Modbus Instruction

1. Modbus system hardware

Modbus is a Master/Slave communications protocol. The user can use Modbus Master Command to read/write the parameter such as position, pose, etc. in a register and use the parameter to edit the project or monitor the robot.

TM robot provides TCP/RTU communications protocol. The user can adjust according to actual status. (Refer to chapter 2)

TM robot can have both TCP and RTU status. The user can obtain an external device of Modbus or robot register data. Third parties can also use an external device such as IPC, PLC etc. to be the master to send the command to obtain relevant information.

Note: In this Instruction, Client is called Master; Server is called Slave.

1.1 Modbus TCP architecture

Modbus TCP communicates via RJ-45. There is only one RJ-45 connector can be utilized to communicate in control box. Please refer to user's manual Hardware Specifications Chapter 5.5 Control Box Interfaces

1.2 Modbus RTU architecture
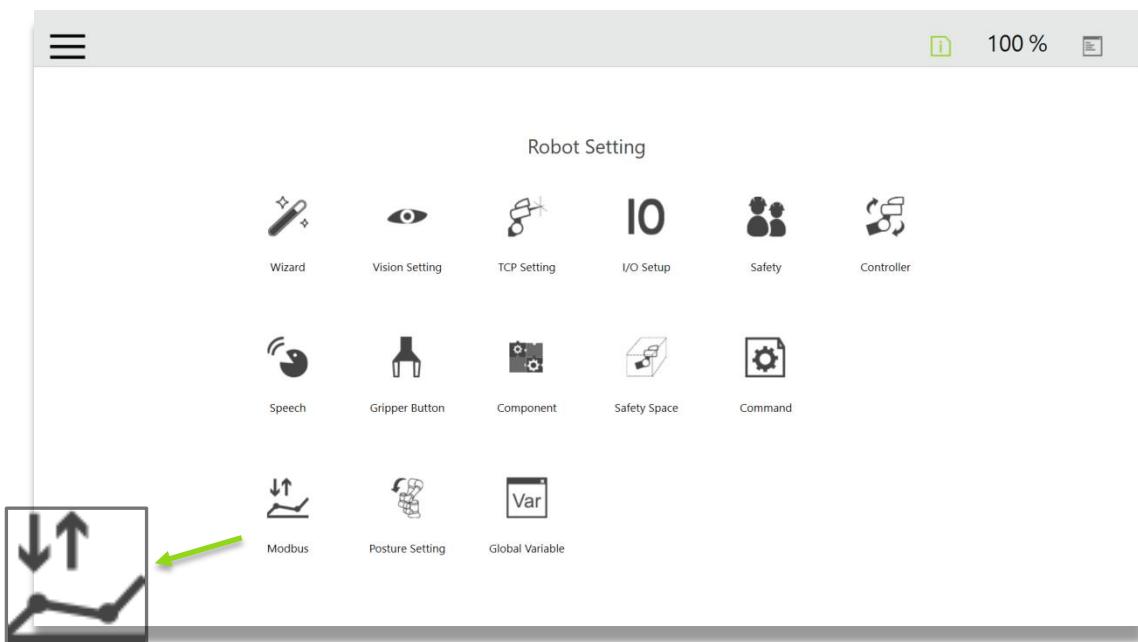
Modbus RTU communicates via serial port. Please refer to user's manual Hardware Specifications Chapter 5.5 Control Box Interfaces.

2. Modbus system software
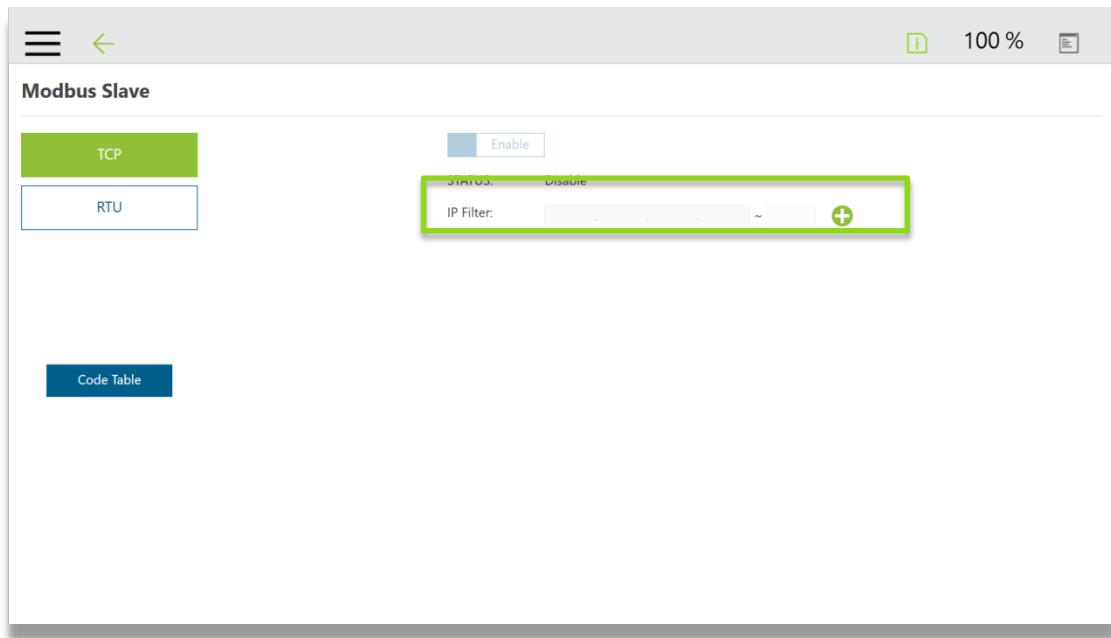
In the HMI interface, the user can set Modbus parameter In Modbus slave page, where user can obtain parameter in Modbus Code Table (Refer to chapter 2)

2.1 Modbus TCP setting

In HMI setting page, click on Modbus to enter "Modbus Slave" page.
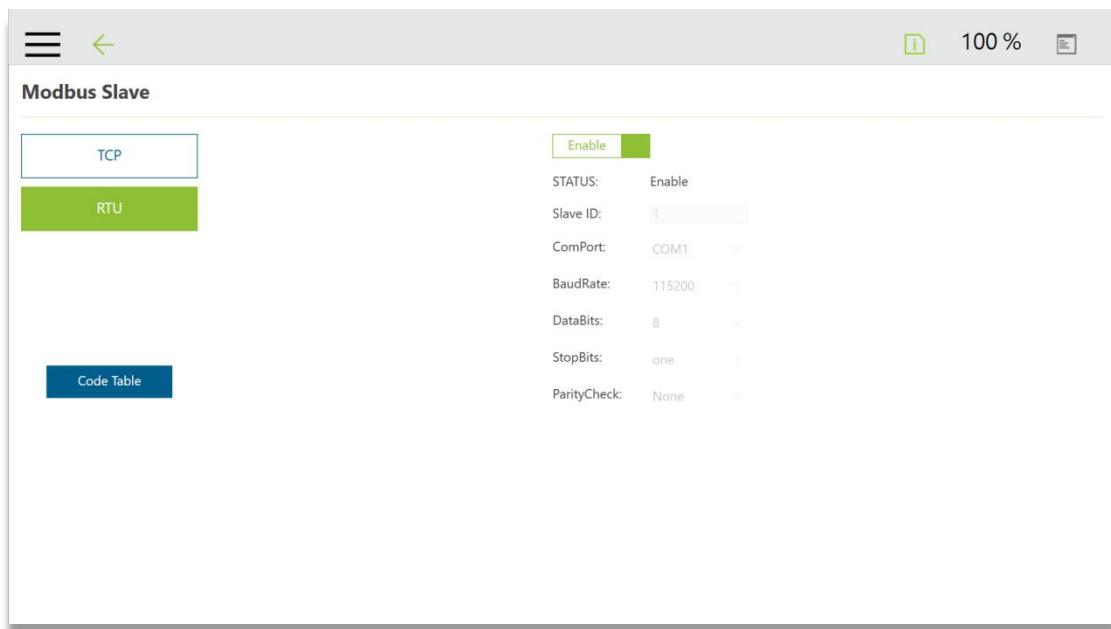
The user must assure the TM robot IP is available before Modbus TCP function enabled.

