Panasonic

TECHNICAL REFERENCE

- Modbus communication
and Block operation Specification -

MODEL

Product Name: AC Servo Driver
Product No.: MINAS-A6/A6L series

Issued on
Oct. 27, 2015
Revised on
Aug. 25, 2016

R2.1

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REVISIONS

Date	Page Points changed Dwg. No. changed	Sym	REVISION Reason for change/contents of change	Signed
Oct. 27, 2015	-	1.0	NEWLY ISSUED	
Aug.01, 2016	P1	2.0	Software version upgrade CPU1 Ver 1.03 → Ver 1.05 CPU2 Ver 1.03 → Ver 1.05	
	P34-36,59-64,66		1) Infinite revolution absolute function	
	-		2) External scale position information monitoring function under semi-closed control	
	-		3) Full-closed control support for load variance suppression function	
	-		4) Functional enhancement of quadrant projection suppression function	
	-		5) Position compare function	
	-		6) Serial absolute external scale Z-phase shift amount setting in pulse regeneration function	
	-		7) Slow stop function	
	-		8) Deterioration diagnosis warning function	

	P65
	P8-9,65
	P24,65
			9) Modbus function enhancements
			   - Strobe input operation automatic OFF
			   - Request action specification switching
			   - Mirror register setting	

	P3,30,33,66
	P30,62-63
	P44,47,51
	P38,66
			10) Block operation function enhancements
			   - Input signal start-up
			   - Full close control support
			   - Infinite length operation
			   - Absolute mode correspondence to origin offset	

	Cover		• Change Changed document title and issuing division	
	Cover		• Addition Added A6L to Product number	
	P1		• Addition Added function comparison table	
	P7-10		• Correction Corrected contents of communication timing	
	P11-16		• Correction Corrected contents of Modbus data construction	
	P17-19		• Addition Added contents to coil information	
	P20-29		• Addition Added contents to register information	
	P33		• Addition Added contents to input and output signal assignment	
	P34		• Correction Corrected listing of wrap around threshold value	
	P37		• Addition Added setting method	
	P39		• Correction Corrected listing of Note *4)	
	P39		• Addition Added Note *4)	
	P46		• Addition Added explanation of target absolute position	

(Note) Revised page numbers are those at the time of issue of the revised edition

REVISIONS

Date	Page Points changed Dwg. No. changed	Sym	REVISION Reason for change/contents of change	Signed
			(Continued from previous page)	
	P48		• Addition Added explanation on drive prohibited input assignment	
	P48		• Correction Corrected contents of detection method	
	P50		• Addition Added explanation of command and Note *2).	
	P53		• Addition Added explanation on the contents of command argument	
	P55		• Addition Added remarks to comparison target "command velocity"	
	P57		• Addition Added start up method	
	P62		• Change Changed attribute of Err80.0	
	P62-63		• Addition Added Err97.0	
	P64		• Addition Added function and contents to P5.31	
Aug. 25, 2016	P2	2.1	Software version upgrade CPU1 Ver 1.05 → Ver 1.06 CPU2 Ver 1.05 → Ver 1.06	
	-		1) "Main power supply AC Off detection time" Expansion of the set range	
	-		2) "Hybrid vibration suppression filter" Expansion of the set range	
	-		3) "Allowable motor operating range setting" Expansion of the protection functions	
	P50		4) "Block operation function" Specification improvement of Decelerate stop command	

(Note) Revised page numbers are those at the time of issue of the revised edition

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1. Scope

This technical document concerns the Modbus communication function specification and the block operation function specifications for MINAS-A6/A6L series.

<MINAS-A6/A6L series Function comparison>

○:Usable   ×:Not usable

Function \ Product		MINAS-A6 series (Standard (Rotating type) Motor controlled type)		
		[A6SE] (Basic type) Product number ending with:E***	[A6SG] (RS485/RS232 Communication type) Product number ending with:G***	[A6SF] (Multifunction type) Product number ending with:F***
Block operation	By Modbus communication	×	○ (Position control)	○ (Position control, full-close control)
	By input signal	○ (Position control)	○ (Position control)	○ (Position control, full-close control)

Function \ Product		MINAS-A6L series (Linea/DD motor control type)		
		-	[A6SL] (RS485/RS232 Communication type) Product number ending with:L***	[A6SM] (Multifunction type) Product number ending with:M***
Block operation	By Modbus communication	-	○ (Position control) *1)	○ (Position control) *1)
	By input signal	-	○ (Position control) *1)	○ (Position control) *1)

*1)   Block operation function cannot be used in case where the feedback scale is serial absolute rotary type.

<Software version>
These materials apply to the servo-amplifiers of the following software versions:
        CPU1 Version: Ver. 1.06
        CPU2 Version: Ver. 1.06
    * Please confirm the software version from the set-up support software (PANATERM) or from the front panel.

Software version	Functional change contents		Corresponding PANATERM
CPU1 Ver 1.03 CPU2 Ver 1.03	Initial release		6.0.0.2 or later
CPU1 Ver 1.05 CPU2 Ver 1.05	Function enhancement version 1		6.0.0.9 or later
	Additional function	Related items	
	1) Infinite revolution absolute function	6-1	
	2) External scale position information monitoring function under semi-closed control	Technical reference (Functional Specification)	
	3) Full-closed control support for load variance suppression function		
	4) Functional enhancement of quadrant projection suppression function		
	5) Position compare function		
	6) Serial absolute external scale Z-phase shift amount setting in pulse regeneration function		
	7) Slow stop function		
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	    - Full close control support
	    - Infinite length operation
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CPU1 Ver 1.06 CPU2 Ver 1.06	Function enhancement version 2		
	Additional function	Related items	
	1) "Main power supply AC Off detection time" Expansion of the set range	Technical reference (Functional Specification)	
	2) "Hybrid vibration suppression filter" Expansion of the set range		
	3) "Allowable motor operating range setting" Expansion of the protection functions		
	4) "Block operation function" Specification improvement of Decelerate stop command - Eliminated the constraint in the case that positioning action is not being executed.	4-6	

    * A new software version is downward compatible with a old software version.
        Parameters used in a old software version can be used in a new software version, as is.

<Related materials>
    SX-DSV03031:   MINAS-A6 series Technical reference (Functional Specification)
    SX-DSV*****:   MINAS-A6L series Technical reference (Functional Specification)

<Points to note>
    (1)   Unauthorized copying or reproduction of all or a part of this document is strictly prohibited.
    (2)   The contents of this document (specification, software version, etc.) are subject to change without notice for product improvement.

2. Summary

In block operation, block programming positioning action is possible by the combination of a maximum of 256 block commands.

In addition to the positioning commands, such as relative positioning, absolute positioning, return to origin command, etc., the use of output signal operation, conditional branching and other commands is possible. Operation of output signals and action pattern changes corresponding to the current motor positions and motor velocity can be easily achieved by combining these commands.

The activation of these block operations can be selected either by Modbus communications or by an input signal from the I/F connector.

The setting of block operation (block parameter setting) can be made by either of the two following methods:
- Block operation editor of the Set-up support software (PANATERM).
- Via Modbus communication (write register).

Relevant parameters

Class	No	Parameter title	Set range	Unit	Functions, contents
5	37	Modbus connection setting	0 to 2	-	Sets RS232/RS485 communications protocol. 0: MINAS standard protocol 1: Modbus-RTU (RS232 communications, 1:1 only) 2: Modbus-RTU (RS485 communications, 1:N compatible)
6	28	Special function select	0 to 2	-	Selects valid/invalid of block operation functions. 0: Block operations invalid 1: Block operations via Modbus communications valid 2: Block operations by input signal valid

2-1   Modbus communication specifications

2-1-1   Connection to communication line

(1)   In case of using RS232 physical layer:
Setting Pr 5.37 "Modbus connection setting" to 1, 1:1 connection Modbus communications by RS232 communication can be used.

Superior controller

RS232 interface

TXD	4	RXD
RXD	3	TXD
GND	1	GND

Servo driver

X2

SN751701 equivalent
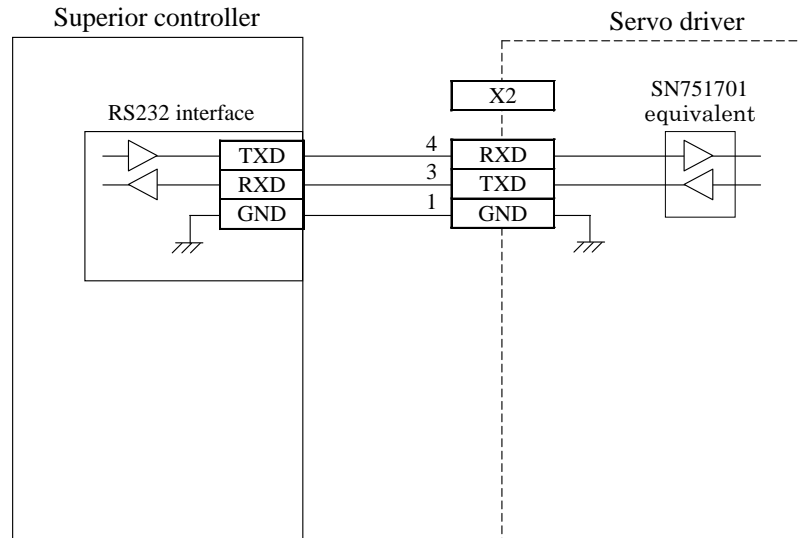
(2) In case of using RS485 physical layer:
By setting Pr 5.37 "Modbus connection setting" to 2, 1: N connection Modbus communications by RS485 communication can be used.
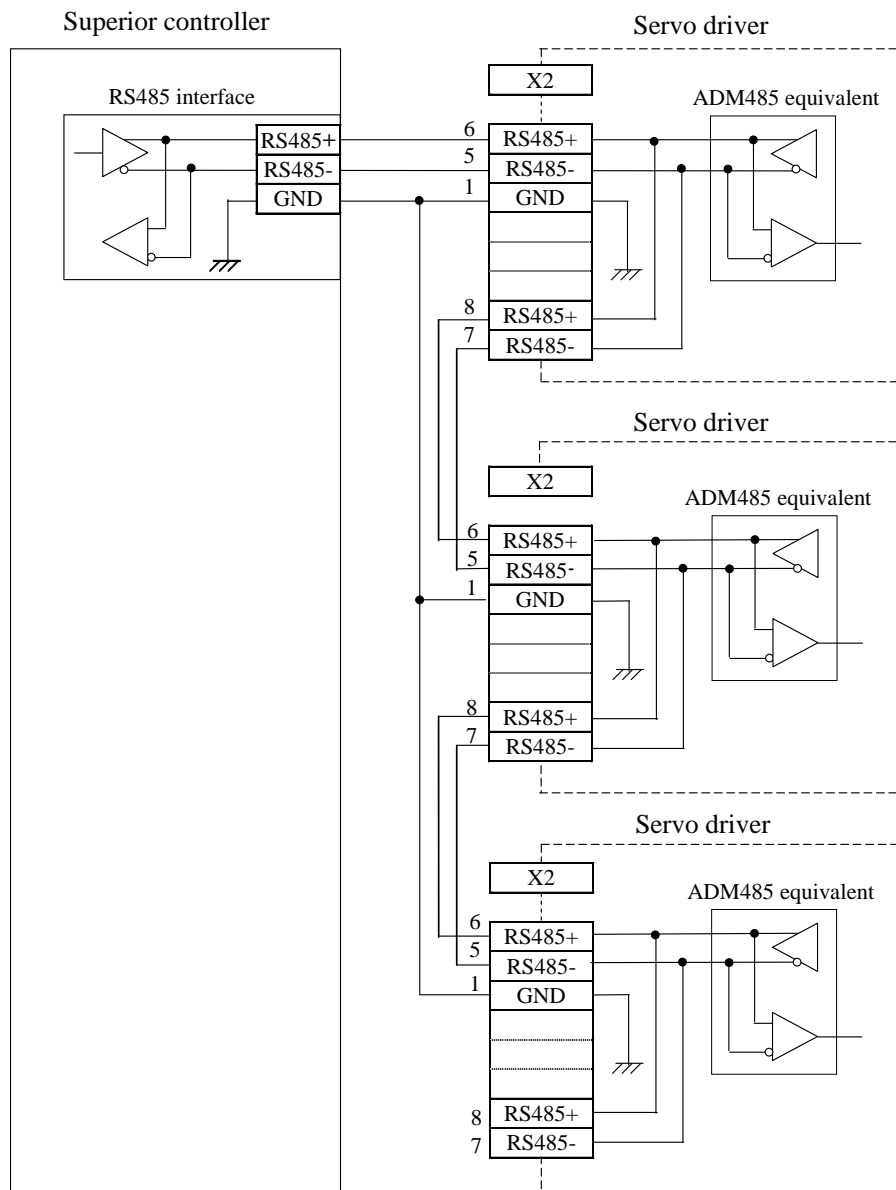
2-1-2   Communication specifications

Protocol	MODBUS-RTU (binary mode only)
Physical layer	RS232 (1:1), RS485 (1:N, Max. 31 axis)
Baud rate *1	2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bps
Data	8 bit
Parity *2	None, even, odd (set to even at shipment)
Start bit	1 bit
Stop bit *2	1, 2 bit (set to 1 bit at shipment)

*1   Baud rate can be selected by Pr 5.29 "Set RS232 communication baud rate" when using RS232 and Pr 5.30 "Set RS485 communication baud rate" when using RS485.

*2   Parity and stop bit can be selected by Pr 5.38 "Set Modbus communications".

Relevant parameters

Class	No	Parameter title	Set range	Unit	Functions, contents
5	29	RS232 communications baud rate setting *1	0 to 7	-	Set baud rate for RS232 communications. 0: 2400, 1: 4800, 2: 9600 3: 19200, 4: 38400, 5: 57600, 6: 115200, 7: 230400 bps Note) In case it is not Modbus communications (Pr.5.37 = 0), when value is set to 7, it will be set internally to 9600 bps.
5	30	RS485 communications baud rate setting *1	0 to 7	-	Set baud rate for RS485 communications. 0: 2400, 1: 4800, 2: 9600 3: 19200, 4: 38400, 5: 57600, 6: 115200, 7: 230400 bps Note) In case it is not Modbus communications (Pr.5.37 = 0), when value is set to 7, it will be set internally to 9600 bps.
5	38	Modbus communication setting	0 to 5	-	Sets parity (Even, odd, none) and stop bit length (1 bit, 2 bits) for Modbus communications. 0: Even/1bit 1: Even/2bit 2: Odd/1bit 3: Odd/2bit 4: None/1bit 5: None/2bit

2-1-3   Communication timing

2-1-3-1   Normal communications

Relevant parameter

Class	No	Parameter title	Set range	Unit	Functions, contents
5	39	Modbus response waiting Time	0 to 10000	ms	Set waiting time to be added from the receipt of Modbus communications request until response data is transmitted. Note) Even if value is set to 0, delay will occur for generation of response data.

T0:   Silent interval time: (3.5 character lengths or 0.75ms, whichever is longer)
T1:   Command processing time (will change in accordance with the command)
T2:   Response waiting time (0 to 1000 ms)
       Can be set by Pr5.39 "Modbus response waiting time". Set to 0 ms at shipment.

2-1-3-2   Broadcast communications (In case of using RS485)

The master station can broadcast commands simultaneously to multiple slave stations by setting 00h to the slave address (broadcast command).

Slave stations receiving the broadcast command will operate as per the setting of Pr5.42 "Modbus broadcast setting."
(When Pr5.42 bit 1 =1, the slave station shall ignore the broadcast command and will not execute request processing nor return a response.)

Relevant parameter

Class	No	Parameter title	Set range	Unit	Functions, contents
5	39	Modbus response waiting Time	0 to 10000	ms	Set waiting time to be added from the receipt of Modbus communications request until response data is transmitted. Note) Even if value is set to 0, delay will occur for generation of response data.
5	40	Modbus communications Time out time	ms	0 to 10000	Sets time to detect Err 80.0 "Modbus communications time out protection", in case Modbus communications specifying own axis or broadcast could not be received within the set length of time from the last time received, during the state where Modbus execution rights are secured. Err 80.0 not detected when set value is 0.
5	42	Modbus broadcast Setting	-32768 to 32767	-	Sets request processing and response action, in case broadcast mode request has been received in Modbus communications. bit 0 response action 0: Invalid (No action) 1: Valid (Action) *1 bit 1: Request processing 0: Valid (Process) 1: Invalid (No processing) bit 2: Strobe input operation automatic off 0: invalid, 1: valid *2 bit 3: Request operation specification switch *1 0: use Pr5.40, 1: Use Pr5.39 bit 4 - 15: Not used Please set to 0 (zero). The lowermost bit is designated as bit 0. *1 In case bit 3 = 0, returns response after Pr5.31 × Pr5.40[ms]. In case bit 3 = 1, returns response after Pr5.31 x Pr5.39 [ms]. Does not return response when bit 1 = 1. *2 After start-up of block operation, strobe input operation will be automatically turn OFF from the amplifier side. No need to write input OFF.

(1)   When response operation is set to Invalid (Pr5.42 bit 0 = 0)

The slave station will not return a response.

- In case the number of slaves = 2:
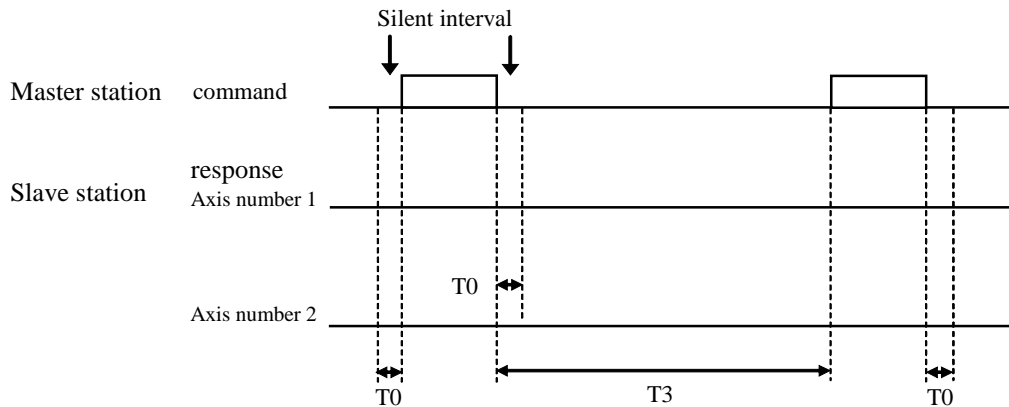
T0:   Silent interval time: (3.5 character lengths or 0.75ms, whichever is longer)
T1:   Command processing time (will change in accordance with the command)
T3:   Broadcast command processing time
$T3 \geq T0+T1$
Master station to transmit the next command after lapse of T3 period.

(2)   When response operation is set to Valid (Pr5.42 bit0=1)

The slave station will not return a response.
When response operation is set to Valid
Each slave station will return a response in accordance with the timing indicated below, based on their individual parameter settings.
Note that this specification is different from the standard Modbus specifications.

- In case the number of slaves = 2:
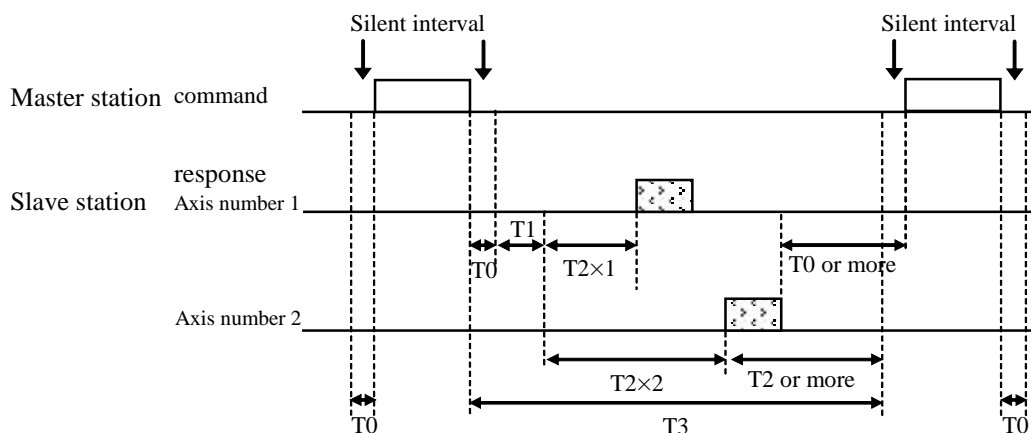
T0:   Silent interval time: (3.5 character lengths or 0.75ms, whichever is longer)
T1:   Command processing time (will change in accordance with the command)
T2:   Response waiting standard time (0 to 1000 ms)
Can be set by Pr5.40 "Modbus communications timeout time" when Pr5.42 bit 3 =0.
Can be set by Pr5.39 "Modbus response wait time" when Pr5.42 bit 3 =1.
Default setting is both set to 0 ms
Actual response wait time for each slave station shall be $T2 \times n$, (n: axis number (Pr5.31))
T3:   Broadcast command processing time
$T3 \geq T0 + T1 + T2 \times$ (largest slave axis number + 1)
Master station to transmit the following command after lapse of T3

2-1-3-3 Abnormal communication

When the slave station fails to receive the command issued from the master station normally, it will ignore the command and will not return a response.

• When a communications error is detected:

Abnormal communication generated
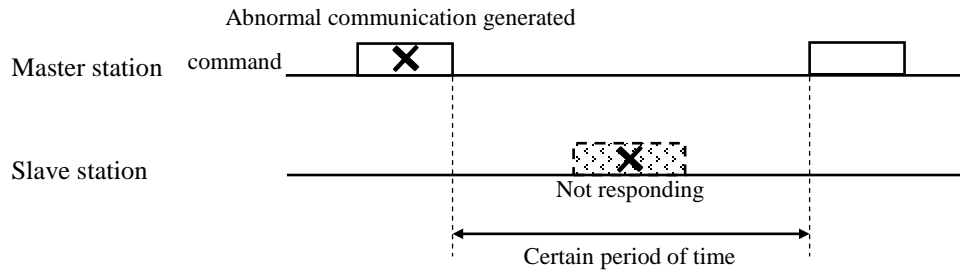
Using the timing charts of paragraphs 2-1-3-1 and 2-1-3-2 as reference, the master station shall judge time out when response from the slave station is not received within a certain period of time.

Furthermore, the slave station can detect time out from the command receiving interval from the master station by setting Pr5.40 "Modbus communication time out time."

Relevant parameter

Class	No	Parameter title	Set range	Unit	Functions, contents
5	40	Modbus communications Time out time		ms	0 to 10000	Sets time to detect Err 80.0 "Modbus communications time out protection", in case Modbus communications specifying own axis or broadcast could not be received within the set length of time from the last time received, during the state where Modbus execution rights are secured. Err 80.0 not detected when set value is 0.

2-1-4   Modbus data configuration

2-1-4-1   Command issue (Master station → Slave station)

Slave address (1 byte)
Function code (1 byte)
Data (0 to 252 bytes)
CRC (2 bytes)

▪ Slave address

00h	Broadcast address
01h to 7Fh	Slave address

▪ Function code

Function code	Function	Contents
01h	Read coil	Read out coil information
03h	Read register	Read out registers for monitors, parameters, etc.
05h	Write coil	Write into the coil
06h	Write register	Write into the register
08h	Communication diagnosis	Loop back test
0Fh	Write multiple coils	Write into multiple coils
10h	Write multiple registers	Write into multiple registers

▪ Data
  Will differ by function code.

▪ CRC
CRC (Cyclic Redundancy Check) will be used for error check of Modbus-RTU.
Generating polynomial, CRC1-16($X^{16}+X^{15}+X^2+1$) will be used to produce the CRC code.

