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HV610-DP card user manual

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1. Overview

Thank you for using HV610 series inverter and choosing HV610-DP card!

The HV610-DP card is a Profibus-DP fieldbus adapter card, which conforms to the internationally accepted Profibus fieldbus standard. The card is installed on the HV610 inverter to improve communication efficiency and facilitate the networking function of the inverter. Make the inverter a slave of the fieldbus and accept the control of the fieldbus master.

HV610-DP card can realize Profibus-DP communication.

Please read this manual carefully before using this product.

2. Installation and wiring

The HV610-DPcard is designed to be used in HV610 series inverters. Please turn off the power supply to the inverter before installation. Wait for about 10 minutes before the inverter's charging indicator goes out before installation. After the HV610-DP card is inserted into the inverter, please fix the corresponding screws to prevent the signal socket between the boards from being damaged by the external signal cable.

■ Card hardware layout

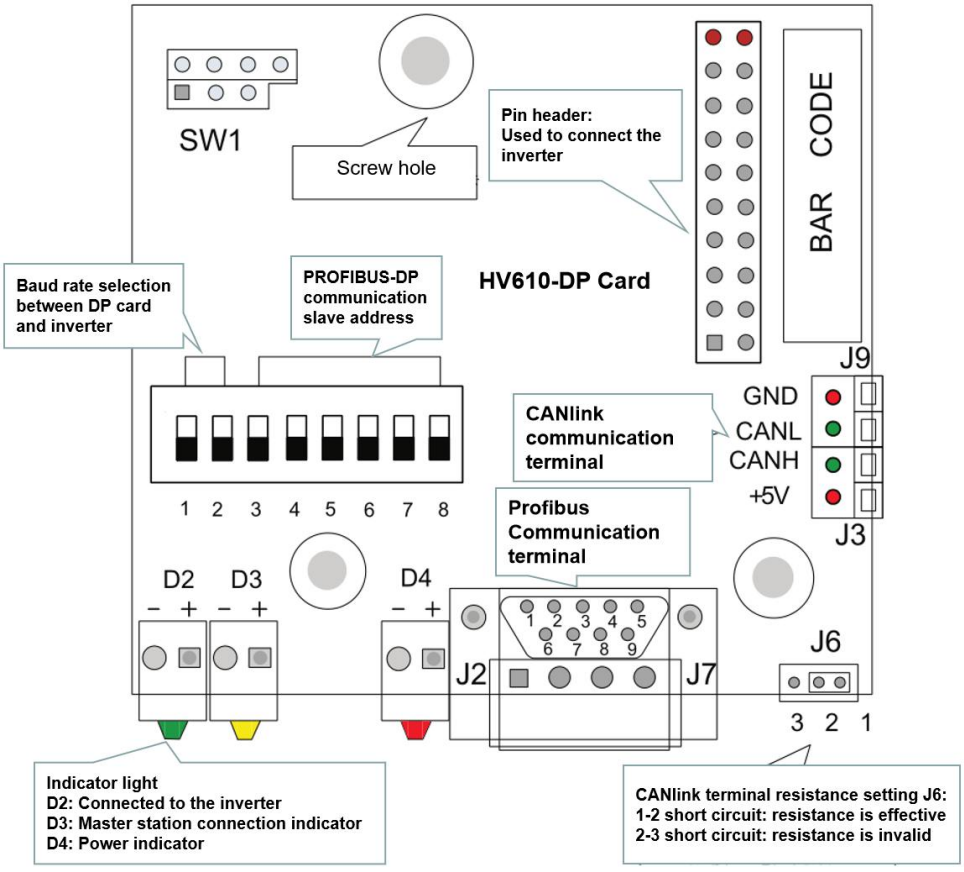


Figure 1 Terminal distribution of HV610-DP card

■ DIP switch description

Bit	Function	Description
1	DP card ON/OFF	OFF: HV610-DP is invalid ON: HV610-DP is valid
2	Reserved	Reserved
3~8	Profibus-DP communication slave address	Bit 3 ~ Bit 8 six-digit binary DIP switch can set station address 0~63. Example: **Bit 3 ~ Bit 8** **Local Address** 00 0000 Fd-02 decision 00 0111 07 01 0100 20 (Note: When the DIP switch is set to 0, the local address is set by the HV610 inverter function code Fd-03)

Note:

This HV610-DP only supports a communication rate of 115.2K with the inverter, that is, the tens digit of Fd-01 needs to be set to 0; the version information of the card cannot be viewed when using HV610-DP; changing the dial bit number 1, you need to power on again the inverter to take effect.

