M6-P CANopen User Manual

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Shenzhen Megmeet Electrical Co., Ltd. provides professional technical support for our customers. You can contact the local branch office or customer service center, or directly contact the company headquarters.

Shenzhen Megmeet Electrical Co., Ltd.
Address: 5th Floor, Block B, Unisplendor Information Harbor, Langshan Road, Nanshan District, Shenzhen, 518057, China
Zip code: 518057
Website: https://www.megmeet.com
Tel: +86-755-86600500
Fax: +86-755-86600562
Service email: driveservice@megmeet.com

Foreword

Thank you for using the M6-P series servo system with CANopen fieldbus functionality, manufactured by Shenzhen Megmeet Electrical Co., Ltd.

Before using the CANopen function described in this manual, please confirm whether the software version of your M6-P series servo system supports CANopen communication.

The M6-P CANopen series servo system supports CANopen bus communication, allowing the product to be connected to a high-speed CANopen network for bus control and operational status monitoring.

The M6-P CANopen series servo system only supports CANopen slave stations. Therefore, this manual primarily introduces the communication functions and related applications of CANopen slave stations. For the corresponding hardware settings, please refer to the "M6-P Series Servo System User Manual".

If you have any questions regarding the use of CANopen, please consult our relevant technical personnel for assistance.

Contents

Chapter 1 M6-P CANopen Introduction

1.1 Product series

Fig. 1-1 M6-P series with CANopen

1.2 Performance parameters

Item	Description
Application layer protocol	CANopen
CAN-ID type	11-bit CAN2.0A
Baud rate	1 Mbit/s, 500 Kbit/s, 250 Kbit/s, 150 Kbit/s
CAN frame length	0 to 8 bytes
Supported protocols	CiA-301 V4.02: CANopen Application Layer and Communication Profile CiA-DSP402 V3.0: Drive and Motion Control Device Profile
Supported services	NMT, SDO, PDO, SYNC, EMCY
PDO transmission type	Timer triggered, SYNC triggered
SDO transmission method	Expedited transfer, segmented transfer
Number of supported PDOs	4 RPDOs, 4 TPDOs
Supported CiA-DSP402 operation modes	Profile position mode, profile velocity mode, homing mode, and profile torque mode

Chapter 2 CANopen Bus Function

2.1 CANopen overview

CANopen is a high-level communication protocol based on Controller Area Network (CAN), including communication sub-protocols and device profiles. It is commonly used in embedded systems and serves as a fieldbus widely applied in industrial control.

CANopen implements protocols from the network layer upward (including network layer) in the OSI model. The CANopen standard includes addressing schemes, several communication sub-protocols, and an application layer defined by device profiles. CANopen supports network management, device monitoring, and communication between nodes, with the data link layer and physical layer typically implemented using CAN.

CANopen standards are developed and reviewed by the non-profit organization CiA (CAN in Automation). Basic CANopen devices and communication sub-protocols are defined in CAN in Automation (CiA) draft standard 301. Motion control specifications are defined in CiA402.

The CANopen communication of M6-P series servo system is based on: CAN2.0A standard frame format.

2.2 Related protocols

Protocol	Name
CiA DS 301 V4.02	CANopen Communication Profile for Industrial Systems - based on CAL
CiA DSP 402 V3.0	CANopen Device Profile

2.3 Terms and abbreviations

Abbreviation	Description
CAN	Controller Area Network
CiA	CAN in Automation (CiA)
COB	Communication Object (COB), a transmission unit in CAN network. Data is transmitted along the entire network within COB. COB itself is part of the CAN message frame.
COB-ID	Communication Object Identifier
EDS	Object dictionary
LMT	Management layer. It is used to configure parameters for each layer in a given CAN model.
NMT	NMT (Network Management) is responsible for initialization, configuration and fault handling on CAN network.
OD	Object
PDO	Process Data Object (PDO)
SDO	Service Data Object (SDO)

Abbreviation	Description
RO	Read-only
RW	Read-write
PP	Profile Position Mode
PV	Profile Velocity Mode
PT	Profile Torque Mode
HM	Homing Mode

2.4 Supported services

Supported services and COB-ID

Function	Function code (ID-bits 10-7)	COB-ID	Communication parameters at OD index
NMT Service	0000	000H	-
Emergency	0001	080H+NodeID	1024H,1015H
SDO Tx	1011	580H+NodeID	1200H
SDO Rs	1100	600H+NodeID	1200H
NMT Error (Node guarding)	1110	700H+NodeID	1016H,1017H
PDO1 Tx	0011	180H+NodeID	1800H
PDO2 Tx	0101	280H+NodeID	1801H
PDO3 Tx	0111	380H+NodeID	1802H
PDO4 Tx	1001	480H+NodeID	1803H
PDO1 Rs	0100	200H+NodeID	1400H
PDO2 Rs	0110	300H+NodeID	1401H
PDO3 Rs	1000	400H+NodeID	1402H
PDO4 Rs	1010	500H+NodeID	1403H

NMT (Network Management)

NMT services support NMT Module Control, NMT Node Guarding, and NMT Boot-up. NMT Node Guarding includes Node Guarding and Heartbeat Message. When using Node Guarding, the slave node monitors received PDO packets. If no PDO data is received within the configured timeout period during Operation state, communication timeout is triggered.

In Node Guarding mode, the Master detects node online status by monitoring Heartbeat Messages.

SDO service

SDO services supported are listed below:

SDO command	Description
0x21	Segmented Write Request
0x22	Write request, unspecified length
0x23	Write request, 4 bytes data
0x27	Write request, 3 bytes data
0x2B	Write request, 2 bytes data
0x2F	Write request, 1 bytes data
0x60	Response to write request
0x40	Read request
0x41	Read response, segmented data
0x42	Read response, unspecified length
0x43	Read response, 4 bytes data
0x47	Read response, 3 bytes data
0x4B	Read response, 2 bytes data
0x4F	Read response, 1 bytes data
0x60	Read request, segmented data
0x70	Read request, segmented data
0x80	Abort transmission, abort code as below

PDO service

The M6-P series servo system supports four RPDO channels and four TPDO channels. The minimum response time for PDO service is 1 ms. PDO transmission supports both synchronous and asynchronous modes.

Supported trigger modes:

- Timer Driven
- Remotely requested

EMCY service

The M6-P series servo system actively reports errors when CANopen communication failures occur. For error types, please consult the CANopen 301 communication specification.

Byte	Content
0 to 1	Emergency Error Code
2	Error register
3 to 7	Reserved

Note:

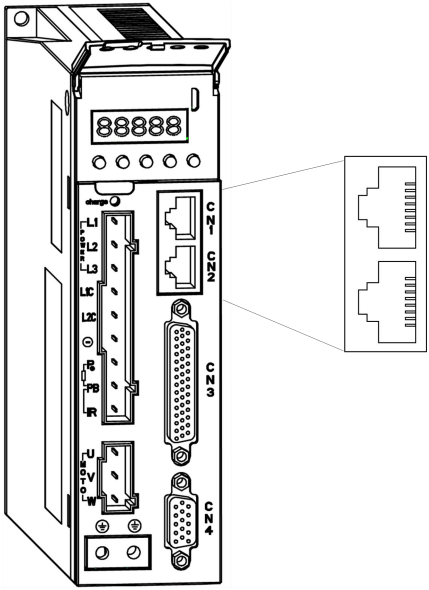
Bytes 0-1: 0xFF00 - User-defined fault

Byte 2: Servo fault code (refer to P10.18 fault table)

The servo actively reports fault information when an alarm occurs.

Chapter 3 Bus Interface and Function Setting

3.1 Bus interface definition

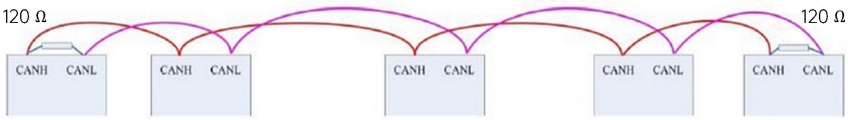


Pin	Definition	Description
1	CANH	CAN port
2	CANL	
3	485+	RS485 port
6	485-	
8	GND	Communication ground
4/5/7	Not defined	

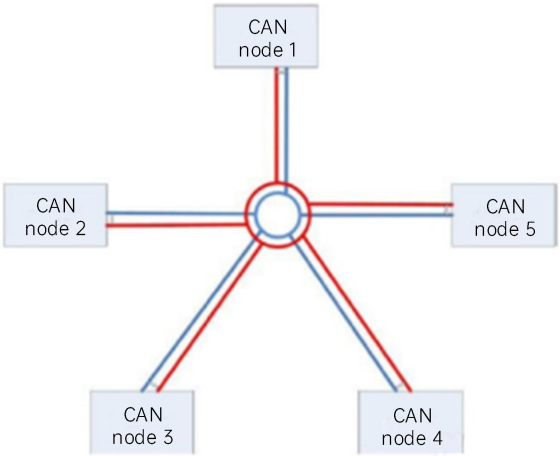
3.2 Bus connection

- All slave stations' CANL and CANH can be connected in series. Star topology connections are not permitted.

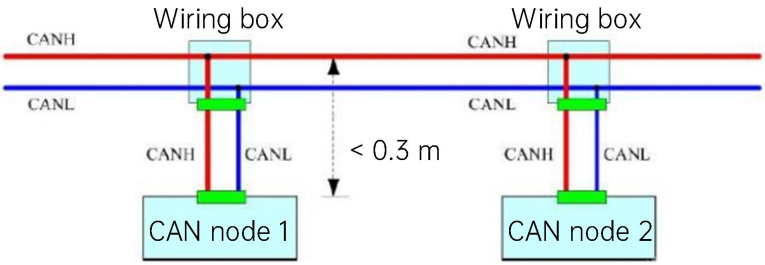
Supported:



Not supported:



Conditionally supported:



- The master station and the last slave node must be connected to a 120 Ω termination resistor respectively.
- To prevent interference, shielded twisted pair cables are strongly recommended for CAN connections.
- Longer cable lengths impose higher driving capability requirements on CAN transceivers.

3.3 Function code settings

The M6-P series servo system's CANopen module supports a maximum of 4 TPDOs and RPDOs. Each PDO can be configured with transmission type, event timer, and mapping objects through function codes. Normal communication will be established once the master activates the node.

For TPDO1 configuration:

Map TPDO1 objects to function codes P16.10–P16.13. After setting the correct number of mapping parameters, power off to apply changes. If TPDO1 mapping fails, refer to P16.09 (TPDO1 mapping status).

Note: Each PDO must not exceed 8 bytes. In P16.10-P16.13, the object dictionary length is specified in byte:

1 byte = 0x08h, 2 bytes = 0x10h, 4 bytes = 0x20h

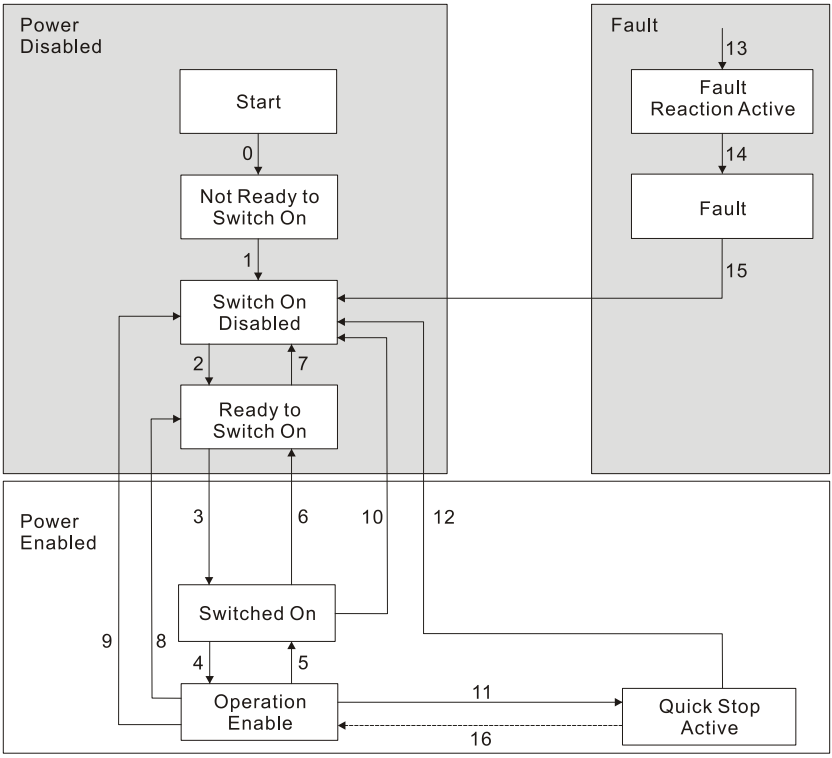
Function code	Name	Range	Min. unit	Default
P16.06	TPDO1 transfer type	0 to 255	1	255
P16.07	TPDO1 event timer	0 to 65535 ms	1 ms	10
P16.08	Number of valid mapping objects for TPDO1	0 to 4	1	2
P16.09	TPDO1 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match	1	0
P16.10	TPDO1 mapping object 1	0–0xXXXXYZZ XXXX – object dictionary index YY – object dictionary sub-index ZZ – object length	1	60410010
P16.11	TPDO1 mapping object 2	0–0xXXXXYZZ XXXX - object dictionary index YY - object dictionary sub-index ZZ - object length	1	606C0020
P16.12	TPDO1 mapping object 3	0–0xXXXXYZZ XXXX – object dictionary index YY – object dictionary sub-index ZZ – object length	1	0
P16.13	TPDO1 mapping object 4	0–0xXXXXYZZ XXXX – object dictionary index YY – object dictionary sub-index ZZ – object length	1	0

Chapter 4 Device Control

The CANopen device profile for drives and motion control (CiA402) describes servo control functions mainly through two parts: operation modes and state machines. As shown below, the control word (6040h) manages mode transitions and state switching. The servo's current operating status is displayed in the status word (6041h). The operation mode (6060h) sets the servo drive's operating mode. Other influencing factors include digital input signals, fault conditions, and additional objects.

4.1 State machine

The state machine defines operational states and corresponding control sequences, while also determining permissible commands for each state. The specific logic is illustrated in the diagram below.



As shown in the diagram, the state machine consists of three main sections: "Power Disabled", "Power Enabled", and "Fault".

After power-on, the drive completes initialization and enters the "SWITCH_ON_DISABLED" state. In this state, the drive's operating mode can be configured while main power remains off.

Through State Transitions 2, 3, and 4, the drive enters "OPERATION ENABLE" state. Here, main power is activated and the drive controls the motor according to the configured operating mode. Therefore, before reaching this state, it is essential to confirm that all drive parameters are properly configured and corresponding input values are zero.

State Transition 9 completes the shutdown of main power circuit.

If the drive triggers an alarm, its state transitions to "Fault". All states will enter "Fault" status upon alarm.

The drive's various states and their meanings are detailed in the following table.

State name	State description
Not Ready to Switch On	The drive is in the process of initializing.
Switch On Disabled	Drive initialization is completed. Drive parameters are configurable.
Ready to Switch On	The drive can be powered on; Drive parameters are configurable.
Switch On	The drive is powered on. Drive parameters are configurable.
Operation Enable	Drive is fault-free. The drive is enabled. Parameter settings are valid.
Quick Stop Active	The drive stops quickly.
Fault Reaction Active	The drive detects that a fault has occurred and performs the fault stop procedure.
Fault	The drive fault occurs and the fault stop ends. The drive function is disabled.

Drive state transitions are described in the following table.

State transition ID	Description
0	The drive automatically performs state transition after reset.
1	The drive automatically performs state transition after reset.
2	Received Shut Down command
3	Received Switch On command
4	Received Enable Operation command
5	Received Disable Operation command
6	Received Shut Down command
7	Received Quick Stop and Disable Voltage command
8	Received Shut Down command
9	Received Disable Voltage command
10	Received Quick Stop or Disable Voltage command
11	Received Quick Stop command
12	Received Quick Stop or Disable Voltage command
13	Drive error, automatic transition

State transition ID	Description
14	Drive error response completed, automatic transition
15	Received Fault Reset command
16	Received Enable Operation command

4.2 Related objects

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
605Ah	VAR	Quick stop option code	INT16	RW	RPDO	-
605Bh	VAR	Shutdown option code	INT16	RW	RPDO	-
605Ch	VAR	Disable operation option code	INT16	RW	RPDO	-
605DH	VAR	Halt option code	INT16	RW	RPDO	-

Object 6040h: Controlword

The control word bit functions include:

- Control status
- Servo operation mode
- Manufacturer-specified options

Index	Object code	Name	Type	Attr.
6040h	VAR	Control word	UINT16	RW

The control word is conventionally referred to as the command word. During communication control, the state machine transition process depends on the control word. In the CiA402 framework, the bit definitions of the control word is as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Fault Reset	Reserved	Reserved	Reserved	Enable Operation	Quick Stop	Enable Voltage	Switch on
Mandatory	Operation mode specific			Mandatory	Mandatory	Mandatory	Mandatory

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Manufacturer specific					Target Reached	Reserved	Halt
Optional					Optional	Optional	Optional

- The control commands composed of Bit0 to Bit3 and Bit7 of the control word are used for state machine transitions. The defined control commands are shown in the following table:

Command	Transitions	Target state	Bit7	Bit3	Bit2	Bit1	Bit0	Control word
Shutdown	2, 6, 8	3 Ready to Switch On	X	X	1	1	0	16#0006
Switch On	3	4 Switched On	X	X	1	1	1	16#0007
Enable Operation	4	5 Operation Enable	X	1	1	1	1	16#000F
Disable Operation	5	4 Switched On	X	0	1	1	1	16#0007
Disable voltage	7, 9, 10, 12	2 Switch On Disabled	X	X	x	0	x	16#0000
Quick Stop	11	6 Quick Stop Active	X	x	0	1	X	16#0002
	7, 12	2 Switch On Disabled						
Fault reset	15	2 Switch On Disabled	0→1	x	x	x	X	16#0080

- Bits 4-6 are used to specify servo modes. For detailed descriptions, refer to the corresponding sections. The following table provides an overview.

Servo mode	Bit4	Bit5	Bit6
Profile position mode	New set-point	Change set immediately	Abs/Rel
Profile velocity mode	Reserved	Reserved	Reserved
Profile torque mode	Reserved	Reserved	Reserved
Homing mode	Homing enable	Reserved	Reserved

- Bit9 and Bit10 are reserved. If no special function is specified, they must be set to 0.
- Bit11-15 are defined by the manufacturer.

Object 6041h: Statusword

The status word is used to indicate the running state of drive. Its bit functions include:

- Current drive state
- Servo mode execution state
- Manufacturer-specified options

Index	Object code	Name	Type	Attr.
6041h	VAR	Status word	UINT16	RO

Data description:

The bit definitions of the status word is as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Warning	Switch on disabled	Quick Stop	Voltage Enabled	Fault	Operation Enabled	Switched on	Ready to Switch on
0 = No warning 1 = Warning	0 = Enabled 1 = Disabled	0 = Stop 1 = No stop	0 = Disabled 1 = Enabled	0 = No fault 1 = Fault	0 = Disabled 1 = Enabled	0 = Not switched on 1 = Switched on	0 = Not ready 1 = Ready

Bit15	Bit14	Bit13	Bit12	Bit11	Bit10	Bit9	Bit8
Reserved	Reserved	Reserved	Reserved	Internal Limit active	Target Reached	Remote	Reserved
Reserved	Reserved	Reserved	Reserved	0 = Normal 1 = Exceeding limit	0 = Not reached 1 = Reached	0 = Remote 1 = Other	Reserved

In most cases, we only need to monitor the lower 8 bits of the status word, particularly bits 6, 5, 3, 2, 1, and 0. Therefore, the status word can be masked with 16#006F (denoted as MSKETA). The resulting typical states are shown in the following table.

State	Bit6	Bit5	Bit3	Bit2	Bit1	Bit0	MSKETA
2 Switch on disabled	1	0	0	0	0	0	16#0040
3 Ready to switch on	0	1	0	0	0	1	16#0021
4 Switched on	0	1	0	0	1	1	16#0023
5 Operation enabled	0	1	0	1	1	1	16#0027
6 Quick Stop Active	0	0	0	1	1	1	16#0007
8 Fault	0	0	1	0	0	0	16#0008

a) Bits 0–3, 5 and 6 servo states

Value (binary)	State
xxxx xxxx x0xx 0000	Not ready to switch on
xxxx xxxx x1xx 0000	Switch on disabled
xxxx xxxx x01x 0001	Ready to switch on
xxxx xxxx x01x 0011	Switched on
xxxx xxxx x01x 0111	Operation enabled
xxxx xxxx x00x 0111	Quick stop active
xxxx xxxx x0xx 1111	Fault reaction active
xxxx xxxx x0xx 1000	Fault

b) Bits 10, 12 and 13 servo states

Servo mode	Bit10	Bit12	Bit13
Profile position mode	Target reached	Position processing	Following error
Profile velocity mode	Target reached	Speed	Slip error
Profile torque mode	Target reached	Reserved	Reserved
Homing mode	Target reached	Homing completed	Homing error

Object 6060h: Modes of operation

6060h is used to select the servo modes of operation.

Index	Object code	Name	Type	Attr.
6060h	VAR	Modes of operation	INT8	RW

Data description:

Value	Servo mode
1	Profile position mode
3	Profile velocity mode
4	Profile torque mode
6	Homing mode

Object 6061h: Modes of operation display

6061h is used to display the current servo modes.

Index	Object code	Name	Type	Attr.
6061h	VAR	Modes of operation display	INT8	RO

Data description: same as 6060h

Object 605Ah: Quick stop option code

605Ah is used to select the quick stop method.

Index	Object code	Name	Type	Attr.
605Ah	VAR	Quick stop option code	INT16	RW

Data description:

Value	Servo mode
0	Coast to stop
1	6084h(PV/PP)/609Ah(HM)/6087h(PT)
2	6085h(PV/PP/HM)/6087h/(PT)
5	6084h(PV/PP)/609Ah(HM)/6087h(PT), drive position lock
6	6085h(PV/PP/HM)/6087h/(PT), drive position lock
Note	Position lock is supported under the torque mode

Object 605Bh: Shutdown option code

605Bh is used to select the shutdown method.

Index	Object code	Name	Type	Attr.
605Bh	VAR	Shutdown option code	INT16	RW

Data description:

Value	Servo mode
0	Coast to stop
1	6084h(PV/PP)/609Ah(HM)/6087h(PT)
2	6085h(PV/PP/HM)/6087h/(PT)

Object 605Ch: Disable operation option code

605Ch is used to select the servo OFF method.

Index	Object code	Name	Type	Attr.
605Ch	VAR	Disable operation option code	INT16	RW

Data description:

Value	Servo mode
0	Coast to stop
1	6084h(PV/PP)/609Ah(HM)/6087h(PT)
2	6085h(PV/PP/HM)/6087h/(PT)

Object 605Dh: Halt option code

605Dh is used to select the halt method.

