Panasonic

No. SX-DSV03456

TECHNICAL REFERENCE

– EtherCAT Communication Specification –

MODEL

Product Name : AC Servo Driver

Product No. : MINAS A6 Multi series

(EtherCAT communication/rotation type)

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Industrial Device Solution Business Unit, Industrial Device Business Division,
Industrial Solutions Company, Panasonic Corporation

7-1-1 Morofuku, Daito-City, Osaka 574-0044, Japan
Phone : +81-72-871-1212
Fax : +81-72-870-3151

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Feb. 15, 2021	1-3,1-4,1-5	2.0	・DM Software version up CPU1 Ver1.01→Ver1.02 CPU2 Ver1.01→Ver1.02 PSM Software version up CPU Ver1.01→Ver1.02	-
	1-5,1-18,6-196		・Function addition “PSM main power supply overload warning / alarm”	
	1-5,1-18,1-19, 6-196,6-206,9-19		・Function addition “PSM rated output power overload warning”	
	1-5		・Function addition “PSM alarm mask”	
	1-5		・Function addition “PSM alarm history expantion”	
	6-205 ,9-18		・Correction Corrected Range and Data Type of 202Dh and 202Eh	
	1-6		・Addition Added the caution about resending when frame reception fails	

Note: The page number (Page) is the current page number at the time of revision.

Table of contents

1. Introduction 1-1

1.1 Introduction 1-2

1.2 Start-up guide 1-7

1.2.1 Preparation and connection (Mainly refer to Chapter 2 and Chapter 3) 1-7

1.2.2 Communication establishment (Mainly refer to Chapter 3 and Chapter 5) 1-8

1.2.3 Object settings (Mainly refer to Chapter 6) 1-9

1.2.4 Motor operation (Mainly refer to Chapter 6) 1-10

1.2.5 When the motor does not operate 1-11

1.2.6 About PANATERM for Multi 1-11

1.2.7 About PANATERM for safety 1-13

1.2.8 About EoE 1-14

1.3 Main differences from the MINAS-A6B series 1-16

2. System Overview 2-1

2.1 EtherCAT overview 2-2

2.2 Reference materials 2-3

2.3 System configuration (Master & slave configuration) 2-4

2.4 Specification list 2-5

3. EtherCAT Communication Specification 3-1

3.1 EtherCAT frame configuration 3-2

3.2 ESM (EtherCAT state machine) 3-4

3.3 ESC address space 3-6

3.4 SII (slave information interface) EEPROM 3-8

3.4.1 SII area (0000h to 003Fh) 3-9

3.5 Synchronous communication mode 3-11

3.5.1 DC (Synchronous with SYNC0 event) 3-12

3.5.2 SM2 (Synchronous with SM2 event) (Not supported) 3-13

3.5.3 Free RUN (Asynchronous) 3-14

3.6 SDO (service data object) 3-15

3.6.1 Message at error occurrence 3-18

3.6.1.1 Abort message 3-18

3.6.1.2 Emergency message 3-19

3.7 PDO (process data object) 3-25

3.7.1 PDO mapping object 3-26

3.7.2 PDO assign object 3-28

3.8 Front panel configuration 3-29

3.8.1 EtherCAT indicators 3-30

3.8.2 Node addressing (Setting station alias) 3-32

3.8.2.1 Reading the value of SII from configured station alias 3-33

3.8.2.2 Reading the value of rotary switch from configured station alias 3-33

3.8.2.3 Reading the value of rotary switch from AL status code (Explicit device ID) 3-34

3.9 Ethernet over EtherCAT(EoE) function 3-35

3.9.1 Setup steps 3-37

3.9.1.1 When the EtherCAT master and Windows® PC are the same 3-38

3.9.1.2 When the EtherCAT master and Windows® PC are different 3-39

3.9.2 PANATERM for Multi / PANATERM for safety startup procedure 3-41

3.9.3 Connection method of PANATERM for Safety 3-42

4. Common Object Specification 4-1

4.1 Object configuration 4-2

5. CoE Communication Area (1000h to 1FFFh) 5-1

5.1 Object list 5-2

5.2 Device information 5-8

5.3 Sync manager communication type (1C00h) 5-10

5.4 PDO (process data object) mapping 5-11

5.4.1 PDO assign object (1C12h to 1C13h) 5-11

5.4.2 PDO mapping object (1600h to 1603h, 1610h to 1613h, 1A00h to 1A03h, 1A10h to 1A13h) 5-13

5.4.3 Default PDO mapping 5-22

5.4.4 PDO mapping setting procedure 5-26

5.5 Sync manager 2/3 synchronization (1C32h, 1C33h) 5-28

5.5.1 DC (Synchronous with SYNC0 event) 5-32

5.5.2 SM2 (Synchronous with SM2 event) (Not supported) 5-34

5.5.3 Free RUN (Asynchronous) 5-36

5.5.4 Input shift time (Not supported) 5-38

5.6 Store parameters (Write object in EEPROM) (1010h) 5-39

5.7 Diagnosis history (Reading function of error (alarm) history) (10F3h) 5-40

6. Drive Profile Area (6000h to 6FFFh)..... 6-1

6.1 Object list..... 6-2

6.2 PDS (power drive systems) specification..... 6-8

6.2.1 Finite state automaton (FSA)..... 6-8

6.3 Controlword (6040h)..... 6-10

6.4 Statusword (6041h)..... 6-12

6.5 Operation mode setting..... 6-15

6.5.1 Supported drive modes (6502h)..... 6-15

6.5.2 Modes of operation (6060h)..... 6-16

6.5.3 Modes of operation display (6061h)..... 6-17

6.5.4 Cautions for changing operation mode..... 6-18

6.6 Position control function (pp, csp, ip, hm)..... 6-19

6.6.1 Common position control function..... 6-19

6.6.1.1 Position control block diagram..... 6-19

6.6.1.2 Full-closed control block diagram..... 6-21

6.6.1.3 Related objects common in position control (Command & setup)..... 6-23

6.6.1.4 Related objects common in position control (Monitoring)..... 6-29

6.6.2 Profile position mode (pp mode)..... 6-38

6.6.2.1 Objects related to pp mode (Command & setup)..... 6-39

6.6.2.2 Objects related to pp mode (Monitoring)..... 6-46

6.6.2.3 Operations of pp mode..... 6-48

6.6.3 Cyclic Position Mode (csp mode)..... 6-53

6.6.3.1 Objects related to csp mode (Command & setup)..... 6-54

6.6.3.2 Objects related to csp mode (Monitoring)..... 6-57

6.6.3.3 Operations of csp mode..... 6-59

6.6.3.4 Calibration process on the occurrence of communication error..... 6-60

6.6.3.5 Amount of change saturation function of command position..... 6-61

6.6.4 Interpolating position mode (ip mode) (Not supported)..... 6-63

6.6.5 Homing Position Mode (hm mode)..... 6-64

6.6.5.1 Objects related to hm mode (Command & setup)..... 6-65

6.6.5.2 Objects related to hm mode (Monitoring)..... 6-70

6.6.5.3 Operations of hm mode (Homing operation)..... 6-73

6.7 Velocity control function..... 6-89

6.7.1 Common velocity control function..... 6-89

6.7.1.1 Velocity control block diagram..... 6-89

6.7.1.2 Related objects common in velocity control (Command & setup)..... 6-91

6.7.1.3 Related objects common in velocity control (Monitoring)..... 6-94

6.7.2 Profile velocity mode (pv mode)..... 6-97

6.7.2.1 Objects related to pv mode (Command & setup)..... 6-98

6.7.2.2 Objects related to pv mode (Monitoring) ... 6-102
6.7.2.3 Operations of pv mode ... 6-106
6.7.3 Cyclic velocity mode (csv mode) ... 6-107
6.7.3.1 Objects related to csv mode (Command & setup) ... 6-108
6.7.3.2 Objects related to csv mode (Monitoring) ... 6-111
6.7.3.3 Operations of csv mode ... 6-113
6.8 Torque control function ... 6-114
6.8.1 Common torque control function ... 6-114
6.8.1.1 Torque control block diagram ... 6-114
6.8.1.2 Related objects common in torque control (Command & setup) ... 6-115
6.8.1.3 Related objects common in torque control (Monitoring) ... 6-118
6.8.2 Profile Torque Mode (tq mode) ... 6-121
6.8.2.1 Objects related to tq mode (Command & setup) ... 6-122
6.8.2.2 Related objects (Monitoring) ... 6-125
6.8.2.3 Operations of tq mode ... 6-127
6.8.3 Cyclic Torque Mode (cst mode) ... 6-128
6.8.3.1 Objects related to cst mode (Command & setup) ... 6-129
6.8.3.2 Objects related to cst mode (Monitoring) ... 6-132
6.8.3.3 Operations of cst mode ... 6-134
6.9 Common motion function ... 6-135
6.9.1 Touch probe function (Position latch request/release) ... 6-135
6.9.1.1 Configuration of touch probe function ... 6-136
6.9.1.2 Touch probe relevant object ... 6-138
6.9.1.3 Touch probe function (60B8h) ... 6-139
6.9.1.4 Touch probe status (60B9h) ... 6-140
6.9.1.5 Touch probe position 1/2 positive value (60BAh - 60BDh) ... 6-141
6.9.1.6 Starting touch probe operation ... 6-141
6.9.1.7 Event mode of touch probe ... 6-142
6.9.1.8 The correction function for detection delay of latch position ... 6-144
6.9.2 Option Code (Deceleration stop sequence) ... 6-145
6.9.2.1 Abort connection option code (6007h) ... 6-147
6.9.2.2 Quick stop option code (605Ah) ... 6-151
6.9.2.3 Shutdown option code (605Bh) ... 6-153
6.9.2.4 Disable operation option code (605Ch) ... 6-155
6.9.2.5 Halt option code (605Dh) ... 6-156
6.9.2.6 Fault reaction option code (605Eh) ... 6-157
6.9.2.7 Sequence at drive inhibition input (POT, NOT) ... 6-159
6.9.3 Digital inputs/digital outputs ... 6-161
6.9.3.1 Digital inputs (60FDh) ... 6-161
6.9.3.2 Digital outputs (60FEh) ... 6-162
6.9.4 Position information ... 6-166

6.9.4.1 Initialization timing of position information 6-166
6.9.4.2 Electronic gear function..... 6-167
6.9.4.3 Polarity (607Eh/687Eh)..... 6-173
6.9.4.4 Initialization of the absolute encoder(Semi-closed control) 6-176
6.9.4.5 Position range limit (607Bh)..... 6-181
6.9.4.6 Home offset (607Ch)..... 6-183
6.9.4.7 Initialization of the absolute scale (Full-closed control) 6-185
6.9.4.8 Backlash compensation function (Not supported) 6-186
6.9.5 Jerk (Not supported) 6-187
6.9.6 Interpolation time period (60C2h)..... 6-188
6.9.7 Servo information monitor object 6-189
6.9.8 Power supply module information monitor object 6-206

7. Servo Parameter Area (2000h to 201Fh, 2100h to 211Fh, 2500h to 251Fh..... 7-1

7.1 Object overview 7-2

8. EtherCAT Relevant Protection Functions 8-1

8.1 Error (alarm) list (Attribute and LED display)..... 8-2
8.1.1 EtherCAT communication-related error (Alarm) 8-2

8.2 EtherCAT-related details of error (Alarm)..... 8-3
8.2.1 Inaccurate ESM demand error protection (Err80.0)..... 8-3
8.2.2 ESM undefined request error protection (Err80.1)..... 8-3
8.2.3 Bootstrap requests error protection (Err80.2) 8-4
8.2.4 Incomplete PLL error protection (Err80.3) 8-4
8.2.5 PDO watchdog error protection (Err80.4) 8-4
8.2.6 PLL error protection (Err80.6) 8-5
8.2.7 Synchronization signal error protection (Err80.7) 8-5
8.2.8 Synchronization cycle error protection (Err81.0)..... 8-7
8.2.9 Mailbox error protection (Err81.1) 8-7
8.2.10 PDO watchdog error protection (Err81.4) 8-8
8.2.11 DC error protection (Err81.5) 8-8
8.2.12 SM event mode error protection (Err81.6) 8-8
8.2.13 SyncManager2/3 error protection (Err81.7) 8-9
8.2.14 TxPDO assignment error protection (Err85.0) 8-10
8.2.15 RxPDO assignment error protection (Err85.1)..... 8-10
8.2.16 Lost link detection error protection (Err85.2)..... 8-11
8.2.17 SII EEPROM error protection (Err85.3) 8-12
8.2.18 Main power undervoltage protection (AC insulation detection 2) (Err88.0) 8-12
8.2.19 Control mode setting error protection (Err88.1) 8-13
8.2.20 ESM requirements during operation error protection (Err88.2) 8-13

8.2.21 Improper operation error protection (Err88.3) 8-14
8.3 Reading error (Alarm) 8-15
8.4 Clear error (alarm)/Clear warning 8-16
8.5 Other, error (alarm) / warning ralated function 8-18

9. Object Dictionary List 9-1

9.1 Object dictionary list 9-2
9.1.1 CoE communication profile area (1000h to 1FFFh) 9-3
9.1.2 Common servo parameter area (2000h to 201Fh) 9-10
9.1.3 Common servo information monitor object area (2020h to 203Fh) 9-17
9.1.4 Power supply module information monitor object 9-19
9.1.5 A axis servo parameter area (2100h-01h to 211Fh-FFh) 9-20
9.1.6 A axis user-specific area: Command object (2120h to 217Fh) 9-42
9.1.7 A axis user-specific area: CoECommunicationCopy object(2280h to 22FFh) 9-44
9.1.8 A axis user-specific area: Monitor object (2300h to 23FFh) 9-45
9.1.9 B axis servo parameter area (2500h-01h to 251Fh-FFh) 9-48
9.1.10 B axis user-specific area: Command object (2520h to 257Fh) 9-70
9.1.11 B axis user-specific area: CoECommunicationCopy object (2680h to 26FFh) 9-72
9.1.12 B axis user-specific area: Monitor object (2700h to 27FFh) 9-73
9.1.13 A axis drive profile area (6000h to 67FFh) 9-76
9.1.14 B axis drive profile area (6800h to 6FFFh) 9-80

10. Glossary of Terms 10-1

10.1 Glossary of terms 10-2

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1

Introduction

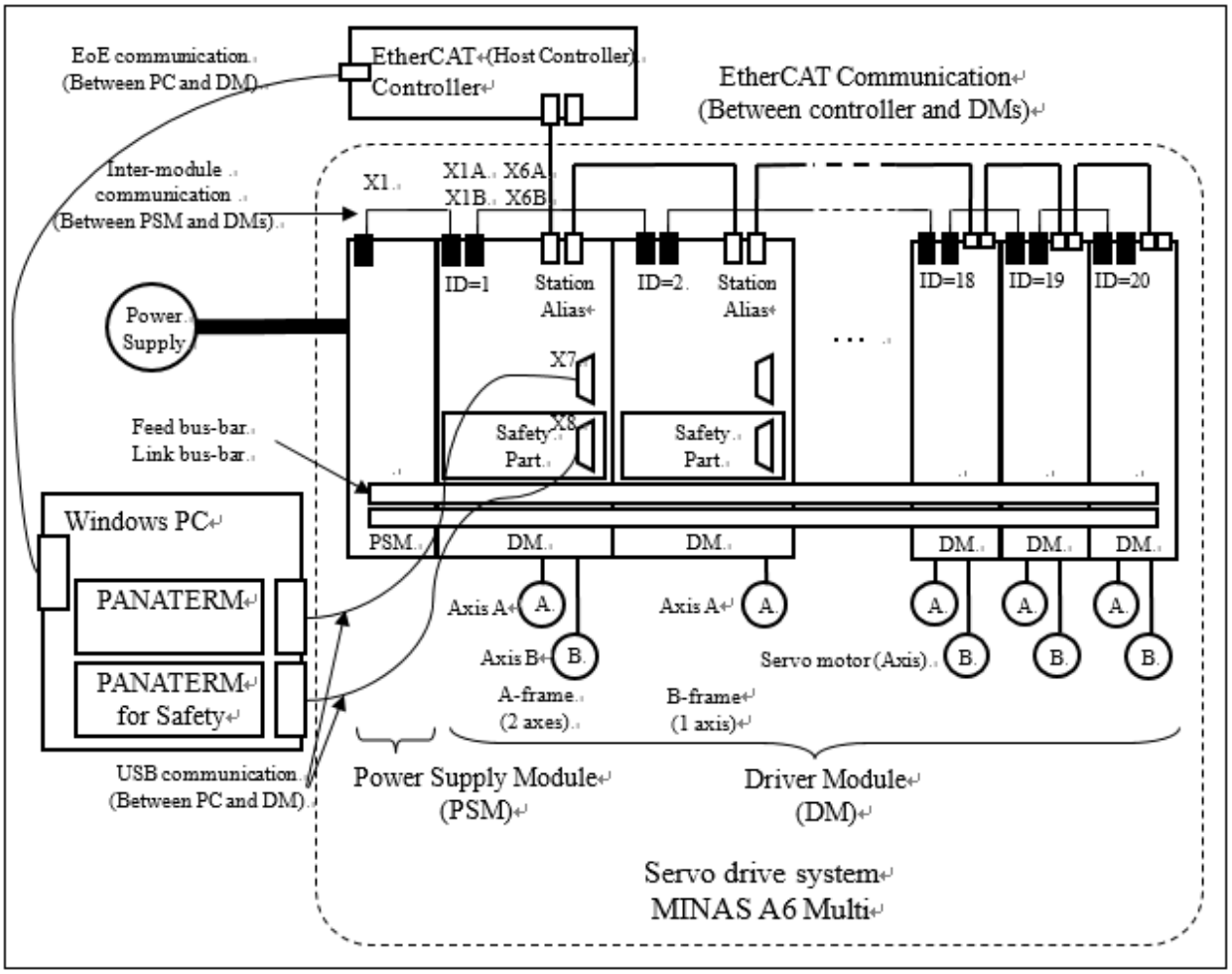
1.1 Introduction

This document is intended to describe the specification of the network interface EtherCAT to connect between the servo drive system MINAS A6 Multi series (slave) and host controller (master).

The MINAS A6 Multi series consists of one power supply module (PSM) and up to 20 driver modules (DM).

One driver module can control motors of 2 axes (Axis A, Axis B) or 1 axis (Axis A only).

The MINAS A6 Multi series configuration is shown below.



Functional correspondence table with MINAS-A6B series

In this software version, the functions of "✕" are not supported in the table below.
The description regarding these functions in the body text may be subject to change without prior notice at handling, hereafter.

✓:Usable ✕:Not usable

Function			Product	
			MINAS A6BF (Multi-function type)	MINAS A6 Multi
			Product number ending with:F CPU1:Ver1.05 CPU2:Ver1.05	<Power supply module> CPU:Ver1.02 <Drive module> CPU1:Ver1.02 CPU2:Ver1.02
Control mode				
	Position control	pp	✓	✓
		csp	✓	✓
		ip	✕	✕
		hm	✓	✓
	Velocity control	pv	✓	✓
		csv	✓	✓
	Torque control	tq	✓	✓
		cst	✓	✓
		cstca	✕	✕
	Full-closed control	-	✓	✓
		Rotary scale	✓	✕
Function				
	Two-degree-of-freedom control	Position	✓	✓
		Velocity	✓	✓
		Torque (Note 1)	✓	✓
		Full-closed	✓	✓
	Safety function (STO)		✓	✓
	Advanced safety function		✕	✓
	Pulse regeneration function		✓	✕
	Damping Control		✓	✓
	Model-type damping filter		✓	✕
	Feed forward function		✓	✓
	Load variation suppression function		✓	✓
	3rd gain switching function		✓	✓
	Friction torque compensation		✓	✓
	Hybrid vibration damping function		✓	✓
	Quadrant projection suppression function		✓	✓
	Torque limit switching function		✓	✓
	Motor working range setting function		✓	✓
	Torque saturation protection function		✓	✓
	Single-turn absolute function		✓	✓
	Infinitely rotation absolute function		✓	✓
	Retracting operation function		✓	✕
	Backlash compensation function		✓	✕

(Note 1) It is not supported in two-degree-of-freedom control (synchronization type).

(To be continued)

Function		MINAS A6BF (Multi-function type)	MINAS A6 Multi
	External scale position information monitor function under semi-closed control	✓	×
	Slow stop function	✓	✓
	Deterioration diagnosis warning function	✓	✓
	Position comparison output function	✓	✓
	SM2(synchronous with SM2 event)	✓	×
	Input shift time	✓	×
	FoE (File over EtherCAT)	×	×
	Jerk	×	×
	Complete Access of SDO message	×	×
	EoE(Ethernet over EtherCAT)	×	✓
	Battery refresh	✓	✓

About absolute encoder

There are two types of absolute encoders: a type that holds multi-turn data with a battery for absolute data (hereinafter referred to as an absolute encoder with a battery) and a type that does not require a battery to hold multi-turn data (hereinafter referred to as a battery-less absolute encoder).
The parts that are not specified are functions common to both absolute encoders.

Software version

This document is to apply to the servo drive system of the software versions below:

- Axis A: CPU1 (Version1): Ver.1.02, CPU2 (Version2): Ver.1.02
- Axis B: CPU1 (Version1): Ver.1.02, CPU2 (Version2): Ver.1.02
- Manufacture Software(Version3): Ver.1.00
- Safety version: CPU1 : Ver.1.00, CPU2 : Ver.1.00
- PSM CPU : Ver.1.02

- If there is no distinction among the software versions 1, 2, and 3 in this document, “software” indicates all of the three versions.
- Check the software versions 1 and 2 by 2107h-2Dh/2507h-2Dh (Refer to “5.2 Device information“) or setup support software PANATERM for Multi.
- Check the software version 3 by 100Ah (Refer to “5.2 Device information“).
- Check the safety versions by 202Ch-01h/202Ch-02h (Refer to “6.9.7 Servo information monitor object“) or setup support software PANATERM for Multi/PANATERM for Safety.
- In this software version, the following functions are not supported. The descriptions about these functions in the document may be changed without a preliminary announcement when they are supported.

Software version		Contents of change	Available PANATERM	
			for Multi	for Safety
DM CPU1(Version1)	Ver1.01	First edition	6.2.0.1 or later	1.7.1.8049 or later
DM CPU2(Version 2)	Ver1.01			
DM Manufacture Software (Version 3)	Ver1.00			
DM Safety CPU1	Ver1.00			
DM Safety CPU2	Ver1.00			
PSM CPU	Ver1.01			

(To be continued)

<table>
<tr><th colspan="2" rowspan="2">Software version</th><th rowspan="2">Contents of change</th><th colspan="2">Available PANATERM</th></tr>
<tr><th>for Multi</th><th>for Safety</th></tr>
<tr><td>CPU1(Version1)</td><td>Ver1.02</td><td rowspan="8">Function extended edition 1
<table><tr><th>Additional capability</th><th>Reference</th></tr><tr><td>1) PSM main power supply overload warning / alarm</td><td>Functional Specification
7.3, 11.1, 11.4.1, 11.5, 11.6
This document
6.9.7</td></tr><tr><td>2) PSM rated output power overload warning</td><td>Functional Specification
7.3, 11.5.3
This document
6.9.7, 6.9.8, 9</td></tr><tr><td>3) PSM alarm mask</td><td>Functional Specification
7.3, 11.5.3, 11.6</td></tr><tr><td>4) PSM alarm history expantion</td><td>-</td></tr></table></td><td rowspan="8">6.2.1.1
or later</td><td rowspan="8">1.7.1.8049
or later</td></tr>
<tr><td>CPU2(Version 2)</td><td>Ver1.02</td></tr>
<tr><td>Manufacture Software (Version 3)</td><td>Ver1.00</td></tr>
<tr><td>Safety CPU1</td><td>Ver1.00</td></tr>
<tr><td>Safety CPU2</td><td>Ver1.00</td></tr>
<tr><td rowspan="2">PSM CPU</td><td rowspan="2">Ver1.02</td></tr>
</table>

Target user

This document is intended for those who design host controller for the servo drive system MINAS A6 Multi series.

Related document

- These reference specifications describe hardware specifications, Safety Precautions,Warranty etc. Please be sure to read carefully, after understanding the contents, refer to this specification.

SX-DSV03452	REFERENCE SPECIFICATIONS Power supply module section
SX-DSV03454	REFERENCE SPECIFICATIONS Drive module section

- These manual describe the details of the advanced safety function and how to use the safety function setting software PANATERM for Safety. For the setup support software PANATERM for Multi, refer to the operation manual installed with the software.

SX-DSV03455	TECHNICAL REFERENCE Functional Specification
SX-DSV03508	PANATERM for Safety Programming Manual
SX-DSV03514	Safety Installation Manual

CAUTION

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- Industrial Device Solution Business Unit, Panasonic Corp. reserves the right to make modifications and improvements to its products and/or documentation, including specifications and software, without prior notice.
- See the REFERENCE SPECIFICATIONS Power supply module section (SX-DSV03452) and REFERENCE SPECIFICATIONS Drive module section (SX-DSV03454) for the shipment setting value of the series.
- Driver module of MINAS A6 Multi (A-frame) can control motors of up to two axes with one driver module, and has two encoder connectors, two external scale connectors, and two motor connectors. Using the product with an incorrect connection of the encoder cable, external scale cable, or motor cable may result in malfunction or failure in the driver module or servo motor. Be sure to check that the connections of the encoder, external scale and servo motor are correct before turning on the power supply.
- The MINAS A6 Multi series may not be fully compatible with the MINAS-A6B series.
- The object configuration is different from that of the MINAS-A6B series. Basically, only the target objects of Axis A are described in the text. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

  Refer to
  For details, refer to “4.1 Object configuration.”
- Considering the case where the servo drive system could not normally receive the EtherCAT frame from the master due to noise etc., check on the master side whether the servo drive system received normally, and if reception fails, resend the EtherCAT frame.

1.2 Start-up guide

A schematic procedure until it can operate with a motor simple substance by pp control is described.

*Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

◆ NOTE

- **This section is only for reference and does not guarantee the operation. Some descriptions including those for the homing operation are omitted. For details, refer to this document and the specifications issued by ETG.**

1.2.1 Preparation and connection (Mainly refer to Chapter 2 and Chapter 3)

- Connect a master with a slave , and a motor with a slave.
- In EtherCAT communication, the ESI file (xml file) which indicated EtherCAT slave information is needed. Please save the ESI file offered from our company at the preservation place of the ESI file specified by the master.

  There are the following two types of ESI file provided by our company.
  - ESI file without OD: ESI file containing only minimal information (Small file size)
  - ESI file with OD: ESI file containing information of the object dictionary (Large file size)

  For other details, please contact us
- A master generates ENI based on ESI offered from our company (using a configuration tool), and builds an EtherCAT network using ENI.(Refer to the operation manual of a master for details.)
- Station alias is set up.

  As for the value of Configured Station Alias(0004h) of SII, 0 is set up at the time of shipment. When it set up Station Alias by front RSW, once switch on a control power supply, write 2007h-2Ah=0 in EEPROM, and set up Station Alias by RSW after turning off a control power supply. (The range of Station Alias which can be set up only by RSW is 0-255. When it set up 256 or more, refer to “3.8.2 Node addressing (Setting station alias)“.)

  Alternatively, setting through AL Status Code (Explicit Device ID) is available. For details, refer to “3.8.2 Node addressing (Setting station alias)“. The master reads the set values of the Configured Station Alias (0012h) of the ESC register and sets them to the Configured Station Address (0010h).

  Thereby addresses such as FPRD commands used in the mailbox are set.
- Switch on a power supply. Switch on both the main power and the control power. Check 7 segment LED in the front after power activation, and check that the error has not occurred.

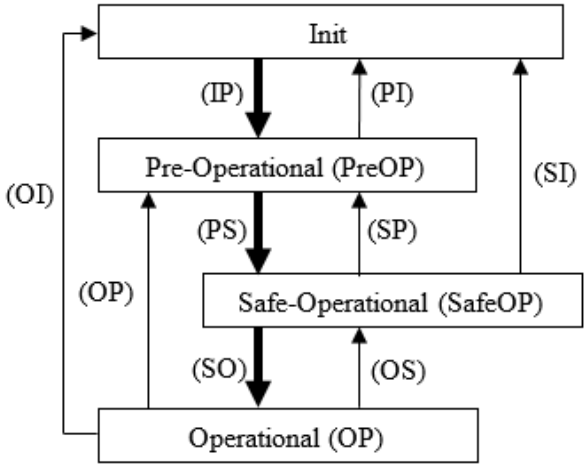
1.2.2 Communication establishment (Mainly refer to Chapter 3 and Chapter 5)

- According to an ENI file, a master performs communicative initialization and construction. It is necessary to set up as follows in DC mode as an example of a setup. (When setting is DC mode, the cycles of 2ms and time until it latches data is 0us.)

  1C32h-01h=2(DC), 1C32h-02h=2000000(ns)
  1C33h-01h=2(DC), 1C33h-03h=0(ns)

- The clearance of ESC each register, The check of VendorID/ ProductCode etc., A setup of Station Alias, An ESC register is set up (SyncManager/FMMU for MailBOX) and an ESM state is made to change from Init to PreOP.
  - After checking that the ESM state has changed to PreOP, a setup (DC, SyncManager/FMMU for PDO) of an ESC register is carried out, and an ESM state is made to change from PreOP to SafeOP.
  - After checking that the ESM state has changed to SafeOP, an ESM state is made to change from SafeOP to OP.

■ **The change state of the EtherCAT application layer**



1.2.3 Object settings (Mainly refer to Chapter 6)

The example of a setting for carrying out absolute position arrangement operation as shown in the following figure by pp control is described.

In order to operate a motor by pp, operation mode (6060h: Modes of operation (Axis A)) is changed.

Set up 6060h = 1(pp).

A target position (607Ah: Target Position (Axis A)) is changed.

Set up 607Ah = 50000000(command).

If the setting of 607Dh (Software position limit (Axis A)) is enabled, the operation range is limited.

A target speed (6081h: Profile velocity (Axis A)) is changed.

Set up 6081h = 2000000(command/s).

Speed is limited by the set value of 607Fh (Max profile velocity (Axis A)) and 6080h (Max motor speed (Axis A)).

An acceleration (6083h: Profile acceleration (Axis A)) is changed.

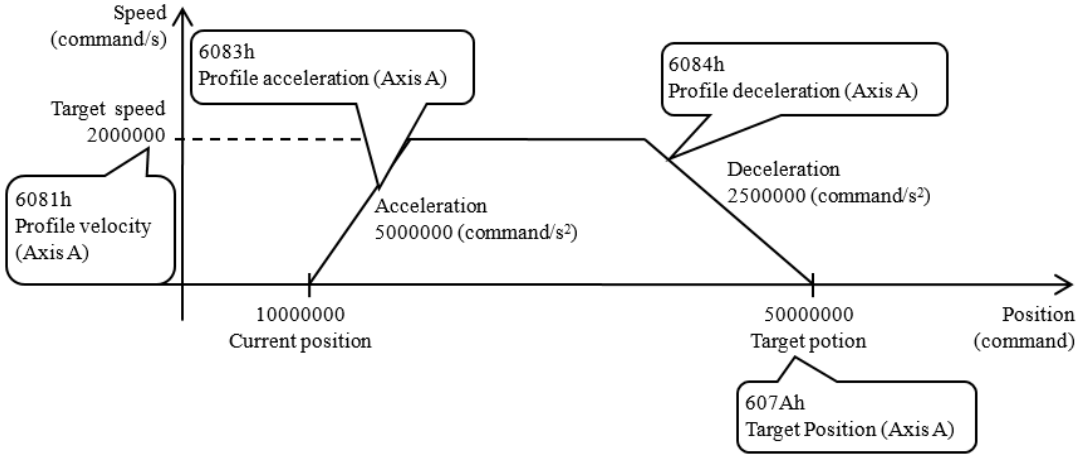
Set up 6083h = 5000000(command/s^2).

Speed is limited by the set value of 60C5h (Max acceleration (Axis A)).

A deceleration (6084h: Profile deceleration (Axis A)) is changed.

Set up 6084h = 2500000(command/s^2).

Speed is limited by the set value of 60C6h (Max deceleration (Axis A)).



Refer to

For details, refer to “6.6.1.3 Related objects common in position control (Command & setup)”.

1.2.4 Motor operation (Mainly refer to Chapter 6)

There is a PDS (Power Drive Systems) state in EtherCAT communication, the state of the motor is expressed.

This PDS can be changed by the object 6040h (Controlword (Axis A)), and reference of a state can be performed at 6041h (Statusword (Axis A)). Be sure to transmit the changes instructions to the following state, after checking that the state had changed at 6041h (Statusword (Axis A)).

A PDS state is changed from "Switch on disabled" to "Ready to switch on".

Set up 040h=0006h (2: Shutdown), check that 6041h changes from xx40h to xx21h. (Note 1)

A PDS state is changed from "Ready to switch on" to "Switched on".

Set up 040h=0007h (3: Switch on), check that 6041h changes from xx21h to xx33h. (Note 1)

A PDS state is changed from "Switched on" to "Operation enabled".

Set up 040h=000Fh (4: Enable operation), check that 6041h changes from xx33h to xx37h.

It will be in servo ON state by becoming 6041h=xx37h.

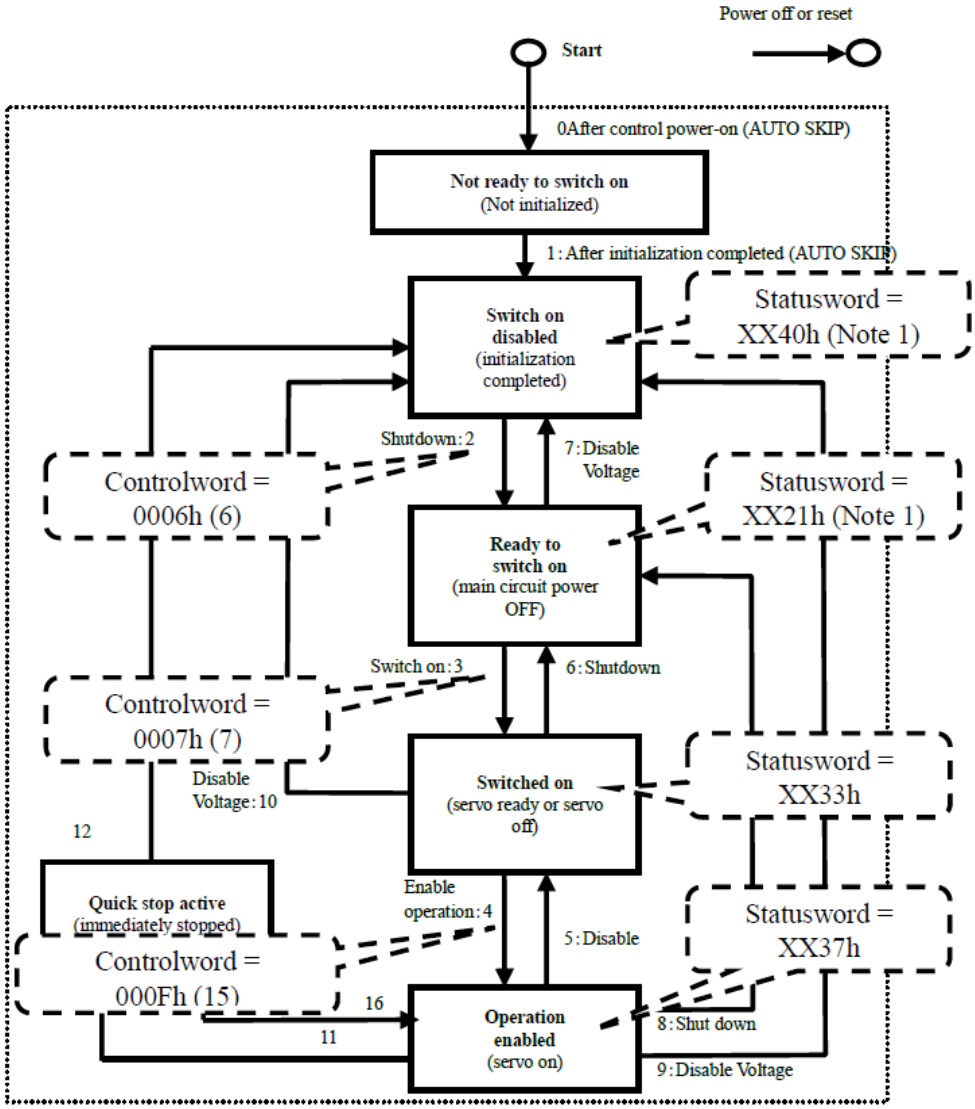
In order to start pp operation, bit4(new set point) of 6040h is changed from 0 to 1.

bit5(change set immediately), bit6(absolute/relative) and bit9(change on set-point) remains at 0.

Set up 6040h=001Fh. Motor starts to operate.

A PDS state is changed from "Operation enabled" to "Switched on", servo-off is carried out.

Set up 6040h=0007h (5: Disable operation), check that 6041h changes from xx37h to xx33h.



(Note 1) The value of 6041h is shown when the main circuit power voltage is not applied to PDS.
If the main circuit power voltage is applied to the PDS, bit 4 (voltage enabled) of 6041h will be 1.

1.2.5 When the motor does not operate

- When servo-on is not performed, before the PDS state inside driver module changes, there is a possibility of having transmitted the changes commands to the following state. Transmit the changes commands to the following state after checking that the PDS change state has been completed.
- Although servo-on is carried out, when the motor does not operate, there may be inaccurate setting object.

  Check the settings of the object. In particular, make sure that the motor operation is not limited by objects that set a maximum value, such as 6080h (Max motor speed (Axis A)), or objects that set an operation range, such as 607Dh (Software position limit (Axis A)). If bit 11 (internal limit active) of 6041h (Statusword (Axis A)) is 1, internal limitation is imposed. Refer to “6.4 Statusword (6041h)” to eliminate the cause of the internal limitation.
- When alarm is occurred, remove the factor of alarm after referring to “8 EtherCAT Relevant Protection Functions” of this document or “Chapter 7 Protective function/Alarm function” in technical reference functional specification (SX-DSV03455).

  After factor of alarm is removed, perform alarm clear after referring to “8.4 Clear error (alarm)/Clear warning” of this document.

1.2.6 About PANATERM for Multi

We will prepare a setup support software "PANATERM for Multi" in MINAS-A6 Multi EtherCAT series.

The following thing is function in PANATERM for Multi.

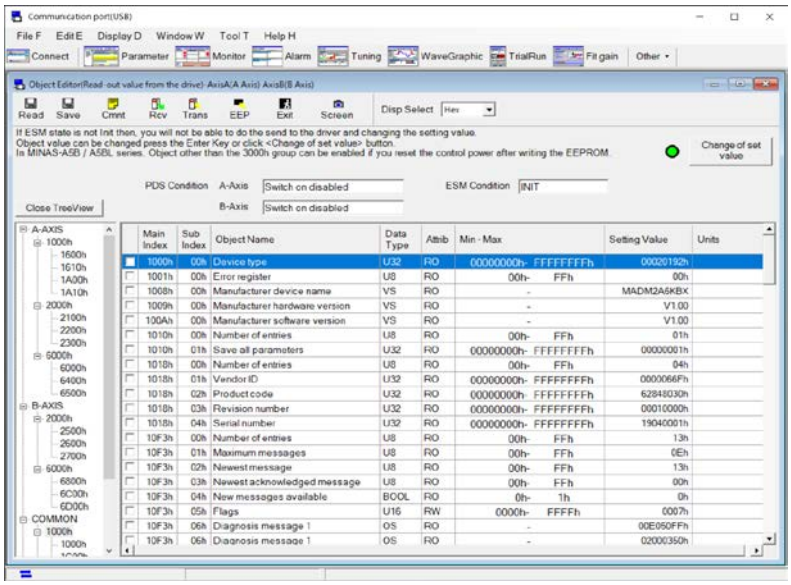
- Reading and writing of servo parameters.
- Reading and writing of objects.
- The status monitor of internal driver and input/output terminals.
- Display alarm detailed information, alarm history display, alarm clearance.
- Graphical display of a motor operation waveform
- A test run, frequency characteristic measurement, etc.

Refer to

Refer to the operation manual of PANATERM for Multi for details.

Reading and writing of objects

- If writing (editing) an object using the object editor, it is necessary to connect with USB or EoE and set the ESM status to Init.
- As for MINAS A6 Multi series, the edit is immediately reflected on the actual object. (See specifications of each object for reflection timing of the actual operation). Note that operation is different.
- In all objects where EEPROM is No, the Attribute becomes RO attribute in the object editor, and it becomes for read only.



A test run, frequency characteristic measurement

As for the MINAS A6 Multi series, PANATERM for Multi operation is available even if the ESM state is set to other than Init (while establishing communication) by setting 2007h-75h bit0=1.

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEP ROM
2007h	75h	Communication function shared setup 1	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes

Bit no.	Description
0	Operation command through PANATERM for Multi when EtherCAT communication is established. (test run function, FFT, fit gain function, Z phase search function and pin assignment setting) Execution enabled. 0: Disabled 1: Enabled

◆ NOTE

- **However, be careful for the following position when operating PANATERM for Multi while establishing communications.**
  - **In case of servo-on with test run, etc. from PANATERM for Multi, the PDS state does not change to "Operation enabled". (quick stop etc. do not work.)**
  - **Warning D2 "PANATERM for Multi command execution warning" occurs to inform the servo-on state by the operation command of PANATERM for Multi to the host controller.**
  - **Err27.6 (operation command conflict protection) occurs when the host controller sends the servo-on command during motor operation with test run, etc. from PANATERM for Multi. And, if the ESM state is changed while the motor is operating, Err88.2 (ESM requirements during operation error protection) occurs.**
  - **If motor is operated from the PANATERM for Multi while using in the increment mode, returning to the origin state will be incomplete. (6041h (Statusword (Axis A)) bit12 of 6060h (Controlword (Axis A))=6(when setting hm) becomes 0.)**
  - **6072h (Max torque (Axis A)) is disabled when the ESM state is Init. It is enabled when ESM state is PreOP or more.**
  - **Err38.1(Over-travel inhibit input protection 2) is not occurred regardless of POT/NOT status when EtherCAT communication is established, even if operation command by PANATERM for Multi is used.**

1.2.7 About PANATERM for safety

In order to use the advanced safety function, it is necessary to create a safety monitoring program using the safety setup support software (PANATERM for Safety) and write it to the driver module.

Refer to

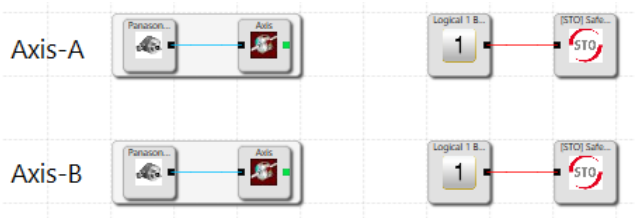
For details on how to create a safety monitoring program, refer to the Technical document (PANATERM for Safety Programming Manual).

- A license key (Option part number : DV0PM24621) is required to use PANATERM for Safety.

  Refer to

  For details, refer to the technical document (PANATERM for Safety Programming Manual).
- In the safety monitoring program executed by the driver module, the thresholds(tolerance) for position monitoring and speed monitoring vary depending on the inertia ratio, filter setting, gain setting, and operating speed, so make appropriate settings according to your operating conditions.
- Write the safety monitoring program to the driver module with the servo off state.
- Check the specifications for the external scale, and set the voltage setting for the external scale connected to the driver module to an appropriate value. If the setting is incorrect, the external scale may be damaged.
- The safety monitoring program at the time of shipment is valid only for the amplifier and STO function. It is possible to drive the motor, but please use it after rewriting the safety monitoring program according to your equipment configuration.

■ **Shipment safety monitoring program**



1.2.8 About EoE

In addition to the conventional USB connection, connection via EoE (Ethernet over EtherCAT) is possible. As a result, there is no need to change the cable as in the case of USB connection, and parameters can be adjusted via EtherCAT communication.

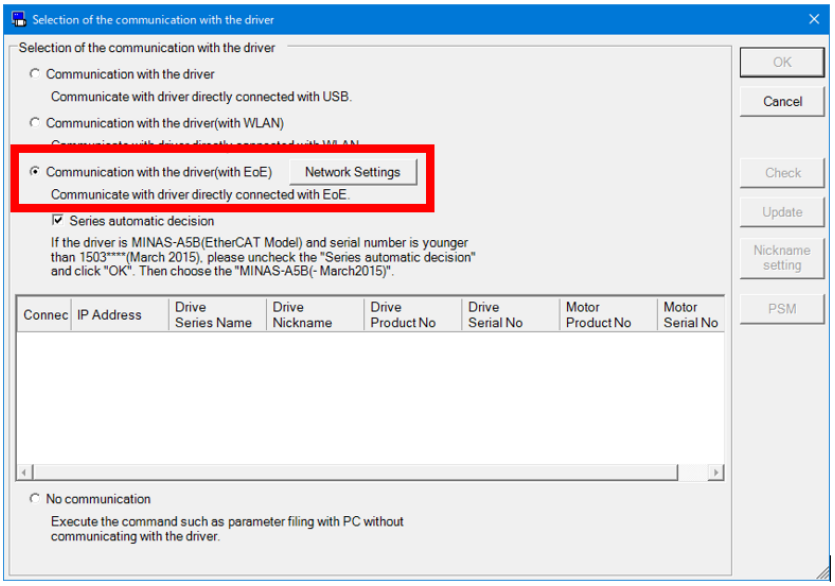
Refer to

For details, refer to “3.9 Ethernet over EtherCAT(EoE) function”.

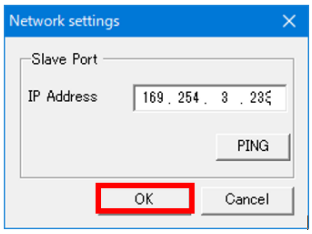
■ EoE connection with PANATERM for Multi

◆ PROCEDURE

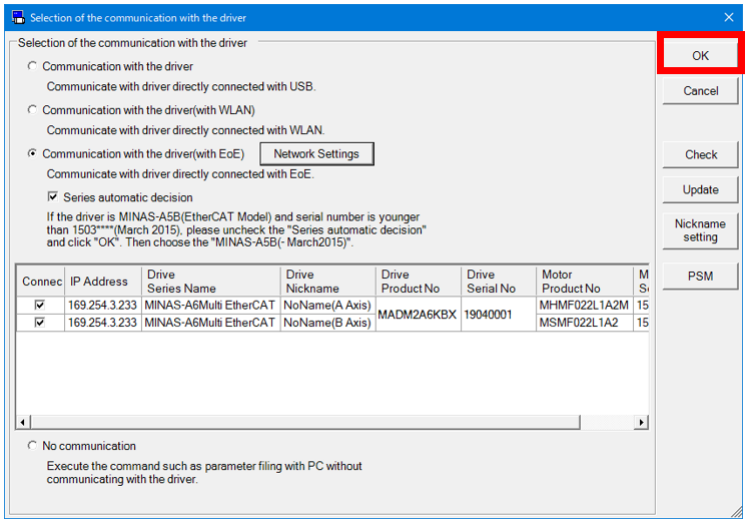
1. **Select the “Communication with the driver(with EoE)” and click the network setting button.**



2. **In the network settings, enter the IP address and click OK.**



3. **Once the driver is found, click the OK button to complete the connection.**

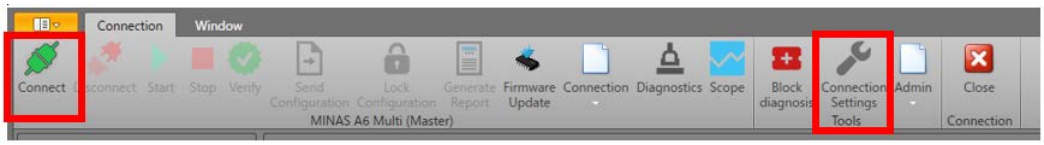


■ **EoE connection with PANATERM for Safety**

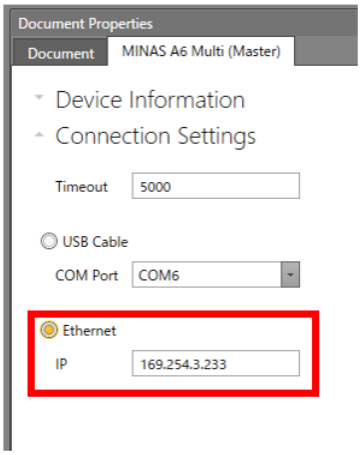
◆ PROCEDURE

1. **Click the Device Interface button.**

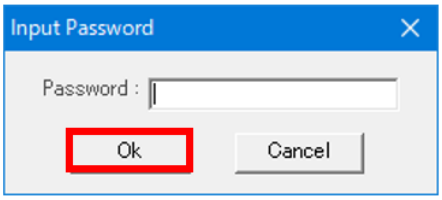
2. **Click the Connection Settings button and select the connection method.**



3. **Select Ethernet and specify the IP address.**



4. **When you click the Connect button, you will be prompted for a password. Enter the safety serial number (safety ID) of the target driver module and click the OK button.**



◆ NOTE

Notes on EoE connection

- **To use an EoE connection, the EtherCAT EoE protocol must be established in advance.**
- **When connecting multiple driver modules, make sure that the IP address and safety serial number (safety ID) are not duplicated.**

1.3 Main differences from the MINAS-A6B series

There are mainly the following differences in specifications when comparing the MINAS A6 Multi series with the MINAS-A6B series. Please inquire about specification differences other than the below.

■ **SX-DSV03456 : Technical document (EtherCAT Communication Specifications)**

chapter	function	Contents	A6BF (Multi-function type) specification CPU1：Ver1.05, CPU2：Ver1.05	A6 Multi Axis A CPU1: Ver1.02, CPU2: Ver1.02 Axis B CPU1: Ver1.02, CPU2: Ver1.02 Safety version: CPU1:Ver.1.00, CPU2:Ver.1.00
1.1	About PANATERM for Multi	PANATERM for Multi object editor	Supported by the single axis pecification	Supported by the 2-axis specification
		Operation command through PANATERM for Multi (USB connection, EoE conenction) when EtherCAT communication is established.	Supported Switching with 3799h:bit0 0: Disabled, 1: Enabled	Supported. 2007h-75h: Switching at bit0 0: Disabled, 1: Enabled
		Safety tools PANATERM for Safety	Not supported	Supported
3.3	ESC address space	PDI Control(0140h)	0x05: SPI Slave *Use SPI communication for PDI	0x08:16 Bit asynchronous Microcontroller interface *Use Parallel bus communication for PDI
3.5	Synchronous Communication Mode	SM2 (Synchronous with SM2 event)	Supported	Not supported
3.5.3	Free RUN (asynchronous)	PDO communication cycle in Free RUN mode	Shortest 250 µs	Shortest 1 ms
3.6.1	Message at abnormality occurrence	Error Field of emergency message	Supported by the single axis specification No discrimination of the alarm occurrence axis in Byte7	Supported by the 2-axis specification Byte 7: Discrimination of the alarm occurrence axis by error code type 00h: Common alarm 01h: Axis A alarm 02h: Axis B alarm
3.7.1 5.4	PDO Mapping object	Mapping object	Supported by the single axis specification For RxPDO: 1600h to 1603h For TxPDO: 1A00h to 1A03h	Supported by the 2-axis specification For RxPDO: 1600h to 1603h (for Axis A), 1610h to 1613h (for Axis B) For TxPDO: 1A00h to 1A03h (for Axis A), 1A10h to 1A13h (for Axis B)
		Maximum PDO data length	RxPDO: 32 [byte] TxPDO: 32 [byte]	RxPDO: Single axis 32 [byte], Total for both axes 64 [byte] TxPDO: Single axis 32 [byte], Total for both axes 64 [byte] *There are restrictions due to the combination of operation mode, electronic gear ratio, and communication cycle. ▼ Refer to (For details, refer to section 3.7.1.)
3.8.2	Node addressing (Setting Station alias)	Station alias related object	3740h (Station alias setup(high)) 3741h (Station alias selection)	2007h-29h (Station alias setup(high)) 2007h-2Ah (Station alias selection)
3.9	Ethernet over EtherCAT (EoE) function	Connect to PANATERM for Multi and PANATERM for Safety via EoE communication	Not supported	Supported

(to be continued)

chapter	function	Contents	A6BF (Multi-function type) specification CPU1：Ver1.05, CPU2：Ver1.05	A6 Multi Axis A CPU1: Ver1.02, CPU2: Ver1.02 Axis B CPU1: Ver1.02, CPU2: Ver1.02 Safety version: CPU1:Ver.1.00, CPU2:Ver.1.00
4.1	Object configuration	Object dictionary configuration	0000h to 0FFFh: Data type area 1000h to 1FFFh: CoE communication area 2000h to 2FFFh: Reserved 3000h to 3FFFh: Servo parameter area 4000h to 4FFFh: User-specific area 5000h to 5FFFh: Reserved 6000h to 6FFFh: Drive profile area 7000h to 9FFFh: Reserved A000h to FFFFh: Reserved	0000h to 0FFFh: Data type area 1000h to 1FFFh: CoE communication area (common to Axis A/B) 2000h to 20FFh: Common object area 2100h to 211Fh: Axis A servo parameter area 2120h to 217Fh: User-specific area 2180h to 227Fh: Reserved 2280h to 23FFh: User-specific area 2400h to 24FFh: Reserved 2500h to 251Fh: Axis B servo parameter area 2520h to 27FFh: User-specific area 2800h to 2FFFh: Reserved 3000h to 3FFFh: Reserved 4000h to 4FFFh: Reserved 5000h to 5FFFh: Reserved 6000h to 6FFFh: Drive profile area 7000h to 9FFFh: Reserved A000h to FFFFh: Reserved
5.2	Device Information	1018h-02h (Product code)	The value given by us. Refer to See the reference specifications “SX-DSV03190”	The value given by us. Refer to See the reference specifications “SX-DSV03454”
5.5	Sync manager 2/3 synchronization (1C32h、1C33h)	1C32h-06h (Calc and copy time)	Setting value 25000	Set value 30000
		1C33h-06h (Calc and copy time)	Setting value 45000	Set value 40000
		Input shift time 1C33h-03h (Shift time)	Supported	Not supported
6.9.4	Position Information	Effective range of electronic gear ratio	8000 times to 1/1000 times (Communication cycle 125µs is supported only 1:1 of the electronic gear ratio.)	8000 times to 1/1000 times *There are restrictions due to the combination of operation mode, electronic gear ratio, and communication cycle. Refer to (For details, refer to section 3.7.1.)
		Full-closed control function (rotary scale)	Supported	Not suppported
		Backlash compensation function	Supported	Not suppported

(to be continued)

chapter	function	Contents	A6BF (Multi-function type) specification CPU1：Ver1.05, CPU2：Ver1.05	A6 Multi Axis A CPU1: Ver1.02, CPU2: Ver1.02 Axis B CPU1: Ver1.02, CPU2: Ver1.02 Safety version: CPU1:Ver.1.00, CPU2:Ver.1.00
6.9.7	Servo information monitor object	2334h (Warning flags (Axis A)) bit5 : PSM ver-regeneration bit6 : DM Fan lock bit16 : PSM Fan lock bit26 : PSM main power supply overload (Note 1) bit27 : PSM rated output power overload (Note 1)	Not supported	Supported
		202Bh (EoE information display)	Not supported	Supported
		202Ch (Safety part information 1)	Not supported	Supported
		202Dh (Safety part information 2)	Not supported	Supported
		202Eh (Safety part information 2)	Not supported	Supported
6.9.8	Power supply module information monitor object	20C0h(Rated output power information)	Not supported	Supported (Note 1)
7	Servo parameter area	Allocation to servo parameter area	3000h to 3FFFh	2000h to 201Fh, 2100h to 211Fh, 2500h to 251Fh
8.2	EtherCAT-related details of error(alarm)	Improper operation error protection (Err88.3) Detection factor	There is no cause of error detection by the combination of electronic gear ratio, communication cycle, and PDO size.	There is a cause of error detection by the combination of electronic gear ratio, communication cycle, and PDO size.
9	Object Dictionary List	Axis limit object 2000h-15h (Axis limit setting)	Not supported	Supported
		Analog monitor related object	Supported 3416h (Type of analog monitor 1) 3417h (Analog monitor 1 output gain) 3418h (Type of analog monitor 2) 3419h (Analog monitor 2 output gain) 3421h (Analog monitor output setup)	Not supported
		Regenerative function object	Supported 3016h(External regenerative resistor setup) 3017h(Selection of load factor for external regenerative resistor)	Object not supported Move to Power Supply Module PSM Pr.00(External regenerative resistor setup) PSM Pr.01(Selection of load factor for external regenerative resistor)
		Main power off detection time object	Supported 3509h(Detection time of main power off) 3714h(Main power off warning detection time)	Object not supported Move to Power Supply Module PSM Pr.02(Detection time of main power off) PSM Pr.03(Main power off warning detection time)
		Function extended shared setup object	Not supported	Supported 2005h-59h(Function extended shared setup 1) 2005h-5Ah(Function extended shared setup 2) 2005h-5Bh(Function extended shared setup 3)

(Note 1) Supported in a software version of function expansion edition 1 or later.

(to be continued)

chapter	function	Contents	A6BF (Multi-function type) specification CPU1：Ver1.05, CPU2：Ver1.05	A6 Multi Axis A CPU1: Ver1.02, CPU2: Ver1.02 Axis B CPU1: Ver1.02, CPU2: Ver1.02 Safety version: CPU1:Ver.1.00, CPU2:Ver.1.00
9	Object Dictionary List	Communication function shared setup object	Not supported	Supported 2007h-75h (Commnunication function shared setup 1) 2007h-76h (Commnunication function shared setup 2) 2007h-77h(Commnunication function shared setup 3)
		Common servo parameter area	The following objects are defined in the servo parameter area. 3400h (SI1 input selection) 3401h (SI2 input selection) 3402h (SI3 input selection) 3403h (SI4 input selection) 3404h (SI5 input selection) 3405h (SI6 input selection) 3406h (SI7 input selection) 3407h (SI8 input selection) 3410h (SO1 output selection) 3411h (SO2 output selection) 3515h (Control input signal reading setup) 3618h (Power-up wait time) 3627h (Warning latch state setup) 3700h (Display on LED) 3701h (Display time setup upon power-up) 3740h (Station alias setup(high)) 3741h (Station alias selection) 3742h (Maximum continuation communication error) 3743h (Lost link detection time)	The following objects are defined in the common servo parameter area. 2004h-01h (SI1 input selection) 2004h-02h (SI2 input selection) 2004h-03h (SI3 input selection) 2004h-04h (SI4 input selection) 2004h-05h (SI5 input selection) 2004h-06h (SI6 input selection) 2004h-07h (SI7 input selection) 2004h-08h (SI8 input selection) 2004h-0Bh (SO1 output selection) 2004h-0Ch (SO2 output selection) 2005h-10h (Control input signal reading setup) 2006h-13h (Power-up wait time) 2006h-1Ch (Warning latch state setup) 2007h-01h (Display on LED) 2007h-02h (Display time setup upon power-up) 2007h-29h (Station Alias setup(high)) 2007h-2Ah (Station Alias selection) 2007h-2Bh (Maximum continuation communication error) 2007h-2Ch (Lost link detection time)
		Common servo information monitor object area	The following objects are defined in the servo information monitor object area. 4F25h(Physical input signal) 4F26h(Physical output signal) 4F62h(Temperature of amplifier) 4F66h(Fan operating time) 4F67h(Fan life expectancy) 4F68h(Capacitor life expectancy) 4F78h(Synchronization signal error count) 4D15h(Drive serial number) 4F61h(Power on cumulative time)	The following objects are defined in the servo information monitor object area. 2021h-00h(Physical input signal) 2022h-00h(Physical output signal) 2023h-00h(Temperature of amplifier) 2024h-00h(Fan operating time) 2025h-00h(Fan life expectancy) 2026h-00h(Capacitor life expectancy) 2028h-00h(Synchronization signal error count) 2029h-00h(Drive serial number) 202Ah-00h(Power on cumulative time)
		Power supply module information monitor object	Not supported	Supported 20C0h (Rated output power information) (Note 1) 20C0h-00h(Number of entries) (Note 1) 20C0h-01h(Power Supply Module rated output power) (Note 1) 20C0h-02h(Drive Module total rated output power) (Note 1)

(Note 1) Supported in a software version of function expansion edition 1 or later.

■ SX-DSV03455：Technical Reference (Functional Specification)

Refer to "EtherCAT Communication specification (SX-DSV03455) in the Technical Reference".

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2

System Overview

2.1 EtherCAT overview

EtherCAT is an abbreviation of Ethernet for Control Automation Technology. It is an open network communication between master and slaves using real time Ethernet developed by Beckhoff Automation GmbH and is administered by ETG (EtherCAT Technology Group).

This product has passed the EtherCAT Conformance Test.

See the Reference Specification “SX-DSV03452” and “SX-DSV03454” for product number of the servo drive system that passed EtherCAT Conformance Test.

EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

2.2 Reference materials

This document is created with reference to the following article.

◆ NOTE

- **About the difference of the written contents of this document and the following reference data, the written contents of this document become effective. It does not guarantee all the description of the reference materials that are not described in this document.**

Number	Document	Type	State	Version	Date
ETG.1000.2	EtherCAT Specification - Part2 • Physical Layer service and protocol specification	S	R	V1.0.4	2017.09.15
ETG.1000.3	EtherCAT Specification - Part3 • Data Link Layer service definition	S	R	V1.0.4	2017.09.15
ETG.1000.4	EtherCAT Specification - Part4 • Data Link Layer protocols specification	S	R	V1.0.4	2017.09.15
ETG.1000.5	EtherCAT Specification - Part5 • Application Layer service definition	S	R	V1.0.4	2017.09.15
ETG.1000.6	EtherCAT Specification - Part6 • Application Layer protocol specification	S	R	V1.0.4	2017.09.15
ETG.1020	Protocol Enhancements	S	R	V1.2.0	2015.12.01
ETG.1300	Indicator and Labeling	S	R	V1.1.1	2015.07.03
ETG.2000	Slave Information	S	R	V1.0.10	2018.02.01
ETG.6010	Implementation Directive for CiA402 Drive Profile	D	R	V1.1.0	2014.11.19

Number	Document	Type	State	Version	Date
IEC61800-7-200 (201)	Adjustable speed electrical power drives systems • Profile type 1 specification	-	-	Ed.1.0	2007.8.10
IEC61800-7-300 (301)	Adjustable speed electrical power drives systems • Mapping of profile type 1 to network technologies	-	-	Ed.1.0	2007.8.10

Number	Document	Type	State	Version	Date
ET1810/ET1811 /ET1812	EtherCAT Slave Controller IP core for Altera FPGAs Release 2.4.4	-	-	V1.0	2015.1.20

2.3 System configuration (Master & slave configuration)

The connection type of EtherCAT is a network system that connects master (FA controller) and multiple slaves with a line.

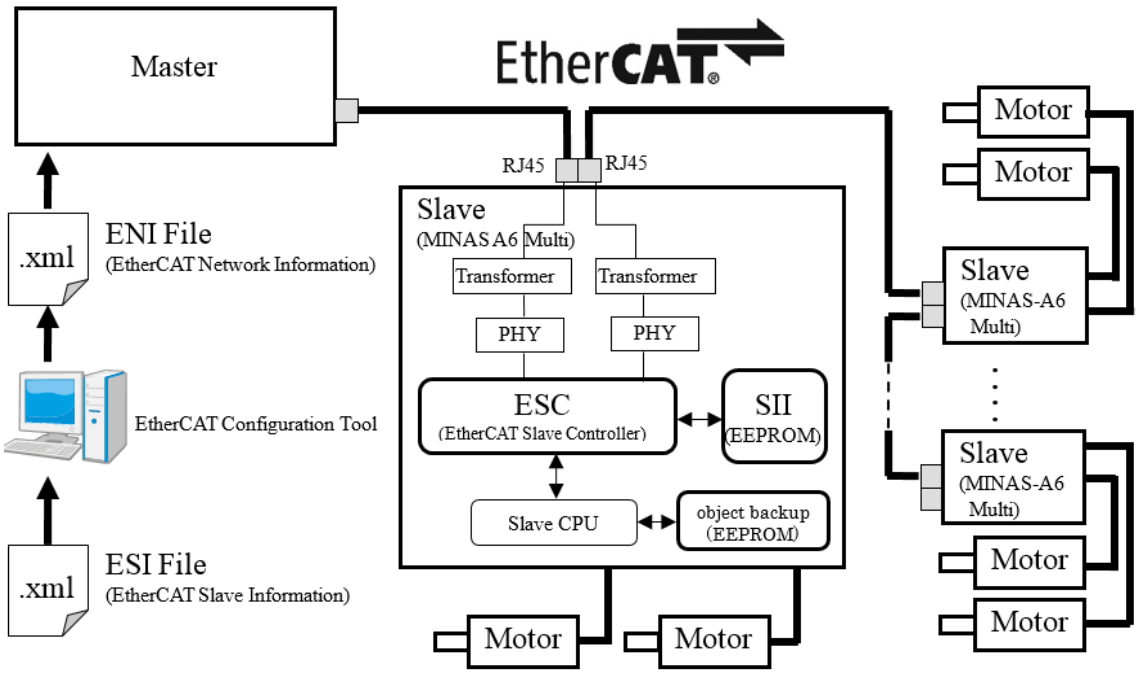
Note

For other than line connection, send an inquiry to us separately.

The number of connectable nodes of slaves depends on the master processing, communication cycle, number of bytes transferred, and so on.

Also check the specification of a master together.

A master generates EtherCAT Network Information (ENI) (using a configuration tool) based on EtherCAT Slave Information (ESI) offered from our company, and builds an EtherCAT network using ENI.



■ EtherCAT Slave Information (ESI)

It is a file of the XML form offered from our company.

The definition of slave peculiar information (Vendor information, product information, a profile, an object, process data, the existence of a synchronization, a SyncManager setup, etc.) is indicated.

■ EtherCAT Network Information (ENI)

This is a file created by a master.

Information which identifies a slave (Vendor information etc.) and information for initializing each slave is contained in ENI and a master performs network initialization and construction based on information indicated to ENI.

■ Slave Information Interface (SII)

EEPROM which saved SII data is connected to ESC. The information on Initialization information of ESC, Spec value of communication settings of the slave application (Data value size of the mailbox), Mapping of process data, etc. is set up into this EEPROM (SII).

◆ NOTE

- **The length of the cable between nodes should be up to 100 m.**
- **Be aware that MINAS-A6B cannot connect to other than EtherCAT communication type for example as RTEX (Realtime Express) communication type(MINAS-A4N, MINAS-A5N and MINAS-A6N series). It is possible to establish connection with MINAS-A5B and MINAS-A6B series of EtherCAT communication type.**

2.4 Specification list

<table>
<tr><th>Item</th><th>Specification</th></tr>
<tr><td>Physical layer</td><td>100BASE-TX (IEEE802.3)</td></tr>
<tr><td>Baud rate</td><td>100[Mbps] (Full duplex)</td></tr>
<tr><td>Topology</td><td>Line (*Note: For other than line connection, send an inquiry to us)</td></tr>
<tr><td>Connection cable</td><td>Twist pair CAT5e</td></tr>
<tr><td>Cable length</td><td>Between nodes: up to 100 m</td></tr>
<tr><td>Number of slaves (shafts) connected</td><td>Up to 65535</td></tr>
<tr><td>Communication port</td><td>2 ports (RJ45 connector)</td></tr>
<tr><td>EtherCAT Indicators (LED)</td><td>[RUN]: RUN Indicator (Green)
[ERR]: ERROR Indicator (Red)
[L/A IN]: Port0 Link/Activity Indicator (Green)
[L/A OUT]: Port1 Link/Activity Indicator (Green)</td></tr>
<tr><td>Station Alias (ID)</td><td>Range: 0 to 65535
• Setting 1
Lower 8 bits: 2-digit rotary switch (front panel)
Upper 8 bits: Object 2007h-29h
or
• Setting 2
SII saving value</td></tr>
<tr><td>Explicit Device ID</td><td>Supported</td></tr>
<tr><td>Device profile</td><td>CoE (CANopen over EtherCAT), EoE(Ethernet over EtherCAT)</td></tr>
<tr><td>SyncManager</td><td>4</td></tr>
<tr><td>FMMU</td><td>3</td></tr>
<tr><td>Modes of Operation
(operation mode)
Abbreviation: Op-mode</td><td>
<table>
<tr><th>Servo loop</th><th colspan="2">Modes of operation</th></tr>
<tr><td rowspan="4">Position</td><td>pp</td><td>Profile position mode</td></tr>
<tr><td>csp</td><td>Cyclic synchronous position mode</td></tr>
<tr><td>ip
(Not supported)</td><td>Interpolate position mode</td></tr>
<tr><td>hm</td><td>Homing mode</td></tr>
<tr><td rowspan="2">Velocity</td><td>pv</td><td>Profile velocity mode</td></tr>
<tr><td>csv</td><td>Cyclic synchronous velocity mode</td></tr>
<tr><td rowspan="2">Torque</td><td>tq</td><td>Torque profile mode</td></tr>
<tr><td>cst</td><td>Cyclic synchronous torque mode</td></tr>
</table>
</td></tr>
<tr><td>Touch Probe</td><td>2ch Positive edge/Negative edge</td></tr>
<tr><td>Synchronous mode</td><td>DC: (SYNC0 event synchronization) (DC 32bit)
SM2: (SM2 event synchronization) (Not supported)
Free RUN: (asynchronous)</td></tr>
<tr><td>Cycle time
(DC, SM2 communication cycle)</td><td>125, 250, 500, 1000, 2000, 4000 [µs]
▶ Note
• 125 µs is not supported for pp, pv, tq control mode.
• 125 µs and 250 µs are not supported for the full-closed control.</td></tr>
<tr><td>Communication object</td><td>SDO (Service Data Object)
PDO (Process Data Object)</td></tr>
<tr><td>SDO message</td><td>Supported: SDO Request, SDO Response, SDO information, Emergency Message
Not supported: Complete Access</td></tr>
<tr><td>Free PDO Mapping</td><td>Supported</td></tr>
<tr><td>Maximum number of PDO assigns</td><td>RxPDO: 4 [Table]
TxPDO: 4 [Table]</td></tr>
</table>

(to be continued)

Item	Specification
Maximum PDO data length	RxPDO: 64 [byte] (Single axis 32 [byte]) TxPDO: 64 [byte] (Single axis 32 [byte]) ▶ Note There are restrictions due to the combination of operation mode, electronic gear ratio, and communication cycle. ▼ Refer to For details, refer to section 3.7.1.
Diagnosis Object	Diagnosis message only
Command Object	Not supported
Shift time	Not supported
Communication error correction of csp	Supported
Object Editor	Supported (The value of the object setting and monitoring are enabled by Setup support software PANATERM for Multi.)
PANTERM operation while EtherCAT communication is established	Supported

3

EtherCAT Communication Specification

3.1 EtherCAT frame configuration

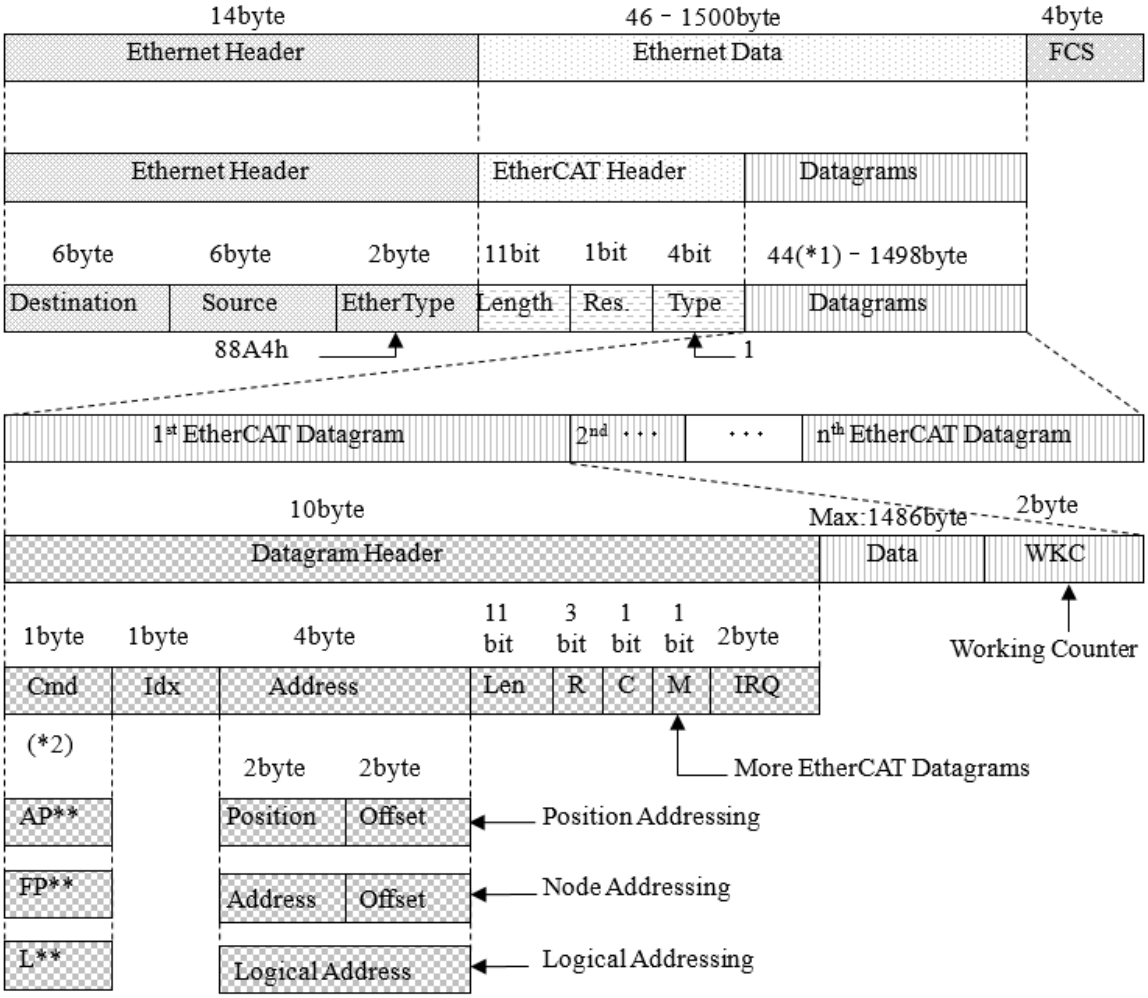
EtherCAT is an Ethernet based, real-time controllable, communication protocol for industrial use.

EtherCAT is an extension of IEEE 802.3 Ethernet standard, allowing you to transfer data in the standard Ethernet frame without changing its basic structure.

Set Ether Type in the Ethernet header to 88A4h, and subsequent Ethernet data is handled as the EtherCAT frame. The EtherCAT frame is composed of a header and not less than one datagram. And, the EtherCAT datagram is further divided more pieces.

ESC handles only the EtherCAT frame with EtherCAT header type = 1.

■ **Ethernet/EtherCAT frame configuration**



(*1) If the Ethernet frame length is shorter than 64 bytes, add 1 to 32 bytes.(Ethernet Header + Ethernet Data + FCS)

(*2) For the details of Cmd, see the next page.

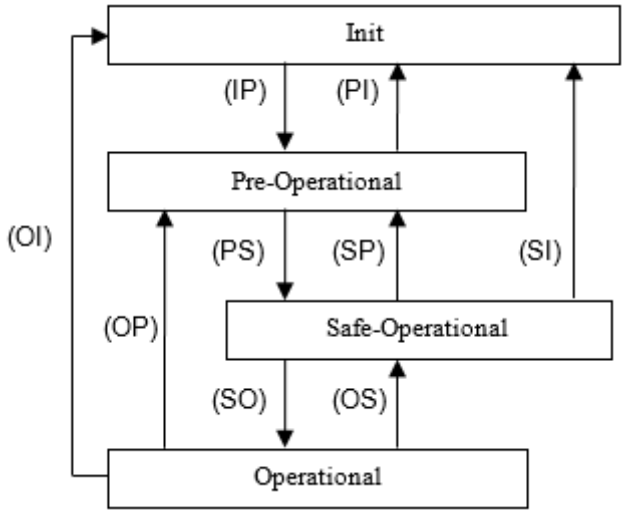
■ **Cmd**

Addressing mode	Cmd	Abbreviation	Name	Explanation
-	00h	NOP	No oparation	No operation is executed.
Position Addressing	01h	APRD	Auto increment physical read	Each slave increments Address. When a frame whose Address value is 0 is received, the required read operation will be executed.
	02h	APWR	Auto increment physical write	Each slave increments Address. When a frame whose Address value is 0 is received, the required write operation will be executed.
	03h	APRW	Auto increment physical read write	Each slave increments Address. When a frame whose Address value is 0 is received, the required read & write operation will be executed.
Node Addressing	04h	FPRD	Configured address phsyical read	When the value of Address matches with Station Address, each slave executes the required read operation.
	05h	FPWR	Configured address phsyical write	When the value of Address matches with Station Address, each slave executes the required write operation.
	06h	FPRW	Configured address phsyical read write	When the value of Address matches with Station Address, each slave executes the required read & write operation.
-	07h	BRD	Broadcast read	All slaves execute the required read operation.
	08h	BWR	Broadcast write	All slaves execute the required write operation.
	09h	BRW	Broadcast read write	All slaves execute the required read & write operation.
Logical Addressing	0Ah	LRD	Logical read	When the value of Logical Address matches with the logical memory area designated by the request of FMMU, each slave executes the required read operation.
	0Bh	LWR	Logical write	When the value of Logical Address matches with the logical memory area designated by the request of FMMU, each slave executes the required write operation.
	0Ch	LRW	Logical read write	When the value of Logical Address matches with the logical memory area designated by the request of FMMU, each slave executes the required read & write operation.
Position Addressing	0Dh	ARMW	Positional physical read / multiple write	Each slave increments Address. A slave which received a frame whose Address value is 0 executes the required read operation. Other slaves execute the write operation.
Node Addressing	0Eh	FRMW	Configured address physical read / multiple write	Each slave compares the values of Address and Station Address. Matching slaves execute the required read operation. Other slaves execute the write operation.
-	0Fh to FFh	-	(Reserved)	-

3.2 ESM (EtherCAT state machine)

The figure below shows a transition diagram for the state (ESM state) of EtherCAT application layer:

■ **State transition diagram of EtherCAT application layer**



Note

The signs (IP etc.) are the abbreviations of the state transitions in the state transition diagram.

(IP): Init → Pre-Operational
(PS): Pre-Operational → Safe-Operational, etc.

ESM state	Possible operation in each state	Communication operation				FFT test run
		CoE			EoE	
		Send/ receive SDO (Mailbox)	Send PDO (S to M)	Receive PDO (M to S)	Ethernet (Mailbox) PANATERM for Multi Connection	
Init	The communication part is initializing and the transmission and reception with both SDO (Mailbox) and PDO are impossible	-	-	-	-	Yes
Pre-Operational (abbr.: PreOP)	Possible to send and receive data through SDO (Mailbox)	Yes	-	-	Yes	Yes
Safe-Operational (abbr.: SafeOP)	The transmission (from slave to master) with PDO as well as the transmission and reception over SDO (Mailbox) are possible	Yes	Yes	-	Yes	Yes
Operational (abbr.: OP)	Possible to send and receive both SDO (Mailbox) and PDO	Yes	Yes	Yes	Yes	Yes

- It is always possible to access an ESC register from the master regardless of the table above.
- When the command update, SYNC0 event, and SM2 event are stopped before the ESM state transition is completed while ESM is changing from Op to other ESM state (Init, PreOP, or SafeOP), a communication error may occur.
- To transit the ESM state continuously, transit next state after confirming that the previous state transition was completed.
- If 2007h-75h bit 0 = 0, for using the test run, FFT, and other functions of PANATERM for Multi(USB communication), the ESM state must be Init. When 2007h-75h bit0=1 is set, PANATERM for Multi(USB, EoE Communication) operation (test run and FFT etc.) can be done even if ESM state is other than Init. Refer to “1.2.6 About “.
- For the ESM status when a safety part alarm occurs(A□□□□ or F□□□□), refer to “6.2.1 Finite state automaton (FSA)”.

The table below lists the relationship between each PDS (Power Drive Systems) and ESM states.

Refer to

For more information on PDS (Power Drive Systems), refer to “Chapter 6.2”.

PDS state		ESM state			
		Init	**PreOP**	**SafeOP**	**Op**
Not ready to switch on		Yes	No	No	No
Switch on disabled		Yes	Yes	Yes	Yes
Ready to switch on	(Note 1)	No	Yes	Yes	Yes
Switched on	(Note 1)	No	Yes	Yes	Yes
Operation enabled	(Note 2) (Note 5)	No	Yes (Note 4)	Yes (Note 4)	Yes
Fault reaction active		Yes	Yes	Yes	Yes
Fault	(Note 3)	Yes	Yes	Yes	Yes

(Note 1) When the ESM state received a transition command from PreOP, SafeOP and OP to Init, the PDS state changes Switch on disabled.

(Note 2) When an ESM state received a transition command to other ESM states with the PDS state at “Operation enabled”, Err.88.2 (ESM requirements during operation error protection) occurs and the PDS state changes to "Fault".

(Note 3) An ESM state is held when a PDS state changes to Fault by errors other than EtherCAT communication relation. However, an ESM state follows the specification indicated in “8.2 EtherCAT-related details of error (Alarm)“ when EtherCAT communication relation error is occurred.

(Note 4) Transition to the Operation enable state PDS should be done at the time of the OP is ESM state.

(Note 5) It may take time for the state to complete a transition in accordance with an ESM request from the master; pay attention to the timeout setting on the master side and other relevant settings.

For example, if the ESM state is changed from “OP” to “PreOP” with the PDS state at “Operation enabled”, Err.88.2 (ESM requirements during operation error protection) occurs, and deceleration is performed in accordance with 605Eh (Fault reaction option code (Axis A)). However, since the ESM state maintains “OP”, the lower the deceleration rate, the longer it takes for the ESM state to transition to “PreOP”.

3.3 ESC address space

MINAS-A6 Multi EtherCAT has the physical address space of 12 Kbyte. The first 4 Kbyte (0000h to 0FFFh) is used as a register space and subsequent 8 Kbyte is used as the process data RAM area.

Major registers are shown below. For details of the resisters and other resisters, refer to the datasheets of the IP cores (ET1810/ET1811/ET1812).

ESC Register Byte Address	Length (Byte)	Description	Initial value (Note 1)
ESC Information			
0000h	1	Type	04h
0001h	1	Revision	02h
0002h to 0003h	2	Build	0044h
0004h	1	FMMUs supported	03h
0005h	1	SyncManagers supported	04h
0006h	1	RAM Size	08h
0007h	1	Port Descriptor	0Fh
0008h to 0009h	2	ESC Features supported	018Ch
Station Address			
0010h to 0011h	2	Configured Station Address	-
0012h to 0013h	2	Configured Station Alias	-
		⋮	
Data Link Layer			
		⋮	
0100h to 0103h	4	ESC DL Control	-
		⋮	
0110h to 0111h	2	ESC DL Status	-
Application Layer			
0120h to 0121h	2	AL Control	-
0130h to 0131h	2	AL Status	-
0134h to 0135h	2	AL Status Code	-
		⋮	
PDI			
0140h	1	PDI Control	08h
0141h	1	ESC Configuration	0Ch
0150h	1	PDI Configuration	03h
0151h	1	SYNC/LATCH PDI Configuration	66h
0152h to 0153h	2	Extended PDI Configuration	-
		⋮	

(Note 1) The initial value is at the time of start-up ESC. Thereafter, may change such as CPU firmware.

ESC Register Byte Address	Length (Byte)	Description	Initial value (Note 1)
		⋮	
Watchdogs			
0400h to 0401h	2	Watchdog Divider	-
0410h to 0411h	2	Watchdog Time PDI	-
0420h to 0421h	2	Watchdog Time Process Data	-
0440h to 0441h	2	Watchdog Status Process Data	-
0442h	1	Watchdog Counter Process Data	-
0443h	1	Watchdog Counter PDI	-
		⋮	
FMMU			
0600h to 062Fh	3x16	FMMU[2:0]	-
+0h to 3h	4	Logical Start Address	-
+4h to 5h	2	Length	-
+6h	1	Logical Start bit	-
+7h	1	Logical Stop bit	-
+8h to 9h	2	Physical Start Address	-
+Ah	1	Physical Start bit	-
+Bh	1	Type	-
+Ch	1	Activate	-
+Dh to Fh	3	Reserved	-
		⋮	
Distributed Clocks (DC) － SYNC Out Unit			
0981h	1	Activation	-
		⋮	
0984h	1	Activation Status	-
098Eh	1	SYNC0 Status	-
		⋮	
0990h to 0993h	4	Start Time Cyclic Operation/Next SYNC0 Pulse	-
		⋮	
09A0h to 09A3h	4	SYNC0 Cycle Time	-
		⋮	

(Note 1) The initial value is at the time of start-up ESC. Thereafter, may change such as CPU firmware.

3.4 SII (slave information interface) EEPROM

MINAS A6 Multi is equipped with 16 Kbit EEPROM for storing the EtherCAT slave information (ESI).
The table below lists the EEPROM structure. ESI uses the word addressing.

SII EEPROM Word Address	+0h	+1h	+2h	+3h	+4h	+5h	+6h	+7h
0000h	EtherCAT Slave Controller Configuration Area							
0008h	Vendor ID		Product Code		Revision Number		Serial Number	
0010h	Hardware Delays				Bootstrap Mailbox Config			
0018h	Mailbox Sync Man Config							
0020h ⋮ 0030h	Reserved							
0038h							Size	Version
0040h ⋮	Additional Information (Subdivided in Categories)							
	Category Strings							
	Category Generals							
	Category FMMU							
	Category SyncManager							
	Category TxPDO / RxPDO for each PDO							

3.4.1 SII area (0000h to 003Fh)

Among the ESC configuration areas (EEPROM word address 0000h to 0007h), Configured Station Alias is automatically read out by ESC and written to the ESC register after the control power is turned on.

To reflect the value after SII EEPROM change to the ESC register, turn off the control power and then on again. Except for this, the initial value of the IP core (ET1810/ET1811/ET1812) is set.

SII EEPROM Word Address	Name	Description	ESC Register Word Address	Data type	Initial value
0000h	PDI Control	Initial value for the PDI control register	0140h 0141h	Unsigned16	0C08h
0001h	PDI Configuration	Initial value for the PDI configuration register	0150h 0151h	Unsigned16	6600h
0002h	Pulse Length of SYNC Signals	Initial value for the pulse length of SYNC signal	0982h 0983h	Unsigned16	0064h
0003h	Extended PDI Configuration	Initial value for the extended PDI configuration register	0152h 0153h	Unsigned16	0000h
0004h	Configured Station Alias	Initial value for the Station Alias (ID) Refer to For details, refer to section 3.8.2.	0012h 0013h	Unsigned16	0000h
0005h	Reserved	Reserved	-	BYTE[4]	-
0006h					
0007h	Checksum	Checksum of ESC configuration area	-	Unsigned16	-

NOTE

- **Basically, do not make changes to other addresses than 0004h (Configured Station Alias) and 0007h (Checksum). 0004h and 0007h need to be changed together. For details, refer to the datasheets of the IP cores (ET1810/ET1811/ET1812).**

The table below lists the contents of SII EEPROM following the ESC configuration area:

SII EEPROM Word Address	Name	Description	ESC Register Word Address	Data type	Initial value
0008h 0009h	Vendor ID	Vendor ID	-	Unsigned32	066Fh
000Ah 000Bh	Product Code	Product code	-	Unsigned32	(Depends on the product)
000Ch 000Dh	Revision Number	Revision No	-	Unsigned32	(Depends on the product)
000Eh 000Fh	Serial Number	Serial No	-	Unsigned32	(Depends on the product)
0010h	Execution Delay	Execution delay	-	Unsigned16	0000h
0011h	Port0 Delay	Port 0 delay	-	Int16	0000h
0012h	Port1 Delay	Port 1 delay	-	Int16	0000h
0013h	Reserved	Reserved	-	BYTE[2]	-
0014h	Bootstrap Receive Mailbox Offset	Offset (from master to slave) of receiving Mailbox in Bootstrap state (Not supported)	-	Unsigned16	0000h
0015h	Bootstrap Receive Mailbox Size	Size (from master to slave) of receiving Mailbox in Bootstrap state (Not supported)	-	Unsigned16	0000h
0016h	Bootstrap Send Mailbox Offset	Offset (from slave to master) of sending Mailbox in Bootstrap state (Not supported)	-	Unsigned16	0000h
0017h	Bootstrap Send Mailbox Size	Size (from slave to master) of sending Mailbox in Bootstrap state (Not supported)	-	Unsigned16	0000h
0018h	Standard Receive Mailbox Offset	Offset (from master to slave) of default receiving Mailbox	-	Unsigned16	1000h
0019h	Standard Receive Mailbox Size	Size (from master to slave) of default receiving Mailbox	-	Unsigned16	0100h
001Ah	Standard Send Mailbox Offset	Offset (from slave to master) of default sending Mailbox	-	Unsigned16	1200h
001Bh	Standard Send Mailbox Size	Size (from slave to master) of default sending Mailbox	-	Unsigned16	0100h
001Ch	Mailbox Protocol	Supported Mailbox protocol	-	Unsigned16	0006h
001Dh ⋮ 003Dh	Reserved	Reserved	-	BYTE[66]	-
003Eh	Size	Size of EEPROM (This driver is equipped with 16 Kbit EEPROM.)	-	Unsigned16	000Fh
003Fh	Version	Version (Fixed at 1.)	-	Unsigned16	0001h
0040h ⋮	Data for each category				

3.5 Synchronous communication mode

The MINAS A6 Multi series enables you to select synchronous modes below:

Synchronous mode	Contents	Synchronization method	Characteristic
DC	Synchronous with SYNC0 event	Synchronize the time information of other slaves based on the time of the first shaft.	• High accuracy • Correction process is required on the master side.
SM2 (Not supported)	Synchronous with SM2 event	Synchronize it to the reception timing of RxPDO.	• There is no transmission delay correction and accuracy is low. • It is necessary to keep the transmission timing constant on the controller side. (dedicated hardware etc.)
FreeRun	Asynchronous	Asynchronous	• Process is simple. • Real-time characteristics are insufficient.

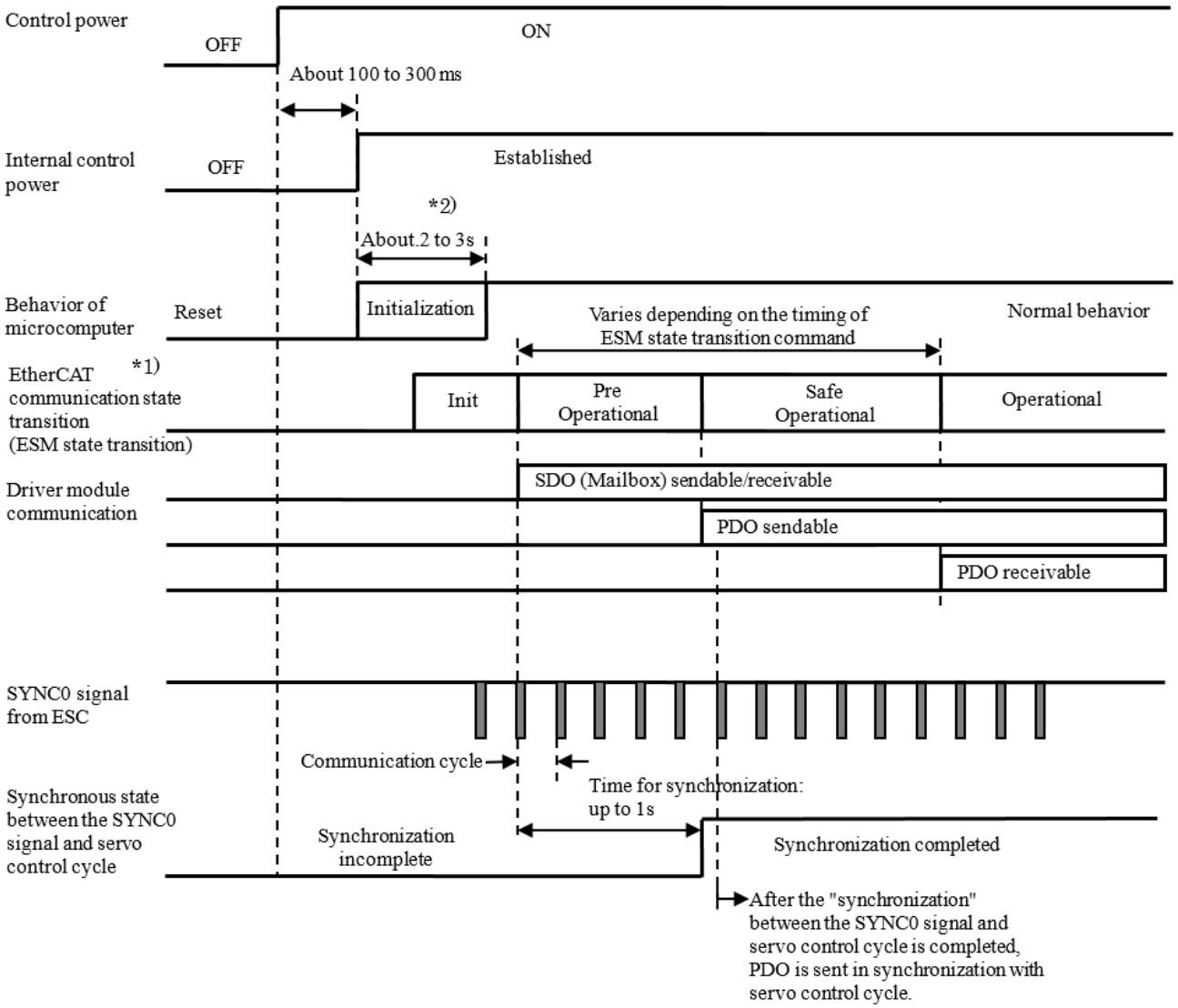
3.5.1 DC (Synchronous with SYNC0 event)

The MINAS A6 Multi series is equipped with 64 bits DC (Distributed Clock). The synchronization of the EtherCAT communication is based on DC.

A slave can be synchronized by sharing the same standard clock (System Time) based on DC. The local cycle of the slave is triggered by the SYNC0 event. The process (servo process) of the slave is triggered by the SYNC0 event cycle, so a slave process is always synchronous with the SYNC0 event.

The master needs to perform propagation delay compensation (offset compensation) at the time of communication initialization, and needs to perform drift compensation periodically.

The figure below shows the flow from the control power-on to the synchronization between the SYNC0 event and slave process (servo process):



*1) The ESM state of the above figure is an internal state of driver module.
Check the completion of changes between each state by the host controller (master) side.

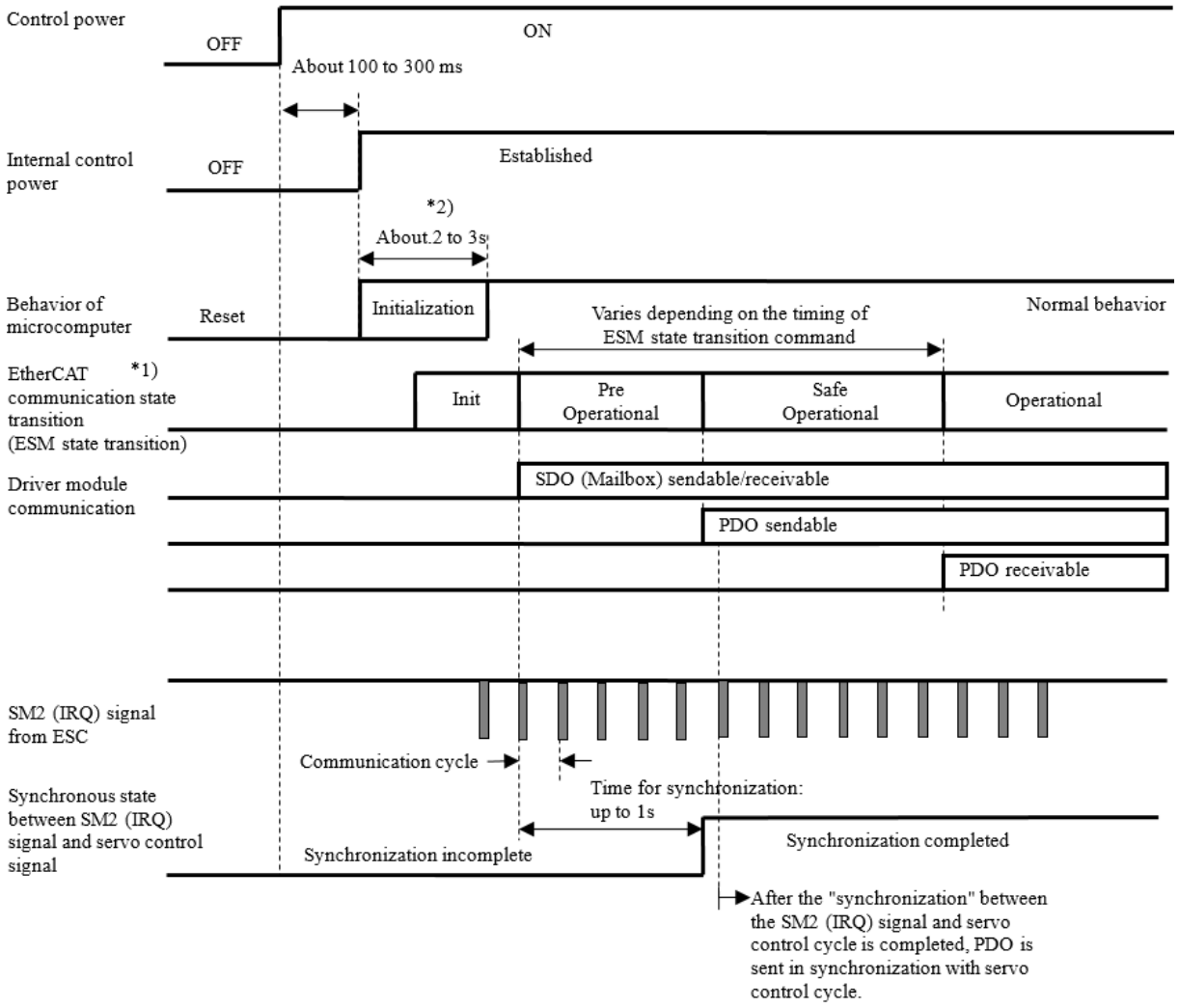
*2) Initialization time can be lengthened by 2006h-13h (Power-up wait time).

3.5.2 SM2 (Synchronous with SM2 event) (Not supported)

Not supported in this software version. Do not set 1C32h-01h (Sync mode) to 01h: SM2, and 1C33h-01h (Sync mode) to 22h: SM2.

Local cycle of the slave is triggered by the SM2 event. The process of the slave is triggered by the SM2 event cycle, so slave process is always synchronous with the SM2 event.

The figure below shows the flow from the control power-on to the synchronization between the SM2 event and slave process (servo process):



*1) The ESM state of the above figure is an internal state of driver module.
Check the completion of changes between each state by the host controller (master) side.

*2) Initialization time can be lengthened by 2006h-13h (Power-up wait time).

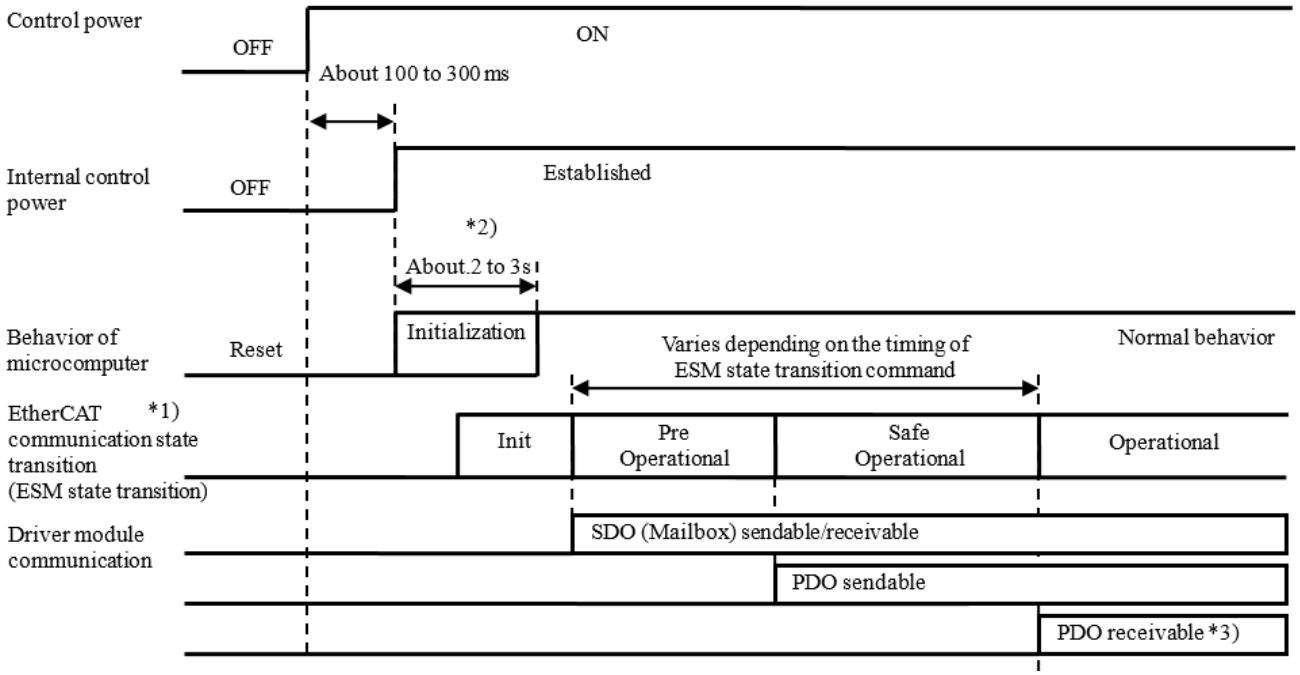
◆ **NOTE**

- **Since the SM2 event occurs in sync with the PDO reception, it is necessary to keep the sending timing of the host controller (master) side constant. If the jitter (dispersion) of sending timing is large, the synchronization will not be completed or an alarm may occur. If it will cause a problem, use DC (synchronous with SYNC0 event).**

3.5.3 Free RUN (Asynchronous)

The Free RUN mode is started by the local timer interrupt of a slave. The local cycle runs independent of the communication cycle and master cycle and is asynchronous from them.

The figure below shows the flow during the control power-on:



*1) The ESM state of the above figure is an internal state of servo driver.
Check the completion of changes between each state by the host controller (master) side.

*2) Initialization time can be lengthened by 2006h-13h (Power-up wait time).

*3) Do not send PDO with a shorter cycle than 1ms.

3.6 SDO (service data object)

The MINAS A6 Multi series supports SDO (Services Data Object).

The data exchange of SDO uses the Mailbox communication. Therefore, be aware that the data update timing of the SDO will be indefinite.

The object setting and various state monitoring of the slaves are enabled by reading/writing data from/into the entry of the object dictionary in the master.

◆ NOTE

- **It may take some time to read and write operations SDO response.**
- **Objects that are updated in the PDO do not update the SDO. They are overwritten with the values of PDO.**

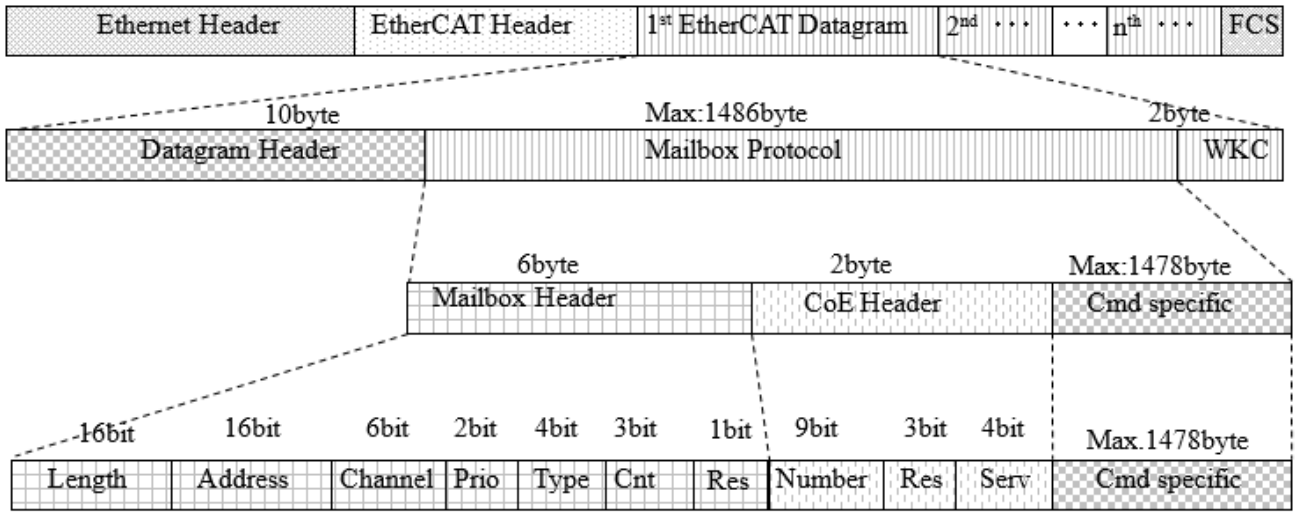
Mailbox frame configuration

The figure below shows the frame configuration of Mailbox/SDO.

