M Series Tutorial_Homing

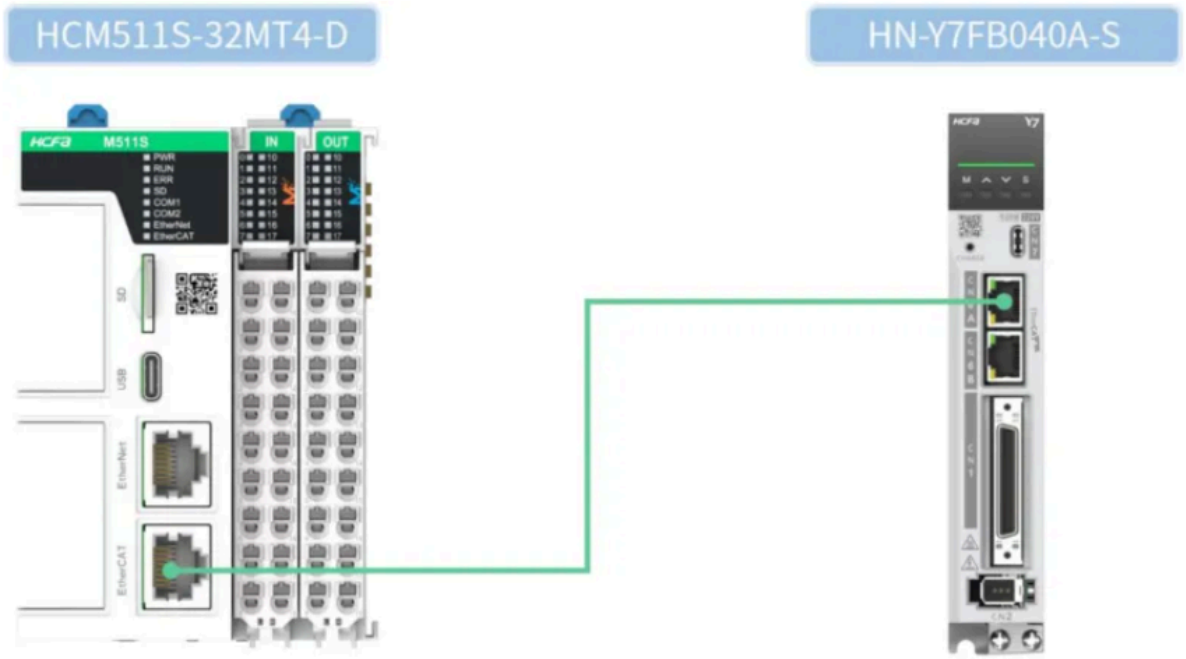
Software: Sysctrl Studio (PLC programming software)

Hardware: M series controller (taking M511S as an example)

Servo (taking HN-Y7FB040A-S as an example)

