FV20 series IP20 book form I/O quick guide manual

Version 1.0, 2024-10-25

Tianjin ELCO Automation Co.,Ltd

CONTENT

1. Product Introduction

The FV20 series IP20 book form I/O modules adopt an integrated design of bus interface, I/O signal and power supply, and is installed on a standard 35mm DIN rail. Currently, it mainly offers 32-bit digital modules, compatible with bus protocols such as Profinet, EtherCAT, Ethernet/IP, and CC-LINK IE Field BASIC.

The FV20 series I/O terminals adopt a detachable and tool free design, equipped with 24VDC and 0V equipotential terminals equal to the number of I/Os, which facilitates sensor power supply wiring and maintenance.

FV20 is particularly suitable for application scenarios with compact installation space, It is also the best I/O choice for small and medium-sized automation systems,such as position sensor signal acquisition, alarm light output, and valve island control, providing cost-effective I/O product solutions for industries such as semiconductors, photovoltaics, and logistics.

2. Version change records

Revision date	Release version	Change content
2024-10	V1.0	First edition manual release

3. Regarding manual acquisition

This manual is not shipped with the product. If you need to obtain an electronic PDF file, you can obtain it through the following methods:

Log in to the official website of ELCO (www.elco holding. com. cn), search for keywords, and download.

Use WeChat to search and follow the official official account of " ELCO Automation" to obtain the product manual.

Contact the sales engineer of ELCO Automation in your region to obtain the latest manual materials.

4. Warranty Statement

Under normal use, if the product malfunctions or is damaged, ELCO Automation is responsible for an 18 months warranty (from the date of manufacture, the delivery date shall prevail, and any contractual agreements shall be executed in accordance with the agreement). If it exceeds 18 months, maintenance fees will be charged.

Within 18 months, repair fees will be charged for product damage caused by the following circumstances.

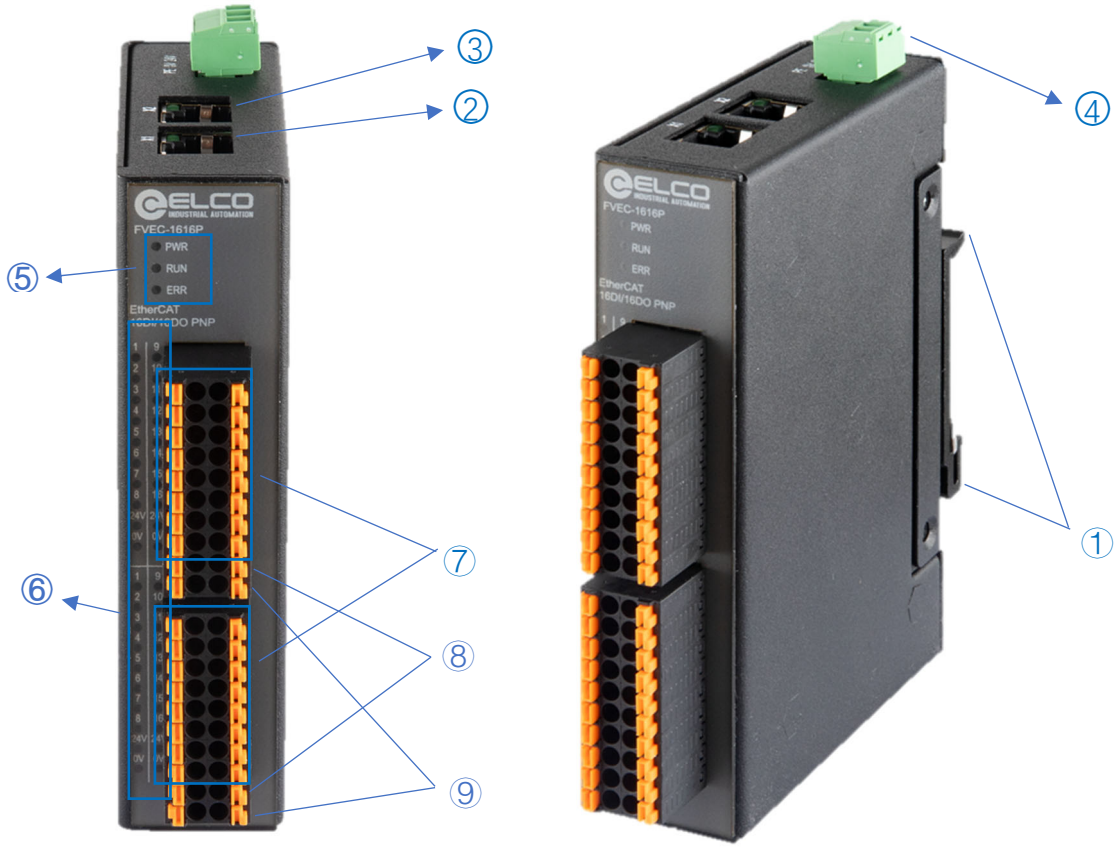
- Failure to operate this product according to the instructions in the manual, resulting in product damage.

- Damage to products caused by fires, floods, and abnormal voltage.
- Using this product for abnormal functions may cause product damage.
- Damage to the product caused by exceeding the specified usage range.
- Secondary damage to products caused by force majeure factors such as natural disasters, earthquakes, and lightning strikes.

The service fees shall be calculated according to the unified standards of ELCO. If there is a contract, the principle of contract priority shall be applied.

