INOVANCE

User Guide

MD380 Series

MD38DP2 PROFIBUS Expansion Card

19011399 A00

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Preface

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

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 station. Besides PROFIBUS-DP communication, MD38DP2 also provides the CANlink communication interface.

This user guide is applicable for the MD38DP2 expansion card with software of version 1.09 or above. (The software version can be obtained by checking the parameter value after installing the expansion card and powering it on. For the MD380 series AC drive, the software version can be obtained from U0-67.)

The MD38DP2 expansion card can be used as MD38DP1 by setting the DIP switch 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 it on other AC drives, contact our technical engineers to check whether available and obtain corresponding information.

◆ Difference between MD38DP2 and MD38DP1:

Item	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
Station number settings	Set by DIP switches 1 to 125	Set by DIP switches 1 to 63. When the DIP switch is set to 0, station numbers 1 to 125 are determined by Fd-02.
Master station disconnection	AC drive informed by the expansion card	Detected by setting Fd-04
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 station informed by the expansion card	The master station detects a fault through PZD1 without obtaining the specific fault information. When the communication between the expansion card and AC drive is interrupted, the master station fails to detect the fault.

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1 Installation and Wiring

The MD38DP2 expansion card is installed inside the MD380 series AC drive. Before installation, de-energize the AC drive and wait about 10 minutes until the charging indicator on the AC drive becomes off. Then, insert the MD38DP2 expansion card into the AC drive and fasten the screws to avoid damage caused by external signal cable tension on the signal socket between boards.

■ Hardware Layout

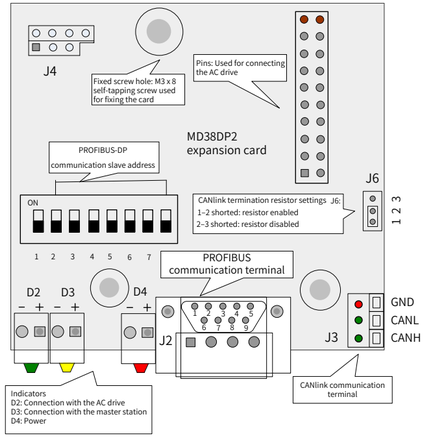
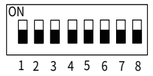


Figure 1 Hardware layout of MD38DP2

■ Description of the DIP Switch



◆ MD38DP2

Digit	Function	Description
1	PROFIBUS-DP card type switchover	OFF: MD38DP2 (default) ON: MD38DP1
2 to 8	PROFIBUS- DP communication slave address	The addresses of stations 1 to 125 can be set by the 7-digit binary DIP switch. For example: Address: DIP Switch Setting (digit 8: least significant bit) 1: 000 0001 7: 000 0111 20: 001 0100 125: 111 1101

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

◆ MD38DP1

Digit	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 addresses of stations 0 to 63 can be set by digits 3 to 8 of the 6-digit binary DIP switch. (digit 8: least significant bit) Example: DIP Switch Setting of Digits 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 on the MD380 series AC drive.)

Note: This type of MD38DP1 expansion card can only communicate with the AC drive at the communication rate of 115.2 k (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 digit 1 is valid upon the next power-on of the AC drive. Other information about MD38DP1 is consistent with that of the original MD380DP expansion card.

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■ Interface Description

◆ Description of standard 9-pin PROFIBUS interface

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

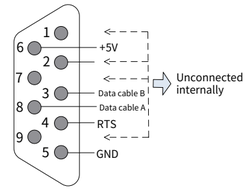

Figure 2 DB9 interface pins

◆ Function description of control terminals

Type	Terminal Symbol	Terminal Name	Function Description
PROFIBUS communication terminals (J2)	1, 2, 7, and 9	NC	Unconnected internally
	3	Data cable B	Positive pole of the data cable
	4	RTS	Request for sending signal
	5	GND	Isolated 5 V power ground
	6	+5V	Isolated 5 V power supply
	8	Data cable A	Negative pole of the data cable
CANlink communication terminals (J3, J9)	CANH	Positive CAN input	Positive pole of the data cable
	CANL	Negative CAN input	Negative pole 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 enabled Pins 2 and 3 shorted: resistor disabled
Indicators[1]	D4 (red)	Power indicator	Steady ON: The AC drive is powered on. OFF: The AC drive is disconnected from the power supply or the PROFIBUS-DP card is installed incorrectly.
	D3 (yellow)	Indicator for the communication between the PROFIBUS-DP card and the master station	Steady ON: The communication between the PROFIBUS-DP card and the PROFIBUS master station is normal. OFF: There is no communication between the PROFIBUS-DP card and the PROFIBUS master station (check the connection of PROFIBUS cables and the setting of station number). Flashing: The master does not operate or a fault occurs on communication between the PROFIBUS-DP card and the master station.
	D2 (green)	Indicator for the 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.) Flashing: Interference exists on communication between the PROFIBUS-DP card and the AC drive or the extension card address is beyond the range of 1 to 125.

[1] For some products, the indicator color may be inconsistent with the terminal symbol. In this case, the terminal symbol is preferred. The indicators are D2, D3, and D4 from left to right. See "Figure 1 Hardware layout of MD38DP2" for details.

2 Communication Parameters

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

■ Communication Card Type Setting for the AC Drive

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

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

■ Parameters Related to Communication Control

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	Setting Range	Hexadecimal Address	Decimal Address
U3-16	Frequency setting	-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	BIT0: DO1 control BIT1: DO2 control BIT2: RELAY1 output control BIT3: RELAY2 output control BIT4: FMR output control BIT5: VDO1 BIT6: VDO2 BIT7: VDO3 BIT8: VDO4 BIT9: 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 a command or frequency 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.