Index	Object code	Name	Type	Attr.
605Dh	VAR	Halt option code	INT16	RW

Data description:

Value	Servo mode
0	Coast to stop
1	6084h(PV/PP)/609Ah(HM)/6087h(PT)
2	6085h(PV/PP/HM)/6087h/(PT)

Object 605Eh: Fault reaction option code

605Eh is used to select the stop mode for level 2 faults. For level 1 faults, only coasting to stop is supported. Refer to Chapter 8 for fault classification.

Index	Object code	Name	Type	Attr.
605Eh	VAR	Fault reaction option code	INT16	RW

Data description:

Value	Servo mode
0	Coast to stop
1	6084h(PV/PP)/609Ah(HM)/6087h(PT)
2	6085h(PV/PP/HM)/6087h/(PT)

Chapter 5 Conversion Factor

To accommodate discrepancies between user units and the servo drive's internal motor control units across different applications, electronic gear ratio function codes can be configured. For details, refer to the "M6-P Series Servo System User Manual". The CiA402 protocol provides a set of conversion factors between user units and internal servo units. These factors automatically translate user-configured parameters into corresponding internal-unit parameters for motor control, while simultaneously converting motor feedback parameters back into user units.

The internal control units of the drive are:

- Motor displacement unit: p (pulse)
- Motor speed unit: rpm (revolutions per minute)

The actual user units are:

- Load displacement unit: mm
- Load speed unit: mm/s (mm per second)

5.1 Gear ratio factor (6091h)

The gear ratio factor essentially represents the motor displacement (unit: p) corresponding to 1 user unit of load displacement.

The gear ratio factor consists of a numerator (6091-1h) and a denominator (6091-2h). Through this factor, a proportional relationship is established between load displacement (user unit) and motor displacement (motor unit).

$$\text{Gear ratio factor (6091h)} = \frac{\text{Motor encoder resolution (6091-1h)}}{\text{Load shaft resolution (6091-2h)}}$$

$$\text{Motor displacement} = \text{Load displacement (user)} \times \text{Gear ratio factor}$$

$$\text{Motor displacement} = \text{Load feedback disaplcement (user)} \times \text{Gear ratio factor}$$

[Example]

For ball screws:

- Each load feed: 40 mm
- Lead pB=10mm/r
- Motor speed to load speed ratio: 2:1
- Motor encoder resolution: 17-bit, P=131072 (p/r)

Thus, the gear ratio factor is calculated as follows:

Gear ratio factor:

$$\text{Gear ratio factor} = \frac{\text{Motor displacement}}{\text{Load displacement}} = \frac{\frac{40\ \text{mm}}{\frac{10\ \text{mm}}{\text{r}}} * 2 * 131072}{40\ \text{mm}} = \frac{131072}{5}$$

It indicates that the load displacement is 5 mm, and the motor displacement is 131072 pulses.

Thus, numerator 6091-1h = 131072

denominator 6091-2h = 5

Chapter 6 Control Mode

Currently, the servo drive supports 4 control modes of CANopen CiA402:

a) Profile Velocity Mode

b) Profile Position Mode

c) Profile Torque Mode

d) Homing Mode

6.1 Profile velocity mode

Profile velocity mode object settings

In the profile velocity mode, the drive receives velocity commands from the master station and performs internal velocity profiling based on the configured acceleration parameters.

- Mode selection: 6060h=03h
- Control word 6040h:

6040	Description
0x06	Servo ready
0x07	Servo ready, servo enable can be activated
0x0F	Enable active, servo operates according to the given velocity profile

- Status word 6041h:

Status word 6041h: Bit10 displays whether the velocity is reached.

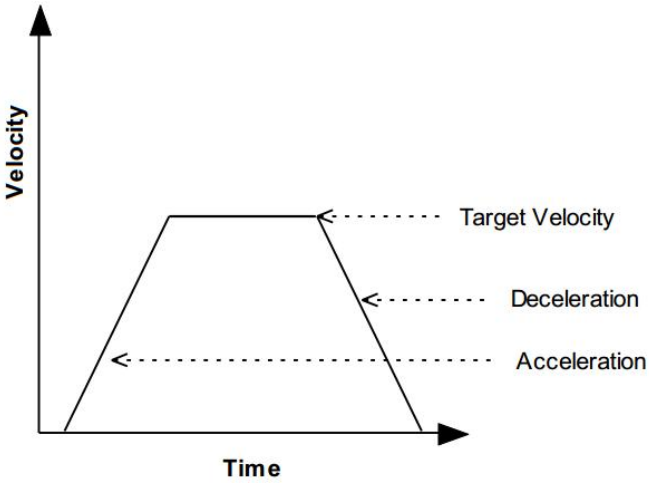
Bit10=0	Velocity not reached
Bit10=1	Velocity reached

Status word 6041h: Bit12 displays whether the velocity is 0.

Bit12=0	Velocity not equal to 0
Bit12=1	Velocity equal to 0

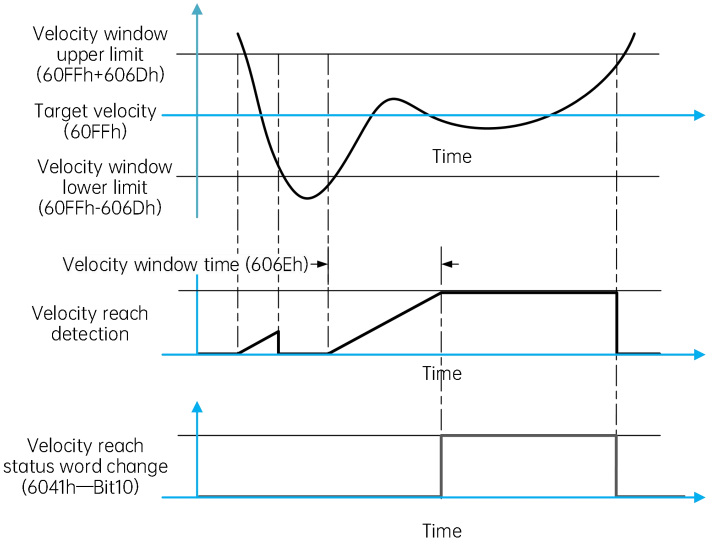
- Velocity profile configuration

Velocity profile configuration includes: Target velocity 60FFh (user unit), Profile acceleration 6083h (user unit), and Profile deceleration 6084h (user unit). All host commands are input in user units, then converted to drive units after limiting and scaling factor processing. The default profile is ramp curve.



- Velocity reach function

This function defines a velocity window around the target velocity (target_velocity). The velocity window (velocity_window) is symmetrically distributed above and below the target velocity. If the drive's actual speed remains stable within this range (velocity_window) for the set duration (velocity_window_time), bit10 (target_reached) of the status word (statusword) will be set to 1. Object 606Dh defines the width of the velocity-reached window, and object 606Eh defines the time threshold for maintaining speed within the window.



- Zero velocity reach function

This function defines that if the drive's actual velocity remains stable within the zero velocity threshold range (zero_velocity_window) for the set duration (zero_velocity_window_time), Bit12 of 6041h will be set to 1. Object 606Fh defines the zero velocity threshold, and object 6070h defines the minimum duration for speed to reach zero. The judgment process is essentially similar to the velocity reach function. It can be regarded as the target velocity being zero.

- Reference polarity

Logic of speed or position reference is set according to the bits of object 0x607E.

Bit	Name	Value	Function
Bit6	Speed reference polarity	0	Speed reference positive logic
		1	Speed reference negative logic
Bit7	Position reference polarity	0	Position reference positive logic
		1	Position reference negative logic

Profile velocity mode related parameters

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
606Bh	VAR	Velocity demand value	INT32	RO	TPDO	rpm
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	rpm
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
606Eh	VAR	Velocity window time	UINT16	RW	RPDO	ms

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
606Fh	VAR	Velocity threshold	UINT16	RW	RPDO	rpm
6070h	VAR	Velocity threshold time	UINT16	RW	RPDO	ms
60FFh	VAR	Target velocity	INT32	RW	RPDO	rpm
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	rpm
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6083h	VAR	Profile acceleration	UINT32	RW	RPDO	ms
6084h	VAR	Profile deceleration	UINT32	RW	RPDO	ms

Profile velocity mode example

- Function code settings

a) Set P02.00 to CANopen mode

P02.00=7;

b) Set the baud rate to 1 MHz

P16.02=3;

c) Set the CANopen node address

P16.01=5; CANopen address

- Related object settings

a) Set [6060h: Mode of operations] to 3 (Profile velocity mode);

605: 2F 60 60 00 03 00 00 00

b) Set [60FFh: Target velocity] to 100 rpm

605: 23 FF 60 00 64 00 00 00

c) Set [6040h: Control word] to control servo state transitions and trigger target position activation (enable with 0x0F, stop with 0x07).

605: 2B 40 60 00 06 00 00 00

605: 2B 40 60 00 07 00 00 00

605: 2B 40 60 00 0F 00 00 00

d) Modify [60FFh: Target velocity] to update the target velocity, in rpm unit.

Note: The motor's rotation direction is determined by the sign of the target velocity: CW for positive values, CCW for negative values.

- Profile velocity basic control commands and status word transitions

Control command	Status word
Power-on or write 80h to the control word (fault reset)	260h

Control command	Status word
Write 06h to 6040	231h
Write 07h to 6040	233h
Write 0Fh to 6040	Zero velocity: 1637h During acceleration or deceleration: 237h Velocity reach: 637h
Fault	Status word Bit3 becomes 1

- Other operations

a) Query [6041h: Status word] to obtain servo drive status feedback (Speed zero, Target reached, Internal limit active);

b) Query [606Ch: Velocity actual value] to obtain the actual velocity feedback (unit: rpm).

6.2 Profile position mode

The servo drive (slave) receives position references from the host controller (master), converts them via the position scaling factor, and uses the result as the target position for internal position control.

Profile position mode object settings

- Mode selection

Set the control mode to profile position mode: 6060h=01h

- Control word 6040h:

Bit definitions related to profile position mode

Bit	Name	Value	Description
Bit4	New set-point	0	New position invalid
		1	New position valid
Bit5	Change set immediately	0	Complete the current position reference before executing the next position reference
		1	Immediately interrupt current position reference to execute the next position reference
Bit6	Abs/Rel	0	Absolute position
		1	Relative position

Example for absolute position not immediately updated

6040	Description
0x06	Servo ready
0x07	Servo ready, servo enable can be activated
0x0F	Enable active, position hold
0x1F	Enable active, position reference valid, and servo position running

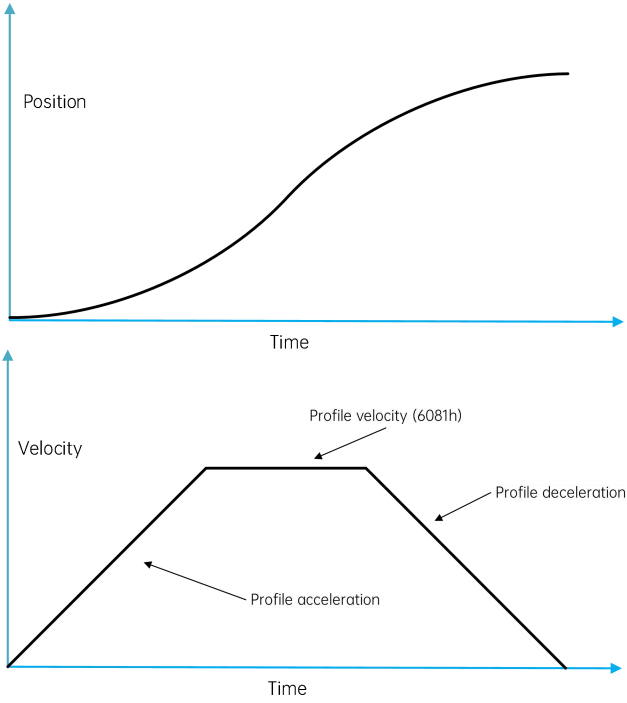
- Status word 6041h:

In the profile position mode, the status word reflects the target position reach status, new set-point acknowledgement status, following error and etc. Its bits definitions are as follows:

Bit	Name	Value	Description
Bit10	Target reached	0	Target position not reached
		1	Target position reached
Bit11	Position reference exceeding limit	0	Position reference not exceeding the internal software position upper and lower limits
		1	Position reference exceeding the internal software position upper and lower limits
Bit12	Set-point acknowledge	0	New reference can be received
		1	New reference can not be received
Bit13	Following error	0	No position deviation
		1	Position deviation

- Position profile configuration

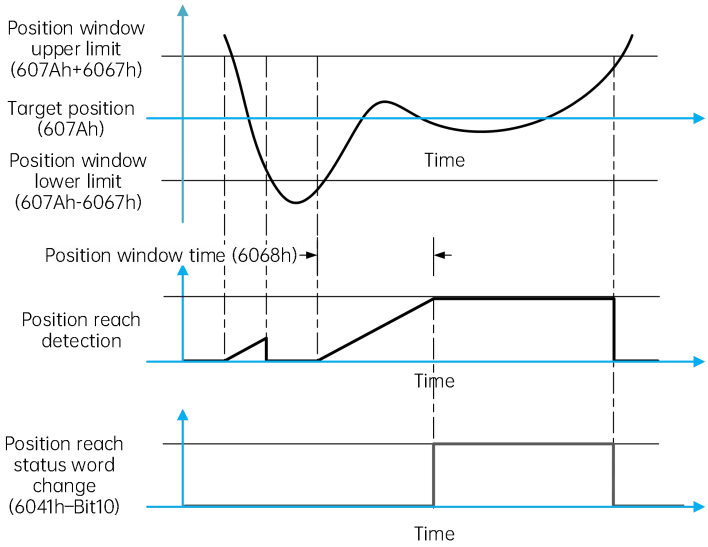
Position profile configuration includes: Target position 607Ah (user unit) and Profile velocity 6081h (user unit). All host commands are input in user units, then converted to drive units after limiting and scaling factor processing. The default profile is ramp position curve.



- Position reach function

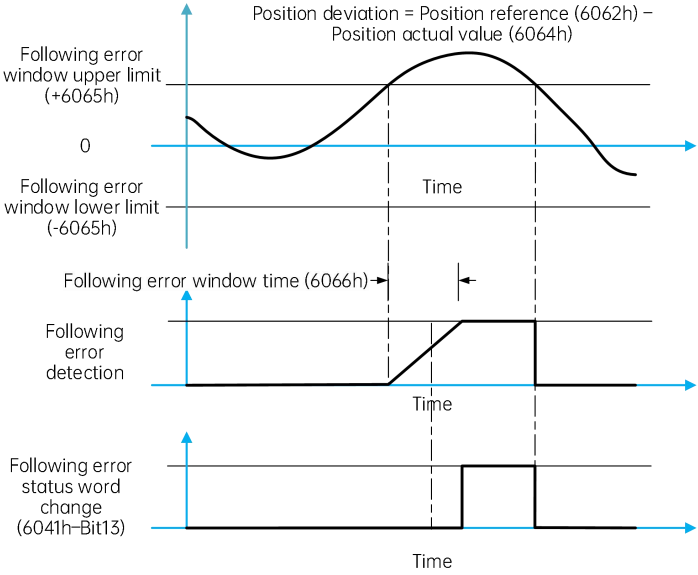
This function defines a position window around the target position (target_position). The position window (position_window) is symmetrically distributed above and below the target position. If the drive's actual position remains stable within this range (position_window) for the set duration (position_window_time), bit10 (target_reached) of the status word will be set to 1. Object 6067h defines the width of the position-reached window, and object 6068h defines the time threshold for maintaining position within the window.

When the drive's position enters the window, a timer starts counting. If the timer reaches the set value (position_window_time) while the drive's position remains within the window throughout, bit10 (target_reached) of the status word will be set to 1. The moment the drive's position leaves this window, bit10 (target_reached) of the status word will be immediately cleared.



- Following error

Following error refers to the deviation between the actual position (position_actual_value) and the demanded position (position_demand_value). The following error window is symmetrically distributed around the demanded position (position_demand_value). If the following error exceeds the following error window (following_error_window) for longer than the set timeout period (following_error_time_out), bit13 (following_error) of the status word will be set to 1.



Profile position mode related parameters

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
6063h	VAR	Position actual value*	INT32	RO	TPDO	p
6064h	VAR	Position actual value	INT32	RO	TPDO	Reference unit
6065h	VAR	Following error window	UINT32	RW	RPDO	Reference unit
6066h	VAR	Following error window time	UINT16	RW	RPDO	ms
6067h	VAR	Position window	UINT32	RW	RPDO	Reference unit
6068h	VAR	Position window time	UINT16	RW	RPDO	ms
607Ah	VAR	Target position	INT32	RW	RPDO	Reference unit
607Dh	ARRAY	Software position limit	INT32	RW	RPDO	Reference unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	rpm
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6081h	VAR	Profile velocity	UINT32	RW	RPDO	rpm
6083h	VAR	Profile acceleration	UINT32	RW	RPDO	ms
6084h	VAR	Profile deceleration	UINT32	RW	RPDO	ms
60F4h	VAR	Following error actual value	INT32	RO	TPDO	Reference unit

Profile position mode example

- Function code settings

a) Set P02.00 to CANopen mode

P02.00=7;

b) Set the baud rate to 1 MHz

P16.02=3;

c) Set the CANopen node address

P16.01=5; CANopen address

- Related object settings

a) Set [6060h: Mode of operations] to 1 (Profile position mode);

605: 2F 60 60 00 01 00 00 00

b) Set [6081h: Profile velocity] to 100 rpm;

605: 23 81 60 00 64 00 00 00

c) Set [607Ah: Target position] to 50000;

605: 23 7A 60 00 50 C3 00 00

d) Set [6040h: Control word] to control servo state transitions, and enable settings of absolute position not immediately updated.

605: 2B 40 60 00 06 00 00 00

605: 2B 40 60 00 07 00 00 00

605: 2B 40 60 00 0F 00 00 00

605: 2B 40 60 00 1F 00 00 00

- Other operations

Query [6041h: Status word] to obtain servo drive status feedback (Speed zero, Target reached, Internal limit active)

6.3 Profile torque mode

The servo drive (slave) receives torque references from the host controller (master) to perform torque control.

Profile torque mode object settings

- Mode selection

Set the control mode to profile torque mode: 6060h = 04h

- Control word 6040h:

6040	Description
0x06	Servo ready
0x07	Servo ready, servo enable can be activated

6040	Description
0x0F	Enable active, servo operates according to the given torque

- Status word 6041h:

Status word 6041h: Bit10 displays whether the torque is reached.

Bit10=0	Torque not reached
Bit10=1	Torque reached

- Torque reach function

This function determines whether the actual torque feedback has reached the torque window. When the difference between the drive's torque actual value (6077h) and the torque reached base value (2007h sub0Eh) exceeds the torque reached valid value (2007h sub0Fh), bit10 (target_reached) of the status word is set to 1. When the difference between the drive's torque actual value (6077h) and the torque reached base value (2007h sub0Eh) falls below the torque reached invalid value (2007h sub10h), bit10 (target_reached) of the status word is immediately cleared.

- Target torque setting: Use 6071h to set the target torque in user unit, unit 0.1%.
- Speed limit setting: Select the speed limit channel according to the function code object dictionary 2007.0Ah (P07.09 FWD speed limit channel) and 2007.0Ch (P07.11 REV speed limit channel). By default, the internal speed limit channel is applied, with the values determined by 2007.0Bh (P07.10 FWD speed limit value) and 2007.0Dh (P07.12 REV speed limit value). Alternatively, you can select the bus speed limit channel and set 607Fh (Max profile velocity) and 6080h (Max motor speed).
- Torque limit setting: Select the torque limit channel according to 2006.0Dh (P06.12 Positive torque limit channel) and 2006.0Eh (P06.13 Negative torque limit channel). By default, the internal torque limit channel is applied, with the positive/negative torque value determined by 2006.0Fh (P06.14 Internal positive torque limit value) and 2006.10h (P06.15 Internal negative torque limit value). Alternatively, you can select the bus torque limit channel, and choose the smaller one between the maximum torque 6072h and positive torque limit 60E0h/negative torque limit 60E1h.

Profile torque mode related parameters

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	rpm
6071h	VAR	Target torque	INT16	RW	RPDO	0.1%
6074h	VAR	Torque demand	INT16	RO	TPDO	0.1%
6077h	VAR	Torque actual value	INT16	RO	TPDO	0.1%
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	rpm
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6087h	VAR	Torque slope	UINT16	RW	RPDO	0.1%/s
60E0h	VAR	FWD torque limit	UINT16	RW	RPDO	0.1%
60E1h	VAR	REV torque limit	UINT16	RW	RPDO	0.1%
2006.0Dh	VAR	P06.12	UINT16	RW	RPDO	-

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
		Positive torque limit channel				
2006.0Eh	VAR	P06.13 Negative torque limit channel	UINT16	RW	RPDO	-
2007.0Ah	VAR	P07.09 FWD speed limit channel	UINT16	RW	RPDO	-
2007.0Ch	VAR	P07.11 REV speed limit channel	UINT16	RW	RPDO	-

Profile torque mode example

- Function code settings

a) Set P02.00 to CANopen mode

P02.00=7;

b) Set the baud rate to 1 MHz

P16.02=3;

c) Set the CANopen node address

P16.01=5; CANopen address

- Related object settings

a) Set [6060h: Mode of operations] to 4 (Profile torque mode);

605: 2F 60 60 00 04 00 00 00

b) Set [6087h: Torque slope] to configure the acceleration/deceleration time as 1.0%/s;

605: 2B 87 60 00 0A 00 00 00

c) Set [6071h: Target torque] to 100.0%;

605: 2B 71 60 00 E8 03 00 00

d) Set [6040h: Control word] to control servo state transitions, and enable torque control.

605: 2B 40 60 00 06 00 00 00

605: 2B 40 60 00 07 00 00 00

605: 2B 40 60 00 0F 00 00 00

- Other operations

Query [6041h: Status word] to obtain servo drive status feedback (Target reached).

6.4 Homing mode

Servo homing refers to the function of controlling the servo motor to find the zero point and complete positioning. Under CANopen bus control, select the servo homing mode to start the homing operation, and the servo will automatically complete homing.

Note: In this mode, it is necessary to connect the limit switch and home switch signals to the digital input terminals of the drive according to the homing mode.

Home mode object settings

- Mode selection

Set the control mode to homing mode: 6060h=06h

- Control word under homing mode

Control word bit definitions related to homing mode

Bit	Name	Value	Description
Bit4	Homing enable selection	0	Homing disabled
		1	Homing enabled

- Status word under homing mode

In the homing mode, the status word indicates the current target position reach status, homing completion status, whether an error is reported, etc. The relevant bit definitions are as follows.

