INST.No.INE-806

CHINO

Digital Indicating Controller

DB2000

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

Table of Contents

1. Introduction

Thank you for purchasing Digital Indicating Controller 'DB 2000 series'.

DB 2000 series is Digital Indicating Controller with indicator accuracy of ±0.1%, control cycle of approximately 0.1 seconds and front size of 96X96mm.
Multi-range input and multi SV (8 type) 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.

A 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 DB and are used for communication with personal computer (hereinafter referred to as PC).

PC can receive measurement data from the DB, various parameters can be set and operation commands can be issued. Number of DB 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 instrument like PC and DB series, only some of them completely conform to the above specifications, and signal wire count and connectors for connection etc. may sometime differ from the specifications.

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 interface has can be connected unconditionally.

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

When investigating the RS-232C specifications, 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 DB series of a number of machines (maximum 31) through the signal that conforms to RS-422A/485.

PC that has RS-422A/485 communication interface is less however as it is a serial communication, connection can be easily done by using RS232C ⟺ RS-422A/485 signal converter.

Line converter (Our company model: SC8-10) for RS-232C ⟺ RS-422A/485 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

DB 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 can not be set by PRIVATE can be set by MODBUS. We recommended to use 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
・Step 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

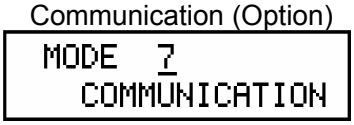
According to the Pro diagram set these 6 parameters 'Communication speed', 'Device number', 'Communication function', 'Communication transmission type', 'Communication protocol', 'Communication character'.

1.1. Click MODE key from the operation screen.

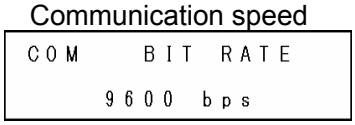
2.2. Select MODE7 from 'Select MODE screen' using ▽ △ keys.

3.3. Set the following items of Communication settings screen (MODE7).

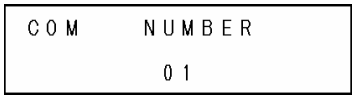
Communication (Option)



↓ SEL key

Communication speed  	Select the following communication speeds using ▽ △ keys Register using ENT key Setting range:2400,4800,9600,19200,38400

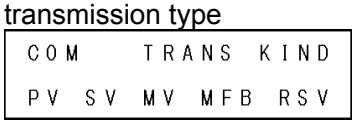
↓ SEL key

Device number  	Select instrument number using > ▽ △ keys Register using ENT key Setting range: 01 to 99

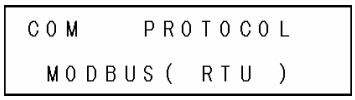
↓ SEL key

Communication function  	Select the communication function mentioned below using the > key Register using ENT key Setting range: COM, REM, TRANS

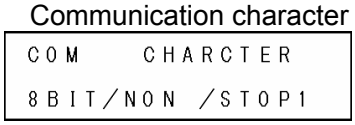
↓ SEL key

Communication transmission type  	Select communication transmission type using > key Register using ENT key Setting range : PV, SV, MV, MFB, RSV Using *[COM KIND] settings can be done on when TRANS is selected

↓ SEL key

Communication Protocol  	Select the communication protocol mentioned below using ▽ △ keys and register it using ENT key Setting range: MODBUS (RTU), MODBUS (ASCII), PRIVATE

↓ SEL key

Communication character  	Select communication characters mentioned below using the ▽ △ keys and register it using 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 if PRIVATE, the setting is 7BIT/EVEN/STOP1.

6-1. Communication speed (COM BIT RATE)

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

① Display ' COM BIT RATE' using SEL key.

② Select communication speed using ∨ ∧ keys and register it using ENT key.

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

6-2. Set device number (COM NUMBER)

Set the device number of DB at the time of RS-422A/485.
In single to multiple DBs that are communicating with the PC, always do the settings such that this DB does not overlap with the other DBs.

① 'COM NUMBER' is displayed using the SEL key.

② Select device number (1 to 99) using > ∨ ∧ keys, select it and register it using ENT key.

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

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

Set the communication function.

① Display 'COM KIND' using SEL key.

② Select communication function using > key and register it using ENT key.

③ If 'COM' is selected, it becomes a high order communication function.

④ If 'REM' is selected, it becomes communication remote function.

⑤ If 'TRANS' is selected, it becomes communication transmission function.

Communication function: COM, REM, TRANS

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

Set communication transmission kind.

① Display 'COM TRANS KIND' using SEL key.

② Select transmission kind using > key and register it using ENT key.

③ If 'PV' is selected, transmit measurement value (PV).

④ If 'SV' is selected, transmit setting value (SV).

⑤ If 'MV' is selected transmit output value (MV).

⑥ If 'MFB' is selected, transmit operation terminal feedback value (MFB).

However, it can be selected only when output format is ON OFF servo type.

⑦ If 'RSV' is selected, transmit remote SV (RSV).

However, it can be selected only in case of specifications with remote signal input.

⑧ 2In case of output specifications, output 1 side 'MV1' and output 2 side 'MV2' can be selected individually.

Transmission type: PV,SV,MV,MFB,RSV

6-5. Setting communication protocol (COM PROTOCOL)

① 'COM PROTOCOL' is displayed using SEL key.

② Select communication protocol using ∨ ∧ keys and register it using ENT key.

Selection	Communication Protocol	Initial value
RTU	MODBUS RTU	RTU
ASCII	MODBUS ASCII	
PRIVATE	PRIVATE	RTU

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

6-6. Setting communication character (COM CHARACTER)

① 'COM CHARACTER' is displayed using SEL key.

② Select communication character using ∨ ∧ keys and register it using ENT key.

【MODBUS RTU】

Selection	Bit length	Parity	Stop bit	Initial value
8N1	8bit	None	1	8N1
8N2			2	
8E1		Even	1	
8E2			2	
8O1		Odd	1	
8O2			2	

【MODBUS ASCII】

Selection	Bit length	Parity	Stop bit	Initial value
7E1	7bit	Even	1	7E1
7E2			2	
7O1		Odd	1	
7O2			2	
8N1	8bit	None	1	
8N2			2	
8E1		Even	1	
8E2			2	
8O1		Odd	1	
8O2			2	

[PRIVATE]

Selection	Bit length	Parity	Stop bit	Initial value
7E1	7bit	Even	1	7E1

7. Wiring

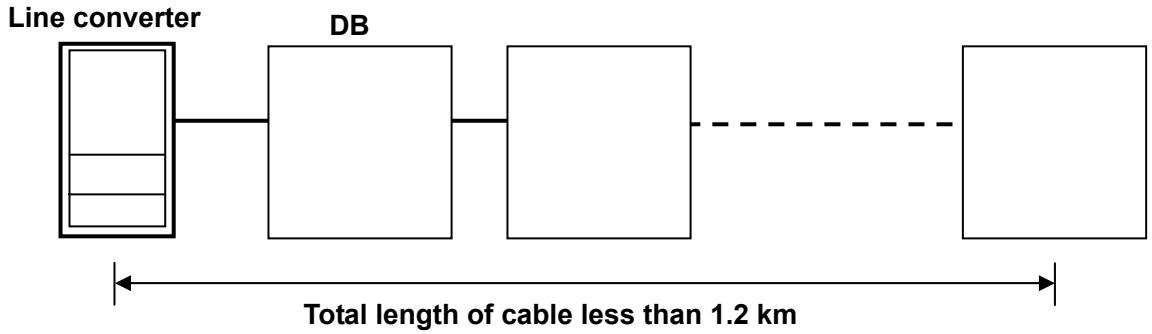
7-1. Precautions while wiring

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-422/485 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 ⟺ Last terminal DB)

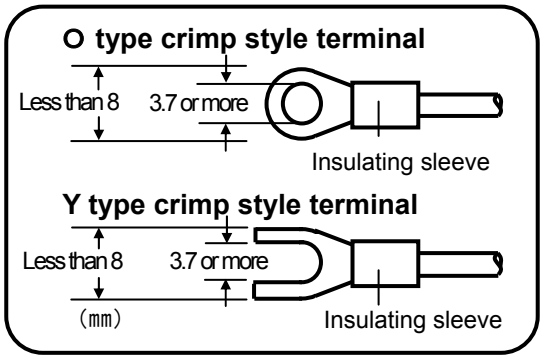


3. Take action to avoid intermixing of noise.

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 0 type or Y type crimp style terminal with insulation sleeve.
(Terminal screw of DB, line converter is M3.5mm.)



5. Apply last terminal resistance.

When using RS-422A/485 communication, apply a resistance of 100Ω to the DB place in the last terminal. (For details see clause 7.4)
(Generally metal coating resistance is okay. It is available with our company and you may order it.)

6. Number of machines of DB connections

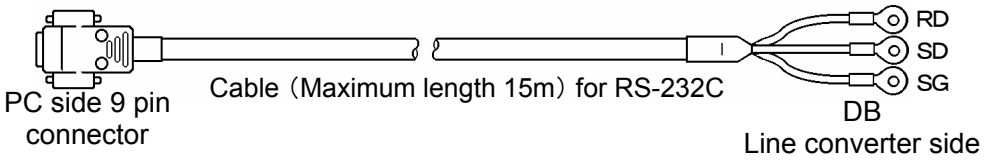
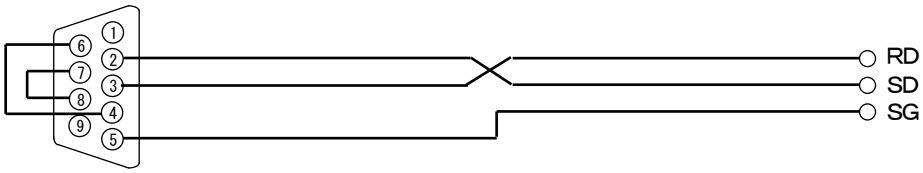
For RS-232C :1
For RS-422A/485 : Maximum 31

7-2. Cable for communication

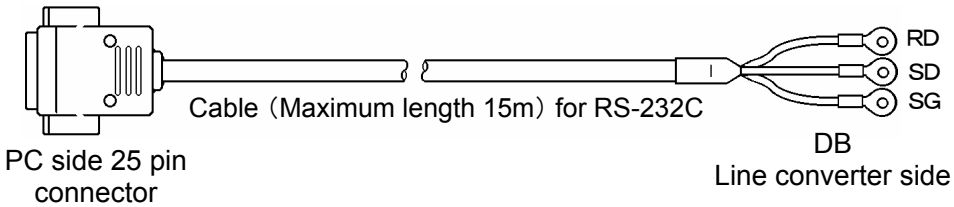
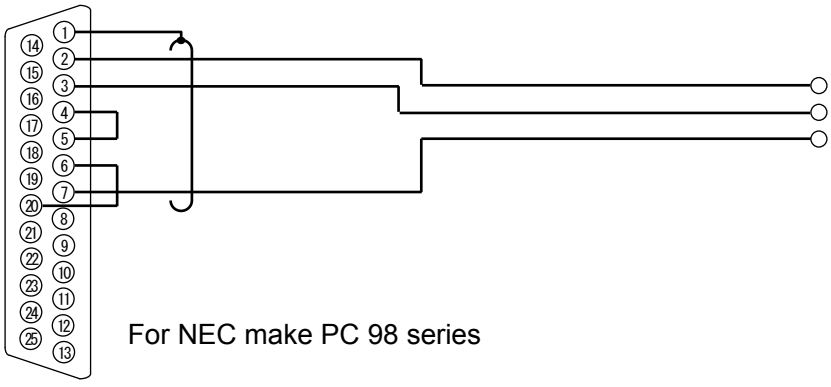
Before connecting get the exclusive communication cables ready. They are available with our company also and you can order them.

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

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

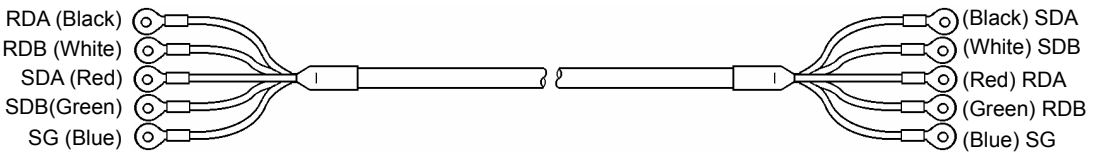
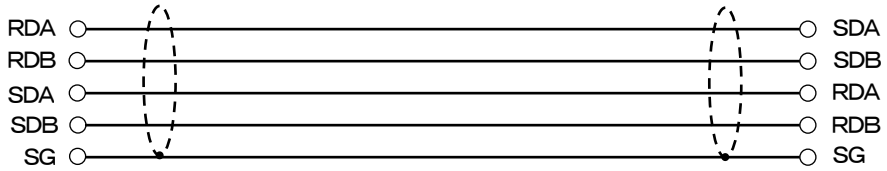
Cable	9 pin connector ↔ 0 type crimp-style terminal ↔RS-232 cable
Format	
Internal wiring	
Model code	**RZ-CRS6☐☐** Cable length is 1 to 15m (Specified)

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

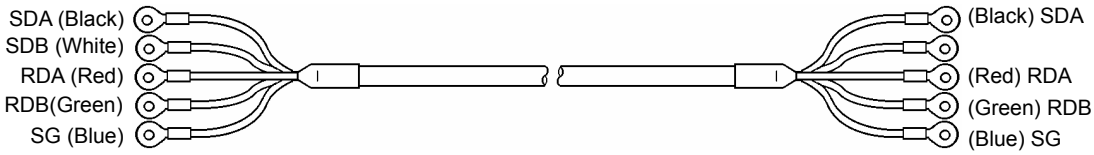
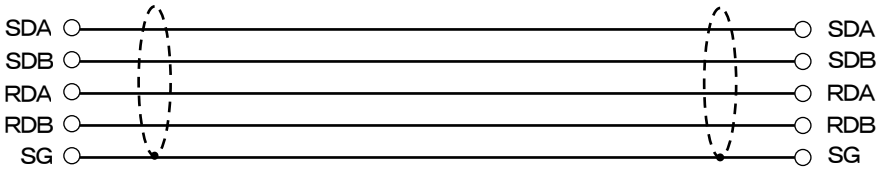
Cable	25 pin connector ↔ 0 type crimp-style terminal RS-232C cable
Format	
Internal wiring	
Model code	**RZ-CRS2☐☐** Cable length is 1 to 15m (Specify)

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

①Connection between line converter and DB

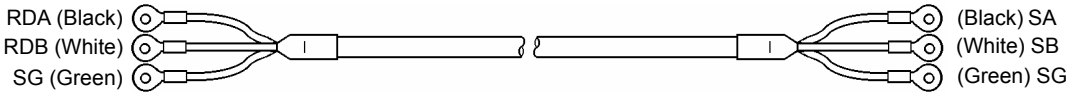
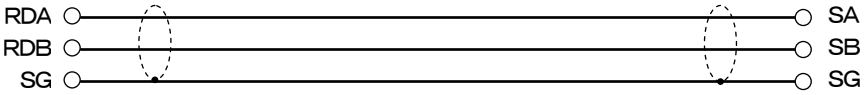
Cable	0 type crimp style terminal ↔ 0 type crimp style terminal RS-422A cable (For line converter)
Format	 Line converter side DB side SG (Signal grand) wiring is available on both sides using 2 wick VCTF wire which is further twisted to 4 wicks. It is disconnected and used as there is no SG terminal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

②Connection between DBs

Cable	0 type crimp style wire ↔ 0 type crimp style RS-422A cable (For serial connection)
Format	 DB side DB side SG (Signal grand) wiring is available on both sides using 2 wick VCTF wire which 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

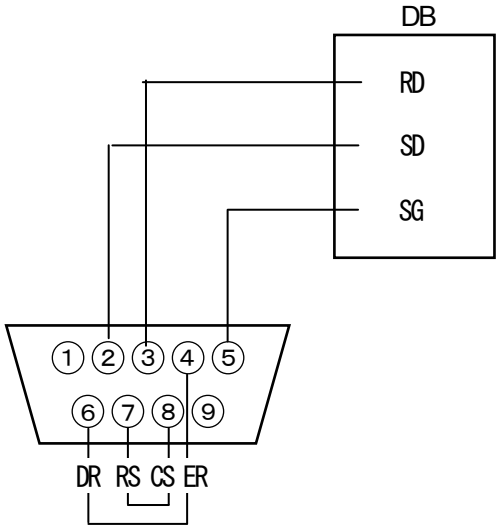
①Connection between line converter and DB; and between DBs

