SV-DA200 Series
AC Servo Drive
PROFINET Technical Guide

INVT INDUSTRIAL TECHNOLOGY (SHANGHAI) CO., LTD

Change history

Release date	Version	Description
Oct. 11, 2018	V1.00	First release.
Oct. 25, 2018	V1.01	Added PLC communication configuration description.
Nov. 14, 2018	V1.02	(1) Added parameters for manually setting device names and IP addresses and related description. (2) Added IRT communication configuration description.
Jul. 1, 2019	V1.03	(1) Rectified the by sequence errors of control words (CWs) and status words (SWs). (2) Adjusted parameters P4.44–P4.49 to set IP addresses and device names. (3) Added V0-1 optimized packets.
Dec. 17, 2019	V2.62	(1) Modified Er24-5 communication disconnection fault trigger condition. (2) Added Er24-6 communication setting alarm. (3) Added the quick stop bit to the CW and the alarm bit to the SW. (4) Deleted the speed command association with P4.31 in the V0-1 packet position mode. (5) Added the parameter P3.46 to determine the accuracy of P4.31, P4.40, and P4.41, of which the default value was 1rpm but could be modified to 0.1rpm.
Jul. 11, 2020	V2.63	(1) Added the functions that overload faults 17-0, 17-1, 18-0 can be cleared. (2) Modified Er2-7 to the encoder multi-turn value loss fault. (3) Modified Er24-5 disconnection fault. The fault is valid only in communication or I/O mode. Otherwise, there is a risk of loss of control. (4) Modified the digital screen function of the CW. (5) Added the monitoring parameters R0.64 and R0.65 to display the actual CW and SW.

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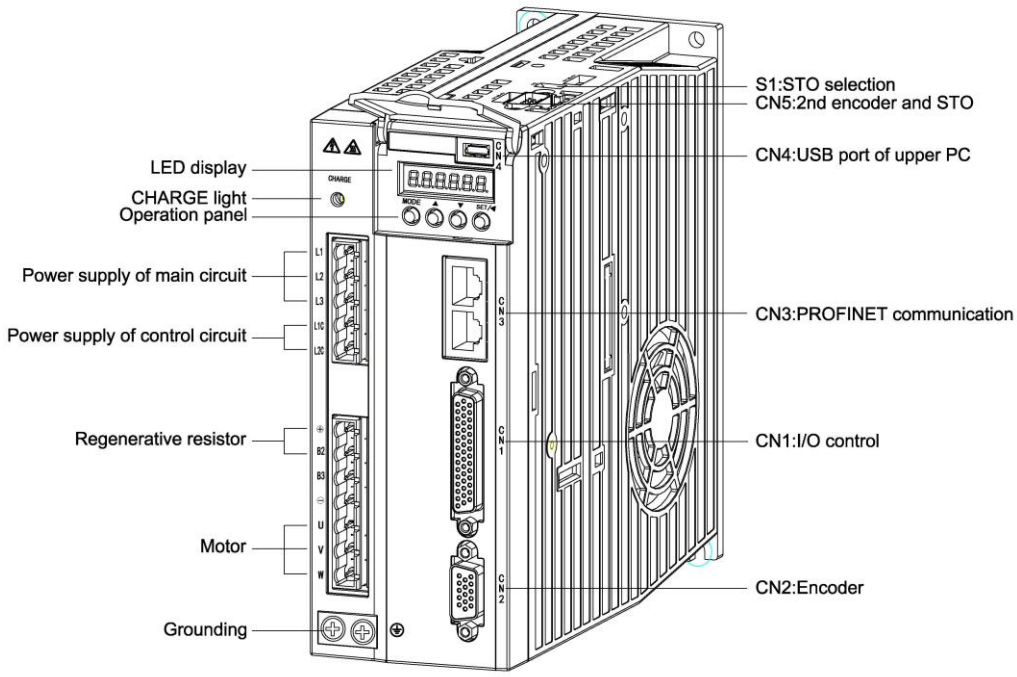
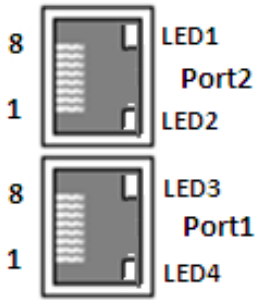
1 Hardware configuration

1.1 Terminal wiring

With a built-in PROFINET communication card, SV-DA200 PROFINET servo drive has similar external appearance with standard DA200, but different from DA200 in CN1 terminal pins, which are described in section 1.3. The structure of the SV-DA200 series servo drive is as follows:



The PROFINET communication card uses two standard RJ45 interfaces, which do not distinguish the direction and can be swappable. (**Note:** When the IRT function is used, the CN3 interfaces are selected based on the upper computer settings, of which the downstream interface is Port1 and the upstream interface is Port2.) The interface diagram is as follows.



Two standard RJ45 interfaces

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	Vcc	LED power supply

Pin	Name	Description
5	Vcc	LED power supply
6	RX-	Receive Data-
7	n/c	Not connected
8	FG	Ground of the housing

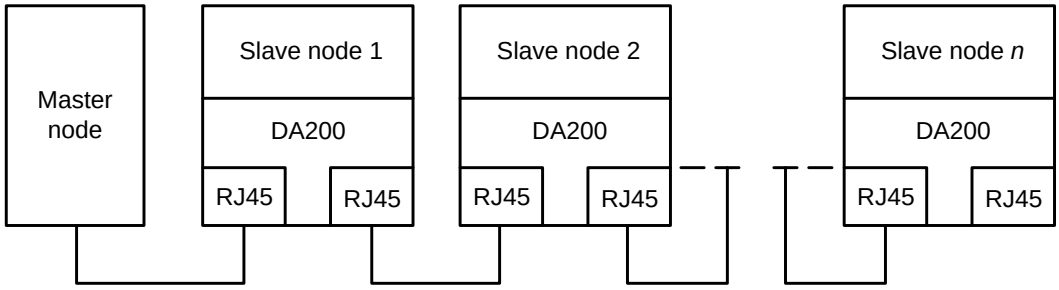
Standard RJ45 interface function table

LED	State	Description
LED1	Off	Port2: The network is not connected.
	Blinking	Port 2: The network communication is normal.
	On	Port2: The network has been connected.
LED2	Off	Servo disabled
	On	Enable servo
LED3	Off	Port1: The network is not connected.
	Blinking	Port 1: The network communication is normal.
	On	Port1: The network has been connected.
LED4	Off	PROFINET communication normal
	Blinking	PROFINET communication fault

CN3 interface LED indicator definition table

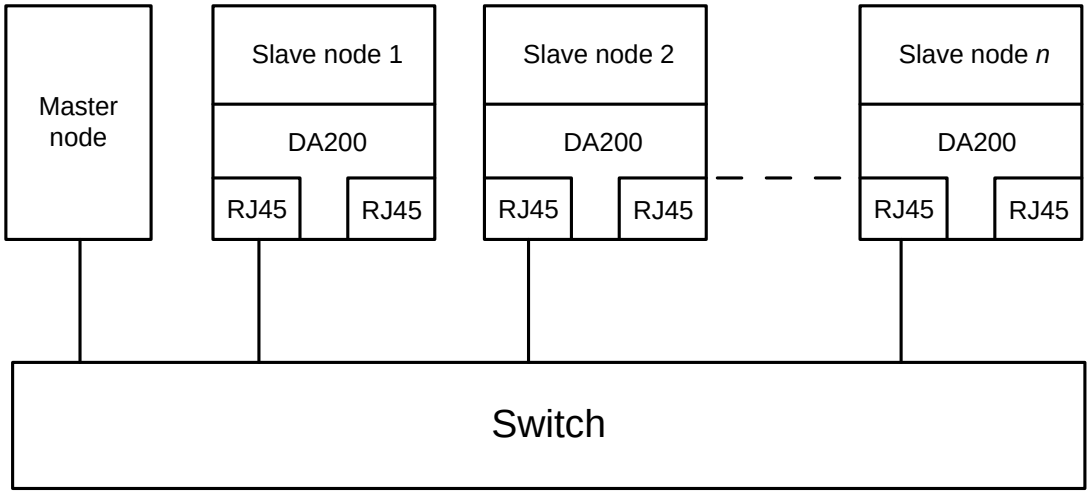
1.2 Electrical connection

With standard RJ45 interfaces, the servo drives can use the linear network topology or star network topology. The electrical connection diagrams are shown as follows.



Linear network topology electrical connection diagram

Note: For the star network topology, you need to prepare PROFINET switches.



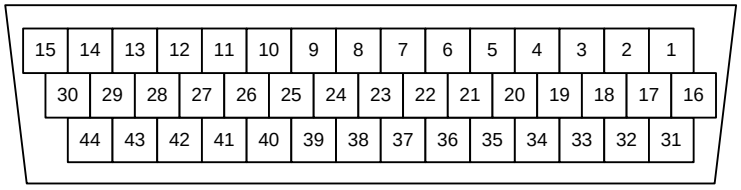
Star network topology electrical connection diagram

1.3 CN1 terminal definition

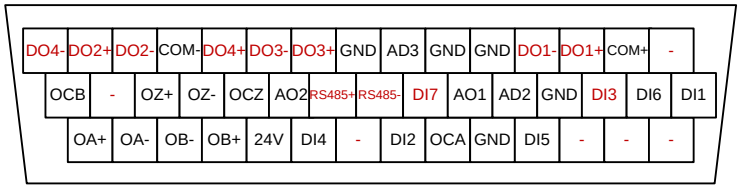
SV-DA200 series PROFINET servo drive and standard DA200 model are different in the IO terminals, which are described in the following.

Pin	Symbol	Function	Pin	Symbol	Function
1	-	Reserved	23	RS485-	RS485-
2	COM+	Common terminal of digital input	24	RS485+	RS485+
3	DO1+	Digital output 1 +	25	AO2	Analog output 2
4	DO1-	Digital output 1 -	26	OCZ	Z-phase open collector output
5	GND	Analog signal ground	27	OZ-	Z-phase differential output -
6	GND	Analog signal ground	28	OZ+	Z-phase differential output +
7	AD3	Analog input 3	29	-	Reserved
8	GND	Analog signal ground	30	OCB	B-phase open collector output
9	DO3+	Digital output 3 +	31	-	Reserved
10	DO3-	Digital output 3 -	32	-	Reserved
11	DO4+	Digital output 4 +	33	-	Reserved
12	COM-	Internal 24V -	34	DI5	Digital input 5
13	DO2-	Digital output 2 -	35	GND	Analog signal ground
14	DO2+	Digital output 2 +	36	OCA	A-phase open collector output
15	DO4-	Digital output 4 -	37	DI2	Digital input 2
16	DI1	Digital input 1	38	-	Reserved
17	DI6	Digital input 6	39	DI4	Digital input 4
18	DI3	Digital input 3	40	24V	Internal 24V +
19	GND	Analog signal ground	41	OB+	B-phase differential output +

Pin	Symbol	Function	Pin	Symbol	Function
20	AD2	Analog input 2	42	OB-	B-phase differential output -
21	AO1	Analog output 1	43	OA-	A-phase differential output -
22	DI7	Digital input 7	44	OA+	A-phase differential output +



CN1 plug pin layout

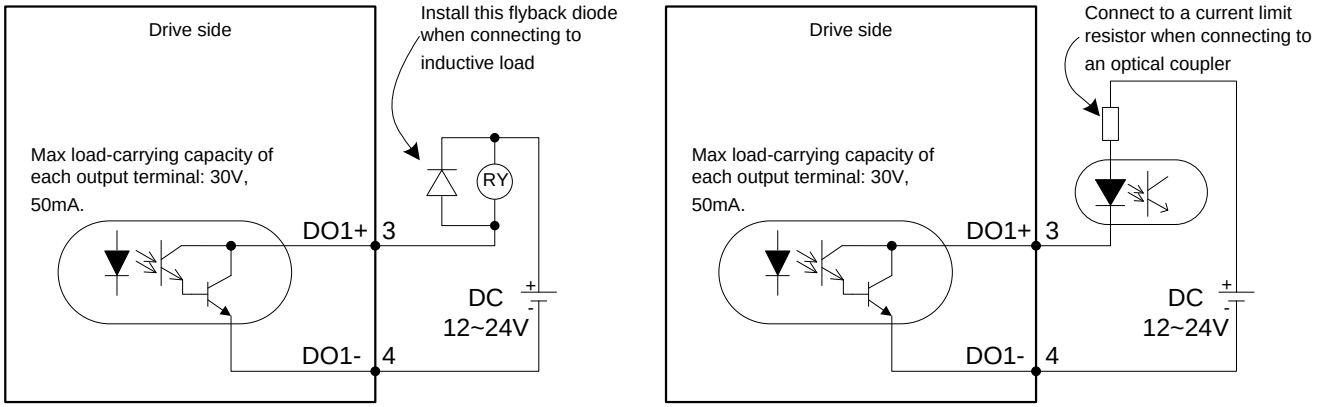


CN1 plug signal layout

The PROFINET servo drive model has two analog inputs, two analog outputs, seven digital inputs, and four digital differential outputs. The PROFINET servo drive model and the standard model are similar in the external wiring of analog input, analog output, and digital input. For details, see section 4.5 in DA200 operation manual.

The following shows the external wiring of digital differential output, using DO1 as an example.

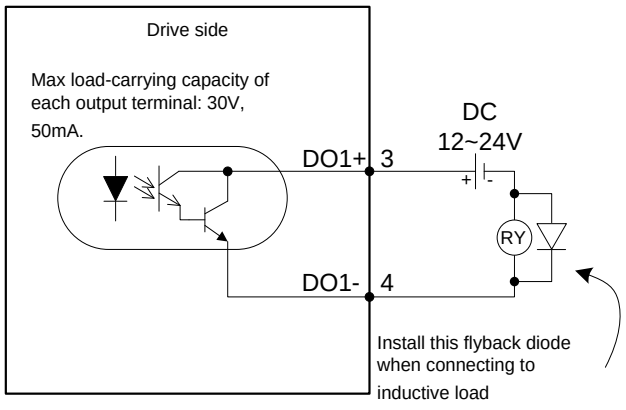
Wiring when using the user-provided power supply:



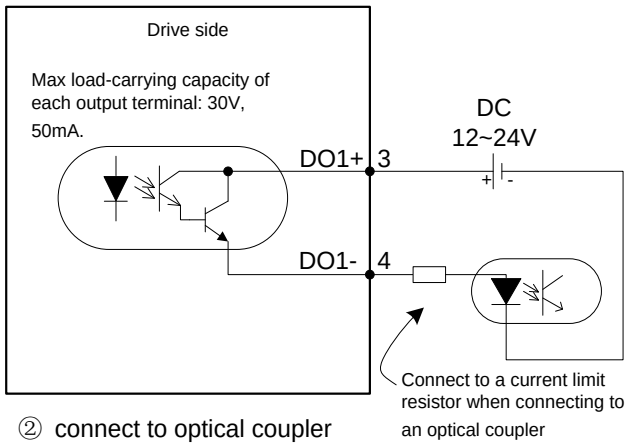
① connect to relay coil

② connect to optical coupler

Alternative wiring:

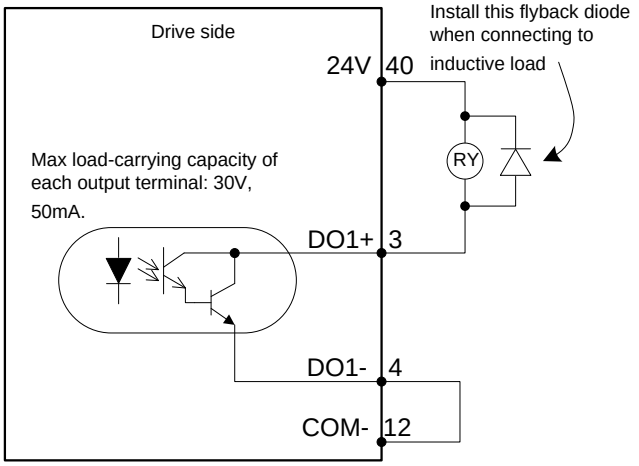


① connect to relay coil

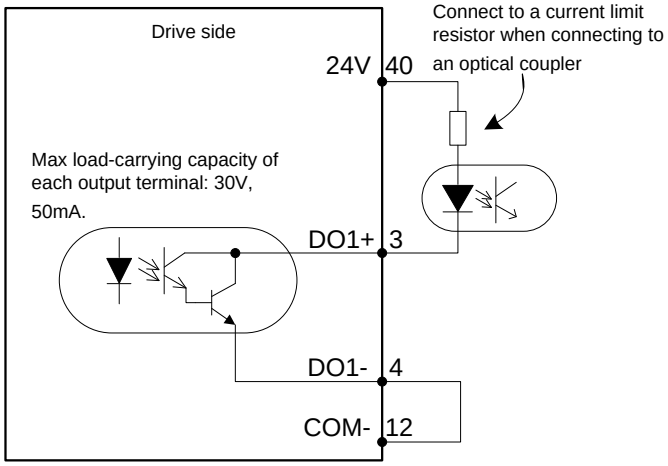


② connect to optical coupler

Wiring when using the local-provided power supply:

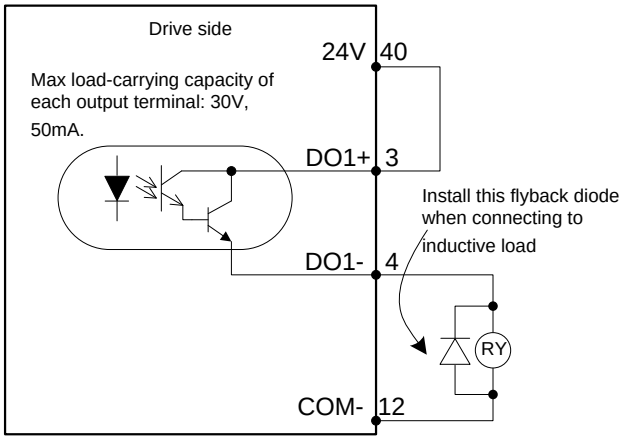


① connect to relay coil

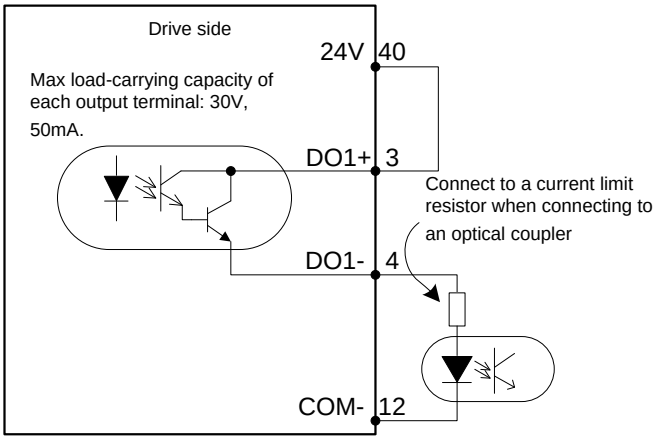


② connect to optical coupler

Alternative wiring:



① connect to relay coil



② connect to optical coupler

2 Software configuration

2.1 Basic settings of PROFINET application

Do as follows before using the servo drive for PROFINET communication:

1. Use the LED panel or ServoPlorer software to set parameter **P0.03** [Control mode selection] according to your needs. (Currently, only options 0–5 are supported.) **0: Position mode**. **1: Speed mode**. **2: Torque mode**. **3: Position/speed hybrid mode**. **4:Position/torque hybrid mode**. **5: Speed/torque hybrid mode.**
2. Use the LED panel or ServoPlorer software to set parameter **P4.10** [Upper computer type] to **1 (Bus input)**.
3. Use the LED panel or ServoPlorer software to set parameter **P4.08** [PROFINET synchronization type], which is RT MODE by default.
4. View **R0.27 to check the** PROFINET clock synchronization calibration status of the drive. If **P4.08** is set to IRT MODE, "Synchronized" is displayed after clock synchronization has been completed.
5. View **R0.29 to check the** PROFINET IP address of the drive.
6. View **R0.61, R0.62, and R0.63** to check the PROFINET MAC address of the drive. For example, if the MAC address is 70:b3:d5:1d:01:d7, R0.61 is 0x70b3, R0.62 is 0xd51d, and R0.63 is 0x1d7.
7. Use the LED panel or ServoPlorer software to set parameter **P4.79** [PROFINET communication packet type] according to your requirement.
8. Use the LED panel or ServoPlorer software to set parameters **P4.80–P4.84** [Configuration of PZD setting parameter n] and **P4.85–P4.89** [Configuration of PZD feedback parameter n] to configure content in the variable process data zone.

Use the commissioning software Proneta or IO controller to set the device name and IP address. Alternatively, you can manually set them. Set related parameters as follows:

9. Use the LED panel or ServoPlorer software to set parameter **P4.44** [PROFINET device name no.], of which the value ranges from 0 to 127. The value 0 indicates DCP setting, while the other values indicate manual setting. The device name is automatically prefixed with "invt-sv-". For example, when P4.44 is set to 12, the device name is "invt-sv-012".
10. Use the LED panel or ServoPlorer software to set parameter **P4.45** [PROFINET network address 1], **P4.46** [PROFINET network address 2], and **P4.47** [PROFINETnetwork address 3], of which the value ranges from 0 to 255.
11. Use the LED panel or ServoPlorer software to set parameter **P4.48** [PROFINET IP address no.]. The value 0 indicates DCP setting, while the other values indicate manual setting.
12. Use the LED panel or ServoPlorer software to set parameter **P4.49** [PROFINET gateway address]. When the IP address is set through the corresponding parameters, the subnet mask is automatically set. For example, if P4.45 is set to 192, P4.46 is set to 168, P4.47 is set to 12, P4.48 is set to 34, and P4.49 is set to 1, the gateway address is 192.168.12.1, subnet mask is 255.255.255.0, and IP address is 192.168.12.34.

Note:

1. You need to re-power on the drive or reset the drive in soft manner for the change of **P0.03, P4.08, and**

P4.10 to take effect.

2. You need to set the slave node (servo drive) device name on the master node (CNC or PLC) or through **P4.44**.
3. The servo drive supports the V0 and V0-1 modified protocol versions (supporting PKW+PZD).
4. When **P4.48 is set to a non-zero value,** you need to set "Set IP address directly on device" on the IO controller.

2.2 PROFINET communication basis

The drive uses cyclic data to set commands and monitor status to implement real-time control and uses the non-cyclic communication function for parameterization, diagnosis, and troubleshooting during cyclic data transmission. The information required in the drive control process includes parameters and process data. Parameters are non-periodic data, used for control command transmission and servo drive configuration. Process data is periodic data, used for servo drive control. The servo drive supports the V0 protocol (supporting PKW+PZD and PPO type 5) and V0-1 modified protocol and standard packets.

2.2.1. DP-V0 protocol

DP-V0 is the basic communication protocol version, which supports only cyclic data exchange (MS0 communication). It has only basic configuration, parameter definition and simple diagnostic mechanism. Periodic packet transmission uses the 32-byte fixed-length transmission method in the following data format.

0–7 (Byte)	8–31 (Byte)
PKW	PZD

In the data, PKW (parameter channel) is used to transmit non-periodic data to set drive parameters and can read parameters from and write parameters to the drive.

PZD (process data channel) is used to transmit periodic data, such as CW, speed command, position command, torque command or SW, speed feedback, position feedback, and torque feedback. PZD can also carry parameter setting data.

PKW packet format

PKW								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE*[1]		IND*[2]		PWE*[3]			

Note:

*[1] PKE is the packet format.

*[2] IND is the parameter communication IND, compliant with the following rules:

(1) It is the same as the Modbus communication address, which is fully in decimal format.

(2) Unless otherwise specified, the address is a 32-bit data address. For example, parameter P4.13 is bus speed reference, which is the int16 type, but the Modbus addresses of the parameter are 1826 and 1827.

*[3] PWE is the parameter value.

*[4] Each time only one PKW request is handled, but the servo drive continuously responds until the controller updates the commands.

PKE packet format

PKE															
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	AK (Task or response ID)				Temporarily set to 0											

AK ID

Master node to slave node		Slave node to master node	
AK ID	**Function**	**Positive response ID**	**Negative response ID**
0	No task.	0	0
1	Read parameters.	1, 2	7
2	Write parameters (a single word).	1	7
3	Write parameters (double words).	2	7
13	Write parameters (a single word) to the EEPROM.	1	7
14	Write parameters (double words) to the EEPROM.	2	7

Examples

(1) Read parameters.

Read P0.05 (Jog speed), of which the value is 200, the Modbus address is 1010, and the data type is int16.

Master node to slave node								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE		IND		PWE			
	16#1000		16#03F2		16#0000_0000			
Slave node to master node								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE		IND		PWE			
	16#1000		16#03F2		16#0000_00C8			

(2) Write parameters.

Write P0.05 (Jog speed), of which the value is 500, the Modbus address is 1010, and the data type is int16.

Master node to slave node								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE		IND		PWE			
	16#2000		16#03F2		16#0000_01F4			
Slave node to master node								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE		IND		PWE			

	16#2000	16#03F2	16#0000_01F4

When the written value (1200) exceeds the max. value (1000) of P0.05 (Jog speed), the negative response ID is 7, and PWE is 2, out of the parameter setting range.

Master node to slave node								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE		IND		PWE			
	16#2000		16#03F2		16#0000_04B0			
Slave node to master node								
PKW number (Byte)	1	2	3	4	5	6	7	8
	PKE		IND		PWE			
	16#7000		16#03F2		16#0000_0002			

PZD packet format:

PZD												
WORD*[1]	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Downstream	CW	Speed command	Position command*[2]		Torque command	Reserved	Configure reference parameter 1*[3]		Configure reference parameter 2		Configure reference parameter 3	
Upstream	SW	Speed feedback	Position feedback		Torque feedback	Reserved	Configure feedback parameter 1		Configure feedback parameter 2		Configure feedback parameter 3	

*[1] The word length is 16 bits.

*[2] The fixed content in PZD has the following relationship in the parameter table: The position command is **P4.12** [Bus position command]; the speed command is **P4.13** [Bus linear speed command]; the torque command is **P4.14** [Bus torque command]; the speed feedback is **R0.21** [Transient speed]; the speed feedback is **R0.02** [Feedback pulse accumulation]; the torque feedback is **R0.06** [Actual toruqe].

*[3] Reference parameters 1–3 correspond to parameters **P4.80–P4.82** [Configuration of PZD setting parameter n], while feedback parameters 1–3 correspond to **P4.85–P4.89** [Configuration of PZD feedback parameter n].

Each bit of the CW is described in the following table.

Bit	Function	Name
0	Control mode switchover (valid when enabled)	MODE_SWITCH
1	Gain switchover	GAIN_SWITCH
2	Inertia ratio switchover	JRATIO_SWITCH
3	Torque limit switchover	TRQLIMIT_SWITCH
4	Zero-speed clamp	ZCLAMP
5	Clearing residual pulses	POSERR_CLEAR
6	Input switchover for vibration suppression	VIB_SUB
7	Quick stop	QUICK_STOP

Bit	Function	Name
8	Screening digital input (0: CN1 digital input is valid. 1: CN1 digital input is invalid, but the CW is valid) *[1]	SERVO_DI_INH
9	Enabling servo	SERVO_ON
10	Clearing faults	FAULT_CLEAR
11	Emergency stop	EMEGENCY
12	Disabling forward driving	POT(POSITIVE_LIMIT)
13	Disabling reverse driving	NOT(NAGETIVE_LIMIT)
14	Home switch signal	HOME_SINGAL
15	Triggering homing	HOME_TRIGGER

Note: *[1] (1) When bit 8 is set to 0, the servo drive uses digital input as the source of the corresponding function (but CW control is still valid, which has an inclusive or relationship with the digital input). (2) When bit 8 is set to 1, digital input is screened, and only the control bit in the CW is used as the source of function. The control function is applicable only to disabling positive/negative driving (the limit switch needs to be set to valid through P3.40), home switch signal, and triggering homing.

Each bit of the SW is described in the following table.

Bit	Function	Name
0	Speed consistent	SPD_COIN
1	Speed reached	SPD_AT
2	Speed being limited	SPD_LIMITING
3	Speed command validity	SPD_CMD_VALID
4	Zero output of speed	SPD_ZERO
5	Torque being limited	TRQ_LIMITING
6	Zeroing completed	HOME_END
7	PZD controlling	PZD_CONTROLING
8	Servo ready for output	READY
9	Servo run output	RUN
10	Fault output	FAULT
11	Alarm output	ALARM
12	External brake released	BREAK_OFF
13	Position command validity	POS_CMD_VALID
14	Positioning completed	POS_COIN
15	Control mode switchover status	MODE_CHANGE_STATUS

Note:

(1) All words and double words used are transmitted in Big-Endian format, that is, transmitting high-order bytes/words before low-order bytes/words (the CWs/SWs are already in Big-Endian format).

(2) The GSD file is a text file. There must be a device description file on each PROFINET slave node on the PROFINET bus. The device description file must be a GSD file, which describes the PROFINET device characteristics. The GSD file contains all defined parameters of the device, such as the supported

information length, and input and output data count.

2.2.2 DP-V0-1 optimized protocol (V2.61 and later)

The parameter **P4.79** [PROFINET communication packet type] is set to V0-1 packet, which still uses the 32-byte fixed-length transmission method, to optimize only PZD parameters. After optimization, the PZD packet format is as follows:

PZD packet format:

PZD												
WORD*[1]	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Downstream	CW	Speed command**[2]	Configure reference parameter 1**[3]		Configure reference parameter 2		Configure reference parameter 3		Configure reference parameter 4		Configure reference parameter 5	
Upstream	SW	Speed feedback	Configure feedback parameter 1		Configure feedback parameter 2		Configure feedback parameter 3		Configure feedback parameter 4		Configure feedback parameter 5	

*[1] The word length is 16 bits.

*[2] The fixed content in PZD has the following relationship in the parameter table: The speed command is **P4.13** [Bus speed command]; the speed feedback is **R0.21** [Transient speed].

*[3] Reference parameters 1–5 correspond to parameters **P4.80–P4.84** [Configuration of PZD setting parameter n], while feedback parameters 1–5 correspond to P4.85–P4.89 [Configuration of PZD feedback parameter n].

2.2.3 Other packets

Not supported currently.

2.3 PLC communication configuration

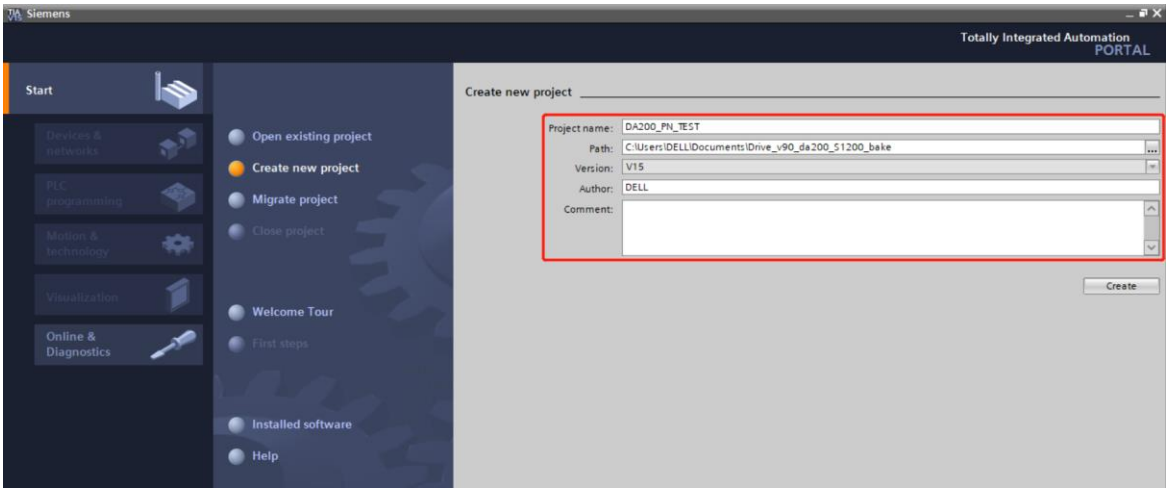
This section describes how to use S7-1500 PLC of Siemens TIA PORTAL V13 to configure PROFINET communication for the servo drive.

The following uses Siemens PLC S7-1500 as an example to describe the configuration process, similar to the configuration process using S7-300, S7-400, or S7-1200.

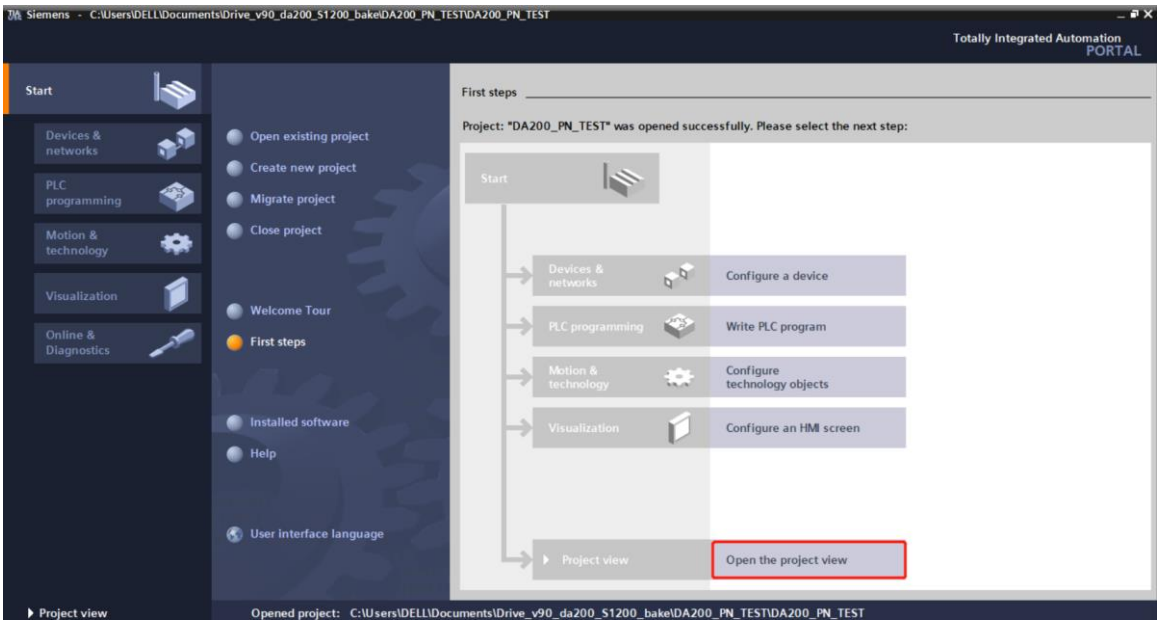
2.3.1 Creating a project

Double-click the TIA Portal V13 icon to start the TIA Portal V13 project tool.

