INOVANCE

MD38DP2 PROFIBUS Communication Expansion Card User Guide

Data Code: 19012442 A00

1. Preface

Thank you for using the MD380/MD500 series AC drive and the MD38DP2 expansion card from Inovance.

As a PROFIBUS DP fieldbus adapter card, the MD38DP2 expansion card meets international PROFIBUS fieldbus standards, improving the communication efficiency of the AC drive. By implementing the AC drive networking function, it enables the AC drive to be a slave controlled by the fieldbus master. Besides PROFIBUS DP communication, MD38DP2 also provides the CANlink communication interface.

This user guide is applicable to the MD38DP2 expansion card with software of version 1.09 or later. You can obtain the version by checking the relevant parameter (for example, U0-67 in the case of an MD380 series AC drive) after the card is installed and powered on.

Through appropriate DIP switch settings, the MD38DP2 expansion card can be used as MD38DP1 to communicate with the original AC drive. When it is used as MD38DP1, the original GSD file (MD38PFS2.GSD) and setting method are used. This user guide mainly describes the functions of MD38DP2. If the functions of MD38DP1 are required, see "Description of the DIP Switch" for details about the DIP switch and setting of Fd-00 on the AC drive and see the MD380 Series PROFIBUS User Guide for other information.

In this user guide, the MD380 series AC drive is used as an example. If you need to use the MD38DP2 expansion card on other AC drives, contact our technical engineers to check applicability and obtain corresponding information.

Difference between MD38DP2 and MD38DP1:

Type	MD38DP2	MD38DP1
Diagnosis	Supported	Not supported
DPV1	Supported	Not supported
PPO4	Supported	Not supported
PPO type selection	Set by the Siemens software tool	Set by Fd-05, which must be consistent with that set by the software tool
PZD mapping address	Set by the Siemens software tool	Manually set by group FE on the AC drive
Device ID settings	1 to 125, set by the DIP switch	1 to 63, set by the DIP switch; or 1 to 125, set by Fd-02 when the DIP switch is set to 0
Master disconnection	AC drive informed by the expansion card	Detected through Fd-04 settings
Communication rate between the expansion card and the AC drive	Constant rate	Set by Fd-00, which must be consistent with the DIP switch settings
Slave fault	Master informed by the expansion card	The master detects faults through PZD1 without obtaining specific fault information. When the communication between the expansion card and the AC drive is interrupted, the master cannot detect faults.

2. Installation and Wiring

The MD38DP2 card is designed to be embedded in the MD 380 series AC drive. Before installation, cut off the power supply of the AC drive and wait for about 10 minutes until the charging indicator of the AC drive becomes off. Then, insert the MD38DP2 card into the AC drive and fasten the screw to protect the signal socket between boards from damage caused by external signal cable tension.

2.1 Hardware Layout

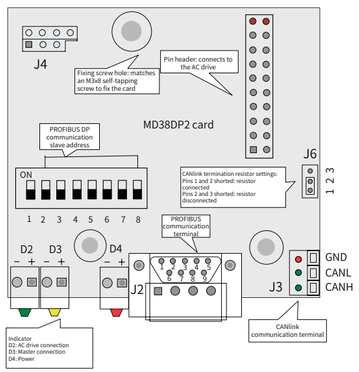
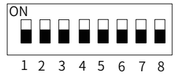


Figure 1: Hardware layout of MD38DP2

2.2 Description of the DIP Switch



MD38DP2:

Switch	Function	Description
1	PROFIBUS DP card type switchover	OFF: MD38DP2 (default) ON: MD38DP1
2 to 8	PROFIBUS DP communication slave address	The seven switches of the binary DIP switch can set the addresses of stations 1 to 125. Example: Address — DIP Switch Settings (Switch 8 as the least significant bit) 1 — 000 0001 7 — 000 0111 20 — 001 0100 125 — 111 1101

Note: The change of Switch 1 takes effect upon the next power-on. The change of slave addresses takes effect immediately after setting.

MD38DP1:

Switch	Function	Description
1	PROFIBUS DP card type switchover	OFF: MD38DP2 (default) ON: MD38DP1
2	Reserved	Reserved
3 to 8	PROFIBUS DP communication slave address	The six switches (switches 3 to 8) of the binary DIP switch can set the addresses of stations 0 to 63. (Switch 8 is the least significant bit.) Example: Settings of Switches 3 to 8 — Local Address 00 0000 — Set by Fd-02 00 0111 — 07 01 0100 — 20 (Note: When the DIP switch is set to 0, the local address is set by Fd-02 of the MD380 series AC drive.)

This type of MD38DP1 expansion card can only communicate with the AC drive at the communication rate of 115.2 kbps (that is, the tens position of Fd-00 must be set to 0). When MD38DP1 is used, the expansion card version cannot be viewed. The change of Switch 1 takes effect upon the next power-on of the AC drive. Other information about MD38DP1 is consistent with that of the earlier version of MD380DP expansion card.

2.3 Interface Description

☞ Standard 9-pin PROFIBUS interface

MD38DP2 is connected to the PROFIBUS master using the standard DB9 socket. The pin assignment and pin arrangement of the standard DB9 socket are the same as those of Siemens' DB9 socket, as shown in the figure below.

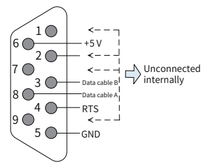


Figure 2: DB9 interface pins

☞ Functions of control terminals

Type	Terminal Mark	Terminal Name	Function Description
PROFIBUS communication terminal (J2)	1, 2, 7, and 9	NC	Unconnected internally
	3	Data cable B	Positive terminal of the data cable
	4	RTS	Request transmit signal
	5	GND	Isolated 5 V power ground
	6	+5V	Isolated 5 V power supply
	8	Data cable A	Negative terminal of the data cable
CANlink communication terminal (J3, J9)	CANH	Positive CAN input	Positive terminal of the data cable
	CANL	Negative CAN input	Negative terminal of the data cable
	GND	Power ground	Isolated 5 V power ground
Programming	SW1	Programming	Interface for production and commissioning. Do not use it.
Jumper	J6	CANlink termination resistor selection	Pins 1 and 2 shorted: resistor connected Pins 2 and 3 shorted: resistor disconnected

Type	Terminal Mark	Terminal Name	Function Description
Indicator*	D4 (red)	Power indicator	Steady ON: The AC drive is powered on. OFF: The AC drive is not energized or the PROFIBUS DP card is not installed properly.
	D3 (yellow)	Indicator of communication between the PROFIBUS DP card and the master	Steady ON: Communication between the PROFIBUS DP card and the PROFIBUS master is normal. OFF: There is no communication between the PROFIBUS DP card and the PROFIBUS master (check the connection of PROFIBUS cables and the device ID settings). Blinking: The master is not running or a fault occurs in communication between the PROFIBUS DP card and the master.
	D2 (green)	Indicator of communication between the PROFIBUS DP card and the AC drive	Steady ON: Communication between the PROFIBUS DP card and the AC drive is normal. OFF: Communication between the PROFIBUS DP card and the AC drive fails. (F0-28 is not set to 1 or the AC drive does not support the MD38DP2 expansion card.) Blinking: Interference exists in communication between the PROFIBUS DP card and the AC drive or the expansion card address is beyond the range of 1 to 125.

Note*: The correspondence between indicator colors and terminal codes may vary on some products. In this case, use the terminal codes, which are D2, D3, and D4 from left to right, as the standard. See Figure 1 for details.

3. Communication Parameters

After installing the MD38DP2 card on the MD380 series AC drive, complete communication configuration to enable the communication between them.

3.1 Communication Card Type Settings for the AC Drive

Set F0-28 to 1 to select PROFIBUS DP as the serial communication protocol, as described in the following table.

Param. No.	Param. Name	Value Range	Value	Meaning
F0-28	Serial communication protocol	0: Modbus protocol 1: Communication card network bridge protocol	1	Selects the special communication card network bridge as the serial communication protocol

3.2 Control Parameters in Communication

The following table lists the major parameters related to communication control. For details on other parameters, see the MD380/MD500 Series AC Drive User Guide.