■ Interface Description

◆ Profibus DB9 interface description

The HV610-DP card uses a standard DB9 socket to connect to the Profibus master station, and its pin signal definition is in accordance with the DB9 socket standard distribution of SIEMENS.

As shown below:

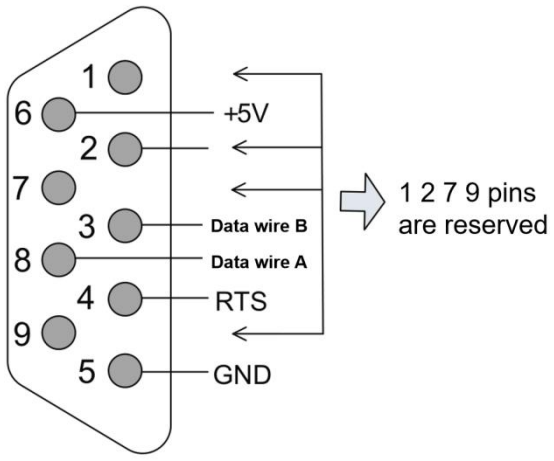


Figure 2 DB9 interface pin function description

◆ Control terminal function description

Type	Terminal	Terminal name	Function
Profibus-DP Communication terminal (J2)	1/2/7/9	NC	No connect (reserved)
	3	Data wire B	Data wire B (+)
	4	RTS	Request to send a signal
	5	GND	Isolated 5V Power Ground
	6	+5V	Isolated 5V Power +5V
	8	Data wire A	Data wire A (-)
Factory reserved	SWI	Reserved	Manufacturer debugging interface, users should not use
Indicator	D4 red	Power Indicator	ON: The inverter is powered on; OFF: The inverter is not connected to power or the DP card is not installed properly.
	D3 yellow	DP card and master station communication indicator	ON: The DP card communicates with the Profibus master station normally; OFF: The DP card and the Profibus master station failed to communicate (you can check the slave address, data format, and connection with the Profibus cable); Blinking: Indicates that there is interference between the DP card and the Profibus master station, intermittent.
	D2 green	DP card and inverter communication indicator	ON: The communication between the DP card and the inverter is normal; OFF: Communication between the DP card and the inverter is unsuccessful (check whether the baud rate setting is correct); Blinking: There is interference between the DP card and the inverter.

3. DP card and HV610 inverter communication configuration instructions

After the HV610-DP card is correctly installed on the HV610 inverter, the relevant communication configuration needs to be completed before the DP card can establish communication with the inverter.

■ Inverter communication card type setting

The function code Fd-00 needs to be set to 1, and Profibus-DP is selected as the serial communication protocol of the inverter, as shown in the following table.

Parameter	Name	Set range	Set value	Description
Fd-00	Serial communication protocol selection	0: Modbus 1: Profibus-DP	1	Serial communication with DP card using Profibus-DP protocol

4. DP card and Profibus master communication configuration instructions

After the DP card communicates with the HV610 inverter, it needs to be correctly wired with the Profibus master station. Setting the relevant communication configuration can realize the communication between the DP card and the Profibus master station, thereby achieving the inverter networking function.

■ Wiring of DP card and Profibus master

The connection diagram between the DP card and the Profibus master station is shown below:

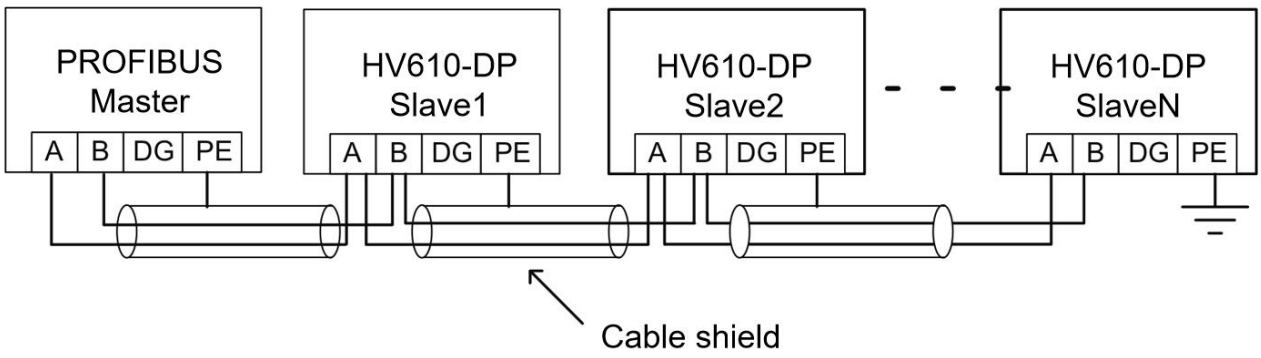


Figure 3 Schematic diagram of the connection between the DP card and the Profibus master station

In the Profibus bus terminal, it is necessary to access the terminal matching resistor, and the dialing code can be dialed according to the indication on the terminal. The PE level of the system must be reliably grounded.

According to the setting of the communication baud rate of the master station, the length of the communication cable between the DP card and the Profibus master station is also required. The length of the communication data cable must be restricted in strict accordance with the SIEMENS DB9 wiring standard.

The baud rate and wire length requirements are shown in the following table:

Baud rate (Kbps)	Data wire A maximum length (m)	Data wire B maximum length (m)
9.6	1200	1200
19.2	1200	1200
187.5	600	600
500	200	200
1500	100	100
6000	100	100
12000	100	100

■ HV610 Profibus-DP slave address configuration

To realize the function of Profibus master-slave control inverter, HV610 Profibus-DP communication slave address must be set. The slave address can be set by the DIP switch on the DP card, or by the inverter function code Fd-03. The slave address of the HV610-DP card is set by the 3 to 8 bits of the DIP switch, as shown in the following table:

DIP switch	Slave address
Profibus-DP communication slave address	Bit 3 ~ Bit 8 six-digit binary DIP switch can set station address 0~63. Example: **Bit 3 ~ Bit 8** **Local Address** 00 0000 Fd-02 decision 00 0111 07 01 0100 20 (Note: When the DIP switch is set to 0, the local address is set by the HV610 inverter function code Fd-03)

When the HV610-DP DIP switch selection address is set to 0, the communication slave address is set by the inverter function code Fd-03, as shown in the following table.

Parameter	Name	Set range	Default value	Description
Fd-03	Local address	0: broadcast address 1 ~ 249	1	DP support slave station number is 1 ~ 125

■ Communication timeout detection setting

In order to determine whether the communication between the HV610-DP communication card and the master station is interrupted, it is necessary to set the function code communication timeout period (Fd-05). If the interval between one communication and the next communication exceeds the communication timeout time, the inverter will report a communication failure error (COF).

Parameter	Name	Set range	Default value
Fd-05	Communication timeout	0.0s：Invalid 0.1s～60.0s	1

■ PPO data format selection

The PPO type is used as the data transmission format in the PROFIDRIVE (variable speed drive) protocol. For details, see the description of the data format definition in the subsequent communication protocol section. HV610 Profibus-DP protocol supports 4 data formats, PPO1, PPO2, PPO3, PPO5 are set by the ten digits of the function code Fd-06, as shown in below table:

Parameter	Name	Set range	Default value
Fd-06	Modbus, Profibus-DP communication data format	Single digit: Modbus Tens digit: Profibus-DP 0: PPO1 format 1: PPO2 format 2: PPO3 format 3: PPO5 format	30

After the above information is configured, the inverter needs to be powered on again to take effect.

5. Profibus-DP communication protocol description

■ Data transfer format

In the PROFIDRIVE protocol, the PPO type is used as the data transmission format. There are five types of PPO types: PPO1, PPO2, PPO3, PPO4, and PPO5. The HV610-DP card supports four types of data formats: PPO1, PPO2, PPO3, and PPO5.