Refer to

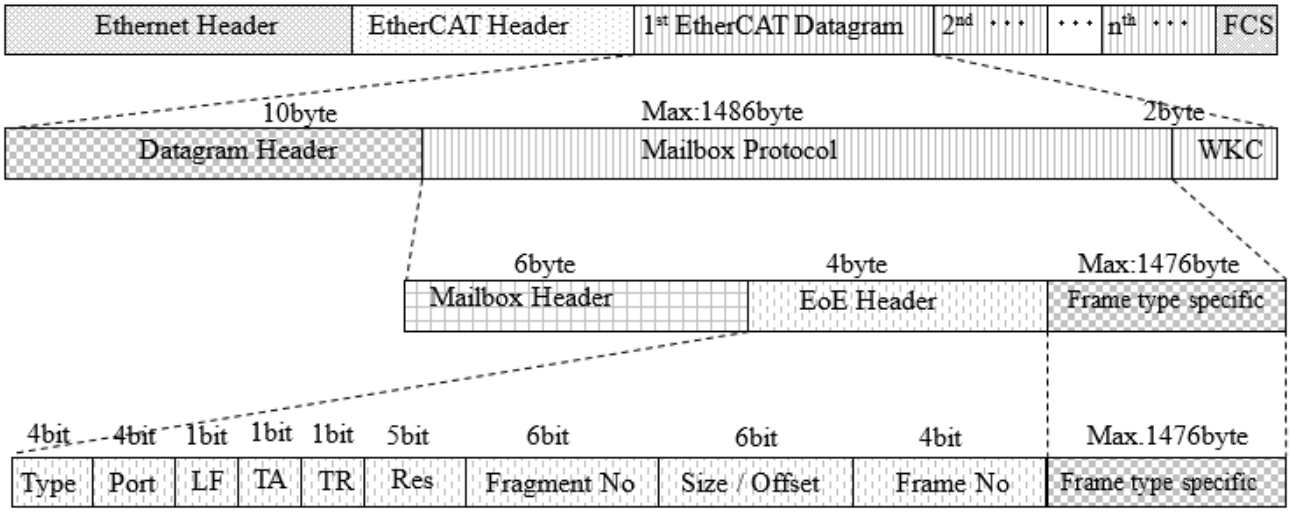
For more information, refer to ETG standards (ETG1000-5 and ETG1000-6).

[CoE data structure]



Frame block	Data field	Data type	Function
Mailbox Header	Length	WORD	Data length of mailbox
	Address	WORD	Source station address
	Channel	Unsigned6	(Reserved)
	Priority	Unsigned2	Priority
	Type	Unsigned4	Mailbox type 00h : Error 01h : (Reserved) 02h : EoE 03h : CoE 04h : FoE (Not supported) 05h : SoE (Not supported) 06h-0Eh : (Reserved) 0Fh : VoE (Not supported)
	Cnt	Unsigned3	Mailbox counter
	Reserved	Unsigned1	(Reserved)
CoE Header	Number	Unsigned9	(Reserved)
	Reserved	Unsigned3	(Reserved)
	Service	Unsigned4	Message type
Cmd specific	Size Indicator	Unsigned1	Dataset size enabled
	Transfer Type	Unsigned1	Select Normal/Expedited transfer
	Dataset Size	Unsigned2	Dataset size setting
	Complete Access	Unsigned1	Select how to access object (Not supported)
	Command Specfier	Unsigned3	Upload/download Select request, response, etc.
	Index	WORD	Object index
	Subindex	BYTE	Object sub-index
	□□□	□□□	Data, abort message, etc. of object [Function varies depending on the combination of the following: Size Indicator, Transfer Type, Data Set Size, Complete Access, Command Specfier]

[EoE data structure]



Frame block	Data field	Data type	Function
EoE Header (Note 1)	FrameType	Unsigned4	EoE frame type
	Port	Unsigned4	Select a specific port
	Last Fragment	Unsigned1	Last fragment identifier
	Time Appended (Not supported)	Unsigned1	TimeStamp appended identifier
	Time Requested (Not supported)	Unsigned1	Request Timestamp
	Reserved	Unsigned5	(Reserved)
	Fragment Number	Unsigned6	Fragment number
	Complete Size (Note 2)	Unsigned6	in 32-octet blocks trunc ((complete size in octet of the Ethernet frame + 31) / 32)
	Offset (Note 2)		Offset in 32-octet blocks of the Ethernet frame fragment
	Frame Number	Unsigned4	Frame number
Frame type specific	□□□	□□□	EoE Data, TimeStamp(Not supported), etc.

(Note 1) The description of EoE Header conforms to the following EoE frame types.
- Initiate EoE
- EoE Fragment

(Note 2) These data switches depending on the frame type.

Mailbox timeout

With this driver module, the timeout time in Mailbox communication is set as follows:

- Timeout time for Mailbox request: 100 ms

  If the master transmits a request to the slave (driver module) and WKC of transmission data of the request frame is updated, the request is considered to be properly received by the slave.

  Although retry operation is performed until WKC is updated, timeout occurs at the master side if WKC is not updated until this setting time expires.

- Timeout time for Mailbox response: 10 seconds

  If the master receives a response to a request from the slave (driver module) and WKC is updated, the response is considered to be properly received by the slave.

  Timeout occurs at the master side if the master does not receive a response where WKC is updated until this setting time expires.

  The maximum time required for the response creation of the slave (driver module).

3.6.1 Message at error occurrence

3.6.1.1 Abort message

When the SDO data exchange (read/write) fails, the error message containing Abort code, called Abort message is returned.

The abort message is an error only for the SDO data exchange. There is not any abort message for the PDO data exchange.

The contents of abort code can differ according to the access conditions.

Abort code	Contents	
05030000h	Toggle bit not changed	(Not supported)
05040000h	SDO protocol timeout	(Not supported)
05040001h	Client/Server command specifier not valid or unknown	
05040005h	Out of memory	(Not supported)
06010000h	Not supported access to an object	
06010001h	Attempt to read to a write only object	(Not supported)
06010002h	Attempt to write to a read only object	
06010003h	Subindex cannot be written, SI0 must be 0 for write access	
06020000h	The object does not exist in the object directory	
06040041h	The object can not be mapped into the PDO	(Not supported)
06040042h	The number and length of the objects to be mapped would exceed the PDO length	(Not supported)
06040043h	General parameter incompatibility reason	(Not supported)
06040047h	General internal incompatibility in the device	(Not supported)
06060000h	Access failed due to a hardware error	
06070010h	Data type does not match, length of service parameter does not match	
06070012h	Data type does not match, length of service parameter too high	(Not supported)
06070013h	Data type does not match, length of service parameter too low	(Not supported)
06090011h	Subindex does not exist	
06090030h	Value range of parameter exceeded (only for write access)	
06090031h	Value of parameter written too high	
06090032h	Value of parameter written too low	
06090036h	Maximum value is less than minimum value	
08000000h	General error	(Not supported)
08000020h	Data cannot be transferred or stored the application	
08000021h	Data cannot be transferred or stored to the application because of local control	(Not supported)
08000022h	Data cannot be transferred or stored to the application because of the present device state	
08000023h	Object dictionary dynamic generation fails or no object dictionary is present	

3.6.1.2 Emergency message

- A slave notifies the master of the emergency message through the mailbox communication when an error (alarm) occurs in the driver module (Slave).
- When no error (alarm) occurs and only warning occurs, it is not reported.
- A maximum of 8 Emergency messages generated while the ESM state is Init are buffered in the order of occurrence, these messages are returned if the ESM state is PreOP or higher. However, if the number of Emergency messages exceeds 8, messages are discarded in the order of occurrence.
- Effective/invalidity of Emergency message transmission can be set up by 10F3h/2281h/2681h (Diagnosis history)- 05h(Flags):bit0.
  Enabling/disabling the transmission of Emergency messages of the Axis A/B can be set individually.
  Enabling/disabling the transmission of Emergency messages of the Axis A is to be set by 10F3h/2281h-05h(Flags): bit0.
  Enabling/disabling the transmission of Emergency messages of the Axis B is to be set by 2681h-05h (Flags): bit0. Emergency message transmission of a default is "effective". (10F3h/2281h/2681h -05h(Flags):bit0=1)

Refer to

Refer to “5.7 Diagnosis history (Reading function of error (alarm) history) (10F3h)” for Sub-Index other than Sub-Index:05h.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
10F3h	-	Diagnosis history	-	-	-	-	-	-	-
		Reads an error history and enables/disables an emergency message.							
	05h	Flags	-	0 to 65535	U16	See below	No	ALL	Yes

bit 0	RW	Permitting execution of Emergency message of Axis A 0: Emergency message of Axis A is disabled 1: Emergency message is issued every time a new abnormality is detected in the Axis A. (Some of the anomaly does not remain in the Diagnosis message)
bit 1	R	Not supported: Fixed at 1
bit 2	R	Not supported: Fixed at 1
bit 3	R	Not supported: Fixed at 0
bit 4	R	Not supported: Fixed at 0
bit 5	R	Diagnosis message clear information of Axis A 0: There is error history information 1: No error history information or completion of clearance of error history information (at the time of 10F3h/2281h -03h=0 writing) (The value is kept until new error (alarm) occurs.)
bit 6 to 15	-	Reserved

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2281h	-	Diagnosis history	-	-	-	-	-	-	-
		• Setting the readout of error history, and enabling/disabling of Emergency messages are to be carried out.							
	05h	Flags	-	0 to 65535	U16	Refer to the following.	No	ALL	Yes

bit 0	RW	Permitting execution of Emergency message of Axis A 0: Emergency message of Axis A is disabled 1: Emergency message is issued every time a new abnormality is detected in the Axis A. (Some abnormalities do not remain in the diagnosis message.)
bit 1	R	Not supported: Fixed at 1
bit 2	R	Not supported: Fixed at 1
bit 3	R	Not supported: Fixed at 0
bit 4	R	Not supported: Fixed at 0
bit 5	R	Diagnosis message clear information of Axis A 0: Error history information exists. 1: No error history information or clearing of error history information Completion (at writing of 10F3h/2281h-03h=0) (Hold until the next error (alarm) occurs.)
bit 6 to 15	-	Reserved

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2681h	-	Diagnosis history	-	-	-	-	-	-	-
		• Setting the readout of error history, and enabling/disabling of Emergency messages are to be carried out.							
	05h	Flags	-	0 to 65535	U16	Refer to the following.	No	ALL	Yes

bit 0	RW	Permitting execution of Emergency message of Axis B 0: Emergency message of Axis B is disabled 1: Emergency message is issued every time a new abnormality is detected in the Axis B. (Some abnormalities do not remain in the diagnosis message.)
bit 1	R	Not supported: Fixed at 1
bit 2	R	Not supported: Fixed at 1
bit 3	R	Not supported: Fixed at 0
bit 4	R	Not supported: Fixed at 0
bit 5	R	Diagnosis message clear information of Axis B 0: Error history information exists. 1: No error history information, or completion of clearing the error history information (at writing of 2681h-03h=0) (Hold until the next error (alarm) occurs.)
bit 6 to 15	-	Reserved

◆ NOTE

- **If error (alarm) occurrence and clearing are repeated multiple times within a short period of time, only the emergency message for the final status may be noticed.**

The emergency message is composed of 8 bytes data as shown in the figure below:

Byte	0	1	2	3	4	5	6	7
Contents	Error code (Note 1) (OD:603Fh) (L) (H)		Error register (Note 2) (OD:1001h)	Error Field (Note 3)				

(Note 1) For details, refer to the following section “Error codeError codeError code“.

(Note 2) For details, refer to the following section “Appendix 1“.

(Note 3) For details, refer to the following section “Error field“

Error code

The same value as 603Fh (Error code (Axis A)) returns to Error code. The error code of the axis on which the most recent alarm occurred is returned. When an alarm has occurred simultaneously on the Axis A/B, the value of 603Fh (Error code (Axis A)) is set. When a common alarm has occurred, the value of 603Fh (Error code (Axis A)) is also set.

The error codes at 0000h to FEFFh are defined in IEC61800-7-201.

FF00h to FFFFh is defined peculiar by the maker and serves as the following contents.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No
		• Displays an alarm (main number only) / warning occurred in the driver module. When both an alarm and warning does not occur, displays 0000h. When an alarm and warning occur at the same time, display the alarm. FF**h ↑—— Alarm (main) number (00h to 9Fh) Warning number(A0h to A9h, ACh, C3h,D2h) Example: FF0Ch: 0Ch=12d. Err12.0 (over voltage protection) occurred FF55h: 55h=85d. Err85.0 (TxPDO assignment error protection) or Err85.1 (RxPDO assignment error protection) occurred							

(Note 1) In the case of Err81.7(SyncManager2/3 error protection) occurs, A000h is displayed as an exception.

(Note 2) The setting of the alarm number to 603Fh (Error code (Axis A)) is the same timing as the "Emergency Message". Therefore, the value is reflected later than bit3 (fault) of 6041h (Statusword (Axis A)).

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
683Fh	00h	Error code (Axis B)	-	0 to 65535	U16	ro	TxPDO	ALL	No
		• Axis B alarm (main number only) and warning that are occurring at the driver module are displayed. When no alarm or warning is generated, 0000h is displayed. If the alarm and warning are generated simultaneously, the alarm is displayed. FF**h ↑—— Alarm (main) number (00h to 9Fh) Warning number (A0h to A9h, ACh, C3h, D2h) Example: FF0Ch: 0Ch=12d. Err12.0 (Overvoltage protection) has occurred. FF55h: 55h=85d. Err85.0 (TxPDO assignment error protection) or Err85.1 (RxPDO assignment error protection) is generated.							

(Note 1) As an exception, A000h is displayed in the case of Err81.7 (SyncManager2/3 setting error).

(Note2) Setting of the alarm number to 683Fh (Error code (Axis B)) is done at the same timing as an Emergency message. Therefore, the value is set later than bit3 (fault) of 6841h (Statusword (Axis B)).

Error register

The same values as 1001h (Error register), 2280h (Error register (Axis A))/2680h (Error register (Axis B)) are returned to the Error register.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1001h	00h	Error Register	-	0 to 255	U8	ro	No	ALL	No

The type (state) of Axis A alarm that is generated at the driver module is displayed.
If no Axis A alarm is generated, 0000h is displayed.
No warning is displayed.

bit	Contents
0	(Not supported)
1	
2	
3	
4	The alarm which is defined in AL status code (Note 1)
5	(Not supported)
6	(reserved)
7	The alarm which is not defined in AL status code (Note 2)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2280h	00h	Error register (Axis A)	—	0 to 255	U8	ro	No	ALL	No

The type (state) of Axis A alarm that is generated at the driver module is displayed.
If no Axis A alarm is generated, 0000h is displayed.
No warning is displayed.

bit	Contents
0	(Not supported)
1	
2	
3	
4	Alarms defined in AL status code are generated. (Note 1)
5	(Not supported)
6	(reserved)
7	Alarms not defined in AL status code are generated. (Note 2)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2680h	00h	Error register (Axis B)	—	0 to 255	U8	ro	No	ALL	No

The type (state) of Axis B alarm that is generated at the driver module is displayed.
If no Axis B alarm is generated, 0000h is displayed.
No warning is displayed.

bit	Contents
0	(Not supported)
1	
2	
3	
4	Alarms defined in AL status code are generated. (Note 1)
5	(Not supported)
6	(reserved)
7	Alarms not defined in AL status code are generated. (Note 2)

(Note 1) "The alarm which is defined in AL status code" is which indicate Err80.0-4 and Err80.6-7, Err81.0-7, Err85.0-1, Err85.3 in the EtherCAT communication related error.

(Note 2) "The alarm which is not defined in AL status code" is which indicate Err85.2, Err88.0-3 in the EtherCAT communication related error and other than EhterCAT communication related error.

Refer to

For details of alarms, refer to “Chapter 8 EtherCAT Relevant Protection Functions”.

Error field

- When abnormalities other than Err81.7(SyncManager2/3 error protection) occur within driver module:
  - The alarm's subnumber is returned to Data [0].
  - 00h is returned to Data [1] to [3].
  - Error code type of the generation error is returned to Data [4].

Data[4]	Error code type
00h	Common alarm
01h	Axis A alarm
02h	Axis B alarm

Ex.) When a common alarm is generated (Err80.4 (PDO watchdog error protection))

Byte	0	1	2	3	4	5	6	7
Contents	Error code 603Fh/683Fh		Error register	Data [0]	Data [1]	Data [2]	Data [3]	Data [4]
Value	FF50h		10h	04h	00h	00h	00h	00h

Alarm main number　　Alarm sub number

Ex.) When Axis A alarm is generated (Err26.0 (Overspeed error protection))

Byte	0	1	2	3	4	5	6	7
Contents	Error code 603Fh		Error register	Data [0]	Data [1]	Data [2]	Data [3]	Data [4]
Value	FF1Ah		80h	00h	00h	00h	00h	01h

Ex.) When Axis B alarm is generated (Err26.0 (Overspeed error protection))

Byte	0	1	2	3	4	5	6	7
Contents	Error code 603Fh		Error register	Data [0]	Data [1]	Data [2]	Data [3]	Data [4]
Value	FF1Ah		80h	00h	00h	00h	00h	02h

- When an abnormal condition is cleared in the driver module:
  - Data [0] to [4] is 00h cleared.

Example: The alarm state is cleared due to the fault reset:

Byte	0	1	2	3	4	5	6	7
Contents	Error code		Error register	Data [0]	Data [1]	Data [2]	Data [3]	Data [4]
Value	0000h		00h	00h	00h	00h	00h	00h

- The SM2/3 setting check at the time of the changes to SafeOp from PreOp is inaccurate in the communication error, and when Err81.7 “SyncManager2/3 error protection” occurs, Error code is set to A000h, Error register is set to 10h, and it returns regular data.

Refer to

For more information, refer to ETG standards (ETG1000-6).

Example:

The Length (ESC Register 0812h and 0813h) of SyncManager2 is invalid (Note 1)

The Physical Start Address (ESC Register 0810h and 0811h) of SyncManager2 is invalid (other than 1000h to 2FFFh, odd, etc.)

The SyncManager2 setting is invalid (set to Inactive, 1buffer, Write, etc.)

The Length (ESC Register 081Ah and 081Bh) of SyncManager3 is invalid (Note 1)

The Physical Start Address (ESC Register 0818h and 0819h) of SyncManager3 is invalid (other than 1000h to 2FFFh, odd, etc.)

The SyncManager3 setting is invalid (set to Inactive, 1buffer, Read, etc.)

Byte	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Contents	**Error code**		**Error register**	**Data (0)**	**Data (1)**	**Data (2)**	**Data (3)**	**Data (4)**
(1)	A000h		10h	08h	(L) Length (Note 2) (H)		(L) Length (Note 2) (H)	
(2)	A000h		10h	09h	00h	10h	FEh	2Fh
(3)	A000h		10h	0Ah	24h (Note 3)	00h (Note 3)	01h (Note 3)	00h (Note 3)
(4)	A000h		10h	0Ch	(L) Length (Note 2) (H)		(L) Length (Note 2) (H)	
(5)	A000h		10h	0Dh	00h	10h	FEh	2Fh
(6)	A000h		10h	0Eh	22h (Note 3)	03h (Note 3)	01h (Note 3)	00h (Note 3)

(Note 1) It returns, when the setting is different from the PDO mapping size. If the PDO mapping size exceeds 32 bytes, Err85.1(RxPDO assignment error protection) occurs, and 01h (the subnumber of the alarm) is returned to Data [0], and 00h is returned to Data (1) to (4).

(Note 2) An actual set value of the PDO mapping size is returned to Length. For example, when the PDO mapping size is 9, returned values are: Data (1) = 09h, Data (2) = 00h, Data (3) = 09h, and Data (4) = 00h.

(Note 3) When the PDO mapping size is 0, 00h is returned to Data (1) to (4).

3.7 PDO (process data object)

The MINAS A6 Multi series supports PDO (Process Data Object).
The real time data transfer over EtherCAT is done by the data exchange with PDO (Process Data Object).
PDO is composed of RxPDO transferring from master to slave and TxPDO transferring from slave to master.

	Sender	Receiver
RxPDO	Master	Slave
TxPDO	Slave	Master

◆ NOTE

- **The object updated by PDO should not carry out updating by SDO.**

3.7.1 PDO mapping object

The PDO mapping is the mapping of the application object from the object dictionary to PDO.

Regarding the MINAS A6 Multi series, the mapping objects of 1600h to 1603h (for Axis A), 1610h to 1613h (for Axis B) can be used for RxPDO, and 1A00h to 1A03h (for Axis A), 1A10h to 1A13h (for Axis B) can be used for TxPDO, as the tables for PDO mapping.

The common servo information monitor object (PDO support object for 2020h to 203Fh) can be set only for 1A00h to 1A03h (for A axis). If a common servo information monitor object is set for 1A10h to 1A13h (for B axis), TxPDO assignment error protection (Err85.0) occurs.

- If a target object of Axis B is set to 1600h to 1603h (for Axis A), RxPDO assignment error protection (Err85.1) is generated.
- If a target object of Axis A is set to 1610h to 1613h (for Axis B), RxPDO assignment error protection (Err85.1) is generated.
- If a target object of Axis B is set to 1A00h to 1A03h (for Axis A), TxPDO assignment error protection (Err85.0) is generated.
- If a target object of Axis A is set to 1A10h to 1A13h (for Axis B), TxPDO assignment error protection (Err85.0) is generated.

The maximum number of application objects to be mapped to a mapping object is as follows:

Item	Description	
	RxPDO	TxPDO
Maximum PDO data length	Single axis 32 [byte], Total for both axes 64 [byte]	Single axis 32 [byte], Total for both axes 64 [byte]

Even when mapping of objects whose single axis only exceeds 32 [byte] is carried out, TxPDO assignment error protection (Err85.0) or RxPDO assignment error protection (Err85.1) are generated.

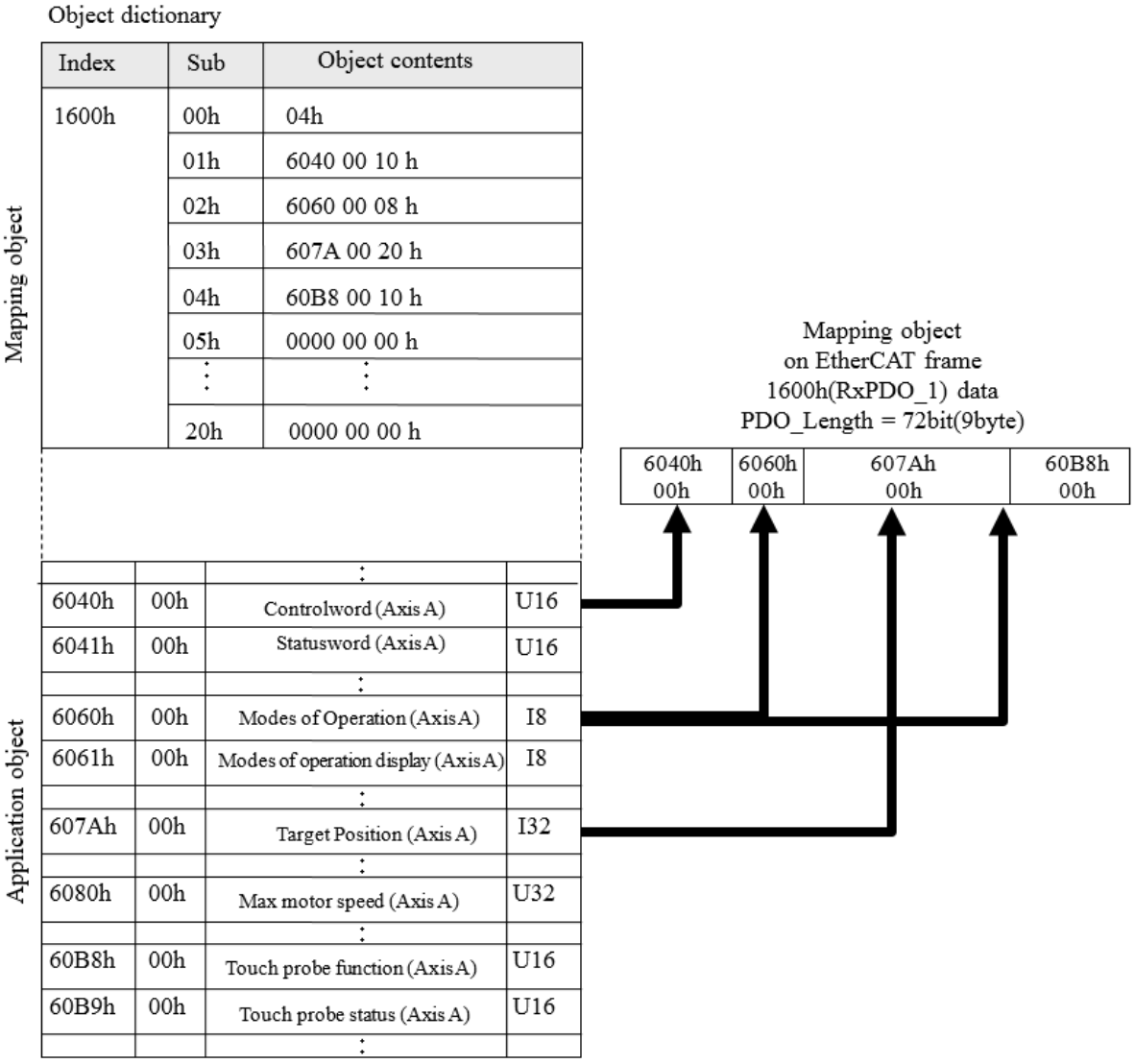
Also, depending on the combination of electronic gear ratio and communication cycle, the maximum PDO size that can be supported will change.

In MINAS A6 Multi Ver1.01, there are combinations of settings that cannot be partially supported compared to A6B single-axis products. An improper operation error protection (Err88.3) occurs when setting a combination that cannot be supported. For details, refer to the table below.

Operation mode	electronic gear ratio	Single axis PDO size [byte]		communication cycle [us]					
		RxPDO	TxPDO	125	250	500	1000	2000	4000
semi-closed or full-closed	1	≤6	≤6	✓	✓	✓	✓	✓	✓
		7 - 32	7 - 32	× (Err88.3)	× (Err88.3)	✓	✓	✓	✓
semi-closed	2 ^ n (n= An integer from 1 - 12)	≤25	≤25	× (Err88.3)	× (Err88.3)	✓	✓	✓	✓
		26 - 32	26 - 32	× (Err88.3)	× (Err88.3)	× (Err88.3)	✓	✓	✓
	1/1000 - 8000 (Other than 1 and 2 ^ n)	≤32	≤32	× (Err88.3)	× (Err88.3)	× (Err88.3)	✓	✓	✓
	Other than those above	≤32	≤32	× (Err88.3)	× (Err88.3)	× (Err88.3)	× (Err88.3)	× (Err88.3)	× (Err88.3)

Setting example of PDO mapping

In the case set application object (6040h, 6060h, 607Ah, 60B8h) to 1600h (Receive PDO mapping 1 (Axis A): RxPDO_1).



Refer to

For more information on setting method, refer to “5.4 PDO (process data object) mapping”.

3.7.2 PDO assign object

To exchange the PDO data, assign a PDO mapping table in Sync Manager. Describe the relationship between PDO mapping table and Sync Manager in the Sync Manager PDO assign object.

MINAS A6 Multi can use 1C12h for RxPDO (SyncManager2) and 1C13h for TxPDO (SyncManager3), as a Sync Manager PDO assign object.

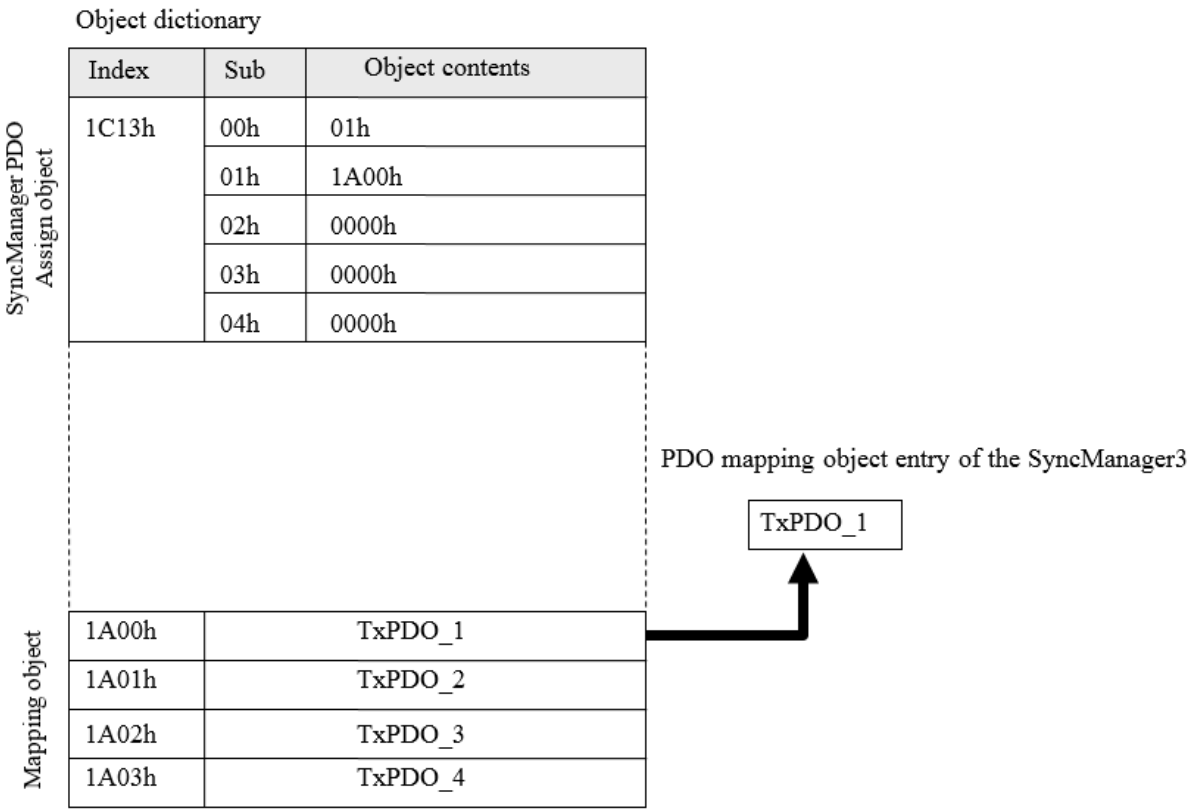
The maximum number of mapping objects to be mapped to an assign object is as follows:

Item	Description	
	RxPDO	TxPDO
Maximum number of PDO assigns	4 [Table]	4 [Table]

Normally, only one mapping object is sufficient, so a change from default is not required.

■ **Setting example of Sync Manager PDO assign object**

In the case set 1A00h (Transmit PDO mapping 1: TxPDO_1) to assign object 1C13h (Sync manager channel 3).



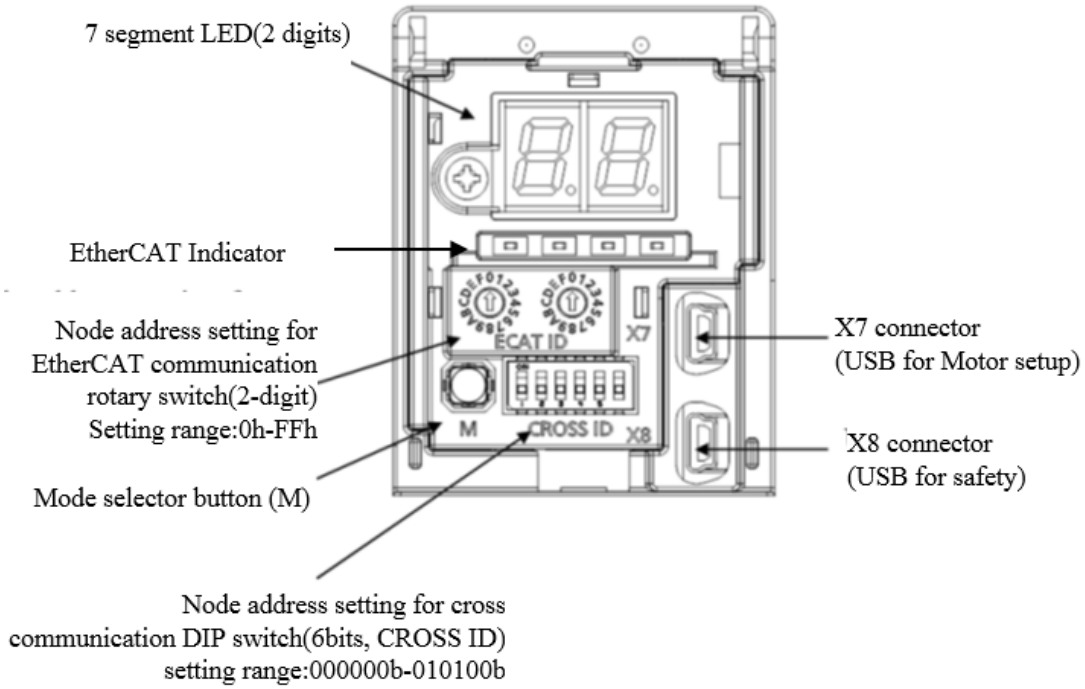
Refer to

For more information on setting method, refer to “5.4 PDO (process data object) mapping”.

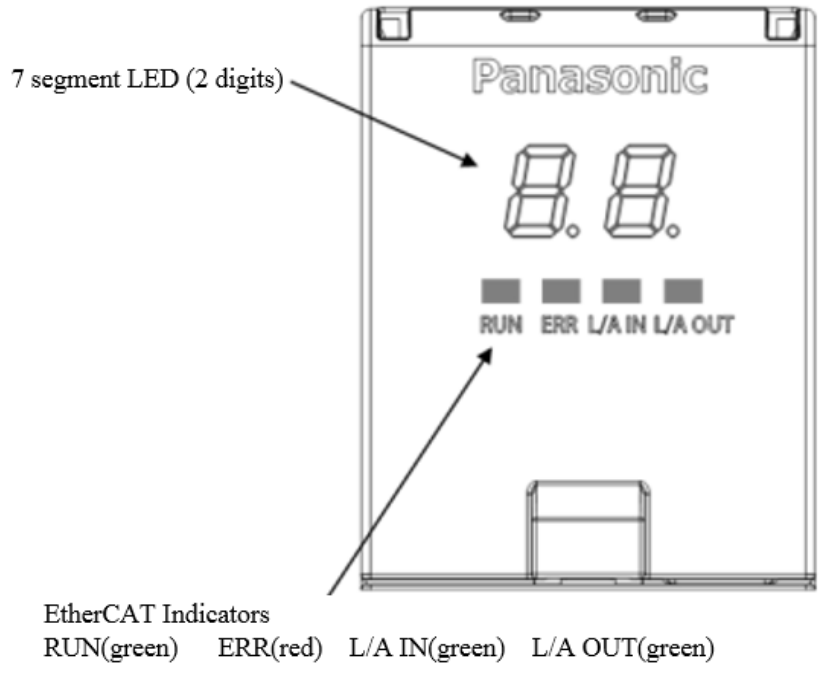
3.8 Front panel configuration

The figure below shows the front panel configuration in the MINAS A6 Multi series:

■ **Front panel cover opened**



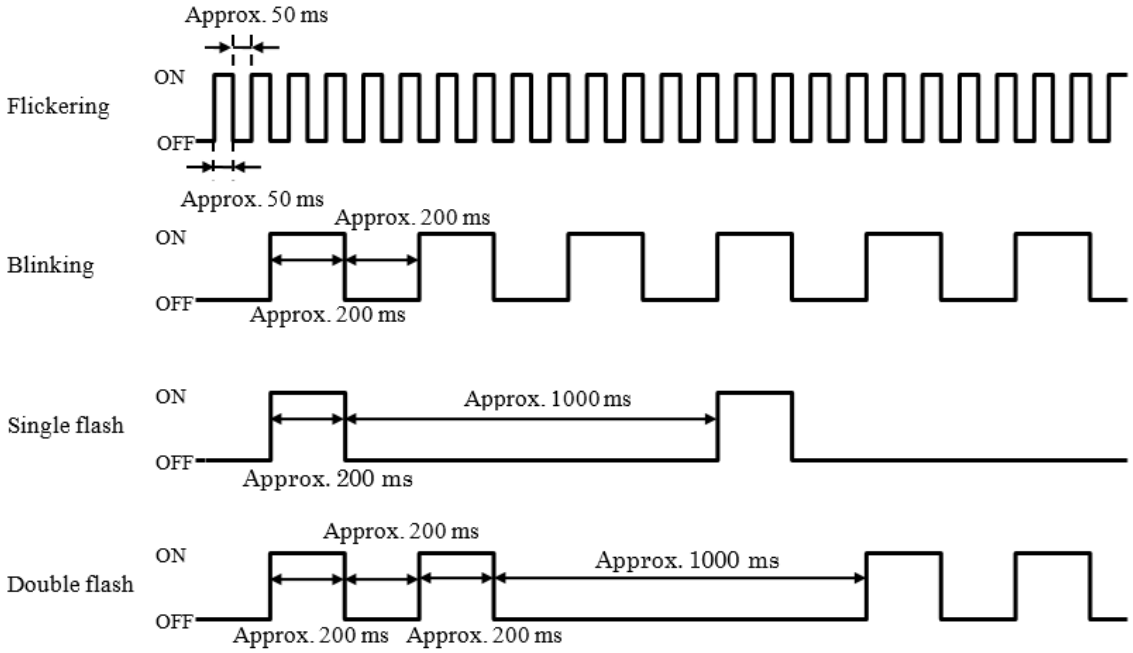
■ **Front panel cover closed**



3.8.1 EtherCAT indicators

MINAS A6 Multi series has four EtherCAT Indicators (LED).

There are four patterns below indicating the LED status besides ON and OFF:



RUN

RUN Indicator indicates the ESM (EtherCAT State Machine) status. LED lights in green.

LED state	Contents
OFF	ESM: INIT state
Blinking	ESM: Pre-operational state
Single flash	ESM: Safe-operational state
ON	ESM: Operational state

ERR

ERR Indicator indicates an alarm state defined in the AL status code. LED lights in red.

LED state	Contents
OFF	No occurrence of alarms defined in the AL status code (Note 1)
Blinking	Communication setup error
Single flash	Synchronous event error
Double flash	Application watchdog timeout
Flickering	Initialization error
ON	PDI error (Note 2)

(Note 1) Alarms defined in the AL status code refer to Err80.0 to 7, Err81.0 to 7, and Err85.0 to 7 of the errors related to EtherCAT communication.

(Note 2) MINAS A6 Multi series is not detected.

Refer to

For more information, refer to “8.1 Error (alarm) list (Attribute and LED display)”.

L/A IN, L/A OUT

L/A IN, L/A OUT Indicators indicate the LINK state and activity of each port's physical layer. LED lights in green.

LED state	Contents
OFF	LINK not established
Flickering	LINK established, there are data transmission and reception.
ON	LINK established, there are no data transmission and reception.

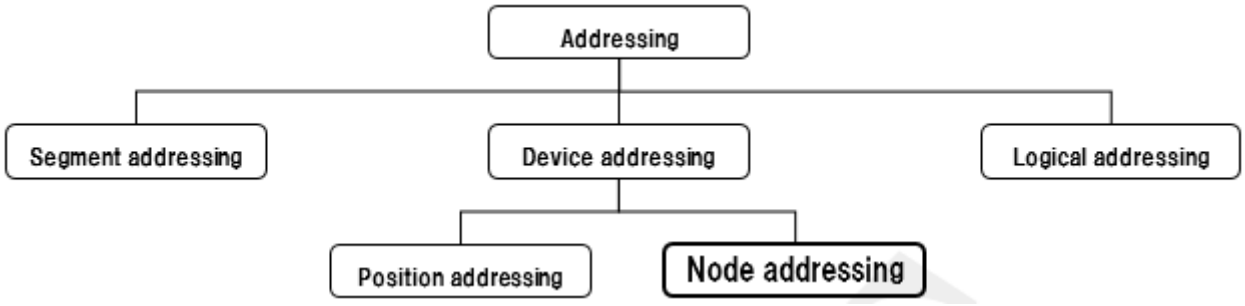
If the time to establish the LINK is too long, it may be able to correct the symptom by the following handling:

- Setting the 2006h-13h(Power-up wait time) values of adjacent driver module to different values

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2006h	13h	Power-up wait time	100ms	0 to 100	I16	rw	No	ALL	Yes
		Set up the standard initialization time approx.1.5 s + α(setting value×0.1s) after power-up. For example, in the case of the preset value 10, it is set to 1.5s+(10×0.1 s) = approx. 2.5s. Note If the period until LINK establishment is too long, this phenomenon may be improved by setting the 2006h-13h values for adjacent driver module to different values.							

3.8.2 Node addressing (Setting station alias)

Addressing mode defined by EtherCAT is as follows.



This section describes about the method of Node addressing. This is peculiar node ID (Station alias) for a master to specify a slave.

In this driver module, Node addressing has three ways regarding setting means and reading method.

Reading the value of SII from Configured Station Alias

Reading the value of 0004h (Configured Station Alias) in the SII from 0012h (Configured Station Alias) of ESC register.

Reading the value of rotary switch from Configured Station Alias

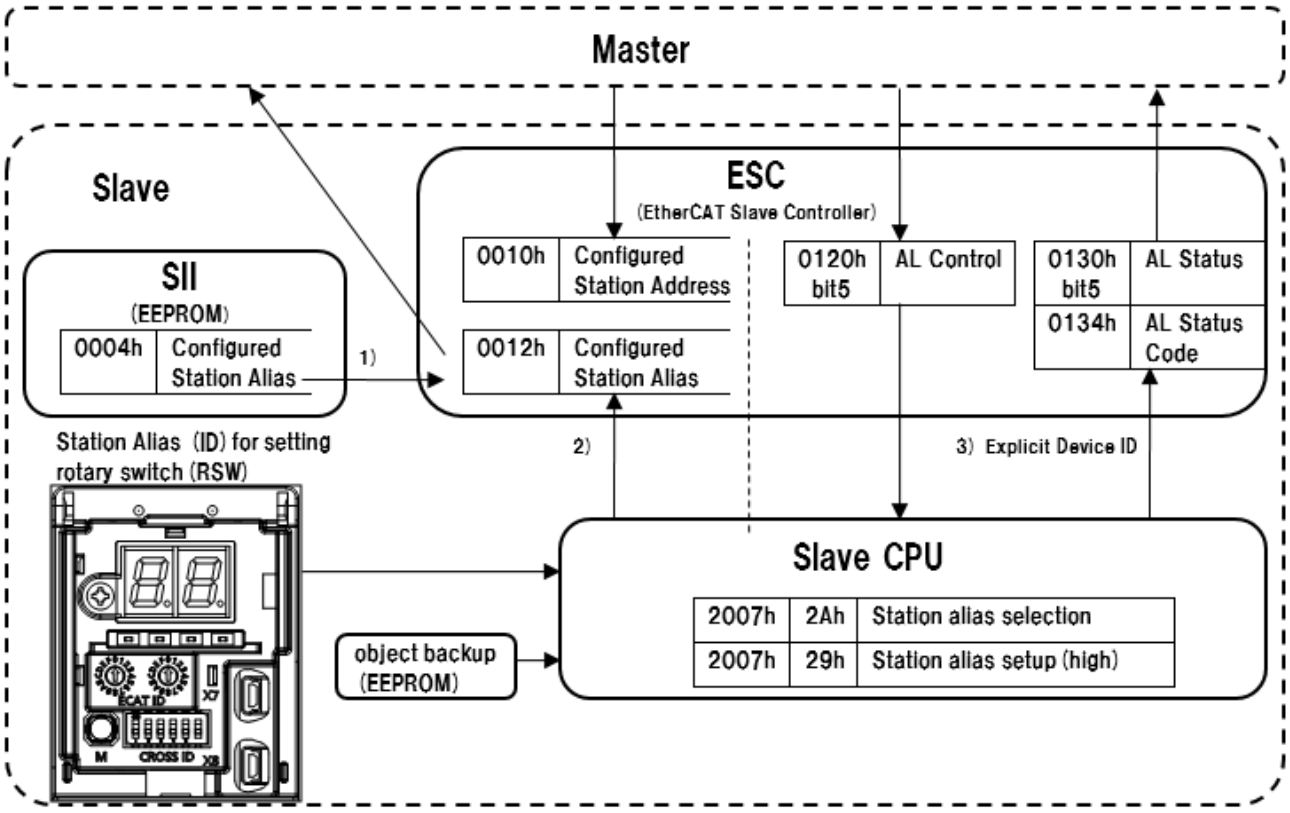
Reading the value made of object 2007h-29h (Station alias setup(high)) and front panel rotary switch from 0012h (Configured Station Alias) of ESC register.

Reading the value of rotary switch from AL Status Code (Explicit Device ID)

Reading the value made of object 2007h-29h (Station alias setup(high)) and front panel rotary switch from AL Status Code(0134h).

The master reads the set values of the Configured Station Alias (0012h) of the ESC register and sets them to the Configured Station Address (0010h).

Thereby addresses such as FPRD commands used in the mailbox are set.



3.8.2.1 Reading the value of SII from configured station alias

This explains the method of reading the value of 0004h (Configured Station Alias) in the SII from 0012h (Configured Station Alias) of ESC register.

Driver module reads the value of object 2007h-2Ah (Station alias selection) from backup EEPROM at the control power-on. If the value is 1, the value saved at 0004h (Configured Station Alias) in the SII into 0012h (Configured Station Alias) of ESC register. Master reads this value.

3.8.2.2 Reading the value of rotary switch from configured station alias

This explains the method of reading the value made of object 2007h-29h (Station alias setup(high)) and front panel rotary switch from 0012h (Configured Station Alias) of ESC register.

Driver module reads the value of object 2007h-2Ah (Station alias selection) from backup EEPROM at the control power-on. If the value is 0, the value made of object 2007h-29h (Station alias setup(high)) and front panel rotary switch into 0012h (Configured Station Alias) of ESC register. Master reads this value.

Selection of station alias setting

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2007h	2Ah	Station Alias selection	-	0 to 2	I16	rw	No	ALL	Yes

Designates how to set a Station Alias.
Default configuration is 1.

value	Function
0	The value made of object 2007h-29h and front panel rotary switch is set as station alias. (Note 1)
1	The value saved at 0004h in the SII is set as station alias.
2	For manufacturer's use (Can not be set)

Note
Specifications are different from MINAS-A5B series.

(Note 1) When the setting value of the rotary switch and 2007h-29h are both 0, set 0 to StationAlias.

How to set the parameters with rotary switch and object

The Station Alias is set by combining a value (lower 8 bits) set by rotary switch and a value (upper 8 bits) in 2007h-29h (Station Alias setup (high)).

Station Alias	
Upper 8 bits	**Lower 8 bits**
Value set by 2007h-29h	Value set by rotary switch

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2007h	29h	Station Alias setup (high)	-	0 to 255	I16	rw	No	ALL	Yes

Designates upper 8 bits of the Station Alias.

◆ NOTE

- **Each setting is enabled when the control power is turned on. Therefore, if a value is changed after control power-on, the change is not yet effective. Note that the change will be effective at next control power-on. To avoid unnecessary problem, do not alter each value after control power-on.**

3.8.2.3 Reading the value of rotary switch from AL status code (Explicit device ID)

This explains the method of reading the value made of object 2007h-29h (Station alias setup(high)) (upper 8 bits) and front panel rotary switch (lower 8 bits) from AL Status Code(0134h).

The Station Alias read by this method is not that of 0012h (Configured Station Alias) of an ESC register.

Bit5 (ID Request) of AL Control(0120h) is set to 1.

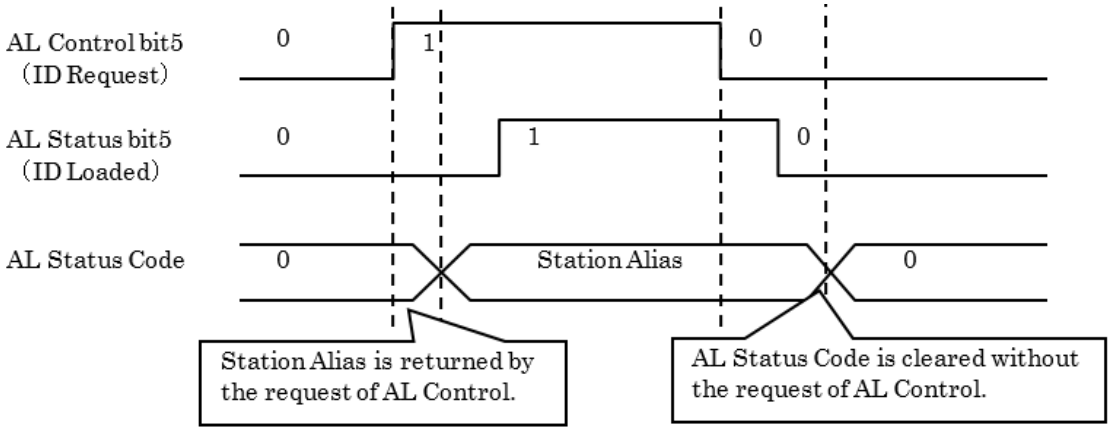
The Station Alias set up by a rotary switch (lower 8 bits) and 2007h-29h (upper 8 bits) returns to AL Status Code (0134h).

1 returns to bit5 (ID Loaded) of AL Status(0130h).

Bit5 (ID Request) of AL Control(0120h) is set to 0.

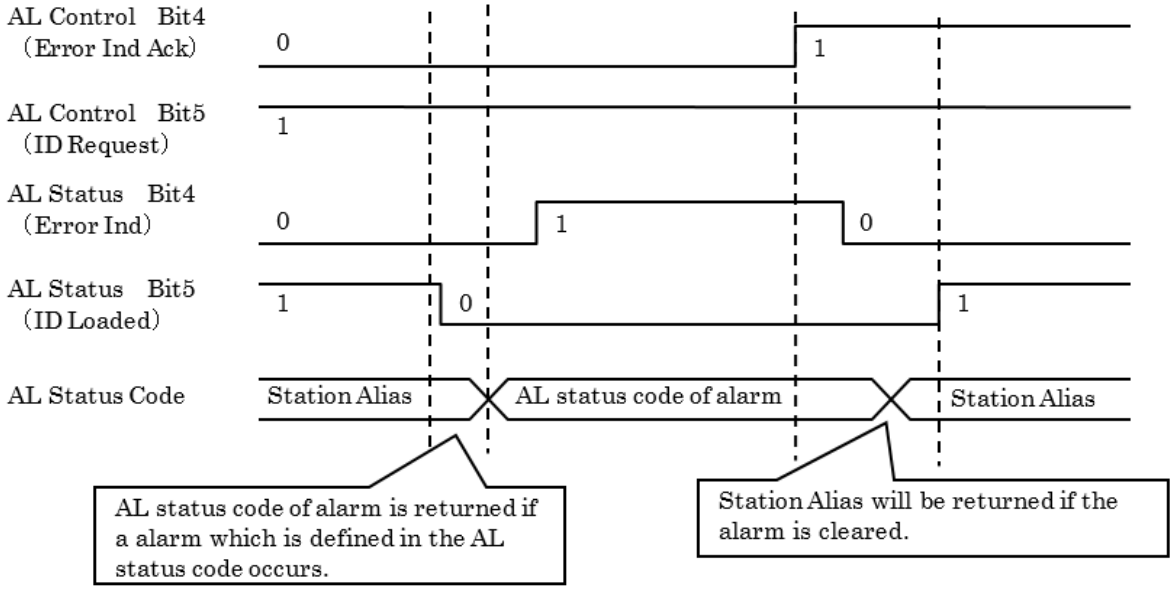
0 returns to bit5 (ID Loaded) of AL Status(0130h).

AL Status Code(0134h) is cleared.



Station alias : It is set up in rotary switch (lower 8 bit) and object 2007h-29h (Station alias setup (high)) (upper 8 bit)

In the period of returning Station Alias, if an alarm which is defined in the AL status code (Err80.0-7, Err81.0-7 and Err85.0-7 in the EtherCAT communication related errors) occurs, AL status code of the alarm is returned. When the alarm is cleared, Station Alias is returned again.



Refer to

To clear alarm, refer to “8.4 Clear error (alarm)/Clear warning”.

3.9 Ethernet over EtherCAT(EoE) function

Ethernet over EtherCAT (EoE) is a function that enables Ethernet packets to be transmitted within an EtherCAT segment between a master and a slave by encapsulating Ethernet packets into EtherCAT Mailbox packets. EoE communication uses the Mailbox.

MINAS A6 Multi supports EoE protocol with the host device (master). Previously, operation commands were issued from PANATERM for Multi or PANATERM for Safety connected via USB communication etc. With this function, by connecting the PC with setup support software (PANATERM for Multi/PANATERM for Safety) installed and servo amplifier (MINAS A6 Multi) with an EtherCAT communication cable, Operation commands from PANATERM for Multi and PANATERM for Safety can be issued via EtherCAT communication.

◆ NOTE

- **Set a fixed IP address for network settings to MINAS A6 Multi. Refer to the setting procedure section below for specific setting procedures.**
- **When not using EoE communication with MINAS A6 Multi, disable the Virtual Ethernet Switch function of the EtherCAT master or disable the slave EoE function of the EtherCAT master.**
- **In the MINAS A6 Multi series, two setup support software (PANATERM for Multi, PANATERM for Safety) can be used together.**

✓: Supported ✕:Not Supported

		PANATERM for Safety	
		Connect via EoEb communication	Connect via USB communication
PANATERM for Multi	Connect via EoE communication	✕ (Note 1)	✓
	Connect via USB communication	✓	✓

(Note 1) EoE communication with the servo amplifier cannot be performed simultaneously from both PANATERM for Multi and PANATERM for Safety. If EoE communication is performed at the same time, communication with the software with which EoE connection was established first takes priority, and the other EoE connection request is rejected until it is disconnected.

- **When extending the test run time-out period, the operation may not be reflected immediately depending on the network load status. Therefore, Perform test operation in a state where the main power supply can be shut off quickly.**
- **When PANATERM for Multi is connected via EoE communication, object writing with the object editor is not possible.Write to the object from CoE or USB communication PANATERM for Multi.**
- **MINAS A6 Multi does not support EoE TimeStamp specification.**

■ Supported protocols

MINAS A6 Multi supports the following TCP / IP stack protocols.

- IPv4(Internet Protocol version 4) *Supports only non-fragmented packets
- ARP(Address Resolution Protocol)
- ICMP(Internet Control Message Protocol)
- Receive Echo Request Message,Supports only Echo Reply Message transmission
- UDP(User Datagram Protocol)
- TCP(Transmission Control Protocol)

■ **Related objects**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
202Bh	-	EoE information display	-	-	-	-	-	-	-
		• EoE setting information is displayed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• The number of Sub-Index of 202Bh (EoE information display) is displayed.							
	01h	Virtual MAC address	-	-	VS	ro	No	ALL	No
		• The virtual MAC address(17byte) set for the device is displayed. Example: “02:01:05:30:03:e9” 18 to 22 bytes are NULL. The value after 23 bytes is undefined. The size of this object is 44 bytes including undefined values.							
	02h	IP address	-	-	VS	ro	No	ALL	No
		• The IP address (Max 15byte) set for the device is displayed. Example: “192.168.1.2” A 1-byte NULL is entered after the IP address.Values after the next data after NULL are undefined. The size of this object is 36 bytes including undefined values.							
	03h	Subnet mask	-	-	VS	ro	No	ALL	No
		• The subnet mask (Max 15byte) set for the device is displayed. Example: “255.255.255.0” A 1-byte NULL is entered after the subnet mask.Values after the next data after NULL are undefined. The size of this object is 36 bytes including undefined values.							
	04h	Default Gateway	-	-	VS	ro	No	ALL	No
		• The default gateway (Max 15byte) set for the device is displayed. Example: “172.16.8.12” A 1-byte NULL is entered after the default gateway.Values after the next data after NULL are undefined. The size of this object is 36 bytes including undefined values.							

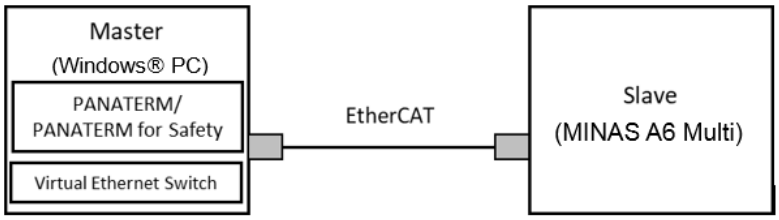
3.9.1 Setup steps

This section describes the setting procedure for performing EoE communication on the EtherCAT network between MINAS A6 Multi and the host device.

The setting procedure varies depending on the connection configuration of the device used. The setting procedure is described for the following two connection configurations.

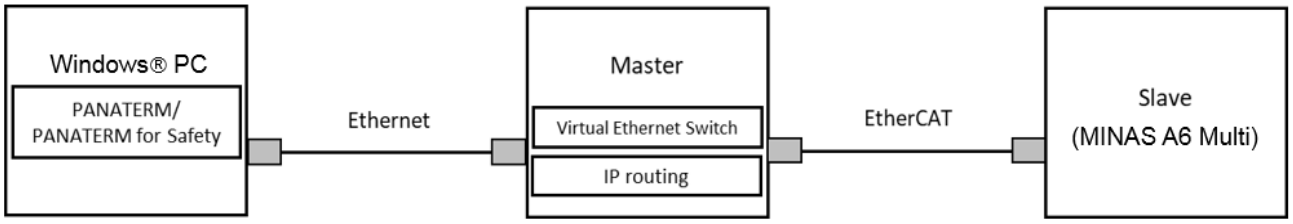
When the EtherCAT master and Windows® PC are the same

In this connection configuration, EtherCAT master and PANATERM for Multi / PANATERM for Safety operate on the same Windows® PC. Requests from PANATERM for Multi and PANATERM for Safety are converted to EoE datagrams within the EtherCAT master and transmitted to the slaves via EtherCAT communication.



When the EtherCAT master and Windows® PC are different

In this connection configuration, the Windows® PC running PANATERM for Multi and PANATERM for Safety is a separate device from the EtherCAT master. When communicating between a Windows® PC and a slave, it is transmitted to the EtherCAT master via Ethernet communication. The EtherCAT master performs IP routing settings in advance, converts the Ethernet data addressed to the slave into an EoE datagram, and sends it to the slave via EtherCAT communication.



In the following setting procedure, a setting example using Windows®10 as the Windows® PC OS is described.

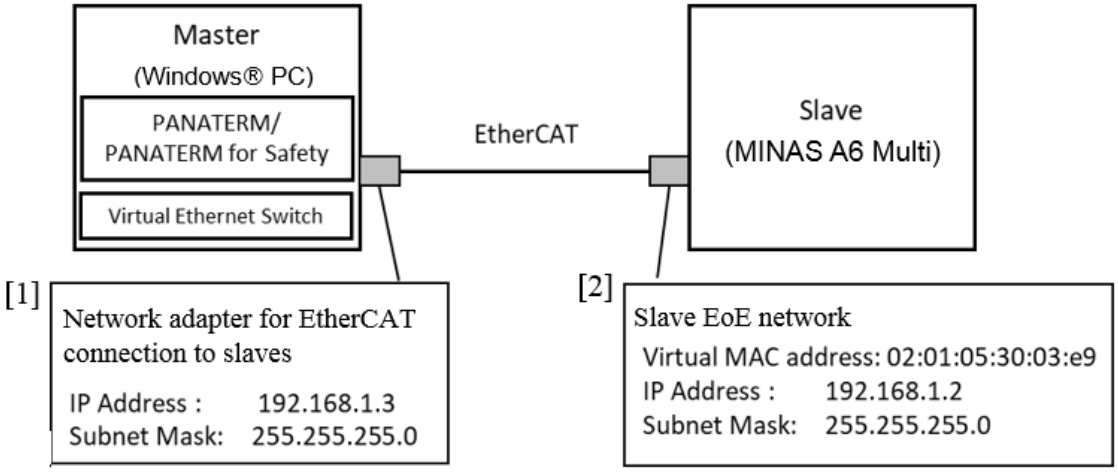
◆ Information

- **“Windows” is a registered trademark of Microsoft Corporation in the United States and other countries.**

3.9.1.1 When the EtherCAT master and Windows® PC are the same

In this configuration, EtherCAT Master and PANATERM for Multi, PANATERM for Safety operate on the same Windows® PC. The following is an example of network settings for each device.

The following setting procedure describes the procedure based on this setting example.



[1] EtherCAT master side setting example

■ **IP address setting**

Set the IP address information for the network adapter connected to the slave by EtherCAT. Set the IP address and subnet mask from the network setting screen on the OS in the master device. There is no need to set a default gateway.

Network adapter settings for EtherCAT connection with Slave

Item	Settings
IP address	192.168.1.3
Sub-net mask	255.255.255.0

■ **EoE settings**

Set the EoE setting on the master device side to master. In order to send Ethernet data generated by PANATERM for Multi / PANATERM for Safety on the master to the slave side as EoE, the virtual Ethernet switch function is enabled and the connection with the TCP / IP stack in the Windows® OS is enabled.

[2] Slave side setting example

■ **IP address setting**

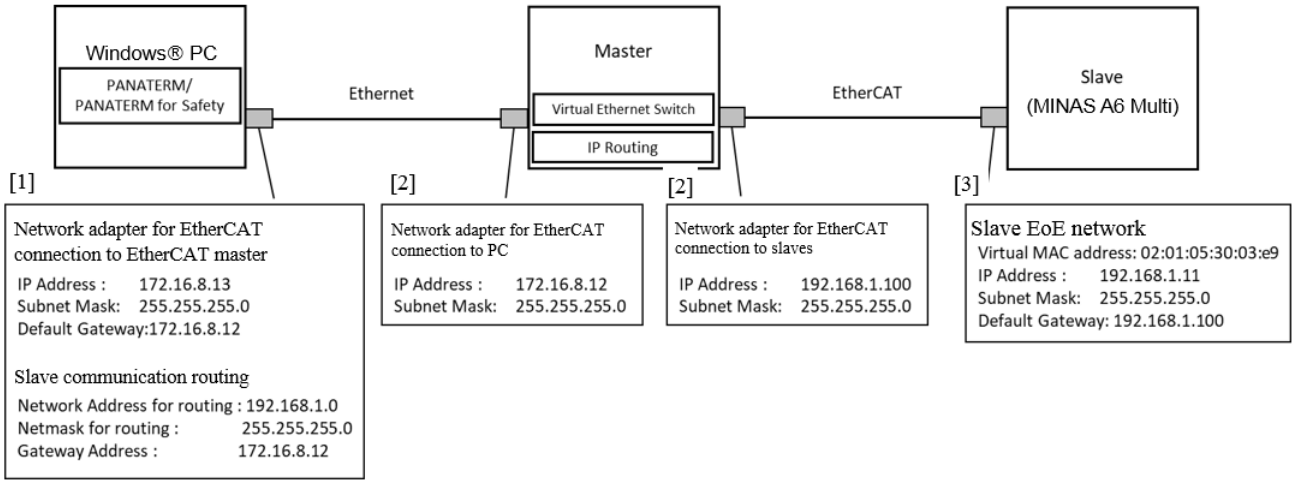
Set the IP address, subnet mask, and virtual MAC address of the slave connected to the EtherCAT master as the master. Set an IP address that is the same subnet as the IP address set in the EtherCAT master. There is no need to set a default gateway.

Slave side EoE network settings

Item	Settings
Virtual MAC address	02:01:05:30:03:e9
IP address	192.168.1.2
Sub-net mask	255.255.255.0

3.9.1.2 When the EtherCAT master and Windows® PC are different

In this configuration, the EtherCAT master and the Windows® PC running PANATERM for Multi and PANATERM for Safety operate on different devices. The following is an example of network settings for each device. The following setting procedure describes the procedure based on this setting example.



[1] Windows® PC side setting example

■ **IP address setting**

Set IP address information for the network adapter connected to the EtherCAT master via Ethernet. Set the IP address, subnet mask, and default gateway from the network settings screen on the Windows® PC.

Network adapter setting for Ethernet connection with EtherCAT master

Item	Settings
IP address	172.16.8.13
Sub-net mask	255.255.255.0
Default gateway	172.16.8.12

■ **Routing settings**

Adds route information for sending packets to the slave in the routing table on the Windows® PC. Add route information from the network settings screen on the Windows® PC.

Routing setting for slave communication

Item	Settings
Network Address for routing	192.168.1.0
Netmask for routing	255.255.255.0
Gateway Address	172.16.8.12

Setting example in Windows®OS

＞ ROUTE ADD 192.168.1.0 MASK 255.255.255.0 172.16.8.12 –p

[2] EtherCAT master side setting example

■ IP address setting

Set IP address information for both the network adapter connected to the Windows® PC via Ethernet and the network adapter connected to the slave via EtherCAT. Set the IP address information from the OS network settings screen on the master device.

Network adapter setting for Ethernet connection with Windows® PC

Item	Settings
IP address	172.16.8.12
Sub-net mask	255.255.255.0

Network adapter settings for EtherCAT connection with Slave

Item	Settings
IP address	192.168.1.100
Sub-net mask	255.255.255.0

■ Routing settings

To transfer Ethernet packets received from the PC to the slave, enable the IP routing function on the master device.

[3] EtherCAT slave side setting example

■ IP address setting

Set the IP address, subnet mask, default gateway, and virtual MAC address on the slave side to the master. For the IP address setting on the slave side, set an address that is the same subnet as the IP address set in the EtherCAT master.

Slave side EoE network settings

Item	Settings
Virtual MAC address	02:01:05:30:03:e9
IP address	192.168.1.11
Sub-net mask	255.255.255.0
default gateway	192.168.1.100

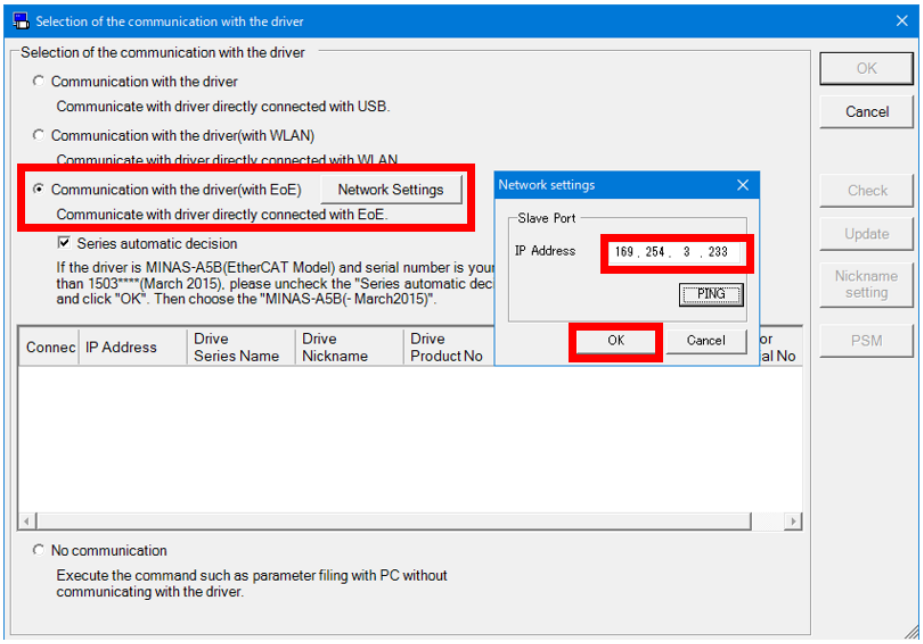
3.9.2 PANATERM for Multi / PANATERM for safety startup procedure

This section describes how to connect PANATERM for Multi / PANATERM for Safety via EoE communication. In both cases, EoE connection is established by specifying the IP address of the slave to be connected.

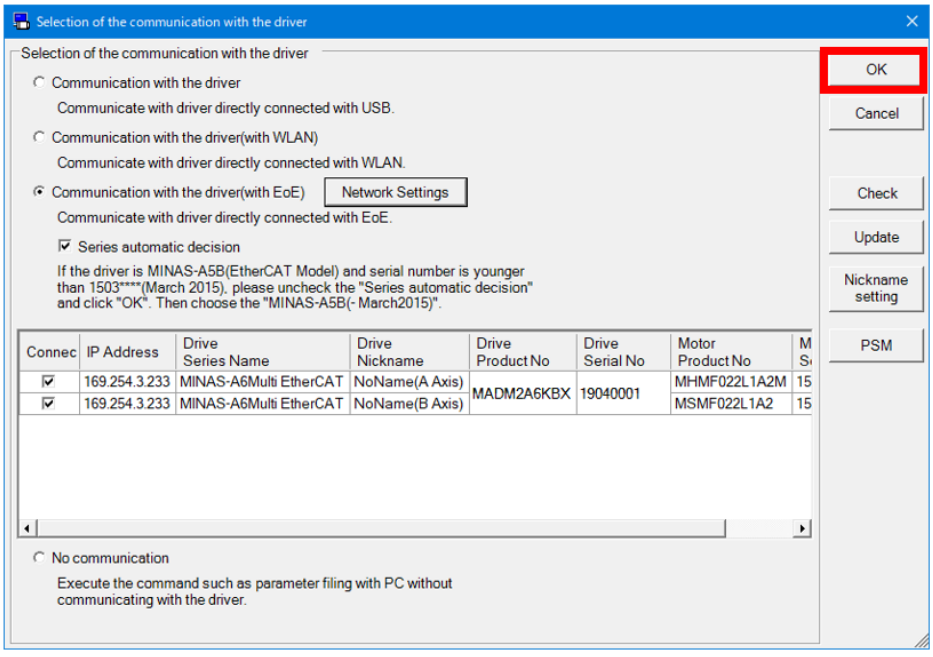
PANATERM for Multi connection method

◆ PROCEDURE

1. **After starting PANATERM for Multi, select "Connection with amplifier (EoE communication)" and "Network setting". Set the IP address of the slave in the “Network Settings” pop-up menu and select OK.**



2. **After a selection, a list of connected servo amplifiers will be displayed on the screen. After selecting the corresponding amplifier, select "OK". By the above operation, to start the communication with the servo amplifier in EoE.**



3.9.3 Connection method of PANATERM for Safety

When connecting PANATERM for Safety via EoE communication, it is necessary to enter the safety serial number (safety ID) assigned to each device as a password. This serial number can be confirmed by referring to the following object. Use PANATERM for Multi to check the value of the corresponding object.

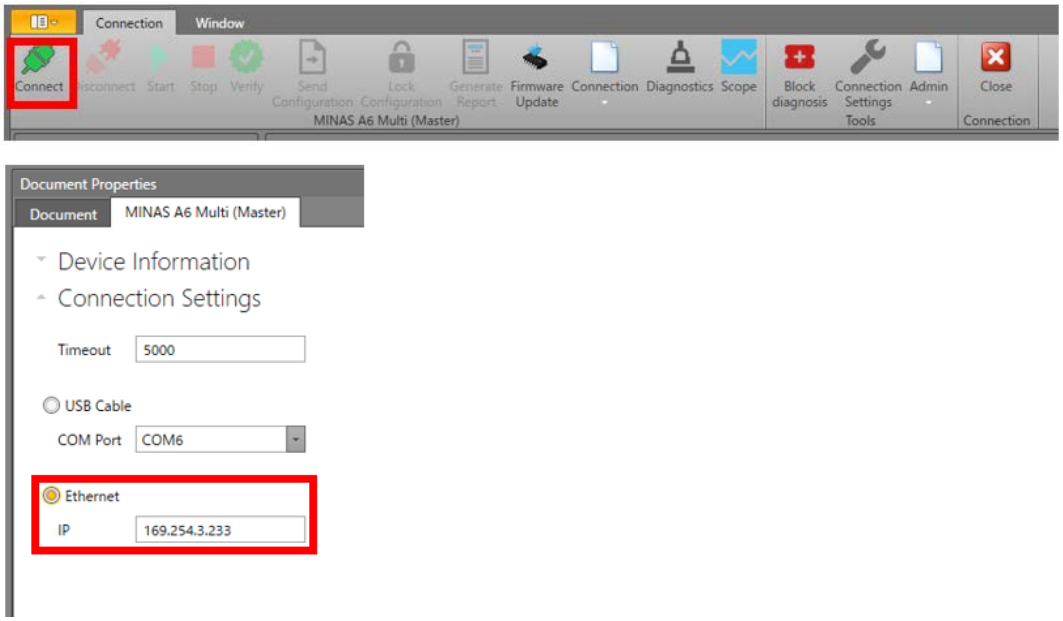
■ **Related objects**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
202Ch	06h	Safety serial number	-	0 to 4294967295	U32	ro	No	ALL	No
		• The serial number of the safety part (safety ID) is displayed.							

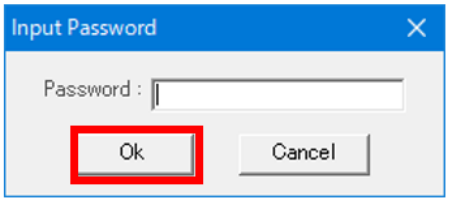
◆ PROCEDURE

1. **After starting PANATERM for Safety, select the Ethernet button on the "Connection setting" screen, set the IP address of the slave, and select "Connection".**

   At that time, the password input screen will be displayed.



2. **Enter the value of the object confirmed earlier and select "OK". By the above operation, to start the communication with the servo amplifier in EoE.**



4

Common Object Specification

4.1 Object configuration

Every object is addressed by 16 bits index which is represented as a 4-digit hexadecimal number and is placed in an object dictionary on an object group basis.

The table below lists the CoE (CANopen over EtherCAT) object dictionary defined in CiA402 and the MINAS A6 Multi series object dictionary.

Index	Contents			Refer to
	Object dictionary defined in CiA402	Object dictionary of MINAS-A6B	Object Dictionary of MINAS A6 Multi	
0000h to 0FFFh	Data type area	Data type area	Data type area	-
1000h to 1FFFh	CoE communication area	CoE communication area	CoE communication area (common to Axis A/B)	Chapter 5
2000h to 20FFh	Manufacturer-specific area	Reserved	Common object area (Note 1)	Chapter 7
2100h to 211Fh			Axis A servo parameter area (Note 2)	Chapter 7
2120h to 217Fh			Axis A command area (Note 3)	Chapter 6
2180h to 227Fh			Reserved	-
2280h to 22FFh			Axis A CoE communication copy area (Note 4)	Chapter 6
2300h to 23FFh			Axis A monitor area (Note 3)	Chapter 6
2400h to 24FFh			Reserved	-
2500h to 251Fh			Axis B servo parameter area (Note 2)	Chapter 7
2520h to 257Fh			Axis B command area (Note 3)	Chapter 6
2680h to 26FFh			Axis B CoE communication copy area (Note 4)	Chapter 6
2700h to 27FFh			Axis B monitor area (Note 3)	Chapter 6
2800h to 2FFFh			Reserved	-
3000h to 3FFFh		Servo parameter area	Reserved	-
4000h to 4FFFh		User-specific area	Reserved	-
5000h to 5FFFh		Reserved	Reserved	-
6000h to 6FFFh	Profile area	Drive profile area	Drive profile area	Chapter 6
7000h to 9FFFh		Reserved	Reserved	-
A000h to FFFFh	Reserved	Reserved	Reserved	-

(Note 1) Define the following objects in the common objects area:

- Shared attribute parameter objects : Servo parameter objects that are common to two axes
- Driver module objects: Monitoring system objects other than servo parameters
- Power module objects: Power module-related monitoring system objects
- EoE related objects: EoE related monitoring system objects
- safety related objects: safety related monitoring system objects

(Note 2) It corresponds to A6B series, 3000s object.

(Note 3) It corresponds to A6B series, 4000s object.

(Note 4) Define a copy object of the CoE communication object such as “1001h-00h: Error Register,” “10F3h: Diagnosis history,” etc.

5

CoE Communication Area (1000h to 1FFFh)

5.1 Object list

Index	Sub-Index	Name
1000h	00h	Device type
1001h	00h	Error register
1008h	00h	Manufacturer device name
1009h	00h	Manufacturer hardware version
100Ah	00h	Manufacturer software version
1010h		Store parameters
	00h	Number of entries
	01h	Save all parameters
1018h		Identity object
	00h	Number of entries
	01h	Vendor ID
	02h	Product code
	03h	Revision number
	04h	Serial number
10F3h		Diagnosis history
	00h	Number of entries
	01h	Maximum messages
	02h	Newest message
	03h	Newest acknowledged message
	04h	New messages available
	05h	Flags
	06h	Diagnosis message 1
	⋮	⋮
	13h	Diagnosis message 14
1600h		Receive PDO mapping 1 (Axis A)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	⋮	⋮
	20h	32nd receive PDO mapped
1601h		Receive PDO mapping 2 (Axis A)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	⋮	⋮
	20h	32nd receive PDO mapped

Index	Sub-Index	Name
1602h		Receive PDO mapping 3 (Axis A)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	⋮	⋮
	20h	32nd receive PDO mapped
1603h		Receive PDO mapping 4 (Axis A)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	⋮	⋮
	20h	32nd receive PDO mapped
1610h	-	Receive PDO mapping 1 (Axis B)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	:	:
	20h	32nd receive PDO mapped
1611h	-	Receive PDO mapping 2 (Axis B)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	:	:
	20h	32nd receive PDO mapped

Index	Sub-Index	Name
1612h	-	Receive PDO mapping 3 (Axis B)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	:	:
	20h	32nd receive PDO mapped
1613h	-	Receive PDO mapping 4 (Axis B)
	00h	Number of entries
	01h	1st receive PDO mapped
	02h	2nd receive PDO mapped
	03h	3rd receive PDO mapped
	04h	4th receive PDO mapped
	05h	5th receive PDO mapped
	06h	6th receive PDO mapped
	07h	7th receive PDO mapped
	08h	8th receive PDO mapped
	:	:
	20h	32nd receive PDO mapped
1A00h		Transmit PDO mapping 1 (Axis A)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped
1A01h		Transmit PDO mapping 2 (Axis A)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped

Index	Sub-Index	Name
1A02h		Transmit PDO mapping 3 (Axis A)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped
1A03h		Transmit PDO mapping 4 (Axis A)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped
1A10h		Transmit PDO mapping 1 (Axis B)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped
1A11h		Transmit PDO mapping 2 (Axis B)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped

Index	Sub-Index	Name
1A12h		Transmit PDO mapping 3 (Axis B)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped
1A13h		Transmit PDO mapping 4 (Axis B)
	00h	Number of entries
	01h	1st transmit PDO mapped
	02h	2nd transmit PDO mapped
	03h	3rd transmit PDO mapped
	04h	4th transmit PDO mapped
	05h	5th transmit PDO mapped
	06h	6th transmit PDO mapped
	07h	7th transmit PDO mapped
	08h	8th transmit PDO mapped
	⋮	⋮
	20h	32nd transmit PDO mapped
1C00h		Sync manager communication type
	00h	Number of used sync manager channels
	01h	Communication type sync manager 0
	02h	Communication type sync manager 1
	03h	Communication type sync manager 2
	04h	Communication type sync manager 3
1C12h		Sync manager channel 2
	00h	Number of assigned PDOs
	01h	PDO mapping object index of assigned RxPDO 1
	02h	PDO mapping object index of assigned RxPDO 2
	03h	PDO mapping object index of assigned RxPDO 3
	04h	PDO mapping object index of assigned RxPDO 4
1C13h		Sync manager channel 3
	00h	Number of assigned PDOs
	01h	PDO mapping object index of assigned TxPDO 1
	02h	PDO mapping object index of assigned TxPDO 2
	03h	PDO mapping object index of assigned TxPDO 3
	04h	PDO mapping object index of assigned TxPDO 4

Index	Sub-Index	Name
1C32h		Sync manager 2 synchronization
	00h	Number of sub-objects
	01h	Sync mode
	02h	Cycle time
	03h	Shift time
	04h	Sync modes supported
	05h	Minimum cycle time
	06h	Calc and copy time
	08h	Command
	09h	Delay time
	0Ah	Sync0 cycle time
	0Bh	Cycle time too small
	0Ch	SM-event missed
	0Dh	Shift time too short
	0Eh	RxPDO toggle failed
	20h	Sync error
1C33h		Sync manager 3 synchronization
	00h	Number of sub-objects
	01h	Sync mode
	02h	Cycle time
	03h	Shift time
	04h	Sync modes supported
	05h	Minimum cycle time
	06h	Calc and copy time
	08h	Command
	09h	Delay time
	0Ah	Sync0 cycle time
	0Bh	Cycle time too small
	0Ch	SM-event missed
	0Dh	Shift time too short
	0Eh	RxPDO toggle failed
	20h	Sync error

5.2 Device information

This section describes the objects for the device information of slaves.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1000h	00h	Device type	-	0 to 4294967295	U32	ro	No	ALL	No
		• Displays a device type. The value of the driver module is fixed at 00020192h.							
1001h	00h	Error register	-	0 to 255	U8	ro	No	ALL	No
		• It displays the type (state) of alarm that is generated at the driver module on the Axis A side. (Note 1) When an alarm does not occur, displays 0000h. No warning is displayed.							
1008h	00h	Manufacture device name	-	-	VS	ro	No	ALL	No
		• Displays a product model with 16 characters. If it is less than 16 characters long, add spaces (20h). NULL is 2 bytes at the end. The size of this object is 18 bytes.							
1009h	00h	Manufacture hardware version	-	-	VS	ro	No	ALL	No
		• Displays a product hardware version with 16 characters. If it is less than 16 characters long, add spaces (20h). NULL is 2 bytes at the end. The size of this object is 18 bytes.							
100Ah	00h	Manufacture software version	-	-	VS	ro	No	ALL	No
		• Displays a product software version 3 with 16 characters. If it is less than 16 characters long, add spaces (20h). NULL is 2 bytes at the end. The size of this object is 18 bytes.							

bit	Contents
0	(Not supported)
1	
2	
3	
4	The alarm which is defined in AL status code (Note 2)
5	(Not supported)
6	(reserved)
7	The alarm which is not defined in AL status code (Note 3)

Example:

byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
character	M	A	D	L	N	1	5	B	E	(space)						

Example: Hardware version: 1.23:

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
character	V	1	.	2	3	(space)										
Application	(Fixed)	Hardware version														

Example:

Byte	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
character	V	1	.	2	3	(space)										
Application	(Fixed)	Software version3														

(Note 1) There is also an object that displays the alarm type (state) on the Axis A side in 2280h-00h (Error register (Axis A)). Also, for alarm type (state) display on the Axis B side, check 2680h-00h (Error register (Axis B)).

(Note 2) "The alarm which is defined in AL status code" indicate Err80.0-4 and Err80.6-7, Err81.0-7, Err85.0-1, Err85.3 in the EtherCAT communication related error.

(Note 3) "The alarm which is not defined in AL status code" indicate Err85.2 and Err88.0-3 in the EtherCAT communication related error and other than EhterCAT communication related error.

Refer to

The details of alarm refer to “Chapter 8 EtherCAT Relevant Protection Functions”.

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Name
Description</th><th>Units</th><th>Range</th><th>Data Type</th><th>Access</th><th>PDO</th><th>Op-mode</th><th>EEPROM</th></tr>
<tr><td rowspan="10">1018h</td><td>-</td><td>Identity object</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">• Displays device information.</td></tr>
<tr><td>00h</td><td>Number of entries</td><td>-</td><td>0 to 255</td><td>U8</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• Represents the number of sub-indexes for this object.
The value is fixed at 04h.</td></tr>
<tr><td>01h</td><td>Vendor ID</td><td>-</td><td>0 to 4294967295</td><td>U32</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• Displays the EtherCAT Vender ID.
The value is fixed at 0000066Fh.</td></tr>
<tr><td>02h</td><td>Product code</td><td>-</td><td>0 to 4294967295</td><td>U32</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• Displays a product code.
Values vary depending on product models.
Servo drive system series judgment is possible from the value of bit31 to 28.
▼ Refer to
See the reference specifications “SX-DSV03454”.
<table>
<tr><th rowspan="2">bit</th><th colspan="2">Description</th></tr>
<tr><th>MINAS-A6B, A6 Multi series</th><th>MINAS-A5B series</th></tr>
<tr><td>31 to 28</td><td>6</td><td>5 or D</td></tr>
</table></td></tr>
<tr><td>03h</td><td>Revision number</td><td>-</td><td>0 to 4294967295</td><td>U32</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• Displays a revision number.
Example) In case of 1.23.
<table>
<tr><td>bit</td><td>31-28</td><td>27-24</td><td>23-20</td><td>19-16</td><td>15-12</td><td>11-8</td><td>7-4</td><td>3-0</td></tr>
<tr><td>value (hex)</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td><td>2</td><td>3</td></tr>
<tr><td>Application</td><td colspan="4">Major revision</td><td colspan="4">Minor revision</td></tr>
</table></td></tr>
<tr><td>04h</td><td>Serial number</td><td>-</td><td>0 to 4294967295</td><td>U32</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• Displays a product serial number.
• If the sequential number portion of product serial numbers is "A000" to "Z999", bit 15-0 of this object is FFFFh.
In that event, refer to 2029h-00h (Drive serial number).
Example) When nameplate product serial number is "P171020001N"
Sequential number portion
<table>
<tr><td>bit</td><td>31-28</td><td>27-24</td><td>23-20</td><td>19-16</td><td>15-12</td><td>11-8</td><td>7-4</td><td>3-0</td></tr>
<tr><td>value (hex)</td><td>1</td><td>7</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td></tr>
</table></td></tr>
<tr><td rowspan="2">202Fh
(Note 1)
(Note 2)</td><td>00h</td><td>Number of axes</td><td>-</td><td>0 to 255</td><td>U8</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• The maximum number of motor axes that can be driven by the driver module is displayed.</td></tr>
<tr><td rowspan="2">2107h</td><td>2Dh</td><td>Software version</td><td>—</td><td>-2147483648 to 2147483647</td><td>I32</td><td>ro</td><td>No</td><td>ALL</td><td>Yes</td></tr>
<tr><td colspan="9">• Displays software version1 and software version2.
Example) In case of the Software version1: 1.23 and Software version2: 4.56
<table>
<tr><td>bit</td><td>31-28</td><td>27-24</td><td>23-20</td><td>19-16</td><td>15-12</td><td>11-8</td><td>7-4</td><td>3-0</td></tr>
<tr><td>value (hex)</td><td>0</td><td>1</td><td>2</td><td>3</td><td>0</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td rowspan="2">Application</td><td rowspan="2">(reserved)</td><td colspan="2">Software version 1</td><td rowspan="2">(reserved)</td><td colspan="2">Software version 2</td></tr>
<tr><td>(major)</td><td>(minor)</td><td>(major)</td><td>(minor)</td></tr>
</table></td></tr>
</table>

(Note 1) Not supported in the first edition of the software version (Ver1.01).
(Note 2) Do not use in a software version of function expansion edition 1.

5.3 Sync manager communication type (1C00h)

Sets the object in 1C00h so as to allocate each Sync Manager to an operation mode.
This value of object is fixed this driver module.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1C00h		Sync manager communication type	-	-	-	-	-	-	-
		• Sets the operation mode of each Sync Manager.							
	00h	Number of used sync manager channels	-	0 to 255	U8	ro	No	ALL	No
		• Represents the number of sub-indexes for this object. The value is fixed at 4.							
	01h	Communication type sync manager 0	-	0 to 4	U8	ro	No	ALL	No
		• Sets the application of Sync Manager 0. 0: Not used 1: Reception through Mailbox (master to slave) 2: Sending through Mailbox (slave to master) 3: RxPDO (master to slave) 4: TxPDO (slave to master) Sync Manager 0 is used for receiving data through Mailbox, so the value is fixed at 1.							
	02h	Communication type sync manager 1	-	0 to 4	U8	ro	No	ALL	No
		• Sets the application of Sync Manager 1. 0: Not used 1: Reception through Mailbox (master to slave) 2: Sending through Mailbox (slave to master) 3: RxPDO (master to slave) 4: TxPDO (slave to master) Sync Manager 1 is used for sending data through Mailbox, so the value is fixed at 2.							
	03h	Communication type sync manager 2	-	0 to 4	U8	ro	No	ALL	No
		• Sets the application of Sync Manager 2. 0: Not used 1: Reception through Mailbox (master to slave) 2: Sending through Mailbox (slave to master) 3: RxPDO (master to slave) 4: TxPDO (slave to master) Sync Manager 2 is used for process data output (RxPDO), so the value is fixed at 3.							
	04h	Communication type sync manager 3	-	0 to 4	U8	ro	No	ALL	No
		• Sets the application of Sync Manager 3. 0: Not used 1: Reception through Mailbox (master to slave) 2: Sending through Mailbox (slave to master) 3: RxPDO (master to slave) 4: TxPDO (slave to master) Sync Manager 3 is used for process data input (TxPDO), so the value is fixed at 4.							

5.4 PDO (process data object) mapping

5.4.1 PDO assign object (1C12h to 1C13h)

Sets the object in 1C12h and 1C13h so as to allocate a PDO mapping table to a Sync Manager.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1C12h	-	Sync manager channel 2	-	-	-	-	-	-	-
		• Sets the PDO mapping object entry for Sync Manager 2. Sync Manager 2 is used as the process data output (RxPDO). It is possible to change this object value only when the ESM state is PreOP. Note • If the sub-index 00h is not cleared to 0 once, 01h - 04h cannot be changed.							
	00h	Number of assigned PDOs	-	0 to 4	U8	rw	No	ALL	Yes
		• Represents the number of assign object for this object.							
	01h	PDO mapping object index of assigned RxPDO 1	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
	02h	PDO mapping object index of assigned RxPDO 2	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
	03h	PDO mapping object index of assigned RxPDO 3	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
	04h	PDO mapping object index of assigned RxPDO 4	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
1C13h	-	Sync manager channel 3	-	-	-	-	-	-	-
		• Sets the PDO mapping object entry for Sync Manager 3. Sync Manager 3 is used as the process data input (TxPDO). It is possible to change this object value only when the ESM state is PreOP. Note If the sub-index 00h is not cleared to 0 once, 01h - 04h cannot be changed.							
	00h	Number of assigned PDOs	-	0 to 4	U8	rw	No	ALL	Yes
		• Represents the number of assign object for this object.							
	01h	PDO mapping object index of assigned TxPDO 1	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
	02h	PDO mapping object index of assigned TxPDO 2	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
	03h	PDO mapping object index of assigned TxPDO 3	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							
	04h	PDO mapping object index of assigned TxPDO 4	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes
		• Designate the PDO mapping object to be used.							

Refer to

For the outline of the PDO mapping, also refer to “3.7.1 PDO mapping object” and “3.7.2 PDO assign object”.

◆ NOTE

- **It is possible to change subindex 01h-04h of 1C12h,1C13h value only when the ESM state is PreOP and subindex00h=0. Abort Code(06010003h) is returned in any other state. After changing the settings, the PDO assign object is reflected when the sub-index 00h is set to number of subindexes to be used and the ESM state transitions to SafeOP.**

5.4.2 PDO mapping object (1600h to 1603h, 1610h to 1613h, 1A00h to 1A03h, 1A10h to 1A13h)

It is possible to use the following objects as the tables for PDO mapping: 1600h to 1603h, 1610h to 1613h for RxPDO, and 1A00h to 1A03h, 1A10h to 1A13h for TxPDO.

The subindex 01h or later indicate the information of the application object to be mapped.

Item	Description	
	RxPDO	TxPDO
Axis A PDO mapping object	1600h to 1603h	1A00h to 1A03h
Axib B PDO mapping object	1610h to 1613h	1A10h to 1A13h

◆ NOTE

- **It is not possible to mix the target object of Axis A and the target object of Axis B in the same mapping object. Only a target object of Axis A can be set to 1600h to 1603h and 1A00h to 1A03h. Also, only a target object of Axis B can be set to 1610h to 1613h and 1A10h to 1A13h.**
- **When a target object of Axis B is set to 1600h to 1603h, RxPDO assignment error protection (Err85.1) is generated. When a target object of Axis B is set to 1A00h to 1A03h, TxPDO assignment error protection (Err85.0) is generated.**
- **When a target object of Axis A is set to 1610h to 1613h, RxPDO assignment error protection (Err85.1) is generated. When a target object of Axis A is set to 1A10h to 1A13h, TxPDO assignment error protection (Err85.0) is generated.**
- **The common servo information monitor object (PDO support object for 2020h to 203Fh) can be set only for 1A00h to 1A03h (for A axis). If a common servo information monitor object is set for 1A10h to 1A13h (for B axis), TxPDO assignment error protection (Err85.0) occurs.**
- **When mapping an object exceeding 32 bytes on one axis, TxPDO assignment error protection (Err85.0) and RxPDO assignment error protection (Err85.1) are generated. Also, Depending on the combination of electronic gear ratio and communication cycle, the maximum PDO size that can be supported will change.**

  In MINAS A6 Multi Ver1.01, there are combinations of settings that cannot be partially supported compared to A6B single-axis products. An improper operation error protection (Err88.3) occurs when setting a combination that cannot be supported.

  For details, refer to the table below.

Operation mode	electronic gear ratio	Single axis PDO size [byte]		communication cycle [us]					
		RxPDO	TxPDO	125	250	500	1000	2000	4000
semi-closed or full-closed	1	≤6	≤6	✓	✓	✓	✓	✓	✓
		7 - 32	7 - 32	× (Err88.3)	× (Err88.3)	✓	✓	✓	✓
semi-closed	2 ^ n (n= An integer from 1 - 12)	≤25	≤25	× (Err88.3)	× (Err88.3)	✓	✓	✓	✓
		26 - 32	26 - 32	× (Err88.3)	× (Err88.3)	× (Err88.3)	✓	✓	✓
	1/1000 - 8000 (Other than 1 and 2 ^ n)	≤32	≤32	× (Err88.3)	× (Err88.3)	× (Err88.3)	✓	✓	✓
	Other than those above	≤32	≤32	× (Err88.3)	× (Err88.3)	× (Err88.3)	× (Err88.3)	× (Err88.3)	× (Err88.3)

RxPDO mapping object (Axis A)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1600h	-	Receive PDO mapping 1 (Axis A)	-	-	-	-	-	-	-
		• An object of RxPDO on Axis A is indicated. It is possible to change this object value only when the ESM state is PreOP. Note If the sub-index 00h is not cleared to 0 once, 01h - 20h cannot be changed.							
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes
		• Set the number of RxPDO objects mapped to this object.							
	01h	1st Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 1st.							
	02h	2nd Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 2nd. The same setting method as the sub-index 01h.							
	03h	3rd Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 3rd. The same setting method as the sub-index 01h.							
	04h	4th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 4th. The same setting method as the sub-index 01h.							
	05h	5th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 5th. The same setting method as the sub-index 01h.							
	06h	6th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 6th. The same setting method as the sub-index 01h.							
	07h	7th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 7th. The same setting method as the sub-index 01h.							
	08h	8th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 8th. The same setting method as the sub-index 01h.							
	⋮	⋮							
	20h	32nd Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 32nd. The same setting method as the sub-index 01h.							
1601h	-	Receive PDO mapping 2 (Axis A)	-	-	-	-	-	-	-
		• The specification of the subindex, etc. is the same as 1600h.							
1602h	-	Receive PDO mapping 3 (Axis A)	-	-	-	-	-	-	-
		• The specification of the subindex, etc. is the same as 1600h.							
1603h	-	Receive PDO mapping 4 (Axis A)	-	-	-	-	-	-	-
		• The specification of the subindex, etc. is the same as 1600h.							

bit	31 ... 16	15 ... 08	07 ... 01
	Index number	Subindex number	Bit length

◆ NOTE

- **Please do not overlap the same object mapping.**
  The action at the time of carrying out a duplication setup is not guaranteed.
- **Only a target object of Axis A can be set. If a target object of Axis B has been set, RxPDO assignment error protection (Err85.1) is generated.**
- **It is possible to change subindex 01h-20h of 1600h-1603h value only when the ESM state is PreOP and subindex00h=0. Abort Code(06010003h) is returned in any other state. After changing the settings, the PDO mapping object is reflected when the sub-index 00h is set to number of subindexes to be used and the ESM state transitions to SafeOP.**

RxPDO mapping object (Axis B)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1610h	-	Receive PDO mapping 1 (Axis B)	-	-	-	-	-	-	-
		• An object of RxPDO on Axis B is indicated. It is possible to change the setting value of this object only when the ESM state is PreOP. Note If the sub-index 00h is not cleared to 0 once, 01h to 20h cannot be changed.							
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes
		• Set the number of RxPDO objects mapped to this object.							
	01h	1st Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 1st.							
	02h	2nd Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 2nd. The same setting method as the sub-index 01h.							
	03h	3rd Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 3rd. The same setting method as the sub-index 01h.							
	04h	4th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 4th. The same setting method as the sub-index 01h.							
	05h	5th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 5th. The same setting method as the sub-index 01h.							
	06h	6th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 6th. The same setting method as the sub-index 01h.							
	07h	7th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 7th. The same setting method as the sub-index 01h.							
	08h	8th Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 8th. The same setting method as the sub-index 01h.							
	⋮	⋮							
	20h	32nd Receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 32nd. The same setting method as the sub-index 01h.							
1611h	-	Receive PDO mapping 2 (Axis B)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1600h.							
1612h	-	Receive PDO mapping 3 (Axis B)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1600h.							
1613h	-	Receive PDO mapping 4 (Axis B)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1600h.							

bit	31 ... 16	15 ... 08	07 ... 01
	Index number	Subindex number	Bit length

◆ NOTE

- **Please do not overlap the same object mapping. The action at the time of carrying out a duplication setup is not guaranteed.**
- **Only a target object of Axis B can be set. If a target object of Axis A has been set, RxPDO assignment error protection (Err85.1) is generated.**
- **It is possible to change sub-index 01h to 20h of 1610h to 1613h value only when the ESM state is PreOP and sub-index 00h=0. Abort Code (06010003h) is returned in any other state. After changing the settings, the PDO mapping object setting is reflected when the sub-index 00h is set to number of sub-indexes to be used and the ESM state transitions to SafeOP.**

TxPDO mapping object (Axis A)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1A00h	-	Transmit PDO mapping 1(Axis A)	-	-	-	-	-	-	-
		• An object of TxPDO on Axis A is indicated. It is possible to change this object value only when the ESM state is PreOP. Note If the sub-index 00h is not cleared to 0 once, 01h - 20h cannot be changed.							
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes
		• Set the number of TxPDO objects mapped to this object.							
	01h	1st Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 1st.							
	02h	2nd Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 2nd. The same setting method as the sub-index 01h.							
	03h	3rd Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 3rd. The same setting method as the sub-index 01h.							
	04h	4th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 4th. The same setting method as the sub-index 01h.							
	05h	5th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 5th. The same setting method as the sub-index 01h.							
	06h	6th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 6th. The same setting method as the sub-index 01h.							
	07h	7th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 7th. The same setting method as the sub-index 01h.							
	08h	8th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 8th. The same setting method as the sub-index 01h.							
	⋮	⋮							⋮
	20h	32nd Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 32nd. The same setting method as the sub-index 01h.							
1A01h	-	Transmit PDO mapping 2(Axis A)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1A00h.							
1A02h	-	Transmit PDO mapping 3(Axis A)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1A00h.							
1A03h	-	Transmit PDO mapping 4(Axis A)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1A00h.							

bit	31 ... 16	15 ... 08	07 ... 01
	Index number	Subindex number	Bit length

◆ NOTE

- **Please do not overlap the same object mapping. The action at the time of carrying out a duplication setup is not guaranteed.**
- **Only a target object of Axis A can be set. If a target object of Axis B has been set, TxPDO assignment error protection (Err85.0) is generated.**
- **It is possible to change sub-index 01h-20h of 1A00h-1A03h value only when the ESM state is PreOP and subindex00h=0. Abort Code(06010003h) is returned in any other state. After changing the settings, the PDO mapping object is reflected when the sub-index 00h is set to number of sub-indexes to be used and the ESM state transitions to SafeOP.**

TxPDO mapping object (Axis B)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1A10h	-	Transmit PDO mapping 1 (Axis B)	-	-	-	-	-	-	-
		• An object of TxPDO on Axis B is indicated. It is possible to change the setting value of this object only when the ESM state is PreOP. Note If the sub-index 00h is not cleared to 0 once, 01h to 20h cannot be changed.							
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes
		• Set the number of TxPDO objects mapped to this object.							
	01h	1st Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 1st.							
	02h	2nd Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 2nd. The same setting method as the sub-index 01h.							
	03h	3rd Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 3rd. The same setting method as the sub-index 01h.							
	04h	4th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 4th. The same setting method as the sub-index 01h.							
	05h	5th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 5th. The same setting method as the sub-index 01h.							
	06h	6th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 6th. The same setting method as the sub-index 01h.							
	07h	7th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 7th. The same setting method as the sub-index 01h.							
	08h	8th Transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 8th. The same setting method as the sub-index 01h.							
	⋮	⋮							⋮
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes
		• Set an object to be mapped 32nd. The same setting method as the sub-index 01h.							
1A11h	-	Transmit PDO mapping 2 (Axis B)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1A00h.							
1A12h	-	Transmit PDO mapping 3 (Axis B)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1A00h.							
1A13h	-	Transmit PDO mapping 4 (Axis B)	-	-	-	-	-	-	-
		• The specification of the sub-index, etc. is the same as 1A00h.							

bit	31 ... 16	15 ... 08	07 ... 01
	Index number	Subindex number	Bit length

◆ NOTE

- **Please do not overlap the same object mapping. The action at the time of carrying out a duplication setup is not guaranteed.**
- **Only a target object of Axis B can be set. If a target object of Axis A has been set, TxPDO assignment error protection (Err85.0) is generated.**
- **It is possible to change sub-index 01h-20h of 1A10h-1A13h value only when the ESM state is PreOP and sub-index 00h=0. Abort Code (06010003h) is returned in any other state. After changing the settings, the PDO mapping object setting is reflected when the sub-index 00h is set to number of sub-indexes to be used and the ESM state transitions to SafeOP.**

5.4.3 Default PDO mapping

This section describes the default PDO mapping definition in MINAS A6 Multi.

This default PDO mapping provides the values of the PDO mapping objects at the time of shipment. This mapping is defined in ESI File (.xml format).