Cable	0 type crimp style terminal ↔ 0 type crimp style terminal RS-485 cable
Format	 Line converter side　　DB 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	
Model code	**RZ-LEC□□□** └ Cable length is 001 to 200m (Specified)

7-3. RS-232C connection

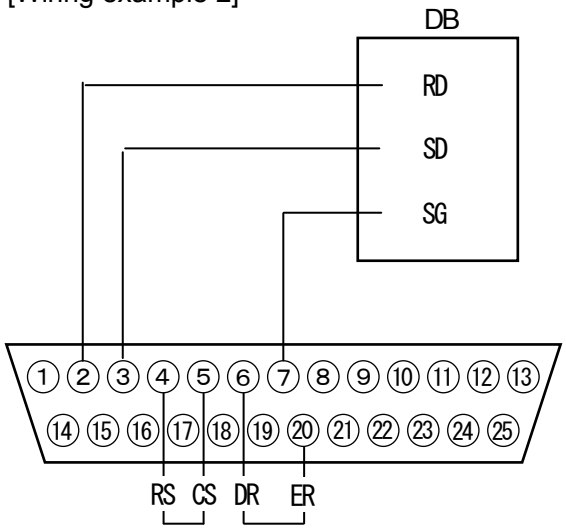
DB uses sending, receiving and Signal Grand (SG) only and does not use any other control signal. In general PC as controlling is done by control signal, it does not operate just by connecting 3 signal wires. As the wiring process in the connector, differs on how the PC controls the control signal, see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

[Wiring example 1]



9 pin connector for PC
（PC-98 series/IBM-PC･AT）

[Wiring example 2]



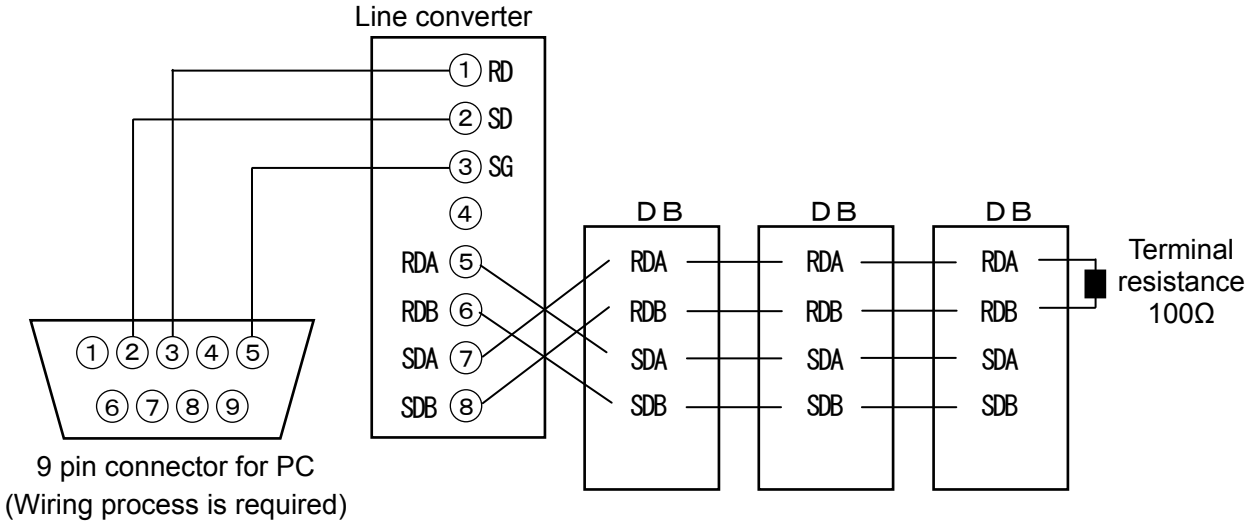
25 pin connector for PC
（PC-98 series）

⚠ Precautions	RS-232C cable length is maximum 15m. NEC make PC98 series 9 bit 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 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 grand 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.)

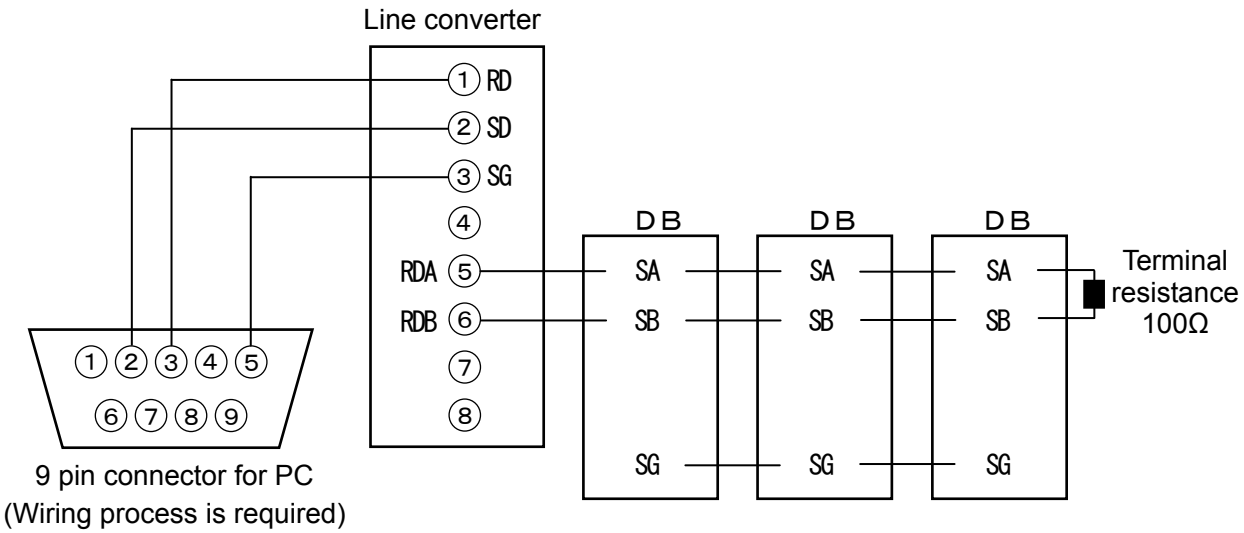
Wiring of RS-422A



⚠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 DB. 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 DB 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 DB communicates without using the control wire. As a result, sometimes reception defect may occur due to DB 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.

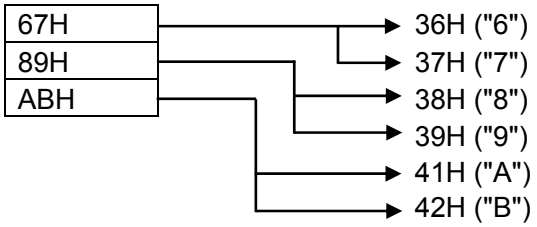
<Table 1 Comparison between RTU mode and ASCII mode>

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, ODH) + LF (Line feed, 0AH)".

RTU mode

Message

ASCII mode

:	Message	CR	LF

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

8-2. Data time interval

Dudring 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 maximum 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, the slave whose slave address matches with the slave address in the command message only responds to that message.

Slave address '0' is used in message (broad cast) for all the slaves from the master. 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 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 DB 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 DB there is a number called 'Reference number' that is allotted and it is required when reading and writing the data. The data in the DB is categorized depending on its type into, 'Digital setting value', 'Digital input data', 'analog input data' and 'analog settings value'. (8-7. DB relative number table)

When reference number of MODBUS original is to be specified, see section 8.8 Reference table for MODBUS protocol.

<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. DB reference number chart table>

Data kind	Parameter	Reference number	Relative number	Code	Reference table
Digital setting value	AT start FB tuning	101 111	100 110	01 05 15	Section 8-7-3
Digital input Data	Error status Event status	10002 to 10124	1 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 No.9 parameter	40001 to 40047 40051 to 40093 40101 to 40148 40151 to 40187 40201 to 40246 40251 to 40296 40301 to 40346 40351 to 40396 40401 to 40446 40451 to 40496 40501 to 40546 40551 to 40596 40601 to 40650	0 to 46 50 to 92 100 to 147 150 to 186 200 to 245 250 to 298 300 to 345 350 to 395 400 to 445 450 to 495 500 to 545 550 to 595 600 to 649	03 06 16	Section 8-7-1
Operation status setting	Operation status information	49056 to 49513	9055 to 9535	03 06 16	Section 8-7-1
Analog input data	Real data parameter	30101 to 30143	100 to 142	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 change 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               */

        /* 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 presence 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 change 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 write, 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 becomes '0'.

⑥ When writing multiple reference numbers, if an error occurs 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, 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 request from high order

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

Example) Reading the measurement value of 'Slave address 02' DB

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])

Measurement value (Analog input data) is stored in reference number '30301 to 30143' (See section 8-3-4. table 3). From the table it is understood that measurement value (PV) is stored in '30101' and PV status is stored in '30102'. (See section 8-7. For details on reading the measurement 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 measurement value and PV status, hence when displayed in 2 bytes, it becomes[00H][02H].

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

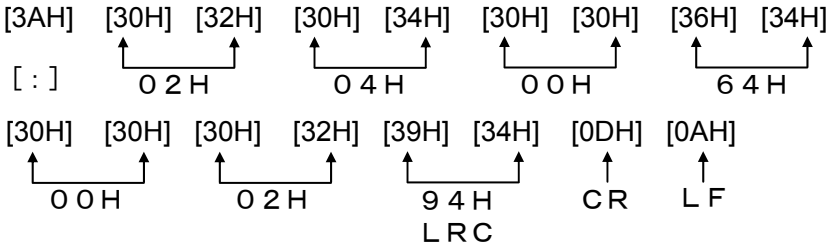
Error check in RTU mode is calculated using CRC-16. (See section 8-3-5.①) Data of message basic division becomes [02H][04H][00H][64H][00H][02H] according to ① to ③ and CRC-16 becomes 2730H. Thus error check data becomes [30H][27H].

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 (Reading the coil status)

[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	OFF

AT1 stop

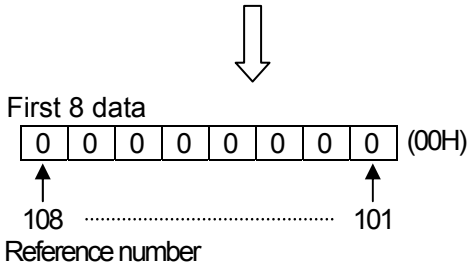
<RTU mode>

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>

Error check CRC (L), CRC (H) part is 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 (Reading the status of input relay)

[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 (Reading the contents of maintenance register)

[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=5.0%,I=60 seconds, D=30 seconds of parameter 1 PID of slave 1.

(Reading 3 units of analog setting value reference number from 490206 to 40208 of slave 1.)

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

← Example of P=50, 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
P(H)	00H
P(L)	32H
I(H)	00H
I(L)	3CH
D(H)	00H
D(L)	1EH
CRC(L)	58H
CRC(H)	B5H

<ASCII mode error check>

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 3 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 (Reading the contents of input register)

[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 (Changing the status of single coil)

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

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

<ASCII mode error check>

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 executing, set 'FF00H'. Set '0000H' at the time of stopping 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 (Writing to single maintenance register)

[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>

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)

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 (Change is status of multiple coils)

[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. It 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

AT1 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>

Error check CRC(L),CRC(H)part is 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 (Writing to multiple maintenance register)

[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 parameter 1 PID 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 (Relative number)	205 (00CDH)	206 (00CEH)	207 (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)	C4H

<ASCII mode error check>

LRC	2EH

LRC	1EH

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 When transmission error (over run, framing, parity, CRC or LRC) is detected in the message.

② When the slave address during the message is not the self address.

③ When 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 When transmission parameters do not match.

⑤ When 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 + 80H
Error code
CRC(L)
CRC(H)

Function code	Function code + 80H
01	81H
02	82H
03	83H
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 data or setting value number is other that 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 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 AT is started during AT ・When FB tuning is executed during program operation ・When AT1, AT4 are executed during READY status ・When AT2, AT3 are executed during RUN status ・When manual output is written when there is no manual operation ・When remote SV is written when local status or communication status is other than REM

8-7.DB relative number 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	Input type number	[Standard input] 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 type input] 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)	[Standard input] 5 (K1) [4-wire type input] 53 (Pt100Ω1)	[Standard input] 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= Plati Ⅱ 1 26= Plati 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

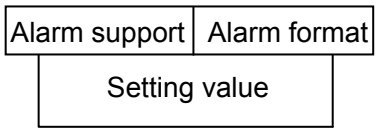
FNC code……Application function code, R/W……R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Communication range)	Initial value	Remarks
						[4-wire type input] 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 See range list. (Section 8-9)
40002	03 06 16	R W W	Unit number	0/2 (0/2)	0 (℃)	0= Celsius temperature (°C) 2=Absolute temperature (K) When input type is 21:CR-AuFe, 52: Pt-Co setting,0:℃ cannot be written. 1 means 'Do not set'.
40003	03 06 16	R W W	RJ	0/1 (0/1)	0	0=RJ_INT (internal) 1=RJ_EXT (external)
40004	03 06 16	R W W	Range 'Zero'	Within input range, Range in which 5 digits can be displayed (-19999 to 30000)	Auto development	Always set zero<span. Range is within the input range and WRITE is performed. (See section 8-9 measurement range and decimal point position)
40005	03 06 16	R W W	Range 'span'	Within input range, Range in which 5 digits can be displayed (-19999 to 30000)	Auto development	Always set zero<span. Range is within the input range and WRITE is performed. (See section 8-9 measurement range and decimal point position)
40006 40007	03 06 16	R W W	Linear scale 'MIN' Linear scale 'MAX'	-19999 to 30000 (-19999 to 30000) -19999 to 30000 (-19999 to 30000)	0 2000.0	Input whose range is set… Decimal point position depends on linear decimal point settings. In TC/Pt input status is READ only and 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 (Communication range)	Initial value	Remarks
40008	03 06 16	R W W	SV decimal point	0 to 4 digits (0 to 4)	1	Set decimal point position of linear scale In TC/Pt input, fixed value for each range can be READ. Writing is not possible.
40009 40010	03 06 16	R W W	SV limiter lower limit SV limiter higher limit	Within the scale setting value (-19999 to 30000) Within the scale setting value (-19999 to 30000)	Lower limit of the range Higher limit of the range	Decimal point position: TC/Pt input=Fixed linear input for each range=linear decimal point setting Always set lower limit<=higher limit.
40011	03 06 16	R W W	PV decimal point	0 to 4 digits (0 to 4)	1	
40012	03 06 16	R W W	Digital filter	0.0 to 99.9 (0 to 999)	0.1seconds	0.0=OFF
40020	03 06 16	R W W	SV decimal point for display	0 to 4 digits (0 to 4)	1	SV decimal point position of the first display part
40021	03 06 16	R W W	Direct/Reverse of control action	0/1 (0/1)	1 (REVERSE)	0= Direct (DIRECT: Direct operation) 1= Reverse (REVERSE: Reverse operation)
40022	03 06 16	R W W	Pulse cycle	1 to 180 (1 to 180)	30 seconds	Control output 1 can WRITE only ON OFF pulse/SSR drive pulse
40023 40024 40025	03 06 16	R W W	FB zero FB span FB dead band	0.0 to 99.9 (0 to 999) 0.1 to 100.0 (1 to 1000) 0.5 to 5.0 (5 to 50)	0.0 100.0 1.0	Always set by zero<span. Control output 1 can write ON OFF servo type only.
40026	03 06 16	R W W	Direct/reverse of control action of output 2	0/1 (0/1)	1 (REVERSE)	0= Direct (DIRECT: Direct operation) 1= Reverse (REVERSE: Reverse operation)
40027	03 06 16	R W W	Pulse 2 cycle	1 to 180 (1 to 180)	30 seconds	Control output 2 can WRITE only ON OFF pulse/SSR drive pulse.
40028	03 06 16	R W W	Output 2 Control system	0/1 (0/1)	0 (PID system)	0= PID system 1= SPLIT system
40030	03 06 16	R W W	Cancel report output	0/1 (0/1)	0 (Usual alarm)	0= (Usual alarm) 1= 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] 0/1/2/3/4/5/6/7/8/10 (0/1/2/3/4/5/6/7/8/10) [Alarm assistance] 0/1/2/3/4/5/6/7 (0/1/2/3/4/5/6/7)	[Format] 1 (Deviation) [Assistance] 0 (Higher limit)	Alarm format 0=PV(Absolute value) 1=DV(Deviation) 2=ADV(Absolute value deviation) 3=SV(Setting value) 4=MV1(Output value 1) 5=MV2(Output value 2) *Only output 2 specifications can be written 6=LOOP(Control loop) * Only output 1 specifications can be written 7=CT(Heater snapping wire) Only specifications with heater snapping wire alarm can be written 8=TIM(Timer) *Only specifications with external signal input can be written. 10=FAIL ·Alarm assistance 0= H__(Higher limit, No wait, No maintenance) 1= HW_(Higher limit, Wait exists, No maintenance) 2= H_K(Higher limit, No Wait, maintenance exists) 3= HWK(Higher limit, Wait exists, maintenance exists) 4= L__(Lower limit, No Wait, No maintenance) 5= LW_(Lower limit, Wait exists, No maintenance 6= L_K(Lower limit, No wait, Maintenance exists) 7= LWK(Lower limit, Wait exists, Maintenance exists) * Low order 8 bits is the alarm format setting, high order 8 bit does alarm assistance function setting. High order 8 bit Low order 8 bit 
40032	03 06 16	R W W	Alarm dead band 'AL1'	0.00 to 200.00 (0 to 20000)	2.00	Decimal point position when alarm format has absolute value/deviation/absolute value deviation/setting value/control loop: When SV DOT=0 it is→1 When SV DOT=1 it is→2 When SV DOT=2 it is→3 When SV DOT=3 it is→4 When SV DOT=4 it is→4 Decimal point position when alarm format is output value/heater snapping wire:1 digit

