INOVANCE

MD500 EtherCAT Expansion Card User Guide

Option for the MD Series AC Drive



1. Overview

Thank you for using Inovance's MD series AC drives and MD500-EtherCAT expansion card (hereinafter referred to as the MD500-ECAT card).

The MD500-ECAT card is an EtherCAT fieldbus adapter card, which can be used in the ultra-high speed I/O network. The protocol is applicable on the I/O layer. This card features high efficiency, flexible topology, and easy operation. It is installed in the MD series AC drive to increase the communication efficiency and implement the AC drive networking function, which enables the AC drive to be a slave controlled by the field bus master station.

The MD500-ECAT card can be used on the MD series AC drives, such as MD500 and MD290.

The MD500-ECAT card software version required in this user guide is 1.00 or above (checked by the parameter on the AC drive after the card is installed and powered on). The corresponding XML file is MD500_1Axis_V1.03.xml. This user guide is applicable only for the MD500 and MD290 series AC drive. If you need to use the MD500-ECAT card on other AC drives, contact our technical engineers to check whether available and obtain corresponding information.

Before using the product, read this user guide thoroughly.



Figure 1-1 Appearance of the MD500-ECAT card

Installation and Settings

2.1 Installing the MD500-ECAT card

The MD500-ECAT card is installed inside the MD500 series AC drive. Before installation, deenergize the AC drive and wait about 10 minutes until the charging indicator on the AC drive becomes off. Then, insert the MD500-ECAT card into the AC drive and fasten the screws to avoid damage caused by external signal cable tension on the signal socket between boards. Figure 2-1 shows the installation.

Note that the ground terminals of both the MD500-ECAT card and AC drive must be connected properly, as shown in Figure 2-2.



Figure 2-1 Installation of the MD500-ECAT card



Figure 2-2 Ground terminal connection between the MD500-ECAT card and AC drive

2.2 Hardware Layout

Figure 2-3 shows the hardware layout of the MD500-ECAT card. The pin header J7 on the back of the MD500-ECAT card is used to connect the AC drive. The MD500-ECAT card provides two network ports J4 and J6 for communication with the master station (or the previous slave station) and next slave station (if existing). For details about the hardware, see table 2-1.



Figure 2-3 MD500-ECAT card (hardware)

Table 2-1 Hardware description of the MD500-ECAT card

| ymbol | Hardware Name | Function Description | |
|-------|---|--|--|
| J7 | Pin header | Used to connect the AC drive. | |
| J4 | Matural | Used for communication with the master station (or the previous | |
| JG | Network port | slave station) and next slave station (if existing). The left one is used for input and the right one is for output. | |
| J1 | EMC ground terminal | Used to connect the EMC ground terminal of the AC drive. | |
| D13 | Power indicator (green) | Used to indicate the power status. On: power-on normal Off: power-on abnormal (Check whether the installation is correct.) | |
| D1 | AC drive communication status indicator (green) | | |
| D4 | EtherCAT interaction indicator (green) | See Table 2-2 Indicator description of the MD500-ECAT card. | |
| D7 | ESC fault indicator (red) | | |

| | Table 2-2 Indicator description of the MD500-ECAT card | | | | |
|-----------|--|--|---|--|--|
| Indicator | | State Description | Solution | | |
| | Steady green | Normal | N/A | | |
| D1 | Steady off | Abnormal communication with the AC drive | Set F0-28 to 1 and check whether the AC drive supports the MD500-ECAT card. | | |

| | h | ndicator | State Description |
|--|----|---------------------|--|
| | | Steady green | Working at OP state |
| | D4 | Flashing green | Working in PREOP/ SAFEOP mode |
| | | Steady OFF | Master station disconnected or working in Initial mode |
| | D7 | Steady OFF | Normal |
| | זט | Steady on in red | ESC internal fault |

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2.3 EtherCAT RJ45 Interfaces

The MD500-ECAT card is connected to the EtherCAT master station using the standard Ethernet RJ45 socket. Its pin signal definitions are the same as those of the standard Ethernet pins. They can be connected using crossover cables or straight-through cables.

| | Terminal Symbol | Terminal Name | | |
|----|--------------------|------------------|-------------------|--|
| J4 | | ECAT IN | Wiring torminal | |
| | J6 | ECAT OUT | winnig terminats. | |



3. Communication Configuration

Drive

After installing the MD500-ECAT card on the MD500 series AC drive, complete communication configuration to enable the communication between them.

