communication	8. Specifications

* Can be checked with the detailed manual supplied with the product.

Major topics contained in other manuals:

	What do you want to do?	See the following instruction manual for more details
☐	I want to know how to install and wire the product.	[Hardware]
☐	I want to know the specification of the product, etc.	[Hardware]
☐	I want to know the functions and how to use them.	[Parameters/Functions]
☐	I want to check the parameter names and their setting range.	[Parameters/Functions] Parameter List (This manual is enclosed with instrument.)
☐	I want to know how to connect this instrument to a programmable logic controller (PLC).	[PLC Communication]

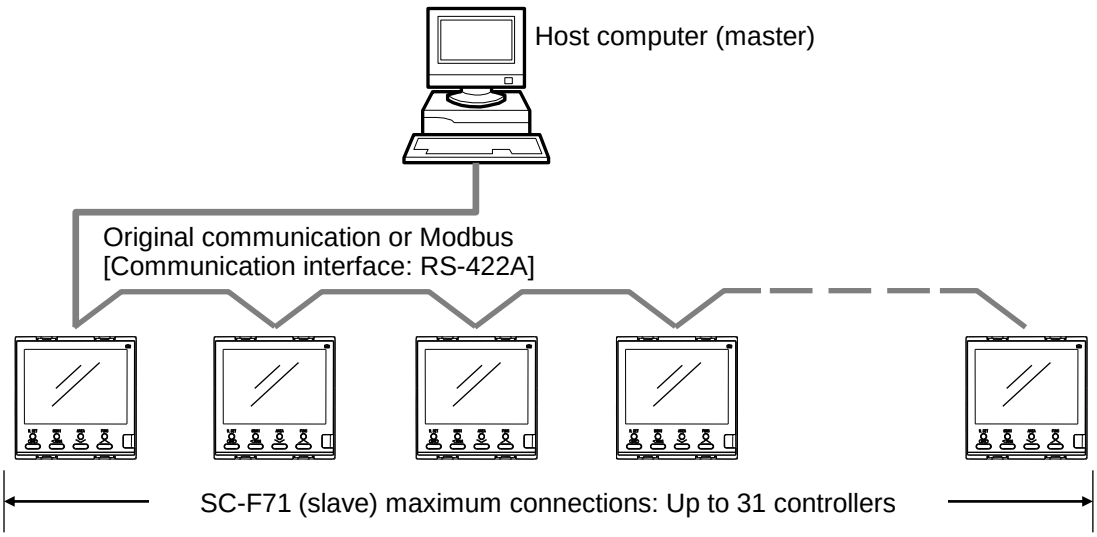
1. Overview

This chapter describes the host communication of SC-F71.

The communication function makes it possible to monitor and set the data of the Multi-purpose Controller SC-F71 from a host computer. The SC-F71 interfaces with the host computer via Modbus or the original communication (ANSI X3.28-1976 subcategories 2.5 and A4) protocols. Communication function is available only when optional communication function has been specified at the time of ordering.
In addition, the controller SC-F71 is equipped standard with a loader communication connector. Therefore, loader communication is possible. For reference purposes, the Modbus protocol identifies the host computer as master, the controller as slave.

■ Host communication (original communication, Modbus) [Optional]
Communication interface: RS-422A

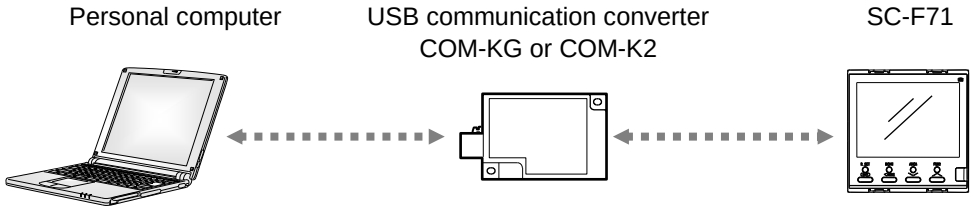
● Multi-drop connection
One host computer (master) can communicate with up to 31 SC-F71s.



● Communication data type
There are such data as shown below for the communication with the computer.

- ● Original communication
  - 7 digits data
- ● Modbus
  - Double word

■ Loader communication
Loader communication allows SC-F71 data to be set from a personal computer. By saving the data that was set using our communication tool PROTEM-T to a computer, the data can be transferred to other SC-F71s, allowing setup to be accomplished much more quickly than when the data is set in each SC-F71 using the front panel keys.
RKC Instrument Inc. (hereinafter RKC) USB communication converter COM-KG or COM-K2 (sold separately) are required for the loader communication.



Maximum connections: 1 controller

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

Loader communication can be used on a SC-F71 even when the Communication function (optional) is not installed.

The loader communication corresponds to the original communication protocol "Based on ANSI X3.28-1976 subcategories 2.5 and A4."

A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM-T is used using a COM-K, the PROTEM-T will not be supported by Windows 8 or later.

■ PLC communication

The PLC communication function makes it possible to monitor and set the data of the Multi-purpose Controller SC-F71 from a programmable controller (PLC).
The SC-F71 can be connected to the programmable controller (PLC) without using any program.

This manual describes the host communication (original communication and Modbus).
For the PLC communication, refer to SC-F71 Instruction Manual [PLC Communication] (172-65712M).

■ Configuration support tool: PROTEM-T

PROTEM-T is an integrated configuration support software to manage parameter setting and measured values of the controller (SC-F71) and consists of the following tools:

- Base Tool: Used to set/verify controller parameters.
- Recipe Tool: Used to conduct overall management of parameter set values of our controllers (storing to a computer and transfer to other controllers.)
- Logger Tool: Used to visualize various data with graphs and perform data logging in CSV format.
- Configuration Tool: Used for configure virtual controllers for the Base Tool. *

* PROTEM-T handles controllers as the unit of a project.
Controllers connected to the project are called "Virtual controllers."

PROTEM-T requires Microsoft.NET Framework 4 to be installed on the computer.

PROTEM-T can be used with original standard protocol and Modbus protocol. PROTEM-T can also be used for loader communication and a host communication.

PROTEM-T will be available on the TLV website: https://www.tlv.com

2. Wiring

This chapter describes how to connect to the host computer.

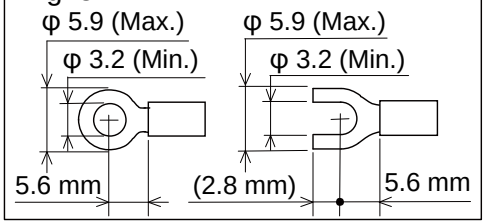
2.1 Wiring Cautions

⚠ WARNING

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

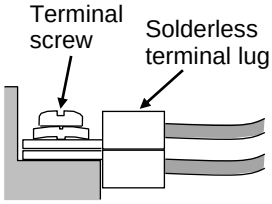
- To avoid noise induction, keep communication wire away from instrument power line, load lines and power lines of other electric equipment.
- Use the solderless terminal appropriate to the screw size.
  Screw size: M3×7 (with 5.8 × 5.8 square washer)
  Recommended tightening torque: 0.4 N・m [4 kgf・cm]
  Applicable wire: Solid/twisted wire of 0.25 to 1.65 mm^2
  Specified dimension: Refer to Fig. at the right
  Specified solderless terminal: Manufactured by J.S.T MFG CO., LTD.
  Circular terminal with isolation V1.25-MS3

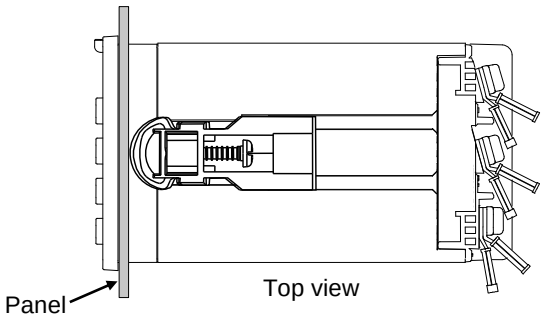
Fig. 3.1



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

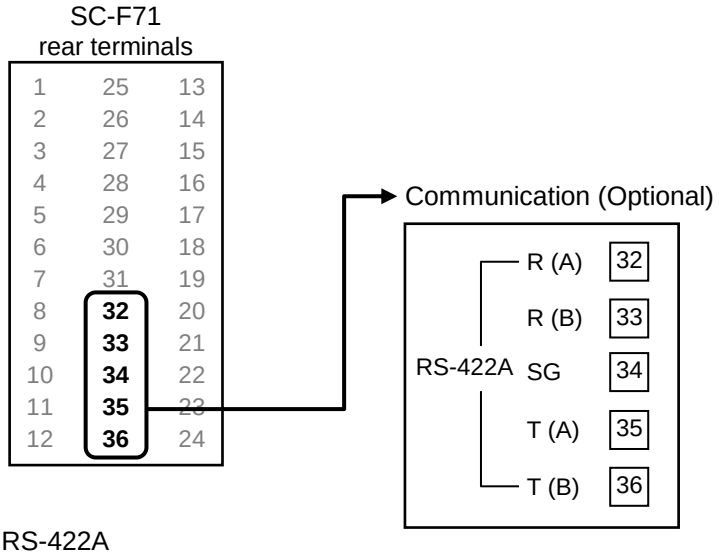
Two solderless terminals are used overlapped.





2.2 Wiring for Host Communication

■ Communication terminal number and signal details

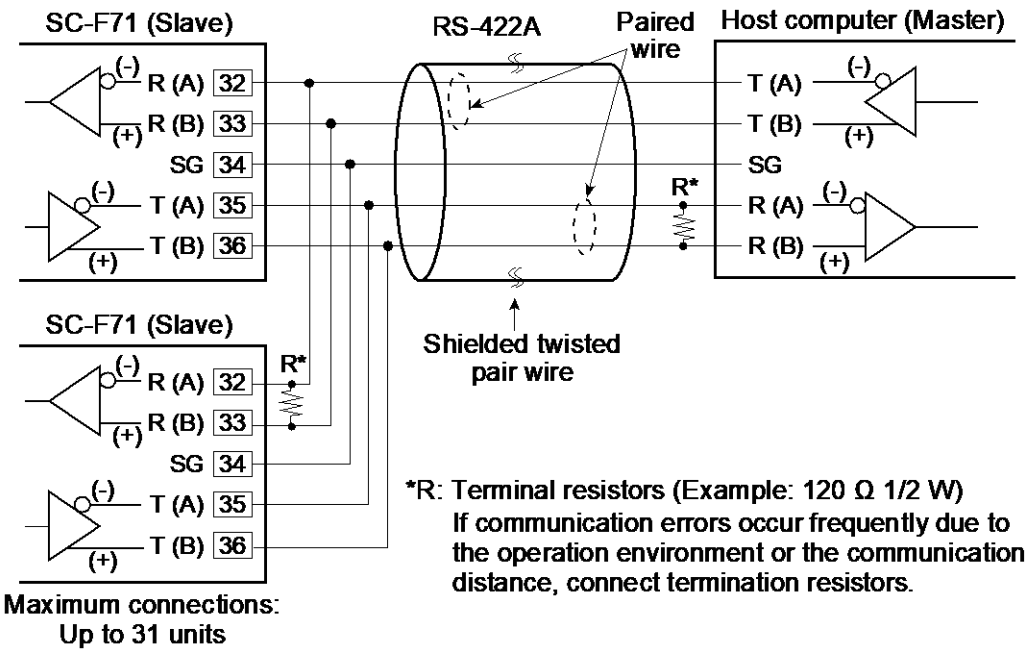


RS-422A

SC-F71 terminal No.	Symbol	Signal name
32	R (A)	Receive data
33	R (B)	Receive data
34	SG	Signal ground
35	T (A)	Send data
36	T (B)	Send data

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

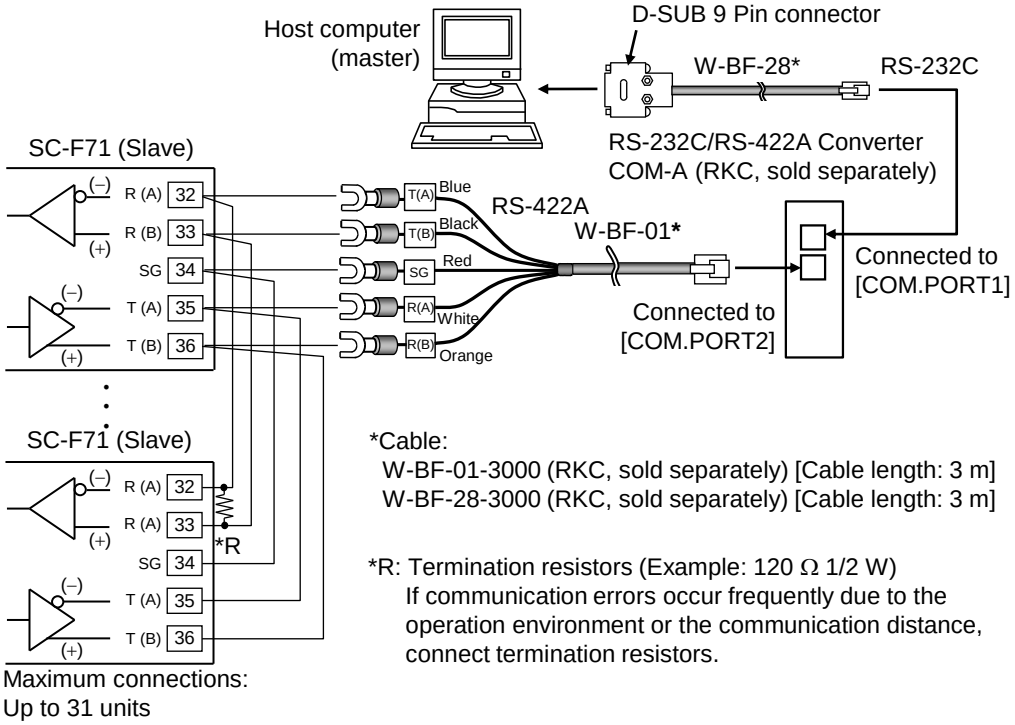
- Wiring example



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

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

- Wiring example



*Cable:
W-BF-01-3000 (RKC, sold separately) [Cable length: 3 m]
W-BF-28-3000 (RKC, sold separately) [Cable length: 3 m]

*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.

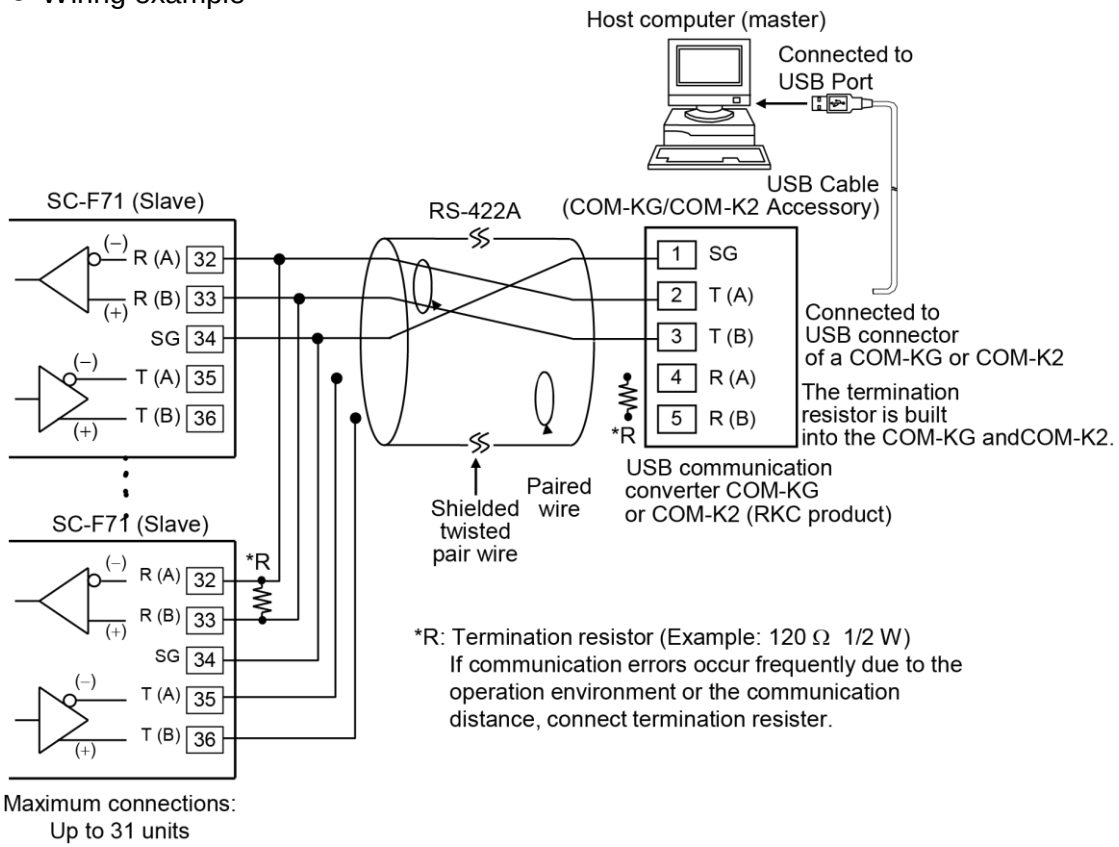
The communication cable and termination resistor(s) must be provided by the customer.

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)
Refer to the COM-A/COM-B Instruction Manual.

Connection to the USB of the host computer (master)

- Wiring example



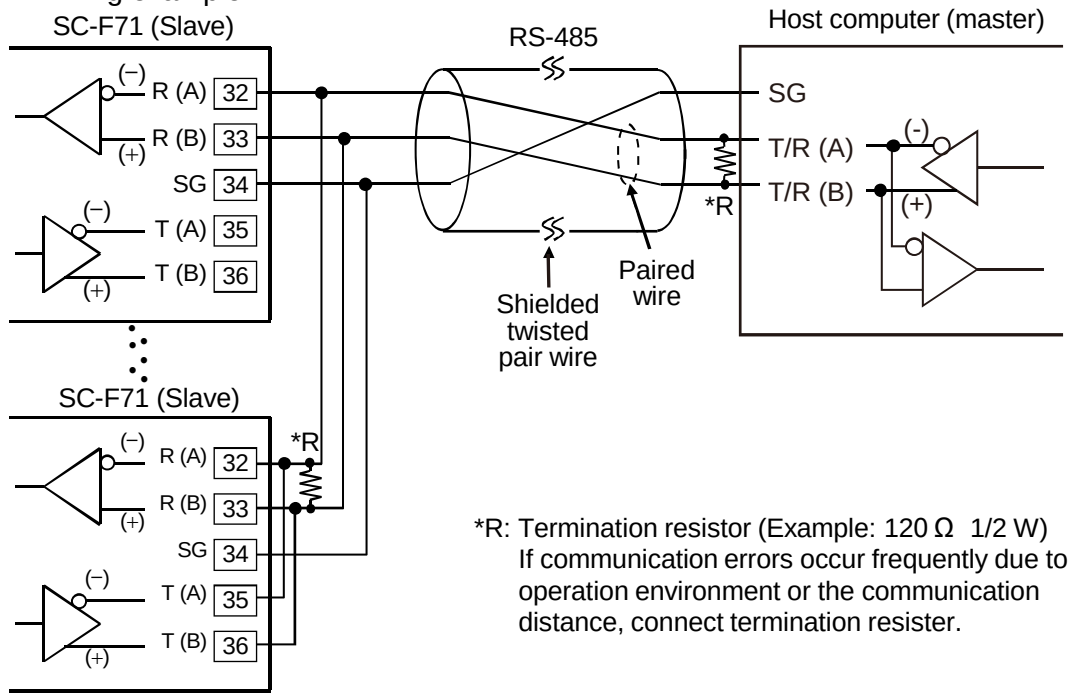
The communication cable and termination resistor(s) must be provided by the customer.

Recommended USB communication converter: COM-KG or COM-K2 (RKC product)
Refer to the COM-KG or COM-K2 Instruction Manual.

A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM-T is used using a COM-K, the PROTEM-T will not be supported by Windows 8 or later.

Connection to the RS-485 port of the host computer (master)

- Wiring example



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

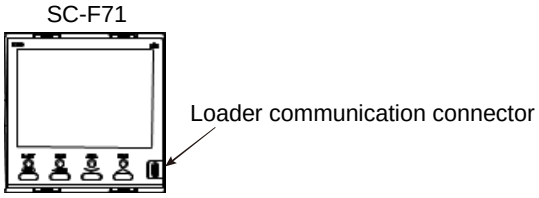
Maximum connections:
Up to 31 units

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

2.3 Connections for Loader Communication

■ Position of loader communication connector

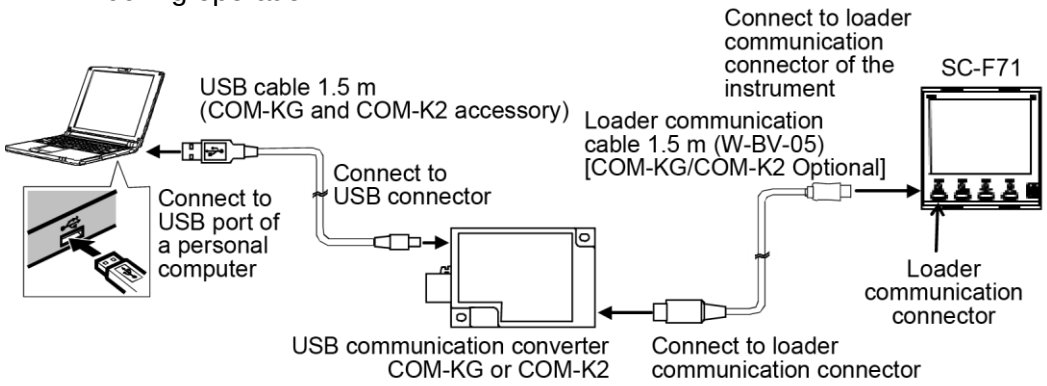
The loader communication connector can be found on the front of the instrument. In the following picture the connector cover is open.



■ Wiring method

Connect the SC-F71, COM-KG or COM-K2 (RKC product, sold separately), 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.



- Communication Tool: PROTEM-T
  Software operation environment: Consult the accompanying manual
- Communication settings on the computer (The following values are all fixed)
  Communication speed: 38400 bps
  Start bit: 1
  Data bit: 8
  Parity bit: Without
  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 original communication protocol “Based on ANSI X3.28-1976 subcategories 2.5 and A4.”
- Loader communication can be used on the SC-F71 even when the Communication function (optional) is not installed.

Recommended USB communication converter: COM-KG or COM-K2 (RKC product). Refer to the COM-KG or COM-K2 Instruction Manual.

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

RKC website: http://www.rkcinst.com

A previous version of COM-K (version 1) can be also used. However, if communication tool PROTEM-T is used using a COM-K, the PROTEM-T will not be supported by Windows 8 or later.

When the instrument is powered off, power can be supplied to the instrument from COM-KG or COM-K2 (or COM-K version 1). 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-KG or COM-K2 (or COM-K version 1), if power is applied to the instrument, the instrument will be reset and starts for normal operation.

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

3. Parameter Setting

This chapter describes how to set up parameters necessary for the host communication.

3.1 Setting of Communication Parameter

3.1.1 Description of each parameter

To establish communication between host computer (master) and SC-F71 (slave), it is necessary to set the following parameters. The communication related parameters can be found in the Function block No. 60: communication (SCI) of Engineering mode. The communication status can be monitored at “Communication response monitor.”

■ Function block No. 60: Communication (SCI)

No.	Symbol	Name	Data range	Description	Factory set value
—	Fn60	Function block No. 60	This is the first parameter symbol of Function block No. 60.		—
327	CMPS	Communication protocol	0: Original communication 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data a transfer: low-order word to high-order word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA-compatible 3C frame [format 4]) Do not set for the host communication.	Select the communication protocol type.	0
328	Add	Device address	Original communication: 0 to 99 Modbus: 1 to 99	Do not use the same device address for more than one SC-F71 in multi-drop connection.	Original communication: 0 Modbus: 1
329	bPS	Communication speed	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	Set the same communication speed for both the SC-F71 (slave) and the host computer (master).	3
330	bIT	Data bit configuration	0 to 11 Refer to Data bit configuration table in 3.1.1 Description of each parameter	Set the same data bit configuration for both the SC-F71 (slave) and the host computer (master).	0
331	INT	Interval time	0 to 250 ms	The Interval time is the waiting time between the receipt of the message from the host computer and the transmission of	10

				the reply message from the SC-F71. Adjust the interval time when the switchover between send and receive is not appropriate.	
332	CMRM	Communication response monitor	Refer to Communication response monitor in 3.1.1 Description of each parameter	Displays the communication state.	—

Data bit configuration table

Set value	Data bit	Parity bit	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

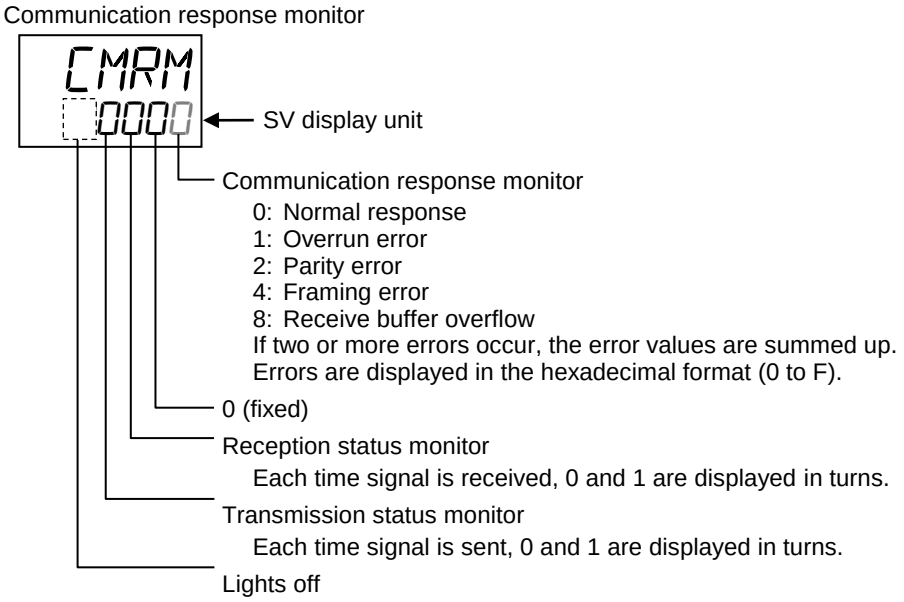
Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

Interval time: The interval time for the SC-F71 should be set to provide a time for host computer to finish sending all data including stop bit and to switch the line to receive status for the host. If the interval time between the two is too short, the SC-F71 may send data before the host computer is ready to receive it. In this case, communication transmission cannot be conducted correctly.

The communication protocol, device address (slave address), communication speed, data bit configuration, and interval time can also be set by loader communication using PROTEM-T. It can also be set by host communication.

- Communication response monitor



3.1.2 Setting procedure

The communication related parameters can be found in the Function block No. 60: Communication (SCI) of Engineering mode.

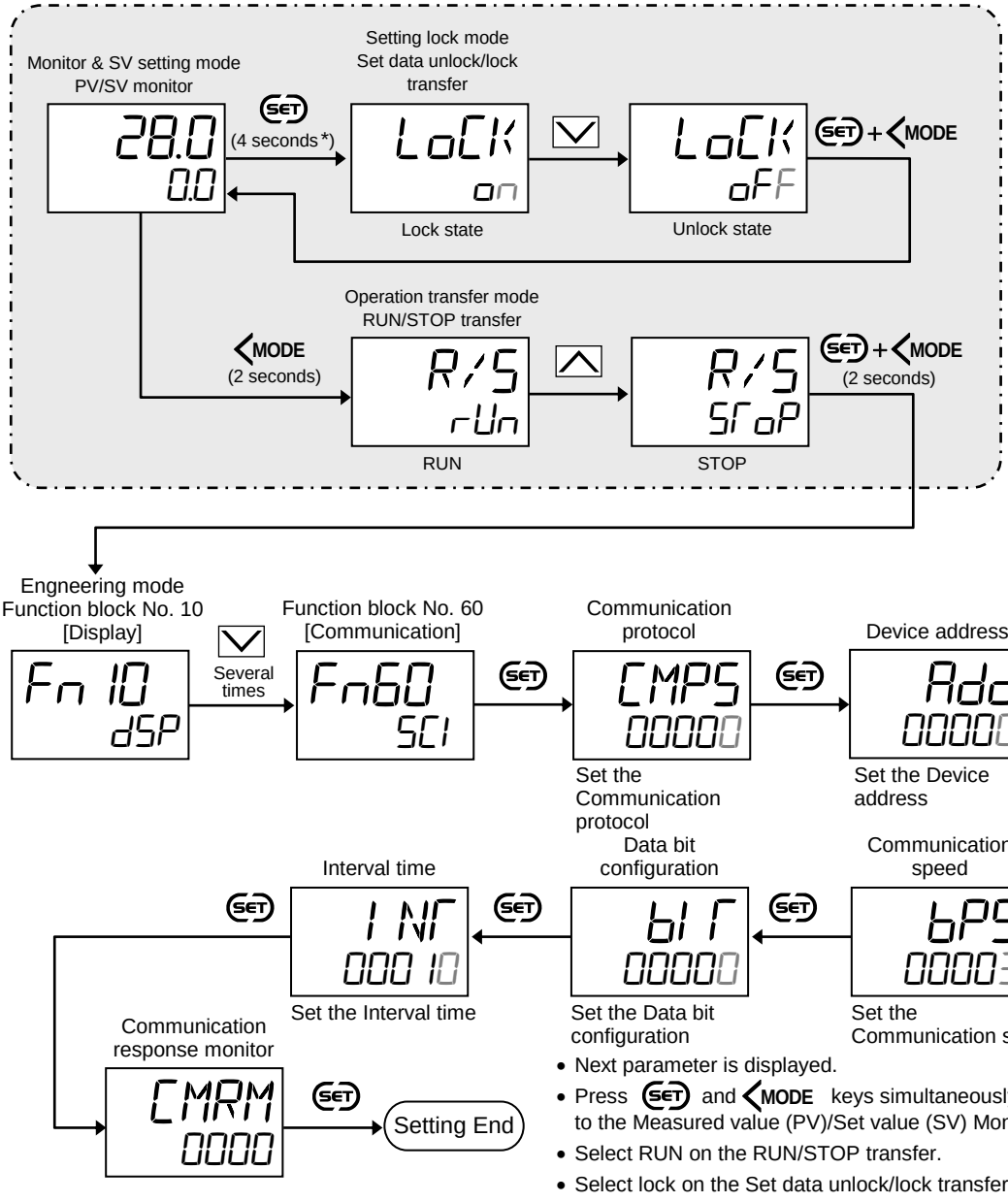
Set value change and registration

- The flashing digit indicates which digit can be set. Press MODE key to go to a different digit.
- 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 Monitor and SV setting mode. The modified data will not be registered in this case.

■ Setting procedure

* Press the SET key until Parameter setting mode is displayed. Keep pressing without releasing your finger from the key to enter the Setting lock mode.

To enter the Engineering mode



- Next parameter is displayed.
- Press SET and MODE keys simultaneously 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.

3.2 Communication Requirements

■ Processing times during data send/receive

When the host computer is using either the polling or selecting procedure for communication, the following processing times are required for SC-F71 to send data:

- Response wait time after SC-F71 sends BCC in polling procedure
- Response wait time after SC-F71 sends ACK or NAK in selecting procedure

Response send time is time when interval time is set at 0 ms.