Bit	Name	Value	Description
Bit10	Target reach	0	Target not reached
		1	Target reached
Bit12	Homing completed	0	Homing not completed
		1	Homing completed
Bit13	Homing error	0	Homing error free
		1	Homing error occurred

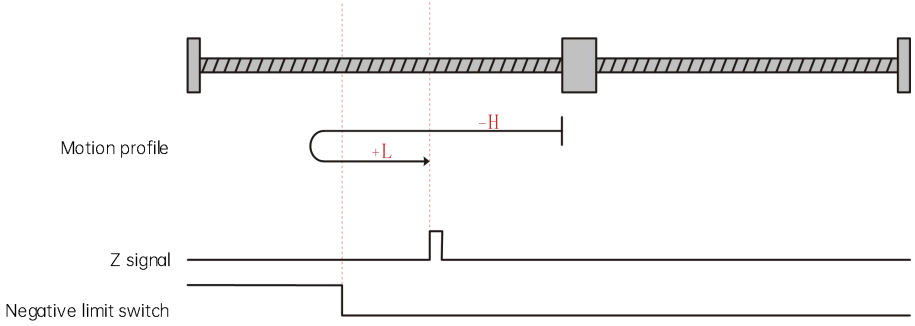
Homing mode

To support more applications, the M6-P series servo system supports CANopen CiA402 homing modes -4 to 35.

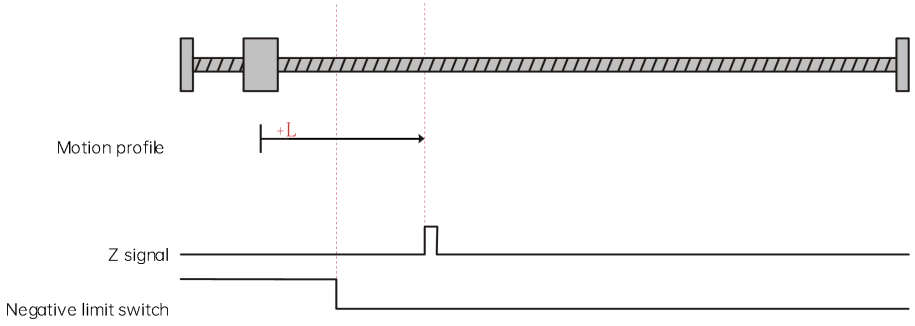
1) 0x6098 = 1

Reverse, negative limit switch as deceleration point and Z signal as home

The current position of the motor is where the negative limit switch is inactive. When the homing is started, the negative limit switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at low speed. After reaching the falling edge of the negative limit switch, the motor continues to run in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



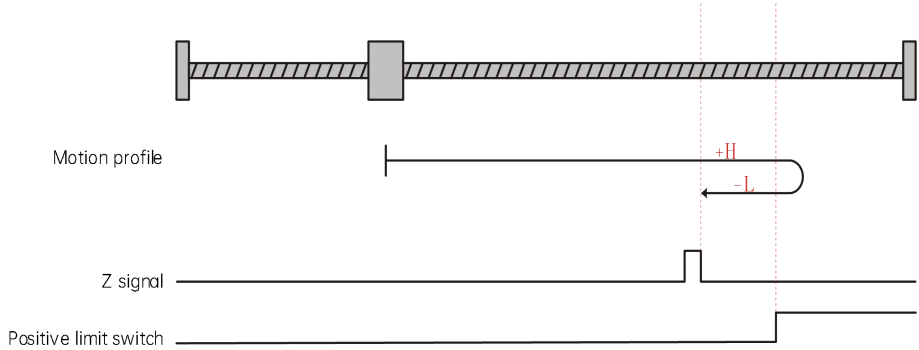
The current position of the motor is at the negative limit switch. When the homing is started, the negative limit switch is at high level, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the negative limit switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



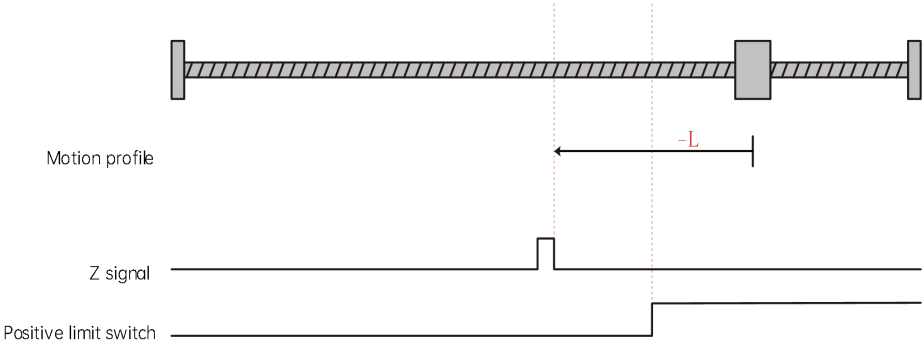
2) 0x6098 = 2

Forward, positive limit switch as deceleration point and Z signal as home

The current position of the motor is where the positive limit switch is inactive. When the homing is started, the positive limit switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at low speed. After reaching the falling edge of the positive limit switch, the motor continues to run in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



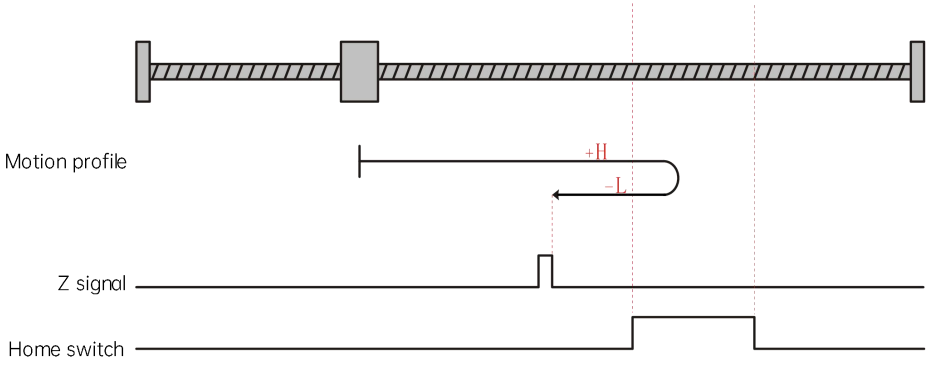
The current position of the motor is at the positive limit switch. When the homing is started, the positive limit switch is at high level, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the positive limit switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



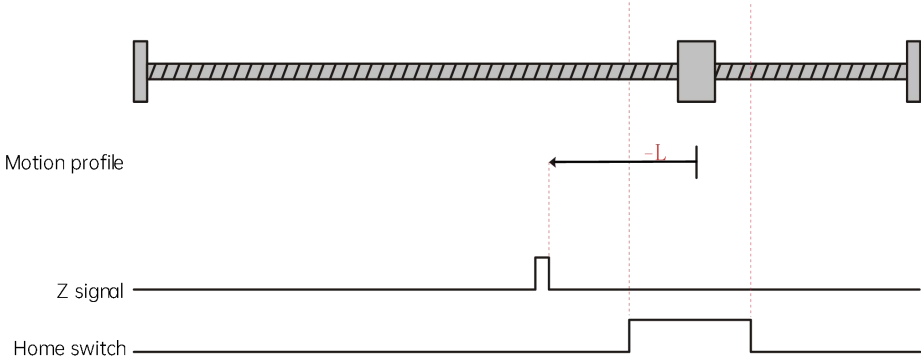
3) 0x6098 = 3

Forward, home switch as deceleration point and Z signal as home

The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor continues to run in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



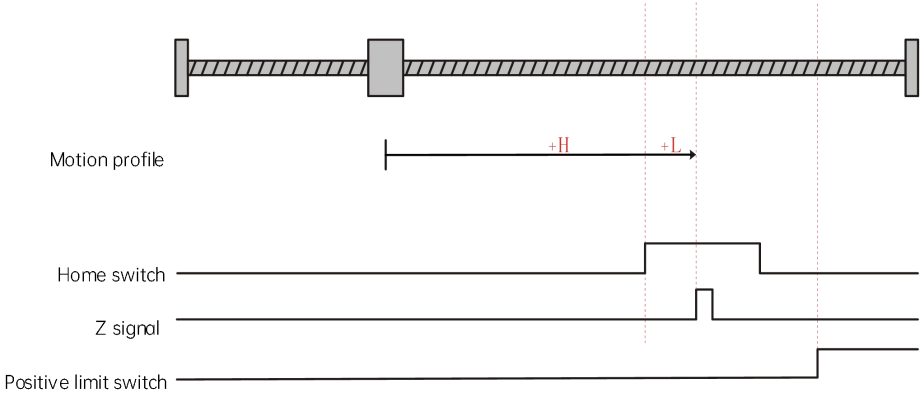
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



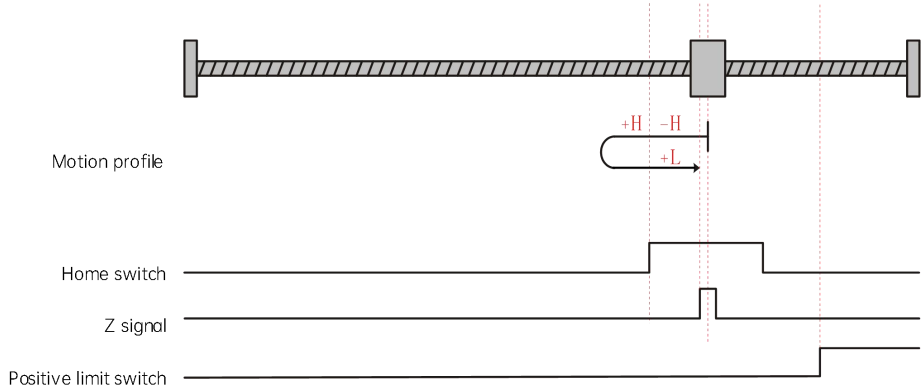
4) 0x6098 = 4

Forward, home switch as deceleration point and Z signal as home

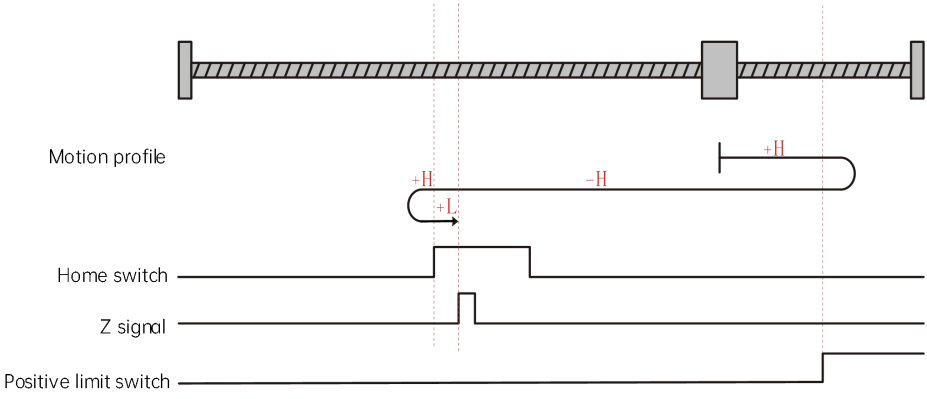
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



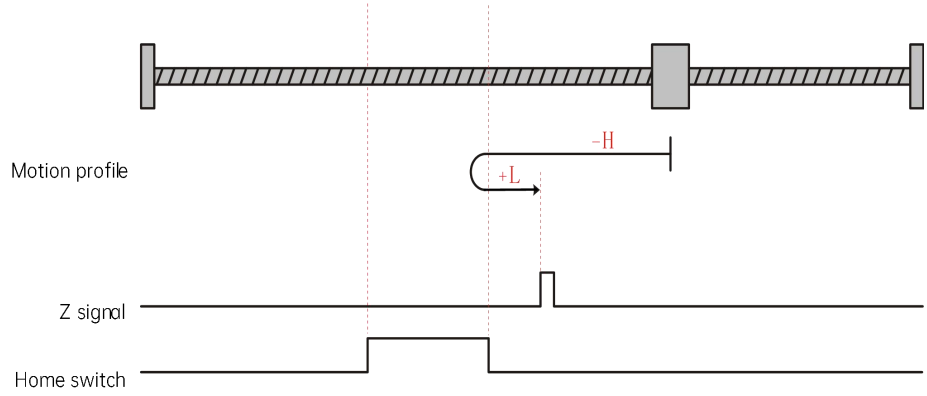
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



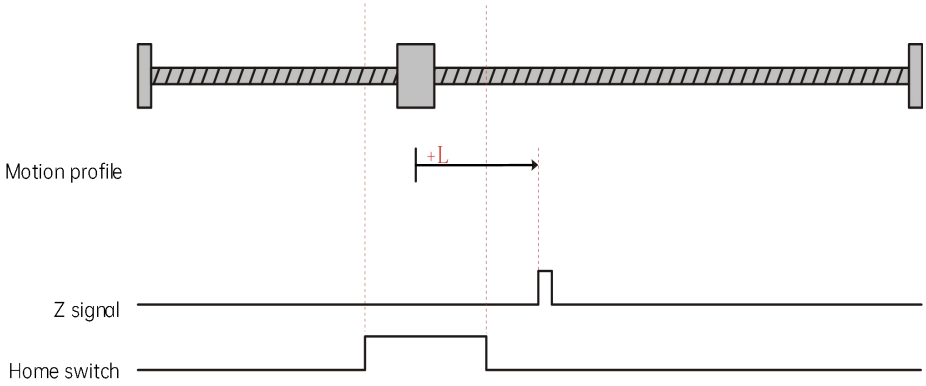
5) 0x6098 = 5

Reverse, home switch as deceleration point and Z signal as home

The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed. After reaching the falling edge of the home switch, the motor continues to run in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



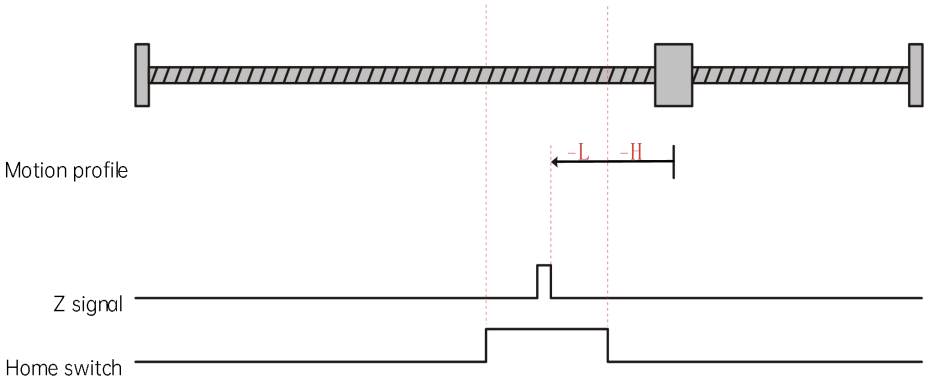
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at low speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low-speed, and stops when reaching the rising edge of the Z signal.



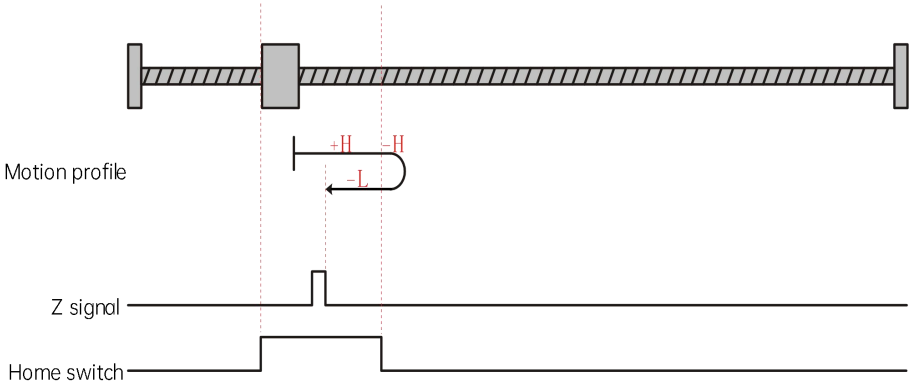
6) 0x6098 = 6

Reverse, home switch as deceleration point and Z signal as home

The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



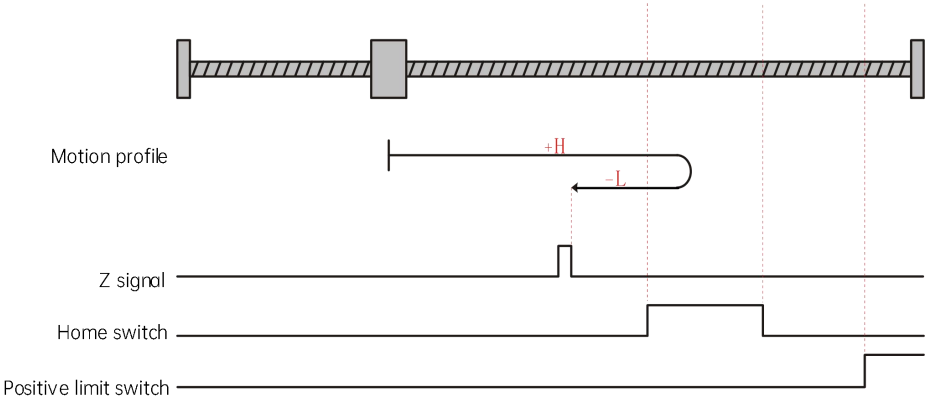
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



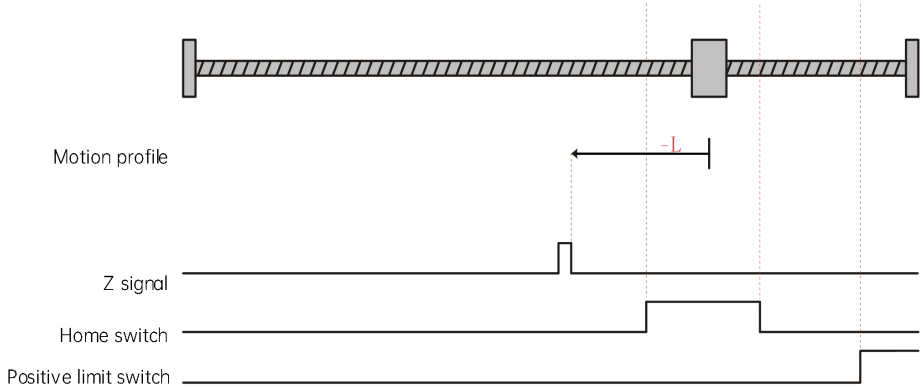
7) 0x6098 = 7

Forward, home switch as deceleration point and Z signal as home

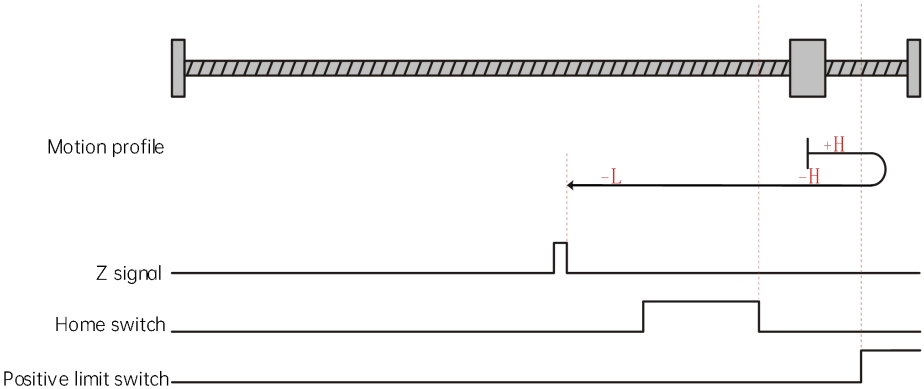
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor continues to run in the reverse direction at low speed, and stops when reaching at the rising edge of the Z signal.



