

MSE6-C2M-5000-FB34 integration with S7-1200 PLC using TIA Portal15.1



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Festo 技术支持

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关键词:

TIA Portal V15.1, Siemens, ProfiNet, MSE6-C2M-5000-FB34

摘要:

本文介绍了使用 **Siemens S7-1200 PLC** 控制 **Festo MSE6-C2M-5000-FB34** 控制器的实例，通讯协议为 **ProfiNet**，**PLC** 编程软件为 **TIA Portal 15.1**。文档主要内容包括 **MSE-C2M-5000** 的产品结构、**TIA Portal** 网络连接、如何集成库文件到 **TIA Portal**、**MSE-C2M-5000** 的库文件描述等。

目标群体:

本文仅针对有一定自动化设备调试基础的工程师，需要对 **Festo MSE-C2M-5000** 节能模块以及 **Siemens TIA Portal** 有一定了解。

声明:

本文档为技术工程师根据官方资料和测试结果编写，旨在指导用户快速上手使用 **Festo** 产品，如果发现描述与官方正式出版物冲突，请以正式出版物为准。

我们尽量罗列了实验室测试的软、硬件环境，但现场设备型号可能不同，软件/固件版本可能有差异，请务必在理解文档内容和确保安全的前提下执行测试。

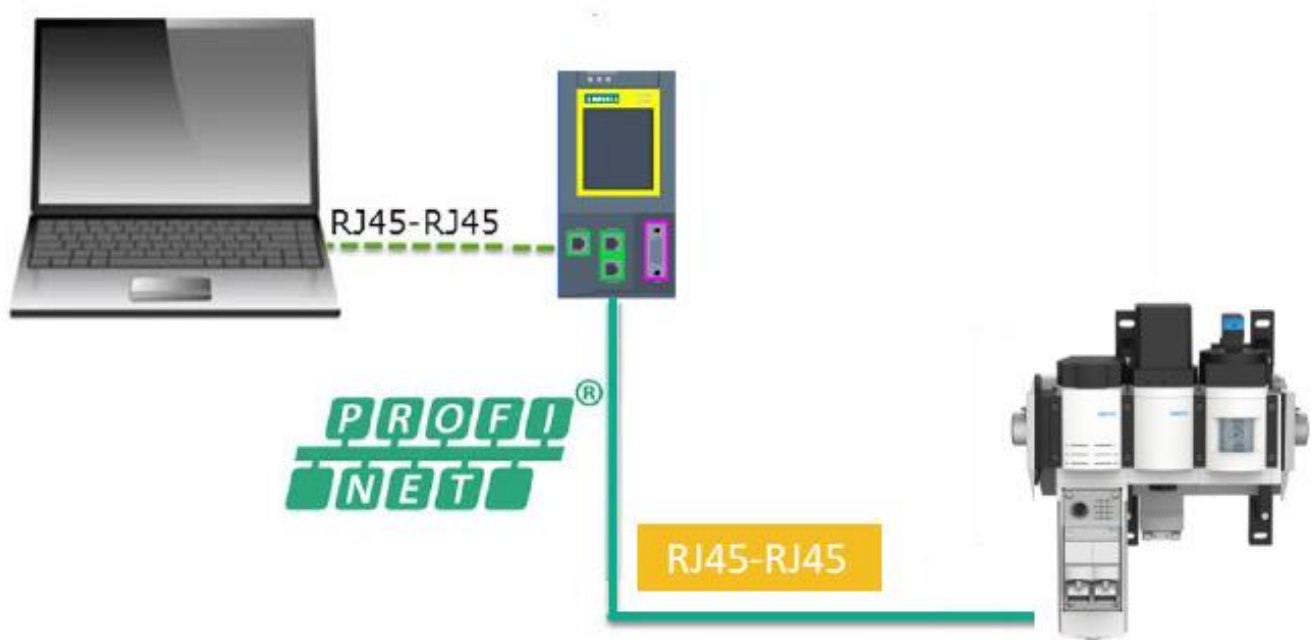
我们会持续更正和更新文档内容，恕不另行通知。

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1 硬件/软件环境

本文档适用于西门子 **S7-1200**、**S7-1500** 系列 PLC 在 **TIA** 环境下，通过 **ProfiNet** 控制 **MSE6-C2M-5000** 节能模块，系统构架如下如下



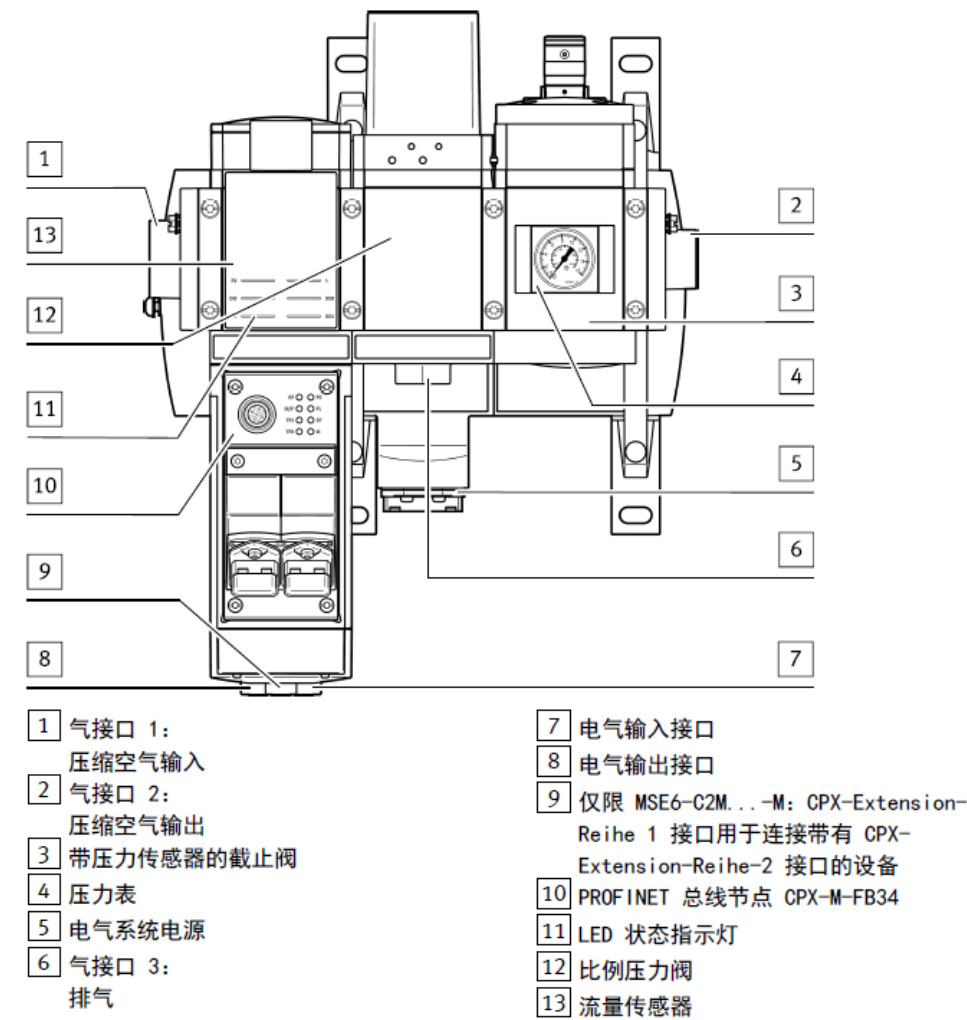
软件环境

- 1、 西门子 **TIA V15.1** 软件
- 2、 **MSE6-C2M-5000-FB33/34/35** GSDML 文件
- 3、 **MSE6-C2M-5000-FB33/34/35** 功能块库文件
- 4、 **Festo Maintenance Tool** 软件
- 5、 **Festo Field Device Tool** 软件

NOTE: 除 **TIA** 软件外，其余与 **FESTO** 相关的软件和 **GSDML** 文件、库文件均可在如下链接查找到
https://www.festo.com.cn/net/zh-cn_cn/SupportPortal/default.aspx

2 MSE-C2M-5000 的产品结构

2.1 产品配置



2.2 LED 状态指示灯说明

模块 LED 状态指示灯

LED 指示灯	含义
P2 (绿色)	
 LED 指示灯亮起	输出压力 $p_2 \geq$ 压力 p_2 下限值
 LED 指示灯闪烁	输出压力 $p_2 <$ 低于压力极限值 p_2 且 输出压力 $p_2 \geq$ 自动待机压力设定值 -0.5 bar
 LED 指示灯未亮起	输出压力 $p_2 <$ 自动待机压力设定值 -0.5 bar
DI0 和 DI1 (绿色)	
 LED 指示灯亮起	电气输入 0 或 1 处存在信号 (逻辑 1)
 LED 指示灯未亮起	电气输入 0 或 1 处无信号 (逻辑 0)
DO0 和 DO1 (黄色)	
 LED 指示灯亮起	电气输出 0 或 1 提供 1 信号 (逻辑 1)
 LED 指示灯未亮起	电气输出 0 或 1 提供 0 信号 (逻辑 0)
红色	
 LED 指示灯亮起	模块故障
 LED 指示灯未亮起	无模块故障



通讯模块 LED 状态指示灯

PS - 电子装置/传感器的工作电源状态 (Power System)			
LED 指示灯 (绿色)	流程	状态	故障处理
 LED 指示灯亮起		无故障, 电子元件和传感器的工作电压存在	-
 LED 指示灯闪烁		电子元件和传感器的工作电压超过公差范围	1. 排除短路/过载 2. 取决于参数设置: • 排除短路后, 将自动开启传感器供电电源 (Default) • 开启/关闭供电电源 (Power-off/on)
 LED 指示灯熄灭		电子元件和传感器的工作电压不存在	检查电子元件的工作电源接口

PL - 阀/输出端的负载电源 (Power Load)			
LED 指示灯 (绿色)	流程	状态	故障处理
 LED 指示灯亮起		无故障, 负载电压正常	无
 LED 指示灯闪烁		负载电压超过公差范围	1. 排除欠压故障 2. 取决于参数设置: • 排除欠压故障后, 将自动开启负载电源 (Default) • 开启/关闭供电电源 (Power-off/on)

SF - 系统故障 (System Failure)			
LED 指示灯 (红色)	流程	状态 ¹⁾	含义/故障处理
 LED 指示灯熄灭		无故障	-
 LED 指示灯 闪烁 1 次		信息或 轻微故障 (故障等级 1)	参见 CPX 系统说明书中的故障编号 说明 (P. BE-CPX-SYS...)
 LED 指示灯 闪烁 2 次		故障 (故障等级 2)	
 LED 指示灯 闪烁 3 次		严重故障 (故障等级 3)	参见 CPX 系统说明书中的故障编号 说明 (P. BE-CPX-SYS...)

¹⁾ 系统故障 LED 指示灯闪烁与出现的故障等级有关:

故障等级 1 (轻微故障): 闪烁 1 次, 暂停

故障等级 2 (故障): 闪烁 2 次, 暂停

故障等级 3 (严重故障): 闪烁 3 次, 暂停

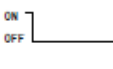
M - 更改参数设置或强制激活			
LED 指示灯 (黄色)	流程	状态	含义/故障处理
 LED 指示灯熄灭		- 以出厂设置 (默认参数设置) 和当前的 CPX 扩展启动系统 - 可以进行外部参数设置 (Default)	无
 LED 指示灯亮起		- 以保存的参数设置和保存的 CPX 扩展启动系统 - 参数和 CPX 扩展永久保存; 禁止外部参数设置 ¹⁾	更换已保存参数设置的 CPX 终端时需要小心 (LED M 指示灯亮起): 维修保养中, 例如: 更换 CPX 终端时, 参数设置不会通过 PLC 或上级系统自动建立。在这种情况下, 请在更换前检查所需的设置, 并必要时建立这些设置。
 LED 指示灯闪烁		- 强制激活 ¹⁾	强制功能已激活 (Force mode; 功能编号 4402 → CPX 系统说明书 P. BE-CPX-SYS...)
¹⁾ 强制功能的显示 (LED 指示灯闪烁) 优先于系统启动设置的显示 (LED 亮起)。			



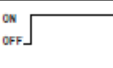
Note: 如遇到 SF 红灯闪烁的情况, ProfiNet 支持 webservice, 可以通过网页搜索 IP 地址的方式读取模块信息和故障信息。读取到故障代码后可通过如下链接下载操作手册查看故障代码描述。

https://www.festo.com/net/en-gb_gb/SupportPortal/default.aspx?tab=3&q=526446

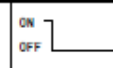
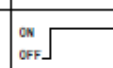
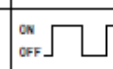
NF - 网络状态/网络故障 (Network Failure)

LED 指示灯 (红色)	流程	状态	故障处理
 LED 指示灯熄灭		无故障 (如果绿色 LED PS 指示灯亮起)	-
 LED 指示灯闪烁		网络连接不正常 - 可能存在下列原因: - 仅在首次调试之前: 配置错误, 例如: MAC-ID 未配置 - 设备名称或设备编号不 正确 - IO Controller 损坏 - 网络连接中断, 短路或 故障	请检查: • 配置 • 设备名称 • 设备编号 • IO-Controller • 网络连接

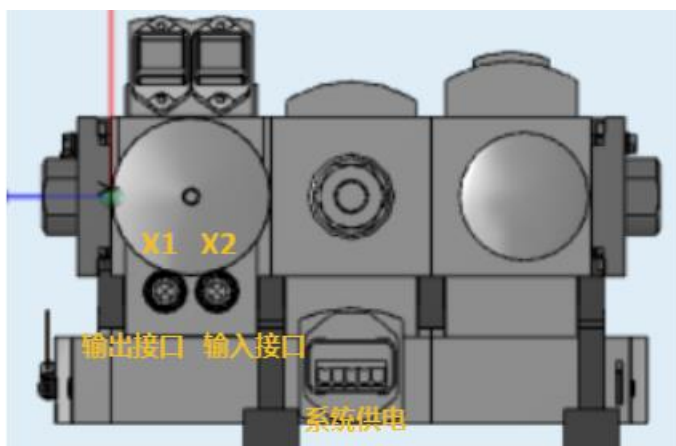
M/P - Maintenance/PROFenergy

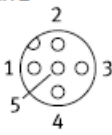
LED 指示灯 (绿色)	流程	状态	故障处理
 LED 指示灯熄灭		不需要维修措施, 不提供 PROFenergy 功能	-
 黄色 LED 指示灯亮起		需要维修措施	请检查: • 插头 • 光导体电缆。
 绿色 LED 指示灯闪烁		PROFenergy 激活	-

TP1, TP2 - 连接状态 (Link 1, 2)

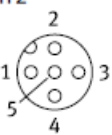
LED 指示灯 (绿色)	流程	状态	故障处理
 LED 指示灯熄灭		无物理网络连接	检查网络连接情况/网络电缆
 LED 指示灯亮起		网络连接正常	-
 LED 指示灯 闪烁		- 两个 LED 指示灯按照 相同的时间节拍闪烁: 模块定位	模块定位: 例如: 故障查找或配置时 → 章节 2.6.1

2.3 电气接口针脚定义



插头 X2	针脚	信号名称	功能
M12 	1	24 V DC U_{SEN}	电源电压电气隔离
	2	Input-1	输入 1
	3	0 V U_{SEN}	0 V 负载
	4	Input-0	输入 0
	5	FE	功能接地

Tab. 3 电气输入 DI0 和 DI1

插头 X1	针脚	信号名称	功能
M12 	1	-	未占用
	2	Output-1	输出 1
	3	0 V _{VA}	0 V 负载
	4	Output-0	输出 0
	5	FE	功能接地