Original communication (Polling procedure) processing times

Procedure details	Time
Response send time after SC-F71 receives ENQ	4.48 ms max.
Response send time after SC-F71 receives ACK	4.64 ms max.
Response send time after SC-F71 receives NAK	4.64 ms max.
Response send time after SC-F71 sends BCC	304 µs max.

Original communication (Selecting procedure) processing times

Procedure details	Time
Response send time after SC-F71 receives BCC	150.4 ms max.
Response wait time after SC-F71 sends ACK	276 µs max.
Response wait time after SC-F71 sends NAK	276 µs max.

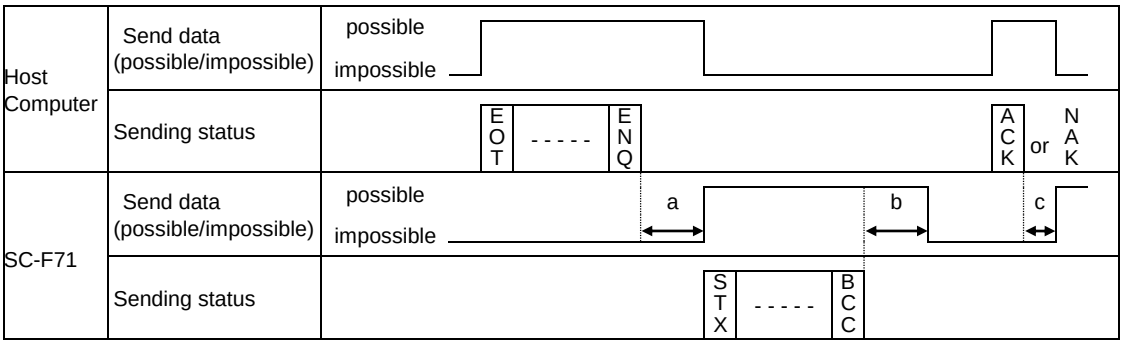
Modbus processing times

Procedure details	Time
Read holding registers [03H] Response send time after the slave receives the query message	14.8 ms max.
Preset single register [06H] Response send time after the slave receives the query message	160 ms max.
Diagnostics (loopback test) [08H] Response send time after the slave receives the query message	14.8 ms max.
Preset multiple registers (Write multiple registers) [10H] Response send time after the slave receives the query message	312 ms max.

■ RS-485 (2-wire system) send/receive timing

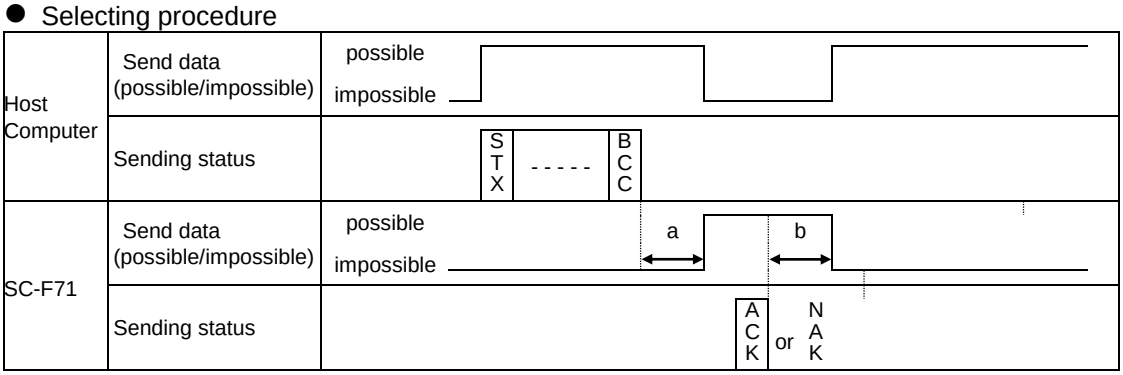
Transmission and reception timing must be determined carefully when the interface of the host computer (master) is RS-485.
RS-485 communication is conducted through a single wire, therefore, the transmission and reception of data requires precise timing.

● Polling procedure



a: Response send time after the SC-F71 receives [ENQ] + Interval time
b: Response send time after the SC-F71 sends BCC
c: Response send time after the SC-F71 receives [ACK] + Interval time or
Response send time after the SC-F71 receives [NAK] + Interval time

● Selecting procedure



a: Response send time after the SC-F71 receives BCC + Interval time
b: Response wait time after the SC-F71 sends ACK or Response wait time after the SC-F71 sends NAK

📖 To switch the host computer from transmission to reception, send data must be on line.

📖 The following processing times are required for the SC-F71 to process data:
- In polling procedure, Response wait time after the SC-F71 sends BCC
- In selecting procedure, Response wait time after the SC-F71 sends ACK or NAK

■ Fail-safe

A transmission error may occur if the transmission line is disconnected, shorted or set to the high-impedance state. In order to prevent the above error, it is recommended that the fail-safe function be provided on the receiver side of the host computer. The fail-safe function can prevent a framing error from its occurrence by making the receiver output stable to the MARK (1) when the transmission line is in the high-impedance state.

4. Original Communication Protocol

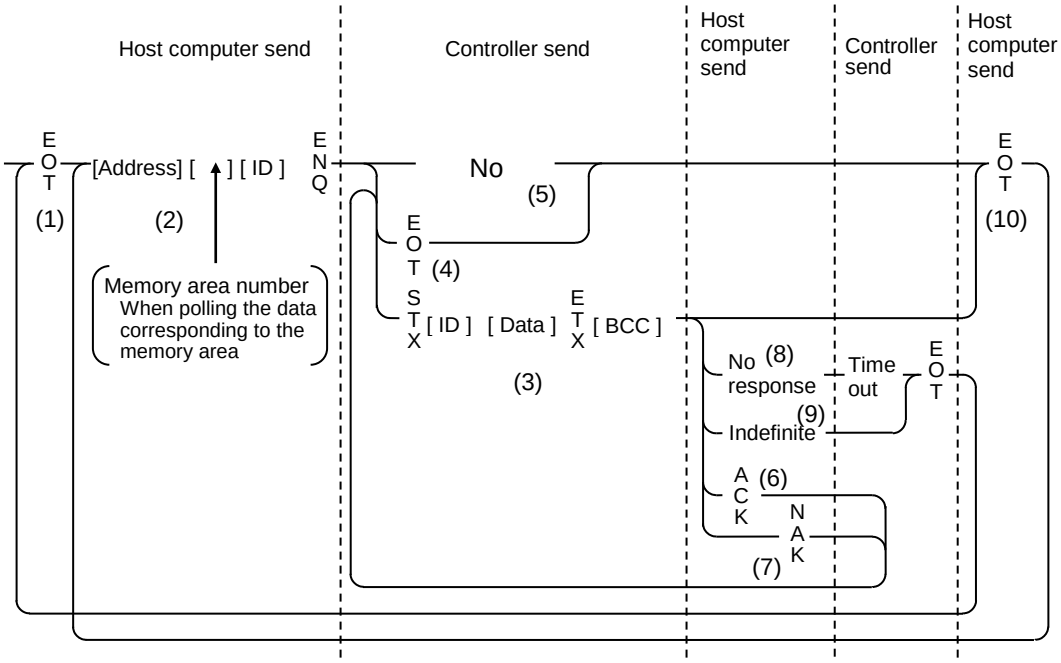
This chapter describes the original communication protocol.
The original communication uses the Polling/Selecting method to establish a data link. The basic procedure follows ANSI X3.28-1976 subcategories 2.5 and A4 basic mode data transmission control procedure (Fast selecting is the selecting method used in this controller). In this chapter the SC-F71 is referred to as the controller.

- The Polling/Selecting procedures are a centralized control method where the host computer controls the entire process. The host computer initiates all communication so the controller responds according to queries and commands from the host.
- The code used in communication is 7-bit ASCII code including transmission control characters. The transmission control characters are EOT (04H), ENQ (05H), ACK (06H), NAK (15H), STX (02H) and ETX (03H). The figures in the parentheses indicate the corresponding hexadecimal number.

Data send/receive state (communication data monitoring and setting) of original communication can be checked by using the following software:
Communication Tool “PROTEM-T”
PROTEM-T will be available on the TLV website: https://www.tlv.com

4.1 Polling

Polling is the action where the host computer requests one of the connected controllers to transmit data. An example of the polling procedure is shown below:



ID: Identifier

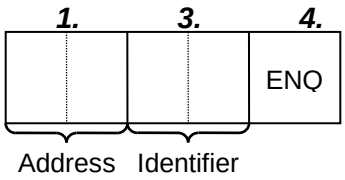
4.1.1 Polling procedures

(1) Data link initialization
Host computer sends EOT to the controllers to initiate data link before polling sequence.

(2) Data sent from host computer - Polling sequence
The host computer sends the polling sequence in the following two types of formats:
- Format in which no Memory area number is specified, and
- Format in which the Memory area number is specified.

■ When no Memory area number is specified

To be sent in this format for any identifier not corresponding to the memory area.

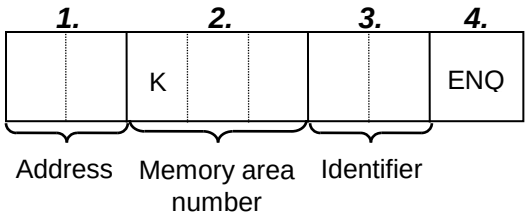


Example:

0	1	M	1	ENQ

■ When the Memory area number is specified

To be sent in this format for any identifier corresponding to the memory area.



Example:

0	1	K	1	0	S	1	ENQ

1. Address (2 digits)
The device address specifies the controller to be polled and each controller must have its own unique device address.
This data is a device address of the controller to be selected and must be the same as the device address set value in item 3. Parameter Setting.

📖 The polling address which transmitted a message once becomes effective so long as data link is not initialized by transmit and receive of EOT.

2. Memory area number (3 digits)
This is the identifier to specify the Memory area number. It is expressed by K1 to K16 to each Memory area number (from 1 to 16). If the Memory area number is assigned with K0, this represents that Control area is specified.

📖 The memory area now used for control is called Control area.

📖 If the Memory area number is not specified when polling the identifier corresponding to the memory area, this represents that the Control area is specified.

📖 If any identifier not corresponding to the memory area is assigned with a Memory area number, this Memory area number is ignored.

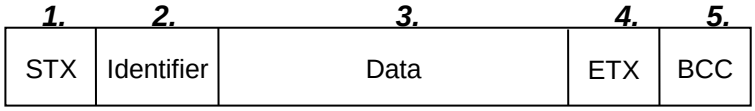
3. Identifier (2 digits)
The identifier specifies the type of data that is requested from the controller. Always attach the ENQ code to the end of the identifier.

☞ Refer to 6.3 Original Communication/Modbus Data for details.

4. ENQ
The ENQ is the transmission control character that indicates the end of the polling sequence. The ENQ must be attached to the end of the identifier. The host computer then must wait for a response from the controller.

(3) Data sent from the controller

If the polling sequence is received correctly, the controller sends data in the following format:



1. STX
STX is the transmission control character which indicates the start of the text transmission (identifier and data).

2. Identifier (2 digits)
The identifier indicates the type of data (measured value, status and set value) sent to the host computer.

☞ Refer to 6.3 Original Communication/Modbus Data for details.

3. Data (7 digits)
Data which is indicated by an identifier of the controller. It is expressed in decimal ASCII code including a minus sign (-) and a decimal point. Data is not zero-suppressed.

📖 The following items have the data length (in digits) as follows.
- Instrument serial number monitor (Identifier RX): 10 digits
- Product identification code monitor (Identifier ID): 32 digits

📖 Memory area soak time monitor and Area soak time become the following data:
- When data range is 0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds:
  Data range is 0:00:00 to 9:59:59, punctuation of time unit is expressed in colon ": (3AH)."
- When data range is 0 hour 00 minute to 99 hours 59 minutes:
  Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon ": (3AH)."
- When data range is 0 minute 00 second to 199 minutes 59 seconds:
  Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon ": (3AH)."

4. ETX
ETX is a transmission control character used to indicate the end of text transmission.

5. BCC
BCC (Block Check Character) detects error by using horizontal parity (even number).
Calculation method of BCC: *Exclusive OR* all data and characters from STX through ETX, not including STX.

Example:

STX	M	1	0	0	1	0	0	.	0	ETX	BCC
	4DH	31H	30H	30H	31H	30H	30H	2EH	30H	03H	← Hexadecimal numbers

BCC = DH ⊕ 31H ⊕ 30H ⊕ 30H ⊕ 31H ⊕ 30H ⊕ 30H ⊕ 2EH ⊕ 30H ⊕ 03H = 50H

(⊕: *Exclusive OR*)

Value of BCC becomes 50H.

(4) EOT sent from the controller (Ending data transmission from the controller)
In the following cases, the controller sends EOT to terminate the data link:
- When the specified identifier is invalid
- When there is an error in the data type
- When data is not sent from the host computer even if the data link is initialized
- When all the data has been sent

(5) No response from the controller
The controller will not respond if the polling address is not received correctly. It may be necessary for the host computer to take corrective action such as a time-out.

(6) ACK (Acknowledgment)
An acknowledgment ACK is sent by the host computer when data received is correct. When the controller receives ACK from the host computer, the controller will send any remaining data of the next identifier without additional action from the host computer.
When the host computer determines to terminate the data link, EOT is sent from the host computer.

☞ For the identifier, refer to 6.3 Original Communication/Modbus Data.

(7) NAK (Negative acknowledge)

If the host computer does not receive correct data from the controller, it sends a negative acknowledgment NAK to the controller. The controller will re-send the same data when NAK is received. This cycle will go on continuously until either recovery is achieved or the data link is corrected at the host computer.

(8) No response from host computer
When the host computer does not respond within approximately three seconds after the controller sends data, the controller sends EOT to terminate the data link. (Time out: 3 seconds)

(9) Indefinite response from host computer
The controller sends EOT to terminate the data link when the host computer response is indefinite.

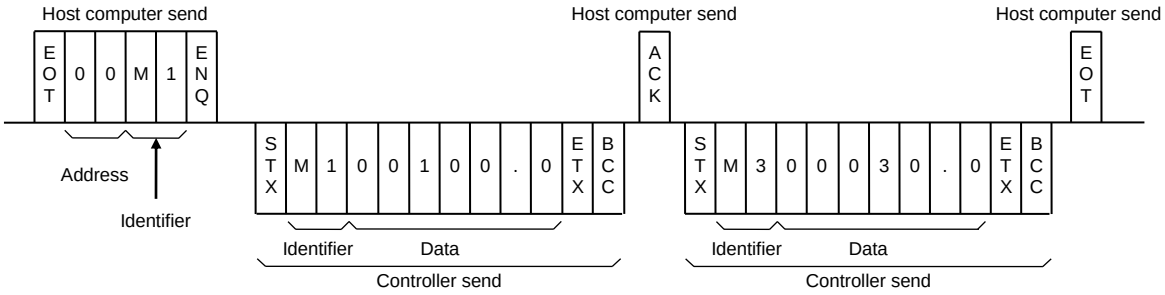
(10) EOT (Data link termination)
The host computer sends EOT message when it is necessary to suspend communication with the controller or to terminate the data link due to lack of response from the controller.

4.1.2 Polling procedure example

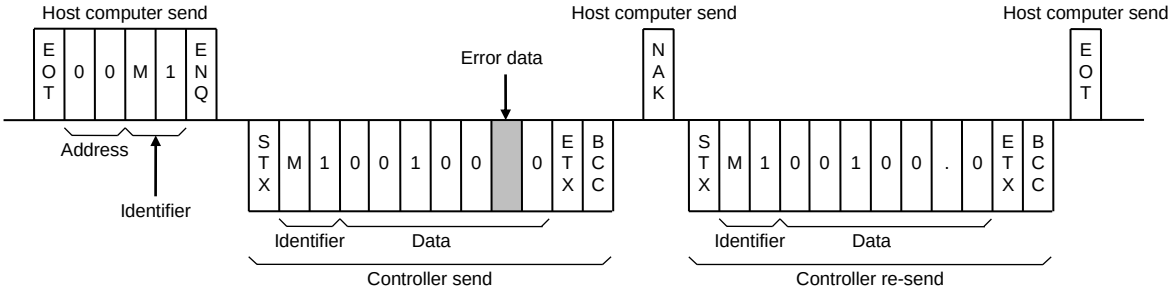
(1) When the monitored items are polled

[Example: Input 1_Measured value (PV) M1]

■ Normal transmission

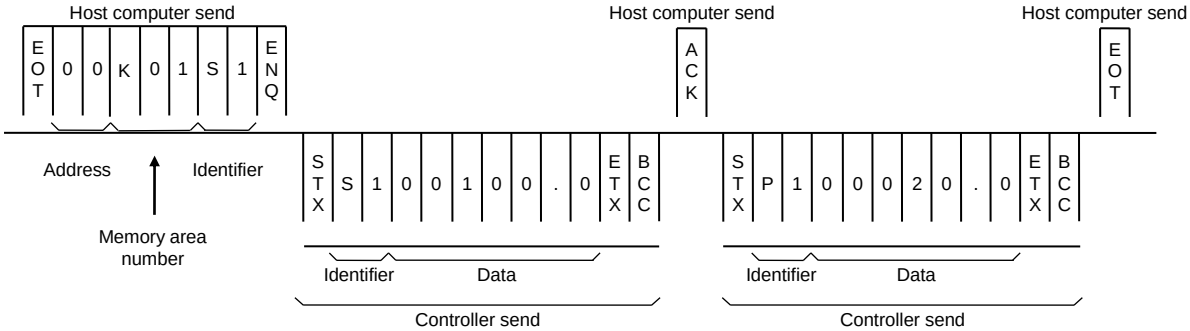


■ Error transmission

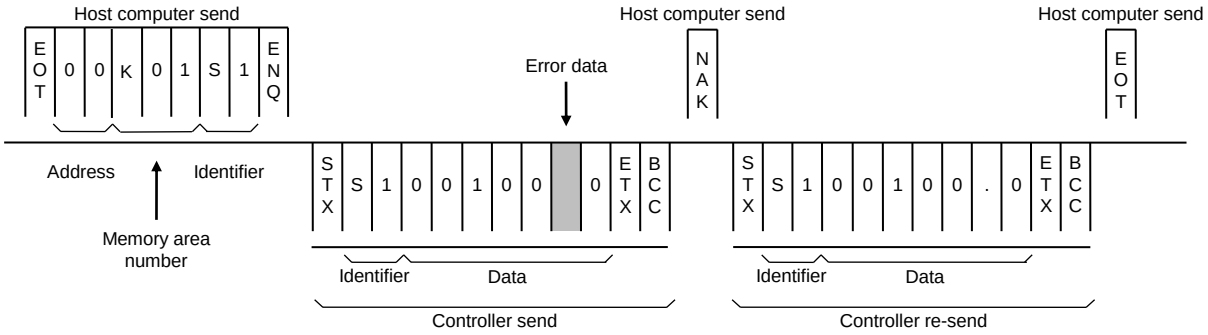


(2) When the items corresponding to the memory area are polled
[Example: Input 1_Set value (SV) S1]

■ Normal transmission

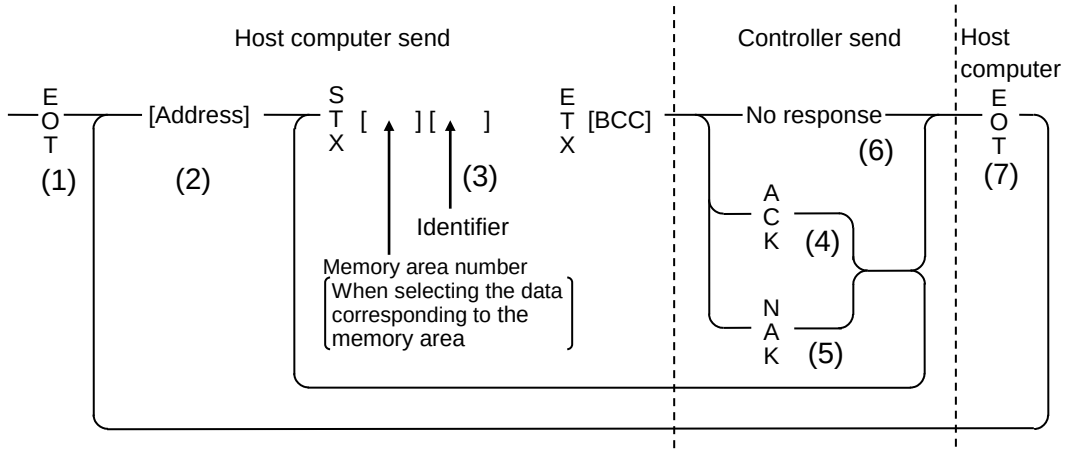


■ Error transmission



4.2 Selecting

Selecting is the action where the host computer requests one of the connected controllers to receive data. An example of the selecting procedure is shown below:



4.2.1 Selecting procedures

(1) Data link initialization
Host computer sends EOT to the controllers to initiate data link before selecting sequence.

(2) Sending selecting address from the host computer
Host computer sends selecting address for the selecting sequence.

■ Address (2 digits)

This data is a device address of the controller to be selected and must be the same as the device address set value in item 3. Parameter Setting.

As long as the data link is not initialized by sending or receiving EOT, the selecting address once sent becomes valid.

(3) Data sent from the host computer

The host computer sends data for the selecting sequence with the following format:

■ When no memory area number is specified

	2.	***3.***		
STX	Identifier	Data	ETX	BCC

■ When the memory area number is specified

	1.	***2.***	***3.***		
STX	Memory area number	Identifier	Data	ETX	BCC

☞ Refer to 4.1 Polling for the STX, ETX and BCC.

1. Memory area number (3 digits)
This is the identifier to specify the Memory area number. It is expressed by K1 to K16 to each Memory area number (from 1 to 16). If the Memory area number is

assigned with K0 this represents that Control area is specified.

The memory area now used for control is called Control area.

If the Memory area number is not specified when selecting the identifier corresponding to the memory area, selecting is made to the memory area.

If any identifier not corresponding to the memory area is assigned with a Memory area number, this Memory area number is ignored.

2. Identifier (2 digits)
The identifier specifies the type of data that is requested from the controller, such as set value.

Refer to 6.3 Original Communication/Modbus Data for details.

3. Data
Data which is indicated by an identifier of the controller is expressed in decimal ASCII code including a minus sign (-) and a decimal point. The channel number can be zero-suppressed.
Number of digits: 7

Memory area soak time monitor and Area soak time become the following data:

- When data range is 0 hour 00 minute 00 second to 9 hours 59 minutes 59 seconds:
  Data range is 0:00:00 to 9:59:59, punctuation of time unit is expressed in colon ": (3AH)."
- When data range is 0 hour 00 minute to 99 hours 59 minutes:
  Data range is 0:00 to 99:59, punctuation of time unit is expressed in colon ": (3AH)."
- When data range is 0 minute 00 second to 199 minutes 59 seconds:
  Data range is 0:00 to 199:59, punctuation of time unit is expressed in colon ": (3AH)."
  In addition to above, when minute and second data are set in more than 60, become as the following:

  Example: 1:65 (1 hour 65 minutes) → 2:05 (2 hours 05 minutes)
  0:65 (0 minute 65 seconds) → 1:05 (1 minute 05 seconds)

- About numerical data

Receivable data

- The controller can receive zero-suppressed data and whole number data (data without decimal fraction). Number of digits vary depends on the identifier. (Number of digits must be up to 7 digits.)
  <Example> Even if the data -1.5 is sent by the host as -001.5, -01.5, -1.5, -1.50, -1.500, the controller receives the data as -1.5.
- When the host computer sends data containing a decimal point to the item without a decimal point, the controller receives a message with the value that is cut off below the decimal point.
  <Example> When setting range is 0 to 200, the controller will receive as follows:

Send data	0.5	100.5
Receive data	0	100

- The controller receives a value truncated to a specified number of decimal places. The digits smaller than that will be cut off.

<Example> When setting range is -10.00 to +10.00, the controller will receives as follows:

Send data	-.5	-.058	.05	-0
Receive data	-0.50	-0.05	0.05	0.00

Unreceivable data

The controller sends NAK when the host computer receives a following data.

+	Plus sign and data with a plus sign
-	Only minus sign (without a number)
.	Only decimal point (period)
-.	Only minus sign and a decimal point

(4) ACK (Acknowledgment)
An acknowledgment ACK is sent by the controller when data received is correct. When the host computer receives ACK from the controller, the host computer will send any remaining data. If there is no more data to be sent to the controller, the host computer sends EOT to terminate the data link.

(5) NAK (Negative acknowledge)
If the controller does not receive correct data from the host computer, it sends a negative acknowledgment NAK to the host computer. Corrections, such as re-send, must be made at the host computer. The controller will send NAK in the following cases:
- When an error occurs on communication the line (parity, framing error, etc.)
- When a BCC check error occurs
- When the specified identifier is invalid
- When receive data exceeds the setting range
- When receive data is the identifier of RO (read only)

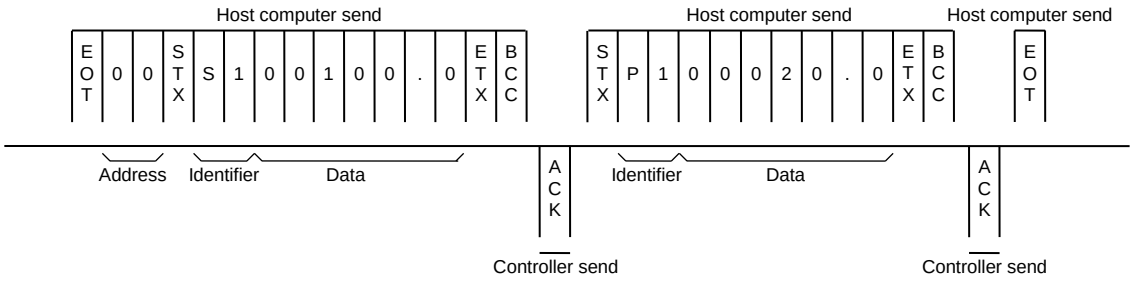
(6) No response from controller
The controller does not respond when it cannot receive the selecting address, STX, ETX or BCC.

(7) EOT (Data link termination)
The host computer sends EOT when there is no more data to be sent from the host computer or there is no response from the controller.

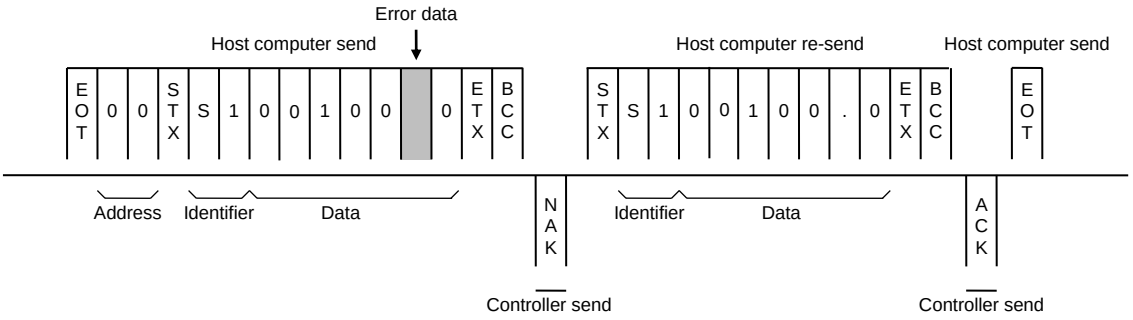
4.2.2 Selecting procedure example

(1) When the items corresponding to the Control area are selected
[Example: Input 1_Set value (SV) S1]

■ Normal transmission

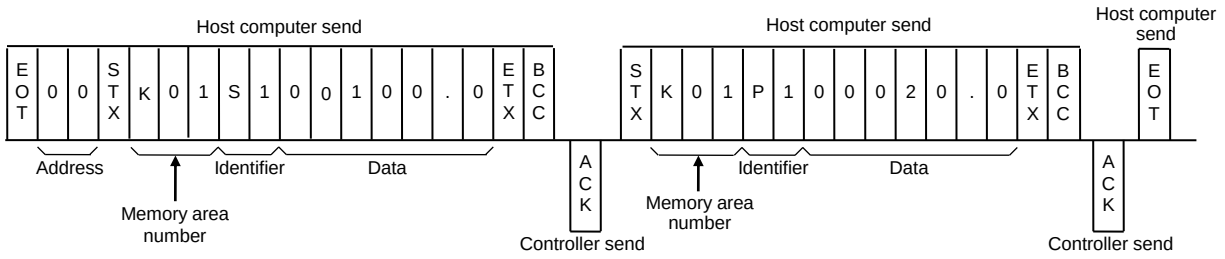


■ Error transmission

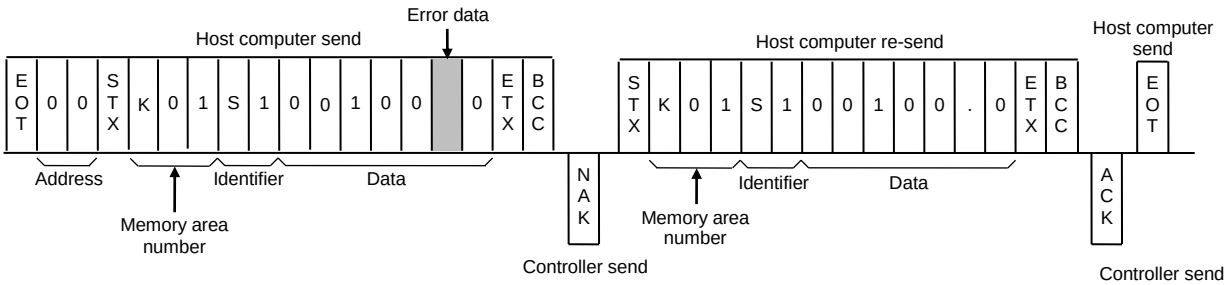


(2) When the items corresponding to the memory area are selected
[Example: Input 1_Set value (SV) S1]

■ Normal transmission



■ Error transmission



5. Modbus Protocol

This chapter describes the Modbus protocol.

In this chapter the host computer and SC-F71 are referred to as master and slave respectively.

The master controls communication between master and slave. A typical message consists of a request (query message) sent from the master followed by an answer (response message) from the slave. When master begins data transmission, a set of data is sent to the slave in a fixed sequence. When it is received, the slave decodes it, takes the necessary action, and returns data to the master.

📖 Data send/receive state (communication data setting) of Modbus can be checked by using the following software:
Communication Tool “PROTEM-T”
PROTEM-T will be available on the TLV website: https://www.tlv.com

5.1 Message Format

The message consists of four parts: slave address, function code, data, and error check code which are always transmitted in the same sequence.

Slave address
Function code
Data
Error check (CRC-16)

Message format

■ Slave address

The slave address is a number from 1 to 99 manually set at the front key panel of the SC-F71.

📖 Master does not communicate with the slave when the address is set to “0.”
☞ Refer to 3. Parameter Setting for details.

Although all connected slave units receive the query message sent from the master, only the slave with the slave address coinciding with the query message will accept the message.

■ Function code

The function codes are the instructions set at the master and sent to the slave describing the action to be executed. The function codes are included when the slave responds to the master.

☞ Refer to 5.2 Function Code for details.

■ Data

The data to execute the function specified by the function code is sent to the slave and corresponding data returned to the master from the slave.

☞ Refer to 5.6 Register Read and Write and 6. Communication Data List for details.

■ Error check

An error checking code (CRC-16: Cyclic Redundancy Check) is used to detect an error in the signal transmission.

