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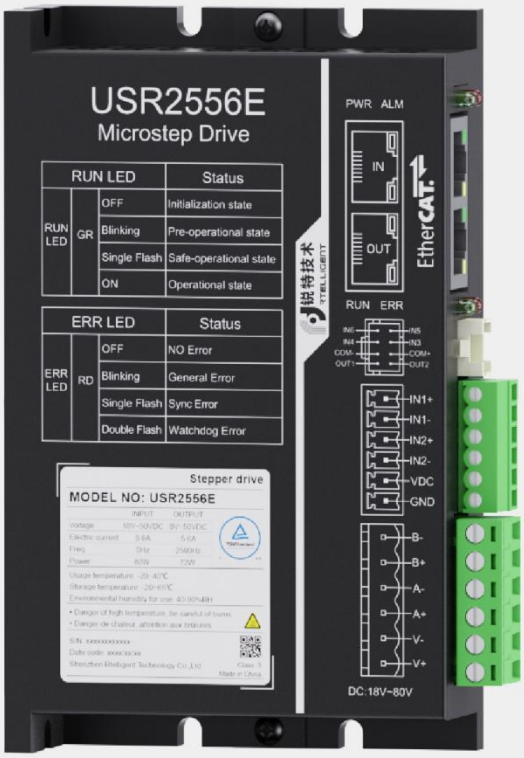
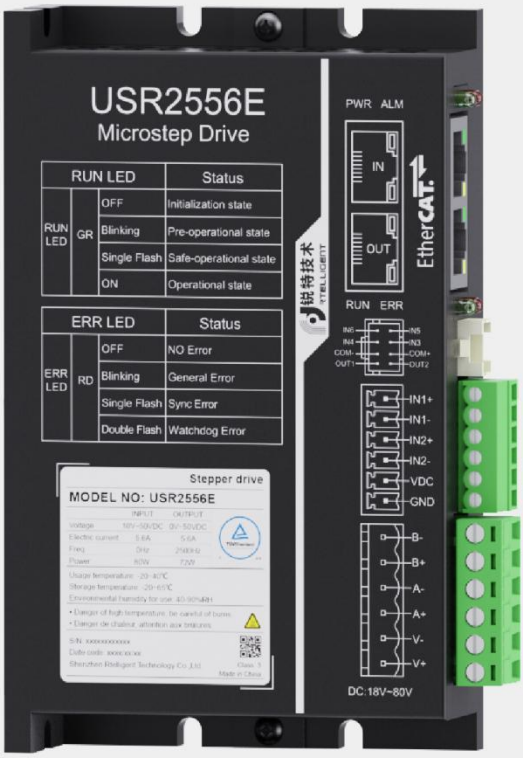
Leading the Way with Intelligent Motion Control




# USR2556E User Manual

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# Revision History

| Date | Version | Description |
|---|---|---|
| 2021.01.22 | V202 | (1) Add the phase loss detection function, when 0x2056 bit7 is 1, enable the phase loss detection.<br>(2) PP, PV mode status flag perfect, homing parameter 0x6099 change to standard 32bit, the previous version is 16bit, non-standard.<br>(3) Homing method 0x6098 change to INT8 type, before the UINT16 is non-standard.<br>(4) Add control support for three-phase motor.<br>(5) Product version unified upgrade to V202 |
| 2024.11.26 | V203 | (1) Add parameter 0x60FE.<br>(2) Add homing method 0/1.<br>(3) Add parameter 0x204B: IO input port filtering.<br>(4) Add the content of fault code 0x603F. |
| 2025.12.26 | V204 | (1) Modify object dictionary description error for 0x2061, 0x2062. |

# 1. Driver Description

## 1.1. Product Introduction

Thank you for choosing the Rtelligent USR2556E stepper motor driver. USR2556E is a high performance bus control stepper motor driver, while integrating the functions of intelligent motion controller. USR2556E driver can be run as standard EtherCAT slave and support CoE (CANopenover).

### 1.1.1. Characteristics

- Support CoE (CANopen over EtherCAT), meet CiA 402 standards
- Support CSP, PP, PV, Homing mode
- The minimum synchronization period is 500us
- Dual port RJ45 connector for EtherCAT communication
- Control methods: open loop control
- Motor type: two phase, three phase
- Digital IO port:

6 channels optically isolated digital signal inputs: IN1 and IN2 are 5V differential inputs, and can also be connected as 5V single-ended inputs; IN3 ~ IN6 are 24V single-ended inputs, common anode connection;

2 channels optically isolated digital signal outputs, maximum tolerance voltage 30V, maximum pouring or pulling current 100mA, common cathode connection method.

### 1.1.2. Electrical Characteristics

USR2556E product specifications

| Product model | USR2556E |
|---|---|
| Output current (A) | 0.5~6A |
| Default current (mA) | 3000 |
| Power supply voltage | 18~50VDC |
| Matched motor | Below 60 base |
| Encoder interface | none |
| Encoder resolution | none |
| Optical isolation input | 6 channels:<br>2 channels of 5V differential input, 4 channels of common anode 24V input |
| Optical isolation output | 2 channels: alarm, brake, in place and general output |
| Communication interface | Dual RJ45, with communication LED indication |

**Please do not exceed the scope of use specified above.*

**Before enabling the motor, the user needs to set the operating current according to the motor specifications, otherwise the current setting beyond the rated range may cause the motor to burn.*

## 1.2. Power and Motor

| Model<br>USR2556E | Description |
|---|---|
| V+ | For USR2556E, the power supply is DC power supply, V+ is connected to the positive pole of the power supply, and V- is connected to the negative pole of the power supply. The recommended power supply voltage is 18-50VDC.<br>**The above power supply voltage is the limit value of the driver. Due to the influence of the back electromotive force of the stepper motor, the customer needs to reserve a certain voltage margin when using it.* |
| V- | |
| A+ | 18~50VDC<br>Two-phase stepper motor winding connection port.<br>Arbitrarily reversing A+, A- or B+, B- windings can make the motor run in the opposite direction. |
| A- | |
| B+ | |
| B- | |

# 1.3. Digital Input and Output Ports

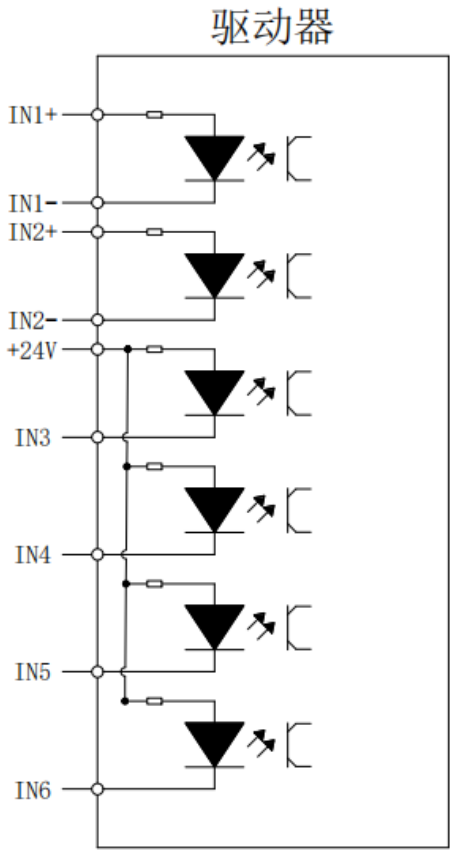
The USR2556E stepper driver has 6 optically isolated digital input ports and 2 optically isolated digital output ports.

## 1.3.1. Digital Input Port

The USR2556E stepper driver has 6 digital input ports and 2 digital output ports. The object dictionary 0x2007 is the function setting of the input port, and 0x2008 is the polarity setting of the input port.

Note: IN1+ / IN1-, IN2+ / IN2- are 5V input terminals, please do not directly connect input signals higher than this voltage, otherwise the driver will be damaged!

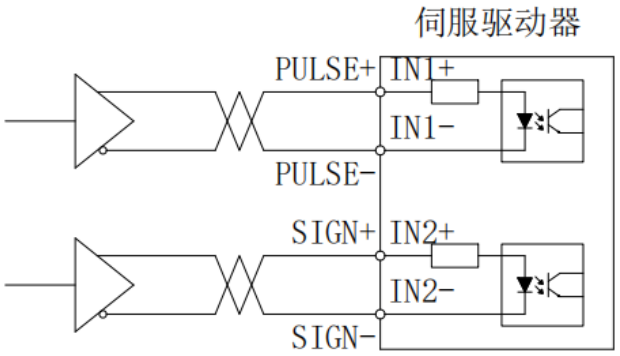
The schematic diagram of the input port is shown below, and the user can connect the system according to the schematic diagram.



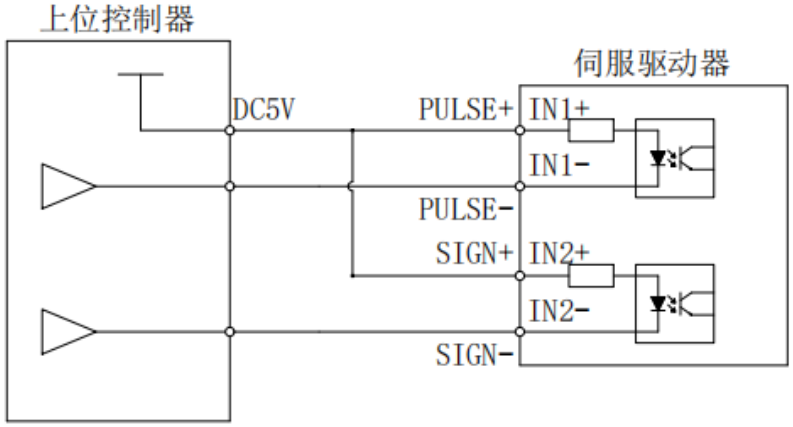

IN1+/ IN1-, IN2+ / IN2- are differential input terminals.

IN1 and IN2 are reserved external motor encoders, which constitute a closed-loop system. USR2556E cannot receive encoder signal.

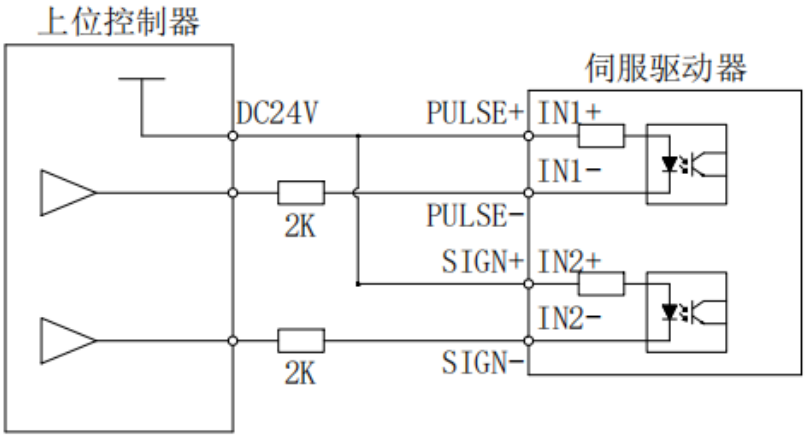
5V differential input




5V single-ended input

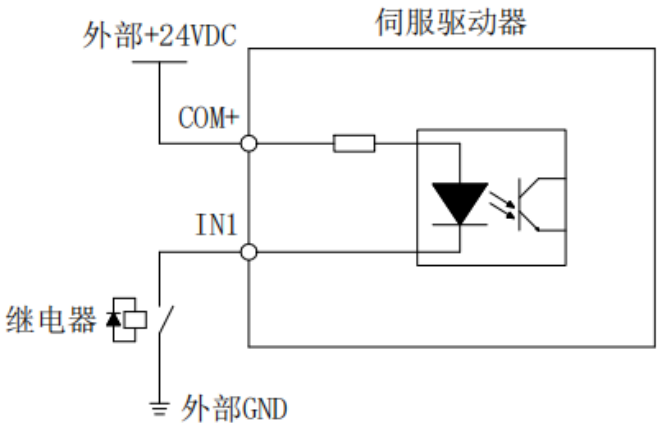



◆ Note: When the IN1 and IN2 ports use 24V input, please connect a 2K current limiting resistor in series, otherwise the driver will be damaged.

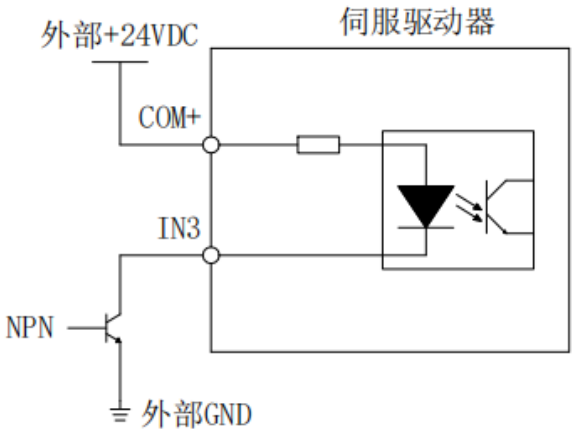


IN3~IN6 are single-ended input terminal

Taking IN3 as an example, the interface circuits of IN3～IN6 are the same. When the upper device is a relay output:




When the upper device is open collector output:




◆ Note: PNP input is not supported

### 1.3.2. Digital Output Port

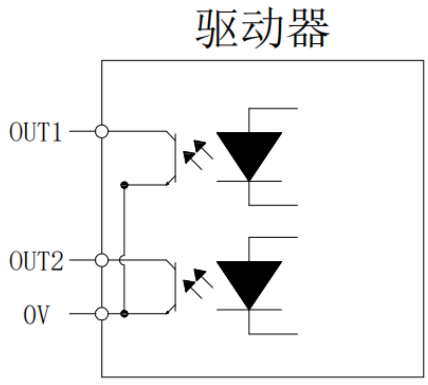
USR2556E contain two optically isolated output signals.

OUT1 output current capacity up to 30 mA.

OUT2 output current capacity up to 150 mA.

By default, the digital output is all open points, the function of output port can be selected through object dictionary 2005, and object dictionary 2006 is used to set the polarity of output port.

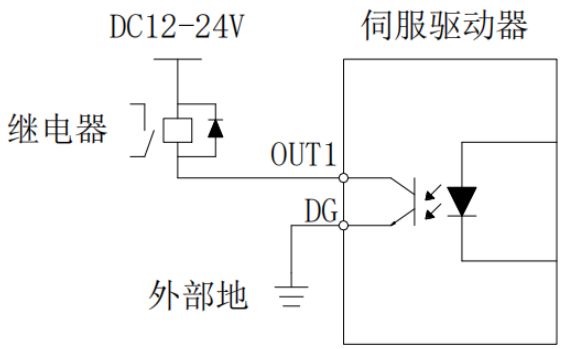
| Object Dictionary | Name | Property | Type | Scope | Default | Unit | Remarks |
|---|---|---|---|---|---|---|---|
| 0x2005: 01 | Output port 1 function | R/W/S | UINT | 0~3 | 1 | --- | Output port function selection:<br>0: Custom output<br>1: Alarm output<br>2: Brake output<br>3: In-place output |
| 0x2005: 02 | Output port 2 function | R/W/S | UINT | 0~3 | 2 | --- | |
| 0x2006 | Output port polarity setting | R/W/S | UINT | 0~3 | 3 | --- | Set the normally open and normally closed characteristics of the output port:<br>0: Normally closed<br>1: Normally open |



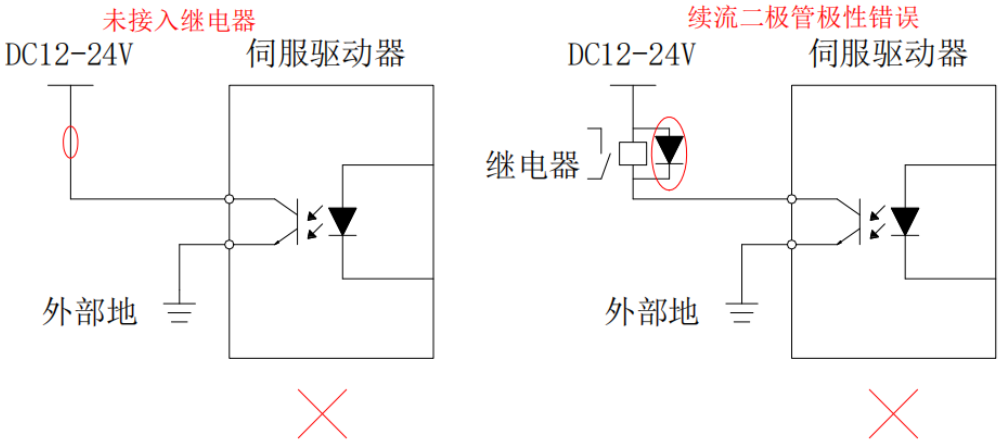

Taking OUT1 as an example, the OUT1~OUT2 interface circuit is the same.