1. CRC production procedure
   1) Set FFFFh as initial value of CRC.
   2) Calculate XOR of the first byte data of command (Slave address) and CRC, and set its result on CRC.
   3) CRC to be shifted right by 1 bit.
   4) In case the lowest digit bit overflow by the right shift in 3) is 0 (zero), go back to 3).
      In case the lowest digit bit is 1, then calculate XOR of A001h and CRC, set the result on CRC and return to 3).
   5) Repeat 3) and 4) until 8 shifts have been performed.
   6) Likewise, Repeat the process from 2) through 5) for the next byte in the command.
   7) The value of the last CRC after repeating the command for the number of data bytes shall be the CRC to be used for the error check.
   8) When adding CRC to the end of the command, make sure that the lower bytes of the CRC comes before the upper bytes (little-endian format)

2. Layout of CRC in the command
   16-bit CRC in the command will be little-endian transmitted, with the lower bytes being transmitted before the upper bytes.
   An example where the value of CRC is 4321h is indicated as follows:

Slave address (1 byte)	
Function code (1 byte)	
Data (0 to 252 bytes)	
CRC (2 bytes) lower	21h
upper	43h

3. CRC error judgment
   The value of CRC set by the host side is compared with the value of CRC recalculated from the command date received by the driver side. If they do not match, received data will be discarded as CRC error.
   And preparation will be made to receive the next transmission. (Will not go into an alarm state)

2-1-4-2   Function code details

(1)   Read coil (01h)

Transmission
Slave address
01h
Coil start address Upper
Lower
Number of coils Upper
Lower
CRC   Lower
Upper

Reply
Slave address
01h
Number of data bytes (N)
Data 1
Data 2
⋮
Data N
CRC   Lower
Upper

Abnormal response
Slave address
81h
Exception code
CRC   Lower
Upper

▪ Coil information for the number of coils set, counting from the address set as the coil start address, shall be sent as a reply.
▪ For the number of data bytes (N), the quotient itself is returned in case there is no remainder when the number of coils divided by 8, and "quotient + 1" in case there is a remainder.
▪ In case there is a remainder, the range off the specified coil number in the last data will be 0 (zero).
▪ Exception code   01h   Abnormal function codes
                         02h   Abnormal data address
                         03h   Abnormal data
                         04h   Abnormal response processing

(2)   Read register (03h)

Transmission
Slave address
03h
Register start address Upper
Lower
Number of register (N)   Upper
Lower
CRC   Lower
Upper

Reply	
Slave address	
03h	
Number of data bytes (N×2)	
Data 1	Upper
	Lower
Data 2	Upper
	Lower
⋮	
Data N	Upper
	Lower
CRC	Lower
	Upper

Abnormal response
Slave address
83h
Exception code
CRC   Lower
Upper

▪ Returns register data for the number of registers specified, counting from the address set as the register start address.
▪ Please set the address to read parameters and monitors for the register start address.
▪ Data is latched for every 10 data, inside the servo driver.
  In case more than 10 read register numbers are to be acquired, the combination of data requiring synchronization must be included within the same 10 data segment. (Example: Absolute 1 revolution data and multiple revolution data)
▪ Exception code   01h   Abnormal function codes
                         02h   Abnormal data address
                         03h   Abnormal data
                         04h   Abnormal response processing

(3)　　　Write coil (05h)

Transmission			Reply			Abnormal response	
Slave address			Slave address			Slave address	
05h			05h			85h	
Address	Upper		Address	Upper		Exception code	
	Lower			Lower		CRC	Lower
Changed data	Upper		Changed data N	Upper			Upper
	Lower			Lower			
CRC	Lower		CRC	Lower			
	Upper			Upper			

▪ Coil at the coil address specified is turned ON or OFF.
　ON :　Changed data upper FFh, lower 00h
　OFF:　Changed data upper 00h, lower 00h
▪ Exception code　01h　　Abnormal function codes
　　　　　　　　　02h　　Abnormal data address
　　　　　　　　　03h　　Abnormal data
　　　　　　　　　04h　　Abnormal response processing

(4)　　　Write register (06h)

Transmission			Reply			Abnormal response	
Slave address			Slave address			Slave address	
06h			06h			86h	
Address	Upper		Address	Upper		Exception code	
	Lower			Lower		CRC	Lower
Changed data	Upper		Changed data	Upper			Upper
	Lower			Lower			
CRC	Lower		CRC	Lower			
	Upper			Upper			

▪ Sets the value of changed data to the register specified as the address.
▪ Please set a valid address for the register start address.
• When writing servo parameters, use "Multiple register write (10h)" and not this function code.
▪ Exception code　01h　　Abnormal function codes
　　　　　　　　　02h　　Abnormal data address
　　　　　　　　　03h　　Abnormal data
　　　　　　　　　04h　　Abnormal response processing

(5)　　Communication diagnosis (08h)

Transmission
Slave address
08h
Diagnosis sub-code　Upper
Lower
Data　Upper
Lower
CRC　Lower
Upper

Reply
Slave address
08h
Diagnosis sub-code　Upper
Lower
Data　Upper
Lower
CRC　Lower
Upper

Abnormal response
Slave address
88h
Exception code
CRC　Lower
Upper

- Diagnosis sub-code
  upper 00h, lower 00h　loop back test
  　　Returns data transmitted from the host as is.
- Exception code　01h　Abnormal function codes
  　　　　　　　03h　Abnormal data
  　　　　　　　04h　Abnormal response processing

(6)　　Write multiple coils (0Fh)

Transmission
Slave address
0Fh
Start address　Upper
Lower
Number of coils　Upper
Lower
Number of data bytes (N)
Changed data 1
Changed data 2
⋮
Changed data N　Upper
CRC　Lower
Upper

Reply
Slave address
0Fh
Start address　Upper
Lower
Number of coils　Upper
Lower
CRC　Lower
Upper

Abnormal response
Slave address
8Fh
Exception code
CRC　Lower
Upper

- Writes data for the number of coils, starting from the coil specified as the start address.
- For the number of data bytes (N), set the quotient itself in case there is no remainder when the number of coils divided by 8, and "quotient + 1" in case there is a remainder.
- Changed data is set by the ON/OFF with 1-bit data (1/0) being assigned to each coil, starting from the coil designated as the start address.
- Exception code　01h　Abnormal function codes
  　　　　　　　02h　Abnormal data address
  　　　　　　　03h　Abnormal data
  　　　　　　　04h　Abnormal response processing

(7)　　　Write multiple registers (10h)

Transmission		
Slave address		
10h		
Start address		Upper
		Lower
Number of registers (N)	Upper	
	Lower	
Number of data bytes (N×2)		
Changed data 1		Upper
		Lower
Changed data 2		Upper
		Lower
⋮		
Changed data N		Upper
		Lower
CRC		Lower
		Upper

Reply	
Slave address	
10h	
Start address	Upper
	Lower
Number of registers (N)	Upper
	Lower
CRC	Lower
	Upper

Abnormal response	
Slave address	
90h	
Exception code	
CRC	Lower
	Upper

- ▪ Writes data for the number of registers, starting from the register specified as the start address.
- ▪ Exception code　01h　Abnormal function codes
    - 02h　Abnormal data address
    - 03h　Abnormal data
    - 04h　Abnormal response processing

2-1-4-3　Coil information

Address	Coil name	Attribute	Contents
Physical input state monitor: Can monitor the physical input state of the input signal (SI1 to SI10)			
0000h	Input signal 1 (SI1)	ReadOnly	0: Input OFF, 1: Input ON
0001h	Input signal 2 (SI2)	ReadOnly	0: Input OFF, 1: Input ON
0002h	Input signal 3 (SI3)	ReadOnly	0: Input OFF, 1: Input ON
0003h	Input signal 4 (SI4)	ReadOnly	0: Input OFF, 1: Input ON
0004h	Input signal 5 (SI5)	ReadOnly	0: Input OFF, 1: Input ON
0005h	Input signal 6 (SI6)	ReadOnly	0: Input OFF, 1: Input ON
0006h	Input signal 7 (SI7)	ReadOnly	0: Input OFF, 1: Input ON
0007h	Input signal 8 (SI8)	ReadOnly	0: Input OFF, 1: Input ON
0008h	Input signal 9 (SI9)	ReadOnly	0: Input OFF, 1: Input ON
0009h	Input signal 10 (SI10)	ReadOnly	0: Input OFF, 1: Input ON
Logic input state monitor: Can monitor each input state.			
0020h	Servo ON input (SRV-ON)	ReadOnly	0: Input OFF, 1: Input ON
0021h	Alarm clear input (A-CLR)	ReadOnly	0: Input OFF, 1: Input ON
0022h	Negative direction drive prohibited input (NOT)	ReadOnly	0: Input OFF, 1: Input ON
0023h	Positive direction drive prohibited input (POT)	ReadOnly	0: Input OFF, 1: Input ON
0024h	Control mode switching input (C-MODE)	ReadOnly	0: Input OFF, 1: Input ON
0025h	Zero velocity clamp input (ZEROSPD)	ReadOnly	0: Input OFF, 1: Input ON
0026h	Command divider multiplier switching 1 input (DIV1)	ReadOnly	0: Input OFF, 1: Input ON
0027h	Forced alarm input (E-STOP)	ReadOnly	0: Input OFF, 1: Input ON
0028h	Command pulse prohibited input (INH)	ReadOnly	0: Input OFF, 1: Input ON
0029h	Gain switching input (GAIN)	ReadOnly	0: Input OFF, 1: Input ON
002Ah	Clear counter input (CL)	ReadOnly	0: Input OFF, 1: Input ON
002Bh	For manufacturer use	ReadOnly	-
002Ch	Inner velocity command select 1 input (INTSPD1)	ReadOnly	0: Input OFF, 1: Input ON
002Dh	Inner velocity command select 2 input (INTSPD2)	ReadOnly	0: Input OFF, 1: Input ON
002Eh	For manufacturer use	ReadOnly	-
002Fh	For manufacturer use	ReadOnly	-
0030h	For manufacturer use	ReadOnly	-
0031h	For manufacturer use	ReadOnly	-
0032h	Inertia ratio switching input (J-SEL)	ReadOnly	0: Input OFF, 1: Input ON
0033h	Vibration damping control switching 1 input (VS-SEL1)	ReadOnly	0: Input OFF, 1: Input ON
0034h	Inner velocity command select 3 input (INTSPD3)	ReadOnly	0: Input OFF, 1: Input ON
0035h	Torque limit switching input (TL-SEL)	ReadOnly	0: Input OFF, 1: Input ON
0036h	Vibration damping control switching 2 input (VS-SEL2)	ReadOnly	0: Input OFF, 1: Input ON
0037h	Command divider multiplier switching 2 input (DIV2)	ReadOnly	0: Input OFF, 1: Input ON
0038h	Velocity sign specifying input (VC-SIGN)	ReadOnly	0: Input OFF, 1: Input ON
0039h	Torque sign specifying input (TC-SIGN)	ReadOnly	0: Input OFF, 1: Input ON
003Ah	For manufacturer use	ReadOnly	-
003Bh	Safety input 1 (SF1)	ReadOnly	0: Input OFF, 1: Input ON
003Ch	Safety input 2 (SF2)	ReadOnly	0: Input OFF, 1: Input ON
003Dh	For manufacturer use	ReadOnly	-
003Eh	For manufacturer use	ReadOnly	-
003Fh	For manufacturer use	ReadOnly	-

Address	Coil name	Attribute	Contents
Logic input signal operation: ON, OFF of each input condition can be operated.			
In case same function is assigned to I/F connector input, it will function as an OR with the state. (Except for servo-on (SRV-ON) input).			
0060h	Servo ON input (SRV-ON) operation	R/W	0000h: Input OFF, FF00h: Input ON
	In case servo-on (SRV-ON) is assigned to the I/F connector input, it will function as AND with the state. Release the I/F connector input assignment to operate servo-on/off by this coil independently.		
0061h	Alarm clear input (A-CLR) operation	R/W	0000h: Input OFF, FF00h: Input ON
0062h to 66h	For manufacturer use	R/W	-
0067h	Forced alarm input (E-STOP) operation	R/W	0000h: Input OFF, FF00h: Input ON
0068h	For manufacturer use	R/W	-
0069h	Gain switching input (GAIN) operation	R/W	0000h: Input OFF, FF00h: Input ON
006Ah to 71h	For manufacturer use	R/W	-
0072h	Inertia ratio switching input (J-SEL) operation	R/W	0000h: Input OFF, FF00h: Input ON
0073h	Vibration damping control switching 1 input (VS-SEL1) operation	R/W	0000h: Input OFF, FF00h: Input ON
0074h	For manufacturer use	R/W	-
0075h	Torque limit switching input (TL-SEL) operation	R/W	0000h: Input OFF, FF00h: Input ON
0076h	Vibration damping control switching 2 input (VS-SEL2) operation	R/W	0000h: Input OFF, FF00h: Input ON
0077h to 7Fh	For manufacturer use	R/W	-
Physical output state monitor: Can monitor the physical output state of the output signal (SO1 to SO6)			
0080h	Output signal 1 (SO1)	ReadOnly	0: Output OFF, 1: Output ON
0081h	Output signal 2 (SO2)	ReadOnly	0: Output OFF, 1: Output ON
0082h	Output signal 3 (SO3)	ReadOnly	0: Output OFF, 1: Output ON
0083h	Output signal 4 (SO4)	ReadOnly	0: Output OFF, 1: Output ON
0084h	Output signal 5 (SO5)	ReadOnly	0: Output OFF, 1: Output ON
0085h	Output signal 6 (SO6)	ReadOnly	0: Output OFF, 1: Output ON
Logic output state monitor: Can monitor each output state.			
00A0h	Servo ready state (S-RDY)	ReadOnly	0: Ready OFF, 1: Ready ON
00A1h	Alarm state (ALM)	ReadOnly	0: Alarm not generated, 1: Alarm generated
00A2h	Positioning complete state (INP)	ReadOnly	0: Incomplete, 1: Complete
00A3h	Mechanical brake release state (BRK-OFF)	ReadOnly	0: Brake activated, 1: Brake released
00A4h	Zero velocity detection state (ZSP)	ReadOnly	0: Undetected, 1: Detected
00A5h	Torque being limited state (TLC)	ReadOnly	0: Unlimited, 1: limited
00A6h	Velocity match detection state (V-COIN)	ReadOnly	0: Undetected, 1: Detected
00A7h	For manufacturer use	ReadOnly	-
00A8h	For manufacturer use	ReadOnly	-
00A9h	Reached velocity detection state (AT-SPEED)	ReadOnly	0: Undetected, 1: Detected
00AAh	For manufacturer use	ReadOnly	-
00ABh	For manufacturer use	ReadOnly	-
00ACh	For manufacturer use	ReadOnly	-
00ADh	Dynamic brake activation state (DBRK)	ReadOnly	0:DB OFF 1:DB ON
00AEh	For manufacturer use	ReadOnly	-
00AFh	Motor electrified state (FREE)	ReadOnly	0: Electrified, 1: Not electrified
00B0h	Warning output 1 state (WARN1)	ReadOnly	0: Warning 1 not generated state, 1: Warning 1 generated state
00B1h	Warning output 2 state (WARN2)	ReadOnly	0: Warning 2 not generated state, 1: Warning 2 generated state
00B2h	Positioning command with or without state (P-CMD)	ReadOnly	0: No positioning command, 1: With positioning command
00B3h	2nd positioning complete state (INP2)	ReadOnly	0: 2nd positioning incomplete, 1: 2nd positioning complete
00B4h	Velocity being limited state (V-LIMIT)	ReadOnly	0: No velocity limit, 1: Velocity being limited
00B5h	Alarm attribute state (ALM-ATB)	ReadOnly	0: Not clearable, 1: Clearable
00B6h	Velocity command with or without state (V-CMD)	ReadOnly	0: No velocity command, 1: With velocity command
00B7h	Safety EDM state (O-EDM)	ReadOnly	0:EDM OFF 1:EDM ON
00B8h to BFh	For manufacturer use	ReadOnly	-

Address	Coil name	Attribute	Contents
Motor activation state monitor: Able to monitor the activation state of the motor			
0100h	Torque being limited state	ReadOnly	0: Torque not limited, 1: Torque being limited
0101h	less than 30r/min detection state	ReadOnly	0: 30r/min or higher, 1: less than 30 r/min
0102h	In negative direction rotating state	ReadOnly	0: Not in negative direction rotation, 1: In negative direction rotation.
0103h	In positive direction rotating state	ReadOnly	0: Not in positive direction rotation, 1: In positive direction rotation.
0104h	For manufacturer use	ReadOnly	-
0105h	For manufacturer use	ReadOnly	-
0106h	For manufacturer use	ReadOnly	-
0107h	For manufacturer use	ReadOnly	-
Block operation control operation: Enables control flags related to block operations to be operated.			
In case the same functions are assigned to I/F connector input, it will function as an OR with the state.			
0120h	Strobe input (STB) operation	R/W	0000h: Input OFF, FF00h: Input ON
0121h	For manufacturer use	R/W	-
0122h	Vicinity of origin input (HOME) operation	R/W	0000h: Input OFF, FF00h: Input ON
0123h	Immediate stop input (H-STOP) operation	R/W	0000h: Input OFF, FF00h: Input ON
0124h	Decelerated stop input (S-STOP) operation	R/W	0000h: Input OFF, FF00h: Input ON
Block operation control monitor: Enables monitoring of control flags related to block operations.			
0130h	Strobe input (STB) state	ReadOnly	0: Input OFF, 1: Input ON
0131h	For manufacturer use	ReadOnly	-
0132h	Vicinity of origin sensor input (HOME) state	ReadOnly	0: Input OFF, 1: Input ON
0133h	Immediate stop input (H-STOP) state	ReadOnly	0: Input OFF, 1: Input ON
0134h	Decelerated stop input (S-STOP) state	ReadOnly	0: Input OFF, 1: Input ON
0138h	For manufacturer use	ReadOnly	-
0139h	For manufacturer use	ReadOnly	-
013Ah	For manufacturer use	ReadOnly	-
013Bh	For manufacturer use	ReadOnly	-
013Ch	For manufacturer use	ReadOnly	-
013Dh	For manufacturer use	ReadOnly	-
013Eh	For manufacturer use	ReadOnly	-
013Fh	For manufacturer use	ReadOnly	-
Block operation state monitor: Enables monitoring of block operation status.			
0140h	Action implementation state (BUSY)	ReadOnly	0: Not implemented, 1: Being implemented
0141h	Returned to origin completed state (HOME-CMP)	ReadOnly	0: Incomplete, 1: Complete
0142h	Block operation output 1 (B-CTRL1)	ReadOnly	0:OFF 1:ON
0143h	Block operation output 2 (B-CTRL2)	ReadOnly	0:OFF 1:ON
0144h	Block operation output 3 (B-CTRL3)	ReadOnly	0:OFF 1:ON
0145h	Block operation output 4 (B-CTRL4)	ReadOnly	0:OFF 1:ON
0146h	Block operation output 5 (B-CTRL5)	ReadOnly	0:OFF 1:ON
0147h	Block operation output 6 (B-CTRL6)	ReadOnly	0:OFF 1:ON

2-1-4-4   Register information

[Address in the 1000h order]

Address	Register name	Units	Range	Number of register	Attribute	Contents
1000h	Manufacturer device name	(ASCII)	-	8	ReadOnly	Amplifier part number (16 characters) Example) In case of "MADLT15SF" 　Address 1000h = 414Dh ("AM") 　Address 1001h = 4C44h ("LD") 　Address 1002h = 3154h ("1T") 　Address 1003h = 5335h ("S5") 　Address 1004h = 0046h (NULL+"F") 　Address 1005h = 0000h (NULL+NULL) 　Address 1006h = 0000h (NULL+NULL) 　Address 1007h = 0000h (NULL+NULL) Note) The two characters inside one register are in reverse order.
1010h	Manufacturer software version	(ASCII)	-	8	ReadOnly	Amplifier software version (16 characters) Example) In case of "V105.001.105.001" 　Address 1010h = 3156h ("1V") 　Address 1011h = 3530h ("50") 　Address 1012h = 302Eh ("0.") 　Address 1013h = 3130h ("10") 　Address 1014h = 312Eh ("1.") 　Address 1015h = 3530h ("50") 　Address 1016h = 302Eh ("0.") 　Address 1017h = 3130h ("10") Note) The two characters inside one register are in reverse order.
1020h	Save all parameters	-	0 to 4294967295	2	R/W	Write parameter into EEPROM Write EEPROM will be executed when "6173h" is written,
1030h	Maximum messages	-	0 to 255	1	ReadOnly	0Eh fixed
1031h	Newest message	-	0 to 255	1	ReadOnly	Latest error history index
1032h	Newest acknowledged message	-	0 to 255	1	R/W	Clear error history Clear error history will be executed when "0000h" is written,
1038h	Diagnosis message 1	-	-	8	ReadOnly	Error history 1, Time of occurrence 　Address 1038h = Time of error occurrence (lower 16 bit) 　　　　　　　　　　[0.5h] 　Address 1039h = Time of error occurrence (upper 16 bit) 　　　　　　　　　　[0.5h] 　Address 103Ah bit15 = For manufacturer use 　　　　　　　　bit14-8 = Error number (main) 　　　　　　　　bit7-0 = Error number (sub) 　Address 103Bh-103Fh = For manufacturer use
1040h	Diagnosis message 2	-	-	8	ReadOnly	Error history 2, Time of occurrence
1048h	Diagnosis message 3	-	-	8	ReadOnly	Error history 3, Time of occurrence
1050h	Diagnosis message 4	-	-	8	ReadOnly	Error history 4, Time of occurrence
1058h	Diagnosis message 5	-	-	8	ReadOnly	Error history 5, Time of occurrence
1060h	Diagnosis message 6	-	-	8	ReadOnly	Error history 6, Time of occurrence
1068h	Diagnosis message 7	-	-	8	ReadOnly	Error history 7, Time of occurrence
1070h	Diagnosis message 8	-	-	8	ReadOnly	Error history 8, Time of occurrence
1078h	Diagnosis message 9	-	-	8	ReadOnly	Error history 9, Time of occurrence
1080h	Diagnosis message 10	-	-	8	ReadOnly	Error history 10, Time of occurrence
1088h	Diagnosis message 11	-	-	8	ReadOnly	Error history 11, Time of occurrence
1090h	Diagnosis message 12	-	-	8	ReadOnly	Error history 12, Time of occurrence
1098h	Diagnosis message 13	-	-	8	ReadOnly	Error history 13, Time of occurrence
10A0h	Diagnosis message 14	-	-	8	ReadOnly	Error history 14, Time of occurrence

[Address in the 3000h order]

Addresses in the 3000h order are assigned to servo parameters (class 0 to 15).
Please refer to Technical Reference (Functional Specification) for details of servo parameters.

Address	3000h + (Class × 100h) + (No.× 2h)
Units	As per servo parameter
Range	As per servo parameter
Number of register	2
Attribute	R/W

Example) Parameter for "Velocity feed forward gain", class 1, No. 10; 3114h

$$3 \quad 1 \quad 14 \quad h$$

No. × 2h (00h to FEh)

Class (0h to Fh)
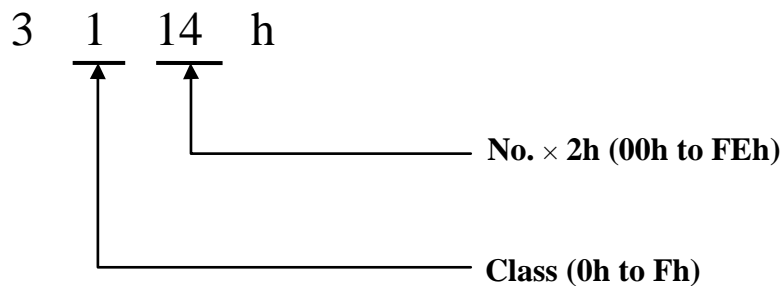
- The number of registers for each servo parameter shall be 2, regardless of its range.
  Always specify the address indicated above for the start address, with the number of registers set to 2, for write or read. (Use "multiple register write (10h)" as the function code for write, not "register write (06h).")

- Always execute read after write to confirm that the written data can be read.