☞ Refer to 5.5 Calculating CRC-16 for details.

5.2 Function Code

Function code contents

Function code (Hexadecimal)	Function	Contents
03H	Read holding registers	Measured (PV) value monitor, Event state monitor, etc.
08H	Diagnostics (loopback test)	loopback test
10H	Preset multiple registers (Write multiple registers)	Set value (SV), Event set value, PID constants, PV bias, etc.

Message length of each function (Unit: byte)

Function code (Hexadecimal)	Function	Query message		Response message	
		Min	Max	Min	Max
03H	Read holding registers	8	8	5	255
08H	Diagnostics (loopback test)	8	8	5	8
10H	Preset multiple registers (Write multiple registers)	11	255	5	8

5.3 Communication Mode

Signal transmission between the master and slaves is conducted in Remote Terminal Unit (RTU) mode.

Items	Contents
Data bit length	8-bit (Binary)
Start mark of message	Unused
End mark of message	Unused
Message length	Refer to 5.2 Function Code
Data time interval	Less than 24-bit time *
Error check	CRC-16 (Cyclic Redundancy Check)

* When sending a command message from the master, set intervals of data configuring one message to time shorter than the 24-bit time. If time intervals become time longer than the 24-bit time the relevant slave assumes that message sending from the master is terminated and there is no response.

5.4 Slave Responses

(1) Normal response

- In the response message of the Read Holding Registers, the slave returns the read out data and the number of data items with the same slave address and function code as the query message.
- In the response message of the Preset Single Register, the slave returns the same message as the query message.
- In the response message of the Diagnostics (Loopback test), the slave returns the same message as the query message.
- In the response message of the Preset Multiple Registers (Write Multiple Registers), the slave returns the slave address, the function code, starting number, and number of holding registers in the multi-query message.

(2) Defective message response

- If the query message from the master is defective, except for transmission error, the slave returns the error response message without any action.

Slave address
Function code
Error code
Error check (CRC-16)

Error response message

- If the self-diagnostic function of the slave detects an error, the slave will return an error response message to all query messages.
- The function code of each error response message is obtained by adding 80H to the function code of the query message.

Error code	Contents
1	Function code error (An unsupported function code was specified)
2	• When the mismatched address is specified. • Address other than 0000H to 00AFH is specified as the starting number.
3	• The maximum number (Read from a read holding resister or write to Preset multiple resisters [Write multiple registers]) has been exceeded. • The setting of the number of data (the number of requested byte) is not set to a double of the requested number of data at the time of “Preset multiple registers (Write multiple registers)”
4	Self-diagnostic error response

(3) No response

The slave ignores the query message and does not respond when:

- The slave address in the query message does not coincide with any slave address settings.
- The CRC code of the master does not coincide with that of the slave.
- Transmission error such as overrun, framing, parity etc., is found in the query message.
- Data time interval in the query message from the master exceeds 24-bit time.

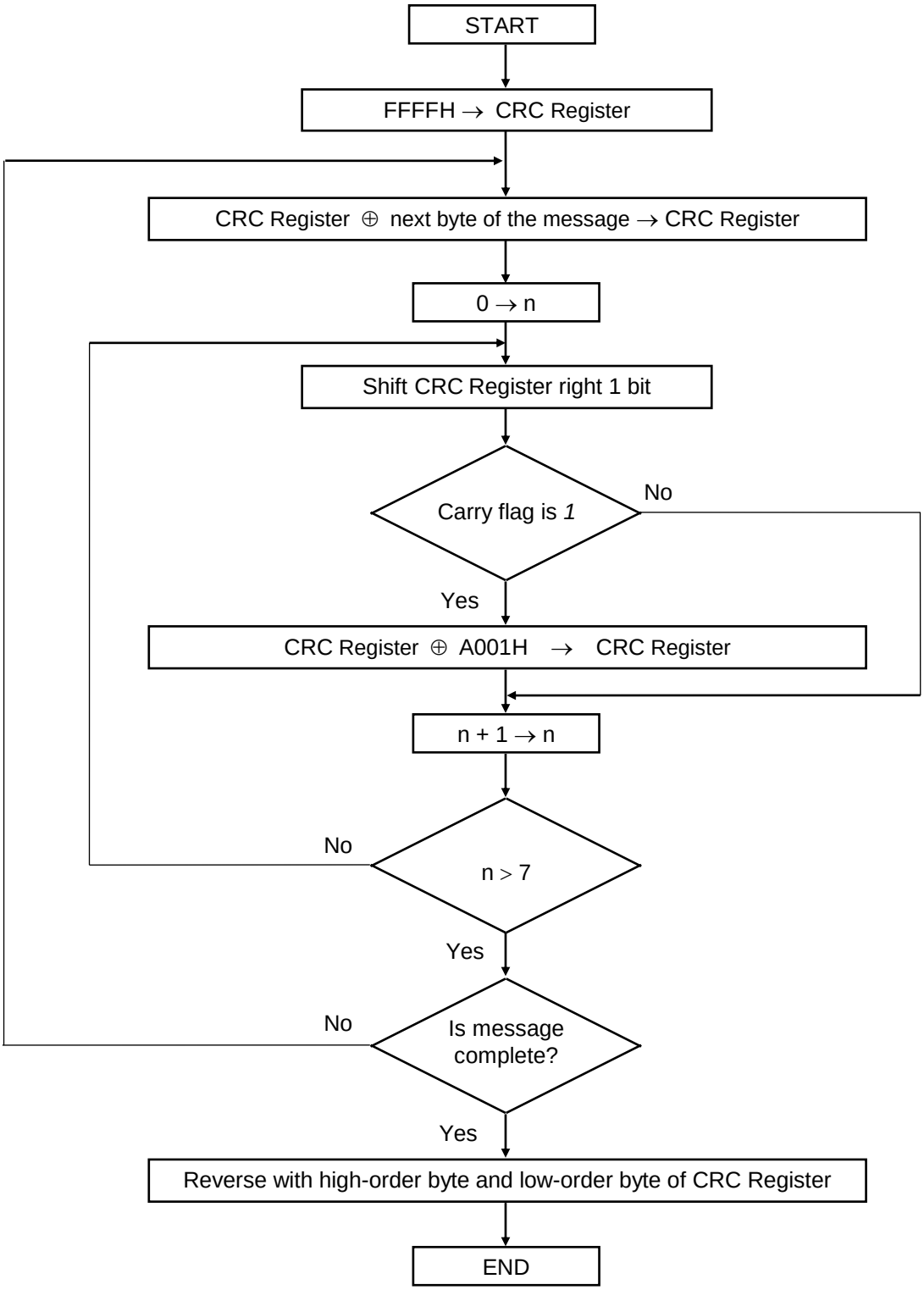
5.5 Calculating CRC-16

A Cyclic Redundancy Check (CRC) is a 2 byte (16-bit) error-detecting code. A transmission device calculates the CRC code after constructing the data message and appends the result of the calculation to the end of the message. The CRC code can be calculated for the slave address, function code, and data (or error code in the case of an error response). The start, stop, and parity bits are not included in the calculation. The reception device calculates the CRC code from the received message in the same way as on the transmission device side. If this CRC code calculated on the reception side and the transmitted CRC code do not match, the reception side ignores the received message (no response is sent).

The CRC code is formed in the following sequence:

1. Load FFFFH to a 16-bit CRC register.
2. Exclusive OR (⊕) the first byte (8 bits) of the message with the CRC register. Return the result to the CRC register.
3. Shift the CRC register 1 bit to the right.
4. If the carry flag is 1, exclusive OR the CRC register with A001 hexadecimal and return the result to the CRC register. If the carry flag is 0, repeat step 3.
5. Repeat step 3 and 4 until there have been 8 shifts.
6. Exclusive OR the next byte (8 bits) of the message with the CRC register.
7. Repeat step 3 through 6 for all bytes of the message (except the CRC).
8. The CRC register contains the 2 byte CRC error code. When they are appended to the message, the low-order byte is appended first, followed by the high-order byte.

CRC-16 Flowchart



n: number of shift

The ⊕ symbol indicates an exclusive OR operation. The symbol for the number of data bits is n.

■ Example of a CRC calculation in the ‘C’ language

This routine assumes that the data types ‘uint16’ and ‘uint8’ exist. These are unsigned 16-bit integer (usually an ‘unsigned short int’ for most C compilers) and unsigned 8-bit integer (unsigned char). ‘z_p’ is a pointer to a Modbus message, and ‘z_message_length’ is its length, excluding the CRC. Note that the Modbus message will probably contain NULL characters and so normal C string handling techniques will not work.

```
uint16 calculate_crc (unit8 *z_p, unit16 z_message_length)

/* CRC runs cyclic Redundancy Check Algorithm on input z_p   */
/* Returns value of 16 bit CRC after completion and          */
/* always adds 2 crc bytes to message                        */
/* returns 0 if incoming message has correct CRC             */
{
    uint16 CRC= 0xffff;
    uint16 next;
    uint16 carry;
    uint16 n;
    uint8 crch, crcl;

    while (z_message_length--) {
        next = (uint16) *z_p;
        CRC ^= next;
        for (n = 0; n < 8; n++) {
              carry = CRC & 1;
              CRC >>= 1;
              if (carry) {
                  CRC ^= 0xA001;
              }
        }
        z_p++;
  }
  crch = CRC / 256;
  crcl = CRC % 256
  z_p [z_message_length++] = crcl;
  z_p [z_message_length] = crch;
  return CRC;
}
```

5.6 Register Read and Write

■ Read holding registers [03H]

The query message specifies the starting register address and quantity of registers to be read. The contents of the holding registers are entered in the response message as data, divided into two parts: the high-order 8-bit and the low-order 8-bit, arranged in the order of the register numbers.

Example: The contents of the four holding registers from 0000H to 0003H are the read out from slave address 2.

Query message

Slave address		02H	
Function code		03H	
Starting number	High	00H	First holding register address
	Low	00H	
Quantity	High	00H	The setting must be between 1 (0001H) and 62 (003EH).
	Low	04H	
CRC-16	High	44H	
	Low	3AH	

Normal response message

Slave address		02H	
Function code		03H	
Number of data		08H	→ Number of holding registers × 2
First holding register contents (Low-order word of the first data)	High	00H	
	Low	62H	
Next holding register contents (High-order word of the first data)	High	00H	
	Low	00H	
Next holding register contents (Low-order word of the next data)	High	00H	
	Low	14H	
Next holding register contents (High-order word of the next data)	High	00H	
	Low	00H	
CRC-16	High	99H	
	Low	51H	

Error response message

Slave address		02H
80H + Function code (+ denotes a logical add)		83H
Error code		03H
CRC-16	High	F1H
	Low	31H

■ Diagnostics (Loopback test) [08H]

The master's query message will be returned as the response message from the slave. This function checks the communication system between the master and slave.

Example: Loopback test for slave address 1

Query message

Slave address		01H
Function code		08H
Test code	High	00H
	Low	00H
Data	High	1FH
	Low	34H
CRC-16	High	E9H
	Low	ECH

Test code must be set to “00.”

Any pertinent data

Normal response message

Slave address		01H
Function code		08H
Test code	High	00H
	Low	00H
Data	High	1FH
	Low	34H
CRC-16	High	E9H
	Low	ECH

Contents will be the same as query message data.

Error response message

Slave address		01H
80H + Function code (+ denotes a logical add)		88H
Error code		03H
CRC-16	High	06H
	Low	01H

■ Preset multiple registers (Write multiple registers) [10H]

The query message specifies the starting register address and quantity of registers to be written. The write data is arranged in the query message with high-order 8-bit first and low-order 8-bit next. Only R/W holding registers can be specified.

Example: Data is written into the two holding registers from 0070H to 0071H of slave address 1.

Query message

Slave address		01H
Function code		10H
Starting number	High	00H
	Low	70H
Quantity	High	00H
	Low	02H
Number of data		04H
Data to first register	High	00H
	Low	01H
Data to next register	High	00H
	Low	00H
CRC-16	High	A5H
	Low	4BH

First holding register number (address)

Set a register address within the following range: 1 to 61 (0001H to 003DH)

→ Number of holding registers × 2

Any pertinent data

Normal response message

Slave address		01H
Function code		10H
Starting number	High	00H
	Low	70H
Quantity	High	00H
	Low	02H
CRC-16	High	40H
	Low	13H

Error response message

Slave address		01H
80H + Function code (+ denotes a logical add)		90H
Error code		02H
CRC-16	High	CDH
	Low	C1H

5.7 Caution for Handling Communication Data

- The numeric range of data used in Modbus protocol is 0000H to FFFFH. Only the set value within the setting range is effective.

📖 FFFFH represents -1.

- The Modbus protocol does not recognize data with decimal points during communication.

  Example 1: When Input 1_Manipulated output value monitor [heat-side] is 5.0%, 5.0 is processed as 50, 50 = 0032H.

Input 1_Manipulated output value	High	00H
monitor [heat-side]	Low	32H

  Example 2: When Input 1_Set value (SV) is -20.0 °C, -20.0 is processed as -200, -200 = 0000H - 00C8H = FF38H.

Input 1_Set value (SV)	High	FFH
	Low	38H

- In our communication a variable is handled described as below.
  - The variable is handled as 4-byte data.
  - One variable use two register addresses (Address of high-order word, Address of low-order word).
  - To Read/Write two-word data is implemented from the low-order word to the high-order word or from the high-order word to the low-order word.

☞ The data transfer sequence is selectable at “Communication protocol” in the Engineering mode. Refer to 3.1 Setting of Communication Parameter for the Communication protocol.

- There are the following constraints in writing data in order to treat variables as 4-byte data.
  - It is not possible to write only high-order words. The communication response is normal, but is not written.
  - Writing only low-order words results in sign extension.
    Example 1: When did a writing only of “0020H” in low-order word.
    The controller interprets high-order word as “0000H.”
    Example 2: When did a writing only of “FFFFH (-1)” in low-order word.
    The controller interprets high-order word as “FFFFH.”
- In this communication, the variables that memory area includes handle different address with for control area and for setting area.
- If data (holding register) exceeding the accessible address range is accessed, an error response message is returned.
- Read data of unused item is “0.”
- Any attempt to write to an unused item is not processed as an error. Data cannot be written into an unused item.
- If data range error occurs during data writing (Write Action), it is not processed as an error. Normal data is written in data register but data with error is not written; therefore, it is recommended to confirm data of changed items after the data setting.
- Communication items not existing in the product because of the specifications are handled as “0” when the data is read in. If write action to this item is performed, no error message is indicated and no data is written.
- Commands should be sent at time intervals of 24 bits after the master receives the response message.

5.8 How to use Modbus data mapping

Data mapping function enables the data that needs to be constantly monitored to be mapped into the specified address area.
Up to 32 communication data can be assigned to the register address in the following table used to actually read the data from/write the data to.

Register address specifying the mapping data	HEX: 1000H to 103FH DEC: 4096 to 4159
Register address actually read from/write to	HEX: 1500H to 153FH DEC: 5376 to 5439
Register address of the mappable data	Refer to 6.3.1 Communication data [Original communication identifier/Modbus].

☞ Refer to the 6.3.3 Data mapping address.

Example: When the data is read in double-word

Data to be mapped: Input 1_Measured value (PV), Input 1_Manipulated output value monitor [heat-side], Event 1 state monitor, Event 2 state monitor

1. Write register addresses of mapping data to register address setting from 1 (1000H, 1001H) to 4 (1006H, 1007H).

Data to be mapped

Name	Register address			
	HEX		DEC	
	Low-order	High-order	Low-order	High-order
Input 1_Measured value (PV)	0000	0001	0	1
Input 1_Manipulated output value monitor [heat-side]	000E	000F	14	15
Event 1 state monitor	001E	001F	30	31
Event 2 state monitor	0020	0021	32	33

Write register address to be mapped to the register address for the designation of data

Register address for data designation

Name	Register address				Setting data
	HEX		DEC		
	Low-order	High-order	Low-order	High-order	
Register address setting 1 [Read/write address: Low-order word 1500H, high-order word 1501H]	1000	1001	4096	4097	Low-order word: 0000H High-order word: 0001H
Register address setting 2 [Read/write address: Low-order word 1502H, high-order word 1503H]	1002	1003	4098	4099	Low-order word: 000EH High-order word: 000FH
Register address setting 3 [Read/write address: Low-order word 1504H, high-order word 1505H]	1004	1005	4100	4101	Low-order word: 001EH High-order word: 001FH
Register address setting 4 [Read/write address: Low-order word 1506H, high-order word 1507H]	1006	1007	4102	4103	Low-order word: 020H High-order word: 0021H

The table below shows the assignment of read/write register addresses 1500H to 1507H by the above mapping.

Register address				Name
HEX		DEC		
Low-order	High-order	Low-order	High-order	
1500	1501	5376	5377	Input 1_Measured value (PV)
1502	1503	5378	5379	Input 1_Manipulated output value monitor [heat-side]
1504	1505	5380	5381	Event 1 state monitor
1506	1507	5382	5383	Event 2 state monitor

2. Reads out the mapping data by following order message.

Slave address		02H
Function code		03H
Starting number	High	15H
	Low	00H
Quantity	High	00H
	Low	04H
CRC-16	High	40H
	Low	36H

First holding register address (1500H)

Number of data (4)

5.9 How to Use Memory Area Data

Memory area function can store up to 16 individual sets of SVs and parameters. One of the areas is used for control, and the currently selected area is Control area. Memory area data can be used to check and change settings that belong to memory areas other than the Control area.

5.9.1 Read and write of memory area data

There are two types of methods for reading from and writing to the Memory area.

Memory area number	Register address of Memory area			
	HEX		DEC	
	Low-order	High-order	Low-order	High-order
Memory area 1	0500 ⋮ 0564 0B60 ⋮ 0B6A	0501 ⋮ 0565 0B61 ⋮ 0B6B	1280 ⋮ 1380 2912 ⋮ 2922	1281 ⋮ 1381 2913 ⋮ 2923
Memory area 2	0566 ⋮ 05CA 0B6C ⋮ 0B76	0567 ⋮ 05CB 0B6D ⋮ 0B77	1382 ⋮ 1482 2924 ⋮ 2934	1383 ⋮ 1483 2925 ⋮ 2935
Memory area 3	05CC ⋮ 0630 0B78 ⋮ 0B82	05CD ⋮ 0631 0B79 ⋮ 0B83	1484 ⋮ 1584 2936 ⋮ 2946	1485 ⋮ 1585 2937 ⋮ 2947
Memory area 4	0632 ⋮ 0696 0B84 ⋮ 0B8E	0633 ⋮ 0697 0B85 ⋮ 0B8F	1586 ⋮ 1686 2948 ⋮ 2958	1587 ⋮ 1687 2949 ⋮ 2959
Memory area 5	0698 ⋮ 06FC 0B90 ⋮ 0B9A	0699 ⋮ 06FD 0B91 ⋮ 0B9B	1688 ⋮ 1788 2960 ⋮ 2970	1689 ⋮ 1789 2961 ⋮ 2971
Memory area 6	06FE ⋮ 0762 0B9C ⋮ 0BA6	06FF ⋮ 0763 0B9D ⋮ 0BA7	1790 ⋮ 1890 2972 ⋮ 2982	1791 ⋮ 1891 2973 ⋮ 2983
Memory area 7	0764 ⋮ 07C8 0BA8 ⋮ 0BB2	0765 ⋮ 07C9 0BA9 ⋮ 0BB3	1892 ⋮ 1992 2984 ⋮ 2994	1893 ⋮ 1993 2985 ⋮ 2995

Memory area 8	07CA ⋮ 082E 0BB4 ⋮ 0BBE	07CB ⋮ 082F 0BB5 ⋮ 0BBF	1994 ⋮ 2094 2996 ⋮ 3006	1995 ⋮ 2095 2997 ⋮ 3007
Memory area 9	0830 ⋮ 0894 0BC0 ⋮ 0BCA	0831 ⋮ 0895 0BC1 ⋮ 0BCB	2096 ⋮ 2196 3008 ⋮ 3018	2097 ⋮ 2197 3009 ⋮ 3019
Memory area 10	0896 ⋮ 08FA 0BCC ⋮ 0BD6	0897 ⋮ 08FB 0BCD ⋮ 0BD7	2198 ⋮ 2298 3020 ⋮ 3030	2199 ⋮ 2299 3021 ⋮ 3031
Memory area 11	08FC ⋮ 0960 0BD8 ⋮ 0BE2	08FD ⋮ 0961 0BD9 ⋮ 0BE3	2300 ⋮ 2400 3032 ⋮ 3042	2301 ⋮ 2401 3033 ⋮ 3043
Memory area 12	0962 ⋮ 09C6 0BE4 ⋮ 0BEE	0963 ⋮ 09C7 0BE5 ⋮ 0BEF	2402 ⋮ 2502 3044 ⋮ 3054	2403 ⋮ 2503 3045 ⋮ 3055
Memory area 13	09C8 ⋮ 0A2C 0BF0 ⋮ 0BFA	09C9 ⋮ 0A2D 0BF1 ⋮ 0BFB	2504 ⋮ 2604 3056 ⋮ 3066	2505 ⋮ 2605 3057 ⋮ 3067
Memory area 14	0A2E ⋮ 0A92 0BFC ⋮ 0C06	0A2F ⋮ 0A93 0BFD ⋮ 0C07	2606 ⋮ 2706 3068 ⋮ 3078	2607 ⋮ 2707 3069 ⋮ 3079
Memory area 15	0A94 ⋮ 0AF8 0C08 ⋮ 0C12	0A95 ⋮ 0AF9 0C09 ⋮ 0C13	2708 ⋮ 2808 3080 ⋮ 3090	2709 ⋮ 2809 3081 ⋮ 3091
Memory area 16	0AFA ⋮ 0B5E 0C14 ⋮ 0C1E	0AFB ⋮ 0B5F 0C15 ⋮ 0C1F	2810 ⋮ 2910 3092 ⋮ 3102	2811 ⋮ 2911 3093 ⋮ 3103

☞ For the memory area data list, refer to the 6.3.2 Memory area data.

☞ The memory area data is used in three groups for the Level PID. Refer to the SC-F71 Instruction Manual [Parameters/Functions] (172-65710M) for details of Level PID.

5.9.2 Control area transfer

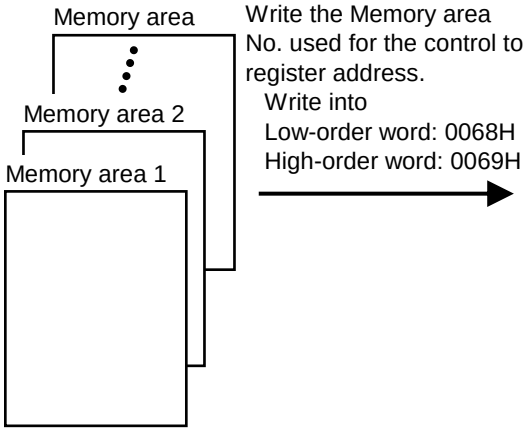
Any memory area used for control is specified by the Memory area transfer. The area now used for control is called Control area.

(HEX:, DEC:)

	Hexadecimal number	Decimal number
Memory area transfer	Low-order word: 0068H High-order word: 0069H	Low-order word: 104 High-order word: 105
Control area (Area now used for control)	0082H to 00E7H	130 to 231

☞ Refer to the 6.3.1 Communication data [Original communication identifier/ Modbus] for the conrol area data list.

📖 The Memory area number (Control area) can be changed at either RUN or STOP.



Data corresponding to a specified Memory area number is called up to the register addresses from 0082H to 00E7H

Name	HEX	
	Low-order	High-order
Input 1_Set value (SV)	0082	0083
Input 2_Set value (SV)	0084	0085
Set value (SV) of differential temperature input	0086	0087
Event 1 set value (EV1)	0088	0089
Event 1 set value (EV1') [low]	008A	008B
Event 2 set value (EV2)	008C	008D
Event 2 set value (EV2') [low]	008E	008F
Event 3 set value (EV3)	0090	0091
Event 3 set value (EV3') [low]	0092	0093
Event 4 set value (EV4)	0094	0095
Event 4 set value (EV4') [low]	0096	0097
Input 1_Proportional band [heat-side]	0098	0099
Input 1_Integral time [heat-side]	009A	009B
Input 1_Derivative time [heat-side]	009C	009D
Input 1_Control response parameter	009E	009F
Input 1_Proactive intensity	00A0	00A1
Input 1_Manual reset	00A2	00A3
Input 1_FF amount	00A4	00A5
⋮	⋮	⋮
Remote/Local transfer selection (Area)	00E6	00E7

Example: When performing control by calling up data in Memory area 3

1. The Memory area number, "3" is written to the Memory area transfer (Low-order word: 0068H High-order word: 0069H).
   Data in Memory area 3 is called up to the register addresses from 0082H to 00E7H.
2. Control is performed by using data in the register addresses from 0082H to 00E7H.

6. Communication Data List

This chapter describes communication data.

6.1 Structure of the original communication/Modbus data map

This part describes identifiers in the original communication and register addresses in Modbus data.
The structure of the original communication/Modbus is as follows.

■ Original communication

Monitor items	
Setting items	⇦ The separator position of the continuous [ACK] polling.
PLC communication system data	⇦ The separator position of the continuous [ACK] polling.

■ Modbus

HEX: Hexadecimal number DEC: Decimal number

Register address				Contents
HEX		DEC		
Low-order	High-order	Low-order	High-order	
0000 : 015C	0001 : 015D	0 : 348	1 : 349	Normal setting data Refer to 6.3.1 Communication data [Original communication identifier/Modbus].
015E : 02E4	015F : 02E5	350 : 740	351 : 741	Data in the Engineering mode Refer to 6.3.1 Communication data [Original communication identifier/Modbus.
02E6 : 02F8	02E7 : 02F9	742 : 760	742 : 761	Normal setting data Refer to 6.3.1 Communication data [Original communication identifier/Modbus].
02FA : 0384	02FB : 0385	762 : 900	763 : 901	Data in the Engineering mode Refer to 6.3.1 Communication data [Original communication identifier/Modbus.
0386 : 04FE	0387 : 04FF	902 : 1278	903 : 1279	Unused
0500 : 0C1E	0501 : 0C1F	1280 : 3202	1281 : 3103	Memory area data Refer to 6.3.2 Memory area data (Direct designation method) [Modbus double word].
0C20 : 0FFE	0C21 : 0FFF	3104 : 4094	3105 : 4095	Unused
1000 : 103E	1001 : 103F	4096 : 4158	4097 : 4159	Mapping setting (32) Refer to ■ Register address for data designation of 6.3.3 Data mapping address [Modbus double word].
1040 : 14FE	1041 : 14FF	4160 : 5374	4161 : 5375	Unused
1500 : 153E	1501 : 153F	5376 : 5438	5377 : 5439	Mapping data (32) Refer to ■ Register address for data read/write of 6.3.3 Data mapping address [Modbus double word].

☞ Refer to the 5.8 How to Use Modbus Data Mapping for the Data mapping.
☞ Refer to the 5.9 How to Use Memory Area Data for the Memory area.

6.2 How to read the table

This part describes how to read the data map of 6.3.1 Communication data [Original communication identifier/Modbus].

(1) (2) (3) (4) (5) (6) (7) (8)

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low-order	High-order	Low-order	High-order			
1	Input 1_ Measured value	**M1**	7	0000	0001	0	1	RO	Input 1_Input range low - (5% of input span) to Input 1_Input range high + (5% of input span) [Varies with the setting of the Decimal point position.]	—
2	Input 1_ Set value (SV) monitor	**MS**	7	0002	0003	2	3	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—

(1) No.: Communication data number

(2) Name: Communication data name

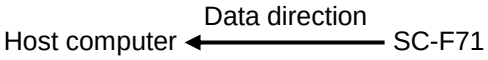
(3) Identifier: Identifier for original communication

(4) Digits: Number of digits for original communication

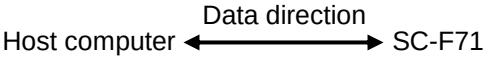
(5) Register address: Register address for Modbus communication
(HEX: Hexadecimal number DEC: Decimal number)

(6) Attribute: A method of how communication data items are read or written when viewed from the host computer is described.

RO: Read only data

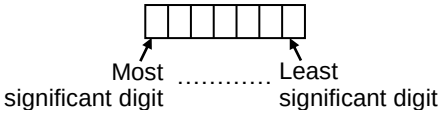


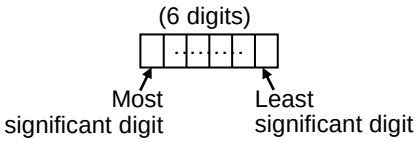
R/W: Read and Write data



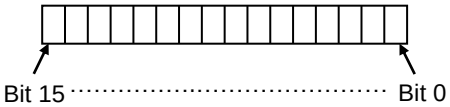
(7) Data range: Read or write range of communication data

- ASCII code data (original communication)





- 16-bit data (Modbus)



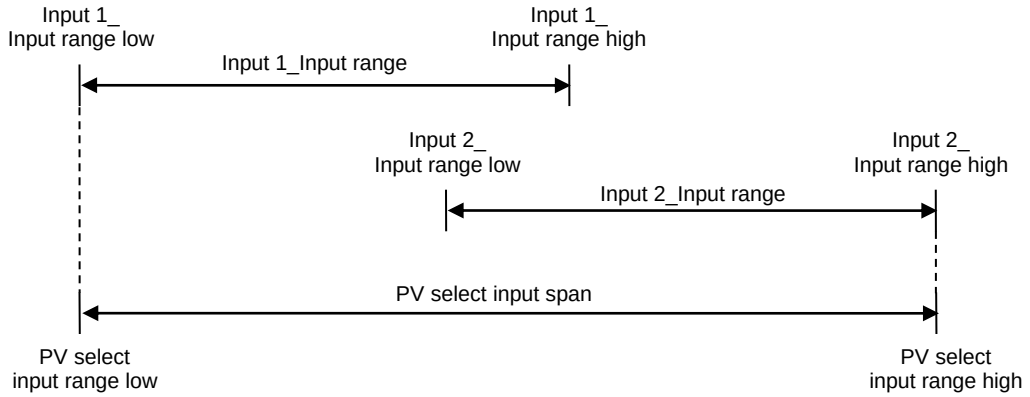
(8) Factory set value: Factory set value of communication data

In the data range and the factory set value some unfamiliar expressions are used. These are used for Control with PV select and can be rephrased as follows:
PV select input span: Input span
PV select input range high: Input range high
PV select input range low: Input range low

The setting range is as follows.

- PV select input range high: Input range high of Input 1 and Input 2, whichever is larger
- PV select input range low: Input range low of Input 1 and Input 2, whichever is smaller
- PV select input span: PV select input range low up to PV select input range high

[Example] When there is a relation as follows between the Input range of Input 1 and Input 2.



The communication data include “Normal setting data,” “Data in the Engineering mode,” “Data of identifiers compatible with other models (dummy data).”
Normal setting data: No. 1 to 169
Data in the Engineering mode: No. 170 to 420

The attribute of the data in the Engineering mode is RO (read only) during RUN (control).

WARNING	Communication data in the Engineering mode should be set according to the application before setting any parameter related to operation. Once the communication data 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. TLV will not bear any responsibility for malfunction or failure as a result of improper changes in the Engineering mode.

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

6.3 Original Communication/Modbus Data

The following table shows the communication identifiers of original communication and Modbus register addresses.

