

Quick Guide: PROFINET IO Device for Doosan Robot

Used devices:

- SIEMENS s7-1200(CPU 1217C DC/DC/DC) & TIA portal v15.1
- Doosan Robot M1013(M2.3.1)

Used files: (all files are available for download at robotlab.doosanrobotics.com)

- GSDML
- pni_io_table.pdf
- DoosanRobot_PNIO.udt

0. Basic

When turn on robot controller, PROFINET IO Device function operates in the background.

Therefore, no settings on TP are required.

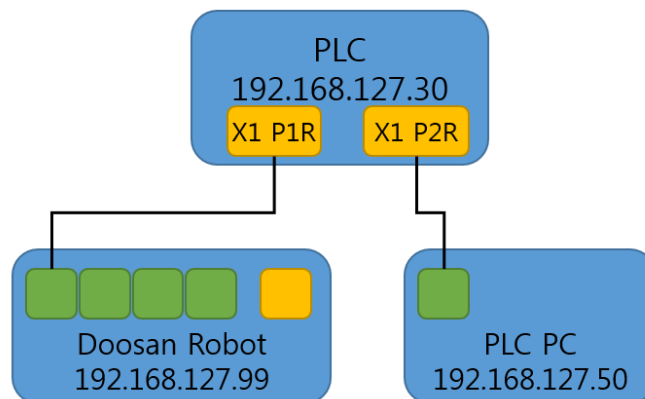
!!!Note: IP address of PROFINET Device is independent of the IP address of Robot Controller.

So IP address for PROFINET Device is set in the TIA portal.

!!!Note: There is internal fixed IP address (192.168.137.100) inside the robot controller in M2.3.1. It is not recommended to connect the PLC and several robot controllers using M2.3.1.

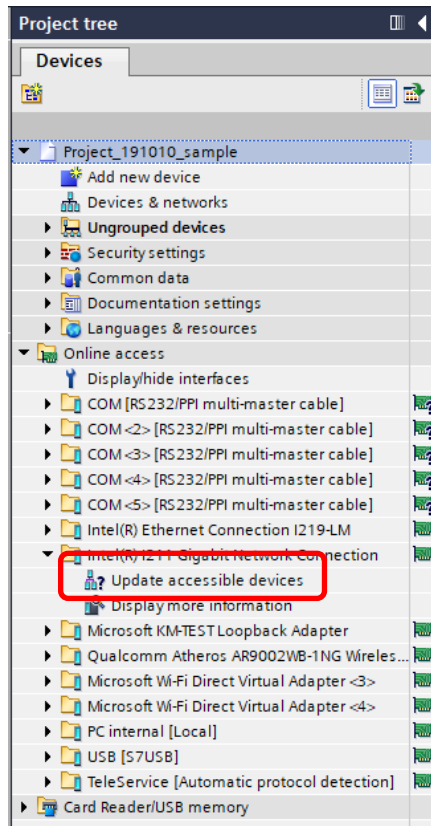
This is not a problem since M2.4 (delete the internal IP address). If you must use M2.3.1, it is recommended not to use the 192.168.137.xxx band.