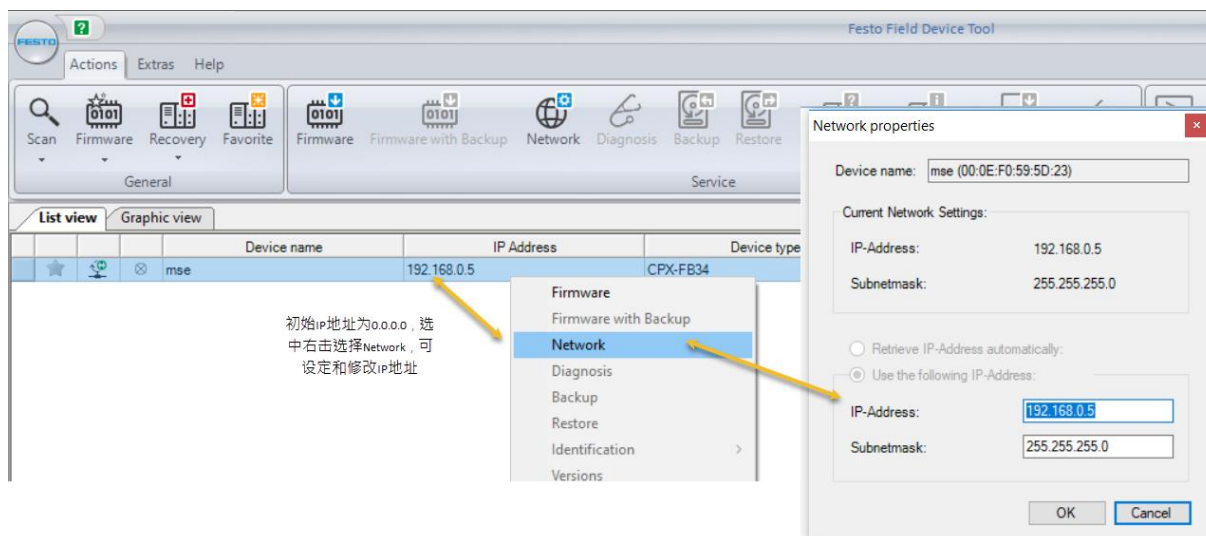
Tab. 4 电气输出 DO0 和 DO1

系统电源
通过 AIDA 推挽式插头为产品供电。

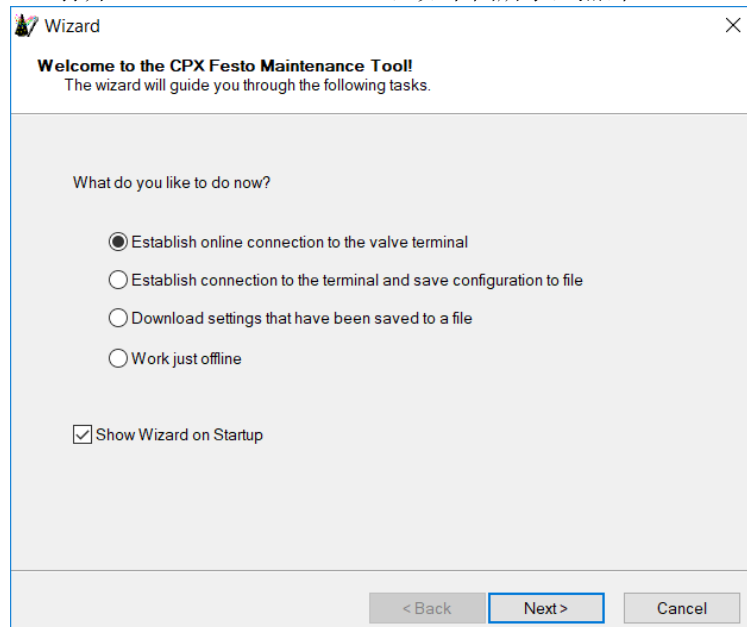
插头	针脚	信号名称	功能
AIDA Push-Pull (推挽式) 5 4 3 2 1 	1	24 V DC $U_{EL/SEN}$	电子元件和传感器的工作电源
	2	0 V $U_{EL/SEN}$	电子元件和传感器的工作电压
	3	24 V DC $U_{OUT/A}$	执行元件负载电源
	4	0 V $U_{OUT/A}$	执行元件负载电压
	5	FE	功能接地

3 MSE-C2M-5000 设定 IP 地址和在 Festo Maintenance Tool 中的配置

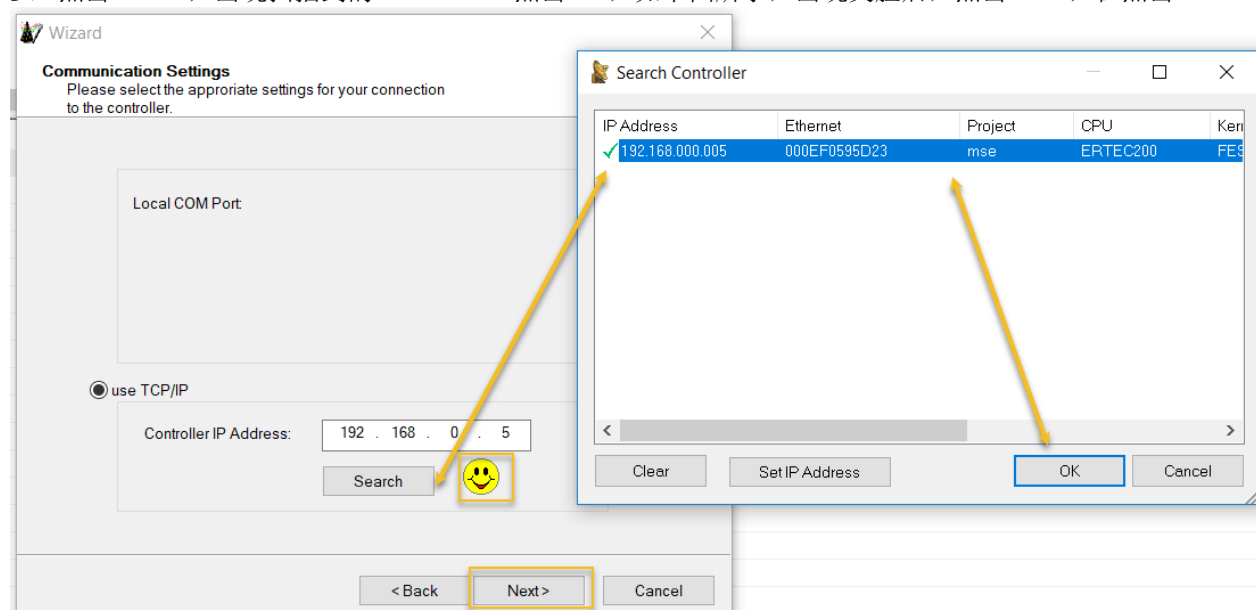
1、MSE-C2M-5000 的初始 IP 地址为 0.0.0.0，可通过 Festo Field Device Tool 软件进行修改设定。



2、打开 Festo Maintenance Tool，如下图所示，点击 Next

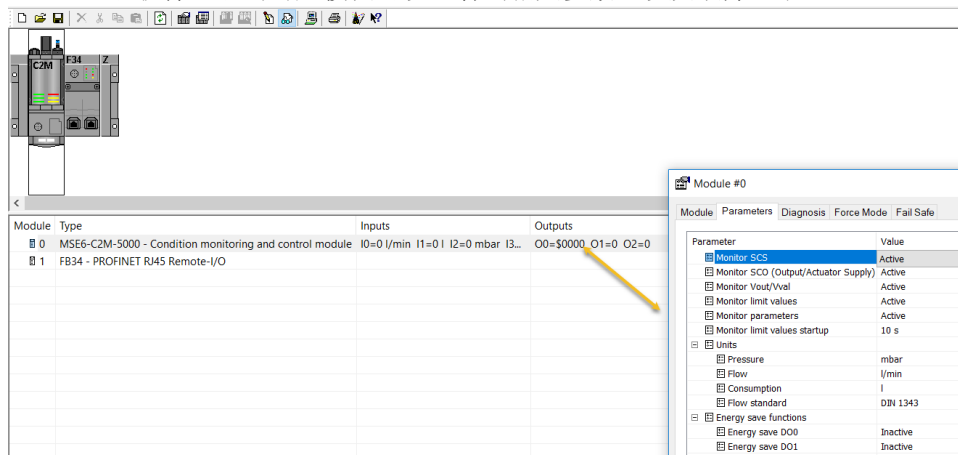


3、点击 Search，出现扫描到的 MSE6-C2M 点击 OK，如下图所示，出现笑脸后，点击 Next，在点击 Finish



Note: 连接 PC 与 MSE6-C2M-5000 模块有两种方式：1.使用 CPX-USB Adapter；2.使用 TCP/IP。使用 TCP/IP 建立连接须保证 PC 与 MSE6-C2M-5000 在同一网段。

4、通过该软件，双击对应模块可以查看到相关参数，以及故障记录。



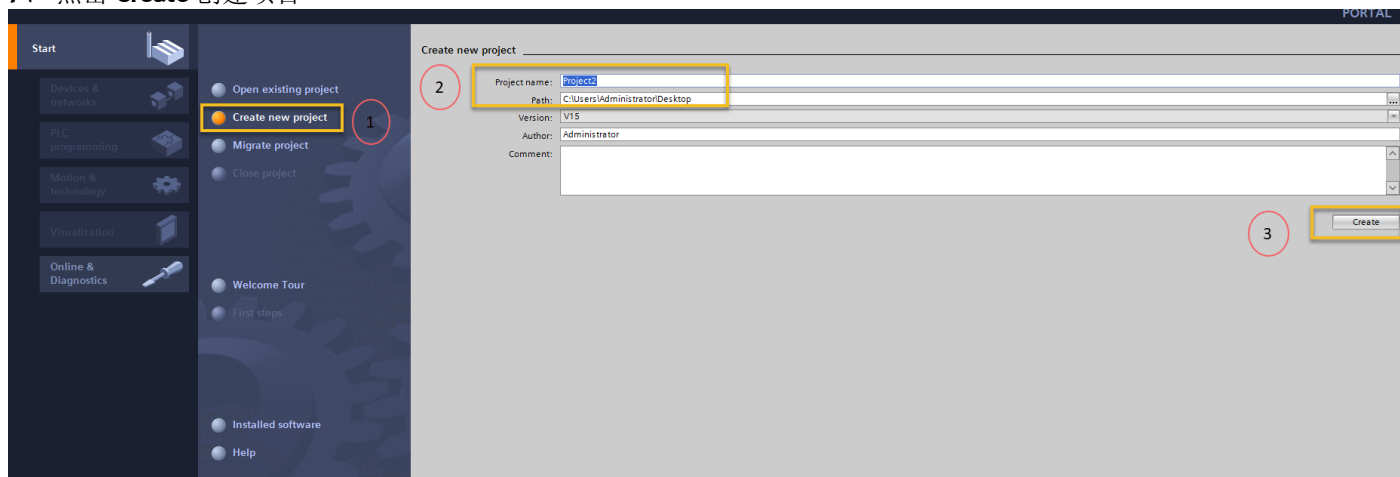
4 TIA Portal15.1 网络连接

4.1 在 TIA Portal 中创建项目

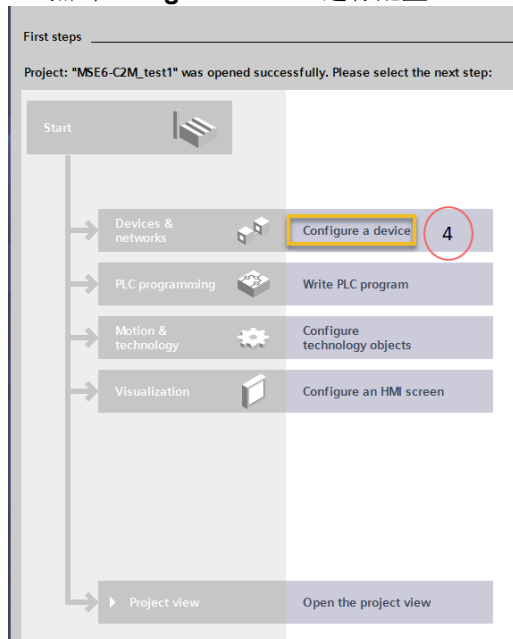
5、打开 TIA Portal V15.1 软件，点击 **Create new project**