6.3.1 Communication data [Original communication identifier/Modbus]

Low: Low-order High: High-order

★ Parameters which can be used in multi-memory area function

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
1	Input 1_Measured value (PV)	**M1**	7	0000	0001	0	1	RO	Input 1_Input range low - (Input 1_5% of input span) to Input 1_Input range high + (Input 1_5% of input span) [Varies with the setting of the Decimal point position.]	—
2	Input 1_Set value (SV) monitor	**MS**	7	0002	0003	2	3	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—
3	Input 2_Measured value (PV)	**M0**	7	0004	0005	4	5	RO	Input 2_Input range low - (Input 2_5% of input span) to Input 2_Input range high + (Input 2_5% of input span) [Varies with the setting of the Decimal point position.]	—
4	Input 2_Set value (SV) monitor	**MT**	7	0006	0007	6	7	RO	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	—
5	PV select Measured value (PV)	**L3**	7	0008	0009	8	9	RO	When controlling with Input 1: Input 1_Input range low - (Input 1_5% of input span) to Input 1_Input range high + (Input 1_5% of input span) When controlling with Input 2: Input 2_Input range low - (Input 2_5% of input span) to Input 2_Input range high + (Input 2_5 % of input span) [Varies with the setting of the Decimal point position.]	—
6	Measured value (PV) of differential temperature input	**L2**	7	000A	000B	10	11	RO	-19999 to +99999 [Varies with the setting of the Decimal point position.]	—
7	Set value (SV) monitor of differential temperature input	**LE**	7	000C	000D	12	13	RO	-(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	—
8	Input 1_Manipulated output value monitor [heat-side]	**O1**	7	000E	000F	14	15	RO	-5.0 to +105.0%	—
9	Input 1_Manipulated output value monitor [cool-side]	**O2**	7	0010	0011	16	17	RO	-5.0 to +105.0%	—

10	Input 2_Manipulated output value monitor	**O0**	7	0012	0013	18	19	RO	-5.0 to +105.0%	—
11	Memory area soak time monitor	**TR**	7	0018	0019	24	25	RO	• Original communication 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 • Modbus [hour:minute:second] 0 to 35999 seconds [hour:minute] 0 to 5999 minutes [minute:second] 0 to 11999 seconds [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	—
12	Remote setting input value monitor	**S2**	7	001A	001B	26	27	RO	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	—
13	Event 1 state monitor	**AA**	7	001E	001F	30	31	RO	0: OFF 1: ON	—
14	Event 2 state monitor	**AB**	7	0020	0021	32	33	RO	0: OFF 1: ON	—
15	Event 3 state monitor	**AG**	7	0022	0023	34	35	RO	0: OFF 1: ON	—
16	Event 4 state monitor	**AH**	7	0024	0025	36	37	RO	0: OFF 1: ON	—
17	Comprehensive event state	**AJ**	7	002E	002F	46	47	RO	0 to 255 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Input 1_Input error high +32: Input 1_Input error low +64: Input 2_Input error high +128: Input 2_Input error low When multiple items are applicable, they are summed up.	—
18	Input 1_Burnout state monitor	**B1**	7	0030	0031	48	49	RO	0: OFF 1: ON	—

19	Input 2_Burnout state monitor	**B0**	7	0032	0033	50	51	RO	0: OFF 1: ON	—
20	DI state monitor	**L1**	7	0036	0037	54	55	RO	Original communication: 0 to 63 The DI state is assigned as a bit image in binary numbers. Transmission data from the SC-F71 is replaced with ASCII code in decimal number. Bit 0: DI1 Bit 1: DI2 Bit 2: DI3 Bit 3: DI4 Bit 4: DI5 Bit 5: DI6 Bit 6 to Bit 7: Unused Data 0: Open 1: Closed	—
									Modbus: 0 to 63 0: Open +1: DI1 Closed +2: DI2 Closed +4: DI3 Closed +8: DI4 Closed +16: DI5 Closed +32: DI6 Closed When multiple items are applicable, they are summed up.	—
21	OUT state monitor	**Q1**	7	0038	0039	56	57	RO	Original communication: 0 to 7 The OUT state is assigned as a bit image in binary numbers. Transmission data from the SC-F71 is replaced with ASCII code in decimal number. Bit 0: OUT1 Bit 1: OUT2 Bit 2: OUT3 Bit 3 to Bit 7: Unused Data 0: OFF 1: ON	—
									Modbus: 0 to 7 0: OFF +1: OUT1 ON +2: OUT2 ON +4: OUT3 ON When multiple items are applicable, they are summed up.	—
22	DO state monitor	**Q2**	7	003A	003B	58	59	RO	Original communication: 0 to 15 The DO state is assigned as a bit image in binary numbers.	—

									Transmission data from the SC-F71 is replaced with ASCII code in decimal number. Bit 0: DO1 Bit 1: DO2 Bit 2: DO3 Bit 3 DO4 Bit 4 to Bit 7: Unused Data 0: OFF 1: ON	
									Modbus: 0 to 15 0: OFF +1: DO1 ON +2: DO2 ON +4: DO3 ON +8: DO4 ON When multiple items are applicable, they are summed up.	—
23	Overall operation status	**L0**	7	003C	003D	60	61	RO	0 to 2047 0: OFF +1: STOP state +2: Input 1_Manual mode state +4: Input 2_Manual mode state +8: Remote mode state (Cascade control state, Differential temperature control state, Input 2 state of Control with PV select) +16: Input 1_Autotuning (AT) state +32: Input 2_Autotuning (AT) state +64: Set value of Input 1 is now changing +128: Set value of Input 2 is now changing +256: Communication monitoring result +512: Input 1_Control error +1024: Input 2_Control error When multiple items are applicable, they are summed up.	—
24	Input 1_PID memory	**PC**	7	003E	003F	62	63	RO	Switching by Memory area number: 1 to 16 Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8 [Which PID memory can be used depends on the setting of the Input 1_Level PID action selection.]	—
25	Input 2_PID memory	**PD**	7	0040	0041	64	65	RO	Switching by Memory area number: 1 to 16	—

									Switching by Set value (SV): 1 to 8 Switching by Measured value (PV): 1 to 8 [Which PID memory can be used depends on the setting of the Input 2_Level PID action selection.]	
26	Input 1_Peak hold monitor	**HQ**	7	0042	0043	66	67	RO	Input 1_Input range low - (Input 1_5% of input span) to Input 1_Input range high + (Input 1_5% of input span) [Varies with the setting of the Decimal point position.]	—
27	Input 1_Bottom hold monitor	**FQ**	7	0044	0045	68	69	RO	Input 1_Input range low - (Input 1_5% of input span) to Input 1_Input range high + (Input 1_5% of input span) [Varies with the setting of the Decimal point position.]	—
28	Input 2_Peak hold monitor	**HR**	7	0046	0047	70	71	RO	Input 2_Input range low - (Input 2_5% of input span) to Input 2_Input range high + (Input 2_5% of input span) [Varies with the setting of the Decimal point position.]	—
29	Input 2_Bottom hold monitor	**FR**	7	0048	0049	72	73	RO	Input 2_Input range low - (Input 2_5% of input span) to Input 2_Input range high + (Input 2_5% of input span) [Varies with the setting of the Decimal point position.]	—
30	Input 1_AT remaining time monitor	**AN**	7	004A	004B	74	75	RO	Original communication 0 hours 00 minutes to 48 hours 00 minutes	—
									Modbus 0 to 2880 minutes	—
31	Input 2_AT remaining time monitor	**AO**	7	004C	004D	76	77	RO	Original communication 0 hours 00 minutes to 48 hours 00 minutes	—
									Modbus 0 to 2880 minutes	—
32	Input 1_AT/ST status monitor	**AP**	7	004E	004F	78	79	RO	-4 to 2 0: AT/ST complete 1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	—
33	Input 2_AT/ST status monitor	**AQ**	7	0050	0051	80	81	RO	-4 to 2 0: AT/ST complete	—

									1: AT running now 2: ST running now -1: Aborted. Setting changed. -2: Aborted. Abnormal input. -3: Aborted. Timeout. -4: Aborted. Abnormal calculated values.	
34	Error code	**ER**	7	0052	0053	82	83	RO	0 to 79 0: Normal +1: Adjustment data error +2: Data back-up error +4: A/D conversion error (Temperature compensation error included) +8: Valve coefficient parameter error (not set) +64: Display units error When multiple items are applicable, they are summed up.	—
35	Integrated operating time	**UT**	7	0054	0055	84	85	RO	0 to 65535 hours	—
36	Peak hold monitor of ambient temperature	**HP**	7	0056	0057	86	87	RO	-120 to +120 °C	—
37	ROM version	**VR**	7	—	—	—	—	RO	Displays the version of ROM built into the instrument	—
38	Product identification code monitor	**ZD**	32	—	—	—	—	RO	Displays product identification code	—
39	Instrument number monitor	**ZC**	10	—	—	—	—	RO	Displays the instrument serial number	—
40	Retransmission output 1 decimal point position	**—**	—	0058	0059	88	89	RO	When the type of retransmission output is as follows: Varies with the setting of the Input 1_Decimal point position. No retransmission output Input 1_Measured value (PV) Input 1_Local SV Input 1_SV monitor value	—

41	Retransmission output 2 decimal point position	—	—	005A	005B	90	91	RO	Input 1_Deviation Remote setting input value Measured value (PV) of differential temperature input When the type of retransmission output is as follows: Varies with the setting of the Input 2_Decimal point position. Input 2_Measured value (PV) Input 2_Local SV Input 2_SV monitor value Input 2_Deviation When the type of retransmission output is as follows: 1 (One decimal place) Input 1_Manipulated output value [heat-side] Input 1_Manipulated output value [cool-side] Input 2_Manipulated output value	—
42	Retransmission output 3 decimal point position	—	—	005C	005D	92	93	RO		—
43	Event 1 decimal point position	—	—	005E	005F	94	95	RO	0: No decimal place 3: Three decimal places 1: One decimal place 4: Four decimal places 2: Two decimal places When the event type is No event, Deviation, Process, or SV: For Input 1, differential temperature input: Varies with the setting of the Input 1_Decimal point position. For Input 2: Varies with the setting of the Input 2_Decimal point position. When the Event type is Manipulated output value: 1 (One decimal place)	—
44	Event 2 decimal point position	—	—	0060	0061	96	97	RO		—
45	Event 3 decimal point position	—	—	0062	0063	98	99	RO		—
46	Event 4 decimal point position	—	—	0064	0065	100	101	RO		—
47	Interlock release	**IL**	7	0066	0067	102	103	R/W	0: Interlock release 1: Interlock state “1: Interlock state” is for monitoring the interlocked state. Do not write “1.”	0
48	Input 1_Soft start remaining time	**TA**	7	02E6	02E7	742	743	RO	Depends on the Soft start time selection [hour:minute] 0:00 to 99:59 (0 to 5999 [minutes]) [minute:second] 0:00 to 199.59 (0 to 11999 [seconds])	—

49	Input 2_Soft start remaining time	**TB**	7	02E8	02E9	744	745	RO	Depends on the Soft start time selection [hour:minute] 0:00 to 99:59 (0 to 5999 [minutes]) [minute:second] 0:00 to 199.59 (0 to 11999 [seconds])	—
50	Memory area transfer	**ZA**	7	0068	0069	104	105	R/W	1 to 16 When the DI1 function selection is set to “Memory area transfer (without area set signal)” and when “External mode” is selected with the Control area Local/External transfer, the data is RO (Read only).	1
51	Input 1_Hold reset	**CQ**	7	006A	006B	106	107	R/W	0: Hold 1: Reset Returns to Hold state automatically after reset.	0
52	Input 2_Hold reset	**CR**	7	006C	006D	108	109	R/W	0: Hold 1: Reset Returns to Hold state automatically after reset.	0
53	Bottom suppression start signal	**S8**	7	006E	006F	110	111	R/W	0 to 3 0: No forced ON +1: Input 1_Bottom suppression action_Forced ON +2: Input 2_Bottom suppression action_Forced ON	0
54	RUN/STOP transfer	**SR**	7	0070	0071	112	113	R/W	0: RUN (Control start) 1: STOP (Control stop)	1
55	Input 1_Autotuning (AT)	**G1**	7	0072	0073	114	115	R/W	0: PID control 1: Start Autotuning When AT is finished, the control will automatically return to “0.”	0
56	Input 2_Autotuning (AT)	**G0**	7	0074	0075	116	117	R/W	0: PID control 1: Start Autotuning When AT is finished, the control will automatically return to “0.”	0
57	Input 1_Startup tuning (ST)	**ST**	7	0076	0077	118	119	R/W	0: ST unused 1: Execute once * 2: Execute always * When ST is finished, the control will automatically return to “0.”	0
58	Input 2_Startup tuning (ST)	**SZ**	7	0078	0079	120	121	R/W	0: ST unused 1: Execute once * 2: Execute always * When ST is finished, the control will automatically return to “0.”	0

59	Input 1_Auto/Manual transfer	**J1**	7	007A	007B	122	123	R/W	0: Auto mode 1: Manual mode	1
60	Input 2_Auto/Manual transfer	**J0**	7	007C	007D	124	125	R/W	0: Auto mode 1: Manual mode	1
61	Remote/Local transfer	**C1**	7	007E	007F	126	127	R/W	When Select function for input 2 is: “Remote setting input” 0: Local mode 1: Remote mode	0
									When Select function for input 2 is: “Cascade control” 0: Single control 1: Cascade control	0
									When Select function for input 2 is: “Control with PV select” 0: Input 1 1: Input 2 When “Switching by level” is selected at “Selection of PV select trigger,” the parameter becomes RO (Read only).	0
									When Select function for input 2 is: “2-loop control/ Differential temperature control” 0: 2-loop control 1: Differential temperature control	0
62	Control area Local/External transfer	**E1**	7	0080	0081	128	129	R/W	0: Local mode 1: External mode	0
63	Input 1_Set value (SV) ★	**S1**	7	0082	0083	130	131	R/W	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0
64	Input 2_Set value (SV) ★	**S0**	7	0084	0085	132	133	R/W	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0
65	Set value (SV) of differential temperature input ★	**S3**	7	0086	0087	134	135	R/W	-(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0
66	Event 1 set value (EV1) When Event 1 type is either high or low limit with individual setting Event 1 set value (EV1) [high]	**A1**	7	0088	0089	136	137	R/W	• Deviation When assigned to Input 1 or Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When assigned to Input 2 -(Input 2_Input span) to +(Input 2_Input span) When Control with PV select is selected at Select function for input 2 -(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.]	High action, high/low action: max. Low action, process action: min.

	★								• Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When Control with PV select is selected at Select function for input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] • Manipulated output value -5.0 to +105.0%	
67	Event 1 set value (EV1') [low] ★	**BT**	7	008A	008B	138	139	R/W	• Deviation When assigned to Input_1 or Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When assigned to Input 2 -(Input 2_Input span) to +(Input 2_Input span) When Control with PV select is selected at Select function for Input 2 -(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.] • Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When Control with PV select is selected at Select function for Input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.]	High/low action: min. Process action: max.

68	Event 2 set value (EV2) When Event 2 type is either high or low limit with individual setting Event 2 set value (EV2) [high] ★	**A2**	7	008C	008D	140	141	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
69	Event 2 set value (EV2') [low] ★	**BU**	7	008E	008F	142	143	R/W	Same as Event 1 set value (EV1') [low]	
70	Event 3 set value (EV3) When Event 3 type is either high or low limit with individual setting Event 3 set value (EV3) [high] ★	**A7**	7	0090	0091	144	145	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
71	Event 3 set value (EV3') [low] ★	**BV**	7	0092	0093	146	147	R/W	Same as Event 1 set value (EV1') [low]	
72	Event 4 set value (EV4) When Event 4 type is either high or low limit with individual setting Event 4 set value (EV4) [high] ★	**A8**	7	0094	0095	148	149	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
73	Event 4 set value (EV4') [low] ★	**BW**	7	0096	0097	150	151	R/W	Same as Event 1 set value (EV1') [low]	
74	Input 1_Proportional band [heat-side] ★	**P1**	7	0098	0099	152	153	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0% of Input 1_Input span (When Control with PV select: 0.0 to 1000.0% of PV select input span) 0 (0.0, 0.00): ON/OFF action NOTE: 0 (0.0, 0.00) cannot be set when temperature control operation [MC-(V)COS(R)] is selected for Input 1_Control action.	TC/RTD inputs: 30 V/I inputs: 3.0

75	Input 1_Integral time [heat-side] ★	**I1**	7	009A	009B	154	155	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
76	Input 1_Derivative time [heat-side] ★	**D1**	7	009C	009D	156	157	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
77	Input 1_Control response parameter ★	**CA**	7	009E	009F	158	159	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control: 0 Heating/Cooling PID control: 2
78	Input 1_Proactive intensity ★	**ZP**	7	00A0	00A1	160	161	R/W	0 to 4 0: No function	2
79	Input 1_Manual reset ★	**MR**	7	00A2	00A3	162	163	R/W	-100.0 to +100.0%	0.0
80	Input 1_FF amount ★	**F3**	7	00A4	00A5	164	165	R/W	-100.0 to +100.0%	0.0
81	Input 1_Output limiter high [heat-side] ★	**OH**	7	00A6	00A7	166	167	R/W	Input 1_Output limiter low [heat-side] to 105.0%	105.0
82	Input 1_Output limiter low [heat-side] ★	**OX**	7	00A8	00A9	168	169	R/W	-5.0% to Input 1_Output limiter high [heat-side]	-5.0
83	Input 1_Dead zone ★	**V5**	7	02EA	02EB	746	747	R/W	0 to 10% of Input 1_Input span [Decimal point position depends on the setting for Input 1_ Valve coefficient F.] 3, 10, 11, 14: No decimal place 2, 12: 1 digit 0, 1, 13: 2 digits 4: 3 digits	See Table 1: Factory set value of the Dead zone
84	Input 2_Proportional band	**P0**	7	00AE	00AF	174	175	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs (When Control with PV select: 0.0 to 1000.0% of PV	TC/RTD inputs: 30 V/I inputs: 3.0

	★								select input span) 0 (0.0, 0.00): ON/OFF action NOTE: 0 (0.0, 0.00) cannot be set when temperature control operation [MC-(V)COS(R)] is selected for Input 2_Control action.	
85	Input 2_Integral time ★	**I0**	7	00B0	00B1	176	177	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
86	Input 2_Derivative time ★	**D3**	7	00B2	00B3	178	179	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
87	Input 2_Control response parameter ★	**C8**	7	00B4	00B5	180	181	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0
88	Input 2_Proactive intensity ★	**ZQ**	7	00B6	00B7	182	183	R/W	0 to 4 0: No function	2
89	Input 2_Manual reset ★	**MQ**	7	00B8	00B9	184	185	R/W	-100.0 to +100.0%	0.0
90	Input 2_FF amount ★	**F4**	7	00BA	00BB	186	187	R/W	-100.0 to +100.0%	0.0
91	Input 2_Output limiter high ★	**OO**	7	00BC	00BD	188	189	R/W	Input 2_Output limiter low to 105.0%	105.0
92	Input 2_Output limiter low ★	**OS**	7	00BE	00BF	190	191	R/W	-5.0% to Input 2_Output limiter high	-5.0
93	Input 2_Dead zone ★	**V6**	7	00C2	00C3	194	195	R/W	0 to 10% of Input 2_Input span [Decimal point position depends on the setting for Input 1_ Valve coefficient F.] 3, 10, 11, 14: No decimal place 2, 12: 1 digit 0, 1, 13: 2 digits 4: 3 digits	See Table 1: Factory set value of the Dead zone

Table 1: Factory set value of the Dead zone

Control	Valve coefficient F (pressure unit)

action	0	1	2	3	4	10	11	12	13
3	0.03	0.03	0.4	3	0.003	—	—	—	—
4	0.04	0.04	0.4	4	0.004	—	—	—	—
5	0.10	0.10	1.5	10	0.010	—	—	—	—
6	0.10	0.10	1.5	10	0.010	—	—	—	—
7	—	—	—	—	—	7	10	0.3	0.14

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
94	Input 1_Proportional band [cool-side] ★	**P2**	7	00C4	00C5	196	197	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0% of Input 1_Input span (When Control with PV select: 0.1 to 1000.0% of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0
95	Input 1_Integral time [cool-side] ★	**I2**	7	00C6	00C7	198	199	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
96	Input 1_Derivative time [cool-side] ★	**D2**	7	00C8	00C9	200	201	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
97	Input 1_Overlap/Deadband ★	**V1**	7	00CA	00CB	202	203	R/W	TC/RTD inputs -(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: -(PV select input span) to +(PV select input span)) (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs -100.0 to +100.0% of Input 1_Input span (When Control with PV select: -100.0 to +100.0% of PV select input span) Minus (-) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0

98	Input 1_Output limiter high [cool-side] ★	**OL**	7	00CC	00CD	204	205	R/W	Heating/Cooling PID control Input 1_Output limiter low [cool-side] to 105.0%	105.0
	Input 1_Output limiter low [heat-side] ★								PID control or Position proportioning PID control -5.0% to Input 1_Output limiter high [heat-side] Same data as the original communication identifier OX	-5.0
99	Input 1_Output limiter low [cool-side] ★	**OY**	7	00CE	00CF	206	207	R/W	-5.0% to Input 1_Output limiter high [cool-side]	-5.0
100	Select Trigger type for Memory area transfer ★	**EY**	7	00D0	00D1	208	209	R/W	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0
101	Area soak time ★	**TM**	7	00D2	00D3	210	211	R/W	• Original communication 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 • Modbus [hour:minute:seconds] 0 to 35999 seconds [hour:minute] 0 to 11999 seconds [minute:second] 0 to 5999 minutes [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	Original communication: 0:00 (0 minutes 00 seconds) Modbus: 0 (0 seconds)
102	Link area number ★	**LP**	7	00D4	00D5	212	213	R/W	0 to 16 0: No function	0
103	Input 1_Soft start time (up) ★	**HJ**	7	02EE	02EF	750	751	R/W	Depends on the Soft start time selection [hour:minute] 0:00 to 99:59 (0 to 5999 [minutes]) [minute:second] 199.59 (0 to 11999 [seconds])	0:00 (0 minutes 00 seconds)
104	Input 1_Soft start time (down) ★	**HK**	7	02F0	02F1	752	753	R/W	Depends on the Soft start time selection [hour:minute] 0:00 to 99:59 (0 to 5999 [minutes]) [minute:second] 199.59 (0 to 11999 [seconds])	0:00 (0 minutes 00 seconds)

105	Input 1_Setting change rate limiter (up) ★	**HH**	7	00D6	00D7	214	215	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
106	Input 1_Setting change rate limiter (down) ★	**HL**	7	00D8	00D9	216	217	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
107	Input 1_Auto/Manual transfer selection (Area) ★	**J2**	7	00DA	00DB	218	219	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
108	Input 1_Manipulated output value (Area) ★	**O8**	7	00DC	00DD	220	221	R/W	Heating/Cooling PID control, Position proportioning PID control -105.0 to +105.0% Other control -5.0 to +105.0% [When either 2: Auto mode (bump) or 4: Manual mode (bump) is selected in Input 1_Auto/Manual transfer selection (Area)]	Heating/Cooling PID control: 0.0 Other control: -5.0
109	Input 2_Soft start time (up) ★	**HS**	7	02F2	02F3	754	755	R/W	Depends on the Soft start time selection [hour:minute] 0:00 to 99:59 (0 to 5999 [minutes]) [minute:second] 199.59 (0 to 11999 [seconds])	0:00 (0 minutes 00 seconds)
110	Input 2_Soft start time (down) ★	**HT**	7	02F4	02F5	756	757	R/W	Depends on the Soft start time selection [hour:minute] 0:00 to 99:59 (0 to 5999 [minutes]) [minute:second] 199.59 (0 to 11999 [seconds])	0:00 (0 minutes 00 seconds)
111	Input 2_Setting change rate limiter (up) ★	**HX**	7	00DE	00DF	222	223	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
112	Input 2_Setting change rate limiter (down) ★	**HY**	7	00E0	00E1	224	225	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0

113	Input 2_Auto/Manual transfer selection (Area) ★	**J3**	7	00E2	00E3	226	227	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
114	Input 2_Manipulated output value (Area) ★	**O9**	7	00E4	00E5	228	229	R/W	-5.0 to +105.0% [When either 2: Auto mode (bump) or 4: Manual mode (bump) is selected in Input 2_Auto/Manual transfer selection (Area)]	-5.0
115	Remote/Local transfer selection (Area) ★	**C2**	7	00E6	00E7	230	231	R/W	When Select function for input 2 is: “Remote setting input” 0: No transfer 1: Local mode 2: Remote mode When Select function for input 2 is: “Cascade control” 0: No transfer 1: Single control 2: Cascade control When Select function for input 2 is: “Control with PV select” 0: No transfer 1: Input 1 2: Input 2 When Select function for input 2 is: “2-loop control/ Differential temperature control” 0: No transfer 1: 2-loop control 2: Differential temperature control	0
116	Display update cycle	**HE**	7	00E8	00E9	232	233	R/W	1: 50 ms* 6: 300 ms 2: 100 ms 7: 350 ms 3: 150 ms 8: 400 ms 4: 200 ms 9: 450 ms 5: 250 ms 10: 500 ms * When “Cascade control” or “2-loop control/Differential temperature control” is selected, Display update cycle is 100 ms even when “1” is selected.	1

117	Input 1_PV bias	**PB**	7	00EA	00EB	234	235	R/W	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: -(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	0
118	Input 1_PV digital filter	**F1**	7	00EC	00ED	236	237	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	0.0
119	Input 1_PV ratio	**PR**	7	00EE	00EF	238	239	R/W	0.500 to 1.500	1.000
120	Input 1_PV low input cut-off	**DP**	7	00F0	00F1	240	241	R/W	0.00 to 25.00% of Input 1_Input span (When Control with PV select: 0.00 to 25.00% of PV select input span)	0.00
121	Input 2_PV bias (RS bias)	**RB**	7	00F2	00F3	242	243	R/W	Input 2_PV bias: -(Input 2_Input span) to +(Input 2_Input span) RS bias -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] RS bias is selected by selecting “Remote setting input” at Select function for input 2.	0
122	Input 2_PV digital filter (RS digital filter)	**F2**	7	00F4	00F5	244	245	R/W	0.0 to 100.0 seconds 0.0: Filter OFF RS digital filter is selected by selecting “Remote setting input” at Select function for input 2.	0.0
123	Input 2_PV ratio (RS ratio)	**RR**	7	00F6	00F7	246	247	R/W	Input 2_PV ratio: 0.500 to 1.500 RS ratio: 0.001 to 9.999 RS ratio is selected by selecting “Remote setting input” at Select function for input 2.	1.000
124	Input 2_PV low input cut-off	**DS**	7	00F8	00F9	248	249	R/W	0.00 to 25.00% of Input 2_Input span (When Control with PV select: 0.0 to 25.00% of PV select input span)	0.00
125	OUT3 proportional cycle time	**T2**	7	00FE	00FF	254	255	R/W	0.1 to 100.0 seconds	2.0
126	OUT3 minimum ON/OFF time of proportional cycle	**OR**	7	0104	0105	260	261	R/W	0 to 1000 ms	0

127	Input 1_Manual manipulated output value	**ON**	7	010E	010F	270	271	R/W	PID control Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side] Heating/Cooling PID control * -(Input 1_Output limiter high [cool-side]) to +(Input 1_ Output limiter high [heat-side]) MC-(V)COS(R) pressure/temperature control Input 1_Output limiter low [heat-side] to whichever the smaller value of either "calculated value from Input 1_ Pressure (temperature) limiter" or "Input 1_Output limiter high [heat-side]". When STOP is set, Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side].	PID control, MC-(V)COS(R) pressure/temperature control: -5.0 Heating/Cooling PID control: 0.0

* In case of Heating/Cooling PID control, the data range has such exceptional conditions as shown below.

(1) Input 1_Output limiter high [cool-side] is ≤ 0.0%

- Input 1_Output limiter low [heat-side] is ≤ 0.0%: 0.0% to +(Input 1_Output limiter high [heat-side])
- Input 1_Output limiter low [heat-side] is > 0.0%: Input 1_Output limiter low [heat-side] to Input 1_Output limiter high [heat-side]

(2) Input 1_Output limiter high [heat-side] is ≤ 0.0%

- Input 1_Output limiter low [cool-side] is ≤ 0.0%: -(Input 1_Output limiter high [cool-side]) to 0.0%
- Input 1_Output limiter low [cool-side] is > 0.0 %: -(Input 1_Output limiter high [cool-side]) to -(Input 1_Output limiter low [cool-side])

(3) Fixed at 0.0% in the following cases: Input 1_Output limiter high [cool-side] ≤ 0.0%, and Input 1_Output limiter high [heat-side] ≤ 0.0%

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
128	Input 1_Level PID setting 1 *	**Q4**	7	0110	0111	272	273	R/W	Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.]	Input 1_Input range high (When Control with PV select: PV select input range high)
129	Input 1_Level PID setting 2 *	**Q5**	7	0112	0113	274	275	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
130	Input 1_Level PID setting 3 *	**Q6**	7	0114	0115	276	277	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
131	Input 1_Level PID setting 4 *	**Q7**	7	0116	0117	278	279	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
132	Input 1_Level PID setting 5 *	**Q8**	7	0118	0119	280	281	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
133	Input 1_Level PID setting 6 *	**Q9**	7	011A	011B	282	283	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1
134	Input 1_Level PID setting 7 *	**QA**	7	011C	011D	284	285	R/W	Same as Input 1_Level PID setting 1	Same as Input 1_ Level PID setting 1

* Level PID settings 1 to 7 of Input 1 always maintain the following relation.
(Input 1_Level PID setting 1) ≤ (Input 1_Level PID setting 2) ≤ (Input 1_Level PID setting 3) ≤ (Input 1_Level PID setting 4) ≤ (Input 1_Level PID setting 5) ≤ (Input 1_Level PID setting 6) ≤ (Input 1_Level PID setting 7)

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
135	Input 1_ON/OFF action differential gap	**MH**	7	011E	011F	286	287	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0% of Input 1_Input span (When Control with PV select: 0.0 to 100.0% of PV select input span)	TC/RTD inputs: 2 V/I inputs: 0.2
136	Input 1_ON/OFF action differential gap (upper)	**IV**	7	0120	0121	288	289	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0% of Input 1_Input span (When Control with PV select: 0.0 to 100.0% of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
137	Input 1_ON/OFF action differential gap (lower)	**IW**	7	0122	0123	290	291	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 100.0% of Input 1_Input span (When Control with PV select: 0.0 to 100.0% of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
138	Input 2_Manual manipulated output value	**OM**	7	0124	0125	292	293	R/W	Input 2_ Output limiter low to Input 2_Output limiter high MC-(V)COS(R) pressure/temperature control Input 2_Output limiter low to whichever the smaller value of either "calculated value from Input 2_ Pressure (temperature) limiter" or "Input 2_Output limiter high". When STOP is set, Input 2_Output limiter low to Input 2_Output limiter high.	-5.0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
139	Input 2_Level PID setting 1 *	**QB**	7	0126	0127	294	295	R/W	Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_Input range high
140	Input 2_Level PID setting 2 *	**QC**	7	0128	0129	296	297	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
141	Input 2_Level PID setting 3 *	**QD**	7	012A	012B	298	299	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
142	Input 2_Level PID setting 4 *	**QE**	7	012C	012D	300	301	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
143	Input 2_Level PID setting 5 *	**QF**	7	012E	012F	302	303	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
144	Input 2_Level PID setting 6 *	**QG**	7	0130	0131	304	305	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1
145	Input 2_Level PID setting 7 *	**QH**	7	0132	0133	306	307	R/W	Same as Input 2_Level PID setting 1	Same as Input 2_ Level PID setting 1

* Level PID settings 1 to 7 of Input 2 always maintain the following relation.
(Input 2_Level PID setting 1) ≤ (Input 2_Level PID setting 2) ≤ (Input 2_Level PID setting 3) ≤ (Input 2_Level PID setting 4) ≤ (Input 2_Level PID setting 5) ≤ (Input 2_Level PID setting 6) ≤ (Input 2_Level PID setting 7)

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
146	Input 2_ON/OFF action differential gap	**MG**	7	0134	0135	308	309	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0% of Input 2_Input span	TC/RTD inputs: 2 V/I inputs: 0.2
147	Input 2_ON/OFF action differential gap (upper)	**IX**	7	0136	0137	310	311	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0% of Input 2_Input span	TC/RTD inputs: 1 V/I inputs: 0.1
148	Input 2_ON/OFF action differential gap (lower)	**IY**	7	0138	0139	312	313	R/W	TC/RTD inputs: 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.0 to 100.0% of Input 2_Input span (When Control with PV select: 0.0 to 100.0% of PV select input span)	TC/RTD inputs: 1 V/I inputs: 0.1
149	Input 1_AT bias	**GB**	7	013A	013B	314	315	R/W	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: -(PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	0
150	Input 2_AT bias	**GA**	7	013C	013D	316	317	R/W	-(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	0
151	FF amount learning	**G7**	7	0142	0143	322	323	R/W	0 to 3 0: No learning +1: Learn Input 1 +2: Learn Input 2 To select two or more functions, sum each value.	0

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
152	Input 1_Determination point of external disturbance	**G8**	7	0144	0145	324	325	R/W	-(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: (PV select input span) to +(PV select input span)) [Varies with the setting of the Decimal point position.]	-1
153	Input 2_Determination point of external disturbance	**G9**	7	0146	0147	326	327	R/W	-(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.]	-1
154	Cascade_Proportional band (master-side)	**MP**	7	0148	0149	328	329	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0% of Input 1_Input span	TC/RTD inputs: 30 V/I inputs: 3.0
155	Cascade_Integral time (master-side)	**MI**	7	014A	014B	330	331	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
156	Cascade_Derivative time (master-side)	**MD**	7	014C	014D	332	333	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
157	Cascade_Proportional band (slave-side)	**SP**	7	014E	014F	334	335	R/W	TC/RTD inputs: 1 (0.1, 0.01) to Input 2_Input span (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs: 0.1 to 1000.0% of Input 2_Input span	TC/RTD inputs: 30 V/I inputs: 3.0
158	Cascade_Integral time (slave-side)	**SI**	7	0150	0151	336	337	R/W	1 to 3600 seconds, 0.1 to 3600.0 seconds or 0.01 to 360.00 seconds [Varies with the setting of the Integral/Derivative time decimal point position.]	240
159	Cascade_Derivative time (slave-side)	**SD**	7	0152	0153	338	339	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60

160	Cascade_Digital filter	**RD**	7	0154	0155	340	341	R/W	0.0 to 100.0 seconds 0.0: Filter OFF	10.0
161	Cascade_Scale high	**RN**	7	0156	0157	342	343	R/W	Cascade_Scale low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter high
162	Cascade_Scale low	**RO**	7	0158	0159	344	345	R/W	Input 2_Setting limiter low to Cascade_Scale high [Varies with the setting of the Decimal point position.]	Input 2_Setting limiter low
163	PV select transfer level	**L8**	7	015A	015B	346	347	R/W	Input 1_Input range low to Input 1_Input range high [Varies with the setting of the Decimal point position.]	Input 1_Input range high
164	PV select transfer time	**L9**	7	015C	015D	348	349	R/W	0.0 to 100.0 seconds	0.0
165	Input 1_Overshoot prevention feature	**KO**	7	02F6	02F7	758	759	R/W	0: No 1: Yes	0
166	Input 2_Overshoot prevention feature	**KP**	7	02F8	02F9	760	761	R/W	0: No 1: Yes	0

Items 140 to 420 are data in the Engineering mode.