The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



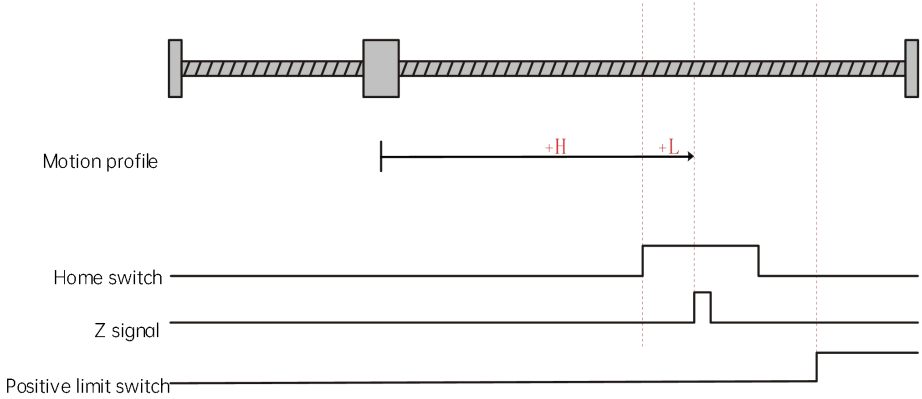
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



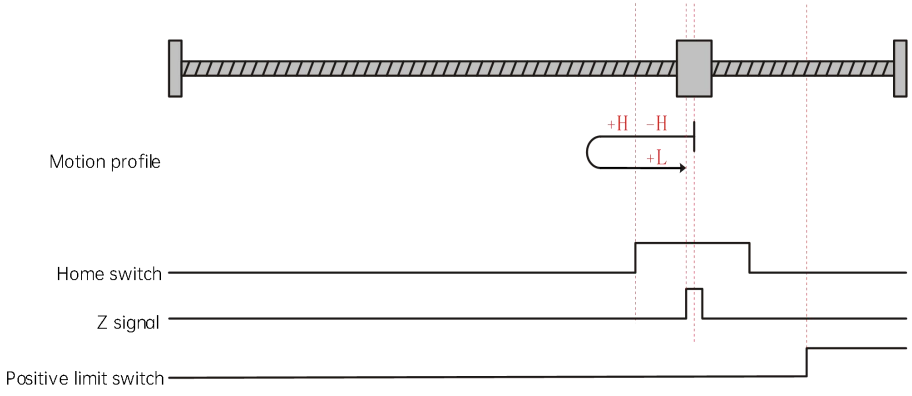
8) 0x6098 = 8

Forward, home switch as deceleration point and Z signal as home

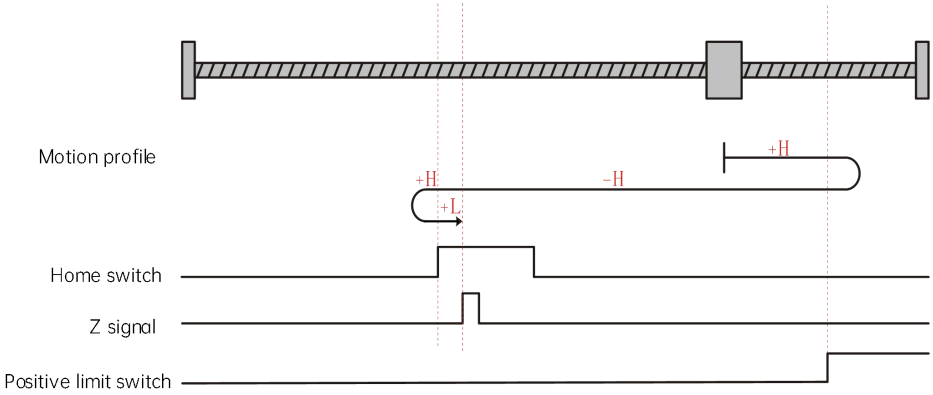
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



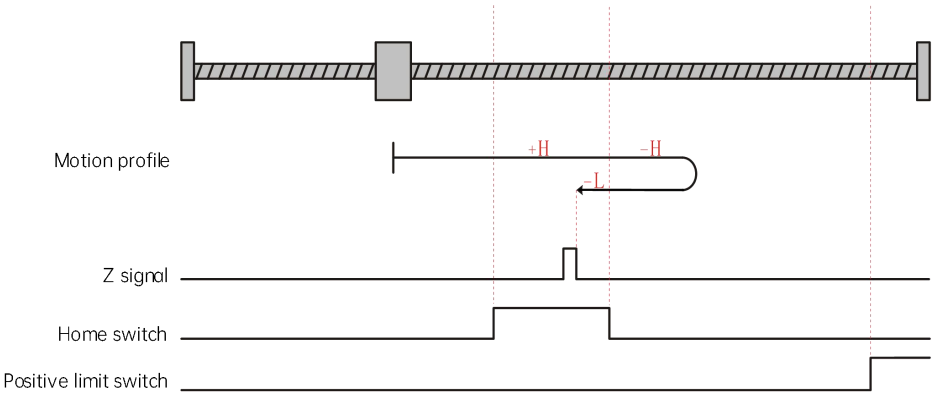
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



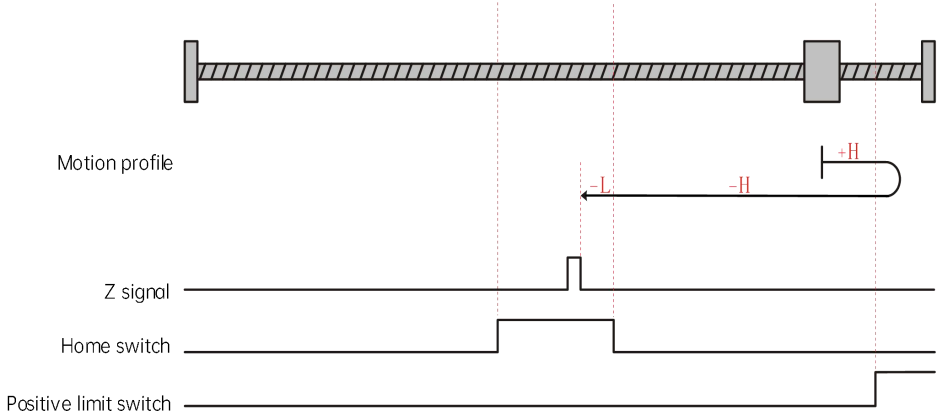
9) 0x6098 = 9

Forward, home switch as deceleration point and Z signal as home

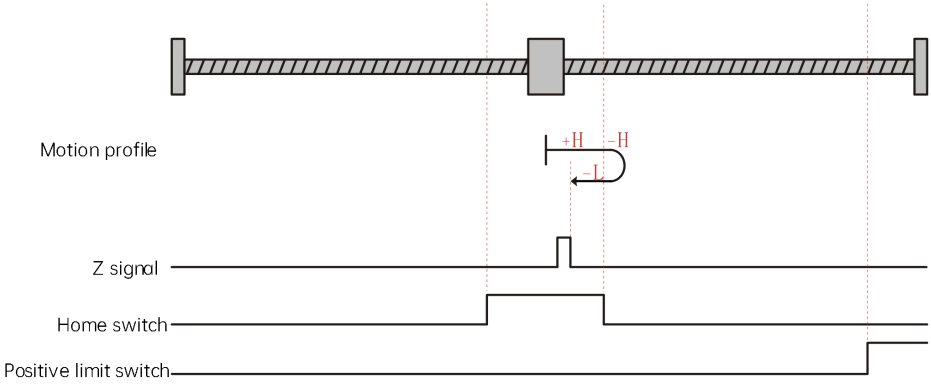
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



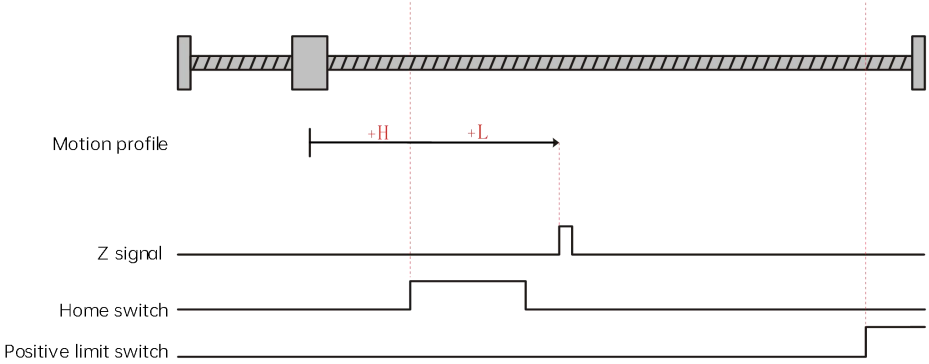
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



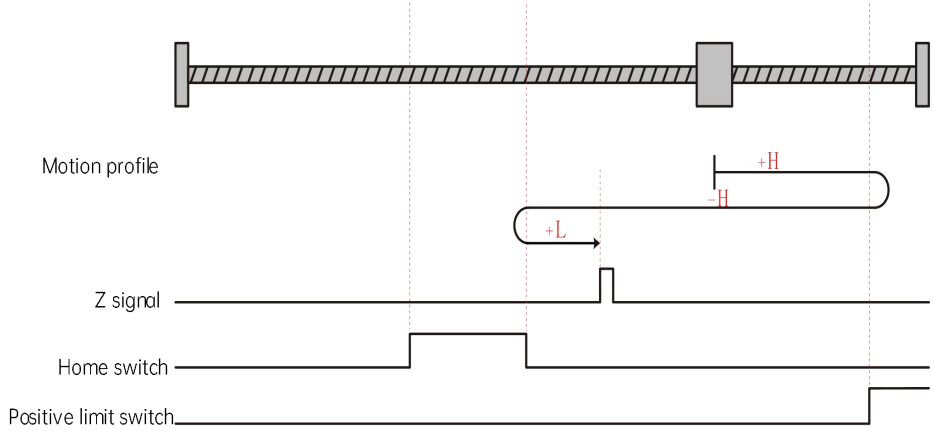
10) 0x6098 = 10

Forward, home switch as deceleration point and Z signal as home

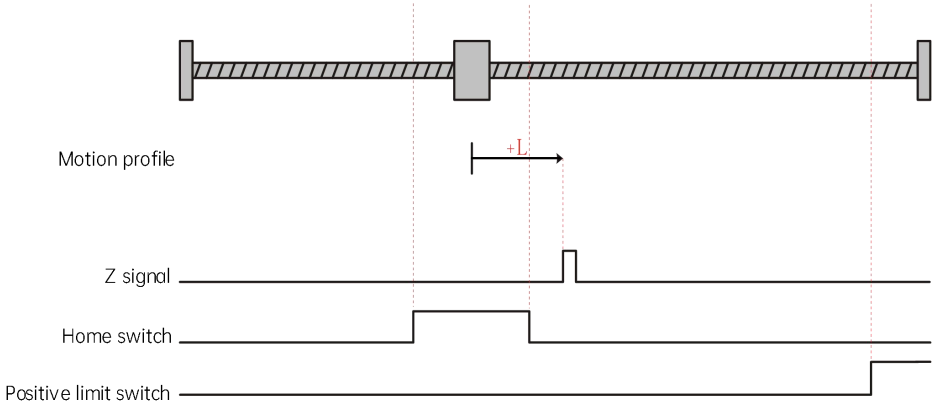
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



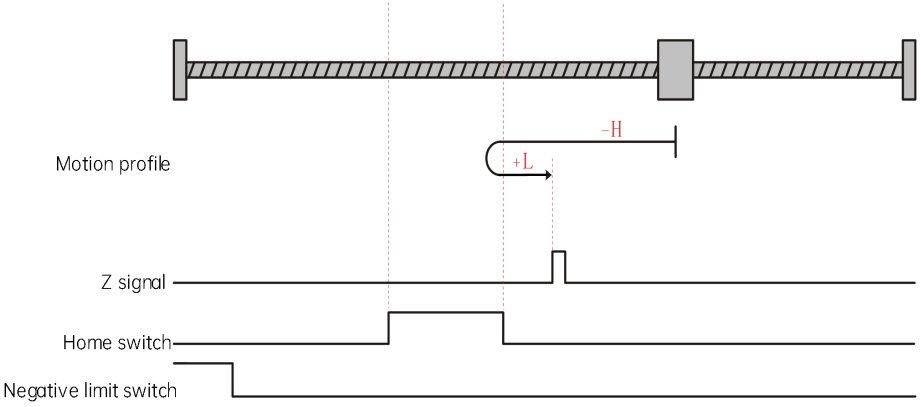
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



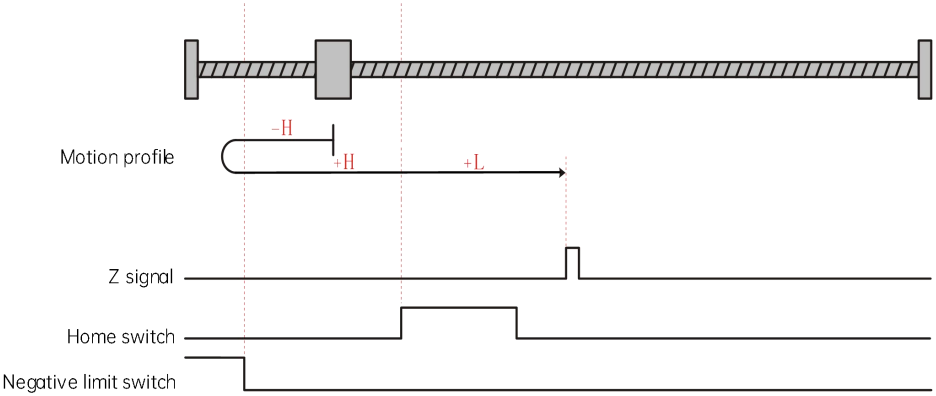
11) 0x6098 = 11

Reverse, home switch as deceleration point and Z signal as home

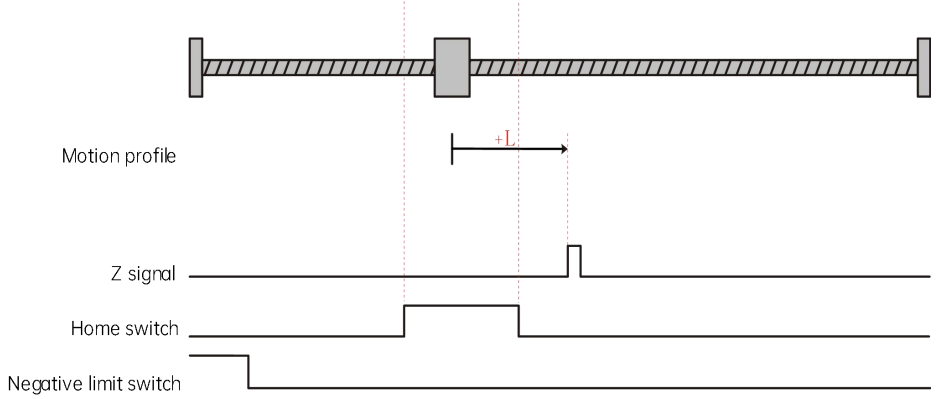
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



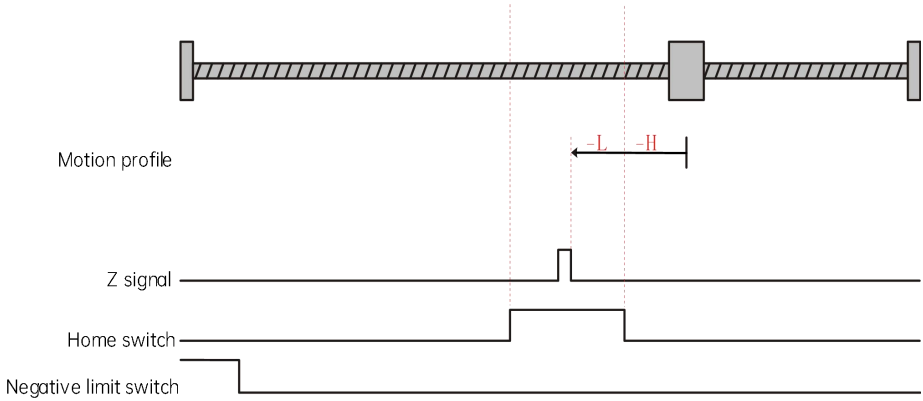
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



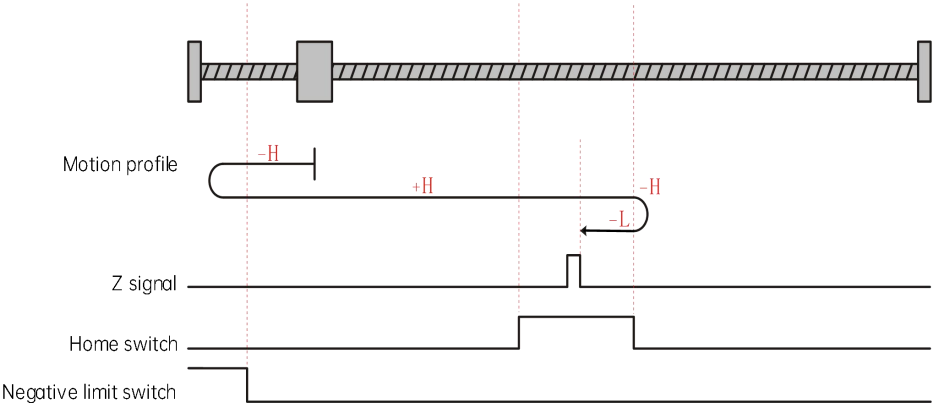
12) 0x6098 = 12

Reverse, home switch as deceleration point and Z signal as home

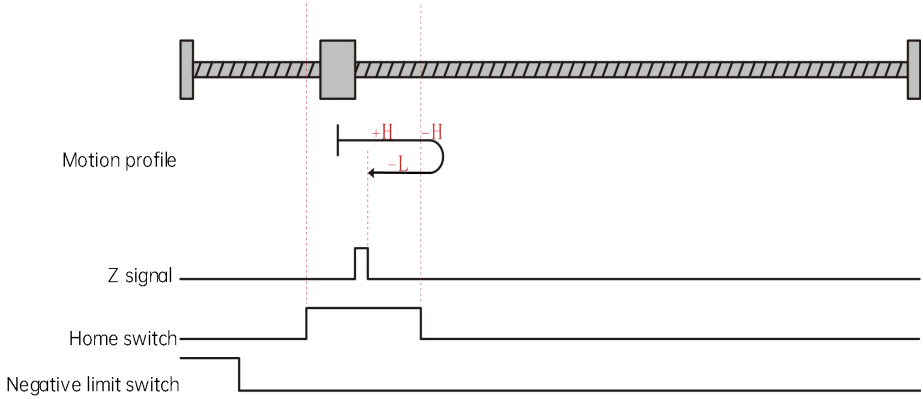
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



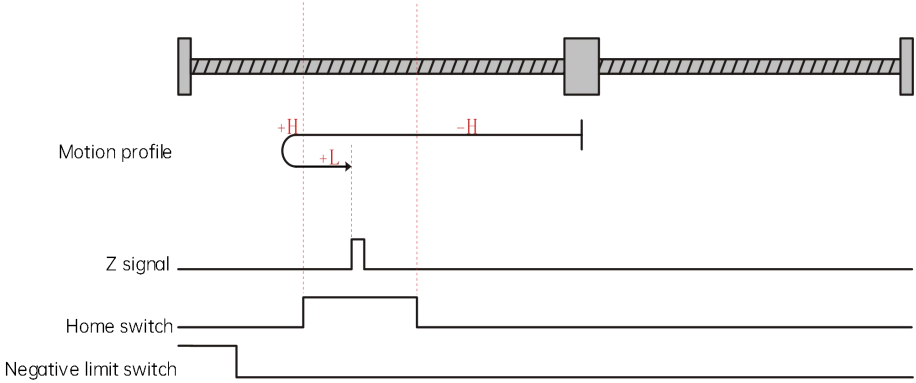
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



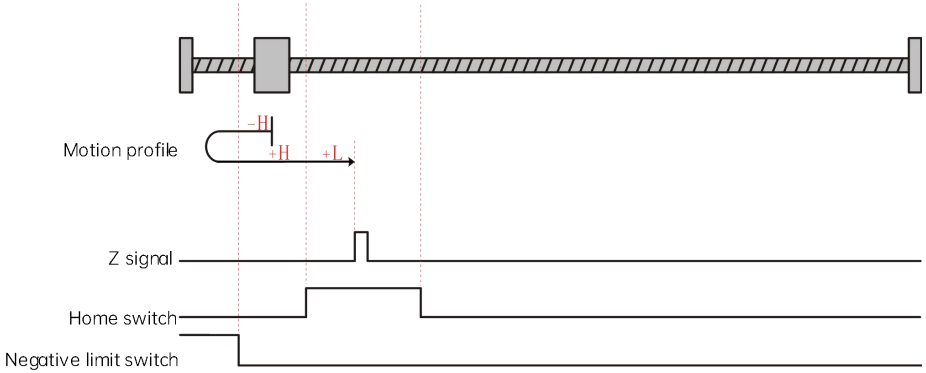
13) 0x6098 = 13

Reverse, home switch as deceleration point and Z signal as home

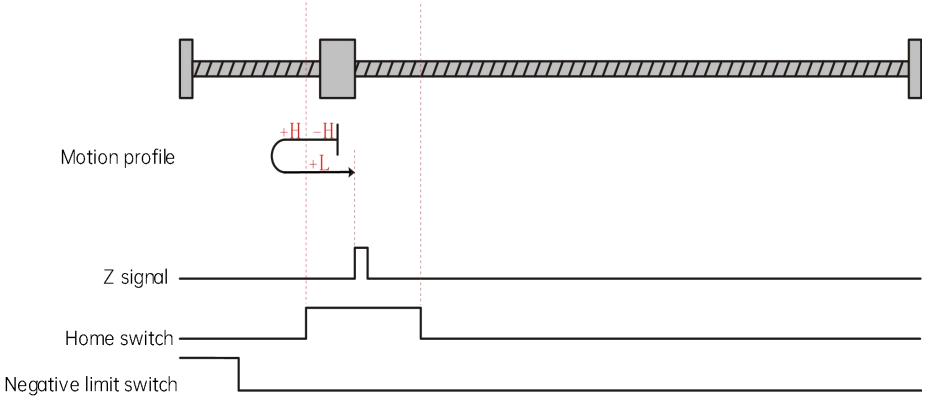
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



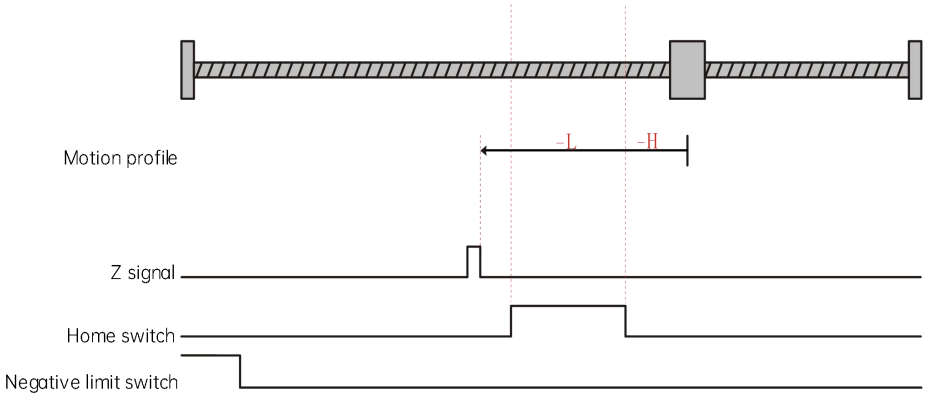
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



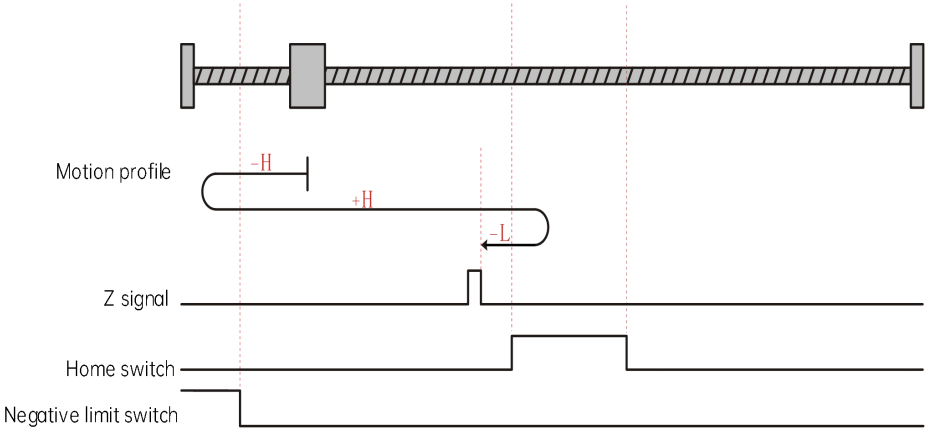
14) 0x6098 = 14

Reverse, home switch as deceleration point and Z signal as home

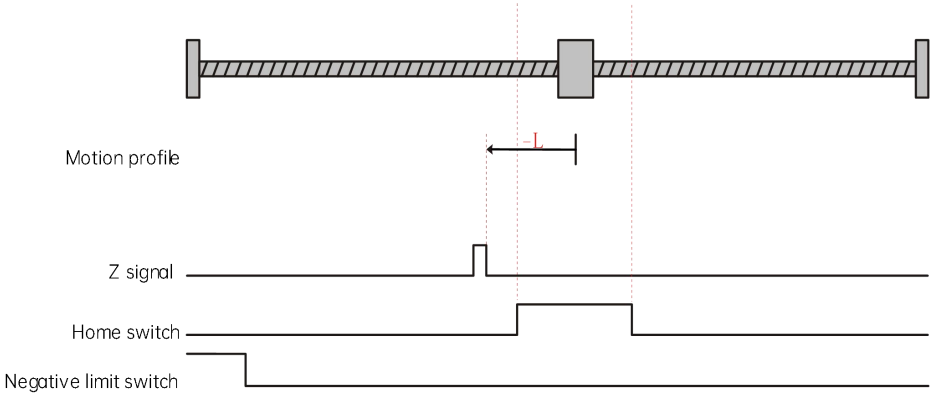
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



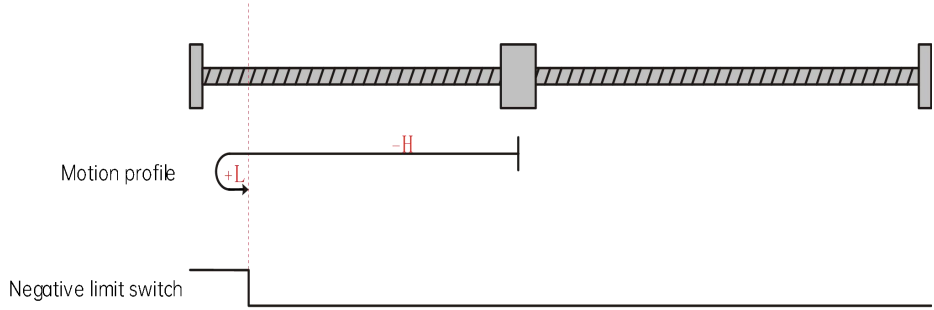
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



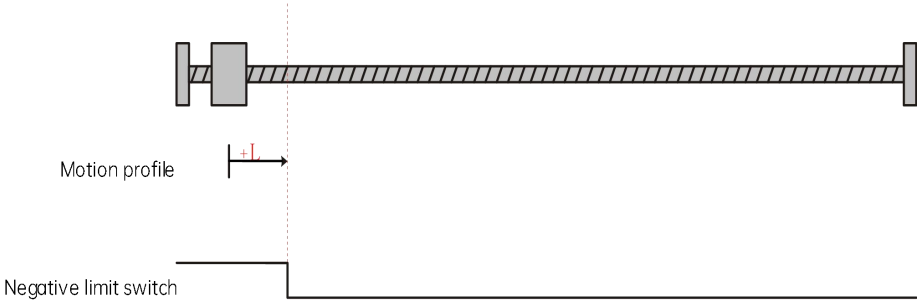
15) 0x6098 = 17

Reverse, negative limit switch as deceleration point and home

The current position of the motor is where the negative limit switch is inactive. When the homing is started, the negative limit switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the negative limit switch.