Communication card setting for the AC drive

AC drive software version:

MD500: U76.62_U77.62 and above (checked by parameters: F7-10 = U76.62; F7-11 = U77.62)

MD290: U29.12_U29.21 and above (checked by parameters: F7-10 = U29.12; F7-11 = U29.21)

The following parameters must be set to enable normal communication between the MD500-ECAT card and MD500/MD290 series AC drive and connect the MD500-ECAT card to the EtherCAT fieldbus nerwork.

| Parameter No. | Parameter Name | Setting Range | Value | Description | |
|------------------|--|--|-------|--|--|
| F0-02 | RUN command selection | 0: Operating panel 1: Terminal 2: Serial communication | 2 | Running command given through communication | |
| | Main frequency reference input selection | 0: Digital setting (non- retentive at power failure) | | | |
| | | 1: Digital setting (retentive at power failure) | | | |
| | | 2: AI1 | | | |
| | | 3: AI2 | | Tauratéran | |
| F0-03 | | 4: AI3 | 9 | Target frequency given through communication | |
| | | 5: Pulse setting (DI5) | | | |
| | | 6: Multi-reference | | | |
| | | 7: Simple PLC | | | |
| | | 8: PID | | | |
| | | 9: Communication setting | | | |

| 3 |
|--|
| Solution |
| N/A |
| Check the configuration. Check whether the AC drive supports the MD500-ECAT card and whether F0-28 is set to 1. Check whether the network port is connected correctly. |
| Check whether the master station and network port are connected correctly. |
| N/A |
| Contact Inovance or the agent for technical support. |

| Parameter No. | arameter Parameter Setting Range | | Value | Description |
|------------------|--|--|--------------|--|
| 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. |
| FD-02 | Slave station alias | 1 to 247 | Undetermined | Alias of the EtherCAT slave station. Its default value is 1. (If the formal name of the slave station is used for communication, the setting of this parameter is not required.) |

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Parameters related to communication control

| Parameter No. | Name | Setting Range | Index | Sub-index | |
|---------------------------------------|-------------------|--|---------|-----------|--|
| Communication control word parameters | | | | | |
| U3-16 | Frequency setting | -Maximum frequency to +Maximum frequency 0.01 Hz | 16#2073 | 16#11 | |
| U3-17 | Control command | 0001: Forward running 0002: Reverse running 0003: Forward jogging 0004: Reverse jogging 0005: Coast to stop 0006: Decelerate to stop 0007: Fault reset | 16#2073 | 16#12 | |
| U3-18 | DO control | BIT0: DO1 control BIT1: DO2 control BIT2: RELAY1 control BIT3: RELAY2 control BIT4: FMR output control BIT5: VDO1 BIT6: VDO2 BIT7: VDO3 BIT8: VDO4 BIT9: VDO5 | 16#2073 | 16#13 | |
| U3-19 | AO1 control | 0 to 7FFF corresponds to 0% to 100%. | 16#2073 | 16#14 | |
| U3-20 | AO2 control | 0 to 7FFF corresponds to 0% to 100%. | 16#2073 | 16#15 | |
| U3-21 | FMP control | 0 to 7FFF corresponds to 0% to 100%. | 16#2073 | 16#16 | |
| U3-22 | Reserved | Reserved | 16#2073 | 16#17 | |
| U3-23 | Speed control | -15000 rpm to +15000 rpm (The setting range is determined by the number of motor pole pairs and frequency setting range.) | 16#2073 | 16#18 | |
| AC drive parameters (commonly-used) | | | | | |
| F0-10 | Maximum frequency | 50.00 Hz to 500.00 Hz | 16#20F0 | 16#0B | |
| F0-17 | Acceleration time | 0.00s to 650.00s (F0-19 = 2) 0.0s to 6500.0s (F0-19 = 1) 0s to 65000s (F0-19 = 0) | 16#20F0 | 16#12 | |
| F0-18 | Deceleration time | 0.00s to 650.00s (F0-19 = 2) 0.0s to 6500.0s (F0-19 = 1) 0s to 65000s (F0-19 = 0) | 16#20F0 | 16#13 | |