Param. No.	Param. Name	Value Range	Hexadecimal Address	Decimal Address
U3-16	Frequency reference	–Maximum frequency to +Maximum frequency Unit: 0.01 Hz	H7310	29456
U3-17	Control command	0001: Forward running 0002: Reverse running 0003: Forward jog 0004: Reverse jog 0005: Coast to stop 0006: Decelerate to stop 0007: Fault reset	H7311	29457
U3-18	DO control	Bit 0: DO1 output control Bit 1: DO2 output control Bit 2: RELAY1 output control Bit 3: RELAY2 output control Bit 4: FMR output control Bit 5: VDO1 Bit 6: VDO2 Bit 7: VDO3 Bit 8: VDO4 Bit 9: VDO5	H7312	29458
U3-19	AO1 control	0 to 7FFF indicate 0% to 100%.	H7313	29459
U3-20	AO2 control	0 to 7FFF indicate 0% to 100%.	H7314	29460
U3-21	FMP control	0 to 7FFF indicate 0% to 100%.	H7315	29461
U3-23	Speed control	Signed data, 1 RPM	H7317	29463

When MD38DP2 is used, the written PZD1 and PZD2 are mapped to U3-17 and U3-16 respectively by default. If any command or frequency reference fails to be written into the AC drive while PZD3 to PZD12 can be written and F0-02 and F0-03 are set to 2 and 9 respectively, check whether FE-00 and FE-01 are U3-17 and U3-16 respectively. If not, manually correct the parameter values.

Note: If the AC drive is updated from an earlier version that supports MD38DP1 to a later version that supports MD38DP2, the preceding operations must be performed or the AC drive must be reset after the update is complete.

3.3 Monitoring Parameters in Communication

Param. No.	Param. Name	Unit	Hexadecimal Address	Decimal Address
U0-00	Operation frequency (Hz)	0.01 Hz	H7000	28672
U0-01	Frequency reference (Hz)	0.01 Hz	H7001	28673
U0-02	Bus voltage (V)	0.1 V	H7002	28674
U0-03	Output voltage (V)	1 V	H7003	28675
U0-04	Output current (A)	0.01 A	H7004	28676
U0-05	Output power (kW)	0.1 kW	H7005	28677
U0-06	Output torque (%)	0.1%	H7006	28678
U0-07	DI state	1	H7007	28679
U0-08	DO state	1	H7008	28680
U0-09	AI1 voltage (V)	0.01 V	H7009	28681
U0-10	AI2 voltage (V)	0.01 V	H700A	28682
U0-11	AI3 voltage (V)	0.01 V	H700B	28683
U0-12	Count value	1	H700C	28684
U0-13	Length value	1	H700D	28685
U0-14	Load speed display	1	H700E	28686
U0-15	PID reference	1	H700F	28687
U0-16	PID feedback	1	H7010	28688
U0-17	PLC stage	1	H7011	28689
U0-18	Pulse input frequency (Hz)	0.01 kHz	H7012	28690
U0-19	Feedback speed (Hz)	0.01 Hz	H7013	28691
U0-20	Remaining running time	0.1 min	H7014	28692
U0-21	AI1 uncalibrated voltage	0.001 V	H7015	28693
U0-22	AI2 uncalibrated voltage	0.001 V	H7016	28694
U0-23	AI3 uncalibrated voltage	0.001 V	H7017	28695
U0-24	Linear speed	1 m/min	H7018	28696
U0-25	Current power-on time	1 min	H7019	28697
U0-26	Current running time	0.1 min	H701A	28698
U0-27	Pulse input frequency	1 Hz	H701B	28699
U0-28	Communication reference	0.01%	H701C	28700
U0-29	Encoder feedback speed	0.01 Hz	H701D	28701
U0-30	Main frequency X display	0.01 Hz	H701E	28702
U0-31	Auxiliary frequency Y display	0.01 Hz	H701F	28703
U0-32	Any memory address	1	H7020	28704
U0-33	Synchronous motor rotor position	0.1°	H7021	28705
U0-34	Motor temperature	1°C	H7022	28706
U0-35	Target torque (%)	0.1%	H7023	28707
U0-36	Resolver position	1	H7024	28708
U0-37	Power factor angle	0.1°	H7025	28709
U0-38	ABZ position	1	H7026	28710
U0-39	Target voltage upon V/f separation	1 V	H7027	28711
U0-40	Output voltage upon V/f separation	1 V	H7028	28712
U0-41	DI state display	1	H7029	28713
U0-42	DO state display	1	H702A	28714
U0-43	DI state display 1	1	H702B	28715
U0-44	DI state display 2	1	H702C	28716
U0-45	Fault information	1	H702D	28717
U0-58	Z signal counting	1	H703A	28730
U0-59	Frequency reference (%)	0.01%	H703B	28731
U0-60	Operation frequency (%)	0.01%	H703C	28732
U0-61	AC drive state	1	H703D	28733
U0-62	Current fault code	1	H703E	28734
U0-63	Data sent by master during point-to-point communication	0.01%	H703F	28735
U0-64	Data sent by slave during point-to-point communication	0.01%	H7040	28736
U0-65	Torque upper limit	0.1%	H7041	28737
U0-66	Expansion card model	100: CANopen 200: PROFIBUS DP 300: CANlink	H7042	28738
U0-67	Expansion card version	1	H7043	28739
U0-68	AC drive state	1	H7044	28740
U0-69	Operation frequency (Hz)	0.01 Hz	H7045	28741
U0-70	Motor speed	1 RPM	H7046	28742
U0-71	Output current	0.1 A	H7047	28743

When MD38DP2 is used, the read PZD1 and PZD2 are mapped to U0-68 and U0-69 respectively by default. If any state or operation frequency fails to be read while PZD3 to PZD12 can be read, check whether FE-20 and FE-21 are U0-68 and U0-69 respectively. If not, manually correct the parameter values.

Note: If the AC drive is updated from an earlier version that supports MD38DP1 to a later version that supports MD38DP2, the preceding operations must be performed or the AC drive must be reset after the update is complete.

4. Communication Examples

After enabling communication between the PROFIBUS DP card and the MD380 series AC drive, enable communication between the PROFIBUS DP card and the PROFIBUS master by connecting the master and configuring related parameters. In this way, AC drive networking is implemented.

4.1 Connection Between the PROFIBUS DP Card and the PROFIBUS Master Station

The following figure shows the connection between the PROFIBUS DP card and the PROFIBUS master.

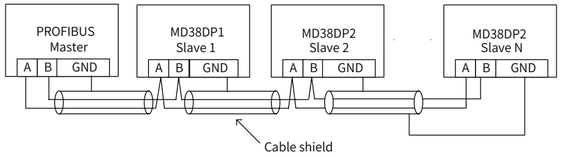
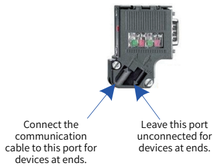


Figure 3: Connection between the PROFIBUS DP card and the PROFIBUS master

Connect termination resistors at both ends of the PROFIBUS bus by setting the DIP switches accordingly. If the termination resistors are connected correctly, the resistance between A1 and B1 should be about 110 Ω when power is off. For the first and last devices on the PROFIBUS bus, connect their communication cables to the ports marked with "IN" (namely, the ports corresponding to A1/B1) on the PROFIBUS DP connectors. Otherwise, termination resistors cannot be connected to the bus. The absence of either required termination resistor will compromise the communication quality and stability.



The length of the communication cable between the PROFIBUS DP card and the PROFIBUS master is dependent on the baud rate settings of the master. Restrict the length of communication cables in strict accordance with Siemens DB9 wiring standard. The following table lists limits of communication cable length based on baud rate.

Baud Rate (kbps)	Maximum Length of Cable Type A (m)	Maximum Length of Cable Type B (m)
9.6	1200	1200
19.2	1200	1200
187.5	600	600
500	200	200
1500	100	70
3000	100	Not supported
6000	100	
12000	100	

The following table lists the technical data of the cables.

Cable Parameter	Type A	Type B
Impedance	135 Ω to 165 Ω (f = 3 MHz to 20 MHz)	100 Ω to 130 Ω (f > 100 kHz)
Capacitor	< 30 pF/m	< 60 pF/m
Resistor	< 110 Ω/km	Not specified
Cross-sectional area of conductor	⩾ 0.34 mm^2	⩾ 0.22 mm^2

4.2 Communication Settings for the PROFIBUS DP Card and PROFIBUS Master Station

4.2.1 Data Transmission Format

In the PROFIdrive protocol, the Parameter Process Data Object (PPO) is used as the data transmission format. PDO includes the PPO1, PPO2, PPO3, PPO4, and PPO5 formats. The MD38DP2 card supports all the five PPO data formats.