⚠ WARNING

Communication data the Engineering mode should be set according to the application before setting any parameter related to operation. Once the communication data 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. TLV 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**.**

No.	Name	Identifier	Digits	Register address				Attribute	Data range	Factory set value
				HEX		DEC				
				Low	High	Low	High			
170	STOP display selection	**DX**	7	015E	015F	350	351	R/W	0: Stop on PV display 1: Stop on SV display 2: Stop on MV display	1
171	ALM lamp lighting condition	**LY**	7	0160	0161	352	353	R/W	0 to 255 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Input 1_Input error high +32: Input 1_Input error low +64: Input 2_Input error high +128: Input 2_Input error low To select two or more functions, sum each value.	15
172	PV flashing display at input error	**DU**	7	0162	0163	354	355	R/W	0: Flashing display 1: Non-flashing display	0

173	Show/Hide Input 1_SV	**H8**	7	0164	0165	356	357	R/W	0: Hide Input 1_SV 1: Show Input 1_SV	1
174	Show/Hide Input 2_SV	**HN**	7	0166	0167	358	359	R/W	0: Hide Input 2_SV 1: Show Input 2_SV	1
175	Show/Hide Input 1_MV	**H9**	7	0168	0169	360	361	R/W	0: Hide 1: Show Input 1_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Soft start remaining time	1
176	Show/Hide Input 2_MV	**HO**	7	016A	016B	362	363	R/W	0: Hide 1: Show Input 2_Manipulated output value (MV) 2: Show Memory area soak time 3: Show Soft start remaining time	1
177	Select hide items in Monitor mode	**LN**	7	016C	016D	364	365	R/W	0 to 31 0: Show all +1: Remote setting input value monitor +2: Manipulated output value (MV) monitor +4: Comprehensive event state +8: Memory area soak time +16: Soft start remaining time To select two or more functions, sum each value.	0
178	Select hide items in Operation transfer mode	**LM**	7	016E	016F	366	367	R/W	0 to 63 0: Show all +1: RUN/STOP transfer +2: Autotuning (AT) +4: Startup tuning (ST) +8: Auto/Manual transfer +16: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +32: Control area Local/External transfer To select two or more functions, sum each value.	0
179	Data registration	**KN**	7	0170	0171	368	369	R/W	0: SET key method Used to register the Set value (SV) using the SET key. 1: Direct registration Used to register the Set value (SV) without pressing the SET key.	0

180	FUNC key assignment	**FK**	7	0172	0173	370	371	R/W	0: Unused 1: RUN/STOP transfer 2: Autotuning (AT) (Common to Input 1 and 2) 3: Input 1_Autotuning (AT) 4: Input 2_Autotuning (AT) 5: Auto/Manual transfer (Common to Input 1 and 2) 6: Input 1_Auto/Manual transfer 7: Input 2_Auto/Manual transfer 8: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 9: Control area Local/External transfer 10: Interlock release 11: Hold reset (Common to Input 1 and 2) 12: Input 1_Hold reset 13: Input 2_Hold reset 14: Set data Unlock/Lock transfer 15: Area jump 16: Parameter setting mode display switching	1
181	FUNC key operation selection	**FL**	7	0174	0175	372	373	R/W	0: Press once The function set at “FUNC key assignment” is activated upon a press of the FUNC key. 1: Press and hold The function set at “FUNC key assignment” is activated by holding the FUNC key pressed.	0
182	Input 1_Input type	**XI**	7	0176	0177	374	375	R/W	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input -10 to +10 V DC 22: Voltage input -5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC	Product identification code specified at the time of order.

183	Input 1_Display unit	**PU**	7	0178	0179	376	377	R/W	0: °C 1: °F	Product identification code specified at the time of order.
184	Input 1_Decimal point position	**XU**	7	017A	017B	378	379	R/W	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: 5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 or 1 RTD input: 0 to 2 Voltage (V)/Current (I) inputs: 0 to 4 (When Control with PV select: Decimal point position setting of Input 1 and Input 2 is compared and the smaller will be used.)	Product identification code specified at the time of order. For V/I inputs: 1
185	Input 1_Input range high	**XV**	7	017C	017D	380	381	R/W	(Input 1_Input range low + 1 digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.] When 3 to 7 (pressure control operation [MC-(V)COS(R)]) is set to Input 1_Control action, the set value for the parameter should be entered with the same pressure unit selected for Input 1_Valve coefficient F.	Product identification code specified at the time of order. For V/I inputs: 100.0
186	Input 1_Input range low	**XW**	7	017E	017F	382	383	R/W	Input 1_Minimum value of input range to (Input 1_Input range high - 1 digit) [Varies with the setting of the Decimal point position.] When 3 to 7 (pressure control operation [MC-(V)COS(R)]) is set to Input 1_Control action, the set value for the parameter should be entered with the same pressure unit selected for Input 1_Valve coefficient F.	Product identification code specified at the time of order. For V/I inputs: 0.0
187	Input 1_Input error determination point (high)	**AV**	7	0180	0181	384	385	R/W	Input 1_Input error determination point (low) to Input 1_ Input range high + (Input 1_5% of input span) [Varies with the setting of the Decimal point position.]	Input 1_Input range high + (Input 1_5% of input span)
188	Input 1_Input error determination point (low)	**AW**	7	0182	0183	386	387	R/W	Input 1_Input range low - (Input 1_5% of input span) * to Input 1_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 1 is RTD, low limit value is about	Input 1_Input range low - (Input 1_5% of input span)

									2 Ω. (Pt100: -245.5 °C [-409.8 °F], JPt100: -237.6 °C [-395.7 °F])	
189	Input 1_Temperature compensation calculation	**R0**	7	0184	0185	388	389	R/W	0: No temperature compensation calculation 1: With temperature compensation calculation	1
190	Input 1_Burnout direction	**BS**	7	0186	0187	390	391	R/W	0: Upscale 1: Downscale	0
191	Input 1_Square root extraction	**XH**	7	0188	0189	392	393	R/W	0: Unused 1: Used	0
192	Input 1_Inverting input	**IB**	7	018A	018B	394	395	R/W	0: Unused 1: Used	0
193	Input 2_Input type	**XR**	7	018E	018F	398	399	R/W	0: TC input K 1: TC input J 2: TC input R 3: TC input S 4: TC input B 5: TC input E 6: TC input N 7: TC input T 8: TC input W5Re/W26Re 9: TC input PLII 10: TC input U 11: TC input L 12: TC input PR40-20 13: RTD input Pt100 14: RTD input JPt100 15: Current input 0 to 20 mA DC 16: Current input 4 to 20 mA DC 17: Voltage input 0 to 10 V DC 18: Voltage input 0 to 5 V DC 19: Voltage input 1 to 5 V DC 20: Voltage input 0 to 1 V DC 21: Voltage input -10 to +10 V DC 22: Voltage input -5 to +5 V DC 23: Voltage input 0 to 100 mV DC 24: Voltage input 0 to 10 mV DC ・When Remote setting input is selected and MC-(V)COS(R) pressure control is selected for Input 1_Control action: 15 to 24 ・When Measured input 2 is selected and MC-(V)COS(R) pressure control is selected for Input 2_Control action: 15 to 24	Same as Input 1_Input type
194	Input 2_Display unit	**PT**	7	0190	0191	400	401	R/W	0: °C 1: °F	Same as Input 1_Display unit
195	Input 2_Decimal point position	**XZ**	7	0192	0193	402	403	R/W	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places TC input: W5Re/W26Re, PR40-20: 0 (fixed) Thermocouples other than those shown above: 0 or 1	Same as Input 1_Decimal point position

									RTD input: 0 to 2 Voltage (V)/Current (I) inputs: 0 to 4	
196	Input 2_Input range high	**XX**	7	0194	0195	404	405	R/W	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): (Input 2_Input range low + 1 digit) to Input 2_Maximum value of input range Voltage (V)/Current (I) Inputs (For Remote setting input): (Input 2_Input range low + 1 digit) to Input 1_Maximum value of input range [Varies with the setting of the Decimal point position.] When 3 to 7 (pressure control operation [MC-(V)COS(R)]) is set to Input 2_Control action, the set value for the parameter should be entered with the same pressure unit selected for Input 1_Valve coefficient F.	Same as Input 1_ Input range high
197	Input 2_Input range low	**XY**	7	0196	0197	406	407	R/W	TC/RTD inputs and Voltage (V)/Current (I) Inputs (For other than Remote setting input): Input 2_Minimum value of input range to (Input 2_Input range high - 1 digit) Voltage (V)/Current (I) Inputs (For Remote setting input): Input 1_Minimum value of input range to (Input 2_Input range high - 1 digit) [Varies with the setting of the Decimal point position.] When 3 to 7 (pressure control operation [MC-(V)COS(R)]) is set to Input 2_Control action, the set value for the parameter should be entered with the same pressure unit selected for Input 1_Valve coefficient F.	Same as Input 1_ Input range low
198	Input 2_Input error determination point (high)	**AX**	7	0198	0199	408	409	R/W	Input 2_Input error determination point (low) to Input 2_Input range high + (Input 2_5% of input span) [Varies with the setting of the Decimal point position.]	Input 2_Input range high + (Input 2_5% of input span)
199	Input 2_Input error determination point (low)	**AY**	7	019A	019B	410	411	R/W	Input 2_Input range low - (Input 2_5% of input span) * to Input 2_Input error determination point (high) [Varies with the setting of the Decimal point position.] * When Input type of Input 2 is RTD, low limit value is about 2 Ω. (Pt100: -245.5 °C [-409.8 °F] , JPt100: -237.6 °C [-395.7 °F])	Input 2_Input range low - (Input 2_5% of input span)

200	Input 2_Temperature compensation calculation	**R1**	7	019C	019D	412	413	R/W	0: No temperature compensation calculation 1: With temperature compensation calculation	1
201	Input 2_Burnout direction	**BR**	7	019E	019F	414	415	R/W	0: Upscale 1: Downscale	0
202	Input 2_Square root extraction	**XG**	7	01A0	01A1	416	417	R/W	0: Unused 1: Used	0
203	Input 2_Inverting input	**IC**	7	01A2	01A3	418	419	R/W	0: Unused 1: Used	0

204	DI1 function selection	**H2**	7	01A4	01A5	420	421	R/W	0: No function 1: RUN/STOP transfer 2: Auto/Manual transfer (Common to Input 1 and 2) 3: Input 1_Auto/Manual transfer 4: Input 2_Auto/Manual transfer 5: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) 6: Interlock release 7: Hold reset (Common to Input 1 and 2) 8: Input 1_Hold reset 9: Input 2_Hold reset 10: Autotuning (AT) (Common to Input 1 and 2) 11: Input 1_Autotuning (AT) 12: Input 2_Autotuning (AT) 13: Set data unlock/lock transfer 14: Direct/Reverse action transfer 15: Memory area transfer (2 points, Without area set signal) 16: Memory area transfer (8 points, Without area set signal) 17: Memory area transfer (8 points, With area set signal) 18: Memory area transfer (16 points, Without area set signal) 19: Memory area transfer (16 points, With area set signal) 20: Area jump	0
205	DI2 function selection	**H3**	7	01A6	01A7	422	423	R/W	0 to 14 Same as DI1 function selection (0 to 14)	0
206	DI3 function selection	**H4**	7	01A8	01A9	424	425	R/W	0 to 14	0

									Same as DI1 function selection (0 to 14)	
207	DI4 function selection	**H5**	7	01AA	01AB	426	427	R/W	0 to 14 Same as DI1 function selection (0 to 14)	0
208	DI5 function selection	**H6**	7	01AC	01AD	428	429	R/W	0 to 14 Same as DI1 function selection (0 to 14)	0
209	DI6 function selection	**H7**	7	01AE	01AF	430	431	R/W	0 to 14 Same as DI1 function selection (0 to 14)	0

210	DI logic invert	**D0**	7	01B0	01B1	432	433	R/W	0 to 31 0: No logic invert +1: RUN/STOP transfer +2: Auto/Manual transfer +4: Remote/Local transfer (Cascade mode transfer, PV select transfer, 2-loop control/Differential temperature control) +8: Set data unlock/lock transfer +16: Direct/Reverse action transfer To select two or more functions, sum each value.	0
211	Area switching time (Without area set signal)	**LJ**	7	01B2	01B3	434	435	R/W	1 to 5 seconds	2
212	OUT1 function selection	**E0**	7	01B4	01B5	436	437	R/W	0: No assignment 1: Input 1_Control output [heat-side] or [open-side] 2: Input 1_Control output [cool-side] or [close-side] 3: Input 2_Control output 4: Retransmission output 5: Logic calculation output (Event, Input error) 6: RUN state output 7: Input 1_Manual mode state output 8: Input 2_Manual mode state output 9: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 10: Input 1_Autotuning (AT) state output 11: Input 2_Autotuning (AT) state output 12: Output while Set value of Input 1 is changing 13: Output while Set value of Input 2 is changing 14: Output of the communication monitoring result 15: FAIL output	1
213	OUT2 function selection	**E2**	7	01B6	01B7	438	439	R/W	Same as OUT1 function selection	4
214	OUT3 function selection	**E3**	7	01B8	01B9	440	441	R/W	Same as OUT1 function selection	4

215	OUT1 logic calculation selection	**W0**	7	01BA	01BB	442	443	R/W	0 to 255 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Input 1_Input error high +32: Input 1_Input error low +64: Input 2_Input error high +128: Input 2_Input error low To select two or more functions, sum each value.	0
216	OUT2 logic calculation selection	**W2**	7	01BC	01BD	444	445	R/W	Same as OUT1 logic calculation selection	0
217	OUT3 logic calculation selection	**W3**	7	01BE	01BF	446	447	R/W	Same as OUT1 logic calculation selection	0
218	Energized/De-energized selection	**NA**	7	01C0	01C1	448	449	R/W	0 to 127 0: All outputs are energized +1: OUT1 de-energized +2: OUT2 de-energized +4: OUT3 de-energized +8: DO1 de-energized +16: DO2 de-energized +32: DO3 de-energized +64: DO4 de-energized To select two or more functions, sum each value.	0
219	Interlock selection	**LF**	7	01C2	01C3	450	451	R/W	0 to 255 0: Unused +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +256: Input 1_Input error high +512: Input 1_Input error low +1024: Input 2_Input error high +2048: Input 2_Input error low To select two or more functions, sum each value.	0

220	Output action at control stop	**SS**	7	01C4	01C5	452	453	R/W	0 to 7 0: OFF +1: Logic calculation output: Action continues +2: Retransmission output: Action continues +4: Instrument status output: Action continues To select two or more functions, sum each value.	0
221	Event action during MAN mode	**MW**	7	02FA	02FB	762	763	R/W	0: Yes 1: No	0
222	OUT1_Type selection	**XJ**	7	02FC	02FD	764	765	R/W	0: Continuous current output (4 to 20 mA) 1: Continuous current output (0 to 20 mA)	0
223	OUT2_Type selection	**XK**	7	02FE	02FF	766	767	R/W	0: Continuous current output (4 to 20 mA) 1: Continuous current output (0 to 20 mA)	0
224	Universal output type selection (OUT3)	**XO**	7	01C6	01C7	454	455	R/W	0: Voltage pulse output 1: Current output (4 to 20 mA) 2: Current output (0 to 20 mA)	1
225	Retransmission output 1 type	**LA**	7	01C8	01C9	456	457	R/W	0: No retransmission output 1: Input 1_Measured value (PV) 2: Input 1_Local SV 3: Input 1_SV monitor value 4: Input 1_Deviation 5: Input 1_Manipulated output value [heat-side] 6: Input 1_Manipulated output value [cool-side] 7: Input 2_Measured value (PV) 8: Input 2_Local SV 9: Input 2_SV monitor value 10: Input 2_Deviation 11: Input 2_Manipulated output value 12: Remote setting input value 13: Measured value (PV) of differential temperature input	0

226	Retransmission output 1 scale high	**HV**	7	01CA	01CB	458	459	R/W	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Deviation -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation -(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value -5.0 to +105.0% Measured value (PV) of differential temperature input -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_ Measured value (PV), Input 1_ Local SV, Input 1_ SV monitor value, and Remote setting input value: Input 1_ Input range high (Control with PV select: PV select input range high) Input 1_Deviation: +(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_ Input range high Input 2_Deviation: +(Input 2_Input span) Manipulated output value: 100.0 Measured value (PV) of differential temperature input: 100

227	Retransmission output 1 scale low	**HW**	7	01CC	01CD	460	461	R/W	No retransmission output, Input 1_Measured value (PV), Input 1_Local SV, Input 1_SV monitor value, and Remote setting input value Input 1_Input range low to Input 1_Input range high (When Control with PV select: PV select input range low to PV select input range high) [Varies with the setting of the Decimal point position.] Input 1_Deviation -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.] Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value Input 2_Input range low to Input 2_Input range high [Varies with the setting of the Decimal point position.] Input 2_Deviation -(Input 2_Input span) to +(Input 2_Input span) [Varies with the setting of the Decimal point position.] Manipulated output value -5.0 to +105.0% Measured value (PV) of differential temperature input -(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	No retransmission output, Input 1_ Measured value (PV), Input 1_ Local SV, Input 1_ SV monitor value, and Remote setting input value: Input 1_Input range low (Control with PV select: PV select input range low) Input 1_Deviation: -(Input 1_Input span) Input 2_Measured value (PV), Input 2_Local SV, and Input 2_SV monitor value: Input 2_Input range low Input 2_Deviation: -(Input 2_Input span) Manipulated output value: 0.0 Measured value (PV) of differential temperature input: -100
228	Retransmission output 2 type	**LB**	7	01CE	01CF	462	463	R/W	Same as Retransmission output 1 type	0
229	Retransmission output 2 scale high	**CV**	7	01D0	01D1	464	465	R/W	Same as Retransmission output 1 scale high	
230	Retransmission output 2 scale low	**CW**	7	01D2	01D3	466	467	R/W	Same as Retransmission output 1 scale low	

231	Retransmission output 3 type	**LC**	7	01D4	01D5	468	469	R/W	Same as Retransmission output 1 type	3
232	Retransmission output 3 scale high	**EV**	7	01D6	01D7	470	471	R/W	Same as Retransmission output 1 scale high	
233	Retransmission output 3 scale low	**EW**	7	01D8	01D9	472	473	R/W	Same as Retransmission output 1 scale low	
234	DO1 function selection	**E4**	7	01DA	01DB	474	475	R/W	0: No assignment 1: Logic calculation output (Event, Input error) 2: RUN state output 3: Input 1_Manual mode state output 4: Input 2_Manual mode state output 5: Remote mode state output (Cascade control state output, Output of differential temperature control state, Input 2 state output of Control with PV select) 6: Input 1_Autotuning (AT) state output 7: Input 2_Autotuning (AT) state output 8: Output while Set value of Input 1 is changing 9: Output while Set value of Input 2 is changing 10: Output of the communication monitoring result 11: FAIL output 12: Input 1_Control error state output* 13: Input 2_Control error state output * * 12 and 13 are displayed only when pressure is controlled by MC-COS(R)/MC-VCOS(R)	0
235	DO2 function selection	**E5**	7	01DC	01DD	476	477	R/W	Same as DO1 function selection	0
236	DO3 function selection	**E6**	7	01DE	01DF	478	479	R/W	Same as DO1 function selection	0
237	DO4 function selection	**E7**	7	01E0	01E1	480	481	R/W	Same as DO1 function selection	0
238	DO1 logic calculation selection	**W4**	7	01E2	01E3	482	483	R/W	0 to 255 0: OFF +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Input 1_Input error high +32: Input 1_Input error low +64: Input 2_Input error high +128: Input 2_Input error low To select two or more functions, sum each value.	0

239	DO2 logic calculation selection	**W5**	7	01E4	01E5	484	485	R/W	Same as DO1 logic calculation selection	0
240	DO3 logic calculation selection	**W6**	7	01E6	01E7	486	487	R/W	Same as DO1 logic calculation selection	0
241	DO4 logic calculation selection	**W7**	7	01E8	01E9	488	489	R/W	Same as DO1 logic calculation selection	0
242	Event 1 assignment	**FA**	7	01EA	01EB	490	491	R/W	1: Input 1 2: Input 2 3: Differential temperature input	1
243	Event 1 type	**XA**	7	01EC	01ED	492	493	R/W	0: None 1: Deviation high (Using SV monitor value) [a] 2: Deviation low (Using SV monitor value) [a] 3: Deviation high/low (Using SV monitor value) [a] 4: Band (Using SV monitor value) [a] 5: Deviation high/low (Using SV monitor value) [High/Low individual setting] [a] 6: Band (Using SV monitor value) [High/Low individual setting] [a] 7: SV high (Using SV monitor value) 8: SV low (Using SV monitor value) 9: Process high [b] 10: Process low [b] 11: Deviation high (Using local SV) [a] 12: Deviation low (Using local SV) [a] 13: Deviation high/low (Using local SV) [a] 14: Band (Using local SV) [a] 15: Deviation high/low (Using local SV) [High/Low individual setting] [a] 16: Band (Using local SV) [High/Low individual setting] [a] 17: SV high (Using local SV) 18: SV low (Using local SV) 19: MV high [heat-side] [b] 20: MV low [heat-side] [b] 21: MV high [cool-side] [b] 22: MV low [cool-side] [b] 23: Process high/low [High/Low individual setting] [b] 24: Process band [High/Low individual setting] [b] [a] Event hold and re-hold action is available. [b] Event hold action is available.	0

244	Event 1 hold action	**WA**	7	01EE	01EF	494	495	R/W	0: Hold action OFF 1: Hold action ON 2: Re-hold action ON Setting hold or re-hold action on the event that is not available with hold and re-hold actions will just be ignored.	0
245	Event 1 differential gap	**HA**	7	01F0	01F1	496	497	R/W	Deviation, Process and SV: • If event assignment is either Input 1 or Differential temperature. 0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) • If event assignment is Input 2 0 to Input 2_Input span [Varies with the setting of the Decimal point position.] MV: 0.0 to 110.0%	Deviation, Process and SV: TC/RTD inputs: 2 V/I inputs: 0.2 MV: 0.2
246	Event 1 timer	**TD**	7	01F2	01F3	498	499	R/W	0.0 to 600.0 seconds	0.0
247	Event 2 assignment	**FB**	7	01F4	01F5	500	501	R/W	Same as Event 1 assignment	
248	Event 2 type	**XB**	7	01F6	01F7	502	503	R/W	Same as Event 1 type	
249	Event 2 hold action	**WB**	7	01F8	01F9	504	505	R/W	Same as Event 1 hold action	
250	Event 2 differential gap	**HB**	7	01FA	01FB	506	507	R/W	Same as Event 1 differential gap	
251	Event 2 timer	**TG**	7	01FC	01FD	508	509	R/W	Same as Event 1 timer	
252	Event 3 assignment	**FC**	7	01FE	01FF	510	511	R/W	Same as Event 1 assignment	
253	Event 3 type	**XC**	7	0200	0201	512	513	R/W	Same as Event 1 type	
254	Event 3 hold action	**WC**	7	0202	0203	514	515	R/W	Same as Event 1 hold action	
255	Event 3 differential gap	**HC**	7	0204	0205	516	517	R/W	Same as Event 1 differential gap	
256	Event 3 timer	**TE**	7	0206	0207	518	519	R/W	Same as Event 1 timer	
257	Event 4 assignment	**FD**	7	0208	0209	520	521	R/W	Same as Event 1 assignment	
258	Event 4 type	**XD**	7	020A	020B	522	523	R/W	Same as Event 1 type	
259	Event 4 hold action	**WD**	7	020C	020D	524	525	R/W	Same as Event 1 hold action	
260	Event 4 differential gap	**HD**	7	020E	020F	526	527	R/W	Same as Event 1 differential gap	
261	Event 4 timer	**TF**	7	0210	0211	528	529	R/W	Same as Event 1 timer	

262	Hot/Cold start	**XN**	7	0222	0223	546	547	R/W	0: Hot/Cold start 1 1: Hot/Cold start 2 2: Cold start 3: STOP start 4. Follow the selected action when power is restored	4
263	RUN/STOP selection when power is restored	**XS**	7	0300	0301	768	769	R/W	0: STOP 1: RUN 2: Operation immediately before power cut	0
264	MAN/AUTO selection when power is restored and RUN transfer	**XM**	7	0302	0303	770	771	R/W	0: MAN 1: AUTO 2: Operation immediately before power cut	0
265	LOC/REM selection when power is restored and RUN transfer	**X8**	7	0304	0305	772	773	R/W	0: LOCAL 1: REMOTE 2: Operation immediately before power cut Defaults to LOCAL when REMOTE is unavailable.	0
266	LOC/EXT selection when power is restored and RUN transfer	**X9**	7	0306	0307	774	775	R/W	0: LOC 1: EXT 2. Operation immediately before power cut Defaults to LOC when EXT is unavailable.	0
267	Output value selection when power is restored and RUN transfer	**X1**	7	0308	0309	776	777	R/W	0: 0% 1: Output limiter low 2: Operation immediately before power cut	0
268	Manual manipulated output value selection	**OT**	7	0224	0225	548	549	R/W	0: The last manipulated output value (Balanceless-bumpless function) 1: Manual manipulated output value	0
269	SV tracking	**XL**	7	0226	0227	550	551	R/W	0 to 3 0: No SV tracking function +1: SV tracking at transferring Remote/Local * * Including Cascade mode transfer, 2-loop control/Differential temperature control transfer +2: SV tracking at transferring Auto/Manual To select two or more functions, sum each value.	1
270	Integral/Derivative time decimal point position	**PK**	7	0228	0229	552	553	R/W	0: No decimal place 1: One decimal place 2: Two decimal places	0

271	Startup tuning (ST) activation conditions	**SU**	7	022A	022B	554	555	R/W	0: Activate the Startup tuning (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 Startup tuning (ST) function when the power is turned on; or when transferred from STOP to RUN. 2: Activate the Startup tuning (ST) function when the Set value (SV) is changed.	0
272	Input 1_Control action	**XE**	7	022C	022D	556	557	R/W	0: PID control (direct action) with Autotuning 1: PID control (reverse action) with Autotuning 2: Heating/Cooling PID control with Autotuning [cooling linear type] 3: Pressure control operation [MC-COS(R)-3] 4: Pressure control operation [MC-COS(R)-16, 15 to 50 mm] 5: Pressure control operation [MC-COS(R)-16, 65 to 150 mm] 6: Pressure control operation [MC-COS(R)-21] 7: Pressure control operation [MC-VCOS(R)] 8: Temperature control operation [MC-COS(R)-16] 9: Temperature control operation [MC-VCOS(R)] For cascade control, only 0 or 1 is selectable. In the case of Control with PV select, only “0 to 2” are selectable.	Product identification code specified at the time of order.
273	Input 1_Output change rate limiter (up) [heat-side]	**PH**	7	022E	022F	558	559	R/W	0.0 to 1000.0%/seconds of manipulated output 0.0: OFF	0.0
274	Input 1_Output change rate limiter (down) [heat-side]	**PL**	7	0230	0231	560	561	R/W	0.0 to 1000.0%/seconds of manipulated output 0.0: OFF	0.0
275	Input 1_Action (high) input error	**WH**	7	0232	0233	562	563	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 1 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 1 is output. When the error is recovered, the operation mode is switched to the PID control.	2

276	Input 1_Action (low) input error	**WL**	7	0234	0235	564	565	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 1 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 1 is output. When the error is recovered, the operation mode is switched to the PID control.	2
277	Input 1_Manipulated output value at input error	**OE**	7	0236	0237	566	567	R/W	Heating/Cooling PID control -105.0 to +105.0% Other control -5.0 to +105.0%	Heating/Cooling PID control: 0.0 Other control: -5.0
278	Input 1_ Manipulated output value at STOP [heat-side]	**OF**	7	0238	0239	568	569	R/W	-5.0 to +105.0%	-5.0
279	Input 1_Start determination point	**SX**	7	023A	023B	570	571	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: Operation starts from any start state selected by Hot/ Cold start [Varies with the setting of the Decimal point position.]	0
280	Input 1_Level PID action selection	**PP**	7	023C	023D	572	573	R/W	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0
281	Input 1_Level PID differential gap	**L5**	7	023E	023F	574	575	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2
282	Input 2_Control action	**XF**	7	0240	0241	576	577	R/W	0: PID control (direct action) with Autotuning 1: PID control (reverse action) with Autotuning 2: n/a 3: Pressure control operation [MC-COS(R)-3] 4: Pressure control operation [MC-COS(R)-16, 15 to 50 mm] 5: Pressure control operation [MC-COS(R)-16, 65 to 150 mm] 6: Pressure control operation [MC-COS(R)-21] 7: Pressure control operation [MC-VCOS(R)] 8: Temperature control operation [MC-COS(R)-16] 9: Temperature control operation [MC-VCOS(R)] For cascade control, only 0 or 1 is selectable.	1

283	Input 2_Output change rate limiter (up)	**PX**	7	0242	0243	578	579	R/W	0.0 to 1000.0%/seconds of manipulated output 0.0: No function	0.0
284	Input 2_Output change rate limiter (down)	**PY**	7	0244	0245	580	581	R/W	0.0 to 1000.0%/seconds of manipulated output 0.0: No function	0.0
285	Input 2_Action (high) input error	**WX**	7	0246	0247	582	583	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 2 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 2 is output. When the error is recovered, the operation mode is switched to the PID control.	2
286	Input 2_Action (low) input error	**WY**	7	0248	0249	584	585	R/W	0: Control continues (with the latest output) 1: Manipulated output value at input error (Manual mode) The operation mode is switched to the Manual mode and the Manipulated output at Input error of Input 2 is output. 2: Manipulated output value at input error (Auto mode) The operation mode remains in the Auto mode and the Manipulated output at Input error of Input 2 is output. When the error is recovered, the operation mode is switched to the PID control.	2
287	Input 2_Manipulated output value at input error	**PE**	7	024A	024B	586	587	R/W	-5.0 to +105.0%	-5.0
288	Input 2_Manipulated output value at STOP	**OJ**	7	024C	024D	588	589	R/W	-5.0 to +105.0%	-5.0
289	Input 2_Start determination point	**SW**	7	024E	024F	590	591	R/W	0 to Input 2_Input span 0: Operation starts from any start state selected by Hot/ Cold start [Varies with the setting of the Decimal point position.]	0
290	Input 2_Level PID action selection	**PO**	7	0250	0251	592	593	R/W	0: Switching by Memory area number 1: Switching by Set value (SV) (Level PID action) 2: Switching by Measured value (PV) (Level PID action)	0
291	Input 2_Level PID differential gap	**L6**	7	0252	0253	594	595	R/W	0 to Input 2_Input span [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 2 V/I inputs: 0.2

292	Input 1_Valve coefficient A	**JN**	7	030A	030B	778	779	R/W	-1999 to 9999	0
293	Input 1_Valve coefficient b	**JO**	7	030C	030D	780	781	R/W	-1999 to 9999	0
294	Input 1_Valve coefficient C	**JP**	7	030E	030F	782	783	R/W	-1999 to 9999	0
295	Input 1_Valve coefficient d	**JQ**	7	0310	0311	784	785	R/W	-1999 to 9999	0
296	Input 1_Valve coefficient E	**JR**	7	0312	0313	786	787	R/W	-1999 to 9999	0
297	Input 1_Valve coefficient F	**JS**	7	0314	0315	788	789	R/W	When Input 1_Control action is set to 3 to 7 or 8: 0 to 4 0: kg/cm^{2}G 1: barg 2: psig 3: kPaG 4: MPaG When Input 1_Control action is 7 or 9: 10 to 14 10: mmHg/Torr 11: mbar 12: inHg 13: psi 14: kPa Refer to the note below regarding the valve coefficient.	Product identification code specified at the time of order.