■ Parameters Related to Communication Monitoring

Param. No.	Param. Name	Unit	Hexadecimal Address	Decimal Address
U0-00	Running 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 voltage before correction	0.001 V	H7015	28693
U0-22	AI2 voltage before correction	0.001 V	H7016	28694
U0-23	AI3 voltage before correction	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

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Param. No.	Param. Name	Unit	Hexadecimal Address	Decimal Address
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	Rated frequency (%)	0.01%	H703B	28731
U0-60	Running 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-point communication	0.01%	H703F	28735
U0-64	Data sent by slave during point-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 number	1	H7043	28739
U0-68	AC drive state	1	H7044	28740
U0-69	Running 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 running 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.

3 Communication Examples

After enabling the communication between the PROFIBUS-DP card and MD380 series AC drive, connect the PROFIBUS master station correctly to enable the communication between the PROFIBUS-DP card and PROFIBUS master station and networking function of the AC drives.

■ Connection Between the PROFIBUS-DP Card and PROFIBUS Master Station

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

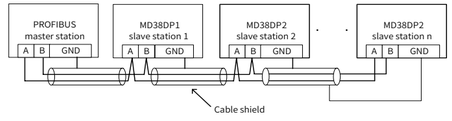
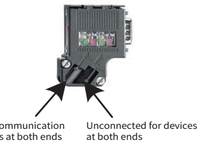


Figure 3 Connection between the PROFIBUS-DP card and PROFIBUS master station

Termination resistors must be connected at both ends of the PROFIBUS bus and DIP switches must be set correctly according to the marks of the wiring terminals. The A1/B1 resistance should be 110 Ω upon power-off after termination resistors are connected correctly. For devices connected at both ends of the PROFIBUS network, the communication cables must be connected from their PROFIBUS-DP terminals to the channels indicated by "IN" (channels corresponding to A1/B1). Otherwise,

termination resistors cannot be connected. If any required termination resistor is not connected, the communication quality will deteriorate.



Connected for communication cables of devices at both ends | Unconnected for devices at both ends

The length of the communication cable between the PROFIBUS-DP card and the PROFIBUS master station varies with different settings of the baud rate of the master station. Restrict communication cable length strictly according to the Siemens DB9 standard. The following table describes requirements on the baud rate and communication cable length.

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	135–165 Ω (f = 3–20 MHz)	100–130 Ω (f > 100 kHz)
Capacitor	< 30 pF/m	< 60 pF/m
Resistor	< 110 Ω/km	Not specified
Cross-sectional area of conductor	⩾ 0.34 mm²	⩾ 0.22 mm²

■ Communication Settings for the PROFIBUS-DP Card and PROFIBUS Master Station

◆ Data Transmission Format

In the PROFIdrive protocol, the PPO is used as the data transmission format, including PPO1, PPO2, PPO3, PPO4, and PPO5. MD38DP2 supports all data formats.

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

Data Format	Supported Function
PPO1	◆ Single function parameter operation ◆ AC drive command and frequency settings ◆ AC drive state and running frequency reading
PPO2	◆ Single function parameter operation ◆ AC drive command and frequency settings ◆ AC drive state and running frequency reading ◆ Periodic writing of four function parameters ◆ Periodic reading of four function parameters
PPO3	◆ AC drive command and frequency settings ◆ AC drive state and running frequency reading
PPO4	◆ AC drive command and frequency settings ◆ AC drive state and running frequency reading ◆ Periodic writing of four function parameters ◆ Periodic reading of four function parameters
PPO5	◆ Single function parameter operation ◆ AC drive command and frequency settings ◆ AC drive state and running frequency reading ◆ Periodic writing of 10 function parameters ◆ Periodic reading of 10 function parameters

Data blocks of the PPO data formats are divided into two zones, including the PKW zone (parameter zone) and PZD zone (process data zone). The following figure shows the PPO data formats supported by MD38DP2.

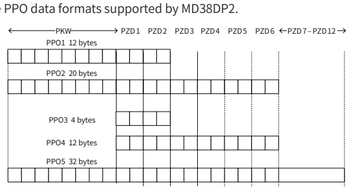


Figure 4 Figure 4 PPO data formats

◆ PKW Data Description

The PKW data is used by the master station to read/write a single parameter of the AC drive. Communication addresses of the AC drive parameters are directly

determined by the communication data. The specific functions are as follows:

– Reading function parameters of AC drive

– Modifying function parameters of AC drive

1) Data format

The PKW data includes three groups of arrays, including the PKE, IND, and PWE. The PKE, IND, and PWE data length are two bytes, two bytes, and four bytes, respectively. The following table describes the data formats.

PKW Data Sent by the Master Station							
Operation Command	Parameter Address		Reserved			Writing: parameter value Reading: null	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE
AC drive PKW response data							
Operation Command	Parameter Address		Reserved			Successful: returned value Failed: error information	
PKE	PKE	IND	IND	PWE	PWE	PWE	PWE

2) Data description

PKW Data Sent by the Master Station		AC drive PKW response data	
PKE	Four higher bits: command code **0**: no request **1**: reading parameter data **2**: modifying parameter data (The preceding command code is in decimal format.) Four lower bits: reserved Eight lower bits: high-order bits of the parameter address	PKE	Four higher bits: response code **0**: no request **1**: correct parameter operation **7**: execution failed Eight lower bits: high-order bits of the parameter address
IND	Eight higher bits: low-order bits of the parameter address Eight lower bits: reserved	IND	Eight higher bits: low-order bits of the parameter address Eight lower bits: reserved
PWE	16 higher bits: reserved 16 lower bits: unused in the read request, and indicating the parameter value in the 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

3) Application

The following figure shows the PKW data sent by the master station and PKW response data sent by the AC drive when the master station reads the AC drive function parameter F0-08.