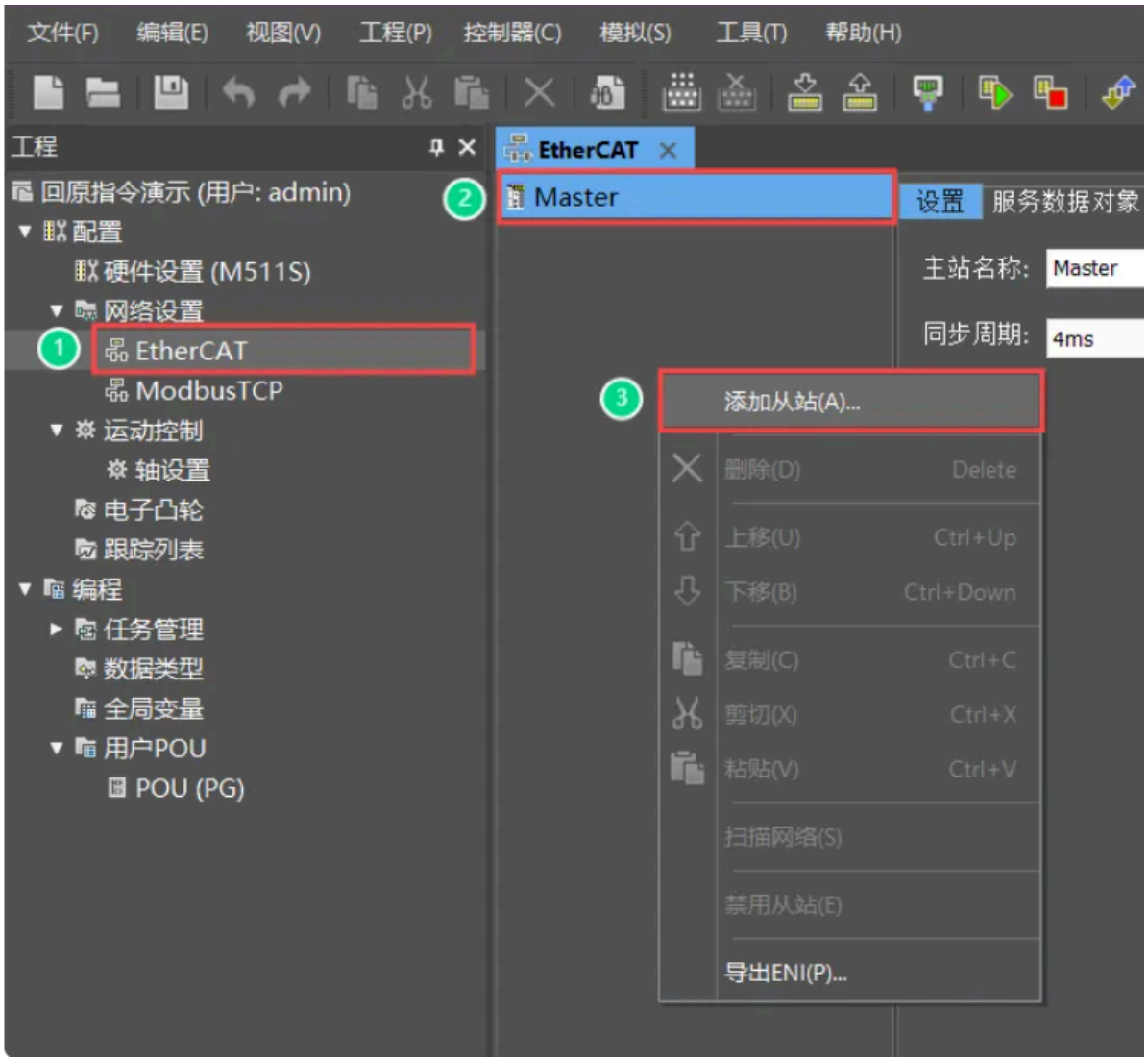
Communication connection

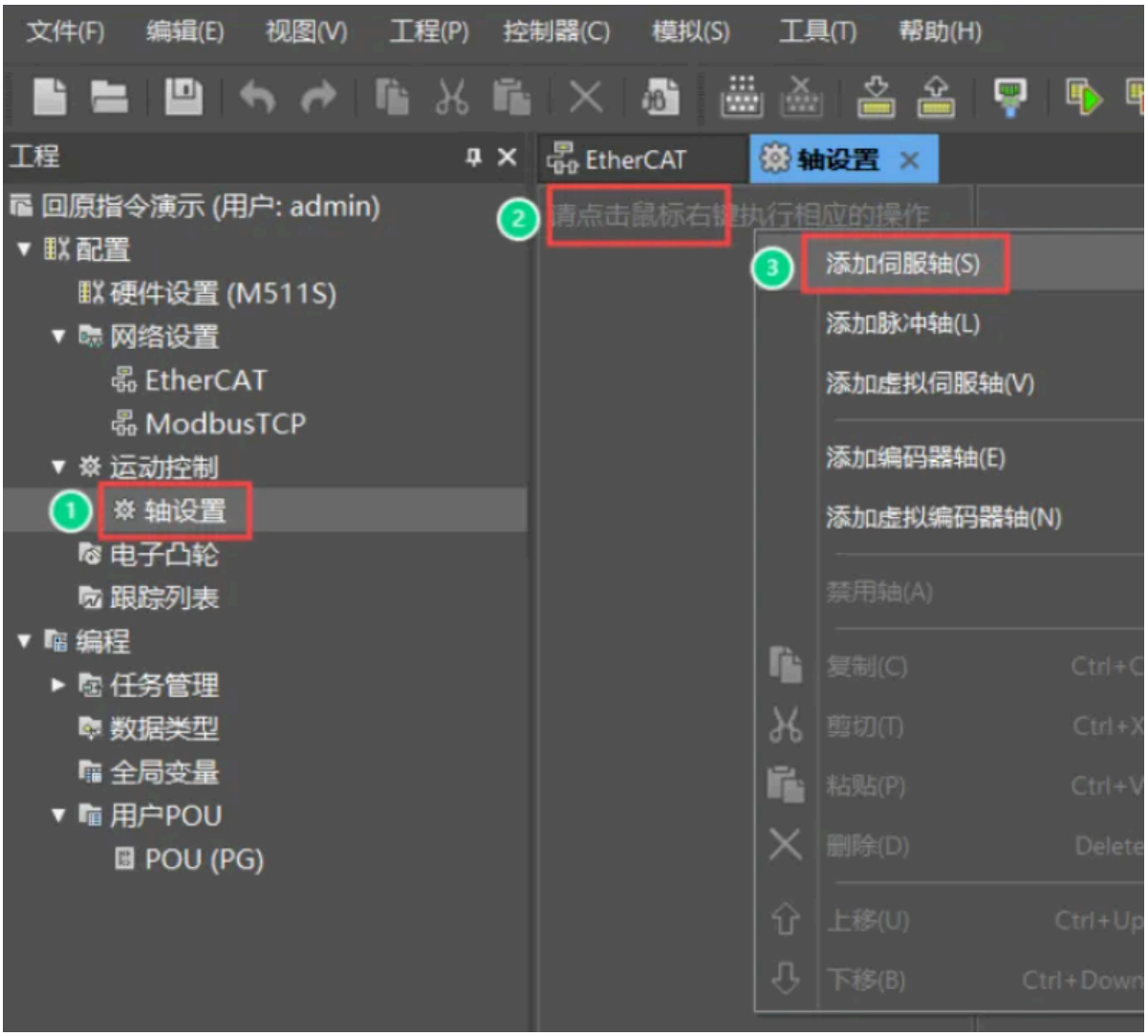
This tutorial uses the M controller HCM511S-32MT4-D and servo HN-Y7FB040A-S. The connection method is shown in the figure below.



