CANopen4.02Manual

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The CANopen4.02 program controls the motor operation according to the servo driver motion control program defined by the CIA402 standard protocol. It mainly includes motion control state machine switching, execution of different motion control modes, and corresponding object dictionaries.

SD700 currently supports CANopen operation modes, including contour position mode, contour speed mode, origin return mode, and interpolation mode. Among them, the torque mode defined by CANopen is not supported by servo drives. The CANopen motion control mode supported by the servo drive can be displayed via the object dictionary 6502h.

Subject 6502h: Supported Drive Modes

Index	**6502H**				
Name	Supports servo operation mode				
Object structure	**VAR**	Type of data	**UINT32**	Data range	**UINT32**
Mapping properties	**Y**	Accessibility	**RO**	Factory setting	**65h**

Parameter Description: Servo operation mode supported by the drive, 0 means not supported, 1 means supported.

Bit	Description	Value
0	Contour position mode	1-support
1	Variable speed mode	0-not supported
2	Contour speed mode	1-support
3	Contour torque mode	0-not supported
4	NA	Reserve
5	Zero return mode	1-support
6	Interpolation position mode	1-support
7~15	NA	Reserve
16~31	Manufacturer custom	Reserved, undefined

1. Servo Motion Control

1.1 CIA402 Control State Machine

The CANopen function defined in the SD700 servo drive uses the motion control state machine defined by CIA402 for state switching. The different state transition diagrams are shown in Figure 1.1 below:

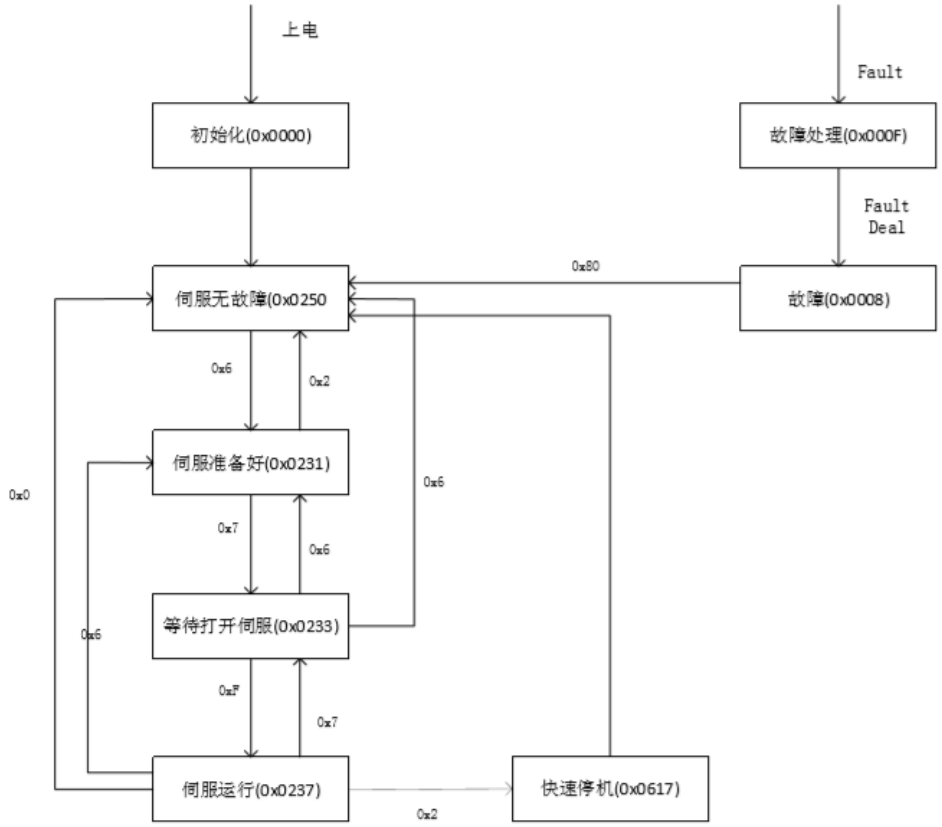


Figure 1.1 SD700 Motion Control State Machine

The CANopen motion control state machine is implemented through the control word object dictionary 6040h and the status word object dictionary 6041h. When the servo driver receives different control words, it switches the corresponding state. The current state of the switched control state machine is displayed by the status word. Among them, the state switching instruction is defined by the lower 4 bits and bit 7 of the control word object dictionary, as shown in Table 1.1 below; the current state of the state machine is defined by the values of the lower 4 bits, bit 5, and bit 6 of the status word, as shown in Table 1.2 below:

Instruction	Bit7	Bit3	Bit2	Bit1	Bit0
	0x0080	0x0008	0x0004	0x0002	0x0001
Shut Down(0x6)	✕	✕	1	1	0
Switch On(0x7)	✕	✕	1	1	1
Disable Voltage(0x0)	✕	✕	✕	0	✕
Quick Stop(0x2)	✕	✕	0	1	✕
Disable Operation(0x7)	✕	0	1	1	1
Enable Operation(0xF)		1	1	1	1
Fault Reset(0x80)	0→1	✕	✕	✕	✕

Table 1.1 Correspondence Between State Switching Instructions and Control Words

0--Current Bit is 0
1--The current bit is 1
× --Current bit is ignored

Status	Bit6	Bit5	Bit3	Bit2	Bit1	Bit0
	0x0040	0x0020	0x0008	0x0004	0x0002	0x0001
Initialization (0x00)	0	×	0	0	0	0
Servo no fault (0x0040)	1	×	0	0	0	0
Servo ready (0x0021)	0	1	0	0	0	1
Waiting to turn on the servo (0x0023)	0	1	0	0	1	1
Servo operation (0x0027)	0	1	0	1	1	1
Quick stop (0x0007)	0	0	1	1	1	1
Troubleshooting (0x000F)	0	×	1	1	1	1
Failure (0x0008)	0	×	1	0	0	0

Table 1.1 Correspondence Between State Switching Instructions and Control Words

0--Current Bit is 0
1--The current bit is 1
× --Current bit is ignored

As shown in Figure 1.1 above, CANopen motion control states define different servo running states, and the descriptions of the different states are shown in Table 1.3 below:

Predefined code	Value	Meaning
Initialization	0x0000	The driver is still in the process of initialization, waiting for initialization to complete, CAN communication can work
Servo no fault	0x0040	Servo-free, and corresponding parameter configuration can be performed
Servo ready	0x0021	Servo ready
Waiting to turn on the servo	0x0023	Wait for enable
Servo run	0x0027	Servo enable, servo driver controls the motor according to the setting Set command to run
Quick stop	0x0007	Quick stop
Troubleshooting	0x000F	If the driver fails, stop according to the set failure shutdown mode.
Fault	0x0008	Fault status. The fault can be cleared by the host and enter the SWITCH_ON_DISABLE (0x0040) state

Table 1.3 State Definition of Control State Machine

The state of servo drive is switched by CANopen as shown in Table 1.4 below:

Canopen status switch	Control word 6040h input	Status word 6041h transition
Power on → Initialize	Automatic switch	0x0000
Initialization → Servo without failure	Automatic switching without failure	0x0250
Servo without failure → Servo is ready	0x6	0x0231

Servo ready → Wait for enable	0x7	0x0233
Wait for enable → Servo running	0xF	0x0237

Servo operation → Wait for enable	0x7	0x0233
Wait for enable → Servo is ready	0x6	0x0231
Servo ready → Servo is free	0x0	0x0250
Wait for enable → Servo is free	0x0	0x0250
Servo operation → Servo is free	0x0	0x0250
Servo operation → Quick stop	0x2	0x0217 (automatic switch to servo-free state after fast stop)
→ Faults deal with	Automatically enter if there is a fault	0x021F
Troubleshooting → Failure	Switch to fault state after fault stop	0x0218
Failure → Servo without failure	0x80	0x0250

Table 1.4 Control State Machine Switching Process

The host computer can enable the servo driver through CANopen. In different operating modes, the servo driver must be enabled through CANopen before the motor can be controlled correctly.

1.2 Control Word 6040h Object Dictionary.

The control word controls the execution of the state machine and the execution of different operating modes, which are defined as follows:

Object 6040h: Control Word					
Index	6040h				
Name	Control word				
Object structure	**VAR**	Type of data	**UINT16**	Data range	**UINT16**
Whether Can map	**Y**	Accessibility	**RW**	Factory setting	**0**

Parameter description	<table><tr><th>Bit</th><th>value</th><th>Function</th></tr><tr><td>0</td><td>0x0001</td><td rowspan="4">Control state machine switching</td></tr><tr><td>1</td><td>0x0002</td></tr><tr><td>2</td><td>0x0004</td></tr><tr><td>3</td><td>0x0008</td></tr><tr><td>4</td><td>0x0010</td><td>New Set Point/Start Home/Enable Ip Mod</td></tr><tr><td>5</td><td>0x0020</td><td>Change Set Immediately</td></tr><tr><td>6</td><td>0x0040</td><td>Absolute / relative position selection</td></tr><tr><td>7</td><td>0x0080</td><td></td></tr><tr><td>8</td><td>0x0100</td><td>Running stop</td></tr><tr><td>9</td><td>0x0200</td><td>—</td></tr><tr><td>1</td><td>0x0400</td><td>—</td></tr><tr><td>1</td><td>0x0800</td><td>—</td></tr><tr><td>1</td><td>0x1000</td><td>—</td></tr><tr><td>1</td><td>0x2000</td><td>—</td></tr><tr><td>1</td><td>0x4000</td><td>—</td></tr><tr><td>1</td><td>0x8000</td><td>—</td></tr></table> Bit4 is a multiplexing bit for different control modes: in position mode, it means that the new position command is triggered; in home mode, it means that home position return is enabled; in interpolation mode, it means that interpolation mode is enabled. Bit5 is the position mode function bit: when set high, the running position command will be interrupted immediately after the new position command is triggered. Bit6 is the function bit in position control mode: 0-absolute position command; 1-relative position command. Bit7 is a common bit for all control modes: a rising edge indicates a fault reset function. Bit8 is a common bit for all control modes: the rising edge indicates that the operation of the position, speed, origin, interpolation, and other modes are suspended.