Please refer to the picture below

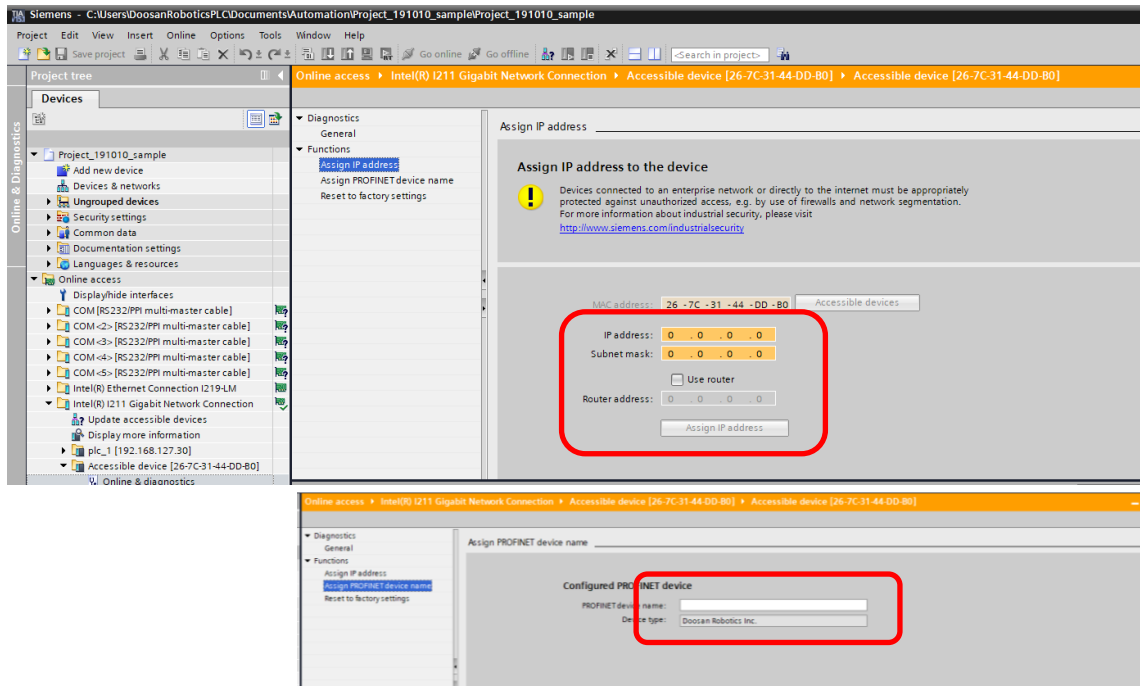


1. TIA portal : Assign IP address & PROFINET device name

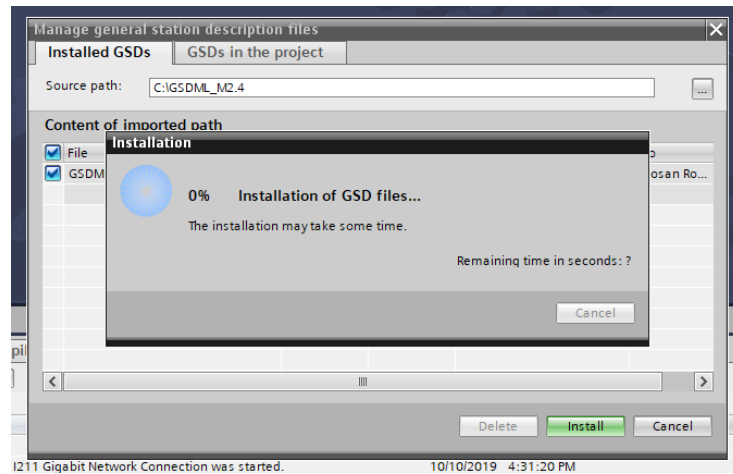
- Click the [Online Access – Network device – Update accessible devices] to find a device.



- Select the device and assign IP address & PROFINET device name(doosan-robot).