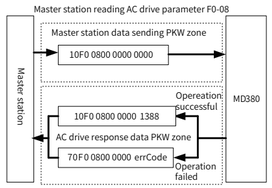


Figure 5 Example PKW data sent by the master station when reading an AC drive parameter

The following figure shows the PKW data sent by the master station and PKW response data sent by the AC drive when the master station modifies the AC drive function parameter F0-08.

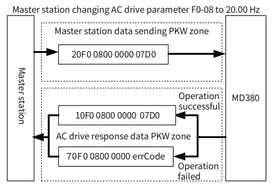


Figure 6 Example PKW data sent by the master station when writing an AC drive parameter

PKW data exchange with the AC drive is performed circularly. If the write command (PKE=0x20xx) is continuously used on EEPROM, the service life of the AC drive's main control chip will be shortened. Therefore, it is recommended that non-periodic write operations (SFB53 described in "Non-periodic Reading/Writing on

the AC Drive Slave Station") or RAM addresses in PKW be used to modify AC drive parameters. The following table lists RAM addresses of 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.

◆ PZD Data Description

The PZD data is used for the master station to modify and read AC drive data in real time and perform periodic data exchange. Data communication addresses are directly configured by the AC drive. It mainly includes:

– Real-time setting of AC drive control command and target frequency

– Real-time reading of AC drive current state and running frequency

– Real-time exchange of function parameter and monitor data between the AC drive and PROFINET master station

The PZD is used for periodic data exchange between the master station and AC drive, as described in the following table.

Master sending data PZD		
AC drive command	AC drive target frequency	Modifying function parameters of AC drive in real time
PZD1	PZD2	PZD3 to PZD12
AC drive response data PZD		
AC drive command	AC drive running frequency	Reading function parameter values of AC drive in real time
PZD1	PZD2	PZD3 to PZD12

1) Data sent by the master station

Master sending data PZD		
	AC drive command word (command source set to "communication")	
PZD1	0: No command 01: Forward running 02: Reverse running 03: Forward jog	04: Reverse jog 05: Coast to stop 06: Decelerate to stop 07: Fault reset
PZD2	AC drive target frequency (frequency source set to "communication"; value unit determined by the AC drive while Hz is used as an example here) The frequency reference ranges from 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 given target frequency exceeds F0-10, the AC drive does not respond to the frequency reference.	
PZD3 to PZD12	Modifying the function parameter values (groups F and A) in real time, not writing to EEPROM FE-02 to FE-11 correspond to PZD3 to PZD12 respectively. For the configuration method, see "PZD Data Description".	

2) AC drive response data

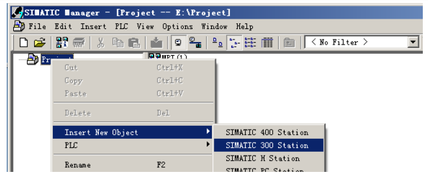
AC drive response data PZD	
PZD1	AC drive running state AC drive running state determined by the bits as follows: 0: Bit0 AC drive stopped; Bit1 Forward running; Bit2 No fault; Bit3 Running frequency not reached 1: Bit0 AC drive running; Bit1 Reverse running; Bit2 AC drive fault; Bit3 Running frequency reached
PZD2	AC drive running frequency: The current AC drive running frequency is returned as 16-bit signed data. When F0-22 is set to 1, -32000 to +32000 corresponds to the actual running frequency -3200.0 Hz to +3200.0 Hz. When F0-22 is set to 2, -32000 to +32000 corresponds to the actual running frequency -320.00 Hz to +320.00 Hz.
PZD3 to PZD12	Reading function parameter values (groups F and A) and monitor parameter values (group U): The function parameter reading addresses are set by FE-22 to FE-31. FE-22 to FE-31 correspond to PZD3 to PZD12 respectively. For the configuration method, see "PZD Data Description".

For details about the PZD definitions of other AC drives, see the corresponding AC drive user guides.

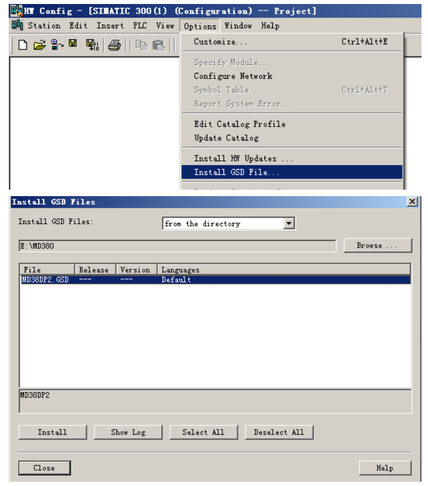
■ Configuring a Slave Station on the S7-300 Master Station in STEP 7 V5.4

When using the PROFIBUS master station, configure the GSD file (obtained from Inovance's agency or manufacturer) of the slave station first to add the slave device to the master station system. If a slave device already exists, skip step 2. Specific operations are as follows:

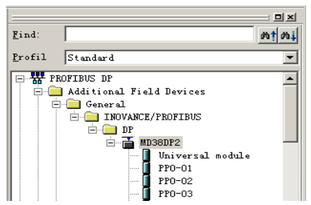
Step 1: Open STEP 7, create a project, and add the S7-300 master station to the project, as shown in the following figure.



