

R-Series Profibus-DP Bus Output User Manual V1.0 of TEC Sensor

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一. Product Introduction

TEC Magnetostrictive Displacement Sensor is a new generation of linear displacement sensor developed by TEC International Technology Co. Ltd. It can provide users with real-time reliable accurate continuous linear displacement signals in harsh working environment. It is widely used in metallurgical equipment construction machinery port machinery new energy and other industrial automation fields.

Description of TEC-Sensor technical parameters:

Measurement data: position (vernier magnetic ring)

Measurement range: 50mm ~ 3000mm, can be customized according to customers

Numbers: 1-3

(1) PROFIBUS-DP/V0 protocol, conforming to GB/T 20540-2006: Measurement and control digital data communications-Field bus for industrial control systems-Part 3: PROFIBUS specification;


(2) Standard PROFIBUS-DP driver interface, self-adaptive baud rate, maximum support 12Mbit/s;

二. Upper Unit Configuration Networking

1. Set up a Profibus master site

Tip: (1)-(10) is the general method for STEP 7 to create a new project and S7-300/PROFIBUS master station. For familiar readers, you can quickly browse and start reading from "2. Configure Profibus-DP slave station".

(1) Copy the GSD file with the TEC sensor to the C:\Program Files\Siemens\Step7\S7DATA\GSD directory. Copy the image of the sensor to the directory C:\Program Files\Siemens\Step7\S7DATA\NSBMP (STEP7 is installed on disk C by default).

(2) Double-click the  "SIMATIC Manager" icon to appear as shown in Figure 1.

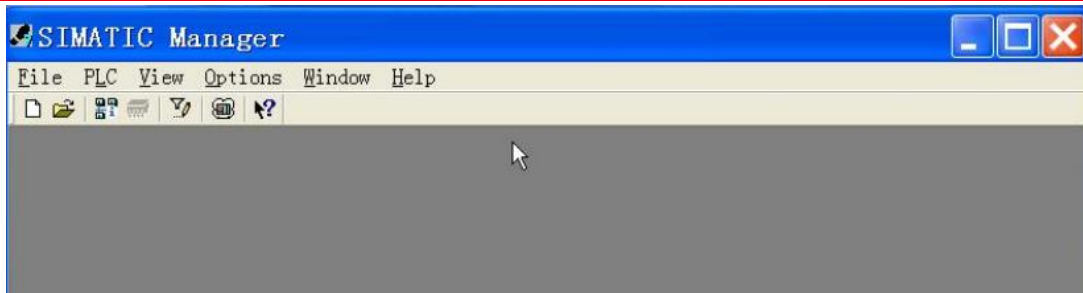


Figure 1

(3) Select File → New, type the File name: XXApplication, and then click OK, as shown in Figure 2.

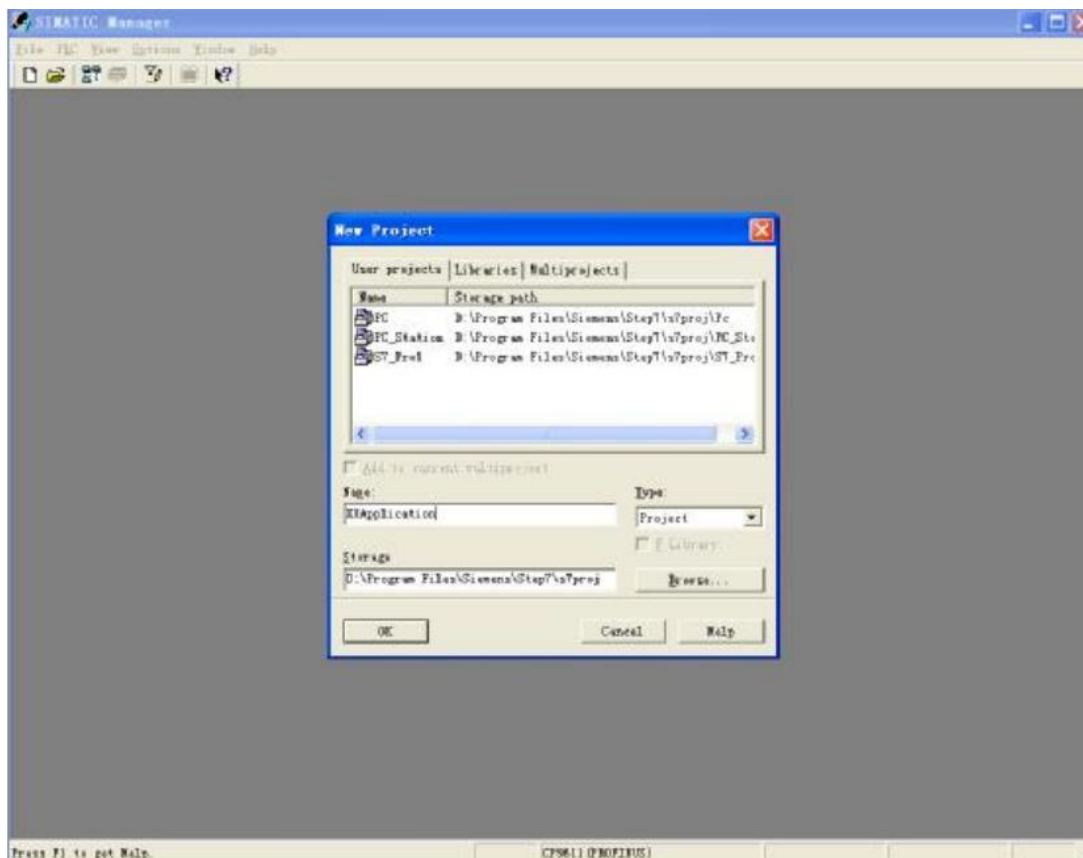


Figure 2

(4) Select XXXApplication, and then select Insert → Station → SIMATIC 300 Station in the title bar.

See figure 3.

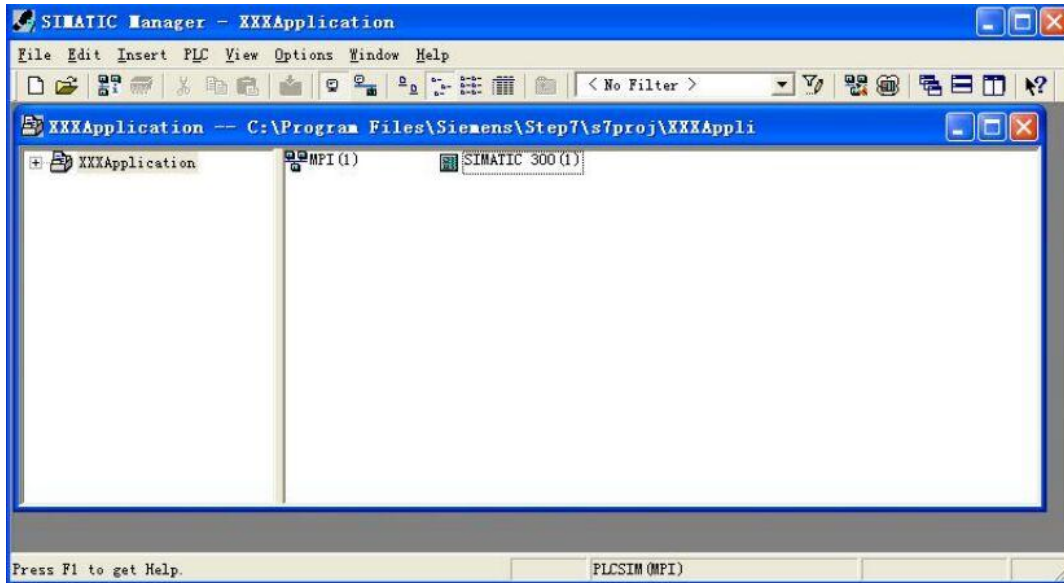


Figure 3

(5) After double-clicking "SIMATIC 300(1)" from Figure 3, and then double-clicking "Hardware", see Figure 4.