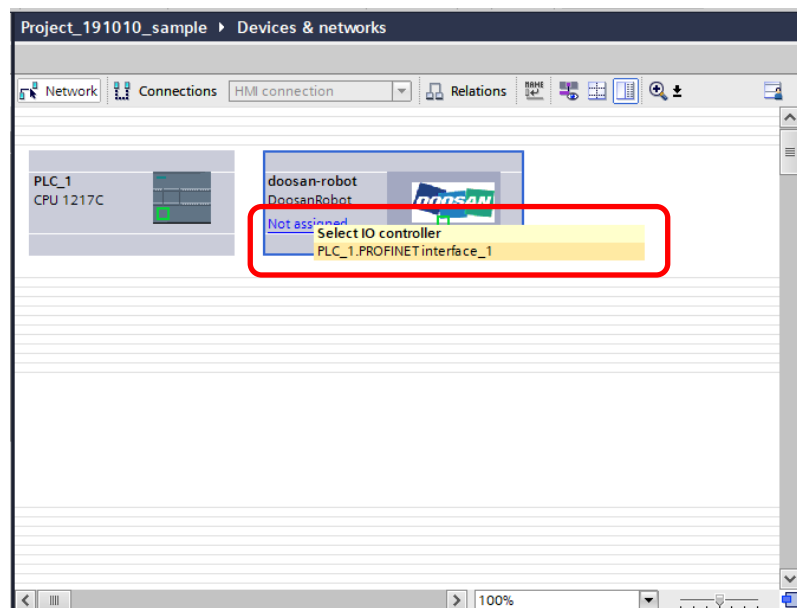


2. Install the Doosan Robot's GSDML file into the TIA portal.



3. Add (doosan-robot) device.

On the (doosan-robot), click the "Not assigned" and assign the PLC.



4. Set the IP address for (doosan-robot) & PLC.

The image displays two screenshots from the SIMATIC Manager software, illustrating the configuration of IP addresses for a Doosan robot and a PLC.

Top Screenshot: doosan-robot [DoosanRobot]

- Device overview table:**

Module	Rack	Slot	I address	Q address	Type
doosan-robot	0	0			DoosanRobot
Interface	0	0 X1			doosan-robot
1_T2O IO Robot State_1	0	1	2..37		1_T2O IO Ro...
2_T2O Joint State_1	0	2	68..211		2_T2O Joint 5...
3_T2O Task State_1	0	3	212..307		3_T2O Task 5...
4_T2O Bit General Purpose R...	0	4	38..45		4_T2O Bit Ge...
5_T2O Int General Purpose R...	0	5	308..403		5_T2O Int Ge...
6_T2O Float General Purpos...	0	6	404..499		6_T2O Float...
7_O2T IO Control_1	0	7		2..13	7_O2T IO Co...
8_O2T Bit General Purpose R...	0	8		14..21	8_O2T Bit Ge...
9_O2T Int General Purpose R...	0	9		164..259	9_O2T Int Ge...
10_O2T Float General Purpo...	0	10		68...163	10_O2T Float...

- Properties - IP protocol:** The "Set IP address in the project" radio button is selected and circled in red. The IP address is set to 192.168.127.30 and the subnet mask is 255.255.255.0.

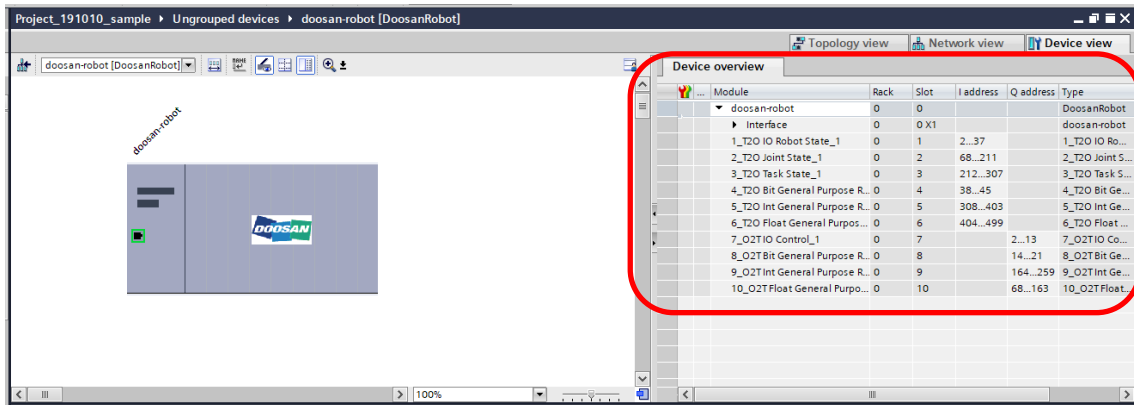
Bottom Screenshot: PLC_1 [CPU 1217C DC/DC]