2.2 Modbus RTU Setting

In Modbus slave page, the user must assure the parameters of setting and external device are synchronized. If the setting is correct, the user can enable Modbus RTU to communicate with the Modbus Slave or Modbus Master.
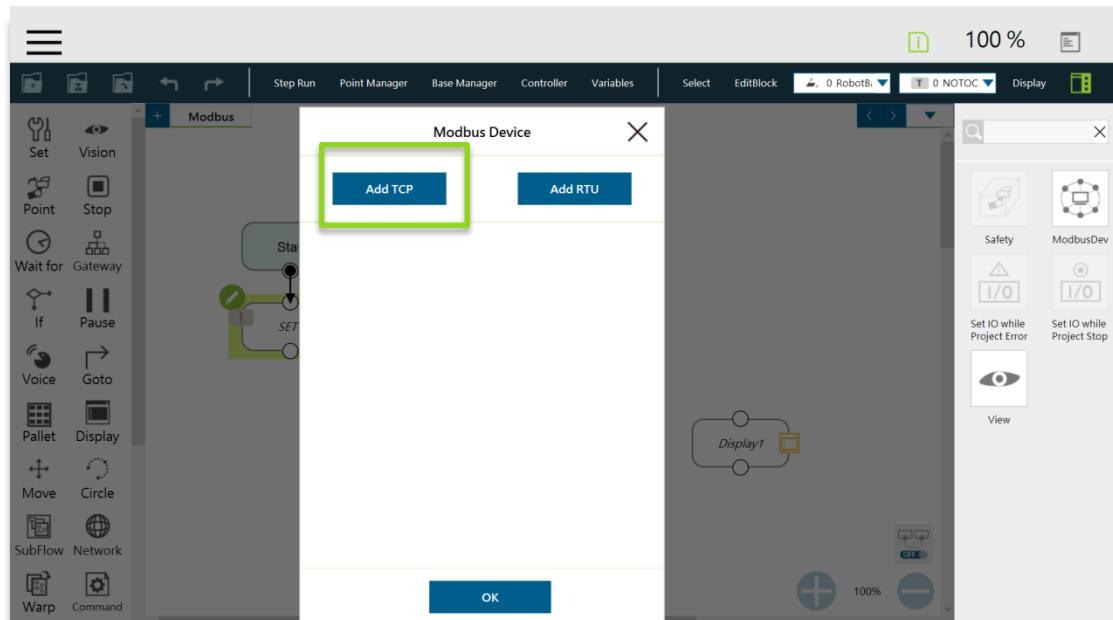
3. Modbus application of project.

The user can add Modbus TCP / RTU device and obtain the variables of Modbus register for the application. Modbus TCP/RTU settings of inside device are the same. This chapter will show how to read the X coordinate of TM robot with Modbus TCP.
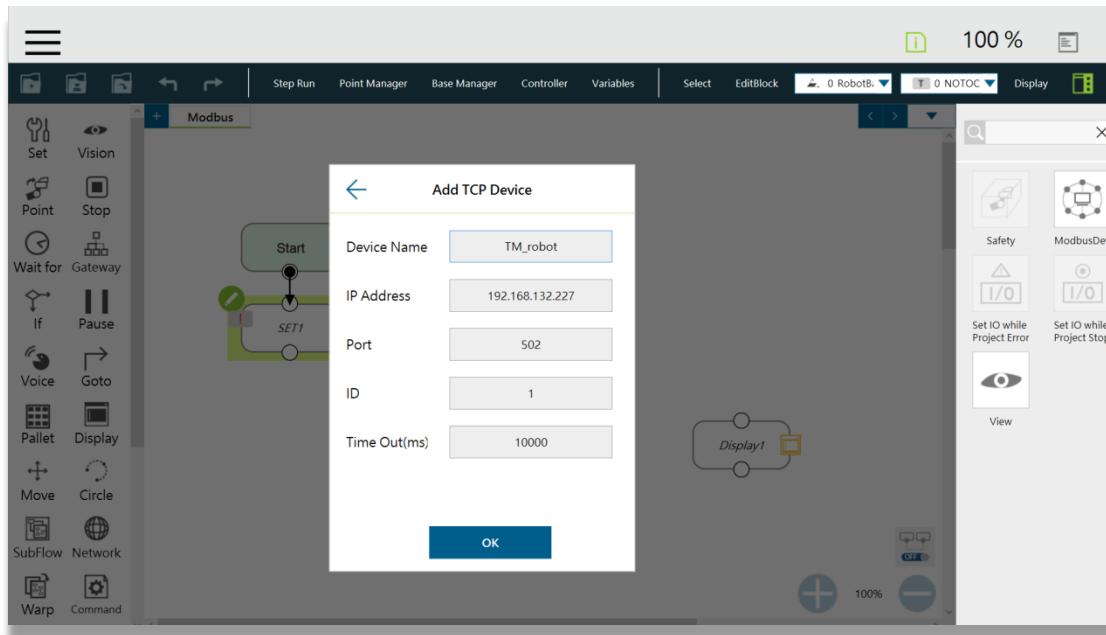
X (Cartesian coordinates)	04	7001~7002	1B59~1B5A	Float	R	Dword	mm
Y (Cartesian coordinates)	04	7003~7004	1B5B~1B5C	Float	R	Dword	mm
Z (Cartesian coordinates)	04	7005~7006	1B5D~1B5E	Float	R	Dword	mm
Rx (Cartesian coordinates)	04	7007~7008	1B5F~1B60	Float	R	Dword	degree