Moreover, a shipment value is determined in the following formats.

bit	31 ... 16	15 ... 08	07 ... 01
	Index number	Subindex number	Bit size

PDO mapping 1

For position control mode (Touch probe available)

Axis A	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1600h)	6040h	00h	16	Controlword (Axis A)	60400010h
	6060h	00h	8	Modes of operation (Axis A)	60600008h
	607Ah	00h	32	Target Position (Axis A)	607A0020h
	60B8h	00h	16	Touch probe function (Axis A)	60B80010h
TxPDO (1A00h)	603Fh	00h	16	Error code (Axis A)	603F0010h
	6041h	00h	16	Statusword (Axis A)	60410010h
	6061h	00h	8	Modes of operation display (Axis A)	60610008h
	6064h	00h	32	Position actual value (Axis A)	60640020h
	60B9h	00h	16	Touch probe status (Axis A)	60B90010h
	60BAh	00h	32	Touch probe pos1 pos value (Axis A)	60BA0020h
	60F4h	00h	32	Following error actual value (Axis A)	60F40020h
	60FDh	00h	32	Digital inputs (Axis A)	60FD0020h

Axis B	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1610h)	6840h	00h	16	Controlword (Axis B)	68400010h
	6860h	00h	8	Modes of operation (Axis B)	68600008h
	687Ah	00h	32	Target Position (Axis B)	687A0020h
	68B8h	00h	16	Touch probe function (Axis B)	68B80010h
TxPDO (1A10h)	683Fh	00h	16	Error code (Axis B)	683F0010h
	6841h	00h	16	Statusword (Axis B)	68410010h
	6861h	00h	8	Modes of operation display (Axis B)	68610008h
	6864h	00h	32	Position actual value (Axis B)	68640020h
	68B9h	00h	16	Touch probe status (Axis B)	68B90010h
	68BAh	00h	32	Touch probe pos1 pos value (Axis B)	68BA0020h
	68F4h	00h	32	Following error actual value (Axis B)	68F40020h
	68FDh	00h	32	Digital inputs (Axis B)	68FD0020h

PDO mapping 2

For position, velocity, and torque control mode (Touch probe available)

Axis A	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1601h)	6040h	00h	16	Controlword (Axis A)	60400010h
	6060h	00h	8	Modes of operation (Axis A)	60600008h
	6071h	00h	16	Target Torque (Axis A)	60710010h
	607Ah	00h	32	Target Position (Axis A)	607A0020h
	6080h	00h	32	Max motor speed (Axis A)	60800020h
	60B8h	00h	16	Touch probe function (Axis A)	60B80010h
	60FFh	00h	32	Target Velocity (Axis A)	60FF0020h
TxPDO (1A01h)	603Fh	00h	16	Error code (Axis A)	603F0010h
	6041h	00h	16	Statusword (Axis A)	60410010h
	6061h	00h	8	Modes of operation display (Axis A)	60610008h
	6064h	00h	32	Position actual value (Axis A)	60640020h
	606Ch	00h	32	Velocity actual value (Axis A)	606C0020h
	6077h	00h	16	Torque actual value (Axis A)	60770010h
	60B9h	00h	16	Touch probe status (Axis A)	60B90010h
	60BAh	00h	32	Touch probe pos1 pos value (Axis A)	60BA0020h
	60FDh	00h	32	Digital inputs (Axis A)	60FD0020h

Axis B	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1611h)	6840h	00h	16	Controlword (Axis B)	68400010h
	6860h	00h	8	Modes of operation (Axis B)	68600008h
	6871h	00h	16	Target Torque (Axis B)	68710010h
	687Ah	00h	32	Target Position (Axis B)	687A0020h
	6880h	00h	32	Max motor speed (Axis B)	68800020h
	68B8h	00h	16	Touch probe function (Axis B)	68B80010h
	68FFh	00h	32	Target Velocity (Axis B)	68FF0020h
TxPDO (1A11h)	683Fh	00h	16	Error code (Axis B)	683F0010h
	6841h	00h	16	Statusword (Axis B)	68410010h
	6861h	00h	8	Modes of operation display (Axis B)	68610008h
	6864h	00h	32	Position actual value (Axis B)	68640020h
	686Ch	00h	32	Velocity actual value (Axis B)	686C0020h
	6877h	00h	16	Torque actual value (Axis B)	68770010h
	68B9h	00h	16	Touch probe status (Axis B)	68B90010h
	68BAh	00h	32	Touch probe pos1 pos value (Axis B)	68BA0020h
	68FDh	00h	32	Digital inputs (Axis B)	68FD0020h

PDO mapping 3

For position and velocity control mode (Touch probe and torque limit available)

Axis A	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1602h)	6040h	00h	16	Controlword (Axis A)	60400010h
	6060h	00h	8	Modes of operation (Axis A)	60600008h
	6072h	00h	16	Max torque (Axis A)	60720010h
	607Ah	00h	32	Target Position (Axis A)	607A0020h
	60B8h	00h	16	Touch probe function (Axis A)	60B80010h
	60FFh	00h	32	Target Velocity (Axis A)	60FF0020h
	6040h	00h	16	Controlword (Axis A)	60400010h
TxPDO (1A02h)	603Fh	00h	16	Error code (Axis A)	603F0010h
	6041h	00h	16	Statusword (Axis A)	60410010h
	6061h	00h	8	Modes of operation display (Axis A)	60610008h
	6064h	00h	32	Position actual value (Axis A)	60640020h
	606Ch	00h	32	Velocity actual value (Axis A)	606C0020h
	6077h	00h	16	Torque actual value (Axis A)	60770010h
	60B9h	00h	16	Touch probe status (Axis A)	60B90010h
	60BAh	00h	32	Touch probe pos1 pos value (Axis A)	60BA0020h
	60FDh	00h	32	Digital inputs (Axis A)	60FD0020h

Axis B	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1612h)	6840h	00h	16	Controlword (Axis B)	68400010h
	6860h	00h	8	Modes of operation (Axis B)	68600008h
	6872h	00h	16	Max torque (Axis B)	68720010h
	687Ah	00h	32	Target Position (Axis B)	687A0020h
	68B8h	00h	16	Touch probe function (Axis B)	68B80010h
	68FFh	00h	32	Target Velocity (Axis B)	68FF0020h
	6840h	00h	16	Controlword (Axis B)	68400010h
TxPDO (1A12h)	683Fh	00h	16	Error code (Axis B)	683F0010h
	6841h	00h	16	Statusword (Axis B)	68410010h
	6861h	00h	8	Modes of operation display (Axis B)	68610008h
	6864h	00h	32	Position actual value (Axis B)	68640020h
	686Ch	00h	32	Velocity actual value (Axis B)	686C0020h
	6877h	00h	16	Torque actual value (Axis B)	68770010h
	68B9h	00h	16	Touch probe status (Axis B)	68B90010h
	68BAh	00h	32	Touch probe pos1 pos value (Axis B)	68BA0020h
	68FDh	00h	32	Digital inputs (Axis B)	68FD0020h

PDO mapping 4

For position, velocity, and torque control mode (Touch probe and torque limit available)

Axis A	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1603h)	6040h	00h	16	Controlword (Axis A)	60400010h
	6060h	00h	8	Modes of operation (Axis A)	60600008h
	6071h	00h	16	Target Torque (Axis A)	60710010h
	6072h	00h	16	Max torque (Axis A)	60720010h
	607Ah	00h	32	Target Position (Axis A)	607A0020h
	6080h	00h	32	Max motor speed (Axis A)	60800020h
	60B8h	00h	16	Touch probe function (Axis A)	60B80010h
	60FFh	00h	32	Target Velocity (Axis A)	60FF0020h
TxPDO (1A03h)	603Fh	00h	16	Error code (Axis A)	603F0010h
	6041h	00h	16	Statusword (Axis A)	60410010h
	6061h	00h	8	Modes of operation display (Axis A)	60610008h
	6064h	00h	32	Position actual value (Axis A)	60640020h
	606Ch	00h	32	Velocity actual value (Axis A)	606C0020h
	6077h	00h	16	Torque actual value (Axis A)	60770010h
	60B9h	00h	16	Touch probe status (Axis A)	60B90010h
	60BAh	00h	32	Touch probe pos1 pos value (Axis A)	60BA0020h
	60FDh	00h	32	Digital inputs (Axis A)	60FD0020h

Axis B	Index	Sub-Index	Size (bit)	Name	Shipment value
RxPDO (1613h)	6840h	00h	16	Controlword (Axis B)	68400010h
	6860h	00h	8	Modes of operation (Axis B)	68600008h
	6871h	00h	16	Target Torque (Axis B)	68710010h
	6872h	00h	16	Max torque (Axis B)	68720010h
	687Ah	00h	32	Target Position (Axis B)	687A0020h
	6880h	00h	32	Max motor speed (Axis B)	68800020h
	68B8h	00h	16	Touch probe function (Axis B)	68B80010h
	68FFh	00h	32	Target Velocity (Axis B)	68FF0020h
TxPDO (1A13h)	683Fh	00h	16	Error code (Axis B)	683F0010h
	6841h	00h	16	Statusword (Axis B)	68410010h
	6861h	00h	8	Modes of operation display (Axis B)	68610008h
	6864h	00h	32	Position actual value (Axis B)	68640020h
	686Ch	00h	32	Velocity actual value (Axis B)	686C0020h
	6877h	00h	16	Torque actual value (Axis B)	68770010h
	68B9h	00h	16	Touch probe status (Axis B)	68B90010h
	68BAh	00h	32	Touch probe pos1 pos value (Axis B)	68BA0020h
	68FDh	00h	32	Digital inputs (Axis B)	68FD0020h

5.4.4 PDO mapping setting procedure

The procedure for setting the PDO mapping is explained using the case where 6081h-00h (Profile velocity (Axis A)) is added to 1600h (Receive PDO mapping 1(Axis A))) as an example.

■ **Before change**

Index	Set value	Object Contents	
1600h-01h	60400010h	6040h-00h	Controlword (Axis A))
1600h-02h	60600008h	6060h-00h	Modes of operation (Axis A))
1600h-03h	607A0020h	607Ah-00h	Target Position (Axis A))
1600h-04h	60B80010h	60B8h-00h	Touch probe function (Axis A))

■ **After change**

Index	Set value	Object Contents		
1600h-01h	60400010h	6040h-00h	Controlword (Axis A))	
1600h-02h	60600008h	6060h-00h	Modes of operation (Axis A))	
1600h-03h	607A0020h	607Ah-00h	Target Position (Axis A))	
1600h-04h	60B80010h	60B8h-00h	Touch probe function (Axis A))	
1600h-05h	60810020h	6081h-00h	Profile velocity (Axis A))	← Addition

Setting method 1: In case of setting using SDO message

◆ **PROCEDURE**

1. **Transition the ESM status from Init to PreOP.**

   It will be possible to transmit the SDO message using the Mailbox protocol.

2. **Set the value of 1600h-00h to 0 with the SDO message.**

   To change SubIndex = 01h or later, it is necessary to set it to 0 temporarily.

3. **Set the value of 1600h-05h to 60810020h with the SDO message.**

   The meaning of 60810020h of the set value is the following.

6	0	8	1	0	0	2	0	h
Index number				SubIndex number		Bit length		

4. **Set the value of 1600h-00h to 5 with the SDO message.**

   It means that the setting of 1600h is used until SubIndex = 05h.

5. **Transition the ESM status from PreOP to SafeOP.**

   TxPDO will be effective.

6. **Transition the ESM status from SafeOP to OP.**

   RxPDO will be effective.

◆ **NOTE**

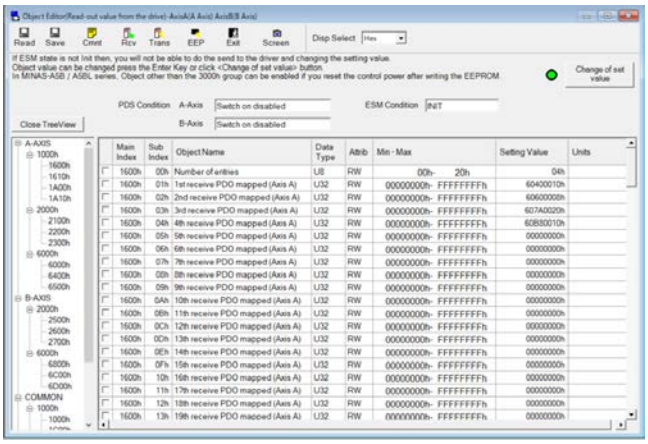
- **If the change description is written into EEPROM by setting the value of 1010-01h to 65766173h with the SDO message after the setting of 4), the setting of 2) to 4) will be unnecessary from the next activation. For the writing method of EEPROM, refer to "5.6 Store parameters (Write object in EEPROM) (1010h)".**

Setting method 2: In case of setting using object editor function of PANATERM for Multi

◆PROCEDURE

1. **Transition the ESM status to Init to activate the object editor.**

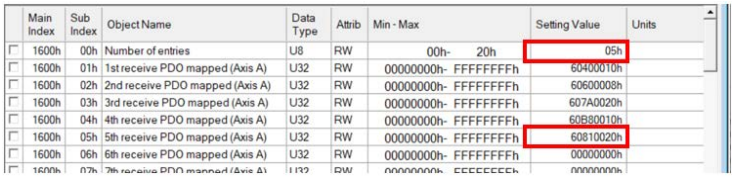
   If setting an object from the object editor, it is necessary to set the ESM status to Init.



2. **Set the value of 1600h-00h to 5 and click the “Change of set value” or press the Enter key.**

3. **Set the value of 1600h-05h to 60810020h and click the “Change of set value” or press the Enter key.**

   If setting it from the object editor, it is not necessary to set the value of 1600h-00h to 0 temporarily. Also, even if the order of 2) and 3) is changed, there is no problem.



	Main Index	Sub Index	Object Name	Data Type	Attrib	Min - Max	Setting Value	Units
	1600h	00h	Number of entries	U8	RW	00h- 20h	05h	
	1600h	01h	1st receive PDO mapped (Axis A)	U32	RW	00000000h- FFFFFFFFh	60400010h	
	1600h	02h	2nd receive PDO mapped (Axis A)	U32	RW	00000000h- FFFFFFFFh	60600008h	
	1600h	03h	3rd receive PDO mapped (Axis A)	U32	RW	00000000h- FFFFFFFFh	607A0020h	
	1600h	04h	4th receive PDO mapped (Axis A)	U32	RW	00000000h- FFFFFFFFh	60B80010h	
	1600h	05h	5th receive PDO mapped (Axis A)	U32	RW	00000000h- FFFFFFFFh	60810020h	
	1600h	06h	6th receive PDO mapped (Axis A)	U32	RW	00000000h- FFFFFFFFh	00000000h	

4. **Transition the ESM status from init to PreOP.**

5. **Transition the ESM status from PreOP to SafeOP.**

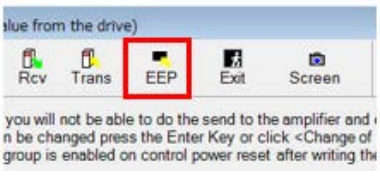
   TxPDO will be effective.

6. **Transition the ESM status from SafeOP to OP.**

   RxPDO will be effective.

◆NOTE

- **If setting value are store EEPROM by clicking "EEP" icon after method 2) and 3), method 2) and 3) are not required from the next startup. When writing (editing) values from the object editor, in MINAS-A5B series, it was necessary to restart the driver after writing the EEPROM. However, in MINAS A6 Multi series and MINAS-A6B series, it will be immediately reflected to actual object (for reflection to actual operation, please check the specification of each object). Be careful as the behavior is different from MINAS-A5B.**



5.5 Sync manager 2/3 synchronization (1C32h, 1C33h)

Set Sync manager 2 with 1C32h (Sync manager 2 synchronization) and Sync manager 3 with 1C33h (Sync manager 3 synchronization).

Sync manager 2 synchronization

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Name
Description</th><th>Units</th><th>Range</th><th>Data Type</th><th>Access</th><th>PDO</th><th>Op-mode</th><th>EEPROM</th></tr>
<tr><td rowspan="6">1C32h</td><td>-</td><td>Sync manager 2 synchronization</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td colspan="9">• Sync manager2 is set up.</td></tr>
<tr><td>00h</td><td>Number of sub-objects</td><td></td><td>0 to 255</td><td>U8</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">• Represents the number of sub-indexes for this object. The value is fixed at 20h.</td></tr>
<tr><td>01h</td><td>Sync mode</td><td>-</td><td>0 to 65535</td><td>U16</td><td>rw</td><td>No</td><td>ALL</td><td>Yes</td></tr>
<tr><td colspan="9">• Set the synchronous mode of Sync Manager 2.
00h: Free Run (not synchronized)
01h: SM2 (synchronized with SM2 Event) (Not supported)
02h: DC SYNC0 (synchronized with Sync0 Event)
03h: Not supported (Can not be set)
• In accordance with the combination with the setting of ESC register 0981h (DC-Activation) (following table), set the set value of this object to the transition time from PreOP to SafeOP automatically.
<table>
<tr><th>ESC register 0981h set status</th><th>1C32h-01h set value</th><th></th><th>Value of 1C32h-01h changed at time of transition from PreOP to SafeOP</th></tr>
<tr><td rowspan="3">DC enable ON</td><td>00h: FreeRun</td><td rowspan="6">⇒</td><td>02h: DC SYNC0</td></tr>
<tr><td>01h: SM2</td><td>02h: DC SYNC0</td></tr>
<tr><td>02h: DC SYNC0</td><td>02h: DC SYNC0</td></tr>
<tr><td rowspan="3">DC enable OFF</td><td>00h: FreeRun</td><td>00h: FreeRun</td></tr>
<tr><td>01h: SM2</td><td>01h: SM2</td></tr>
<tr><td>02h: DC SYNC0</td><td>00h: FreeRun</td></tr>
</table>
Note
SM2 synchronization is not supported in this software version.
01h: Do not set SM2.</td></tr>
<tr><td>02h</td><td>Cycle time</td><td>ns</td><td>0 to 4294967295</td><td>U32</td><td>rw</td><td>No</td><td>ALL</td><td>Yes</td></tr>
<tr><td colspan="9">• Sets the cycle of Sync Manager.
<table>
<tr><th>Sync mode (1C32h-01h)</th><th>Function</th></tr>
<tr><td>00h (FreeRun)</td><td>Set an event interval with a local timer. 0 can be also set.</td></tr>
<tr><td>01h (Synchronous with SM2)</td><td>Set the minimum interval of the SM2 event.</td></tr>
<tr><td>02h (DC SYNC0)</td><td>Set Sync0 Cycle Time (ESC register: 0x9A0h).</td></tr>
</table>
• Set 125000 (125 µs), 250000 (250 µs), 500000 (500 µs), 1000000 (1 ms), 2000000 (2 ms), or 4000000 (4 ms). Setting other values causes Err81.0 (Synchronization cycle error protection).</td></tr>
<tr><td>03h</td><td>Shift time</td><td>ns</td><td>0 to 4294967295</td><td>U32</td><td>ro</td><td>No</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="9">Not supported</td></tr>
</table>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1C32h	04h	Sync modes supported	-	0 to 65535	U16	ro	No	ALL	No

• Sets the synchronous type to be supported.

Bit No.	Description
0	Free Run mode support 0: Not supported, 1: FreeRun mode support This driver module will be set to 1
1	SM synchronous mode support 0: Not supported, 1: SM2 event synchronous support This driver module will be set to 1
4 to 2	DC synchronous type support 000b: Not supported, 001b: DC Sync 0 event support This driver module will be set to 001b
6 to 5	Output shift support 00b: Not supported, 01b: Shift support for a local timer This driver module will be set to 00b
15 to 7	Reserved

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
05h	Minimum cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No

• This is the minimum value of the configurable communication cycle. It is 125000 for this driver module. (Note 1)

Set 125000 (1250µs), 250000 (250 µs), 500000 (500 µs), 1000000 (1 ms), 2000000 (2 ms), or 4000000 (4 ms) to 1C32h-02h. Setting other values causes Err81.0 (Synchronization cycle error protection).

Note

As for MINAS-A5B series, this object is the minimal value from the SM2 event or SYNC0 event to completion of writing or reading out to ESC. In this case, it is 40000 for this driver module. (Note 1)

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
06h	Calc and copy time	ns	0 to 4294967295	U32	ro	No	ALL	No

• Time from the SM2 event or SYNC0 event to completion of reading out to the ESC.

This time may become longer if signals vary.
It is 30000 for this driver module. (Note 1)

Note

As for MINAS-A5B series, this object is the time from the SM2 event or SYNC0 event to completion of generation of PWM signal. In this case, it is 225000 for this driver module. (Note 1)

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
08h	Command	-	0 to 65535	U16	ro	No	ALL	No

• Not supported

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
09h	Delay Time	ns	0 to 4294967295	U32	ro	No	ALL	No

• Time from the PWM command output to the turning ON/OFF of power transistor output.
It is 0 for this driver module. (Note 1)

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
0Ah	Sync0 cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No

• In the case of DC SYNC0 (1C32h-01h=02h), the value 09A0h is set to the ESC register.
In other cases, 0 is set.

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
0Bh	Cycle time too small	-	0 to 65535	U16	ro	No	ALL	No

Not supported

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
0Ch	SM-event missed	-	0 to 65535	U16	ro	No	ALL	No

Not supported

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
0Dh	Shift time too short	-	0 to 65535	U16	ro	No	ALL	No

Not supported

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
0Eh	RxPDO toggle failed	-	0 to 65535	U16	ro	No	ALL	No

Not supported

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
20h	Sync error	-	0 to 1	BOOL	ro	No	ALL	No

Not supported

(Note 1) These setting values are only for reference and do not guarantee their descriptions.

Sync manager 3 synchronization

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1C33h	-	Sync manager 3 synchronization	-	-	-	-	-	-	-
		• Sync manager3 is set up.							
	00h	Number of sub-objects	-	0 to 255	U8	ro	No	ALL	No
		• Represents the number of sub-indexes for this object. The value is fixed at 20h.							
	01h	Sync mode	-	0 to 65535	U16	rw	No	ALL	Yes
		• Set the synchronous mode of Sync Manager 3. 00h: Free Run (not synchronized) 01h: Not supported (Cannot be set) 02h: DC SYNC0 (synchronized with Sync0 Event) 03h: Not supported (Cannot be set) 22h: SM2 (Synchronous with SM2 Event) (Not supported) • In accordance with the combination with the setting of ESC register 0981h (DC-Activation) (following table), set the set value of this object to the transition time from PreOP to SafeOP automatically.							

ESC register 0981h set status	1C33h-02h set value		Value of 1C33h-02h changed at time of transition from PreOP to SafeOP
DC enable ON	00h: FreeRun	⇒	02h: DC SYNC0
	22h: SM2		02h: DC SYNC0
	02h: DC SYNC0		02h: DC SYNC0
DC enable OFF	00h: FreeRun		00h: FreeRun
	22h: SM2		22h: SM2
	02h: DC SYNC0		00h: FreeRun

Note

SM2 synchronization is not supported in this software version.
22h: Do not set SM2.

	02h	Cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No
		• Sets the cycle of Sync Manager. The same value is set as 1C32h:02h.							
	03h	Shift time (Not supported)	ns	0 to 4294967295	U32	rw	No	ALL	No
		• Set the time from the Sync0 and SM2 events until slave CPU write value of the RxPDO to ESC. Set the value in steps of 125000 and value under Cycle time. Normally, set 0.							

Note

Input shift time is not supported in this software version.
Do not set 1C33h-03h (Shift time) to other than 0.

	04h	Sync modes supported	-	0 to 65535	U16	ro	No	ALL	No
		• Sets the synchronous type to be supported.							

Bit No.	Description
0	Free Run mode support 0: Not supported, 1: Free run mode support This driver module will be set to 1
1	SM synchronous mode support 0: Not supported, 1: SM2 event synchronous support This driver module will be set to 1
4 to 2	DC synchronous type support 000b: Not supported, 001b: DC Sync0 event support This driver module will be set to 001b
6 to 5	DC synchronous type support 000b: Not supported, 001b: DC Sync0 event support This driver module will be set to 001b
15 to 7	Reserved

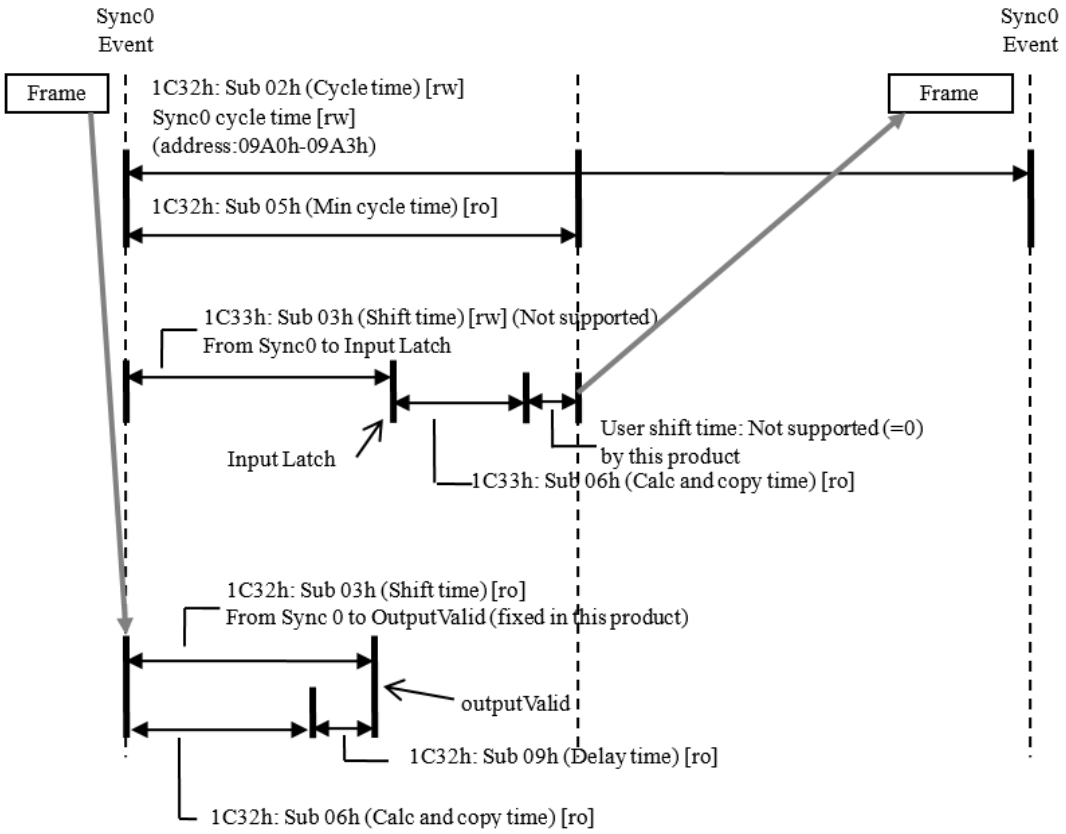
Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1C33h	05h	Minimum cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No
		• This is the minimum value of the configurable communication cycle. The same value as 1C32h:05h. Note As for MINAS-A5B series, this object is the minimal value from the SM2 event or SYNC0 event to completion of writing or reading out to ESC.							
	06h	Calc and copy time	ns	0 to 4294967295	U32	ro	No	ALL	No
		• This is the time from the SM2 event or SYNC0 event to completion of writing into the ESC register. It is 40000 for this driver module. (Note 1) Note As for MINAS-A5B series, this object is the time from the data latching in the encoder to the writing of communication data in the ESC register. In this case, it is 210000 for this driver module. (Note 1)							
	08h	Command	-	0 to 65535	U16	ro	No	ALL	No
		Not supported							
	09h	Delay time	ns	0 to 4294967295	U32	ro	No	ALL	No
		Time from the PWM command output to the turning ON/OFF of power transistor output. The same value as 1C32h:09h.							
	0Ah	Sync0 cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No
		The same value as 1C32h-0Ah.							
	0Bh	Cycle time too small	-	0 to 65535	U16	ro	No	ALL	No
		Not supported							
	0Ch	SM-event missed	-	0 to 65535	U16	ro	No	ALL	No
		Not supported							
	0Dh	Shift time too short	-	0 to 65535	U16	ro	No	ALL	No
		Not supported							
	0Eh	RxPDO toggle failed	-	0 to 65535	U16	ro	No	ALL	No
		Not supported							
	20h	Sync error	-	0 to 1	BOOL	ro	No	ALL	No
		Not supported							

(Note 1) These setting values are only for reference and do not guarantee their descriptions.

5.5.1 DC (Synchronous with SYNC0 event)

This section describes the DC synchronous mode specification for this driver module.

Synchronization method	Characteristic
Synchronize the time information of other slaves based on the time of the first slave.	• High accuracy • Correction process is required on the master side.



■ **Synchronization setting for Sync manager 2/3 during the DC synchronous mode**

Index	Sub-Index	Access	Name	Value
1C32h	00h	ro	Number of sub-objects	20h
	01h	rw	Sync mode	02h:DC SYNC0 (synchronized with Sync0 Event)
	02h	rw	Cycle time	125 µs: 125000, 250 µs: 250000, 500 µs: 500000, 1 ms: 1000000, 2ms:2000000, 4ms:4000000
	03h	ro	Shift time	Not supported
	04h	ro	Sync modes supported	bit 4-2: DC synchronous type support 001b: DC Sync 0 event support
	05h	ro	Minimum cycle time	125000 (Note 1)
	06h	ro	Calc and copy time	30000 (Note 1)
	09h	ro	Delay time	0 (Note 1)
	0Ah	ro	Sync0 cycle time	Value of ESC register 09A0h
	0Bh	ro	Cycle time too small	Not supported
	0Ch	ro	SM-event missed	Not supported
	0Dh	ro	Shift time too short	Not supported
	20h	ro	Sync error	Not supported

(Note 1) These setting values are only for reference and do not guarantee their descriptions.

Index	Sub-Index	Access	Name	Value
1C33h	00h	ro	Number of sub-objects	Same setting as 1C32h:00h.
	01h	rw	Sync mode	02h:DC SYNC0 (synchronized with Sync0 Event)
	02h	ro	Cycle time	Same setting as 1C32h:02h.
	03h	rw	Shift time (Not supported)	0 ns to 3875000 ns (Set the writing timing of the TxPDO value from slave CPU to ESC in steps of 125000ns.) Note Input shift time is not supported in this software version. Do not set 1C33h-03h (Shift time) to other than 0.
	04h	ro	Sync modes supported	27h Refer to See Chapter 5.5 for setting contents.
	05h	ro	Minimum cycle time	Same setting as 1C32h:05h.
	06h	ro	Calc And copy time	40000 (Note 1)
	09h	ro	Delay time	Same setting as 1C32h: 09h.
	0Ah	ro	Sync0 cycle time	Same setting as 1C32h: 0Ah
	0Bh	ro	Cycle time too small	Not supported
	0Ch	ro	SM-event missed	Not supported
	0Dh	ro	Shift time too short	Not supported
	20h	ro	Sync error	Not supported

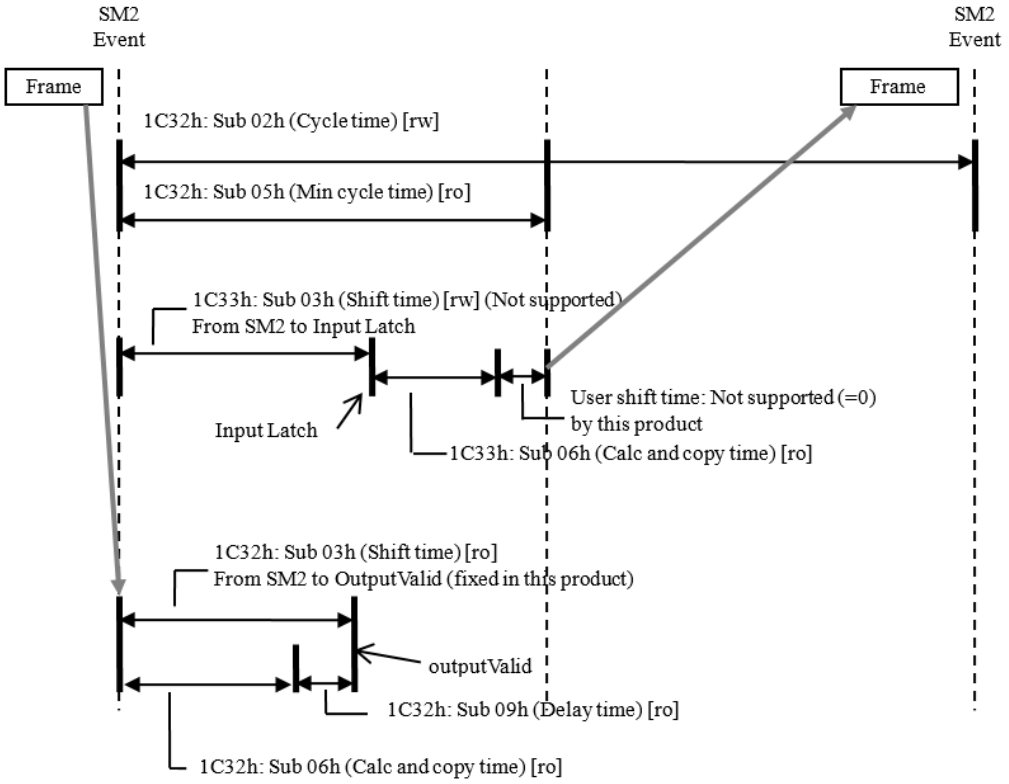
(Note 1) These setting values are only for reference and do not guarantee their descriptions.

5.5.2 SM2 (Synchronous with SM2 event) (Not supported)

Not supported in this software version.
Do not set 1C32h-01h (Sync mode) to 01h: SM2, and 1C33h-01h (Sync mode) to 22h: SM2.

This section describes the SM2 mode specification for this driver module.

Synchronization method	Characteristic
Synchronize it to the reception timing of RxPDO.	• There is no transmission delay correction and accuracy is low. • It is necessary to keep the transmission timing constant on the master side. (dedicated hardware etc.)



■ **Synchronization setting for Sync manager 2/3 during the SM2 event synchronous mode**

Index	Sub-Index	Access	Name / Description	Value
1C32h	00h	ro	Number of sub-objects	20h (fixed)
	01h	rw	Sync mode	01h:SM2 (synchronized with SM2 Event)
	02h	rw	Cycle time	125 µs:125000, 250 µs: 250000, 500 µs: 500000, 1 ms: 1000000, 2ms:2000000, 4ms:4000000
	03h	ro	Shift time	Not supported
	04h	ro	Sync modes supported	bit 1: SM synchronous mode support 1: SM2 event synchronization support
	05h	ro	Minimum cycle time	125000 (Note 1)
	06h	ro	Calc And copy time	30000 (Note 1)
	09h	ro	Delay time	0 (Note 1)
	0Ah	ro	Sync0 cycle time	0
	0Bh	ro	Cycle time too small	Not supported
	0Ch	ro	SM-event missed	Not supported
	0Dh	ro	Shift time too short	Not supported
	20h	ro	Sync error	Not supported

(Note 1) These setting values are only for reference and do not guarantee their descriptions.

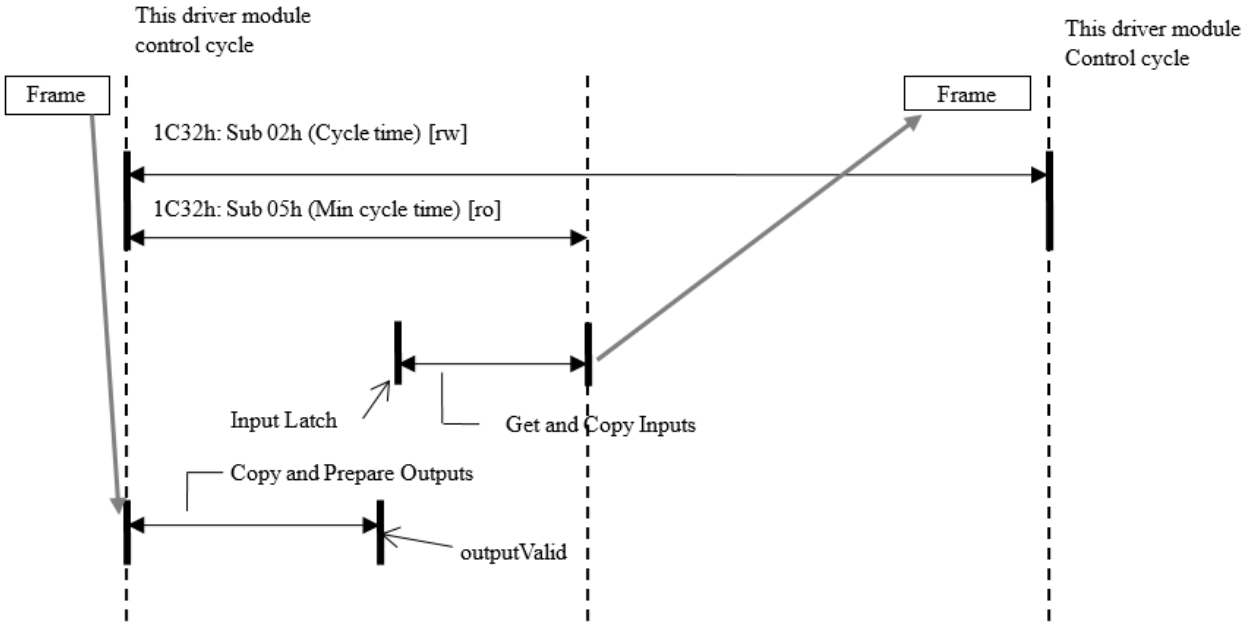
Index	Sub-Index	Access	Name / Description	Value
1C33h	00h	ro	Number of sub-objects	Same setting as 1C32h:00h.
	01h	rw	Sync mode	22h: SM2 (Synchronous with SM2 Event)
	02h	ro	Cycle time	Same setting as 1C32h:02h.
	03h	rw	Shift time (Not supported)	0 ns to 3875000 ns (Set the writing timing of the TxPDO value from slave CPU to ESC in steps of 125000.) Note Input shift time is not supported in this software version. Do not set 1C33h-03h (Shift time) to other than 0.
	04h	ro	Sync modes supported	27h Refer to See Chapter 5.5 for setting contents.
	05h	ro	Minimum cycle time	Same setting as 1C32h: 05h.
	06h	ro	Calc and copy time	40000 (Note 1)
	09h	ro	Delay time	Same setting as 1C32h: 09h.
	0Ah	ro	Sync0 cycle time	Same setting as 1C32h: 0Ah.
	0Bh	ro	Cycle time too small	Not supported
	0Ch	ro	SM-event missed	Not supported
	0Dh	ro	Shift time too short	Not supported
	20h	ro	Sync error	Not supported

(Note 1) These setting values are only for reference and do not guarantee their descriptions.

5.5.3 Free RUN (Asynchronous)

This section describes the Free Run mode specification for this driver module.

Synchronization method	Characteristic
Asynchronous	• Process is simple. • Real-time characteristics are insufficient.



■ **Synchronization setting for Sync manager 2/3 during the Free Run mode**

Index	Sub-Index	Access	Name	Value
1C32h	00h	ro	Number of sub-objects	20h (fixed)
	01h	rw	Sync mode	00h:Free Run (not synchronized)
	02h	rw	Cycle time	125 µs: 125000, 250 µs: 250000, 500 µs: 500000, 1 ms: 1000000, 2ms:2000000, 4ms:4000000
	03h	ro	Shift time	Not supported
	04h	ro	Sync modes supported	bit 0: Free Run mode support 1: Free Run mode support
	05h	ro	Minimum cycle time	125000 (Note 1)
	06h	ro	Calc and copy time	Not supported
	09h	ro	Delay time	Not supported
	0Ah	ro	Sync0 cycle time	0
	0Bh	ro	Cycle time too small	Not supported
	0Ch	ro	SM-event missed	Not supported
	0Dh	ro	Shift time too short	Not supported
	20h	ro	Sync error	Not supported

(Note 1) These setting values are only for reference and do not guarantee their descriptions.

Index	Sub-Index	Access	Name	Value
1C33h	00h	ro	Number of sub-objects	Same setting as 1C32h: 00h.
	01h	rw	Sync mode	00h: FreeRun (not synchronized)
	02h	ro	Cycle time	Same setting as 1C32h: 02h.
	03h	rw	Shift time	Not supported
	04h	ro	Sync modes supported	27h Refer to See Chapter 5.5 for setting contents.
	05h	ro	Minimum cycle time	Same setting as 1C32h: 05h.
	06h	ro	Calc and copy time	Same setting as 1C32h: 06h.
	09h	ro	Delay time	Same setting as 1C32h: 09h.
	0Ah	ro	Sync0 cycle time	Same setting as 1C32h: 0Ah.
	0Bh	ro	Cycle time too small	Not supported
	0Ch	ro	SM-event missed	Not supported
	0Dh	ro	Shift time too short	Not supported
	20h	ro	Sync error	Not supported

5.5.4 Input shift time (Not supported)

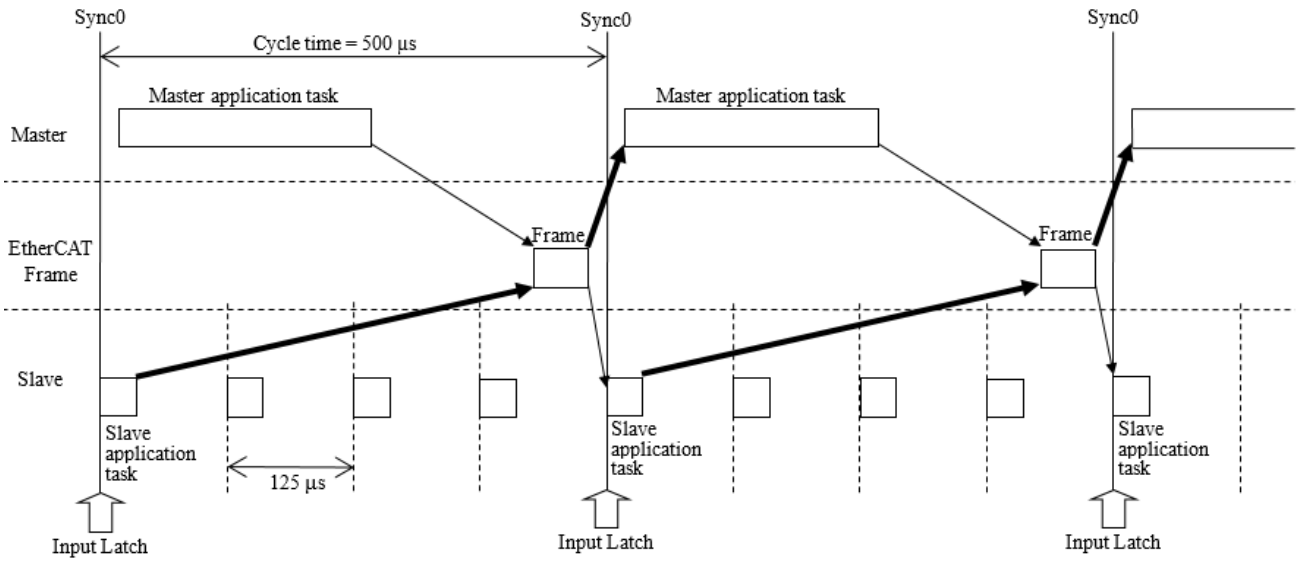
Not supported in this software version. Do not set 1C33h-03h (Shift time) to other than 0.

To provide the newest slave information to the master, it is supported for the input shift time.

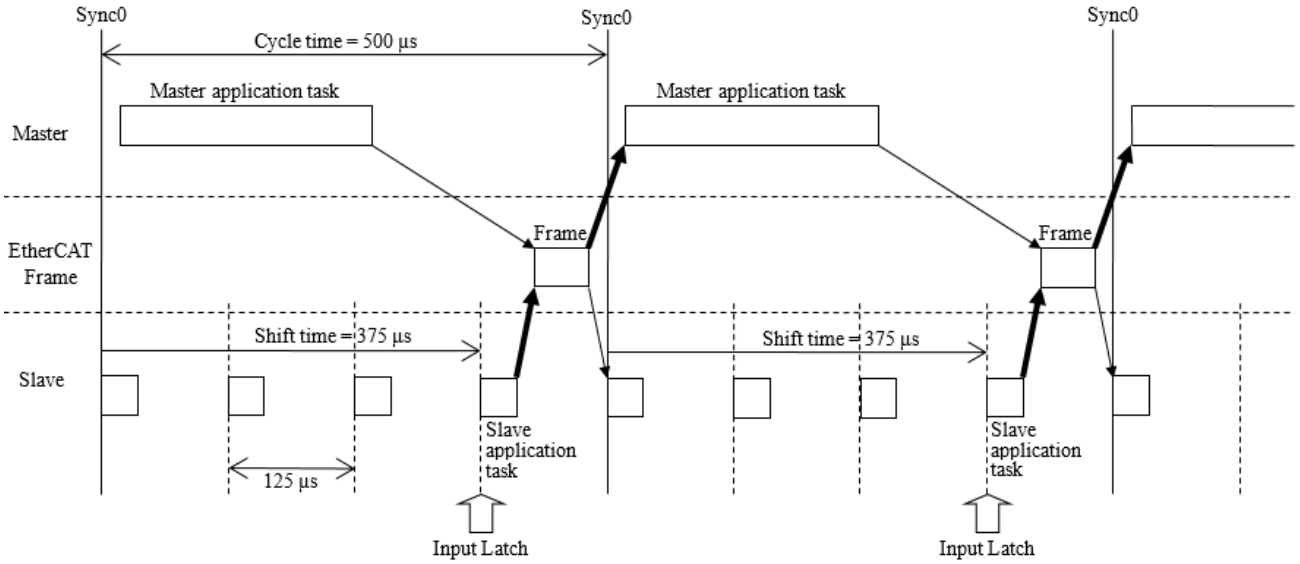
By setting 1C33h-03h (Shift time), it is possible to adjust the timing of Input Latch with accuracy of 125 µs and set it to a value most immediately before the TxPDO frame transmission.

In particular, it is effective for the case where the communication cycle (cycle time) is extended.

■ **DC cycle time = 500 µs, Input shift time = 0 µs**



■ **DC cycle time = 500 µs, Input shift time = 375 µs**



5.6 Store parameters (Write object in EEPROM) (1010h)

Send 65766173h(“save”) to a slave with the EtherCAT communication data by using the object 1010h-01h (Save all parameters) to batch write (back up) different object data in EEPROM and RAM into EEPROM. Write object data of both the Axes A and B.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
1010h	-	Store parameters	-	-	-	-	-	-	-
		• Writes (backs up) the object data into EEPROM. Only the objects whose EEPROM field in the object list are "Yes" are backed up.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• Represents the number of sub-indexes for this object. The value is fixed at 1.							
	01h	Save all parameters	-	0 to 4294967295	U32	rw	No	ALL	No
		• By writing 65766173h (“save”) on the EtherCAT communication data, all the target objects to be backed up on both the Axes A and B are backed up in a lump to EEPROM. When the process is completed, it will be 00000001h regardless of pass or fail. Read-out after control power-on is 00000001h.							

- Only the objects whose EEPROM field in the object list is "Yes" are backed up.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Dh	-	Software position limit	-	-	-	-	-	pp ip csp	-
	00h	Number of entries	-	2	U8	ro	No		No
	01h	Min position limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes

*This table is a thing for explanation.
Please understand that it differs from an actual object list.

Objects whose value of this field is “Yes” are backed up.

- When “Control power undervoltage protection” (Err.11.0) occurs, EEPROM cannot be accessed and the objects cannot be saved in EEPROM.
- In writing into EEPROM, about 10 seconds maximum. (when changing all objects)

  Do not shut off control power while writing to EEPROM.
- The objects of the attributes C and R in the servo parameter area (object 2000h to 201Fh,2100h to 211Fh,2500h to 251Fh) will be effective after resetting the control power.

Refer to
For information to attributes of servo parameter, refer to "Functional Specification of the Technical document(SX-DSV03455)".

- The writing count into EEPROM is limited.
- During writing into EEPROM, other SDO commands are not received.
- In cases below, an abort message is returned:
  - Write access to 1010h-00h
  - The data written to 1010h-01h is other than 65766173h(“save”)

Refer to
For other abort messages, refer to “3.6.1 Message at error occurrence“.

5.7 Diagnosis history (Reading function of error (alarm) history) (10F3h)

In MINAS A6 Multi series, up to 14 error (alarm) histories are read out for each axis using the objects 10F3h (Diagnosis history), 2281h (Diagnosis history (Axis A)) and 2681h (Diagnosis history (Axis B)).

10F3h(Diagnosis history)	Error (alarm) history of Axis A
2281h(Diagnosis history (Axis A))	Error (alarm) history of Axis A *Copy object of 10F3h
2681h(Diagnosis history (Axis B))	Error (alarm) history of Axis B

Use the object 10F3h (Diagnosis history) to read up to 14 error (alarm) histories.

The error (alarm) histories are stored up to 14 limit. They are placed from 10F3h-06h (Diagnosis message 1) to 103Fh-13h (Diagnosis message 14) one by one in the order of occurrence. Error (alarm) history is also stored in 2281h (Diagnosis history (Axis A)) as same as in 10F3h.

The sub-index number where the latest error (alarm) history is stored can be confirmed by 103Fh-02h (Newest Message) and 2281h-02h (Newest Message).

The 10F3h (Diagnosis history) and 2281h (Diagnosis history (Axis A)) are not supported by PDO. Since reading out each sub-index of 10F3h (Diagnosis history) and 2281h (Diagnosis history (Axis A)) becomes SDO, the concurrency cannot be guaranteed.

The error (alarm) history displayed in 10F3h (Diagnosis history) as well as 2281h (Diagnosis history (Axis A)) is set by reading out the information backed up in the EEPROM of this driver module, when the control power supply is turned on.

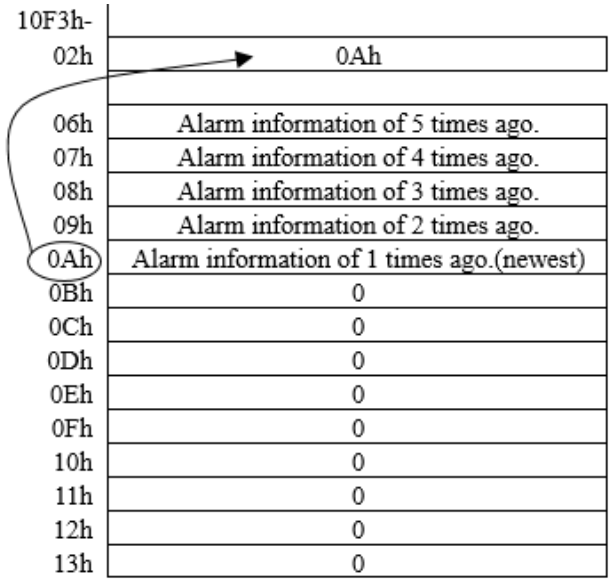
The error (alarm) history displayed in 10F3h (Diagnosis history) as well as 2281h (Diagnosis history (Axis A)) is only the alarm generated in this driver module, and warning is not displayed nor stored.

Moreover, some alarms are not displayed nor stored in 10F3h (Diagnosis history) as well as 2281h (Diagnosis history (Axis A)).

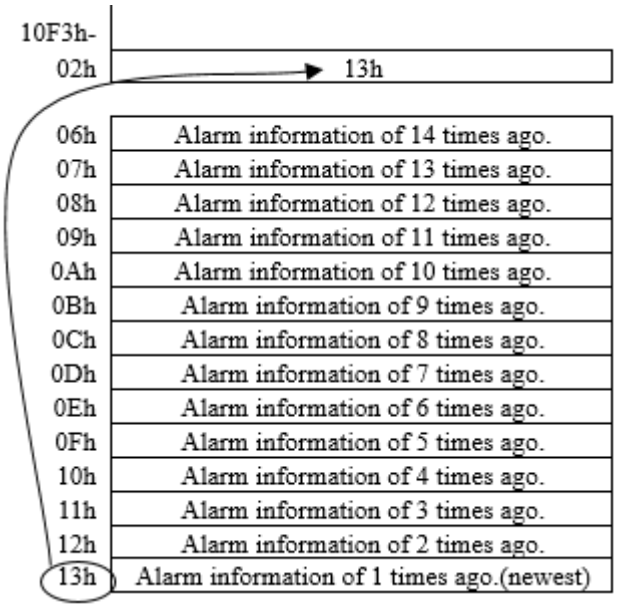
Refer to

Please refer to "Functional Specification (SX-DSV03455)" for details

■ **In the case of for 5 alarm histories**



■ **In the case of for 14 alarm histories**



Note

In 2281h (Diagnosis history (Axis A)), the error (alarm) history is also displayed as same as in 10F3h (Diagnosis history).

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
10F3h / 2281h	-	Diagnosis history	-	-	-	-	-	-	-
		• Readout of the error history of Axis A, and setting the enable/disable of the Emergency message are to be performed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• Represents the number of sub-indexes for this object. The value is fixed at 13h.							
	01h	Maximum messages	-	0 to 255	U8	ro	No	ALL	No
		• Represents the number of error messages which this driver module is possible to store. The value is fixed at 0Eh. (14times)							
	02h	Newest message	-	0 to 255	U8	ro	No	ALL	No
		• Displays the sub-index where the latest error message is stored. • Indicates 0 when there is no alarm history such as immediately after the alarm history is cleared.							
	03h	Newest acknowledged message	-	0 to 255	U8	rw	No	ALL	No
		Read: always 0 Write: writing of 00h: All Diagnosis messages of Axis A are cleared. writing of other than 00h: Output of SDO Abort (Code 0x06090030)							
	04h	New messages available	-	0 to 1	BOOL	ro	No	ALL	No
		• It does not support with this driver module. The value is fixed at 0.							
	05h	Flags	-	0 to 65535	U16	See below	No	ALL	Yes

bit 0	RW	Permitting execution of Emergency message of Axis A 0: Emergency message of Axis A is disabled 1: Emergency message is issued every time a new abnormality is detected in the Axis A. (Some abnormalities do not remain in the Diagnosis message) Refer to For the detail of the emergency message, refer to Section 3.6.1.
bit 1	R	Not supported : Fixed at 1
bit 2	R	Not supported : Fixed at 1
bit 3	R	Not supported : Fixed at 0
bit 4	R	Not supported : Fixed at 0
bit 5	R	Diagnosis message clear information of Axis A 0: Error history information of Axis A exists. 1: No error history information of Axis A, or completion of clearing the error history information (at writing of 10F3h/2281h-03h=0) (It is held until the next error (alarm) is generated.)
bit 6 to 15	-	Reserved

06h	Diagnosis message 1		-		-		OS		ro		No		ALL		No (Note 1)	
	• An error history is displayed.															
	Example:	01	E0	10	FF	02	00	00	00	00	00	00	00	00	00	00
	Application	(L) (H) (Refer to the following.)		(L) (H) Error code		(L) (H) (Fixed value)		(L) (H) Text ID		(L) (Fixed value)						(H)
		Diag code				Flags		Text ID		Time stamp						

Item	Description	
Diag code	Diagnostic code which identifies a message	
	bit0-15:	0xE001 is returned when an alarm is generated on Axis A, and 0xE000 is returned when a common alarm is generated.
	bit16-31:	For the error code, the value set to object 603Fh is returned.
Flags	The values are fixed at 0002h.	
Text ID	The Text ID defined for each error message (Error code) is returned. The main alarm number is set in the upper 8 bits and the sub-alarm number is set in the lower 8 bits.	
Time stamp	It denotes the time when an error is generated. The value is fixed at 0000000000000000h because it is not supported.	

:	:							
13h	Diagnosis message 14	-	-	OS	ro	No	ALL	No (Note 1)
	• An error history is displayed. The content is same as the sub-index 06h.							

(Note 1) Although not backed up as an object, it is transmitted from the alarm information backed up separately.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2681h	-	Diagnosis history (Axis B)	-	-	-	-	-	-	-
		• Readout of the error history of Axis B, and setting the enable/disable of the Emergency message are to be performed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• The sub-index number of this object is indicated. The value is fixed at 13h.							
	01h	Maximum messages (Axis B)	-	0 to 255	U8	ro	No	ALL	No
		• The number of error messages that this driver module can store is indicated. The value is fixed at 0Eh (14 records).							
	02h	Newest message (Axis B)	-	0 to 255	U8	ro	No	ALL	No
		• The sub-index that contains the most recent error message is indicated. • If there is no alarm history such as immediately after clearing the alarm history, 0 is indicated.							
	03h	Newest acknowledged message (Axis B)	-	0 to 255	U8	rw	No	ALL	No
		Read: always 0 Write: writing of 00h: All Diagnosis messages of Axis A are cleared. writing of other than 00h: Output of SDO Abort (Code 0x06090030)							
	04h	New messages available (Axis B)	-	0 to 1	BOOL	ro	No	ALL	No
		• It is not supported by this driver module. The value is fixed at 0.							
	05h	Flags (Axis B)	-	0 to 65535	U16	Refer to the following.	No	ALL	Yes

bit 0	RW	Permitting execution of Emergency message of Axis B 0: Emergency message of Axis B is disabled 1: Emergency message is issued every time a new abnormality is detected in the Axis B. (Some abnormalities do not remain in the Diagnosis message) ▼ Refer to For the detail of the emergency message, refer to Section 3.6.1.
bit 1	R	Not supported : Fixed at 1
bit 2	R	Not supported : Fixed at 1
bit 3	R	Not supported : Fixed at 0
bit 4	R	Not supported : Fixed at 0
bit 5	R	Diagnosis message clear information of Axis B 0: Error history information exists. 1: No error history information, or completion of clearing the error history information (at writing of 10F3h-03h=0) (It is held until the next error (alarm) is generated.)
bit 6 to 15	-	Reserved

Example:	01	E0	10	FF	02	00	00	00	00	00	00	00	00	00	00	00
Application	(L) (H) (Refer to the following.)		(L) (H) Error code		(L) (H) (Fixed value)		(L) (H) Text ID		(L) (Fixed value)						(H)	
	Diag code				Flags		Text ID		Time stamp							

Item	Description	
Diag code	Diagnostic code which identifies a message	
	bit0-15:	0xE002 is returned when an alarm is generated on Axis B, and 0xE000 is returned when a common alarm is generated.
	bit16-31:	For the error code, the value set to object 683Fh is returned.
Flags	The values are fixed at 0002h.	
Text ID	The Text ID defined for each error message (Error code) is returned. The main alarm number is set in the upper 8 bits and the sub-alarm number is set in the lower 8 bits.	
Time stamp	It denotes the time when an error is generated. The value is fixed at 0000000000000000h because it is not supported.	

06h	Diagnosis message 1 (Axis B)	-	-	OS	ro	No	ALL	No (Note 1)
	• The error history of Axis B is displayed.							
:	:							
13h	Diagnosis message 14	-	-	OS	ro	No	ALL	No (Note 1)
	• An error history is displayed. The content is same as the sub-index 06h.							

(Note 1) Although not backed up as an object, it is transmitted from the alarm information backed up separately.

6

Drive Profile Area (6000h to 6FFFh)

6.1 Object list

Target object of Axis A

Index	Sub-Index	Name
6007h	00h	Abort connection option code (Axis A)
603Fh	00h	Error code (Axis A)
6040h	00h	Controlword (Axis A)
6041h	00h	Statusword (Axis A)
605Ah	00h	Quick stop option code (Axis A)
605Bh	00h	Shutdown option code (Axis A)
605Ch	00h	Disable operation option code (Axis A)
605Dh	00h	Halt option code (Axis A)
605Eh	00h	Fault reaction option code (Axis A)
6060h	00h	Modes of operation (Axis A)
6061h	00h	Modes of operation display (Axis A)
6062h	00h	Position demand value (Axis A)
6063h	00h	Position actual internal value (Axis A)
6064h	00h	Position actual value (Axis A)
6065h	00h	Following error window (Axis A)
6066h	00h	Following error time out (Axis A)
6067h	00h	Position window (Axis A)
6068h	00h	Position window time (Axis A)
6069h	00h	Velocity sensor actual value (Axis A)
606Ah	00h	Sensor selection code (Axis A)
606Bh	00h	Velocity demand value (Axis A)
606Ch	00h	Velocity actual value (Axis A)
606Dh	00h	Velocity window (Axis A)
606Eh	00h	Velocity window time (Axis A)
606Fh	00h	Velocity threshold (Axis A)
6070h	00h	Velocity threshold tim (Axis A)e
6071h	00h	Target torque (Axis A)
6072h	00h	Max torque (Axis A)
6073h	00h	Max current (Axis A)
6074h	00h	Torque demand (Axis A)
6075h	00h	Motor rated current (Axis A)
6076h	00h	Motor rated torque (Axis A)
6077h	00h	Torque actual value (Axis A)
6078h	00h	Current actual value (Axis A)
6079h	00h	DC link circuit voltage (Axis A)
607Ah	00h	Target position (Axis A)
607Bh	-	Position range limit (Axis A)
	00h	Highest sub-index supported
	01h	Min position range limit
	02h	Max position range limit
607Ch	00h	Home offset (Axis A)
607Dh	-	Software position limit (Axis A)
	00h	Number of entries
	01h	Min position limit
	02h	Max position limit
607Eh	00h	Polarity (Axis A)
607Fh	00h	Max profile velocity (Axis A)

Index	Sub-Index	Name
6080h	00h	Max motor speed (Axis A)
6081h	00h	Profile velocity (Axis A)
6082h	00h	End velocity (Axis A)
6083h	00h	Profile acceleration (Axis A)
6084h	00h	Profile deceleration (Axis A)
6085h	00h	Quick stop deceleration (Axis A)
6086h	00h	Motion profile type (Axis A)
6087h	00h	Torque slope (Axis A)
6088h	00h	Torque profile type (Axis A)
608Fh	-	Position encoder resolution (Axis A)
	00h	Highest sub-index supported
	01h	Encoder increments
	02h	Motor revolutions
6091h	-	Gear ratio (Axis A)
	00h	Number of entries
	01h	Motor revolutions
	02h	Shaft revolutions
6092h	-	Feed constant (Axis A)
	00h	Highest sub-index supported
	01h	Feed
	02h	Shaft revolutions
6098h	00h	Homing method (Axis A)
6099h	-	Homing speeds (Axis A)
	00h	Number of entries
	01h	Speed during search for switch
	02h	Speed during search for zero
609Ah	00h	Homing acceleration (Axis A)
60A3h	00h	Profile jerk use (Axis A)
60A4h	-	Profile jerk (Axis A)
	00h	Highest sub-index supported
	01h	Profile jerk1
	02h	Profile jerk2
60B0h	00h	Position offset (Axis A)
60B1h	00h	Velocity offset (Axis A)
60B2h	00h	Torque offset (Axis A)
60B8h	00h	Touch probe function (Axis A)
60B9h	00h	Touch probe status (Axis A)
60BAh	00h	Touch probe pos1 pos value (Axis A)
60BBh	00h	Touch probe pos1 neg value (Axis A)
60BCh	00h	Touch probe pos2 pos value (Axis A)
60BDh	00h	Touch probe pos2 neg value (Axis A)
60C2h	-	Interpolation time period (Axis A)
	00h	Highest sub-index supported
	01h	Interpolation time period value
	02h	Interpolation time index
60C5h	00h	Max acceleration (Axis A)
60C6h	00h	Max deceleration (Axis A)

Index	Sub-Index	Name
60E3h	-	Supported homing method (Axis A)
	00h	Number of entries
	01h	1st supported homing method
	to	-
	20h	32nd supported homing method
60F2h	00h	Positioning option code (Axis A)
60F4h	00h	Following error actual value (Axis A)
60FAh	00h	Control effort (Axis A)
60FCh	00h	Position demand internal value (Axis A)
60FDh	00h	Digital inputs (Axis A)
60FEh	-	Digital outputs (Axis A)
	00h	Number of entries
	01h	Physical outputs
	02h	Bit mask
60FFh	00h	Target velocity (Axis A)
6502h	00h	Supported drive modes (Axis A)

Target object of Axis B

Index	Sub-Index	Name
6807h	00h	Abort connection option code (Axis B)
683Fh	00h	Error code (Axis B)
6840h	00h	Controlword (Axis B)
6841h	00h	Statusword (Axis B)
685Ah	00h	Quick stop option code (Axis B)
685Bh	00h	Shutdown option code (Axis B)
685Ch	00h	Disable operation option code (Axis B)
685Dh	00h	Halt option code (Axis B)
685Eh	00h	Fault reaction option code (Axis B)
6860h	00h	Modes of operation (Axis B)
6861h	00h	Modes of operation display (Axis B)
6862h	00h	Position demand value (Axis B)
6863h	00h	Position actual internal value (Axis B)
6864h	00h	Position actual value (Axis B)
6865h	00h	Following error window (Axis B)
6866h	00h	Following error time out (Axis B)
6867h	00h	Position window (Axis B)
6868h	00h	Position window time (Axis B)
6869h	00h	Velocity sensor actual value (Axis B)
686Ah	00h	Sensor selection code (Axis B)
686Bh	00h	Velocity demand value (Axis B)
686Ch	00h	Velocity actual value (Axis B)
686Dh	00h	Velocity window (Axis B)
686Eh	00h	Velocity window time (Axis B)
686Fh	00h	Velocity threshold (Axis B)
6870h	00h	Velocity threshold time (Axis B)
6871h	00h	Target torque (Axis B)
6872h	00h	Max torque (Axis B)
6873h	00h	Max current (Axis B)
6874h	00h	Torque demand (Axis B)
6875h	00h	Motor rated current (Axis B)
6876h	00h	Motor rated torque (Axis B)
6877h	00h	Torque actual value (Axis B)
6878h	00h	Current actual value (Axis B)
6879h	00h	DC link circuit voltage (Axis B)
687Ah	00h	Target position (Axis B)
687Bh	-	Position range limit (Axis B)
	00h	Highest sub-index supported
	01h	Min position range limit
	02h	Max position range limit
687Ch	00h	Home offset (Axis B)
687Dh	-	Software position limit (Axis B)
	00h	Number of entries
	01h	Min position limit
	02h	Max position limit
687Eh	00h	Polarity (Axis B)
687Fh	00h	Max profile velocity (Axis B)
6880h	00h	Max motor speed (Axis B)
6881h	00h	Profile velocity (Axis B)
6882h	00h	End velocity (Axis B)

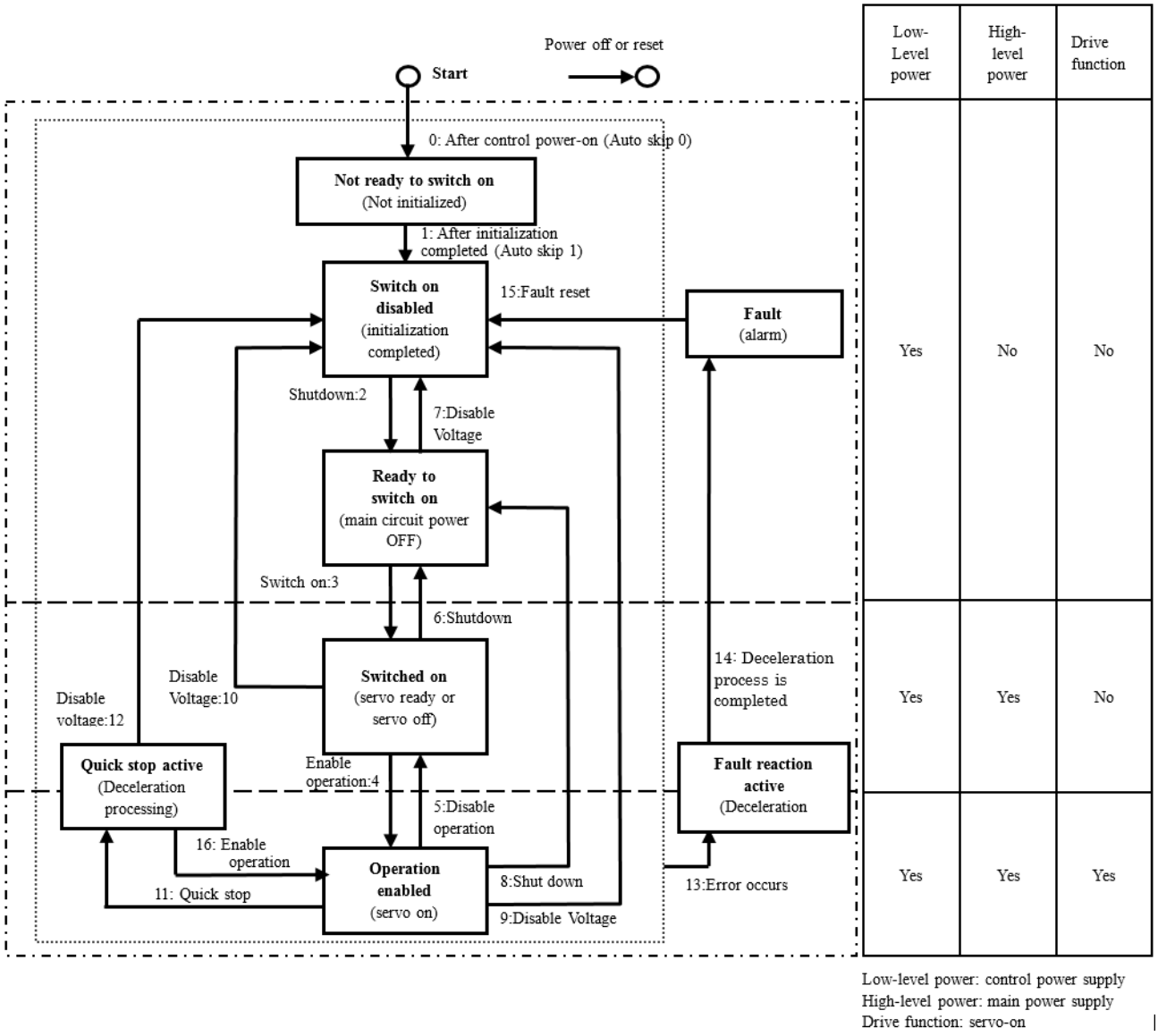
Index	Sub-Index	Name
6883h	00h	Profile acceleration (Axis B)
6884h	00h	Profile deceleration (Axis B)
6885h	00h	Quick stop deceleration (Axis B)
6886h	00h	Motion profile type (Axis B)
6887h	00h	Torque slope (Axis B)
6888h	00h	Torque profile type (Axis B)
688Fh	-	Position encoder resolution (Axis B)
	00h	Highest sub-index supported
	01h	Encoder increments
	02h	Motor revolutions
6891h	-	Gear ratio (Axis B)
	00h	Number of entries
	01h	Motor revolutions
	02h	Shaft revolutions
6892h	-	Feed constant (Axis B)
	00h	Highest sub-index supported
	01h	Feed
	02h	Shaft revolutions
6898h	00h	Homing method (Axis B)
6899h	-	Homing speeds (Axis B)
	00h	Number of entries
	01h	Speed during search for switch
	02h	Speed during search for zero
689Ah	00h	Homing acceleration (Axis B)
68A3h	00h	Profile jerk use (Axis B)
68A4h	-	Profile jerk (Axis B)
	00h	Highest sub-index supported
	01h	Profile jerk1
	02h	Profile jerk2
68B0h	00h	Position offset (Axis B)
68B1h	00h	Velocity offset (Axis B)
68B2h	00h	Torque offset (Axis B)
68B8h	00h	Touch probe function (Axis B)
68B9h	00h	Touch probe status (Axis B)
68BAh	00h	Touch probe pos1 pos value (Axis B)
68BBh	00h	Touch probe pos1 neg value (Axis B)
68BCh	00h	Touch probe pos2 pos value (Axis B)
68BDh	00h	Touch probe pos2 neg value (Axis B)
68C2h	-	Interpolation time period (Axis B)
	00h	Highest sub-index supported
	01h	Interpolation time period value
	02h	Interpolation time index
68C5h	00h	Max acceleration (Axis B)
68C6h	00h	Max deceleration (Axis B)
68E3h	-	Supported homing method (Axis B)
	00h	Number of entries
	01h	1st supported homing method
	:	:
	20h	32nd supported homing method
68F2h	00h	Positioning option code (Axis B)
68F4h	00h	Following error actual value (Axis B)
68FAh	00h	Control effort (Axis B)

Index	Sub-Index	Name
68FCh	00h	Position demand internal value (Axis B)
68FDh	00h	Digital inputs (Axis B)
68FEh	-	Digital outputs (Axis B)
	00h	Number of entries
	01h	Physical outputs
	02h	Bit mask
68FFh	00h	Target velocity (Axis B)
6D02h	00h	Supported drive modes (Axis B)

6.2 PDS (power drive systems) specification

6.2.1 Finite state automaton (FSA)

The figure below defines state transition (FSA) of driver module PDS related to the power control triggered by the user command or error detection etc. (After that, describe “PDS state” in this document.)



Low-level power: control power supply
High-level power: main power supply
Drive function: servo-on

- The conditions of a servo ready state are that High-level power(main power supply) is in the state of ON. When High-level power (main power supply) is in the state of OFF, it does not become servo ready and can not transition to the state Switched on.
- After transition to Operation enabled(servo on), perform an operation command after time for 100ms or more.
- When a recoverable alarm (A □□□□) occurs in the safety part,The target axis of the recoverable alarm becomes STO state. The PDS status of the axis that became STO state is Switch on disabled, but the ESM status does not change.
- If an unrecoverable alarm (F □□□□) occurs in the safety part, both axes of the driver module will enter an alarm state due to Err31.5(Safety function error protection 5). At this time, the PDS state of both axes becomes Fault reaction active, and the ESM state does not transition.

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

PDS state transition events (transition condition) and actions are listed in the table below.

PDS transition must be performed while handshaking with transition status. (Next transition command must be sent after checking at 6041h: statusword (Axis A) that transition has completed.)

PDS Transition		Event(s)	Action(s)
0	Auto skip 0	• Automatically changes after control power-on or after resetting application	• The drive functions are self-diagnosed and initialized.
1	Auto skip 1	• Automatic transition after the completion of initialization.	• The communication is established.
2	Shutdown	• Not in STO state, the Shutdown command is received	• Nothing in particular
3	Switch on	• In the state of ON of High-level power, the Switch-on command is received	• Nothing in particular
4	Enable operation	• The Enable operation command is received	• The drive functions are validated. Also, all the set point data is cleared.
5	Disable operation	• The Disable operation command is received	• The drive functions are disabled.
6	Shutdown	• In the state of ON of High-level power, the Shutdown command is received • When High-level power detects the state of OFF.	• Nothing in particular
7	Disable voltage	• The Disable voltage command is received. • The Quick stop command is received. • The state transitions to Init when the ESM state is PreOP, SafeOP, or OP • It becomes STO state.	• Nothing in particular
8	Shutdown	• In the state of ON of High-level power, the Shutdown command is received	• The drive functions are disabled.
9	Disable voltage	• The Disable voltage command is received • The OFF state of High-level power is detected when the value of Abort connection option code is 2 • It becomes STO state.	• The drive functions are disabled.
10	Disable voltage	• The Disable voltage command is received. • The Quick stop command is received. • The state transitions to Init when the ESM state is PreOP, SafeOP, or OP • It becomes STO state.	• Nothing in particular
11	Quick stop	• The Quick stop command is received • The OFF state of High-level power is detected when the value of Abort connection option code is 3	• The Quick stop function starts.
12	Disable Voltage	• Quick stop function is completed and quick stop option code is 1, 2 or 3. • After Quick stop function is completed, received Disable voltage command quick stop option code is 5, 6, or 7. • High-level power OFF is detected. • It becomes STO state.	• The drive functions are disabled.
13	Error occurs	• An error is detected • The OFF state of High-level power is detected when the value of Abort connection option code is 1 • A trigger for retracting operation activation is detected (Note 1)	• Performs the established Fault reaction function. • Performs the retracting operation function. (Note 1)
14	Auto skip 2	• After completing the deceleration process due to an error detection, the state transitions automatically • After completing or suspending the retracting operation, the state transitions automatically. (Note 1)	• The drive functions are disabled.
15	Fault reset	• After releasing factor error, The Fault reset command is received	• Resets the Fault state when there is no Fault factor.
16	Enable operation	• When the Quick stop option code is 5, 6, or 7, the Enable operation command is received	• The drive functions are validated.

(Note 1) In this software version,The retracting operation is not supported.

6.3 Controlword (6040h)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Use the object 6040h (Control word (Axis A)) to set the commands to control a slave (driver module) including the PDS state transition.

◆ CAUTION

- **When using this object, be sure to use the PDO and enable the PDO watchdog. SDO cannot judge communication cut-off, therefore an electricity state of the motor might be continued and becomes non-safe.**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6040h	00h	Controlword	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

bit information details

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r						oms	h	fr	oms			eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

■ bit7,3-0 (fault reset / enable operation / quick stop / enable voltage / switch on)

Indicates the PDS command. Here, describes the combination of bits corresponding to the command:

-: Indefinite

Command	Bits of the controlword					PDS Transitions
	bit 7	bit 3	bit 2	bit 1	bit 0	
	Fault reset	enable operation	quick stop	enable voltage	switch on	
Shutdown	0	-	1	1	0	2,6,8
Switch on	0	0	1	1	1	3
Switch on + Enable operation	0	1	1	1	1	3+4 (Note 1)
Enable operation	0	1	1	1	1	4, 16
Disable voltage	0	-	-	0	-	7, 9, 10, 12
Quick stop	0	-	0 (Note 2)	1	-	7,10, 11
Disable operation	0	0	1	1	1	5
Fault reset		-	-	-	-	15

(Note 1) Automatic transition to Enable operation state after executing “switch on” state functionality.

(Note 2) "Quick stop" command is enabled if the bit is '0'. Please keep in mind that the bit performs reverse operation compared to other bits.

■ **bit8(halt)**

If 1, the motor is decelerated and stopped temporarily according to 605Dh (Halt option code (Axis A)). After the motor stops, restoring the bit to 0 resumes the operation. In the hm control mode, however, operation is not restarted even if the bit is restored to 0 after the stop by 1.

■ **bit9, 6-4 (operation mode specific)**

Below table shows the behavior of the operation mode (Op-mode) specific bits. (For details, refer to the relevant object's section of each operation mode.)

-: not used (Set to 0)

Op-mode	bit9	bit6	bit5	bit4
pp	change on set-point	absolute / relative	change set immediately	new set-point
pv	-	-	-	-
tq	-	-	-	-
hm	-	-	-	start homing
ip	-	-	-	enable interpolation
csp	-	-	-	-
csv	-	-	-	-
cst	-	-	-	-

6.4 Statusword (6041h)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Use the object 6041h (Status word) to check a slave (driver module (Axis A)) state.

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

• Displays the driver module state.

bit information details

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r		oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ **bit6, 5, 3-0 (switch on disabled / quick stop / fault / operation enable / switched on / ready to switch on)**

This bit enables to confirm the PDS state. The table below lists the states and corresponding bits:

Statusword	PDS state	
xxxx xxxx x0xx 0000 b	Not ready to switch on	Initialization non-completed
xxxx xxxx x1xx 0000 b	Switch on disabled	Initialization completed
xxxx xxxx x01x 0001 b	Ready to switch on	Main circuit power OFF
xxxx xxxx x01x 0011 b	Switched on	Servo-off/servo ready
xxxx xxxx x01x 0111 b	Operation enabled	Servo-on
xxxx xxxx x00x 0111 b	Quick stop active	Immediate stop
xxxx xxxx x0xx 1111 b	Fault reaction active	Error (alarm) discriminated
xxxx xxxx x0xx 1000 b	Fault	Error (alarm) state

■ **bit4 (voltage enabled):**

If 1, the main circuit power voltage is applied to PDS.

■ **bit5 (quick stop):**

If 0, it indicates PDS responds to quick stop request. Quick stop enabled if the bit is '0'.

Please keep in mind that the bit performs reverse operation compared to other bits.

■ **bit7 (warning):**

If 1, it is indicating a warning. The PDS state does not change during the warning, also, continues the motor operation.

■ **bit8 (reserved)**

This bit is not used (fixed at 0).

■ **bit9 (remote)**

If 0 (local), 6040h (Control word (Axis A)) indicates the state of impossible processing.

If 1 (remote), 6040h (Control word (Axis A)) indicates the state of possible processing.

It will be set to 1 if ESM state transitions to over PreOP or more.

■ **bit13, 12, 10 (operation mode specific)**

Below table shows the behavior of the operation mode (Op-mode) specific bits.

(For details, refer to the relevant object's section of each operation mode.)

-: not used(Indefinite)

Op-mode	bit13	bit12	bit10
pp	following error	set-point acknowledge	target reached
pv	max slippage error (Not supported)	speed	target reached
tq	-	-	target reached
hm	homing error	homing attained	target reached
ip	-	ip mode active	target reached
Csp	following error	drive follows command value	-
Csv	-	drive follows command value	-
Cst	-	drive follows command value	-

■ **bit11 (internal limit active)**

Bit11(internal limit active) of the 6041h (Statusword (Axis A)) is set to 1 when the internal limit factor occurs.

The following indicates the factors at which bit11(internal limit active) of the 6041h (Statusword (Axis A)) is set to 1.

Bit11(internal limit active) of the 6041h (Statusword (Axis A)) is indicate conditions for which be 1 below.

Control mode		Internal limiting factor	Servo on / off state
Position control	pp,csp	Emergncy stop (Note 1)	on
		Torque limit	on (Note 2)
		Over-travel inhibition input (POT/NOT)	on / off
		Software limit	on / off
	hm	Emergncy stop (Note 1)	On
		Torque limit	on (Note 2)
Velocity control	pv,csv	Emergncy stop (Note 1)	On
		Torque limit	on (Note 2)
		Over-travel inhibition input (POT/NOT)	on / off
Torque control	tq,cst	Emergncy stop (Note 1)	On
		Torque limit (Note 3)	on (Note 2)
		Over-travel inhibition input (POT/NOT)	on / off
		Rotational direction setup	on

(Note 1) Excluding a case where torque is not limited even during emergency stop.

(Note 2) If torque limit is 0, bit11 (internal limit active) is 1 even if servo-off.

The minimum value of the following is the torque limit.

- The sum of 6071h (Target torque (Axis A)) and 60B2h (Torque offset (Axis A)) (Only during torque control (tq, cst))
- 6072h (Max torque (Axis A))
- 2100h-0Eh(1st torque limit)
- 2105h-17h(2nd torque limit) (Only for when "2105h-16h = 2 or 4 " excluding torque control)

(Note 3) By setting the 2107h-04h(Output setup during torque limit), it is possible to switch the torque limit judgment conditions at the time of torque control.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	04h	Output setup during torque limit	-	0 to 1	I16	rw	No	cst tq	Yes
		Set up judgment condition of output whiletorque is limited by torque control. 0 : Turn ON at torque limit including torque command value (6071h + 60B2h) 1 : Turn ON at torque limit excluding torque command value (6071h + 60B2h)							

■ **bit15, 14 (reserved)**

This bit is not used (fixed to 0).

6.5 Operation mode setting

6.5.1 Supported drive modes (6502h)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

The 6502h (Supported drive modes (Axis A)) enables to confirm the operation modes (Modes of operation) supported by this driver module.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6502h	00h	Supported drive modes (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No

• Displays the supported operation mode (Mode of operation).
When the value is 1, the mode is supported.

bit	31 - 16	15 - 10	9	8	7	6	5	4	3	2	1	0
Op-mode	ms	r	cst	csv	csp	ip	hm	r	tq	pv	vl	pp
Value	0···0	0···0	1	1	1	0	1	0	1	1	0	1

ms: manufacturer-specific
r: reserved

bit	Modes of operation	Abbreviation	Support (Note 1)
0	Profile position mode	pp	Yes
1	Velocity mode	vl	No
2	Profile velocity mode	pv	Yes
3	Torque profile mode	tq	Yes
5	Homing mode	hm	Yes
6	Interpolated position mode	ip	No
7	Cyclic synchronous position mode	csp	Yes
8	Cyclic synchronous velocity mode	csv	Yes
9	Cyclic synchronous torque mode	cst	Yes

(Note 1) Response status is different depending on the software version.

6.5.2 Modes of operation (6060h)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

The operation mode is set by 6060h (Modes of operation (Axis A)).

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6060h	00h	Modes of operation (Axis A)	-	-128 to 127	I8	rw	RxPDO	ALL	Yes

• Set the operation mode of the driver module.
The not supported operation mode cannot be set.

bit	Modes of operation	Abbreviation	Support (Note 1)
-128 to -1	Reserved	-	No
0	No mode change / no mode assigned	-	Yes
1	Profile position mode	pp	Yes
2	Velocity mode	vl	No
3	Profile velocity mode	pv	Yes
4	Torque profile mode	tq	Yes
6	Homing mode	hm	Yes
7	Interpolated position mode	ip	No
8	Cyclic synchronous position mode	csp	Yes
9	Cyclic synchronous velocity mode	csv	Yes
10	Cyclic synchronous torque mode	cst	Yes
11 to 127	Reserved	-	No

(Note 1) Response status is different depending on the software version.

- Since 6060h (Modes of operation (Axis A)) is default = 0 (No mode change/no mode assigned), make sure to set the operation mode value after the control power-on.
  If the setting value of 6060h changes PDS state to Operation enabled when 6060h is 0, occur Err88.1" Operation mode setting error protection".
- If not supported operation mode is set by SDO, an Abort message is returned as out of range.
- If 6060h is set to 0 after changing 6060h to the supported operation mode (pp, hm, csp, csv, cst, etc.) from initial state 6060h=0 (No mode assigned), the operation mode is not changed as "No mode changed." (The operation mode last time is held. For information, refer to "6.5.4 Cautions for changing operation mode)."

6.5.3 Modes of operation display (6061h)

The 6061h (Modes of operation display (Axis A)) enables to confirm the internal operation mode of this driver module.

After setting 6060h (Modes of operation (Axis A)), monitor this object to confirm that the system operation is set as expected.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6061h	00h	Modes of operation display (Axis A)	-	-128 to 127	I8	ro	TxPDO	ALL	No

• Displays the operation mode at present.

The definition is the same as 6060h (Modes of operation (Axis A)).

bit	Modes of operation	Abbreviation	Support (Note 1)
-128 to -1	Reserved	-	No
0	No mode change / no mode assigned	-	Yes
1	Profile position mode	pp	Yes
2	Velocity mode	vl	No
3	Profile velocity mode	pv	Yes
4	Torque profile mode	tq	Yes
6	Homing mode	hm	Yes
7	Interpolated position mode	ip	No
8	Cyclic synchronous position mode	csp	Yes
9	Cyclic synchronous velocity mode	csv	Yes
10	Cyclic synchronous torque mode	cst	Yes
11 to 127	Reserved	-	No

(Note 1) Response status is different depending on the software version.

6.5.4 Cautions for changing operation mode

- The operation mode can be switched by changing the value of 6060h (Modes of operation (Axis A)).
- The 6061h (Modes of operation display (Axis A)) enables to confirm the operation mode of the driver module at present.
- When changing the operation mode, synchronize 6060h and the RxPDO objects related to operation mode and then update.
- The values of objects that are not supported by the changed operation mode are irregular.
- About 2 ms is required from the time when the operation mode is changed until the completion of the change. During this time, the value of 6061h and the value of the object of TxPDO related to the operation mode are irregular.
- The MINAS A6 Multi series do not support changing the control mode during operation. When changing the operation mode, make sure that the motor is stopped. If the control mode is changed during a motor operation (including during an origin return operation and deceleration stop), the operation cannot be guaranteed.

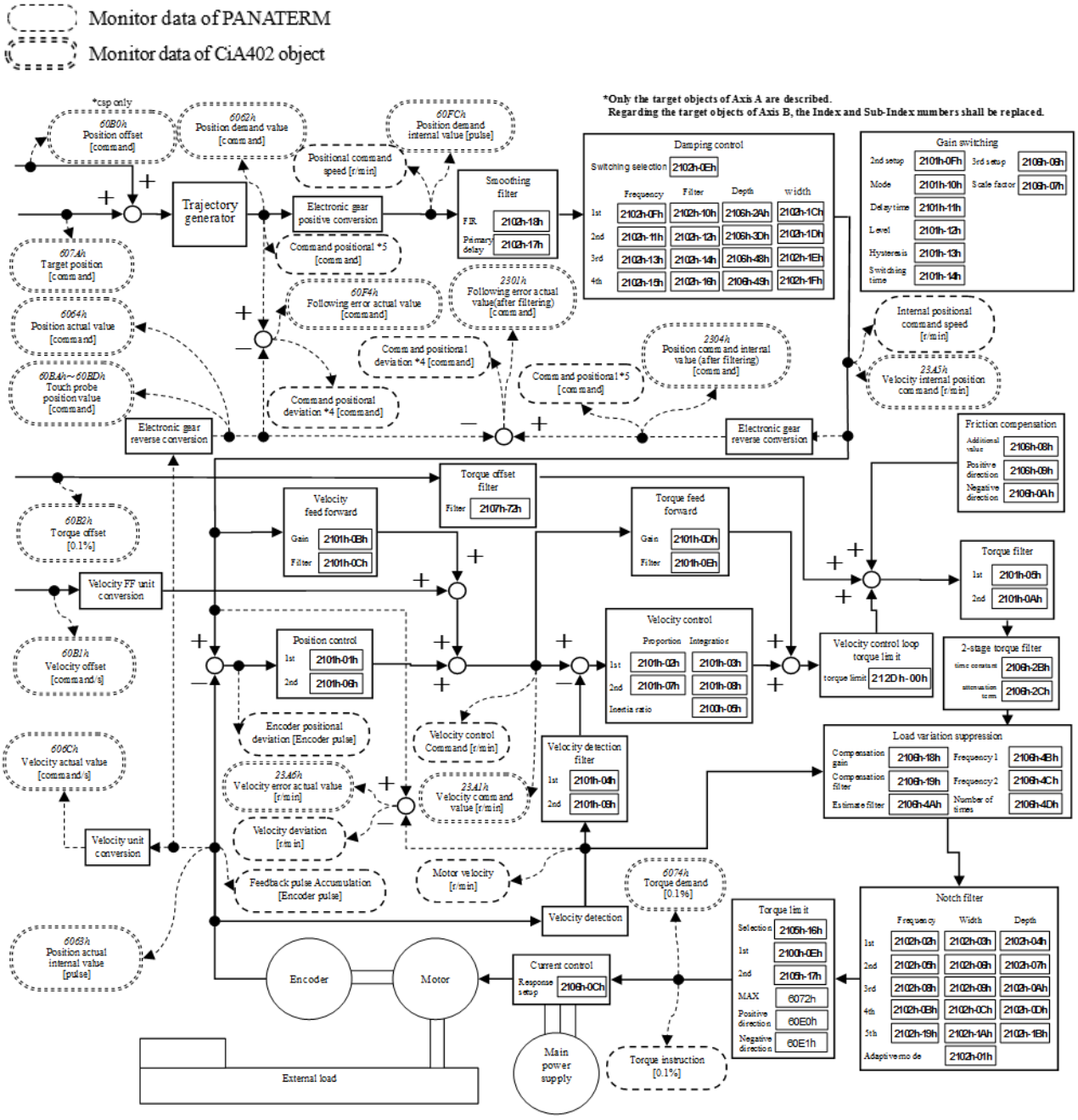
  The mode may not be changed immediately or Err27.4 (command error protection 1) etc. may occur.
- When 6060h and 6061h are 0 and PDS state is made to change to "Operation enabled", Err88.1(Operation mode setting error protection) occurs.
- Set the values other than 0 to 6060h(Modes of operation) once, when set as 6060h=0 after that, the last operation mode is held.
- If a not supported operation mode is set to 6060h, Err88.1 (Operation mode setting error protection) occurs.
- During the full-closed control, only the position controls are supported.
  Therefore, during full-closed control, if 6060h (Modes of operation) is set to 3 (pv), 4(tq), 9 (csv), or 10 (cst), Err88.1 (Operation mode setting error protection) occurs.
- Since two-degree-of-freedom control mode(synchronization type) does not support velocity control mode and torque control, 3(pv), 4(tq), 9 (csv) or 10 (cst) is set to 6060h (Modes of operation (Axis A)) while two-degree-of-freedom control mode (synchronization type) is enabled,
  Err88.1 (Operation mode setting error protection) occurs.

6.6 Position control function (pp, csp, ip, hm)

6.6.1 Common position control function

6.6.1.1 Position control block diagram

Block diagram of position control



*1) A slanting number (ex.:*607Ah*) shows the object number of EtherCAT.

*2) A bold letter number (ex.:2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) The method to calculate the positional deviation on PANATERM for Multi (standard) varies depending on the setting of the command positional deviation output change (bit 14) of 2107h-18h(Communication function extended setup 2).

▼ Refer to

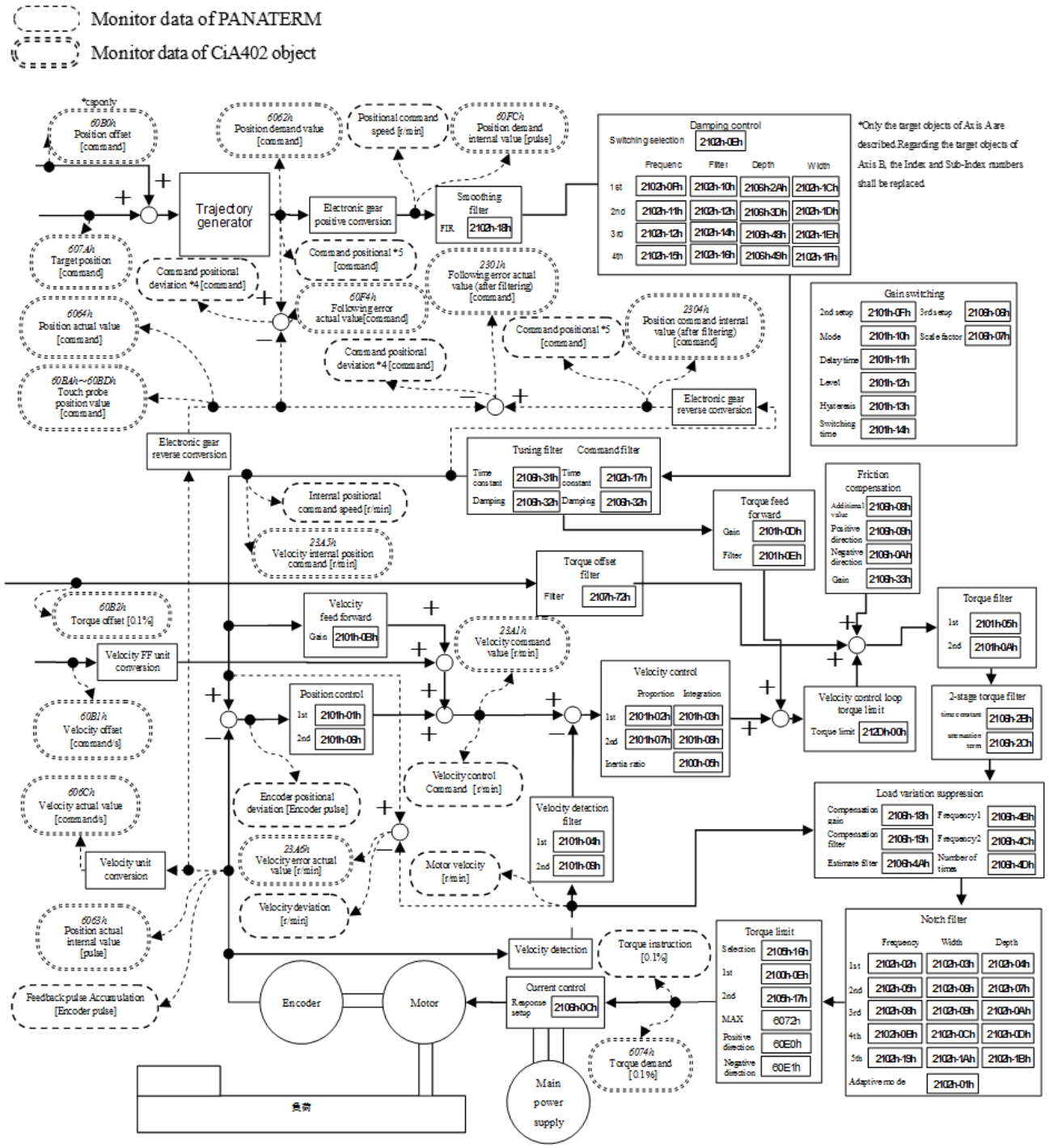
For details, refer to the technical document, "Functional Specification (SX-DSV03455)".

*5) The position command on PANATERM for Multi changes depending on the setting of the bit3(Command pulse accumulation value) of 2107h-64h (Communication function extended setup 6).

*6) When performing test run function, Z phase search, Frequency characteristic measurement (position loop characteristic) from PANATERM for Multi, the driver module switches to position control mode internally.

Block diagram of two-degree-of-freedom control mode (with position control)

In 2 degrees of freedom control mode, the structure in the following block diagram is adopted.



*1) A slanting number (ex.:*607Ah*) shows the object number of EtherCAT.

*2) A bold letter number (ex.:2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) The method to calculate the positional deviation on PANATERM for Multi (standard) varies depending on the setting of the command positional deviation output change (bit 14) of 2107h-18h(Communication function extended setup 2).

▼ Refer to

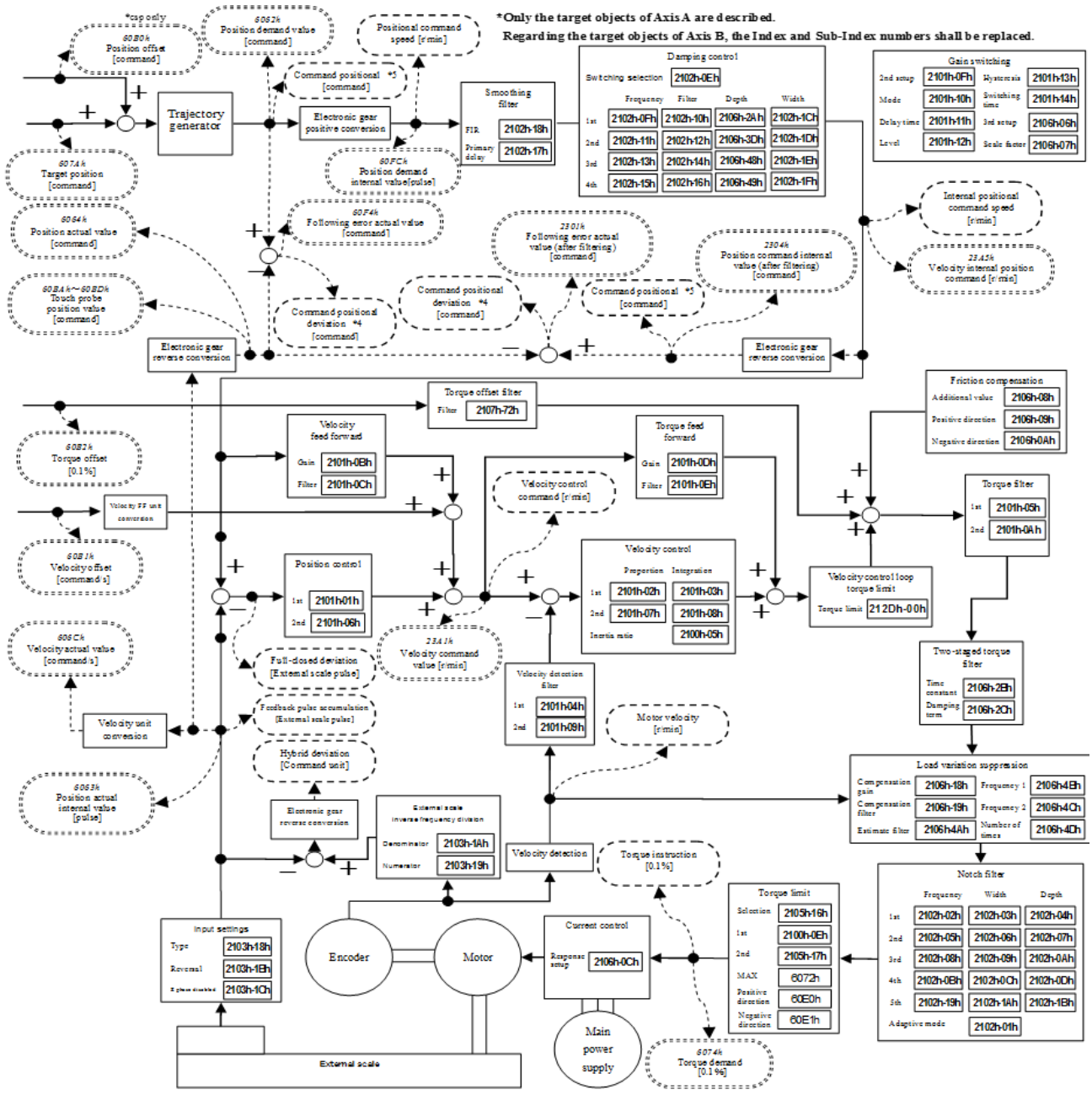
For details, refer to the technical document, "Functional Specification (SX-DSV03455)".

*5) The position command on PANATERM for Multi changes depending on the setting of the bit3(Command pulse accumulation value) of 2107h-64h(Communication function extended setup 6).

*6) When performing test run function, Z phase search, Frequency characteristic measurement (position loop characteristic) from PANATERM for Multi, the driver module switches to position control mode internally.

6.6.1.2 Full-closed control block diagram

Block diagram of full-closed control



*1) A slanting number shows (ex: *607Ah*) the object number of EtherCAT.

*2) A bold letter number (ex.:2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) The method to calculate the positional deviation on PANATERM for Multi (standard) varies depending on the setting of bit14 (command positional deviation output change) of 2107h-18h (Communication function extended setup 2).

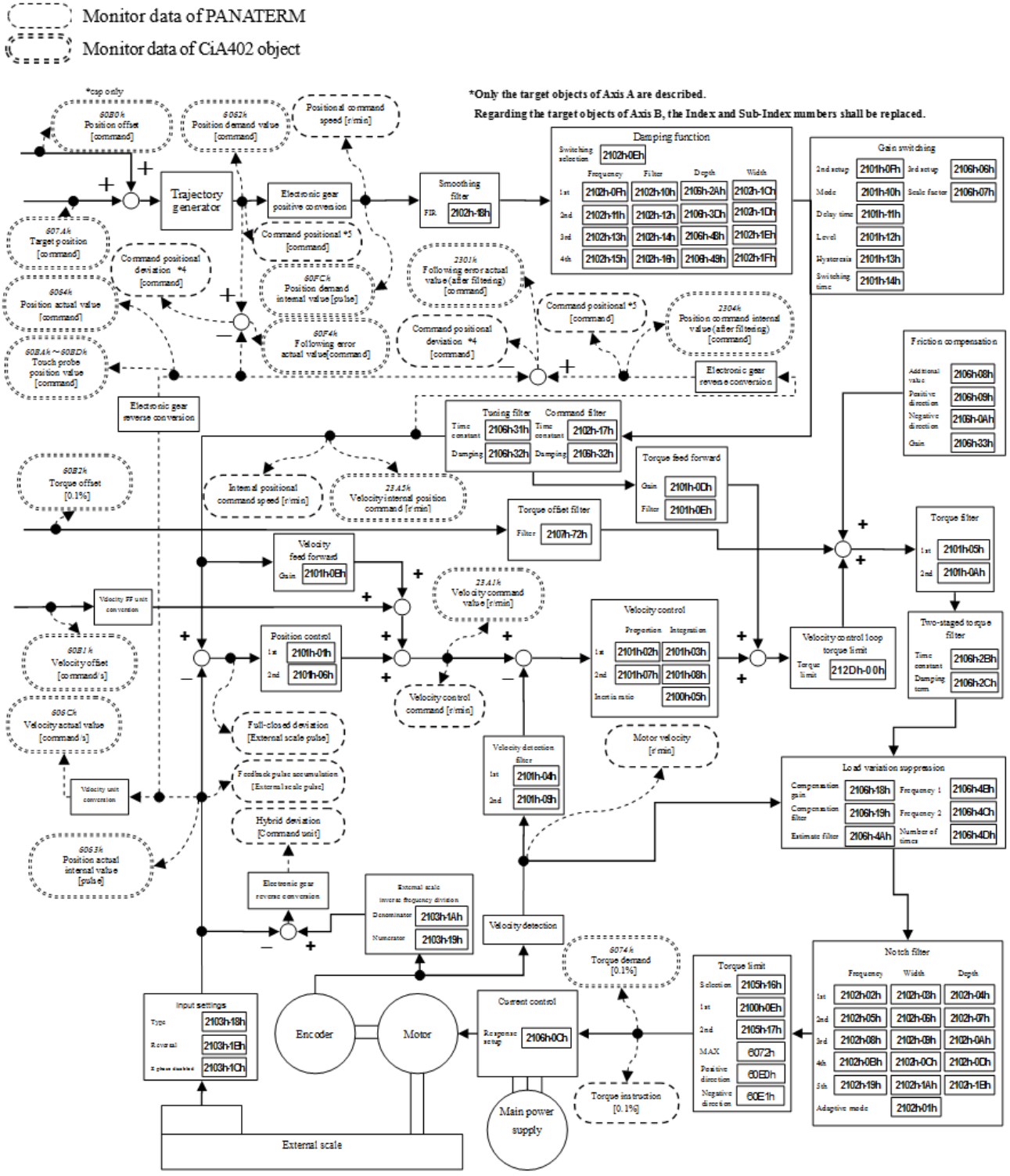
▼ Refer to

For details, refer to the technical document, "Functional Specification (SX-DSV03455)".

*5) The position command on PANATERM for Multi can be switched depending on the setting of the bit3 (Command pulse accumulation value) of 2107h-64h (Communication function extended setup 6).

Block diagram of two-degree-of-freedom control mode (with full-closed control)

In 2 degrees of freedom control mode, the structure in the following block diagram is adopted.



*1) A slanting number shows (ex: *607Ah*) the object number of EtherCAT.

*2) A bold letter number (ex.:2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) The method to calculate the positional deviation on PANATERM for Multi (standard) varies depending on the setting of bit14 (command positional deviation output change) of 2107h-18h (Communication function extended setup 2).

Refer to

For details, refer to the technical document, "Functional Specification (SX-DSV03455)".

*5) The position command on PANATERM for Multi can be switched depending on the setting of the bit3 (Command pulse accumulation value) of 2107h-64h (Communication function extended setup 6)

6.6.1.3 Related objects common in position control (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode			
								pp	csp	ip	hm
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 - 65535	U16	rw	RxPDO	Yes	Yes	Yes	Yes
6040h	00h	Controlword (Axis A)	-	0 - 65535	U16	rw	RxPDO	Yes	Yes	Yes	Yes
6072h	00h	Max torque (Axis A)	0.1%	0 - 65535	U16	rw	RxPDO	Yes	Yes	Yes	Yes
607Ah	00h	Target position (Axis A)	Command	-2147483648 - 2147483647	I32	rw	RxPDO	Yes	Yes	-	-
607Dh	-	Software position limit (Axis A)	-	-	-	-	-	Yes	Yes	Yes	—
	00h	Number of entries	-	2	U8	ro	No				
	01h	Min position limit	Command	-2147483648 - 2147483647	I32	rw	RxPDO				
	02h	Max position limit	Command	-2147483648 - 2147483647	I32	rw	RxPDO				
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	Yes
6080h	00h	Max motor speed (Axis A)	r/min	0 - 4294967295	U32	rw	RxPDO	Yes	Yes	Yes	Yes
6081h	00h	Profile velocity (Axis A)	Command/s	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	-
6082h	00h	End velocity (Axis A)	Command/s	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	-
6083h	00h	Profile acceleration (Axis A)	Command/s^2	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	-
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	-
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 - 2147483647	I32	rw	RxPDO	Yes	Yes	Yes	Yes
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 - 32767	I16	rw	RxPDO	Yes	Yes	Yes	Yes
60C5h	00h	Max acceleration (Axis A)	Command/s^2	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	Yes
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 - 4294967295	U32	rw	RxPDO	Yes	-	Yes	Yes
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 - 65535	U16	rw	RxPDO	Yes	Yes	Yes	Yes
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 - 65535	U16	rw	RxPDO	Yes	Yes	Yes	Yes
60F2h	00h	Positioning option code (Axis A)	-	0 - 65535	U16	rw	RxPDO	Yes	-	-	-

- Besides, there are related objects for each operation mode.
- The function of 6040h (Control word (Axis A)) can differ according to the operation mode.

Refer to

Refer to the section "Related objects" of each operation mode.

Position system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Ah	00h	Target position (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO	pp csp	No
		• Set the target position.							