n of EtherCAT communication interfaces

| Description |
|---|
| nals. The left one is for input and the right one is for output. |
| |
| card is installed, ECAT IN is on the left and ECAT OUT is on the righ 15 interface. The two interfaces must be connected correctly. isted pair (STP) network cable must be used for ensuring stability. |
| |
| |

3.1 Communication Configuration for the MD500-ECAT Card and MD500 AC

| | | | | 5 |
|------------------|---|----------------------------------|---------|-----------|
| Parameter No. | Name | Setting Range | Index | Sub-index |
| F0-19 | Acceleration/Deceleration time unit | 0: 1s 1: 0.1s 2: 0.01s | 16#20F0 | 16#14 |
| F8-00 | Jog running frequency | 0.00 Hz to the maximum frequency | 16#20F8 | 16#01 |
| F8-01 | Jog acceleration time | 0.0s to 6500.0s | 16#20F8 | 16#02 |
| F8-02 | Jog deceleration time | 0.0s to 6500.0s | 16#20F8 | 16#03 |
| A0-03 | Torque digital setting in torque control | -200.0% to +200.0% | 16#20A0 | 16#04 |
| A0-05 | Forward maximum frequency in torque control | 0.00 Hz to the maximum frequency | 16#20A0 | 16#06 |
| A0-06 | Reverse maximum frequency in torque control | 0.00 Hz to the maximum frequency | 16#20A0 | 16#07 |
| U0-06 | Output torque (%) | - | 16#2070 | 16#07 |
| U0-07 | DI state | - | 16#2070 | 16#08 |
| U0-08 | DO state | - | 16#2070 | 16#09 |
| U0-24 | Current speed | - | 16#2070 | 16#19 |
| U0-38 | Encoder position | - | 16#2070 | 16#27 |
| 2001H | DO control | - | 16#2020 | 16#02 |
| 8000H | Current fault | - | 16#2080 | 16#01 |

The AC drive parameter indices are described as below:

Each object within the dictionary shall be addressed uniquely by using an index and sub-index.

"Index": This field (hexadecimal) specifies the position of the same type of objects in the dictionary.

"Sub-index": This field specifies the offset of each object in the same index in hexadecimal format.

The mapping between AC drive parameters and the object dictionary is as follows:

Object dictionary index = 0x2000 + Parameter group number

Object dictionary sub-index = Hexadecimal of offset in parameter group + 1

By default, when the MD500-ECAT card is used, the written PDO1 and PDO2 are mapped to U3-17 and U3-16, respectively. Therefore, the first item of RPDO must be U3-17; otherwise, the running will be abnormal. Besides, if the eight higher bits of U3-17 are written with any non-zero value, the AC drive will report a communication fault (Err16).

