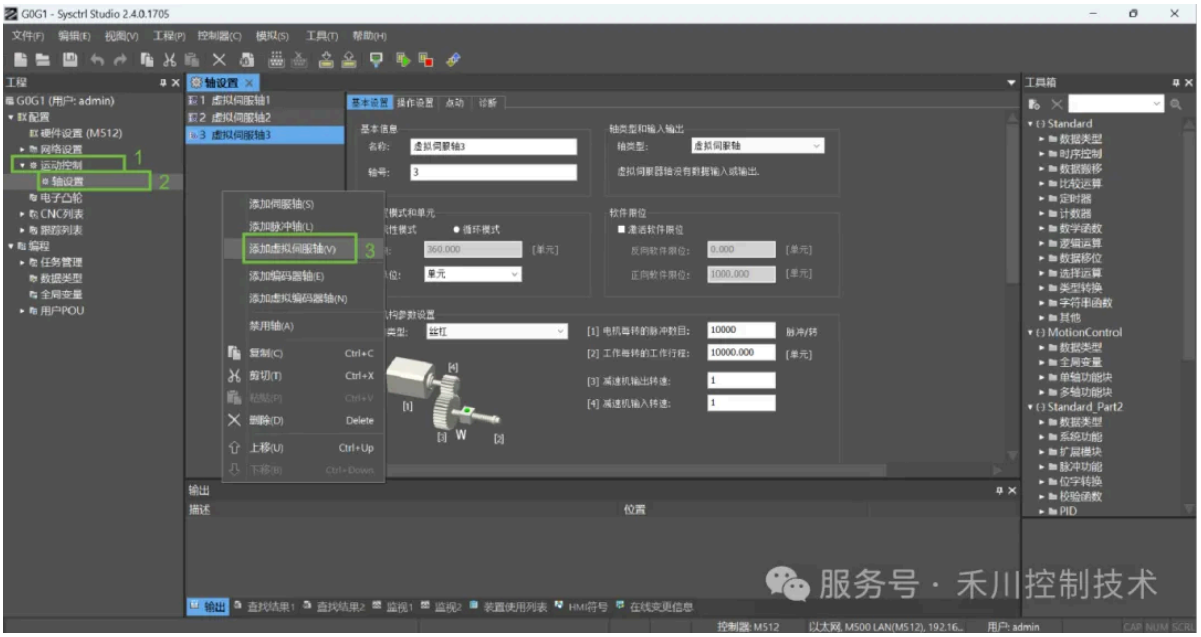
How to Move a Servo Motor

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.