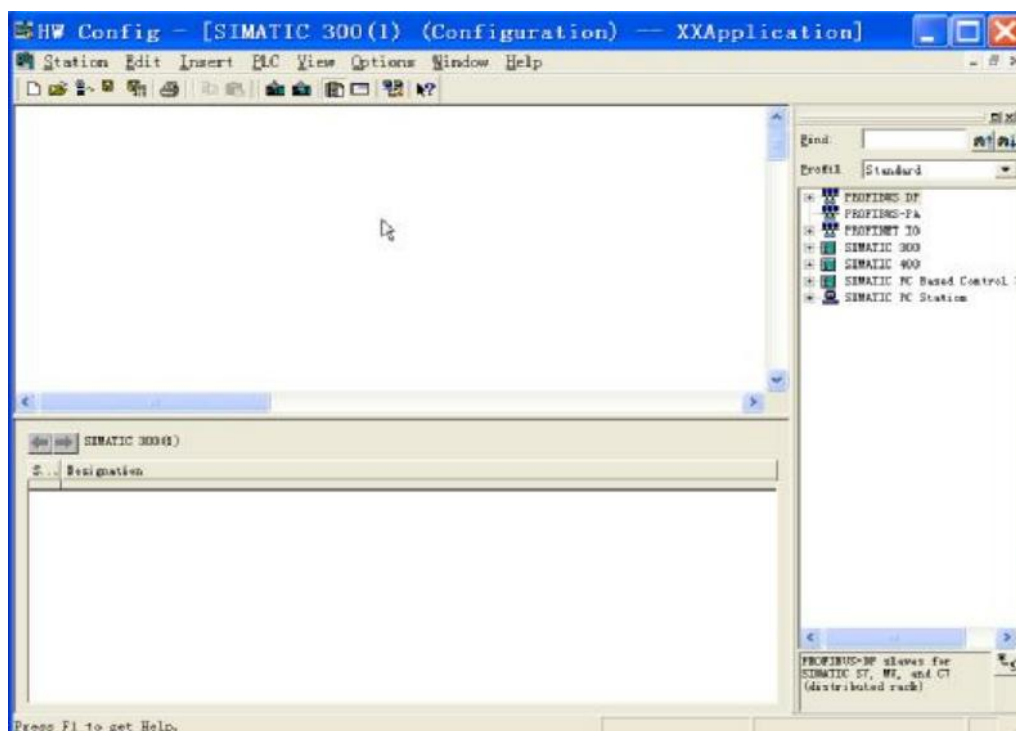


Figure 4

(6) Select Option → Update Catalog, as shown in Figure 5. Step 7 automatically adds the GSD file for the XXXApplication device to the device's Catalog, which can be found in the PROFIBUS-DP path according to the path configured in the GSD.

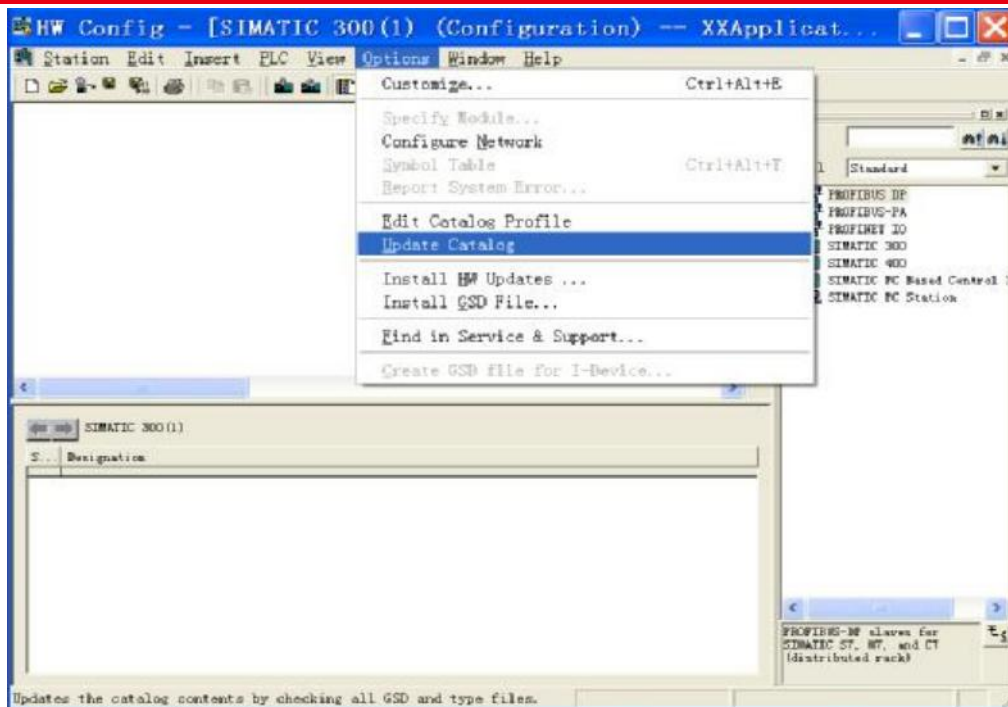


Figure 5

(7) Configure the rack: Double-click Hardware Catalog\SIMATIC 300\RACK-300\Rail from the right.

As shown in Figure 6.