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
40034	03 06 16	R W W	Alarm delay	0.0 to 20000 (0 to 20000)	0.0 seconds	
40036	03 06	R W	Alarm format 'AL2'	Same as alarm format 'AL1'	[Format] 1 (Deviation) [Assistance] 4 (Lower limit)	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'
40041	03 06 16	R W W	Alarm format 'AL3'	Same as alarm format 'AL1'	[Format] 1 (Deviation) [Assistance] 0 (Higher limit)	Same as alarm format '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'	[Format] 1 (Deviation) [Assistance] 4 (Lower limit)	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 (Range during communication)	Initial value	Remarks
40051	03 06 16	R W W	Transmission (H) analog type	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV 1=PV 2=MV1 3=MV2 4=MFB 5=RSV WRITE is not possible when there is no transmission signal output MV2 writing is not possible when there is no control output 2. MFB cannot be written when control output 1 is other than ON/OFF servo. RSV cannot be written when there is no remote signal input
40052 40053	03 06 16	R W W	Transmission (H) and transmission scale 'zero' Transmission (H) transmission scale (span)	[In case of PV/SV/RSV] -19999 to 30000 (-19999 to 30000) [In case of MV1/MV2/MFB] -1999.9 to 3000.0 (-19999 to 30000)	Measurement range	Writing is not possible when there is no transmission signal output. [In case of PV/SV/RSV] Decimal point position: SV decimal point position
40061	03 06 16	R W W	Transmission (N) Analog type	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV 1=PV 2=MV1 3=MV2 4=MFB 5=RSV Writing is not possible when there is not transmission signal output. MV2 writing is not possible when there is no control output 2. MFB cannot be written when control output 1 is other than ON/OFF servo. RSV cannot be written when there is no remote signal input
40062 40063	03 06 16	R W W	Transmission (N) and transmission scale 'zero' Transmission (N) transmission scale (span)	[In case of PV/SV/RSV] -19999 to 30000 (-19999 to 30000) [In case of MV1/MV2/MFB] -1999.9 to 3000.0 (-19999 to 30000)	Measurement range	Writing is not possible when there is no transmission signal output. [In case of PV/SV/RSV] Decimal point position: SV decimal point position

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
40079	03 06 16	R W W	Digital transmission type 1	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV 1=PV 2=MV1 3=MV2 4=MFB 5=RSV Writing is not possible when it is not a function with communication. MV2 writing is not possible when there is no control output 2. MFB cannot be written when control output 1 is other than ON/OFF servo. RSV cannot be written when there is no remote signal input
40080	03 06 16	R W W	Digital Transmission type 2	0/1/2/3/4/5 (0/1/2/3/4/5)	1 (PV)	0=SV 1=PV 2=MV1 3=MV2 4=MFB 5=RSV Writing is not possible when there are no commuication 2 port specifications. MV2 writing is not possible when there is no control output 2. MFB writing is not possible when control output 1 is other than ON/OFF servo. RSV writing is not possible when there is no remote signal input.
40092	03 06 16	R W W	Operation at the time of inserting the power supply	0/1 (0/1)	0 (CONTINUE)	0= Continue transmission (CONTINUE) 1= READY status (READY)

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	Output 2 gap	-100.0 to 100.0 (-1000 to 1000)	0.0%	
40102	03 06 16	R W W	Output 2 PID 'P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999)	5.0%	
40103	03 06 16	R W W	Output 2 PID 'I'	0(∞) 1 to 9999 (0: Infinity 1 to 9999)	60 seconds	
40104	03 06 16	R W W	Output 2 PID 'D'	0 to 9999 (0 to 9999)	30 seconds	
40105	03 06 16	R W W	Output 2 limit (Output 2 scale) 'Lower limit value'	-5.0 to 100.0 (-50 to 1000)	0.0%	Always set output 2 limit as lower limit<higher limit.
40106	03 06 16	R W W	Output 2 limit (Output 2 scale) 'Higher limit value'	0.0 to 105.0 % (0 to 1050)	100.0%	Always set output 2 limit as lower limit<higher limit.
40108	03 06 16	R W W	Dead band of output 2	0.1 to 9.9 (1 to 99)	0.5%	
40111	03 06 16	R W W	Output dead band	0.1 to 9.9 (1 to 99)	0.5%	
40112	03 06 16	R W W	Output during PV abnormality 'Lower limit'	-5.0 to 105.0 (-50 to 1050)	0.0%	
40113	03 06 16	R W W	Output during PV abnormality 'Higher limit'	-5.0 to 105.0 (-50 to 1050)	0.0%	
40116	03 06 16	R W W	Descending SV change rate	0.0:function OFF -1999.9 to -0.1 (-19999 to 0)	0.0	
40117	03 06 16	R W W	Ascending SV change rate	0.0:function OFF 0.1 to 2000.0 (Seconds or minutes or hours) (0 to 20000)	0.0	
40118	03 06 16	R W W	SV slope unit	0/1/2 (0/1/2)	1	0=Seconds 1=Minutes 2=Hours
40121	03 06 16	R W W	Split direct	0.0 to 60.0 (0 to 600)	0.0%	Writing is possible when heating/cooling output type with control output 2 is a matching box (SPLIT).
40122	03 06 16	R W W	Split reverse	40.0 to 100.0 (400 to 1000)	100.0%	Writing is possible when heating/cooling output type with control output 2 is a matching box (SPLIT).

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
40123	03 06 16	R W W	Deadband 2	0.0 to 9.9 % (0 to 99)	0.0%	
40124	03 06 16	R W W	PID dead band	0.0 to 9.9 (0 to 99)	0.0%	
40126	03 06 16	R W W	Control loop Abnormality judgment time	0 to 20000 seconds (0 to 20000)	3600 seconds	Data becomes invalid in case of output 2 specifications.
40131	03 06 16	R W W	Remote filter	0.0: Function OFF 0.1 to 99.9 (Seconds) (0 to 999)	0.0	
40133	03 06 16	R W W	Cascade ratio	0.00 to 1.00 (0 to 100)	1.00	
40134	03 06 16	R W W	Cascade bias	-99.9 to 100.0 (-999 to 1000)	0.0	
40143	03 06 16	R W W	Remote/local switching	0/1 (0/1)	0	0=LOCAL 1=REMOTE
40144	03 06 16	R W W	Remote scale MIN	-19999 to 30000 (-19999 to 30000)	0000.0	Decimal point position: SV decimal point position
40145	03 06 16	R W W	Remote scale MAX	-19999 to 30000 (-19999 to 30000)	2000.0	Decimal point position: SV decimal point position
40148	03 06 16	R W W	Control algorithm	0/1 (0/1)	0	0= Position type PID 1= Speed type PID

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	'SV (target) value' that is being used	Within the range of range scale	-	
40156	03 06 16	R W W	PID 'P' that is being executed	0:2 position control 0.1 to 999.9 (0 to 9999)	-	
40157	03 06 16	R W W	PID 'I' that is being executed	0 (∞) 1 to 9999 (0 to 9999)	-	
40158	03 06 16	R W W	PID 'D' that is being executed	0 to 9999 (0 to 9999)	-	
40181	03 06 16	R W W	Alarm value 1 that is being executed	-19999 to 30000 (-19999 to 30000)	-	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] [Decimal point position:1] [Alarm format 1=TIMER] No decimal point
40183	03 06 16	R W W	Alarm value 2 that is being executed	-19999 to 30000 (-19999 to 30000)	-	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format=TIMER] No decimal point
40185	03 06 16	R W W	Alarm value 3 that is being executed	-19999 to 30000 (-19999 to 30000)	-	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format=TIMER] No decimal point
40187	03 06 16	R W W	Alarm value 4 that is being executed	-19999 to 30000 (-19999 to 30000)	-	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] [Decimal point position:1] [Alarm format=TIMER] No decimal point

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
40201	03 06 16	R W W	SV 8 type 'Parameter 1'	Within SV limit range (Within SV limit range)	0	
40206	03 06 16	R W W	PID 16 type 'Parameter 1 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40207	03 06 16	R W W	PID 16 type 'Parameter 1 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40208	03 06 16	R W W	PID 16 type 'Parameter 1 of D'	0 to 9999 (0 to 9999)	30 seconds	
40209 40210	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Parameter 1 of lower limit value' Output limit 8 types (Output scale 8 types) 'Parameter 1 of higher limit value'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40211	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 1'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40212	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 1'	0.1 to 100.0 (1 to 1000)	100.0%	
40213	03 06 16	R W W	Sensor correction 'Parameter 1'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40214	03 06 16	R W W	A.R.W 'Parameter 1 of lower limit value'	-100.0 to 0.0 (-1000 to 0)	-50.0%	
40215	03 06 16	R W W	A.R.W 'Parameter 1 of higher limit value'	0.0 to 100.0 (0 to 1000)	50.0%	
40216	03 06 16	R W W	Output preset 'Parameter 1'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40231	03 06 16	R W W	Alarm value 1 8 types 'Parameter 1'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40233	03 06 16	R W W	Alarm value 2 8 types 'Parameter 1'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40235	03 06 16	R W W	Alarm value 3 8 types 'Parameter 1'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40237	03 06 16	R W W	Alarm value 4 8 types 'Parameter 1'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40246	03 06 16	R W W	Remote shift 'Parameter 1'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

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
40251	03 06 16	R W W	SV 8 type ‘Parameter 2’	Within SV limit range (Within SV limit range)	0	
40256	03 06 16	R W W	PID 16 type 'Parameter 2 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40257	03 06 16	R W W	PID 16 TYPE 'Parameter 2 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40258	03 06 16	R W W	PID 16 type 'Parameter 2 of D'	0 to 9999 (0 to 9999)	30 seconds	
40259 40260	03 06 16	R W W	Output limit 8 types (Output scale 8 types) ‘Lower limit value of parameter 2’ Output limit 8 types (Output scale 8 types) ‘Higher limit value of parameter 2’	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40261	03 06 16	R W W	Output variation limit 8 types ‘Descending parameter 2’	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40262	03 06 16	R W W	Output variation limit 8 types ‘Ascending parameter 2’	0.1 to 100.0 (1 to 1000)	100.0%	
40263	03 06 16	R W W	Sensor correction ’Parameter 2’	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40266	03 06 16	R W W	Output preset	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40281	03 06 16	R W W	Alarm value 1 8 types ’Parameter 2’	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40283	03 06 16	R W W	Alarm value 2 8 types ’Parameter 2’	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40285	03 06 16	R W W	Alarm value 3 8 types 'Parameter 2'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40287	03 06 16	R W W	Alarm value 4 8 types 'Parameter 2'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40296	03 06 16	R W W	Remote shift 'Parameter 2'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

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
40301	03 06 16	R W W	SV 8 type 'Parameter 3'	Within SV limit range (Within SV limit range)	0	
40306	03 06 16	R W W	PID 16 type 'Parameter 3 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40307	03 06 16	R W W	PID 16 type 'Parameter 3 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40308	03 06 16	R W W	PID 16 type 'Parameter 3 of D'	0 to 9999 (0 to 9999)	30 seconds	
40309 40310	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Lower limit value of parameter 3' Output limit 8 types (Output scale 8 types) 'Higher limit value of parameter 3'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40311	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 3'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40312	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 3'	0.1 to 100.0 (1 to 1000)	100.0%	
40313	03 06 16	R W W	Sensor correction 'Parameter 3'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40316	03 06 16	R W W	Output preset 'Parameter 3'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40331	03 06 16	R W W	Alarm value 1 8 types 'Parameter 3'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40333	03 06 16	R W W	Alarm value 2 8 types 'Parameter 3'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40335	03 06 16	R W W	Alarm value 3 8 types 'Parameter 3'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40337	03 06 16	R W W	Alarm value 4 8 types 'Parameter 3'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40346	03 06 16	R W W	Remote shift 'Parameter 3'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

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
40351	03 06 16	R W W	SV 8 type 'Parameter 4'	Within SV limit range (Within SV limit range)	0	
40356	03 06 16	R W W	PID 16 type 'Parameter 4 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40357	03 06 16	R W W	PID 16 type 'Parameter 4 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40358	03 06 16	R W W	PID 16 type 'Parameter 4 of D'	0 to 9999 (0 to 9999)	30 seconds	
40359 40360	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Lower limit value of parameter 4' Output limit 8 types (Output scale 8 types) 'Higher limit value of parameter 4'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40361	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 4'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40362	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 4'	0.1 to 100.0 (1 to 1000)	100.0%	
40363	03 06 16	R W W	Sensor correction 'Parameter 4'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40366	03 06 16	R W W	Output preset 'Parameter 4'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40381	03 06 16	R W W	Alarm value 1 8 types 'Parameter 4'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40383	03 06 16	R W W	Alarm value 2 8 types 'Parameter 4'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] [Decimal point position:1] [Alarm format 1=TIMER] No 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
40385	03 06 16	R W W	Alarm value 3 8 types 'Parameter 4'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40387	03 06 16	R W W	Alarm value 4 8 types 'Parameter 4'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40396	03 06 16	R W W	Remote shift 'Parameter 4'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

⑨ 8 type parameter 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
40401	03 06 16	R W W	SV 8 type 'Parameter 5'	Within SV limit range (Within SV limit range)	0	
40406	03 06 16	R W W	PID 16 type 'Parameter 5 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40407	03 06 16	R W W	PID 16 type 'Parameter 5 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40408	03 06 16	R W W	PID 16 type 'Parameter 5 of D'	0 to 9999 (0 to 9999)	30 seconds	
40409 40410	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Lower limit value of parameter 5' Output limit 8 types (Output scale 8 types) 'Higher limit value of parameter 5'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40411	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 5'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40412	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 5'	0.1 to 100.0 (1 to 1000)	100.0%	
40413	03 06 16	R W W	Sensor correction 'Parameter 5'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40416	03 06 16	R W W	Output preset 'Parameter 5'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40431	03 06 16	R W W	Alarm value 1 8 types 'Parameter 5'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40433	03 06 16	R W W	Alarm value 2 8 types 'Parameter 5'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40435	03 06 16	R W W	Alarm value 3 8 types 'Parameter 5'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40437	03 06 16	R W W	Alarm value4 8 type 'Parameter 5'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40446	03 06 16	R W W	Remote shift 'Parameter 5'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

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
40451	03 06 16	R W W	SV 8 type 'Parameter 6'	Within SV limit range (Within SV limit range)	0	
40456	03 06 16	R W W	PID 16 type 'Parameter 6 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40457	03 06 16	R W W	PID 16 type 'Parameter 6 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40458	03 06 16	R W W	PID 16 type 'Parameter 6 of D'	0 to 9999 (0 to 9999)	30 seconds	
40459 40460	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Lower limit value of parameter 6' Output limit 8 types (Output scale 8 types) 'Higher limit value of parameter 6'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40461	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 6'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40462	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 6'	0.1 to 100.0 (1 to 1000)	100.0%	
40463	03 06 16	R W W	Sensor correction 'Parameter 6'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40466	03 06 16	R W W	Output preset 'Parameter 6'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40481	03 06 16	R W W	Alarm value 1 8 types 'Parameter 6'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40483	03 06 16	R W W	Alarm value 2 8 types 'Parameter 6'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40485	03 06 16	R W W	Alarm value 3 8 types 'Parameter 6'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40487	03 06 16	R W W	Alarm value 4 8 types 'Parameter 6'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40496	03 06 16	R W W	Remote shift 'Parameter 6'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