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv tq cst	Yes
		• Set the velocity limit. • The maximum value is limited by the internal processing at 6080h (Max motor speed (Axis A)). • When 2106h-62h (Function expansion setup 3) bit8=0 is set, this setting becomes valid for pp, hm, ip, pv. When 2106h-62h (Function expansion setup 3) bit8=1 is set, this setting becomes valid for pp,hm,ip,pv,tq,cst.							
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	ALL	Yes
		• Set the maximum speed of motor. • The maximum value is limited by the maximum speed read from the motor in internal processing. The value stored in EEPROM is set when the control power is turned on.							
6081h	00h	Profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes
		• Set the target velocity. • The maximum value is limited by the internal processing at either the smaller 607Fh (Max profile velocity (Axis A)) and 6080h(Max motor speed (Axis A)).							
6082h	00h	End velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes
		• Set the end velocity. Because this driver module does not support it, always returns 0.							
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pp hm ip pv csp csv	Yes
		• Set the offset of the velocity command (velocity feedforward). • The maximum value is limited by the internal processing at 6080h(Max motor speed (Axis A)).							

Torque system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	No
		• When 60FEh-01h (Physical outputs) bit19=1 is set at the state of 60FE-02h (Bit mask) bit19=1, the torque command value generated from velocity control is limited at the set value.							
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• Set the maximum torque of the motor. • The maximum value is limited by the maximum torque of the motor in the internal processing. • The maximum torque of the motor varies depending on the motor applied.							
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	ALL	Yes
		• Set the offset of the torque command (torque feedforward). • During slowdown in over-travel inhibition (in emergency stop), the torque feedforward level becomes 0.							
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• The torque limit in the positive direction is set, at the time when 2105h-16h (Selection of torque limit)=5 has been set.							
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• The torque limit in the negative direction is set, at the time when 2105h-16h (Selection of torque limit)=5 has been set.							

Acceleration and deceleration system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6083h	00h	Profile acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp ip pv	Yes
		• Set the profile acceleration. • If it is set to 0, internal processing is treated as 1.							
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp ip pv	Yes
		• Set the profile deceleration. • If it is set to 0, internal processing is treated as 1.							
60C5h	00h	Max acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes
		• Set the maximum acceleration. • If it is set to 0, internal processing is treated as 1.							
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes
		• Set the maximum deceleration. • If it is set to 0, internal processing is treated as 1.							

Other

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No	Description
bit7	Internal value state selection of objects 60B2h(Torque offset (Axis A)) in servo-off (Fall prevention function in the event of Servo-ON) 0: Clear 1: Updated with the set value of 60B2h

Note

When this setting value is set to 1, set the value of 60B2h (Torque offset (Axis A)) to a value smaller than the value of 2105h-0Ch(Torque setup for emergency stop)

Software position limit (607Dh)

Set to operation range of positioning command value by 607Dh (Software position limit (Axis A)).

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Dh	-	Software position limit (Axis A)	-	-	-	-	-	-	-
		• Set the software limit value.							
	00h	Number of entries	-	2	U8	ro	No	pp ip csp	No
		• Displays the number of sub-indexes for 607Dh (Software position limit (Axis A)).							
	01h	Min position limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO	pp ip csp	Yes
		• Set the software limit value in negative direction.							
	02h	Max position limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO	pp ip csp	Yes
		• Set the software limit value in positive direction.							

■ Setting unit

607Dh (Software position limit (Axis A)) is set in units of command.

Set a value including 607Ch (Home offset (Axis A)) in the same way as 6062h (Position demand value (Axis A)).

Refer to

For information on Home offset, refer to “6.9.4.6 Home offset (607Ch)”.

■ Activation

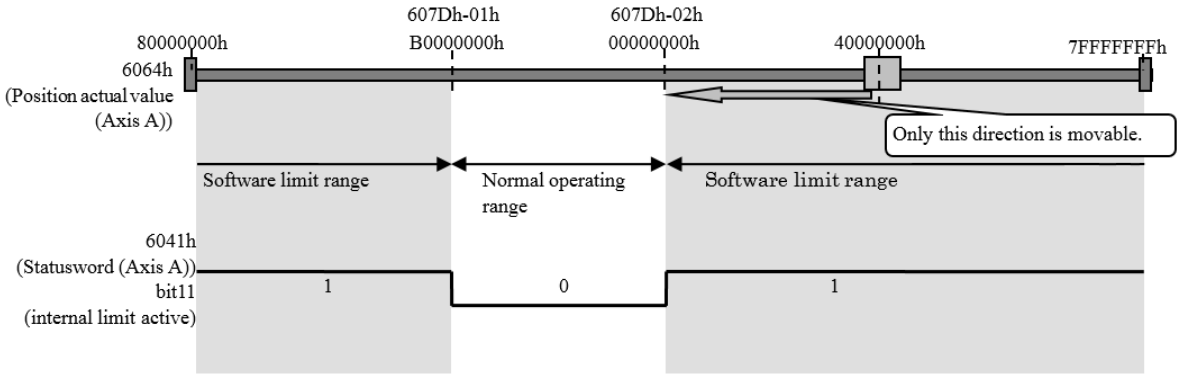
To enable the software limit, must satisfy the following conditions.

- It is the position operation mode (pp, ip, csp).
- The position coordinate is finalized.
  - Absolute mode: ESM state is PreOP or more.
  - Incremental mode: The return to home position operation has been completed normally.
- 607Dh-01h < 607Dh-02h.

In incremental mode, the software limit function will be disable when the ESM state transits from Init to PreOP, so execute the homing operation again.

◆ NOTE

- **At the time of position information initialization, make a setting so that the actual position is within the range of 607Dh-01h to 607Dh-02h (normal operating range). Except when the actual position is outside of the normal operating range, the actual position can be moved only in the direction in which it falls within the normal operating range. (It cannot be moved in the opposite direction.) Bit 11 (internal limit active) of 6041h (Statusword (Axis A)) remains 1 until the actual position falls within the normal operating range.**



■ **Invalidation**

If disable the software limit function, make the preset value of each object into the following conditions.

607Dh-01h >= 607Dh-02h

Example) 607Dh-01h = 0
607Dh-02h = 0

■ **Workings of wrap around**

If want to perform the operation wraparound, please disable software limit function.

If the actual position or command position is wrapped around when the software limit function is effective, Err88.3 (improper operation error protection) will occur.

Also bit 11 (internal limit active) of 6041h (Statusword (Axis A)) will be indefinite.

■ **Workings of limit detection**

Upon detection of the actual position or command position reaching the software limit during motor operation, deceleration is started according to quick stop ramp (Note 1).

For csp control mode, however, deceleration may be started in a delayed fashion depending on the command division timing.

(Note 1) quick stop ramp: 605Ah (Quick option code (Axis A)) is 2 or 6

6.6.1.4 Related objects common in position control (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode			
								pp	csp	ip	hm
212Bh	00h	Over load factor (Axis A)	0.1%	0 - 65535	U16	ro	TxPDO	Yes	Yes	Yes	Yes
2301h	00h	Following error actual value (after filtering) (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2304h	00h	Position command internal value (after filtering) (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
230Ch	00h	Velocity command value (after filtering) (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
230Dh	00h	External scale position	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2020h	00h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	Yes	Yes	Yes	Yes
2341h	00h	Number of entries	-	2	U8	ro	No	Yes	Yes	Yes	Yes
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	Yes	Yes	Yes	Yes
2348h	00h	External scale pulse total (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2349h	00h	External scale absolute position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2387h	00h	External scale data (Higher) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
2388h	00h	External scale data (Lower) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
23A5h	00h	Velocity internal position command (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
23A6h	00h	Velocity error actual value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode			
								pp	csp	ip	hm
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	Yes	Yes	Yes	Yes
6062h	00h	Position demand value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
6065h	00h	Following error window (Axis A)	Command	0 to 4294967295	U32	rw	RxPDO	Yes	Yes	-	-
6066h	00h	Following error time out (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	Yes	Yes	-	-
6067h	00h	Position window (Axis A)	Command	0 to 4294967295	U32	rw	RxPDO	Yes	-	Yes	-
6068h	00h	Position window time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	Yes	-	Yes	-
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes	Yes	Yes
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO	Yes	Yes	Yes	Yes
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes	Yes	Yes
60F4h	00h	Following error actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
60FAh	00h	Control effort (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes
60FCh	00h	Position demand internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes	Yes	Yes

Besides, there are related objects for each operation mode.

Refer to

Refer to the section "Related objects" of each operation mode.

Position system

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2301h	00h	Following error actual value (after filtering) (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Position deviation (after filtering) is displayed.							
2304h	00h	Position command internal value (after filtering) (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Internal command position (after filtering) is displayed.							
230Dh	00h	External scale position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Position of the external scale is displayed.							
2341h	-	Motor encoder data (Axis A)	-	-	-	-	-	-	-
		• Position information is displayed.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		• The number of Sub-Index of 2341h (Motor encoder data (Axis A)) is displayed.							
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Motor mechanical angle (encoder single-turn data) is displayed.							
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• - Multi-turn data of the absolute encoder is displayed.							
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The electrical angle of the motor is displayed.							
2348h	00h	External scale pulse total (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Sum of external scale pulse counts is displayed.							
2349h	00h	External scale absolute position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Absolute position of the external scale is displayed.							
2387h	00h	External scale data (Higher) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Higher 24 bits of external scale data is displayed.							
2388h	00h	External scale data (Lower) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Lower 24 bits of external scale data is displayed.							

Position system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6062h	00h	Position demand value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No
		• Indicates a command position (= IPOS).							
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Indicate the motor of actual position. If full-close control or encoder unit other than full-closed control, is external scale unit.							
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Indicate actual position of the motor. Under full-closed control, this is the external scale position.							
60F4h	00h	Following error actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	pp ip hm csp	No
		• Indicate position deviation.							
60FCh	00h	Position demand internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	pp ip hm csp	No
		• Indicates an internal command position.							

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
230Ch	00h	Velocity command value (after filtering) (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Command velocity (after filtering) is displayed.							
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Velocity control command is displayed.							
23A5h	00h	Velocity internal position command (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Internal position command velocity is displayed.							
23A6h	00h	Velocity error actual value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Velocity deviation is displayed.							
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Indicate sensor value of actual velocity. Return 0 always because this driver module not supported.							
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Indicate the motor of actual velocity (= FSPD).							
60FAh	00h	Control effort (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	pp ip hm csp	No
		• Indicate command value of internal velocity (output position loop).							

Torque system

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Bh	00h	Over load factor (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	ALL	No
		• The ratio [0.1%] to the rated load is displayed.							
2020h	00h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Regenerative load ratio (ratio of the alarm occurrence level of Over-regeneration load protection) is displayed.							
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Inertia ratio is displayed. The ratio of load inertia to the motor's rotor inertia (equivalent of 2100h-05h) Inertia ratio = (load inertia/rotor inertia) x 100							
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Positive direction torque limit value is displayed.							
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Negative direction torque limit value is displayed.							
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Indicates an internal command torque.							
6076h	00h	Motor rated torque	mN·m	0 to 4294967295	U32	ro	TxPDO	ALL	No
		• Reads out the rated torque from the motor and automatically sets it.							
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Indicates actual torque. • It becomes a value equivalent to actual current value. • This output value is a reference value and does not guarantee an actual value.							

Statusword (6041h) <Common functions in position control>

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

This section describes the following functions of 6041h (Statusword).

- bit 10: target reached (completed positioning detected)
- bit 13: following error (position over-deviation detected)

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

• Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms Following error (only pp, cps	(differ in operation mode)	ila	oms Target reached (except csp)	rm	r	w	sod	qs	ve	f	oe	so	rtso

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

Refer to

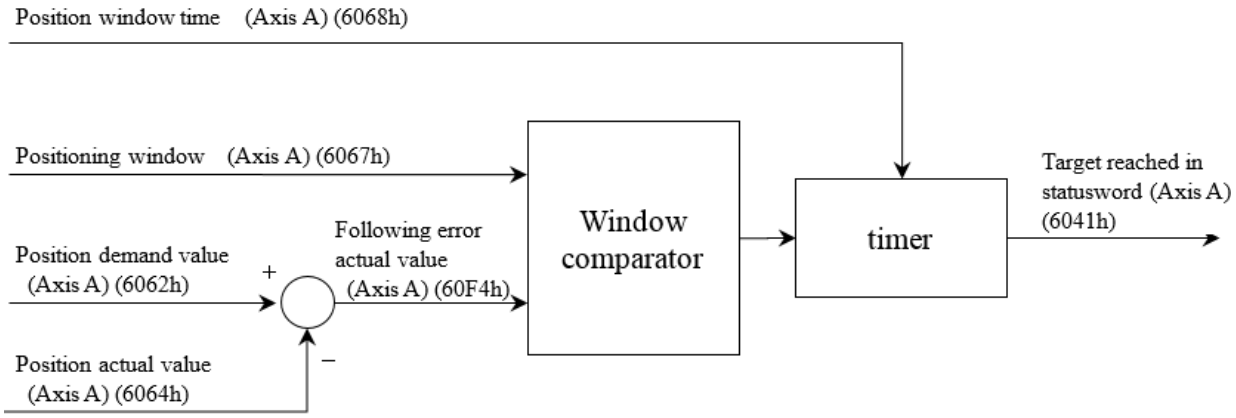
For other functions, refer to the section "Related objects" of each operation mode.

■ **bit10: target reached (position reached)**

When the servo is on (Operation enabled state), all set-points have been released with the command generation completed, the difference between 6062h (Position demand value (Axis A)) and 6064h (Position actual value (Axis A)) is within the range set in 6067h (Position window (Axis A)), and the time set in 6068h (Position window time (Axis A)) elapses, bit 10 (target reached) of 6041h (Statusword (Axis A)) is set to 1.

bit	Name	Value	Definition
10	target reached	0	halt=0 (during normal operation) : Positioning not yet completed halt=1 (during stop by halt) : During axis deceleration
		1	halt=0 (during normal operation) : Positioning completed halt=1 (during stop by halt) : Axis stop (Axis speed is 0.)

Position reached (functional overview)



Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6067h	00h	Position window (Axis A)	Command	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes
		• Set the threshold where bit 10 (Target reached) of 6041h (Statusword (Axis A)) becomes 1 when the difference between 6062h (Position demand value (Axis A)) and 6064h (Position actual value (Axis A)) is within the range set by this parameter and the time set in 6068h (Position window time (Axis A)) elapses. If the position deviation is out of the values set by this parameter, the bit 10 of 6041h will be 0.							
6068h	00h	Position window time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	pp ip	Yes
		• Set the time until bit 10 of 6041h (Statusword) is turned ON when the difference between 6062h (Position demand value (Axis A)) and 6064h (Position actual value (Axis A)) is within the range set by 6067h (Position window (Axis A)).							

Refer to

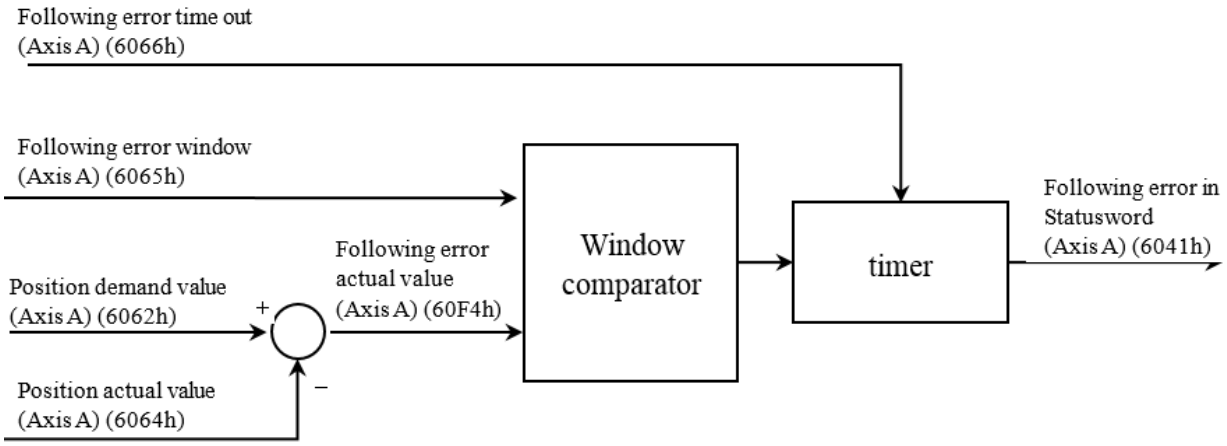
For Positioning complete output (INP/INP2) function, refer to the technical document, "Functional Specification (SX-DSV03455)".

■ **bit13 : following error**

When the value of 60F4h(Following error actual value (Axis A)) goes beyond the range set by 6065h (Following error window (Axis A)) for the time set by 6066h (Following error time out (Axis A)), the bit 13(following error) of 6041h (Statusword (Axis A)) is set to 1.

bit	Name	Value	Definition
13	following error	0	When 60F4h (Following error actual value (Axis A)) (= 6062h (Position demand value (Axis A)) - 6064h (Position actual value (Axis A))) does not go beyond the range set by 6065h (Following error window (Axis A)). Or, 60F4h goes beyond the value set by 6065h but the time set by 6066h does not elapse.
		1	60F4h (Following error actual value (Axis A)) goes beyond the range set by 6065h (Following error window (Axis A)) for the time or more set by 6066h (Following error time out (Axis A))

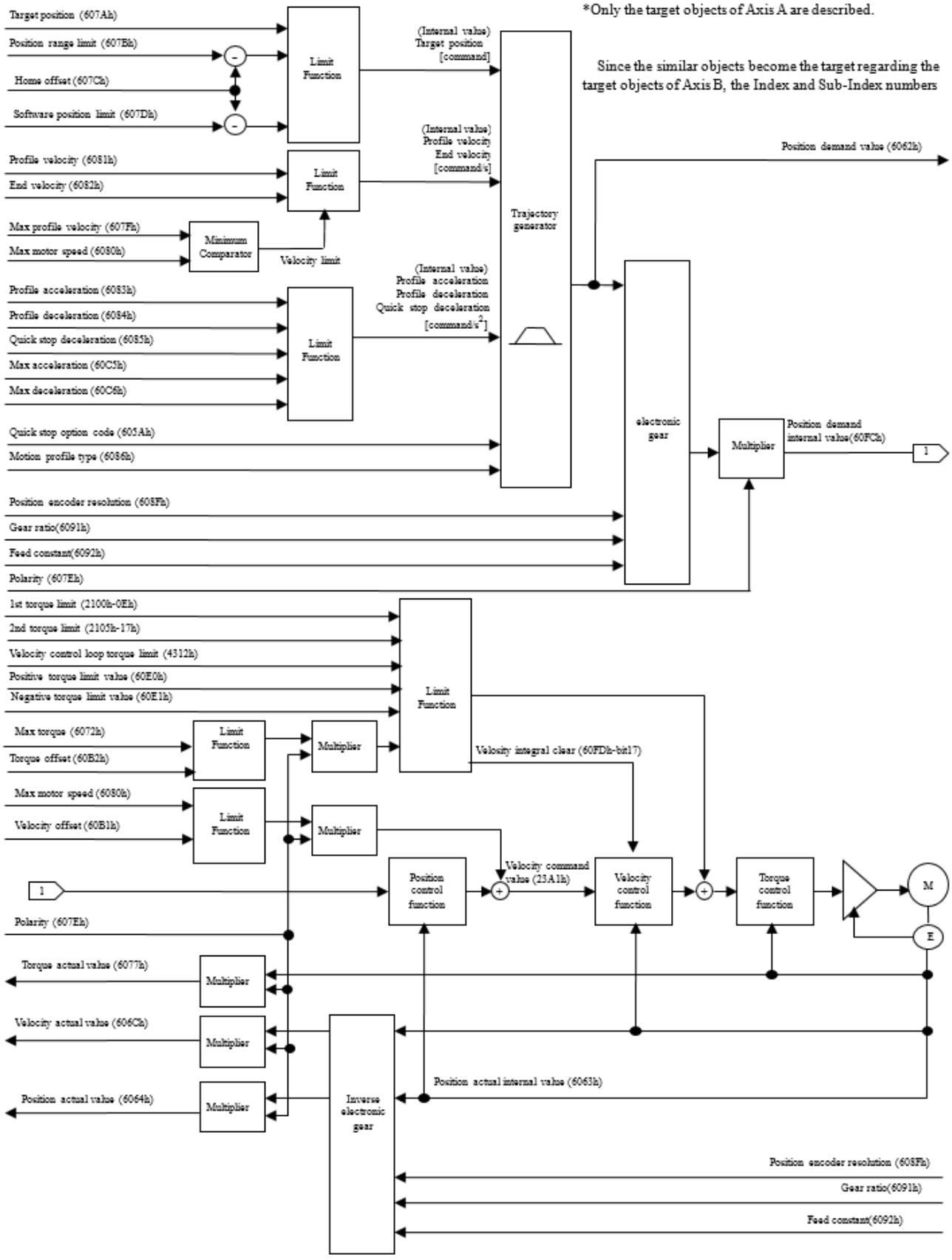
Following error (functional overview)



Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6065h	00h	Following error window (Axis A)	Command	0 to 4294967295	U32	rw	RxPDO	pp csp	Yes
		• Set the threshold where the bit13 (following error) of 6041h (Statusword) will be 1 when the value of 604Fh (Following error actual value) is out of the values set by this parameter.							
6066h	00h	Following error time out (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	pp csp	Yes
		• If the state which the value of 604Fh(Following error actual value (Axis A)) is exceeded setting range of 6065h(Following error window (Axis A)) is continued more than setting value of this parameters, bit13(following error) of 6041h(Statusword (Axis A)) is set 1.							

6.6.2 Profile position mode (pp mode)

It is a position control mode to operate by designating the target position, target velocity, addition-subtraction velocity, etc. and creating a position command in the driver module. In this control mode, please use the communication cycle of 250µs or more.



6.6.2.1 Objects related to pp mode (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
60F2h	00h	Positioning option code (Axis A)	-	0 to 65535	U16	rw	RxPDO

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
607Ah	00h	Target position	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Dh	-	Software position limit (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Min position limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
6081h	00h	Profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6082h	00h	End velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6083h	00h	Profile acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60C5h	00h	Max acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO

Refer to
For more information, refer to “6.6.1 Common position control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6086h	00h	Motion profile type (Axis A)	-	-32768 to 32767	I16	rw	RxPDO
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60A3h	00h	Profile jerk use (Axis A)	-	1 to 2, 255	U8	rw	No
60A4h	-	Profile jerk (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Profile jerk1	Command/s^3	0 to 4294967295	U32	rw	No
	02h	Profile jerk2	Command/s^3	0 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

Refer to

For more information, refer to “6.9 Common motion function”.

Controlword (6040h) <Functions in pp mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms change on set-point	h	fr	oms Absolute/ relative	Change set immediately	New set-point	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

■ bit9, 6-4 (operation mode specific)

Bit	Name	Value	Definition
4	new set-point	0->1	It is a trigger to activate a positioning operation and update a set value. Imports new positioning tasks (607Ah (Target position (Axis A)) and 6081h (Profile velocity (Axis A)) etc.).
5	change set immediately	0	After the positioning operation at present is completed, next positioning operation starts.
		1	Suspends the positioning operation at present and starts next positioning operation at once. The additional option of the operation change timing is set with the cio bit (bit3-2) of 60F2h (Positioning option code (Axis A)).
6	absolute/ relative	0	Handles 607Ah (Target position (Axis A)) as an absolute position
		1	Handles 607Ah (Target position (Axis A)) as a relative position. The additional option in relative positioning is set with the relative option (bit1-0) of 60F2h (Positioning option code (Axis A)).
9	change on set-point	-	Refer to the table below This is not supported by this software version.

The table below lists the difference of an operation according to the combination of bits 9, 5 and 4.

bit 9 change on set-point	bit 5 change set immediately	bit 4 new set-point	Definition
0	0	0->1	The next positioning operation starts after the positioning operation at present is completed (refer to example 1 or 3)
X	1	0->1	The next positioning operation is performed immediately (refer to example 1 or 2)
1	0	0->1	After the positioning operation is performed to the target position at present with the present profile velocity, the next positioning operation starts (refer to example 1 or 3) This is not supported by this software version.

◆ NOTE

- **Do not change the acceleration or deceleration(*) during motor operation. If change the acceleration or deceleration, change bit4(new set-point) from 0 to 1 after the motor stops.**

  (*) 6083h (Profile acceleration (Axis A))
  6084h (Profile deceleration (Axis A))
  60C5h (Max acceleration (Axis A))
  60C6h (Max deceleration (Axis A))

- **Note that when the set point is executed (bit 4 (new set-point) is changed from 0 to 1 in the following conditions, that positioning task will be discarded.**
  - **Set-point when 6081h (Profile velocity (Axis A)) = 0**
  - **Set-point to the direction with which the position will not get out of the limited state by the software limit**
  - **Set-point to the direction with which the position will not get out of the limited state by the drive prohibition**
- **If the following status occurs, all the positioning tasks will be discarded, so care should be taken.**
  - **If run-inhibition is detected during deceleration due to halt = 1**
  - **If run-inhibition is detected with positioning task operating to opposite direction of positioning task being executed buffered**
- **Allow 2 ms from the time when pp operation is started until the next pp operation is started (the new set-point is changed from 0 to 1).**
- **If it is stopped with halt, the setting of 6040h: bit5, 9 and 60F2h in the positioning task being executed (during a halt stop) will be cleared inside (set value 0).**

Positioning option code (60F2h)

This object is an additional option to determine the operational specifications for positioning operation in pp mode.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Positioning option code (Axis A)	-	0 to 65535	U16	rw	RxPDO	pp	Yes

• Set the specification of positioning operation.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ms	Reserved									rro		cio		relative option	

Abbreviation	Description
ms	manufacturer-specific
rro	request-response option
cio	change immediately option

■ bit1-0 (relative option)

The abs/reel bit (bit6) of 6040h (Controlword (Axis A)) is set to 1, determine the operation specification of relative positioning when performing the operation. Normally it is used in mode 0.

bit 1	bit 0	Relative positioning mode	Definition
0	0	mode 0	The operation is relative to the target position (absolute coordinate value) in the last operation. (Note 1) When there is no target position in the last operation or the operation has been executed in other control modes, the operation is relative to the absolute coordinate value 0. When the operation has been executed in other control modes, the previous target position is discarded.
0	1	mode 1	The positioning is relative to the 6062h(Position demand value (Axis A)) (= value output by trajectory generator). (Note 2)
1	0	mode 2	The positioning is relative to the 6064h (Position actual value (Axis A)). (Ntoe 2)
1	1	mode 3	Reserved

(Note 1) When the next operation is started in mode 0 during pausing the previous operation by over-travel inhibition or quick stop etc., the next target position becomes relative position from the previous target position.
The movement direction becomes the direction which is shorter at the distance from the command position at pausing the previous positioning operation to the next target position.
In other words, if the difference between the next target position and the command position at pausing the previous positioning operation is outside the range of -2147483648 to 2147483647, it operates in the opposite direction to the sign of the set relative position. Please be careful.
If this operation becomes problematic for applications that operate in the same direction and interrupt frequently, please use mode 1.

(Note 2) A propagation delay or other factors may prevent the position from reaching the expected position.

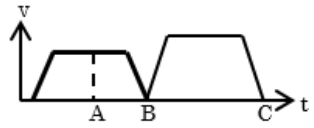
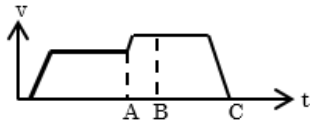
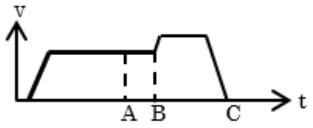
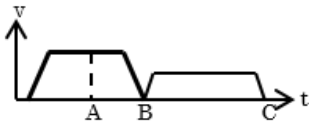
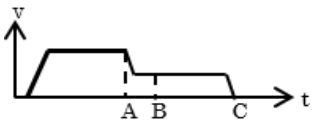
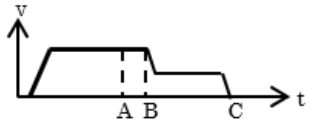
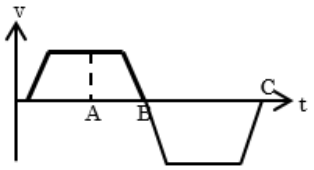
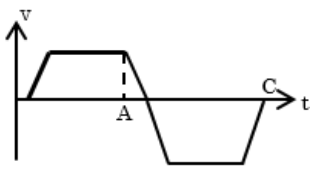
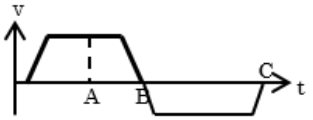
■ **bit3-2 (cio (change immediately option))**

The change set immediately bit(bit5) of 6040h (Controlword (Axis A)) is set 1, determine the operation specification if start the next positioning operation immediately.

This software version supports this specification only when bits 3 and 2 are both 0. Do not set it to a value other than 0.

bit 3	bit 2	Definition
0	0	Update the operate (including changes of Profile velocity and acceleration, etc.) new positioning tasks immediately.
0	1	A new positioning task (including the changes of profile velocity, acceleration, etc.) operate continuously to the positioning task running at present arrives(continue operation without stopping on the target position of the positioning task that is currently performed.). This software version does not support this specification.
1	0	reserved
1	1	reserved

The following indicate the operation pattern by a combination of change set immediately bit (bit5) of 6040h (Controlword (Axis A)) and cio (change immediately option) bit(bit3-2) of 60F2h (Positioning option code (Axis A)).

6040h:00h(bit5) change set immediately	**0**		**1**	
60F2h:00h(bit3-2) cio (change immediately option)	**00**	**01 (Not Supported)**	**60F2h:00h(bit3-2) cio (change immediately option)**	**00**
When the target position was updated in the same direction and speed is accelerated.				
When the target position was updated in the same direction and speed is decelerated.				
When a target position is updated to a counter direction.			 Note It does not arrive at the last target position.	

A : Timing which changed the command

B : Target position (last time) arrival timing

C : Target position (after updating) arrival timing

Thick line : It operates on condition of before changing a command.

Thin line : It operates on condition of after changing a command.

■ **bit5-4 (rro (request-response option))**

After the positioning operation is started, the master is supposed to set the new_set-point (bit 4) of 6040h (Control word (Axis A)) to 0; however, this option allows the slave to automatically set it to 0.

bit 5	**bit 4**	**Definition**
bit 5	bit 4	Definition
0	0	The handshake is necessary, as shown in the examples 1 to 3.
0	1	The slave releases the New setpoint bit automatically as soon as the drive arrives at the target position. (It is set as 0.)
1	0	The slave releases the new setpoint bit automatically as soon as the slave accepts a new target position. (It is set as 0.)

6.6.2.2 Objects related to pp mode (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6062h	00h	Position demand value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6065h	00h	Following error window (Axis A)	Command	0 to 4294967295	U32	rw	RxPDO
6066h	00h	Following error time out (Axis A)	1ms	0 to 65535	U16	rw	RxPDO
6067h	00h	Position window (Axis A)	Command	0 to 4294967295	U32	rw	RxPDO
6068h	00h	Position window time (Axis A)	1ms	0 to 65535	U16	rw	RxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6076h	00h	Motor rated torque (Axis A)	mN•m	0 - 4294967295	U32	ro	TxPDO
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
60F4h	00h	Following error actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FAh	00h	Control effort (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
60FCh	00h	Position demand internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO

Refer to

For more information, refer to “6.6.1 Common position control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to section 6.9.

Statusword (6041h) <Functions in pp mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

• Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	following error	set-point acknowledge		Target reached										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13,12,10 (operation mode specific)

bit	Name	Value	Definition
10	target reached	-	Refer to Refer to “6.6.1.3“.
12	set-point acknowledge	0	The new set-point is 0, the motion is done (in process) for the last target position, and the buffer is empty
		1	Data for a new positioning task has been imported into the buffer and it is not empty
13	following error	-	Refer to Refer to “6.6.1.3“.

6.6.2.3 Operations of pp mode

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Example 1 (basic set-point)

The master sets the value of 607Ah (Target position (Axis A)) and then changes the value of the bit 4 (New setpoint) of 6040h (Control word (Axis A)) from 0 to 1. In that case, also set 6081h (Profile velocity (Axis A)). If the value of 6081h (Profile velocity (Axis A *1)) is 0, the motor does not work.

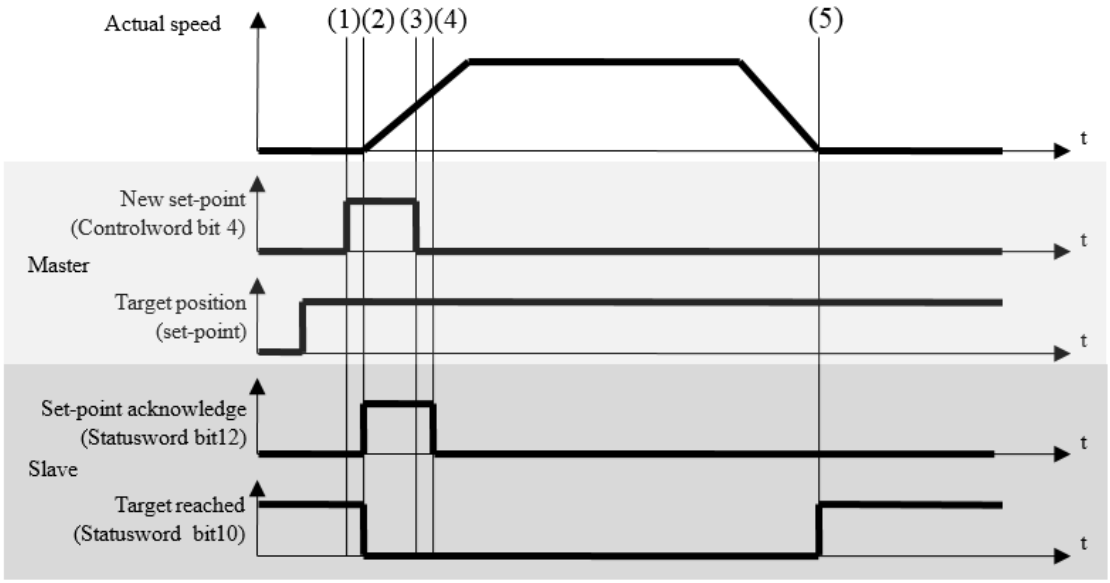
The slave confirms the rising edge (from 0 to 1) of the bit 4 (New setpoint) of 6040h (Control word (Axis A)) and starts the positioning motion toward the target position, 607Ah (Target position (Axis A)). Here, the slave changes the value of the bit 12 (Setpoint acknowledge) of 6041h (Status word (Axis A)) from 0 to 1.

The master confirms that the value of the bit12 (Setpoint acknowledge) of 6041h (Status word (Axis A)) is changed from 0 to 1 and puts the bit 4 (New setpoint) of 6040h (Control word (Axis A)) back to 0.

The slave confirms that the bit 4 (New setpoint) of 6040h (Control word (Axis A)) is set to 0 and sets the bit 12 (Setpoint acknowledge) of 6041h (Status word (Axis A)) to 0.

When the motion arrives at the target position, the slave changes the value of the bit 10 (Target reached) of 6041h (Status word (Axis A)) from 0 to 1.

■ **Set-point example**



*1) 6081h (Profile velocity (Axis A)) is limited by the smaller of 607Fh (Max profile velocity (Axis A)) or 6080h (Max motor speed). A change that is made to the preset value of 607Fh (Max profile velocity (Axis A)) or 6080h (Max motor speed (Axis A)) during operation will not be reflected in that operation.

Example 2 (Data change in operation, without buffer: Single set-point)

When bit5 (change set immediately) of 6040h (controlword (Axis A)) is 1, if it made changes to the data for the positioning operation during operation, interrupting the current positioning operation, is started the next positioning operation immediately.

The master confirms that the bit12 (set-point acknowledge) of 6041h (Statusword (Axis A)) is 0, changes the value of 607Ah (Target position (Axis A)), and then changes the value of the bit4 (new setpoint) of 6040h (Controlword (Axis A)) from 0 to 1.

Note

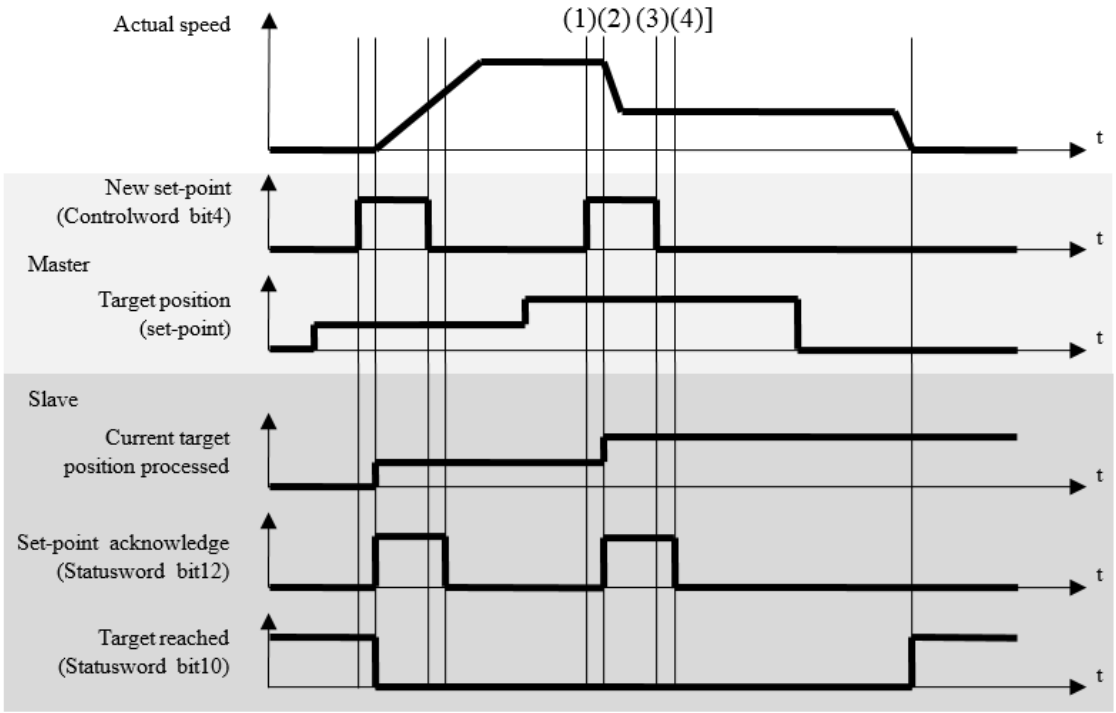
Acceleration and deceleration must not change at this time.

The slave confirms the rising edge (from 0 to 1) of the bit4 (new setpoint) of 6040h (Controlword (Axis A)) and updates 607Ah (Target position (Axis A)) with a new target position. Here, the slave changes the value of the bit12 (setpoint acknowledge) of 6041h (Statusword (Axis A)) from 0 to 1.

The master confirms that the value of the bit12 (setpoint acknowledge) of 6041h (Statusword (Axis A)) is changed from 0 to 1 and puts the bit4 (new setpoint) of 6040h (Controlword (Axis A)) back to 0.

The slave confirms that the bit4 (new setpoint) of 6040h (Controlword (Axis A)) is set to 0 and sets the bit12 (setpoint acknowledge) of 6041h (Statusword (Axis A)) to 0.

■ **Handshaking procedure for the single set-point method**



◆ NOTE

- **Similar steps 1 to 4 enable to change 6081h (Profile velocity (Axis A)).**
- **Also, after changing 607Ah (Target position (Axis A)) and 6081h (Profile velocity (Axis A)), perform the steps 1 to 4 mentioned above to update 607Ah (Target position (Axis A)) and 6081h (Profile velocity (Axis A)) at the same time.**

Example 3 (Data change in operation, with buffer: Set of set-points)

When bit5 (change set immediately) of 6040h (Controlword (Axis A)) is 0, if it made changes to the data for the positioning operation during operation, completing the current positioning operation, is started the next positioning operation immediately.

The master confirms that the bit12 (set-point acknowledge) of 6041h (Statusword (Axis A)) is 0, changes the value of 607Ah (Target position (Axis A)), and then changes the value of the bit4 (new setpoint) of 6040h (Controlword (Axis A)) from 0 to 1.

Note

Acceleration and deceleration must not change at this time.

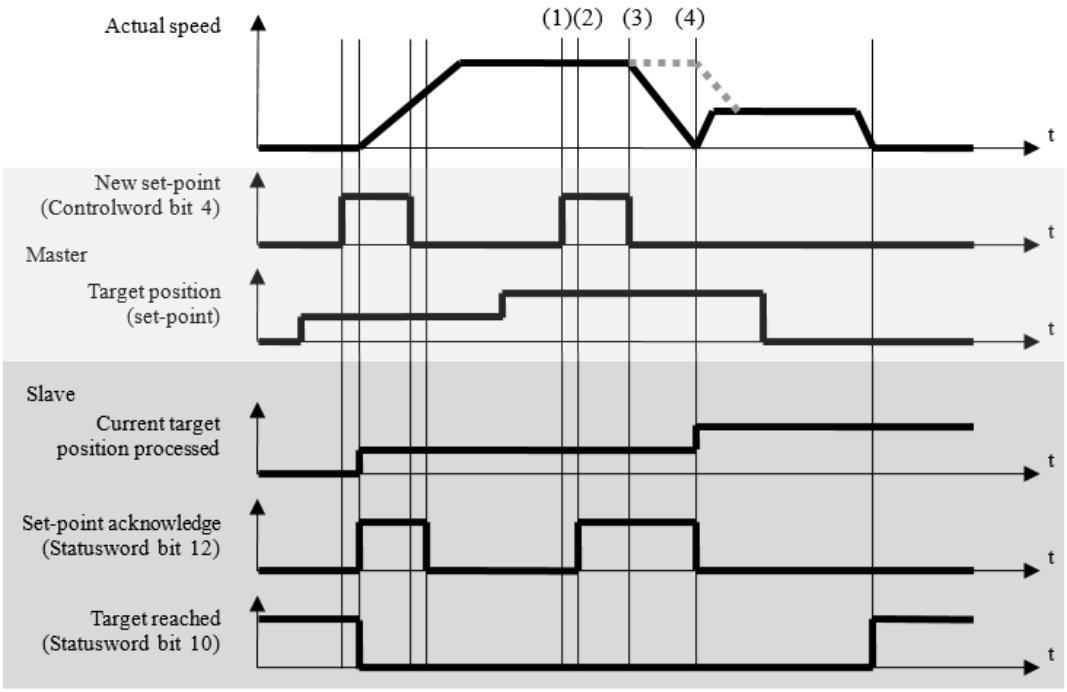
The slave confirms the rising edge (0 to 1) of the bit4 (new set-point) of 6040h (Controlword (Axis A)) and buffers 607Ah (Target position (Axis A)) as a new target position. Here, the slave changes the value of the bit12 (setpoint acknowledge) of 6041h (Statusword (Axis A)) from 0 to 1.

At this stage, the positioning operation is continued for the target position before the change.

The master confirms that the value of the bit12 (set-point acknowledge) of 6041h (Statusword (Axis A)) is changed from 0 to 1 and puts the bit4 (new set-point) of 6040h (Controlword (Axis A)) back to 0.

The slave confirms that bit4 (new set-point) of 6040h (Controlword (Axis A)) is set to 0 and that the current positioning operation is completed, and starts a positioning operation for the new target position. At this point, the buffer becomes empty, bit12 (set-point acknowledge) of 6041h (Statusword (Axis A)) is set to 0.

■ **Handshaking procedure for the set of set-point method**



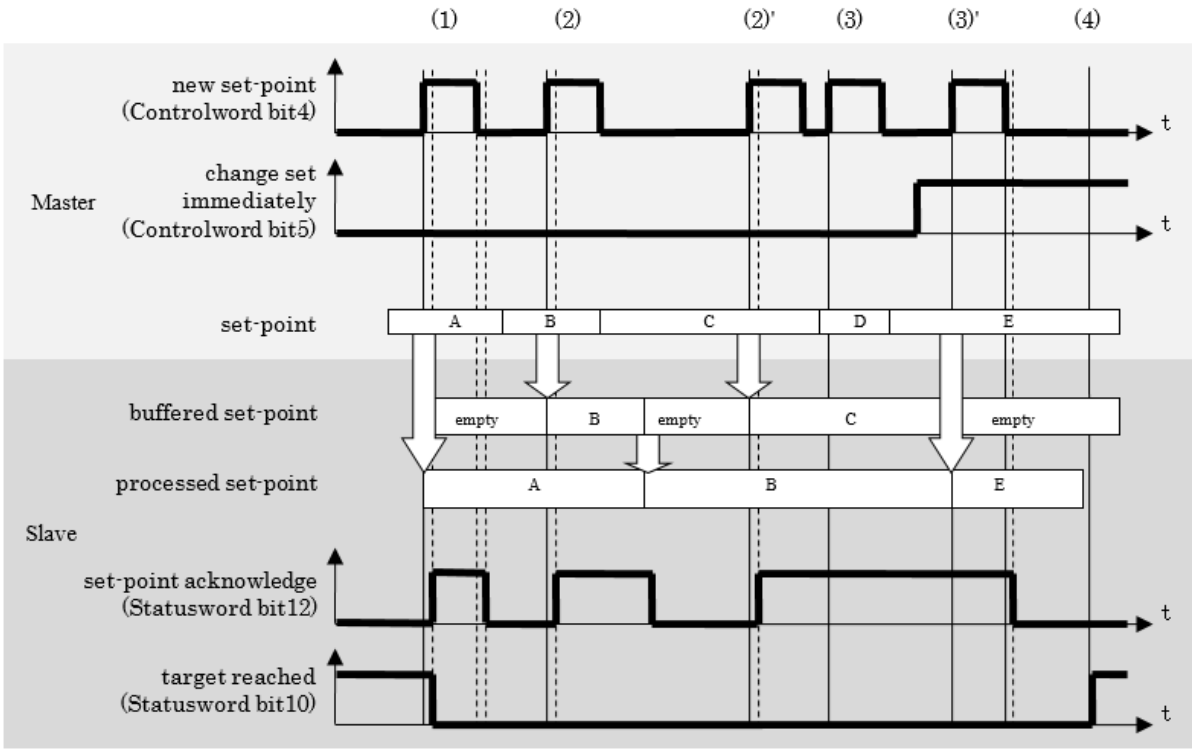
◆ NOTE

- **Similar steps 1 to 4 enable to change 6081h (Profile velocity (Axis A)).**
- **After changing 607Ah (Target position (Axis A)) and 6081h (Profile velocity (Axis A)), perform the steps 1 to 4 mentioned above to update 607Ah (Target position (Axis A)) and 6081h (Profile velocity (Axis A)) at the same time.**
- **The dashed line as shown in the figure below indicates actual velocity when the bit9 (change of setpoint) of 6040h (Controlword (Axis A)) is set to 1. However, if the new target position is the opposite of the operating direction, the position stops at the previous target position, and a reverse operation is performed.**

Example 4 (Buffering of set-points)

There are two set-point for the buffering set-point and the execution set-point.
The following figure indicates the handling of these set-point.

■ **Set-point handling for two set-points**



When the set-point is not in progress, a new set-point (A) will be effective immediately.

When the set-point is in progress, a new setpoint (B or C) is stored each time the first set-point buffer is empty.

When all set-point buffers are in use (if the bit12(setpoint acknowledge) of 6041h (Statusword (Axis A)) is 1), the update of the set-point buffer is dependent on the bit5 (change set immediately) of 6040h (Controlword (Axis A)).

If the bit5(change set immediately) of 6040h (Controlword (Axis A)) is not set to 1, new set-points(D) are not processed but suspended.

If the bit5(change set immediately) of 6040h (Controlword (Axis A)) is set to 1, new set-points(E) are processed immediately as a single set-point.

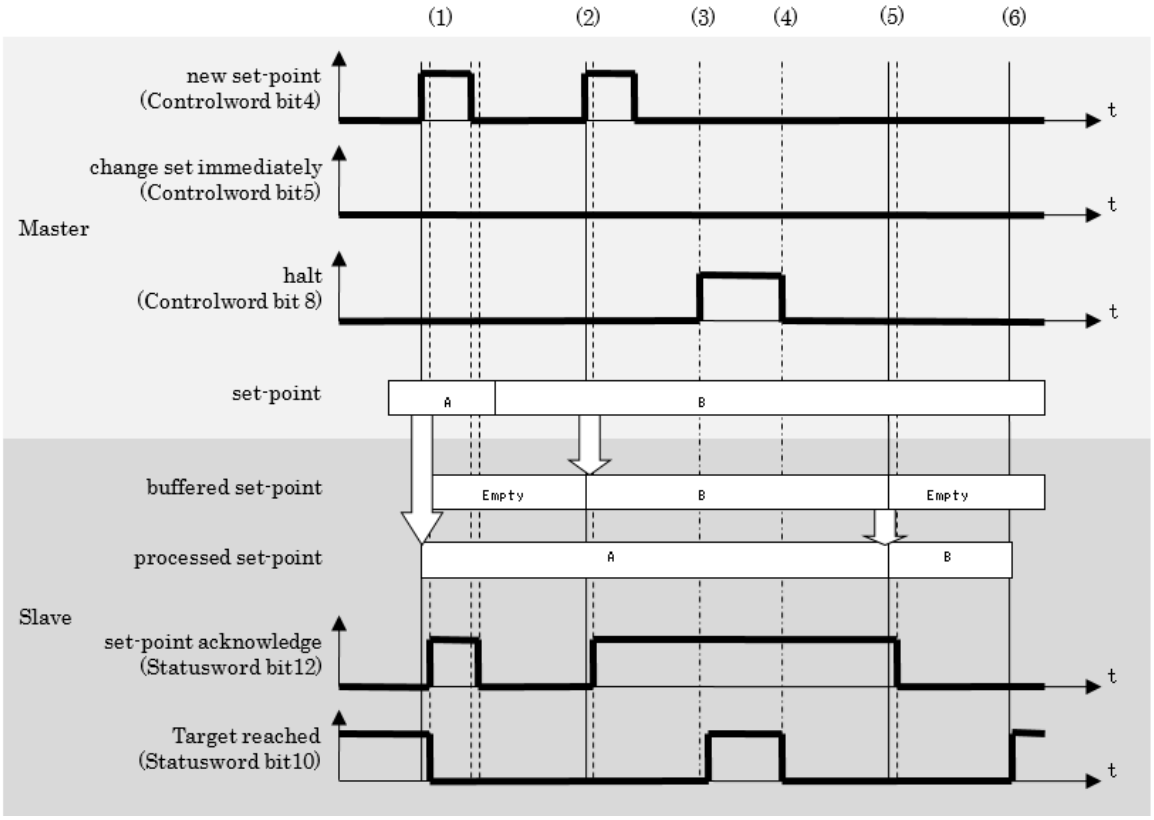
In this case, all set-points (B, C and D) loaded before the bit5(change set immediately) of 6040h (Controlword) is set to 1 are discarded.

Until all set-points are processed, the bit10(target reached) of 6041h(Statusword (Axis A)) remains to be 0.

Example 5 (Temporary stop by halt)

When bit8 (halt) of 6040h (Controlword (Axis A)) changes to 1 during pp operation, the positioning operation is stopped temporarily. When bit8 (halt) returns to 0, a positioning operation to the set-point for execution is resumed.

The following figure indicates the handling of these set-points.



When the set-point is not in process, the new set-point(A) takes effect immediately.

When the set-point is in process, the new set-point(B) is stored if the set-point buffer is empty.

If 1 is set to bit 8 (halt) of 6040h (Controlword (Axis A)) while the first set-point(A) is in process, the first set-point(A) is suspended.

At this time, if deceleration stop is executed and speed reaches 0, bit10 (target reached) for 6041h (Statusword (Axis A)) becomes 1.

After that, when 0 is set to bit 8 (halt) of 6040h (Controlword (Axis A)), the operation for the first set-point is resumed.

At this time, bit10 (target reached) for 6041h (Statusword (Axis A)) becomes 0.

When the operation for the first set-point(A) is completed, the new set-point(B) is processed.

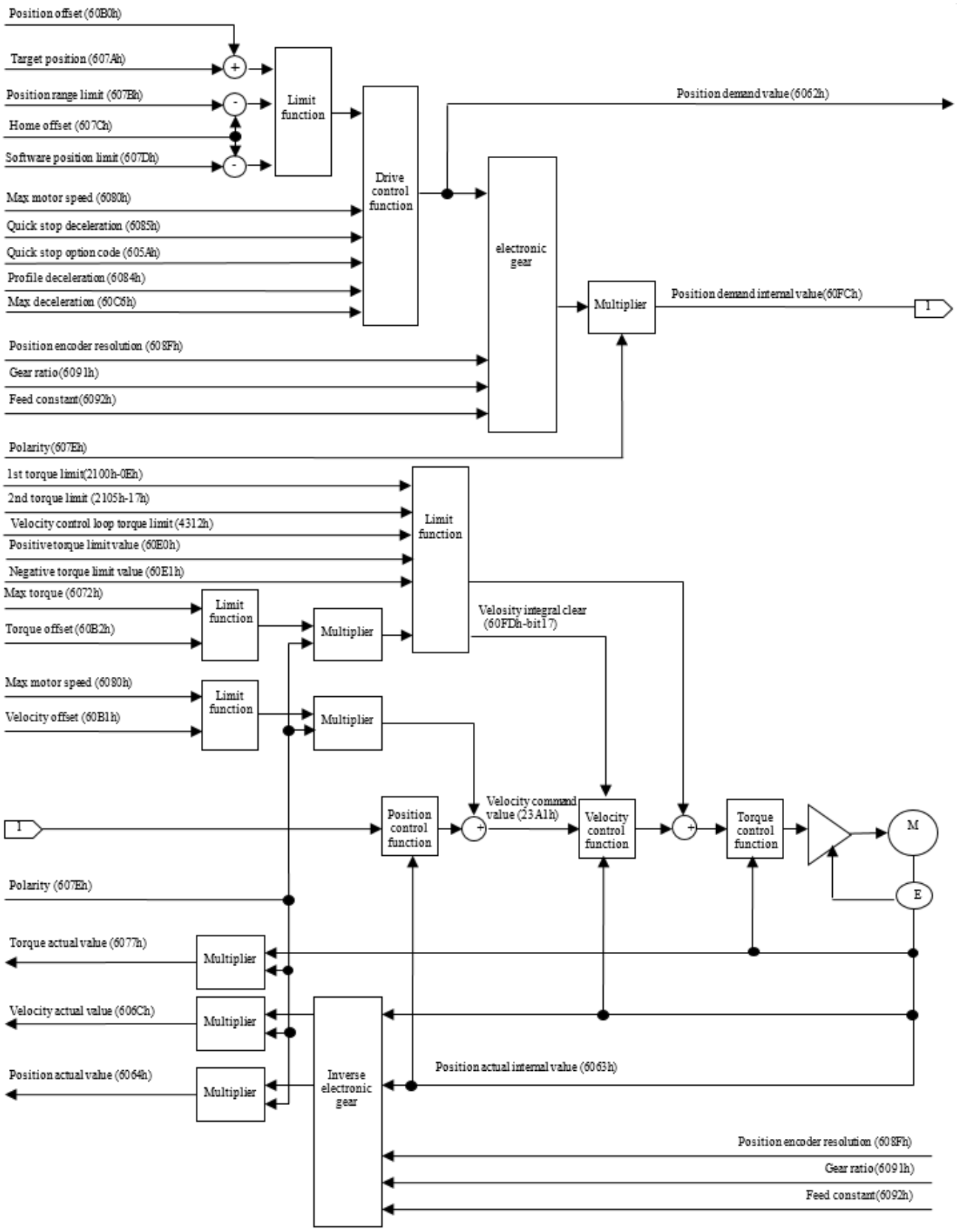
Bit 10 (target reached) of 6041h (Statusword (Axis A)) remains 0 until all set-points are processed.

6.6.3 Cyclic Position Mode (csp mode)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

It is a position control mode to operate by creating a command position in the host controller (master) and updating (transmitting) the command position in an interpolation cycle.

Use in DC or SM2 synchronization mode.



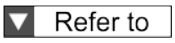
6.6.3.1 Objects related to csp mode (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
60B0h	00h	Position offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
2107h	17h	Communication function extended setup 1	-	-32768 to 32767	I16	rw	No
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
607Ah	00h	Target position (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Dh	-	Software position limit (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Min position limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO



For more information, refer to section 6.6.1.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60C2h	-	Interpolation time period (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Interpolation time period value	-	0 to 255	U8	rw	No
	02h	Interpolation time index	-	-128 to 63	I8	rw	No
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

Refer to
For more information, refer to “6.9 Common motion function”.

Controlword (6040h) <Functions in csp mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms r	h	fr	oms r	r	r	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

Note

The csp mode does not use the oms bit.

Position system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60B0h	00h	Position offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO	csp	Yes

• Set the offset of the position command.

Other

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	17h	Communication function extended setup 1	—	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
2007h-17h bit5	6080h (Max motor speed (Axis A)) on csp mode (Amount of change saturation function of command position) 0: Invalid, 1: Valid

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	—	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
2107h-19h bit11	The setting condition that 6041h bit12 (drive follows command value) will be 0 is changed. 0 : Limiting torque and speed limit (only cst) is included. 1 : Limiting torque and speed limit (only cst) is not included.

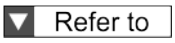
6.6.3.2 Objects related to csp mode (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO

Besides, there are related objects common to the position control.

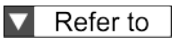
Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6062h	00h	Position demand value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6065h	00h	Following error window (Axis A)	Command	0 to 4294967295	U32	rw	TxPDO
6066h	00h	Following error time out (Axis A)	1ms	0 to 65535	U16	rw	TxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	RxPDO
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
60F4h	00h	Following error actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FAh	00h	Control effort (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
60FCh	00h	Position demand internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO



For more information, refer to section 6.6.1.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO



For more information, refer to “6.9 Common motion function”.

Statusword (6041h) <Functions in csp mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	following error	Drive follows command value		r										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13,12,10 (operation mode specific)

bit	Name	Value	Definition
10	reserved	-	Not used
12	Drive follows command value	0	Operation is not performed according to the target position. (Note 1)
		1	Operation is performed according to the target position. (Note 1)
13	following error	-	Please refer to “6.6.1.4“.

(Note 1) “Operation is performed according to the target position” refers to cases where the following conditions are all satisfied

- PDS state is Operation enabled
- While not in deceleration (Halt, POT/NOT, Quickstop, Shutdown, Disable operation, Fault and software limit)
- While not in Halt status
- POT not detected when a positive direction operation command is in process or NOT is not detected when a negative direction operation command is in process.
- Torque limit has not occurred(Valid only when this condition 2107h-19h -bit11 is 0)
- When a positive direction operation command is in process, the actual position or the commanded position is within the range set by 607Dh-02h.
- When a negative direction operation command is in process, the actual position or the commanded position is within the range set by 607Dh-01h.

Other

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	—	-32768 to 32767	I16	rw	No	ALL	Yes

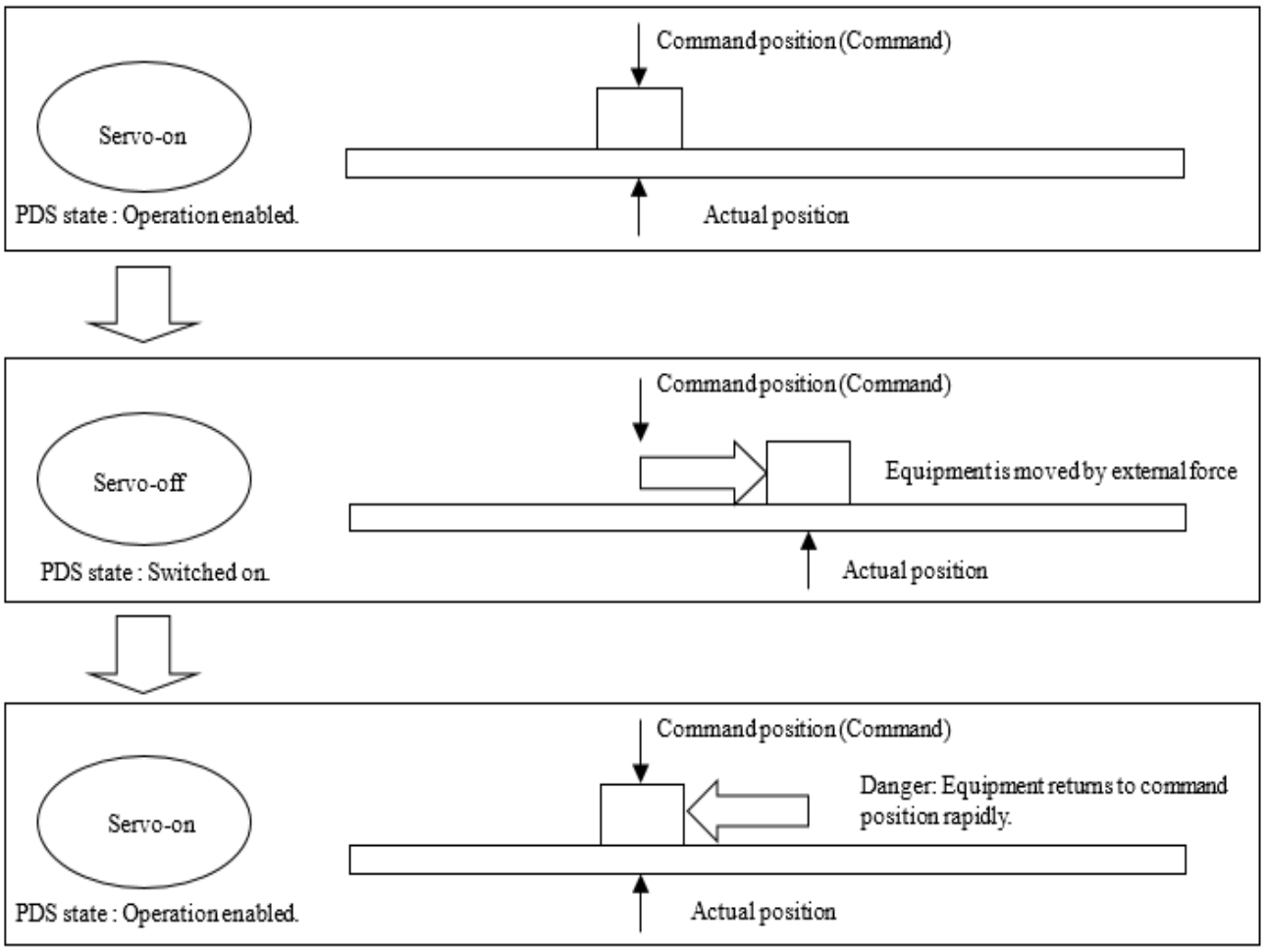
Bit No.	Description
2107h-19h bit11	The setting condition that 6041h bit12 (drive follows command value) will be 0 is changed. 0 : Limiting torque and speed limit (only cst) is included. 1 : Limiting torque and speed limit (only cst) is not included.

6.6.3.3 Operations of csp mode

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

- Motion profile (trajectory) generation is done in the master rather than the slave in cyclic position control mode.
- Target position is the sum of 60B0h (Position offset (Axis A)) and 607Ah (Target position (Axis A)), and is interpreted as an absolute position.
- For the operation command update (transmission), do input when approx. 100 ms has elapsed after the servo ON(Operation enabled).
- 60C2h (Interpolation time period (Axis A)) indicates the cycle update two objects 607Ah (Target Position) and 60B0h (Position offset (Axis A)).This value is set to the same period 1C32h-02h (Cycle time).
  As for the host controller (master), be sure to update the target position in the cycle of 60C2h (Interpolation time period).
- In the servo-off state, configure the master process so as to follow 6064h (Position actual value (Axis A)) the additional value of 60B0h (Position offset (Axis A)) and 607Ah (Target Position (Axis A)). When it did not follow, because if the motor is moving, such as external force during servo-off, the operation is trying to return to the target position that was inputted at the time of servo-on next time, it is very dangerous. Configure the similar following process when switching to csp control mode from other control modes than csp control mode as well.

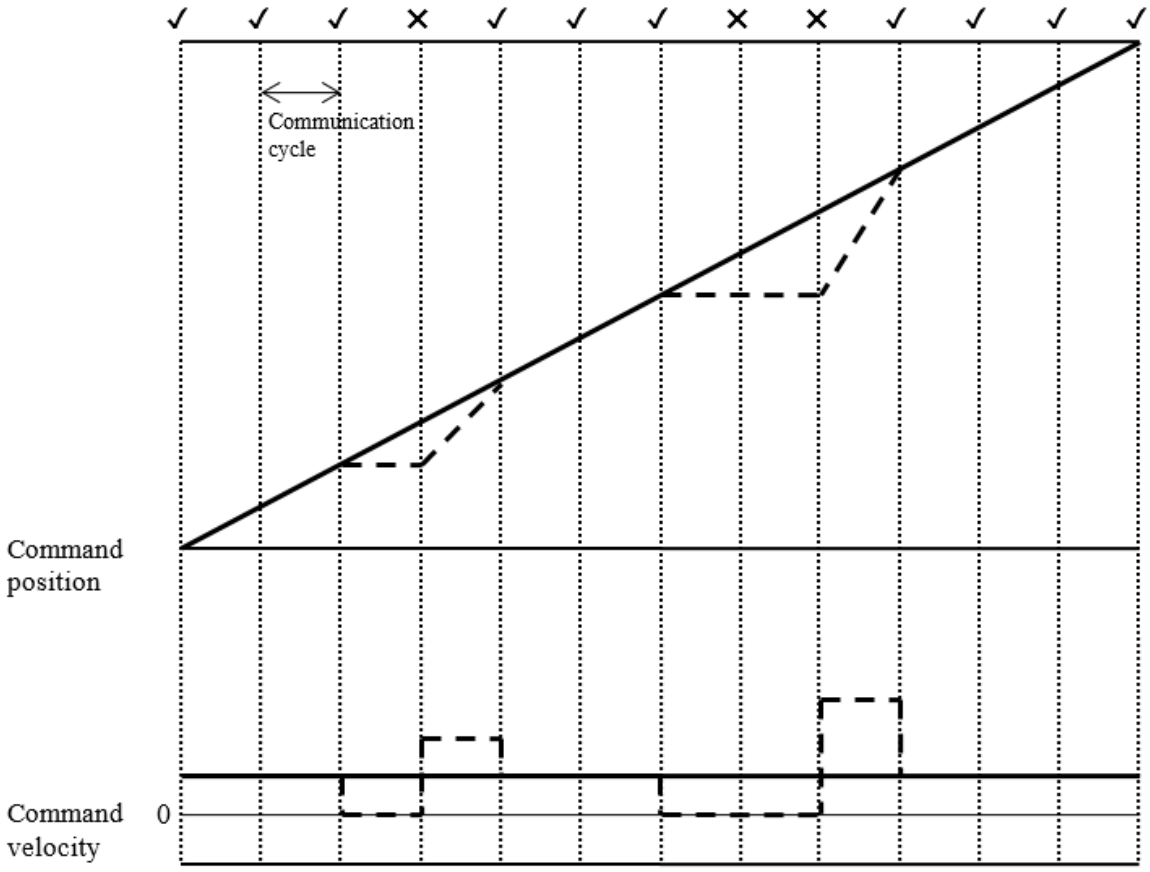
■ **Bad example: Command position at servo-off (Command position is not set with actual position**



6.6.3.4 Calibration process on the occurrence of communication error

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

If a communication error occurred during operation and 607Ah (Target Position (Axis A)) could not be restored properly, the target position is presumed and calibration is performed.



Solid line: After command calibration, Dashed line: Before command calibration

✓: Communication successful, ✕: Communication error

6.6.3.5 Amount of change saturation function of command position

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

This is to prevent the occurrence of Err27.4 by an unusual command position value and the ability to saturate the amount of change in the command position converted from 6080h (Max motor speed (Axis A)) for the purpose of stabilizing the behavior of motor.

■ **Scope**

This function following control mode only supports.

Mode	Conditions that command position saturation function to operate
Control mode	Position control mode (csp)

■ **Related objects**

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	17h	Communication function extended setup 1	—	-32768 to 32767	I16	rw	No	ALL	Yes
		Bit No. / Description bit5: 6080h(Max motor speed (Axis A)) on csp mode(Amount of change saturation function of command position) 0: Invalid on csp 1: Valid on csp							
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	ALL	Yes
		• Set the maximum speed of motor. • The maximum value is limited by the maximum speed read from the motor in internal processing. The value stored in EEPROM is set when the control power is turned on.							

◆ NOTE

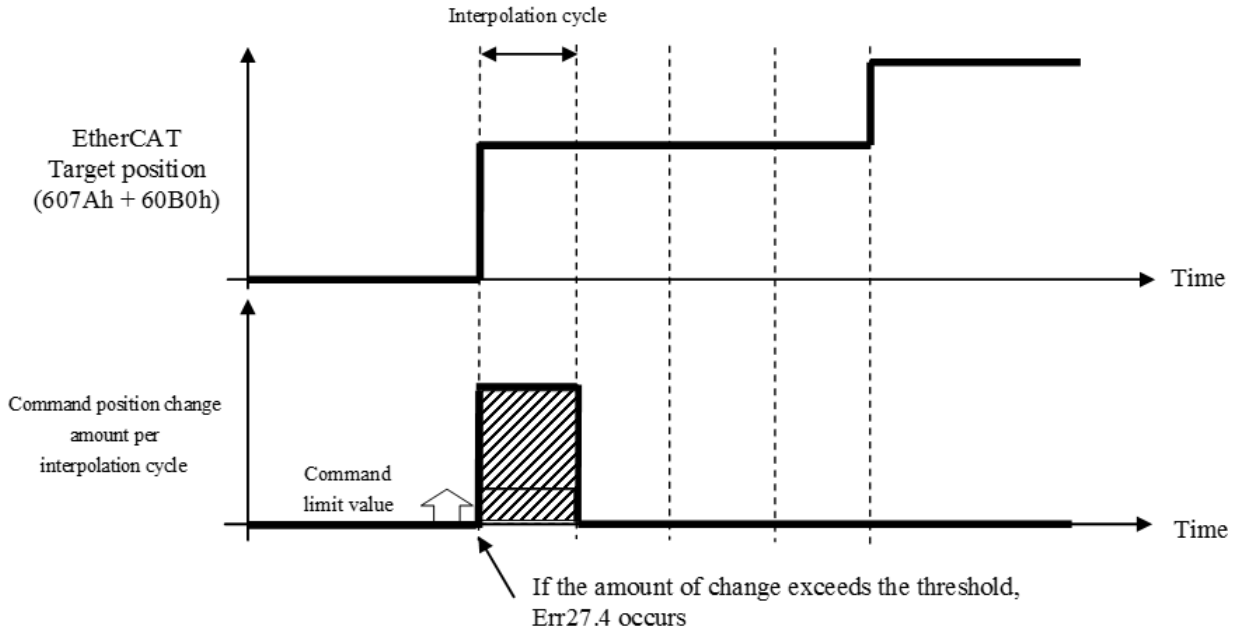
- **When this function is valid(2107h-17h bit5=1), it suppress Err27.4 by dividing a command position even if the command position is abnormal.**
- **When this function is valid(2107h-17h bit5=1) and 6080h=0, the amount of change in the command position is limited to 0 and the motor does not move. And bit11(internal limit active) of 6041h(Statusword (Axis A)) does not become 1.**

Example (Interpolation cycle=125us)

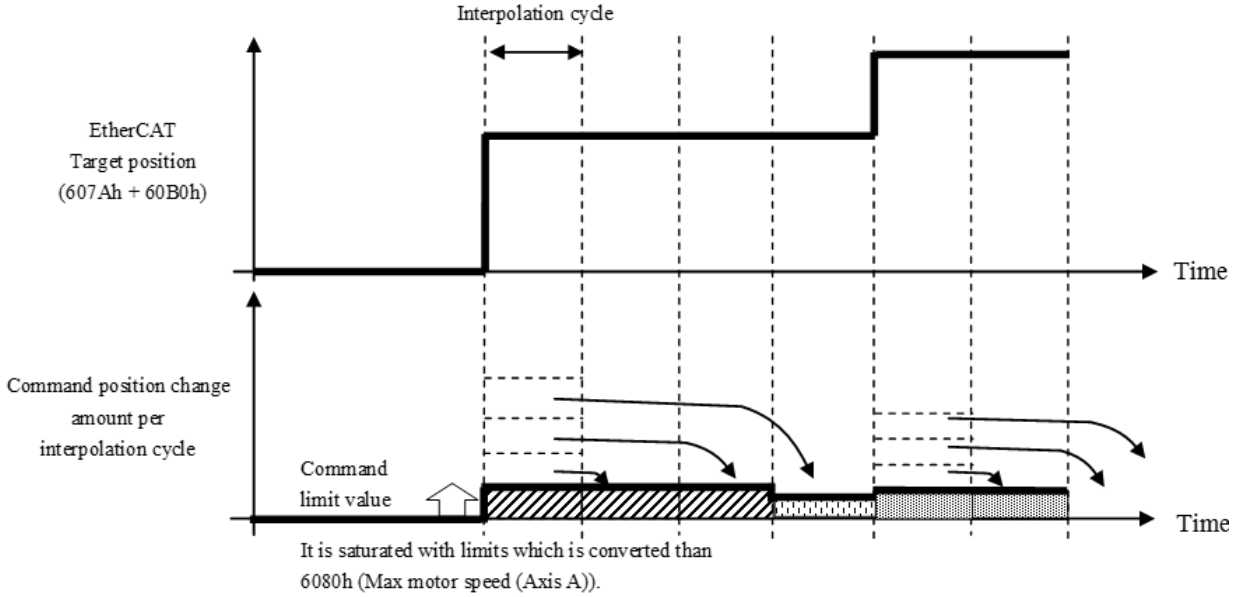
If the change amount of the target position(607Ah(Target position(Axis A)) + 60B0h(Position offset (Axis A))) exceeds the command limit value(a threshold value for Err27.4 occurrence) from the host controller saturated with limit values obtained by converting the command position change per interpolation cycle from 6080h.

This prevents the occurrence of Err27.4 even if the host controller sends an unusual command position, the operation is stabilized.

■ **During invalid amount of change saturation function of command position**



■ **During valid amount of change saturation function of command position**



6.6.4 Interpolating position mode (ip mode) (Not supported)

This mode is not supported by this software version. Do not set 6060h (Modes of operation (Axis A)) to 7.

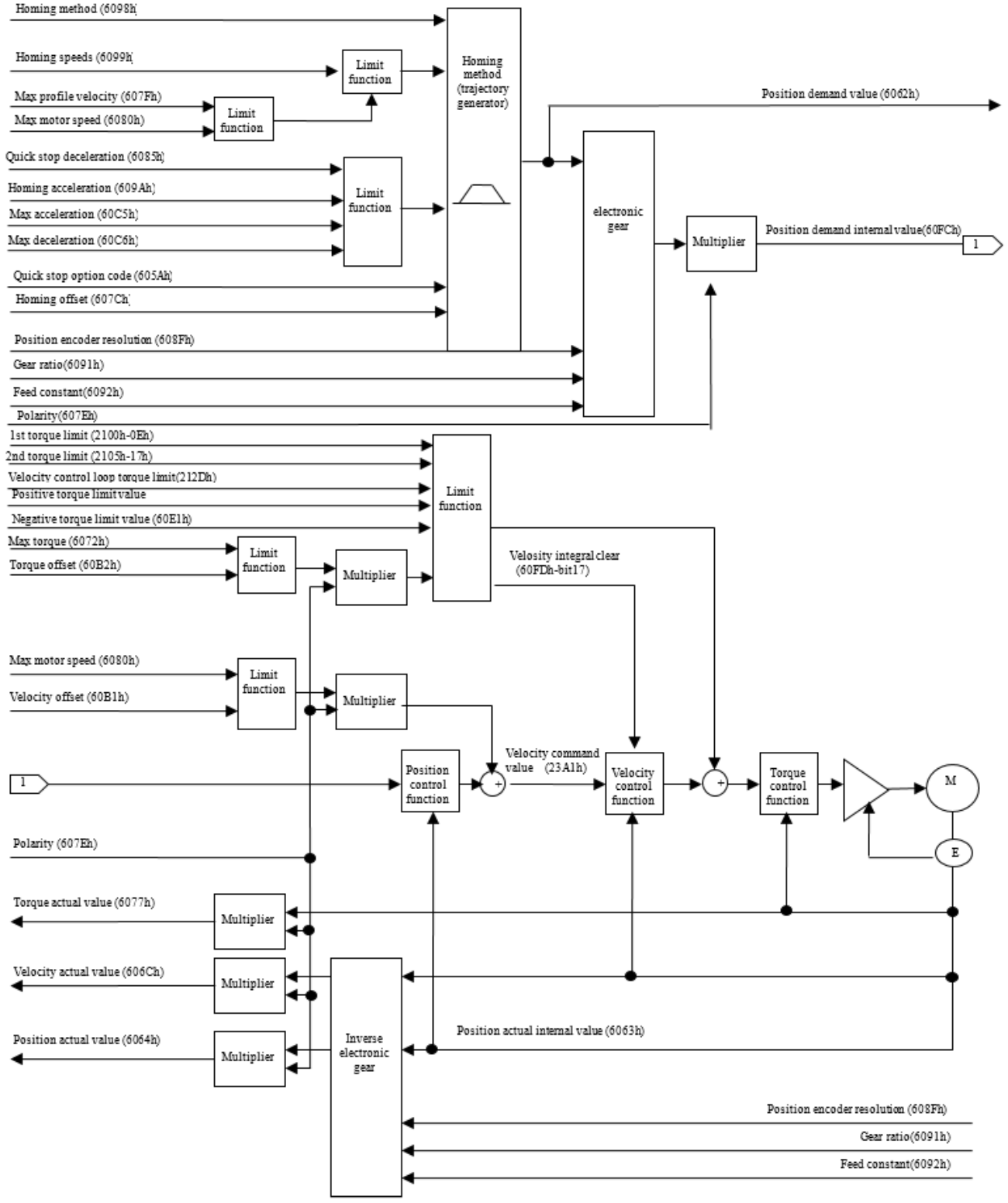
It is a position control mode to operate by creating a command position in the host controller (master) and updating the command position buffered by buffering it to the driver module inside in the communication cycle in an interpolation time.

6.6.5 Homing Position Mode (hm mode)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

It is a position control mode to execute an origin return operation by designating the origin return method, operation speed, etc. and creating a position command in the driver module.

If it is used in the incremental mode, it is necessary to execute the origin return operation before executing the positioning operation after the control power is turned on.



6.6.5.1 Objects related to hm mode (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
6098h	00h	Homing method (Axis A)	-	-128 to 127	I8	rw	RxPDO
6099h	-	Homing speeds	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Speed during search for switch	Command/s	0 to 4294967295	U32	rw	RxPDO
	02h	Speed during search for zero	Command/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60C5h	00h	Max acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO

Refer to

For more information, refer to “6.6.1 Common position control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

Refer to
For more information, refer to section 6.9.

Controlword (6040h) <Functions in hm mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms r	h	fr	oms r	r	Start homing	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

■ bit9, 6-4 (operation mode specific)

Bit	Name	Value	Definition
4	start homing	0 -> 1	The homing operation starts.
5	(reserved)	-	Not used
6	(reserved)	-	Not used
9	(reserved)	-	Not used

When bit4 (start homing) of 6040h (Controlword (Axis A)) is started, parameters related to the homing position control mode (hm) (homing method, velocity, acceleration, deceleration, etc.) are stored, and the operation is started.

Even if a new return to home position operation is started during the return to home position operation (bit4 for 6040h is started up again), the new return to home position operation will be ignored.

◆ NOTE

- **When 2106h-63h (Function expansion setup 4) bit8=1 is set, the origin return operation is started even in the case where the control mode is switched from 6060h (Mode of Operation (Axis A))=8 (csp) to 6 (hm) at the state of 6040h (Controlword (Axis A)) bit4=1. However, it only responds to the case of switching from the csp control mode to the hm control mode.**

Homing method (6098h)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6098h	00h	Homing method (Axis A)	-	-128 to 127	I8	rw	No	hm	Yes

• Set the homing method.

Value	Definition
0	No homing method assigned
1	-Ve LS & Index Pulse
2	+Ve LS & Index Pulse
3	+Ve HS & Index Pulse direction reversal
4	+Ve HS & Index Pulse no direction change
5	-Ve HS & Index Pulse direction reversal
6	-Ve HS & Index Pulse no direction change
7	on +Ve HS -Index Pulse
8	on +Ve HS +Index Pulse
9	After +ve HS reverse +Index Pulse
10	After +ve HS +Index Pulse
11	on -Ve HS -Index Pulse
12	on -Ve HS +Index Pulse
13	After -ve HS reverse +Index Pulse
14	After -ve HS +Index Pulse
15	Reserved
16	Reserved
17	Same as 1 without Index Pulse
18	Same as 2 without Index Pulse
19	Same as 3 without Index Pulse
20	Same as 4 without Index Pulse
21	Same as 5 without Index Pulse
22	Same as 6 without Index Pulse
23	Same as 7 without Index Pulse
24	Same as 8 without Index Pulse
25	Same as 9 without Index Pulse
26	Same as 10 without Index Pulse
27	Same as 11 without Index Pulse
28	Same as 12 without Index Pulse
29	Same as 13 without Index Pulse
30	Same as 14 without Index Pulse
33	On Index Pulse +Ve direction
34	On Index Pulse -Ve direction
35	Current position = home
37	Current position = home

Abbreviation	Description
+Ve	positive direction
- Ve	negative direction
LS	Limit switch
HS	Home switch

◆ NOTE

- **When the Homing operation starts with other than setting values supported by 6098h (Homing method (Axis A)), an Homing error occurs (bits13 of 6041h(Status word (Axis A)) is 1).**
- **The Homing method cannot be changed while the homing position control mode (hm) is in process. To change the Homing method, stop the motor (stop the hm mode).**

Homing speeds (6099h)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6099h		Homing speeds (Axis A)	-	-	-	-	-	-	-
		• Set the velocity during the Homing mode (hm).							
	00h	Number of entries	-	2	U8	ro	No	hm	No
		• Displays the number of sub-indexes for 6099h (Homing speeds).							
	01h	Speed during search for switch	Command/s	0 to 4294967295	U32	rw	RxPDO	hm	Yes
		• Set the operation velocity until the Switch signal is detected. • The maximum value is limited by the internal processing to the smallest of 60F7h (Max profile velocity (Axis A)) or 6080h (Max motor speed (Axis A)) or 2147483647.							
	02h	Speed during search for zero	Command/s	0 to 4294967295	U32	rw	RxPDO	hm	Yes
		• Set the operation velocity until the position is detected homing. If the home detection position is the edge of the Switch signal, set this value as small as possible. • The maximum value is limited by the internal processing to the smallest of 60F7h (Max profile velocity (Axis A)) or 6080h (Max motor speed (Axis A)) or 2147483647.							

Refer to

For more information about applying for each speed, refer to the example of the operation of each Homing method.

Homing acceleration (609Ah)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	hm	Yes
		• Set the acceleration and deceleration during the Homing mode (hm). • The deceleration of homing operation is common in this object. • At the final stop of each Homing method (when the homing position is detected), the servo lock is carried out for the stopping, instead of using the preset value of this object. • If it is set to 0, internal processing is treated as 1.							

6.6.5.2 Objects related to hm mode (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO
60E3h	-	Supported homing method (Axis A)	-	-	-	-	-
	00h	Number of entries	-	1 to 254	U8	ro	No
	01h	1st supported homing method	-	0 to 32767	U16	ro	No
	to						
	20h	32nd supported homing method	-	0 to 32767	U16	ro	No

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6062h	00h	Position demand value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
60F4h	00h	Following error actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FAh	00h	Control effort (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
60FCh	00h	Position demand internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO

Refer to
For more information, refer to “6.6.1 Common position control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO

Refer to
For more information, refer to “6.9 Common motion function”.

Statusword (6041h) <Functions in hm mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

• Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	Homing error	Homing attained		Target reached										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13,12,10 (operation mode specific)

bit	Name	Value	Definition
10	target reached	0	In operation
		1	Stopped state
12	homing attained	0	The homing operation is incomplete (Note 1)
		1	The homing operation complete to be performed successfully (Note 2)
13	homing error	0	A homing error does not occur (normal)
		1	A homing error occurs (The homing operation is not performed successfully)

The combination of the bits 13, 12 and 10 is as follows:

bit 13	bit 12 (Note 2)	bit 10	Definition
0	0	0	Homing
0	0	1	The homing operation is suspended or not started
0	1	0	The homing operation is completed, but the operation does not arrive at the target position
0	1	1	The homing operation is completed successfully
1	0	0	The homing error is detected but still working
1	0	1	The homing error is detected and stopped

(Note 1) In the incremental mode, bit12 (homing attained) becomes 0 under the following cases.

- When control power is turned on
- When the ESM status has changed from Init to PreOp
- When the return to home position operation is started

  Even when Homing operation is started without motor operation(Method35, Method37), homing attained becomes 0. However, the time of 0 is a short time(about 2ms).
- When operations on PANATERM for Multi (test run function, FFT, fit gain function, Z phase search function and pin assignment setting) are finished. (If 2007h-75h bit0 is 1)
- When Err27.4 (Command error protection) occurs

(Note 2) In the absolute mode, bit12 (homing attained) is always 1.

In hm mode, bit12 (homing attained) become 0 when the multi-turn data clear run.
After the multi-turn data clear completion, bit12 (homing attained) will return to 1.

Supported homing method (60E3h)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60E3h		Supported homing method (Axis A)	-	-	-	-	-	-	-
		• Displays the homing methods supported.							
	00h	Number of entries	-	32	U8	ro	No	ALL	No
		• Displays the number of homing method that it supports for 60E3h (Supported homing method (Axis A)).							
	01h	1st supported homing method	-	0 - 32767	U16	ro	No	ALL	No
		• Displays the first homing method supported.							
	to								
	20h	32nd supported homing method	-	0 - 32767	U16	ro	No	ALL	No
		• Displays the 32nd homing method supported.							

Index	Sub-Index	bit 15 to 8	bit 7 to 0
		Reserved	Supported Homing method (Note 1)
60E3h	01h	0	1
	02h	0	2
	03h	0	3
	04h	0	4
	05h	0	5
	06h	0	6
	07h	0	7
	08h	0	8
	09h	0	9
	0Ah	0	10
	0Bh	0	11
	0Ch	0	12
	0Dh	0	13
	0Eh	0	14
	0Fh	0	17
	10h	0	18
	11h	0	19
	12h	0	20
	13h	0	21
	14h	0	22
	15h	0	23
	16h	0	24
	17h	0	25
	18h	0	26
	19h	0	27
	1Ah	0	28
	1Bh	0	29
	1Ch	0	30
	1Dh	0	33
	1Eh	0	34
	1Fh	0	35
	20h	0	37

(Note 1) The relation between Homing method and values refer to 6098h(Homing method (Axis A)).

6.6.5.3 Operations of hm mode (Homing operation)

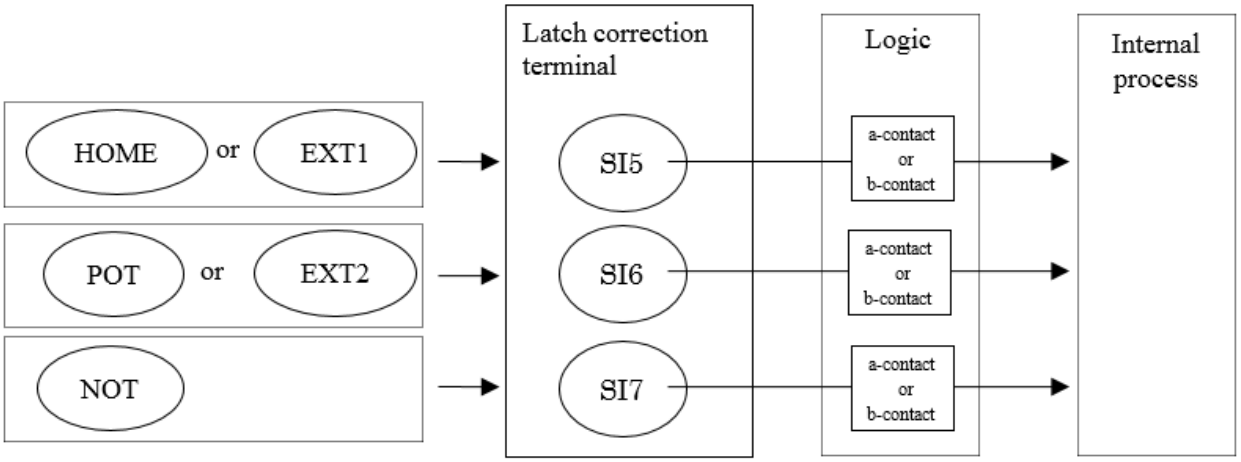
Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

When using incremental mode, perform the homing operation because it is necessary to initialize position information before starting normal operation.

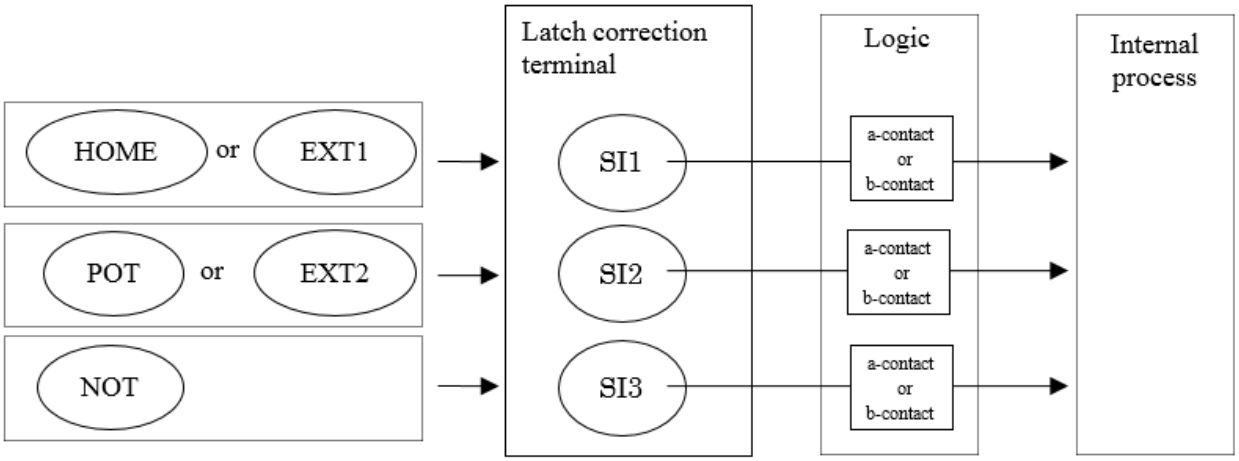
- After the detection of the home position, initialize(Preset) the following object on the basis of its position. 6062h(Position demand value (Axis A)) = 6064h(Position actual value (Axis A)) = 607Ch(Home offset (Axis A)) 6063h(Position actual internal value (Axis A)) = 60FCh(Position demand internal value (Axis A)) = 0
- If homing operation is performed, position information will be initialized(preset). Therefore, it is necessary to reacquire the data (Touch probe position etc.) acquired to base the old position informations.
- A change that is made to 607Ch (Home offset (Axis A)) during a homing operation will not be reflected in that homing operation. It is reflected from the next homing operation (initialization of position information at completion).
- When the edges of the switch signals (HOME, POT, NOT) are used as the origin detection positions, assignment to SI5, SI6, & SI7 shall be done for the Axis A, and assignment to SI1, SI2, & SI3 shall be done for the Axis B, which are the latch correction pins respectively. If allocation is incorrect, Homing error will occur.

  For more information, refer to Functional Specification of the "Technical document (SX-DSV03455)".

■ **Connections to use edge of the sensor signal as home position (Axis A)**



■ **Connections to use edge of the sensor signal as home position. (Axis B)**

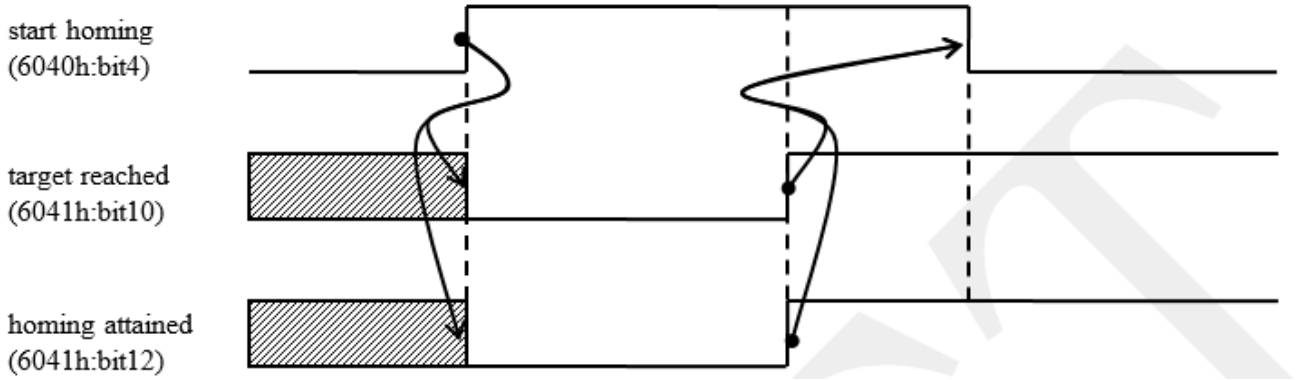


The following terms that indicates in the figure each Method described below indicates the following content.

Item	Description
Index pulse	Z-phase signal of encoder (Set at full-closed control is external scale)
Home switch	Logic signal state of Origin proximity input (HOME)
Positive limit	Logic signal state of Positive direction over-travel inhibition input (POT)
Negative limit	Logic signal state of Negative direction over-travel inhibition input (NOT)

- For the operation command update (transmission), do input when approx. 100 ms has elapsed after the servo ON (Operation enabled).

The sequence of the hm control mode is shown below.



- If you perform a homing operation using the Index pulse, it is recommended that you set the 2107h-17h (Communication function extended setup 1) bit7(In Z phase homing Over-travel inhibit input setup) to 1.In the above setting, Index pulse movement amount becomes abnormal operation to the detection position, and to generate Err94.3 the (Home position return error protection 2) detects the inhibit input you can do the protection.
- If return to origin is cancelled by halt and such from the host device during a homing operation between origin detection and return to origin completion, Err27.7 (Position information initialization error protection) occurs.

Homing return speed limit function

When the home position detection, the motor returns overshoot distance (Homing return).

At this time, in the case of high response setting to position command and high speed (mode of 2 degree of freedom control, etc.), if run homing return, the sound may occur when the homing is completed.

When the 2107h-17h bit6(Homing return speed limit function enabled) is set to "1", homing return speed limit function is enabled.

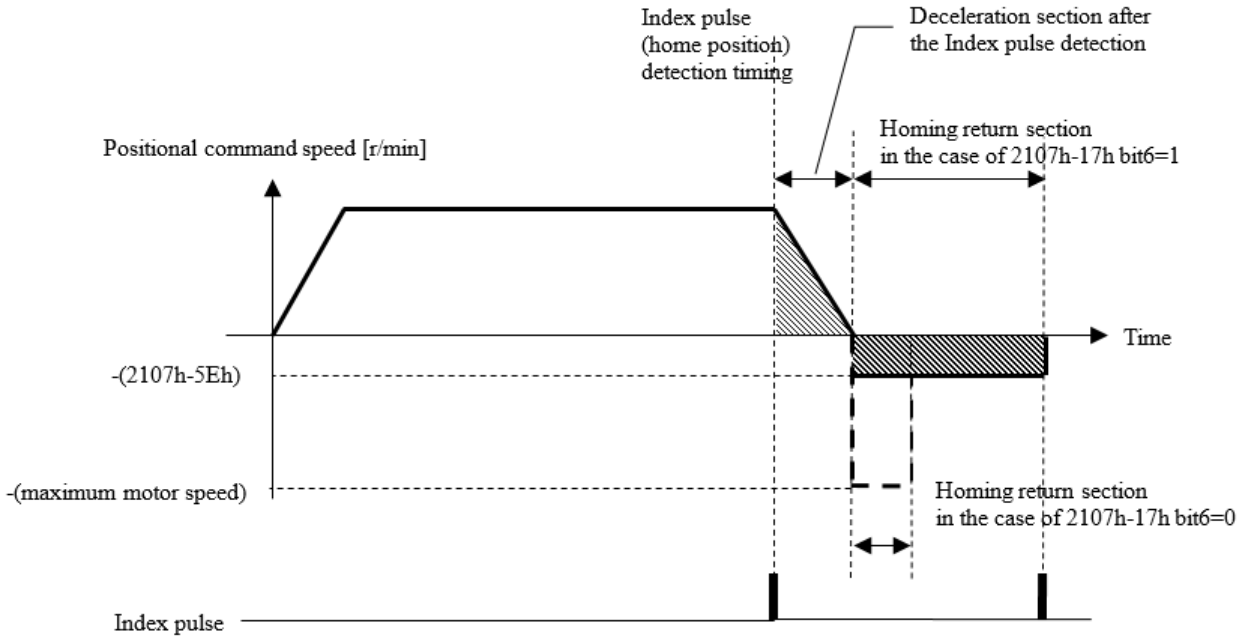
If this function is enabled, homing return speed is limited by the 2107h-5Eh (Homing return speed limit value). The effect of reducing the occurrence of sound is expected.

Refer to

For the timing (Attribute) at which bit 6 of 2107h-17h and 2107h-5Eh setting changes are reflected, refer to "9 Object Dictionary List ".

If this function is enabled, the time to homing completion might extending. If this function is disabled, homing return speed is limited by the maximum motor speed that the driver has internally. When homing return speed exceeds the 2105h-0Eh (Over-speed level setup), Err26.0(Over-speed protection) occurs. When homing return speed exceeds the 2106h-10h (2nd over-speed level setup), Err26.1(2nd over-speed protection) occurs.

■ **Example of performing homing(Positive direction) with Index pulse**



Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	17h	Communication function extended setup 1	-	-32768 32767	I16	rw	No	ALL	Yes

Bit No.	Description
bit6	Homing return speed limit function enabled 0: Invalid 1: Valid

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	5Eh	Homing return speed limit value	r/min	0 to 20000	I16	rw	No	hm	Yes

• Sets the Homing return limit speed.
When the set value is less than the internal minimum speed, it is limited by the internal minimum speed.
When setting value is greater than the maximum motor speed, it will be limited by the maximum motor speed.

Homing error occur conditions

In case of Homing operation, it becomes abnormalities (Homing error = 1) on condition of the following.

Homing Error Conditions	Detail
Started in absolute mode	Homing was started in absolute mode. (Note 2)
Started when operation is not enabled	Homing was started when the PDS status is not in Operation enabled. (Note 2) (excluding Method 35, 37)
Started when target speed is 0	Homing was started when setting values for 6099h-01h or 6099h-02h was 0. (Note 2) Except following • 6099h-01h with Method 35/37 • 6099h-02h with Method 33/34/35/37
Limit switch detects both	In a Homing start-up or during Homing operation, both Limit switch of Positive/Negative was detected. (Note 2) (Note 3)
Penetrate the Limit switch	In the case of a method to reverse Limit switch During deceleration operation after detection for reversal of the rise of the Limit switch, detected a falling edge of the Limit switch
Penetrate the Home switch	In the case of a method to reverse Home switch During deceleration operation after detection for reversal of the rise of the Home switch, detected a falling edge of the Home switch
Installation relation between Home switch and Limit switch is unsuitable.	In the case of a method to reverse Home switch During deceleration operation after detection for reversal of the rise of the Home switch, detected a rising edge of the Limit switch
	In the case of a method to not reverse Limit switch Limit switch is detected during the Home switch search. (Note 1)
Installation relation between Index pulse and Limit switch is unsuitable.	In the case of a method to detect the Index pulse Rising edge of Limit switch is detected during an Index pulse search.
	In the case of a method to not reverse Limit switch Limit switch is detected during the Index pulse search. (Note 1)
Home switch and Limit switch have not been allocated.	Axis A: HOME is not assigned to SI5, POT is not assigned to SI6, and NOT is not assigned to SI7. Axis B: HOME is not assigned to SI1, POT is not assigned to SI2, and NOT is not assigned to SI3.

(Note 1) Homing error is not detected when an operation to get out of the limitation by the limit switch (an operation in the opposite direction of the limited direction) is performed with the limit switch detected at the homing start-up (Note 2).

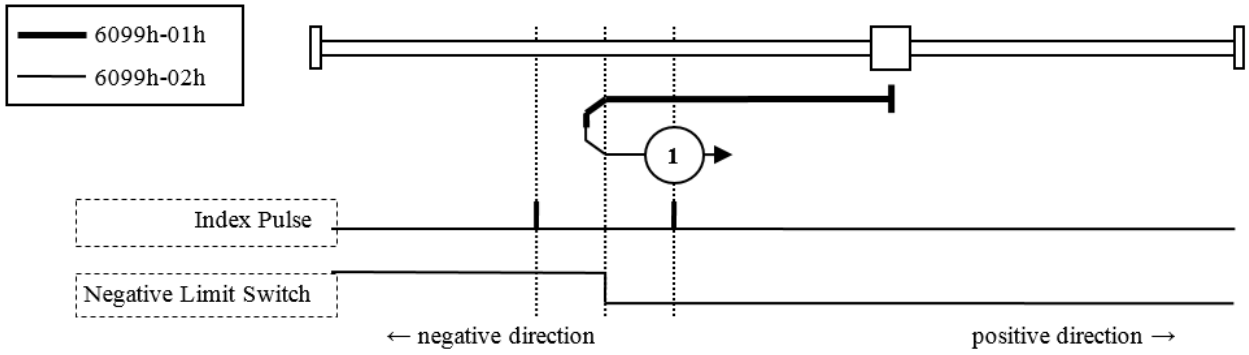
(Note 2) A homing start-up indicate a timing to change bit4(start homing) of 6040h(Controlword (Axis A)) to 1 from 0.

(Note 3) When 2105h-05h (Over-travel inhibit input setup) = 0, Err38.0 (Over-travel inhibit input protection 1) occurs, instead of a homing error.

■ **Method 1**

- This Method, if Negative limit switch is inactive, the initial operation direction turns into he negative direction. (An inactive state is shown in the state of low level by a figure)
- Home detection position is the first Index pulse detection position in the Positive side position of after a Negative limit signal becomes inactive. (See figure)
- When NOT is not assigned, Homing error will occur(Homing error = 1).

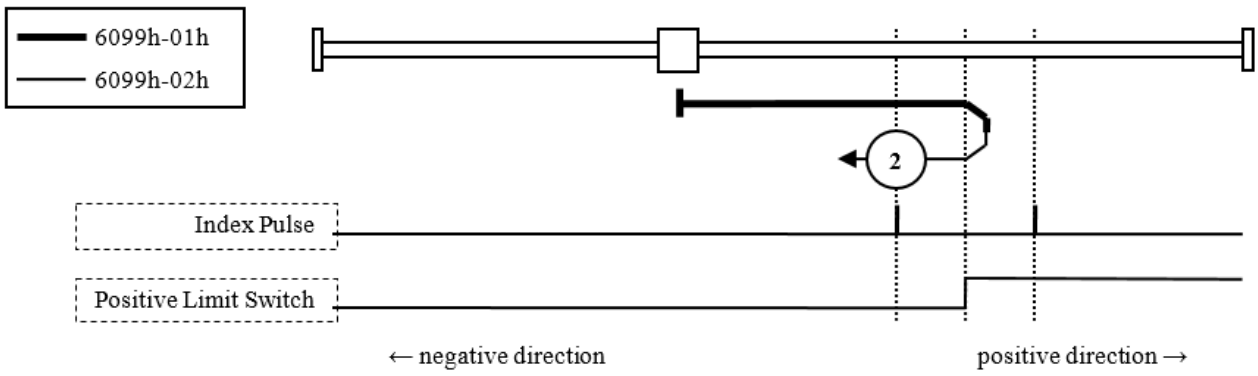
Homing on negative limit switch and index pulse



■ **Method 2**

- This Method, if Positive limit switch is inactive, the initial operation direction turns into he positive direction. (An inactive state is shown in the state of low level by a figure)
- Home detection position is the first Index pulse detection position in the Negative side position of after a Positive limit signal becomes inactive. (See figure)
- When POT is not assigned, Homing error will occur(Homing error = 1).