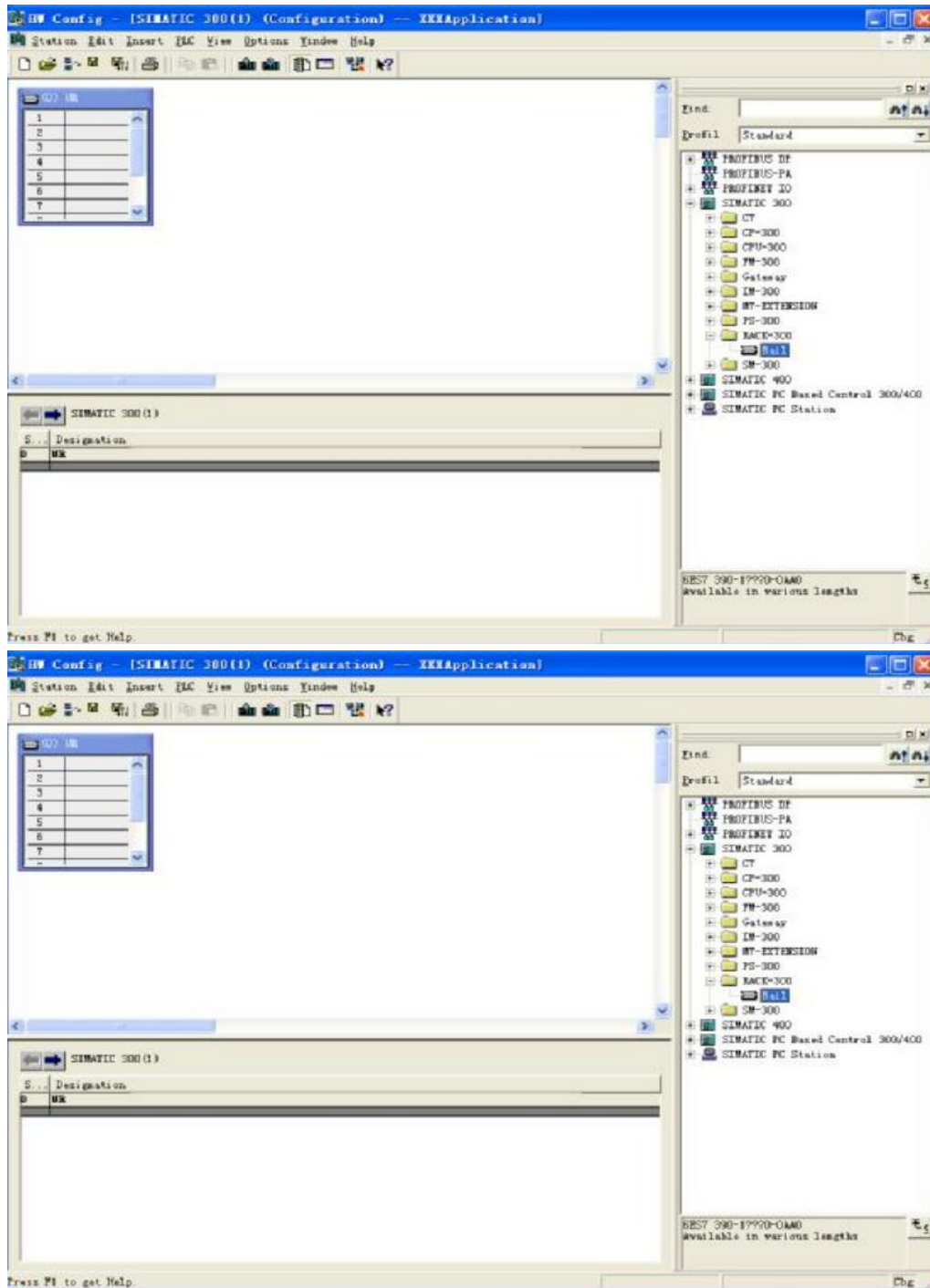


Figure 6

(8) Configure PLC integrated power supply: First select the rack UR1 slot, right-click Insert Object, and then select the actual PLC power supply (such as PS307 5A). As shown in Figure 7.

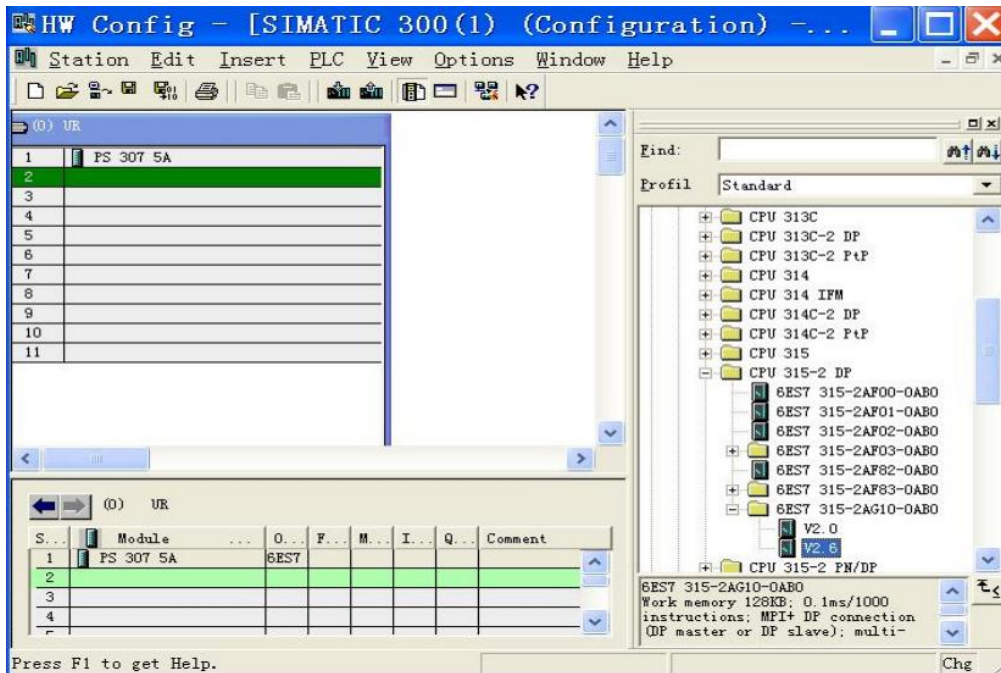


Figure 7

(9) Configure the CPU: Select the rack UR2 slot first, then double-click the corresponding CPU model from Hardware Catalog\SIMATIC 300\CPU-300\CPU 315-2 DP\ select 6ES7 315-2AG10-0AB0 V2.6 in this example, as shown in Figure 8, and then click OK.

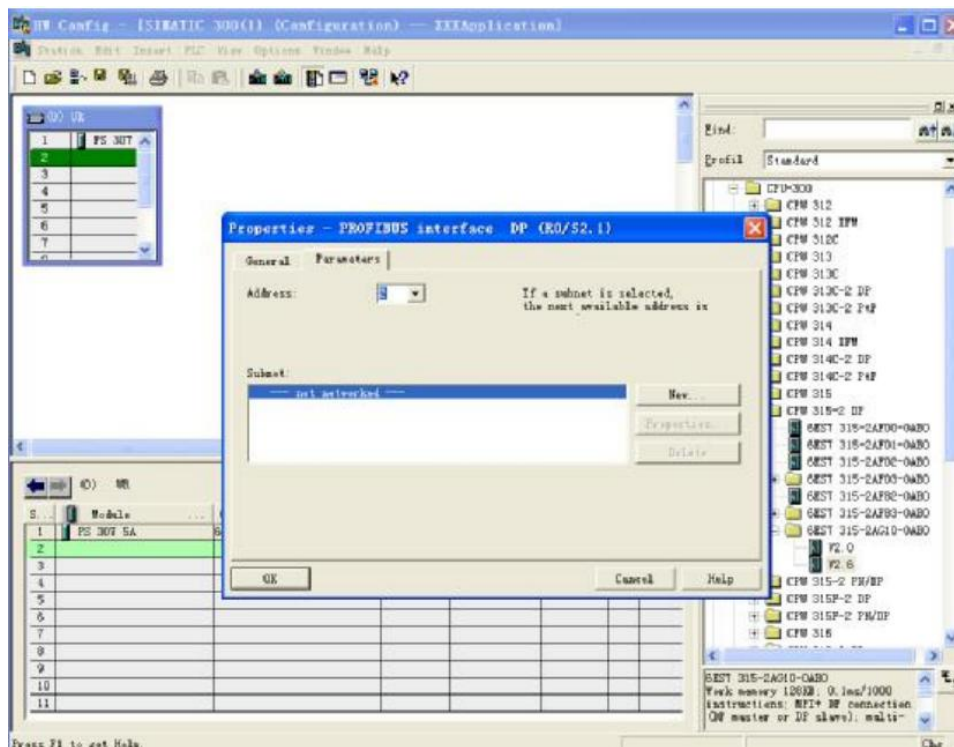


Figure 8

(10) Configure PROFIBUS-DP: Right-click the E2 slot and select Add Master System. On the

Properties tab, first set the Address for the DP Master Station, then select New to create a New subnet PROFIBUS, on the Network Settings tab, select the appropriate transfer rate (such as 187.5 kbit/s), the rest are default settings, and finally click OK. The setting interface is shown in 9. The set interface is shown in Figure 10.

