CANopen

User Manual

MOONS'
moving in better ways

Shanghai Anpu Mingzhi Automation Equipment Co., Ltd.

Version:1.0
1/11/2021

content

foreword

1 Instruction Manual

Thank you for purchasing MOONS servo products.Introduction to this manualM3DVSeries supportCANopenbus communication servo driveCANopenUse of communication functions,other functions,Hardware wiring method,Operation parameter setting method, etc.,Please refer toM3DV CANopenAC Servo System User Manual.

This manual is designed toFAsystem,debuggingFAequipment,maintainFAEquipment written by personnel.

For users who use this product for the first time,Please read this manual carefully.if yesCANopenDoubts about the use of communication,Please consult our company's technical support personnel for assistance.

Our company is committed to the continuous improvement of servo products,The contents of this manual are subject to change from time to time;For the latest version of the manual,Please download from the official website or ask for it from the relevant personnel.

2 Version Information

Version	time	change content
1.0	2021year1moon	first edition

1 CANOpen introduction

1.1 CAN Overview

CAN (Controller Area Network) bus is a robust serial communication protocol compatible with high communication rates. It can be used as a field bus in applications with large electromagnetic noise because CAN bus itself only defines Layer 1 (Physical Layer) and Layer 2 (Data Link Layer) of the ISO/OSI model. When implemented, users need to define the protocol of the application layer themselves. During the development of the bus, various versions of CAN application layer protocol were created. The most common application layer protocols today are CANopen, DeviceNet and SAE J1939.

1.2 CANOpen Introduction

CANOpen is a high-level communication protocol that is built on the controller area network (CANBus), including its communication sub-protocol and device sub-protocol. Often used in embedded systems, it is also a field bus commonly used in industrial control.

1.3 CANOpen Technical Terms

The following are terms commonly used when discussing CANOpen.

Abbreviation	Definition
CAN	Controller Area Network
CiA	CAN in Automation Group (Standards Body)
COB	Communication Object
COB-ID	Communication Object Identifier
NMT	Network Management State Machine
Node-ID	Node Identifier
PDS	Power Drive Systems
INIT	NMT Mode: Initialized State
PREOP	NMT Mode: Pre-Operational State
OP	NMT Mode: Operational State
OD	Object Dictionary
PDO	Process data Object
SDO	Service Data Object
RxPDO	Recieve (Incoming) PDO
TxPDO	Transmit (Outgoing) PDO
SYNC	Synchronization Object
EMCY	Emergency Object
EDS	Electronic Data Sheet

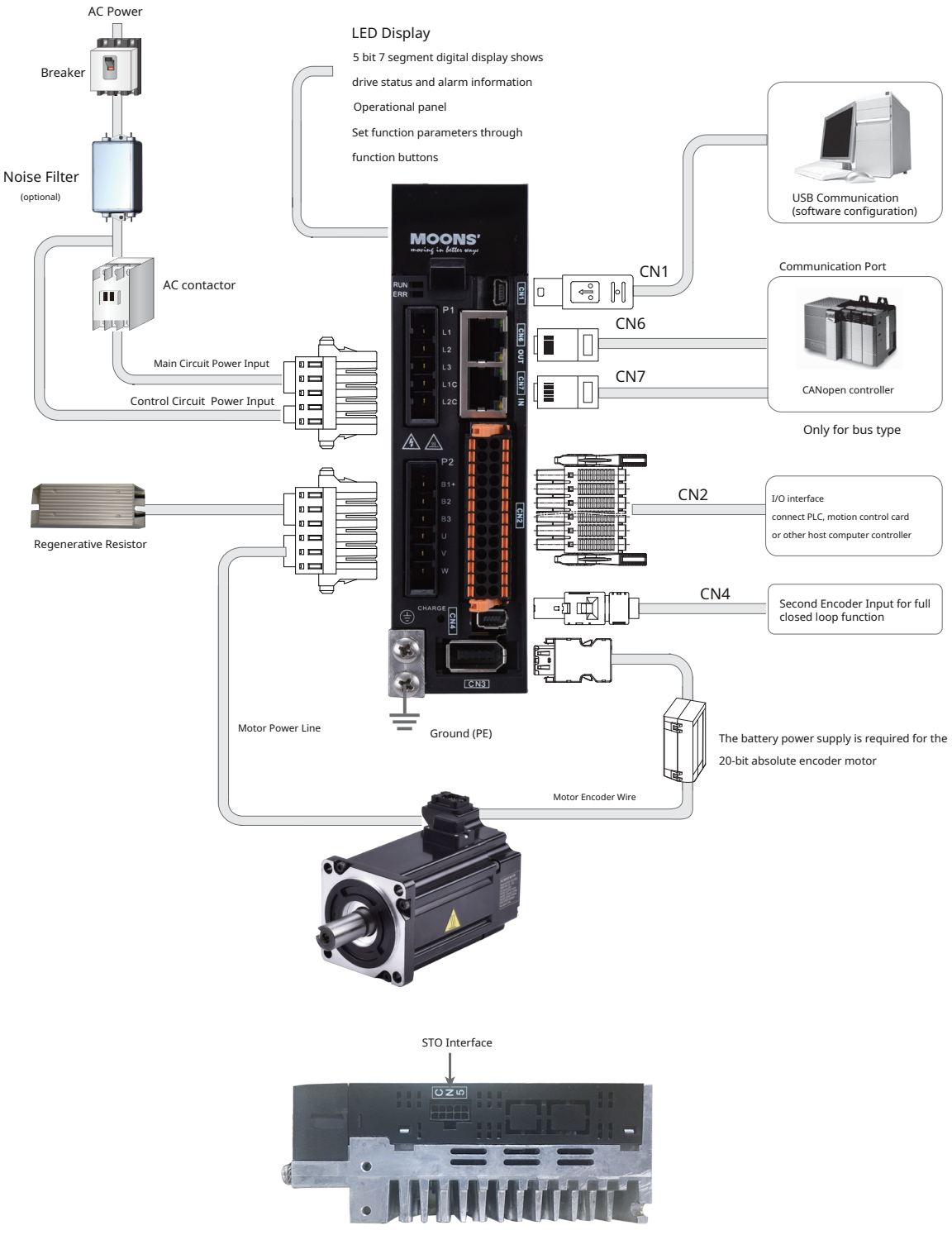
2 product description

2.1 CANopenCommunication Specifications

physical layer	CiA303-1 Cabling and connector pin assignment
communication standard	CiA301 and CiA402 Drive Profile
communication rates	12.5Kbps, 20Kbps, 50Kbps, 125Kbps 250Kbps, 500Kbps, 800Kbps, 1Mbps
communication objects	NMT: Network Management Object SDO: Aperiodic data PDO: Periodic data,4 RxPDOs,4 TxPDOs SYNC: Synchronization Object EMCY: Emergency Object Heartbeat: Heartbeat Object
Operating modes	Interpolated Position Mode(IP)* Profile Position Mode(PP) Profile Profile Velocity Mode(PV) Profile Torque Mode(TQ) Homing Mode(HM) Cyclic Synchronous Velocity Mode (CSV)
Number of axes supported	127 axes (max)

* :Interpolation position mode under development

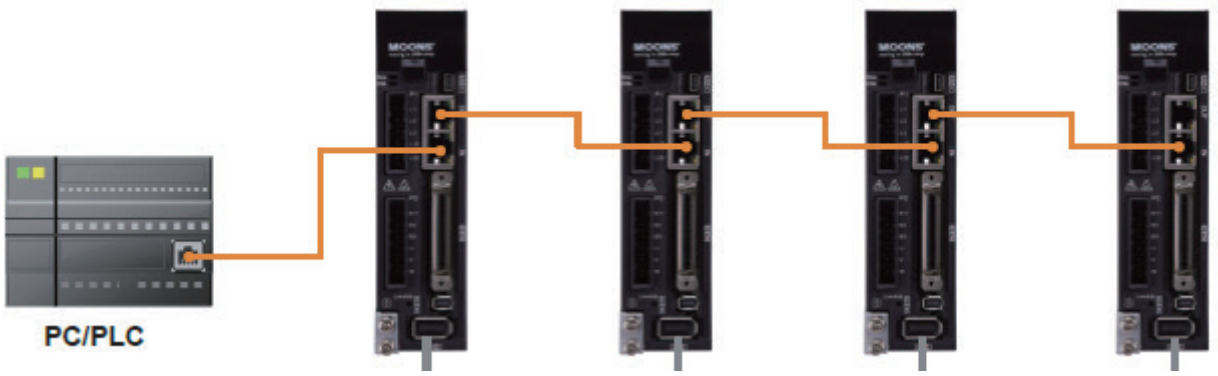
2.2 System Configuration



2.3 Internet connection

2.3.1 Drive Connection Instructions

A CANopen network generally consists of a master device and multiple slave devices. How the slave devices are connected depends on the master. The servo drive provides a set of ports for CANopen communications.

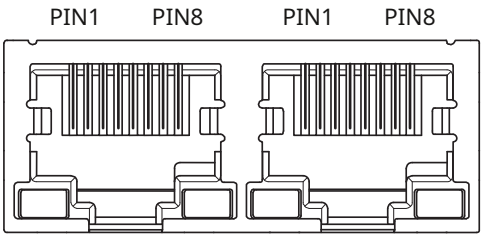


Note:

1.The bus network cable should be kept separate from other cables, especially strong electrical lines, to avoid potential sources of interference.

2.The network cable should use twisted pairs to improve its resistance to interference from high frequency magnetic field noise. This may also reduce noise the network cable itself may produce and radiate.

2.3.2 CANOpen Communication Port Description



PIN NO.	Signal Name
1	CAN_H
2	CAN_L
3	GND
4	-
5	-
6	CHGND
7	GND
8	-

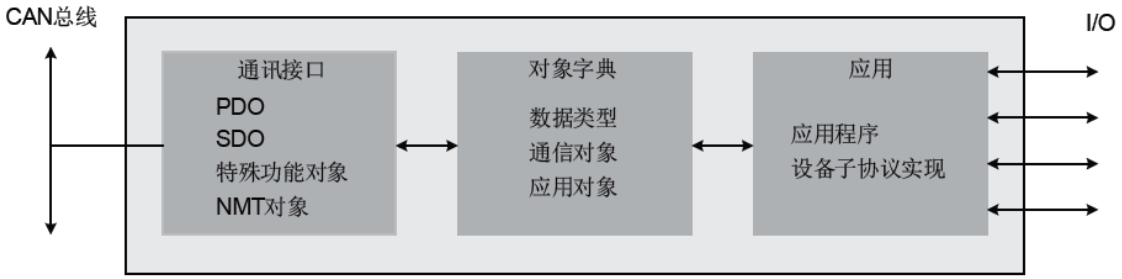
2.3.3 Cable Specifications

The CANOpen network connection uses Category 5 and above network cables.

3 CANopen Communication Basics

3.1 CANopen Reference Model

The CANOpen network reference model is mainly composed of two parts: the data link layer and the application layer. The Data Link layer is mainly responsible for the CAN bus Protocol whereas the CiA402 motion control protocol is embedded in the Application Layer. The CANopen network reference model is as follows:



The application layer contains the Object Dictionary (OD). The Object Dictionary contains parameters, application data, process data interface and PDO mapping information. Process data objects (PDOs) are structured according to, and contain data defined by, the PDO Mapping Objects defined in the OD. Process data communication is cyclically read and written. Acyclic communication , implemented via Service Data Objects (SDOs), is used to read from and write to all objects contained in the Object Dictionary.

3.2 Object Dictionary (OD)

The Object Dictionary is the most important part of the device specification. It is an ordered set of parameters and variables, including a device's description and its network state. These parameters and variables are referred to as objects. These can be accessed through a network in an ordered and predefined manner.

The CANOpen protocol uses an object dictionary arranged by 16-bit indexes and 8-bit sub-indexes. The structure of the object dictionary is as follows:

index (HEX)	Object Type
000	Not Used
0001h-001Fh	Static Data Types
0020h-003Fh	Complex Data Types
0040h-005Fh	Manufacturer-specific complex data types
0060h-007Fh	Device Profile Specific Static Data Types
0080h-009Fh	Device Profile Specific Complex Data Types
00A0h-0FFFh	Reserved for future development
1000h-1FFFh	Communication Profile Area
2000h-5FFFh	Manufacturer specific Profile area
6000h-9FFFh	Standardised Device Profile Area
A000h-FFFFh	Reserved for future development

3.3 Commonly Used Communication Objects

3.3.1 Network Management Objects (NMT)

Network management objects include Boot-up messages, Heartbeat objects and NMT (state machine) information. Based on master-slave communication mode, NMT is used to manage and monitor individual nodes in the network, mainly implement node state control, error control and node startup functions.

3.3.2 Service Data Objects (SDO)

Service Data Objects are both transmitted and received.

Through the use of SDOs, which specify indexes and sub-indexes, a controller can access objects in a device's Object Dictionary. The SDO protocol specifies that the service type must be specified, that there be a reply to each SDO request and the length of SDO request/reply packets (8 bytes).

3.3.3 Process data Objects(PDO)

Process Data Objects are both transmitted (TPDOs) and received (RPDOs). Used to transfer real-time data with low overhead, their size is limited between 1 to 8 bytes.

Each CANOpen device contains 8 default PDO channels - 4 TPDO channels and 4 RPDO Channels. PDOs can be transmitted either synchronously or asynchronously , the method of choice being specified by the PDO's communication parameters. The content of each PDO message is also predefined by the corresponding PDO mapping parameters.

3.3.4 Synchronization Objects (SYNC)

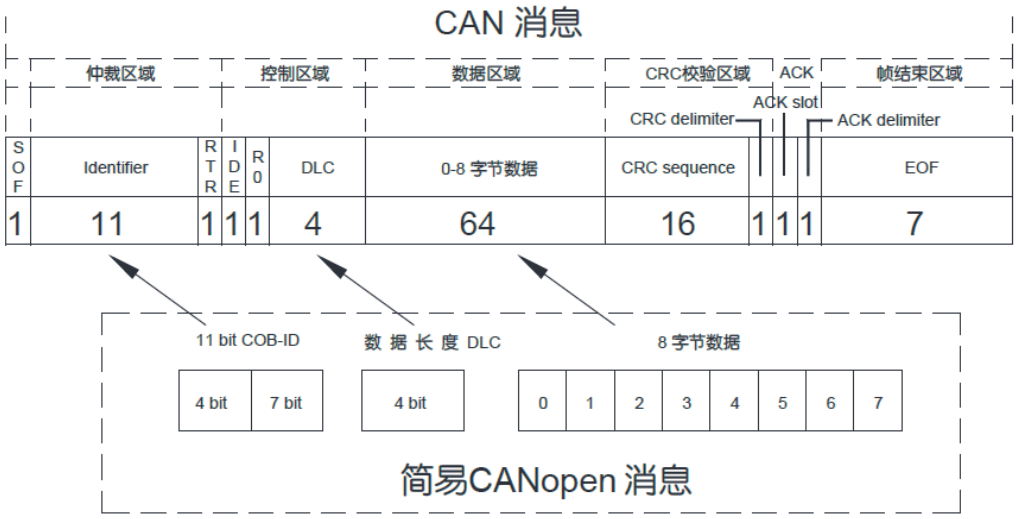
The synchronization object is produced by the CANOpen master and periodically broadcast on the CAN bus. It is used to implement a clock on the network. Each device can be configured independently to use this synchronization object to communicate synchronously on the network.

3.3.5 Emergency Object (EMCY)

EMCY objects are messages produced and transmitted when the internal communication of a device fails or an error in operation of the device occurs.

3.4 CANOpen Message Structure

The structure of a CANOpen message is as follows:



The Communication Object Identifier (COB-ID) specifies the priority of an object in the communication process and the identification of the communication object.
The COB-ID length corresponds to the 11-bit frame of the CAN2.0A specification. The 11-bit COB-ID consists of two parts, the 4-bit object function code and a 7-bit node identifier.

10	9	8	7	6	5	4	3	2	1	0
function code				node **ID**						

Each CANOpen communication object has a default COB-ID that can be read through, and some may even be modified, through an SDO.

The list of objects is as follows:

communication object	function code	Node address	**COB-ID**	object index
NMT	0000b	0	0h	—
SYNC	0001b	0	80h	1005h, 1006h
TIME	0010b	1 ~ 127	100h + Node ID	1012h, 1013h
EMCY	0001b	1 ~ 127	80h + Node ID	1014h
TPDO1	0011b	1 ~ 127	180h + Node ID	1800h
RPDO1	0100b	1 ~ 127	200h + Node ID	1400h
TPDO2	0101b	1 ~ 127	280h + Node ID	1801h
RPDO2	0110b	1 ~ 127	300h + Node ID	1401h
TPDO3	0111b	1 ~ 127	380h + Node ID	1802h
RPDO3	1000b	1 ~ 127	400h + Node ID	1402h
TPDO4	1001b	1 ~ 127	480h + Node ID	1803h
RPDO4	1010b	1 ~ 127	500h + Node ID	1403h
T_SDO	1011b	1 ~ 127	580h + Node ID	1200h
R_SDO	1100b	1 ~ 127	600h + Node ID	1200h
NMT error control	1110b	1 ~ 127	700h + Node ID	1016h, 1017h

3.5 Network Management (NMT)

The network management (NMT) is oriented towards CANOpen devices and follows the master-slave structure. NMT objects are used to perform NMT tasks such as initialize, start, monitor, reset or stop CANOpen devices in the network. All CANOpen devices are treated as NMT slaves. NMT slaves are uniquely identified in the network by their node ID (value in the range of 1 through 127). NMT requires that only one device in the CANOpen network perform the function of an NMT master.

3.5.1 NMT Message Structure

The structure of an NMT message is as follows:

COB-ID	**RTR**	data segment -**2 bytes**	
		0	**1**
0x000	0	NMT Control Command	Node_ID

The COB-ID of every NMT object is fixed to 0x000.

The first byte of the data segment is the command word and indicates the function of the data frame.

The second byte of the data segment is the CANopen Node Identifier. If 0 is used as the identifier, the NMT object is broadcast to all slave devices on the network.

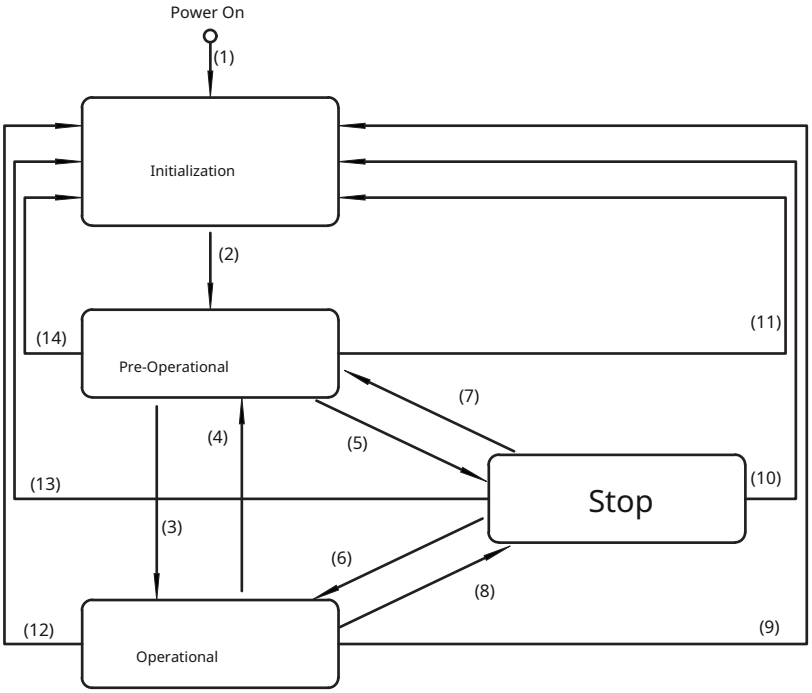
The detailed description of the command word is as follows:

NMT Control Command	NMT State
0x01	Operational
0x02	Stopped
0x80	Pre-Operational
0x81	Initialization/ Node Reset
0x82	reset communication

After the NMT instruction is executed, the state of an NMT slave will change accordingly and is specified in every heartbeat object transmitted by the slave.

3.5.2 The CANOpen State Machine

The CANOpen state machine is used to describe the states and state transitions of the slave device. The CANOpen state machine of the slave application consists of CANopen master control. After the slave is powered on, it automatically enters the initialization state. The state of a device is switched according to the specification, from the pre-operational state to the operational state. The operational state can be directly switched to various other states.



CANopen state machine

state switching process	instruction
(1)	Automatically enters NMT Initialization state after power up
(2)	NMT Initialization complete, automatically enters the pre-operational state
(3)	Indicates that the NMT service has started a remote node
(4)(7)	Indicates that the NMT service has switched a remote node to the pre-operational state
(5)(8)	Indicates that the NMT service has stopped a remote node
(6)	Indicates that the NMT service has started a remote node
(9)(10)(11)	Indicates that the NMT service has re-initialized a remote node
(12)(13)(14)	Indicates that the NMT service has re-initiated communication with a remote node

After the device is powered on, it will automatically enter the initialization state which consists of initializing, resetting the node and resetting communications.

Initializing: Load the parameters of each module

Reset node: Reboot the device

Reset communication: Restore the communication parameters in the object dictionary to the last saved value.

The objects supported in the various NMT states are as follows:

NMT state	communication action					
	SDO	**PDO**	**SYNC**	**EMCY**	**NMT**	node,error control
Initialization	not supported	not supported	not supported	not supported	not supported	not supported
Pre-Operational	supported	not supported	supported	supported	supported	supported
Operational	supported	supported	supported	supported	supported	supported
Stop	not supported	not supported	not supported	not supported	supported	supported

3.5.3 NMT Control

NMT Controls are used to detect whether a device is online and the state of the device in the network. NMT control consists of node/lifetime protection and the heartbeat function.

- Node/Life Protection*

Node Protection: The NMT master, via remote frames, periodically queries the status of an NMT slave.

Lifetime Protection: The slave monitors the status of the master indirectly through the remote frame interval received for monitoring the slave.

*: MOONS' CANopen products do not support this feature

- Heartbeat

The CANopen device can send heartbeat packets based on the period set by the producer heartbeat interval object 0x1017 (milliseconds). After configuring the producer heartbeat interval 0x1017, the node heartbeat function is activated and the heartbeat messages are generated.

The heartbeat transmission message consists of the COB-ID and a 1 byte data segment, The message format is as follows:

COB-ID	**RTR**	data segment -**1 byte**
		0
0x700 + Node_ID	0	status word

The status word specified in the data segment indicates the state machine status of the device as follows:

NMT STatus Code	Description
0	Initialization
4	Stopped
5	Operational
0x7F	Pre-Operational

3.6 Service Data Objects

Service Data Objects are a CANOpen tool for direct access to object entries in the device object dictionary. They can access each entry in the object dictionary by specifying the entry's index and sub-index. SDOs can read the contents of an object in the object dictionary and can also modify their value.

3.6.1 SDO Transmission Method

The SDO transmission method follows the client-server model with one-to-one requests and responses. First a request is made by the client T_SDO and then the server responds with an R_SDO. The request and the response will have individual COB-IDs.

3.6.2 SDO Message Structure

The SDO transmission message consists of the COB-ID and the data segment. The data segment is in little endian mode, that means the least significant byte of a 16-bit word is in the front and the most significant byte in the back. SDO The data segment must contain 8 bytes.

The format of an SDO message is as follows:

COB-ID	data segment -**8 bytes**							
580h + Node_ID	0	1	2	3	4	5	6	7
600h + Node_ID	command code	index		sub-index	data			

Command Code: Specifies the access type and the data length of the data segment

Index and Sub-index: Specifies the object being addressed by specifying its location in the OD

Data: Contains the value of or the value to be written into the object being addressed

• **SDO** Write Message

		COB-ID	0	1	2	3	4~7
client request		600h + Node_ID	2Fh	index		sub-index	Write 1 byte of data to the object, remaining 3 Bytes of data are 0
			2Bh				Write 2 bytes of data to the object, remaining 2 Bytes of data are 0
			27h				Write 3 bytes of data to the object, remaining byte of data is 0
			23h				Write 4 bytes of data to object
server response	normal	580h + Node_ID	60h				Write data feedback, the value is 0
	abnormal		80h				Abort code

• **SDO** Read Message

		COB-ID	0	1	2	3	4~7
client request		600h + Node_ID	40h	index		sub-index	The value of the object is 0
server response	normal	580h + Node_ID	41h				the value of the object
	abnormal		80h				abort code

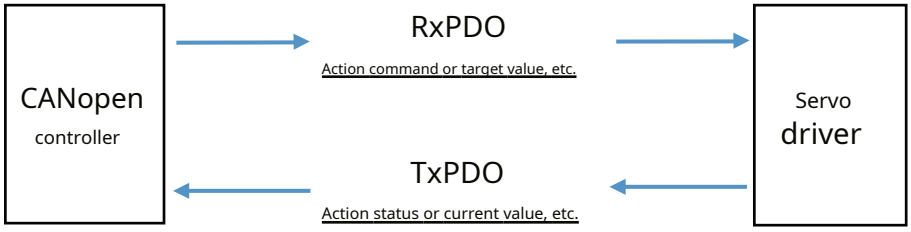
The SDO abort codes when communication is abnormal are as follows:

Abort Code**(Hex)**	Description	Abort Code**(Hex)**	Description
05030000	No change in trigger bit	06070010	Inconsistent quantity/type, Service parameter length mismatch
05040000	SDO Protocol timed out	06070012	Inconsistent quantity/type,Service parameter length is too long
05040001	Invalid/unknown client/server directive specifier	06070013	inconsistent data types,Service parameter length is too short
05040005	out of storage	06090011	sub-index does not exist
06010000	Perform unsupported access to object	06090030	Parameter value out of specification (write access only)
06010001	Perform read access to write-only objects	06090031	The parameter value written is too large
06010002	Perform write access to read-only objects	06090032	The parameter value written is too small
06010003	Cannot write to sub-index because 0 is not set in the sub-index 0	06090036	The maximum value is less than the minimum value
06020000	The object does not exist in the object dictionary	08000000	general error
06040041	Object cannot be mapped to PDO	08000020	Data cannot be transferred/stored in the app
06040042	The number and length of mapped objects exceeds PDO length	08000021	due to local control, sata cannot be transferred/stored in the app
06040043	Regular parameters are inconsistent	08000022	in the current state of the device, data cannot be transferred/stored in the app
06040047	General device internal inconsistencies	08000023	Object dictionary dynamic generation failed/object dictionary does not exist
06060000	Object access failed due to hardware error		

3.7 Process Data Objects

Process Data Objects are used to transmit real-time data and are the most important data transmission method in CANOpen Communications. PDO transmission does not require an acknowledgment. The data length of a PDO is limited to 1-8 bytes.

There are two PDO types. RPDOs are used by the driver to receive data from the controller. TPDOs are used by the driver to transmit data to the controller.



Note:

Objects updated through PDOs should not be updated via SDOs.

3.7.1 PDO Mapping

PDO Mapping refers to the mapping of an object's address from the OD into the format of a PDO (TPDO or RPDO) for real-time transmission of data to and from said object. The PDO communication object and the mapping object jointly determine the final transmission method and content of a PDO. The mapping objects 0x1600~0x1603 and 0x1A00~0x1A03 store the mapping tables of RPDOs and TPDOs respectively.

The maximum number of application objects that can be mapped to PDOs is dictated by the maximum length of PDOs:

Maximum PDO Data length	1 RxPDO: 8 bytes, 4 RxPDO: 32 bytes
	1 TxPDO: 8 bytes, 4 TxPDO: 32 bytes

The list of PDOs is as follows:

name		communication object	map object	**COB-ID**
RPDO	1	1400h	1600h	200h + Node ID
	2	1401h	1601h	300h + Node ID
	3	1402h	1602h	400h + Node ID
	4	1403h	1603h	500h + Node ID
TPDO	1	1800h	1A00h	180h + Node ID
	2	1801h	1A01h	280h + Node ID
	3	1802h	1A02h	380h + Node ID
	4	1803h	1A03h	480h + Node ID

3.7.2 PDO Communication Object

• Identifier of PDOs

The CAN identifier of PDOs is the COB-ID which contains control bits and identification data. The COB-ID determines the priority of a PDO on the CAN bus. The COB-ID value of a PDO can be accessed at sub-index 0x01 of the communication object of said PDO.

• **PDO** Transmission Methods

The transmission method of each PDO is located at sub-index 0x02 of its communication object. The user may specify the transmission method for each PDO. The supported transmission methods are the following:

Transmission Method	Description
Synchronous Transmission	Acyclic: Transmission triggered by remote frame or object-specific events Cyclic: transmission triggered by 1 - 240 SYNC frames
Asynchronous Transmissionr	Transmission triggered by remote frame Object-specific events trigger delivery

The different values of the communication object, sub-index 0x02, represent the different transmission methods and define the trigger for transmission/processing of TPDOs and RPDOs respectively. The relationship between the value of communication object, sub-index 0x02, and the transmission method is the following:

Communication Object (sub-index 0x02) value	PDO Trigger Conditions (**B = both needed O = one or both**)			Resulting Transmission Method
	SYNC	**RTR**	**Event**	
0	B	—	B	synchronous, aperiodic
1 ~ 240	O	—	—	synchronous, periodic
241 ~ 251		—	—	reserved
252	B	B	—	synchronous, in RTR after*
253	—	O	—	asynchronous in RTR after*
254	—	O	O	Asynchronous, producer specific events
255	—	O	O	Asynchronous, device profile specific events

Note:

1.*:MOONS' CANopen communication products do not support this function

2. SYNC means received SYNC-object.

3. RTR Indicates that a remote frame was received.

4. An Event indicates a change in value or a timer interrupt.
5. When the communication type value is 1 to 240, the value represents the number of SYNC objects between the two PDOs.
6. When the transmission type of TPDO is 0, if the mapping data changes and 1 synchronous frame is received, the TPDO is sent.
7. When the transmission type of TPDO is 1 to 240, the TPDO is sent when the corresponding number of synchronous frames is received.
8. When the transmission type of TPDO is 254 or 255, the mapping data changes or the event timer interrupts, and the TPDO is sent.
9. When the transmission type of RPDO is 0 ~ 240, the latest data of the RPDO is updated to the application whenever 1 synchronous frame is received; when the transmission type of RPDO is At 254 or 255, the received data is updated directly to the app.

- Inhibit Time

In order to avoid the problem that the CAN network is continuously occupied by TPDO data, and other data with lower priority cannot access the bus, an inhibit time can be set through the communication object 0x1800-0x1803 sub-index 0x03. The inhibit time is the minimum time in between transmissions of the PDO. The unit of this parameter is 100μs. After this parameter value is set, ensure that the transmission interval time for the same TPDO is not less than the time corresponding to this parameter.

- Event Timer

To set an even timer for asynchronous transfer (The communication type 254 or 255) of TPDO data, the user must address sub-index 0x05 of communication objects 0x1800~0x1803. The event timer is a trigger event that can trigger the corresponding TPDO transmission. The unit of this parameter is 1 ms. If other events such as data changes occur during the timer running cycle, The TPDO transmission will also trigger, and the event timer is reset immediately.

3.7.3 PDO Mapping Object

The PDO mapping object contains pointers to the corresponding process data of the TPDO or RPDO, including the indexes, sub-indexes and mapped objects' lengths. The data length of the each PDO can be up to 8 bytes, and one or more objects can be mapped at the same time. The sub-index 0x00 of the mapping object records the number of objects currently mapped to the corresponding PDO.

The following is a PDO mapping example: Assign application object 0x603F, 0x6041 and 0x6061 to mapping object 0x1A00 (TPDO_1)

Mapping Object		application object description		
index	sub-index	index	sub-index	Data length
0x1A00	0	0x03		
	1	0x603F	0x00	0x10
	2	0x6041	0x00	0x10
	3	0x6061	0x00	0x08

Application object		
index	sub-index	name
0x603F	0x00	error code
0x6041	0x00	status word
0x6061	0x00	Control mode display

Note:

Changing the PDO mapping object is valid only when the CANOpen communication state is in the pre-operational state.

3.7.4 PDO Mapping steps

The steps to map PDOs using SDOs are the following:

1. Change the NMT state to pre-operational

2. Disable the PDO in question by setting the most significant bit of the COB-ID of the PDO's communication object to 1. (COB-ID found in sub-index 0x01 of objects 0x1400-0x1403 and 0x1800-0x1803)

3. Set the number of mapped objects in the PDOs mapping object to 0 .
total mapped objects found in sub-index 0x00 of 0x1600-0x1603 and 0x1A00-0x1A03

4. Begin to write PDO Mapping Content to the mapping mbject

Map to each sub-index of the mapping object separately

5 Write to the total of mapped objects

Write the new number of mapped objects to sub-index 0x00 of the mapping object

6: Reactivate the PDO by reverting the MSB of the COB-ID of the PDO's communication object to 0

BundlePDOofCOB-IDThe highest bit is set to0

3.8 Synchronization Objects (SYNC)

Synchronization objects (SYNC) are a mechanism that allows control between the transmission and receiving of multiples nodes in a CANOpen network.

3.8.1 SYNC Generator

Synchronization-related objects include the COB-ID of synchronization objects 0x1005 and the synchronous communication cycle period 0x1006.

0x1005: The second most significant bit of the COB-ID determines whether the SYNC generator is active. A value of '1' activates the generator. A value of "0" deactivates the generator.

0x1006: Determines the time interval of generated SYNC objects. Its units are in μs.

3.8.2 SYNC Object Transmission

The transmission of synchronization objects follows the producer-consumer model. A SYNC producer sends out a SYNC frame and all other nodes on the CAN network can receive the frame without producing feedback. Only one SYNC generator is allowed on the same CAN network.

The transmission of synchronous PDOs is dependent on the SYNC frame. There are two possible transmission methods based on SYNC frames:

A. For synchronous RPDOs, as long as the PDO is received, the RPDO will be updated to the application at the next SYNC.

B. For synchronous TPDOs, there are two types of SYNC based transmission. These are detailed in the following chart:

	PDO transmission	Description
Synchronous TPDO	acyclic	The PDO transmission method is set to 0. The PDO is transmitted synchronously with the SYNC object but not periodically.
	cyclic	The PDO transmission type is set between 1 ~ 240, and as long as the specified amount of SYNC objects is received, the TPDO must be transmitted.

Note: After all synchronous PDOs meet the sending conditions, the sending duration is limited to the time set by the synchronization window length 0x1007. Its units are in ms. Synchronous PDOs not sent within the alloted window will be discarded.

3.9 Emergency Objects (EMCY)

Emergency Objects are sent by a CANOpen node when an alarm occurs at the node. Objects related to the EMCY objects include error register 0x1001, predefined error field 0x1003 and the COB-ID of EMCY objects 0x1014.

0x1001: Reflects the general error state of the node. The individual bits are classified by the

corresponding error.

0x1003: Behaves as an alarm history, providing insight into errors that have occurred at the node.

0x1014: Can be used to activate/deactivate EMCY objects via most significant bit of the COB-ID. A value of "1" indicates EMCY is deactivated. A value of "0" indicates EMCY is activated.

The emergency message structure is as follows:

COB-ID	byte							
	0	1	2	3	4	5	6	7
80h + Node_ID	error code		error register 1001h	Reserve	Manufacturer custom			

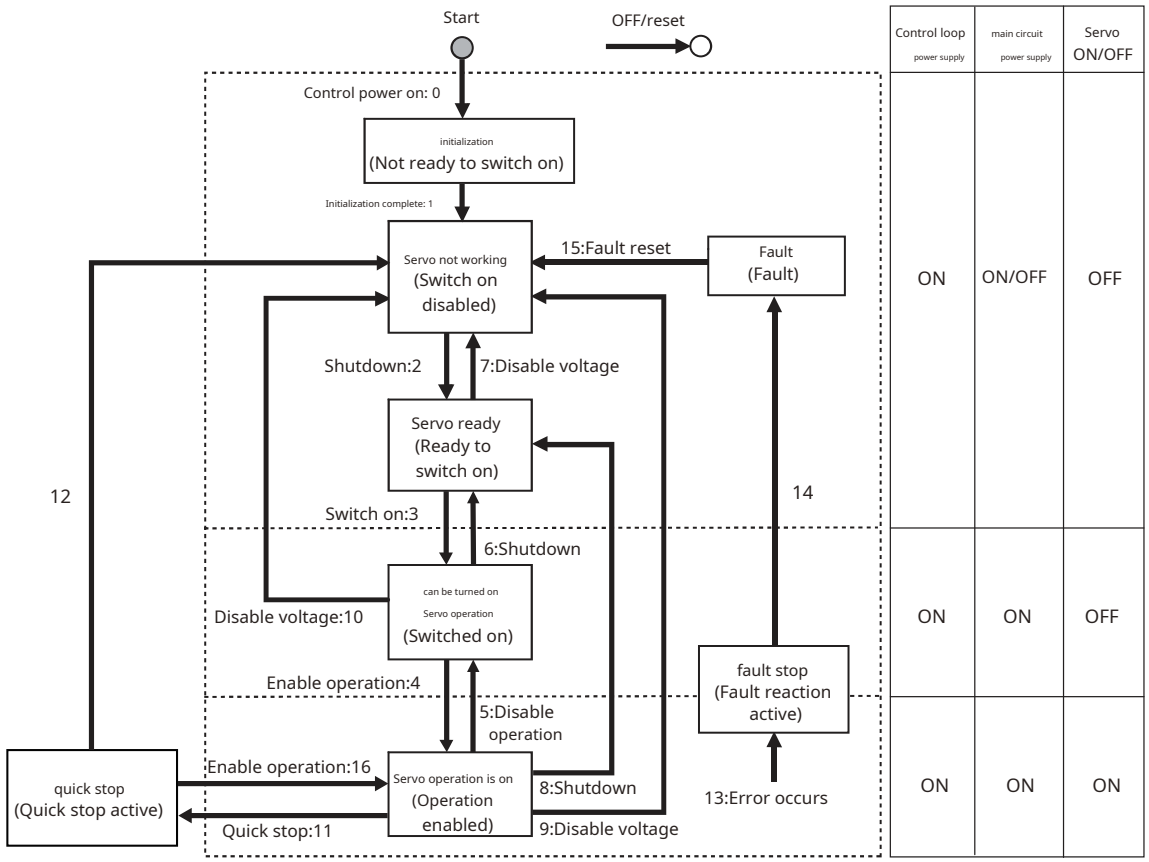
When communication is abnormal, the error code is consistent with DS301 requirements and the error code is always consistent with the error register 0x1001.

4 Motion Control Mode Introduction

4.1 Servo Drive PDS Control

In a CANopen servo drive, the PDS state refers to the state of Power Drive Systems. The status of the PDS can be changed through the Control Word 0x6040 and displayed through the Status Word 0x6041. CANopen servo drives must undergo a state change in accordance with the process specified in the standard CiA402 protocol, i.e. must send an instruction to the next state change after confirming that the status has changed through the 0x6041.

4.1.1 Status Transition Process



• Each PDS state is described in the following table

status	Description
initialization	After turning on the control circuit power,initialization is in progress Drive parameters cannot be set
Servo not working	Servo drive parameters can be set Drive parameters can be set
Servo ready	Main circuit power can be entered at any timeONstatus Drive parameters can be set
Servo operation can be turned on	Main circuit power supplyON Drive parameters can be set
Servo operation is on	Servo On status Drive parameters can be set
quick stop	Quick stop function activated,A quick shutdown process is in progress Drive parameters can be set
fault stop	An error occurs in the servo drive,Error shutdown process in progress
Fault	Error shutdown completed Drive parameters can be set

4.1.2 state control command

Control word (0x6040) controls the PDS status via the bit combinations in the table below :

CiA402state transition		control word**0x6040**	status word**0x6041**of**bit0~bit9**
0	Power-on→initialization	natural transition,No control commands required	0x0000
1	initialization→Servo not working	natural transition,No control commands required If an error occurs during initialization,enter directly13	0x0250
2	Servo not working→Servo ready	0x0006	0x0231
3	Servo ready→Servo operation can be turned on	0x0007	0x0233
4	Servo operation can be turned on→Servo operation is on	0x000F	0x0237
5	Servo operation is on→Servo operation can be turned on	0x0007	0x0233
6	Servo operation can be turned on→Servo ready	0x0006	0x0231
7	Servo ready→Servo not working	0x0000	0x0250
8	Servo operation is on→Servo ready	0x0006	0x0231
9	Servo operation is on→Servo not working	0x0000	0x0250
10	Servo operation can be turned on→Servo not working	0x0000	0x0250
11	Servo operation is on→quick stop	0x0002	0x0217
12	quick stop→Servo not working	quick stop0x605Aset as0~2Time, natural transition,No control commands required	0x0250
13	→fault stop	Except for "error",in any other state,Once the servo drive reports an error,automatic transfer to Troubleshooting Status,No control commands required	0x020F
14	fault stop→Fault	After the error handling is completed,automatic transfer,No control commands required	0x0208
15	Fault→Servo not working	0x80,bit7:0→1	0x0250
16	quick stop→Servo operation is on	quick stop0x605Achoose5~6,After the stop is complete,send0x000F	0x0237

Note:

Bits 10-15 of the Status Word (0x6041) are related to the servo control mode. In the above table they are represented by "0". For the specific status of each, please refer to the corresponding control mode of the servo.

• The bit combinations for the Control Word (0x6040) and their effect on the PDS status are as follows:

instruction	control word**0x6040**					state switch
	bit **7** (**fr**)	bit **3** (**eo**)	bit **2**(**qs**)	bit **1** (**ev**)	bit **0** (**so**)	
Shutdown	0	X	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
Disable voltage	0	X	X	0	X	7,9,10,12
Quick stop	0	X	0	1	X	11
Disable operation	0	0	1	1	1	5
Enable operation	0	1	1	1	1	4,16
Fault reset	0→1	X	X	X	X	15

Note:

X:Indicates that this bit has no effect at this time on the PDS status switch, generally write "0".

so: switch on Servo

qs: quick stop

fr: fault reset

ev: enable voltage (Turn on the main circuit power)　　eo: enable Servo operation

- The PDS Status and corresponding Status Word **0x6041** bit combinations are as follows:

state		status word **0x6041**						
		bit **6** (**sod**)	bit **5** (**qs**)	bit **4** (**ve**)	bit **3** (**f**)	bit **2** (**oe**)	bit **1** (**so**)	bit **0** (**rtso**)
Not ready to switch on	initialization	0	X	X	0	0	0	0
Switch on disabled	Servo trouble-free, Servo not working	1	X	X	0	0	0	0
Ready to switch on	Servo ready	0	1	X	0	0	0	1
Switched on	Servo can be turned on server running	0	1	X	0	0	1	1
Operation enabled	Servo is running turn on	0	1	X	0	1	1	1
Quick stop active	quick stop	0	0	X	0	1	1	1
Fault reaction active	fault response	0	X	X	1	1	1	1
Fault	report an error	0	X	X	1	0	0	0

Note:

X: Does not affect the PDS status

rtso: ready to switch on

so: switched on Servo operation can be enabled

oe: operation enabled Servo operation is on

f: fault report an error

ve: voltage enabled Main circuit power on

qs: quick stop

sod: switch on disabled Servo not working

4.2 Control Mode Settings

The CANopen control modes supported by the servo drive are as follows:

Control Mode	abbreviation
position control (Profile Position Mode)	PP
speed control (Profile Velocity Mode)	PV
Torque control (Torque Profile Mode)	TQ
Cyclic Synchronous Speed Control (Cyclic Synchronous Velocity Mode)	CSV
Return to zero control (Homing Mode)	HM
Interpolation position control (Profile Position Mode)	IP
Q programming (Q Program Mode)	Q

4.2.1 Setting the Control Mode

The control mode of the servo drive is set via object 0x6060. The relationship between the control modes and the value of 0x6060 is as follows:

0x6060	
control mode	value
Q	- 1
PP	1
PV	3
TQ	4
CSV	9
HM	6
IP	7

Note:

The default value of 0x6060 is 0. Be sure to set the value of the required control mode after the drive control power is turned on.

4.2.2 Control Mode Read

The control mode currently set on the drive can be read via object 0x6061. The relationship between the control modes and the value of 0x6061 is as follows:.

0x6061	
control mode	value
Q	- 1
PP	1
PV	3
TQ	4
CSV	9
HM	6
IP	7

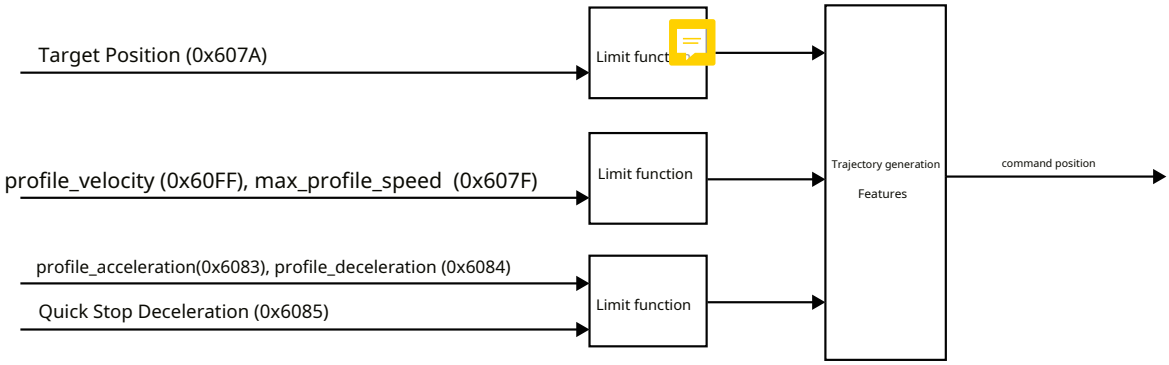
4.2.3 Precautions When Switching Control Modes

1. It is forbidden to switch the control mode during the movement of the motor
2. When the control mode is switched, ensure to update the objects in the RPDO related to the 0x6060 control mode.
3. It takes a certain amount of time for a switch in control modes to complete, during this process object 0x6061 and those found in a TPDO related to the control mode will hold an undetermined value.
4. In the changed control mode, the value of an unsupported object is undefined.
5. An error occurs when setting a control mode not supported by the drive.
6. Fully closed-loop control is only supported in position control modes (PP, HM, IP). Other modes do not support fully closed-loop control.

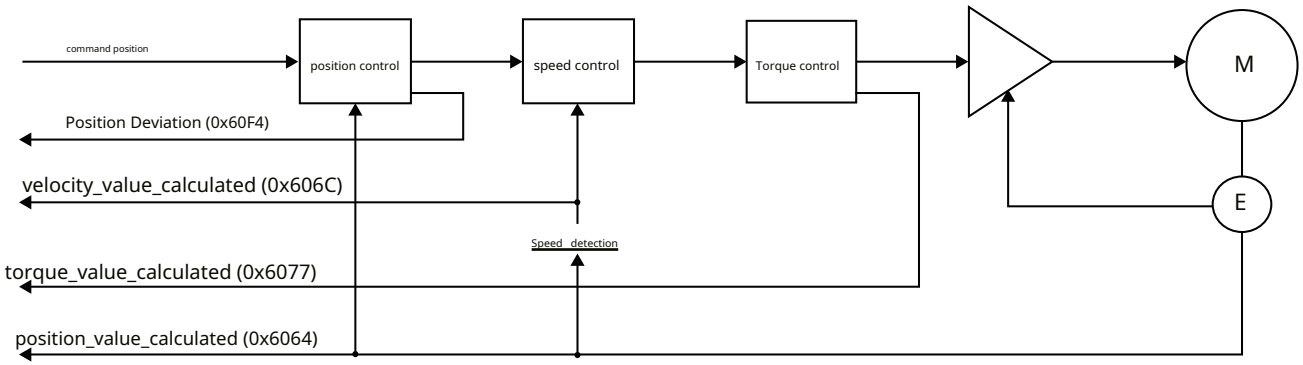
4.3 Profile Position Control Mode

In the Profile Position (PP) control mode, the servo drive generates a motion profile based on the acceleration, deceleration, velocity and target position set by the controller. The user may specify when setting the motion parameters whether the motor operates in relative or absolute positioning mode. To enable PP mode, set 0x6060 to 1.

