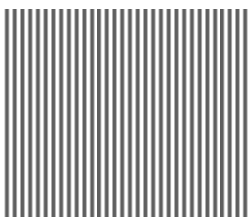


CHINO

Digital Program Controller

KP2000

**COMMUNICATIONS
INTERFACES**



INSTRUCTIONS

Retain this manual apart from the instrument
and in an easily accessible place.

Please make sure that this manual is handed to the final user of the instrument.

CHINO

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1. Introduction

Thank you for purchasing Digital Program Controller 'KP2000 series'.

KP 2000 series is Digital Program Controller with indicator accuracy of (0.1%, control cycle of approximately 0.1 seconds and front size of 96X96mm.

Multi-range input and up to 30 types of program patterns etc. are various functionalities that are provided as standard provisions. Besides a digital indicator with large easy to view LED display, various settings have an interactive system with high resolution dot matrix LCD display and handling is also easy with precise control.

Understand the controller properly and read this instruction manual beforehand in order to avoid any trouble.

This is a 'Communication' instruction manual. For general specifications, read 'General' instruction manual along with this manual.

Request

- For the persons doing instrumentation, installation and sales-

Be sure to handover this instruction manual to the persons using the controller.

- For the users of the controller -

Preserve this instruction manual until you scrap the controller.

Notice

1. You should not copy or forward fully or partially this document without prior notice.
2. The contents of this document may be changed without notice.
3. We have taken enough care regarding the contents of this document however if at all you notice a mistake or an omission contact our nearest office.
4. Please understand that regarding the result of the operation, whatever is the result the company will not be responsible.

2. For safe use of the product

In order to use the controller safely, read the following precautions and understand them.

2-1 Prerequisites for use

The controller is a general product of component type that is to be used by mounting it in a panel for instrumentation inside a room. Do not use it in any other condition.

When using, design a fail safe on the final product side and review regularly and use the controller after confirming the safety of the system. For the wiring, adjustment and operation of the controller, contact a professional having knowledge of instrumentation.

It is necessary that the people actually using this controller read this instruction manual, and have enough understanding of various precautions and the basic operations of the controller.

2-2. Symbol mark

The following symbol marks are used in the product itself and in this instruction manual hence understand the meaning of these symbol marks properly.

Symbol mark	Meaning
 Warning	If there is a possibility of death or severe injuries then explain the precautions to avoid that possibility.
 Precaution	If there is a possibility of small injuries or a possibility of the controller or its nearby devices getting damaged then explain the precautions to avoid those possibilities.
	It is a symbol for ground terminal. Always connect the ground terminal to protective grounding.

3. Overview

RS-232C, RS-422A, RS-485 are available in communication interface of KP and are used for communication with personal computer (hereinafter referred to as PC).

PC can receive measurement data from KP, various parameters can be set and operation commands can be issued. Number of KP connections is 1 for RS-232 and maximum 31 for RS-422A, RS-485.

3-1. RS-232C communication interface

RS-232C is the data communication standard set and executed by Electronic India Alliance (EIA) and Japanese equivalent for that is JIS C 6361.

This standard is basically an interface with modem and data terminal device connected to it and only electrical and mechanical specifications are given.

Presently RS-232C communication interface that is used in industrial instruments like PC and DB series, only some of them completely conform to the above standards, and signal wire count and connectors for connection etc. may sometimes differ from the standards.

As nothing is specified about the software part or what we call 'data transmission procedure' it does not mean that the devices that RS-232C communication interfaces can be connected unconditionally.

Hence, it is necessary that the designer investigates and confirms the specifications and transmission procedure of the mutual device. However if the connection partner is able to program those specifications optionally like the PC, the designer, by creating the appropriate program, can combine it with almost all the devices.

When investigating the RS-232C standards, the method of referring to JIS C 6361 is the simplest method.

3-2. RS-422A/485 communication interface

RS-422A/485 communication interface can communicate by connecting in parallel the KP series of a number of machines (maximum 31) through the signal that conforms to RS-422A/485.

PCs that have RS-422A/485 communication interface are less however as it is a serial communication, connection can be easily done by using RS232C $\longleftrightarrow$ RS-422A/485 signal converter.

Line converter (Our company model: SC8-10) for RS-232C $\longleftrightarrow$ RS-422A/485 signal conversion is available with our company. You may order it from us.

Difference between RS-422A and RS-485 is that RS-422A uses 4 signal wires whereas RS-485 uses 2 signal wires.

4. Communication Protocol

KP has the following two protocols and switching can be done by front key settings.

4-1. MODBUS Protocol

MODBUS is a registered trademark of SCHNEIDER company.

MODBUS protocol has two modes namely RTU mode and ASCII mode and switching can be done using front key settings. It has the transmission function of measurement data and settings, operation function.

4-2. PRIVATE Protocol

PRIVATE is usual CHINO protocol.

Switching is done by setting the front key. It has the transmission function of measurement data and settings, operation function.

Old instrument of CHINO products is compatible with new instrument, however the parameter, which cannot be set by PRIVATE, can be set by MODBUS. We recommended using MODBUS protocol if communication is set newly.

5. Communication Specifications

5-1. MODBUS

• Communication system	: Half duplex asynchronous system (Polling selecting system)
• Protocol	: MODBUS protocol
• Communication speed	: 38400,19200,9600,4800,2400bps switching
• Start bit	: 1 bit
• Data length	: 7 bits (ASCII mode) 8 bits (RTU mode/ASCII mode)
• Parity bit	: None/even/odd
• Stop bit	: 1 bit/2 bits
• Transmission code	: ASCII (ASCII mode) Binary (RTU mode)
• Error check: (Error detection)	LRC (ASCII mode) CRC-16 (RTU mode)
• Data transmission procedure	: No procedure
• Usage signal name	: Sending and receiving data only(Without using the control signal)

5-2. PRIVATE

• Communication system	: Half duplex asynchronous system (Polling selecting system)
• Protocol	: PRIVATE protocol
• Communication speed	: 38400,19200,9600,4800,2400bps switching
• Start bit	: 1 bit
• Data length	: 7 bits
• Parity bit	: Even
• Stop bit	: 1 bit
• Transmission code	: ASCII code
• Error check (Error detection)	: BCC (Block check character) Check sum
• Data transmission procedure	: No procedure
• Usage signal name	: Sending and receiving data only (Without using the control signal)

6. Setting the parameters for PC communication

According to the flow chart, set these 6 parameters 'Communication speed', 'Device number', 'Communication function', 'Communication transmission type', 'Communication protocol' and 'Communication character'.

1. Click **RUN MODE** key from the operation screen.
2. Select MODE 8 from 'Select MODE screen' using **RESET** **PTN** key.
3. Set the following fields of Communication settings screen (MODE8).

Communication (Option) MODE 8 COMMUNICATION	
↓ STOP SEL key	
Communication speed COM BIT RATE 9600 bps	Select the following communication speeds using RESET PTN key Register using A/M ENT key Setting range: 2400, 4800, 9600, 19200, 38400
↓ STOP SEL key	
Device number (For RS-422/485) COM NUMBER 01	Select instrument number using ADV FNC RESET PTN key Register using A/M ENT key Setting range: 01 to 99
↓ STOP SEL key	
Communication function COM KIND COM TRANS	Select the following communication function using ADV FNC key Register using A/M ENT key Setting range: COM, TRANS
↓ STOP SEL key	
Communication transmission type COM TRANS KIND PV SV MV1 MV2 SUB	Select the following communication transmission type using ADV FNC key Register it using A/M ENT key. Setting range : PV, SV, MV1, MV2, SUB Using *[COM KIND] settings can be done only when TRANS is selected
↓ STOP SEL key	
Communication Protocol COM PROTOCOL MODBUS (RTU)	Select the communication protocol mentioned below using RESET PTN key Register it using A/M ENT key Setting range: MODBUS(RTU), MODBUS(ASCII), PRIVATE
↓ STOP SEL key-	
Communication character COM CHARACTER 8BIT / NON / STOP1	Select communication characters mentioned below using the RESET PTN key and register it using A/M ENT key Setting range: 7BIT/EVEN/STOP1, 7BIT/EVEN/STOP2, 7BIT/ODD /STOP1, 7BIT/ODD /STOP2, 8BIT/NON /STOP1, 8BIT/NON /STOP2, 8BIT/EVEN/STOP1, 8BIT/EVEN/STOP2, 8BIT/ODD /STOP1, 8BIT/ODD /STOP2

In case of PRIVATE, the setting is 7BIT/EVEN/STOP1.

6-1. Communication speed (COM BIT RATE)

Use KP and PC in same communication speed. (Usually initial value can be 9600 bps.)

- ① Display 'COMBITRATE' using  key.
- ② Select communication speed using   key and register it using  key.

Communication speed: 2400bps, 4800bps, 9600bps, 19200bps, 38400bps, (Initial value is 9600bps)

6-2. Set device number (COM NUMBER)

Set the device number of KP at the time of RS-422A/485.

In single to multiple KPs that communicate with the PC, always do the settings such that one KP does not overlap with the other KPs.

- ① 'COM NUMBER' is displayed using the  key.
- ② Set device number (1 to 99) using     key, select it and register it using  key.



Precautions

- ① Device number should be in a range from 1 to 99 and it should not overlap with the other KPs. (Initial value 1)
- ② In case of RS-232C, KP is connected to 1 machine but set the device number. Usually initial value can be 1.

6-3. Set the communication function (COM KIND)

Set the communication function.

- ① Display 'COM KIND' using  key.
- ② Select communication function using   key and register it using  key.
- ③ If 'COM' is selected, it becomes a high order communication function.
- ④ If 'TRANS' is selected, it becomes communication transmission function.

Communication function: COM, TRANS

6-4. Setting communication transmission kind (COM TRANS KIND)

Set communication transmission kind.

- ① Display 'COM TRANSKIND' using  key.
- ② Select transmission kind using   key and register it using  key.
- ③ If 'PV' is selected, measurement value (PV) is transmitted.
- ④ If 'SV' is selected, setting value (SV) is transmitted.
- ⑤ If 'MV' is selected output value (MV) is transmitted.
- ⑥ If 'MFB' is selected, operation terminal feedback value (MFB) is transmitted.
However, it can be selected only when output format is ON OFF servo type.
- ⑦ If 'SUB' is selected, setting value of subsidiary output is transmitted. However, it is displayed only in case of specifications with transmission signal output and when transmission type 'SUB' is selected.
- ⑧ In case of output 2 specifications, output 1 side 'MV1' and output 2 side 'MV2' can be selected individually.

Transmission type: PV, SV, MV (MV1, MV2), MFB, SUB

6-5. Setting communication protocol (COM PROTOCOL)

- ① 'COM PROTOCOL' is displayed using  key.
- ② Select communication protocol using   key and register it using  key.

Selection	Communication Protocol	Initial value
MODBUS (RTU)	MODBUS protocol RTU mode	MODBUS (RTU)
MODBUS (ASCII)	MODBUS protocol ASCII mode	
PRIVATE	PRIVATE protocol	

※ If communication protocol is changed, communication character changes to initial value.

6-6. Setting communication character (COM CHARACTER)

- ① 'COM CHARACTER' is displayed using  key.
- ② Select communication character using   key and register it using  key.

[MODBUS RTU]

Selection	Bit length	Parity	Stop bit	Initial value
8BIT/NON/STOP1	8bit	None	1	8BIT/NON/STOP1
8BIT/NON/STOP2			2	
8BIT/EVEN/STOP1		Even	1	
8BIT/EVEN/STOP2			2	
8BIT/ODD/STOP1		Odd	1	
8BIT/ODD/STOP2			2	

[MODBUS ASCII]

Selection	Bit length	Parity	Stop bit	Initial value
7BIT/EVEN/STOP1	7bit	Even	1	7BIT/EVEN/STOP1
7BIT/EVEN/STOP2			2	
7BIT/ODD/STOP1		Odd	1	
7BIT/ODD/STOP2			2	
8BIT/NON/STOP1	8bit	None	1	
8BIT/NON/STOP2			2	
8BIT/EVEN/STOP1		Even	1	
8BIT/EVEN/STOP2			2	
8BIT/ODD/STOP1		Odd	1	
8BIT/ODD/STOP2			2	

[PRIVATE] (*When communication protocol is PRIVATE, communication character screen is not displayed)

Selection	Bit length	Parity	Stop bit	Initial value
7BIT/EVEN/STOP1	7bit	Even	1	7BIT/EVEN/STOP1

7. Wiring

7-1. Precautions while wiring

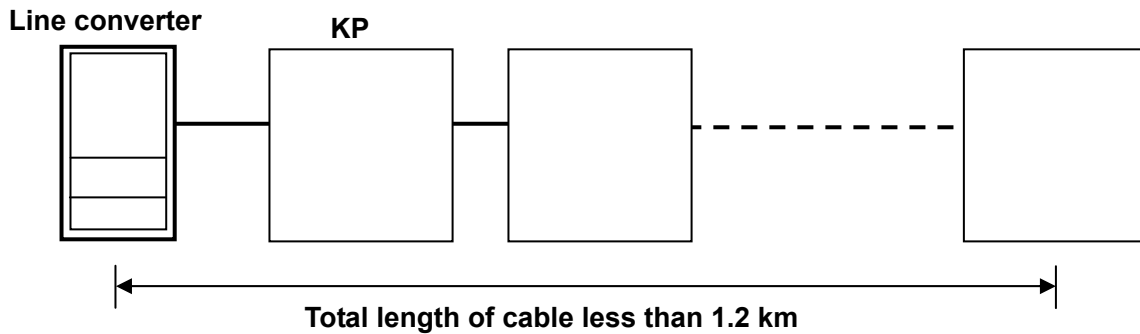
1. Communication terminal

Depending on the communication interfaces that are specified, terminal arrangement differs.
Refer to 4-3 Wiring in instruction manual [general] for terminal numbers.

2. Total length of RS-422A/485 communication cable is less than 1.2 km

Wiring space between each device can be anything but the total cable length distance is less than 1.2km.

(Line converter $\longleftrightarrow$ Last terminal KP)



3. Take action to avoid intermixing of noise.

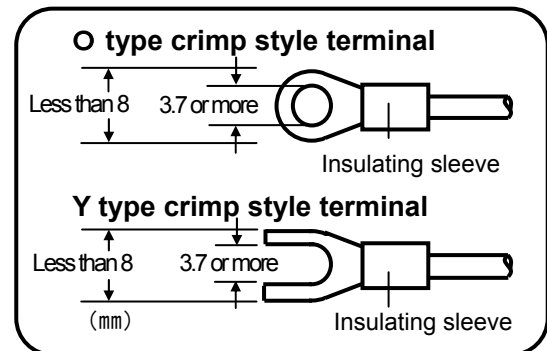
To avoid effect of noise place the power cable and other communication cables away from each other by at least 50 cm or more.

4. Always perform the crimp-style terminal process.

One of the causes of communication defect is loss of connection.

Always process the communication cable terminal using O type or Y type crimp style terminal with insulation sleeve.

(Terminal screw of KP, line converter is M3.5mm.)



5. Apply last terminal resistance.

When using RS-422A/485 communication, apply a resistance of 100Ω to the KP place in the last terminal. (For details, see clause 7.4)

(General metal coating resistance is okay. It is available with our company and you may order it.)

6. Number of machines of DB connections

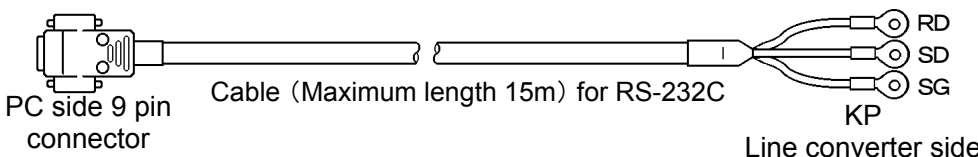
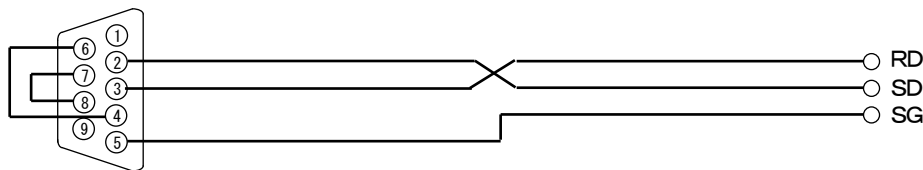
For RS-232C	:1
For RS-422A/485	: Maximum 31

7-2. Cable for communication

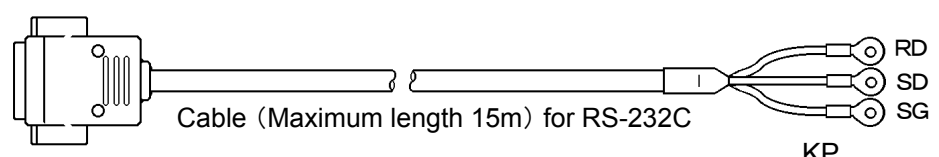
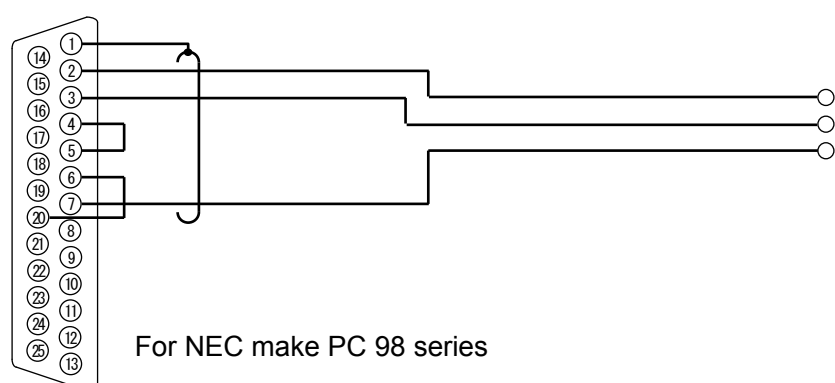
Before connecting, prepare the exclusive communication cables. They are available with our company also and you can order them.

7-2-1. Communication cable for RS-232C (Between PC/Line converter)

① Connection between PC (9 pin) and KP, PC (9 pin) and line converter

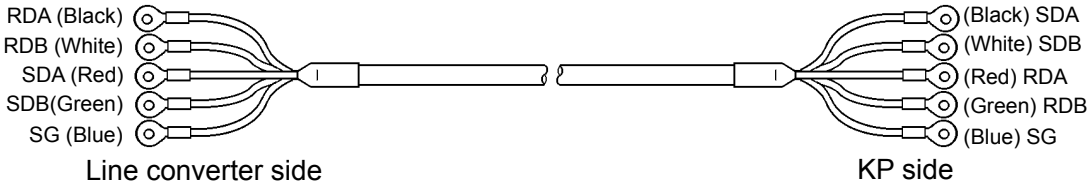
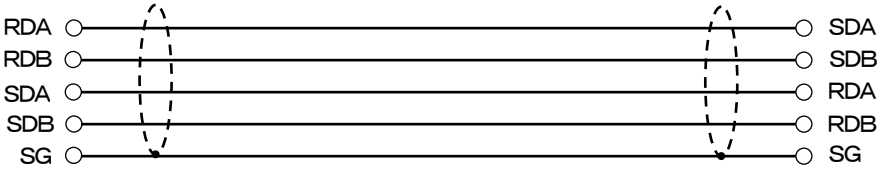
Cable	9 pin connector ↔ 0 type crimp-style terminal ↔ RS-232C cable
Format	 PC side 9 pin connector Cable (Maximum length 15m) for RS-232C Line converter side KP
Internal wiring	 RD SD SG
Model code	RZ-CRS6 ☐ ☐ Cable length is 1 to 15m (Specified)

② Connection between PC (25 pin) and KP, PC (25 pin) and line converter

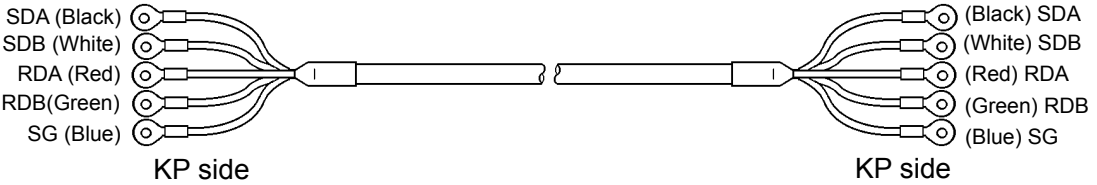
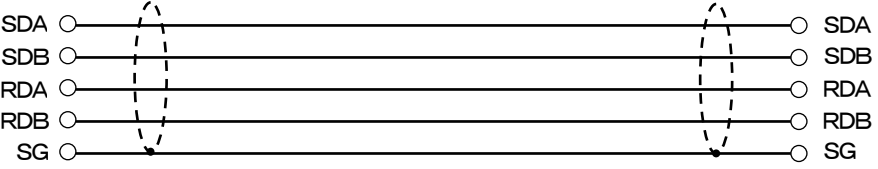
Cable	25 pin connector ↔ 0 type crimp-style terminal RS-232C cable
Format	 PC side 25 pin connector Cable (Maximum length 15m) for RS-232C Line converter side KP
Internal wiring	 For NEC make PC 98 series
Model code	RZ-CRS2 ☐ ☐ Cable length is 1 to 15m (Specify)

7-2-2. Communication cable for RS-422A

① Connection between line converter and KP

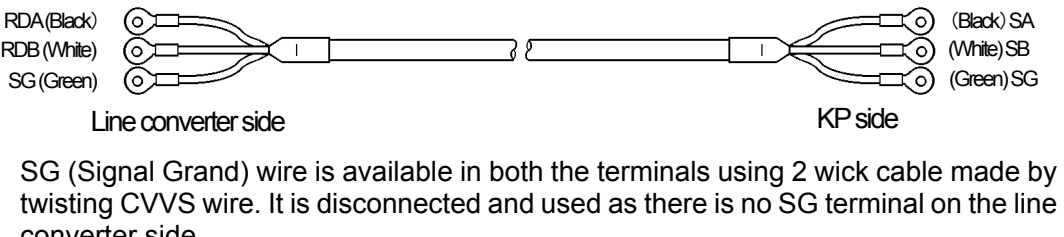
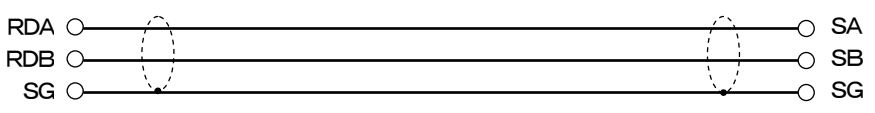
Cable	0 type crimp style terminal ↔ 0 type crimp style terminal RS-422A cable (For line converter)
Format	 Line converter side KP side SG (Signal grand) wiring is available on both sides using 2 wick VCTF wire that is further twisted to 4 wicks. It is disconnected and used as there is no SG terminal on the line converter side.
Internal wiring	
Model code	RZ-CRA2 □□  Cable length is 01 to 99m (Specified)

② Connection between KPs

Cable	0 type crimp style wire ↔ 0 type crimp style RS-422A cable (For serial connection)
Format	 KP side KP side SG (Signal grand) wiring is available on both sides using 2 wick VCTF wire that is further twisted to 4 wicks.
Internal wiring	
Model code	RZ-CRA1 □□  Cable length is 01 to 99m (Specified)

7-2-3. Communication cable for RS-485

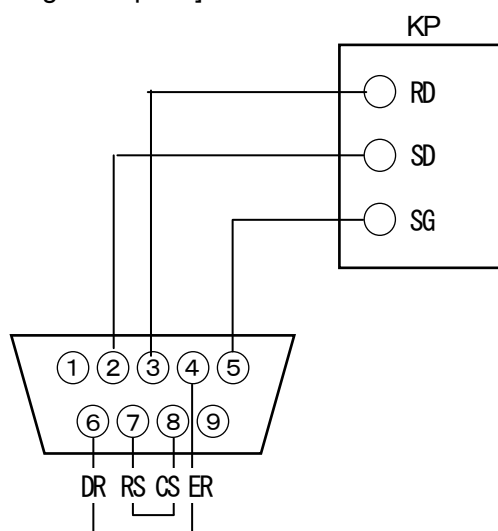
① Connection between line converter and KP; and between KPs

Cable	0 type crimp style terminal ↔ 0 type crimp style terminal RS-485 cable
Format	 Line converter side KP side SG (Signal Grand) wire is available in both the terminals using 2 wick cable made by twisting CVVS wire. It is disconnected and used as there is no SG terminal on the line converter side.
Internal wiring	 RDA ○ SA RDB ○ SB SG ○ SG
Model code	RZ-LEC └─ Cable length is 001 to 200m (Specified)

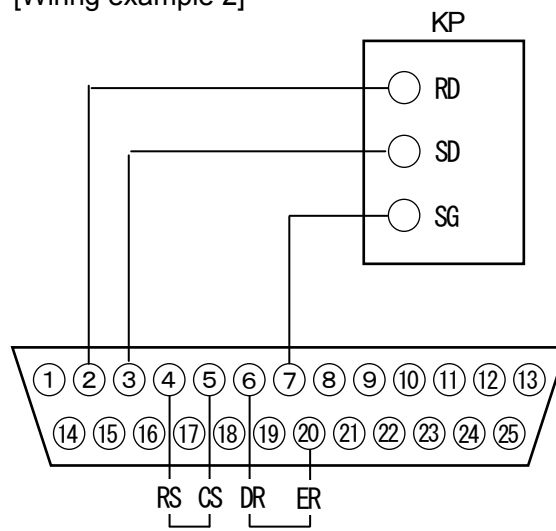
7-3. RS-232C connection

KP uses sending, receiving and Signal Grand (SG) only and does not use any other control signal. In general PC as controlling is done by control signal, it does not operate just by connecting 3 signal wires. As the wiring process in the connector, differs on how the PC controls the control signal, see the instruction manual of the PC that is being used.

[Wiring example 1]



[Wiring example 2]



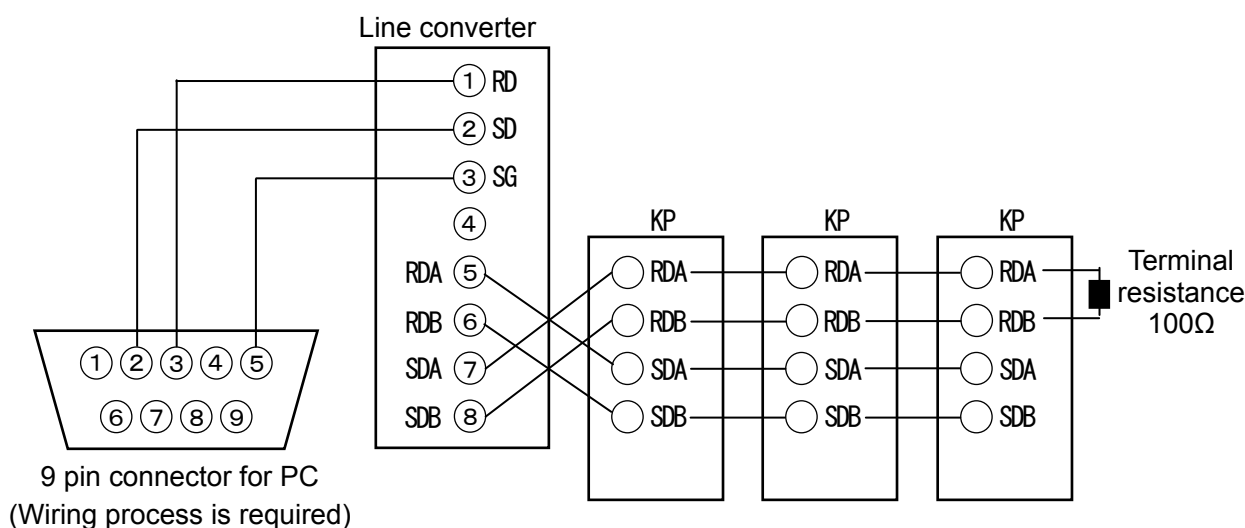
Precautions

RS-232C cable length is maximum 15m. NEC make PC98 series 9 pin connector is 'Wiring example 1' and 25 pin connector is connected as shown in 'Wiring example 2'.

7-4. Wiring of RS-422A/485

Connect RS-422A/485 communication interface to the PC using line converter (Our company model: SC8-10). Line converter and PC use only three signals namely send, receive and signal ground and do not use any other control signal. Hence, wiring process in the connector similar to that in RS-232C connection, is necessary. (For details, see the instruction manual of the line converter.)