Then choose Create new project. On the right of the interface, enter **Project name**, **Path**, **Version**, **Author**, and **Comment**, and click **Create**. See the following figure.



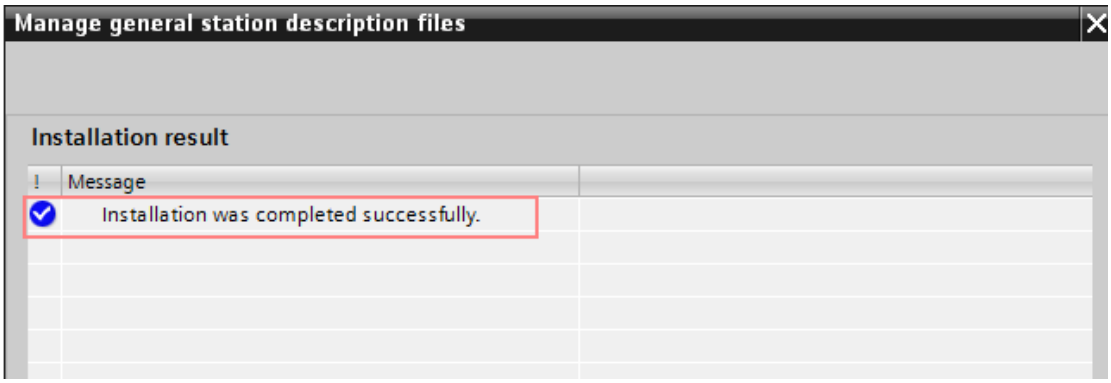
Then double-click to open the project view, as shown in the following figure.



2.3.2 Adding the GSD file

In the project view, choose **Option (N)** from the toolbar. Then choose **Manage general station description files (GSD)**. In the dialog box that appears, enter the source path of the GSD file, select the GSD file, and click **Install**.

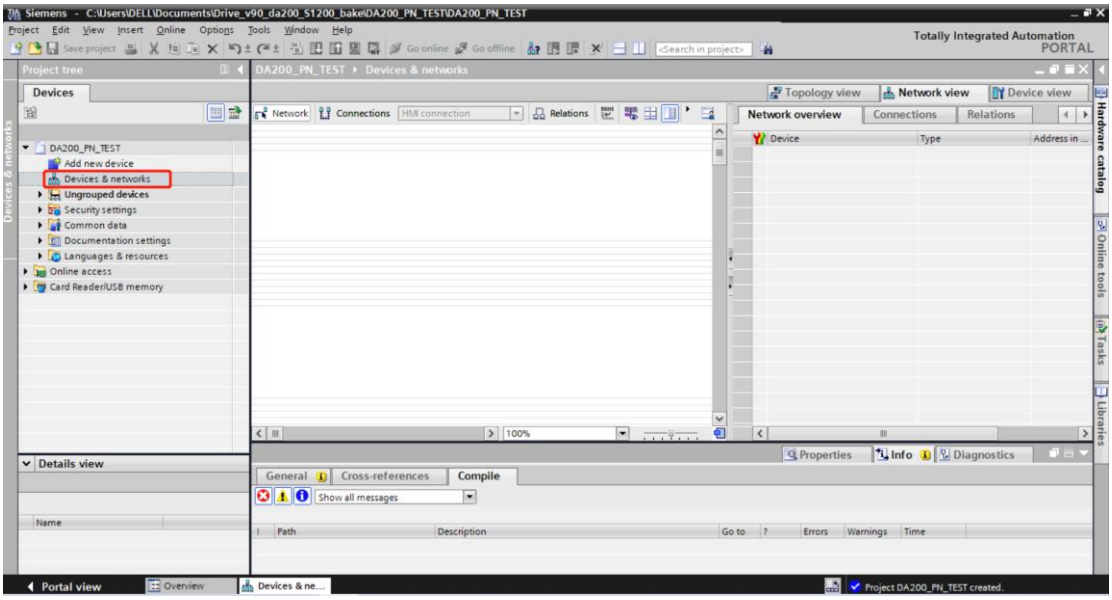
If the installation is successful, the following dialog box appears.



2.3.3 Configuring basic information on project

(1) Enter the project view.

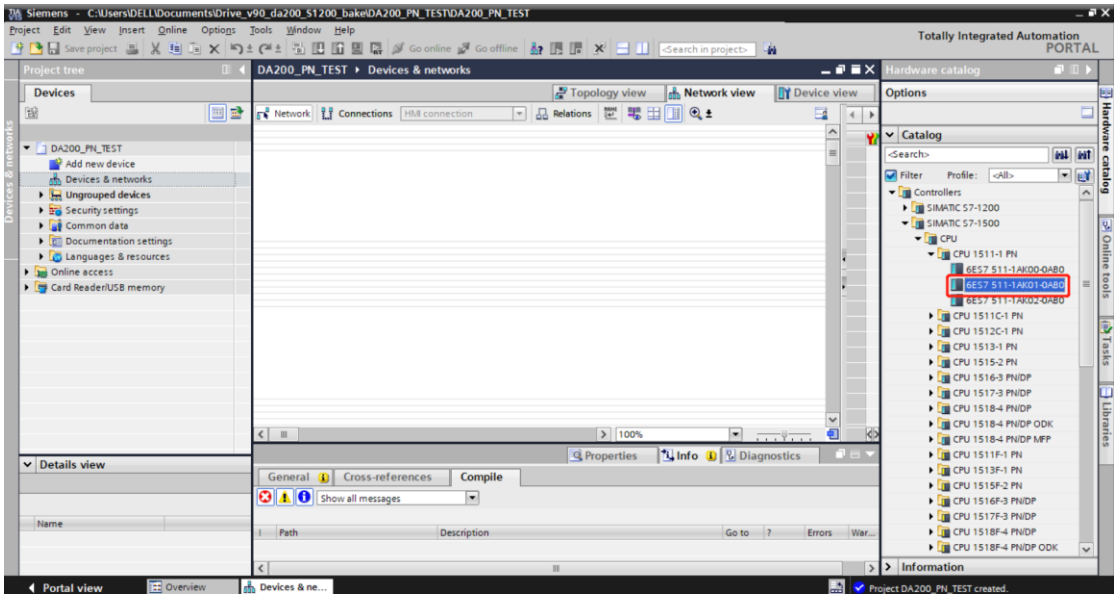
Double-click **Devices & networks** in the project view.



(2) Add project devices.

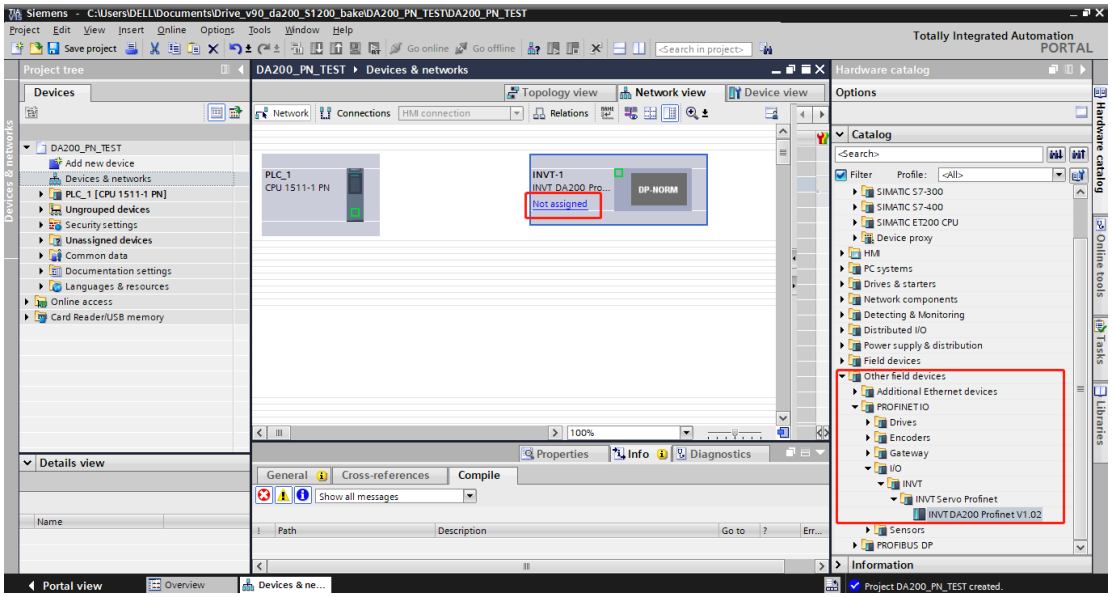
① Add S7-1500 PLC to the project.

For example, choose **Controllers** > **SIMATIC S7-1500** > **CPU** > **CPU 1511-1 PN** > **6ES7 511-1AK01-0AB0** in the **Hardware catalog** panel on the right, and then double-click or drag the **6ES7 511-1AK01-0AB0** icon to the project.

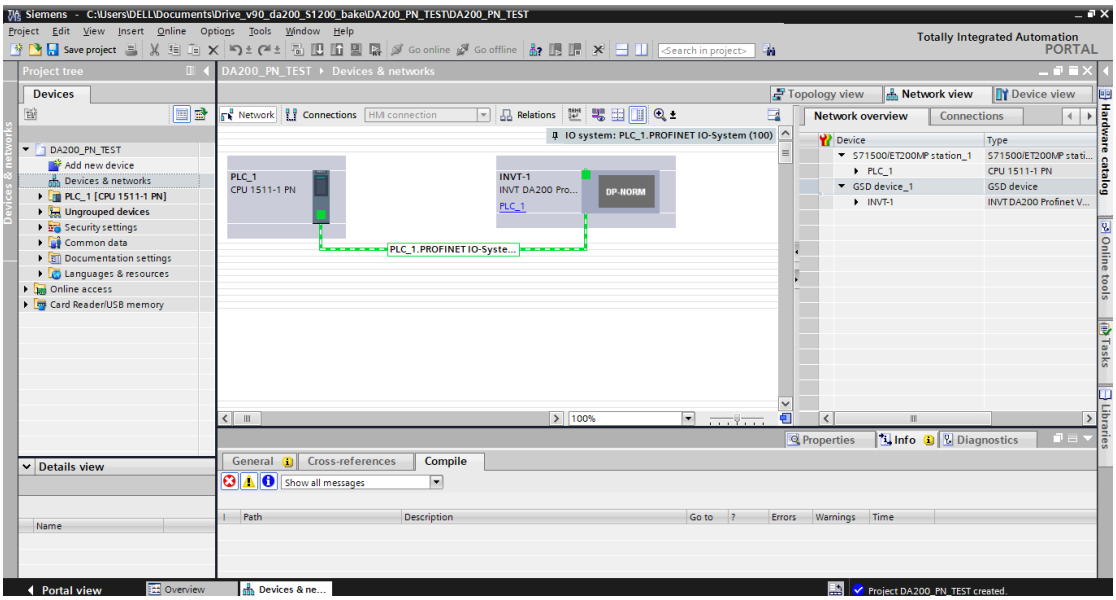


② Add DA200 drive to the project.

In the **Hardware catalog** panel on the right, choose **Other field devices** > **PROFINET IO** > **I/O** > **INVT** > **INVT Servo Profinet** > **INVT Profinet Adapter V1.0**, and then double-click the **INVT Profinet Adapter V1.0** icon to add the DA200 drive to the project. See the following figure.

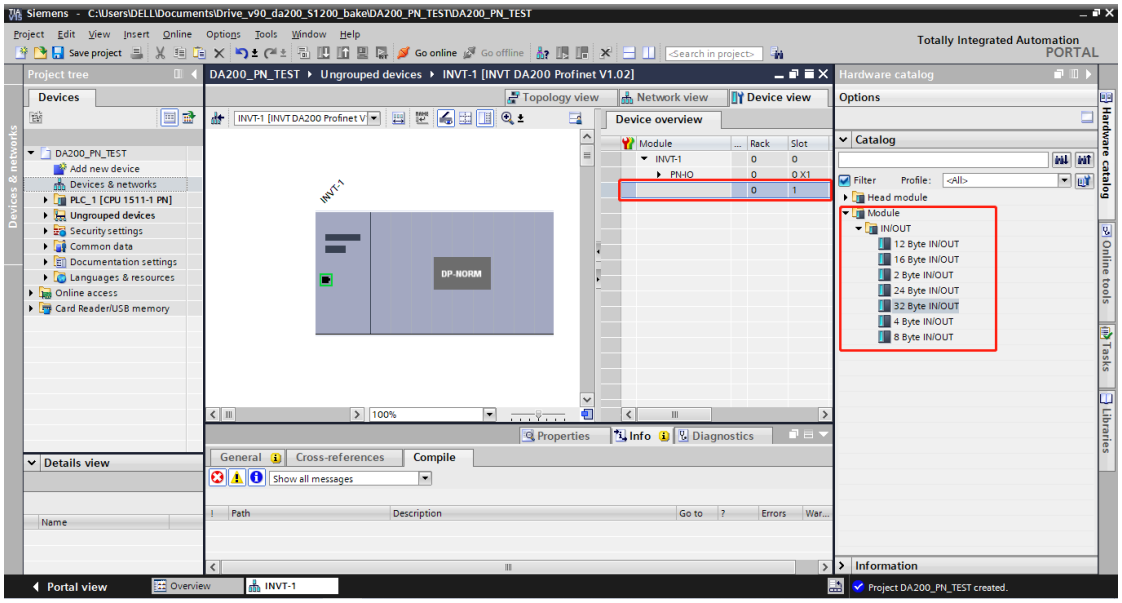


Click the **Not assigned** option of **INVT Profinet Adapter V1.0**, and select the IO controller **PLC_1.PROFINET interface_1**. In the network view, the CPU and INVT PROFINET have been connected to the same PROFINET sub network.

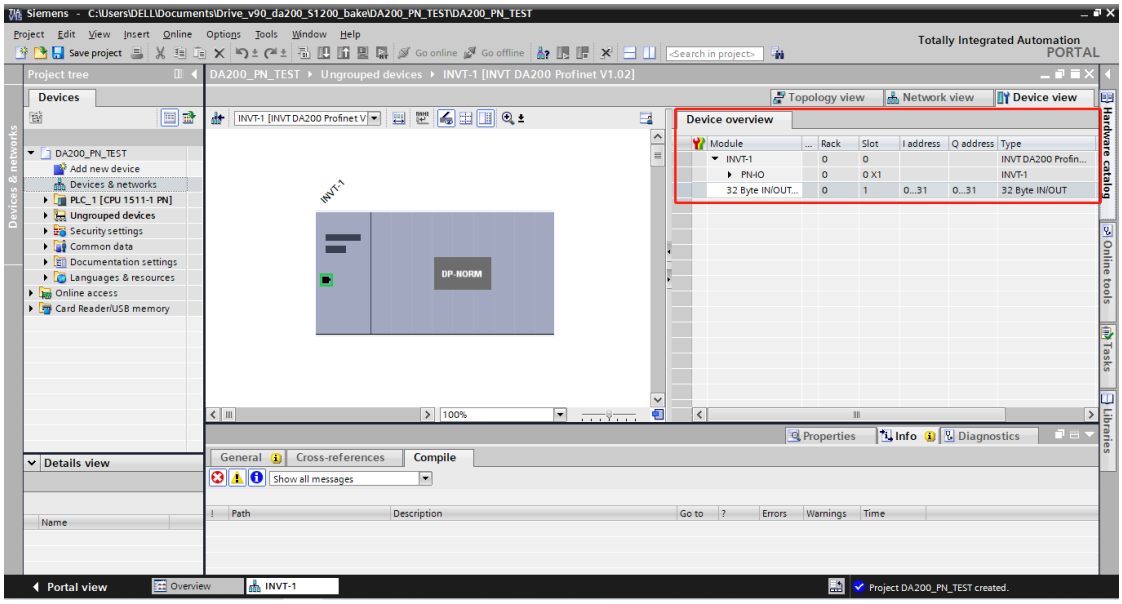


③ Add INVT I/O sub modules to the project.