- The following is a graphical description of motion profile generation based on input parameters:



- Control Loop Structure for Position Control Mode



4.3.1 Position Control Mode Related Objects

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x603F	— —	Error Code	RO	UNSIGNED16	— —	— —	0	TxPDO
0x6040		control word	RW	UNSIGNED16	— —	0~2^{16}-1	0	RxPDO
0x6041		status word	RO	UNSIGNED16	— —	— —	0	TxPDO
0x605A		quick stop	RW	INTEGER16	— —	0~8	2	NO
0x605B		Shutdown method	RW	INTEGER16	— —	0~2	0	NO
0x605C		Prohibited mode of operation	RW	INTEGER16	— —	0~2	1	NO
0x605D		stop mode	RW	INTEGER16	— —	0~1	0	NO
0x6060		control mode	RW	INTEGER8	— —	- 1~10	0	RxPDO
0x6061		Control mode display	RO	INTEGER8	— —	— —	0	TxPDO
0x6064		position_value_calculated	RO	INTEGER32	Pulses	— —	0	TxPDO
0x606C		velocity_value_calculated	RO	INTEGER32	Pulses/s	— —	0	TxPDO
0x6073		max_current	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x6077		torque_value_calculated	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6078		current_actual_value	RO	INTEGER16	0.1%	— —	0	TxPDO
0x607A		Target Position	RW	INTEGER32	Pulses	- 2^{31}~2^{31}-1	0	RxPDO
0x607F		max_profile_speed	RW	UNSIGNED32	Pulses/s	0~2^{32}-1	800000	RxPDO
0x6081		P2P_profile_velocity	RW	UNSIGNED32	Pulses/s	0~2^{32}-1	50000	RxPDO
0x6083		profile_acceleration	RW	UNSIGNED32	Pulses/s	0~2^{32}-1	1000000	RxPDO
0x6084		profile_deceleration	RW	UNSIGNED32	Pulses/s^2	0~2^{32}-1	1000000	RxPDO
0x6085		Quick Stop Deceleration	RW	UNSIGNED32	Pulses/s^2	0~2^{32}-1	30000000	NO
0x60F4		Position Deviation	RO	INTEGER32	Pulses	— —	0	TxPDO
0x2AB1	0x03	Dynamic braking Method on Motor Fault	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	The longest action time when an error is reported	RW	UNSIGNED32	ms	0~30000	0	NO

4.3.2 Control Word Settings

In position control mode, the meaning of the control word 0x6040 is as follows. The shaded bits are used in Profile Position Mode:

15...10	9	8	7	6	5	4	3	2	1	0
Reserved	Change of set point	Halt	Fault reset	Abs/rel	Change set immediately	New set point	Enable operation	Quick stop	Enable voltage	Switch on

bit	name		value	instruction
0	Switch on	Start the servo operation	0	invalid
			1	efficient
1	Enable voltage	Turn on the main circuit power	0	invalid
			1	efficient
2	Quick stop	quick stop	0	efficient
			1	invalid
3	Enable operation	Servo operation	0	invalid
			1	efficient
4	New set point	set new value	0->1	1. start positioning 2. Setpoint update is triggered (0x607A,0x6081,0x6083,0x6084)
5	Change setpoint immediately	update immediately	0	After the current positioning action is completed,Perform the next positioning action
			1	Interrupt the positioning operation being executed,Immediately start the next positioning action
6	Abs/rel	targeting type	0	0x607A Execute as absolute position
			1	0x607A Execute as a relative position
7	Fault reset	Error reset	0->1	Perform an error reset
8	Halt	stop	0	invalid
			1	according to 0x605D, the current stop method executes the stop action
9	Change of set point	continue to operate	0	invalid
			1	setpoint update
10~15	Reserved	reserved	0	reserved function,Please keep it as "0"

4.3.3 Status Word Definition

In position control mode, the meaning of the status word is as follows. The shaded bits are those corresponding to the Profile Position control mode.

7	6	5	4	3	2	1	0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

15	14	13	12	11	10	9	8
Reserved	Reserved	Reserved	Set point acknowledge	Internal limit active	Target reached	Remote	Reserved

bit	name		value	instruction
0	Ready to Switch on	Servo ready	0	invalid
			1	efficient
1	Switched on	Servo operation can be turned on	0	invalid
			1	efficient
2	Operation enabled	Servo operation is on	0	invalid
			1	efficient
3	Fault	report an error	0	no error
			1	There is an error
4	Voltage enabled	Main circuit power on	0	invalid
			1	efficient
5	Quick stop	quick stop	0	Quick stop works
			1	Quick stop doesn't work
6	Switch on disabled	Servo not working	0	invalid
			1	efficient
7	Warning	Call the police	0	reserved function,keep as "0"
8	Reserved	reserved	0	reserved function,keep as "0"
9	Remote	remote control	0	invalid
			1	Control word control is valid
10	Target reached	Positioning completed	0	control wordbit8=0,Positioning not completed;control wordbit8=1,decelerating
			1	control wordbit8=0,Positioning completed;control wordbit8=1,speed is0
11	Internal limit active	Internal limit is valid	0	Digital input limit is not triggered
			1	Digital input limit is triggered
12	Set point acknowledge	Set value confirmation	0	New settings can be updated
			1	New settings have been updated
13	Reserved	reserved	0	reserved function,keep as "0"
14	Reserved	reserved	0	reserved function,keep as "0"
15	Reserved	reserved	0	reserved function,keep as "0"

4.3.4 Profile Position Paremeters

Please refer to the following table for the conditions of position arrival, dynamic error following, positioning completion, etc., and the setting of position error alarm thresholds.

index	sub-index	name	instruction
0x2A14	— —	absolute arrival position	When the absolute value of the difference between the actual position and this set value is not greater than100PulsesTime,Position arrival signal is valid
0x2A15	0x01	Dynamic following error threshold	The absolute value of the position deviation value is within this set value,Dynamic error following signal is valid
	0x02	Motion Condition Timer	The absolute value of the position deviation value is within the position error threshold of the positioning completion signal,and the duration reaches0x2A15 subindex2When setting the time,Positioning complete signal is valid,status word0x6041ofbit10=1
	0x03	Positioning complete signal position error threshold	
	0x04	Command position input completion detection time	The detection time of whether the drive receives the command position from the controller is completed or not
0x2AA8	— —	Position Error Alarm Threshold	When the absolute value of the position deviation is greater than this set value,The drive will report a position error overrun fault; When this setting is0Time,Position error out-of-limit detection will not be enabled

4.3.5 Functional example

Step 1: Enable Location Mode

The controller writes 1 to 0x6060. Confirm that PP mode is set by querying 0x6061.

Step 2: Motor Enable

Write 0x06, 0x07, 0x0F sequentially to 0x6040 to place the motor into the enabled state. Confirm that the motor is enabled by querying 0x6041. If bits 0, 1 and 2 hold a value of "1", the motor is enabled.

Step 3: Set Profile Parameters

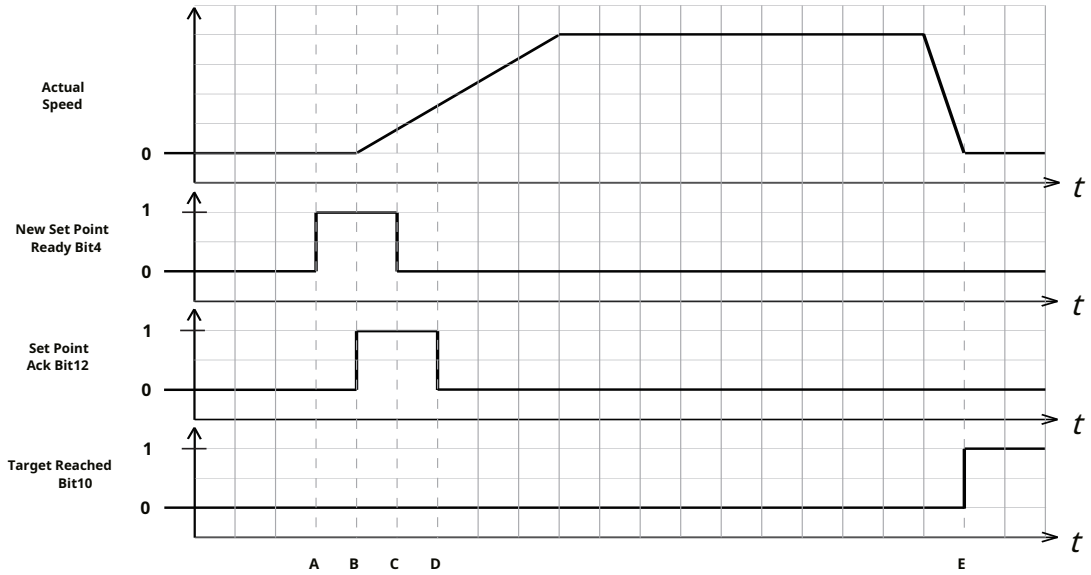
According to application requirements, write parameters such as target position, speed, acceleration and deceleration to 0x607A, 0x6081, 0x6083, 0x6084 respectively.

Step 4: Start / Stop Running

According to the application requirements, select relative positioning or absolute positioning (relative: bit 6 of 0x6040 is 1, absolute: bit 6 of 0x6040 is 0).

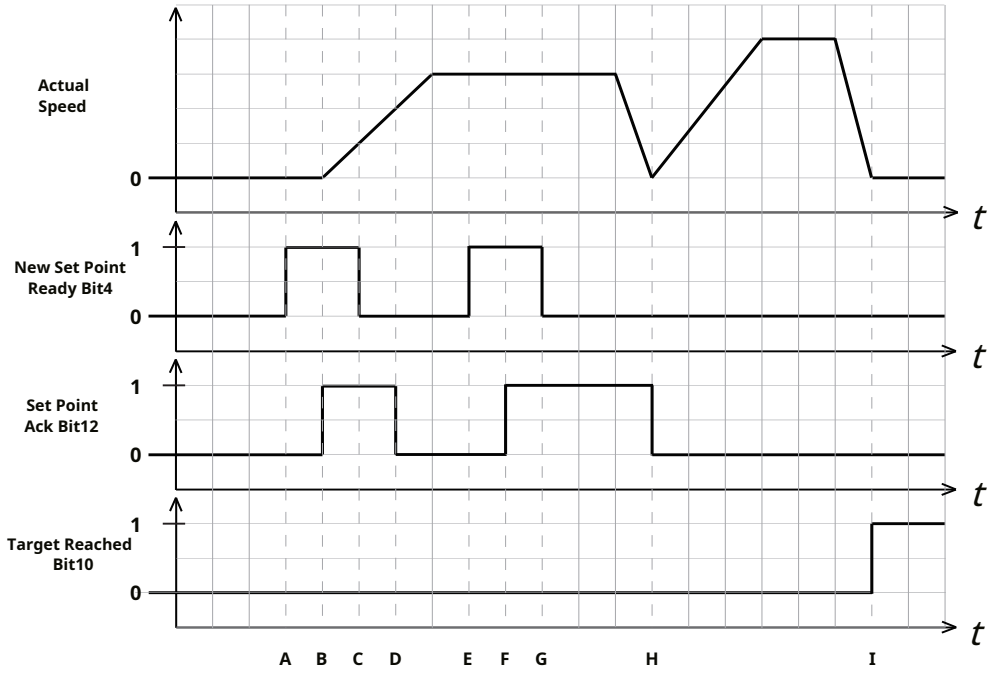
Different positioning profiles require different instruction sets. Please refer to the following examples for further details:

- Single Set Point Move



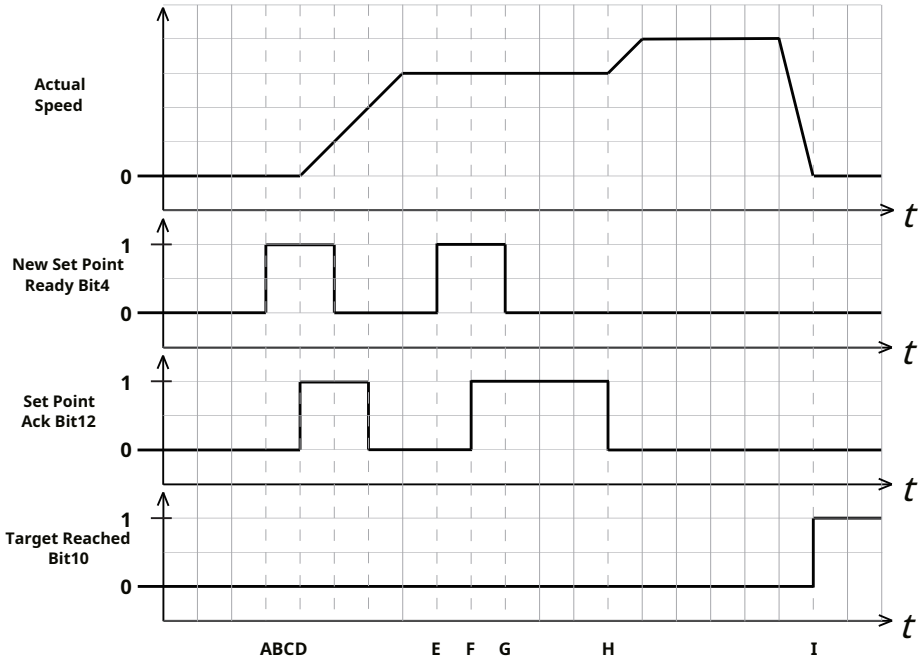
Point in Trajectory	control word(**0x6040**)			status word **(0x6041)**		instruction
	set new value **(bit4)**	update immediately **(bit5)**	update set value **(bit9)**	Set value confirmation **(bit12)**	Positioning completed **(bit10)**	
Start	0	0	0	0	0	Wait for the trigger to execute the action
A	0->1	0	0	0	0	Trigger the Motion Profile Generator
B	1	0	0	0->1	0	Motion Profile has been generated, commence execution
C	1->0	0	0	1	0	Reset Motion Profile Generator Trigger Bit
D	0	0	0	1->0	0	Motion Profile Generator trigger bit has been reset and can be triggered for a new profile
E	0	0	0	0	1	Positioning completed

- Multiple Setpoints, stops between set points



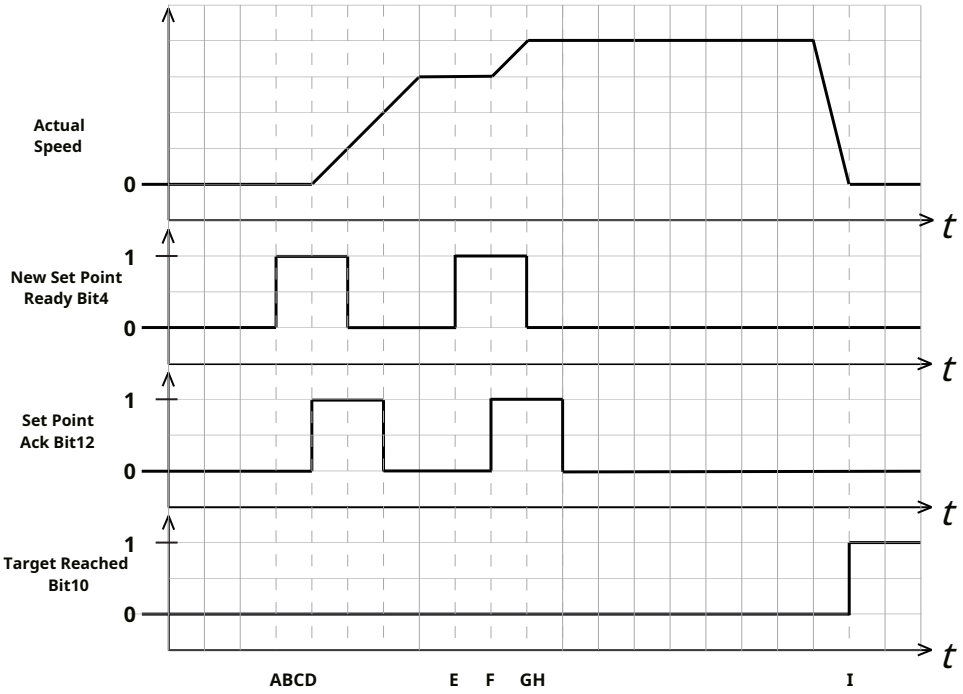
Point in Trajectory	control word **(0x6040)**			status word **(0x6041)**		instruction
	set new value **(bit4)**	update immediately **(bit5)**	update set value **(bit9)**	Set value confirmation **(bit12)**	Positioning completed **(bit10)**	
Start	0	0	0	0	0	Drive waiting for set point
A	0->1	0	0	0	0	User tells drive a set-point is ready
B	1	0	0	0->1	0	Drive acknowledges ser-point, starts executing set-point
C	1->0	0	0	1	0	User pulls new set-point ready bit low
D	0	0	0	1->0	0	Drive pulls set-point ready bit low, indicating its ready to recieve another set-point
E	0->1	0	0	0	0	Drive waiting for set point
F	1	0	0	0->1	0	Drive acknowledges set-point, buffers it as another set-point is still in progress
G	1->0	0	0	1	0	User pulls new set-point ready bit low
H	0	0	0	1->0	0	Drive pulls set-point ack bit low, starts executing new set-point as soon as old one is finished
I	0	0	0	0	1	The set-point is finished, no set-points in buffer, so Target Reached bit is set

- Multiple Set Points, continuous motion



Point in Trajectory	control word **(0x6040)**			status word **(0x6041)**		instruction
	set new value **(bit4)**	update immediately **(bit5)**	update set value **(bit9)**	Set value confirmation **(bit12)**	Positioning completed **(bit10)**	
Start	0	0	1	0	0	Drive waiting for set-point
A	0->1	0	1	0	0	User tells drive a set-point is ready
B	1	0	1	0->1	0	Drive acknowledges set-point, starts executing set-point
C	1->0	0	1	1	0	User pulls new set-point ready bit low
D	0	0	1	1->0	0	Drive pulls set point ack bit low, indicating ready to receive another set-point
E	0->1	0	1	0	0	User tells drive another set-point is ready
F	1	0	1	0->1	0	Drive acknowledges set-point, buffers it, as another set-point is still in progress
G	1->0	0	1	1	0	User pulls new set-point ready bit low
H	0	0	1	1->0	0	Drive pulls set-point ack bit low, starts executing new set-point as soon as the old one is finished
I	0	0	1	0	1	The set-point is finished, no set-points in buffer, so Target Reached bit is set

- Multiple Setpoints, immediate change in Motion

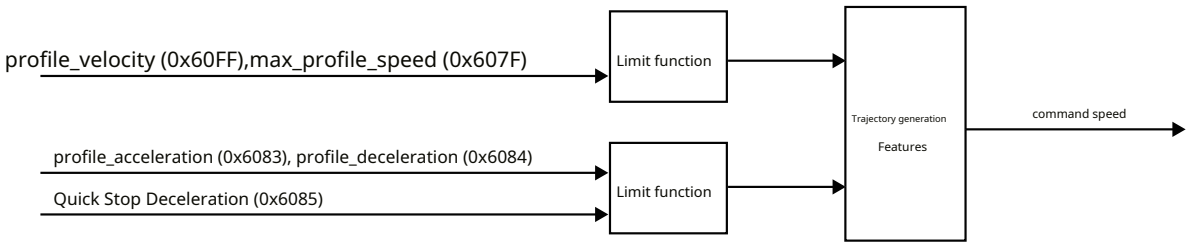


Point in Trajectory	control word **(0x6040)**			status word **(0x6041)**		instruction
	set new value **(bit4)**	update immediately **(bit5)**	update set value **(bit9)**	Set value confirmation **(bit12)**	Positioning completed **(bit10)**	
Start	0	1	X	0	0	Drive waiting for set-point
A	0->1	1	X	0	0	User tells drive a set-point is ready
B	1	1	X	0->1	0	Drive acknowledges set-point, starts executing set-point
C	1->0	1	X	1	0	User pulls new set-point ready bit low
D	0	1	X	1->0	0	Drive pulls set point ack bit low, indicating ready to receive another set-point
E	0->1	1	X	0	0	User tells drive another set-point is ready
F	1	1	X	0->1	0	Drive acknowledges set-point, immediately executes it, beginning transition to new set-point speed and position
G	1->0	1	X	1	0	User pulls new set-point ready bit low
H	0	1	X	1->0	0	Drive pulls set-point ack bit low
I	0	1	X	0	1	The set-point is finished, no set-points in buffer, so Target Reached bit is set

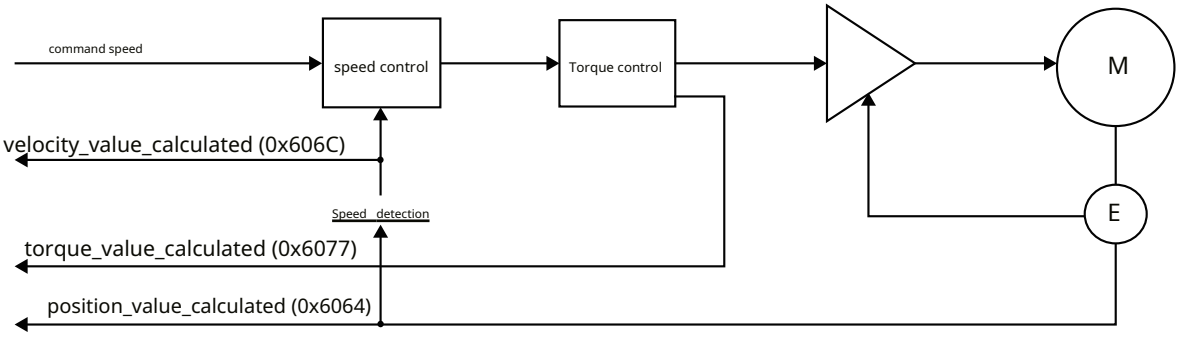
4.4 Profile Velocity Mode

Profile Velocity Mode is a relatively simple operating mode. Once the velocity, acceleration, and deceleration are set, the drive will either command the motor to accelerate to the running velocity according to the acceleration parameter, or to halt movement according to the deceleration parameter.To enable the profile velocity mode, the value 3 must be written to the mode of operation OD entry, located at dictionary address 6060h.

- Diagram of Velocity Profile Generation



- Control Loop for Profile Velocity Mode



4.4.1 Profile Velocity Mode Related Objects

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x603F	— —	error code	RO	UNSIGNED16	— —	— —	0	TxPDO
0x6040		control word	RW	UNSIGNED16	— —	0~2_{16}-1	0	RxPDO
0x6041		status word	RO	UNSIGNED16	— —	— —	0	TxPDO
0x605A		quick stop	RW	INTEGER16	— —	0~8	2	NO
0x605B		Shutdown method	RW	INTEGER16	— —	0~2	0	NO
0x605C		Prohibited mode of operation	RW	INTEGER16	— —	0~2	1	NO
0x605D		stop mode	RW	INTEGER16	— —	0~1	0	NO
0x6060		control mode	RW	INTEGER8	— —	- 1~10	0	RxPDO
0x6061		Control mode display	RO	INTEGER8	— —	— —	0	TxPDO
0x6064		position_value_calculated	RO	INTEGER32	Pulses	— —	0	TxPDO
0x606C		velocity_value_calculated	RO	INTEGER32	Pulses/s	— —	0	TxPDO
0x6073		max_current	RW	UNSIGNED16	0.1%	0~3000	3000	RxPDO
0x6077		torque_value_calculated	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6078		current_actual_value	RO	INTEGER16	0.1%	— —	0	TxPDO
0x607F		max_profile_speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO
0x6083		profile_acceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	1000000	RxPDO
0x6084		profile_deceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	1000000	RxPDO
0x6085		Quick Stop Deceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	30000000	NO
0x60FF		profile_velocity	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	100000	RxPDO
0x2AB1	0x03	Dynamic braking Method on Motor Fault	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	The longest action time when an error is reported	RW	UNSIGNED32	ms	0~30000	0	NO

4.4.2 Control Word settings

In Profile Velocity Control Mode, the meaning of the Control Word 0x6040 is as follows. The shaded bits are used in Profile Velocity Mode:

15 ••• 10	9	8	7	6	5	4	3	2	1	0
Reserved	Reserved	Halt	Fault reset	Reserved	Reserved	Reserved	Enable operation	Quick stop	Enable voltage	Switch on

bit	name		value	instruction
0	Switch on	Start the servo operation	0	invalid
			1	valid
1	Enable voltage	Turn on the main circuit power	0	invalid
			1	valid
2	Quick Stop	quick stop	0	valid
			1	invalid
3	Enable Operation	Servo operation	0	invalid
			1	valid
4	Reserved	reserved	0	reserved function,Please keep it as "0"
5	Reserved	reserved	0	reserved function,Please keep it as "0"
6	Reserved	reserved	0	reserved function,Please keep it as "0"
7	Fault reset	Error reset	0->1	Perform an error reset
8	Halt	stop	0	Speed control starts or continues
			1	according to0x605DThe set stop method executes the stop action
9	Reserved	reserved	0	reserved function,Please keep it as "0"
10~15	Reserved	reserved	0	reserved function,Please keep it as "0"

4.4.3 Status Word Definition

In Profile Velocity Control Mode, the meaning of the Status Word 0x6041 is as follows. The shaded bits are used in Profile Velocity Mode:

7	6	5	4	3	2	1	0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

15	14	13	12	11	10	9	8
Reserved	Reserved	Reserved	Speed	Internal limit active	Target reached	Remote	Reserved

bit	name		value	instruction
0	Ready to Switch on	Servo ready	0	invalid
			1	valid
1	Switched on	Servo operation can be turned on	0	invalid
			1	valid
2	Operation enabled	Servo operation is on	0	invalid
			1	valid
3	Fault	report an error	0	no error
			1	There is an error
4	Voltage enabled	Main circuit power on	0	invalid
			1	valid
5	Quick stop	quick stop	0	Quick stop works
			1	Quick stop doesn't work
6	Switch on disabled	Servo not working	0	invalid
			1	valid
7	Warning	Call the police	0	reserved function,keep as "0"
8	Reserved	reserved	0	reserved function,keep as "0"
9	Remote	remote control	0	invalid
			1	Control word control is valid
10	Target reached	target speed reached	0	control wordbit8=0,The target speed has not reached the control wordbit8=1,decelerating
			1	control wordbit8=0,target speed reached control wordbit8=1,speed is0
11	Internal limit active	Internal limit is valid	0	Digital input limit is not triggered
			1	Digital input limit is triggered
12	Speed	zero speed arrival	0	Not reaching zero speed range
			1	reach zero speed range
13	Reserved	reserved	0	reserved function,Please keep it as "0"
14	Reserved	reserved	0	reserved function,Please keep it as "0"
15	Reserved	reserved	0	reserved function,Please keep it as "0"

4.4.4 Profile Velocity Parameters

Please refer to the following table for the conditions of velocity reached, zero-speed detection and speed consistency.

index	sub-index	name	instruction
0x2A15	0x02	Motion Condition Timer	Timer whose setting helps determine the validity of Velocity Reached, Zero-Speed Detection and Velocity Consistency signals.
0x2A16	0x01	Zero Speed Judgment hreshold	When the absolute value of the actual speed is within the zero speed judgment threshold, for the duration of time set in 0x215A sub-index 0x02, it is considered that the motor is close to a static state, and the zero-speed detection signal is valid.
	0x02	Velocity Reached Threshold	When the absolute value of the actual speed exceeds this set value, for the duration of time set in 0x2A15 sub-index 0x02, it is considered that The actual speed of the motor reached the expected value, and the Velocity Reached signal is valid
	0x03	Speed Coincidence Range	When the absolute value of the difference between the actual speed and the target speed 0x60FF is within this set value, for the duration of time set in 0x2A15 sub-index 0x02, it is considered that the actual speed of the motor reached the expected value. The Velocity Consistent signal is valid. Bit10 =1 of status word 0x6041

4.4.5 Functional example

Step 1: Enable PV mode

Write the value of 3 to 0x6060. To confirm the control mode, query 0x6061.

Step 2: Motor Enable

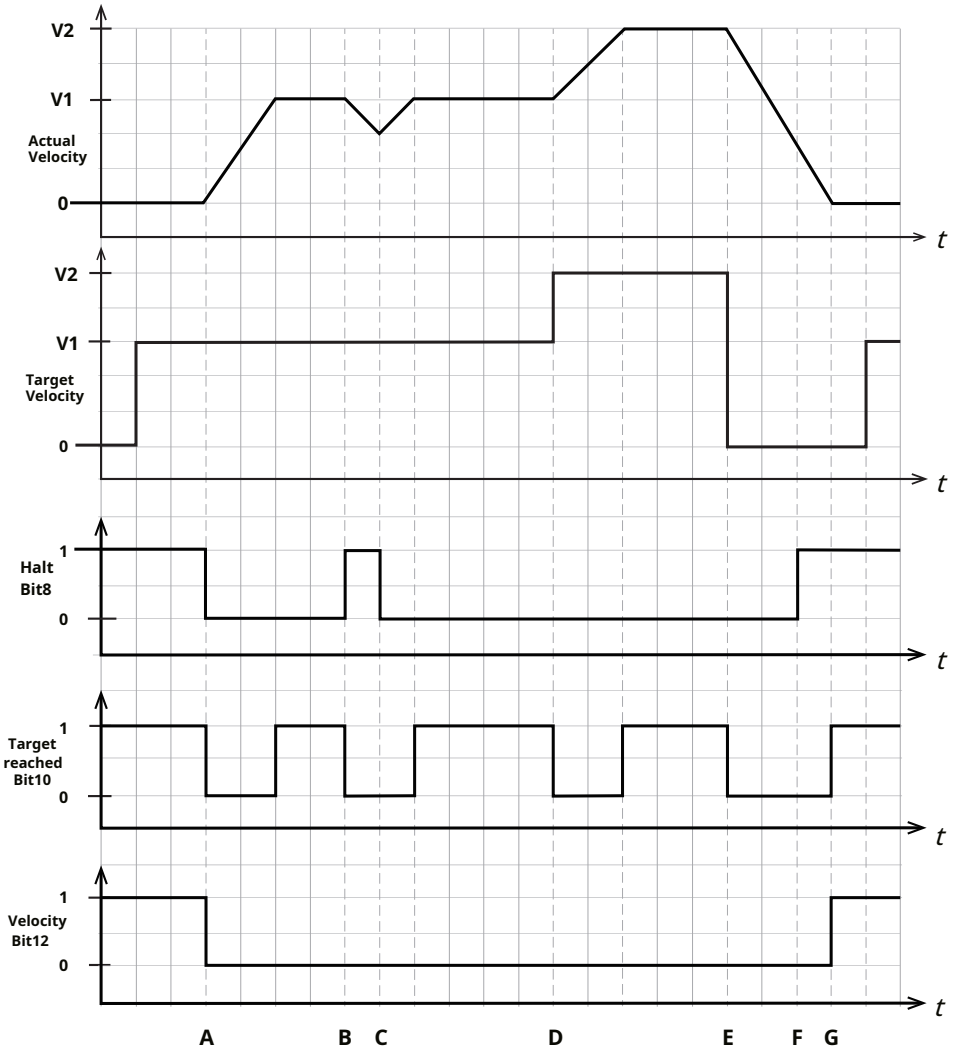
Write values 0x06, 0x07, and 0x10F, sequentially, to 0x6040. To confirm the status of the motor, query 0x6041.

Step 3: Set Profile Parameters

According to application requirements, write target velocity, profile acceleration and profile deceleration values to 0x60FF, 0x6083 and 0x6084 respectively.

Step 4: Execute/Halt Motion

Via the Control Word, 0x6040, control when motion executes or comes to a stop. This is accomplished by toggling the value of bit 8 of the control word. A value of "0" executes motion. A value of "1" halts it, bringing the motor to a stop using the set deceleration parameter.

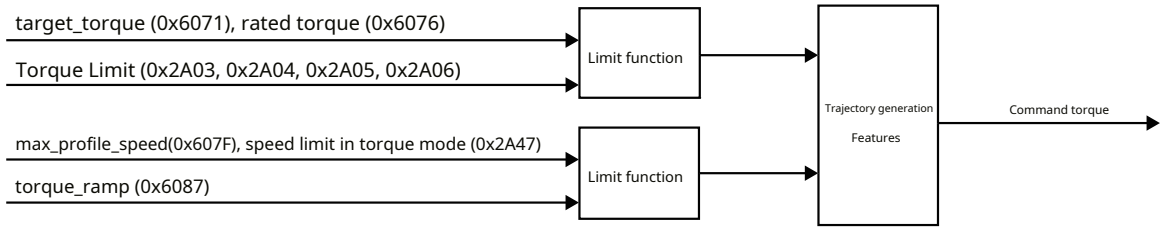


Point in Trajectory	Control Word **(0x6040)**	Status Word **(0x6041)**		Target Velocity **(0x60FF)**	instruction
	stop**(bit8)**	Zero Speed **(bit12)**	target speed to up to**(bit10)**		
Start	1	1	1	0	motor stopped
A	1->0	1->0	1->0	V1	Motor accelerates to speed V1
B	0->1	0	1->0	V1	Motor decelerates to stopped
C	1->0	0	0	V1	Motor accelerates to V1
D	0	0	1->0	V1->V2	Motor accelerates from V1 to V2
E	0	0	1->0	V2->0	Motor decelerates from V2 to 0
F	0->1	0	0	0	Motor remains stopped
G	1	0->1	0->1	0	Motor remains stopped

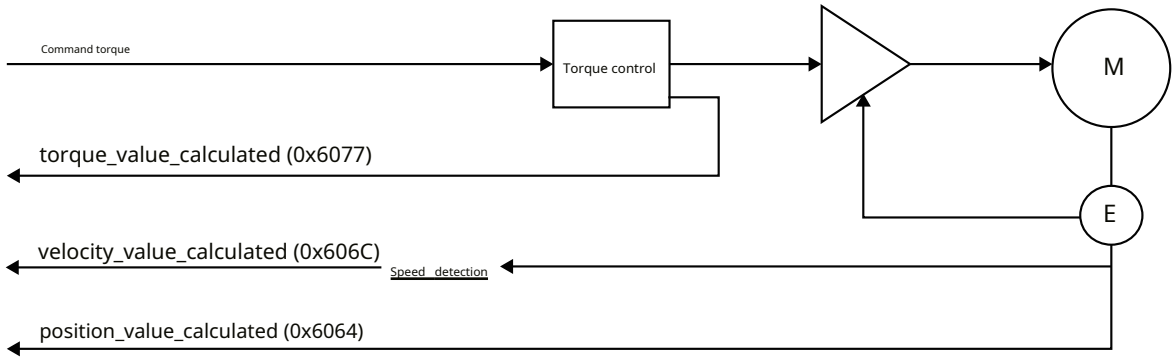
4.5 Profile Torque Control Mode

In the torque control mode, the servo drive generates a motion profile according to the target torque and torque command change rate (torque ramp) set by the controller, and controls the motor to perform the motion according to the generated motion trajectory. To enabletorque control mode, set object 0x6060 to a value of 4.

- Diagram of Torque Control Profile Generation



- Control Loop of Torque Control Mode



4.5.1 Torque Control Related Objects

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x603F		error code	RO	UNSIGNED16	— —	— —	0	TxPDO
0x6040		control word	RW	UNSIGNED16	— —	0~2_{16}-1	0	RxPDO
0x6041		status word	RO	UNSIGNED16	— —	— —	0	TxPDO
0x605A		quick stop	RW	INTEGER16	— —	0~8	2	NO
0x605B		Shutdown method	RW	INTEGER16	— —	0~2	0	NO
0x605C		Prohibited mode of operation	RW	INTEGER16	— —	0~2	1	NO
0x605D		stop mode	RW	INTEGER16	— —	0~1	0	NO
0x6060		control mode	RW	INTEGER8	— —	- 1~10	0	RxPDO
0x6061		Control mode display	RO	INTEGER8	— —	— —	0	TxPDO
0x6064		position_value_calculated	RO	INTEGER32	Pulses	— —	0	TxPDO
0x606C		velocity_value_calculated	RO	INTEGER32	Pulses/s	— —	0	TxPDO
0x6071	— —	target torque	RW	INTEGER16	0.1%	0~3000	0	RxPDO
0x6073		max_current	RW	UNSIGNED16	0.1%	0~3000	3000	RxPDO
0x6074		Command torque	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6077		torque_value_calculated	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6078		current_actual_value	RO	INTEGER16	0.1%	— —	0	TxPDO
0x607F		max_profile_speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO
0x6087		Torque ramp	RW	UNSIGNED32	0.1%/s		0	RxPDO
0x2A03		first torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A04		Second torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A05		Third torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A06		Fourth torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A47		Speed limit in torque mode	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO
0x2AB1	0x03	The action of dynamic braking when an error is reported	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	The longest action time when an error is reported	RW	UNSIGNED32	ms	0~30000	0	NO

4.5.2 Control word settings

In Profile Torque Control Mode, the meaning of the Control Word 0x6040 is as follows. The shaded bits are used in Profile Torque Control Mode:

15 ••• 10	9	8	7	6	5	4	3	2	1	0
Reserved	Reserved	Halt	Fault reset	Reserved	Reserved	Reserved	Enable operation	Quick stop	Enable voltage	Switch on

bit	name		value	instruction
0	Switch on	Start the servo operation	0	invalid
			1	efficient
1	Enable voltage	Turn on the main circuit power	0	invalid
			1	efficient
2	Quick Stop	quick stop	0	efficient
			1	invalid
3	Enable Operation	Servo operation	0	invalid
			1	efficient
4	Reserved	reserved	0	reserved function,Please keep it as "0"
5	Reserved	reserved	0	reserved function,Please keep it as "0"
6	Reserved	reserved	0	reserved function,Please keep it as "0"
7	Fault reset	Error reset	0->1	Perform an error reset
8	Halt	stop	0	Torque control starts or continues
			1	according to0x605DThe set stop method executes the stop action
9	Reserved	reserved	0	reserved function,Please keep it as "0"
10~15	Reserved	reserved	0	reserved function,Please keep it as "0"

4.5.3 Status word definition

In Profile Torque Control Mode, the meaning of the Status Word 0x6041 is as follows. The shaded bits are used in Profile Torque Control Mode:

7	6	5	4	3	2	1	0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

15	14	13	12	11	10	9	8
Reserved	Reserved	Reserved	Reserved	Internal limit active	Target reached	Remote	Reserved

bit	name		value	instruction
0	Ready to Switch on	Servo ready	0	invalid
			1	efficient
1	Switched on	Servo operation can be turned on	0	invalid
			1	efficient
2	Operation enabled	Servo operation is on	0	invalid
			1	efficient
3	Fault	report an error	0	no error
			1	There is an error
4	Voltage enabled	Main circuit power on	0	invalid
			1	efficient
5	Quick stop	quick stop	0	Quick stop works
			1	Quick stop doesn't work
6	Switch on disabled	Servo not working	0	invalid
			1	efficient
7	Warning	Call the police	0	reserved function,keep as "0"
8	Reserved	reserved	0	reserved function,keep as "0"
9	Remote	remote control	0	invalid
			1	Control word control is valid
10	Target reached	Target torque reached	0	control wordbit8=0,Command torque0x6074Target torque not reached control wordbit8=1,decelerating
			1	control wordbit8=0,Command torque0x6074reach target torque control wordbit8=1,speed is0
11	Internal limit active	Internal limit is valid	0	Digital input limit is not triggered
			1	Digital input limit is triggered
12	Reserved	reserved	0	reserved function,keep as "0"
13	Reserved	reserved	0	reserved function,keep as "0"
14	Reserved	reserved	0	reserved function,keep as "0"
15	Reserved	reserved	0	reserved function,keep as "0"

4.5.4 Torque Control Parameters

Please refer to the following table for the conditions for torque arrival and torque consistency

index	sub-index	name	instruction
0x2A15	0x02	Motion Condition Timer	When the absolute value of the difference between the command torque and the target torque, 0x6071, is within the range of the Torque Variance Range, and lasts the duration of time specified in 0x2A15 sub-index 0x02, the actual torque of the motor is considered to have reached the desired value. The Torque Consistency signal is valid. Bit 10 = '1' for the Status Word 0x6041.
0x2A17	— —	Torque Variance Range	
0x2A18		Torque Reached Threshold	When the absolute value of the difference between the command torque and this value is within the Torque Variance Range, (0x2A17), for the duration of time specified in 0x2A15 sub-index 0x02, it is considered that the actual torque of the motor reached its target value. The Torque Arrival signal is valid.

4.5.5 Functional example

Step 1: Enable Profile Torque Mode

Write the value of 4 to 0x6060. To confirm the control mode, query 0x6061.

Step 2: Motor Enable

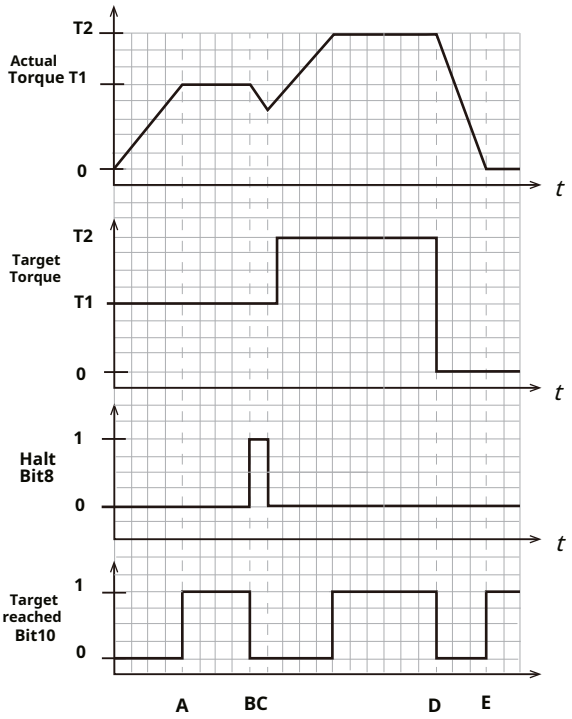
Write values 0x06, 0x07, and 0x10F , sequentially, to 0x6040. To confirm the status of the motor, query 0x6041.

Step 3: Set Profile Parameters

According application requirements, write parameters Target Torque, Velocity Limit and Torque Ramp in torque to 0x6071,0x2A47and0x6087 respectively.

Step 4: Execute/Halt Motion

Via the Control Word, 0x6040, control when motion executes or comes to a stop. This is accomplished by toggling the value of bit 8 of the Control Word. A value of "0" executes motion. A value of "1" halts it, decelerating the motor to a stop.

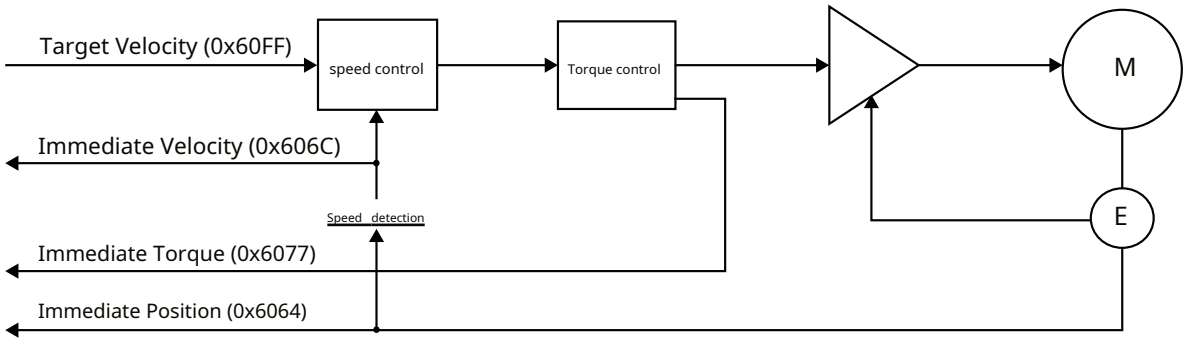


map point	Control Word**(0x6040)**	Status Word **(0x6041)**	Target Torque **(0x6071)**	instruction
	stop**(bit8)**	Target torque reached **(bit10)**		
Start	0	1	T1	Ramp torque to T1
A	0	0->1	T1	Maintain torque at T1
B	0->1	1->0	0	Ramp torque to zero
C	1->0	0	0->T2	Ramp torque to T2
D	0	1->0	T2->0	Ramp torque to zero
E	0	0->1	0	Maintain torque at zero

4.6 Cyclic Synchronous Velocity Control Mode

In Cyclic Synchronous Velocity Control Mode, the controller generates the motion trajectory, and sends the target speed to the servo drive every SYNC cycle. The servo drive follows the target speed. To enable the periodic synchronous speed control mode, set 0x6060 to a value of 9.

- Control Loop of Cyclic Synchronous Speed Control Mode



4.6.1 Cyclic Synchronous Speed Control Mode Related Parameters

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x603F	— —	error code	RO	UNSIGNED16	— —	— —	0	TxPDO
0x6040		control word	RW	UNSIGNED16	— —	0~2_{16}-1	0	RxPDO
0x6041		status word	RO	UNSIGNED16	— —	— —	0	TxPDO
0x605A		quick stop	RW	INTEGER16	— —	0~8	2	NO
0x605B		Shutdown method	RW	INTEGER16	— —	0~2	0	NO
0x605C		Prohibited mode of operation	RW	INTEGER16	— —	0~2	1	NO
0x6060		control mode	RW	INTEGER8	— —	- 1~10	0	RxPDO
0x6061		Control mode display	RO	INTEGER8	— —	— —	0	TxPDO
0x6064		actual location	RO	INTEGER32	Pulses	— —	0	TxPDO
0x606C		actual speed	RO	INTEGER32	Pulses/s	— —	0	TxPDO
0x6073		Maximum current	RW	UNSIGNED16	0.1%	0~3000	3000	RxPDO
0x6077		actual torque	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6078		actual current	RO	INTEGER16	0.1%	— —	0	TxPDO
0x607F		Maximum speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO
0x6085		Quick stop deceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	30000000	NO
0x60FF		target speed	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	100000	RxPDO
0x2AB1	0x03	The action of dynamic braking when an error is reported	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	The longest action time when an error is reported	RW	UNSIGNED32	ms	0~30000	0	NO

4.6.2 Control Word Settings

In Cyclic Synchronous Velocity Control, the meanings of Control Word 6040 are as follows:

15 ••• 10	9	8	7	6	5	4	3	2	1	0
Reserved	Reserved	Halt	Fault reset	Reserved	Reserved	Reserved	Enable operation	Quick stop	Enable voltage	Switch on

bit	name		value	instruction
0	Switch on	Start the servo operation	0	invalid
			1	efficient
1	Enable voltage	Turn on the main circuit power	0	invalid
			1	efficient
2	Quick Stop	quick stop	0	efficient
			1	invalid
3	Enable Operation	Servo operation	0	invalid
			1	efficient
4	Reserved	reserved	0	reserved function,Please keep it as "0"
5	Reserved	reserved	0	reserved function,Please keep it as "0"
6	Reserved	reserved	0	reserved function,Please keep it as "0"
7	Fault reset	Error reset	0->1	Perform an error reset
8	Halt	stop	0	reserved function,Please keep it as "0"
9	Reserved	reserved	0	reserved function,Please keep it as "0"
10~15	Reserved	reserved	0	reserved function,Please keep it as "0"

4.6.3 Status word definition

In Cyclic Synchronous Velocity Control Mode, the meaning of the Status Word 0x6041 is as follows. The shaded bits are used in Cyclic Synchronous Velocity Control Mode:

7	6	5	4	3	2	1	0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

15	14	13	12	11	10	9	8
Reserved	Reserved	Reserved	Drive follows the command value	Internal limit	Status toggle	Remote	Reserved

bit	name		value	instruction
0	Ready to Switch on	Servo ready	0	invalid
			1	efficient
1	Switched on	Servo operation can be turned on	0	invalid
			1	efficient
2	Operation enabled	Servo operation is on	0	invalid
			1	efficient
3	Fault	report an error	0	no error
			1	There is an error
4	Voltage enabled	Main circuit power on	0	invalid
			1	efficient
5	Quick stop	quick stop	0	Quick stop works
			1	Quick stop doesn't work
6	Switch on disabled	Servo not working	0	invalid
			1	efficient
7	Warning	Call the police	0	reserved function,keep as "0"
8	Reserved	reserved	0	reserved function,keep as "0"
9	Remote	remote control	0	invalid
			1	Control word control is valid
10	Status toggle	state switch	0	Master not updating target speed
			1	Master update target speed
11	Interanl limit active	Internal limit is valid	0	Digital limit input is not triggered
			1	Digital limit input is triggered
12	Drive follows the command value	Execute actions according to the target speed	0	Action not performed according to target speed
			1	Execute actions according to the target speed
13	Reserved	reserved	0	reserved function,keep as "0"
14	Reserved	reserved	0	reserved function,keep as "0"
15	Reserved	reserved	0	reserved function,keep as "0"

4.6.4 Cyclic Synchronous Velocity Parameters

Please refer to the following table for the conditions for Zero-Speed detection, Velocity Reached and Velocity Consistency.

index	sub-index	name	instruction
0x2A15	0x02	Motion Condition Timer	Timer whose setting helps determine the validity of Velocity Reached, Zero-Speed Detection and Velocity Consistency signals.
0x2A16	0x01	Zero Speed Threshold	When the absolute value of the actual speed is within the zero speed judgment threshold, for the duration of time set in 0x215A sub-index 0x02, it is considered that the motor is close to a static state, and the zero-speed detection signal is valid.
	0x02	Velocity Reached Threshold	When the absolute value of the actual speed exceeds this set value, for the duration of time set in 0x2A15 sub-index 0x02, it is considered that The actual speed of the motor reached the expected value, and the Velocity Reached signal is valid
	0x03	Speed Coincidence Range	When the absolute value of the difference between the actual speed and the target speed 0x60FF is within this set value, for the duration of time set in 0x2A15 sub-index 0x02, it is considered that the actual speed of the motor reached the expected value. The Velocity Consistent signal is valid. Bit10 =1 of status word 0x6041

4.6.5 Functional example

Step 1: Enable Cyclic Sync Speed mode

Write the value of 9 to 0x6060. Confirm the set control mode by querying 0x6061.