- Device overview table:**

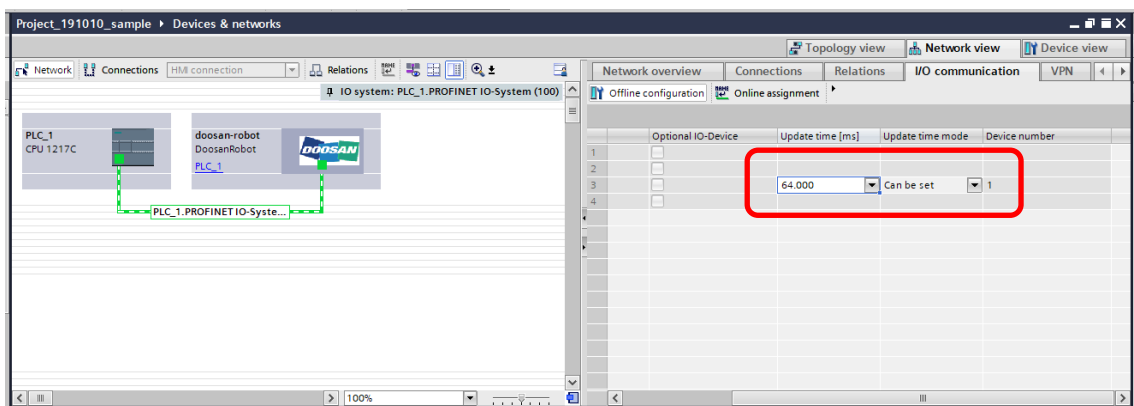
Module	Slot	I address	Q address	Type
PLC_1	1			CPU 1217C DC/DC
DI 14/DQ 10_1	1.1	0..1	0..1	DI 14/DQ 10
AI 2/AQ 2_1	1.2	64..67	64..67	AI 2/AQ 2
HSC_1	1.16	1000..10...		HSC
HSC_2	1.17	1004..10...		HSC
HSC_3	1.18	1008..10...		HSC
HSC_4	1.19	1012..10...		HSC
HSC_5	1.20	1016..10...		HSC
HSC_6	1.21	1020..10...		HSC
Pulse_1	1.32		1000..10...	Pulse generator (f
Pulse_2	1.33		1002..10...	Pulse generator (f
Pulse_3	1.34		1004..10...	Pulse generator (f
Pulse_4	1.35		1006..10...	Pulse generator (f

- Properties - IP protocol:** The "Set IP address in the project" radio button is selected and circled in red. The IP address is set to 192.168.127.30 and the subnet mask is 255.255.255.0.