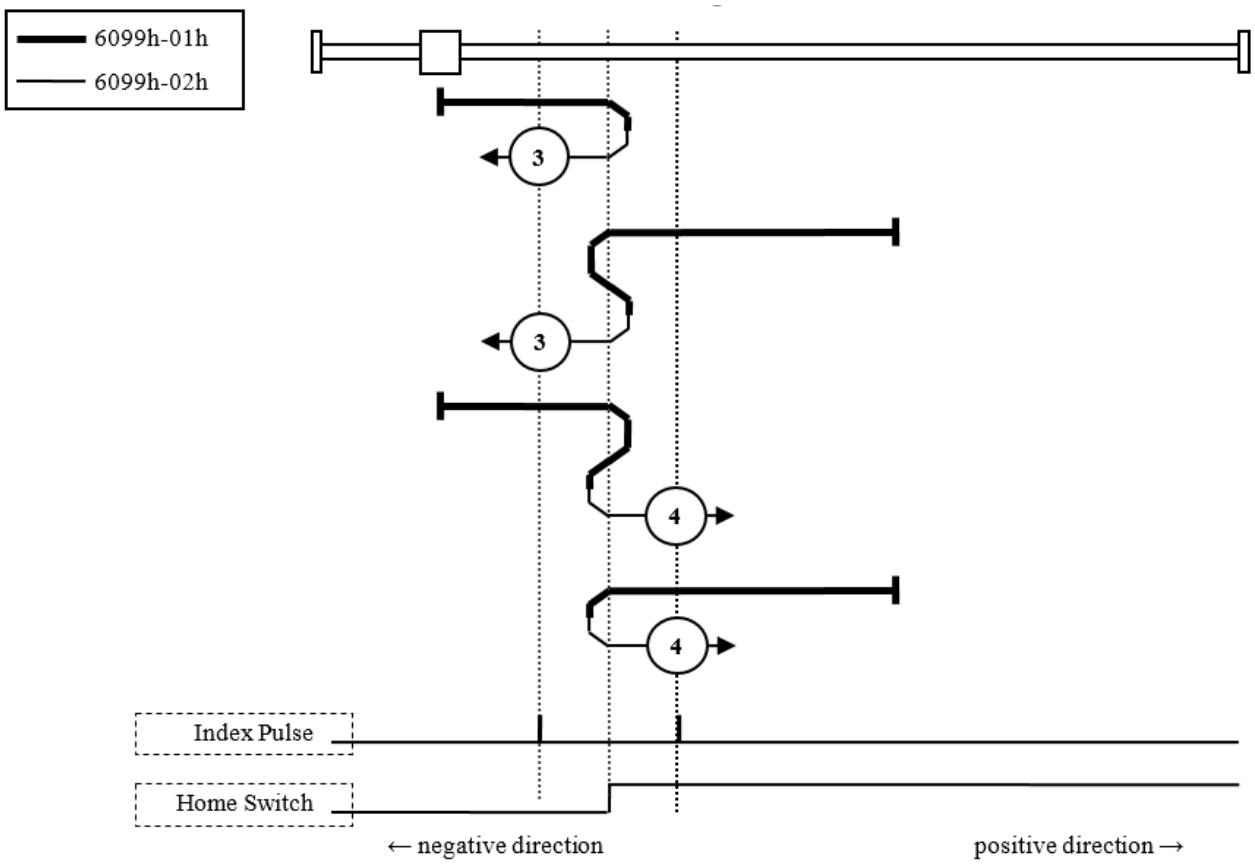
Homing on positive limit switch and index pulse



■ **Method 3, 4**

- These Methods, the initial operation direction changes in the state of Home switch at startup
- Home detection position is the first Index pulse detection position in the Negative side or Positive side after the change of state of Home switch. (See figure)
- When HOME is not assigned, Homing error will occur(Homing error = 1).

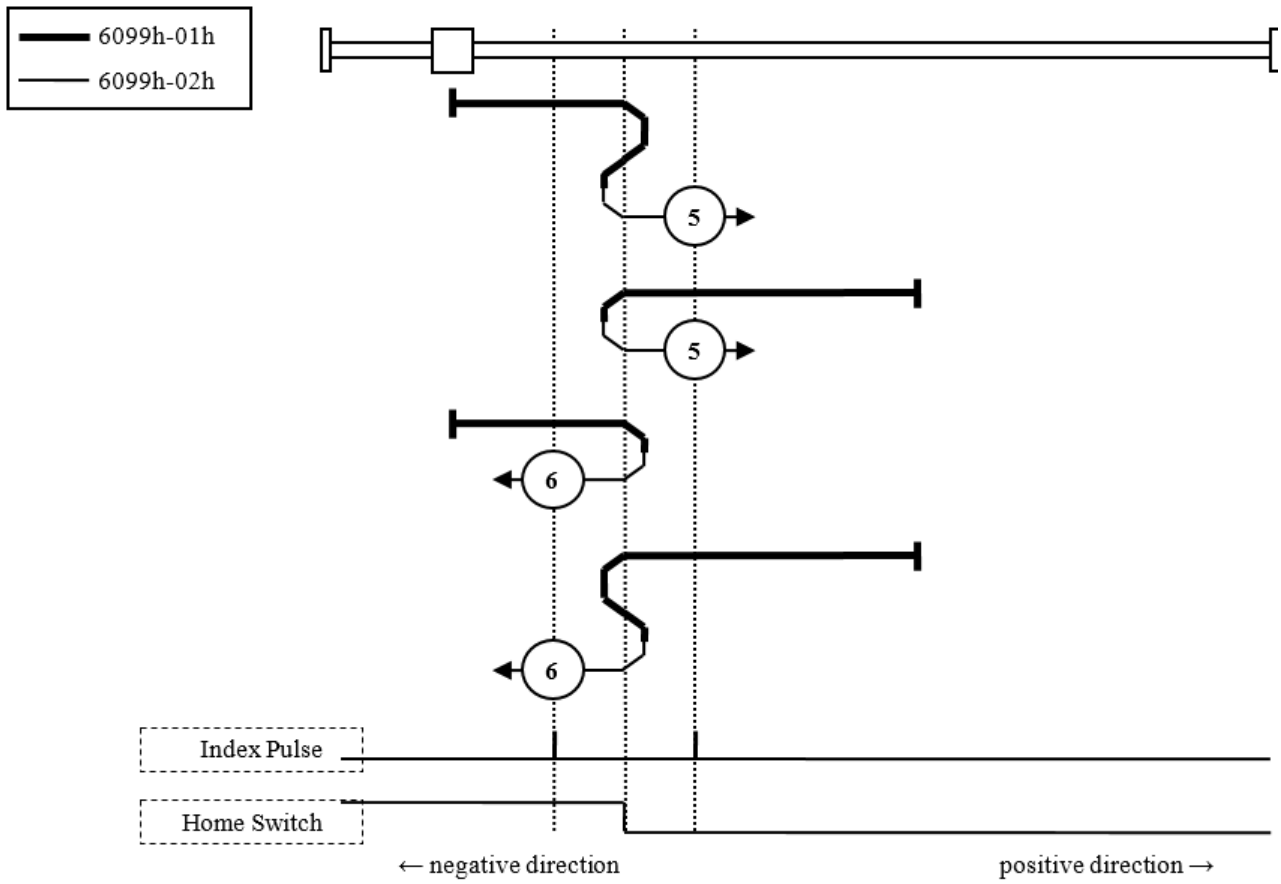
Homing on positive home switch and index pulse



■ **Method 5, 6**

- These Methods, the initial operation direction changes in the state of Home switch at startup
- Home detection position is the first Index pulse detection position in the Negative side or Positive side after the change of state of Home switch. (See figure)
- When HOME is not assigned, Homing error will occur(Homing error = 1).

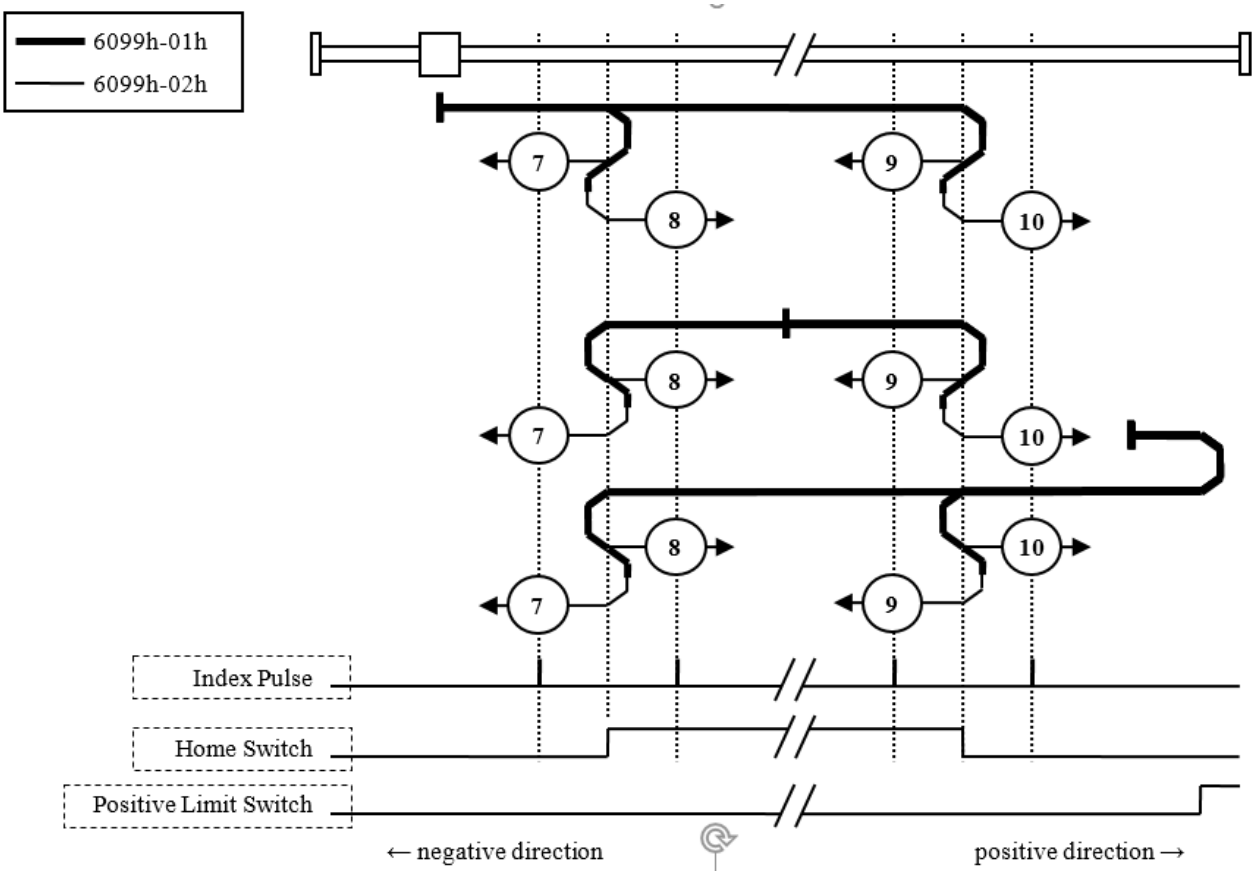
Homing on negative home switch and index pulse



■ **Method 7, 8, 9, 10**

- These Methods, use Home switch and Index pulse.
- Method 7 and 8 initial operation directions, when Home switch is active at the time of a start of operation, becomes the Negative direction.
- Method 9 and 10 initial operation directions, when Home switch is active at the time of a start of operation, becomes the Positive direction.
- Home detection position is the near Index pulse in the rising or falling edge of Home switch. (See figure)
- When HOME and POT are not assigned, Homing error will occur(Homing error = 1).

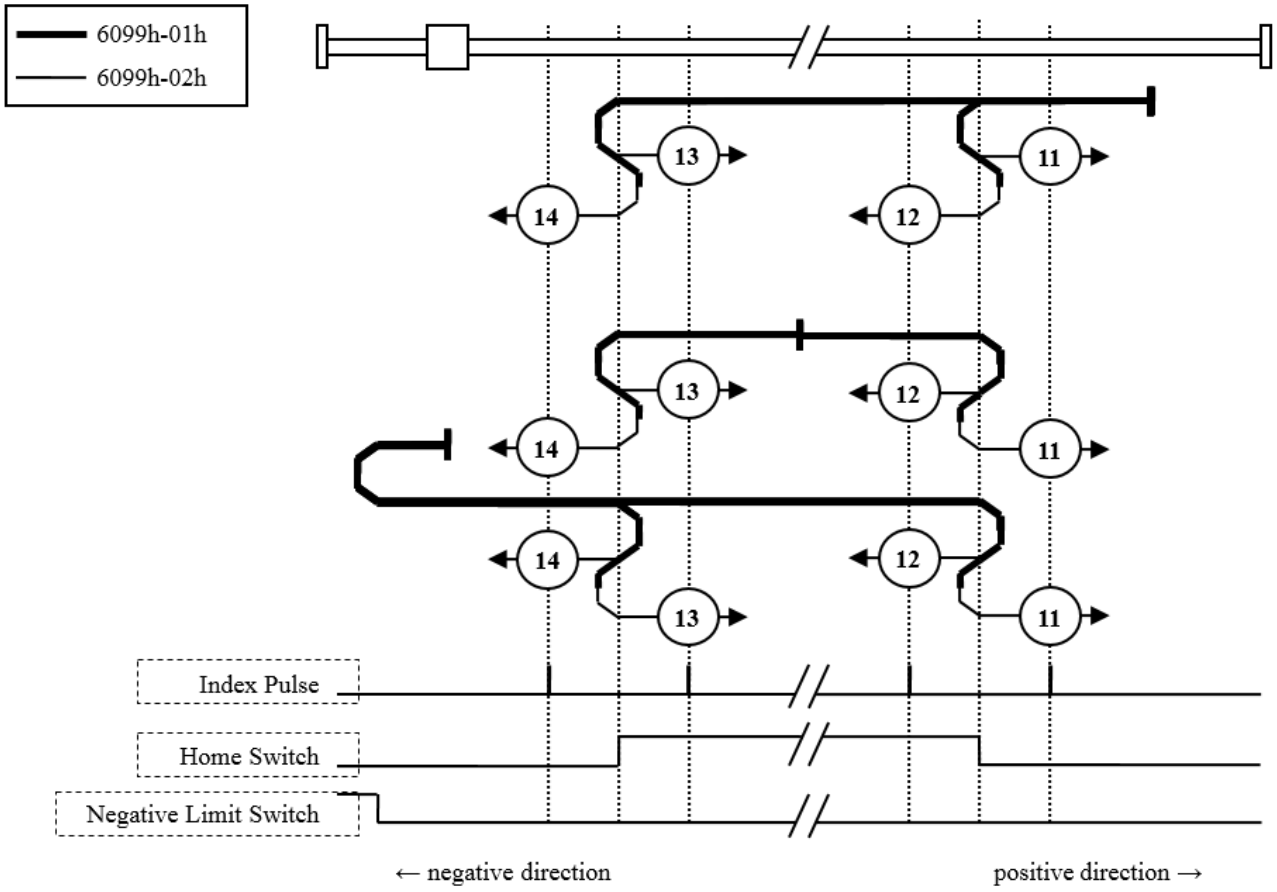
Homing on home switch and index pulse - positive initial motion



■ **Method 11, 12, 13, 14**

- These Methods, use Home switch and Index pulse.
- Method 11 and 12 initial operation directions, when Home switch is active at the time of a start of operation, becomes the Positive direction.
- Method 13 and 14 initial operation directions, when Home switch is active at the time of a start of operation, becomes the Negative direction.
- Home detection position is the near Index pulse in the rising or falling edge of Home switch. (See figure)
- When HOME and NOT are not assigned, Homing error will occur(Homing error = 1).

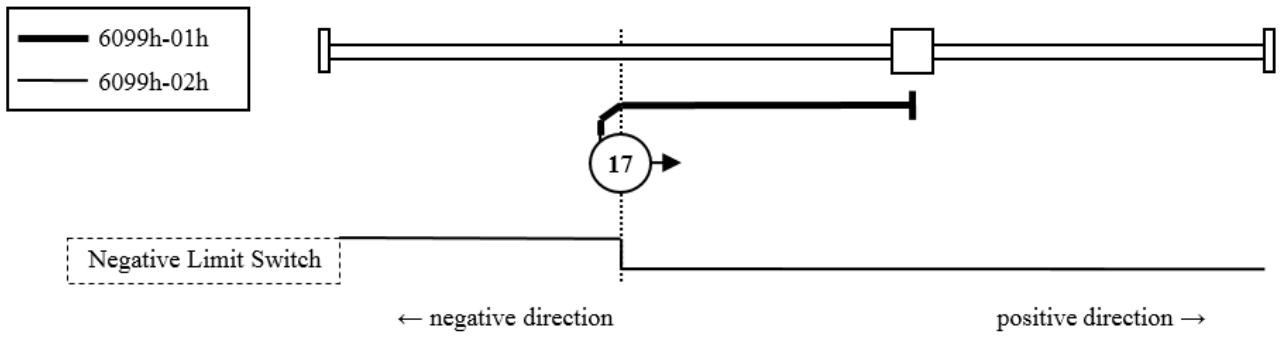
Homing on home switch and index pulse - negative initial motion



■ **Method 17**

- This Method resembles Method1. The difference is home detection position is not Index pulse. It is becoming the position where Limit switch changed. (See figure)
- When NOT is not assigned, Homing error will occur(Homing error = 1).

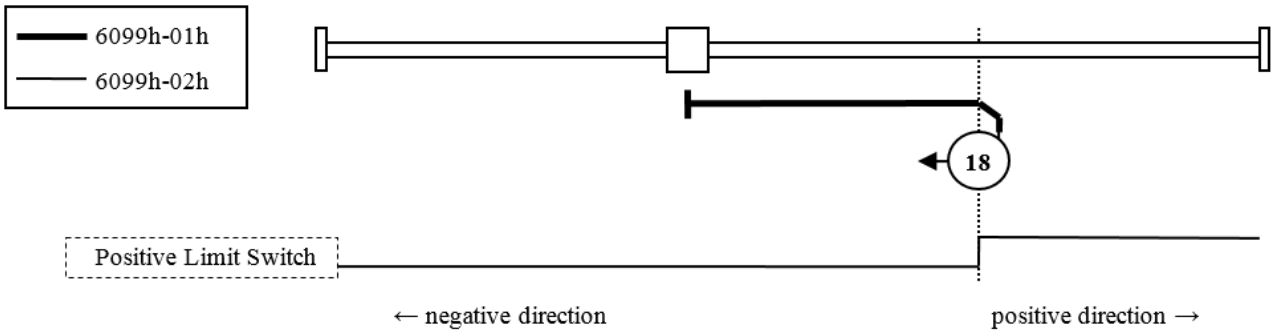
Homing on negative limit switch



■ **Method 18**

- This Method resembles Method2. The difference is home detection position is not Index pulse. It is becoming the position where Limit switch changed. (See figure)
- When POT is not assigned, Homing error will occur(Homing error = 1).

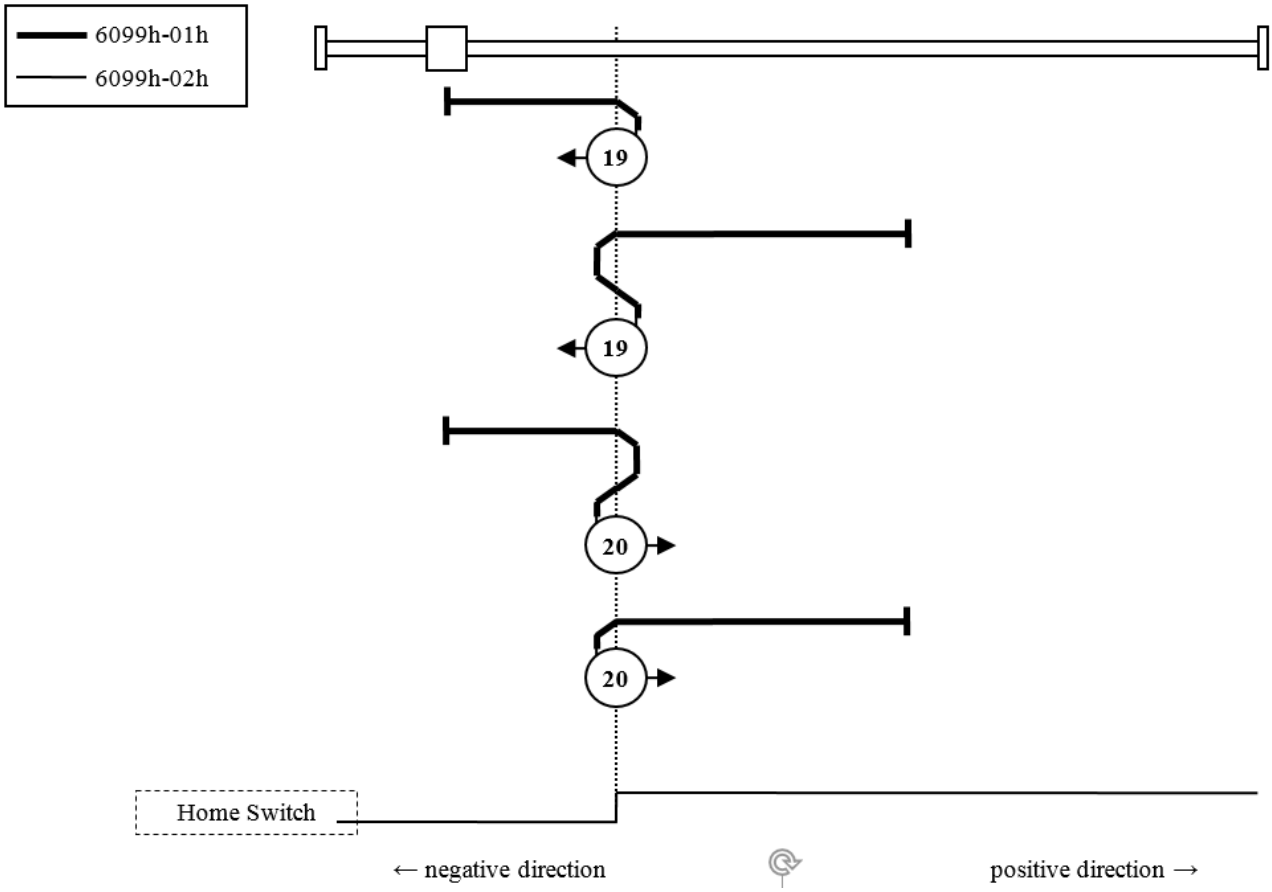
Homing on positive limit switch



■ **Method 19, 20**

- These Methods resembles Method3 and 4. The difference is home detection position is not Index pulse. It is becoming the position where Home switch changed. (See figure)
- When HOME is not assigned, Homing error will occur(Homing error = 1).

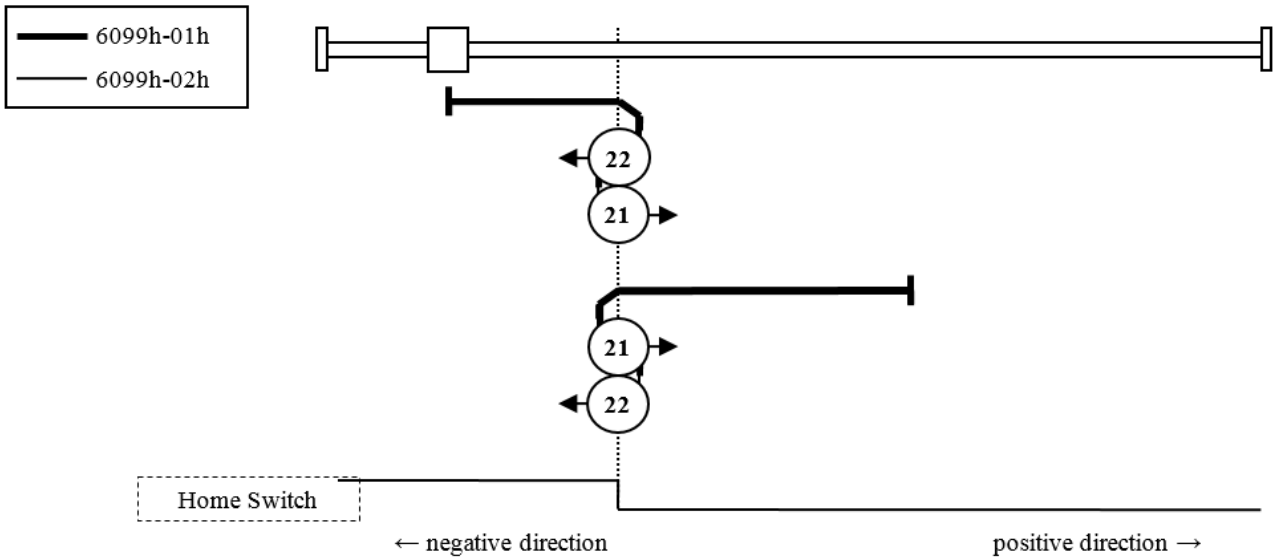
Homing on positive home switch



■ **Method 21, 22**

- These Methods resembles Method5 and 6. The difference is home detection position is not Index pulse. It is becoming the position where Home switch changed. (See figure)
- When HOME is not assigned, Homing error will occur(Homing error = 1).

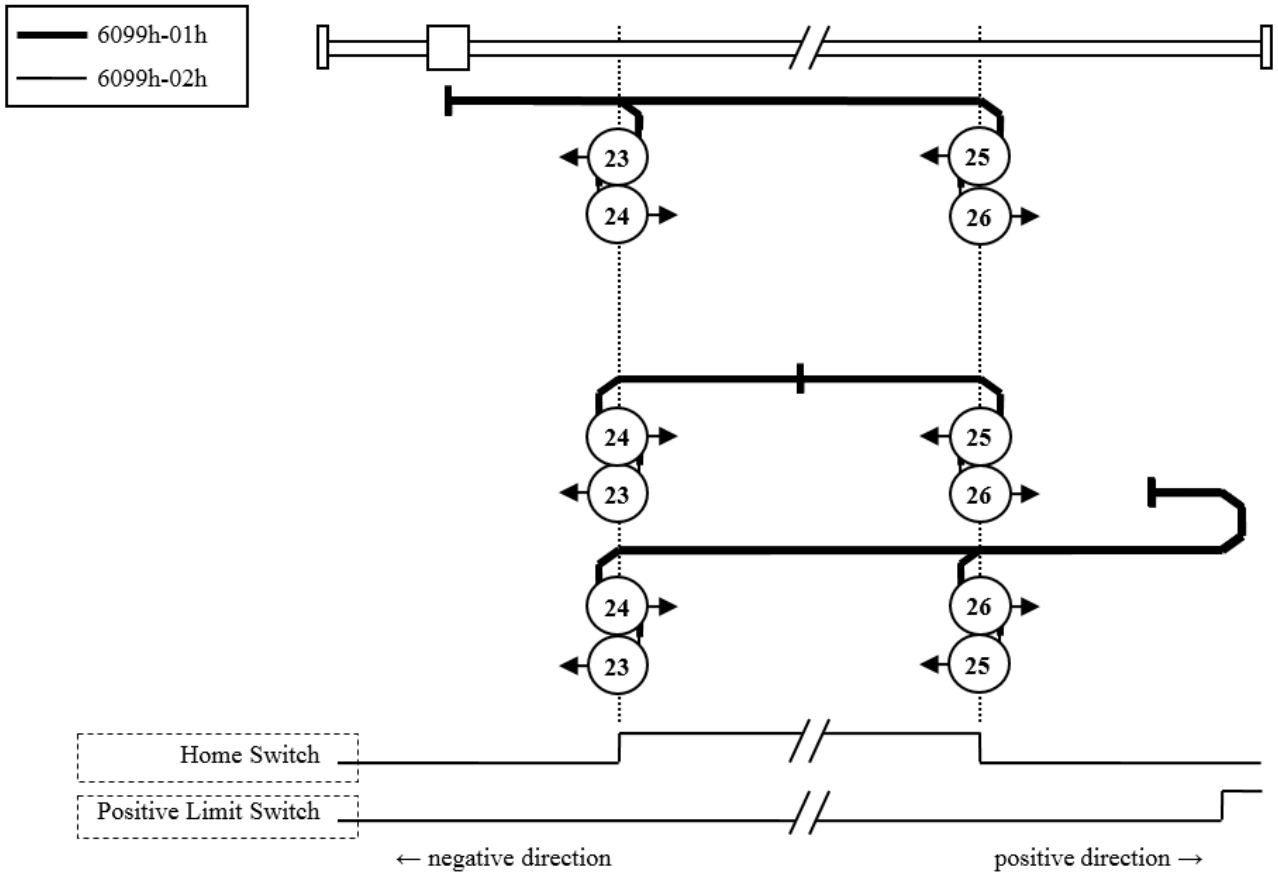
Homing on negative home switch and index pulse



■ **Method 23, 24, 25, 26**

- These Methods resembles Method7,8,9 and 10. The difference is home detection position is not Index pulse. It is becoming the position where Home switch changed. (See figure)
- When HOME and POT are not assigned, Homing error will occur(Homing error = 1).

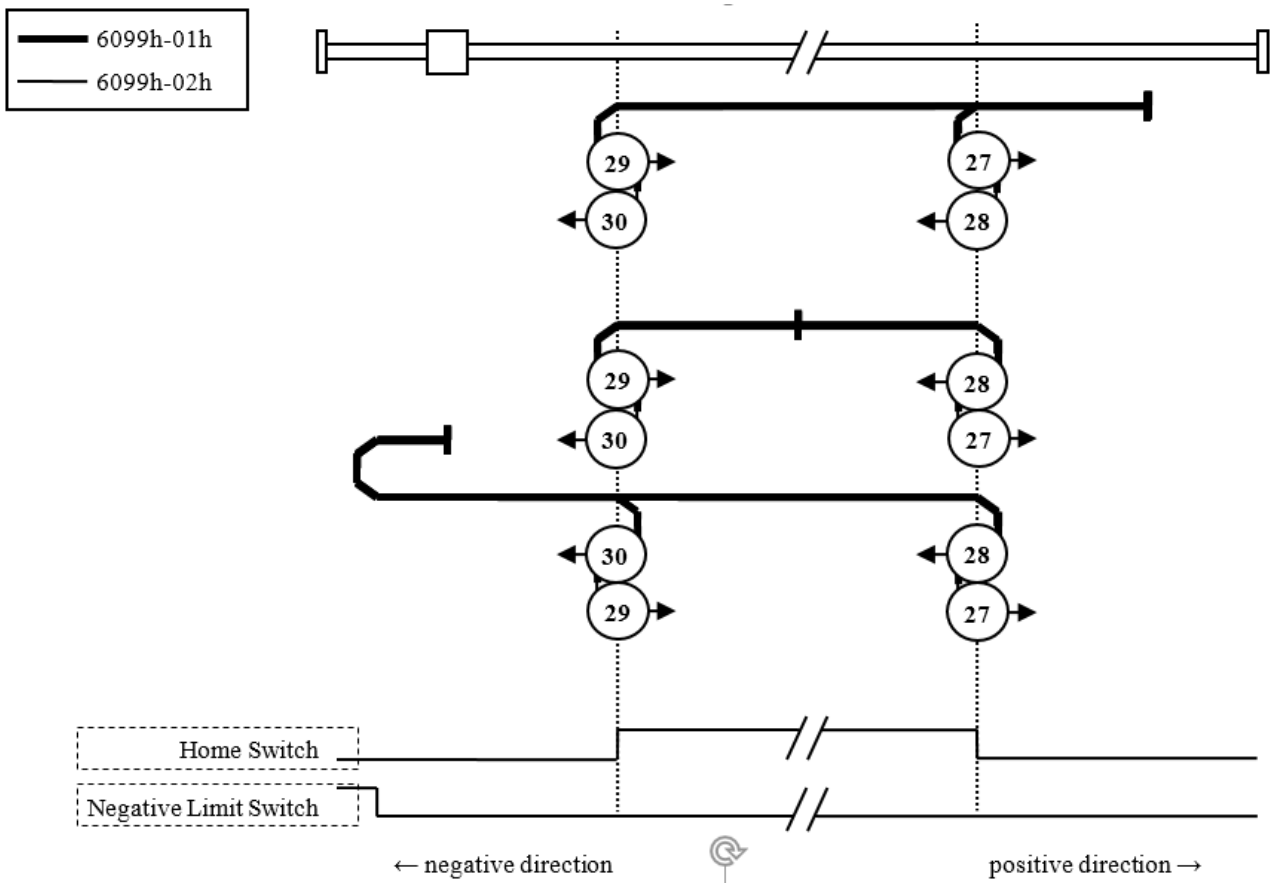
Homing on home switch and index pulse - positive initial motion



■ **Method 27, 28, 29, 30**

- These Methods resembles Method11,12,13 and 14. The difference is home detection position is not Index pulse. It is becoming the position where Home switch changed. (See figure)
- When HOME and NOT are not assigned, Homing error will occur(Homing error = 1).

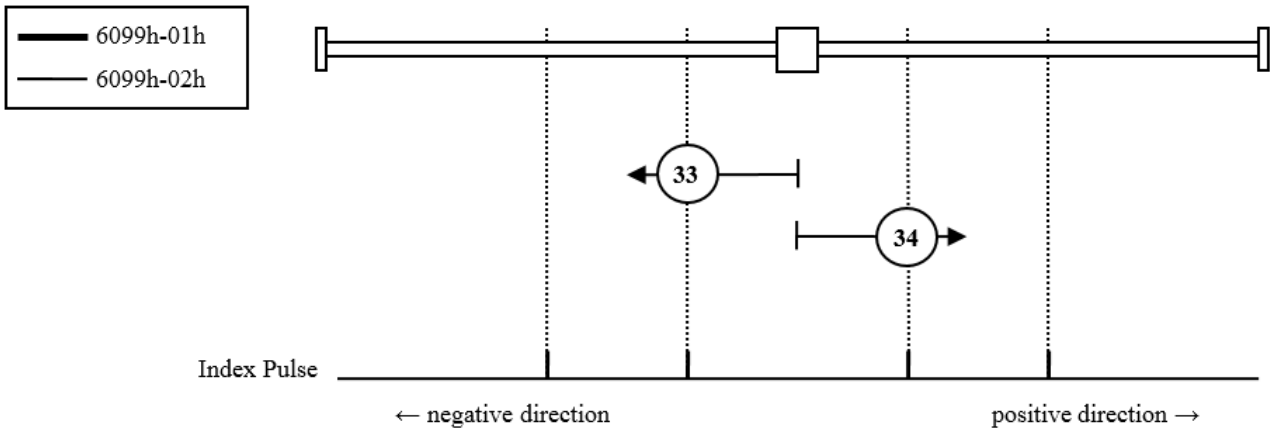
Homing on home switch and index pulse - negative initial motion



■ **Metho 33, 34**

- These Methods, use only Index pulse.
- Index pulse detected in operates in the direction shown in a figure is home detection position. (See figure)

Homing on index pulse



■ **Metho 35, 37**

- Used to set the coordinate system (position information) of the driver module.

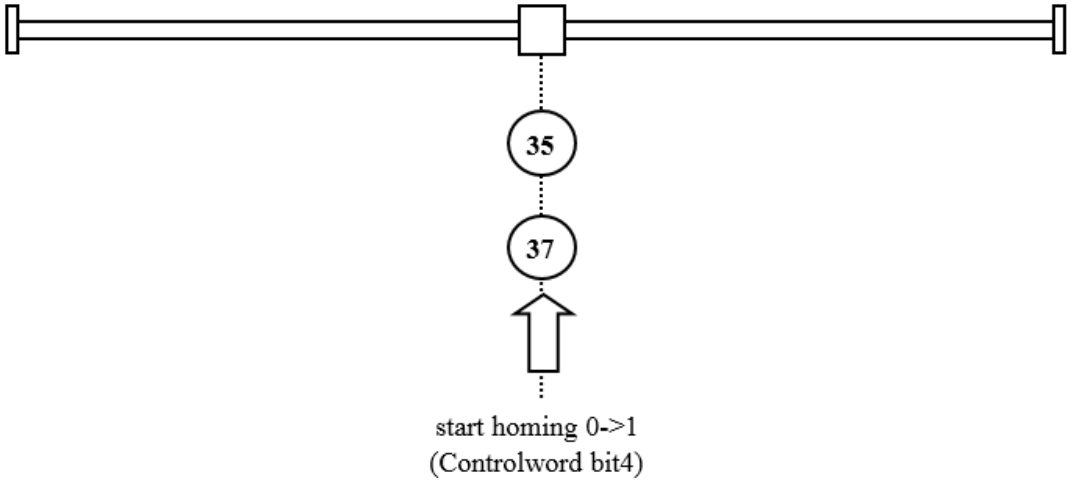
The following objects is initialized(Preset) on the basis of that position on homing startup.

- 6062h(Position demand value (Axis A)) = 6064h(Position actual value (Axis A)) = 607Ch(Home offset (Axis A))
- 6063h(Position actual internal value (Axis A)) = 60FCh(Position demand internal value (Axis A)) = 0

Note

607Ch (Home offset (Axis A)) is added to 6062h and 6064h.

- Practicable even if the PDS state is not Operation enabled.
- After 100ms or more expiration from stopping the command position, run Method 35 or 37.
- Although Method35 and 37 are the same functions, use Method37 according to the ETG standard at the time of a new design.

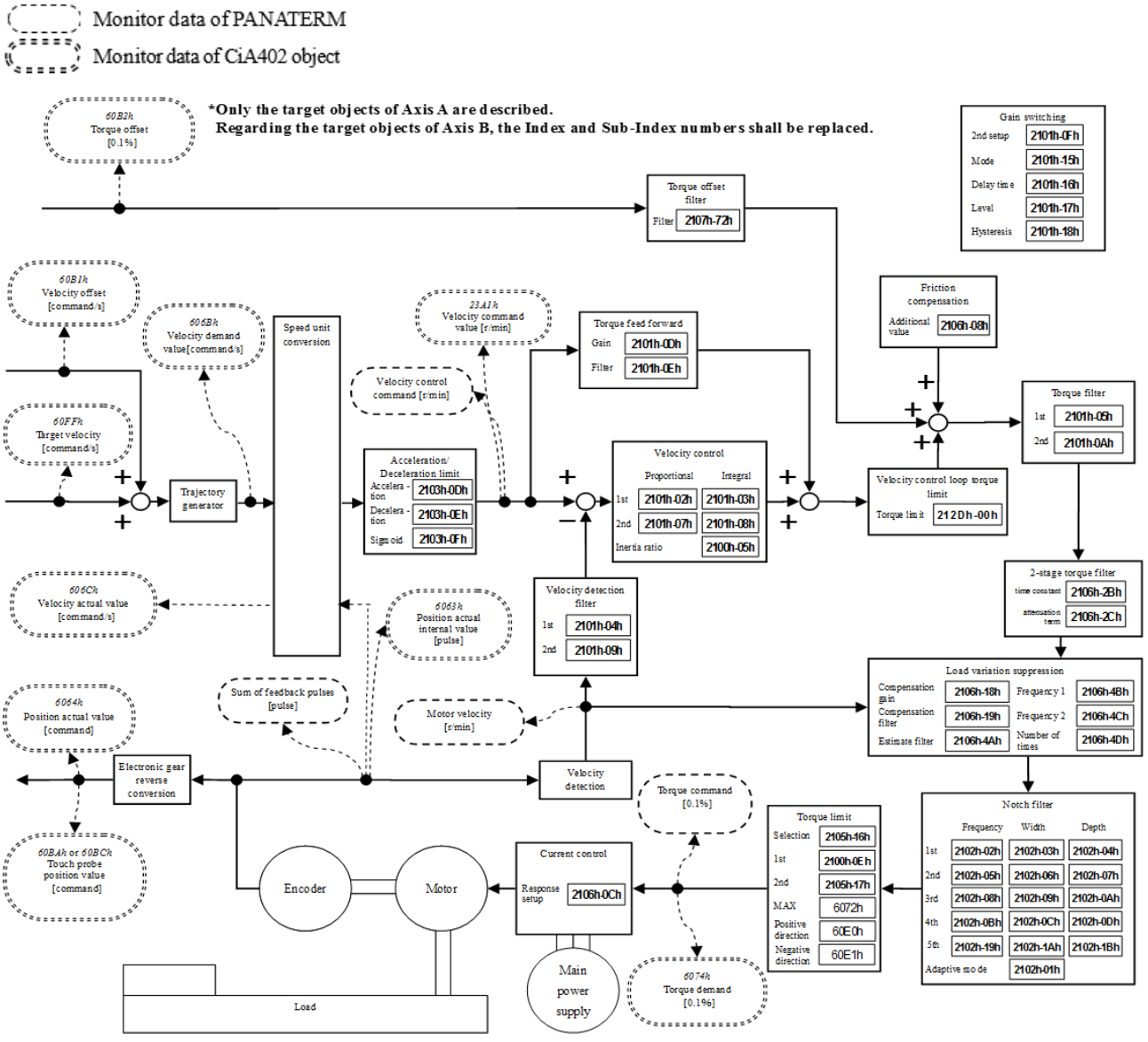


6.7 Velocity control function

6.7.1 Common velocity control function

6.7.1.1 Velocity control block diagram

Block diagram of velocity control



*1) A slanting number (ex.:607Ah) shows the object number of EtherCAT.

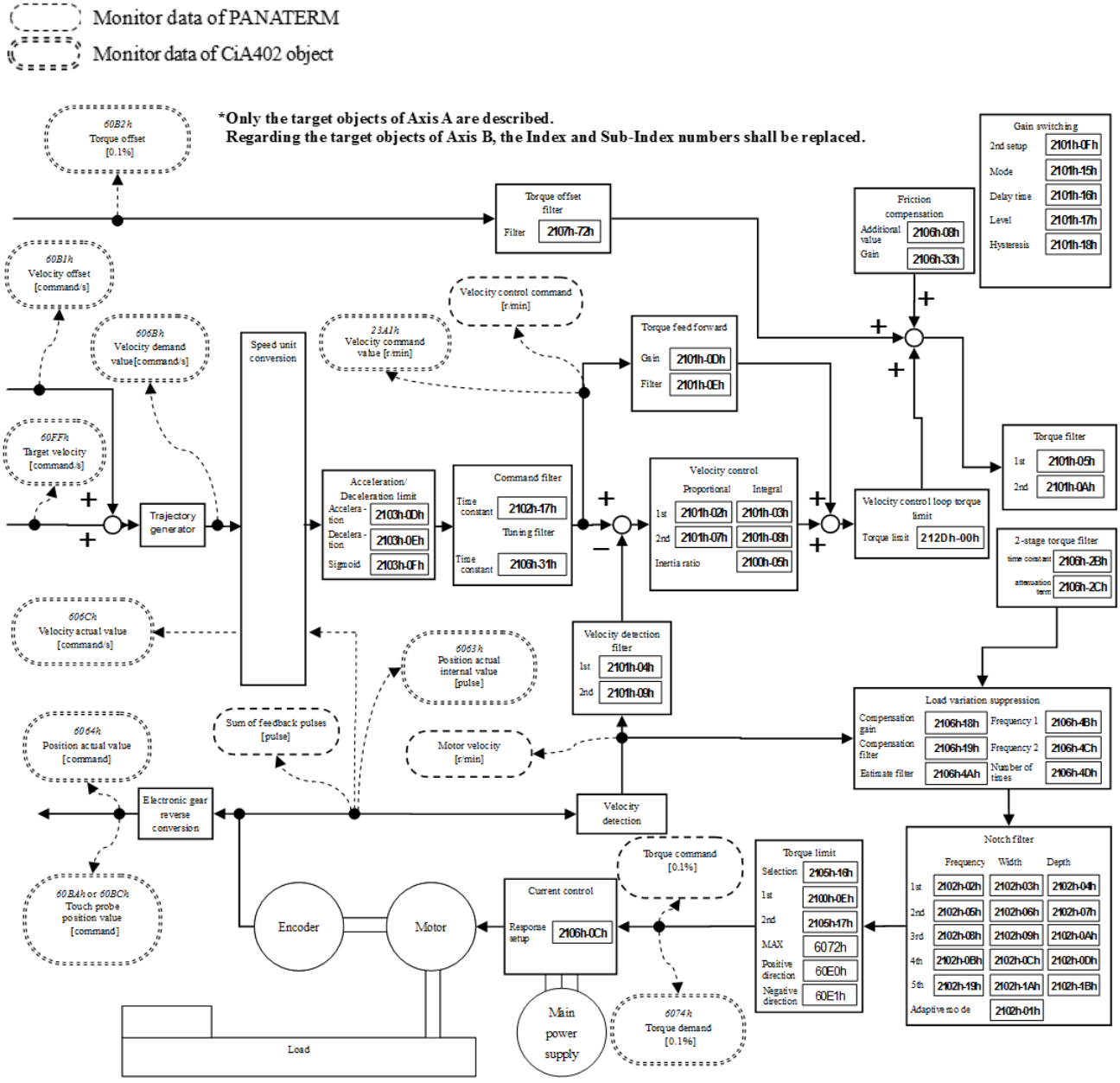
*2) A bold letter number (ex.:2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) When performing Frequency characteristic measurement (speed close loop characteristic, Torque speed (Vertical)) from the PANATERM for Multi, the driver module switches to velocity control internally.

Block diagram of the 2 degrees of freedom control mode (Velocity control)

In the mode of 2 degrees of freedom control, the structure in the following block diagram is adopted.



*1) A slanting number (ex.:607Ah) shows the object number of EtherCAT.

*2) A bold letter number (ex.: 2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) When performing Frequency characteristic measurement (speed close loop characteristic, Torque speed (Vertical)) from the PANATERM for Multi, the driver module switches to velocity control internally.

6.7.1.2 Related objects common in velocity control (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode	
								pv	csv
2103h	0Dh	Acceleration time setup	1ms/ (1000r/min)	0 to 10000	I16	rw	No	Yes	Yes
2103h	0Eh	Deceleration time setup	1ms/ (1000r/min)	0 to 10000	I16	rw	No	Yes	Yes
2103h	0Fh	Sigmoid acceleration / deceleration time setup	1ms	0 to 1000	I16	rw	No	Yes	Yes
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	Yes	Yes
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	Yes	Yes
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO	Yes	Yes
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	Yes	Yes
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
60FFh	00h	Target velocity (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO	Yes	Yes

- Besides, there are related objects for each control mode.
- The function of 6040h (Control word (Axis A)) can differ according to the control mode.

Refer to the section "Related objects" of each control mode.

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2103h	0Dh	Acceleration time setup	1ms/ (1000r/min)	0 to 10000	I16	rw	No	pv csv	Yes
		• Set the acceleration processing time in response to the velocity instruction input.							
2103h	0Eh	Deceleration time setup	1ms/ (1000r/min)	0 to 10000	I16	rw	No	pv csv	Yes
		• Set the deceleration processing time in response to the velocity instruction input.							
2103h	0Fh	Sigmoid acceleration/ deceleration time setup	1ms	0 to 1000	I16	rw	No	pv csv	Yes
		• Set the S-curve time for acceleration/deceleration process when the velocity instruction is applied.							
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	ALL	Yes
		• Set the maximum speed of motor. • The maximum value is limited by the maximum speed read from the motor in internal processing. The value stored in EEPROM is set when the control power is turned on.							
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pp ip pv hm csp csv	Yes
		• Set the offset value (velocity feed forward) of the velocity command. • The maximum value is limited by the 6080h (Max motor speed (Axis A)) in internal processing.							
60FFh	00h	Target velocity (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pv csv	No
		• Set the target velocity. • The internal target velocity is the sum of the preset value of this object and 60B1h (Velocity offset (Axis A)). • The maximum value of the internal target velocity is limited by the internal processing at either the smaller 607Fh (Max profile velocity (Axis A)) and 6080h (Max motor speed (Axis A)).							

Torque system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	No
		• When 60FEh-01h (Physical outputs) bit19=1 is set at the state of 60FE-02h (Bit mask) bit19=1, the torque command value generated from velocity control is limited at the set value.							
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• Sets the maximum torque of the motor. • The maximum value is limited by the maximum torque read out from the motor in internal processing. • The maximum torque of the motor varies with the motor used.							
60B2h	00h	Torque offset (Axis A)	0.1%	0 to 4294967295	U32	rw	RxPDO	ALL	No
		• Sets the offset of the torque command (torque feedforward). • During slowdown in over-travel inhibition (in emergency stop), the torque feedforward level becomes 0.							
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• The torque limit in the positive direction is set, at the time when 2105h-16h (Selection of torque limit)=5 has been set.							
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• The torque limit in the negative direction is set, at the time when 2105h-16h (Selection of torque limit)=5 has been set.							

Other

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	—	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
bit7	Internal value state selection of objects 60B2h(Torque offset (Axis A)) in servo-off (Fall prevention function in the event of Servo-ON) 0: Clear 1: Updated with the set value of 60B2h

Note

When this setting value is set to 1, set the value of 60B2h (Torque offset (Axis A)) to a value smaller than the value of 2105h-0Ch(Torque setup for emergency stop)

6.7.1.3 Related objects common in velocity control (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode	
								pv	csv
212Bh	00h	Over load factor (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	Yes	Yes
230Dh	00h	External scale position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2020h	00h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	Yes	Yes
2341h	00h	Number of entries	-	2	U8	ro	No	Yes	Yes
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	Yes	Yes
2348h	00h	External scale pulse total (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2349h	00h	External scale absolute position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2387h	00h	External scale data (Higher) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2388h	00h	External scale data (Lower) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	Yes	Yes
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
606Bh	00h	Velocity demand value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO	Yes	Yes
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes

- Besides, there are related objects for each control mode.
- The function of 6041h (Status word (Axis A)) can differ according to each control mode.

Refer to
Refer to the section "Related objects" of each control mode.

Position system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
230Dh	00h	External scale position (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Position of the external scale is displayed.							
2341h	-	Motor encoder data (Axis A)	-	-	-	-	-	-	-
		• Position information is displayed.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		• The number of Sub-Index of 2341h (Motor encoder data (Axis A)) is displayed.							
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Motor mechanical angle (encoder single-turn data) is displayed.							
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Multi-turn data of the absolute encoder is displayed.							
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The electrical angle of the motor is displayed.							
2348h	00h	External scale pulse total (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Sum of external scale pulse counts is displayed.							
2349h	00h	External scale absolute position (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Absolute position of the external scale is displayed.							
2387h	00h	External scale data (Higher) (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Higher 24 bits of external scale data is displayed.							
2388h	00h	External scale data (Lower) (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Lower 24 bits of external scale data is displayed.							
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the actual position of the motor. The value is on an encoder basis during other than full-closed control, and on an external scale basis during full-closed control.							
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the actual position of the motor. Under full-closed control, this is the external scale position.							

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Velocity control command is displayed.							
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Indicate sensor value of actual velocity. Return 0 always because this driver module not supported.							
606Bh	00h	Velocity demand value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	pv csv	No
		• Displays internal command velocity.							
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the actual velocity of the motor.							

Torque system

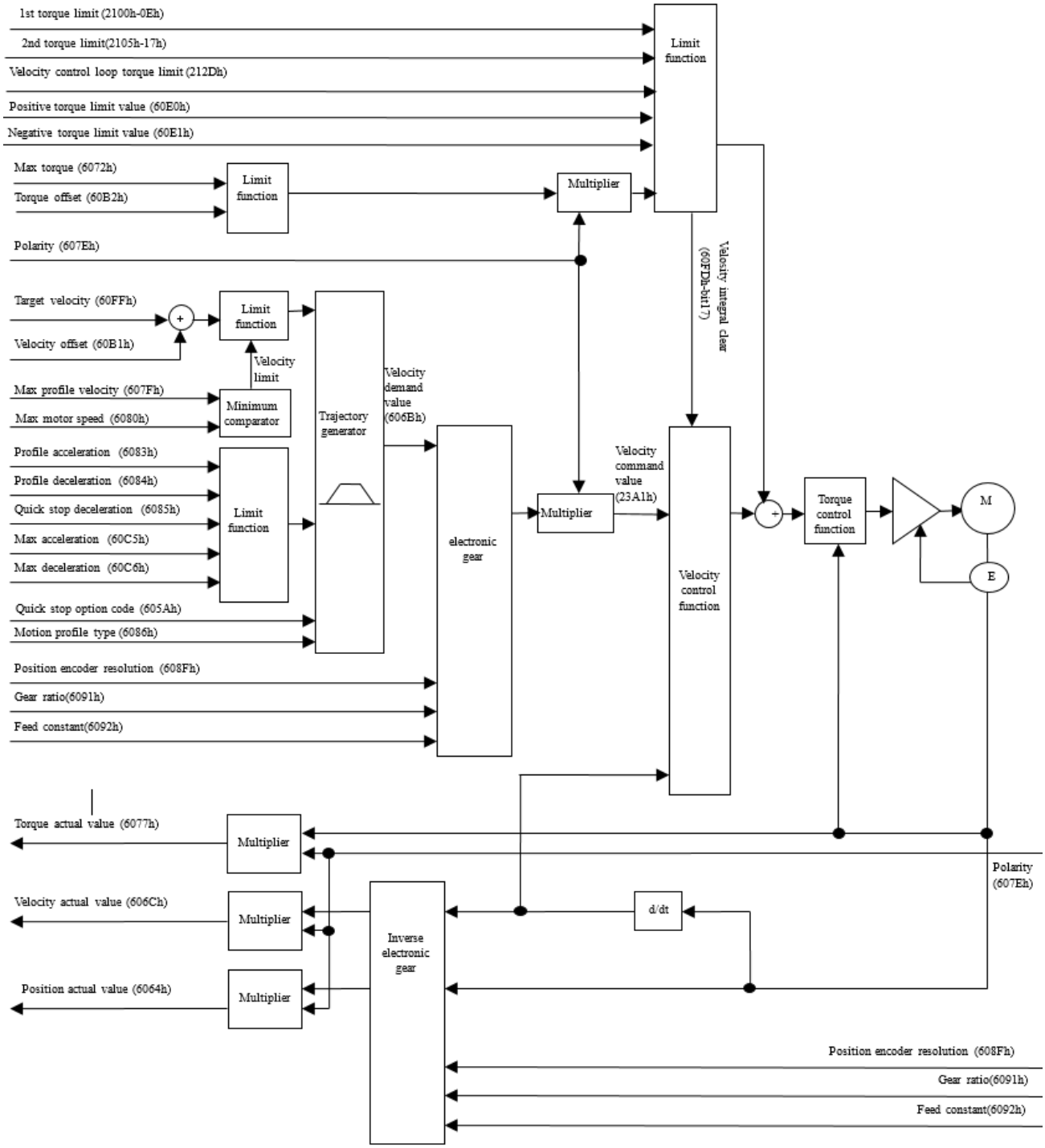
Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Bh	00h	Over load factor (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	ALL	No
		• The ratio [0.1%] to the rated load is displayed.							
2020h	00h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Regenerative load ratio (ratio of the regenerative overload protection to the alarm occurrence level) is displayed.							
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Inertia ratio is displayed. The ratio of load inertia to the motor's rotor inertia (equivalent of value of 2100h-05h) Inertia ratio = (load inertia/rotor inertia) x 100							
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Positive direction torque limit value is displayed.							
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Negative direction torque limit value is displayed.							
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Displays internal command torque.							
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO	ALL	No
		• Automatically set the rated torque of the motor.							
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Displays the actual torque. • It becomes a value equivalent to actual current value. • This output value is a reference value and does not guarantee an actual value.							

6.7.2 Profile velocity mode (pv mode)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

It is a velocity control mode to operate by designating the target velocity, addition-subtraction velocity, etc. and creating a position command in the driver module.

In this control mode, please use the communication cycle of 250μs or more.



6.7.2.1 Objects related to pv mode (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
606Ah	00h	Sensor selection code (Axis A)	-	-32768 to 32767	I16	rw	TxPDO
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6083h	00h	Profile acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60C5h	00h	Max acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60FFh	00h	Target velocity (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO

Refer to
For more information, refer to “6.7.1 Common velocity control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6086h	00h	Motion profile type (Axis A)	-	-32768 to 32767	I16	rw	RxPDO
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60A3h	00h	Profile jerk use (Axis A)	-	1 to 2, 255	U8	rw	No
60A4h	-	Profile jerk (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Profile jerk1	Command/s^3	0 to 4294967295	U32	rw	No
	02h	Profile jerk2	Command/s^3	0 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

Refer to
For more information, refer to “6.9 Common motion function”.

Controlword (6040h) <Functions in pv mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms r	h	fr	oms r	r	r	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

Note

The pv mode does not use the oms bit.

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
606Ah	00h	Sensor selection code (Axis A)	-	-32768 to 32767	I16	ro	TxPDO	pv	No
		• The speed sensor to detect 606Ch (Velocity actual value (Axis A)) is to be set. Since this driver module does not support velocity sensor, always 0 is set. 0: Actual position from the position sensor 1: Actual velocity from the velocity sensor (not supported)							
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv	Yes
		• Set the velocity limit in the profile position mode (pp), homing position mode (hm), interpolating position mode (ip), and profile velocity mode (pv). • The maximum value is limited by the (Max motor speed (Axis A)) 6080h in internal processing.							

Acceleration and deceleration system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6083h	00h	Profile acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp ip pv	Yes
		• Set the profile acceleration. • If it is set to 0, internal processing is treated as 1.							
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp ip pv	Yes
		• Set the profile deceleration. • If it is set to 0, internal processing is treated as 1.							
60C5h	00h	Max acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv	Yes
		• Set the maximum acceleration. • If it is set to 0, internal processing is treated as 1.							
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv	Yes
		• Set the maximum deceleration. • If it is set to 0, internal processing is treated as 1.							

6.7.2.2 Objects related to pv mode (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO
606Dh	00h	Velocity window (Axis A)	Command/s	0 to 65535	U16	rw	RxPDO
606Eh	00h	Velocity window time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO
606Fh	00h	Velocity threshold (Axis A)	Command/s	0 to 65535	U16	rw	RxPDO
6070h	00h	Velocity threshold time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO

Besides, there are related objects common to the position control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO
606Bh	00h	Velocity demand value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO

Refer to

For more information, refer to “6.7.1 Common velocity control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to “6.9 Common motion function”.

Statusword (6041h) <Functions in pv mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

• Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	max slippage error	speed		Target reached										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13 (operation mode specific)

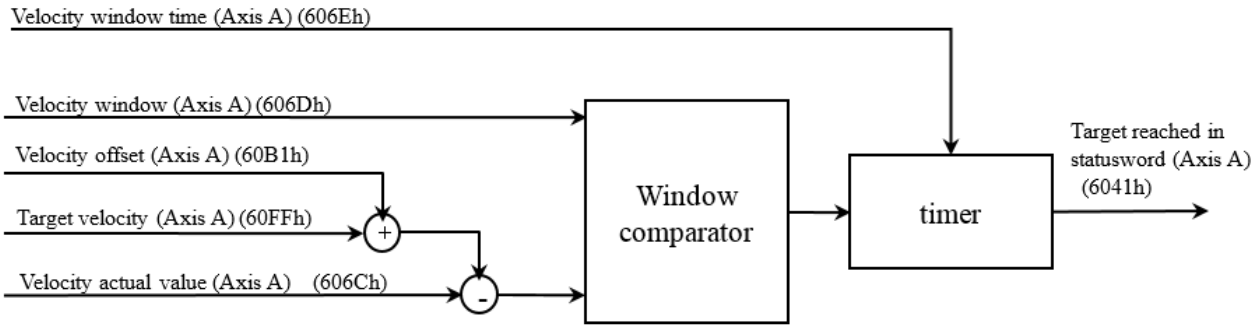
bit	Name	Value	Definition
13	max slippage error	-	(not supported)

■ **bit10 (target reached(Velocity reached))**

When the difference between 60FFh (Target velocity (Axis A)) + 60B1h (Velocity offset (Axis A)) and 606Ch (Velocity actual value) is in the range set by 606Dh (Velocity window (Axis A)) and the time set by 606Eh (Velocity window time (Axis A)) has elapsed, bit10 of 6041h (Statusword (Axis A)) is set to 1.

Bit	Name	Value	Definition
10	target reached	0	halt=0 (during normal operation) : Speed control not yet completed halt=1 (during stop by halt) : During axis deceleration
		1	halt=0 (during normal operation) : Speed control completed halt=1 (during stop by halt) : Axis stop (Axis speed is 0.)

Velocity reached (functional overview)



Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
606Dh	00h	Velocity window (Axis A)	Command/s	0 to 65535	U16	rw	RxPDO	pv	Yes
		• Set the threshold where bit 10 (Target reached) of 6041h (Statusword (Axis A)) will be 1 when the difference between the sum of 60FFh (Target velocity (Axis A)) and 60B1h (Velocity offset (Axis A)), and 606Ch (Velocity actual value (Axis A)), is within the range set by this parameter and the time set by 606Eh (Velocity window time) has elapsed. If the velocity deviation is out of the values set by this parameter, the bit 10 of 6041h will be 0.							
606Eh	00h	Velocity window time (Axis A)	1ms	0 to 65535	U16	rw	RxPDO	pv	Yes
		• Set the time from the point when the difference between the sum of 60FFh (Target velocity (Axis A)) and 60B1h (Velocity offset (Axis A)), and 606Ch (Velocity actual value (Axis A)), falls within the range set by 606Dh (Velocity window (Axis A)) to bit10 (target reached) of 6041h (Statusword (Axis A)) becomes 1.							

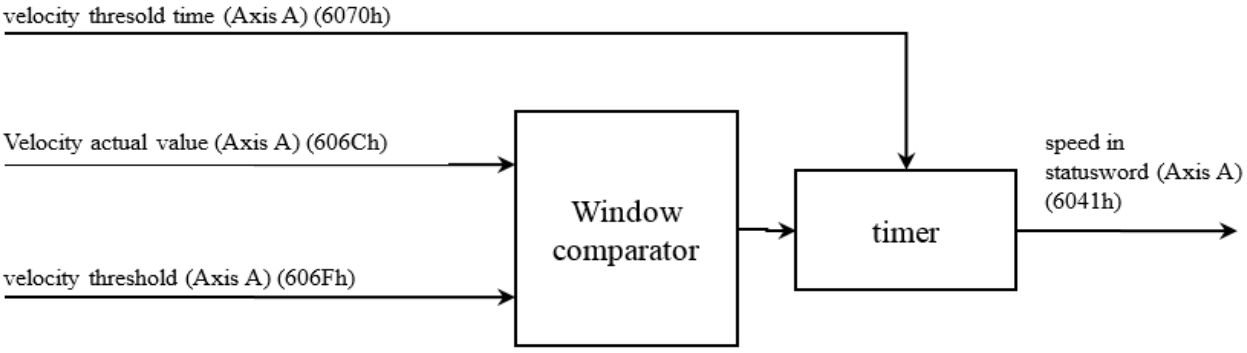
■ **bit12 (speed)**

When 606Ch (Velocity actual value (Axis A)) exceeds the value set in 606Fh (Velocity threshold (Axis A)) and the time set by 6070h (Velocity threshold time (Axis A)) has elapsed, bit 12 of 6041h (Statusword (Axis A)) changes to 0.

When 606Ch (Velocity actual value (Axis A)) becomes lower than the value set in 606Fh (Velocity threshold (Axis A)), bit12 of 6041h (Statusword (Axis A)) changes to 1, which indicates that the motor has stopped.

Bit	Name	Value	Definition
12	speed	0	Motor is operating
		1	Motor is not operating

Speed (functional overview)

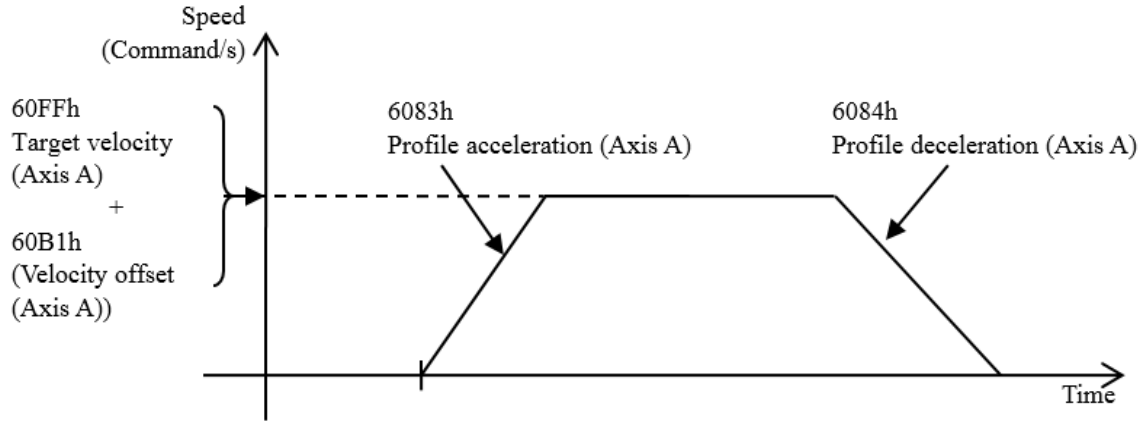


Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
606Fh	00h	Velocity threshold (Axis A)	Command/s	0 to 65535	U16	rw	RxPDO	pv	Yes
		• Set the threshold where bit 12 (speed) of 6041h (Statusword (Axis A)) becomes 0 when 606Ch (Velocity actual value (Axis A)) exceeds the value set to this parameter and the time set in 6070h (Velocity threshold time (Axis A)) has elapsed. When the velocity becomes the value set in this parameter or less, bit 12 of 6041 (Statusword (Axis A)) changes to 1.							
6070h	00h	Velocity threshold time (Axis A)	1ms	0 to 65535	U16	rw	RxPDO	pv	Yes
		• Set the time from the point when 606Ch (Velocity actual value (Axis A)) exceeds the value set to 606Fh (Velocity threshold (Axis A)) until the point when bit 12 of 6041h (Statusword (Axis A)) changes to 0.							

6.7.2.3 Operations of pv mode

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

- Profile velocity control mode generates a velocity command value according to the following parameters.
  - Target velocity (Axis A) (60FFh)
  - Velocity offset (Axis A) (60B1h)
  - Profile acceleration (Axis A) (6083h)
  - Profile deceleration (Axis A) (6084h)
- Target velocity is additional value of the 60FFh (Target velocity (Axis A)) and 60B1h(Velocity offset (Axis A)).
- For the operation command update (transmission), do input when approx. 100 ms has elapsed after the servo ON(Operation enabled command).
- There are various sensors for velocity detection. The MINAS A6 Multi series detects the position and velocity by using an encoder (position sensor).
- As the monitoring function, the Velocity actual value (606Ch (Axis A)) provides the information to host controller.



◆ NOTE

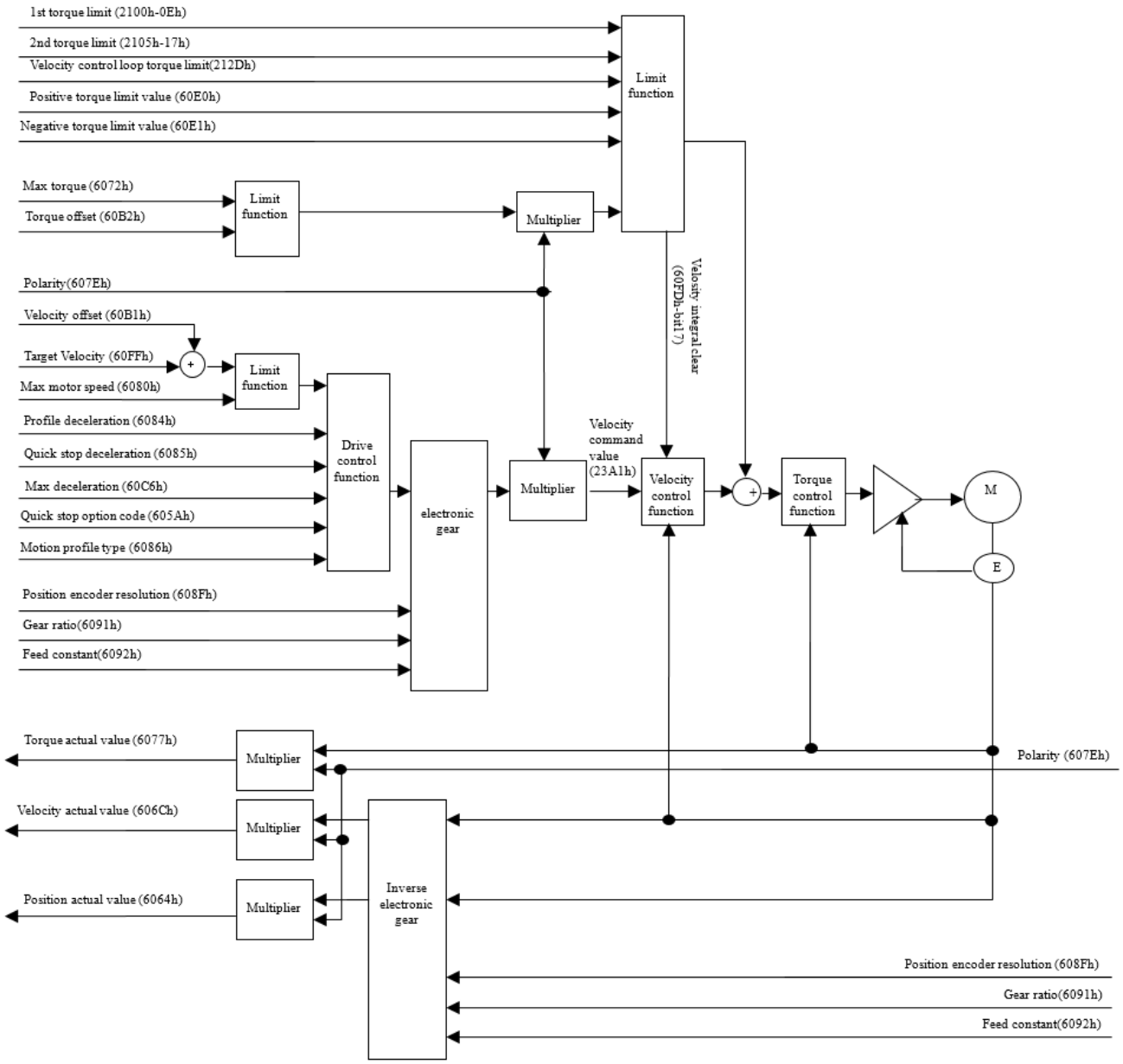
- **The sum of 60FFh (Target velocity (Axis A)) and 60B1h (Velocity offset (Axis A)) is limited by the smallest one out of 607Fh(Max profile velocity (Axis A)), 6080h (Max motor speed (Axis A)), 2147483647. However, a change that is made to the value of 607Fh(Max profile velocity (Axis A)) and 6080h (Max motor speed (Axis A)) during operation will not be reflected in that operation.**

6.7.3 Cyclic velocity mode (csv mode)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

It is a velocity control mode to operate by creating a command velocity in the host controller (master) and updating (transmitting) the command velocity in an interpolation cycle.

Use it in the DC or SM2 synchronization mode.



6.7.3.1 Objects related to csv mode (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No

Besides, there are related objects common to the velocity control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
60B1h	00h	Velocity offset (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60FFh	00h	Target velocity (Axis A)	Command/s	-2147483648 to 2147483647	I32	rw	No

For more information, refer to “6.7.1 Common velocity control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60C2h	-	Interpolation time period (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Interpolation time period value	-	0 to 255	U8	rw	No
	02h	Interpolation time index	-	-128 to 63	I8	rw	No
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

Refer to

For more information, refer to “6.9 Common motion function”.

Controlword (6040h) <Functions in csv mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms r	h	fr	oms r	r	r	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

Note

The csv mode does not use the oms bit.

Other

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	—	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
2107h-19h bit11	The condition that 6041h bit12 (drive follows command value) will be 0. 0 : Limiting torque and speed limit (only cst) is included. 1 : Limiting torque and speed limit (only cst) is not included.

6.7.3.2 Objects related to csv mode (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO

Besides, there are related objects common to the velocity control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO
606Bh	00h	Velocity demand value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	TxPDO
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO

Refer to

For more information, refer to “6.7.1 Common velocity control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to “6.9 Common motion function”.

Statusword (6041h) <Functions in csv mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

• Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	r	drive follows command value		r										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13,12,10(operation mode specific)

bit	Name	Value	Definition
10	reserved	-	Not used
12	drive follows command value	0	Operation is not performed according to the target velocity. (Note 1)
		1	Operation is performed according to the target velocity. (Note 1)
13	reserved	-	Not used

(Note 1) “Operation is performed according to the target velocity” refers to cases where the following conditions are all satisfied:

- PDS state is Operation enabled
- While not in deceleration (Halt, POT/NOT, Quickstop, Shutdown, Disable operation and Fault)
- While not in Halt status
- POT not detected when a positive direction operation command is in process, or NOT not detected when a negative direction operation command is in process
- Torque limit has not occurred(Valid only when this condition 2107h-19h -bit11 is 0)

-

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	—	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
2107h-19h bit11	The condition that 6041h bit12 (drive follows command value) will be 0. 0: Limiting torque and speed limit (only cst) is included. 1: Limiting torque and speed limit (only cst) is not included.

6.7.3.3 Operations of csv mode

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

- Motion profile (trajectory) generation is done in the master rather than the slave in the cyclic velocity control mode.
- Target velocity is additional value of 60FFh(Target velocity (Axis A)) and 60B1h(Velocity offset (Axis A)).
- For the operation command update (transmission), do input when approx. 100 ms has elapsed after the servo ON(Operation enabled command).
- 60C2h (Interpolation time period (Axis A)) indicates the cycle to update the two object for 60FFh(Target velocity (Axis A)) and 60B1h(Velocity offset (Axis A)).This value is set to the cycle which is the same as 1C32-02h(Cycle time).
- As monitoring information, we provide 606Ch(Velocity actual value (Axis A)) etc.

◆ NOTE

- **The sum of 60FFh (Target velocity (Axis A)) and 60B1h (Velocity offset (Axis A)) is limited by 6080h (Max motor speed (Axis A)) or 2147483647, whichever is smaaler. However, a change that is made to the value of 6080h (Max motor speed (Axis A)) during operation will not be reflected in that operation.**

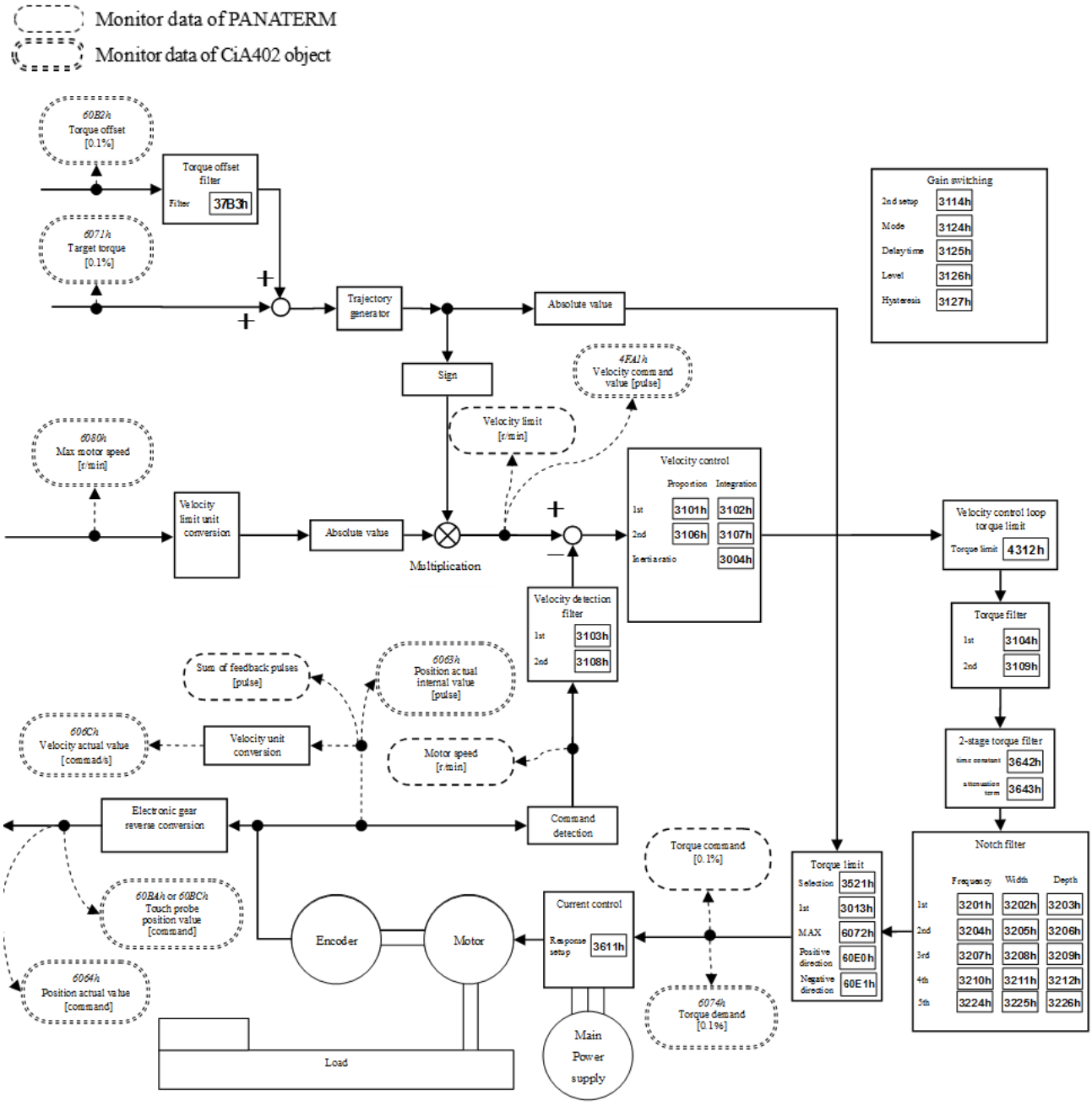
6.8 Torque control function

6.8.1 Common torque control function

6.8.1.1 Torque control block diagram

Block diagram of torque control

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.



*1) A slanting number (ex.:607Ah) shows the object number of EtherCAT.

*2) A bold letter number (ex.:2100h-01h) shows a parameter number.

*3) Polarity was omitted.

*4) When performing Frequency characteristic measurement (Torque speed (normal)) from the PANATERM for Multi, the driver module switches to torque control internally.

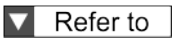
6.8.1.2 Related objects common in torque control (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode	
								pv	csv
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	Yes	Yes
6071h	00h	Target torque (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	Yes	Yes
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
607Fh	00h	Max profile velocity (Axis A)	Command unit/s	0 to 4294967295	U32	rw	RxPDO	Yes (Note 1)	Yes (Note 1)
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	Yes	Yes
6087h	00h	Target slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO	Yes	Yes
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	Yes	Yes
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	Yes	Yes

(Note 1) When 2106h-62h (Function expansion setup 3) bit8=0 (value at the time of shipment) is set, it becomes "No".

- Besides, there are related objects common to the position control.
- The function of 6040h (Control word (Axis A)) can differ according to the control mode.



Refer to the section "Related objects" of each control mode.

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Fh	00h	Max profile velocity (Axis A)	Command unit/s	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv tq cst	Yes
		• Speed limit value is set. • The maximum value is limited to 6080h (Max motor speed (Axis A)) by internal processing. • When 2106h-62h (Function expansion setup 3) bit8=0 is set, this setting becomes invalid for tq, cst. When 2106h-62h (Function expansion setup 3) bit8=1 is set, this setting becomes valid for tq, cst							
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	ALL	Yes
		• Set the maximum speed of motor. • The maximum value is limited by the maximum speed read out from the motor in internal processing. • The value stored in EEPROM is set when the control power is turned on.							

Torque system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	No
		• When 60FEh-01h (Physical outputs) bit19=1 is set at the state of 60FE-02h (Bit mask) bit19=1, the torque command value generated from velocity control is limited at the set value.							
6071h	00h	Target torque (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	tq cst	Yes
		• Set the torque command in the torque profile mode (tq) and cyclic synchronous torque mode (cst). When the value exceeds 6072h (Max torque (Axis A)), the value is limited by 6072h.							
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• Set the maximum torque of the motor. • The maximum value is limited by the maximum torque read out from the motor in internal processing. • The maximum torque of the motor varies with the motor applied.							
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO	tq cst	Yes
		• Set a parameter value for giving slope to a torque command. • In the cyclic synchronous torque mode (cst), torque slope is effective only during the deceleration stop sequence. • When 0 has been set, the setting is regarded as 1 internally.							
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	ALL	Yes
		• Set the offset of a torque command (torque feedforward). • During slowdown in over-travel inhibition (in emergency stop), the torque feedforward level becomes 0.							
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• The torque limit in the positive direction is set, at the time when 2105h-16h (Selection of torque limit)=5 has been set.							
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes
		• The torque limit in the negative direction is set, at the time when 2105h-16h (Selection of torque limit)=5 has been set.							

Other

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3 (Axis A)	—	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
bit7	Internal value state selection of objects 60B2h(Torque offset (Axis A)) in servo-off (Fall prevention function in the event of Servo-ON) 0: Clear 1: Updated with the set value of 60B2h

Note

When this setting value is set to 1, set the value of 60B2h (Torque offset (Axis A)) to a value smaller than the value of 2105h-0Ch(Torque setup for emergency stop)

6.8.1.3 Related objects common in torque control (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Supported mode	
								pv	csv
212Bh	00h	Over load factorv (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	Yes	Yes
230Dh	00h	External scale position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2020h	00h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	Yes	Yes
2341h	00h	Number of entries	-	2	U8	ro	No	Yes	Yes
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	Yes	Yes
2348h	00h	External scale pulse total (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2349h	00h	External scale absolute position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2387h	00h	External scale data (Higher) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
2388h	00h	External scale data (Lower) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
23A8h	00h	Positive direction torque limit value (Axis A)	0.05 %	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	Yes	Yes
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6064h	00h	Position actual value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
606Ch	00h	Velocity actual value (Axis A)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	Yes	Yes
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes
6075h	00h	Motor rated current (Axis A)	mA	0 to 4294967295	U32	ro	No	Yes	Yes
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	No	Yes	Yes
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes
6078h	00h	Current actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	Yes	Yes
6079h	00h	DC link circuit voltage (Axis A)	mV	0 to 4294967295	U32	ro	TxPDO	Yes	Yes

- Besides, there are related objects for each control mode.
- The function of 6041h (Status word) can differ according to each control mode.

Refer to
Refer to the section "Related objects" of each control mode.

Position system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
230Dh	00h	External scale position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Position of the external scale is displayed.							
2341h	-	Motor encoder data (Axis A)	-	-	-	-	-	-	-
		• Position information is displayed.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		• The number of Sub-Index of 2341h (Motor encoder data (Axis A)) is displayed.							
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Motor mechanical angle (encoder single-turn data) is displayed.							
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Multi-turn data of the absolute encoder is displayed.							
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The electrical angle of the motor is displayed.							
2348h	00h	External scale pulse total (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Sum of external scale pulse counts is displayed.							
2349h	00h	External scale absolute position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Absolute position of the external scale is displayed.							
2387h	00h	External scale data (Higher) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Higher 24 bits of external scale data is displayed.							
2388h	00h	External scale data (Lower) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Lower 24 bits of external scale data is displayed.							
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the actual position of the motor. The value is on an encoder basis during other than full-closed control, and on an external scale basis during full-closed control.							
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the actual position of the motor. Under full-closed control, this is the external scale position.							

Velocity system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Velocity control command is displayed.							
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Indicate sensor value of actual velocity. Return 0 always because this driver module not supported.							
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the actual velocity of the motor.							

Torque system

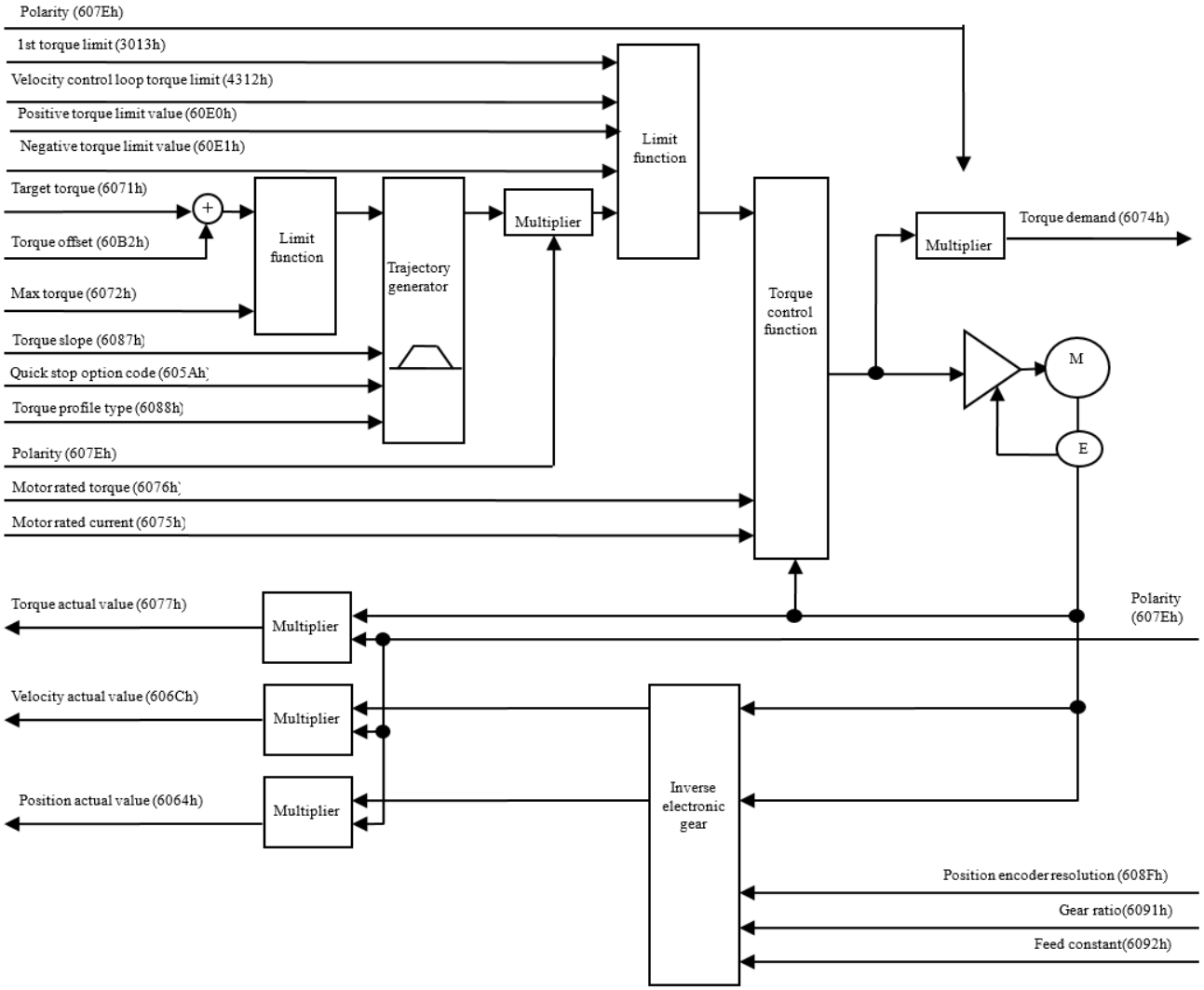
Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Bh	00h	Over load factor (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	ALL	No
		• The ratio [0.1%] to the rated load is displayed.							
2020h	00h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Regenerative load ratio (ratio of the regenerative overload protection to the alarm occurrence level) is displayed.							
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Inertia ratio is displayed. The ratio of load inertia to the motor's rotor inertia (equivalent of value of 2100h-05h) Inertia ratio = (load inertia/rotor inertia) x 100							
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		Positive direction torque limit value is displayed.							
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Negative direction torque limit value is displayed.							
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Displays internal command torque.							
6075h	00h	Motor rated current (Axis A)	mA	0 to 4294967295	U32	ro	No	ALL	No
		• Automatically set the rated current of motor.							
6076h	00h	Motor rated torque	mN·m	0 to 4294967295	U32	ro	No	ALL	No
		• Automatically set the rated torque of motor.							
6077h	00h	Torque actual value	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Displays the actual torque. • This output value is a reference value calculated from the actual current, and does not guarantee the actual value.							
6078h	00h	Current actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No
		• Displays actual current value.							
6079h	00h	DC link circuit voltage (Axis A)	mV	0 to 4294967295	U32	ro	TxPDO	ALL	No
		• Displays the PN voltage in the main circuit power.							

6.8.2 Profile Torque Mode (tq mode)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

It is a torque control mode to operate by designating the target torque, addition-subtraction velocity, etc. and creating a position command in the driver module.

In this control mode, please use the communication cycle of 250μs or more.



6.8.2.1 Objects related to tq mode (Command & setup)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
6088h	00h	Torque profile type (Axis A)	-	-32768 to 32767	I16	rw	RxPDO

Besides, there are related objects common to the torque control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6071h	00h	Target torque	0.1%	-32768 to 32767	I16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Target slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO

For more information, refer to “6.8.1 Common torque control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

Refer to
For more information, refer to “6.9 Common motion function”.

Controlword (6040h) <Functions in tq mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms r	h	fr	oms r	r	r	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

Note

The tq mode does not use the oms bit.

Torque system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO	tq cst	Yes
		• Set a parameter value for giving slope to a torque command. • In the cyclic synchronous torque mode (cst), torque slope is effective only during the deceleration stop sequence. • When 0 has been set, the setting is regarded as 1 internally.							
6088h	00h	Torque profile type (Axis A)	-	-32768 to 32767	I16	rw	RxPDO	tq	Yes
		• Set the torque profile type used for changing the torque. 0: Linear slope 1: Not supported (sin2 slope)							

6.8.2.2 Related objects (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO
6073h	00h	Max current (Axis A)	0.1%	0 to 65535	U16	ro	No

Besides, there are related objects common to the torque control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO
606Ch	00h	Velocity actual value (Axis A)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6075h	00h	Motor rated current (Axis A)	mA	0 to 4294967295	U32	ro	No
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	No
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6078h	00h	Current actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6079h	00h	DC link circuit voltage (Axis A)	mV	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to “6.8.1 Common torque control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to “6.9 Common motion function”.

Statusword (6041h) <Functions in tq mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No
		• Displays the driver module state.							

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	r	r		target reached										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13,12,10 (operation mode specific)

bit	Name	Value	Definition	
10	target reached	0	halt=0 (during normal operation)	: 6074h (Torque demand (Axis A)) has not yet reached target torque.
			halt=1 (during stop by halt)	: During axis deceleration
		1	halt=0 (during normal operation)	: 6074h (Torque demand (Axis A)) has reached target torque.
			halt=1 (during stop by halt)	: Axis stop (Axis speed is 0.)
12	(reserved)	-	Not used	
13	(reserved)	-	Not used	

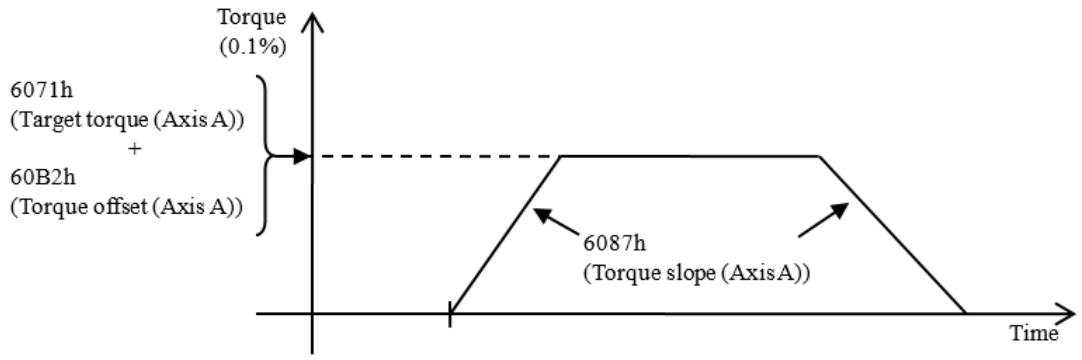
Torque system

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6073h	00h	Max current (Axis A)	0.1%	0 to 65535	U16	rw	No	tq	No
		• Displays the maximum current.							

6.8.2.3 Operations of tq mode

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

- Profile torque control mode generates a torque command value according to the following parameters.
  - Target torque (Axis A) (6071h)
  - Torque offset (Axis A) (60B2h)
  - Torque slope (Axis A) (6087h)
- Target torque is additional value of 6071h(Target torque (Axis A)) and 60B2h(Torque offset (Axis A)).
- For the operation command update (transmission), do input when approx. 100 ms has elapsed after the servo ON(Operation enabled command).
- As monitoring information, we provide 6077h (Torque actual value (Axis A)) etc.



◆ NOTE

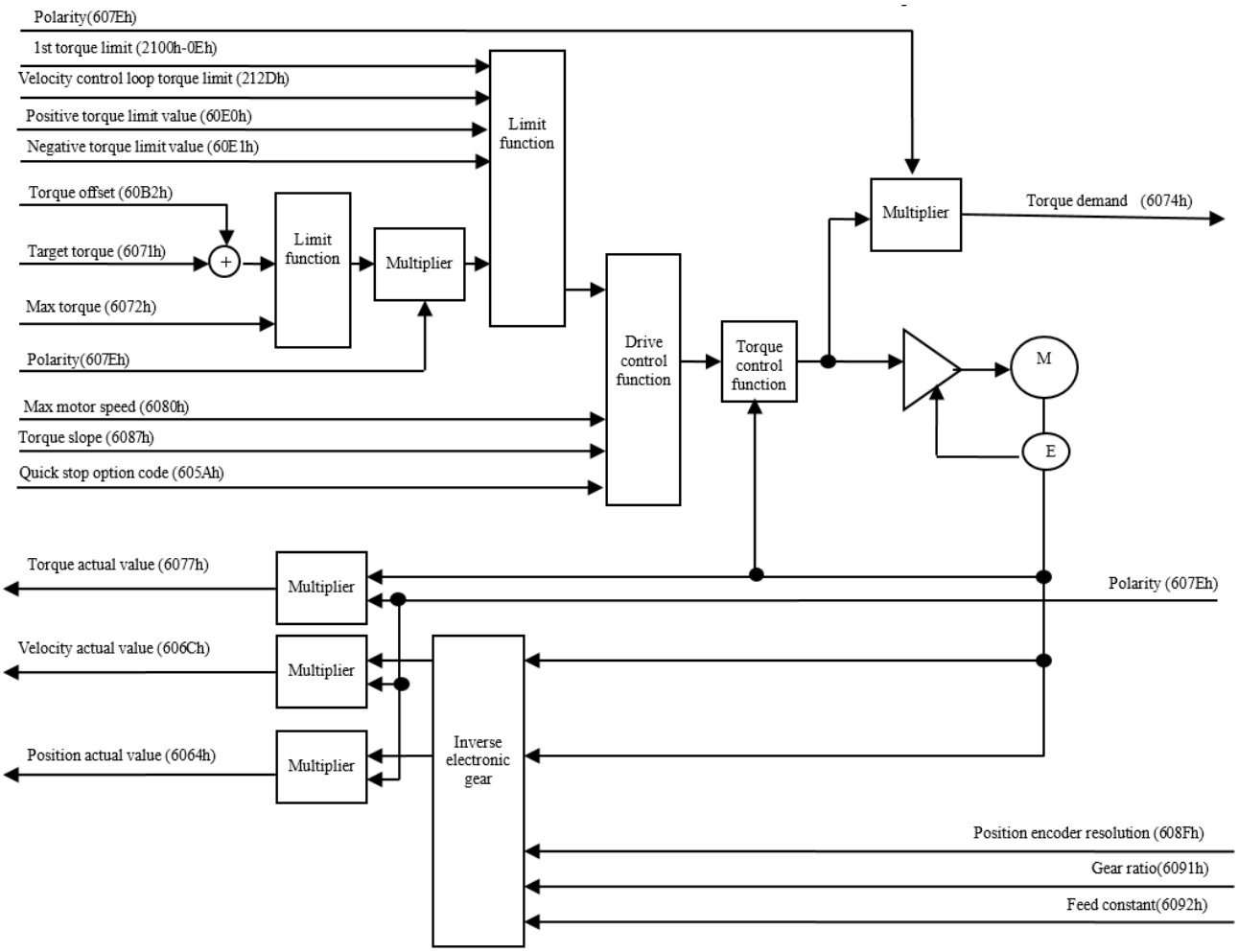
- **The sum of 6071h (Target torque (Axis A)) and 60B2h (Torque offset (Axis A)) is limited by the lowest value among 6072h (Max torque (Axis A)) and 2100h-0Eh (1st torque limit).**
- **The velocity is limited by 6080h (Max motor speed (Axis A)).**
- **Even if these setting values are changed during operation, they are not reflected during the operation.**

6.8.3 Cyclic Torque Mode (cst mode)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

It is a torque control mode to operate by creating a command torque in the host controller (master) and updating (transmitting) the command torque in an interpolation cycle.

Use it in the DC or SM2 synchronization mode.

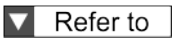


6.8.3.1 Objects related to cst mode (Command & setup)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No

Besides, there are related objects common to the torque control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
6071h	00h	Target torque (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
607Fh	00h	Max profile velocity (Axis A)	Command/s	0 to 4294967295	U32	rw	RxPDO
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Target slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO



For more information, refer to “6.8.1 Common torque control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No
607Bh	-	Position range limit (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No
6091h	-	Gear ratio (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
6092h	-	Feed constant (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Feed	Command	1 to 4294967295	U32	rw	No
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60C2h	-	Interpolation time period (Axis A)	-	-	-	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No
	01h	Interpolation time period value	-	0 to 255	U8	rw	No
	02h	Interpolation time index	-	-128 to 63	I8	rw	No
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO

For more information, refer to “6.9 Common motion function”.

Controlword (6040h) <Functions in cst mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No

• Set a command to a driver module including the PDS state transition.

Bit information details

15-10	9	8	7	6	5	4	3	2	1	0
r	oms r	h	fr	oms r	r	r	eo	qs	ev	so

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
h	halt
fr	fault reset
eo	enable operation
qs	quick stop
ev	enable voltage
so	switch on

Note

The cst mode does not use the oms bit.

Other

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
2107h-19h bit11	The condition that 6041h bit12 (drive follows command value) will be 0. 0 : Limiting torque and speed limit (only cst) is included. 1 : Limiting torque and speed limit (only cst) is not included.

6.8.3.2 Objects related to cst mode (Monitoring)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO

Besides, there are related objects common to the torque control.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO
6064h	00h	Position actual value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO
606Ch	00h	Velocity actual value (Axis A)	Command/s	-2147483648 to 2147483647	I32	ro	TxPDO
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6075h	00h	Motor rated current (Axis A)	mA	0 to 4294967295	U32	ro	No
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	No
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6078h	00h	Current actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO
6079h	00h	DC link circuit voltage (Axis A)	mV	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to “6.8.1 Common torque control function”.

There is a related object of common motion as well.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO

Refer to

For more information, refer to “6.9 Common motion function”.

Statusword (6041h) <Functions in cst mode>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No

Displays the driver module state.

Bit information details

15-14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
r	oms		ila	oms	rm	r	w	sod	qs	ve	f	oe	so	rtso
	r	drive follows command value		r										

Abbreviation	Description
r	reserved (not supported)
oms	operation mode specific (operation mode dependent bit)
ila	internal limit active
rm	remote
w	warning
sod	switch on disabled
qs	quick stop
ve	voltage enabled
f	fault
oe	operation enabled
so	switched on
rtso	ready to switch on

■ bit13,12,10 (operation mode specific)

bit	Name	Value	Definition
10	reserved	-	Not used
12	Drive follows command value	0	Operation is not performed according to the target torque. (Note 1)
		1	Operation is performed according to the target torque. (Note 1)
13	reserved	-	Not used

(Note 1) “Operation is performed according to the target torque” refers to cases where the following conditions are all satisfied:

- PDS state is Operation enabled
- While not in deceleration (Halt, POT/NOT, Quickstop, Shutdown, Disable operation and Fault)
- While not in Halt status
- POT not detected when a positive direction operation command is in process, or NOT not detected when a negative direction operation command is in process
- Torque limit has not occurred(Valid only when this condition 2107h-19h -bit11 is 0)
- Velocity limit has not occurred(Valid only when this condition 2107h-19h -bit11 is 0)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No	ALL	Yes

Bit No.	Description
2107h-19h bit11	The condition that 6041h bit12 (drive follows command value) will be 0. 0 : Limiting torque and speed limit (only cst) is included. 1 : Limiting torque and speed limit (only cst) is not included.

6.8.3.3 Operations of cst mode

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

- Motion profile (trajectory) generation is done by the master, not the slave in cyclic torque control mode.
- Target torque is additional value of 6071h(Target torque (Axis A)) and 60B2h(Torque offset (Axis A)).
- For the operation command update (transmission), do input when approx. 100 ms has elapsed after the servo ON(Operation enabled command).
- 60C2h (Interpolation time period (Axis A)) indicates the cycle to update the two object for 6071h (Target torque (Axis A)) and 60B2h (Torque offset (Axis A)).This value is set to the cycle which is the same as 1C32-02h(Cycle time).
- As monitoring information, we provide 6077h (Torque actual value (Axis A)) etc.

◆ NOTE

- **The sum of 6071h (Target torque (Axis A)) and 60B2h (Torque offset (Axis A)) is limited by the minimum value of either 6072h (Max torque (Axis A)) or 2100h-0Eh(1st torque limit).**
- **The velocity is limited by 6080h (Max motor speed (Axis A)).**

6.9 Common motion function

6.9.1 Touch probe function (Position latch request/release)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well. The external input terminal assignment is (SI5, SI6) for the A axis and (SI1, SI2) for the B axis.

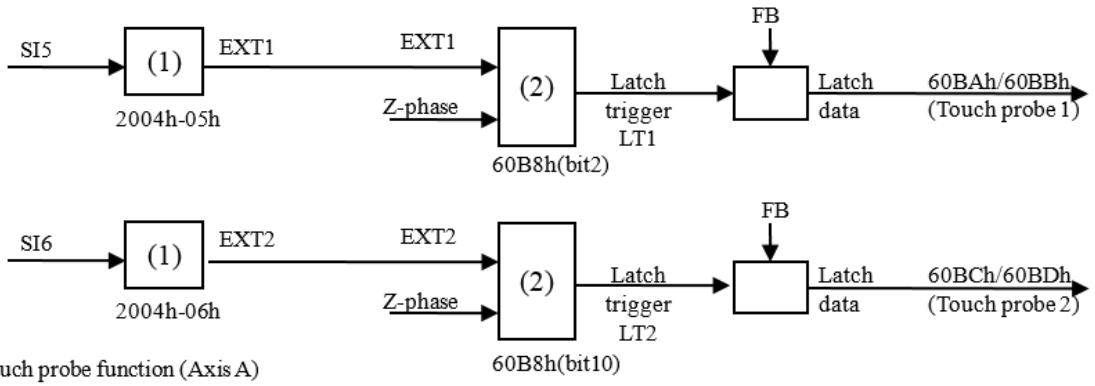
This function selects a latch trigger signal from external input (EXT1/EXT2) or Z-phase (one rotation data of rotary encoder is 0 position during semi-closed control, and Z-phase position of external incremental scale during full-closed control) and latches the feedback position.

- When using the external input (EXT1/EXT2) for the latch trigger signal, assign EXT1 to SI5, and EXT2 to SI6 for the Axis A, also EXT1 to SI1, and EXT2 to SI2 for the Axis B.

  When Homing operation is carried out without assigning, Err88.3 (Improper operation error protection) occurs.
- If the latch trigger signal is external input(EXT1/EXT2), the import difference occurs. Reduce the velocity around the latch trigger signal input as much as possible.
- Set the input ON width and OFF width of the latch trigger signal to 2 ms or more.
- If the Z-phase is selected by the trigger while using absolute scale during full-closed control, Err88.3 (Improper operation error protection) occurs.
- If the setting chooses the Z-phase selection at the trigger, please do not select edge falling. The operation can not be guaranteed if it set to the above setting.
- The touch probe function is disabled in the cases below: (The value of 60B9h is cleared to 0.)
  - The ESM state becomes Init
  - The mode changed into the hm mode
- Please do not set at the same time the rising and falling edges of the same TouchProbe.
  Behavior when set at the same time can not be guaranteed.
- Multi-turn clear, test run, frequency response analyzing, Z-phase search, fit gain, and pin assign setting from PANATERM for Multi may not be performed when TouchProbe is running. Behavior when one of these is performed cannot be guaranteed.
- TouchProbe can normally use up to 2ch at the same time, but only 1ch can be used when using vibration suppression control.
  If you are using vibration suppression control, do not set TouchProbe for the second channel.
  The behavior when operated with that setting cannot be guaranteed.

6.9.1.1 Configuration of touch probe function

For axis A



60B8h：Touch probe function (Axis A)
60BAh：Touch probe pos1 pos value (Axis A)
60BBh：Touch probe pos1 neg value (Axis A)
60BCh：Touch probe pos2 pos value (Axis A)
60BDh：Touch probe pos2 neg value (Axis A)

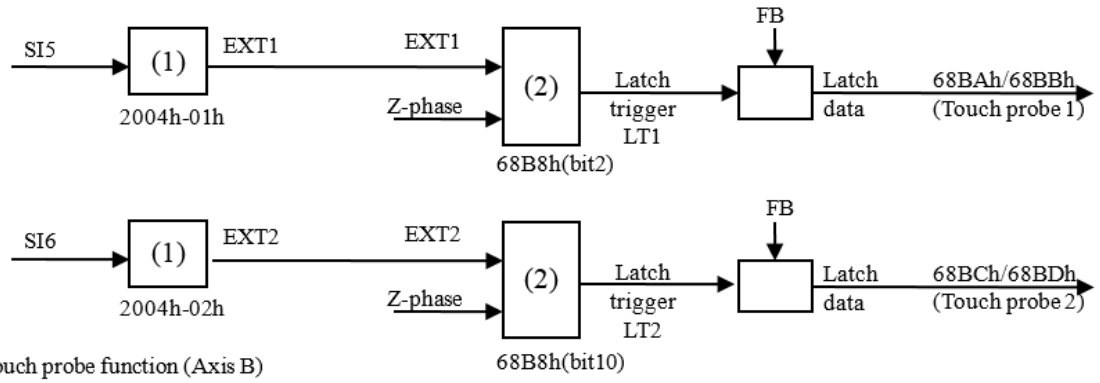
■ **Allocating general-purpose input**

Signal	Parameter	Allocation	Setup value
SI5	2004h-05h	Selects EXT1 a-contact	00202020h
		Selects EXT1 b-contact	00A0A0A0h
SI6	2004h-06h	Selects EXT2 a-contact	00212121h
		Selects EXT2 b-contact	00A1A1A1h

■ **60B8h (Touch probe function (Axis A))**

bit10	LT2	bit2	LT1
0	EXT2	0	EXT1
1	Z-phase	1	Z-phase

For axis B



68B8h：Touch probe function (Axis B)
68BAh：Touch probe pos1 pos value (Axis B)
68BBh：Touch probe pos1 neg value (Axis B)
68BCh：Touch probe pos2 pos value (Axis B)
68BDh：Touch probe pos2 neg value (Axis B)

■ Allocating general-purpose input

Signal	Parameter	Allocation	Setup value
SI5	2004h-05h	Selects EXT1 a-contact	20202020h
		Selects EXT1 b-contact	20A0A0A0h
SI6	2004h-06h	Selects EXT2 a-contact	20212121h
		Selects EXT2 b-contact	20A1A1A1h

■ 68B8h (Touch probe function (Axis B))

bit10	LT2	bit2	LT1
0	EXT2	0	EXT1
1	Z-phase	1	Z-phase

6.9.1.2 Touch probe relevant object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO

6.9.1.3 Touch probe function (60B8h)

The basic object used for starting touch probe operation and configuring various setting.