When the upper device is relay input:

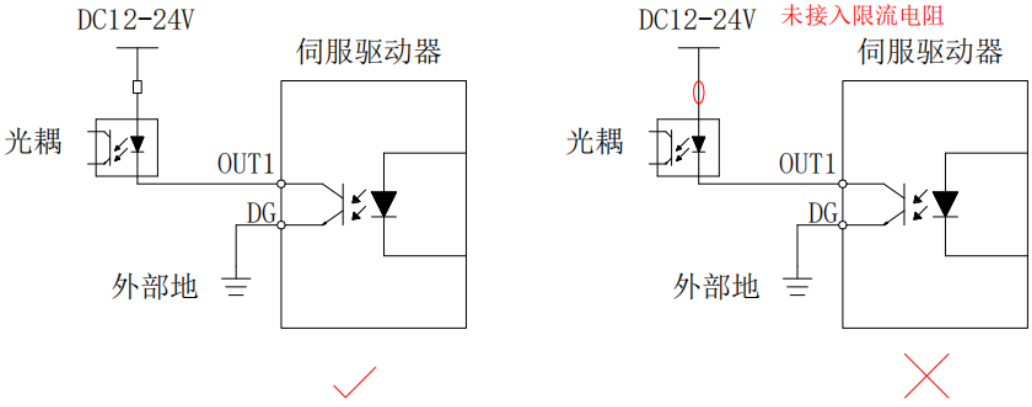
Correct wiring diagram:




Wrong wiring diagram:




When the upper device is optocoupler input:



# 1.4. Connection EtherCAT

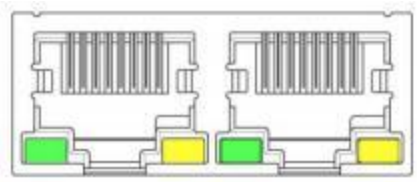
Please use CAT5E (or higher level) network cable.

The Ethernet input interface IN is connected to the Ethernet output interface OUT of the previous driver on the controller or the bus. The Ethernet output interface OUT is connected to the Ethernet input interface IN of the next driver on the bus. If the driver is the last node on the bus, you only need to connect the Ethernet input interface IN.

## 1.4.1. EtherCAT Status Indicator

The yellow light of RJ45 is used for Link status, indicating whether there is a network cable connection.

The green light of RJ45 is used for Activity state, indicating whether there is data communication.



RUN/ERRLED indicator:

| LED | Color | Status | Description |
|---|---|---|---|
| RUN | Green | Not bright | Initialization status |
| | | Slow flash | pre-operational status |
| | | Single flash | Safe-operational status |
| | | Always bright | Operational status |
| ERR | Red | Not bright | No error |
| | | Slow flash | General error |
| | | Single flash | Synchronization error |
| | | Double flash | Watchdog error |

Fast flash: bright for 50ms, dark for 50ms (10Hz). So cycle.

Slow flash: bright for 200ms, dark for 200ms (2.5Hz). So cycle.

Single flash: bright for 200ms, dark for 1s. So cycle.

Double flash: bright for 200ms, dark for 200ms, bright for 200ms, dark for 1s. So cycle.

## 1.5. EtherCAT Site Address

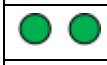
USR2556E support two methods to set the slave address: object dictionary 0x2150 to set the site alias and ESC to set the site alias, and select through the object dictionary 0x2151.

The default 0x2151 is 0, and the node address is allocated by the master station and saved in the EEPROM.

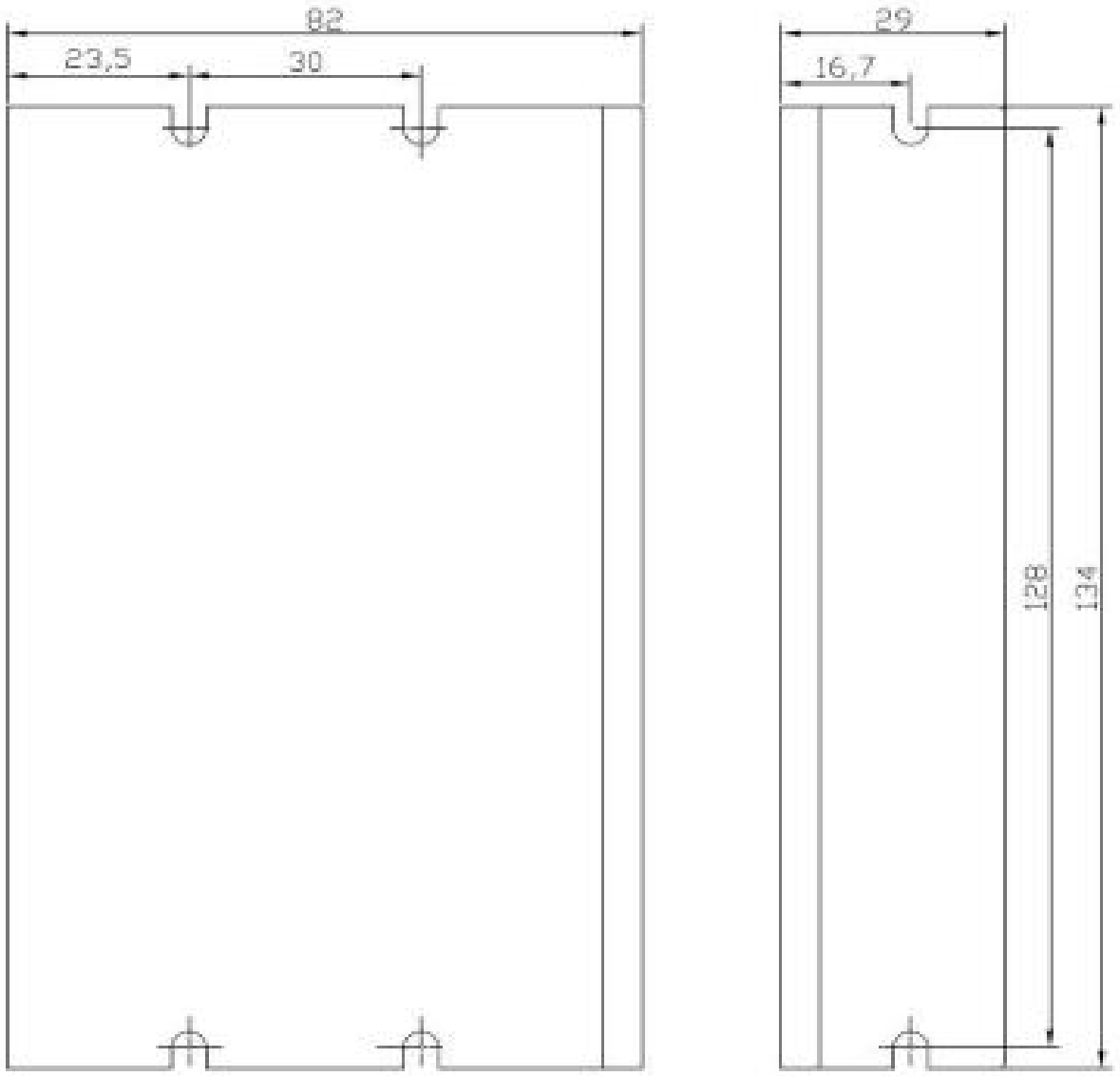
When users need to set their own fixed address, they need to set 0x2151 to 1, and then write the required address value in 0x2150.

| 0x2151 | 0x2150 | Site address |
|---|---|---|
| 0 | 1001 | Master station configures site aliases to ESC EEPROM 0x0004 word addresses |
| 1 | Set value | Object dictionary 2150 sets the value to the node address value |

## 1.6. Alarm Code

| LED status | | Driver status |
|---|---|---|
|  | Green light on constantly | Driver not enabled |
|  | Green light flashing | The driver works fine |
|  | 1 Green, 1 Red | Driver overcurrent |
|  | 1 Green, 2 Red | Driver input power overvoltage |
|  | 1 Green, 3 Red | Driver internal voltage error |
|  | 1 Green, 6 Red | Parameter check error |
|  | 1 Green, 7 Red | Motor winding phase loss |

# 1.7. Mechanical Dimensions




**USR2556E installation size**

# 2. Parameter Description and Settings

## 2.1. General Parameters

### 2.1.1. 0x1000 Device Type

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED32 | RO | NO | 0x00040192 |

Bit 0~15: Device profile number 0x0192: CiA402

Bit 16~31: Additional information 0x0004: Stepper drive

### 2.1.2. 0x1008 Device Name

Displays the model of current driver.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | Visible string | RO | NO | ECR60 |

### 2.1.3. 0x1009 Hardware Version

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | Visible string | RO | NO | 0xA1 |

### 2.1.4. 0x100A Software Version

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | Visible string | RO | NO | 0x101B |

### 2.1.5. Save Parameters

Sub-index of object dictionary 0x1010: 01 Write 1 to save current parameters.

When saving the parameters, first stop the motor running, then save the parameters. The data structure is as follows:

| Index | Sub-index | Name | PDO mapping | Default |
|---|---|---|---|---|
| 1010 | 00 | Maximum number of sub-indexes | No | 1 |
| | 01 | Save parameters | No | 0 |

### 2.1.6. Restore Factory Settings

Sub-index of object dictionary 0x1011: 01 Write 1, and then power on again to restore the driver to the factory state.

When restoring the factory setting, first stop the motor running, then save the parameters.

| Index | Sub-index | Name | PDO mapping | Default |
|---|---|---|---|---|
| 1011 | 00 | Maximum number of sub-indexes | No | 1 |
| | 01 | Save parameters | No | 0 |

## 2.2. Manufacturer-Specific Object

### 2.2.1. 0x2000 Operating Current

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2000 | Peak Current | R/W/S | UINT | 100~6000 | 3000 | mA |

This object is used to set the sinusoidal peak current when the stepper motor is running in open loop.

### 2.2.2. 0x2001 Subdivision/resolution

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2001 | Motor Resolution | R/W/S | UINT | 200~65535 | 10000 | Pulse/rev |

This object is used to set the number of pulses required to run the motor for one revolution, when the stepper motor is running in open loop.

### 2.2.3. 0x2002 Standby Time

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2002 | Idle Time | R/W/S | UINT | 200~65535 | 500 | ms |

This object is used to set the time for the stepper motor to enter the standby state after it stops running when the stepper motor is running in open loop.

### 2.2.4. 0x2003 Percentage of Standby Current

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2003 | Idle Current Percent | R/W/S | UINT | 0~100 | 50 | % |

This object is used to set the percentage of the holding current relative to the operating current set by 0x2000 when the stepper motor is running in open loop and the motor stops running and enters the standby state.

### 2.2.5. 0x2005 Output Port Function

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2005:01 | Output 1 Function | R/W/S | UINT | 0~3 | 1 | --- |
| 0x2005:02 | Output 2 Function | R/W/S | UINT | 0~3 | 2 | --- |

USR2556E contains two output ports, this object is used to set the function corresponding to the output port.

The port function is defined as follows:

| Value | Function |
|---|---|
| 0 | Custom output |
| 1 | Alarm output |
| 2 | Brake output |
| 3 | In place output |

When set as a custom output, the state of the port can be controlled by the polarity setting of 0x2006.

### 2.2.6. 0x2006 Output Port Polarity

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2006 | Outputs Polarity | R/W/S | UINT | 0~3 | 3 | --- |

Set the normally open and normally closed characteristics of the output port: Bit0 is the polarity setting for output port 1, Bit1 is the polarity setting for output port 2.

0—— Normally closed

1—— Normally open

| Bit15~bit2 | Bit1 | Bit0 |
|---|---|---|
| --- | OUT2 | OUT1 |

## 2.2.7. 0x2007 Input Port Function

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2007:01 | Input 1 Function | R/W/S | UINT | 0~8 | 0 | --- |
| 0x2007:02 | Input 2 Function | R/W/S | UINT | 0~8 | 0 | --- |
| 0x2007:03 | Input 3 Function | R/W/S | UINT | 0~8 | 1 | --- |
| 0x2007:04 | Input 4 Function | R/W/S | UINT | 0~8 | 2 | --- |
| 0x2007:05 | Input 5 Function | R/W/S | UINT | 0~8 | 3 | --- |
| 0x2007:06 | Input 6 Function | R/W/S | UINT | 0~8 | 6 | --- |

USR2556E contains 6 input ports, this object is used to set the corresponding function of the input port.

| Value | Function |
|---|---|
| 0 | General input port |
| 1 | CW limit input |
| 2 | CCW limit input |
| 3 | HOME input |
| 4 | Fault clearance |
| 5 | Emergency stop signal |
| 6 | Motor offline |
| 7 | Probe 1 |
| 8 | Probe 2 |

The state of the input port can be read through the 0x60FD object. The polarity of the input port can be set by the 0x2008 object.

## 2.2.8. 0x2008 Input Port Polarity

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2008 | Inputs Polarity | R/W/S | UINT | 0~3F | 0x3F | --- |

Each bit defines the polarity of the corresponding port. Bit 0 defines the polarity of input port 1:

| Bit15~bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|---|---|---|---|---|---|---|
| --- | IN6 | IN5 | IN4 | IN3 | IN2 | IN1 |

0——Normally closed，1——Normally open

### 2.2.9. 0x2009 Filter Time

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2009 | Filter Time | R/W/S | UINT | 0~25600 | 6400 | us |

The USR2556E has a built-in sliding average filter, and this object is used to set the time of the sliding average filter. The larger the filter time, the smoother the motor starts and stops, but the greater the motor response lag.

Lag time = Filter time

### 2.2.10. 0x200A Shaft Lock Time

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2009 | Soft lock Time | R/W/S | UINT | 0~65535 | 1000 | 50us |

When USR2556E is enabled, the stepper motor needs to be locked for initial positioning. In order to reduce the jitter of initial positioning, USR2556E has a built-in ramp-locking function. This object is used to set the ramp time of the motor shaft lock when the motor is enabled.

Shaft lock time = set value*50us*2 = set value*100us

### 2.2.11. 0x200B Current Loop Parameters

| Object Dictionary | Name | Property | Type | Scope | Default | Remarks |
|---|---|---|---|---|---|---|
| 0x200B:01 | AutoPI enable | R/W/S | UINT | 0~1 | 1 | The driver identify the motor parameters while positioning for the first time and automatically calculates the PI gain<br>0-- disable; 1-- enable |
| 0x200B:02 | Iloop_Kp | R/W/S | UINT | 100~65535 | 1000 | When 0x200B: 01 is 1, this register cannot be set. When it is 0, users can set |
| 0x200B:03 | Iloop_Ki | R/W/S | UINT | 0~10000 | 200 | |
| 0x200B:04 | Iloop_Kc | R/W/S | UINT | 0~1024 | 256 | Anti-integral saturation coefficient |

USR2556E uses current control to achieve subdivision operation of stepper motors. USR2556E adopts automatic parameter recognition algorithm by default to recognize the electrical parameters of the motor and automatically calculate the appropriate current loop PI parameters. When the automatically identified PI parameters cannot meet the requirements, users can set the parameters by themselves.

## 2.2.12. 0x200C Motor Parameters

| Object Dictionary | Name | Property | Type | Scope | Default | Remarks |
|---|---|---|---|---|---|---|
| 0x200C:01 | Motor type | R/W/S | UINT | 0~1 | 0 | 0: Two-phase stepper motor<br>1: Three-phase stepper motor |
| 0x200C:02 | Resistance Auto | R | UINT | 100~65535 | 1000 | When automatic PI is turned on, the motor winding resistance value is recognized.<br>Unit: mOhm |
| 0x200C:03 | Inductance Auto | R | UINT | 0~10 | 1 | When automatic PI is turned on, the motor winding inductance value is recognized.<br>Unit: mH |
| 0x200C:04 | Resistance Set | R/W/S | UINT | 0~10000 | 1000 | Motor winding resistance value<br>Unit: mOhm |
| 0x200C:05 | Inductance Set | R/W/S | UINT | 1~10 | 1 | Motor winding inductance value<br>Unit: mH |
| 0x200C:06 | BEMF coefficient | R/W/S | UINT | 0~1000 | 256 | BEMF coefficient |

When the USR2556E drives a stepper motor in open-loop control mode, the motor parameters themselves are not involved in the motor control process, and no special settings are required from the user. The user can verify the correct connection of the motor by checking the self-identified resistance and inductance values of this object.

## 2.2.13. 0x200D Run Reverse

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x200D | Invert motor direction | R/W/S | UINT | 0~1 | 0 | --- |

If the forward direction of the motor is inconsistent with the system requirements, this object can reverse the direction of the motor without modifying the motor wiring.

## 2.2.14. 0x200E Internal Alarm Code

| Object Dictionary | Name | Property | Type | Default |
|---|---|---|---|---|
| 0x200E | Alarm Code | R | UINT | 0 |

This object displays the current fault code of the driver, and each bit of the object corresponds to an alarm status.

| Alarm code | Alarm status |
|---|---|
| 0x0001 | Internal voltage error |
| 0x0002 | Overcurrent |
| 0x0004 | Overvoltage |
| 0x0008 | Reserved |
| 0x0080 | Position error is out of tolerance |
| Other | Reserved |

When the above fault occurs, after the fault condition is eliminated, by writing 0x80 in the 0x6040 object, the fault codes of 0x603F and 0x200E will be cleared.