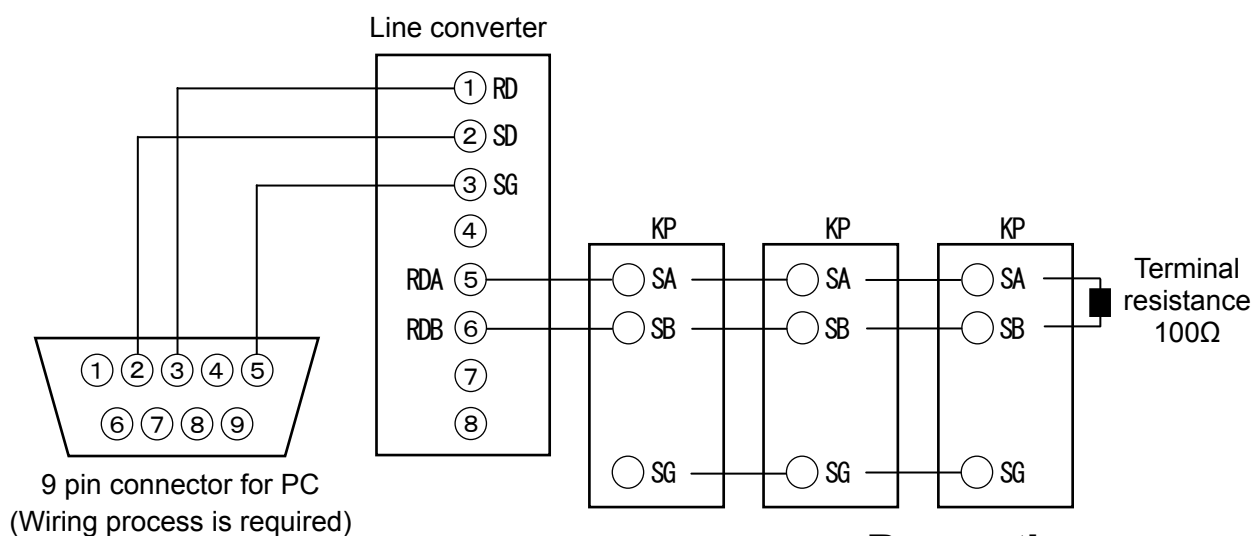
Wiring of RS-422A



⚠ Precautions

Do not connect the SG wire to FG terminal or grounding terminal of the device.

Wiring of RS-485



⚠ Precautions

Do not connect the SG wire to FG terminal or grounding terminal of the device.

8. MODBUS protocol

Basic procedure and precautions regarding communication



Precautions

In order to avoid accidents always read the contents and understand them.

1. When setting (Right) the parameters, setting is controlled using key operations.

Communication is possible any time in KP. Response is received against the data request from the PC at any time.

2. Device number is necessary in RS-232C also.

In RS-232C, PC and KP are connected on one to one basis. Device is set and communication for this device number is performed.

3. As control signal wire is not used, consider resending the command.

Serial interface of KP communicates without using the control wire. As a result, sometimes reception defect may occur due to KP status hence consider resending the command.

4. Do not remove the communication cable or a device and do not switch ON-OFF the power supply during communication.

If cable or device that makes up the serial interface is removed or power supply is switched ON-OFF, operation is stopped and error may occur. If this is the status, it is necessary to reset all the devices that make up the serial interface and redo everything from the beginning.

5. Send the next command only after confirming that the communication drive is OFF.

In RS-422A/485, multiple devices are connected to the same communication line and only one machine whose device number is specified by the PC drives the communication line. At that time in order that the PC receives all the characters for sure, let some time elapse after the last character is sent and then switch OFF the drive of communication line. If command for the next device is sent by the PC before it gets switched OFF, signals conflict and normal communication is not performed, hence take care when using high speed PCs. This interval is approximately 5ms.

8-1. Message transmission mode

There are two types of modes namely RTU (Remote Terminal Unit) mode and ASCII mode and they are selected using the front key setting.

<Table 1 Comparison between RTU mode and ASCII mode>

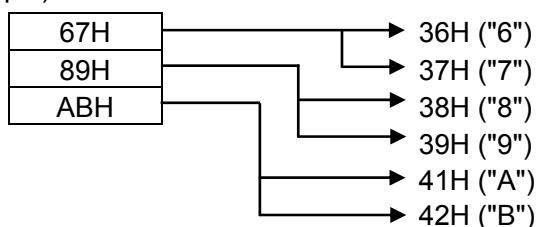
Item		RTU mode	ASCII mode
Interface		RS-232C, RS-422A, RS-485	
Communication system		Half duplex asynchronous system	
Communication speed		2400,4800,9600,19200,38400bps	
Transmission code		Binary	ASCII
Error check (Error detection)	Vertical direction	Parity	
	Horizontal direction	CRC-16	LRC
Character configuration	Start bit	1 bit	
	Data length	7 bit/8 bits	
	Parity bit	None/even/odd	
	Stop bit	1 bit/2 bits	
Message start code		None	: (Colon)
Message end code		None	CR, LF
Data time interval		Less than 28 bit time	Less than 1 second

8-1-1. Transmission data

RTU mode is binary forwarding. ASCII mode splits the RTU 8 bit binary into high order and low order 4 bits and garbles each character (0 to 9, A to F).

Example) RTU mode

ASCII mode

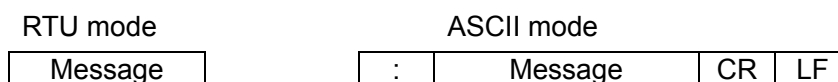


As the length of message in RTU mode is half that of ASCII mode and hence effective transmission is done.

8-1-2. Configuration of the message frame

RTU mode is made up of message part only.

ASCII mode is made up of start character ":" (Colon, 3AH)", message and end character "CR (Carriage return, 0DH) + LF (Line feed, 0AH)".



ASCII mode has a strong point that, as the start character is ":" it facilitates troubleshooting.

8-2. Data time interval

During RTU mode: Less than 9600bps = 20msec, 9600bps or more = 5msec

During ASCII mode: Less than 1 second

When sending a message, do not let the time interval of data that makes up one message exceed the time span mentioned above. If it exceeds the time interval mentioned above, the receiving side (this device), in order to judge the end of transmission from the transmission side, processes it as an abnormal message reception.

In RTU mode message characters should be sent continuously whereas in ASCII mode as character gap is up to 1 second, master (PC) processing speed is comparatively slow but it can be used.

8-3. Message configuration

MODBUS message is made up of the following, in case of both the RTU and ASCII mode.

Slave address
Function code
Data
Error check

8-3-1. Slave address

Set the slave address beforehand in a range of 1 to 99 using front key setting. Master usually does the transmission with one slave. All the connected devices receive in common the message sent from the master. However, only the slave whose slave address matches with the slave address in the command message responds to that message.

Slave address '0' is used in message (broad cast) from the master for all the slaves. In this case the slave does not return a response.

8-3-2. Function code

Function code is a code that is to be executed in the slave and each data is roughly categorized as follows. For details, see the reference table.

- ① Digital setting value : AT start
- ② Digital input data : Event status and DI input status
- ③ Analog setting value : Various setting information. Numeric value range is a numeric value within the range of 16 bits.
-32768 to 32767 (For details see reference table).
- ④ Analog input data : Measurement data, status etc. Numeric value range is a numeric value within a range of 16 bits.

<Table 2. Function code table>

Code	Function	Unit	MODBUS original function (Reference)
01	Read digital (ON/OFF) setting value	1 bit	Read coil status
02	Read digital input data	1 bit	Read input relay status
03	Read analog setting value	16 bits	Read the contents of maintenance register
04	Read analog input data	16 bits	Read the contents of input register
05	Write the digital setting value	1 bit	Change the status of single coil
06	Write the analog setting value	16 bits	Write to single maintenance register
08	Loop back test (Send the received data)		Loop back test
15	Write multiple digital setting values		Change the status of multiple coils
16	Write multiple analog setting values		Write to multiple maintenance registers

8-3-3. Data division

Function of data differs depending on the function code. During the request from the master, it consists of code number (relative number calculated from reference number mentioned hereinafter) of the data that is to be read and written and the data unit count etc. Response from the slave is made up of data etc. that is requested.

Basic data of MODBUS is 16 bit integer on a whole and presence or absence of tag is specified for each data. Thus by putting the decimal point after another number make it as an integer value or by fixing the decimal point position make it standard by upper and lower limit of the scale and express it. In KP a system of putting the decimal point in a different position is fetched.

Precautions

In the data division, specific numeric value can be assigned as error data, like input data. When using such data, first judge the error of the data and then combine it with decimal point data. If it is combined with decimal data earlier, then error data is mistook as normal data.

8-3-4. Reference number

In the KP there is a number called 'Reference number' that is allotted and it is required when reading and writing the data. The data in the KP is categorized depending on its type into, 'Digital setting value', 'Digital input data', 'analog input data' and 'analog settings value'. Number in the message is specified by "relative number" which is corresponding with each reference number.

<Table 3. Reference number and relative number>

Data kind	Reference number	Relative number	MODBUS original (Reference)
Digital setting value	1 to 10000	Reference number-1	Coil
Digital input data	10001 to 20000	Reference number-10001	Input relay
Analog input data	30001 to 40000	Reference number-30001	Input register
Analog setting value	40001 to 50000	Reference number-40001	Maintenance register

Example) Relative number of measurement value (PV) of 'Reference number 30101' is '100'.

<Table 4. Reference number chart table>

Data kind	Parameter	Reference number	Relative number	Code	Reference table
Digital setting value	Tuning	101 to 111	100 to 110	01 05 15	Section 8-7-3
Digital input Data	System abnormality status Alarm status	10002 to 10005 10117 to 10124	1 to 4 116 to 123	02	Section 8-7-4
Analog setting value	Setup parameter 1 Setup parameter 2 1 type parameter Execution parameter & specific parameter 8 type parameter No.1 8 type parameter No.2 8 type parameter No.3 8 type parameter No.4 8 type parameter No.5 8 type parameter No.6 8 type parameter No.7 8 type parameter No.8 Parameter for No. 9 & AT Setting parameter System setting Program pattern information Program pattern setting/editing Operation status information	40001 to 40047 40051 to 40092 40101 to 40148 40151 to 40195 40206 to 40245 40256 to 40295 40306 to 40345 40356 to 40395 40406 to 40445 40456 to 40495 40506 to 40545 40556 to 40595 40601 to 40650 40701 to 40724 48001 to 48033 49003 to 49049 49055 to 49096 49501 to 49536	0 to 46 50 to 91 100 to 147 150 to 194 205 to 244 255 to 294 305 to 344 355 to 394 405 to 444 455 to 494 505 to 544 555 to 594 600 to 649 700 to 723 8000 to 8032 9002 to 9048 9054 to 9095 9500 to 9535	03 06 16	Section 8-7-1
Analog input data	Real data, parameter information	30101 to 30144	100 to 143	04	Section 8-7-2

8-3-5. Error check

Error check of transmission frame differs depending on the mode.

RTU mode: CRC-16

ASCII mode: LRC

① Calculation of CRC-16

CRC system assigns the information that is to be sent, by generating polynomials, and sends the rest of the information by appending it at the end. Generating polynomial is as follows.

$$1 + X^2 + X^{15} + X^{16}$$

Target extends from slave address to the end of the data and calculation is done by the following procedure.

- 1) Initialization (=FFFFH) of CRC-16 data (Consider it as X)
- 2) Exclusive-OR (EX-OR) of data 1 and X → X
- 3) Shift X one bit to the right → X
- 4) If carry appears get A001H and EX-OR. If it does not appear go to 5). → X
- 5) Repeat 3) and 4) until shifting is done for 8 times.
- 6) Net data and EX-OR of X. → X
- 7) Same as 3) to 5).
- 8) Repeat till the end of the data.
- 9) Create messages in low order and high order of 16 bit data (X) that is calculated.

Example) When data is [02H] [07H], CRC-16 becomes 1241H hence the error check data becomes [41H] [12H].

Reference: CRC-16 calculation program

```
/***** CRC-16 calculation program (C language) *****/
#include <stdio.h>
#include <conio.h>

void main(void)
{
    /** Internal variable declaration ***/
    unsigned int      iLoopCnt;                /* Loop counter */
    unsigned short    usData;                  /* Input data */
    unsigned short    usCrcData;               /* CRC-16 data */
    unsigned short    usErrChkData;           /* Error check data */
    int               iDummy;                 /* Dummy variable */

    /* (1) Initialize the output result of CRC-16 data */
    usCrcData = 0xffff;

    printf("Enter hexadecimal data.(End using [q]) >\n");
    while( scanf("%x",&usData) != 0 )
    {
        /* Get the exclusion of CRC output result and the data that is input */
        usCrcData = usData ^ usCrcData;

        /** Do the CRC calculation ***/
        /* Repeat till shifting up to 8 bits is done */
        for( iLoopCnt = 0 ; iLoopCnt < 8 ; iLoopCnt++ )
        {
            /* Check the existence of carry */
            if( usCrcData & 0x0001 )
            {
                /* When carry occurs */
                /* Shift CRC output result 1 bit to the right */
                usCrcData = usCrcData >> 1;

                /* Get the exclusion with A001H */
                usCrcData = usCrcData ^ 0xa001;
            }
            else
            {
                /* When carry does not occur */
                /* Shift CRC output result 1 bit to the right */
                usCrcData = usCrcData >> 1;
            }
        } /* for */
    } /* while */

    printf( "CRC-16 data is %xH..\n", usCrcData );

    /* Create error check data */
    usErrChkData = ( usCrcData >> 8 ) | ( usCrcData << 8 );
    printf( "Data for error check is %xH.", usErrChkData );

    iDummy = getch();
}
```

② LRC calculation method

Target extends from slave address to the end of the data and calculation is done by the following procedure.

- 1) Create message in RTU mode.
- 2) Add from the beginning (Slave address) to the end of data. → X
- 3) Get the complement (bit inversion) of X. → X
- 4) Add 1. (X=X+1)
- 5) Add X as LRC at the end of the message.
- 6) Convert everything to ASCII character.

Example) When data is [02H][07H], LRC becomes [F7H] hence

Binary message becomes [02H] [07H] [F7H]

ASCII message becomes [30H] [32H] [30H] [37H] [46H] [37H]

Reference: LRC calculation program

```
/* LRC calculation program (C language) */
```

```
#include <stdio.h>
```

```
#include <conio.h>
```

```
void main(void)
```

```
{
```

```
    /* Internal variable declaration */
```

```
    unsigned short    usData;                /* Input data */
```

```
    unsigned short    usLrcData;            /* LRC data */
```

```
    int               iDummy;              /* Dummy variable */
```

```
    /* Initialize the output result of LRC data */
```

```
    usLrcData = 0;
```

```
    printf(" Enter hexadecimal data.(End using [q]) >\n");
```

```
    while( scanf("%x",&usData) != 0 )
```

```
    {
```

```
        /* Add from the beginning to the end of the data */
```

```
        usLrcData += usData;
```

```
        /* Cancel high order, 1 byte */
```

```
        usLrcData = usLrcData & 0xff;
```

```
    } /* while */
```

```
    /* Get the exclusion with FFH */
```

```
    usLrcData = usLrcData ^ 0xff;
```

```
    /* Add 1 */
```

```
    usLrcData = usLrcData++;
```

```
    /* Cancel high order, 1 byte */
```

```
    usLrcData = usLrcData & 0xff;
```

```
    /* LRC error check */
```

```
    printf( "LRC-16 data is %xH..\n", usLrcData );
```

```
    iDummy = getch();
```

```
}
```

8-3-6. Precautions while processing the data

- ① Decimal point position of each data is clearly mentioned in the reference table. There are various points like fixing the decimal point position, points to be decided for every measurement range (See section 8.9) items as per linear decimal point setting. Take care about the decimal point position when data is regenerated.
- ② As every data can be accessed (changed), it is necessary to take care at the time of setting the related data. For example, there exists data initialization process etc. depending on the change in the measurement range. Process contents are mentioned in reference number table.
- ③ Read and write the data in the range of the numbers, specified by reference number. If data is read and written for the reference numbers that are not specified, device operation may get affected.
- ④ Many reference numbers that are not continuous can be read and written, however, if the reference number that is not specified is the starting number than it is an error (Error-02H).
- ⑤ When reading a number of reference numbers, the data of the number that is not specified by the reference number becomes '0'.
- ⑥ When writing multiple reference numbers, if an error is detected all the settings become disabled.

8-4. Method of creating a message

Message is made up of ① Slave address, ② Function code, ③ Data division, and ④ Error check code. (See section 8-3.)

Message that can be read and written once is within the following range.

Function code	Number of data units	
	ASCII mode	RTU mode
01	64	64
02	64	64
03	32	64
04	32	64
15	64	64
16	32	64

Note) Number of units of data is the number of requests from high order

Method of creating a message is explained in the following example.

Example) Reading the PV value and PV status of 'Slave address 02' of KP.

8-4-1. Message in RTU mode

① Slave address: 02 [02H]

② Function code: 04 [04H]

Becomes 'Reading analog input data (Reading contents of input register)'. When action code is '04' specify 'Relative number of data 2 bytes' and 'number of units of data' that is to be read in data division. (See section 8-5. For 'function code: 04', see section 8-5-4.)

※ It is necessary to confirm the number of bytes of data.

③ Data division: Starting relative number 100 ([00H][64H]), Number of units 2 ([00H][02H])

PV value and PV status are stored in reference number '30032 to 30144' (See section 8-3-4. table 3). From the reference table, it is understood that PV value is stored in '30101' and PV status is stored in '30102'. (See section 8-7. For details on reading the PV value see sections 8-7-2.) Relative number of the beginning 'Reference number 30101' is 30101-30001=100 and if displayed in 2 bytes it becomes '[00H] [64H]' (See section 8-3-4 table 3).

Number of units of data to be read is '2 units' of PV value and PV status, hence when displayed in 2 bytes, it becomes [00H] [02H].

④ Error check: Calculate using CRC-16 2730H ([30H][27H])

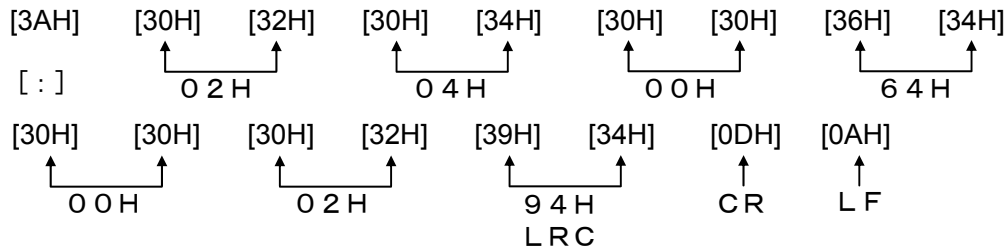
Error check in RTU mode is calculated using CRC-16. (See section 8-3-5.①) Data of message basic division becomes [02H][04H][00H][64H][00H][02H] according to ① to ③ and CRC-16 becomes 2730H. Thus error check data becomes [30H][27H].

⑤ Message: [02H][04H][00H][64H][00H][02H][30H][27H]

Create message according to the message configuration. (See 8-3.)

8-4-2. ASCII mode message

Calculate error check LRC from message basic division. LRC becomes 94H (See section 8-3-5.②). Convert each data of basic division to ASCII code and also convert LRC to ASCII code and add it to basic division. Starting character of message is ":" and add "CR", "LF" at the end.



8-5. Function code

Function code wise response is shown below. (See section 8-3-2 <Table 2. Function code table>)

Note) See section 8-6 for response in case of abnormality

8-5-1. Reading digital setting value [Function code: 01 (01H)]

Read only from specified number to specified units 'Continuous (ON/OFF) digital setting value of the number' is read. ON/OFF data is made up of data (1 byte) that contains 8 units in numeric order and the response message data. LSB (DO side) of each data becomes a digital data of the smallest number. If the units that are to be read are not in multiples of 8, then the bits that are not required become 0.

Example) Reading the digital settings value reference number 101 of slave 2

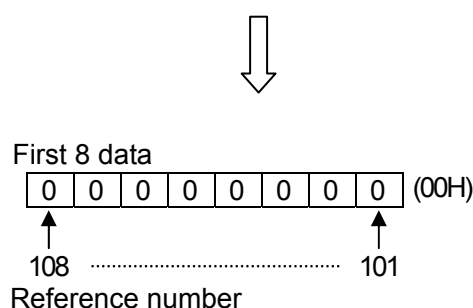
Reference number	101
Data	0

AT1 end

<RTU mode>

Master → Device	
Slave address	02H
Function code	01H
Starting number (H)	00H
Starting number (L)	64H
Number of units (H)	00H
Number of units (L)	01H
CRC(L)	BCH
CRC(H)	26H

Device → Master (Normal)	
Slave address	02H
Function code	01H
Data count	01H
Initial 8 data	00H
CRC(L)	51H
CRC(H)	CCH



<ASCII mode error check> (*CRC(L)(H) of the above are LRC as follows.)

LRC	98H
-----	-----

LRC	FCH
-----	-----

Note) Starting number (Relative number) is 'Reference number-1'. (Decimal 100(=101-1) → Hexadecimal 64H)

Note) Data count is the number of bytes of data.

(It differs from request units. For example request unit is 1 unit, data count is 1 unit).

8-5-2. Reading digital input data) [Function code: 02 (02H)]

Read only from specified number to specified units 'Digital (ON/OFF) input data with continuous numbers'. ON/OFF data is made up of data (1 byte) that contains 8 units in numeric order and the response message data. LSB (DO side) of each data becomes a digital data of the smallest number. If the units that are to be read are not in multiples of 8, then the bits that are not required become 0. Example of response is same as that of 'Function code 01'. However starting number (Relative number) is 'Reference number-10001'.

8-5-3. Reading analog setting value [Function code: 03 (03H)]

From the specified number, only the number of units of the continuation of number 'Analog setting value (2 bytes: 16 bytes) data' that are specified are read. Data is split into high order 8 bits to low order 8 bits and is arranged in numeric order and consists of the data of response message.

Example) Reading P, I, D of PID number 1 of slave 1.

(Reading 3 units of analog setting value reference number from 40206 to 40208 of slave 1.)

Reference number (Starting number)	40206 (00CDH)	40207 (00CEH)	40208 (00CFH)
Data	50 (0032H)	60 (003CH)	30 (001EH)

← Example of
P = 5.0,
I = 60,
D = 30

<RTU mode>

Master → Device

Slave address	01H
Function code	03H
Starting number (H)	00H
Starting number (L)	CDH
Number of units (H)	00H
Number of units (L)	03H
CRC (L)	94H
CRC (H)	34H

Device → Master (Normal)

Slave address	01H
Function code	03H
Data count	06H
Pattern No. (H)	00H
Pattern No. (L)	32H
Step No. (H)	00H
Step No. (L)	3CH
Step repeat (H)	00H
Step repeat (L)	1EH
CRC (L)	58H
CRC (H)	B5H

<ASCII mode error check> (*CRC(L)(H) of the above are LRC as follows.)

LRC	2CH
-----	-----

LRC	6AH
-----	-----

Note) Starting number (Relative number) is 'Reference number-40001'.

Note) Data count is the number of bytes of data.

(It differs from request units. In the example request unit count is three units, data count is 6 unit).

Note) There is a limitation on the number of data units of the message (This device can be sent) that can be received once.

(See section 8-4.)

8-5-4. Reading analog input data [Function code: 04 (04H)]

From the specified number, only the number of units 'Analog input (2 bytes: 16 bytes) data of the continuation number' that are specified are read. Data is split into high order 8 bits to low order 8 bits and is arranged in numeric order and consists of the data of response message. Response example is similar to that of 'Function code 03'. However starting number (Reference number) is 'Reference number-30001'.

8-5-5. Writing the digital setting value [Function code: 05 (05H)]

Consider the digital setting value of the specified number as the status (ON/OFF) that is specified.

Example) Execute AT1 of slave 2. (Switch ON the digital setting value reference number 101 of slave 2.)

<RTU mode>

Master → Device		Device → Master (Normal)	
Slave address	02H	Slave address	02H
Function code	05H	Function code	05H
Setting value number (H)	00H	Setting value number (H)	00H
Setting value number (L)	64H	Setting value number (L)	64H
Setting status (H)	FFH	Setting status (H)	FFH
Setting status (L)	00H	Setting status (L)	00H
CRC(L)	CDH	CRC(L)	CDH
CRC(H)	D6H	CRC(H)	D6H

<ASCII mode error check> (*CRC(L)(H) of the above are LRC as follows.)

LRC	96H	LRC	96H
-----	-----	-----	-----

Note) During normal response the response is same as command message.

Note) Setting value number (Relative number) is 'Reference number-1'. (Decimal 100(=101-1) → Hexadecimal 64H)

Note) At the time of starting, set 'FF00H'. Set '0000H' at the time of ending AT.

Note) If slave address is considered as 0, all the slave machines execute that command. However, no slave machine responds.

8-5-6. Writing analog setting value [Function code: 06 (06H)]

Consider the analog setting value of the specified number as the set value.

Example) Set input type number of slave 1 as 5 (K1).

<RTU mode>

Master → Device

Slave address	01H
Function code	06H
Setting value number (H)	00H
Setting value number (L)	00H
Set data (H)	00H
Set data (L)	05H
CRC(L)	49H
CRC(H)	C9H

Device → Master (Normal)

Slave address	01H
Function code	06H
Setting value number (H)	00H
Setting value number (L)	00H
Set data (H)	00H
Set data (L)	05H
CRC(L)	49H
CRC(H)	C9H

<ASCII mode error check> (*CRC(L)(H) of the above are LRC as follows.)

LRC	F4H
-----	-----

LRC	F4H
-----	-----

Note) Starting number (Relative number) is 'Reference number-40001'.

Note) During normal response the response is same as command message.

Note) If slave address is considered as 0, all the slave machines execute that command.
However, no slave machine responds.

8-5-7. Loop back test [Function code: 08 (08H)]

Perform transmission check between master slaves. Respond for the diagnosis code that is specified. In this device perform 'return check to send the received data as it is' and diagnosis code is fixed as '0000H'.

Example) Implement 'Loop back test' to slave 2.

<RTU mode>

Master → Device

Slave address		02H
Function code		08H
Diagnosis code (H)	Fixed	00H
Diagnosis code (L)		00H
Option data		*
Option data		*
CRC(L)		*
CRC(H)		*

Device → Master (Normal)

Device Master (Normal)		
Slave address		02H
Function code		08H
Diagnosis code (H)	Fixed	00H
Diagnosis code (L)		00H
Received data		*
Received data		*
CRC(L)		*
CRC(H)		*

8-5-8. Writing multiple digital setting value [Function code: 15 (0H)]

From the specified number consider the digital setting value of the specified number of units as the specified status (ON/OFF).

ON/OFF specification becomes, one data of 8 units in numeric order. LSB (DO side) of each data becomes the digital data of smallest number. If the units to be written are not in multiples of 8, ignore the bits that are not required.

Example) Set AT1 of slave 2 to start.

(Change the digital setting value reference number 101 of slave 2 to the following status.)

Reference number	101
Data	ON

AT start

<RTU mode>

Master → Device

Slave address	02H
Function code	0FH
Starting number (H)	00H
Starting number (L)	64H
Number of units (H)	00H
Number of units (L)	01H
Data count	01H
Initial 8 data	01H
CRC(L)	DEH
CRC(H)	8AH

Device → Master (Normal)

Slave address	02H
Function code	0FH
Starting number (H)	00H
Starting number (L)	64H
Number of units (H)	00H
Number of units (L)	01H
CRC(L)	D5H
CRC(H)	E7H

<ASCII mode error check> (*CRC(L)(H) of the above are LRC as follows.)

LRC	88H
-----	-----

LRC	8AH
-----	-----

Note) Starting number (Relative number) is 'Reference number-1'. (Decimal 100(=101-1) → Hexadecimal 64H)

Note) If slave address is changed to 0, all the slave machines execute that command. However, no slave machine responds.

Note) There is a restriction on the number of data units of message that can be sent once (That this device can receive).
(See section 8-4.)

8-5-9. Writing multiple analog setting values [Function code: 16 (10H)]

From the specified number, change the analog setting value of specified number of units to the specified value. Data is split into high order 8 bits and low order 8 bits, is arranged in numeric order and then sent.

Example) Set PID number 1 of slave 1 as P=12.0%, I=90 seconds, D=25 seconds.

(Set 3 units of analog setting value reference number from 40206 to 40208 of slave 1.)

Reference number (Starting number)	40206 (00CDH)	40207 (00CEH)	40208 (00CFH)
Data	120 (0078H)	90 005AH	25 (0019H)

<RTU mode>

Master → Device

Slave address	01H
Function code	10H
Starting number (H)	00H
Starting number (L)	CDH
Number of units (H)	00H
Number of units (L)	03H
Data count	06H
Initial data (H)	00H
Initial data (L)	78H
Second data (H)	00H
Second data (L)	5AH
Third data (H)	00H
Third data (L)	19H
CRC(L)	33H
CRC(H)	95H

Device → Master(Normal)

Slave address	01H
Function code	10H
Starting number (H)	00H
Starting number (L)	CDH
Number of units (H)	00H
Number of units (L)	03H
CRC(L)	11H
CRC(H)	F7H

<ASCII mode error check> (*CRC(L)(H) of the above are LRC as follows.)