5. FV20 series introduction

5.1. Introduction to Appearance and Function



No.	Name	Function	Status
1	**Module fixed buckles**		
	-	Used to fix the module on the installation rail	-
2	**Bus input interface**		
	X1	RJ45,Female,with indicators	Blinking: There is network data exchange Extinguished: No network connection
3	**Bus output interface**		
	X2	RJ45,Female,with indicators	Blinking: There is network data exchange Extinguished: No network connection
4	**Power supply terminal block**		
	L	24VDC+	-
	M	0V	-
	PE	Protective Ground	-

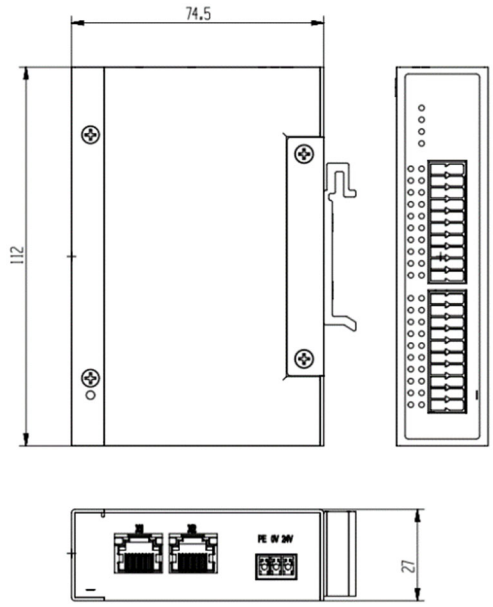
5	**Diagnostic LEDs**		
	PWR	Power status indication	
	RUN	Bus status indication	
	ERR	Module error indication	
6	**I/O status indicators**		
	1-32	I/O indicators	Green on: I/O corresponding channel high level; Off: I/O corresponding channel low level; Red on: I/O corresponding channel undervoltage or short circuit;
7	**I/O terminal blocks**		
8	**External power supply terminal 24 V**		
9	**External power supply terminal 0V**		

5.2. Technical specifications

Order Data				
Product model	**FVEC-3200P**	**FVEC-1616P**	**FVEC-0032P**	**FVEC-1616UP**
Description	EtherCAT, 32DI, PNP	EtherCAT, 16DI/16DO, PNP	EtherCAT, 32DO, PNP	EtherCAT, 16DI/16DIO, PNP
Product model	**FVEC-3200N**	**FVEC-1616N**	**FVEC-0032N**	**FVEC-1616UN**
Description	EtherCAT, 32DI, NPN	EtherCAT, 16DI/16DO, NPN	EtherCAT, 32DO, NPN	EtherCAT, 16DI/16DIO, NPN
Product model	**FVPN-3200P**	**FVPN-1616P**	**FVPN-0032P**	**FVPN-1616UP**
Description	Profinet, 32DI, PNP	Profinet, 16DI/16DO, PNP	Profinet, 32DO, PNP	Profinet, 16DI/16DIO, PNP
Product model	**FVPN-3200N**	**FVPN-1616N**	**FVPN-0032N**	**FVPN-1616UN**
Description	Profinet, 32DI, NPN	Profinet, 16DI/16DO, NPN	Profinet, 32DO, NPN	Profinet, 16DI/16DIO, NPN
Product model	**FVEI-3200P**	**FVEI-1616P**	**FVEI-0032P**	**FVEI-1616UP**
Description	Ethernet/IP, 32DI, PNP	Ethernet/IP, 16DI/16DO, PNP	Ethernet/IP, 32DO, PNP	Ethernet/IP, 16DI/16DIO, PNP
Product model	**FVEI-3200N**	**FVEI-1616N**	**FVEI-0032N**	**FVEI-1616UN**
Description	Ethernet/IP, 32DI, NPN	Ethernet/IP, 16DI/16DO, NPN	Ethernet/IP, 32DO, NPN	Ethernet/IP, 16DI/16DIO, NPN
Product model	**FVCB-3200P**	**FVCB-1616P**	**FVCB-0032P**	**FVCB-1616UP**
Description	CC-LINK IE FV, 32DI, PNP	CC-LINK IE FV, 16DI/16DO, PNP	CC-LINK IE FV, 32DO, PNP	CC-LINK IE FV, 16DI/16DIO, PNP
Product model	**FVCB-3200N**	**FVCB-1616N**	**FVCB-0032N**	**FVCB-1616UN**
Description	CC-LINK IE FB,	CC-LINK IE FB,	CC-LINK IE FB,	CC-LINK IE FB,

	32DI，NPN	16DI/16DO，NPN	32DO，NPN	16DI/16DIO，NPN
Interface type				
Bus	2×RJ45,100 BASE-TX			
Power	3-pos spring terminal			
I/O	4 × 8-pos pluggable spring terminal			
Aux terminals	8×8-pos pluggable spring terminal			
Electrical data				
Input channels	32	16	-	Max.32
Input power supply current	Max.125 mA/CH, less 4 A in total	Max.125 mA/CH, less 2 A in total	-	Max.125 mA/CH, less 2 A in total
Input filtering delay	1.6ms		-	1.6ms
Output channels	-	16	32	Max.16
Output current	-	Max.500 mA/CH，less 4 A in total		
Load type	-	Indicator lights, miniature solenoid valves, etc		
Output frequency	-	Resistive load up to 100Hz, inductive load up to 5Hz		
Diagnosis				
Bus status	LED indicators，communication message			
Power status	LED indicators			
Short circuit and overload	LED indicators			
General data				
IP grade	IP20			
Temperature	Working temperature：-5 ℃ to 60 ℃，Storage temperature：-25 ℃ to 70 ℃			
Humidity	15 %-95 %，no condensation			
Working altitude	0-2000 m			
Pollution degree	II			
Module size H×W×D	112 mm×27 mm×74.5 mm			

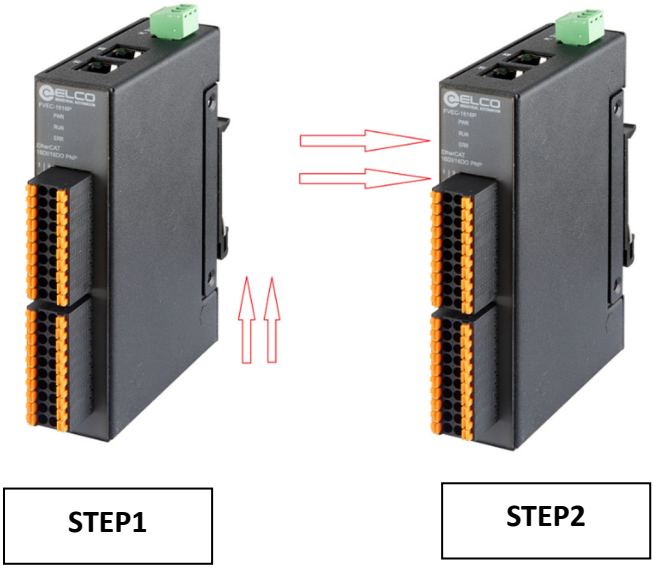
5.3. Dimension drawing



6. Mechanical installation and disassembly

6.1. Module installation

The installation of FV20 product can be carried out according to the steps shown in the following figure：



STEP1：Use upward force to snap the buckle into the guide rail;;

STEP2：After the module is inserted into the guide rail, press the module inward and lock the buckle in place to complete the fixed installation.

