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MD38I03 I/O Expansion Card

User Guide

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Preface

■ Introduction

The MD38IO3 card is a multi-function I/O expansion card. It can expand your device with three digital inputs, one isolated input for RS485 communication signals, and one normally-open relay output.

This user guide describes the applicable AC drives, dimensions, interfaces, installation, and wiring of this product.

■ Revision History

Date	Version	Description
November 2023	A00	First release

■ Access to the Guide

This guide is not delivered with the product. You can obtain the PDF version in the following ways:

- Visit www.inovance.com, go to "Support" > "Download", search by keyword, and then download the PDF file.
- Scan the QR code on the product with your smart phone.
- Scan the QR code below to install the Inovance app, and search for the following AC drives in the app to obtain this guide.
 - MD290
 - MD480 (T2 and larger models)
 - MD500
 - MD500E
 - MD500-PLUS
 - MD510
 - MD520



■ Warranty

For faults and damage incurred during normal use in the warranty period, Inovance provides free repair service. (For details of the warranty period, see the purchase order.) A maintenance fee will be charged out of the warranty period.

Even in the warranty period, a maintenance fee will be charged for repair of the following damage:

- Damage caused by operations not following the instructions in the guide
- Damage caused by fire, flood, or abnormal voltage
- Damage caused by unintended use of the product
- Damage caused by use beyond the specified scope of application of the product
- Damage or secondary damage caused by force majeure (natural disaster, earthquake, and lightning strike)

The maintenance fee will be charged according to our latest Price List if not otherwise agreed upon.

For details, see the Product Warranty Card.

Table of Contents

Preface.....	1
1 Product Information	4
1.1 Introduction	4
1.2 Applicable AC Drives	4
1.3 Outline Dimensions.....	5
1.4 Interface Description.....	6
2 Installation and Wiring	8
2.1 Installation.....	8
2.2 Wiring	9

1 Product Information

1.1 Introduction

The MD38IO3 card is a multi-function I/O expansion card. It can expand your device with three digital inputs, one isolated input for RS485 communication signals, and one normally-open relay output.

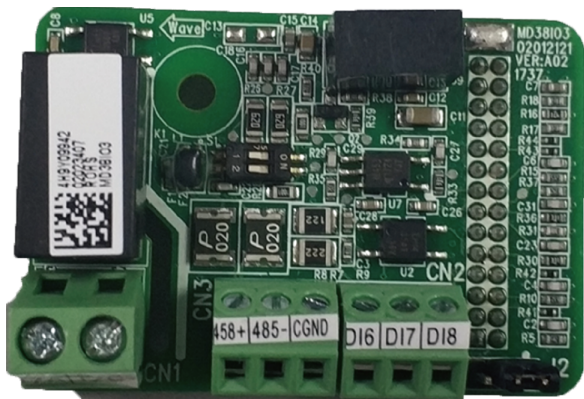


Figure 1-1 MD38IO3 card appearance

1.2 Applicable AC Drives

Card Model	Order No.	Applicable AC Drive
MD38IO3	01040051	MD290 MD480 (T2 and larger models) MD500 MD500E MD500-PLUS MD510 MD520 CS290 CS710 ES680