LRC	2EH
-----	-----

LRC	1FH
-----	-----

Note) Starting number (Relative number) is 'Reference number-40001'.

Note) If slave address is considered as 0, all the slave machines execute that command. However, no slave machine responds.

Note) There is a restriction on the number of data units of message that can be sent once (That this device can receive). (See section 8-4.)

8-6. Process during abnormality

If there is an error in the contents of the message from the master, respond as follows.

8-6-1. In case of no response

In the following cases the messages are ignored and no response is given.

- ① Transmission error (over run, framing, parity, CRC or LRC) is detected in the message.
- ② The slave address during the message is not the self address.
- ③ The data interval of the message is long.
 - RTU mode...When less than 9600bps:20msec or more
 - When 9600bps or more: 5msec or more
 - ASCII mode...1 second or more
- ④ Transmission parameters do not match.
- ⑤ Received message exceeds the number of bytes that can be received (Sometimes no response is given when the number of messages that can be received are received.)

Note) When slave address is '0' by write function, it there is no error in the message, message is executed but there is no response. If the error mentioned above occurs in the message then also there is no response, hence when slave address is '0' the normality/abnormality cannot be judged.

8-6-2. Response of error message

In the contents of the message from the master if the errors mentioned in section 8-6-1 do not occur instead if the following error is detected, then display (respond) as 'error message' the code that shows error contents.

Format of error message is as follows.

Slave address	Function code	Function code + 80H
Function code+80H	01	81H
Error code	02	82H
CRC(L)	03	83H
CRC(H)	04	84H
	05	85H
	06	86H
	08	88H
	15	8FH
	16	90H

Error codes are as follows.

Error code	Contents
01H	Function code defect When function code that is not specified is received
02H	Relative number (reference number) defect When received starting number or setting value number is other than what is specified
03H	Defect of number of units of data · When the number of units of data to be sent in response to the received message exceeds the specified number of units · When requested number of data units is 0 · When received specified data count and actual data count do not match
11H	Other than setting value range When numeric value that is out of setting range is mentioned in the reference table
12H	Cannot be set · When linear decimal point is written during TC/Pt input · When linear scale is written during TC/Pt input · When control format writes SV at the time of stationary operation, during program operation · When AT is started during AT · When AT1, AT4 is executed during the program operation at the time of resetting · When AT2, AT3 is executed except during the program operation at the time of resetting · When operation screen and drive pattern no. are set at the time other than that of resetting · When FB tuning is executed during AT, FB tuning · When operation screen and drive pattern no. is set, except when pattern selection system is COM or FREE · When ADV, STOP is set during RESET · When RUN, STOP, ADV is set during END · When RUN, STOP, ADV, RESET is set during CONST · When manual output is written when there is no manual output operation · When operation screen and program drive is set except when program drive system is MASTER COM or FREE · When program operation sets time unit except during RESET · When program operation sets control algorithm except during RESET · When pattern copy trigger is set when pattern of copy source is not set or pattern of copy destination is not deleted · When program operation sets pattern clear trigger except during RESET · When program operation sets step addition trigger except during RESET · When program operation sets step deletion trigger except during RESET

8-7. Reference table

8-7-1. Analog setting value

① Setup parameter 1

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
40001	03 06 16	R W W	Measurement range	[Universal] 1/2/3/4/5/6/7/8/9/ 10/11/12/13/14/15/ 16/17/18/19/20/21 /22/23/24/25/26/ 27/28/31/32/33/34 /35/36/37/41/42/ 44/45/46/47/49/50 /51/53/54/56/57 (1/2/3/4/5/6/7/8/9/ 10/11/12/13/14/15/ 16/17/18/19/20/21 /22/23/24/25/26/ 27/28/31/32/33/34 /35/36/37/41/42/ 44/45/46/47/49/50 /51/53/54/56/57) [4-wire resistance thermometer] 41/42/44/45/46/47 /49/50/51/52/53 /54/56/57 (41/42/44/45/46/ 47/49/50/51/52/53 /54/56/57)	[Universal] 5 (K1) [4-wire type input] 53 (Pt100Ω1)	[Universal] 1= B 2= R1 3= R2 4= S 5= K1 6= K2 7= K3 8= E1 9= E2 10= E3 11= E4 12= J1 13= J2 14= J3 15= J4 16= T1 17= T2 18= WRe5-26 19= W-WRe26 20= NiMo-Ni 21= CR-AuFe 22= N 23= PR5-20 24= PtRh40-20 25= Platinel II 1 26= Platinel II 2 27= U 28= L 31= ±10mV 32= ±20mV 33= ±50mV 34= ±100mV 35= ±5V 36= 0-20mA 37= ±10V 41= JPt100Ω1 42= JPt100Ω2 44= JPt100Ω4 45= JPt100Ω5 46= QPt100Ω1 47= QPt100Ω2 49= QPt100Ω4 50= QPt100Ω5 51= Pt50Ω 53= Pt100Ω1 54= Pt100Ω2 56= Pt100Ω4 57= Pt100Ω5

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
						[4-wire resistance thermometer] 41= JPt100Ω1 42= JPt100Ω2 44= JPt100Ω4 45= JPt100Ω5 46= QPt100Ω1 47= QPt100Ω2 49= QPt100Ω4 50= QPt100Ω5 51= Pt50Ω 52= Pt-Co 53= Pt100Ω1 54= Pt100Ω2 56= Pt100Ω4 57= Pt100Ω5 *Refer to the range list. (Section 8-9)
40002	03 06 16	R W W	Unit	0/2 (0/2)	0 (°C)	0= °C 2= K ・When measurement range is 21:CR-AuFe, 52: Pt-Co setting, 0:°C cannot be written. ・Do not write 1.
40003	03 06 16	R W W	RJ	0/1 (0/1)	0	0= INT (RJ function ON) 1= EXT (RJ function OFF)
40004 40005	03 06 16	R W W	Range 'Zero' 'Span'	Within scale range of measurement range (-19999 to 30000)	Each range	・WRITE within the scale range of measurement range. ・WRITE when zero < span *See section 8-9 Measurement range and decimal point position
40006 40007	03 06 16	R W W	Linear scale 'MIN' 'MAX'	-19999 to 30000 (-19999 to 30000) -19999 to 30000 (-19999 to 30000)	0.0 2000.0	・Decimal point position = Linear scale decimal point ・Measurement range except direct voltage/current = writing is not possible.
40008	03 06 16	R W W	SV decimal point Linear scale decimal point	0 to 4 (0 to 4)	1 (Decimal 1-digit)	・Measurement range is thermocouple/resistance thermometer. Fixed value of each range is possible to READ (*See Measurement range and decimal point position (Section 8-9)) ・Measurement range is direct voltage/current Possible to READ/WRITE of linear scale decimal point.
40009 40010	03 06 16	R W W	SV range 'Lower limit' 'Higher limit'	-19999 to 30000 (-19999 to 30000)	Measurement range	・Decimal point position = SV decimal point ・Write when lower limit ≤ higher limit.
40011	03 06 16	R W W	PV decimal point	0 to 4 (0 to 4)	1 (Decimal 1-digit)	
40012	03 06 16	R W W	Digital filter	0.0 to 99.9 (0 to 999)	0.1 seconds	0.0=OFF

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
40020	03 06 16	R W W	SV decimal point for display	0 to 4 (0 to 4)	1 (Decimal 1-digit)	SV decimal point position of upper display
40021	03 06 16	R W W	Direct/Reverse control action	0/1 (0/1)	1 (REVERSE)	0= DIRECT (Direct operation) 1= REVERSE (Reverse operation)
40022	03 06 16	R W W	Pulse cycle	1 to 180 (1 to 180)	30 seconds	·When first output is ON-OFF pulse/ SSR drive pulse, possible to WRITE.
40023	03 06 16	R W W	FB zero	0.0 to 99.9 (0 to 999)	0.0%	·When first output is ON-OFF servo, possible to WRITE. ·WRITE when zero<span.
40024			FB span	0.1 to 100.0 (1 to 1000)	100.0%	
40025			FB dead band	0.5 to 5.0 (5 to 50)	1.0%	
40026	03 06 16	R W W	[Second output] Direct/reverse of control action	0/1 (0/1)	1 (REVERSE)	0= DIRECT (Direct operation) 1= REVERSE (Reverse operation)
40027	03 06 16	R W W	[Second output] Pulse cycle	1 to 180 (1 to 180)	30 seconds	·When control output 2 is ON-OFF pulse/SSR drive pulse, can be written.
40028	03 06 16	R W W	[Second output] Control system	0/1 (0/1)	0 (PID)	0= PID control operation 1= SPLIT control system
40030	03 06 16	R W W	Cancel alarm output	0/1 (0/1)	0 (NON)	0= NON 1= RESET (Cancel alarm)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks		
40031	03 06 16	R W W	Alarm format 'AL1'	[Alarm format] 00h/01h/02h/03h /04h/05h/07h/08h /09h/0Ah (00h/01h/02h/03h /04h/05h/07h/08h /09h/0Ah) [Alarm assistance] 00h/01h/02h/03h /04h/05h/06h/ 07h (00h/01h/02h/03h /04h/05h/06h/ 07h)	0001h (DV-H)	READ/WRITE as low order 8 bits is [alarm format], high order 8 bit is [alarm assistance]. High order 8 bit Low order 8 bit <table><tr><td>Alarm assistance</td><td>Alarm format</td></tr></table> └─ Alarm format 'AL1' ─┘ [Alarm format] 00h=PV(Absolute value alarm) 01h=DV(Deviation alarm) 02h=ADV(Absolute value deviation alarm) 03h=SV(Setting value alarm) 04h=MV or MV1(Output value alarm 1) 05h=MV2(Output value alarm 2 *Only output 2 specifications can be written 07h=CT(Heater snapping wire alarm) *Only specifications with heater snapping wire alarm can be written 08h=TIM (Timer) *Only specifications with external signal input can be written. 09h=WAIT (Waiting time alarm) 0Ah=FAIL(Fail alarm) [Alarm assistance] (*When alarm format is CT, TIMER, WAIT or FAIL, reading/writing is no effect) 00h= H(Higher limit alarm) 01h= HW(Higher limit alarm, Wait exists) 02h= H K(Higher limit alarm, maintenance exists) 03h= HWK(Higher limit alarm, Wait exists, maintenance exists) 04h= L(Lower limit alarm) 05h= LW(Lower limit alarm, Wait exists) 06h= L K(Lower limit alarm, Maintenance exists) 07h= LWK(Lower limit alarm, Wait exists, Maintenance exists) (Example) Data of alarm format · 0102h=ADV-HW · 0304h=MV-HMK · 000Ah=FAIL	Alarm assistance	Alarm format
Alarm assistance	Alarm format							
40032	03 06 16	R W W	Alarm dead band 'AL1'	0.00 to 200.00 (0 to 20000)	2.00	Decimal point position = Each alarm format (1) When PV, DV, ADV, SV, and SV decimal point + 1-digit (Max. 4-digit) (2) When MV and CT, decimal point 1-digit *When alarm format is TIMER, WAIT, or FAIL, READ/WRITE is no effect.		
40034	03 06 16	R W W	Alarm delay	0.0 to 2000.0 (0 to 20000)	0.0 seconds	0.0 seconds = no delay		
40036	03 06 16	R W W	Alarm format 'AL2'	Same as alarm format 'AL1'	0401h (DV-L)	Same as alarm format 'AL1'		
40037	03 06 16	R W W	Alarm dead band 'AL2'	Same as alarm dead band 'AL1'	2.00	Same as alarm dead band 'AL1'		

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
40041	03 06 16	R W W	Alarm format 'AL3'	Same as alarm dead band 'AL1'	0001h (DV-H)	Same as alarm dead band 'AL1'
40042	03 06 16	R W W	Alarm dead band 'AL3'	Same as alarm dead band 'AL1'	2.00	Same as alarm dead band 'AL1'
40046	03 06 16	R W W	Alarm format 'AL4'	Same as alarm format 'AL1'	0401h (DV-L)	Same as alarm format 'AL1'
40047	03 06 16	R W W	Alarm dead band 'AL4'	Same as alarm dead band 'AL1'	2.00	Same as alarm dead band 'AL1'

② Setup parameter 2

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
40051	03 06 16	R W W	[High accuracy type] Transmission type	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV (Setting value) 1=PV (Measurement value) 2=MV (Output value) or MV1 (Output value 1) 3=MV2 (Output value 2) * Only output 2 specifications can be written. 4=MFB (Actuator feedback value) * When ON-OFF servo output specifications, can be written. 5=SUB (Auxiliary output) *When with high accuracy transmission output, can be written.
40052 40053	03 06 16	R W W	[High accuracy type] Transmission scale 'zero' 'span'	-19999 to 30000 (-19999 to 30000)	Measurement range	· When with high accuracy transmission output, can be written. · Decimal point position = Each transmission type. (1) When there are PV and SV, decimal point is SV decimal point (2) When there are MV, MFB, and SUB, decimal point is 1-digit
40061	03 06 16	R W W	[Standard type] Transmission type	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV (Setting value) 1=PV (Measurement value) 2=MV (Output value) or MV1 (Output value 1) 3=MV2 (Output value 2) * Only output 2 specifications can be written. 4=MFB (Actuator feedback value) * When ON-OFF servo output specifications, can be written. 5=SUB (Auxiliary output) *When with standard transmission output, can be written.
40062 40063	03 06 16	R W W	[Standard type] Transmission scale 'zero' 'span'	-19999 to 30000 (-19999 to 30000)	Measurement range	· When with standard transmission output, can be written. · Decimal point position = Each transmission type. (1) When PV and SV, SV decimal point (2) When MV, MFB, and SUB, decimal point 1-digit
40079	03 06 16	R W W	Communication transmission type	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV (Setting value) 1=PV (Measurement value) 2=MV (Output value) or MV1 (Output value 1) 3=MV2 (Output value 2) * Only output 2 specifications can be written. 4=MFB (Actuator feedback value) * When ON-OFF servo output specifications, can be written. 5=SUB (Auxiliary output) *When with communication port, can be written.

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
40080	03 06 16	R W W	[For COM2] Communication transmission type	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV (Setting value) 1=PV (Measurement value) 2=MV (Output value) or MV1 (Output value 1) 3=MV2 (Output value 2) * Only output 2 specifications can be written. 4=MFB (Actuator feedback value) * When ON-OFF servo output specifications, can be written. 5=SUB (Auxiliary output) *When with communication output 2, can be written.
40092	03 06 16	R W W	Operation when starting the power supply	0/1 (0/1)	0 (CONTINUE)	0= CONTINUE (Status before power cut off) 1= READY (Status of program operation reset)

③ 1 type parameter

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40101	03 06 16	R W W	[Second output] Gap	-100.0 to 100.0 (-1000 to 1000)	0.0%	· Only output 2 specifications can be written.
40102	03 06 16	R W W	[Second output] PID 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control · Only output 2 specifications can be written.
40103	03 06 16	R W W	[Second output] PID 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞ · Only output 2 specifications can be written.
40104	03 06 16	R W W	[Second output] PID 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF · Only output 2 specifications can be written.
40105 40106	03 06 16	R W W	[Second output] Output limiter 'Lower limit' 'Higher limit'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0% (0 to 1050)	0.0% 100.0%	· Only output 2 specifications can be written. · Write when lower limit < higher limit.
40108	03 06 16	R W W	[Second output] Second output dead band	0.1 to 9.9 (1 to 99)	0.5%	· Only output 2 specifications can be written.
40111	03 06 16	R W W	Output dead band	0.1 to 9.9 (1 to 99)	0.5%	
40112 40113	03 06 16	R W W	Output during PV abnormality 'UDR' 'OVR'	-5.0 to 105.0 (-50 to 1050)	0.0%	
40121 40121	03 06 16	R W W	[Second output] Split 'Direct' 'Reverse'	0.0 to 60.0 (0 to 600) 40.0 to 100.0 (400 to 1000)	0.0% 100.0%	· Only output 2 specifications can be written. · When second output control type is split control (SPRIT), can be written.
40123	03 06 16	R W W	[Second output] Second output dead band	0.0 to 9.9% (0 to 99)	0.0%	· Only output 2 specifications can be written.
40124	03 06 16	R W W	PID dead band	0.0 to 9.9 (0 to 99)	0.0%	
40147	03 06 16	R W W	SV correction	-19999 to 20000 (-19999 to 20000)	0	Decimal point position = SV decimal point + 1-digit (Max. 4-digit) (Example) When PV decimal point is 1 digit, decimal point position become 2 digits.
40148	03 06 16	R W W	Control algorithm	0/1 (0/1)	0 (POSITION)	0= POSITION (Position type PID) 1= VELOCITY (Speed type PID) * When program operation is other than RESET, writing is not possible.

④ Execution parameter, Specific parameter

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40151	03	R	[Upper display] SV (setting value)	Within the range of SV limit (Within the range of SV limit)	0.0	SV value 1) SV during program operation 2) SV during constant value operation · Decimal point position = SV decimal point · No WRITE
40156	03 06 16	R W W	[Executing] PID 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40157	03 06 16	R W W	[Executing] PID 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40158	03 06 16	R W W	[Executing] PID 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40159 40160	03 06 16	R W W	[Executing] Output limiter 'Lower limit' 'Higher limit'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 % (0 to 1050)	0.0% 100.0%	· WRITE when Lower limit < higher limit.
40161 40162	03 06 16	R W W	[Execution] Output variation limiter 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	0.0% 100.0%	
40163	03 06 16	R W W	[Execution] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	· Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40164 40165	03 06 16	R W W	[Execution] A.R.W 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 10000)	-50.0% 50.0%	
40166	03 06 16	R W W	Output preset	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40181 40183 40185 40187	03 06 16	R W W	[Executing] Alarm value 1 Alarm value 2 Alarm value 3 Alarm value 4	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	· Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40195	03 06 16	R W W	[Executing] Auxiliary output	0.0 to 100.0 (0 to 1000)	0.0%	

⑤ 8 type parameter No. 1

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40206	03 06 16	R W W	[16 type parameter] PID, No.1 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40207	03 06 16	R W W	[16 type parameter] PID, No.1 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40208	03 06 16	R W W	[16 type parameter] PID, No.1 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40209 40210	03 06 16	R W W	[8 type parameter] Output limiter, No.1 'Lower limit' 'Higher limit'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	·WRITE during lower limit<higher limit.
40211 40212	03 06 16	R W W	[8 type parameter] Output variation limiter, No.1 'Descending' 'Ascending'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40213	03 06 16	R W W	[8 type parameter] Sensor correction No.1	-19999 to 20000 (-19999 to 20000)	0.0	·Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position become 2-digit.
40214 40215	03 06 16	R W W	[8 type parameter] A.R.W, No.1 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40216	03 06 16	R W W	[8 type parameter] Output preset, No.1	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40218	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.1	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40219	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.1 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	·Setting of HHH of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40220	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.1 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	·Setting of LL of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40221	03 06 16	R W W	[8 type parameter] Time signal ON, No.1 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	·Can be written when there is external signal input. ·Setting of HHH of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40222	03 06 16	R W W	[8 type parameter] Time signal ON, No.1 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40223	03 06 16	R W W	[8 type parameter] Time signal OFF, No.1 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40224	03 06 16	R W W	[8 type parameter] Time signal OFF, No.1 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40231 40233 40235 40237	03 06 16	R W W	[8 type parameter] Alarm value 1 No.1 Alarm value 2 No.1 Alarm value 3 No.1 Alarm value 4 No.1	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40245	03 06 16	R W W	[8 type parameter] Auxiliary output, No.1	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑥ 8 type parameter No. 2

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40256	03 06 16	R W W	[16 type parameter] PID No.2 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40257	03 06 16	R W W	[16 type parameter] PID No.2 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40258	03 06 16	R W W	[16 type parameter] PID No.2 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40259 40260	03 06 16	R W W	[8 type parameter] Output limiter No.2 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	·WRITE during lower limit<higher limit.
40261 40262	03 06 16	R W W	[8 type parameter] Output variation limiter, No.2 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40263	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	· Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40264 40265	03 06 16	R W W	[8 type parameter] A.R.W, No.2 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40266	03 06 16	R W W	[8 type parameter] Output preset, No.2	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40268	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.2	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40269	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.2 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40270	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.2 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40271	03 06 16	R W W	[8 type parameter] Time signal ON, No.2 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Can be written when there is external signal input. · Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40272	03 06 16	R W W	[8 type parameter] Time signal ON, No.2 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40273	03 06 16	R W W	[8 type parameter] Time signal OFF, No.2 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40274	03 06 16	R W W	[8 type parameter] Time signal OFF, No.2 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40281 40283 40285 40287	03 06 16	R W W	[8 type parameter] Alarm value 1 No.2 Alarm value 2 No.2 Alarm value 3 No.2 Alarm value 4 No.2	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40295	03 06 16	R W W	[8 type parameter] Auxiliary output, No.2	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑦ 8 type parameter No.3

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40306	03 06 16	R W W	[16 type parameter] PID No.3 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40307	03 06 16	R W W	[16 type parameter] PID No.3 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40308	03 06 16	R W W	[16 type parameter] PID No.3 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40309 40310	03 06 16	R W W	[8 type parameter] Output limiter No.3 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	· WRITE during lower limit<higher limit.
40311 40312	03 06 16	R W W	[8 type parameter] Output variation limiter, No.3 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40313	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	· Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40314 40315	03 06 16	R W W	[8 type parameter] A.R.W, No.3 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40316	03 06 16	R W W	[8 type parameter] Output preset, No.3	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40318	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.3	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40319	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.3 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40320	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.3 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40321	03 06 16	R W W	[8 type parameter] Time signal ON, No.3 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Can be written when there is external signal input. · Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40322	03 06 16	R W W	[8 type parameter] Time signal ON, No.3 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or sec- onds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40323	03 06 16	R W W	[8 type parameter] Time signal OFF, No.3 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40324	03 06 16	R W W	[8 type parameter] Time signal OFF, No.3 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or sec- onds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40331 40333 40335 40337	03 06 16	R W W	[8 type parameter] Alarm value 1 No.3 Alarm value 2 No.3 Alarm value 3 No.3 Alarm value 4 No.3	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40345	03 06 16	R W W	[8 type parameter] Auxiliary output, No.3	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑧ 8 type parameter No.4

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40356	03 06 16	R W W	[16 type parameter] PID No.4 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40357	03 06 16	R W W	[16 type parameter] PID No.4 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40358	03 06 16	R W W	[16 type parameter] PID No.4 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40359 40360	03 06 16	R W W	[8 type parameter] Output limiter No.4 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	·WRITE during lower limit<higher limit.
40361 40362	03 06 16	R W W	[8 type parameter] Output variation limiter, No.4 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40363	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	·Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40364 40365	03 06 16	R W W	[8 type parameter] A.R.W, No.4 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40366	03 06 16	R W W	[8 type parameter] Output preset, No.4	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40368	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.4	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40369	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.4 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	·Setting of HHH of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40370	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.4 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	·Setting of LL of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40371	03 06 16	R W W	[8 type parameter] Time signal ON, No.4 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	·Can be written when there is external signal input. ·Setting of HHH of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40372	03 06 16	R W W	[8 type parameter] Time signal ON, No.4 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Can be written when there is external signal input. · Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40373	03 06 16	R W W	[8 type parameter] Time signal OFF, No.4 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Can be written when there is external signal input. · Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40374	03 06 16	R W W	[8 type parameter] Time signal OFF, No.4 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Can be written when there is external signal input. · Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40381 40383 40385 40387	03 06 16	R W W	[8 type parameter] Alarm value 1 No.4 Alarm value 2 No.4 Alarm value 3 No.4 Alarm value 4 No.4	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	· Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40395	03 06 16	R W W	[8 type parameter] Auxiliary output, No.4	0.0 to 100.0 % (0 to 1000)	0.0 %	· When there is transmission signal output, can be written. · When there is communication port, can be written.

⑨ 8 type paramter No.5

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40406	03 06 16	R W W	[16 type parameter] PID No.5 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40407	03 06 16	R W W	[16 type parameter] PID No.5 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40408	03 06 16	R W W	[16 type parameter] PID No.5 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40409 40410	03 06 16	R W W	[8 type parameter] Output limiter No.5 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	· WRITE during lower limit<higher limit.
40411 40412	03 06 16	R W W	[8 type parameter] Output variation limiter, No.5 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40413	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	· Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40414 40415	03 06 16	R W W	[8 type parameter] A.R.W, No.5 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40416	03 06 16	R W W	[8 type parameter] Output preset, No.5	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40418	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.5	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40419	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.5 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40420	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.5 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40421	03 06 16	R W W	[8 type parameter] Time signal ON, No.5 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Can be written when there is external signal input. · Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40422	03 06 16	R W W	[8 type parameter] Time signal ON, No.5 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40423	03 06 16	R W W	[8 type parameter] Time signal OFF, No.5 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40424	03 06 16	R W W	[8 type parameter] Time signal OFF, No.5 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40431 40433 40435 40437	03 06 16	R W W	[8 type parameter] Alarm value 1 No.5 Alarm value 2 No.5 Alarm value 3 No.5 Alarm value 4 No.5	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40445	03 06 16	R W W	[8 type parameter] Auxiliary output, No.5	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑩ 8 type parameter No.6

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40456	03 06 16	R W W	[16 type parameter] PID No.6 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40457	03 06 16	R W W	[16 type parameter] PID No.6 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40458	03 06 16	R W W	[16 type parameter] PID No.6 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40459 40460	03 06 16	R W W	[8 type parameter] Output limiter No.6 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	· WRITE during lower limit<higher limit.
40461 40462	03 06 16	R W W	[8 type parameter] Output variation limiter, No.6 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40463	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	· Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40464 40465	03 06 16	R W W	[8 type parameter] A.R.W, No.6 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40466	03 06 16	R W W	[8 type parameter] Output preset, No.6	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40468	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.6	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40469	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.6 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40470	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.6 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40471	03 06 16	R W W	[8 type parameter] Time signal ON, No.6 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Can be written when there is external signal input. · Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40472	03 06 16	R W W	[8 type parameter] Time signal ON, No.6 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40473	03 06 16	R W W	[8 type parameter] Time signal OFF, No.6 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40474	03 06 16	R W W	[8 type parameter] Time signal OFF, No.6 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40481 40483 40485 40487	03 06 16	R W W	[8 type parameter] Alarm value 1 No.6 Alarm value 2 No.6 Alarm value 3 No.6 Alarm value 4 No.6	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40495	03 06 16	R W W	[8 type parameter] Auxiliary output, No.6	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑪ 8 type parameter No.7

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40506	03 06 16	R W W	[16 type parameter] PID No.7 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40507	03 06 16	R W W	[16 type parameter] PID No.7 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40508	03 06 16	R W W	[16 type parameter] PID No.7 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40509 40510	03 06 16	R W W	[8 type parameter] Output limiter No.7 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	· WRITE during lower limit<higher limit.
40511 40512	03 06 16	R W W	[8 type parameter] Output variation limiter, No.7 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40513	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	· Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40514 40515	03 06 16	R W W	[8 type parameter] A.R.W, No.7 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40516	03 06 16	R W W	[8 type parameter] Output preset, No.7	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40518	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.7	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40519	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.7 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40520	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.7 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	· Setting of LL of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40521	03 06 16	R W W	[8 type parameter] Time signal ON, No.7 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	· Can be written when there is external signal input. · Setting of HHH of HHH:LL · Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40522	03 06 16	R W W	[8 type parameter] Time signal ON, No.7 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40523	03 06 16	R W W	[8 type parameter] Time signal OFF, No.7 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40524	03 06 16	R W W	[8 type parameter] Time signal OFF, No.7 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40531 40533 40535 40537	03 06 16	R W W	[8 type parameter] Alarm value 1 No.7 Alarm value 2 No.7 Alarm value 3 No.7 Alarm value 4 No.7	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40545	03 06 16	R W W	[8 type parameter] Auxiliary output, No.7	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑫ 8 type paramter No.8

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40556	03 06 16	R W W	[16 type parameter] PID No.8 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40557	03 06 16	R W W	[16 type parameter] PID No.8 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40558	03 06 16	R W W	[16 type parameter] PID No.8 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40559 40560	03 06 16	R W W	[8 type parameter] Output limiter No.8 'Lower limit ' 'Higher limit '	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	·WRITE during lower limit<higher limit.
40561 40562	03 06 16	R W W	[8 type parameter] Output variation limiter, No.8 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	
40563	03 06 16	R W W	[8 type parameter] Sensor correction	-19999 to 20000 (-19999 to 20000)	0.00	·Decimal point position = PV decimal point + 1-digit (MAX 4-digit) (Example) When PV decimal point is 1-digit, decimal point position is 2-digit.
40564 40565	03 06 16	R W W	[8 type parameter] A.R.W, No.8 'Lower limit' 'Higher limit'	-100.0 to 0.0 (-1000 to 0) 0.0 to 100.0 (0 to 1000)	-50.0% 50.0%	
40566	03 06 16	R W W	[8 type parameter] Output preset, No.8	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40568	03 06 16	R W W	[8 type parameter] Real temperature compensation, No.8	1 to 20000 (1 to 20000)	2000.0	Decimal point position = SV decimal point
40569	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.8 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	·Setting of HHH of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40570	03 06 16	R W W	[8 type parameter] Waiting time alarm, No.8 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	·Setting of LL of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)
40571	03 06 16	R W W	[8 type parameter] Time signal ON, No.8 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	·Can be written when there is external signal input. ·Setting of HHH of HHH:LL ·Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) Incase of M:S (minutes:seconds), M (minutes)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40572	03 06 16	R W W	[8 type parameter] Time signal ON, No.8 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40573	03 06 16	R W W	[8 type parameter] Time signal OFF, No.8 'Hours' or 'Minutes'	0 to 999 (0 to 999)	000 (Hours or minutes)	- Can be written when there is external signal input. - Setting of HHH of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40574	03 06 16	R W W	[8 type parameter] Time signal OFF, No.8 'Minutes' or 'Seconds'	0 to 59 (0 to 59)	00 (Minutes or seconds)	- Can be written when there is external signal input. - Setting of LL of HHH:LL - Unit = Every time unit 1) In case of H:M (hours:minutes), H (hours) 2) In case of M:S (minutes:seconds), M (minutes)
40581 40583 40585 40587	03 06 16	R W W	[8 type parameter] Alarm value 1 No.8 Alarm value 2 No.8 Alarm value 3 No.8 Alarm value 4 No.8	-19999 to 30000 (-19999 to 30000)	3000.0 -1999.9 3000.0 -1999.9	- Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, READ/WRITE is no effect.
40595	03 06 16	R W W	[8 type parameter] Auxiliary output, No.7	0.0 to 100.0 % (0 to 1000)	0.0 %	- When there is transmission signal output, can be written. - When there is communication port, can be written.