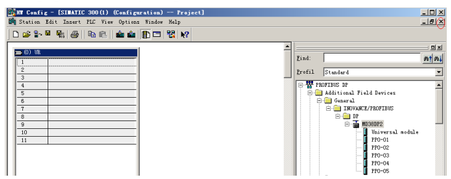
Step 2: Double-click Hardware to access the **HW Config** window. In the **HW Config** window, add the **MD38DP2.GSD** file, as shown in the following figure.



Click **Install**. After the installation is complete, the PROFIBUS-DP module of MD38DP2 is displayed, as shown in the following figure.

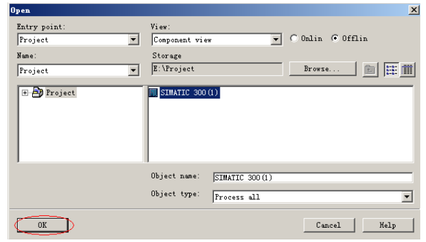


Note: If any master station or slave station already exists on the **HW.config** page, close the current page by clicking the X button (marked by a red circle in the following figure) before importing the GSD file.

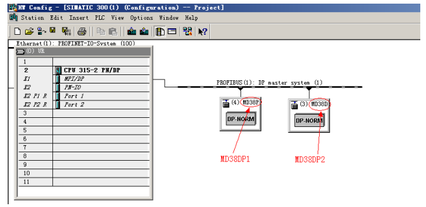


In this case, you can save the original project. If an alarm indicating that system data cannot be created is displayed, click **OK**. After closing the current configuration page, you can install the GSD file by performing the preceding steps. After the installation is complete, click the button marked by the red circle in the following figure to open the original project.

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

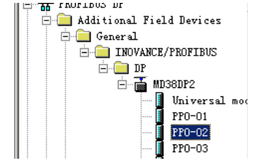


Step 3: Configure the actual hardware system, as shown in the following figure.



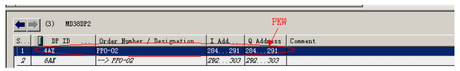
In the preceding figure, station 4 is MD38DP1, which is only used as an example. For details about its usage, see the MD380 Series PROFIBUS User Guide. MD38DP1 and MD38DP2 can exist on the same network.

Step 4: Configure data features of the slave station.



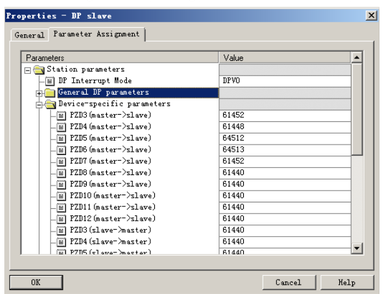
After the PPO type is added, the address assigned by the PLC to the slave station is displayed, as shown in the following figure. Slot 1 marked by a red circle in the following figure indicates the PKW address of 8 bytes. Slot 2 indicates the PZD address of 12 bytes.

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



Step 5: Configure the PZD.

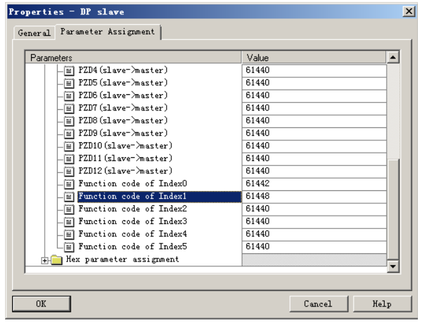
The fixed configuration of PZD1 and PZD2 cannot be modified by users. PZD3 to PZD12 are for customized periodic data exchange. They can be set in hardware configuration. Double-click the MD38DP2 sign in **HW Config**, click **Device-specific parameters**, and configure corresponding parameter addresses as required.



PZDx(master->slave) indicates the address used by the master station to write the slave station, and **PZDx(slave->master)** indicates the address used by the master station to read the slave station. **PZD3** to **PZD12** displayed in decimal are available. For example, to set **PZD3(master->slave)** 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. PZD mapping relations must be set independently for each slave station as required (if mapping relations of various slave stations are the same, you can select one configured slave station, press **Ctrl+C**, select the PROFIBUS-DP bus in the configuration, press **Ctrl+V**, and modify the station number).

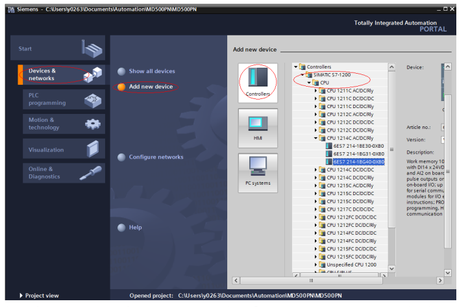
To enable the non-periodic read and write parameter function of DPV1, set corresponding parameters in customized indexes at the end of **Device-specific parameters**. MD380 provides six customized indexes numbered from 0 to 5, as shown in the following figure. For example, indexes 0 and 1 are set to F0-02 and F0-08, respectively.



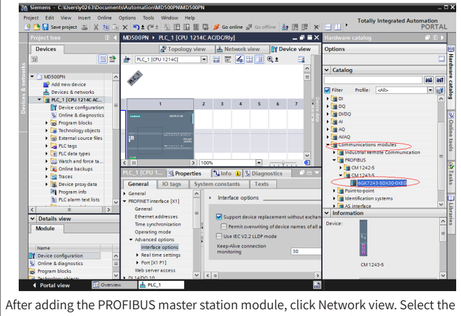
After all the preceding operations are complete, the PROFIBUS slave station is configured. Now, you can compile programs in the S7-300 to control the AC drive.