- In the initial state, the contents to be read will be the parameter set value, but this can be changed by writing values to the following registers.
      Address 4210h "Servo parameter area output switching"
            0000h: Parameter set value
            0001h: Parameter minimum value
            0002h: Parameter maximum value
            0003h: Parameter attributes

- Write the value to the following register to save the set values of servo parameters to EEPROM.
      Address 1020h "Save all parameters"
            6173h: Execute writing EEPROM

[Address in the 4000h order]

Address	Register name	Units	Range	Number of register	Attribute	Contents
4000h	Statusword1	-	0 to 65535	1	ReadOnly	Amplifier state
4001h	Error code	-	0 to 65535	1	ReadOnly	Error number main (1byte), sub (1byte) Example) In case of Err26.0 1400h (main: 1Ah=26, sub: 00h=0)
4002h	Motor name	-	-	8	ReadOnly	Motor part number (16 characters) Example) In case of MSMF022L2CMT Address 4002h = 534Dh ("SM") Address 4003h = 464Dh ("MF") Address 4004h = 3230h ("20") Address 4005h = 4C32h ("L2") Address 4006h = 4332h ("C2") Address 4007h = 544Dh ("TM") Address 4008h = 2020h (" ") Address 4009h = 2020h (" ") Note) The two characters in one register will be in reverse order.
400Ah	Motor serial number	-	0 to 4294967295	2	ReadOnly	Motor serial number Production year (1 byte), production month (1 byte), serial number (2 bytes) Example) When serial number is 14120001: Address 400Ah = 0C0Eh (December, (20)14) Address 400Bh = 0001h (serial No. = 0001)
400Ch	Warning flag	-	0 to 4294967295	2	ReadOnly	Warning flag
400Eh	Overload ratio	%	0 to 500	1	ReadOnly	Motor load rate
400Fh	Regenerative load factor	%	-32768 to 32767	1	ReadOnly	Regeneration load rate
4010h	Power supply on integrated time	0.5h	-2147483648 to 2147483647	2	ReadOnly	Aggregate power-on hours
4012h	Driver temperature	°C	-32768 to 32767	1	ReadOnly	Servo driver temperature
4013h	Number of times of irruptive resistance relay changing	Times	-2147483648 to 2147483647	2	ReadOnly	Number of rush resistor relay changing
4015h	Number of times of dynamic brake relay changing	Times	-2147483648 to 2147483647	2	ReadOnly	Number of dynamic brake relay changing
4017h	Fan operation time	0.5h	0 to 1000000	2	ReadOnly	Fan operating hours
4019h	Fan life time integrated value	0.1%	0 to 1000	1	ReadOnly	Fan life integrated value
401Ah	Condenser life time integrated value	0.1%	0 to 1000	1	ReadOnly	Capacitor life integrated value
401Bh	Encoder temperature	° C	-32768 to 32767	1	ReadOnly	Encoder temperature
401Ch	Velocity command value	Command unit/s	-2147483648 to 2147483647	2	ReadOnly	Pre-filter command velocity
401Eh	Velocity command value	rpm	-32768 to 32767	1	ReadOnly	Position command velocity
401Fh	Velocity command value	rpm	-32768 to 32767	1	ReadOnly	Internal position command velocity
4020h	Position command value	Command unit	-2147483648 to 2147483647	2	ReadOnly	Post-filter command position
4022h	Following error actual value	pulse	-2147483648 to 2147483647	2	ReadOnly	Encoder position deviation
4024h	Velocity command value	rpm	-32768 to 32767	1	ReadOnly	Velocity control command
4025h	Velocity actual value	rpm	-32768 to 32767	1	ReadOnly	Motor velocity
4026h	Velocity limit value	rpm	-32768 to 32767	1	ReadOnly	Velocity limit
4027h	Full close position following error	pulse	-2147483648 to 2147483647	2	ReadOnly	Full close deviation
4029h	Hybrid following error	Command unit	-2147483648 to 2147483647	2	ReadOnly	Hybrid deviation
402Bh	Velocity command value	Command unit/s	-2147483648 to 2147483647	2	ReadOnly	Post filter command velocity

(To be continued)

Address	Register name	Unit	Range	Number of register	Attribute	Contents
4100h	Absolute multiturn data clear function	-	0 to 65535	1	R/W	Absolute clear function Absolute clear will be executed when "6165h" is written,
4102h	Trip reset function	-	0 to 65535	1	R/W	Clear alarm and warning Alarm and warning clear will be executed when "7274h" is written,
4200h	Encoder ID-L	–	0 to 255	1	ReadOnly	Encoder ID-L
	Encoder ID-H	–	0 to 255		ReadOnly	Encoder ID-H
4201h	Encoder status-L	–	0 to 255	1	ReadOnly	Encoder status-L
	Encoder status-H	–	0 to 255		ReadOnly	Encoder status-H
4202h	Encoder single turn data-L	–	0 to 255	2	ReadOnly	Encoder 1 rotation data-L
	Encoder single turn data-M	–	0 to 255		ReadOnly	Encoder 1 rotation data-M
	Encoder single turn data-H	–	0 to 255		ReadOnly	Encoder 1 rotation data-H
4204h	Encoder multi turn data-L	–	0 to 255	1	ReadOnly	Encoder multi-rotation data-L
	Encoder multi turn data-H	–	0 to 255		ReadOnly	Encoder multi-rotation data-H
4208h	External scale ID-L	–	0 to 255	1	ReadOnly	External scale ID-L
	External scale ID-H	–	0 to 255		ReadOnly	External scale ID-H
4209h	External scale status-L	–	0 to 255	1	ReadOnly	External scale status-L
	External scale status-H	–	0 to 255		ReadOnly	External scale status-H
420Ah	External scale data (Lower 24bit)-L	–	0 to 255	2	ReadOnly	External scale data (lower 24 bit)-L
	External scale data (Lower 24bit)-M	–	0 to 255		ReadOnly	External scale data (lower 24-bit)-M
	External scale data (Lower 24bit)-H	–	0 to 255		ReadOnly	External scale data (lower 24-bit)-H
420Ch	External scale data (Upper 24bit)-L	–	0 to 255	2	ReadOnly	External scale data (Upper 24 bit)-L
	External scale data (Upper 24bit)-M	–	0 to 255		ReadOnly	External scale data (Upper 24 bit)-M
	External scale data (Upper 24bit)-H	–	0 to 255		ReadOnly	External scale data (Upper 24 bit)-H
4210h	Servo parameter area output switching	–	0 to 65535	1	R/W	Servo parameter area output switching 0000h: Parameter set value 0001h: Parameter minimum value 0002h: Parameter maximum value 0003h: Parameter attributes
4300h	mode	–	0 to 255	1	R/W	Set Modbus communication right *1 55h: Acquire communication rights AAh: Release communication rights

(To be continued)

*1) The servo amp will enter the following condition when Modbus communication right is acquired:
- All front panel operations cannot be used except for monitor mode (exclusive function)
- Err80.0 "Modbus communications time out protection" will be valid

Modbus communication right cannot be acquired if the front panel status is in "Execution indication," other than monitor mode.
(Refer to Technical Materials (Basic function specification edition) regarding the front panel.)

This register (4300h) cannot be set to Pr5.58 - 65, 79 - 86 "Modbus mirror register setting."

Address	Register name	Unit	Range	Number of register	Attribute	Contents
4400h	Physical input	–	0 to 4294967295	2	ReadOnly	Physical input state monitor (coil map)
4402h	Logical input	–	0 to 4294967295	2	ReadOnly	Logic input state monitor (coil map)
4406h	Virtual input	–	0 to 4294967295	2	R/W	Logic input signal operation (coil map)
4408h	Physical output	–	0 to 4294967295	2	ReadOnly	Physical output state monitor (coil map)
440Ah	Logical output	–	0 to 4294967295	2	ReadOnly	Logic output state monitor (coil map)
4410h	Statusflag	–	0 to 255	1	ReadOnly	Motor activation state monitor (coil map)
4411h	Block controlword	–	0 to 65535	1	R/W	Block operation control operation (coil map)
4412h	Actual block controlword	–	0 to 65535	1	ReadOnly	Block operation control monitor (coil map)
4413h	Block statusflag	–	0 to 65535	1	ReadOnly	Block operation state monitor (coil map)
4414h	Block number	–	0 to 65535	1	R/W	Specify block number
4415h	Actual block number	–	0 to 65535	1	ReadOnly	Actual block number
4416h	Block number monitor	–	0 to 65535	1	ReadOnly	Currently valid block number
4418h	Mirror register 1	-	*3)	1	*3)	Write to Modbus register address set in Pr5.58 "Modbus mirror register set 1" is enabled. *2)
4419h	Mirror register 2	-	*3)	1	*3)	Write to Modbus register address set in Pr5.59 "Modbus mirror register set 1" is enabled. *2)
441Ah	Mirror register 3	-	*3)	1	*3)	Write to Modbus register address set in Pr5.60 "Modbus mirror register set 1" is enabled. *2)
441Bh	Mirror register 4	-	*3)	1	*3)	Write to Modbus register address set in Pr5.61 "Modbus mirror register set 1" is enabled. *2)
441Ch	Mirror register 5	-	*3)	1	*3)	Write to Modbus register address set in Pr5.62 "Modbus mirror register set 1" is enabled. *2)
441Dh	Mirror register 6	-	*3)	1	*3)	Write to Modbus register address set in Pr5.63 "Modbus mirror register set 1" is enabled. *2)
441Eh	Mirror register 7	-	*3)	1	*3)	Write to Modbus register address set in Pr5.64 "Modbus mirror register set 1" is enabled. *2)
441Fh	Mirror register 8	-	*3)	1	*3)	Write to Modbus register address set in Pr5.65 "Modbus mirror register set 1" is enabled. *2)
4420h	Mirror register 9	-	*3)	1	*3)	Write to Modbus register address set in Pr5.79 "Modbus mirror register set 1" is enabled. *2)
4421h	Mirror register 10	-	*3)	1	*3)	Write to Modbus register address set in Pr5.80 "Modbus mirror register set 1" is enabled. *2)
4422h	Mirror register 11	-	*3)	1	*3)	Write to Modbus register address set in Pr5.81 "Modbus mirror register set 1" is enabled. *2)
4423h	Mirror register 12	-	*3)	1	*3)	Write to Modbus register address set in Pr5.82 "Modbus mirror register set 1" is enabled. *2)
4424h	Mirror register 13	-	*3)	1	*3)	Write to Modbus register address set in Pr5.83 "Modbus mirror register set 1" is enabled. *2)
4425h	Mirror register 14	-	*3)	1	*3)	Write to Modbus register address set in Pr5.84 "Modbus mirror register set 1" is enabled. *2)
4426h	Mirror register 15	-	*3)	1	*3)	Write to Modbus register address set in Pr5.85 "Modbus mirror register set 1" is enabled. *2)
4427h	Mirror register 16	-	*3)	1	*3)	Write to Modbus register address set in Pr5.86 "Modbus mirror register set 1" is enabled. *2)

(To be continued)

*1) For the coil map, refer to the corresponding classifications in 2-1-4-3 "Coil information."
The address configuration based on the leading address of the classification shall be the coil map.
Example: Coil 0067h "Forced alarm input (E-STOP) operation" in "Logic input signal operation" will correspond to bit 7 of register 4406h "Logic input signal operation (coil map)."

*2) Read and write to Modbus register data set in PR5.58 to Pr5.65, and Pr5.79 to Pr5.86 is possible.
Address conversion of mirror register is effective only once. (Register address combining multiple mirror registers cannot be set).
When address has been set for a mirror register, processing will be conducted as if a read or writable register exists at the address. (Activity not affected)
Only register addresses between 1000h and in the 6000h range can be set with the mirror register (no coil information can be set).

*3) The range and attribute of the mirror register shall be similar to the destination register.

Address	Register name	Unit	Range	Number of register	Attribute	Contents
4600h	Block velocity 0	r/min	0 to 20000	1	R/W	Pr60.00 (Block operation velocity 0)
4601h	Block velocity 1	r/min	0 to 20000	1	R/W	Pr60.01 (Block operation velocity 1)
4602h	Block velocity 2	r/min	0 to 20000	1	R/W	Pr60.02 (Block operation velocity 2)
4603h	Block velocity 3	r/min	0 to 20000	1	R/W	Pr60.03 (Block operation velocity 3)
4604h	Block velocity 4	r/min	0 to 20000	1	R/W	Pr60.04 (Block operation velocity 4)
4605h	Block velocity 5	r/min	0 to 20000	1	R/W	Pr60.05 (Block operation velocity 5)
4606h	Block velocity 6	r/min	0 to 20000	1	R/W	Pr60.06 (Block operation velocity 6)
4607h	Block velocity 7	r/min	0 to 20000	1	R/W	Pr60.07 (Block operation velocity 7)
4608h	Block velocity 8	r/min	0 to 20000	1	R/W	Pr60.08 (Block operation velocity 8)
4609h	Block velocity 9	r/min	0 to 20000	1	R/W	Pr60.09 (Block operation velocity 9)
460Ah	Block velocity 10	r/min	0 to 20000	1	R/W	Pr60.10 (Block operation velocity 10)
460Bh	Block velocity 11	r/min	0 to 20000	1	R/W	Pr60.11 (Block operation velocity 11)
460Ch	Block velocity 12	r/min	0 to 20000	1	R/W	Pr60.12 (Block operation velocity 12)
460Dh	Block velocity 13	r/min	0 to 20000	1	R/W	Pr60.13 (Block operation velocity 13)
460Eh	Block velocity 14	r/min	0 to 20000	1	R/W	Pr60.14 (Block operation velocity 14)
460Fh	Block velocity 15	r/min	0 to 20000	1	R/W	Pr60.15 (Block operation velocity 15)
4610h	Block accelaration 0	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.16 (Block operation acceleration 0)
4611h	Block accelaration 1	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.17 (Block operation acceleration 1)
4612h	Block accelaration 2	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.18 (Block operation acceleration 2)
4613h	Block accelaration 3	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.19 (Block operation acceleration 3)
4614h	Block accelaration 4	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.20 (Block operation acceleration 4)
4615h	Block accelaration 5	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.21 (Block operation acceleration 5)
4616h	Block accelaration 6	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.22 (Block operation acceleration 6)
4617h	Block accelaration 7	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.23 (Block operation acceleration 7)
4618h	Block accelaration 8	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.24 (Block operation acceleration 8)
4619h	Block accelaration 9	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.25 (Block operation acceleration 9)
461Ah	Block accelaration 10	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.26 (Block operation acceleration 10)
461Bh	Block accelaration 11	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.27 (Block operation acceleration 11)
461Ch	Block accelaration 12	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.28 (Block operation acceleration 12)
461Dh	Block accelaration 13	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.29 (Block operation acceleration 13)
461Eh	Block accelaration 14	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.30 (Block operation acceleration 14)
461Fh	Block accelaration 15	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.31 (Block operation acceleration 15)
4620h	Block decelaration 0	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.32 (Block operation deceleration 0)
4621h	Block decelaration 1	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.33 (Block operation deceleration 1)
4622h	Block decelaration 2	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.34 (Block operation deceleration 2)
4623h	Block decelaration 3	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.35 (Block operation deceleration 3)
4624h	Block decelaration 4	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.36 (Block operation deceleration 4)
4625h	Block decelaration 5	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.37 (Block operation deceleration 5)
4626h	Block decelaration 6	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.38 (Block operation deceleration 6)
4627h	Block decelaration 7	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.39 (Block operation deceleration 7)
4628h	Block decelaration 8	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.40 (Block operation deceleration 8)
4629h	Block decelaration 9	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.41 (Block operation deceleration 9)
462Ah	Block decelaration 10	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.42 (Block operation deceleration 10)
462Bh	Block decelaration 11	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.43 (Block operation deceleration 11)
462Ch	Block decelaration 12	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.44 (Block operation deceleration 12)
462Dh	Block decelaration 13	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.45 (Block operation deceleration 13)
462Eh	Block decelaration 14	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.46 (Block operation deceleration 14)
462Fh	Block decelaration 15	ms/(3000 r/min)	0 to 10000	1	R/W	Pr60.47 (Block operation deceleration 15)
4630h	For manufacturer use	-	-32768 to 32767	1	R/W	-
4631h	Block home offset	command unit	-2147483648 to 2147483647	2	R/W	Pr60.49 (Block operation origin offset)
4633h	Block max position limit	command unit	-2147483648 to 2147483647	2	R/W	Pr60.50 (Block operation positive direction software limit)
4635h	Block min position limit	command unit	-2147483648 to 2147483647	2	R/W	Pr60.51 (Block operation negative direction software limit)
4637h	Block homing speed (high)	r/min	0 to 20000	1	R/W	Pr60.52 (Block operation origin return velocity (high speed))

(To be continued)

Address	Register name	Unit	Range	Number of register	Attribute	Contents
4638h	Block homing speed (low)	rpm	0 to 20000	1	R/W	Pr60.53 (Block operation origin return velocity (low speed))
4639h	Block homing accelaration	ms /(3000 r/min)	0 to 10000	1	R/W	Pr60.54 (Block operation origin return acceleration)
463Ah	Block homingless	-	0 to 1	1	R/W	Pr60.55 (Invalidate block operation origin return)
4800h	Block command 0	-	-2147483648 to 2147483647	2	R/W	Pr56.000 (Block command 0)
4802h	Block data 0	-	-2147483648 to 2147483647	2	R/W	Pr56.001 (Block data 0)
4804h	Block command 1	-	-2147483648 to 2147483647	2	R/W	Pr56.002 (Block command 1)
4806h	Block data 1	-	-2147483648 to 2147483647	2	R/W	Pr56.003 (Block data 1)
...	...	...	...	...	...	...
48FCh	Block command 63	-	-2147483648 to 2147483647	2	R/W	Pr56.126 (Block command 63)
48FEh	Block data 63	-	-2147483648 to 2147483647	2	R/W	Pr56.127 (Block data 63)
4900h	Block command 64	-	-2147483648 to 2147483647	2	R/W	Pr57.000 (Block command 64)
4902h	Block data 64	-	-2147483648 to 2147483647	2	R/W	Pr57.001 (Block data 64)
4904h	Block command 65	-	-2147483648 to 2147483647	2	R/W	Pr57.002 (Block command 65)
4906h	Block data 65	-	-2147483648 to 2147483647	2	R/W	Pr57.003 (Block data 65)
...	...	...	...	...	...	...
49FCh	Block command 127	-	-2147483648 to 2147483647	2	R/W	Pr57.126 (Block command 127)
49FEh	Block data 127	-	-2147483648 to 2147483647	2	R/W	Pr57.127 (Block data 127)
4A00h	Block command 128	-	-2147483648 to 2147483647	2	R/W	Pr58.000 (Block command 128)
4A02h	Block data 128	-	-2147483648 to 2147483647	2	R/W	Pr58.001 (Block data 128)
4A04h	Block command 129	-	-2147483648 to 2147483647	2	R/W	Pr58.002 (Block command 129)
4A06h	Block data 129	-	-2147483648 to 2147483647	2	R/W	Pr58.003 (Block data 129)
...	...	...	...	...	...	...
4AFCh	Block command 191	-	-2147483648 to 2147483647	2	R/W	Pr58.126 (Block command 191)
4AFEh	Block data 191	-	-2147483648 to 2147483647	2	R/W	Pr58.127 (Block data 191)
4B00h	Block command 192	-	-2147483648 to 2147483647	2	R/W	Pr59.000 (Block command 192)
4B02h	Block data 192	-	-2147483648 to 2147483647	2	R/W	Pr59.001 (Block data 192)
4B04h	Block command 193	-	-2147483648 to 2147483647	2	R/W	Pr59.002 (Block command 193)
4B06h	Block data 193	-	-2147483648 to 2147483647	2	R/W	Pr59.003 (Block data 193)
...	...	...	...	...	...	...
4BFCh	Block command 255	-	-2147483648 to 2147483647	2	R/W	Pr59.126 (Block command 255)
4BFEh	Block data 255	-	-2147483648 to 2147483647	2	R/W	Pr59.127 (Block data 255)

(To be continued)

Address	Register name	Unit	Range	Number of register	Attribute	Contents
4D00h	Position deviation (after filter)	pulse	-2147483648 to 2147483647	2	Read Only	Position deviation (after filter)
4D02h	Encoder resolution	pulse/r	-2147483648 to 2147483647	2	Read Only	Encoder resolution
4D06h	Actual velocity	r/min	-2147483648 to 2147483647	2	Read Only	Actual speed
4D08h	Torque command	0.05%	-2147483648 to 2147483647	2	Read Only	Torque command
4D0Ah	Velocity command (before filter)	r/min	-2147483648 to 2147483647	2	Read Only	Velocity command (before filter)
4D0Ch	Velocity command (after filter)	r/min	-2147483648 to 2147483647	2	Read Only	Velocity command (after filter)
4D0Eh	External scale position	pulse	-2147483648 to 2147483647	2	Read Only	External scale position
4D10h	Regeneration load rate	0.1%	-2147483648 to 2147483647	2	Read Only	Regeneration load rate
4D12h	Overload load rate	0.2%	-2147483648 to 2147483647	2	Read Only	Overload load rate
4D14h	Enhanced logic input	-	-2147483648 to 2147483647	2	Read Only	Enhanced logic input
4D16h	Enhanced logic output	-	-2147483648 to 2147483647	2	Read Only	Enhanced logic output
4D18h	Physical input	-	-2147483648 to 2147483647	2	Read Only	Physical input
4D1Ah	Physical output	-	-2147483648 to 2147483647	2	Read Only	Physical output
4D1Ch	Inertia ratio	%	-2147483648 to 2147483647	2	Read Only	Inertia ratio
4D1Eh	Motor automatic recognition effective state	-	-2147483648 to 2147483647	2	Read Only	Motor automatic recognition effective state
4D20h	Warning flag	-	-2147483648 to 2147483647	2	Read Only	Warning flag
4D22h	Control mode	-	-2147483648 to 2147483647	2	Read Only	Control mode
4D24h	Mechanical angle (Encoder 1 rotation data)	pulse	-2147483648 to 2147483647	2	Read Only	Mechanical angle (Encoder 1 rotation data)
4D26h	Electrical angle	0.0879°	-2147483648 to 2147483647	2	Read Only	Electrical angle
4D28h	Multi-rotation data of absolute encoder	R	-2147483648 to 2147483647	2	Read Only	Multi-rotation data of absolute encoder
4D2Ah	Counter reference time	0.5h	-2147483648 to 2147483647	2	Read Only	Counter reference time
4D2Ch	Accumulated power on time	0.5h	-2147483648 to 2147483647	2	Read Only	Accumulated power on time
4D2Eh	Alarm generated time	0.5h	-2147483648 to 2147483647	2	Read Only	Alarm generated time
4D30h	Amplifier temperature	°C	-2147483648 to 2147483647	2	Read Only	Amplifier temperature
4D32h	Encoder temperature	°C	-2147483648 to 2147483647	2	Read Only	Encoder temperature
4D34h	Fan operating time	0.5h	-2147483648 to 2147483647	2	Read Only	Fan operating time
4D36h	Integrated fan life hours	0.1%	-2147483648 to 2147483647	2	Read Only	Integrated fan life hours
4D38h	Capacitor life accumulated hours	0.1%	-2147483648 to 2147483647	2	Read Only	Capacitor life accumulated hours
4D3Ah	Main power supply PN voltage	V	-2147483648 to 2147483647	2	Read Only	Main power supply PN voltage

(To be continued)

Address	Register name	Unit	Range	Number of register	Attribute	Contents
4D42h	Encoder communication abnormal count	times	-2147483648 to 2147483647	2	Read Only	Encoder communication abnormal count
4D46h	External scale communication abnormal count	times	-2147483648 to 2147483647	2	Read Only	External scale communication abnormal count
4D54h	Number of irruptive resistance relay change	times	-2147483648 to 2147483647	2	Read Only	Number of irruptive resistance relay change
4D56h	Number of dynamic brake relay change	times	-2147483648 to 2147483647	2	Read Only	Number of dynamic brake relay change
4D5Ch	Logic input	-	-2147483648 to 2147483647	2	Read Only	Logic input
4D5Eh	Logic output	-	-2147483648 to 2147483647	2	Read Only	Logic output
4D60h	External scale position (before command direction reversing)	pulse	-2147483648 to 2147483647	2	Read Only	External scale position (before command direction reversing)
4DC0h	Deterioration diagnosis state	-	-2147483648 to 2147483647	2	Read Only	Deterioration diagnosis state
4DC2h	Average deterioration diagnosis torque command value	0.1%	-2147483648 to 2147483647	2	Read Only	Average deterioration diagnosis torque command value
4DC4h	Standard deterioration diagnosis torque command value	0.1%	-2147483648 to 2147483647	2	Read Only	Standard deterioration diagnosis torque command value
4DC6h	Deterioration diagnosis inertia ratio estimate	%	-2147483648 to 2147483647	2	Read Only	Deterioration diagnosis inertia ratio estimate
4DC8h	Deterioration diagnosis unbalanced load estimate	0.1%	-2147483648 to 2147483647	2	Read Only	Deterioration diagnosis unbalanced load estimate
4DCAh	Deterioration diagnosis dynamic wear estimate	0.1%	-2147483648 to 2147483647	2	Read Only	Deterioration diagnosis dynamic wear estimate
4DCCh	Deterioration diagnosis viscous friction estimate	0.1%/ (1000 r/min)	-2147483648 to 2147483647	2	Read Only	Deterioration diagnosis viscous friction estimate

[Address in the 6000h order]

Address	Register name	Unit	Range	Number of register	Attribute	Contents
6001h	Error code	−	0 to 65535	1	ReadOnly	Read error No.
600Ah	Modes of operation display	−	- 128 to 127	1	ReadOnly	Amplifier internal control mode
600Bh	Position demand value	command unit	-2147483648 to 2147483647	2	ReadOnly	Pre-filter command position
600Dh	Position actual internal value	pulse	-2147483648 to 2147483647	2	ReadOnly	Motor position (FB scale unit)
600Fh	Position actual value	command unit	-2147483648 to 2147483647	2	ReadOnly	Motor position
601Ah	Velocity demand value	command unit/s	-2147483648 to 2147483647	2	ReadOnly	Internal command velocity
601Ch	Velocity actual value	command unit/s	-2147483648 to 2147483647	2	ReadOnly	Motor velocity
6025h	Torque demand	0.1%	-32768 to 32767	1	ReadOnly	Internal command torque
6026h	Motor rated current	mA	0 to 4294967295	2	ReadOnly	Rated motor current
602Ch	DC link circuit voltage	mV	0 to 4294967295	2	ReadOnly	Main power supply PN voltage
609Ch	Following error actual value	command unit	-2147483648 to 2147483647	2	ReadOnly	Position deviation
609Eh	Control effort	command unit/s	-2147483648 to 2147483647	2	ReadOnly	Internal command velocity (output of position loop)
60A0h	Position demand internal value	pulse	-2147483648 to 2147483647	2	ReadOnly	Internal command position
60A2h	Digital inputs	−	0 to 4294967295	2	ReadOnly	External input signal monitor

*1) When using addresses in the 6000h range, set block operation to "Valid" (Pr 6.28 is non 0).