6.2. Module disassembly

Use a flathead screwdriver or similar tool to pry up the rail lock, and then pull out the module in a direction away from the DIN rail.
The I/O terminals of the module can be removed separately for easy module replacement.

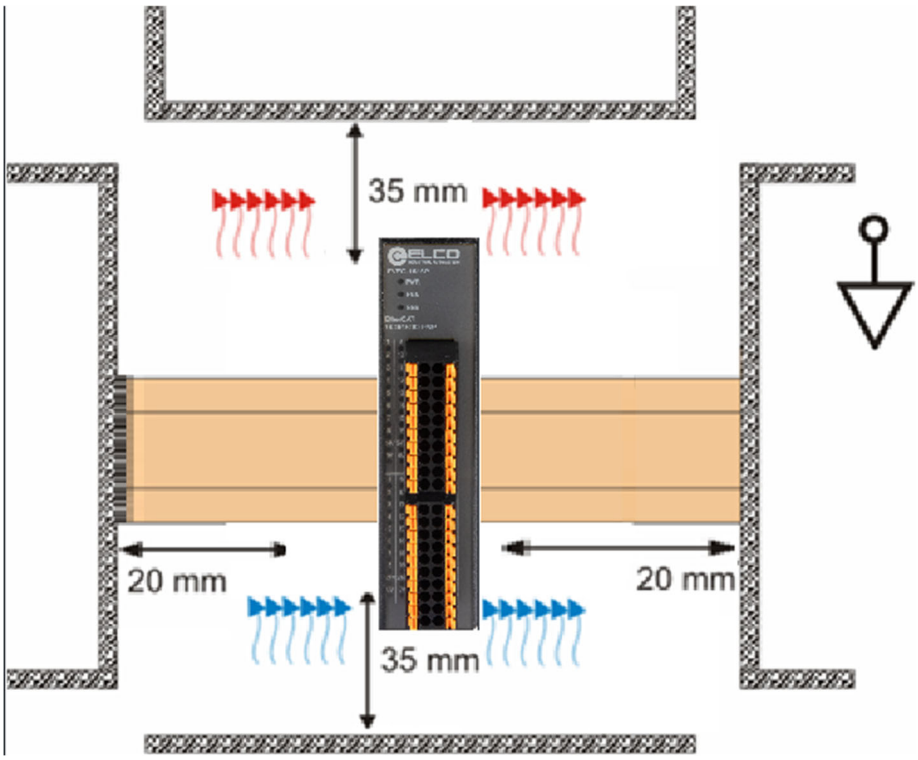
ATTENTION

During installation, align the module with the DIN rail and press the fixing device in the direction indicated by the arrow. After installation, there will be a noticeable clicking sound; change the position of the locking device slightly; after installing the module properly, make the locking device clamp the upper edge of the rail; to avoid damaging the product, do not apply excessive force.

ATTENTION

The mechanical installation and disassembly of modules require qualified professional mechanical personnel to operate and pay attention to the correct wearing and use of labor protection equipment.

6.3. Installation position and minimum distances



Mount the mounting rail horizontally for the specified installation position. The connection surfaces of the coupler and the I/O modules must face forwards. This can be seen from the illustration.

The components are ventilated from bottom to top, which enables optimum cooling of the electronics by convection ventilation. The direction specification "down" corresponds to the direction of the positive acceleration due to gravity.

ATTENTION

Observe minimum distances

Maintain the distances to neighboring devices and control cabinet walls specified in the figure. This is the only way to ensure optimum convection cooling.

If sufficient convection cooling is not ensured, the devices may overheat and be damaged.

7. Electrical installation and wiring

7.1. Cable specification

7.1.1. Communication cable

Bus communication uses shielded network cables for data transmission, without short circuits, misalignment, and poor contact; The length of the cable between devices cannot exceed 100m, as exceeding this length will cause signal attenuation and affect normal communication. The following specifications of communication cables are recommended:

Item	Specification
Cable type	Elastic crossover cable, S-FTP, category 5
Standards met	EIA/TIA568A，EN50173，ISO/IEC11801 EIA/TIA bulletin TSB，EIA/TIA SB40-A&TSB36
Conductor section	AWG26
Wire type	Twisted pair
Wire pair	4

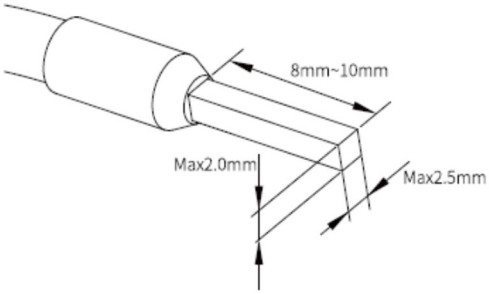
Pre-wired connectors are better for communication and construction. Elco pre-wired connectors can provide customized cable material and cable length in accordance with communication technology requirements. The following Elco Ethernet connectors are available:

Model	Description
E16DA4002M020	RJ45-M12 double-ended pre-wired Ethernet connector, male straight, D-CODE, 4-pin, Cat5e, PVC, 2 M, fixed installation
E66D04002M020	RJ45-RJ45 double-ended pre-wired Ethernet connector，male straight-male straight，4-pin，Cat5e，PVC，2 M, fixed installation
E16DA4004M020	RJ45-M12 double-ended pre-wired Ethernet connector, male straight, D-CODE，4-pin，Cat5e，PVC，2 M，suitable for drag chain
E66D04004M020	RJ45-RJ45 double-ended pre-wired Ethernet connector，male straight-male straight，4-pin，Cat5e，PUR，2 M，suitable for drag chain

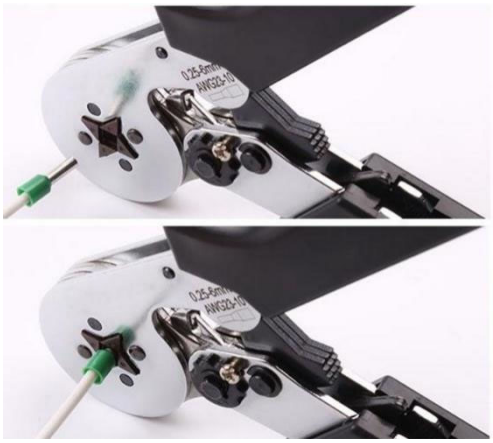
For more selection of Ethernet connectors, please refer to Elco's "Connectivity System Catalog".