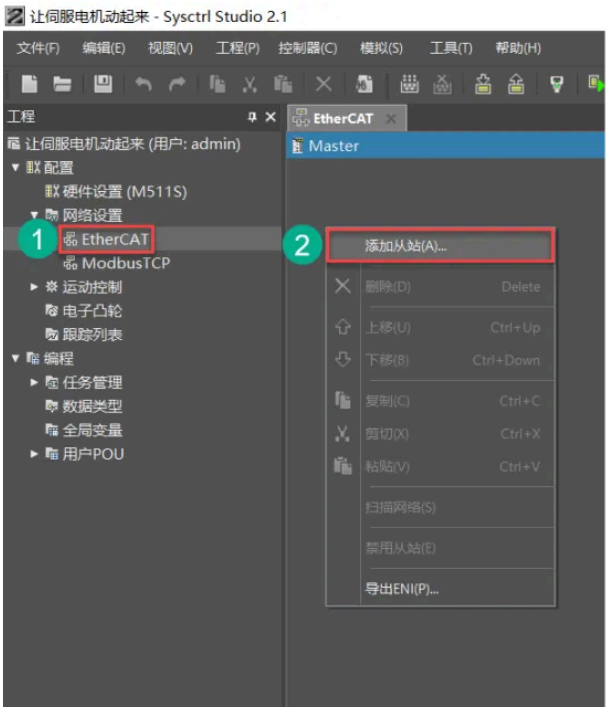


Sysctrl Studio project configuration

Basic Settings

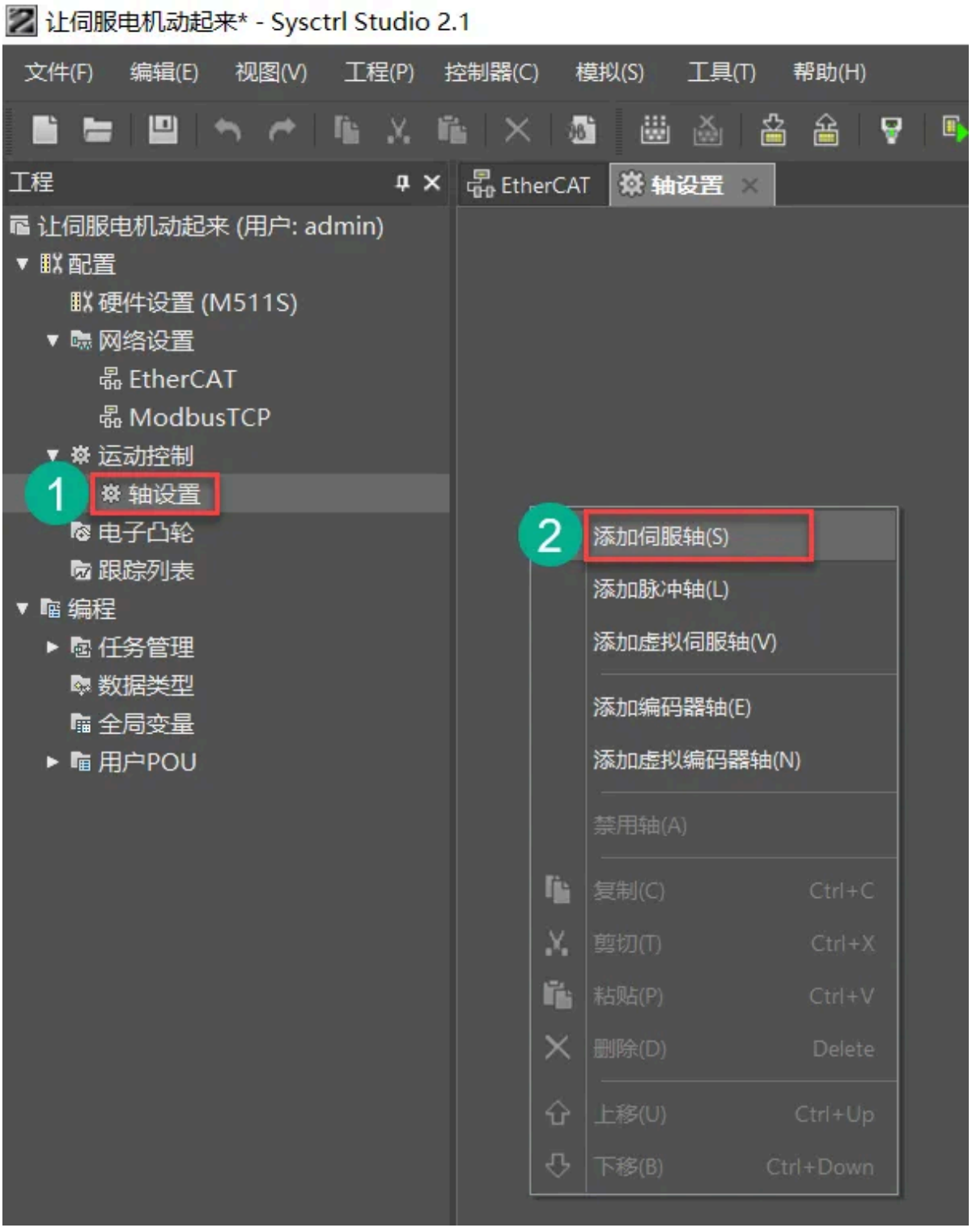
Step 1: Add a slave

Double-click to open the Sysctrl Studio software and create a new project. Click [Network Settings] >> [EtherCAT] >> right-click [Add Slave] in the blank area and select the servo slave to be added.



Step 2: Add Servo Axis

Click [Motion Control] >> [Axis Settings] >> right-click on the blank space and click [Add Servo Axis]



Step 3: Associate the device

Click [Link to device...] and select the device to be linked.

Step 4: Mechanism parameter configuration

[1] Number of pulses per motor revolution

Determined by the motor encoder resolution

① Y7S servo with motor

The Y7S must be used with motors that have electronic tags (PNXXXM versions - **the fourth digit of the PN code is M**). When using a motor with an electronic tag with the Y7S, the default resolution is 23 bits, regardless of whether the encoder is magnetic or optical.

For example:

A. P/N (first four digits): 220M >> 23-bit resolution >> 2^23=8388608

B. P/N (first four digits): 671M >> 23-bit resolution >> 2^23 = 8388608

② X series driver with motor

The resolution of the electronic tag motor (magnetic encoder) paired with the X-series driver remains at 17 bits due to consideration for existing customer applications. The resolution of the electronic tag motor (optical encoder) paired with the X-series driver is 23 bits. The encoder specifications can be determined by the naming convention and then mapped to the number of pulses.

SV - X6 MH 040 A - N 2 C D - ****

编码器规格

符号	规格
D	23 BIT绝对值
A	17 BIT绝对值
N	17 BIT增量式

For example:

A. SV - X6MH010A - N2CD: D>>23 BIT absolute value>>2^23 = 8388608

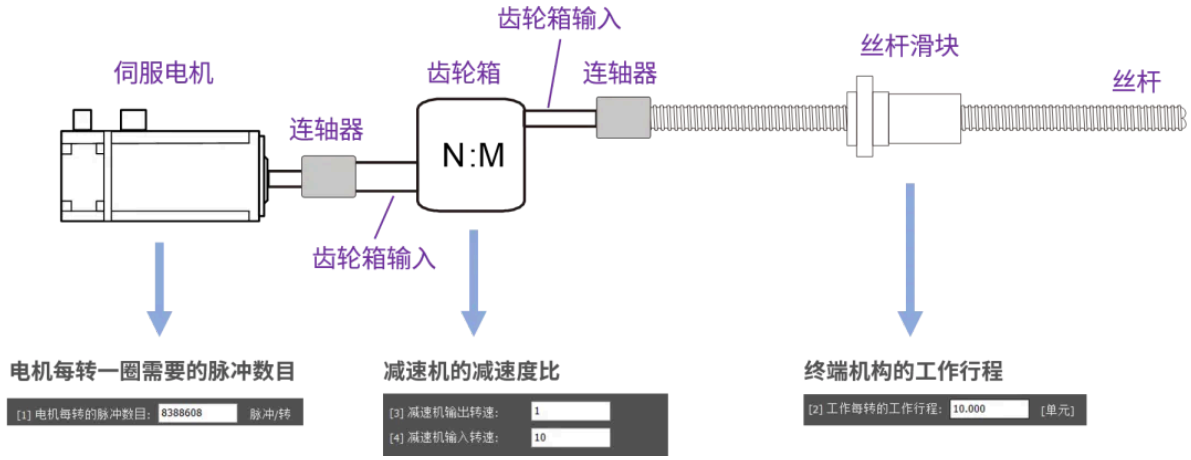
B. SV - X2MH040A - N2LA : A>>17 BIT absolute value>>2^17 = 131072

[2] Working distance per revolution

For example, if the screw pitch is 10mm, the mechanism lead is 10mm, and the unit is mm. In the motion instruction, the unit of the position parameter is mm, and the unit of the speed parameter is mm/s.