The following table lists the functions supported by each data format.

Data Format	Supported Function
PPO1	Operation on a single function parameter Setting of AC drive command and frequency Reading of AC drive state and operation frequency
PPO2	Operation on a single function parameter Setting of AC drive command and frequency Reading of AC drive state and operation frequency Cyclic writing of 4 function parameters Cyclic reading of 4 function parameters
PPO3	Setting of AC drive command and frequency Reading of AC drive state and operation frequency

Data Format	Supported Function
PPO4	Setting of AC drive command and frequency Reading of AC drive state and operation frequency Cyclic writing of 4 function parameters Cyclic reading of 4 function parameters
PPO5	Operation on a single function parameter Setting of AC drive command and frequency Reading of AC drive state and operation frequency Cyclic writing of 10 function parameters Cyclic reading of 10 function parameters

Data blocks of the PPO data are divided into two areas, PKW area (parameter value) and PZD area (process data). The following figure shows the structure of each PPO data format supported by MD38DP2.

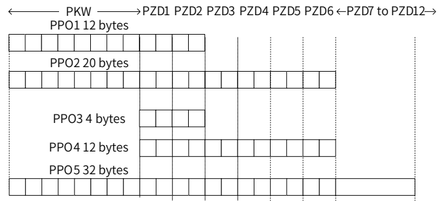


Figure 4: PPO data formats

4.2.2 PKW Data Description

The PKW area enables the master to read or write a single AC drive parameter. The communication address of the AC drive parameter is directly specified in the communication data. The PKW area is used to:

a) Read a function parameter of the AC drive.
b) Modify a function parameter of the AC drive.

☞ Data format

The PKW area consists of three parts: PKE, IND, and PWE. The PKE, IND, and PWE parts always contain two bytes, two bytes, and four bytes, respectively, as shown in the following table.

PKW Area in Master Request							
Operation Command	Parameter Address		Reserved			Write: Parameter value Read: Null	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE
PKW Area in AC Drive Response							
Operation Command	Parameter Address		Reserved			Successful: Returned value Failed: Error information	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE

☞ Data description

PKW Area in Master Request		PKW Area in AC Drive Response	
PKE	High-order 4 bits: Command code 0: No request 1: Read 2: Write (The preceding command code is in decimal format.) Low-order 4 bits: Reserved Low-order 8 bits: High-order bits of the parameter address	PKE	High-order 4 bits: Response code 0: No request 1: Operation correct 7: Cannot execute Low-order 8 bits: High-order bits of the parameter address
IND	High-order 8 bits: Low-order bits of the parameter address Low-order 8 bits: Reserved	IND	High-order 8 bits: Low-order bits of the parameter address Low-order 8 bits: Reserved
PWE	High-order 16 bits: Reserved Low-order 16 bits: Reserved (in the case of read request) or parameter value (in the case of write request)	PWE	Request successful: Parameter value Request failed: Error code (consistent with standard Modbus) 1: Invalid command 2: Invalid address 3: Invalid data 4: Other error

☞ Application example

The following figure shows the PKW area in the request and response transmitted between the master and the AC drive when the master requests to read function parameter F0-08 of the AC drive.

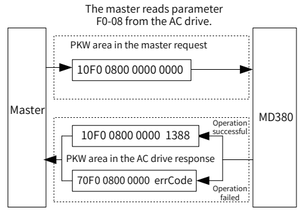


Figure 5: Example of PKW data transmitted when the master requests to read an AC drive parameter

The following figure shows the PKW area in the request and response transmitted between the master and the AC drive when the master requests to change function parameter F0-08 of the AC drive.

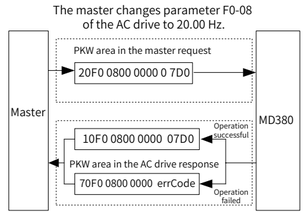


Figure 6: Example of PKW data transmitted when the master requests to write an AC drive parameter

PKW data exchange with the AC drive is performed cyclically. Continuous access to the EEPROM with the write command (PKE = 0x20xx) will significantly reduce the service life of the AC drive's main control chip. Therefore, to modify AC drive parameters, it is advisable to use the acyclic write command (SFB53, see "Acyclic Read/Write Operations") or operate the RAM addresses in PKW. The following table lists the RAM addresses of the parameters.

Parameter Group	Address
F0 to FF	0x00 to 0x0F
A0 to AF	0x40 to 0x4F

For example, the RAM address of F0-10 is 0x000A.

4.2.3 PZD Area

The PZD area enables the master to modify or read AC drive data in real time and exchange data with the AC drive cyclically. The data communication addresses are directly configured by the AC drive. The PZD area is used to:

a) Set the AC drive control command or frequency reference in real time.
b) Read the AC drive status or operation frequency in real time.
c) Exchange function parameter data and monitoring parameter data between the AC drive and the PROFIBUS master in real time.

PZD is used for the following cyclic data exchange between the master and the AC drive.

PZD Area in Master Request		
AC Drive Command	AC Drive Frequency Reference	Real-Time Modification of AC Drive Function Parameters
PZD1	PZD2	PZD3 to PZD12
PZD Area in AC Drive Response		
AC Drive Command	AC Drive Operation Frequency	Real-Time Reading of AC Drive Function Parameters
PZD1	PZD2	PZD3 to PZD12

☞ Master request

PZD Area in Master Request		
PZD1	AC drive command word (valid when the command source is set to communication)	
	0: No command	04: Reverse jog
	01: Forward running	05: Coast to stop
	02: Reverse running	06: Decelerate to stop
	03: Forward jog	07: Fault reset
PZD2	Specifies the AC drive frequency reference (valid when the frequency reference source is set to communication; the value unit is determined by the AC drive and Hz is used as an example here). The frequency reference range is 0 to F0-10. When F0-22 is set to 1, the frequency range is 0.0 Hz to 3200.0 Hz. When F0-22 is set to 2, the frequency range is 0.00 Hz to 320.00 Hz. When the specified frequency reference exceeds F0-10, the AC drive does not respond to the frequency reference.	

PZD3 to PZD12	Specifies parameter values (group F and group A) to be modified in real time. The modification is not written to EEPROM. FE-02 to FE-11 correspond to PZD3 to PZD12. For the configuration, see PZD data configuration.

☞ AC drive response

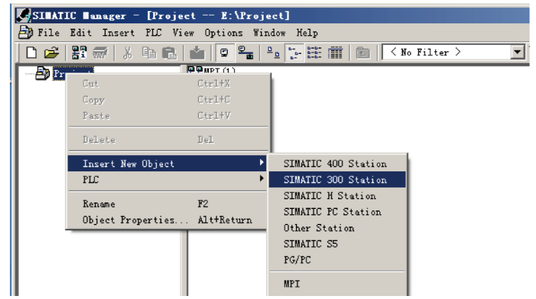
PZD Area in AC Drive Response	
PZD1	AC drive operation status AC drive operation status is indicated by bits, as follows: Bit 0: 0 = AC drive stopped; 1 = AC drive running Bit 1: 0 = Forward running; 1 = Reverse running Bit 2: 0 = No fault; 1 = AC drive fault Bit 3: 0 = Operation frequency not reached; 1 = Operation frequency reached
PZD2	Indicates the AC drive operation frequency: The current AC drive operation frequency is indicated by 16-bit signed data in the response. When F0-22 is set to 1, –32000 to +32000 correspond to the actual operation frequency –3200.0 Hz to +3200.0 Hz. When F0-22 is set to 2, –32000 to +32000 correspond to the actual operation frequency -320.00 Hz to +320.00 Hz.
PZD3 to PZD12	Indicates function parameter values (group F and group A) and monitoring parameter values (group U) read in real time. The addresses of the read function parameters are specified by FE-22 to FE-31. FE-22 to FE-31 correspond to PZD3 to PZD12. For the configuration, see PZD data configuration.

For the definition of PZD data for other types of AC drives, see the corresponding user guides.