Step 2: Motor Enable

Write 0x06,0x07,0x0F, sequentially, to 0x6040. To confirm the status of the motor query 0x6041.

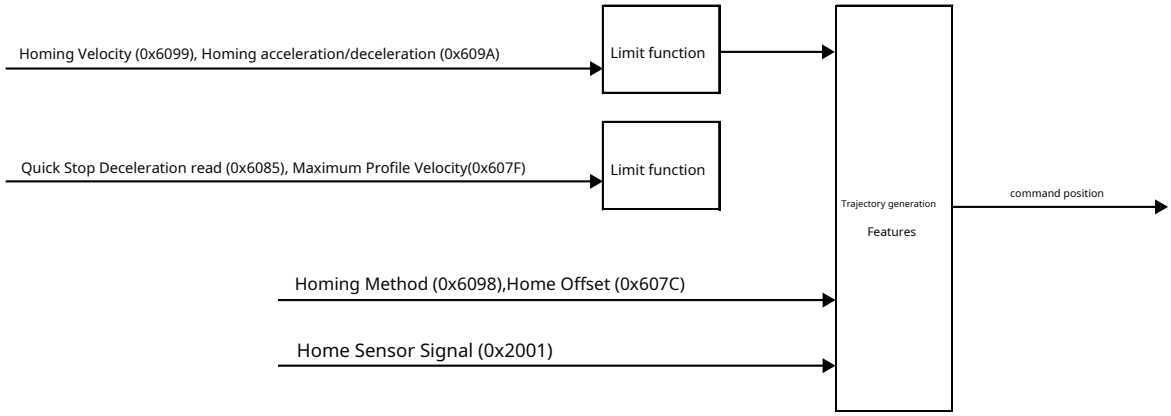
Step 3: Set Run Parameters and control start/stop

The controller generates the motion profile according to the set profile parameters. The controller periodically writes the target velocity to 0x60FF to control motor operation.

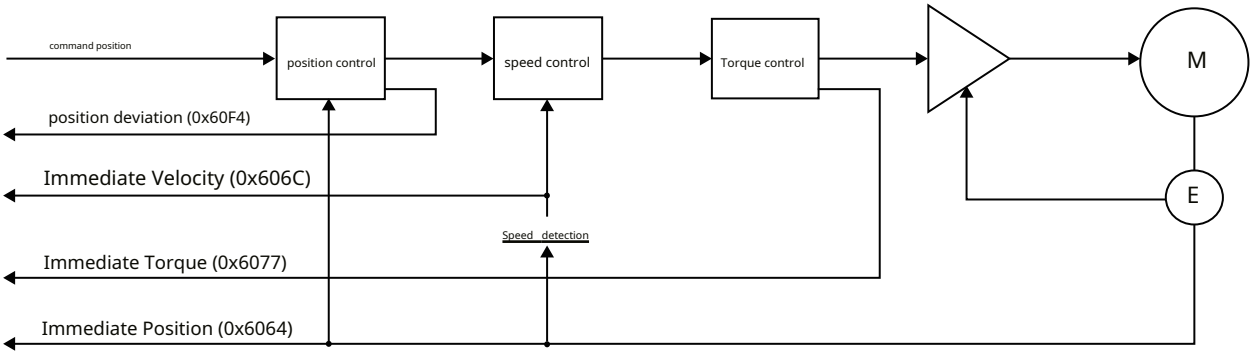
4.7 Homing Mode

In Homing Control Mode, the servo drive generates a motion profile according to the parameters such as homing acceleration/deceleration, velocity, Home Offset etc. Homing mode and the Home sensor signal are set by the controller which also controls execution of the generated motion profile. To enable Homing Mode, set 0x6060 to the value of 6. The M3 CANOpen series of AC servo drives supports 39 ways to home.

- Diagram of Homing Profile Generation



- Control Loop Of Homing Mode



4.7.1 Homing Control Mode Related Object

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x603F	— —	error code	RO	UNSIGNED16	— —	— —	0	TxPDO
0x6040		control word	RW	UNSIGNED16	— —	0~2_{16}-1	0	RxPDO
0x6041		status word	RO	UNSIGNED16	— —	— —	0	TxPDO
0x605A		Emergency stop method	RW	INTEGER16	— —	0~8	2	NO
0x605B		Shutdown method	RW	INTEGER16	— —	0~2	0	NO
0x605C		Prohibited mode of operation	RW	INTEGER16	— —	0~2	1	NO
0x605D		stop mode	RW	INTEGER16	— —	0~1	0	NO
0x6060		control mode	RW	INTEGER8	— —	- 1~10	0	RxPDO
0x6061		Control mode display	RO	INTEGER8	— —	— —	0	TxPDO
0x6064		actual location	RO	INTEGER32	Pulses	— —	0	TxPDO
0x606C		actual speed	RO	INTEGER32	Pulses/s	— —	0	TxPDO
0x6073		Maximum current	RW	UNSIGNED16	0.1%	0~3000	3000	RxPDO
0x6077		actual torque	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6078		actual current	RO	INTEGER16	0.1%	— —	0	TxPDO
0x607C		Origin offset	RW	INTEGER32	Pulses	- 2_{31}~2_{31}-1	0	RxPDO
0x607F		Maximum speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO
0x6085		Emergency stop deceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	30000000	RxPDO
0x6098		Back to origin method	RW	INTEGER8	— —	- 4~35	0	RxPDO
0x6099	0x01	High speed for finding origin	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	0	RxPDO
	0x02	Origin low speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	0	RxPDO
0x609A	— —	Return to origin acceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	0	RxPDO
0x60F4		Actual position deviation	RO	INTEGER32	Pulses	— —	0	TxPDO
0x2A08		Torque limit of hard limit homing mode	RW	UNSIGNED32	0.1%	0~3000	3000	RxPDO
0x2AB1	0x03	The action of dynamic braking when an error is reported	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	The longest action time when an error is reported	RW	UNSIGNED32	ms	0~30000	0	NO

4.7.2 Control Word Settings

In Homing Control Mode, the meaning of the Control Word 0x6040 is as follows. The shaded bits are used in Homing Control Mode:

15 ••• 10	9	8	7	6	5	4	3	2	1	0
Reserved	Reserved	Halt	Fault reset	Reserved	Reserved	Homing operation start	Enable operation	Quick stop	Enable voltage	Switch on

bit	name		value	instruction
0	Switch on	Start the servo operation	0	invalid
			1	efficient
1	Enable voltage	Turn on the main circuit power	0	invalid
			1	efficient
2	Quick Stop	quick stop	0	efficient
			1	invalid
3	Enable Operation	Servo operation	0	invalid
			1	efficient
4	Homing operation start	Start back to origin	0	Return to origin does not start
			0->1	Start back to origin
			1	Return to origin in progress
			1->0	Terminate back to origin
5	Reserved	reserved	0	reserved function,Please keep it as "0"
6	Reserved	reserved	0	reserved function,Please keep it as "0"
7	Fault reset	Error reset	0->1	Perform an error reset
8	Halt	stop	0	invalid
			1	according to0x605DThe set stop method executes the stop action
9	Reserved	reserved function	0	reserved function,Please keep it as "0"
10~15	Reserved	reserved function	0	reserved function,Please keep it as "0"

4.7.3 Status Word Definition

In Homing Control Mode, the meaning of the Status Word 0x6041 is as follows. The shaded bits are used in Homing Control Mode:

7	6	5	4	3	2	1	0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

15	14	13	12	11	10	9	8
Reserved	Reserved	Reserved	Homing attained	Internal limit active	Target reached	Remote	Reserved

bit	name		value	instruction
0	Ready to Switch on	Servo ready	0	invalid
			1	efficient
1	Switched on	Servo operation can be turned on	0	invalid
			1	efficient
2	Operation enabled	Servo operation is on	0	invalid
			1	efficient
3	Fault	report an error	0	no error
			1	There is an error
4	Voltage enabled	Main circuit power on	0	invalid
			1	efficient
5	Quick stop	quick stop	0	Quick stop works
			1	Quick stop doesn't work
6	Switch on disabled	Servo not working	0	invalid
			1	efficient
7	Warning	Call the police	0	reserved function,keep as "0"
8	Reserved	reserved	0	reserved function,keep as "0"
9	Remote	remote control	0	invalid
			1	Control word control is valid
10	Target reached	Location arrives	0	control wordbit8=0,did not reach the origin;control wordbit8=1,decelerating
			1	control wordbit8=0,reach the origin;control wordbit8=1,speed is0
11	Interanl limit active	Internal limit is valid	0	Digital limit input is not triggered
			1	Digital limit input is triggered
12	Homing attained	back to origin complete	0	Return to origin is not completed
			1	Return to origin operation completed
13	Homing error	back to origin error	0	Return to origin without exception
			1	Abnormal return to origin
14	Reserved	reserved	0	reserved function,keep as "0"
15	Reserved	reserved	0	reserved function,keep as "0"

4.7.4 Functional example

Step 1: Enable Homing Mode

Write the value 6 to 0x6060. To confirm the control mode, query 0x6061.

Step 2: Motor Enable

Write 0x06,0x07,0x0F sequentially to 0x6040 to enable the motor. To confirm the status of the motor, query 0x6041

Step 3: Set Run Parameters

According application requirements, set the homing method, homing velocity, homing acceleration/deceleration, home offset and other parameters by writing to objects 0x6098,0x6099,0x609A,0x607C respectively.

Step 4: Execute/Halt Motion

The controller can control the execution/stop of the homing operation by toggling the state of bit 4 of 0x6040. When bit 4 changes from '0' to '1', the motor begins to home according to the method specified by 0x6098.

4.7.5 Introduction to Homing Methods

Homing is used to find the mechanical origin and define the position relationship between the mechanical origin and the mechanical zero.

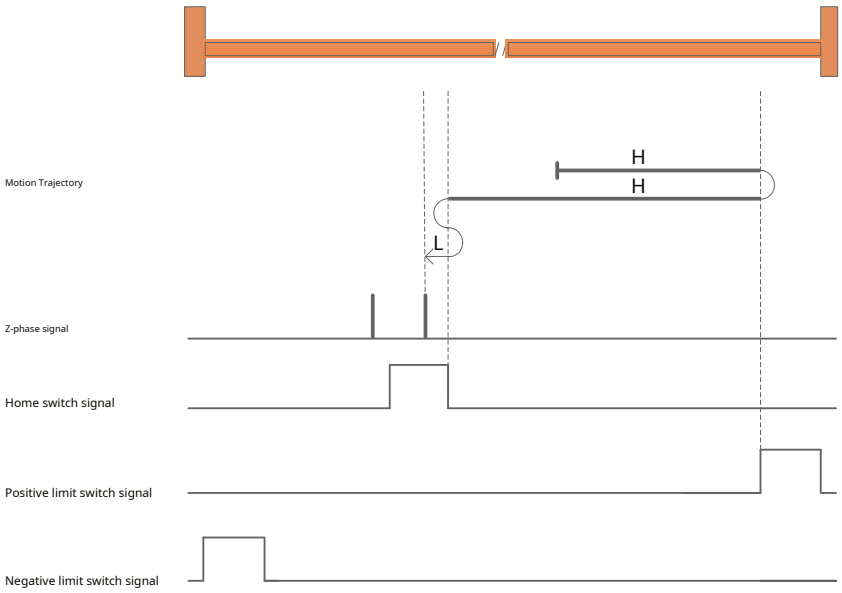
Mechanical origin: a fixed position on the machine, can be a certain sensor or it can also be motor Z-Phase signal.

Mechanical zero: The mechanical absolute 0 on a machine.

After returning to the origin, the position where the motor stops is the mechanical origin, and by setting the origin bias 0x607C,you can define the relationship between the mechanical origin and the mechanical zero point.

Mechanical origin = Mechanical zero + 0x607C

When 0x607C=0, the mechanical origin coincides with the mechanical zero.



H: Search Home Switch Speed 0x6099 sub-index 1

L: Search Zero-Position Speed 0x6099 sub-index 2

Home switch signal: HOM-SW = 0 Indicates that the origin signal is invalid, HOM-SW = 1Indicates that the origin signal is valid

positive limit switch signal: POT = 0 Indicates that the positive limit signal is invalid, POT = 1 Indicates that the positive limit signal is valid and the

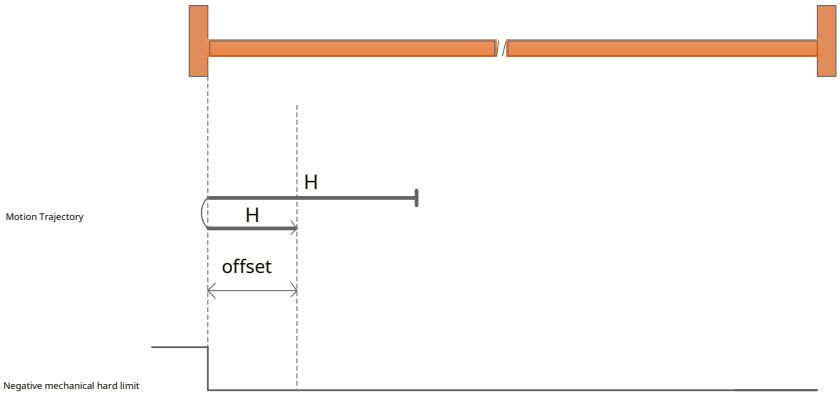
negative limit switch signal : NOT = 0 Indicates that the negative limit signal is invalid, NOT = 1 Indicates that the negative limit signal is valid

Homing methods -4 ~ -1 are manufacturer specific ways back to the origin. The driver does not require an external switch signal as an auxiliary signal at the origin. Instead, by limiting the torque of the motor in the process of homing, when the mechanical hard limit and the motor load make contact, the motor becomes stationary letting the driver know that the mechanical origin has been found. During the process of homing, the torque limit of the motor is set by 0x2A08. 100% corresponds to 1 times the rated torque of the motor. The torque limit value is set according to the application requirements. Setting this value is too low may lead to inaccurate homing operations. Setting the value too large may damage the mechanical equipment.

Note:

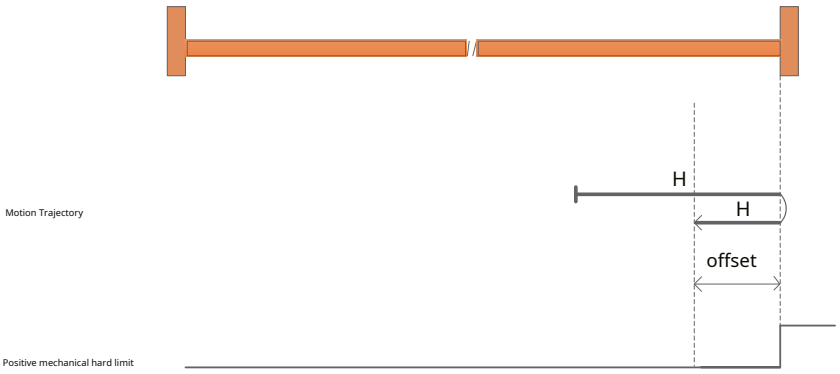
When using homing methods -4~ -1, it is necessary to set a suitable homeoffset 0x607C, so that the mechanical home is found in the process of returning to the mechanical zero. When the motor back tracks the set Homing Offset distance, 0x607C, the load leaves the mechanical hard limit and the actual position after the motor stops 0x6064 is 0.

Homing Method-**4**: Negative regression, looking for negative mechanical hard limit



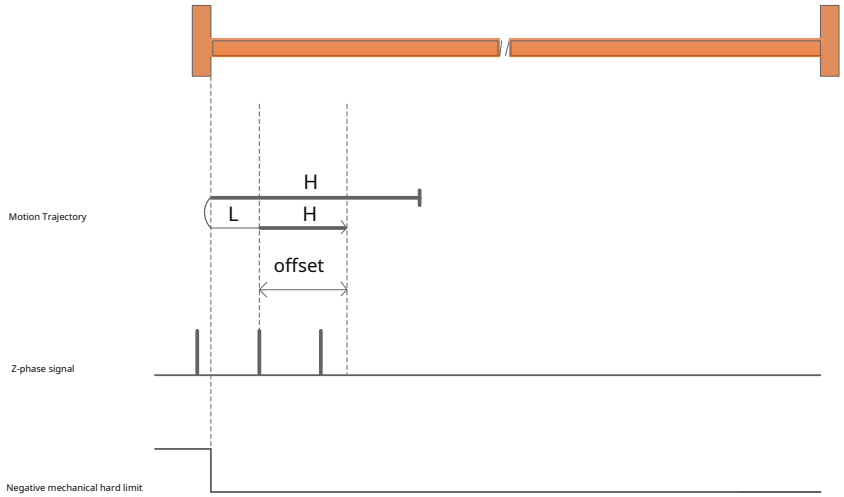
a) Start the return to the mechanical hard limit (mechanical zero) with a negative high speed. When the mechanical hard limit is met and the blocking force is equal to the limited torque output of the motor, it will decelerate and stop. Home offset in positive direction, at high-speed, a total distance of 0x607C. The position of the motor after stopping is 0, the mechanical home.

Homing Method-**3**: Positive regression, looking for positive mechanical hard limit



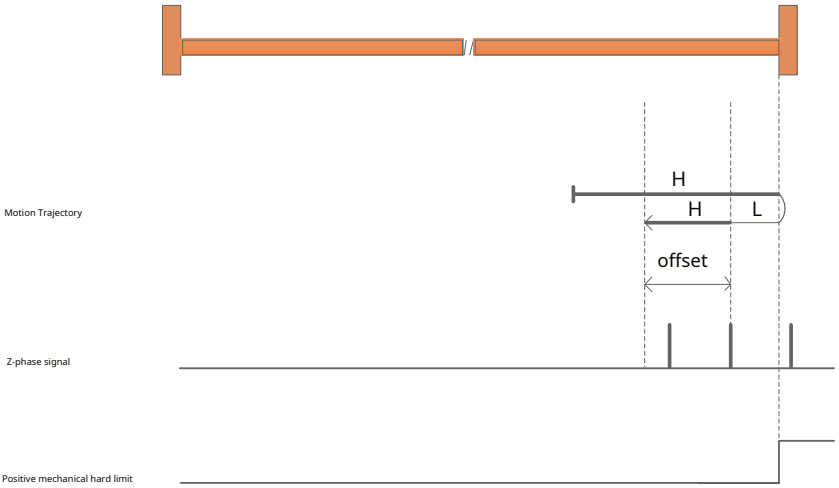
a) Start the return to the mechanical hard limit (mechanical zero) with a positive high speed. When the mechanical hard limit is met and the blocking force is equal to the limited torque output of the motor, it will decelerate and stop. Home offset in negative direction, at high-speed, a total distance of 0x607C. The position of the motor after stopping is 0, the mechanical home.

Homing Method **-2**: Negative regression, look for negative mechanical hard limit and **Z** Phase pulse signal on offset



a) Start the return to the mechanical hard limit (mechanical zero) with a negative high speed. When the mechanical hard limit is met and the blocking force is equal to the limited torque output of the motor, it will decelerate and stop. Home offset in forward direction, at low-speed, until the first Z-Pulse is detected. Then offset in the forward direction again, at high speed, a total distance of 0x607C. The position of the motor after stopping is 0, the mechanical home.

Homing Method**-1**: Positive regression, look for positive mechanical hard limit and **Z** Phase pulse signal



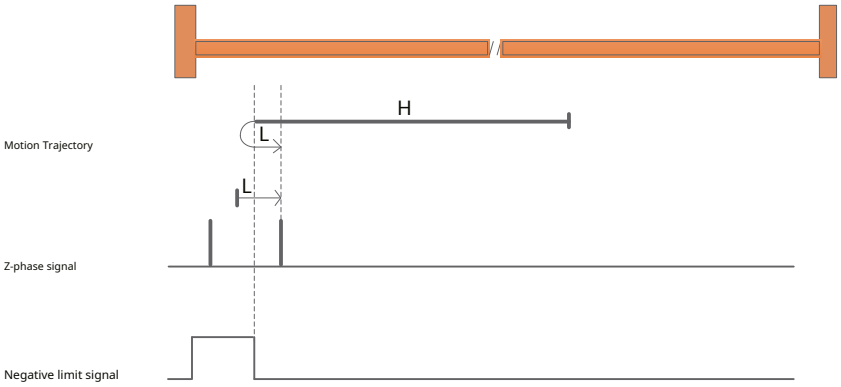
a) Start the return to the mechanical hard limit (mechanical zero) with a positive high speed. When the mechanical hard limit is met and the blocking force is equal to the limited torque output of the motor, it will decelerate and stop. Home offset in negative direction, at low-speed, until the first Z-Pulse is detected. Then offset in the negative direction again, at high speed, a total distance of 0x607C. The position of the motor after stopping is 0, the mechanical home.

Homing Method 1~35 are defined by the CiA402 drive profile specification.

Note:

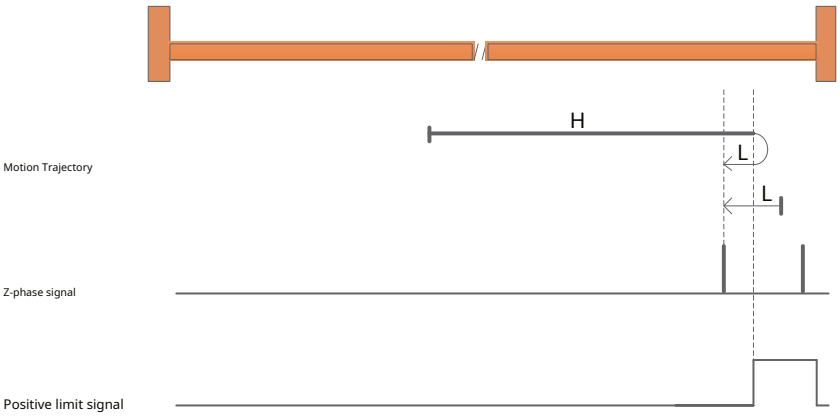
When using Homing methods 1 ~ 35, after the homing operation is completed, the actual position of the motor 0x6064 is the value of the home offset 0x607C.

Homing Method **1**: Negative regression, find the negative limit and **Z** Pulse signal



a) When starting the regression, NOT=0. Start the regression at a negative high speed, after encountering the NOT rising edge, decelerate and reverse, running at a forward low speed, encountering the FIRST Z pulse signal after the NOT descending edge.
b) NOT = 1 at the beginning of the regression, which begins at a forward low speed and stops at the first Z pulse after encountering the descending edge of NOT.

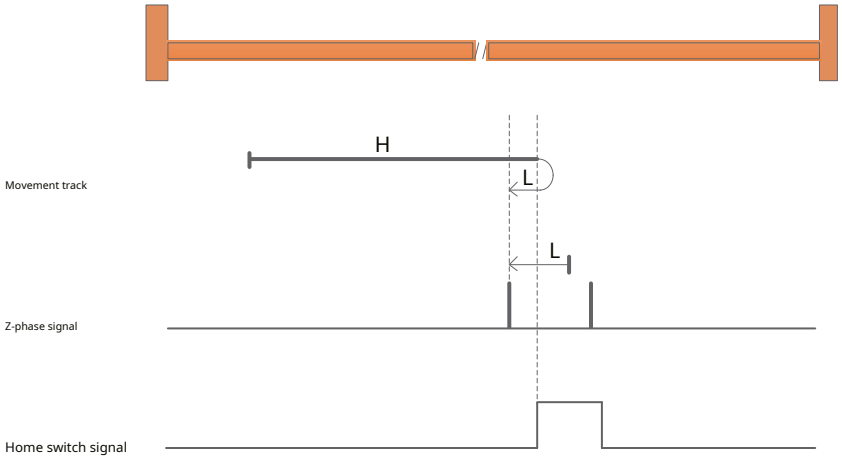
Homing Method **2**: Positive regression, find the positive limit and **Z** Pulse signal



a) POT = 0 at the beginning of the regression. Start the regression at a forward high speed, encounter the POT rising edge, decelerate, reverse at a negative low speed, and encounter the first Z pulse after the POT falling edge.

b) POT=1 at the beginning of the regression. Start the regression at a negative low speed and stop at the first Z pulse after encountering the pot falling edge.

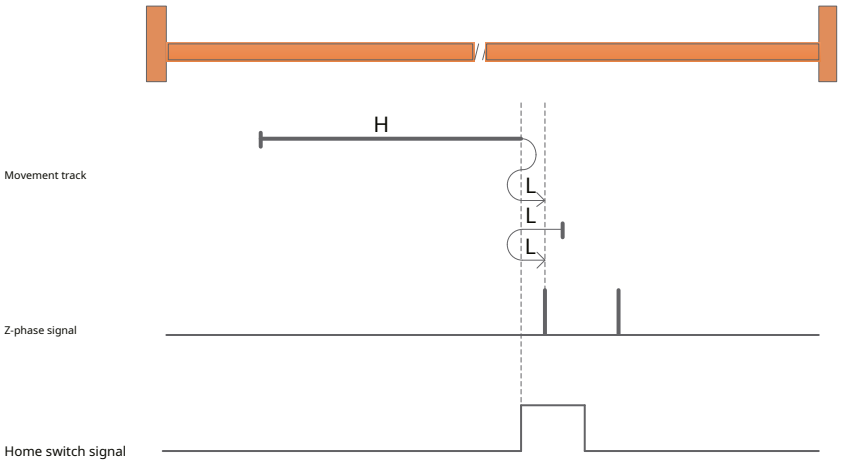
Homing Method **3**: Positive regression, find the origin sensor falling edge and **Z** Pulse signal



a) HOM-SW = 0 at the beginning of the regression. Start the regression at a forward high speed, encounter the HOM-SW rising edge, decelerate, reverse, run at a negative low speed, and stop at the first Z pulse after encountering the HOM-SW descending edge.

b) HOM-SW = 1 at the beginning of the regression. Start the regression at low speed in the negative direction, meet the first Z pulse after the HOM-SW falling edge.

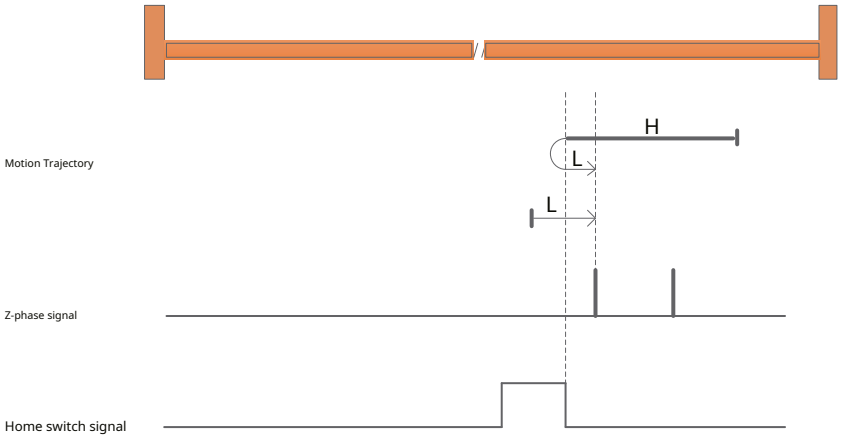
Homing Method **4**: Positive regression, find the origin sensor rising edge and **Z** Pulse signal



a) HOM-SW = 0 at the beginning of the regression. Start the regression at a forward high speed. After encountering the HOM-SW rising edge, decelerate, reverse at negative low-speed returning to a HOM-SW invalid position (HOM-SW=0) and decelerate to a stop. Afterwards, move forward at low-speed, encounter the first Z pulse after the HOM-SW rising edge.

b) HOM-SW = 1 at the beginning of the regression. Start the regression at a negative low speed. After encountering the HOM-SW falling edge, decelerate, reverse, and move forward at low speed. Stop at the first Z pulse after encountering the HOM-SW rising edge.

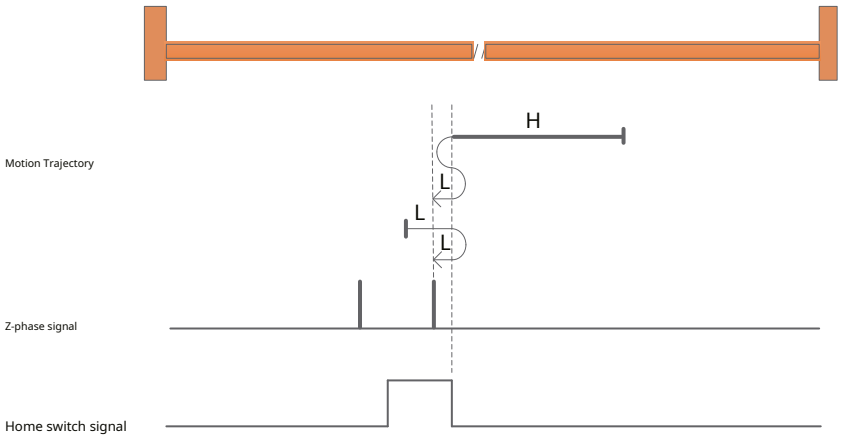
Homing Method **5**: Negative regression, find the origin sensor falling edge and **Z** Pulse signal



a) HOM-SW=0 at the beginning of the regression. Begin the regression at a negative high speed, encounter the HOM-SW rising edge, decelerate, reverse, run at a forward low speed, and stop at the first Z pulse after encountering the HOM-SW falling edge.

b) At the beginning of the regression, HOM-SW=1. Begin the regression at a forward low speed and stop at the first Z pulse after encountering the HOM-SW falling edge.

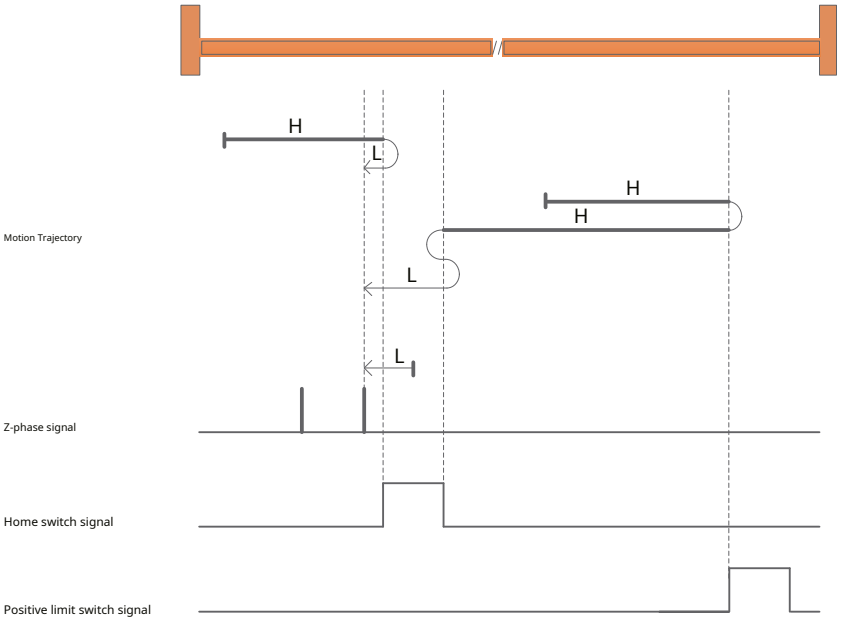
Homing Method **6**: Negative regression, find the origin sensor rising edge and **Z** Pulse signal



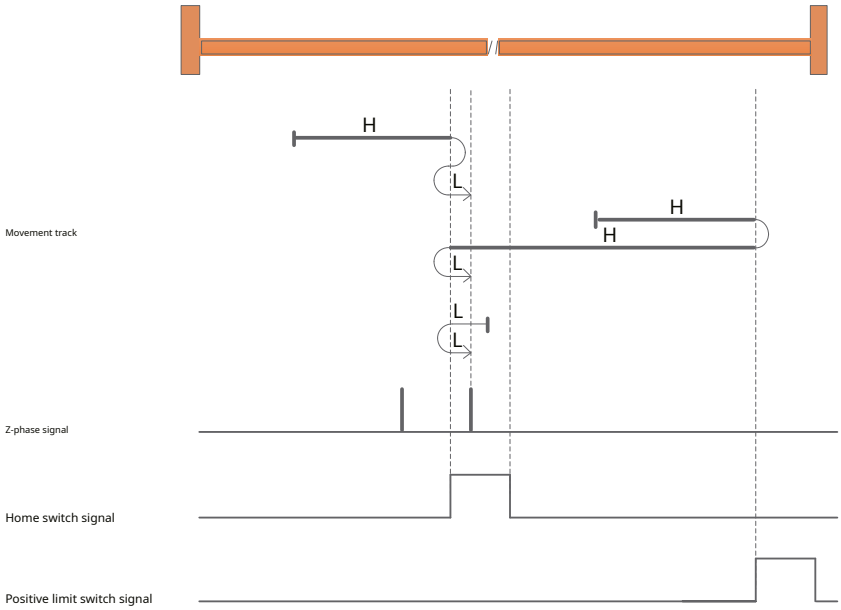
a) At the beginning of the regression HOM-SW = 0. Begin the regression at negative high speed. After encountering the HOM-SW rising edge, decelerate, reverse, run at a forward low speed until reaching a HOM-SW invalid position (HOM-SW=0) again and then decelerate to a stop. Begin moving at negative low speed until encountering the first Z pulse after the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW=1. Begin the regression at a forward low speed, after encountering the HOM-SW falling edge, decelerate, reverse at negative low speed. Stop at the first Z pulse stops after encountering the HOM-SW rising edge.

Homing Method**7**: Positive regression. Find the origin sensor falling edge and **Z**Pulse signal. Automatically reverse when encountering the positive limit



a) At the beginning of the regression, HOM-SW=0 and the load is located on the negative side of the home sensor position. Start the regression at a positive high speed, and until encountering HOM-SW. After the rising edge, decelerate, reverse, and run at low speed in the negative direction, and stop at the first Z pulse after the falling edge of HOM-SW.
b) At the beginning of the regression, HOM-SW=0 and the load is located on the positive side of the home sensor position. Start the regression at high speed in the positive direction, and encounter the rising edge of the POT. After the rising edge, decelerate, reverse, and run at high speed in the negative direction. After encountering the rising edge of HOM-SW, decelerate, reverse, and run at low speed in the forward direction to HOM-SW. after reaching a HOM-SW invalid position again (HOM-SW=0), decelerate and stop. Then run at a low speed in the negative direction, and stop at the first Z pulse after encountering the falling edge of HOM-SW.
c) At the beginning of the regression, HOM-SW=1. Start the regression at low speed in the negative direction, and stop at the first Z pulse after encountering the falling edge of HOM-SW.
Return-to-origin method 8: Forward return, look for the rising edge of the origin sensor and Z pulse signal, and automatically reverse when encountering the positive limit
Homing Method **8**: Positive regression. Find the home sensor rising edge and **Z** Pulse signal. Automatically reverse when encountering positive limit

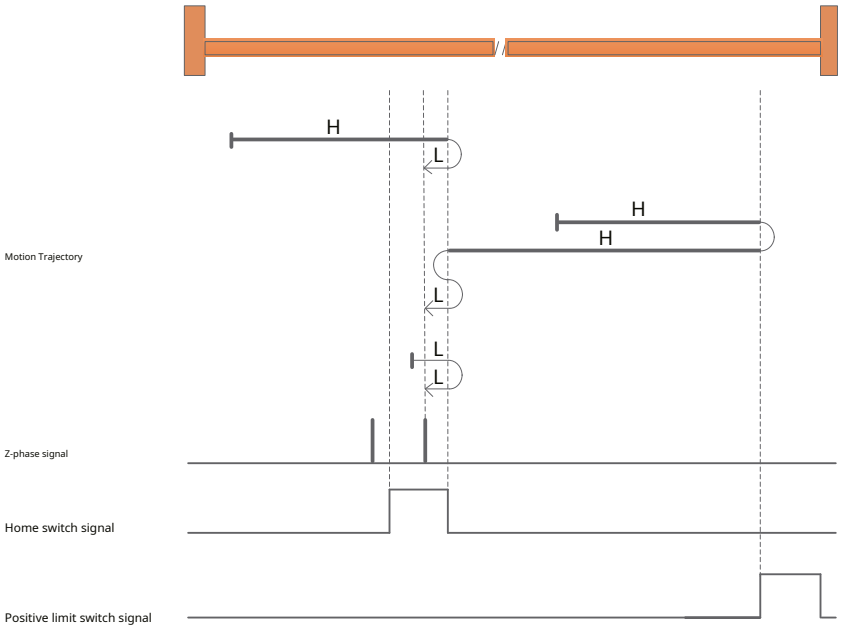


a) At the beginning of the regression HOM-SW = 0. The load is located on the negative side of the location of the home sensor. Begin the regression at forward high speed. After encountering the HOM-SW rising edge, decelerate, reverse at negative low speed until reaching a HOM-SW invalid position (HOM-SW=0) and then decelerate to a stop. Then run forward at low speed stopping at the first Z-pulse after the HOME-SW rising edge.

b) At the beginning of the regression HOM-SW = 0. The load is located on the positive side of the location of the home sensor. Begin the regression at a forward high speed. After encountering the rising edge of the POT, decelerate and reverse at negative high-speed. After encountering the falling edge of the HOM-SW, decelerate and reverse at forward low-speed operation. Stop at the first Z pulse after encountering the HOM-SW rising edge.

c) At the beginning of the regression HOM-SW = 1. Begin the regression at a negative low speed. After encountering the HOM-SW falling edge, decelerate and reverse at forward low speed. Stop at the first Z pulse stops after encountering the HOM-SW rising edge.

Homing Method **9**: Positive regression. Find the home sensor rising edge and the **Z** pulse signal. Automatically reverse when encountering positive limit

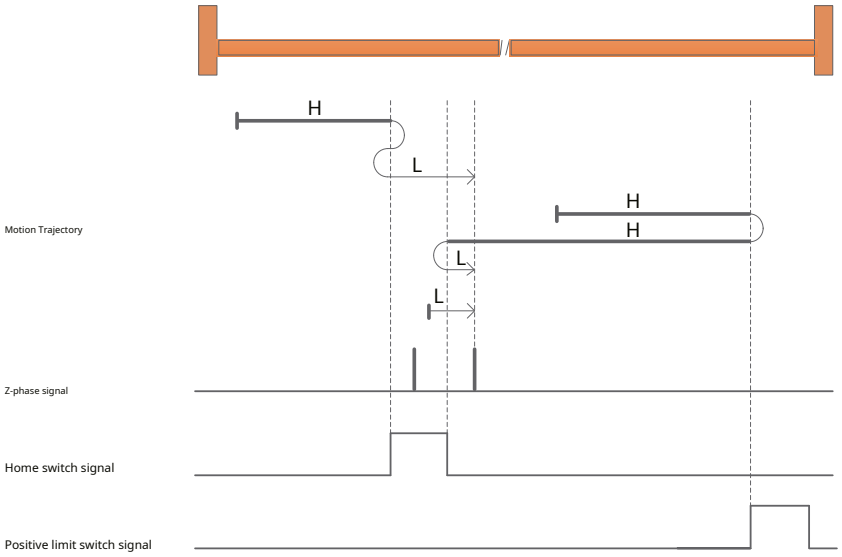


a) At the beginning of the regression HOM-SW = 0. The load is located on the negative side of the home sensor. Begin the regression at a forward high speed until encountering a HOM-SWfalling edge. Decelerate and reverse at a negative low speed. Stop at the first Z pulse after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0. The load is located on the positive side of the home sensor. Begin the regression at a forward high speed. After encountering the rising edge of the POT, decelerate and reverse at negative high-speed. After encountering the rising edge of HOM-SW, decelerate and reverse at forward low speed until reaching a HOM-SW invalid position (HOM-SW=0). After reaching the position,decelerate to a stop. After, run at a negative low speed. Stop at the first Z pulse stops after encountering the rising edge of the HOM-SW.

c) At the beginning of the regression HOM-SW=1. Begin the regression at a forward low speed. After encountering the HOM-SW falling edge, decelerate and reverse at a negative low speed. Stop at the first Z pulse after encountering the rising edge of THE HOM-SW.

Homing Method **10**: Positive regression, find the home sensor falling edge and the Z Pulse signal. Automatically reverse when encountering positive limit

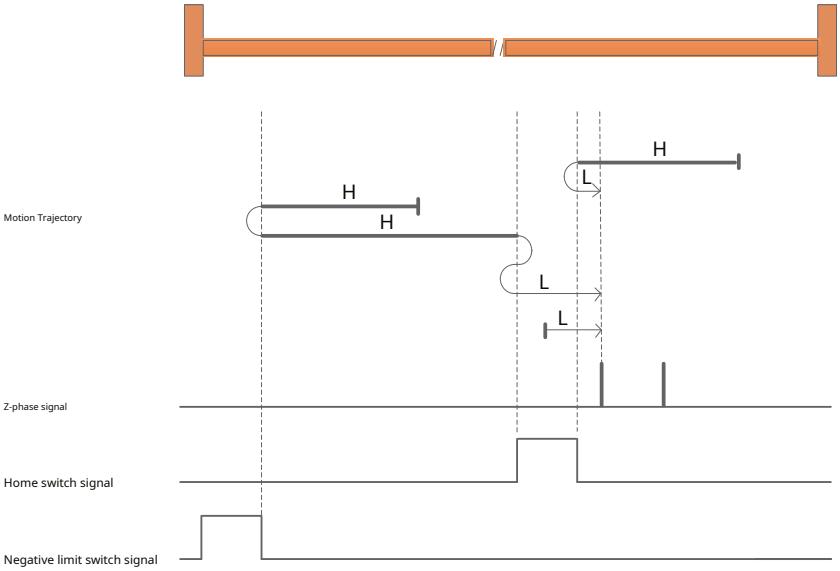


a) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regressio at a forward high speed. After encountering the HOM-SW rising edge decelerate and reverse at a negative low-speed to the HOM-SW invalid position (HOM-SW=0) and deceleration to a stop. Then move forward at a low speed, stopping after encountering the first Z pulse after the HOM-SW descending edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a positive high speed, until encountering the rising edge of the POT. Decelerate and reverse at negative high-speed. After encountering the rising edge of the HOM-SW, decelerate and reverse at a positive low speed, coming to a stop at the first Z pulse stops after the HOM-SW falling edge.

c) At the beginning of the regression, HOM-SW=1. Begin the regression at a positive low speed and stop at the first Z pulse after encountering the HOM-SW falling edge.

Homing Method **11**: Negative regression, find the origin sensor falling edge and the **Z** pulse signal. Automatically reverse when encountering negative limit

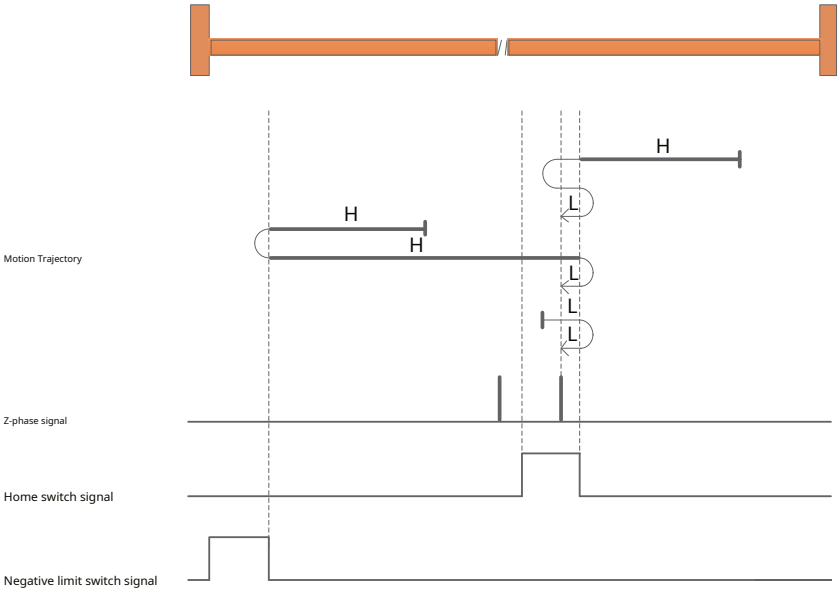


a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a negative high speed, until encountering the HOM-SW rising edge. Deceleration and reverse at positive low speed. Stop at the first Z pulse after encountering the HOM-SW falling edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a negative high speed until encountering the rising edge of NOT. Decelerate, reverse at forward high speed operation. After encountering the rising edge of HOM-SW, decelerate and reverse at negative low speed running past HOM-SW. After reaching the invalid HOM-SW position (HOM-SW=0), the decelerate to a stop. Then runs at a positive low speed, stopping at the first Z pulse after encountering the falling edge of the HOM-SW.

c) At the beginning of the regression, HOM-SW=1. Begin the regression at a positive low speed and stop at the first Z pulse after encountering the HOM-SW falling edge.

Homing Method 12: Negative regression, look for the rising edge of the home sensor and Z pulse signal. Reverse automatically after encountering the negative limit.

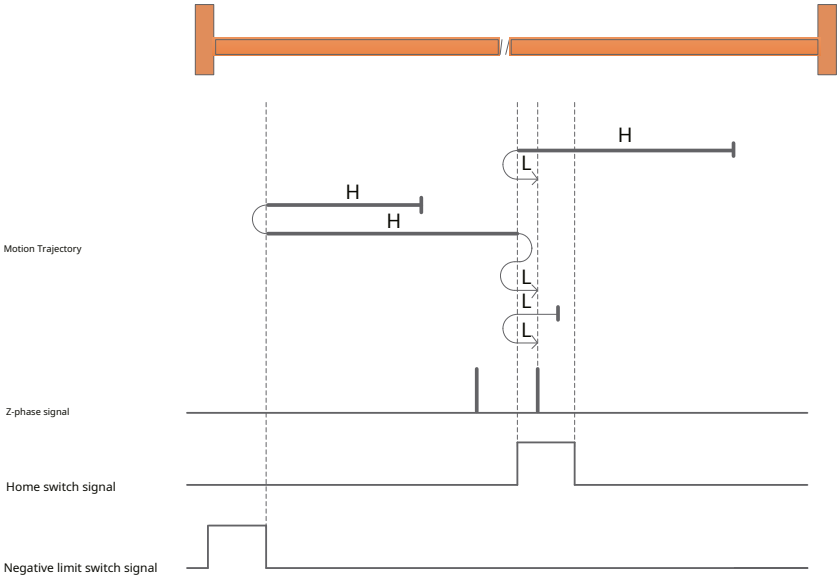


a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a negative high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a forward low speed until reaching the HOM-SW invalid position (HOM-SW=0). Then decelerate to a stop travel a negative low speed. Stop at the first Z Pulse after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a negative high speed, until encountering the rising edge of NOT. Decelerate and reverse at a positive high-speed. After encountering the falling edge of HOM-SW, decelerate, reverse at negative low-speed operation. Stop at the first Z pulse after encountering the HOM-SW rising edge.

c) At the beginning of the regression HOM-SW=1. Begin the regression at a forward low speed until encountering the HOM-SW falling edge. Decelerate and reverse at a negative low speed. Stop at the first Z pulse after encountering the HOM-SW rising edge.