[3] Reducer output speed, [4] Reducer input speed

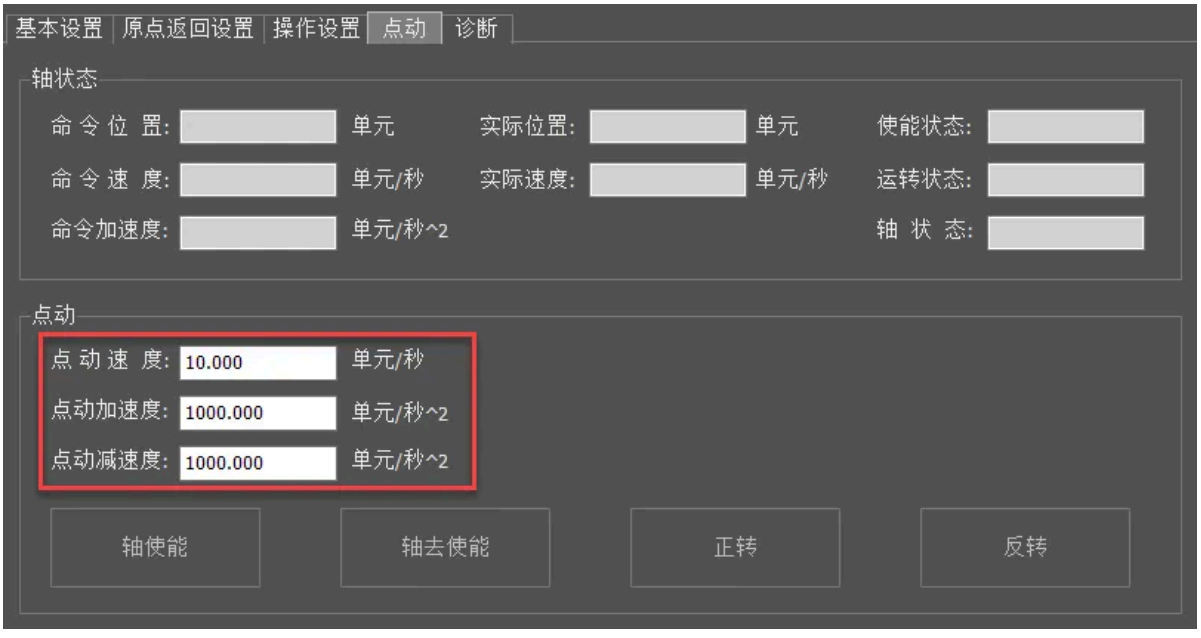
For example, if the speed ratio of the reducer is 10:1, the output speed is set to 1 and the input speed is 10.



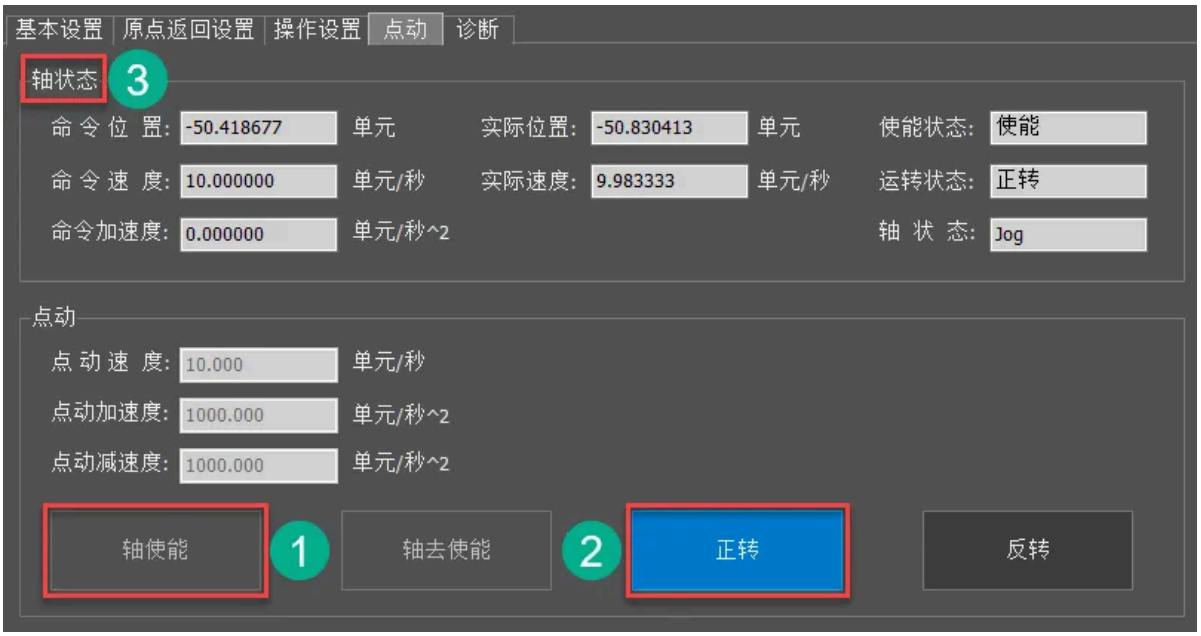
The parameter configuration completion interface is as follows

Programming-free control of motor operation

(1) Click [Jog] and enter the appropriate jog speed, acceleration, and deceleration in the jog window.



(2) Enter the monitoring state. Click [Axis Enable], and after successful enablement, click [Forward] or [Reverse]. The current axis status information will be displayed in the axis status window.