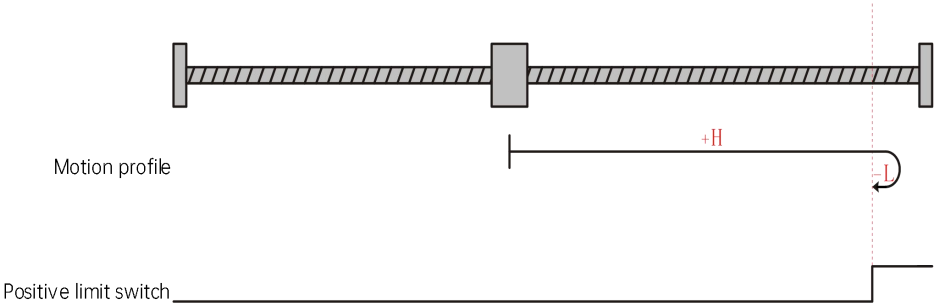
The current position of the motor is where the negative limit switch is active. When the homing is started, the negative limit switch is at high level, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the negative limit switch.



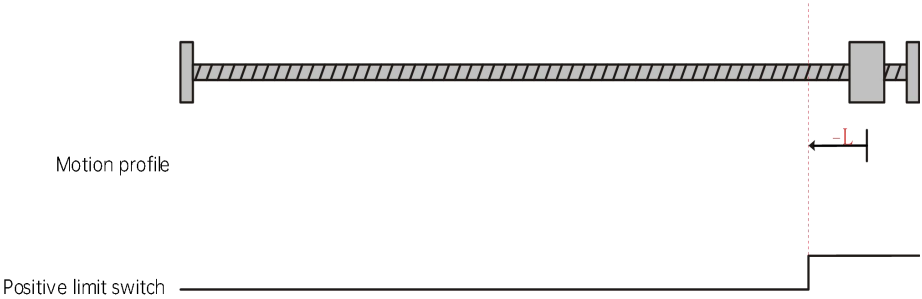
16) 0x6098 = 18

Forward, positive limit switch as deceleration point and home

The current position of the motor is where the positive limit switch is inactive. When the homing is started, the positive limit switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the positive limit switch.



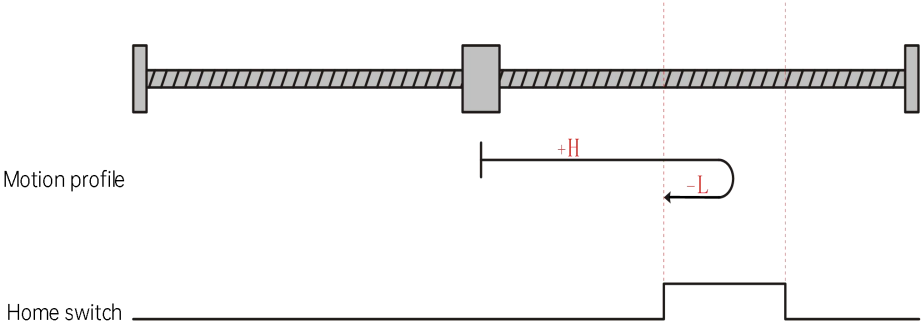
The current position of the motor is where the positive limit switch is active. When the homing is started, the positive limit switch is at high level, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the positive limit switch.



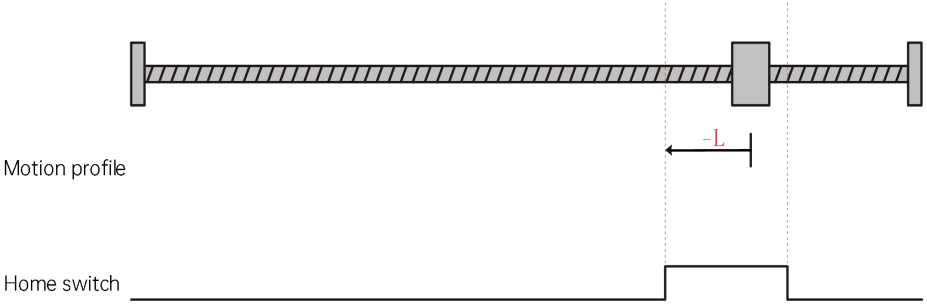
17) 0x6098 = 19

Forward, home switch as deceleration point and home

The current position of the motor is where the home switch is inactive. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



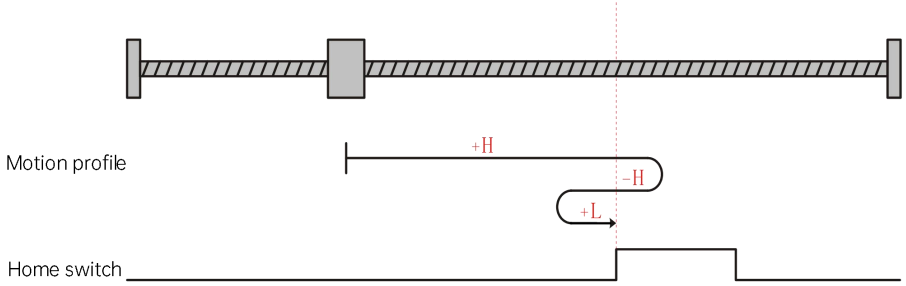
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



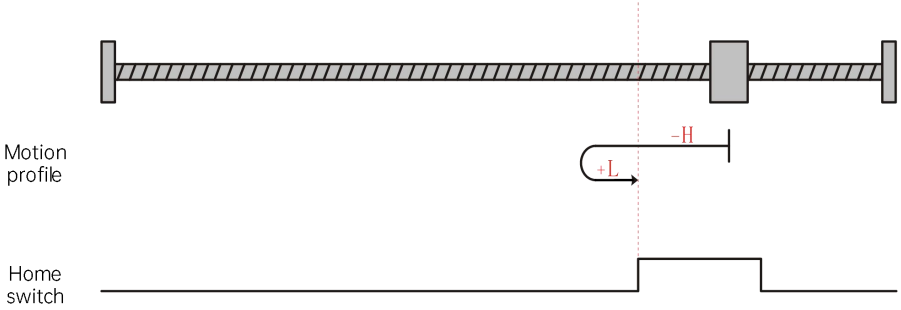
18) 0x6098 = 20

Forward, home switch as deceleration point and home

The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



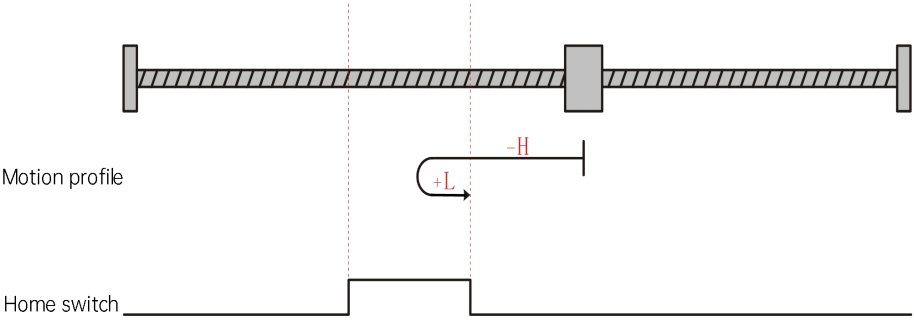
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



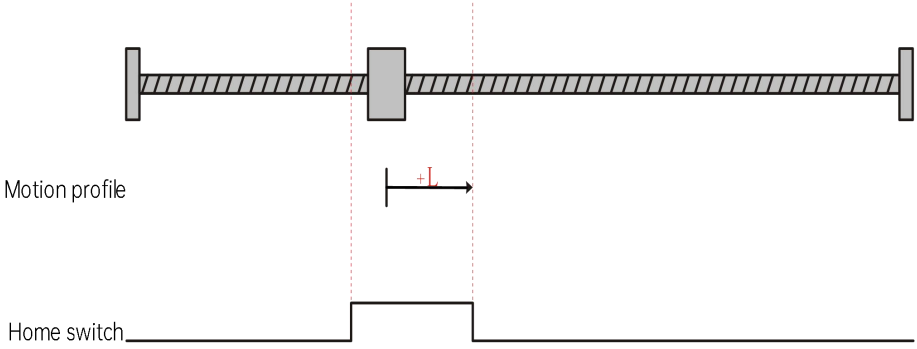
19) 0x6098 = 21

Reverse, home switch as deceleration point and home

The current position of the motor is where the home switch is inactive. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



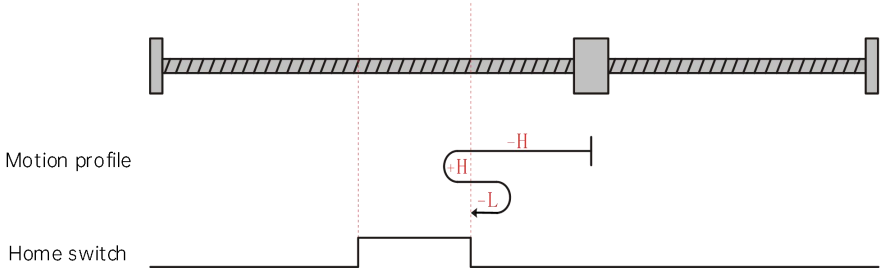
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



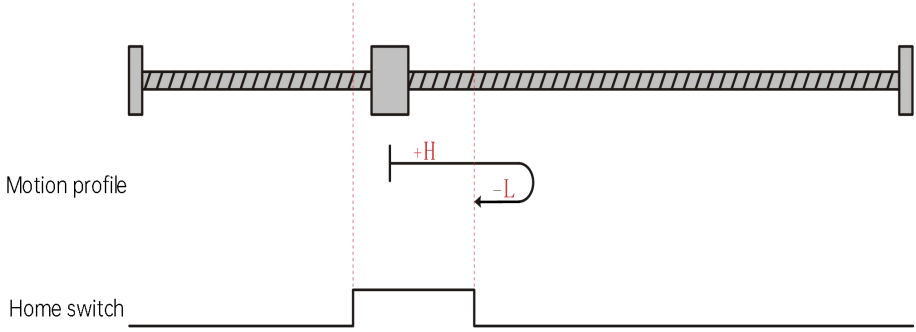
20) 0x6098 = 22

Reverse, home switch as deceleration point and home

The current position of the motor is between the home switch and the positive limit switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



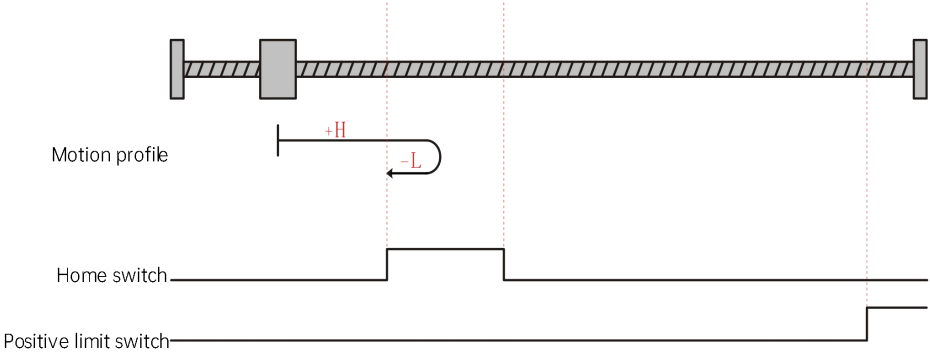
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



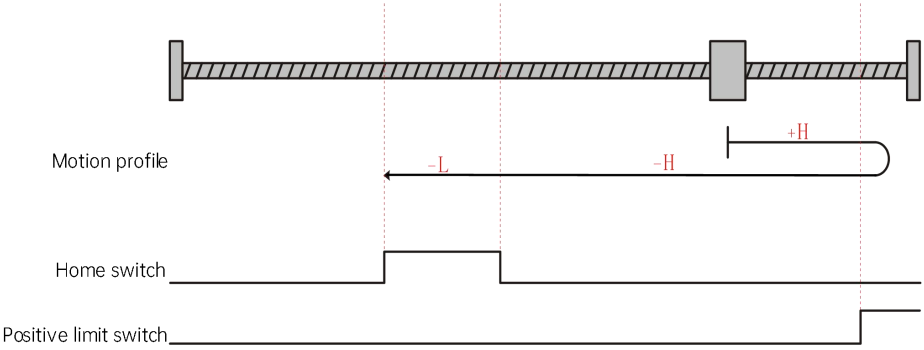
21) 0x6098 = 23

Forward, home switch as deceleration point and home

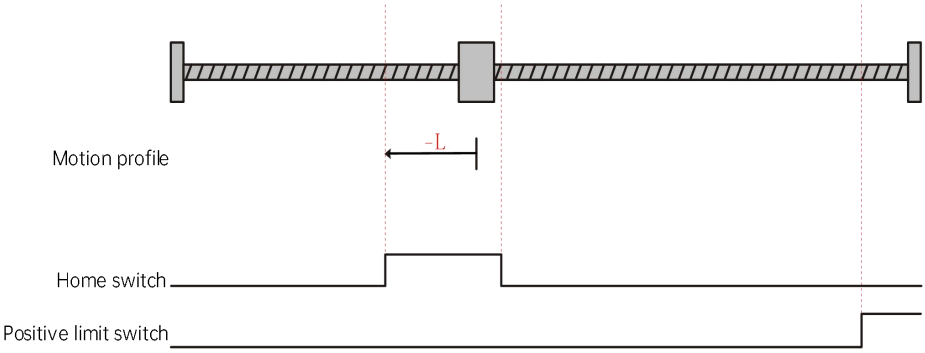
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



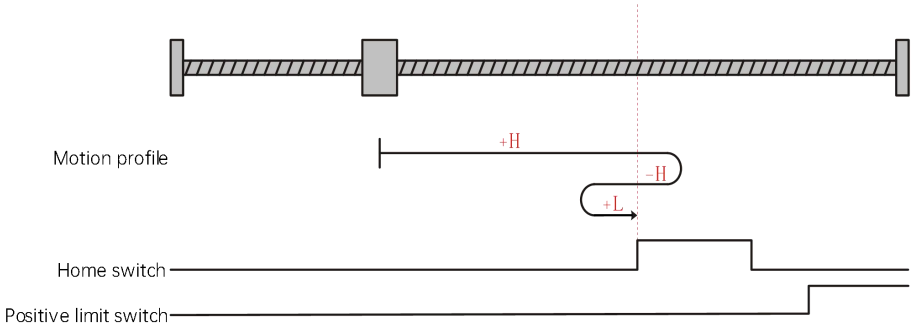
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



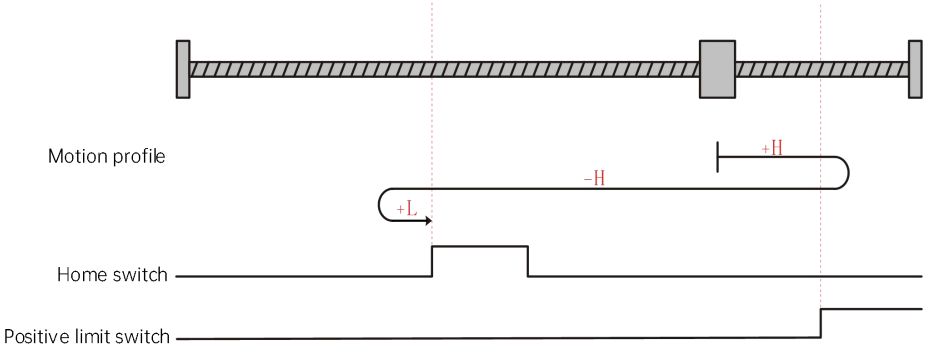
22) 0x6098 = 24

Forward, home switch as deceleration point and home

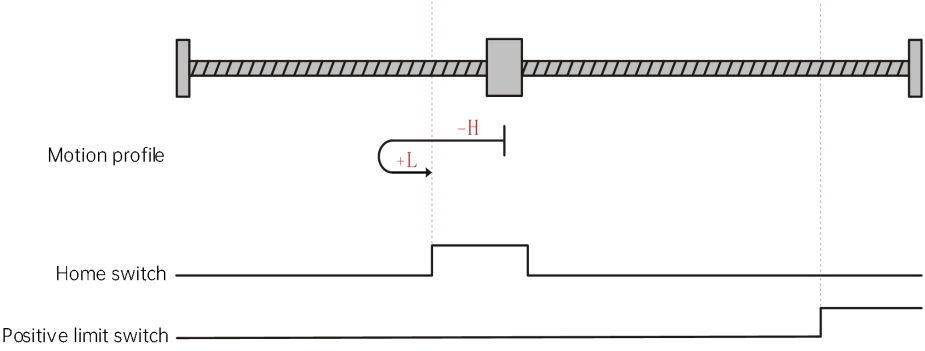
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



The current position of the motor is between the home switch and the positive limit switch. When the homing is started, the home switch is at low level, and the motor starts homing in the forward direction at high speed. After reaching the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



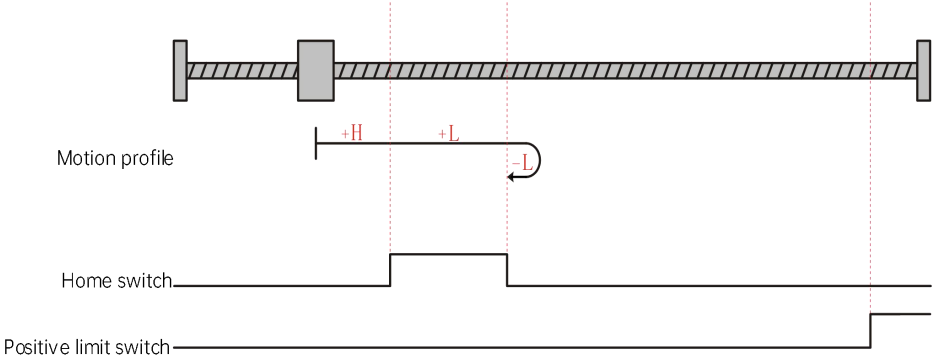
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the reverse direction at high speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



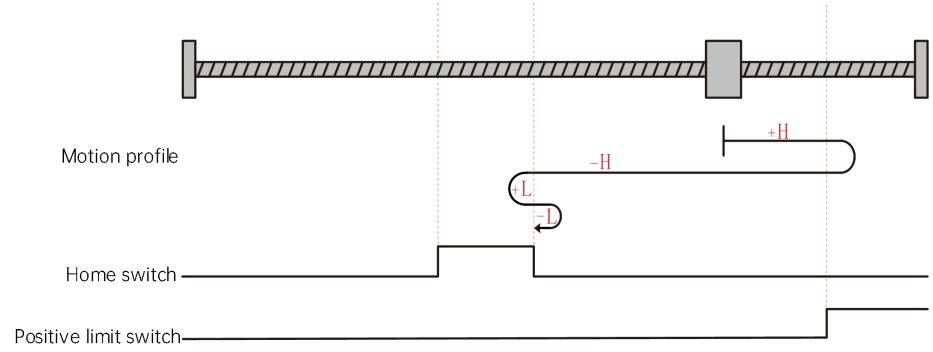
23) 0x6098 = 25

Forward, home switch as deceleration point and home

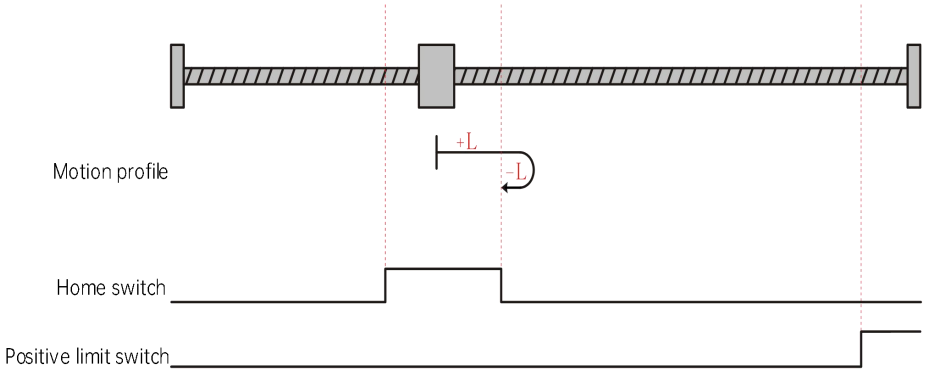
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