2-2   Basic specification of block operation functions

Item	Specification
Block processing cycle	1.0 [ms]
Number of blocks	256
Number of velocity set parameters	16
Number of acceleration set parameters	16
Number of deceleration set parameters	16
Activation method	Modbus communications, input signal
Conditional branch	Compatible (Jump, =, >, <)
Control mode	Position control, full closed control
Origin return	Compatible *1)
Renew velocity	Compatible
Wrap around	Compatible
Electronic gear	Compatible

*1)   By setting Pr. 60.55 "Set invalid block operation origin return" to 1 will enable positioning action to be made without origin return even in increment mode.

2-3   Initial setting and limitations

In order to validate block operation functions by Modbus communications, it is necessary to set parameter Pr. 6.28 "Special function select" to 1 and Pr. 5.37 "Modbus connection setting" to either 1 or 2. In addition, to activate block operation function, parameter Pr6.28 "Special function select" needs to be selected to 2.

In this case, analog and pulse I/F will become invalid.

Class	No.	Name	Attribute	Set value	Command I/F	Control mode
6	28	Special function select	Reclose power supply	0	Analog/pulse input method	Position/velocity/torque/full-closed control
				1	Block operation method by Modbus communications	Position/full-closed control
				2	Block operation method by input signal	Position/full-closed control

Set Pr.60.55 "Set invalid block operation origin return" to 1 to conduct relative positioning action or absolute positioning action omitting origin return action under increment mode. In such a case, the position when the power is reclosed shall become the origin (0).

Class	No.	Parameter name	Set range	Attribute	Unit	Set value	Contents
60	55	Set invalid block operation origin return	0 to 1	Reclose power supply	-	0	Under increment mode, origin return action will be required prior to relative positioning or absolute positioning action is made. In absolute mode, origin return will not be required, regardless of this setting.
						1	Origin return action will not be required for both increment mode and absolute mode.

Remarks)   Increment mode: Position control mode where the current position at the time of power closing will be the origin (0). (Pr0.15 = 1)

Absolute mode: Position control mode where the current position at the time of power closing is referenced by the position memorized by the absolute encoder. (Pr0.15 = non 1)

Please set the block parameter prior to starting the block operation. Please refer to Chapter 3 for details of block parameters.

2-4   Set various stop seque actions

When block operation functions are validated, the following specifications shall apply for stop sequence in case of drive prohibited, servo OFF, main power supply OFF and alarm.

Furthermore, slow stop function (Refer to Technical reference (Functional Specification) 6-5-7) cannot be used when block operation is valid.

▪   Sequence at drive prohibited

Pr5.04	Pr5.05	Decelerating (30 r/min or greater)			After stop (30 r/min or less)		
		Stop method	Deviation	Internal position command generation / Block operation	Command after stop	Deviation	Internal position command generation / Block operation
0	0, 1, 2	Dynamic brake action	Clear	Forced stop	Torque command for drive prohibited direction = 0.	Maintain *1)	Restarting block operation will validate action only in reverse direction to the drive prohibited direction.*2)

(Note)   Origin return is not dependent on the value of Pr.5.05 "(Sequence at drive prohibited). Please refer to paragraph 4-5 for details.

*1)   In case drive prohibited input is detected while in action at 30 r/min or less, deviation will be temporarily cleared at the detection timing.

*2)   Block operation will be forced stop, in case drive prohibited input is detected while in action at 30 r/min or less.
Please note that internal position command will be generated in where the torque command is 0 (zero) and block operation has been restarted against the drive prohibited direction.

▪   Sequence at servo OFF

Pr5.06	Decelerating (30 r/min or greater)			After stop (30 r/min or less)		
	Stop method	Deviation	Internal position command generation / Block operation	Command after stop	Deviation	Internal position command generation / Block operation
0, 4	Dynamic brake action	Clear	Forced stop	Dynamic brake action	Clear	Forced stop
1, 5	Free run	Clear	Forced stop	Dynamic brake action	Clear	Forced stop
2, 6	Dynamic brake action	Clear	Forced stop	Free run	Clear	Forced stop
3, 7	Free run	Clear	Forced stop	Free run	Clear	Forced stop
8	Immediate stop*3)	Maintain	Forced stop	Dynamic brake action	Clear	Forced stop
9	Immediate stop*3)	Maintain	Forced stop	Free run	Clear	Forced stop

*3)   In case of immediate stop, torque limit shall be in accordance with the set value of Pr 5.11 (Immediate stop torque limit).

▪ Sequence at main power supply OFF

Pr5.07	Decelerating (30 r/min or greater)			After stop (30 r/min or less)		
	Stop method	Deviation	Internal position command generation / Block operation	Command after stop	Deviation	Internal position command generation / Block operation
0,4	Dynamic brake action	Clear	Forced stop	Dynamic brake action	Clear	Forced stop
1,5	Free run	Clear	Forced stop	Dynamic brake action	Clear	Forced stop
2,6	Dynamic brake action	Clear	Forced stop	Free run	Clear	Forced stop
3,7	Free run	Clear	Forced stop	Free run	Clear	Forced stop
8	Immediate stop *4)	Maintain	Forced stop	Dynamic brake action	Clear	Forced stop
9	Immediate stop *4)	Maintain	Forced stop	Free run	Clear	Forced stop

*4) In case of immediate stop, torque limit shall be in accordance with the set value of Pr 5.11 (Immediate stop torque limit).

▪ Sequence at alarm

Pr5.10	Decelerating (30 r/min or greater)				After stop (30 r/min or less)		
	Stop method		Deviation	Internal position command generation / Block operation	Command after stop	Deviation	Internal position command generation / Block operation
0	Dynamic brake action		Clear	Forced stop	Dynamic brake action	Clear	Forced stop
1	Free run		Clear	Forced stop	Dynamic brake action	Clear	Forced stop
2	Dynamic brake action		Clear	Forced stop	Free run	Clear	Forced stop
3	Free run		Clear	Forced stop	Free run	Clear	Forced stop
4	Action A *5)	Immediate stop *6)	Maintain	Forced stop	Dynamic brake action	Clear	Forced stop
	Action B *5)	DB action	Clear				
5	Action A *5)	Immediate stop *6)	Maintain	Forced stop	Dynamic brake action	Clear	Forced stop
	Action B *5)	Free run	Clear				
6	Action A *5)	Immediate stop *6)	Maintain	Forced stop	Free run	Clear	Forced stop
	Action B *5)	DB action	Clear				
7	Action A *5)	Immediate stop *6)	Maintain	Forced stop	Free run	Clear	Forced stop
	Action B *5)	Free run	Clear				

*5) Actions A and B indicates whether to trigger immediate stop when errors occur. When immediate stop supported alarm has been activated, in case the set value is from 4 to 7, action A will be taken and will stop immediately. In case immediate stop unsupported alarm has been activated, it will not stop immediately, but dynamic brake (DB) action or free run, specified in action B, will be taken. Please maintain the main circuit power supply until it decelerates and stops.
Please refer to the Technical Reference (Basic function specifications) for immediate stop supporting alarms.

*6) In case of immediate stop, torque limit shall be in accordance with the set value of Pr 5.11 (Immediate stop torque limit).

2-5 Input/output signal assignment function for block operation
For input/output signals, arbitrary function used for block operation can be assigned to any input/output pin of I/F connector. To use function that relevant to block operation, for instance origin input (HOME) or returned to origin completed state output (HOME-CMP) , Pr4.00~Pr4.09 and Pr4.10~Pr4.15 need to be changed and assigned to each of the pins. Function numbers that relevant to block operation are as following.

Input function number for block operation table

Signal name	Symbol	Input signal assignment Pr4.00 to 4.09 Setup value		Corresponding Modbus coil/register	
		a-contact	b-contact		
Origin input	HOME	21h	A1h	Block operation control operation	0122h
Immediate stop input	H-STOP	22h	A2h		0123h
Decelerated stop input	S-STOP	23h	A3h		0124h
Strobe input	STB	24h	A4h		0120h
Designated block number input 1	B-SEL 1	25h	A5h	4414h "Block number"	
Designated block number input 2	B-SEL 2	26h	A6h		
Designated block number input 4	B-SEL 4	27h	A7h		
Designated block number input 8	B-SEL 8	28h	A8h		
Designated block number input 16	B-SEL 16	29h	A9h		
Designated block number input 32	B-SEL 32	2Ah	AAh		
Designated block number input 64	B-SEL 64	2Bh	ABh		
Designated block number input 128	B-SEL 128	2Ch	ACh		

Output function number for block operation table

Signal name	Symbol	Output signal assignment Pr4.10 to 4.15 Setup value	Corresponding Modbus coil	
Action implementation state output	BUSY	21h	Block operation control operation	0140h
Returned to origin completed state output	HOME-CMP	22h		0141h
Block operation output 1	B-CTRL1	23h		0142h
Block operation output 2	B-CTRL2	24h		0143h
Block operation output 3	B-CTRL3	25h		0144h
Block operation output 4	B-CTRL4	26h		0145h
Block operation output 5	B-CTRL5	27h		0146h
Block operation output 6	B-CTRL6	28h		0147h

Please refer to the Technical Reference (Functional specifications) for detail of input/output signal assignment.

[When block operation by Modbus communication start is valid (Pr6.28 =1)]
- I/F connector input and Modbus coil (Logic input signal operation/block operation control operation) will function in OR. However, servo on input (SRV-ON) will function as AND for the I/F connector input and Modbus coil (0060h). In case servo on input is not assigned to the I/F connector input, servo on/off will be operated only by the Modbus coil (0060h).
- Modbus register 4414h "Block number" is used to designate block numbers (0 to 255). (Designated block number input is invalid)

[When block operation by start by input signal is effective (Pr6.28 = 2)]
- Use designated block number input to designate block numbers (0 to 255). In order to designate all 256 blocks, it is necessary to allocate all 8 signals of B-SEl1 to B-SEl128 as input signals. The method to designate block numbers are as follows:

Block number	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Designated block number input	B-SEL 128	B-SEL 64	B-SEL 32	B-SEL 16	B-SEL 8	B-SEL 4	B-SEL 2	B-SEL 1

(Example) To designate Block number 145 B-SEL 1, B-SEl 16 and B-SEL 128 must be turned ON.

2-6 Wraparound of command position

Wrap around processing will be activated when the amount of change of the command position exceeds the following values:

Absolute encoder setting	Command position range [Command unit]		Wraparound threshold [Command unit]
	Lower limit	Upper limit	
Infinite rotation absolute mode *1)	0	$(2^{23}\times$(set value for Pr6.88 +1) / Electronic gear ratio) -1	$(2^{23}\times$(set value for Pr6.88 +1) / Electronic gear ratio) / 2
Other than infinite rotation absolute mode	80000000h (-2147483648)	7FFFFFFFh (2147483647)	7FFFFFFFh (2147483647)

*1)   Please refer to 6-1 for infinite rotation absolute mode.

Example of wraparound processing
When absolute target position has changed from 7FFFFFFFh to 80000000h in Infinite rotation absolute mode.

Servo internal computation
Command position (command unit)

4294967295 [command unit] to negative direction
No relative transfer

1 [command unit] transfer in positive direction (wraparound processing)

7FFFFFFFh

80000000h

80000000h

Physical position
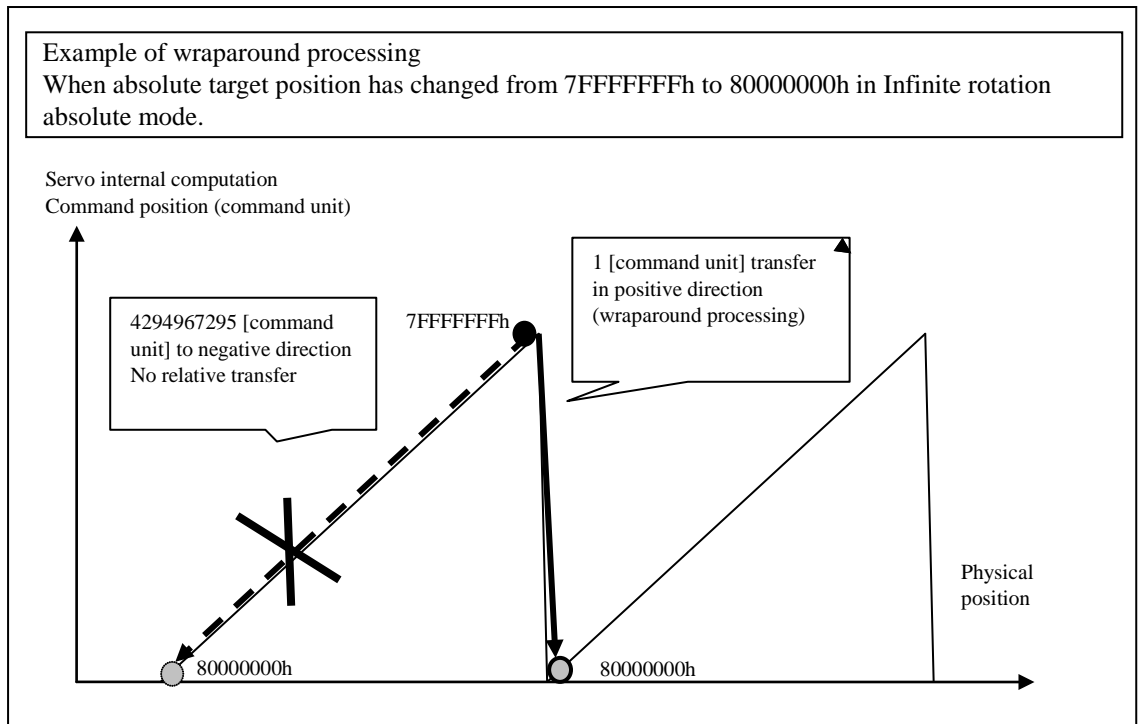
2-7   Initialization of absolute encoder

*This shall not apply to MINAS-A6L Series ([A6SL]/[A6SM]).

When using the absolute encoder under position control mode, return to origin operation will not be required (with the exception where the absolute encoder is to be used under increment mode). However, the multi-rotation data must be cleared during initialization for the first start-up after installation of the batteries.

2-7-1   Absolute data

Data read out from the absolute encoder (23 bits/r) consists of the single rotation data that indicate the position inside one motor rotation, and the multi-rotation data that counts from 1 up for every motor rotation. Of these, the multi-rotation data is an electric counter and is backed up by batteries.
Both data has a polarity that increases with CCW rotation.
Whether to generate Err41.0 "Absolute counter overflow error protection" in case the multi-rotation data has overflowed can be selected by parameter Pr0.15 "Absolute encoder setting."

	Back up when power supply has been shut off	Data width	Code	Data range
Single rotation data	Not required	23 bit	None	0 to 8388607
Multi-rotation data	Battery back-up	16 bit	Yes	0 to 65535 (max) *1)

*1)   In the infinite rotation absolute mode, the upper limit can be set by Pr6.68 "Absolute multi-rotation upper limit."
Set to 65535 (maximum value) for setting other than infinite rotation absolute mode.
Please refer to 6-1 for infinite rotation absolute mode.

When power is switched on, the servo amplifier will set the motor position based on the following formula:

With the 23 bit absolute encoder, single rotation data is 23 bits, while the multi-rotation data is 16 bits, and the synthesized actual location will have a 39 bit width. Of this, only the lower 32 bits will be returned to the upstream equipment as the motor position. As a result, the upmost 7 bits out of 16 bits of the multi-rotation data is lost and its effective bit length will become 9 bits.

Parameter Pr0.00 "Set rotating direction"		Motor position *1)
If 1, (CCW in positive direction)	23bit	$APOS = M \times 2^{23} + S + OFS$
If 0, (CW in positive direction)	23bit	$APOS = -(M \times 2^{23} + S) + OFS$

APOS: Actual_Position
          Motor position
M: Multi-turn_Data
          Multi-rotation data
S: Single-turn_Data
          Single rotation data
OFS: Pr60.49
          Block operation origin offset

*1) Calculation formula when the electronic gear ratio is 1:1.
When setting the electronic gear, keep it to fit within a signed 32 bit width.
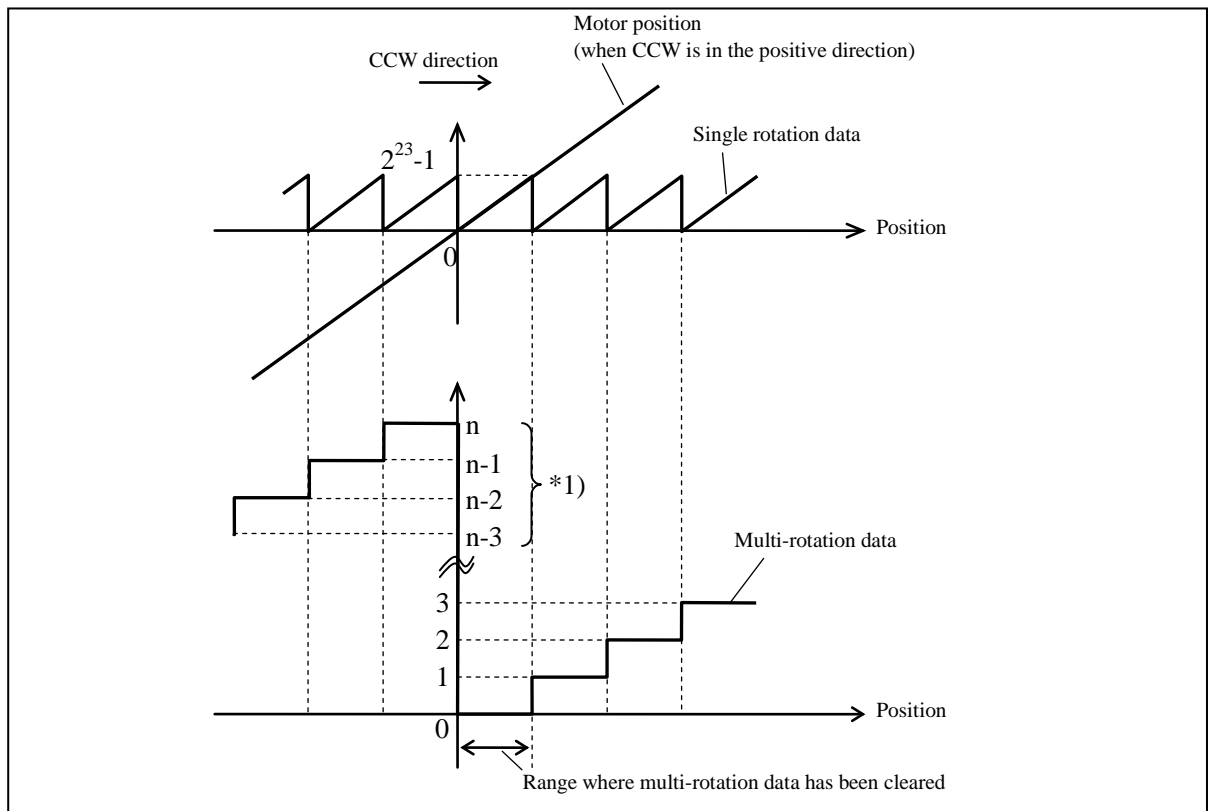
*1)   The value of n shall be as follows:
        Infinite rotation absolute mode: n = Value set for Pr6.88
        Other than infinite rotation absolute mode: n = 65535

2-7-2   Clearing multi-rotation data

When multi-rotation data is cleared, the point of variation of multi-rotation data on the CW side of the position where the clear was made, shall become the actual position "0." To prevent devisation when setting, plseas conduct "clear" in a position that is farthest away from the point of variation of multi-rotation data, where the one rotation data is 2^{22} (for 23 bits/r).

> <Points to note to prevent unnecessary troubles>
>   When clearing multi-rotation data, please turn off the servo, immobilize it with a brake, etc., if required, and secure safety before taking any action
>   Maintain the servo in OFF state during the operation, and after completion, first turn off all control power supply, and then reclose the power supply

Use set-up support software PANATERM (via USB communication) or Modbus communication to clear the multi-rotation data.   *2)
When multi-rotation data is cleared, Err27.1 "Absolute clear error protection" will occur. This is a safety feature and is not an abnormality.

*2)   Write values into the following register to clear multi-rotation data via Modbus communication.
        Address 4100h   "Absolute multiturn data clear function"
            6165h : Execute absolute clear

3. Block parameters

This chapter lists the parameters related to block operation. These parameters must be set before activating the block operations. No guarantees can be made for the action due to the block operation related parameters changed after activation of block operation.

Unexpected action may occur as a result of errors in the setting of block operation commands and data, etc. The customer is requested to carry out fail-safe design and to secure safety within its operating range at the location of use.

Block parameters can be set by either of the following methods:

• Set-up support software (PANATERM)
Selecting "Other" → "Block operation editor" from the tool bar will enable the editing of block data (Classifications 56 to 59) and operation setting (Classification 60) in their respective dedicated screens. Clicking on the block number to be edited will indicate the edit screen.

• Via Modbus communications
Use Modbus function code "Write register (06h)" or "Write multiple registers (10h)" to write date into registers 4600h to 4BFFh (block parameter domain).
Please refer to 2-1-4-2 for details of the function codes and 2-1-4-4 for details of the registers.