⑬ No.9 & parameter for AT

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40601	03 06 16	R W W	[16 type parameter] PID, No.9-1 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40602	03 06 16	R W W	[16 type parameter] PID, No.9-1 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40603	03 06 16	R W W	[16 type parameter] PID, No.9-1 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40604	03 06 16	R W W	[16 type parameter] PID, No.9-2 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40605	03 06 16	R W W	[16 type parameter] PID, No.9-2 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40606	03 06 16	R W W	[16 type parameter] PID, No.9-2 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40607	03 06 16	R W W	[16 type parameter] PID, No.9-3 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40608	03 06 16	R W W	[16 type parameter] PID, No.9-3 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40609	03 06 16	R W W	[16 type parameter] PID, No.9-3 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40610	03 06 16	R W W	[16 type parameter] PID, No.9-4 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40611	03 06 16	R W W	[16 type parameter] PID, No.9-4 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40612	03 06 16	R W W	[16 type parameter] PID, No.9-4 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40613	03 06 16	R W W	[16 type parameter] PID, No.9-5 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40614	03 06 16	R W W	[16 type parameter] PID, No.9-5 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40615	03 06 16	R W W	[16 type parameter] PID, No.9-5 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40616	03 06 16	R W W	[16 type parameter] PID, No.9-6 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40617	03 06 16	R W W	[16 type parameter] PID, No.9-6 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40618	03 06 16	R W W	[16 type parameter] PID, No.9-6 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40619	03 06 16	R W W	[16 type parameter] PID, No.9-7 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40620	03 06 16	R W W	[16 type parameter] PID, No.9-7 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40621	03 06 16	R W W	[16 type parameter] PID, No.9-7 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40622	03 06 16	R W W	[16 type parameter] PID, No.9-8 'P'	0.0 to 999.9 (0 to 9999)	5.0%	0.0 = 2 position control
40623	03 06 16	R W W	[16 type parameter] PID, No.9-8 'I'	0 to 9999 (0 to 9999)	60 seconds	0 = ∞
40624	03 06 16	R W W	[16 type parameter] PID, No.9-8 'D'	0 to 9999 (0 to 9999)	30 seconds	0 = OFF
40625	03 06 16	R W W	[8 type parameter] SV for AT2, No.1	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40626	03 06 16	R W W	[8 type parameter] SV for AT2, No.2	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40627	03 06 16	R W W	[8 type parameter] SV for AT2, No.3	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40628	03 06 16	R W W	[8 type parameter] SV for AT2, No.4	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40629	03 06 16	R W W	[8 type parameter] SV for AT2, No.5	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40630	03 06 16	R W W	[8 type parameter] SV for AT2, No.6	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40631	03 06 16	R W W	[8 type parameter] SV for AT2, No.7	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point
40632	03 06 16	R W W	[8 type parameter] SV for AT2, No.8	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position = SV decimal point

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks								
40633	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-1 section'	Within SV limit range (Within SV limit range)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40634	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-2 section'	No.9-1 section MAX to higher limit of SV limit (No.9-1 section MAX to higher limit of SV limit)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40635	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-3 section'	No.9-2 section MAX to higher limit of SV limit (No.9-2 section MAX to higher limit of SV limit)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40636	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-4 section'	No.9-3 section MAX to higher limit of SV limit (No.9-3 section MAX to higher limit of SV limit)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40637	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-5 section'	No.9-4 section MAX to higher limit of SV limit (No.9-4 section MAX to higher limit of SV limit)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40638	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-6 section'	No.9-5 section MAX to higher limit of SV limit (No.9-5 section MAX to higher limit of SV limit)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40639	03 06 16	R W W	[8 type parameter] SV section for automatic PID 'No.9-7 section'	No.9-6 section MAX to higher limit of SV limit (No.9-6 section MAX to higher limit of SV limit)	Automatic development	· Setting of SV section MAX value · Decimal point position = SV decimal point								
40640 40641 40642 40643 40644 40645 40646 40647	03 06 16	R W W	[8 type parameter] SV for AT2, No.1 No.2 No.3 No.4 No.5 No.6 No.7 No.8	Range of the section for automatic PID (Range of the section for automatic PID)	Automatic development	· Decimal point position = SV decimal point								
40641	03 06 16	R W W	Start direction for AT 2/3	Within the range of SV section No. 9-2 (Within the range of SV section No. 9-2)	Automatic development	Decimal point position: SV decimal point position								
40642	03 06 16	R W W	Execution for AT2 'ON/OFF'	0/1 (0/1)	[No.1] 1 (ON) [No.2 to No.8] 0 (OFF)	0=OFF 1=ON *After relating bit 0 to 8 of lower 8 bit to SV No.1 to 8 for AT2, READ/WRITE ON/OFF. Lower 8 bits <table><tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table> No.8 No.1	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0							

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks								
40650	03 06 16	R W W	Execution for AT3 'ON/OFF'	0/1 (0/1)	0 (OFF)	0=OFF 1=ON *After relating bit 0 to 8 of lower 8 bit to SV No.1 to 8 for AT3, READ/WRITE ON/OFF. Lower 8 bits <table><tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table> No.8 No.1	7	6	5	4	3	2	1	0
7	6	5	4	3	2	1	0							

(0/1)

0/1

⑭ Setting parameter

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40701 40702	03 06 16	R W W	[Second output] Output variation limiter 'Descent' 'Ascent'	-100.0 to -0.1 (-1000 to -1) 0.1 to 100.0 (1 to 1000)	-100.0% 100.0%	· Writing is possible only in case of output 2 specifications
40703 40704	03 06 16	R W W	[Second output] Output during PV abnormality 'Lower limit ' 'Higher limit '	-5.0 to 105.0 (-50 to 1050)	0.0%	· Writing is possible only in case of output 2 specifications
40707	03 06 16	R W W	Preset manual	-5.0 to 105.0 (-50 to 1050)	0.0%	· Writing is possible when there is external signal input
40708	03 06 16	R W W	[Second output] Preset manual	-5.0 to 105.0 (-50 to 1050)	0.0%	· Writing is possible when there are output 2 specifications and external signal input.
40711	03 06 16	R W W	Measurement range correction 'Zero'	-19.999 to 20.000 (-19999 to 20000)	00.000	
40712	03 06 16	R W W	Measurement range correction 'Span'	0.9000 to 1.1000 (9000 to 11000)	1.0000	
40713	03 06 16	R W W	First output correction 'Zero'	-10.000 to 10.000 (-10000 to 10000)	00.000	· When first output is current/voltage output, can be written.
40714	03 06 16	R W W	First output correction 'Span'	0.9000 to 1.1000 (9000 to 11000)	1.0000	· When first output is current/voltage output, can be written.
40715	03 06 16	R W W	Second output correction 'Zero'	-10.000 to 10.000 (-10000 to 10000)	00.000	· When second output is current/voltage output, can be written.
40716	03 06 16	R W W	Second output correction 'Span'	0.9000 to 1.1000 (9000 to 11000)	1.0000	· When second output is current/voltage output, can be written.
40719	03 06 16	R W W	Transmission output (High accuracy) correction 'Zero'	-10.000 to 10.000 (-10000 to 10000)	00.000	· When there is transmission signal output (high accuracy type), can be written.
40720	03 06 16	R W W	Transmission output (High accuracy) correction 'Span'	0.9000 to 1.1000 (9000 to 11000)	1.0000	· When there is transmission signal output (high accuracy type), can be written.
40721	03 06 16	R W W	Transmission output (General) correction 'Zero'	-10.000 to 10.000 (-10000 to 10000)	00.000	· When there is transmission signal output (general type), can be written.
40722	03 06 16	R W W	Transmission output (General) correction 'Span'	0.9000 to 1.1000 (9000 to 11000)	1.0000	· When with transmission signal output (general type), can be written.
40723	03 06 16	R W W	CT input correction 'Zero'	-10.000 to 10.000 (-10000 to 10000)	00.000	· When there is heater disconnection alarm, can be written.
40724	03 06 16	R W W	CT input correction 'Span'	0.9000 to 1.1000 (9000 to 11000)	1.0000	· When there is heater disconnection alarm, can be written.

⑮ System setting

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
48001	03 06 16	R W W	Display back light	0/1/2 (0/1/2)	2 (AUTO)	0=Green 1=Orange 2=AUTO (Normal...Green, Alarm activation ...Orange)
48002	03 06 16	R W W	Display contrast	0 to 100 (0 to 100)	50%	
48003	03 06 16	R W W	Key backlight	0/1/2 (0/1/2)	0 (AUTO)	0=AUTO (In case of pressing the key, lighting [extinction after 30 seconds]) 1=OFF (Always extinction) 2=ON (Always lighting)

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
						· Function of terminal (Lower order 8 bits) [DI] (External signal input) 00h = -- (no setting) 01h = RUN/STOP (RUN/STOP operation) 02h = ADV (ADVANCE operation) 03h = RESET (RESET operation) 04h = WAIT (WAIT operation) 05h = FAST (FAST operation) 06h = PTN1 (Pattern No. selection BCD_1) 07h = PTN2 (Pattern No. selection BCD_2) 08h = PTN4 (Pattern No. selection BCD_4) 09h = PTN8 (Pattern No. selection BCD_8) 0Ah = PTN10 (Pattern No. selection BCD_10) 0Bh = PTN20 (Pattern No. selection BCD_20) 0Ch = MAN1/AUTO1 (MAN1/AUTO1 switching) 0Dh = MAN2/AUTO2 (MAN2/AUTO2 switching) *When there is output 2 specifications, can be written 0Eh = PRESET/AUTO (Preset manual/AUTO switching) 0Fh = ALARM RESET (Alarm output reset) 10h = PV HOLD (PV hold) 11h = TIMER1 (Start/reset of timer 1) 12h = TIMER2 (Start/reset of timer 2) 13h = TIMER3 (Start/reset of timer 3) 14h = TIMER4 (Start/reset of timer 4) [DO] (External signal output) 00h = -- (no setting) 01h= TS1 (Time signal 1) 02h= TS2 (Time signal 2) 03h= TS3 (Time signal 3) 04h= TS4 (Time signal 4) 05h= TS5 (Time signal 5) 06h= TS6 (Time signal 6) 07h= TS7 (Time signal 7) 08h= TS8 (Time signal 8) 09h= RUN/STOP (RUN/STOP status signal) 0Ah=ADV (ADVANCE status signal) 0Bh=RESET (RESET status signal) 0Ch=WAIT (WAIT status signal) 0Dh=END (END status signal)
48012			External signal allocation [First zone] Terminal No.12			
48013			Terminal No.13			
48014			Terminal No.14			
48015			Terminal No.15			
48016			Terminal No.16			
48017			Terminal No.17			
48019			[Second zone] Terminal No.19			
48020	03	R	Terminal No.20	0000h to 020Dh	**00h	
48021	06	W	Terminal No.21	(0000h to 020Dh)	(Each format)	
48022	16	W	Terminal No.22			
48023			Terminal No.23			
48024			Terminal No.24			
48026			[Third zone] Terminal No.26			
48027			Terminal No.27			
48028			Terminal No.28			
48029			Terminal No.29			
48030			Terminal No.30			
48031			Terminal No.31			
48032			Terminal No.32			
48033			Terminal No.33			

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks												
						· Type of terminal (Lower order 8 bits) 00h = -(no terminal or other than external signal input/output terminal) 01h = DI (External signal input terminal) 02h = DO (External signal output terminal) *Type of terminal can not be written. *When type of terminal is other than DI or DO, can not be written. [READ] (FNC_03) READ as type of terminal of external signal input/output for lower order 8 bits and function of terminal for higher orders 8 bits. <table><tr><td>High order 8 bits</td><td>Low order 8 bits</td></tr><tr><td>Type of terminal</td><td>Function of terminal</td></tr><tr><td>15</td><td>8 7 0</td></tr></table> [WRITE] (FNC_06, FNC_16) WRITE as type of terminal of external signal input/output for lower order 8 bits. High order 8 bits are region of Reserve. <table><tr><td>High order 8 bits</td><td>Low order 8 bits</td></tr><tr><td>(Reseve)</td><td>Function of terminal</td></tr><tr><td>15</td><td>8 7 0</td></tr></table>	High order 8 bits	Low order 8 bits	Type of terminal	Function of terminal	15	8 7 0	High order 8 bits	Low order 8 bits	(Reseve)	Function of terminal	15	8 7 0
High order 8 bits	Low order 8 bits																	
Type of terminal	Function of terminal																	
15	8 7 0																	
High order 8 bits	Low order 8 bits																	
(Reseve)	Function of terminal																	
15	8 7 0																	

⑩ Program pattern information

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
49003	03 06 16	R W W	[Program pattern for R/W] Pattern No.	1 to 30 (1 to 30)	1 (Pattern 1)	Setting for Reading/Writing of program pattern (reference 49005 to 49045) 1 = PTN01 (pattern 1) to 30 = PTN30 (pattern 30) *Set before reading/writing of pattern information. *Written pattern number is stored until tuning off the power of instrument. *Reading/writing of pattern number of this reference is dedicated data for reading/writing program pattern information by communications. When read/write pattern number during program operation, use reference 49066/30126.
49004	03 06 16	R W W	[Program pattern for R/W] Step No.	0 to 19 (0 to 19)	0 (Step 0)	Setting for Reading/Writing of program pattern (reference 49005 to 49045) 1 = STP00 (pattern 0) to 19 = STP19 (pattern 19) *Set before reading/writing of pattern information. *Written step number is stored until tuning off the power of instrument. *Reading/writing of step number of this reference is dedicated data for reading/writing program pattern information by communications. When read/write step number during program operation, use reference 49066/30126.
49005	03 06 16	R W W	[Program pattern] Step repeat	0 to 99, FFh (0 to 99, FFh)	FFh (Blank display)	0 = Repeat starting step 1 to 99 = Repeat ending step FFh = Blank display (Excepting start/end step) *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49006	03 06 16	R W W	[Program pattern] SV	Within the range of SV limit (Within the range of SV limit)	0.0	· Decimal point position = SV decimal point *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is after the final step.

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
49007	03 06 16	R W W	[Program pattern] Time 'Hours' or 'Minutes'	000 to 999 (0 to 999)	0 (Hours or minutes)	· Setting of HHH of HHH:LL · Unit = Every time unit *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the next step of the final step (= final step + 1). *When write to the next step of the final step, step is added to end of the pattern.
49008	03 06 16	R W W	[Program pattern] Time 'Minutes' or 'Seconds'	00 to 59 (0 to 59)	0 (Minutes or seconds)	· Setting of LL of HHH:LL · Unit = Every time unit *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the next step of the final step (= final step + 1). *When write to the next step of the final step, step is added to end of the pattern.
49010	03 06 16	R W W	[Program pattern] PID No.	.0 to 9 (0 to 9)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 9 = No.1 to 9 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49012	03 06 16	R W W	[Program pattern] Alarm No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49013	03 06 16	R W W	[Program pattern] Output limit No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49014	03 06 16	R W W	[Program pattern] Output variation limit No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49015	03 06 16	R W W	[Program pattern] Output preset No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
49016	03 06 16	R W W	[Program pattern] Sensor correction No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49017	03 06 16	R W W	[Program pattern] A. R. W. No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49018	03 06 16	R W W	[Program pattern] Real temperature compensation No.	0 to 8 (0 to 8)	0 (OFF)	0 = OFF 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49019	03 06 16	R W W	[Program pattern] Waiting alarm No.	0 to 8 (0 to 8)	[STEP1] 1 (No.1) [From STEP2] 0 (No.0)	0 = No.0 (continue of the prior step number) 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49020 49021 49022 49023 49024 49025 49026 49027	03 06 16	R W W	[Program pattern] Time signal No. "TS1" "TS2" "TS3" "TS4" "TS5" "TS6" "TS7" "TS8"	0 to 20 (0 to 20)	0 (OFF)	0 = OFF (All OFF) 1 to 8 = No.1 to No.8 11 to 18 = No.1R to No.8R (repeat) 20 = ON (ALL ON) *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49036	03 06 16	R W W	[Program pattern] Auxiliary output	0 to 8 (0 to 8)	0 (OFF)	0 = OFF 1 to 8 = No.1 to 8 *Read/write after writing reference 49003 and 49004. *Writing is not possible when reference 49004 is step 0 or after the final step.
49040	03	R	[Program pattern] Existing step count	0 to 19 (0 to 19)	0 (No setting step)	0 = No setting step to 19 = Setting step number 19

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
			End step No.		(Step 0)	0 = STP00 (Step 0) to 19 = STP19 (Step 19) *No writing *Read/write after writing reference 49003. *Step No. setting of reference 49004 is not necessary.
49041	03 06 16	R W W	[Program pattern] Start SV	Within the range of SV limit (Within the range of SV limit)	0	·Decimal point position = SV decimal point *Read/write after writing reference 49003. *Setting of step No. of reference 49004 is not necessary.
49042	03 06 16	R W W	[Program pattern] Start system	0/1 (0/1)	0 (SV start)	0= SV start 1= PV start *Read/write after writing reference 49003. *Setting of step No. of reference 49004 is not necessary
49043	03 06 16	R W W	[Program pattern] Link destination pattern No.	0 to 19 (0 to 19)	0 (Non link)	0 = Non pattern link 1 = Link to pattern 1 19 = Link to pattern 19 *Read/write after writing reference 49003. *Setting of step No. of reference 49004 is not necessary.
49044	03 06 16	R W W	[Program pattern] Output when program ended [First output]	-5.0 to 105.0, 7FFFh (-50 to 1050, 7FFFh)	7FFFh (CON- TROL)	-50 to 1050 = -5.0 to 105.0% 7FFFh = CONTROL *Read/write after writing reference 49003. *Setting of step No. of reference 49004 is not necessary.
49045	03 06 16	R W W	[Second output] [Program pattern] Output when program ended [Second output]	-5.0 to 105.0, 7FFFh (-50 to 1050, 7FFFh)	7FFFh (CON- TROL)	50 to 1050 = -5.0 to 105.0% 7FFFh = CONTROL ·WRITE is possible only in case of output 2 specifications. *Read/write after writing reference 49003. *Setting of step No. of reference 49004 is not necessary.
49048	03 06 16	R W W	Time unit	0/1 (0/1)	0 (H:M)	0= H:M (Hours:Minutes) 1= M:S(Minutes:Seconds) * When program operation is other than during RESET, writing is not possible.
49049	03 06 16	R W W	SV during reset	Within the range of SV limit (Within the range of SV limit)	0	*When no transmission signal output and communication function is other than TRANS, writing is not possible.

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
49055	03 06 16	R W W	Pattern repeat	0 to 9999 (0 to 9999)	0 times	

[Supplemental remarks] Procedure of reading/writing to step information of program pattern

1) Example of procedure reading SV, time, and PID No. of step 1 of pattern No.1.

[Procedure 1] Register pattern No. and step No. of step is performed reading.

Setting

- Pattern No. = Pattern1

- Step No. = Step 1

(Example of command = 0110232A000204000100016CF9)

Master → Instrument	Command	Setting contents
Slave address	01H	Set the instrument number (MODE 8 of sending command to KP.)
Function cord	10H	Set the function cord 16 (= 10H) for writing multiple analog setting values.
Starting number(H)	23H	Specify starting number (beginning number) of reference is written continuous.
Ending number (L)	2AH	(Set the reference number 49003(=49003-40001=9002=232AH))
Quantity (H)	00H	Set two (=02H), which is the number from reference number 49003 (pattern No.) to 49004 (step No).
Quantity (L)	02H	
Data number	04H	4 byte (04H) = 2 × 2 byte data
Pattern No. (H)	00H	[Reference number 49003] Set the pattern No. of program pattern is written.
Pattern No. (L)	01H	When write to pattern 1, set 01 (0001H)
Step No. (H)	00H	[Reference number 49004] Set the step No. of program pattern is written.
Step No. (L)	01H	When write to pattern 1, set 01 (0001H)
CRC(L)	6CH	Set the cord for error check.
CRC(H)	F9H	(When it is MODBUS_RTU protocol, set the error check value of CRC-16.)

[Procedure 2] Notify parameter type of step information is performed reading (master → instrument).

Specify the reading of

- SV

- Time

- PID No.

(Example of command = 0103232D00051E44)

Master → Instrument	Command	Setting contents
Slave address	01H	Set the instrument number (MODE 8 of sending command to KP.)
Function cord	03H	Set the function cord 03 (= 03H) for reading analog setting values.
Starting number(H)	23H	Specify starting number (beginning number) of reference is written continuous.
Ending number (L)	2DH	(Set the reference number 49006(=49006-40001=9005=232DH))
Quantity (H)	00H	Set five (=05H), which is the number from reference number 49006 (SV) to 49010 (PID No).
Quantity (L)	05H	
CRC(L)	1EH	Set the cord for error check.
CRC(H)	44H	(When it is MODBUS_RTU protocol, set the error check value of CRC-16.)

*When perform reading again to same pattern No. and step No., skip procedure 1.

[Procedure 3] Acquire the parameter is performed reading (instrument → master).

(The following is an example of command response from instrument to master after procedure 2 when SV, time, PID No. of pattern 1 and step 1 are following setting.)

Acquiring

• SV = 111.1

• Time = 22:33 (H:M)

• PID No. = No.4

(Example of command = 01030A045700160021000000047555)

Master → Instrument	Command	Setting contents
Slave address	01H	Set the instrument number (MODE 8 of sending command to KP.)
Function cord	03H	Set the function cord 03 (= 03H) for reading analog setting values.
Number of data	0AH	10 byte (0AH) = 5×2 byte data
SV(H)	04H	[Reference number 49006] Acquire SV value.
SV(L)	57H	0457H → (Decimal notation) → 1111 → (SV decimal point=1) → 111.1
Time, hours or minutes (H)	00H	[Reference number 49007] Acquire high order (HHH:) of time.
Time, hours or minutes (L)	16H	0016H → (Decimal notation) → 22
Time, minutes or seconds (H)	00H	[Reference number 49007] Acquire low order (: LL) of time.
Time, minutes or seconds (L)	21H	0021H → (Decimal notation) → 33
[Not Use]	00H	[Reference number 49009] is not in use reference number.
[Not Use]	00H	Erase the stored data for dummy data (indefinite).
PID No.(H)	00H	[Reference number 49010] Acquire PID No.
PID No.(L)	04H	04H → (Decimal notation) → 4
CRC(L)	75H	Set the cord for error check.
CRC(H)	55H	(When it is MODBUS_RTU protocol, set the error check value of CRC-16.)

Caution

When perform reading of program pattern (step) information, performed reading of each parameter after registration (writing) of corresponding pattern No. and step No. of reference 49003/49004.

2) Example of procedure of setting (writing) SV, time, and PID No. to step 1 of pattern No.1.

[Procedure 1] Register pattern No. and step No. of step which is written.

Setting · Pattern No. = Pattern

· Step No. = Step 1

(Example of command = 0110232A000204000100016CF9)

Master → Instrument	Command	Setting contents
Slave address	01H	Set the instrument number (MODE 8 of sending command to KP.)
Function cord	10H	Set the function cord 16 (= 10H) for writing multiple analog setting values.
Starting number(H)	23H	Specify starting number (beginning number) of reference is written continuous.
Ending number (L)	2AH	(Set the reference number 49003(=49003-40001=9002=232AH))
Quantity (H)	00H	Set two (=02H), which is the number from reference number 49003 (pattern No.) to 49004 (step No).
Quantity (L)	02H	
Data number	04H	4 byte (04H) = 2 × 2 byte data
Pattern No. (H)	00H	[Reference number 49003] Set the pattern No. of program pattern is written.
Pattern No. (L)	01H	When write to pattern 1, set 01 (0001H)
Step No. (H)	00H	[Reference number 49004] Set the step No. of program pattern is written.
Step No. (L)	01H	When write to pattern 1, set 01 (0001H)
CRC(L)	6CH	Set the cord for error check.
CRC(H)	F9H	(When it is MODBUS_RTU protocol, set the error check value of CRC-16.)

[Procedure 2] Notify step information is performed writing.

Setting · SV = 123.4

· Time = 76:54 (H:M)

· PID No. = No. 2 (Example of command = 0110232D00050A04D2004C0036000000024EBD)

Master → Instrument	Command	Setting contents
Slave address	01H	Set the instrument number (MODE 8 of sending command to KP.)
Function cord	10H	Set the function cord 16 (= 10H) for writing multiple analog setting values.
Starting number(H)	23H	Specify starting number (beginning number) of reference is written continuous.
Ending number (L)	2DH	(Set the reference number 49006(=49006-40001=9005=232DH))
Quantity (H)	00H	Set five (=05H), which is the number from reference number 49006 (SV) to 49010 (PID No).
Quantity (L)	05H	
Data number	0AH	10 byte (0AH) = 5 × 2 byte data
SV(H)	04H	[Reference number 49006] Acquire SV value.
SV(L)	D2H	Setting of SV=123.4 → (Eliminate decimal point) → 1234 → (Hexadecimal notation) → 04D2H
Time, hours or minutes (H)	00H	[Reference number 49007] Acquire high order (HHH:) of time.
Time, hours or minutes (L)	4CH	Setting of 76 hours of 76:54 → (Hexadecimal notation) → 004CH
Time, minutes or seconds (H)	00H	[Reference number 49007] Acquire low order (: LL) of time.
Time, minutes or seconds (L)	36H	Setting of 54 minutes of 76:54 → (Hexadecimal notation) → 0036H
[Not Use]	00H	[Reference number 49009] is not in use reference number.
[Not Use]	00H	Set 0000H
PID No.(H)	00H	[Reference number 49010] Acquire PID No.
PID No.(L)	02H	Setting of PID No.2 → (Hexadecimal notation) → 0002H
CRC(L)	4EH	Set the cord for error check.
CRC(H)	BDH	(When it is MODBUS_RTU protocol, set the error check value of CRC-16.)

*When perform Writing again to same pattern No. and step No., skip procedure 1.

Caution

When perform writing of program pattern (step) information, performed writeing of each parameter after registration (writing) of corresponding pattern No. and step No. of reference 49003/49004.