1.3 Status Word 6041h Object Dictionary

Object 6041h: Control Word					
Index	6041h				
Name	Control word				
Object structure	**VAR**	Type of data	**UINT16**	Data range	**UINT16**
Whether Can map	**Y**	Accessibility	**RO**	Factory setting	**0**

Parameter description	

0	0x0001	Control state machine status display bits
1	0x0002	
2	0x0004	
3	0x0008	
4	0x0010	Voltage Enable
5	0x0020	Control state machine status display bits
6	0x0040	Control state machine status display bits
7	0x0080	Warning
8	0x0100	Drive is moving
9	0x0200	Remote
10	0x0400	Target Reach
11	0x0800	Position Limit Active
12	0x1000	Set Point Acknowledge/Speed 0/Home Attached
13	0x2000	Following Error/Home Error
14	0x4000	——
15	0x8000	Home Done

Bit4 is a general-purpose bit. Set high means the servo drive is powered on. This bit is set when the control state machine is initialized.

Bit7 is a general-purpose bit. This bit is set automatically when there is an alarm in the servo drive.

Bit8 is a general-purpose bit. This bit is set when the servo drive is moving.

Bit9 is a general-purpose bit. This bit is set automatically when the CAN function is enabled. This bit is set when the control state machine is initialized.

Bit10 Position speed dedicated bit. In the position mode, the position is set when the servo positioning is completed; in the speed mode, the position is set when the servo speed reaches the set speed.

Bit11 General purpose bit. When the servo operation position value exceeds the set position limit value, the position is set. Bit12 for position, speed and origin mode. In the position mode, it means that the new position command sent by the host computer is correctly received; in the speed mode, it means that the current motor running speed reaches 0 speed; in the origin mode, the position is set after the servo origin return is completed.

Bit13 is dedicated to position and origin. In the position mode, the position is set when the position overshoot value exceeds the set threshold; in the home position mode, the position return is failed.

Bit15 is a general-purpose bit for all modes. This bit is set when the servo drive executes home position return and the home position return is successful.

1.4 Control Mode Switching

Currently SD700CANopen function only supports several control modes including contour position mode, contour speed mode, origin return mode, and interpolation position mode. The control mode is switched via the object dictionaries 6060h and 6061h.

Object 6060h Modes of Operation

Index	6060h				
Name	Mode choose				
Object structure	**VAR**	Type of data	**Int8**	Data range	**Int8**

Whether Can map	**Y**	Accessibility	**RW**	Factory setting	**0**

Parameter description	Setting value	Control mode setting
	1	Contour position mode
	3	Contour speed mode
	4	Torque mode (not supported)
	6	Origin return mode
	7	Interpolation position mode
	Othe	No definition

Object **6061h Modes of Operation Display**

Index	6061h				
Name	Mode choose				
Object structure	**VAR**	Type of data	**Int8**	Data range	**Int8**
Whether Can map	**Y**	Accessibility	**RO**	Factory setting	**0**

Parameter description	Display value	Control mode setting
	1	Contour position mode
	3	Contour speed mode
	4	Torque mode (not supported)
	6	Origin return mode
	7	Interpolation position mode
	Other	No definition

SD700 servo drive currently supports contour position mode, contour speed mode, origin return mode, and interpolation position mode. The switching conditions between different control modes are shown in the following table:

Mode switch	Switching conditions
Position mode → speed mode	Switch after positioning is completed, mode display 1 → 3
Position mode → origin mode	After positioning is completed, the mode display changes from 1 → 6
Position mode → Interpolation position mode	After positioning is completed, the mode display changes from 1 → 7
Speed Mode → Position Mode	Switching after the speed is reached, the mode display changes from 3 → 1
Speed Mode → Origin Mode	Switching after the speed is reached, the mode display changes from 3 → 6
Speed mode → Interpolation position mode	Switching after the speed is reached, the mode display changes from 3 → 7
Origin mode → Position mode	Switching after the return to origin is completed, the mode display changes from 6 → 1
Origin mode → speed mode	After the return to origin is completed, the mode display changes from 6 → 3

Origin mode → interpolation position mode	Switching after the return to origin is completed, the mode display changes from 6 → 7
Interpolation position mode → other modes	Switch immediately, mode display changes immediately

When a control mode other than the above definition is set via CANopen, the servo drive does not operate. When the mode is switched, the mode switching is successful only when the servo drive operation mode display object dictionary 6061h is consistent with the expected operation mode 6060h. For example, if the current running origin return mode is set to 60 through 6060h, you want to switch to the position mode. If the home position return is being executed, the operation mode can be switched correctly after the home position return is completed. The period 6061h is consistently displayed as the 6 home position return mode.

2 Contour Position Control Mode

2.1 Parameter Configuration of Contour Position Mode

Contour position mode, according to the target position value, target speed value, acceleration and deceleration time sent by the host computer, through the servo drive
The actuator automatically plans the position trajectory.

The CANopen object dictionary that needs to be set for each position command curve planning includes: target position value (607Ah), target speed value (6081h), acceleration time (6083h), deceleration time (6084h).

Object 607Ah: Target Position

Index	607Ah				
Name	Target Position				
Object structure	**VAR**	Type of data	**INT32**	Data range	**INT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	Contour position mode target position value, the unit is command unit. The target position value is divided into an absolute position value and a relative position value. When bit 6 of control word 6040h is In the case of 0, the target position is absolute; when bit6 of 6040 is 1, the target position is a relative position.				

Object 6081h: Profile Velocity

Index	6081h				
Name	Profile Velocity				
Object structure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	Contour position mode target speed value in rpm.The contour speed settings are all positive. When the position command value is negative, the target speed is inverted.				

Object 6083h:Profile Acceleration

Index	6083h				
Name	Profile Acceleration				
Object structure	**VAR**	Type of data	**UINT32**	Data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter Description	Acceleration time in contour position and speed mode in ms. Acceleration time is defined as the time for the motor to accelerate from 0rpm to the maximum speed.				

Object 6084h:Profile Deceleration

Index	6084h				
Name	Profile Deceleration				
Object structure	**VAR**	Type of data	**UINT32**	Data range	**UINT32**
whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter Description	Deceleration time in contour position and speed mode in ms. Deceleration time is defined as the time from when the motor decelerates from the maximum speed to 0.				

The above parameters define the running parameters of the contour position mode. In addition, during the position mode running, the servo driver will detect in real time whether the current position command is positioned and whether the running position exceeds the set range. The outline of related object words for outline position mode is shown in the following table:

Index	Sub-index	Name	Access permission	Mapping attributes	Type of data	Unit	Range	Default value
6039	00	Error code	RO	Y	UINT16	——	UINT16	0
6040	00	Control word	RW	Y	UINT16	——	UINT16	0
6041	00	Status word	RO	Y	UINT16	——	UINT16	0
6060	00	Operation mode	RW	Y	UINT8	——	UINT8	0
6061	00	Operation mode Display	RO	Y	UINT8	——	UINT8	0
6064	00	Actual position value	RO	Y	INT32	One unit	INT32	0
6065	00	Excessive position deviation threshold	RW	Y	UINT32	One unit	UINT32	60000
6067	00	Position reached threshold	RW	Y	UINT32	One unit	UINT32	100
6068	00	Location arrival time	RW	Y	UINT16	ms	UINT16	0
607A	00	Target position value	RW	Y	INT32	One unit	INT32	0
607D	01	Software limit minimum	RW	Y	INT32	One unit	INT32	-2^31
	02	Software limit maximum	RW	Y	INT32	One unit	INT32	2^31
6081	00	Target speed	RW	Y	UINT32	rpm	UINT32	0
6083	00	Acceleration time	RW	Y	UINT16	ms	UINT16	200
6084	00	Deceleration time	RW	Y	UINT16	ms	UINT16	200
6093	01	Electronic gear molecule	RW	Y	UINT32	——	UINT32	1

	02	Electronic gear denominator	RW	Y	UINT32	——	UINT32	1

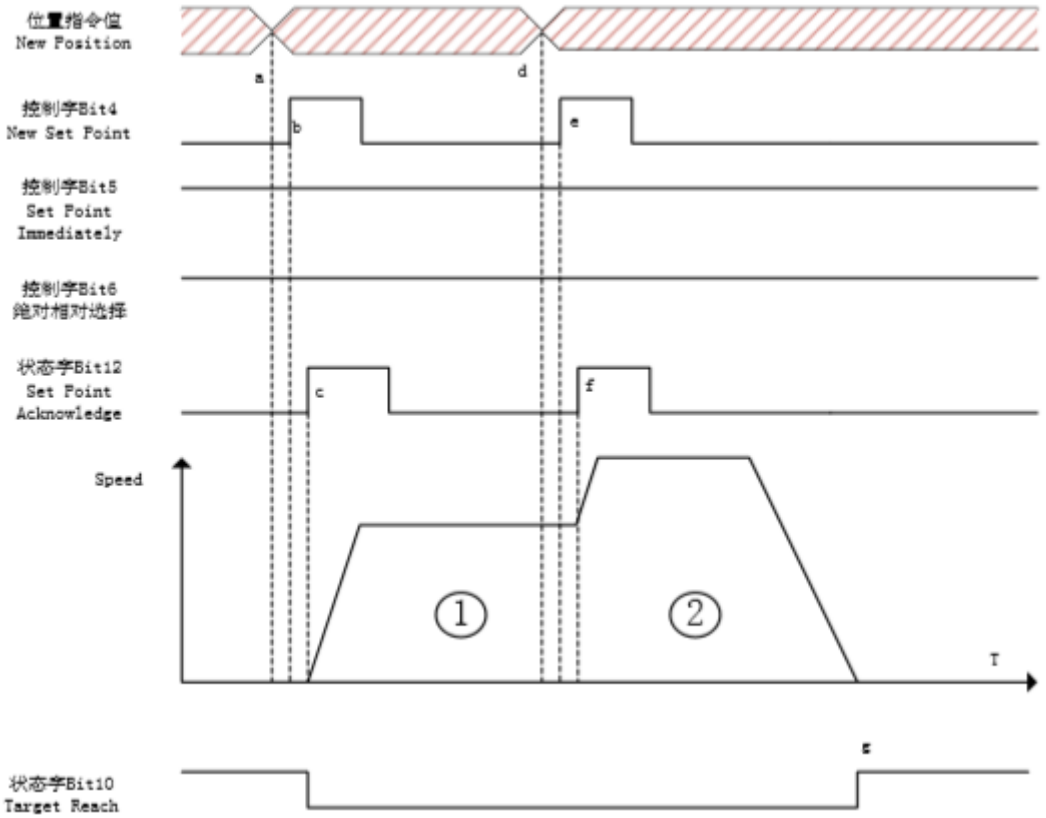
2.2 Contour Position Mode Operation Setting Steps