## 2.2.15. 0x200F Internal Status Code

| Object Dictionary | Name | Property | Type | Default |
|---|---|---|---|---|
| 0x200F | Status Code | R | UINT | 0 |

This object displays the current status code of the driver, and each bit of the object corresponds to a status.

| Status code | Status |
|---|---|
| 0x0001 | Driver enabled |
| 0x0002 | Driver failed |
| 0x0004 | In place signal |
| 0x0008 | Motor running or stopped |
| 0x0010 | Homing completed or not |
| 0x0020 | Driver ready |
| Other | Reserved |

### 2.2.16. 0x2010 Position Cleared

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2010 | Zero Position | R/W | UINT | 0~1 | 0 | --- |

Setting the object to 01h can clear the position value (position actual value) in 0x6064.

It is usually used when the motor is always moving in one direction. The user needs to stop the motor at an appropriate time, clear the actual position value through this object, and then enable the motor again. Otherwise, the motor position counter will be saturated.

### 2.2.17. 0x2011 Control Mode

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2011 | Control mode | R/W/S | UINT | 0~2 | 0 | --- |

Set the working mode of the stepper motor.

0: open loop

1: closed loop

2: closed loop / FOC mode

USR2556E can only work in open loop mode, setting other values is invalid.

### 2.2.18. 0x2020~0x2026 Reserved

0x2020~0x2026 are reserved for compatible closed-loop driver parameter settings, and users are forbidden to set these parameters.

### 2.2.19. 0x2043 Speed Given

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2043 | Speed Reference | R | UINT | -3000~3000 | 0 | RPM |

This object reflects the given speed of the current motor.

### 2.2.20. 0x2044 Speed Feedback

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2044 | Speed Feedback | R | UINT | -3000~3000 | 0 | RPM |

This object reflects the actual speed of the current motor. Since the USR2556E stepper driver has no position feedback information, the system believes that the motor is not locked at this time, and this object returns the estimated motor speed reference.

## 2.2.21. 0x2048 Voltage

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2048 | Bus Voltage | R | UINT | --- | 0 | 10mV |

Bus voltage value (V)= Object value/100.

## 2.2.22. 0x2049 Input Level

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2049 | Input Level | R | UINT | --- | 0 | --- |

Display the physical level of the current IO input.

| Bit15~bit6 | Bit5 | Bit4 | Bit3 | Bit2 | Bit1 | Bit0 |
|---|---|---|---|---|---|---|
| --- | IN6 | IN5 | IN4 | IN3 | IN2 | IN1 |

0—— No input signal

1—— Input signal

## 2.2.23. 0x204A Output Level

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x204A | Output Level | R | UINT | --- | 0 | --- |

Displays the physical level of the current output port.

| Bit15~Bit2 | Bit1 | Bit0 |
|---|---|---|
| --- | OUT2 | OUT1 |

0—— Indicates that the current output port has an output

1—— Indicates that the current output port has no output

## 2.2.24. 0x204B IO Input Port Filter

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x204B | IN Port filter | R/W | UINT | 0~65535 | 60 | 50us |

Set value * 50us = Actual time

### 2.2.25. 0x204C Homing Method Selection

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x204C | HM method select | R/W | UINT | 0~1 | 0 | --- |

0—— Homing method 0; 1—— Homing method 1

### 2.2.26. 0x2060 Harmonic Amplitude of the First Resonance Point

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2060 | Amplitude of First Anti-Vibration | R/W/S | UINT | 0~1000 | 0 | --- |

Used to eliminate the vibration of the first resonance point of the two-phase stepper motor. This method offsets resonance by adding a certain harmonic to the set current. The amplitude and phase of the harmonics need to be adjusted to eliminate vibration.

### 2.2.27. 0x2061 First Resonance Point Phase A Harmonic Phase

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2060 | Phase A of First Anti-Vibration | R/W/S | UINT | 0~1024 | 0 | --- |

Adjust the harmonic phase of phase A winding

### 2.2.28. 0x2062 First Resonance Point Phase B Harmonic Phase

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x2062 | Phase B of First Anti-Vibration | R/W/S | UINT | 0~1024 | 0 | --- |

Adjust the harmonic phase of phase B winding

## 2.3. CIA402 Object Dictionary

### 2.3.1. 0x603F Fault Code

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x603F | Error Code | R/W | UINT | --- | 0 |

When a fault occurs, first eliminate the fault condition, then write 0x0080 to the control word 0x6040 and clear 0x603F.

The fault code is as follows:

| Error Code | Description |
|---|---|
| 0x7500 | Communication fault |
| 0x3150 | Phase A circuit internal voltage error |
| 0x3151 | Phase B circuit internal voltage error |
| 0x8611 | Closed-loop mode tracking error over limit |
| 0x2211 | Overcurrent |
| 0x3110 | Overvoltage |
| 0x3210 | Overvoltage |
| 0x7122 | Motor power cable phase loss fault |
| 0x5530 | Parameter storage fault |

### 2.3.2. 0x6040 Control Words

This object is used to control the state of the drive and movement. Can enable/disable the drive; start and stop the motor; clear faults, etc.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6040 | Control Word | R/W | UINT | --- | 0 |

The bits of the control word are defined as follows:

| Bit | Description |
|---|---|
| 0 | Switch ON |
| 1 | Enable Voltage |
| 2 | Quick Stop |
| 3 | Enable Operation |
| 4 | Operation mode related |
| 5 | Operation mode related |
| 6 | Operation mode related |
| 7 | Fault reset |
| 8 | Pause |
| 9 | Operation mode related |
| 10-15 | Reserved |

Detailed description of the combination of Bit 0~3 and Bit7:

| Command | Control word bit | | | | |
|---|---|---|---|---|---|
| | Bit7 | Bit3 | Bit2 | Bit1 | Bit0 |
| Shutdown | 0 | x | 1 | 1 | 0 |
| Switch on | 0 | 0 | 1 | 1 | 1 |
| Switch on + Enable operation | 0 | 1 | 1 | 1 | 1 |
| Disable voltage | 0 | x | x | 0 | x |
| Quick stop | 0 | x | 0 | 1 | x |
| Disable Operation | 0 | 0 | 1 | 1 | 1 |
| Enable Operation | 0 | 1 | 1 | 1 | 1 |
| Fault reset | 0->1 | x | x | x | x |

Definition of Bit4、5、6、8、9 in related modes

PP mode:

| Bit | Name | Value | Description |
|---|---|---|---|
| 4 | A new target position | 0->1 | Change from 0 to 1, set a new target position |
| 5 | Reserved | | |
| 6 | Absolute/relative | 0 | Absolute position mode |
| | | 1 | Relative position mode |
| 8 | Pause | 0 | The motor is waiting to be positioned |
| | | 1 | Stop running |
| 9 | Reserved | | |

PV mode:

| Bit | Name | Value | Description |
|---|---|---|---|
| 8 | Pause/run | 0 | The motor runs to the set speed |
| | | 1 | The motor decelerates to 0 and stops |

Homing mode:

| Bit | Name | Value | Description |
|---|---|---|---|
| 4 | Start to Home | 0->1 | Start to Home |
| 8 | Pause | 0 | Controlled by bit4 |
| | | 1 | Stop homing |

### 2.3.3. 0x6041 Status Word

This object sets the probe function.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED16 | RW | Yes | 0 |

The register bits are defined as follows:

| Bit | Description |
|---|---|
| 0 | Ready To Switch ON |
| 1 | Switch ON |
| 2 | Operation Enabled |
| 3 | Fault |
| 4 | Voltage Enabled |
| 5 | Quick Stop |
| 6 | Switch On Disabled |
| 7 | Warning |
| 8 | Reserved |
| 9 | Remote |
| 10 | Target arrival |
| 11-15 | Reserved |

Bit 9: Remote, this bit indicates whether the control word has been settled.

### 2.3.4. 0x6060 Operation Mode

Used to set the operation mode.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6060 | Mode of Operation | RW | INTEGER8 | | 0 |

USR2556E driver support the following operating modes:

| Value | Mode |
|---|---|
| 1 | Profile Position Mode (PP) |
| 3 | Profile Velocity Mode (PV) |
| 6 | Homing Mode (HM) |
| 8 | Cyclic Synchronous Position Mode (CSP) |

### 2.3.5. 0x6061 Operation Mode Display

Display the current operating mode, the definition is the same as 0x6060.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6061 | Mode of Operation Display | R | INTEGER8 | | 0 |

### 2.3.6. 0x6064 Actual position

Display the actual position of the current motor, the unit is Pulse.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6064 | Position Actual Value | R | UNIT | | 0 |

### 2.3.7. 0x606C Actual Speed

Display the actual speed of the current motor. The unit is RPM

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x606C | Position Actual Velocity | R | UNIT | | 0 |

### 2.3.8. 0x607A Target Position

This object sets the target position in PP mode and CSP mode, the unit is Pulse.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x607A | Profile Target Position | RW | INTEGER32 | | 0 |

In PP mode, Bit6 (0x6040.6) of the control word is used to set the coordinates to be relative.
In CSP mode, the target position is absolute position mode.

### 2.3.9. 0x607C Home Offset

This object is used to set the offset of the home sensor and position 0, the unit is Pulse.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x607C | Home Offset | RW | INTEGER32 | | 0 |

### 2.3.10. 0x6081 Profile Speed

This object is used to set the maximum speed of the trapezoidal acceleration/deceleration command in PP mode. The unit is Pulse/s.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6081 | Profile Velocity | RW | INTEGER32 | | 10000 |

### 2.3.11. 0x6083 Profile Acceleration

This object is used to set the acceleration of the trapezoidal acceleration/deceleration command in PP mode and PV mode, the unit is Pulse/s^2.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6083 | Profile Acceleration | RW | INTEGER32 | | 100000 |

### 2.3.12. 0x6084 Profile Deceleration

This object is used to set the deceleration of the trapezoidal acceleration/deceleration command in PP mode and PV mode, the unit is Pulse/s^2.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6084 | Profile Deceleration | RW | INTEGER32 | | 100000 |

### 2.3.13. 0x6085 Quickstop Deceleration

This object is used to set the deceleration of the motor when it hits the limit, home and other sensors in PP mode, PV mode, and HOME mode. The unit is Pulse/s.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6085 | Quickstop Deceleration | RW | INTEGER32 | | 500000 |

### 2.3.14. 0x6098 Homing Method

This object is used to set the homing method for the motor.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x6098 | Homing Method | RW | INTEGER8 | 17~35 | 17 |

For detailed description, please refer to homing mode.

### 2.3.15. 0x6099 Homing Speed

This object sets the motor speed when in homing mode.

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x6099: 01 | Homing Velocity (fast) | R/W/S | UNSIGNED32 | --- | 10000 | Pulse/s |
| 0x6099: 02 | Homing Velocity (slow) | R/W/S | UNSIGNED32 | --- | 2000 | Pulse/s |

## 2.3.16. 0x609A Homing Acceleration

This object is used to set the acceleration and deceleration of the position curve when in homing mode. The unit is Pulse/s^2.

| Object Dictionary | Name | Property | Type | Scope | Default |
|---|---|---|---|---|---|
| 0x609A | Homing Acceleration | RW | UNSIGNED32 | | 100000 |

## 2.3.17. 0x60B8 Probe Function Setting

This object sets the probe function.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED16 | RW | Yes | 0 |

The register bits are defined as follows:

| Bit | Value | Definition |
|---|---|---|
| 0 | 0 | Probe 1 disabled |
| | 1 | Probe 1 enable |
| 1 | | Reserved |
| 2 | | Reserved |
| 3 | | Reserved |
| 4 | 0 | Disable probe 1 rising edge latch |
| | 1 | Enable probe 1 rising edge latch |
| 5 | 0 | Disable probe 1 falling edge latch |
| | 1 | Enable probe 1 falling edge latch |
| 6 | | Reserved |
| 7 | | Reserved |
| 8 | 0 | Probe 2 disabled |
| | 1 | Probe 2 enable |
| 9 | | Reserved |
| 10 | | Reserved |
| 11 | | Reserved |
| 12 | | Disable probe 2 rising edge latch |
| | | Enable probe 2 rising edge latch |
| 13 | | Disable probe 1 falling edge latch |
| | | Enable probe 1 falling edge latch |
| 14 | | Reserved |
| 15 | | Reserved |

The positive position is latched at the rising edge, and the negative position is latched at the falling edge.

## 2.3.18. 0x60B9 Probe Status

This object defines the status of the probe function.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED16 | R | Yes | 0 |

The status bits are defined as follows:

| Bit | Value | Definition |
|---|---|---|
| 0 | 0 | Probe 1 disabled |
| | 1 | Probe 1 enable |
| 1 | 0 | Probe 1 rising edge latch: none |
| | 1 | Probe 1 rising edge latch: yes |
| 2 | 0 | Probe 1 falling edge latch: none |
| | 1 | Probe 1 falling edge latch: yes |
| 3-7 | 0 | Reserved |
| 8 | 0 | Probe 2 disabled |
| | 1 | Probe 2 enable |
| 9 | 0 | Probe 2 rising edge latch: none |
| | 1 | Probe 2 rising edge latch: yes |
| 10 | 0 | Probe 2 falling edge latch: none |
| | 1 | Probe 2 falling edge latch: yes |
| 11-15 | 0 | Reserved |

## 2.3.19. 0x60BA Probe 1 Positive Latch Value

This object holds the position latched by the rising edge of probe 1.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED32 | R | Yes | 0 |

## 2.3.20. 0x60BB Probe 1 Negative Latch Value

This object holds the position latched by the falling edge of probe 1.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED32 | R | Yes | 0 |

## 2.3.21. 0x60BC Probe 2 Positive Latch Value

This object holds the position latched by the rising edge of probe 2.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED32 | R | Yes | 0 |

## 2.3.22. 0x60BD Probe 2 Negative Latch Value

This object holds the position latched by the falling edge of probe 2.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED32 | R | Yes | 0 |

## 2.3.23. 0x60FD Digital Inputs

This object monitors the input port of the driver.

| Object Type | Data Type | Access Type | PDO Mapping | Default Value |
|---|---|---|---|---|
| VAR | UNSIGNED32 | RO | Yes | 0x00000000 |

| | | |
|---|---|---|
| Bit0 | CCW limit | 0 —— Invalid<br>1 —— Limit is valid |
| Bit1 | CW limit | |
| Bit2 | HOME | 0 —— HOME is invalid<br>1 —— HOME is valid |
| Bit3~Bit15 | Reserved | |
| Bit16 | IN1 | Physical state of input port<br>0 —— Input signal is invalid<br>1 —— Input signal is valid |
| Bit17 | IN2 | |
| Bit18 | IN3 | |
| Bit19 | IN4 | |
| Bit20 | IN5 | |
| Bit21 | IN6 | |
| Bit22~Bit31 | Reserved | |

## 2.3.24. 0x60FE Digital Outputs

This object controls the digital output signal.

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x60FE: 01 | physical outputs | R/W/S | UNSIGNED32 | --- | 0 | --- |
| 0x60FE: 02 | bit mask | R/W/S | UNSIGNED32 | --- | 0 | --- |

◆ Physical outputs:

Bit0~15: Reserved

Bit16~17: For controlling OUT1 to OUT2

Bit18~31: Reserved

0 and 1 correspond to output off and on

◆ Bit mask:

Bit0~15: Reserved

Bit16~17: For enabling OUT1 to OUT2

Bit18~31: Reserved

0 and 1 control whether the output port is enabled. 0- not enabled, 1- enabled

## 2.3.25. 0x60FF PV Mode Speed Setting

This object sets the speed in PV mode, the unit is Pulse/s.

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x60FF | Target Velocity | R/W | DINT | --- | 0 | Pulse/s |

This object is 32-bit signed data, and the positive and negative values respectively represent the two directions of motor operation.

## 2.3.26. 0x6502 Operation Mode Supported

This object describes the operation mode supported by the driver.

| Object Dictionary | Name | Property | Type | Scope | Default | Unit |
|---|---|---|---|---|---|---|
| 0x6502 | Supported Drive Modes | R | UDINT | --- | 0x000000A5(165) | --- |

The bits are defined as follows:

| Bit | Description |
|---|---|
| 0 | PP: Profile Position Mode |
| 1 | VI: Velocity Mode |
| 2 | PV: Profile Velocity Mode |
| 3 | TQ: Torque Profile Mode |
| 4 | Reserved |
| 5 | HM: Homing Mode |
| 6 | IP: Interpolated Position Mode |
| 7 | CSP: Cyclic Sync Position Mode |
| 8 | CSV: Cyclic Sync Velocity Mode |
| 9 | Cyclic Sync Torque Mode |
| 10-31 | reserved |

Bit value = 0: Not support

Bit value = 1: Support

USR2556E stepper driver support PP, PV, HM, CSP modes.