6、输入项目名称和选择项目保存路径

7、点击 **Create** 创建项目



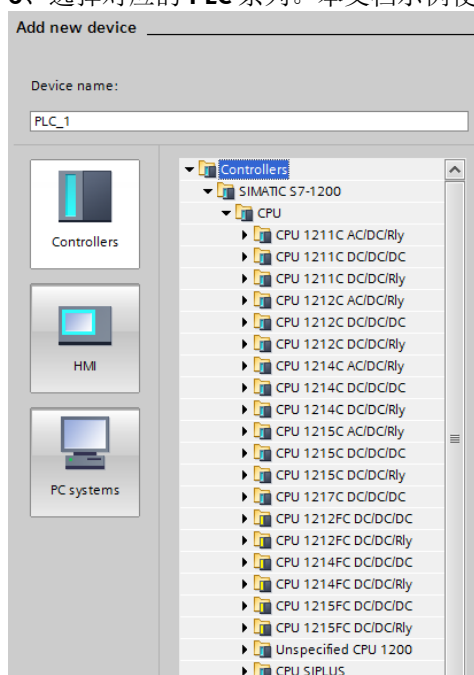
4、点击 **configure a device** 进行配置 PLC



5、点击 **Add new device** 添加新的 PLC 到项目中

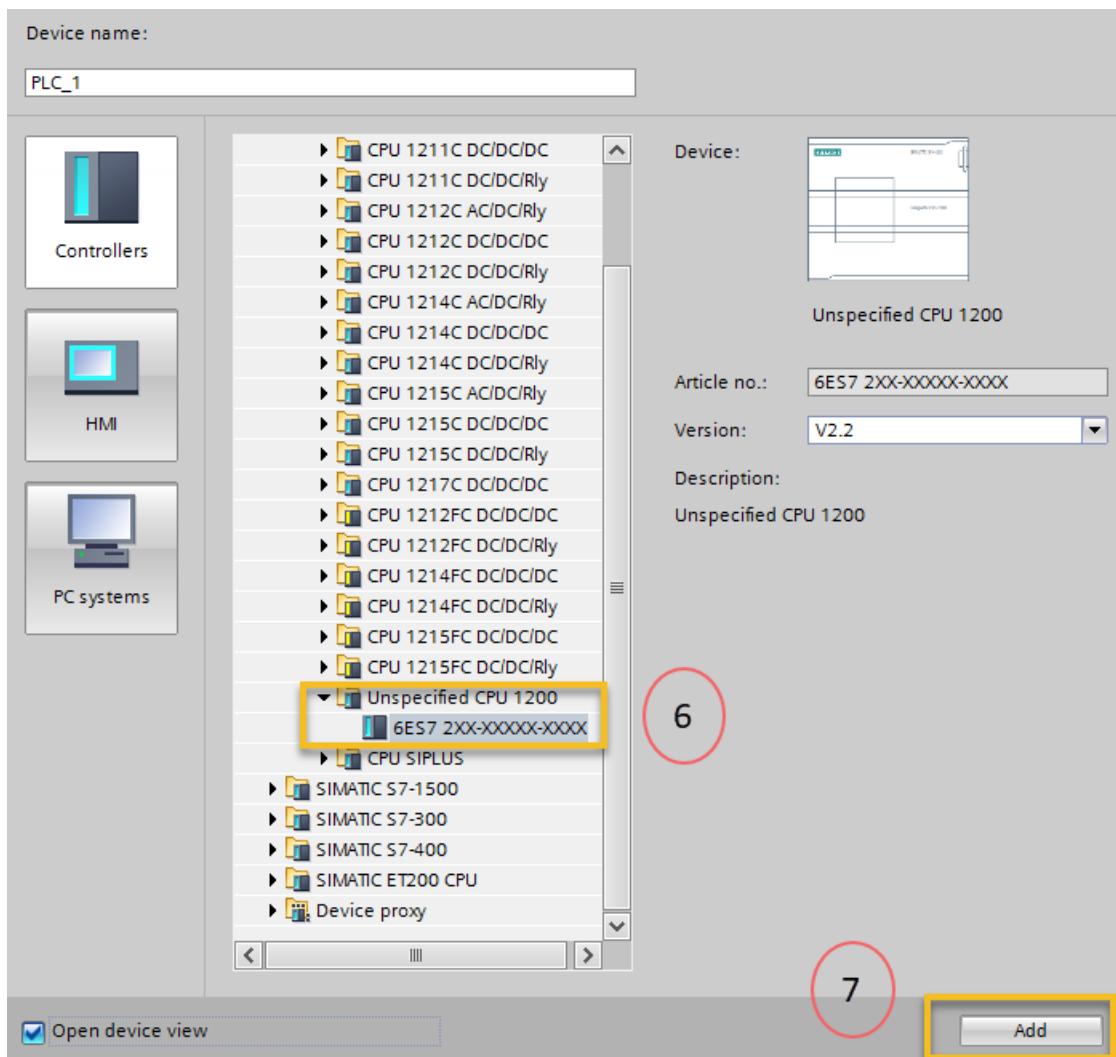


6、选择对应的 PLC 系列。本文档示例使用的是 **S7-1200**。如下列表显示的是所有 **S7-1200** 系列的 CPU。

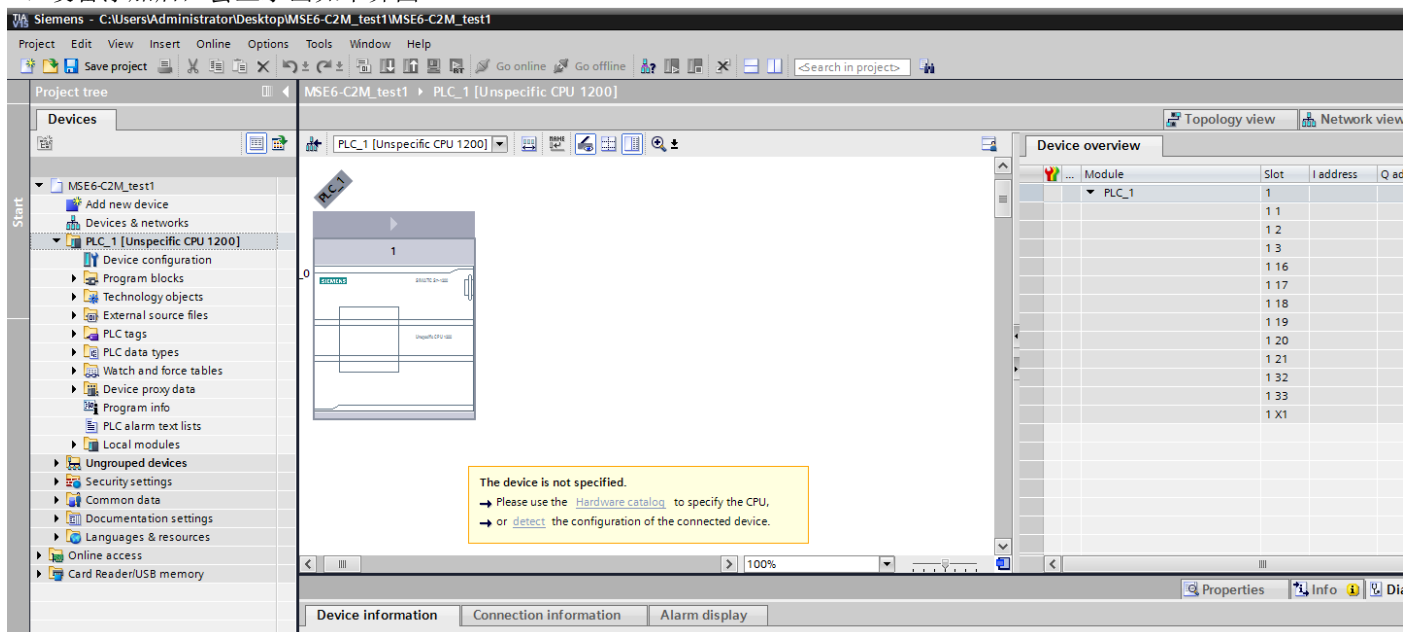


7、选择 **Unspecified CPU S7-1200**，点击 **Add** 添加。

Note: 选择 **Unspecified CPU S7-1200** 后，实际连接的 PLC 硬件配置可以通过硬件配置检测读取到。这样可以节省配置时间。

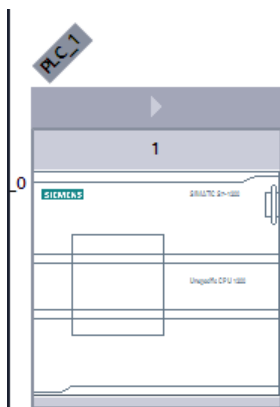


8、设备添加后，会显示出如下界面。



4.2 检测网络中连接的 PLC 的实际硬件配置

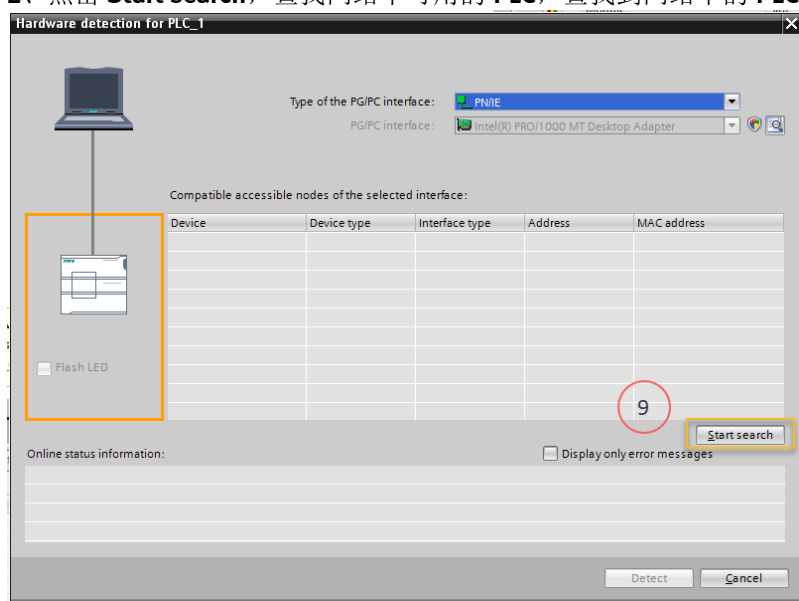
1、点击 detect



8

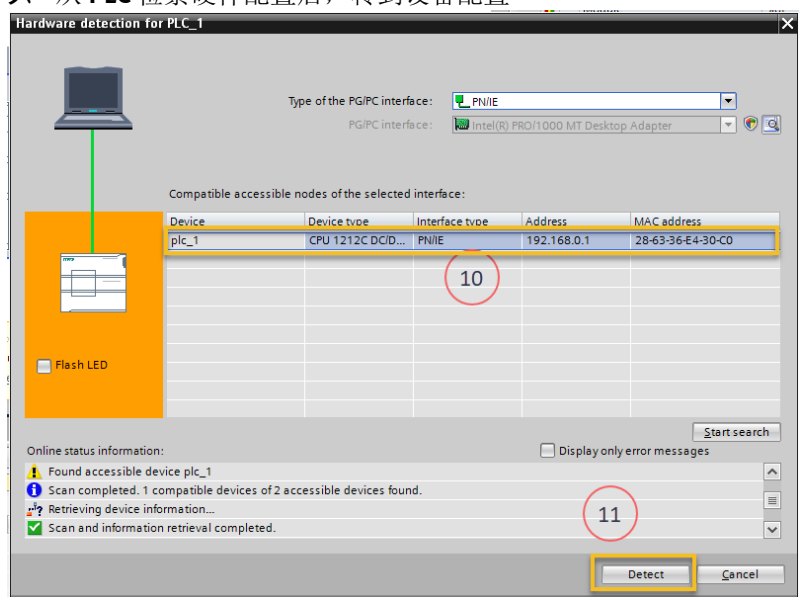
The device is not specified.
 → Please use the [Hardware catalog](#) to specify the CPU,
 → or [detect](#) the configuration of the connected device.

2、点击 **Start search**，查找网络中可用的 PLC，查找到网络中的 PLC 后会在列表中显示出。



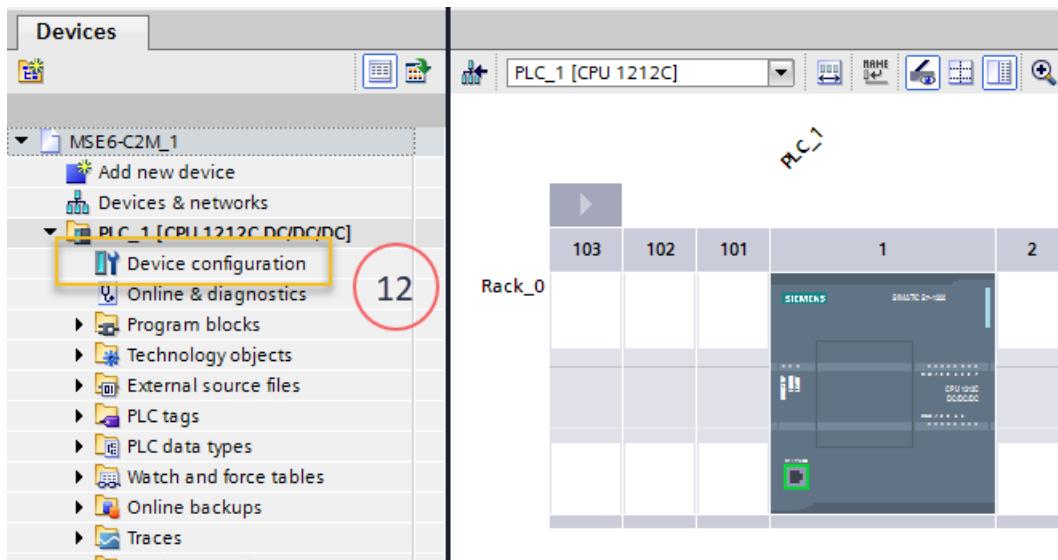
8、在查找到的列表中选择与 **MSE6-C2M-5000** 模块通讯的 PLC，点击 **Detect**

9、从 PLC 检索硬件配置后，转到设备配置

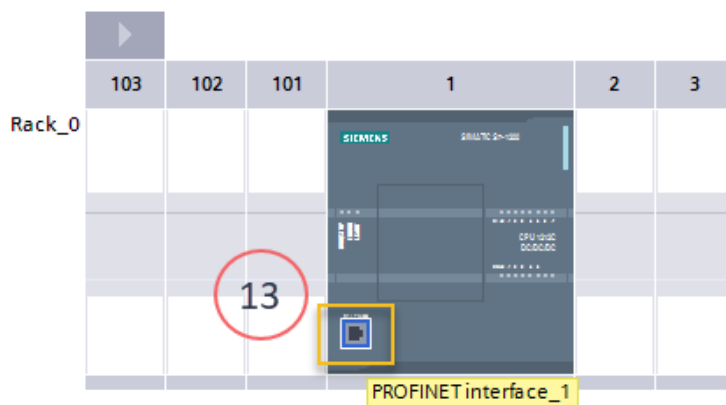


4.3 检测网络中连接的 PLC 的实际硬件配置

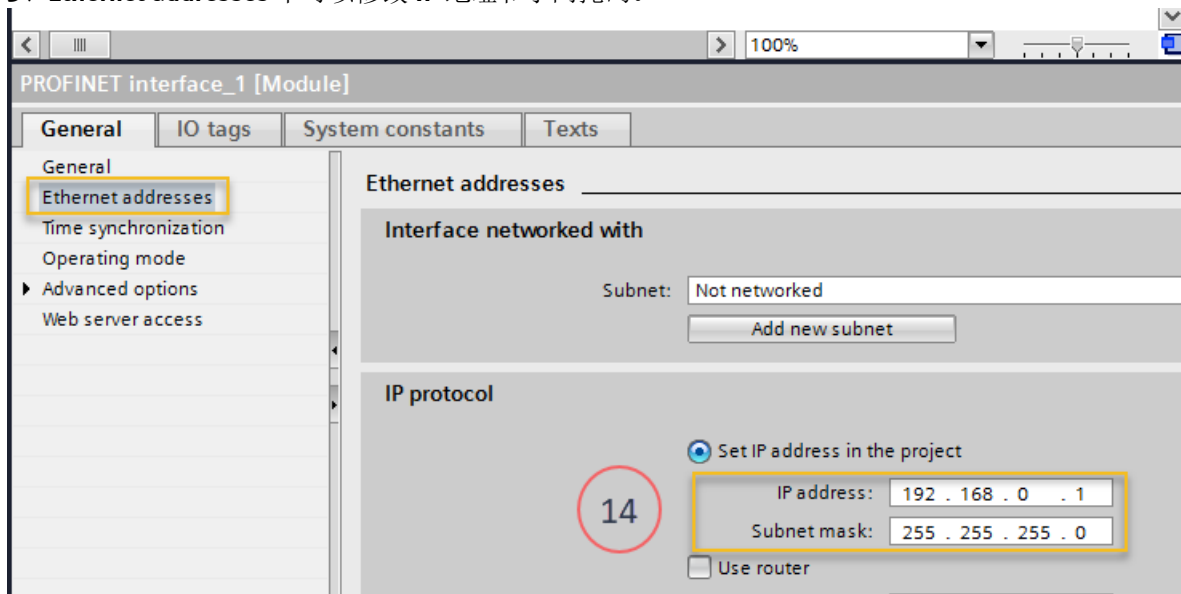
1、双击 **Device configuration**



2、双击 **PROFINET interface_1** 后可以查看 **ProfiNet interface** 的属性



3、**Ethernet addresses** 中可以修改 IP 地址和子网掩码。



NOTE: PLC 的 **ProfiNet interface** IP 地址、**MSE6-C2M-5000-FB34** 通讯模块的 IP 地址以及 PC 的 IP 地址要在相同网段下。

4.4 加载 MSE6-C2M-500-FB34 的 GSDML 文件到 TIA Portal

- 1、从 support portal 下载 MSE6-C2M-500-FB34 的 GSDML 文件，连接如下。

https://www.festo.com.cn/net/zh-cn_cn/SupportPortal/default.aspx?q=8085455&tab=4&s=t#result

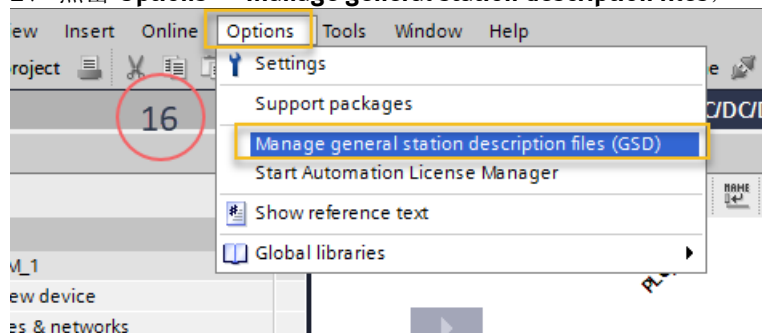
进入网页，点击 **software** 标签，点击设备描述文件下载。下载保存压缩包后解压。（GSDML 文件需要加载到 TIA Portal 中，所以 GSDML 文件必须先解压）