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No
		• Set the Touch probe function.							

■ **Bit description**

bit	value	Note	
0	0	Switch off touch probe 1	Touch Probe 1 Start/stop
	1	Enable touch probe 1	
1	0	Trigger first event	Touch Probe 1 Select event mode
	1	Continuous	
2	0	Trigger with touch probe 1 input	Touch Probe 1 Select trigger (external input/Z-phase)
	1	Trigger with 0 impulse signal of position encoder	
3	-	Reserved	Not used
4	0	Switch off sampling at positive edge of touch probe 1	Touch Probe 1 (Note 1) (Note 3 Select rising edge
	1	Enable sampling at positive edge of touch probe 1	
5	0	Switch off sampling at negative edge of touch probe 1	Touch Probe 1 (Note 1) (Note 2) (Note 3) Select falling edge
	1	Enable sampling at negative edge of touch probe 1	
6 to 7	-	Not Supported	Not used

bit	value	Note	
8	0	Switch off touch probe 2	Touch Probe 2 Start/stop
	1	Enable touch probe 2	
9	0	Trigger first event	Touch Probe 2 Select event mode (single/continuous)
	1	Continuous	
10	0	Trigger with touch probe 2 input	Touch Probe 2 Select trigger (external input/Z-phase)
	1	Trigger with 0 impulse signal of position encoder	
11	-	Reserved	Not used
12	0	Switch off sampling at positive edge of touch probe 2	Touch Probe 2 (Note 1) (Note 3) Select rising edge
	1	Enable sampling at positive edge of touch probe 2	
13	0	Switch off sampling at negative edge of touch probe 2	Touch Probe 2 (Note 1) (Note 2) (Note 3) Select falling edge
	1	Enable sampling at negative edge of touch probe 2	
14 to 15	-	Not Supported	Not used

(Note 1) Please do not set at the same time the rising and falling edges of the same TouchProbe. Behavior when set at the same time can not be guaranteed.

(Note 2) When choose the Z-phase selection at the trigger, please do not select edge falling. The action at the time of performing the above-mentioned setup cannot be guaranteed.

(Note 3) Indicates that the logical state changes from OFF to ON and the rising edge of the signal of interest. Also, indicate the timing of changes from ON to OFF logic state of the signal of interest is falling edge.

6.9.1.4 Touch probe status (60B9h)

Displays the state of the touch probe operation.

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No
		• Displays the state of the Touch probe function.							

■ **Bit description**

bit	value	Note	
0	0	Touch probe 1 is switch off	Touch probe 1 operation stop
	1	Touch probe 1 is enabled	Touch probe 1 is in operation
1	0	Touch probe 1 no positive edge value stored	Rising edge Touch probe 1 is incomplete status
	1	Touch probe 1 positive edge value stored	Rising edge Touch probe 1 is completion status
2	0	Touch probe 1 no negative edge value stored	Falling edge Touch probe 1 is incomplete status
	1	Touch probe 1 negative edge value stored	Falling edge Touch probe 1 is completion status
3 to 5	-	Reserved	Not used
6 to 7	-	Not Supported	Not used

bit	value	Note	
8	0	Touch probe 2 is switch off	Touch probe 2 operation stop
	1	Touch probe 2 is enabled	Touch probe 2 is in operation
9	0	Touch probe 2 no positive edge value stored	Rising edge Touch probe 2 is incomplete status
	1	Touch probe 2 positive edge value stored	Rising edge Touch probe 2 is completion status
10	0	Touch probe 2 no negative edge value stored	Falling edge Touch probe 2 is incomplete status
	1	Touch probe 2 negative edge value stored	Falling edge Touch probe 2 is completion status
11 to 13	-	Reserved	Not used
14 to 15	-	Not Supported	Not used

6.9.1.5 Touch probe position 1/2 positive value (60BAh - 60BDh)

Displays the latch position imported.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60BAh	00h	Touch probe pos1 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the position latched at the rising edge of Touch probe 1.							
60BBh	00h	Touch probe pos1 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the position latched at the falling edge of Touch probe 1.							
60BCh	00h	Touch probe pos2 pos value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the position latched at the rising edge of Touch probe 2.							
60BDh	00h	Touch probe pos2 neg value (Axis A)	Command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Displays the position latched at the falling edge of Touch probe 2.							

6.9.1.6 Starting touch probe operation

When the bit0/bit8 (Touch probe start/stop) of 60B8h (Touch probe function (Axis A)) is changed from 0 (Stop) to 1 (Start), imports various setting conditions (60B8h: bits 1 - 7/bits 9 - 15) and starts the Touch probe operation.

To enable the change of various setting conditions, put back the bit0/bit8 to 0 (Stop) once and then set the bit0/bit8 to 1 (Start) again.

6.9.1.7 Event mode of touch probe

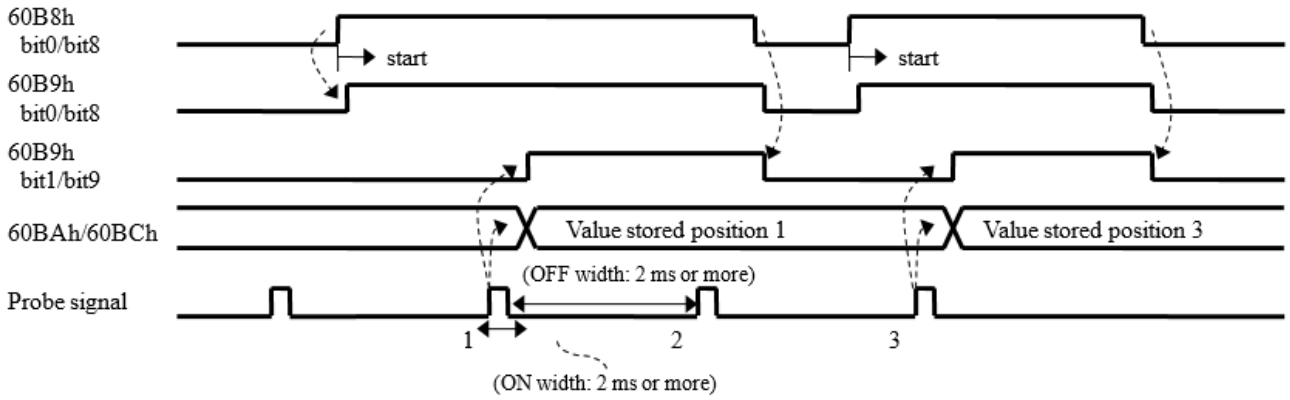
The bit1/bit9 (Select event mode) of 60B8h (Touch probe function (Axis A)) enable to select 0 (Trigger first event) or 1 (Continuous) mode.

Trigger first event mode (60B8h: bit 1 = 0/bit9 = 0)

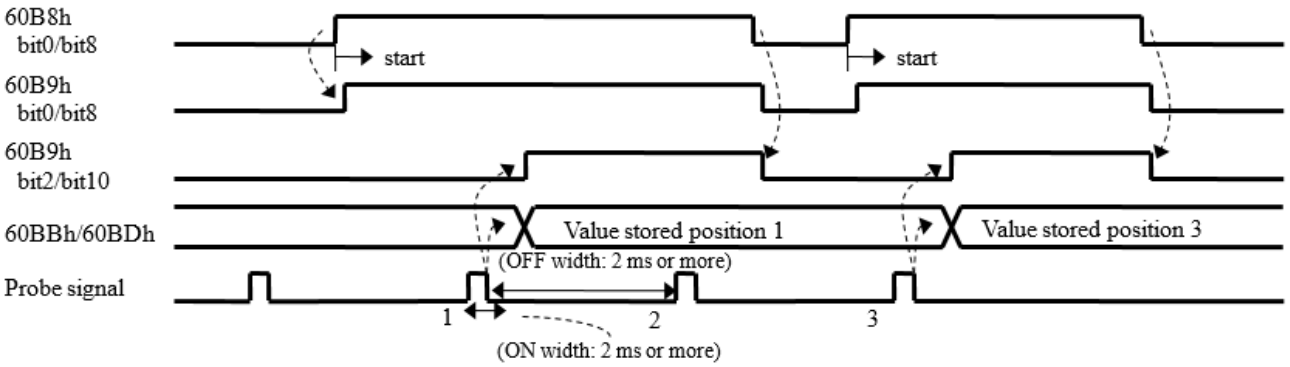
After the startup, this mode is latched only by the first trigger signal.

To import the signal again, restart the touch probe function.

■ **Positive edge**



■ **Negative edge**

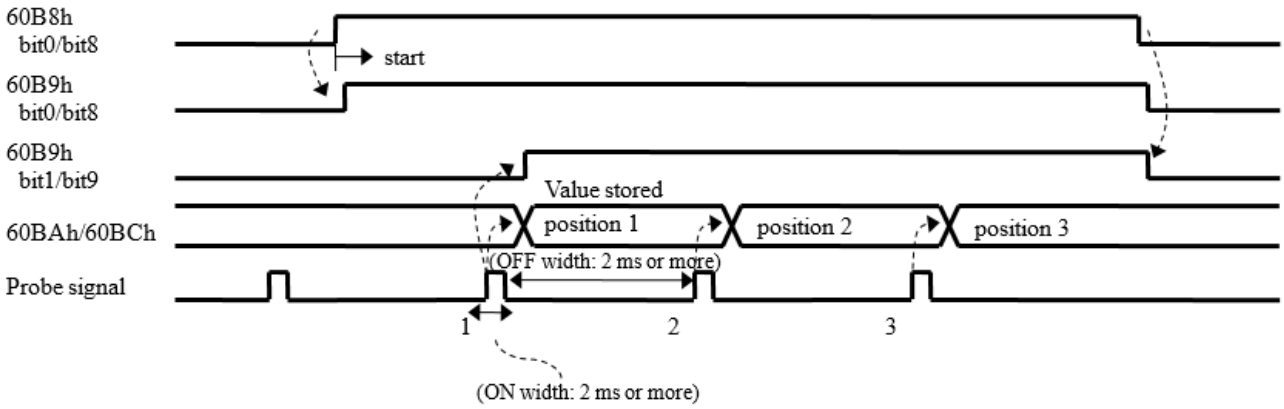


Continuous mode (60B8h: bit1 = 1/bit9 = 1)

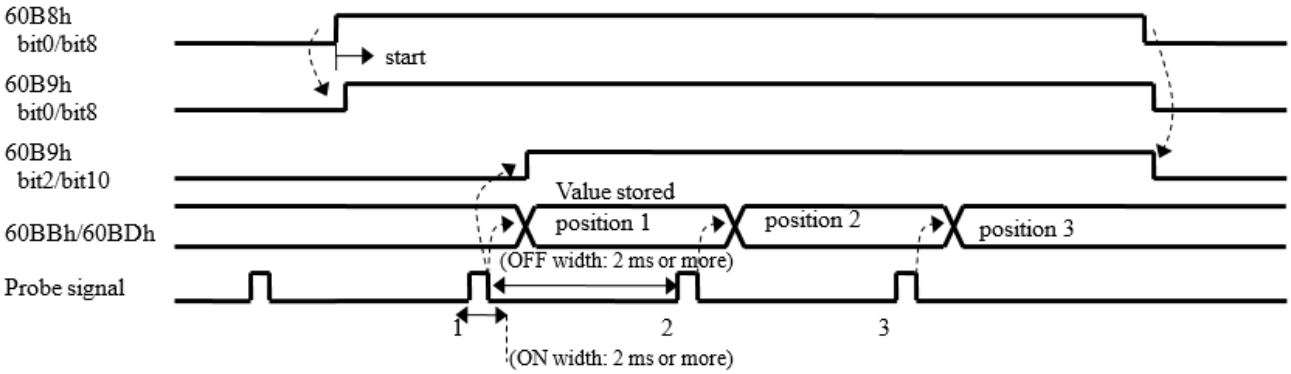
After the startup, this mode is latched each time the trigger signal is detected.

A stored value is retained until the next probe signal.

■ **Positive edge**



■ **Negative edge**



Note

The shortest sampling cycle by the latch trigger signal becomes 4 ms.

6.9.1.8 The correction function for detection delay of latch position

Set the correction time for delay of the latch trigger signal detection.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	0Ah	Correction time of latch delay 1	25ns	-2000 to 2000	I16	rw	No	ALL	Yes
2107h	19h	Communication function extended setup 3	Command	-32768 to 32767	I16	rw	No	ALL	Yes
2107h	5Dh	Correction time of latch delay 2	25ns	-2000 to 2000	I16	rw	No	ALL	Yes

0Ah

• Set the correction time for delay of the latch trigger signal detection.

This parameter can be switched by 2107h-19h (Communication function extended setup 3) bit5.

Bit No.	Description
bit5	0: The correction time is reflected in both the latch signal rising edge detection and the latch signal falling edge detection. 1: The correction time is reflected in the latch signal rising edge detection.

Note

Signal state of edge detection means the following

The rising edge detection means the photocoupler is turned ON.

The falling edge detection means the photocoupler is turned OFF.

19h

• bit 5: The correction function for detection delay of latch position.

Bit No.	Description
bit5	0: The correction time of both the latch signal rising edge detection and the latch signal falling edge detection is set by 2107h-0Ah(Correction time of latch delay 1) 1: The correction time of the latch signal rising edge detection is set by 2107h-0Ah(Correction time of latch delay 1), the correction time of the latch signal falling edge detection is set by 2107h-5Dh(Correction time of latch delay 2).

5Dh

• Set the correction time for delay of the latch trigger signal detection.

This parameter can be switched by 2107h-19h (Communication function extended setup 3) bit5.

Bit No.	Description
2107h-19h bit5	0: Invalid bit5 is 1: The correction time is reflected in the latch signal falling edge detection.

Note

Signal state of edge detection means the following

The rising edge detection means the photocoupler is turned ON.

The falling edge detection means the photocoupler is turned OFF.

◆ NOTE

- **Delay time of the latch trigger signal detection is different by the operating environment and aging. In the case of requesting accuracy, please set the correction time of latch delay as necessary.**

6.9.2 Option Code (Deceleration stop sequence)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Sets how to decelerate and stop the motor if main power is shut down or an alarm occurs while PDS is Operation enabled state (servo-on state).

Combine the deceleration function (option code) defined by CoE (CiA402) and the deceleration function on the servo (MINAS-A6) side (dynamic brake stop, free-run stop, emergency stop).

■ **PDS option code list**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No

■ **Related option code list**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv hm ip csp csv	Yes
		• Set the profile deceleration. • If it is set to 0, internal processing is treated as 1.							
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp ip pv hm csp csv	Yes
		• If 605Ah (Quick stop option code (Axis A)) is “2” or “6”, is set to value of deceleration parameter to be used deceleration stopping at the time of Quick stop or disable voltage. • It is used when 605Dh (Halt option code (Axis A)) and 605Eh (Fault reaction option code (Axis A)) is “2”. • If it is set to 0, internal processing is treated as 1.							
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO	tq cst	Yes
		• Set a parameter value for giving slope to a torque command. • In the cyclic synchronous torque mode (cst), torque slope is effective only during the deceleration stop sequence. • When 0 has been set, the setting is regarded as 1 internally.							
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	hm	Yes
		• Set the acceleration and deceleration during the Homing mode (hm). • The deceleration of homing operation is common in this object. • At the final stop of each Homing method (when the homing position is detected), the servo lock is carried out for the stopping, instead of using the preset value of this object. • If it is set to 0, internal processing is treated as 1.							
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes
		• Set the maximum deceleration. • If it is set to 0, internal processing is treated as 1.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2105h	07h	Sequence at Servo-Off	-	0 to 9	I16	rw	No	ALL	Yes
		• Set the state after stop and during deceleration in the following cases: - when 605Ah (Quick stop option code (Axis A)) is "0" and Quick stop is accepted; - when 605Bh (Shutdown option code (Axis A)) is "0" and Shutdown or Disable voltage is accepted; - when 605Ch (Disable operation option code (Axis A)) is "0" and Disable operation is accepted; - when 6007h (Abort connection option code (Axis A)) is "2", 605Bh is “0”, and main power is shut off; or - when 6007h (Abort connection option code (Axis A)) is "3", 605Ah is “0”, and main power is shut off. ▼ Refer to For more information, refer to "Specification for basic functions (SX-DSV03455)".							
2105h	0Bh	Sequence at alarm	-	0 to 7	I16	rw	No	ALL	Yes
		• Set to state after the stop during deceleration at the time of alarm occurrence except Err80.0-80.7, Err81.0-81.7, Err85.0-85.7 and Err88.0-88.7. ▼ Refer to For more information, refer to "Specification for basic functions (SX-DSV03455)".							

If other deceleration factors (such as an alarm) occur during deceleration, the deceleration is performed according to the following priority.

Basically, the deceleration function on the servo (MINAS-A6) side has a higher priority.

High priority

- Servo (MINAS-A6) side deceleration (When alarm)
- STO deceleration (Note 4)
- Servo (MINAS-A6) side deceleration (When servo off, When the main power is off)
- Servo (MINAS-A6) side deceleration (When drive is inhibited)
- Fault deceleration
- Retracting operation (Note 5)
- Other CoE (CiA402) side deceleration (Note 1) (Note 3)
- Limit system deceleration (Note 2)
- Halt deceleration
- Normal deceleration

Low priority

If a deceleration factor with a higher priority occurs, the process is switched to that deceleration process even if a preceding deceleration operation is in process. (Note 3)

If a deceleration factor of the lower level of priority occurs, the deceleration operation accepted first will be retained.

Example)

When an alarm occurs during deceleration by 605Ah (Quick stop option code (Axis A)), the deceleration process switches to that of 605Eh (Fault reaction option code) (Axis A).

(Note 1) It refers to deceleration by Quick stop, Shutdown, and Disable operation.

(Note 2) It refers to deceleration by inputting of over-travel inhibition (POT, NOT) and Software limit.

(Note 3) If 0(servo side deceleration) is selected with the option code of the another CoE side deceleration, Priority is the same as servo side deceleration(When servo off). However, even in this case,if another factor of deceleration of the CoE side occurs during Fault deceleration, the servo side deceleration is not enabled and the fault deceleration is continued.

(Note 4) STO deceleration is the deceleration by STO function and it decelerates with the setting of 2105h-0Bh.
See Overview of "Technical Reference, Basic Function Specifications (SX-DSV03455)".

(Note 5) During the retracting operation, the PDS state becomes "Fault reaction active" and the PDS state transition by the user command can not be performed. Therefore, even if “Servo (MINAS - A 6) side deceleration (When servo OFF)” occurs, the retracting operation is continued regardless of the priority.
In this software version,The retracting operation is not supported.

6.9.2.1 Abort connection option code (6007h)

Sets how to decelerate and stop the motor when main power off.

The operation sequence of main power-off state changes by combination of 6007h (Abort connection option code (Axis A)), 2105h-09h (L/V trip selection upon main power off), PSM Pr.02(Detection time of main power off) etc.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No	ALL	Yes
		• When physical main power supply interception occurs, the sequence of deceleration stop to be executed between the Up to the power supply interception detection time set up at PSM Pr.02(Detection time of main power off) from after power supply interception 70ms is set up. In the case of PSM Pr.02 =2000, only the sequence of deceleration stop set up by this object is performed. It is prohibition of a setup except the following value. 0: No action 1: Fault signal (Deceleration according to 605Eh(Fault reaction option code (Axis A))) 2: Disable voltage command (Deceleration according to 605Bh(Shutdown option code (Axis A))) 3: Quick stop command (Deceleration according to 605Ah(Quick stop option code (Axis A)))							
2105h	08h	Sequence upon main power off	-	0 to 9	I16	rw	No	ALL	Yes
		• Set the deceleration mode on the servo (MINAS-A6) side (sequence when main power is off). Set status during deceleration and status after stop when bit0 of 2105h-09h (L/V trip selection upon main power off) is set to "0" and a value other than "2000" is set for PSM Pr.02(Detection time of main power off) with main power off. ▼ Refer to For more information, refer to "Specification for basic functions (SX-DSV03455)".							
2105h	09h	L/V trip selection upon main power off	-	0 to 3	I16	rw	No	ALL	Yes
		• Select to perform servo off or LV trip at time of main power alarm.							

Bit No.	Description
0	0: perform servo off according to setting of 6007h (Abort connection option code (Axis A)) or 2105h-08h (Sequence upon main power off). 1: Detected Err13.1 ”Main power supply undervoltage protection ”
1	0:The main power off warning only detected servo state 1:The main power off warning always detected

2005h	0Ah	Detection time of main power off	1 ms	20 to 2000	I16	rw	No	ALL	Yes
		• Set the starting time of deceleration by 2105h-08h (Sequence upon main power off). The deceleration by 2105h-08h (Sequence upon main power off) is disabled when this parameter is set 2000. ▶ Note Even if 2000 is set, the deceleration process on the CoE (CiA402) side will not be disabled.) The setting resolution is 2 ms. For example, if the set value = 99, it will be processed in 100 ms.							

There is a related object also to others.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6085h	00h	Quick stop deceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
2105h	07h	Sequence at Servo-Off	—	0 to 9	I16	rw	No
2105h	0Bh	Sequence at alarm	—	0 to 7	I16	rw	No

▼ Refer to

For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

The following table shows the operation sequence for each combination of objects.

Basically, the deceleration function defined in CoE (CiA402) is effective until the deceleration function on the servo (MINAS-A6) side is activated by detection of the insulation of the main power AC (between L1 and L3).

- When “No action” is set by 6007h = 0, the CoE(CiA402) deceleration function does not operate, and the deceleration function on the servo (MINAS-A6) side operates.
- When the voltage between P and N decreases, Err13.0 (Main power undervoltage protection (PN)) occurs with the highest priority, causing the operation in accordance with 2105h-0Bh(Sequence at alarm).

Refer to

Refer to "Functional Specification of the Technical document (SX-DSV03455)" as well.

In case of PSM Pr.02 = 2000 (When detection of the insulation of the main power AC is invalid)

State	Setting value of 6007h	Setting value of target option code	Deceleration method
At the time of under voltage between P and N	-	-	Decelerate according to 2105h-0Bh after Err13.0 occurrence
At the time of insulating main power AC (between L1-L3)	0 (No action)	-	Hold the operation state
	1 (Fault signal)	605Eh=0	Decelerate according to 2105h-0Bh after Err88.0 occurrence
		Except 605Eh=0	Err88.0 occurrence after deceleration according to 605Eh
	2 (Disable voltage command)	605Bh=0	Decelerate according to 2105h-07h
		Except 605Bh=0	Decelerate according to 605Bh
	3 (Quick stop command)	605Ah=0	Decelerate according to 2105h-07h
		Except 605Ah=0	Decelerate according to 605Ah

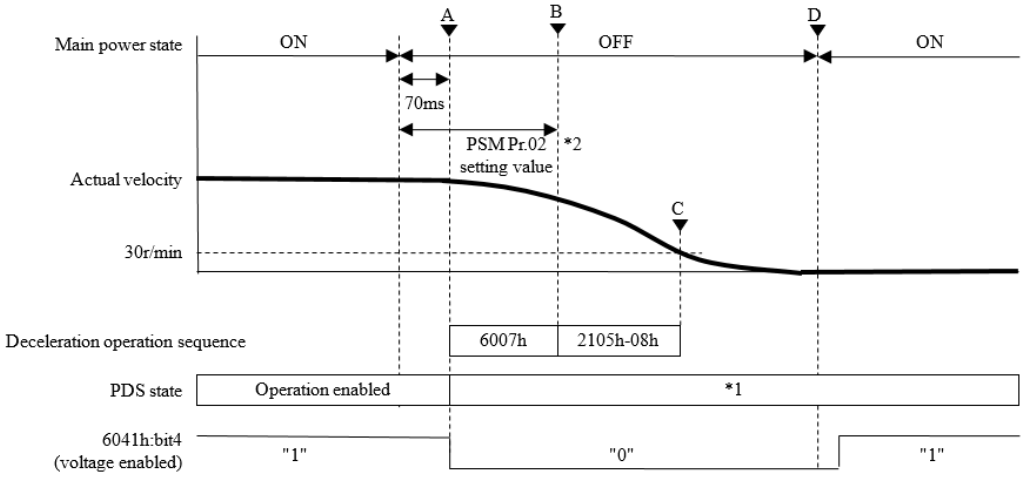
In case of PSM Pr.02 ≠ 2000 (When detection of the insulation of the main power AC is valid)

State	Setting value of 6007h	Setting value of target option code	Deceleration method			
			Before elapse of time set in PSM Pr.02	→	After elapse of time set in PSM Pr.02 (Note 1) 2105h-09h (bit0)	
At the time of undervoltage between P and N	-	-	Decelerate according to 2105h-0Bh after Err13.0 occurrence			
At the time of insulating main power AC (between L1-L3)	0 (No action)	-	Hold the operation state	→	0	Decelerate according to 2105h-08h
					1	Decelerate according to 2105h-0Bh after Err13.1 occurrence
	1 (Fault signal)	605Eh=0	Decelerate according to 2105h-0Bh after Err88.0 occurrence			
		Except 605Eh=0	Err88.0 occurrence after deceleration according to 605Eh	→	0	Decelerate according to 2105h-08h Err88.0 occurrence after deceleration
					1	Decelerate according to 2105h-0Bh after Err13.1 occurrence (Err88.0 occurrence after deceleration)
	2 (Disable voltage command)	605Bh=0	Decelerate according to 2105h-07h	→	0	Decelerate according to 2105h-08h
					1	Decelerate according to 2105h-08h
		Except 605Bh=0	Decelerate according to 605Bh	→	0	Decelerate according to 2105h-08h
					1	Decelerate according to 2105h-0Bh after Err13.1 occurrence
	3 (Quick stop command)	605Ah=0	Decelerate according to 2105h-07h	→	0	Decelerate according to 2105h-08h
					1	Decelerate according to 2105h-08h
		Except 605Ah=0	Decelerate according to 605Ah	→	0	Decelerate according to 2105h-08h
					1	Decelerate according to 2105h-0Bh after Err13.1 occurrence

(Note 1) Deceleration is not executed if the actual speed has reached 30 r/min or below before the time set for PSM Pr.02 elapses.

■ Example of the deceleration and stop due to main power shut-down

A	The deceleration by 6007h is started 70ms after main power OFF.
B	If the time set up at PSM Pr.02 after the main power supply OFF passes, it will change to deceleration by 2105h-08h.
C	After detecting actual velocity 30 r/min or less, the motor stops.
D	If the main power is turned ON, 6041h: bit4 (Status word (Axis A): voltage enabled) changes to 1



*1: The PDS state under slowdown and after a stop changes with this object and preset values 2105h-09h(bit0) and PSM Pr.02. Refer to the following page table.

*2: If actual velocity becomes 30 or less r/min when PSM Pr.02 = 2000(detection of main power AC insulation invalid) and before the time set up at PSM Pr.02 passed, deceleration and stop processing by 2105h-08h is not carried out.

*3: If main power off is detected in the sequence at servo-off, after decelerated stop according to the sequence at servo-off, the state transitions to the operation after stop according to the sequence at main power off.

PDS state during deceleration and stop

■ Before the time progress set up at PSM Pr.02, or PSM Pr.02 = 2000(detection of main power AC insulation invalid)

6007h's Value (Note 1)	PDS state during deceleration	PDS state after stop (about 30 r/min or less)
0	Hold the current state	When PDS state is Operation enabled at the time of main power-off: Operation enabled
		When PDS state is Quick stop active at the time of main power-off: Switch on disabled
1	Fault reaction active	Fault
2	Hold the current state	Switch on disabled
3	Quick stop Active	Switch on disabled

(Note 1) It is not dependent on the preset value of 2105h-09h(bit0).

■ After the time progress set up at PSM Pr.02

6007h's Value	Target Option code value	2105h-09h's (bit 0) Value	PDS state during deceleration	PDS state after stop (approx. 30 r/min or less)
0	-	0	Current state is maintained.	When PDS state is Operation enabled at the time of main power-off: Ready to switch on
				When PDS state is Quick stop active at the time of main power-off: Switch on disabled
		1	Fault reaction active	Fault
1	-	-	Fault reaction active	Fault
2	605Bh=0	-	Current state is maintained.	Switch on disabled
	Other than 605Bh=0	0	Current state is maintained.	Switch on disabled
		1	Fault reaction active	Fault
3	605Ah=0	-	Quick stop active	Switch on disabled
	Other than 605Ah=0	0	Quick stop active	Switch on disabled
		1	Fault reaction active	Fault

6.9.2.2 Quick stop option code (605Ah)

Sets how to decelerate and stop the motor when the PDS command "Quick Stop" is accepted.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No	ALL	Yes

• Set the sequence during "Quick Stop" or "Disable voltage". The definition can differ according to the operation mode. Other than the values below are disabled.

pp, csp, ip, csv, pv

Value	Description
-1	For manufacturer's use
-2	
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), moves to Switch on disabled.
1	After the motor stops due to 6084h (Profile deceleration (Axis A)), moves to Switch on disabled.
2	After the motor stops due to 6085h (Quick stop deceleration (Axis A)), moves to Switch on disabled.
3	After the motor stops due to 60C6h(Max deceleration (Axis A)), moves to Switch on disabled.
5	After the motor stops due to 6084h (Profile deceleration (Axis A)), moves to Quick stop active. (Note 1)
6	After the motor stops due to 6085h (Quick stop deceleration (Axis A)), moves to Quick stop active. (Note 1)
7	After the motor stops due to 60C6h(Max deceleration (Axis A)), moves to Quick stop active. (Note 1)

hm

Value	Description
-1	For manufacturer's use
-2	
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), moves to Switch on disabled.
1	After the motor stops due to 609Ah (Homing acceleration (Axis A)), moves to Switch on disabled.
2	After the motor stops due to 6085h(Quick stop deceleration (Axis A)), moves to Switch on disabled.
3	After the motor stops due to 60C6h(Max deceleration (Axis A)), moves to Switch on disabled.
5	After the motor stops due to 609Ah (Homing acceleration (Axis A)), moves to Quick stop active. (Note 1)
6	After the motor stops due to 6085h(Quick stop deceleration (Axis A)), moves to Quick stop active. (Note 1)
7	After the motor stops due to 60C6h(Max deceleration (Axis A)), moves to Quick stop active. (Note 1)

cst, tq

Value	Description
-1	For manufacturer's use
-2	
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), moves to Switch on disabled.
1	After the motor stops due to 6087h (Torque slope (Axis A)), moves to Switch on disabled.
2	
3	After the motor stops due to 0 torque, moves to Switch on disabled.
5	After the motor stops due to 6087h (Torque slope (Axis A)), moves to Quick stop active. (Note 1)
6	
7	After the motor stops due to 0 torque, moves to Quick stop active. (Note 1)

(Note 1) Status is changed to Switch on disabled if main power is shut off at 6007h=3.

There is a related object also to others.

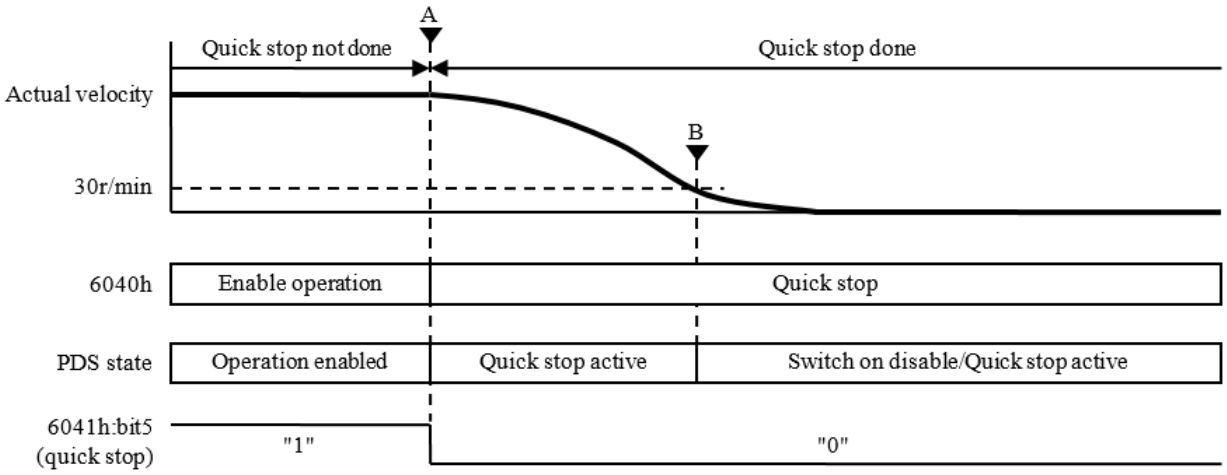
Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6085h	00h	Quick stop deceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
60C6h	00h	Max deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
2105h	07h	Sequence at Servo-Off	-	0 to 9	I16	rw	No

Refer to

For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

■ Example of deceleration and stop due to Quick Stop

A	When 6040h: bit 2 (Control word: quick stop) changes from 1 to 0, the deceleration start. The PDS state during the deceleration is Quick stop active.
B	After detecting actual velocity 30 r/min or less, the motor stops. The PDS state after the stop is Switch on disable or Quick stop active.



6.9.2.3 Shutdown option code (605Bh)

Sets how to decelerate and stop the motor when the PDS command "Shutdown" or "Disable voltage" is accepted.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No	ALL	Yes

• Set the sequence when the PDS command "Shutdown" is accepted. The definition can differ according to the operation mode. Other than the values below are disabled.

(1) The PDS command "Shutdown" is accepted

pp, csp, ip, csv, pv

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), changes to Ready to switch on.
1	After the motor stops due to 6084h (Profile deceleration (Axis A)), changes to Ready to switch on.

hm

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), changes to Ready to switch on.
1	After the motor stops due to 609Ah (Homing acceleration (Axis A)), changes to Ready to switch on.

cst, tq

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), changes to Ready to switch on.
1	After the motor stops due to 6087h (Torque slope (Axis A)), changes to Ready to switch on.

(2) The PDS command "Disable voltage" is accepted.

pp, csp, ip, csv, pv

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), changes Switch on disabled.
1	After the motor stops due to 6084h(Profile deceleration (Axis A)), changes Switch on disabled.

hm

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), changes Switch on disabled.
1	After the motor stops due to 609Ah(Homing acceleration (Axis A)), changes Switch on disabled.

cst, tq

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), changes Switch on disabled.
1	After the motor stops due to 6087h(Torque slope (Axis A)), changes Switch on disabled.

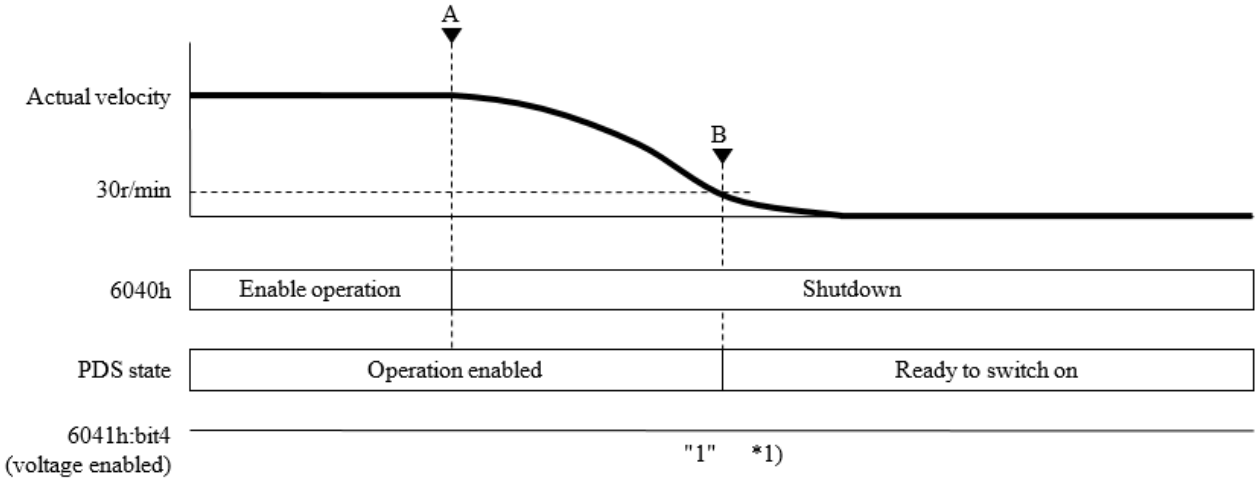
There is a related object also to others.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
2105h	07h	Sequence at Servo-Off	-	0 to 9	I16	rw	No

Refer to
For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

■ Example of deceleration and stop due to Shutdown command

A	When the PDS command "Shutdown" is accepted, the deceleration start. The PDS state keeps Operation enabled during the deceleration.
B	After detecting actual velocity 30 r/min or less, the motor stops. The PDS state will be Ready to switch on after the stop.



*1) 6041h: bit 4 (Status word (Axis A): voltage enabled) remains 1.

6.9.2.4 Disable operation option code (605Ch)

Sets how to decelerate and stop the motor when the PDS command "Disable operation" is accepted.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No	ALL	Yes

• Set the sequence during Disable Operation. The definition can differ according to the operation mode. Other than the values below are disabled.

pp, csp, ip, csv, pv

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), moves to Switched on.
1	After the motor stops due to 6084h (Profile deceleration (Axis A)), moves to Switched on.

hm

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), moves to Switched on.
1	After the motor stops due to 609Ah (Homing acceleration (Axis A)), moves to Switched on.

cst, tq

Value	Description
0	After the motor stops due to 2105h-07h (Sequence at Servo-Off), moves to Switched on.
1	After the motor stops due to 6087h (Torque slope (Axis A)), moves to Switched on.

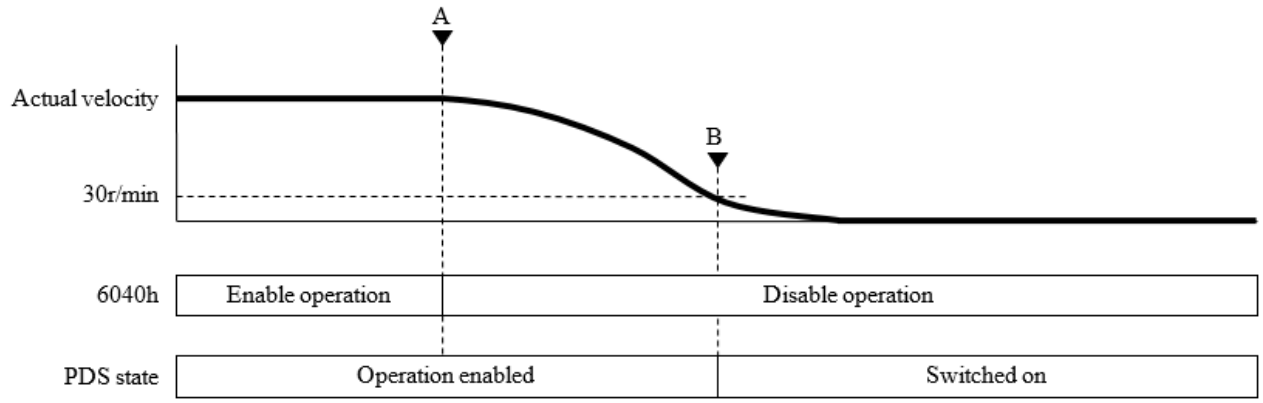
There is a related object also to others.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
2105h	07h	Sequence at Servo-Off	-	0 to 9	I16	rw	No

Refer to
For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

■ Example of deceleration and stop due to servo-off

A	If the servo amplifier accepts to PDS command “Disable operation”, the deceleration start. The PDS state keeps Operation enabled during the deceleration.
B	After detecting actual velocity 30 r/min or less, the motor stops. The PDS state will be Switched on after the stop.



6.9.2.5 Halt option code (605Dh)

Sets how to decelerate and stop the motor when the halt bit of 6040h (Control word (Axis A)) is set to 1.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No	ALL	Yes

• Set how to stop the motor during the Halt operation. The definition can differ according to the operation mode. Other than the values below are disabled.

pp, csp, ip, csv, pv

Value	Description
1	After the motor stops due to 6084h (Profile deceleration (Axis A)), keeps Operation enabled.
2	After the motor stops due to 6085h (Quick stop deceleration (Axis A)), keeps Operation enabled.
3	After the motor stops due to 6072h (Max torque (Axis A)),60C6h (Max deceleration (Axis A)), keeps Operation enabled.

hm

Value	Description
1	After the motor stops due to 609Ah (Homing acceleration (Axis A)), keeps Operation enabled.
2	After the motor stops due to 6085h (Quick stop deceleration (Axis A)), keeps Operation enabled.
3	After the motor stops due to 6072h (Max torque (Axis A)),60C6h (Max deceleration (Axis A)), keeps Operation enabled.

cst, tq

Value	Description
1	After the motor stops due to 6087h (Torque slope (Axis A)), keeps Operation enabled.
2	
3	After the motor stops due to the 0 torque, keeps Operation enabled.

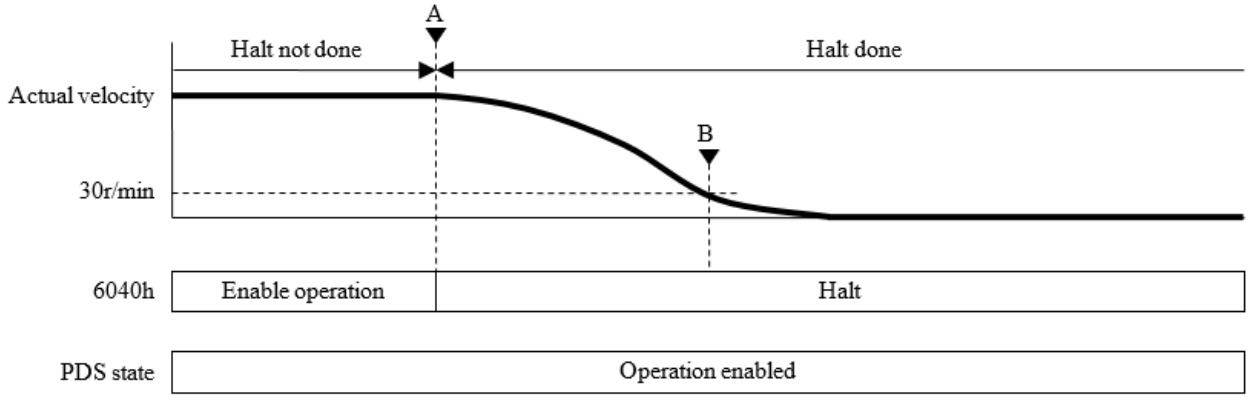
There is a related object also to others.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO

Refer to
For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

■ Example of deceleration and stop due to the Halt function

A	When 6040h: bit 8 (Control word (Axis A): halt) changes from 0 to 1, the deceleration start. The PDS state keeps Operation enabled during the deceleration.
B	After detecting actual velocity 30 r/min or less, the motor stops. The PDS state keeps Operation enabled after the stop.



6.9.2.6 Fault reaction option code (605Eh)

Sets how to decelerate the motor when an alarm occurs.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
605Eh	00h	Fault reaction option code	-	0 to 2	I16	rw	No	ALL	Yes

• Set the sequence during the Fault reaction. The definition can differ according to the operation mode. Other than the values below are disabled.

(1) On occurrence of Err80.0 to 80.7, 81.0 to 81.7, 85.0 to 85.7, and 88.0 to 88.7

pp, csp, ip, csv, pv

Value	Description
0	After the motor stops due to 2105h-0Bh (Sequence at alarm), moves to Fault.
1	After the motor stops due to 6084h (Profile deceleration (Axis A)), moves to Fault.
2	After the motor stops due to 6085h (Quick stop deceleration (Axis A)), moves to Fault.

hm

Value	Description
0	After the motor stops due to 2105h-0Bh (Sequence at alarm), moves to Fault.
1	After the motor stops due to 609Ah (Homing acceleration (Axis A)), moves to Fault.
2	After the motor stops due to 6085h (Quick stop deceleration (Axis A)), moves to Fault.

cst, tq

Value	Description
0	After the motor stops due to 2105h-0Bh (Sequence at alarm), moves to Fault.
1	After the motor stops due to 6087h (Torque slope (Axis A)), moves to Fault.
2	

(2) On occurrence of other than alarms specified by the term above (1)

Value	Description
0	After the motor stops due to 2105h-0Bh (Sequence at alarm), moves to Fault.
1	
2	

Note

If Err81.1, Err85.2, or Err85.3 occurs during csv, pv, cst, or tq control with 605Eh = 1 or 2, ESM transitions to INIT. Therefore, the motor stops without following the above deceleration. If the above specifications are problematic, set 605Eh to 0.

There is a related object also to others.

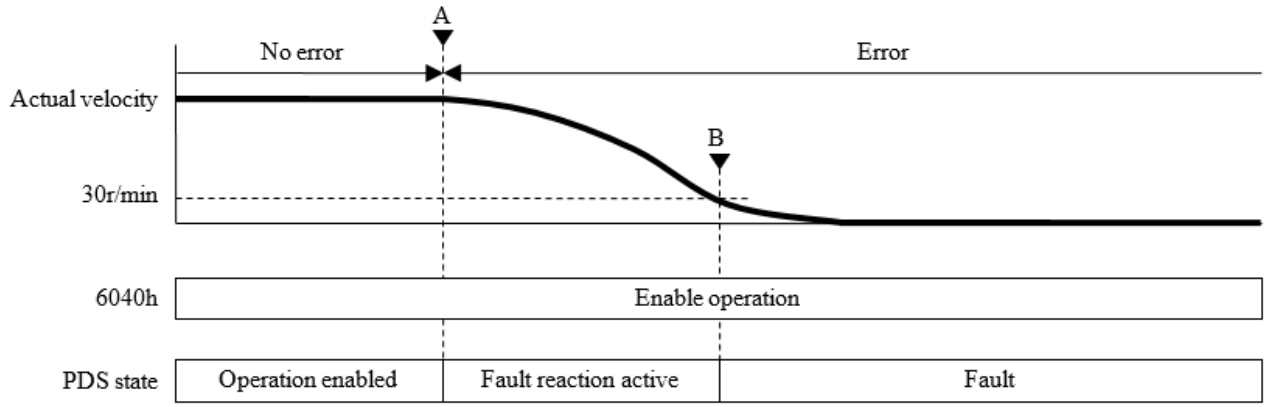
Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6084h	00h	Profile deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6085h	00h	Quick stop deceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO
609Ah	00h	Homing acceleration (Axis A)	Command/s^2	0 to 4294967295	U32	rw	RxPDO
2105h	0Bh	Sequence at alarm	-	0 to 7	I16	rw	No

Refer to

For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

■ **Example of deceleration and stop due to alarm occurrence**

A	When an alarm occurs, the deceleration start. The PDS state during the deceleration is Fault reaction active
B	After detecting actual velocity 30 r/min or less, the motor stops. The PDS state will be Fault after the stop.



6.9.2.7 Sequence at drive inhibition input (POT, NOT)

Sets the operation sequence after the input of drive inhibition input (POT, NOT).

■ **Related object**

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Name
Description</th><th>Units</th><th>Range</th><th>Data Type</th><th>Access</th><th>PDO</th><th>Op-mode</th><th>EEPROM</th></tr>
<tr><td>2105h</td><td>05h</td><td>Over-travel inhibit input setup</td><td>-</td><td>0 to 3</td><td>I16</td><td>rw</td><td>No</td><td>ALL</td><td>Yes</td></tr>
<tr><td colspan="10">• Sets the operation after input of drive inhibition input (POT, NOT).
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0</td><td>Functions as POT; inhibition of positive direction drive and NOT; inhibition of negative direction drive. When POT is input during positive direction operation, or NOT is input during negative direction operation, the operation stops in accordance with 2105h-05h (Sequence at over-travel inhibit).</td></tr>
<tr><td>1</td><td>Functions as POT, inhibition of positive direction drive and NOT, inhibition of negative direction drive. When POT is input during positive direction operation, or NOT is input during negative direction operation, the operation stops according to the following.
- pp, csp, ip, csv, pv
Motor is stopped by 6085h (Quick stop deceleration (Axis A)).
- cst, tq
Motor is stopped by 6087h (Torque slope (Axis A)).</td></tr>
<tr><td>2</td><td>Err38.0 (Over-travel inhibit input protection 1) occurs when either POT or NOT is input.</td></tr>
<tr><td>3</td><td>Reserved for manufacturer's use (do not set this)</td></tr>
</table>
▼ Refer to
For more information, refer to "Functional Specification of the Technical document (SX-DSV03455)".</td></tr>
<tr><td>2105h</td><td>06h</td><td>Sequence at over-travel inhibit</td><td>-</td><td>0 to 2</td><td>I16</td><td>rw</td><td>No</td><td>ALL</td><td>Yes</td></tr>
<tr><td colspan="10">• Sets the state after stop during deceleration after input of drive inhibition input (POT, NOT) when 2105h-05h (Over-travel inhibit input setup) is "0".
▼ Refer to
For more information, refer to "Functional Specification of the Technical document (SX-DSV03455)".</td></tr>
</table>

▼ Refer to

For more information, see "Functional Specification of the Technical document (SX-DSV03455)".

There is a related object also to others.

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO
6085h	00h	Quick stop deceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO

Refer to

For more information, refer to beginning of “6.9.2 Option Code (Deceleration stop sequence)”.

◆ NOTE

- **If NOT is set for positive operation direction or POT is set for negative operation direction, operations cannot be guaranteed when a sensor has been installed incorrectly.**

6.9.3 Digital inputs/digital outputs

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

The bits of Digital inputs/Digital outputs represent the input state of positive limit switch(POT), negative limit switch(NOT), and home switch(HOME), each logical input state of EXT1 - EXT2, E-STOP and SI-MON1 - SI-MON5 and logical output state of EX-OUT1 and set_brake of all the function signals allocated by the servo parameters 2004h-01h to 2004h-08h, 2004h-0Bh, and 2004h-0Ch.

Refer to

For information on the signal allocation and logical setting, refer to the technical document "Functional Specification"(SX-DSV03455).

6.9.3.1 Digital inputs (60FDh)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No

• Indicate the logical input state of external input signal.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)						RET status [RET-STAT]	[INP]
Bit	23	22	21	20	19	18	17	16
Function	[SI-MON5] /[E-STOP]	[SI-MON4]	[SI-MON3]	[SI-MON2] /[EXT2]	[SI-MON1] /[EXT1]	[RET]	Velocity integral clear [VI-CLR]	(reserved)
Bit	15	14	13	12	11	10	9	8
Function	(reserved)							
Bit	7	6	5	4	3	2	1	0
Function	(reserved)				(Not Supported)	home switch [HOME]	positive limit switch [POT]	negative limit switch [NOT]

(Note) In the brackets, the code names of the I/O connector input signal and output signal are shown.

The details of each bit are as follows:

Value	Definition
0	Switched off (logical input state is OFF)
1	Switched on (logical input state is ON)

- The Bit 2 (Home switch), Bit 1 (Positive limit switch), and Bit 0 (Negative limit switch) of 60FDh (Digital Inputs (Axis A)) represent the home input signal (HOME), positive overtravel input signal (POT), and negative overtravel input signal (NOT) of parallel I/O connector.
- Bit17 [VI-CLR] becomes 1 at the state where velocity integration value is cleared, by internal processing or setting of 60FEh bit20 [vel-loop integral clear].

Refer to

- For bit24 of positioning complete signal(INP), refer to "Specification for basic functions(SX-DSV03455)".
- Regarding the bit25 [RET-STAT] and bit18 [RET], refer to the "Functional Specification (SX-DSV03455)" in the Technical Reference.

6.9.3.2 Digital outputs (60FEh)

◆ CAUTION

- **When performing set brake signal control using this object, be sure to use the PDO and enable the PDO watchdog.SDO cannot judge communication cut-off, therefore brakes may not work and becomes non-safe.When use set brake signal, please set the output signal assignment(Setting of 2004h-0Bh and 2004h-0Ch). Also, when use the brake release signal(BRK-OFF) without using the set brake, please set the output signal assignment (Setting of 2004h-0Bh and 2004h-0Ch). For details, refer to Technical document "Functional Specification" (SX-DSV03455).**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-	-	-

• Used to manipulate the output transistor of the external output signal.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)							
Bit	23	22	21	20	19	18	17	16
Function	(Not Supported)			vel-loop integral clear	vel-loop torque limit	(Not Supported)		EX-OUT1 (Note 1)
Bit	15	14	13	12	11	10	9	8
Function	(reserved)							
Bit	7	6	5	4	3	2	1	0
Function	(reserved							Set brake

Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
00h	Number of entries	-	2	U8	ro	No	ALL	No
	• Displays the number of sub-indexes of 60FEh.							
01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO	ALL	Yes
	• Manipulate the output of the external output signal.							
02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO	ALL	Yes
	• Set the output operation of external output signal mask function for digital output.							

(Note 1) Only for the Axis A of the driver module with an inter-module communication ID of 1, the general-purpose output EX-OUT1 can be replaced with the contactor output MC-OUT of the power supply module. For details, refer to Technical document "Functional Specification" (SX-DSV03455).

Following are details of each bit.

■ **Subindex 01h : Physical outputs**

Bit	Name	value	Note
0	set brake	0	don't set brake(brake does not operate)
		1	set brake(brake operates)
16	EX-OUT1	0	Switched off (output transistor OFF)
		1	Switched off (output transistor ON)
19 (Note 1) (Note 3)	vel-loop torque limit	0	There is no torque limit for velocity control loop.
		1	There is a torque limit for velocity control loop.
20 (Note 2) (Note 3)	vel-loop integral clear	0	The velocity integration value is not cleared.
		1	The velocity integration value is cleared.

(Note 1) Valid/Invalid of the torque limit function by 212Dh (Velocity control loop torque limit (Axis A)) is switched.

(Note 2) When bit20=1 is set, the integration value of velocity loop becomes always 0.

(Note 3) For details, refer to the block diagrams described in "6.6 Position control function (pp, csp, ip, hm)" to "6.8 Torque control function".

■ **Subindex 02h : Bit mask**

Bit	Name	value	Note
0	set brake Bit mask	0	Disable output (Set brakeoutput disabled)
		1	Enable output (Set brakeoutput enabled)
16	EX-OUT1 Bit mask	0	Disable output (EX-OUT 1 output disabled)
		1	Enable output (EX-OUT 1 output enabled)
19	vel-loop torque limit bit mask	0	Disable output (vel-loop torque limit output disabled)
		1	Enable output (vel-loop torque limit output enabled)
20	vel-loop integral clear bit mask	0	Disable output (vel-loop integral clear output disabled)
		1	Enable output (vel-loop integral clear output enabled)

Note

When the Bit mask is disabled, each physical output other than set break are processed as the default value (= 0) in the driver module.

The output transistor state changes as follows in each communication state:

Sign	Setting value of 2107h-19h	Setting value of 60FEh		State of output transistor			
		01h (Physical outputs)	02h (Bit mask)	Reset	Communication established (Note 1)	Communication intercepted (Note 1)	Communication re-established (Note 1)
set brake (Note 2)	-	0	0	set brake = 1 (brake on)	set brake = 1 (brake on)	set brake = 1 (brake on)	set brake = 1 (brake on)
		1					
		0	1	set brake = 1 (brake on)	set brake = 0	set brake = 1 (brake on)	set brake = 0
		1			set brake = 1 (brake on)		set brake = 1 (brake on)
EX-OUT1	bit0 = 0 (hold)	0	0	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0
		1					
		0	1	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0 (hold)	EX-OUT1 = 0
		1			EX-OUT1 = 1	EX-OUT1 = 1 (hold)	EX-OUT1 = 1
	bit0 = 1 (initialization)	0	0	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0
		1					
		0	1	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0	EX-OUT1 = 0
		1			EX-OUT1 = 1		EX-OUT1 = 1
vel-loop torque limit	-	0	0	vel-loop torque limit = 0	vel-loop torque limit = 0	vel-loop torque limit = 0	vel-loop torque limit = 0
		1					
		0	1	vel-loop torque limit = 0	vel-loop torque limit = 0	vel-loop torque limit = 0	vel-loop torque limit = 0
		1			vel-loop torque limit = 1 (There is a torque limit.)		vel-loop torque limit = 1 (There is a torque limit.)
vel-loop integral clear	-	0	0	vel-loop integral clear = 0	vel-loop integral clear = 0	vel-loop integral clear = 0	vel-loop integral clear = 0
		1					vel-loop integral clear = 1
		0	1	vel-loop integral clear = 0	vel-loop integral clear = 0	vel-loop integral clear = 0	vel-loop integral clear = 0
		1			vel-loop integral clear = 1 (Velocity integration value is cleared.)		vel-loop integral clear = 1 (Velocity integration value is cleared.)

(Note 1)
"Communication established", "Communication intercepted", and "Communication re-established" refer to the following cases.

Item	Description
Communication established	ESM state is PreOP or higher
Communication intercepted (Note)	PDO communication is disabled (ESM state transitioned to other states than OP), or SDO communication is disabled (ESM state transitioned to Init)
Communication re-established	After 60FEh-01h or 60FEh-02h is successfully written

(Note) When using 60FEh (Digital output (Axis A)), map it to RxPDO.

■ Related objects

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2107h	19h	Communication function extended setup 3	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes

Bit No.	Description
0	The state setting of EX-OUT1 output at the time of communication interception after communication established of the EtherCAT (ESM state is more than PreOP) 0: hold 1: Initialization(output at EX-OUT1=0)

(Note 2)
2104h-3Ch (Mechanical brake signal setup) sets the mechanical brake signal output from the mechanical brake output (BRK +/-), and does not affect the set brake output from SO1 / SO2.
The set brake can be used for the mechanical brake release signal output from the mechanical brake output(BRK +/-).The mechanical brake output (BRK +/-) operates according to the following table.
For details, refer to the technical document, "Functional Specification (SX-DSV03455)".

2104h-3Ch (Mechanical brake signal setup)	Signal	60FEh/68FDh (Digital outputs) Setting value		Output transistor state (BRK+/-)							
				At reset		At communication established		At communication intercepted		At communication re-established	
		01h (Physical outputs)	02h (Bit mask)	Servo OFF	Servo ON	Servo OFF	Servo ON	Servo OFF	Servo ON	Servo OFF	Servo ON
0	BRK-OFF	0	0	Hold	Release	Hold	Release	Hold	Release	Hold	Release
		1									
		0	1								
		1									
1	set brake	0	0	Hold							
		1									
		0	1	Hold		Release		Hold		Release	
		1				Hold				Hold	
2	BRK-OFF or set brake	0	0	Hold	Release	Hold	Release	Hold	Release	Hold	Release
		1									
		0	1			Release				Release	
		1				Hold				Hold	

- The external brake release signal (BRK-OFF) releases the mechanical brake at servo ON and operates the mechanical brake at servo OFF or in case of an error occurrence.
  ▼ Refer to
  Refer to the technical document, "Functional Specification (SX-DSV03455)".
- The set brake output (set brake) forcibly controls the mechanical brake from the controller side via EtherCAT communication. It outputs the signal set up in 60FEh/68FDh (Digital outputs) bit0, and turns OFF the output transistor (operates the brake) when it is 1.

◆ NOTE

- **If the mechanical brake is operated while the servo motor is rotating, the mechanical brake may become abnormally worn or damaged and result in equipment failure.**
- **Releasing the brake on the vertical axis may cause the equipment to fall due to its own weight. Be careful on its falling when releasing the brake.**
- **Operating the brake while the motor is rotating may cause the brake to be worn or damaged, and result in a damage to the motor bearing or encoder.**
- **2104h-3Ch (Mechanical brake signal setup) is an object of always effective attribute. When changing the setting value, employ caution not to cause abnormal operation of the brake.**
- **2104h-3Ch (Mechanical brake signal setup) sets up the signal which is output from the mechanical brake output (BRK+/BRK-). It will not change the output signal from the I/O connector. To control the mechanical brake from the I/O connector, assign the desired brake release signal.**
- **Err17.0 "Mechanical brake circuit voltage error protection" or Err17.1 "Mechanical brake circuit overload protection" will occur if an error occurs in the mechanical brake circuit.**

■ **Related object**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2104h	3Ch	Mechanical brake signal setup	-	0 to 2	I16	rw	No	ALL	Yes

• Set the mechanical brake signal output from the mechanical brake output (BRK +/-).

Value	Description
0	BRK-OFF
1	set brake
2	BRK-OFF / set brake

6.9.4 Position information

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Refer to

For details, refer to “3.7.1 PDO mapping object”.

6.9.4.1 Initialization timing of position information

This driver module initializes(preset) position information object at the following timing.

- Initialization timing (conditions)
  - At the time of the control power supply ON
  - When establishing communication (when changing ESM state from Init to PreOP)
  - When returning to origin is completed
  - When clearing absolute multi-turn from PANATERM for Multi or EtherCAT communication
  - When PANATERM for Multi operation(test run function, frequency response analyzing function, Z phase search,fit gain) is completed.
  - When setting pin assign by PANATERM for Multi.
  - When Err27.4 (Command error protection) occurs
- Object to be initialized
  - 2304h(Position command internal value(after filtering) (Axis A))
  - 230Dh(External scale position (Axis A)) (Full-closed control only)
  - 2348h(External scale pulse total (Axis A)) (Full-closed control only)
  - 2386h(Hybrid deviation (Axis A)) (Full-closed control only)
  - 23A7h(External scale position(Applied polarity) (Axis A)) (Full-closed control only)
  - 2341h-02h(Multi-turn data) (Only when clearing absolute multi-turn)
  - 6062h (Position demand value (Axis A))
  - 6063h (Position actual internal value (Axis A))
  - 6064h (Position actual value (Axis A))
  - 60FCh (Position demand internal value (Axis A))

These objects are based on 6063h (Position actual internal value (Axis A)) which shows the feedback position of a motor, the code translation by the electronic gear function, Polarity, and Home offset which are mentioned later are considered, and it is initialized (preset).

Also, Changing the set value of electronic gear ratio, Polarity, and Home offset is reflected at the timing later described in this section.

Please confirm "4) Initialization of the absolute encoder" mentioned later about notes at the time of using an absolute encoder.

6.9.4.2 Electronic gear function

The electronic gear is a function which makes the value which multiplies by the electronic gear ratio defined by the object to the position command from host controller as the position command to a position control section.

By using this function, the number of revolutions and travel of the motor per command can be set to the desired value.

In MINAS A6 Multi series, a setup of an electronic gear ratio with a parameter Pr0.08(Number of command pulses per motor revolution), Pr0.09(Numerator of electronic gear) and Pr0.10(Denominator of electronic gear) has not corresponded, an electronic gear ratio is set up by the object 608Fh(Position encoder resolution (Axis A)), 6091h(Gear ratio (Axis A)) and 6092h(Feed constant (Axis A)) specified to CoE (CiA402).

The equation below calculates the relationship between the unit (command) defined by the user and internal unit (pulse):

$$\text{Electronic gear ratio} = \frac{\text{Position encoder resolution} \times \text{Gear ratio}}{\text{Feed constant}}$$

$$\text{Position demand value} \times \text{Electronic gear ratio} = \text{Position demand internal value}$$

◆ NOTE

- **Electronic gear ratio is valid only within the range of 8000 times to 1/1000 times. When the range is exceeded, the value is saturated in the range, and Err88.3 (Improper operation error protection) occurs.**
- **When the denominator or numerator exceeds the unsigned 64-bit size in the calculation process of electronic gear ratio, Err88.3 (Improper operation error protection) occurs.**
- **When the denominator or numerator exceeds the unsigned 32-bit size in the final calculation result of electronic gear ratio, Err88.3 (Improper operation error protection) occurs.**
- **Set the electronic gear ratio with several objects. An error may become large depending on the combination of settings.**
- **608Fh-01h (Encoder increments) is automatically set according to encoder resolution. Under full-closed control, it is also automatically set according to encoder resolution. The default value of 6092h-01h (Feed) is set so that the electronic gear ratio is 1:1 when a 23-bit/r encoder is used. When using other encoders than a 23-bit/r encoder, pay attention to the electronic gear ratio settings.**
- **Electronic gear ratio setting is reflected at the following timing.**
  - **At the time of the control power supply ON**
  - **When establishing communication (when changing ESM state from Init to PreOP)**
  - **When returning to origin is completed**
  - **When clearing absolute multi-turn from PANATERM for Multi or EtherCAT communication**
  - **When PANATERM for Multi operation(test run function, frequency response analyzing function, Z phase search, fit gain) is completed.**
  - **When setting pin assign by PANATERM for Multi.**
  - **When Err27.4 (Command error protection) occurs**

  Note that the setting is not reflected as is even if the setting values for the related objects have been changed.
- **In the position information initialization when Init changes to PreOP in the absolute mode, make a setting so that the value of "Absolute encoder position [pulse/unit]/Electronic gear ratio" is in the range from -2^{31} (-2147483648) to $+2^{31}-1$ (2147483647). Operations out of this range are not guaranteed. Check the operation range of the absolute encoder position and the electronic gear ratio.**

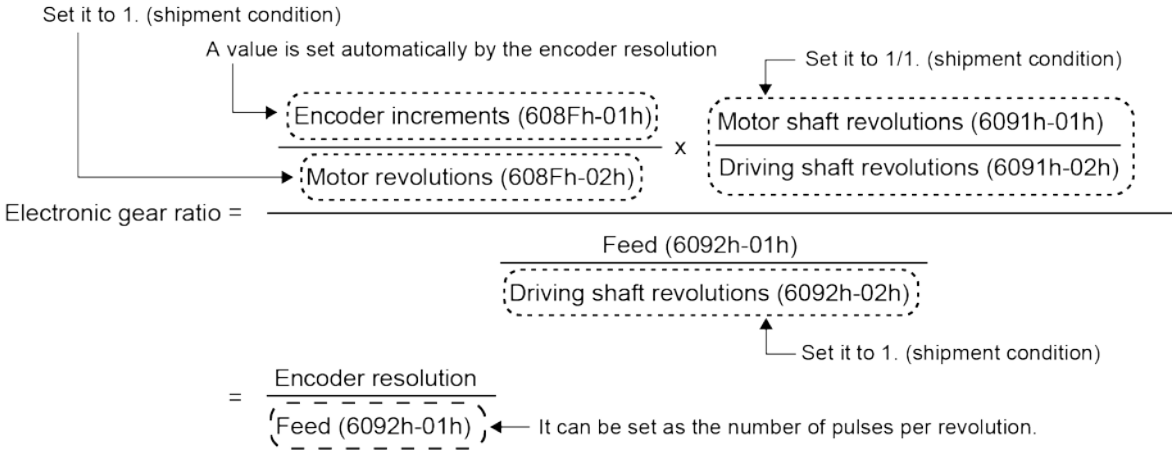
- **The unit of the movement amount setting of the test run function by the setup support tool PANATERM for Multi is [command unit]. Note that operations are different from those of the MINAS-A5B series.**
- **Communication cycle setup at 125 µs or 250 µs is supported only if the electronic gear ratio is 1:1. Err88.3 (Improper operation error protection) occurs when the electronic gear ratio is other than 1:1.**
- **Communication cycle setup at 500 µs is supported only if the electronic gear ratio is a power of 2. Err88.3 (Improper operation error protection) occurs when the electronic gear ratio is other than a power of 2.**
- **Err88.3 (Improper operation error protection) occurs if the TxPDO size for either Axis A or B is set larger than 25 bytes while the communication cycle is 500 µs and the electronic gear ratio is a power of 2.**
- **Err88.3 (Improper operation error protection) occurs if the RxPDO size for either Axis A or B is set larger than 25 bytes while the communication cycle is 500 µs and the electronic gear ratio is a power of 2.**
- **For details, refer to “3.7.1 PDO mapping object”.**

Electronic gear setting example

In the MINAS A6 Multi series, it is impossible to set the electronic gear using the “number of command pulses per motor revolution (Pr0.08)” and “electronic gear numerator (Pr0.09)/denominator (Pr0.10)” in contrast to the MINAS-A6N series.

When setting the electronic gear like the MINAS-A6N, refer to the following.

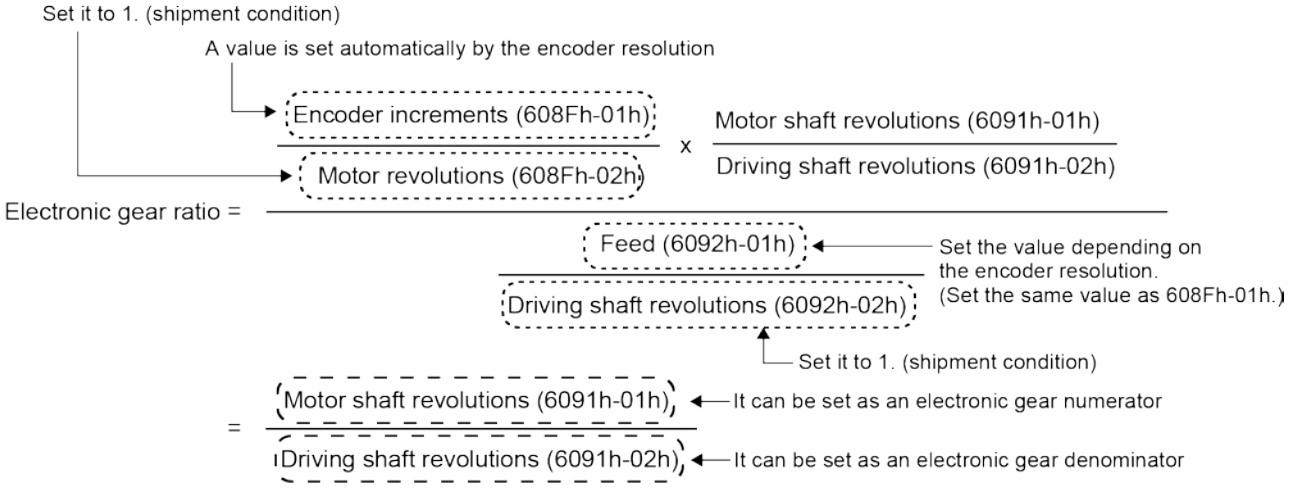
■ **When setting the electronic gear ratio by setting the number of command pulses per motor revolution under semi-closed control**



608Fh-01h (Encoder increments) is set automatically from the connected encoder resolution.

By setting 608Fh-02h (Motor revolutions), 6091h-01h (Motor shaft revolutions), 6091h-02h (Driving shaft revolutions) and 6092h-02h (Driving shaft revolutions) to 1 (shipment condition), it is possible to set 6092h-01h (Feed) as the “number of command pulses per motor revolution”.

■ **When setting the electronic gear ratio by setting the numerator/denominator of electronic gear under semi-closed control or full-closed control**



608Fh-01h (Encoder increments) is set automatically from the connected encoder resolution.

By setting 6092h-01h (Feed) to the encoder resolution (the same value as 608F-01h (Encoder increments), and in the case of the 23bit/r encoder, the shipment condition) and setting 608Fh-02h (Motor revolutions) and 6092h-02h (Driving shaft revolutions) to 1 (shipment condition), it is possible to set 6091h-01h (Motor shaft revolutions) to the “electronic gear numerator” and 6091h-02h (Driving shaft revolutions) to the “electronic gear denominator”.

Backup of electronic gear set value

The electronic-gear-related objects (6091h-01h, 6091h-02h, 6092h-01h and 6092h-02h) are backup target objects.

It is recommended to execute a backup (writing into EEPROM) after a change.

By executing a backup, it will be unnecessary to change setting each time when the control power is turned on.

Refer to

As for the backup method, refer to “5.6 Store parameters (Write object in EEPROM) (1010h)”.

Electronic gear setting and backup by object editor

It is possible to set and back up objects using the object editor of PANATERM for Multi(USB communication).

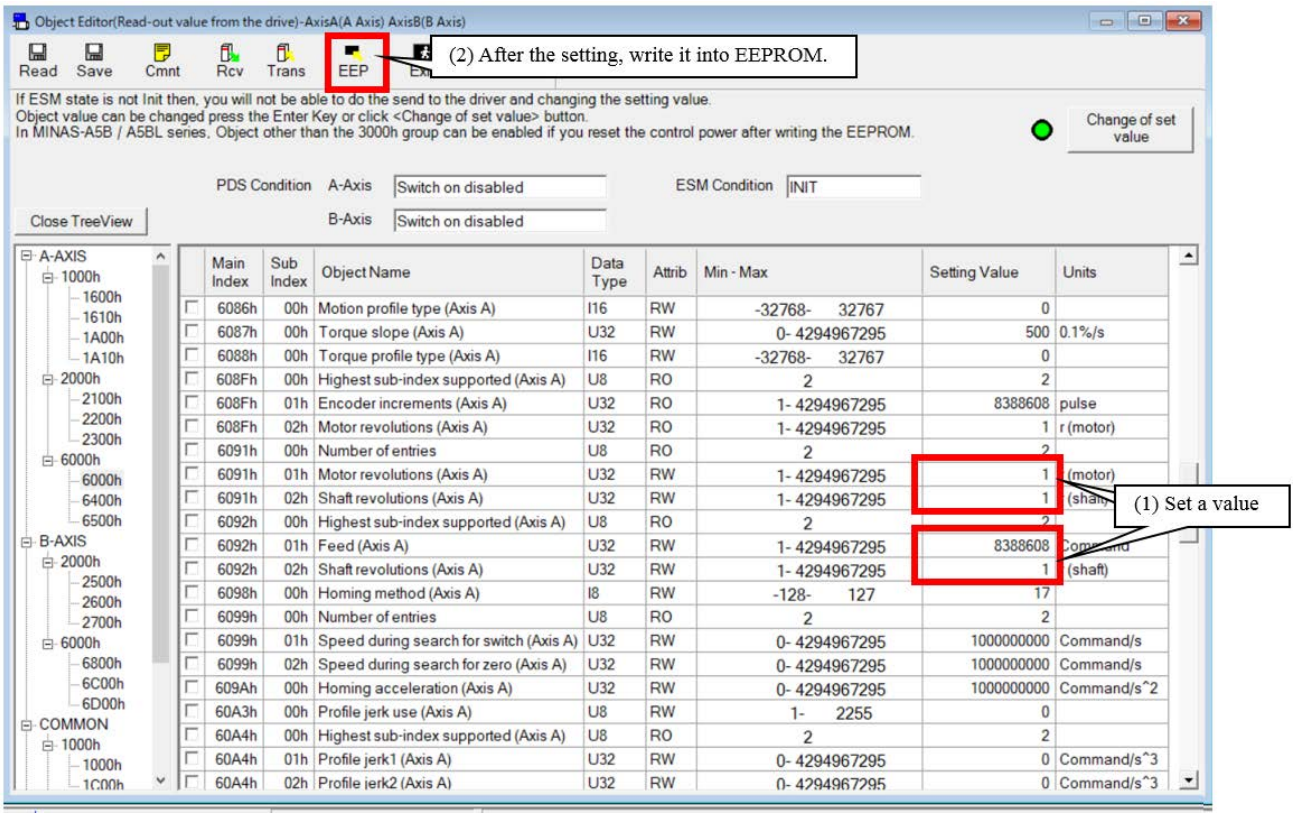
When the PANATERM for Multi connect by the EoE communication, it can not be write objects using the object editor.

For the MINAS-A5B series, it was necessary to turn on the control power again after the backup in order to reflect the electronic gear setting value changed by using the object editor on the object.

As for the MINAS A6 Multi series, immediately reflected in the actual object,

The electronic gear setting values set by using the object editor are reflected on the object in the same manner as when the value of the object is changed via the aforementioned EtherCAT as same timing.

Unlike the MINAS-A5B series, note that the setting value is reflected on the object even if the control power is not turned ON again after the backup.



■ **Position encoder resolution (608Fh)**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
608Fh		Position encoder resolution (Axis A)	-	-	-	-	-	-	-
		• Encoder resolution is set automatically.							
	00h	Highest sub-index supported	-	2	U8	ro	No	ALL	No
		• Displays the number of sub-indexes of 608Fh.							
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No	ALL	No
		• Indicate the moving amount of the encoder. Encoder resolution is set automatically as the value. Under full-closed control, encoder resolution is also set automatically.							
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No	ALL	No
		• Indicate the rotating speed of motor. The value fixes 1.							

This object defines the resolution of the encoder per motor revolution.

$$\text{Position encoder resolution} = \frac{\text{Encoder increments (608Fh-0h)}}{\text{Motor revolutions (608Fh-02h)}}$$

This object is set up automatically according to the information read out from a motor connected to the driver module.

Example 1)

When a 23bit/r encoder is connected.

608Fh-01h (Encoder increments) = 8388608

608Fh-02h (Motor revolutions) = 1

Position encoder resolution = 8388608 / 1 = 8388608

■ **Gear ratio (6091h)**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6091h		Gear ratio (Axis A)	-	-	-	-	-	-	-
		• Set the gear ratio.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		• Displays the number of sub-indexes of 6091h.							
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No	ALL	Yes
		• Set the rotating speed of motor.							
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No	ALL	Yes
		• Set the rotating speed of the shaft.							

This object defines the relationship between the rotating speeds of motor and shaft after the gearbox output.

$$\text{Gear ratio} = \frac{\text{Motor shaft revolutions (6091h-01h)}}{\text{Driving shaft revolutions (6091h-02h)}}$$

■ **Feed constant (6092h)**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
6092h		Feed constant (Axis A)	-	-	-	-	-	-	-
		• Set the feed constant. feed constant = feed / Shaft revolutions							
	00h	Highest sub-index supported	-	2	U8	ro	No	ALL	No
		• Displays the number of sub-indexes of 6092h.							
	01h	Feed	command	1 to 4294967295	U32	rw	No	ALL	Yes
		• Set the feed amount.							
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No	ALL	Yes
		• Set the rotating speed of the shaft.							

This object indicates the operating quantity per rotation of the shaft after the gearbox output.

$$\text{Feed constant} = \frac{\text{Feed (6092h-01h)}}{\text{Driving shaft revolutions (6092h-02h)}}$$

6.9.4.3 Polarity (607Eh/687Eh)

It is possible to set the polarity (rotation direction of motor) for the position command, velocity command, and torque command, and their offset.

In MINAS A6 Multi series, a setup of the hand of cut by parameter Pr0.00 (Rotational direction) has not corresponded, the hand of cut is set up by object Polarity (Axis A) (607Eh) specified to CoE (CiA402).

In addition, object Polarity (Axis A) (607Eh) is not what replaced parameter Pr0.00 (hand-of-cut setup) as it was, it becomes effective when performing the target object of the following table data transfer between a CoE (CiA402) process division and a motor control process division.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No	ALL	Yes

• Select the combination of the command polarities for the position command, velocity command, torque command input, position offset, velocity offset (adding velocity), torque offset (adding torque), position feedback, velocity feedback, and torque feedback from the followings:

Note

Setting value of this object set 0(the value of bit7-5 is 0) set so that position, velocity, torque polarity is all the same. Also, set to 224 (the value of bit 7-5 is 1).

Certified in other settings is not possible.

Setting value	Description
0	No reverse of sign of torque, velocity, position
224	Reverse of sign of torque, velocity, and position possible
Other than above	Not supported (Do not set)

Bit No.	Description
7	Position polarity 0: no sign inversion, 1: sign inversion occurs
6	Velocity polarity 0: no sign inversion, 1: sign inversion occurs
5	Torque polarity 0: no sign inversion, 1: sign inversion occurs
4 to 0	Reserved

• Set to 0.

Target object

• Instructions / setting
- 607Ah(Target position (Axis A))
- 60B0h(Position offset (Axis A))
- 60FFh(Target velocity (Axis A))
- 60B1h(Velocity offset (Axis A))
- 6071h(Target torque (Axis A))
- 60B2h(Torque offset (Axis A))

• Monitor
- 2304h(Position command internal value(after filtering) (Axis A))
- 6062h(Position demand value (Axis A))
- 6064h(Position actual value (Axis A))
- 606Bh(Velocity demand value (Axis A))
- 606Ch(Velocity actual value (Axis A))
- 6074h(Torque demand (Axis A))
- 6077h(Torque actual value (Axis A))
- 6078h(Current actual value (Axis A))

• External input
- 60FDh-00h(Digital input (Axis A)) is bit1(positive limit switch(POT))
- 60FDh-00h(Digital input (Axis A)) is bit0(negative limit switch(NOT))
- POT and NOT of external input signal

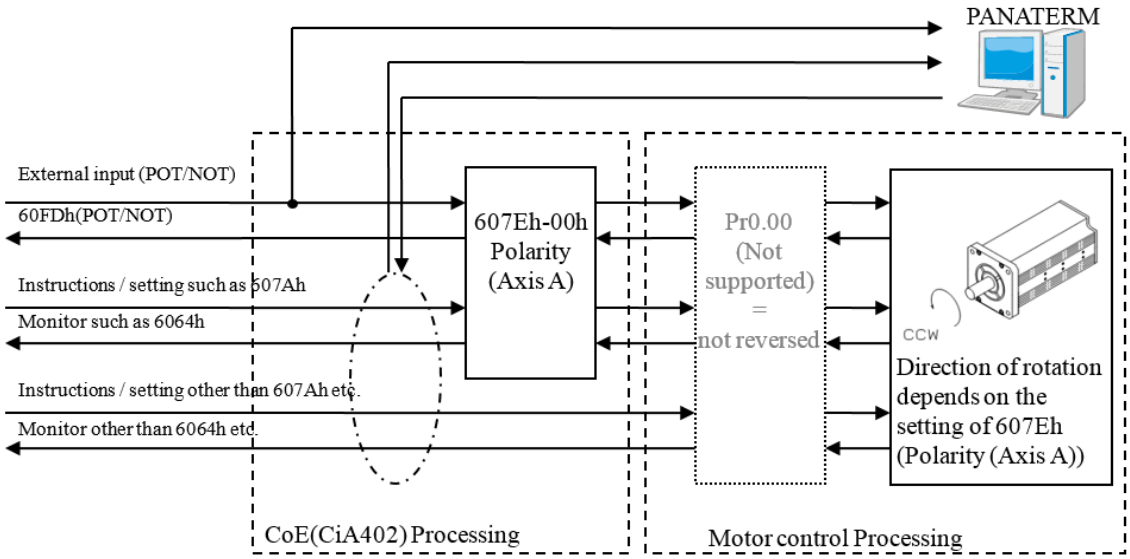
Data other than the target object in the table on the previous page, the setting of 607Eh (Polarity (Axis A)) is reflected in the monitor data on the setup support tool PANATERM for Multi related to the object.

In addition, the settings of 607Eh (Polarity (Axis A)) are reflected on POT/NOT during execution from PANATERM for Multi including test run function, frequency response analyzing function and Z phase search function.

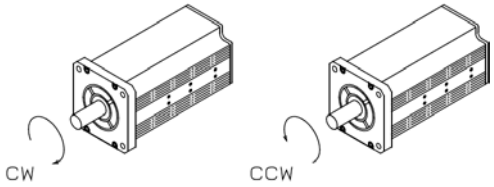
Note that operations are different from those of the MINAS-A5B series.

When 607Eh (Polarity (Axis A)) is setting to reverse of sign, when you perform a test run etc., please be careful of the logic of the drive inhibition.

■ **no sign inversion: Motor turns CCW in response to positive direction command.**
sign inversion occurs: Motor turns CW in response to positive direction command.



- The direction of motor rotation, it sees from the poll end of a load side, a clockwise rotation is defined as CW, and a counterclockwise rotation is defined as CCW.



◆ **NOTE**

- **607Eh(Polarity (Axis A)) setting is reflected at the following timing.**
  - **At the time of the power supply ON**
  - **When establishing communication (when changing ESM state from Init to PreOP)**
  - **When PANATERM for Multi operation(test run function, frequency response analyzing function, Z phase search, fit gain) is completed.**
  - **When setting pin assign by PANATERM for Multi.**
  - **When Err27.4 (Command error protection) occurs.**

  Note that the setting of Polarity is not reflected after returning to the origin, after multi-turn clearing of the absolute encoder.
- **The fit gain function performs reciprocating motion of the motor several times. When executing the fit gain function with changing only 607Eh(Polarity (Axis A))'s value without reflection,the polarity setting is reflected at finishing the first motor operation, and the second motor operation is reversed. If excute the fit gain function, the setting of Polarity is reflected in advance.**

- **In the pulse regeneration function, the set value of 607Eh(Polarity (Axis A)) when control power supply has been turned on is reflected.**

6.9.4.4 Initialization of the absolute encoder(Semi-closed control)

Homing operation is not necessary with the absolute encoder at the position control mode (except when using the absolute encoder as the incremental mode). However, it is necessary to clear “Multi-turn data” at the first start up of the machine.

Absolute data

There are 2 types of data which are read out from the absolute encoder (23 bits/r), “Single-turn data (2341h-01h:Mechanical angle(Single-turn data))” which shows the position of motor’s rotation within a single turn, and “Multi-turn data (2341h-02h:Multi-turn data)” which counts each single turn. In this, Multi-turn data is an electrical counter, so it is configured to back up internally.

Both data have a polarity to increase in the direction of CCW which seen from the motor shaft end.

Be able to select whether Err. 41.0, “Absolute encoder counter overflow” will be generated or not when Multi-turn data has overflowed, with the parameter, “Absolute encoder setup” (2100h-10h).

Item	Description	
	Single-turn data	**Multi-turn data**
Back up at control power off	Not necessary	(Note 2)
Data width	23 bit	16 bit
+/- Sign	Unsigned	Signed
Data range	0 to 8388607	0 to 65535 (max.) (Note 1)

(Note 1) In continuous rotating absolute mode, the upper limit can be set with 2106h-59h (Absolute encoder multi-turn data upper-limit value). It is 65535(maximum value) in non continuous rotating absolute mode.

Refer to
For details on the continuous rotating absolute mode, refer to "Specification for basicfunctions (SX-DSV03455)".

(Note 2) Backup in the event of power shutdown varies depending on 2100h-10h "Absolute Encoder Setting".

Absolute encoder type	2100h-10h (Absolute encoder setup)	
	0,2,4	**1,3**
Battery-powered	Battery backup	Not required
Battery-less	Not required	

In this driver module, the position information is initialized at the timing described in “6.9.4.1 Initialization timing of position information".

In the 23bit absolute encoder, since single-turn data is 23-bit width and multi-turn data is 16-bit width, the width of the synthetic data will be 39-bit width, but the value to set for the object as position information is 32-bit width.

6063h sets only lower 32 bits of the absolute encoder data as position information so that 7bits in the highest order of multi-turn data (16bits) are lost, and the effective bit length will be 9 bits.

6064h calculates the position information according to the following formula and the position information after calculation will be 32-bit width. Therefore, the effective bit length of the multi-turn data fluctuates according to the electronic gear reverse conversion value.

607Eh (Polarity (Axis A))	Position information
When set to 0 (CCW is positive direction)	6063h = $M \times 2^{23} + S$ *Effective bit length of M is 9 bits.
	6064h = (($M \times 2^{23} + S$) ×Electronic gear reverse conversion value) + 607Ch *Effective bit length of M is 16bits maximum. Example: If the electronic gear reverse conversion value is 0.5,the effective bit length is 10 bits.
When set to 224 (CW is positive direction)	6063h = $M \times 2^{23} + S$ *Effective bit length of M is 9 bits.
	6064h = - (($M \times 2^{23} + S$) ×Electronic gear reverse conversion value) + 607Ch *Effective bit length of M is 16bits maximum. Example: If the electronic gear reverse conversion value is 0.5,the effective bit length is 10 bits.

6063h: Position actual internal value

6064h: Position actual value

607Ch: Home offset

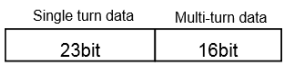
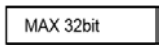
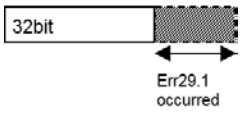
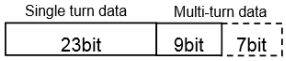
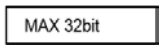
M: 2341h-02h:Multi-turn data

S: 2341h-01h:Mechanical angle(Single-turn data)

If the value of the actual position calculated from one rotation data, multi-rotation data, and the electronic gear inverse calculation value exceeds 32-bit width, Err29.1 “Counter Overflow Protection 1” is generated. Therefore, the effective bit length of the multi-turn data fluctuates according to the electronic gear reverse conversion value.

However, the number of rotations up to 65535 rotations can be handled by setting 2106h-63h bit3 “Valid bit extension of multi-rotation data” to 0.

The effective range of multi-rotation data can be specified with 2106h-63h -bit3.

2106h-63h -bit3	**Effective range for encoder data [pulse unit]**	**Actual positions data [command] (Not e2) (6063h ×Electronic gear reverse conversion value)**		**Effective maximum number of turns (Note 1)**	**Err29.1**
		Electronic Gear ratio	**Data range**		
0		128 times or more		65535 (-32768 to 32767)	- (Note 4)
		Less than 128 times		65534 or less (-32767 or more – 32766 or less) * It depends on the electronic gear ratio.	Detection (Note 3)
1		1 time or more		511 (-256 to 255)	- (Note 4)
		Less than 1 time		510 or less (-255 or more – 254 or less) * It depends on the electronic gear ratio.	- (Note 4)

(Note 1) For the value of multi-rotation data, unrestricted information (0 to 65535) is displayed as unsigned data on the PANATERM for Multi and via EtherCAT communication. (In the infinite rotation absolute mode, the value of 2106h-59h is the upper limit to be displayed.) For a generated actual position [command unit], the signed data in () is used.

• "When 2106h-63h bit 3 is 0"

With the upper 16 bits of the multi-rotation data being valid, the actual position is calculated within the range of the effective maximum rotation speed.

Example) The actual position is calculated, using multi-rotation data 1 = 1,32768 = -32768, and 65535 = -1.

• "When 2106h-63h bit 3 is 1"

With the upper 7 bits of the multi-rotation data being ignored, the actual position is calculated in the range of the effective maximum rotation speed.

Example)

The actual position is calculated, using multi-rotation data 1 = 1, 256 = -256, and 511 = -1. If it is out of the range of the effective maximum rotation speed (the upper 7 bits of multi-rotation data are not 0), it is initialized at the same actual position as within the range of the effective maximum rotation speed (the upper 7 bits of multi-rotation data are 0).

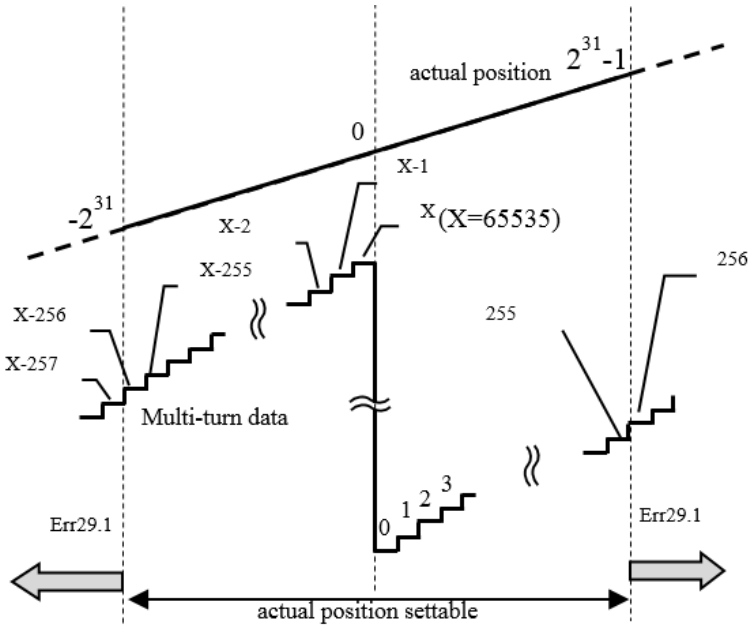
(Note 2) The value of the actual position calculated from one rotation data, multi-rotation data, and the electronic gear inverse calculation value must be within 32-bit width. The host controller must not give a position command that exceeds this range.

(Note 3) If the value of the actual position calculated from one rotation data, multi-rotation data, and the electronic gear inverse calculation value exceeds 32-bit width, Err29.1 “Counter Overflow Protection 1” is generated.

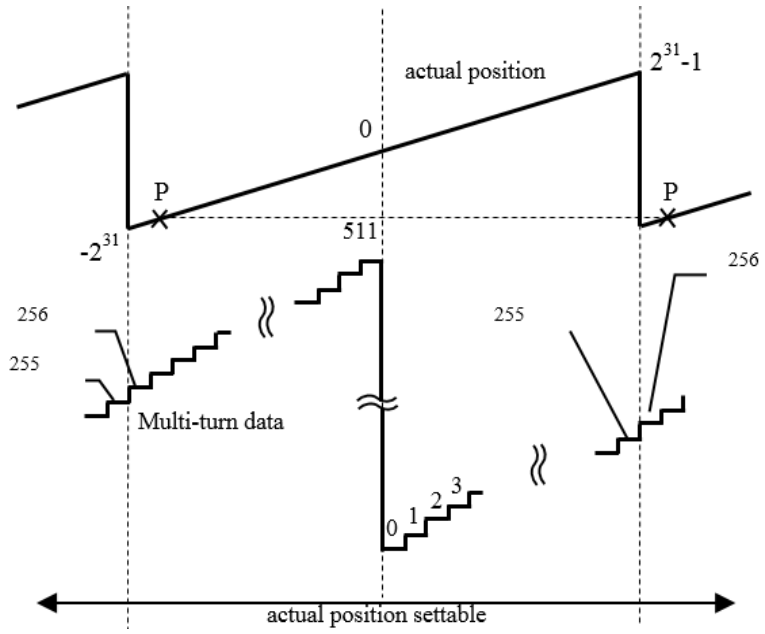
(Note 4) If you want to rotate it infinitely in one direction, set it to "2106h-63h bit 3 = 0 and electronic gear ratio: 128 times or more " or "2106h-63h bit 3 = 1 " to avoid error detection. However, depending on the setting of the electronic gear ratio, the position when the power is turned on again after the actual position exceeds 32 bits may differ from the position before power shutdown.

Differences in actual position by the effective multi-turn bit number when electronic gear ratio is 1 are shown below.

■ **2106h-63h bit3=0**



■ **2106h-63h bit3=1**



Position information treated by this driver module becomes 32-bit width data. If the position information of the absolute encoder of 33 bits or more, the position information can be calculated with the following formula. Please multiply this result by the reciprocal of electronic gear ratio when using electronic gear.

position information of the absolute encoder
= 2341h-02h (Multi-turn data) × 2^{23} + 2341h-01h (Mechanical angle(Single-turn data))

To obtain accurate position information, 2341h-01h and 2341h-02h should be allocated to TxPDO.

When not allocating 2341h-01h and 2341h-02h to TxPDO, data should be read at the same timing as much as possible with SDO.

In that event, there may be an approximate one-turn difference in the vicinity of the changing point of the multi-turn data, and the data to be used should be that read when the motor has stopped in a position near the farthest position where single-turn data is 222 instead of the data read in the vicinity of the changing point of the multi-turn data.

Clearing multi-turn data

When clearing multi-turn data, zero position will be multi-turn transition point at CW side in the zone where cleared.

The multi-turn data may change intermittently in the vicinity of the changing point of the multi-turn data. So, clearing multi-turn data at this point may causes the actual position 0 to deviate by 1 rotation.

In order to avoid it, execute the clearing operation at the position where single-turn data is 2^{22} which is the farthest from the transition point of multi-turn data.

◆ NOTE

<Notes to avoid a trouble>

- **Execute this process (clear multi-turn data) in Servo-OFF, and in fixing the moving parts by brake etc. if necessary, and in confirming safety.**
  Keep Servo-OFF until data clearing completes.
  After that, turn off control power once, and turn on the power again.

- Multi-data is cleared via the PANATERM for Multi (USB communication, EoE communication) or EtherCAT communication.
- If multi-turn data is cleared via the “PANATERM for Multi” (USB communication, EoE communication), Err. 27.1, “Motion command error” will occur. However, this is not a problem because of a step for safety.
- In via EtherCAT communication, multi-turn data clearing operation is possible to run using the 2123h -01h(Special function start flag 1) and 2124h-00h(Special function setting 9 (Axis A)).

  Set the 2124h -00h(Special function setting 9) to 0031h, and change the bit9 of 2124h -01h from 0 to 1,the multi-turn data clearing operation will run.
- In hm mode, bit12 of 6041h (homing attained) become 0 when the multi-turn data clear run.

  After the multi-turn data clear completion, bit12 of 6041h (homing attained) will return to 1.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2123h	-	Special function start (Axis A)	-	-	-	-	-	-	-
		• Run a special function in accordance with the set value of 2124h-00h.							
	00h	Number of entries	-	3	U8	ro	No	ALL	No
		• Displays the number of sub-indexes for 2123h.							
	01h	Special function start flag 1	-	0 to 4294967295	U32	rw	No	ALL	No
		Bit no. / Description 9: At the rising edge(0->1) detection of this bit, run the special function in accordance with the set value of 2124h-00h. After setting this bit to 1, please return to 0 at any time. Even if return this bit to 0 during running the special function, the special function will continue.							
	02h	Special function start flag 2	-	0 to 94967295	U32	rw	No	ALL	No
		For manufacturer’s use (Please do not change from the default value(0).)							
2124h	00h	Special function setting 9 (Axis A)	-	0 to 65535	U16	rw	No	ALL	No
		• Set value of the following table to this object, and rise (0->1) the bit9 of 2123h-01h, run the special function in accordance with the set value of 2124h-00h. After the special function performed, the value of this object will return to 0000h. In the state that it cannot multi-turn data clear, the abort message occurs when rise bit9 of 2123h -01h. In this case, the object does not return to 0000h.							

Value	Function
0000h	do nothing.
0031h	Absolute encoder multi-turn data clear
Other than the above	Action indefinite. Please do not set.

◆ NOTE

<Precautions for multi-turn data clear via EtherCAT communication>

- **Execute in servo-off.**
- **Do not execute the multi-turn data clear during running the touch probe function.**
- **Do not execute the ESM transition during running the multi-turn data clear.**
- **Do not do not change the control mode during running the multi-turn data clear.**
- **Do not execute multi-turn data clearing and battery refresh via PANATERM for Multi during multi-turn data clearing via EtherCAT communication.**
- **If run multi-turn data clear via EtherCAT communication in the following state, the driver module returns the Abort Message "08000022h". After confirming that the driver module is not in the following state, run the multi-turn data clear via EtherCAT communication.**
  - **servo-on state.**
  - **During running the multi-turn data clear (via EtherCAT communication)**
  - **During running the multi-turn data clear (via PANATERM for Multi)**
  - **When using incremental encoder**
  - **During running the touch probe function**
  - **When the single-turn absolute mode(2100h-0Fh=3)**

  *** When an Abort Message occurs, 2124h-00h(Special function setting 9 (Axis A)) does not return to 0000h.**
- **When execute the multi-turn data clear via EtherCAT communication, Err27.1(Absolute clear protection) does not occur.**

6.9.4.5 Position range limit (607Bh)

If the value of 607Ah (Target position (Axis A)) exceeds 607Bh (Position range limit (Axis A)), operated wraparound processing. In the absolute system, the same wraparound process operates.

In the absolute system, the same wraparound process operates. However, In Absolute positioning with pp control or csp control in continuous rotating absolute encoder mode, the wraparound value varies depending on the Pr6.88“Absolute encoder multi-turn data upper-limit value” and electronic gear settings.

Also, if 607Ah is set outside the range of 607Bh, Err91.1 (command error protection) occurs.

For modes other than continuous rotating absolute encoder mode, the values are internally processed as 607Bh-01h=80000000h and 607Bh-02h=7FFFFFFFh.

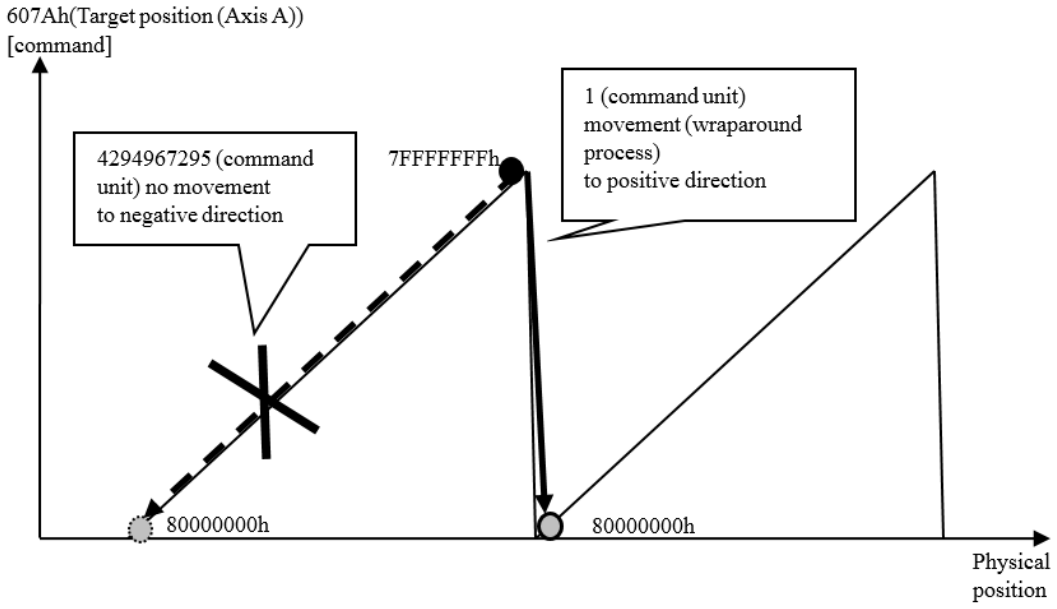
Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Bh		Position range limit (Axis A)	-	-	-	-	-	-	-
		• Set the boundary position coordinates wrap around.							
	00h	Highest sub-index supported	-	2	U8	ro	No	ALL	No
		• Displays the number of sub-indexes for 607Bh (Position range limit (Axis A)).							
	01h	Min position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO	ALL	Yes
		• When the position coordinate falls below this setting value (minimum value), the value is wrapped around to the other range (maximum value). In continuous rotating absolute encoder mode, the value calculated with the internal processing is automatically set. For modes other than continuous rotating absolute encoder mode, the value is internally treated as 80000000h (shipment setting value).							
	02h	Max position range limit	Command	-2147483648 to 2147483647	I32	rw	RxPDO	ALL	Yes
		• When the position coordinate exceeds this setting value (maximum value), the value is wrapped around to the other range (minimum value). In continuous rotating absolute encoder mode, the value calculated with the internal processing is automatically set. For modes other than continuous rotating absolute encoder mode, the value is internally treated as 7FFFFFFFh (shipment setting value).							

■ **Example of wraparound process**

607Bh-01h (Min position range limit) = 80000000h

607Bh-02h (Max position range limit) = 7FFFFFFFh

In the above case, when 607Ah (Target position (Axis A)) changes from 7FFFFFFFh to 80000000h. (absolute positioning mode)

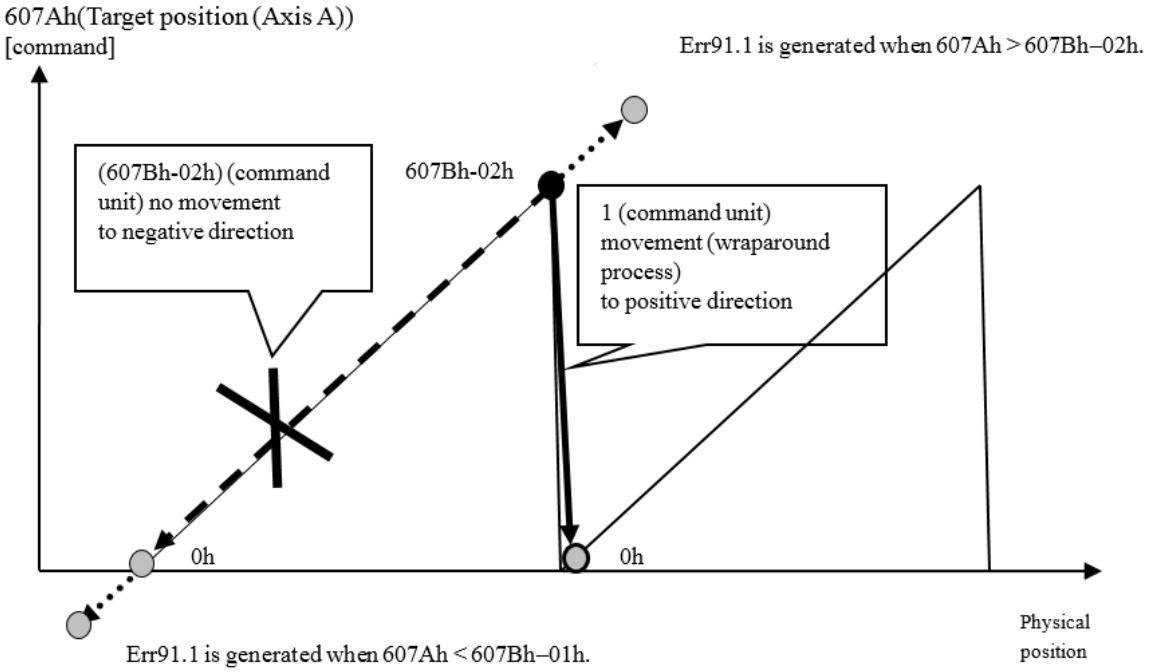


■ **Example of wraparound process (Continuous rotating absolute encoder function mode)**

607Bh-01h (Min position range limit) = 0h

The case where 607Ah (Target position (Axis A)) is changed from 607Bh-02h to 607Bh-01h (transfer of absolute value),

when 607Bh-02h (Max position range limit) = $\frac{2^{23}}{\text{Electronic gear ratio}} \times (2106\text{h-}59\text{h} + 1) - 1$



6.9.4.6 Home offset (607Ch)

Updating of this object is always possible, but it is reflected in the actual position information at the following timing.