## 2.4. CIA402 Motion Control

### 2.4.1. Operation Mode

USR2556E EtherCAT stepper driver support the following operation modes (0x6060):

Profile Position (PP)

Profile Velocity (PV)

Cyclic Synchronous Position (CSP)

Homing (HM)

### 2.4.2. PP (Profile Position Mode)

**Profile position mode description:**

Standard position mode is a point-to-point operation mode that uses a set point composed of speed, acceleration, deceleration and target position. Once all these parameters are set, the driver will buffer these commands and start executing the set point.

**Enable PP mode**

To enable the profile position mode, the value of the object dictionary 6060h (operation mode) must be set to 0001h. The object dictionary 6061h (operation mode display) can be used to confirm whether the driver has entered the correct operation mode.

**Set operating parameters**

Use object dictionary 607Ah, 6081h, 6083h, 6084h to set position, velocity, acceleration, deceleration respectively.

**Start and stop**

After power on, the driver is in the disabled state. Writing 0006h into the control word 6040h will make the drive enter the "ready to switch on" state.

By sending 001Fh to the object dictionary 6040h of the control word, to indicate a new set point and start movement.

To enable the operation of the driver, the value 001Fh must be written into the object dictionary address 6040h of the control word. This also means that a new set point is ready. The driver uses Bit12 of the status word (6041h) to indicate that a valid setpoint is received. Because the set point is edge triggered, once the driver receives and processes the set point, the control word must be cleared by writing 000FH to the control word register.

**Controlword Bits**

New set point (bit 4) - set this bit high to clock in a new set-point. Once the driver receives the set point, Bit12 of the status word will be set to high (1), and Bit4 of the control word needs to be set to 0;

Setpoint Change (Bit 9): If it is low, the driver enters an idle state after executing the current setpoint and waits for the next new setpoint. If it is high, the driver will run to the last set point at the last set speed, then switch to the new speed and run to the new set point.

Setpoint takes effect immediately (Bit 5): If this bit is high, the new setpoint takes effect immediately and the motor will run to the new position at the speed of the new setpoint.

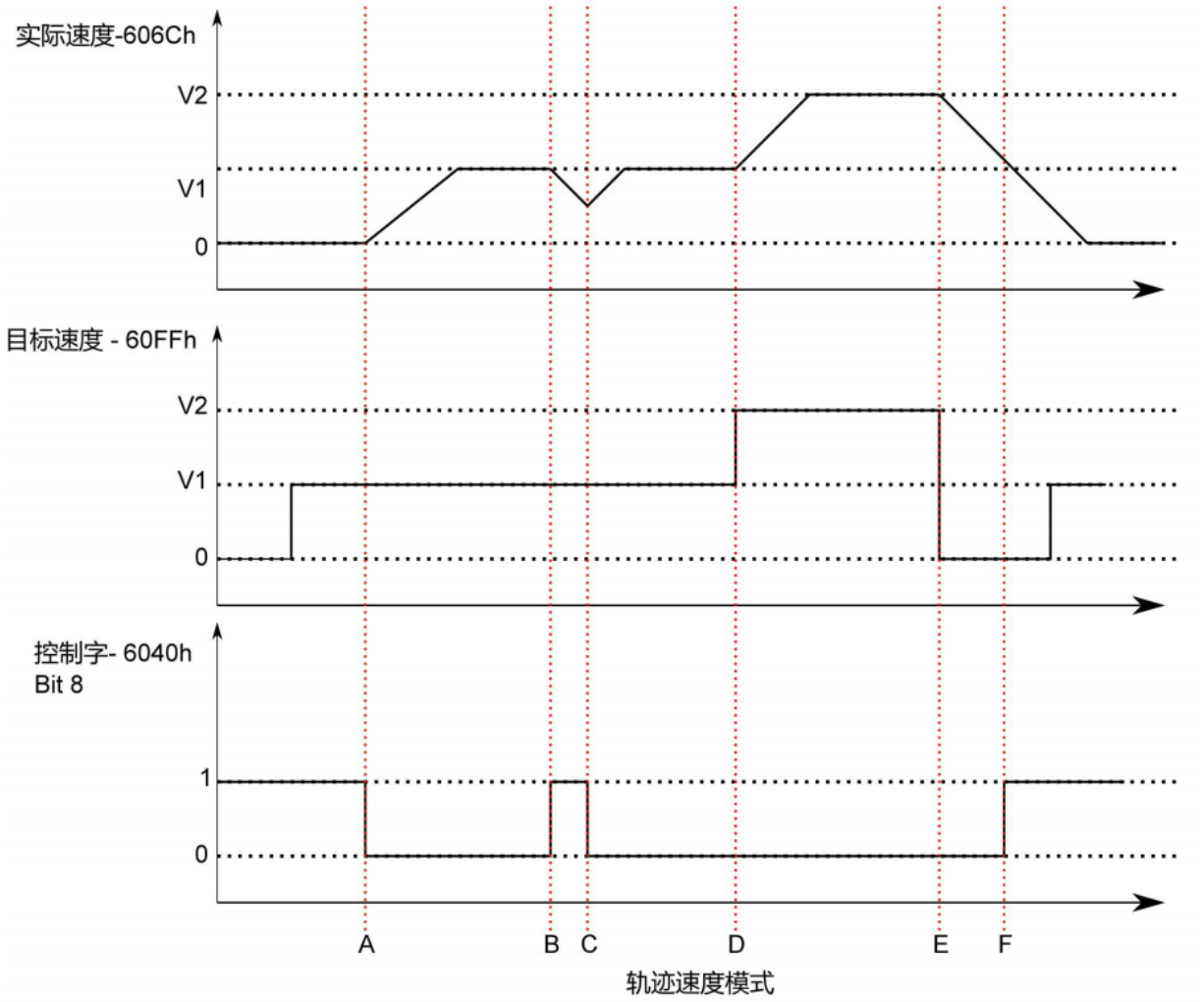
Absolute mode/relative mode (Bit 6): If it is high, the set point is in relative position mode. For example, if the previous motor position is 10000 steps, and the new set point is 20000, the final position will be 30000. If it is low, the set point is in absolute position mode. If the previous motor position is 10000 and the new set position is 20000, then the new position will be 20000. (The distance from the previous position to the new position is 10000 steps). Do not change this position when the motor is moving.

## 2.4.3. PV (Profile Velocity Mode)

**Profile velocity mode description**

The profile velocity is a relatively simple mode of operation. Once the speed, acceleration and deceleration are set, the driver will command the motor to accelerate to the running speed according to the acceleration parameter, or stop the movement according to the deceleration parameter.

The figure below shows an example of configuring the speed mode.




The above figure shows the corresponding relationship between the motor running status, actual speed, target speed and control word.

| | Target speed | 6040h stop bit Bit4 | Motor movement status |
|---|---|---|---|
| Start | 0 | 1 | Motor stop |
| A | V1 | 1 -> 0 | Motor accelerates to V1 |
| B | V1 | 0 ->1 | Motor decelerates to stop |
| C | V1 | 1 -> 0 | Before the motor stopped, it accelerated to V1. |
| D | V1 -> V2 | 0 | Motor accelerates from V1 to V2 |
| E | V2 -> 0 | 0 | Motor decelerates from V2 to 0 |
| F | 0 | 0 -> 1 | Motor stop |
| G | 0 -> V1 | 1 | Motor stop |

The table above explains how the stop bit and the target speed are used together to affect motor speed. Between points B and C, the motor does not come to a complete stop, but decelerates according to the trajectory deceleration value that begins at point B. When the stop bit switches at point C, it immediately accelerates back to the target speed. At point E, reducing the target speed to zero has the same effect as using the stop bit.

It should be noted that no matter if the stop bit is set and the target speed is set to zero, a torque will be maintained on the motor. If you want the axis to move freely, the driver must be placed in the driver disabled (disabled) status.

**Enable PV mode**

To enable the profile velocity mode, the value of object dictionary 6060h (operation mode) must be set to 0003h. The object dictionary 6061h (operation mode display) can be used to confirm whether the driver has entered the correct operation mode.

**Set operating parameters**

Use object dictionary 60FFh, 6083h, 6084h to set the speed, acceleration and deceleration of the profile velocity mode respectively.

**Enable driver**

After power on, the driver is in the disabled state. Writing 0006h into the control word 6040h will make the driver enter the "ready to switch on" state. Write 010Fh into 6040h to make the driver enter the "Operation Enabled" state, and the motor is stopped.

**Start and stop**

To start and stop the movement, switch the control word stop bit (bit 8). When the stop bit is set to 0 (000Fh), the movement will start or continue; when the stop bit is set to 1 (010Fh), the movement will stop.

Profile velocity (60FFh) more than zero means the motor is running forward, less than zero means the motor is reversing, and equal to zero means the motor is stopped. Users can directly set the motor to enter the reverse state when the motor is running forward, and the motor will decelerate to stop and accelerate to the set speed in the reverse direction.

## 2.4.4. CSP (Cyclic Sync Position Mode)

**Cyclic sync position mode description**

In this mode, the main controller generates a position trajectory and sends the target position (0x607A) to the d river in each PDO update cycle. The driver feedbacks the actual motor position and optional actual motor speed and torque.

**Enable CSP mode**

To enable the cyclic synchronization position mode, the value 0008h must be written to the dictionary address 6060h.

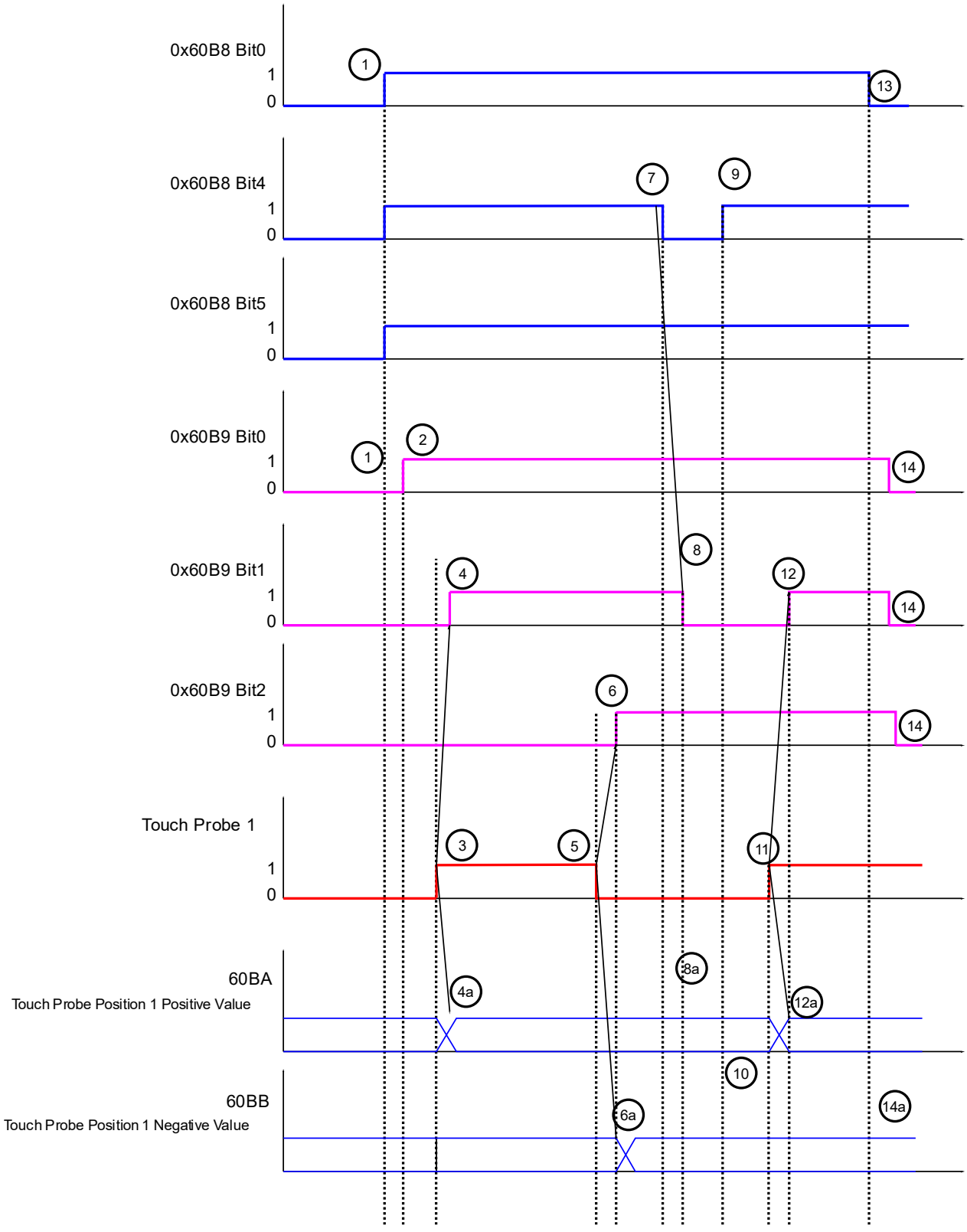
**Enable driver**

After power on, the drive is in the disabled state. Writing 0006h into the control word 6040h will make the drive enter the "ready to switch on" state. Write the value 0x000F to 6040h again, the drive will be in the enabled state, and the motor can respond to the CSP command.

## 2.4.5. Probe Function

The probe function latches the motor position information through the digital input port. USR2556E's digital input port function and polarity can be defined by 0x2007, 0x2008. The relevant object dictionary of the probe function is as follows:

| Index | Object description |
|---|---|
| 0x60B8 | Touch Probe Function |
| 0x60B9 | Touch Probe Status |
| 0x60BA | Touch Probe Position 1 Positive Value |
| 0x60BB | Touch Probe Position 1 Negative Value |
| 0x60BC | Touch Probe Position 2 Positive Value |
| 0x60BD | Touch Probe Position 2 Negative Value |




**Probe timing diagram**

| Serial No. | Change of registers | Probe action |
|---|---|---|
| 1 | 60B8 Bit 0 = 1<br>60B8 Bit 1,4,5 | Enable probe 1<br>Configure the rising edge and falling edge of the enable probe |
| 2 | -> 60B9 Bit 0 = 1 | The state "probe 1 enabled" is set |
| 3 | External probe signal rising edge | |
| 4 | -> 60B9 Bit 1 = 1 | The state "Probe 1 rising edge latch" is set |
| 4a | -> 60BA | The positive position of probe 1 is latched |
| 5 | External probe signal falling edge | |
| 6 | -> 60B9 Bit 2 = 1 | The state "Probe 1 falling edge latch" is set |
| 6a | -> 60BB | The negative position of probe 1 is latched |
| 7 | -> 60B8 Bit: 4 | Rising edge latch function: disabled |
| 8 | -> 60B9 Bit 0 = 0 | The state "Probe 1 rising edge latch" is cleared |
| 8a | -> 60BA | Probe 1 positive position, the latch position remains unchanged |
| 9 | -> 60B8 Bit 4 = 1 | Rising edge latch function: enable |
| 10 | -> 60BA | Probe 1 positive position, the latch position remains unchanged |
| 11 | External probe signal rising edge | |
| 12 | -> 60B9 Bit 1 = 1 | The state "Probe 1 rising edge latch" is set |
| 12a | -> 60BA | The positive position of probe 1 is latched |
| 13 | -> 60B8 Bit 0 = 0 | Probe 1 function: disabled |
| 14 | -> 60B9 Bit 0,1,2 = 0 | Status bit is cleared |
| 14a | -> 60BA,60BB | No change in the positive/negative latch position of probe 1 |

**Probe timing description**

## 2.4.6. Homing Mode

Set homing parameters

Set the homing speed, acceleration, home offset and related sensor input signals.

The relevant object dictionary is as follows:

| Object dictionary | Description |
|---|---|
| 0x607C | Home offset |
| 0x6098 | Homing method setting |
| 0x6099 | Homing speed |
| 0x609A | Homing acceleration |
| 0x2007 | Input port function selection |
| 0x2008 | Input port polarity setting |

**Enable Homing mode:**

To enable the homing mode, the value of object dictionary 6060h (operation mode) must be set to 0006h. The object dictionary 6061h (operation mode display) can be used to confirm whether the drive has entered the correct operation mode.

After the drive is initially powered on, it is in the disabled state. Write 6 to the control word 6040h, set the drive to the "ready to switch on" state, then write 000Fh to the control word 6040h, and set the drive to "Operation Enabled Mode".

**Active Homing function:**

Set the homing method through the 6098h object dictionary.

Set the homing speed through 0x6099.

Through the Bit4 of the control word 6040h, the rising edge from 0 to 1, can start the function of homing. The status of homing is queried through the 6041 status word.