7.1.2. Power and signal cables

The FX20 series adopts tool-free spring wiring terminals, and the wiring needs to be equipped with tube type cold pressing cable lugs. Please refer to the following figure for the stripping length and cable lug specifications:



Standard cable crimper can be used for pressing the wire ear, as shown in the following figure:

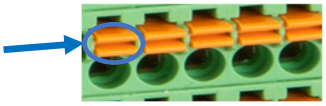


The wire connection does not need tools, and the wiring method is as follows:

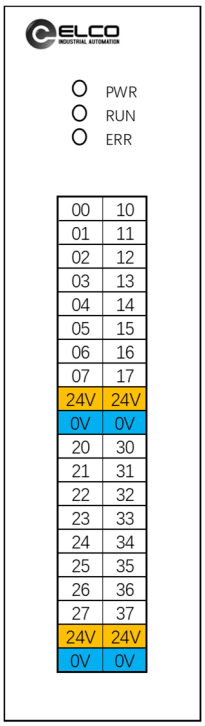
1) Install the wire ear on the wire;
2) Insert the wire installed with the wire ear into the plug-in terminal to its most;
3) Pull the cable to ensure it's fixed securely.

To release the wire:

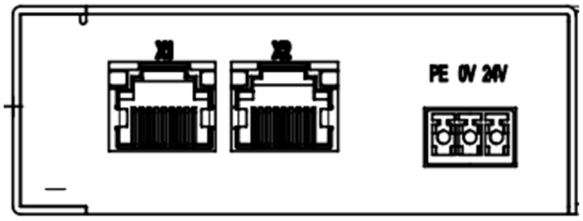
1) Press the terminal spring button with your hand or a flat screwdriver
2) Pull out the wire and release the button.



7.2. FB20 wiring diagram



Front view



Vertical view

8. Input/output data structure

8.1. FV**-3200P(N) Process Data Structure

4 bytes of input								
BYTE 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 0.7	I 0.6	I 0.5	I 0.4	I 0.3	I 0.2	I 0.1	I 0.0
Terminal No.	i8	i7	i6	i5	i4	i3	i2	i1
BYTE 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 1.7	I 1.6	I 1.5	I 1.4	I 1.3	I 1.2	I 1.1	I 1.0
Terminal No.	i16	i15	i14	i13	i12	i11	i10	i9
BYTE 2	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 2.7	I 2.6	I 2.5	I 2.4	I 2.3	I 2.2	I 2.1	I 2.0
Terminal No.	i24	i23	i22	i21	i20	i19	i18	i17
BYTE 3	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 3.7	I 3.6	I 3.5	I 3.4	I 3.3	I 3.2	I 3.1	I 3.0
Terminal No.	i32	i31	i30	i29	i28	i27	i26	i25

8.2. FV**-1616P(N) Process Data Structure

2 bytes of input, 2 bytes of output								
BYTE 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 0.7	I 0.6	I 0.5	I 0.4	I 0.3	I 0.2	I 0.1	I 0.0
Terminal No.	i8	i7	i6	i5	i4	i3	i2	i1
BYTE 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 1.7	I 1.6	I 1.5	I 1.4	I 1.3	I 1.2	I 1.1	I 1.0
Terminal No.	i16	i15	i14	i13	i12	i11	i10	i9
2 bytes of output								
BYTE 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 0.7	Q 0.6	Q 0.5	Q 0.4	Q 0.3	Q 0.2	Q 0.1	Q 0.0
Terminal No.	Q8	Q7	Q6	Q5	Q4	Q3	Q2	Q1
BYTE 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 1.7	Q 1.6	Q 1.5	Q 1.4	Q 1.1	Q 1.2	Q 1.1	Q 1.0
Terminal No.	Q16	Q15	Q14	Q13	Q12	Q11	Q10	Q9

8.3. FV**-0032P(N) Process Data Structure

4 bytes of output								
BYTE 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 0.7	Q 0.6	Q 0.5	Q 0.4	Q 0.3	Q 0.2	Q 0.1	Q 0.0
Terminal No.	Q8	Q7	Q6	Q5	Q4	Q3	Q2	Q1

BYTE 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 1.7	Q 1.6	Q 1.5	Q 1.4	Q 1.3	Q 1.2	Q 1.1	Q 1.0
Terminal No.	Q16	Q15	Q14	Q13	Q12	Q11	Q10	Q9
BYTE 2	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 2.7	Q 2.6	Q 2.5	Q 2.4	Q 2.3	Q 2.2	Q 2.1	Q 2.0
Terminal No.	Q24	Q23	Q22	Q21	Q20	Q19	Q18	Q17
BYTE 3	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 3.7	Q 3.6	Q 3.5	Q 3.4	Q 3.3	Q 3.2	Q 3.1	Q 3.0
Terminal No.	Q32	Q31	Q30	Q29	Q28	Q27	Q26	Q25

8.4. FV**-1616UP(N) Process Data Structure

4 bytes of intput								
BYTE 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 0.7	I 0.6	I 0.5	I 0.4	I 0.3	I 0.2	I 0.1	I 0.0
Terminal No.	i8	i7	i6	i5	i4	i3	i2	i1
BYTE 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 1.7	I 1.6	I 1.5	I 1.4	I 1.3	I 1.2	I 1.1	I 1.0
Terminal No.	i16	i15	i14	i13	i12	i11	i10	i9
BYTE 2	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 2.7	I 2.6	I 2.5	I 2.4	I 2.3	I 2.2	I 2.1	I 2.0
Terminal No.	i24	i23	i22	i21	i20	i19	i18	i17
BYTE 3	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	I 3.7	I 3.6	I 3.5	I 3.4	I 3.3	I 3.2	I 3.1	I 3.0
Terminal No.	i32	i31	i30	i29	i28	i27	i26	i25
2 bytes of output								
BYTE 0	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 0.7	Q 0.6	Q 0.5	Q 0.4	Q 0.3	Q 0.2	Q 0.1	Q 0.0
Terminal No.	Q8	Q7	Q6	Q5	Q4	Q3	Q2	Q1
BYTE 1	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Addr.	Q 1.7	Q 1.6	Q 1.5	Q 1.4	Q 1.1	Q 1.2	Q 1.1	Q 1.0
Terminal No.	Q16	Q15	Q14	Q13	Q12	Q11	Q10	Q9