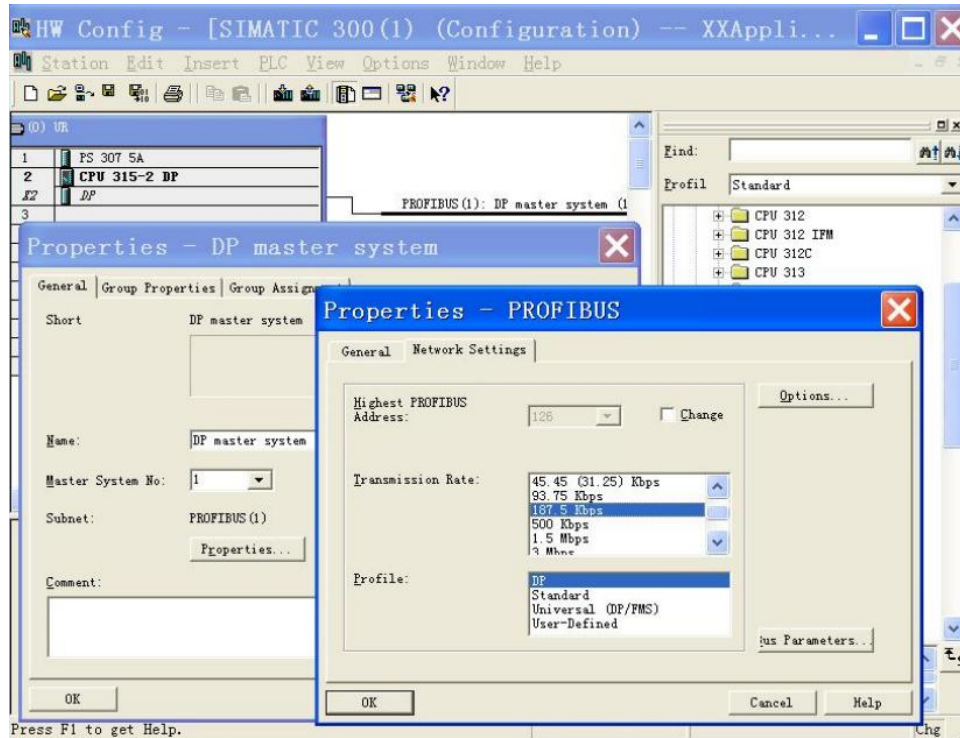


Figure 9

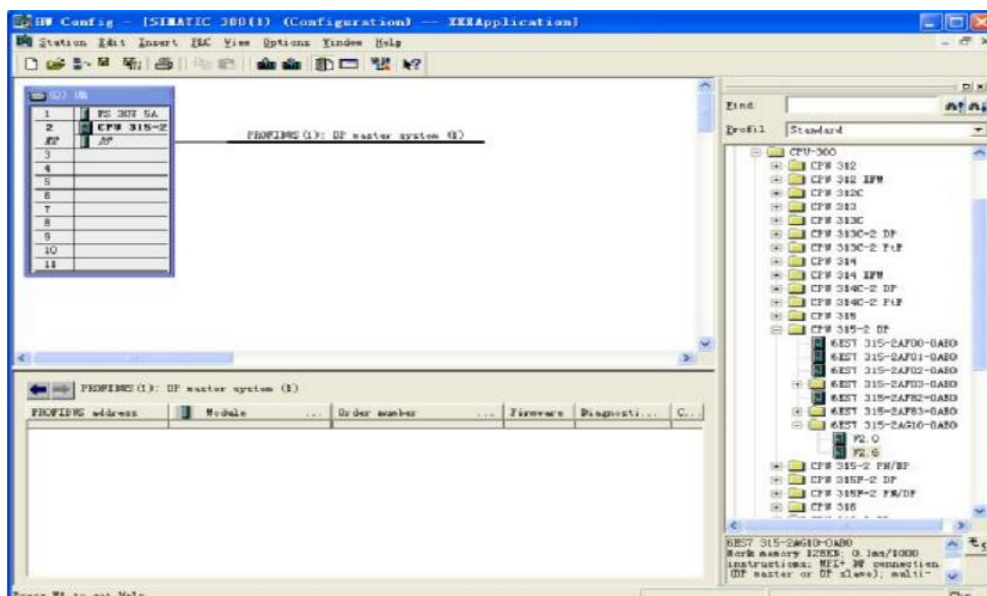


Figure 10

2. Configure the Profibus-DP slave

(1) Configure the DP slave station. From the Hardware Catalog on the right, under the PROFIBUS

DP\Additional Field Devices\General\ directory, find the sensor module file that goes with the sensor (for example, TEC-DP by default). (If there is no corresponding directory or file, please close the current sub-interface window (note that it is not the main window), then select Option → Update Catalog, and then reopen SIMATIC 300 (1) through Station\ open), select this module file, and drag it into the PROFIBUS-DP master system bus, or directly click the PROFIBUS (1) DP master system (1) bus to make it selected, open PROFIBUS DP\Additional Field Devices\ General\ TEC-DP in Hardware Catalog, double-click, and then set it from the Station. The corresponding slave Address should be set, and finally click OK.

The operation interface is shown in Figure 11. After clicking OK, the interface looks like Figure 12.

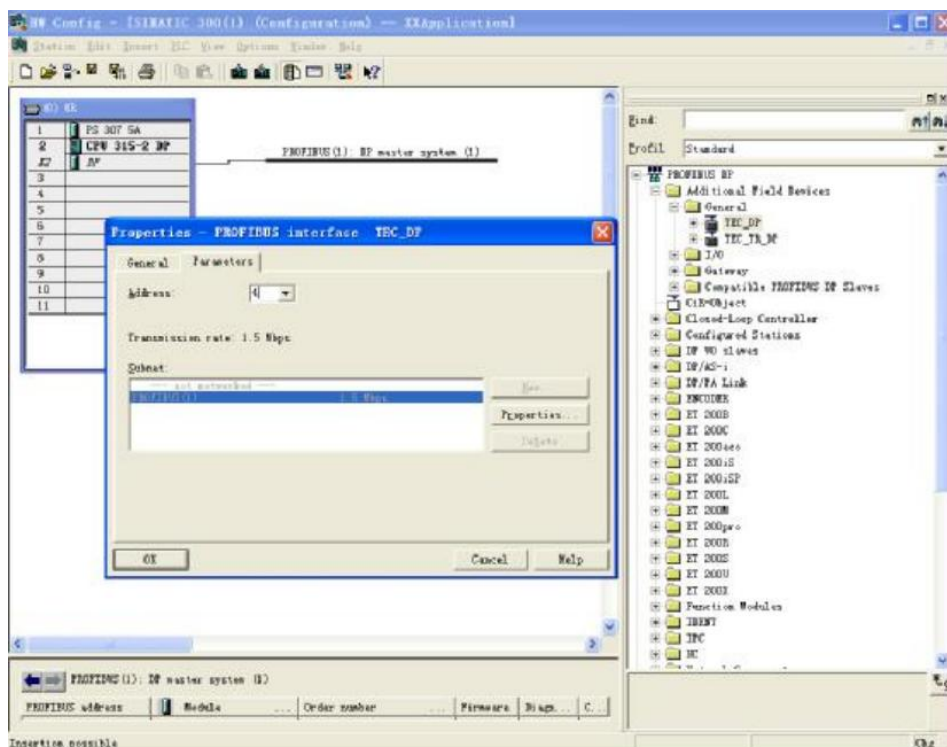


Figure 11

(2) Configure the PROFIBUS input/output of TEC_DP

① In the Hardware Catalog, open the TEC_DP directory in PROFIBUS DP\Additional Field Devices\General\. As shown in Figure 12.