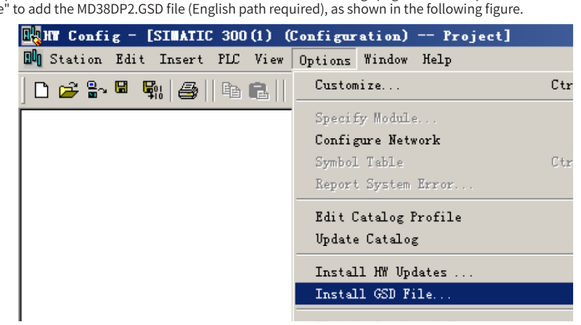
4.3 Configuring a Slave on the S7-300 Master in STEP 7 V5.4

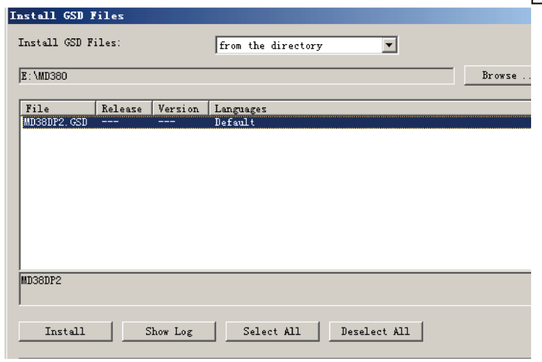
Before using the PROFIBUS master, you need to configure the General Station Description (GSD) file of the slave to add the slave device to the system of the master. If the GSD file is already configured, skip step 2. You can obtain the GSD file from Inovance or its agent. The steps are as follows.

Step 1: Open STEP 7, create a project, and add the S7-300 master to the project, as shown in the following figure.

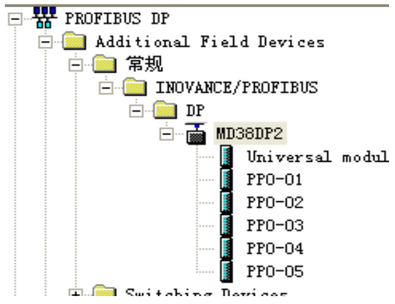


Step 2: Double-click the Hardware icon to access the "HW Config" page. Choose "Options" > "Install GSD file" to add the MD38DP2.GSD file (English path required), as shown in the following figure.

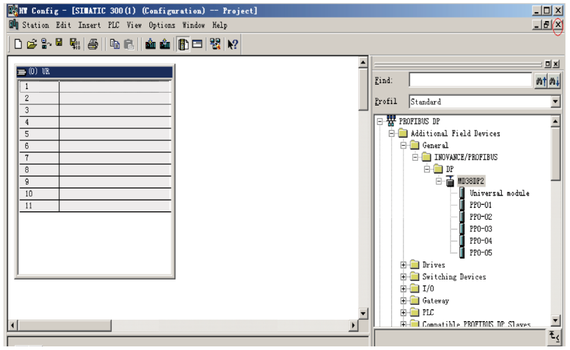




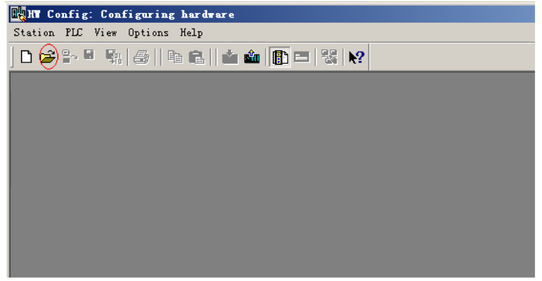
Click "Install". After the installation is completed, the PROFIBUS DP module named "MD38DP2" is displayed in the list, as shown in the following figure.



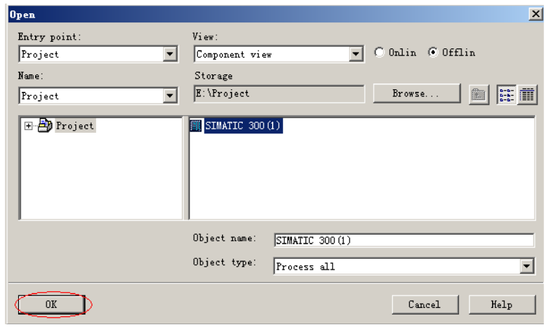
Note: If any master or slave already exists on the "HW Config" page, close the current page by clicking the Close button (marked with a red circle in the following figure) before importing the GSD file.



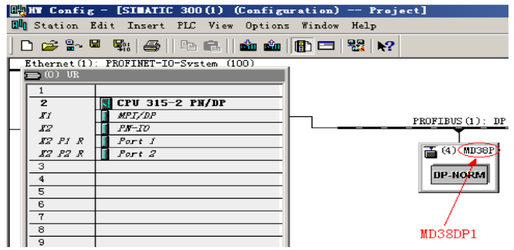
In this case, you can save the original project. If a warning indicating that system data cannot be created is displayed, click "OK". After closing the current configuration page, you can install the GSD file by following the preceding steps. After the installation is completed, click the Open button, as shown in the following figure.



Select the original configuration project, and click "OK" to open it.

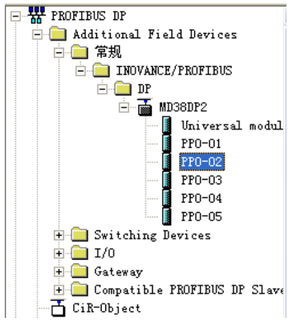


Step 3: Configure the actual hardware system, as shown in the following figure.



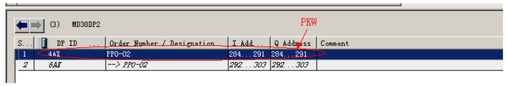
In the preceding figure, 4 is MD38DP1, which is only used as an example. For details about its usage, see the MD380 Series PROFIBUS User Guide. MD38DP1 and MD38DP2 cards can exist on the same network.

Step 4: Configure data properties of the slave.



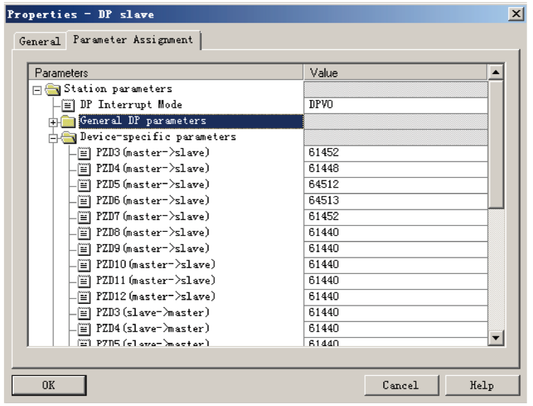
After the PPO type is added, the address assigned by the PLC to the slave is displayed, as shown in the following figure. Slot 1 marked with a red circle in the following figure indicates the PKW address (8 bytes). Slot 2 indicates the PZD address (12 bytes).

If the selected PPO type does not have a PKW area, the I address and Q address of slot 1 are blank.



Step 5: Configure PZD.

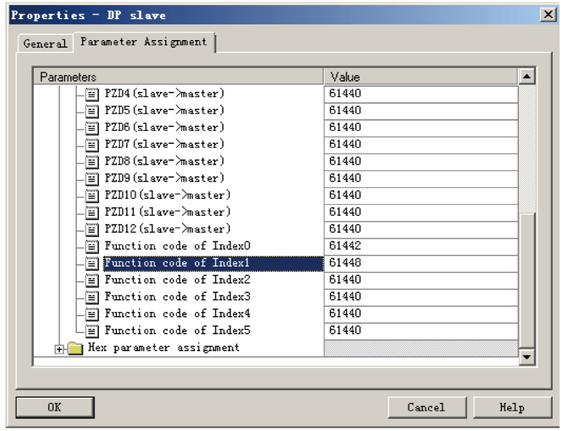
PZD1 and PZD2 configurations are preset and cannot be modified by users. PZD3 to PZD12 are intended for cyclic data exchange. They can be set by users in hardware configuration. Double-click the MD38DP icon in "HW Config", click "Device-specific parameters", and configure corresponding parameter addresses as required.



"PZDx(master->slave)" indicates the address used by the master to write data to the slave. "PZDx(slave->master)" indicates the address used by the master to read the slave. PZD3 to PZD12 are displayed in decimal and can be modified. For example, to set "PZD3(master->slaver)" to F0-12, enter "61452".