⑰ Program pattern setting/editing

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
49056	03 06 16	R W W	[Execution] SV	Within the range of SV limit (Within the range of SV limit)	0.0	[MODE0] Reading/writing of execution SV · Decimal point position = SV decimal point
49057	03 06 16	R W W	[Execution] Time 'Hours' or 'Minutes'	000 to 999 (0 to 999)	000 (Hours or minutes)	[MODE0] Reading/writing of time · Setting of HHH of HHH:LL · Unit = Every time unit
49058	03 06 16	R W W	[Execution] Time 'Minutes' or 'Seconds'	00 to 59 (0 to 59)	00 (Minutes or seconds)	[MODE0] Reading/writing of time · Setting of LL of HHH:LL · Unit = Every time unit
49066	03 06 16	R W W	[Upper display] Pattern No.	1 to 30 (1 to 30)	1 (Pattern 1)	Reading /writing of pattern No. is performed program operation. 1 = PTN01 (Pattern 1) to 30 = PTN19 (pattern 30) *Writing is not possible in the following cases *When control format (reference 49521) is CONST, writing is not possible. *When pattern selection system is other than COM in the case of 'with pattern selection input option'.
49067	03 06 16	R W W	[Operation screen] Program operation	[READ] 1/2/3/4/5/6 (1/2/3/4/5/6) [WRITE] 1/2/4/6 (1/2/4/6)	1 (RESET)	[READ] (FNC_03) 1= RESET (Reset of program operation) 2= RUN Run of program operation) 3= FAST (Fast-forward of program operation) 4= STOP (Stop of program operation) 5= END (End of program operation) 6= ADV (Advance of step) [WRITE] (FNC_06, FNC_16) 1= RESET(Reset of program operation) 2= RUN (Run of program operation) 4= STOP (Stop of program operation) 6= ADV (Advance of step) *When program drive system (reference 49516) is other than MASTER COM/FREE, writing is not possible. *When control format (reference 49521) is CONST, writing is not possible. *When program operation is in RESET, writing of ADV/STOP is not possible. *When program operation is in END, writing of RUN/STOP/ADV is not possible.

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks						
49093	03 06 16	R W W	[Pattern/step editing] Pattern copy	[READ] 0/1/2/3/4/5 (0/1/2/3/4/5) [WRITE] 0102h to 1E1Dh (0102h to 1E1Dh)	-	Reading of [pattern/step] status [READ] (FNC_03) 0= No edition 1= Add step 2= Delete step 3= Pattern copy 4= Pattern clear (1 pattern) 5= Clear all patterns Pattern copy [WRITE] (FNC_06, FNC_16) 1= PTN1 (pattern 1) to 30= PTN30 (pattern 30) · High order 8 bits = Copy source pattern No. · Low order 8 bits = Copy source pattern No. <table><tr><td>High order 8 bit</td><td>Low order 8 bit</td></tr><tr><td>Copy source pattern No.</td><td>Copy destination pattern No.</td></tr><tr><td>15</td><td>8 7 0</td></tr></table> *When copy source pattern is not set (step number in existence (reference 49040) is 0 step), writing (pattern copy) is not possible. *When copy destination pattern is not erased (step number in existence (reference 49040) is other than 0 step). Writing (pattern copy) is not possible. → After clear in copy destination pattern (reference 49094), perform pattern copy. *When copy destination pattern No. and copy source pattern No. is same, writing (pattern copy) is not possible. *Continuous writing is not performed from reference 49093 to 49096 by FNC16 (function cord).	High order 8 bit	Low order 8 bit	Copy source pattern No.	Copy destination pattern No.	15	8 7 0
High order 8 bit	Low order 8 bit											
Copy source pattern No.	Copy destination pattern No.											
15	8 7 0											
49094	03 06 16	R W W	[Pattern/step editing] Pattern clear	[READ] 0/1/2/3/4/5 (0/1/2/3/4/5) [WRITE] 0 to 30 (0 to 30)	-	Reading of [pattern/step] status [READ] (FNC_03) 0= No edition 1= Add step 2= Delete step 3= Copy pattern 4= Clear pattern (1 pattern) 5= Clear all patterns Pattern clear [WRITE] (FNC_06, FNC_16) 0= Clear all pattern (All pattern information is initialized). 1= PTN1 (Pattern 1 is initialized) to 30= PTN30 (Pattern 30 is initialized) *Caution: When write [0], all pattern information is initialized. *When program operation (reference 49067) is other than RESET, writing is not possible.						

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks						
49095	03 06 16	R W W	[Pattern/step editing] Add step	[READ] 0/1/2/3/4/5 (0/1/2/3/4/5) [WRITE] 0101h to 1312h (0101h to 1312h)	-	Reading of [pattern/step] status [READ] (FNC_03) 0= No edition 1= Add step 2= Delete step 3= Pattern copy 4= Pattern clear (1 pattern) 5= Clear all patterns Step adding [WRITE] (FNC_06, FNC_16) · High order 8 bits = Pattern No. 1= PTN1 (pattern 1) to 19= PTN19 (pattern 19) · Low order 8 bits = Step No. 1= STP1 (step1) to 18= STP18 (step18) <table><tr><td>High order 8 bit</td><td>Low order 8 bit</td></tr><tr><td>Pattern No.</td><td>Step No.</td></tr><tr><td>15</td><td>8 7 0</td></tr></table> *When program operation (reference 49067) is other than RESET, writing is not possible. *When step number in existence (reference 49040) is other than 19 step, writing (add step) is not possible. *When step number is exceed the step number in existence (reference 49040), writing (add step) is not possible.	High order 8 bit	Low order 8 bit	Pattern No.	Step No.	15	8 7 0
High order 8 bit	Low order 8 bit											
Pattern No.	Step No.											
15	8 7 0											

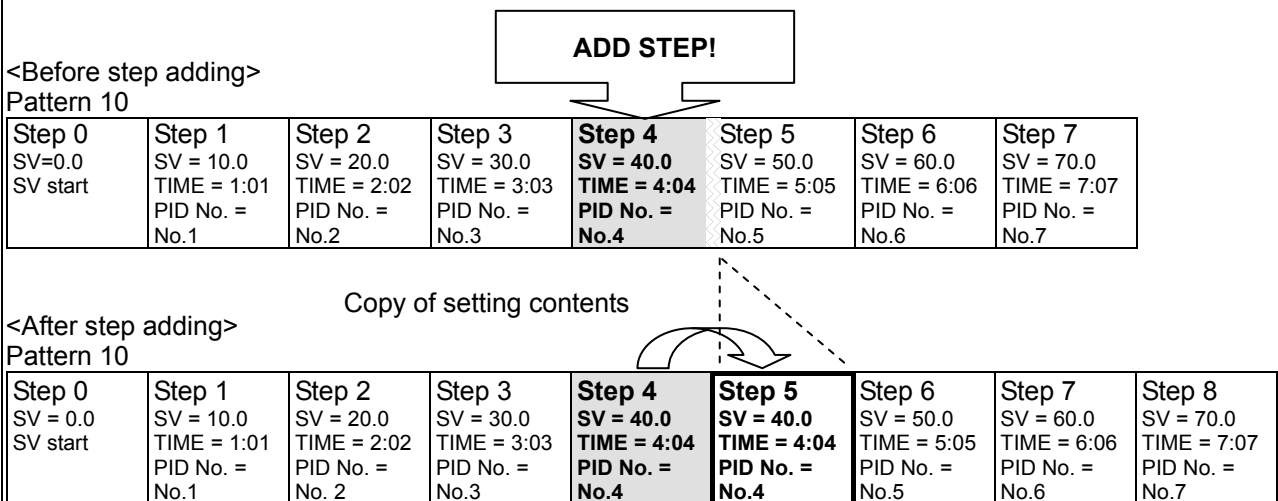
[Supplemental remarks]

The following is the example of adding new step between step 4 and step 5 of pattern 10.

<Command of step adding>

Issue of command of FNC code = 0.6, reference No. = 49095, setting data = 0A04h (0Ah → pattern No. = pattern 10, 04h → step No. = step 4).

* Example of command [MODBUS_RTU, slave address (instrument number) = 01]010623860A0464C4



Content of step adding operation:

- 1) Setting content of step 5 to step 7 is moved step 6 to step 8.
- 2) Add same content of step 4 to step 5.

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks						
49096	03 06 16	R W W	[Pattern/step editing] Delete step	[READ] 0/1/2/3/4/5 (0/1/2/3/4/5) [WRITE] 0101h to 1313h (0101h to 1313h)	-	Reading of [pattern/step] status [READ] (FNC_03) 0= No edition 1= Add step 2= Delete step 3= Pattern copy 4= Pattern clear (1 pattern) 5= Clear all patterns Step deleting [WRITE] (FNC_06, FNC_16) · High order 8 bits = Pattern No. 1= PTN1 (pattern 1) to 19= PTN19 (pattern 19) · Low order 8 bits = Step No. 1= STP1 (step1) to 18= STP19 (step19) <table><tr><td>High order 8 bit</td><td>Low order 8 bit</td></tr><tr><td>Pattern No.</td><td>Step No.</td></tr><tr><td>15</td><td>8 7 0</td></tr></table> *When program operation (reference 49067) is other than RESET, writing is not possible. *When step number in existence (reference 49040) is 0, writing (delete step) is not possible. *When step number is exceed the step number in existence (reference 49040), writing (delete step) is not possible	High order 8 bit	Low order 8 bit	Pattern No.	Step No.	15	8 7 0
High order 8 bit	Low order 8 bit											
Pattern No.	Step No.											
15	8 7 0											

[Supplemental remarks] The following is the example of deleting step 3 of pattern 10.

<Command of step deleting>

Issue of command of FNC code = 0.6, reference No. = 49096, setting data = 0A03h (0Ah → pattern No. = pattern 10, 03h → step No. = step 3).

* Example of command [MODBUS_RTU, slave address (instrument number) = 01]010623870A0374C6

DELETE STEP!

<Before step deleting>

Pattern 10

Step 0 SV = 0.0 SV start	Step 1 SV = 10.0 TIME = 1:01 PID No. = No.1	Step 2 SV = 20.0 TIME = 2:02 PID No. = No.2	Step 3 SV = 30.0 TIME = 3:03 PID No. = No.3	Step 4 SV = 40.0 TIME = 4:04 PID No. = No.4	Step 5 SV = 50.0 TIME = 5:05 PID No. = No.5	Step 6 SV = 60.0 TIME = 6:06 PID No. = No.6	Step 7 SV = 70.0 TIME = 7:07 PID No. = No.7
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<After step deleting>

Pattern 10

Step 0 SV = 0.0 SV start	Step 1 SV = 10.0 TIME = 1:01 PID No. = No.1	Step 2 SV = 20.0 TIME = 2:02 PID No. = No.2	Step 3 SV = 40.0 TIME = 4:04 PID No. = No.4	Step 4 SV = 50.0 TIME = 5:05 PID No. = No.5	Step 5 SV = 60.0 TIME = 6:06 PID No. = No.6	Step 6 SV = 70.0 TIME = 7:07 PID No. = No.7
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Content of step deleting operation:

- 1) Delete setting content of step 3.
- 2) Setting content of step 4 to step 7 is moved step 4 to step 6.

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks																																																
49501	03 06 16	R W W	Setting screen mode lock (bit support)	0000h to 19FFh (0000h to 19FFh)	0000h (Normal display)	[READ] (FNC_03) 0= Normal display 1= Lock (lock status) or NoDisp (screen non display) [WRITE] (FNC_06, FNC_16) 0= Normal display 1= Lock (lock status) * READ/WRITE after relating bit 0 to 12 of 16 bits data to mode 0 to 12. *Reading is indefinite and writing is no effect to unallocated bit (mode) or unshown mode. Low order 8 bit <table><tr><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td></tr><tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>bit 7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table> High order 8 bit <table><tr><td></td><td></td><td></td><td>mode</td><td>mode</td><td></td><td></td><td>mode</td></tr><tr><td></td><td></td><td></td><td>12</td><td>11</td><td></td><td></td><td>8</td></tr><tr><td>bit 15</td><td></td><td></td><td>12</td><td>11</td><td></td><td></td><td>8</td></tr></table>	mode	mode	mode	mode	mode	mode	mode	mode	7	6	5	4	3	2	1	0	bit 7	6	5	4	3	2	1	0				mode	mode			mode				12	11			8	bit 15			12	11			8
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bit 7	6	5	4	3	2	1	0																																															
			mode	mode			mode																																															
			12	11			8																																															
bit 15			12	11			8																																															
49502	03 06 16	R W W	Automatic tuning	0/1/2/3/4 (0/1/2/3/4)	0 (END)	0=END (AT end, AT forced termination [for WRITE]) 1=AT1 (AT of executing SV) 2=AT2 (AT of SV 8 type for AT2) 3=AT3 (AT of SV 8 type for AT3) 4=AT4 (AT of executing SV [for second output]) *When status of automatic tuning is except END, automatic tuning can not be written. *When automatic tuning is forced termination, WRITE 0 (END). *Condition of writing for AT1 to 4 is as follows. [In case of AT1/AT4] ·When program operation (reference 49067) is RESET, writing is not possible (excepting when CONST). ·When there is not second output, writing of AT4 is not possible. [In case of AT2/AT3] ·When program operation (reference 49067) is RESET, writing is possible (excepting when CONST).																																																
49503	03 06 16	R W W	[Output display screen] A/M switching	0/1 (0/1)	0 (AUTO)	AUTO/MAN switching for first output. 0=AUTO (Automatic output operation) 1=MANUAL (Manual output operation)																																																
49504	03 06 16	R W W	[Output display screen] Manual output	-5.0 to 105.0 % (-50 to 1050)	-	Manual output value for first output *When A/M switching (reference 49503) is manual, can be written.																																																

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
49505	03 06 16	R W W	[Second output] [Output display screen] A/M switching	0/1 (0/1)	0 (AUTO)	AUTO/MAN switching for second output 0=AUTO (Automatic output operation) 1=MANUAL (Manual output operation) *WRITE is possible only in case of output 2 specifications.
49506	03 06 16	R W W	[Second output] [Output display screen] Manual output	-5.0 to 105.0 % (-50 to 1050)	-	Manual output value for second output *When A/M switching (reference 49505) is manual, can be written. *WRITE is possible only in case of output 2 specifications
49516	03 06 16	R W W	Program drive system	0/1/2/3/4 (0/1/2/3/4)	0 (MASTER KEY)	0=MASTER KEY (front key) 1=MASTER EXT (external input) 2=SLAVE EXT (synchronous method external input) 3=MASTER COM (communication) 4=FREE (front key/external input/communication) *Writing is possible in case of 'with external signal input'
49517	03 06 16	R W W	Select pattern system	0/1/2/3 (0/1/2/3)	0 (KEY)	0=KEY (font key) 1=EXT (external input) 2=COM (communication) 3=FREE (front key/external input/communication) *Writing is possible only in case of 'with external signal input'
49521	03 06 16	R W W	Control format	0/1 (0/1)	0 (Program operation)	0= Program operation 1= Constant operation
49522	03 06 16	R W W	[Constant operation] SV (Setting value)	Within the range of SV limit (Within the range of SV limit)	0.0	Reading/writing of SV value during constant operation. Decimal point position : SV decimal point position *When control format (reference 49521) is PROGRAM, writing is not possible and reading is no effect.
49533	03 06 16	R W W	Key lock of driving operation	0/1 (0/1)	0 (UNLOCK)	0= UNLOCK (lock release) 1= LOCK (lock)
49534	03 06 16	R W W	Time display system	0/1/2/3 (0/1/2/3)	0 (PASS STEP)	0= PASS STEP (step elapsed time) 1= PASS PATTERN (pattern elapsed time) 2= REMAIN STEP (step remaining time) 3= REMAIN PATTERN (pattern remaining time)
49535	03 06 16	R W W	PV hold	0/1 (0/1)	0 (NON)	0=NON (hold OFF) 1=HOLD (hold ON)
49536	03 06 16	R W W	Presence/absence of CT display	0/1 (0/1)	0 (NON)	0=NON (CT measurement value non display) 1=DISPLAY (display CT measurement value) *Writing is not possible except with heater disconnect alarm specifications.

8-7-2. Analog input data (READ only)

Real data, parameter information

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Detailed explanation
30101	04	R	[Upper display] PV (Measurement value)	7FFFh = +OVR (over input or higher limit burn out) 8000h = -OVER (under input or lower limit burn out) ·Decimal point position = PV decimal point
30102	04	R	[Upper display] PV status	0= Normal 1=+ OVR (over input or higher limit burn out ... display 「 <u> </u> <u> </u> 」) 2= -OVR (under input or lower limit burn out ... display 「 <u> </u> <u> </u> 」)
30103	04	R	[Upper display] SV (Setting value)	SV value (1) SV during program operation (2) SV during constant operation ·Decimal point position = PV decimal point
30105	04	R	[Output display screen] MV1 (First output value)	Control output value of MV2 (second output) -50 to 1050=-5.0 to 105.0%
30106	04	R	[Upper display] MV1 status	MV1 (first output) status 0=AUTO (Automatic output operation) 1=MAN1 (Manual output operation ... lighting [MAN1]) 2=AT (During automatic tuning ... lighting [AT]) 3=END (Output when program end) 4=PV abnormality output 5=FB AT (During feedback tuning) 6=RESET (Program operation reset)
30107	04	R	[Second output [Output display screen] MV2 (Second output value)	Control output value of MV2 (second output) -50 to 1050=-5.0 to 105.0% *When without second output specifications, READ indefinite value.
30108	04	R	[Second output] [Operation screen] MV2 status	MV2 (second output) status 0=AUTO (Automatic output operation) 1=MAN2 (Manual output operation ... lighting [MAN2]) 2=AT (During automatic tuning ... lighting [AT]) 3=END (Output when program end) 4=PV abnormality output 5=FB AT (During feedback tuning) 6=RESET (Program operation reset) *When without second output specifications, indefinite value is read.
30109	04	R	[Execution] SV	[MODE0] SV in execution ·Decimal point position = PV decimal point

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Detailed explanation
30110 30111 30112 30113	04	R	[Execution] Alarm value 1 Alarm value 2 Alarm value 3 Alarm value 4	[MODE0] Execution alarm value 1 [MODE0] Execution alarm value 2 [MODE0] Execution alarm value 3 [MODE0] Execution alarm value 4 · Decimal point position = Each alarm format. (1) When there are PV, DV, ADV, and SV, decimal point is SV decimal point. (2) When there are MV and CT, decimal point is 1-digit. (3) When there is TIMER, decimal point is none. *When alarm format is WAIT and FAIL, reading is no effect.
30114 30115 30116	04	R	[Execution] PID 'P' 'I' 'D'	[MODE0] Execution PID, P value (0 to 9999=0.0 to 999.9%) [MODE0] Execution PID, I value (0 to 9999=0 to 9999 seconds) [MODE0] Execution PID, D value (0 to 9999=0 to 9999 seconds)
30117 30118	04	R	[Execution] Output limiter 'Lower limit' 'Higher limit'	[MODE0] Execution output limiter (-50 to 1050 = -5.0 to 105.0%)
30119 30120	04	R	[Execution] Output variation limiter 'Descent' 'Ascent'	[MODE0] Execution output variation limiter Descent (1 to 1000 = 0.1 to 100.0%) Ascent (-1000 to -1 = -100.0 to -0.1%)
30121	04	R	[Execution] Sensor correction	[MODE0] Execution sensor correction (-19999 to 20000) · Decimal point position = PV decimal point + 1 digit (MAX 4 digit)
30122 30123	04	R	[Execution] A.R.W. 'Lower limit' 'Higher limit'	[MODE0] Execution A.R.W. Lower limit (-1000 to 0 = -100.0 to 0.0%) Higher limit (0 to 1000 = 0.0 to 100.0%)
30126	04	R	[Upper display] PTN (Pattern No. in selection)	Pattern No. during selection (1 to 30 = pattern 1 to 30)
30127	04	R	[Upper display] STP (Step No. in execution)	Step No. during execution (0 to 19 = step 1 to 19)
30128	04	R	[Time display screen] Patten progress time 'Hours' or 'Minutes'	'Hours' or 'Minutes' of program pattern elapsed/remaining time 000 to 999 = 0 to 999 'Days' or 'Hours' or 'Minutes' FFFFh = Time display digit over (over the 999:23 [D:H] display) · Unit = Every time unit (reference 30131) of time display screen
30129	04	R	[Time display screen] Patten progress time 'Minutes' or 'Seconds'	'Minutes' or 'Seconds' of program pattern elapsed/remaining time 00 to 23 = 0 to 23 'Hours' 00 to 59 = 0 to 59 'Minutes' or 'Seconds' FFFFh = Time display digit over (over the 999:23 [D:H] display) · Unit = Every time unit (reference 30131) of time display screen
30130	04	R	[Time display screen] Time display system	[MODE2] Time display system 0= PASS STEP (Step elapsed time) 1= PASS PATTERN (Pattern elapsed time) 2= REMAIN STEP (Step remaining time) 3= REMAIN PATTERN (Pattern remaining time)
30131	04	R	[Time display screen] Time unit of time display screen	Time unit of time display screen 0= D:H (Day : Hours) 1= H:M (Hours : Minutes) 2= M:S (Minutes : Seconds)
30133	04	R	[Operation screen] CT measurement value	CT measurement value (0 to 1100 = 0.0 to 110.0A) FFFFh = No CT value (CT value not obtained status) FFFEh = Initial CT value got (CT value display waiting in the operation screen) *Indefinite value is read except with heater disconnect alarm specifications.

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Detailed explanation																																															
30134	04	R	[Operation screen] FB (Feedback)	Feedback value (0 to 1000 = 0.0 to 100.0%) *Indefinite value is read except with ON-OFF servo specifications.																																															
30141	04	R	[Setting screen] Mode screen, lock status	0= Normal display or NoDisp (screen non display) 1= Lock (lock status) * READ after relating bit 0 to 12 of 16bits data to mode 0 to 12. *Reading is indefinite value to unallocated bit (mode) or unshown mode. Low order 8 bit <table><tr><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td><td>mode</td></tr><tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table> bit 7 6 5 4 3 2 1 0 High order 8 bit <table><tr><td></td><td></td><td></td><td>mode</td><td>mode</td><td></td><td></td><td>mode</td></tr><tr><td></td><td></td><td></td><td>12</td><td>11</td><td></td><td></td><td>8</td></tr></table> bit 15 12 11 8	mode	mode	mode	mode	mode	mode	mode	mode	7	6	5	4	3	2	1	0				mode	mode			mode				12	11			8															
mode	mode	mode	mode	mode	mode	mode	mode																																												
7	6	5	4	3	2	1	0																																												
			mode	mode			mode																																												
			12	11			8																																												
30142	04	R	Alarm status	Status of alarm 1 to alarm 4 0h = Alarm OFF (extinction [AL1] or [AL2] or [AL3] or [AL4]) 0h = Alarm ON (lighting [AL1] or [AL2] or [AL3] or [AL4]) Ah = Alarm resetting (extinction [AL1] or [AL2] or [AL3] or [AL4], lighting [WAIT]) *READ after relating to the following in 16 bit data. Bit 0 to 3 = Alarm 1 Bit 4 to 7 = Alarm 2 Bit 8 to 11 = Alarm 3 Bit 12 to 15 = Alarm 4 <table><tr><td colspan="4">Alarm 4</td><td colspan="4">Alarm 3</td><td colspan="4">Alarm2</td><td colspan="4">Alarm 1</td></tr><tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr></table> <table><tr><td>Alarm OFF (0h)...</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>Alarm ON (5h)...</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>Alarm OFF during wait operation (Ah)...</td><td>1</td><td>0</td><td>1</td><td>0</td></tr></table>	Alarm 4				Alarm 3				Alarm2				Alarm 1				15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Alarm OFF (0h)...	0	0	0	0	Alarm ON (5h)...	0	1	0	1	Alarm OFF during wait operation (Ah)...	1	0	1	0
Alarm 4				Alarm 3				Alarm2				Alarm 1																																							
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0																																				
Alarm OFF (0h)...	0	0	0	0																																															
Alarm ON (5h)...	0	1	0	1																																															
Alarm OFF during wait operation (Ah)...	1	0	1	0																																															
30143	04	R	[Upper display] Input abnormality status	0= No error 1= Error activation (lighting [ERR])																																															
30144	04	R	Time signal status	0= Time signal OFF (extinction [TS1] or [TS2] or or [TS8]) 1= Time signal ON (lighting [TS1] or [TS2] or or [TS8]) * READ after relating bit 0 to 7 of 16 bits data to time signal 1 to 8. Low order 8 bits <table><tr><td>TS8</td><td>TS7</td><td>TS6</td><td>TS5</td><td>TS4</td><td>TS3</td><td>TS2</td><td>TS1</td></tr></table> bit7 6 5 4 3 2 1 0	TS8	TS7	TS6	TS5	TS4	TS3	TS2	TS1																																							
TS8	TS7	TS6	TS5	TS4	TS3	TS2	TS1																																												

8-7-3. Digital setting value

Tuning

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
101	01 05 15	R W W	AT1	0/1 [0000h/FF00h] (END/START) In the bracket [] In case of FNC code 05	0 (END)	0= END (AT1 end or unexecuted) 1= START (AT start or executing) *When executing AT1 or executing FB tuning, writing of START cannot be possible. *When READ/WRITE, use auto tuning (reference 49502) except AT1.
111	01 05 15	R W W	FB tuning	0/1 [0000h/FF00h] (END/START) In the bracket [] In case of FNC code 05	0 (END)	0= END (FB tuning end or unexecuted) 1= START (FB tuning start or executing) *Writing of START is not possible excepting program operation reset. *When executing AT or executing FB tuning, writing of START is not possible. *Writing is not possible except ON-OFF servo output specifications.