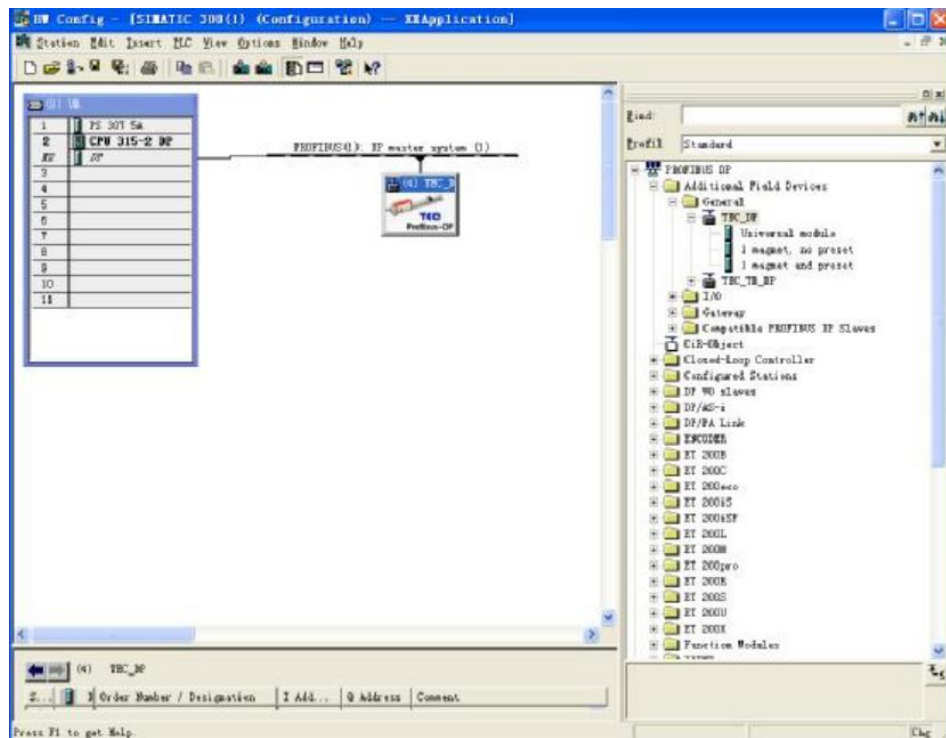


Figure 12

② There are two slots (logically, non-physical devices) in TEC_DP. Select one slot and double-click "1 magnet, no preset" in TEC_DP. Figure 12 shows the result of adding "1 magnet, no preset" to the 1# slot.

Figure 13 is a slave configuration with the 1# slot set to "1 magnet and preset" with a default value.

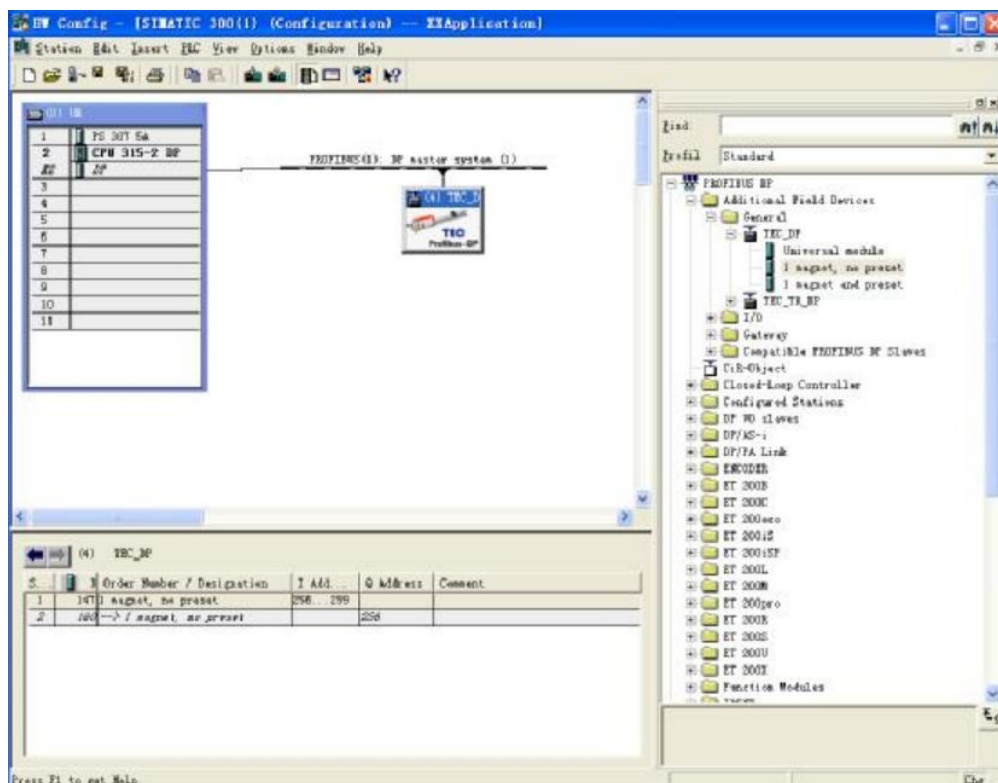


Figure 12

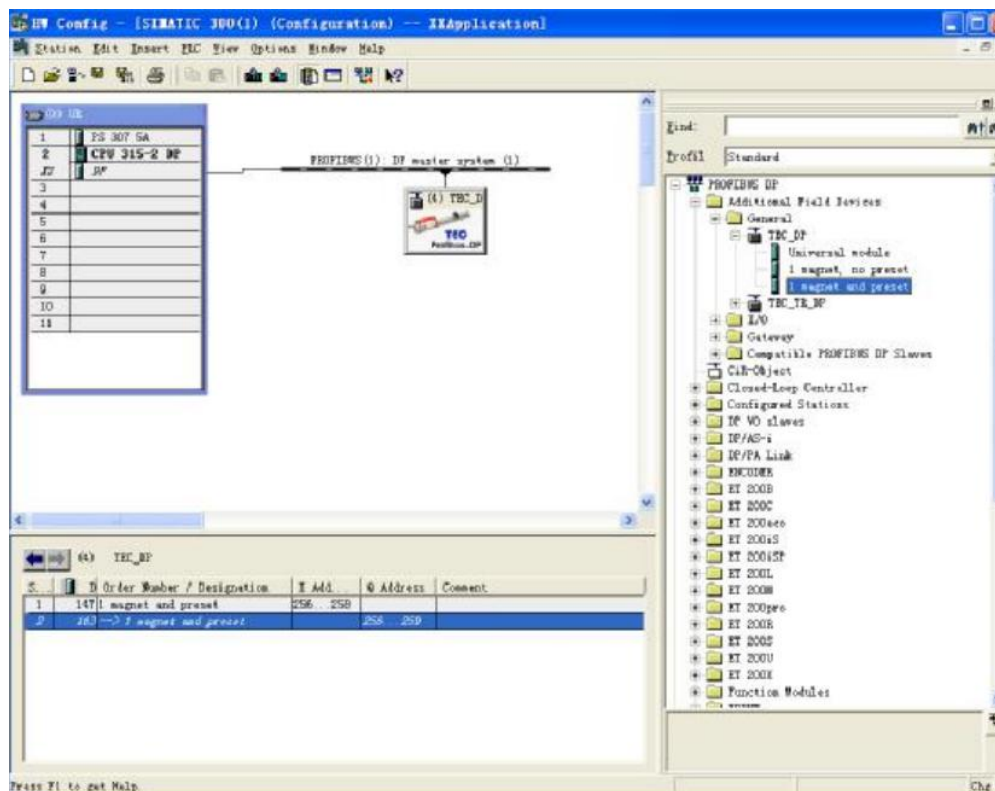


Figure 13

(3) Configure the TEC_DP interface. Double-click the TEC_DP icon on the DP bus to open the device configuration window and select Parameter Assignment, as shown in Figure 14. Through various options, the parameters of the sensor can be set concretely. The detailed description of its parameters will be specified in the following sections.