Sysctrl Studio project basic configuration

Basic settings


文件(F)
编辑(E)
视图(V)
工程(P)
控制器(C)
模拟(S)
工具(T)
帮助(H)
工程
回原指令演示 (用户: admin)
配置
硬件设置 (M511S)
网络设置
EtherCAT
ModbusTCP
运动控制
轴设置
电子凸轮
跟踪列表
编程
任务管理
数据类型
全局变量
用户POU
POU (PG)
EtherCAT
Master
设置
服务数据对象
主站名称:
Master
同步周期:
4ms
添加从站(A)...
删除(D)
Delete
上移(U)
Ctrl+Up
下移(B)
Ctrl+Down
复制(C)
Ctrl+C
剪切(X)
Ctrl+X
粘贴(V)
Ctrl+V
扫描网络(S)
禁用从站(E)
导出ENI(P)...
1
2
3


文件(F)
编辑(E)
视图(V)
工程(P)
控制器(C)
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电子凸轮
跟踪列表
编程
任务管理
数据类型
全局变量
用户POU
POU (PG)
EtherCAT
轴设置
请点击鼠标右键执行相应的操作
添加伺服轴(S)
添加脉冲轴(L)
添加虚拟伺服轴(V)
添加编码器轴(E)
添加虚拟编码器轴(N)
禁用轴(A)
复制(C)
剪切(T)
粘贴(P)
删除(D)
上移(U)
下移(B)
1
2
3

基本设置 | 原点返回设置 | 操作设置 | 点动 | 诊断

基本信息

名称: 伺服轴1

轴号: 1

轴类型和输入输出

轴类型: 伺服轴

关联到设备... [节点1001] H

轴位置模式和单元

○ 线性模式 ● 循环模式

模: 360.000 [单元]