The contour setting mode operation setting steps are shown in the following table:

		Parameter input	Status word display
Servo enabled	0	0	0x0250
	1	6040h = 0x06	0x0231
	2	6040h = 0x07	0x0233
	3	6040h = 0x0F	0x0237
Control mode switch	4	6060h = 1	0x0637
Contour position parameter assignment	5	607Ah = 10000	0x0637
	6	6081h = 1000	0x0637
	7	6083h = 200	0x0637
	8	6084h = 200	0x0637
	9	6093h_01 = 1	0x0637
	10	6093h_02 = 1	0x0637
Absolute /relative position selection	11	6040hBit6 Set to 1 (Clear absolute position)	0x0637
Position command trigger	12	6040h Bit4 set 1	0x1237
Clear the trigger bit	13	6040hBit4 Cleared	0x0237
Positioning is complete	14	——	0x0637

2.3 Contour Position Mod

①Relative position command, immediate update mode



Operation steps:

a. Position instruction assignment. First assign the target position value through the object dictionary 607Ah, and give the target position value.

b. Position command trigger. Position instruction execution is triggered by the rising edge of status word bit4. When triggered, via control word bit5 given the immediate update position command, the control word bit6 gives the relative position command.

c. A new position instruction is received. After the servo driver detects the rising edge of the control word bit4, it starts to plan the position. At the same time, the status word bit10 positioning completion flag is cleared, and the status word bit12 changes from low to high.

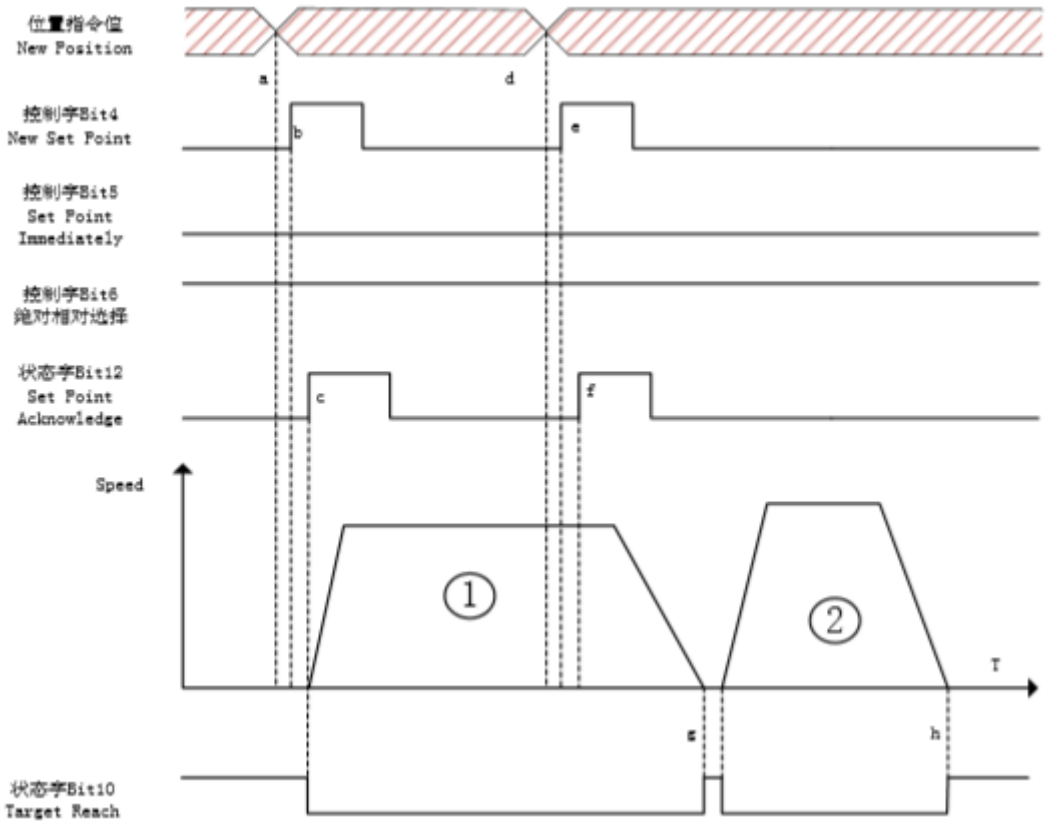
d. Assignment of the second position command. If the first position command is not completed, assign a new position command value to 607Ah.

e. The new position command is triggered. A new position instruction is triggered by the rising edge of the control word bit4.

f. The servo driver receives the new position command. Judgment control word bit5 immediately receives the new position command as high level, so immediately plan the next position command value from the current speed. The pulse value that has not been executed in the first stage position command is accumulated in the second stage position command.

g. After the execution of the second stage position instruction, the status word bit10 positioning completion flag is set to 1.

②Relative position command, not updated immediately



Operation steps:

a. Position instruction assignment. First assign the target position value through the object dictionary 607Ah, and give the target position value.

b. Position command trigger. Position instruction execution is triggered by the rising edge of status word bit4.

c. A new position instruction is received. The servo driver detects the rising edge of the control word bit4 and receives a new position command. The control word bit5 is 0, which means that the current position command is a non-immediate update mode, and the control word bit6 is 1, which means that the current position command is a relative position command. After the position command is triggered, the position trajectory is planned. At the same time, the status word bit10 positioning completion flag is cleared, and the status word bit12 Set Point Acknowledge changes from low to high.

d. Assignment of the second position command. If the first position command is not completed, assign a new position command value to 607Ah.

e. The new position command is triggered. A new position instruction is triggered by the rising edge of the control word bit4.

f. The servo driver receives the new position command. It is judged that the control word bit5 is 0, and the position command is not updated immediately. Wait for the first position command to complete before executing.

g. The execution of the first position command is completed. Status word bit10 Positioning completion signal is set to 1, and the two-segment position instruction of the planning ground is started. Status word bit10 Positioning completion signal is cleared. The detection control word bit6 is 1, indicating the relative position command value.

h. The execution of the second stage position instruction is completed, and the status word bit10 positioning completion signal is set to 1.

3 The Contour Speed Mode

3.1 Parameter configuration of contour speed mode

In the profile speed mode, the target speed (60FFh), profile acceleration time (6083h), and profile deceleration time are configured.(6084h) Control the motor to run at the set speed. During running, changing the value of the target speed (60FFh) can change the running speed of the motor.

The parameters related to the contour speed mode are as follows:

Object 60FFh:Target speed					
Index	60FFh				
Name	Contour speed mode target speed value				
Object structure	**VAR**	Type of data	**Int16**	Data range	**Int16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	Contour speed target speed value in rpm.				

Object 6083h:Profile Acceleration					
Index	6083h				
Name	Profile Acceleration				
Object structure	**VAR**	Type of data	**UINT32**	Data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter Description	Acceleration time in contour position and speed mode in ms. Acceleration time is defined as the time for the motor to accelerate from 0rpm to the maximum speed.				

Object 6084h:Profile Deceleration					
Index	6084h				
Name	Profile Deceleration				
Objectstructure	**VAR**	Type of data	**UINT32**	Data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter Description	Deceleration time in contour position and speed mode in ms. Deceleration time is defined as the time from when the motor decelerates from the maximum speed to 0.				

During the speed mode running, the speed mode running track is mainly modified by the above 3 parameters. In the contour speed mode, the related object dictionary list is

shown in the following table:

Index	Sub-index	name	Access permission	Mapping attributes	Type of data	Unit	Range	Default value
6039	00	Error code	RO	Y	UINT16	——	UINT16	0
6040	00	Control word	RW	Y	UINT16	——	UINT16	0
6041	00	Status word	RO	Y	UINT16	——	UINT16	0
6060	00	Operation mode	RW	Y	UINT8	——	UINT8	0
6061	00	Operation mode display	RO	Y	UINT8	——	UINT8	0
6064	00	Actual position value	RO	Y	INT32	Unit	INT32	0
606C	00	Actual speed feedback value	R0	Y	INT16	rpm	INT16	0
606D	00	Speed reached threshold	RW	Y	UINT16	rpm	UINT16	10
606E	00	Speed arrival time window	RW	Y	UINT16	ms	UINT16	0
606F	00	Zero speed threshold	RW	Y	UINT16	rpm	UINT16	10
6070	00	Zero speed time window	RW	Y	UINT16	ms	UINT16	0
6083	00	Contour acceleration time	RW	Y	UINT16	ms	UINT16	200
6084	00	Contour deceleration time	RW	Y	UINT16	ms	UINT16	200
60FF	00	Contour target speed value	RW	Y	INT16	rpm	INT16	0