**Stop the homing function:**

Set the homing method through the 6098h object dictionary. Through the Bit8 of the control

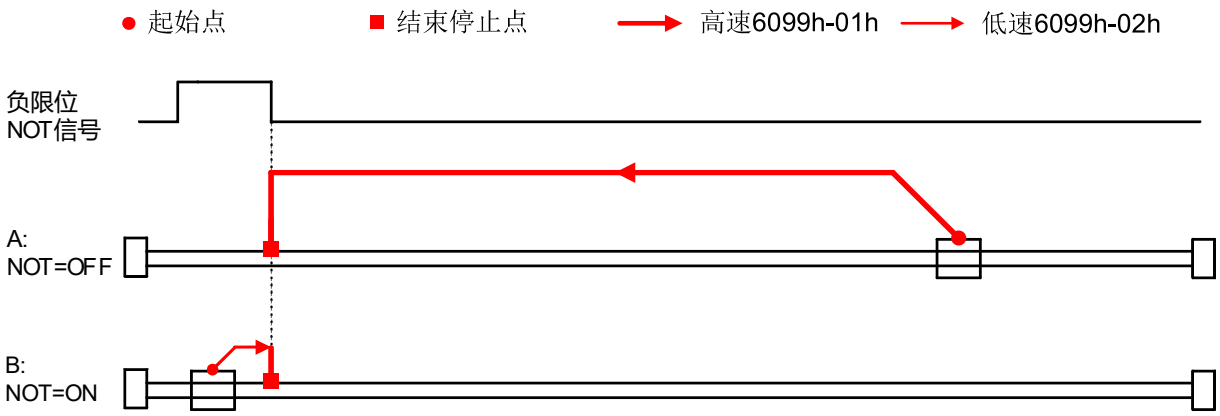
word 6040h, the rising edge from 0 to 1, can stop the function of homing. The status of homing is queried through the 6041 status word.

### 2.4.6.1. Homing Method 0

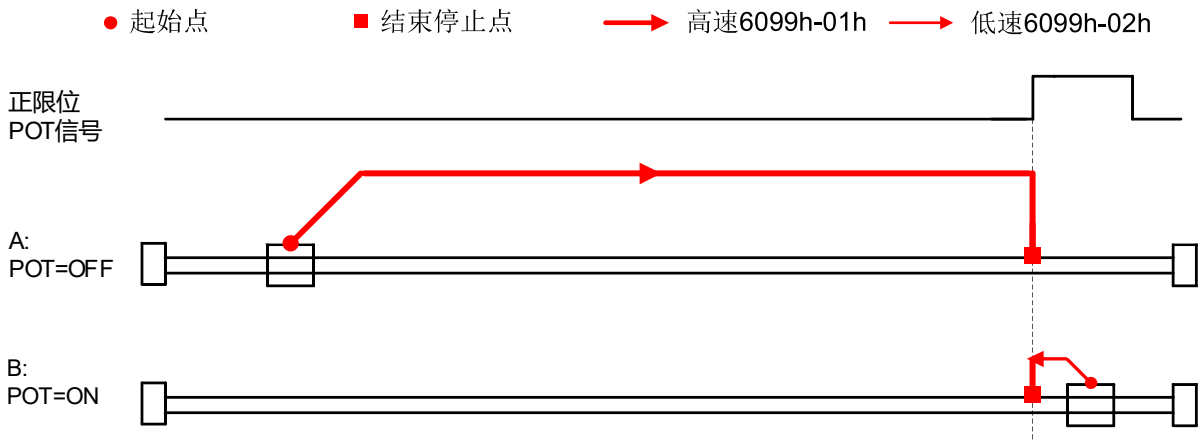
The USR2556E driver supports 17~30, 35 homing methods. The specific definition and the process of homing are described as follows.

The switching between homing method 0 and 1 needs to be set at 0x204C.