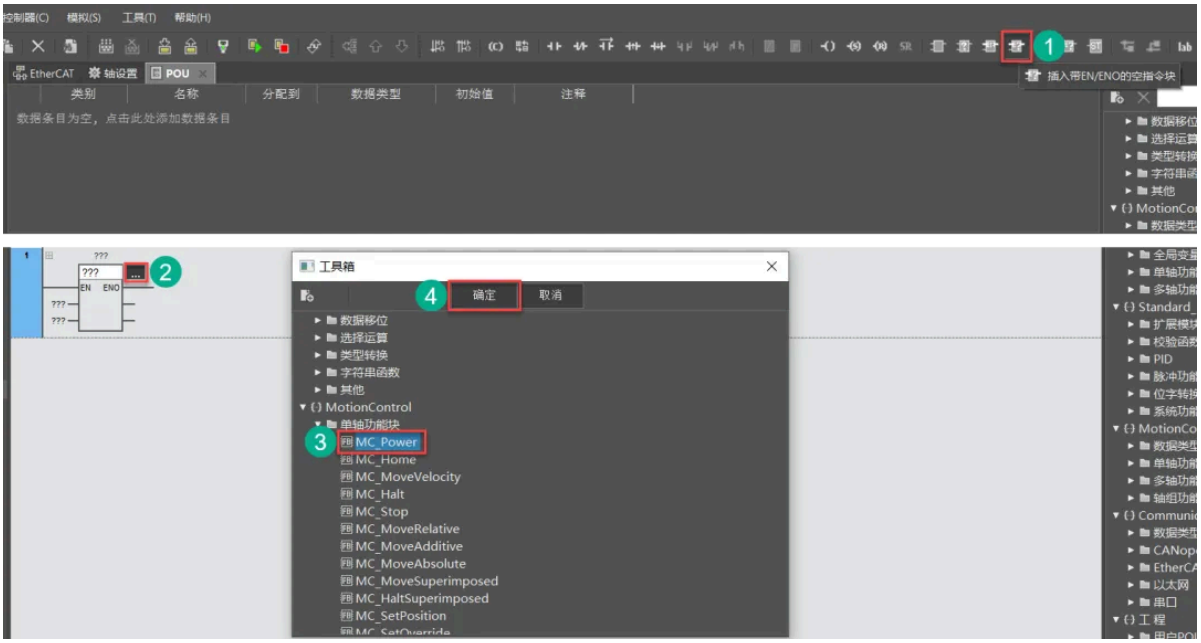
(3) After the test, you can click [Axis Disable]

Programming control of motor operation

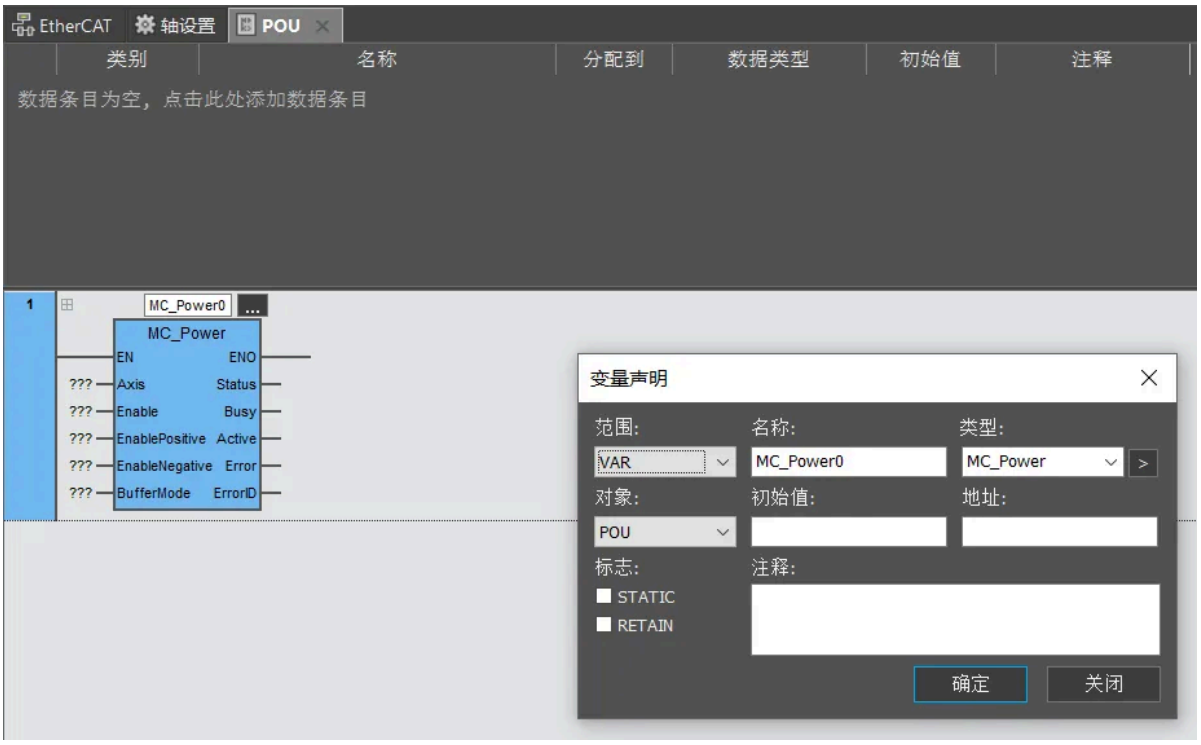
(1) Open the default POU. The default task type is event trigger, and the default event selection is motion event. The motion control function block needs to be called in the motion event type to be used normally.

If there is no motion event task, the programming-free control of the jog of the motor's running part cannot be used normally.

