MEGMEET

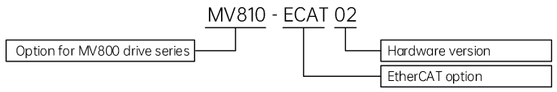
MV800 EtherCAT Communication Option

User Manual

Bom code: R33011119
Version: V00

1 Product Information

1.1 Designation rule



1.2 Functions and specifications

MV810-ECAT02 option provides communication expansion for the MV800 drive series. Its functions and specifications are explained below:

1.2.1 Function features

(1) Supports PDO and SDO services
(2) Supports access of drive parameters through SDO
(3) Supports 100 Mbps full duplex
(4) Supports the speed mode and the torque mode
(5) Supports the SM mode and the DC mode with a minimum cycle of 1 ms
(6) Supports 4 configurable PDO groups

1.2.2 Basic specifications

EtherCAT connector	Interface	Two RJ45 ports (IN, OUT)
	Transmission mode	High-speed bus
	Transmission media	CAT5 shielded twisted pair cables
	Galvanic isolation	500 V DC
Communication	Network standard	EtherCAT
	Transmission protocol	100 BASE-TX (IEEE 802.3)
	Transmission distance	100 m
	Bus transmission speed	100 Mbps Auto-Defect
	Module name	MV810-ECAT02
	XML file	MV800_ECAT_CoE_V2.00.xml
	SDO	SDO request, SDO response
	PDO	Variable PDO mapping
Electrical specifications	Power voltage	3.3 V DC (provided by the drive)
	Insulation voltage	500 V DC
	Power consumption	1 W
	Weight	25 g
Environment	Noise immunity	ESD (IEC 61800-5-1, IEC 61000-4-2) EFT (IEC 61800-5-1, IEC 61000-4-4) Surge Test (IEC 61800-5-1, IEC 61000-4-5) Conducted Susceptibility Test (IEC 61800-5-1, IEC 61000-4-6)
	Operating/Storage environment	Operating: -10 to 50℃ (temperature), 95% (humidity) Storage: -25 to 70℃ (temperature), 95% (humidity)
	Vibration/Shock resistance	International standards GB 4798.3-2007, GB 12668.501—2013/IEC 61800-5-1 (IEC 60068-2-6)

1.3 Terminal description

1.3.1 Layout

Fig. 1 shows the front and back views of MV810-ECAT02.

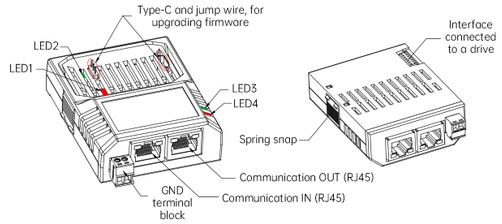


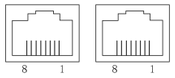
Fig. 1

The option has GND, two RJ45 ports and the interface connected to a drive.

1.3.2 Pin definitions

EtherCAT adopts the standard RJ45 ports. This communication option has 2 RJ45 ports: IN and OUT.
The pin definitions of MV810-ECAT02 are listed below:

Pin	Name	Description
1	TX+	Transmit Data+
2	TX-	Transmit Data-
3	RX+	Receive Data+
4	N/C	NOT CONNECTED
5	N/C	NOT CONNECTED
6	RX-	Receive Data-
7	N/C	NOT CONNECTED
8	N/C	NOT CONNECTED



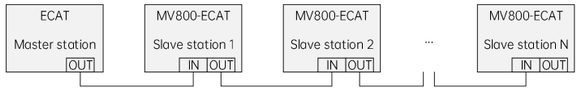
1.3.3 Parameter settings for EtherCAT network connection

To use MV810-ECAT02 to operate the MV800 series drive, you need to set the operation command channel and frequency source to the bus communication card, as shown in the following table.

Drive parameter	Value	Function description
P02.02	2	Set the operation command channel to communication control
P02.03	3	Set the communication command channel to EtherCAT
P02.05	8	Set the main frequency source to bus card (EtherCAT)

1.3.4 Network topology

EtherCAT network is generally composed of a master station and multiple slave stations. The network structure can be divided into the bus type, star type, tree type, etc., or the combination of several types, realizing flexible device connection and wiring. The bus-type network topology is shown in the figure below.