- At the time of the power supply ON
- When establishing communication (when changing ESM state from Init to PreOP)
- When returning to origin is completed
- When clearing absolute multi-turn from PANATERM for Multi or EtherCAT communication
- When PANATERM for Multi operation(test run function, frequency response analyzing function, Z phase search, fit gain) is completed.
- When setting pin assign by PANATERM for Multi.
- When Err27.4 (Command error protection) occurs

The following objects are initialized (preset) based on the position at the aforementioned timing.

- When home position is detected

6063h(Position actual internal value (Axis A)) = 60FCh(Position demand internal value (Axis A)) = 0
6062h(Position demand value (Axis A)) = 6064h(Position actual value (Axis A))
= 607Ch(Home offset (Axis A))

- When initialize position except detecting home position

6063h(Position actual internal value (Axis A)) = 60FCh(Position demand internal value (Axis A))
6062h(Position demand value (Axis A)) = 6064h (Position actual value (Axis A))
= 6063h (Position actual internal value (Axis A))
+ 607Ch (Home offset (Axis A))

Note

The above descriptions are for cases where the electronic gear ratio is 1:1 and polarity is not reversed.

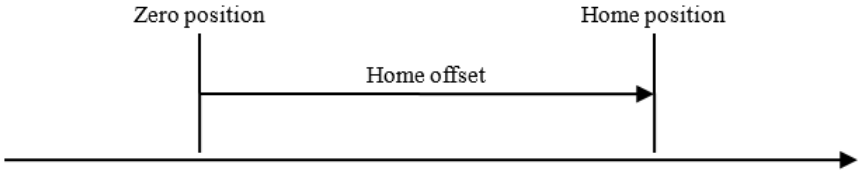
Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
607Ch	00h	Home offset (Axis A)	Command	-2147483648 to 2147483647	I32	rw	RxPDO	ALL	Yes
		• After completing the homing position control mode (hm), position information is set so that the detected index pulse position becomes equal to the value of this object. Also, the value of this object is added to the position information at the following timing. - At the time of the power supply ON - When establishing communication (when changing ESM state from Init to PreOP) - When returning to origin is completed - When clearing absolute multi-turn from PANATERM for Multi or EtherCAT communication - When PANATERM for Multi operation(test run function, frequency response analyzing function, Z phase search, fit gain) is completed. - When setting pin assign by PANATERM for Multi. - When Err27.4 (Command error protection) occurs							

◆ NOTE

- **If you do homing, the position information is reset. Therefore, it is necessary is re-acquired data acquired by the old coordinate system (for example, Touch probe position).**

■ **Home offset definition**

Home position	Home position detection position	
Zero position	In the case of the incremental system	0 (It is the position when the control power supply is turned on, or the position asked by subtracting the home offset from the home position detected by hm)
	In the case of the absolute system	In the case of the semi-closed control: Zero position of the absolute encoder In the case of the full-closed control: It is the zero position of the external scale of the absolute encoder.



6.9.4.7 Initialization of the absolute scale (Full-closed control)

Absolute data

With the absolute scale under full-closed control, 48-bit width position information is composed of low 24-bit(2388h:External scale data(Lower) (Axis A)) and high 24-bit(2387h:External scale data(Higher) (Axis A)) external scale position data, but the value set for the object as position information is in 32-bit width.

With respect to 6063h, only low 32-bit absolute scale data is set as position information, and only low 8 bits are significant in the case of high 24-bit data.

With respect to 6064h, position information is calculated based on the following formula, and the calculated position information will be in 32-bit width.

Therefore, the significant bit length of external scale position data under full-closed control varies depending on the electronic gear reverse conversion value.

Under full-closed control, if the value calculated by ((H×2^{24}+L) * Electronic gear reverse conversion value) exceeds the 32-bit width or if the denominator or numerator exceeds the 64-bit size in the process of the calculation above, Err29.1 (Counter overflow protection 1) occurs.

607Eh (Polarity (Axis A))	position information
When set to 0 (CCW is positive direction)	6063h = (H×2^{24}+L)　*Effective bit length of H is 8 bits.
	6064h = ((H×2^{24}+L) × Electronic gear reverse conversion value) + 607Ch *Effective bit length of H is 21 bits.
When set to 224 (CW is positive direction)	6063h = (H×2^{24}+L)　*Effective bit length of H is 8 bits.
	6064h = -((H×2^{24}+L) × Electronic gear reverse conversion value) + 607Ch *Effective bit length of H is 21 bits.

6063h: Position actual internal value (Axis A)

6064h: Position actual value (Axis A)

607Ch: Home offset (Axis A)

L: 2387h：External scale data(Higher) (Axis A)

H: 2388h：External scale data(Lower) (Axis A)

Clear of multi-turn data (Not supported)

In this software version, the full-closed control function (rotary scale) is not supported.

When the full-closed control function in rotary scale is used, it is possible to clear the multi-turn data.

Refer to

- Regarding the clear of multi-turn data, refer to “6.9.4.4 Initialization of the absolute encoder(Semi-closed control)“.
- Regarding the full-closed control function (rotary scale), refer to "Functional Specification (SX-DSV03455)".

6.9.4.8 Backlash compensation function (Not supported)

In this software version, the backlash compensation function is not supported.

- At the time of position control (including full-closed control), compensation of backlash (mechanical gap between the drive shaft and driven shaft) is possible by the object 2107h-05h (Selection of backlash compensation), 2107h-06h (Compensation amount of backlash), and 2107h-07h (Constant for backlash compensation).
- As for the feedback position at compensating the backlash, the compensated portion of backlash appears at the transient state during compensation of backlash. However, after completing the compensation of backlash, the value from which the compensated portion of backlash has been removed is returned.

Refer to

As for the specification regarding the function of backlash compensation, refer to "Functional Specification (SX-DSV03455)" in the Technical Reference.

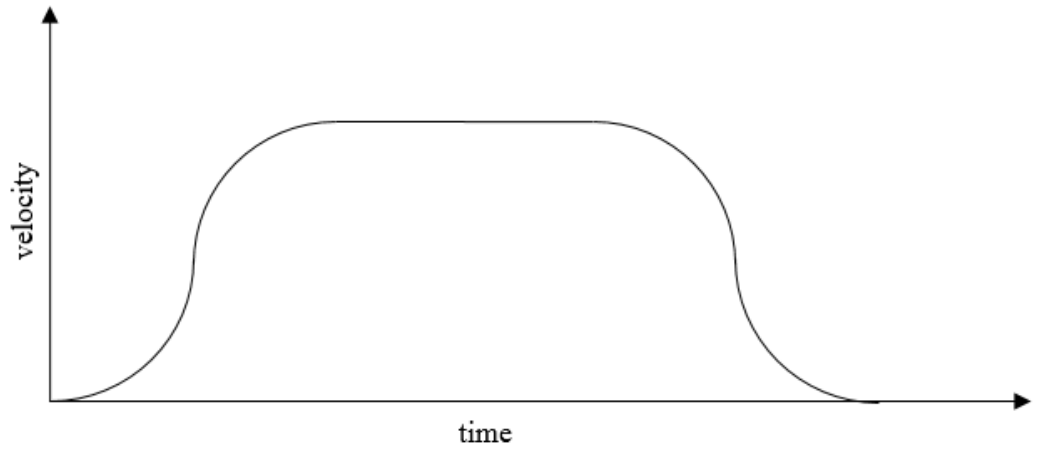
6.9.5 Jerk (Not supported)

This function is not supported by this software version.

Set the 6086h (Motion profile type (Axis A)), 60A4h-01h (Profile jerk1), and 60A4h-02h (Profile jerk2) at 0, and then set the 60A3h (Profile jerk use (Axis A)) at 1.

By setting up Jerk, the change rate of the degree of acceleration and deceleration can be smoothed.

■ **Velocity/time diagram with jerk positions**



This function cannot be used because it is not supported.

Also, can smooth using 2102h-17h (Positional command smoothing filter) and 2102h-18h (Positional command FIR filter).

Refer to

For more information, refer to "Functional Specification of the Technical document (SX-DSV03455)".

6.9.6 Interpolation time period (60C2h)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

60C2h (Interpolation time period (Axis A)) is set up automatically as follows with a communication cycle. Please do not change.

Item		Description	
		60C2h-01h	60C2h-02h
Communication cycle	125 µs	125	-6
	250 µs	25	-5
	500 µs	5	-4
	1 ms	1	-3
	2 ms	2	-3
	4 ms	4	-3

Index	Sub-Index	Name Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
60C2h	-	Interpolation time period (Axis A)	-	-	-	-	-	-	-
		• Set the interpolation time cycle.							
	00h	Highest sub-index supported	-	2	U8	ro	No	ip csp csv cst	No
		• Displays the number of sub-indexes for 60C2h (Interpolation time period (Axis A)).							
	01h	Interpolation time period value	-	0 to 255	U8	rw	No	ip csp csv cst	Yes
		• Set the interpolation time cycle value. Set up automatically with a communication cycle.							
	02h	Interpolation time index	-	-128 to 63	I8	rw	No	ip csp csv cst	Yes
		• Set the interpolation time index. Set up automatically with a communication cycle.							

6.9.7 Servo information monitor object

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

This is the object for monitoring information owned by the driver module.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2029h	00h	Drive serial number	-	-	VS	ro	No	ALL	No
		• The amplifier serial number is displayed. (A maximum of 8 characters) NULL is 2 bytes at the end. The size of this object is 10 bytes. Example: “17100001”							
2120h	00h	History number (Axis A)	-	0 to 3	U8	rw	No	ALL	No
		• Select alarm incidental information to be displayed at 212Ch (Alarm accessory information (Axis A)). When set to 0, displays incidental information of the current alarm. When set to 1 to 3, displays supplementary information on alarms from 1 to 3 before the alarm that occurred in the past.							
2121h	00h	Alarm main no (Axis A)	-	0 to 127	U8	rw	No	ALL	No
		• - Select the alarm sub-number information to display with 2337h-10h (Multiple sub alarm information). The alarm sub number information of the alarm main number set in this object is displayed.							
2125h	-	External scale ID (Axis A)	-	-	-	-	-	-	-
		• The external scale ID is displayed.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		- The number of Sub-Index of 2125h (External scale ID (Axis A)) is displayed.							
	01h	External scale vendor ID	-	-	VS	ro	No	ALL	No
		• The vendor ID of the external scale ID is displayed. NULL is 1 byte at the end. The size of this object is 2 bytes. 3: Mitutoyo Corporation 4: Magnescale Co., Ltd. 5: Common ID (Panasonic communication specification)							
	02h	External scale model ID	-	-	VS	ro	No	ALL	No
		• The model ID of the external scale is displayed. NULL is 1 byte at the end. The size of this object is 2 bytes.							

Vendor name	Model ID	
		Absolute/Incremental
Mitutoyo Corp.	1	Absolute
	2	Absolute (Electromagnetic induction type)
	3	Incremental
Magnescale Co., Ltd.	1	Absolute
	2	Incremental
	3	Incremental (Laser scale)
Common ID (Panasonic communication specification)	1	Absolute
	2	Incremental

2127h	00h	Motor serial number (Axis A)	-	-	VS	ro	No	ALL	No
		• The motor serial number is displayed. (A maximum of 8 characters) NULL is 2 bytes at the end. The size of this object is 10 bytes. Example: “17040021”							
212Bh	00h	Over load factor (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	ALL	No
		• The overload factor (ratio to the motor rated load) is displayed.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Ch	-	Alarm accessory information (Axis A)	-	-	-	-	-	-	-
		• The supplementary information of the alarm specified by 2120h (History number (Axis A)) is displayed. - When 2120h (History number (Axis A))=0 is set, the supplementary information of the current alarm is displayed. - When 2120h (History number (Axis A)) = 1 to 3 is set, supplementary information on previous alarms from 1 to 3 that occurred in the past is displayed.							
	00h	Number of entries	-	36	U8	ro	No	ALL	No
		• The number of Sub-Index of 212Ch (Alarm accessory information (Axis A)) is displayed.							
	01h	History number echo	-	0 to 3	U8	ro	No	ALL	No
		• Echo back of the history number set with 2120h (History number (Axis A)) is displayed.							
	02h	Alarm code	-	0 to 4294967295	U32	ro	No	ALL	No
		• Alarm code is displayed. bit31-15: Used by manufacturer bit14-8: Alarm main numbers bit7-0: Alarm sub numbers							
	03h	Control mode	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Control mode is displayed. 0: Position control mode 1: Velocity control mode 2: Torque control mode 3: Full closed control mode							
	04h	Motor speed	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Motor speed is displayed.							
	05h	Positional command velocity	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Position command velocity is displayed.							
	06h	Velocity control command	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Velocity control command is displayed.							
	07h	Torque command	0.05%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Torque command is displayed.							
	08h	Position command deviation	Command	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Position command deviation is displayed.							
	09h	Position actual internal value	pulse	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Motor position is displayed.							
	0Bh	Input port (logic signal)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Input port (logic signal) is displayed.							
	0Ch	Output port (logic signal)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Output port (logic signal) is displayed.							
	0Dh	Analog input	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Analog input is displayed.							
	10h	Overload ratio	0.2%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Overload ratio is displayed.							
	11h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Regenerative load ratio is displayed.							
	12h	Voltage across PN	V	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Voltage across PN is displayed.							
	13h	Temperature of amplifier	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Amplifier temperature is displayed.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
212Ch	14h	Warning flags	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Warning flags are displayed. Bit assignment is as follows.							

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)							
Bit	23	22	21	20	19	18	17	16
Function	(Not Supported)							
Bit	15	14	13	12	11	10	9	8
Function	(Note Supported)	Scale communica-tion	Oscilation detection	Main power off	(Not Supported)			Scale error
Bit	7	6	5	4	3	2	1	0
Function	Overload	Fan lock	Over-regeneration	Encoder communicati on	Encoder overheat	Lifetime detection	(Not Supported)	Battery warning

	15h	Inertia ratio	%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Inertia ratio is displayed.							
	19h	Temperature of encoder	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Encoder temperature is displayed.							
	1Dh	U-phase current detection value	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• U-phase current detection value is displayed.							
	1Eh	W-phase current detection value	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• W-phase current detection value is displayed.							
	21h	Encoder single-turn data	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Encoder single-turn data is displayed.							
	22h	Encoder communication error count (accumulated)	times	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Number of continuous occurrences of encoder communication errors (Accumulated value) is displayed.							
	23h	External scale communication data error count (accumulated)	times	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• - Number of continuous occurrences of external scale communication errors (Accumulated value) is displayed.							

Note

212Ch (Alarm accessory information (Axis A)) does not support PDO.

Since each Sub-Index of 212Ch is read from SDO communication, simultaneity cannot be guaranteed.

<table>
<tr><th>Index</th><th>Sub-Index</th><th>Name
Description</th><th>Units</th><th>Range</th><th>Data Type</th><th>Access</th><th>PDO</th><th>Op-mode</th><th>EEPROM</th></tr>
<tr><td>2301h</td><td>00h</td><td>Following error actual value (after filtering) (Axis A)</td><td>command</td><td>-2147483648 to 2147483647</td><td>I32</td><td>ro</td><td>TxPDO</td><td>pp
hm
csp</td><td>No</td></tr>
<tr><td colspan="10">• Position deviation (after filtering) is displayed.</td></tr>
<tr><td>2304h</td><td>00h</td><td>Position command internal value (after filtering) (Axis A)</td><td>command</td><td>-2147483648 to 2147483647</td><td>I32</td><td>ro</td><td>TxPDO</td><td>pp
hm
csp</td><td>No</td></tr>
<tr><td colspan="10">• Internal command position (after filtering) is displayed.</td></tr>
<tr><td>230Ch</td><td>00h</td><td>Velocity command value (after filtering) (Axis A)</td><td>r/min</td><td>-2147483648 to 2147483647</td><td>I32</td><td>ro</td><td>TxPDO</td><td>pp
hm
csp</td><td>No</td></tr>
<tr><td colspan="10">• Command speed (after filtering) is displayed.
Note
This object displays the same value as 23A5h (Velocity internal position command).
Please use 23A5h when monitoring.</td></tr>
<tr><td>230Dh</td><td>00h</td><td>External scale position (Axis A)</td><td>pulse
(external scale)</td><td>-2147483648 to 2147483647</td><td>I32</td><td>ro</td><td>TxPDO</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="10">• Position of the external scale is displayed.</td></tr>
<tr><td>2020h</td><td>00h</td><td>Regenerative load ratio</td><td>%</td><td>-2147483648 to 2147483647</td><td>I32</td><td>ro</td><td>TxPDO</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="10">• Regenerative load ratio (ratio of the regenerative overload protection to the alarm occurrence level) is displayed.</td></tr>
<tr><td>2321h</td><td>00h</td><td>Logical input signal (Axis A)</td><td>-</td><td>0 to 4294967295</td><td>U32</td><td>ro</td><td>TxPDO</td><td>ALL</td><td>No</td></tr>
<tr><td colspan="10">• Logic level of input signal is displayed.
<table>
<tr><td>Bit</td><td>31</td><td>30</td><td>29</td><td>28</td><td>27</td><td>26</td><td>25</td><td>24</td></tr>
<tr><td>Function</td><td>Dynamic brake switching input (DB-SEL)</td><td colspan="2">(Not Supported)</td><td>Safety input 2 (SF2)</td><td>Safety input 1 (SF1)</td><td colspan="3">(Not Supported)</td></tr>
<tr><td>Bit</td><td>23</td><td>22</td><td>21</td><td>20</td><td>19</td><td>18</td><td>17</td><td>16</td></tr>
<tr><td>Function</td><td colspan="8">(Not Supported)</td></tr>
<tr><td>Bit</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td></tr>
<tr><td>Function</td><td colspan="8">(Not Supported)</td></tr>
<tr><td>Bit</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>Function</td><td>Forced alarm input (E-STOP)</td><td colspan="4">(Not Supported)</td><td>Positive direction over-travel inhibition input (POT)</td><td>Negative direction over-travel inhibition input (NOT)</td><td>External alarm clear input (A-CLR)</td><td>(Not Supported)</td></tr>
</table></td></tr>
</table>

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2322h	00h	Logical output signal (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No

• Logic level of output signal is displayed.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)	STO status monitor output (STO) (Note 2) (Note 3)	(Not Supported)					General purpose output (EX-OUT1)
Bit	23	22	21	20	19	18	17	16
Function	EDM output (EDM)	Velocity command ON/OFF output (V-CMD)	Alarm attribute output (ALM-ATB)	Speed in-limit output (V-LIMIT)	Positioning complete output 2 (INP2)	Positional command ON/OFF output (P-CMD)	Warning output 2 (WARN2)	Warning output 1 (WARN1)
Bit	15	14	13	12	11	10	9	8
Function	Servo on status output (SRV-ST) (Note 1)	(Not Supported)				Deterioration diagnosis speed output (V-DIAG)	At-velocity output (AT-SPEED)	(Not Supported)
Bit	7	6	5	4	3	2	1	0
Function	(Not Supported)	Speed matching output (V-COIN)	Torque in-limit signal output (TLC)	Zero-speed detection output signal (ZSP)	External brake release signal (BRK-OFF)	Positioning complete output (INP)	Alarm output (ALM)	Servo-Ready output (S-RDY)

(Note 1) 0 indicates the servo ON status and 1 indicates the servo OFF status.
(Note 2) Please refer to the "Functional Specification edition (SX-DSV03455)" for STO status.
(Note 3) STO status monitor output signal is not a safety related part.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2323h	00h	Logical input signal (expansion portion) (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No

• Logical level of input signal (extended portion) is displayed.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)							
Bit	23	22	21	20	19	18	17	16
Function	(Not Supported)	General purpose monitor input 5 (SI-MON5)	General purpose monitor nput 4 (SI-MON4)	General purpose monitor input 3 (SI-MON3)	General purpose monitor input 2 (SI-MON2)	General purpos monitor input 1 (SI-MON1)	(Not Supported)	
Bit	15	14	13	12	11	10	9	8
Function	(Not Supported)		Retracting operation input (RET)	(Not Supported)				
Bit	7	6	5	4	3	2	1	0
Function	(Not Supported)			Origin proximity input (HOME)	(Not Supported)		External latch input 2 (EXT2)	External latch input 1 (EXT1)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2021h	00h	Physical input signal	-	0 to 4294967295	U32	ro	TxPDO	ALL	No

Physical level status of input signal is displayed.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)							
Bit	23	22	21	20	19	18	17	16
Function	(Not Supported)							
Bit	15	14	13	12	11	10	9	8
Function	(Not Supported)							
Bit	7	6	5	4	3	2	1	0
Function	SI8 Input	SI7 Input	SI6 Input	SI5 Input	SI4 Input	SI3 Input	SI2 Input	SI1 Input

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2022h	00h	Physical output signal	-	0 to 4294967295	U32	ro	TxPDO	ALL	No

Physical level of output signal is displayed.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)							
Bit	23	22	21	20	19	18	17	16
Function	(Not Supported)							
Bit	15	14	13	12	11	10	9	8
Function	(Not Supported)							
Bit	7	6	5	4	3	2	1	0
Function	(Not Supported)					SO3 output	SO2 output	SO1 output

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Inertia ratio is displayed.

The ratio of load inertia to the motor's rotor inertia (equivalent of value of 2100h-05h)

Inertia ratio = (load inertia/rotor inertia) x 100

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2332h	00h	Motor automatic identification (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Enabled state of automatic motor identification is displayed.

0: Automatic identification is invalid.

1: Automatic identification is valid.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2333h	00h	Cause of motor no work (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• The number which shows the cause that the motor is not running is displayed.

Cause number (Note 1)	item	Contents (Note 2)
0	No cause	Any cause of no revolution cannot be detected. The state that the motor normally rotates.
1	Not in servo ready state	• The main power of the driver module has not been turned on or some kind of errors is occurring. • Synchronization between communication and servo is not established. • STO status Due to the aforementioned reasons, the servo ready is off.
2	Servo On command is not given to the driver module	• The Servo On command is not given to the driver module. • The PDS state is not “Operation enabled”, etc.
3	Over-travel inhibit input active	Pr5.04=0, 1 (Over-travel inhibit input active) • Positive drive inhibit input (POT) is ON and operation command is positive direction. • Negative drive inhibit input (NOT) is ON and operation command is negative direction. Pr5.04=2 (Occurrence of alarm with over-travel inhibit input) • Positive drive inhibit input (POT) or Negative drive inhibit input (NOT) is ON regardless of operation command input.
4	Torque limit value too small	Valid torque limit value is set to 5% or below the rated value.
7	Too low frequency of position command input	Position command per control period is 1 command unit or smaller.
10	Too low command speed through EtherCAT communication	The command speed through EtherCAT communication is set at 30 [r/min] or lower.
11	Manufacturer use	-
12	Too low command torque through EtherCAT communication	The command torque from EtherCAT communication is low: 5% or below the rated value.
13	Speed limit too low	The speed limit value of 6080h is set to 30[r/min] or below.
14	Other causes	Above mentioned 1 to 13 cases are not available and the motor does not rotate. (Too small command value, too heavy load, locking, crashing, driver module /motor failure, etc.)

(Note 1) Even if the value that was read out was other than 0, the motor may revolve.

(Note 2) The position command generation process may be interrupted by over-travel inhibit input, resulting detection of cause 7 instead of cause 3.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2334h	00h	Warning flags (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• The flag indicating the status of warnings that are currently occurring is displayed.

Bit assignment is as follows.

Bit	31	30	29	28	27	26	25	24
Function	(Not Supported)				PSM rated output power overload (Note 1)	PSM main power supply overload (Note 1)	(Not Supported)	PANATERM for Multi command execution
Bit	23	22	21	20	19	18	17	16
Function	Deteriora-tion diagnosis	(Not Supported)						PSM Fan lock
Bit	15	14	13	12	11	10	9	8
Function	(Not Supported)	scale communica-tion	Oscillation detection	Main power off	(Not Supported)			scale error
Bit	7	6	5	4	3	2	1	0
Function	Overload	DM Fan lock	PSM Over-regeneration	Encoder Communica-tion	Encoder overhea	Lifetime detection	(Not Supported)	Battery warning

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2337h	-	Multiple alarm/warning information (Axis A)	-	-	-	-	-	-	-

• The information of alarms and warnings that are currently occurring is indicated to an applicable bit.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
	00h	Number of entries	-	18	U8	ro	No	ALL	No

• The number of Sub-Index of 2337h (Multiple alarm/warning information (Axis A)) is displayed.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
	01h	Multiple alarm information 1	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Alarm information of alarm main numbers 0 to 31 is displayed.

Bit	31	30	29	28	27	26	25	24
Function	Err31.*	Err30.*	Err29.*	Err28.*	Err27.*	Err26.*	Err25.*	Err24.*
Bit	23	22	21	20	19	18	17	16
Function	Err23.*	Err22.*	Err21.*	Err20.*	Err19.*	Err18.*	Err17.*	Err16.*
Bit	15	14	13	12	11	10	9	8
Function	Err15.*	Err14.*	Err13.*	Err12.*	Err11.*	Err10.*	Err9.*	Err8.*
Bit	7	6	5	4	3	2	1	0
Function	Err7.*	Err6.*	Err5.*	Err4.*	Err3.*	Err2.*	Err1.*	Err0.*

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
	02h	Multiple alarm information 2	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Alarm information of alarm main numbers 32 to 63 is displayed.

Bit	31	30	29	28	27	26	25	24
Function	Err63.*	Err62.*	Err61.*	Err60.*	Err59.*	Err58.*	Err57.*	Err56.*
Bit	23	22	21	20	19	18	17	16
Function	Err55.*	Err54.*	Err53.*	Err52.*	Err51.*	Err50.*	Err49.*	Err48.*
Bit	15	14	13	12	11	10	9	8
Function	Err47.*	Err46.*	Err45.*	Err44.*	Err43.*	Err42.*	Err41.*	Err40.*
Bit	7	6	5	4	3	2	1	0
Function	Err39.*	Err38.*	Err37.*	Err36.*	Err35.*	Err34.*	Err33.*	Err32.*

(Note 1) Supported in a software version of function expansion edition 1 or later

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2337h	03h	Multiple alarm information 3	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Alarm information of alarm main numbers 64 to 95 is displayed.

Bit	31	30	29	28	27	26	25	24
Function	Err95.*	Err94.*	Err93.*	Err92.*	Err91.*	Err90.*	Err89.*	Err88.*
Bit	23	22	21	20	19	18	17	16
Function	Err87.*	Err86.*	Err85.*	Err84.*	Err83.*	Err82.*	Err81.*	Err80.*
Bit	15	14	13	12	11	10	9	8
Function	Err79.*	Err78.*	Err77.*	Err76.*	Err75.*	Err74.*	Err73.*	Err72.*
Bit	7	6	5	4	3	2	1	0
Function	Err71.*	Err70.*	Err69.*	Err68.*	Err67.*	Err66.*	Err65.*	Err64.*

04h	Multiple alarm information 4	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Alarm information of alarm main numbers 96 to 127 is displayed.

Bit	31	30	29	28	27	26	25	24
Function	Err127.*	Err126.*	Err125.*	Err124.*	Err123.*	Err122.*	Err121.*	Err120.*
Bit	23	22	21	20	19	18	17	16
Function	Err119.*	Err118.*	Err117.*	Err116.*	Err115.*	Err114.*	Err113.*	Err112.*
Bit	15	14	13	12	11	10	9	8
Function	Err111.*	Err110.*	Err109.*	Err108.*	Err107.*	Err106.*	Err105.*	Err104.*
Bit	7	6	5	4	3	2	1	0
Function	Err103.*	Err102.*	Err101.*	Err100.*	Err99.*	Err98.*	Err97.*	Err96.*

10h	Multiple sub alarm information	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Alarm information of the sub number of the set alarm main number set with 2121h (Alarm main no (Axis A)).

Refer to

Refer to the readout procedure of alarm information of the 2337h (Multiple alarm/warning information (Axis A))

Bit	31	30	29	28	27	26	25	24
Function	Err*.31	Err*.30	Err*.29	Err*.28	Err*.27	Err*.26	Err*.25	Err*.24
Bit	23	22	21	20	19	18	17	16
Function	Err*.23	Err*.22	Err*.21	Err*.20	Err*.19	Err*.18	Err*.17	Err*.16
Bit	15	14	13	12	11	10	9	8
Function	Err*.15	Err*.14	Err*.13	Err*.12	Err*.11	Err*.10	Err*.9	Err*.8
Bit	7	6	5	4	3	2	1	0
Function	Err*.7	Err*.6	Err*.5	Err*.4	Err*.3	Err*.2	Err*.1	Err*.0

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2337h	11h	Multiple warning information 1	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Warning information of warning codes A0h to BFh is displayed.

Bit	31	30	29	28	27	26	25	24
Function	WngBFh	WngBEh	WngBDh	WngBCh	WngBBh	WngBAh	WngB9h	WngB8h
Bit	23	22	21	20	19	18	17	16
Function	WngB7h	WngB6h	WngB5h	WngB4h	WngB3h	WngB2h	WngB1h	WngB0h
Bit	15	14	13	12	11	10	9	8
Function	WngAFh	WngAEh	WngADh	WngACh	WngABh	WngAAh	WngA9h	WngA8h
Bit	7	6	5	4	3	2	1	0
Function	WngA7h	WngA6h	WngA5h	WngA4h	WngA3h	WngA2h	WngA1h	WngA0h

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
	12h	Multiple warning information 2	-	-2147483648 to 2147483647	I32	ro	No	ALL	No

• Warning information of warning codes C0h to DFh is displayed.

Bit	31	30	29	28	27	26	25	24
Function	WngDFh	WngDEh	WngDDh	WngDCh	WngDBh	WngDAh	WngD9h	WngD8h
Bit	23	22	21	20	19	18	17	16
Function	WngD7h	WngD6h	WngD5h	WngD4h	WngD3h	WngD2h	WngD1h	WngD0h
Bit	15	14	13	12	11	10	9	8
Function	WngCFh	WngCEh	WngCDh	WngCCh	WngCBh	WngCAh	WngC9h	WngC8h
Bit	7	6	5	4	3	2	1	0
Function	WngC7h	WngC6h	WngC5h	WngC4h	WngC3h	WngC2h	WngC1h	WngC0h

◆ NOTE

- **The procedure for reading alarm information of 4F37h is shown below.**
  (example) When reading alarm information with Err26.1 and Err38.0 occurring in multiple.
  - **Alarm information of alarm main numbers 0 to 31 is acquired from 4F37h-01h.**
    When Err26.1 occurs, 1 is returned to bit 26.
  - **Alarm information of alarm main numbers 32 to 63 is acquired from 4F37h-02h.**
    When Err38.0 occurs, 1 is returned to bit 6.
  - **Alarm information of alarm main numbers 64 to 95 is acquired from 4F37h-03h.**
    It returns 0 because the corresponding alarm has not occurred.
  - **Alarm information of alarm main numbers 96 to 127 is acquired from 4F37h-04h.**
    It returns 0 because the corresponding alarm has not occurred.
- **Next, the alarm sub number is acquired for the alarm main number where the alarm is generated.**
  - **Set 26 to 4310h (Alarm main no) and obtain the alarm sub number of alarm main number 26 from 4F37h-10h.**
    When Err26.1 occurs, 1 is returned to bit 1.
  - **Set 38 to 4310h (Alarm main no) and obtain the alarm sub number of alarm main number 38 from 4F37h-10h.**
    When Err38.0 occurs, 1 is returned to bit 0.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2341h	-	Motor encoder data (Axis A)	-	-	-	-	-	-	-
		• Position information is displayed.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		• The number of Sub-Index of 2341h (Motor encoder data) is displayed.							
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Motor mechanical angle (encoder single-turn data) is displayed.							
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Multi-turn data of the absolute encoder is displayed. Note At the time of the increment mode (2100h-10h =1), multi-turn data become undefined values.							
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The electrical angle of the motor is displayed.							
2344h	00h	Encoder status (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Status of encoder is displayed.							
2348h	00h	External scale pulse total (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Sum of external scale pulse counts is displayed.							
2349h	00h	External scale absolute position (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Absolute position of the external scale is displayed.							
234Ah	00h	External scale position deviation (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Full close deviation is displayed.							
202Ah	00h	Power on cumulative time	30 minutes	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Cumulative on-time of control power to the driver module is displayed.							
2023h	00h	Temperature of amplifier	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Temperature inside the driver module is displayed.							
2363h	00h	Temperature of encoder (Axis A)	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Encoder inside the encoder is displayed. Note Applicable only to 23-bit encoder: 0 for unsupported encoder.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2364h	00h	Inrush resistance relay operating count (Axis A)	times	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Number of inrush current resistance relay operations is displayed. (Note 1) Note Saturation will occur at maximum value of 40000000h.							
2365h	00h	Dynamic brake operating count (Axis A)	times	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Number of dynamic brake relay operations is displayed. (Note 1) Note Saturation will occur at maximum value of 40000000h.							
2024h	00h	Fan operating time	30 minutes	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Operating time of the cooling fan is displayed. (Note 1) (Note 2)							
2025h	00h	Fan life expectancy	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Cumulative value of cooling fan life is displayed. (Note 1) (Note 2)							
2026h	00h	Capacitor life expectancy	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The ratio when the life of the main power condenser is set to 100%. (Note 1)							
236Ch	00h	Motor power consumption (Axis A)	W	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Motor power consumption is displayed.							
236Dh	00h	Amount of motor power consumption (Axis A)	Wh	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Motor power consumption amount is displayed.							
236Eh	00h	Cumulative value of motor power consumption (Axis A)	Wh	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Cumulative value of motor power consumption is displayed. (Note 1) Note Saturation will occur at maximum value of 2147483647.							
2027h	00h	Lost link error count	times	0 to 65535	U16	ro	No	ALL	No
		• Cumulative number of lost links is displayed.							
2028h	00h	Synchronization signal error count	times	0 to 65535	U16	ro	No	ALL	No
		• Number of consecutive misses sync or IRQ is displayed.							
2381h	00h	Encoder communication error count (accumulated) (Axis A)	times	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Number of cumulative number of occurrences of encoder communication errors is displayed. Note Saturation will occur at maximum value of FFFh. Cleared by reboot of driver module or reset of control power supply.							
2383h	00h	External scale communication error count (accumulated) (Axis A)	times	0 to 65535	U16	ro	TxPDO	ALL	No
		• Number of cumulative number of occurrences of external communication errors is displayed. Note Saturation will occur at maximum value of FFFh. Cleared by reboot of driver module or reset of control power supply.							

(Note 1) It is recorded every 30 minutes. It will be truncated from the integrated value if power supply is cut off before 30 minutes elapse.
(Note 2) It becomes 0 when the fan is not installed.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2384h	00h	External scale communication data error count (accumulated) (Axis A)	times	0 to 65535	U16	ro	TxPDO	ALL	No
		• Number of cumulative number of occurrences of external communication data errors is displayed. Note Saturation will occur at maximum value of FFFh. Cleared by reboot of driver module or reset of control power supply.							
2386h	00h	Hybrid deviation (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Hybrid deviation is displayed.							
2387h	00h	External scale data (Higher) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Higher 24 bits of external scale data is displayed.							
2388h	00h	External scale data (Lower) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Lower 24 bits of external scale data is displayed.							
2389h	00h	External scale status (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No
		• Status of the external scale ID is displayed.							
238Ah	00h	External scale Z phase counter (Axis A)	-	0 to 65535	U16	ro	No	ALL	No
		• When incremental external scale is used in full-closed control or in semi-closed control with the external scale position information monitor function enabled, the Z-phase counter value read from the external scale is displayed as 0 to F [hex].							
238Ch	00h	External scale single-turn data (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• External scale single-turn data are displayed.							
2391h	00h	Estimation accuracy of magnetic pole position (Axis A)	degree	0 to 180	U8	ro	TxPDO	ALL	No
		• Estimation accuracy when executing estimation of the magnetic pole position (electrical angle: 0 - 180 [deg]) is displayed. Note Since this object is not supported in the MINAS A6 Multi series, 0 is always returned.							
2392h	00h	Execution time of estimation of magnetic pole position (Axis A)	ms	0 to 65535	U16	ro	TxPDO	ALL	No
		• Execution time (run-time) when estimating the magnetic pole position is displayed. Note Since this object is not supported in the MINAS A6 Multi series, 0 is always returned.							
2393h	00h	Maximum travel distance to positive direction when estimating magnetic pole position (Axis A)	pulse (feedback scale unit)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• By putting the start position of executing estimation of the magnetic pole position as a reference, the maximum travel distance [pulse] to the positive direction is returned. Note Since this object is not supported in the MINAS A6 Multi series, 0 is always returned.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2394h	00h	Maximum travel distance to negative direction when estimating magnetic pole position (Axis A)	pulse (feedback scale unit)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• By putting the start position of executing estimation of the magnetic pole position as a reference, the maximum travel distance (pulse) to the negative direction is returned. Note Since this object is not supported in the MINAS A6 Multi series, 0 is always returned.							
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Velocity control command is displayed.							
23A5h	00h	Velocity internal position command (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Internal position command velocity is displayed.							
23A6h	00h	Velocity error actual value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No
		• Speed deviation is displayed. 0 is displayed under full-closed control.							
23A7h	00h	External scale position (Applied polarity) (Axis A)	pulse (external scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• The external scale position (Polarity applied) is displayed.							
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Positive direction torque limit value is displayed.							
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Negative direction torque limit value is displayed.							
23ABh	00h	Gain switching flag (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No
		• Gain switching flag is displayed.							

Value	Description
0	First gain section
1	Second gain section
3	Third gain section

23B1h	00h	Deterioration diagnosis state (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Deterioration diagnosis status is displayed.							

Bit no.	Description
0	Deterioration diagnosis warning is enabled
1	Load characteristics estimation is enabled
2	Load characteristics estimation convergence is completed
3	Deterioration diagnosis velocity output
4	Deterioration diagnosis torque average time has passed
5	Deterioration diagnosis warning factor (torque command average value)
6	Deterioration diagnosis warning factor (inertia ratio)
7	Deterioration diagnosis warning factor (offset load)
8	Deterioration diagnosis warning factor (dynamic friction)
9	Deterioration diagnosis warning factor (viscous friction)

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
23B2h	00h	Deterioration diagnosis torque command average value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Deterioration diagnosis torque command average value is displayed.							
23B3h	00h	Deterioration diagnosis torque command standard value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Deterioration diagnosis torque command standard deviation is displayed.							
23B4h	00h	Deterioration diagnosis inertia ratio estimate value (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Deterioration diagnosis inertia ratio is displayed.							
23B5h	00h	Deterioration diagnosis offset load estimate value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Deterioration diagnosis offset load estimate value is displayed.							
23B6h	00h	Deterioration diagnosis dynamic friction estimate value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• Deterioration diagnosis dynamic friction estimate is displayed.							
23B7h	00h	Deterioration diagnosis viscous friction estimate value (Axis A)	0.1%/ (10000 r/min)	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• - Deterioration diagnosis viscous friction estimate is displayed.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
202Bh	-	EoE information display	-	-	-	-	-	-	-
		• EoE setting information is displayed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• The number of Sub-Index of 202Bh (EoE information display) is displayed.							
	01h	Virtual MAC address	-	-	VS	ro	No	ALL	No
		• The virtual MAC address(17byte) set for the device is displayed. Example: “02:01:05:30:03:e9” 18 to 22 bytes are NULL. The value after 23 bytes is undefined. The size of this object is 44 bytes including undefined values.							
	02h	IP address	-	-	VS	ro	No	ALL	No
		• The IP address (Max 15byte) set for the device is displayed. Example: “192.168.1.2” A 1-byte NULL is entered after the IP address. Values after the next data after NULL are undefined. The size of this object is 36 bytes including undefined values.							
	03h	Subnet mask	-	-	VS	ro	No	ALL	No
		• The subnet mask (Max 15byte) set for the device is displayed. Example: “255.255.255.0” A 1-byte NULL is entered after the subnet mask. Values after the next data after NULL are undefined. The size of this object is 36 bytes including undefined values.							
	04h	Default Gateway	-	-	VS	ro	No	ALL	No
		• The default gateway (Max 15byte) set for the device is displayed. Example: “172.16.8.12” A 1-byte NULL is entered after the default gateway. Values after the next data after NULL are undefined. The size of this object is 36 bytes including undefined values.							
202Ch	-	Safety part information 1	-	-	-	-	-	-	-
		• Information about devices in the safety part is displayed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• - The number of Sub-Index of 202Ch (Safety part information 1) is displayed.							
	01h	Safety CPU1 version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The software version of CPU1 in the safety part is displayed.							
	02h	Safety CPU2 version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The software version of CPU2 in the safety part is displayed.							
	03h	Safety boot version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The boot software version of the safety part is displayed.							
	04h	Safety device ID	-	0 to 65535	U16	ro	No	ALL	No
		• The device ID of the safety part is displayed.							
	05h	Safety FPGA version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No
		• The FPGA version of the safety part is displayed.							
	06h	Safety serial number	-	0 to 4294967295	U32	ro	No	ALL	No
		• The serial number of the safety part (safety ID) is displayed.							

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
202Dh	-	Safety part information 2	-	-	-	-	-	-	-
		• Information related to I / O signals of the safety part displayed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• The number of Sub-Index of 202Dh (Safety part information 2) is displayed.							
	01h	Safety status info	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• The safety status information of the safety department is displayed. Refer to For details of safety status information, refer to the technical document (PANATERM for Safety Programming Manual).							
	02h	Safety digital inputs	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• The input signal of the safety part is displayed. Refer to For details on the input signal of the safety part, refer to the technical document (PANATERM for Safety Programming Manual).							
	03h	Safety digital outputs	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• The output signal of the safety part is displayed. Refer to For details on the output signal of the safety part, refer to the technical document (PANATERM for Safety Programming Manual).							
202Eh	-	Safety part information 3	-	-	-	-	-	-	-
		The alarm information of the safety part displayed.							
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No
		• The number of Sub-Index of 202Eh (Safety part information 3) is displayed.							
	01h	Safety code main	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• The alarm code for the safety part is displayed. Refer to For details on alarm codes, refer to the technical document (PANATERM for Safety Programming Manual).							
	02h	Safety code ECS A	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• Among the alarm codes in the safety part, alarm codes related to the A-axis encoder are displayed. • Displayed only when the mute function is enabled. Refer to For details on encoder related alarm codes and mute function, refer to the technical document (PANATERM for Safety Programming Manual).							
	03h	Safety code ECS B	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• Among the alarm codes in the safety part, alarm codes related to the B-axis encoder are displayed. • Displayed only when the mute function is enabled. Refer to For details on encoder related alarm codes and mute function, refer to the technical document (PANATERM for Safety Programming Manual).							
	04h	Safety code ICS	-	-32768 to 32767	I16	ro	Yes	ALL	No
		• Among the alarm codes in the safety part, alarm codes related to digital input are displayed. • Displayed only when the mute function is enabled. Refer to For details on alarm codes related to digital input and mute function, refer to the technical document (PANATERM for Safety Programming Manual).							
202Fh (Note 1) (Note 2)	00h	Number of axes	-	0 to 255	U8	ro	No	ALL	No
		• The maximum number of motor axes that can be driven by the driver module is displayed.							

(Note 1) Not supported in the first edition of the software version (Ver1.01).
(Note 2) Do not use in a software version of function expansion edition 1.

6.9.8 Power supply module information monitor object

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
20C0h	-	Rated output power information	-	-	-	-	-	-	-
		• Rated output power information of the power supply module is displayed.							
	00h	Number of entries	-	2	U8	ro	No	ALL	No
		• The number of Sub-Index of 20C0h (Rated output power information) is displayed.							
	01h	Power Supply Module rated output power	0.01kW	0 to 65535	U16	ro	No	ALL	No
		• Power supply module rated output power is displayed.							
	02h	Drive Module total rated output power	0.01kW	0 to 65535	U16	ro	No	ALL	No
		• The sum of the rated output power of the drive modules connected to the power supply module is displayed. In case of 2-axis specification, rated output power for one drive module is calculated based on the number of used axes set in 2000h-15h.							

7

Servo Parameter Area (2000h to 201Fh, 2100h to 211Fh, 2500h to 251Fh

7.1 Object overview

Objects from 2000h to 201Fh, 2100h to 211Fh, and 2500h to 251Fh are assigned to the servo parameters. (Excluding Class 15)

Assignment to each servo parameter is as shown in the table below.

Servo parameter area	Assigned servo parameter
2000h to 201Fh	Servo parameter with the shared attribute
2100h to 211Fh	Servo parameter of Axis A
2500h to 251Fh	Servo parameter of Axis B

Refer to

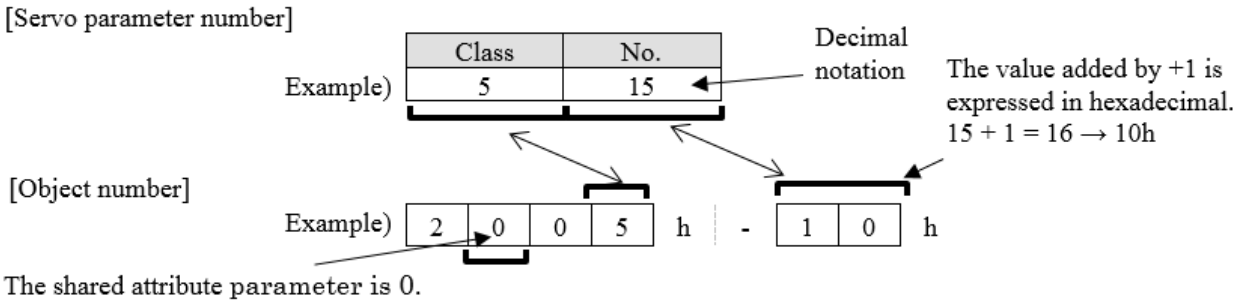
For more information on the servo parameters, refer to "Specification for basic functions (SX-DSV03455)".

The correspondence between the servo parameter numbers and object numbers is as follows:

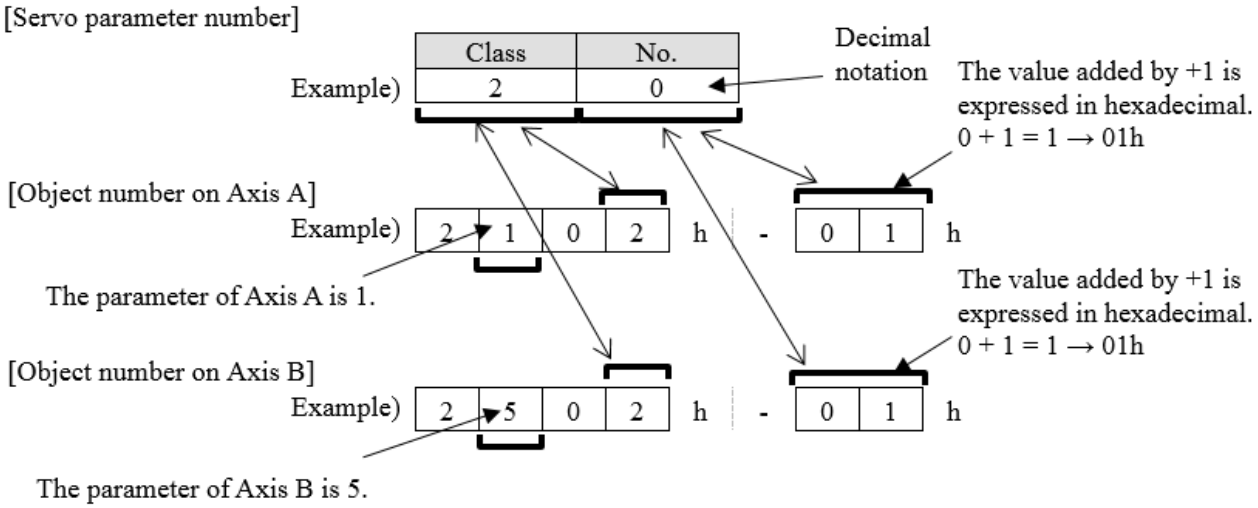
The classification number corresponds to the 1st digit of the Index, and No. indicates the value where the group of sub-index + 1 is converted into hexadecimal.

The third digit of the Index distinguishes the common (0), Axis A (1), and Axis B (5).

■ **Servo parameter with the shared attribute (2000h to 201Fh)**



■ **Servo parameters of Axis A (2100h to 211Fh, 2500h to 251Fh)**



8

EtherCAT Relevant Protection Functions

8.1 Error (alarm) list (Attribute and LED display)

The table below lists the LED display and alarm attribute when an error (alarm) occurs:

8.1.1 EtherCAT communication-related error (Alarm)

When an error(alarm) not related to EtherCAT communication occurs, the ERR Indicator display and AL Status Code are as follows.

- ERR Indicator display: OFF
- ESC register AL Status Code: 0000h

Err No		Alarm name	Clearable	Emergency stop (Note 1)	History (Note 2)	ERR Indicator display	ESC register AL Status Code
Main	Sub						
80	0	ESM unauthorized request error protection	Yes	Yes	Yes	Blinking	0011h
	1	ESM undefined request error protection	Yes	Yes	Yes	Blinking	0012h
	2	Bootstrap requests error protection	Yes	No	Yes	Blinking	0013h
	3	Incomplete PLL error protection	Yes	No	Yes	Single flash	002Dh
	4	PDO watchdog error protection	Yes	Yes	Yes	Double flash	001Bh
	6	PLL error protection	Yes	Yes	Yes	Single flash	0032h
	7	Synchronization signal error protection	Yes	Yes	Yes	Single flash	002Ch
81	0	Synchronization cycle error protection	Yes	No	Yes	Blinking	0035h
	1	Mailbox error protection	Yes	No	Yes	Blinking	0016h
	4	PDO watchdog error protection	Yes	No	Yes	Blinking	001Fh
	5	DC error protection	Yes	No	Yes	Blinking	0030h
	6	SM event mode error protection	Yes	No	Yes	Blinking	0028h
	7	SyncManager2/3 error protection	Yes	No	Yes	Blinking	001Dh 001Eh
85	0	TxPDO assignment error protection	Yes	No	Yes	Blinking	0024h
	1	RxPDO assignment error protection	Yes	No	Yes	Blinking	0025h
	2	Lost link error protection	Yes	Yes	Yes	Double flash	0000h
	3	SII EEPROM error protection	No	No	Yes	Flickering	0051h
88	0	Main power undervoltage protection (AC insulation detection 2)	Yes	Yes	No	OFF	0000h
	1	Control mode setting error protection	Yes	Yes	Yes	OFF	0000h
	2	ESM requirements during operation error protection	Yes	Yes	Yes	OFF	0000h
	3	Improper operation error protection	No	Yes	Yes	OFF	0000h

(Note 1) The emergency stop indicates the alarm that emergency stops the operation when 2105h-0Bh (Sequence at alarm) is set to 4 - 7. For more information, refer to "Specification for basic functions (SX-DSV03455)".

(Note 2) A "history" shows whether it leaves error(alarm) generating as a history at error(alarm) developmental time, or it does not leave.

The error(alarm) from which the "history" serves as Yes are saved as a generating history from Subindex06h -13h(Diagnosis message 1 - 14) of 10F3h(Diagnosis history) and 2281h(Diagnosis history (Axis A)) at developmental time.

8.2 EtherCAT-related details of error (Alarm)

Only EtherCAT communication-related error(alarm) are published in this chapter.

Refer to

Please refer to the volume on "Functional Specification (SX-DSV03455)" for other alarms.

The AL Status Code and ESM status are updated to the latest error status related to the EtherCAT every time an EtherCAT related error is detected.

For the display of PANATERM for Multi or 7-segment LED and Abort messages, the Err number detected first is displayed and maintained until the alarm is cleared.

8.2.1 Inaccurate ESM demand error protection (Err80.0)

Item	Description
Primary factor	The change state demand which cannot change from the present state was received. Init to SafeOP Init to OP PreOP to OP OP to Bootstrap PreOP to Bootstrap SafeOP to Bootstrap
ESM state to detect	All the ESM states
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	• When the present state is Init, PreOP, or SafeOP: It remains in the present ESM state. • When the present state is OP: SafeOP
ESC register AL Status Code	0011h
Disposition	Check the change state request of host controller.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.2 ESM undefined request error protection (Err80.1)

Item	Description
Primary factor	The change state request which does not have a definition (except the following) was received. 1 : Request Init State 2 : Request Pre-Operational State 3 : Request Bootstrap State 4 : Request Safe-Operational State 8 : Request Operational State
ESM state to detect	All the ESM states
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	• When the present state is Init, PreOP, or SafeOP: It remains in the present ESM state. • When the present state is OP: SafeOP
ESC register AL Status Code	0012h
Disposition	Check the change state request of host controller.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.3 Bootstrap requests error protection (Err80.2)

Item	Description
Primary factor	The following change state request was received. 3 : Request Bootstrap State
ESM state to detect	form Init to Bootstrap
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	Init
ESC register AL Status Code	0013h
Disposition	Check the change state request of host controller.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.4 Incomplete PLL error protection (Err80.3)

Item	Description
Primary factor	Phasing servo and communication(PLL lock) could not be completed even after the lapse of 1s after the start of the synchronization process. Refer to Refer to Appendix 1.
ESM state to detect	from PreOP to SafeOP
Synchronous mode to detect	DC, SM2
ESM state after detection	PreOP
ESC register AL Status Code	002Dh
Disposition	<In case of DC> - Check setting of DC mode. - Check whether propagation delay compensation or drift compensation is correct. <In case of SM2> - Check whether the transmitting timing of PDO from host controller is constant. - Check whether there is any problem in wiring of an EtherCAT communication cable. - Check whether the excessive noise has started the EtherCAT communication cable.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Single flash

8.2.5 PDO watchdog error protection (Err80.4)

Item	Description
Primary factor	Bit10 of AL Event Request(0220h) did not turn on within the time set by the ESC register addresses 0400h and 0420h during PDO communication (SafeOP or OP). Refer to Refer to Appendix 1.
ESM state to detect	SafeOP*1), OP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	SafeOP
ESC register AL Status Code	001Bh
Disposition	- Check whether the transmitting timing of PDO from host controller is constant(not stop). - Increase the timeout value of the PDO watchdog detection. - Check whether there is any problem in wiring of an EtherCAT telecommunication cable. - Check whether the excessive noise has started the EtherCAT communication cable.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Double flash

(Note 1) For this driver module, the watchdog at SM3 (TxPDO) is disabled, and only the watchdog at SM2 (RxPDO) is detected. Hence, the alarm is detected only in the OP state.

8.2.6 PLL error protection (Err80.6)

Item	Description
Primary factor	Phasing servo and communication(PLL lock) separated during operation in the state of SafeOP or OP. Refer to Refer to Appendix 1.
ESM state to detect	SafeOP, OP
Synchronous mode to detect	DC, SM2
ESM state after detection	SafeOP
ESC register AL Status Code	0032h
Disposition	<In case of DC> - Check setting of DC mode. - Check whether propagation delay compensation or drift compensation is correct. <In case of SM2> - Check whether the transmitting timing of PDO from host controller is constant. - Check whether there is any problem in wiring of an EtherCAT communication cable. - Check whether the excessive noise has started the EtherCAT communication cable. Note If the error cannot be resolved, shut off and reset the control power.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Single flash

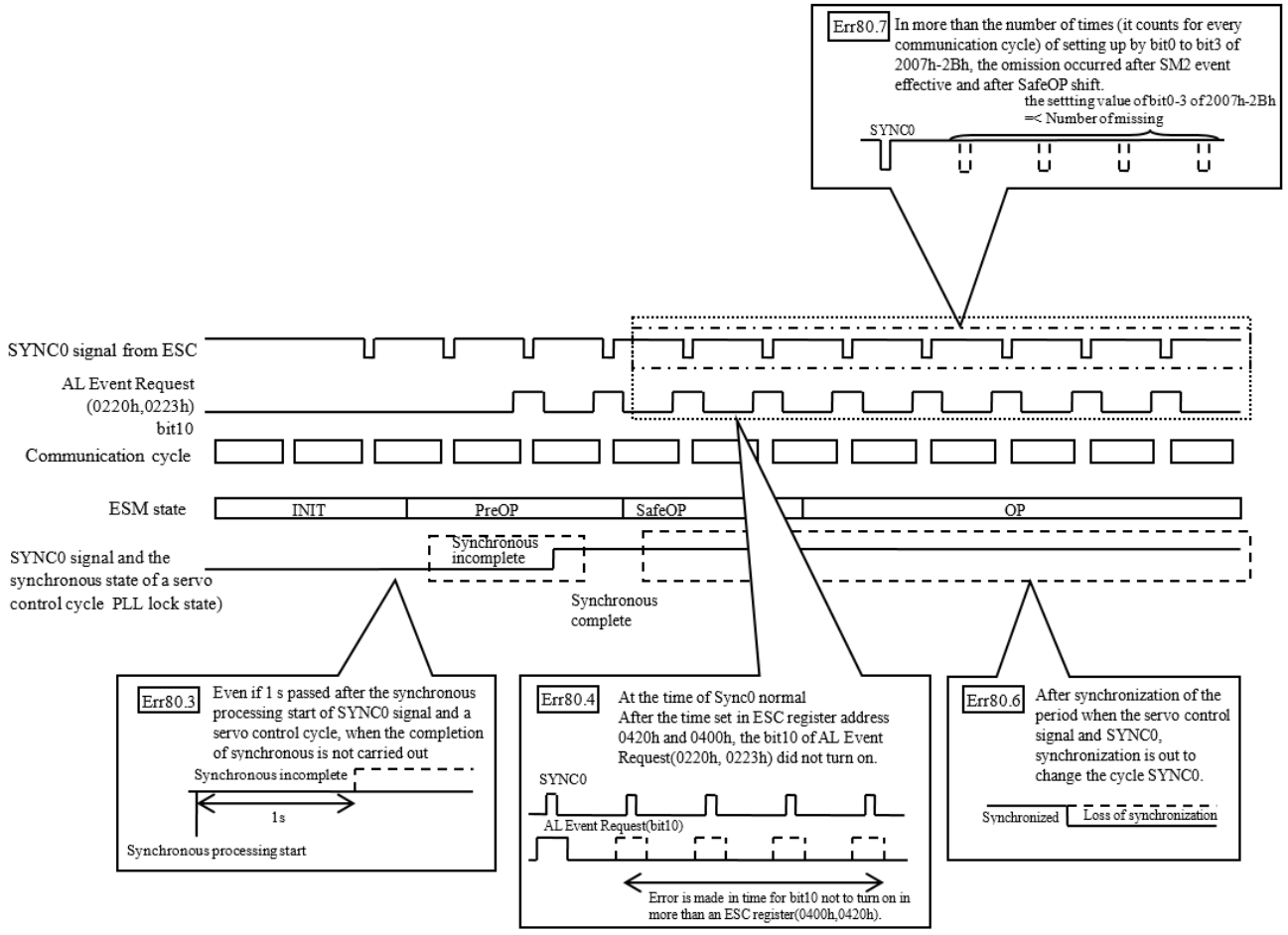
8.2.7 Synchronization signal error protection (Err80.7)

Item	Description
Primary factor	More than the threshold value that the omission of the interruption processing by SYNC0 or IRQ set up by bit0-3 of 2007h-2Bh (Maximum continuation communication error) in after the completion of synchronous processing generated. Refer to Refer to Appendix 1.
ESM state to detect	SafeOP, OP
Synchronous mode to detect	DC, SM2
ESM state after detection	SafeOP
ESC register AL Status Code	002Ch
Disposition	<In case of DC> - Check setting of DC mode. - Check whether propagation delay compensation or drift compensation is correct. <In case of SM2> - Check whether the transmitting timing of PDO from host controller is constant. - Check whether there is any problem in wiring of an EtherCAT communication cable. - Check whether the excessive noise has started the EtherCAT communication cable. - The preset value of 2007h-2Bh (Maximum continuation communication error) bit0-3 is enlarged. Note If the error cannot be resolved, shut off and reset the control power.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Single flash

Appendix 1. About the generating conditions of Err80.3 to Err80.7

The example in DC synchronous is shown in the following figure.

(In a case SM2 synchronous, SYNC0 signal replaces an IRQ signal.)



■ **Related objects**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2007h	2Bh	Maximum continuation communication error	—	-32768 to 32767	I16	rw	No	ALL	Yes

• Set an upper limit on the number of consecutive occurrences communication error.

Bit	Description
0 to 3	Detection threshold of Err 80.7 (0 to 15 times. When 0 is set, the detection of Err80.7 is disabled.)
4 to 7	Reserved
8 to 11	Reserved
12 to 15	Reserved

8.2.8 Synchronization cycle error protection (Err81.0)

Item	Description	
Primary factor	If set to cycle synchronization (SYNC0 cycle) is not supported • It sets except 125000, 250000, 500000, 1000000, 2000000, and 4000000 [ns] to ESC register SYNC0 Cycle Time (09A0h) or object 1C32h: sub 02h (Cycle time). • The set value of an ESC register and an object are not matched.	If set to cycle synchronization (IRQ cycle) is not supported • It sets except 125000,250000, 500000, 1000000, 2000000, and 4000000 [ns] to object 1C32h: sub 02h (Cycle time).
ESM state to detect	from PreOP to SafeOP	
Synchronous mode to detect	DC	SM2
ESM state after detection	PreOP	
ESC register AL Status Code	0035h	
Disposition	Set up a synchronous period correctly.	
Alarm clear attribute	Clearance is possible.	
Display of ERR Indicator	Blinking	

8.2.9 Mailbox error protection (Err81.1)

Item	Description
Primary factor	SM setup of Mailbox is wrong. A setup of SM0/1 was set as the unjust value. • A Physical Start Address: ESC register (0800h, 0801h/0808h,0809h) setup of SyncManager0/1 is inaccurate. - The area for reception of Mailbox overlaps the area for transmission. - The area for transmission/reception of Mailbox overlaps the area for transmission/reception of SyncManager2/3 - Address specification of the area for transmission/reception of Mailbox is odd number. • A Length: ESC register (0802h,0803h/080Ah, 080Bh) setup of SyncManager0/1 is inaccurate. - Out of range of SyncManager0: Blow 32byte - Out of range of SyncManager1: Blow 32byte • A Control Register: ESC register (0804h/080Ch) setup of SyncManager0/1 is inaccurate. - Set code other than 0110b in 0804h:bit3-0 - Set code other than 0010b in 080Ch:bit3-0
ESM state to detect	from Init to PreOP,PreOP,SafeOP,OP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	Init
ESC register AL Status Code	0016h
Disposition	Set the Sync manager correctly in accordance with the ESI file descriptions.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.10 PDO watchdog error protection (Err81.4)

Item	Description
Primary factor	A setup of the watchdog timer of PDO is wrong. **<In case of DC, SM2 mode>** Although PDO watch dog trigger is effective (SyncManager: Bit6 which is the register 0804h set to 1), when the detection timeout value of PDO watchdog timer cycle setup (registers 0400h and 0420h) was less than "communication cycle x2". **<In case of FreeRun mode>** Although PDO watch dog trigger is effective (SyncManager: Bit6 which is the register 0804h set to 1), when the detection timeout value of PDO watchdog timer cycle setup (registers 0400h and 0420h) was the following was set as less than 2 ms.
ESM state to detect	from PreOP to SafeOP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	PreOP
ESC register AL Status Code	001Fh
Disposition	Set up detection timeout value of watchdog timer correctly.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.11 DC error protection (Err81.5)

Item	Description
Primary factor	DC setting is wrong. • A value other than the following was set to bit 2-0 of 0981h (Activation) of the ESC register: bit 2-0 = 000b bit 2-0 = 011b
ESM state to detect	from PreOP to SafeOP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	PreOP
ESC register AL Status Code	0030h
Disposition	Check setting of DC mode.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.12 SM event mode error protection (Err81.6)

Item	Description
Primary factor	SM event mode which is not supported was set up. • A value other than 00h (FreeRun), 01h(SM2), and 02h (DC SYNC0) was set to 1C32h-01h (Sync mode). • A value other than 00h (FreeRun), 02h (DC SYNC0), or 22h (SM2) was set to 1C33h-01h (Sync mode). • When 000b was set to bit 2-0 of 0981h of the ESC register, SM2 setting was set to only either 1C32h-01h or 1C33h-01h.
ESM state to detect	from PreOP to SafeOP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	PreOP
ESC register AL Status Code	0028h
Disposition	• 1C32h-01h (Sync mode) should set up 00h (FreeRun), 01h(SM2), or 02h (DC SYNC0). • 1C33h-01h (Sync mode) should set up 00h (FreeRun), 02h (DC SYNC0), or 22h (SM2). • Set same value to 1C32h-01h and 1C33h-01h.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.13 SyncManager2/3 error protection (Err81.7)

Item	Description	
Primary factor	SyncManager2 was set as the unjust value. • A Physical Start Address (ESC register 0810h) setup of SyncManager2 is inaccurate. - Receiving area overlaps with the area for the transmission. - The area for transmission/reception of Mailbox overlaps the area for transmission/reception of SyncManager2/3 - Addressing transmission and reception area is an odd number. - Start addresses is out of range. • A Length (ESC register 0812h) setup of SyncManager2 is inaccurate. - Different from RxPDO size. • A Control Register (ESC register 0814h) setup of SyncManager2 is inaccurate. - Other than 01b is set to bit3-2.	A setup of SyncManager3 was set as the unjust value. • A Physical Start Address (ESC register 0818h) setup of SyncManager3 is inaccurate. - Receiving area overlaps with the area for the transmission. - The area for transmission/reception of Mailbox overlaps the area for transmission/reception of SyncManager2/3 - Addressing transmission and reception area is an odd number. - Start addresses is out of range. • A Length (ESC register 081Ah) setup of SyncManager3 is inaccurate. - Different from TxPDO size. • A Control Register (ESC register 081Ch) setup of SyncManager3 is inaccurate. - Other than 00b is set to bit3-2.
ESM state to detect	from PreOP to SafeOP, SafeOP, OP	
Synchronous mode to detect	DC, FreeRun, SM2	
ESM state after detection	PreOP	
ESC register AL Status Code	001Dh	001Eh
Disposition	Set SyncManager2 correctly in accordance with the ESI file descriptions.	Set SyncManager3 correctly in accordance with the ESI file descriptions.
Alarm clear attribute	Clearance is possible.	
Display of ERR Indicator	Blinking	

8.2.14 TxPDO assignment error protection (Err85.0)

Item	Description
Primary factor	• When a TxPDO size on the Axis A side is set to more than 32 bytes • When a TxPDO size on the Axis B side is set to more than 32 bytes • When a target object of Axis B is set to 1A00h to 1A03h (For Axis A) • When a target object of Axis A is set to 1A10h to 1A13h (For Axis B)
ESM state to detect	from PreOP to SafeOP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	PreOP
ESC register AL Status Code	0024h
Disposition	• Set the TxPDO size for each of the Axis A and Axis B, within 32 bytes. • Set only the target objects of Axis A to 1A00h to 1A03h. • Set only the target objects of Axis B to 1A10h to 1A13h.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.15 RxPDO assignment error protection (Err85.1)

Item	Description
Primary factor	• When a RxPDO size on the Axis A side is set to more than 32 bytes • When a RxPDO size on the Axis B side is set to more than 32 bytes • When a target object of Axis B is set to 1600h to 1603h (For Axis A) • When a target object of Axis A is set to 1610h to 1613h (For Axis B)
ESM state to detect	from PreOP to SafeOP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	PreOP
ESC register AL Status Code	0025h
Disposition	• Set the RxPDO size for each of the Axis A and Axis B, within 32 bytes. • Set only the target objects of Axis A to 1600h to 1603h. • Set only the target objects of Axis B to 1610h to 1613h.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Blinking

8.2.16 Lost link detection error protection (Err85.2)

Item	Description
Primary factor	The time set in 2007h-2Ch (Lost link detection time) elapsed when either Port 0 or Port 1 fell and remains in the lost link state after the ESM state transitioned from Init to PreOP (not including a port that had been in the lost link state at the time of transition from Init to PreOP).
ESM state to detect	PreOP, SafeOP, OP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	Init
ESC register AL Status Code	0000h
Disposition	• Check whether there is any problem in wiring of an EtherCAT communication cable. • Check whether there is any problem in the communication from host controller.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	Double flash

■ **Related object**

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
2007h	2Ch	Lost link detection time	ms	0 to 32767	I16	rw	No	ALL	Yes
		• When the time set in this parameter elapsed when either Port 0 or Port 1 fell and remains in the lost link state after the ESM state transitioned from Init to PreOP (not including a port that had been in the lost link state at the time of transition from Init to PreOP), Err85.2 (EtherCAT communication interception error) occurs. • When 0 is set, the detection of Err85.2 (Lost link detection error protection) is disabled.							

◆ NOTE

- **This alarm is generated only by the slave that detected a lost link. A subsequent slave that has not detected a lost link does not detect this alarm. To enable the detection of the alarm by a subsequent slave, assign PDO and enable the PDO watchdog. Note that the default value of 2007h-2Ch (Lost link detection time) is set to 0 (invalid).**

8.2.17 SII EEPROM error protection (Err85.3)

Item	Description
Primary factor	• Vendor ID, Product code, or Revision number do not agree between SII (EEPROM) and the object values. • Reading out from and writing to SII (EEPROM) are improper. • If any of bit11 to14 of ESC register 0502h is set to 1.
ESM state to detect	All ESM states
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	Init
ESC register AL Status Code	0051h
Disposition	Check the data of SII. Retry reading out from and writing to SII.
Alarm clear attribute	Clearance is impossible.
Display of ERR Indicator	Flickering

◆ NOTE

- **If Err 85.3 is occured while it is not connected to the host controller, the driver module may be faulty. Please replace the driver module.**

8.2.18 Main power undervoltage protection (AC insulation detection 2) (Err88.0)

Item	Description
Primary factor	• Main circuit power supply OFF was detected when the preset value of 6007h (Abort connection option code (Axis A)) is 1 and the PDS state is “Operation Enabled” or “Quick stop active”. • Switch on command was received when the preset value of 6007h (Abort connection option code (Axis A)) is 1 and the PDS state is “Ready to switch on” and main circuit power supply OFF.
ESM state to detect	PreOP, SafeOP, OP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	It remains in the present ESM state.
ESC register AL Status Code	0000h
Disposition	• The capacity rise of power supply voltage. A power supply is changed. The cause by which the magnetic contactor of the main power supply fell is removed, and a power supply is switched on again. • Each phase (L1, L2, L3) of a power supply is connected correctly. The single phase 100V and the single phase 200V should use L1 and L3. • It replaces with new driver module.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	OFF

8.2.19 Control mode setting error protection (Err88.1)

Item	Description
Primary factor	• The PDS state was changed to “Operation enabled” when the value set to 6060h (Modes of operation (Axis A)) is 0 and the value set to 6061h (Modes of operation display) is 0. • Unsupported control mode is set to 6060h (Modes of operation (Axis A)). • A control mode other than position control is set to 6060h (Modes of operation (Axis A)) in full-closed control. • 4 (tq) or 10 (cst) is set to 6060h (Modes of operation (Axis A)) while in 2 degrees freedom control mode (standard type). Note It will occur in Function extended edition 2 or earlier. • 3 (pv), 4 (tq), 9(csv) or 10 (cst) is set to 6060h (Modes of operation (Axis A)) while in 2 degrees freedom control mode (Synchronization type). • Under full-closed control, the control mode was set to 2 degrees of freedom control mode (synchronization type).
ESM state to detect	All the ESM states
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	It remains in the present ESM state.
ESC register AL Status Code	0000h
Disposition	• Check preset value of 6060h (Modes of operation (Axis A)). • Check 2 degree of freedom control related parameter Pr 6.47 bit 0 and bit3 Since parameter shipping values are different from MINAS-A5B series, please be careful.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	OFF

8.2.20 ESM requirements during operation error protection (Err88.2)

Item	Description
Primary factor	• When a PDS state was "Operation enabled" or "Quick stop active", the transition command to other ESM state was received. • When 2007h-75h bit0=1 is set, the transition command from the current ESM state to other ESM state was received during servo-on (occurrence of warning D2) from PANATERM for Multi.
ESM state to detect	Init, PreOP, SafeOP, OP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	A state transition request from host contoller is followed.
ESC register AL Status Code	0000h
Disposition	Check the state transition request from higher rank equipment.
Alarm clear attribute	Clearance is possible.
Display of ERR Indicator	OFF

8.2.21 Improper operation error protection (Err88.3)

Item	Description
Primary factor	• When EXT1/EXT2 is not assigned to input signal, EXT1/EXT2 was selected in trigger selection of a touch probe (60B8h (Touch probe function (Axis A))). • When Z-phase is chosen by trigger selection of a touch probe (60B8h (Touch probe function (Axis A))) at the time of absolute mode of full-closed. • When the software limit function is enabled, a wraparound occurred to the actual position or command position.
ESM state to detect	PreOP, SafeOP, OP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	It remains in the present ESM state.
ESC register AL Status Code	0000h
Disposition	• Set up the functional allotment for input signal correctly. • Set up trigger selection correctly. • Check the relation between the operation range setting and the software limit setting.
Alarm clear attribute	Clearance is impossible.
Display of ERR Indicator	OFF

Item	Description
Primary factor	• The calculation result of electronic gear ratio fell outside the range of 8000 times to 1/1000 times. • In the calculation process of electronic gear ratio, the denominator or numerator exceeds an unsigned 64-bit size. • In the final calculation result of electronic gear ratio, the denominator or numerator exceeds an unsigned 32-bit size.
ESM state to detect	Init to PreOP
Synchronous mode to detect	DC, FreeRun, SM2
ESM state after detection	A state transition request from the master is followed.
ESC register AL Status Code	0000h
Disposition	Review the electronic gear settings and turn ON the control power again.
Alarm clear attribute	Clearance is impossible.
Display of ERR Indicator	OFF

Item	Description
Primary factor	• When the electronic gear ratio is set to other than 1:1 with a communication cycle of 250 μs or less • When the electronic gear ratio is set to other than a power of 2 or other than 1:1 with the communication cycle of 500 us • In the case where a TxPDO size of either Axis A or Axis B is set to more than 6 bytes at the communication cycle of 250 μs or less, when the synchronous mode is DC, SM2 • In the case where a TxPDO size of either Axis A or Axis B is set to more than 25 bytes at the communication cycle of 500 μs, with the electronic gear ratio set to a power-multiple of 2, when the synchronous mode is DC, SM2 • In the case where a RxPDO size of either Axis A or Axis B is set to more than 6 bytes at the communication cycle of 250 μs or less, when the synchronous mode is DC, SM2 • In the case where a RxPDO size of either Axis A or Axis B is set to more than 25 bytes at the communication cycle of 500 μs, with the electronic gear ratio set to a power-multiple of 2, when the synchronous mode is DC, SM2
ESM state to detect	PreOP → SafeOP、SafeOP、OP
Synchronous mode to detect	DC、SM2
ESM state after detection	Remains in the current ESM state
ESC register AL Status Code	0000h
Disposition	Review the electronic gear settings and turn ON the control power again.
Alarm clear attribute	Cannot be cleared
Display of ERR Indicator	OFF

8.3 Reading error (Alarm)

Only the target objects of Axis A are described. Since the similar objects become the target regarding the target objects of Axis B, the Index and Sub-Index numbers shall be replaced, as well.

Error code is defined by IEC61800-7-201 until 0000h from FEFFh. Error code can define peculiar until FF00h from FEFFh by manufacturer, is indicated by the following contents.

The lower 8 bits of the value (FF00h to FFFFh) defined indicates the main alarm number of the servo error (alarm), as listed in the table below. (The sub alarm number cannot be read.) Note that the main alarm number is hexadecimal.

Index	Sub-Index	Name / Description	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	Yes	ALL	No

• Displays an alarm (main number only) / warning occurred in the driver module.

When both an alarm and warning does not occur, displays 0000h.

When an alarm and warning occur at the same time, display the alarm.

FF**h

Alarm (main) number (00h to 9Fh)

Warning number(A0h to A9h, C3h, D2h etc.)

Example:

FF0Ch: 0Ch=12d	Err12.0 (over voltage protection) occurred
FF55h: 55h=85d	Err85.0 (TxPDO assignment error protection) or Err85.1 (RxPDO assignment error protection) occurred

Note

• As exception, when the exception of Err81.7(SyncManager2/3 error protection) occurs, display A000h.

• The setting of the alarm number to 603Fh (Error code (Axis A)) is the same timing as the "Emergency Message". Therefore, the value is reflected later than bit3 (fault) of 6041h (Statusword (Axis A)).

8.4 Clear error (alarm)/Clear warning

How to reset the protection function in the context of EtherCAT error(alarm) can be cleared.

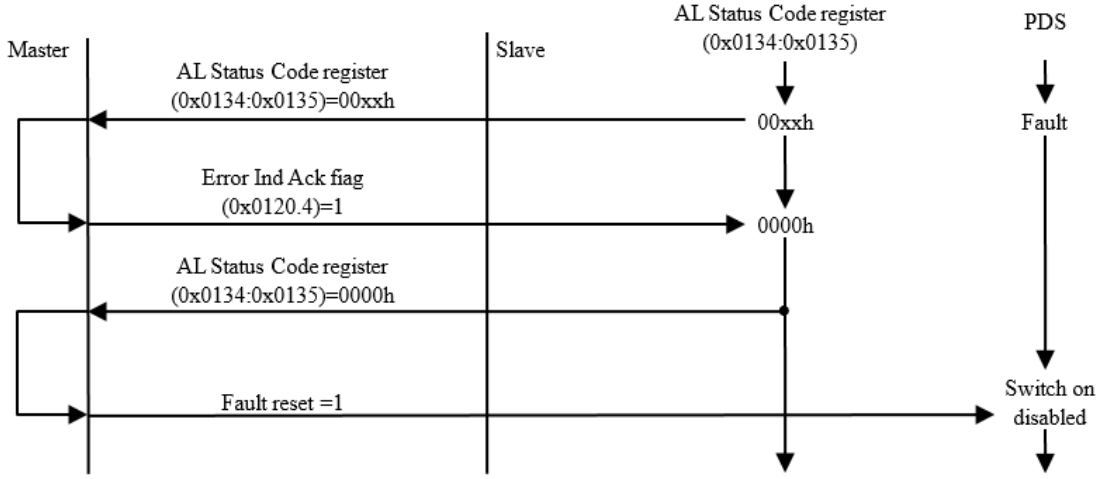
Either method 1, 2, 3 below enable to recover from error (alarm).

Also, for information on other than the EtherCAT relevant protection functions, refer to "Technical document Functional Specification (SX-DSV03455)".

◆ PROCEDURE

■ **Method 1**

1. Set the bit 4 (Error Ind Ack) to "1" in AL Control.
2. After that, the controller sets the bit 7 of 6040h (Control word (Axis A)) from 0 to 1 (sends the Fault reset command) to complete the error (alarm) clear.
3. After the error (alarm) clear is completed, the PDS state changes from Fault to Switch on disabled.



■ **Method 2**

1. Perform error (alarm) clear by PANATERM for Multi.
2. After the error (alarm) clear is completed, the PDS state changes from Fault to Switch on disabled.

■ **Method 3**

1. Change the external alarm clear input (A-CLR) from OFF state to ON state.
2. - After the error (alarm) clear is completed, the PDS state changes from Fault to Switch on disabled.

◆ NOTE

- **There is a delay of time between the notice and error (alarm) or between the warning and notice in AL Status, so the notice is not synchronous**
- **The LED display (RUN, ERR), ESM state, and AL Status in the front panel are updated to the latest communication error status each time a communication error is detected. However, the Err number detected first time is displayed in the segment 7 LED and held until the Fault is reset. (The unclearable error (alarm) are kept even after the Fault is reset.)**
- **If the alarm is occurring at the same time more than one, may not be able to clear even the cause of the alarm has been released if not release the cause of all alarms.**
- **An alarm is not successfully cleared even when alarm clearance is executed from PANTERM or from EtherCAT (Fault reset command) with external alarm clear input (A-CLR) ON. In this case, turn OFF external alarm clear input (A-CLR) temporarily, send the Fault reset command, or execute alarm clearance from PANATERM for Multi.**
- **When the PDS status is Fault reaction active, the error (alarm) cannot be cleared.**

How to clear warning

- When warning latch state is set to latch setting by 2006h-1Ch (Warning latch state setup), after generating warnings to be latched, the warning will not be cleared even if the cause is released.

  In this case, you can clear the warning that is currently occurring by setting the bit 7 of 6040h (Control word (Axis A)) from 0 to 1 (send the Fault reset command) via EtherCAT, by executing the error (alarm) clear from PANATERM for Multi or by switching the external alarm clear input (A - CLR) from OFF to ON. However, when the PDS status is Fault reaction active, the warning cannot be cleared.

- When an external alarm clear input (A-CLR) is in ON state, warning does not occur.

8.5 Other, error (alarm) / warning ralated function

Function related error(alarm) and warning have been described in addition to this section, refer to the section below.

Function	Refer to
Abort message	Section 3.6.1
Emergency message	Section 3.6.1
1001h (Error register)	Section 3.6.1, 5.2
10F3h (Diagnosis history)	Section 3.6.1, 5.7
603Fh (Error code)	Section 3.6.1

9

Object Dictionary List

9.1 Object dictionary list

"Attribute" indicates the timing when the change of object value becomes effective.

Attribute	Description
A	Always effective
B	Avoid changes during a motor operation and command discharge as much as possible. Because there is a possibility of transiently unstable operation. ▶ Note The reflection timing in the case where it is changed during a motor operation and command discharge is indefinite.
C	Effective after reset control power or after pin assign setting from PANATERM for Multi
R	Effective after control power reset
P	Effective at time of transition from Init to PreOP
S	Effective at time of transition from PreOP to SafeOP
H	Effective after the position information determined
X	Object which cannot be changed such as read only or not-supported object

▶ Note

Objects that cannot be written to EEPROM are displayed as ro in PANATERM for Multi.

.

"PDO" indicates whether PDO mapping is possible or not.

▼ Refer to

For details of PDO mapping, please refer to “5.4 PDO (process data object) mapping”.

Item	Description
No	RxRDO and TxPDO mapping not supported. (only SDO is supported)
RxPDO	RxPDO mapping available
TxPDO	TxPDO mapping available

NULL is entered at the end of the VS type object.
For the size of each object, refer to the detailed explanation in this technical document.

9.1.1 CoE communication profile area (1000h to 1FFFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1000h	00h	Device type	-	0 to 4294967295	U32	ro	No	ALL	No	X
1001h	00h	Error register	-	0 to 255	U8	ro	No	ALL	No	X
1008h	00h	Manufacturer device name	-	-	VS	ro	No	ALL	No	X
1009h	00h	Manufacturer hardware version	-	-	VS	ro	No	ALL	No	X
100Ah	00h	Manufacturer software version	-	-	VS	ro	No	ALL	No	X
1010h	-	Store parameters	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Save all parameters	-	0 to 4294967295	U32	rw	No	ALL	No	A
1018h	-	Identity object	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Vendor ID	-	0 to 4294967295	U32	ro	No	ALL	No	X
	02h	Product code	-	0 to 4294967295	U32	ro	No	ALL	No	X
	03h	Revision number	-	0 to 4294967295	U32	ro	No	ALL	No	X
	04h	Serial number	-	0 to 4294967295	U32	ro	No	ALL	No	X
10F3h	-	Diagnosis history	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Maximum messages	-	0 to 255	U8	ro	No	ALL	No	X
	02h	Newest message	-	0 to 255	U8	ro	No	ALL	No	X
	03h	Newest acknowledged message	-	0 to 255	U8	rw	No	ALL	No	A
	04h	New messages available	-	0 to 1	BOOL	ro	No	ALL	No	X
	05h	Flags	-	0 to 65535	U16	rw	No	ALL	Yes	A
	06h	Diagnosis message 1	-	-	OS	ro	No	ALL	No	X
	:									
	13h	Diagnosis message 14	-	-	OS	ro	No	ALL	No	X

■ CoE communication profile area (1000h to 1FFFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1600h	-	Receive PDO mapping 1 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1601h	-	Receive PDO mapping 2 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1602h	-	Receive PDO mapping 3 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1603h	-	Receive PDO mapping 4 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S

■ **CoE communication profile area (1000h to 1FFFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1610h	-	Receive PDO mapping 1 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1611h	-	Receive PDO mapping 2 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1612h	-	Receive PDO mapping 3 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1613h	-	Receive PDO mapping 4 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd receive PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S

■ CoE communication profile area (1000h to 1FFFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1A00h	-	Transmit PDO mapping 1 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1A01h	-	Transmit PDO mapping 2 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1A02h	-	Transmit PDO mapping 3 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1A03h	-	Transmit PDO mapping 4 (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S

■ **CoE communication profile area (1000h to 1FFFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1A10h	-	Transmit PDO mapping 1 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1A11h	-	Transmit PDO mapping 2 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1A12h	-	Transmit PDO mapping 3 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
1A13h	-	Transmit PDO mapping 4 (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 32	U8	rw	No	ALL	Yes	S
	01h	1st transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	02h	2nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	3rd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	04h	4th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	05h	5th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	06h	6th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	07h	7th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
	08h	8th transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S
				:						
	20h	32nd transmit PDO mapped	-	0 to 4294967295	U32	rw	No	ALL	Yes	S

■ CoE communication profile area (1000h to 1FFFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1C00h	-	Sync manager communication type	-	-	-	-	-	-	-	-
	00h	Number of used sync manager channels	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Communication type sync manager 0	-	0 to 4	U8	ro	No	ALL	No	X
	02h	Communication type sync manager 1	-	0 to 4	U8	ro	No	ALL	No	X
	03h	Communication type sync manager 2	-	0 to 4	U8	ro	No	ALL	No	X
	04h	Communication type sync manager 3	-	0 to 4	U8	ro	No	ALL	No	X
1C12h	-	Sync manager channel 2	-	-	-	-	-	-	-	-
	00h	Number of assigned PDOs	-	0 to 4	U8	rw	No	ALL	Yes	S
	01h	PDO mapping object index of assigned RxPDO 1	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes	S
	02h	PDO mapping object index of assigned RxPDO 2	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes	S
	03h	PDO mapping object index of assigned RxPDO 3	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes	S
	04h	PDO mapping object index of assigned RxPDO 4	-	1600h to 1603h 1610h to 1613h	U16	rw	No	ALL	Yes	S
1C13h	-	Sync manager channel 3	-	-	-	-	-	-	-	-
	00h	Number of assigned PDOs	-	0 to 4	U8	rw	No	ALL	Yes	S
	01h	PDO mapping object index of assigned TxPDO 1	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes	S
	02h	PDO mapping object index of assigned TxPDO 2	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes	S
	03h	PDO mapping object index of assigned TxPDO 3	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes	S
	04h	PDO mapping object index of assigned TxPDO 4	-	1A00h to 1A03h 1A10h to 1A13h	U16	rw	No	ALL	Yes	S

■ **CoE communication profile area (1000h to 1FFFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
1C32h	-	Sync manager 2 synchronization	-	-	-	-	-	-	-	-
	00h	Number of sub-objects	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Sync mode	-	0 to 65535	U16	rw	No	ALL	Yes	S
	02h	Cycle time	ns	0 to 4294967295	U32	rw	No	ALL	Yes	S
	03h	Shift time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	04h	Sync modes supported	-	0 to 65535	U16	ro	No	ALL	No	X
	05h	Minimum cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	06h	Calc and copy time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	08h	Command	-	0 to 65535	U16	ro	No	ALL	No	X
	09h	Delay time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	0Ah	Sync0 cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	0Bh	Cycle time too small	-	0 to 65535	U16	ro	No	ALL	No	X
	0Ch	SM-event missed	-	0 to 65535	U16	ro	No	ALL	No	X
	0Dh	Shift time too short	-	0 to 65535	U16	ro	No	ALL	No	X
	0Eh	RxPDO toggle failed	-	0 to 65535	U16	ro	No	ALL	No	X
	20h	Sync error	-	0 to 1	BOOL	ro	No	ALL	No	X
1C33h	-	Sync manager 3 synchronization	-	-	-	-	-	-	-	-
	00h	Number of sub-objects	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Sync mode	-	0 to 65535	U16	rw	No	ALL	Yes	S
	02h	Cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	03h	Shift time	ns	0 to 4294967295	U32	rw	No	ALL	No	S
	04h	Sync modes supported	-	0 to 65535	U16	ro	No	ALL	No	X
	05h	Minimum cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	06h	Calc and copy time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	08h	Command	-	0 to 65535	U16	ro	No	ALL	No	X
	09h	Delay time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	0Ah	Sync0 cycle time	ns	0 to 4294967295	U32	ro	No	ALL	No	X
	0Bh	Cycle time too small	-	0 to 65535	U16	ro	No	ALL	No	X
	0Ch	SM-event missed	-	0 to 65535	U16	ro	No	ALL	No	X
	0Dh	Shift time too short	-	0 to 65535	U16	ro	No	ALL	No	X
	0Eh	RxPDO toggle failed	-	0 to 65535	U16	ro	No	ALL	No	X
	20h	Sync error	-	0 to 1	BOOL	ro	No	ALL	No	X

9.1.2 Common servo parameter area (2000h to 201Fh)

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2000h	-	Common Parameter Class 0	-	-	-	-	-	-	-	-
2000h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2000h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2000h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2000h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2000h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2000h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2000h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2000h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2000h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2000h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2000h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2000h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2000h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2000h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2000h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2000h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2000h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2000h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2000h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2000h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2000h	14h	Reserved 20	-	0 to 0	I16	rw	No	ALL	Yes	R
2000h	15h	Axis limit setting	-	0 to 1	I16	rw	No	ALL	Yes	R
2004h	-	Common Parameter Class 4	-	-	-	-	-	-	-	-
2004h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2004h	01h	SI1 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	02h	SI2 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	03h	SI3 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	04h	SI4 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	05h	SI5 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	06h	SI6 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	07h	SI7 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	08h	SI8 input selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2004h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2004h	0Bh	SO1 output selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C
2004h	0Ch	SO2 output selection	-	0 to 16777215	I32	rw	No	ALL	Yes	C

■ **Common servo parameter area (2000h to 201Fh)**

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2005h	-	Common Parameter Class 5	-	-	-	-	-	-	-	-
2005h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2005h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2005h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2005h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2005h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2005h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2005h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2005h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2005h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2005h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2005h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2005h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2005h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2005h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2005h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2005h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-

■ Common servo parameter area (2000h to 201Fh)

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2005h	10h	Control input signal reading setup	-	0 to 3	I16	rw	No	ALL	Yes	C
2005h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2005h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2005h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2005h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2005h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2005h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2005h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2005h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2005h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2005h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2005h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2005h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2005h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2005h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2005h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2005h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2005h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2005h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2005h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2005h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2005h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2005h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2005h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2005h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2005h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2005h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2005h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2005h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2005h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2005h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2005h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2005h	30h	Reserved 48	-	-	I16	-	-	-	-	-
2005h	31h	Reserved 49	-	-	I16	-	-	-	-	-
2005h	32h	Reserved 50	-	-	I16	-	-	-	-	-
2005h	33h	Reserved 51	-	-	I16	-	-	-	-	-
2005h	34h	Reserved 52	-	-	I16	-	-	-	-	-
2005h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2005h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2005h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2005h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2005h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2005h	3Ah	Reserved 58	-	-	I16	-	-	-	-	-
2005h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2005h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2005h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2005h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2005h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2005h	40h	Reserved 64	-	-	I16	-	-	-	-	-

■ **Common servo parameter area (2000h to 201Fh)**

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2005h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2005h	42h	Reserved 66	-	-	I16	-	-	-	-	-
2005h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2005h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2005h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2005h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2005h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2005h	48h	Reserved 72	-	-	I16	-	-	-	-	-
2005h	49h	Reserved 73	-	-	I16	-	-	-	-	-
2005h	4Ah	Reserved 74	-	-	I16	-	-	-	-	-
2005h	4Bh	Reserved 75	-	-	I16	-	-	-	-	-
2005h	4Ch	Reserved 76	-	-	I16	-	-	-	-	-
2005h	4Dh	Reserved 77	-	-	I16	-	-	-	-	-
2005h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2005h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-
2005h	50h	Reserved 80	-	-	I16	-	-	-	-	-
2005h	51h	Reserved 81	-	-	I16	-	-	-	-	-
2005h	52h	Reserved 82	-	-	I16	-	-	-	-	-
2005h	53h	Reserved 83	-	-	I16	-	-	-	-	-
2005h	54h	Reserved 84	-	-	I16	-	-	-	-	-
2005h	55h	Reserved 85	-	-	I16	-	-	-	-	-
2005h	56h	Reserved 86	-	-	I16	-	-	-	-	-
2005h	57h	Reserved 87	-	-	I16	-	-	-	-	-
2005h	58h	Reserved 88	-	-	I16	-	-	-	-	-
2005h	59h	Function extended shared setup 1	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	B
2005h	5Ah	Function extended shared setup 2	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	C
2005h	5Bh	Function extended shared setup 3	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	R
2006h	-	Common Parameter Class 6	-	-	-	-	-	-	-	-
2006h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2006h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2006h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2006h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2006h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2006h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2006h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2006h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2006h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2006h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2006h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2006h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2006h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2006h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2006h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2006h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2006h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2006h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2006h	12h	Reserved 18	-	-	I16	-	-	-	-	-

■ Common servo parameter area (2000h to 201Fh)

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2006h	13h	Power-up wait time	100 ms	0 to 100	I16	rw	No	ALL	Yes	R
2006h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2006h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2006h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2006h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2006h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2006h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2006h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2006h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2006h	1Ch	Warning latch state setup	-	0 to 3	I16	rw	No	ALL	Yes	C
2007h	-	Common Parameter Class 7	-	-	-	-	-	-	-	-
2007h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2007h	01h	Display on LED	-	0 to 32767	I16	rw	No	ALL	Yes	A
2007h	02h	Display time setup upon power-up	100 ms	0 to 1000	I16	rw	No	ALL	Yes	R
2007h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2007h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2007h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2007h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2007h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2007h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2007h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2007h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2007h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2007h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2007h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2007h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2007h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2007h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2007h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2007h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2007h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2007h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2007h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2007h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2007h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2007h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2007h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2007h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2007h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2007h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2007h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2007h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2007h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2007h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2007h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2007h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2007h	23h	Reserved 35	-	-	I16	-	-	-	-	-

■ **Common servo parameter area (2000h to 201Fh)**

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2007h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2007h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2007h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2007h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2007h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2007h	29h	Station Alias setup(high)	-	0 to 255	I16	rw	No	ALL	Yes	R
2007h	2Ah	Station Alias selection	-	0 to 2	I16	rw	No	ALL	Yes	R
2007h	2Bh	Maximum continuation communication error	-	-32768 to 32767	I16	rw	No	ALL	Yes	R
2007h	2Ch	Lost link detection time	ms	0 to 32767	I16	rw	No	ALL	Yes	R
2007h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2007h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2007h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2007h	30h	Reserved 48	-	-	I16	-	-	-	-	-
2007h	31h	Reserved 49	-	-	I16	-	-	-	-	-
2007h	32h	Reserved 50	-	-	I16	-	-	-	-	-
2007h	33h	Reserved 51	-	-	I16	-	-	-	-	-
2007h	34h	Reserved 52	-	-	I16	-	-	-	-	-
2007h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2007h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2007h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2007h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2007h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2007h	3Ah	Reserved 58	-	-	I16	-	-	-	-	-
2007h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2007h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2007h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2007h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2007h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2007h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2007h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2007h	42h	Reserved 66	-	-	I16	-	-	-	-	-
2007h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2007h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2007h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2007h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2007h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2007h	48h	Reserved 72	-	-	I16	-	-	-	-	-
2007h	49h	Reserved 73	-	-	I16	-	-	-	-	-
2007h	4Ah	Reserved 74	-	-	I16	-	-	-	-	-
2007h	4Bh	Reserved 75	-	-	I16	-	-	-	-	-
2007h	4Ch	Reserved 76	-	-	I16	-	-	-	-	-
2007h	4Dh	Reserved 77	-	-	I16	-	-	-	-	-
2007h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2007h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-
2007h	50h	Reserved 80	-	-	I16	-	-	-	-	-
2007h	51h	Reserved 81	-	-	I16	-	-	-	-	-
2007h	52h	Reserved 82	-	-	I16	-	-	-	-	-
2007h	53h	Reserved 83	-	-	I16	-	-	-	-	-
2007h	54h	Reserved 84	-	-	I16	-	-	-	-	-

■ Common servo parameter area (2000h to 201Fh)

Common attribute servo parameter object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2007h	55h	Reserved 85	-	-	I16	-	-	-	-	-
2007h	56h	Reserved 86	-	-	I16	-	-	-	-	-
2007h	57h	Reserved 87	-	-	I16	-	-	-	-	-
2007h	58h	Reserved 88	-	-	I16	-	-	-	-	-
2007h	59h	Reserved 89	-	-	I16	-	-	-	-	-
2007h	5Ah	Reserved 90	-	-	I16	-	-	-	-	-
2007h	5Bh	Reserved 91	-	-	I16	-	-	-	-	-
2007h	5Ch	Reserved 92	-	-	I16	-	-	-	-	-
2007h	5Dh	Reserved 93	-	-	I16	-	-	-	-	-
2007h	5Eh	Reserved 94	-	-	I16	-	-	-	-	-
2007h	5Fh	Reserved 95	-	-	I16	-	-	-	-	-
2007h	60h	Reserved 96	-	-	I16	-	-	-	-	-
2007h	61h	Reserved 97	-	-	I16	-	-	-	-	-
2007h	62h	Reserved 98	-	-	I16	-	-	-	-	-
2007h	63h	Reserved 99	-	-	I16	-	-	-	-	-
2007h	64h	Reserved 100	-	-	I16	-	-	-	-	-
2007h	65h	Reserved 101	-	-	I16	-	-	-	-	-
2007h	66h	Reserved 102	-	-	I16	-	-	-	-	-
2007h	67h	Reserved 103	-	-	I16	-	-	-	-	-
2007h	68h	Reserved 104	-	-	I16	-	-	-	-	-
2007h	69h	Reserved 105	-	-	I16	-	-	-	-	-
2007h	6Ah	Reserved 106	-	-	I16	-	-	-	-	-
2007h	6Bh	Reserved 107	-	-	I16	-	-	-	-	-
2007h	6Ch	Reserved 108	-	-	I16	-	-	-	-	-
2007h	6Dh	Reserved 109	-	-	I16	-	-	-	-	-
2007h	6Eh	Reserved 110	-	-	I16	-	-	-	-	-
2007h	6Fh	Reserved 111	-	-	I16	-	-	-	-	-
2007h	70h	Reserved 112	-	-	I16	-	-	-	-	-
2007h	71h	Reserved 113	-	-	I16	-	-	-	-	-
2007h	72h	Reserved 114	-	-	I16	-	-	-	-	-
2007h	73h	Reserved 115	-	-	I16	-	-	-	-	-
2007h	74h	Reserved 116	-	-	I16	-	-	-	-	-
2007h	75h	Communication function shared setup 1	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	B
2007h	76h	Communication function shared setup 2	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	C
2007h	77h	Communication function shared setup 3	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	R

9.1.3 Common servo information monitor object area (2020h to 203Fh)

Common attribute servo information monitor object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2020h	00h	Reserved	-	-	I32	-	-	-	-	-
2021h	00h	Physical input signal	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2022h	00h	Physical output signal	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2023h	00h	Temperature of amplifier	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2024h	00h	Fan operating time	30 min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2025h	00h	Fan life expectancy	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2026h	00h	Capacitor life expectancy	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2027h	00h	Reserved	-	-	U16	-	-	-	-	-
2028h	00h	Synchronization signal error count	time	0 to 65535	U16	ro	No	ALL	No	X
2029h	00h	Drive serial number	-	-	VS	ro	No	ALL	No	X
202Ah	00h	Power on cumulative time	30 min	-2147483648 to 2147483647	I32	ro	No	All	No	X

■ Common servo information monitor object area (2020h to 203Fh)

Common attribute servo information monitor object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
202Bh	-	EoE information	-	-	-	-	-	-	-	-
202Bh	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
202Bh	01h	Virtual MAC address	-	-	VS	ro	No	ALL	No	X
202Bh	02h	IP address	-	-	VS	ro	No	ALL	No	X
202Bh	03h	Subnet mask	-	-	VS	ro	No	ALL	No	X
202Bh	04h	Default Gateway	-	-	VS	ro	No	ALL	No	X
202Ch	-	Safety part information 1	-	-	-	-	-	-	-	-
202Ch	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
202Ch	01h	Safety CPU1 version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
202Ch	02h	Safety CPU2 version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
202Ch	03h	Safety boot version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
202Ch	04h	Safety device ID	-	0 to 65535	U16	ro	No	ALL	No	X
202Ch	05h	Safety FPGA version	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
202Ch	06h	Safety serial number	-	0 to 4294967295	U32	ro	No	ALL	No	X
202Dh	-	Safety part information 2	-	-	-	-	-	-	-	-
202Dh	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
202Dh	01h	Safety status info	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Dh	02h	Safety digital inputs	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Dh	03h	Safety digital outputs	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Eh	-	Safety part information 3	-	-	-	-	-	-	-	-
202Eh	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
202Eh	01h	Safety code main	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Eh	02h	Safety code ECS A	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Eh	03h	Safety code ECS B	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Eh	04h	Safety code ICS	-	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
202Fh (Note 1) (Note 2)	00h	Number of axes	-	0 to 255	U8	ro	No	ALL	No	X

(Note 1) Not supported in the first edition of the software version (Ver1.01).

(Note 2) Do not use in a software version of function expansion edition 1.

9.1.4 Power supply module information monitor object

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
20C0h (Note 1)	-	Rated output power information	—	—	—	—	—	—	—	—
20C0h (Note 1)	00h	Number of entries	—	2	U8	ro	No	ALL	No	X
20C0h (Note 1)	01h	Power Supply Module rated output power	0.01kW	0 - 65535	U16	ro	No	ALL	No	X
20C0h (Note 1)	02h	Drive Module total rated output power	0.01kW	0 - 65535	U16	ro	No	ALL	No	X

(Note 1) Supported in a software version of function extended edition 1 or later.