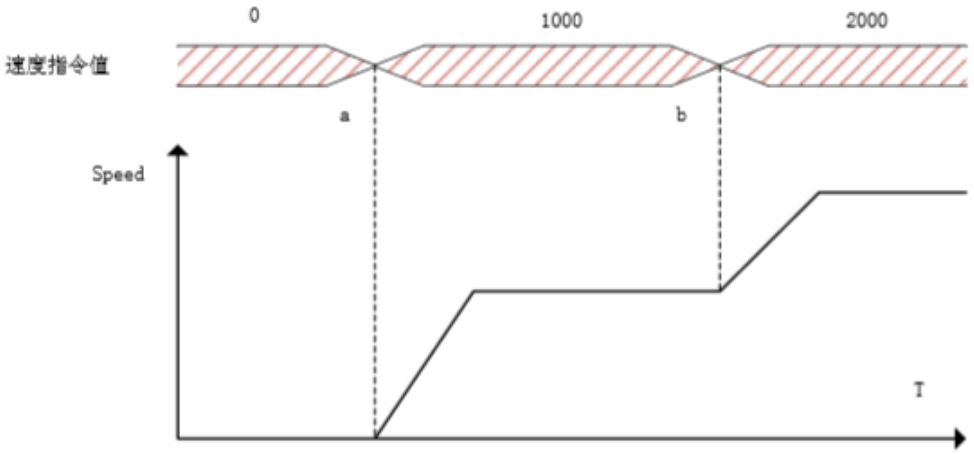
3.2 Contour Speed Mode Is On

The outline of the contour speed mode is as follows:

		Parameter input	State word display
Servo enable	0	0	0x0250
	1	6040h = 0x06	0x0231
	2	6040h = 0x07	0x0233
	3	6040h = 0x0F	0x0237
Control mode switching	4	6060h = 3	0x1637
Contour speed parameter assignment	5	60FFh = 10000	0x0237
	6	6083h = 200	0x0237
	7	6084h = 200	0x0237

	3	6040h = 0x0F	0x0237
Control mode switching	4	6060h = 3	0x1637
Contour speed parameter assignment	5	60FFh = 10000	0x0237
	6	6083h = 200	0x0237
	7	6084h = 200	0x0237

3.3 Operation Timing Diagram of Contour Speed Mode



a. Speed command given. After the speed command is given, the servo control motor runs at the set speed.
b. Speed command changes. After the speed command changes, the servo control motor changes speed from the current speed to the set speed.

4 The Origin Return Mode

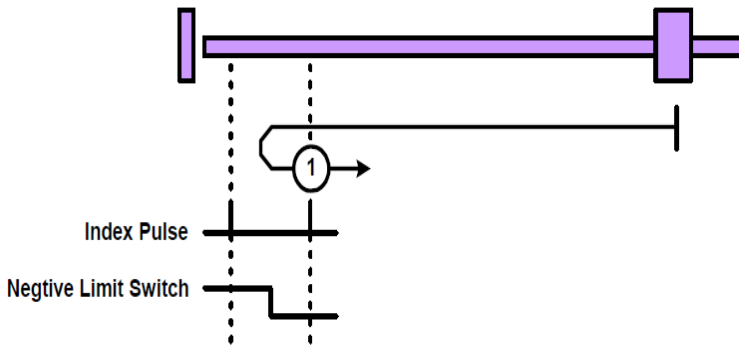
The origin return mode is where the host computer controls the servo drive action through CANopen to find the mechanical origin of the equipment. The origin signal can be the origin input signal, Z pulse of the motor encoder, or positive and negative limit signals.

The home position return function requires the host computer to set the home position return mode (6098h), home position high speed (home position first speed 6099h_01), home position low speed (home position return second speed 6099h_02) through CANopen. The homing can be enabled and stopped by the control word.

4.1. Origin Regression Related Object Dictionary

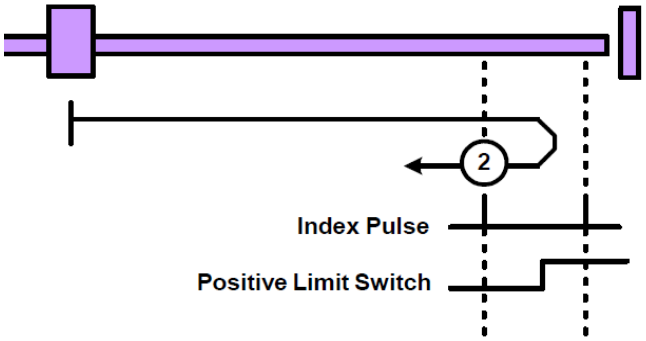
Object 607Ch: Origin offset					
Index	607Ch				
Name	Origin offset				
Object structure	VAR	Type of data	INT32	Data range	INT32
Whether can map	Y	Accessibility	RW	Factory setting	0
Parameter Description	Defines the number of pulses at the origin of the zero point after the origin return is completed. Unit command unit.				

Object 6098h:Homing method					
Index	6098h				
Name	Homing method				
Object structure	VAR	Type of data	Int8	Data range	0~35
Whether Can Map	Y	Accessibility	RW	Factory setting	0
Parameter Description	Define the CANopen origin return method. Each origin return method is shown in the following figure:				



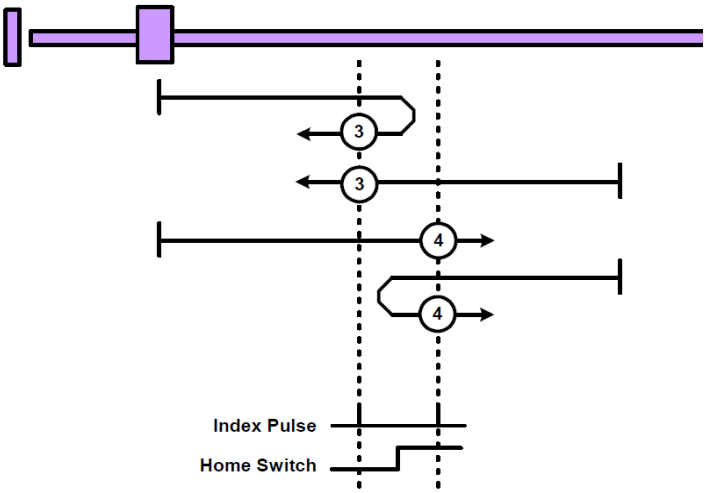
Origin return method 1

Start the origin return → find the negative limit at high speed in the reverse direction → encounter the rising edge of the negative limit → decelerate to 0 → find the negative limit at the low speed in the positive direction; the falling edge → find the Z pulse in the positive direction



Origin return method 2

Start the return to origin → Find the positive limit at high speed in the positive direction → encounter the rising edge of the positive limit → decelerate to 0 → reverse the low speed to find the positive limit.



Origin return method 3

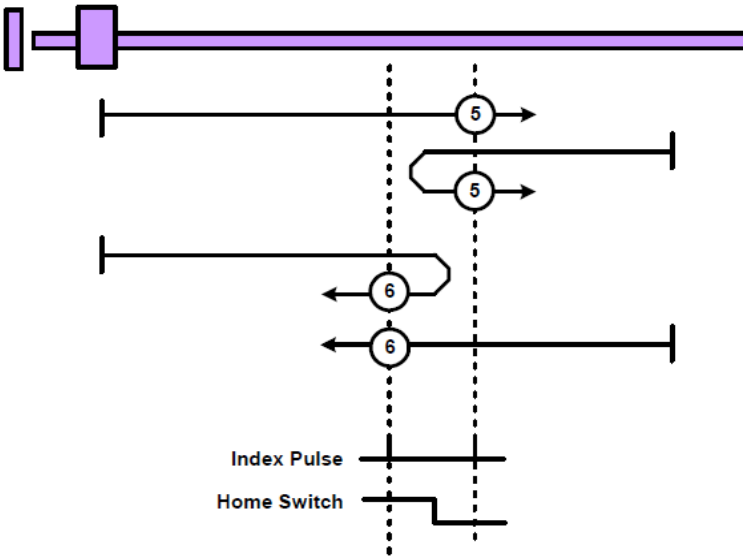
a. Start origin return → Origin signal is OFF → Rising edge of origin signal at high speed in forward direction → Deceleration to 0 → Falling edge of origin signal at low speed in reverse direction → Z pulse in reverse direction

b. Start origin return → Origin signal ON → Reverse low speed find origin signal falling edge → Reverse find Z pulse

Origin return method 4:

a. Start origin return → Origin signal OFF → Rising edge of origin in high speed in forward direction → Deceleration to 0 → Finding origin in low speed in reverse direction Falling edge → Z pulse in forward direction

b. Start origin return → origin signal ON → find origin falling edge at low speed in reverse → find Z pulse in forward direction



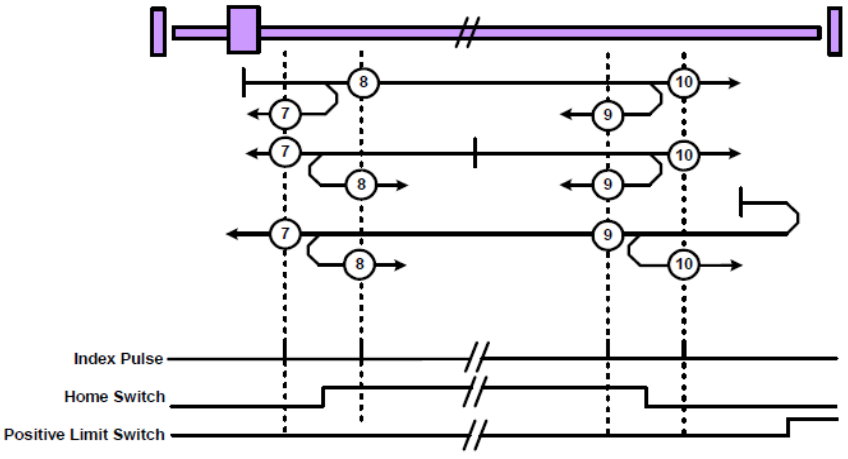
Origin return method 5：

a. Start origin return → origin signal OFF → reverse high speed to find origin rising edge → decelerate to 0 → forward low speed to find origin down falling edge → forward to find Z pulse

b. Start origin return → origin signal ON → find origin falling edge at low speed in forward direction → find Z pulse in forward direction

Origin return method 6:

a. Start origin return → Origin signal OFF → Rising edge of origin at high speed in reverse direction → Deceleration to 0 → Falling edge of origin at low speed in forward direction → Z pulse in reverse



Origin return method **7**：

a. Start origin return → origin signal OFF → find the origin rising edge at high speed in the forward direction → decelerate to 0 → find the origin at the low speed in the reverse direction at the falling edge → find the Z pulse in the reverse direction

b. Start origin return → origin signal ON → find origin falling edge at low speed in reverse → find Z pulse in reverse

c. Start origin return → origin OFF → positive high speed find origin rising edge → hit positive limit → reverse high speed find origin falling edge → decelerate to 0 → forward low speed find origin rising edge → reverse find Z pulse