By default, all PZDs of MD380 are set to F0-00 (61440 in decimal). For unused PZDs, modification is not required and default values can be retained. Every slave must be configured with its own PZD mapping relations. (If multiple slaves use the same mapping relations, you can set them with the clipboard function. Specifically, select a configured slave, press Ctrl+C, select the PROFIBUS DP bus in the configuration, press Ctrl+V, and modify the device ID).

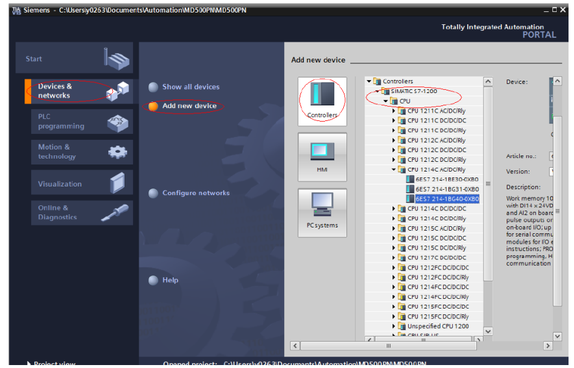
To enable the acyclic parameter read and write function of DPV1, set relevant parameters in user-definable indexes at the end of the device-specific parameter list. MD380 provides six user-definable indexes numbered from 0 to 5, as shown in the following figure. For example, you can set index 0 to F0-02 and index 1 to F0-08.



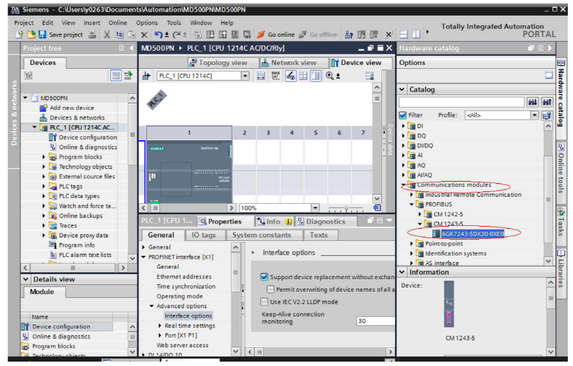
After the preceding steps, the PROFIBUS slave is configured. Now, you can compile programs on the S7-300 master to control the AC drive.

4.4 Configuring a Slave on the S7-1200 Master in TIA Portal V13

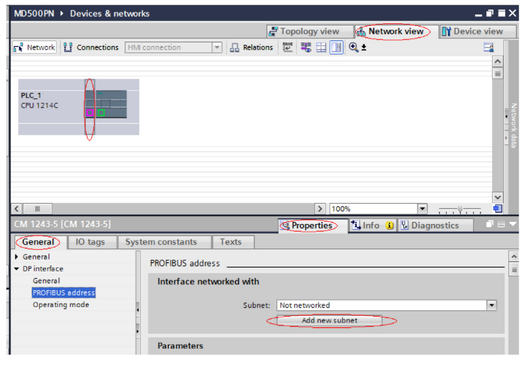
Step 1: Open TIA Portal V13, create a project, and add an S7-1200 master based on the actual situations.



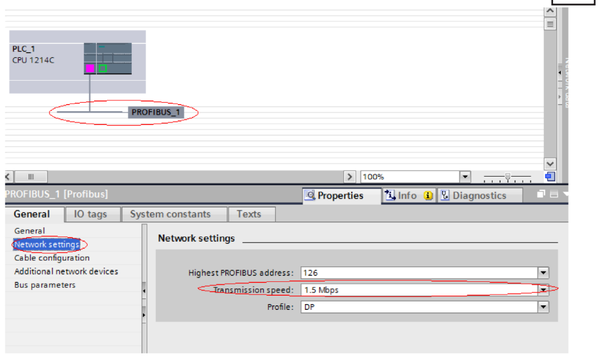
The S7-1200 CPU does not have a PROFIBUS interface, so you need to add a PROFIBUS communication module first. In this example, a CM1243-5 master module is added.



After adding the PROFIBUS master module, click "Network view". Select the communication module. Choose "Properties" > "General" > "New subnet" to create a PROFIBUS network. You can also modify the master device ID on this page.

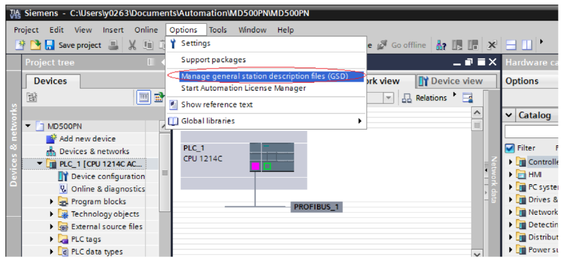


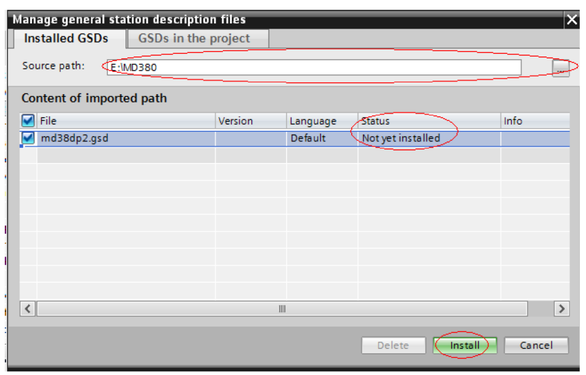
To modify the PROFIBUS baud rate, click "Network view", and choose "Properties" > "General" > "Network settings". Click the "Transmission speed" drop-down list to select a baud rate.



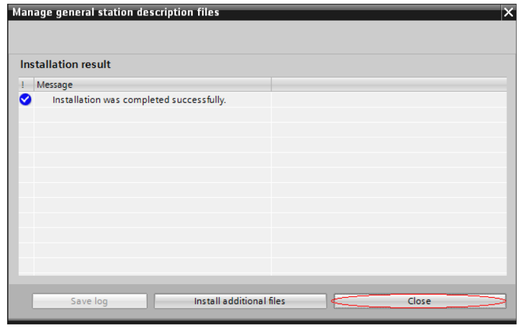
Step 2: Install the GSD file. Skip this step if the GSD file has been installed.

If the GSD file is not installed yet, "Not yet installed" is displayed in the "Status" column. Select the GSD file and click "Install". (Note that an error will occur if the installation path contains any Chinese character.)

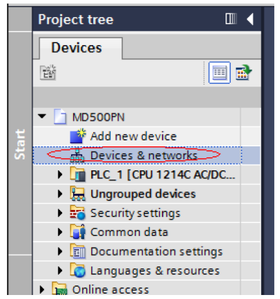




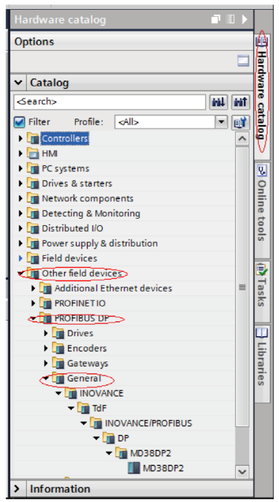
When the following interface is displayed, the installation is completed. Click "Close".



During installation of the GSD file, the PORTAL automatically closes the configuration page. After the installation is completed, double-click "Devices & networks" in the "Start" pane on the left to open the original configuration page.

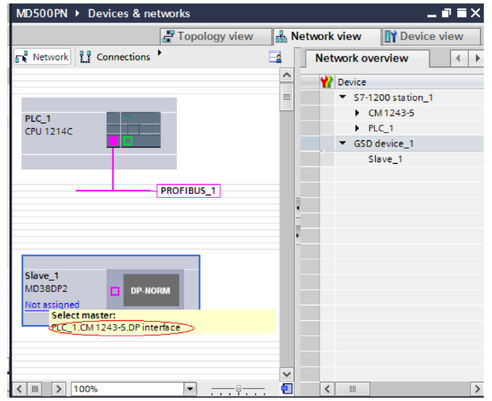


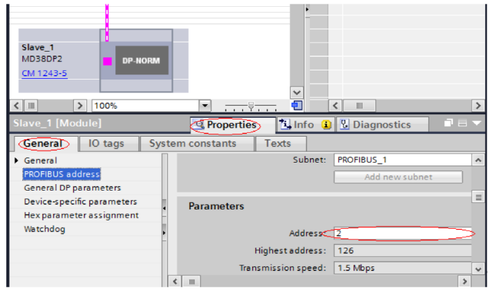
Similar to STEP 7, choose "Hardware catalog" > "Other field devices" > "PROFIBUS DP" > "General", and you will find MD38DP2 in the list, as shown in the following figure.