单位: 单元

软件限位

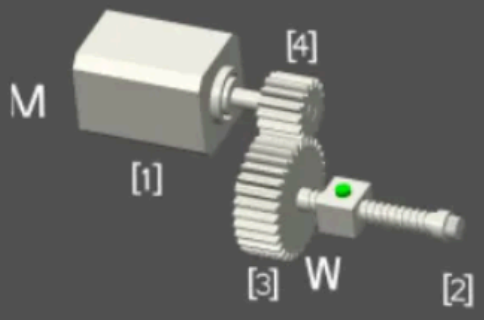
■ 激活软件限位

反向软件限位: 0.000

正向软件限位: 1000.000

传动机构参数设置

机构类型: 丝杠



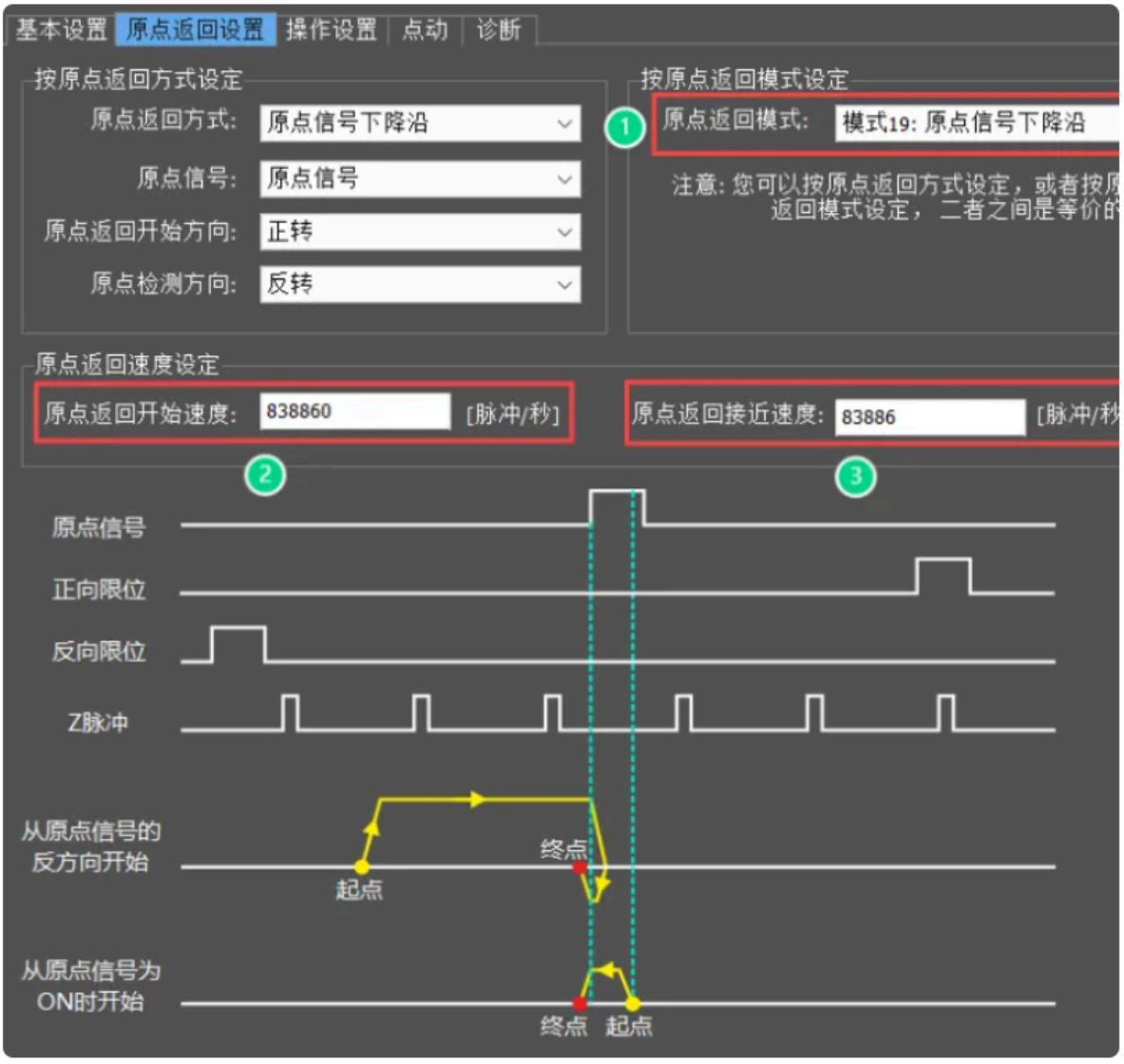
1

[1] 电机每转的脉冲数目: 8388608

[2] 工作每转的工作行程: 360.000

[3] 减速机输出转速: 1

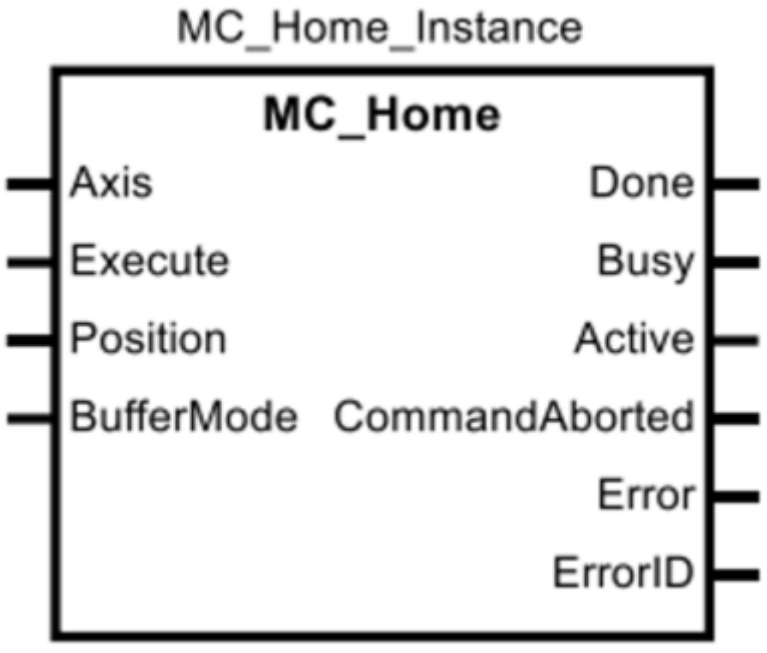
[4] 减速机输入转速: 1



[Add slave station] >> [Add servo axis] >> [Related equipment] >> [Mechanism parameter setting]

Homing Instruction

MC_Home



① Functional description

This command controls the axis to return to its origin position according to the specified mode. After returning to the origin position, the axis position becomes the value specified by Position. It is worth noting that this command is used to trigger the driver's own homing function. The corresponding signal must be connected to the driver according to the homing function requirements. The homing mode and homing speed can be set in the axis configuration section of the software. Specific parameter settings and status can be referred to in the table below.

②Pin Description

■ **Input variable**

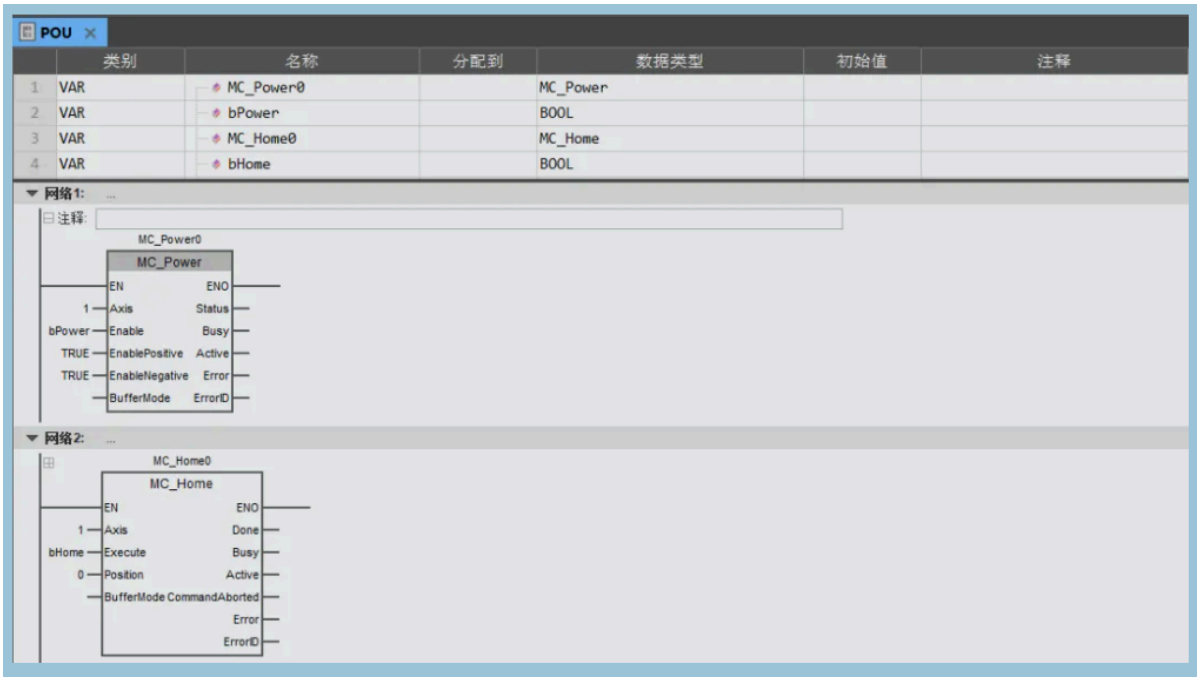
Name	Meaning	Data type	Valid range	Default	Description
Axis	Axis number	USINT	Depend on model	Required field	Specify the axis number of the control axis
Execute	Start	BOOL	TRUE or FALSE	FALSE	Execute the instruction when the rising edge of the parameter is detected
Position	Home position	LREAL	Negative number, positive number, 0	0	The set position of the axis after finding the origin (unit: travel unit) *1
BufferMode	Buffer mode	MC_Buffer_Mode	0: Reserved	0	Reserved