Homing Method 13: Negative regression, find the home sensor rising edge and the **Z** pulse signal. Automatically reverse when encountering negative limit

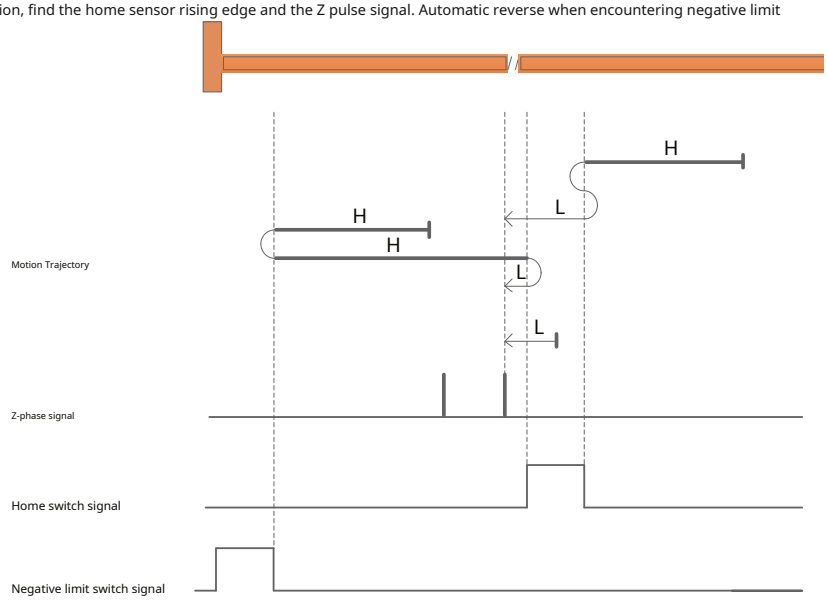


a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a negative high speed, until encountering the falling edge of the HOM-SW. Decelerate and reverse at a positive low speed. Stop at the first Z pulse after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a negative high speed, until encountering the rising edge of NOT. Decelerate and reverse at positive high-speed until encountering the rising edge of HOM-SW. Decelerate and reverse at negative low speed until reaching a HOM-SW is invalid position(HOM-SW=0). Afterwards, decelerate to a stop. Run forward at a low speed. Stop at the first Z pulse after encountering the rising edge of HOM-SW.

c) At the beginning of the regression HOM-SW= 1. Begin the regression at a negative low speed until encountering the HOM-SW falling edge. Decelerate and reverse and positive low speed. Stop at the first Z pulse after encountering the rising edge of the HOM-SW.

Homing Method **14**:negative regression, find the home sensor rising edge and the Z pulse signal. Automatic reverse when encountering negative limit



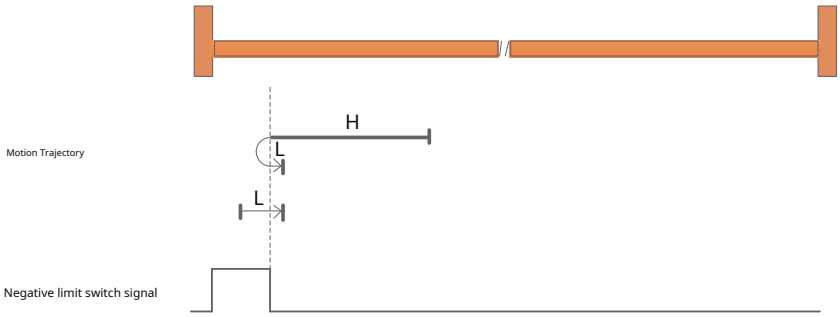
a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of origin sensor. The regression begins at a negative high speed. After encountering the HOM-SW rising edge, decelerate, reverse, forward low-speed running to the HOM-SW invalid position and then slow down to stop, after which the negative low-speed operation, encounter HOM-SW The first Z pulse stops after the descending edge.

b) At the beginning of the regression HOM-SW = 0 and lthe load is located on the negative side of the home sensor. Begin the regression at a negative high speed until encountering the rising edge of NOT. Decelerate and reverse at positive high-speed. After encountering the rising edge of HOM-SW, decelerate and reverse at a negative low-speed operation. Stop at the first Z pulse after encountering the falling edge of HOM-SW.

c) HOM-SW=1 at the beginning of the regression. Begin the regression at a negative low speed and stop at the first Z pulse after encountering the HOM-SW descending edge.

Homing Method **15**,**16: Reserved**

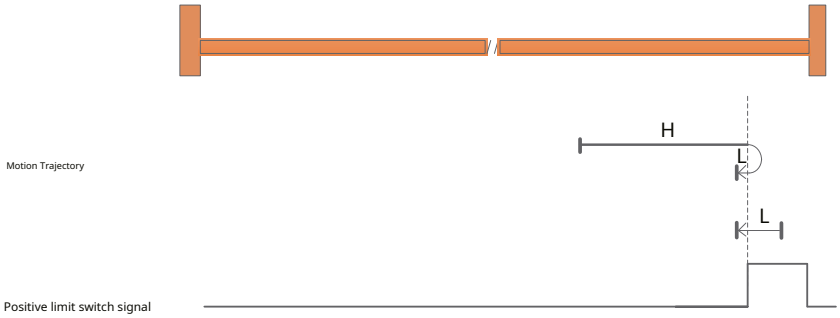
Homing Method **17**: Negative regression, Looking for negative limit signal



a) When starting the regression, NOT=0. Start the regression at a negative high speed until encountering the NOT rising edge. Decelerate and reverses at a positive low speed. Stop after encountering the NOT falling edge.

b) When the regression begins, NOT=1. Begin the regression at a positive low speed. Stop after encountering the NOT falling edge.

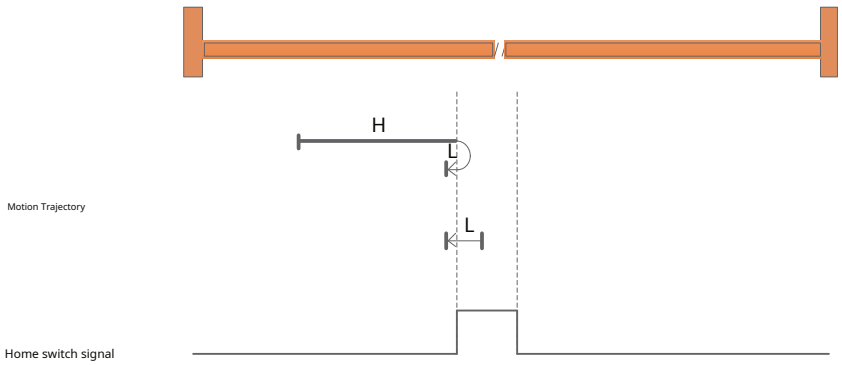
Homing Method 18: Positive regression, look for positive limit signal



a) Pot=0 at the beginning of the regression. Start the regression at a positive high speed until encountering the POT rising edge. Decelerate and reverse at a negative low speed. Stop after encountering the POT falling edge.

b) Pot=1 at the beginning of the regression. Start the regression at a negative low speed. Stop after encountering the POT falling edge.

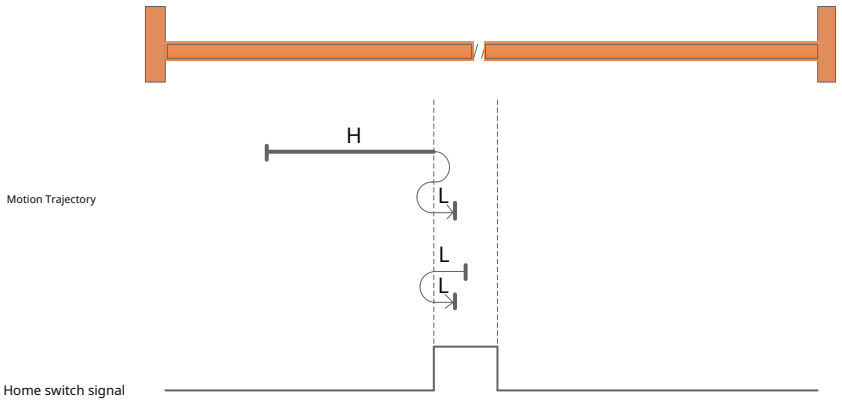
Homing Method **19**: Positive regression, find the home sensor falling edge signal



a) HOM-SW=0 at the beginning of the regression. Start the regression at a positive high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a negative low speed. Stop after encountering the HOM-SW falling edge.

b) At the beginning of the regression, the HOM-SW=1. Start the regression at a negative low speed. Stop after encountering the HOM-SW falling edge.

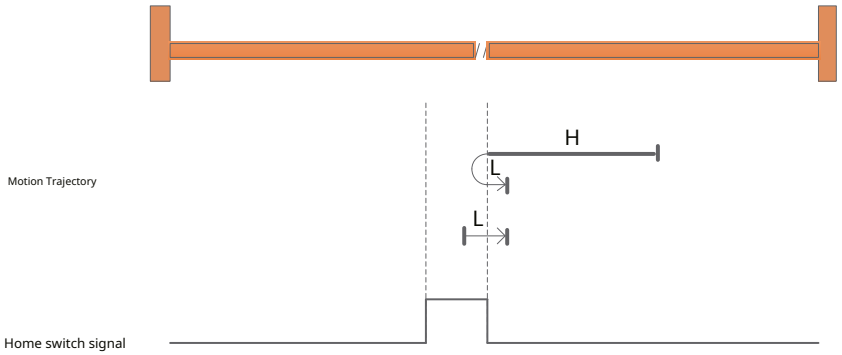
Homing Method **20**: Positive regression, find the home sensor rising edge signal



a) At the beginning of the regression HOM-SW= 0. Begin the regression at a positive high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a negative low-speed running to the HOM-SW invalid position (HOM-SW=0). Decelerate to a stop. Move at a positive low-speed. Stop after encountering the HOM-SW.

b) At the beginning of the regression HOM-SW = 1. Begin the regression in a negative low speed until encountering the HOM-SW falling edge. Decelerate and then reverse in a positive low speed. Stop after encountering the HOM-SW rising edge.

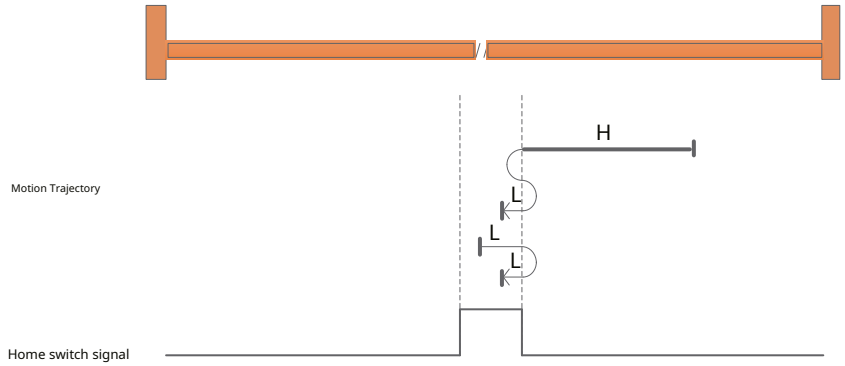
Homing Method 21: Negative regression, find the home sensor falling edge signal



a) At the beginning of the regression HOM-SW = 0. Begin the regression at a negative high speed until encountering the HOM-SW rising edge. decelerate and reverse at a positve low speed. Stop after encountering the HOM-SW falling edge.

b) HOM-SW=1 at the beginning of the regression. Start at a positive low speed, and stop after encountering aHOM-SW falling edge.

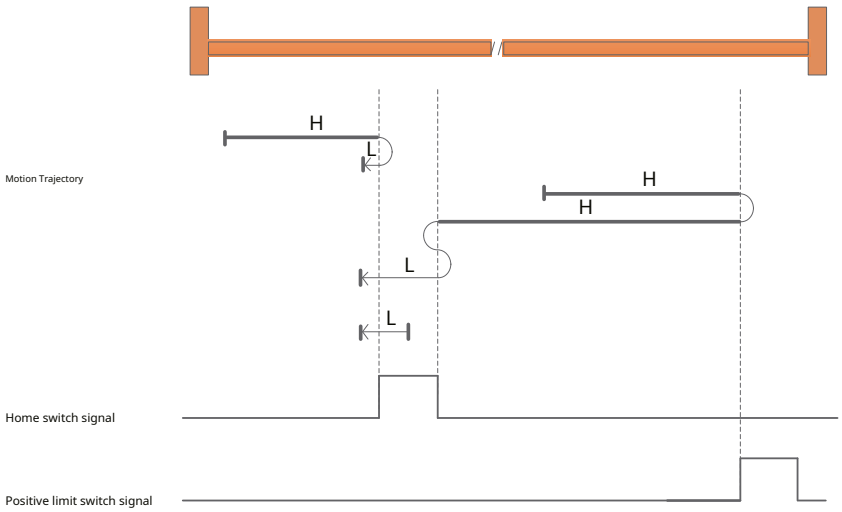
Homing Method 22: Negative regression, find the home sensor rising edge signal



a) At the beginning of the regression HOM-SW = 0. Begin the regression at a negative high speed until encountering the HOM-SW rising edge. decelerate and reverse at a positive low-speed until reaching the HOM-SW invalid position (HOM-SW=0) and stop. Then travel at a negative low-speed, stopping after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW=1. Begin the regression begins at a positive low speed until encountering the HOM-SW falling edge. decelerate and reverse at a negative low-speed. Stop after encountering the HOM-SW rising edge.

Homing Method 23: Positive regression, find the home sensor falling edge signal. Automatically reverse when encountering positive limit

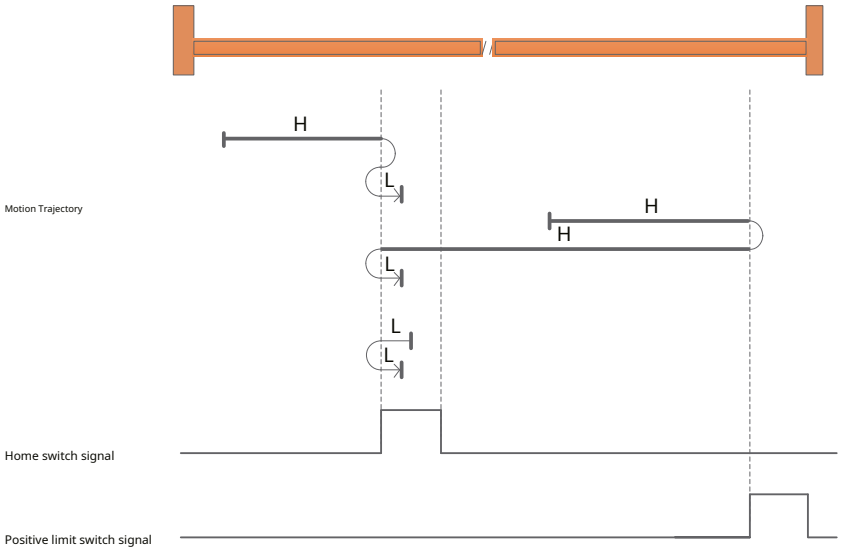


a) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a positive high speed, until encountering the HOM-SW rising edge. Decelerate and reverse at a negative low speed. Stop at the HOM-SW falling edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a positive high speed, until encountering the POT rising edge. Decelerate and reverse at a negative low speed until encountering the rising edge of HOM-SW. Decelerate and reverse at a positive low speed until reaching HOM-SW invalid position (HOM-SW=0). Decelerate and reverse at negative low speed, stopping after encountering the HOM-SW falling edge.

c) At the beginning of the regression HOM-SW=1. Begin the regression at a negative low speed, and stop after encountering the HOM-SW falling edge.

Homing Method 24: Positive regression, find the home sensor rising edge signal. Automatically reverse when encountering positive limit

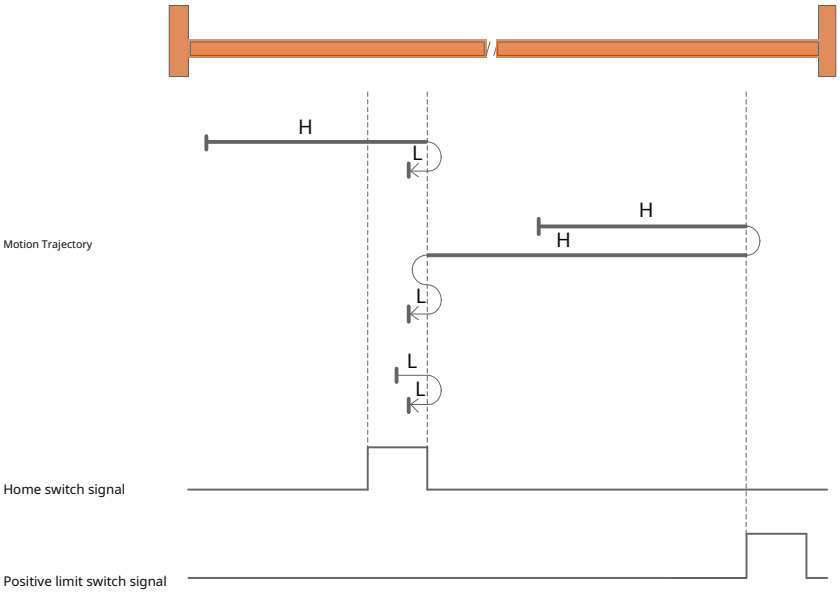


a) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a positive high speed, until encountering the HOM-SW rising edge. Decelerate and reverse at a negative low speed until reaching HOM-SW invalid (HOM-SW=0) and then decelerate and stop. Advance at a positive low speed. Stop after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a positive high speed, until encountering the POT rising edge. Decelerate and reverse at a negative high speed until reaching the HOM-SW falling edge. Decelerate, reverse at a positive low-speed. Stop after encountering the HOM-SW falling edge.

c) At the beginning of the regression HOM-SW = 1. Begin the regression at a negative low speed. After encountering the HOM-SW falling edge, decelerate and reverse at a positive low speed. Stop after encountering the HOM-SW rising edge.

Homing Method **25**: Positive regression, find the home sensor rising edge signal. Automatically reverse when encountering positive limit

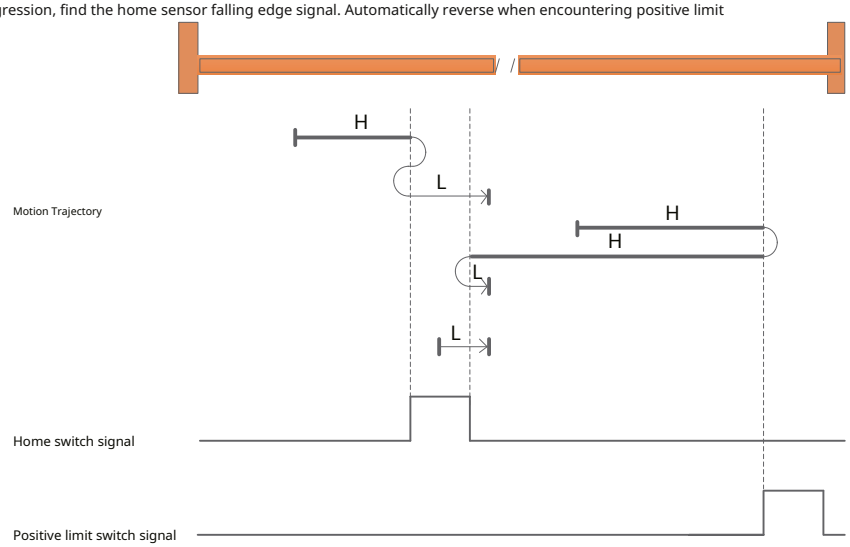


a) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a positive high speed decelerating after encountering the HOM-SW falling edge. Reverse and run at a negative low speed. Stop after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a positive high speed, until encountering the POT rising edge. Decelerate and reverse at negative high-speed. After encountering the rising edge of the HOM-SW, decelerate and reverse at a positive low speed until reaching HOM-SW invalid (HOM-SW=0). Decelerate and reverse at a negative low speed. Stop after encountering the rising edge of HOM-SW.

c) At the beginning of the regression HOM-SW = 1. Begin the regression at a positive low speed until encountering the HOM-SW falling edge. Decelerate and reverse at a negative low speed and stop after encountering the rising edge of HOM-SW.

Homing Method **26**: Positive regression, find the home sensor falling edge signal. Automatically reverse when encountering positive limit

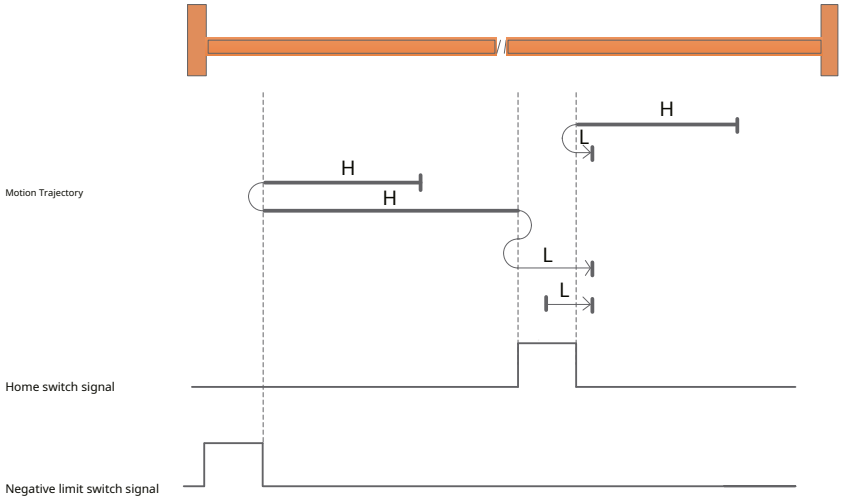


a) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a positive high speed until encountering the HOM-SW rising edge. Decelerate and reverse at negative low-speed until reaching the HOM-SW invalid region (HOM-SW=0) . Decelerate to a stop. Move at a positive ow speed. Stop after encountering the HOM-SW falling edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a positive high speed, until encountering the POT rising edge. Decelerate and reverse at negative high-speed until encountering the rising edge of HOM-SW. Decelerate and reverse at a positive low-speed. Stop after encountering the HOM-SW falling edge.

c) HOM-SW=1 at the beginning of the regression. Begin the regression at a low positive speed. Stop after encountering the HOM-SW falling edge.

Homing Method **27**: Negative regression, find the home sensor falling edge signal. Automatically reverse when encountering negative limit

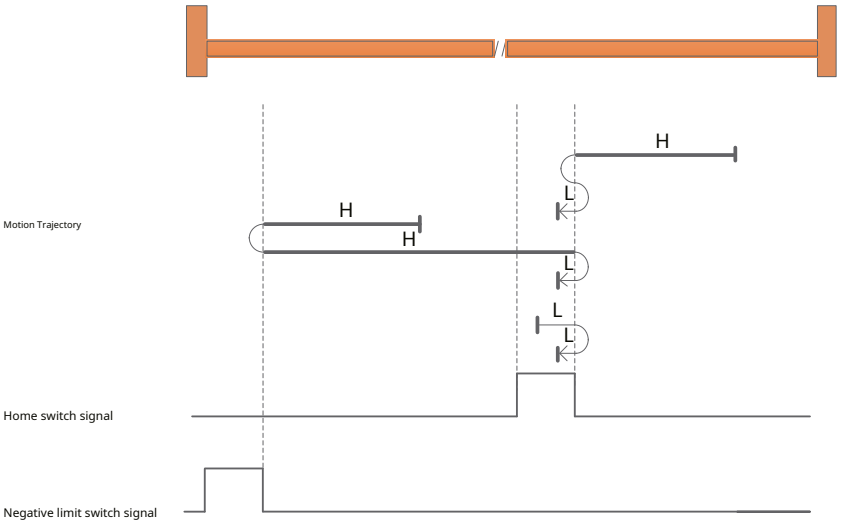


a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at a negative high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a positive low speed. Stop after encountering the HOM-SW falling edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a negative high speed until encountering the NOT rising edge. Decelerate and reverse at a positive high-speed until encountering the rising edge of HOM-SW. Decelerate and reverse at a negative low speed until reaching HOM-SW=0. Decelerate and reverse at a positive low speed. Stop after encountering the falling edge of the HOM-SW.

c) HOM-SW=1 at the beginning of the regression. Begin the regression at a positive low speed. Stop after encountering the HOM-SW falling edge.

Homing Method 28: Negative regression, find the home sensor rising edge signal. Automatically reverse when encountering negative limit

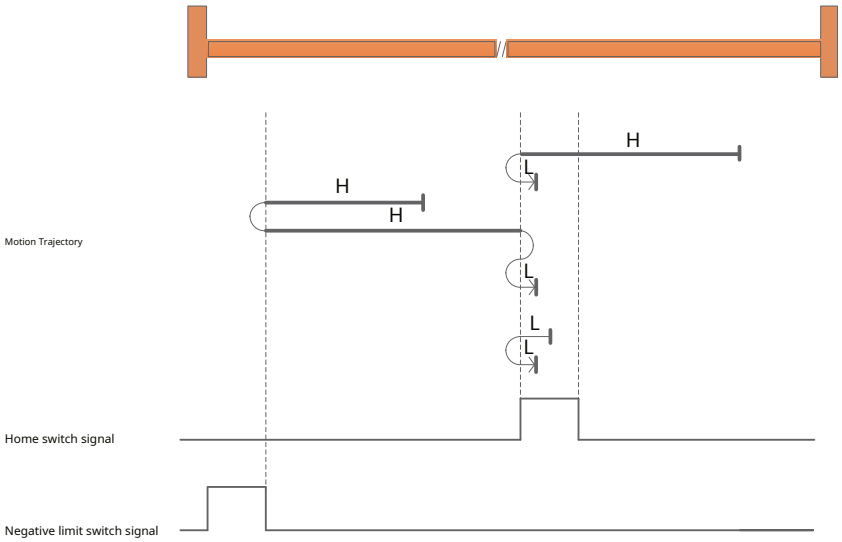


a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression with a negative high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a positive low-speed until HOM-SW=0 and decelerate to a stop. Then move at a negative low-speed. Stop after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression with a negative high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a positive high-speed until encountering the falling edge of HOM-SW. Decelerate and reverse at a negative low speed operation. Stop after encountering the HOM-SW rising edge.

c) At the beginning of the regression HOM-SW = 1. Begin the regression at a positive low speed until encountering the HOM-SW falling edge. Decelerate and reverse at a negative low speed. Stop after encountering the HOM-SW rising edge.

Homing Method **29**: Negative regression, find the home sensor rising edge signal. Automatically reverse when encountering negative limit

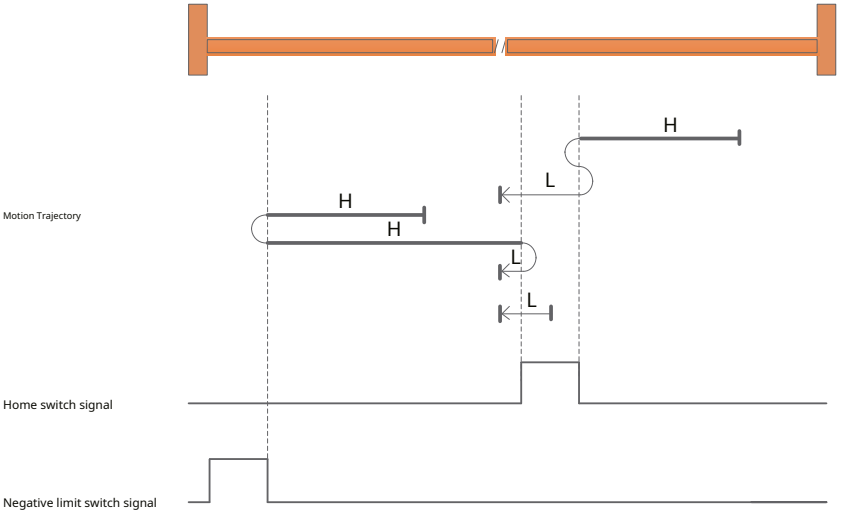


a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression with a negative high speed until encountering the HOM-SW falling edge. Decelerate and reverse at positive low-speed. Stop after encountering the HOM-SW rising edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression with a negative high speed until encountering the NOT rising edge. Decelerate and reverse at a positive high speed until encountering the HOM-SW rising edge. Decelerate and reverse at a negative low speed reaching HOM-SW=0. Decelerate and reverse at a forward low speed. Stop after encountering the rising edge of HOM-SW.

c) HOM-SW = 1at the beginning of the regression. Begin the regression at a negative low speed until encountering the HOM-SW falling edge. Decelerate and reverse at positive low speed. Stop after encountering the rising edge of HOM-SW.

Homing Method **30**: Negative regression, find the home sensor falling edge signal. Automatically reverse when encountering negative limit



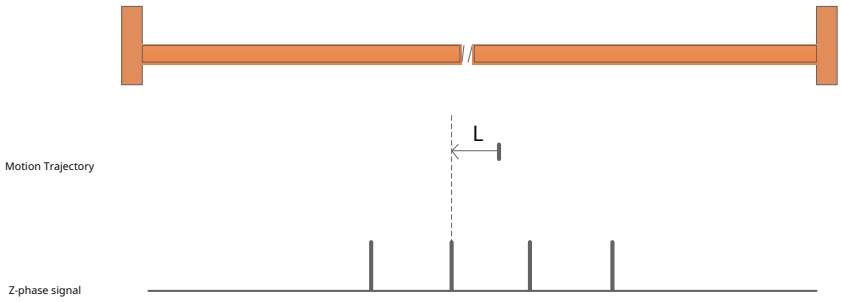
a) At the beginning of the regression HOM-SW = 0 and the load is located on the positive side of the home sensor. Begin the regression at negative high speed until encountering the HOM-SW rising edge. Decelerate and reverse at positive low-speed until reaching HOM-SW=0. Decelerate and reverse at negative low-speed. Stop after encountering the HOM-SW falling edge.

b) At the beginning of the regression HOM-SW = 0 and the load is located on the negative side of the home sensor. Begin the regression at a negative high speed until encountering the rising edge of NOT. Decelerate and reverse at a positive high-speed until encountering the rising edge of HOM-SW. Decelerate and reverse at a negative low-speed. Stop after encountering the HOM-SW falling edge.

c) At the beginning of the regression, the HOM-SW=1. Begin the regression at a negative low speed. Stop after encountering the HOM-SW falling edge.

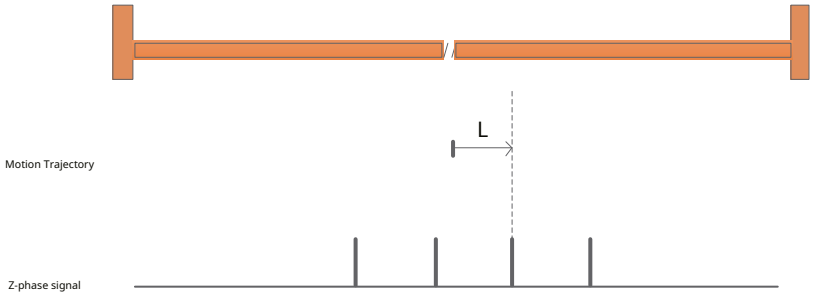
Homing Method **31**,**32** Reserved

Homing Method **33**: negative regression, find the first **Z** Pulse signal



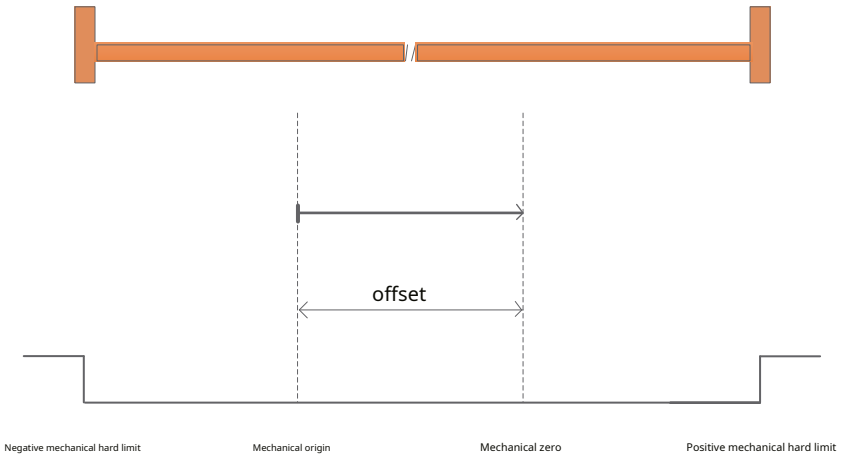
a) Start regression at a low negative speed. Stop after encountering the first Z pulse.

Homing Method **34**: Positive regression, find the first **Z** Pulse signal



a) Start the regression at a postive low speed. Stop after encountering the first Z pulse

Homing Method **35**:Take the current position as the machine origin



4.8 Q Program Control Mode

The Q Program Control mode is a control method unique to Applied Motion Products. By programming in Q language, complex motion control can be achieved with minimal use of the CiA402 motion control protocol. Each drive can store up to 12 Q program segments, and each Q segment can support to 63 lines of instruction. Q programs must be pre-written and downloaded to the drive via the Luna Software. The controller sends instructions via CANopen communication to invoke the Q program. Enabling the Q programming control mode requires the 0x6060 to be set to -1.

4.8.1 Q Program Control Mode Related Objects

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**
0x603F	— —	error code	RO	UNSIGNED16	— —	— —	0	TxPDO
0x6040		control word	RW	UNSIGNED16	— —	0~2_{16}-1	0	RxPDO
0x6041		status word	RO	UNSIGNED16	— —	— —	0	TxPDO
0x605A		quick stop	RW	INTEGER16	— —	0~8	2	NO
0x605B		Shutdown method	RW	INTEGER16	— —	0~1	1	NO
0x605C		Prohibited mode of operation	RW	INTEGER16	— —	0~1	1	NO
0x605D		stop mode	RW	INTEGER16	— —	0~1	0	NO
0x6060		control mode	RW	INTEGER8	— —	- 1~10	0	RxPDO
0x6061		Control mode display	RO	INTEGER8	— —	— —	0	TxPDO
0x6064		actual location	RO	INTEGER32	Pulses	— —	0	TxPDO
0x606C		actual speed	RO	INTEGER32	Pulses/s	— —	0	TxPDO
0x6073		Maximum current	RW	UNSIGNED16	0.1%	0~3000	3000	RxPDO
0x6077		actual torque	RO	INTEGER16	0.1%	— —	0	TxPDO
0x6078		actual current	RO	INTEGER16	0.1%	— —	0	TxPDO
0x607F		Maximum speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO
0x6085		Emergency stop deceleration	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	30000000	NO
0x60F4		Actual position deviation	RO	INTEGER32	Pulses	— —	0	TxPDO
0x2007		Qblock number	RW	UNSIGNED8	— —	1~12	1	RxPDO
0x2AB1	0x03	Dynamic braking action when an error is reported	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	The longest action time when an error is reported	RW	UNSIGNED32	ms	0~30000	0	NO

4.8.2 Control Word settings

In Q Program Control Mode, the meaning of the Control Word 0x6040 is as follows. The shaded bits are used in Q Program Control Mode.

15 ••• 10	9	8	7	6	5	4	3	2	1	0
Reserved	Reserved	Halt	Fault reset	Reserved	Reserved	Q program start	Enable operation	Quick stop	Enable voltage	Switch on

bit	name		value	instruction
0	Switch on	Start the servo operation	0	invalid
			1	efficient
1	Enable voltage	Turn on the main circuit power	0	invalid
			1	efficient
2	Quick Stop	quick stop	0	efficient
			1	invalid
3	Enable Operation	Servo operation	0	invalid
			1	efficient
4	Q program start	start executionQprogram	0->1	invokedQblock
5	Reserved	reserved	0	reserved function,Please keep it as "0"
6	Reserved	reserved	0	reserved function,Please keep it as "0"
7	Fault reset	Error reset	0->1	Perform an error reset
8	Halt	stop	0	invalid
			1	according to0x605DThe set stop method executes the stop action
9	Reserved	reserved	0	reserved function,Please keep it as "0"
10~15	Reserved	reserved	0	reserved function,Please keep it as "0"

4.8.3 Status Word definition

In Q Program Control Mode, the meaning of the Status Word 0x6041 is as follows. The shaded bits are used in Q Program Control Mode.

7	6	5	4	3	2	1	0
Warning	Switch on disabled	Quick stop	Voltage enabled	Fault	Operation enabled	Switched on	Ready to switch on

15	14	13	12	11	10	9	8
Reserved	Reserved	Reserved	Reserved	Internal limit	Target Reached	Remote	Reserved

bit	name		value	instruction
0	Ready to Switch on	Servo ready	0	invalid
			1	efficient
1	Switched on	Servo operation can be turned on	0	invalid
			1	efficient
2	Operation enabled	Servo operation is on	0	invalid
			1	efficient
3	Fault	report an error	0	no error
			1	There is an error
4	Voltage enabled	Main circuit power on	0	invalid
			1	efficient
5	Quick stop	quick stop	0	Quick stop works
			1	Quick stop doesn't work
6	Switch on disabled	Servo not working	0	invalid
			1	efficient
7	Warning	Call the police	0	reserved function,keep as "0"
8	Reserved	reserved	0	reserved function,keep as "0"
9	Remote	remote control	0	invalid
			1	Control word control is valid
10	Target Reached	Qprogram run complete	0	control wordbit8=0,QProgram not finished control wordbit8=1,decelerating
			1	control wordbit8=0,Qprogram run complete control wordbit8=1,speed is0
11	Interanl limit active	Internal limit is valid	0	Digital limit input is not triggered
			1	Digital limit input is triggered
12	Reserved	reserved	0	reserved function,keep as "0"
13	Reserved	reserved	0	reserved function,keep as "0"
14	Reserved	reserved	0	reserved function,keep as "0"
15	Reserved	reserved	0	reserved function,keep as "0"

4.8.4 Functional example

Step 1: Enable Homing Mode

Write the value -1 to 0x6060. To confirm the control mode, query 0x6061.

Step 2: Motor Enable

Write 0x06,0x07,0x0F sequentially to 0x6040 to enable the motor. To confirm the status of the motor, query 0x6041

Step 3: Set Run Parameters

According application requirements, the user selects the Q program segment to run by writing to 0x2007

Step 4: Execute/Halt Motion

The controller can control the execution/stop of the homing operation by toggling the state of bit 4 of 0x6040. When bit 4 changes from '0' to '1', the motor begins to execute the set Q segment.

5 Application function

5.1 Digital input and output functions

The M3 CANopen series AC servo drives have 8 general purpose inputs and 4 general purpose outputs that can be software configured. The logical state of each signal and its meaning may also be configured. Only one function may be assigned to each input and output. The same function cannot be assigned to different inputs or outputs at the same time.

The general purpose inputs X7 and X8 are high-speed inputs. When using functions with precision requirements, use the X7 and X8 high-speed inputs.

■ List of assignable input functions

function name	symbol	function code	
		Closed	**Open**
General Purpose Input	GPIN	0	
Alarm clear	A-CLR	3	4
Forward rotation prohibition limit	CW-LMT	5	6
Reverse prohibition limit	CCW-LMT	7	8
Gain switching	GAIN-SEL	11	12
emergency stop	E-STOP	13	14
Torque limit input	TQ-LMT	19	20
Zero speed clamp input	ZCLAMP	twenty one	twenty two
Speed limit input	V-LMT	37	38
origin sensor	HOM-SW	39	40
Virtual forward rotation prohibition limit	Virtual-CW-LMT	41	42
Virtual reverse prohibition limit	Virtual-CCW-LMT	43	44

Closed: Digital input ON
Open: Digital input OFF

- General Purpose

General purpose digital input. Does not affect motor action. Controller can monitor input port status.

- Alarm clear

Clear drive alarm status through external digital signal,Some alarm states cannot be cleared by this function.

- CW Position Limit

Inputs that prohibits movement in the CW direction. After this input is valid, the motor decelerates to a stop according to the quick stop deceleration value 0x6085. Bit 1 of the I/O status object 0x60FDis set to 1. Bit 11 of the Status Word 0x6041 (Inertia limit active) is set to 1.

External CW limit signal used in homing mode.

- CCW Limit

Inputs that prohibits movement in the CCW direction. After this input is valid, the motor decelerates to a stop according to the quick stop deceleration value 0x6085. Bit 0 of the I/O status object 0x60FDis set to 1. Bit 11 of the Status Word 0x6041 (Inertia limit active) is set to 1.

External CCW limit signal used in homing mode.

- Gain Switching

Select to use the first group/second group of gain parameters through external digital signal. When this input is valid, use the second set of gain parameters. When this input is invalid, use the first set of gain parameters.

- Emergency Stop

Control the motor to decelerate and stop through an external digital signal. When this input is valid, the motor decelerates to a stop according to the stop method set by 0x2038.

- Torque Limit Input

Switch the torque limit value through an external digital signal. When this input is valid, the motor will be controlled according to the I/O control method of the torque limit control mode set by 0x2A02.

- Zero speed clamp input

The command speed is forced to 0 by an external digital signal. When this input is valid, the absolute value of the actual speed of the motor is within the zero-speed judgment threshold (0x2A16 sub-index 1). When duration of time reaches that set by 0x2A15 sub-index 2, the servo system enters a standstill, rotor lock state. At this point, the control loop of the system will ensure the motor returns to the locked standstill position - even if the motor shaft rotates due to external forces.

- Speed Limit Input

The motor speed in torque mode is limited by an external digital signal. When this input is valid, the speed limit function is valid, and the speed limit value is set by 0x6081 setting.

- Home Sensor

Deceleration signal or Home Sensor signal during the homing process. When this input is valid, bit 2 of the digital input status object 0x60FD (home switch) takes a value of 1.

- Software CW Position Limit

When this input is valid, it does not affect the motor action. Bit 1 (CW limit) of the digital input status object

0x60FD is set to 1. ExternalCW limit signal used in homing mode.

- Software CCW Position Limit

When this input is valid, it does not affect the motor action. Bit 0 (CCW limit) of the digital input status object

0x60FD is set to 1. External CCW limit signal used in homing mode.

■ Digital Input Related Objects

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2A20	0x01	P5-00	MU1	digital input1Features	RW	UNSIGNED16	— —	0~46	7	NO
	0x02	P5-01	MU2	digital input2Features	RW	UNSIGNED16	— —	0~46	5	NO
	0x03	P5-02	MU3	digital input3Features	RW	UNSIGNED16	— —	0~46	3	NO
	0x04	P5-03	MU4	digital input4Features	RW	UNSIGNED16	— —	0~46	0	NO
	0x05	P5-04	MU5	digital input5Features	RW	UNSIGNED16	— —	0~46	13	NO
	0x06	P5-05	MU6	digital input6Features	RW	UNSIGNED16	— —	0~46	19	NO
	0x07	P5-06	MU7	digital input7Features	RW	UNSIGNED16	— —	0~46	0	NO
	0x08	P5-07	MU8	digital input8Features	RW	UNSIGNED16	— —	0~46	39	NO
0x2A21	0x01	P5-28	FI1	digital input1filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x02	P5-29	FI2	digital input2filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x03	P5-30	FI3	digital input3filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x04	P5-31	FI4	digital input4filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x05	P5-32	FI5	digital input5filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x06	P5-33	FI6	digital input6filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x07	P5-34	FI7	digital input7filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x08	P5-35	FI8	digital input8filter	RW	UNSIGNED16	ms	0~8000	0	NO

Note: Do not set the 0x2A20 parameter value to a value other than the function code.

■ List of Assignable Output Functions

function name	symbol	function code	
		Closed	**Open**
Universal output	GPOUT	0	
fault output	ALM	1	2
warning output	WARN	3	4
Brake release output	BRK	5	6
Servo on status	SON-ST	7	8
Positioning completed	COIN	9	10
Dynamic error following	DYM-LMT	11	12
Torque arrives	TQ-REACH	13	14
torque limit	T-LMT	15	16
same speed	V-COIN	17	18
speed to reach	AT-SPD	19	20
speed limit	V-LMT	twenty one	twenty two
Servo Ready	S-RDY	twenty three	twenty four
back to origin complete	HOMED	25	26
Software limit (forward rotation)	SLCW	27	28
Software limit (reverse)	SLCCW	29	30
Location arrives	IN-POS	31	32
Zero speed detection output	Z-SPD	33	34
same torque	T-COIN	35	36

Closed: Output ON
Open: Output OFF

- General Purpose Output

General purpose digital output. The controller can force the output signal state.

- Fault Output

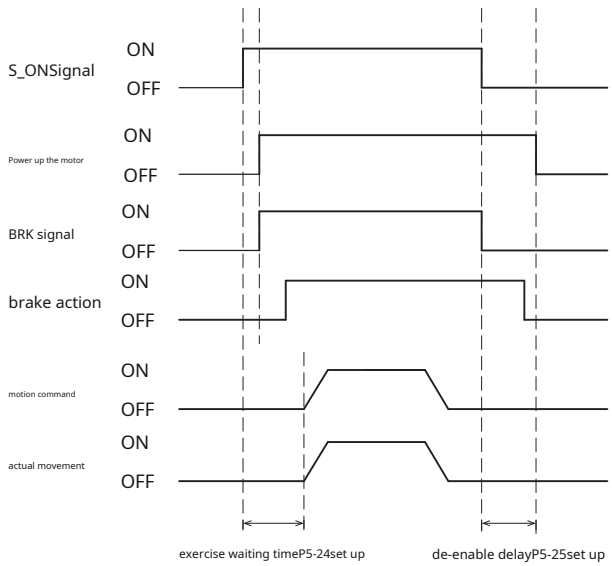
Output is employed when the drive experiences any type of Fault

- Warning Output

Output is employed whent he drive produces any type of warning.

- Brake Release Output

Used to control the electromagnetic brake action of the motor. Since the brake has a delay in action, in order to avoid damage to the brake, it is necessary to pay attention to the state of the motor during use. When working in CSP, CSV and CST control modes, the parameter setting value of P5-24 is invalid. When designing the control program, be sure to allow enough time to ensure that the brake is open before controlling the motor movement, otherwise the motor brake will be damaged.

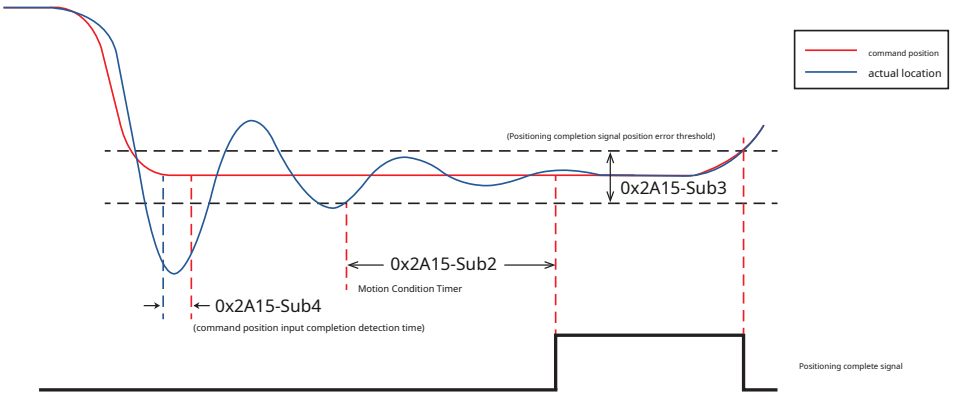


• **Servo On** Status

Output is used to notify when the servo enable is turned on.

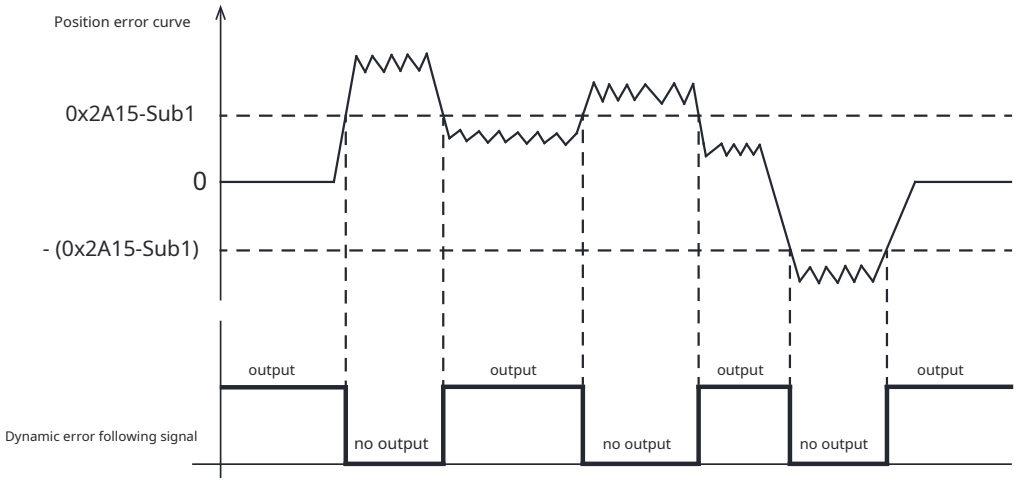
- Position Reached

This output is used when the commanded position is reached. This occurs when no new location command is received internally by the drive during the set completion detection time at the command position in object 0x2A15 sub-index 4. Also when the absolute value of the position deviation value is within the position error threshold of the positioning completion signal 0x2A15 sub-index 3 for the duration set in 0x2A15 sub-index 2.