(2) Insert the MC_Power function block



The software will automatically instantiate the function block



(3) Set the MC_Power function block input pin

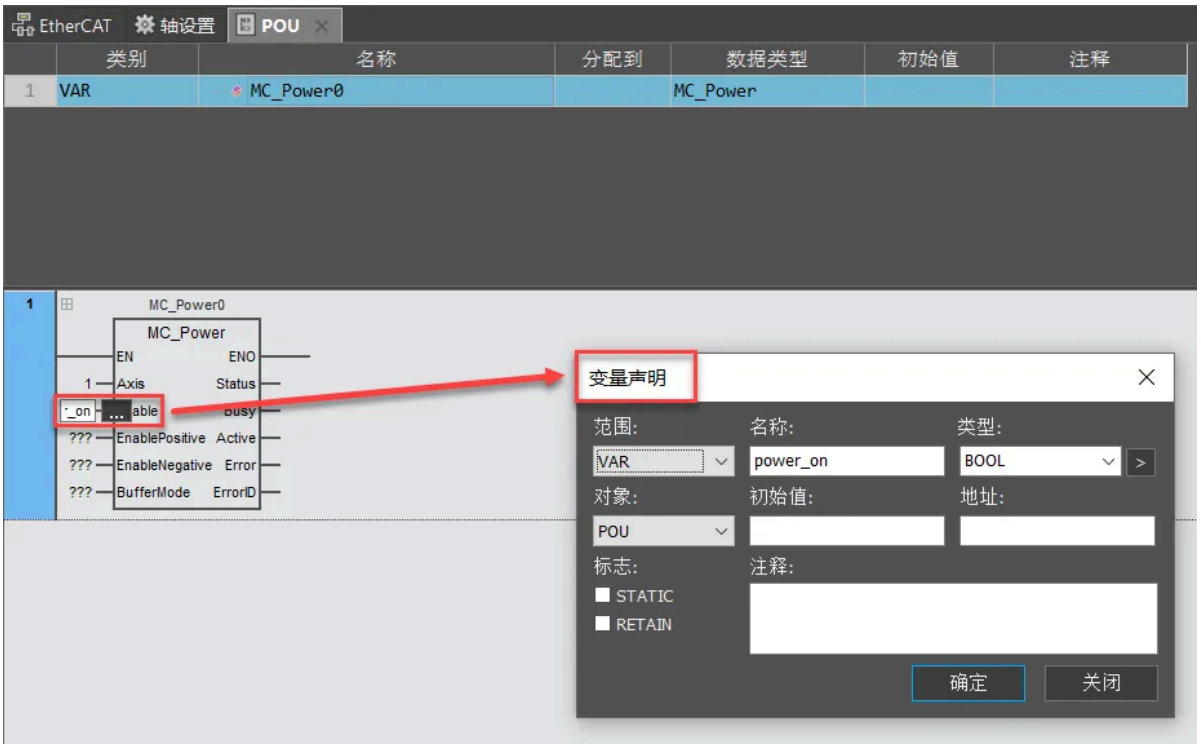
■ **Input variable**

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
Enable	Effective	BOOL	TRUE or FALSE	FALSE	Set to TRUE, control axis enters operating state Set to FALSE, release the axis's operating status
EnablePositive	Positive effective	BOOL	TRUE or FALSE	FALSE	Set to TRUE, allow axis forward rotation Set to FALSE, prohibit axis forward rotation
EnableNegative	Negative effective	BOOL	TRUE or FALSE	FALSE	Set to TRUE , allow axis reverse rotation Set to FALSE , prohibit axis reverse rotation
BufferMode	Buffer mode	MC_Buffer_Mode	0: mcAborting 1: mcBuffered	0	When Enable changes from TRUE to FALSE, the specified axis is released from operating state

■ **Output variable**

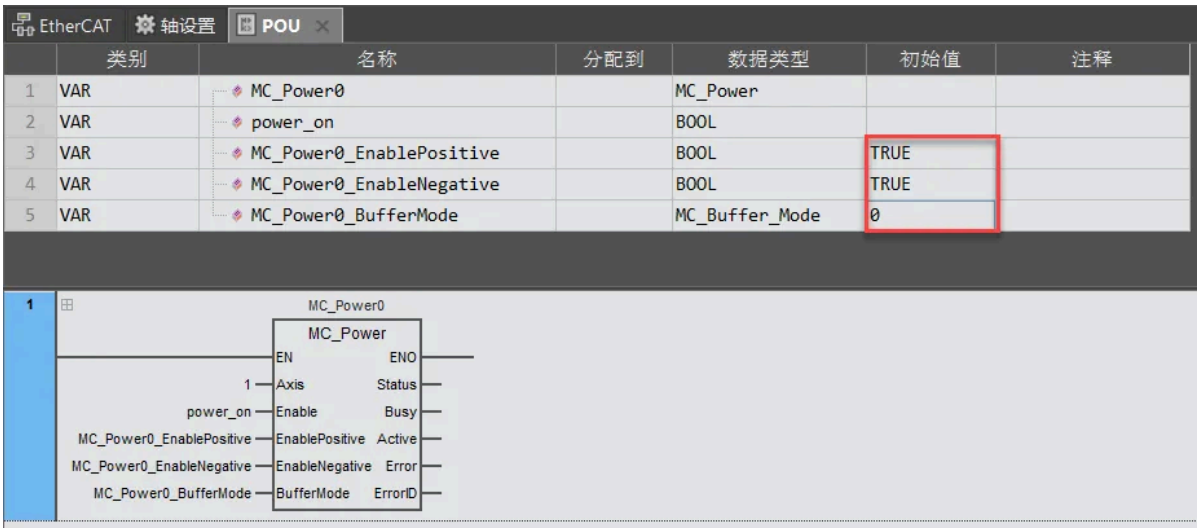
Name	Meaning	Data type	Valid range	Description
Status	Operable	BOOL	TRUE or FALSE	TRUE when the axis state has entered the operating state FALSE when the axis state is in the released operating state
Busy	Executing	BOOL	TRUE or FALSE	TRUE when the instruction is executed
Active	Under control	BOOL	TRUE or FALSE	TRUE when the axis is under control
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.