*1: For a detailed introduction to instruction units, please refer to the *"Parameter unit of motion control instructions"*.

■ **Output variable**

Name	Meaning	Data type	Valid range	Description
Done	Completed	BOOL	TRUE or FALSE	TRUE when the instruction is completed
Busy	Executing	BOOL	TRUE or FALSE	TRUE when the instruction is executed
Active	Under control	BOOL	TRUE or FALSE	TRUE when the axis is under control
CommandAborted	Aborted	BOOL	TRUE or FALSE	TRUE when an instruction is aborted
Error	Error	BOOL	TRUE or FALSE	TRUE when there is an error
ErrorID	Error code	WORD	0~65535	Refer to "*instruction error code description*" for the meaning of the output error code value when an instruction execution error occurs.

Instruction Test



MC_ Home **function block test**

a. Select mode 19 for the servo axis parameters to return to their original state. Set the origin return start speed to 838860 pulses per second and the origin return approach speed to 83886 pulses per second. Enable the axis and trigger the MC_Home function block.

Result: The servo enters the homing mode. The axis searches for the origin signal in the forward direction at a speed of 36 (0.1 rpm). After encountering the origin signal, it decelerates and stops. Then it runs in the reverse direction at a low speed. After detecting the falling edge of the origin signal, it stops and sets the origin.

b. After triggering the MC_Home function block, read PDO16#6061

Result: The control mode of the 16#6061 drive is displayed as 6.

[Description] The MC_Home instruction triggers the internal return to origin function of the servo drive.

MC_HomeWithParm (return to origin with specified parameters)

① Functional description

This command controls the axis to return to its home position according to the mode set in HomeMode. After returning to home, the axis position changes to the value specified in Position. This command triggers the drive's own homing function. The corresponding signal must be connected to the drive according to the homing function's requirements. After executing this command, the servo's homing mode, homing speed, and acceleration are modified. For specific parameter settings and status, refer to the table below.

②Pin Description

■ Input variable

Name	Meaning	Data type	Valid range	Default	Description
Axis	Axis number	USINT	Depend on model	Required field	Specify the axis number of the control axis
Execute	Start	BOOL	TRUE or FALSE	FALSE	Execute the instruction when the rising edge of the parameter is detected
HomeMode	Homing mode	USINT	1~35	Required field	Control the way the specified axis finds the origin
Position	Home position	LREAL	Negative number, positive number, 0	0	The set position of the axis after finding the origin (unit: travel unit) *1
SpeedToSwitch	Starting speed of homing	UDINT	Positive number, 0		Set the speed when searching for the origin
SpeedToZero	Homing approach speed	UDINT	Positive number, 0		The speed at which deceleration stops after encountering the home signal
HomeAcc	Acceleration when searching for the origin	UDINT	Positive number, 0		Acceleration from stationary to reaching the origin and returning to the starting velocity
BufferMode	Buffer mode	MC_Buffer_Mode	0: Reserved	0	Reserved

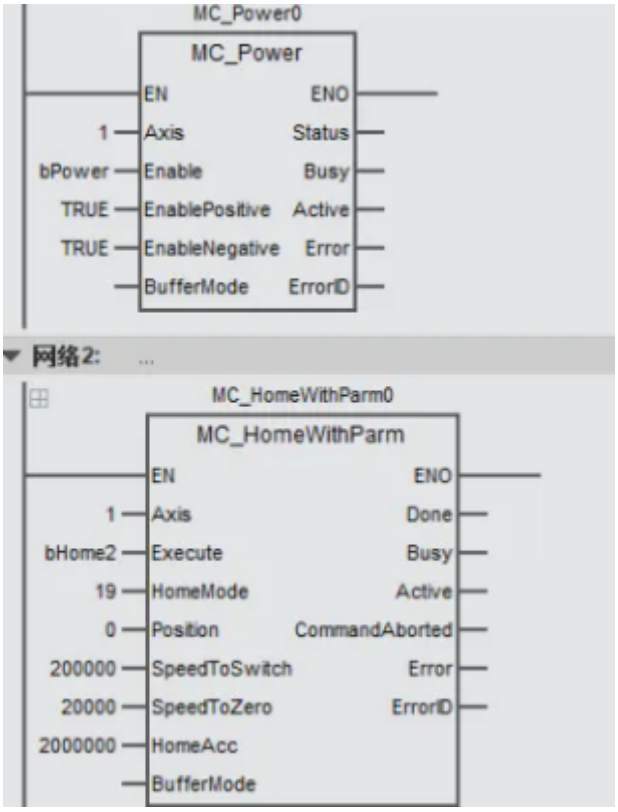
*1: For a detailed of instruction units, please refer to the *"Parameter unit of motion control instructions"*.