The functions that each data format can complete are as follows:

Data type	Function	Data type	Function
PPO1	◆ Single function parameter operation ◆ Inverter command, frequency control ◆ Inverter status, running frequency reading	PPO3	◆ Inverter command, frequency control ◆ Inverter status, running frequency reading
PPO2	◆ Single function parameter operation ◆ Inverter command, frequency control ◆ Inverter status, running frequency reading ◆ 4 function parameters are written periodically ◆ 4 function parameters are be read periodically	PPO5	◆ Single function parameter operation ◆ Inverter command, frequency control ◆ Inverter status, running frequency reading ◆ 10 function parameters are written periodically ◆ 10 function parameters are be read periodically

The data block contained in the PPO type data format is divided into two areas, namely the PKW area (parameter area) and the PZD area (process data area). The HV610-DP card supports four types of PPO data formats as shown below:

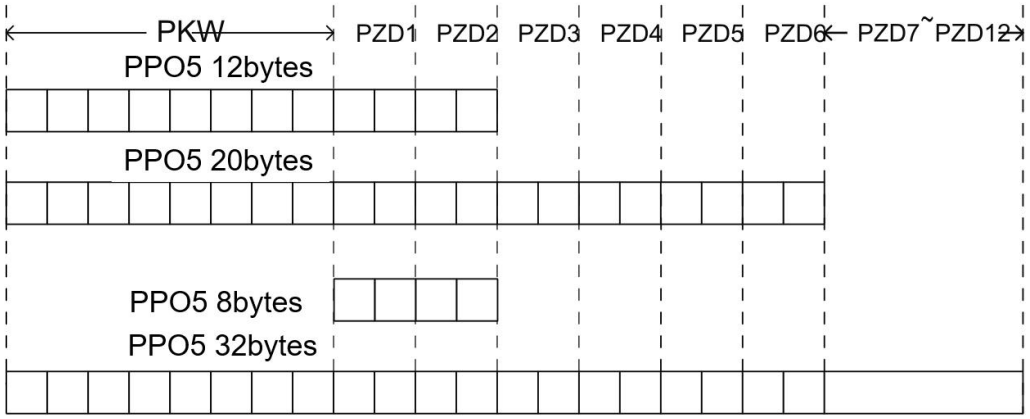


Figure 4 PPO type data format description

■ PKW area data description

The data in the PKW area mainly implements the reading and writing of the single function code of the inverter by the master station, and the communication address of the inverter function code is directly given by the communication data. The functions implemented are as follows:a) Read the function parameters of the inverterb) Change of inverter function parameters.

◆ Data format

The data in the PKW area contains three sets of array areas, namely PKE, IND, and PWE. The PKE data byte length is 2 bytes, IND is 2 bytes, and PWE is 4 bytes. The data format is shown in the following table:

Master station sends data PKW							
Command	Function code address		Reserved			Write : parameter value Read: None	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE
Inverter response data PKW							
Command	Function code address		Reserved			Success: return value Failed: error message	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE

◆ Data description

Master sends data PKW description		Inverter response data PKW description	
PKE	High 4 digits: command code 0: No request 1: Read function code parameter data 2: Change function code parameter data 14: Change function code parameter data and store it in EEPROM (The above command code is decimal data) Low 4 bits: reserved Low 8 bits: function code parameter address high bits	PKE	High 4 digits: Response code 0: No request 1: Function code parameter operation is correct 7: Unable to execute Low 8 bits: function code parameter address high bits
IND	High 8 bits: Function code parameter address lower bits Low 8 bits: reserved	IND	High 8 bits: Function code parameter address lower bits Low 8 bits: reserved
PWE	High 16 bits: reserved Low 16 bits: Not used when read request; indicates parameter value when write request	PWE	When the request is successful: parameter value When the request fails: Error code (consistent with MODBUS):

			1: Incorrect password 2: Read and write command error 3: CRC check error 4: Invalid address 5: invalid parameter 6: Parameter change is invalid 7: System lock 8: Parameter is being stored

◆ Application examples

The master station reads the send data PKW area of the inverter function parameter F0-09 and the drive response data PKW area as shown below:

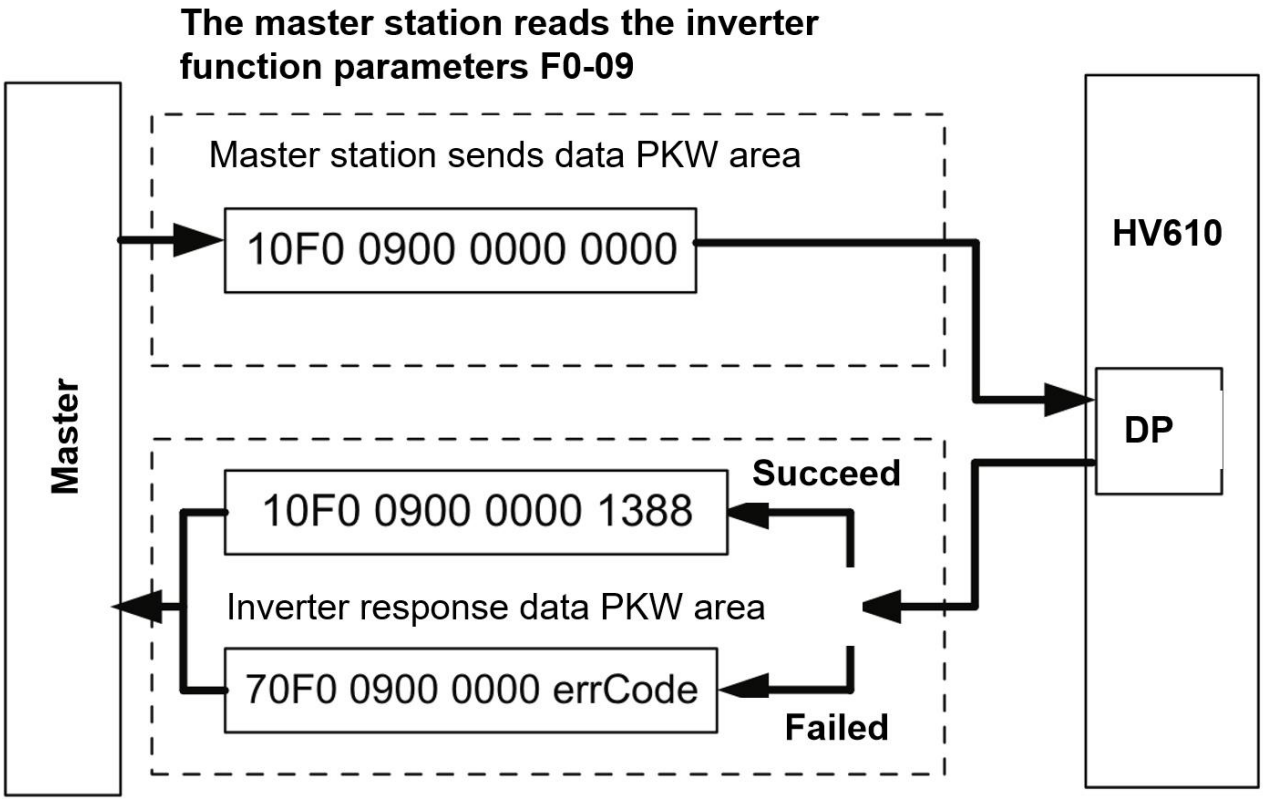


Figure 5 Example of master station reading inverter parameters and sending PKW data

The master station changes the send data PKW area of the inverter function parameter F0-09 and the inverter response data PKW area as shown below:

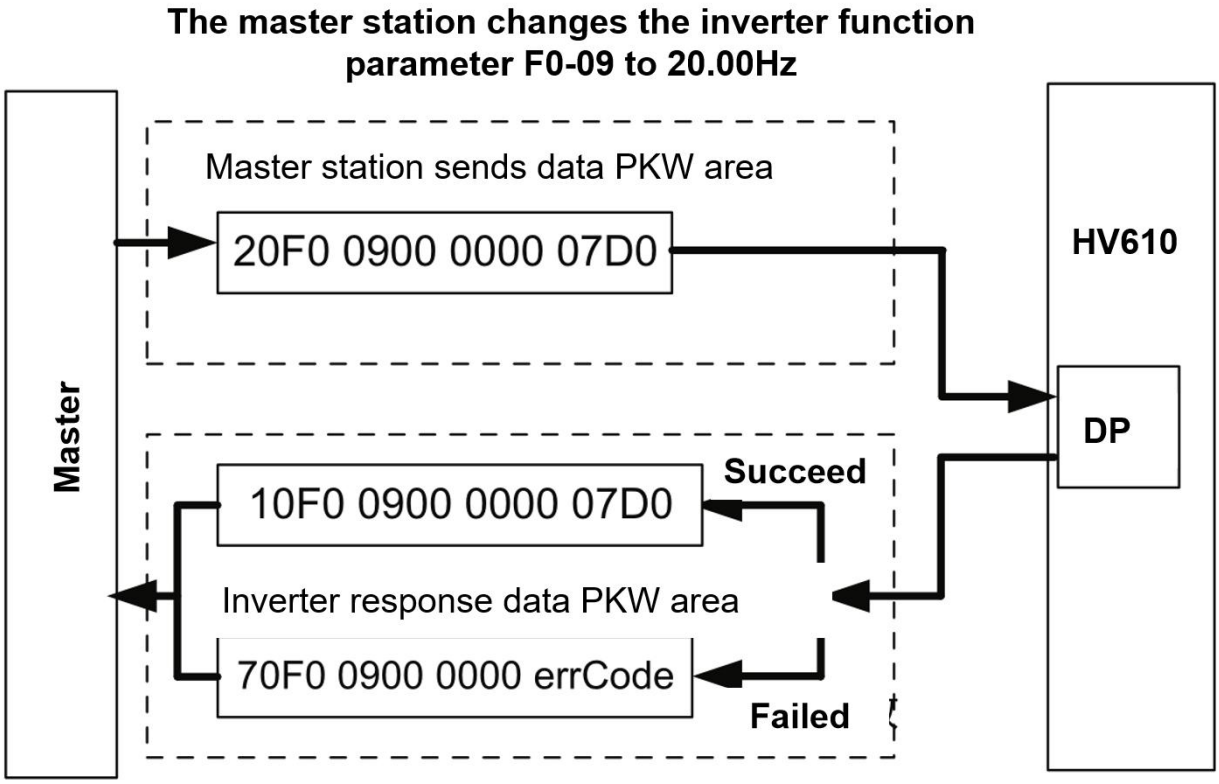


Figure 6 Example of master station writing inverter parameters and sending PKW data

The PKW data will interact with the inverter in a cyclic execution manner. If you use a write command (PKE = 0x20xx) to continuously operate the EEPROM, the life of the inverter's main control chip will be greatly reduced. If you need to change the parameters of the inverter's function code, it is recommended to use PKW In the operation of the RAM address, the corresponding RAM address of the function code F0 ~ FF group is 0x00 ~ 0x0F; the corresponding address of the A0 ~ AF group is 0x40 ~ 0x4F. For example, the corresponding RAM address of F0-10 is 0x000A.

■ PZD area data description

The data in the PZD area enables the master station to change and read the inverter data in real time and perform periodic data interaction. The communication address of the data is directly configured by the inverter. It mainly includes the following:a) Inverter control command and target frequency given in real timeb) Real-time reading of inverter's current status and operating frequencyc) Function parameter and monitoring parameter data real-time interaction between inverter and PROFIBUS master stationThe PZD process data mainly completes the periodic data exchange between the master station and the inverter. The interaction data is as follows:

Master station sends data PZD area		
Commands	Inverter target frequency	Inverter function parameters change in real time
PZD1	PZD2	PZD3~PZD12
Inverter response data PZD area		
Commands	Inverter running frequency	Inverter function parameters reading in real time
PZD1	PZD2	PZD3~PZD12

◆ Master sends data description

PZD1 and PZD2 are fixed configurations and cannot be modified by the user. PZD3 ~ PZD12 are user-defined periodic data interactions, corresponding to the HV610 series inverter FE group function code parameters. This group of parameters are user-defined parameters. The master station sends data PZD3 ~ PZD12 corresponding to FE-00 ~ FE-09, and the inverter response data PZD3 ~ PZD12 corresponds to FE-10 ~ FE-19. Modify the setting value of the FE group parameter to exchange data with the master station. Setting the FE group parameter value to F0.00 means skipping the data area.

◆ Application examples

The master station periodically change the inverter's function parameter F0-09 through PZD3:

1. Enter FE-00, the initial keyboard display is shown in the figure: 
2. Modified to F0-09, the keyboard display is as follows: 
3. The master station periodically change the F0-09 function code by filling PZD3 data (do not write EEPROM):

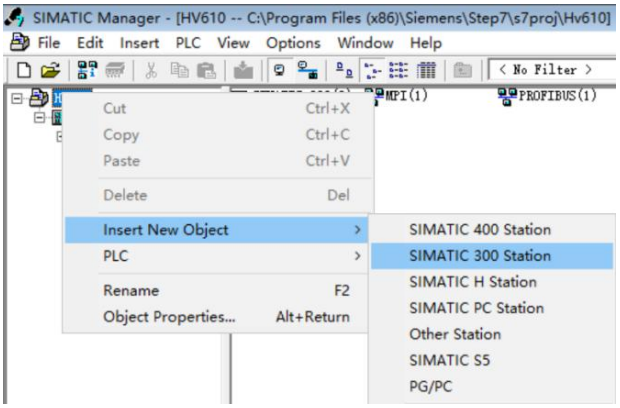
The master station periodically reads the inverter’s function parameter U0-06 through PZD3:

1. Enter FE-10. The initial keyboard display is shown in the figure. 
2. Modified to U0-06, the keyboard display is as follows: 
3. The master station reads the PZD3 data to realize U0-06: periodic reading output torque.

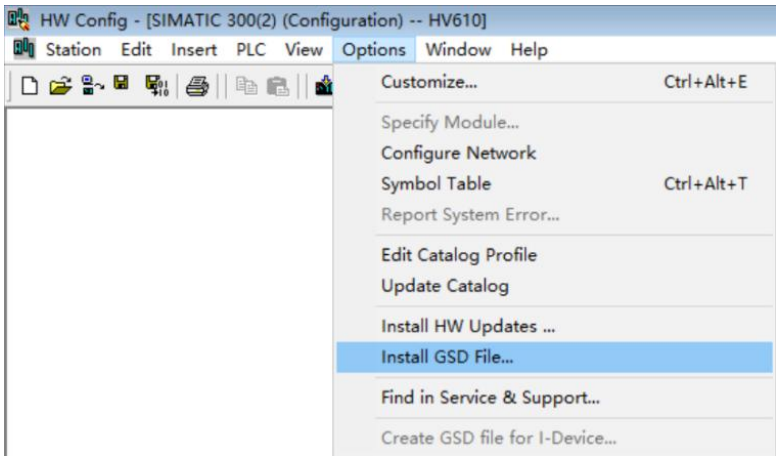
6. Configure GSD on the S7-300 master

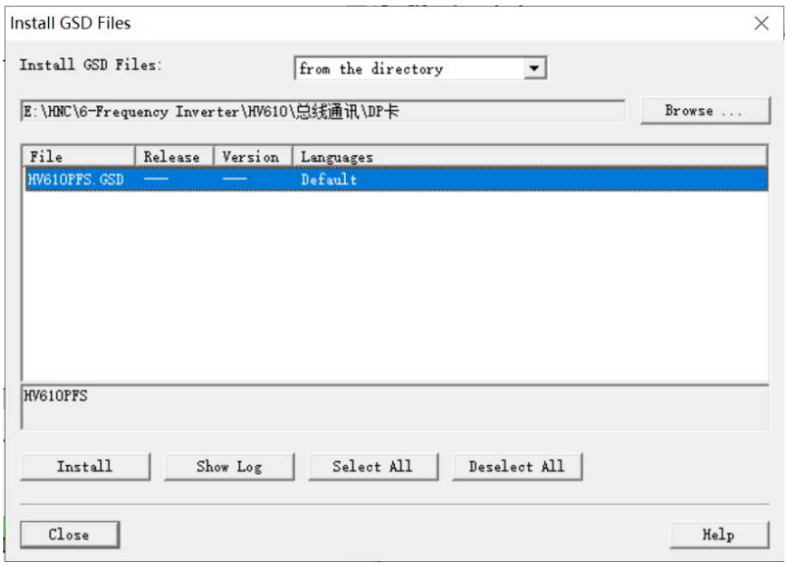
When using the PROFIBUS master, you must first configure the .GSD file of the slave so that the corresponding slave device is added to the system of the master .GSD files can be obtained from HNC agents or manufacturers. The specific operations are as follows:

1. Build a project in STEP7, add the S7-300 master station to the project, as shown below:

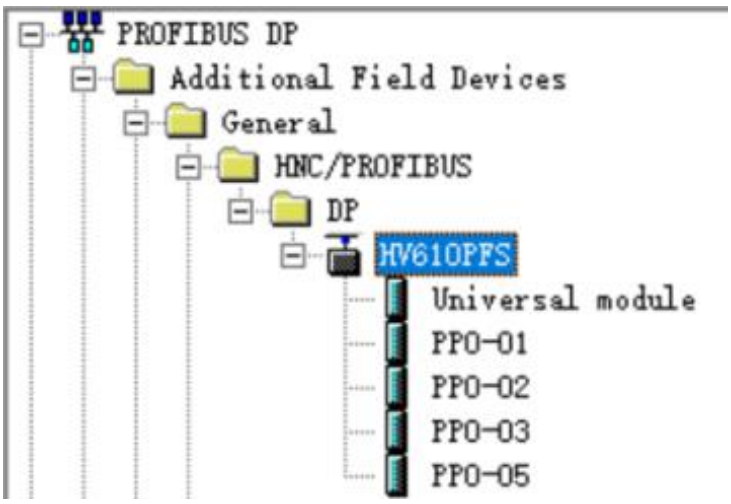


2. Double-click the hardware logo to enter the HW config configuration, and add the MD38PFS.GSD file in the HW config configuration screen, as follows:

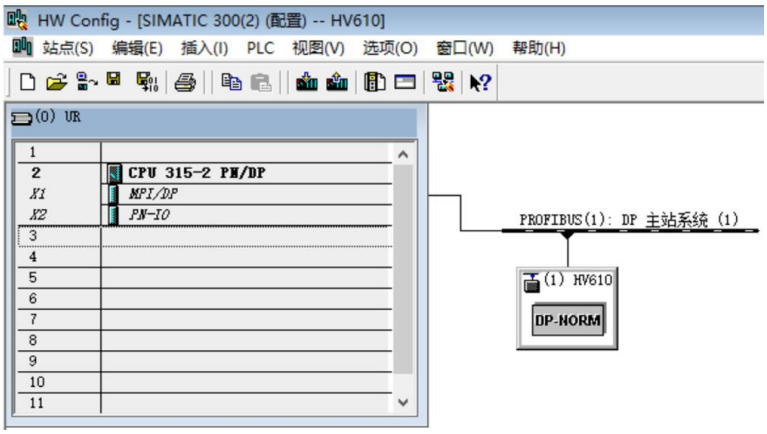




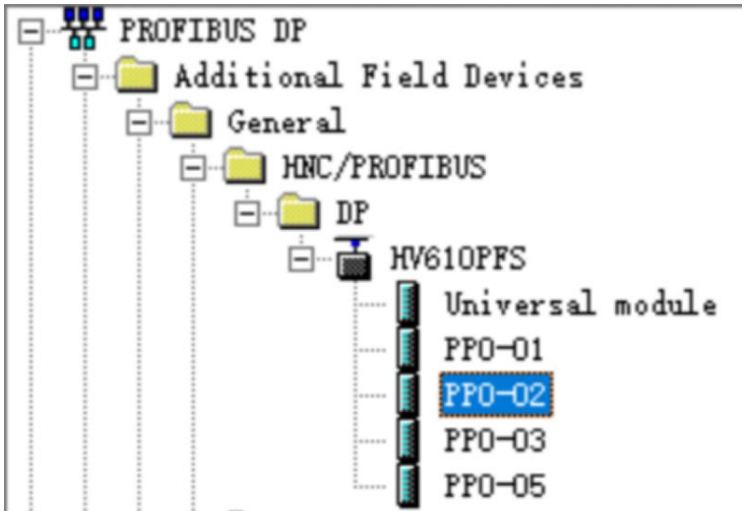
3. Click Install. After the installation is completed, there will be a PROFIBUS-DP module of MD38PFS in the system.



4. The actual hardware system of the configuration system is shown below:



5. Configure the data characteristics of the slave:



All the above operations complete the operation of the PROFIBUS slave. You can control the inverter by writing the corresponding program in S7-300.

7. Fault description and processing

Indicator	Fault state	Fault description	Troubleshoot
D4 Red	OFF	DP card is not powered on	Please check whether the DP card and inverter interface are connected well
D2 Green	Flicker	Intermittent connection between DP card and inverter	Please check whether the grounding is good and eliminate the interference on site
D2 Green	OFF	The connection between the DP card and the inverter is not successful	Please check whether the setting of Profibus-DP baud rate function code (ten digits of Fd-01) is consistent with the baud rate of the DIP switch.
D3 Yellow	Flicker	Intermittent connection between DP card and Profibus master	Please check whether the grounding is good and eliminate the interference on site
D2 Yellow	OFF	DP card and Profibus master connection failed	Please check if the slave address and data format are correct, if the Profibus cable connection is normal, if the slave address and data format are configured correctly