3-1   Action set parameters

Classification	No.	Name	Attribute	Size [bit]	Contents
60	0	Block operation velocity [0]	Always effective *1)	16	Able to provide 16 types of block operation velocity. Units: [r/min] Set range: 0 to 20000 *2) *3) Sets value of 1 to the arguments for relative positioning, absolute positioning, and velocity update command. The number set inside the brackets ([ ]) of the parameter name (velocity number) shall be set for the argument 1 of each command, and not the parameter No.
	1	Block operation velocity [1]			
	2	Block operation velocity [2]			
	3	Block operation velocity [3]			
	4	Block operation velocity [4]			
	5	Block operation velocity [5]			
	6	Block operation velocity [6]			
	7	Block operation velocity [7]			
	8	Block operation velocity [8]			
	9	Block operation velocity [9]			
	10	Block operation velocity [10]			
	11	Block operation velocity [11]			
	12	Block operation velocity [12]			
	13	Block operation velocity [13]			
	14	Block operation velocity [14]			
	15	Block operation velocity [15]			
	16	Block operation acceleration setting [0]	Always effective *1)	16	Able to provide 16 types of acceleration. Units: [ms] Set range: 0 to 10000 *3) *4) To be set to acceleration time of 0 to 3000 [r/min].
	17	Block operation acceleration setting [1]			
	18	Block operation acceleration setting [2]			
	19	Block operation acceleration setting [3]			
	20	Block operation acceleration setting [4]			
	21	Block operation acceleration setting [5]			
	22	Block operation acceleration setting [6]			
	23	Block operation acceleration setting [7]			
	24	Block operation acceleration setting [8]			
	25	Block operation acceleration setting [9]			
	26	Block operation acceleration setting [10]			
	27	Block operation acceleration setting [11]			
	28	Block operation acceleration setting [12]			
	29	Block operation acceleration setting [13]			
	30	Block operation acceleration setting [14]			
	31	Block operation acceleration setting [15]			

Classification	No.	Name	Attribute	Size [bit]	Contents
60	32	Block operation deceleration setting [0]	Always effective *1)	16	Able to provide 16 types of deceleration. Units: [ms] Set range: 0 to 10000　*3)　*4) To be set to deceleration time of 3000 to 0 [r/min].
	33	Block operation deceleration setting [1]			
	34	Block operation deceleration setting [2]			
	35	Block operation deceleration setting [3]			
	36	Block operation deceleration setting [4]			
	37	Block operation deceleration setting [5]			
	38	Block operation deceleration setting [6]			
	39	Block operation deceleration setting [7]			
	40	Block operation deceleration setting [8]			
	41	Block operation deceleration setting [9]			
	42	Block operation deceleration setting [10]			
	43	Block operation deceleration setting [11]			
	44	Block operation deceleration setting [12]			
	45	Block operation deceleration setting [13]			
	46	Block operation deceleration setting [14]			
	47	Block operation deceleration setting [15]			
	48	Block operation method setting	Reclose power supply	16	Sets origin offset valid/invalid for absolute mode.　bit :0: used by manufacturer:　Set fixed to 0　bit 1: Origin offset under absolute mode　0: invalid, 1: valid　bit 2 -15: Not used, Set fixed to 0 The lowermost bit is bit 0.
	49	Block operation origin offset	Reclose power supply	32	Sets offset amount of origin when origin return is completed in block operation, under increment mode. Sets the amount of offset between the encoder position in block operation and the machine coordinate position under absolute mode. Becomes valid when Pr60.48 (Block operation method setting) bit 1 is set to 1.
	50	Block operation positive direction software limit	Reclose power supply	32	Set range of software limit when origin return is completed in block operation.
	51	Block operation negative direction software limit	Reclose power supply	32	Set range of software limit when origin return is completed in block operation.
	52	Block operation origin return velocity (high speed)	Reclose power supply	16	Sets high action velocity for origin return. Units: [r/min] Set range: 0 to 20000　*2)　*3)
	53	Block operation origin return velocity (low speed)	Reclose power supply	16	Sets low action velocity for origin return. Units: [r/min] Set range: 0 to 20000　*2)　*3)
	54	Block operation origin return acceleration and deceleration	Reclose power supply	16	Sets acceleration and deceleration for origin return action. Units: [ms] Set range: 0 to 10000　*3)　*4) To be set for duration from 0 to 3000 [r/min].
	55	Invalidate block operation origin return	Reclose power supply	16	Set to 1 to conduct relative positioning action or absolute positioning action without returning to origin under increment mode. Set range: 0 to 1 0:　Under increment mode, origin return action will　be required prior to relative positioning or　absolute positioning action is made.　In absolute mode, origin return will not be　required, regardless of this setting. 1:　Origin return action will not be required for both　increment mode and absolute mode.

*1) Although the attribute is always effective, there are no guarantees for changes made while block operation is activated. To be always set before block operation. Always stop the block operation first, before changing values.

*2) Block related velocity data, as a parameter set value, may be set up to a maximum of 20,000, however, the internal data will be limited to the maximum velocity of the motor.

*3) If 0 (zero) is set for velocity, acceleration time, and deceleration time when block operation is activated, Err. 93.1 (block data setting abnormal protection) will be triggered.

*4) When acceleration or deceleration velocity exceeds 4294967295 [command units/s^2], Err93.1 "Block data setting error protection" will be triggered .

*5) Please set the block operation positive direction soft limit with a value larger than the block operation negative direction soft limit.
Furthermore, the value for block operation origin offset must be set to a value equal or larger than block operation negative direction soft limit but equal or smaller than block operation positive direction soft limit..

3-2   Block data

Block data is comprised of 64 bits of data per block, and is separated into 32 bit command region (block[n].command) and 32 bit data region (block[n].data).

(Note) Value in [ ] denotes the block number.

These block data are assigned to parameters (classifications 56 through 59) and must be set before the start of block operation.
Contents of block data will differ with each command. Please refer to Chapter 4 for details.

3-2-1   Block [n]. command structure

bit byte	7	6	5	4	3	2	1	0
0	(Reserved)							
1	Argument 3				Argument 4		Argument 5	
2	Argument 1				Argument 2			
3	Command code							

3-2-2   Block [n]. data structure

bit byte	7	6	5	4	3	2	1	0
0								LL
1				Argument 7				LH
2								HL
3								HH

3-2-3 Block data assignment

Although the attribute is always effective, there are no guarantees for changes made while block operation is activated. To be always set before block operation. Always stop the block operation first, before changing values.

Classifi-cation	No.	Name	Attribute	Size [bit]	Classifi-cation	No.	Name	Attribute	Size [bit]
56	000	Block[0].command	Always effective	32	56	064	Block[32].command	Always effective	32
	001	Block[0].data		32		065	Block[32].data		32
	002	Block[1].command		32		066	Block[33].command		32
	003	Block[1].data		32		067	Block[33].data		32
	004	Block[2].command		32		068	Block[34].command		32
	005	Block[2].data		32		069	Block[34].data		32
	006	Block[3].command		32		070	Block[35].command		32
	007	Block[3].data		32		071	Block[35].data		32
	008	Block[4].command		32		072	Block[36].command		32
	009	Block[4].data		32		073	Block[36].data		32
	010	Block[5].command		32		074	Block[37].command		32
	011	Block[5].data		32		075	Block[37].data		32
	012	Block[6].command		32		076	Block[38].command		32
	013	Block[6].data		32		077	Block[38].data		32
	014	Block[7].command		32		078	Block[39].command		32
	015	Block[7].data		32		079	Block[39].data		32
	016	Block[8].command		32		080	Block[40].command		32
	017	Block[8].data		32		081	Block[40].data		32
	018	Block[9].command		32		082	Block[41].command		32
	019	Block[9].data		32		083	Block[41].data		32
	020	Block[10].command		32		084	Block[42].command		32
	021	Block[10].data		32		085	Block[42].data		32
	022	Block[11].command		32		086	Block[43].command		32
	023	Block[11].data		32		087	Block[43].data		32
	024	Block[12].command		32		088	Block[44].command		32
	025	Block[12].data		32		089	Block[44].data		32
	026	Block[13].command		32		090	Block[45].command		32
	027	Block[13].data		32		091	Block[45].data		32
	028	Block[14].command		32		092	Block[46].command		32
	029	Block[14].data		32		093	Block[46].data		32
	030	Block[15].command		32		094	Block[47].command		32
	031	Block[15].data		32		095	Block[47].data		32
	032	Block[16].command		32		096	Block[48].command		32
	033	Block[16].data		32		097	Block[48].data		32
	034	Block[17].command		32		098	Block[49].command		32
	035	Block[17].data		32		099	Block[49].data		32
	036	Block[18].command		32		100	Block[50].command		32
	037	Block[18].data		32		101	Block[50].data		32
	038	Block[19].command		32		102	Block[51].command		32
	039	Block[19].data		32		103	Block[51].data		32
	040	Block[20].command		32		104	Block[52].command		32
	041	Block[20].data		32		105	Block[52].data		32
	042	Block[21].command		32		106	Block[53].command		32
	043	Block[21].data		32		107	Block[53].data		32
	044	Block[22].command		32		108	Block[54].command		32
	045	Block[22].data		32		109	Block[54].data		32
	046	Block[23].command		32		110	Block[55].command		32
	047	Block[23].data		32		111	Block[55].data		32
	048	Block[24].command		32		112	Block[56].command		32
	049	Block[24].data		32		113	Block[56].data		32
	050	Block[25].command		32		114	Block[57].command		32
	051	Block[25].data		32		115	Block[57].data		32
	052	Block[26].command		32		116	Block[58].command		32
	053	Block[26].data		32		117	Block[58].data		32
	054	Block[27].command		32		118	Block[59].command		32
	055	Block[27].data		32		119	Block[59].data		32
	056	Block[28].command		32		120	Block[60].command		32
	057	Block[28].data		32		121	Block[60].data		32
	058	Block[29].command		32		122	Block[61].command		32
	059	Block[29].data		32		123	Block[61].data		32
	060	Block[30].command		32		124	Block[62].command		32
	061	Block[30].data		32		125	Block[62].data		32
	062	Block[31].command		32		126	Block[63].command		32
	063	Block[31].data		32		127	Block[63].data		32

Classifi-cation	No.	Name	Attribute	Size [bit]	Classifi-cation	No.	Name	Attribute	Size [bit]
57	000	Block[64].command	Always effective	32	57	064	Block[96].command	Always effective	32
	001	Block[64].data		32		065	Block[96].data		32
	002	Block[65].command		32		066	Block[97].command		32
	003	Block[65].data		32		067	Block[97].data		32
	004	Block[66].command		32		068	Block[98].command		32
	005	Block[66].data		32		069	Block[98].data		32
	006	Block[67].command		32		070	Block[99].command		32
	007	Block[67].data		32		071	Block[99].data		32
	008	Block[68].command		32		072	Block[100].command		32
	009	Block[68].data		32		073	Block[100].data		32
	010	Block[69].command		32		074	Block[101].command		32
	011	Block[69].data		32		075	Block[101].data		32
	012	Block[70].command		32		076	Block[102].command		32
	013	Block[70].data		32		077	Block[102].data		32
	014	Block[71].command		32		078	Block[103].command		32
	015	Block[71].data		32		079	Block[103].data		32
	016	Block[72].command		32		080	Block[104].command		32
	017	Block[72].data		32		081	Block[104].data		32
	018	Block[73].command		32		082	Block[105].command		32
	019	Block[73].data		32		083	Block[105].data		32
	020	Block[74].command		32		084	Block[106].command		32
	021	Block[74].data		32		085	Block[106].data		32
	022	Block[75].command		32		086	Block[107].command		32
	023	Block[75].data		32		087	Block[107].data		32
	024	Block[76].command		32		088	Block[108].command		32
	025	Block[76].data		32		089	Block[108].data		32
	026	Block[77].command		32		090	Block[109].command		32
	027	Block[77].data		32		091	Block[109].data		32
	028	Block[78].command		32		092	Block[110].command		32
	029	Block[78].data		32		093	Block[110].data		32
	030	Block[79].command		32		094	Block[111].command		32
	031	Block[79].data		32		095	Block[111].data		32
	032	Block[80].command		32		096	Block[112].command		32
	033	Block[80].data		32		097	Block[112].data		32
	034	Block[81].command		32		098	Block[113].command		32
	035	Block[81].data		32		099	Block[113].data		32
	036	Block[82].command		32		100	Block[114].command		32
	037	Block[82].data		32		101	Block[114].data		32
	038	Block[83].command		32		102	Block[115].command		32
	039	Block[83].data		32		103	Block[115].data		32
	040	Block[84].command		32		104	Block[116].command		32
	041	Block[84].data		32		105	Block[116].data		32
	042	Block[85].command		32		106	Block[117].command		32
	043	Block[85].data		32		107	Block[117].data		32
	044	Block[86].command		32		108	Block[118].command		32
	045	Block[86].data		32		109	Block[118].data		32
	046	Block[87].command		32		110	Block[119].command		32
	047	Block[87].data		32		111	Block[119].data		32
	048	Block[88].command		32		112	Block[120].command		32
	049	Block[88].data		32		113	Block[120].data		32
	050	Block[89].command		32		114	Block[121].command		32
	051	Block[89].data		32		115	Block[121].data		32
	052	Block[90].command		32		116	Block[122].command		32
	053	Block[90].data		32		117	Block[122].data		32
	054	Block[91].command		32		118	Block[123].command		32
	055	Block[91].data		32		119	Block[123].data		32
	056	Block[92].command		32		120	Block[124].command		32
	057	Block[92].data		32		121	Block[124].data		32
	058	Block[93].command		32		122	Block[125].command		32
	059	Block[93].data		32		123	Block[125].data		32
	060	Block[94].command		32		124	Block[126].command		32
	061	Block[94].data		32		125	Block[126].data		32
	062	Block[95].command		32		126	Block[127].command		32
	063	Block[95].data		32		127	Block[127].data		32

Classifi-cation	No.	Name	Attribute	Size [bit]	Classifi-cation	No.	Name	Attribute	Size [bit]
58	000	Block[128].command	Always effective	32	58	064	Block[160].command	Always effective	32
	001	Block[128].data		32		065	Block[160].data		32
	002	Block[129].command		32		066	Block[161].command		32
	003	Block[129].data		32		067	Block[161].data		32
	004	Block[130].command		32		068	Block[162].command		32
	005	Block[130].data		32		069	Block[162].data		32
	006	Block[131].command		32		070	Block[163].command		32
	007	Block[131].data		32		071	Block[163].data		32
	008	Block[132].command		32		072	Block[164].command		32
	009	Block[132].data		32		073	Block[164].data		32
	010	Block[133].command		32		074	Block[165].command		32
	011	Block[133].data		32		075	Block[165].data		32
	012	Block[134].command		32		076	Block[166].command		32
	013	Block[134].data		32		077	Block[166].data		32
	014	Block[135].command		32		078	Block[167].command		32
	015	Block[135].data		32		079	Block[167].data		32
	016	Block[136].command		32		080	Block[168].command		32
	017	Block[136].data		32		081	Block[168].data		32
	018	Block[137].command		32		082	Block[169].command		32
	019	Block[137].data		32		083	Block[169].data		32
	020	Block[138].command		32		084	Block[170].command		32
	021	Block[138].data		32		085	Block[170].data		32
	022	Block[139].command		32		086	Block[171].command		32
	023	Block[139].data		32		087	Block[171].data		32
	024	Block[140].command		32		088	Block[172].command		32
	025	Block[140].data		32		089	Block[172].data		32
	026	Block[141].command		32		090	Block[173].command		32
	027	Block[141].data		32		091	Block[173].data		32
	028	Block[142].command		32		092	Block[174].command		32
	029	Block[142].data		32		093	Block[174].data		32
	030	Block[143].command		32		094	Block[175].command		32
	031	Block[143].data		32		095	Block[175].data		32
	032	Block[144].command		32		096	Block[176].command		32
	033	Block[144].data		32		097	Block[176].data		32
	034	Block[145].command		32		098	Block[177].command		32
	035	Block[145].data		32		099	Block[177].data		32
	036	Block[146].command		32		100	Block[178].command		32
	037	Block[146].data		32		101	Block[178].data		32
	038	Block[147].command		32		102	Block[179].command		32
	039	Block[147].data		32		103	Block[179].data		32
	040	Block[148].command		32		104	Block[180].command		32
	041	Block[148].data		32		105	Block[180].data		32
	042	Block[149].command		32		106	Block[181].command		32
	043	Block[149].data		32		107	Block[181].data		32
	044	Block[150].command		32		108	Block[182].command		32
	045	Block[150].data		32		109	Block[182].data		32
	046	Block[151].command		32		110	Block[183].command		32
	047	Block[151].data		32		111	Block[183].data		32
	048	Block[152].command		32		112	Block[184].command		32
	049	Block[152].data		32		113	Block[184].data		32
	050	Block[153].command		32		114	Block[185].command		32
	051	Block[153].data		32		115	Block[185].data		32
	052	Block[154].command		32		116	Block[186].command		32
	053	Block[154].data		32		117	Block[186].data		32
	054	Block[155].command		32		118	Block[187].command		32
	055	Block[155].data		32		119	Block[187].data		32
	056	Block[156].command		32		120	Block[188].command		32
	057	Block[156].data		32		121	Block[188].data		32
	058	Block[157].command		32		122	Block[189].command		32
	059	Block[157].data		32		123	Block[189].data		32
	060	Block[158].command		32		124	Block[190].command		32
	061	Block[158].data		32		125	Block[190].data		32
	062	Block[159].command		32		126	Block[191].command		32
	063	Block[159].data		32		127	Block[191].data		32

Classifi-cation	No.	Name	Attribute	Size [bit]	Classifi-cation	No.	Name	Attribute	Size [bit]
59	000	Block[192].command	Always effective	32	59	064	Block[224].command	Always effective	32
	001	Block[192].data		32		065	Block[224].data		32
	002	Block[193].command		32		066	Block[225].command		32
	003	Block[193].data		32		067	Block[225].data		32
	004	Block[194].command		32		068	Block[226].command		32
	005	Block[194].data		32		069	Block[226].data		32
	006	Block[195].command		32		070	Block[227].command		32
	007	Block[195].data		32		071	Block[227].data		32
	008	Block[196].command		32		072	Block[228].command		32
	009	Block[196].data		32		073	Block[228].data		32
	010	Block[197].command		32		074	Block[229].command		32
	011	Block[197].data		32		075	Block[229].data		32
	012	Block[198].command		32		076	Block[230].command		32
	013	Block[198].data		32		077	Block[230].data		32
	014	Block[199].command		32		078	Block[231].command		32
	015	Block[199].data		32		079	Block[231].data		32
	016	Block[200].command		32		080	Block[232].command		32
	017	Block[200].data		32		081	Block[232].data		32
	018	Block[201].command		32		082	Block[233].command		32
	019	Block[201].data		32		083	Block[233].data		32
	020	Block[202].command		32		084	Block[234].command		32
	021	Block[202].data		32		085	Block[234].data		32
	022	Block[203].command		32		086	Block[235].command		32
	023	Block[203].data		32		087	Block[235].data		32
	024	Block[204].command		32		088	Block[236].command		32
	025	Block[204].data		32		089	Block[236].data		32
	026	Block[205].command		32		090	Block[237].command		32
	027	Block[205].data		32		091	Block[237].data		32
	028	Block[206].command		32		092	Block[238].command		32
	029	Block[206].data		32		093	Block[238].data		32
	030	Block[207].command		32		094	Block[239].command		32
	031	Block[207].data		32		095	Block[239].data		32
	032	Block[208].command		32		096	Block[240].command		32
	033	Block[208].data		32		097	Block[240].data		32
	034	Block[209].command		32		098	Block[241].command		32
	035	Block[209].data		32		099	Block[241].data		32
	036	Block[210].command		32		100	Block[242].command		32
	037	Block[210].data		32		101	Block[242].data		32
	038	Block[211].command		32		102	Block[243].command		32
	039	Block[211].data		32		103	Block[243].data		32
	040	Block[212].command		32		104	Block[244].command		32
	041	Block[212].data		32		105	Block[244].data		32
	042	Block[213].command		32		106	Block[245].command		32
	043	Block[213].data		32		107	Block[245].data		32
	044	Block[214].command		32		108	Block[246].command		32
	045	Block[214].data		32		109	Block[246].data		32
	046	Block[215].command		32		110	Block[247].command		32
	047	Block[215].data		32		111	Block[247].data		32
	048	Block[216].command		32		112	Block[248].command		32
	049	Block[216].data		32		113	Block[248].data		32
	050	Block[217].command		32		114	Block[249].command		32
	051	Block[217].data		32		115	Block[249].data		32
	052	Block[218].command		32		116	Block[250].command		32
	053	Block[218].data		32		117	Block[250].data		32
	054	Block[219].command		32		118	Block[251].command		32
	055	Block[219].data		32		119	Block[251].data		32
	056	Block[220].command		32		120	Block[252].command		32
	057	Block[220].data		32		121	Block[252].data		32
	058	Block[221].command		32		122	Block[253].command		32
	059	Block[221].data		32		123	Block[253].data		32
	060	Block[222].command		32		124	Block[254].command		32
	061	Block[222].data		32		125	Block[254].data		32
	062	Block[223].command		32		126	Block[255].command		32
	063	Block[223].data		32		127	Block[255].data		32

4. Commands

4-1 Command list

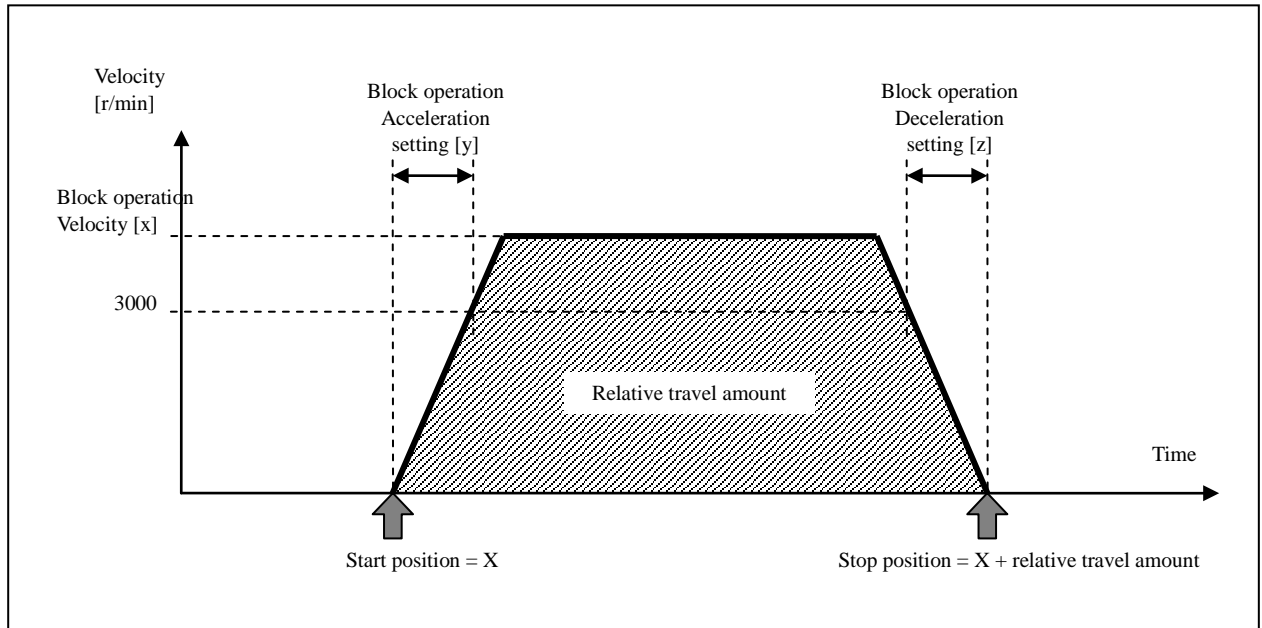| Command name	Blockdata [n] (64bit)							Data
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Relative positioning	01h	Velocity number	Acceleration setting number	Deceleration setting number	-	Block transition condition	(Reserved)	Relative travel amount [command unit]
Absolute positioning	02h	Velocity number	Acceleration setting number	Deceleration setting number	-	Block transition condition	(Reserved)	Target absolute position [command unit]
Infinite length operation	03h	Velocity number	Acceleration setting number	Deceleration setting number	Operating direction	Block transition condition	(Reserved)	--
Origin return	04h	Detection method	-	-	Origin return direction	Block transition condition	(Reserved)	-
Decelerate stop	05h	Stop method	-	-	-	Block transition condition	(Reserved)	-
Renew velocity	06h	Velocity number	-	-	Operating direction *1)	Block transition condition	(Reserved)	-
Decrement counter start	07h	-	-	-	-	Block transition condition	(Reserved)	Counter set value [1ms]
Output signal operation	08h	B-CTRL1 B-CTRL2	B-CTRL3 B-CTRL4	B-CTRL5 B-CTRL6	-	Block transition condition	(Reserved)	-
Jump	09h	-	Block No. (destination)			Block transition condition	(Reserved)	-
Conditional branch (=)	0Ah	For comparison	Block No. (destination, if Yes))			Block transition condition	(Reserved)	Compared value (threshold)
Conditional branch (>)	0Bh	For comparison	Block No. (destination, if Yes))			Block transition condition	(Reserved)	Compared value (threshold)
Conditional branch (<)	0Ch	For comparison	Block No. (destination, if Yes))			Block transition condition	(Reserved)	Compared value (threshold)

*1) Only effective in case of infinite length operation.