Parameters related to communication monitoring

| Parameter No. | Name | Unit | Decimal Address |
|------------------|--------------------------|---------|-----------------|
| U0-00 | Running frequency (Hz) | 0.01 Hz | 28672 |
| U0-01 | Frequency reference (Hz) | 0.01 Hz | 28673 |
| U0-02 | Bus voltage (V) | 0.1 V | 28674 |
| U0-03 | Output voltage (V) | 1 V | 28675 |
| U0-04 | Output current (A) | 0.01 A | 28676 |
| U0-05 | Output power (kW) | 0.1 kW | 28677 |
| U0-06 | Output torque (%) | 0.1% | 28678 |
| U0-07 | DI state | 1 | 28679 |
| U0-08 | DO state | 1 | 28680 |
| U0-09 | AI1 voltage (V) | 0.01 V | 28681 |
| U0-10 | AI2 voltage (V) | 0.01 V | 28682 |
| U0-11 | AI3 voltage (V) | 0.01 V | 28683 |
| U0-12 | Count value | 1 | 28684 |
| U0-13 | Length value | 1 | 28685 |
| U0-14 | Load speed display | 1 | 28686 |
| U0-15 | PID reference | 1 | 28687 |

| | | | 6 | |
|------------------|--|------------------|-----------------|-------------|
| Parameter No. | Name | Unit | Decimal Address | Pa |
| U0-16 | PID feedback | 1 | 28688 | U0-7 |
| U0-17 | PLC stage | 1 | 28689 | U0-8 |
| U0-18 | Pulse input reference (Hz) | 0.01 kHz | 28690 | U0-8 |
| U0-19 | Feedback speed (Hz) | 0.01 Hz | 28691 | 10-1 |
| U0-20 | Remaining running time | 0.1 min | 28692 | |
| U0-21 | All voltage before correction | 0.001 V | 28693 | - 00-8 |
| U0-22 | Al2 voltage before correction | 0.001 V | 28694 | U0-8 |
| U0-23 | AI3 voltage before correction | 0.001 V | 28695 | 1 |
| U0-24 | Linear speed | 1 m/min | 28696 | U0- |
| U0-25 | Current power-on time | 1 min | 28697 | 1 |
| U0-26 | Current running time | 0.1 min | 28698 | U0-8 |
| U0-27 | Pulse input frequency | 1 Hz | 28699 | 1 |
| U0-28 | Communication reference | 0.01% | 28700 | - U0-8 |
| U0-29 | Encoder feedback speed | 0.01 Hz | 28701 | 1 |
| U0-30 | Main frequency X display | 0.01 Hz | 28702 | - U0-8 |
| U0-31 | Auxiliary frequency Y display | 0.01 Hz | 28703 | 1 |
| U0-32 | Any memory address | 1 | 28704 | - U0-8 |
| U0-33 | Synchronous motor rotor position | 0.1° | 28705 | By de |
| U0-34 | Motor temperature | 1°C | 28706 | and will b |
| U0-35 | Target torque (%) | 0.1% | 28707 | |
| U0-36 | Resolver position | 1 | 28708 | 3.2 |
| U0-37 | Power factor angle | 0.1° | 28709 | - Stat |
| U0-38 | ABZ position | 1 | 28710 | After |
| U0-39 | Target voltage upon V/f separation | 1 V | 28711 | card |
| U0-40 | Output voltage upon V/f separation | 1 V | 28712 | 3.2 Ethe |
| U0-41 | DI state display | 1 | 28713 | follo |
| U0-42 | DO state display | 1 | 28714 | |
| U0-43 | DI state display 1 | 1 | 28715 | |
| U0-44 | DI state display 2 | 1 | 28716 | |
| U0-45 | Fault information | 1 | 28717 | |
| U0-58 | Z signal counting | 1 | 28730 | |
| U0-59 | Rated frequency (%) | 0.01% | 28731 | |
| U0-60 | Running frequency (%) | 0.01% | 28732 | 3.2. |
| U0-61 | AC drive state | 1 | 28733 | _ In th |
| U0-62 | Current fault code | 1 | 28734 | |
| U0-63 | Data sent by master during point-point communication | 0.01% | 28735 | The perfe |
| U0-64 | Data sent by slave during point-point communication | 0.01% | 28736 | AC d |
| U0-65 | Torque upper limit | 0.1% | 28737 | 4 |
| | | 100: CANopen | | |
| | | 200: PROFIBUS-DP | | |
| U0-66 | Expansion card model | 300: CANlink | 28738 | The |
| | | 400: PROFINET | | drive |
| | | 500: EtherCAT | | - |
| U0-67 | Expansion card version | 0.01 | 28739 | |
| U0-68 | AC drive state | 1 | 28740 | |
| U0-69 | Running frequency (Hz) | 0.01 Hz | 28741 | |
| U0-70 | Motor speed | 1 rpm | 28742 | |