Users can set variables directly at the pins, and the variables will be automatically declared

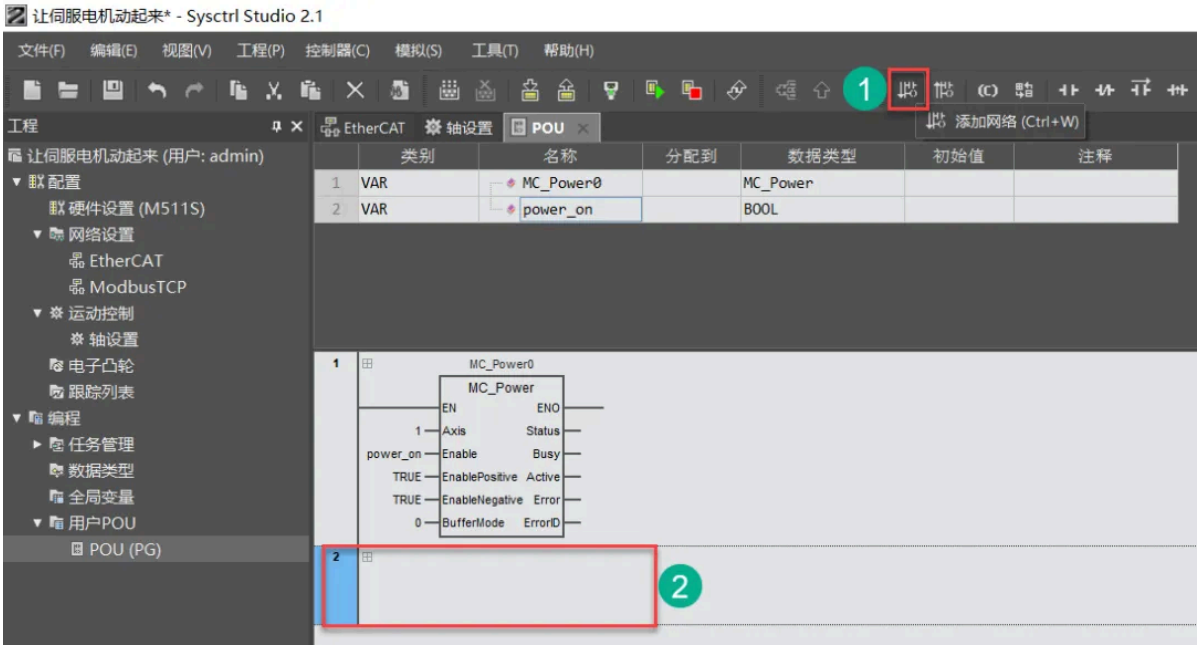


Or right-click the function block and click Automatically create input variables

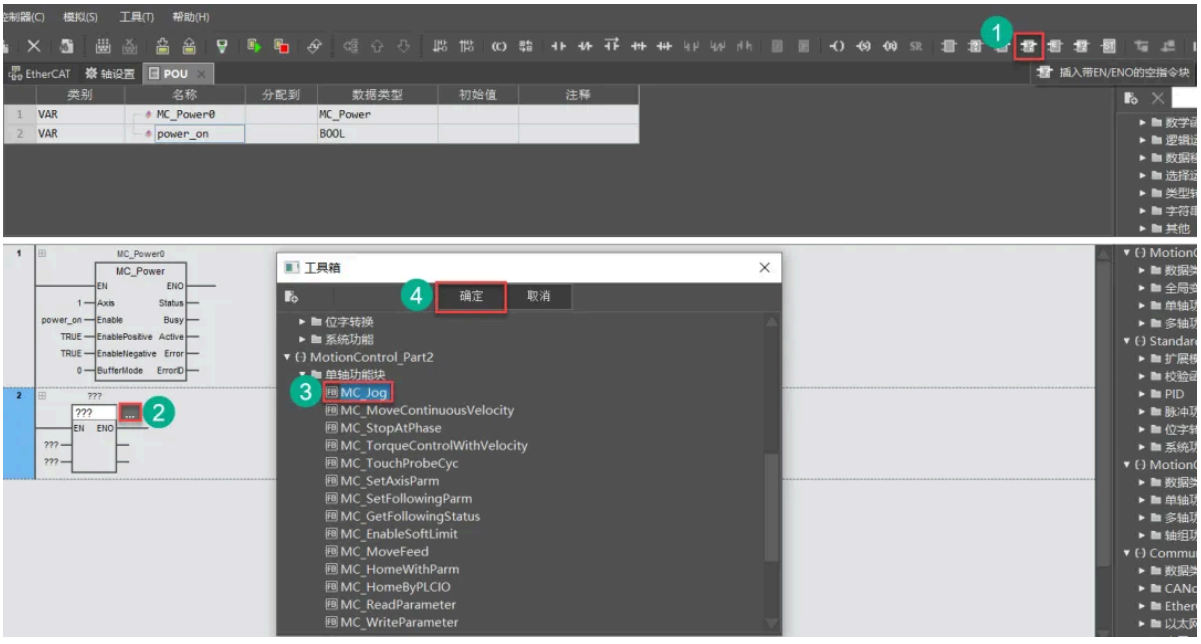
For ease of use, users can set initial values for some variables in the function block



(4) Add a network



(5) Insert the MC_Jog function block



(6) Set the MC_Jog function block input pin.