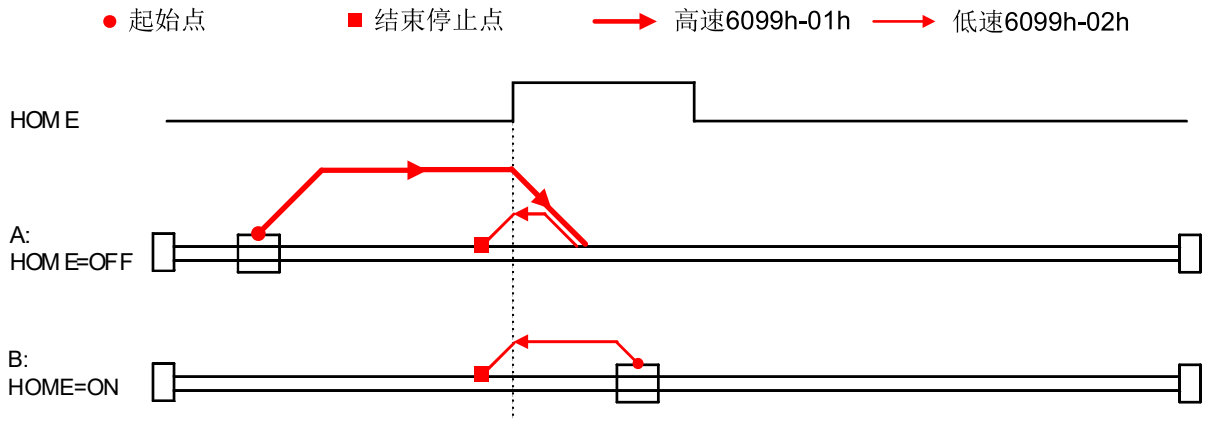
#### (1) Method 17



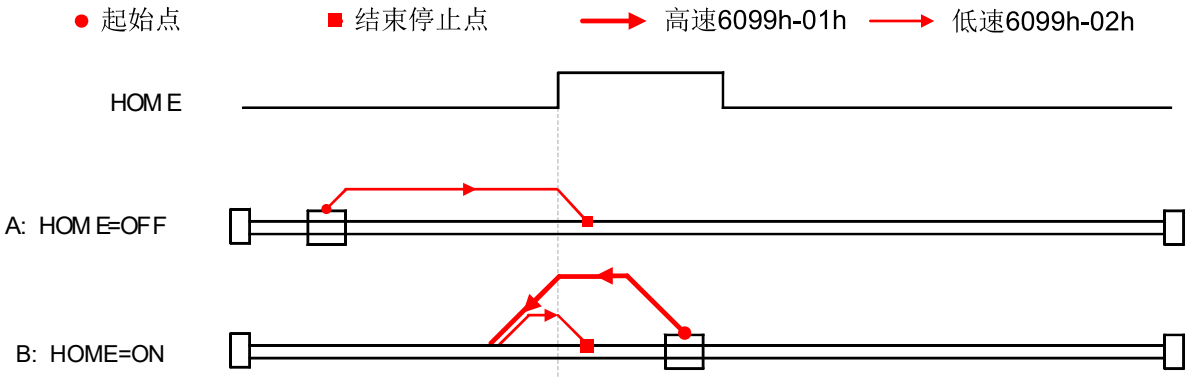

#### (2) Method 18



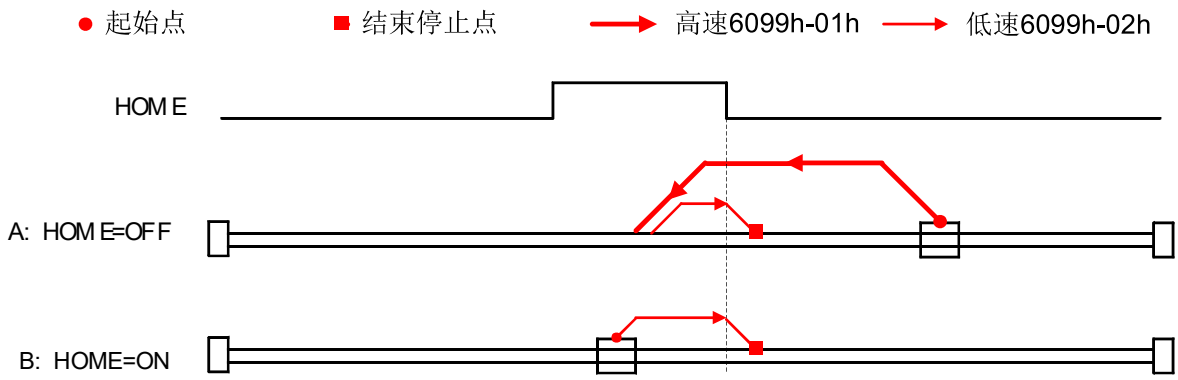
### (3) Method 19



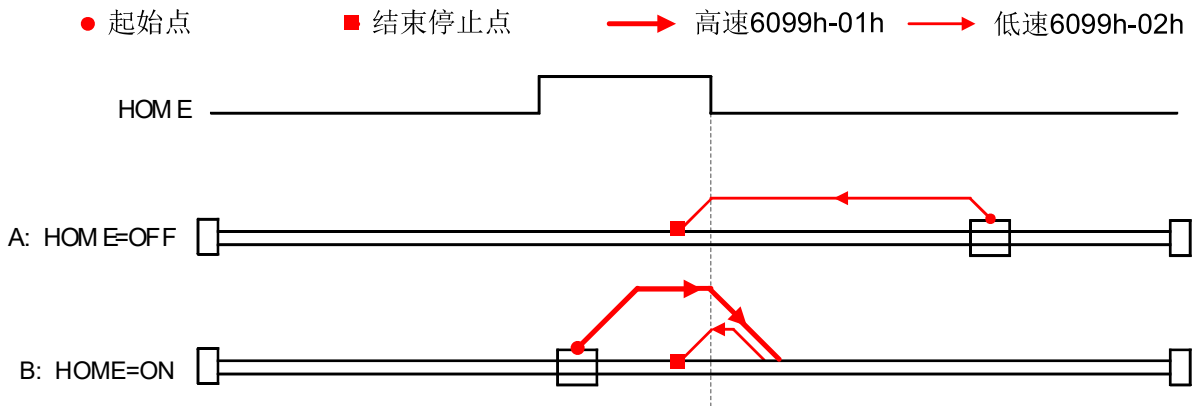

### (4) Method 20



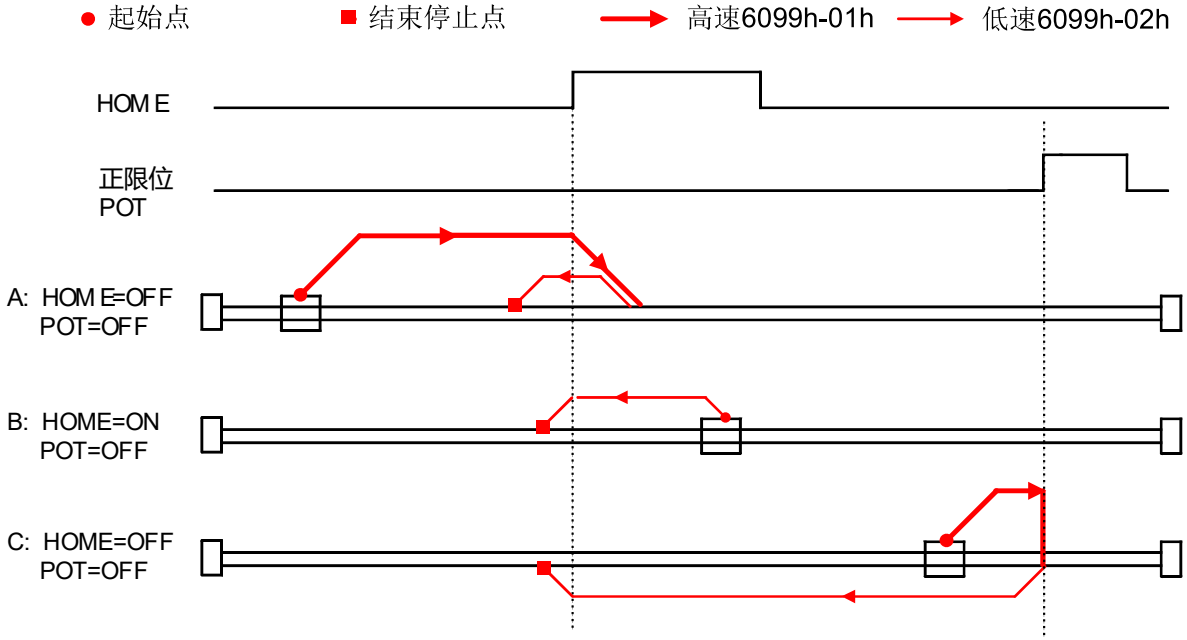

### (5) Method 21



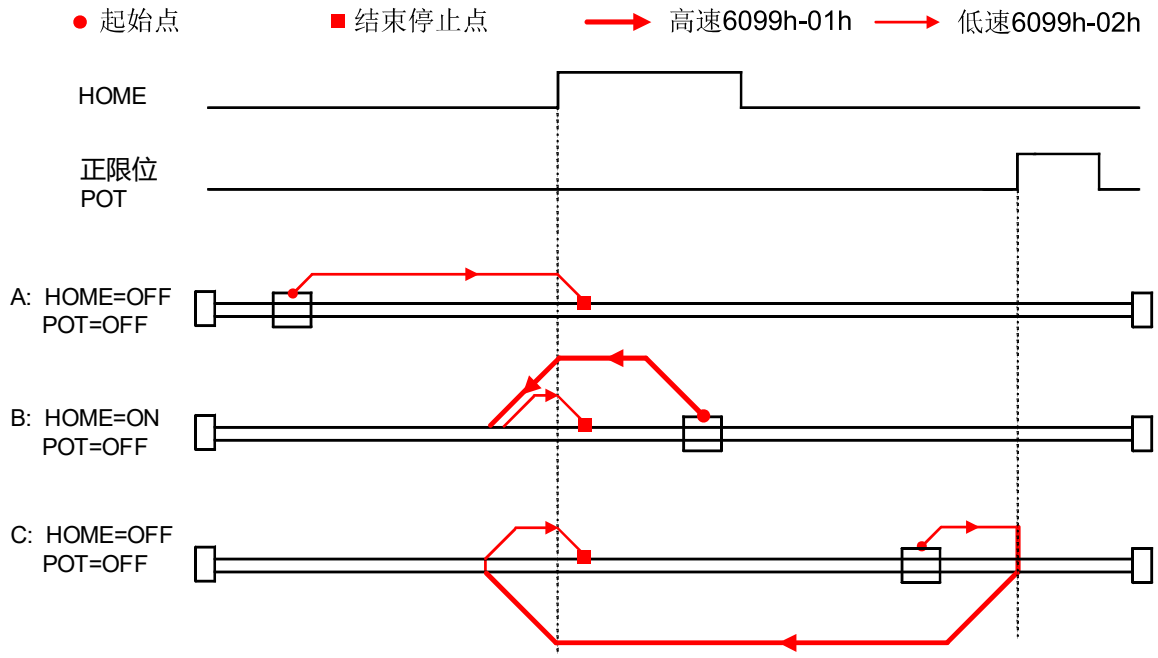
### (6) Method 22



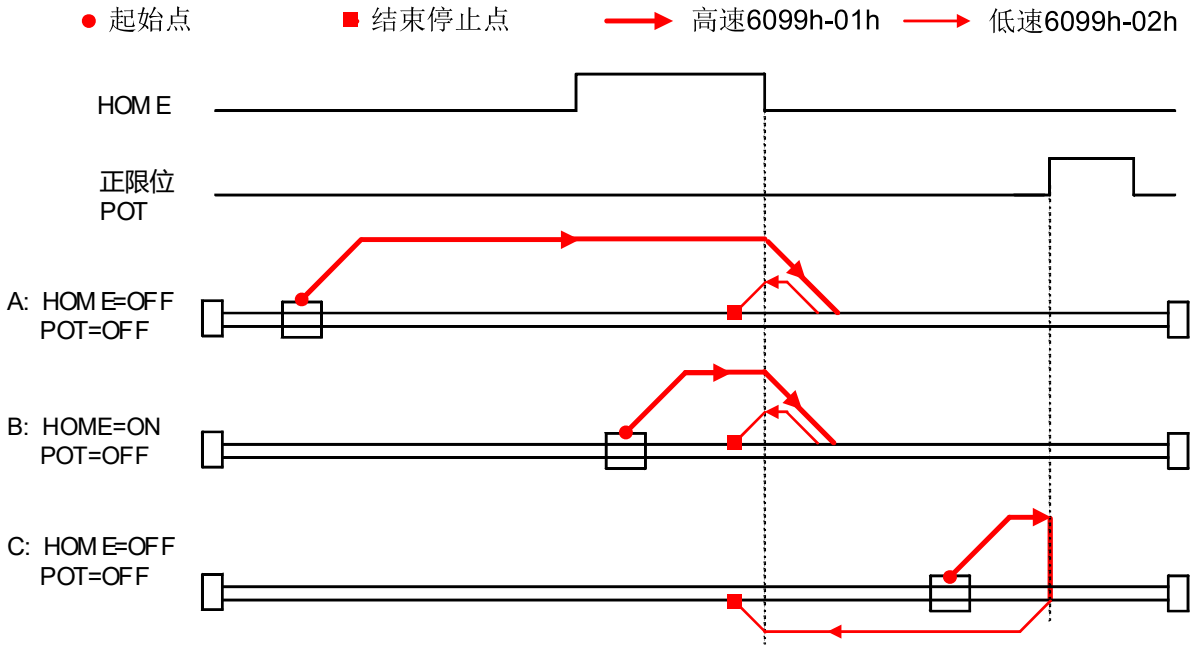

### (7) Method 23



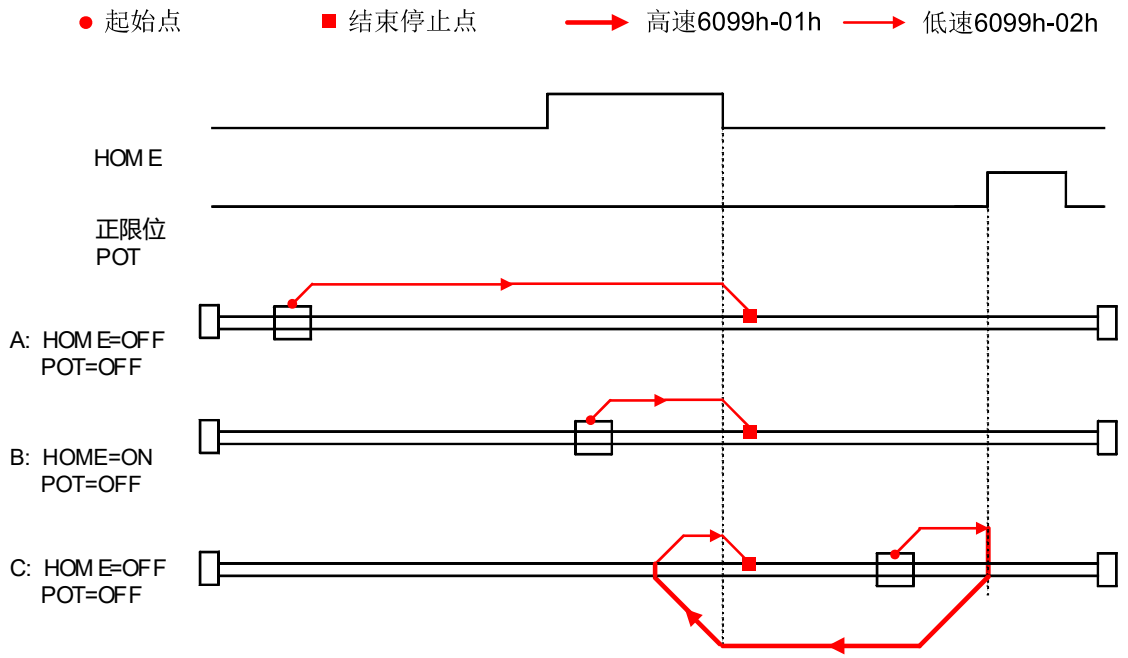
### (8) Method 24



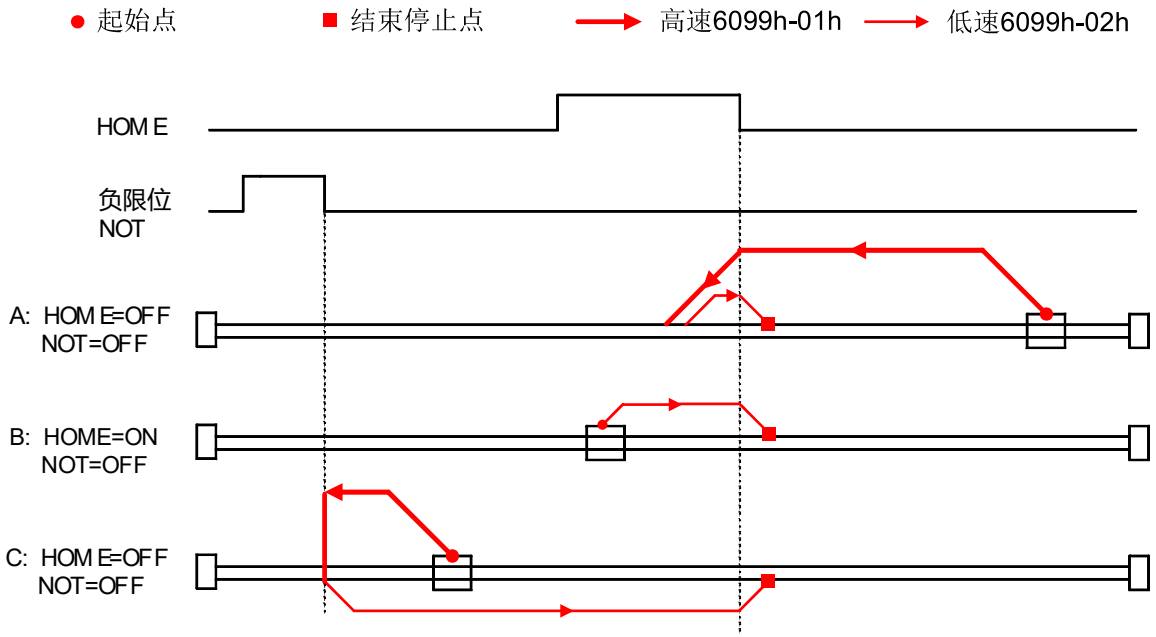

### (9) Method 25



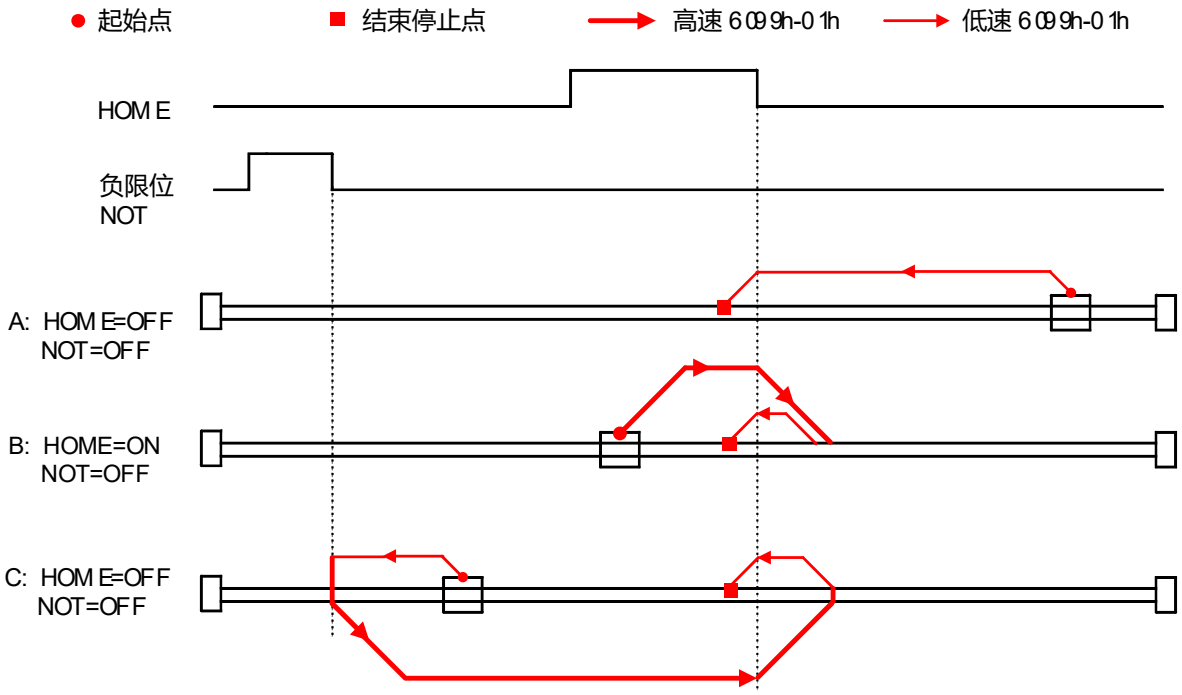
## (10) Method 26



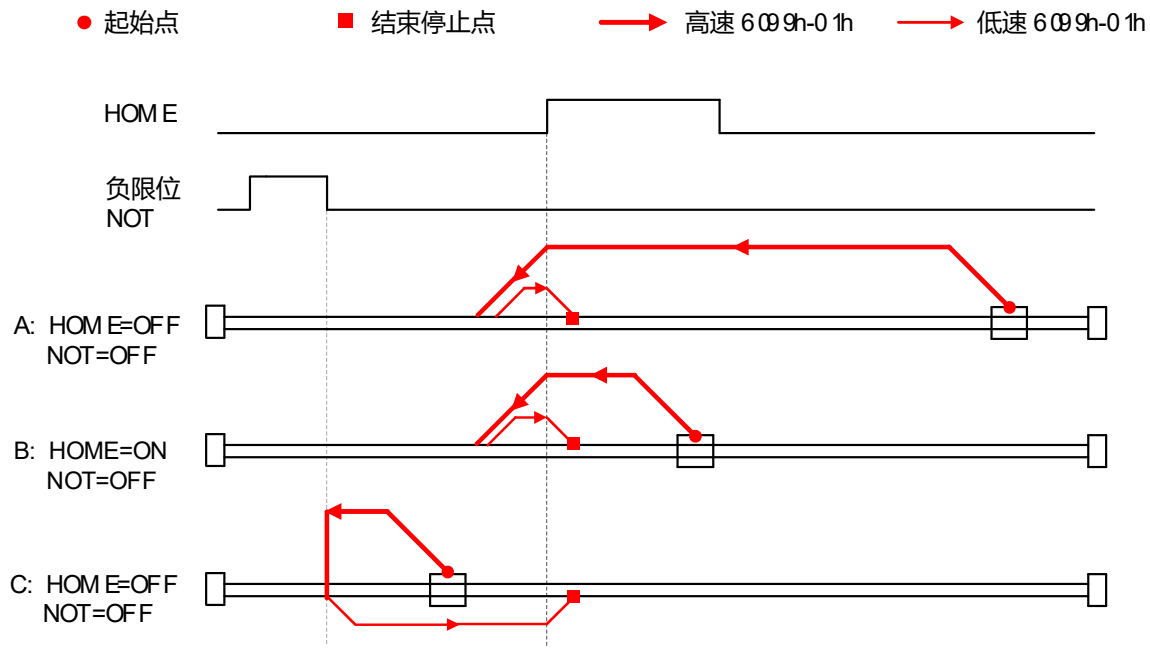

## (11) Method 27



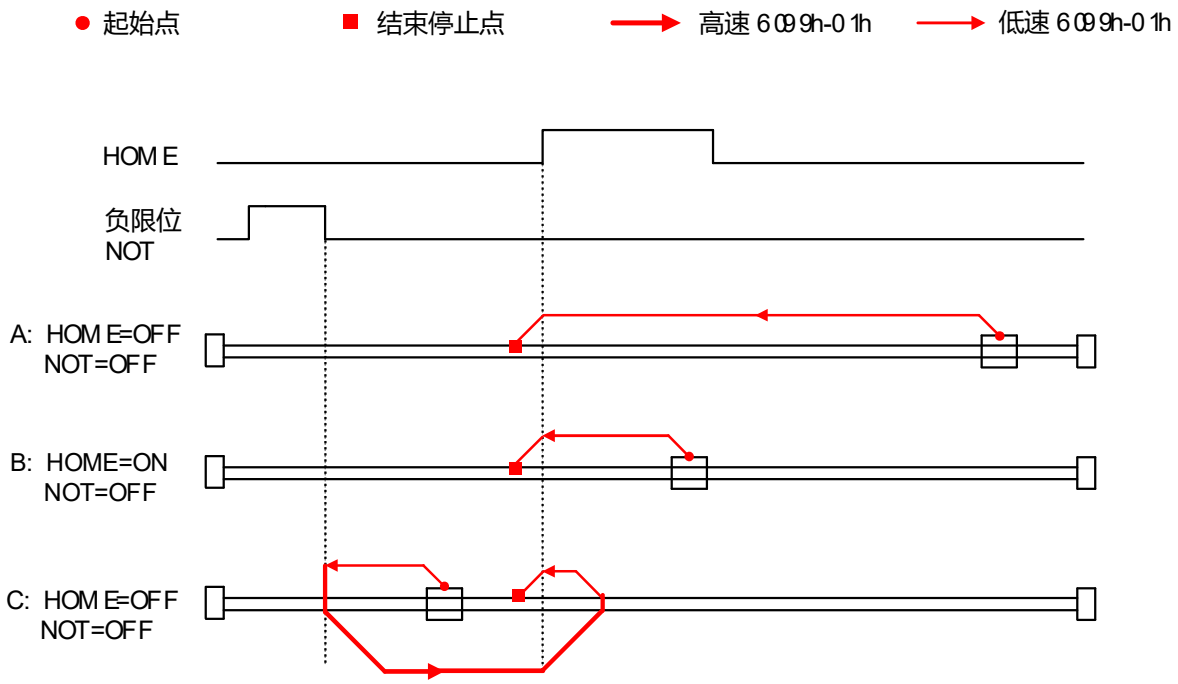
## (12) Method 28



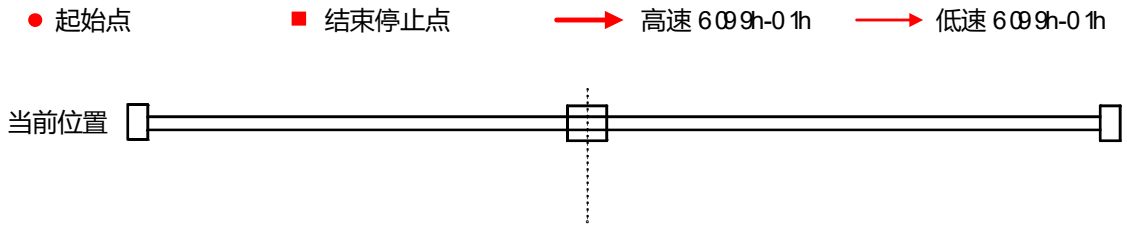

## (13) Method 29



## (14) Method 30




## (15) Method 35

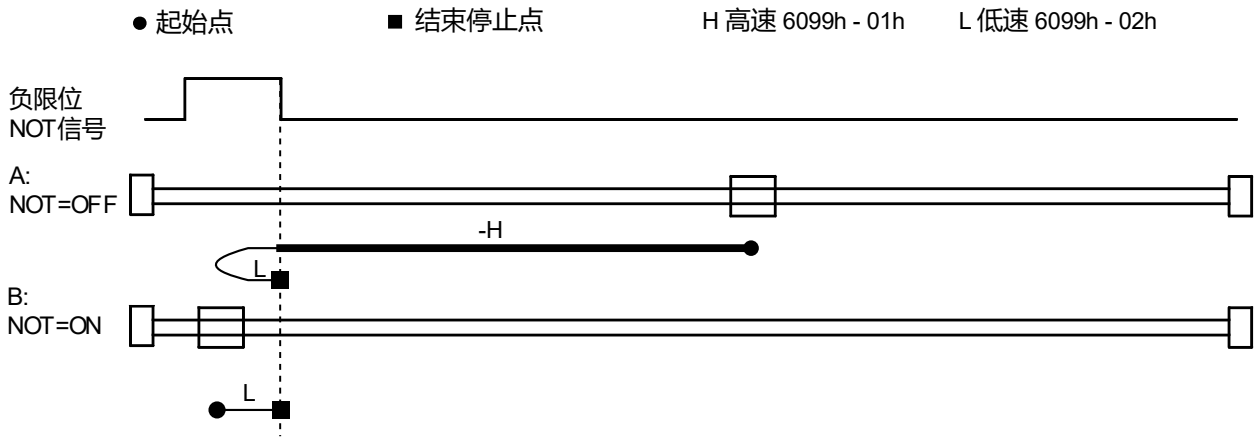


### 2.4.6.2. Homing Method 1

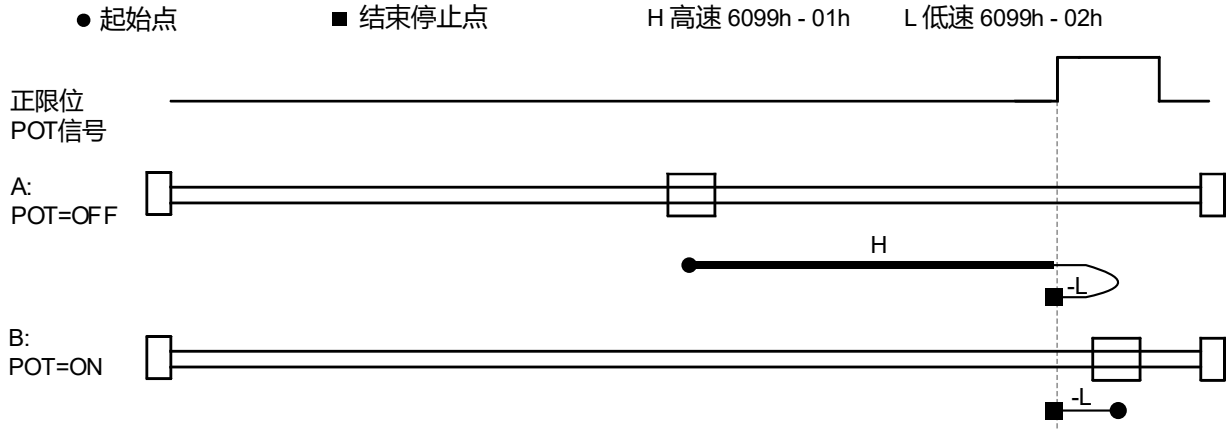
The USR2556E driver supports 17~30, 35 homing methods. The specific definition and the process of homing are described as follows.