| Parameter No. | Name | Unit | Decimal Address |
|------------------|---|-------|-----------------|
|)-71 | Output current | 0.1 A | 28743 |
|)-80 | EtherCAT slave station name | 1 | 28752 |
|)-81 | EtherCAT slave site alias | 1 | 28753 |
|)-82 | EtherCAT ESM transmission error code | 1 | 28754 |
|)-83 | EtherCAT XML file version | 0.01 | 28755 |
|)-84 | EtherCAT synchronization loss times | 1 | 28756 |
|)-85 | Maximum EtherCAT port 0 invalid frames and errors per unit time | 1 | 28757 |
|)-86 | Maximum EtherCAT port 1 invalid frames and errors per unit time | 1 | 28758 |
|)-87 | Maximum EtherCAT port forwarding errors per unit time | 1 | 28759 |
|)-88 | Maximum EtherCAT data frame processing unit errors per unit time | 1 | 28760 |
|)-89 | Maximum EtherCAT port link losses per unit time | 1 | 28761 |
| | | | |

e abnormal.

communication Settings for the MD500-ECAT Card and EtherCAT Master on

enabling the communication between the MD500-ECAT card and MD500 AC drive, connect herCAT master station correctly to enable the communication between the MD500-ECAT nd EtherCAT master station and networking function of the AC drives.

EtherCAT Topology

CAT supports various topological structures including star, bus, and tree topologies and combination. This enables flexible and convenient equipment connection and wiring. The ing figure shows the bus topology.



EtherCAT Communication Protocol

DC mode, the DC synchronous mode period must be at least 1 ms but shorter then 100 ms. wise, an EtherCAT communication fault will occur.

PDO data description

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

- Real-time setting of AC drive control command and target frequency
- b) Real-time reading of AC drive current state and running frequency
- Function parameter and monitor data real-time exchange between AC drive and EtherCAT master station

DO process data is used for periodic data exchange between the master station and AC as described in the following table.

| Master sending PDO (0x1600) | | | |
|-----------------------------|---------------------------|--|--|
| Fixed | I RPDO | Variable RPDO | |
| AC drive command | AC drive target frequency | Modifying function parameters of AC drive in real time | |
| PD01 | RPDO2 | RPDO3 to RPDO10 | |

|--|

ault, when the MD500-ECAT card is used, the read PDO1 and PDO2 are mapped to U0-68 0-69, respectively. Therefore, the first item of TPDO must be U0-68; otherwise, the running

Figure 3-1 Bus topology

| | Corresponding AC drive da | ata PDO (0x1A00) |
|----------------|-------------------------------|--|
| AC drive state | AC drive running frequency | Reading function parameters of AC drive in real time |
| PD01 | TPDO2 | TPDO3 to TPDO10 |

Note: A maximum of 10 RPDOs and 10 TPDOs can be configured.

Data sent by the master station

| | Master sending data RPDO |
|-----------------|--|
| | AC drive command word (command source set to "communication") |
| RPDO1 | 01: Forward running 02: Reverse running 03: Forward jogging 04: Reverse jogging 05: Coast to stop 06: Stop according to F6-10 (Stop mode) 07: Fault reset |
| RPDO2 | AC drive target frequency (frequency source set to "communication") in the range of reverse frequency upper limit (negative value) to forward frequency upper limit (decimal places included, for example, 2000 corresponds to 20.00 Hz on the AC drive) When the given target frequency exceeds this range, the AC drive runs at the frequency upper limit. |
| | For example, if the frequency upper limit is set to 50.00 Hz and the communication setting is 6000, the AC drive will run at 50.00 Hz in the forward direction. If the frequency upper limit is set to 50.00 Hz and the communication setting is -6000, the AC drive will run at 50.00 Hz in the reverse direction. |
| | Modifying the function parameter values (groups F and A) in real time, not written into EEPROM |
| RPDO3 to RPDO10 | FE-02 to FE-09 correspond to RPDO3 to RPDO10 respectively. For the configuration method, see PDO data configuration. |