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
40501	03 06 16	R W W	SV 8 type 'Parameter 7'	Within SV limit range (Within SV limit range)	0	
40506	03 06 16	R W W	PID 16 type 'Parameter 7 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40507	03 06 16	R W W	PID 16 type 'Parameter 7 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40508	03 06 16	R W W	PID 16 type 'Parameter 7 of D'	0 to 9999 (0 to 9999)	30 seconds	
40509 40510	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Lower limit value of parameter 7' Output limit 8 types (Output scale 8 types) 'Higher limit value of parameter 7'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40511	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 7'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40512	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 7'	0.1 to 100.0 (1 to 1000)	100.0%	
40513	03 06 16	R W W	Sensor correction 'Parameter 7'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40516	03 06 16	R W W	Output preset 'Parameter 7'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40531	03 06 16	R W W	Alarm value 1 8 types 'Parameter 7'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40533	03 06 16	R W W	Alarm value 2 8 types 'Parameter 7'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40535	03 06 16	R W W	Alarm value 3 8 types 'Parameter 7'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40537	03 06 16	R W W	Alarm value 4 8 types 'Parameter 7'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40546	03 06 16	R W W	Remote shift 'Parameter 7'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

⑫ 8 type parameter 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
40551	03 06 16	R W W	SV 8 type 'Parameter 8'	Within SV limit range (Within SV limit range)	0	
40556	03 06 16	R W W	PID 16 type 'Parameter 8 of P'	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40557	03 06 16	R W W	PID 16 type 'Parameter 8 of I'	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40558	03 06 16	R W W	PID 16 type 'Parameter 8 of D'	0 to 9999 (0 to 9999)	30 seconds	
40559 40560	03 06 16	R W W	Output limit 8 types (Output scale 8 types) 'Lower limit value of parameter 8' Output limit 8 types (Output scale 8 types) 'Higher limit value of parameter 8'	-5.0 to 100.0 (-50 to 1000) 0.0 to 105.0 (0 to 1050)	0.0% 100.0%	Always set the output limit as lower limit<higher limit.
40561	03 06 16	R W W	Output variation limit 8 types 'Descending parameter 8'	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40562	03 06 16	R W W	Output variation limit 8 types 'Ascending parameter 8'	0.1 to 100.0 (1 to 1000)	100.0%	
40563	03 06 16	R W W	Sensor correction 'Parameter 8'	-19999 to 20000 (-19999 to 20000)	0.0%	Decimal point position: 0.1 times resolution of PV decimal point position
40566	03 06 16	R W W	Output preset 'Parameter 8'	-100.0 to 100.0 (-1000 to 1000)	50.0%	
40581	03 06 16	R W W	Alarm value 1 8 types 'Parameter 8'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40583	03 06 16	R W W	Alarm value 2 8 types 'Parameter 8'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No 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
40585	03 06 16	R W W	Alarm value 3 8 types 'Parameter 8'	-19999 to 30000 (-19999 to 30000)	3000.0	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40587	03 06 16	R W W	Alarm value 4 8 types 'Parameter 8'	-19999 to 30000 (-19999 to 30000)	-1999.9	[Alarm format = DV, PV, ADV, SV] Decimal point position: SV decimal point position [Alarm format=MV, CT, LOOP,] Decimal point position:1 [Alarm format 1=TIMER] No decimal point
40596	03 06 16	R W W	Remote shift 'Parameter 8'	-19999 to 20000 (-19999 to 20000)	0	Decimal point position: 0.1 times resolution of SV decimal point position

⑬ No.9 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
40601	03 06 16	R W W	PID 16 type ‘Parameter 9-1 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40602	03 06 16	R W W	PID 16 type ’Parameter 9-1 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40603	03 06 16	R W W	PID 16 type ‘Parameter 9-1 of D’	0 to 9999 (0 to 9999)	30 seconds	
40604	03 06 16	R W W	PID 16 type ‘Parameter 9-2 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40605	03 06 16	R W W	PID 16 type ’Parameter 9-2 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40606	03 06 16	R W W	PID 16 type ‘Parameter 9-2 of D’	0 to 9999 (0 to 9999)	30 seconds	
40607	03 06 16	R W W	PID 16 type ‘Parameter 9-3 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40608	03 06 16	R W W	PID 16 type ’Parameter 9-3 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40609	03 06 16	R W W	PID 16 type ‘Parameter 9-3 of D’	0 to 9999 (0 to 9999)	30 seconds	
40610	03 06 16	R W W	PID 16 type ‘Parameter 9-4 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40611	03 06 16	R W W	PID 16 type ’Parameter 9-4 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40612	03 06 16	R W W	PID 16 type ‘Parameter 9-4 of D’	0 to 9999 (0 to 9999)	30 seconds	
40613	03 06 16	R W W	PID 16 type ‘Parameter 9-5 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40614	03 06 16	R W W	PID 16 type ’Parameter 9-5 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	

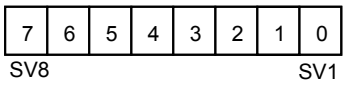
FNC code……Application function code, R/W……R: READ, W: WRITE

Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
40615	03 06 16	R W W	PID 16 type ‘Parameter 9-5 of D’	0 to 9999 (0 to 9999)	30 seconds	
40616	03 06 16	R W W	PID 16 type ‘Parameter 9-6 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40617	03 06 16	R W W	PID 16 type ’Parameter 9-6 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40618	03 06 16	R W W	PID 16 type ‘Parameter 9-6 of D’	0 to 9999 (0 to 9999)	30 seconds	
40619	03 06 16	R W W	PID 16 type ‘Parameter 9-7 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40620	03 06 16	R W W	PID 16 type ’Parameter 9-7 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40621	03 06 16	R W W	PID 16 type ‘Parameter 9-7 of D’	0 to 9999 (0 to 9999)	30 seconds	
40622	03 06 16	R W W	PID 16 type ‘Parameter 9-8 of P’	0:2 position control 0.1 to 999.9 (0:2 position control 1 to 9999:P value)	5.0%	
40623	03 06 16	R W W	PID 16 type ’Parameter 9-8 of I’	0 (∞) 1 to 9999 (0: Infinity 1 to 9999:I value)	60 seconds	
40624	03 06 16	R W W	PID 16 type ‘Parameter 9-8 of D’	0 to 9999 (0 to 9999)	30 seconds	
40625	03 06 16	R W W	SV 8 type of AT2 ’Parameter 1’	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40626	03 06 16	R W W	SV 8 type of AT2 ’Parameter 2’	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40627	03 06 16	R W W	SV 8 types of AT2 ’Parameter 3’	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40628	03 06 16	R W W	SV 8 type of AT2 ’Parameter 4’	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40629	03 06 16	R W W	SV 8 type of AT2 ’Parameter 5’	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position

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
40630	03 06 16	R W W	SV 8 type of AT2 'Parameter 6'	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40631	03 06 16	R W W	SV 8 types of AT2 'Parameter 7'	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40632	03 06 16	R W W	SV 8 types of AT2 'Parameter 8'	-19999 to 30000 (-19999 to 30000)	Automatic development	Decimal point position: SV decimal point position
40633	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 1'	Within SV limit range (Within SV limit range)	Automatic development	Decimal point position: SV decimal point position
40634	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 2'	Prior section Max value to SV limit higher limit value (Prior section Max value to SV limit higher limit value)	Automatic development	Decimal point position: SV decimal point position
40635	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 3'	Prior section Max value to SV limit higher limit value (Prior section Max value to SV limit higher limit value)	Automatic development	Decimal point position: SV decimal point position
40636	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 4'	Prior section Max value to SV limit higher limit value (Prior section Max value to SV limit higher limit value)	Automatic development	Decimal point position: SV decimal point position
40637	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 5'	Prior section Max value to SV limit higher limit value (Prior section Max value to SV limit higher limit value)	Automatic development	Decimal point position: SV decimal point position
40638	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 6'	Prior section Max value to SV limit higher limit value (Prior section Max value to SV limit higher limit value)	Automatic development	Decimal point position: SV decimal point position
40639	03 06 16	R W W	SV 8 section of PID NO.9 'Parameter 7'	Prior section Max value to SV limit higher limit value (Prior section Max value to SV limit higher limit value)	Automatic development	Decimal point position: SV decimal point position
40640	03 06 16	R W W	SV 8 type of AT3 'Parameter 1'	Within the range of SV section No. 9-1 (Within the range of SV section No. 9-1)	Automatic development	Decimal point position: SV decimal point position
40641	03 06 16	R W W	SV 8 type of AT3 'Parameter 2'	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

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
40642	03 06 16	R W W	SV 8 type of AT3 'Parameter 3'	Within the range of SV section No. 9-3 (Within the range of SV section No. 9-3)	Automatic development	Decimal point position: SV decimal point position
40643	03 06 16	R W W	SV 8 type of AT3 'Parameter 4'	Within the range of SV section No. 9-4 (Within the range of SV section No. 9-4)	Automatic development	Decimal point position: SV decimal point position
40644	03 06 16	R W W	SV 8 type of AT3 'Parameter 5'	Within the range of SV section No. 9-5 (Within the range of SV section No. 9-5)	Automatic development	Decimal point position: SV decimal point position
40645	03 06 16	R W W	SV 8 type of AT3 'Parameter 6'	Within the range of SV section No. 9-6 (Within the range of SV section No. 9-6)	Automatic development	Decimal point position: SV decimal point position
40646	03 06 16	R W W	SV 8 type of AT3 'Parameter 7'	Within the range of SV section No. 9-7 (Within the range of SV section No. 9-7)	Automatic development	Decimal point position: SV decimal point position
40647	03 06 16	R W W	SV 8 type of AT3 'Parameter 8'	Within the range of SV section No. 9-8 (Within the range of SV section No. 9-8)	Automatic development	Decimal point position: SV decimal point position
40648	03 06 16	R W W	'Start direction' of AT 2, 3	0/1 (0/1)	0 (UP)	0= UP 1= DOWN
40649	03 06 16	R W W	ON/OFF flag of AT2	0/1 (0/1)	0 (OFF)	0=OFF 1=ON *Consider bit 0 to bit 8 of lower 8 bits as ON/OFF flag of SV1 to SV8. Lower 8 bits 
40650	03 06 16	R W W	ON/OFF flag of AT3	0/1 (0/1)	0 (OFF)	0=OFF 1=ON *Same as that of reference 40649

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
40707	03 06 16	R W W	Preset manual	-5.0 to 105.0 % (-50 to 1050)	0.0%	
40708	03 06 16	R W W	Output 2 Preset manual	-5.0 to 105.0 % (-50 to 1050)	0.0%	WRITE is possible only in case of output 2 specifications
40711	03 06 16	R W W	Measurement range･ Zero correction	-19.999 to 20.000 (-19999 to 20000)	00.000	
40712	03 06 16	R W W	Measurement range･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	
40713	03 06 16	R W W	Output 1･ Zero correction	-10.000 to 10.000 (-10000 to 10000)	00.000	
40714	03 06 16	R W W	Output 1･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	
40715	03 06 16	R W W	Output 2･ Zero correction	-10.000 to 10.000 (-10000 to 10000)	00.000	WRITE is possible only in case of output 2 specifications
40716	03 06 16	R W W	Output 2･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	WRITE is possible only in case of output 2 specifications
40717	03 06 16	R W W	Remote input･ Zero correction	-19.999 to 20.000 (-19999 to 20000)	00.000	WRITE is possible only with remote signal
40718	03 06 16	R W W	Remote input･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	WRITE is possible only with remote signal
40719	03 06 16	R W W	Transmission output (High performance)･ Zero correction	-10.000 to 10.000 (-10000 to 10000)	00.000	Write is possible only with analog transmission
40720	03 06 16	R W W	Transmission output (High performance)･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	Write is possible only with analog transmission
40721	03 06 16	R W W	Transmission output (General)･ Zero correction	-10.000 to 10.000 (-10000 to 10000)	00.000	Write is possible only with analog transmission
40722	03 06 16	R W W	Transmission output (General)･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	Write is possible only with analog transmission
40723	03 06 16	R W W	CT input･ Zero correction	-10.000 to 10.000 (-10000 to 10000)	00.000	WRITE is possible only with CT

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
40724	03 06 16	R W W	CT input･ Span correction	0.9000 to 1.1000 (9000 to 11000)	1.0000	WRITE is possible only with CT
40727	03 06 16	R W W	Output variation limit ‘Descending of No. 9’	-100.0 to -0.1 (-1000 to -1)	-100.0%	
40728	03 06 16	R W W	Output variation limit ‘Ascending of No. 9’	0.1 to 100.0 (1 to 1000)	100.0%	

⑭ DI/DO function allotment

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 backlight	0/1/2 (0/1/2)	2 (AUTO)	0=Green 1=Orange 2=AUTO(Green and orange automatic switching)
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(Automatic ON/OFF) 1=OFF (Does not glow normally) 2=ON (Glows normally)
48012	03 06 16	R W W	Terminal No.12 DI/DO function allocation	・Lower order 8 bits [DI] 1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16 (1/2/3/4/5/6/7/8/9/10/11/12/13/14/15/16) ・Higher order 8 bits 0/1 (0/1)	-	・Lower order 8 bits [DI] 0=Terminal information not confirmed 1=SV1 2=SV2 3=SV4 4=SV8 5=READY/RUN 6=MAN1/AUTO1 7=MAN2/AUTO2 8=PRESET/AUTO 9=ALARM RESET 10=PV HOLD 11=TIMER1 12=TIMER2 13=TIMER3 14=TIMER4 15=SLOPE HOLD 16=SLOPE RESET *When reading, lower 8 bit becomes DI/DO and higher 8 bits become DI/DO type. When writing DI/DO type cannot be set. High order 8 bits Low order 8 bits DI/DO types | DI/DO function. Setting value ・High order 8 bits 0= No terminal or other than input output terminal 1= DI terminal *In case of no terminal, DI/DO function cannot be written.
48013	03 06 16	R W W	Terminal No.13 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48014	03 06 16	R W W	Terminal No.14 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012

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

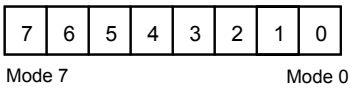
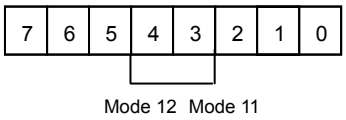
Reference number	FNC code	R/W	Data name	Setting range (Range during communication)	Initial value	Remarks
48015	03 06 16	R W W	Terminal No.15 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48016	03 06 16	R W W	Terminal No.16 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48017	03 06 16	R W W	Terminal No.17 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48019	03 06 16	R W W	Terminal No.19 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48020	03 06 16	R W W	Terminal No.20 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48021	03 06 16	R W W	Terminal No.21 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48022	03 06 16	R W W	Terminal No.22 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48023	03 06 16	R W W	Terminal No.23 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48024	03 06 16	R W W	Terminal No.24 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48026	03 06 16	R W W	Terminal No.26 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48027	03 06 16	R W W	Terminal No.27 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48028	03 06 16	R W W	Terminal No.28 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48029	03 06 16	R W W	Terminal No.29 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48030	03 06 16	R W W	Terminal No.30 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48031	03 06 16	R W W	Terminal No.31 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012
48032	03 06 16	R W W	Terminal No.32 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012

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
48033	03 06 16	R W W	Terminal No.33 DI/DO function allocation	Reference number Same as 48012	-	Reference number Same as 48012

⑮ Operation status 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
49056	03 06 16	R W W	Executing SV (Mode 0)	Within SV limit range (Within SV limit range)	0	
49501	03 06 16	R W W	Setting screen mode lock (bit support)	(0 to 65535)	-	0= Setting screen normal display 1= Setting screen lock status 1= Setting screen no display * Bit 0 to Bit 7 of low order 8 bits are set as mode 0 to mode 7 sequentially, bit 3 and 4 high order 8 bit are set as mode 11, mode 12. Low order 8 bit  High order 8 bit 
49502	03 06 16	R W W	AT start/stop	0/1/2/3/4/5 (0/1/2/3/4/5)	0 (END)	0=END 1=AT1 2=AT2 3=AT3 4=AT4 5=Cannot be used At the time of setting AT1 to 4, writing is not possible during auto tuning execution. [For AT1] ·Writing is not possible in READY status. [For AT2] ·Writing is not possible in RUN status. [For AT3] ·Writing is not possible in RUN status. [For AT4] ·Writing is not possible when output 2 does not exist. ·Writing is not possible in READY status.
49503	03 06 16	R W W	Operation screen ‘A/M switching’	0/1 (0/1)	1	0=AUTO 1=MANUAL
49504	03 06 16	R W W	Operation screen ‘MANUAL output 1’	-5.0 to 105.0 % (-50 to 1050)	0.0%	Writing is possible during manual operation