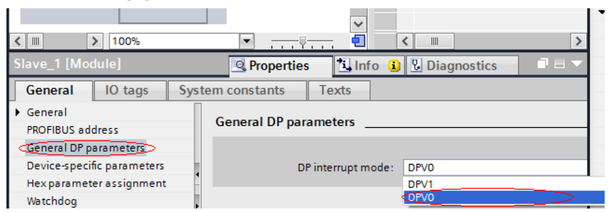
Step 3: Start the configuration.

On the "Hardware catalog" tab page, double-click "MD38DP2" or drag it to "Network view" under "Devices & networks". Click "Not assigned" below the slave name to select the corresponding PROFIBUS network. Select the slave, choose "Properties" > "General", and set the slave device ID. Note that the settings must be consistent with that set by the DIP switch on the MD38DP2 expansion card.

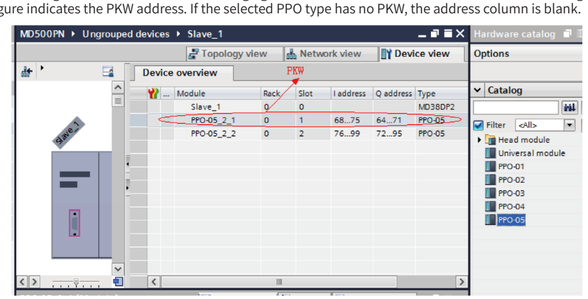




Click "General DP parameters" and set "DP interrupt mode" to "DPV0" by using the drop-down list, as shown in the following figure.

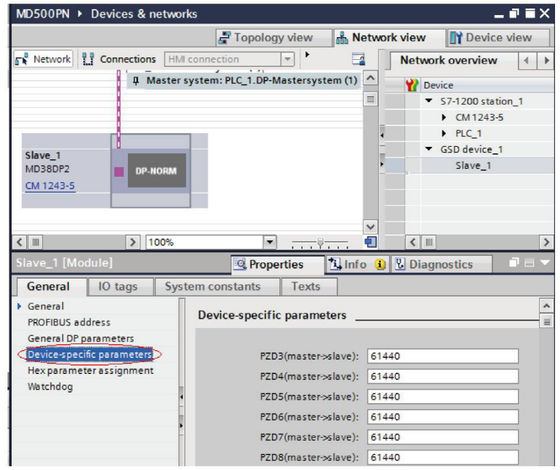


Click "Device view". Select a suitable PPO type under "Hardware catalog". Check the addresses assigned for each segment, as shown in the following figure. The row marked with a red circle in the following figure indicates the PKW address. If the selected PPO type has no PKW, the address column is blank.



Step 4: Set the PZD mapping.

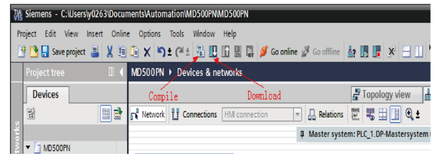
Click "Network view". Click "Device-specific parameters" to set the mapping relations of PZD3 to PZD12. The PZD mapping relations for the PLC to read and write the slave must be set separately. For details, see "Configuring a Slave on the S7-300 Master in STEP 7 V5.4".



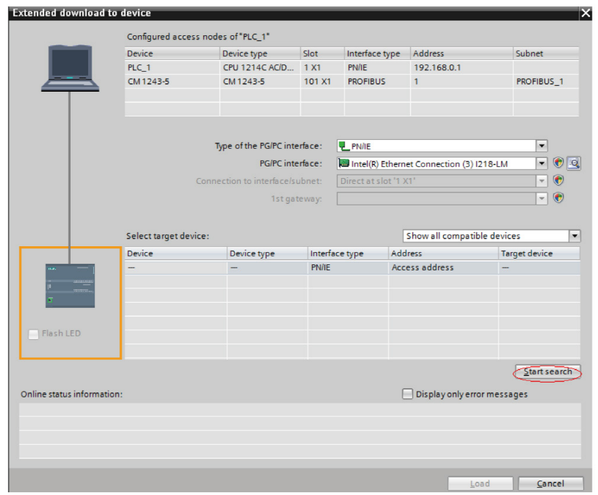
Step 5: Compile and download the configuration.

If the settings of multiple slaves are the same, select a configured slave, press Ctrl+C and then Ctrl+V (or right-click the configured slave and choose "Copy" and then "Paste") to connect more slaves to the network, and then modify their device IDs.

After every required slave is configured, save the configuration and click the Compile button. After the compiling is completed successfully, click the Download button.

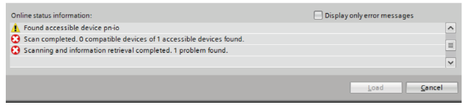


On the displayed page, set the interface for the PC to communicate with the PLC. In this example, a local network port is selected. Then, click "Start search" to search for the PLC.



If no accessible device is found, the connection between the PC and PLC is faulty. Eliminate the fault

first. (This problem also occurs if the PC downloaded configurations through Ethernet in STEP 7 before. In this case, restart the PC or change the PG/PC interface to a non-Ethernet interface in STEP 7.)



If the connection is normal, the "Load" button is available. You can click "Load" to download the configuration to the PLC as prompted.

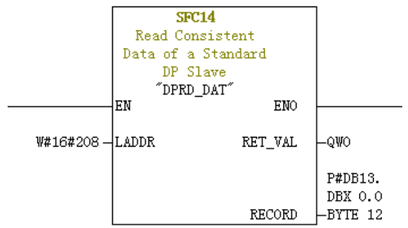
4.5 Cyclic Read/Write Operations on the AC Drive Slave

In this example, the PLC is S7 315-2PN/DP, and the following figure shows the address assignment.

1) Directly use the MOVE command to enable the AC drive to run in the forward direction at the target frequency of 30 Hz (F0-02 = 2, F0-03 = 9), as shown in the following figure.

The operations for writing other data are similar. The read data can be transmitted from the PIW register to the common Q, I, L, M, or D register using the MOVE command and then be parsed.

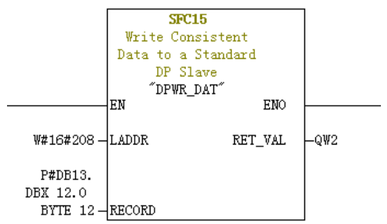
2) Use SFC14 and SFC15.



LADDR: Start address configured in the I block of the module, which must be in hexadecimal format.

RET_VAL: Return value. If an error occurs during function activation, the return value contains an error code. If no error occurs, 0 is returned.

RECORD: Target area of the read user data. Its length must be consistent with the length of the module configuration selected in STEP 7. Only the byte data type is allowed.



LADDR: Start address configured in the Q block of the module, which must be in hexadecimal format.

RET_VAL: Return value. If an error occurs during function activation, the return value contains an error code. If no error occurs, 0 is returned.

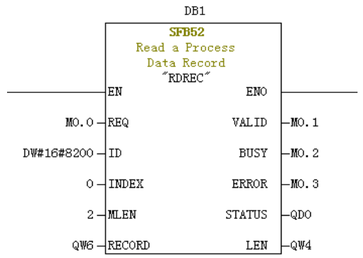
RECORD: Source area of the user data to be written. Its length must be consistent with the length of the module configuration selected in STEP 7. Only the byte data type is allowed.

For both SFC14 and SFC15, the addresses must be in hexadecimal format converted from the I and Q start addresses (in this example, the address is 520, which is H208 in hexadecimal format). The length of RECORD must be consistent with the BYTE length of the PPO type PZD (in this example, PPO2 is used,

which includes six PZDs, that is, a total of 12 bytes).

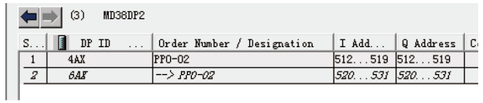
4.6 Acyclic Read/Write Operations on the AC Drive Slave

To perform acyclic read and write operations on an AC drive as a PROFIBUS DP slave, you need Siemens system function blocks SFB52 (read) and SFB53 (write). Create an organization block in the program, and add relevant function blocks and programs in the organization block.