8.5. Explanation of Power Diagnostic Bit

Diag. byte	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Power Supply Status	00000000 =Reserved 00000001 = Reserved 00000010 = Reserved 00000100 = Reserved							

	00001000 = Reserved 00010000 = Reserved 00100000 =Aux. power supply 2 warning 01000000 = Aux. power supply 1 warning 10000000 =System power supply warning

8.6. Channel diagnostic bit description

FVEC-0032P/ FVEC-0032N（00-17）and（20-37）Overload detection

Diag. Bytes	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Byte0	Diag CH8	Diag CH7	Diag CH6	Diag CH5	Diag CH4	Diag CH3	Diag CH2	Diag CH1
Byte1	Diag CH16	Diag CH15	Diag CH14	Diag CH13	Diag CH11	Diag CH11	Diag CH10	Diag CH9
Byte2	Diag CH24	Diag CH23	Diag CH22	Diag CH21	Diag CH20	Diag CH19	Diag CH18	Diag CH17
Byte3	Diag CH32	Diag CH31	Diag CH30	Diag CH29	Diag CH28	Diag CH27	Diag CH26	Diag CH25

FVEC-1616P/ FVEC-1616N（20-37）Overload detection

Diag. Bytes	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Byte0	Diag CH8	Diag CH7	Diag CH6	Diag CH5	Diag CH4	Diag CH3	Diag CH2	Diag CH1
Byte1	Diag CH16	Diag CH15	Diag CH14	Diag CH13	Diag CH11	Diag CH11	Diag CH10	Diag CH9
Byte2								
Byte3								

FVEC-1616UP/ FVEC-1616UN（20-37）Overload detection

Diag. Bytes	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Byte0	Diag CH8	Diag CH7	Diag CH6	Diag CH5	Diag CH4	Diag CH3	Diag CH2	Diag CH1
Byte1	Diag CH16	Diag CH15	Diag CH14	Diag CH13	Diag CH11	Diag CH11	Diag CH10	Diag CH9
Byte2								
Byte3								

FVEC-3200P/ FVEC-3200N No diagnosis

9. Configuration and testing

9.1. Testing at Omron Sysmac Studio

Configure FV20 series modules using ESI files (in. xml format), which are used to integrate FV20 series modules into your system as standard EtherCAT slaves.

Taking Omron's Sysmac Studio programming software used in the EtherCAT system as an example, add ESI files according to the following steps:

Install Sysmac Studio and copy the ESI file (. xml file) of FV20 to the following installation directory, for example:

C:\OMRON\Sysmac Studio\IODeviceProfiles\EsiFiles\UserEsiFiles.

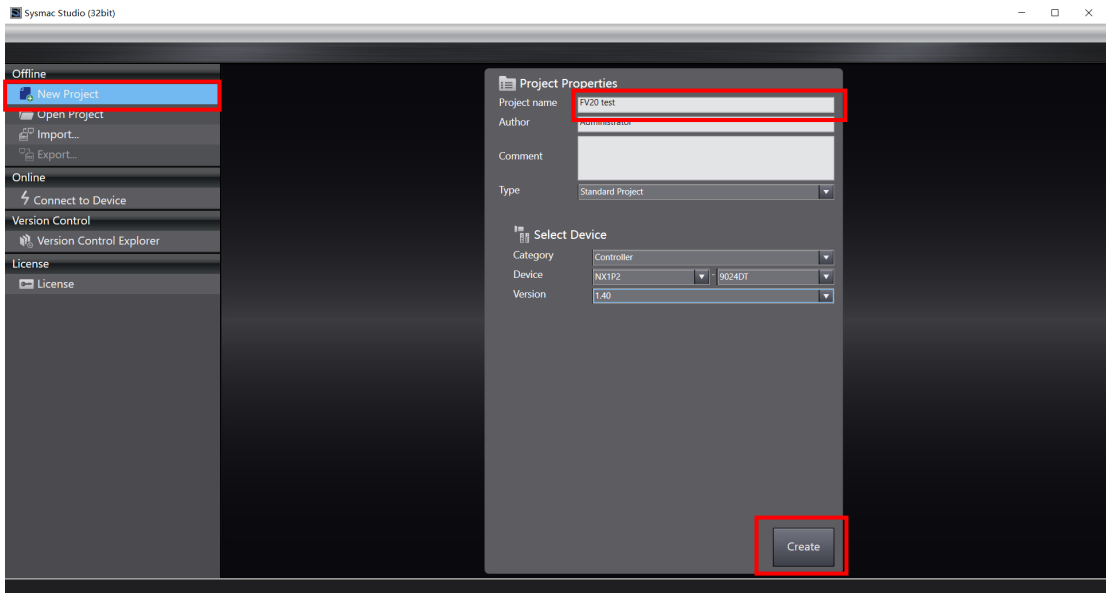
This example uses the FV20 series distributed I/O fromELCO Company as the EtherCAT slave to connect Omron's controller NX1P2-9024DT with EtherCAT interface. By default, Sysmac Studio has been installed on the PC and the required network card information has been set. The FV20 series ESI file has also been installed, and all power supply and bus connections have been completed. Please refer to the Sysmac Studio user manual for the above operation process.