AC drive response data

| | AC drive response data TPDO |
|-----------------|--|
| | AC drive running state |
| TPDO1 | AC drive running state determined by the bits as follows: |
| | Bit0: 0: AC drive stop; 1: AC drive running |
| | Bit1: 0: Forward running; 1: Reverse running |
| | Bit2: 0: No fault; 1: AC drive fault |
| | Bit3: 0: Running frequency not reached; 1: Running frequency reached |
| | Bit4 to Bit7: Reserved |
| | Bit8 to Bit15: AC drive fault code |
| | AC drive running frequency (unit: 0.01 Hz) |
| TPDO2 | The current AC drive running frequency is returned. The returned data is 16-bit signed data and the received data is 16-bit unsigned data. Variables must be mapped to the 16-bit signed data. |
| TPDO3 to TPDO10 | Reading function parameter values (groups F and A) and monitor parameter values (group U): |
| | FE-22 to FE-29 correspond to TPDO3 to TPDO10 respectively. For the configuration method, see PDO data configuration. |

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

Service data object (SDO)

EtherCAT SDO is used to transfer non-cyclic data, such as communication parameter configuration and servo drive running parameter configuration. The EtherCAT CoE service types include:

- 1) Critical event message
- 2) SDO request
- 3) SDO response
- 4) TxPDO
- 5) RxPDO
- 6) Remote TxPDO sending request

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- 7) Remote RxPDO sending request
- 8) SDO information

Currently, the AC drive supports SDO requests and responses. For details about SDO-related parameters, see the MD500 and MD290 user guides.

3.3 Using the MD500-ECAT Card with Beckhoff's Controller

Beckhoff's TwinCAT master station is used as an example to describe the configuration of the MD500-ECAT card.

NOTE:

The 100M Ethernet network adapter with Intel chip must be used. Other network adapters may not support EtherCAT.

- 1) Install TwinCAT.
- Windows XP system: tcat_2110_2230 is recommended.

Windows 7 32-bit system: tcat_2110_2248 is recommended.

2) Copy the EtherCAT configuration file (MD500_1Axis_V1.03.xml.XML) of MD500 to the TwinCAT installation directory.

TwinCAT2 directory: TwinCAT\IO\EtherCAT

TwinCAT3 directory: TwinCAT\3.1\config\IO\EtherCAT

TwinCAT3 is used as an example in the following section. The operation steps for TwinCAT2 are similar.

3) Start TwinCAT.

Click New Project to create a project.



| 4) Install the TwinCAT ne | twork adapter driver. |
|--|--|
| TwinCAT Project7 - Microsoft Visual Studio (Adn | inistrator) |
| FILE EDIT VIEW PROJECT BUILD DEBUG | TWINCAT TWINSAFE PLC TOOLS SCOPE WINDOW HELP |
| Solution Explorer + 1 × Solution Explorer + 1 × Search Solution Explorer (Dr1+) P · Solution TwinCAT Project7 (1 project) | Activate Configuration Activate Configuration Restart TwinCAT System Restart TwinCAT (Config Mode) Reload Devices Scan Toggle Free Run State Kenu Ocline Data |
| | Image: Show Unine Data Image: Show Sub Items Image: Security Management Image: Show Sub Items Image: Show Sub Item |
| Mappings | File Handling > Selected Item > EtherCAT Devices > Target Browser > Filter Designer > About TwinCAT |