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
49505	03 06 16	R W W	Operation screen 'A/M switching 2'	0/1 (0/1)	1	0=AUTO 1=MANUAL
49506	03 06 16	R W W	Operation screen 'MANUAL output 2'	-5.0 to 105.0 % (-50 to 1050)	0.0%	Writing is possible during manual operation
49510	03 06 16	R W W	Run/Ready	0/1 (0/1)	0	0=RUN status 1=READY status
49511	03 06 16	R W W	Select execution No.	1 to 8 (1 to 8)	1	1= Execution No.1 2= Execution No.2 | 8= Execution No.8
49512	03 06 16	R W W	Remote SV	Within SV limit range (Within SV limit range)	-	Communication function is REM, remote SV setting from communication is possible. R/L switching depends on front screen operation. Writing is not possible when local function and communication function is other than REM.
49526	03 06 16	R W W	PID No. switching	0/1 (0/1)	0	0= Use PID No.1 to 8 1= Use PID No.9
49531	03 06 16	R W W	Tracking in case of local	0/1 (0/1)	0 (OFF)	0= Tracking function OFF 1= Tracking function ON
49535	03 06 16	R W W	PV hold	0/1 (0/1)	0	0=PV hold OFF 1=PV hold ON
49536	03 06 16	R W W	Presence/absence of CT value display	0/1 (0/1)	0	0= No CT display 1= CT display exists

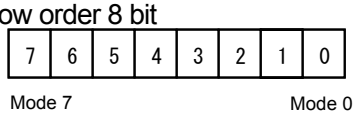
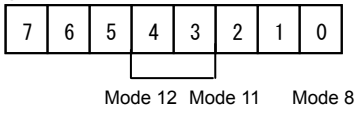
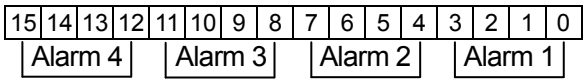
8-7-2. Analog input data (READ only)

① 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	Measurement value (PV)	Decimal point position: Depends on PV decimal point setting 32767 when PV is + over range -32768 when PV is - over range
30102	04	R	PV status	0= Normal 1=+ Over range 2=--Over range
30103	04	R	Setting value (SV)	SV that is being presently used (Setting value SV, remote SV, sloping SV etc.) Decimal point position: TC/Pt input= Fixed for each range Linear input= Depends on linear decimal point setting
30104	04	R	SV status	0= Fixed value 1= Remote SV 2= Slope operation in process
30105	04	R	Control output value 1	-50 to 1050=-5.0 to 105.0%
30106	04	R	MV1 status	0=AUTO 1=MAN 2=AT 4=PV ERR OUT 5=FB AT
30107	04	R	Control output value 2	-50 to 1050=-5.0 to 105.0%
30108	04	R	MV2 status	0=AUTO 1=MAN 2=AT 4=PV ERR OUT 5=FB AT
30109 30110 30111 30112 30113	04	R	Execution SV Execution alarm value 1 Execution alarm value 2 Execution alarm value 3 Execution alarm value 4	Execution SV setting value (Decimal point position is same in 30103) Execution alarm 1 setting value (Decimal point position is same in 40231) Execution alarm 2 setting value (Decimal point position is same in 40233) Execution alarm 3 setting value (Decimal point position is same in 40235) Execution alarm 4 setting value (Decimal point position is same in 40237)
30114 30115 30116	04	R	Execution P Execution I Execution D	Execution P setting value (0 to 9999=0.0 to 999.9%) Execution I setting value (0 to 9999=0 to 9999 seconds) Execution D setting value (0 to 9999=0 to 9999 seconds)
30124	04	R	Execution No.	Execution No.(1 to 8)
30133	04	R	CT value	65535= No CT value (CT value non acquisition status) 65534= Initial CT value acquisition (Display wait of CT value in operation screen)
30134	04	R	FB value	FB value of operation screen 2

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

Reference number	FNC code	R/W	Data name	Detailed explanation
30141	04	R	Lock status	0= Setting screen normal display 1= Setting screen lock status 0= Setting screen non display *Bit 0 to Bit 7 of low order 8 bits are set as mode 0 to mode 7 sequentially, bit 3 and 4 high order 8 bit are set as mode 11, mode 12. Low order 8 bit  High order 8 bit 
30142	04	R	Alarm status	 Alarm OFF→ 0 0 0 0 Alarm ON→ 0 1 0 1 Alarm OFF during wait operation → 1 0 1 0
30143	04	R	Error other status	0= No error 1= Error occurrence

8-7-3. Digital setting value

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 start	0/1 [0000h/FF00h] (End/start) In the bracket [ ] In case of FNC code 05	0 (End)	0=AT1 end (End) 1=Start AT1 or executing AT Cannot be executed when getting ready. Cannot be executed during 2 position control. Cannot be executed during FB tuning. When executing AT other than AT1, execute using reference 49502 of function 03, 06, 16.
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=FB tuning end (End) 1=FB tuning start or FB tuning executing Execution is not possible during program operation. Execution is not possible during AT tuning or FB tuning.

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

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

Reference number	FNC code	R/W	Data name	Detailed explanation		
10002	02	R	A/D error	0= Normal 1= During A/D error occurrence		
10005	02	R	Correction data error	0= Normal 1= During correction data error occurrence		
10117	02	R	Alarm 1 status	0=Alarm OFF	1=Alarm ON	0=Alarm OFF during WAIT operation
10118			Alarm 1 status	0	0	1
10119			Alarm 2 status	0=Alarm OFF	1=Alarm ON	0= Alarm OFF during WAIT operation
10120			Alarm 2 status	0	0	1
10121			Alarm 3 status	0=Alarm OFF	1=Alarm ON	0= Alarm OFF during WAIT operation
10122			Alarm 3 status	0	0	1
10123			Alarm 4 status	0=Alarm OFF	1=Alarm ON	0= Alarm OFF during WAIT operation
10124			Alarm 4 status	0	0	1

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	Input type number	40051	Transmission (H) Analog type	40101	Output 2·gap	40151	SV (R) is being used
40002	Unit number	40052	Transmission (H) Scale MIN	40102	Output 2·P	40152	
40003	RJ	40053	Transmission (H) Scale·MAX	40103	Output 2·I	40153	
40004	Range ZERO	40054		40104	Output 2·D	40154	
40005	Range SPAN	40055		40105	Output 2 limit L	40155	
40006	Linear scale MIN	40056		40106	Output 2 limit H	40156	P
40007	Linear scale MAX	40057		40107		40157	I
40008	SV decimal point position	40058		40108	Output 2·2 position DB	40158	D
40009	SV limiter L	40059		40109		40159	
40010	SV limiter H	40060		40110		40160	
40011	PV decimal point position	40061	Transmission (N) Analog type	40111	2 position dead band	40161	
40012	Digital filter	40062	Transmission (N) Scale MIN	40112	Output lower limit during PV abnormality	40162	
40013		40063	Transmission (N) Scale MAX	40113	Output higher limit during PV abnormality	40163	
40014		40064		40114		40164	
40015		40065		40115		40165	
40016		40066		40116	SV variation rate DW	40166	
40017		40067		40117	SV variation rate UP	40167	
40018		40068		40118	SV slope unit	40168	
40019		40069		40119		40169	
40020	SV decimal point for display	40070		40120		40170	
40021	Control operation Direct/Reverse	40071		40121	Split Dir	40171	
40022	Pulse cycle	40072		40122	Split Rev	40172	
40023	FB·ZERO	40073		40123	Dead band 2	40173	
40024	FB·SPAN	40074		40124	PID dead band	40174	
40025	FB·Gain	40075		40125		40175	
40026	Output 2 Direct/Reverse	40076		40126	Control loop judgment time	40176	
40027	Pulse 2 cycle	40077		40127		40177	
40028	Output 2 control system	40078		40128		40178	
40029		40079	Digital transmission type 1	40129		40179	
40030	Cancel alarm output	40080	Digital transmission type 2	40130		40180	
40031	Alarm format 1	40081		40131	Remote filter	40181	Alarm value 1 setting
40032	Alarm dead band 1	40082		40132		40182	
40033		40083		40133	Cascade ratio r	40183	Alarm value 2 setting
40034	Alarm delay	40084		40134	Cascade bias b	40184	
40035		40085		40135		40185	Alarm value 3 setting
40036	Alarm format 2	40086		40136		40186	
40037	Alarm dead band 2	40087		40137		40187	Alarm value 4 setting
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 when power supply is inserted	40142		40192	
40043		40093		40143	Remote/local switching	40193	
40044		40094		40144	Remote scale MIN	40194	
40045		40095		40145	Remote scale MAX	40195	
40046	Alarm format 4	40096		40146		40196	
40047	Alarm dead band 4	40097		40147		40197	
40048		40098		40148	Control algorithm	40198	
40049		40099		40149		40199	
40050		40100		40150		40200	

Analog setting value (40001 to 49999)							
8 types parameter No.1		8 types parameter No.2		8 types parameter No.3		8 types parameter No.4	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
40201	Target SV	40251	Target SV	40301	Target SV	40351	Target SV
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 limit L	40259	Output limit L	40309	Output limit L	40359	Output limit L
40210	Output limit H	40260	Output limit H	40310	Output limit H	40360	Output limit H
40211	Output variation limit DW	40261	Output variation limit DW	40311	Output variation limit DW	40361	Output variation limit DW
40212	Output variation limit UP	40262	Output variation limit UP	40312	Output variation limit UP	40362	Output variation limit UP
40213	Sensor correction	40263	Sensor correction	40313	Sensor correction	40363	Sensor correction
40214	A.R.W. lower limit value	40264		40314		40364	
40215	A.R.W. higher limit value	40265		40315		40365	
40216	Output preset	40266	Output preset	40316	Output preset	40366	Output preset
40217		40267		40317		40367	
40218		40268		40318		40368	
40219		40269		40319		40369	
40220		40270		40320		40370	
40221		40271		40321		40371	
40222		40272		40322		40372	
40223		40273		40323		40373	
40224		40274		40324		40374	
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 setting	40281	Alarm value 1 setting	40331	Alarm value 1 setting	40381	Alarm value 1 setting
40232		40282		40332		40382	
40233	Alarm value 2 setting	40283	Alarm value 2 setting	40333	Alarm value 2 setting	40383	Alarm value 2 setting
40234		40284		40334		40384	
40235	Alarm value 3 setting	40285	Alarm value 3 setting	40335	Alarm value 3 setting	40385	Alarm value 3 setting
40236		40286		40336		40386	
40237	Alarm value 4 setting	40287	Alarm value 4 setting	40337	Alarm value 4 setting	40387	Alarm value 4 setting
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		40295		40345		40395	
40246	Remote shift	40296	Remote shift	40346	Remote shift	40396	Remote shift
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	Target SV	40451	Target SV	40501	Target SV	40551	Target SV
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 limit L	40459	Output limit L	40509	Output limit L	40559	Output limit L
40410	Output limit H	40460	Output limit H	40510	Output limit H	40560	Output limit H
40411	Output variation limit DW	40461	Output variation limit DW	40511	Output variation limit DW	40561	Output variation limit DW
40412	Output variation limit UP	40462	Output variation limit UP	40512	Output variation limit UP	40562	Output variation limit UP
40413	Sensor correction	40463	Sensor correction	40513	Sensor correction	40563	Sensor correction
40414		40464		40514		40564	
40415		40465		40515		40565	
40416	Output preset	40466	Output preset	40516	Output preset	40566	Output preset
40417		40467		40517		40567	
40418		40468		40518		40568	
40419		40469		40519		40569	
40420		40470		40520		40570	
40421		40471		40521		40571	
40422		40472		40522		40572	
40423		40473		40523		40573	
40424		40474		40524		40574	
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 setting	40481	Alarm value 1 setting	40531	Alarm value 1 setting	40581	Alarm value 1 setting
40432		40482		40532		40582	
40433	Alarm value 2 setting	40483	Alarm value 2 setting	40533	Alarm value 2 setting	40583	Alarm value 2 setting
40434		40484		40534		40584	
40435	Alarm value 3 setting	40485	Alarm value 3 setting	40535	Alarm value 3 setting	40585	Alarm value 3 setting
40436		40486		40536		40586	
40437	Alarm value 4 setting	40487	Alarm value 4 setting	40537	Alarm value 4 setting	40587	Alarm value 4 setting
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		40495		40545		40595	
40446	Remote shift	40496	Remote shift	40546	Remote shift	40596	Remote shift
40447		40497		40547		40597	
40448		40498		40548		40598	
40449		40499		40549		40599	
40450		40500		40550		40600	

Analog setting value (40001 to 49999)							
No.9 Parameter				DI/DO function allocation		Operation status information	
No.	Contents	No.	Contents	No.	Contents	No.	Contents
40601	Parameter 9-1･P	40701		48001	Display backlight	49001	
40602	Parameter 9-1･I	40702		48002	Display contrast	49002	
40603	Parameter 9-1･D	40703		48003	Key backlight	49003	
40604	Parameter 9-2･P	40704		48004		49004	
40605	Parameter 9-2･I	40705		48005		49005	
40606	Parameter 9-2･D	40706		48006		49006	
40607	Parameter 9-3･P	40707	Preset manual	48007		49007	
40608	Parameter 9-3･I	40708	Preset manual 2	48008		49008	
40609	Parameter 9-3･D	40709		48009		49009	
40610	Parameter 9-4･P	40710		48010		49010	
40611	Parameter 9-4･I	40711	Measurement range･Zero correction	48011		49011	
40612	Parameter 9-4･D	40712	Measurement range･Span correction	48012	Terminal No.12 DI/DO	49012	
40613	Parameter 9-5･P	40713	Output 1 Zero correction	48013	Terminal No.13 DI/DO	49013	
40614	Parameter 9-5･I	40714	Output 1 Span correction	48014	Terminal No.14 DI/DO	49014	
40615	Parameter 9-5･D	40715	Output 2 Zero correction	48015	Terminal No.15 DI/DO	49015	
40616	Parameter 9-6･P	40716	Output 2 Span correction	48016	Terminal No.16 DI/DO	49016	
40617	Parameter 9-6･I	40717	Remote input Zero correction	48017	Terminal No.17 DI/DO	49017	
40618	Parameter 9-6･D	40718	Remote input Span correction	48018		49018	
40619	Parameter 9-7･P	40719	High performance･Zero correction	48019	Terminal No.19 DI/DO	49019	
40620	Parameter 9-7･I	40720	High performance･Span correction	48020	Terminal No.20 DI/DO	49020	
40621	Parameter 9-7･D	40721	General Zero correction	48021	Terminal No.21 DI/DO	49021	
40622	Parameter 9-8･P	40722	General Span correction	48022	Terminal No.22 DI/DO	49022	
40623	Parameter 9-8･I	40723	CT input･Zero correction	48023	Terminal No.23 DI/DO	49023	
40624	Parameter 9-8･D	40724	CT input･Span correction	48024	Terminal No.24 DI/DO	49024	
40625	AT2･SV1	40725		48025		49025	
40626	AT2･SV2	40726		48026	Terminal No.26 DI/DO	49026	
40627	AT2･SV3	40727	No.9 variation limit (Lower)	48027	Terminal No.27 DI/DO	49027	
40628	AT2･SV4	40728	No.9 variation limit (Higher)	48028	Terminal No.28 DI/DO	49028	
40629	AT2･SV5	40729		48029	Terminal No.29 DI/DO	49029	
40630	AT2･SV6	40730		48030	Terminal No.30 DI/DO	49030	
40631	AT2･SV7	40731		48031	Terminal No.31 DI/DO	49031	
40632	AT2･SV8	40732		48032	Terminal No.32 DI/DO	49032	
40633	SV section 1	40733		48033	Terminal No.33 DI/DO	49033	
40634	SV section 2	40734		48034		49034	
40635	SV section 3	40735		48035		49035	
40636	SV section 4	40736		48036		49036	
40637	SV section 5	40737		48037		49037	
40638	SV section 6	40738		48038		49038	
40639	SV section 7	40739		48039		49039	
40640	AT3･SV1	40740		48040		49040	
40641	AT3･SV2	40741		48041		49041	
40642	AT3･SV3	40742		48042		49042	
40643	AT3･SV4	40743		48043		49043	
40644	AT3･SV5	40744		48044		49044	
40645	AT3･SV6	40745		48045		49045	
40646	AT3･SV7	40746		48046		49046	
40647	AT3･SV8	40747		48047		49047	
40648	AT2/AT3 start	40748		48048		49048	
40649	AT2･ON/OFF flag	40749		48049		49049	
40650	AT3･ON/OFF flag	40750		48050		49050	