■ Configuring a Slave Station with S7-1200 in TIA Portal V13

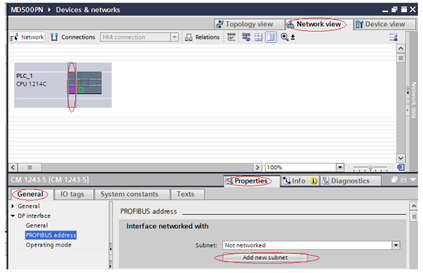
Step 1: Open TIA Portal V13, create a project, and add an S7-1200 master station according to actual situations.



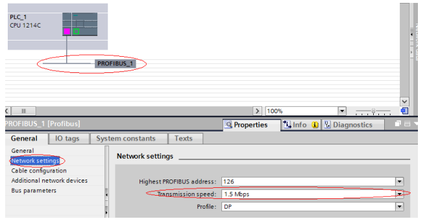
Since the S7-1200 CPU has no PROFIBUS interfaces, a PROFIBUS communication module must be added. In this example, a CM1243-5 master station module is required.



After adding the PROFIBUS master station module, click Network view. Select the communication module, click **Add new subnet** under **Properties** > **General** to create a PROFIBUS network. You can modify the master station number here.

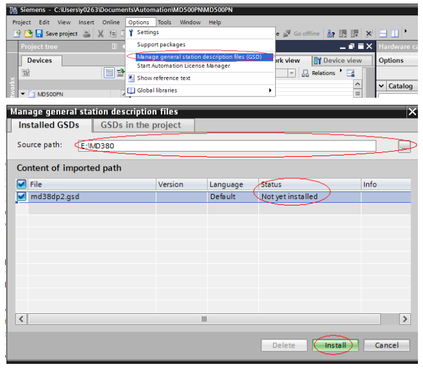


To modify the PROFIBUS baud rate, click **Network view**, click **Network settings** under **Properties** > **General**, and select a proper baud rate for **Transmission speed**.

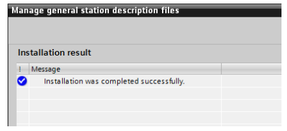


Step 2: Install the GSD file. Skip this step if a GSD file has been installed.

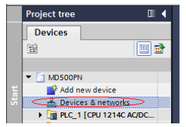
If a GSD file is not installed yet, **Not yet installed** will be displayed as the status. Select the GSD file and click **Install.**



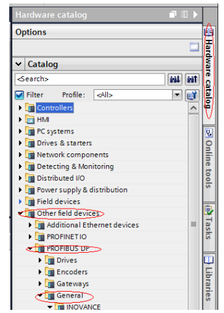
If the following figure is displayed, the installation is complete. In this case, click **Close**.



During the installation of the GSD file, the PORTAL will automatically close the configuration page. After the installation is complete, double-click **Devices & networks** on the left to open the original configuration page.

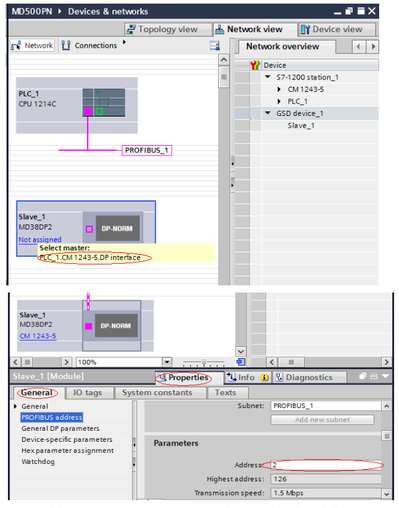


Now, MD38DP2 is displayed under **Hardware catelog** > **Other field devices** > **PROFIBUS-DP** > **General**, which is the same as that in STEP 7.

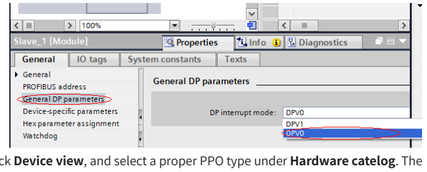


Step 3: Start the configuration.

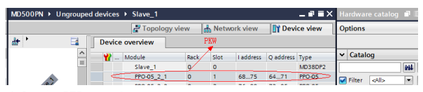
On the **Hardware catelog** page, double-click **MD38DP2** or drag it to **Network view** under **Devices & networks**, and click **Not assigned** for the slave to select the corresponding PROFIBUS network. Select the slave, and set the slave station number under **Properties** > **General**. Note that the setting must be consistent with that set by the DIP switches on the MD38DP2 expansion card.



Click **General DP parameters**, and select DPV0 as the PROFIBUS-DP interruption mode, as shown in the following figure.

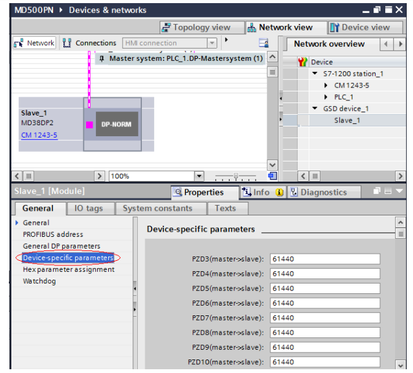


Click **Device view**, and select a proper PPO type under **Hardware catelog**. The addresses assigned for each segment are displayed as follows. The PKW address below is marked with a red circle. If the selected PPO has no PKW, the column will be left blank.