8-7-4. Digital input data (READ only)

System abnormality status/Alarm status

FNC code.....Application function code, R/W.....R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Detailed explanation
10002 10005	02	R	System abnormality	0= Normal (extinction [ERR]) 1= Lighting [ERR] (1) Input abnormality (A/D error activation) (2) Correction data abnormality etc.
10117	02	R	[Upper display] Alarm 1 status	[AL1] of alarm 1, lighting/extinction 0=Alarm OFF (extinction [AL1]) 1=Alarm ON (lighting [AL1])
10118	02	R	Alarm 1 output cancellation status	[WAIT] by alarm 1, lighting/extinction 0=Non waiting operation of alarm 1 1=During alarm output reset of alarm 1
10119	02	R	[Upper display] Alarm 2 status	[AL2] of alarm 2, lighting/extinction 0=Alarm OFF (extinction [AL2]) 1=Alarm ON (lighting [AL2])
10120	02	R	Alarm 2 output cancellation status	[WAIT] by alarm 2, lighting/extinction 0=Non waiting operation of alarm 2 1=During alarm output reset of alarm 2
10121	02	R	[Upper display] Alarm 3 status	[AL3] of alarm 3, lighting/extinction 0=Alarm OFF (extinction [AL3]) 1=Alarm ON (lighting [AL3])
10122	02	R	Alarm 3 output cancellation status	[WAIT] by alarm 3, lighting/extinction 0=Non waiting operation of alarm 3 1=During alarm output reset of alarm 3
10123	02	R	[Upper display] Alarm 4 status	[AL4] of alarm 4, lighting/extinction 0=Alarm OFF (extinction [AL4]) 1=Alarm ON (lighting [AL4])
10124	02	R	Alarm 4 output cancellation status	[WAIT] by alarm 4, lighting/extinction 0=Non waiting operation of alarm 4 1=During alarm output reset of alarm 4

8-8.MODBUS protocol support reference table

Analog setting value (40001 to 49999)							
Setup parameter 1		Setup parameter 2		1 type parameter		Execution parameters and specific parameters	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
40001	Measurement range	40051	[High accuracy] Transmission type	40101	[Second] Output gap	40151	SV (Setting value) (R)
40002	Unit	40052	[High accuracy] Scale, ZERO	40102	[Second] P	40152	
40003	RJ	40053	[High accuracy] Scale, SPAN	40103	[Second] I	40153	
40004	Measurement range ZERO	40054		40104	[Second] D	40154	
40005	Measurement range SPAN	40055		40105	[Second] Output limiter, Lower limit	40155	
40006	Linear scale MIN	40056		40106	[Second] Output limiter, Higher limit	40156	Executing P
40007	Linear scale MAX	40057		40107		40157	Executing I
40008	SV decimal point position/Linear decimal point	40058		40108	[Second] Output dead band	40158	Executing D
40009	SV range, Lower limit	40059		40109		40159	Executing output limiter, Lower limit
40010	SV range, Higher limit	40060		40110		40160	Executing output limiter, Higher limit
40011	PV decimal point	40061	[General] Transmission type	40111	Output dead band	40161	Output variation limiter, Descent
40012	Digital filter	40062	[General] Scale, ZERO	40112	Lower limit output during PV abnormality	40162	Output variation limiter, Ascent
40013		40063	[General] Scale, SPAN	40113	Upper limit output during PV abnormality	40163	Execution sensor correction
40014		40064		40114		40164	Executing ARW lower limit value
40015		40065		40115		40165	Executing ARW higher limit value
40016		40066		40116		40166	Output preset
40017		40067		40117		40167	
40018		40068		40118		40168	
40019		40069		40119		40169	
40020	SV decimal point for display	40070		40120		40170	
40021	Control action direct/reverse	40071		40121	Split, Direct	40171	
40022	Pulse cycle	40072		40122	Split, Reverse	40172	
40023	FB·ZERO	40073		40123	[Second] PID dead band	40173	
40024	FB·SPAN	40074		40124	PID dead band	40174	
40025	FB·dead band	40075		40125		40175	
40026	[Second] Direct/Reverse of control operation	40076		40126		40176	
40027	[Second] Pulse cycle	40077		40127		40177	
40028	[Second] Control type	40078		40128		40178	
40029		40079	Communication transmission type	40129		40179	
40030	Cancel alarm output	40080	[COM2] Communication transmission type 2	40130		40180	
40031	Alarm format 1	40081		40131		40181	Alarm value 1
40032	Alarm dead band 1	40082		40132		40182	
40033		40083		40133		40183	Alarm value 2
40034	Alarm delay	40084		40134		40184	
40035		40085		40135		40185	Alarm value 3
40036	Alarm format 2	40086		40136		40186	
40037	Alarm dead band 2	40087		40137		40187	Alarm value 4
40038		40088		40138		40188	
40039		40089		40139		40189	
40040		40090		40140		40190	
40041	Alarm format 3	40091		40141		40191	
40042	Alarm dead band 3	40092	Operation at the time of starting the power supply	40142		40192	
40043		40093		40143		40193	
40044		40094		40144		40194	
40045		40095		40145		40195	Auxiliary output
40046	Alarm format 4	40096		40146		40196	
40047	Alarm dead band 4	40097		40147	SV correction	40197	
40048		40098		40148	Control algorithm	40198	
40049		40099		40149		40199	
40050		40100		40150		40200	

Analog setting value (40001 to 49999)							
8 type parameter No.1		8 type parameter No.2		8 type parameter No.3		8 type parameter No.4	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
40201		40251		40301		40351	
40202		40252		40302		40352	
40203		40253		40303		40353	
40204		40254		40304		40354	
40205		40255		40305		40355	
40206	P	40256	P	40306	P	40356	P
40207	I	40257	I	40307	I	40357	I
40208	D	40258	D	40308	D	40358	D
40209	Output limiter, Lower limit	40259	Output limiter, Lower limit	40309	Output limiter, Lower limit	40359	Output limiter, Lower limit
40210	Output limiter, Higher limit	40260	Output limiter, Higher limit	40310	Output limiter, Higher limit	40360	Output limiter, Higher limit
40211	Output variation limiter, Descent	40261	Output variation limiter, Descent	40311	Output variation limiter, Descent	40361	Output variation limiter, Descent
40212	Output variation limiter, Ascent	40262	Output variation limiter, Ascent	40312	Output variation limiter, Ascent	40362	Output variation limiter, Ascent
40213	Sensor correction	40263	Sensor correction	40313	Sensor correction	40363	Sensor correction
40214	A.R.W. lower limit	40264	A.R.W. lower limit	40314	A.R.W. lower limit	40364	A.R.W. lower limit
40215	A.R.W. higher limit	40265	A.R.W. higher limit	40315	A.R.W. higher limit	40365	A.R.W. higher limit
40216	Output preset	40266	Output preset	40316	Output preset	40366	Output preset
40217		40267		40317		40367	
40218	Real temperature compensation	40268	Real temperature compensation	40318	Real temperature compensation	40368	Real temperature compensation
40219	Waiting time alarm, Hours or minutes	40269	Waiting time alarm, Hours or minutes	40319	Waiting time alarm, Hours or minutes	40369	Waiting time alarm, Hours or minutes
40220	Waiting time alarm, Minutes or seconds	40270	Waiting time alarm, Minutes or seconds	40320	Waiting time alarm, Minutes or seconds	40370	Waiting time alarm, Minutes or seconds
40221	Time signal ON, Hours or minutes	40271	Time signal ON, Hours or minutes	40321	Time signal ON, Hours or minutes	40371	Time signal ON, Hours or minutes
40222	Time signal ON, Minutes or seconds	40272	Time signal ON, Minutes or seconds	40322	Time signal ON, Minutes or seconds	40372	Time signal ON, Minutes or seconds
40223	Time signal OFF, Hours or minutes	40273	Time signal OFF, Hours or minutes	40323	Time signal OFF, Hours or minutes	40373	Time signal OFF, Hours or minutes
40224	Time signal OFF, Minutes or seconds	40274	Time signal OFF, Minutes or seconds	40324	Time signal OFF, Minutes or seconds	40374	Time signal OFF, Minutes or seconds
40225		40275		40325		40375	
40226		40276		40326		40376	
40227		40277		40327		40377	
40228		40278		40328		40378	
40229		40279		40329		40379	
40230		40280		40330		40380	
40231	Alarm value 1	40281	Alarm value 1	40331	Alarm value 1	40381	Alarm value 1
40232		40282		40332		40382	
40233	Alarm value 2	40283	Alarm value 2	40333	Alarm value 2	40383	Alarm value 2
40234		40284		40334		40384	
40235	Alarm value 3	40285	Alarm value 3	40335	Alarm value 3	40385	Alarm value 3
40236		40286		40336		40386	
40237	Alarm value 4	40287	Alarm value 4	40337	Alarm value 4	40387	Alarm value 4
40238		40288		40338		40388	
40239		40289		40339		40389	
40240		40290		40340		40390	
40241		40291		40341		40391	
40242		40292		40342		40392	
40243		40293		40343		40393	
40244		40294		40344		40394	
40245	Auxiliary output	40295	Auxiliary output	40345	Auxiliary output	40395	Auxiliary output
40246		40296		40346		40396	
40247		40297		40347		40397	
40248		40298		40348		40398	
40249		40299		40349		40399	
40250		40300		40350		40400	

Analog setting value (40001 to 49999)							
8 types parameter No. 5		8 types parameter No. 6		8 types parameter No. 7		8 types parameter No. 8	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
40401		40451		40501		40551	
40402		40452		40502		40552	
40403		40453		40503		40553	
40404		40454		40504		40554	
40405		40455		40505		40555	
40406	P	40456	P	40506	P	40556	P
40407	I	40457	I	40507	I	40557	I
40408	D	40458	D	40508	D	40558	D
40409	Output limiter, Lower limit	40459	Output limiter, Lower limit	40509	Output limiter, Lower limit	40559	Output limiter, Lower limit
40410	Output limiter, Higher limit	40460	Output limiter, Higher limit	40510	Output limiter, Higher limit	40560	Output limiter, Higher limit
40411	Output variation limiter, Descent	40461	Output variation limiter, Descent	40511	Output variation limiter, Descent	40561	Output variation limiter, Descent
40412	Output variation limiter, Ascent	40462	Output variation limiter, Ascent	40512	Output variation limiter, Ascent	40562	Output variation limiter, Ascent
40413	Sensor correction	40463	Sensor correction	40513	Sensor correction	40563	Sensor correction
40414	A.R.W. lower limit	40464	A.R.W. lower limit	40514	A.R.W. lower limit	40564	A.R.W. lower limit
40415	A.R.W. higher limit	40465	A.R.W. higher limit	40515	A.R.W. higher limit	40565	A.R.W. higher limit
40416	Output preset	40466	Output preset	40516	Output preset	40566	Output preset
40417		40467		40517		40567	
40418	Real temperature compensation	40468	Real temperature compensation	40518	Real temperature compensation	40568	Real temperature compensation
40419	Waiting time alarm, Hours or minutes	40469	Waiting time alarm, Hours or minutes	40519	Waiting time alarm, Hours or minutes	40569	Waiting time alarm, Hours or minutes
40420	Waiting time alarm, Minutes or seconds	40470	Waiting time alarm, Minutes or seconds	40520	Waiting time alarm, Minutes or seconds	40570	Waiting time alarm, Minutes or seconds
40421	Time signal ON, Hours or minutes	40471	Time signal ON, Hours or minutes	40521	Time signal ON, Hours or minutes	40571	Time signal ON, Hours or minutes
40422	Time signal ON, Minutes or seconds	40472	Time signal ON, Minutes or seconds	40522	Time signal ON, Minutes or seconds	40572	Time signal ON, Minutes or seconds
40423	Time signal OFF, Hours or minutes	40473	Time signal OFF, Hours or minutes	40523	Time signal OFF, Hours or minutes	40573	Time signal OFF, Hours or minutes
40424	Time signal OFF, Minutes or seconds	40474	Time signal OFF, Minutes or seconds	40524	Time signal OFF, Minutes or seconds	40574	Time signal OFF, Minutes or seconds
40425		40475		40525		40575	
40426		40476		40526		40576	
40427		40477		40527		40577	
40428		40478		40528		40578	
40429		40479		40529		40579	
40430		40480		40530		40580	
40431	Alarm value 1	40481	Alarm value 1	40531	Alarm value 1	40581	Alarm value 1
40432		40482		40532		40582	
40433	Alarm value 2	40483	Alarm value 2	40533	Alarm value 2	40583	Alarm value 2
40434		40484		40534		40584	
40435	Alarm value 3	40485	Alarm value 3	40535	Alarm value 3	40585	Alarm value 3
40436		40486		40536		40586	
40437	Alarm value 4	40487	Alarm value 4	40537	Alarm value 4	40587	Alarm value 4
40438		40488		40538		40588	
40439		40489		40539		40589	
40440		40490		40540		40590	
40441		40491		40541		40591	
40442		40492		40542		40592	
40443		40493		40543		40593	
40444		40494		40544		40594	
40445	Auxiliary output	40495	Auxiliary output	40545	Auxiliary output	40595	Auxiliary output
40446		40496		40546		40596	
40447		40497		40547		40597	
40448		40498		40548		40598	
40449		40499		40549		40599	
40450		40500		40550		40600	

Analog setting value (40001 to 49999)							
Parameter for No.9 & AT		Setting parameter		System setting		Program pattern information	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
40601	PID No.9-1·P	40701	[Second] Variation limiter, Descent	48001	Display back light	49001	
40602	PID No.9-1·I	40702	[Second] Variation limiter, Ascent	48002	Display contrast	49002	
40603	PID No.9-1·D	40703	[Second] PV abnormality output lower limit	48003	Key back light	49003	Pattern No. [for pattern R/W]
40604	PID No.9-2·P	40704	[Second] PV abnormality output higher limit	48004		49004	Step No. [for pattern R/W]
40605	PID No.9-2·I	40705		48005		49005	Step repeat
40606	PID No.9-2·D	40706		48006		49006	SV
40607	PID No.9-3·P	40707	Preset manual	48007		49007	Time, hours or minutes
40608	PID No.9-3·I	40708	[Second] Preset manual	48008		49008	Time, minutes or seconds
40609	PID No.9-3·D	40709		48009		49009	
40610	PID No.9-4·P	40710		48010		49010	PID No.
40611	PID No.9-4·I	40711	Measurement range correction, Zero	48011		49011	
40612	PID No.9-4·D	40712	Measurement range correction, Span	48012	External signal allocation, Terminal No.12	49012	Alarm No.
40613	PID No.9-5·P	40713	First output correction, Zero	48013	External signal allocation, Terminal No.13	49013	Output limiter No.
40614	PID No.9-5·I	40714	First output correction, Span	48014	External signal allocation, Terminal No.14	49014	Output variation limiter No.
40615	PID No.9-5·D	40715	Second output correction, Zero	48015	External signal allocation, Terminal No.15	49015	Output preset No.
40616	PID No.9-6·P	40716	Second output correction, Span	48016	External signal allocation, Terminal No.16	49016	Sensor correction No.
40617	PID No.9-6·I	40717		48017	External signal allocation, Terminal No.17	49017	A.R.W. No.
40618	PID No.9-6·D	40718		48018		49018	Real temperature compensation No.
40619	PID No.9-7·P	40719	Transmission output (H) correction, Zero	48019	External signal allocation, Terminal No.19	49019	Waiting time alarm No.
40620	PID No.9-7·I	40720	Transmission output (H) correction, Span	48020	External signal allocation, Terminal No.20	49020	Time signal 1 No.
40621	PID No.9-7·D	40721	Transmission output (L) correction, Zero	48021	External signal allocation, Terminal No.21	49021	Time signal 2 No.
40622	PID No.9-8·P	40722	Transmission output (L) correction, Span	48022	External signal allocation, Terminal No.22	49022	Time signal 3 No.
40623	PID No.9-8·I	40723	CT input correction, Zero	48023	External signal allocation, Terminal No.23	49023	Time signal 4 No.
40624	PID No.9-8·D	40724	CT input correction, Span	48024	External signal allocation, Terminal No.24	49024	Time signal 5 No.
40625	SV No.1 for AT2	40725		48025		49025	Time signal 6 No.
40626	SV No.2 for AT2	40726		48026	External signal allocation, Terminal No.26	49026	Time signal 7 No.
40627	SV No.3 for AT2	40727		48027	External signal allocation, Terminal No.27	49027	Time signal 8 No.
40628	SV No.4 for AT2	40728		48028	External signal allocation, Terminal No.28	49028	
40629	SV No.5 for AT2	40729		48029	External signal allocation, Terminal No.29	49029	
40630	SV No.6 for AT2	40730		48030	External signal allocation, Terminal No.30	49030	
40631	SV No.7 for AT2	40731		48031	External signal allocation, Terminal No.31	49031	
40632	SV No.8 for AT2	40732		48032	External signal allocation, Terminal No.32	49032	
40633	SV section 1 for automatic PID	40733		48033	External signal allocation, Terminal No.33	49033	
40634	SV section 2 for automatic PID	40734		48034		49034	
40635	SV section 3 for automatic PID	40735		48035		49035	
40636	SV section 4 for automatic PID	40736		48036		49036	Auxiliary output No.
40637	SV section 5 for automatic PID	40737		48037		49037	
40638	SV section 6 for automatic PID	40738		48038		49038	
40639	SV section 7 for automatic PID	40739		48039		49039	
40640	SV No.1 for AT3	40740		48040		49040	Existing set step count (R)
40641	SV No.2 for AT3	40741		48041		49041	Start SV
40642	SV No.3 for AT3	40742		48042		49042	Start system
40643	SV No.4 for AT3	40743		48043		49043	Link destination pattern No.
40644	SV No.5 for AT3	40744		48044		49044	Output when program ended 1
40645	SV No.6 for AT3	40745		48045		49045	Output when program ended 2
40646	SV No.7 for AT3	40746		48046		49046	
40647	SV No.8 for AT3	40747		48047		49047	
40648	Start direction for AT2/3	40748		48048		49048	Time unit
40649	Execution ON/OFF for AT2	40749		48049		49049	SV during reset
40650	Execution ON/OFF for AT3	40750		48050		49050	

Analog setting value (40001 to 49999)				Analog input data (30001 to 39999)			
Program pattern setting/editing		Operation status information		Real data & parameter			
No.	Contents	No.	Contents	No.	Contents	No.	Contents
49051		49501	Setting screen mode lock	30001		30101	PV (measurement value)
49052		49502	Automatic tuning	30002		30102	PV status
49053		49503	A/M switching	30003		30103	SV (setting value)
49054		49504	Manual output	30004		30104	
49055	Pattern repeat	49505	[Second] A/M switching	30005		30105	MV1 (first output value)
49056	Executing SV	49506	[Second] Manual output	30006		30106	MV1 status
49057	Executing time, 'Hours' or 'Minutes'	49507		30007		30107	MV2 (second output value)
49058	Executing time, 'Minutes' or 'Second'	49508		30008		30108	MV2 status
49059		49509		30009		30109	Executing SV
49060		49510		30010		30110	Executing alarm 1
49061		49511		30011		30111	Executing alarm 2
49062		49512		30012		30112	Executing alarm 3
49063		49513		30013		30113	Executing alarm 4
49064		49514		30014		30114	Executing, P
49065		49515		30015		30115	Executing, I
49066	Pattern No.	49516	Program drive system	30016		30116	Executing, D
49067	Program operation	49517	Select pattern system	30017		30117	Executing output limiter, Lower limit
49068		49518		30018		30118	Executing output limiter, Higher limit
49069		49519		30019		30119	Executing output variation limiter, Descent
49070		49520		30020		30120	Executing output variation limiter, Ascent
49071		49521	Cntrol format	30021		30121	Executing sensor correction
49072		49522	[CONST] SV (Setting value)	30022		30122	Executing A.R.W., Lower limit
49073		49523		30023		30123	Executing A.R.W., Higher limit
49074		49524		30024		30124	
49075		49525		30025		30125	
49076		49526		30026		30126	PTN (Pattern No. in selection)
49077		49527		30027		30127	STP (Step No. in execution)
49078		49528		30028		30128	Progress time, 'Hours' or 'Minutes'
49079		49529		30029		30129	Progress time, 'Minutes' or 'Seconds'
49080		49530		30030		30130	Time display system
49081		49531		30031		30131	Time display screen time unit
49082		49532		30032		30132	
49083		49533	Key lock of driving operation	30033		30133	CT measurement value
49084		49534	Time display system	30034		30134	FB (Feedback)
49085		49535	PV hold	30035		30135	
49086		49536	Presence/absence of CT value display	30036		30136	
49087		49537		30037		30137	
49088		49538		30038		30138	
49089		49539		30039		30139	
49090		49540		30040		30140	
49091		49541		30041		30141	Mode screen, lock status
49092		49542		30042		30142	Alarm status
49093	Pattern copy	49543		30043		30143	Input abnormality status
49094	Pattern clear	49544		30044		30144	Time signal status
49095	Add step	49545		30045		30145	
49096	Delete step	49546		30046		30146	
49097		49547		30047		30147	
49098		49548		30048		30148	
49099		49549		30049		30149	
49100		49550		30050		30150	

Digital setting value (1 to 10000)				Digital input data (10001 to 20000)			
Tuning				System abnormality status		Alarm status	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
101	AT1	151		10001		10101	
102		152		10002	System abnormality	10102	
103		153		10003		10103	
104		154		10004		10104	
105		155		10005	System abnormality	10105	
106		156		10006		10106	
107		157		10007		10107	
108		158		10008		10108	
109		159		10009		10109	
110		160		10010		10110	
111	FB tuning	161		10011		10111	
112		162		10012		10112	
113		163		10013		10113	
114		164		10014		10114	
115		165		10015		10115	
116		166		10016		10116	
117		167		10017		10117	Alarm 1 status
118		168		10018		10118	Alarm 1 output cancellation status
119		169		10019		10119	Alarm 2 status
120		170		10020		10120	Alarm 2 output cancellation status
121		171		10021		10121	Alarm 3 status
122		172		10022		10122	Alarm 3 output cancellation status
123		173		10023		10123	Alarm 4 status
124		174		10024		10124	Alarm 4 output cancellation status
125		175		10025		10125	
126		176		10026		10126	
127		177		10027		10127	
128		178		10028		10128	
129		179		10029		10129	
130		180		10030		10130	
131		181		10031		10131	
132		182		10032		10132	
133		183		10033		10133	
134		184		10034		10134	
135		185		10035		10135	
136		186		10036		10136	
137		187		10037		10137	
138		188		10038		10138	
139		189		10039		10139	
140		190		10040		10140	
141		191		10041		10141	
142		192		10042		10142	
143		193		10043		10143	
144		194		10044		10144	
145		195		10045		10145	
146		196		10046		10146	
147		197		10047		10147	
148		198		10048		10148	
149		199		10049		10149	
150		200		10050		10150	

8-9. Measurement range and decimal point position

<Measurement range list table>

Input type		Range		SV DOT	Range		SV DOT
Thermocouple (TC)		SV(°C) Setting, display range			SV(K) Setting, display range		
	B	0.0	to 1820.0	1	273.0	to 2093.0	1
	R1	0.0	to 1760.0	1	273.0	to 2033.0	1
	R2	0.0	to 1200.0	1	273.0	to 1473.0	1
	S	0.0	to 1760.0	1	273.0	to 2033.0	1
	K1	-200.0	to 1370.0	1	73.0	to 1643.0	1
	K2	0.0	to 600.0	1	273.0	to 873.0	1
	K3	-200.0	to 300.0	1	73.0	to 573.0	1
	E1	-270.0	to 1000.0	1	3.0	to 1273.0	1
	E2	0.0	to 700.0	1	273.0	to 973.0	1
	E3	-270.0	to 300.0	1	3.0	to 573.0	1
	E4	-270.0	to 150.0	1	3.0	to 423.0	1
	J1	-200.0	to 1200.0	1	73.0	to 1473.0	1
	J2	-200.0	to 900.0	1	73.0	to 1173.0	1
	J3	-200.0	to 400.0	1	73.0	to 673.0	1
	J4	-100.0	to 200.0	1	173.0	to 473.0	1
	T1	-270.0	to 400.0	1	3.0	to 673.0	1
	T2	-200.0	to 200.0	1	73.0	to 473.0	1
	W5-26	0.0	to 2310.0	1	273.0	to 2583.0	1
	W0-26	0.0	to 2310.0	1	273.0	to 2583.0	1
	NiMO	-50.0	to 1410.0	1	223.0	to 1683.0	1
	AuFe	0.0	to 280.0 (K)	1	0.0	to 280.0	1
	N	0.0	to 1300.0	1	273.0	to 1573.0	1
	PR5-20	0.0	to 1800.0	1	273.0	to 2073.0	1
	PR20-40	0.0	to 1880.0	1	273.0	to 2153.0	1
	Plati1	0.0	to 1390.0	1	273.0	to 1663.0	1
	Plati2	0.0	to 600.0	1	273.0	to 873.0	1
	U	-200.0	to 400.0	1	73.0	to 673.0	1
	L	-200.0	to 900.0	1	73.0	to 1173.0	1
DC voltage and current		Range setting scope					
	10mV	-10	to 10 (mV)	0 to 4	to		
	20mV	-20	to 20 (mV)	0 to 4	to		
	50mV	-50	to 50 (mV)	0 to 4	to		
	100mV	-100	to 100 (mV)	0 to 4	to		
	5V	-5	to 5 (V)	0 to 4	to		
	mA	-20	to 20 (mV)	0 to 4	to		

Thermometer resistance		SV(°C) Setting, display range		SV(K) Setting, display range	
	JPt100Ω1	-200.0 to 649.0	1	73.0 to 922.0	1
	JPt100Ω2	-200.0 to 400.0	1	73.0 to 673.0	1
	JPt100Ω4	-200.0 to 200.0	1	73.0 to 473.0	1
	JPt100Ω5	-100.0 to 100.0	1	173.0 to 373.0	1
	QPt100Ω1	-200.0 to 649.0	1	73.0 to 922.0	1
	QPt100Ω2	-200.0 to 400.0	1	73.0 to 673.0	1
	QPt100Ω4	-200.0 to 200.0	1	73.0 to 473.0	1
	QPt100Ω5	-100.0 to 100.0	1	173.0 to 373.0	1
	Pt50Ω	-200.0 to 649.0	1	73.0 to 922.0	1
	Pt100Ω1	-200.0 to 850.0	1	73.0 to 1123.0	1
	Pt100Ω2	-200.0 to 400.0	1	73.0 to 673.0	1
	Pt100Ω4	-200.0 to 200.0	1	73.0 to 473.0	1
	Pt100Ω5	-100.0 to 100.0	1	173.0 to 373.0	1
	Pt-Co (Exclusive 4-wire system)	4.0 to 374.0 (K)	1	4.0 to 374.0	1

9. PRIVATE protocol

9-1. Difference between RS—232C and RS-422A/485

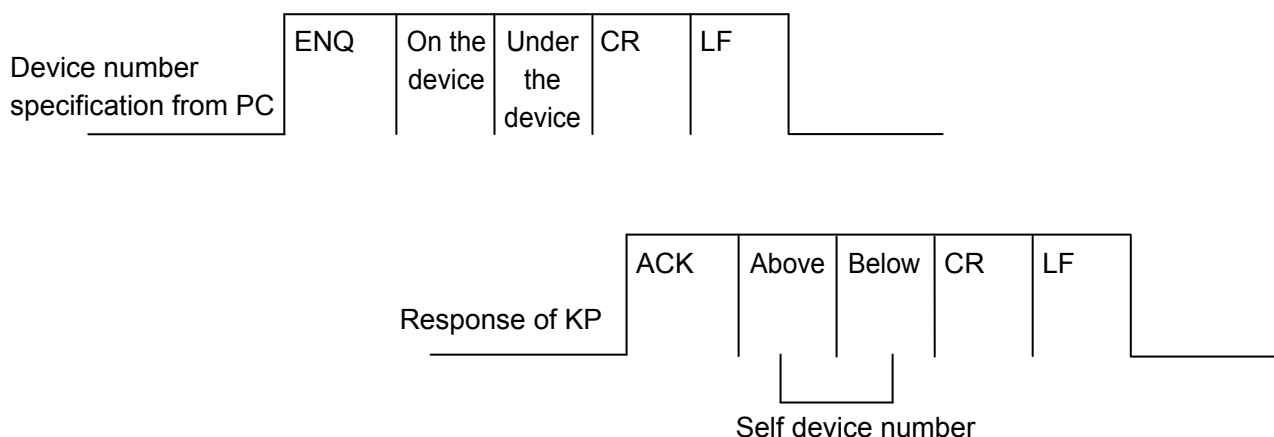
Only the level of RS-232C and RS-422A/RS-485 differs electrically, the communication procedure is the same.

However RS-422A/RS-485 connects devices in series and communicates one of the devices by sending device number using specified procedure from computer.

This is called establishing the data link. For that each device sets its own device number beforehand such that it does not overlap with the other device number.(See 'setting parameters for communication') After the data link is established, communication procedure of RS-232C and RS-422A/RS-485 is exactly the same.

9-1-1. Establishing the data link

From the PC if you want to communicate by using the following procedure, send the device numbers before hand and establish data link with that device and communicate. After establishing the data link communicate with that device according to the procedure explained in 'Communication format'.



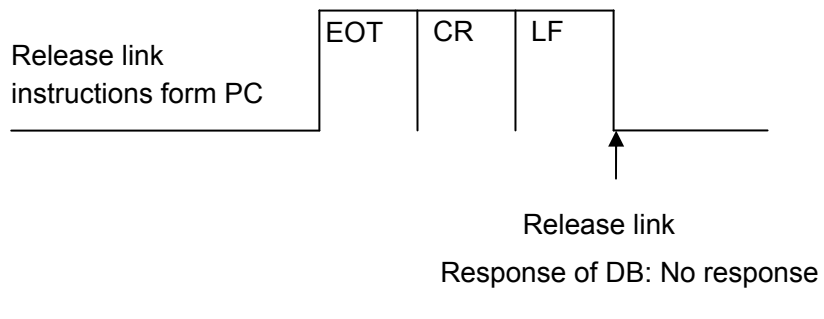
Precautions

To avoid accidents always read these contents and understand them.

1. Always send the device numbers in 2 digits from 01 to 99.
2. Do not use the device number 00.
3. Only the specified device responds within 1 second.
4. When the device of the specified device number does not exist, then there is no response.
5. If there is a device whose data link is already established the data link of that device is automatically released because data link with some other device is established.
6. If there is a power failure, a back up of the data link status of the data link before power failure is taken.
7. ENQ, ACK are control codes and they are expressed as hexadecimals as follows.
ENQ: 05H
ACK: 06H
8. When device number 1 is sent response of KP is as follows.
ACK 30 31 CR LF
When device number 99 is sent response of KP is as follows.
ACK 39 39 CR LF

9-1-2. Releasing the data link

When communicating with the device other than the device that is presently communicating, release the data link with the following procedure from the PC and then establish the data link with the next device by the procedure mentioned earlier.



Precautions

To avoid accidents always read these contents and understand them.

1. By using this command, the data link of all the devices that are connected is released and following data link is established.
2. Data link of each device that is connected is released within 10msec from when this command given, hence for sending it further from the PC a time of 10msec or more is necessary.
3. EOT is control code and it is expressed as hexadecimal as follows.
EOT: 04H

9-2. Basic procedure of communication

9-2-1. Text format at the time of sending and receiving

STX	TEXT	ETX	BCC L	BCC H	CR	LF
-----	------	-----	-------	-------	----	----

- ① Character received before STX is not received.
- ② Always add CR(0DH), LF(0AH) as end code. (For both sending and receiving).

9-2-2. Check sum

This device adds check sum data as BCC (Block Check Code).

Check sum means, seeing each text data as binary and sending low order 8 bits of that total sum as hexadecimal character.

- ① Target range of BCC



- ② BCC (Check sum)

The low order 8 bit data of the pure binary total sum of target range data is split into high and low order 4 bits and are converted to characters(30 to 39, 41 to 46H) 0 to F, and is kept in high order and low order sequence. (2 characters)

STX	TEXT	ETX	BCC L	BCC H	CR	LF
-----	------	-----	-------	-------	----	----

- ③ When adding parity to BCC, the parity of BCC itself is considered.
- ④ BCC is not added in positive and negative response.
- ⑤ Nor it is added to ENQ, ACK, EOT.
- ⑥ BCC is added and checked for both sending and receiving.

STX	1	2	,	0	ETX	BCC L	BCC H	CR	LF
	31	32	2C	30	03	32	43		
						(2)	(C)		

When the data to be sent and received is changed due to noise etc, by comparing with that value calculated on the receiving side, that occurrence may be detected.