1.3 Outline Dimensions

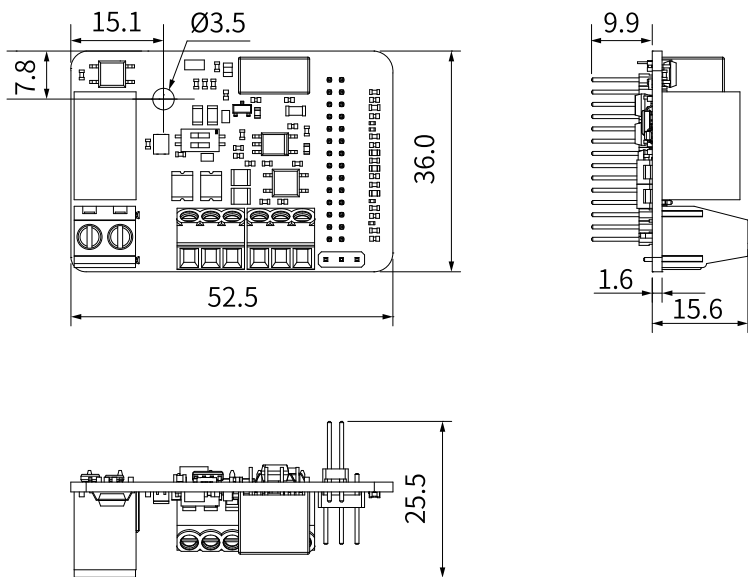


Figure 1-2 MD38IO3 card dimensions (unit: mm)

1.4 Interface Description

■ Interface layout

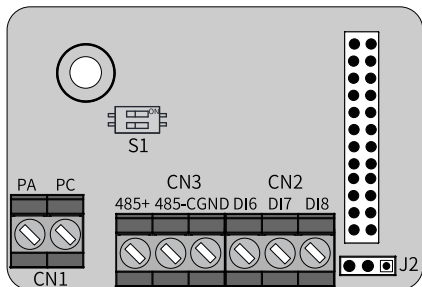




Figure 1-3 MD38IO3 card interface layout

■ Interfaces



Table 1-1 MD38IO3 card interface function description

Mark		Terminal Name	Function Description	Terminal Layout
CN1	PA-PC	Normally-open terminal	Driving capacity of the contact: 250 VAC/5 A, 30 VDC/5 A	
CN2	DI6 to DI8	Three digital input terminals	<ul style="list-style-type: none"> ● Photocoupler isolation, compatible with dual-polarity inputs; maximum input frequency: 100 Hz ● Input impedance: 3.4 kΩ ● Voltage upon level input: 9 V to 24 V 	

Mark		Terminal Name	Function Description	Terminal Layout
CN3	RS485+	Positive terminal for RS485 communication signal	Supports the Modbus protocol; isolated input	
	RS485-	Negative terminal for RS485 communication signal		
	CGND	Ground terminal for RS485 communication signal		
S1	RS485 termination resistor selection	2-pin DIP switch	<ul style="list-style-type: none"> The termination resistor is connected when pins 1 and 2 are set to ON. The termination resistor is disconnected when pins 1 and 2 are set to OFF. 	

■ Jumper

Table 1-2 MD38IO3 card jumper

Mark	Terminal Name	Function Description	Jumper/DIP Switch Settings
J2	Jumper for selecting DI terminal wiring mode (sink/source)	Wire the DI terminals in sink mode. Connect OP to 24 V.	
		Wire the DI terminals in source mode. Connect OP to COM.	

Note

The jumper setup is based on the top view of the expansion card with the main wiring terminal as the bottom side. For the position of the jumper, see the PCB silkscreen.

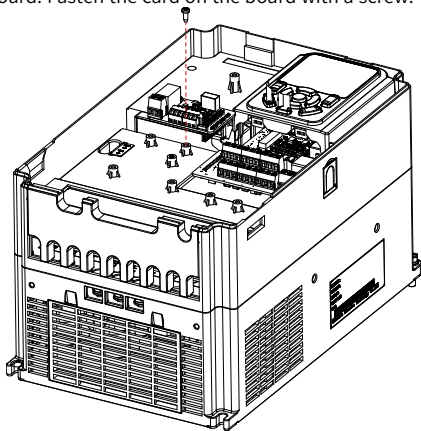
2 Installation and Wiring

2.1 Installation

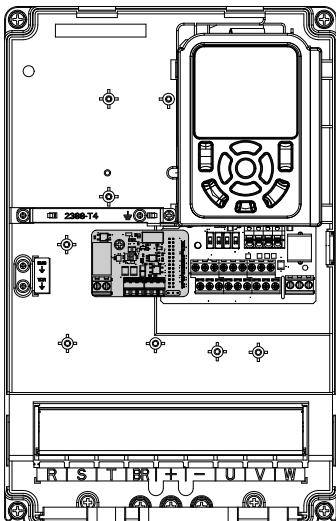
Note

Install the card only when the AC drive is completely de-energized.