Step 4: Set the PZD mapping.

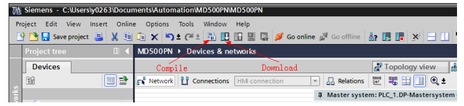
Click **Network view** and then click **Device-specific parameters** to set the mappings of PZD3 to PZD12. Note that the PZD mappings for the PLC reading/writing slave station are set respectively. For specific settings, see "Configuring a Slave Station on the S7-300 Master Station in STEP 7 V5.4".



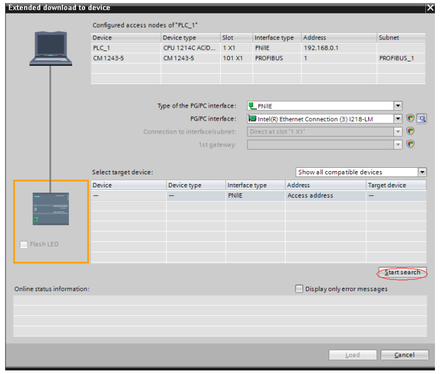
Step 5: Compile and download the configuration.

If the settings of various slave stations are the same, you can select one configured slave station, press **Ctrl+C** and then **Ctrl+V** to connect more slave stations to the network and then modify their station numbers.

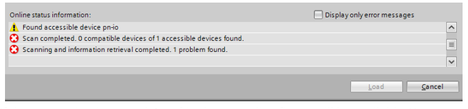
After all slave configurations are complete, save the configurations, and then click the compile button. After the compiling is completed successfully, click the download button.



On the displayed page, set the communication interfaces of the PC and PLC as required. In this example, configure the local network port and 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 this fault first. (This problem also occurs when a PC is used for download through both STEP 7 and PORTAL. 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, **Load** in the preceding figure will be available. You can click **Load** to start download and perform subsequent operations as prompted to download the configuration to the PLC.

■ Periodic Reading/Writing on the AC Drive Slave Station

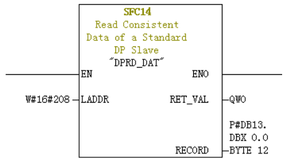
Address assignment is used as an example in the following figure. In this example, the PLC is S7 315-2PN/DP.

1) Directly using the MOVE command

As shown in the following figure, forward running of the AC drive is started with the target frequency of 30 Hz (F0-02 = 2, F0-03 =9).

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.

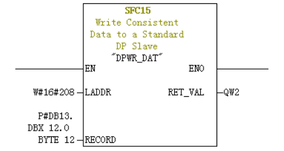
2) Using the SFC14 and SFC15



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

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

RECORD: Indicates the 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: Indicates the initial address configured in the Q block of the module, which must be in hexadecimal format.

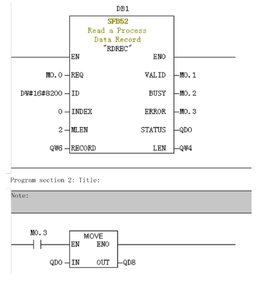
RET_VAL: If an error occurs during function activation, the return value contains an error code. If no error occurs, 0 is returned.

RECORD: Indicates the 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 initial 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 of 12 bytes).

■ Non-periodic Reading/Writing on the AC Drive Slave Station

To perform non-periodic reading and writing on the slave PROFIBUS-DP station of the AC drive, Siemen's system function modules SFB52 (for reading) and SFB53 (for writing) are required. Create an organization block in the program, and add relevant function blocks and programs in the organization block.

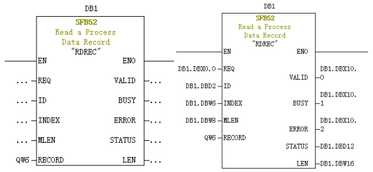


After M0.0 is set, the function block reads F0-02 (Index 0 has been set to F0-02 before) of the AC drive No. 3 and saves it in QW6. Field definitions are as follows:

- **REQ**: Command enablement. When this field is set to 1, the function block is enabled.
- **ID**: Logic address. To specify this field, convert any bit in the Q address of the corresponding AC drive slave station to a decimal value, and set bit 15 of the value to 1. For example, after Q512 is converted to the decimal value H200 and bit 15 is set to 1, H8200 is obtained.

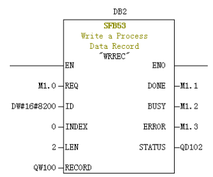
- **INDEX**: Index ranging from 0 to 5. This field can be customized to an index mapping address of a slave station as required.
- **MLEN**: Maximum length of the data to be obtained. For MD38DP2, this field must be set to **2**.
- **RECORD**: Target region of an obtained data record. This field is used to store read data when the read operation is performed and sent data when the write operation is performed.
- **VALID**: New data record received and valid.
- **BUSY**: When the field value is **ON**, operations are not complete.
- **ERROR**: When the field value is **ON**, an error occurs.
- **STATUS**: Block status or error information.
- **LEN**: Obtained data record length.

During the invocation, you can customize parameters or use partial or all default parameters, as shown in the following figure.



In the preceding figure, default parameters are used on the left, that is, parameters are set according to the information shown on the right. You can set customized or default parameters for corresponding blocks as required.

Non-periodic write operations are similar to non-periodic read operations. The RECORD field stores data to be written, as shown in the following figure.