9-2-3. Basic procedure of communication

- ① In case of KP with communication option, communication is possible at any point of time.
- ② In RS—422A/RS-485, first of all data link is established and then communication with KP is performed according to the communication format. In the end the data link is released and made available for next communication.
- ③ In RS-232C, communication with KP is done according to the communication format from the beginning.
- ④ If a command is sent for KP from high order PC or if parameter setting and pattern setting is done KP does not accept it and a negative response is sent if FNC key or the corresponding mode is not locked.
In this case, please lock the FNC key or the corresponding mode.
- ⑤ In case of data request command from high order PC, KP outputs the data regardless of lock/no lock status. (However, pattern setting data is output in case of RESET only)
- ⑥ When KP receives a data request from high order PC, if the request is correct, the data is sent. If the request is incorrect or if data sending is not possible, a negative response is sent.
- ⑦ When KP receives parameter setting, command from high order PC, if the command and the settings are correct a positive response is sent after internal processing.
If there is a mistake in the setting, command or if setting, command cannot be received, a negative response is sent.

9-2-4. Control code

Following code is used during communication.

STX(Text start signal)	: 02H
ETX(Text end signal)	: 03H
ACK(Positive response)	: 06H
NAK(Negative response)	: 15H
[RS-422A/485]	
ENQ(Enquiry signal)	: 05H
EOT(Transmission end signal)	: 04H

9-3. Communication format



Precautions

When transfer the parameter from old instrument to this instrument, check the setting range of each parameter because some parameters of setting range (for example, SV (setting value), alarm value etc.) is different from old instrument.

9-3-1. Data request command (PC → KP)

Command name	Command format	Status
① Real data request	STX Δ1, Δ1, ETX BCC CR LF (DF)	Current data request
② Execution parameter request	STX Δ1, Δ2, ETX BCC CR LF (EF)	Mode 0 execution parameter request
③ Setting program pattern data request [In case of resetting only]	STX Δ1, Δ3, □□, □□, ETX BCC CR LF Step No. Pattern No. Repeat pattern in case of 00 Request data	Program pattern data request Data request for each step
④ Individual setting parameter request	STX Δ1, Δ4, □□, □□, ETX BCC CR LF 1 to 8=Parameter No. When parameter is 8 types When 91 to 98=PID9 When 1=Parameter is 1 type Parameter type No.*1 * 1 parameter type No. is a number given to setting parameter and is indicated in section 9-3-5.	Data request by specifying 1 setting parameter
⑤ Program pattern setting status request	STX Δ1, Δ5, □□, ETX BCC CR LF Pattern No.(1 to 30)	Pattern setting status request
⑥ Device status request	STX Δ1, Δ6, ETX BCC CR LF (20)	Request configuration status of the device
⑦ Mode lock status request	STX Δ1, Δ7, ETX BCC CR LF (30)	Request each mode lock status
⑧ Status 1 request	STX Δ1, Δ8, ETX BCC CR LF (40)	Request the status of alarm, error, time signal
⑨ Status 2 request	STX Δ1, Δ9, ETX BCC CR LF (50)	Request the status of program operation

(Note)Δ=Space

9-3-2. Response output of KP to the data request command (KP → PC)

Function	Output format
① Real data output	STX Δ1, □□, □□, □, □□□□□□□□, □□□□□□□□, □□□□□□□□ Pattern No. Step No. PV(Measurement value) SV(Set value) All 9 digits in case of ±OR 0 in case of resetting PV status: 0=Normal, 1=+OR 2=-OR 4=Hardware error □, □, □□□, □□ □, □□□□□□□□, □, □□□□□□□□ Time unit [1=Minute, 2=Hours, 3=Days] MV1 (Output value) MV2(Output 2) In case of output 2 format Data in output 1 becomes a dummy data Time display system [1=Elapsed step, 2=Elapsed pattern, 3=Remaining step, 4=Remaining pattern] 0=0= AUTO, 1=1= MAN, 2=2= AT, 3=3= PRG, END OUT, 4=4= PV ERR OUT, 5=5= FB AT, 6=6= RESET ETX BCC CR LF All 9 digits in case of over range (Note) PV, SV data up to 4 positions after the decimal point can be sent and if it exceeds 6 digits including the decimal point, the digit in the lowest position is truncated.
② Mode 0 Execution parameter output	STX Δ2, □□□□□□□□, □□□□□□□□, □□□□□□□□, □□□□□□□□ Execution target SV Execution P Execution I □□□□□□□□, □□□□□□□□, □□□□□□□□, □□□□□□□□ Execution D Execution AL1 Execution AL2 □□□□□□□□, □□□□□□□□, □□□□□□□□, □□□□□□□□ Execution AL3 Execution AL4 Execution OL □□□□□□□□, □□□□□□□□, □□□□□□□□, □□□□□□□□ Execution OH Execution variation limit Execution sensor correction □□□□□□□□, □□□□□□□□, □□□□□□□□, □□□□□□□□ Second P Second I Second D In case of output 2 format, the data becomes dummy data in output 1. ETX BCC CR LF (Note) Output variation reads the ascending value.
③ Setting program pattern data output [In case of reset only]	(i) Step 0 output STX Δ3, Δ1, □□, Δ0, □□□□□□□□, □, ETX BCC CR LF Pattern No. Step No. Start SV 0= Start SV 1= Start PV (ii) Step n output STX Δ3, Δ2, □□, □□, □□□□□□□□, □□□, □□, □□, □□ Pattern No. Step No. SV Time. Repeat count Δ0= Repeat start step ΔΔ= Un-set step □, □, □, □, □, □, □, □□, □□, □□, □□, □□, □□ PID ALM OPL OSL TS1 TS2 TS3 TS4 TS5 No. No. No. No. Waiting time No. Real temperature compensation No. Sensor correction No. 0=ALL OFF 1=No.1 2= Repeat No.1 17=ALL ON ETX BCC CR LF

Function	Output format
	(iii) END step output STX Δ3, Δ3, □□, □□, □□, □□□□□□, ETX BCC CR LF Pattern No. Step No. Output in case of END Link destination 0= Output 0 Pattern No. 200= Fixed control 0=No link (Note) When output is read in case of END, output in case of END of output 1 is read. (iv) Repeat pattern output STX Δ3, Δ6, □□□□□□□□, ETX BCC CR LF Repeat count
④ Individual setting parameter output	KP sends the requested setting parameter. Sending format is the same as individual parameter setting format in case of setting from PC in KP. (See 9-3-5) However as the number of digits of the data differ, see Appendix 1 Communication format list for the details.
⑤ Program pattern setting status output	STX Δ5, □□, □□, ETX BCC CR LF □□ Setting step count 0= Not set □□ Pattern No.
⑥ Device status output	STX Δ6, □, □, □, □, □, □, □, □, □, □, ETX BCC CR LF □ 1=Controller 2=Setter □ 0=Setter 1=Full multi-input 2=4-wire type Input □ Output 1 1=61, 65 2=62 3=63 □ Time unit 0=Hours/minutes 1=Minute/seconds □ Select pattern □ External drive □ Time signal □ Transmission 0=Does not exist 1=Exists □ Output 2 0=None 1=61, 65 3=63

Function	Output format
⑦ Mode lock status output	STX Δ7, ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ETX BCC CR LF 1 2 3 4 5 6 7 8 Mode 0 FNC key { 0= Non lock 1=Lock 2=NoDisp
⑧ Status 1 Output	STX Δ8, ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , AL1 AL2 AL3 AL4 TS1 TS2 TS3 TS4 TS5 { 00=Alarm OFF 01=Alarm ON 10=Waiting Alarm OFF Error { 0=Normal 1=+OR 2=—OR 4=Hardware error Waiting time alarm { 0=OFF 1=ON Time signal { 0=OFF 1=ON ETX BCC CR LF
⑨ Status 2 Output	STX Δ9, ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , RUN { 0= 1=RUN STOP { 0= 1=STOP RESET { 0= 1=RESET END { 0= 1=END ADV { 0= 1=ADV CONST { 0=PRG 1=CONST M/S { 0=Master 1=Slave FNC key { 0=Non lock 1=Lock LOCK { 0=Normal 1=AT in process AT { 0=Normal 1=Real temperature compensation WAIT { 0=Normal 1=Real temperature compensation MAN2 { 0=AUTO In case of output 2 format 1=MAN Data in output 1 becomes the dummy data. MAN1 { 0=AUTO 1=MAN ETX BCC CR LF

9-3-3. Command that moves the KP status (PC → KP)

Command function	Command format
① Program drive [FNC lock]	STX Δ2, Δ1, □, □□, ETX BCC CR LF Pattern No. 1=RUN 2=STOP 3=ADV 4=RESET 5= Select pattern [Only in case of selecting RUN, pattern.] In cases other than that space is set (Note) When external drive input, select pattern input are attached, it is necessary to set the program drive system, select pattern system in COM. (communication), in mode 1.
② Execution parameter setting [Mode 0 lock]	STX Δ2, Δ2, □□□□, □□□□, □□□□, □□□□□□, P I D AL1 □□□□□□, □□□□□□, □□□□□□, □□□□□□, □□□□□□, AL2 AL3 AL4 OL OH □□□□□□, □□□□□□, ETX BCC CR LF OSL Sensor correction (Note) OSL sets the ascending/descending absolute value. In other cases alarm format AL becomes the dummy data.
③ AUTO/MAN switching [FNC lock]	STX Δ2, Δ3, □, □□□, □, □□□, ETX BCC CR LF MV1 Set manual output value MV2 In case of output format 2 Space setting in output 1 format [0=MV2 AUTO, at that time MV1 is space setting] 1=MV1 MAN [0=MV1 AUTO, at that time MV1 is space setting] 1=MV1 MAN

Command function	Command format
④ Fixed control (CONST) [Mode 1 lock]	STX Δ2, Δ4, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF SV [0=PRG, at that time SV is space setting 1=CONST
⑤ Alarm Cancel output [Mode 1 lock]	STX Δ2, Δ5, ETX BCC CR LF (20)
⑥ Auto tuning Start/stop [Mode 1 lock]	STX Δ2, Δ6, ☐ ETX BCC CR LF [0=AT stop 1=AT1 start 2=AT2 start 3=AT3 start
⑦ Mode Lock/release lock	STX Δ2, Δ7, ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ☐ , ETX BCC CR LF Mode 0 FNC key 1 2 3 4 5 6 7 8 [0=Non lock 1=Lock
⑧ Time display system [Mode 1 lock]	STX Δ2, Δ8, ☐ , ETX BCC CR LF [1=Elapsed step 2=Elapsed pattern 3=Remaining steps 4=Remaining pattern

9-3-4. Program pattern setting (PC → KP) [At the time of resetting only] [Mode 2 lock]

Set field	Set format
① Step 0	STX Δ3, Δ1, □□, 0 0, □□□□□□, □, ETX BCC CR LF Pattern No. Step No. Start SV 0= Start SV 1=Start PV
② Step n	STX Δ3, Δ2, □□, □□, □□□□□□, □□□, □□, Pattern No. Step No. SV Time ETX BCC CR LF When setting the relevant step for the first time, if time is set as "0" (000 hours/00 minutes, or 000 minutes/00 seconds) error code 41 may occur. When setting the time as "0", set the time as 000 001 and after the pattern setting is done, change the setting to 0000 000 . (Note) Delimiter of time hours/minutes, minutes/seconds is period.
③ END step	STX Δ3, Δ3, □□, □□, □□, □□□□□□, ETX BCC CR LF Pattern No. Step No. Output in case of END 0= Output 0 200= Fixed control Link destination pattern No. 00=No link (Note) When output is written at the time of END, output is set at the time of END of output 1, output 2.
[Mode 2 lock] [Mode 4 lock]	④ Parameter No. setting
	STX Δ3, Δ4, □□, □□, □, □, □, □, □, □, □, □, Pattern No. Step No. PID No. ALM No. OPL No. OSL No. Waiting time number Real temperature compensation No. (0=OFF) Sensor correction No. □□, □□, □□, □□, □□, ETX BCC CR LF TS1 TS2 TS3 TS4 TS5 00=ALL OFF *Set 00 in case of no TS. 01=No.1 02=Repeat No.1 16=Repeat No.8 99=ALL ON
⑤ Repeat step	STX Δ3, Δ5, □□, □□, □□, □□, ETX BCC CR LF Pattern No. Starting step Starting < End, always End step Repeat count 1 to 99=Count 00=Cancel repeat
⑥ Repeat pattern	STX Δ3, Δ6, □□□□, ETX BCC CR LF Repeat count
⑦ Copy pattern	STX Δ3, Δ7, □□, □□, ETX BCC CR LF Copy source pattern No. Copy and Pattern
⑧ Clear pattern	STX Δ3, Δ8, □□, ETX BCC CR LF 00=Clear ALL 1 to 19=Clear pattern unit

9-3-5. Individual parameter setting (PC → KP)

Parameter type	No.	Format
Alarm (1 to 8) [Mode 3 lock]	12	STX 12, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐☐☐☐☐☐ AL1 ☐☐☐☐☐☐ AL2 ☐☐☐☐☐☐ AL3 ☐☐☐☐☐☐ ETX BCC CR LF ☐☐☐☐☐☐ AL4 Do not change the setting when all digits are space. 1 to 8=PID No. 0=Copy to No. 1 to 8 (Note) When alarm format is something else AL becomes the dummy data.
PID (1 to 8) (91 to 98) [Mode 3 lock]	13	STX 13, ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐☐☐☐☐☐ P ☐☐☐☐☐☐ I ☐☐☐☐☐☐ D ETX BCC CR LF Do not change the setting when all digits are space. 1 to 8=PID No. 91 to 98=PID No. 0=No.1 to 8, 90=Copy to No.91 to 98
Output variation limit (1 to 8) [Mode 4 lock]	14	STX 14, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF 1 to 8=Parameter No. 0=Copy to No. 1 to 8 (Note) When output variation limit is read, ascending value is read and when it is written ascending/descending absolute value is set.
Output higher and lower limit (1 to 8) [Mode 4 lock]	15	STX 15, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF ☐☐☐☐☐☐ OL-L ☐☐☐☐☐☐ OL-H Do not change the setting when all digits are space. 1 to 8=Parameter No. 0=Copy to No. 1 to 8
Sensor correction (1 to 8) [Mode 5 lock]	16	STX 16, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF 1 to 8=Parameter No. 0=Copy to No. 1 to 8
Real temperature compensation (1 to 8) [Mode 6 lock]	17	STX 17, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF 1 to 8=Parameter No. 0=Copy to No. 1 to 8
Waiting time alarm (1 to 8) [Mode 6 lock]	18	STX 18, ☐ , ☐ ☐ ☐ . ☐ ☐ ☐ , ETX BCC CR LF 1 to 8=Parameter No. 0=Copy to No. 1 to 8 (Note) Delimiter for time hours/minute, minutes/seconds is a period.

Parameter type	No.	Format
Time signal (1 to 8) [Mode 6 lock]	19	STX 19, ☐ , ☐ ☐ ☐ . ☐ ☐ , ☐ ☐ ☐ . ☐ ☐ , ETX BCC CR LF ON Time OFF Time Do not change the setting in case of 6 digits space. 1 to 8=Parameter No. 0=Copy to No. 1 to 8 (Note) Delimiter for time hours/minute, minutes/seconds is a period.
Digital filter [Mode 5 lock]	20	STX 20, ☐ ☐ ☐ ☐ , ETX BCC CR LF
Transmission type Transmission scale [Mode 7 lock]	21	STX 21, ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF Scale Min Scale MAX Do not change the setting when all digits are space. Transmission type 0=SV 1=PV 2=MV1 4=MV2 5=Others (Note) Transmission type:5=Others cannot be written.
Output 2 gap [Mode 3 lock]	22	STX 22, ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF
Output 2 PID [Mode 3 lock]	23	STX 23, ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ , ETX BCC CR LF Second P Second I Second D
Output 2 variation limit [Mode 4 lock]	24	STX 24, ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF (Note) When output 2 variation limit is read, ascending value is read and when it is written ascending/descending absolute value is set.
Output 2 higher and lower limit [Mode 4 lock]	25	STX 25, ☐ ☐ ☐ ☐ ☐ ☐ , ☐ ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF Second OL Second OH Do not change the setting when all digits are space.
Second position 2 dead band [Mode 3 lock]	26	STX 26, ☐ ☐ ☐ , ETX BCC CR LF
Output in case of PV 2 abnormality [Mode 4 lock]	27	STX 27, ☐ ☐ ☐ ☐ ☐ , ETX BCC CR LF (Note) When output is read during PV 2 abnormality, higher limit value is read and when it is written higher limit/lower limit value is set.
Output 2 Direct/reverse [Mode 4 lock]	28	STX 28, ☐ , ETX BCC CR LF 0=DIRECT 1=REV.

Parameter type	No.	Format
Measurement input unit [Mode 5 lock]	30	STX 30, , , ETX BCC CR LF Unit:0=°C, 2=K Input unit No.
RJ INT/EXT [Mode 5 lock]	31	STX 31, , ETX BCC CR LF 0=INT 1=EXT
SV decimal point [Mode 5 lock]	32	STX 32, , ETX BCC CR LF (Note) Differs from display SV decimal point.
PV decimal point [Mode 5 lock]	33	STX 33, , ETX BCC CR LF
Alarm delay [Mode 3 lock]	34	STX 34, , ETX BCC CR LF
Alarm format Alarm dead band [Mode 3 lock]	35	STX 35, , , , ETX BCC CR LF Dead band Alarm format: 0=DV-H, 1=DV-HW, 2=DV-L, 3=DV-LW, 4=PV-H, 5=PV-L, 6=Other 1 to 4=Alarm No. 0=Copy to No.1 to 4 (Note)Alarm format:6=Other than that cannot be written.
Position 2 dead band [Mode 3 lock]	36	STX 36, , ETX BCC CR LF
Pulse cycle [Mode 4 lock]	37	STX 37, , ETX BCC CR LF (Note) When pulse cycle is read, pulse cycle of output 1 is read and when it is written, pulse cycle of output 1 and output 2 is set.
FB zero Span Gain [Mode 4 lock]	38	STX 38, , , , ETX BCC CR LF Zero Span Gain Do not change the setting when all digits are space.
Output preset [Mode 4 lock]	39	STX 39, , ETX BCC CR LF (Note) When output preset is read, No. 1 is read and when it is written, it is set in No.1 to No.8.
Output at the time of PV abnormality [Mode 4 lock]	40	STX 40, , ETX BCC CR LF (Note) When output is read in case of PV abnormality, higher limit value is read and when it is written, higher limit/lower limit value is set.
Output Direct/reverse [Mode 4 lock]	41	STX 41, , ETX BCC CR LF 0=DIRECT 1=REV.

Parameter type	No.	Format
Linear range [Mode 5 lock]	42	STX 42, <u>□□□□□□</u> , <u>□□□□□□</u> , ETX BCC CR LF ZERO SPAN Do not change the setting when all digits are space.
Linear scale [Mode 5 lock]	43	STX 43, <u>□□□□□□</u> , <u>□□□□□□</u> , ETX BCC CR LF MIN MAX Do not change the setting when all digits are space.
ARW [Mode 3 lock]	44	STX 44, <u>□□□□□</u> , <u>□□□□□</u> , ETX BCC CR LF Lower limit Higher limit Do not change the setting when all digits are space. (Note) When ARW is read No.1 is read and when it is written it is set in No.1 to No.8.
AT2 SV (1 to 8) [Mode 3 lock]	45	STX 45, <u>□</u> , <u>□</u> , <u>□□□□□</u> , ETX BCC CR LF AT2SV 0=OFF 1=ON 1 to 8=Parameter No. 0=Copy to No.1 to 8
SV section (AT3) (1 to 7) [Mode 3 lock]	46	STX 46 <u>□</u> , <u>□□□□□□</u> , ETX BCC CR LF Delimiter SV 1 to 7=Parameter No.
AT3 SV (1 to 8) [Mode 3 lock]	47	STX 47, <u>□</u> , <u>□</u> , <u>□□□□□</u> , ETX BCC CR LF AT3SV 0=OFF 1=ON 1 to 8=Parameter No.
AT start direction [Mode 3 lock]	48	STX 48, <u>□</u> , ETX BCC CR LF 0=UP 1=Down
SV during reset [Mode 2 lock]	49	STX 49, <u>□□□□□□</u> , ETX BCC CR LF

9-4. Positive response and negative response

9-4-1. Positive response

ACK	CR	LF
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ACK=06H

9-4-2. Negative response

NAK	Error	Code	CR	LF
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NAK=15H

* Do not apply STX, ETX, BCC to ACK/NAK.

9-4-3. Error code

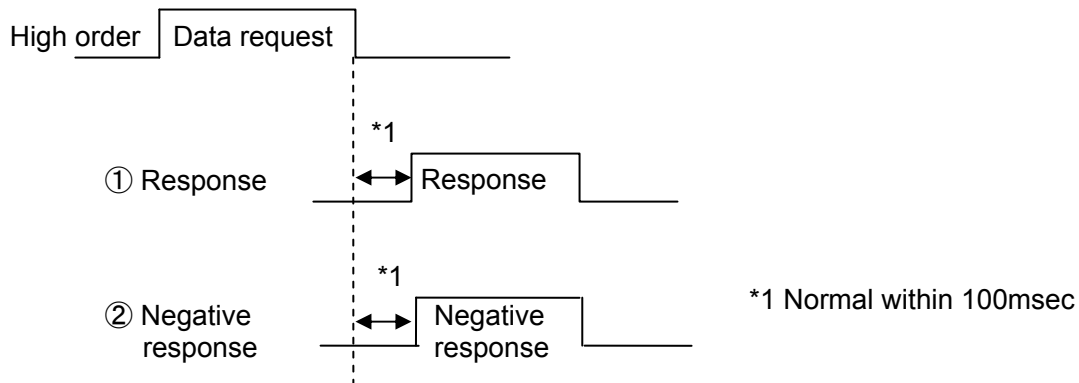
Code	Error type	Contents
△1	Framing	· During non lock, high order was confirmed and command was sent.
△2	Over run	
△3	Parity	
△4	Check sum	
△5	Lock/non lock	
10	Format	· First communication code error
11	"	
12	"	
14	"	
15	"	
16	Numeric value	· Excess reception buffer
20	Data	
21	"	
22	"	
23	"	
24	"	· Cannot recognize as numerals.
25	"	
30	Program drive	
31	"	
32	"	
33	"	· Undefined numeric value is received. (Numeric value is out of range)
34	"	
35	External drive OP	

(Note)△=Space

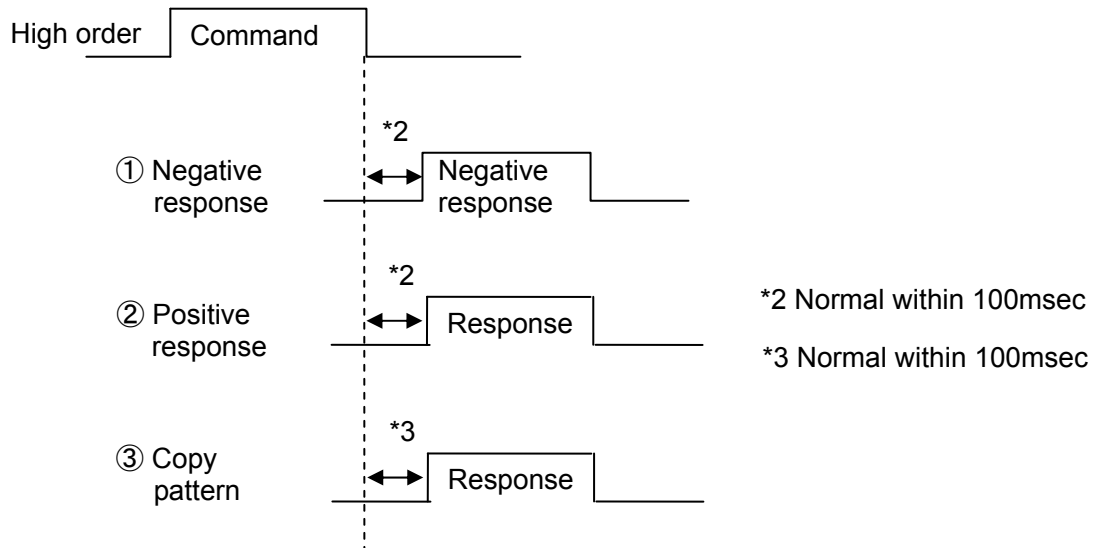
Code	Error type	Contents
36	Select pattern OP	· Select pattern selected the pattern in case of KEY or ETX
40	Set pattern	· Set the pattern except for RESET.
41	"	· Continued 2 steps and set Time=0.
43	"	· Set parameter No. in unset step (END step).
44	"	· Did repeat setting in unset step.
45	"	· Set after END step. (Add)
46	"	· Set END after unset step.
50	Copy pattern	· Copy pattern except in case of RESET.
51	"	· Copy destination is not cleared.
52	"	· Copy source pattern is not set.
53	Clear pattern	· Clear pattern except during RESET.
54	Read pattern	· Read requested the pattern data except during RESET.
55	"	· Read requested the unset step.
60	RUN;PTN No.	· Unset pattern is RUN. (Link destination includes the unset pattern)
61	RUN; Repeat step	· Repeat step setting of the pattern that was RUN is an error
65	AT start	· Started AT1 during RESET, PRG.
66	"	· Started AT2 except for RESET, PRG.
67	"	· Started AT3 except for RESET, PRG.
99	Others	· At the time of other error

9-5.Communication time chart

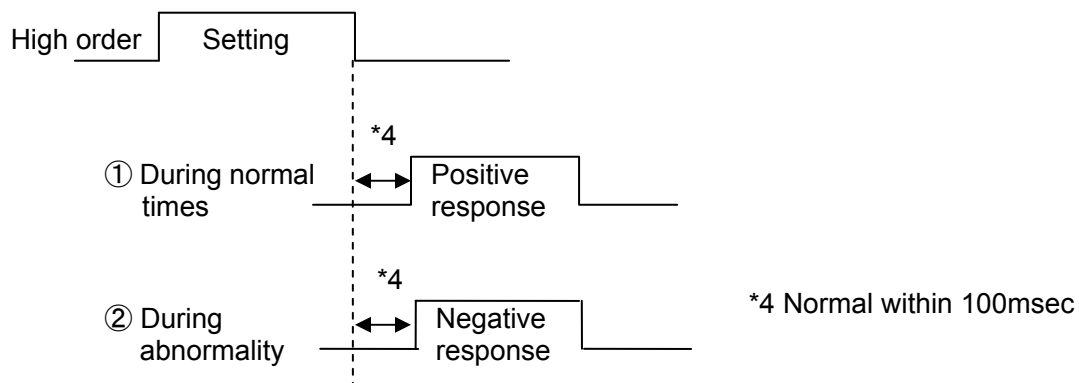
9-5-1. Response to data request



9-5-2. Response to command

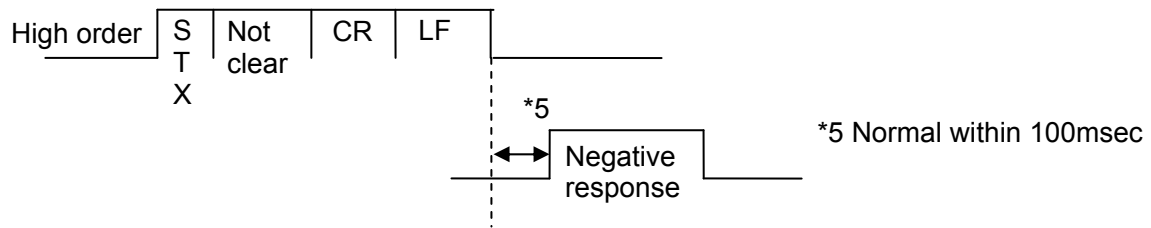


9-5-3. Response to pattern setting, parameter setting

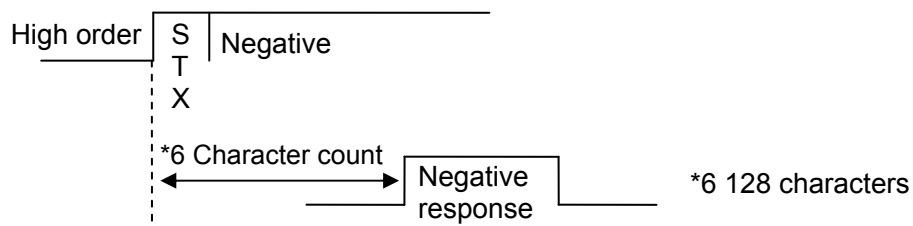


9-5-4. During other abnormalities

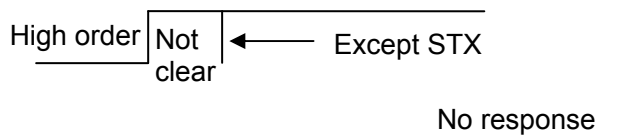
① Contents unclear



② Exceeding character count (Excess buffer)



③ When beginning with other than STX



Precautions

* When the front key operation 1 to 5 is to be repeated, it takes some seconds.