The pressure unit to be entered for the pressure value is defined by the valve coefficient F. Parameters to be entered in pressure units, such as measurement input range, target set value, and alarm set value, must be entered in the same pressure units selected for the valve coefficient F. If the pressure unit and the parameter do not match, the product will not operate properly.

· To use a pressure unit other than the valve coefficient F (indicated on the valve coefficient plate), refer to the "Converting valve coefficient" section to convert the valve coefficient and change the valve coefficient F along with valve coefficients A, C, and E.

298	Input 1_Valve coefficient F pressure standard	**NU**	7	0316	0317	790	791	R/W	0: Atmospheric pressure standard 1: Absolute pressure standard	Product identification code specified at the time of order.
299	Input 1_Control valve selection	**NS**	7	0318	0319	792	793	R/W	0: MC-VCOS(R) 1: PC-VCOS(R)	0

300	Input 1_Pressure (Temp) limiter	**PA**	7	031A	031B	794	795	R/W	When Input 1_Control action is set to 3 to 7: Input 1_Input range low to Input 1_Input range high When Input 1_Control action is set to 8: Valve coefficient Coefficient F = 0 (kg/cm^2): 0.00 to 99.99 Coefficient F = 1 (barg): 0.00 to 99.99 Coefficient F = 2 (psig): 0.0 to 999.9 Coefficient F = 3 (kPaG): 0 to 9999 Coefficient F = 4 (MPaG): 0.000 to 9.999 When Input 1_Control action is 9: 0.0 to whichever the smaller value of either Input 1_range high or 140.0 °C (280.0 °F) Select the temperature unit according to the following conditions: When Input type is set to Temperature input: Input 1_ Display unit When Input type is set to V/I input: Input 1_Temperature limiter unit [Varies with the setting of the Decimal point position, when a setting is other than 8 for Input 1_Control action.] NOTE: Pressure (temperature) limiter function is OFF when 0 (0.0, 0.00, 0.000) is set	When a setting other than "7" is selected in Input 1_ Control action: 0 When “7” is selected in Input 1_ Control action: Input 1_Input range high
301	Input 1_Temperature limiter unit	**PV**	7	031C	031D	796	797	R/W	0: °C 1:°F	Product identification code specified at the time of order.
302	Input 1_Regression equation bias	**OC**	7	031E	031F	798	799	R/W	-50.0 to 50.0%	0.0
303	Input 1_Response speed self-learning selection	**X6**	7	0320	0321	800	801	R/W	0: Yes 1: No	0
304	Input 1_Response speed learning parameter t1 0 up	**Z0**	7	0322	0323	802	803	R/W	0 to 9999 seconds	6
305	Input 1_Response speed learning parameter t2 0 down	**Z1**	7	0324	0325	804	805	R/W	0 to 9999 seconds	6

306	Input 1_Response speed learning parameter t3 set up	**Z2**	7	0326	0327	806	807	R/W	0 to 9999 seconds	6
307	Input 1_Response speed learning parameter t4 set down	**Z3**	7	0328	0329	808	809	R/W	0 to 9999 seconds	6
308	Input 1_Response speed learning parameter L1 0 up	**Z4**	7	032A	032B	810	811	R/W	0 to 9999 seconds	2
309	Input 1_Response speed learning parameter L2 0 down	**Z5**	7	032C	032D	812	813	R/W	0 to 9999 seconds	2
310	Input 1_Response speed learning parameter L3 set up	**Z6**	7	032E	032F	814	815	R/W	0 to 9999 seconds	2
311	Input 1_Response speed learning parameter L4 set down	**Z7**	7	0330	0331	816	817	R/W	0 to 9999 seconds	2
312	Input 1_Response speed learning parameter S1 0 up	**Z8**	7	0332	0333	818	819	R/W	0 to 9999 seconds	2
313	Input 1_Response speed learning parameter S2 0 down	**Z9**	7	0334	0335	820	821	R/W	0 to 9999 seconds	2
314	Input 1_Response speed learning parameter S3 set up	**ZM**	7	0336	0337	822	823	R/W	0 to 9999 seconds	2
315	Input 1_Response speed learning parameter S4 set down	**ZN**	7	0338	0339	824	825	R/W	0 to 9999 seconds	2
316	Input 1_No. of corrective actions	**FF**	7	033A	033B	826	827	R/W	0 to 99 times (99: unlimited times)	99
317	Input 1_Corrective action repeat	**FO**	7	033C	033D	828	829	R/W	0: Yes 1: No	1
318	Input 1_Corrective actions for ramp control	**FS**	7	033E	033F	830	831	R/W	0: Yes 1: No	0
319	Input 1_Lower range of corrective action amount	**VL**	7	0340	0341	832	833	R/W	0.0 to 105.0%	20.0
320	Input 1_Upper range of corrective action amount	**VM**	7	0342	0343	834	835	R/W	0.0 to 105.0%	20.0
321	Input 2_Valve coefficient A	**J4**	7	0344	0345	836	837	R/W	-1999 to 9999	0
322	Input 2_Valve coefficient b	**J5**	7	0346	0347	838	839	R/W	-1999 to 9999	0
323	Input 2_Valve coefficient C	**J6**	7	0348	0349	840	841	R/W	-1999 to 9999	0
324	Input 2_Valve coefficient d	**J7**	7	034A	034B	842	843	R/W	-1999 to 9999	0
325	Input 2_Valve coefficient E	**J8**	7	034C	034D	844	845	R/W	-1999 to 9999	0

326	Input 2_Valve coefficient F	**J9**	7	034E	034F	846	847	R/W	When Input 1_Control action is set to 3 to 6 or 8: 0: kg/cm^2 1: barg 2: psig 3: kPaG 4: MPaG When Input 1_Control action is 7 or 9: 10: mmHg/Torr 11: mbar 12: inHg 13: psi 14: kPa	Same as Input 1_ Valve coefficient F (pressure unit)
327	Input 2_Pressure standard for valve coefficient F	**NT**	7	0350	0351	848	849	R/W	0: Atmospheric pressure standard 1: Absolute pressure standard	Same as pressure standard for Input 1_Valve coefficient F
328	Input 2_Control valve selection	**NV**	7	0352	0353	850	851	R/W	0: MC-VCOS(R) 1: PC-VCOS(R)	0
329	Input 2_Pressure (Temp) limiter	**PF**	7	0354	0355	852	853	R/W	When Input 2_Control action is set to 3 to 7: Input 2_Input range low to Input 2_Input range high When Input 2_Control action is set to 8: Valve coefficient Coefficient F = 0 (kg/cm^{2}G): 0.00 to 99.99 Coefficient F = 1 (barg): 0.00 to 99.99 Coefficient F = 2 (psig): 0.0 to 999.9 Coefficient F = 3 (kPaG): 0 to 9999 Coefficient F = 4 (MPaG): 0.000 to 9.999 When Input 2_Control action is 9: 0.0 to Whichever the smaller value of either Input 2_range high or 140.0 °C (280.0 °F) Select the temperature unit according to the following conditions: When Input type is set to Temperature input: Input 2_ Display unit When Input type is set to V/I input: Input 2_Temperature limiter unit [Varies with the setting of the Decimal point position, when a setting is other than 8 for Input 2_Control action.] NOTE: Pressure (temperature) limiter function is OFF when 0 (0.0, 0.00, 0.000) is set	When a setting other than “7” is selected in Input 2_ Control action: 0 When “7” is selected in Input 2_ Control action: Input 2_Input range high

330	Input 2_Temperature limiter unit	**PW**	7	0356	0357	854	855	R/W	0: °C 1: °F	Same as Input 1_ Pressure (Temp) limiter unit
331	Input 2_Regression equation bias	**OD**	7	0358	0359	856	857	R/W	-50.0 to 50.0%	0.0
332	Input 2_Response speed self-learning selection	**X7**	7	035A	035B	858	859	R/W	0: Yes 1: No	0
333	Input 2_Response speed learning parameter t1 0 up	**ZB**	7	035C	035D	860	861	R/W	0 to 9999 seconds	6
334	Input 2_Response speed learning parameter t2 0 down	**ZE**	7	035E	035F	862	863	R/W	0 to 9999 seconds	6
335	Input 2_Response speed learning parameter t3 set up	**ZH**	7	0360	0361	864	865	R/W	0 to 9999 seconds	6
336	Input 2_Response speed learning parameter t4 set down	**ZI**	7	0362	0363	866	867	R/W	0 to 9999 seconds	6
337	Input 2_Response speed learning parameter L1 0 up	**ZJ**	7	0364	0365	868	869	R/W	0 to 9999 seconds	2
338	Input 2_Response speed learning parameter L2 0 down	**ZK**	7	0366	0367	870	871	R/W	0 to 9999 seconds	2
339	Input 2_Response speed learning parameter L3 set up	**ZL**	7	0368	0369	872	873	R/W	0 to 9999 seconds	2
340	Input 2_Response speed learning parameter L4 set down	**ZO**	7	036A	036B	874	875	R/W	0 to 9999 seconds	2
341	Input 2_Response speed learning parameter S1 0 up	**ZR**	7	036C	036D	876	877	R/W	0 to 9999 seconds	2
342	Input 2_Response speed learning parameter S2 0 down	**ZS**	7	036E	036F	878	879	R/W	0 to 9999 seconds	2
343	Input 2_Response speed learning parameter S3 set up	**ZT**	7	0370	0371	880	881	R/W	0 to 9999 seconds	2
344	Input 2_Response speed learning parameter S4 set down	**ZU**	7	0372	0373	882	883	R/W	0 to 9999 seconds	2
345	Input 2_No. of corrective actions	**ZV**	7	0374	0375	884	885	R/W	0 to 99 times (99: unlimited times)	99

346	Input 2_Corrective action repeat	**FT**	7	0376	0377	886	887	R/W	0: Yes 1: No	1
347	Input 2_Corrective actions for ramp control	**FU**	7	0378	0379	888	889	R/W	0: Yes 1: No	0
348	Input 2_Lower range of corrective action amount	**VN**	7	037A	037B	890	891	R/W	0.0 to 105.0%	20.0
349	Input 2_Upper range of corrective action amount	**VO**	7	037C	037D	892	893	R/W	0.0 to 105.0%	20.0
350	Input 1_Output change rate limiter (up) [cool-side]	**PM**	7	0260	0261	608	609	R/W	0.0 to 1000.0%/seconds of manipulated output 0.0: OFF	0.0
351	Input 1_Output change rate limiter (down) [cool-side]	**PN**	7	0262	0263	610	611	R/W	0.0 to 1000.0%/seconds of manipulated output 0.0: OFF	0.0
352	Input 1_ Manipulated output value at STOP [cool-side]	**OG**	7	0264	0265	612	613	R/W	-5.0 to +105.0%	-5.0
353	Undershoot suppression factor	**KB**	7	0266	0267	614	615	R/W	0.000 to 1.000	1000
354	Overlap/Deadband reference point	**UY**	7	0268	0269	616	617	R/W	0.0 to 1.0	0.0
355	Bottom suppression function	**G6**	7	026A	026B	618	619	R/W	0: No function 1: FF amount is added by level 2: FF amount is forcibly added	0
356	Select function for input 2	**KL**	7	026C	026D	620	621	R/W	0: No function 1: Remote setting input 2: 2-loop control/Differential temperature control 3: Control with PV select 4: Cascade control (Slave single ↔ Cascade) 5: Cascade control (Master single ↔ Cascade) 6: Input circuit error alarm Selectable range is limited depending on Input 1_ Control action. PID control: 0 to 6 When pressure control operation [MC-(V)COS(R)] is selected: 0 to 2, 6 Heating/Cooling control: 0 to 3, 6	1

357	Cascade_AT mode (master-side)	**GK**	7	026E	026F	622	623	R/W	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1
358	Cascade_AT mode (slave-side)	**GL**	7	0270	0271	624	625	R/W	0: Easy adjustment (AT: one cycle) 1: Load factor adjustment (AT: 2 cycles)	TC/RTD inputs: 0 V/I inputs: 1
359	Selection of PV select trigger	**L7**	7	0272	0273	626	627	R/W	0: Switching by level 1: Switching by signal (Key, DI and Communication)	0
360	Input circuit error alarm set value	**L4**	7	0274	0275	628	629	R/W	0 to Input 1_Input span 0: No function [Varies with the setting of the Decimal point position.]	TC/RTD inputs: 10 V/I inputs: 5% of Input 1_Input span
361	Communication protocol	**IS**	7	0276	0277	630	631	R/W	0: Original communication 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data transfer: low-order word to high-order word) 3: PLC communication (MITSUBISHI MELSEC series special protocol QnA compatible 3C frame [Format 4])	0
362	Device address	**IP**	7	0278	0279	632	633	R/W	Original communication: 0 to 99 Modbus: 1 to 99 PLC communication: 0 to 30	Original communication: 0 Modbus: 1 PLC communication: 0
363	Communication speed	**IR**	7	027A	027B	634	635	R/W	0: 2400 bps 1: 4800 bps 2: 9600 bps 3: 19200 bps 4: 38400 bps 5: 57600 bps	3

<table>
<tr><td>364</td><td>Data bit configuration</td><td>IQ</td><td>7</td><td>027C</td><td>027D</td><td>636</td><td>637</td><td>R/W</td><td>Data bit configuration table<table><tr><th>Set value</th><th>Data bit</th><th>Parity bit</th><th>Stop bit</th></tr><tr><td>0</td><td>8</td><td>Without</td><td>1</td></tr><tr><td>1</td><td>8</td><td>Without</td><td>2</td></tr><tr><td>2</td><td>8</td><td>Even</td><td>1</td></tr><tr><td>3</td><td>8</td><td>Even</td><td>2</td></tr><tr><td>4</td><td>8</td><td>Odd</td><td>1</td></tr><tr><td>5</td><td>8</td><td>Odd</td><td>2</td></tr><tr><td>6</td><td>7</td><td>Without</td><td>1</td></tr><tr><td>7</td><td>7</td><td>Without</td><td>2</td></tr><tr><td>8</td><td>7</td><td>Even</td><td>1</td></tr><tr><td>9</td><td>7</td><td>Even</td><td>2</td></tr><tr><td>10</td><td>7</td><td>Odd</td><td>1</td></tr><tr><td>11</td><td>7</td><td>Odd</td><td>2</td></tr></table>Original communication: 0 to 11
Modbus: 0 to 5</td><td>0</td></tr>
<tr><td>365</td><td>Interval time</td><td>IT</td><td>7</td><td>027E</td><td>027F</td><td>638</td><td>639</td><td>R/W</td><td>0 to 250 ms</td><td>10</td></tr>
<tr><td>366</td><td>Register type</td><td>QZ</td><td>7</td><td>0280</td><td>0281</td><td>640</td><td>641</td><td>R/W</td><td>MITSUBISHI PLC
0: D register (data register)
1: R register (file register)
2: W register (link register)
3: ZR register (Method of specifying consecutive numbers when 32767 of R register is exceeded.)</td><td>0</td></tr>
<tr><td>367</td><td>Register start number (High-order 4-bit)</td><td>QS</td><td>7</td><td>0282</td><td>0283</td><td>642</td><td>643</td><td>R/W</td><td>0 to 15</td><td>0</td></tr>
<tr><td>368</td><td>Register start number (Low-order 16-bit)</td><td>QX</td><td>7</td><td>0284</td><td>0285</td><td>644</td><td>645</td><td>R/W</td><td>0 to 65535</td><td>1000</td></tr>
<tr><td>369</td><td>Monitor item register bias</td><td>R3</td><td>7</td><td>0286</td><td>0287</td><td>646</td><td>647</td><td>R/W</td><td>12 to 65535</td><td>12</td></tr>
<tr><td>370</td><td>Setting item register bias</td><td>R4</td><td>7</td><td>0288</td><td>0289</td><td>648</td><td>649</td><td>R/W</td><td>0 to 65535</td><td>0</td></tr>
<tr><td>371</td><td>Instrument link recognition time</td><td>QT</td><td>7</td><td>028A</td><td>028B</td><td>650</td><td>651</td><td>R/W</td><td>0 to 255 seconds</td><td>5</td></tr>
<tr><td>372</td><td>PLC response waiting time</td><td>VT</td><td>7</td><td>028C</td><td>028D</td><td>652</td><td>653</td><td>R/W</td><td>0 to 3000 ms</td><td>255</td></tr>
<tr><td>373</td><td>PLC communication start time</td><td>R5</td><td>7</td><td>028E</td><td>028F</td><td>654</td><td>655</td><td>R/W</td><td>1 to 255 seconds</td><td>5</td></tr>
<tr><td>374</td><td>Slave register bias</td><td>R8</td><td>7</td><td>0290</td><td>0291</td><td>656</td><td>657</td><td>R/W</td><td>0 to 65535</td><td>80</td></tr>
</table>

375	Number of recognizable devices	**QU**	7	0292	0293	658	659	R/W	0 to 30	8
376	Station number	**QV**	7	0294	0295	660	661	R/W	0 to 31	0
377	PC number	**QW**	7	0296	0297	662	663	R/W	0 to 255	255
378	Monitor item selection 1	**R6**	7	0298	0299	664	665	R/W	0 to 65535	387
379	Monitor item selection 2	**R7**	7	029A	029B	666	667	R/W	0 to 65535	16512
380	Monitor item selection 3	**R9**	7	029C	029D	668	669	R/W	0 to 65535	1024
381	Setting item selection 1	**RE**	7	029E	029F	670	671	R/W	0 to 65535	16480
382	Setting item selection 2	**RF**	7	02A0	02A1	672	673	R/W	0 to 65535	7850
383	Setting item selection 3	**RG**	7	02A2	02A3	674	675	R/W	0 to 65535	32768
384	Setting item selection 4	**RH**	7	02A4	02A5	676	677	R/W	0 to 65535	771
385	Setting item selection 5	**RI**	7	02A6	02A7	678	679	R/W	0 to 65535	0
386	Setting item selection 6	**RJ**	7	02A8	02A9	680	681	R/W	0 to 65535	0
387	Setting item selection 7	**RK**	7	02AA	02AB	682	683	R/W	0 to 65535	0
388	Setting item selection 8	**RL**	7	02AC	02AD	684	685	R/W	0 to 65535	49152
389	Setting item selection 9	**RM**	7	0384	0385	900	901	R/W	0 to 65535	4
390	Soft start/Setting change rate limiter selection	**MA**	7	037E	037F	894	895	R/W	0: Soft start 1: Setting change rate limiter	0
391	Soft start time selection	**TS**	7	0380	0381	896	897	R/W	0: m.s 1: h.m	0
392	Soft start start point selection	**SV**	7	0382	0383	898	899	R/W	0: Measured value (PV) start 1: Zero point start	0
393	Setting change rate limiter unit time	**HU**	7	02AE	02AF	686	687	R/W	1 to 3600 seconds	60
394	Soak time unit	**RU**	7	02B0	02B1	688	689	R/W	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	1
395	Input 1_Setting limiter high	**SH**	7	02B2	02B3	690	691	R/W	Input 1_Setting limiter low to Input 1_Input range high (When Control with PV select: Input 1_Setting limiter low to PV select input range high) [Varies with the setting of the Decimal point position.]	Input 1_Input range high (When Control with PV select: PV select input range high)

396	Input 1_Setting limiter low	**SL**	7	02B4	02B5	692	693	R/W	Input 1_Setting limiter low to Input 1_Input range high (When Control with PV select: PV select input range low to Input 1_Setting limiter high) [Varies with the setting of the Decimal point position.]	Input 1_Input range low (When Control with PV select: PV select input range low)
397	Input 2_Setting limiter high	**U0**	7	02B6	02B7	694	695	R/W	Input 2_Setting limiter low to Input 2_Input range high [Varies with the setting of the Decimal point position.]	Input 2_Input range high
398	Input 2_Setting limiter low	**U1**	7	02B8	02B9	696	697	R/W	Input 2_Input range low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	Input 2_Input range low
399	Initialization	**DC**	7	02BA	02BB	698	699	R/W	1225: Start initialization Other values: Set values are maintained After the initialization, this instrument is restarted. This setting will automatically go back to zero.	0
400	Set data unlock/lock transfer	**LU**	7	02BC	02BD	700	701	R/W	0: Unlock state 1: Lock state	0
401	Set lock level	**LK**	7	02BE	02BF	702	703	R/W	Original communication: 0 to 31 The Set lock level is assigned as a bit image in binary numbers. Transmission data from the SC-F71 is replaced with ASCII code in decimal number. Bit 0: SV setting mode + Parameter select mode Bit 1: Operation transfer mode Bit 2: Parameter setting mode Bit 3: Setup setting mode Bit 4: Engineering mode Bit 5 to Bit 7: Unused Data 0: Unlock 1: Lock Modbus: 0 to 31 0: Unlock +1: SV setting mode + Parameter select mode +2: Operation transfer mode +4: Parameter setting mode +8: Setup setting mode +16: Engineering mode	0
402	Area lock	**LL**	7	02C0	02C1	704	705	R/W	0: Memory area is adjustable when the setting data is locked. 1: Memory area is not adjustable when the setting data is locked. (Memory area transfer mode is not displayed)	0

403	Select Blind function	**BQ**	7	02C2	02C3	706	707	R/W	0: Blind function: OFF 1: Blind function: ON	0
404	Parameter select direct registration	**LD**	7	02C4	02C5	708	709	R/W	0: Direct registration: OFF 1: Direct registration: ON	0
405	Parameter select setting 1	**BA**	7	02C6	02C7	710	711	R/W	1 to 351 (Screen No.) 0: No registration	0
406	Parameter select setting 2	**BB**	7	02C8	02C9	712	713	R/W	Same as the Parameter select setting 1	
407	Parameter select setting 3	**BC**	7	02CA	02CB	714	715	R/W	Same as the Parameter select setting 1	
408	Parameter select setting 4	**BD**	7	02CC	02CD	716	717	R/W	Same as the Parameter select setting 1	
409	Parameter select setting 5	**BE**	7	02CE	02CF	718	719	R/W	Same as the Parameter select setting 1	
410	Parameter select setting 6	**BF**	7	02D0	02D1	720	721	R/W	Same as the Parameter select setting 1	
411	Parameter select setting 7	**BG**	7	02D2	02D3	722	723	R/W	Same as the Parameter select setting 1	
412	Parameter select setting 8	**BH**	7	02D4	02D5	724	725	R/W	Same as the Parameter select setting 1	
413	Parameter select setting 9	**BI**	7	02D6	02D7	726	727	R/W	Same as the Parameter select setting 1	
414	Parameter select setting 10	**BJ**	7	02D8	02D9	728	729	R/W	Same as the Parameter select setting 1	
415	Parameter select setting 11	**BK**	7	02DA	02DB	730	731	R/W	Same as the Parameter select setting 1	
416	Parameter select setting 12	**BL**	7	02DC	02DD	732	733	R/W	Same as the Parameter select setting 1	
417	Parameter select setting 13	**BM**	7	02DE	02DF	734	735	R/W	Same as the Parameter select setting 1	
418	Parameter select setting 14	**BN**	7	02E0	02E1	736	737	R/W	Same as the Parameter select setting 1	
419	Parameter select setting 15	**BO**	7	02E2	02E3	738	739	R/W	Same as the Parameter select setting 1	
420	Parameter select setting 16	**BP**	7	02E4	02E5	740	741	R/W	Same as the Parameter select setting 1	

6.3.2 Memory area data (Direct designation method) [Modbus double word]

Register addresses 0500H to 0B5FH are used to check and change set values belonging to the Memory area.

☞ For Memory area, refer to the 5.9 How to Use Memory Area Data.