支持平台

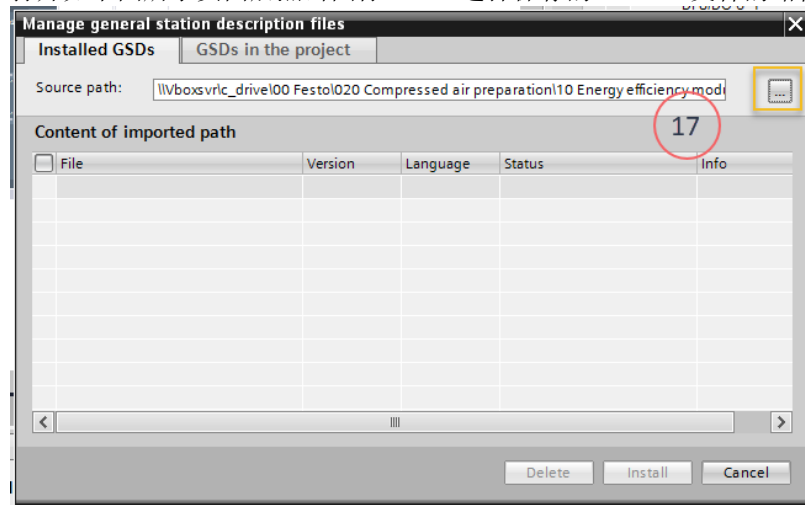
在左侧选择分类或者直接搜索。



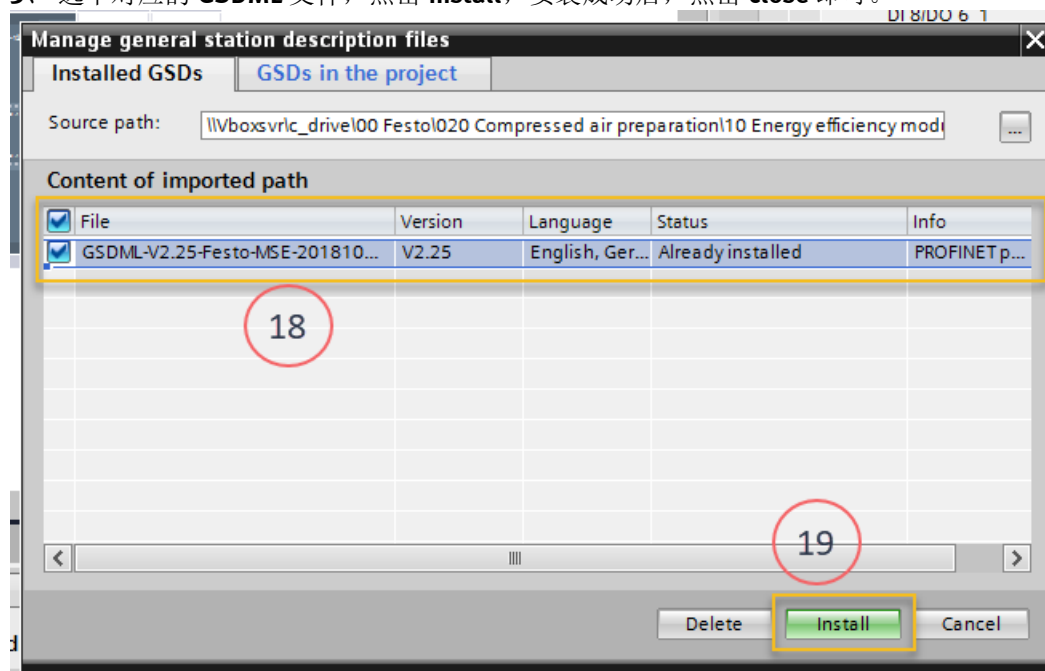
- 2、点击 **Options** → **Manage general station description files**,



打开如下图所示页面后点击图标  选择保存的 GSDML 文件的路径。

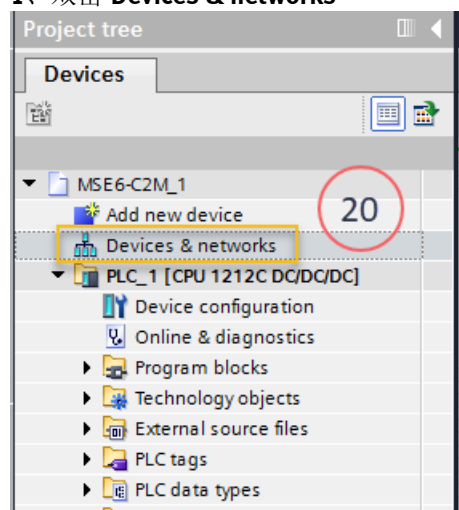


3、选中对应的 GSDML 文件，点击 **install**，安装成功后，点击 **close** 即可。

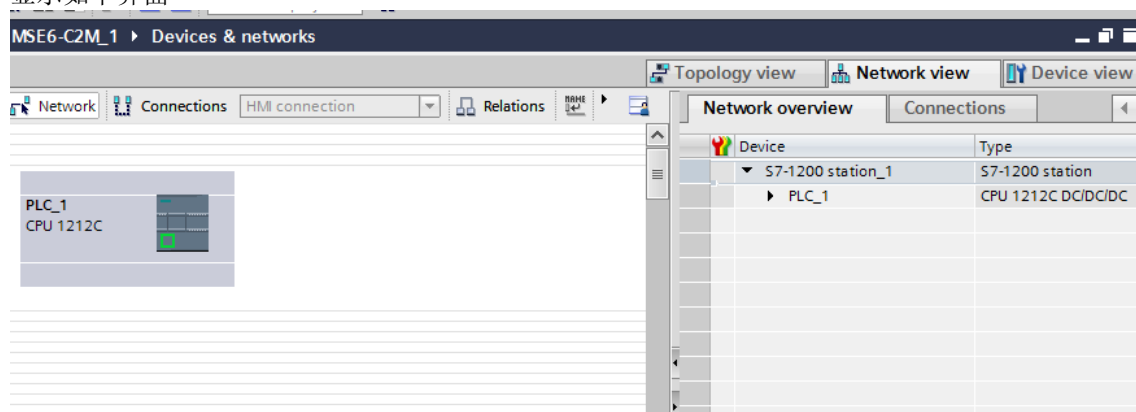


4.5 配置 MSE6-C2M-5000 到 TIA Portal

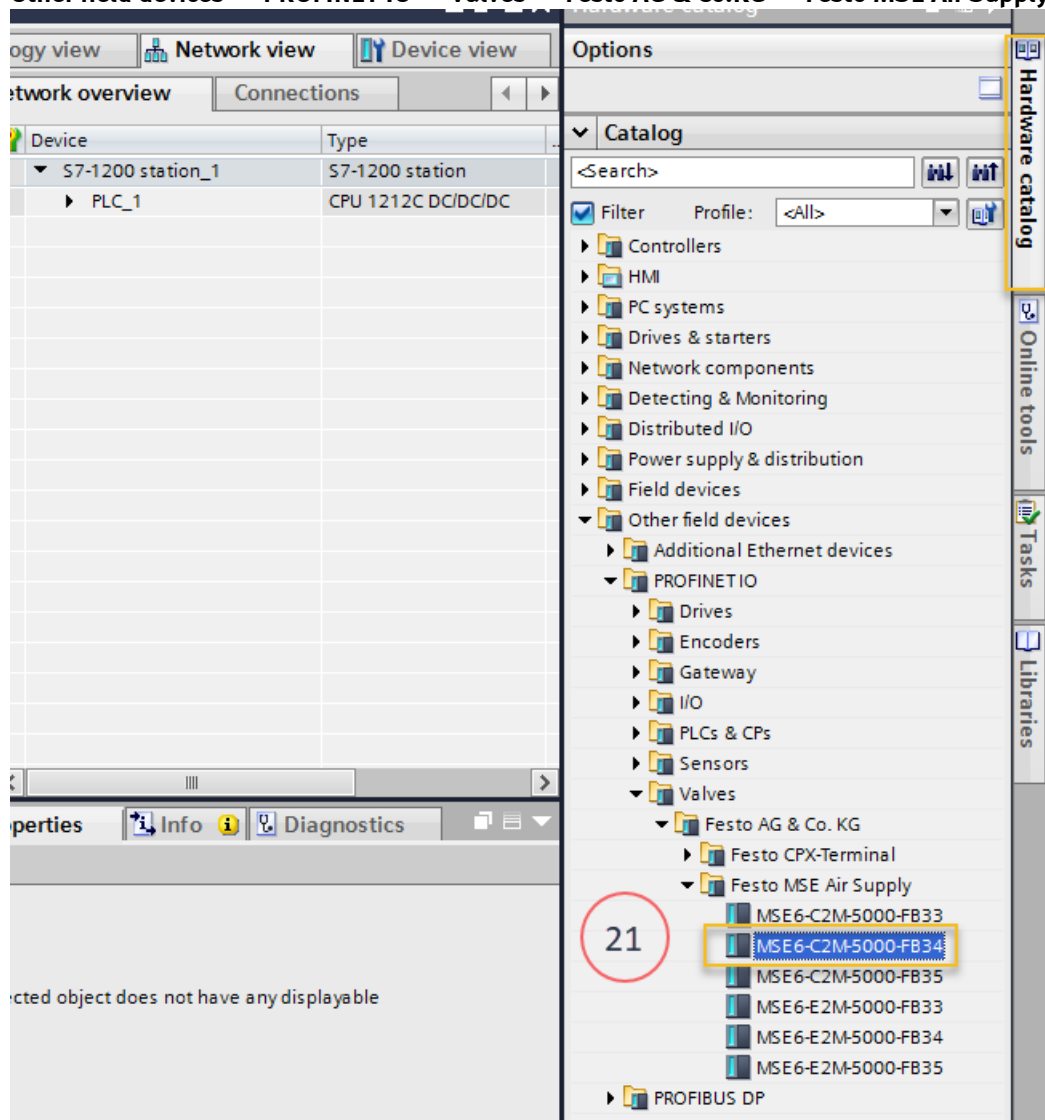
1、双击 **Devices & networks**



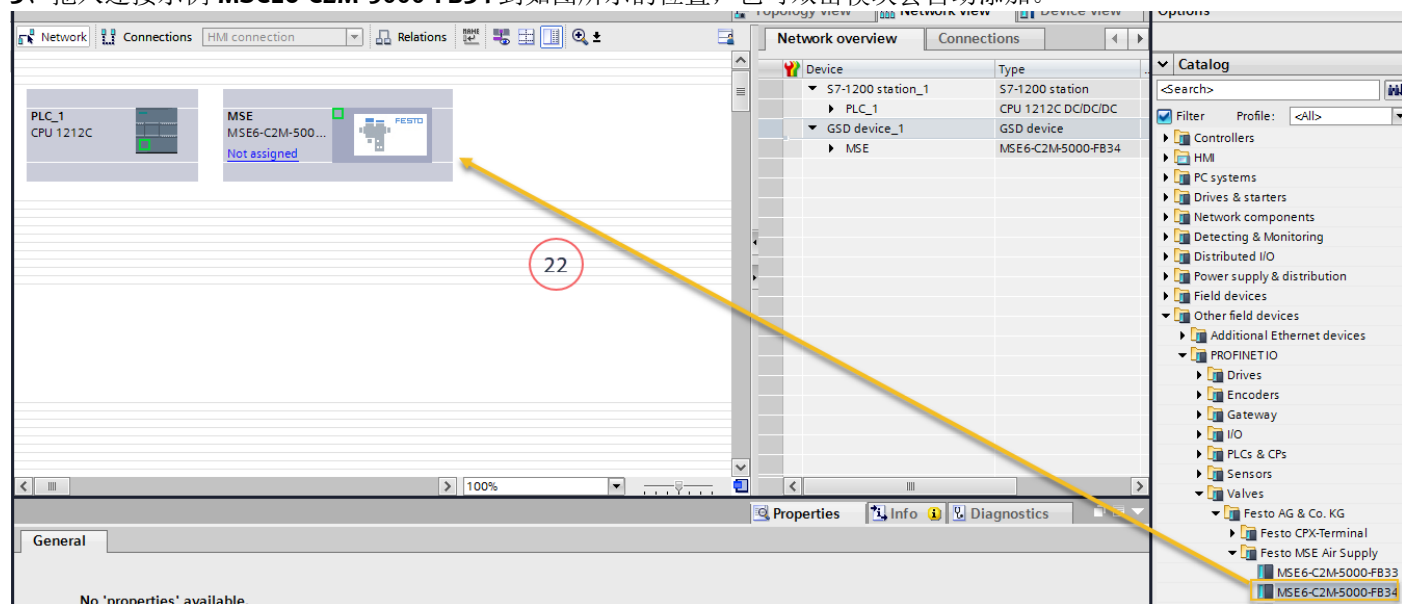
显示如下界面



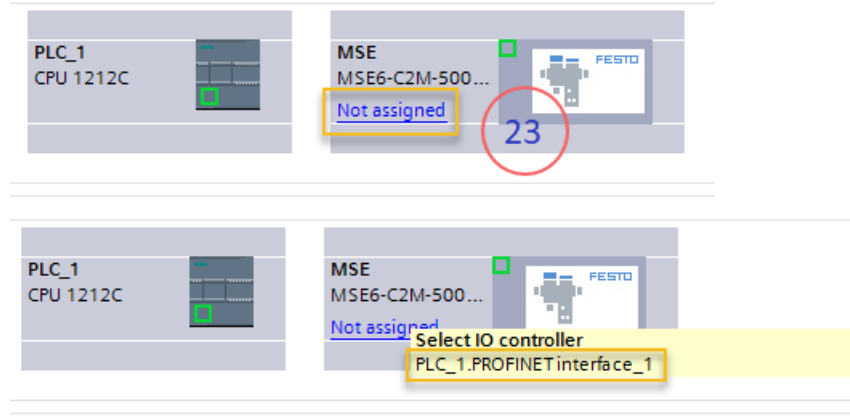
2、选择 **Hardware catalog**，在如下路径下找到对应连接的 **MSE6-C2M-5000** 模块
Other field devices → **PROFINET IO** → **Valves** → **Festo AG & Co.KG** → **Festo MSE Air Supply**



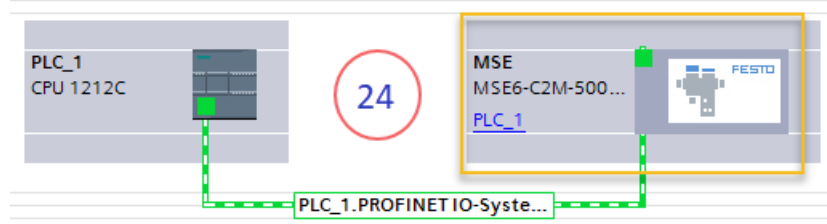
3、拖入连接示例 **MSCE6-C2M-5000-FB34** 到如图所示的位置，也可双击模块会自动添加。



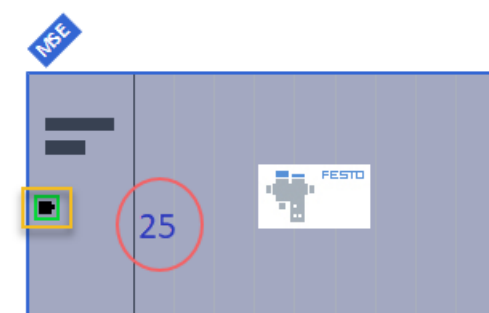
4、点击 **Not assigned**，选择 **PLC_1 PROFINET interface_1**，连接 PLC 与 MSE6-C2M。