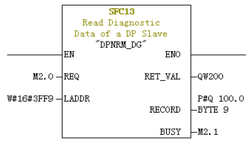
Note that before running an organization block, you need to download data blocks (above the function block with DB1 and DB2 used as examples) to the PLC. Otherwise, the DB block unloading error will be generated.

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. After the write operation is complete (M1.1 is set to 1), the program is invoked to reset M1.0, as shown in the following figure.

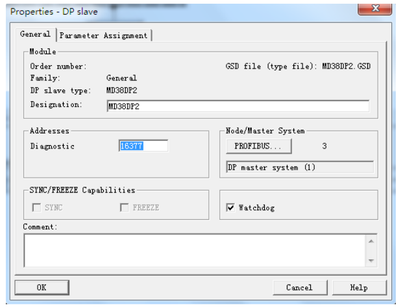
Execution of SFB52 and SFB53 requires invoking relevant blocks for multiple times each time. Therefore, do not invoke them when single execution is required.

■ Diagnosis

Use SFC13 in the program to obtain specific diagnosis information of each slave station, as shown in the following figure.



- **REQ**: Command enablement. When this field is set to **ON**, diagnosis information reading is initiated.
- **LADDR**: Configured diagnosis address of the slave PROFIBUS-DP station. The actual value is shown in the following figure. For SFC13, the address must be specified in hexadecimal.



- **RET_VAL**: Error code (negative) displayed when invocation errors occur and actual transmitted data length (positive) displayed when no error occurs.
- RECORD: Target region of the read diagnosis data. The value must be data in byte data type with nine characters. Otherwise, an error will be generated during invocation. Byte definitions are as follows:

1) Bytes 0–2: Station status
2) Byte 3: Master station number
3) Byte 4: Supplier ID (high byte)
4) Byte 5: Supplier ID (low byte)
5) Byte 6: Dedicated device diagnosis length (fixed to 3)
6) Byte 7: Dedicated device diagnosis (high byte)
7) Byte 8: Dedicated device diagnosis (low byte)

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

Dedicated device 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.

4 Troubleshooting

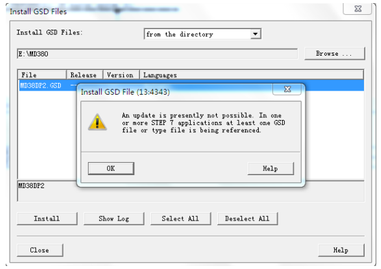
■ Status Description of PROFIBUS-DP Card Indicators and Troubleshooting

Indicator[1]	Action	Fault Description	Solution
Red (D4)	OFF	The PROFIBUS-DP card is not powered on.	Check that connection between the DP card and the AC drive is secure.
Green (D2)	OFF	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 card and the AC drive is secure.
Green (D2)	1 Hz blinking	Connection between the DP card and the AC drive fails.	Check that the PROFIBUS-DP station numbers are set to 1 to 125.
Yellow (D3)	1 Hz blinking	Incorrect configuration	Check that the GSD is correct.
Yellow (D3)	2 Hz blinking	Parameter error	Check that all parameter addresses in Device-specific parameters are supported by the AC drive.
Yellow (D3)	5 Hz blinking	Master station stopped	Check the master station status.
Yellow (D3)	OFF	The connection between the PROFIBUS-DP card and the PROFIBUS master station fails.	Check that the slave station address is correct and the PROFIBUS cable is connected securely.

[1] For some products, the indicator color may be inconsistent with the terminal symbol. In this case, the terminal symbol is preferred. The indicators are D2, D3, and D4 from left to right. See "Figure 1 Hardware layout of MD38DP2" for details.

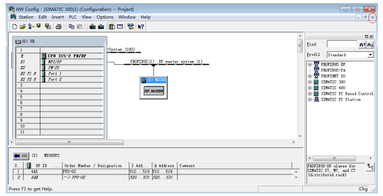
■ Troubleshooting for GSD Installation Failure

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

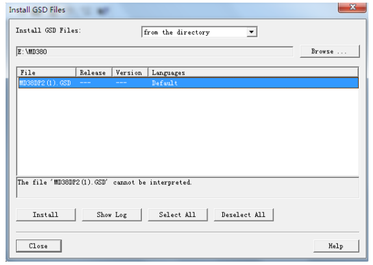


Possible cause: The current hardware configuration has been opened and the GSD is used by other components.

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



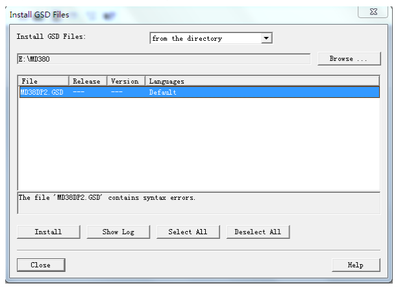
- Symptom 2: The file cannot be interpreted.



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

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

- Symptom 3: The file contains syntax errors.



Possible cause: The GSD file content is modified.

Solution: Use a correct GSD file.