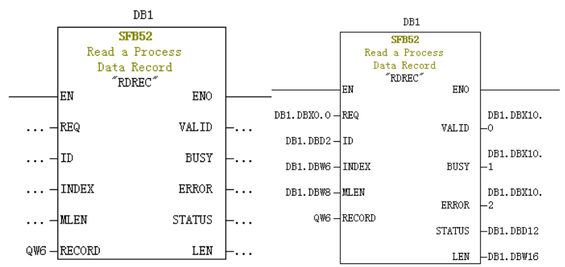
After M0.0 is set, the function block reads F0-02 (Index 0 has been set to F0-02 before) of the AC drive No. 3 and saves it in QW6. The fields are defined as follows:

- REQ: Command enable. When this bit is set to 1, the function block is enabled.
- ID: Logic address. To specify this field, convert any Q address of the corresponding AC drive slave to a hexadecimal value, and set bit 15 of the value to 1. For example, convert Q512 to a hexadecimal value, H200. Then, set bit 15 to 1 and you can obtain H8200.



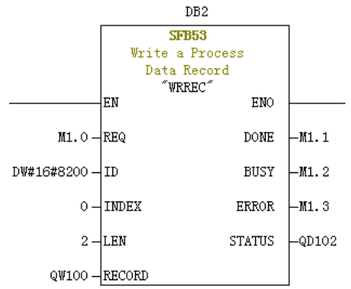
- INDEX: Index number. The value range is 0 to 5. This field can be customized to an index mapping address of a slave as needed.
- MLEN: Maximum length of the data to be obtained. For MD38DP2, this field must be set to 2.
- RECORD: Target area of the obtained data record. This field is used to store read data when the read operation is performed and sent data when the write operation is performed.
- VALID: The new data record is received and valid.
- BUSY: When the value is ON, the operation is not completed.
- ERROR: Error flag. When the value is ON, an error has occurred.
- STATUS: Block status or error information.
- LEN: Length of the obtained data record.

When you call this block, you can use customized parameters or some or all default parameters, as shown below.



In the left figure, default parameters are used, which is equivalent to the parameter settings shown in the right figure. You can set customized or default parameters for corresponding blocks as required.

Acyclic write operations are similar to acyclic read operations, while the RECORD field stores data to be written, as shown below.



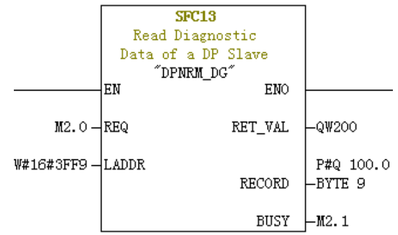
Note that before running an organization block, you need to download data blocks (above the function block, DB1 and DB2 in this example) to the PLC. Otherwise, an error indicating that the DB blocks are not loaded will be reported.

SFB53 is used to perform operations on the EEPROM. Therefore, the program is required to invoke relevant operations when required and disable relevant operations in time. As shown in the following figure, after the write operation is complete (M1.1 is set to 1), the program is invoked to reset M1.0.

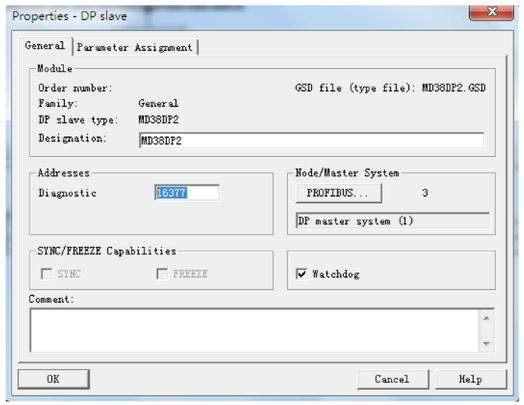
When SFB52 and SFB53 are executed, relevant blocks need to be invoked for multiple times. Therefore, do not invoke them when single execution is required.

4.7 Diagnosis

You can use SFC13 in the program to read diagnosis data of a slave, as shown in the following figure.



- REQ: Command enable. When this field is set to ON, diagnosis data reading is enabled.
- LADDR: Configured diagnosis address of the PROFIBUS DP slave. The following figure shows the actual value. For SFC13, the address must be specified in hexadecimal.



- RET_VAL: Error code (negative) when a call error occurs, or actual length of transmitted data (positive) when no error occurs.
- RECORD: Target area of the read diagnosis data. The value type must be BYTE and the length must be nine bytes. Otherwise, an error is reported during the call. The nine bytes are defined as follows:

Byte 0 to byte 2: Device status

Byte 3: Master device ID

Byte 4: Supplier ID (high-order byte)

Byte 5: Supplier ID (low-order byte)

Byte 6: Device-specific diagnosis length (constantly 3)

Byte 7: High-order byte of device-specific diagnosis

Byte 8: Low-order byte of device-specific diagnosis

- BUSY: When this field is 1, reading is not completed.

Device-specific diagnosis provides relevant AC drive fault information, which is consistent with the value of U0-62. When the communication between the PROFIBUS DP expansion card and AC drive is interrupted, 0x34 is returned.

5. Troubleshooting

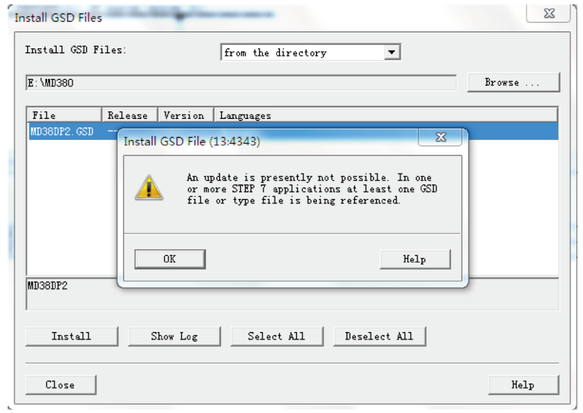
5.1 PROFIBUS DP Card Indicator Status and Troubleshooting

Indicator*	Fault Status	Fault Description	Solution
Red (D4)	OFF	The PROFIBUS DP card is not powered on.	Check that the PROFIBUS DP card is securely connected to the AC drive.
Green (D2)	OFF	The connection between the PROFIBUS DP card and the AC drive failed.	Check that F0-28 is set to 1 and the connection between the PROFIBUS DP expansion card and the AC drive is secure.
Green (D2)	Blinking at 1 Hz	The connection between the PROFIBUS DP card and the AC drive is not successful.	Check that the PROFIBUS DP device ID is within the range of 1 to 125.
Yellow (D3)	Blinking at 1 Hz	Configuration error	Check that the GSD file is correct.
Yellow (D3)	Blinking at 2 Hz	Parameter error	Go to the page of device-specific parameters and check that all the parameter addresses are supported by the AC drive.
Yellow (D3)	Blinking at 5 Hz	The master is not running.	Check the master status.
Yellow (D3)	OFF	The connection between the PROFIBUS DP card and the PROFIBUS master is not successful.	Check that the slave address is correct and the PROFIBUS cable is connected properly.

Note*: The correspondence between indicator colors and terminal codes may vary on some products. In this case, use the terminal codes, which are D2, D3, and D4 from left to right, as the standard. See Figure 1 for details.

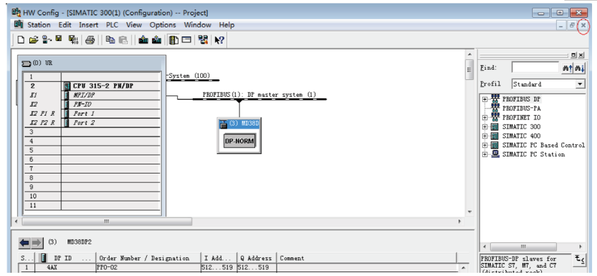
5.2 Troubleshooting for GSD Installation Failure

☞ Problem 1: The GSD file cannot be installed or updated when STEP 7 is used, as shown in the following figure.