The FV20 series distributed I/O uses the following products as configuration examples:

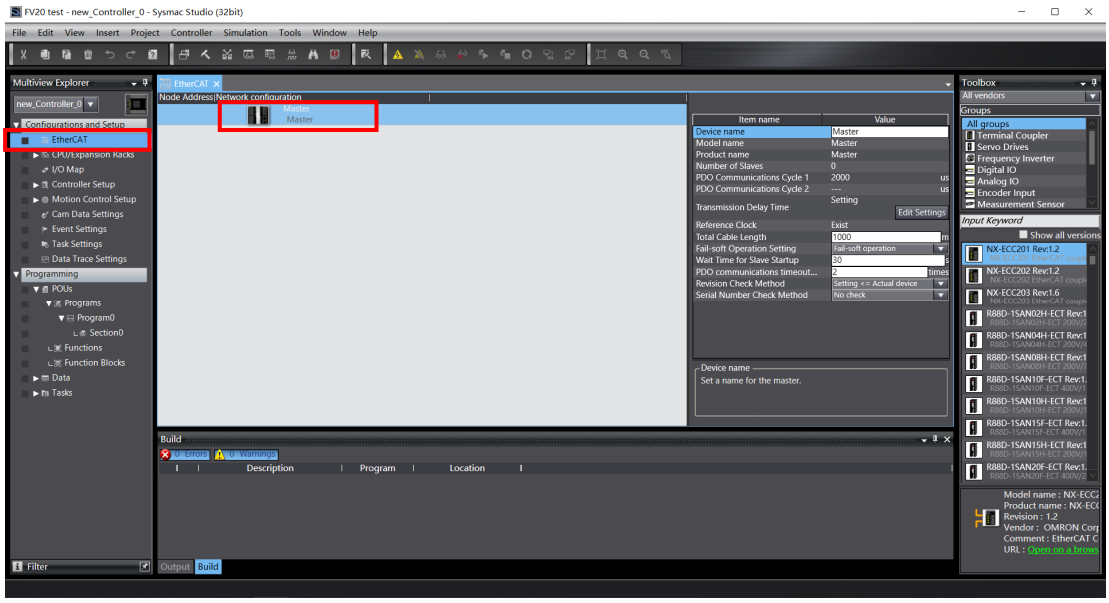
Type	Description	Qty
FVEC-3200P	EtherCAT,32DI,PNP	1

The configuration process of FV20 in Omron Sysmac Studio is as follows:

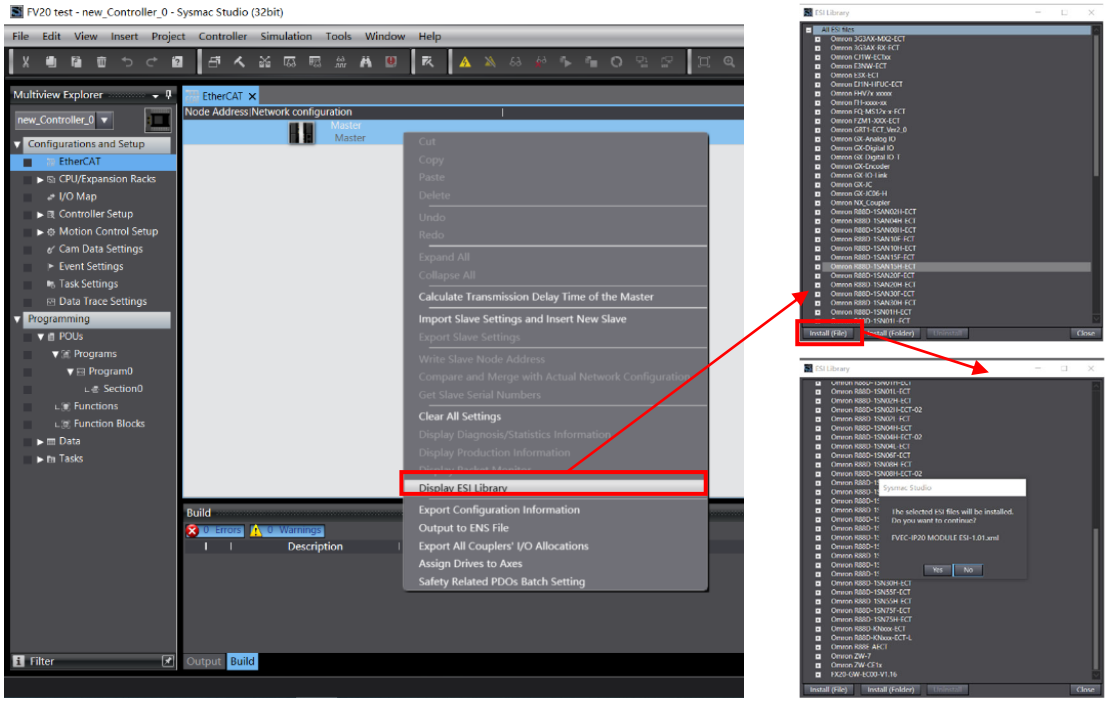
9.1.1. Open the Sysmac Studio software with version V1.40 or higher. Click on 'New Project'. Fill in the corresponding information according to the PLC model and click "Create".



9.1.2. Double click "EtherCAT" in the "Configuration and Setup" list on the left, and the corresponding controller icon can be seen in the "Node Address and Network Configuration" interface.