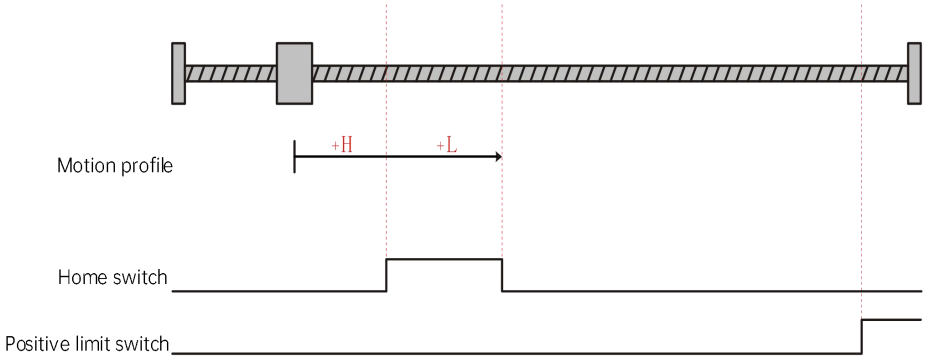
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the forward direction at low speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



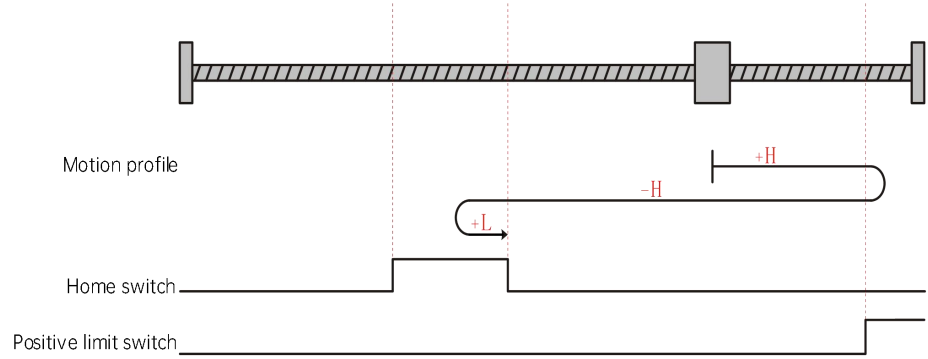
24) 0x6098 = 26

Forward, home switch as deceleration point and home

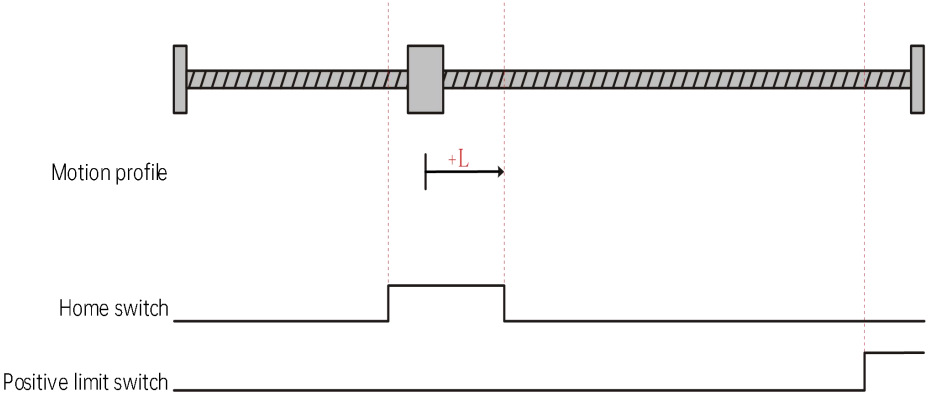
The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the forward direction at high speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



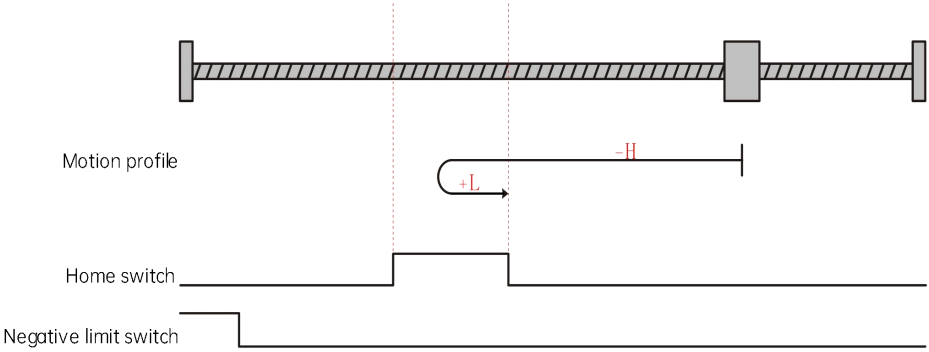
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



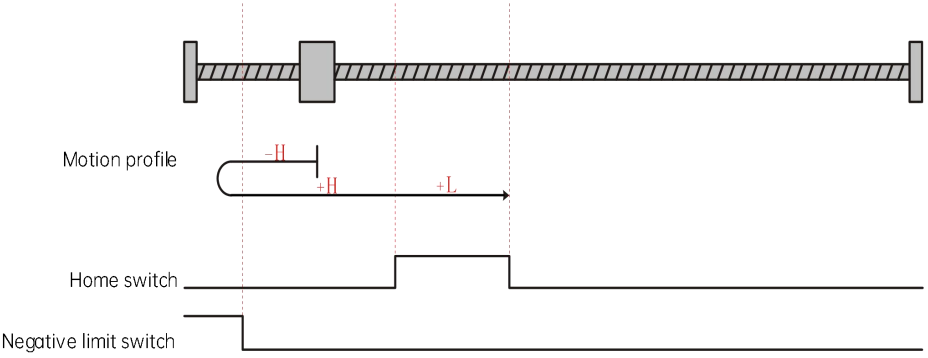
25) 0x6098 = 27

Reverse, home switch as deceleration point and home

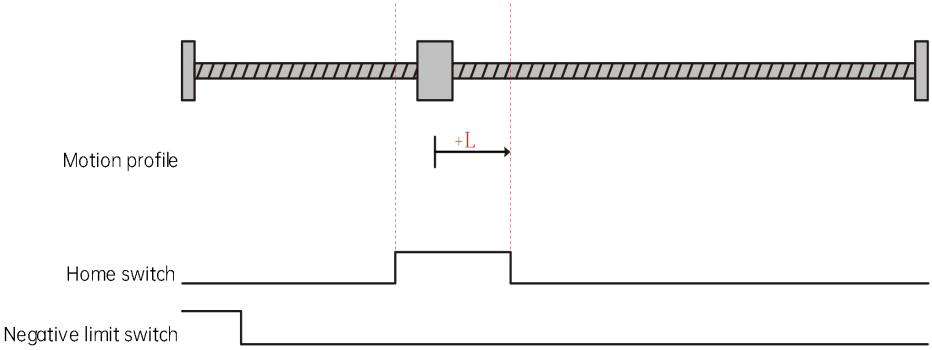
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



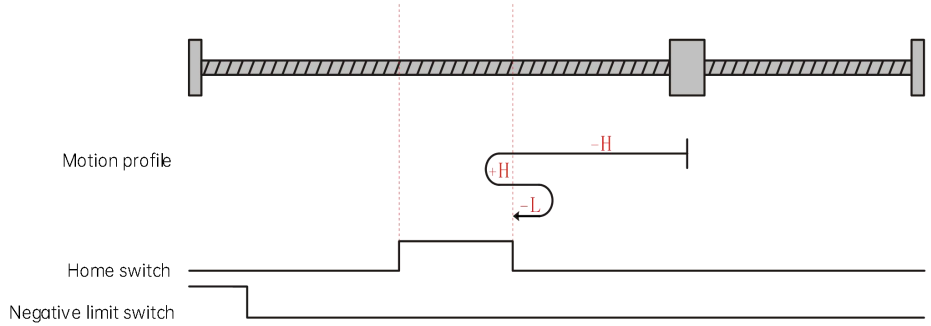
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the forward direction at low speed, and stops when reaching the falling edge of the home switch.



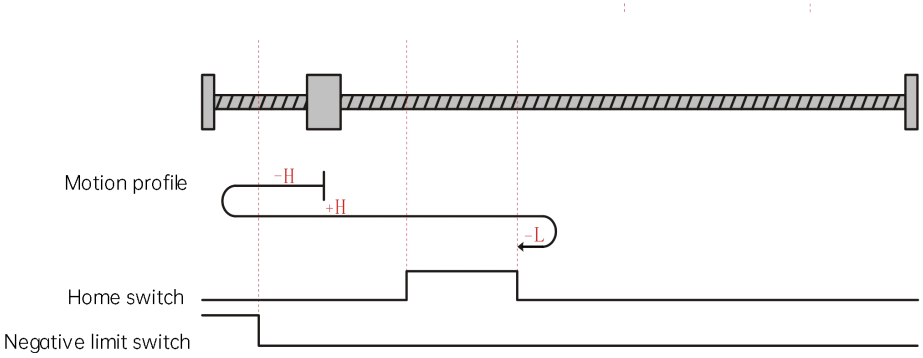
26) 0x6098 = 28

Reverse, home switch as deceleration point and home

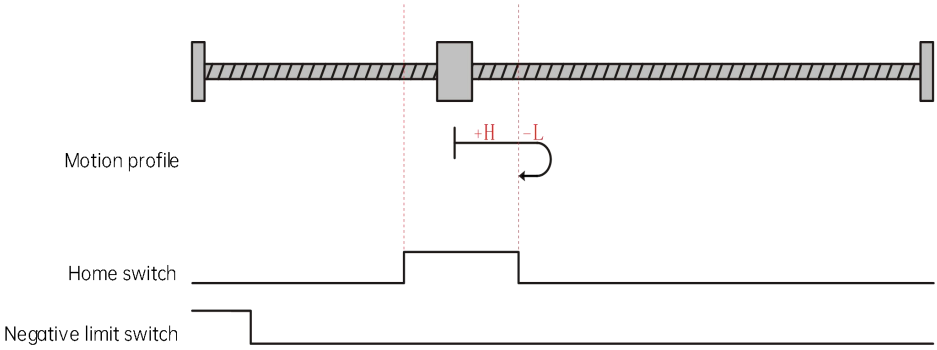
The current position of the motor is between the home switch and the positive limit switch. When the homing is started, the home switch is at low level, and the motor starts homing in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the negative limit switch, the motor runs in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



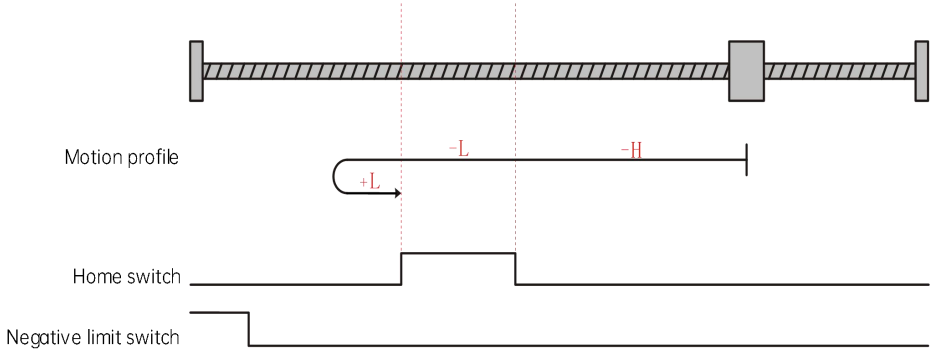
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor starts homing in the forward direction at high speed. After reaching the falling edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the rising edge of the home switch.



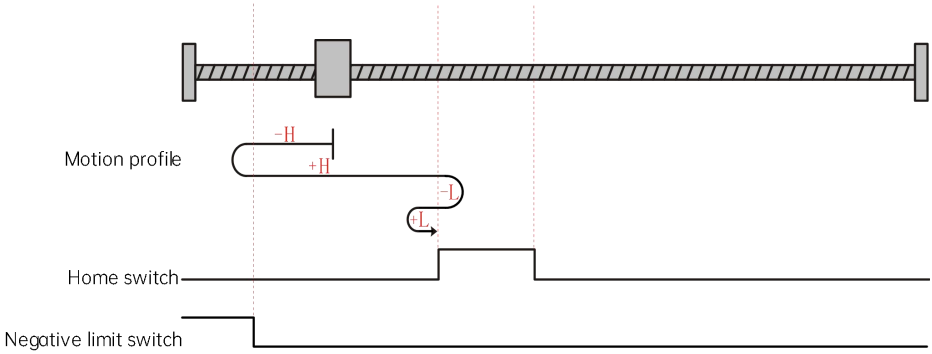
27) 0x6098 = 29

Reverse, home switch as deceleration point and home

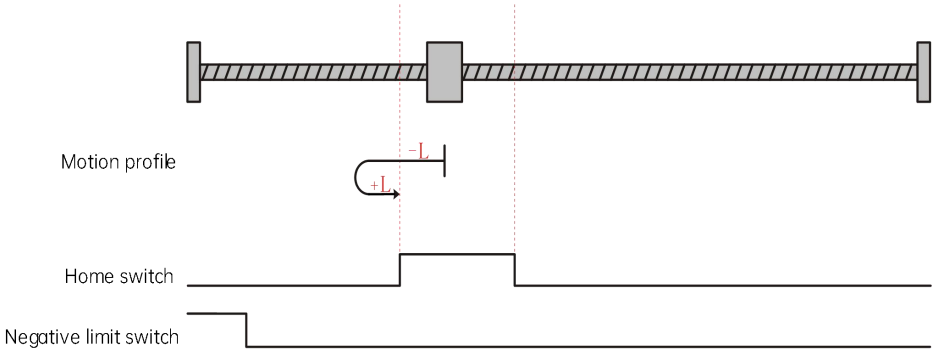
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



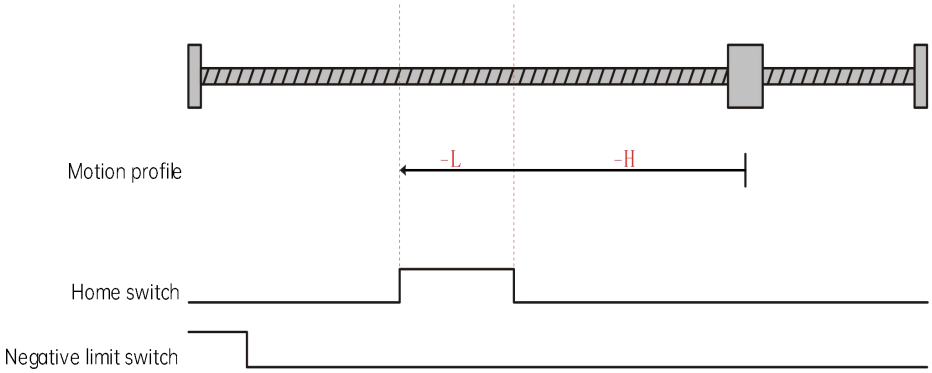
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, and the motor runs in the reverse direction at low speed. After reaching the falling edge of the home switch, the motor runs in the forward direction at low speed, and stops when reaching the rising edge of the home switch.



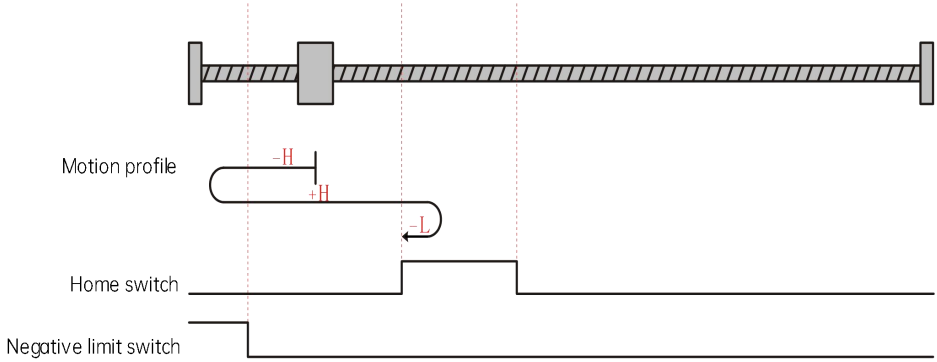
28) 0x6098 = 30

Reverse, home switch as deceleration point and home

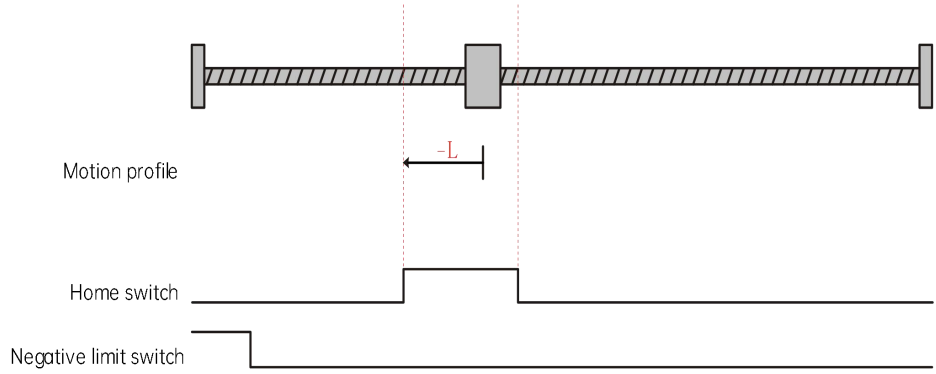
The current position of the motor is between the positive limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



The current position of the motor is between the negative limit switch and the home switch. When the homing is started, the home switch is at low level, and the motor runs in the reverse direction at high speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at high speed. After reaching the rising edge of the home switch, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



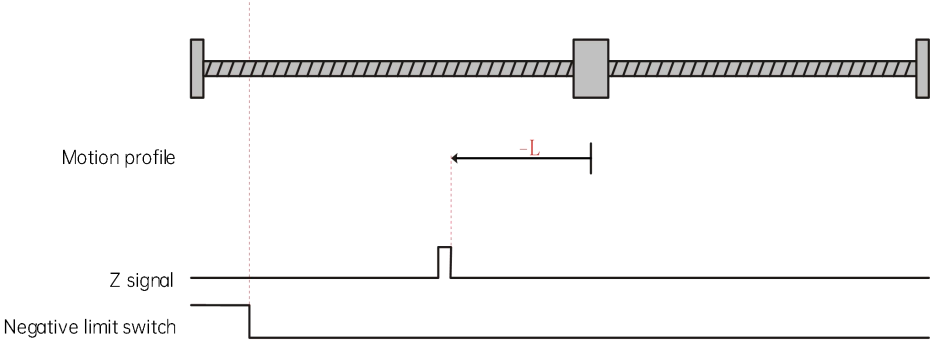
The current position of the motor is where the home switch is active. When the homing is started, the home switch is at high level, the motor runs in the reverse direction at low speed, and stops when reaching the falling edge of the home switch.



29) 0x6098 = 33

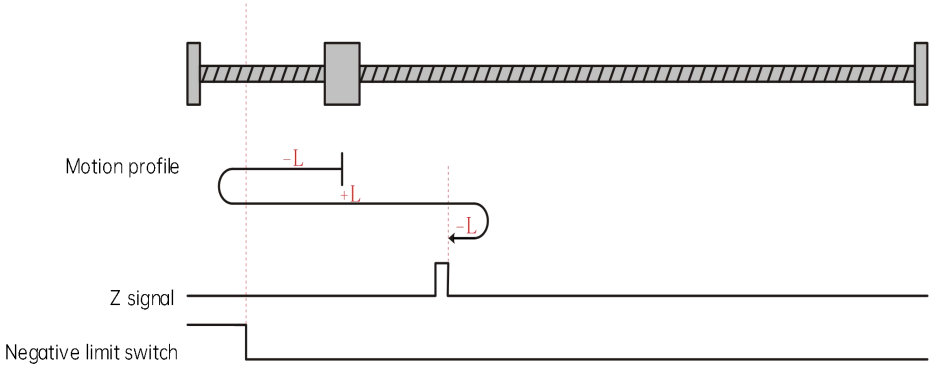
Reverse, motor Z signal as deceleration point and home

When there is at least one Z signal in the distance between the current position of the motor and the negative limit switch, the motor starts homing in the reverse direction at low speed, and stops when reaching the rising edge of the Z signal.



When the current position of the motor is at the Z signal, the homing enable is triggered, and the current position is immediately remembered as the home position to stop.

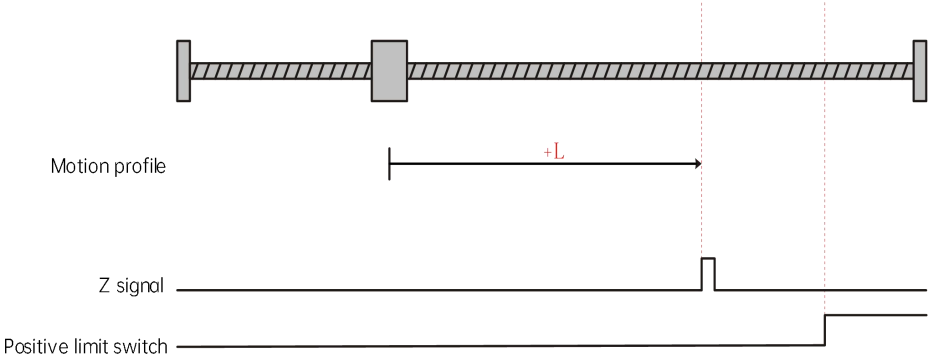
When there are no Z signals between the current position of the motor and the negative limit switch, the motor starts homing in the reverse direction at low speed. After reaching the rising edge of the negative limit switch, the motor runs in the forward direction at low speed. After reaching the falling edge of the Z signal, the motor runs in the reverse direction at low speed, and stops once the Z signal is found.



30) 0x6098 = 34

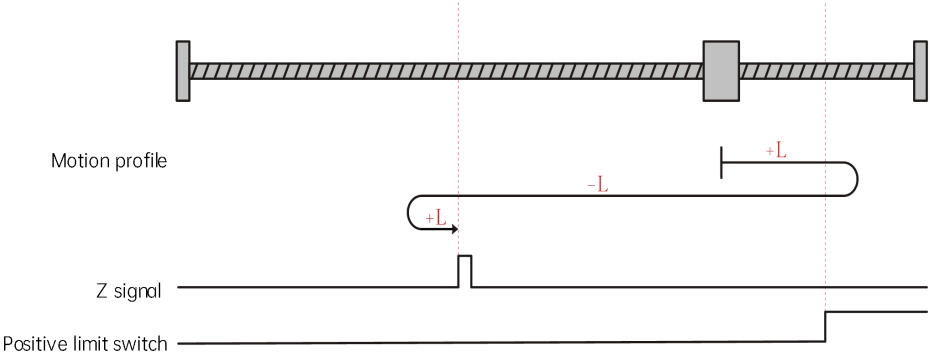
Forward, motor Z signal as deceleration point and home

When there is at least one Z signal in the distance between the current position of the motor and the positive limit switch, the motor starts homing in the forward direction at low speed, and stops when reaching the rising edge of the Z signal.