3.1 Add TCP device

Click on ModbusDev in the collapsible tool box on the right, the user can add TCP device.
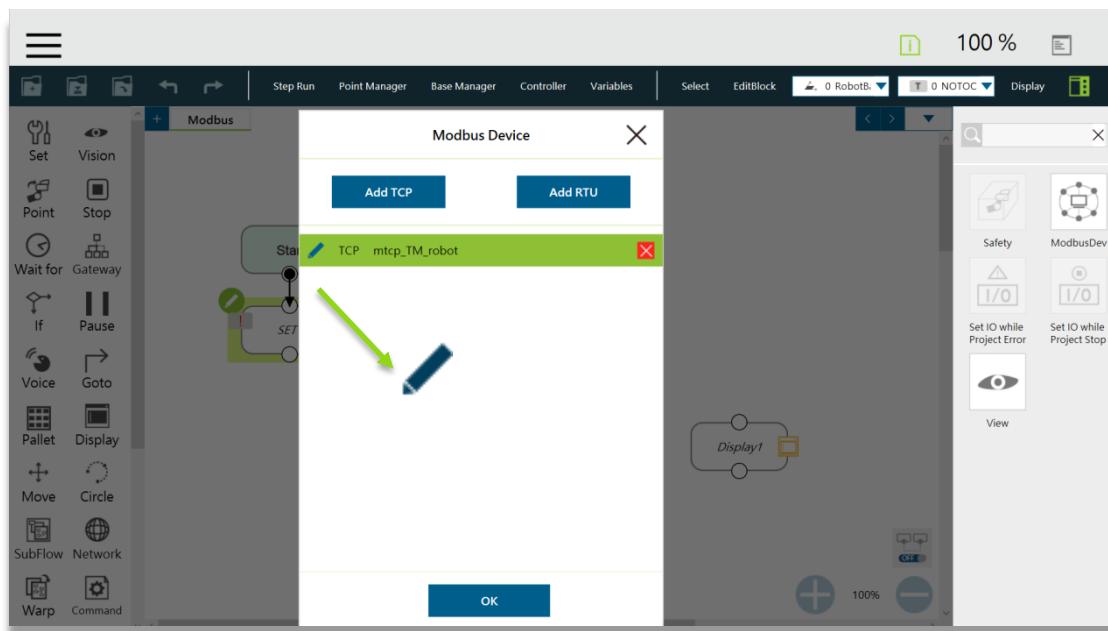
After adding TCP device, the user can set the parameters of TCP device, such as device name, Modbus address, and press the OK button to save the parameters.
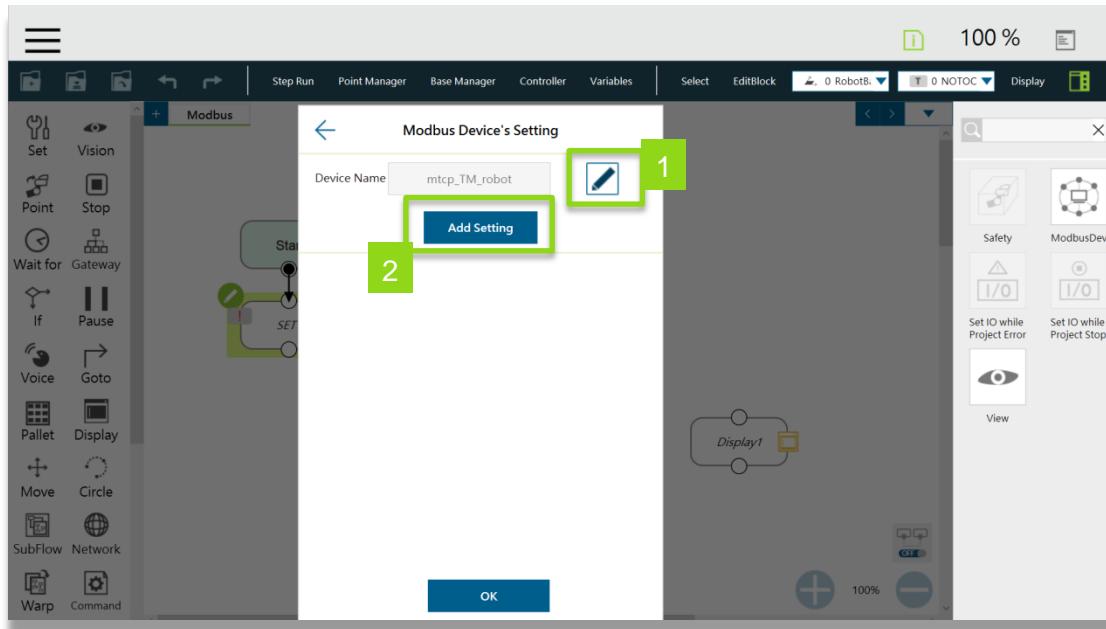
3.2 TCP device setting

The user can use the edit icon of Modbus list to edit the TCP's device setting.

On the edit page, User can check the setting of Modbus device. Clicking on the pen button in "tag 1", User can edit the Modbus device parameter.
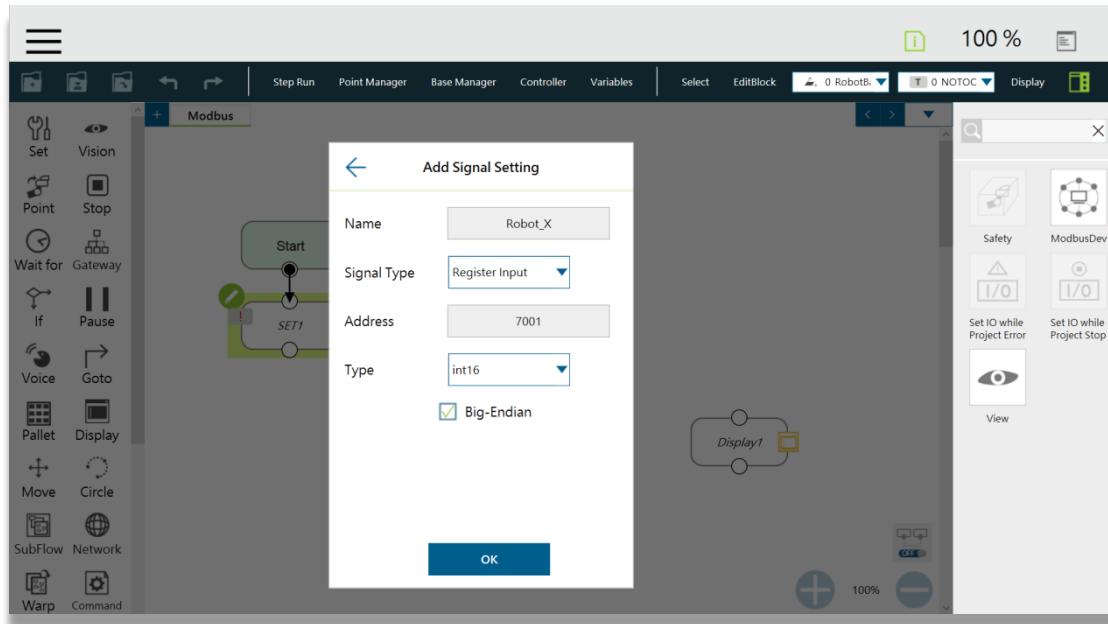
Clicking on the "Add Setting" button in "tag 2", User can add setting parameters to the Modbus device.