4-2　Relative positioning

Command Code : 1h

Used in case of conducting relative positioning action.

Command name	Blockdata [n] (64bit)							
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Relative positioning	01h	Velocity number	Acceleration setting number	Deceleration setting number	-	Block transition condition	(Reserved)	Relative travel amount [command unit]

Block operation Velocity [x]

Block operation Acceleration setting [y]

Block operation Deceleration setting [z]

3000

Relative travel amount

Time

Start position = X

Stop position = X + relative travel amount

	Command argument	Set range	Contents
1	Velocity number	0 to 15	Set selection number x for block operation velocity [x].
2	Acceleration setting number	0 to 15	Set selection number y for block operation acceleration setting [y].
3	Deceleration setting number	0 to 15	Set selection number z for block operation deceleration setting [z].
4	-	-	Please set to 0 (zero).
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0:　Transitions to next block after start. 　　　　1:　Transitions to next block after completion of positioning. *1) [MSB] 0:　Ends block operation for this block. 　　　　1:　Continues block operation.
6	-	-	Please set to 0 (zero).
7	Relative travel amount	80000001h to 7FFFFFFFh (-2147483647 to 2147483647)	Relative travel amount to be set by command units.

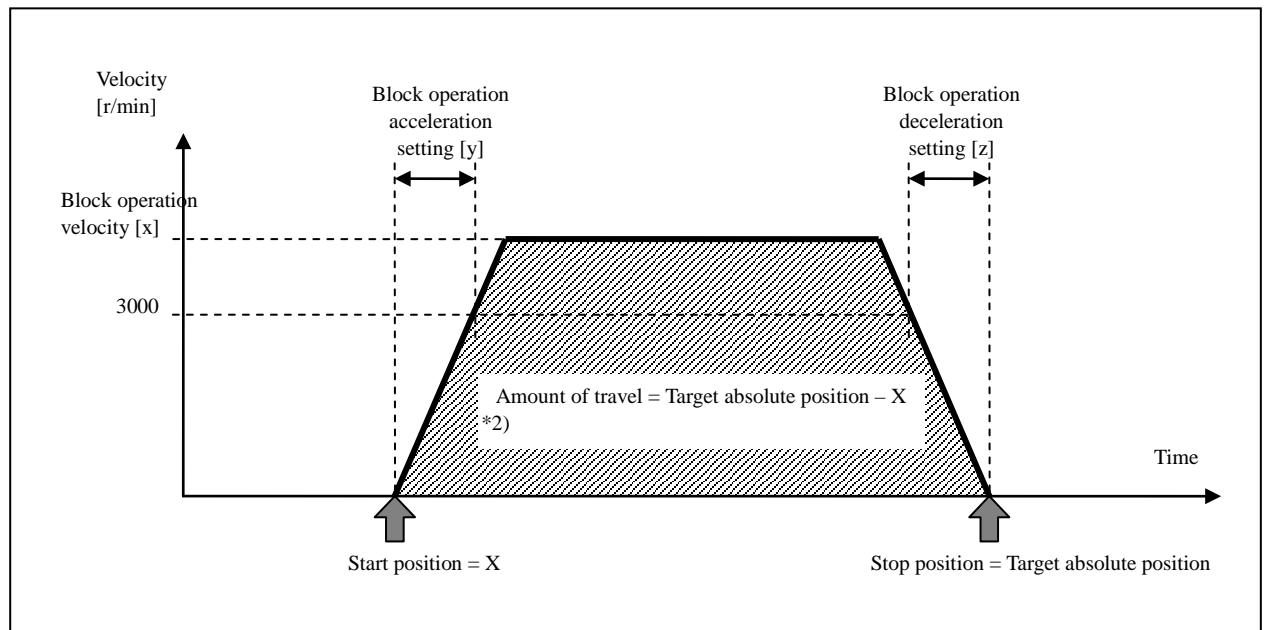| Parameter	Set range	Unit	Contents
Block operation velocity [x]	0 to maximum motor velocity	[r/min]	Sets velocity
Block operation acceleration setting [y]	0 to 10000	[ms]	Sets acceleration To be set at acceleration time of 0 to 3000 [r/min].
Block operation deceleration setting [z]	0 to 10000	[ms]	Sets deceleration To be set at deceleration time of 3000 to 0 [r/min].

*1)　"After completion of positioning" shall mean the point when internal positioning command generation processing has ended. It is not judged by the actual stopping of the motor. Furthermore, please note that movement command will be issued even if the internal positioning command generation processing has ended, in case position command filter (FIR, smoothing) is being used.

4-3　Absolute positioning

Command Code : 2h

Used in case of conducting absolute positioning action.

Command name	Blockdata [n] (64bit)							
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Absolute positioning	02h	Velocity number	Acceleration setting number	Deceleration setting number	-	Block transition condition	(Reserved)	Target absolute position [command unit]

	Command argument	Set range	Contents
1	Velocity number	0 to 15	Set selection number x for block operation velocity [x].
2	Acceleration setting number	0 to 15	Set selection number y for block operation acceleration setting [y].
3	Deceleration setting number	0 to 15	Set selection number z for block operation deceleration setting [z].
4	-	-	Please set to 0 (zero).
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0:　Transitions to next block after start. 　　　1:　Transitions to next block after completion of positioning. *1) [MSB] 0:　Ends block operation for this block. 　　　1:　Continues block operation.
6	-	-	Please set to 0 (zero).
7	Target absolute position	80000000h to 7FFFFFFFh (-2147483648 to 2147483647)	Sets target absolute position (with sign) in command units. In case the amount of travel is set to 80000000h (2147483648), it will be operated as 0 (zero) amount of travel, and if set in excess of 80000000h (2147483648), wrap around processing will be enabled. (Refer to 2-6)

Parameter	Set range	Unit	Contents
Block operation velocity [x]	0 to maximum motor velocity	[r/min]	Sets velocity
Block operation acceleration setting [y]	0 to 10000	[ms]	Sets acceleration To be set at acceleration time of 0 to 3000 [r/min].
Block operation deceleration setting [z]	0 to 10000	[ms]	Sets deceleration To be set at deceleration time of 3000 to 0 [r/min].

*1)　"After completion of positioning" shall mean the point when internal positioning command generation processing has ended. It is not judged by the actual stopping of the motor. Furthermore, please note that movement command will be issued even if the internal positioning command generation processing has ended, in case position command filter (FIR, smoothing) is being used.

*2)　Case where warp around is not performed.

4.4 Infinite length operation

Command code: 3h

Used for infinite length operation.

Command name	Block data [n] (64 bits)						
	Command						Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8 bits	4 bits	4 bits	4 bits	2 bits	2 bits	8 bits	32 bits
Infinite length operation	03h	Velocity number	Acceleration setting number	Deceleration setting number	Operation direction	Block transition condition	(Reserved)	—
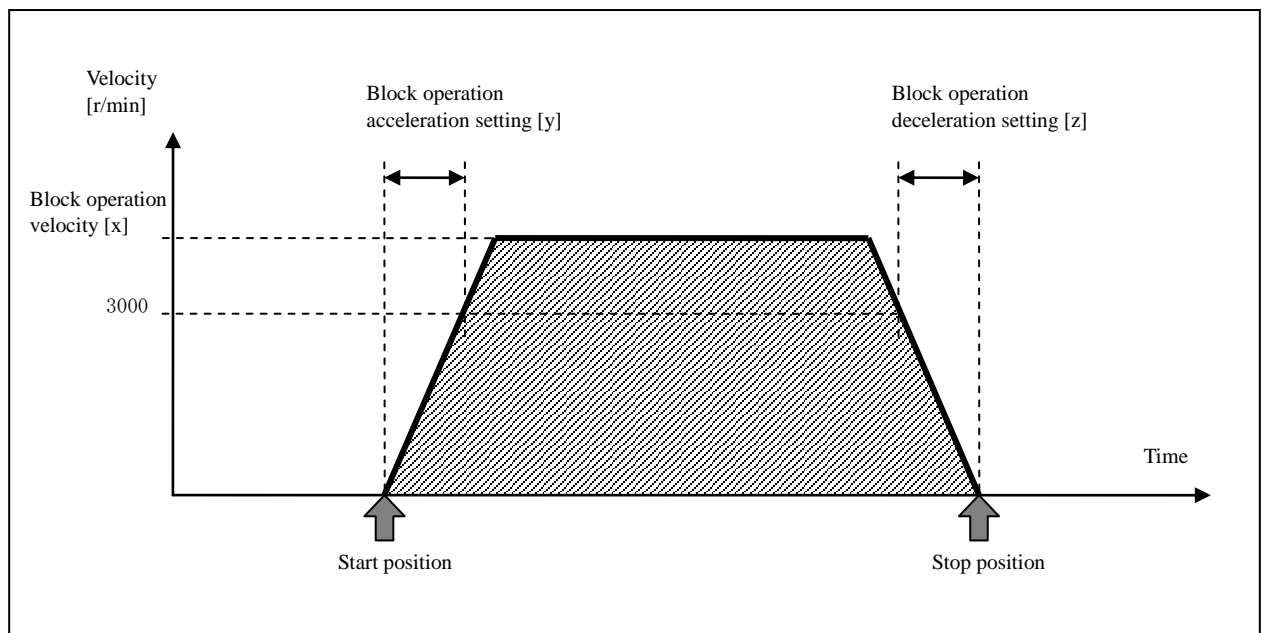
	Command argument	Setting range	Contents
1	Velocity number	0 - 15	Sets selected number x for block operation velocity [x]
2	Acceleration setting number	0 - 15	Sets selected number y for block operation acceleration set [y].
3	Deceleration setting number	0 - 15	Sets selected number z for block operation deceleration set [z].
4	Operation direction	0 - 1	0: positive direction, 1: negative direction
5	Block transition condition	0 - 3	Sets block transition condition after execution of this command: [LSB] 0, 1: Transitions to next block after booting [MSB] 0: Ends block operation with this block. 1: Continues with the block operation
6	-	-	Please set to 0
7	-	-	Please set to 0

Parameter	Setting range	Units	Contents
block operation velocity [x]	0 - Maximum motor velocity	[rpm]	Sets velocity
block operation acceleration set [y].	0 - 10000	[ms]	Sets acceleration, Setting conducted in acceleration time range of 0 to 3000 [r/min]
block operation deceleration set [z].	0 - 10000	[ms]	Sets deceleration Setting conducted in deceleration time range of 3000 to 0 [r/min]

*1)   Please use either of the two following methods to stop infinite length operation. (Entering block number for deceleration and stop command in strobe input operation will not stop the operation).

[1]   Immediate stop and decelerated stop by immediate stop input/decelerated stop input:
(In case of decelerated stop by decelerated stop input, stop will be made in accordance with the block operation deceleration setting [z], specified by the set deceleration umber.)

[2]   Immediate stop and decelerated stop by combination of conditional branch command and decelerated stop command:

4-5　　Return to origin

Command Code : 4h

Used in case of conducting origin return action.

In the case of increment mode, there is a need to conduct origin return action. However, by setting Pr.60.55 "Set invalid block operation origin return" to 1, origin return action can be omitted. In such a case, the position when the power is reclosed shall become the origin (0).

In case origin return command is executed in absolute mode, Err 94.2 "Origin return abnormal protection" will occur.

In addition, there is a need to assign a generic input (SIn) as vicinity of origin input (HOME) and connect the origin sensor in advance. Furthermore, there is a need to connect the limit sensor (prohibited drive input) in advance and assign general input (SIn) to positive direction prohibited drive input (POT) and negative direction prohibited drive input (NOT).

In case using detection method is 2, SI4 only can be assigned to origin input (HOME), (if any other pins are assigned, Err 94.2 "Origin return error protection" will occur). A noise canceling filter process is conducted in the read-out of the input signal. Please set so that the sensor signal width is 4 ms or wider. Furthermore, in case detection method is 1, in order to prevent detection error, please arrange so that the time from the leading edge reference detection of the vicinity of origin input (HOME) to the Z phase is 10 ms or larger.

In case there are problems in installing the vicinity of origin input (HOME) and limit sensor (drive prohibited input), Err 94.2 "Origin return abnormal protection" will occur.
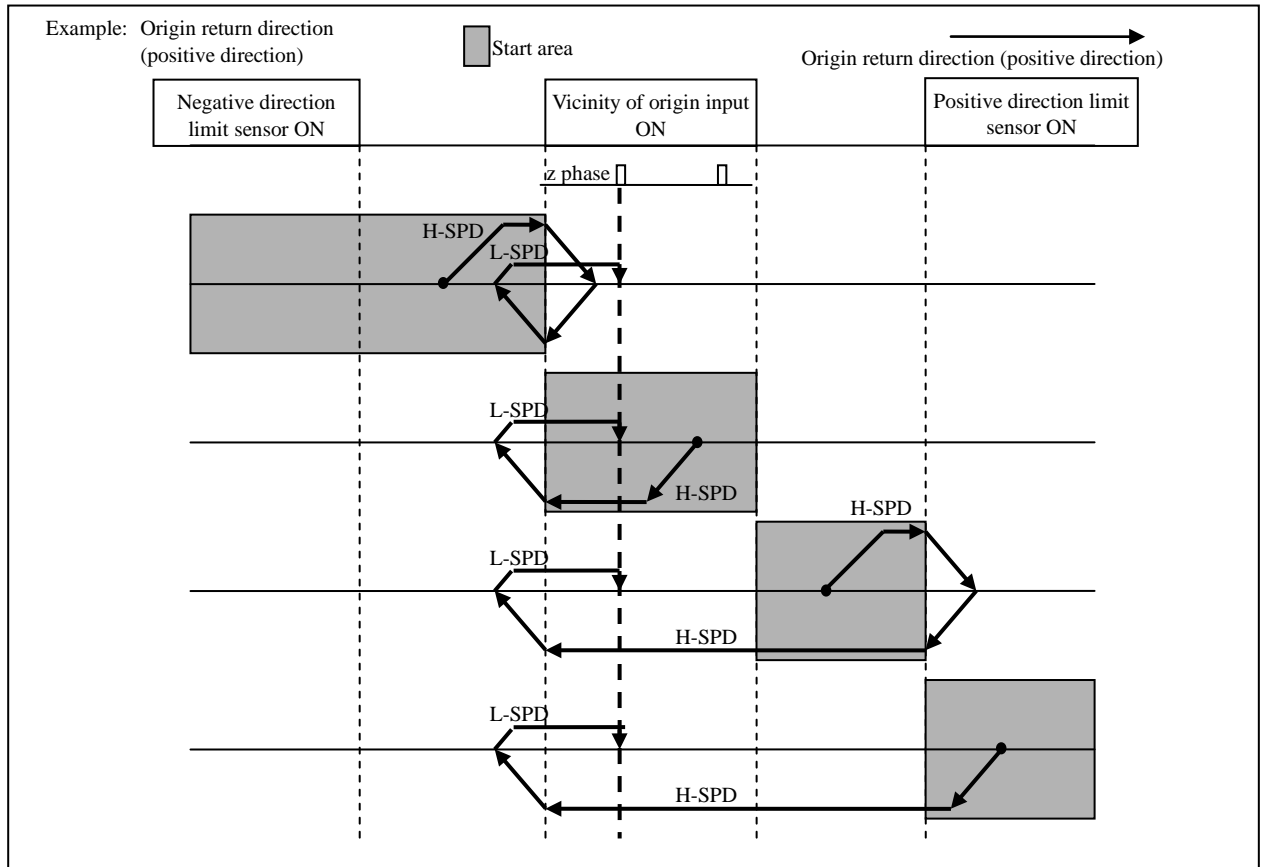
When drive prohibited input in origin return direction is turned ON during origin return action, please note that regardless of the value of Pr 5.05 "Sequence at drive prohibited", reverse action still under servo-ON state will be executed. When the drive prohibited input for origin return direction is turned ON and the drive prohibited input for the direction opposite to the origin return direction being turned ON while it is in reverse action, Err 94.2 "Origin return abnormal protection" will occur.

Origin return action velocity shall be as per Pr 60.52 "Block operation origin return velocity (high speed)" or Pr 60.53 "Block operation origin return velocity (low speed). Acceleration shall be as per Pr 60.54 "Block operation origin return acceleration and deceleration".

Command name	Blockdata [n] (64bit)							
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Origin return	04h	Detection method	-	-	Origin return direction	Block transition condition	(Reserved)	-

Command argument		Set range	Contents
1	Detection method	0 to 3	Sets method for detection of origin location. 0: Unspecified (Err93.1 "Block data setting error protection" will occur). 1: Leading edge reference of vicinity of origin sensor (HOME) + z phase. 2: Leading edge reference of vicinity of origin sensor (HOME) 3: For manufacturer use
2	-	-	Please set to 0 (zero).
3	-	-	Please set to 0 (zero).
4	Origin return direction	0 to 1	Sets operation direction for origin detection. 0: Positive direction, 1: Negative direction
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0, 1: Transitions to next block after completion of origin return. [MSB] 0: Ends block operation for this block. 　　　　 1: Continues block operation.
6	-	-	Please set to 0 (zero).
7	-	-	Please set to 0 (zero).

Example 1) Detection method 1: Leading edge reference of origin sensor (HOME) + z phase.

Example: Origin return direction (positive direction)

Start area

Origin return direction (positive direction)

Negative direction limit sensor ON	Vicinity of origin input ON	Positive direction limit sensor ON

z phase

H-SPD
L-SPD

L-SPD
H-SPD

H-SPD
L-SPD
H-SPD

L-SPD
H-SPD

Example 2)　Detection method 2: Leading edge reference of vicinity of origin input (HOME)

Example: Origin return direction (positive direction)

Start area

Origin return direction (positive direction)

Negative direction limit sensor ON	Vicinity of origin input ON	Positive direction limit sensor ON

H-SPD
L-SPD

L-SPD
H-SPD

L-SPD
H-SPD
H-SPD

L-SPD
H-SPD
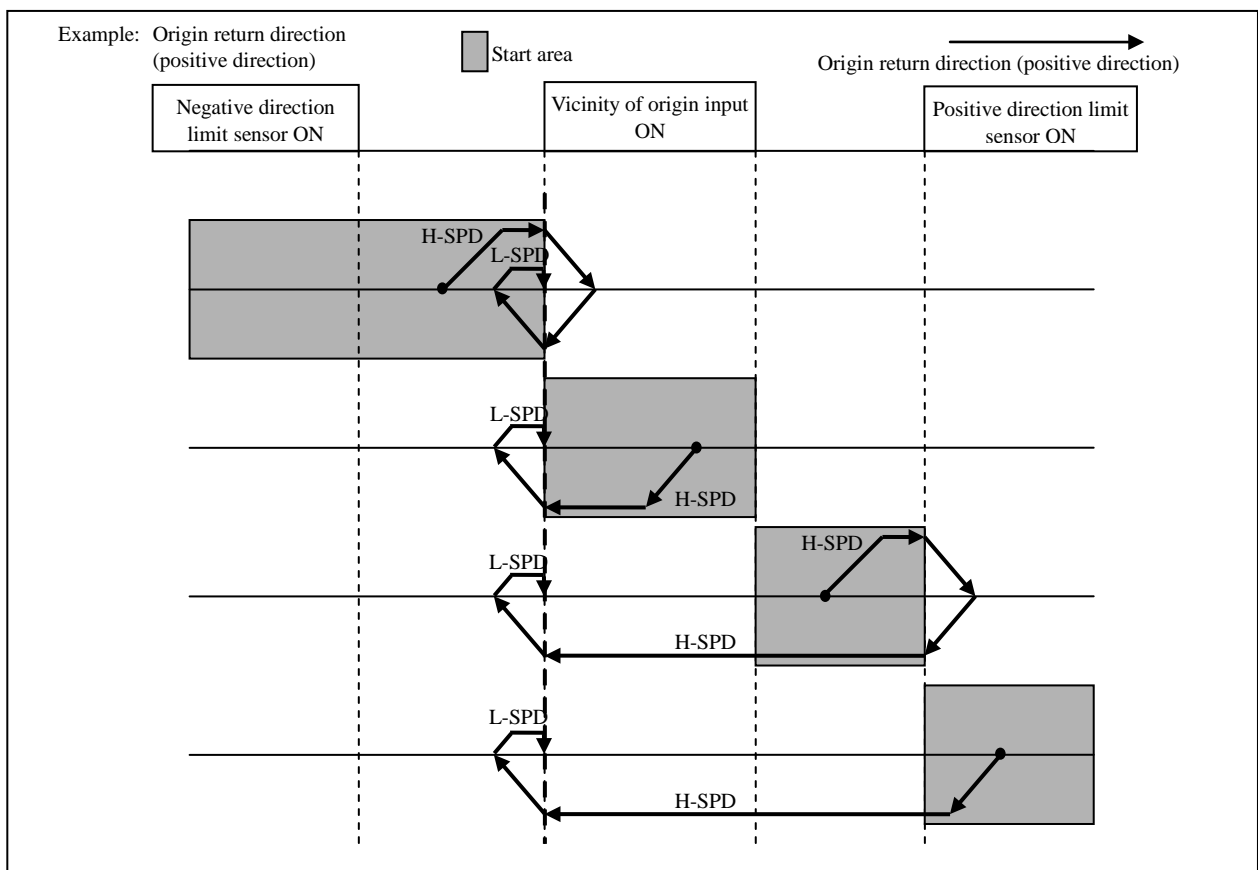
4-6 Decelerate stop

Command Code : 5h

Used in case of conducting forced stop of positioning action.   *2

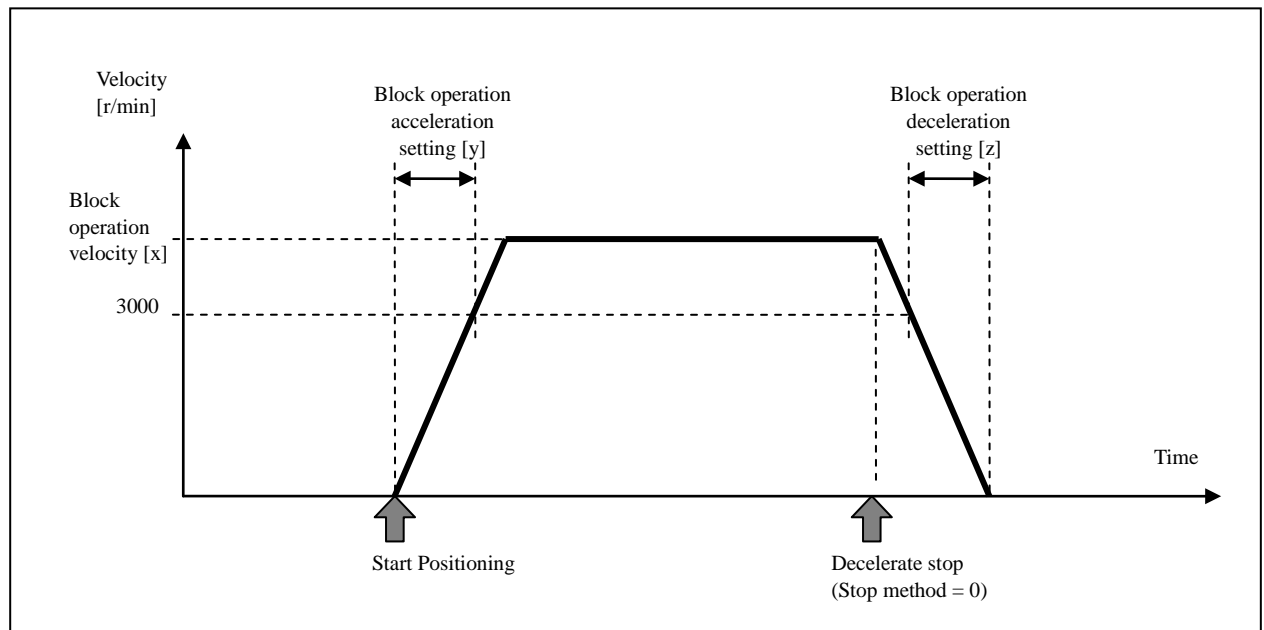| Command name	Blockdata [n] (64bit)							Data
	Command							
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Decelerate stop	05h	Stop method	-	-	-	Block transition condition	(Reserved)	-

Block operation acceleration setting [y] — Block operation deceleration setting [z] — Block operation velocity [x] — 3000 — Velocity [r/min] — Time — Start Positioning — Decelerate stop (Stop method = 0)

	Command argument	Set range	Contents
1	Stop method	0 to 1	Sets method of decelerating and stop. 0: Stops at the set deceleration established at the time of start up of the current action 1: Immediate stop
2	-	-	Please set to 0 (zero).
3	-	-	Please set to 0 (zero).
4	-	-	Please set to 0 (zero).
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0, 1: Transitions to next block after deceleration and stop. *1) [MSB] 0: Ends block operation for this block. 1: Continues block operation.
6	-	-	Please set to 0 (zero).
7	-	-	Please set to 0 (zero).