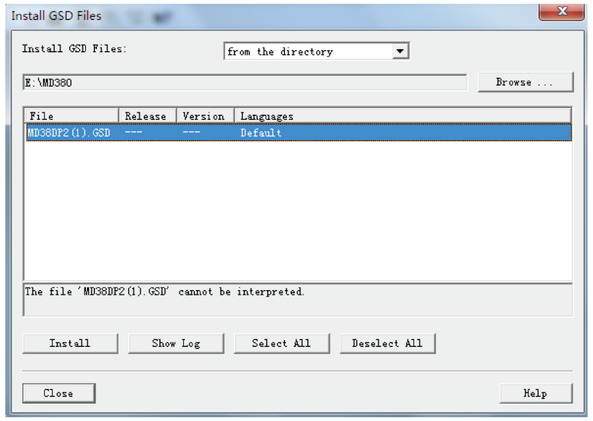


Possible cause: The current hardware configuration page has been opened and the GSD file is being used by other components.

Solution: Close the current configuration page by clicking the Close button (marked with a red circle in the following figure). Then, install or update the GSD file and open the configuration page again.



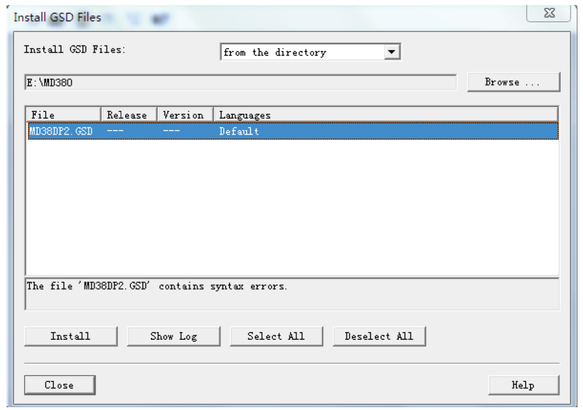
☞ Problem 2: The file cannot be interpreted.



Possible cause: During the GSD file transmission, the file name is changed manually or by the transmission tool. In this case, the file name fails to meet the PROFIBUS requirements.

Solution: Change the GSD file name to MD38DP2.GSD.

☞ Problem 3: The file contains syntax errors.



Possible cause: The GSD file is modified.

Solution: Use a correct GSD file.

☞ Other cases

Some versions of STEP 7 and PORTAL do not support a path that contains Chinese for installing the GSD file. In this case, store the GSD file in a path that does not contain Chinese characters.

5.3 Troubleshooting for Common Faults

Fault Description		Solution
After the AC drive is powered on, only the power indicator (D4) is on. This means that communication between the PROFIBUS DP card and the AC drive is not established.		1. Check that F0-28 is set to 1. 2. Check the AC drive type. This user guide only describes the usage on MD380 or MD500. For other AC drive models, contact the technical engineers to obtain the correct user guides. 3. Check whether the AC drive software supports MD38DP2.
After the AC drive is powered on, the power indicator (D4) is on and the communication indicator (D2) blinks.		Set the device ID correctly (within the range of 1 to 125). Note that Switch 8 is the least significant bit of the address.
After the connection is established, all the indicators on the PLC are green, but data cannot be written into or read from the AC drive.	Connection fails after configuration loading. After the configuration is downloaded, indicators D2 and D4 on the PROFIBUS DP card are steady on while the yellow indicator D3 is off.	1. Check if the cable is properly connected. 2. Check the DIP switches on the DP connectors. Only the DIP switches on the DP connectors of the first and last AC drives on the network must be set to ON, whereas other DIP switches must be set to OFF. 3. If the AC drive is the last device on the network, check that the communication cable is connected to the IN port of its DP connector. (If the communication cable is connected to the OUT port, the OUT terminal is not connected to the network even when the DIP switch is set to ON.) 4. Check that the device ID settings on the PROFIBUS DP card are consistent with the configuration. Note that Switch 8 is the least significant bit of the address. 5. Check that the GSD file used in the configuration is correct.
	After the configuration is downloaded, indicators D2 and D4 on the PROFIBUS DP card are steady on while the yellow indicator D3 blinks slowly at about 1 Hz to 2 Hz.	1. Check that the GSD file used is correct. 2. Check that the PZD mapping is set correctly. Device-specific parameters in STEP 7 and PORTAL must be set in decimal format. Therefore, you need to convert the parameter numbers to decimal values when setting device-specific parameters. For example, FC-11 must be expressed as 64523 in decimal (and 0xFC0B in hexadecimal). If you set a parameter number that is not supported by the AC drive, the connection will fail. Also note that PZD mapping does not support Modbus addresses, such as H2000 and H8000.
	After the configuration is downloaded, the yellow indicator D3 on the PROFIBUS DP card blinks quickly.	The PLC is not running. Check the PLC status and locate the fault cause (possibly because the OB block does not exist).
	No data can be written/read.	Check whether the operated address is correct. No matter whether the PPO type used contains the PKW area, the address for the read or write operation is in the second row (namely, the last row). For example, if the I address and Q address in the last row of the are both 520 to 531 (note that the I and Q addresses may start from different numbers), the PZD1 written into the AC drive is stored in QW520, PZD2 is stored in QW522, and so on. (If the PLC is an S7-300 or S7-400 model, PQW is required.) If SFC15 is used, check whether RET_VAL of the SFC15 block is 0. If not, an invocation error exists. Eliminate the error first and invoke the block again. For details, see "Performing Cyclic Read/Write Operations on the AC Drive Slave".
	PZD3 or subsequent data can be written, but PZD1 or PZD2 cannot be written/ read.	Check that F0-02 is set to 2 and F0-03 is set to 9. Check whether the command value (not the bit value) is in the range of 1 to 7 and the frequency reference value is in the range of –F0-10 to +F0-10. If not, the write operation will fail. Check whether FE-00 is consistent with U3-17 and FE-01 is consistent with U3-16. If not, manually correct the parameter values or reset to factory settings.
	PZD1 and PZD2 can be written/ read, while PZD3 or subsequent data cannot be written/ read.	Check whether the PPO type supports the relevant PZD fields. Check whether device-specific parameters are set correctly.
		Check the logic relations. Check whether the same PZD is assigned with values for multiple times in a certain logic relation (check whether the value given by the PLC is correct under the logic relation in the monitoring table of the PLC).
After communication is established, the AC drive reports ERR16, which cannot be cleared. However, the indicators on the DP card and the BF indicator on the PLC are normal.		In the PLC program, check whether the value converted from the high-order eight bits of PZD1 (QW data) written to the AC drive is 0. If not, change it to 0. Note that the PZD1 command in this user guide refers to a value instead of the bits. Note: This solution applies to MD380 and MD500 only. For other AC drives, consult the technical support center.
After communication is established, the communication is normal when the AC drive is not running. However, when one or more AC drives are running, the AC drive is disconnected randomly.		1. Disconnect the power supply and measure the resistance between A1 and B1 of the DP-slave connector at the farthest end with a multimeter. The resistance must be 100±20 Ω. 2. Check that the shield layers of cables are connected together and in good contact with the sheet metal in the DP connector. The shield layers are not required to connect to other GND terminals.
After the connection is established, the AC drive reports a fault. After the PLC configuration is changed and downloaded again or after the AC drive alone is powered on again, the faulty slave still cannot connect to the network.		MD38DP2 only supports the interruption mode DPV0. If the interruption mode is set to DPV1, when a slave is faulty, the PLC master may disable the DP connection channel of the slave or disable all the PLC communication (which usually occurs on an S7-1200 master). When such a problem occurs, go to the page of general DP parameters and change the DP interruption mode of the slave to DPV0 (the mode is DPV0 by default in STEP 7 and DPV1 by default in PORTAL). Then, compile and download the configuration, and power on the PLC again.

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2. Within the warranty period, a maintenance fee will be charged for damage caused by the following reasons:
   A. Improper use or repair/modification without prior permission
   B. Fire, flood, abnormal voltage, natural disasters, and secondary disasters
   C. Hardware damage caused by dropping or transportation after procurement
   D. Operations not following the user guide
   E. Factors out of the equipment (for example, external device factors)
3. If the equipment is faulty or damaged, fill in the Warranty Card correctly and in detail.
4. The maintenance fee will be charged according to the latest Maintenance Price List of Inovance.
5. The Warranty Card is not re-issuable. Keep the card well and present it to the maintenance personnel during maintenance.
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INOVANCE Warranty Card

Customer information	Company add.:	
	Company name: Post code:	Contact: Tel.:
Product information	Product model:	
	Barcode (paste the barcode here):	
	Agent:	
Fault information	(Maintenance date and description): Maintained by:	

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