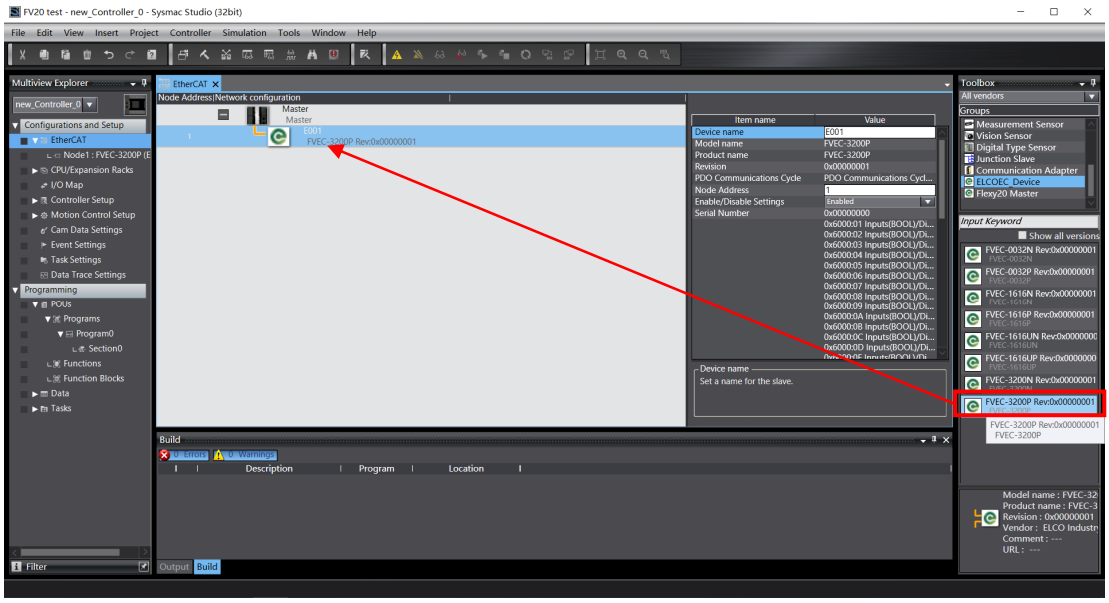


9.1.3. Right click on "Master" and select "Show ESI Library" from the pop-up list. In the newly opened window interface, select "Install" to manually install the ESI file for FV20. This feature has the same effect as installing ESI files by copying files, and requires Sysmac Studio software version higher than 1.4. Users with lower versions still need to install through copying files.

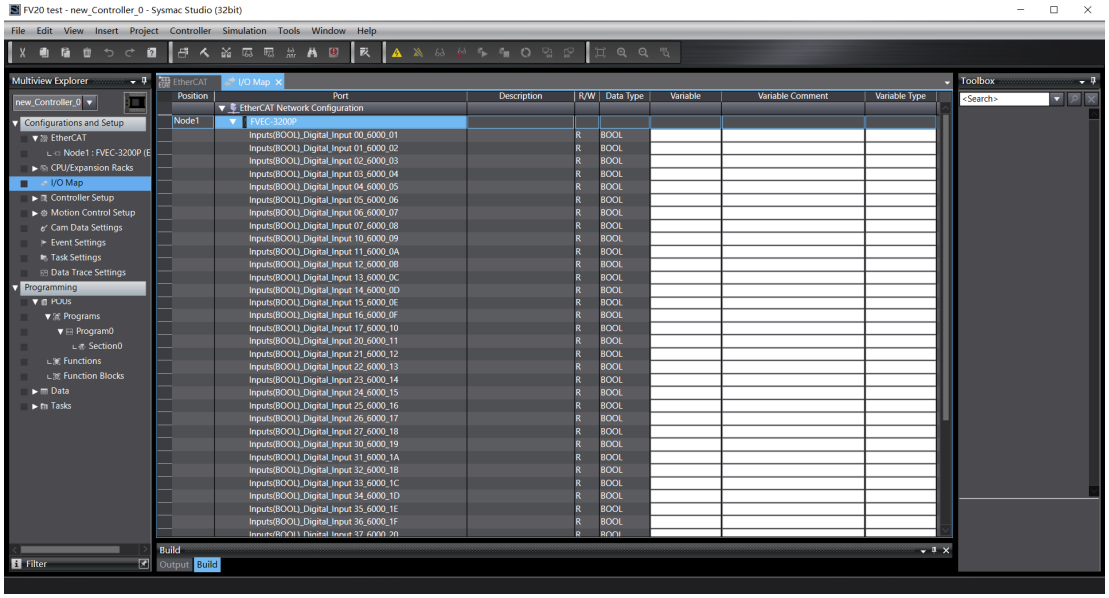


9.1.4. After successfully importing the ESI file, in the "Toolbox" list on the right side of System Studio, find "ELCO EC-Device" and drag the module

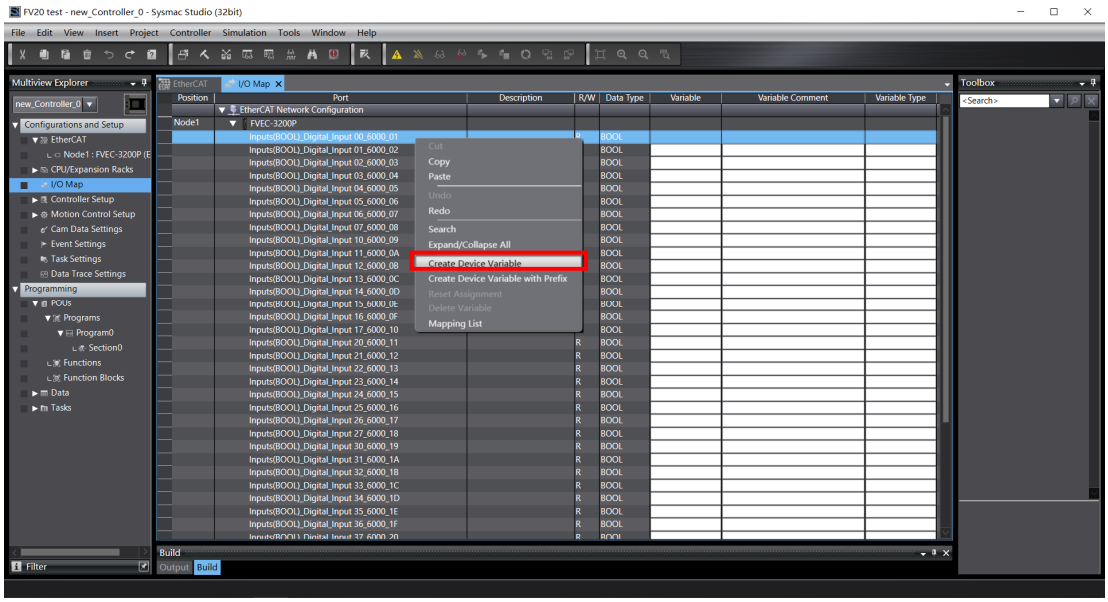
"FVEC-3200P" below to the main device. The system will assign EtherCAT node addresses based on the connection order (which can also be modified as needed).

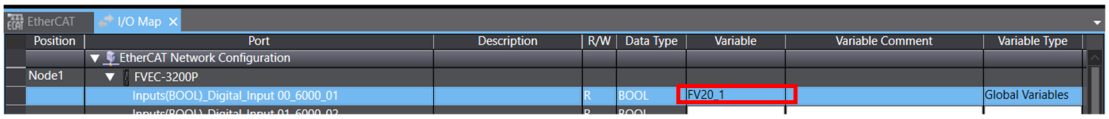


9.1.5. Double click "I/O Mapping" in the "Configuration and Setup" list on the left to open the “I/O Map” Configuration interface. Here you can see the signals and status related to the FV20 module, including reserved bytes and diagnostic words for the FV20 input/output module.