3.3 Modbus register setting

In the device setting page, the user can look up the setting parameters for the X coordinate of the TM robot address from the Modbus code table. Enter the 7001 address and the type of this variable is a float.
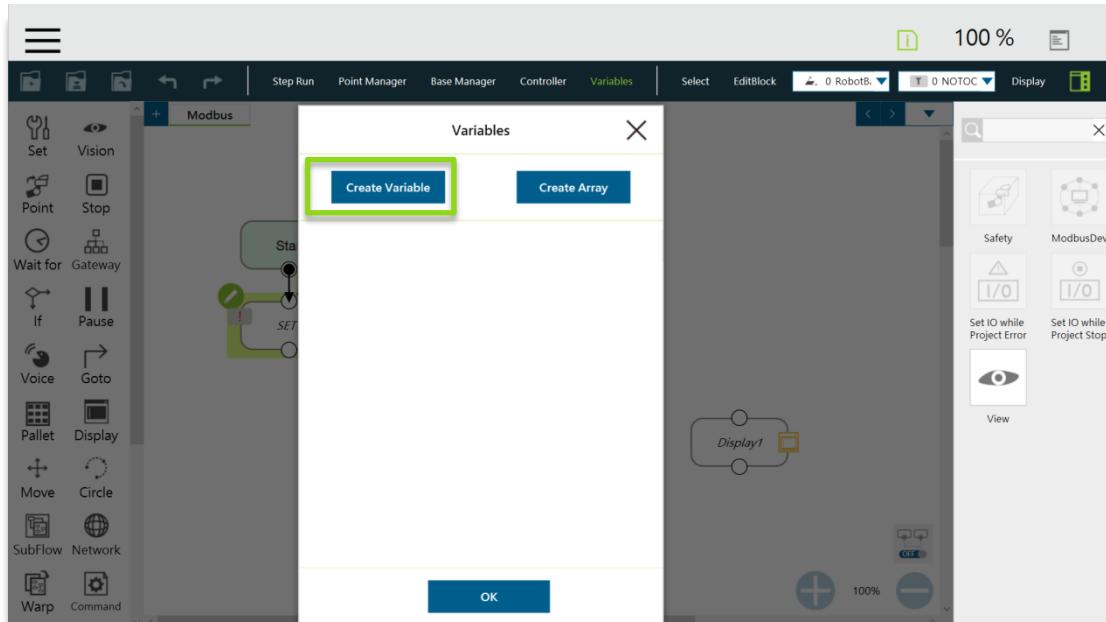
X (Cartesian coordinates)	04	7001~7002	1B59~1B5A	Float	R	Dword	mm
Y (Cartesian coordinates)	04	7003~7004	1B5B~1B5C	Float	R	Dword	mm
Z (Cartesian coordinates)	04	7005~7006	1B5D~1B5E	Float	R	Dword	mm
Rx (Cartesian coordinates)	04	7007~7008	1B5F~1B60	Float	R	Dword	degree

。
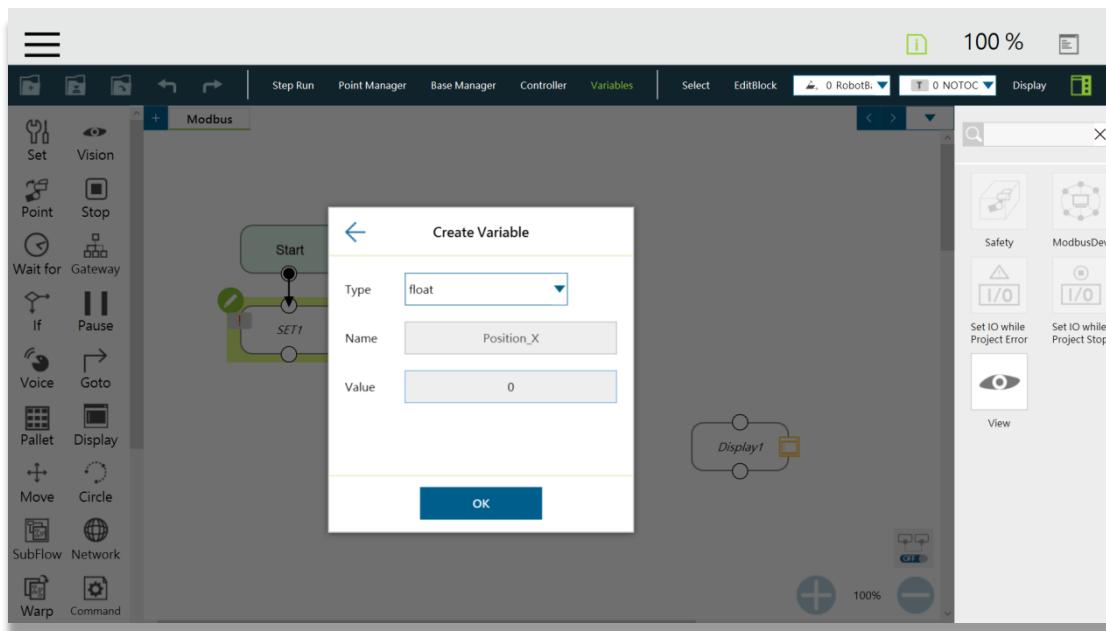
When finished, the user can use the device name and setting name in the userflow files. The user can access to this setting parameters again by clicking on the ModbusDev in the collapsible tool box.

3.4 Read value of Modbus register
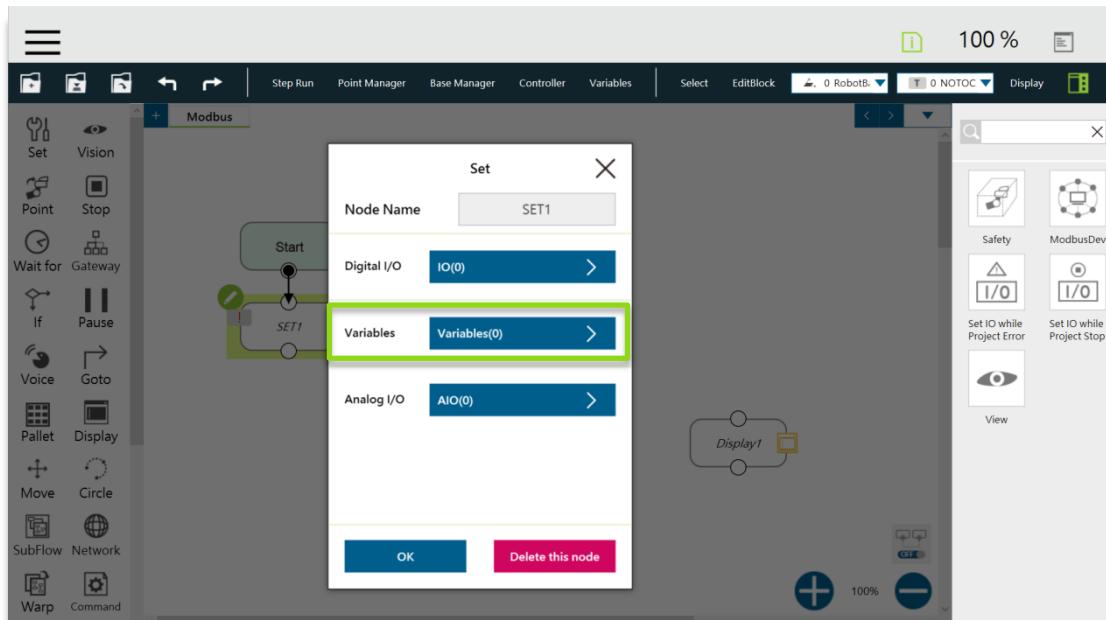
The following example will show how to access the X Coordinate of TM robot when editing flow. The user must create a variable for storing the X-coordinate value of the register.
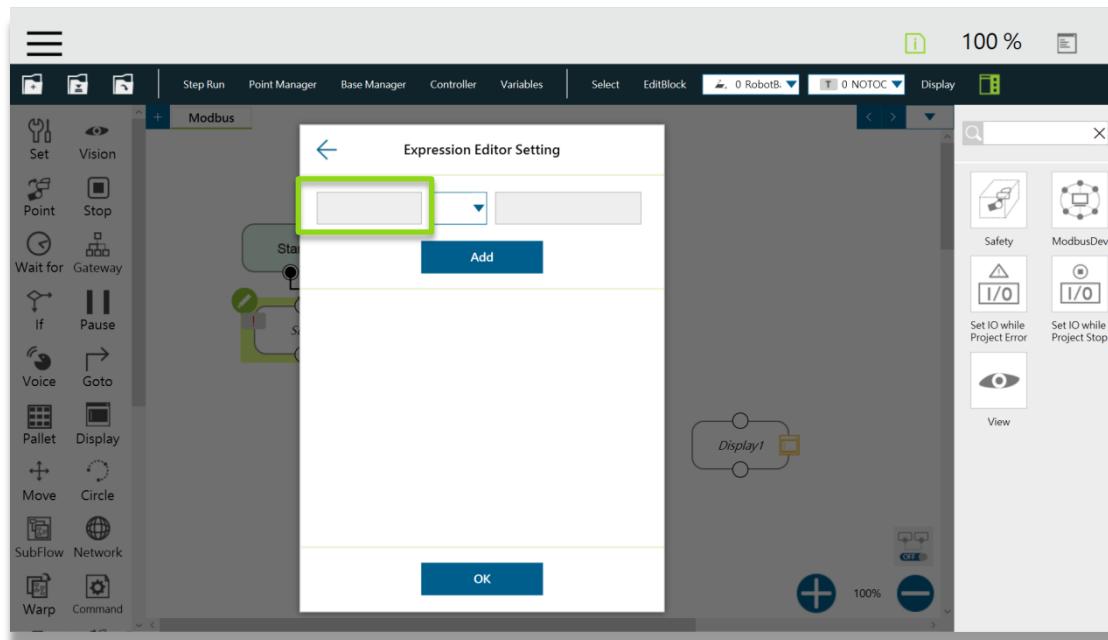
In this example, a float type variable "var_Position_X" is created.