The switching between homing method 0 and 1 needs to be set at 0x204C.

#### (1) Method 17

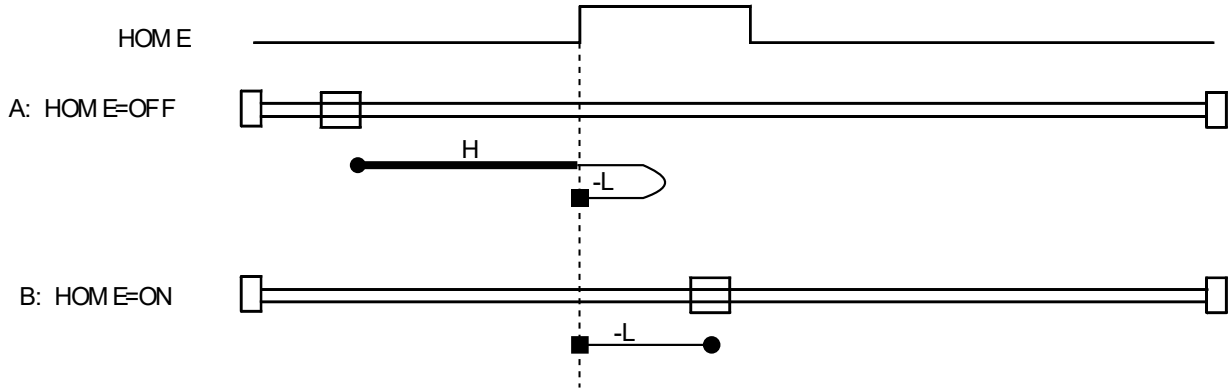



#### (2) Method 18



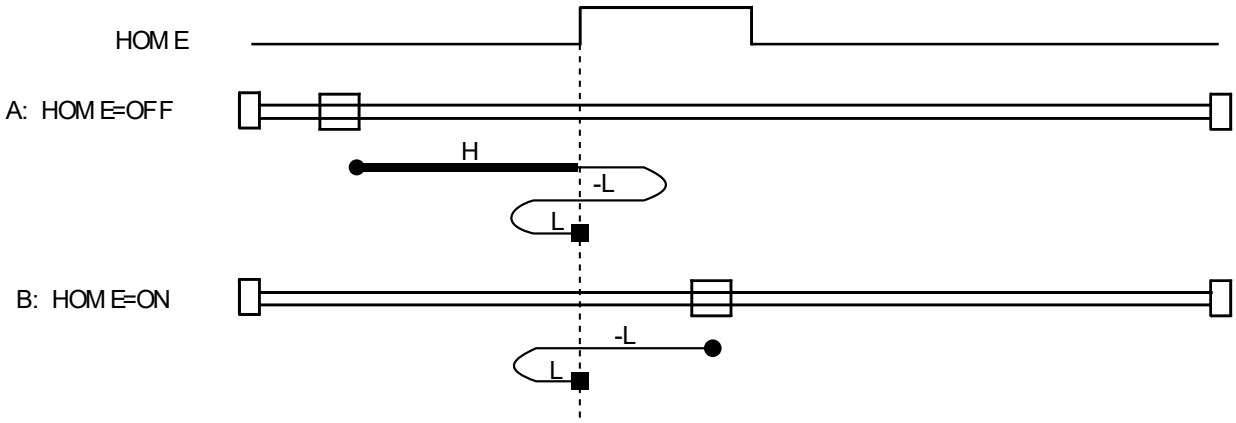
### (3) Method 19

● 起始点　　■ 结束停止点　　H 高速 6099h - 01h　　L 低速 6099h - 02h



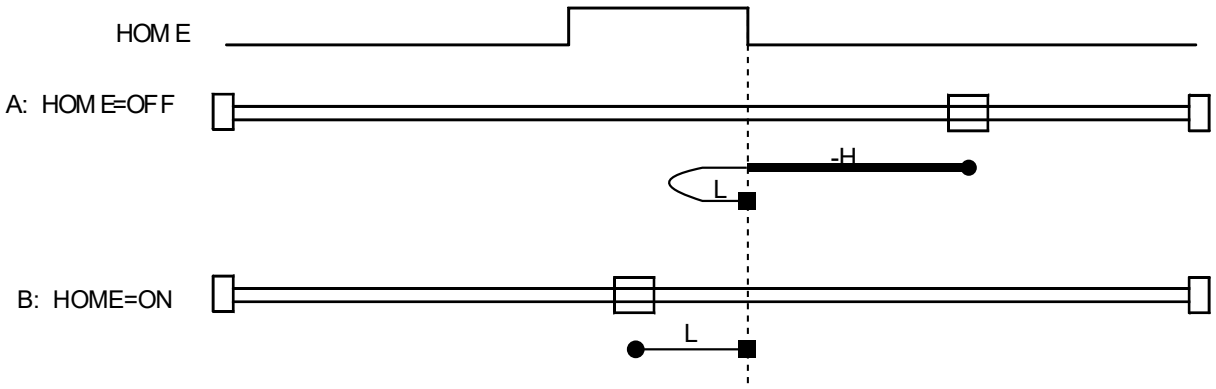

### (4) Method 20

● 起始点　　■ 结束停止点　　H 高速 6099h - 01h　　L 低速 6099h - 02h

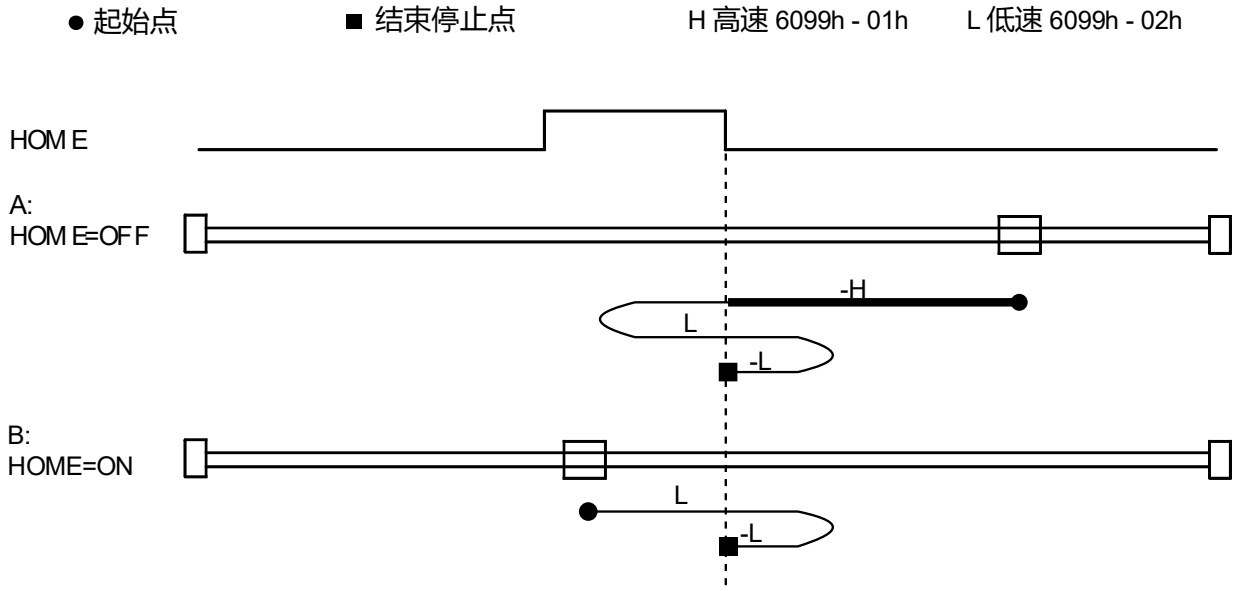



### (5) Method 21

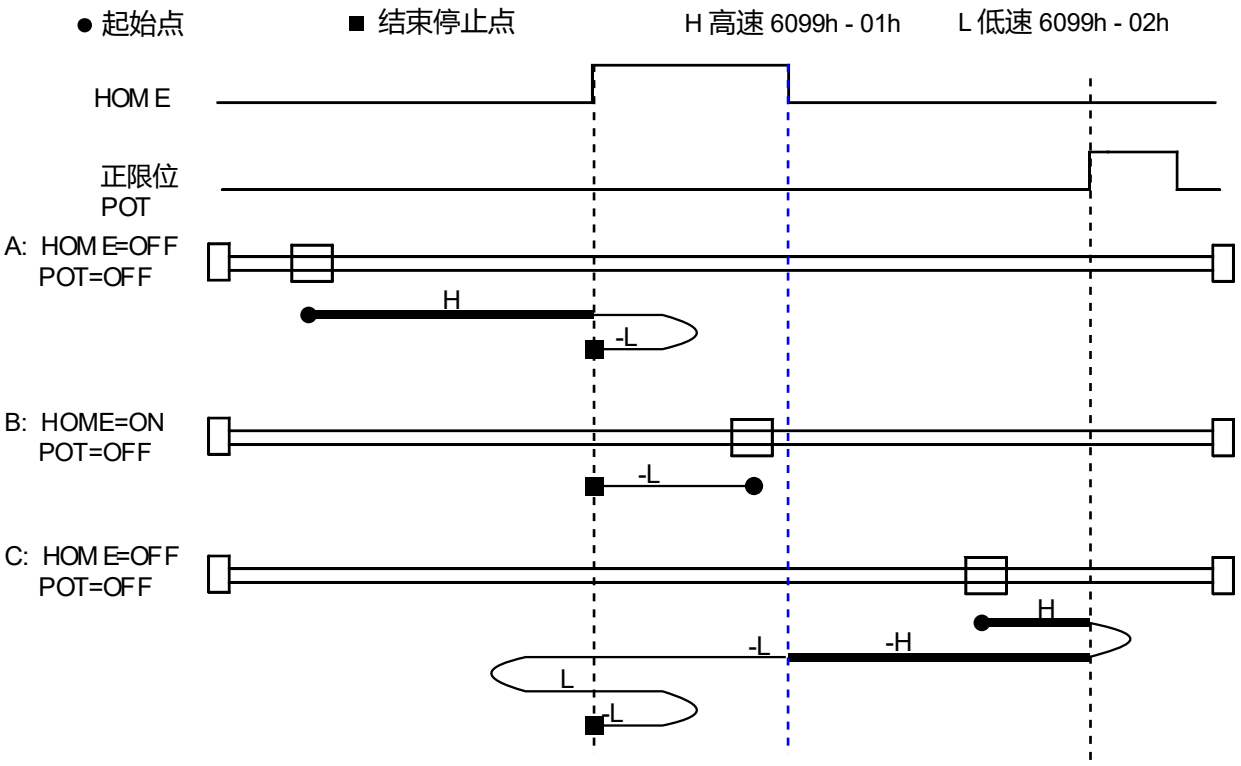
● 起始点　　■ 结束停止点　　H 高速 6099h - 01h　　L 低速 6099h - 02h