When the current position of the motor is at the Z signal, the homing enable is triggered, and the current position is immediately remembered as the home position to stop.

When there are no Z signals between the current position of the motor and the positive limit switch, the motor starts homing in the forward direction at low speed. After reaching the rising edge of the positive limit switch, the motor runs in the reverse direction at low speed. After reaching the falling edge of the Z signal, the motor runs in the forward direction at low speed, and stops once the Z signal is found.



31) 0x6098 = 35

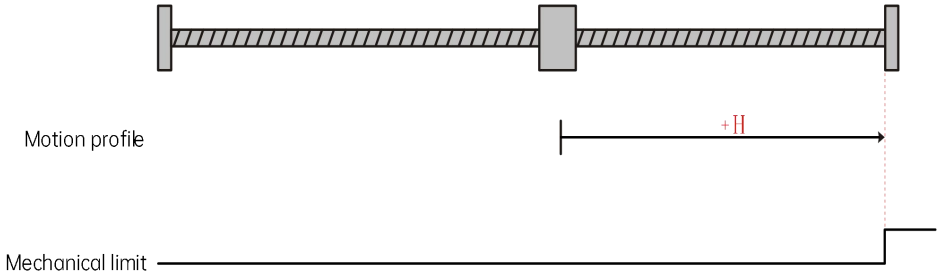
Take the current position as the home

32) 0x6098 = -1

Forward, mechanical limit as deceleration point and home

The motor starts homing in the forward direction at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reached time), the motor stops.

Function code	Name	Value range	Min. unit	Default value	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immediately	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reached time	0 to 65535 ms	1 ms	1	Immediately	At stop	

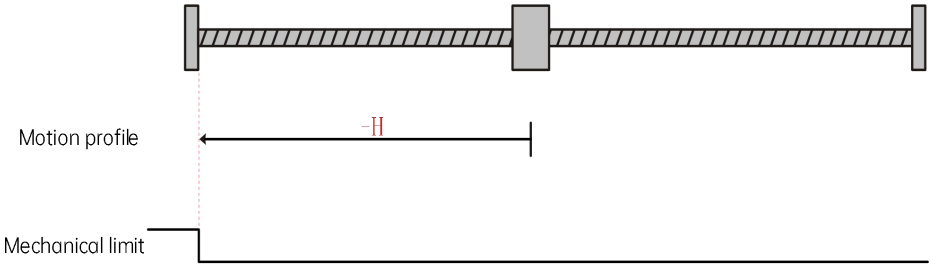


33) 0x6098 = -2

Reverse, mechanical limit as deceleration point and home

The motor starts homing in the reverse direction at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reached time), the motor stops.

Function code	Name	Value range	Min. unit	Default value	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immedia tely	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reached time	0 to 65535 ms	1 ms	1	Immedia tely	At stop	

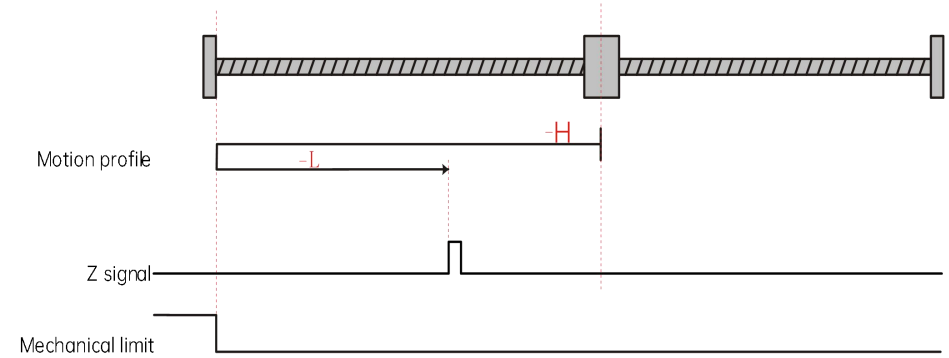


34) 0x6098 = -3

Reverse, mechanical limit as deceleration point, and motor Z signal as home

The motor starts homing in the reverse direction at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reached time), the motor searches for the Z signal at low speed in the forward direction and then stops.

Function code	Name	Value range	Min. unit	Default value	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immedia tely	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reached time	0 to 65535 ms	1 ms	1	Immedia tely	At stop	

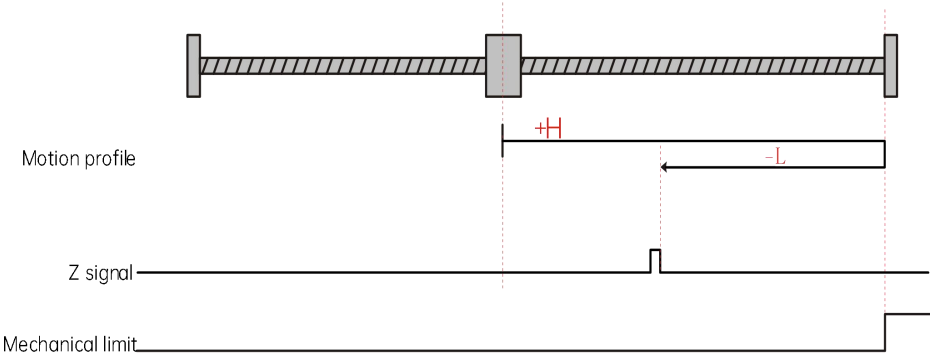


35) 0x6098 = -4

Forward, mechanical limit as deceleration point, and motor Z signal as home

The motor starts homing in the forward direction at high speed. After the motor reaches the mechanical limit position, with the output torque reaching 2017.15h (P23.20 Homing torque limit), and such state being kept for the time specified by 2017.16h (P23.21 Homing torque reached time), the motor searches for the Z signal at low speed in the reverse direction and then stops.

Function code	Name	Value range	Min. unit	Default value	Effective time	Property	Function
P23.20	Homing torque limit	0 to 400.0%	0.1%	30.0%	Immediately	At stop	The motor reaches the mechanical limit position if the output torque reaches the homing torque limit (P23.20) and such state is kept for the time specified by P23.21.
P23.21	Homing torque reached time	0 to 65535 ms	1 ms	1	Immediately	At stop	



Homing mode related parameters

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
6098h	VAR	Homing method	INT8	RW	RPDO	-
6099h	ARRAY	Homing speeds	UINT32	RW	RPDO	rpm
609Ah	VAR	Homing acceleration	UINT32	RW	RPDO	ms
607Ch	VAR	Home offset	INT32	RW	RPDO	Reference unit

Homing mode example

- Function code settings

a) Set P02.00 to CANopen mode

P02.00=7;

b) Set the baud rate to 1 MHz

P16.02=3;

c) Set the CANopen node address

P16.01=5; CANopen address

- Related object settings

a) Set [6060h: Mode of operations] to 6 (Homing mode);

605: 2F 60 60 00 06 00 00 00

b) Set [6098h: Homing method] to 20 (Forward, home switch as deceleration point and home);

605: 2F 98 60 00 14 00 00 00

c) Set [6099h: Homing speeds], deceleration point searching speed as 200 rpm and home searching speed as 20 rpm;

605: 23 99 60 01 C8 00 00 00

605: 23 99 60 02 14 00 00 00

d) Set [6040h: Control word] to control servo state transitions, and trigger homing mode.

605: 2B 40 60 00 06 00 00 00

605: 2B 40 60 00 07 00 00 00

605: 2B 40 60 00 0F 00 00 00

605: 2B 40 60 00 1F 00 00 00

Chapter 7 Servo Applications

7.1 Touch probes

M6-P series supports 2 probe inputs, capable of simultaneously recording position information corresponding to the rising and falling edges of both probe signals.

When DI terminals are used as probe trigger signals, DI9/DI10 serve as high-speed input terminals. Set P03.08 (DI9) and P03.09 (DI10) to No. 49 function (touch probe 1) and No. 50 function (touch probe 2).

The Z signal can also be used as a probe trigger signal.

Object dictionary	Name	Type	Attr.	PDO mapping	Unit
60B8h	Touch probe function	UINT16	RW	RPDO	-
60B9h	Touch probe status	UINT16	RO	TPDO	-
60BAh	Touch probe Pos1 pos value	INT32	RO	TPDO	Reference unit
60BBh	Touch probe Pos1 neg value	INT32	RO	TPDO	Reference unit
60BCh	Touch probe Pos2 pos value	INT32	RO	TPDO	Reference unit
60BDh	Touch probe Pos2 neg value	INT32	RO	TPDO	Reference unit

Object dictionary	Bit	Function
60B8h Touch probe function	0	0 - Disable touch probe 1 1 - Enable touch probe 1
	1	0 - Touch probe 1 single latching 1 - Touch probe 1 continuous latching
	2	0 - DI terminal to trigger touch probe 1 1 - Z signal to trigger touch probe 1
	3	Reserved
	4	0 - Disable latching of touch probe 1 position at the positive edge 1 - Enable latching of touch probe 1 position at the positive edge
	5	0 - Disable latching of touch probe 1 position at the negative edge 1 - Enable latching of touch probe 1 position at the negative edge
	6–7	Reserved
	8	0 - Disable touch probe 2 1 - Enable touch probe 2
	9	0 - Touch probe 2 single latching 1 - Touch probe 2 continuous latching
	10	0 - DI terminal to trigger touch probe 2 1 - Z signal to trigger touch probe 2
	11	Reserved

	12	0 - Disable latching of touch probe 2 position at the positive edge 1 - Enable latching of touch probe 2 position at the positive edge
	13	0 - Disable latching of touch probe 2 position at the negative edge 1 - Enable latching of touch probe 2 position at the negative edge
	14–15	Reserved
Object dictionary	Bit	Function
60B9h Touch probe status	0	0 - Touch probe 1 disabled 1 - Touch probe 1 enabled
	1	0 - No positive edge value latched for touch probe 1 1 - Positive edge value latched for touch probe 1
	2	0 - No negative edge value latched for touch probe 1 1 - Negative edge value latched for touch probe 1
	3–7	Reserved
	8	0 - Touch probe 2 disabled 1 - Touch probe 2 enabled
	9	0 - No positive edge value latched for touch probe 2 1 - Positive edge value latched for touch probe 2
	10	0 - No negative edge value latched for touch probe 2 1 - Negative edge value latched for touch probe 2
	11–15	Reserved

7.2 Input and output terminals 60FDh/60FEh

M6 supports 60FDh to indicate the input status of each terminal on the drive.

Object dictionary	Bit	Function
60FDh Digital inputs	0	1 - Negative limit switch valid 0 - Negative limit switch invalid
	1	1 - Positive limit switch valid 0 - Positive limit switch invalid
	2	1 - Home signal valid 0 - Home signal invalid
	3–15	Reserved
	16	1 - DI1 input valid 0 - DI1 input invalid
	17	1 - DI2 input valid 0 - DI2 input invalid
	18	1 - DI3 input valid 0 - DI3 input invalid
	19	1 - DI4 input valid

Object dictionary	Bit	Function
		0 - DI4 input invalid
	20	1 - DI5 input valid 0 - DI5 input invalid
	21	1 - DI6 input valid 0 - DI6 input invalid
	22	1 - DI7 input valid 0 - DI7 input invalid
	23	1 - DI8 input valid 0 - DI8 input invalid
	24	1 - STO input valid 0 - STO input invalid
	25	1 - Z signal valid 0 - Z signal invalid
	26	1 - Touch probe 1 valid 0 - Touch probe 1 invalid
	27	1 - Touch probe 2 valid 0 - Touch probe 2 invalid
	28–31	Reserved

M6 supports 60FEh, using CANopen bus to control the forced output of DO signals.

Before the drive enters OP, the DO terminals do not output.

After the drive enters OP, the DO terminals output according to the corresponding bit of 60FEh Sub1 once the 60FEh Sub2 terminal enable is valid.

If the drive exits OP (disconnection), the DO output follows P20.27.

Object dictionary	Bit	Function
60FEh Sub1 DO forced output control	0–15	Reserved
	16	1 - DO1 Switch on 0 - DO1 Switch off
	17	1 - DO2 Switch on 0 - DO2 Switch off
	18	1 - DO3 Switch on 0 - DO3 Switch off
	19	1 - DO4 Switch on 0 - DO4 Switch off
	20	1 - DO5 Switch on 0 - DO5 Switch off
	21	1 - DO6 Switch on 0 - DO6 Switch off

Object dictionary	Bit	Function
	22–31	Reserved
60FEh Sub2 DO forced output enable	0–15	Reserved
	16	1 - DO1 output enabled 0 - DO1 output disabled
	17	1 - DO2 output enabled 0 - DO2 output disabled
	18	1 - DO3 output enabled 0 - DO3 output disabled
	19	1 - DO4 output enabled 0 - DO4 output disabled
	20	1 - DO5 output enabled 0 - DO5 output disabled
	21	1 - DO6 output enabled 0 - DO6 output disabled
	22–31	Reserved
P20.27	0	0 - DO1 status unchanged after disconnection 1 - DO1 no output
	1	0- DO2 status unchanged after disconnection 1 - DO2 no output
	2	0 - DO3 status unchanged after disconnection 1 - DO3 no output
	3	0 - DO4 status unchanged after disconnection 1 - DO4 no output
	4	0 - DO5 status unchanged after disconnection 1 - DO5 no output
	5	0 - DO6 status unchanged after disconnection 1 - DO6 no output
	6–15	Reserved

7.3 User unit selection

Position user unit

Users can set pulses for one motor revolution through P05.05 (2005.06h) to match the controller's position reference. The default value is 2097152 p/r. The electronic gear ratio (6091h) can also be set.

Speed user unit

Users can select the speed user unit through P20.15 (2014.10h). By default, the bus speed user unit is "rpm", and the bus acceleration/deceleration time unit is "ms / 1000 rpm". If P20.15 is set to 1, the bus speed user unit is "reference unit/s", and the bus acceleration/deceleration time unit is "reference unit/s^2".

If the acceleration exceeds 100 rpm / 1 ms, the drive will operate at the maximum acceleration of 100 rpm / 1 ms.

Torque user unit

Users can select the torque user unit through P20.14 (2014.0Fh). By default, the bus torque user unit is 0.1% (Rated torque P01.04 (2001.05h)).

Chapter 8 Troubleshooting

The drive has two protection types: Fault and Alarm. When a fault or alarm occurs, the high byte of 0x603F is 0xFF, and the low byte is the fault code or alarm code. Refer to P10.18 for details. To determine whether it is a fault or alarm, check Bit7 of 0x6041: Bit7=1 indicates an alarm, otherwise it is a fault.