Double-click the **INVT Profinet Adapter V1.0** icon to enter the device view. See the following figure.



On the right, choose **Hardware catalog** > **Module**, or double-click or drag the 32 Byte IN/OUT module to the blank area in device view, as shown in the following figure. Then the 32 Byte IN/OUT module has been added to the project.



④ Set S7-1500 and INVT PROFINET basic parameters.

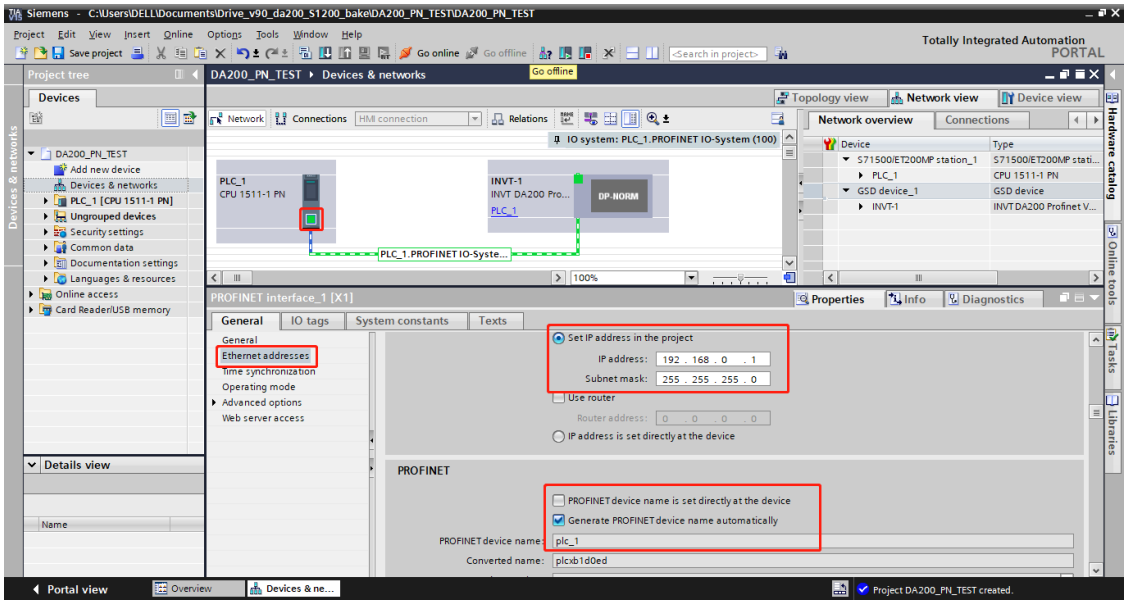
a. Set S7-1500 CPU parameters.

◆ Double-click **Devices & networks** to enter the editing interface in the network view.

◆ Double-click the PLC S7-1500 icon to enter the device view.

◆ Double-click the network interface position of the S7-1500 icon to enter the **PROFINET interface_1** editing interface.

◆ Click the **General** tab, choose **Ethernet addresses**, and set parameters (such as the PLC IP address and name).



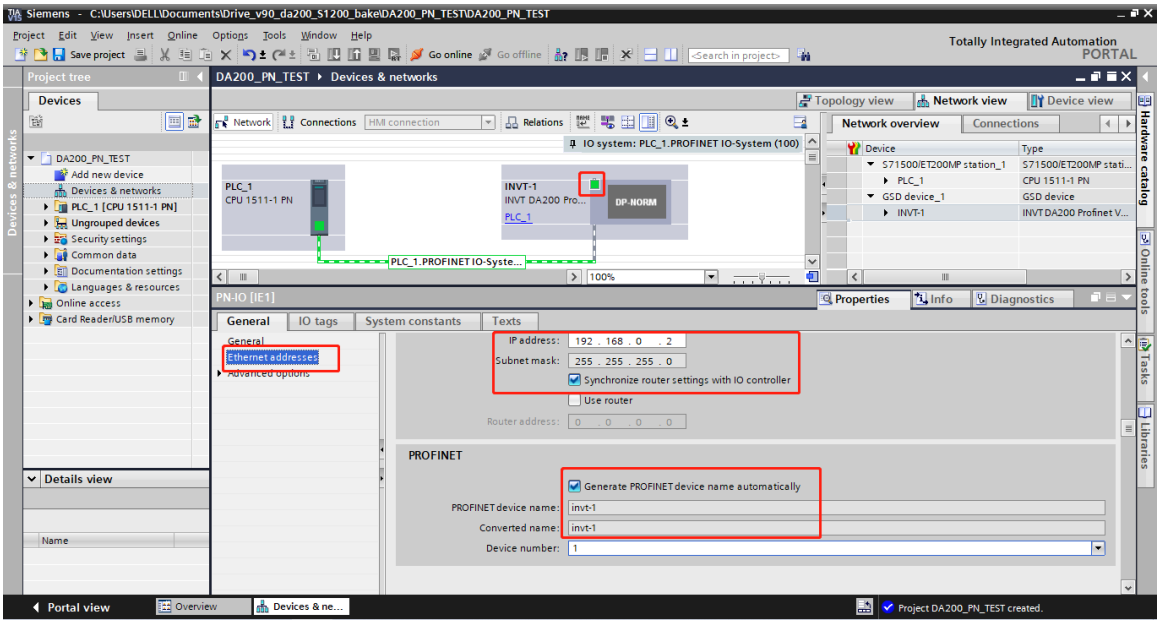
④ Set INVT PROFINET communication parameters.

◆ Double-click **Devices & networks** to enter the editing interface in the network view.

◆ Double-click the INVT PROFINET icon to enter the device view.

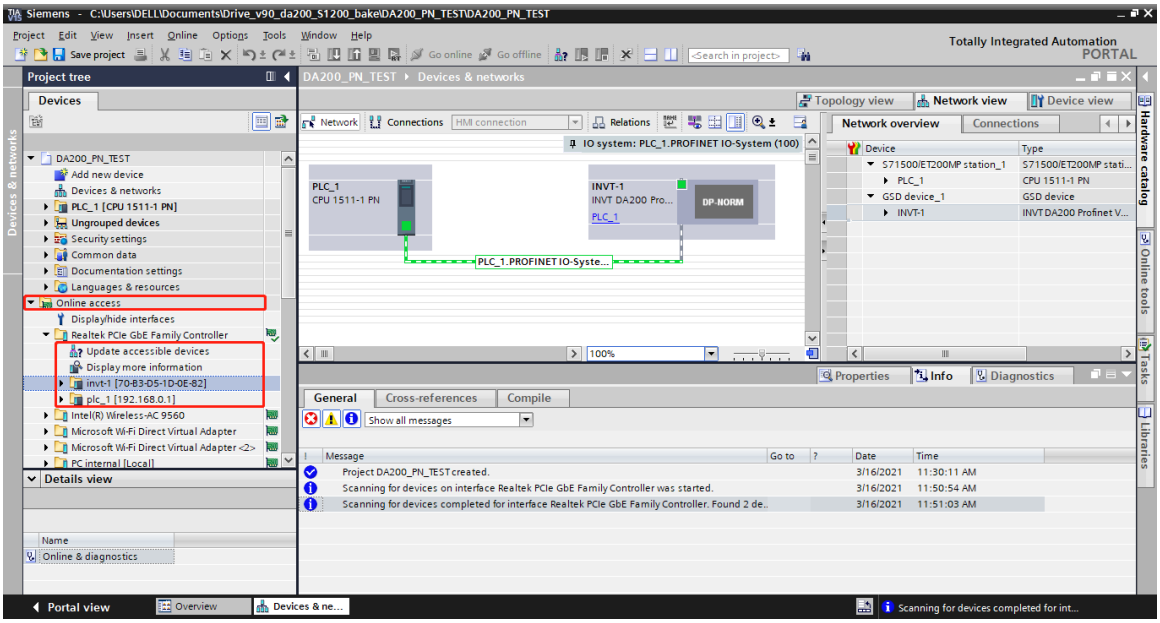
◆ Double-click the network interface position of the INVT PROFINET icon to enter the PROFINET interface editing interface.

◆ Click the **General** tab, choose **PROFINET interface_1 [X1]** > **Ethernet addresses**, and then set INVT PROFINET parameters, as shown in the following figure.



2.3.4 Allocating IO devices

First of all, ensure that the CPU and INVT PROFINET communication card have been connected to your computer through a network cable.



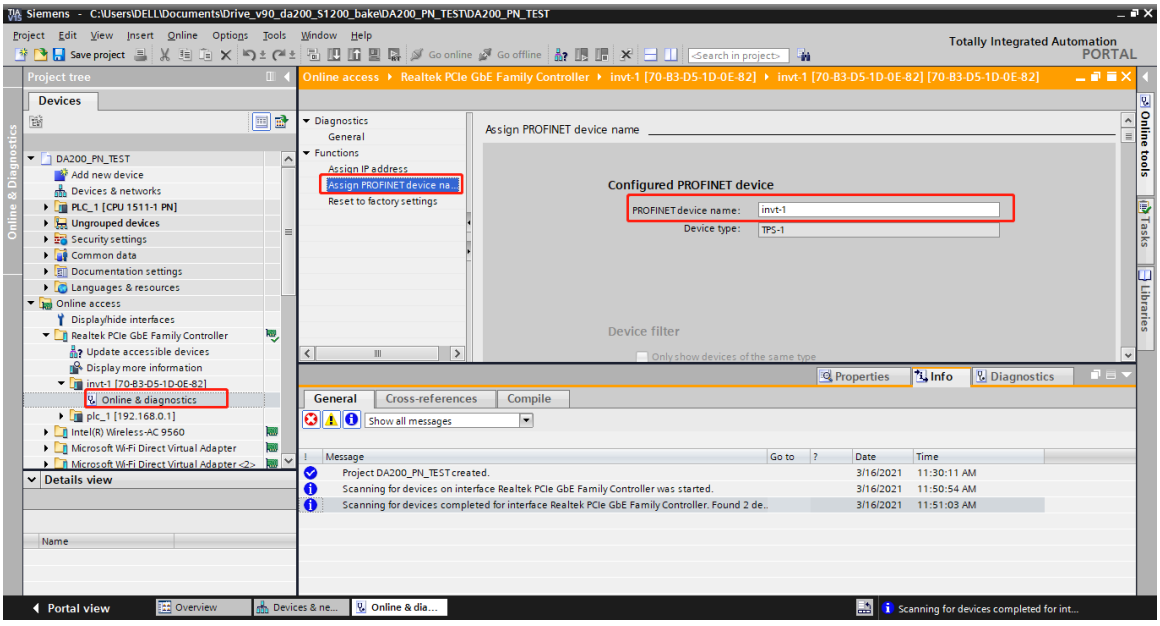
● In the project tree, choose **Online access**, find the network card corresponding to your computer.

● Double-click **Update accessible devices**, and wait for a period of time. All the devices scanned in the network are displayed.

● Find and click the option corresponding to DA200 drive.

(Note: If DA200 drive is used for the first time, it does not have a device name, but its MAC address can be scanned.)

● Double-click **Online & diagnostics** to enter the online commissioning state.



● Choose **Functions** > **Assign PROFINET device name**.

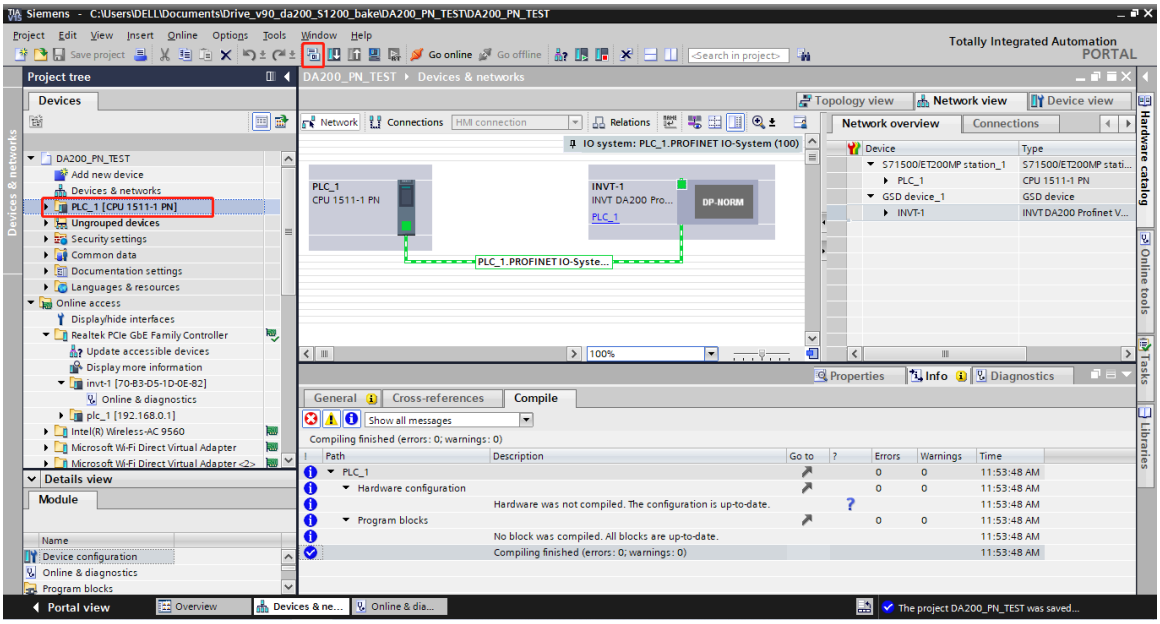
● Set parameters, and click **Assign name**.

● Note: The PROFINET communication card name that is online set must be the same as the PROFINET communication card name that is set during project configuration. Otherwise, devices cannot communicate through PROFINET.

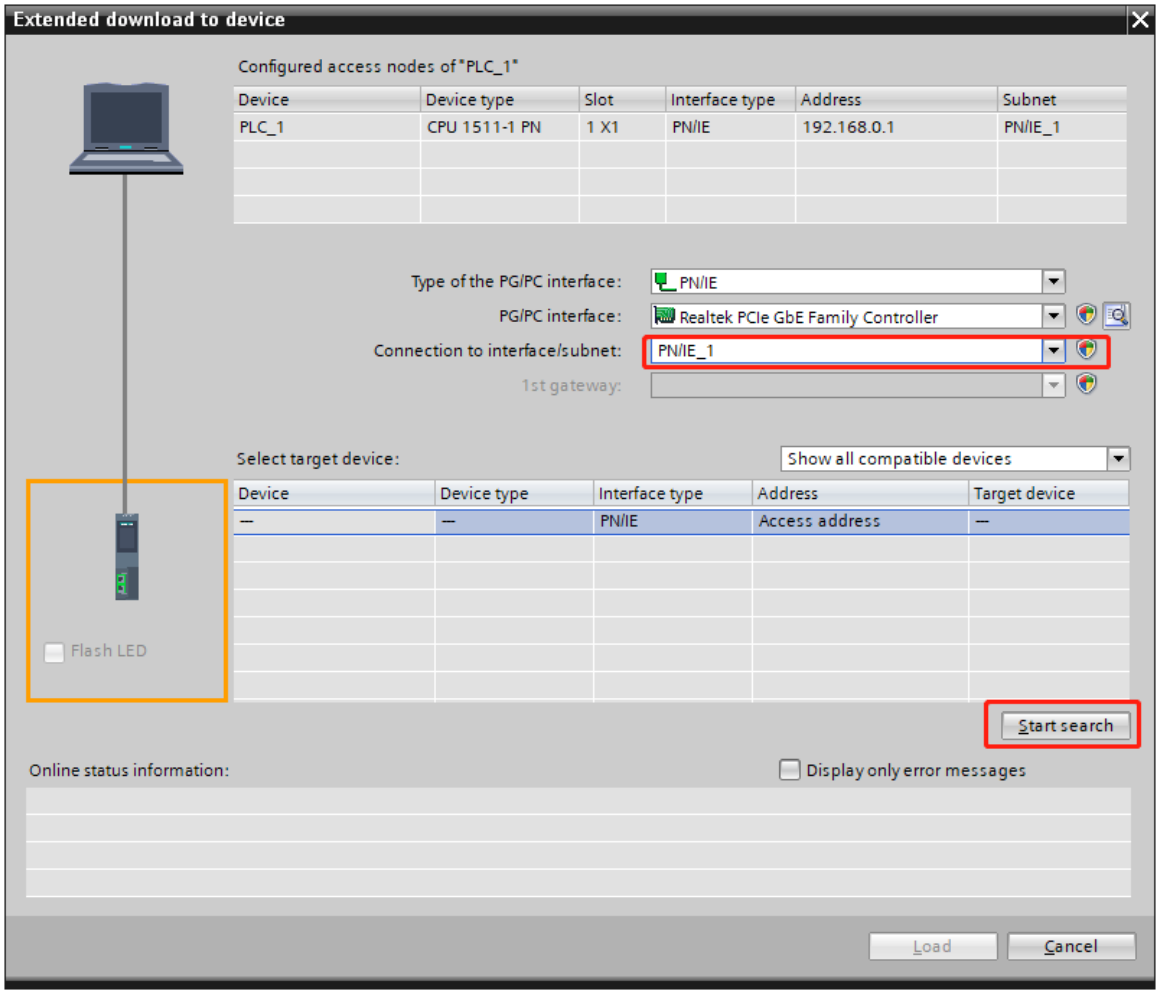
● Click **Assign name** to assign device names. (Note: The device name **invt-1** is used for example, which must be the same as the device name configured on the PROFINET communication card in the project.)