Origin return method 8:

a. Start origin return → Origin signal OFF → Rising edge of origin in high speed in forward direction → Deceleration to 0 → Finding origin in low speed in reverse direction Falling edge → Z pulse in forward direction

b. Start origin return → origin signal ON → find origin falling edge at low speed in reverse → find Z pulse in forward direction

c. Start origin return → Origin OFF → Positive high-speed find origin rising edge → hit positive limit → reverse high-speed find origin falling edge → decelerate to 0 → forward low-speed find origin rising edge → forward find Z pulse

Origin return method 9:

a. Start origin return → Origin signal OFF → Find the origin at a high speed and the falling edge → Decelerate to 0 → Find the origin at a low speed in the reverse direction Rising edge → Find the Z pulse in the reverse direction

b. Start origin return → Origin signal ON → Find the origin falling edge in high speed in the forward direction → Decelerate to 0 → Find the origin rising edge in low speed in the reverse direction → Find the Z pulse in the reverse direction

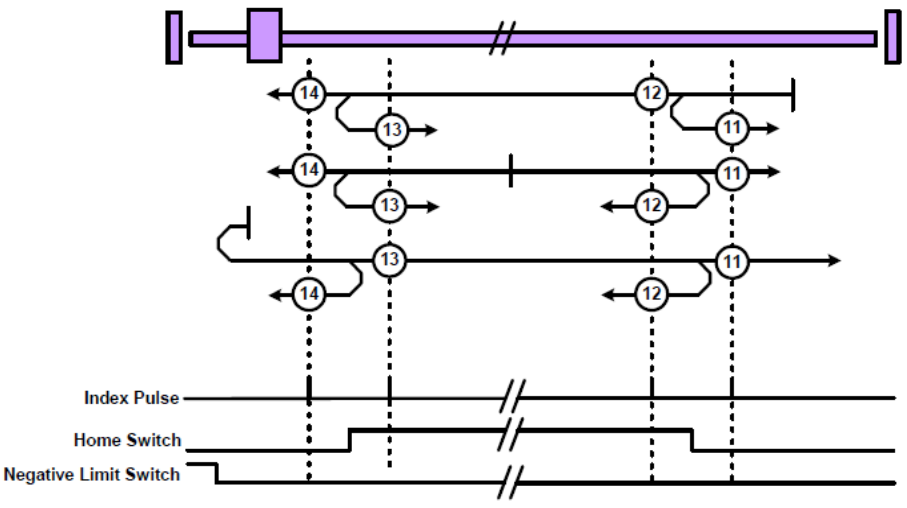
c. Start origin return → Origin OFF → Front to find origin at high speed in the forward direction → Reaching positive limit → Rising at origin in high speed at the reverse direction → Decelerate to 0 → Find origin at the low speed in the forward direction to fall at the origin → Reverse Z pulse

Origin return method 10:

a. Start origin return → Origin signal OFF → Find the origin at a high speed and the falling edge → Decelerate to 0 → Find the origin at a low speed in the reverse direction Rising edge → Find the Z pulse in the reverse direction

b. Start origin return → Origin signal ON → Find the origin falling edge in high speed in the forward direction → Decelerate to 0 → Find the origin rising edge in low speed in the reverse direction → Find the Z pulse in the reverse direction

c. Start origin return → Origin OFF → Front to find origin at high speed in the forward direction → Reaching positive limit → Rising at origin in high speed at the reverse direction → Decelerate to 0 → Find origin at the low speed in the forward direction to fall at the origin → Reverse Z pulse



Origin return method **11**:

a. Origin return start → Origin signal OFF → Rising edge of origin at high speed in reverse direction → Deceleration to 0 → Finding origin at low speed in negative direction Falling edge → Z pulse in forward direction

b. Origin return start → Origin signal ON → Find the origin falling edge at low speed in the forward direction → Find the Z pulse in the forward direction

c. Origin return start → Origin signal OFF → Rising edge of origin at high speed in reverse direction → Touching negative limit → Finding origin of high speed in forward direction Signal falling edge → Deceleration to 0 → Rising edge of origin at low speed in reverse direction → Find Z pulse in forward direction

Origin return method 12:

a. Origin return start → Origin signal OFF → Rising edge of origin in reverse at high speed → Deceleration to 0 → Falling edge of origin in forward direction at low speed → Z pulse in reverse

b. Origin return start → Origin signal ON → Find the origin falling edge at low speed in the forward direction → Find the Z pulse in the reverse direction

c. Origin return start → Origin signal OFF → Rising edge of origin at high speed in reverse direction → Touching negative limit position → Rising edge of origin at high speed in signal direction → Deceleration to 0 → Rising edge of origin at low speed in reverse direction → Z pulse in reverse direction

Origin return method 13:

a. Origin return start → Origin signal OFF → Reverse high speed to find origin falling edge → Deceleration to 0 → Forward low speed to find origin on rising edge → Forward looking Z pulse

b. Origin return start → Origin signal ON → Reverse high speed to find origin falling edge → Deceleration to 0 → Forward low speed to find origin rising edge → Find Z pulse in forward direction

c. Origin return start → Origin signal OFF → Reverse high-speed find origin falling edge → hit negative limit → Forward high-speed find origin signal rising edge → Deceleration to 0 → Reverse low-speed find origin signal falling edge → Forward Z pulse

Origin return method 14:

a. Origin return start → origin signal OFF → reverse high speed to find origin falling edge → decelerate to 0 → forward low speed to find origin on rising edge → reverse Z pulse

b. Origin return start → origin signal ON → reverse high speed to find origin falling edge →

deceleration to 0 → forward low speed to find origin rising edge → reverse Z pulse

c. Origin return start → Origin signal OFF → Reverse high-speed find origin falling edge → hit negative limit → Positive high-speed find origin signal rising edge → Deceleration to 0 → Reverse low-speed find origin signal falling edge → Reverse Z pulse

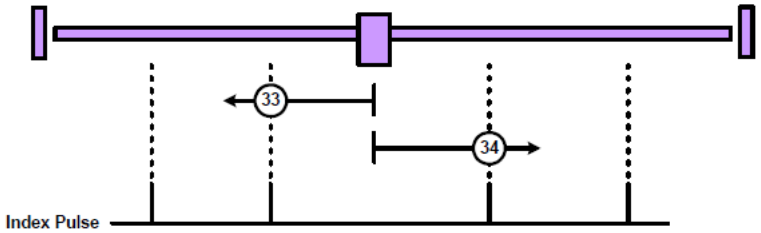
Origin return method 15: Reserved.

Origin return method 16: Reserved.

Origin return method 17 ～ 30: Same as Origin return method 1 ～ 14, the difference is: Origin return method 1 ～ 14 uses Z pulse as the origin, Origin return method 17 ～ 30 does not use Z pulse as the origin.

Origin return method 31: Reserved.

Origin return method 32: Reserved.



Origin return method 33：

Origin return start → find the first Z pulse in negative direction

Origin return method 34:

Origin return start → find the first Z pulse in the forward direction

Object 6099h:Homing Speeds

Index	6099h				
Name	Homing Speeds				
Object structure	**ARR**	Type of data	**UINT8**	Data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**-**
Parameter description	Define origin return high speed and low speed				
Sub-index	00h				
Name	Origin regression speed sub-index number				
Object structure	**VAR**	Type of data	**UINT8**	Data range	**2**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**2**
Parameter description	Origin return speed Sub-index number				
Sub-index	01h				

Name	Origin return high speed				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**100**
Parameter description	Origin return high speed, unit rpm				
Sub-index	02h				
Name	Origin return to low speed				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**10**
Parameter description	Origin return to low speed, unit rpm				

Object 609Ah: Homing Acceleration

Index	$609A_h$				
Name	Homing Acceleration				
Object structure	**VAR**	Type of data	**UINT16**	Data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter description	Defines the acceleration / deceleration time during origin return, the unit is ms. The acceleration time is the time required to accelerate from 0rpm to the maximum speed; the deceleration time is the time required to decelerate from the maximum speed to 0rpm.				

The parameters involved in the origin return process are shown in the following table:

Index	Sub-index	Name	Access permission	Mapping attributes	Type of data	Unit	Range	Default value
6039	00	error code	RO	Y	UINT16	——	UINT16	0
6040	00	Control word	RW	Y	UINT16	——	UINT16	0
6041	00	Status word	RO	Y	UINT16	——	UINT16	0
6060	00	Operation mode	RW	Y	UINT8	——	UINT8	0
6061	00	Operation mode display	RO	Y	UINT8	——	UINT8	0
6064	00	Actual position value	RO	Y	INT32	One unit	INT32	0
6065	00	Excessive position deviation threshold	RW	Y	UINT32	Instruction unit	UINT32	3840000
6067	00	Position reached threshold	RW	Y	UINT32	Instruction unit	UINT32	100

6068	00	Location arrival time	RW	Y	UINT16	ms	UINT16	0
607A	00	Target position value	RW	Y	INT32	Instruction unit	INT32	0
607D	01	Software limit minimum	RW	Y	INT32	Instruction unit	INT32	-2^31
	02	Software limit maximum	RW	Y	INT32	Instruction unit	INT32	2^31
607C	00	Origin return offset	RW	Y	INT32	Instruction unit	INT32	0
6098	00	Origin return method	RW	Y	UINT8	——	UINT8	0
6099	01	Origin return high speed	RW	Y	UINT16	rpm	UINT16	100
	02	Origin return to low speed	RW	Y	UINT16	rpm	UINT16	10
609A	00	Origin return acceleration / deceleration time	RW	Y	UINT16	ms	UINT16	200