603Fh	VAR	Error Code	UINT16	RW	TPDO	-

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.001	Drive overcurrent	Level 1	The motor cables are in poor contact.	Check whether the cable connector is loose.	Fasten the connector.
			The motor cables are grounded.	Check the insulation resistance between the UVW and the grounding cable of the motor.	Replace the motor if the insulation is poor.
			The motor UVW cables are short circuited.	Check whether the motor UVW cables are short circuited.	Connect the motor cables correctly.
			The motor is damaged.	Check whether resistance between motor cables is balanced.	Replace the motor if the resistance is unbalanced.
			The gain setting is improper, causing the motor to oscillate.	Check whether the motor oscillates or generates a shrill noise, or view the running graphics.	Re-adjust the gain.
			The encoder cable is incorrectly wired, corrosive, or connected loosely.	Check whether the encoder wiring is good and reliable.	Re-weld or fasten the encoder cable.
Er.002	Drive main circuit overvoltage	Level 1	The main circuit input voltage is too high.	Measure the input power line voltage.	Adjust the power voltage according to the specification.
			The braking resistor fails.	Measure the resistance between P and PB.	If the resistor is open, replace the external braking resistor.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
			External braking resistor value does not match. (The resistance is too large, causing insufficient energy absorption during braking.)	Check the braking resistor value.	Select the appropriate braking resistor according to operating conditions and load.
			The motor is in the abrupt acceleration/ deceleration state.	Check the deceleration ramp time during running and monitor the DC bus voltage P11.09.	Increase the acceleration/deceleration time in the allowed range.
Er.003	Drive control power overvoltage	Level 1	The control power voltage is higher than the input voltage range.	Measure the control power line voltage.	Adjust the control power voltage according to the product specification.
Er.004	Motor is blocked	Level 1	Output phase (UVW) loss or incorrect phase sequence	Perform motor trial running when the motor has no load and check the motor wiring.	Reconnect the motor cables correctly or replace them.
			The UVW outputs are disconnected.	Check the wiring.	Reconnect the motor cables correctly or replace them.
			The motor rotor is locked due to mechanical factors.	Confirm the running command and motor speed.	Eliminate mechanical factors.
Er.006	Input phase loss	Level 2	There is input phase loss within L1, L2, L3.	Check the input wiring, and the input power.	If the input power is single-phase 220 V, just set P10.00=1; if the input power is three-phase 220 V, check whether the input power has phase loss, and replace the cable wiring.
Er.007	Output phase loss	Level 2	There is output phase loss within U, V, W.	Check the output wiring, the motor and cables.	Replace the cable wiring.
Er.008	Drive overheat	Level 1	Ambient temperature is too high.	Check the cooling conditions around the drive.	Improve the servo drive cooling conditions, and reduce the ambient temperature.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
			Multiple overload operation	Check whether overload has been reported in the fault records.	Waiting for 60 sec to reset after overload; increase the drive and motor capacity; increase the acceleration and deceleration time; or reduce the load.
			The fan is damaged.	Check whether the fan runs normally during drive running.	Replace the fan.
Er.009	Braking resistor overload	Level 2	The external braking resistor is in poor connection, becomes loose or disconnected.	Check the braking resistor wiring according to the correct wiring diagrams.	Rewire according to the correct wiring diagrams.
			The jumper across terminals P and PB is disconnected when the internal braking resistor is used.	Check the jumper wire.	Properly connect the jumper wire.
			The capacity of servo drive or braking resistor is insufficient.	Calculate the maximum braking energy.	Improve braking resistor capacity; improve servo capacity; or increase acceleration and deceleration time.
			The load inertia is too large.	Check the load inertia.	Improve the drive, motor, and resistor capacity.
Er.010	Power module protection	Level 1	There is interphase short circuit or short circuit to ground for three output phases.	Check cables and output motor insulation.	Replace the cables or motor.
			Instantaneous overcurrent of the drive	See the overcurrent solutions.	See the overcurrent solutions.
			The auxiliary power supply is damaged, and the drive voltage is insufficient.	Seek for technical support.	Seek for technical support.
			Inverter module bridging conduction	Seek for technical support.	Seek for technical support.
			Abnormal control board	Seek for technical support.	Seek for technical support.
			Braking pipe damaged	Seek for technical support.	Seek for technical support.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.011 Er.012	Er.011: Servo drive overload Er.012: Motor overload	Level 1	Motor wiring and encoder wiring are incorrect.	Check the wiring according to the wiring diagram.	Rewire according to the correct wiring diagram, and replace the cables.
			The load is too heavy. The motor keeps output of effective torque higher than the rated torque for a long time.	Check the overload characteristic and operation commands of the servo drive or servo motor.	Increase the drive and motor capacity, reduce the load, or increase the acceleration and deceleration time.
			The acceleration/ deceleration is too frequent or the load inertia is too large.	Check the inertia ratio, and the start-stop cycle.	Increase the acceleration and deceleration time.
			The gain adjustment is inappropriate, the stiffness is too strong, and the motor vibrates generating abnormal noise.	Observe whether the motor vibrates and generates noise during running.	Re-adjust the gain.
			The servo drive or motor model is set incorrectly.	Check motor model settings	Set the correct model.
			The motor block occurs due to mechanical factors, resulting in very heavy load during running.	Check the running commands and the actual motor speed by using the debugging platform or the operating panel.	Eliminate mechanical factors.
			Note: You can clear the fault or re-power on the system 60 sec after occurrence of the overload fault.		
Er.013	EEPROM read/write fault	Level 2	Parameter read/write error. The number of parameter write operations exceeded the maximum limit within a certain time period.	Check whether instantaneous power failure occurs during parameter writing. Check whether parameters are changed frequently by the host device.	After restoring the default parameters (P02.22), re-enter the parameters. Change the parameter writing method and write again.
Er.014	Abnormal serial port communication	Level 2	Improper setting of communication parameters	Check the function code settings.	Set the correct baud rate, communication data format, etc.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
			The communication cable is wired incorrectly or unreliably connected, disconnected, etc.	Check whether the communication cable is correct and reliable.	Reconnect the communication cable, or replace the communication cable.
			Improper setting of fault parameters.	Check whether P15.02 is set too short.	Set P15.02 correctly.
			The host device does not work.	Check the host system signal.	Check whether the host device is working.
Er.015	External braking resistor is too small	Level 1	The resistance of the external braking resistor is smaller than the minimum value required by the servo drive.	Measure the resistance and check P02.20.	Replace the braking resistor, and change P02.20.
Er.016	Current detection circuit abnormal	Level 1	The wiring or the plug-in units of the control board loosens.	Check whether the control board cables and plug-in units are loose.	Check the wiring and rewire.
			The AI input voltage is too high.	Check whether the AI voltage input is above 12 V.	Adjust AI input.
Er.018	Poor auto-tuning	Level 1	Motor parameters are set incorrectly.	Check the motor nameplate parameters.	Re-enter the correct motor parameters.
			When reverse running is inhibited, reverse rotation auto-tuning is performed.	Check whether reverse inhibition is enabled.	Cancel reverse running inhibition.
			Incorrect motor wiring	Check the motor wiring.	Check that the UVW power cables are connected properly and the phase sequence is correct.
Er.019	Encoder fault	Level 1	Encoder type error	Check the encoder type.	Enter the correct encoder type.
			Encoder disconnection	Check the encoder cable.	Replace the encoder cable.
Er.020	Undervoltage during main circuit operation	Level 1	Grid voltage drop	Measure whether the grid voltage is abnormal.	Improve the power grid.
			The load is too large or the motor does not match the drive.	Check the load matching conditions.	Select the appropriate drive and motor.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.021	AI function conflict	Level 1	The same AI is used for different functions.	Check the settings of AI channel in the function parameters.	Adjust AI functions to avoid conflicts.
Er.022	Incorrect parameter setting of control mode	Level 1	Parameter auto-tuning is performed in non-VC control mode.	Check the setting of control mode.	Change the control mode parameter.
Er.024	Abnormal AI input	Level 2	The AI voltage is too high.	Measure AI channel input voltage.	Reduce the AI voltage to less than 12 V.
			The AI wiring is incorrect.	Check the AI wiring according to the correct wiring diagram.	Re-wiring.
Er.025	Temperature sampling disconnection	Level 2	The temperature sampling circuit is abnormal.		Seek for technical support.
			The temperature sensor or signal cable is abnormal.		Seek for technical support.
Er.027	Servo motor overspeed	Level 1	The initial angle of encoder is wrong.	Check the initial angle of encoder (P01.21).	Retune the encoder angle.
			The actual speed of the servo motor exceeds the overspeed threshold.	Check whether the overspeed threshold is appropriate (the overspeed threshold is set by P10.12. If P10.12 is equal to 0, the overspeed threshold is 1.2 times the maximum motor speed; if P10.12 is not equal to 0, the overspeed threshold takes the smaller value between P10.12 or 1.2 times the motor's maximum speed).	Set the correct overspeed threshold.
			The UVW phase sequence is incorrect.	Check the servo motor wiring.	Check the motor wiring and rewire.
			Input reference is higher than the overspeed level.	Confirm the input reference.	Reduce the input reference, or adjust the gain.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
			The motor speed overshoots.	Check the motor speed waveform.	Reduce the controller gain, adjust the servo gain, or adjust the operating conditions.
			The servo drive is faulty.	Check whether the fault remains after the drive is powered off and powered on again.	Replace the servo drive.
Er.031	Encoder multi-turn count overflow	Level 2	The multi-turn count exceeds 65535.	Check whether P11.33 exceeds the maximum number of encoder turns.	Run the motor under the speed mode, and make the multi-turn count value deviate from the overflow threshold 65535; or hide the multi-turn overflow fault.
Er.032	Position deviation is too large	Level 2	The position deviation exceeds P05.21.	Check whether the position deviation detection range P05.21 is too small or whether the position gain P08.02 is too small.	Increase the position loop gain P08.02.
Er.033	Abnormal pulse input	Level 2	The pulse frequency exceeds the value set by P10.13.	Check whether the maximum position pulse frequency P10.13 is too small.	Set P10.13 again according to the maximum position pulse frequency required for the normal operation of the machine. If the output pulse frequency of host controller is greater than 4 MHz, such frequency must be reduced.
Er.034	Fully closed-loop position deviation too large	Level 2	The position deviation of external encoder and internal encoder is too large.	Check whether the number of pulses of external encoder per revolution of the motor P13.01 is set correctly, and whether the fully closed-loop excessive position deviation threshold P13.04 is too small.	Increase the fully closed-loop position excessive deviation threshold P13.04.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.035	Fully closed-loop parameter setting error	Level 2	In the fully closed-loop position mode, the source is the internal position reference, but the internal and external loop switching mode is used.	Check whether P13.03 is 2, and check whether the source of position reference is internal position reference: multi-segment position reference, and interrupt positioning function.	When using the fully closed-loop function and the position reference source is internal position reference, only the external encoder feedback mode can be used, that is, P13.03 can only be 1.
Er.036	CAN bus communication interrupted	Level 2	The communication between the CAN master station and the servo is interrupted for more than the time of P16.03.	Check the wiring between the CAN master and the servo.	Rewire or adjust the disconnection detection time P16.03 according to the communication cycle.
Er.037	Homing timeout	Level 2	After the homing is enabled, the home is not found within the time of P12.09.	Check the homing mode and the homing timeout detection time P12.09.	Set an appropriate homing timeout detection time according to the homing path.
Er.039	Positive overtravel	Level 2	When P10.04=0, the positive limit switch is exceeded during running.	Check whether mechanical equipment encounters the limit switch.	Run the motor in reverse to get the device off the limit switch.
Er.040	Negative overtravel	Level 2	When P10.04=0, the negative limit switch is exceeded during running.	Check whether mechanical equipment encounters the limit switch.	Run the motor in reverse to get the device off the limit switch.
Er.043	External fault	Level 2	The external fault terminal acts.	Check whether the fault terminal is triggered by mistake.	Check the external wiring.
Er.046	Short circuited to ground upon power-on	Level 1	The power output cables (UVW) of the servo drive are short circuited to ground.	Disconnect the UVW cables from the motor, and measure whether the power cables are short circuited to ground.	Connect the cables again or replace them.
			The motor is short circuited to ground.	Disconnect the UVW cables from the motor, and measure whether the motor internal power cables are short circuited to ground.	Replace the motor.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.047 Er.048 Er.049	Internal logic error	Level 1	----------	----------	Seek for technical support.
Er.056	Excessive deviation of bus position	Level 2	Position deviation exceeds the set value of 0x6065.	Check whether the position deviation threshold (0x6065) is too small or the position gain (P08.02) is too small.	Set P17.26 to 1 to restore the default values of bus object dictionary; and increase the position loop gain P08.02.
Er.061	Electronic gear ratio error	Level 1	The electronic gear ratio is set incorrectly.	Check whether the electronic gear ratio parameter setting is reasonable.	Correctly set the electronic gear ratio parameters.
Er.066	Homing logic wrong	Level 2	Homing parameters are improper, or the homing command is executed during positioning.	Check homing parameters such as home searching acceleration/deceleration time and homing mode.	Set homing parameters according to the actual homing mode, or wait for the positioning to complete before homing.
Er.070	Motor number invalid or incorrect	Level 1	An invalid motor number was set.	Check the motor number.	Set the correct motor number through P01.00.
Er.071	Incremental encoder UVW position error	Level 1	The UVW position of incremental encoder is invalid.	Check whether the motor end and servo end of the encoder cable are reversed. Re-plug the encoder terminals, and repeat power-on several times to see if there is still a fault.	Exchange the encoder cable plugs (according to marks on the servo end). Check the encoder wiring or replace the encoder.
Er.072	Program burning error	Level 1	The software program is inconsistent with the hardware.	Check whether the hardware model and software model match.	Seek for technical support.
Er.073	Failed to bootstrap	Level 1	When the 220 V drive is enabled, the motor speed is too large (over 200 rpm).	Before enabling, check if the motor rotates.	Enable it after the motor is stationary or lower than 200 rpm.
Er.074	Torque off state	Level 1	STO input signals are abnormal.	Check the STO input signals.	Configure the STO terminal input correctly.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.075	Absolute encoder battery undervoltage	Level 2	Absolute encoder battery voltage is lower than 3.1 V when the drive is powered on.	Measure whether the battery voltage is lower than 3.1 V.	Seek for technical support.
Er.076	Absolute encoder battery disconnection	Level 2	The absolute encoder battery is disconnected or the battery voltage is lower than 2.75 V when the drive is powered off.	Check whether the encoder battery wiring is disconnected when the drive is powered off; and measure whether the battery voltage is too low.	If Er.076 is reported for the first power-on, press the reset button to clear the fault; if the fault cannot be cleared after multiple resets, replace the encoder cable or the encoder battery.
Er.077	Encoder type setting error	Level 1	The actual encoder type is inconsistent with that read by P01.00.	Check whether the encoder type in P01.00 is consistent with the actual encoder type.	Confirm the motor model and change the value of P01.00.
Er.078	No parameters stored in absolute encoder EEPROM	Level 1	When P01.00 reads the absolute encoder EEPROM, the EEPROM has no parameters.	Check whether parameters are written in the encoder EEPROM.	Seek for technical support.
Er.079	Absolute encoder EEPROM parameter write error	Level 1	An error occurred when writing parameters to the absolute encoder EEPROM.	Power off and restart to see if the parameters can be rewritten.	Confirm the encoder type, replace the encoder, or replace the motor.
Er.080	Control circuit undervoltage	Level 1	The control circuit is powered off or undervoltage, with only USB power supply.	Check and measure whether the control circuit voltage is within the normal range, and whether the control circuit power wiring is normal.	Check the power wiring and replace the control power supply.
Er.081 Er.082	Internal logic error	Level 1	----------	----------	Seek for technical support.
Er.083	Second encoder error	Level 1	The second encoder type is incorrect.	Check the second encoder type setting.	Input the correct second encoder type.
			The second encoder is disconnected.	Check the second encoder cable.	Replace the second encoder cable.

Fault code	Fault	Fault level	Fault cause	Check method	Solution
Er.084	Absolute encoder EEPROM parameter read error	Level 1	An error occurred when reading parameters from the absolute encoder EEPROM.	Power off and restart to see if there is still an error.	Confirm the encoder type, replace the encoder, or replace the motor.
Er.085	Drive output disconnection	Level 1	The drive's U, V, W output cables are disconnected.	Check whether U, V, W outputs are disconnected.	Reconnect the U, V, W cables.

Chapter 9 Object Dictionary Table

M6-P parameter object index is shown in the following table:

Group	Index	Sub-index	Note
P00	2000h	01h to Number of parameters in this group	Index of drive parameter = (2000h + group number); Sub-index of drive parameter = (the parameter within this group + 1). [Example]: The first parameter of P00 group P00.00: Index = 2000h, sub-index = 01h. The 11th parameter of P00 group P00.10: Index = 2000h, sub-index = 0Bh
P01	2001h	01h to Number of parameters in this group	
……			

Related drive parameters are listed as follows:

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
P02.00	Control mode selection	0: Speed mode 1: Position mode 2: Torque mode 3: Speed mode ← → position mode 4: Torque mode ← → position mode 5: Speed mode ← → torque mode 6: Speed mode ← →torque mode ← → position mode 7: CANopen mode 8: EtherCAT mode	1	0	Immediately	At stop	PST
P06.12	Positive torque limit channel	0: Internal positive torque limit value 1: Bus positive torque limit value 2: MIN (internal positive torque limit value, bus positive torque limit value) 3: External positive torque limit value 4: AI1 5: AI2	1	0	Immediately	At stop	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
P06.13	Negative torque limit channel	0: Internal negative torque limit value 1: Bus negative torque limit value 2: MIN (internal negative torque limit value, bus negative torque limit value) 3: External negative torque limit value 4: AI1 5: AI2	1	0	Immediately	At stop	PST
P06.14	Internal positive torque limit value	0.0% to 400.0%	0.1%	Model dependent	Immediately	During running	PST
P06.15	Internal negative torque limit value	0.0% to 400.0%	0.1%	Model dependent	Immediately	During running	PST
P07.09	FWD speed limit channel	0: FWD speed limit value 1: Bus speed limit value 2: MIN (FWD speed limit value, bus speed limit value) 3: AI1 4: AI2	1	0	Immediately	At stop	T
P07.10	FWD speed limit value	0.0% to 100.0%	0.1%	100.0	Immediately	During running	T
P07.11	REV speed limit channel	0: REV speed limit value 1: Bus speed limit value 2: MIN (REV speed limit value, bus speed limit value) 3: AI1 4: AI2	1	0	Immediately	At stop	T
P07.12	REV speed limit value	0.0% to 100.0%	0.1%	100.0	Immediately	During running	T
P07.13	Base value for torque reached	0.0 to 400.0%	0.1%	0.0	Immediately	During running	T
P07.14	Valid value for torque reached	0.0 to 400.0%	0.1%	20.0	Immediately	During running	T

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
P07.15	Invalid value for torque reached	0.0 to 400.0%	0.1%	10.0	Immediately	During running	T
P16.00	CAN software version	000 to FFF			-	Display	-
P16.01	CAN communication address	0 to 127	1	5	Power-on again	At stop	-
P16.02	Baud rate of CAN communication	0: 125 kbits/s 1: 250 kbits/s 2: 500 kbits/s 3: 1000 kbits/s	1	0	Power-on again	At stop	-
P16.03	CAN disconnection detection time	0.0 to 1000.0 s (When the parameter is set to 0, no disconnection detection is performed)	0.1	0.0 s	Power-on again	At stop	-
P16.04	CAN communication status	0: Boot-up 4: Stopped 5: Operational 127: Pre-operational	1	-	-	Display	-
P16.05	PDO configuration mode selection	0: Menu configuration 1: Master configuration	1	0	Power-on again	At stop	-
P16.06	TPDO1 transmission type	0 to 255	1	255	Power-on again	Setting	PST
P16.07	TPDO1 event timer	0 to 65535	1 ms	10	Power-on again	Setting	PST
P16.08	Number of valid mapped objects in TPDO1	0 to 4	1	2	Power-on again	Setting	PST
P16.09	TPDO1 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read only	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		5: Parameter write only 6: PDO length does not match					
P16.10	TPDO1 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	60410010	Power-on again	Setting	PST
P16.11	TPDO1 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	606C0020	Power-on again	Setting	PST
P16.12	TPDO1 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.13	TPDO1 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.14	TPDO2 transmission type	0 to 255	1	255	Power-on again	Setting	PST
P16.15	TPDO2 event timer	0 to 65535 ms	1 ms	0	Power-on again	Setting	PST
P16.16	Number of valid mapped objects in TPDO2	0 to 4	1	0	Power-on again	Setting	PST
P16.17	TPDO2 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match					
P16.18	TPDO2 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.19	TPDO2 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.20	TPDO2 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.21	TPDO2 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.22	TPDO3 transmission type	0 to 255	1	255	Power-on again	Setting	PST
P16.23	TPDO3 event timer	0 to 65535 ms	1 ms	0	Power-on again	Setting	PST
P16.24	Number of valid mapped objects in TPDO3	0 to 4	1	0	Power-on again	Setting	PST
P16.25	TPDO3 mapping status	0: The mapping object is configured correctly 1: The parameter does	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match					
P16.26	TPDO3 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.27	TPDO3 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.28	TPDO3 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.29	TPDO3 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.30	TPDO4 transmission type	0 to 255	1	255	Power-on again	Setting	PST
P16.31	TPDO4 event timer	0 to 65535 ms	1ms	0	Power-on again	Setting	PST
P16.32	Number of valid mapped objects in TPDO4	0 to 4	1	0	Power-on again	Setting	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
P16.33	TPDO4 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match	1	0	-	Display	PST
P16.34	TPDO4 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.35	TPDO4 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.36	TPDO4 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.37	TPDO4 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.38	Number of valid mapped objects in RPDO1	0 to 4	1	2	Power-on again	Setting	PST
P16.39	RPDO1 mapping status	0: The mapping object is configured correctly	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match					
P16.40	RPDO1 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	60400010	Power-on again	Setting	PST
P16.41	RPDO1 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	60FF0020	Power-on again	Setting	PST
P16.42	RPDO1 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.43	RPDO1 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.44	Number of valid mapped objects in RPDO2	0 to 4	1	0	Power-on again	Setting	PST
P16.45	RPDO2 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		2: The parameter is not mappable 3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match					
P16.46	RPDO2 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.47	RPDO2 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.48	RPDO2 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.49	RPDO2 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.50	Number of valid mapped objects in RPDO3	0 to 4	1	0	Power-on again	Setting	PST
P16.51	RPDO3 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		3: Parameter length does not match 4: Parameter read only 5: Parameter write only 6: PDO length does not match					
P16.52	RPDO3 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.53	RPDO3 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.54	RPDO3 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.55	RPDO3 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.56	Number of valid mapped objects in RPDO4	0 to 4	1	0	Power-on again	Setting	PST
P16.57	RPDO4 mapping status	0: The mapping object is configured correctly 1: The parameter does not exist 2: The parameter is not mappable 3: Parameter length does not match	1	0	-	Display	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
		4: Parameter read only 5: Parameter write only 6: PDO length does not match					
P16.58	RPDO4 mapping object 1	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.59	RPDO4 mapping object 2	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.60	RPDO4 mapping object 3	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.61	RPDO4 mapping object 4	0–0xXXXXYZZ XXXX - Object dictionary index YY - Object dictionary sub-index ZZ - Object length	1	0	Power-on again	Setting	PST
P16.62	Whether to store function code parameters written through CANopen in EEPROM	0: Do not store 1: Store function code parameters written through CAN in the drive's EEPROM	1	1	Immediately	At stop	-
P17.26	CANopen bus parameter initialization	0: No action 1: Restore to factory settings 2: Save parameters	1	0	Immediately	At stop	-
P20.14	Torque user unit	0: 0.1% 1: 0.01 N·M	1	0	Immediately	At stop	PST

Function code	Name	Range	Min. Unit	Default	Effective time	Property	Mode
P20.15	Speed user unit	0: rpm 1: Reference unit/s	1	0	Immediately	At stop	PST
P20.27	Bus-forced DO state setting upon disconnection	0: DO status unchanged after disconnection 1: DO no output LED ones: Bit0 to Bit3: DO1 to DO4 LED tens: Bit4 to Bit5: DO5 to DO6	1	00	Immediately	At stop	PST

Drive object dictionary is listed below:

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
603Fh	VAR	Error code	UINT16	RW	TPDO	-
6040h	VAR	Control word	UINT16	RW	RPDO	-
6041h	VAR	Status word	UINT16	RO	TPDO	-
605Ah	VAR	Quick stop option code	INT16	RW	RPDO	-
605Bh	VAR	Shutdown option code	INT16	RW	RPDO	-
605Ch	VAR	Disable operation option code	INT16	RW	RPDO	-
605Dh	VAR	Halt option code	INT16	RW	RPDO	-
605Eh	VAR	Fault reaction option code	INT16	RW	RPDO	-
6060h	VAR	Modes of operation	INT8	RW	RPDO	-
6061h	VAR	Modes of operation display	INT8	RO	TPDO	-
6063h	VAR	Position actual value* (motor unit)	INT32	RO	TPDO	p
6064h	VAR	Position actual value (user unit)	INT32	RO	TPDO	Reference unit
6065h	VAR	Following error window	UINT32	RW	RPDO	Reference unit
6066h	VAR	Following error window time	UINT16	RW	RPDO	ms
6067h	VAR	Position window	UINT32	RW	RPDO	Reference unit
6068h	VAR	Position window time	UINT16	RW	RPDO	ms
6069h	VAR	Velocity sensor actual value	INT32	RO	TPDO	rpm
606Bh	VAR	Velocity demand value	INT32	RO	TPDO	rpm
606Ch	VAR	Velocity actual value	INT32	RO	TPDO	rpm

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
606Dh	VAR	Velocity window	UINT16	RW	RPDO	rpm
606Eh	VAR	Velocity window time	UINT16	RW	RPDO	ms
606Fh	VAR	Velocity threshold	UINT16	RW	RPDO	rpm
6070h	VAR	Velocity threshold time	UINT16	RW	RPDO	ms
6071h	VAR	Target torque	INT16	RW	RPDO	0.1%
6072h	VAR	Max torque	UINT16	RW	RPDO	0.1%
6074h	VAR	Torque demand	INT16	RO	TPDO	0.1%
6077h	VAR	Torque actual value	INT16	RO	TPDO	0.1%
607Ah	VAR	Target position	INT32	RW	RPDO	Reference unit
607Ch	VAR	Home offset	INT32	RW	RPDO	Reference unit
607Dh	ARRAY	Software position limit	INT32	RW	RPDO	Reference unit
607Eh	VAR	Polarity	UINT8	RW	RPDO	-
607Fh	VAR	Max profile velocity	UINT32	RW	RPDO	rpm
6080h	VAR	Max motor speed	UINT32	RW	RPDO	rpm
6081h	VAR	Profile velocity	UINT32	RW	RPDO	rpm
6083h	VAR	Profile acceleration	UINT32	RW	RPDO	ms/ 1000 rpm
6084h	VAR	Profile deceleration	UINT32	RW	RPDO	ms/ 1000 rpm
6085h	VAR	Quick stop deceleration	UINT32	RW	RPDO	ms/ 1000 rpm
6087h	VAR	Torque slope	UINT16	RW	RPDO	0.1%/s
6091h	ARRAY	Gear ratio	UINT32	RW	RPDO	-
6098h	VAR	Homing method	INT8	RW	RPDO	-
6099h	ARRAY	Homing speeds	UINT32	RW	RPDO	rpm
609Ah	VAR	Homing acceleration	UINT32	RW	RPDO	ms/ 1000 rpm
60B8h	VAR	Touch probe function	INT16	RW	RPDO	-
60B9h	VAR	Touch probe status	UINT16	RO	TPDO	-
60BAh	VAR	Touch probe Pos1 pos value	INT32	RO	TPDO	Reference unit
60BBh	VAR	Touch probe Pos1 neg value	INT32	RO	TPDO	Reference unit

Index	Object code	Name	Type	Attr.	PDO mapping	Unit
60BCh	VAR	Touch probe Pos2 pos value	INT32	RO	TPDO	Reference unit
60BDh	VAR	Touch probe Pos2 neg value	INT32	RO	TPDO	Reference unit
60E0h	VAR	FWD torque Limit	UINT16	RW	RPDO	0.1%
60E1h	VAR	REV torque Limit	UINT16	RW	RPDO	0.1%
60F4h	VAR	Following error actual value	INT32	RO	TPDO	Reference unit
60FDh	VAR	Digital inputs	UINT32	RO	TPDO	-
60FEh	ARRAY	Digital outputs	UINT32	RW	RPDO	-
60FFh	VAR	Target velocity	INT32	RW	RPDO	rpm

Appendix 1 Warranty and Service

Shenzhen Megmeet Electrical Co., Ltd. manufactures motor drive products strictly according to the ISO9001:2015 standard. In case of any product abnormalities, please contact the distributor or the headquarters. Our company will provide full technical support for you.

1. Warranty period

The product is warranted for 18 months from the purchase date, however, the warranty date shall not exceed 24 months after the manufacturing date on the nameplate.

2. Warranty scope

During the warranty period, any product abnormalities incurred due to our company can be freely repaired or replaced by our company. In case of the following situations, maintenance fees will also be charged even if the product is still in the warranty period.

(1) The damages are caused by fire, flood, strong lightning strike, etc.

(2) The damages are caused by users' unauthorized modifications.

(3) The product is damaged due to drop or in transmission after the purchase.

(4) The product is damaged because the standard requirements are not obeyed in actual use.

(5) The product is damaged because the user does not follow the instructions of the user manual.

3. After-sales service

(1) If there are specific requirements for drive installation and trial operation, or the working status of the drive is not satisfactory (such as unsatisfactory performance and function), please contact the distributor or Shenzhen Megmeet Electrical Co., Ltd.

(2) In case of any abnormality, contact the distributor or Shenzhen Megmeet Electrical Co., Ltd. immediately for help.

(3) During the warranty period, our company will repair any drive abnormality incurred due to the product manufacturing and design free of charge.

(4) If the product is out of the warranty period, our company can provide paid repairing service according to the customers' needs.

(5) The service charge is calculated by actual costs. If there is an agreement, the agreement shall prevail.

Shenzhen Megmeet Electrical Co., Ltd.

Address: 5th Floor, Block B, Unisplendor Information Harbor, Langshan Road, Nanshan District, Shenzhen, 518057, China

Tel: +86-755-86600500

Fax: +86-755-86600562

Zip code: 518057

Website: https://www.megmeet.com