■ **Input variable**

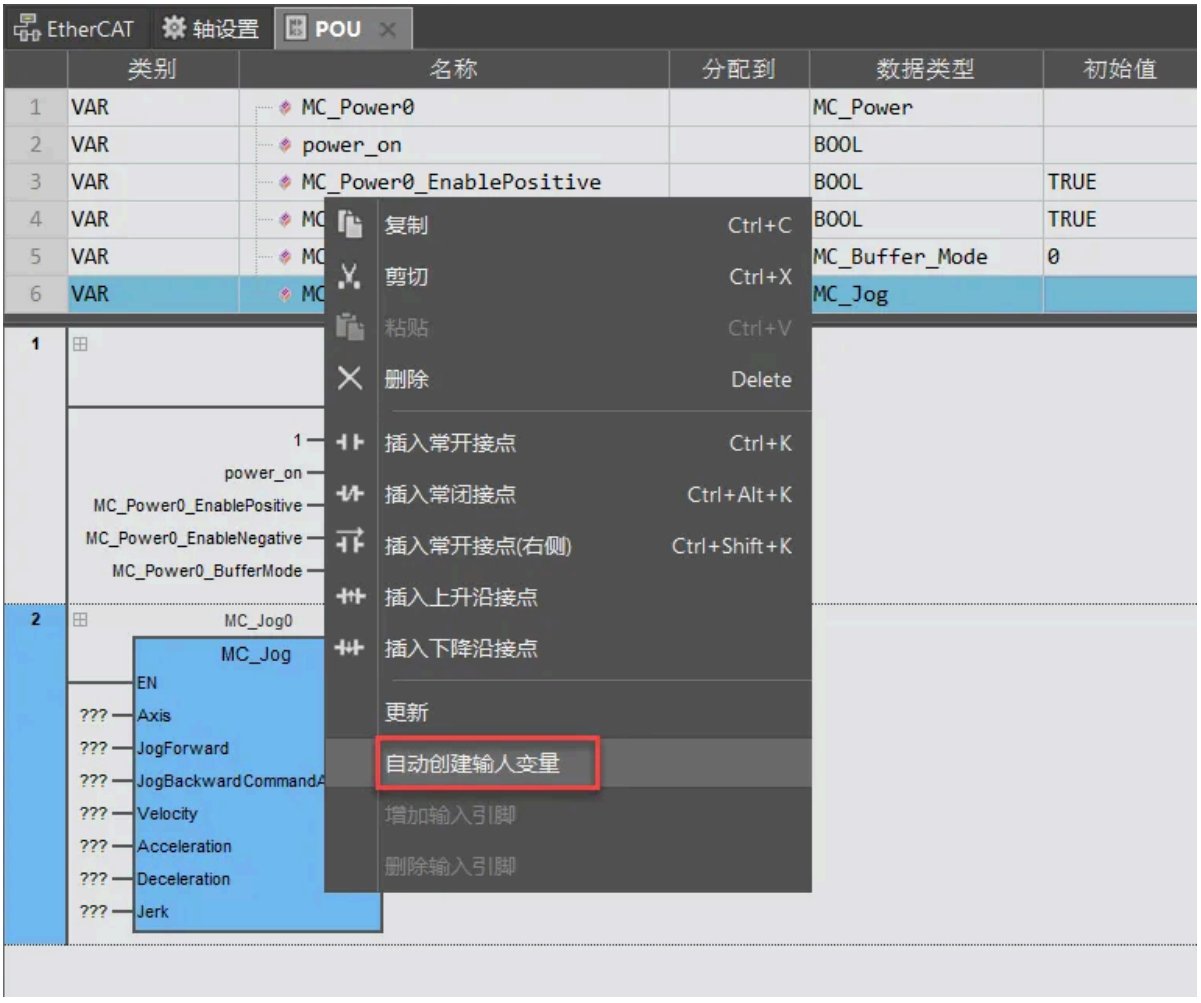
Name	Meaning	Data type	Valid range	Default	Description
Axis	Axis number	USINT	Depend on model	Required field	Specify the axis number of the control axis
JogForward	Jog forward	BOOL	TRUE or FALSE	FALSE	Set to TRUE, control the axis to move forward Set to FALSE, stop forward movement
JogBackward	Jog backward	BOOL	TRUE or FALSE	FALSE	Set to TRUE, control the axis to move backward Set to FALSE, stop reverse movement
Velocity	Target velocity	LREAL	Positive number	Required field	Specify target velocity *1 (unit: travel unit/second) *2
Acceleration	Acceleration	LREAL	Positive number	Required field	Specify acceleration *1 (unit: travel unit/second^2) *2
Deceleration	Deceleration	LREAL	Positive number	Required field	Specify deceleration *1 (unit: travel unit/second^2) *2
Jerk	Jerk	LREAL	Positive number	Required field	Specify jerk *1 (unit: travel unit/second^3) *2

*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
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.

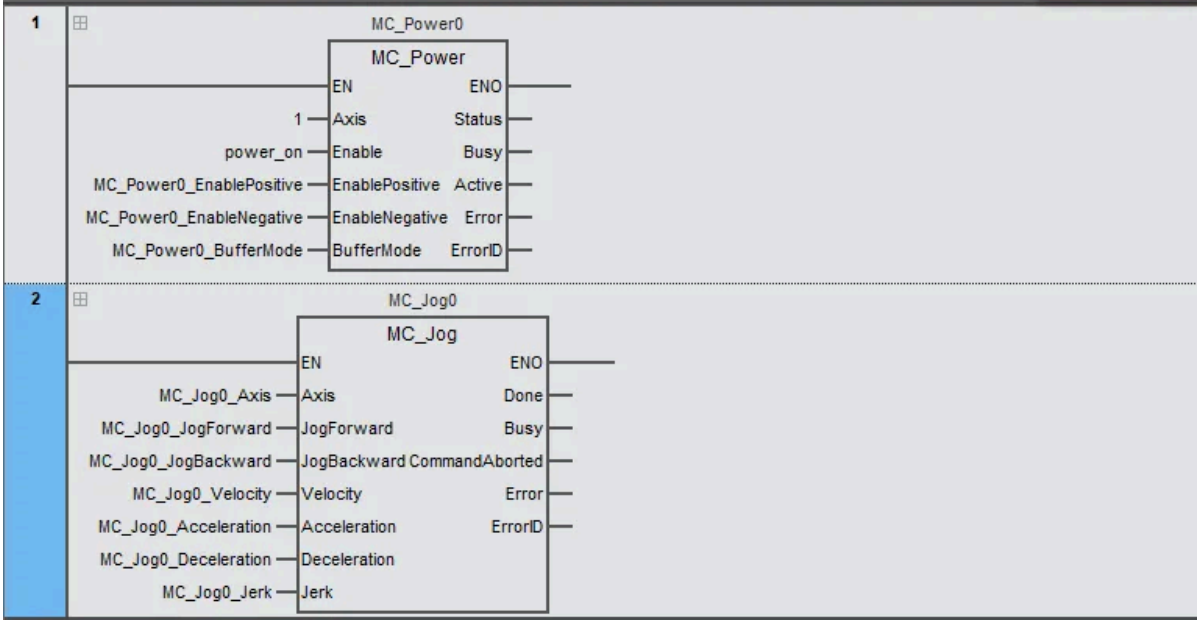
Right-click the function block and select Automatically create input variables.