*1) "After deceleration and stop" shall mean the point when internal positioning command generation processing has ended. It is not judged by the actual stopping of the motor. Furthermore, please note that movement command will be issued even if the internal positioning command generation processing has ended, in case position command filter (FIR, smoothing) is being used.

*2) Regarding software version (CPU1/CPU2) Ver1.05 or earlier, when this command is executed when positioning action is not being executed, it may cause abnormal positioning thereafter (block operation state output (BUSY) remains unchanged at 1). In such case, turn servo OFF to return to normal condition.
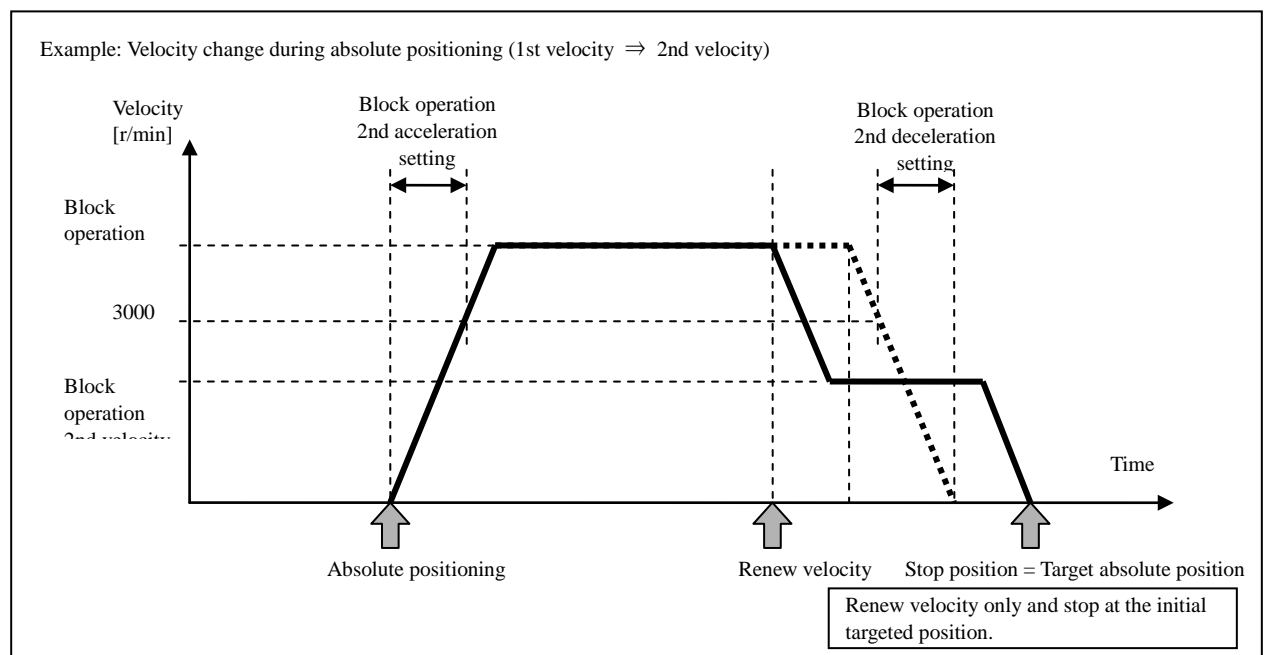
4-7 Renew velocity

Command Code : 6h

To be used to renew the velocity of the current action.

Action prior to execution of this command will be continued during renewal of velocity and after renewal.

This is only valid for relative positioning action or absolute positioning action, and the velocity during origin return action cannot be renewed during the action. Furthermore, velocity cannot be renewed, once the action has entered the deceleration stop action.

Command name	Blockdata [n] (64bit)							Data
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Renew velocity	06h	Velocity number	-	-	Operation direction *2)	Block transition condition	(Reserved)	-

Example: Velocity change during absolute positioning (1st velocity ⇒ 2nd velocity)

Renew velocity only and stop at the initial targeted position.

	Command argument	Set range	Contents
1	Velocity number	0 to 15	Selects velocity after renewal. Set selection number x for block operation velocity [x].
2	-	-	Please set to 0 (zero).
3	-	-	Please set to 0 (zero).
4	Operation direction *2)	0 to 1	0: Positive direction, 1: Negative direction

5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command.
			[LSB] 0: Transitions to next block after start.
			    1: Transitions to the next block after completing the action (that was in action prior to renewal of velocity). *1)
			[MSB] 0: Ends block operation for this block.
			    1: Continues block operation.

6	-	-	Please set to 0 (zero).
7	-	-	Please set to 0 (zero).

Parameter	Set range	Unit	Contents
Block operation velocity [x]	0 to maximum motor velocity	[r/min]	Sets velocity

*1) "After completion of action" shall mean the point when internal positioning command generation processing has ended. It is not judged by the actual stopping of the motor. Furthermore, please note that movement command will be issued even if the internal positioning command generation processing has ended, in case position command filter (FIR, smoothing) is being used.

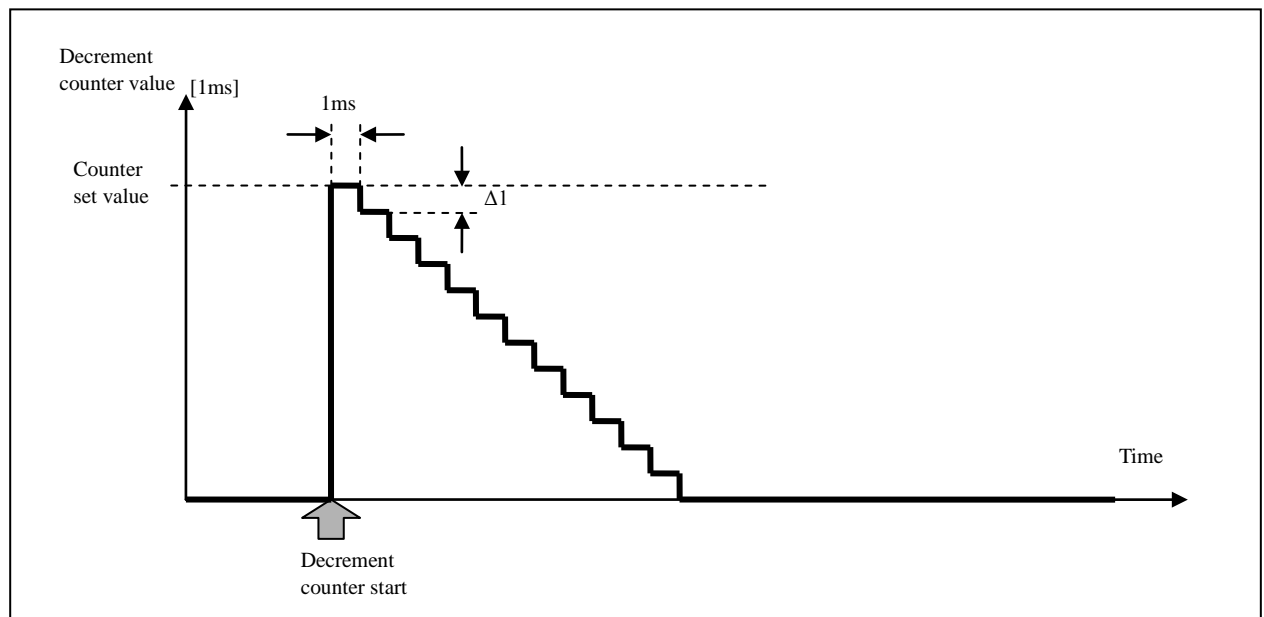*2) Effective only under infinite length operation.

4-8   Start decrement counter

Command Code : 7h

Used to start the decrement counter.

The value of the decrement counter is referenced by the conditional branch commands (Ah, Bh, and Ch).

Command name	Blockdata [n] (64bit)							Data
	Command							
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Decrement counter start	07h	-	-	-	-	Block transition condition	(Reserved)	Counter set value [1ms]

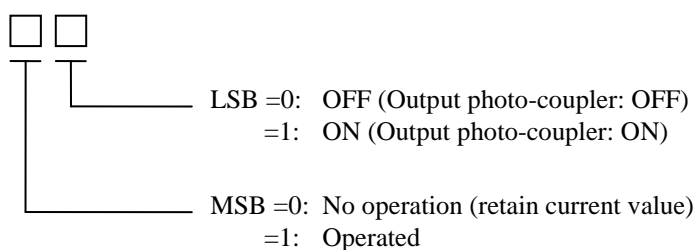|	Command argument	Set range	Contents
1	-	-	Please set to 0 (zero).
2	-	-	Please set to 0 (zero).
3	-	-	Please set to 0 (zero).
4	-	-	Please set to 0 (zero).
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0: Transitions to next block after start. 1: Starts counter and transitions to next block after counter stops (reaches 0). Can be used as a wait timer until the start of the next block. [MSB] 0: Ends block operation for this block. 1: Continues block operation.
6	-	-	Please set to 0 (zero).
7	Counter set value	0 to 1000000	Sets the initial value of the decrement counter in 1[ms] units. Counter will decrement from the initial value by 1 for each 1 ms cycle and will stop when it reaches 0. The value of the counter after start is used in the conditional branch command.

4-9   Output signal operation

Command Code : 8h

To be used to operate the output signal.

Block operation output (B-CTRLn) must be assigned to the generic output terminal (SOn) in advance.

Command name	Blockdata [n] (64bit)							Data
	Command							
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Output signal operation	08h	B-CTRL1 B-CTRL2	B-CTRL3 B-CTRL4	B-CTRL5 B-CTRL6	-	Block transition condition	(Reserved)	-

LSB =0: OFF (Output photo-coupler: OFF)
   =1: ON (Output photo-coupler: ON)

MSB =0: No operation (retain current value)
   =1: Operated

	Command argument	Set range	Contents
1	B-CTRL1/B-CTRL2	0 to 15	The following operation is enabled when the generic output terminal SOn is set to the block operation output B-DTRLn:
2	B-CTRL3/B-CTRL4	0 to 15	The following operations shall be set by the upper 2 bits for B-CTRL/3/5 and by the lower 2 bits for B-CTRL 2/4/6:
3	B-CTRL5/B-CTRL6	0 to 15	0: No operation (retain current value) 1. For manufacturer use (Err93.1 "Block data setting abnormal protection" will occur.) 2: OFF (Photo-coupler output: OFF) 3: ON (Photo-coupler output: ON)
4	-	-	Please set to 0 (zero).
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0,1: Transitions to next block after start. [MSB] 0: Ends block operation for this block. 1: Continues block operation.
6	-	-	Please set to 0 (zero).
7	-	-	Please set to 0 (zero).

4-10　Jump

Command Code : 9h

Used when transitioning (jumping) to the designated block number.

Command name	Blockdata [n] (64bit)							
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Jump	09h	-	Block No. (destination)			Block transition condition	(Reserved)	-

	Command argument	Set range	Contents
1	-	-	Please set to 0 (zero).
2	Block number	0 to 255	Set destination block number
3			
4			
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0,1:　Transitions to designated block after start. [MSB] 0,1:　Continues block operation.
6	-	-	Please set to 0 (zero).
7	-	-	Please set to 0 (zero).

4-11 Conditional branch

Command Code : Ah, Bh, Ch

Used when transitioning to the designated block number (destination when YES), when the designated conditions are satisfied.

Command name	Blockdata [n] (64bit)							
	Command							Data
	Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 6	Argument 7
	8bit	4bit	4bit	4bit	2bit	2bit	8bit	32bit
Conditional branch (=)	0Ah	For comparison	Block No. (destination, if Yes)			Block transition condition	(Reserved)	Compared value (threshold)
Conditional branch (>)	0Bh	For comparison	Block No. (destination, if Yes)			Block transition condition	(Reserved)	Compared value (threshold)
Conditional branch (<)	0Ch	For comparison	Block No. (destination, if Yes)			Block transition condition	(Reserved)	Compared value (threshold)

	Command argument	Set range	Contents			
1	For comparison	0 to 15	Value	For comparison	Unit	Remarks
			0	Command position	Command unit	Command position after filter
			1	Current position	Command unit	Current position of motor
			2	Position deviation	Command unit	Position deviation (= Command position - current position)
			3	Command velocity	r/min	Command motor velocity (before filter)
			4	Motor velocity	r/min	Current motor velocity
			5	Command torque	0.1%	Command motor torque
			6	Decrement counter	-	Decrement counter value
			7	Input signal	-	Can be used under conditional branch (=). *1)
			8	Output signal	-	Can be used under conditional branch (=). *2)
			9 to 15	(Reserved)	-	Please do not use
2 3 4	Block number	0 to 255	Specify the destination block number for the case that command conditions have been satisfied (when YES).			
5	Block transition condition	0 to 3	Sets block transition conditions after execution of this command. [LSB] 0: If YES, transitions to designated block after start, and if NO, then to the next block. 1: Will execute the block until it becomes YES, and will transition to the designated block at YES. [MSB] 0: Ends block operation for this block. 1: Continues block operation.			
6	Compared value (threshold)	80000000h to 7FFFFFFFh	Sets compared value (threshold). Contents and units of compared values shall differ with the comparison subjects.			

(Note) In case of conditional branch (=), there is a possibility of judgment error from sampling timing and electronic gear input errors. In such case, please use conditional branches (>) or (<).

*1) Comparison subject: Input signal (7h)

Can be used under conditional branch (=). Err 93.1 (Block data set abnormal protection) will occur when conditional branches (>) and (<) are set for comparison.

Transition to the designated block number (destination when YES) will be executed, when all conditions for each of the signals are satisfied.

Compared value (4 byte)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Function	Byte								
Signal condition	LL	SI8	SI7	SI6	SI5	SI4	SI3	SI2	SI1
	LH	-	-	-	-	-	-	SI10	SI9
With or without comparison	HL	SI8	SI7	SI6	SI5	SI4	SI3	SI2	SI1
	HH	-	-	-	-	-	-	SI10	SI9

Always set 0 to the "for manufacturer use" bit (-).

The 4 byte compared value data is separated into 2 byte units.

▪ Upper 2 bytes (HH, HL): Sets whether to compare or not, for each bit.
　　　　　　　　　　0: Without comparison
　　　　　　　　　　1: Compare
▪ Lower 2 bytes: (LH, LL): Sets the value to be compared (signal state of physical level) for each bit.
　　　　　　　　　　0: Input photo-coupler OFF (physical level)
　　　　　　　　　　1: Input photo-coupler ON (physical level)

*2) Comparison subject: Output signal (8h)

Can be used under conditional branch (=). Err 93.1 (Block data set abnormal protection) will occur when conditional branches (>) and (<) are set for comparison.

Transitioning to the designated block number (destination when YES) will be executed, when all conditions for each of the signals are satisfied.

Compared value (4 byte)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
Function	Byte								
Signal condition	LL	-	-	TLC	ZSP	BRK-OFF	INP	ALM	S-RDY
	LH	-	INP2	-	WARN2	WARN1	-	-	-
With or without comparison	HL	-	-	TLC	ZSP	BRK-OFF	INP	ALM	S-RDY
	HH	-	INP2	-	WARN2	WARN1	-	-	-

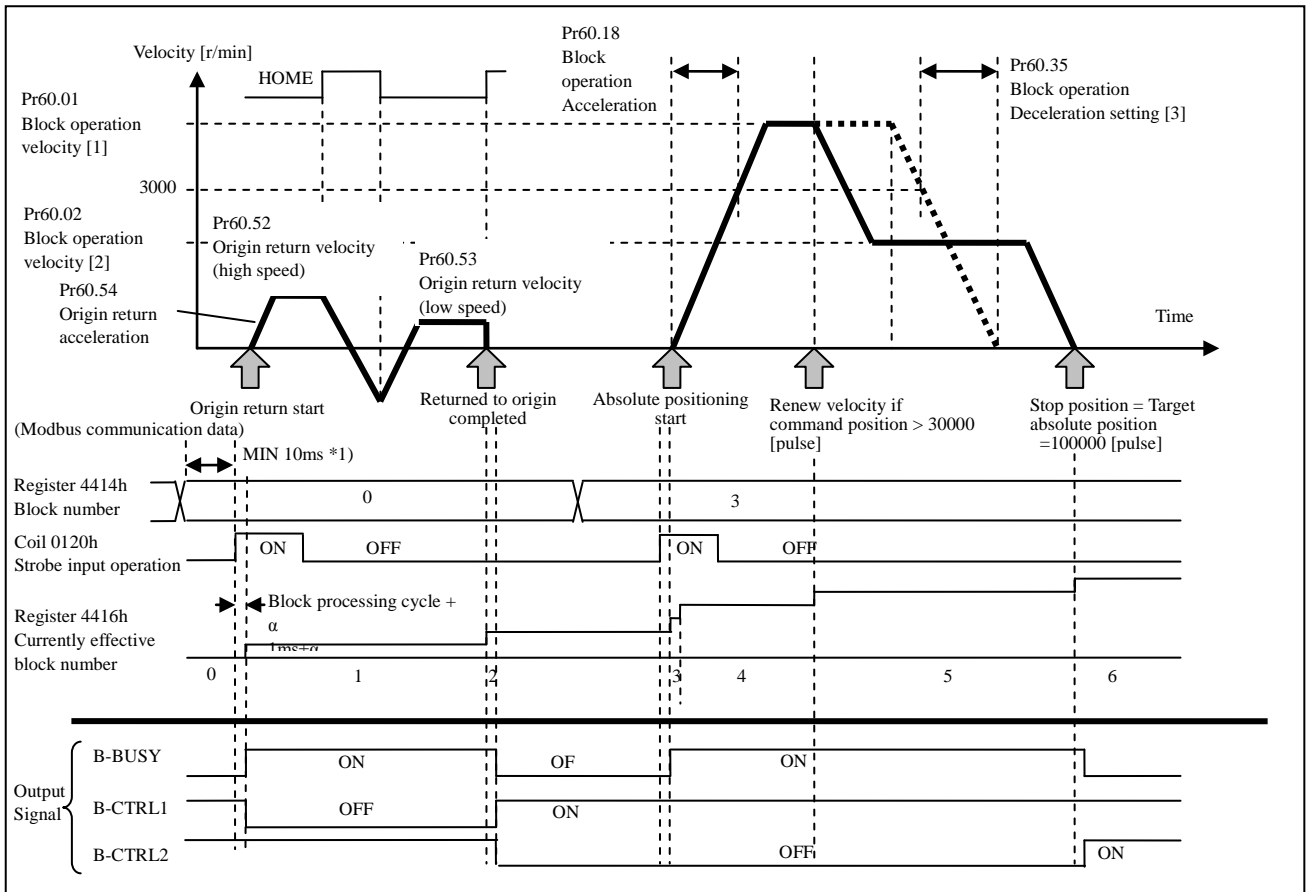Always set 0 to the "for manufacturer use" bit (-).

The 4 byte compared value data is separated into 2 byte units.

▪ Upper 2 bytes (HH, HL): Sets whether to compare or not, for each bit.
　　　　　　　　　　0: Without comparison
　　　　　　　　　　1: Compare
▪ Lower 2 bytes: (LH, LL): Sets the value to be compared (signal state of logic level) for each bit.
　　　　　　　　　　0: OFF (Logic level)
　　　　　　　　　　1: ON (Logic level)

4-12   Block transition, start, and finish

4-12-1   Block transition conditions

The number of blocks that can be set is limited to a maximum of 256 and efficient block setting (block programming) is necessary to conduct complex actions. Efficiency of block programming can be achieved by effectively using block transition conditions.

Block transition conditions are set by argument 5 (Block transition condition) for each block, and the functions of the upper bit (MSB) and the lower bit (LSB) are grouped as follows:

```
☐☐
 │ │
 │ └─────── LSB : Sets block transition conditions in case of block continuation (MSB = 1) *1)
 │              0 : Transitions to designated block after start of processing of subject block. *2)
 │              1 : Transitions to designated block after completion of processing of subject block. *2)
 │
 └───────── MSB : Sets whether to end or continue with the block operation in this block.
                0 : Ends block operation on completion of the block operation currently being
                    processed.
                1 : Continues with block operation even after completion of the block operation
```

*1)   In case block end (MSB = 0) is set, the lower bit (LSB) setting will become invalid and block operation will end upon completion of the processing of the subject block.

*2)   The functions of lower bits (LSB) will vary with each command. The above indicates the basic commands, however, for example, with jump command (9h), regardless of the set value, it will transition to the designated block after start. Please refer to the explanations for each command for details.

4-12-2   Start and finish of block operation

To start block operation, designate the block No. to be started and turn strobe input (STB) ON. Block operation state output (BUSY) will turn to 1 with the starting of block operation.
- Block No. designation: Register 4414h or I/F connector input (B-SEL 1 to 128)
- Strobe input (STB):   Coil 0120h or I/F connector (STB)

To finish block operation, pre-set the block transition condition to MSB = 0 by the block No. command of the block to be finished. Block operation state output (BUSY) will turn to 0 with the finish of block operation.

However, in case action type command (relative positioning, absolute positioning, origin return) is in the process of being executed, before the subject block is reached, then block operation will not be completed until the action has been completed (*1) and block operation condition output (BUSY) will continue to be 1.

*1)   "Completion of action" shall mean the point when internal positioning command generation processing has ended. It is not judged by the actual stopping of the motor. Furthermore, please note that movement command will be issued even if the internal positioning command generation processing has ended, in case position command filter (FIR, smoothing) is being used.

In addition, the following block operation will be forced terminated, as exceptional processing.

- When immediate stop or decelerated stop has been input (external input, Modbus communications).
- Upon servo-OFF condition (including servo OFF caused by triggering of alarm or drive prohibited input).
- Absolute potiosion has reached to the software limit.

5. Block operation example

Block number	Block parameter set value Upper: Command Lower: Data	Blockdata [n] (64bit)						Data
		Command						
		Command code	Argument 1	Argument 2	Argument 3	Argument 4	Argument 5	Argument 7
		8bit	4bit	4bit	4bit	2bit	2bit	32bit
0	08800200h 00000000h	Output signal operation	B-CTRL1 OFF B-CTRL2 maintain	B-CTRL3 maintain B-CTRL4 maintain	B-CTRL5 maintain B-CTRL6 maintain	-	Block continue Transition after start	-
		08h	8	0	0	0	2	0
1	04200300h 00000000h	Origin return	HOME leading edge	-	-	Positive direction	Block continue Transition after completion	-
		04h	2	0	0	0	3	0
2	08E00000h 00000000h	Output signal operation	B-CTRL1 ON B-CTRL2 OFF	B-CTRL3 maintain B-CTRL4 maintain	B-CTRL5 maintain B-CTRL6 maintain	-	Block complete	-
		08h	Eh	0	0	0	0	0
3	02123200h 000186A0h (100000)	Absolute positioning	Velocity	Acceleration	Deceleration	-	Block continue Transition after start	Target absolute position
		02h	1	2	3	0	2	100000
4	0B001700h 00007530h (30000)	Conditional branch (>)	Command position	Destination when YES (lock number 5)			Block continue Wait transition till YES	Compared value
		0Bh	0	5			3	30000
5	06200300h 00000000h	Renew velocity	Velocity	-	-	-	Block continue Transition after completion	-
		06h	2	0	0	0	3	0
6	08300000h 00000000h	Output signal operation	B-CTRL1 maintain B-CTRL2 ON	B-CTRL3 maintain B-CTRL4 maintain	B-CTRL5 maintain B-CTRL6 maintain	-	Block complete	-
		08h	3	0	0	0	0	0
7 to 255	00000000h 00000000h	-	-	-	-	-	-	-
		0h	0	0	0	0	0	0

*1) Maintain interval of 10 ms or more from B-SELn input to STB input.

6. Applied functions

   6-1   Infinite rotation absolute function

*This shall not apply to MINAS-A6L Series ([A6SL]/[A6SM]).

This is a function to allow the setting of the upper limit value of multi-rotation data of the absolute encoder to any value.