Choose TWINCAT > Show Real Time Ethernet Compatible Devices.... In the displayed dialog box, select the local network adapter in **Incompatible devices**, and click **Install**. After installation, the installed network adapter is displayed in **Installed and ready to use devices**.

| □ | Install |
|---|---------|
| Installed and ready to use devices(for demo use only) | |
| Liomnatible devices | Update |
| | Bind |
| | Unbind |
| | Enable |
| | Disable |

Click **OK**.

| | | .NET Framework 4 + Sort by: Default | • # E | Search Installed Templates (Ctrl+E) |
|---|---------------------------------------|--|------------------|---|
| Installed Templates Other Proje TwinCAT Me TwinCAT PLI TwinCAT Pros Samples Online | ct Types easurement C ojects | TwinCAT XAE Project (XML format) | TwinCAT Projects | Type: TwinCAT Projects TwinCAT XAE System Manager Configuration |
| | | <u>Click here to go online and find</u> | templates. | |
| Name: | TwinCAT Proje | <u>Click here to go online and find</u> | templates. | |
| Name: Location: | TwinCAT Proje C:\Users\J3298 | <u>Click here to go online and find</u> ct7 \Documents\Visual Studio 2013\Projects | templates. | Browse |

5) Search for devices.

9

Create a project, right-click **Device**, and then click **Scan** to search for devices, as shown in the following figure.

10

| | | 11 | 12 |
|--|---|---|---|
| M TwinCAT Project7 - | - Microsoft Visual Studio (Administrator) | Click OK . | |
| FILE EDIT VIEW | PROJECT BUILD DEBUG TWINCAT TWINSAFE PLC TOOLS SCOPE WINDOW HELP | EtherCAT drive(s) added | × |
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| ck OK . | | Jolution TwinCAT Project7' (1 project) Object Id: 0x03020001 Jim TwinCAT Project7 Type: MD500_1Axis_V1.02 | |
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| ck OK. | | ▶ Mappings | |
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| | Cancel Select All Unselect All | 6) Configure PDO parameters. 1. Configure TPDO. Select 0x1A00 when configuring TPDO. The first two items are set to TPI be changed. Right click at the position indicated by the red arrow in the the TPDO mapping as required. |)O by default and cannot following figure to add |
| ck Yes . | Microsoft Visual Studio | | |

Click OI

| | | 11 | | | | | | 12 |
|--|--|---|---|--------------------------|--------------|---------------|--|--|
| ject7 - Microsoft Visual Studio (Administrat | tor) | Click OK . | | | | | | |
| EW PROJECT BUILD DEBUG TWI | INCAT TWINSAFE PLC TOOLS SCOPE WINDOW HELP | EtherCAT drive(s) added | | | | × | | |
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| NC-Task 1 SAE - Device 2 (EtherCAT | | | · |

2. Configure RPDO.

Select 0x1600 when configuring RPDO. The first two items are set to RPDO by default and cannot be changed. Right click at the position indicated by the red arrow in the following figure to add the RPDO mapping as required.

| TwinCAT Project7 - Microsoft Visual Studio (A | dministrator) | | | | | | | | |
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| A 📲 Devices | <i>Q</i> x1600 | | Index | Size | Offs | Name | | | Type |
| Device 2 (EtherCAT) | | | 0x2073:12 | 2.0 | 0.0 | Control | Command | | UINT |
| 🚔 Image | | | 0x2073:11 | 2.0 | 2.0 | Writter | Freq | | INT |
| 🛟 Image-Info | | | | | 4.0 🔫 | | | | |
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| VCState | | onnite | Type | - | 3120 | -Add | in/Out | oser | Linked to |
| InfoData | Tinverter State | U | UIN | - | 2.0 | /1.0 | Input | 0 | |
| Mappings | Vutput Frq | 0 | UIN | 1 | 2.0 | /3.0 | Input | 0 | |
| | | | | | | | | - | ALC 4 ALC |

3. View the SDO data list.

After the OP state is activated, you can view real-time data in the SDO data list or double-click the object dictionary to modify the SDO data.