Analog setting value (40001 to 49999)							
Operation status information		Operation status information					
No.	Contents	No.	Contents	No.	Contents	No.	Contents
49051		49501	Mode lock (bit support)	49551			
49052		49502	AT start/stop	49552			
49053		49503	A/M switching 1	49553			
49054		49504	MAN output 1 value	49554			
49055		49505	A/M switching 2	49555			
49056	SV (Mode 0)	49506	MAN output 2 value	49556			
49057		49507		49557			
49058		49508		49558			
49059		49509		49559			
49060		49510	Run/Ready	49560			
49061		49511	Select execution No.	49561			
49062		49512	Remote SV	49562			
49063		49513		49563			
49064		49514		49564			
49065		49515		49565			
49066		49516		49566			
49067		49517		49567			
49068		49518		49568			
49069		49519		49569 _			
49070		49520		49570			
49071		49521		49571			
49072		49522		49572			
49073		49523		49573			
49074		49524		49574			
49075		49525		49575			
49076		49526	PID No. switching	49576			
49077		49527		49577			
49078		49528		49578			
49079		49529		49579			
49080		49530		49580			
49081		49531	Tracking during local switching	49581			
49082		49532		49582			
49083		49533		49583			
49084		49534		49584			
49085		49535	PV hold	49585			
49086		49536	Presence/absence of CT value display	49586			
49087		49537		49587			
49088		49538		49588			
49089		49539		49589			
49090		49540		49590			
49091		49541		49591			
49092		49542		49592			
49093		49543		49593			
49094		49544		49594			
49095		49545		49595			
49096		49546		49596			
49097		49547		49597			
49098		49548		49598			
49099		49549		49599			
49100		49550		49600			

Analog input data (30001 to 39999)							
Type information		Real data & Parameter					
No.	Contents	No.	Contents	No.	Contents	No.	Contents
30001		30101	PV data				
30002		30102	PV status				
30003		30103	SV is being used				
30004		30104	SV status				
30005		30105	MV1				
30006		30106	MV1 status				
30007		30107	MV2				
30008		30108	MV2 status				
30009		30109	Execution SV (Mode 0)				
30010		30110	Execution alarm 1(Mode 0)				
30011		30111	Execution alarm 2(Mode 0)				
30012		30112	Execution alarm 3(Mode 0)				
30013		30113	Execution alarm 4(Mode 0)				
30014		30114	Execution P(Mode 0)				
30015		30115	Execution I(Mode 0)				
30016		30116	Execution D(Mode 0)				
30017		30117					
30018		30118					
30019		30119					
30020		30120					
30021		30121					
30022		30122					
30023		30123					
30024		30124	Execution No.				
30025		30125					
30026		30126					
30027		30127					
30028		30128					
30029		30129					
30030		30130					
30031		30131					
30032		30132					
30033		30133	CT value				
30034		30134	FB value				
30035		30135					
30036		30136					
30037		30137					
30038		30138					
30039		30139					
30040		30140					
30041		30141	Lock status				
30042		30142	Alarm status				
30043		30143	Status other than error				
30044		30144					
30045		30145					
30046		30146					
30047		30147					
30048		30148					
30049		30149					
30050		30150					

8-9. Measurement range and decimal point position

<Measurement range list table>

Input type		Range		SV DOT	Range		SV DOT
Thermocouple (TC)		SV(℃) 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		

		SV(℃) Setting, display range				SV(K) Setting, display range			
Thermometer resistance	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

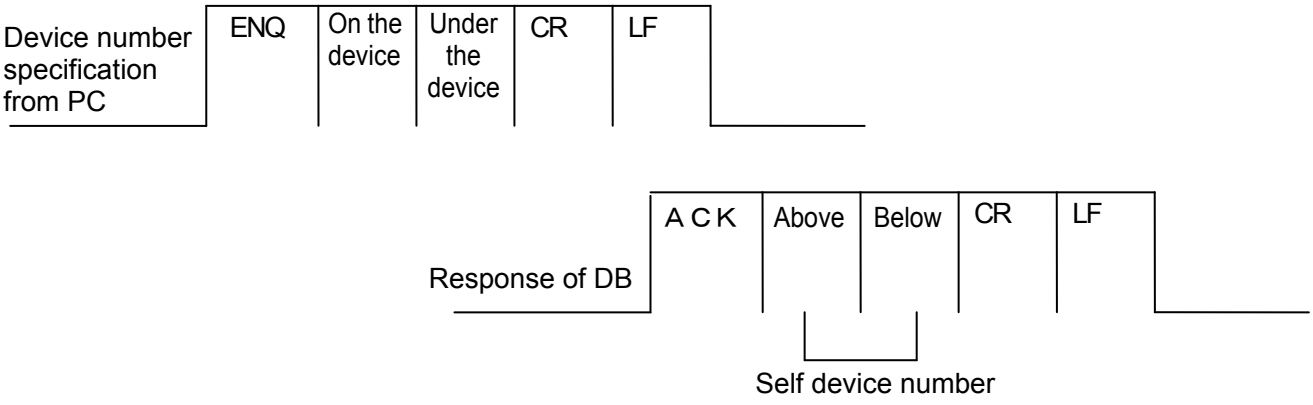
Only the electrical level of RS-232C and RS-422A/RS-485 differs, the communication procedure is the same.

However RS-422A/RS-485 connects a number of devices in series, and 1 device amongst that sends the device number from the PC by a fixed procedure and thus communication with that device is possible.

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 (RS-422A/RS-485 only)

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'.

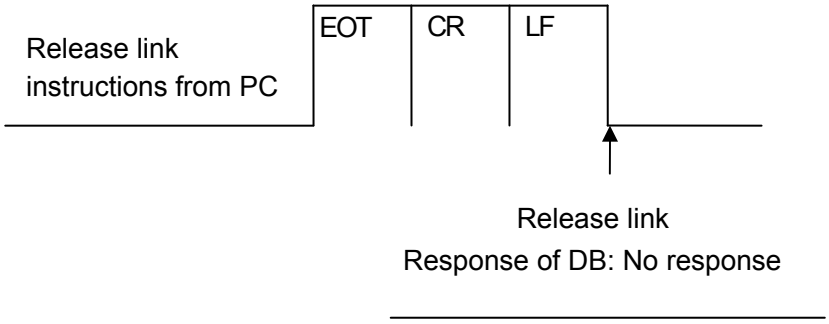


⚠Precautions	To avoid accidents always read these contents and understand them.

1. Always send the device numbers in 2 digits from 01 to 99.
2. Do not use the device number 00. (Number 00 is used during RS-232C communication)
3. Only the specified device only 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.
6. ENQ, ACK are control codes and they are expressed as hexadecimals as follows.
   ENQ:05H
   ACK:06H
7. When device number 1 is sent response of DB is as follows.
   ACK 31 CR LF
   When device number 99 is sent response of DB is as follows.
   ACK 39 39 CR LF

9-1-2. Releasing the data link

When communicating with the DB other than the DB that is currently being communicated with, after releasing the data link by the following procedure from the PC, establish the data link with the following DB by the procedure mentioned in the earlier section.



⚠Precautions	To avoid accidents always read these contents and understand them.

1. By using this command, the data link of all the DBs that are connected is released and following data link is established.
2. Data link of each DB which is connected is released within 10msec by using this command, 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 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

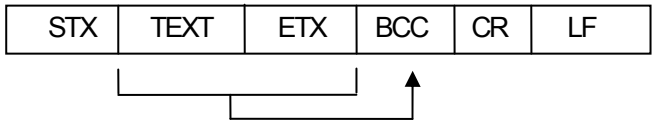
① Character received before STX is not received.
② Always add CR(0DH), LF(0AH) as end code. (For both sending and receiving).

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 and receiving low order 8 bits of that total sum as hexadecimal character of 2 digits.

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.

(Example)

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. Positive and negative response of DB

① Positive response

A	CR	LF

② Negative response

N	CR	LF	: During error

C	CR	LF	: Check sum error

L	CR	LF	: When each mode of DB is not key locked and when PC has done the parameter settings

F	CR	LF	: Format error

D	CR	LF	: Setting error

9-2-4. Basic procedure of communication

① In case of DB with communication option, communication is possible at any point of time.
However when setting the parameter from the PC, if each mode of DB is not locked, DB cannot accept the settings. A negative response "L" is sent.
Method of locking is, key locking all the modes from mode 0 to mode 7 after confirming the settings of mode 7.
Data can be sent from DB at any point of time.

② In RS—422A/RS-485, first of all data link is established and the communication with DB 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 DB is done according to the communication format from the beginning.

④ When DB receives the data request from the PC, if the request is correct it sends the data. If there is a mistake in the request, negative response if sent.

⑤ When DB receives parameter settings from PC, if the settings are correct, positive response "A" is sent after internal processing. If there is a mistake in the settings negative response is sent.

9-2-5. Control code

Following code is used in communication control.

STX (Text start signal)	:02H
ETX (Text end signal)	:03H

[For RS-422A/RS-485]

ENQ (Enquiry signal)	:05H
ACK (Positive response)	:06H
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. Request command of PC and send format type of DB

① Data request command

Command name	Command format	Function	Reference section
(1) Real data request	STX △1, △1, ETX BCC CR LF (DF)	Requesting PV, SV, MV data	89
(2) Execution parameter request	STX △1, △2, ETX BCC CR LF (EF)	Execute SV,P,I,D,AL1 to AL4 data request	89
(3) Individual setting parameter request	STX △1, △3, □□, □, (□□: Parameter type; □: No.) ETX BCC CR LF	Data request after specifying 1 setting parameter	90
(4) Status 1 request	STX △1, △8, ETX BCC CR LF (40)	Occurrence status of execution No. AL1 to AL4, PV, hardware error status request	90
(5) Status 2 request	STX △1, △9, ETX BCC CR LF (50)	A/M,AT,R/L status request	90

(Note)△= Space

②Command that moves the DB status

Command status	Command format	Function
(1) AUTO/MAN switching	STX △2, △1, □, □□□, □□□,ETX BCC CR LF (MV1: Set manual output value; MV2(During output 2): When no output 2 option, set space.; □: 0=AUTO, at that time space is set for MV1,MV2, 1=MAN)	Auto/manual switching and manual output setting
(2) Cancel alarm output	STX △2, △2, 1, ETX BCC CR LF (C5)	Same as alarm output cancellation in mode 1
(3) Remote/local switching	STX △2, △3, □, ETX BCC CR LF (1= Remote, 0= Local)	Same as Remote/local switching in mode 1
(4) Select execution No.	STX △2, △4, □, ETX BCC CR LF (Execution No. 1 to 8)	Same as 'Select execution No.' in mode 1
(5) Start/Stop auto tuning	STX △2, △5, □, ETX BCC CR LF (1= AT start, 0=AT stop)	Same as AT start, stop in mode 1

(Note) △= Space

③Real data request

Real data request: STX △1, △1, ETX BCC CR LF

(DF)

DB sending: STX △1, □, □□□□□□□□, □, □□□□□□□□,

PV (Measurement value)

SV (Setting value)

PV status
0: Normal
1:+ over range
2:— over range

During over range
Total digits 9

1 to 8 : SV No.
0: Remote SV

□□□□□□□□, □□□□□□□□, ETX BCC CR LF

MV1 (Output value)

MV2 (Output 2 value)

In case of output 2 option,
Dummy data when there is no option

[Reference] When DB sends a numeric value data, right justified or 0 suppressed data is sent in 8 digits PV, SV data with up to 4 digits after the decimal is sent. If it exceeds 6 digits including the decimal point then the last digit is truncated and the data is sent.

(Note)△= Space

④Execution parameter request

Execution parameter request: STX △1, △2, ETX BCC CR LF

(EF)

DB sending: STX △2, □, □□□□□□□□, □□□□□□□□,

Execution No. SV

Execute P

1 to 8: Execution No.

□□□□□□□□, □□□□□□□□, □□□□□□□□, □□□□□□□□,

Execute I Execute D Execute AL1 Execute AL2

□□□□□□□□, □□□□□□□□, ETX BCC CR LF

Execute AL3 Execute AL4

[Reference] When DB sends a numeric value data, right justified or 0 suppressed, data is sent as 8 digits.

(Note) △= Space

⑤ Individual parameter request

(1) Individual setting parameter request: STX △1, △3, □□, □ ETX BCC CR LF

- □□: Parameter type No. *1
- □: 1 to 8: When there are 8 types of Parameter No. parameters; 1: When there is 1 type of parameter

(2) Sending DB: DB sends the setting parameters that are requested.
Sending format is the same as format order at the time of setting it in DB from PC.
However the number of digits of the data differ. For details see appendix 11.1 communication format list.

*1 parameter type No. is a no. given to setting parameter and is indicated in section 8.2.

[Reference] When DB sends a numeric value data, right justified or 0 suppressed, data is sent as 8 digits.

(Note) △= Space

⑥ Status 1 request

(1) Status 1 request: STX △1, △8, ETX BCC CR LF
(40)

(2) DB sending: STX △8, □, □□, □□, □□, □□, □, □, ETX BCC CR LF

- □: Execution No. (1 to 8): 00: Alarm OFF; 01: Alarm ON; 10: Waiting
- □□: AL1 AL2 AL3 AL4 Alarm OFF
- □: Hardware error: 1: Error; 0: Normal
- □: PV error: 1: Error (±OR); 0: Normal

(Note) △= Space

⑦Status 2 request

(1) Status 2 request: STX △1, △9, ETX BCC CR LF
(50)

(2) DB sending: STX △9, □, □, □, ETX BCC CR LF

- □: R/L: 1: Remote; 0: Local
- □: A.T: 1: Being AT; 0:Normal
- □: A/M: 1:MAN; 0:AUTO

(Note) △= Space

9-3-2. Type and format of the parameter that is to be set in DB from the PC

(Parameter communication format of DB: Number of digits of data is 8.)