2 Installation

2.1 Accessory list

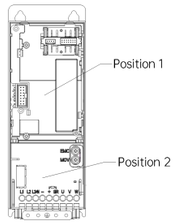
Accessory list	Specifications	Quantity
MV810-ECAT02 option (with expansion box)	75 × 60 × 24 mm	1
User manual	A3 × 1	1

2.2 Installation method

The installation position, interface and steps of MV810-ECAT02 are described below:

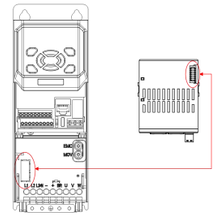
2.2.1 Installation position

MV800 drive series provides two positions for installation of accessory cards and options: position 1 and position 2 in the right figure (taking enclosure B as an example, similar for other enclosures), where position 1 is for the installation of various PG cards and position 2 is for the installation of PN options, ECAT options, I/O options and so on.



2.2.2 Installation interface

The electrical interface of the MV810 EtherCAT option is connected to the drive as shown in the right figure.



2.2.3 Installation steps

Installation method: front side mounting of ECAT
(1) When the drive is powered off, press the granulated part on the middle-upper of the lower cover, slide it down firmly to take down the cover, as shown in Fig. 2-a.
(2) Use a straight screwdriver to pry open the dustproof cap, as shown in Fig. 2-b.
(3) Install the ECAT option: hold the expansion box (a bus card inside) upwards (indicators up), then align the expansion box with the electrical bus interface of the installation position 2, and press down horizontally to buckle the spring snap of the expansion box into the groove at the lower part of the drive, as shown in Fig. 2-c and Fig. 2-d.
(4) The bus card is successfully installed, as shown in Fig. 2-e.

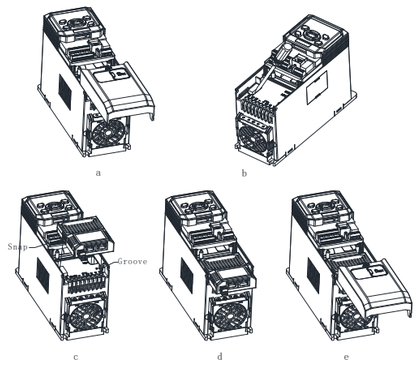


Fig. 2 ECAT card installation steps

(5) Grounding: MV810-ECAT02 must be grounded during wiring as shown in Fig. 3. You need to prepare and crimp the cable by yourself.

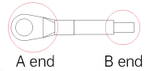


Fig. 3 Grounding terminal connection

Grounding method:
connect the B end of the grounding cable to the option's grounding terminal block, and you can check the grounding cable diameter and torque by referring to Table 1;
then connect the A end of the grounding cable to the grounding rack PE (the mark for grounding, circled in Fig. 4) of the drive (taking enclosure B as an example, similar for others), and you can check the grounding screw specifications and torque by referring to Table 2.

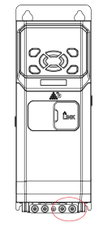


Fig. 4

Table 1 Recommended diameter and torque for the grounding cable

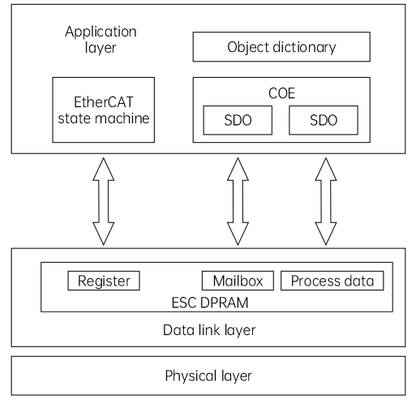
Option	Screw	Diameter	Stripped part	Torque (±10%)
MV810-ECAT02	M2.0	0.5 to 1.5 mm²/ (28 to 16 AWG)	5 to 6 mm	2 kg-cm/(1.7 lb.in)/ (0.2 N·m)

Table 2 Recommended grounding screw and torque

Enclosure	Screw	Torque (±10%)
B	M3	7 kg-cm/(6.08 lb-in)/(0.68 N·m)
C	M4	15 kg-cm/(13.0 lb-in)/(1.47 N·m)
D		