Align the connector and positioning hole of the I/O expansion card with those on the AC drive control board. Fasten the card on the board with a screw.



The installation is completed as shown in the following figure.



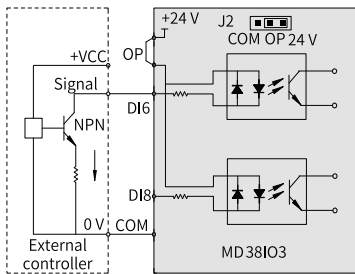
2.2 Wiring

■ DI terminals

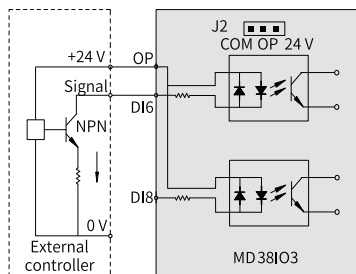
- Sink wiring

Most commonly, the internal 24 V power supply of the AC drive is used to power the card. In this case, connect the OP terminal to the internal 24 V power supply, and connect the COM terminal of the AC drive to the 0 V terminal of the external controller.

To use an external 24 V power supply, connect the +24 V terminal of the external power supply to the OP terminal, and connect the 0 V terminal of the external power supply to the corresponding DI terminal through the contact of the controller.



Sink wiring where the internal 24 V power supply of the AC drive is used



Sink wiring where an external 24 V power supply is used

Figure 2-1 Sink wiring

Note

In the mode, the DIs of different AC drives cannot be connected in parallel. Otherwise, the DI may malfunction. If DIs of different AC drives must be connected in parallel, connect the anode of a diode to the DI in series and make the diode satisfy the requirement: $I_F > 40 \text{ mA}$ and $V_R > 40 \text{ V}$, as shown in [“Figure 2-2” on page 11](#).

The MD520 series AC drive is used as an example for illustration, as shown in [“Figure 2-2” on page 11](#).

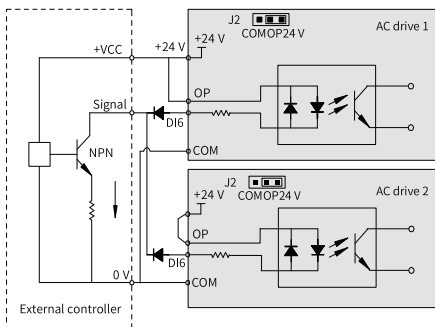


Figure 2-2 Sink wiring for parallel DI terminals of multiple AC drives (example)

- Source wiring

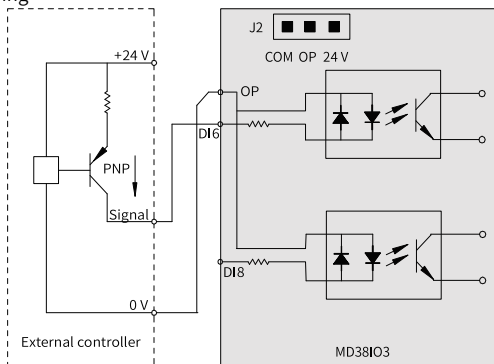


Figure 2-3 Source wiring

In source wiring, an external 24 V power supply is needed to power the card, as shown in “[Figure 2-3](#)” on page 11. In this case, ensure that the external 0 V terminal is connected to the OP terminal.