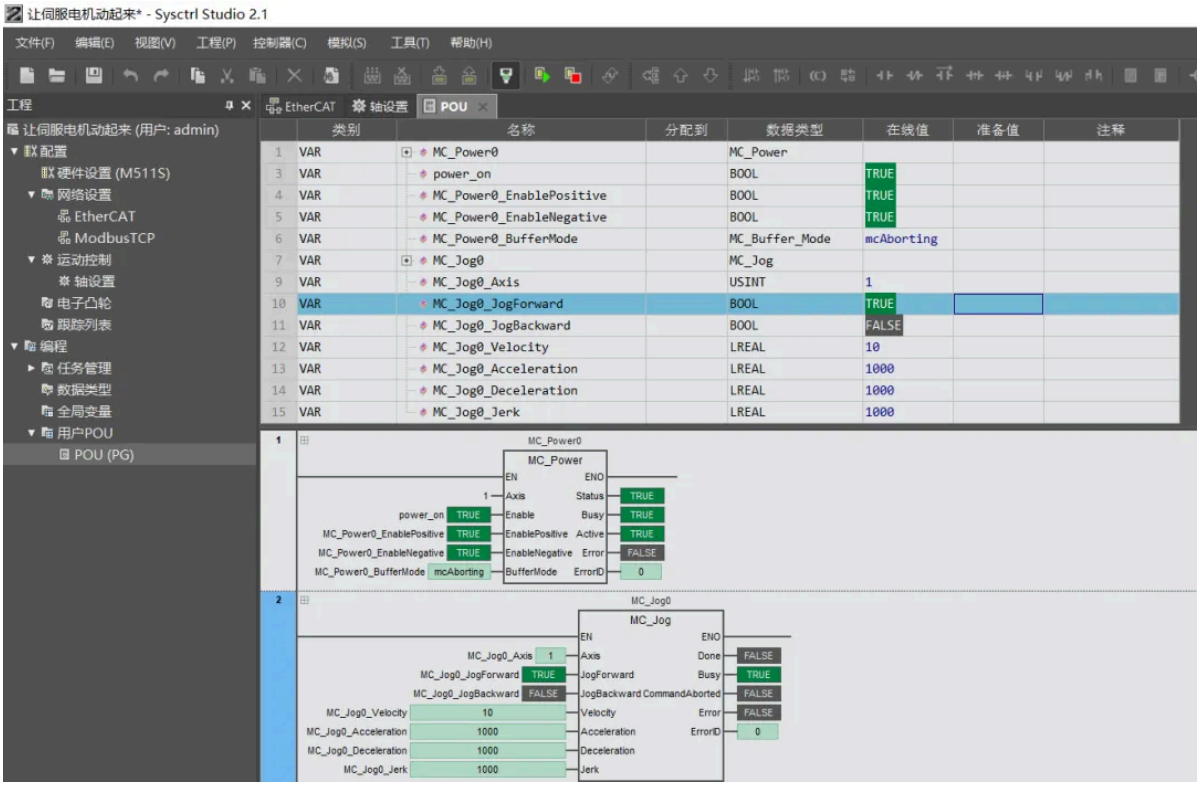
Set initial values for some variables in the function block

EtherCAT | 轴设置 | POU

	类别	名称	分配到	数据类型	初始值
1	VAR	MC_Power0		MC_Power	
2	VAR	power_on		BOOL	
3	VAR	MC_Power0_EnablePositive		BOOL	TRUE
4	VAR	MC_Power0_EnableNegative		BOOL	TRUE
5	VAR	MC_Power0_BufferMode		MC_Buffer_Mode	0
6	VAR	MC_Jog0		MC_Jog	
7	VAR	MC_Jog0_Axis		USINT	1
8	VAR	MC_Jog0_JogForward		BOOL	
9	VAR	MC_Jog0_JogBackward		BOOL	
10	VAR	MC_Jog0_Velocity		LREAL	10
11	VAR	MC_Jog0_Acceleration		LREAL	1000
12	VAR	MC_Jog0_Deceleration		LREAL	1000
13	VAR	MC_Jog0_Jerk		LREAL	1000



(7) Download the project to the controller, enter the monitoring state, and perform testing.


让伺服电机动起来* - Sysctrl Studio 2.1
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
让伺服电机动起来 (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
轴设置
POU
类别 名称 分配到 数据类型 在线值 准备值 注释
1 VAR MC_Power0 MC_Power
3 VAR power_on BOOL TRUE
4 VAR MC_Power0_EnablePositive BOOL TRUE
5 VAR MC_Power0_EnableNegative BOOL TRUE
6 VAR MC_Power0_BufferMode MC_Buffer_Mode mcAborting
7 VAR MC_Jog0 MC_Jog
9 VAR MC_Jog0_Axis USINT 1
10 VAR MC_Jog0_JogForward BOOL TRUE
11 VAR MC_Jog0_JogBackward BOOL FALSE
12 VAR MC_Jog0_Velocity LREAL 10
13 VAR MC_Jog0_Acceleration LREAL 1000
14 VAR MC_Jog0_Deceleration LREAL 1000
15 VAR MC_Jog0_Jerk LREAL 1000
1
MC_Power0
MC_Power
EN ENO
1 Axis Status TRUE
power_on TRUE Enable Busy TRUE
MC_Power0_EnablePositive TRUE EnablePositive Active TRUE
MC_Power0_EnableNegative TRUE EnableNegative Error FALSE
MC_Power0_BufferMode mcAborting BufferMode ErrorID 0
2
MC_Jog0
MC_Jog
EN ENO
MC_Jog0_Axis 1 Axis Done FALSE
MC_Jog0_JogForward TRUE JogForward Busy TRUE
MC_Jog0_JogBackward FALSE JogBackward CommandAborted FALSE
MC_Jog0_Velocity 10 Velocity Error FALSE
MC_Jog0_Acceleration 1000 Acceleration ErrorID 0
MC_Jog0_Deceleration 1000 Deceleration
MC_Jog0_Jerk 1000 Jerk