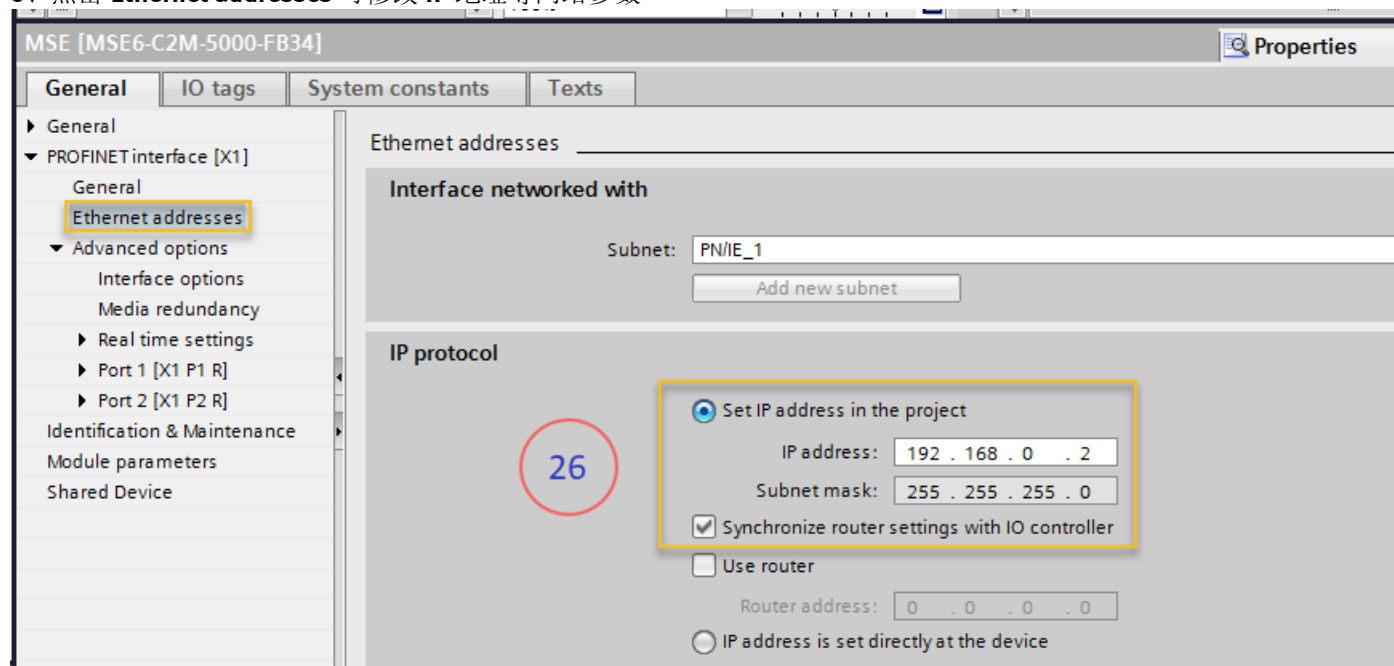
双击 **MSE** 模块会看到 5 所示图片



5、点击  会查看模块属性

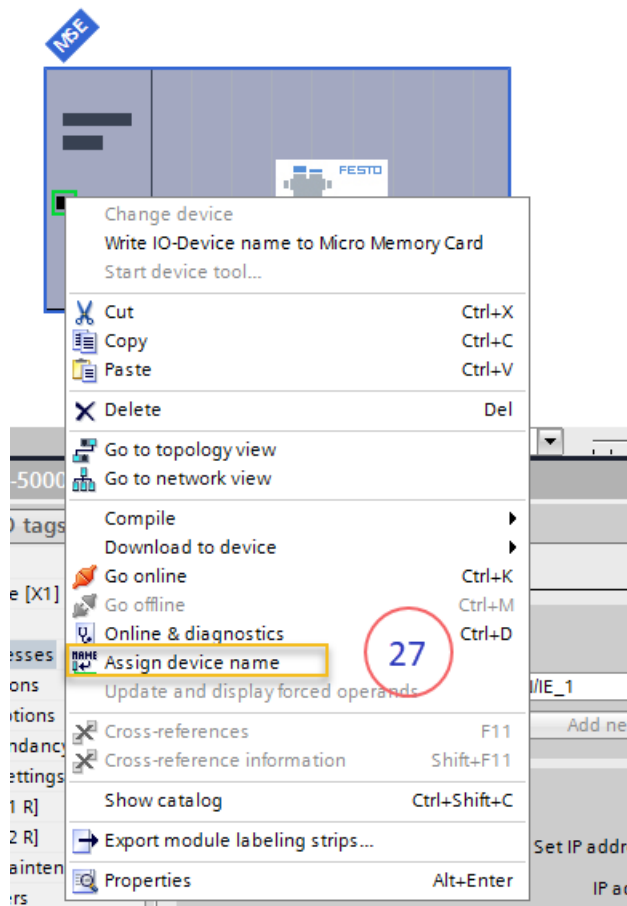


6、点击 **Ethernet addresses** 可修改 IP 地址等网络参数

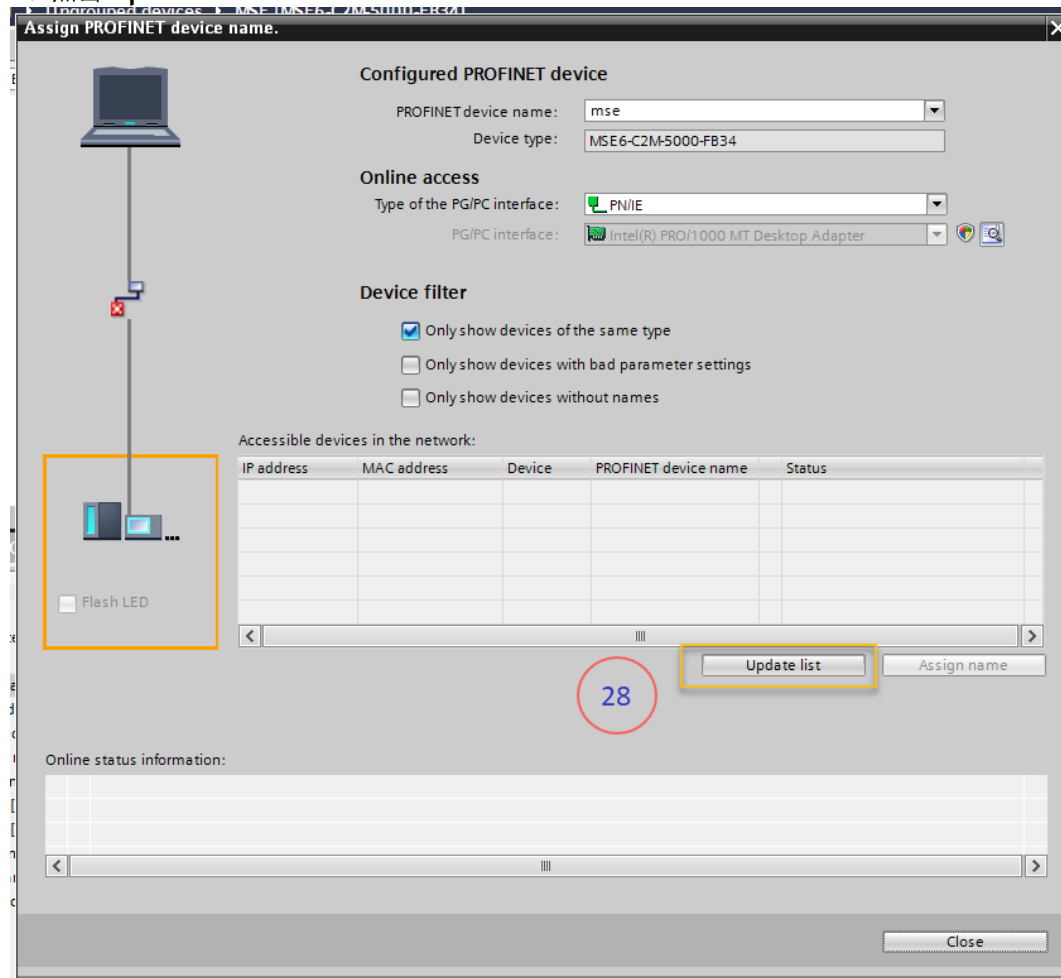


NOTE: PLC 的 ProfiNet interface IP 地址、MSE6-C2M-5000-FB34 通讯模块的 IP 地址以及 PC 的 IP 地址要在相同网段下。

7、右击 **MSE** 模块，选择 **Assign device name** 分配设备名称



8、点击 **Update list**



扫描网络中的可用设备后，点击 **Assign name**



Flash LED

Configured PROFINET device
PROFINET device name: mse
Device type: MSE6-C2M-5000-FB34

Online access
Type of the PG/PC interface: PN/IE
PG/PC interface: Intel(R) PRO/1000 MT Desktop Adapter

Device filter
☒ Only show devices of the same type
☐ Only show devices with bad parameter settings
☐ Only show devices without names

Accessible devices in the network:

IP address	MAC address	Device	PROFINET device name	Status
192.168.0.5	00-0E-F0-59-5D-23	Festo CPX...	--	No device name assigned

29

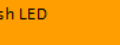
Update listAssign name

Online status information:

 Search completed. 1 of 2 devices were found.

Close

Status 显示 OK 后，点击 **close** 关闭窗口。


Flash LED

☒ Only show devices of the same type
☐ Only show devices with bad parameter settings
☐ Only show devices without names

Accessible devices in the network:

IP address	MAC address	Device	PROFINET device name	Status
192.168.0.5	00-0E-F0-59-5D-23	Festo CPX...	mse	OK

30

Update listAssign name

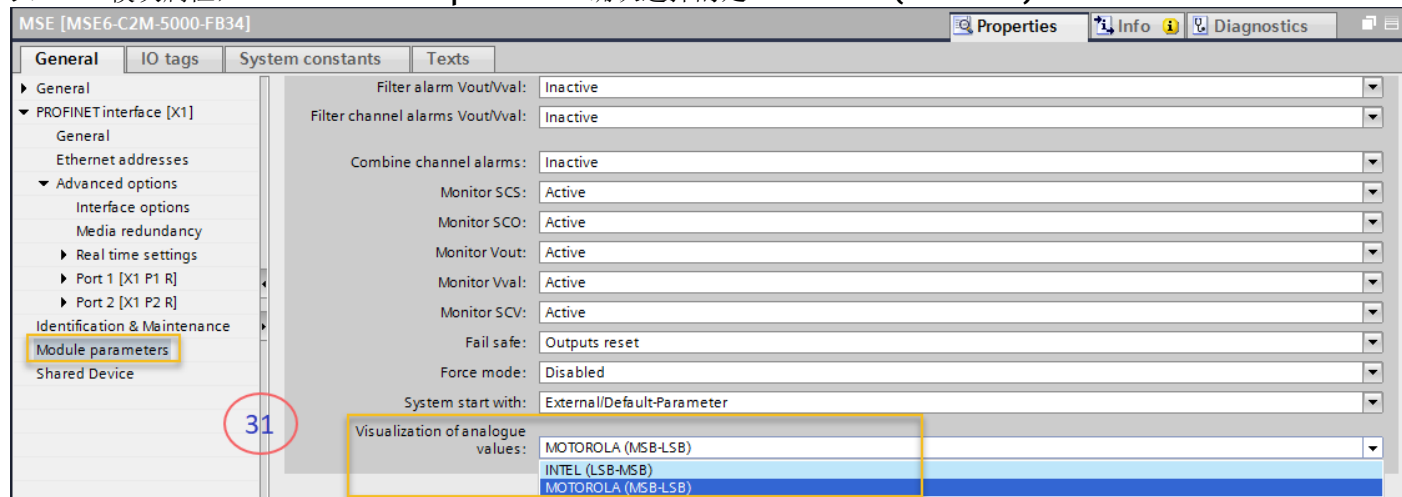
Online status information:

 Search completed. 1 of 2 devices were found.
 The PROFINET device name "mse" was successfully assigned to MAC address "00-0E-F0-59-5D-23".

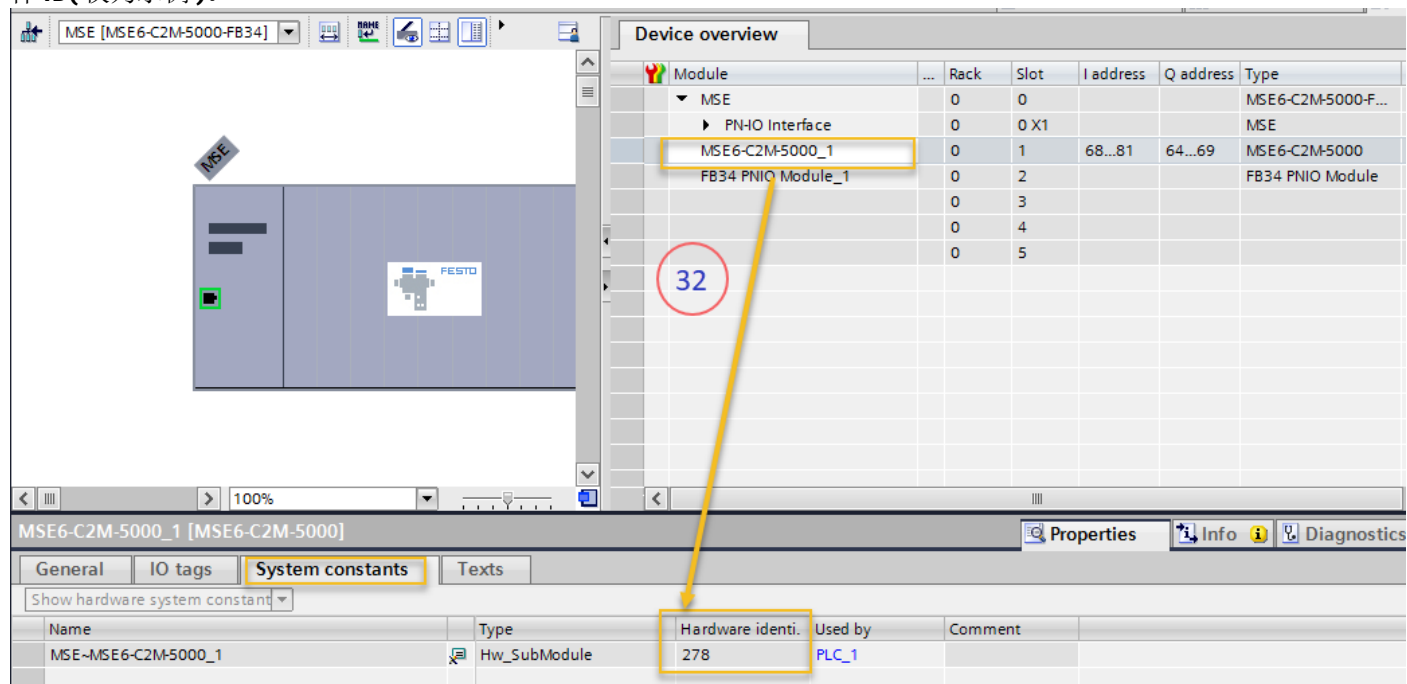
Close

NOTE: 要确保 TIA 中配置的设备名称与 MSE6-C2M 硬件匹配。

9、MSE 模块属性，General → Modul parameters 确认选择的是 MOTOROLA (MSB-LSB)

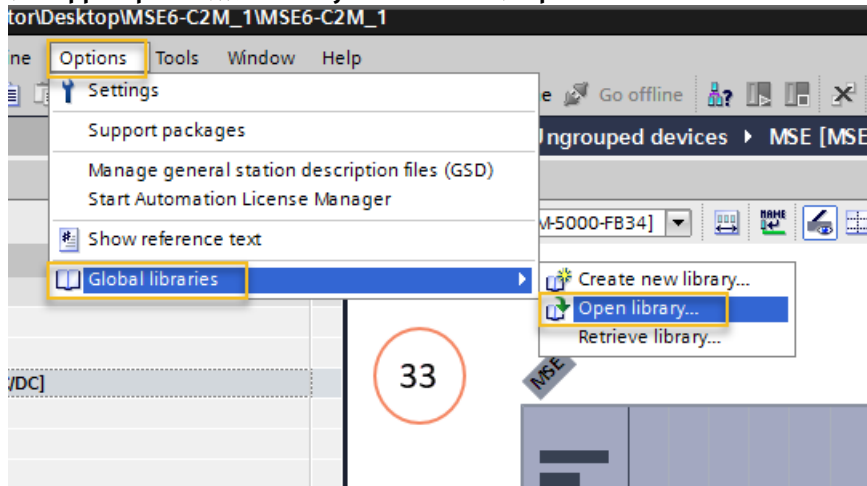


10、点击 **system constants** 可查看到 MSE6-C2M 的 Hardware identifier 硬件 ID，即 278 为连接的 MSE6-C2M-5000 的硬件 ID(仅为示例)。