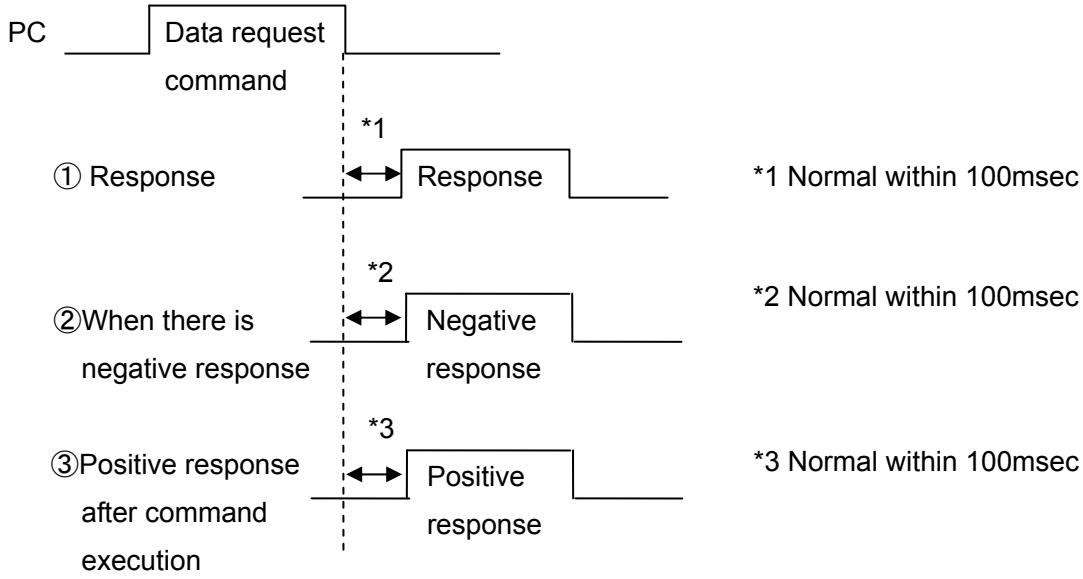
Parameter type	No.	Format
SV (1 to 8)	11	STX 11, □, □□□□□□, ETX BCC CR LF SV 1 to 8=PID No. 0=Copy to No. 1 to 8
Alarm (1 to 8)	12	STX 12, □, □□□□□□, □□□□□□, □□□□□□, AL1 AL2 AL3 □□□□□□, ETX BCC CR LF AL4 When 6 digits, all digits are space do not change the setting. 1 to 8=PID No. 0=Copy to No. 1 to 8 (Note) When alarm format is other than that, AL becomes dummy data.
PID (1 to 8)	13	STX 13,□, □□□□□□, □□□□, □□□□, ETX BCC CR LF P I D When all digits are space, do not change the settings. 1 to 8=PID No. 0=No.1 to 8, 90=Copy to No.91 to 98
Output variation limit (1 to 8)	14	STX 14,□, □□□□□, ETX BCC CR LF 1 to 8=PID No. 0=Copy to No. 1 to 9 (Note) When output variation limit is read, ascending value is read and when it is written ascending/descending absolute value is set.
Higher and lower limit output limit (1 to 8)	15	STX 15, □, □□□□□, □□□□□, ETX BCC CR LF OL-L OL-H 1 to 8=PID No. 0=Copy to No. 1 to 8

Parameter type	No.	Format
Sensor correction	16	STX 16, □□□□□□, ETX BCC CR LF (Note) When sensor correction is read, No. 1 is read and when it is written No.1 to No.8 is set.
Digital filter	17	STX 17, □□□□, ETX BCC CR LF
SV variation rate	18	STX 18, □□□□□, ETX BCC CR LF (Note) When set value variation rate is read, ascending value is read and when it is written, ascending/descending absolute value is set.
Remote scale	19	STX 19, □□□□□□, □□□□□□, ETX BCC CR LF MIN MAX When 6 digits, all digits are space do not change the setting.
Cascade	20	STX 20, □□□□, □□□□□, ETX BCC CR LF r b When all digits are space, do not change the settings.
Remote shift	21	STX 21, □□□□□□, ETX BCC CR LF (Note) When remote shift is read, No.1 is read, when it is written No.1 to No.8 is set.
Remote filter	22	STX 22, □□□□□□, ETX BCC CR LF
Transmission type Transmission scale	23	STX 23, □, □□□□□□, □□□□□□, ETX BCC CR LF Scale Min Scale MAX When 6 digits, all digits are space, do not change the setting. Transmission type: 0=SV, 1=PV, 2=MV, 3= Others (Note) Transmission type:3=Other writing is not possible
Output 2 P	24	STX 24, □□□□□, ETX BCC CR LF
Output 2 gap	25	STX 25, □□□□□, ETX BCC CR LF
Measurement input unit	30	STX 30, □□, □, ETX BCC CR LF Unit:0=℃, 2=K Input type No.

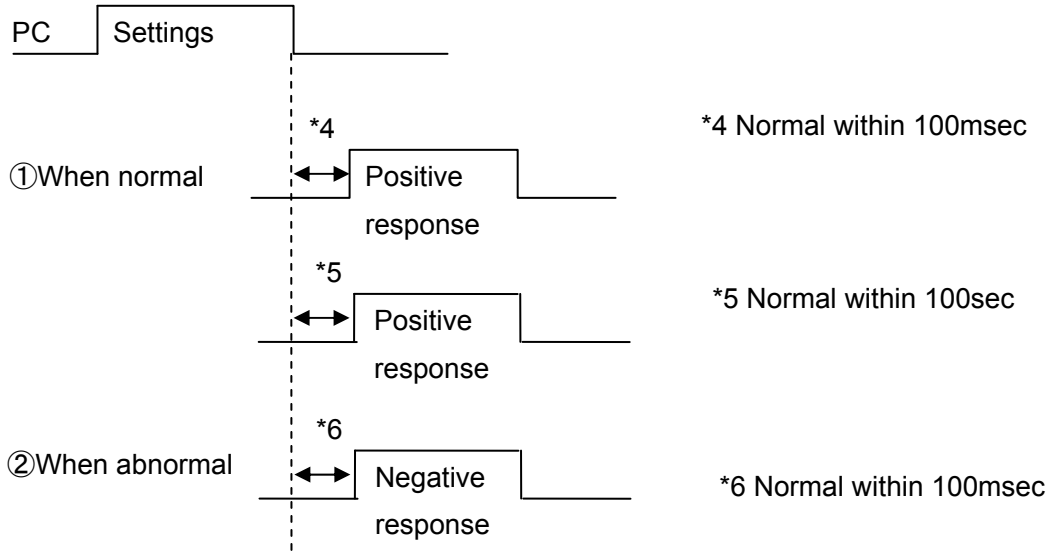
Parameter type	No.	Format
RJ INT/EXT	31	STX 31, □, ETX BCC CR LF 0=INT 1=EXT
Linear scale	32	STX 32, □□□□□□, □□□□□□, ETX BCC CR LF MIN MAX When 6 digits, all digits are space do not change the setting.
PV DOT	33	STX 33, □, ETX BCC CR LF
Scale DOT	34	STX 34, □, ETX BCC CR LF (Note) Differs from displayed SV decimal point.
Alarm format Alarm dead band	35	STX 35, □, □, □□□□□, ETX BCC CR LF Dead band Alarm: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 Nos. 1 to 4 (Note)Alarm format: 6=Nothing else can be written.
Dead band	36	STX 36, □□□, ETX BCC CR LF (Note) When dead band is read, dead band of output 1 is read and when it is written, it is set in dead band of output 1 and output 2.
Pulse cycle	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, it is set in pulse cycle of output 1, output 2.
FB zero Span Gain	38	STX 38, □□□□□, □□□□□, □□□, ETX BCC CR LF Zero Span Gain When all digits are space do not change the settings.
Output preset	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	40	STX 40, □□□□□, ETX BCC CR LF
Output Direct/Reverse	41	STX 41, □, ETX BCC CR LF 0=DIRECT 1=REV. (Note) When output direct/reverse is read, direct/reverse of control action of output 1 is read and when it is written, it is set in direct/reverse control action of output 1, output 2.

9-4. Communication time chart

9-4-1. Response to request command

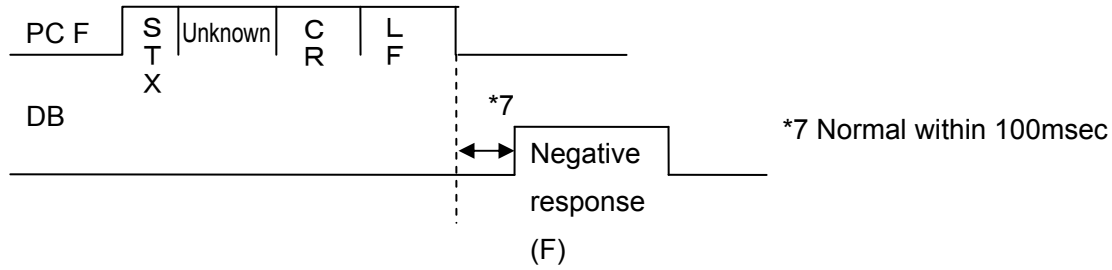


9-4-2. Response to the settings from the PC

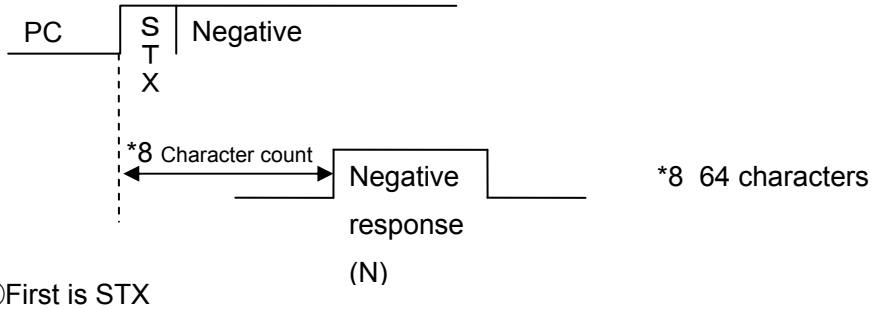


9-4-3. During other abnormalities

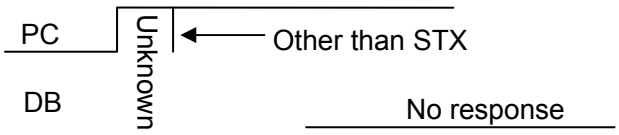
①Contents unknown



②Excess number of characters (buffer over)



③First is STX



9-4-4. Response of the PC

As indicated in sections from 9-5-1. to 9-5-3., regarding the settings and the requests from PC, DB responds after a specific time. If there is no response from the DB even after the specific time, it is necessary to perform the settings, requests again from the PC. For the timer time for resending from the PC, see the time chart in sections from 9-5-1. to 9-5-3.

⚠Precautions	To avoid accidents always read these contents and understand them.

This device, starting from the SV value writes each parameter once in EEPROM and takes a backup until the next setting change, but there is a limitation to the write count. (Approximately one million times)

Thus avoid the following usage method as the write count increases.

・If program is controlled using a PC, SV value is written frequently and in a short time the limiting write count is reached and EEPROM breaks.

[Counter measures]

When controlling the program using PC use communication remote function (See section 10.). If this method is used, there is no load on EEPROM.

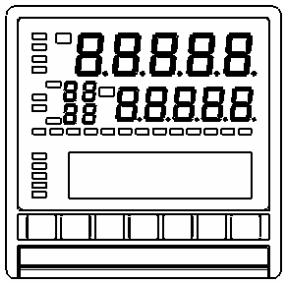
(However communication is not performed.)

10. Communication transmission, communication remote

10-1. Overview

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

When this function is used, if multiple DBs operate with the same condition, 1 machine from amongst them is the master device set for communication transmission and the others are slave devices set in communication remote. Maximum 31 slave device SVs can be set using communication. To change it to DB (master device) doing communication transmission or to communication remote DB (slave device) receiving it, it can be done by key settings of device itself.



If communication function of mode 7 is set as 'TRANS', it becomes a communication transmission (Master device) function.

If remote/local switching of mode 1 is set to 'REMOTE', it becomes a communication remote (slave device) function.

(Communication function settings and transmission data contents)

Mode 8, communication function settings (Master device) → (Slave device)	Transmission data contents
Protocol=PRIVATE (Transmission) → (Remote) [DB]	● Master device transmits the remote SV data and slave device receives it ● PRIVATE protocol
Protocol=MODBUS (Transmission) → (Remote) [DB]	● Master device transmits Run/Ready, execution no. selection, remote SV and remote device receives it. ● MODBUS protocol

※ In order that remote device does the reception it to necessary to switch it to remote mode.

※ Master device sends the following data.

・PRIVATE protocol

Remote SV data = Data selected in communication transmission type

・MODBUS protocol

① Run/Ready=Run/Ready status

② Select execution No. =Executing No.

③ Remote SV = Data selected in communication transmission type

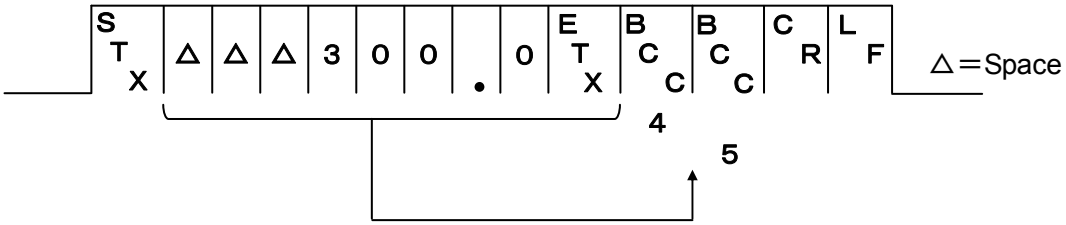
10-2. Specifications of communication division

- Communication system :Asynchronous method
- Communication speed :38400, 19200, 9600, 4800, 2400bps switching
- 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 : Sent or received 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 low order and high order.

(Example)



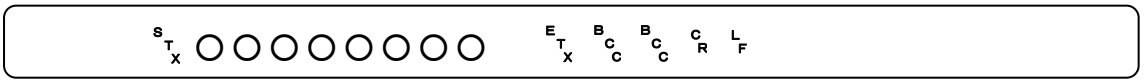
Character	△	△	△	3	0	0	•	0	ETX	Total sum=BCC
ASCII code	20h	20h	20h	33h	30h	30h	2Eh	30h	03h	154h=45

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 PROTCOL). (See 6-5)
5) Setting communication character (COM CHARCTER). (See 6-6)

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



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

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

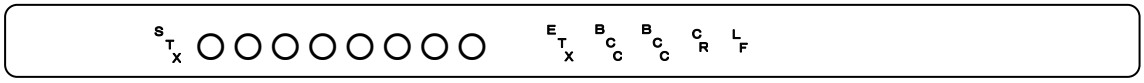
10-4. Communication remote settings

If the device is set to communication remote, SV data is received instead of analog, by digital communication. Just by the reception of SV data not being analog but digital communication, it has a function similar to remote/local (Option). However in communication remote, there is no remote scale function. By combination of communication transmission DB and communication remote DB, remote control and zone control that do not depend on analog are possible.

① In DB of communication remote, set the following parameters,
   1) Set the communication speed (COM BIT RATE). (See 6-1)
   2) Set the communication function (COM KIND). (See 6-3)
   3) Set the communication transmission type (COM TRANS KIND). (See 6-4)
   4) Set the communication protocol. (See 6-5)
   5) Set the communication character(COM CHARCTER). (See 6-6)
   6) Set the remote shift (REMOTE SHIFT). (Setting as per the requirement) (See General user's manual mode 2)

② If remote/local switching of mode 1 is set to 'REMOTE', and communication function of mode 7 is set to 'REM' then it becomes communication remote (slave device) function.
③ For setting of communication parameter, see section 6.
④ When the status is remote status, control using SV in case of local, until the initial remote SV data is received. Do the same at the time of starting the power supply also.

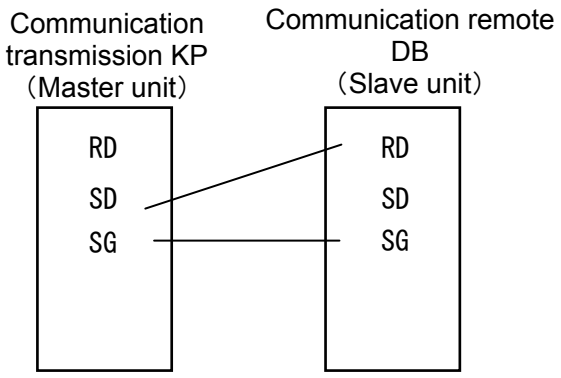
In case of 'PRIVATE mode' communication remote, DB receives in the following format. When communication function is set as 'REM' in 'PRIVATE mode' DB does not respond.



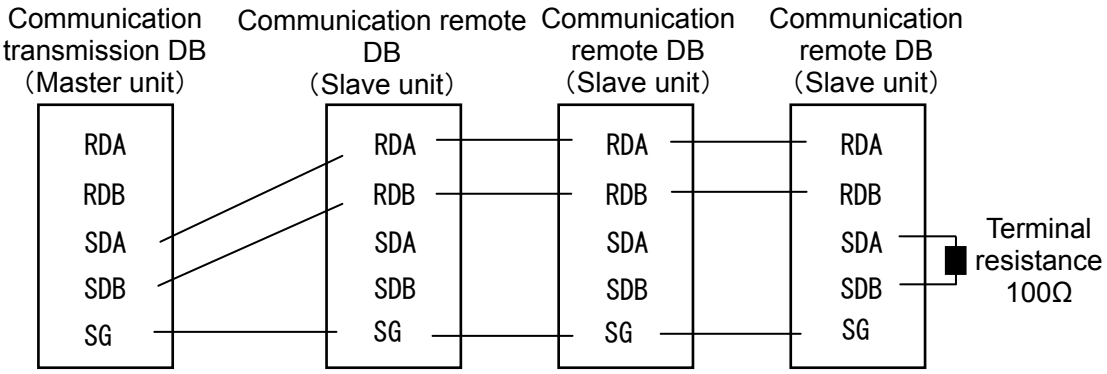
⚠ Precautions	① When connecting DB using communication remote, communication transmission the communication speed and transmission protocol must be the same. ② If analog remote and communication remote are used simultaneously analog remote takes precedence. ③ Analog transmission type and communication 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.