5. Add the desired I/O module for (doosan –robot)

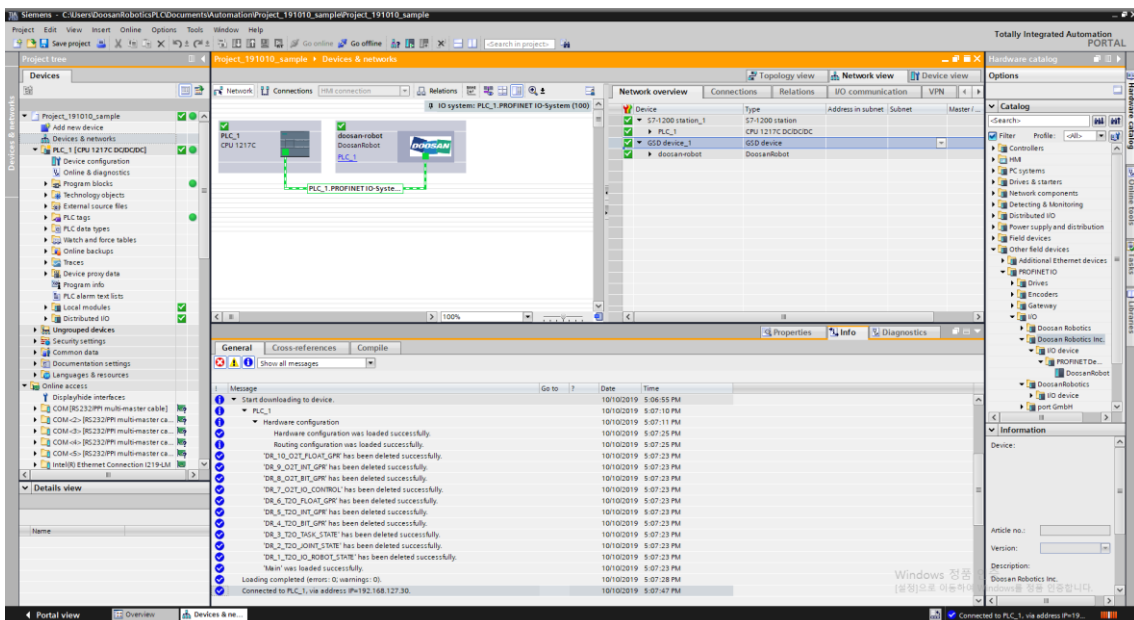


6. Modify update time. (Higher than 64ms is strongly recommended)



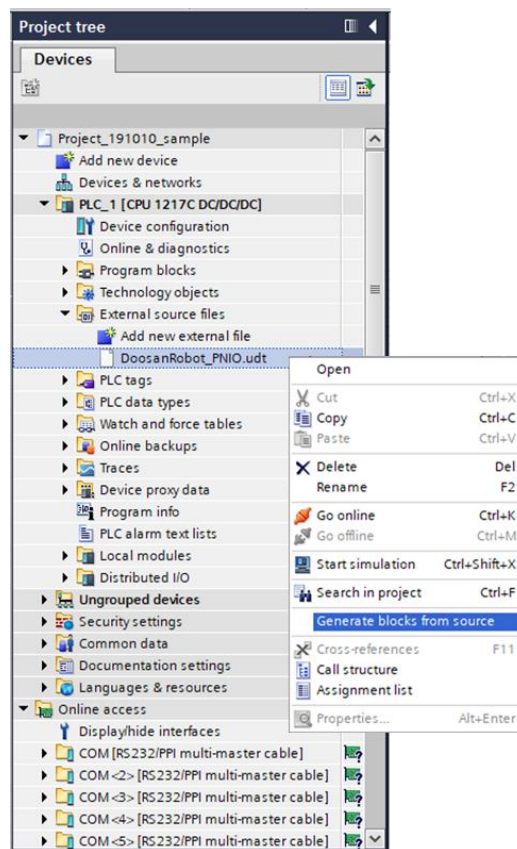
7. Compile & Download hardware configuration to the PLC.

8. Go online on the PLC



[Next step is for checking data]

9. UDT import & generate block from source



10. Make tag table

The screenshot shows the 'Default tag table' window in SIMATIC Manager. The table contains the following data:

Name	Data type	Address	Retain	Access...	Write...	Visibl...	Comment
joint_state	*DR_2_T2O_JOINT_STATE*	%I68.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Joint_Position	Array[0..5] of Real	%I68.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Position[0]	Real	%ID68	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Position[1]	Real	%ID72	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Position[2]	Real	%ID76	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Position[3]	Real	%ID80	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Position[4]	Real	%ID84	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Position[5]	Real	%ID88	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree
Joint_Velocity	Array[0..5] of Real	%I92.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : degree/sec
Joint_Motor_Current	Array[0..5] of Real	%I116.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : A
Joint_Motor_Temperature	Array[0..5] of Real	%I140.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : celsius scale
Joint_Torque	Array[0..5] of Real	%I164.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : Nm
Joint_External_Torque	Array[0..5] of Real	%I188.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Unit : Nm
<Add new>			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