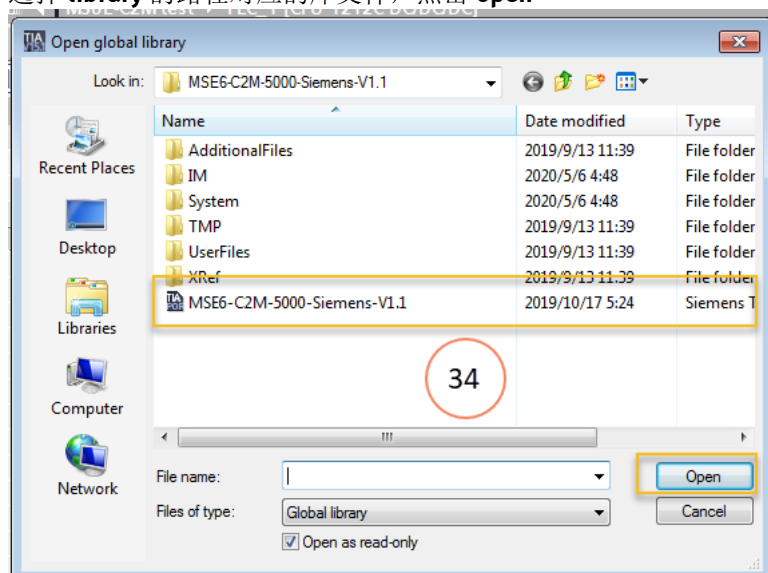


5 集成库文件到 TIA Portal

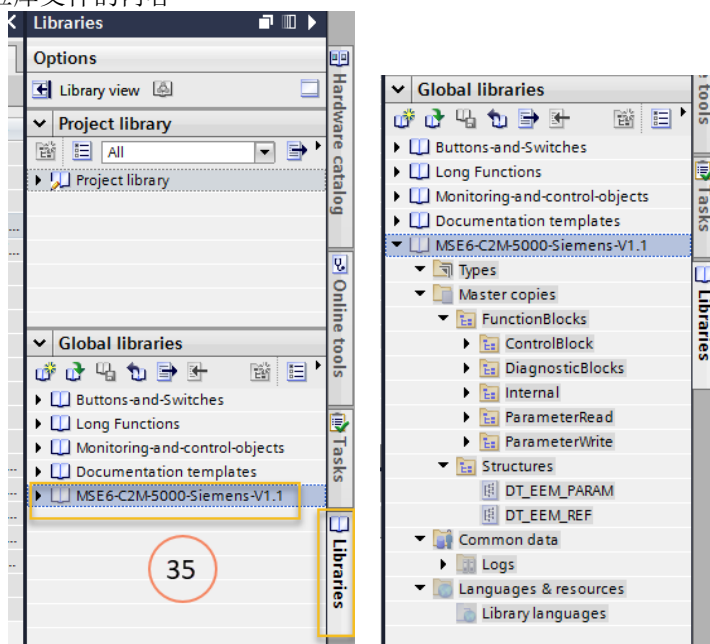
- 1、在 **support portal** 解压 **library**，TIA Portal 中 **options** → **Global Libraries** → **Open Library**



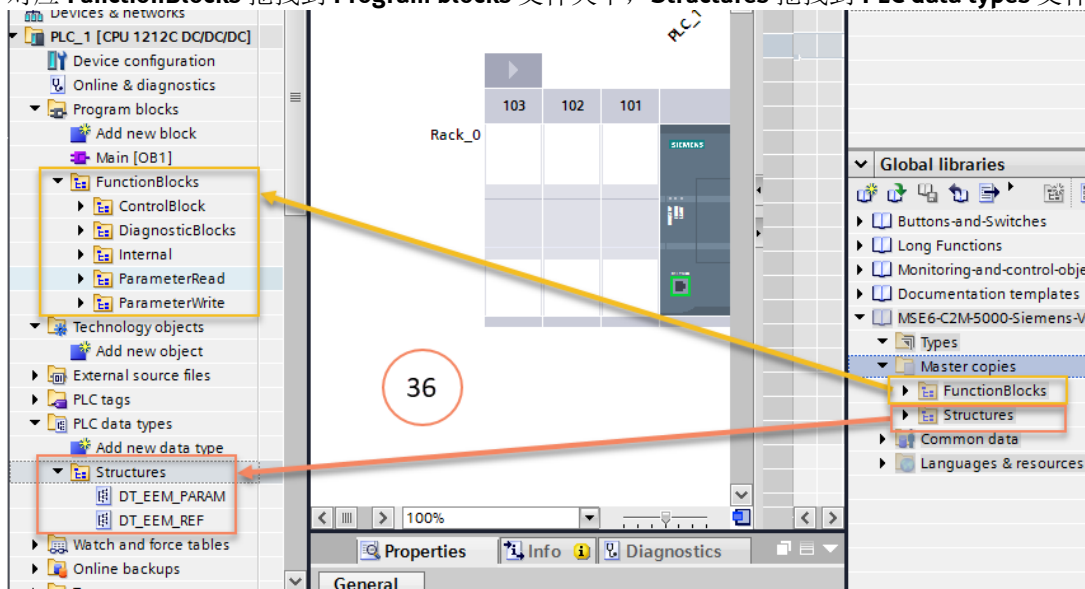
- 2、选择 **library** 的路径对应的库文件，点击 **open**



- 3、点击 **libraries** → **Global Libraries**，可以看到加载后的 **MSE6_C2M_5000-Siemens-V1.1** 的库文件，打开后可以查看到对应库文件的内容



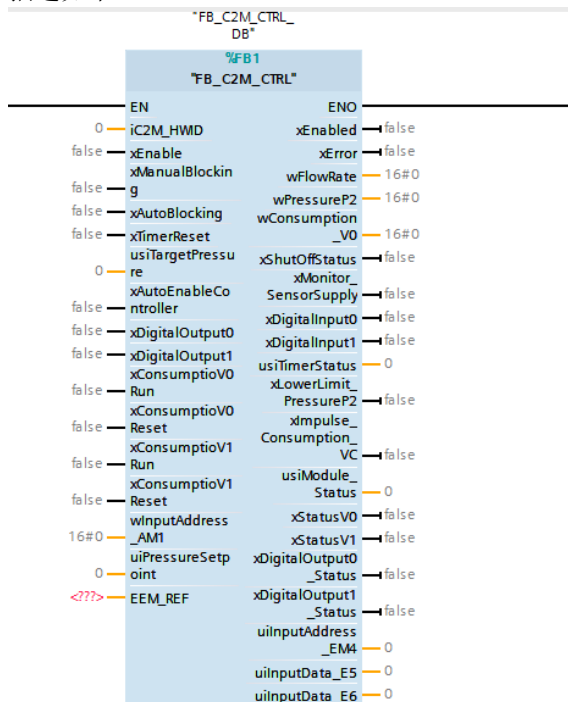
3、对应 **FunctionBlocks** 拖拽到 **Program blocks** 文件夹下，**Structures** 拖拽到 **PLC data types** 文件夹下。



6 MSE6-C2M-5000-Siemens 库文件描述

6.1 FB_C2M_CTRL

该功能块允许用户执行 **MSE6-C2M-5000** 的模块控制操作。使用该功能块，可以控制电控 **2/2** 阀的切断功能、实现压力调节、耗气量检测等。功能块还可以压力和压力变化值的监控等。如下是 **FB_C2M_CTRL block**。功能块对应的数据端口描述如下



INPUT DATA

NAME	DATA TYPE	DESCRIPTION
iC2M_HWID	HW_ANY	Hardware ID of the MSE6-C2M-5000 module in TIA Portal. Refer Section 6.5 to get to know about the identification of Hardware ID of MSE6-C2M-5000 module.
xEnable	BOOL	TRUE - Enable the Function Block FALSE - Disable the Function Block
xManualBlocking	BOOL	FALSE - Open Shut off valve(Presurization state) TRUE - Close shut off valve(Blocking state)
xAutoBlocking	BOOL	FALSE - User controlled pressure regulation and blocking function active (Default). TRUE - Automatic pressure regulation and blocking function active.
xTimerReset	BOOL	FALSE - No change in status of Q_Low timers(default). TRUE - Resetting Q_Low timers.
usiTargetPressure	USINT	It has the following values 0 = user-controlled target pressure = Power-On target pressure (depending on Pm.28.2, default) 1 = user-controlled target pressure = 2.5 bar 2 = electronic pressure regulation not active 3 = user-controlled target pressure = target pressure user variable (Am.2)
xAutoEnableController	BOOL	FALSE - automatic pressure regulation and blocking function not active (default) TRUE - automatic pressure regulation and blocking function active
xDigitalOutput0	BOOL	FALSE - Electrical output 0 sends logic 0 (default). TRUE - Electrical output 0 sends logic 1.
xDigitalOutput1	BOOL	FALSE - Electrical output 1 sends logic 0 (default). TRUE - Electrical output 1 sends logic 1.
xConsumptionV0Run	BOOL	FALSE - Measurement not active: measurement is stopped (default). TRUE - Measurement active: measurement is started or continued.

NAME	DATA TYPE	DESCRIPTION
xConsumptionV0Reset	BOOL	FALSE – Consumption reset function not active (default). TRUE – Consumption reset function active.
xConsumptionV1Run	BOOL	FALSE – Measurement not active: measurement is stopped (default). TRUE – Measurement active: measurement is started or continued.
xConsumptionV1Reset	BOOL	FALSE – Consumption reset function not active (default). TRUE – Consumption reset function active.
wInputAddress_AM1	WORD	Selectable input address.
uiPressureSetpoint	UINT	Pressure Setpoint P2.

Table 8.1.1: FB_C2M_CTRL Input Data

INOUT DATA

NAME	DATA TYPE	DESCRIPTION
EEM_REF	STRUCTURE of the Type DT_EEM_REF	Please refer Section 8.1.1 to get detailed description of the Content of this structure.

NOTE: Section 6.5 对应指的是第 21 页的 **Hardware identifier** 硬件 ID

NOTE: Section 8.1.1 指的是如下图所示的 **DT_EEM_REF** 的结构数据

DT_EEM_REF structure 的数据描述

NAME	DATA TYPE	DESCRIPTION
abInputs	ARRAY[0..11] OF BYTE	Array of Byte Inputs
abOutputs	ARRAY[0..3] OF BYTE	Array of Byte Outputs
iC2M_HWID	INT Or HW_ANY	Hardware ID of MSE6-C2M-5000 module in TIA Portal.
iDeviceType	INT	0 = invalid Device Type 1 = E2M 2 = D2M 3 = C2M
iProtocol	INT	0 = invalid Protocol Type 1 = PROFINET 2 = ETHERNET/IP 3 = Ether CAT 4 = Modbus/TCP
xDiagnosisEnabled	BOOL	TRUE = Diagnostic block is enabled
xDiagnosisDone	BOOL	TRUE = Diagnostic block finishes requesting for Diagnostics

OUTPUT DATA

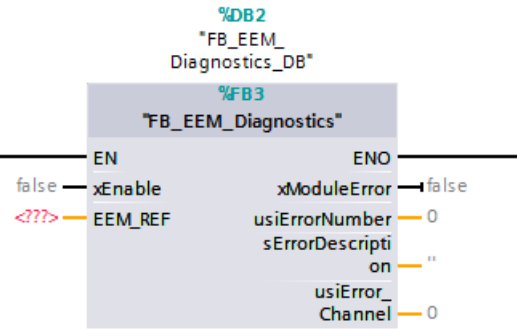
NAME	DATA TYPE	DESCRIPTION
xEnabled	BOOL	TRUE – Function Block is enabled FALSE – Function Block is disabled
xError	BOOL	FALSE – No error during FB operation TRUE – Error during FB operation
wFlowRate	WORD	Flow Rate Value.
wPressureP2	WORD	Pressure P2 value.
	WORD	Consumption Measurement Value
xShutOffStatus	BOOL	FALSE – Shut off valve opened (pressurisation) TRUE – Shut off valve closed (Blocking)
xMonitorSensorSupply	BOOL	FALSE – Sensor supply is switched off. TRUE – Sensor supply is switched on.
xDigitalInput0	BOOL	FALSE – signal at electrical input 0 not present (logic 0) TRUE – signal at electrical input 0 applied (logic 1)
xDigitalInput1	BOOL	FALSE – signal at electrical input 1 not present (logic 0) TRUE – signal at electrical input 1 applied (logic 1)
siTimerStatus	SINT	0 – RESET : Q_Low Timer Not Started 1 – RUN : Q_Low Timer Running 2 – UP : Q_Low Timer Expired
xLowerLimitPressureP2	BOOL	FALSE = pressure P2 is > the parameter value Lower pressure critical limit P2 TRUE = pressure P2 is < the parameter value Lower pressure critical limit P2
xImpulse_Consumption_VC	BOOL	Indicates the measurement impulse of the continuous consumption measurement and has the following values: 0 = idle signal between consumption measurement impulses. 1 = 100 ms continuous consumption measurement impulse after 200 l with consumption unit l³. 1 = 100 ms continuous consumption measurement impulse after 10 scf with consumption unit scf.
xStatusV0	BOOL	FALSE = measurement of consumption V0 not active TRUE = measurement of consumption V0 active
xStatusV1	BOOL	FALSE = measurement of consumption V1 not active TRUE = measurement of consumption V1 active
xDigitalOutput0_Status	BOOL	FALSE = no short-circuit/overload at electrical output 0 TRUE = short-circuit/overload at electrical output 0
xDigitalOutput1_Status	BOOL	FALSE = no short-circuit/overload at electrical output 1 TRUE = short-circuit/overload at electrical output 1
uiInputAddress_EM4	UINT	The address of the current input value is transmitted. In the basic setting, the address value 0 is set.
uiInputData_EM5	UINT	The input data of the currently set address is transmitted.
uiInputData_EM6	UINT	The input data of the currently set address is transmitted.

NAME	DATA TYPE	DESCRIPTION
usiModuleStatus	USINT	It has the following values 0 = USER_RISE: pressure increase until user-set target pressure is reached (USER mode) 1 = USER_PON: pressure regulation to set Power-On target pressure (USER mode) 2 = USER_MIN: pressure regulation to minimum target pressure = 2.5 bar (USER mode) 3 = USER_REGOFF: electronic pressure regulation deactivated (USER mode) 4 = USER_VAR: pressure regulation to set target pressure according to Am.2 (USER mode) 5 = USER_SHUTOFF: module in shut-off mode (USER mode) 7 = OFF_24VA: missing load voltage supply, pressure regulation and blocking function not active (USER/AUTO mode) 8 = AUTO_NORMAL: pressure regulation at parameterised target pressure Auto Normal (AUTO mode) 9 = AUTO_WAIT: pressure regulation at parameterised set point pressure Auto Normal during an underrun of the parameter value Auto-controller flow rate critical limit, Q_low-Timer running (AUTO mode) 10 = AUTO_HOLD: pressure regulation at parameterised target pressure Auto Normal, Q_low-Timer expired, automatic pressure regulation and blocking function not activated (AUTO mode) 11 = AUTO_SHUTOFF: module in blocking state, Q_low-Timer expired, automatic pressure regulation and blocking function activated (AUTO mode) 12 = AUTO_STANDBY: pressure regulation to parameterised target pressure Auto Standby (AUTO mode) 13 = AUTO_RISE: pressure increase up to the configured target pressure Auto Normal (AUTO mode)

6.2 FB_EMM_Diagnostics

该功能块是允许用户检索 **MSE6-C2M-5000** 模块的针对信息，功能块可提供如下信息
已发生的错数量；错误发生时对应的通道号；模块对应的错误代码；诊断块每一秒都会检测 **MSE6-C2M-5000** 的诊断信息。

NOTE: 在使用 **FB_EEM_Diagnostics** 前，必须在项目中调用 **FB_C2M_CTRL** 并且已启用。



对应的数据端口描述如下

NAME	DATA TYPE	DESCRIPTION
xEnable	BOOL	TRUE -Enable the Function Block FALSE- Disable the Function Block

INOUT DATA

NAME	DATA TYPE	DESCRIPTION
EEM_REF	Structure of the Type DT_EEM_REF	Please refer Section 8.1.1 to get detailed description of the Content of this structure.

NOTE: Section 8.1.1 对应指的是第 25 页 DT_EEM_REF structure 的数据描述

OUTPUT DATA

NAME	DATA TYPE	DESCRIPTION
xModuleError	BOOL	FALSE – No error in the MSE6-C2M-5000 module operation. TRUE – Error exists in the MSE6-C2M-5000 module operation.
usiErrorNumber	USINT	Gives the current error number occurred in the module.
usiError_Channel	WORD	Gives the channel number where the error exists.
sErrorDescription	STRING	Gives the description of the error occurred in the module . Refer Table 8.2.4 to see the error description.