■ Troubleshooting for Common Faults

Fault Description		Solution
After the AC drive is powered on, only the power indicator (D4) is on, which indicates that the connection between the PROFIBUS-DP card and AC drive fails.		1. Check that F0-28 is set to 1. 2. Check the AC drive type. This user guide only describes the usage on MD380/MD500. For some AC drive models, this user guide is unavailable. In this case, 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.		The station number is not in the range of 1 to 125. Note that digit 8 of the DIP switch is the least significant bit of the address.
Connection fails after the configuration is downloaded.	After the configuration is downloaded, D2 and D4 are steady ON while the yellow indicator D3 is OFF on the PROFIBUS-DP card.	1. Check whether the cable is correctly connected. 2. Check the DIP switches on the PROFIBUS-DP interfaces. The DIP switches on the PROFIBUS-DP interfaces at both ends of the network must be set to ON, and the DIP switches on other PROFIBUS-DP interfaces must be set to OFF. 3. If the AC drive is connected at the end, check whether the communication cable is connected through IN of the PROFIBUS-DP interface. (If the communication cable is connected through OUT, OUT cannot be connected to the network when the PROFIBUS-DP interface is set to ON.) 4. Check whether the station number settings on the PROFIBUS-DP card are consistent with the configuration. Digit 8 of the DIP switch is the least significant bit of the address. 5. Check whether the GSD used by the configuration is correct.
	After the configuration is downloaded, D2 and D4 are steady ON while the yellow indicator D3 blinks slowly at the frequency of about 1 Hz to 2 Hz on the PROFIBUS-DP card.	1. Check whether the GSD used is correct. 2. Check whether the PZD mapping relations are set correctly. Device-specific parameters in STEP 7 and TIA PORTAL must be set in decimal format. Therefore, the parameter numbers must be converted to decimal values when setting device-specific parameters. For example, the decimal value of FC-11 is 64523 (0xFC0B in hexadecimal format). If a parameter number that the AC drive does not support is entered, the connection fails. Note that addresses using Modbus (such as H2000 and H8000) are unavailable for PZD mapping.
	After the configuration is downloaded, the yellow indicator D3 on the PROFIBUS-DP card blinks quickly.	The PLC is not in the running status. Check the PLC status and locate the fault cause (the OB block may not exist.)
After the connection is successful, all indicators on the PLC are ON in green, but data cannot be written into or read from the AC drive. (1)	No data can be written/read.	Check whether the operation address is correct. The PKW zone is always required. The operation address locates in the second row (that is, the last row). For example, if the I address and Q address in the last row of the station are both 520 to 531 (note that the I and Q addresses may start from different numbers), the PZD1 and PZD2 data written into the AC drive store in QW520 and QW522, respectively. (If the PLC is S7-300 and S7-400, PQW is used.) If SFC15 is used, check whether RET_VAL of the SFC15 block is 0. If not, an invocation error exists. Eliminate this error first and invoke the block again. For details about the operations, see "Periodic Reading/Writing on the AC Drive Slave Station".
	PZD3 or subsequent data can be written, while PZD1 or PZD2 cannot be written/read.	Check whether F0-02 and F0-03 are set to 2 and 9, respectively. Check whether the command reference is in the range of 1 to 7 (not bit) or frequency reference is in the range of -F0-10 to +F0-10. If not, the write operation fails. Check whether FE-00 and FE-01 are U3-17 and U3-16, respectively. If not, manually correct the parameter values or restore to factory settings.

Fault Description		Solution
After the connection is successful, all indicators on the PLC are ON in green, but data cannot be written into or read from the AC drive. (2)	PZD1 and PZD2 can be written/read, while PZD3 or subsequent data cannot be written/read.	Check whether the PZD is supported by the PPO type. Check whether Device-specific parameters are set correctly.
		Check the logic relations. Check whether the same PZD is assigned for multiple times in a certain logic relation (by checking whether the value given by the PLC is correct under the logic relation in the monitoring table of the PLC).
After the communication is connected, the AC drive reports ERR16, which cannot be cleared. However, the indicators on the PROFIBUS-DP card and the BF indicator on the PLC are normal.		Check whether the eight higher bits of the PZD1 data (QW data) written into the AC drive are 0 in the PLC program. If not, change them to 0. The PZD1 command in this user guide refers to values instead of bits. Note: This item is applicable for MD380/MD500 only. If other AC drives are used, consult the technical engineers.
After the communication is connected, the communication is normal when the AC drive is running. However, when one or more AC drives are running, the AC drive is disconnected randomly.		1. Disconnect the power supply. Use a multimeter to measure the A1/B1 resistance of the PROFIBUS-DP slave station interface at the farthest end. The correct resistance should be 100±20 Ω. 2. Check whether the cable shields are connected. The cable shields must be connected properly with the sheet metal in the PROFIBUS-DP interface. The cable shields are not required to connect with other GND.
After the connection is successful, if the AC drive reports a fault, the PLC configuration is changed and downloaded, or only the AC drive is powered on again, the original faulty slave station cannot be connected to the network.		MD38DP2 only supports the interruption mode DPV0. If the interruption mode is set to DPV1, the PLC master station may close the PROFIBUS-DP connection channel of the slave station or interrupt all the PLC communication (which usually occurs on S7-1200). When such a symptom occurs, change the PROFIBUS-DP interruption mode (the default values in STEP 7 and TIA PROTAL are DPV0 and DPV1 respectively) of the slave station to DPV0 under General DP parameters. Then, complete compiling, download the configuration, and power on the PLC again.

INOVANCE Warranty Agreement

1) Inovance provides an 18-month free warranty to the equipment itself from the date of manufacturing (subject to the information indicated by the barcode on the product) for the failure or damage under normal use conditions.
2) Within the warranty period, maintenance will be charged for the damage caused by the following reasons:
   a. Improper use or disassembly/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 instructions
   e. Damage out of the equipment (for example, external device factors)
3) The maintenance fee is charged according to the latest Maintenance Price List of Inovance.
4) If there is any problem during the service, contact Inovance's agent or Inovance directly.
5) You are assumed to agree on terms and conditions of this warranty agreement by purchase of the product. Inovance reserves the rights for explanation of this agreement.

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