In order to make the variable "var_Position_X" to obtain the coordinate value of TM ROBOT in the X direction.
It's necessary to add Set Node from the left side of the Flow program and click on Variables to access the edit mode.
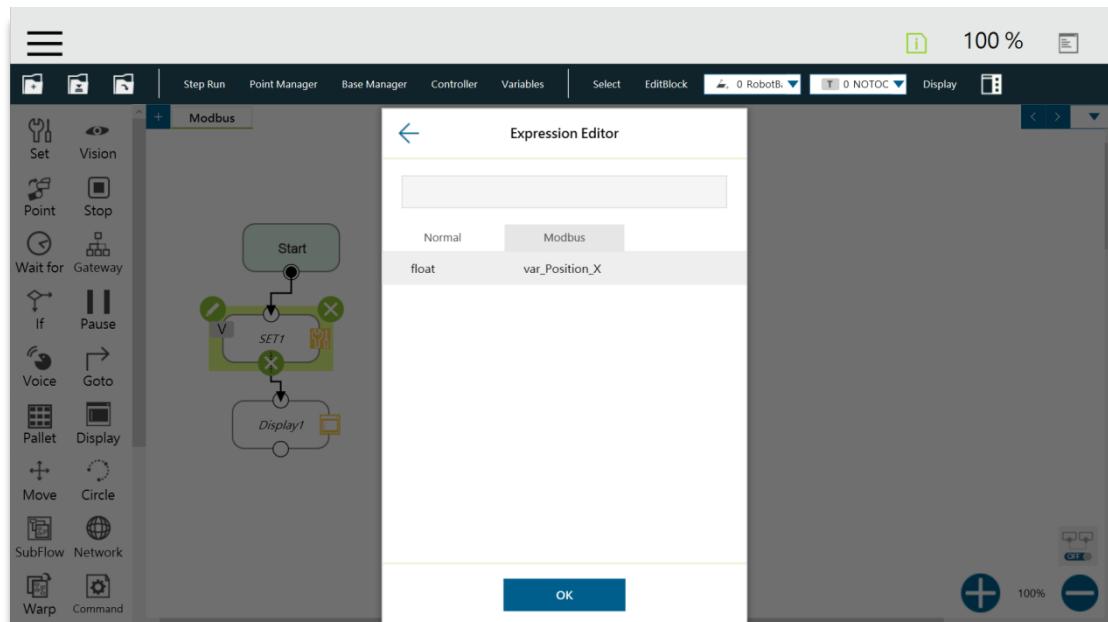
Add the variable into the left textbox.
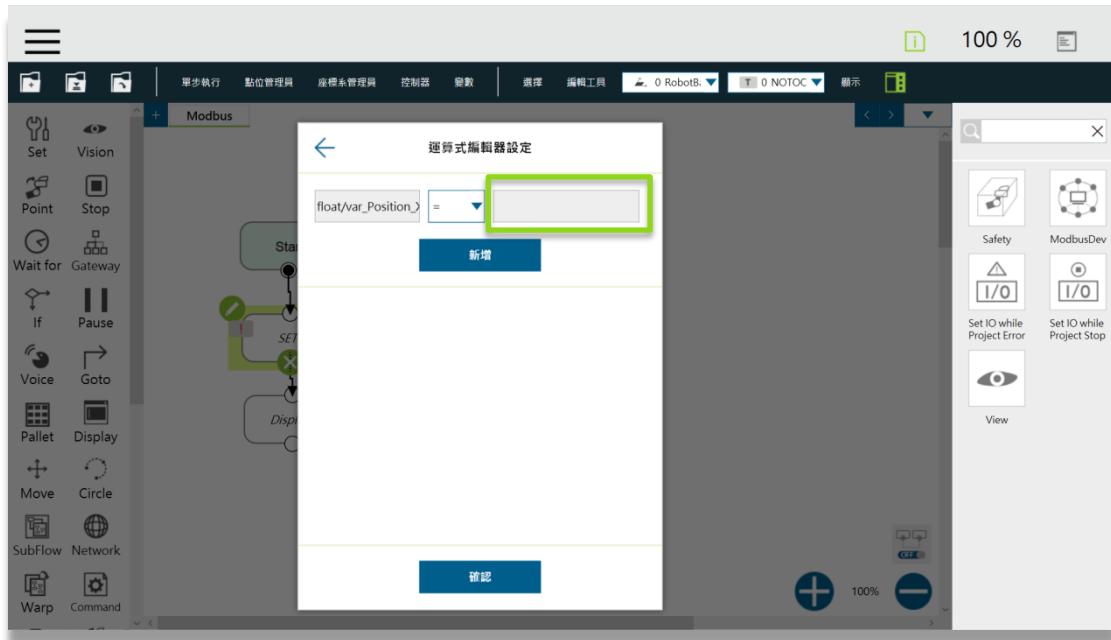
After choosing the variable, the user can insert the variable into the upper textbox and build an expression. When finished, press OK button to go back to the main page.
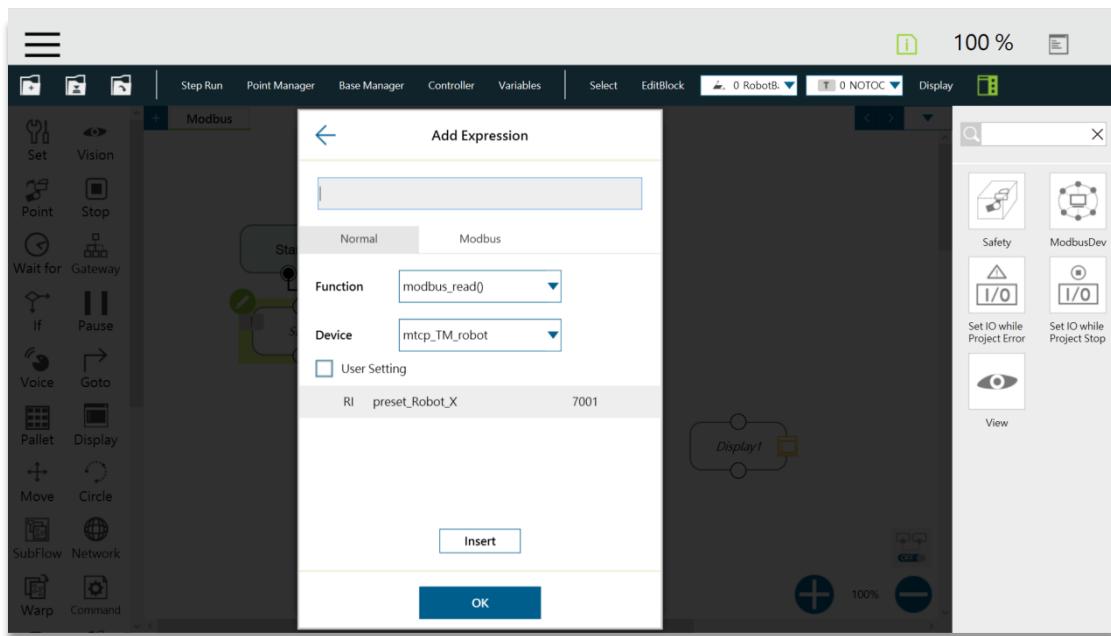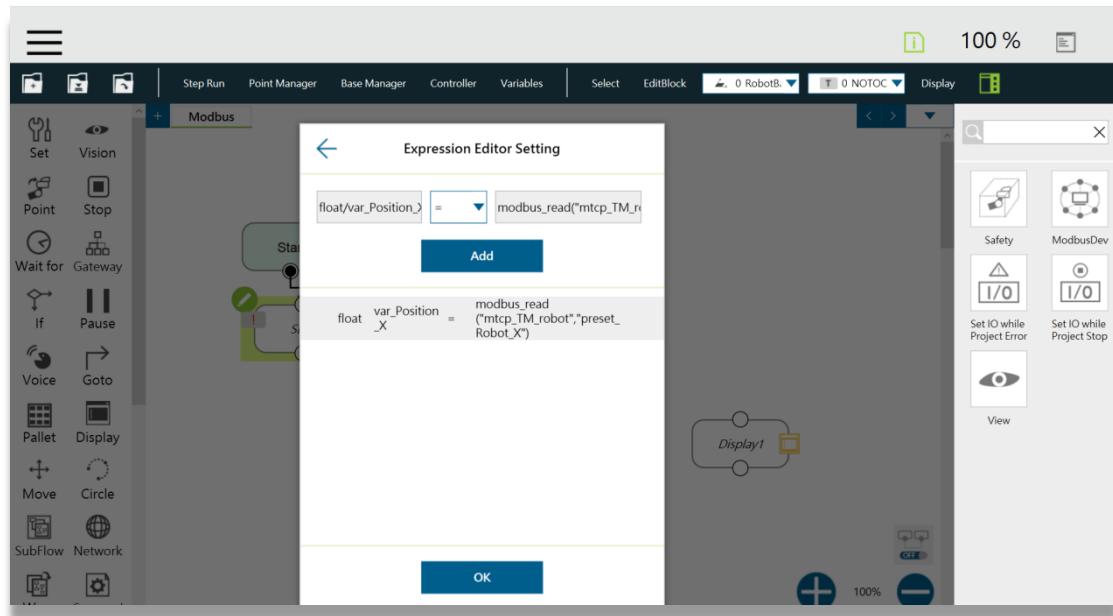
After selecting the operator in the middle,
click on edit box on the right to edit the expression editing page for Modbus.