■ Output variable

Name	Meaning	Data type	Valid range	Description
Done	Completed	BOOL	TRUE or FALSE	TURE when the instruction execution is completed
Busy	Executing	BOOL	TRUE or FALSE	TRUE when the instruction is executed
Active	Under control	BOOL	TRUE or FALSE	TRUE when the axis is under control
CommandAborted	Aborted	BOOL	TRUE or FALSE	TRUE when an instruction is aborted
Error	Error	BOOL	TRUE or FALSE	TRUE when there is an error
ErrorID	Error code	WORD	0~65535	Refer to "*instruction error code description*" for the meaning of the output error code value when an instruction execution error occurs.

Instruction Test

Project Settings



MC_HomeWithParm function block test

a. Function block input parameters return to the original mode selection mode 19, set the origin return start speed to 200,000 pulses per second, the origin return approach speed to 20,000 pulses per second, enable the axis, and trigger the MC_HomeWithParm function block.

Result: The servo enters the homing mode and searches for the origin signal in the forward direction at a speed of 8.58 (0.02 rpm). It decelerates and stops when it encounters the origin signal, then runs in the reverse direction at a low speed. It stops when it detects the falling edge of the origin signal and sets the origin.

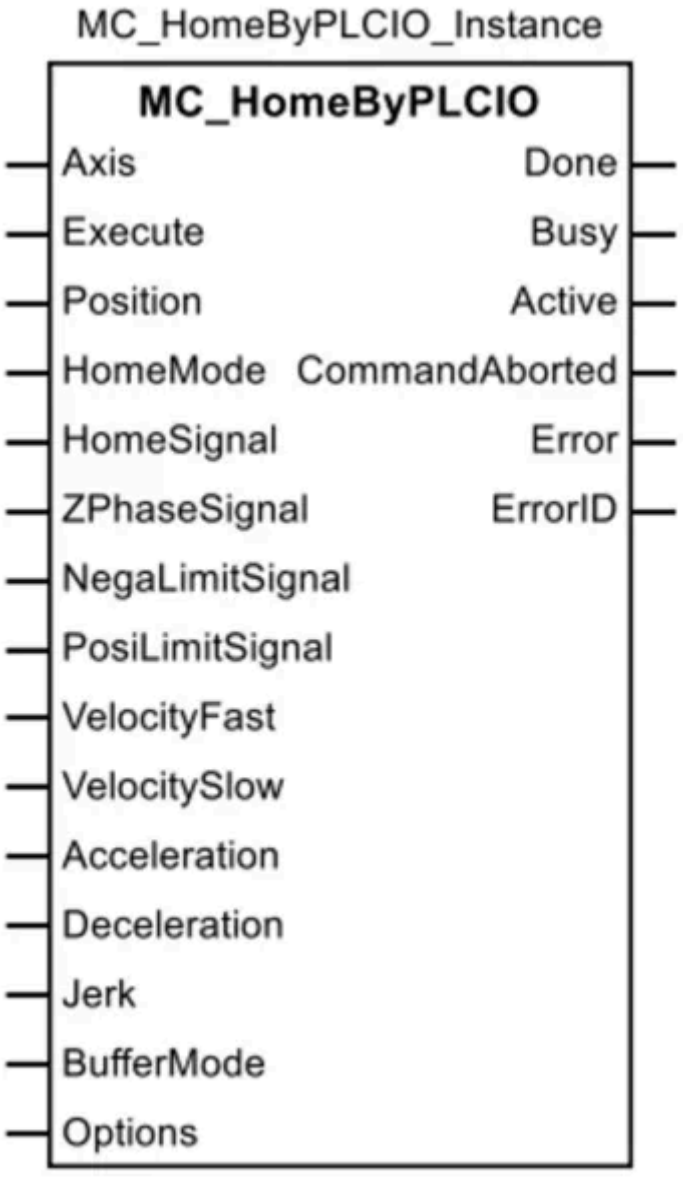
b. After triggering the MC_HomeWithParm function block, read PDO16#6061

Result: The control mode of the 16#6061 drive is displayed as 6.

[Description]

The MC_HomeWithParm command performs essentially the same actions as the MC_Home command, differing only in how the return parameters are set. The MC_HomeWithParm command is more flexible, allowing users to modify parameters such as the return method and speed on devices such as touch screens.

MC_HomeByPLCIO (Homing by controller)



① Functional description

This command controls the axis to return to its home position according to the mode specified by HomeMode. After returning to the home position, the axis position becomes the value specified by Position. The command has 15 HomeMode homing modes: Modes 17 through 30, and Mode 35. Note that this command is a controller homing function, requiring the corresponding signal to be connected to the controller according to its homing function requirements. For specific parameter settings and status, refer to the table below.