11. Swap for 4byte Data

e.g) DR_1_T2O_IO_ROBOT_STATE : Analog Input/Output 0/1

DR_2_T2O_JOINT_STATE : All Data

DR_3_T2O_TASK_STATE : All Data

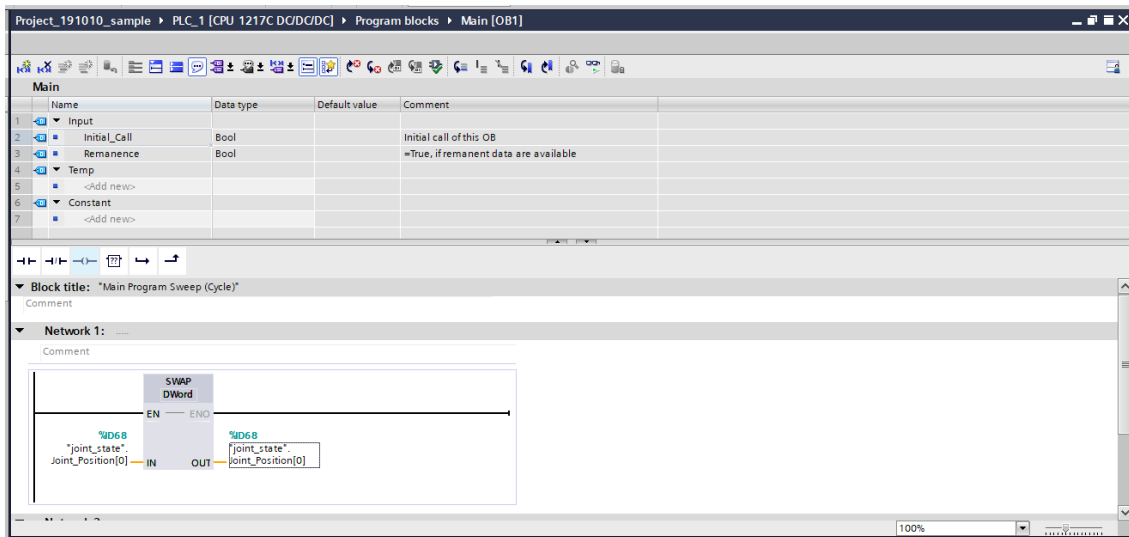
DR_5_T2O_INT_GPR(General Purpose Register) : All Data

DR_6_T2O_FLOAT_GPR(General Purpose Register) : All Data

DR_7_O2T_IO_CONTROL : Analog Output 0/1

DR_9_O2T_INT_GPR(General Purpose Register) : All Data

DR_10_O2T_FLOAT_GPR(General Purpose Register) : All Data



12. Check Data(After Compile – Download to Device – Go Online)

The screenshot shows the "Default tag table" in SIMATIC Manager. The table lists various tags and their properties. A red box highlights the "Add new" button in the top-left corner of the table. The table columns include Name, Data type, Address, Retain, Access, Write, Visible, Monitor value, and Comment.

Name	Data type	Address	Retain	Access	Write	Visible	Monitor value	Comment
Joint_State	*DR_2_T2O_JOINT_STATE	%I68.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	
Joint_Position	Array[0..5] of Real	%I68.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	Unit : degree
Joint_Position[0]	Real	%ID68	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	119.9949	Unit : degree
Joint_Position[1]	Real	%ID72	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	119.9949	Unit : degree
Joint_Position[2]	Real	%ID76	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	119.9949	Unit : degree
Joint_Position[3]	Real	%ID80	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	119.9949	Unit : degree
Joint_Position[4]	Real	%ID84	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	119.9949	Unit : degree
Joint_Position[5]	Real	%ID88	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	119.9949	Unit : degree
Joint_Velocity	Array[0..5] of Real	%I92.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	Unit : degree/sec
Joint_Motor_Current	Array[0..5] of Real	%I116.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	Unit : A
Joint_Motor_Temperature	Array[0..5] of Real	%I140.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	Unit : celsius scale
Joint_Torque	Array[0..5] of Real	%I164.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	Unit : Nm
Joint_External_Torque	Array[0..5] of Real	%I188.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	0	Unit : Nm
<Add new>			<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		