3 EtherCAT Network Reference Model

EtherCAT (CoE) network reference model consists of two parts: the data link layer and the application layer.
The data link layer is mainly responsible for the EtherCAT communication protocol, and the application layer of CoE has an object dictionary which includes communication parameters, application program data and PDO mapping information.
Process data objects (PDO) consist of objects in the object dictionary that can be PDO mapped, and the PDO data is defined by PDO mapping. The reading/writing of PDO data is cyclic without requirements to look up the object dictionary, while the reading/writing of service data objects (SDO) is non-cyclic with requirements to look up the object dictionary.
Various application layer protocols are available for EtherCAT communication. The following figure is the EtherCAT structure based on the CANopen application layer:



4 PDO Data Description

The PDO data description of MV810-ECAT02 is shown in the following table (all data in the table are 16-bit variables in which data with negative values available are INT16 type and data without negative values are UINT16 type):
RxPDO (master transmits, slave receives):

Index/ Subindex	Meaning	Description	Value range	Attr.
6040h/0	Control word	Bit0: Forward running	0: Disabled; 1: Enabled	RW
		Bit1: Reverse running	0: Disabled; 1: Enabled	
		Bit2: Forward jogging	0: Disabled; 1: Enabled	
		Bit3: Reverse jogging	0: Disabled; 1: Enabled	
		Bit4: Stop	0: Disabled; 1: Enabled	
		Bit5: Coast to stop	0: Disabled; 1: Enabled	
		Bit6: Fault reset	0: Disabled; 1: Enabled	
		Bit7: Emergency stop	0: Disabled; 1: Enabled	

Index/ Subindex	Meaning	Description	Value range	Attr.
2100h/0	Drive torque upper limit	Unit: 0.1%	0.0 to 300.0% (corresponding to 0 to 3000)	RW
2101h/0	Braking torque upper limit	Unit: 0.1%	0.0 to 300.0%	RW
2102h/0	FWD frequency upper limit	Unit: 0.01 Hz	0.00 to 599.00 Hz (corresponding to 0 to 59900)	RW
2103h/0	REV frequency upper limit	Unit: 0.01 Hz	0.00 to 599.00 Hz	RW
2104h/0	Voltage reference for V/F separation	Unit: 1 V	0 to 1000 V	RW
2105h/0	DO output	Bit0: DO1 terminal Bit1: DO2 terminal Bit2: DO3 terminal Bit3: RO terminal	0: Disabled; 1: Enabled 0: Disabled; 1: Enabled 0: Disabled; 1: Enabled 0: Disabled; 1: Enabled	RW
2106h/0	AO1 output	Unit: 0.01%	0.00 to 100.00% (corresponding to 0 to 10000)	RW
2107h/0	HDO1 output	Unit: 0.001 kHz	0.000 to 50.000 kHz (corresponding to 0 to 50000)	RW
2108h/0	HDO2 output	Unit: 0.001 kHz	0.000 to 50.000 kHz	RW
2109h/0	Process PID reference	Unit: 0.1%	-100.0 to 100.0% (corresponding to -1000 to 1000)	RW
210Ah/0	Process PID feedback	Unit: 0.1%	-100.0 to 100.0%	RW
210Bh/0	Position setting	Currently unavailable	Currently unavailable	RW
210Ch/0	Torque setting	Unit: 0.1%	-300.0 to 300.0%	RW
210Dh/0	Frequency setting	Unit: 0.01 Hz	0.00 to 599.00 Hz	RW

TxPDO (slave transmits, master receives):