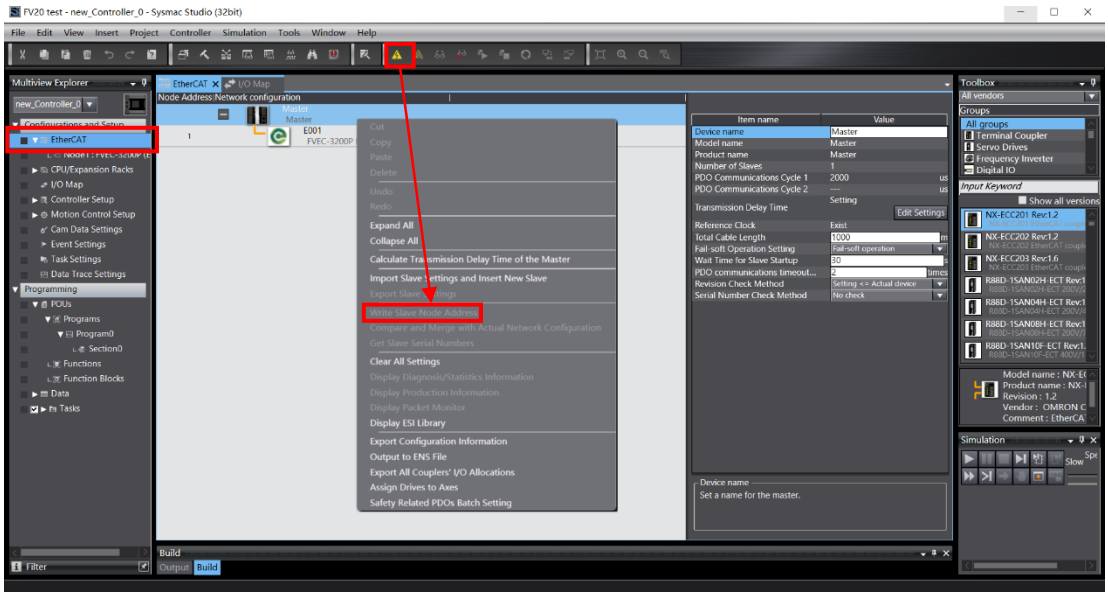


9.1.6. In this interface, various variables for this FV20 module can be automatically generated by right clicking on the module model and selecting "Create New Device Variable". Users can also manually fill in the variables as needed.





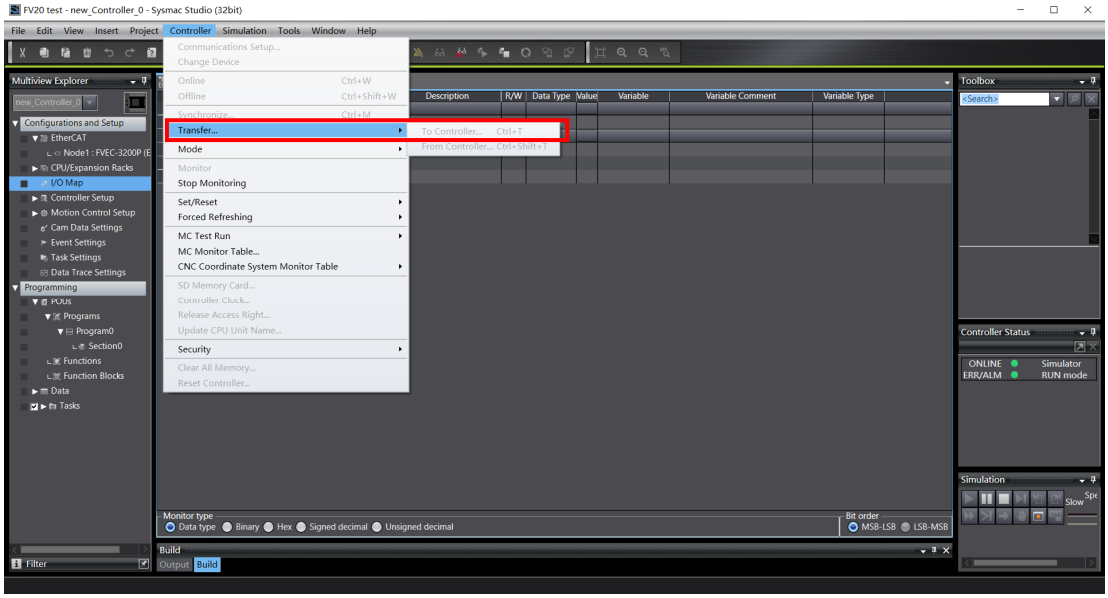
9.1.7. At this point, the configuration of the FV20 module has been completed. Now, it is necessary to modify the EtherCAT node address of the FV20 input/output module to match the program configuration. Switch the software to online mode, double-click to open the "EtherCAT" configuration interface, right-click on the master device and select "Write slave device node address" from the pop-up menu.



After successful writing, the FV20 module needs to be powered on again to activate the new address.

9.1.8. Switch the software to online mode, click the download button to download the configuration and program to the PLC. If everything is

configured correctly at this time, the RUN indicator light of the FV20 input/output module will display green.



10. Fault diagnosis LEDs

Name	Status	Meaning	Handling suggestions
FV20 LEDs			
LK	On	Normal	None
	Off	Communication Failure	Check if the PLC configuration is correct;
			Check if the bus communication cable connection is normal;
			Module damaged, replace.
ER	Off	Normal	None
	Red on	Failure	Short circuit fault in input/output channel;
			The power supply voltage is too low.
UA	On	Normal	None
	Off	Abnormal power supply	Check if the power cable wiring is correct;
			Check if the power supply voltage is within the range of 24 VDC ± 20%
1-32 Channel LEDs	Off	Channel low level	None
	On	Channel high level	None
X1	Off	No network	Check the network cable connection of the corresponding network port
	Blink	network connected and data exchanged	None
X2	Off	No network	Check the network cable connection of the corresponding network port
	Blink	network connected and data exchanged	None