9-5-5. Response of PC

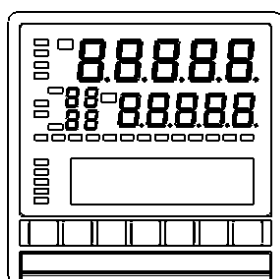
Response of KP for the request and setting from PC is carried out after a certain time. In other words if there is no response from KP after a fixed time, it is necessary send a request and settings from the PC again. For timer time when it is resend, see the time chart.

10. Communication (Digital) transmission

10-1. Overview

KP can, not only communicate with the PC but also can digitally communicate with KP → DB device (Between our company's controller-DB). It is called "Communication transmission" "Communication remote".

If this function is used, DBs on multiple machines operate with the same condition, consider KP as master device which is set in communication transmission and DB as slave device which is set in communication remote. Maximum 31 slave device SVs can be set using communication. It can be change to KP (master device) doing communication transmission or to communication remote DB (slave device) receiving it, by key settings of device itself.



If communication function of mode 8 is set as 'TRANS', it becomes a communication transmission (master unit) function.

(Communication function settings and transmission data contents)

Mode 8, Communication function settings (Master unit) → (Slave unit)	Transmission data contents
MODBUS protocol (Transmission) → (Remote) [Between DB/KP series]	• MODEBUS protocol • Master unit transmits "Run/Ready status", "SV No.", and "remote SV data (no decimal point information)", and then slave unit receives it
PRIVATE protocol (Transmission) → (Remote) [Between KP and controller of out company]	• PRIVATE protocol • Master unit transmits "remote SV data (with decimal point information)", and slave unit receives it. • To be compatible with controllers of our company except DB/KP series.

※Perform the following operation as master unit.

• MODBUS protocol

- ①Run/Ready ... Master unit: Transmit program operation
Run = Except program operation RESET
Ready = Program operation RESET
- ②SV No. ... Master unit: Transmit Executing PID No. of mode 0
- ③Remote SV data ... Transmit data selected in communication transmission type

• PRIVATE protocol

- Remote SV data ... Transmit data selected in communication transmission type

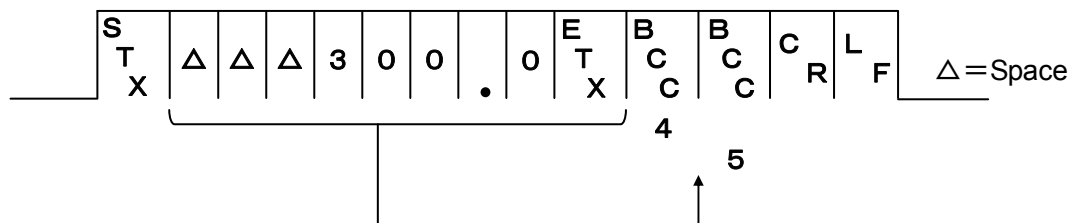
10-2. Specifications of communication division

- Communication system :Asynchronous method
- Communication speed :38400,19200,9600,4800,2400bps switching communication speed
- Start bit :1 bit
- Data length :7 bit (ASCII mode/PRIVATE mode) or 8 bits (RTU mode/ASCII mode)
- Parity bit :None (RTU mode/ASCII mode), Even (RTU mode/ASCII mode/PRIVATE mode), Odd (RTU mode/ASCII mode)
- Stop bit :1 bit (RTU mode/ASCII mode/PRIVATE mode), 2 bits (RTU mode/ASCII mode)
- Transmission code :ASCII (ASCII mode/PRIVATE mode) or Binary (RTU mode)
- Error check :Check sum ※1...For PRIVATE mode
:CRC-16 ...For RTU mode
:LRC ...For ASCII mode
- Usage signal name : Send or receive data only, without using control signal

※1 Check sum (BCC)

Check sum means, total sum of characters after STX up to ETX is calculated, lower order 8 bits are split into high and low order 4 bits and are converted to characters from 0 to F and are sent and received sequentially in high order and low order.

(Example)



Character	Δ	Δ	Δ	3	0	0	.	0	ETX	Total sum=BCC
ASCII code	20h	20h	20h	33h	30h	30h	2Eh	30h	03h	154h=45

10-3. Communication transmission setting

Set the following parameters in communication transmission KP.

- 1) Setting the communication speed (COM BIT RATE). (See 6-1)
- 2) Setting the communication function (COM KIND). (See 6-3)
- 3) Setting communication transmission type (COM TRANS KIND). (See 6-4)
- 4) Setting communication protocol (COM PROTOCOL). (See 6-5)
- 5) Setting communication character (COM CHARACTER). (See 6-6)

Reference In case of 'PRIVATE mode' communication transmission, KP outputs the data in the following format.

s_{TX} ○ ○ ○ ○ ○ ○ ○ ○	E_{TX} B_C B_C C_R L_F
--------------------------	----------------------------------

Data output: PV (measurement value), SV (Control setting value), MV1 (Output 1 value), MV2 (Output 2 value), MFB (Feedback value), RSV (Remote SV), SUB (Subsidiary output)

※ In case of 'RTU/ASCII mode' communication transmission, output the data by slave address '0' in MODBUS format mentioned earlier.



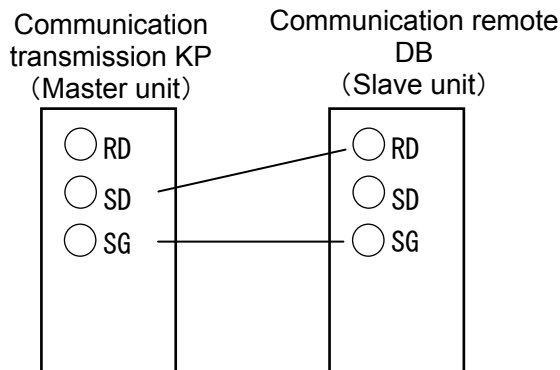
Precautions

- ① When connecting KP using communication transmission and DB using communication remote, the communication speed and transmission protocol must be the same.
- ② If analog remote and communication remote are used simultaneously analog remote takes precedence.
- ③ Analog transmission type and communication transmission type can be set separately.
- ④ If analog transmission option and communication transmission option are used simultaneously, transmission output is done from both.

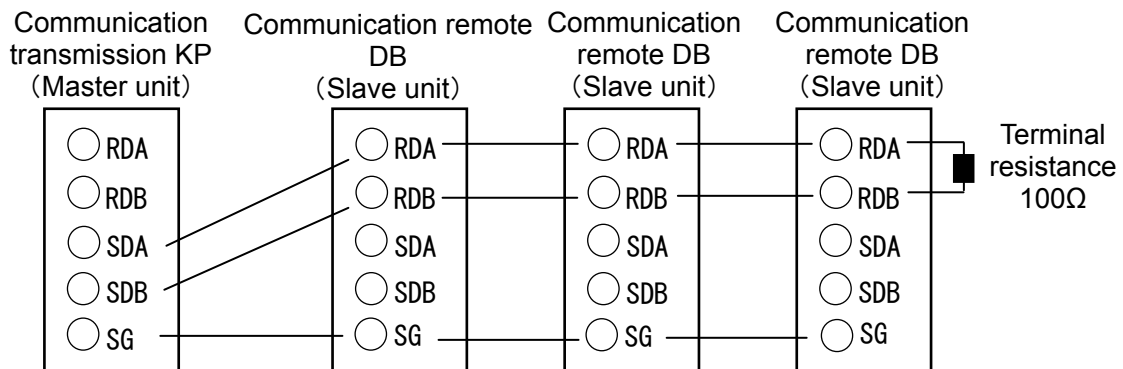
'Transmission scale lower limit' 'Transmission scale higher limit' 'remote scale lower limit' 'remote scale higher limit' of the parameter is set at the time of analog transmission/remote. Thus when using communication transmission one need not set them.

10-4. Wiring

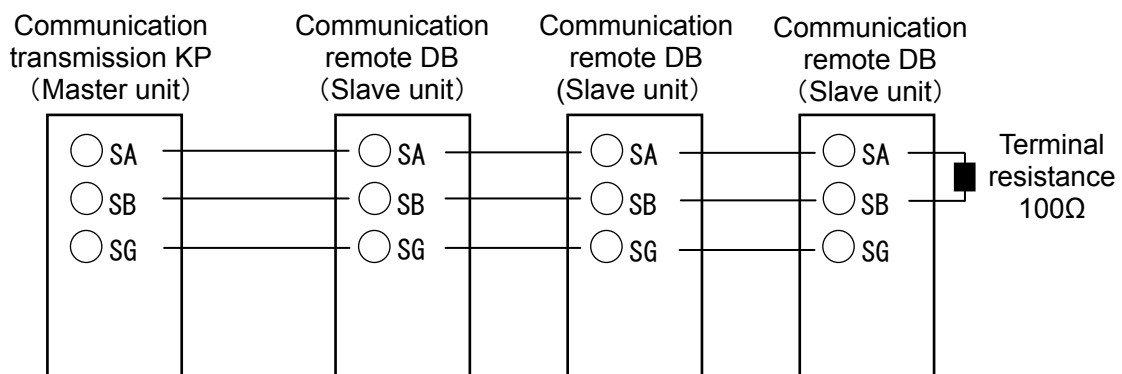
10-4-1. For RS-232C



10-4-2. For RS-422A



10-4-3. For RS-485



Precautions

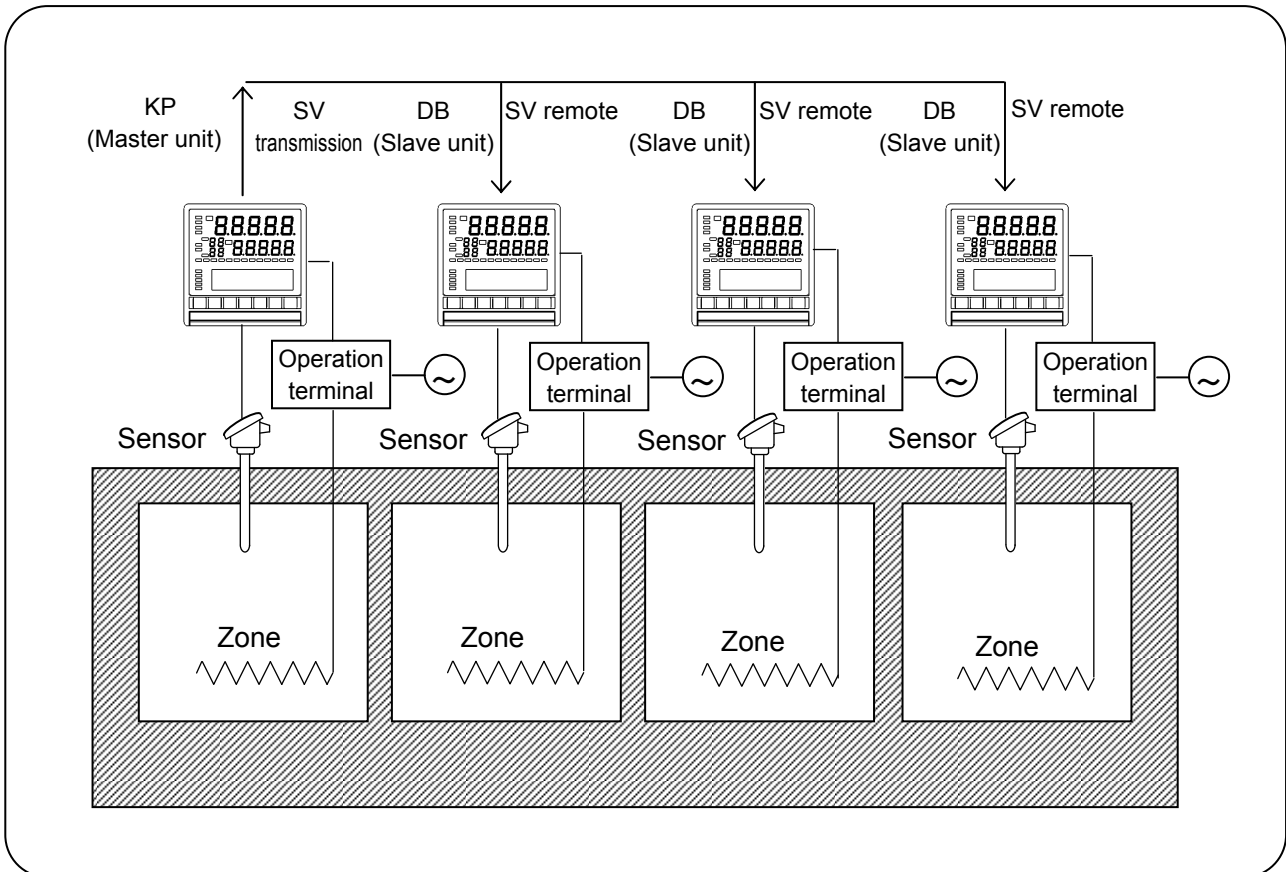
Refer to 4-3. Wiring in instruction manual [general] for terminal numbers.

10-5. Example of combination

10-5-1. Multizone temperature control

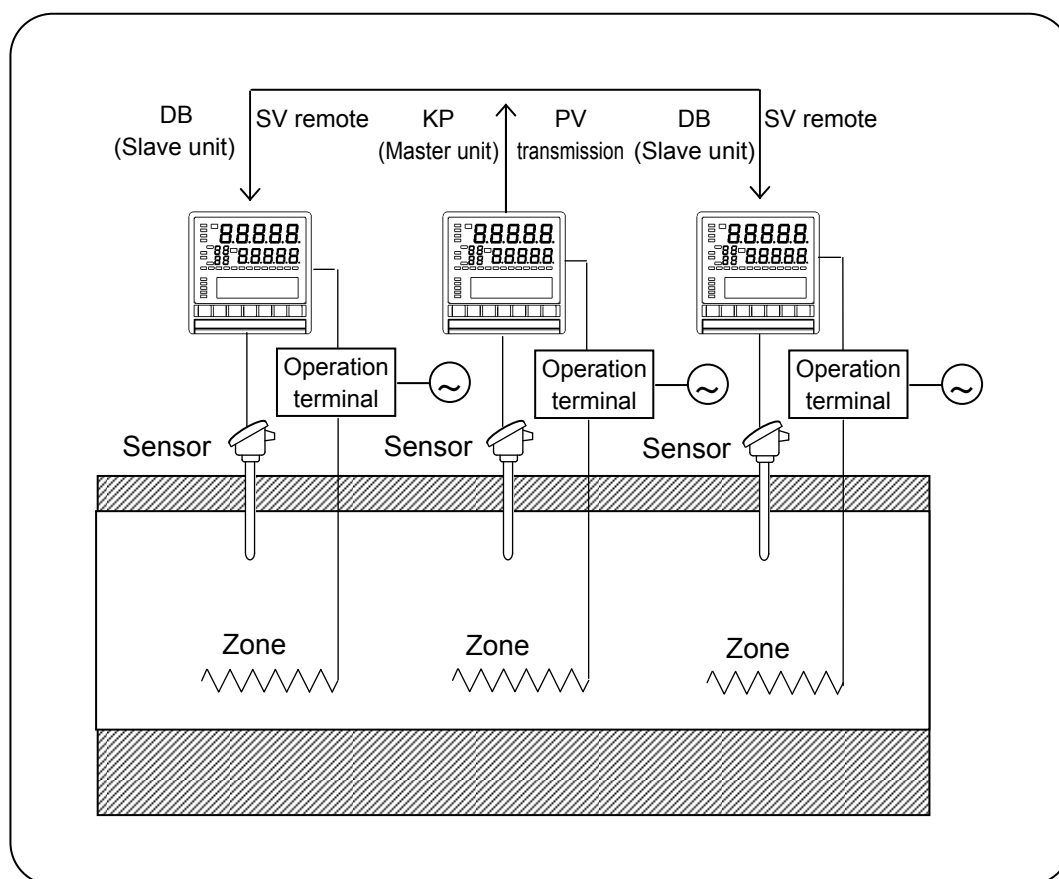
Perform communication transmission for SV using KP of master unit, and slave unit DB receives using communication remote.

As there is no error in analog division, remote control with good precision is possible. If remote shift of DB is used, temperature slope can be held in multizone,



10-5-2. Controlling burning furnace zone

Communication transmission for PV is done using master unit in the center and both the slave unit SV as PV using communication remote and soaking furnace can be controlled properly.



11. Appendix

11-1. Communication format list

As mentioned below Δ=Space(20H), X=Code data and numeric value data at the time of setting, O=Code data and numeric value data at the time of sending KP, SX=STX(02H), EX=ETX(03H), BCBC=BCC, CR=CR(0DH), LF=LF(0AH).

Communication Item	Format																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Real data request	SX	Δ	1	,	Δ	1	,	EX	BC D	BC F	CR	LF																				
Response output	SX	Δ	1	,	○	○	,	○	○	,	○	,	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	○	,	
	PTN				STP				PV								SV															
	○	,	○	,	○	○	○	,	○	○	,	○	,	○	○	○	○	○	○	○	○	,	○	,	○	○	○	○	○	○	○	
	TIME				MV1												MV2															
	○	○	,	EX	BC	BC	CR	LF																								
	(MV2)																															
Execution parameter request	SX	Δ	1	,	Δ	2	,	EX	BC E	BC F	CR	LF																				
Response output	SX	Δ	2	,	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	○	○	
	SV								P								I															
	,	○	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	,	○	○
	D				AL1												AL2				AL3											
	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	○	,	○	○	○	○	○	
	(AL3)				AL4								OL-L								OL-H											
	○	○	○	,	○	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	
	(OL-H)				OSL								Sensor correction								Second_P											
	,	○	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	,	EX	BC	BC	CR	LF							
	Second_I												Second_D																			

Communication Item	Format																																																											
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Setting program Pattern data request	SX	Δ	1	,	Δ	3	,	x	x	,	x	x	,	EX	BC	BC	CR	LF																																										
	PTN										STP																																																	
Step 0 output	SX	Δ	3	,	Δ	1	,	○	○	,	Δ	0	,	○	○	○	○	○	○	○	○	,	○	,	EX	BC	BC	CR	LF																															
	PTN										Start SV																																																	
Step n output	SX	Δ	3	,	Δ	2	,	○	○	,	○	○	,	○	○	○	○	○	○	○	○	,	○	○	,	○	○	,	○	○	,	○																												
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	,	EX	BC	BC	CR	LF																																																						
END step output	SX	Δ	3	,	Δ	3	,	○	○	,	○	○	,	○	○	,	○	○	○	,	EX	BC	BC	CR	LF																																			
	PTN										STP										Link																																							
Pattern repeat output	SX	Δ	3	,	Δ	6	,	○	○	○	○	○	○	○	○	,	EX	BC	BC	CR	LF																																							
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Individual settings Parameter request	SX	Δ	1	,	Δ	4	,	x	x	,	x	x	,	EX	BC	BC	CR	LF																																										
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Program pattern Setting status request	SX	Δ	1	,	Δ	5	,	x	x	,	EX	BC	BC	CR	LF																																													
	PTN																																																											
Response output	SX	Δ	5	,	○	○	,	○	○	,	EX	BC	BC	CR	LF																																													
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Device status request	SX	Δ	1	,	Δ	6	,	EX	BC 2	BC 0	CR	LF																																																
Response output	SX	Δ	6	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	EX	BC	BC	CR	LF																																	
Mode lock Status request	SX	Δ	1	,	Δ	7	,	EX	BC 3	BC 0	CR	LF																																																
Response output	SX	Δ	7	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	EX	BC	BC	CR	LF																														
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Status 1 Request	SX	Δ	1	,	Δ	8	,	EX	BC 4	BC 0	CR	LF																																																
Response output	SX	Δ	8	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○																											
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Response output	SX	Δ	9	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	○	,	EX	BC																											
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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Time signal	SX	1	9	,	x	,	x	x	x	,	x	x	,	x	x	x	,	x	x	,	EX	BC	BC	CR	LF					
	SX	1	9	,			O					O			O				O		EX	BC	BC	CR	LF					
	No.				ON_Time										OFF_Time															
Digital filter	SX	2	0	,	x	x	x	x	,	EX	BC	BC	CR	LF	BC	BC	CR	LF												
	SX	2	0	,	O	O	O	O		O	O	O		EX																
Transmission type	SX	2	1	,	x	,	x	x	x	x	x	x	,	x	x	x	x	x	x	,	EX	BC	BC	CR	LF	BC	BC	CR	LF	
	SX	2	1	,	O		O	O	O	O	O	O		O						O		O	O		EX	BC	BC	CR	LF	
	Type				Scale MIN										Scale MAX															
Second output gap	SX	2	2	,	x	x	x	x	x	x	,	EX	BC	BC	EX	CR	LF	BC	CR	LF										
	SX	2	2	,	O	O	O	O	O	O		EX																		
Second output PID	SX	2	3	,	x	x	x	x	x	,	x	x	x		x	x	x	x	x	,	EX	BC	BC	CR	LF	O	O	O	O	O
	SX	2	3	,	O	O	O	O	O		O	O	O		O	O	O	O	O		O	BC	BC	O	O	O	O	O	O	O
	Second_P										Second_I										Second_D									
	,	EX	BC	BC	CR	LF																								
Second output variation limit	SX	2	4	,	x	x	x	x	x	,	EX	BC	BC	CR	LF	BC	BC	CR	LF											
	SX	2	4	,	O	O	O	O	O		O	O		EX																
Second output higher and lower limit	SX	2	5	,	x	x	x	x	x	,	x	x	x		x	x	,	EX	BC	BC	CR	LF	O		EX	BC	BC	CR	LF_	
	SX	2	5	,	O	O	O	O	O		O	O		O			O	O	O	O		O			EX	BC	BC	CR	LF_	
	Second_OL-L										Second_OL-H																			
Second output dead band	SX	2	6	,	x	x	x	,	EX	BC	BC	CR	LF	EX	BC	BC	CR	LF												
	SX	2	6	,	O	O	O		O	O	BC	O		EX																
Output at the time of second PV abnormality	SX	2	7	,	x	x	x	x	x	,	EX	BC	BC	CR	LF	BC	CR	LF												
	SX	2	7	,	O	O	O	O	O		O	O		EX																
Second output Direct/reverse	SX	2	8	,	x	,	EX	BC	BC	CR	LF																			
	SX	2	8	,	O		EX	BC	BC	CR	LF																			
Measurement input unit	SX	3	0	,	x	x	,	x	,	EX	BC	BC	CR	LF																
	SX	3	0	,	O	O		O		EX	BC	BC	CR	LF																
Input Unit																														
SV decimal point	SX	3	2	,	x	,	EX	BC	BC	CR	LF																			
	SX	3	2	,	O		EX	BC	BC	CR	LF																			
PV decimal point	SX	3	3	,	x	,	EX	BC	BC	CR	LF																			
	SX	3	3	,	O		EX	BC	BC	CR	LF																			
Alarm delay	SX	3	4	,	x	x	x	x	x	x	,	EX	BC	BC	EX	CR	LF	BC	CR	LF										
	SX	3	4	,	O	O	O	O	O	O		O																		

Communication Item	Format																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
Alarm format	SX	3	5	,	x	,	x	,	x	x	x	x	x	,	EX	BC	BC	CR	LF	BC	BC	CR	LF									
Alarm dead band	SX	3	5		O		O		O	O	O	O	O		O	O	BC	BC	CR	EX	LF	BC	BC	CR	LF							
	No.					Mode					Dead band																					
Output dead band	SX	3	6	,	x	x	x	,	EX	BC	BC	CR	LF	,	EX	BC	BC	CR	LF													
	SX	3	6		O	O	O		O	O	O	O	LF		EX	BC	BC	CR	LF													
Pulse cycle	SX	3	7	,	x	x	x	,	EX	BC	BC	CR	LF	LF																		
	SX	3	7		O	O	O		EX	EX	BC	BC	CR	CR	LF	LF																
FB Zero	SX	3	8	,	x	x	x	x	x	x	,	x	x	x	x	x	x	x	x	x	EX	BC	BC	CR	LF	O	O	O	O	O	O	
Span	SX	3	8		O	O	O	O	O	O	O	O	O	,	O	O	O	O	O	O	O	O	EX	BC	BC	CR	LF	O	O	O	O	
Dead band	ZERO										SPAN										Dead band											
	,	EX	BC	BC	CR	LF																										
Output preset	SX	3	9	,	x	x	x	x	x	x	,	EX	BC	BC	EX	BC	BC	LF	BC	CR	LF											
	SX	3	9		O	O	O	O	O	O	O	O	BC	,	BC	EX	BC	BC	LF	BC	CR	LF										
Output during PV abnormality	SX	4	0	,	x	x	x	x	x	x	,	EX	BC	BC	CR	LF	BC	BC	CR	LF												
	SX	4	0		O	O	O	O	O	O	O	EX	O	BC	,	CR	EX	LF	BC	BC	CR	LF										
Output Direct/reverse	SX	4	1	,	x	,	EX	BC	BC	CR	LF	LF																				
	SX	4	1		O	,	EX	EX	BC	BC	CR	CR	LF	LF																		
Linear range	SX	4	2	,	x	x	x	x	x	x	,	x	x	x	x	x	x	x	x	O	EX	O	BC	O	BC	CR	LF	EX	BC	BC	LF	
	SX	4	2		O	O	O	O	O	O	O	O	O	,	O	O	O	O	O	O	O	O	EX	O	BC	O	BC	CR	LF	EX	BC	BC
	ZERO										SPAN																					
Linear scale	SX	4	3	,	x	x	x	x	x	x	,	x	x	x	x	x	x	x	x	O	EX	O	BC	O	BC	CR	LF	EX	BC	BC	CR	LF
	SX	4	3		O	O	O	O	O	O	O	O	O	,	O	O	O	O	O	O	O	O	EX	O	BC	O	BC	CR	LF	EX	BC	BC
	Scale MIN										Scale MAX																					
A.R.W	SX	4	4	,	x	x	x	x	x	x	,	x	x	x	x	x	x	x	x	EX	O	BC	BC	CR	LF	O	,	EX	BC	BC	CR	LF
	SX	4	4		O	O	O	O	O	O	O	O	O	,	O	O	O	O	O	O	O	O	EX	O	BC	O	BC	CR	LF	O		
	Lower limit										Higher limit																					
AT2 SV	SX	4	5	,	x	,	x	,	x	x	x	x	x	x	EX	BC	BC	CR	EX	BC	CR	LF	BC	CR	LF							
	SX	4	5		O	,	O	,	O	O	O	O	O	O	O	O	EX	BC	,	BC	EX	BC	CR	LF	BC	CR	LF					
	No.					AT2_SV																										
SV section	SX	4	6	,	x	,	x	x	x	x	x	x	O	EX	BC	BC	CR	BC	LF	BC	CR	LF										
	SX	4	6		O	,	O	O	O	O	O	O	O	O	EX	BC	,	BC	EX	BC	CR	BC	LF	BC	CR	LF						
	No.					Delimiter SV																										
AT3 SV	SX	4	7	,	x	,	x	,	x	x	x	x	x	x	O	EX	BC	BC	CR	BC	CR	LF	BC	CR	LF							
	SX	4	7		O	,	O	,	O	O	O	O	O	O	O	O	O	EX	BC	,	BC	EX	BC	CR	BC	CR	LF	CR	LF			
	No.					AT3 SV																										
AT start direction	SX	4	8	,	x	,	EX	BC	BC	CR	LF	LF																				
	SX	4	8		O	,	EX	EX	BC	BC	CR	CR	LF	LF																		
SV during reset	SX	4	9	,	x	x	x	x	x	x	O	EX	O	BC	BC	EX	BC	CR	BC	LF	BC	CR	LF									
	SX	4	9		O	O	O	O	O	O	O	O	O	BC	,	BC	EX	BC	BC	CR	LF											

11-2. Input type No. - Input type support table

① Thermocouple scale

No.	Input type
1	B
2	R1
3	R2
4	S
5	K1
6	K2
7	K3
8	E1
9	E2
10	E3
11	E4
12	J1
13	J2
14	J3
15	J4
16	T1
17	T2
18	WRe5-26
19	WRe0-26
20	NiMo
21	AuFe
22	N
23	PR5-20
24	PR20-40
25	Plati1
26	Plati2
27	U
28	L

② Direct current and current scale

No.	Input type
31	10mV
32	20mV
33	50mV
34	100mV
35	5V
36	20mA
37	10V

③ Resistance thermometer

No.	Input type
41	JPt100Ω1
42	JPt100Ω2
44	JPt100Ω4
45	JPt100Ω5
46	QPt100Ω1
47	QPt100Ω2
49	QPt100Ω4
50	Pt100Ω5
51	Pt50Ω
52	Pt-Co
53	Pt100Ω1
54	Pt100Ω2
56	Pt100Ω4
57	Pt100Ω5

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