■ **Input variable**

Name	Meaning	Data type	Valid range	Default	Description
Axis	Axis number	USINT	Depend on model	Required field	Specify the axis number of the control axis
Execute	Start	BOOL	TRUE or FALSE	FALSE	Execute the instruction when the rising edge of the parameter is detected
Position	Home position	LREAL	Negative number, positive number, 0	0	The set position of the axis after homing (unit: travel unit)
HomeMode	Home mode	INT	17~30、35	0	Different modes of homing For details, please refer to Appendix 1 Homing modes
HomeSignal	Home signal	BOOL	TRUE or FALSE	FALSE	When the rising edge of this parameter is detected, the axis executes corresponding actions based on different homing modes (this signal needs to be connected to the controller)
ZPhaseSignal	Z-phase signal	BOOL	TRUE or FALSE	FALSE	Not available for now
NegaLimitSignal	Negative limit signal	BOOL	TRUE or FALSE	FALSE	When the rising edge of this parameter is detected, the axis executes corresponding actions based on different homing modes (this signal needs to be connected to the controller)
PosiLimitSignal	Positive limit signal	BOOL	TRUE or FALSE	FALSE	When the rising edge of this parameter is detected, the axis executes corresponding actions based on different homing modes (this signal needs to be connected to the controller)
VelocityFast	Starting velocity of homing	LREAL	Negative number, positive number, 0	0	Set the velocity when searching for the origin
VelocityLow	Homing approach velocity	LREAL	Negative number, positive number, 0	0	The velocity at which deceleration stops after encountering the home signal
Acceleration	Acceleration	LREAL	Negative number, positive number, 0	0	Specify acceleration *1 (Unit: travel unit/second^2) *2

Deceleration	Deceleration	LREAL	Negative number, positive number, 0	0	Specify deceleration *1 (Unit: travel unit/second²) *2
Jerk	Jerk	LREAL	Negative number, positive number, 0	0	Specify jerk *1 (Unit: travel unit/second³) *2
BuffMode	Buffer mode	MC_Buffer_Mode	0：mcAborting	0	Reserved
Options	Reserved	Reserved	Reserved	Reserved	Reserved

*1: For the relationship among Velocity, Acceleration, Deceleration, and Jerk, please refer to the *"Parameter description of motion control instructions"*.

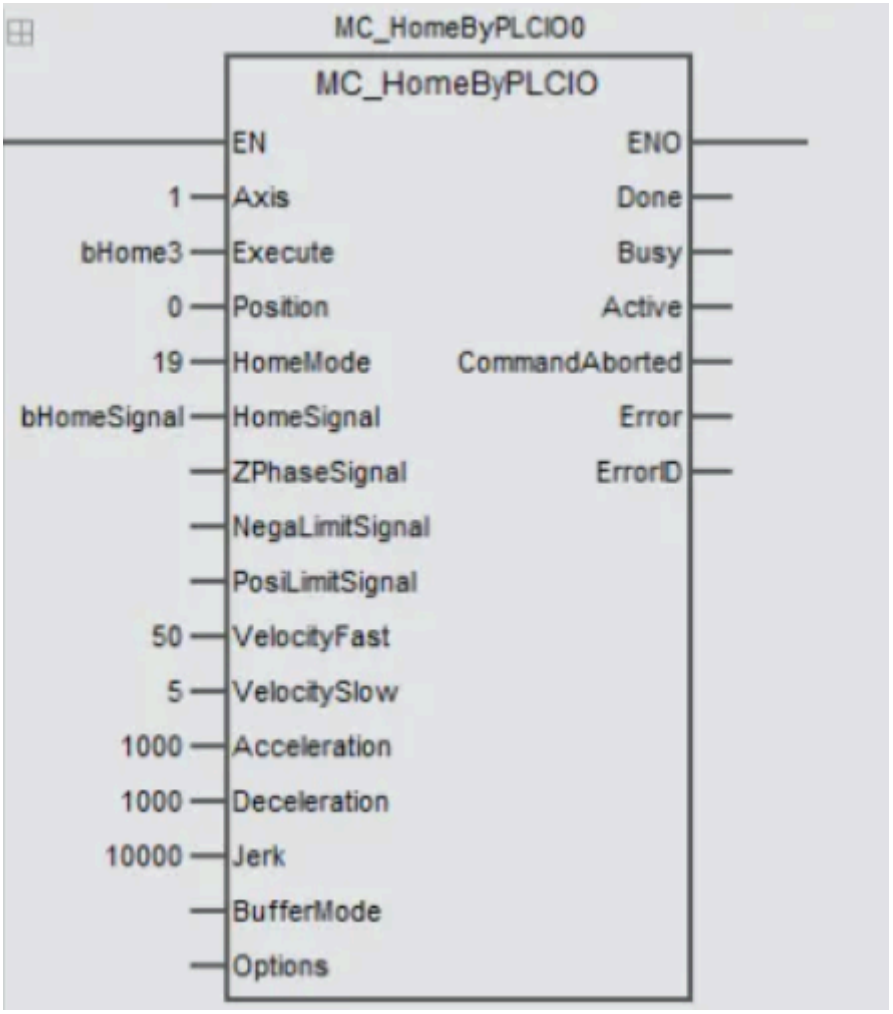
*2: For a detailed introduction to instruction units, please refer to the *"Parameter unit of motion control instructions"*.

■ **Output variable**

Name	Meaning	Data type	Valid range	Description
Done	Completed	BOOL	TRUE or FALSE	TRUE when jogging stops
Busy	Executing	BOOL	TRUE or FALSE	TRUE when the instruction is executed
Active	Under control	BOOL	TRUE or FALSE	TRUE when the axis is under control
CommandAborted	Aborted	BOOL	TRUE or FALSE	TRUE when an instruction is aborted
Error	Error	BOOL	TRUE or FALSE	TRUE when there is an error
ErrorID	Error code	WORD	0~65535	Refer to "*instruction error code description*" for the meaning of the output error code value when an instruction execution error occurs.