This function enables the turntable angle of rotation (position) to be obtained in case the usage of a turntable, etc. is rotated continuously in one direction, during use as a turntable, etc.

In addition, being an absolute encoder, there is no need to reset the origin after reclosing of the power supply.

Turntable 1 rotation

Reduction rate
(Mechanical gear ratio)
1/m

m revolutions

1 rotation of turntable from m
revolutions of motor

A6 motor
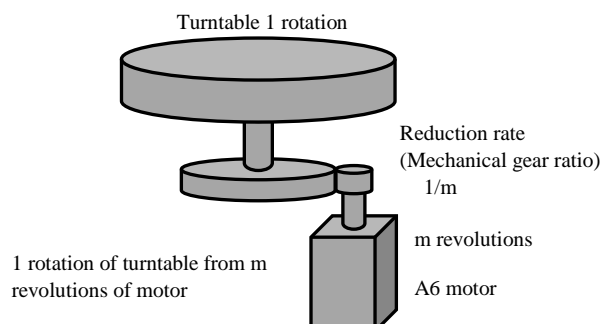
(1)   Applicable scope
This function cannot be applied unless the following conditions are satisfied:

	Condition where infinite length absolute function is activated
Control mode	- Position control mode
Other	- The amount of motor revolutions per 1 turntable rotation is an integer of 512 or smaller. - Command position per 1 turntable rotation = Encoder resolution (2^{23}) / Electronic gear ratio / Reduction ratio (1/m), is an integer of $2^{23}-1$ or smaller. - Elements other than the control parameter to be appropriately set and shall not interfere with the normal revolutions of the motor.

(2)   Related parameters

Classification	No.	Parameter name	Set range	Unit	Functions
0	15	Absolute encoder set	0 to 4	-	Sets the method of use of the absolute encoder. 　0: Use under absolute system (Absolute mode) 　1: Use under incremental system (incremental mode) 　2: Ignore multi-rotation counter overflow even though used under the absolute system (Absolute mode). 　3: For manufacturer use (Not to be set) 　4: Upper limit of multi-rotation counter can be set at any value, even though used under the absolute system (Absolute mode). Ignore multi-rotation counter overflow. (infinite revolution absolute mode)
6	88	Absolute multi-rotation data upper limit	0 to 65534	-	Sets the upper limit value of absolute multi-rotation data. When the multi-rotation data exceeds the set value, the multi-rotation data will change to 0. Inversely, if it turns less than 0, it will change to this set value. In case Pr0.15 is set to 0 or 2 (absolute mode), the upper limit value for absolute multi-rotation data will be 65535, regardless of the set value.
60	49	Block operation origin offset	-2147483648 to 2147483647	Command unit	Sets the amount of origin offset when return to origin has been completed under block operations in increment mode, Sets the amount of offset between the encoder location and mechanical coordinate system location under block operations in absolute mode. Setting bit 1 to 1 in Pr60.48 (Block operation method set," will activate the setting.

(3) Notes

This function will become effective by setting Pr0.15 "Absolute encoder set" to 4, and reclosing the control power supply.
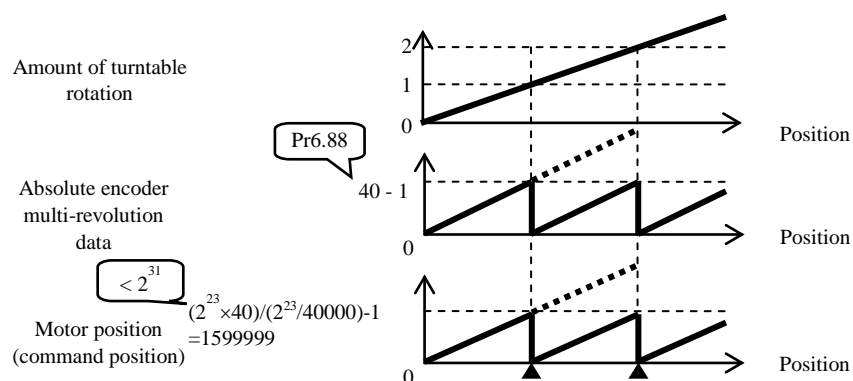
- When the encoder multi-rotation data upper limit value and the amplifier parameter multi-rotation data upper limit value does not match when the control power supply is reclosed, Err92.3 "Multi-rotation data upper limit inconsistency error protection" will be triggered but this is not an error. Reclosing the amplifier control power supply will eliminate any further occurrences.
- Set Pr6.88 "Absolute multi-rotation data upper limit value" to (m-1). m is the denominator of the reduction ratio.
- The motor position will wrap around also at the position where the multi-rotation data will wrap around.
- Command position should be provided to match this motor position.
- Please refer to item 2-6 for details of wrap around process.
- Set Pr6.88 "Absolute multi-rotation data upper limit value" so that the motor position and command position will not exceed $(2^{31}-1)$.
- The motor position of this amplifier is set, taking Pr0.00 "Rotational direction set," Pr6.88 "Block operation origin offset," etc., into consideration.
- Please refer to Item 2-7 for details.
- Please refer to Item 4-7-1-1 of Technical Reference (Functional specification) for absolute system configuration.
- Please set Pr60.49 "Block operation origin offset" within the range of 0 to ((Set value for Pr6.88 + 1) × encoder resolution / electronic gear ratio) -1, If setting is made outside this range Err93.8 "Parameter set error protection" will be triggered.

(4) Operation example

Procedure when the electronic gear ratio is $2^{23}/4000$, with a reduction ratio of 40 motor revolutions to 1 turntable rotation (m = 40) shall be as follows:

[1] Set Pr0.15 = 4 and Pr6.88 = 39, and write into EEPROM
[2] Reclose amplifier control power supply
[3] The multi-rotation data upper limit on the encoder side will be automatically renewed by switching on the amplifier
[4] Err92.3 "Multi-rotation data upper limit inconsistency error protection" generated.
[5] Reclose amplifier control power supply
[6] Multi-rotation data upper limit is now effective and the motor position is generated as shown in the figure below
[7] The motor position will wrap around at $2^{23} \times 40$ -1. The command position shall match this and will wrap around to operate.
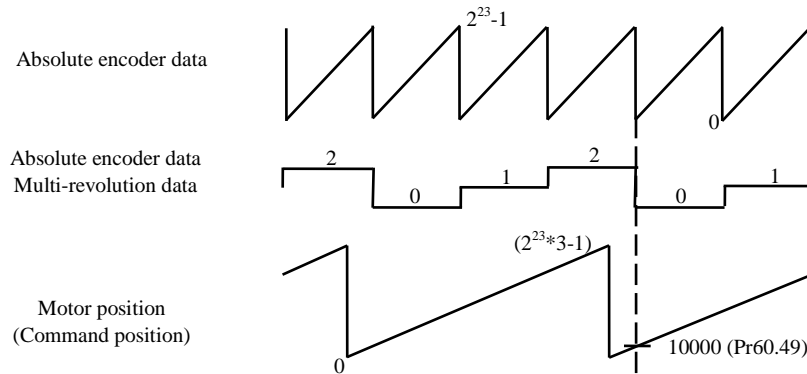
* The multi-rotation data upper limit is maintained by a battery power source connected to the encoder. When the amplifier control power supply is switched-on the next occasion, the procedure will start from [6] above.

Amount of turntable rotation

Pr6.88

Absolute encoder multi-revolution data

$< 2^{31}$

$(2^{23} \times 40)/(2^{23}/40000)-1$
$=1599999$

Motor position (command position)

40 - 1

Position

Position

Position

(5) Absolute origin position offset
When using a 23-bit absolute encoder, the absolute origin position offset shall be as follows:

i) When CCW = positive direction, electronic gear ratio (Pr0.09 / Pr 0.10) = 1/1, Pr 6.88 "Absolute multi-rotation data upper limit value" = 2, and Pr60.49 "Block operation origin offset" = 10000

ii) When CW = positive direction, electronic gear ratio (Pr0.09 / Pr 0.10) = 1/1, Pr 6.88 "Absolute multi-rotation data upper limit value" = 2, and Pr60.49 "Block operation origin offset" = 10000
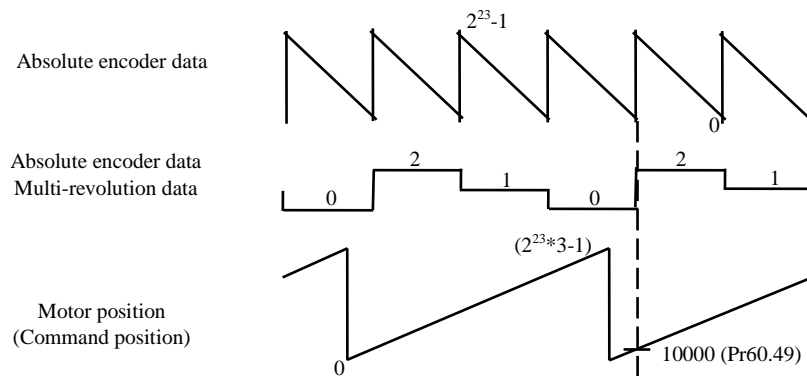
7. Protection functions to detect when Modbus communication/block operation function is effective

7-1   List of protection functions to detect when Modbus communication/block operation function is effective

(Note) Please refer to Technical reference (Functional Specifications) for protection functions other than those indicated below.

Alarm number		Alarm name	Attribute		
Main	Sub		History record	Clear enabled	Immediate stop *1)
27	1	Absolute clear abnormal protection	○	×	×
29	1	Counter overflow protection 1	○	×	×
29	2	Counter overflow abnormal protection 2	○	×	×
80	0	Modbus communication timeout protection	○	×	×
92	0	Encoder data recovery abnormal protection	○	×	×
92	1	External scale data recovery error protection	○	×	×
92	3	Multi-rotation data upper limit inconsistency error protection	○	×	×
93	0	Parameter setup error 1	○	×	×
93	1	Block data setting error protection	○	○	×
93	8	Parameter set error protection 6	○	×	×
94	0	Block operation abnormal protection	○	○	×
94	2	Origin return abnormal protection	○	○	×
97	0	Control mode setting error protection	×	×	×

*1)   Immediate stop indicates alarms that will trigger immediate stop, when Pr.5.10 (Sequence upon alarm) is set between 4 and 7. Please refer to Technical Reference (Functional specification) for details.

7-2   Details of protection functions to detect when Modbus communication/block operation function is effective

Alarm number		Alarm name	Cause	Treatment
Main	Sub			
27	1	Absolute clear abnormal protection	Absolute encode multi-rotation clear has been executed by USB communications.	・ Confirm whether absolute encode multi-rotation clear has been executed by USB communications. (Note) This is a safety measure and is not an abnormality. Alarm will not be triggered when multi-rotation clear is conducted by Modbus communications, however, please re-set the control power supply, even in this case.
29	1	Counter overflow error protection 1	The value of absolute encoder (absolute external scale) position [in pulse units] / electronic gear ratio has exceeded $\pm 2^{31}$ (2147483648), in the position information initialization process after reclosing of control power supply in absolute mode when block operation is valid,	・ Confirm the operational range of absolute encoder (absolute external scale) position and conduct a review of the electronic gear ratio.
29	2	Counter overflow abnormal protection 2	The value of positioning deviation has exceeded $\pm 2^{30}$ (1073741824) in command units.	・ Confirm that motor rotates in accordance with the positioning command. ・ Confirm that output torque has not saturated by the torque monitor. ・ Adjust gain. ・ Set Pr.0.13 ("1st torque limit setting" and Pr5.22 "2nd torque limit setting" to maximum ・ Connect encoder connection wiring as per the wiring diagram.
80	0	Modbus communications timeout protection	Modbus communication against own axis has not been received for more than the set time, under a state where rights have been acquired under register 4300h "Modbus communication rights setting."	・ Set Pr5.40 "Modbus communication timeout period" to 0 to be disabled or to appropriate time. ・ Check the connection of Modbus communication.

Alarm number		Alarm name	Cause	Treatment
Main	Sub			
92	0	Encoder data recovery abnormal protection	Initialization process of internal position information has not conducted normally under absolute and semi-closed control mode.	• Secure encoder power supply voltage at DC5V±5% (4.75 to 5.25V). Care must be taken when the encoder lines are lengthy. • If motor wires and encoder wires are bundled together, separate them. • Connect shield to FG
	1	External scale data recovery error protection	Initialization of internal position location has been conducted abnormally under full closed control and under absolute mode, with block operations valid	• Secure power supply voltage of 5 VDC±5%(4.75 to 5.25 V) for the external scale. Special care should be taken in case the external scale connecting cable is long. • In case the motor line and the external scale connecting cable is bundled together, separate them. • Connect shield to FG. Refer to connection diagram for external scale.
	3	Multi-rotation data upper limit inconsistency error protection	The encoder multi-rotation upper limit value and the amplifier parameter multi-rotation data upper limit value does not match, under. infinite revolution absolute mode.	• Confirm set values of the parameters • In case it occurs immediately after switching the control power supply on, reclose the control power supply. (This is not abnormal.)
93	0	Parameter setup error 1	[1] Electronic gear ratio exceeds the allowable range. [2] When block operation is valid by start by Modbus communications (Pr6.28 = 1) and Modbus connection was disabled (Pr 5.37 is 0).	• Check the setting value of the parameter. [1] When a block operation was enabled (Pr 6.28 is non 0), Electronic gear ratio must be in the range 1/1000 to 8000. [2] When a block operation was enabled (Pr 6.28 is non 0), Modbus connection was disabled (Pr 5.37 is 0).
	1	Block data setting abnormal protection	[1] Velocity, acceleration and deceleration have been set to 0 to start block operation. [2] Conditional branch command does not support the subject of comparison. [3] Specified block data command was undefined. [4] Other, abnormal block data settings exists.	[1] Set value other than 0 to velocity, acceleration and deceleration. [2] Confirm there are no problems with the conditional branch command or comparison subjects. [3] Confirm there are no problems with the block data. Confirm there are no problems with the block number designations. [4] Confirm there are no problems with the block data settings.
	8	Parameter set error protection 6	The absolute origin position offset has been set outside the range under absolute mode origin offset valid setting (Pr60.48 bit 1 = 1) under infinite revolution absolute mode, when block operation is valid (Pr6.28 is other than 0).	• Check set values of parameters
94	0	Block operation abnormal protection	[1] A new action command was executed while an action command (during execution of position command generation process) was being executed. [2] Start conducted by specifying new block number while block operation was being conducted. [3] Block operation started even though servo was OFF, etc.	[1] Confirm there are no problems with the block operation sequence. [2] Confirm there are no problems with the upper side sequence. [3] Confirm there are no problems with the upper side sequence.
	2	Origin return abnormal protection	[1] A block operation of origin return command was executed while in absolute mode. [2] Drive prohibited input for origin return direction has been turned ON during the origin return action, and the drive prohibited input for the direction opposite to the origin return direction has been turned ON while it is in reverse action. [3] Relative positioning or absolute positioning has been executed under origin return uncompleted state.	[1] Confirm there are no problems with the block data settings or the absolute mode settings. [2] Confirm there are no problems in the arrangement of the drive prohibited input and the origin (sensor input, Z phase). [3] Confirm there are no problems with the setting of block data and others.
97	0	Control mode setting error protection	Block operation is set to enabled, when other than Position control (Pr0.01 = 0) or full-close control (Pr0.01 = 6)	Check the setting of Pr 0.01"control mode setting" and Pr 6.28 "Special function selection"

8. List of parameters

Classification 0: Special settings

Class	No	Parameter title	Unit	Set range	Functions, contents	Attribute	Related control modes	Relations
0	15	Absolute encoder setting	-	0 to 4	Select method of use of absolute encoder	Reclose power supply	All	6-1

Classification 5: Extended settings

Class	No	Parameter title	Unit	Set range	Functions, contents	Attribute	Related control modes	Relations
5	29	RS232 communications baud rate setting *1	-	0 to 7	Set baud rate for RS232 communications. 0: 2400, 1: 4800, 2: 9600 3: 19200, 4: 38400, 5: 57600, 6: 115200, 7: 230400 bps Note) In case it is not Modbus communications (Pr.5.37 = 0), when value is set to 7, it will be set internally to 9600 bps.	Reclose power supply	All	2-1-2
	30	RS485 communications baud rate setting *1	-	0 to 7	Set baud rate for RS485 communications. 0: 2400, 1: 4800, 2: 9600 3: 19200, 4: 38400, 5: 57600, 6: 115200, 7: 230400 bps Note) In case it is not Modbus communications (Pr.5.37 = 0), when value is set to 7, it will be set internally to 9600 bps.	Reclose power supply	All	2-1-2
	31	Axis number	-	0 to 127	Sets axis number for communications. In case of RS232 or RS485, please use within the range up to 31. In case of Modbus, use within the range of 1 to 127. (However, the maximum number of connection axis shall be limited to 31.) 0: will invalidate Modbus communications.	Reclose power supply	All	-
	37	Modbus connection setting	-	0 to 2	Sets RS232/RS485 communications protocol. 0: MINAS standard protocol 1: Modbus-RTU (RS232 communications, 1:1 only) 2: Modbus-RTU (RS485 communications, 1:N compatible)	Reclose power supply	All	-
	38	Modbus communication setting	-	0 to 5	Sets parity (Even, odd, none) and stop bit length (1 bit, 2 bits) for Modbus communications. 0: Even/1bit 1: Even/2bit 2: Odd/1bit 3: Odd/2bit 4: None/1bit 5: None/2bit	Reclose power supply	All	2-1-3
	39	Modbus response waiting Time	ms	0 to 10000	Set waiting time to be added from the receipt of Modbus communications request until response data is transmitted. Note) Even if value is set to 0, delay will occur for generation of response data.	Always effective	All	2-1-3
	40	Modbus communications Time out time	ms	0 to 10000	Sets time to detect Err 80.0 "Modbus communications time out protection", in case Modbus communications specifying own axis or broadcast could not be received within the set length of time from the last time received, when rights have been acquired under register 4300h "Modbus communication rights setting" and Err 80.0 is not detected when set value is 0.	Always effective	All	2-1-3

(Continued)

Class	No	Parameter title	Unit	Set range	Functions, contents	Attribute	Related control modes	Relations
5	42	Modbus broadcast Setting	-	-32768 to 32767	Sets request processing and response action, in case broadcast mode request has been received in Modbus communications. 　bit 0 response action 　　0: Invalid (No action) 1: Valid (Action) *1 　bit 1: Request processing 　　0: Valid (Process) 1: Invalid (No processing) 　bit 2: Strobe input operation automatic off 　　0: invalid, 1: valid *2 　bit 3: Request operation specification switch *1 　　0: use Pr5.40, 1: Use Pr5.39 　bit 4 - 15: Not used　　Please set to 0 (zero). The lowermost bit is designated as bit 0. *1　In case bit 3 = 0, 　returns response after Pr5.31 × Pr5.40[ms]. 　In case bit 3 = 1, 　returns response after Pr5.31 x Pr5.39 [ms]. 　Does not return response when bit 1 = 1. *2　After start-up of block operation, strobe input 　operation will be automatically turn OFF from 　the amplifier side. No need to write input OFF.	Always effective	All	2-1-3 2-1-4
	58	Modbus mirror register setting 1	-	-32768 to 32767	Sets register address linked to Modbus register address 4418h "Mirror register 1."	Reclose power supply	All	2-1-4
	59	Modbus mirror register setting 2	-	-32768 to 32767	Sets register address linked to Modbus register address 4419h "Mirror register 2."	Reclose power supply	All	2-1-4
	60	Modbus mirror register setting 3	-	-32768 to 32767	Sets register address linked to Modbus register address 441Ah "Mirror register 3."	Reclose power supply	All	2-1-4
	61	Modbus mirror register setting 4	-	-32768 to 32767	Sets register address linked to Modbus register address 441Bh "Mirror register 4."	Reclose power supply	All	2-1-4
	62	Modbus mirror register setting 5	-	-32768 to 32767	Sets register address linked to Modbus register address 441Ch "Mirror register 5."	Reclose power supply	All	2-1-4
	63	Modbus mirror register setting 6	-	-32768 to 32767	Sets register address linked to Modbus register address 441Dh "Mirror register 6."	Reclose power supply	All	2-1-4
	64	Modbus mirror register setting 7	-	-32768 to 32767	Sets register address linked to Modbus register address 441Eh "Mirror register 7."	Reclose power supply	All	2-1-4
	65	Modbus mirror register setting 8	-	-32768 to 32767	Sets register address linked to Modbus register address 441F h "Mirror register 8."	Reclose power supply	All	2-1-4
	79	Modbus mirror register setting 9	-	-32768 to 32767	Sets register address linked to Modbus register address 4420h "Mirror register 9."	Reclose power supply	All	2-1-4
	80	Modbus mirror register setting 10	-	-32768 to 32767	Sets register address linked to Modbus register address 4421h "Mirror register 10."	Reclose power supply	All	2-1-4
	81	Modbus mirror register setting 11	-	-32768 to 32767	Sets register address linked to Modbus register address 4422h "Mirror register 11."	Reclose power supply	All	2-1-4
	82	Modbus mirror register setting 12	-	-32768 to 32767	Sets register address linked to Modbus register address 4423h "Mirror register 12."	Reclose power supply	All	2-1-4
	83	Modbus mirror register setting 13	-	-32768 to 32767	Sets register address linked to Modbus register address 4424h "Mirror register 13."	Reclose power supply	All	2-1-4
	84	Modbus mirror register setting 14	-	-32768 to 32767	Sets register address linked to Modbus register address 4425h " Mirror register 14."	Reclose power supply	All	2-1-4
	85	Modbus mirror register setting 15	-	-32768 to 32767	Sets register address linked to Modbus register address 4426h "Mirror register 15."	Reclose power supply	All	2-1-4
	86	Modbus mirror register setting 16	-	-32768 to 32767	Sets register address linked to Modbus register address 4427h "Mirror register 16."	Reclose power supply	All	2-1-4

Classification 6: Special setting

Class	No	Parameter title	Unit	Set range	Functions, contents	Attribute	Related control modes	Relations
6	28	Special function select	-	0 to 2	Selects valid/invalid of block operation functions. 0:Block operations invalid 1: Block operation valid by start by Modbus communication 2: Block operation valid by start by input signal	Reclose power supply	Block operation	2-3
6	88	Absolute multi-rotation data upper limit value	-	0 to 65534	Sets absolute multi-rotation data upper limit value. When the multi-rotation data exceeds this set value, the multi-rotation data will turn to 0. Inversely, if it goes below 0, it will change to this set value. Internal value will be set to 65535 in case Pr0.15 is set to 0 or 2 (absolute mode)	Reclose power supply	All	6-1

Classification 56 to 60: Block data
Please refer to Item 3-2 for details.

Classification 60: Block operation setting

Class	No	Parameter title	Unit	Set range	Functions, contents	Attribute	Related control modes	Relations
60	48	Block operation method set	-	-32768 to 32767	Set origin offset valid or invalid under absolute mode	Reclose power supply	Block operation	3-1
	49	Block operation Origin offset	Command unit	-2147483648 to 2147483647	Sets the amount of origin offset at origin return completion in block operation under increment mode. Sets the amount of offset between the encoder position of block operation under absolute mode and the mechanical coordinate system location. Set bit 1 of Pr60.48 (Block operation method setting) to make it valid.	Reclose power supply	Block operation	3-1
	50	Block operation Positive direction software limit	Command unit	-2147483648 to 2147483647	Sets soft limit range in block operation after return to origin completion.	Reclose power supply	Block operation	3-1
	51	Block operation Negative direction software limit	Command unit	-2147483648 to 2147483647	Sets soft limit range in block operation after return to origin completion.	Reclose power supply	Block operation	3-1
	52	Origin return velocity under block operation. (high speed)	r/min	0 to 20000	Sets high-speed operation velocity for return to origin	Reclose power supply	Block operation	3-1
	53	Origin return velocity under block operation. (low speed)	r/min	0 to 20000	Sets low-speed operation velocity for return to origin	Reclose power supply	Block operation	3-1
	54	Block operation Origin return acceleration	ms/ (3000r/ min)	0 to 10000	Sets acceleration and deceleration for return to origin	Reclose power supply	Block operation	3-1
	55	Set invalid block operation origin return	-	0 to 1	Set to 1 when conducting relative positioning operations and absolute positioning operations, without return to origin operation under increment mode.	Reclose power supply	Block operation	3-1