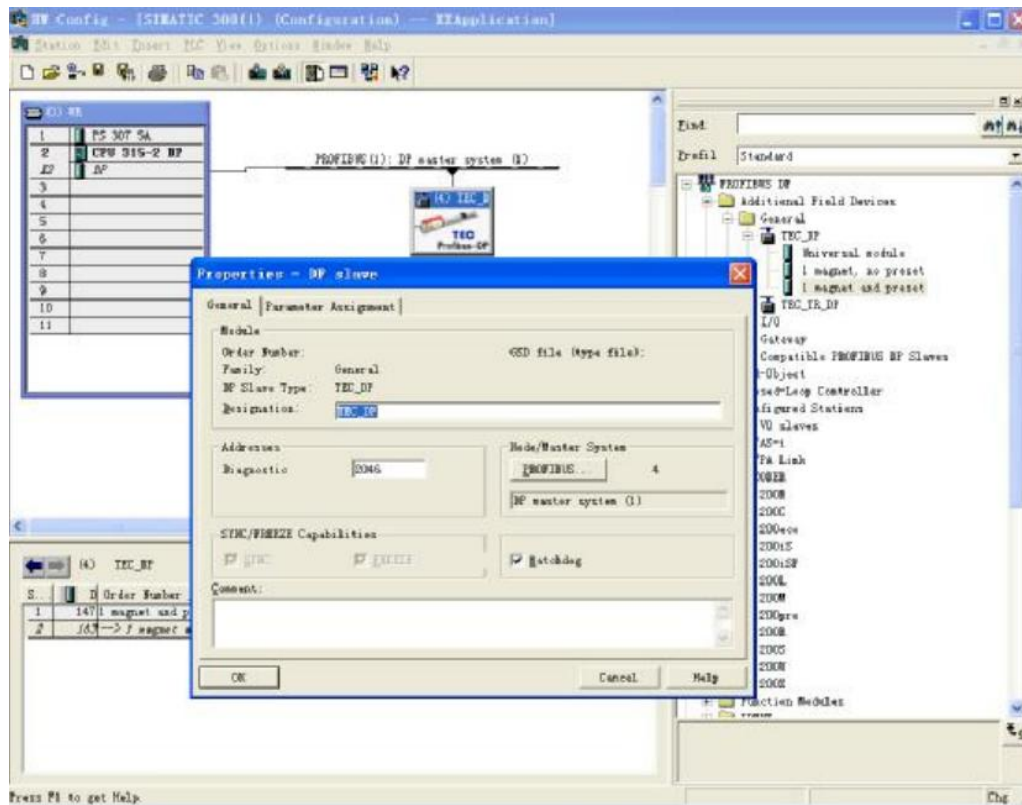




Figure 14

(4) Save and Compile. Click on the  Save and Compile, and finally click  to download the configuration to the PLC.

Ξ. Configuration Parameters and Instructions of Slave Stations

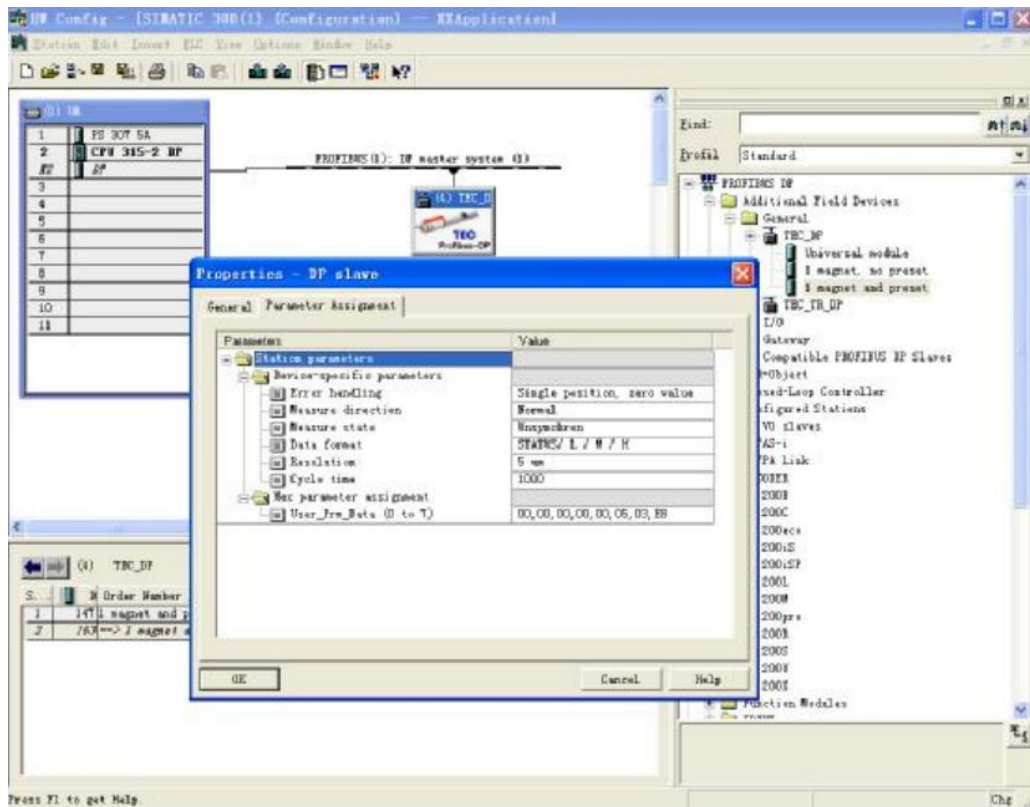


Figure 15

(1) One menu with magnetic ring without default value

Menus without default values only have function configuration, and there is no function of setting default values.

Error handling

Single position, zero value	Outside the measurement range, display a value of 0
Single position, old value	Display the last value beyond the measurement range
All position, zero value	Outside the measurement range, display a value of 0
All position, old value	Display the last value beyond the

	measurement range
--	-------------------

Measure direction

Normal	Normal output
Reverse	Reverse output

Measure state

Unsynchrnon	Slightly
Syschrnon	Slightly

Data format

Status/L/M/H	24-bit Intel data format and status
Status/H/M/L	24-bit Motorola data format and status
L/M/H/Status	Reverse Motorola data format and status
HH/H/L/LL	32-bit Motorola data format

Resolution

User-settable output data resolution	5um, 10um, 20um, 50um, 100um, 200um, 500um, 1000um
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Cycle time

Slightly	Slightly
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(2) One menu with magnetic ring without default value

The menu with preset value not only has function configuration, but also has the function of setting the starting value of preset value through PLC. The start and end addresses of the default values are shown by the Q address in Figure 16 below.