9.1.5 A axis servo parameter area (2100h-01h to 211Fh-FFh)

Category 0: Basic configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2100h	-	Parameter Class 0 (Axis A)	-	-	-	-	-	-	-	-
2100h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2100h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2100h	02h	Control mode setup	-	0 to 6	I16	rw	No	ALL	Yes	R
2100h	03h	Real-time auto-gain tuning setup	-	0 to 6	I16	rw	No	ALL	Yes	B
2100h	04h	Real-time auto-tuning machine stiffness setup	-	0 to 31	I16	rw	No	ALL	Yes	B
2100h	05h	Inertia ratio	%	0 to 10000	I16	rw	No	ALL	Yes	B
2100h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2100h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2100h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2100h	09h	Reserved 9	-	-	I32	-	-	-	-	-
2100h	0Ah	Reserved 10	-	-	I32	-	-	-	-	-
2100h	0Bh	Reserved 11	-	-	I32	-	-	-	-	-
2100h	0Ch	Reserved 12	-	-	I32	-	-	-	-	-
2100h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2100h	0Eh	1st torque limit	%	0 to 500	I16	rw	No	ALL	Yes	B
2100h	0Fh	Position deviation excess setup	command	0 to 1073741824	I32	rw	No	csp pp hm ip	Yes	A
2100h	10h	Absolute encoder setup	-	0 to 4	I16	rw	No	ALL	Yes	C
2100h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2100h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2100h	13h	Reserved 19	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 1: Gain tuning

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2101h	-	Parameter Class 1 (Axis A)	-	-	-	-	-	-	-	-
2101h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2101h	01h	1st gain of position loop	0.1 /s	0 to 30000	I16	rw	No	csp pp hm ip	Yes	B
2101h	02h	1st velocity loop gain	0.1 Hz	1 to 32767	I16	rw	No	ALL	Yes	B
2101h	03h	1st velocity loop integration time constant	0.1 ms	1 to 10000	I16	rw	No	ALL	Yes	B
2101h	04h	1st filter of velocity detection	-	0 to 5	I16	rw	No	ALL	Yes	B
2101h	05h	1st torque filter time constant	0.01 ms	0 to 2500	I16	rw	No	ALL	Yes	B
2101h	06h	2nd gain of position loop	0.1 /s	0 to 30000	I16	rw	No	csp pp hm ip	Yes	B
2101h	07h	2nd velocity loop gain	0.1 Hz	1 to 32767	I16	rw	No	ALL	Yes	B
2101h	08h	2nd velocity loop integration time constant	0.1 ms	1 to 10000	I16	rw	No	ALL	Yes	B
2101h	09h	2nd filter of velocity detection	-	0 to 5	I16	rw	No	ALL	Yes	B
2101h	0Ah	2nd torque filter time constant	0.01 ms	0 to 2500	I16	rw	No	ALL	Yes	B
2101h	0Bh	Velocity feed forward gain	0.1%	0 to 4000	I16	rw	No	csp pp hm ip	Yes	B
2101h	0Ch	Velocity feed forward filter	0.01 ms	0 to 6400	I16	rw	No	csp pp hm ip	Yes	B
2101h	0Dh	Torque feed forward gain	0.1%	0 to 2000	I16	rw	No	ALL	Yes	B
2101h	0Eh	Torque feed forward filter	0.01 ms	0 to 6400	I16	rw	No	ALL	Yes	B
2101h	0Fh	2nd gain setup	-	0 to 1	I16	rw	No	ALL	Yes	B
2101h	10h	Mode of position control switching	-	0 to 10	I16	rw	No	csp pp hm ip	Yes	B
2101h	11h	Delay time of position control switching	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2101h	12h	Level of position control switching	-	0 to 20000	I16	rw	No	csp pp hm ip	Yes	B
2101h	13h	Hysteresis at position control switching	-	0 to 20000	I16	rw	No	csp pp hm ip	Yes	B
2101h	14h	Position gain switching time	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 1: Gain tuning

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2101h	15h	Mode of velocity control switching	-	0 to 5	I16	rw	No	csv pv	Yes	B
2101h	16h	Delay time of velocity control switching	0.1 ms	0 to 10000	I16	rw	No	csv pv	Yes	B
2101h	17h	Level of velocity control switching	-	0 to 20000	I16	rw	No	csv pv	Yes	B
2101h	18h	Hysteresis at velocity control switching	-	0 to 20000	I16	rw	No	csv pv	Yes	B
2101h	19h	Mode of torque control switching	-	0 to 3	I16	rw	No	cst tq	Yes	B
2101h	1Ah	Delay time of torque control switching	0.1 ms	0 to 10000	I16	rw	No	cst tq	Yes	B
2101h	1Bh	Level of torque control switching	-	0 to 20000	I16	rw	No	cst tq	Yes	B
2101h	1Ch	Hysteresis at torque control switching	-	0 to 20000	I16	rw	No	cst tq	Yes	B
2101h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2101h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2101h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2101h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2101h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2101h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2101h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2101h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2101h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2101h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2101h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2101h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2101h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2101h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2101h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2101h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2101h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2101h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2101h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2101h	30h	Reserved 48	-	-	I16	-	-	-	-	-
2101h	31h	Reserved 49	-	-	I16	-	-	-	-	-
2101h	32h	Reserved 50	-	-	I16	-	-	-	-	-
2101h	33h	Reserved 51	-	-	I16	-	-	-	-	-
2101h	34h	Reserved 52	-	-	I16	-	-	-	-	-
2101h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2101h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2101h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2101h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2101h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2101h	3Ah	Reserved 58	-	-	I16	-	-	-	-	-
2101h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2101h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2101h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2101h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2101h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 1: Gain tuning

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2101h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2101h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2101h	42h	Reserved 66	-	-	I16	-	-	-	-	-
2101h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2101h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2101h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2101h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2101h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2101h	48h	Reserved 72	-	-	I16	-	-	-	-	-
2101h	49h	Reserved 73	-	-	I16	-	-	-	-	-
2101h	4Ah	Reserved 74	-	-	I16	-	-	-	-	-
2101h	4Bh	Reserved 75	-	-	I16	-	-	-	-	-
2101h	4Ch	Reserved 76	-	-	I16	-	-	-	-	-
2101h	4Dh	Reserved 77	-	-	I16	-	-	-	-	-
2101h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2101h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-

■ A axis servo parameter area (2100h-01h to 211Fh-FFh)

Category 2: Anti-vibration filter

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2102h	-	Parameter Class 2 (Axis A)	-	-	-	-	-	-	-	-
2102h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2102h	01h	Adaptive filter mode setup	-	0 to 6	I16	rw	No	csp pp hm ip csv pv	Yes	B
2102h	02h	1st notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2102h	03h	1st notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2102h	04h	1st notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2102h	05h	2nd notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2102h	06h	2nd notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2102h	07h	2nd notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2102h	08h	3rd notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2102h	09h	3rd notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2102h	0Ah	3rd notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2102h	0Bh	4th notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2102h	0Ch	4th notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2102h	0Dh	4th notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2102h	0Eh	Selection of damping filter switching	-	0 to 6	I16	rw	No	csp pp hm ip	Yes	B
2102h	0Fh	1st damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2102h	10h	1st damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B
2102h	11h	2nd damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2102h	12h	2nd damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B
2102h	13h	3rd damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2102h	14h	3rd damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 2: Anti-vibration filter

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2102h	15h	4th damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2102h	16h	4th damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B
2102h	17h	Positional command smoothing filter	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2102h	18h	Positional command FIR filter	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2102h	19h	5th notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2102h	1Ah	5th notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2102h	1Bh	5th notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2102h	1Ch	1st damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2102h	1Dh	2nd damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2102h	1Eh	3rd damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2102h	1Fh	4th damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2102h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2102h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2102h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2102h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2102h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2102h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2102h	26h	Reserved 38	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 3: Velocity, Torque, and Full-closed controls

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2103h	-	Parameter Class 3 (Axis A)	-	-	-	-	-	-	-	-
2103h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2103h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2103h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2103h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2103h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2103h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2103h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2103h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2103h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2103h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2103h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2103h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2103h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2103h	0Dh	Acceleration time setup	1 ms/ (1000 r/min)	0 to 10000	I16	rw	No	csv pv	Yes	B
2103h	0Eh	Deceleration time setup	1 ms/ (1000 r/min)	0 to 10000	I16	rw	No	csv pv	Yes	B
2103h	0Fh	Sigmoid acceleration / deceleration time setup	1 ms	0 to 1000	I16	rw	No	csv pv	Yes	B
2103h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2103h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2103h	12h	Selection of speed limit	-	2	I16	rw	No	cst tq	Yes	B
2103h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2103h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2103h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2103h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2103h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2103h	18h	External scale selection	-	0 to 6	I16	rw	No	ALL	Yes	R
2103h	19h	Numerator of external scale division	-	0 to 8388608	I32	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	R
2103h	1Ah	Denominator of external scale division	-	1 to 8388608	I32	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	R
2103h	1Bh	Reversal of direction of external scale	-	0 to 3	I16	rw	No	ALL	Yes	R
2103h	1Ch	External scale Z phase disconnection detection disable	-	0 to 1	I16	rw	No	ALL	Yes	R
2103h	1Dh	Hybrid deviation excess setup	command	1 to 134217728	I32	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	C
2103h	1Eh	Hybrid deviation clear setup	rotation	0 to 100	I16	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	C

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 4: I/O monitor

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2104h	-	Parameter Class 4 (Axis A)	-	-	-	-	-	-	-	-
2104h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2104h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2104h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2104h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2104h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2104h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2104h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2104h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2104h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2104h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2104h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2104h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2104h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2104h	0Dh	Reserved 13	-	-	I32	-	-	-	-	-
2104h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2104h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2104h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2104h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2104h	12h	Reserved 18	-	-	I32	-	-	-	-	-
2104h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2104h	14h	Reserved 20	-	-	I32	-	-	-	-	-
2104h	15h	Reserved 21	-	-	I32	-	-	-	-	-
2104h	16h	Reserved 22	-	-	I32	-	-	-	-	-
2104h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2104h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2104h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2104h	1Ah	Reserved 26	-	-	I32	-	-	-	-	-
2104h	1Bh	Reserved 27	-	-	I32	-	-	-	-	-
2104h	1Ch	Reserved 28	-	-	I32	-	-	-	-	-
2104h	1Dh	Reserved 29	-	-	I32	-	-	-	-	-
2104h	1Eh	Reserved 30	-	-	I32	-	-	-	-	-
2104h	1Fh	Reserved 31	-	-	I32	-	-	-	-	-
2104h	20h	Positioning complete (In-position) range	command	0 to 2097152	I32	rw	No	csp pp hm ip	Yes	A
2104h	21h	Positioning complete (In-position) output setup	-	0 to 10	I16	rw	No	csp pp hm ip	Yes	A
2104h	22h	INP hold time	1ms	0 to 30000	I16	rw	No	csp pp hm ip	Yes	A
2104h	23h	Zero-speed	r/min	10 to 20000	I16	rw	No	ALL	Yes	A
2104h	24h	Speed coincidence range	r/min	10 to 20000	I16	rw	No	csv pv cst tq	Yes	A

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 4: I/O monitor

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2104h	25h	At-speed (Speed arrival)	r/min	10 to 20000	I16	rw	No	csv pv cst tq	Yes	A
2104h	26h	Mechanical brake action at stalling setup	1 ms	0 to 10000	I16	rw	No	ALL	Yes	B
2104h	27h	Mechanical brake action at running setup	1 ms	0 to 32000	I16	rw	No	ALL	Yes	B
2104h	28h	Brake release speed setup	r/min	30 to 3000	I16	rw	No	ALL	Yes	B
2104h	29h	Selection of alarm output 1	-	0 to 40	I16	rw	No	ALL	Yes	A
2104h	2Ah	Selection of alarm output 2	-	0 to 40	I16	rw	No	ALL	Yes	A
2104h	2Bh	Positioning complete (In-position) range 2	command	0 to 2097152	I32	rw	No	csp pp hm ip	Yes	A
2104h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2104h	2Dh	Position comparison output pulse width setting	0.1 ms	0 to 32767	I16	rw	No	ALL	Yes	R
2104h	2Eh	Position comparison output polarity selection	-	0 to 7	I16	rw	No	ALL	Yes	R
2104h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2104h	30h	Pulse output selection	-	0 to 7	I16	rw	No	ALL	Yes	R
2104h	31h	Position comparison value 1	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	32h	Position comparison value 2	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	33h	Position comparison value 3	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	34h	Position comparison value 4	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	35h	Position comparison value 5	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	36h	Position comparison value 6	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	37h	Position comparison value 7	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	38h	Position comparison value 8	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2104h	39h	Position comparison output delay compensation amount	0.1 us	-32768 to 32767	I16	rw	No	ALL	Yes	R
2104h	3Ah	Position comparison output assignment setting	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	R
2104h	3Bh	Reserved 59	-	-	I32	-	-	-	-	-
2104h	3Ch	Mechanical brake signal setup	-	0 to 2	I16	rw	No	ALL	Yes	B

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 5: Extended configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2105h	-	Parameter Class 5 (Axis A)	-	-	-	-	-	-	-	-
2105h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2105h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2105h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2105h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2105h	04h	Reserved 4	-	-	I32	-	-	-	-	-
2105h	05h	Over-travel inhibit input setup	-	0 to 2	I16	rw	No	ALL	Yes	C
2105h	06h	Sequence at over-travel inhibit	-	0 to 2	I16	rw	No	ALL	Yes	C
2105h	07h	Sequence at Servo-Off	-	0 to 9	I16	rw	No	ALL	Yes	B
2105h	08h	Sequence upon main power off	-	0 to 9	I16	rw	No	ALL	Yes	B
2105h	09h	L/V trip selection upon main power off	-	0 to 3	I16	rw	No	ALL	Yes	B
2105h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2105h	0Bh	Sequence at alarm	-	0 to 7	I16	rw	No	ALL	Yes	B
2105h	0Ch	Torque setup for emergency stop	%	0 to 500	I16	rw	No	ALL	Yes	B
2105h	0Dh	Over-load level setup	%	0 to 500	I16	rw	No	ALL	Yes	A
2105h	0Eh	Over-speed level setup	r/min	0 to 20000	I16	rw	No	ALL	Yes	B
2105h	0Fh	Motor working range setup	0.1 rotation	0 to 1000	I16	rw	No	csp pp hm ip	Yes	A
2105h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2105h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2105h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2105h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2105h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2105h	15h	Position setup unit select	-	0 to 1	I16	rw	No	csp pp hm ip	Yes	C
2105h	16h	Selection of torque limit	-	0 to 5	I16	rw	No	ALL	Yes	B
2105h	17h	2nd torque limit	%	0 to 500	I16	rw	No	csp pp hm ip csv pv	Yes	B
2105h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2105h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2105h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2105h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2105h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2105h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2105h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2105h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2105h	20h	USB axis address	-	0 to 127	I16	rw	No	ALL	Yes	C
2105h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2105h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2105h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2105h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2105h	25h	Reserved 37	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 5: Extended configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2105h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2105h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2105h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2105h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2105h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2105h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2105h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2105h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2105h	2Eh	Quadrant glitch positive-direction compensation value	0.1%	-1000 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2105h	2Fh	Quadrant glitch negative-direction compensation value	0.1%	-1000 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2105h	30h	Quadrant glitch compensation delay time	1 ms	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2105h	31h	Quadrant glitch compensation filter setting L	0.01 ms	0 to 6400	I16	rw	No	csp pp hm ip	Yes	B
2105h	32h	Quadrant glitch compensation filter setting H	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2105h	33h	Reserved 51	-	-	I32	-	-	-	-	-
2105h	34h	Reserved 52	-	-	I32	-	-	-	-	-
2105h	35h	Reserved 53	-	-	I32	-	-	-	-	-
2105h	36h	Reserved 54	-	-	I32	-	-	-	-	-
2105h	37h	Reserved 55	-	-	I32	-	-	-	-	-
2105h	38h	Reserved 56	-	-	I32	-	-	-	-	-
2105h	39h	Slow stop deceleration time setting	1 ms/ (1000 r/min)	0 to 10000	I16	rw	No	csp(s) pp(s) hm(s) ip(s)	Yes	B
2105h	3Ah	Slow stop S-shape acceleration and deceleration setting	1 ms	0 to 1000	I16	rw	No	csp(s) pp(s) hm(s) ip(s)	Yes	B
2105h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2105h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2105h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2105h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2105h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2105h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2105h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2105h	42h	Reserved 66	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 5: Extended configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2105h	43h	Deterioration diagnosis convergence judgment time	0.1 s	0 to 10000	I16	rw	No	ALL	Yes	A
2105h	44h	Deterioration diagnosis inertia ratio upper limit	%	0 to 10000	I16	rw	No	ALL	Yes	A
2105h	45h	Deterioration diagnosis inertia ratio lower limit	%	0 to 10000	I16	rw	No	ALL	Yes	A
2105h	46h	Deterioration diagnosis unbalanced load upper limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2105h	47h	Deterioration diagnosis unbalanced load lower limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2105h	48h	Deterioration diagnosis dynamic friction upper limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2105h	49h	Deterioration diagnosis dynamic friction lower limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2105h	4Ah	Deterioration diagnosis viscous friction upper limit	0.1%/ (10000 r/min)	0 to 10000	I16	rw	No	ALL	Yes	A
2105h	4Bh	Deterioration diagnosis viscous friction lower limit	0.1%/ (10000 r/min)	0 to 10000	I16	rw	No	ALL	Yes	A
2105h	4Ch	Deterioration diagnosis velocity setting	r/min	-20000 to 20000	I16	rw	No	ALL	Yes	A
2105h	4Dh	Deterioration diagnosis torque average time	1 ms	0 to 10000	I16	rw	No	ALL	Yes	A
2105h	4Eh	Deterioration diagnosis torque upper limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2105h	4Fh	Deterioration diagnosis torque lower limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2106h	-	Parameter Class 5 (Axis A)	-	-	-	-	-	-	-	-
2106h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2106h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2106h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2106h	03h	Speed deviation excess setup	r/min	0 to 20000	I16	rw	No	csp(s) pp(s) hm(s) ip(s)	Yes	A
2106h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2106h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2106h	06h	Position 3rd gain valid time	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2106h	07h	Position 3rd gain scale factor	%	50 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2106h	08h	Torque command additional value	%	-100 to 100	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	09h	Positive direction torque compensation value	%	-100 to 100	I16	rw	No	csp pp hm ip	Yes	B
2106h	0Ah	Negative direction torque compensation value	%	-100 to 100	I16	rw	No	csp pp hm ip	Yes	B
2106h	0Bh	Function expansion setup	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2106h	0Ch	Current response setup	%	10 to 300	I16	rw	No	ALL	Yes	B
2106h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2106h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2106h	0Fh	Emergency stop time at alarm	1 ms	0 to 1000	I16	rw	No	ALL	Yes	B
2106h	10h	2nd over-speed level setup	r/min	0 to 20000	I16	rw	No	ALL	Yes	B
2106h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2106h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2106h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2106h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2106h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2106h	16h	Reserved 22	-	-	I32	-	-	-	-	-
2106h	17h	Reserved 23	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2106h	18h	Load change compensation gain	%	-100 to 100	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	19h	Load change compensation filter	0.01 ms	10 to 2500	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2106h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2106h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2106h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2106h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2106h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2106h	20h	Real time auto tuning estimation speed	-	0 to 3	I16	rw	No	ALL	Yes	B
2106h	21h	Real time auto tuning custom setup	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2106h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2106h	23h	Hybrid vibration suppression gain	0.1 /s	0 to 30000	I16	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	B
2106h	24h	Hybrid vibration suppression filter	0.01 ms	0 to 32000	I16	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	B
2106h	25h	Dynamic brake operation input setup	-	0 to 1	I16	rw	No	ALL	Yes	R
2106h	26h	Oscillation detecting level	0.1%	0 to 1000	I16	rw	No	ALL	Yes	B
2106h	27h	Alarm mask setup	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2106h	28h	Alarm mask setup 2	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2106h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2106h	2Ah	1st damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2106h	2Bh	2-stage torque filter time constant	0.01 ms	0 to 2500	I16	rw	No	ALL	Yes	B
2106h	2Ch	2-stage torque filter attenuation term	—	0 to 1000	I16	rw	No	ALL	Yes	B
2106h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2106h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2106h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2106h	30h	Function expansion setup 2	-	-32768 to 32767	I16	rw	No	ALL	Yes	R

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2106h	31h	Tuning filter	0.1 ms	0 to 2000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	32h	Command / tuning filter damping	-	0 to 99	I16	rw	No	csp pp hm ip	Yes	B
2106h	33h	Viscous friction compensating gain	0.1%/ (10000 r/min)	0 to 10000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	34h	Wait time for emergency stop	ms	0 to 10000	I16	rw	No	ALL	Yes	B
2106h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2106h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2106h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2106h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2106h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2106h	3Ah	Torque saturation error protection detection time	1 ms	0 to 5000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	3Bh	Reserved 59	-	-	I32	-	-	-	-	-
2106h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2106h	3Dh	2nd damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2106h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2106h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2106h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2106h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2106h	42h	Reserved 66	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2106h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2106h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2106h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2106h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2106h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2106h	48h	3rd damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2106h	49h	4th damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2106h	4Ah	Load estimation filter	0.01 ms	0 to 2500	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	4Bh	Torque compensation frequency 1	0.1 Hz	0 to 5000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	4Ch	Torque compensation frequency 2	0.1 Hz	0 to 5000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	4Dh	Load estimation count	-	0 to 8	I16	rw	No	csp pp hm ip csv pv	Yes	B
2106h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2106h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2106h	50h	Reserved 80	-	-	I16	-	-	-	-	-
2106h	51h	Reserved 81	-	-	I16	-	-	-	-	-
2106h	52h	Reserved 82	-	-	I16	-	-	-	-	-
2106h	53h	Reserved 83	-	-	I16	-	-	-	-	-
2106h	54h	Reserved 84	-	-	I16	-	-	-	-	-
2106h	55h	Reserved 85	-	-	I16	-	-	-	-	-
2106h	56h	Reserved 86	-	-	I16	-	-	-	-	-
2106h	57h	Reserved 87	-	-	I16	-	-	-	-	-
2106h	58h	Reserved 88	-	-	I32	-	-	-	-	-
2106h	59h	Absolute encoder multi-turn data upper-limit value	-	0 to 65534	I32	rw	No	ALL	Yes	C
2106h	5Ah	Reserved 90	-	-	I16	-	-	-	-	-
2106h	5Bh	Reserved 91	-	-	I16	-	-	-	-	-
2106h	5Ch	Reserved 92	-	-	I16	-	-	-	-	-
2106h	5Dh	Reserved 93	-	-	I16	-	-	-	-	-
2106h	5Eh	Reserved 94	-	-	I16	-	-	-	-	-
2106h	5Fh	Reserved 95	-	-	I16	-	-	-	-	-
2106h	60h	Over-load warning detection level	%	0 to 114	I16	rw	No	ALL	Yes	A
2106h	61h	Over-load warning release level	%	0 to 114	I16	rw	No	ALL	Yes	A
2106h	62h	Function expansion setup 3	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	B
2106h	63h	Function expansion setup 4	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	R
2106h	64h	Reserved 100	-	-	I16	-	-	-	-	-
2106h	65h	Reserved 101	-	-	I16	-	-	-	-	-
2106h	66h	Reserved 102	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2107h	-	Parameter Class 7 (Axis A)	-	-	-	-	-	-	-	-
2107h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2107h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2107h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2107h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2107h	04h	Output setup during torque limit	-	0 to 1	I16	rw	No	cst tq	Yes	A
2107h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2107h	06h	Reserved 6	-	-	I32	-	-	-	-	-
2107h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2107h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2107h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2107h	0Ah	Correction time of latch delay 1	25 ns	-2000 to 2000	I16	rw	No	ALL	Yes	B
2107h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2107h	0Ch	Reserved 12	-	-	I32	-	-	-	-	-
2107h	0Dh	Reserved 13	-	-	I32	-	-	-	-	-
2107h	0Eh	Reserved 14	-	-	I32	-	-	-	-	-
2107h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2107h	10h	Reserved 16	-	-	I32	-	-	-	-	-
2107h	11h	Torque saturation error protection frequency	time	0 to 30000	I16	rw	No	csv pp hm ip csv pv	Yes	B
2107h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2107h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2107h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2107h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2107h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2107h	17h	Communication function extended setup 1	-	-32768 to 32767	I16	rw	No	ALL	Yes	R
2107h	18h	Communication function extended setup 2	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2107h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2107h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2107h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2107h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2107h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2107h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2107h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2107h	20h	Reserved 32	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2107h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2107h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2107h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2107h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2107h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2107h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2107h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2107h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2107h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2107h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2107h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2107h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2107h	2Dh	Software version	-	-2147483648 to 2147483647	I32	ro	No	ALL	Yes	X
2107h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2107h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2107h	30h	Reserved 48	-	-	I16	-	-	-	-	-
2107h	31h	Reserved 49	-	-	I16	-	-	-	-	-
2107h	32h	Reserved 50	-	-	I16	-	-	-	-	-
2107h	33h	Reserved 51	-	-	I16	-	-	-	-	-
2107h	34h	Reserved 52	-	-	I16	-	-	-	-	-
2107h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2107h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2107h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2107h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2107h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2107h	3Ah	Reserved 58	-	-	I16	-	-	-	-	-
2107h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2107h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2107h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2107h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2107h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2107h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2107h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2107h	42h	Reserved 66	-	-	I16	-	-	-	-	-
2107h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2107h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2107h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2107h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2107h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2107h	48h	Reserved 72	-	-	I16	-	-	-	-	-
2107h	49h	Reserved 73	-	-	I16	-	-	-	-	-
2107h	4Ah	Reserved 74	-	-	I16	-	-	-	-	-
2107h	4Bh	Reserved 75	-	-	I16	-	-	-	-	-
2107h	4Ch	Reserved 76	-	-	I16	-	-	-	-	-
2107h	4Dh	Reserved 77	-	-	I16	-	-	-	-	-
2107h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2107h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2107h	50h	Reserved 80	-	-	I16	-	-	-	-	-
2107h	51h	Reserved 81	-	-	I16	-	-	-	-	-
2107h	52h	Reserved 82	-	-	I16	-	-	-	-	-
2107h	53h	Reserved 83	-	-	I16	-	-	-	-	-
2107h	54h	Reserved 84	-	-	I16	-	-	-	-	-
2107h	55h	Reserved 85	-	-	I16	-	-	-	-	-
2107h	56h	Reserved 86	-	-	I16	-	-	-	-	-
2107h	57h	Reserved 87	-	-	I16	-	-	-	-	-
2107h	58h	Communication function extended setup 5	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2107h	59h	Reserved 89	-	-	I16	-	-	-	-	-
2107h	5Ah	Reserved 90	-	-	I16	-	-	-	-	-
2107h	5Bh	Reserved 91	-	-	I16	-	-	-	-	-
2107h	5Ch	Reserved 92	-	-	I16	-	-	-	-	-
2107h	5Dh	Correction time of latch delay 2	25 ns	-2000 to 2000	I16	rw	No	ALL	Yes	B
2107h	5Eh	Homing return speed limit value	r/min	0 to 20000	I16	rw	No	hm	Yes	C
2107h	5Fh	Reserved 95	-	-	I16	-	-	-	-	-
2107h	60h	Reserved 96	-	-	I16	-	-	-	-	-
2107h	61h	Reserved 97	-	-	I16	-	-	-	-	-
2107h	62h	Reserved 98	-	-	I16	-	-	-	-	-
2107h	63h	Reserved 99	-	-	I16	-	-	-	-	-
2107h	64h	Communication function extended setup 6	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2107h	65h	Reserved 101	-	-	I16	-	-	-	-	-
2107h	66h	Reserved 102	-	-	I32	-	-	-	-	-
2107h	67h	Reserved 103	-	-	I32	-	-	-	-	-
2107h	68h	Reserved 104	-	-	I32	-	-	-	-	-
2107h	69h	Reserved 105	-	-	I32	-	-	-	-	-
2107h	6Ah	Reserved 106	-	-	I16	-	-	-	-	-
2107h	6Bh	Reserved 107	-	-	I16	-	-	-	-	-
2107h	6Ch	Reserved 108	-	-	I16	-	-	-	-	-
2107h	6Dh	Reserved 109	-	-	I16	-	-	-	-	-
2107h	6Eh	Reserved 110	-	-	I16	-	-	-	-	-
2107h	6Fh	Communication function extended setup 7 (Note 1) (Note 2)	-	-	I32	rw	No	ALL	Yes	B
2107h	70h	Reserved 112	-	-	I16	-	-	-	-	-
2107h	71h	Reserved 113	-	-	I16	-	-	-	-	-
2107h	72h	Torque offset filter	0.01 ms	0 to 6400	I16	rw	No	ALL	Yes	B

(Note 1) Not supported in the first edition of the software version (Ver1.01).

(Note 2) Cannot be used in a software version of function expansion edition 1. Fix the value to 0.

■ **A axis servo parameter area (2100h-01h to 211Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2107h	73h (Note1)	Reserved 115	—	—	I16	—	—	—	—	—
2107h	74h (Note1)	Reserved 116	—	—	I16	—	—	—	—	—
2107h	75h (Note1)	Reserved 117	—	—	I32	—	—	—	—	—
2107h	76h (Note1)	Reserved 118	—	—	I32	—	—	—	—	—
2107h	77h (Note1)	Reserved 119	—	—	I32	—	—	—	—	—
2107h	78h (Note1)	Reserved 120	—	—	I16	—	—	—	—	—
2107h	79h (Note1)	Reserved 121	—	—	I32	—	—	—	—	—
2107h	7Ah (Note1)	Reserved 122	—	—	I32	—	—	—	—	—
2107h	7Bh (Note1)	Reserved 123	—	—	I16	—	—	—	—	—
2107h	7Ch (Note1)	Reserved 124	—	—	I16	—	—	—	—	—
2107h	7Dh (Note1) (Note2)	Over-travel inhibit input protection detection dead zone setup	command unit	0 – 2147483647	I32	rw	No	csp	Yes	B

(Note 1) Not supported in the first edition of the software version (Ver1.01).

(Note 2) Cannot be used in a software version of function expansion edition 1. Fix the value to 0.

A axis servo parameter area (2100h-01h to 211Fh-FFh)

Category 8: Specific configuration 3

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2108h	-	Parameter Class 8 (Axis A)	-	-	-	-	-	-	-	-
2108h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2108h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2108h	02h	Reserved 2	-	-	I32	-	-	-	-	-
2108h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2108h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2108h	05h	Reserved 5	-	-	I32	-	-	-	-	-
2108h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2108h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2108h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2108h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2108h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2108h	0Bh	Reserved 11	-	-	I32	-	-	-	-	-
2108h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2108h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2108h	0Eh	Reserved 14	-	-	I32	-	-	-	-	-
2108h	0Fh	Reserved 15	-	-	I32	-	-	-	-	-
2108h	10h	Reserved 16	-	-	I32	-	-	-	-	-
2108h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2108h	12h	Reserved 18	-	-	I32	-	-	-	-	-
2108h	13h	Reserved 19	-	-	I32	-	-	-	-	-
2108h	14h	Reserved 20	-	-	I16	-	-	-	-	-

9.1.6 A axis user-specific area: Command object (2120h to 217Fh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2120h	00h	History number (Axis A)	-	0 to 3	U8	rw	No	ALL	No	A
2121h	00h	Alarm main no (Axis A)	-	0 to 127	U8	rw	No	ALL	No	A
2122h	00h	Reserved	-	-	U8	-	-	-	-	-
2123h	-	Special function start (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	3	U8	ro	No	ALL	No	X
	01h	Special function start flag 1	-	0 to 4294967295	U32	rw	No		No	B
	02h	Special function start flag 2	-	0 to 4294967295	U32	rw	No		No	B
	03h	Reserved 3	-	-	U32	rw	-	-	-	-
2124h	00h	Special function setting 9 (Axis A)	-	0 to 65535	U16	rw	No	ALL	No	B
2125h	-	External scale ID (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No	ALL	No	X
	01h	External scale vendor ID	-	-	VS	ro	No		No	X
	02h	External scale model ID	-	-	VS	ro	No		No	X
2126h	-	Reserved	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2	U8	-	-	-	-	-
	01h	Reserved 1	-	-	U32	-	-	-	-	-
	02h	Reserved 2	-	-	U32	-	-	-	-	-
2127h	00h	Motor serial number (Axis A)	-	-	VS	ro	No	ALL	No	X
2128h	00h	Reserved	-	-	VS	-	-	-	-	-
2129h	00h	Reserved	-	-	VS	-	-	-	-	-
212Bh	00h	Over load factor (Axis A)	0.1%	0 to 65535	U16	ro	TxPDO	ALL	No	X

■ **A axis User-specific area:Command object (2120h to 217Fh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
212Ch	-	Alarm accessory information (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	36 to 36	U8	ro	No	ALL	No	X
	01h	History number echo	-	0 to 3	U8	ro	No	ALL	No	X
	02h	Alarm code	-	0 to 4294967295	U32	ro	No	ALL	No	X
	03h	Control mode	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	04h	Motor speed	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	05h	Positional command velocity	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	06h	Velocity control command	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	07h	Torque command	0.05%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	08h	Position command deviation	command	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	09h	Position actual internal value	pulse	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Ah	Reserved 10	-	-	I32	-	-	-	-	-
	0Bh	Input port (logic signal)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Ch	Output port (logic signal)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Dh	Analog input	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Eh	Reserved 14	-	-	I32	-	-	-	-	-
	0Fh	Reserved 15	-	-	I32	-	-	-	-	-
	10h	Overload ratio	0.2%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	11h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	12h	Voltage across PN	V	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	13h	Temperature of amplifier	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	14h	Warning flags	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	15h	Inertia ratio	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	16h	Reserved 22	-	-	I32	-	-	-	-	-
	17h	Reserved 23	-	-	I32	-	-	-	-	-
	18h	Reserved 24	-	-	I32	-	-	-	-	-
	19h	Temperature of encoder	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	1Ah	Reserved 26	-	-	I32	-	-	-	-	-
	1Bh	Reserved 27	-	-	I32	-	-	-	-	-
	1Ch	Reserved 28	-	-	I32	-	-	-	-	-
	1Dh	U-phase current detection value	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	1Eh	W-phase current detection value	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	1Fh	Reserved 31	-	-	I32	-	-	-	-	-
	20h	Reserved 32	-	-	I32	-	-	-	-	-
	21h	Encoder single-turn data	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	22h	Encoder communication error count (accumulated)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	23h	External scale communication data error count (accumulated)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	24h	Reserved 36	-	-	I32	-	-	-	-	-
212Dh	00h	Velocity control loop torque limit (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	No	A

9.1.7 A axis user-specific area: CoECommunicationCopy object(2280h to 22FFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2280h	00h	Error register (Axis A)	-	0 to 255	U8	ro	No	ALL	No	X
2281h	-	Diagnosis history (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Maximum messages	-	0 to 255	U8	ro	No	ALL	No	X
	02h	Newest message	-	0 to 255	U8	ro	No	ALL	No	X
	03h	Newest acknowledged message	-	0 to 255	U8	rw	No	ALL	No	A
	04h	New messages available	-	0 to 1	BOOL	ro	No	ALL	No	X
	05h	Flags	-	0 to 65535	U16	rw	No	ALL	Yes	A
	06h	Diagnosis message 1	-	-	OS	ro	No	ALL	No	X
	:									
	13h	Diagnosis message 14	-	-	OS	ro	No	ALL	No	X

9.1.8 A axis user-specific area: Monitor object (2300h to 23FFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2301h	00h	Following error actual value (after filtering) (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
2303h	00h	Reserved	-	-	I32	-	-	-	-	-
2304h	00h	Position command internal value (after filtering) (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
230Bh	00h	Reserved	-	-	I32	-	-	-	-	-
230Ch	00h	Velocity command value (after filtering) (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
230Dh	00h	External scale position (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2321h	00h	Logical input signal (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2322h	00h	Logical output signal (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2323h	00h	Logical input signal (expansion portion) (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2324h	00h	Reserved	-	-	U32	-	-	-	-	-
2331h	00h	Inertia ratio (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2332h	00h	Motor automatic identification (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2333h	00h	Cause of motor no work (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2334h	00h	Warning flags (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2336h	00h	Reserved	-	-	I32	-	-	-	-	-
2337h	-	Multiple alarm/warning information (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	18 to 18	U8	ro	No	ALL	No	X
	01h	Multiple alarm information 1	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	02h	Multiple alarm information 2	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	03h	Multiple alarm information 3	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	04h	Multiple alarm information 4	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	05h	Reserved 5	-	-	I32	-	-	-	-	-
	:									
	0Fh	Reserved 15	-	-	I32	-	-	-	-	-
	10h	Multiple sub alarm information	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	11h	Multiple warning information 1	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	12h	Multiple warning information 2	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2341h	-	Motor encoder data (Axis A)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2 to 2	U8	ro	No	ALL	No	X
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X

■ **A axis User-specific area: monitor object (2300h to 23FFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2342h	00h	Electrical angle (Axis A)	0.0879°	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2344h	00h	Encoder status (Axis A)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2346h	00h	Reserved	-	-	U16	-	-	-	-	-
2348h	00h	External scale pulse total (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2349h	00h	External scale absolute position (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
234Ah	00h	External scale position deviation (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
2351h	00h	Reserved	-	-	I32	-	-	-	-	-
2353h	00h	Reserved	-	-	U32	-	-	-	-	-
2363h	00h	Temperature of encoder (Axis A)	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2364h	00h	Inrush resistance relay operating count (Axis A)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2365h	00h	Dynamic brake operating count (Axis A)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
236Ah	00h	Reserved	-	-	I32	-	-	-	-	-
236Bh	00h	Reserved	-	-	I32	-	-	-	-	-
236Ch	00h	Motor power consumption (Axis A)	W	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
236Dh	00h	Amount of motor power consumption (Axis A)	Wh	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
236Eh	00h	Cumulative value of motor power consumption (Axis A)	Wh	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2372h	00h	Reserved	-	-	I32	-	-	-	-	-
2373h	00h	Reserved	-	-	I32	-	-	-	-	-
2381h	00h	Encoder communication error count (accumulated) (Axis A)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2382h	00h	Reserved	-	-	I32	-	-	-	-	-
2383h	00h	External scale communication error count (accumulated) (Axis A)	time	0 to 65535	U16	ro	TxPDO	ALL	No	X
2384h	00h	External scale communication data error count (accumulated) (Axis A)	time	0 to 65535	U16	ro	TxPDO	ALL	No	X
2385h	00h	Reserved	-	-	I32	-	-	-	-	-
2386h	00h	Hybrid deviation (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
2387h	00h	External scale data(Higher) (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2388h	00h	External scale data(Lower) (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2389h	00h	External scale status (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
238Ah	00h	External scale Z phase counter (Axis A)	-	0 to 65535	U16	ro	No	ALL	No	X
238Ch	00h	Reserved	-	-	I32	-	-	-	-	-

■ **A axis User-specific area: monitor object (2300h to 23FFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
23A1h	00h	Velocity command value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
23A4h	00h	Reserved	-	-	I32	-	-	-	-	-
23A5h	00h	Velocity internal position command (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
23A6h	00h	Velocity error actual value (Axis A)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
23A7h	00h	External scale position (Applied polarity) (Axis A)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
23A8h	00h	Positive direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
23A9h	00h	Negative direction torque limit value (Axis A)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
23ABh	00h	Gain switching flag (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
23ACh	00h	Reserved	-	-	I32	-	-	-	-	-
23AFh	00h	Estimated position for seamless mode change (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
23B1h	00h	Deterioration diagnosis state	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23B2h	00h	Deterioration diagnosis torque command average value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23B3h	00h	Deterioration diagnosis torque command standard value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23B4h	00h	Deterioration diagnosis inertia ratio estimate value (Axis A)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23B5h	00h	Deterioration diagnosis offset load estimate value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23B6h	00h	Deterioration diagnosis dynamic friction estimate value (Axis A)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23B7h	00h	Deterioration diagnosis viscous friction estimate value (Axis A)	0.1%/ (10000 r/min)	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
23F5h	00h	Reserved	-	-	I32	-	-	-	-	-
23F6h	00h	Reserved	-	-	I32	-	-	-	-	-
23F7h	-	Reserved	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2 to 2	U8	ro	No	ALL	No	X
	01h	Reserved 1	-	-	I32	-	-	-	-	-
	02h	Reserved 2	-	-	I32	-	-	-	-	-
23F8h	-	Reserved	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2 to 2	U8	ro	No	ALL	No	X
	01h	Reserved 1	-	-	I32	-	-	-	-	-
	02h	Reserved 2	-	-	I32	-	-	-	-	-
23FDh	00h	Reserved	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X

9.1.9 B axis servo parameter area (2500h-01h to 251Fh-FFh)

Category 0: Basic configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2500h	-	Parameter Class 0 (Axis B)	-	-	-	-	-	-	-	-
2500h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2500h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2500h	02h	Control mode setup	-	0 to 6	I16	rw	No	ALL	Yes	R
2500h	03h	Real-time auto-gain tuning setup	-	0 to 6	I16	rw	No	ALL	Yes	B
2500h	04h	Real-time auto-tuning machine stiffness setup	-	0 to 31	I16	rw	No	ALL	Yes	B
2500h	05h	Inertia ratio	%	0 to 10000	I16	rw	No	ALL	Yes	B
2500h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2500h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2500h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2500h	09h	Reserved 9	-	-	I32	-	-	-	-	-
2500h	0Ah	Reserved 10	-	-	I32	-	-	-	-	-
2500h	0Bh	Reserved 11	-	-	I32	-	-	-	-	-
2500h	0Ch	Reserved 12	-	-	I32	-	-	-	-	-
2500h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2500h	0Eh	1st torque limit	%	0 to 500	I16	rw	No	ALL	Yes	B
2500h	0Fh	Position deviation excess setup	command	0 to 1073741824	I32	rw	No	csp pp hm ip	Yes	A
2500h	10h	Absolute encoder setup	-	0 to 4	I16	rw	No	ALL	Yes	C
2500h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2500h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2500h	13h	Reserved 19	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 1: Gain tuning

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2501h	-	Parameter Class 1 (Axis B)	-	-	-	-	-	-	-	-
2501h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2501h	01h	1st gain of position loop	0.1 /s	0 to 30000	I16	rw	No	csp pp hm ip	Yes	B
2501h	02h	1st velocity loop gain	0.1 Hz	1 to 32767	I16	rw	No	ALL	Yes	B
2501h	03h	1st velocity loop integration time constant	0.1 ms	1 to 10000	I16	rw	No	ALL	Yes	B
2501h	04h	1st filter of velocity detection	-	0 to 5	I16	rw	No	ALL	Yes	B
2501h	05h	1st torque filter time constant	0.01 ms	0 to 2500	I16	rw	No	ALL	Yes	B
2501h	06h	2nd gain of position loop	0.1 /s	0 to 30000	I16	rw	No	csp pp hm ip	Yes	B
2501h	07h	2nd velocity loop gain	0.1 Hz	1 to 32767	I16	rw	No	ALL	Yes	B
2501h	08h	2nd velocity loop integration time constant	0.1 ms	1 to 10000	I16	rw	No	ALL	Yes	B
2501h	09h	2nd filter of velocity detection	-	0 to 5	I16	rw	No	ALL	Yes	B
2501h	0Ah	2nd torque filter time constant	0.01 ms	0 to 2500	I16	rw	No	ALL	Yes	B
2501h	0Bh	Velocity feed forward gain	0.1%	0 to 4000	I16	rw	No	csp pp hm ip	Yes	B
2501h	0Ch	Velocity feed forward filter	0.01 ms	0 to 6400	I16	rw	No	csp pp hm ip	Yes	B
2501h	0Dh	Torque feed forward gain	0.1%	0 to 2000	I16	rw	No	ALL	Yes	B
2501h	0Eh	Torque feed forward filter	0.01 ms	0 to 6400	I16	rw	No	ALL	Yes	B
2501h	0Fh	2nd gain setup	-	0 to 1	I16	rw	No	ALL	Yes	B
2501h	10h	Mode of position control switching	-	0 to 10	I16	rw	No	csp pp hm ip	Yes	B
2501h	11h	Delay time of position control switching	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2501h	12h	Level of position control switching	-	0 to 20000	I16	rw	No	csp pp hm ip	Yes	B
2501h	13h	Hysteresis at position control switching	-	0 to 20000	I16	rw	No	csp pp hm ip	Yes	B
2501h	14h	Position gain switching time	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 1: Gain tuning

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2501h	15h	Mode of velocity control switching	-	0 to 5	I16	rw	No	csv pv	Yes	B
2501h	16h	Delay time of velocity control switching	0.1 ms	0 to 10000	I16	rw	No	csv pv	Yes	B
2501h	17h	Level of velocity control switching	-	0 to 20000	I16	rw	No	csv pv	Yes	B
2501h	18h	Hysteresis at velocity control switching	-	0 to 20000	I16	rw	No	csv pv	Yes	B
2501h	19h	Mode of torque control switching	-	0 to 3	I16	rw	No	cst tq	Yes	B
2501h	1Ah	Delay time of torque control switching	0.1 ms	0 to 10000	I16	rw	No	cst tq	Yes	B
2501h	1Bh	Level of torque control switching	-	0 to 20000	I16	rw	No	cst tq	Yes	B
2501h	1Ch	Hysteresis at torque control switching	-	0 to 20000	I16	rw	No	cst tq	Yes	B
2501h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2501h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2501h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2501h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2501h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2501h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2501h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2501h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2501h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2501h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2501h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2501h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2501h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2501h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2501h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2501h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2501h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2501h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2501h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2501h	30h	Reserved 48	-	-	I16	-	-	-	-	-
2501h	31h	Reserved 49	-	-	I16	-	-	-	-	-
2501h	32h	Reserved 50	-	-	I16	-	-	-	-	-
2501h	33h	Reserved 51	-	-	I16	-	-	-	-	-
2501h	34h	Reserved 52	-	-	I16	-	-	-	-	-
2501h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2501h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2501h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2501h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2501h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2501h	3Ah	Reserved 58	-	-	I16	-	-	-	-	-
2501h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2501h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2501h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2501h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2501h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2501h	40h	Reserved 64	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 1: Gain tuning

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2501h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2501h	42h	Reserved 66	-	-	I16	-	-	-	-	-
2501h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2501h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2501h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2501h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2501h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2501h	48h	Reserved 72	-	-	I16	-	-	-	-	-
2501h	49h	Reserved 73	-	-	I16	-	-	-	-	-
2501h	4Ah	Reserved 74	-	-	I16	-	-	-	-	-
2501h	4Bh	Reserved 75	-	-	I16	-	-	-	-	-
2501h	4Ch	Reserved 76	-	-	I16	-	-	-	-	-
2501h	4Dh	Reserved 77	-	-	I16	-	-	-	-	-
2501h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2501h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 2: Anti-vibration filter

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2502h	-	Parameter Class 2 (Axis B)	-	-	-	-	-	-	-	-
2502h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2502h	01h	Adaptive filter mode setup	-	0 to 6	I16	rw	No	csp pp hm ip csv pv	Yes	B
2502h	02h	1st notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2502h	03h	1st notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2502h	04h	1st notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2502h	05h	2nd notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2502h	06h	2nd notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2502h	07h	2nd notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2502h	08h	3rd notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2502h	09h	3rd notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2502h	0Ah	3rd notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2502h	0Bh	4th notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2502h	0Ch	4th notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2502h	0Dh	4th notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2502h	0Eh	Selection of damping filter switching	-	0 to 6	I16	rw	No	csp pp hm ip	Yes	B
2502h	0Fh	1st damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2502h	10h	1st damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B
2502h	11h	2nd damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2502h	12h	2nd damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B
2502h	13h	3rd damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2502h	14h	3rd damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 2: Anti-vibration filter

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2502h	15h	4th damping frequency	0.1 Hz	0 to 3000	I16	rw	No	csp pp hm ip	Yes	B
2502h	16h	4th damping filter setup	0.1 Hz	0 to 1500	I16	rw	No	csp pp hm ip	Yes	B
2502h	17h	Positional command smoothing filter	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2502h	18h	Positional command FIR filter	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2502h	19h	5th notch frequency	Hz	50 to 5000	I16	rw	No	ALL	Yes	B
2502h	1Ah	5th notch width selection	-	0 to 20	I16	rw	No	ALL	Yes	B
2502h	1Bh	5th notch depth selection	-	0 to 99	I16	rw	No	ALL	Yes	B
2502h	1Ch	1st damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2502h	1Dh	2nd damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2502h	1Eh	3rd damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2502h	1Fh	4th damping width setting	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2502h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2502h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2502h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2502h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2502h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2502h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2502h	26h	Reserved 38	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 3: Velocity, Torque, and Full-closed controls

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2503h	-	Parameter Class 3 (Axis B)	-	-	-	-	-	-	-	-
2503h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2503h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2503h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2503h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2503h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2503h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2503h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2503h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2503h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2503h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2503h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2503h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2503h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2503h	0Dh	Acceleration time setup	1 ms/ (1000 r/min)	0 to 10000	I16	rw	No	csv pv	Yes	B
2503h	0Eh	Deceleration time setup	1 ms/ (1000 r/min)	0 to 10000	I16	rw	No	csv pv	Yes	B
2503h	0Fh	Sigmoid acceleration / deceleration time setup	1ms	0 to 1000	I16	rw	No	csv pv	Yes	B
2503h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2503h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2503h	12h	Selection of speed limit	-	2	I16	rw	No	cst tq	Yes	B
2503h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2503h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2503h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2503h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2503h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2503h	18h	External scale selection	-	0 to 6	I16	rw	No	ALL	Yes	R
2503h	19h	Numerator of external scale division	-	0 to 8388608	I32	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	R
2503h	1Ah	Denominator of external scale division	-	1 to 8388608	I32	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	R
2503h	1Bh	Reversal of direction of external scale	-	0 to 3	I16	rw	No	ALL	Yes	R
2503h	1Ch	External scale Z phase disconnection detection disable	-	0 to 1	I16	rw	No	ALL	Yes	R
2503h	1Dh	Hybrid deviation excess setup	command	1 to 134217728	I32	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	C
2503h	1Eh	Hybrid deviation clear setup	rotation	0 to 100	I16	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	C

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 4: I/O monitor

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2504h	-	Parameter Class 4 (Axis B)	-	-	-	-	-	-	-	-
2504h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2504h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2504h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2504h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2504h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2504h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2504h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2504h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2504h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2504h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2504h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2504h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2504h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2504h	0Dh	Reserved 13	-	-	I32	-	-	-	-	-
2504h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2504h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2504h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2504h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2504h	12h	Reserved 18	-	-	I32	-	-	-	-	-
2504h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2504h	14h	Reserved 20	-	-	I32	-	-	-	-	-
2504h	15h	Reserved 21	-	-	I32	-	-	-	-	-
2504h	16h	Reserved 22	-	-	I32	-	-	-	-	-
2504h	17h	Reserved 23	-	-	I16	-	-	-	-	-
2504h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2504h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2504h	1Ah	Reserved 26	-	-	I32	-	-	-	-	-
2504h	1Bh	Reserved 27	-	-	I32	-	-	-	-	-
2504h	1Ch	Reserved 28	-	-	I32	-	-	-	-	-
2504h	1Dh	Reserved 29	-	-	I32	-	-	-	-	-
2504h	1Eh	Reserved 30	-	-	I32	-	-	-	-	-
2504h	1Fh	Reserved 31	-	-	I32	-	-	-	-	-
2504h	20h	Positioning complete (In-position) range	command	0 to 2097152	I32	rw	No	csp pp hm ip	Yes	A
2504h	21h	Positioning complete (In-position) output setup	-	0 to 10	I16	rw	No	csp pp hm ip	Yes	A
2504h	22h	INP hold time	1 ms	0 to 30000	I16	rw	No	csp pp hm ip	Yes	A
2504h	23h	Zero-speed	r/min	10 to 20000	I16	rw	No	ALL	Yes	A
2504h	24h	Speed coincidence range	r/min	10 to 20000	I16	rw	No	csv pv cst tq	Yes	A
2504h	25h	At-speed (Speed arrival)	r/min	10 to 20000	I16	rw	No	csv pv cst tq	Yes	A

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 4: I/O monitor

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2504h	26h	Mechanical brake action at stalling setup	1 ms	0 to 10000	I16	rw	No	ALL	Yes	B
2504h	27h	Mechanical brake action at running setup	1 ms	0 to 32000	I16	rw	No	ALL	Yes	B
2504h	28h	Brake release speed setup	r/min	30 to 3000	I16	rw	No	ALL	Yes	B
2504h	29h	Selection of alarm output 1	-	0 to 40	I16	rw	No	ALL	Yes	A
2504h	2Ah	Selection of alarm output 2	-	0 to 40	I16	rw	No	ALL	Yes	A
2504h	2Bh	Positioning complete (In-position) range 2	command	0 to 2097152	I32	rw	No	csp pp hm ip	Yes	A
2504h	2Ch	Reserved 44	-	-	I32	-	-	-	-	-
2504h	2Dh	Position comparison output pulse width setting	0.1 ms	0 to 32767	I16	rw	No	ALL	Yes	R
2504h	2Eh	Position comparison output polarity selection	-	0 to 7	I16	rw	No	ALL	Yes	R
2504h	2Fh	Reserved 47	-	-	I32	-	-	-	-	-
2504h	30h	Pulse output selection	-	0 to 1	I16	rw	No	ALL	Yes	R
2504h	31h	Position comparison value 1	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	32h	Position comparison value 2	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	33h	Position comparison value 3	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	34h	Position comparison value 4	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	35h	Position comparison value 5	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	36h	Position comparison value 6	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	37h	Position comparison value 7	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	38h	Position comparison value 8	command	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	A
2504h	39h	Position comparison output delay compensation amount	0.1 us	-32768 to 32767	I16	rw	No	ALL	Yes	R
2504h	3Ah	Position comparison output assignment setting	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	R
2504h	3Bh	Reserved 59	-	-	I32	-	-	-	-	-
2504h	3Ch	Mechanical brake signal setup	-	0 to 2	I16	rw	No	ALL	Yes	B

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 5: Extended configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2505h	-	Parameter Class 5 (Axis B)	-	-	-	-	-	-	-	-
2505h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2505h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2505h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2505h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2505h	04h	Reserved 4	-	-	I32	-	-	-	-	-
2505h	05h	Over-travel inhibit input setup	-	0 to 2	I16	rw	No	ALL	Yes	C
2505h	06h	Sequence at over-travel inhibit	-	0 to 2	I16	rw	No	ALL	Yes	C
2505h	07h	Sequence at Servo-Off	-	0 to 9	I16	rw	No	ALL	Yes	B
2505h	08h	Sequence upon main power off	-	0 to 9	I16	rw	No	ALL	Yes	B
2505h	09h	L/V trip selection upon main power off	-	0 to 3	I16	rw	No	ALL	Yes	B
2505h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2505h	0Bh	Sequence at alarm	-	0 to 7	I16	rw	No	ALL	Yes	B
2505h	0Ch	Torque setup for emergency stop	%	0 to 500	I16	rw	No	ALL	Yes	B
2505h	0Dh	Over-load level setup	%	0 to 500	I16	rw	No	ALL	Yes	A
2505h	0Eh	Over-speed level setup	r/min	0 to 20000	I16	rw	No	ALL	Yes	B
2505h	0Fh	Motor working range setup	0.1 rotation	0 to 1000	I16	rw	No	csp pp hm ip	Yes	A
2505h	10h	Reserved 16	-	-	I16	-	-	-	-	-
2505h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2505h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2505h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2505h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2505h	15h	Position setup unit select	-	0 to 1	I16	rw	No	csp pp hm ip	Yes	C
2505h	16h	Selection of torque limit	-	0 to 5	I16	rw	No	ALL	Yes	B
2505h	17h	2nd torque limit	%	0 to 500	I16	rw	No	csp pp hm ip csv pv	Yes	B
2505h	18h	Reserved 24	-	-	I16	-	-	-	-	-
2505h	19h	Reserved 25	-	-	I16	-	-	-	-	-
2505h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2505h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2505h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2505h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2505h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2505h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2505h	20h	USB axis address	-	0 to 127	I16	rw	No	ALL	Yes	C
2505h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2505h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2505h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2505h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2505h	25h	Reserved 37	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 5: Extended configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2505h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2505h	27h	Reserved 39	-	-	I16	-	-	-	-	-
2505h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2505h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2505h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2505h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2505h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2505h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2505h	2Eh	Quadrant glitch positive-direction compensation value	0.1%	-1000 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2505h	2Fh	Quadrant glitch negative-direction compensation value	0.1%	-1000 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2505h	30h	Quadrant glitch compensation delay time	1 ms	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2505h	31h	Quadrant glitch compensation filter setting L	0.01 ms	0 to 6400	I16	rw	No	csp pp hm ip	Yes	B
2505h	32h	Quadrant glitch compensation filter setting H	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2505h	33h	Reserved 51	-	-	I32	-	-	-	-	-
2505h	34h	Reserved 52	-	-	I32	-	-	-	-	-
2505h	35h	Reserved 53	-	-	I32	-	-	-	-	-
2505h	36h	Reserved 54	-	-	I32	-	-	-	-	-
2505h	37h	Reserved 55	-	-	I32	-	-	-	-	-
2505h	38h	Reserved 56	-	-	I32	-	-	-	-	-
2505h	39h	Slow stop deceleration time setting	1 ms/ (1000 r/min)	0 to 10000	I16	rw	No	csp(s) pp(s) hm(s) ip(s)	Yes	B
2505h	3Ah	Slow stop S-shape acceleration and deceleration setting	1 ms	0 to 1000	I16	rw	No	csp(s) pp(s) hm(s) ip(s)	Yes	B
2505h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2505h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2505h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2505h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2505h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2505h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2505h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2505h	42h	Reserved 66	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 5: Extended configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2505h	43h	Deterioration diagnosis convergence judgment time	0.1 s	0 to 10000	I16	rw	No	ALL	Yes	A
2505h	44h	Deterioration diagnosis inertia ratio upper limit	%	0 to 10000	I16	rw	No	ALL	Yes	A
2505h	45h	Deterioration diagnosis inertia ratio lower limit	%	0 to 10000	I16	rw	No	ALL	Yes	A
2505h	46h	Deterioration diagnosis unbalanced load upper limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2505h	47h	Deterioration diagnosis unbalanced load lower limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2505h	48h	Deterioration diagnosis dynamic friction upper limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2505h	49h	Deterioration diagnosis dynamic friction lower limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2505h	4Ah	Deterioration diagnosis viscous friction upper limit	0.1%/ (10000 r/min)	0 to 10000	I16	rw	No	ALL	Yes	A
2505h	4Bh	Deterioration diagnosis viscous friction lower limit	0.1%/ (10000 r/min)	0 to 10000	I16	rw	No	ALL	Yes	A
2505h	4Ch	Deterioration diagnosis velocity setting	r/min	-20000 to 20000	I16	rw	No	ALL	Yes	A
2505h	4Dh	Deterioration diagnosis torque average time	1 ms	0 to 10000	I16	rw	No	ALL	Yes	A
2505h	4Eh	Deterioration diagnosis torque upper limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A
2505h	4Fh	Deterioration diagnosis torque lower limit	0.1%	-1000 to 1000	I16	rw	No	ALL	Yes	A

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2506h	-	Parameter Class 5 (Axis B)	-	-	-	-	-	-	-	-
2506h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2506h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2506h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2506h	03h	Speed deviation excess setup	r/min	0 to 20000	I16	rw	No	csp(s) pp(s) hm(s) ip(s)	Yes	A
2506h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2506h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2506h	06h	Position 3rd gain valid time	0.1 ms	0 to 10000	I16	rw	No	csp pp hm ip	Yes	B
2506h	07h	Position 3rd gain scale factor	%	50 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2506h	08h	Torque command additional value	%	-100 to 100	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	09h	Positive direction torque compensation value	%	-100 to 100	I16	rw	No	csp pp hm ip	Yes	B
2506h	0Ah	Negative direction torque compensation value	%	-100 to 100	I16	rw	No	csp pp hm ip	Yes	B
2506h	0Bh	Function expansion setup	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2506h	0Ch	Current response setup	%	10 to 300	I16	rw	No	ALL	Yes	B
2506h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2506h	0Eh	Reserved 14	-	-	I16	-	-	-	-	-
2506h	0Fh	Emergency stop time at alarm	1 ms	0 to 1000	I16	rw	No	ALL	Yes	B
2506h	10h	2nd over-speed level setup	r/min	0 to 20000	I16	rw	No	ALL	Yes	B
2506h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2506h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2506h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2506h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2506h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2506h	16h	Reserved 22	-	-	I32	-	-	-	-	-
2506h	17h	Reserved 23	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2506h	18h	Load change compensation gain	%	-100 to 100	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	19h	Load change compensation filter	0.01 ms	10 to 2500	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2506h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2506h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2506h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2506h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2506h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2506h	20h	Real time auto tuning estimation speed	-	0 to 3	I16	rw	No	ALL	Yes	B
2506h	21h	Real time auto tuning custom setup	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2506h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2506h	23h	Hybrid vibration suppression gain	0.1 /s	0 to 30000	I16	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	B
2506h	24h	Hybrid vibration suppression filter	0.01 ms	0 to 32000	I16	rw	No	csp(F) pp(F) hm(F) ip(F)	Yes	B
2506h	25h	Dynamic brake operation input setup	-	0 to 1	I16	rw	No	ALL	Yes	R
2506h	26h	Oscillation detecting level	0.1%	0 - 1000	I16	rw	No	ALL	Yes	B
2506h	27h	Alarm mask setup	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2506h	28h	Alarm mask setup 2	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2506h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2506h	2Ah	1st damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2506h	2Bh	2-stage torque filter time constant	0.01 ms	0 to 2500	I16	rw	No	ALL	Yes	B
2506h	2Ch	2-stage torque filter attenuation term	-	0 to 1000	I16	rw	No	ALL	Yes	B
2506h	2Dh	Reserved 45	-	-	I16	-	-	-	-	-
2506h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2506h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2506h	30h	Function expansion setup 2	-	-32768 to 32767	I16	rw	No	ALL	Yes	R

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2506h	31h	Tuning filter	0.1 ms	0 to 2000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	32h	Command / tuning filter damping	-	0 to 99	I16	rw	No	csp pp hm ip	Yes	B
2506h	33h	Viscous friction compensating gain	0.1%/ (10000 r/min)	0 to 10000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	34h	Wait time for emergency stop	ms	0 to 10000	I16	rw	No	ALL	Yes	B
2506h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2506h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2506h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2506h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2506h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2506h	3Ah	Torque saturation error protection detection time	1 ms	0 to 5000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	3Bh	Reserved 59	-	-	I32	-	-	-	-	-
2506h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2506h	3Dh	2nd damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2506h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2506h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2506h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2506h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2506h	42h	Reserved 66	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2506h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2506h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2506h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2506h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2506h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2506h	48h	3rd damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2506h	49h	4th damping depth	-	0 to 1000	I16	rw	No	csp pp hm ip	Yes	B
2506h	4Ah	Load estimation filter	0.01 ms	0 to 2500	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	4Bh	Torque compensation frequency 1	0.1 Hz	0 to 5000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	4Ch	Torque compensation frequency 2	0.1 Hz	0 to 5000	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	4Dh	Load estimation count	-	0 to 8	I16	rw	No	csp pp hm ip csv pv	Yes	B
2506h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2506h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 6: Specific configuration

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2506h	50h	Reserved 80	-	-	I16	-	-	-	-	-
2506h	51h	Reserved 81	-	-	I16	-	-	-	-	-
2506h	52h	Reserved 82	-	-	I16	-	-	-	-	-
2506h	53h	Reserved 83	-	-	I16	-	-	-	-	-
2506h	54h	Reserved 84	-	-	I16	-	-	-	-	-
2506h	55h	Reserved 85	-	-	I16	-	-	-	-	-
2506h	56h	Reserved 86	-	-	I16	-	-	-	-	-
2506h	57h	Reserved 87	-	-	I16	-	-	-	-	-
2506h	58h	Reseved 88	-	-	I32	-	-	-	-	-
2506h	59h	Absolute encoder multi-turn data upper-limit value	-	0 to 65534	I32	rw	No	ALL	Yes	C
2506h	5Ah	Reserved 90	-	-	I16	-	-	-	-	-
2506h	5Bh	Reserved 91	-	-	I16	-	-	-	-	-
2506h	5Ch	Reserved 92	-	-	I16	-	-	-	-	-
2506h	5Dh	Reserved 93	-	-	I16	-	-	-	-	-
2506h	5Eh	Reserved 94	-	-	I16	-	-	-	-	-
2506h	5Fh	Reserved 95	-	-	I16	-	-	-	-	-
2506h	60h	Over-load warning detection level	%	0 to 114	I16	rw	No	ALL	Yes	A
2506h	61h	Over-load warning release level	%	0 to 114	I16	rw	No	ALL	Yes	A
2506h	62h	Function expansion setup 3	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	B
2506h	63h	Function expansion setup 4	-	-2147483648 to 2147483647	I32	rw	No	ALL	Yes	R
2506h	64h	Reserved 100	-	-	I16	-	-	-	-	-
2506h	65h	Reserved 101	-	-	I16	-	-	-	-	-
2506h	66h	Reserved 102	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2507h	-	Parameter Class 7 (Axis B)	-	-	-	-	-	-	-	-
2507h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2507h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2507h	02h	Reserved 2	-	-	I16	-	-	-	-	-
2507h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2507h	04h	Output setup during torque limit	-	0 to 1	I16	rw	No	cst tq	Yes	A
2507h	05h	Reserved 5	-	-	I16	-	-	-	-	-
2507h	06h	Reserved 6	-	-	I32	-	-	-	-	-
2507h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2507h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2507h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2507h	0Ah	Correction time of latch delay 1	25 ns	-2000 to 2000	I16	rw	No	ALL	Yes	B
2507h	0Bh	Reserved 11	-	-	I16	-	-	-	-	-
2507h	0Ch	Reserved 12	-	-	I32	-	-	-	-	-
2507h	0Dh	Reserved 13	-	-	I32	-	-	-	-	-
2507h	0Eh	Reserved 14	-	-	I32	-	-	-	-	-
2507h	0Fh	Reserved 15	-	-	I16	-	-	-	-	-
2507h	10h	Reserved 16	-	-	I32	-	-	-	-	-
2507h	11h	Torque saturation error protection frequency	time	0 to 30000	I16	rw	No	csv pp hm ip csv pv	Yes	B
2507h	12h	Reserved 18	-	-	I16	-	-	-	-	-
2507h	13h	Reserved 19	-	-	I16	-	-	-	-	-
2507h	14h	Reserved 20	-	-	I16	-	-	-	-	-
2507h	15h	Reserved 21	-	-	I16	-	-	-	-	-
2507h	16h	Reserved 22	-	-	I16	-	-	-	-	-
2507h	17h	Communication function extended setup 1	-	-32768 to 32767	I16	rw	No	ALL	Yes	R
2507h	18h	Communication function extended setup 2	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2507h	19h	Communication function extended setup 3	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2507h	1Ah	Reserved 26	-	-	I16	-	-	-	-	-
2507h	1Bh	Reserved 27	-	-	I16	-	-	-	-	-
2507h	1Ch	Reserved 28	-	-	I16	-	-	-	-	-
2507h	1Dh	Reserved 29	-	-	I16	-	-	-	-	-
2507h	1Eh	Reserved 30	-	-	I16	-	-	-	-	-
2507h	1Fh	Reserved 31	-	-	I16	-	-	-	-	-
2507h	20h	Reserved 32	-	-	I16	-	-	-	-	-
2507h	21h	Reserved 33	-	-	I16	-	-	-	-	-
2507h	22h	Reserved 34	-	-	I16	-	-	-	-	-
2507h	23h	Reserved 35	-	-	I16	-	-	-	-	-
2507h	24h	Reserved 36	-	-	I16	-	-	-	-	-
2507h	25h	Reserved 37	-	-	I16	-	-	-	-	-
2507h	26h	Reserved 38	-	-	I16	-	-	-	-	-
2507h	27h	Reserved 39	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2507h	28h	Reserved 40	-	-	I16	-	-	-	-	-
2507h	29h	Reserved 41	-	-	I16	-	-	-	-	-
2507h	2Ah	Reserved 42	-	-	I16	-	-	-	-	-
2507h	2Bh	Reserved 43	-	-	I16	-	-	-	-	-
2507h	2Ch	Reserved 44	-	-	I16	-	-	-	-	-
2507h	2Dh	Software version	-	-2147483648 to 2147483647	I32	ro	No	ALL	Yes	X
2507h	2Eh	Reserved 46	-	-	I16	-	-	-	-	-
2507h	2Fh	Reserved 47	-	-	I16	-	-	-	-	-
2507h	30h	Reserved 48	-	-	I16	-	-	-	-	-
2507h	31h	Reserved 49	-	-	I16	-	-	-	-	-
2507h	32h	Reserved 50	-	-	I16	-	-	-	-	-
2507h	33h	Reserved 51	-	-	I16	-	-	-	-	-
2507h	34h	Reserved 52	-	-	I16	-	-	-	-	-
2507h	35h	Reserved 53	-	-	I16	-	-	-	-	-
2507h	36h	Reserved 54	-	-	I16	-	-	-	-	-
2507h	37h	Reserved 55	-	-	I16	-	-	-	-	-
2507h	38h	Reserved 56	-	-	I16	-	-	-	-	-
2507h	39h	Reserved 57	-	-	I16	-	-	-	-	-
2507h	3Ah	Reserved 58	-	-	I16	-	-	-	-	-
2507h	3Bh	Reserved 59	-	-	I16	-	-	-	-	-
2507h	3Ch	Reserved 60	-	-	I16	-	-	-	-	-
2507h	3Dh	Reserved 61	-	-	I16	-	-	-	-	-
2507h	3Eh	Reserved 62	-	-	I16	-	-	-	-	-
2507h	3Fh	Reserved 63	-	-	I16	-	-	-	-	-
2507h	40h	Reserved 64	-	-	I16	-	-	-	-	-
2507h	41h	Reserved 65	-	-	I16	-	-	-	-	-
2507h	42h	Reserved 66	-	-	I16	-	-	-	-	-
2507h	43h	Reserved 67	-	-	I16	-	-	-	-	-
2507h	44h	Reserved 68	-	-	I16	-	-	-	-	-
2507h	45h	Reserved 69	-	-	I16	-	-	-	-	-
2507h	46h	Reserved 70	-	-	I16	-	-	-	-	-
2507h	47h	Reserved 71	-	-	I16	-	-	-	-	-
2507h	48h	Reserved 72	-	-	I16	-	-	-	-	-
2507h	49h	Reserved 73	-	-	I16	-	-	-	-	-
2507h	4Ah	Reserved 74	-	-	I16	-	-	-	-	-
2507h	4Bh	Reserved 75	-	-	I16	-	-	-	-	-
2507h	4Ch	Reserved 76	-	-	I16	-	-	-	-	-
2507h	4Dh	Reserved 77	-	-	I16	-	-	-	-	-
2507h	4Eh	Reserved 78	-	-	I16	-	-	-	-	-
2507h	4Fh	Reserved 79	-	-	I16	-	-	-	-	-
2507h	50h	Reserved 80	-	-	I16	-	-	-	-	-
2507h	51h	Reserved 81	-	-	I16	-	-	-	-	-
2507h	52h	Reserved 82	-	-	I16	-	-	-	-	-
2507h	53h	Reserved 83	-	-	I16	-	-	-	-	-
2507h	54h	Reserved 84	-	-	I16	-	-	-	-	-
2507h	55h	Reserved 85	-	-	I16	-	-	-	-	-
2507h	56h	Reserved 86	-	-	I16	-	-	-	-	-
2507h	57h	Reserved 87	-	-	I16	-	-	-	-	-

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2507h	58h	Communication function extended setup 5	-	-32768 to 32767	I16	rw	No	ALL	Yes	C
2507h	59h	Reserved 89	-	-	I16	-	-	-	-	-
2507h	5Ah	Reserved 90	-	-	I16	-	-	-	-	-
2507h	5Bh	Reserved 91	-	-	I16	-	-	-	-	-
2507h	5Ch	Reserved 92	-	-	I16	-	-	-	-	-
2507h	5Dh	Correction time of latch delay 2	25 ns	-2000 to 2000	I16	rw	No	ALL	Yes	B
2507h	5Eh	Homing return speed limit value	r/min	0 to 20000	I16	rw	No	hm	Yes	C
2507h	5Fh	Reserved 95	-	-	I16	-	-	-	-	-
2507h	60h	Reserved 96	-	-	I16	-	-	-	-	-
2507h	61h	Reserved 97	-	-	I16	-	-	-	-	-
2507h	62h	Reserved 98	-	-	I16	-	-	-	-	-
2507h	63h	Reserved 99	-	-	I16	-	-	-	-	-
2507h	64h	Communication function extended setup 6	-	-32768 to 32767	I16	rw	No	ALL	Yes	B
2507h	65h	Reserved 101	-	-	I16	-	-	-	-	-
2507h	66h	Reserved 102	-	-	I32	-	-	-	-	-
2507h	67h	Reserved 103	-	-	I32	-	-	-	-	-
2507h	68h	Reserved 104	-	-	I32	-	-	-	-	-
2507h	69h	Reserved 105	-	-	I32	-	-	-	-	-
2507h	6Ah	Reserved 106	-	-	I16	-	-	-	-	-
2507h	6Bh	Reserved 107	-	-	I16	-	-	-	-	-
2507h	6Ch	Reserved 108	-	-	I16	-	-	-	-	-
2507h	6Dh	Reserved 109	-	-	I16	-	-	-	-	-
2507h	6Eh	Reserved 110	-	-	I16	-	-	-	-	-
2507h	6Fh	Communication function extended setup 7 (Note 1) (Note 2)	-	-	I32	rw	No	ALL	Yes	B
2507h	70h	Reserved 112	-	-	I16	-	-	-	-	-
2507h	71h	Reserved 113	-	-	I16	-	-	-	-	-
2507h	72h	Torque offset filter	0.01 ms	0 to 6400	I16	rw	No	ALL	Yes	B
2507h	73h (Note1)	Reserved 115	—	—	I16	—	—	—	—	—
2507h	74h (Note1)	Reserved 116	—	—	I16	—	—	—	—	—
2507h	75h (Note1)	Reserved 117	—	—	I32	—	—	—	—	—
2507h	76h (Note1)	Reserved 118	—	—	I32	—	—	—	—	—
2507h	77h (Note1)	Reserved 119	—	—	I32	—	—	—	—	—

(Note 1) Not supported in the first edition of the software version (Ver1.01).

(Note 2) Cannot be used in a software version of function expansion edition 1. Fix the value to 0.

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 7: Specific configuration 2

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2507h	78h (Note1)	Reserved 120	—	—	I16	—	—	—	—	—
2507h	79h (Note1)	Reserved 121	—	—	I32	—	—	—	—	—
2507h	7Ah (Note1)	Reserved 122	—	—	I32	—	—	—	—	—
2507h	7Bh (Note1)	Reserved 123	—	—	I16	—	—	—	—	—
2507h	7Ch (Note1)	Reserved 124	—	—	I16	—	—	—	—	—
2507h	7Dh (Note1) (Note2)	Over-travel inhibit input protection detection dead zone setup	command unit	0 – 2147483647	I32	rw	No	csp	Yes	B

(Note 1) Not supported in the first edition of the software version (Ver1.01).

(Note 2) Cannot be used in a software version of function expansion edition 1. Fix the value to 0.

■ **B axis servo parameter area (2500h-01h to 251Fh-FFh)**

Category 8: Specific configuration 3

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2508h	-	Parameter Class 8 (Axis B)	-	-	—	-	-	-	-	-
2508h	00h	Number of entries	-	0 to 255	U8	rw	No	ALL	Yes	X
2508h	01h	Reserved 1	-	-	I16	-	-	-	-	-
2508h	02h	Reserved 2	-	-	I32	-	-	-	-	-
2508h	03h	Reserved 3	-	-	I16	-	-	-	-	-
2508h	04h	Reserved 4	-	-	I16	-	-	-	-	-
2508h	05h	Reserved 5	-	-	I32	-	-	-	-	-
2508h	06h	Reserved 6	-	-	I16	-	-	-	-	-
2508h	07h	Reserved 7	-	-	I16	-	-	-	-	-
2508h	08h	Reserved 8	-	-	I16	-	-	-	-	-
2508h	09h	Reserved 9	-	-	I16	-	-	-	-	-
2508h	0Ah	Reserved 10	-	-	I16	-	-	-	-	-
2508h	0Bh	Reserved 11	-	-	I32	-	-	-	-	-
2508h	0Ch	Reserved 12	-	-	I16	-	-	-	-	-
2508h	0Dh	Reserved 13	-	-	I16	-	-	-	-	-
2508h	0Eh	Reserved 14	-	-	I32	-	-	-	-	-
2508h	0Fh	Reserved 15	-	-	I32	-	-	-	-	-
2508h	10h	Reserved 16	-	-	I32	-	-	-	-	-
2508h	11h	Reserved 17	-	-	I16	-	-	-	-	-
2508h	12h	Reserved 18	-	-	I32	-	-	-	-	-
2508h	13h	Reserved 19	-	-	I32	-	-	-	-	-
2508h	14h	Reserved 20	-	-	I16	-	-	-	-	-

9.1.10 B axis user-specific area: Command object (2520h to 257Fh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2520h	00h	History number (Axis B)	-	0 to 3	U8	rw	No	ALL	No	A
2521h	00h	Alarm main no (Axis B)	-	0 to 127	U8	rw	No	ALL	No	A
2522h	00h	Reserved	-	-	U8	-	-	-	-	-
2523h	-	Special function start (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	3	U8	ro	No	ALL	No	X
	01h	Special function start flag 1	-	0 to 4294967295	U32	rw	No		No	B
	02h	Special function start flag 2	-	0 to 4294967295	U32	rw	No		No	B
	03h	Reserved 3	-	-	U32	rw	-	-	-	-
2524h	00h	Special function setting 9 (Axis B)	-	0 to 65535	U16	rw	No	ALL	No	B
2525h	-	External scale ID (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2	U8	ro	No	ALL	No	X
	01h	External scale vendor ID	-	-	VS	ro	No		No	X
	02h	External scale model ID	-	-	VS	ro	No		No	X
2526h	-	Reserved	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2	U8	-	-	-	-	-
	01h	Reserved 1	-	-	U32	-	-	-	-	-
	02h	Reserved 2	-	-	U32	-	-	-	-	-
2527h	00h	Motor serial number (Axis B)	-	-	VS	ro	No	ALL	No	X
2528h	00h	Reserved	-	-	VS	-	-	-	-	-
2529h	00h	Reserved	-	-	VS	-	-	-	-	-
252Bh	00h	Over load factor (Axis B)	0.1%	0 to 65535	U16	ro	TxPDO	ALL	No	X

■ **B axis User-specific area:Command object (2520h to 257Fh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
252Ch	-	Alarm accessory information (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	36 to 36	U8	ro	No	ALL	No	X
	01h	History number echo	-	0 to 3	U8	ro	No	ALL	No	X
	02h	Alarm code	-	0 to 4294967295	U32	ro	No	ALL	No	X
	03h	Control mode	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	04h	Motor speed	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	05h	Positional command velocity	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	06h	Velocity control command	r/min	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	07h	Torque command	0.05%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	08h	Position command deviation	command	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	09h	Position actual internal value	pulse	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Ah	Reserved 10	-	-	I32	-	-	-	-	-
	0Bh	Input port (logic signal)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Ch	Output port (logic signal)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Dh	Analog input	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	0Eh	Reserved 14	-	-	I32	-	-	-	-	-
	0Fh	Reserved 15	-	-	I32	-	-	-	-	-
	10h	Overload ratio	0.2%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	11h	Regenerative load ratio	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	12h	Voltage across PN	V	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	13h	Temperature of amplifier	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	14h	Warning flags	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	15h	Inertia ratio	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	16h	Reserved 22	-	-	I32	-	-	-	-	-
	17h	Reserved 23	-	-	I32	-	-	-	-	-
	18h	Reserved 24	-	-	I32	-	-	-	-	-
	19h	Temperature of encoder	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	1Ah	Reserved 26	-	-	I32	-	-	-	-	-
	1Bh	Reserved 27	-	-	I32	-	-	-	-	-
	1Ch	Reserved 28	-	-	I32	-	-	-	-	-
	1Dh	U-phase current detection value	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	1Eh	W-phase current detection value	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	1Fh	Reserved 31	-	-	I32	-	-	-	-	-
	20h	Reserved 32	-	-	I32	-	-	-	-	-
	21h	Encoder single-turn data	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	22h	Encoder communication error count (accumulated)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	23h	External scale communication data error count (accumulated)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	24h	Reserved 36	-	-	I32	-	-	-	-	-
252Dh	00h	Velocity control loop torque limit (Axis B)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	No	A

9.1.11 B axis user-specific area: CoECommunicationCopy object (2680h to 26FFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2680h	00h	Error register (Axis B)	-	0 to 255	U8	ro	No	ALL	No	X
2681h	-	Diagnosis history (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	0 to 255	U8	ro	No	ALL	No	X
	01h	Maximum messages	-	0 to 255	U8	ro	No	ALL	No	X
	02h	Newest message	-	0 to 255	U8	ro	No	ALL	No	X
	03h	Newest acknowledged message	-	0 to 255	U8	rw	No	ALL	No	A
	04h	New messages available	-	0 to 1	BOOL	ro	No	ALL	No	X
	05h	Flags	-	0 to 65535	U16	rw	No	ALL	Yes	A
	06h	Diagnosis message 1	-	-	OS	ro	No	ALL	No	X
	:									
	13h	Diagnosis message 14	-	-	OS	ro	No	ALL	No	X

9.1.12 B axis user-specific area: Monitor object (2700h to 27FFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2701h	00h	Following error actual value (after filtering) (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
2703h	00h	Reserved	-	-	I32	-	-	-	-	-
2704h	00h	Position command internal value (after filtering) (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
270Bh	00h	Reserved	-	-	I32	-	-	-	-	-
270Ch	00h	Velocity command value (after filtering) (Axis B)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
270Dh	00h	External scale position (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2721h	00h	Logical input signal (Axis B)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2722h	00h	Logical output signal (Axis B)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2723h	00h	Logical input signal (expansion portion) (Axis B)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
2724h	00h	Reserved	-	-	U32	-	-	-	-	-
2731h	00h	Inertia ratio (Axis B)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2732h	00h	Motor automatic identification (Axis B)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2733h	00h	Cause of motor no work (Axis B)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2734h	00h	Warning flags (Axis B)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2736h	00h	Reserved	-	-	I32	-	-	-	-	-
2737h	-	Multiple alarm/warning information (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	18 to 18	U8	ro	No	ALL	No	X
	01h	Multiple alarm information 1	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	02h	Multiple alarm information 2	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	03h	Multiple alarm information 3	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	04h	Multiple alarm information 4	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	05h	Reserved 5	-	-	I32	-	-	-	-	-
	:									
	0Fh	Reserved 15	-	-	I32	-	-	-	-	-
	10h	Multiple sub alarm information	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	11h	Multiple warning information 1	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
	12h	Multiple warning information 2	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2741h	-	Motor encoder data (Axis B)	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2 to 2	U8	ro	No	ALL	No	X
	01h	Mechanical angle (Single-turn data)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
	02h	Multi-turn data	rotation	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2742h	00h	Electrical angle (Axis B)	0.0879°	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2744h	00h	Encoder status (Axis B)	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2746h	00h	Reserved	-	-	U16	-	-	-	-	-

■ B axis User-specific area: monitor object (2700h to 27FFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
2748h	00h	External scale pulse total (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2749h	00h	External scale absolute position (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
274Ah	00h	External scale position deviation (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
2751h	00h	Reserved	-	-	I32	-	-	-	-	-
2753h	00h	Reserved	-	-	U32	-	-	-	-	-
2763h	00h	Temperature of encoder (Axis B)	°C	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2764h	00h	Inrush resistance relay operating count (Axis B)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2765h	00h	Dynamic brake operating count (Axis B)	Time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
276Ah	00h	Reserved	-	-	I32	-	-	-	-	-
276Bh	00h	Reserved	-	-	I32	-	-	-	-	-
276Ch	00h	Motor power consumption (Axis B)	W	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
276Dh	00h	Amount of motor power consumption (Axis B)	Wh	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
276Eh	00h	Cumulative value of motor power consumption (Axis B)	Wh	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2772h	00h	Reserved	-	-	I32	-	-	-	-	-
2773h	00h	Reserved	-	-	I32	-	-	-	-	-
2781h	00h	Encoder communication error count (accumulated) (Axis B)	time	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
2782h	00h	Reserved	-	-	I32	-	-	-	-	-
2783h	00h	External scale communication error count (accumulated) (Axis B)	time	0 to 65535	U16	ro	TxPDO	ALL	No	X
2784h	00h	External scale communication data error count (accumulated) (Axis B)	time	0 to 65535	U16	ro	TxPDO	ALL	No	X
2785h	00h	Reserved	-	-	I32	-	-	-	-	-
2786h	00h	Hybrid deviation (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
2787h	00h	External scale data(Higher) (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2788h	00h	External scale data(Lower) (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
2789h	00h	External scale status (Axis B)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
278Ah	00h	External scale Z phase counter (Axis B)	-	0 to 65535	U16	ro	No	ALL	No	X
278Ch	00h	Reserved	-	-	I32	-	-	-	-	-

■ **B axis User-specific area: monitor object (2700h to 27FFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
27A1h	00h	Velocity command value (Axis B)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
27A4h	00h	Reserved	-	-	I32	-	-	-	-	-
27A5h	00h	Velocity internal position command (Axis B)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
27A6h	00h	Velocity error actual value (Axis B)	r/min	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm csp	No	X
27A7h	00h	External scale position (Applied polarity) (Axis B)	pulse (External scale)	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
27A8h	00h	Positive direction torque limit value (Axis B)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
27A9h	00h	Negative direction torque limit value (Axis B)	0.05%	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
27ABh	00h	Gain switching flag (Axis B)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
27ACh	00h	Reserved	-	-	I32	-	-	-	-	-
27AFh	00h	Estimated position for seamless mode change (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
27B1h	00h	Deterioration diagnosis state	-	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27B2h	00h	Deterioration diagnosis torque command average value (Axis B)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27B3h	00h	Deterioration diagnosis torque command standard value (Axis B)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27B4h	00h	Deterioration diagnosis inertia ratio estimate value (Axis B)	%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27B5h	00h	Deterioration diagnosis offset load estimate value (Axis B)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27B6h	00h	Deterioration diagnosis dynamic friction estimate value (Axis B)	0.1%	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27B7h	00h	Deterioration diagnosis viscous friction estimate value (Axis B)	0.1%/ (10000 r/min)	-2147483648 to 2147483647	I32	ro	No	ALL	No	X
27F5h	00h	Reserved	-	-	I32	-	-	-	-	-
27F6h	00h	Reserved	-	-	I32	-	-	-	-	-
27F7h	-	Reserved	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2 to 2	U8	ro	No	ALL	No	X
	01h	Reserved 1	-	-	I32	-	-	-	-	-
	02h	Reserved 2	-	-	I32	-	-	-	-	-
27F8h	-	Reserved	-	-	-	-	-	-	-	-
	00h	Number of entries	-	2 to 2	U8	ro	No	ALL	No	X
	01h	Reserved 1	-	-	I32	-	-	-	-	-
	02h	Reserved 2	-	-	I32	-	-	-	-	-
27FDh	00h	Reserved	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X

9.1.13 A axis drive profile area (6000h to 67FFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
6007h	00h	Abort connection option code (Axis A)	-	0 to 3	I16	rw	No	ALL	Yes	A
603Fh	00h	Error code (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
6040h	00h	Controlword (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No	A
6041h	00h	Statusword (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
605Ah	00h	Quick stop option code (Axis A)	-	-2 to 7	I16	rw	No	ALL	Yes	A
605Bh	00h	Shutdown option code (Axis A)	-	0 to 1	I16	rw	No	ALL	Yes	A
605Ch	00h	Disable operation option code (Axis A)	-	0 to 1	I16	rw	No	ALL	Yes	A
605Dh	00h	Halt option code (Axis A)	-	1 to 3	I16	rw	No	ALL	Yes	A
605Eh	00h	Fault reaction option code (Axis A)	-	0 to 2	I16	rw	No	ALL	Yes	A
6060h	00h	Modes of operation (Axis A)	-	-128 to 127	I8	rw	RxPDO	ALL	Yes	A
6061h	00h	Modes of operation display (Axis A)	-	-128 to 127	I8	ro	TxPDO	ALL	No	X
6062h	00h	Position demand value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
6063h	00h	Position actual internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
6064h	00h	Position actual value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
6065h	00h	Following error window (Axis A)	command	0 to 4294967295	U32	rw	RxPDO	pp csp	Yes	A
6066h	00h	Following error time out (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	pp csp	Yes	A
6067h	00h	Position window (Axis A)	command	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes	A
6068h	00h	Position window time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	pp ip	Yes	A
6069h	00h	Velocity sensor actual value (Axis A)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
606Ah	00h	Sensor selection code (Axis A)	-	-32768 to 32767	I16	rw	RxPDO	pv	Yes	X
606Bh	00h	Velocity demand value (Axis A)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	pv csv	No	X
606Ch	00h	Velocity actual value (Axis A)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
606Dh	00h	Velocity window (Axis A)	command/s	0 to 65535	U16	rw	RxPDO	pv	Yes	A
606Eh	00h	Velocity window time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	pv	Yes	A
606Fh	00h	Velocity threshold (Axis A)	command/s	0 to 65535	U16	rw	RxPDO	pv	Yes	A
6070h	00h	Velocity threshold time (Axis A)	1 ms	0 to 65535	U16	rw	RxPDO	pv	Yes	A
6071h	00h	Target torque (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	tq cst	Yes	A
6072h	00h	Max torque (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes	A
6073h	00h	Max current (Axis A)	0.1%	0 to 65535	U16	ro	No	tq	No	X
6074h	00h	Torque demand (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
6075h	00h	Motor rated current (Axis A)	mA	0 to 4294967295	U32	ro	No	ALL	No	X
6076h	00h	Motor rated torque (Axis A)	mN·m	0 to 4294967295	U32	ro	No	ALL	No	X
6077h	00h	Torque actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
6078h	00h	Current actual value (Axis A)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No	X

■ **A axis Drive profile area (6000h to 67FFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
6079h	00h	DC link circuit voltage (Axis A)	mV	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
607Ah	00h	Target position (Axis A)	command	-2147483648 to 2147483647	I32	rw	RxPDO	pp csp	No	A
607Bh	-	Position range limit (Axis A)	-	-	-	-	-	ALL	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Min position range limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	X
	02h	Max position range limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	X
607Ch	00h	Home offset (Axis A)	command	-2147483648 to 2147483647	I32	rw	RxPDO	ALL	Yes	P,H
607Dh	-	Software position limit (Axis A)	-	-	-	-	-	pp ip csp	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Min position limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	P,H
	02h	Max position limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	P,H
607Eh	00h	Polarity (Axis A)	-	0 to 255	U8	rw	No	ALL	Yes	P,H
607Fh	00h	Max profile velocity (Axis A)	command/s	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv	Yes	B
6080h	00h	Max motor speed (Axis A)	r/min	0 to 4294967295	U32	rw	RxPDO	ALL	Yes	B
6081h	00h	Profile velocity (Axis A)	command/s	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes	A
6082h	00h	End velocity (Axis A)	command/s	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes	X
6083h	00h	Profile acceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv ip	Yes	A
6084h	00h	Profile deceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv ip	Yes	A
6085h	00h	Quick stop deceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv hm ip csp csv	Yes	A
6086h	00h	Motion profile type (Axis A)	-	-32768 - 32767	I16	rw	RxPDO	pp pv ip	Yes	A
6087h	00h	Torque slope (Axis A)	0.1%/s	0 to 4294967295	U32	rw	RxPDO	tq cst	Yes	A
6088h	00h	Torque profile type (Axis A)	-	-32768 to 32767	I16	rw	RxPDO	tq	Yes	A
608Fh	-	Position encoder resolution (Axis A)	-	-	-	-	-	ALL	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No		No	X
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No		No	X

■ **A axis Drive profile area (6000h to 67FFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
6091h	-	Gear ratio (Axis A)	-	-	-	-	-	ALL	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No		Yes	P,H
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No		Yes	P,H
6092h		Feed constant (Axis A)	-	-	-	-	-	ALL	-	
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Feed	command	1 to 4294967295	U32	rw	No		Yes	P,H
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No		Yes	P,H
6098h	00h	Homing method (Axis A)	-	-128 to 127	I8	rw	RxPDO	hm	Yes	B
6099h	-	Homing speeds (Axis A)	-	-	-	-	-	hm	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Speed during search for switch	command/s	0 to 4294967295	U32	rw	RxPDO		Yes	A
	02h	Speed during search for zero	command/s	0 to 4294967295	U32	rw	RxPDO		Yes	A
609Ah	00h	Homing acceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO	hm	Yes	A
60A3h	00h	Profile jerk use (Axis A)	-	1 to 2 , 255	U8	rw	No	pp pv ip	Yes	A
60A4h	-	Profile jerk (Axis A)	-	-	-	-	-	pp pv ip	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Profile jerk1	command/s^3	0 to 4294967295	U32	rw	No		Yes	A
	02h	Profile jerk2	command/s^3	0 to 4294967295	U32	rw	No		Yes	A
60B0h	00h	Position offset	command	-2147483648 to 2147483647	I32	rw	RxPDO	csp	Yes	A
60B1h	00h	Velocity offset (Axis A)	command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pp pv hm ip csp csv	Yes	A
60B2h	00h	Torque offset (Axis A)	0.1%	-32768 to 32767	I16	rw	RxPDO	ALL	Yes	A
60B8h	00h	Touch probe function (Axis A)	-	0 to 65535	U16	rw	RxPDO	ALL	No	A
60B9h	00h	Touch probe status (Axis A)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
60BAh	00h	Touch probe pos1 pos value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
60BBh	00h	Touch probe pos1 neg value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
60BCh	00h	Touch probe pos2 pos value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
60BDh	00h	Touch probe pos2 neg value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X

■ **A axis Drive profile area (6000h to 67FFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
60C2h	-	Interpolation time period (Axis A)	-	-	-	-	-	ip csp csv cst	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Interpolation time period value	-	0 to 255	U8	rw	No		Yes	A
	02h	Interpolation time index	-	-128 to 63	I8	rw	No		Yes	A
60C5h	00h	Max acceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes	A
60C6h	00h	Max deceleration (Axis A)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes	A
60E0h	00h	Positive torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes	A
60E1h	00h	Negative torque limit value (Axis A)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes	A
60E3h	-	Supported homing method (Axis A)	-	-	-	-	-	ALL	-	-
	00h	Number of entries	-	32	U8	ro	No		No	X
	01h	1st supported homing method	-	0 to 32767	U16	ro	No		No	X
	:								:	
	20h	32nd supported homing method	-	0 to 32767	U16	ro	No		No	X
60F2h	00h	Positioning option code (Axis A)	-	0 to 65535	U16	rw	RxPDO	pp	Yes	A
60F4h	00h	Following error actual value (Axis A)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
60FAh	00h	Control effort (Axis A)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
60FCh	00h	Position demand internal value (Axis A)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
60FDh	00h	Digital inputs (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
60FEh	-	Digital outputs (Axis A)	-	-	-	-	-	ALL	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO		Yes	A
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO		Yes	A
60FFh	00h	Target velocity (Axis A)	command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pv csv	No	A
6403h	00h	Motor catalogue number (Axis A)	-	-	VS	ro	No	ALL	No	X
6502h	00h	Supported drive modes (Axis A)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X

9.1.14 B axis drive profile area (6800h to 6FFFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
6807h	00h	Abort connection option code (Axis B)	-	0 to 3	I16	rw	No	ALL	Yes	A
683Fh	00h	Error code (Axis B)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
6840h	00h	Controlword (Axis B)	-	0 to 65535	U16	rw	RxPDO	ALL	No	A
6841h	00h	Statusword (Axis B)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
685Ah	00h	Quick stop option code (Axis B)	-	-2 to 7	I16	rw	No	ALL	Yes	A
685Bh	00h	Shutdown option code (Axis B)	-	0 to 1	I16	rw	No	ALL	Yes	A
685Ch	00h	Disable operation option code (Axis B)	-	0 to 1	I16	rw	No	ALL	Yes	A
685Dh	00h	Halt option code (Axis B)	-	1 to 3	I16	rw	No	ALL	Yes	A
685Eh	00h	Fault reaction option code (Axis B)	-	0 to 2	I16	rw	No	ALL	Yes	A
6860h	00h	Modes of operation (Axis B)	-	-128 to 127	I8	rw	RxPDO	ALL	Yes	A
6861h	00h	Modes of operation display (Axis B)	-	-128 to 127	I8	ro	TxPDO	ALL	No	X
6862h	00h	Position demand value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
6863h	00h	Position actual internal value (Axis B)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
6864h	00h	Position actual value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
6865h	00h	Following error window (Axis B)	command	0 to 4294967295	U32	rw	RxPDO	pp csp	Yes	A
6866h	00h	Following error time out (Axis B)	1 ms	0 to 65535	U16	rw	RxPDO	pp csp	Yes	A
6867h	00h	Position window (Axis B)	command	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes	A
6868h	00h	Position window time (Axis B)	1 ms	0 to 65535	U16	rw	RxPDO	pp ip	Yes	A
6869h	00h	Velocity sensor actual value (Axis B)	-	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
686Ah	00h	Sensor selection code (Axis B)	-	-32768 to 32767	I16	rw	RxPDO	pv	Yes	X
686Bh	00h	Velocity demand value (Axis B)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	pv csv	No	X
686Ch	00h	Velocity actual value (Axis B)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
686Dh	00h	Velocity window (Axis B)	command/s	0 to 65535	U16	rw	RxPDO	pv	Yes	A
686Eh	00h	Velocity window time (Axis B)	1 ms	0 to 65535	U16	rw	RxPDO	pv	Yes	A
686Fh	00h	Velocity threshold (Axis B)	command/s	0 to 65535	U16	rw	RxPDO	pv	Yes	A
6870h	00h	Velocity threshold time (Axis B)	1 ms	0 to 65535	U16	rw	RxPDO	pv	Yes	A
6871h	00h	Target torque (Axis B)	0.1%	-32768 to 32767	I16	rw	RxPDO	tq cst	Yes	A
6872h	00h	Max torque (Axis B)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes	A
6873h	00h	Max current (Axis B)	0.1%	0 to 65535	U16	ro	No	tq	No	X
6874h	00h	Torque demand (Axis B)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
6875h	00h	Motor rated current (Axis B)	mA	0 to 4294967295	U32	ro	No	ALL	No	X
6876h	00h	Motor rated torque (Axis B)	mN·m	0 to 4294967295	U32	ro	No	ALL	No	X
6877h	00h	Torque actual value (Axis B)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
6878h	00h	Current actual value (Axis B)	0.1%	-32768 to 32767	I16	ro	TxPDO	ALL	No	X
6879h	00h	DC link circuit voltage (Axis B)	mV	0 to 4294967295	U32	ro	TxPDO	ALL	No	X

■ **B axis Drive profile area (6800h to 6FFFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
687Ah	00h	Target position (Axis B)	command	-2147483648 to 2147483647	I32	rw	RxPDO	pp csp	No	A
687Bh	-	Position range limit (Axis B)	-	-	-	-	-	ALL	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Min position range limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	X
	02h	Max position range limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	X
687Ch	00h	Home offset (Axis B)	command	-2147483648 to 2147483647	I32	rw	RxPDO	ALL	Yes	P,H
687Dh	-	Software position limit (Axis B)	-	-	-	-	-	pp ip csp	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Min position limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	P,H
	02h	Max position limit	command	-2147483648 to 2147483647	I32	rw	RxPDO		Yes	P,H
687Eh	00h	Polarity (Axis B)	-	0 - 255	U8	rw	No	ALL	Yes	P,H
687Fh	00h	Max profile velocity (Axis B)	command/s	0 to 4294967295	U32	rw	RxPDO	pp hm ip pv	Yes	B
6880h	00h	Max motor speed (Axis B)	r/min	0 to 4294967295	U32	rw	RxPDO	ALL	Yes	B
6881h	00h	Profile velocity (Axis B)	command/s	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes	A
6882h	00h	End velocity (Axis B)	command/s	0 to 4294967295	U32	rw	RxPDO	pp ip	Yes	X
6883h	00h	Profile acceleration (Axis B)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv ip	Yes	A
6884h	00h	Profile deceleration (Axis B)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv ip	Yes	A
6885h	00h	Quick stop deceleration (Axis B)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp pv hm ip csp csv	Yes	A
6886h	00h	Motion profile type (Axis B)	-	-32768 to 32767	I16	rw	RxPDO	pp pv ip	Yes	A
6887h	00h	Torque slope (Axis B)	0.1%/s	0 to 4294967295	U32	rw	RxPDO	tq cst	Yes	A
6888h	00h	Torque profile type (Axis B)	-	-32768 to 32767	I16	rw	RxPDO	tq	Yes	A
688Fh	-	Position encoder resolution (Axis B)	-	-	-	-	-	ALL	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Encoder increments	pulse	1 to 4294967295	U32	ro	No		No	X
	02h	Motor revolutions	r (motor)	1 to 4294967295	U32	ro	No		No	X

■ B axis Drive profile area (6800h to 6FFFh)

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
6891h	-	Gear ratio (Axis B)	-	-	-	-	-	ALL	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Motor revolutions	r (motor)	1 to 4294967295	U32	rw	No		Yes	P,H
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No		Yes	P,H
6892h		Feed constant (Axis B)	-	-	-	-	-	ALL	-	
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Feed	command	1 to 4294967295	U32	rw	No		Yes	P,H
	02h	Shaft revolutions	r (shaft)	1 to 4294967295	U32	rw	No		Yes	P,H
6898h	00h	Homing method (Axis B)	-	-128 to 127	I8	rw	RxPDO	hm	Yes	B
6899h	-	Homing speeds (Axis B)	-	-	-	-	-	hm	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Speed during search for switch	command/s	0 to 4294967295	U32	rw	RxPDO		Yes	A
	02h	Speed during search for zero	command/s	0 to 4294967295	U32	rw	RxPDO		Yes	A
689Ah	00h	Homing acceleration (Axis B)	command/s^2	0 to 4294967295	U32	rw	RxPDO	hm	Yes	A
68A3h	00h	Profile jerk use (Axis B)	-	1 to 2 , 255	U8	rw	No	pp pv ip	Yes	A
68A4h	-	Profile jerk (Axis B)	-	-	-	-	-	pp pv ip	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Profile jerk1	command/s^3	0 to 4294967295	U32	rw	No		Yes	A
	02h	Profile jerk2	command/s^3	0 to 4294967295	U32	rw	No		Yes	A
68B0h	00h	Position offset	command	-2147483648 to 2147483647	I32	rw	RxPDO	csp	Yes	A
68B1h	00h	Velocity offset (Axis B)	command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pp pv hm ip csp csv	Yes	A
68B2h	00h	Torque offset (Axis B)	0.1%	-32768 to 32767	I16	rw	RxPDO	ALL	Yes	A
68B8h	00h	Touch probe function (Axis B)	-	0 to 65535	U16	rw	RxPDO	ALL	No	A
68B9h	00h	Touch probe status (Axis B)	-	0 to 65535	U16	ro	TxPDO	ALL	No	X
68BAh	00h	Touch probe pos1 pos value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
68BBh	00h	Touch probe pos1 neg value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
68BCh	00h	Touch probe pos2 pos value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
68BDh	00h	Touch probe pos2 neg value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	ALL	No	X
68C2h	-	Interpolation time period (Axis B)	-	-	-	-	-	ip csp csv cst	-	-
	00h	Highest sub-index supported	-	2	U8	ro	No		No	X
	01h	Interpolation time period value	-	0 to 255	U8	rw	No		Yes	A
	02h	Interpolation time index	-	-128 to 63	I8	rw	No		Yes	A

■ **B axis Drive profile area (6800h to 6FFFh)**

Index	Sub-Index	Name	Units	Range	Data Type	Access	PDO	Op-mode	EEPROM	Attribute
68C5h	00h	Max acceleration (Axis B)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes	A
68C6h	00h	Max deceleration (Axis B)	command/s^2	0 to 4294967295	U32	rw	RxPDO	pp hm pv ip	Yes	A
68E0h	00h	Positive torque limit value (Axis B)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes	A
68E1h	00h	Negative torque limit value (Axis B)	0.1%	0 to 65535	U16	rw	RxPDO	ALL	Yes	A
68E3h	-	Supported homing method (Axis B)	-	-	-	-	-	ALL	-	-
	00h	Number of entries	-	32	U8	ro	No		No	X
	01h	1st supported homing method	-	0 to 32767	U16	ro	No		No	X
	:								:	
	20h	32nd supported homing method	-	0 to 32767	U16	ro	No		No	X
68F2h	00h	Positioning option code (Axis B)	-	0 to 65535	U16	rw	RxPDO	pp	Yes	A
68F4h	00h	Following error actual value (Axis B)	command	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
68FAh	00h	Control effort (Axis B)	command/s	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
68FCh	00h	Position demand internal value (Axis B)	pulse	-2147483648 to 2147483647	I32	ro	TxPDO	pp hm ip csp	No	X
68FDh	00h	Digital inputs (Axis B)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X
68FEh	-	Digital outputs (Axis B)	-	-	-	-	-	ALL	-	-
	00h	Number of entries	-	2	U8	ro	No		No	X
	01h	Physical outputs	-	0 to 4294967295	U32	rw	RxPDO		Yes	A
	02h	Bit mask	-	0 to 4294967295	U32	rw	RxPDO		Yes	A
68FFh	00h	Target velocity (Axis B)	command/s	-2147483648 to 2147483647	I32	rw	RxPDO	pv csv	No	A
6C03h	00h	Motor catalogue number (Axis B)	-	-	VS	ro	No	ALL	No	X
6D02h	00h	Supported drive modes (Axis B)	-	0 to 4294967295	U32	ro	TxPDO	ALL	No	X

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10

Glossary of Terms

10.1 Glossary of terms

Term/abbreviation	Description
AL	Application Layer
CSP,csp	Cyclic Synchronous Position (profile)
CSV,csv	Cyclic Synchronous Velocity
CST,cst	Cyclic Synchronous Torque
DC	Distributed Clocks
ESC	EtherCAT Slave Controller
ESM	EtherCAT State Machine
FG	Function Group
HM,hm	Homing Mode
MBX	Mailbox
PDO	Process Data Object
PDS	Power Drive Systems
PP,pp	Profile Position
RxPDO	Receive PDO
SM	SyncManager
TxPDO	Transmit PDO
WDT	Watchdog Timer
nma	No Mode Assigned
ms	manufacturer-specific (Controlword 6040h)
oms	operation mode specific (Controlword 6040h)
eo	enable operation (Controlword 6040h)
r	reserved (Controlword 6040h)
qs	quick stop (Controlword 6040h)
ev	enable voltage (Controlword 6040h)
h	halt (Controlword 6040h)
so	switch on (Controlword 6040h)
fr	fault reset (Controlword 6040h)
RW	Read-Write
rw	read-write
ro	read-only
c	constant
Alarm	Error
Warning	Warning
Yes	Supported (or condition met)
No	Not supported (or condition not met)
-	Not applicable (or out of scope)

■ **Data type**

Term/abbreviation	Description
U8	Unsigned8
U16	Unsigned16
U32	Unsigned32
Int8	Integer8
Int16	Integer16
Int32	Integer32
VS	Visible String
BOOL	Boolean
OS	Octet String