2.3.5 Saving, compiling, and downloading project configuration information

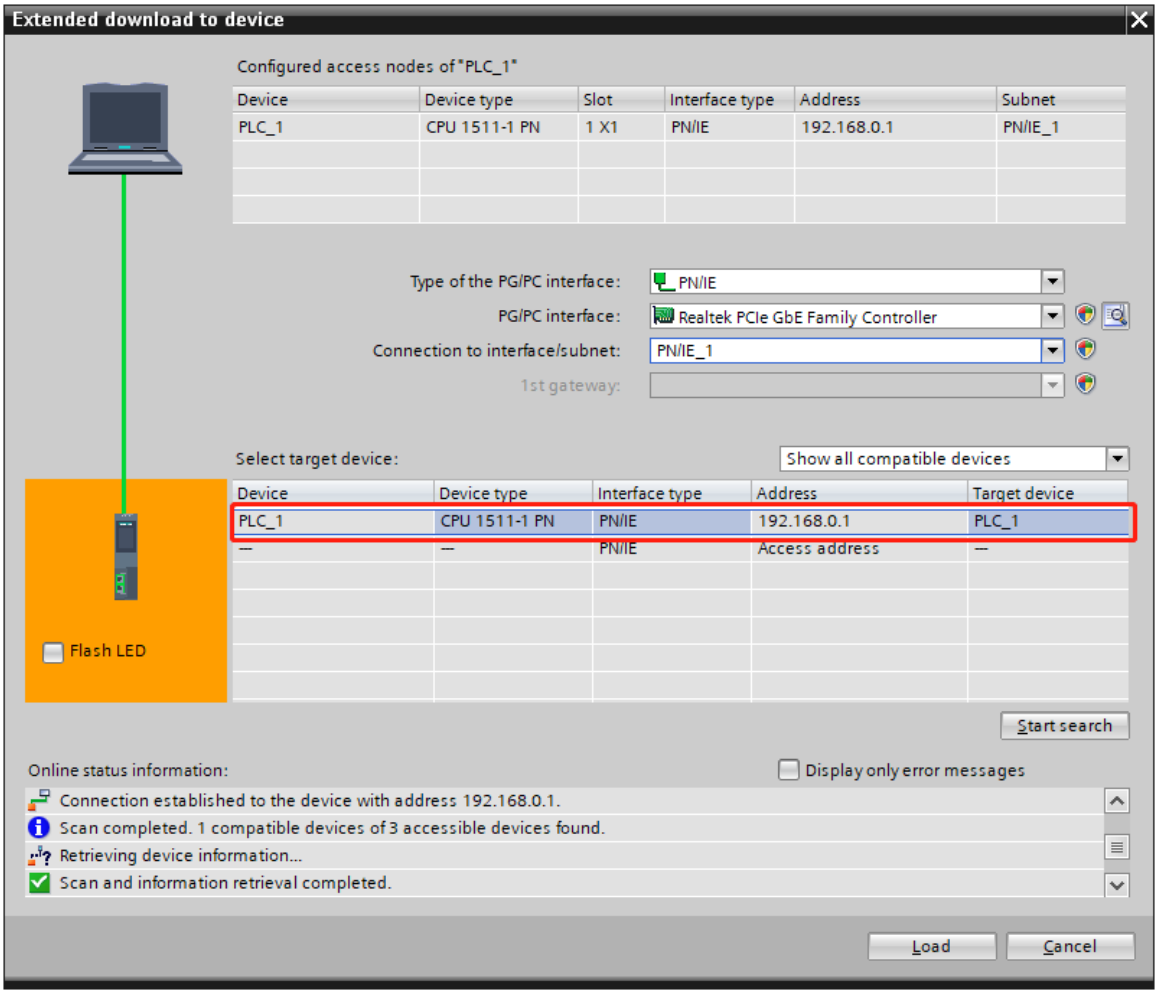
After configuring the project, you need to download the project configuration information to the CPU. See the following figure. Choose **Save project** to save the project. Right-click **PLC_1 [CPU 1511-1 PN]** and choose **Compile** > **Hardware and software (only changes)**.



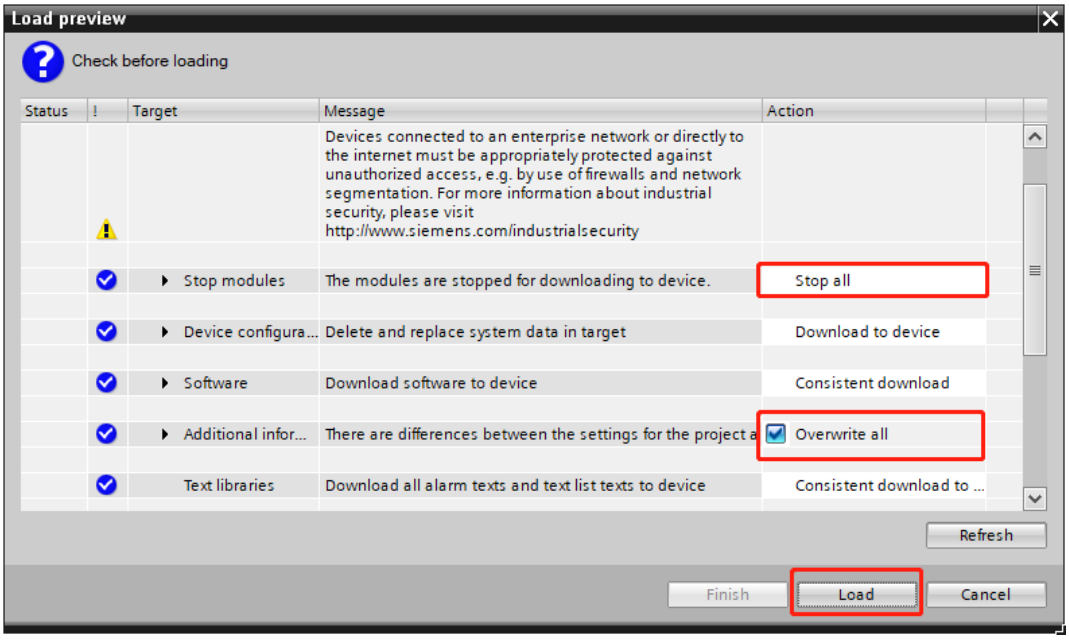
Click the **Download to device** icon to download the project configuration to the PLC. Then the following interface appears. Select **PN/IE_1** from the **Connection to interface/subnet** drop-down list box. Click **Start search** in the lower right corner to start scanning for PLC devices in the detection network.



See the following figure.

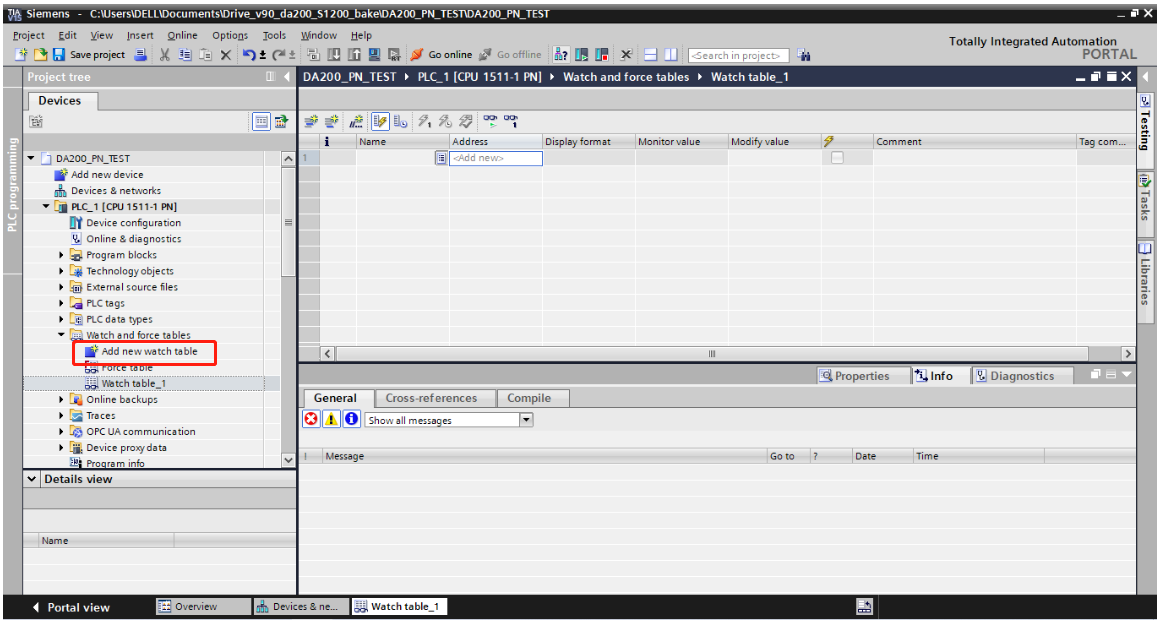


Select the PLC to download (there is only one PLC in the example), and click **Download**. Click the corresponding buttons, and then **Finish**.

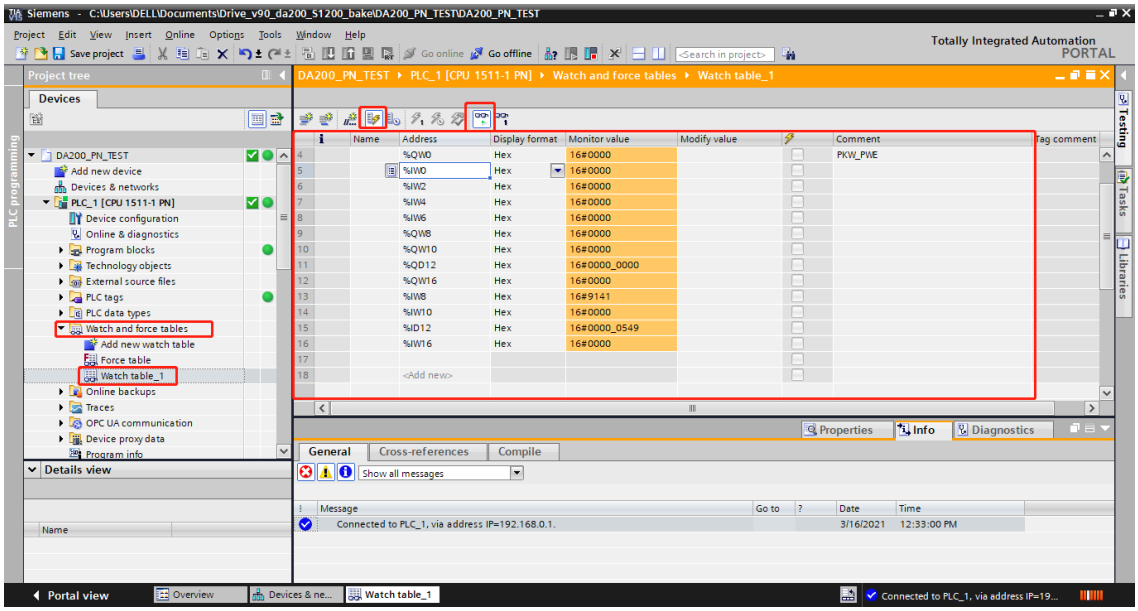


2.3.6 Configuring variable table monitoring

Choose **Watch and force tables** > **Add new watch table** in the project tree on the left.



QW0–QW31 correspond to the PLC output addresses, consistent with the Q addresses in the configuration, while IW0–IW31 correspond to the PLC input addresses, consistent with the I addresses in the configuration. You can monitor and modify the values.



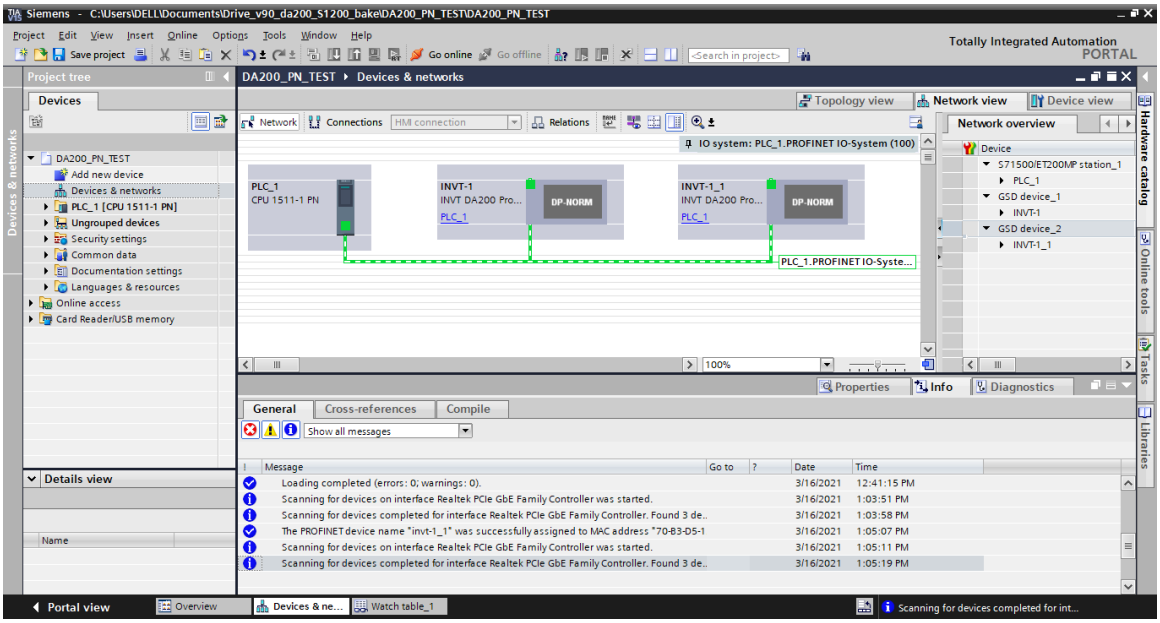
2.4 Configuring IRT communication

This section describes how to use S7-1500 PLC of Siemens TIA PORTAL V13 to configure PROFINET IRT communication for the servo drive.

The following uses Siemens PLC S7-1500 as an example to describe the configuration process, which is also applicable to the PLC with PROFINET interface with the IRT function.

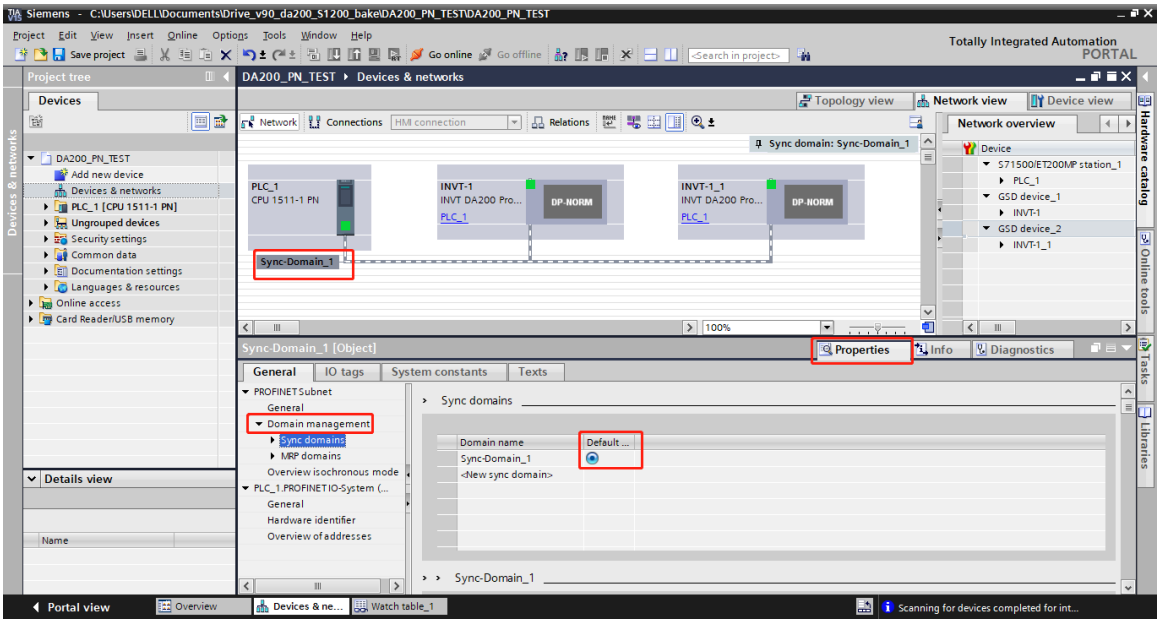
2.4.1 Creating a project

Open TIA PORTAL V13, and create a project, which contains one PLC S7-1500, two DA200 servo drives, to which INVT I/O sub modules are added. Set the IP addresses and device names of S7-1500 and DA200. Assign device names invt-1 and invt-1_1 to the two DA200 servo drives online. The project is as shown in the following figure.