10-5. Wiring

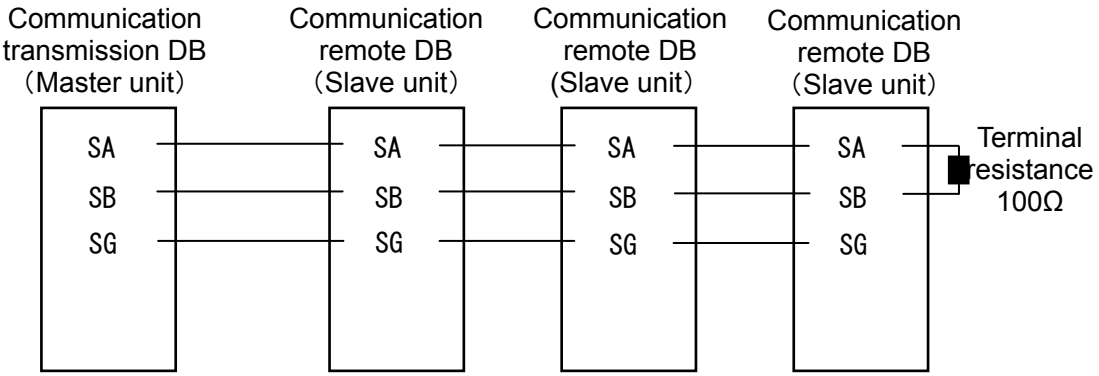
10-5-1. For RS-232C



10-5-2. For RS-422A



10-5-3.For RS-485



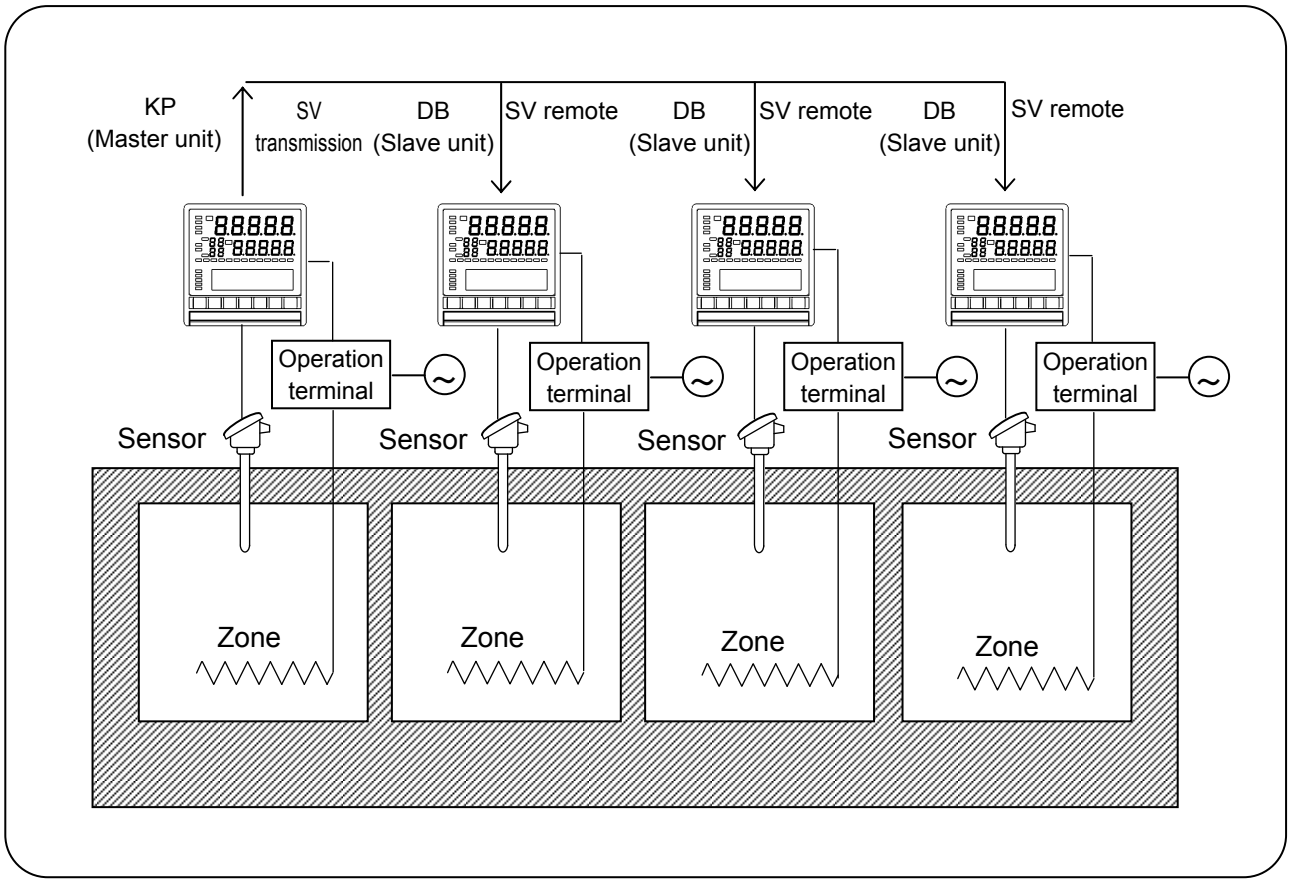
Precautions	Refer to 4-3. Wiring in instruction manual [general] for terminal numbers.

10-6. Example of combination

10-6-1. Multizone temperature control

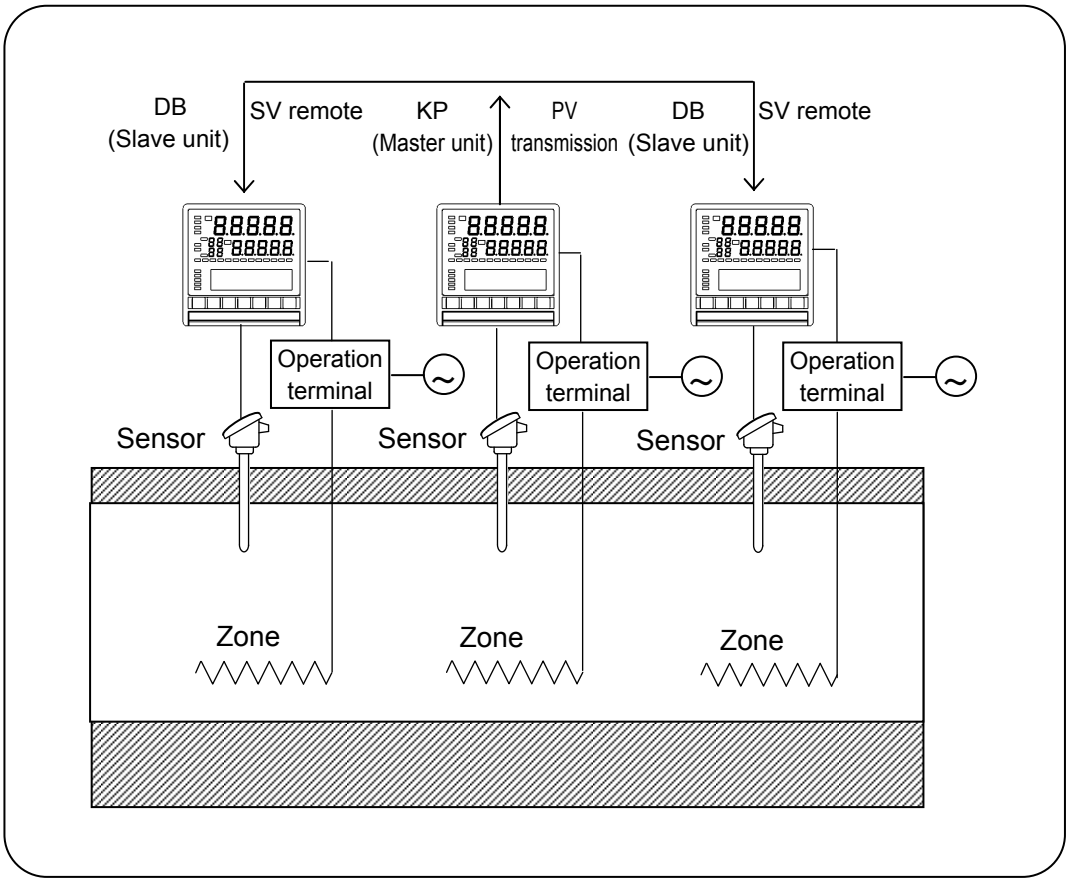
Perform communication transmission for SV using KP of base unit, and slave unit DB receives using communication remote.

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 mulitzone,



10-6-2. Controlling burning furnace zone

Communication transmission for PV is done using base unit in the center and both the cordless handsets receive SV as PV using communication remote and soakablity can be controlled properly.



11. Appendix

11-1. Communication format list

As mentioned below △=Space (20H), X=Code data and numeric value data at the time of setting, ○=Code data and numeric value data at the time of sending DB, 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	△	1	,	△	1	,	EX	BC	BC	CR	LF																		
	SX	△	1	,	○	,	○	○	○	○	○	○	○	○	,	○	,	○	○	○	○	○	○	○	○	,	○	○	○	○
										PV											SV								MV1	
	○	○	○	○	,	○	○	○	○	○	○	○	○	,	EX	BC	BC	CR	LF											
						MV2																								
Execution parameter Request	SX	△	1	,	△	2	,	EX	BC	BC	CR	LF																		
	SX	△	2	,	○	,	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	○	,	○	○	○	○	○
											SV								P									I		
	○	○	,	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	,
							D									AL1									AL2					
	○	○	○	○	○	○	○	○	,	○	○	○	○	○	○	○	○	,	EX	BC	BC	CR	LF						
				AL3									AL4																	
Individual settings parameter request	SX	△	1	,	△	3	,	×	×	,	×	,	EX	BC	BC	CR	LF													
Status1 Request	SX	△	1	,	△	8	,	EX	BC	BC	CR	LF																		
	SX	△	8	,	○	,	○	○	,	○	○	,	○	○	,	○	○	,	○	,	○	,	EX	BC	BC	CR	LF				
							AL1			AL2			AL3			AL4														
Status 2 Request	SX	△	1	,	△	9	,	EX	BC	BC	CR	LF																		
	SX	△	9	,	○	,	○	,	○	,	EX	BC	BC	CR	LF															
A/M Switching	SX	△	2	,	△	1	,	×	,	×	×	×	,	×	×	×	,	EX	BC	BC	CR	LF									
											MV1				MV2															
Alarm output Cancel	SX	△	2	,	△	2	,	1	,	EX	BC	BC	CR	LF																
R/L Switching	SX	△	2	,	△	3	,	×	EX	BC	BC	CR	LF																	
Select execution number	SX	△	2	,	△	4	,	×	,	EX	BC	BC	CR	LF																
AT start	SX	△	2	,	△	5	,	×	,	EX	BC	BC	CR	LF																

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
SV (1 to 8)	SX SX	11	11	, ,	× O	, ,	× O	× O	× O	× O	× O	× O	, O	EXO	BC ,	BCEX	CRBC	LFBC	CR	LF										
										SV																				
Alarm (1 to 8)	SX SX	11	22	, ,	× O	, .	× O	× O	× O	× O	× O	× O	, O	× O	× ,	× O	× O	× O	× O	, O	× O	× O	× O	× ,	× O	× O	, O	× O	× O	× O
										AL1										AL2								AL3		
	× O	× O	× ,	, O	EXO	BCO	BCO	CRO	LFO	O	O	,	EX	BC	BC	CR	LF													
							AL4																							
PID (1 to 8)	SX SX	11	33	, ,	× O	, ,	× O	× O	× O	× O	× O	, O	× O	× O	× ,	× O	, O	× O	× O	× O	× O	, O	EXO	BC ,	BCO	CRO	LFO	O	O	O
										P									I								D		
	O	O	,	EX	BC	BC	CR	LF																						
Output variation limit (1 to 8)	SX SX	11	44	, ,	× O	, ,	× O	× O	× O	× O	× O	, O	EXO	BCO	BC ,	CREX	LFBC	BC	CR	LF										
Output high and low limit (1 to 8)	SX SX	11	55	, ,	× O	, ,	× O	× O	× O	× O	× O	, O	× O	× O	× ,	× O	× O	, O	EXO	BCO	BCO	CRO	LFO	,	EX	BC	BC	CR	LF	
										OL-L									OL-H											
Sensor correction	SX SX	11	66	, ,	× O	× O	× O	× O	× O	× O	, O	EXO	BC ,	BCEX	CRBC	LFBC	CR	LF												
Digital filter	SX SX	11	77	, ,	× O	× O	× O	× O	, O	EXO	BCO	BCO	CR ,	LFEX	BC	BC	CR	LF												
SV variation rate	SX SX	11	88	, ,	× O	× O	× O	× O	× O	EXO	BCO	BCO	CREX	LFBC	BC	CR	LF													
Remote scale	SX SX	11	99	, ,	× O	× O	× O	× O	× O	× O	, O	× O	× ,	× O	× O	× O	× O	, O	EXO	BCO	BCO	CR ,	LFEX	BC	BC	CR	LF			
									MIN								MAX													
Cascade	SX SX	22	00	, ,	× O	× O	× O	× O r	, O	× O	× O	× O	× ,	× O	, O	EXO	BCO b	BCO	CRO	LFO	O	,	EX	BC	BC	CR	LF			
Remote Shift	SX SX	22	11	, ,	× O	× O	× O	× O	× O	× O	, O	EXO	BC ,	BCEX	CRBC	LFBC	CR	LF												
Remote filter	SX SX	22	22	, ,	× O	× O	× O	× O	, O	EXO	BCO	BCO	CR ,	LFEX	BC	BC	CR	LF												
Transmission type Transmission scale	SX SX	22	33	, ,	× O	, ,	× O	× O	× O	× O	× O	× O	, O	× O	× ,	× O	× O	× O	× O	, O	EXO	BCO	BCO	CR ,	LFEX	BC	BC	CR	LF	
										MIN									MAX											

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
Output 2 P	SX SX	2 2	4 4	, ,	× ○	× ○	× ○	× ○	× ○	, ○	EX ○	BC○	BC ,	CR EX	LF BC	BC	CR	LF												
Output 2 gap	SX SX	2 2	5 5	, ,	× ○	× ○	× ○	× ○	× ○	, ○	EX ○	BC ○	BC ,	CR EX	LF BC	BC	CR	LF												
Measurement input unit	SX SX	3 3	0 0	, ,	× ○	× ○	, ,	× ○	, ,	EX EX	BC BC	BC BC	CR CR	LF LF																
Linear scale	SX SX	3 3	2 2	, ,	× ○	× ○	× ○	× ○	× ○	× ○	, ○	EX ○	BC ○	BC ○	CR ,	LF EX	BC	BC	CR	LF										
	MIN																MAX													
PV DOT	SX SX	3 3	3 3	, ,	× ○	, ,	EX EX	BC BC	BC BC	CR CR	LF LF																			
Scale DOT	SX SX	3 3	4 4	, ,	× ○	, ,	EX EX	BC BC	BC BC	CR CR	LF LF																			
Alarm format Alarm dead band	SX SX	3 3	5 5	, ,	× ○	, ,	× ○	, ,	× ○	× ○	× ○	× ○	× ○	, ○	EX ○	BC ○	BC ,	CR EX	LF BC	BC	CR	LF								
Dead band	SX SX	3 3	6 6	, ,	× ○	× ○	× ○	, ○	EX ○	BC ○	BC ○	CR ○	LF ,	EX	BC	BC	CR	LF												
Pulse cycle	SX SX	3 3	7 7	, ,	× ○	× ○	× ○	, ,	EX EX	BC BC	BC BC	CR CR	LF LF																	
FB zero span	SX SX	3 3	8 8	, ,	× ○	× ○	× ○	× ○	× ○	, ○	× ○	× ○	× ,	× ○	× ○	, ○	× ○	× ○	× ○	, ○	EX ○	BC ,	BC ○	CR ○	LF ○	○	○	○	○	○
Gain	ZERO																SPAN _						GAIN							
	,	EX	BC	BC	CR	LF																								
Output preset	SX SX	3 3	9 9	, ,	× ○	× ○	× ○	× ○	× ○	, ○	EX ○	BC ○	BC ,	CR EX	LF BC	BC	CR	LF												
Output during PV abnormality	SX SX	4 4	0 0	, ,	× ○	× ○	× ○	× ○	× ○	, ○	EX ○	BC ○	BC ,	CR EX	LF BC	BC	CR	LF												
Output Direct/reverse	SX SX	4 4	1 1	, ,	× ○	, ,	EX EX	BC BC	BC BC	CR CR	LF 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	JPt50Ω
52	Pt-Co
53	Pt100Ω1
54	Pt100Ω2
56	Pt100Ω4
57	Pt100Ω5

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