The user can insert the expression into the upper text by selecting the Modbus read function, and the device name and setting name. After finished, press the OK button to go back to main page.
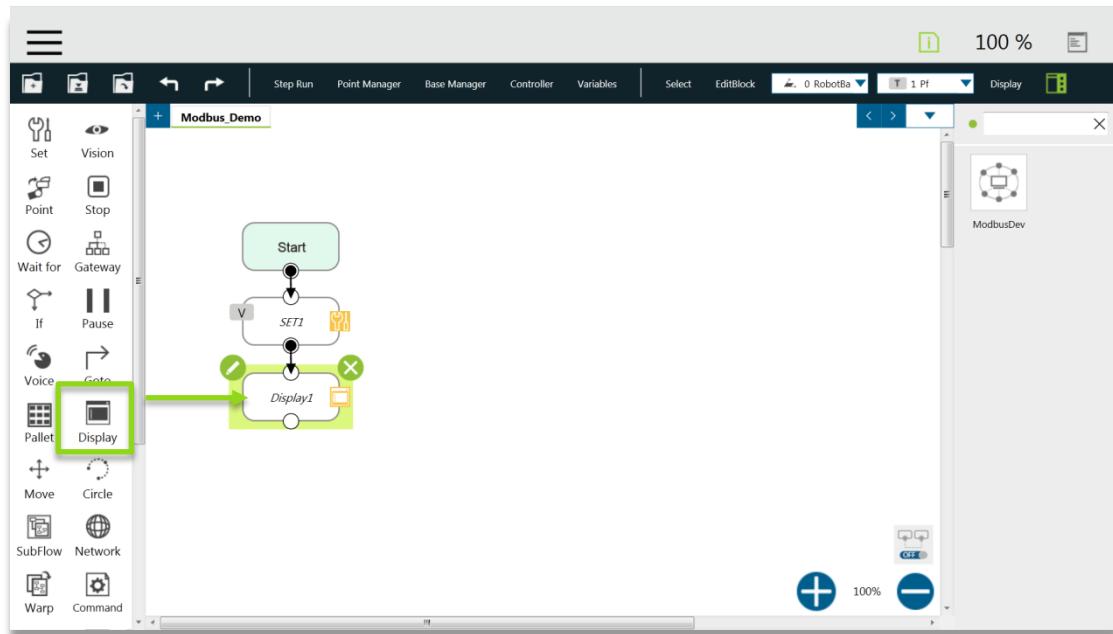
When going back to the main page, HMI will display the edited function.
Click on add button then the HMI will check whether the function is correct. If the function is incorrect, HMI will show an error. Otherwise, this function will be added to the list below.
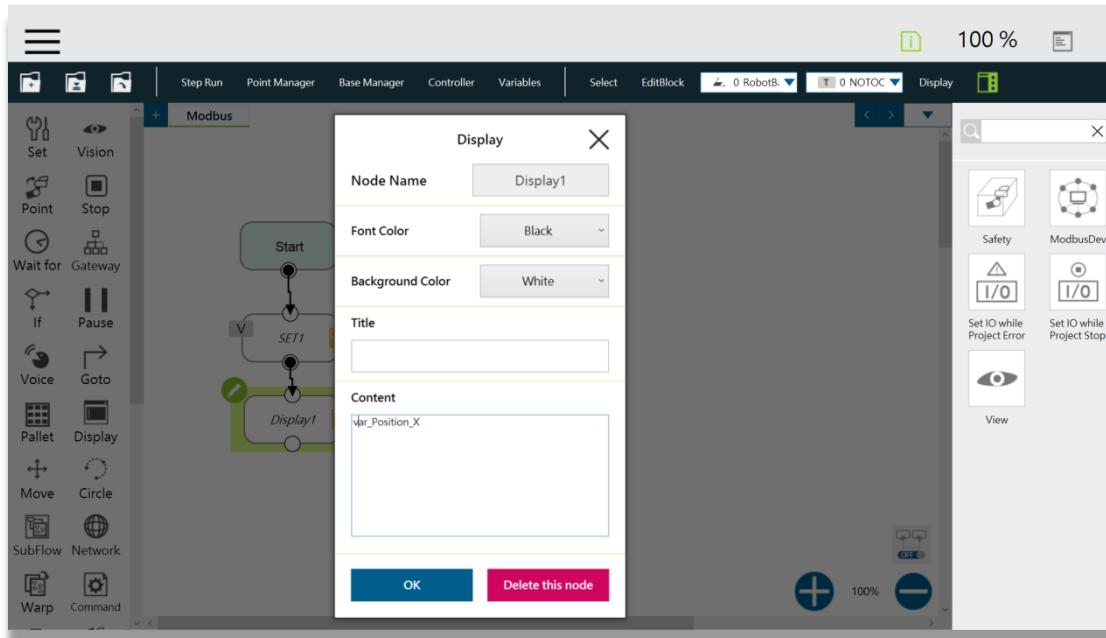
3.5 Show value of Modbus register