- Dynamic Error Following

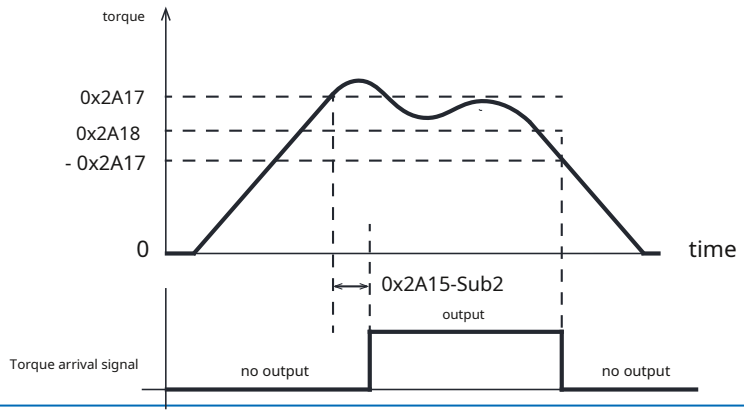
Output is used to notify that the absolute value of the position deviation value is within the dynamic following error threshold set in 0x2A15 sub-index 1.



- Commanded Torque Reached

This output is valid when the difference between the actual torque and the torque reached threshold value stored in 0x2A18 is greater than 0x2A17 and the duration reaches the set time of 0x2A15 sub-index 2.

During the torque drop phase, this output is invalid when the difference between the torque reached threshold stored in 0x2A18 and the the actual torque is less than 0x2A17.

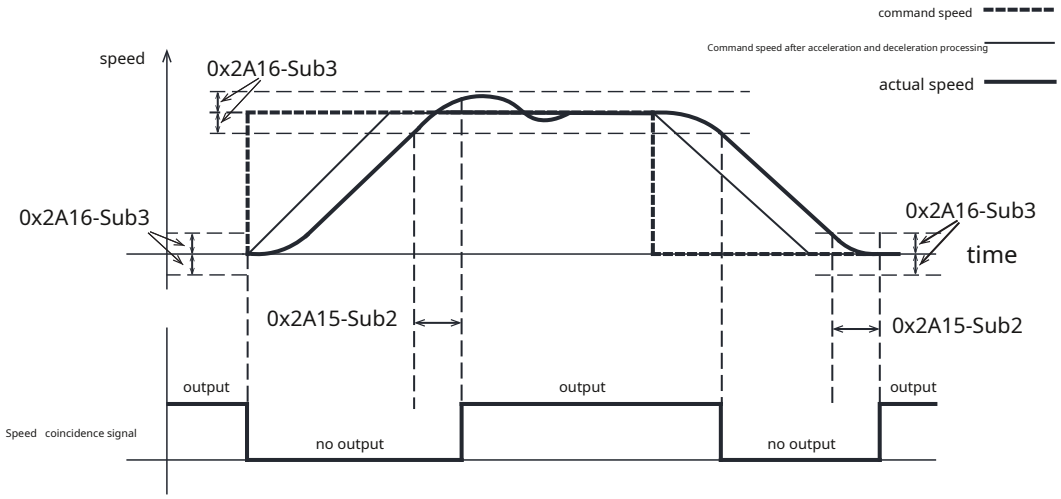


- torque limit

This output is valid when the output torque reaches the torque limit setting value in the corresponding torque limit mode.

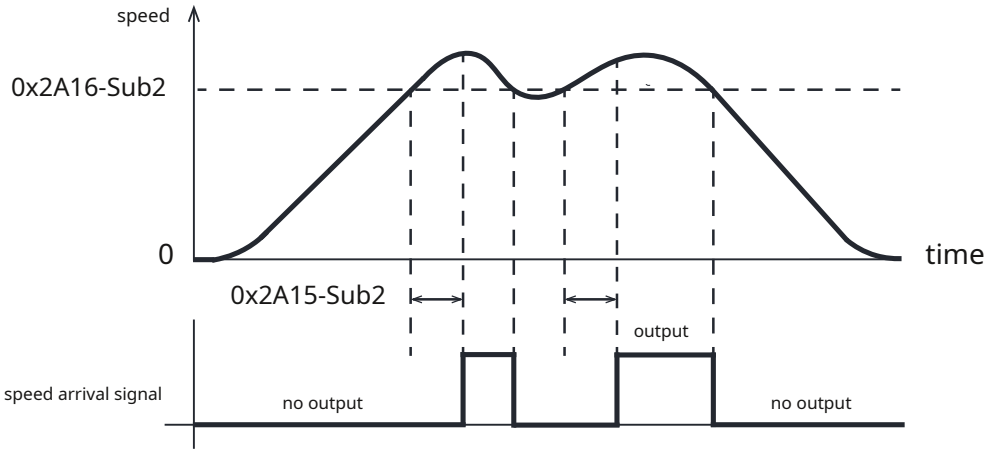
- Speed Consistency

This output is valid when the absolute value of the velocity deviation value is within the speed uniform fluctuation range 0x2A16 sub-index 3 and the duration reaches the set time of 0x2A15 sub-index 2.



- Target Speed Reached

This output is valid when the absolute value of the actual speed exceeds the setpoint of the determined speed to the target value of 0x2A16 sub-index 2, and the duration reaches the set time of 0x2A15 sub-index 2.



- Speed Limit

This output is valid when the actual speed reaches the maximum speed of the motor or when the speed limit in torque mode is reached.

• Servo Ready

This output is valid when the main and control circuits are turned on, if the driver does not have a fault alarm.

- Homing Complete

This output is valid when the homing operation ends normally.

- software limit **(Positive)**

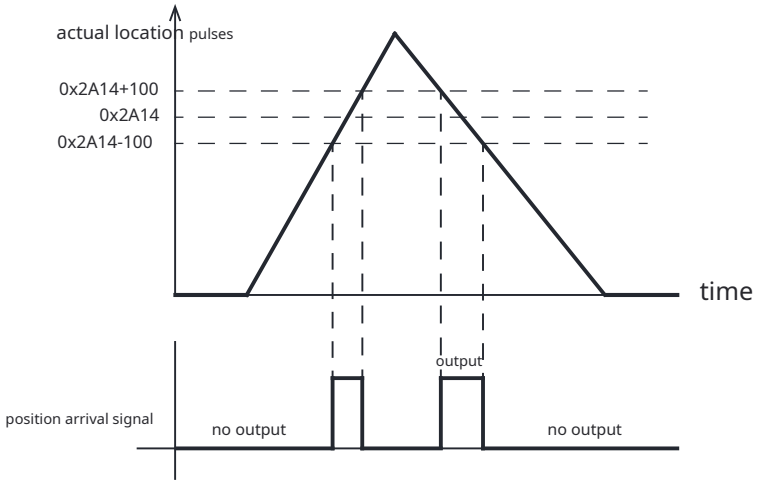
This output is valid when the actual position exceeds the positive software limit value

- software limit (Negative)

This output is valid when the actual position exceeds the software limit value in the negative direction.

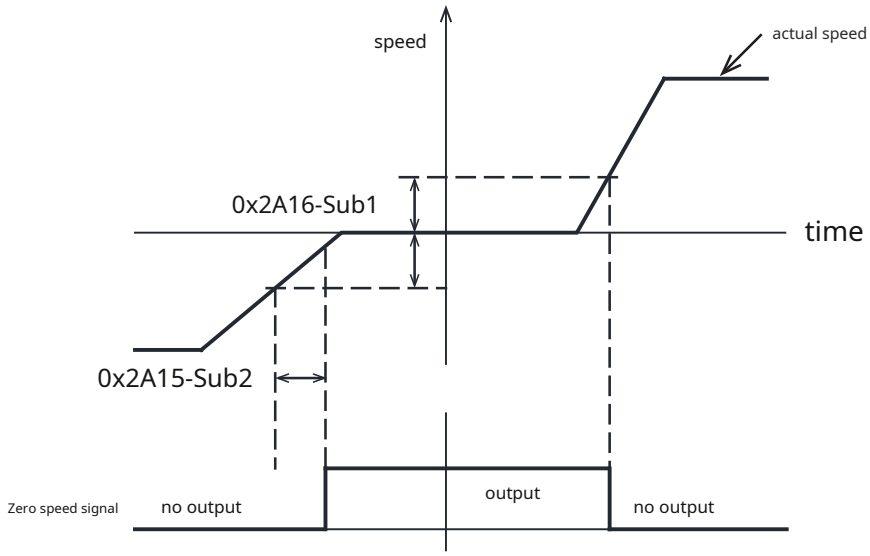
- Location arrives

When the actual position of the motor and the absolute reach position 0x2A14The absolute value of the difference is not greater than100PulsesTime,This output works.



- Zero speed detection output

This output is valid when the actual absolute speed value is within the zero-speed judgment threshold 0x2A16 sub-index 1 and the duration reaches the set time of 0x2A15 sub-index 2.



- Torque Consistency

This output is valid when the absolute value of the difference between the actual torque and the target torque is within 0x2A17 of the torque consistent fluctuation range and the duration reaches the set time of 0x2A15 sub-index 2.

■ Digital Output Related Parameters

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2A10	0x01	P5-12	MO1	digital output1Features	RW	UNSIGNED16	— —	0~36	0	NO
	0x02	P5-13	MO2	digital output2Features	RW	UNSIGNED16	— —	0~36	twenty three	NO
	0x03	P5-14	MO3	digital output3Features	RW	UNSIGNED16	— —	0~36	2	NO
	0x04	P5-15	MO4	digital output4Features	RW	UNSIGNED16	— —	0~36	9	NO

Note: Do not set the 0x2A10 parameter value to a value other than the function code.

5.2 Virtual digital input function

The virtual digital input function is a function that is not affected by the external digital input hardware circuitry, and the internal state of the input signal is forcibly controlled by instructions. The virtual digital input function enables the driver to perform the functions of all external digital input signals without receiving external digital input signals, such as controlling gain switching, torque limiting, zero-speed clamping, forward/reverse disable limits, etc. through digital input signals

- Virtual digital input function related parameters

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2AB0	0x01	Input state settings	RW	UNSIGNED16	— —	0~2_8-1	0	RxPDO
	0x02	input status enable	RW	UNSIGNED16	— —	0~2_8-1	0	RxPDO

- Enable virtual digital input function

Users can enable the virtual digital input function by setting the parameters of 0x2AB0 sub-index 2. Please refer to the following table 0x2AB0 sub-index 2 for definitions.

bit	Features	instruction
0	digital input1	0:Disable virtual input 1:Enable virtual input
1	digital input2	
2	digital input3	
3	digital input4	
4	digital input5	
5	digital input6	
6	digital input7	
7	digital input8	
15~8	reserved	reserved function,Please keep it as "0"

- Virtual digital input signal state setting

The user can control the status of the input signal by setting the parameters of 0x2AB0 sub-index 1. Please refer to the following table 0x2AB0 sub-index 1 for each bit definition.

bit	Features	instruction
0	digital input1	0:Virtual input optocoupler disconnected 1:Virtual input optocoupler on
1	digital input2	
2	digital input3	
3	digital input4	
4	digital input5	
5	digital input6	
6	digital input7	
7	digital input8	
15~8	reserved	reserved function,Please keep it as "0"

- Functional example

Using the virtual input function, digital inputs 1~5 are controlled, and the states of the digital inputs 6~8 are controlled by the external hardware circuit. The specific operation steps are as follows:

Step 1: Enable the virtual input function for digital inputs 1~5 by setting 0x2AB0 Sub-Index 2 = 0x003F

Step 2: Control the virtual inputs 1~5 by setting 0x2AB0 Sub-Index 1 = 0x003F

- Precautions for using virtual digital input function
  1. After each power-on of the drive, be sure to re-enable the virtual digital input function, otherwise, the virtual input is forced to be invalid
  2. The virtual digital input signal does not support the input signal filtering function

5.3 Limit function

The limit function is a function that uses a limit signal issued by a switch connected to the driver input and output connector CN2 to disable motor rotation when the driver receives a valid signal.

- Limit function related parameters

function name	symbol	function code		Action type
		Closed	**Open**	
Forward rotation prohibition limit	CW-LMT	5	6	Decelerate to stop
Reverse prohibition limit	CCW-LMT	7	8	
Virtual forward rotation prohibition limit	Virtual-CW-LMT	41	42	normal exercise
Virtual reverse prohibition limit	Virtual-CCW-LMT	43	44	

When the drive digital input is configured to the above function code, the limit function is turned on, and when the driver detects a valid limit input signal, the motor acts according to the set action mode.

Closed: Digital Input ON
Open: Digital input OFF

- Action Description

logical type	function code	Action description
Closed	5	When it is detected that the limit input signal is valid: 1. motor according to0x6085The set deceleration decelerates to stop 2. According to the corresponding valid negative/positive limit signal,digital input0x60FDofbit0andbit1set1 3. status word0x6041ofbit11(Internal limit active)set1 4. The drive prompts the corresponding limit alarm information
	7	
Open	6	
	8	
Closed	39	When it is detected that the limit input signal is valid: According to the corresponding valid negative/positive limit signal,digital input0x60FDofbit0andbit1set1
	41	
Open	40	
	42	

- Precautions for using the limit function

1. In the factory setting, the digital input 1 and 2 are used as the limit signal input ports, and the function codes configured are 7 and 5 respectively

2. When the controller side uses the limit signal to limit the motor motion range, and the limit input signal is connected to the driver, it is recommended that the limit function on the drive side be configured as a limit function code with the action type of normal movement

3. When the limit function action type is configured as the limit function code of deceleration stop, when only the forward rotation prohibition limit is effective, the motor cannot be driven in the forward direction. However, the motor can still be driven in the negative direction. Conversely, when only the reverse prohibition limit is effective, the negative direction of the motor cannot be driven, but the positive direction can move normally

5.4 CANopen Communication watchdog function

CANopen communication watchdog is used to monitor the status of the master. The slave detects the watchdog sent by the master at intervals set by 0x2060 sub-index 3. If the message is not received, it is considered that the slave dropped communications. The slave will perform the action specified by 0x2060 sub-index 5 after such a timeout.

- Communication watchdog function related parameters

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2060	0x01	enable watchdog	RW	UNSIGNED16	— —	0~1	0	RxPDO
	0x02	watchdog status	RO	UNSIGNED16	— —	0~2	3000	TxPDO
	0x03	Communication interruption timeout	RW	UNSIGNED16	ms	0~65536	500	NO
	0x04	watchdog trigger event	RW	UNSIGNED16	— —	0~0x1F	0x1F	NO
	0x05	Action after communication interruption	RW	UNSIGNED16	— —	0~14	0	NO

- Communication watchdog parameter configuration

Step 1: Set the monitoring time

Set the monitoring time via 0x2060 sub-index 3 in

ms Step 2: Set up trigger events

Set the trigger event via 0x2060 sub-index 4

0x01：RPDO1 0x02：RPDO2 0x04：RPDO3 0x08：RPDO4 0x10：SYNC

Step 3: Set the motor action after the communication is interrupted

0: Deceleration stops and goes to enable

1: Deceleration stop, keep enabled state

2 ~ 14: Call the Q program,2 for the first Q program,14 for the 12th Q program

Step 4: Turn on the watchdog

Set whether the watchdog is turned on by 0x2060 sub-index 1

0: Do not turn on 1: Turn on

Step 5: check the status of the watchdog. The watchdog status can be determined by 0x2060 sub-index

2

0: Indicates that the watchdog is not turned on

1: Indicates that the watchdog timed out

2: Indicates that the watchdog is turned on, but has not timed out

5.5 Torque limit function

Torque limiting is a function that controls the output torque of the motor by limiting the output current of the driver. The M3 CANopen series switches the torque limit value according to the direction of motion, the torque limit input signal, and the torque limit input command of CANopen communications. This function is often used to perform stamping and suppress torque during start-up /deceleration to protect various types of mechanical equipment.

- Torque Limit Related Parameters

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2A02	— —	P1-10	LD	Torque limit method	RW	UNSIGNED16	— —	0~5	1	NO
0x2A03		P1-06	CC	first torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A04		P1-25	CX	Second torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A05		P1-26	CY	Third torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A06		P1-27	CZ	Fourth torque limit	RW	UNSIGNED16	0.1%	0~3000	3000	NO
0x2A23	0x01	P4-06	AD2	Analog input2dead zone	RW	UNSIGNED32	mV	0~255	0	NO
	0x02	P4-04	AV2	Analog input2Offset	RW	INTEGER32	mV	- 10000 ~10000	0	NO
	0x03	P4-08	AF2	Analog input2low pass filter waver	RW	UNSIGNED32	0.1Hz	0~20000	1000	NO
0x2A26	0x02	— —	— —	Analog input2Auto zero	RW	INTEGER32	— —	0~1	0	NO
0x2A27	0x05	P4-02	AN	Analog torque scaling	RW	UNSIGNED32	0.1%	0~3000	1000	NO
0x60E0	— —	— —	— —	Forward torque limit	RW	UNSIGNED16	0.1%	0~3000	1000	RxPDO
0x60E1	— —	— —	— —	Negative torque limit	RW	UNSIGNED16	0.1%	0~3000	1000	RxPDO

Note: 100.0% corresponds to1times the rated torque of the motor.

- Torque Limit Method

According to the torque limit method 0x2A02 settings, the following actions can be performed.

Torque limit method **(0x2A02)**	Forward torque limit	Negative torque limit
0	0x60E0	0x60E1
1	0x2A03	
2	0x2A03	0x2A04
3	TQ-LMTefficient:0x2A03	
	TQ-LMTinvalid:0x2A05	
4	The second analog input torque limit	
5	TQ-LMTefficient:0x2A03	TQ-LMTefficient:0x2A04
	TQ-LMTinvalid:0x2A05	TQ-LMTinvalid:0x2A06

Note: TQ-LMT Indicates the digital torque limit input signal.

The torque limit is limited by the maximum torque limit value.

5.6 Electronic gear function

An electronic gear is a function in which the input position command received by the driver is multiplied by the set electronic gear ratio and used as a position control for the internal position command. The electronic gear ratio division (electronic gear ratio <1) or multiplication (electronic gear ratio >1) function allows you to set the actual distance the motor rotates or moves when the input position command is 1 command unit.

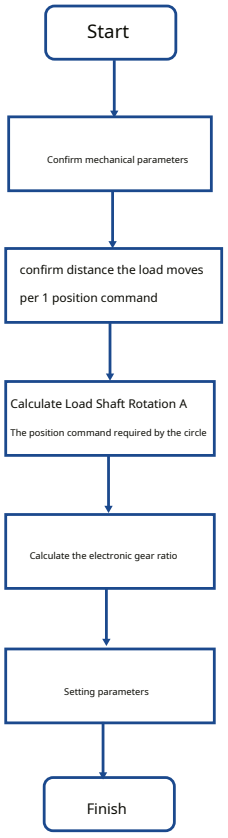
- Electronic gear function related parameters

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	PDO
0x2A90	0x00	P3-05	EG	Number of pulses required per revolution	RW	UNSIGNED32	Pulses	200~131072	131072	NO
0x2A93	0x01	P3-00	EN	Electronic gear ratio numerator	RW	UNSIGNED32	— —	1~2_{31}-1	32000	NO
	0x02	P3-01	EU	Electronic gear ratio denominator	RW	UNSIGNED32	— —	1~2_{31}-1	32000	NO
— —	— —	P3-16	PU	Electronic gear ratio switch	RW		— —	0~1	0	— —

$$\text{Internal position command} = \text{position command} \times \text{electronic gear ratio} = \frac{\text{Position Command x 0x2A93-Sub1}}{\text{0x2A93-Sub2}}$$

- Electronic gear ratio setting operation steps

The electronic gear ratio varies depending on the mechanical structure, so please follow the steps below to set it.



Confirm the reduction ratio of the reducer, the diameter of the gear index circle in the gear transmission, Pulley indexing circle diameter, screw lead, etc. in pulley drive

Check the distance traveled by the load corresponding to one position command

Combined with mechanical parameters, a position command corresponds to the distance the load moves, Calculate the number of position commands required for one rotation of the load

$$\text{Electronic gear ratio} = \frac{1048576}{\text{The number of position commands required for one rotation of the load}} \times \text{Reduction ratio}$$

(Reduction ratio refers to the ratio of the speed of the input shaft of the reducer to the speed of the output shaft)

According to the calculation result, set the electronic gear ratio when the motor is stationary

note:

1, the electronic gear ratio setting range 1/8192~8192, when the actual setting of the electronic gear ratio is greater than 8192, the system will automatically calculate according to the electronic gear ratio of 8192; when the actual setting of the electronic gear ratio is less than 1/8192 , the system automatically calculates the electronic gear ratio as 1/8192.

2. Do not change the electronic gear parameters during the movement of the motor.

5.7 Gain switching function

Gain switching is a function of switching the position loop gain, speed loop gain, and current loop command torque filter in the motion control of the driver. Using gain switching, you can optimize the response performance of the motor in the stationary state or motion, when the inertia of the load changes.

The gain switching function of the M3 CANopen series AC servo products is only effective in position and speed control mode and can be controlled by the servo internal state, gain switching input signal, and gain switching instructions for CANopen communication.

- Gain switching function related parameters

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	PDO
0x2A69	0x01	P0-33	SD	Gain switching condition selection	RW	UNSIGNED32	— —	0~4	0	NO
	0x02	P0-34	PN	position deviation	RW	UNSIGNED32	Pulses	0~2_{31}-1	0	NO
	0x03	P0-35	VN	actual speed	RW	INTEGER32	Pulses/s	0~2_{31}-1	0	NO
	0x04	P0-36	TN	actual torque	RW	INTEGER16	0.1%	0~3000	0	NO
	0x05	P0-37	SE1	The second gain switches to the first Gain delay time	RW	UNSIGNED32	ms	0~10000	10	NO
	0x06	P0-38	SE2	The first gain switches to the second Gain delay time	RW	UNSIGNED32	ms	0~10000	10	NO

- Gain switching mode selection

There are two modes to control the switching of the first set of gains and the second set of gains of the servo drive, as detailed in the following table:

model	selected condition	instruction
Mode one	Digital input configured as gain switching function	Switch the gain according to the digital input state
Mode two	Mode one is not selected	set the gain according to 0x2A69 sub-index 1

Priority of the two modes: Mode 1 > Mode 2

- Gain switching condition settings

value	Gain switching condition	instruction
0	Fixed at the first set of gains	Fixed at the first set of gains
1	Large position deviation	Valid only in position control mode, fully closed-loop function In the first group of gains, if the absolute value of the actual position deviation exceeds the set value of 0x2A69 sub-index 2, and the duration reaches 0x2A69 sub-index 5, switch to the second group of gains In the second group of gains, if the absolute value of the actual position deviation is lower than the set value of 0x2A69 sub-index 2, and the duration reaches 0x2A69 sub-index 6, return to the first group of gains
2	Large Speed Deviation	In the first group of gains, if the absolute value of the actual speed exceeds the set value of sub-index 3 of 0x2A69, and the duration reaches 0x2A69 sub-index 5, switch to the second group of gains In the second group of gains, if the absolute value of the actual speed is lower than the set value of 0x2A69 sub-index 3, and the duration reaches 0x2A69 sub-index 6 s, return to the first group of gains
3	Large Torque Deviation	In the first group of gains, if the percentage of the absolute value of the actual torque relative to the rated torque of the motor exceeds the setting of sub-index 4 of 0x2A69, and the duration reaches the set time of 0x2A69 sub-index 5, switch to the second group of gains In the second group of gains, if the percentage of the absolute value of the actual torque relative to the rated torque of the motor is lower than the setting of sub-index 4 of 0x2A69 , and the duration reaches the set time of 0x2A69 sub-index 6, return to the first group of gains
4	Positioning completed	Valid only in position control mode and full closed loop function In the first group of gains, if the positioning is not completed, switch to the second group of gains. In the second group of gains, if the positioning is completed and the duration reaches the set time of 0x2A69 sub-index 6, return to the first group gain.

5.8 Dynamic braking function

The dynamic braking function can be used as the method of stopping the servo motor when the servo is disabled, the driver reports an error or another issue presents itself. The dynamic braking works when the motor U/V/W three-phase are short-circuited. The motor will stop at the fastest speed, so as to protect the safety of equipment and people.

- Parameters related to the dynamic braking function

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2A16	0x01	P5-42	ZV	Zero speed judgment threshold	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	500	NO
0x2AB1	0x01	P1-29	YV	Action when de-enable	RW	UNSIGNED32	— —	0~5	0	NO
	0x02	P1-31	YM	During deceleration of de-enable the longest action time of	RW	UNSIGNED32	— —	0~30000	500	NO
	0x03	P1-30	YR	Action when an error is reported	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	P1-32	YN	Error during deceleration longest action time	RW	UNSIGNED32	— —	0~30000	0	NO
0x606C	— —	— —	IV	actual speed	RO	INTEGER32	Pulses/s	— —	0	TxPDO

- Description of dynamic braking action when servo is disabled

When the servo is disabled, the dynamic braking action is set by 0x2AB1 sub-index 1, and the maximum operating time during the deceleration process is set by 0x2AB1 sub-index 2. Please refer to the following table. The deceleration process refers to the set time when the absolute value of the actual speed of the motor is within the zero-speed judgment threshold or the deceleration time reaches 0x2AB1 sub-index 2.

value	instruction	
	deceleration process	stop
0	stop now	maintain free movement
1	stop now	dynamic braking action
2	free movement	maintain free movement
3	free movement	dynamic braking action
4	dynamic braking action	maintain free movement
5	dynamic braking action	dynamic braking action

- Description of dynamic braking action when servo error is reported

When the servo reports an error, the dynamic braking action is set by 0x2AB1 sub-index 3, and the maximum operating time during the deceleration process is set by 0x2AB1 sub-index 4. Please refer to the following table. The deceleration process refers to the set time when the absolute value of the actual speed of the motor is within the zero-speed judgment threshold or the deceleration time reaches the 0x2AB1 sub-index 4.

value	instruction	
	deceleration process	stop
0	free movement	maintain free movement
1	free movement	dynamic braking action
2	dynamic braking action	maintain free movement
3	dynamic braking action	dynamic braking action

- Precautions for using the dynamic brake function

1. Dynamic braking is used as a stopping mechanism when servo operation is abnormal. Please do not use it to stop normal operation.

2. When the drive control power input is disconnected, the dynamic brake still remains in action

3. When the dynamic brake has been started, do not drive the motor further via external force. The dynamic brake circuit may be damaged, and even cause the drive to smoke or catch fire

4. The frequency and frequency of dynamic brake use require

frequency: more than 5 minutes / 1 ti

Number of times: 1000 stops from the rated speed, under the applicable load inertia conditions

5.9 Pulse frequency division output function

Pulse divider output is a function that outputs external position command pulses or encoder feedback position information outwards in a 2-phase pulse (A/B phase) differential with a 90° phase difference, while supporting Z-phase pulse output.

- Pulse frequency division output function related parameters

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	PDO
0x2A94	0x01	P3-12	PO	Pulse output source	RW	UNSIGNED32	— —	1~3	1	NO
	0x02	P3-13	ON	Divider ratio numerator	RW	UNSIGNED32	— —	0~13107200	10000	NO
	0x03	P3-14	OD	divider ratio denominator	RW	UNSIGNED32	— —	0~13107200	131072	NO
	0x04	— —	— —	outputA/BPulse phase setting	RW	UNSIGNED16	— —	0~1	0	NO
	0x05	— —	— —	outputZPhase pulse polarity setting	RW	UNSIGNED16	— —	0~1	0	NO

When using the pulse divider output function, the output pulse source, divider ratio, output pulse phase, and Z-phase pulse output polarity should be set as needed.

- Output pulse source selection

The source of the output pulse is set by 0x2A94 sub-index 1, as shown in the table below.

value	instruction
1	Motor encoder
2	second encoder
3	External position command pulse

- Frequency division ratio

By setting the divider ratio numerator (0x2A94 sub-index 2) and the divider ratio denominator (0x2A94 sub-index 3), you can change the number of output pulses per rotation of the motor; When the divider ratio numerator or divider denominator is set to 0, Pulses are output without the effects of frequency division processing.

1, When the output pulse source selects the motor encoder or the second encoder

Divider ratio numerator **>** divider ratio denominator The resolution of the output pulse when the motor rotates one revolution = the numerator of the frequency division ratio

Divider ratio numerator ≤ divider ratio denominator The resolution of the output pulse when the motor rotates one revolution = (frequency division ratio numerator/frequency division ratio denominator) * 131072

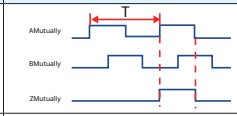
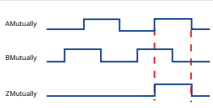
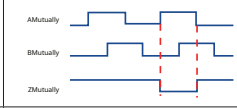
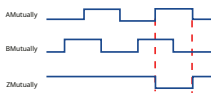
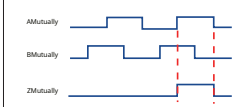
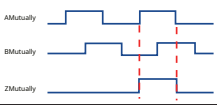
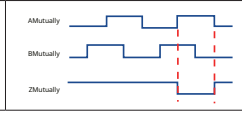
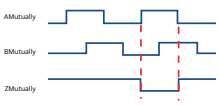
2, When the output pulse source selects external position command pulse

The divider ratio is invalid and the output pulse is equivalent to the source pulse without any processing

- output pulse phase and **Z** Pulse Polarity Setting

By setting the output pulse phase (0x2A94 sub-index 4),you can change the phase relationship between the A-phase and B-phase pulses.

By setting the output Z-phase pulse polarity (0x2A94 sub-index 5), you can change the polarity of the Z-phase pulse, which synchronizes the output with the A-phase pulse.

0x2A94subindex4 (output pulse phase)	0x2A94subindex5 (outputZpulse polarity)	CWdirection rotation Schematic diagram of output pulse	CCWdirection rotation Schematic diagram of output pulse
0	0		
	1		
1	0		
	1		

5.10 Full closed loop function

Full closed-loop control is the function of position control that uses an externally mounted second encoder to directly detect and feedback the mechanical position of the driven object This makes the control unaffected by mechanical errors and temperature-induced position changes, improving the final positioning accuracy of the equipment.

The full closed-loop control function is suitable for position control mode (PP), cyclic synchronous position control mode (CSP) and Home control mode (HM),and cannot be applied to speed control mode (PV), cyclic synchronous speed control mode (CSV), Torque Control Mode (TQ) and Periodic Synchronous Torque Control Mode (CST).

The M3 Series AC Servo Driver CN4 connector is used to connect to an external second encoder that can receive A, B and Z phase differential signals.

- Full closed-loop function related parameters

index	sub-index	code	instruction	name	access type	type of data	unit	set range	Defaults	**PDO**
0x2A6A	— —	P1-4	XM	Fully closed loop mode switch	RW	UNSIGNED32	— —	0~1	0	NO
0x2A6B		P3-11	XR	Second encoder resolution	RW	UNSIGNED32	Pulses/mm	200~100000	10000	NO
0x2A77		P3-09	XT	Hybrid deviation in full closed loop mode Clear setting	RW	UNSIGNED32	rev	1~100	10	NO
0x2A78		P3-10	XO	Hybrid deviation in full closed loop mode Alarm threshold	RW	UNSIGNED32	Pulses	0~100000	100000	NO
0x2A6C		P3-06	PV	second encoder inputA/B Pulse phase setting	RW	UNSIGNED32	— —	0~1	0	NO
0x2A90		P3-05	EG	Number of pulses required per revolution	RW	UNSIGNED32	Pulses	200~131072	10000	NO
0x2A93	0x01	P3-00	EN	Electronic gear ratio numerator	RW	UNSIGNED32	— —	$1\sim2_{31}$-1	32000	NO
	0x02	P3-01	EU	Electronic gear ratio denominator	RW	UNSIGNED32	— —	$1\sim2_{31}$-1	32000	NO

- Full closed loop mode setting

Enabling full closed-loop mode requires setting the 0x2A6A to 1,and by default the value of 0x2A6A is 0,which is semi-closed-loop mode.

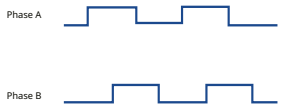
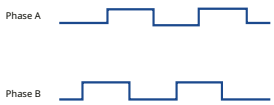
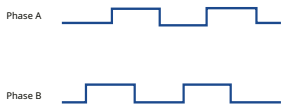
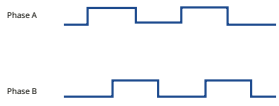
- Second encoder resolution setting

When the second encoder is a linear displacement sensor, the value of the 0x2A6B is the number of pulses per 1mm of displacement output by the second encoder.

When the second encoder is a rotary displacement sensor, the value of 0x2A6B is the number of pulses per rotation output by the second encoder.

- second encoder input **A/B** Pulse phase setting

The count direction of the A/B phase pulse of the second encoder in the driver is set as shown in the table below.

0x2A6C	Order of Phases	Counter increasing direction	Counter decreasing direction
0	A ahead of B		
1	B ahead of A		

- Full closed loop mode electronic gear ratio setting

The calculation method of electronic gear ratio in full closed loop mode is as follows:

$$\frac{\text{0x2A93-Sub1}}{\text{0x2A93-Sub2}} = \frac{\text{Number of pulses required per motor revolution}}{\text{The number of feedback pulses of the second encoder for one rotation of the motor}}$$

Note:

1. When the electronic gear ratio numerator or denominator in the full closed-loop mode is set to 0, the system will automatically calculate according to the electronic gear ratio of 1:1.
2. The effective setting range of the electronic gear ratio is 1/8192~8192, when the actual setting of the electronic gear ratio is greater than 8192, the system will automatically calculate according to the electronic gear ratio of 8192; when the actual setting of the electronic gear ratio is less than At 1/8192, the system automatically calculates the electronic gear ratio of 1/8192.
3. If the electronic gear ratio is set incorrectly, the position calculated from the motor encoder feedback and the position deviation calculated from the second encoder feedback increase, and a fully closed-loop position error overrun fault will occur in the long-distance movement.

- Full closed loop mode mixed deviation setting

Set when the absolute value of the difference between the feedback position of the motor encoder and the feedback position of the second encoder is greater than the set value of 0x2A78, the drive will report a fully closed Protection function for loop position error overrun fault.

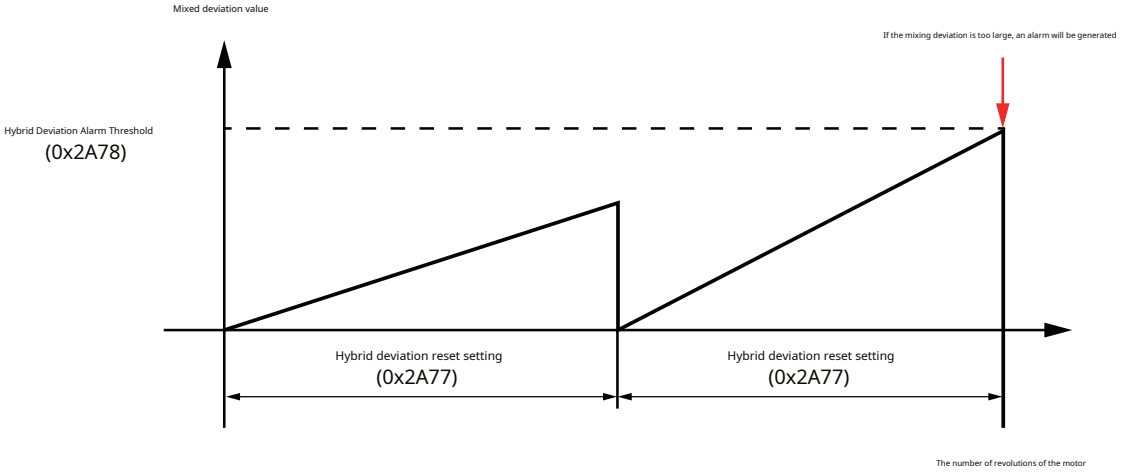
index	sub-index	name	instruction
0x2A77	— —	Full closed loop mode hybrid deviation clearing setting	In full closed loop mode,Motor per revolution0x2A77lap to clear a mix deviation
0x2A78		Full closed loop mode mixed deviation alarm threshold	In full closed loop mode,The maximum allowable mixing deviation in the application

note:

1, servo motor rotation 0x2A77, the mixing deviation is always less than 0x2A78 set value, the 0x2A77 lap, clear the full closed-loop mixing deviation, mixing deviation and motor rotation from 0 to recount.

2, servo motor rotation 0x2A77, once the mixing deviation is greater than the 0x2A78 set value, immediately clear the full closed-loop mixing deviation, at the same time, the driver will occur a full closed-loop position error overrun error, mixing deviation and motor rotation from 0 to recount.

3. When the 0x2A78 is set to 0, the mixing deviation is not detected.



5.11 Absolute value system use

The absolute encoder not only detects the position of the motor within one revolution, but also counts the number of revolutions of the motor. Absolute encoders are divided into battery type and non-Battery type. When the drive is powered off, the encoder with battery type records multi-turn data while using a battery power supply, and the battery-less encoder does not require a battery power supply to record multi-turn data. After power-on, the drive calculates the absolute position of the mechanical load through the absolute position of the encoder, without repeating Mechanical back-to-origin operation.

M3 series AC servo can be equipped with a 20-bit encoder battery operated absolute encoder or a 17-bit battery-free absolute encoder. For encoder specifications, please refer to the table below.

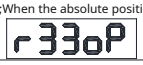
project	content	
motor model	SM3*-****A***	SM3*-****B***
voltageVCC	DC 4.5V~5.5V(Typ 5V)	
External battery voltage	DC 3.3~5.5V(Type 3.6V)	— —
voltageVCCcurrent consumption	Typ 160mA	
External battery consumption current	Type 15μA	— —
1Number of revolution pulses	1048576(20-bit)	131072(17-bit)
Number of multi-turn gyroscopes	65536(16-bit)	
communication method	Half-duplex acyclic serial communication	
communication rate	4Mbps	
Operating temperature	0~85°C	

- Absolute value system related parameters

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**
0x200C	— —	position clear	RW	UNSIGNED8	— —	0~1	0	NO
0x2A90		Number of pulses required per revolution	RW	UNSIGNED32	Pulses	200~131072	10000	NO
0x2A9C	0x04	Absolute encoder usage mode	RW	UNSIGNED16	— —	0~3	2	NO
	0x05	Absolute encoder reset	RW	UNSIGNED16	— —	0~2	0	NO
0x6064	— —	actual location	RO	INTEGER32	Pulses	— —	0	TxPDO

- Absolute encoder mode selection

The usage mode of the absolute value encoder can be set by 0x2A9C sub-index 4, please refer to the following table for the settings and descriptions of various modes

value	model	instruction
0	Incremental encoder	Use as incremental encoder,No position power-off memory function
1	Single-turn absolute encoder	Use as absolute value encoder,Does not require battery power,With single-turn position power-off memory function
2	Multiturn encoder	Use as absolute value encoder,With position power-off memory function;When the absolute position count is out of range,The drive will report an absolute position overflow warning,The alarm code is 
3	Multi-turn encoder does not count overflow	Use as absolute value encoder,With position power-off memory function;When the absolute position count is out of range,The drive has no alarm prompt

The M3 series AC servo drives automatically identify the motor encoder type, and for absolute encoder motors, the default mode of use is multiturn encoder.

- Absolute encoder clear

When used as an absolute encoder, set the origin position at the initial startup of the machine, select the encoder resolution via 0x2A90 and then operate the drive. When the absolute position loss or absolute encoder multi-turn error alarm occurs, the absolute encoder needs to be cleared.

By setting the parameter value of 0x2A9C sub-index 5, you can clear the alarm of the absolute encoder or clear the multiturn data, see the following table.

value	Features
0	no action
1	reset fault
2	Clear multi-lap data

The steps to zero out an absolute encoder using CANopen communication are as follows:

Step 1: Control the motor in the servo OFF state

Step 2: Write 2 to 0x209C sub-index 5, Clear encoder multi-turn data

Step 3: Write 1 to 0x209C sub-index 5 to clear encoder alarm

Step 4: Write 1 to 0x200C, the actual position of the motor 0x6064 Clear Zero

Step 5: The drive is powered off and restarted

- Absolute encoder position data

Suppose that the number of pulses required for the motor to rotate one turn 0x2A90 has a value of M. The value of the actual position of the motor 0x6064 is N and depending on the encoder's mode of use, can vary in range and storage type. The ranges and storage type for motor position N depending on the encoder mode are the following:

1. Incremental encoder

   $-2^{31} \le N \le 2^{31}-1$

After the drive is powered off and restarted, the multi-turn count automatically returns to zero, and the value of the actual motor position 0x6064 is 0.

2. Single-turn absolute encoder

$-2^{31} \le N \le 2-1^{31}$

After the drive is powered off and restarted, the multi-turn count automatically returns to zero, and only the single-turn position value is recorded. The single-turn position count range is as follows:

When the motor rotation direction selects the value of 0x2A0A as 0, 0～M-1

When the motor rotation direction selects the value of 0x2A0A as 1, - (M-1)～0

3. Multi-Turn Encoder

$-2^{31} \le N \le 2^{31}-1$

After the drive is powered off and restarted, the actual motor position 0x6064 remains the value before power off.

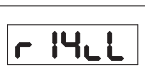
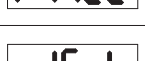
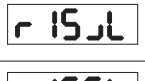
6 Servo fault diagnosis

6.1 Troubleshooting at Servo Start

Please refer to the following table for faults at start-up, their causes and their remedies.