Instruction Test

Project Settings



MC_HomeByPLCIO function block test (following are the sequential steps)

a. Function block input parameters return to original mode, select mode 19, set the origin return start speed to 50 user units per second, the origin return approach speed to 5 user units per second, enable the axis, and trigger the MC_HomeByPLCIO function block.

Result: The servo motor starts searching for the origin, searching for the origin signal in the forward direction at a speed of 50 (0.14 rpm). It decelerates and stops when it encounters the origin signal, then runs in the reverse direction at a low speed. It stops when it detects the falling edge of the origin signal, and the origin is set.

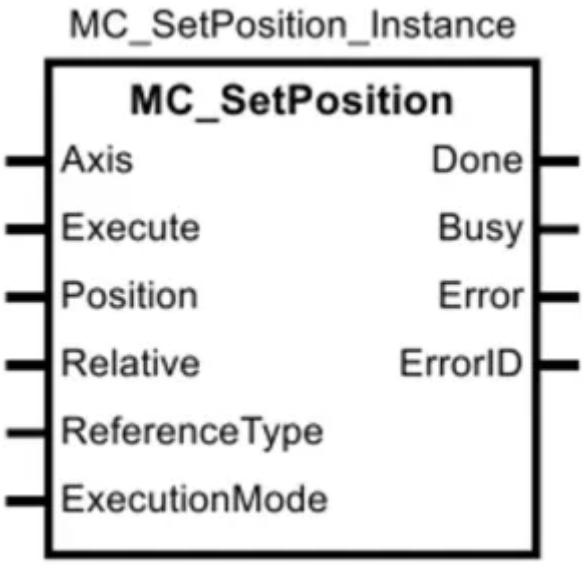
b. After triggering the MC_HomeByPLCIO function block, read PDO16#6061 multiple times

Result: When the servo motor is searching for the origin after the command is triggered, the value of 16#6061 is 8. After the origin is found, the value of 16#6061 is 6.

[Explanation]

The MC_HomeByPLCIO instruction performs basically the same actions as the previous two instructions, but the origin and limit signals are connected to the controller. The servo motor's home action is controlled by the controller. Only after finding the origin position will the servo's No. 35 home method (with the current position as the origin) be triggered.

MC_SetPosition (Set Axis Position)



① Functional description

This command sets the axis position to a specified value. The following features are important: 1. This command only modifies the axis position, not the drive position; 2. This command has no effect on the currently executing motion, but does affect subsequent commands; 3. The axis does not actually move during the execution of this command. For detailed parameter settings and status, refer to the table below.

②Pin Description

■ Input variable

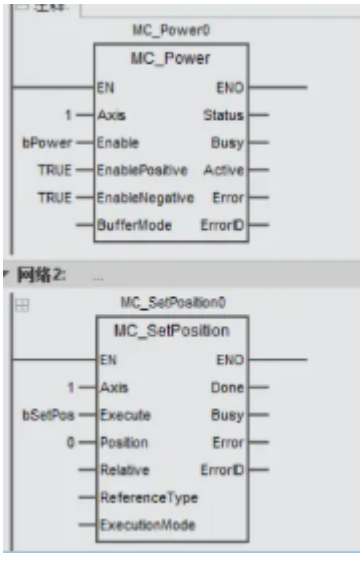
Name	Meaning	Data type	Valid range	Default	Description
Axis	Axis number	USINT	Depend on model	Required field	Specify the axis number of the control axis
Execute	Execute	BOOL	TRUE or FALSE	FALSE	Execute this instruction when the rising edge of this parameter is detected
Position	Target position	LREAL	Positive number, Negative number, 0	0	Specify the target position (Unit: Travel unit)
Relative	Relative position selection	BOOL	TRUE or FALSE	FALSE	Specifies the relative position type TRUE: Relative FALSE: Absolute
ReferenceType	Position type selection	MC_ ReferenceType	0: mcCommandPosition 1: mcActualPosition	0	Specifies the position type 0: Command position 1: Actual position
ExecutionMode	Execution mode	Reserved	Reserved	Reserved	Reserved (This input pin can be left unfilled with variables or constants)

■ Output variable

Name	Meaning	Data type	Valid range	Description
Done	Completed	BOOL	TRUE or FALSE	TRUE when the instruction is completed
Busy	Executing	BOOL	TRUE or FALSE	TRUE when the instruction is executed
Error	Error	BOOL	TRUE or FALSE	TRUE when there is an error
ErrorID	Error Code	WORD	0~65535	Refer to "instruction error code description" for the meaning of the output error code value when an instruction execution error occurs.

Instruction Test

Project Settings



MC_SetPosition function block test

a. Check the command position and actual position in the axis status before executing the MC_SetPosition instruction

Result: The command position and the actual position are not 0.

b. Read the PDO16#6064 position feedback value before executing the MC_SetPosition instruction

Result: The position feedback value of 16#6064 is also not 0.

c. After executing the MC_SetPosition instruction, check the command position and actual position in the axis status

Result: The command position and the actual position are 0.

d. Read the PDO16#6064 position feedback value after executing the MC_SetPosition instruction

Result: The position feedback value of 16#6064 is still not 0.

e. Execute the MC_HomeByPLCIO instruction again and read the PDO16#6064 position feedback value.

Result: The position feedback value of 16#6064 is 0.

[Note]

The MC_SetPosition instruction only modifies the command position and actual position on the controller side, and does not affect the PDO feedback value of the drive