After Modbus and variable are set, user can use Display Node to show the value of the variable.
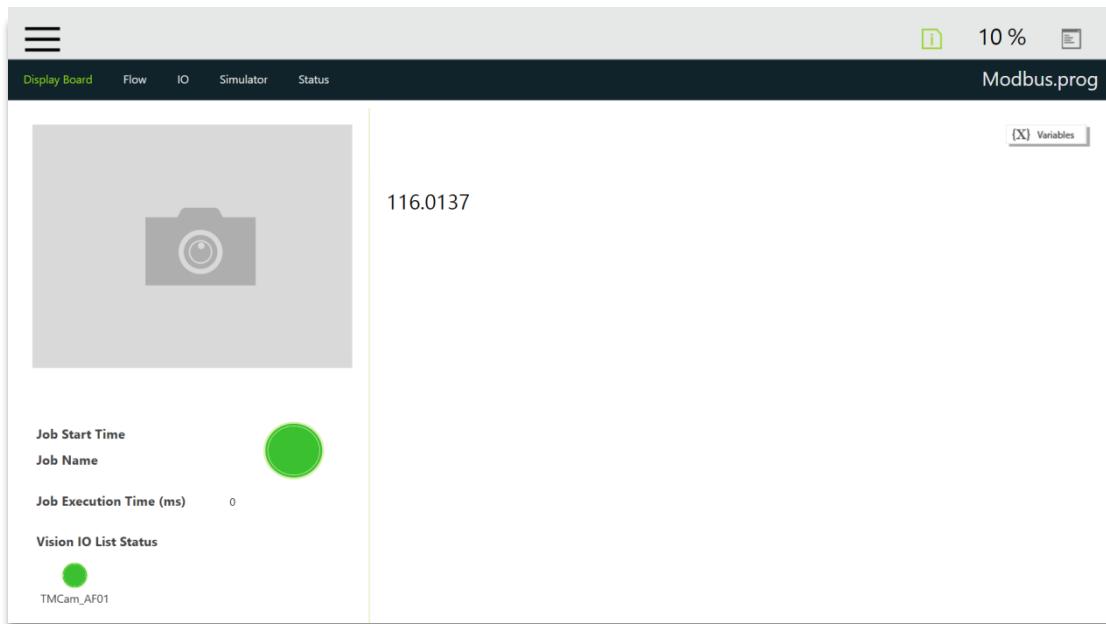
Enter the var_Position_x into content textbox.

The user can get the value to verify whether the value from Modbus collide with the x coordinate of the TM robot.

The value will be shown when the project runs to the Display Node

According to the demand, the user can accomplish the task by utilizing the value from Modbus with other nodes such as Set、Of、Case、WaitFor etc.

4. Modbus Codetable

Classify	Function Code	R/W	Note
Digital Output	01	R	
Digital Input	02	R	
Register Output	03	R	Classification description
Register Input	04	R	
Digital Output	05	W	
Register Output	06	W	

Robot Status	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
Error or Not	02	7201	1C21	Bool	R	Yes:1 No: 0
Project Running or Not	02	7202	1C22	Bool	R	Yes:1 No: 0
Project Editing or Not	02	7203	1C23	Bool	R	Yes:1 No: 0
Project Pause or Not	02	7204	1C24	Bool	R	Yes:1 No: 0
Get Permission or Not	02	7205	1C25	Bool	R	Yes:1 No: 0

End Module	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
DI 0	02	0800	0320	Bool	R	
DI 1	02	0801	0321	Bool	R	
DI 2	02	0802	0322	Bool	R	High: 1 Low: 0
DO 0	01/05	0800	0320	Bool	R/W	
DO 1	01/05	0801	0321	Bool	R/W	
DO 2	01/05	0802	0322	Bool	R/W	
DO 3	01/05	0803	0323	Bool	R/W	
AI 0	04	0800	0320	Float	R	

Control Box DI/O	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
DO 0	01/05	0000	0000	Bool	R/W	
DO 1	01/05	0001	0001	Bool	R/W	
DO 2	01/05	0002	0002	Bool	R/W	
DO 3	01/05	0003	0003	Bool	R/W	
DO 4	01/05	0004	0004	Bool	R/W	
DO 5	01/05	0005	0005	Bool	R/W	
DO 6	01/05	0006	0006	Bool	R/W	
DO 7	01/05	0007	0007	Bool	R/W	
DO 8	01/05	0008	0008	Bool	R/W	
DO 9	01/05	0009	0009	Bool	R/W	
DO 10	01/05	0010	000A	Bool	R/W	
DO 11	01/05	0011	000B	Bool	R/W	
DO 12	01/05	0012	000C	Bool	R/W	
DO 13	01/05	0013	000D	Bool	R/W	
DO 14	01/05	0014	000E	Bool	R/W	
DO 15	01/05	0015	000F	Bool	R/W	High: 1
DI 0	02	0000	0000	Bool	R	Low: 0
DI 1	02	0001	0001	Bool	R	
DI 2	02	0002	0002	Bool	R	
DI 3	02	0003	0003	Bool	R	
DI 4	02	0004	0004	Bool	R	
DI 5	02	0005	0005	Bool	R	
DI 6	02	0006	0006	Bool	R	
DI 7	02	0007	0007	Bool	R	
DI 8	02	0008	0008	Bool	R	
DI 9	02	0009	0009	Bool	R	
DI 10	02	0010	000A	Bool	R	
DI 11	02	0011	000B	Bool	R	
DI 12	02	0012	000C	Bool	R	
DI 13	02	0013	000D	Bool	R	
DI 14	02	0014	000E	Bool	R	
DI 15	02	0015	000F	Bool	R	