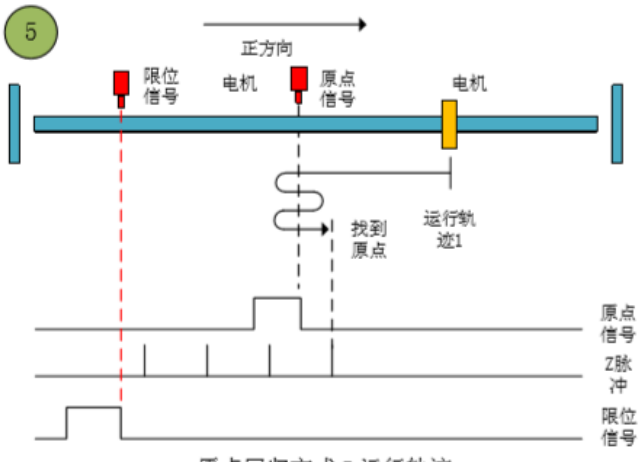
4.2. Origin Return State Machine Switch

The steps for turning on the origin return function are as follows:

		Parameter input	State dislay
Servo enable	0	0	0x0250
	1	6040h = 0x06	0x0231
	2	6040h = 0x07	0x0233
	3	6040h = 0x0F	0x0237
Control mode switching	4	6060h = 6	0x0237
Contour speed parameter assignment	5	60FFh = 10000	0x0237
	6	6083h = 200	0x0237
	7	6084h = 200	0x0237

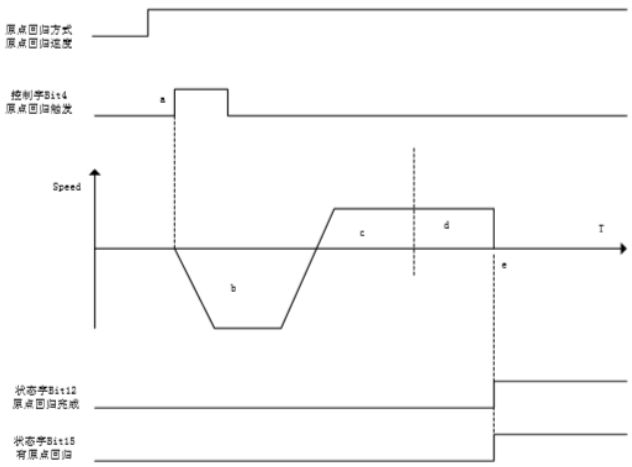
4.3. Origin Return

Taking origin regression mode 5 as an example, the realization of origin regression is described as follows:



原点回归方式 5 运行轨迹

原点回归运行过程如下所示：



a. Origin return trigger. The rising edge of control word bit4 triggers the origin return operation.

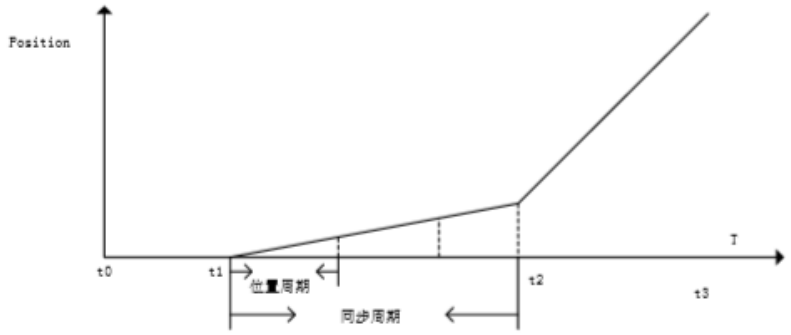
b. Find the rising edge of the origin signal at high speed in the reverse direction. After encountering the rising edge of the origin signal, decelerate to 0.

c. Find the falling edge of the origin signal at the low speed in the positive direction.

d. Find the falling edge of the origin signal and continue to run to the Z pulse position in the positive direction.

e. Go to the Z pulse and the origin return is completed. Status word bit12 Set to zero when return-to-origin is complete; status word bit15 Set to zero when the home mark is found.

5 Interpolation Position Mode



插补位置示意图

In the interpolation position mode, the host computer sends a position value every synchronization cycle. The servo driver receives the interpolation position value and subdivides the interpolation position value into each position loop cycle.

The host computer sends an interpolation position command value in each synchronization cycle. The servo driver is divided into each position cycle according to the received interpolation position value. The control motor controls the interpolation according to the host computer. Position trajectory runs.

5.1 Dictionary of Objects Related to Interpolation Position Instructions

Object 60C1h: Interpolation data record					
Index	**60C1h**				
Name	**Interpolation data record**				
Object structure	**ARR**	type of data	**UINT16**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Sub-index	0				
Name	Origin regression speed sub-index number				
Object structure	**VAR**	type of data	**UINT8**	data range	**3**
Whether can map	**N**	Accessibility	**RO**	Factory setting	**3**
Parameter description	Define the number of interpolation position commands Sub-index				

Sub-index	1				
Name	Interpolated position command value				
Objectstructure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	Interpolate position command value. unit is the instruction unit.				
Sub-index	2				
Name	**Interpolation Position Unit**				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	Position interpolation position command unit selection. 0-interpolation absolute position command; 1-interpolation incremental position command In the interpolation absolute position command mode, 60C1_01 is selected for the input of the interpolation mode command; In the interpolation incremental position command mode, the interpolation mode command input selection is 60C1_03.				

Sub-index	**3**				
Name	Interpolation speed command				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can	**Y**	Accessibility	**RW**	Factory	**0**
Parameter Description	Interpolation speed command. The unit is rpm. The interpolation speed command defines the number of pulses sent per cycle. Equivalent to the corresponding speed value.				

Object60C2h:Interpolation Time Perid

Index	**60C2h**				
Name	**Interpolation Time Period**				
Object structure	ARR	type of data	UINT16	data range	UINT32
Whether can map	Y	Accessibility	RW	Factory setting	0
Sub-index	0				
Name	Origin regression speed sub-index number				
Object structure	VAR	type of data	UINT8	data range	2

Whether can map	N	Accessibility	RO	Factory setting	2
Parameter description	Number of sub-index of the object dictionary in the interpolation period				
Sub-index	1				
Name	**Interpolation Time Units**				
Object structure	VAR	type of data	UINT8	data range	UINT8
Whether can map	Y	Accessibility	RW	Factory setting	1
Parameter description	Interpolation cycle time, unit is given by 60C2_02. Example: When 60C2_02 is -3, and when 60C2_01 is 1, it means that the interpolation cycle currently set is 1ms. Note: The interpolation cycle and synchronization cycle must be the same				
Sub-index	2				
Name	**Interpolation Time Index**				
Object structure	VAR	type of data	UINT8	data range	UINT8
Whether can map	Y	Accessibility	RW	Factory setting	-3
Parameter description	The unit of the interpolation period is given. When -3 is given, it means that the interpolation cycle unit is ms When -4 is given, it means that the interpolation cycle unit is 0.1ms When -2 is given, it means that the interpolation cycle unit is 10ms				

5.2 Operation Mode of Interpolation Mode

Interpolation mode runs two operation modes: interpolation position and interpolation speed. The interpolation instruction value is generated by the host computer plan.

During the synchronization cycle, the host computer plans the interpolation command value and sends it to the servo driver to control the motor operation through PDO. The interpolation position operation method is shown in the following table:

Step		Object dictionary assignment
Servo enable	0	Control word 6040h → 0x06
	1	Control word 6040h → 0x07
	2	Control word 6040h → 0x0F

Interpolation period assignment	3	Interpolation cycle 60C2_01 → 2
	4	Interpolation cycle 60C2_02 → -3
Interpolation type selection	5	Interpolation value 60C1_02 → 0 interpolation position mode
Operating mode switching	6	Operating mode 6060 → 7
	7	Operating mode display 6061 → 7
Interpolation enable	8	Control word bit4 is set to 1
Interpolation position assignment	9	Interpolation value 60C1_01 for absolute position value
Message sending	10	Send a synchronization message
	11	Host computer sends PDO message
	12	Motor execution

The operation mode of interpolation speed mode is shown in the following table:

Step		Object dictionary assignment
Servo enable	0	Control word 6040h→0x06
	1	Control word 6040h→0x07
	2	Control word 6040h→0x0F
Interpolation period assignment	3	Interpolation cycle 60C2_01 → 2
	4	Interpolation cycle 60C2_02 → -3
Interpolation type selection	5	Interpolation value 60C1_02 → 1 interpolation speed mode
Operating mode switching	6	Operating mode 6060 → 7
	7	Operating mode display 6061 → 7
Interpolation enable	8	Control word bit4 is set to 1
Interpolation position assignment	9	Interpolation value 60C1_03 For incremental position value
Message sending	10	Send a synchronization message
	11	Host computer sends PDO message
	12	Motor execution

5.3. Dictionary of Objects Related to Interpolation Mode

The dictionary of objects related to the interpolation mode is shown in the following table:

Index	Sub-index	Name	Access permission	Mapping attributes	Type of data	Unit	Range	Default value
6039	00	error code	RO	Y	UINT16	——	UINT16	0
6040	00	Control word	RW	Y	UINT16	——	UINT16	0

6041	00	Status word	RO	Y	UINT16	——	UINT16	0
6060	00	Operation mode	RW	Y	UINT8	——	UINT8	0
6061	00	Operation mode display	RO	Y	UINT8	——	UINT8	0
6064	00	Actual position value	RO	Y	INT32	Instruction unit	INT32	0
6065	00	Excessive position deviation threshold	RW	Y	UINT32	Instructio n unit	UINT32	3840000
6067	00	Position reached threshold	RW	Y	UINT32	Instructio n unit	UINT32	100
6068	00	Location arrival time	RW	Y	UINT16	ms	UINT16	0
607A	00	Target position value	RW	Y	INT32	Instruction unit	INT32	0
607D	01	Software limit minimum	RW	Y	INT32	Instruction unit	INT32	-2^31
60C1	02	Software limit maximum	RW	Y	INT32	Instruction unit	INT32	2^31
	01	Interpolated position absolute position value	RW	Y	INT32	Instruction unit	INT32	0
	02	Interpolation mode selection	RW	Y	UINT16	——	UINT16	0
	03	Interpolation speed command value	RW	Y	INT16	rpm	INT16	0
60C2	01	Interpolation period value	RW	Y	UINT8	——	UINT8	1
	02	Interpolation cycle unit	RW	Y	INT 8	——	INT 8	-3