Boot process	Fault	Cause	Troubleshooting
Turn on the control power(L1C,L2C) Turn on main power(L1,L2,L3)	The digital control panel does not display	Control supply voltage failure	Measure the AC voltage between L1C, L2C
		Servo drive failure	Return to facotyr for repair
	Display shows 	No firmware downloaded in the drive	Download firmware or return to factory for repair
	Display shows 	refer to the Servo Alarms List on 6.2	

6.2 List of Servo Alarms

Display content	Description	type of alert	Drive status after alarm	resettable	error code (0x603F)	DSP alarm code (0x200F)
	Drive power module over temperature	Fault	Servo off	Yes	0xFF11	0x00000008
	Drive internal voltage error	Fault	Servo off	Yes	0xFF05	0x00000010
	Drive overvoltage	Fault	Servo off	Yes	0xFF02	0x00000020
	Drive overcurrent	Fault	Servo off	Yes	0xFF01	0x00000080
		Fault	Servo off	Yes		
		Fault	Servo off	Yes		
	FPGA Error	Fault	Servo off	no	0xFF0D	0x00000010
	Motor encoder not connected	Fault	Servo off	no	0xFF07	0x00000200
	Position error overrun	Fault	Servo off	Yes	0xFF06	0x00000001
	Drive low voltage	Fault	Servo off	Yes	0xFF36	0x00000020
	Motor speed exceeds limit	Fault	Servo off	Yes	0xFF38	0x00080000
	Forward rotation prohibition limit and reverse rotation prohibition limit	warning	does not change the current state, the motor cannot continue in either the positive or negative direction	Yes	0xFF33	0x00000006
	negative rotation prohibition limit	warning	does not change the current state, the motor cannot continue motion in negative direction	Yes	0xFF32	0x00000002
	Positive rotation prohibition limit	warning	Does not change the current state, the motor cannot continue motion in positive direction	Yes	0xFF31	0x00000004
	Motor overload status	warning	Does not change the current state	Yes	0xFF34	0x00002000
	Communication alarm	warning	Does not change the current state	Yes	— —	0x00000400
	Failed to save parameters	warning	Servo off	Yes	0xFF41	0x00000010
	Drive main circuit power input phase loss	warning	Does not change the current state	Yes	0xFF39	0x00010000
	Safe torque off	warning	Servo off	Yes	0xFF0B	0x00020000

Display content	Description	type of alert	Drive status after alarm	resettable	Error Code (0x603F)	DSP alarm code (0x200F)
r21rF	Regeneration potential discharge failed	warning	Does not change the current state	Yes	0xFF0A	0x00001000
r22uU	Drive undervoltage	warning	Does not change the current state	Yes	0xFF3F	0x00100000
r239E	Q segment is empty	warning	Does not change the current state	Yes	0xFF37	0x00008000
r24dd	Commanded motion when motor not enabled	warning	Does not change the current state	Yes	0xFF35	
r25ur	Drive internal voltage alarm	Fault	Servo off	Yes	0xFF05	0x00000010
r26ur		Fault	Servo off	Yes		
r27E=	emergency stop	Fault	Status is set by 0x605A	Yes	0xFF3A	0x00200000
r28FP	Full closed loop hybrid deviation overrun	Fault	Servo off	Yes	0xFF08	0x00800000
r29FE	Second encoder not connected	Fault	Servo off	no	0xFF09	0x00400000
r30nE	Parameter read failed	Fault	Servo off	Yes	0xFF0E	0x00000010
r31bt	Absolute encoder battery undervoltage	warning	Does not change the current state	Yes	0xFF3B	0x01000000
r32AP	Absolute position lost	warning	Does not change the current state	no	0xFF3C	0x02000000
r33oP	Absolute position overflow	warning	Does not change the current state	no	0xFF3D	0x04000000
r34Mt	Motor overtemperature	Fault	Servo off	Yes	0xFF3E	0x00000008
r35Ct	Drive processor overtemperature	Fault	Servo off	Yes	0xFF03	
r36Mr	Absolute encoder multi-turn error	Fault	Servo off	no	0xFF0F	0x10000000
r37=t	Motor stall protection	Fault	Servo off	Yes	0xFF10	0x20000000
r39Hr	Homing parameter configuration error	warning	Does not change the current state	Yes		0x80000000
r40HC	Motor anti-collision protection	Fault	Servo off	Yes		0x20000000
r41Er	Motor encoder communication error	Fault	Servo off	no		0x00000010
r42 io	I/O Signal function multiplexing	warning	Does not change the current state	Yes		0x00008000

6.3Servo Alarm Causes and Solutions

Display content	Description	Cause	Troubleshooting	Alarm Clear Method
r0 iot	drive power module over temperature	The temperature of the heat sink and power components of the driver is higher than Over temperature protection point 1. Ambient temperature is too high 2. The operating temperature of the driver exceeds the specified value 3. Overload, exceeding the rated load of the drive and is used continuously 4. Drive cooling fan failure	1. Reduce drive operating temperature and improve cooling conditions 2. Increase the power of the driver and motor, and prolong the acceleration and deceleration time, reduce the load 3. Replace the fan or send the servo drive for repair	Alarm clear
r02ur	drive internal voltage error	The internal voltage of the driver is lower than the normal value	Check the voltage of the power supply, if there is still a problem, please replace the driver device.	Re-power on to clear
r03uH	Drive overvoltage	Drive DC bus voltage is too high 220V series: higher than 420VDC 1. The power supply voltage exceeds the allowable input voltage range 2. Regenerative resistor not connected 3. The built-in regenerative resistor is too small to meet the regeneration potential 4. The external regenerative resistor does not match and cannot meet the absorption requirements of the regeneration potential 5. Drive failure (circuit failure)	1. Check the input voltage 2. Check whether the parameter settings of the internal/external regenerative resistor are reasonable 3. Detect the resistance of the external absorption resistor, if it is ∞, it is Broken or damaged, please replace the external absorption resistor 4. Use a larger external regenerative resistor 5. If the above does not solve the problem, please replace the drive	Alarm clear
r04HC r05LC r06rC	Drive overcurrent	1. Drive failure 2. The motor wires U, V, W are short-circuited 3. Motor burned out 4. Poor motor wire contact 5. Motor acceleration and deceleration is too large 6. The load is too heavy, and the effective torque exceeds the rated speed of the motor, torque, and continuous operation for a long time 7. Poor adjustment of gain parameters causes motor vibration 8. The machine is collided and the load suddenly becomes heavier 9. The electromagnetic brake is in action 10. If used in multi-axis operation, double check the motor wiring for each unit	1. Remove the motor cable, power on the driver, if still fails, you need to replace the drive with a new one 2. Check whether the motor wires U, V, W are short-circuited, and whether the connector wires have burrs. 3. Check whether the sequence of U, V and W of the motor wires is correct, U-Red, V-Yellow, W-Blue 4. Check the insulation resistance between the motor lines U,V,W and the motor ground wire, and replace the new motor if the insulation is poor 5. Increase the power of the drive and motor, extend the acceleration and deceleration time, and reduce the load 6. Check whether the connector plugs of the motor connection parts U,V,W are off, and if they are loose or detached, they should be tightened 7. Whether the gain parameters are properly debugged 8. Measure the voltage at the brake terminals 9. Correctly connect the motor wire and encoder wire to their respective connector on the corresponding axis	Alarm clear
r07Fb	FPGA Error	Failed to read parameters at power-on	The alarm persists after the drive is powered back on, replace the drive or contact the manufacturer	Re-power on to clear
r09Eb	Motor encoder not connected	Motor encoder not connected to drive	1.Confirm that the encoder cable is connected to the motor correctly 2.Confirm that the encoder cable is properly connected to the drive 3.Replace the encoder cable 4.Power on again, and replace the motor if there are still problems	Re-power on to clear
r 10PL	Position error overrun	The position error exceeds the setpoint of the parameter P3-04"Position error alarm threshold"	1.Check if the parameter P3-04"Position Error Alarm Threshold" is too small 2.Whether the gain parameters are properly debugged 3.Whether the motor selection matches the actual load, acceleration and deceleration is too large 4.Whether unreasonable torque limits are used 5.Whether the electronic gear ratio is set correctly 6.Check that the mechanical part of the motor drive is stuck 7.Check that the electromagnetic brake is turned on 8.Properly connect the motor wire and encoder wire to their respective corresponding shafts	Alarm clear
r 11Lu	Drive low voltage	The driver DC bus voltage is too low 220V Driver Series: Bus voltage is below 90VDC 1.Low supply voltage 2. Insufficient power supply capacity, affected by the inrush current when the main power supply is turned on, resulting in a drop in the supply voltage 3.Drive failure (circuit failure)	Measure the input voltage 1.Increase the power supply voltage capacity or replace the power supply 2.Properly connect the power supply 3.Check the driver L1/L2/L3 terminals and input voltage 4.If the above does not resolve the issue, replace the drive	Alarm clear

Display content	Description	Cause	Troubleshooting	Alarm Clear Method
	Motor speed exceeds limit	Motor speed exceeds P2-00 limit value of	Check whether the motor command speed is within its rated range 1. Avoid excessive command speeds 2. Check the input frequency of the command pulse 3. When overshoot occurs due to poor adjustment of gain parameters, please correct the gain adjustment 4. Connect the encoder cable correctly according to the wiring diagram	Alarm clear
	Forward rotation prohibition limit and Reverse prohibition limit	1.Positive rotation prohibition limit or negative rotation prohibition limit is triggered 2. The actual position of the motor exceeds the software limit range	1. Check if the external limit switch is triggered 2. Check whether the limit input function is set correctly 3. Are the switches, wires and wiring connected to the limit input? 3. Ensure that the software limit is correct	Clears after disengaging the limit
	Negative prohibition limit	1. The reverse limit function of digital input is triggered 2. The actual position of the motor exceeds the software limit range		Clears after disengaging the limit
	Positive rotation prohibition limit	1. The positive rotation prohibition limit function of digital input is triggered 2. The actual position of the motor exceeds the software limit range		
	Motor overload status	The driver output current reaches the set current 1. The acceleration/deceleration setting is too large 2. The load is too heavy, the actual torque exceeds the set continuous operation torque for a long time 3. Poor adjustment of gain parameters causes motor vibration 4. The driven mechanism has collided with a hard limit and the load suddenly increases 5. The electromagnetic brake is in action 6. When there are multiple motors, wiring may be mixed up	1. Whether the gain parameters are properly debugged 2. Whether the motor selection matches the actual load and whether the acceleration or deceleration is too large 3. Check whether the sequence of U, V and W of the motor wires is correct, U-Red, V-Yellow, W-Blue 4. Increase the power of the driver and motor, and prolong the acceleration and deceleration time, reduce the load 5. Measure the voltage at the brake terminals	When output current drops below motor rated current, alarm self clears
	Communication alarm	1. An error occurred when using USB communication 2. An error occurs when using RS485 communication	1. The Luna software is trying to establish communication with the drive (This is a normal alarm at this time) 2. Check whether the communication address and baud rate are set correctly 3. Check whether the communication line is normal	self clears when communications restored to normal
	Failed to save parameters	Failed to save parameters	Please try saving again	Alarm clear
	Drive main circuit power supply input phase loss	Drive that requires3-phase power to operate powered by single phase	1.Check whether the main circuit wiring is reliable 2.Check whether the phases of the main circuit input power L1, L2, L3 differ by 120 degrees	Alarm clear
	Safe torque off	Safe torque off STO function is activated, pin SF1/SF2 is open	Check the input wiring status of safety inputs 1 and 2, or the safety All sensors etc. settings are triggered	Self clears after STO Inputs return to normal
	Regeneration potential discharge failed	1. Regenerative resistor disconnected 2. Built-in regenerative resistor is too small,Unable to meet the absorption regeneration potential 3. External regenerative resistor mismatch. Unable to meet the absorption regeneration potential	1. Check if the wiring of the external regenerative resistor is correct 2. Check whether the parameter settings of the internal/external regenerative resistor are reasonable 3. Check the resistance value of the external regenerative resistor, if ∞, it is broken or damaged. Please replace the external regenerative resistor 4. Use an external regenerative resistor with a larger value 5. Reduce the running speed of the equipment and increase the acceleration and deceleration time	Alarm clear
	Drive undervoltage	220V driver series: bus voltage below 170VDC 1. The power supply voltage is low, and a momentary power failure occurs 2. The power supply capacity is insufficient, and it is affected by the inrush current when the main power supply is turned on, causing the supply voltage to drop 3. The main circuit of the drive is not powered 4. Drive failure (circuit failure)	Check the input voltage 1. Replace the power supply or Improve power supply voltage capacity 2. Connect the power correctly 3. Check the driveL1/L2/L3Terminals and Input Voltage 4. If the above does not solve the problem, please replace the drive	Self clears when input voltage falls within specified range
	Q Segment Is empty	The drive is running in Q mode but current Q segment empty	1. Check whether the called segment has a Q program 2. Check whether the Q program is written incorrectly and cannot be run	Alarm clear
	Commanded Motion when motor not enabled	When the motor is not enabled, the drive received a motion command	Please enable the motor first and resend the operation command	Alarm clear
	drive internal voltage Error	The internal voltage of the driver is lower than the normal value	Check the voltage of the power supply,If you have any questions, please contact the manufacturer connect	Power Cycle to clear
				
	emergency stop	Digital input emergency stop function is triggered	1. Check if the emergency stop input switch is malfunctioning 2. Confirm whether the emergency stop input logic setting is correct	Self clears after removal of E-Stop Trigger

Display content	Description	Cause	Troubleshooting	Alarm Clear Method
r28FP	Fully closed loop hybrid deviation Overrun	Full closed-loop control mixed deviation exceeds the set value	1. examine the P3-10I setting 2. Examine CN4 to ensure external encoder connection is normal	Alarm clear
r29FE	Second encoder not connected	Second encoder Input to CN4 is abnormal	1. Check whether the connection of the second encoder connection is normal 2. Check whether the second encoder signal is normal	Alarm clear
r30nE	Parameter read failed	Abnormal internal memory of the drive	If it cannot be cleared after power cycling, please contact the manufacturer	Power cycle to clear
r3 1bt	Absolute encoder battery undervoltage	When the absolute encoder works in multi-turn mode,Battery The voltage is lower than the specified value 3.2V	Reminder to replace the battery To prevent the loss of absolute position, replace the battery with the drive powered on	auto clear
r32AP	Absolute position lost	At power-up, the absolute encoder operates in a multiturn mode with a battery voltage below 2.8V or an interruption in power supply that loses the absolute position of the internal multiturn 1.The encoder type is configured to an absolute value, but no battery is installed 2.Absolute encoders are used for the first time at the factory 3.The battery voltage is too low and the battery is not replaced in time 4.Replace the battery in case the drive control power is powered off 5.The battery-powered line is poorly contacted or disconnected	1.Check if the battery voltage is lower than 2.8V,if so please replace the battery in time 2.Replace the battery with the drive controlled by electrical power 3.Check and repair the wiring so that the battery can properly power the encoder a)Check the encoder wiring b)Check the wiring inside and outside the battery compartment and between the drive	After replacing the battery, the absolute value coder multi-turn zero operation is required
r33oP	Absolute position overflow	1. The number of turns of the absolute encoder multi-turn exceeds the maximum range: -32768 ~ +32767 2. The absolute position exceeds the maximum range parameterP3-05*(-32768) ~ parameter P3- 05*(+32767) -1	1. Check that the actual position of the motor exceeds the maximum range 2. Out of range, do absolute encoder multi-turn zeroing 3. For unidirectional operation, set the P3-15 to 2 (multi-turn encoder does not count overflow).	Self clears after multi-turn zeroing of absolute encoders
r34Nt	Motor overtemperature	The drive detects that the motor temperature exceeds the specified value	1. Check if the ambient temperature where the motor is located is too high 2. Reduce the ambient temperature of the motor and improve the cooling conditions 3. boost drive,motor capacity, extend acceleration and deceleration time and reduce load 4. Check whether the motor is rubbed by the load 5. When using a motor with an oil seal, please derate the output torque of the motor. It should be equal to 70% of its rated torque. 6. The heat dissipation and torque of the motor are measured when the motor is mounted on a standard heat dissipation board. When the motor mounting plate is small, in order to prevent the motor from overheating, please derate its output. 7. The motor temperature is normal and cannot be cleared by re-powering, please replace the motor	Alarm clear
r35Ct	drive processor over temperature	Drive processor temperature is too high	1.Detect if the ambient temperature of the drive is too high 2.Reduces the ambient temperature of the drive and improves the cooling conditions 3.The drive needs to be mounted on a heat-dissipating metal backplane 4.Increase the power of the drive and motor, extend the acceleration and deceleration time, and reduce the load 5.Check that the cooling fan is working properly 6.The drive heat sink temperature is normal and the alarm persists after powering back on, replace the drive	Alarm clear
r36Nr	Absolute encoder multiturn error	Absolute encoder multiturn error 1.The encoder type is configured to an absolute value, but no battery is installed 2.Absolute encoders are used for the first time at the factory	Absolute encoder multi-turn clearing operation is required	Self clears after multi-turn zeroing of absolute encoders
r37Et	Motor stall protection	Operating in non-torque mode, the motor stall time exceeded set time in P1-28	1. Check whether the mechanical parts driven by the motor are stuck 2. Check if the electromagnetic brake is activated	Alarm clear
r38CE	CANopencommunication Error	CANOpen communication error 1.CANopen communication parameters are misconfigured 2.CANopen communication was interrupted	1. Examine CANOpen Communication configuration parameters 2. Check whether the communication line is normal	Self clears after communications normalize
r39Hr	Homing parameter configuration error	1. A hominh parameter is mis-configured 2. Using a homing method with a limit signal when the limit signal is not configured 3. Using a homing mode with a home signal when the home signal is not configured	Check whether the homing parameters are properly configured	Alarm clear

Display content	Description	Cause	Troubleshooting	Alarm Clear Method
	Motor collision protection	The instantaneous change of current exceeds the P1-34 setpoint	1. Check whether the load collided with an object 2. Check if the P1-34 setpoint is too small	Alarm clear
	Motor encoder communication error	Communication error between motor encoder and drive	1. Check motor encoder wire 2. If the encoder line is normal and the alarm persists after drive is power cycled, please replace the motor or contact the manufacturer	Power Cycle to clear
	I/O Signal function multiplexing	1.The functionality of the I/O signals used in the Q program is not general purpose 2.The functionality of the I/O signals used in the SCL directive is not general purpose	1.Configure the relevant I/O signal functions as generic purpose 2.Use I/O signals that are configured as general purpose	Alarm clear

7 object dictionary

The object dictionary is the most important part of the device specification. it is an ordered set of parameters and variables that contain the description of the device and the state of the device network. Each object is addressed with a 16-bit index value, and an 8-bit sub-index is defined to allow access to individual elements in the data structure.

7.1 Object Dictionary Description

7.1.1 object dictionary classification

Please refer to the following table for the object dictionary structure outline.

Index Range (hex)	Object Class
0x0000	Not Used
0x0001 - 0x001F	Static data types (standard data types i.e. BOOL, INTEGER16)
0x0020 - 0x003F	Complex data types (predefined structures composed of simple types,likePDO CommPar,SDO Parameter)
0x0040 - 0x005F	Manufacturer-defined complex data types
0x0060 - 0x007F	Device Profile Specific Static Data Types
0x0080 - 0x009F	Device Profile Specific Complex Data Types
0x00A0 - 0x0FFF	Reserved for further use
0x1000 - 0x1FFF	Communication Profile Area
0x2000 - 0x5FFF	Manufacturer Specific Profile Area
0x6000 - 0x9FFF	Standardised Device Profile Area
0xA000 - 0xFFFF	Reserved for further use

7.1.2 Quantity Type

Refer to the following table for the data types used in this document.

type of data	size	Scope
BOOL	— —	0~1
UNSIGNED8	1 byte	$0\sim2_8-1$
UNSIGNED16	2 byte	$0\sim2_{16}-1$
UNSIGNED32	4 byte	$0\sim2_{32}-1$
INTEGER8	1byte	$-2_7\sim2_7-1$
INTEGER16	2 byte	$-2_{15}\sim2_{15}-1$
INTEGER32	4 byte	$-2_{31}\sim2_{31}-1$
Visible string	— —	— —

7.1.3 Object Property Description

For the properties contained in a CANOpen object see the following table.

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**

Property	Content
index	use4object index in hexadecimal representation
sub-index	use2object sub-index in hexadecimal representation
name	object name/sub-index name
access type	RO:read only RW:read/write
type of data	Please refer to7.1.2 type of data
unit	physical unit
set range	Range of data that can be set
Defaults	Factory-set value
PDO Mapping	RxPDO: mappable to RPDO TxPDO: mappable to TPDO NO: not mappable PDO

7.2 Communication Profile (0x1000-0x1FFF)

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1000	— —	Device Type	RO	UNSIGNED32	— —	— —	0x00020192	NO

Describe the device subprotocol type.

bit	name	content
0~15	Device Profile	0x0192:CiA402
16~31	Additional Information	0x02:server Driver
twenty four~31	model	reserved

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1001	— —	error register	RO	UNSIGNED8	— —	— —	0	NO

Describes the type of error that occurs in the servo drive,when a bit is set1When the error defined by this bit occurs.

bit	instruction	bit	instruction
0	Generic error	4	communication error
1	Current error	5	Device sub-protocol specific errors
2	voltage error	6	reserved
3	temperature error	7	reserved

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1008	— —	device name	RO	Visible string	— —	— —	M3-EC	NO

Name of the manufacturer as string

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1009	— —	hardware version	RO	Visible string	— —	— —	Hardware version decision	NO

Name of the hardware version as string.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x100A	— —	Software version	RO	Visible string	— —	— —	Software version decision	NO

Contains the manufacturer software version description.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1010	— —	parameter save	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~1	1	NO
	0x01	save all parameters	RW	UNSIGNED32	— —	0~2^{32}-1	0	NO

This object supports the saving of parameters in non-volatile memory.

Writing value 0x65766173 ('s','a','v','e' from LSB to MSB) into this location stores all Manufacturer specific parameters into the EEPROM.

MSB			LSB
e	v	a	s
65h	76h	61h	73h

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1011	— —	parameter initialization	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~1	1	NO
	0x01	restore all parameters	RW	UNSIGNED32	— —	0~2^{32}-1	1	NO

With this object the default values of parameters according to the communication or device profile are restored.

when in sub-index 0x01 write "64616F6Ch" (ASCII code:l oad) to restore factory defaults. After processing the value of this object is automatically restored to 1 regardless of whether the restore operation is successful or not.

MSB			LSB
d	a	o	l
64h	61h	6Fh	6Ch

Note:

For setting parameters to take effect, please restart the servo drive.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1018	— —	object identity	— —	— —	— —	— —	— —	— —
	0x00	max sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	Vendor-ID	RO	UNSIGNED32	— —	— —	0x00000168	NO
	0x02	Product Code	RO	UNSIGNED32	— —	— —	0x00000007	NO
	0x03	Revision number	RO	UNSIGNED32	— —	— —	0x00000001	NO
	0x04	Serial number	RO	UNSIGNED32	— —	— —	Firmware version decision	NO

The object at index 1018h contains general information about the device.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x10F1	— —	wrong settings	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~2	2	NO
	0x01	local error response	RW	UNSIGNED32	— —	— —	— —	NO
	0x02	Sync Error Count Limit	RW	UNSIGNED16	— —	— —	— —	NO

This feature is reserved. Not currently supported.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1600	— —	RxPDO1 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	5	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60400010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60600008	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x607A0020	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60B80010	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FE0120	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of RPDO1

sub-index 0x01~0x0C display the mapped application object information. The structure of the mapped application object is as follows:

MSB			LSB
bit	31 ••• 16	15 ••• 8	7 ••• 0
instruction	index	sub-index	data length in bits

note:

Changing the PDO mapping object is valid only if the CANopen communication state is pre-operational.

Be sure to reconfigure the mapped object each time the drive powers up, otherwise, the mapped object is the default parameter for the drive. When the same object is mapped multiple times, only the last object value is valid.

The maximum number of mappable application objects for 1 RxPDO is 12, and the maximum data length that can be mapped by 4 RxPDOs is 68 bytes.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1601	— —	RxPDO2 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	5	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60400010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60600008	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FF0020	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60B80010	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FE0120	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of RPDO2

sub-index 0x01~0x0C display the mapped application object information. For the structure and precautions of application object mapping, please refer to 0x1600.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1602	— —	RxPDO3 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	5	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60400010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60600008	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x607A0020	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60810020	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FE0120	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of RPDO3

sub-index 0x01~0x0C display the mapped application object information. For the structure and precautions of application object mapping, please refer to 0x1600.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1603	— —	RxPDO4 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	4	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60400010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60600008	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FF0020	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FE0120	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of RPDO4

sub-index 0x01~0x0C display the mapped application object information. For the structure and precautions of application object mapping, please refer to 0x1600.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1A00	— —	TxPDO1 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	11	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x603F0010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60410010	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60610008	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60640020	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60F40020	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60B90010	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BA0020	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BB0020	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BC0020	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BD0020	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FD0020	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of TPDO1

sub-index 0x01~0x0C display the mapped application object information. The structure of the mapped application object is as follows:

MSB			LSB
bit	31 ●●● 16	15 ●●● 8	7 ●●● 0
instruction	index	sub-index	bit length

Note:

Changing the PDO mapping object is valid only if the CANopen communication state is pre-operational.

Be sure to reconfigure the mapped object each time the drive powers up, otherwise, the mapped object is the default parameter for the drive.

When the same object is mapped multiple times, only the last object value is valid.

The maximum number of mappable app objects for 1 TxPDO is 12, and the maximum data length that can be mapped by 4 TxPDOs is 68 bytes.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1A01	— —	TxPDO2 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	12	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x603F0010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60410010	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60610008	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60640020	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x606C0020	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60F40020	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60B90010	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BA0020	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BB0020	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BC0020	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60BD0020	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FD0020	NO

Contains the mapping of TPDO2

sub-index 0x01~0x0C display the mapped application object information. For the structure and precautions of application object mapping, please refer to0x1A00.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1A02	— —	TxPDO3mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	7	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x603F0010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60410010	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60610008	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60640020	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x606C0020	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60F40020	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FD0020	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of TPDO3

sub-index 0x01~0x0C display the mapped application object information. For the structure and precautions of application object mapping, please refer to 0x1A00..

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1A03	— —	TxPDO4 mapping parameters	— —	— —	— —	— —	— —	— —
	0x00	Number of mapped objects	RO	UNSIGNED8	— —	0~12	7	NO
	0x01	mapped object 1	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x603F0010	NO
	0x02	mapped object 2	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60410010	NO
	0x03	mapped object 3	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60610008	NO
	0x04	mapped object 4	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60640020	NO
	0x05	mapped object 5	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x606C0020	NO
	0x06	mapped object 6	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60F40020	NO
	0x07	mapped object 7	RW	UNSIGNED32	— —	0~0xFFFFFFFF	0x60FD0020	NO
	0x08	mapped object 8	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x09	mapped object 9	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0A	mapped object 10	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0B	mapped object 11	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO
	0x0C	mapped object 12	RW	UNSIGNED32	— —	0~0xFFFFFFFF	— —	NO

Contains the mapping of TPDO4

sub-index 0x01~0x0C display the mapped application object information. For the structure and precautions of application object mapping, please refer to 0x1A00.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1C00	— —	Sync Manager Communication Type	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	SM0 Communication type	RO	UNSIGNED8	— —	— —	1	NO
	0x02	SM1 Communication type	RO	UNSIGNED8	— —	— —	2	NO
	0x03	SM2 Communication type	RO	UNSIGNED8	— —	— —	3	NO
	0x04	SM3 Communication type	RO	UNSIGNED8	— —	— —	4	NO

Describes the communication type for each synchronization manager.

Please refer to the table below for the relationship between the set value and the communication type:

value	Description
1	Mailbox receiving (Master→Slave)
2	Mailbox sending (slave→Master
3	RxPDO(Master→Slave)
4	TxPDO(Slave→Master)

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1C12	— —	Sync Manager 2 RxPDO Assignment	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	1	NO
	0x01	The index of the object allocated for RxPDO1	RW	UNSIGNED16	— —	0x1600~0x1603	0x1600	NO
	0x02	The index of the object allocated for RxPDO2	RW	UNSIGNED16	— —	0x1600~0x1603	— —	NO
	0x03	The index of the object allocated for RxPDO3	RW	UNSIGNED16	— —	0x1600~0x1603	— —	NO
	0x04	The index of the object allocated for RxPDO4	RW	UNSIGNED16	— —	0x1600~0x1603	— —	NO

Specifies the indexes of the objects allocated for RPDOs

Note:
Changing the PDO assignment object is valid only when the CANopen communication state is in the pre-operational state.
After the drive is powered on each time, be sure to reconfigure the allocation object, otherwise, the allocation object is the default parameter of the drive.
The maximum number of mappable objects is 4.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x1C13	— —	Sync Manager 3 TxPDO Assignment	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	1	NO
	0x01	The index of the object allocated for TxPDO1	RW	UNSIGNED16	— —	0x1A00~0x1A03	0x1A00	NO
	0x02	The index of the object allocated for TxPDO2	RW	UNSIGNED16	— —	0x1A00~0x1A03	— —	NO
	0x03	The index of the object allocated for TxPDO3	RW	UNSIGNED16	— —	0x1A00~0x1A03	— —	NO
	0x04	The index of the object allocated for TxPDO4	RW	UNSIGNED16	— —	0x1A00~0x1A03	— —	NO

Specifies the indexes of the objects allocated for TPDOs

Note:
Changing the PDO assignment object is valid only when the CANopen communication state is in the pre-operational state.
After the drive is powered on each time, be sure to reconfigure the allocation object, otherwise, the allocation object is the default parameter of the drive.
The maximum number of mappable objects is 4.

7.3 Manufacturer Specific Profile (0x2000-0x5FFF)

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2001	— —	Home Sensor	RO	UNSIGNED8	— —	0~8	8	NO

Specifies the input port for the homing sensor used in Home Control Mode. Assign the desired port number via a numeric value e.g. 1 represents a digital input X1

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2002	— —	Digital output status	RO	UNSIGNED32	— —	— —	0	NO

Describes the state of the drive's digital output ports.

bit	31 ●●● 20	19	18	17	16	15 ●●● 0
instruction	reserved	Y4	Y3	Y2	Y1	reserved

The following correlates the bit value with a corresponding output status: '0': Output OFF '1': Output ON

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2006	— —	Alarm clear	RW	UNSIGNED8	— —	0x55,0xAA	0	RxPDO

Describes the ability to clear a drive alarm type as a warning.

When the failure that caused the drive alarm is lifted, 0x55, then 0xAA are written to this object, and when the value of this object is switched from 0x55 to 0xAA, the drive alarm action is performed.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2007	— —	Q segment number	RW	UNSIGNED8	— —	1~12	1	RxPDO

Specifies the Q segment number that is invoked via the CANopen communication instruction in Q programming mode.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x200B	— —	DSP status code	RO	UNSIGNED32	— —	— —	0	TxPDO

Describes the current status code of a drive. Status of the drive is indicated by the bit(s) with a value of 1.

bit	Description		bit	Description
0	Servo enable		16	CSPfollow
1	sampling (LunaSoftware oscilloscope function is enabled)		17	Speed Consistency
2	Drive reports failure		18	zero speed
3	Movement in place		19	Torque arrives
4	in motion		20	same torque
5	jogging running		twenty one	The second group gain is working
6	decelerating		twenty two	The second control mode is working
7	waiting for an input signal (e.g. executeWIinstruction)		twenty three	speed to reach
8	parameter saving		twenty four	Homing Complete
9	drive warning		31~25	reserved function,keep as "0"
10	back to origin			
11	wait time (e.g. executionWT,WDinstruction)			
12	internal use			
13	Encoder checking			
14	Q program is running			
15	Servo ready			

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x200C	— —	Position Zero	RW	UNSIGNED8	— —	0~1	0	NO

Defines the function of zeroing out the value of the actual position 0x6064 of the motor.

Writing 1 to this object clears the current position of the motor to zero, after which the value of this object automatically reverts to 0.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x200F	— —	DSP Alarm Code	RO	UNSIGNED32	— —	— —	0	TxPDO

Describes the currentalarm code of a drive. Current alarm at the drive is indicated by the bit(s) with a value of 1.

bit	instruction		bit	instruction
0	Position error overrun		16	Drive main circuit power input phase loss
1	Reverse prohibition limit		17	Safe torque off
2	Forward rotation prohibition limit		18	reserved function,keep as "0"
3	over temperature		19	Motor speed exceeds limit
4	internal error		20	Drive undervoltage
5	Supply voltage out of range		21	emergency stop
6	reserved function,keep as "0"		22	Second encoder not connected
7	Drive overcurrent		23	Full closed loop hybrid deviation overrun
8	reserved function,keep as "0"		24	Absolute encoder battery undervoltage
9	Motor encoder not connected		25	Absolute position lost
10	USBCommunication exception		26	Absolute position overflow
11	reserved function,keep as "0"		27	Bus watchdog trigger
12	Regeneration potential bleed failed		28	Absolute encoder multi-turn error
13	Motor overload status		29	Abnormal motor action protection
14	reserved function,keep as "0"		30	reserved function,keep as "0"
15	Unusual start alarm		31	Back-to-origin parameter configuration error

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2019	— —	Driver Temperatures	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	Driver PCB Plate Temperature	RO	UNSIGNED16	0.1°C	— —	0	NO
	0x02	Driver DSP Temperature	RO	UNSIGNED16	0.1°C	— —	0	NO
	0x03	reserved	RO	UNSIGNED16	— —	— —	0	NO
	0x04	reserved	RO	UNSIGNED16	— —	— —	0	NO

Describes the temperature of the internal modules of the drive.

- sub-index 0x01 displays the driver PCB plate temperature.
- sub-index 0x02 displays the temperature value of the driver processor chip.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2020	— —	Node Address (Node-ID)	RO	UNSIGNED16	— —	0~0x7F	0	NO

Set the CANopen communication slave address (NODE-ID). May also set it through the drive configuration software Luna or the operation panel. The change takes effect after power cycle.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2021	— —	Communication Baud Rate	RO	UNSIGNED16	— —	0~7	0x0000	NO

Set the baud rate of CANOpen communication. May also set through the driver configuration software Luna or the operation panel. The change takes effect after power cycle.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2030	— —	DC Bus Voltage	RO	UNSIGNED16	0.1V	— —	0	NO

Describes the DC bus voltage value after the rectified input voltage of the main circuit of the drive.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2031	— —	DSP Firmware Version No.	RO	Visible string	— —	— —	0	NO
Specifies the device's DSP Firmware Version No.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2032	— —	FPGA Firmware Version No.	RO	Visible string	— —	— —	0	NO
Specifies the device's FPGA Firmware Version No.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2033	— —	Encoder Firmware Version Number	RO	Visible string	— —	— —	0	NO
Specifies the device's encoder Firmware Version No.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2038	— —	E-Stop Method	RW	UNSIGNED16	— —	0~1	0	NO

Specifies the stopping mode of the motor when the emergency stop signal of the digital input of the drive is valid.

value	Description
0	Stop Immediately, enter the Switch on disabled stat. During the stop, the dynamic brake will act according to the setting method of 0x2AB1 sub-index 1.
1	Stop Immediately, the drive reports an error and disables the motor. During the stop, the dynamic brake acts according to the setting method of 0x2AB1 sub-index 1.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2100	— —	User Defined Registers	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~26	26	NO
	0x01	Accumulator Register	RO	INTEGER32	— —	-2^{31}~2^{31}-1	0	NO
	0x02	User Defined Register 1	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x03	User Defined Register 2	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x04	User Defined Register 3	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x05	User Defined Register 4	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x06	User Defined Register 5	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x07	User Defined Register 6	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x08	User Defined Register 7	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x09	User Defined Register 8	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x0A	User Defined Register 9	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x0B	User Defined Register 10	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x0C	User Defined Register 11	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x0D	User Defined Register 12	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x0E	User Defined Register 13	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x0F	User Defined Register 14	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x10	User Defined Register 15	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x11	User Defined Register 16	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x12	User Defined Register 17	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x13	User Defined Register 18	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x14	User Defined Register 19	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x15	User Defined Register 20	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x16	User Defined Register 21	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x17	User Defined Register 22	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x18	User Defined Register 23	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x19	User Defined Register 24	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
	0x1A	User Defined Register 25	RW	INTEGER32	— —	- 2^{31}~2^{31}-1	0	Tx/RxPDO
Describes the volatile memory provided by the drive for use by the user.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A01	— —	Torque Overload Duration	RW	UNSIGNED32	ms	0~30000	0	NO

Describes the maximum duration for which the motor is overloaded with 3 times the rated torque.

When it is set to 0, the maximum duration for the motor running at 3 times overload is 2000 ms, during which the drive will not give an overload warning;

When it is set to non-0, the maximum duration for the motor running at 3 times overload will be equivalent to the set value, during which the driver will give an overload warning.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A02	— —	Torque Limit Method	RW	UNSIGNED32	— —	0~5	1	NO

Specifies the method for motor torque limiting

value	Description	
	Forward torque limit	Negative torque limit
0	0x60E0	0x60E1
1	0x2A03	
2	0x2A03	0x2A04
3	TQ-LMT Efficient: 0x2A03	
	TQ-LMT invalid: 0x2A05	
4	The second analog input torque limit	
5	TQ-LMT Efficient: 0x2A03	TQ-LMT efficient: 0x2A04
	TQ-LMT Invalid: 0x2A06	TQ-LMT Invalid: 0x2A06

Note:

TQ-LMT represents a digital torque limit input.

For torque limiting functions, see page 81.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A03	— —	First Torque Limit	RW	UNSIGNED32	0.1%	0~3000	3000	NO

Sets the first torque limit value of the motor. 100.0% corresponds to 1x the motor rated torque.

Note:

If the set value of this object is too small, the servo motor may experience insufficient torque when accelerating and decelerating.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A04	— —	Second Torque Limit	RW	UNSIGNED32	0.1%	0~3000	3000	NO

Sets the second torque limit value of the motor. 100.0% corresponds to 1x the motor rated torque.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A05	— —	Third Torque Limit	RW	UNSIGNED32	0.1%	0~3000	3000	NO

Sets the third torque limit value of the motor. 100.0% corresponds to 1x the motor rated torque.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A06	— —	Fourth Torque Limit	RW	UNSIGNED32	0.1%	0~3000	3000	NO

Sets the fourth torque limit value of the motor. 100.0% corresponds to 1x the motor rated torque.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A08	— —	Hard Stop Homing Torque Limit	RW	UNSIGNED32	0.1%	0~3000	1000	NO

This object sets the motor torque limit value for the manufacturer specified homing methods (-4 to -1). 100.0% corresponds to 1x the motor rated torque.

Note:

The value of this object is set according to the user's application requirement. If the set value is too small, it may lead to inaccurate homing. If the set value is too large it may cause damage to mechanical equipment.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A09	— —	Motor Stall Protection Time	RW	UNSIGNED32	ms	0~30000	0	NO

Sets the motor stall protection time.

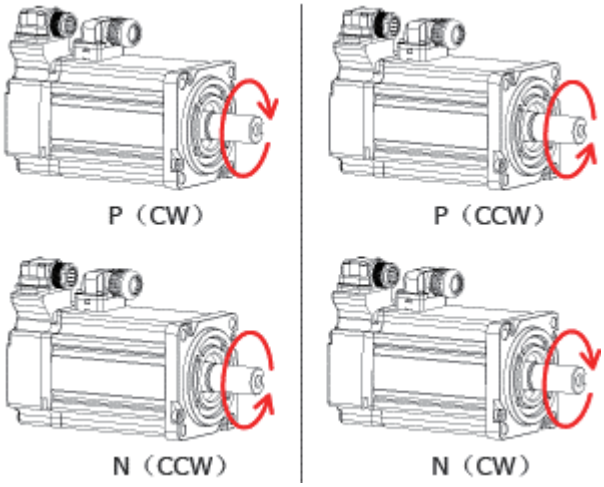
In non-torque modes, when the drive detects a motor stall and the duration exceeds this set value, the drive reports a motor stall failure. The drive displays alarm code: 

When this object is set to 0, it deactivates Motor Stall Protection.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A0A	— —	Motor Rotation Direction	RW	UNSIGNED8	— —	0~1	0	NO

Define the direction of positive and negative motion (when viewed from motor shaft)

value	positive direction of rotation	Description
0	CW directio is positive	During positive motion, when viewed from the motor shaft side, the shaft rotates clockwise.
1	CCW direction is positive	During positive motion, when viewed from the motor shaft side, the shaft rotates counter-clockwise.



index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A0B	— —	Encoder Resolution	RO	UNSIGNED32	— —	— —	2^{20}	NO

Defines the resoltuion of the motor encoder

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A10	— —	Digital output port function	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	digital output1Features	RW	UNSIGNED16	— —	0~36	0	NO
	0x02	digital output2Features	RW	UNSIGNED16	— —	0~36	twenty three	NO
	0x03	digital output3Features	RW	UNSIGNED16	— —	0~36	2	NO
	0x04	digital output4Features	RW	UNSIGNED16	— —	0~36	9	NO

Set the digital output port function. Please refer to the following table for parameter value settings. Do not set values other than those defined in the table.

function name	symbol	function name	
		Closed	**Open**
General Purpose	GPOUT	0	
Fault Output	ALM	1	2
Warning Output	WARN	3	4
Brake Release Output	BRK	5	6
Servo-on Status Output	SON-ST	7	8
Positioning Complete	COIN	9	10
Dynamic error following	DYM-LMT	11	12
Torque Reached Output	TQ-REACH	13	14
Torque Limit Output	T-LMT	15	16
Velocity Coincidence	V-COIN	17	18
Target Velocity Reached	AT-SPD	19	20
Velocity limit	V-LMT	21	22
Servo Ready	S-RDY	23	24
Homing Complete	HOMED	25	26
software limit(Positive)	SLCW	27	28
software limit(Negative)	SLCCW	29	30
In Position	IN-POS	31	32
Zero speed detection output	Z-SPD	33	34
Torque Coincidence	T-COIN	35	36

Closed: Output ON Open: Output OFF

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A11	— —	Analog Output 1 Parameter Configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~3	3	NO
	0x01	Offset	RW	UNSIGNED32	mV	— —	0	NO
	0x02	target	RW	UNSIGNED32	— —	0~32000	1000	NO
	0x03	function definition	RW	UNSIGNED32	— —	0~5	0	NO

Set the parameters of analog output 1

• Sub-index 0x01 sets the theoretical output voltage value of analog output 1 when the actual output voltage is 0V. This feature is reserved and is not currently supported.
• Sub-index 0x02 sets the value of the physical quantity selected by the output function of 0x03 when the actual output voltage is +10V (except 0x03=0).
• Sub-index 0x03 sets the physical quantity corresponding to the output voltage signal.

value	physical quantity	unit	Scope	instruction
0	actual voltage	mV	- 10000~10000	Use the OA1 command to directly set the actual voltage value that needs to be output
1	actual current	0.1%	0~3000	When the theoretical output voltage is +10V, the percentage of the actual output current of the driver relative to the rated current of the motor
2	command current	0.1%	0~3000	When the theoretical output voltage is +10V, the percentage of the command current relative to the rated current of the motor
3	actual speed	rps	0~100	When the theoretical output voltage is +10V, the actual speed of the motor
4	target speed	rps	0~100	When the theoretical output voltage is +10V, the speed loop gives the target speed
5	position error	Pulses	0~32640	When the theoretical output voltage is +10V, the position error after the electronic gear ratio

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A13	— —	Brake output parameter configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~2	2	NO
	0x01	Motion delay after brake release	RW	UNSIGNED32	ms	0~32000	200	NO
	0x02	Motor disable delay after brake engagement	RW	UNSIGNED32	ms	0~32000	200	NO

Set the parameters when the digital output of the drive is configured as the brake release function.

• Sub-index 0x01 sets the delay time from brake output ON (brake release) to execution of motion command.

• Sub-index 0x02 sets the delay time from brake output OFF (brake braking) to motor disabling.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A14	— —	Absolute arrival position	RW	INTEGER32	Pulses	-2^{31}-1~2^{31}-1	10000	NO

Sets the target position threshold parameter for when the digital output of the drive is configured as the position reaching function. When the absolute value of the difference between the actual position of the motor and this set value is less than 100 pulses, the position arrival signal is valid.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A15	— —	Positioning state related parameters	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	Dynamic following error threshold	RW	UNSIGNED32	Pulses	$0\sim2_{31}$-1	10	NO
	0x02	Motion Condition Timer	RW	UNSIGNED32	ms	0~30000	40	NO
	0x03	Positioning complete signal position error threshold	RW	UNSIGNED32	Pulses	0~32000	40	NO
	0x04	Command position input completion detection time	RW	UNSIGNED32	ms	0~20000	2	NO

Set the parameters for the state related to the motor position.

• Sub-index 0x01 sets the dynamic following error threshold. When the absolute value of the position deviation value is within this set value, the dynamic error following signal is valid.

• Sub-index 0x02 sets the valid time window for positioning completion, speed arrival, speed agreement, zero-speed detection, torque arrival and torque agreement signals.

• Sub-index 0x03 sets the position error threshold of the positioning completion signal, the absolute value of the position deviation value is within this set value, and the duration reaches the set time of sub-index 2 of 0x2A15, the positioning completion signal is valid.

• Sub-index 0x04 sets the detection time when the drive receives the controller command position or not.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A16	— —	Speed-related state parameters	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~3	3	NO
	0x01	Zero speed judgment threshold	RW	UNSIGNED32	Pulses/s	$0\sim2_{32}$-1	5000	NO
	0x02	Velocity Reached Threshold	RW	UNSIGNED32	Pulses/s	$0\sim2_{32}$-1	100000	NO
	0x03	Velocity Coincidence Range	RW	UNSIGNED32	Pulses/s	$0\sim2_{32}$-1	2000	NO

Sets parameters for motor speed related states.

• Sub-index 0x01 sets the zero-speed judgment threshold. If the command speed is 0 and the absolute value of the actual speed is within this set value, and the duration reaches the time set by sub-index 2 of 0x2A15, the The zero-speed detection signal is valid when the motor is close to a standstill.

• Sub-index 0x02 sets the target value for judging the speed reached. When the the actual speed exceeds this set value, and the duration reaches the time set by sub-index 2 of 0x2A15, it is considered that the motor speed reached the expected value. The speed arrival signal is valid.

• Sub-index 0x03 sets the fluctuation range for Velocity Coincidence to be achieved. If the absolute value of the difference between the actual speed and the target speed 0x60FF is within this set value, and the duration reaches 0x2A15 sub-index 0x02, it is considered that the actual speed of the motor reached the expected value, and the Velocity Coincidence signal is valid.

$$\text{speed(rpm)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times \text{setpoint}}{\text{0x2A90}}$$

Speed < 0.25 RPM sets the speed setting to 0.

The maximum speed that can be set is 6000rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A17	— —	Torque uniform fluctuation range	RW	UNSIGNED32	0.1%	0~3000	10	NO

Set the fluctuation range in which the motor torque is consistent.

When the absolute value of the difference between the actual torque and the target torque 0x6071 is within this set value, and the duration reaches the set time of sub-index 2 of 0x2A15, it is considered that the actual torque of the motor has reached the time limit. The desired value, the torque consistent signal is valid.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A18	— —	Judging that the torque reaches the target value	RW	UNSIGNED32	0.1%	0~3000	0	NO

Set the target value for judging torque arrival.

When the absolute value of the difference between the value of the actual torque and the target value is within the torque consistent fluctuation range (0x2A17), and the duration reaches the set time of sub-index 2 of 0x2A15, it is considered that the actual torque of the motor reached the expected value. The torque arrival signal is valid.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A20	— —	Digital Input Function Assignments	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~8	8	NO
	0x01	Digital Input 1 Function	RW	UNSIGNED16	— —	0~46	7	NO
	0x02	Digital Input 2 Function	RW	UNSIGNED16	— —	0~46	5	NO
	0x03	Digital Input 3 Function	RW	UNSIGNED16	— —	0~46	3	NO
	0x04	Digital Input 4 Function	RW	UNSIGNED16	— —	0~46	0	NO
	0x05	Digital Input 5 Function	RW	UNSIGNED16	— —	0~46	13	NO
	0x06	Digital Input 6 Function	RW	UNSIGNED16	— —	0~46	19	NO
	0x07	Digital Input 7 Function	RW	UNSIGNED16	— —	0~46	0	NO
	0x08	Digital Input 8 Function	RW	UNSIGNED16	— —	0~46	39	NO

Set the functions of the digital input ports of the drive. Please refer to the following table for parameter value setting. Do not set values other than those defined in the table.

function name	symbol	value	
		Closed	**Open**
General Purpose	GPIN	0	
Alarm Clear	A-CLR	3	4
CW Position Limit	CW-LMT	5	6
CCW Position Limit	CCW-LMT	7	8
Gain Switching	GAIN-SEL	11	12
Emergency Stop	E-STOP	13	14
Torque Limit Input	TQ-LMT	19	20
Zero Speed Clamp Input	ZCLAMP	21	22
Speed Limit Input	V-LMT	37	38
Home Switch	HOM-SW	39	40
Virtual CW Limit	Virtual-CW-LMT	41	42
Virtual CCW Limit	Virtual-CCW-LMT	43	44

Closed: Input ON Open: Input OFF

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A21	— —	Digital Input Filtering	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~8	8	NO
	0x01	Digital Input 1 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x02	Digital Input 2 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x03	Digital Input 3 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x04	Digital Input 4 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x05	Digital Input 5 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x06	Digital Input 6 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x07	Digital Input 7 Filter	RW	UNSIGNED16	ms	0~8000	0	NO
	0x08	Digital Input 8 Filter	RW	UNSIGNED16	ms	0~8000	0	NO

Set the filter time of the low-pass filter of the digital input port of the drive. The input filter supports up to 4 valid inputs at once.

Note:

Setting the appropriate filter time is beneficial to eliminate external interference signals. If the filter time is too long, it will cause the input signal to lag.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A22	— —	Analog Input 1 Configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~5	5	NO
	0x01	dead zone	RW	UNSIGNED32	mV	0~255	0	NO
	0x02	Offset	RW	INTEGER32	mV	- 10000~10000	0	NO
	0x03	low pass filter	RW	UNSIGNED32	0.1Hz	0~20000	1000	NO
	0x04	trigger threshold	RW	INTEGER32	mV	- 10000~10000	5000	NO
	0x05	reserved	— —	— —	— —	— —	0	NO

Set the analog input 1 parameters.

- Sub-index 0x01 sets the range of analog input 1 input voltage when the sampling voltage value of the drive is 0.
- Sub-index 0x02 sets the actual input voltage value of analog input 1 when the sampling voltage value of the drive is 0.
- Sub-index 0x03 sets the drive's low-pass filtering frequency for the input voltage signal.
- Sub-index 0x04 sets the voltage value when the digital level state changes when the analog input of the drive is used as a digital function.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A23	— —	Analog Input 2 Configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~5	5	NO
	0x01	dead zone	RW	UNSIGNED32	mV	0~255	0	NO
	0x02	Offset	RW	INTEGER32	mV	- 10000~10000	0	NO
	0x03	low pass filter	RW	UNSIGNED32	0.1Hz	0~20000	1000	NO
	0x04	trigger threshold	RW	INTEGER32	mV	- 10000~10000	5000	NO
	0x05	reserved	— —	— —	— —	— —	— —	NO

Set the analog input 2 parameters

• Sub-index 0x01 sets the range of analog input 2 input voltage when the sampling voltage value of the drive is 0.

• Sub-index 0x02 sets the actual input voltage value of analog input 2 when the sampling voltage value of the drive is 0.

• Sub-index 0x03 sets the drive's low-pass filtering frequency for the input voltage signal.

• Sub-index 0x04 sets the voltage value when the digital level state changes when the analog input of the drive is used as a digital function.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A25	— —	Analog input voltage value	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~3	3	NO
	0x01	Analog Input 1 Voltage Value	RO	INTEGER32	mV	— —	0	TxPDO
	0x02	Analog Input 2 Voltage Value	RO	INTEGER32	mV	— —	0	TxPDO
	0x03	reserved	— —	— —	— —	— —	0	TxPDO

Describe the actual sampled voltage value of the analog input.

- sub-index 0x01 Describe the actual value of the sampled voltage at analog input 1
- sub-index 0x02 Describe the actual value of the sampled voltage at analog input 2

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A26	— —	Analog input auto-zero	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~3	3	NO
	0x01	Analog Input 1 Auto Zero	RW	INTEGER32	— —	0~1	0	NO
	0x02	Analog Input 2 Auto Zero	RW	INTEGER32	— —	0~1	0	NO
	0x03	reserved	— —	— —	— —	— —	0	NO

Set the analog input sampling voltage to auto-zero.

• Sub-index 0x01 sets the automatic zero adjustment of the sampling voltage of analog input 1 and 2. When this parameter is set to 1, the automatic zero adjustment is performed, and then the value of this object is automatically restored to 0.

• Sub-index 0x02 sets the automatic zero adjustment of the sampling voltage of analog input 1 and 2. When this parameter is set to 1, the automatic zero adjustment is performed, and then the value of this object is automatically restored to 0.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A27	— —	Analog Input Function Assignment	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~6	6	NO
	0x01	Analog Input 1 Function Assignment	RW	UNSIGNED32	— —	0~1	0	NO
	0x02	reserved	— —	UNSIGNED32	— —	— —	0	NO
	0x03	reserved	— —	UNSIGNED32	— —	— —	0	NO
	0x04	reserved	— —	UNSIGNED32	— —	— —	0	NO
	0x05	Analog Velocity Scaling	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	500000	NO
	0x06	Analog Torque Scaling	RW	UNSIGNED32	0.1%	0~3000	1000	NO

Set the function of the analog input signal.