Control Box AI/O	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
AO 0	03/16	0000~0001	0000~0001	Float	R/W	
AI 0	04	0000~0001	0000~0001	Float	R	
AI 1	04	0002~0003	0002~0003	Float	R	

Robot Coordinate	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note1	Note2
X (Cartesian coordinates)	04	7001~7002	1B59~1B5A	Float	R	Dword	mm
Y (Cartesian coordinates)	04	7003~7004	1B5B~1B5C	Float	R	Dword	mm
Z (Cartesian coordinates)	04	7005~7006	1B5D~1B5E	Float	R	Dword	mm
Rx (Cartesian coordinates)	04	7007~7008	1B5F~1B60	Float	R	Dword	degree
Ry (Cartesian coordinates)	04	7009~7010	1B61~1B62	Float	R	Dword	degree
Rz (Cartesian coordinates)	04	7011~7012	1B63~1B64	Float	R	Dword	degree
Joint 1	04	7013~7014	1B65~1B66	Float	R	Dword	degree
Joint 2	04	7015~7016	1B67~1B68	Float	R	Dword	degree
Joint 3	04	7017~7018	1B69~1B6A	Float	R	Dword	degree
Joint 4	04	7019~7020	1B6B~1B6C	Float	R	Dword	degree
Joint 5	04	7021~7022	1B6D~1B6E	Float	R	Dword	degree
Joint 6	04	7023~7024	1B6F~1B70	Float	R	Dword	degree
X (Tool coordinate)	04	7025~7026	1B71~1B72	Float	R	Dword	mm
Y (Tool coordinates)	04	7027~7028	1B73~1B74	Float	R	Dword	mm
Z (Tool coordinates)	04	7029~7030	1B75~1B76	Float	R	Dword	mm
Rx(Tool coordinates)	04	7031~7032	1B77~1B78	Float	R	Dword	degree
Ry(Tool coordinates)	04	7033~7034	1B79~1B7A	Float	R	Dword	degree
Rz(Tool coordinates)	04	7035~7036	1B7B~1B7C	Float	R	Dword	degree

Robot Coordinate (When touchstop node be triggered)	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note1	Note2
X (Cartesian coordinates)	04	7401~7402	1CE9~1CEA	Float	R	Dword	mm
Y (Cartesian coordinates)	04	7403~7404	1CEB~1CEC	Float	R	Dword	mm
Z (Cartesian coordinates)	04	7405~7406	1CED~1CEE	Float	R	Dword	mm
Rx (Cartesian coordinates)	04	7407~7408	1CEF~1CF0	Float	R	Dword	degree
Ry (Cartesian coordinates)	04	7409~7410	1CF1~1CF2	Float	R	Dword	degree
Rz (Cartesian coordinates)	04	7411~7412	1CF3~1CF4	Float	R	Dword	degree
Joint 1	04	7413~7414	1CF5~1CF6	Float	R	Dword	degree
Joint 2	04	7415~7416	1CF7~1CF8	Float	R	Dword	degree
Joint 3	04	7417~7418	1CF9~1CFA	Float	R	Dword	degree
Joint 4	04	7419~7420	1CFB~1CFC	Float	R	Dword	degree
Joint 5	04	7421~7422	1CFD~1CFE	Float	R	Dword	degree
Joint 6	04	7423~7424	1CFF~1D00	Float	R	Dword	degree
X (Tool coordinate)	04	7425~7426	1D01~1D02	Float	R	Dword	mm
Y (Tool coordinates)	04	7427~7428	1D03~1D04	Float	R	Dword	mm
Z (Tool coordinates)	04	7429~7430	1D05~1D06	Float	R	Dword	mm
Rx (Tool coordinates)	04	7431~7432	1D07~1D08	Float	R	Dword	degree
Ry (Tool coordinates)	04	7433~7434	1D09~1D0A	Float	R	Dword	degree
Rz (Tool coordinates)	04	7435~7436	1D0B~1D0C	Float	R	Dword	degree

Robot Stick	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
Project Running Speed	04	7101	1BBD	Int16	R	%
M/A Mode	04	7102	1BBE	Int16	R	A:1; M:2
Play/Pause	05	7104	1BC0	Bool	W	
Stop	05	7105	1BC1	Bool	W	Bottom down: 1
Stick+	05	7106	1BC2	Bool	W	Bottom up: 0
Stick-	05	7107	1BC3	Bool	W	

Others 1	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
Current Time: Year	04	7301	1C85	Int16	R	
Current Time: Month	04	7302	1C86	Int16	R	
Current Time: Date	04	7303	1C87	Int16	R	
Current Time: Hour	04	7304	1C88	Int16	R	
Current Time: Minute	04	7305	1C89	Int16	R	
Current Time: Second	04	7306	1C8A	Int16	R	
IPC Connect Number	04	7307	1C8B	Int16	R	$\leqq$ User Connect Limit
User Connect Limit	04	7330	1CA2	Int16	R	0: No limit
Modbus Proxy Port	04	7319	1C97	Int16	R	5432
Last Error Code	04	7320~7321	1C98~1C99	Int32	R	Dword
Last Error Time: Year	04	7322	1C9A	Int16	R	
Last Error Time: Month	04	7323	1C9B	Int16	R	
Last Error Time: Date	04	7324	1C9C	Int16	R	
Last Error Time: Hour	04	7325	1C9D	Int16	R	
Last Error Time: Minute	04	7326	1C9E	Int16	R	
Last Error Time: Second	04	7327	1C9F	Int16	R	

Others 2	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note1	Note2
Controller Temperature	04	7340~7341	1CAC~1CAD	Float	R	Dword	Celsius
Manipulator Voltage	04	7342~7343	1CAE~1CAF	Float	R	Dword	Voltage
Manipulator Power Consumption	04	7344~7345	1CB0~1CB1	Float	R	Dword	Watt
Manipulator Current	04	7346~7347	1CB2~1CB3	Float	R	Dword	A
Control Box IO Current	04	7348~7349	1CB4~1CB5	Float	R	Dword	mA
End Module IO Current	04	7350~7351	1CB6~1CB7	Float	R	Dword	mA

Others 3	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
Robot Light	04	7332	1CA4	Int16	R	1: Solid Red, fatal error. 3: Solid Blue, standby in Auto Mode. 4: Flashing Blue, project running in Auto Mode. 5: Solid Green, standby in Manual Mode. 6: Flashing Green, project running in Manual Mode. 9: Alternating Blue&Red, Auto Mode error. 10: Alternating Green&Red, Manual Mode error. 15: Light Blue, safe activation mode. 18: Flashing Green(9), project pause in Manual Mode. 19: Flashing Blue(9), project pause in Auto Mode.

Others 4	FC	Address$_{10}$	Address$_{16}$	Type	R/W	Note
User Define Area	01/02/03/04/05/06	9000~9999	2328~270F	User-define	R/W	

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