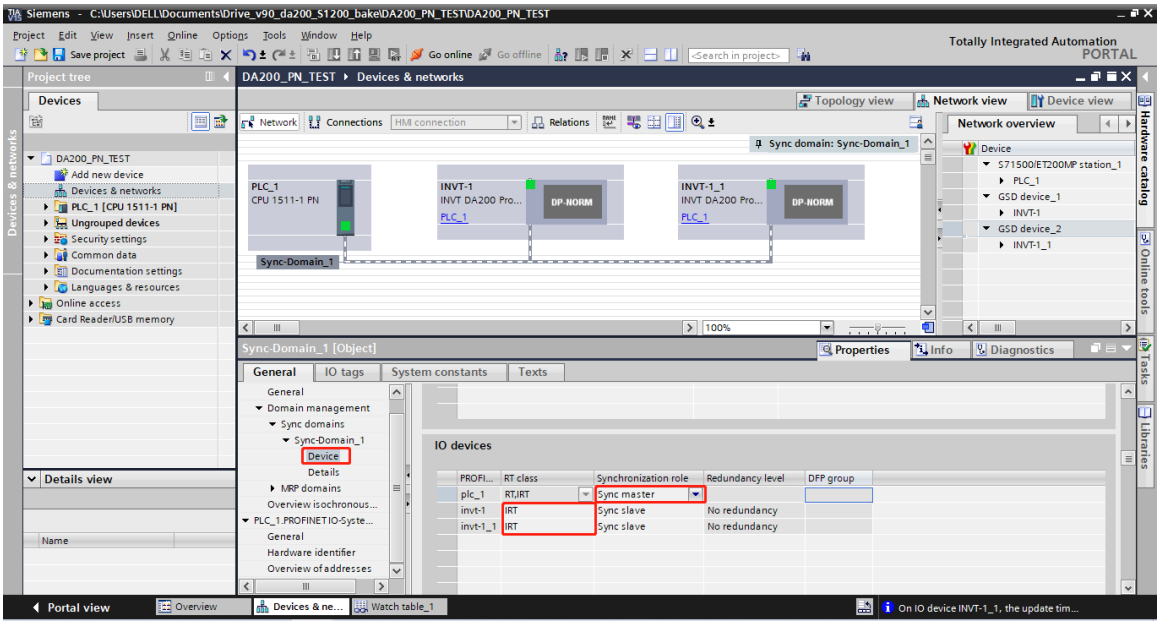


2.4.2 Setting connection attributes

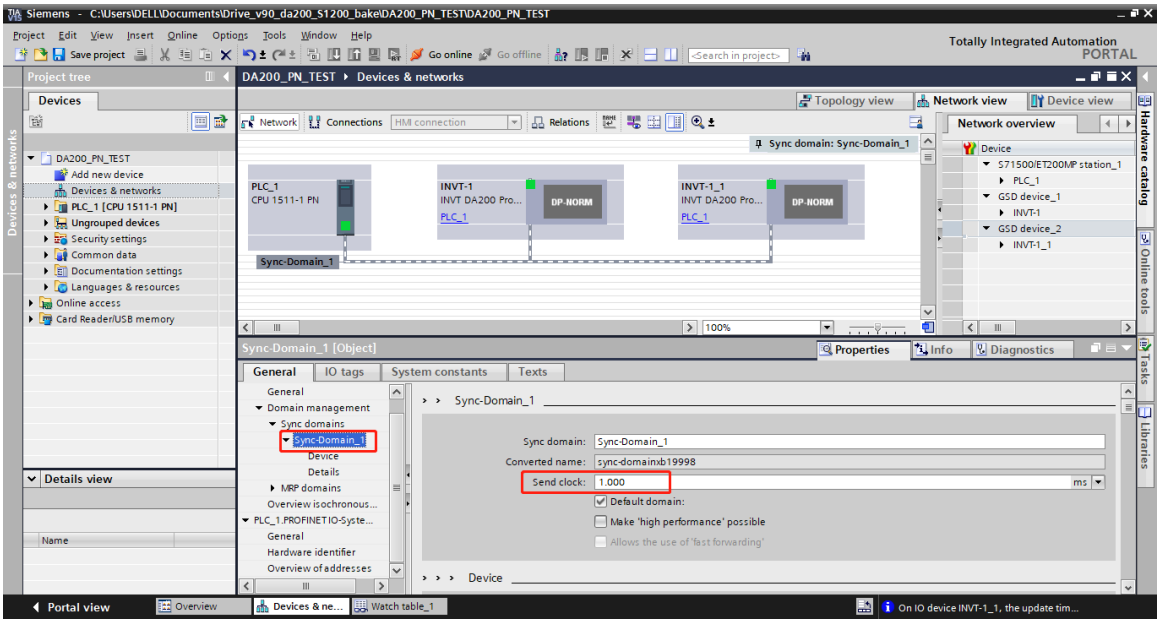
(1) Choose **PN/IE_1** > **Properties** > **General** > **Domain management** > **Sync domains**, and make **Sync-Domain_1** valid. See the following figure.



(2) Choose **Device**. Set PLC_1 to the synchronization master node, and set the RT class of INVT-1 and INVT-1_1 to IRT. See the following figure.

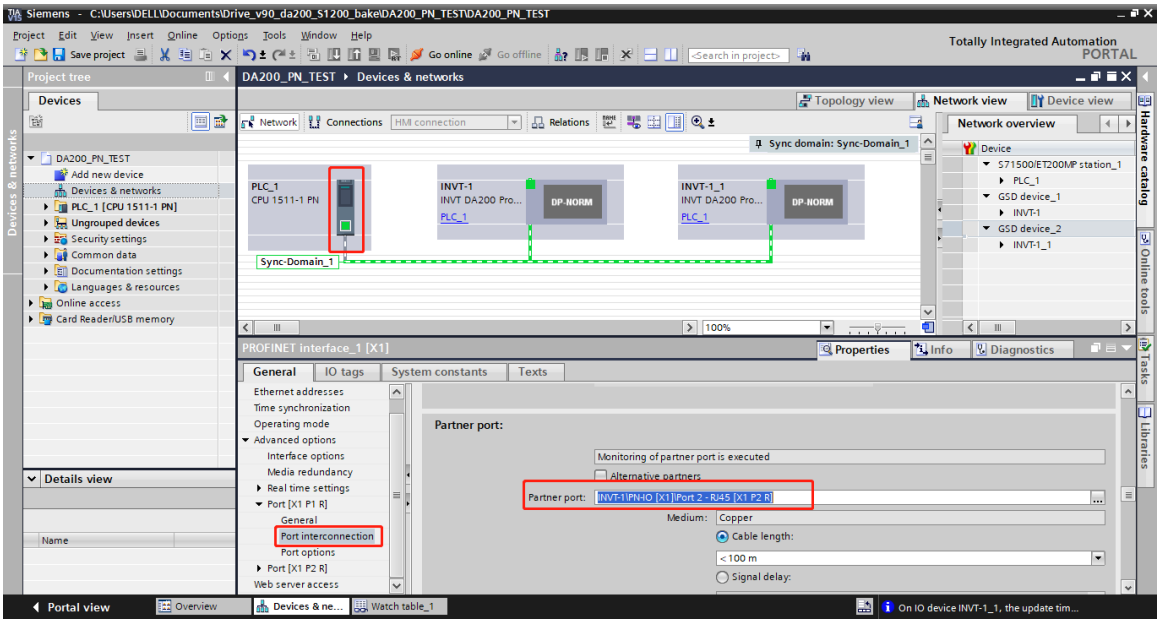


(3) Click **Sync-Domain_1**, and set the sending clock. See the following figure.

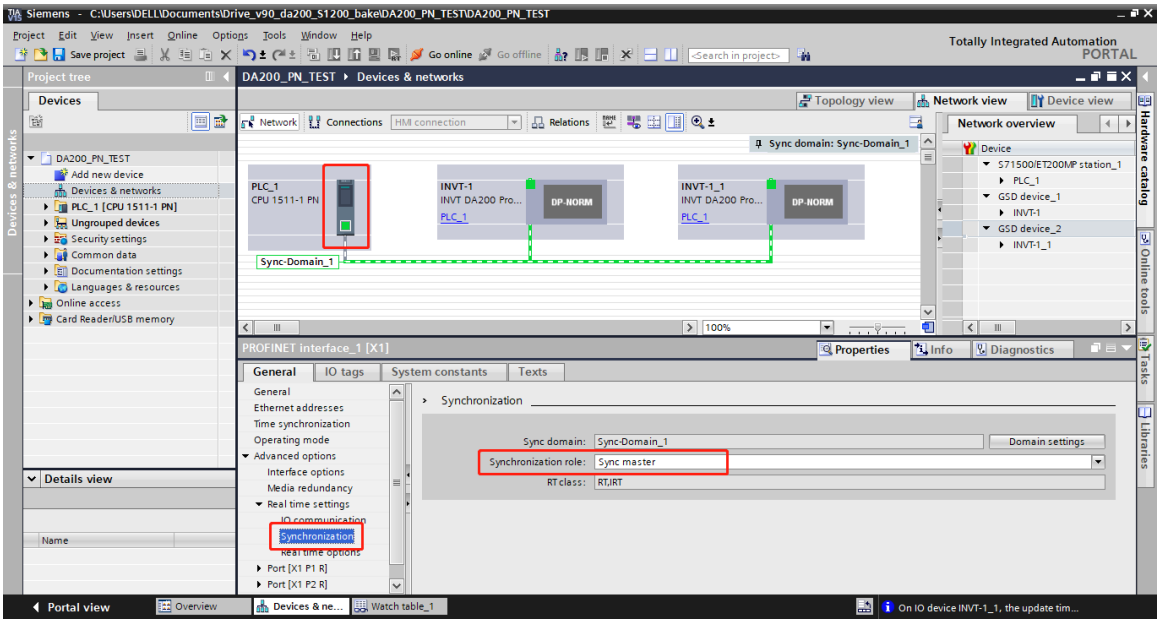


2.4.3 Configuring the PLC

(1) Click **PLC_1**. Choose **PROFINET interface_1 [X1]** > **Port[X1 P1 R]** > **Port interconnection**, and set partner ports. In the example, Port1 of the PLC is connected to Port2 of the INVT-1 drive. See the following figure.

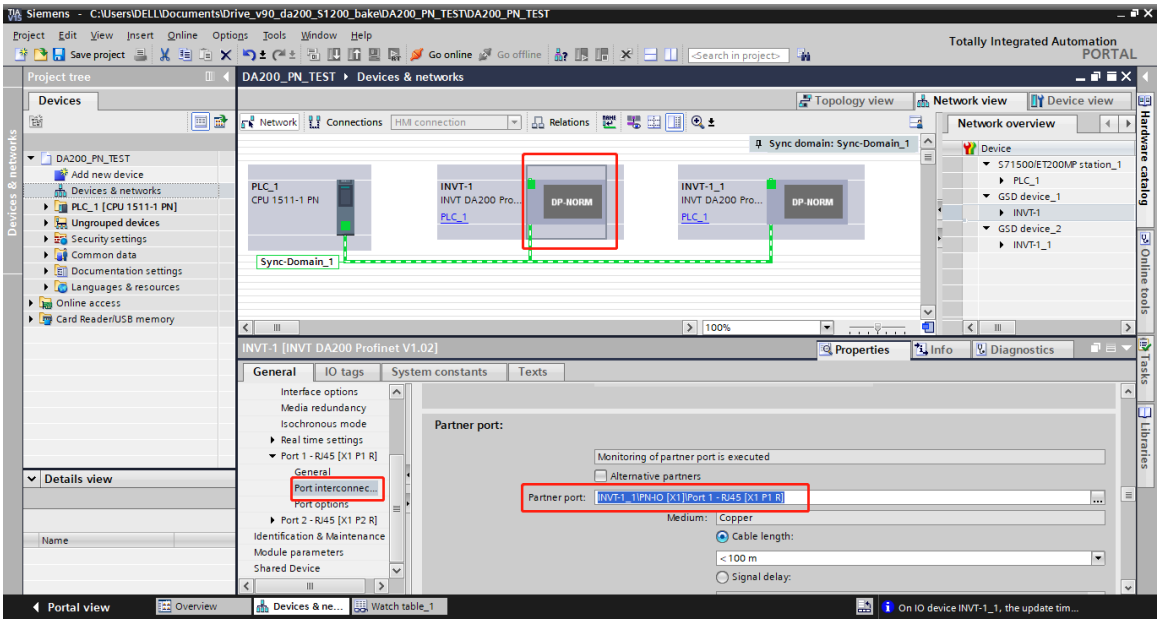


Click **Synchronization**. Set **Synchronization role** to **Sync master**. See the following figure.

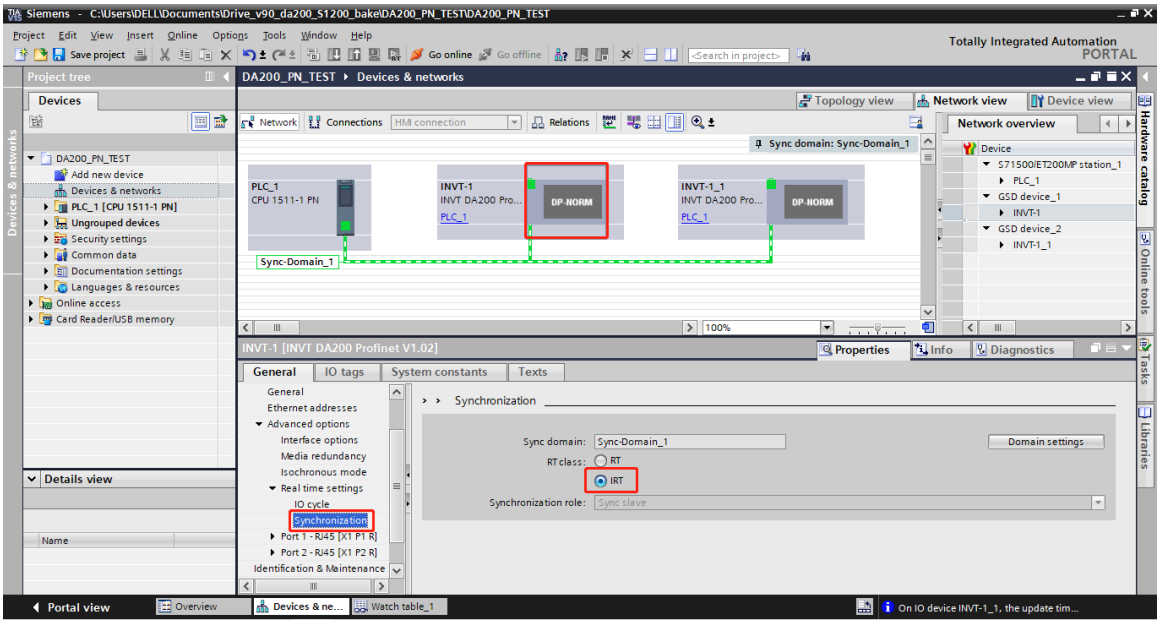


2.4.4 Configuring DA200 drive

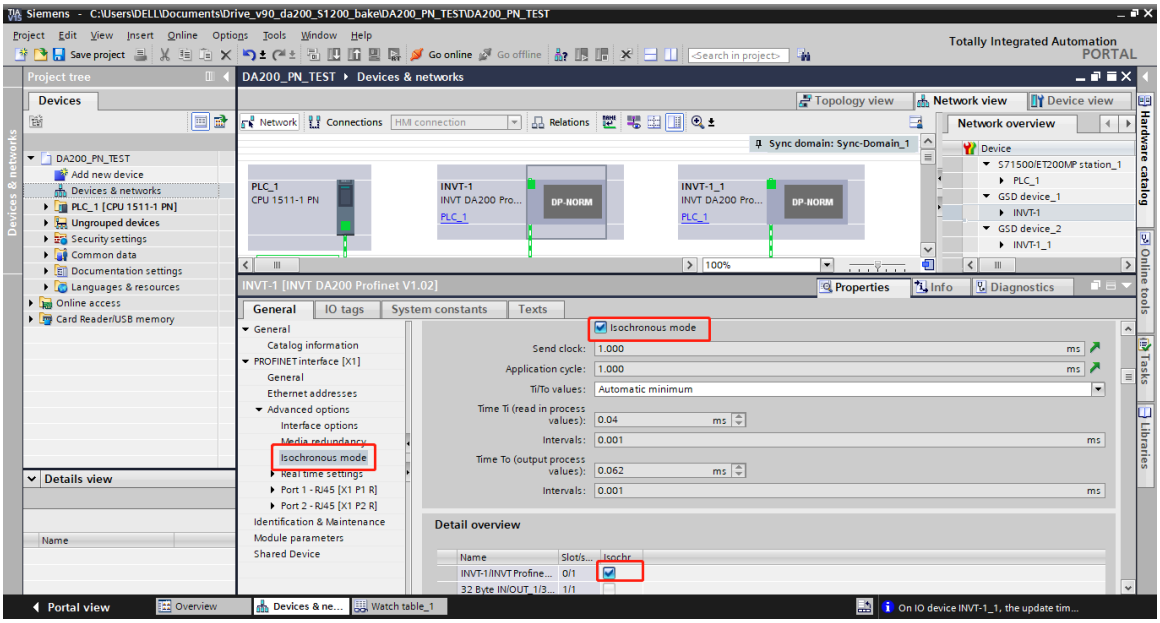
(1) Click **INVT-1**. Choose **PROFINET interface_1 [X1]** > **Port1- RJ45[X1 P1 R]** > **Port interconnection**, and set partner ports. In the example, Port1 of the INVT-1 drive is connected to Port1 of the INVT-1_1 drive. See the following figure.