- sub-index 0x01 Set the analog input 1 function.

value	instruction
0	General Purpose
1	Analog Speed Control

- sub-index 0x02 reserved.
- sub-index 0x03 reserved.
- sub-index 0x04 reserved.
- Sub-index 0x05 sets the function of analog input 1 to limit speed. When the analog sampling voltage value is +10V, the drive controls the command speed value of the motor.

$$\text{speed(rpm)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times \text{setpoint}}{\text{0x2A90}}$$

- Sub-index 0x06 sets the function of analog input 2 to limit torque. When the analog sampling voltage value is +10V, the drive controls the command torque as a percentage of the motor's rated torque.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A30	— —	Main Control Mode	RW	UNSIGNED32	— —	1,15,21,30	twenty one	NO

Specifies the main control mode of the drive.

value	Description
1	Torque mode (TQ)
15	Cyclic Synchronous Velocity Mode (CSV)
21	Profile Velocity Mode (PV),Homing Mode (HM), Q Program Mode
30	Profile Position Mode (PP)

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A31	— —	Secondary Control Mode	RW	UNSIGNED32	— —	1,2,7,11,15,21	twenty one	NO

Describes the secondary control mode of the drive. This feature is reserved and not currently supported.

value	Description
1	Command Torque Mode
2	Analog Torque Mode
7	Pulse Mode
11	Analog Speed Mode
15	Command Speed Mode
21	Point-to-Point Position Mode

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A32	— —	Power-on working mode	RO	UNSIGNED32	— —	— —	10	NO

Describes the state of the drive after power-on.

value	Description
10	Modbus mode, power on disabled

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A33	— —	Speed Control Clamp Mode	RW	UNSIGNED32	— —	1~2	2	NO

Describes the control type of the drive in Profile Velocity Mode (PV) and Cyclic Synchronous Velocity Mode.

value	instruction
1	Real-time detection of position error, when the absolute value of the position error is greater than the position error alarm threshold 0x2AA8, the driver will report a position error overrun fault
2	Speed control only, no position error detected

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A34	— —	Regen Resistor Parameter Configurations		— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~3	3	NO
	0x01	Resistance Value	RW	INTEGER32	Ω	10~32000	200	NO
	0x02	Resistor Power	RW	INTEGER32	W	0~32000	40	NO
	0x03	Absorption Time Constant	RW	INTEGER32	ms	0~8000	1000	NO

Sets the parameters of the built-in or external regenerative energy absorption resistor.

•sub-index 0x01 sets the resistance of the built-in or external regenerative energy absorption resistor.
•sub-index 0x01 sets the power of the built-in or external regenerative energy absorption resistor.
•sub-index 0x03 sets the absorption resistance energy absorption time.

Note:

1. The full range of M3 drivers have built-in regenerative resistors. Different driver models have different specifications of built-in resistors. The minimum resistance allowed for external resistors is also different.

2. Please set the parameters of the regen resistor according to the specifications of the actual external resistor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A35	— —	Operation Panel Lock	RW	UNSIGNED32	— —	0~1	0	NO

Specifies the drive's control panel lock function setting

value	Description
0	Enable operation panel parameter setting
1	Disable operation panel parameter setting

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A36	— —	LED Default Display Item	RW	UNSIGNED32	— —	0~20	0	NO

Set the LED display item on the control panel of the drive.

value	Description		value	Description
0	Real-Time Motor Velocity unit: RPM		11	Alarm History3
1	Real-Time Motor Position Deviation unit: Pulses		12	Alarm History4
2	Command Pulse Input Count unit: Pulses		13	Alarm History 5
3	Motor Encoder Position unit: Pulses		14	Alarm History 6
4	Command Position unit: Pulses		15	Alarm History 7
5	Drive Temperature unit: 0.1°C		16	Analog Input 1 Sampling Voltage unit: mV
6	DC bus voltage value unit: 0.1V		17	Analog Input 2 Sampling Voltage unit: mV
7	CANOpen Communication Node ID		18	Digital Input Status 0:Input OFF, 1: Input ON
8	Alarm History 0		19	Digital Output Status 0: Output OFF, 1: Output ON
9	Alarm History1		20	Command Torque Percentage unit: 0.1%
10	Alarm History 2		21	reserved

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A37	— —	Alarm Masking	RW	UNSIGNED32	— —	$0 \sim 2_{32}-1$	$2_{32}-1$	NO

Sets the warning message displayed on the driver LED display, which is masked when a bit is set to 0.

bit	Description		bit	Description
0	reserved		16	reserved function, please keep it as "1"
1	Negative Position Limit		17	reserved function, please keep it as "1"
2	Positive Position Limit		18	reserved function, please keep it as "1"
3	reserved function, please keep it as "1"		19	reserved function, please keep it as "1"
4	reserved function, please keep it as "1"		20	reserved function, please keep it as "1"
5	reserved function, please keep it as "1"		21	Emergency Stop
6	reserved function, please keep it as "1"		22	reserved function, please keep it as "1"
7	reserved function, please keep it as "1"		23	reserved function, please keep it as "1"
8	reserved function, please keep it as "1"		24	reserved function, please keep it as "1"
9	reserved function, please keep it as "1"		25	Absolute Position Lost
10	USB Communication alarm		26	Absolute Position Overflow
11	Failed to save parameters		27	reserved function, please keep it as "1"
12	reserved function, please keep it as "1"		28	reserved function, please keep it as "1"
13	Overload Status		29	reserved function, please keep it as "1"
14	reserved function, please keep it as "1"		30	reserved function, please keep it as "1"
15	Motion commanded when disabled		31	Homing Parameter Configuration Error

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A42	— —	Jog Speed Configuration (Scaled)	RW	INTEGER32	Pulses/s	$-2_{31} \sim 2_{31}-1$	100000	NO

Set the drives Jog Speed (scaled)

$$\text{speed(rpm)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times 0x2A42}{0x2A90}$$

when |speed|< 0.25 rpm, the set speed value is 0.

The maximum settable |Speed| value is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A43	— —	Jog Acceleration (Scaled)	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	1000000	NO

Specifies the drives Jog Acceleration (scaled)

$$\text{acceleration(rpm/s)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times 0x2A43}{0x2A90}$$

When acceleration <10 rpm/s, the set acceleration value is0.

The maximum settable value of acceleration is 300000 rpm/s.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A44	— —	Jog Deceleration (Scaled)	RW	UNSIGNED32	Pulses/s_2	0~2_{32}-1	1000000	NO

Specifies the drives Jog deceleration (scaled)

$$\text{deceleration(rpm/s)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times 0x2A44}{0x2A90}$$

When deceleration <10 rpm/s, the set deceleration value is 0.

The maximum settable value of deceleration is 300000 rpm/s.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A45	— —	Internal point-to-point mode speed regulation (scaled)	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	20000	NO

Set the speed change value of the servo in the Q programming mode (Q) using FC and FD instructions to control the motor movement.

$$\text{speed(rpm)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times 0x2A45}{0x2A90}$$

when |speed|< 0.25 rpm, the set speed value is 0.

The maximum settable |Speed| value is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A46	— —	Multi-speed control parameter setting (scaled)	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~8	8	NO
	0x01	1st gear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	20000	NO
	0x02	2ndgear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	100000	NO
	0x03	3rd gear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	200000	NO
	0x04	4th gear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	250000	NO
	0x05	5th gear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	300000	NO
	0x06	6th gear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	350000	NO
	0x07	7th gear speed value	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	400000	NO
	0x08	8th gear speed value	RW	INTEGER32	Pulses/s	- 2^{31}~2^{31}-1	500000	NO

Sets the speed parameters of the servo when using multi-segment speed control in Q programming mode(Q).

$$\text{speed (rpm)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times \text{setpoint}}{0x2A90}$$

when |speed|< 0.25 rpm, the set speed value is 0.

The maximum settable |Speed| value is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A47	— —	Speed limit in torque mode (scaled)	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO

Set the maximum speed value of the servo in torque mode (TQ) and cyclic synchronous torque mode (CST).

$$\text{speed (rpm)} = \frac{60 \times \text{setpoint}}{\text{The number of pulses required for one revolution of the motor}} = \frac{60 \times 0x2A47}{0x2A90}$$

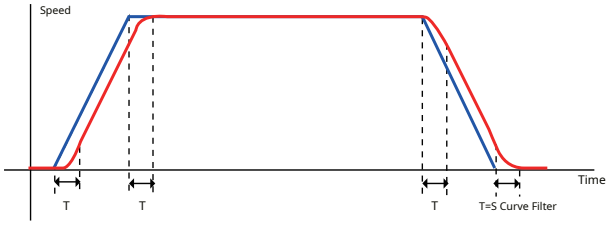
The setting should not be greater than the maximum speed setting value of 0x607F.

When |speed|< 0.25 rpm, the set speed value is 0. At this time, the driver only has current loop control, and the maximum speed setting value is 6000rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A4C	— —	Jerk Time	RW	UNSIGNED32	ms	0~125	10	NO

Sets the FIR filter time for the drive when using internal trajectory planning. This parameter can reduce the motion transients of the motor and mechanical system, and make the motor run more smoothly.

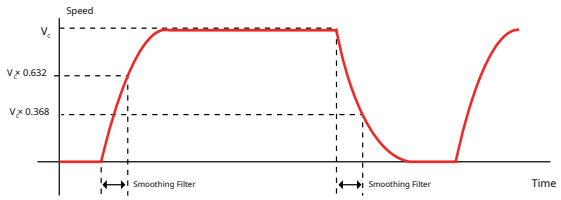
The effect of the jerk time on the input command is shown in the figure below.



index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A4D	— —	low pass smoothing filter	RW	UNSIGNED32	ms	0~1000	10	NO

Set the smoothing filter time for the drive to the command. This parameter can reduce the motion transients of the motor and mechanical system, and make the motor run more smoothly.

The effect of the command smoothing filter time on the input command is shown in the figure below.



index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A4E	— —	interpolation filter	RW	UNSIGNED32	ms	0~125	10	NO

Set the FIR filter time of the drive for external position commands. This parameter can reduce the motion transients of the motor and mechanical system, and make the motor run more smoothly.

For the effect of the interpolation filter time on the input command, please refer to the 0x2A4C parameter effect diagram.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A50	— —	Parameter Tuning Mode	RW	UNSIGNED32	— —	0~2	0	NO

Set the drive parameter tuning mode.

value	Tuning mode	Description
0	No tuning	The user only needs to set the system rigidity level
1	auto-tuning	The user needs to set the system rigidity level, load type and Inertia Ratio Parameters
2	Fine Tuning	The user needs to manually set the inertia ratio and gain parameters

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A51	— —	load type	RW	UNSIGNED32	— —	0~2	0	NO

Set the type of servo motor load.

when 0x2A50, the parameter tuning type, is set to1 (auto-tuning), please refer to the following table for load type settings.

value	load type	instruction
0	normal load	Horizontally placed screw-type loads
1	rigid load	Rigid lead screw, turntable load
2	Flexible load	Use timing belt,belt load

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A52	— —	Load inertia ratio	RW	UNSIGNED32	0.01	0~10000	0	NO

Set the ratio of the inertia of the mechanical load to the moment of inertia of the motor rotor.

$$\text{Load inertia ratio} = \frac{\text{Mechanical load inertia + motor rotor inertia}}{\text{Motor rotor moment of inertia}}$$

when 0x2A50, the parameter tuning type, is set to 1 o r2(automatic tuning or advanced tuning), this object allows manual setting or automatic detection of load inertia ratio.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A53	— —	first rigidity level	RW	UNSIGNED32	— —	1~20	5	NO

Set the rigidity of the servo system. In no-tuning and auto-tuning modes, the higher the rigidity level, the stronger the gain and faster the response. Excessive rigidity can cause vibration and noise. 1 is the least rigid,20 is the most rigid.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A54	— —	Second rigidity level	RW	UNSIGNED32	— —	1~20	5	NO
Set the rigidity of the servo system. When gain switching is turned on, the second rigidity level is valid under the corresponding conditions. In no-tuning and auto-tuning modes, the higher the rigidity level, the stronger the gain and faster the response. Excessive rigidity can cause vibration and noise. 1 is the least rigid,20 is the most rigid.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A55	— —	first position loop gain	RW	UNSIGNED32	0.1Hz	0~20000	52	NO
Sets the position control loop proportional gain. This parameter determines the responsiveness of the position loop. Increasing the position loop gain can reduce the system following error and reduce positioning time. Setting too high may cause vibration and noise.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A56	— —	1st position loop integration time constant	RW	UNSIGNED32	ms	0~30000	0	NO
Sets the position loop integral time constant. Reducing the integral time constant can improve the responsiveness of the position loop and reduce following error. This feature is reserved and not yet supported								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A57	— —	First position loop differential time constant	RW	UNSIGNED32	ms	0~30000	0	NO
Sets the position loop differential time constant. Reducing the differential time constant can significantly enhance the system's ability to suppress vibration, and quickly stabilize.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A58	— —	First Position Loop Differential Filtering frequency	RW	UNSIGNED32	0.1Hz	0~40000	20000	NO
Sets the position loop differential filtering frequency. Reducing the differential filter frequency prevents jitter, and reduces the noise caused by the differential time constant.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A59	— —	Speed feed forward gain	RW	INTEGER32	0.01%	- 30000~30000	3000	NO
Sets the speed feed forward gain. Improves responsiveness during position loop control and reduces positioning time. Setting too large may cause overshooting or vibration and the positioning time may not be shortened.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A5A	— —	speed feedforward filter frequency	RW	UNSIGNED32	0.1Hz	0~40000	20000	NO
Sets the speed feedforward cutoff frequency. Reducing the velocity feedforward filter frequency suppresses velocity overshoot or vibration, but the positional deviation increases as the velocity changes.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A5B	— —	First command speed gain	RW	INTEGER32	0.01%	- 30000~30000	10000	NO
Sets speed loop command speed reference gain. Increasing the command speed gain can improve the responsiveness of the speed loop control.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A5C	— —	first speed loop gain	RW	UNSIGNED32	0.1Hz	0~30000	183	NO
Sets the speed loop gain. This parameter determines the responsiveness of the speed loop, the larger the parameter is, the faster the speed loop responds. Setting too high may cause vibration and noise. In position control mode, to increase the position loop gain, it is necessary to increase the speed loop gain at the same time.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A5D	— —	Integral time of the first speed loop constant	RW	UNSIGNED32	ms	0~30000	189	NO
Sets the speed loop integral time constant. The smaller the value of this parameter, the better the integral effect and the smaller the steady-state deviation. If the setting is too small, it will cause vibration and noise of the entire servo system.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A5E	— —	Acceleration feedforward gain	RW	UNSIGNED32	0.01%	0~20000	3000	NO
Set the acceleration feed forward gain. By giving the open-loop control current of a certain load under a certain acceleration, the system followability can be significantly improved, thereby suppressing the overshoot at the end of acceleration and deceleration.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A5F	— —	Acceleration feedforward filter frequency	RW	UNSIGNED32	0.1Hz	0~40000	20000	NO

Sets acceleration feedforward filter frequency.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A60	— —	First command torque filter frequency	RW	UNSIGNED32	0.1Hz	0~40000	1099	NO

Sets the filter frequency of the command torque low-pass filter.

By low-pass filtering the command torque one caan make the command torque smoother by dampening vibration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A61	— —	Second position loop gain	RW	UNSIGNED32	0.1Hz	0~20000	52	NO

Sets the position control loop proportional gain.

This parameter determines the responsiveness of the position loop. Increasing the position loop gain can reduce the system following error, reducing the positioning time. Setting too high may cause vibration and noise.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A62	— —	Second position loop integration time constant	RW	UNSIGNED32	ms	0~32767	0	NO

Sets the position loop integral time constant. Reducing the integral time constant can improve the responsiveness of the position loop by reducing following error. This feature is reserved and not yet supported

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A63	— —	Second position loop differential time constant	RW	UNSIGNED32	ms	0~30000	0	NO

Sets the position loop derivative time constant. Reducing the differential time constant can significantly enhance the system's ability to suppress vibration, and quickly stabilize..

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A64	— —	Second Position Loop Differential Filtering frequency	RW	UNSIGNED32	0.1Hz	0~40000	20000	NO

Sets the position loop differential cutoff frequency. Reducing the differential filter frequency prevents jitter,and reduces the noise caused by the differential time constant.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A65	— —	Second command speed gain	RW	INTEGER32	0.01%	- 30000~30000	10000	NO

Sets speed loop command speed reference gain. Increasing the command speed gain can improve the responsiveness of the speed loop control.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A66	— —	Second speed loop gain	RW	UNSIGNED32	0.1Hz	0~30000	183	NO

Sets the second speed loop gain.

This parameter determines the responsiveness of the speed loop. The larger the parameter is, the faster the speed loop responds. Setting too high may cause vibration and noise. In position control mode, if the user increases the position loop gain, they must also increase speed loop gain.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A67	— —	Second speed loop integration time constant	RW	UNSIGNED32	ms	0~30000	189	NO

Set speed loop integral time constant.

The smaller the value of this parameter, the better the integration effect and the smaller the steady-state deviation. Setting too small will cause vibration and noise of the entire servo system.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A68	— —	Second command torque filter frequency	RW	UNSIGNED32	0.1Hz	0~40000	1099	NO

Sets the filter frequency of the command torque low-pass filter.

By low-pass filtering the command torque, one can make the command torque smoother by dampening vibration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A69	— —	Gain switching parameter configuration	— —	— —	— —	— —	— —	NO
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~6	6	NO
	0x01	Gain switching condition selection	RW	UNSIGNED32	— —	0~4	0	NO
	0x02	position deviation	RW	UNSIGNED32	Pulses	0~2_{31}-1	0	NO
	0x03	Max Velocity	RW	INTEGER32	Pulses/s	0~2_{31}-1	0	NO
	0x04	Max Torque	RW	INTEGER16	0.1%	0~3000	10	NO
	0x05	The second gain switches to the first gain benefit delay time	RW	UNSIGNED32	ms	0~10000	10	NO
	0x06	The first gain switches to the second gain benefit delay time	RW	UNSIGNED32	ms	0~10000	10	NO

Set parameters for gain switching.

- sub-index 0x01 sets the gain switching conditions.

value	Gain switching condition	instruction
0	Fixed at the first set of gains	Fixed at the first set of gains
1	Position Deviation	Only in position control mode. Valid for full closed loop function In the first set of gains, the absolute value of the actual position deviation exceeds 0x2A69 sub-index 0x02 and the duration reaches 0x2A69 sub-index 0x06 . Switch to the second set of gains In the second set of gains, the absolute value of the actual position deviation is less than 0x2A69 sub-index 0x02 and the duration reaches 0x2A69 sub-index 0x05. Return to the first set of gains.
2	Velocity Overshoot	In the first set of gains, the absolute value of the actual speed exceeds 0x2A69 sub-index 0x03 and the duration reaches 0x2A69 sub-index 0x06. Switch to the second set of gains In the second set of gains, the absolute value of the actual speed is lower than 0x2A69 sub-index 0x03 and the duration reaches 0x2A69 sub-index 0x05. Return to the first set of gains
3	Torque Overshoot	In the first set of gains, the percentage of the absolute value of the actual torque relative to the rated torque of the motor exceeds 0x2A69 sub-index 0x04 and the duration reaches 0x2A69 sub-index 0x06. Switch to the second set of gains. In the second set of gains, the percentage of the absolute value of the actual torque relative to the rated torque of the motor is lower than 0x2A69 sub-index 0x04, and the duration reaches 0x2A69 sub-index 0x05. Return to the first set of gains
4	Positioning completed	Only in position control mode. Valid for full closed loop function in the first set of gains, if positioning is not completed, switch to the second set of gains in the second set of gains, if the positioning is completed and the duration reaches 0x2A69 sub-index 0x05, return to the first set of gains

- sub-index 0x02 Sets the position deviation value that causes gain switching when the gain switching condition is selected as position deviation.
- sub-index 0x03 Sets the maximum speed value that causes gain switching when the gain switching condition is selected as Velocity Overshoot.
- sub-index 0x04 Sets the maximum torque value that causes gain switching when the gain switching condition is selected as Torque Overshoot.
- sub-index 0x05 Sets the time required for the switching condition to be satisfied and cause a switch from the second set of gains to the first set of gains.
- sub-index 0x06 Sets the time required for the switching condition to be satisfied and cause a switch from the first set of gains to the second set of gains.

Note:

For gain switching function, please refer to page 83.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A6A	— —	Fully closed loop mode switch	RW	UNSIGNED32	— —	0~1	0	NO

Set the servo system full closed-loop control function.

value	Description
0	Semi-closed loop control mode
1	Fully closed loop control mode The drive needs to be connected to the second encoder

Note:

For fully closed loop function, please refer to page 86.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A6B	— —	Second encoder resolution	RW	UNSIGNED32	Pulses/mm	200~100000	10000	NO

Sets the resolution of the second encoder under the fully closed-loop control function of the servo system.

When the second encoder is a linear displacement encoder, the value of the 0x2A6B object is the number of pulses that the second encoder outputs every 1mm displacement.

When the second encoder is a rotary displacement sensor, the value of 0x2A6b is the number of pulses output by the second encoder rotating one turn.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A6C	— —	Second Encoder Direction	RW	UNSIGNED32	— —	0~1	0	NO

Sets the positive direction of the internal count of the drive for the second encoder connected to the drive.

value	Description
0	A Phase ahead of B Phase
1	B Phase ahead of A Phase

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A6D	— —	position loop gain (fully closed loop mode)	RW	UNSIGNED32	0.1Hz	0~20000	52	NO

Sets the proportional gain of the position control loop under the fully closed loop function.

This parameter determines the responsiveness of the position loop. Increasing the position loop gain can reduce the system following error and reduce positioning time. Setting too high may cause vibration and noise.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A6E	— —	Position Loop integral Time constant (fully closed loop mode)	RW	UNSIGNED32	ms	0~32767	0	NO

Sets the integral time constant of the position loop under the fully closed loop function.Reducing the integral time constant can improve the responsiveness of the position loop and reduce following error. This feature is reserved and not yet supported

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A6F	— —	position loop differential time constant (fully closed loop mode)	RW	UNSIGNED32	ms	0~30000	0	NO

Sets the differential time constant of the position loop under the fully closed loop function.Reducing the differential time constant can significantly enhance the system's ability to suppress vibration,and quickly stabilized.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A70	— —	position loop differential filter frequency (fully closed loop mode)	RW	UNSIGNED32	0.1Hz	0~40000	20000	NO

Sets the differential filter frequency of the position loop under the fully closed loop control mode. Reducing the differential filter frequency prevents jitter and reduces the noise caused by the differential time constant.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A71	— —	command speed gain (fully closed loop mode)	RW	INTEGER32	0.01%	- 30000~30000	10000	NO

Sets the command speed gain under full closed loop control mode. Increasing the command speed gain can improve the responsiveness of the speed loop control.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A72	— —	Speed loop gain (fully closed loop mode)	RW	UNSIGNED32	0.1Hz	0~30000	183	NO

Sets the speed loop gain under the fully closed loop control mode.

This parameter determines the responsiveness of the speed loop. The larger the parameter is, the faster the speed loop responds. Setting too high may cause vibration and noise. In position control mode, if the user increases the position loop gain the user needs to increase speed loop gain at the same time.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A73	— —	Speed loop integral time constant (fully closed loop mode)	RW	UNSIGNED32	ms	0~30000	189	NO

Set the speed loop integral time constant under the fully closed loop function.

The smaller the value of this parameter, the better the integration effect and the smaller the steady state deviation. Setting too small will cause vibration and noise in the servo system.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A74	— —	command torque filter wave frequency (fully closed loop mode)	RW	UNSIGNED32	0.1Hz	0~40000	1099	NO

Sets the filter frequency of the command torque low-pass filter under the full closed-loop function.

By performing low-pass filtering on the command torque, the command torque can be smoother and lower the vibration

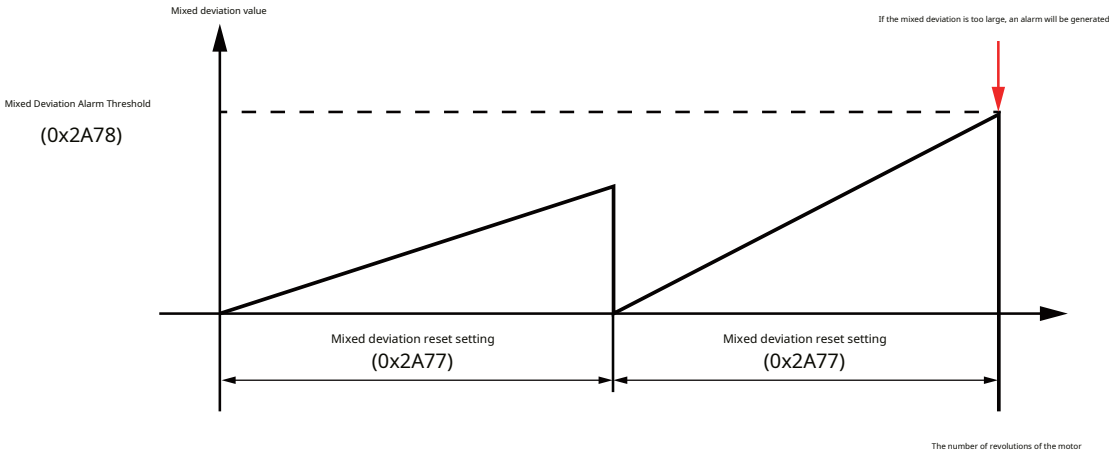
index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A77	— —	Hybrid deviation clearing in full closed loop mode Zero setting	RW	UNSIGNED32	Revolutions	1~100	10	NO

Set in fully closed-loop mode. When the driver is in normal operation, the motor clears the mixed deviation every time it rotates the amount of revolutions set in 0x2A77. Mixed deviation is the difference between the feedback position of the motor encoder and the feedback position of the second encoder.

Set the value of 0x2A77 to N：

1. During the N laps of the servo motor rotation, the mixing deviation is always less than the set value of 0x2A78. At the nth lap, the fully closed-loop mixing deviation is cleared. The mixing deviation and the number of turns of the motor rotation start from 0 again.

2. Within N laps of the servo motor rotation, once the mixing deviation is greater than the set value of 0x2A78, the fully closed-loop mixing deviation will be cleared immediately. At the same time, the driver will report an error if the mixing deviation is too large. The mixed deviation and the number of turns of the motor are recounted from 0.



Note:

The number of revolutions of the motor keeps counting.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A78	— —	Full closed loop mode mixed deviation report alarm threshold	RW	UNSIGNED32	Pulses	0~2_{31}-1	100000	NO

Set in fully closed loop mode. References the maximum value of the allowed mixed deviation (the difference between the feedback position of the motor encoder and the feedback position of the second encoder) in the application. When the actual mixed deviation is greater than this set value, the drive will report fully closed loop position error over-limit fault. The alarm code is 

'0' Indicates that the system does not detect mixing deviations.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A80	— —	Position phase compensation	— —	— —	— —	— —	— —	— —

This feature is reserved and not yet supported

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A81	— —	Position notch filter parameter settings	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	Notch filter switch	RW	UNSIGNED32	— —	0~1	0	NO
	0x02	Notch filter Center frequency	RW	UNSIGNED32	Hz	100~4000	3000	NO
	0x03	Notch Filter Frequency Bandwidth	RW	UNSIGNED32	Hz	1~4000	0	NO
	0x04	Notch filter depth	RW	UNSIGNED32	0.01dB	- 300~-10000	- 4000	NO

Sets Position Notch Filter Parameters. This feature is reserved and not yet supported

- sub-index 0x01 Sets whether the notch filter is enabled. 0: Indicates that the position notch filter function is turned off, 1: Indicates that the position notch filter function is on.
- sub-index 0x02 Sets the center frequency of the position notch filter.
- sub-index 0x03 Sets the frequency width of the position notch filter.
- sub-index 0x04 Sets the depth of the position notch filter.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A82	— —	Speed phase compensation	— —	— —	— —	— —	— —	— —
This feature is reserved and not yet supported								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A83	— —	Velocity notch filter parameter settings	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	Notch filter switch	RW	UNSIGNED32	— —	0~1	0	NO
	0x02	Notch filter center frequency	RW	UNSIGNED32	Hz	100~4000	3000	NO
	0x03	Notch Filter Bandwidth Frequency	RW	UNSIGNED32	Hz	1~4000	200	NO
	0x04	Notch filter depth	RW	UNSIGNED32	0.01dB	- 300~-10000	- 4000	NO

Set velocity notch filter parameters.This feature is reserved,Not yet supported

- sub-index 0x01 Sets whether the notch filter is enabled. 0: Indicates that the velocity notch filter function is turned off, 1: Indicates that the velocity notch filter function is enabled.
- sub-index 0x02 Sets the center frequency of the velocity notch filter.
- sub-index 0x03 Set the frequency width of the velocity notch filter.
- sub-index 0x04 Sets the depth of the velocity notch filter.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A84	— —	Torque Phase Compensation	— —	— —	— —	— —	— —	— —
This feature is reserved and not yet supported								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A85	— —	Resonance suppression filter 1 parameter configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	filter switch	RW	UNSIGNED32	— —	0~1	0	NO
	0x02	Resonance center frequency	RW	UNSIGNED32	0.1Hz	1000~40000	30000	NO
	0x03	Bandwidth class	RW	UNSIGNED32	— —	0~20	0	NO
	0x04	depth rating	RW	UNSIGNED32	— —	0~100	1	NO

Sets the parameters of resonance suppression filter 1.

• Sub-index 0x01 sets whether resonance suppression filter 1 is turned on. 0: indicates off,1: indicates on.
• Sub-index 0x02 sets the center frequency, the resonant frequency, of resonant filter 1. The resonant frequency is obtained through the mechanical analysis function and can be manually selected whether to use it.
• Sub-index 0x03 sets the bandwidth level of resonant rejection filter 1, which is the ratio of the notch width to the center frequency. The larger this setpoint, the greater the notch width.
• Sub-index 0x04 sets the center frequency depth level of resonant rejection filter 1. The smaller this setting, the greater the notch depth, and the better the vibration suppression effect, but too small will increase the vibration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A86	— —	resonance suppression filter2parameter configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	filter switch	RW	UNSIGNED32	— —	0~1	0	NO
	0x02	Resonance frequency	RW	UNSIGNED32	0.1Hz	1000~40000	30000	NO
	0x03	Bandwidth class	RW	UNSIGNED32	— —	0~20	0	NO
	0x04	depth rating	RW	UNSIGNED32	— —	0~100	1	NO

Sets the parameters of resonance suppression filter 2.

•Sub-index 0x01 sets whether resonance suppression filter 2 is turned on. 0: indicates off,1: indicates on.
•Sub-index 0x02 sets the center frequency, the resonant frequency, of resonant filter 2, which is obtained by mechanical analysis and can be manually selected whether to use it.
•Sub-index 0x03 sets the bandwidth level of resonant rejection filter 2, which is the ratio of the notch width to the center frequency. The larger this setpoint, the greater the notch width.
•Sub-index 0x04 sets the center frequency depth level of resonant rejection filter 2. The smaller this setting, the greater the notch depth, and the better the vibration suppression effect, but too small will increase the vibration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A87	— —	resonance suppression filter3parameter configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	filter switch	RW	UNSIGNED32	— —	0~2	0	NO
	0x02	Resonance frequency	RW	UNSIGNED32	0.1Hz	1000~40000	30000	NO
	0x03	Bandwidth class	RW	UNSIGNED32	— —	0~20	0	NO
	0x04	depth rating	RW	UNSIGNED32	— —	0~100	1	NO

Sets the parameters of resonance suppression filter 3.
•Sub-index 0x01 sets whether resonance suppression filter 3 is turned on. 0: indicates off,1: indicates on.
•Sub-index 0x02 sets the center frequency, the resonant frequency, of resonant filter 3, which is obtained by mechanical analysis and can be manually selected whether to use it.
•Sub-index 0x03 sets the bandwidth level of resonant rejection filter 3, which is the ratio of the notch width to the center frequency. The larger this setpoint, the greater the notch width.
•Sub-index 0x04 sets the center frequency depth level of resonant rejection filter 3. The smaller this setting, the greater the notch depth, and the better the vibration suppression effect, but too small will increase the vibration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A88	— —	Vibration suppression filter4parameter configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	filter switch	RW	UNSIGNED32	— —	0~2	0	NO
	0x02	Resonance frequency	RW	UNSIGNED32	0.1Hz	1000~40000	30000	NO
	0x03	Bandwidth class	RW	UNSIGNED32	— —	0~20	0	NO
	0x04	depth rating	RW	UNSIGNED32	— —	0~100	1	NO

Sets the parameters of resonance suppression filter 4.
•Sub-index 0x01 sets whether resonance suppression filter 4 is turned on. 0: indicates off,1: indicates on.
•Sub-index 0x02 sets the center frequency, the resonant frequency, of resonant filter 4, which is obtained by mechanical analysis and can be manually selected whether to use it.
•Sub-index 0x03 sets the bandwidth level of resonant rejection filter4, which is the ratio of the notch width to the center frequency. The larger this set-point, the greater the notch width.
•Sub-index 0x04 sets the center frequency depth level of resonant rejection filter 4. The smaller this setting, the greater the notch depth, and the better the vibration suppression effect, but too small will increase the vibration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A90	— —	Motor Resolution (Pulses/revolution)	RW	UNSIGNED32	— —	200~131072	10000	NO

Set the number of pulses required for one revolution of the servo motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A91	— —	Pulse input filter width	RW	UNSIGNED32	0.1μs	0~32000	5	NO

Sets the minimum pulse width of the input pulses of the driver's digital input ports X1 and X2 under pulse position control mode.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A92	— —	Pulse input setting	RW	UNSIGNED32	— —	0~31	9	NO

Sets the Input Pulse control type

bit	Features	value	instruction
1~0	Pulse type	00b	pulse/direction
		01b	CW/CCW
		10b	A/B quadrature pulse
		11b	reserved
2	command pulse rotation turn direction	0	positive
		1	reverse
3	trigger edge	0	rising edge
		1	falling edge
4	input source	0	Input X1/X2
		1	reserved
31~5	reserved	0	reserved

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A93	— —	Electronic gear ratio parameter setting	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~2	2	NO
	0x01	Electronic gear ratio numerator	RW	UNSIGNED32	— —	1~2_{31}-1	1048576	NO
	0x02	Electronic gear ratio denominator	RW	UNSIGNED32	— —	1~2_{31}-1	10000	NO

Set servo system electronic gear ratio parameters.

$$\text{Internal position command} = \text{position command} \times \text{electronic gear ratio} = \frac{\text{Position Command x 0x2A93-Sub1}}{\text{0x2A93-Sub2}}$$

- sub-index 0x01 Sets the electronic gear ratio numerator.
- sub-index 0x02 Sets the electronic gear ratio denominator.

Note:

1. The electronic gear ratio setting range is 1/8192~8192. When the actual set electronic gear ratio is greater than 8192, the system will automatically follow the electronic gear ratio as 8192. When the actual set electronic gear ratio is less than 1/8192. The system will automatically follow the electronic gear ratio as 1/8192.

2. Do not change the electronic gear parameters during movement of the motor.

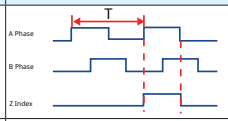
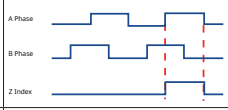
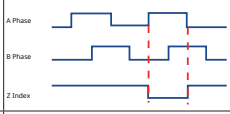
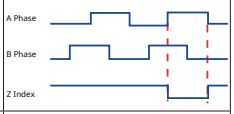
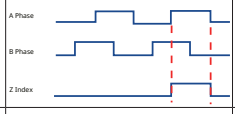
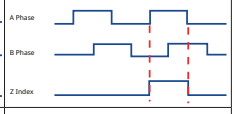
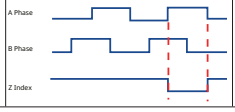
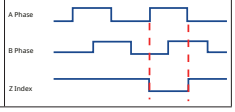
index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A94	— —	Pulse frequency division output parameter configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~5	5	NO
	0x01	Pulse output source	RW	UNSIGNED32	— —	1~3	1	NO
	0x02	Divider ratio numerator	RW	UNSIGNED32	— —	0~13107200	10000	NO
	0x03	divider ratio denominator	RW	UNSIGNED32	— —	0~13107200	131072	NO
	0x04	output A/B Pulse phase setting	RW	UNSIGNED32	— —	0~1	0	NO
	0x05	output Z Pulse Polarity Setting	RW	UNSIGNED32	— —	0~1	0	NO

Set the output parameters of the driver pulse divider.

- sub-index 0x01 sets the source of the drive output pulse.

value	instruction
1	Motor encoder
2	second encoder
3	External position command pulse

- sub-index 0x02 sets the numerator of the frequency division ratio of the drive output pulse.
- sub-index 0x03 sets the denominator of the frequency division ratio of the drive output pulse.
- sub-index 0x04 sets the drive output A/B pulse phase.
- sub-index 0x05 sets the polarity of the Z pulse by the driver

0x2A94-Sub4 (output pulse phase)	0x2A94-Sub5 (output Z pulse polarity)	CW direction rotation Schematic diagram of output pulse	CCW direction rotation Schematic diagram of output pulse
0	0		
	1		
1	0		
	1		

Note:

When the ratio numerator or the ratio denominator is set to 0, pulses are processed without frequency division output. For pulse frequency division output function, please refer to page 82.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A9A	— —	Absolute encoder motor parameters	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~6	6	NO
	0x01	connection	RO	UNSIGNED16	— —	0~1	0	NO
	0x02	motor model	RO	Visible string	— —	— —	0	NO
	0x03	Motor serial number	RO	Visible string	— —	— —	0	NO
	0x04	Motor rated current	RO	UNSIGNED32	0.01A	— —	0	NO
	0x05	Motor rated torque	RO	UNSIGNED32	mN.m	— —	0	NO
	0x06	Motor rated speed	RO	UNSIGNED32	rpm	— —	0	NO
	0x07	reserved	— —	— —	— —	— —	0	— —

Describes the parameters for the drive to connect an absolute encoder motor.

- sub-index 0x01 describes whether the drive is connected to a motor. 0:Motor not connected,1:Motor connected
- sub-index 0x02 describes the model to which the drive is connected to the motor.
- sub-index 0x03 describes the serial number of the motor to which the drive is connected.
- sub-index 0x04 describes the rated current at which the driver connects to the motor.
- sub-index 0x05 describes the rated torque at which the drive connects to the motor.
- sub-index 0x06 describes the rated speed at which the drive is connected to the motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A9B	— —	Incremental encoder motor parameters	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~6	6	NO
	0x01	connection	RO	UNSIGNED16	— —	0~1	0	NO
	0x02	motor model	RO	Visible string	— —	— —	0	NO
	0x03	Motor serial number	RO	Visible string	— —	— —	0	NO
	0x04	Motor rated current	RO	UNSIGNED32	0.01A	— —	0	NO
	0x05	Motor rated torque	RO	UNSIGNED32	mN.m	— —	0	NO
	0x06	Motor rated speed	RO	UNSIGNED32	rpm	— —	0	NO
	0x07	reserved	— —	— —	— —	— —	0	— —

Describes the parameters of the drive connected to the incremental encoder motor.

- sub-index 0x01 describes whether the drive is connected to a motor. 0:Motor not connected,1:Motor connected
- sub-index 0x02 describes the model of the motor connected to the driver.
- sub-index 0x03 describes the serial number of the motor connected to the driver.
- sub-index 0x04 describes the rated current of the motor connected to the driver.
- sub-index 0x05 describes the rated torque of the motor connected to the driver.
- sub-index 0x06 describes the rated speed of the motor connected to the driver.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2A9C	— —	Encoder information	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~5	5	NO
	0x01	Encoder type	RO	UNSIGNED16	— —	— —	0	NO
	0x02	encoder error code	RO	UNSIGNED32	— —	— —	0	NO
	0x03	Encoder temperature	RO	Visible string	0.1°C	— —	0	NO
	0x04	Absolute encoder usage mode	RW	UNSIGNED16	— —	0~3	2	NO
	0x05	Absolute encoder reset	RW	UNSIGNED16	— —	0~2	0	NO

Describes the encoder information of the motor connected to the drive.

- sub-index 0x01 Describes the type of motor encoder.

value	Description		value	Description
0	15 Wire Incremental Encoder		4	reserved
1	9 Wire Incremental Encoder		5	17 Bit battery-free absolute encoder
2	reserved		6	20 Bit absolute value photoelectric encoder
3	20 Bit incremental photoelectric encoder		7	17 Bit Incremental Magnetic Encoder

- sub-index 0x02 Describes motor encoder error codes

0x2A9C sub-index 0x01 values of 3/6/7:

bit	Description
0	battery voltage is lower than 3.2V
1	The battery is not connected or the voltage is below 2.8V
17~2	internal use
18	Encoder not connected
twenty two~19	internal use
twenty three	The encoder needs to perform a multi-turn reset
31~twenty one	internal use

0x2A9C sub-index 0x01 value of 5:

bit	Description
0	Register communication error
1	Encoder transmit data error
2	Encoder communication timeout
3	auto send error
4	Encoder communication error
31~5	internal use

- sub-index 0x03 Describes the motor encoder temperature.
- sub-index 0x04 Sets the absolute value encoder usage mode.

value	model
0	Incremental encoder
1	Single-turn absolute encoder
2	Multiturn encoder
3	Multi-turn encoder does not count overflow

- sub-index 0x05 is set to clear the alarm of the absolute encoder or clear the multi-turn data.

Note

For the use of the absolute value system, please refer to page 88

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AA0	— —	actual output current	RO	UNSIGNED32	0.1%	— —	0	NO
Describe the percentage of the actual output current of the drive to the rated current.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AA1	— —	Motor torque constant	RO	UNSIGNED32	mN.m/A	— —	430	NO
Describes the torque constant of the motor connected to the drive.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AA2	— —	Pulse input count	RO	UNSIGNED32	Pulses	— —	0	TxPDO
Describes the number of external pulses received at the drives digital input ports X1,X2								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AA3	— —	Second encoder position	RO	UNSIGNED32	Pulses	— —	0	TxPDO
Describes the position value fed back by the second encoder connected to the drive.								

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AA8	— —	Position Error Alarm Threshold	RW	UNSIGNED32	Pulses	0~2_{31}-1	100000	NO

Sets the Position Error Alarm Threshold.

When the absolute value of the actual position deviation is greater than this set value, the drive will report a position error overrun fault, The alarm code is  .

When this set value is 0 Time,Position error out-of-limit detection will not be enabled.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AB0	— —	Virtual digital inputs	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~2	2	NO
	0x01	Input state settings	RW	UNSIGNED16	— —	0~2_8-1	0	RxPDO
	0x02	input status enable	RW	UNSIGNED16	— —	0~2_8-1	0	RxPDO

Sets the drive's virtual digital input state.

- subindex0x01Set the input state of the virtual digital input signal.

bit	Features	instruction
0	digital input 1	0:Virtual input optocoupler disconnected 1:Virtual input optocoupler on
1	digital input 2	
2	digital input 3	
3	digital input 4	
4	digital input 5	
5	digital input 6	
6	digital input 7	
7	digital input 8	
15~8	reserved	reserved function,Please keep it as "0"

- sub-index 0x02 Sets whether to enable virtual digital input function.

bit	Features	instruction
0	digital input 1	0: Disable virtual input 1: Enable virtual input
1	digital input 2	
2	digital input 3	
3	digital input 4	
4	digital input 5	
5	digital input 6	
6	digital input 7	
7	digital input 8	
15~8	reserved	reserved function,Please keep it as "0"

Note:

For virtual digital input functions, please refer to page 76.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x2AB1	— —	Dynamic Brake Parameter Configuration	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~4	4	NO
	0x01	Braking Mode when Motor Disabled	RW	UNSIGNED32	— —	0~5	0	NO
	0x02	Maximum action time (Servo Disabled)	RW	UNSIGNED32	ms	0~30000	500	NO
	0x03	Action when an error is reported	RW	UNSIGNED32	— —	0~3	0	NO
	0x04	Maximum Action Tiem (Servo Error)	RW	UNSIGNED32	ms	0~30000	0	NO

Sets the action of the drive to control the dynamic braking.

- sub-index 0x01 sets the action of dynamic brake when the servo is disabled.

value	instruction	
	deceleration process	stop
0	Immediate Stop	maintain free movement
1	Immediate Stop	dynamic braking action
2	free movement	maintain free movement
3	free movement	dynamic braking action
4	dynamic braking action	maintain free movement
5	dynamic braking action	dynamic braking action

- sub-index 0x02 sets the maximum action time during the deceleration process that the servo is disabled

- sub-index 0x03 sets the action of the dynamic brake when the servo reports an error.

value	instruction	
	deceleration process	stop
0	free movement	maintain free movement
1	free movement	dynamic braking action
2	dynamic braking action	maintain free movement
3	dynamic braking action	dynamic braking action

- sub-index 0x04 sets the longest operation time during the deceleration process of the servo error.

Note:

For the dynamic braking function, please refer to page 84.

7.4 Standardised Device Profile Objects (0x6000-0x9FFF

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x603F	— —	Error Code	RO	UNSIGNED16	— —	— —	0	TxPDO

Describe the current alarm code of the drive.

The error codes and their descriptions are as follows:

error code	Description
0xFF01	Drive overcurrent
0xFF02	Drive overvoltage
0xFF03	Drive processor overtemperature
0xFF04	reserved function
0xFF05	Drive internal voltage error
0xFF06	Position error overrun
0xFF07	Motor encoder not connected
0xFF08	Full closed loop hybrid deviation overrun
0xFF09	Second encoder not connected
0xFF0A	Regeneration potential Drain failed
0xFF0B	Safe torque off(STO)
0xFF0C	reserved function
0xFF0D	FPGA Mistake
0xFF0E	Parameter read failed
0xFF0F	Absolute encoder multi-turn error
0xFF10	Motor stall protection
0xFF11	Drive power module over temperature
0xFF31	Positive rotation prohibition limit
0xFF32	Negative prohibition limit
0xFF33	Positive rotation prohibition limit and Negative rotation prohibition limit
0xFF34	Motor overload status
0xFF35	Command the motor to run when it is not enabled
0xFF36	Drive low voltage
0xFF37	Q Segment empty
0xFF38	Motor speed exceeds limit
0xFF39	Drive main circuit power input phase loss
0xFF3A	Digital input emergency stop
0xFF3B	Absolute encoder undervoltage
0xFF3C	Absolute position lost
0xFF3D	Absolute position overflow
0xFF3E	Motor overtemperature
0xFF3F	Drive undervoltage
0xFF41	Failed to save parameters
0xFF42	I/O Signal function multiplexing
0xFF43	Bus watchdog trigger
0xFFFF	other errors

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**
0x6040	— —	control word	RW	UNSIGNED16	— —	0~2_{16}-1	0	RxPDO

Used to control the servo drive PDS state transition.

The corresponding function of each bit and its description are as follows:

bit	name		instruction
0	Switch on	Start the servo operation	1: valid 0:invalid
1	Enable voltage	Turn on the main circuit power	1: valid 0:invalid
2	Quick stop	quick stop	0: valid 1:invalid
3	Enable operation	Servo operation	1: valid 0:invalid
6~4	Operation mode specific	Control mode related	Bits specific to each control mode
7	Fault reset	Error reset	Clear drive failures,Active on rising edge
8	Halt	stop	Bits specific to each control mode
9	Operation mode specific	Control mode related	Bits specific to each control mode
15~10	Reserved	reserved	reserved function,Please keep it as "0"

The bits specific to each control mode are described below:

control mode	control word				
	bit**9**	bit**8**	bit**6**	bit**5**	bit**4**
location mode (PP)	setpoint update (Change of set point)	Stop (Halt)	absolute/relative (Abs/rel)	update immediately (Change set immediately)	set new value (New set point)
speed mode (PV)	— —	Stop (Halt)	— —	— —	— —
Torque mode (TQ)	— —	Stop (Halt)	— —	— —	— —
Periodic Synchronous Velocity Mode (CSV)	— —	— —	— —	— —	— —
Homing mode (HM)	— —	Stop(Halt)	— —	— —	Start homing (Homing operation start)
Q program mode (Q)	— —	Stop (Halt)	— —	— —	start Q program execution (Q program start)

Note:

1. Each individual assignment of the control word is meaningless. Must be combined with related bits to form a control instruction.

2. bit 0 ~ bit 3 and bit 7 have the same meaning in various control modes. Control instructions must be sent in sequence before the driver can enter the preset according to the CiA402 state machine switching process.

3 . bit 10～bit 15 are reserved functions. Please keep it as “0".

index	sub-index	name	access type	type of data	unit	set range	Defaults	**PDO**
0x6041	— —	status word	RO	UNSIGNED16	— —	— —	0	TxPDO

Describes the current state of the servo drive PDS.