The starting value of the default value is set as follows:

Q Address QA1 Output Control Control Byte(Controller->>Sensor)

QA2 Default Low Byte

QA3 Default Medium Byte

QA4 Default High Bytes

Note: QA1-QA4 are arranged from small to large according to Q Address in Figure 16.

S...	DP ID	Order Number / Designation	I Address	Q Address	Comment
1	147	1 magnet and preset	256...259		
2	163	--> 1 magnet and preset		256...259	
3					

Figure 16

The trigger command code is input by the output control bit of the sensor:

0x12 acts on the input buffer and 0x10 resets the input buffer.

For example, the current resolution is 5um, and the magnet needs to be positioned 50.8 mm away from the dead zone of the sensor. The action is as follows:

Enter 0x12 for QA1, 0xB0 for QA2, 0x27 for QA3, 0x00 for QA4, and then activate the variables after entering them in the variable table.

(3) DP bus configuration

After parameter configuration, the sensor needs configuration data. Configuration is to set the length of input and output data when data exchange is carried out on DP bus.

Input and output data length settings:

The input data length of the sensor is 4 bytes, 1 byte is status information and 3 bytes is measurement position data.

The output data length of the sensor is at least 1 byte, which controls synchronous measurement. If the configuration mode with preset value is selected during configuration, there are still three bytes sent

No Preset: 1 byte

Preset: 4 bytes (1 byte control data/3 byte Preset value)

For example:

The configuration data is 0x93, 0xA0

1 position module (4 bytes of input data)

1 control byte (1 byte of output data)

Configuration data is 0x93, 0x93, 0xA3

2 position module (8 bytes of input data)

1 control byte with preset function (4 bytes output data)

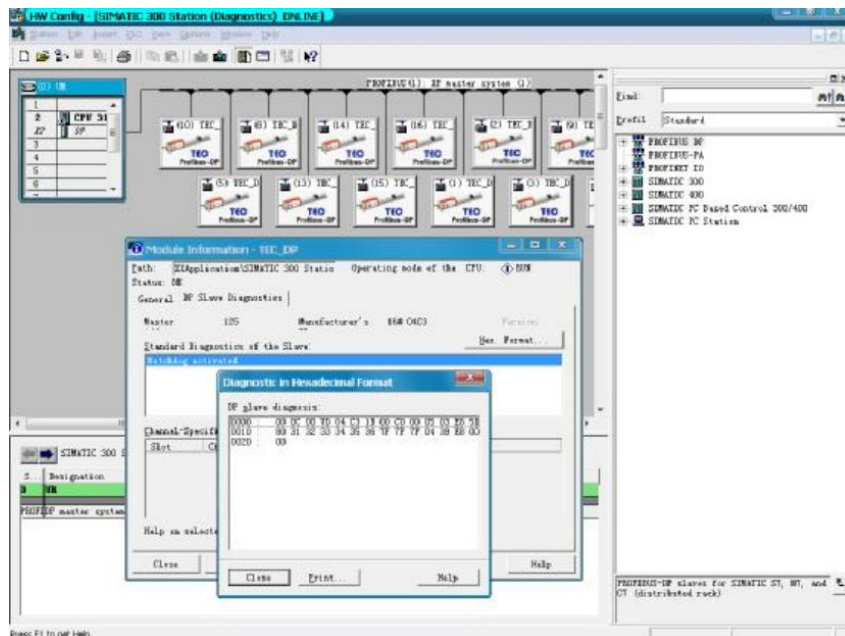
Please refer to relevant manuals for specific settings.

四. Description of Product Diagnostic Function

TEC sensor supports PLC upper computer software Step 7 for on-line diagnosis function. After running the diagnostic function in Step 7, the DP slave diagnostic buffer displays the actual operating parameter values of the sensor.

Diagnostic operation is operated by  in hardware configuration interface.

The normal diagnosis results are shown in the following figure:



This data is in hexadecimal format, and the diagnostic values are defined as follows:

Bytes 1-6 are defined with reference to the Profibus standard (Siemens EN 50170 Vol. 2)

Byte 7 Extended diagnostic data length

Byte 8 Reserved

Byte 9 Sensor error handling

Byte 10 Sensor display resolution high byte

Byte 11 Sensor display resolution low byte

Byte 12 Sensor measurement time high byte

Byte 13 Sensor measurement time low byte

Byte 14 Number of sensor magnetic rings

Byte 15 Sensor measurement mode

Byte 16 Sensor measurement length high byte

Byte 17 Sensor measurement length low byte

Byte 18 ~ 26 Sensor product serial number

Byte 27 ~ 29 Sensor pulse velocity (cm/s) 24-bit unsigned number

Bytes 30 ~ 32 Sensor default value is high, medium and low. (Appears in with default mode)

Byte 31 Sensor error status

五. Address Modification and Connection Method of Slave Station

1. Using CP5611 card to modify the slave address of the sensor

(1) Use Step7 software to read the sensor slave address. First, modify the property of "Set PG/PC Interface" so that the current interface is in CP5611 (PROFIBUS state. As shown in Figure 17.



Figure 17

(2) First select the current slave station to be allocated, select PLC-> PROFIBUS-> Assign PROFIBUS Address in the main menu of STEP7 or HW Config, enter the state of reading the address of slave station equipment, select the drop-down list button, change the required address, and finally click OK. After the address modification is successful, STEP7 will return to the current state.

Figure 18 is an address setting state. The Current PROFIBUS column in Figure 19 shows the currently existing slave address. Figure 20 is an address reassignment to the current slave station. That is, select the address you want to assign from the drop-down menu in the New PROFIBUS Address column.