(2) Click **Synchronization** and set the RT class to IRT. See the following figure.



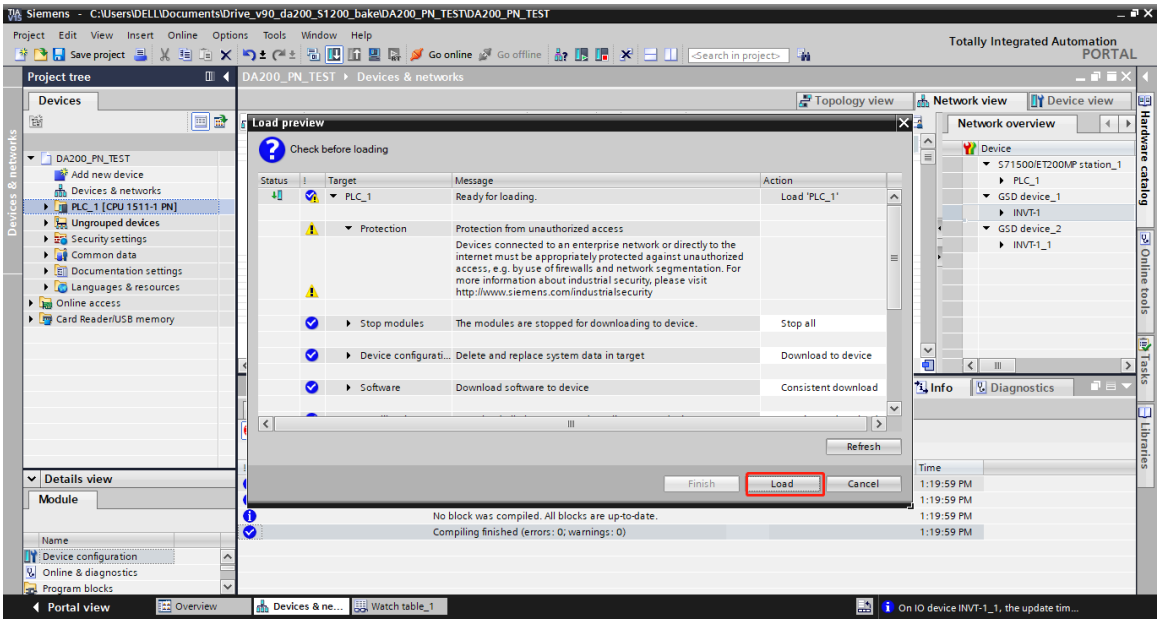
(3) Click **Isochronous mode** on the left, and choose **Isochronous mode** on the right. See the following figure.



(4) Click **INVT-1_1**, and make similar settings.

2.4.5 Saving, compiling, and downloading project configuration information

(1) After the compilation, download the project configuration to the PLC. See the following figure.



(2) Set parameter **P4.08** to IRT MODE, and save the setting. After soft reset or re-power on, view **R0.27** to check whether the PROFINET clock synchronization calibration status of DA200 drive is **Synchronized**.

3 Operation modes

3.1Position mode–Bus position

3.1.1 Basic description

The servo driver (slave node) receives a position command from the upper computer (master node). After electronic gear ratio conversion, the command is used as the target position for internal position control. In this way, position control is implemented.

When **P0.22** is set to a non-zero value:

Position command encoder unit = Position command user unit x Encoder resolution / **P0.22**

P0.22=Motor PPR

When **P0.22** is set to 0:

Position command encoder unit = Position command user unit x **P0.25** / **P0.26**

P0.25=Numerator of gear ratio 1

P0.26=Denominator of gear ratio 1

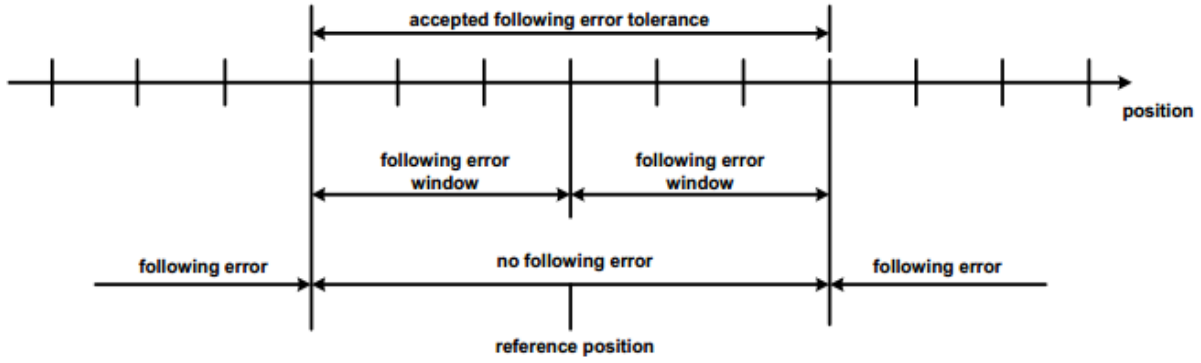
Note: In this mode, you need to plan parameters such as the speed and acceleration on the PLC.

3.1.2 Operation procedure

1. Set **P0.03** [Control mode] (**IND = 1006) to 0** [Position mode].
2. Set **P4.12** [Bus position command] to the target position (**IND = 1824**; unit: user unit).
3. Set **P0.33** [Position command smooth filter] (**IND = 1066**). Make the setting take effect immediately. You can make PZD set parameters (for V2.61 or later).
4. Set **P0.34**[Position command FIR filter] (**IND = 1068**) (FIR filter time = PZD control cyclic period). Disable for the setting to take effect.
5. Set **P0.22** (**IND = 1044) to adjust the denominator of the gear ratio**.
6. Set CW.bit0 (SERVO_DI_INH) to 1, and then set CW.bit1 (SERVO_ON) to enable the servo drive and start the motor.
7. Query **R0.02** (**IND = 4004**) to obtain the motor actual position feedback (position feedback is the data of bit 64).
8. Query the SW for corresponding information to obtain the servo drive status feedback (READY, RUN, POS_CMD_VALID, and POSITION_COIN).

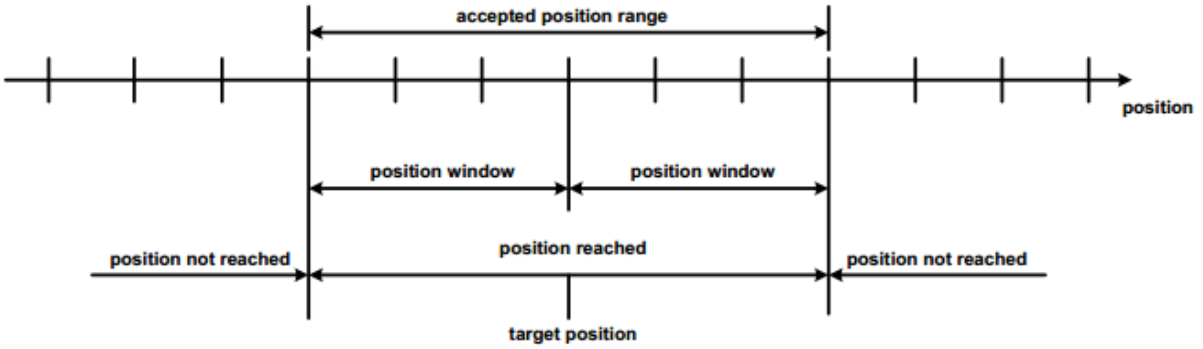
3.1.3 Other objects

1. Set **P4.33 (IND = 1866**) to adjust the tolerance (unit: user unit).
2. Query **R0.04** (**IND = 4012**) to obtain the motor actual position deviation (unit: user unit).



Reference position

3. Set **P3.50 (IND = 1700**) to adjust the positioning completion range (unit: user unit).



Position reached

3.2 Position mode–Internal PTP

3.2.1 Basic description

The servo driver (slave node) receives a position command from the upper computer (master node). After electronic gear ratio conversion, the command is used as the target position for internal position control. In this way, position control is implemented.

When **P0.22** is set to a non-zero value:

Position command encoder unit = Position command user unit x Encoder resolution / **P0.22**

P0.22=Motor PPR

When **P0.22** is set to 0:

Position command encoder unit = Position command user unit x **P0.25** / **P0.26**

P0.25=Numerator of gear ratio 1

P0.26=Denominator of gear ratio 1

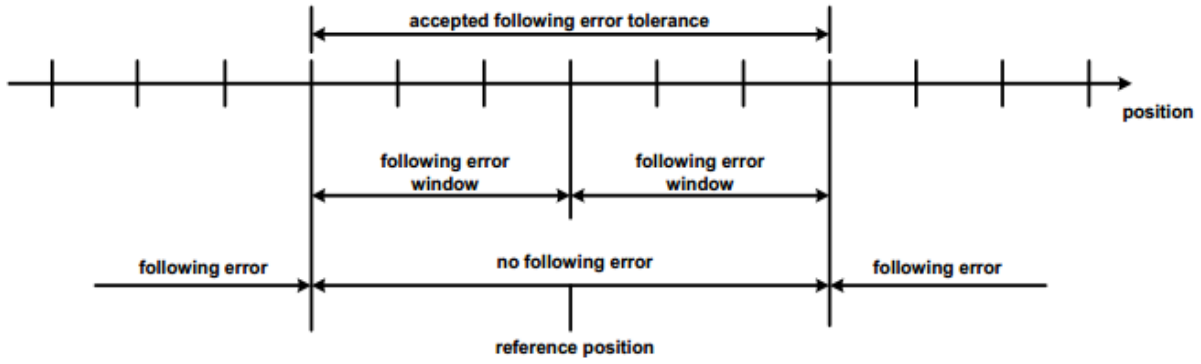
3.2.2 Operation procedure

1. Set **P0.03** [Control mode] (**IND = 1006) to 0** [Position mode].
2. Set **P0.20** [Position command selection] (**IND = 1040) to 2** [PTP control].
3. Set **P4.80** [Configuration of PZD setting parameter 1] (**IND = 2042**). Check the value of **P5.21** (unit: r/min).

4. Set **P4.81** [Configuration of PZD setting parameter 2] (**IND = 3202**). Check the value of **PTP0.01** (unit: user unit).
5. Send the PTP trigger signal through PKW data.
6. Set **P0.33** [Position command smooth filter] (**IND = 1066**). Make the setting take effect immediately. You can make PZD set parameters (for V2.61 or later).
7. Set **P0.34**[Position command FIR filter] (**IND = 1068**) (FIR filter time = PZD control cyclic period). Disable for the setting to take effect.
8. Set **P0.22** (**IND = 1044) to adjust the denominator of the gear ratio**.
9. Set CW.bit0 (SERVO_DI_INH) to 1, and then set CW.bit1 (SERVO_ON) to enable the servo drive and start the motor.
10. Query **R0.02** (**IND = 4004**) to obtain the motor actual position feedback (position feedback is the data of bit 64).
11. Query the SW for corresponding information to obtain the servo drive status feedback (READY, RUN, POS_CMD_VALID, and POSITION_COIN).

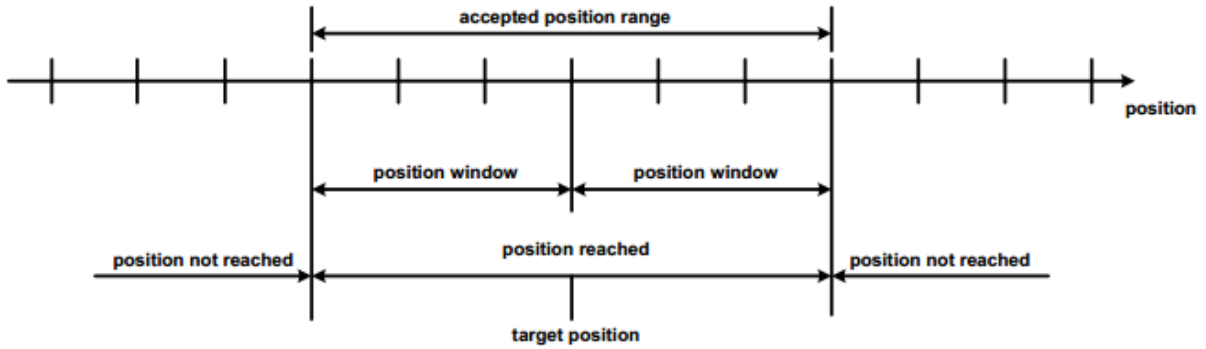
3.2.3 Other objects

1. Set **P4.33 (IND = 1866**) to adjust the tolerance (unit: user unit).
2. Query **R0.04** (**IND = 4012**) to obtain the motor actual position deviation (unit: user unit).



Reference position

3. Set **P3.50 (IND = 1700**) to adjust the positioning completion range (unit: user unit).



Position reached

3.3 Speed mode

3.3.1 Basic description

In speed mode, the servo drive (slave node) receives a speed command from the upper computer (master node), and plans the speed based on acceleration parameter settings.

3.3.2 Operation procedure

1. Set **P0.03** [Control mode] (IND = 1006) to **1** [Speed mode].
2. Set **P4.13** [Bus speed command] to the target rotation speed (IND = 1826 or Word 1 in PZD) (unit: rpm).
3. Set **P0.54** [ACC time] (**IND = 1108)** to modify the ACC curve (unit: ms; from 0 to rated rotation speed).
4. Set **P0.55** [DEC time] (**IND = 1110)** to modify the DEC curve (unit: ms; from rated rotation speed to 0).
5. Set CW.bit0 (SERVO_DI_INH) to 1, and then set CW.bit1 (SERVO_ON) to enable the servo drive and start the motor.
6. Query the SW for corresponding information to obtain the servo drive status feedback (READY, RUN, SPD_CMD_VALID, SPEED_COIN, and SPEED_AT).
7. Query **R0.21** [Transient speed] (**IND = 4046) to obtain the actual speed feedback (unit:** rpm).

3.3.3 Other objects

1. Set **P3.53** [Speed consistency range] (**IND = 1706) to modify the range** (unit: rpm).
2. Set **P3.54** [Speed consistency range] (**IND = 1708) to modify the range** (unit: rpm).
3. Set **P3.55** [Zero-speed range] (**IND = 1710) to modify the range** (unit: rpm).
4. Set **P4.31** [Max. speed limit] (**IND = 1862) to modify the limit** (unit: rpm).
5. Set **P4.39** [Speed out-of-tolerance limit] (**IND = 1878) to modify the limit** (unit: rpm).

3.4 Torque mode

3.4.1 Basic description

In torque mode, the servo drive (slave node) receives a torque command from the upper computer (master node), and plans the torque based on parameter settings.

3.4.2 Operation procedure

1. Set **P0.03** [Control mode] (**IND = 1006) to 2** [Torque mode].
2. Set **P0.68** [Torque command RAMP time] (**IND = 1136)** to modify the torque planning time (unit: ms from 0 to 100% of rated torque).
3. Set **P4.14** [Bus speed command] to the target torque (**IND = 1828** or Word 4 in PZD) (unit: 0.1% of rated torque).
4. Set **P0.46** [Speed limit 1] (**IND = 1092) to modify the limit** (unit: rpm).
5. Set CW.bit0 (SERVO_DI_INH) to 1, and then set CW.bit1 (SERVO_ON) to enable the servo drive and start the motor.
6. Query the SW for corresponding information to obtain the servo drive status feedback (READY, RUN, SPEED_LIMITING, and TORQUE_LIMITING).
7. Query **R0.06** [Actual torque] (**IND = 4016**) to obtain the actual torque output (unit: 0.1% of rated torque).

8. Query **R0.21** [Transient speed] (**IND = 4046) to obtain the actual speed feedback (unit:** rpm).

3.4.3 Other objects

1. Set **P0.10** [Max. torque limit] (**IND = 1020) to modify the limit** (unit: 0.1% of rated torque).
2. Query **P8.03** [Rated torque] (**IND = 2606**) to obtain the motor rated torque (unit: 0.01Nm).
3. Query **R0.10** [Output current] (**IND = 4024**) to obtain the actual output current (unit: 0.01A).