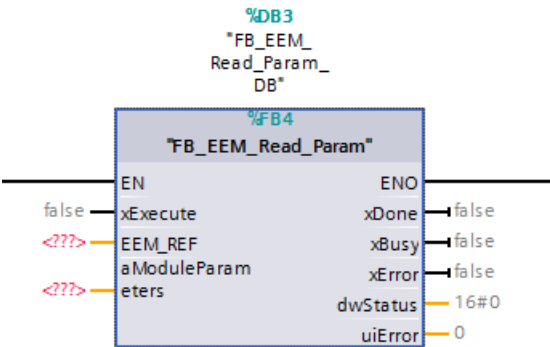
NOTE: table 8.2.4 对应指的是如下图所示 sErrorDescription 的错误代码描述

sErrorDescription

NAME	DATA TYPE	DESCRIPTION
usiErrorNumber	usiErrorChannel	
0		NO_ERROR
2	3	SHORT_CIRCUIT_OR_OVERLOAD_SENSOR_SUPPLY
10	0	UPPER_FLOW_RATE_LIMIT_EXCEEDED
	2	UPPER_PRESSURE_LIMIT_EXCEEDED
	3	UPPER_PRESSURE_CHANGE_LIMIT_EXCEEDED
15	0	FLOW_SENSOR_DEFECTIVE
	2	PRESSURE_SENSOR_P2_DEFECTIVE
24	2	FAULT_PARAMETER_LOWER_CRITICAL_LIMIT
25	0	INVALID_UPPER_CRITICAL_LIMIT_FLOW_RATE
	2	INVALID_UPPER_CRITICAL_LIMIT_PRESSURE
	3	INVALID_UPPER_CRITICAL_LIMIT_PRESSURE_CHANGE
26		UNDERVOLTAGE
29		PARAMETERIZATION_ERROR

6.3 FB_EMM_Read_Param

该功能块是允许用户读取 MSE6-C2M 模块的参数；允许用户读取所需的参数；用户必须将参数的功能编号作为功能块的输入；功能块将返回参数值作为输出；功能块允许用户在同时读取多个参数。



INPUT DATA

NAME	DATA TYPE	DESCRIPTION
xExecute	BOOL	TRUE -Execute FB on rising edge FALSE – The FB will not be executed.

INOUT DATA

NAME	DATA TYPE	DESCRIPTION
EEM_REF	STRUCTURE of the Type EEM_REF	Please refer Section 8.1.1 to get detailed description of the Content of this structure.
aModuleParameters	Array 0..99 of DT_EEM_PARAM	Please refer Section 8.3.1 to get detailed description of the Content of this structure.

NOTE: Section 8.1.1 对应指的是第 25 页 DT_EEM_REF structure 的数据描述

NOTE: Section 8.3.1 对应指的是如下图所示 DT_EEM_PARAM 的描述

DT_EEM_PARAM

NAME	DATA TYPE	DESCRIPTION
wParameter_Number	WORD	Gives the Parameter Number. Refer Table 8.3.4 for the function numbers.
wValue	WORD	The value to be written to the parameter. For FB_EEM_Read_Param , the wValue will get the parameter values read. For FB_EEM_Write_Param , the wValue will hold the values to be written to the parameter.

NOTE: Table 8.3.4 对应指的是 wParameter_Number 即参数的功能编号，如下图所示

FUNCTION NUMBER(wParameterNumber)	PARAMETER READ(wValue)
4828	Monitoring Bit 0: SCS (short circuit/overload in sensor supply) Bit 1: SCS (short circuit/overload at outputs) Bit 2: Uaus/Uven (undervoltage in actuator supply) Bit 6: Critical limits Bit 7: Parameters
4835	Monitor Limit Values 0 .. 0 s 1 .. 3 s 2 .. 5 s 3 .. 10 s default 4 .. 30 s 5 .. 60 s 6 .. 120 s 7 .. 300 s 8 255 Not permissible
4836	Units for Pressure, consumption, flow rate and flow rate standard. Units Bit 0 ... 1: Pressure Bit 2 ... 3: Flow rate Bit 4 ... 5: Consumption Bit 6 ... 7: Flow standard
4838	Pressure change sample time.
4839	Upper Limit Flow Rate
4841	Upper Limit Pressure
4843	Upper Limit Pressure Change
4845	Auto Control delay time
4847	Auto Controller Flow rate critical limit
4849	Pressure setpoint Auto Normal
4851	Pressure setpoint Auto Standby
4853	Lower Pressure Critical Limit P2
4855	Bit 1: signal extension channel digital input 1 Bit 2 ... 3: signal extension time digital inputs Bit 4 ... 5: debouncing time digital inputs Bit 6: behaviour of sensor supply USEN/EL after short circuit/ overload Bit 7: behaviour of digital outputs after short circuit / overload

FUNCTION NUMBER(wParameterNumber)	PARAMETER READ(wValue)
4856	Module control (byte 1) Bit 0 ... 1: Q_low-Timer Reset selection Bit 2: target pressure power on Bit 3: selection for digital output 0 Bit 4 ... 6: target pressure rise limit

OUTPUT DATA

NAME	DATA TYPE	DESCRIPTION
xDone	BOOL	TRUE -Parameter reading function is over with no errors FALSE - Parameter reading function is not over due to some errors
xBusy	BOOL	TRUE -Reading function is under process FALSE - Reading function is not under process.
xError	BOOL	TRUE -Reading function has some errors. FALSE - Reading function has no errors
dwStatus	Double Word	Gives the status of the RDREC instruction of TIA portal used for reading Profinet Parameters. Refer RDREC Status in TIA Portal Help section to get detailed description on RDREC instruction status.
uiError	UINT	Error number of the error which has occurred during the parameters read function. Refer EEM_Error (Table 8.3.6) to get detailed description on Error Number.

NOTE: Table 8.3.6 对应指的是 **EEM_Error** 即错误号，如下图所示

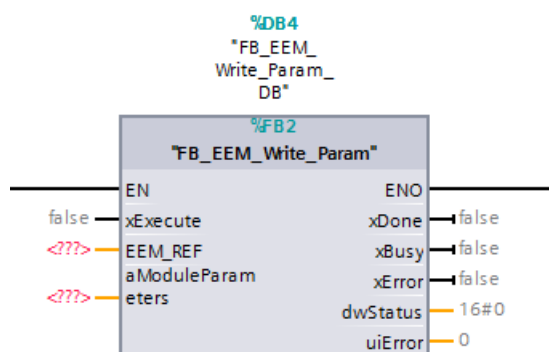
EEM_Error

Error Number	DESCRIPTION
1001	Invalid Index. Check the parameter Index for Read/Write
1002	Error Read Parameter. Check communication Settings
1003	Error Write Parameter. Check communication Settings

6.4 FB_EEM_Read_Param

该功能块允许用户更改 **MSE6-C2M** 模块的参数值且只能使用该功能块更改允许编辑的参数；功能块允许用户编写他想要的参数；用户必须将参数的功能编号及其值作为输入给到功能块；功能块允许用户同时写入多个参数。

NOTE: 有两个参数只能通过此功能块进行编辑：电控关断阀的循环时间。



INPUT DATA

NAME	DATA TYPE	DESCRIPTION
xExecute	BOOL	TRUE -Execute FB on rising edge FALSE – The FB will not be executed.

INOUT DATA

NAME	DATA TYPE	DESCRIPTION
EEM_REF	STRUCTURE of the Type EEM_REF	Please refer Section 8.1.1 to get detailed description of the Content of this structure.
aModuleParameters	Array 0..99 of DT_EEM_PARAM	Please refer Section 8.3.1 to get detailed description of the Content of this structure.

NOTE: Section 8.1.1 对应指的是第 25 页 DT_EEM_REF structure 的数据描述

NOTE: Section 8.3.1 对应指的是第 29 页 DT_EEM_PARAM 的描述

OUTPUT DATA

NAME	DATA TYPE	DESCRIPTION
xDone	BOOL	TRUE -Parameter reading function is over with no errors FALSE- Parameter reading function is not over due to some errors
xBusy	BOOL	TRUE -Reading function is under process FALSE- Reading function is not under process.
xError	BOOL	TRUE -Reading function has some errors. FALSE- Reading function has no errors
dwStatus	Double Word	Gives the status of the WRREC instruction of TIA portal used for writing Profinet Parameters. Refer WRREC Status in TIA Portal Help section to get detailed description on WRREC instruction status.
uiError	UINT	Error number of the error which has occurred during the parameters read function. Refer EEM_Error (Table 8.3.6) to get detailed description on Error Number.

NOTE: Table 8.3.6 对应指的是第 30 页的 EEM_Error 即错误号。

7 aMouduleParameters 的描述

aMouduleParameters 是针对 structure DT_EEM_Read_Param 的详细描述

7.1 在 FB_EMM_Read_Param 的用法

1、假设创建了一个变量 EEM_Param_Read 将其链接到 INOUT 参数 aMouduleParameters

Name	Data type
EEM_Param_Read	Array[0..99] of "DT_EEM_PARAM"

2、Array 展开对应如下

global_C2M								
	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint
1	Static							
2	C2M1	"DT_EEM_REF"			☒	☒	☒	
3	EEM_PARAM_READ	Array[0..99] of "DT...			☒	☒	☒	☒
4	EEM_PARAM_READ[0]	"DT_EEM_PARAM"			☒	☒	☒	☒
5	wParameter_Number	Word	16#0		☒	☒	☒	
6	wValue	Word	Parameter value read		☒	☒	☒	
7	EEM_PARAM_READ[1]	"DT_EEM_PARAM"			☒	☒	☒	☒
8	wParameter_Number	Word	16#0		☒	☒	☒	
9	wValue	Word	16#0		☒	☒	☒	
10	EEM_PARAM_READ[2]	"DT_EEM_PARAM"			☒	☒	☒	☒
11	wParameter_Number	Word	16#0		☒	☒	☒	
12	wValue	Word	16#0		☒	☒	☒	
13	EEM_PARAM_READ[3]	"DT_EEM_PARAM"			☒	☒	☒	☒
14	wParameter_Number	Word	16#0		☒	☒	☒	
15	wValue	Word	16#0		☒	☒	☒	
16	EEM_PARAM_READ[4]	"DT_EEM_PARAM"			☒	☒	☒	☒
17	wParameter_Number	Word	16#0		☒	☒	☒	
18	wValue	Word	16#0		☒	☒	☒	
19	EEM_PARAM_READ[5]	"DT_EEM_PARAM"			☒	☒	☒	☒
20	EEM_PARAM_READ[6]	"DT_EEM_PARAM"			☒	☒	☒	☒

NOTE: Function Number 请查看第 29 页对应 wParameter_Number 即参数的功能编号

3、要读取如压力变化的采样时间、流量上限值、压力上限值等，可以在第 29 页查看到对应 function number 分别是 4838、4839、4841

4、通过 read 功能块执行可读取对应功能号的数值。

Name	Address	Display format	Monitor value	Modify value
*global_C2M.EEM_PARAM_READ[0].wParameter_Num...		DEC	4838	4838
*global_C2M.EEM_PARAM_READ[0].wValue		DEC	1	
*global_C2M.EEM_PARAM_READ[1]				
*global_C2M.EEM_PARAM_READ[1].wParameter_Num...		DEC	4839	4839
*global_C2M.EEM_PARAM_READ[1].wValue		DEC	32767	
*global_C2M.EEM_PARAM_READ[2]				
*global_C2M.EEM_PARAM_READ[2].wParameter_Num...		DEC	4841	4841
*global_C2M.EEM_PARAM_READ[2].wValue		DEC	32767	

7.2 在 FB_EMM_Write_Param 的用法

1、假设创建了一个变量 EEM_Param_Write 将其链接到 INOUT 参数 aMouduleParameters

EEM_Param_Write	Array[0..99] of "DT_EEM_PARAM"
-----------------	--------------------------------

2、Array 展开对应如下

global_C2M					
Name	Data type	Start value	Retain	Access	
Static			☐		
C2M1	"DT_EEM_REF"		☐		
EEM_PARAM_READ	Array[0..99] of "DT_EEM_PARAM"		☐		
EEM_PARAM_WRITE	Array[0..99] of "DT_EEM_PARAM"		☐		
EEM_PARAM_WRITE[0]	"DT_EEM_PARAM"		☐		
wParameter_Number	Word	Function Number 16#0	☐		
wValue	Word	value to be written to Parameter	☐		
EEM_PARAM_WRITE[1]	"DT_EEM_PARAM"		☐		
wParameter_Number	Word	16#0	☐		
wValue	Word	16#0	☐		
EEM_PARAM_WRITE[2]	"DT_EEM_PARAM"		☐		
wParameter_Number	Word	16#0	☐		
wValue	Word	16#0	☐		
EEM_PARAM_WRITE[3]	"DT_EEM_PARAM"		☐		
wParameter_Number	Word	16#0	☐		
wValue	Word	16#0	☐		
EEM_PARAM_WRITE[4]	"DT_EEM_PARAM"		☐		
EEM_PARAM_WRITE[5]	"DT_EEM_PARAM"		☐		
EEM_PARAM_WRITE[6]	"DT_EEM_PARAM"		☐		

- 3、要读取如压力变化的采样时间、流量上限值、压力上限值等，可以在第 29 页看到对应 **function number** 分别是 **4838、4839、4841**

- 4、通过 **write** 功能块执行可写入对应功能号所需的数值。

Name	Address	Display format	Monitor value	Modify value		
*global_C2M.EEM_PARAM_WRITE[0].wParameter_Number		DEC	4838	4838	☒	
*global_C2M.EEM_PARAM_WRITE[0].wValue		DEC	2	2	☒	
*global_C2M.EEM_PARAM_WRITE[1]					☐	
*global_C2M.EEM_PARAM_WRITE[1].wParameter_Number		DEC	4839	4839	☒	
*global_C2M.EEM_PARAM_WRITE[1].wValue		DEC	32760	32760	☒	
*global_C2M.EEM_PARAM_WRITE[2]					☐	
*global_C2M.EEM_PARAM_WRITE[2].wParameter_Number		DEC	4841	4841	☒	
*global_C2M.EEM_PARAM_WRITE[2].wValue		DEC	32760	32760	☒	

然后通过 **read** 功能块读取数据，确认修改的数据已被写入。

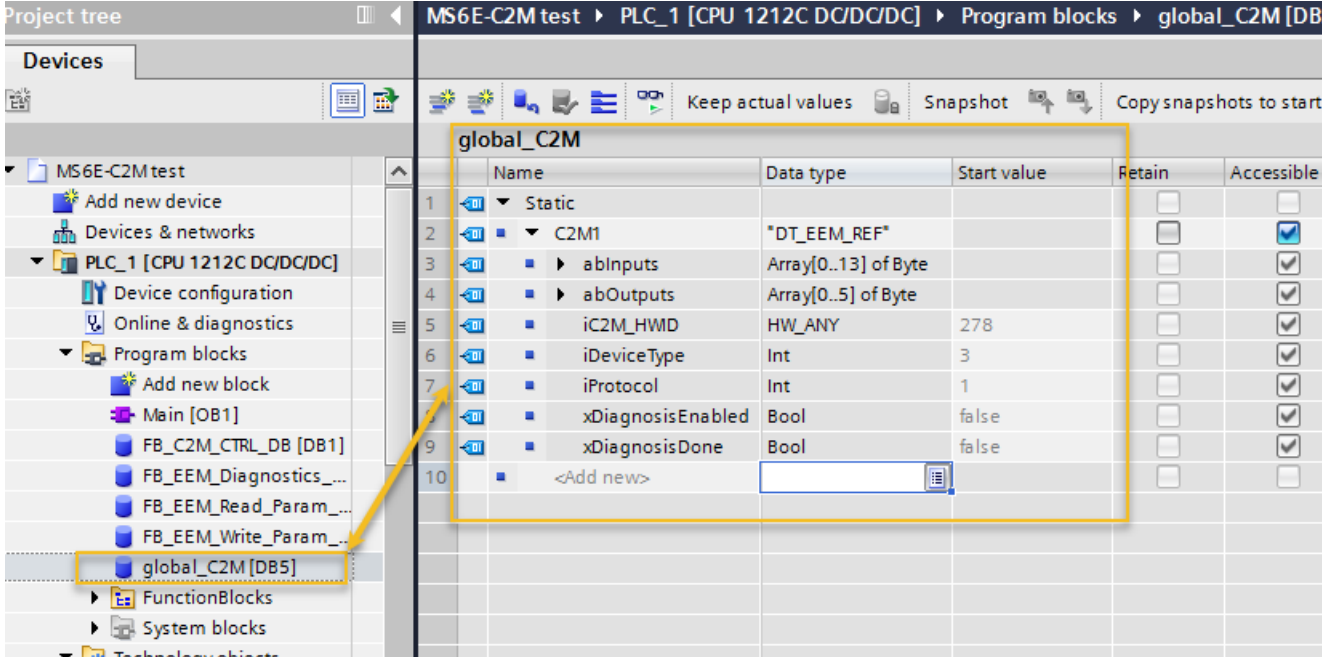
Name	Address	Display format	Monitor value	Modify value		
*global_C2M.EEM_PARAM_READ[0].wParameter_Num...		DEC	4838	4838	☒	
*global_C2M.EEM_PARAM_READ[0].wValue		DEC	2		☐	
*global_C2M.EEM_PARAM_READ[1]					☐	
*global_C2M.EEM_PARAM_READ[1].wParameter_Num...		DEC	4839	4839	☒	
*global_C2M.EEM_PARAM_READ[1].wValue		DEC	32760		☐	
*global_C2M.EEM_PARAM_READ[2]					☐	
*global_C2M.EEM_PARAM_READ[2].wParameter_Num...		DEC	4841	4841	☒	
*global_C2M.EEM_PARAM_READ[2].wValue		DEC	32760		☐	
FB_EEM_Read_Param_DB.xExecute		Bool	TRUE	TRUE	☒	