6 CANopen Motion Control 6000h Group Object

Dictionary Allocation

The CANopen6000h group object dictionary assignment is shown in the following table:

Index	Sub-index	Name	Access permission	Mapping attributes	Type of data	Unit	Range	Default value
6039	00	error code	RO	Y	UINT16	——	UINT16	0
6040	00	Control word	RW	Y	UINT16	——	UINT16	0
6041	00	Status word	RO	Y	UINT16	——	UINT16	0
6060	00	Operation mode	RW	Y	UINT8	——	UINT8	0
6061	00	Operation mode display	RO	Y	UINT8	——	UINT8	0
6062	00	Position command value	RO	Y	INT32	Instruction unit	INT32	0
6064	00	Actual position value	RO	Y	INT32	Instruction unit	INT32	0
6065	00	Excessive position deviation threshold	RW	Y	UINT32	Instruction unit	UINT32	3840000
6067	00	Position reached threshold	RW	Y	UINT32	Instruction unit	UINT32	100
6068	00	Location arrival time	RW	Y	UINT16	ms	UINT16	0
606B	00	Speed command value	RO	Y	INT16	rpm	INT16	0
606C	00	Actual speed feedback value	RO	Y	INT16	rpm	INT16	0
606D	00	Speed reached threshold	RW	Y	UINT16	rpm	UINT16	10
606E	00	Speed arrival time window	RW	Y	UINT16	ms	UINT16	0
606F	00	Zero speed threshold	RW	Y	UINT16	rpm	UINT16	10
6070	00	Zero speed time window	RW	Y	UINT16	ms	UINT16	0
6071	00	Target torque value	RW	Y	INT16	0.1%	INT16	0

6074	00	Torque command value	RO	Y	INT16	0.1 %	INT16	0
6075	00	Rated current	RO	Y	UINT32	mA	UINT32	0
6076	00	Rated torque	RO	Y	UINT32	mNm	UINT32	0
6077	00	Actual current value	RO	Y	INT16	0.1 %	INT16	0
6078	00	Actual torque value	RO	Y	INT16	0.1 %	INT16	0
607A	00	Target position value	RW	Y	INT32	Instruction unit	INT32	0
607D	01	Software limit minimum	RW	Y	INT32	Instruction unit	INT32	-2^31
	02	Software limit maximum	RW	Y	INT32	Instruction unit	INT32	2^31
607C	00	Origin return offset	RW	Y	INT32	Instruction unit	INT32	0

607D	01	Software limit minimum	RW	Y	INT32	Instruction unit	INT32	-2^31
	02	Software limit maximum	RW	Y	INT32	Instruction unit	INT32	2^31
6081	00	Target speed	RW	Y	UINT32	rpm	UINT32	0
6083	00	acceleration time	RW	Y	UINT16	ms	UINT16	200
6084	00	deceleration time	RW	Y	UINT16	ms	UINT16	200
6093	01	Electronic gear molecule	RW	Y	UINT32	——	UINT32	1
	02	Electronic Gear Denominator	RW	Y	UINT32	——	UINT32	1
6098	00	Origin return method	RW	Y	UINT8	——	UINT8	0
6099	01	Origin return high speed	RW	Y	UINT16	rpm	UINT16	100
	02	Origin return to low speed	RW	Y	UINT16	rpm	UINT16	10
609A	00	Origin return acceleration / deceleration time	RW	Y	UINT16	ms	UINT16	200
60C1	01	Interpolated position absolute position value	RW	Y	INT32	Instruction unit	INT32	0

	02	Interpolation mode selection	RW	Y	UINT16	—	UINT16	0
	03	Interpolation speed command value	RW	Y	INT16	rpm	INT16	0
60C2	01	Interpolation period value	RW	Y	UINT8	—	UINT8	1
	02	Interpolation cycle unit	RW	Y	INT8	—	INT8	-3
60FD	00	Numerical input	RO	Y	UINT16	—	UINT16	
60FE	00	Number of numerical outputs	RO	N	UINT8	—	1	1
	01	Numerical output	RO	Y	UINT16	—	UINT16	0
60FF	00	Target speed	RW	Y	INT16	rpm	INT16	0
6502	00	Servo driver supports operation mode	RO	Y	UINT16	—	UINT16	0

7 CANopen6000 Group Object Dictionary Detailed Description

Object 603Fh: Error Code

Index	603Fh				
Name	Error Code				
Object structure	VAR	type of data	UINT16	data range	UINT16
Whether can	Y	Accessibility	RO	Factory setting	0-
Parameter	Record the current servo drive failure information				

Object 6040h: Control Word

Index	6040h				
Name	Control Word				
Object structure	VAR	type of data	UINT16	data range	UINT16
Whether can map	Y	Accessibility	RW	Factory setting	0

Parameter Description

Bit	Value	Function
0	0x0001	Control state machine switching
1	0x0002	
2	0x0004	
3	0x0008	
4	0x0010	New Position Trig/Start Home/Enable Ip Mod
5	0x0020	Change Set Immediately
6	0x0040	Absolute / relative position selection
7	0x0080	Fault reset
8	0x0100	Stop running
9	0x0200	——
10	0x0400	——
11	0x0800	——
12	0x1000	——
13	0x2000	——
14	0x4000	——
15	0x8000	——

Bit4 is a multiplexed bit for different control modes: In position mode, it means that the new position command is triggered; the origin

In the regression mode, it means that the origin return is turned on; in the

	interpolation mode, it means that the interpolation mode is enabled. **Bit5 is the position mode function bit: when set high, the running position command will be interrupted immediately after the new position command is triggered.** **Bit6 is the function bit in position control mode: 0-absolute position command; 1-relative position command.** **Bit7 is a common bit for all control modes: a rising edge indicates a fault reset function.** **Bit8 is a common bit for all control modes: the rising edge indicates that the operation of the position, speed, origin, interpolation, and other modes are suspended.**

Object 6041h: Status Word

Index	6041_h				
Name	**Status Word**				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can	**Y**	Accessibility	**RO**	Factory setting	**0**

Parameter Description

Bit	Value	Function
0	0x0001	Control state machine status display bits
1	0x0002	
2	0x0004	
3	0x0008	
4	0x0010	Voltage Enable
5	0x0020	Control state machine status display bits
6	0x0040	Control state machine status display bits
7	0x0080	Warning
8	0x0100	Drive is moving
9	0x0200	Remote
10	0x0400	Target Reach
11	0x0800	Position Limit Active
12	0x1000	Set Point Acknowledge/Speed 0/Home Attached
13	0x2000	Following Error/Home Error
14	0x4000	——
15	0x8000	Home Done

	Bit4 is a general-purpose bit. Set high means the servo drive is powered on. This bit is set when the control state is initialized. **Bit7 is a general-purpose bit. This bit is set automatically when there is an alarm in the servo drive.** **Bit8 is a general-purpose bit. When the servo drive is moving, the relocation is set.** **Bit9 is a general-purpose bit. After the CAN function is enabled, the bit is set automatically. This bit is set when the control state machine is initialized.** **Bit10 Position speed dedicated bit. In the position mode, the position is set when the servo positioning is completed; in the speed mode, the position is set when the servo speed reaches the set speed.** **Bit11 General purpose bit. When the servo operation position value exceeds the set position limit value, the position is set. Bit12 For position, speed and origin mode. In the position mode, it means that the new position command sent by the host computer is correctly received; in the speed mode, it means that the current motor running speed reaches 0 speed, the position is set; in the origin mode, the servo changes to set after finding the origin.** **Bit13 is dedicated to position and origin. In the position mode, the position will be set when the position overshoot value exceeds the set threshold; in the home position mode, the position return will be changed after the home position return fails.** **Bit15 is a general-purpose bit for all modes. The servo driver executes the home position return, and after the home position return is completed, the repositioning is set.**

object 6060h: Modes of Operation

Index	6060h				
Name	Modes of Operation				
Object structure	**VAR**	type of data	**UINT8**	data range	**UINT8**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description					

Setting value	Control mode setting
1	Contour position mode
3	Contour speed mode
4	Torque mode (not supported)
6	Origin return mode
7	Interpolation position mode
other	No definition

Object 6061h :Modes of Operation Display

Index	6061h				
Name	Modes of Operation Display				
Object structure	**VAR**	type of data	**UINT8**	data range	**UINT8**
Whether can	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description					

Display value	Control mode display
1	Contour position mode
3	Contour speed mode

4	Torque mode (not supported)
6	Origin return mode
7	Interpolation position mode
Other	No definition

Object 6062h: Position Demand Value

Index	6062h				
Name	Position Demand Value				
Object structure	**VAR**	type of data	**INT32**	data range	**INT32**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Position command value, the unit is command unit				

Object 6064h: Position Actual Value

Index	6064h				
Name	Position Actual Value				
Object structure	VAR	type of data	INT32	data range	INT32
Whether can	Y	Accessibility	RO	Factory setting	0
Parameter	Position feedback value, unit command unit				

Object 6065h: Excessive user position deviation threshold

Index	6065h				
Name	Excessive user position deviation threshold				
Object structure	VAR	type of data	UINT32	data range	UINT32
Whether can	Y	Accessibility	RW	Factory setting	60000
Parameter Description	During the motor running, the position deviation value threshold value, the unit command unit. If the position deviation exceeds this value, the servo will alarm that the position deviation is too large.				

Object 6067h: Position reached threshold

Index	6067h				
Name	Position reached threshold				
Object structure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**100**
Parameter Description	The position command deviation value is less than the position arrival threshold and continues for a period of time. The position arrival signal is set to 1. Unit: instruction unit				

Object 6068h: Position Window Time

Index	6068h				
Name	Position Window Time				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**0**

Parameter Description	Position arrival time in ms. When the position command deviation is within the position command deviation threshold, after the continuous position arrival time, the motor positioning is completed.

Object 606Bh: User actual speed instruction

Index	606Bh				
Name	User actual speed instruction				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Motor running speed command value, unit rpm				

Object 606Ch: Speed feedback (Velocity Actual Value)

Index	606Ch				
Name	Speed feedback				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter	The actual running speed of the motor in rpm.				