Index/ Subindex	Meaning	Description	Value range	Attr.
6041h/0	Status word	Bit0: Forward running Bit1: Reverse running Bit2: Stop Bit3: Fault Bit4: Power-down Bit5: Ready state Bit6: Motor number Bit7: Motor type Bit8: Overload pre-warning Bit9–Bit10: Command channel	0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Not ready; 1: Ready 0: Motor 1; 1: Motor 2 0: Asynchronous; 1: Synchronous 0: Invalid; 1: Valid 0: Keypad; 1: Terminal; 2: Communication	RO
2200h/0	Output current	Unit: 0.1 A	0.0 to 6553.5 A (corresponding to 0 to 65535)	RO
2201h/0	Output voltage	Unit: 1 V	0 to 65535 V	RO
2202h/0	Output frequency	Unit: 0.01 Hz	0.00 to 599.00 Hz (corresponding to 0 to 59900)	RO
2203h/0	Output torque	Unit: 0.1%	-300.0 to 300.0% (corresponding to -3000 to 3000)	RO
2204h/0	Bus voltage	Unit: 0.1 V	0.0 to 6553.5 V	RO
2205h/0	DI status 1	Bit0: DI1 terminal Bit1: DI2 terminal	0: Invalid; 1: Valid 0: Invalid; 1: Valid	RO
		Bit2: DI3 terminal Bit3: DI4 terminal	0: Invalid; 1: Valid 0: Invalid; 1: Valid	
2206h/0	DI status 2	Bit0: DI5 terminal Bit1: DI6 terminal Bit2: DI7 terminal Bit3: DI8 terminal	0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid	RO
2207h/0	DO status	Bit0: DO1 terminal Bit1: DO2 terminal Bit2: DO3 terminal Bit3: RO terminal	0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid 0: Invalid; 1: Valid	RO
2208h/0	Motor power	Unit: 0.1%	-300.0 to 300.0% (corresponding to -3000 to 3000)	RO
2209h/0	Output power	Unit: 0.1 kW	0.0 to 6553.5kW (corresponding to 0 to 65535)	RO
220Ah/0	Actual position value	Currently unavailable	Currently unavailable	RO
603Fh/0	Error code	Refer to "MV800 Series High-performance Vector Control Drive User Manual"		RO

5 SDO Data Description

EtherCAT mailbox data SDO is used to transmit non-cyclic data, such as the configuration of communication parameters and function codes of the drive. The drive's function codes can be read/written through SDO, for example, object dictionaries of 0x2000–0x2062 corresponding to function groups P00–P98. For detailed description of function codes, refer to "MV810 High-performance Vector Control Drive User Manual".

6 Fault Diagnosis

6.1 LED indicator description and fault diagnosis

MV810-ECAT02 has five LED indicators (see Fig. 1): the LEDs on the PCBA of the expansion box and the LED on the communication port. The LED on the PCBA indicates the function status and power status; and the LED on the communication port indicates whether the communication status of MV810-ECAT02 is normal.

Description of LED on the PCBA of the expansion box:

LED	Status	Description	Action
LED1 (Red)	Steady on	Normal power supply for the ECAT option	No need for actions
	Off	No power supply for the ECAT option	Check whether the ECAT option is properly connected to the drive
LED2 (Green)	Off	The state machine is in the Init state	Check whether the ECAT option is properly connected to the host device
	Flashing quickly	The state machine is in the Pre-OP state	Check whether the ECAT option is properly connected to the host device
	Flashing slowly	The state machine is in the Safe-OP state	Check whether the ECAT option is properly connected to the host device
	Steady on	The state machine is in the OP state	No need for actions
LED3 (Green)	Steady on	The master station reads/writes the function code normally	No need for actions
	Flashing every 0.5 s	The master station fails to read/write the function code	Check the reading/writing faults in 6.2 and find the causes
LED4 (Red)	Off	Normal	No need for actions
	Steady on	Communication timeout between master station and slave station	Check whether the ECAT option is properly connected to the drive
	Flashing every 0.5 s	Malfunction of ESC	Contact the manufacturer

Description of LED on the communication port:

LED status	Description	Action
Yellow light flashing	Normal connection with data transmission	No need for actions
Green light steady on	Normal connection	No need for actions
Yellow light steady on	Normal connection without data transmission	Check whether there is communication between the EtherCAT master station and slave station
Green light off	Disconnection	Check the wire connection

6.2 Reading/Writing faults of function codes

The object dictionary under the index 0x2064 indicates the reading/writing faults of function codes by the EtherCAT master station. Subindex 1 indicates the fault codes, in which the high 8 bits indicate the writing fault and the low 8 bits indicate the reading fault. Subindex 2 indicates the index of the function code which the system fails to read/write. For example, 0x0200 indicates the reading/writing fault on the function code P02.00. The fault codes are listed below:

Fault type	Fault code
Incorrect password	0xF1
The index does not exist	0xF4
Invalid parameter	0xF5
Read-only parameter	0xF6
System is locked	0xF7
EEPROM is saving	0xF8

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Warranty bill of communication option

Customer company:	
Detailed address:	
Contact:	Tel:
Option model:	
Option No:	
Purchase date:	
Service unit:	
Contact:	Tel:
Maintenance date:	

MEGMEET Certificate	Checker:_____ Manufacturing date:_____ The product has been tested in line with design standards and approved for leaving the factory.