■ RS485 communication bus use instructions

RS485 connection topology

The RS485 bus connection topology is shown in the figure below. It is recommended to use a shielded twisted pair cable as the RS485 bus, and use twisted pair cables to connect the RS485+ and RS485- terminals. Connect a 120 Ω termination resistor to each end of the bus to prevent signal reflection. Set pins 1 and 2 of the switch S1 on the expansion card to ON to connect the termination resistor to the AC drive. Connect the RS485 reference ground of every node together. Up to 128 nodes can be connected. The length of each cable connecting a node to the bus must be less than 3 m.

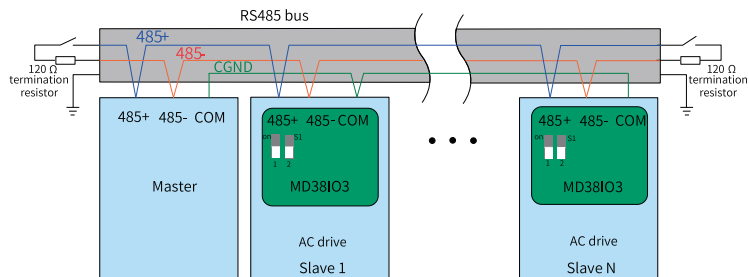


Figure 2-4 RS485 bus topology

Multi-node connection method

When there are a large number of nodes, the daisy chain topology must be used. If branch line connection is required, the length of the branch cable should be less than 3 m and as short as possible. Star connection is strictly prohibited. Common bus connection topologies are shown in the following figures.

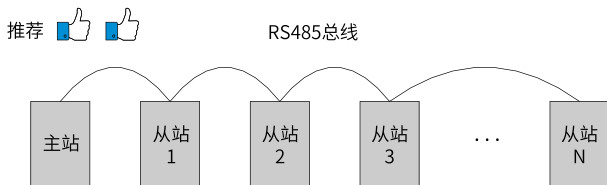


Figure 2-5 Daisy chain topology



Figure 2-6 Branch line connection

Any branch cable should not exceed 3 m.

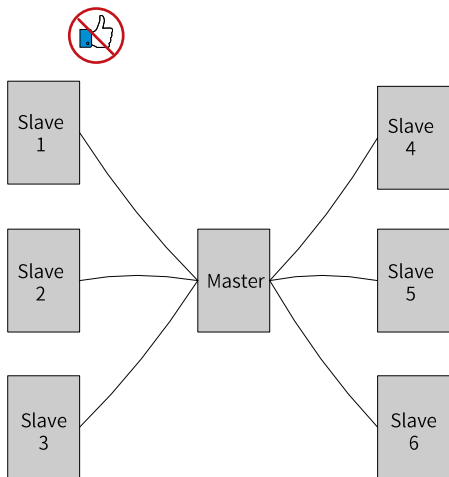


Figure 2-7 Star topology (prohibited)

■ Transmission distance and number of nodes

The following table lists the maximum number of nodes and transmission distance supported by the standard RS485 circuit at different transmission rates.

No.	Speed	Transmission Distance	Number of Nodes	Cable Size
1	115.2 kbps	100 m	128	26 AWG
2	19.2 kbps	1,000 m	128	26 AWG

■ Relay output terminal

Inductive loads (relays, contactors, and motors) cause voltage spikes at cutoff of current. To minimize such interference, connect a voltage dependent resistor to the relay contact. In addition, connect absorption circuits, such as voltage dependent resistors, RC absorption circuits, and diodes, to the inductive loads.

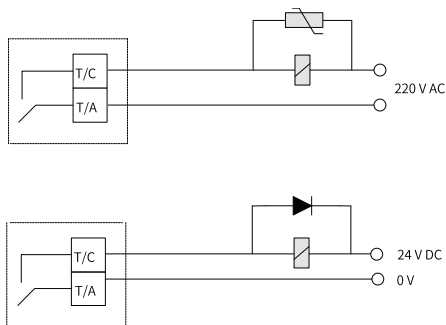


Figure 2-8 Anti-interference treatment for the relay output terminal