Object 606Dh: Speed reached threshold

Index	606Dh				
Name	Speed reached threshold				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**100**
Parameter Description	The speed deviation value is within the speed reaching threshold. After a period of time, the speed reaching signal is set to 1. Unit rpm				

Object 606Eh: Speed arrival time window

Index	606Eh				
Name	Speed arrival time window				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	The speed deviation value is within the speed threshold, the running time reaches the time window value, and the speed arrival signal is set to 1. Unit ms				

Object 606Fh: Zero speed threshold

Index	606Fh				
Name	Zero speed threshold				
Object structure	**VAR**	type of data	**UINT16**	data range	**0~2000**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**10**
Parameter Description	When the speed is close to 0 speed, when the speed is within the 0 speed threshold, after a period of time, the 0 speed arrival signal is set to 1. Unit rpm				

Object 6070h: Zero speed time window

Index	6070h

Name	Zero speed time window				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	0 Speed arrival time window value in ms				

Object 6071h: Target torque

Index	6071h				
Name	Target torque				
Object structure	**VAR**	type of data	**INT16**	data range	**-3000~3000**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	It is only used in the contour torque mode and reflects the torque command (unit: 0.1%).				

Object 6074h: Torque demand value

Index	6074h				
Name	Torque demand value				
Object structure	**VAR**	type of data	**INT16**	data range	**-3000~3000**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	Only used in contour torque mode, output value under torque limit condition (unit: 0.1%).				

Object 6075h: Motor rated current

Index	6075h				
Name	Motor rated current				
Object structure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Rated current (in mA) on the motor nameplate. All current related parameter values are related to this parameter.				

Object 6076h: Motor rated torque

Index	6076h				
Name	Motor rated torque				
Object structure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Rated torque on the motor nameplate (unit: mNm). All torque related parameter values are related to this parameter.				

Object 6077h: Instant torque output

Index	6077h				
Name	Instant torque output				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**

Parameter description	Response to the momentary torque output of the servo motor (unit: 0.1%).

Object 6078h: Instantaneous current output

Index	6078h				
Name	Instantaneous current output				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Response to the instantaneous current output of the servo motor (unit: 0.1%).				

Object 607Ah: Target Position

Index	607Ah				
Name	Target Position				
Object structure	**VAR**	type of data	**INT32**	data range	**INT32**
Whether can	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	Set the servo target position (unit: command unit) in the contour position mode. When bit 6 of control word 6040h is 0, 607Ah is the target absolute position of the current segment; when bit 6 of control word 6040h is 1, 607Ah is the target incremental displacement of the current segment.				

Object 607Ch: Home Offset

Index	607Ch				
Name	Home Offset				
Object structure	**VAR**	type of data	**Int32**	data range	**Int32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	The value of the zero-point deviation from the origin when returning to origin. Unit command unit				

Object 607Dh: Software absolute position limit

Index	607Dh				
Name	Software absolute position limit				
Object structure	**ARR**	type of data	**INT32**	data range	**INT32**
Sub-index	**0**				
Name	Numbers of Entry				
Object structure	**ARR**	type of data	**UINT8**	data range	**2**
Whether can map	**N**	Accessibility	**R0**	Factory setting	**2**
Sub-index	1				
Name	Min Software Position Limit				
Object structure	**VAR**	type of data	**INT32**	data range	**INT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**-2^{31}**
Parameter description	Software-defined position running minimum position value, unit command unit.				
Sub-index	2				
Name	Max Software Position Limit				

Object structure	**VAR**	type of data	**INT32**	data range	**INT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	$2^{31}-1$
Parameter description	Software-defined position running maximum position value, unit command unit.				

Object 6081h:Profile Velocity

Index	6081h				
Name	Profile Velocity				
Object structure	**VAR**	Type of data	**UINT32**	Data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	In Profile Velocity mode, the speed is given. Unit rpm				

Object 6083h: Profile Acceleration

Index	6083h				
Name	Profile Acceleration				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter description	In profile position mode, the acceleration time when the motor accelerates from 0rpm to the maximum speed (single Bit: ms).				

Object 6084h: Profile Deceleration

Index	6084h				
Name	Profile Deceleration				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**200**
Parameter Description	In contour position mode, the deceleration time when the motor decelerates from the maximum speed to 0rpm (single Bit: ms).				

Object 6093h: Positin Factor

Index	6093h				
Name	Positin Factor				
Object structure	**ARR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**-**
Parameter description	Electronic gear ratio parameter The position factor is used to establish the proportional relationship between the load displacement and the motor displacement specified by the user: Motor displacement (motor unit) = load displacement (user unit) × position factor The setting of the position factor is related to the mechanical reduction ratio, mechanical size related parameters, and motor resolution. The calculation method is as follows:				
Sub-index	0				
Name	Sub-index Number of Entries				
Object structure	**VAR**	type of data	**UINT8**	data range	**2**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**2**
Sub-index	1				
Name	Position factor molecule				
Object structure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**1**
Sub-index	2				
Name	Position factor denominator				
Object structure	**VAR**	type of data	**UINT32**	data range	**UINT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**1**

Object 6098h:Origin return method

Index	6098h				
Name	Origin return method				
Object structure	**VAR**	type of data	**INT8**	data range	**0~35**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	Define Origin return method				

Object 609Ah: Homing Acceleration

Index	$609A_h$				
Name	Origin return acceleration				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**100**
Parameter Description	Acceleration time when the motor accelerates from 0rpm to 3000rpm in zero return mode (unit:ms).				

Object 6099h: Homing Speeds

Index	6099_h				
Name	Homing Speeds				
Object structure	**ARR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**-**
Sub-index	0				
Name	Sub-index Number of Entries				
Object structure	**VAR**	type of data	**UINT8**	data range	**2**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**2**
Sub-index	1				
Name	Search deceleration point signal speed				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**100**
Parameter description	Origin return high speed, unit rpm				
Sub-index	2				
Name	Speed During Search for Zero				
Object structure	**VAR**	type of data	**UINT16**	data range	**1~500**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**20**
Parameter description	Origin return to low speed, unit rpm				

Object 60C1h: Interpolation data record

Index	$60C1_h$				
Name	Interpolation data record				
Object structure	**ARR**	type of data	**INT32**	data range	**INT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	Interpolation mode command parameter setting				
Sub-index	0				
Name	Sub-index Number of Entries				
Object structure	**VAR**	type of data	**UINT8**	data range	**3**
Whether can map	**N**	Accessibility	**RO**	Factory setting	**3**

Sub-index	**1**				
Name	Absolute position command value				
Object structure	**VAR**	type of data	**INT32**	data range	**INT32**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	Interpolation mode absolute position command value, unit command unit.				
Sub-index	**1**				
Name	Incremental / absolute position command selection				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter Description	Set the interpolation mode command unit. 0-Interpolation position is absolute position value, read position command value from 60C1_01 object dictionary; 1-Interpolation position is incremental position value, and incremental position command value is taken from 60C1_03 object dictionary.				
Sub-index	**3**				
Name	Incremental position command value				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter description	The incremental position command value in the interpolation position mode is relative to the interpolation speed value. Unit rpm				

Object 60C2h: Interpolation Time Period					
Index	$60C2_h$				
Name	Interpolation Time Period				
Object structure	**ARR**	type of data	**UINT8**	data range	**UINT8**
whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Sub-index	0				
Name	Number of Entries				
Object structure	**VAR**	type of data	**UINT8**	data range	**2**
Whether can map	**N**	Accessibility	**RO**	Factory setting	**2**
Parameter Description	Number of interpolation period object dictionary Sub-index				
Sub-index	1				
Name	Interpolation Time Units				
Object structure	**VAR**	type of data	**UINT8**	data range	**UINT8**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**1**
Parameter Description	Interpolation cycle time, the unit is given by 60C2_02. Example: When 60C2_02 is -3, and when 60C2_01 is 1, it means that the interpolation cycle currently set is 1ms. Note: The interpolation cycle and synchronization cycle must be the same				

Sub-index	2				
Name	Interpolation Time Index				
Object structure	**VAR**	type of data	**UINT8**	data range	**UINT8**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**-3**
Parameter Description	The unit of the interpolation period is given. When -3 is given, it means that the interpolation cycle unit is ms When -4 is given, it means that the interpolation cycle unit is 0.1ms				

Object **60FDh: Digital Input**

Index	$60FD_h$				
Name	Digital Input				
Object structure	**VAR**	Type of data	**UINT16**	Data range	**UINT16**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Reflect the current DI terminal logic of the driver, 0 means invalid, 1 means valid				

Object **60FEh: Digital Output**

Index	**$60FE_h$**				
Name	Digital Output				
Object structure	**ARR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Sub-index	0				
Name	Number of Entries				
Object structure	**VAR**	type of data	**Uint8**	data range	**1**
Whether can map	**N**	Accessibility	**RO**	Factory setting	**1**
Sub-index	1				
Name	Physical Outputs				
Object structure	**VAR**	type of data	**UINT16**	data range	**UINT16**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**0**
Parameter Description	Reflect the current DO terminal logic of the driver, 0 means invalid, 1 means valid				

Object 60FFh: Target Velocity

Index	**$60FF_h$**				
Name	Digital input				
Object structure	**VAR**	type of data	**INT16**	data range	**INT16**
Whether can map	**Y**	Accessibility	**RW**	Factory setting	**0**
Parameter	In contour speed mode, the user speed command (unit: 0.1rpm).				

Description	

Object 6502h: Supported Drive Modes

Index	6502h				
Name	Supports servo operation mode				
Object structure	**VAR**	Type of data	**UINT16**	Data range	**UINT16**
Whether can map	**Y**	Accessibility	**RO**	Factory setting	**1Bh**
Parameter Description	Servo operation mode supported by the drive, 0 means not supported, 1 means supported.				

bit	description	Value
0	Contour position mode	1-support
1	Contour speed mode	1-support
2	Contour torque mode	0-not supported
3	Zero return mode	1-support
4	Interpolation position mode	1-support