Each corresponding function and its description is as follows

bit	name		Description
0	Ready to switch on	Servo ready	1:valid 0:invalid
1	Switched on	Servo operation can be turned on	1:valid 0:invalid
2	Operation enabled	Servo operation is on	1:valid 0:invalid
3	Fault	report an error	1:valid 0:invalid
4	Voltage enabled	Main circuit power on	1:valid 0:invalid
5	Quick stop	quick stop	0:valid 1:invalid
6	Switch on disabled	Servo not working	1:valid 0:invalid
7	Warning	Alarm	reserved function,keep as "0"
8	Reserved	reserved	reserved function,keep as "0"
9	Remote	remote control	Indicates that control is being performed using the control word 1: Valid 0: Invalid
10	Operation mode specific	Control mode related	Bits specific to each control mode
11	Internal limit active	Internal restrictions are in effect	Indicates that the limit function is working* 1: Valid 0: Invalid
12	Operation mode specific	Control mode related	Bits specific to each control mode
15~13	Reserved	reserved	reserved function,keep as "0"

* : Limit function includes digital input limit.

The bits specific to each control mode are described below:

control mode	control word		
	bit**13**	bit**12**	bit**10**
Location mode (PP)	— —	Set value confirmation (Set point acknowledge)	Positioning completed (Target reached)
speed mode (PV)	— —	zero speed arrival (Speed)	target velocity reached (Target reached)
Torque Mode (TQ)	— —	— —	Target torque reached (Target reached)
Cyclic Synchronous Velocity Mode (CSV)	— —	Execute actions according to the target speed (Drive follows the command value)	state switch (Status toggle)
Home mode (HM)	Homing error	Homing complete	Target Location Reached
Q Program Mode (Q)	— —	— —	Q Program Execution Complete (Q program complete)

Note:

1. bit 0 ~ bit 6 and bit 9 have the same meaning in various control modes.
2. bit 7 ~ bit 8 and bit 13 ~ bit 15 reserved function, keep as "0".

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x605A	— —	quick stop	RW	INTEGER16	— —	0~8	2	NO

Set the quick stop mode of the servo motor. Depending on the control mode, definitions vary.

PP/PV mode:

value	instruction	
	Deceleration	stop
0	defined by 0x2AB1 sub-index 0x01	
1	deceleration set by 0x6084	Defined by 0x2AB1 sub-index 1
2	deceleration set by 0x6085	
3	reserved	
4		
5	deceleration set by 0x6084	keep enabled
6	deceleration set by 0x6085	
7	reserved	
8		

CSV mode:

value	instruction	
	Deceleration	stop
0	defined by 0x2AB1 sub-index 0x01	
1	deceleration set by 0x6085	Defined by 0x2AB1 sub-index 1
2		
3	reserved	
4		
5	deceleration set by 0x6085	keep enabled
6		
7	reserved	
8		

IP mode:

value	instruction	
	deceleration process	stop
0	defined by 0x2AB1 sub-index 0x01	
1	Immediate Stop	Defined by 0x2AB1 sub-index 1
2	deceleration set by 0x6085	
3	reserved	
4		
5	Immediate Stop	keep enabled
6	deceleration set by 0x6085	
7	reserved	
8		

TQ mode:

value	instruction	
	deceleration process	stop
0	defined by 0x2AB1 sub-index 0x01	
1	Command torque is cleared immediately	Defined by 0x2AB1 sub-index 1
2		
3	reserved	
4		
5	Command torque is cleared immediately	keep enabled
6		
7	reserved	
8		

HM mode:

value	instruction	
	deceleration process	stop
0	defined by 0x2AB1 sub-index 0x01	
1	deceleration set by 0x609A	Defined by 0x2AB1 sub-index 1
2	deceleration set by 0x6085	
3	reserved	
4		
5	deceleration set by 0x609A	keep enabled
6	deceleration set by 0x6085	
7	reserved	
8		

Q mode:

value	instruction		
	not executing**Q**program	is executing**Q**motion instructions in the program	
	movement command	deceleration process	stop
0	Defined by 0x2AB1 sub-index 0x01	Select the quick stop method for processing according to the control mode supported by the motion instructions	Defined by 0x2AB1 sub-index 0x01
1			
2			
3	reserved		
4			
5	keep enabled	Select the quick stop method for processing according to the control mode supported by the motion instructions	keep enabled
6			
7	reserved		
8			

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x605B	— —	Shutdown method	RW	INTEGER16	— —	0~2	0	NO

Sets the action of the servo from Operation enabled to Ready to switch on when it receives PDS commands to Shutdown.

Depending on the control mode, the definition varies, please refer to the definition of 0x605C.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x605C	— —	Prohibited mode of operation	RW	INTEGER16	— —	0~2	1	NO

Sets the action of the servo from Operation enabled to Switched on when receiving the PDS command Disable operation.

The definition varies depending on the control mode.

PP/PV mode:

value	Definition	
	deceleration process	after stop
0	defined by 0x2AB1 sub-index 0x01	
1	deceleration set by 0x6084	defined by 0x2AB1 sub-index 0x01
2	deceleration set by 0x6085	

CSV mode:

value	Definition	
	deceleration process	after stop
0	defined by 0x2AB1 sub-index 0x01	
1	Command speed is cleared immediately	defined by 0x2AB1 sub-index 0x01
2		

IP mode:

value	Definition	
	deceleration process	after stop
0	defined by 0x2AB1 sub-index 0x01	
1	stop now	defined by 0x2AB1 sub-index 0x01
2		

TQ mode:

value	Definition	
	deceleration process	after stop
0	defined by 0x2AB1 sub-index 0x01	
1	Command torque is cleared immediately	defined by 0x2AB1 sub-index 0x01
2		

HM mode:

value	Definition	
	deceleration process	after stop
0	defined by 0x2AB1 sub-index 0x01	
1	deceleration set by 0x609A	defined by 0x2AB1 sub-index 0x01
2	deceleration set by 0x6085	

Q mode:

value	Definition		
	not executing**Q**program	is executing**Q**motion instructions in the program	
	movement command	deceleration process	stop
0	defined by 0x2AB1 sub-index 0x01	Select the quick stop method for processing according to the control mode supported by the motion instructions	defined by 0x2AB1 sub-index 0x01
1			
2			

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x605D	— —	Pause mode	RW	INTEGER16	— —	0~1	0	NO

Sets the action of the motor when the servo Halt bit is set.

The definition varies depending on the control mode

PP/PV mode:

value	Definition	
	deceleration process	stop
0	deceleration set by 0x6084	keep enabled
1	reserved	

TQ mode:

value	Definition	
	deceleration process	stop
0	torque ramp set by 0x6087	keep enabled
1	reserved	

HM mode:

value	Definition	
	deceleration process	stop
0	deceleration set by 0x609A	keep enabled
1	reserved	

Q mode:

value	Definition		
	not executing**Q**program	is executing**Q**motion instructions in the program	
	movement command	deceleration process	stop
0	keep enabled	Select the quick stop method for processing according to the control mode supported by the motion instructions	keep enabled
1	reserved		

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x605E	— —	Fault stop method	RW	INTEGER16	— —	0~2	2	NO

Sets the stop method of the motor when a servo error occurs. This feature is reserved,The stop method when the servo

error occurs is not supported yet. Please refer to 0x2AB1 sub-index 0x03 and sub-index 0x04 definitions.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6060	— —	Modes_of_Operation	RW	INTEGER8	— —	- 1~10	0	RxPDO

Sets the control mode of the servo.

In SDO communication, if an unsupported control mode is set, an ABORT code is returned.

In PDO communication, if an unsupported control mode is set, the previous control mode is maintained

value	instruction
- 1	Q Program control (Q)
0	unspecified
1	Profile position control (PP)
3	Profile Velocity control(PV)
4	Torque control (TQ)
6	Homing Model (HM)
8	Interpolated position control (IP)
9	Cyclic Synchronous Speed Control (CSV)

Note:

For control mode switching, please refer to page 22

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6061	— —	Modes_of_operation_display	RO	INTEGER8	— —	- 1~10	0	TxPDO

Specifies the current control mode of the servo.

value	instruction
- 1	Q Program control (Q)
0	unspecified
1	Profile position control (PP)
3	Profile Velocity control(PV)
4	Torque control (TQ)
6	Homing Model (HM)
7	Interpolated position control (IP)
9	Cyclic Synchronous Speed Control (CSV)

Note:

For control mode switching, please refer to page 22

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6064	— —	Position_value_calculated	RO	INTEGER32	Pulses	— —	0	TxPDO

Describes the current position of the servo motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x606C	— —	Velocity_value_calculated	RO	INTEGER32	Pulses/s	— —	0	TxPDO

Describes the current speed of the servo motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6071	— —	target_torque	RW	INTEGER16	0.1%	- 3000~3000	0	RxPDO

Sets the target torque value of the servo in torque mode (TQ).

100.0% corresponds to 1 times the rated torque of the motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6073	— —	max_current	RW	UNSIGNED16	0.1%	0~3000	3000	RxPDO

Sets the max current of the drive while in torque mode (TQ)

100.0% corresponds to 1 times the rated current of the motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6074	— —	torque_demand_value	RO	INTEGER16	0.1%	— —	0	TxPDO

This parameter is the output value of the torque limit function

100.0% corresponds to 1 times the rated torque of the motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6077	— —	Torque_value_calculated	RO	INTEGER1	0.1%	— —	0	TxPDO

Specifies the current torque output of the motor while in Torque Mode (TQ)

100.0% corresponds to1 times the rated torque of the motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6078	— —	current_actual_value	RO	INTEGER16	0.1%	— —	0	TxPDO

Specifies the instantaneous current in the drive motor.

100.0% corresponds to 1 times the rated current of the motor.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x607A	— —	Target Position	RW	INTEGER32	Pulses	- 2_{31}~2_{31}-1	0	RxPDO

Set the servo target location while in Profile Position Mode (PP)

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x607C	— —	Home Offset	RW	INTEGER32	Pulses	- 2_{31}~2_{31}-1	0	RxPDO

The home_offset object is the difference between the zero position for the application and the machine home position (found during homing). During homing the home position is found and, once the homing is completed, the zero position is offset from the home position by addingthe home_offset to the home position. All subsequent absolute moves shall be taken relativeto this new zero position.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x607D	— —	Software limit setting	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~2	2	NO
	0x01	negative position software limit value	RW	INTEGER32	Pulses	- 2_{31}~2_{31}-1	0	NO
	0x02	positive position software limit value	RW	INTEGER32	Pulses	- 2_{31}~2_{31}-1	0	NO

Sets the servo software limit values. This feature is reserved and not yet supported

- Sub-index 0x01 sets the software limit in the negative direction.
- Sub-index 0x02 sets the software limit in the positive direction.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x607E	— —	Polarity	RW	UNSIGNED8	— —	0~1	0	RxPDO

Sets the polarity of position, torque and velocty in their respective control modes. This feature is reserved and not yet supported

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x607F	— —	max_profile_speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	800000	RxPDO

Sets the maximum speed allowed in either direction in a move profile.

$$\text{speed(rpm)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60 \times 0x607F}{0x2A90}$$

When the actual speed of the motor exceeds this set value, the drive will report an overspeed fault. The alarm code is 

- when the set speed is < 0.25 rpm, the set speed becomes 0.
- The maximum speed that can be set is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6081	— —	P2P_profile_velocity	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	50000	RxPDO

Set the servo target speed in position mode (PP)

$$\text{speed (rpm)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60x0x6081}{0x2A90}$$

- when the set speed is < 0.25 rpm, the set speed becomes 0.
- The maximum speed that can be set is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6083	— —	profile_acceleration	RW	UNSIGNED32	Pulses/s^2	0~2_{32}-1	1000000	RxPDO

Set the servo acceleration while in Profile Position mode (PP) or Profile Velocity mode (PV)

$$\text{acceleration (rpm/s)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60x0x6083}{0x2A90}$$

- When the acceleration is less than 10 rpm/s, the planned acceleration is set to 0.
- The maximum programmable acceleration can be set to 300000 rpm/s.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6084	— —	profile_deceleration	RW	UNSIGNED32	Pulses/s^2	0~2_{32}-1	1000000	RxPDO

Set the servo deceleration while in Profile Position mode (PP) or Profile Velocity mode (PV)

$$\text{deceleration(rpm/s)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60x0x6084}{0x2A90}$$

- When the deceleration is less than 10 rpm/s, the planned deceleration is set to 0.
- ·The maximum programmable deceleration can be set to 300000 rpm/s.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6085	— —	Quick stop deceleration	RW	UNSIGNED32	Pulses/s^2	0~2_{32}-1	30000000	NO

Sets the Servo Quick Stop Deceleration.

$$\text{deceleration(rpm/s)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60x0x6085}{0x2A90}$$

- When the deceleration <10 rpm/s, the quick stop deceleration is set to 0.
- The maximum programmable quick stop deceleration is 300000 rpm/s.

The profile acceleration/deceleration is limited by the quick stop deceleration.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6087	— —	torque_ramp	RW	UNSIGNED32	0.1%/s	0~2_{32}-1	0	RxPDO

Sets the servo command torque acceleration/deceleration in torque mode (TQ).

This parameter describes the rate of change of torque in units of per thousand of rated torque per second.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6098	— —	homing_method	RW	INTEGER8	— —	- 4~35	0	RxPDO

Set the homing method of the servo motor.

Note:

For the introduction of the homing method, please refer to page 46.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6099	— —	Homing Speed	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	**U**NSIGNED8	— —	0~2	2	NO
	0x01	Homing High Speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	0	RxPDO
	0x02	Homing Low Speed	RW	UNSIGNED32	Pulses/s	0~2_{32}-1	0	RxPDO

Sets the two speed values for homing methods 1-35 defined in CiA402.

- sub-index 0x01 sets the homing medium and high speed value.
- sub-index 0x02 sets the homing low and medium speed value.

$$\text{speed(rpm)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60 \times \text{setpoint}}{0x2A90}$$

•when the set speed is < 0.25 rpm, the set speed becomes 0.

•The maximum speed that can be set is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x609A	— —	homing_acceleration_deceleration	RW	UNSIGNED32	Pulses/s^2	0~2_{32}-1	0	RxPDO

Sets the acceleration/deceleration value for homing methods 1-35 defined in CiA402.

$$\text{acceleration/deceleration(rpm/s)} = \frac{60 \times \text{setpoint}}{\text{pulses per revolution}} = \frac{60 \times 0x609A}{0x2A90}$$

- When acceleration/deceleration < 10 rpm/s, the homing acceleration/deceleration are set to 0 .
- The maximum settable value of acceleration/deceleration is 300000 rpm/s.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60B0	— —	position offset	RW	INTEGER32	Pulses	- 2_{31}~2_{31}-1	0	RxPDO

Set the command position offset of the servo in cyclic synchronization position mode. This feature is reserved and not yet supported:

Target Position = 0x607A + 0x60B0

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60B1	— —	Velocity Offset	RW	INTEGER32	pulses/s	- 2_{31}~2_{31}-1	0	RxPDO

Set the command velocity offset of the servo in the cyclic synchronous speed mode. This feature is reserved and not yet supported:

Target Velocity = 0x60FF + 0x60B1

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60B2	— —	Torque Offset	RW	INTEGER32	0.1%	- 3000~3000	0	RxPDO

Set the command torque offset of the servo in cyclic synchronous torque mode. This feature is reserved and not yet supported:

Target Torque = 0x6071 + 0x60B2

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60E0	— —	Torque Limit Positive Direction	RW	UNSIGNED16	0.1%	0~3000	0	RxPDO

Set the maximum torque limit, in the positive direction, of the servo.

100.0% corresponds to 1 times the rated torque of the motor.

Note:

For the torque limit function, please refer to page 82.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60E1	— —	Torque Limit Negative Direction	RW	UNSIGNED16	0.1%	0~3000	0	RxPDO

Set the maximum torque limit, in the negative direction, of the servo.

100.0% corresponds to 1times the rated torque of the motor.

Note:

For the torque limit function, please refer to page 82.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60F4	— —	Actual position deviation	RO	INTEGER32	Pulses	— —	0	TxPDO

Describes the deviation between the command position of the servo motor and the feedback position of the encoder.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60FD	— —	digital input	RO	UNSIGNED32	— —	— —	0	TxPDO

Specifies the state of the current digital inputs of the drive.

The functions of each bit are defined as follows:

bit	Features	description
0	Negative limit signal	0:The limit signal is invalid 1:The limit signal is valid
1	Positive limit signal	
2	Home sensor signal	0:The origin signal is invalid 1:The origin signal is valid
15~3	reserved	reserved,keep as "0"
16	digital input 1	0:Input optocoupler disconnected 1:The input optocoupler is turned on
17	digital input 2	
18	digital input 3	
19	digital input 4	
20	digital input 5	
21	digital input 6	
22	digital input 7	
23	digital input 8	
31~24	reserved	reserved,keep as "0"

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60FE	— —	digital output	— —	— —	— —	— —	— —	— —
	0x00	maximum sub-index	RO	UNSIGNED8	— —	0~2	2	NO
	0x01	Output state setting	RW	UNSIGNED32	— —	0~2_{32}-1	0	RxPDO
	0x02	output status enable	RW	UNSIGNED32	— —	0~2_{32}-1	0	RxPDO

Set the state of the digital output signal of the servo drive.

- sub-index 0x01 Set the output state of the digital output signal.

bit	Features	description
15~0	reserved	reserved function,keep as "0"
16	digital output 1	0: Output OFF 1: Output ON
17	digital output 2	
18	digital output 3	
19	digital output 4	
31~20	reserved	reserved function, Please keep it as "0"

- sub-index 0x02 sets whether outputs from sub-index 0x01 are enabled/ disabled

bit	Features	description
15~0	reserved	reserved,Please keep it as "0"
16	digital output 1	0: Disable output 1:Enable output
17	digital output 2	
18	digital output 3	
19	digital output 4	
31~20	reserved	reserved function,Please keep it as "0"

Example: Digital outputs 1 to 4 are set as general-purpose outputs, and the optocouplers of digital outputs 1 and 3 are turned ON through 0x60FE, and the optocouplers of 2 and 4 are turned off. The specific operation steps are as follows:

Step 1: Enable usage of digital outputs 1~4 (0x60FE-Sub2=0x000F0000)

Step 2: Turn on digital outputs 1 and 3, and turn off digital outputs 2 and 4 (0x60FE-Sub1=0x00050000)

Note:

1. When the digital output port is assigned a special output function, the physical output's status is controlled by the output function that was set and is not affected by the 0x60FE. Refer to page 71 for output functions.

2. When using 0x60FE to control the status of the digital output port, you need to set the digital output as a general-purpose output.

3. For the actual physical output status, please query 0x2002.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x60FF	— —	profile_velocity	RW	INTEGER32	Pulses/s	- 2_{31}~2_{31}-1	0	RxPDO

Sets the target velocity for Profile Velocity and Cyclic Synchronous Velocity Mode.

$$\text{speed(rpm)} = \frac{\text{60 x setpoint x electronic gear ratio}}{\text{Pulses per revolution}} = \frac{\text{60 x 0x60FF x 0x2A93-Sub1}}{\text{0x2A90 x 0x2A93-Sub2}}$$

•when the set speed is < 0.25 rpm, the set speed becomes 0.

•The maximum speed that can be set is 6000 rpm.

index	sub-index	name	access type	type of data	unit	set range	Defaults	PDO
0x6502	— —	Supported Control Modes	RO	UNSIGNED32	— —	— —	66477	NO

Specifies the control modes supported by the servo drive.

1: Mode supported 0: Mode NOT supported

bit	instruction	value
0	Position control mode (PP)	1
1	Frequency conversion speed regulation mode (VI)	0
2	Profile Velocity Mode (PV)	1
3	Torque mode (TQ)	1
4	reserved	0
5	Homing mode (HM)	1
6	Interpolated position mode (IP)	0
7	Cyclic Synchronous Position Mode (CSP)	0
8	Cyclic Synchronous Velocity Mode (CSV)	1
9	Cyclic synchronous torque mode (CST)	0
15~10	reserved	0
16	Q program mode (Q)	1
31~17	reserved	0

Appendix I: Object dictionary and parameter code comparison table

The M3 Servo Series has a total of 6 parameter groups denoted by their own code. See the following table:

parameter group	type	Function
P0-XX	PID Gain Parameters	Set the gain parameters of the servo
P1-XX	Device Parameters	Set various functional parameters of the drive
P2-XX	Motion Profile Parameters	Set the various motion profile parameters required to execute motion
P3-XX	Encoder and Pulse Input Parameters	Set parameters related to encoder, pulse input/output
P4-XX	Analog I/O Parameters	Set parameters related to analog input/output
P5-XX	Digital I/O Parameters	Set parameters related to digital input/output

P0-XX Group: PID Gain Parameters

index	sub-index	code	instruction	name	Defaults	Scope	unit	Effective mechanism
0x2A50	— —	P0-00	UM	Parameter tuning mode	0	0 ~ 2	— —	Effective immediately
0x2A51	— —	P0-01	LY	load type	0	0 ~ 2	— —	Effective immediately
0x2A52	— —	P0-02	NR	Load inertia ratio	0	0 ~ 100	— —	Effective immediately
0x2A53	— —	P0-03	KG	first rigidity class	5	1 ~ 20	— —	Effective immediately
0x2A54	— —	P0-04	KX	Second rigidity level	5	1 ~ 20	— —	Effective immediately
0x2A55	— —	P0-05	KP	first position loop gain	52	0 ~ 20000	0.1Hz	Effective immediately
0x2A57	— —	P0-07	KD	1st position loop differential time constant	2000	0 ~ 30000	ms	Effective immediately
0x2A58	— —	P0-08	KE	First position loop differential filter frequency	20000	0 ~ 40000	0.1Hz	Effective immediately
0x2A59	— —	P0-09	KL	Speed feed forward gain	10000	- 30000 ~ 30000	0.01%	Effective immediately
0x2A5A	— —	P0-10	KR	Velocity feedforward filter frequency	20000	0 ~ 40000	0.1Hz	Effective immediately
0x2A5B	— —	P0-11	KF	First command speed gain	10000	- 30000 ~ 30000	0.01%	Effective immediately
0x2A5C	— —	P0-12	VP	first speed loop gain	183	0 ~ 30000	0.1Hz	Effective immediately
0x2A5D	— —	P0-13	VI	1st speed loop integral time constant	189	0 ~ 30000	ms	Effective immediately
0x2A5E	— —	P0-14	KK	Acceleration feedforward gain	3000	0 ~ 20000	0.01%	Effective immediately
0x2A5F	— —	P0-15	KT	Acceleration feedforward filter frequency	20000	0 ~ 40000	0.1Hz	Effective immediately
0x2A60	— —	P0-16	KC	First command torque filter frequency	1099	0 ~ 40000	01Hz	Effective immediately
0x2A61	— —	P0-17	UP	Second position loop gain	52	0 ~ 20000	0.1Hz	Effective immediately
0x2A63	— —	P0-19	UD	Second position loop differential time constant	2000	0 ~ 30000	ms	Effective immediately
0x2A64	— —	P0-20	UE	The second position loop differential filter frequency	15000	0 ~ 40000	0.1Hz	Effective immediately
0x2A65	— —	P0-21	UF	Second command speed gain	10000	- 30000 ~ 30000	0.01%	Effective immediately

index	sub-index	code	instruction	name	Defaults	Scope	unit	Effective mechanism
0x2A66	— —	P0-22	UV	Second speed loop gain	183	0 ~ 30000	0.1Hz	Effective immediately
0x2A67	— —	P0-23	UG	Second speed loop integral time constant	189	0 ~ 30000	ms	Effective immediately
0x2A68	— —	P0-24	UC	Second command torque filter frequency	1099	0 ~ 40000	01Hz	Effective immediately
0x2A6D	— —	P0-25	XP	Fully closed loop - position loop gain	52	0 ~ 20000	0.1Hz	Effective immediately
0x2A6F	— —	P0-27	XD	Fully closed loop - position loop differential time constant	2000	0 ~ 30000	ms	Effective immediately
0x2A70	— —	P0-28	XE	Fully closed loop-position loop differential filtering frequency	15000	0 ~ 40000	0.1Hz	Effective immediately
0x2A71	— —	P0-29	XF	Full closed loop - command speed gain	10000	- 30000 ~ 30000	0.01%	Effective immediately
0x2A72	— —	P0-30	XV	Fully closed loop - speed loop gain	183	0 ~ 30000	0.1Hz	Effective immediately
0x2A73	— —	P0-31	XG	Full closed loop - speed loop integral time constant	189	0 ~ 30000	ms	Effective immediately
0x2A74	— —	P0-32	XC	Full closed loop - command torque filter frequency	1099	0 ~ 40000	0.1Hz	Effective immediately
0x2A69	0x01	P0-33	SD	Gain switching condition selection	0	0 ~ 4	— —	Effective immediately
	0x02	P0-34	PN	Gain Switching Condition - Position	0	0 ~ 2147483647	Pulses	Effective immediately
	0x03	P0-35	VN	Gain Switching Condition - Speed	0	0 ~ 100	rps	Effective immediately
	0x04	P0-36	TN	Gain Switching Condition - Torque	10	0 ~ 3000	0.1%	Effective immediately
	0x05	P0-37	SE1	The second gain switches to the first gain delay	10	0 ~ 10000	ms	Effective immediately
	0x06	P0-38	SE2	The first gain switches to the second gain delay	10	0 ~ 10000	ms	Effective immediately
— —	— —	P0-39	LR	Velocity Feedback Filter	0	0 ~ 3	— —	Effective immediately

P1-XX Group: Device Parameters

index	sub-index	code	instruction	name	Defaults	Scope	unit	Effective mechanism
0x2A30	— —	P1-00	CM	master control mode	twenty one	1,15,21,26,30	— —	Effective immediately
0x2A31	— —	P1-01	EN	second control mode	twenty one	1,2,7,11,15,21	— —	Effective immediately
0x2A32	— —	P1-02	PM	Power-on working mode	10	10	— —	Take effect after restart
0x2A33	— —	P1-03	JM	Speed Control Clamp Mode	2	1 ~ 2	— —	Effective immediately
0x2A6A	— —	P1-04	XM	Fully closed loop mode switch	0	0 ~ 1	— —	Effective immediately
		P1-05	GC	Command torque in internal torque mode	0	- 3000 ~ 3000	0.1%	Effective immediately
0x2A03	— —	P1-06	CC	first torque limit	3000	0 ~ 3000	0.1%	Effective immediately
0x2A18	— —	P1-07	CV	Torque reaches target value	0	0 ~ 3000	0.1%	Effective immediately
0x2A08	— —	P1-08	HC	Torque in hard limit homing mode Limit	1000	0 ~ 3000	0.1%	Effective immediately
0x2A01	— —	P1-09	CL	Torque overload duration	0	0 ~ 30000	ms	Effective immediately
0x2A02	— —	P1-10	LD	Torque limit method	1	0 ~ 5	— —	Effective immediately
0x2A0A	— —	P1-11	RN	Motor rotation direction selection	0	0 ~ 1	— —	Take effect after restart
— —	— —	P1-12	IF	Data Format	H	D,H	— —	Effective immediately
0x2020	— —	P1-17	CO	CANopenCommunication node address	1	1 ~ 127	— —	Take effect after restart
0x2022	— —	P1-18	CB	CANopenCommunication baud rate	0	0 ~ 7	— —	Take effect after restart
0x2A34	0x01	P1-19	ZR	Regenerative absorption resistor resistance	200	10 ~ 32000	Ω	Effective immediately
	0x02	P1-20	ZC	Regenerating Absorption Resistor Power	40	0 ~ 32000	W	Effective immediately
	0x03	P1-21	ZT	Regeneration absorption time constant	1000	0 ~ 8000	ms	Effective immediately
0x2A35	— —	P1-22	PK	Key setting lock	0	0 ~ 1	— —	Effective immediately
0x2A36	— —	P1-23	DD	leddefault display item	0	0 ~ 20	— —	Effective immediately
0x2A37	— —	P1-24	MA	Alarm masking	4294967295	0 ~ 4294967295	— —	Effective immediately
0x2A04	— —	P1-25	CX	Second torque limit	3000	0 ~ 3000	0.1%	Effective immediately
0x2A05	— —	P1-26	CY	Third torque limit	3000	0 ~ 3000	0.1%	Effective immediately
0x2A06	— —	P1-27	CZ	Fourth torque limit	3000	0 ~ 3000	0.1%	Effective immediately
0x2A09	— —	P1-28	HT	Motor stall protection time	0	0 ~ 30000	ms	Effective immediately
0x2AB1	0x01	P1-29	YV	Dynamic brakes when disabled action	0	0 ~ 5	— —	Effective immediately
	0x03	P1-30	YR	The action of the dynamic brake when an error is reported	0	0 ~ 3	— —	Effective immediately
	0x02	P1-31	YM	Dynamic brakes are decelerating after disabling The longest action time in the process	500	0 ~ 30000	ms	Effective immediately
	0x04	P1-32	YN	Dynamic braking during deceleration reporting an error longest action time in	0	0 ~ 30000	ms	Effective immediately
— —	— —	P1-33	OT	Power input phase loss detection switch	0	0 ~ 1	— —	Effective immediately
— —	— —	P1-34	RT	Current instantaneous change alarm threshold	1000	0 ~ 3000	0.1%	Effective immediately

P2-XX Group: Motion Profile Parameters

index	sub-index	code	instruction	Features	Defaults	Scope	unit	Effective mechanism
0x607F	— —	P2-00	VM	Maximum speed	80	0 ~ 100	rps	Effective immediately
0x6085	— —	P2-01	AM	Servo brake deceleration	3000	0.167 ~ 5000	rps/s	Effective immediately
0x2A42	— —	P2-02	JS	Internal speed mode target speed	10	- 100 ~ 100	rps	Effective immediately
0x2A43	— —	P2-03	JA	Internal Velocity Mode Acceleration	100	0.167 ~ 5000	rps/s	Effective immediately
0x2A44	— —	P2-04	JL	Internal speed mode deceleration	100	0.167 ~ 5000	rps/s	Effective immediately
0x2A4C	— —	P2-05	JT	jerk time	10	0 ~ 125	ms	Effective immediately
		P2-06	VE	Speed in internal peer-to-peer mode	10	0.0042 ~ 100	rps	Effective immediately
		P2-07	AC	Acceleration in internal peer-to-peer mode	100	0.167 ~ 5000	rps/s	Effective immediately
		P2-08	DE	Deceleration in internal peer-to-peer mode	100	0.167 ~ 5000	rps/s	Effective immediately
0x2A45	— —	P2-09	VC	Speed down in internal peer-to-peer mode	2	0 ~ 100	rps	Effective immediately
0x2A46	0x01	P2-10	JC1	Multi-speed control: the first1gear speed	2	- 100 ~ 100	rps	Effective immediately
	0x02	P2-11	JC2	Multi-speed control: the first2gear speed	10	- 100 ~ 100	rps	Effective immediately
	0x03	P2-12	JC3	Multi-speed control: the first3gear speed	20	- 100 ~ 100	rps	Effective immediately
	0x04	P2-13	JC4	Multi-speed control: the first4gear speed	25	- 100 ~ 100	rps	Effective immediately
	0x05	P2-14	JC5	Multi-speed control: the first5gear speed	30	- 100 ~ 100	rps	Effective immediately
	0x06	P2-15	JC6	Multi-speed control: the first6gear speed	35	- 100 ~ 100	rps	Effective immediately
	0x07	P2-16	JC7	Multi-speed control: the first7gear speed	40	- 100 ~ 100	rps	Effective immediately
	0x08	P2-17	JC8	Multi-speed control: the first8gear speed	50	- 100 ~ 100	rps	Effective immediately
0x609A	— —	P2-18	HA1	Return to origin acceleration/deceleration	100	0.167 ~ 5000	rps/s	Effective immediately
0x6099	0x01	P2-24	HV1	The first speed of returning to the origin	10	0.0042 ~ 100	rps	Effective immediately
	0x02	P2-25	HV2	The second speed of returning to the origin	1	0.0042 ~ 100	rps	Effective immediately
0x607C	— —	P2-27	HO	Return to origin offset	0	- 2147483647 ~ +2147483647	pulses	Effective immediately
0x2A4D	— —	P2-28	KJ	low pass smoothing filter	0	0 ~ 1000	ms	Effective immediately
0x2A4E	— —	P2-29	FF	interpolation filter	10	0 ~ 125	ms	Effective immediately
0x2A47	— —	P2-30	VT	Speed limit in torque mode	80	0 ~ 100	rps	Effective immediately

Note:

The correspondence between the object dictionary and the setting value of the parameter table is as follows:

$$\text{speed (rps)} = \frac{\text{set value}}{\text{The number of pulses required for one revolution of the motor}} = \frac{\text{set value}}{\text{0x2A90}}$$

$$\text{acceleration/deceleration}_{\text{(rps/s)}} = \frac{\text{set value}}{\text{The number of pulses required for one revolution of the motor}} = \frac{\text{set value}}{\text{0x2A90}}$$

set value:Object dictionary settings

P3-XX Group: Encoder and Input Pulse Parameters

index	sub-index	code	instruction	Features	Defaults	Scope	unit	Effective mechanism
0x2A93	0x01	P3-00	EN	Electronic gear ratio numerator	32000	0 ~ 2147483647	— —	Effective immediately
	0x02	P3-01	EU	Electronic gear ratio denominator	32000	0 ~ 2147483647	— —	Effective immediately
0x2A91	— —	P3-02	SZ	Pulse input filter width	5	0 ~ 32000	0.1μs	Take effect after restart
0x2A92	— —	P3-03	PT	Pulse input setting	9	0 ~ 31	— —	Take effect after restart
0x2AA8	— —	P3-04	PF	Position error alarm limit	100000	0 ~ 2147483647	pulses	Effective immediately
0x2A90	— —	P3-05	EG	Number of pulses required per revolution	10000	200 ~ 131072	pulses/rev	Take effect after restart
0x2A6C	— —	P3-06	PV	The direction of the second encoder	0	0 ~ 1	— —	Effective immediately
0x2A77	— —	P3-09	XT	Hybrid deviation in fully closed loop mode Clear setting	10	1 ~ 100	rev	Effective immediately
0x2A78	— —	P3-10	XO	Hybrid deviation in fully closed loop mode Alarm threshold	100000	0 ~ 2147483647	pulses	Effective immediately
0x2A6B	— —	P3-11	XR	Second encoder resolution	10000	200 ~ 100000	pulses/mm	Effective immediately
0x2A94	0x01	P3-12	PO	Pulse frequency division output mode	1	0 ~ 256	— —	Take effect after restart
	0x02	P3-13	ON	Pulse divider output ratio numerator	10000	0 ~ 13107200	— —	Take effect after restart
	0x03	P3-14	OD	Pulse frequency division output ratio denominator	131072	0 ~ 13107200	— —	Take effect after restart
0x2A9C	0x04	P3-15	ES	Absolute encoder usage mode	2	0 ~ 3	— —	Take effect after restart
— —	— —	P3-16	PU	Electronic gear ratio switch	0	0 ~ 1	— —	Take effect after restart

P4-XX Group: Analog I/O Parameters

index	sub-index	code	instruction	Features	Defaults	Scope	unit	Effective mechanism
0x2A27	0x05	P4-01	AG	Analog input speed scaling	50	0 ~ 100	rps/10V	Effective immediately
	0x06	P4-02	AN	Analog input torque scaling	1000	0 ~ 3000	0.1%	Effective immediately
0x2A22	0x02	P4-03	AV1	Analog input1Offset	0	- 10000 ~ 10000	mV	Effective immediately
0x2A23	0x02	P4-04	AV2	Analog input2Offset	0	- 10000 ~ 10000	mV	Effective immediately
0x2A22	0x01	P4-05	AD1	Analog input1dead zone	0	0 ~ 255	mV	Effective immediately
0x2A23	0x01	P4-06	AD2	Analog input2dead zone	0	0 ~ 255	mV	Effective immediately
0x2A22	0x03	P4-07	AF1	Analog input1low pass filter	1000	0 ~ 2000	0.1Hz	Effective immediately
0x2A23	0x03	P4-08	AF2	Analog input2low pass filter	1000	0 ~ 2000	0.1Hz	Effective immediately
0x2A22	0x04	P4-09	AT1	Analog input1trigger threshold	5000	- 10000 ~ 10000	mV	Effective immediately
0x2A23	0x04	P4-10	AT2	Analog input2trigger threshold	5000	- 10000 ~ 10000	mV	Effective immediately
0x2A27	0x01	P4-11	FA1	Speed limit source setting	1	0 ~ 1	— —	Effective immediately
0x2A11	0x02	P4-16	OS1	Analog output1target	1000	1 ~ 32000	— —	Effective immediately

index	sub-index	code	instruction	Features	Defaults	Scope	unit	Effective mechanism
0x2A11	0x03	P4-18	XA1	Analog output1function definition	0	0 ~ 5	— —	Effective immediately

P5-XX Group: Digital I/O Parameters

index	sub-index	code	instruction	Features	Defaults	Scope	unit	Effective mechanism
0x2A20	0x01	P5-00	MU1	digital input1Features	7	0 ~ 46	— —	Effective immediately
	0x02	P5-01	MU2	digital input2Features	5	0 ~ 46	— —	Effective immediately
	0x03	P5-02	MU3	digital input3Features	stallmmediatelyeffect	0 ~ 46	— —	Effective immediately
	0x04	P5-03	MU4	digital input4Features	0	0 ~ 46	— —	Effective immediately
	0x05	P5-04	MU5	digital input5Features	13	0 ~ 46	— —	Effective immediately
	0x06	P5-05	MU6	digital input6Features	19	0 ~ 46	— —	Effective immediately
	0x07	P5-06	MU7	digital input7Features	0	0 ~ 46	— —	Effective immediately
	0x08	P5-07	MU8	digital input8Features	39	0 ~ 46	— —	Effective immediately
0x2A10	0x01	P5-12	MO1	digital output1Features	twenty three	0 ~ 34	— —	Effective immediately
	0x02	P5-13	MO2	digital output2Features	2	0 ~ 34	— —	Effective immediately
	0x03	P5-14	MO3	digital output3Features	9	0 ~ 34	— —	Effective immediately
	0x04	P5-15	MO4	digital output4Features	0	0 ~ 34	— —	Effective immediately
0x2A13	0x01	P5-24	BD	Movement waiting time after brake release	200	0 ~ 32000	ms	Effective immediately
	0x02	P5-25	BE	after brake,motor disable wait delay	200	0 ~ 32000	ms	Effective immediately
0x2001	— —	P5-27	HX	origin sensor	8	1 ~ 8	— —	Effective immediately
0x2A21	0x01	P5-28	FI1	digital input1filter	0	0 ~ 8000	ms	Effective immediately
	0x02	P5-29	FI2	digital input2filter	0	0 ~ 8000	ms	Effective immediately
	0x03	P5-30	FI3	digital input3filter	0	0 ~ 8000	ms	Effective immediately
	0x04	P5-31	FI4	digital input4filter	0	0 ~ 8000	ms	Effective immediately
	0x05	P5-32	FI5	digital input5filter	0	0 ~ 8000	ms	Effective immediately
	0x06	P5-33	FI6	digital input6filter	0	0 ~ 8000	ms	Effective immediately
	0x07	P5-34	FI7	digital input7filter	0	0 ~ 8000	ms	Effective immediately
	0x08	P5-35	FI8	digital input8filter	0	0 ~ 8000	ms	Effective immediately

index	sub-index	code	instruction	Features	Defaults	Scope	unit	Effective mechanism
0x2A15	0x01	P5-38	PL	Dynamic following error threshold	10	0 ~ 2147483647	pulses	Effective immediately
	0x03	P5-39	PD	Positioning complete signal position error threshold	40	0 ~ 32000	pulses	Effective immediately
	0x02	P5-40	PE	Motion Condition Timer	10	0 ~ 30000	ms	Effective immediately
	0x04	P5-41	TT	Pulse input completion detection time	2	0 ~ 20000	ms	Effective immediately
0x2A16	0x01	P5-42	ZV	Zero speed judgment threshold	0.5	0.1 ~ 2	rps	Effective immediately
	0x03	P5-43	VR	Speed consistent fluctuation range	0.1	0 ~ 100	rps	Effective immediately
	0x02	P5-44	VV	Judging that the speed reaches the target value	10	0 ~ 100	rps	Effective immediately
0x2A17	— —	P5-45	TV	Torque reaches the fluctuation range	10	0 ~ 3000	0.1%	Effective immediately
0x2A14	— —	P5-46	DG	absolute arrival position	10000	- 2147483647 ~ +2147483647	pulses	Effective immediately
— —	— —	P5-47	LP	Positive soft limit	0	- 2147483647 ~ +2147483647	pulses	Effective immediately
— —	— —	P5-48	LM	Reverse soft limit	0	- 2147483647 ~ +2147483647	pulses	Effective immediately
0x6098	— —	P5-49	HE	Back to origin method	1	- 4 ~ 35	— —	Effective immediately

Appendix II: Updating Firmware

- Updating Firmware Notes

1. Before updating the firmware, you need to confirm with the manufacturer's technical staff whether the drive supports the new firmware.

2. Since the configuration parameters may be lost during the firmware update, you need to back up the configuration files of each drive before updating the firmware, keep these files safe, and re-download the configuration files after the update is complete.

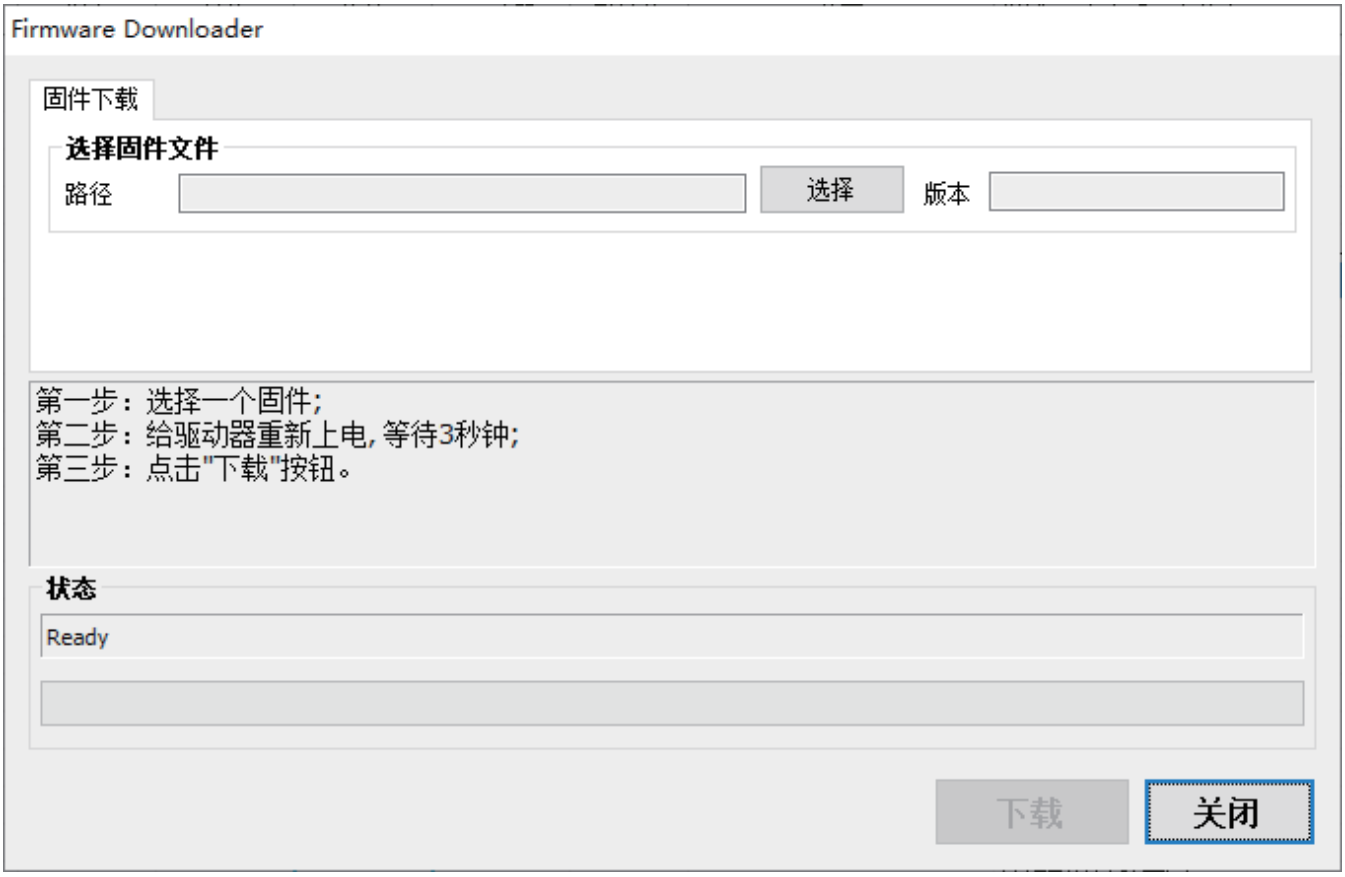
3. In the process of updating the firmware, do not power off the drive.

4. After the firmware update, the drive needs to be powered off and restarted.

- Firmware update method

1. Update the firmware via the serial connection

Use the firmware download tool integrated within the Luna software to download the firmware to the drive.



The firmware download procedure is as follows:

Step 1: Open tools in the Luna Software menu bar and select the Firmware Download Tools item

Step 2: Click the Select button in the pop-up Firmware Downloader dialog box to select a firmware (the firmware file type is .msdf or . msdaf)

Step 3: Power the drive back on and wait 3 seconds

Step 4: Click the "Download" button to start downloading the firmware and wait for the prompt notifying the download was successful

connect MOONS'

Customer consultation center

400-820-9661

MOONS headquarters

No. 168, Mingjia Road, Minbei Industrial Zone, Minhang District, Shanghai

Postcode: 201107

Domestic office

Shenzhen

Room 503, Building A7, Nanshan Zhiyuan, No. 1001, Xueyuan Avenue, Nanshan District,

Shenzhen Postcode: 518071

Beijing

Room 816, Block B, China Electronics Building, No. 3 Danling Street, Haidian District,

Beijing Postcode: 100080

Nanjing

Room 1101/1102, 11th Floor, Building 2, New Town Development Center, No. 126 Tianyuan Middle Road, Jiangning

District, Nanjing

Postcode: 211106

Qingdao

Room 1012, Zhuoyue Building, No. 16 Fengcheng Road, Shibei District, Qingdao

Postcode: 266000

Wuhan

Room 3001, Shimao Building, No. 686 Jiefang Avenue, Jianghan District,

Wuhan Postcode: 430022

Chengdu

Room 1917, Weston Federal Building, No. 19, Section 4, Renmin South Road, Wuhou District, Chengdu

Zip Code: 610041

Xi'an

Room 1006, Block D, Wangzuo International City, No. 1 Tangyan Road, Xi'an

Postcode: 710065

Ningbo

Room 309, Tower B, Taifu Plaza, No. 565, Jingjia Road, Jiangdong District, Ningbo City, Zhejiang

Province Postcode: 315040

Guangzhou

Room 06, 40th Floor, Tower B, Yew Chung Plaza, No. 9 Linhe West Road, Tianhe District,

Guangzhou Postcode: 510610

North American Company

MOONS'INDUSTRIES (AMERICA), INC. (Chicago) 1113
North Prospect Avenue, Itasca, IL 60143 USA

MOONS'INDUSTRIES (AMERICA), INC. (Boston) 36 Cordage
Park Circle, Suite 310 Plymouth, MA 02360 USA

APPLIED MOTION PRODUCTS, INC. 404
Westridge Dr. Watsonville, CA 95076, USA

LIN ENGINEERING, INC.
16245 Vineyard Blvd., Morgan Hill, CA 95037

European companies

MOONS'INDUSTRIES (EUROPE) SRL Via Torri
Bianche n.1 20871 Vimercate(MB) Italy

AMP & MOONS'AUTOMATION(GERMANY)GMBH
Borsenstrabe 14
60313 Frankfuit am Main Germany

Southeast Asian companies

MOONS'INDUSTRIES (SOUTH-EAST ASIA) PTE. LTD. 33 Ubi
Avenue 3 #08-23 Vertex Singapore 408868

Japanese company

MOONS'INDUSTRIES JAPAN CO., LTD.
222-0033

Kanagawa Prefecture Yokohama City, Konkita-ku, Shin-Yokohama 2-chome 12-12

Shin-Yokohama Mitsunobu 6F 602

ISO 14001 TÜV SUD ISO 9001 OHSAS 18001

http://www.moons.com.cn E-mail:
ama-info@moons.com.cn

MOONS' moving in better ways 安浦鸣志

• The product specifications and technical parameters listed in this catalog are for reference only, and our company reserves the right to change without prior note. For product details, please contact our sales department.