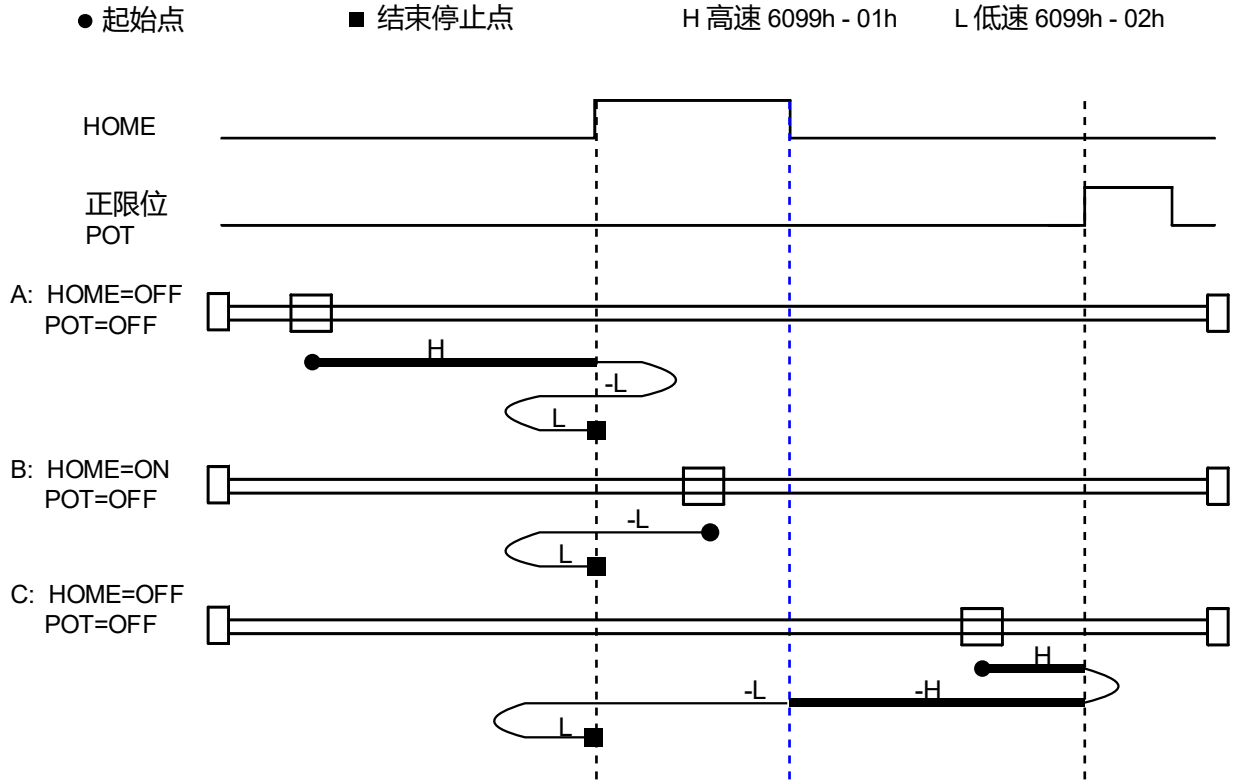
### (6) Method 22



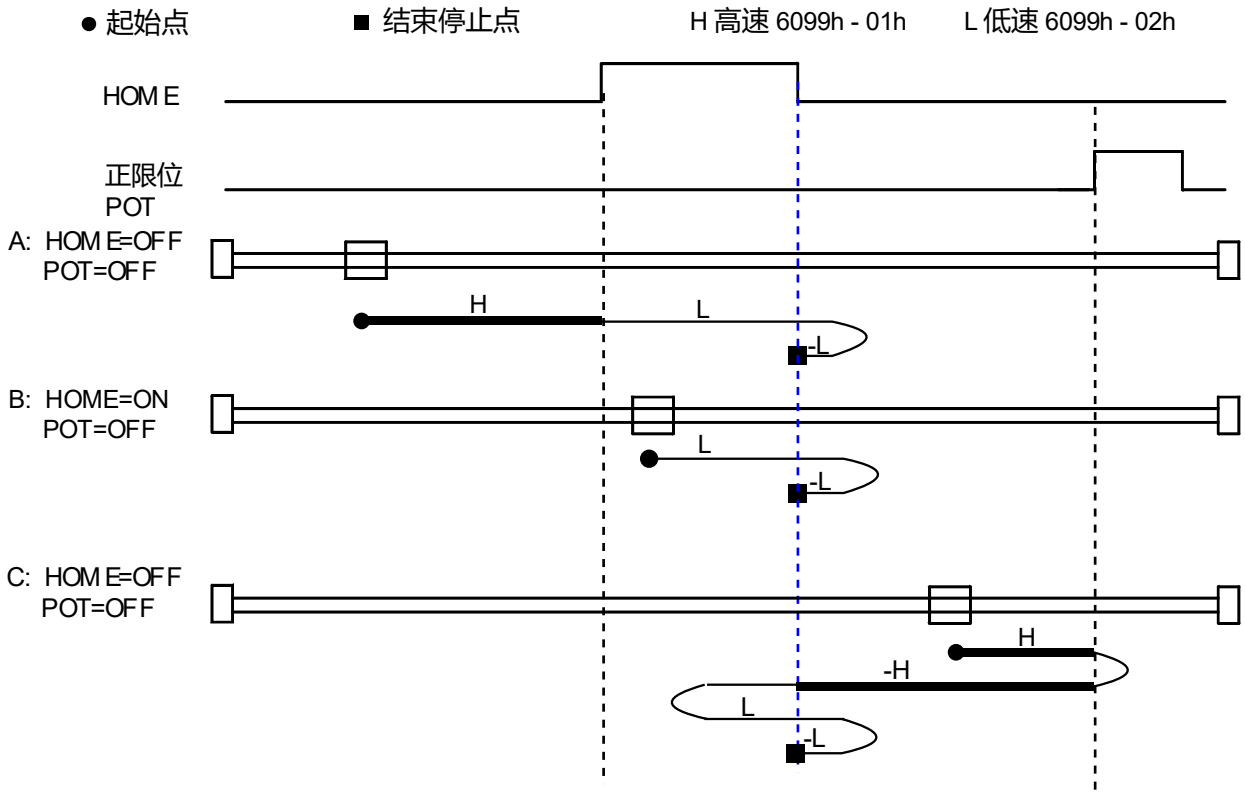

### (7) Method 23



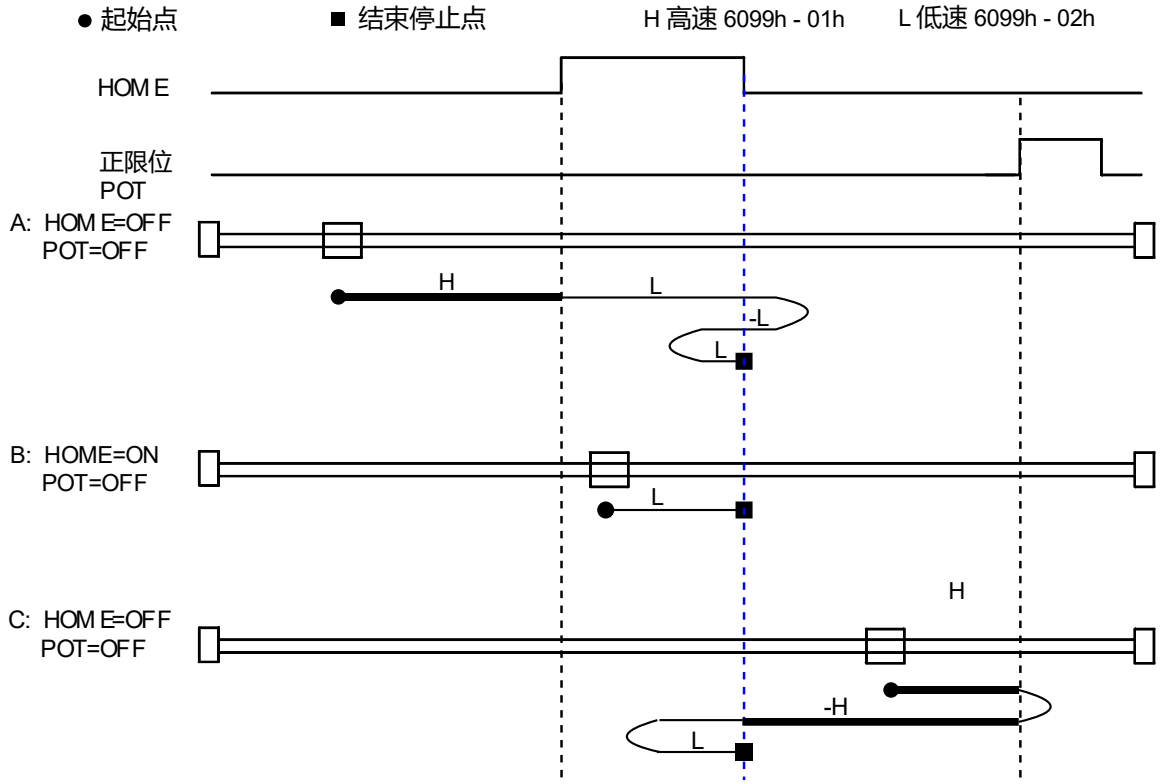
## (8) Method 24



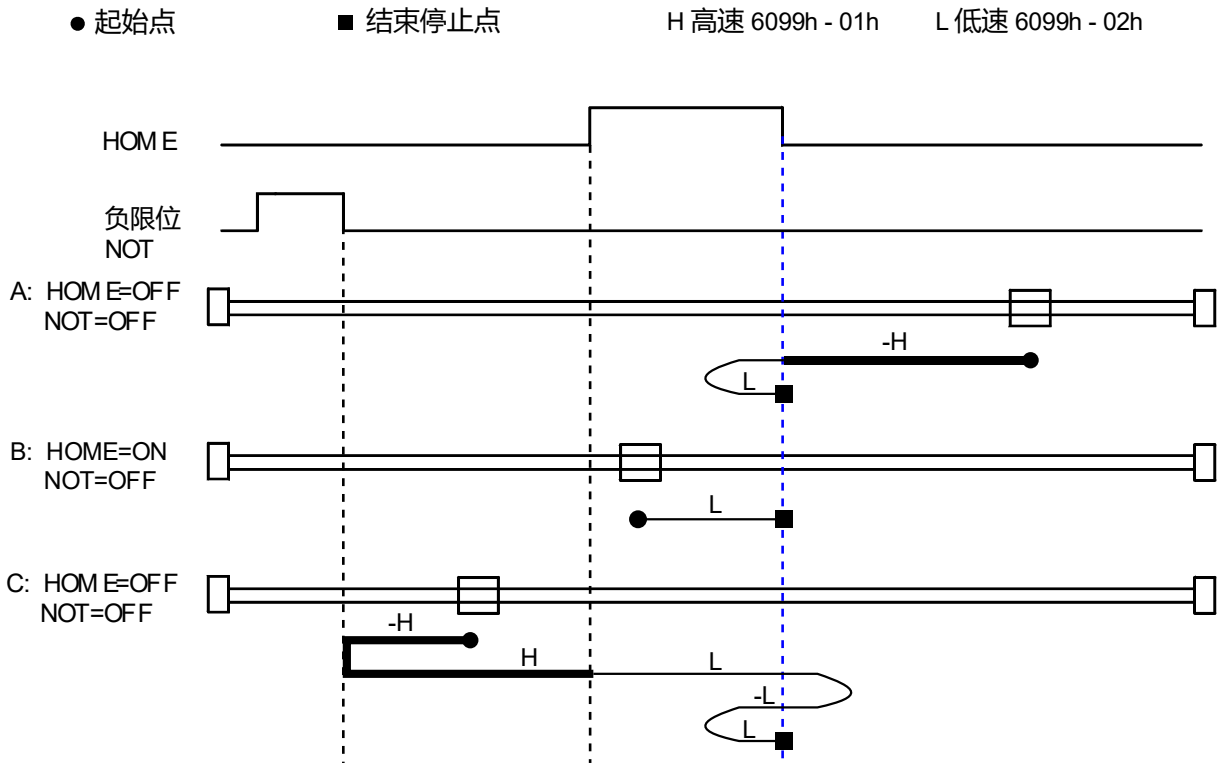

## (9) Method 25



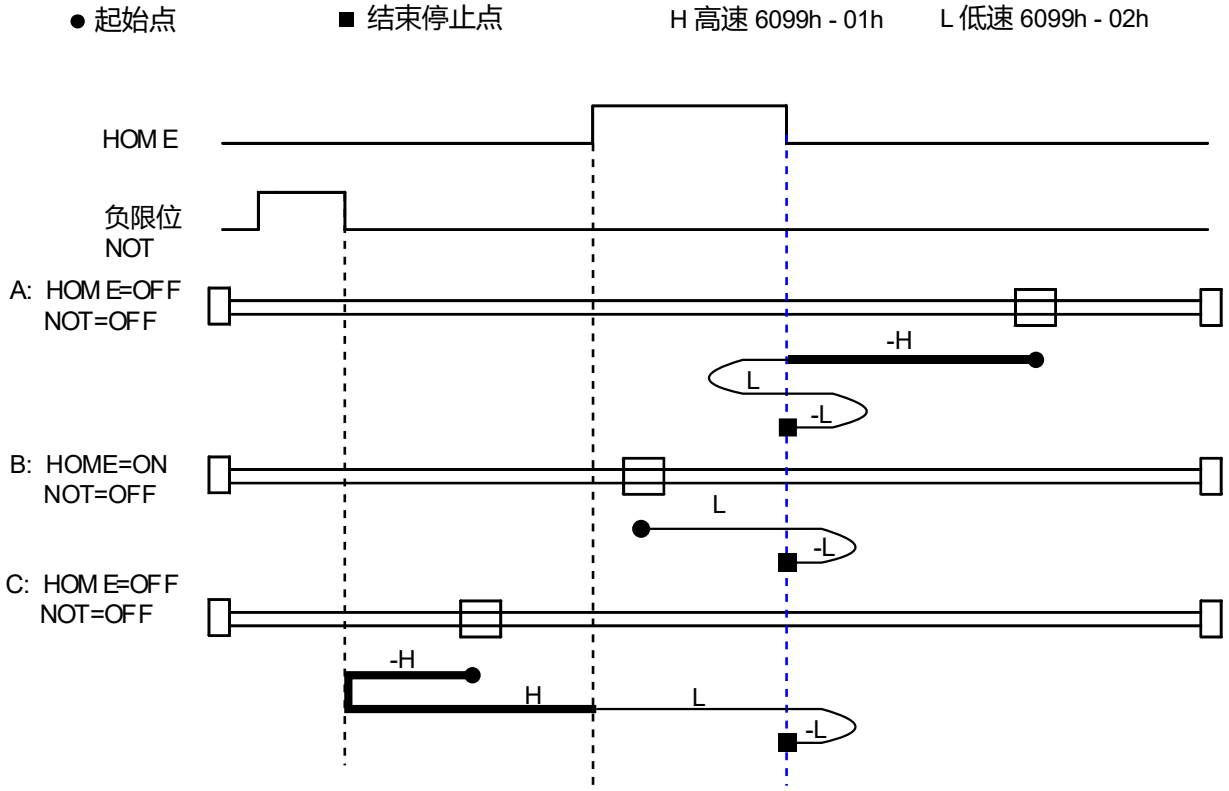
## (10) Method 26



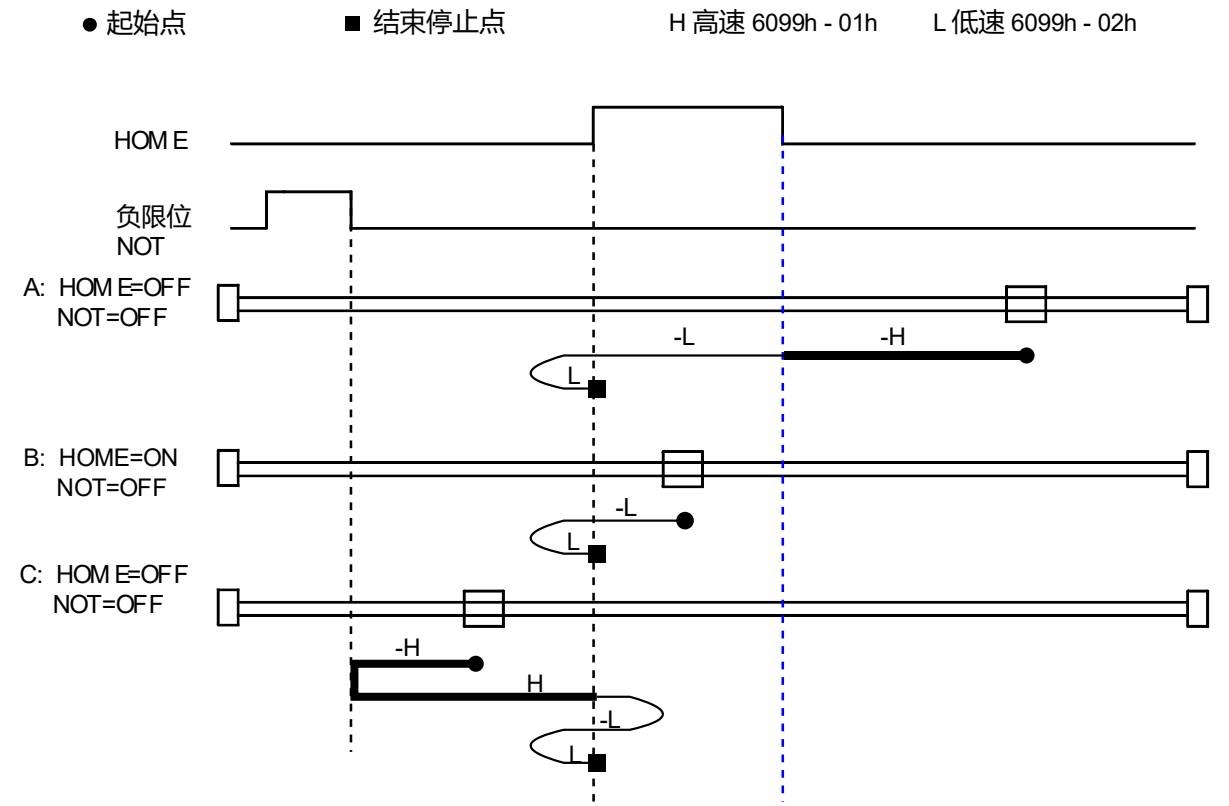

## (11) Method 27



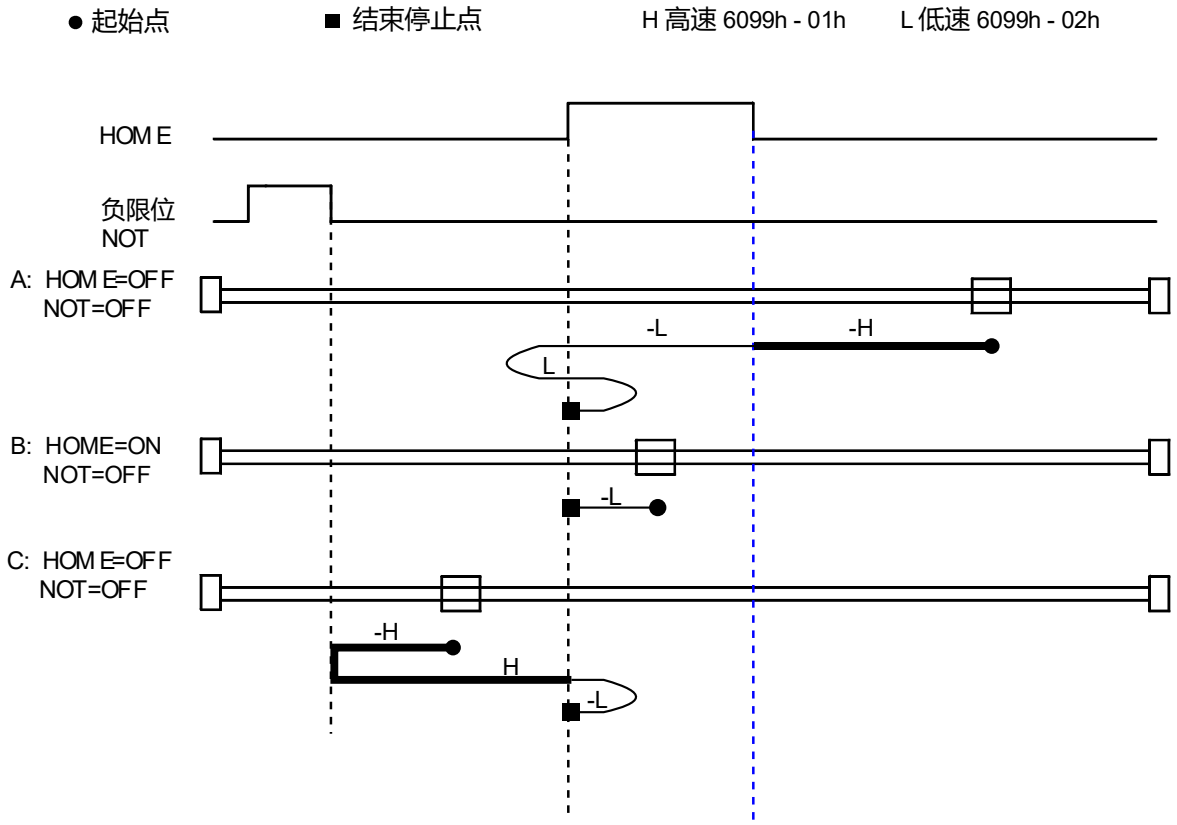
## (12) Method 28



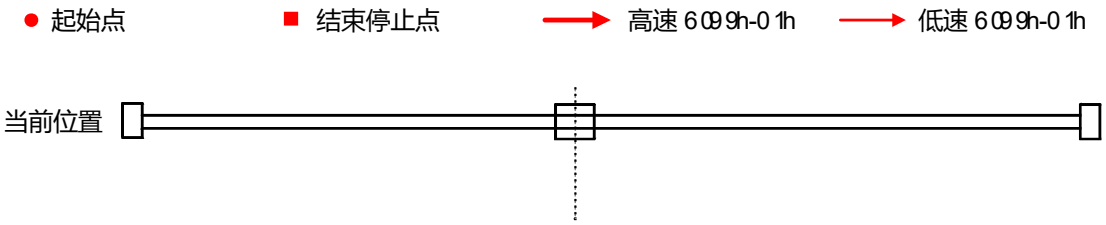

## (13) Method 29



## (14) Method 30




## (15) Method 35



# SUPPORTS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