■ Memory area 1 data

Low: Low-order High: High-order

No.	Name	Register address				Attri-bute	Data range	Factory set value
		HEX		DEC				
		Low	High	Low	High			
1	Input 1_Set value (SV)	0500	0501	1280	1281	R/W	Input 1_Setting limiter low to Input 1_Setting limiter high [Varies with the setting of the Decimal point position.]	0
2	Input 2_Set value (SV)	0502	0503	1282	1283	R/W	Input 2_Setting limiter low to Input 2_Setting limiter high [Varies with the setting of the Decimal point position.]	0
3	Set value (SV) of differential temperature input	0504	0505	1284	1285	R/W	-(Input 1_Input span) to +(Input 1_Input span) [Varies with the setting of the Decimal point position.]	0
4	Event 1 set value (EV1) Event 1 set value (EV1) [high]	0506	0507	1286	1287	R/W	• Deviation When assigned to Input 1 or Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When assigned to Input 2 -(Input 2_Input span) to +(Input 2_Input span) When Control with PV select is selected at Select function for input 2 -(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.]	High action, high/low action: max. Low action, process action: min.
							• Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When Control with PV select is selected at Select function for Input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.] • Manipulated output value: -5.0 to +105.0%	

5	Event 1 set value (EV1') [low]	0508	0509	1288	1289	R/W	• Deviation When assigned to Input_1 or Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When assigned to Input 2 -(Input 2_Input span) to +(Input 2_Input span) When Control with PV select is selected at Select function for Input 2 -(PV select input span) to +(PV select input span) [Varies with the setting of the Decimal point position.]	High/low action: min. Process action: max.
							• Input value or Set value When assigned to Input 1 Input 1_Input range low to Input 1_Input range high When assigned to Input 2 Input 2_Input range low to Input 2_Input range high When assigned to Differential temperature input -(Input 1_Input span) to +(Input 1_Input span) When Control with PV select is selected at Select function for Input 2 PV select input range low to PV select input range high [Varies with the setting of the Decimal point position.]	
6	Event 2 set value (EV2) Event 2 set value (EV2) [high]	050A	050B	1290	1291	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
7	Event 2 set value (EV2') [low]	050C	050D	1292	1293	R/W	Same as Event 1 set value (EV1') [low]	
8	Event 3 set value (EV3) Event 3 set value (EV3) [high]	050E	050F	1294	1295	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
9	Event 3 set value (EV3') [low]	0510	0511	1296	1297	R/W	Same as Event 1 set value (EV1') [low]	
10	Event 4 set value (EV4) Event 4 set value (EV4) [high]	0512	0513	1298	1299	R/W	Same as Event 1 set value (EV1)/Event 1 set value (EV1) [high]	
11	Event 4 set value (EV4') [low]	0514	0515	1300	1301	R/W	Same as Event 1 set value (EV1') [low]	
12	Input 1_Proportional band [heat-side]	0516	0517	1302	1303	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0% of Input 1_Input span (When Control with PV select: 0.0 to 1000.0% of PV select input span) 0 (0.0, 0.00): ON/OFF action	TC/RTD inputs: 30 V/I inputs: 3.0

							NOTE: 0 (0.0, 0.00) cannot be set when temperature control operation [MC-(V)COS(R)] is selected for Input 1_Control action.	
13	Input 1_Integral time [heat-side]	0518	0519	1304	1305	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
14	Input 1_Derivative time [heat-side]	051A	051B	1306	1307	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
15	Input 1_Control response parameter	051C	051D	1308	1309	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	PID control: 0 Heating/Cooling PID control: 2
16	Input 1_Proactive intensity	051E	051F	1310	1311	R/W	0 to 4 0: No function	2
17	Input 1_Manual reset	0520	0521	1312	1313	R/W	-100.0 to +100.0%	0.0
18	Input 1_FF amount	0522	0523	1314	1315	R/W	-100.0 to +100.0%	0.0
19	Input 1_Output limiter high [heat-side]	0524	0525	1316	1317	R/W	Input 1_Output limiter low [heat-side] to 105.0 %	105.0
20	Input 1_Output limiter low [heat-side]	0526	0527	1318	1319	R/W	-5.0% to Input 1_Output limiter high [heat-side]	-5.0
21	Input 2_Proportional band	052C	052D	1324	1325	R/W	TC/RTD inputs 0 (0.0, 0.00) to Input 2_Input span (Unit: °C [°F]) (When Control with PV select: 0 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.0 to 1000.0% of Input 2_Input span (When Control with PV select: 0.0 to 1000.0% of PV select input span) 0 (0.0, 0.00): ON/OFF action NOTE: 0 (0.0, 0.00) cannot be set when temperature control operation [MC-(V)COS(R)] is selected for Input 2_Control action.	TC/RTD inputs: 30 V/I inputs: 3.0

22	Input 2_Integral time	052E	052F	1326	1327	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240
23	Input 2_Derivative time	0530	0531	1328	1329	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
24	Input 2_Control response parameter	0532	0533	1330	1331	R/W	0: Slow 1: Medium 2: Fast [When the P or PD action is selected, this setting becomes invalid]	0
25	Input 2_Proactive intensity	0534	0535	1332	1333	R/W	0 to 4 0: No function	2
26	Input 2_Manual reset	0536	0537	1334	1335	R/W	-100.0 to +100.0%	0.0
27	Input 2_FF amount	0538	0539	1336	1337	R/W	-100.0 to +100.0%	0.0
28	Input 2_Output limiter high	053A	053B	1338	1339	R/W	Input 2_Output limiter low to 105.0%	105.0
29	Input 2_Output limiter low	053C	053D	1340	1341	R/W	-5.0% to Input 2_Output limiter high	-5.0
30	Input 1_Proportional band [cool-side]	0542	0543	1346	1347	R/W	TC/RTD inputs 1 (0.1, 0.01) to Input 1_Input span (Unit: °C [°F]) (When Control with PV select: 1 to PV select input span) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs 0.1 to 1000.0% of Input 1_Input span (When Control with PV select: 0.1 to 1000.0% of PV select input span)	TC/RTD inputs: 30 V/I inputs: 3.0
31	Input 1_Integral time [cool-side]	0544	0545	1348	1349	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PD action [Varies with the setting of the Integral/Derivative time decimal point position.]	240

32	Input 1_Derivative time [cool-side]	0546	0547	1350	1351	R/W	0 to 3600 seconds, 0.0 to 3600.0 seconds or 0.00 to 360.00 seconds 0 (0.0, 0.00): PI action [Varies with the setting of the Integral/Derivative time decimal point position.]	60
33	Input 1_Overlap/Deadband	0548	0549	1352	1353	R/W	TC/RTD inputs -(Input 1_Input span) to +(Input 1_Input span) (When Control with PV select: -(PV select input span) to +(PV select input span)) (Unit: °C [°F]) [Varies with the setting of the Decimal point position.] Voltage (V)/Current (I) inputs -100.0 to +100.0% of Input 1_Input span (When Control with PV select: -100.0 to +100.0% of PV select input span) Minus (-) setting results in Overlap. However, the overlapping range is within the proportional range.	TC/RTD inputs: 0 V/I inputs: 0.0
34	Input 1_Output limiter high [cool-side]	054A	054B	1354	1355	R/W	Heat/Cool PID control Input 1_Output limiter low [cool-side] to 105.0%	105.0
	Input 1_Output limiter low [heat-side]						PID control or Position proportioning PID control -5.0% to Input 1_Output limiter high [heat-side] Same data as the original communication identifier OX	-5.0
35	Input 1_Output limiter low [cool-side]	054C	054D	1356	1357	R/W	-5.0% to Input 1_Output limiter high [cool-side]	-5.0
36	Select Trigger type for Memory area transfer	054E	054F	1358	1359	R/W	0 to 63 0: No assignment +1: Event 1 +2: Event 2 +4: Event 3 +8: Event 4 +16: Digital input 1 (DI1) Close edge +32: Digital input 1 (DI1) Open edge To select two or more functions, sum each value.	0
37	Area soak time	0550	0051	1360	1361	R/W	• Original communication 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	Original communication: 0:00 (0 minutes 00 seconds) Modbus: 0 (0

							• Modbus [hours:minutes:seconds] 0 to 35999 seconds [hours:minutes] 0 to 11999 seconds [minutes:seconds] 0 to 5999 minutes [Data range of Memory area soak time monitor can be selected on the Soak time unit.]	seconds)
38	Link area number	0552	0553	1362	1363	R/W	0 to 16 0: No function	0
39	Input 1_Setting change rate limiter (up)	0554	0555	1364	1365	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
40	Input 1_Setting change rate limiter (down)	0556	0557	1366	1367	R/W	0 to Input 1_Input span (When Control with PV select: 0 to PV select input span) 0: No function [Varies with the setting of the Decimal point position.]	0
41	Input 1_Auto/Manual transfer selection (Area)	0558	0559	1368	1369	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump) 3: Manual mode (bumpless) 4: Manual mode (bump)	0
42	Input 1_Manipulated output value (Area)	055A	055B	1370	1371	R/W	Heating/Cooling PID control: -105.0 to +105.0% Other control: -5.0 to +105.0% [When either 2: Auto mode (bump) or 4: Manual mode (bump) is selected in Input 1_Auto/Manual transfer selection (Area)]	Heating/Cooling PID control: 0.0 Other control: -5.0
43	Input 2_Setting change rate limiter (up)	055C	055D	1372	1373	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
44	Input 2_Setting change rate limiter (down)	055E	055F	1374	1375	R/W	0 to Input 2_Input span 0: No function [Varies with the setting of the Decimal point position.]	0
45	Input 2_Auto/Manual transfer selection (Area)	0560	0561	1376	1377	R/W	0: No transfer 1: Auto mode (bumpless) 2: Auto mode (bump)	0

							3: Manual mode (bumpless) 4: Manual mode (bump)	
46	Input 2_Manipulated output value (Area)	0562	0563	1378	1379	R/W	-5.0 to +105.0% [When either 2: Auto mode (bump) or 4: Manual mode (bump) is selected in Input 2_Auto/Manual transfer selection (Area)]	-5.0
47	Remote/Local transfer selection (Area)	0564	0565	1380	1381	R/W	When Select function for input 2 is: “Remote setting input” 0: No transfer 1: Local mode 2: Remote mode	0
							When Select function for input 2 is: “Cascade control” 0: No transfer 1: Single control 2: Cascade control	
							When Select function for input 2 is: “Control with PV select” 0: No transfer 1: Input 1 2: Input 2	
							When Select function for input 2 is: “2-loop control/Differential temperature control” 0: No transfer 1: 2-loop control 2: Differential temperature control	
48	Input 1_Dead zone	0B60	0B61	2912	2913	R/W	0 to 10% of Input 1_Input span [Decimal point position depends on the setting for Input 1_ Valve coefficient F.] 3, 10, 11, 14: no decimal point place 2, 12: one digit 0, 1, 13: two digits 4: three digits	See Table: Factory set value of the Dead zone
49	Input 2_Dead zone	0B62	0B63	2914	2915	R/W	0 to 10% of Input 1_Input span [Decimal point position depends on the setting for Input 1_ Valve coefficient F.] 3, 10, 11, 14: no decimal point place 2, 12: one digit 0, 1, 13: two digits	See Table: Factory set value of the Dead zone

							4: three digits	
50	Input 1_Soft start time (up)	0B64	0B65	2916	2915	R/W	[hours:minutes] 0 hours 00 minutes to 99 hours 59 minutes [minutes:seconds] 0 minutes 00 seconds to 199 minutes 59 seconds [Data range of Soft start time can be selected on the Soft start unit.]	0:00 (0 minutes 00 seconds)
51	Input 1_Soft start time (down)	0B66	0B67	2918	2919	R/W	[hours:minutes] 0 hours 00 minutes to 99 hours 59 minutes [minutes:seconds] 0 minutes 00 seconds to 199 minutes 59 seconds [Data range of Soft start time can be selected on the Soft start unit.]	0:00 (0 minutes 00 seconds)
52	Input 2_Soft start time (up)	0B68	0B69	2920	2921	R/W	[hours:minutes] 0 hours 00 minutes to 99 hours 59 minutes [minutes:seconds] 0 minutes 00 seconds to 199 minutes 59 seconds [Data range of Soft start time can be selected on the Soft start unit.]	0:00 (0 minutes 00 seconds)
53	Input 2_Soft start time (down)	0B6A	0B6B	2922	2933	R/W	[hours:minutes] 0 hours 00 minutes to 99 hours 59 minutes [minutes:seconds] 0 minutes 00 seconds to 199 minutes 59 seconds [Data range of Soft start time can be selected on the Soft start unit.]	0:00 (0 minutes 00 seconds)

Table: Factory set value of the Dead zone

Control action*	Valve coefficient F (pressure unit)									
	0	1	2	3	4	10	11	12	13	14
3	0.03	0.03	0.4	3	0.003	–	–	–	–	–
4	0.04	0.04	0.4	4	0.004	–	–	–	–	–
5	0.10	0.10	1.5	10	0.010	–	–	–	–	–
6	0.10	0.10	1.5	10	0.010	–	–	–	–	–
7	–	–	–	–	–	7	10	0.3	0.14	1

■ Memory area 2 to 5 data

Register addresses for Memory areas 2 to 5. For details of attribute, data range and factory set values, refer to the same line No. in ■ Memory area 1 data.

Low: Low-order High: High-order

No.	Name	Memory area 2				Memory area 3				Memory area 4				Memory area 5			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV)	0566	0567	1382	1383	05CC	05CD	1484	1485	0632	0633	1586	1587	0698	0699	1688	1689
2	Input 2_Set value (SV)	0568	0569	1384	1385	05CE	05CF	1486	1487	0634	0635	1588	1589	069A	069B	1690	1691
3	Set value (SV) of differential temperature input	056A	056B	1386	1387	05D0	05D1	1488	1489	0636	0637	1590	1591	069C	069D	1692	1693
4	Event 1 set value (EV1) Event 1 set value (EV1) [high]	056C	056D	1388	1389	05D2	05D3	1490	1491	0638	0639	1592	1593	069E	069F	1694	1695
5	Event 1 set value (EV1') [low]	056E	056F	1390	1391	05D4	05D5	1492	1493	063A	063B	1594	1595	06A0	06A1	1696	1697
6	Event 2 set value (EV2) Event 2 set value (EV2) [high]	0570	0571	1392	1393	05D6	05D7	1494	1495	063C	063D	1596	1597	06A2	06A3	1698	1699
7	Event 2 set value (EV2') [low]	0572	0573	1394	1395	05D8	05D9	1496	1497	063E	063F	1598	1599	06A4	06A5	1700	1701
8	Event 3 set value (EV3) Event 3 set value (EV3) [high]	0574	0575	1396	1397	05DA	05DB	1498	1499	0640	0641	1600	1601	06A6	06A7	1702	1703
9	Event 3 set value (EV3') [low]	0576	0577	1398	1399	05DC	05DD	1500	1501	0642	0643	1602	1603	06A8	06A9	1704	1705
10	Event 4 set value (EV4) Event 4 set value (EV4) [high]	0578	0579	1400	1401	05DE	05DF	1502	1503	0644	0645	1604	1605	06AA	06AB	1706	1707
11	Event 4 set value (EV4') [low]	057A	057B	1402	1403	05E0	05E1	1504	1505	0646	0647	1606	1607	06AC	06AD	1708	1709
12	Input 1_Proportional band [heat-side]	057C	057D	1404	1405	05E2	05E3	1506	1507	0648	0649	1608	1609	06AE	06AF	1710	1711
13	Input 1_Integral time [heat-side]	057E	057F	1406	1407	05E4	05E5	1508	1509	064A	064B	1610	1611	06B0	06B1	1712	1713
14	Input 1_Derivative time [heat-side]	0580	0581	1408	1409	05E6	05E7	1510	1511	064C	064D	1612	1613	06B2	06B3	1714	1715
15	Input 1_Control response parameter	0582	0583	1410	1411	05E8	05E9	1512	1513	064E	064F	1614	1615	06B4	06B5	1716	1717
16	Input 1_Proactive intensity	0584	0585	1412	1413	05EA	05EB	1514	1515	0650	0651	1616	1617	06B6	06B7	1718	1719
17	Input 1_Manual reset	0586	0587	1414	1415	05EC	05ED	1516	1517	0652	0653	1618	1619	06B8	06B9	1720	1721
18	Input 1_FF amount	0588	0589	1416	1417	05EE	05EF	1518	1519	0654	0655	1620	1621	06BA	06BB	1722	1723
19	Input 1_Output limiter high [heat-side]	058A	058B	1418	1419	05F0	05F1	1520	1521	0656	0657	1622	1623	06BC	06BD	1724	1725
20	Input 1_Output limiter low [heat-side]	058C	058D	1420	1421	05F2	05F3	1522	1523	0658	0659	1624	1625	06BE	06BF	1726	1727
21	Input 2_Proportional band	0592	0593	1426	1427	05F8	05F9	1528	1529	065E	065F	1630	1631	06C4	06C5	1732	1733
21	Input 2_Integral time	0594	0595	1428	1429	05FA	05FB	1530	1531	0660	0661	1632	1633	06C6	06C7	1734	1735

23	Input 2_Derivative time	0596	0597	1430	1431	05FC	05FD	1532	1533	0662	0663	1634	1635	06C8	06C9	1736	1737
24	Input 2_Control response parameter	0598	0599	1432	1433	05FE	05FF	1534	1535	0664	0665	1636	1637	06CA	06CB	1738	1739
25	Input 2_Proactive intensity	059A	059B	1434	1435	0600	0601	1536	1537	0666	0667	1638	1639	06CC	06CD	1740	1741
26	Input 2_Manual reset	059C	059D	1436	1437	0602	0603	1538	1539	0668	0669	1640	1641	06CE	06CF	1742	1743
27	Input 2_FF amount	059E	059F	1438	1439	0604	0605	1540	1541	066A	066B	1642	1643	06D0	06D1	1744	1745
28	Input 2_Output limiter high	05A0	05A1	1440	1441	0606	0607	1542	1543	066C	066D	1644	1645	06D2	06D3	1746	1747
29	Input 2_Output limiter low	05A2	05A3	1442	1443	0608	0609	1544	1545	066E	066F	1646	1647	06D4	06D5	1748	1749
30	Input 1_Proportional band [cool-side]	05A8	05A9	1448	1449	060E	060F	1550	1551	0674	0675	1652	1653	06DA	06DB	1754	1755
31	Input 1_Integral time [cool-side]	05AA	05AB	1450	1451	0610	0611	1552	1553	0676	0677	1654	1655	06DC	06DD	1756	1757
32	Input 1_Derivative time [cool-side]	05AC	05AD	1452	1453	0612	0613	1554	1555	0678	0679	1656	1657	06DE	06DF	1758	1759
33	Input 1_Overlap/Deadband	05AE	05AF	1454	1455	0614	0615	1556	1557	067A	067B	1658	1659	06E0	06E1	1760	1761
34	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side]	05B0	05B1	1456	1457	0616	0617	1558	1559	067C	067D	1660	1661	06E2	06E3	1762	1763
35	Input 1_Output limiter low [cool-side]	05B2	05B3	1458	1459	0618	0619	1560	1561	067E	067F	1662	1663	06E4	06E5	1764	1765
36	Select Trigger type for Memory area transfer	05B4	05B5	1460	1461	061A	061B	1562	1563	0680	0681	1664	1665	06E6	06E7	1766	1767
37	Area soak time	05B6	05B7	1462	1463	061C	061D	1564	1565	0682	0683	1666	1667	06E8	06E9	1768	1769
38	Link area number	05B8	05B9	1464	1465	061E	061F	1566	1567	0684	0685	1668	1669	06EA	06EB	1770	1771
39	Input 1_Setting change rate limiter (up)	05BA	05BB	1466	1467	0620	0621	1568	1569	0686	0687	1670	1671	06EC	06ED	1772	1773
40	Input 1_Setting change rate limiter (down)	05BC	05BD	1468	1469	0622	0623	1570	1571	0688	0689	1672	1673	06EE	06EF	1774	1775
41	Input 1_Auto/Manual transfer selection (Area)	05BE	05BF	1470	1471	0624	0625	1572	1573	068A	068B	1674	1675	06F0	06F1	1776	1777
42	Input 1_Manipulated output value (Area)	05C0	05C1	1472	1473	0626	0627	1574	1575	068C	068D	1676	1677	06F2	06F3	1778	1779
43	Input 2_Setting change rate limiter (up)	05C2	05C3	1474	1475	0628	0629	1576	1577	068E	068F	1678	1679	06F4	06F5	1780	1781
44	Input 2_Setting change rate limiter (down)	05C4	05C5	1476	1477	062A	062B	1578	1579	0690	0691	1680	1681	06F6	06F7	1782	1783
45	Input 2_Auto/Manual transfer selection (Area)	05C6	05C7	1478	1479	062C	062D	1580	1581	0692	0693	1682	1683	06F8	06F9	1784	1785
46	Input 2_Manipulated output value (Area)	05C8	05C9	1480	1481	062E	062F	1582	1583	0694	0695	1684	1685	06FA	06FB	1786	1787
47	Remote/Local transfer selection (Area)	05CA	05CB	1482	1483	0630	0631	1584	1585	0696	0697	1686	1687	06FC	06FD	1788	1789
48	Input 1_Dead zone	0B6C	0B6D	2924	2925	0B78	0B79	2936	2937	0B84	0B85	2948	2949	0B90	0B91	2960	2961
49	Input 2_Dead zone	0B6E	0B6D	2926	2927	0B7A	0B7B	2938	2939	0B86	0B87	2950	2951	0B92	0B93	2962	2963
50	Input 1_Soft start time (up)	0B70	0B71	2928	2929	0B7C	0B7D	2940	2941	0B88	0B89	2952	2953	0B94	0B95	2964	2965
51	Input 1_Soft start time (down)	0B72	0B73	2930	2931	0B7E	0B7F	2942	2943	0B8A	0B8B	2954	2955	0B96	0B97	2966	2967
52	Input 2_Soft start time (up)	0B74	0B75	2932	2933	0B80	0B81	2944	2945	0B8C	0B8D	2956	2957	0B98	0B99	2968	2969
53	Input 2_Soft start time (down)	0B76	0B77	2934	2935	0B82	0B83	2946	2947	0B8E	0B8F	2958	2959	0B9A	0B9B	2970	2971

■ Memory area 6 to 9 data

Register addresses for Memory areas 6 to 9.
For details of attribute, data range and factory set values, refer to the same line No. in ■ **Memory area 1 data**.

Low: Low-order High: High-order

No.	Name	Memory area 6				Memory area 7				Memory area 8				Memory area 9			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV)	06FE	06FF	1790	1791	0764	0765	1892	1893	07CA	07CB	1994	1995	0830	0831	2096	2097
2	Input 2_Set value (SV)	0700	0701	1792	1793	0766	0767	1894	1895	07CC	07CD	1996	1997	0832	0833	2098	2099
3	Set value (SV) of differential temperature input	0702	0703	1794	1795	0768	0769	1896	1897	07CE	07CF	1998	1999	0834	0835	2100	2101
4	Event 1 set value (EV1) Event 1 set value (EV1) [high]	0704	0705	1796	1797	076A	076B	1898	1899	07D0	07D1	2000	2001	0836	0837	2102	2103
5	Event 1 set value (EV1') [low]	0706	0707	1798	1799	076C	076D	1900	1901	07D2	07D3	2002	2003	0838	0839	2104	2105
6	Event 2 set value (EV2) Event 2 set value (EV2) [high]	0708	0709	1800	1801	076E	076F	1902	1903	07D4	07D5	2004	2005	083A	083B	2106	2107
7	Event 2 set value (EV2') [low]	070A	070B	1802	1803	0770	0771	1904	1905	07D6	07D7	2006	2007	083C	083D	2108	2109
8	Event 3 set value (EV3) Event 3 set value (EV3) [high]	070C	070D	1804	1805	0772	0773	1906	1907	07D8	07D9	2008	2009	083E	083F	2110	2111
9	Event 3 set value (EV3') [low]	070E	070F	1806	1807	0774	0775	1908	1909	07DA	07DB	2010	2011	0840	0841	2112	2113
10	Event 4 set value (EV4) Event 4 set value (EV4) [high]	0710	0711	1808	1809	0776	0777	1910	1911	07DC	07DD	2012	2013	0842	0843	2114	2115
11	Event 4 set value (EV4') [low]	0712	0713	1810	1811	0778	0779	1912	1913	07DE	07DF	2014	2015	0844	0845	2116	2117
12	Input 1_Proportional band [heat-side]	0714	0715	1812	1813	077A	077B	1914	1915	07E0	07E1	2016	2017	0846	0847	2118	2119
13	Input 1_Integral time [heat-side]	0716	0717	1814	1815	077C	077D	1916	1917	07E2	07E3	2018	2019	0848	0849	2120	2121
14	Input 1_Derivative time [heat-side]	0718	0719	1816	1817	077E	077F	1918	1919	07E4	07E5	2020	2021	084A	084B	2122	2123
15	Input 1_Control response parameter	071A	071B	1818	1819	0780	0781	1920	1921	07E6	07E7	2022	2023	084C	084D	2124	2125
16	Input 1_Proactive intensity	071C	071D	1820	1821	0782	0783	1922	1923	07E8	07E9	2024	2025	084E	084F	2126	2127
17	Input 1_Manual reset	071E	071F	1822	1823	0784	0785	1924	1925	07EA	07EB	2026	2027	0850	0851	2128	2129
18	Input 1_FF amount	0720	0721	1824	1825	0786	0787	1926	1927	07EC	07ED	2028	2029	0852	0853	2130	2131
19	Input 1_Output limiter high [heat-side]	0722	0723	1826	1827	0788	0789	1928	1929	07EE	07EF	2030	2031	0854	0855	2132	2133
20	Input 1_Output limiter low [heat-side]	0724	0725	1828	1829	078A	078B	1930	1931	07F0	07F1	2032	2033	0856	0857	2134	2135
21	Input 2_Proportional band	072A	072B	1834	1835	0790	0791	1936	1937	07F6	07F7	2038	2039	085C	085D	2140	2141

22	Input 2_Integral time	072C	072D	1836	1837	0792	0793	1938	1939	07F8	07F9	2040	2041	085E	085F	2142	2143
23	Input 2_Derivative time	072E	072F	1838	1839	0794	0795	1940	1941	07FA	07FB	2042	2043	0860	0861	2144	2145
24	Input 2_Control response parameter	0730	0731	1840	1841	0796	0797	1942	1943	07FC	07FD	2044	2045	0862	0863	2146	2147
25	Input 2_Proactive intensity	0732	0733	1842	1843	0798	0799	1944	1945	07FE	07FF	2046	2047	0864	0865	2148	2149
26	Input 2_Manual reset	0734	0735	1844	1845	079A	079B	1946	1947	0800	0801	2048	2049	0866	0867	2150	2151
27	Input 2_FF amount	0736	0737	1846	1847	079C	079D	1948	1949	0802	0803	2050	2051	0868	0869	2152	2153
28	Input 2_Output limiter high	0738	0739	1848	1849	079E	079F	1950	1951	0804	0805	2052	2053	086A	086B	2154	2155
29	Input 2_Output limiter low	073A	073B	1850	1851	07A0	07A1	1952	1953	0806	0807	2054	2055	086C	086D	2156	2157
30	Input 1_Proportional band [cool-side]	0740	0741	1856	1857	07A6	07A7	1958	1959	080C	080D	2060	2061	0872	0873	2162	2163
31	Input 1_Integral time [cool-side]	0742	0743	1858	1859	07A8	07A9	1960	1961	080E	080F	2062	2063	0874	0875	2164	2165
32	Input 1_Derivative time [cool-side]	0744	0745	1860	1861	07AA	07AB	1962	1963	0810	0811	2064	2065	0876	0877	2166	2167
33	Input 1_Overlap/Deadband	0746	0747	1862	1863	07AC	07AD	1964	1965	0812	0813	2066	2067	0878	0879	2168	2169
34	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side]	0748	0749	1864	1865	07AE	07AF	1966	1967	0814	0815	2068	2069	087A	087B	2170	2171
35	Input 1_Output limiter low [cool-side]	074A	074B	1866	1867	07B0	07B1	1968	1969	0816	0817	2070	2071	087C	087D	2172	2173
36	Select Trigger type for Memory area transfer	074C	074D	1868	1869	07B2	07B3	1970	1971	0818	0819	2072	2073	087E	087F	2174	2175
37	Area soak time	074E	074F	1870	1871	07B4	07B5	1972	1973	081A	081B	2074	2075	0880	0881	2176	2177
38	Link area number	0750	0751	1872	1873	07B6	07B7	1974	1975	081C	081D	2076	2077	0882	0883	2178	2179
39	Input 1_Setting change rate limiter (up)	0752	0753	1874	1875	07B8	07B9	1976	1977	081E	081F	2078	2079	0884	0885	2180	2181
40	Input 1_Setting change rate limiter (down)	0754	0755	1876	1877	07BA	07BB	1978	1979	0820	0821	2080	2081	0886	0887	2182	2183
41	Input 1_Auto/Manual transfer selection (Area)	0756	0757	1878	1879	07BC	07BD	1980	1981	0822	0823	2082	2083	0888	0889	2184	2185
42	Input 1_Manipulated output value (Area)	0758	0759	1880	1881	07BE	07BF	1982	1983	0824	0825	2084	2085	088A	088B	2186	2187
43	Input 2_Setting change rate limiter (up)	075A	075B	1882	1883	07C0	07C1	1984	1985	0826	0827	2086	2087	088C	088D	2188	2189
44	Input 2_Setting change rate limiter (down)	075C	075D	1884	1885	07C2	07C3	1986	1987	0828	0829	2088	2089	088E	088F	2190	2191
45	Input 2_Auto/Manual transfer selection (Area)	075E	075F	1886	1887	07C4	07C5	1988	1989	082A	082B	2090	2091	0890	0891	2192	2193
46	Input 2_Manipulated output value (Area)	0760	0761	1888	1889	07C6	07C7	1990	1991	082C	082D	2092	2093	0892	0893	2194	2195
47	Remote/Local transfer selection (Area)	0762	0763	1890	1891	07C8	07C9	1992	1993	082E	082F	2094	2095	0894	0895	2196	2197
48	Input 1_Dead zone	0B9C	0B9D	2972	2973	0BA8	0BA9	2984	2985	0BB4	0BB5	2996	2997	0BC0	0BC1	3008	3009
49	Input 2_Dead zone	0B9E	0B9F	2974	2975	0BAA	0BAB	2986	2987	0BB6	0BB7	2998	2999	0BC2	0BC3	3010	3011
50	Input 1_Soft start time (up)	0BA0	0BA1	2976	2977	0BAC	0BAD	2988	2989	0BB8	0BB9	3000	3001	0BC4	0BC5	3012	3013
51	Input 1_Soft start time (down)	0BA2	0BA3	2978	2979	0BAE	0BAF	2990	2991	0BBA	0BBB	3002	3003	0BC6	0BC7	3014	3015
52	Input 2_Soft start time (up)	0BA4	0BA5	2980	2981	0BB0	0BB1	2992	2993	0BBC	0BBD	3004	3005	0BC8	0BC9	3016	3017
53	Input 2_Soft start time (down)	0BA6	0BA7	2982	2983	0BB2	0BB3	2994	2995	0BBE	0BBF	3006	3007	0BCA	0BCB	3018	3019

■ Memory area 10 to 13 data

Register addresses for Memory areas 10 to 13.
For details of attribute, data range and factory set values, refer to the same line No. in ■ **Memory area 1 data**.