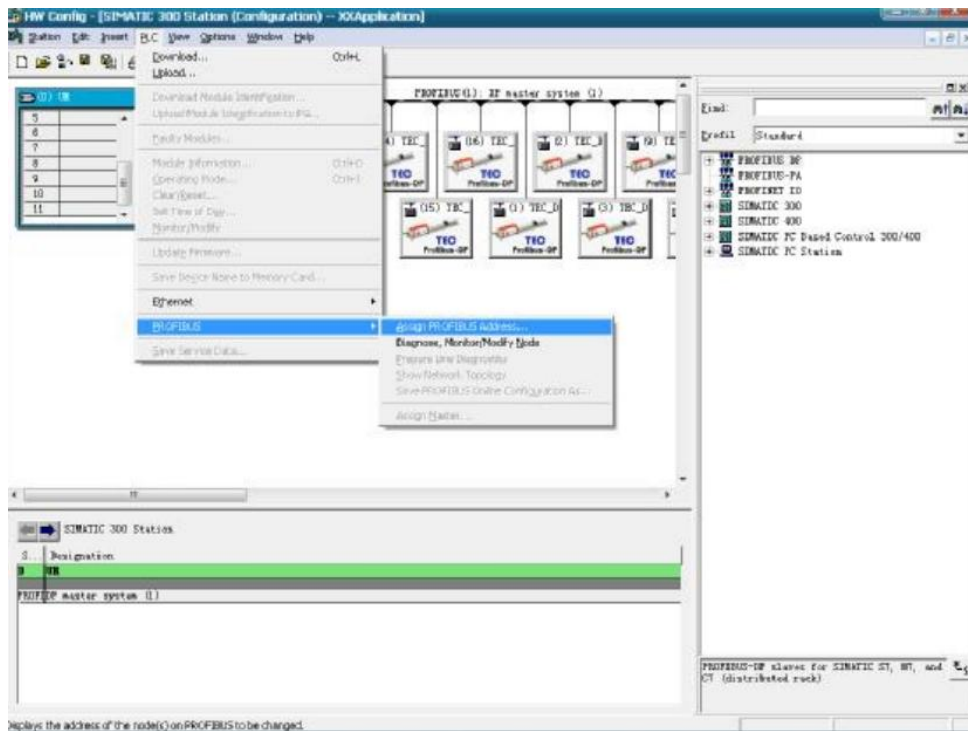


Figure 18

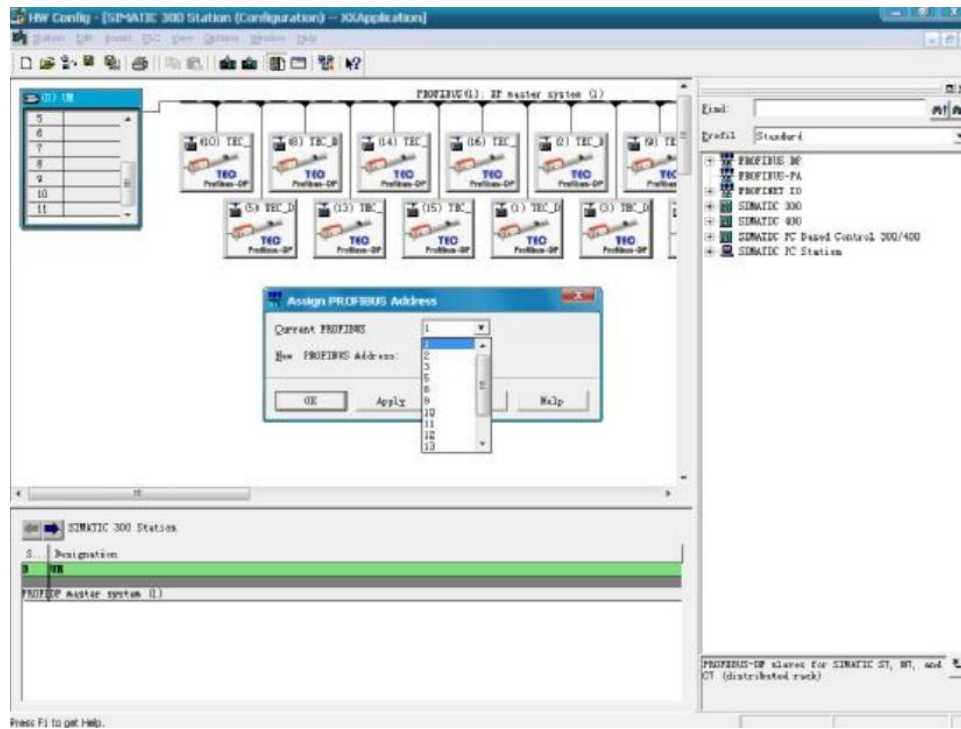


Figure 19

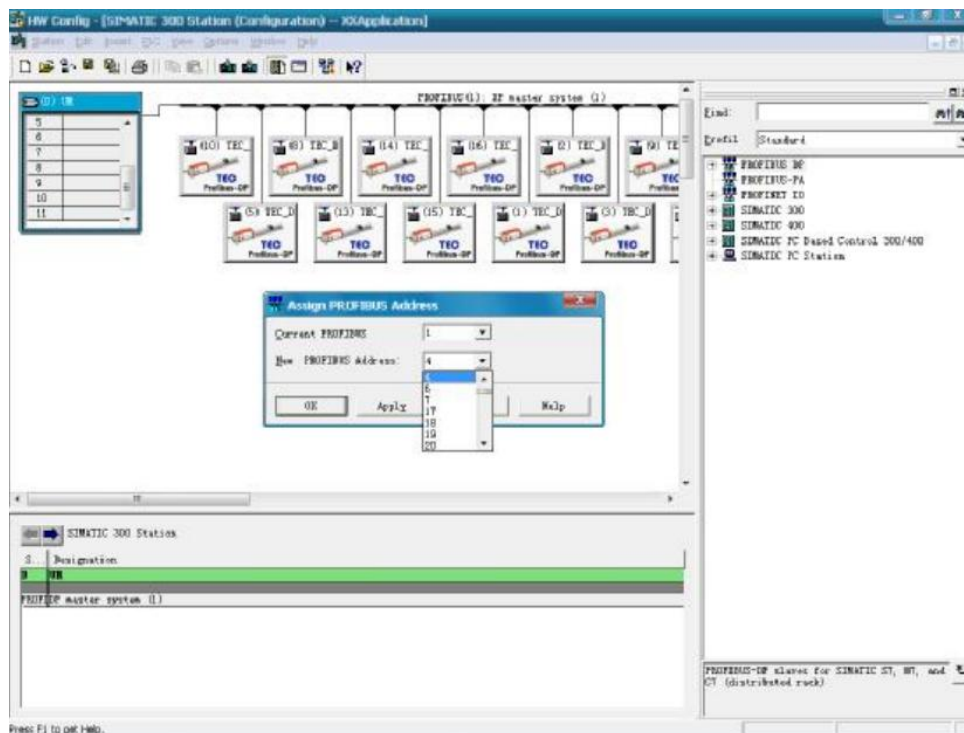


Figure 20

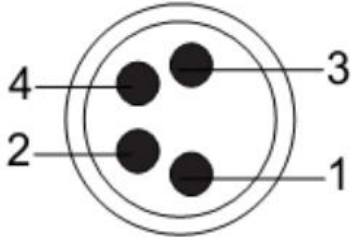
(3) After the modification, the attribute of "Setting PG/PC Interface" is changed back to the original CP5611 (MPI) state, and the MPI communication between STEP7 and PLC is restored.

Refer to Figure 17.

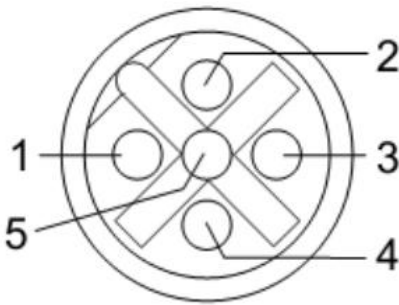
2. DP interface D53 connection mode

The connection mode between PROFIBUS bus and sensor is linear bus, with termination at both ends, with or without stub and branch (tree type).

The sensor 24VDC input interface pins are defined as follows:

Power supply connector			
Sensor connector pin arrangement		Cable	Signal
4-pin male connector M8 × 1  Sensor-oriented head	Connector pin	Line color	Power supply
	1	Brown	+24VDC (+20%、-15%)
	2	White	Don't connect
	3	Blue	0V (ground)
	4	Black	Don't connect


The sensor D53 interface pins are defined as follows:

Profibus-DP input connector			
Sensor connector pin arrangement		Cable	Signal
5-pin female connector M12 × 1  Sensor-oriented head	Connector pin	Line color	Output
	1	--	Don't connect
	2	Green	RxD/TxD-N (bus)
	3	--	Don't connect
	4	Red	RxD/TxD-P (bus)
	5	Shielded wire	Shielding

六. Precautions

Working environment temperature: 0 ~ 85°C, humidity < 95%

This manual includes precautions to be followed to protect products and connected equipment from damage.

Warning:  Live plugging and unplugging of PROFIBUS-DP cable is prohibited.