4 Troubleshooting

4.1 PROFINET communication faults and solutions

Fault code	Name	Possible cause	Solution
Er24-0	PROFINET fault–Incorrect PWK parameter ID	The PWK parameter ID is incorrect.	View the manual and ensure that the PWK parameter ID is the same as the corresponding parameter ID.
Er24-1	PROFINET fault–PWK parameter value out of range	The PWK parameter value is out of the allowed range.	View the manual and ensure that the PWK parameter value is within the allowed range.
Er24-2	PROFINET fault–PWK parameter read only	The PWK parameter is read only	View the manual and ensure that the PWK parameter can be read and written.
Er24-3	PROFINET fault–PZD setting parameter not exist	The PZD setting parameter ID is incorrect.	View the manual and ensure that the PZD setting parameter ID is the same as the corresponding parameter ID.
Er24-4	PROFINET fault–PZD setting parameter property unmatched	The PZD setting parameter property is not instant effective.	View the manual and ensure that the PZD setting parameter property is instant effective.
Er24-5	PROFINET fault–Disconnected communication	After the drive is enabled, the network cable is not inserted properly or the PROFINET master node does not run properly.	Ensure that the network cable is inserted properly. Check for and handle the interference problem. Ensure that the PROFINET master node runs properly.
Er24-6	PROFINET alarm–Incorrect communication setting	When bus input is not set through P4.10, communication or I/O sets the enabling.	Set P4.10 to bus input.

4.2 DA200 servo drive faults and solutions

Fault code	Name	Possible cause	Solution
Er01-0	IGBT fault	The drive actual output current exceeds the specified value. 1. Drive fault (such as drive circuit or IGBT fault). 2. Motor cables U, V, and W are short connected, or motor cables are grounded or contacted improperly. 3. The motor breaks down. 4. The motor cables U, V, and W are connected in reverse phases. 5. Improper parameter settings cause systematic divergence. 6. The ACC/DEC time in the start or stop process is too short. 7. Transient load is too heavy.	1. Remove the motor cables and then enable the drive. If the fault persists, replace the drive. 2. Ensure the motor cables and wiring are in good conditions. 3. Reduce the settings of P0.10 and P0.11 to reduce the maximum output torque. 4. Adjust loop parameters to make the system stable, and reduce the setting of P0.12. 5. Increase the ACC/DEC time. 6. Replace the drive with a new one with greater power. 7. Replace the motor.
Er02-0	Encoder fault–Encoder disconnection	1. The encoder is not connected. 2. The encoder plug contact is loose. 3. One of encoder signal cables U, V, W, A, B, and Z is disconnected. 4. Encoder phases A and B are reverse. 5. Noise causes communication interruption or data exceptions. 6. The encoder communicates properly but with data exceptions. 7. The FPGA that communicates with the	1. Connect the encoder according to the correct wiring method. Ensure the encoder plug contact is proper. Replace the encoder cable if the cable is broken. 2. Ensure the encoder power voltage is proper. 3. Eliminate the conditions that disturb encoder cables. Route encoder cables and motor cables separately.
Er02-1	Encoder fault–Encoder feedback deviation too large		
Er02-2	Encoder fault– Parity error		
Er02-3	Encoder fault–CRC error		
Er02-4	Encoder fault–Frame error		
Er02-5	Encoder fault–Short frame error		
Er02-6	Encoder fault–Encoder timeout		
Er02-7	Encoder fault–Multi-turn absolute value loss		

Fault code	Name	Possible cause	Solution
		encoder reports timeout.	
Er02-8	Encoder fault–Encoder battery low-voltage alarm	When a multi-turn absolute encoder is used, the external battery voltage of the encoder is between 3.0V–3.2V.	1. Ensure the encoder battery cable is connected properly. 2. Use the multimeter to check whether the external battery voltage is lower than 3.2V. If yes, replace the battery. 3. Replace the battery when the drive power is on. Otherwise, encoder data will be lost.
Er02-9	Encoder fault–Encoder battery undervoltage fault	When a multi-turn absolute encoder is used, the external battery voltage of the encoder is between 2.5V–3.2V.	1. Ensure the encoder battery cable is connected properly. 2. Use the multimeter to check whether the external battery voltage is lower than 3.0V. If yes, replace the battery. 3. Replace the battery when the drive power is on. Otherwise, encoder data will be lost.
Er02-a	Encoder fault–Encoder overheating	The encoder feedback temperature is higher than the temperature threshold for protection against overheating.	1. Ensure the temperature threshold for protection against overheating is correct. 2. Stop the motor to lower the encoder temperature.
Er02-b	Encoder fault–Encoder EEPROM writing error	If the motor is used with a communication encoder, a communication transmission or data check error occurs when the drive updates data to the encoder EEPROM.	1. Ensure encoder cables are connected properly and eliminate the conditions that disturb encoder communication. 2. Make multiple writing attempts. If the fault is reported repeatedly, replace the motor.
Er02-c	Encoder fault–No data in encoder EEPROM	If the motor is used with a communication encoder, no data is found in the encoder EEPROM when the motor attempts to read data from it during power-on.	1. Select the motor model based on the setting of P0.00 and execute the operation of writing data to the encoder EEPROM through P4.97. 2. Mask this fault by setting P4.98. The motor parameters in

Fault code	Name	Possible cause	Solution
			the drive EEPROM are used for initialization.
Er02-d	Encoder fault–Encoder EEPROM data check error	If the motor is used with a communication encoder, a data check error occurs when the motor attempts to read data from the encoder EEPROM during power-on.	1. Ensure encoder cables are connected properly and eliminate the conditions that disturb encoder communication. 2. Select the motor model based on the setting of P0.00 and execute the operation of writing data to the encoder EEPROM through P4.97 so that data in the encoder EEPROM is updated. 3. Mask this fault by setting P4.98. The motor parameters in the drive EEPROM are used for initialization.
Er03-0	Current sensor fault–Phase-U current sensor fault	1. The current sensor or detection circuit is abnormal. 2. Power-on is made when the motor shaft is in non-static state.	Re-power on when the motor shaft in static state. If the fault is reported repeatedly, replace the drive.
Er03-1	Current sensor fault–Phase-V current sensor fault		
Er03-2	Current sensor fault–Phase-W current sensor fault		
Er04-0	System initialization fault	There are failed self-check items after power-on initialization is complete.	1. Perform re-power on. 2. If the fault occurs repeatedly, replace the drive.
Er05-1	Setting fault–Motor model not exist	P0.00 is set incorrectly.	1. Ensure the motor model is set correctly. 2. Ensure the motor parameter model matches the drive power class.
Er05-2	Setting fault–Motor and drive model not match		
Er05-3	Setting fault–Incorrect software limits	Software limits are set incorrectly. The setting of P0.35 is equal to or less than that of P0.36.	Set P0.35 and P0.36 correctly.
Er05-4	Setting fault–Incorrect	P5.10 is set incorrectly.	Set P5.10 correctly.

Fault code	Name	Possible cause	Solution
	homing mode		
Er05-5	Setting fault–PTP-control travel overflow	The single increment of a PTP idle travel exceeds (2^{31} - 1).	Ensure a single travel is not greater than (2^{31} - 1) in absolute position mode.
Er07-0	Regenerative discharge overload fault	1. The braking resistor power is low. 2. The motor speed is too high or the deceleration is too quick, which causes the failure to absorb the regenerate energy within specified time. 3. The action limit of the external braking resistor is restricted to the duty ratio 10%.	1. Replace the internal braking resistor with an external one and increase the power. 2. Modify the deceleration time and reduce the regenerative discharge action rate. 3. Reduce the motor rotation speed. 4. Improve the capacity of the motor and drive.
Er08-0	AI overvoltage fault–AI speed command	1. The voltage input to the analog speed command port exceeds the setting of P3.22. 2. The voltage input to the analog torque command port exceeds the setting of P3.25. 3. The voltage input to the AI3 port exceeds the setting of P3.75.	1. Set P3.22, P3.25, and P3.75 correctly. 2. Ensure the terminal wiring is proper. 3. Set P3.22, P3.25, and P3.75 to 0 to disable protection.
Er08-1	AI overvoltage fault–AI torque command		
Er08-2	AI overvoltage fault–AI 3		
Er09-0	EEPROM fault–Read/write error	1. Data is damaged in the data storage area when the drive reads data from the EEPROM. 2. Writing data to the EEPROM is disturbed.	1. Try again after re-power on. 2. If the fault occurs repeatedly, replace the drive.
Er09-1	EEPROM fault–Data check error	The data read from EEPROM during power-on is different from the data that is written.	1. Set all parameters again. 2. If the fault occurs repeatedly, replace the drive.
Er10-0	Hardware fault–FPGA fault	The FPGA on the control board reports a fault.	1. Perform re-power on. 2. If the fault occurs repeatedly, replace the drive.
Er10-1	Hardware	The external communication	1. Perform re-power on.

Fault code	Name	Possible cause	Solution
	fault–Communication card fault	card is faulty.	2. If the fault occurs repeatedly, replace the communication card.
Er10-2	Hardware fault–To-ground short circuit fault	One of the motor cables V and W is short connected to the ground, which is found in to-ground short circuit detection during drive power-on.	1. Ensure motor cables are connected properly. 2. Replace motor cables or check for ageing of insulation.
Er10-3	Hardware fault–External input fault	This fault occurs when the digital terminal configured with the external fault input function acts.	1. Clear the external fault input and enable fault clearing. 2. Re-power on the drive.
Er10-4	Hardware fault–Emergency stop fault	This fault occurs when the digital terminal configured with the emergency stop function acts.	1. Cancel the emergency stop input and enable fault clearing. 2. Re-power on the drive.
Er11-0	Software fault–Motor control task re-entry	1. The DSP CPU utilization is too high. 2. The DSP has bugs.	1. Disable unnecessary functions. 2. Contact the customer service personnel to update the DSP.
Er11-1	Software fault–Periodic task re-entry		
Er11-2	Software fault–Illegal operation		
Er12-0	I/O fault–Duplicate DI assignment	Two or more digital inputs are configured with the same function.	Set P3.00–P3.09 and ensure each setting is unique.
Er12-1	I/O fault–Duplicate AI assignment	When the drive is a standard model, the function of AI3 is set to speed command.	Set parameter P3.70 (AI3 function) to another value.
Er12-2	I/O fault–Pulse input frequency too high	The pulse input frequency detected by the drive is higher than the specified frequency. 1. External input pulse signal frequency is too high. 2. The internal pulse frequency detection circuit of the drive is damaged.	1. Check whether the actual frequency of external input pulse signal exceeds the max. pulse frequency corresponding to P0.21 [Command pulse input selection]. 2. Reduce the external input pulse signal frequency. 3. If the fault persists though the external input signal is normal,

Fault code	Name	Possible cause	Solution
			replace the drive.
Er13-0	Main circuit fault–Overvoltage fault	The detected DC voltage of the drive main circuit is higher than the specified voltage. 1. The grid voltage is too high. 2. Under the braking condition, no braking resistor or pipe is connected, or the braking resistor is damaged. 3. The DEC time in the stop process is too short. 4. The internal DC voltage detection circuit of the drive is damaged.	1. Ensure the grid input voltage is within the allowed range. 2. Ensure the internal braking resistor is not loose or damaged. Ensure the external braking resistor is not damaged. 3. Increase the DEC time. 4. Check R0.07 when the drive is disabled. If it is abnormal and does not match the grid input voltage, replace the drive.
Er13-1	Main circuit fault–Undervoltage fault	The detected DC voltage of the drive main circuit is lower than the specified voltage. 1. The grid voltage is too low. 2. The buffer relay is not closed. 3. The drive output power is too high. 4. The internal DC voltage detection circuit of the drive is damaged.	1. Ensure the grid input voltage is within the allowed range. 2. Re-power on. Ensure the buffer relay is closed. If the buffer relay is closed, there is a sound indicating actuation. 3. Check R0.07 when the drive is disabled. If it is abnormal and does not match the grid input voltage, replace the drive.
Er14-0	Control power undervoltage fault	The detected control power DC voltage of the drive is lower than the specified voltage. 1. The grid voltage is too low. 2. The DC voltage detection circuit of the internal control power of the drive is damaged.	1. Ensure the grid input voltage is within the allowed range. 2. Check R0.08 when the drive is disabled. If it is abnormal and does not match the grid input voltage, replace the drive.
Er18-0	Motor overload fault	1. Long-time overload run. 2. Transient load is too heavy.	1. Replace the drive and motor with the new ones with greater power.

Fault code	Name	Possible cause	Solution
Er19-0	Speed fault–Overspeed fault	The motor speed absolute value exceeds the setting of P4.32. 1. The motor stalls or motor phases U, V, and W are in reverse sequence. 2. The electronic gear ratio or motor speed loop control parameters are not set properly. 3. The setting of P4.32 is less than that of P4.31 [Max. speed limit]. 4. The encoder feedback signal is interfered.	1. Ensure the electronic gear ratio is set properly. 2. Ensure the motor speed loop control parameters are set properly. 3. Ensure the motor cable phases are in correct sequence. 4. Ensure the motor and encoder are connected properly. 5. Replace the motor with a new one with a higher speed.
Er19-1	Speed fault–FWD overspeed fault	The speed feedback exceeds the setting of P4.40 by more than 20ms.	1. Ensure the encoder is normal. 2. Set P4.40 properly.
Er19-2	Speed fault–REV overspeed fault	The speed feedback exceeds the setting of P4.41 by more than 20ms.	1. Ensure the encoder is normal. 2. Set P4.41 properly.
Er19-3	Speed fault–Incorrect overspeed parameter setting	The setting of P4.40 is less than 0 or that of P4.41 is greater than 0.	1. Ensure the encoder is connected properly. 2. Set P4.40 or P4.41 properly.
Er19-4	Runaway fault	The motor phase sequence is incorrect or the initial angle is incorrect.	1. Ensure the motor phases are in correct sequence. 2. Set P4.96.
Er20-0	Speed out-of-tolerance-range fault	In non-torque mode, the deviation between the motor speed and speed command exceeds the setting of P4.39. 1. The motor phases U, V, and W are in reverse sequence or motor cables are not connected. 2. The motor load is too heavy, which causes motor stalling.	1. Ensure the motor phases are in correct sequence and motor cables are connected properly. 2. Check whether the conveyor belt or chain is too tight or the workbench reaches the boundary or encounters obstacles. If yes, resolve the problem. 3. Ensure the speed loop control parameters are set properly, the

Fault code	Name	Possible cause	Solution
		3. The drive force is insufficient, which causes motor stalling. 4. The speed loop control parameters are not set properly. 5. The setting of P4.39 is too low.	drive is intact and undamaged, and the servo system model is correct. 4. Increase the setting of P4.39. 5. Set P4.39 to 0, which disables the detecting for a speed out-of-tolerance-range fault.
Er22-0	Out-of-tolerance fault–Position out of tolerance	1. Server response time is too slow. Therefore the residual pulses exceed the setting of P4.33. 2. The motor load is too heavy, which causes motor stalling. 3. Pulse input frequency is too high, exceeding the max. motor speed. 4. The step variable in the position command input exceeds the setting of P4.33.	1. Check whether the conveyor belt or chain is too tight or the workbench reaches the boundary or encounters obstacles. If yes, resolve the problem. 2. Increase the settings of position loop or speed feed-forward gain parameters. Alternatively, increase the setting of P4.33. 3. Adjust electronic gear ratio parameters. 4. Reduce the step variable in the position command input.
Er22-1	Out-of-tolerance fault–Hybrid control deviation too large	In fully-closed loop control, the feedback position deviation between the grating ruler and encoder exceeds the setting of P4.64.	1. Ensure the motor and load are connected properly. 2. Ensure the grating ruler and drive are connected properly. 3. Ensure P4.60, P4.61, and P4.62 are set properly.
Er22-2	Position increment overflow fault	The single variation in the position command after electronic gear ratio conversion exceeds (2^{31}-1).	1. Reduce the single variable in the position command. 2. Modify the electronic gear ratio to a proper setting.
Er23-0	Drive overtemperature fault	1. The ambient temperature of the drive exceeds the specified temperature. 2. The drive is overloaded.	1. Reduce the ambient temperature and improve the ventilation condition. 2. Replace the servo system with a new one with greater power.

Fault code	Name	Possible cause	Solution
			3. Increase the ACC/DEC time and reduce the load.
Er25-6	Application fault–Homing offside	The limit switch or software limit is enabled during homing.	Modify the setting of P5.10 and then execute homing after re-power on.
Er25-7	Application fault–Inertia identifying failed	1. During inertia identifying, the motor stops rotating with vibration of longer than 3.5s. 2. The actual ACC time for inertia identifying is too short. 3. The inertia identifying speed is lower than 150r/min.	1. Improve the mechanical rigidity properly. 2. Increase the setting of P1.07. 3. Increase the setting of P1.06.

Service line: 400-700-9997; 86-21-34637660 Website: www.invt-tech.com

INVT INDUSTRIAL TECHNOLOGY (SHANGHAI) CO.,LTD.

Building 1, 188 Xinjunhuan Road, Pujiang Town, Minhang District, Shanghai

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