NOTE: 当执行 **FB_EEM-Write_Param** 时，**Function Numbers** 需要写入到 **wParameterNumber**，要写入的数值须在 **wValue** 中写入。

8 集成功能块到项目中

8.1 集成功能块到项目中

- 1、创建全局数据块，定义名称为 **global_C2M**，然后在该数据块中添加变量，名称为 **C2M1** 数据类型选择 **DT_EEM_REF**



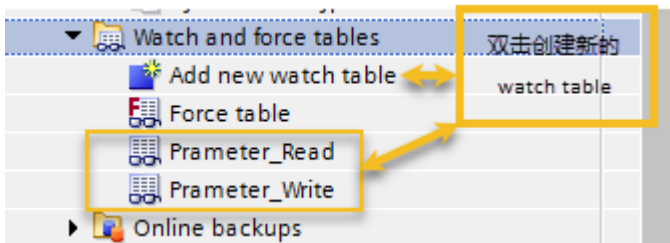
- 2、创建两个变量，数据类型为 **Array[0..99] of "DT_EEM_PARAM"**

Name	Data type	Start value
Static		
C2M1	"DT_EEM_REF"	
EEM_PARAM_READ	Array[0..99] of "DT_EEM_PARAM"	
EEM_PARAM_WRITE	Array[0..99] of "DT_EEM_PARAM"	

EEM_PARAM_WRITE 链接到 aModuleParameters of FB_Write_Param

EEM_PARAM_READ 链接到 aModuleParameters of FB_Read_Param

- 3、创建 **watch table** 监控表，增加与全局数据块(global_C2M)一样的内容



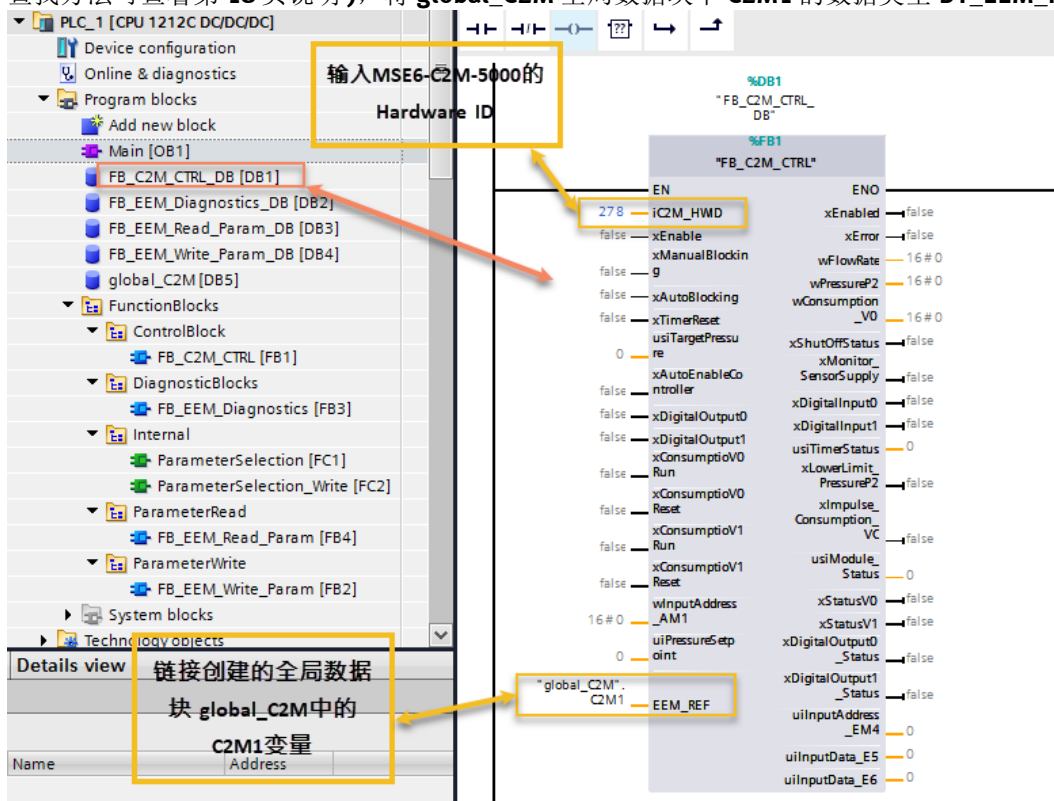
- 4、将全局数据块的(global_C2M)的 **EEM_PARAM_READ** 元素组链接到 **watch table**，如下图所示

	Name	Address	Display format	Monitor value	Modify value
1	*global_C2M.EEM_PARAM_READ[0].wParameter_Number		Hex		
2	*global_C2M.EEM_PARAM_READ[0].wValue		Hex		
3	*global_C2M.EEM_PARAM_READ[1]				
4	*global_C2M.EEM_PARAM_READ[1].wParameter_Number		Hex		
5	*global_C2M.EEM_PARAM_READ[1].wValue		Hex		
6	*global_C2M.EEM_PARAM_READ[2]				
7	*global_C2M.EEM_PARAM_READ[2].wParameter_Number		Hex		
8	*global_C2M.EEM_PARAM_READ[2].wValue		Hex		
9	*global_C2M.EEM_PARAM_READ[3]				
10	*global_C2M.EEM_PARAM_READ[3].wParameter_Number		Hex		
11	*global_C2M.EEM_PARAM_READ[3].wValue		Hex		
12	*global_C2M.EEM_PARAM_READ[4]				
13	*global_C2M.EEM_PARAM_READ[4].wParameter_Number		Hex		
14	*global_C2M.EEM_PARAM_READ[4].wValue		Hex		
15	*global_C2M.EEM_PARAM_READ[5]				

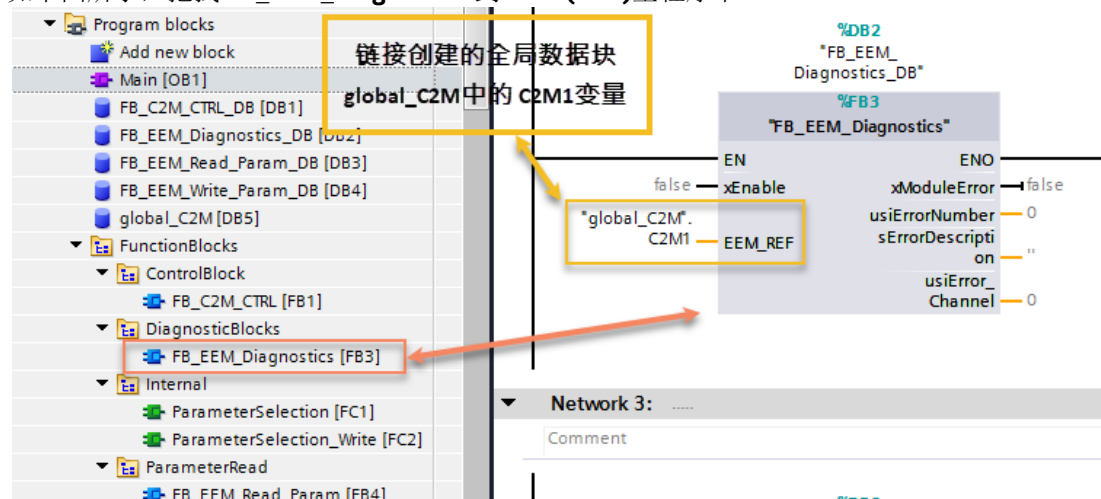
5、同样的，将全局数据块的(global_C2M)的 EEN_PARAM_WRITE 元素组链接到 watch table，如下图所示

	Name	Address	Display format	Monitor value	Modify value
1	*global_C2M.EEM_PARAM_WRITE[0].wParameter_Number		Hex		
2	*global_C2M.EEM_PARAM_WRITE[0].wValue		Hex		
3	*global_C2M.EEM_PARAM_WRITE[1]				
4	*global_C2M.EEM_PARAM_WRITE[1].wParameter_Number		Hex		
5	*global_C2M.EEM_PARAM_WRITE[1].wValue		Hex		
6	*global_C2M.EEM_PARAM_WRITE[2]				
7	*global_C2M.EEM_PARAM_WRITE[2].wParameter_Number		Hex		
8	*global_C2M.EEM_PARAM_WRITE[2].wValue		Hex		
9	*global_C2M.EEM_PARAM_WRITE[3]				
10	*global_C2M.EEM_PARAM_WRITE[3].wParameter_Number		Hex		
11	*global_C2M.EEM_PARAM_WRITE[3].wValue		Hex		
12	*global_C2M.EEM_PARAM_WRITE[4]				
13	*global_C2M.EEM_PARAM_WRITE[4].wParameter_Number		Hex		
14	*global_C2M.EEM_PARAM_WRITE[4].wValue		Hex		
15	*global_C2M.EEM_PARAM_WRITE[5]				
16	*global_C2M.EEM_PARAM_WRITE[5].wParameter_Number		Hex		
17	*global_C2M.EEM_PARAM_WRITE[5].wValue		Hex		
18	*global_C2M.EEM_PARAM_WRITE[6]				

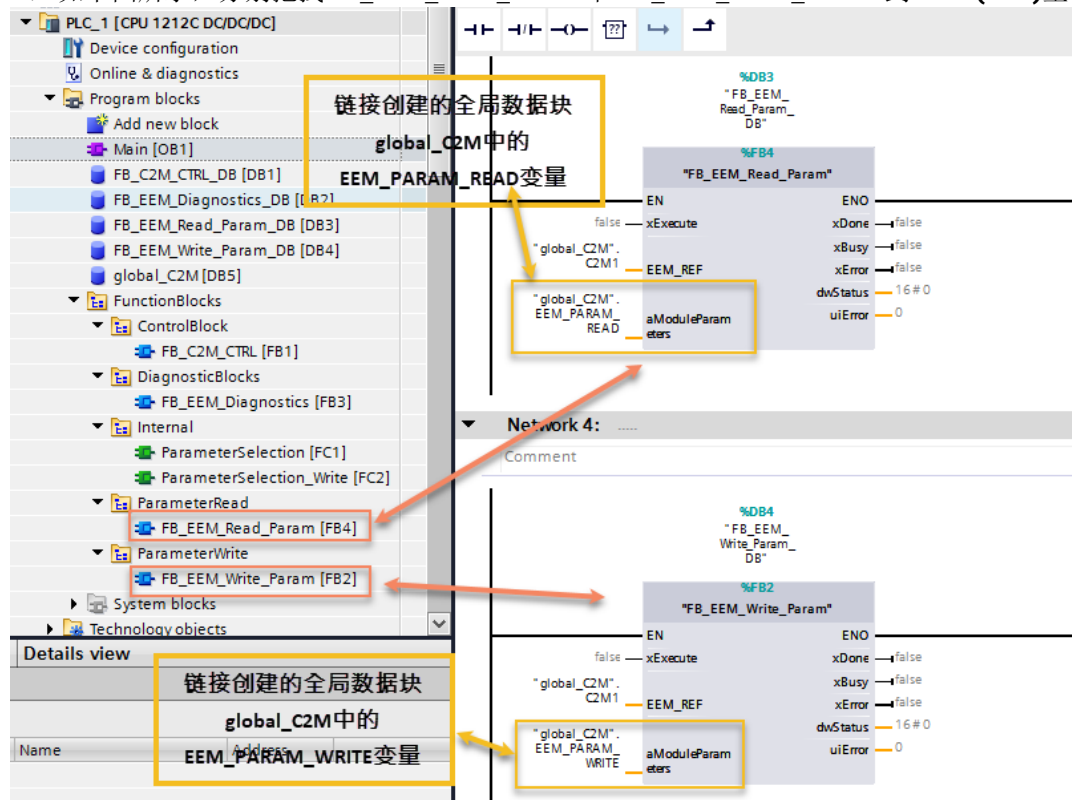
6、如下图所示，拖拽 FB_C2M_CTRL 功能块到 Main(OB1)主程序中，输入 MSE6-C2M-5000 的 Hardware ID (硬件 ID 的查找方法可查看第 18 页说明)，将 global_C2M 全局数据块中 C2M1 的数据类型 DT_EEM_REF 链接到 EEM_REF。



7、如下图所示，拖拽 FB_EEM_Diagnostics 到 Main(OB1)主程序中



8、如下图所示，分别拖拽 **FB_EEM_Read_Param** 和 **FB_EEM_Write_Param** 到 **Main(OB1)**主程序中。



9、完成后，进行编译、下载到 PLC 中，Go online 保持 PLC 处于 RUN 模式。

8.2 在线后参数读写举例

- 1、读取压力变化的采样时间、流量上限值、压力上限值等，可以在第 29 页查看到对应 function number 分别是 4838、4839、4841
- 2、在 **watch table** 创建的 **PARAM_READ** 中，写入 **function number**，然后执行，可以看到对应的数据

Name	Address	Display format	Monitor value	Modify value	Comment
*global_C2M.EEM_PARAM_READ[0].wParameter_Num...		DEC	4838	4838	
*global_C2M.EEM_PARAM_READ[0].wValue		DEC	1		压力变化采样时间
*global_C2M.EEM_PARAM_READ[1].wParameter_Num...		DEC	4839	4839	
*global_C2M.EEM_PARAM_READ[1].wValue		DEC	32767		流量上限值
*global_C2M.EEM_PARAM_READ[2].wParameter_Num...		DEC	4841	4841	
*global_C2M.EEM_PARAM_READ[2].wValue		DEC	32767		压力上限值
FB_EEM_Read_Param_DB.xExecute		Bool	TRUE	TRUE	

3、**watch table** 创建的 **PARAM_WRITE** 中写入压力变化的采样时间、流量上限值、压力上限值并执行。

Name	Address	Display format	Monitor value	Modify value	
*global_C2M.EEM_PARAM_WRITE[0].wParameter_Number		DEC	4838	4838	
*global_C2M.EEM_PARAM_WRITE[0].wValue		DEC	2	2	
*global_C2M.EEM_PARAM_WRITE[1].wParameter_Number		DEC	4839	4839	
*global_C2M.EEM_PARAM_WRITE[1].wValue		DEC	32760	32760	
*global_C2M.EEM_PARAM_WRITE[2].wParameter_Number		DEC	4841	4841	
*global_C2M.EEM_PARAM_WRITE[2].wValue		DEC	32760	32760	

3、在查看 **watch table** 创建的 **PARAM_READ** 中，重新执行，可读到新写入的数据

Name	Address	Display format	Monitor value	Modify value	
*global_C2M.EEM_PARAM_READ[0].wParameter_Num...		DEC	4838	4838	
*global_C2M.EEM_PARAM_READ[0].wValue		DEC	2		新写入的压力变化采样时间
*global_C2M.EEM_PARAM_READ[1].wParameter_Num...		DEC	4839	4839	
*global_C2M.EEM_PARAM_READ[1].wValue		DEC	32760		新写入的流量上限值
*global_C2M.EEM_PARAM_READ[2].wParameter_Num...		DEC	4841	4841	
*global_C2M.EEM_PARAM_READ[2].wValue		DEC	32760		新写入的压力上限值
FB_EEM_Read_Param_DB.xExecute		Bool	TRUE	TRUE	

NOTE: 执行信号是上升沿，所以写入数据完成后，再次读取数据，需要重新复位。