Low: Low-order High: High-order

No.	Name	Memory area 10				Memory area 11				Memory area 12				Memory area 13			
		Register address				Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV)	0896	0897	2198	2199	08FC	08FD	2300	2301	0962	0963	2402	2403	09C8	09C9	2504	2505
2	Input 2_Set value (SV)	0898	0899	2200	2201	08FE	08FF	2302	2303	0964	0965	2404	2405	09CA	09CB	2506	2507
3	Set value (SV) of differential temperature input	089A	089B	2202	2203	0900	0901	2304	2305	0966	0967	2406	2407	09CC	09CD	2508	2509
4	Event 1 set value (EV1) Event 1 set value (EV1) [high]	089C	089D	2204	2205	0902	0903	2306	2307	0968	0969	2408	2409	09CE	09CF	2510	2511
5	Event 1 set value (EV1') [low]	089E	089F	2206	2207	0904	0905	2308	2309	096A	096B	2410	2411	09D0	09D1	2512	2513
6	Event 2 set value (EV2) Event 2 set value (EV2) [high]	08A0	08A1	2208	2209	0906	0907	2310	2311	096C	096D	2412	2413	09D2	09D3	2514	2515
7	Event 2 set value (EV2') [low]	08A2	08A3	2210	2211	0908	0909	2312	2313	096E	096F	2414	2415	09D4	09D5	2516	2517
8	Event 3 set value (EV3) Event 3 set value (EV3) [high]	08A4	08A5	2212	2213	090A	090B	2314	2315	0970	0971	2416	2417	09D6	09D7	2518	2519
9	Event 3 set value (EV3') [low]	08A6	08A7	2214	2215	090C	090D	2316	2317	0972	0973	2418	2419	09D8	09D9	2520	2521
10	Event 4 set value (EV4) Event 4 set value (EV4) [high]	08A8	08A9	2216	2217	090E	090F	2318	2319	0974	0975	2420	2421	09DA	09DB	2522	2523
11	Event 4 set value (EV4') [low]	08AA	08AB	2218	2219	0910	0911	2320	2321	0976	0977	2422	2423	09DC	09DD	2524	2525
12	Input 1_Proportional band [heat-side]	08AC	08AD	2220	2221	0912	0913	2322	2323	0978	0979	2424	2425	09DE	09DF	2526	2527
13	Input 1_Integral time [heat-side]	08AE	08AF	2222	2223	0914	0915	2324	2325	097A	097B	2426	2427	09E0	09E1	2528	2529
14	Input 1_Derivative time [heat-side]	08B0	08B1	2224	2225	0916	0917	2326	2327	097C	097D	2428	2429	09E2	09E3	2530	2531
15	Input 1_Control response parameter	08B2	08B3	2226	2227	0918	0919	2328	2329	097E	097F	2430	2431	09E4	09E5	2532	2533
16	Input 1_Proactive intensity	08B4	08B5	2228	2229	091A	091B	2330	2331	0980	0981	2432	2433	09E6	09E7	2534	2535
17	Input 1_Manual reset	08B6	08B7	2230	2231	091C	091D	2332	2333	0982	0983	2434	2435	09E8	09E9	2536	2537
18	Input 1_FF amount	08B8	08B9	2232	2233	091E	091F	2334	2335	0984	0985	2436	2437	09EA	09EB	2538	2539
19	Input 1_Output limiter high [heat-side]	08BA	08BB	2234	2235	0920	0921	2336	2337	0986	0987	2438	2439	09EC	09ED	2540	2541
20	Input 1_Output limiter low [heat-side]	08BC	08BD	2236	2237	0922	0923	2338	2339	0988	0989	2440	2441	09EE	09EF	2542	2543
21	Input 2_Proportional band	08C2	08C3	2242	2243	0928	0929	2344	2345	098E	098F	2446	2447	09F4	09F5	2548	2549
22	Input 2_Integral time	08C4	08C5	2244	2245	092A	092B	2346	2347	0990	0991	2448	2449	09F6	09F7	2550	2551

23	Input 2_Derivative time	08C6	08C7	2246	2247	092C	092D	2348	2349	0992	0993	2450	2451	09F8	09F9	2552	2553
24	Input 2_Control response parameter	08C8	08C9	2248	2249	092E	092F	2350	2351	0994	0995	2452	2453	09FA	09FB	2554	2555
25	Input 2_Proactive intensity	08CA	08CB	2250	2251	0930	0931	2352	2353	0996	0997	2454	2455	09FC	09FD	2556	2557
26	Input 2_Manual reset	08CC	08CD	2252	2253	0932	0933	2354	2355	0998	0999	2456	2457	09FE	09FF	2558	2559
27	Input 2_FF amount	08CE	08CF	2254	2255	0934	0935	2356	2357	099A	099B	2458	2459	0A00	0A01	2560	2561
28	Input 2_Output limiter high	08D0	08D1	2256	2257	0936	0937	2358	2359	099C	099D	2460	2461	0A02	0A03	2562	2563
29	Input 2_Output limiter low	08D2	08D3	2258	2259	0938	0939	2360	2361	099E	099F	2462	2463	0A04	0A05	2564	2565
30	Input 1_Proportional band [cool-side]	08D8	08D9	2264	2265	093E	093F	2366	2367	09A4	09A5	2468	2469	0A0A	0A0B	2570	2571
31	Input 1_Integral time [cool-side]	08DA	08DB	2266	2267	0940	0941	2368	2369	09A6	09A7	2470	2471	0A0C	0A0D	2572	2573
32	Input 1_Derivative time [cool-side]	08DC	08DD	2268	2269	0942	0943	2370	2371	09A8	09A9	2472	2473	0A0E	0A0F	2574	2575
33	Input 1_Overlap/Deadband	08DE	08DF	2270	2271	0944	0945	2372	2373	09AA	09AB	2474	2475	0A10	0A11	2576	2577
34	Input 1_Output limiter high [cool-side]Input 1_ Output limiter low [heat-side]	08E0	08E1	2272	2273	0946	0947	2374	2375	09AC	09AD	2476	2477	0A12	0A13	2578	2579
35	Input 1_Output limiter low [cool-side]	08E2	08E3	2274	2275	0948	0949	2376	2377	09AE	09AF	2478	2479	0A14	0A15	2580	2581
36	Select Trigger type for Memory area transfer	08E4	08E5	2276	2277	094A	094B	2378	2379	09B0	09B1	2480	2481	0A16	0A17	2582	2583
37	Area soak time	08E6	08E7	2278	2279	094C	094D	2380	2381	09B2	09B3	2482	2483	0A18	0A19	2584	2585
38	Link area number	08E8	08E9	2280	2281	094E	094F	2382	2383	09B4	09B5	2484	2485	0A1A	0A1B	2586	2587
39	Input 1_Setting change rate limiter (up)	08EA	08EB	2282	2283	0950	0951	2384	2385	09B6	09B7	2486	2487	0A1C	0A1D	2588	2589
40	Input 1_Setting change rate limiter (down)	08EC	08ED	2284	2285	0952	0953	2386	2387	09B8	09B9	2488	2489	0A1E	0A1F	2590	2591
41	Input 1_Auto/Manual transfer selection (Area)	08EE	08EF	2286	2287	0954	0955	2388	2389	09BA	09BB	2490	2491	0A20	0A21	2592	2593
42	Input 1_Manipulated output value (Area)	08F0	08F1	2288	2289	0956	0957	2390	2391	09BC	09BD	2492	2493	0A22	0A23	2594	2595
43	Input 2_Setting change rate limiter (up)	08F2	08F3	2290	2291	0958	0959	2392	2393	09BE	09BF	2494	2495	0A24	0A25	2596	2597
44	Input 2_Setting change rate limiter (down)	08F4	08F5	2292	2293	095A	095B	2394	2395	09C0	09C1	2496	2497	0A26	0A27	2598	2599
45	Input 2_Auto/Manual transfer selection (Area)	08F6	08F7	2294	2295	095C	095D	2396	2397	09C2	09C3	2498	2499	0A28	0A29	2600	2601
46	Input 2_Manipulated output value (Area)	08F8	08F9	2296	2297	095E	095F	2398	2399	09C4	09C5	2500	2501	0A2A	0A2B	2602	2603
47	Remote/Local transfer selection (Area)	08FA	08FB	2298	2299	0960	0961	2400	2401	09C6	09C7	2502	2503	0A2C	0A2D	2604	2605
48	Input 1_Dead zone	0BCC	0BCD	3020	3021	0BD8	0BD9	3032	3033	0BE4	0BE5	3044	3045	0BF0	0BF1	3056	3057
49	Input 2_Dead zone	0BCE	0BCF	3022	3023	0BDA	0BDB	3034	3035	0BE6	0BE7	3046	3047	0BF2	0BF3	3058	3059
50	Input 1_Soft start time (up)	0BD0	0BD1	3024	3025	0BDC	0BDD	3036	3037	0BE8	0BE9	3048	3049	0BF4	0BF5	3060	3061
51	Input 1_Soft start time (down)	0BD2	0BD3	3026	3027	0BDE	0BDF	3038	3039	0BEA	0BEB	3050	3051	0BF6	0BF7	3062	3063
52	Input 2_Soft start time (up)	0BD4	0BD5	3028	3029	0BE0	0BE1	3040	3041	0BEC	0BED	3052	3053	0BF8	0BF9	3064	3065
53	Input 2_Soft start time (down)	0BD6	0BD7	3030	3031	0BE2	0BE3	3042	3043	0BEE	0BEF	3054	3055	0BFA	0BFB	3066	3067

■ Memory area 14 to 16 data

Register addresses for Memory areas 14 to 16.
For details of attribute, data range and factory set values, refer to the same line No. in ■ **Memory area 1 data**.

Low: Low-order High: High-order

No.	Name	Memory area 14				Memory area 15				Memory area 16			
		Register address				Register address				Register address			
		HEX		DEC		HEX		DEC		HEX		DEC	
		Low	High	Low	High	Low	High	Low	High	Low	High	Low	High
1	Input 1_Set value (SV)	0A2E	0A2F	2606	2607	0A94	0A95	2708	2709	0AFA	0AFB	2810	2811
2	Input 2_Set value (SV)	0A30	0A31	2608	2609	0A96	0A97	2710	2711	0AFC	0AFD	2812	2813
3	Set value (SV) of differential temperature input	0A32	0A33	2610	2611	0A98	0A99	2712	2713	0AFE	0AFF	2814	2815
4	Event 1 set value (EV1) Event 1 set value (EV1) [high]	0A34	0A35	2612	2613	0A9A	0A9B	2714	2715	0B00	0B01	2816	2817
5	Event 1 set value (EV1') [low]	0A36	0A37	2614	2615	0A9C	0A9D	2716	2717	0B02	0B03	2818	2819
6	Event 2 set value (EV2) Event 2 set value (EV2) [high]	0A38	0A39	2616	2617	0A9E	0A9F	2718	2719	0B04	0B05	2820	2821
7	Event 2 set value (EV2') [low]	0A3A	0A3B	2618	2619	0AA0	0AA1	2720	2721	0B06	0B07	2822	2823
8	Event 3 set value (EV3) Event 3 set value (EV3) [high]	0A3C	0A3D	2620	2621	0AA2	0AA3	2722	2723	0B08	0B09	2824	2825
9	Event 3 set value (EV3') [low]	0A3E	0A3F	2622	2623	0AA4	0AA5	2724	2725	0B0A	0B0B	2826	2827
10	Event 4 set value (EV4) Event 4 set value (EV4) [high]	0A40	0A41	2624	2625	0AA6	0AA7	2726	2727	0B0C	0B0D	2828	2829
11	Event 4 set value (EV4') [low]	0A42	0A43	2626	2627	0AA8	0AA9	2728	2729	0B0E	0B0F	2830	2831
12	Input 1_Proportional band [heat-side]	0A44	0A45	2628	2629	0AAA	0AAB	2730	2731	0B10	0B11	2832	2833
13	Input 1_Integral time [heat-side]	0A46	0A47	2630	2631	0AAC	0AAD	2732	2733	0B12	0B13	2834	2835
14	Input 1_Derivative time [heat-side]	0A48	0A49	2632	2633	0AAE	0AAF	2734	2735	0B14	0B15	2836	2837
15	Input 1_Control response parameter	0A4A	0A4B	2634	2635	0AB0	0AB1	2736	2737	0B16	0B17	2838	2839
16	Input 1_Proactive intensity	0A4C	0A4D	2636	2637	0AB2	0AB3	2738	2739	0B18	0B19	2840	2841
17	Input 1_Manual reset	0A4E	0A4F	2638	2639	0AB4	0AB5	2740	2741	0B1A	0B1B	2842	2843
18	Input 1_FF amount	0A50	0A51	2640	2641	0AB6	0AB7	2742	2743	0B1C	0B1D	2844	2845
19	Input 1_Output limiter high [heat-side]	0A52	0A53	2642	2643	0AB8	0AB9	2744	2745	0B1E	0B1F	2846	2847
20	Input 1_Output limiter low [heat-side]	0A54	0A55	2644	2645	0ABA	0ABB	2746	2747	0B20	0B21	2848	2849
21	Input 2_Proportional band	0A5A	0A5B	2650	2651	0AC0	0AC1	2752	2753	0B26	0B27	2854	2855
22	Input 2_Integral time	0A5C	0A5D	2652	2653	0AC2	0AC3	2754	2755	0B28	0B29	2856	2857

23	Input 2_Derivative time	0A5E	0A5F	2654	2655	0AC4	0AC5	2756	2757	0B2A	0B2B	2858	2859
24	Input 2_Control response parameter	0A60	0A61	2656	2657	0AC6	0AC7	2758	2759	0B2C	0B2D	2860	2861
25	Input 2_Proactive intensity	0A62	0A63	2658	2659	0AC8	0AC9	2760	2761	0B2E	0B2F	2862	2863
26	Input 2_Manual reset	0A64	0A65	2660	2661	0ACA	0ACB	2762	2763	0B30	0B31	2864	2865
27	Input 2_FF amount	0A66	0A67	2662	2663	0ACC	0ACD	2764	2765	0B32	0B33	2866	2867
28	Input 2_Output limiter high	0A68	0A69	2664	2665	0ACE	0ACF	2766	2767	0B34	0B35	2868	2869
29	Input 2_Output limiter low	0A6A	0A6B	2666	2667	0AD0	0AD1	2768	2769	0B36	0B37	2870	2871
30	Input 1_Proportional band [cool-side]	0A70	0A71	2672	2673	0AD6	0AD7	2774	2775	0B3C	0B3D	2876	2877
31	Input 1_Integral time [cool-side]	0A72	0A73	2674	2675	0AD8	0AD9	2776	2777	0B3E	0B3F	2878	2879
32	Input 1_Derivative time [cool-side]	0A74	0A75	2676	2677	0ADA	0ADB	2778	2779	0B40	0B41	2880	2881
33	Input 1_Overlap/Deadband	0A76	0A77	2678	2679	0ADC	0ADD	2780	2781	0B42	0B43	2882	2883
34	Input 1_Output limiter high [cool-side] Input 1_Output limiter low [heat-side]	0A78	0A79	2680	2681	0ADE	0ADF	2782	2783	0B44	0B45	2884	2885
35	Input 1_Output limiter low [cool-side]	0A7A	0A7B	2682	2683	0AE0	0AE1	2784	2785	0B46	0B47	2886	2887
36	Select Trigger type for Memory area transfer	0A7C	0A7D	2684	2685	0AE2	0AE3	2786	2787	0B48	0B49	2888	2889
37	Area soak time	0A7E	0A7F	2686	2687	0AE4	0AE5	2788	2789	0B4A	0B4B	2890	2891
38	Link area number	0A80	0A81	2688	2689	0AE6	0AE7	2790	2791	0B4C	0B4D	2892	2893
39	Input 1_Setting change rate limiter (up)	0A82	0A83	2690	2691	0AE8	0AE9	2792	2793	0B4E	0B4F	2894	2895
40	Input 1_Setting change rate limiter (down)	0A84	0A85	2692	2693	0AEA	0AEB	2794	2795	0B50	0B51	2896	2897
41	Input 1_Auto/Manual transfer selection (Area)	0A86	0A87	2694	2695	0AEC	0AED	2796	2797	0B52	0B53	2898	2899
42	Input 1_Manipulated output value (Area)	0A88	0A89	2696	2697	0AEE	0AEF	2798	2799	0B54	0B55	2900	2901
43	Input 2_Setting change rate limiter (up)	0A8A	0A8B	2698	2699	0AF0	0AF1	2800	2801	0B56	0B57	2902	2903
44	Input 2_Setting change rate limiter (down)	0A8C	0A8D	2700	2701	0AF2	0AF3	2802	2803	0B58	0B59	2904	2905
45	Input 2_Auto/Manual transfer selection (Area)	0A8E	0A8F	2702	2703	0AF4	0AF5	2804	2805	0B5A	0B5B	2906	2907
46	Input 2_Manipulated output value (Area)	0A90	0A91	2704	2705	0AF6	0AF7	2806	2807	0B5C	0B5D	2908	2909
47	Remote/Local transfer selection (Area)	0A92	0A93	2706	2707	0AF8	0AF9	2808	2809	0B5E	0B5F	2910	2911
48	Input 1_Dead zone	0BFC	0BFD	3068	3069	0C08	0C09	3080	3081	0C14	0C15	3092	3093
49	Input 2_Dead zone	0BFE	0BFF	3070	3071	0C0A	0C0B	3082	3083	0C16	0C17	3094	3095
50	Input 1_Soft start time (up)	0C00	0C01	3072	3073	0C0C	0C0D	3084	3085	0C18	0C19	3096	3097
51	Input 1_Soft start time (down)	0C02	0C03	3074	3075	0C0E	0C0F	3086	3087	0C1A	0C1B	3098	3099
52	Input 2_Soft start time (up)	0C04	0C05	3076	3077	0C10	0C11	3088	3089	0C1C	0C1D	3100	3101
53	Input 2_Soft start time (down)	0C06	0C07	3078	3079	0C12	0C13	3090	3091	0C1E	0C1F	3102	3103

6.3.3 Data mapping address [Modbus double word]

Necessary data can be read/written as a batch operation by assigning any desired data (max. 32) continuously.
☞ For the Data mapping, refer to the **5.8 How to Use Modbus Data Mapping**.

■ **Register addresses for data designation**

Low: Low-order High: High-order

No.	Name	Register address				Attri-bute	Data range	Factory set value
		HEX		DEC				
		Low	High	Low	High			
1	Register address setting 1 [Read/write address: Low-order word 1500H, high-order word 1501H]	1000	1001	4096	4097	R/W	Set the register address of data to be assigned to 1500H to 153FH Decimal number: -1 to 20479 (-1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 103FH) and read/write (1500H to 153FH) will be invalid (without mapping), even if set.	-1
2	Register address setting 2 [Read/write address: Low-order word 1502H, high-order word 1503H]	1002	1003	4098	4099	R/W		-1
3	Register address setting 3 [Read/write address: Low-order word 1504H, high-order word 1505H]	1004	1005	4100	4101	R/W		-1
4	Register address setting 4 [Read/write address: Low-order word 1506H, high-order word 1507H]	1006	1007	4102	4103	R/W		-1
5	Register address setting 5 [Read/write address: Low-order word 1508H, high-order word 1509H]	1008	1009	4104	4105	R/W		-1
6	Register address setting 6 [Read/write address: Low-order word 150AH, high-order word 150BH]	100A	100B	4106	4107	R/W		-1
7	Register address setting 7 [Read/write address: Low-order word 150CH, high-order word 150DH]	100C	100D	4108	4109	R/W		-1
8	Register address setting 8 [Read/write address: Low-order word 150EH, high-order word 150FH]	100E	100F	4110	4111	R/W		-1
9	Register address setting 9 [Read/write address: Low-order word 1510H, high-order word 1511H]	1010	1011	4112	4113	R/W		-1
10	Register address setting 10 [Read/write address: Low-order word 1512H, high-order word 1513H]	1012	1013	4114	4115	R/W		-1
11	Register address setting 11 [Read/write address: Low-order word 1514H, high-order word 1515H]	1014	1015	4116	4117	R/W		-1
12	Register address setting 12 [Read/write address: Low-order word 1516H, high-order word 1517H]	1016	1017	4118	4119	R/W		-1
13	Register address setting 13 [Read/write address: Low-order word 1518H, high-order word 1519H]	1018	1019	4120	4121	R/W		-1
14	Register address setting 14 [Read/write address: Low-order word 151AH, high-order word 151BH]	101A	101B	4122	4123	R/W		-1

15	Register address setting 15 [Read/write address: Low-order word 151CH, high-order word 151DH]	101C	101D	4124	4125	R/W	Set the register address of data to be assigned to 1500H to 153FH Decimal number: -1 to 20479 (-1: Without mapping) Hexadecimal numeral: FFFFH to 4FFFH (FFFFH: Without mapping) The register addresses for data designation (1000H to 103FH) and read/write (1500H to 153FH) will be invalid (without mapping), even if set.	-1
16	Register address setting 16 [Read/write address: Low-order word 151EH, high-order word 151FH]	101E	101F	4126	4127	R/W		-1
17	Register address setting 17 [Read/write address: Low-order word 1520H, high-order word 1521H]	1020	1021	4128	4129	R/W		-1
18	Register address setting 18 [Read/write address: Low-order word 1522H, high-order word 1523H]	1022	1023	4130	4131	R/W		-1
19	Register address setting 19 [Read/write address: Low-order word 1524H, high-order word 1525H]	1024	1025	4132	4133	R/W		-1
20	Register address setting 20 [Read/write address: Low-order word 1526H, high-order word 1527H]	1026	1027	4134	4135	R/W		-1
21	Register address setting 21 [Read/write address: Low-order word 1528H, high-order word 1529H]	1028	1029	4136	4137	R/W		-1
22	Register address setting 22 [Read/write address: Low-order word 152AH, high-order word 152BH]	102A	102B	4138	4139	R/W		-1
23	Register address setting 23 [Read/write address: Low-order word 152CH, high-order word 152DH]	102C	102D	4140	4141	R/W		-1
24	Register address setting 24 [Read/write address: Low-order word 152EH, high-order word 152FH]	102E	102F	4142	4143	R/W		-1
25	Register address setting 25 [Read/write address: Low-order word 1530H, high-order word 1531H]	1030	1031	4144	4145	R/W		-1
26	Register address setting 26 [Read/write address: Low-order word 1532H, high-order word 1533H]	1032	1033	4146	4147	R/W		-1
27	Register address setting 27 [Read/write address: Low-order word 1534H, high-order word 1535H]	1034	1035	4148	4149	R/W		-1
28	Register address setting 28 [Read/write address: Low-order word 1536H, high-order word 1537H]	1036	1037	4150	4151	R/W		-1
29	Register address setting 29 [Read/write address: Low-order word 1538H, high-order word 1539H]	1038	1039	4152	4153	R/W		-1
30	Register address setting 30 [Read/write address: Low-order word 153AH, high-order word 153BH]	103A	103B	4154	4155	R/W		-1
31	Register address setting 31 [Read/write address: Low-order word 153CH, high-order word 153DH]	103C	103D	4156	4157	R/W		-1
32	Register address setting 32 [Read/write address: Low-order word 153EH, high-order word 153FH]	103E	103F	4158	4159	R/W		-1

■ Register addresses for data read/write

Low: Low-order High: High-order

No.	Name	Register address				Attri-bute	Data range	Factory set value
		HEX		DEC				
		Low	High	Low	High			
1	Data specified Register address setting 1 (Low-order word 1000H, high-order word 1001H)	1500	1501	5376	5377			
2	Data specified Register address setting 2 (Low-order word 1002H, high-order word 1003H)	1502	1503	5378	5379			
3	Data specified Register address setting 3 (Low-order word 1004H, high-order word 1005H)	1504	1505	5380	5381			
4	Data specified Register address setting 4 (Low-order word 1006H, high-order word 1007H)	1506	1507	5382	5383			
5	Data specified Register address setting 5 (Low-order word 1008H, high-order word 1009H)	1508	1509	5384	5385			
6	Data specified Register address setting 6 (Low-order word 100AH, high-order word 100BH)	150A	150B	5386	5387			
7	Data specified Register address setting 7 (Low-order word 100CH, high-order word 100DH)	150C	150D	5388	5389			
8	Data specified Register address setting 8 (Low-order word 100EH, high-order word 100FH)	150E	150F	5390	5391		Based on the data specified at 1000H to 103FH.	
9	Data specified Register address setting 9 (Low-order word 1010H, high-order word 1011H)	1510	1511	5392	5393			
10	Data specified Register address setting 10 (Low-order word 1012H, high-order word 1013H)	1512	1513	5394	5395			
11	Data specified Register address setting 11 (Low-order word 1014H, high-order word 1015H)	1514	1515	5396	5397			
12	Data specified Register address setting 12 (Low-order word 1016H, high-order word 1017H)	1516	1517	5398	5399			
13	Data specified Register address setting 13 (Low-order word 1018H, high-order word 1019H)	1518	1519	5400	5401			
14	Data specified Register address setting 14 (Low-order word 101AH, high-order word 101BH)	151A	151B	5402	5403			
15	Data specified Register address setting 15 (Low-order word 101CH, high-order word 101DH)	151C	151D	5404	5405			

16	Data specified Register address setting 16 (Low-order word 101EH, high-order word 101FH)	151E	151F	5406	5407	Based on the data specified at 1000H to 103FH.
17	Data specified Register address setting 17 (Low-order word 1020H, high-order word 1021H)	1520	1521	5408	5409	
18	Data specified Register address setting 18 (Low-order word 1022H, high-order word 1023H)	1522	1523	5410	5411	
19	Data specified Register address setting 19 (Low-order word 1024H, high-order word 1025H)	1524	1525	5412	5413	
20	Data specified Register address setting 20 (Low-order word 1026H, high-order word 1027H)	1526	1527	5414	5415	
21	Data specified Register address setting 21 (Low-order word 1028H, high-order word 1029H)	1528	1529	5416	5417	
22	Data specified Register address setting 22 (Low-order word 102AH, high-order word 102BH)	152A	152B	5418	5419	
23	Data specified Register address setting 23 (Low-order word 102CH, high-order word 102DH)	152C	152D	5420	5421	
24	Data specified Register address setting 24 (Low-order word 102EH, high-order word 102FH)	152E	152F	5422	5423	
25	Data specified Register address setting 25 (Low-order word 1030H, high-order word 1031H)	1530	1531	5424	5425	
26	Data specified Register address setting 26 (Low-order word 1032H, high-order word 1033H)	1532	1533	5426	5427	
27	Data specified Register address setting 27 (Low-order word 1034H, high-order word 1035H)	1534	1535	5428	5429	
28	Data specified Register address setting 28 (Low-order word 1036H, high-order word 1037H)	1536	1537	5430	5431	
29	Data specified Register address setting 29 (Low-order word 1038H, high-order word 1039H)	1538	1539	5432	5433	
30	Data specified Register address setting 30 (Low-order word 103AH, high-order word 103BH)	153A	153B	5434	5435	
31	Data specified Register address setting 31 (Low-order word 103CH, high-order word 103DH)	153C	153D	5436	5437	
32	Data specified Register address setting 32 (Low-order word 103EH, high-order word 103FH)	153E	153F	5438	5439	

7. Troubleshooting

This chapter describes how to cope with errors during communication.

⚠ 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.

This section lists some of the main causes and solutions for communication problems. If you cannot solve a problem, please contact TLV.

7.1 Original Communication

Problem	Possible cause	Solution
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 and data bit configuration with those of the host computer	Confirm the settings and set them correctly
	Wrong address setting	
	Error in the data format	Re-examine the communication program
	Transmission line is not set to the receive state after data send (for RS-485)	
	Communication protocol setting is wrong	Set “0: Original communication” at Communication protocol referring to 3.1 Setting of Communication Parameter.
EOT return	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it
	Error in the data format	Reexamine the communication program
NAK return	Error occurs on the line (parity bit error, framing error, etc.)	Confirm the cause of error, and solve the problem appropriately. (Confirm the transmitting data, and resend data)
	BCC error	
	The data exceeds the setting range	Confirm the setting range and transmit correct data
	The specified identifier is invalid	Confirm the identifier is correct or that with the correct function is specified. Otherwise correct it

7.2 Modbus

Problem	Possible cause	Solution
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 and data bit configuration with those of the host computer	Confirm the settings and set them correctly
	Wrong address setting	
	A transmission error (overrun error, framing error, parity error or CRC-16 error) is found in the query message	Re-transmit after time-out occurs or verify communication program
	The time interval between adjacent data in the query message is too long, exceeding 24-bit time	
	Communication protocol setting is wrong	Set “1” or “2” at Communication protocol referring to 3.1 Setting of Communication Parameter. 1: Modbus (Order of data transfer: high-order word to low-order word) 2: Modbus (Order of data a transfer: low-order word to high-order word)
Error code 1	Function code error (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. If the same error occurs when the power is turned back on, please contact TLV.

8. Specifications

8.1 Original Communication

Interface:	Based on RS-422A, EIA standard
Connection method:	2-wire system, half-duplex multi-drop connection
Synchronous method:	Start/Stop synchronous type
Communication speed:	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps
Protocol:	ANSI X3.28-1976 subcategories 2.5 and A4 Polling/Selecting type
Data bit configuration:	Start bit: 1 Data bit: 7 or 8 Parity bit: Without, Odd or Even Stop bit: 1 or 2
Error control:	Vertical parity (With parity bit selected) Horizontal parity (BCC check)
Communication code:	ASCII 7-bit code
Termination resistor:	Externally terminal connected (120 Ω 1/2 W)
Maximum connections:	Up to 31 controllers
Signal logic:	RS-422A

Signal logic	Logic
V (A) – V (B) ≥ 1.5 V	0 (SPACE)
V (A) – V (B) ≤ –1.5 V	1 (MARK)

Maximum transmission distance:	Voltage between V (A) and V (B) is the voltage of (A) terminal for the (B) terminal. 1.2 km (This is the maximum value specified in the standard and actual value depends on the product specification.)

8.2 Modbus

Interface:	Based on RS-422A EIA standard
Connection method:	2-wire system, half-duplex multi-drop connection
Synchronous method:	Start/Stop synchronous type
Communication speed:	2400 bps, 4800 bps, 9600 bps, 19200 bps, 38400 bps, 57600 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: Without, Odd or Even Stop bit: 1 or 2
Protocol:	Modbus
Signal transmission mode:	Remote Terminal Unit (RTU) mode
Function code:	03H (Read holding registers) 06H (Preset single register) 08H (Diagnostics: loopback test) 10H (Preset multiple registers [Write multiple registers])
Error control:	Vertical parity (With parity bit selected) Horizontal parity (BCC check)
Error check method:	CRC-16
Error code:	1: Function code error 2: When the mismatched address is specified. 3: • The maximum number (Read from a read holding resistor or write to Preset multiple resistors [Write multiple registers]) has been exceeded. • The setting of the number of data (the number of requested byte) is not set to a double of the requested number of data at the time of “Preset multiple registers (Write multiple registers)” 4: Self-diagnostic error response

Termination resistor:	Externally terminal connected (Example: 120 Ω 1/2 W)
Maximum connections:	Up to 31 controllers
Signal logic:	RS-422A

Signal logic	Logic
V (A) − V (B) ≥ 1.5 V	0 (SPACE)
V (A) − V (B) ≤ −1.5 V	1 (MARK)

Maximum transmission distance:	Voltage between V (A) and V (B) is the voltage of (A) terminal for the (B) terminal. 1.2 km (This is the maximum value specified in the standard and actual value depends on the product specification.)

8.3 Loader Communication

Protocol:	For the original communication protocol only
Synchronous method:	Start/Stop synchronous type
Communication speed:	38400 bps
Data bit configuration:	Start bit: 1 Data bit: 8 Parity bit: Without Stop bit: 1 Number of communication data digits: 7 (fixed)
Maximum connections:	1 point (COM-KG or COM-K2 only)
Connection method:	COM-KG or COM-K2 loader cable (W-BV-05)
Interval time:	10 ms

When the instrument is powered off, power can be supplied to the instrument from COM-KG or COM-K2 (or COM-K version 1). 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-KG or COM-K2 (or COM-K version 1), if power is applied to the instrument, the instrument will be reset and starts for normal operation.

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

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Service

For Service or Technical Assistance: Contact your TLV representative or your regional TLV office.

In Europe:

TLV EURO ENGINEERING GmbH
Daimler-Benz-Straße 16-18, 74915 Waibstadt, **Germany**
Tel: [49]-(0)7263-9150-0
Fax: [49]-(0)7263-9150-50

TLV EURO ENGINEERING UK LTD.
Units 7 & 8, Furlong Business Park, Bishops Cleeve, Gloucestershire GL52 8TW, **U.K.**
Tel: [44]-(0)1242-227223
Fax: [44]-(0)1242-223077

TLV EURO ENGINEERING FRANCE SARL
Parc d'Ariane 2, bât. C, 290 rue Ferdinand Perrier, 69800 Saint Priest, **France**
Tel: [33]–(0)4-72482222
Fax: [33]-(0)4-72482220

In North America:

TLV CORPORATION
13901 South Lakes Drive, Charlotte, NC 28273-6790, **U.S.A.**
Tel: [1]-704-597-9070
Fax: [1]-704-583-1610

In Mexico and Latin America:

TLV ENGINEERING S. A. DE C. V.
Av. Jesús del Monte 39-B-1001, Col. Hda. de las Palmas, Huixquilucan, Edo. de México, 52763, **Mexico**
Tel: [52]-55-5359-7949
Fax: [52]-55-5359-7585

In Oceania:

TLV PTY LIMITED
Unit 8, 137-145 Rooks Road, Nunawading, Victoria 3131, **Australia**
Tel: [61]-(0)3-9873 5610
Fax: [61]-(0)3-9873 5010

In East Asia:

TLV PTE LTD
36 Kaki Bukit Place, #02-01/02, **Singapore** 416214
Tel: [65]-6747 4600
Fax: [65]-6742 0345

TLV SHANGHAI CO., LTD.
Room 5406, No. 103 Cao Bao Road, Shanghai, **China** 200233
Tel: [86]-(0)21-6482-8622
Fax: [86]-(0)21-6482-8623

TLV ENGINEERING SDN. BHD.
No.16, Jalan MJ14, Taman Industri Meranti Jaya, 47120 Puchong, Selangor, **Malaysia**
Tel: [60]-3-8065-2928
Fax: [60]-3-8065-2923

TLV PRIVATE LIMITED
252/94 (K-L) 17th Floor, Muang Thai-Phatra Complex Tower B, Rachadaphisek Road, Huaykwang, Bangkok 10310, **Thailand**
Tel: [66]-2-693-3799
Fax: [66]-2-693-3979

TLV INC.
#302-1 Bundang Technopark B, 723 Pangyo-ro, Bundang, Seongnam, Gyeonggi, 13511, **Korea**
Tel: [82]-(0)31-726-2105
Fax: [82]-(0)31-726-2195

In the Middle East:

TLV ENGINEERING FZCO
Building 2W, No. M002, PO Box 371684, Dubai Airport Free Zone, Dubai, **UAE**
Email: sales-me@tlv.co.jp

In Other Countries:

TLV INTERNATIONAL, INC.
881 Nagasuna, Noguchi, Kakogawa, Hyogo 675-8511, **Japan**
Tel: [81]-(0)79-427-1818
Fax: [81]-(0)79-425-1167

Manufacturer:

TLV CO., LTD.
881 Nagasuna, Noguchi, Kakogawa, Hyogo 675-8511, **Japan**
Tel: [81]-(0)79-422-1122
Fax: [81]-(0)79-422-0112