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|---------------------------|------------------|
| (Old Configuration Will k | be overwritten!) |
| ОК | Cancel |
| | 23 |
| Microsoft Visual Studio | |



Click **OK** to enter the OP state.



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| Image: State Sta | inistrator) TWINCAT TWINSAFE PLC TOOLS SCOPE WINDOW HELP • ♥ • ▶ Attach • • • Release • TwinCAT RT (x64) • • ♥ • ● △ △ △ △ ○ □ = ◎ ↓ ○ □ = ◎ ↓ ○ □ = ◎ ↓ ○ ○ ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● |
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3.4 Using the MD500-ECAT Card with the AM600 Master Station

with the master station.

14

1) Start the software, and create an AM600 project.

Select AM600-CPU1608TP, as shown in th

| Categories Lib | : raries jects | Templates: Standard project | |
|-------------------|-----------------------|-----------------------------------|-----------------------------|
| | ntaining one device | one application, and an empt | vimplementation for PLC_PRG |
| Name: | MD500ECAT appli | ation | |
| Location: | C: \Users \dell \Docu | ments | ▼ [|
| | | | |

5. Control the AC drive through PDO.

Write corresponding values through the configured RPDO to control the AC drive.

| | | | 1 | 6 |
|--|--|---|--|--|
| roject | | Σ | 3 | |
| You are abou objects withi - One program - A program - A cyclic tas - A reference | It to create a new standard project. This wizard will create the following in this project: mmable device as specified below PLC_PRG in the language specified below k which calls PLC_PRG to the newest version of the Standard library currently installed. |] | | |
| Device: PLC_PRG in: | AM600-CPU 1608TP/TN (Shenzhen Inovance Control Technology) Structured Text (ST) OK Cance | 2 | • | |
| | You are abou objects withi - One program - A program - A cyclic tas - A reference Device: PLC_PRG in: | roject You are about to create a new standard project. This wizard will create the following objects within this project: One programmable device as specified below A program PLC_PRG in the language specified below A cyclic task which calls PLC_PRG A reference to the newest version of the Standard library currently installed. Device: AM600-CPU1608TP/TN (Shenzhen Inovance Control Technology) PLC_PRG in: Structured Text (ST) OK Cance | roject You are about to create a new standard project. This wizard will create the following objects within this project: One programmable device as specified below A program PLC_PRG in the language specified below A cyclic task which calls PLC_PRG A reference to the newest version of the Standard library currently installed. Device: AM600-CPU1608TP/TN (Shenzhen Inovance Control Technology) PLC_PRG in: Structured Text (ST) OK Cancel | roject You are about to create a new standard project. This wizard will create the following objects within this project: • One programmable device as specified below • A program PLC_PRG in the language specified below • A cyclic task which calls PLC_PRG • A reference to the newest version of the Standard library currently installed. Device: AM600-CPU1608TP/TN (Shenzhen Inovance Control Technology) ▼ PLC_PRG in: Structured Text (ST) ▼ OK Cancel |

2) Add the MD500 AC drive slave station. Open the network configuration, import the EtherCAT configuration file of MD500. If any configuration file of other version exists, delete the existing configuration file before importing a new one. Drag the device in the network device list to add the AC drive slave station, as shown in the following figure.

| Devices 👻 🕂 💥 | K Network Configuration X | | | | | |
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The AM600 master station is used as an example to describe how to use the MD500-ECAT card

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| IIC. | iui | lowing | inguic. |
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3) Configure PDO parameters.

Right click at the position indicated by the red arrow in the following figure to add the TPDO mapping as required. Control Command and Inverter State of the RPDO cannot be changed and they must be set as the first items. Otherwise, the running will be abnormal.

| rices * # X | Network Configuration | 1 InoM | D500N X | | | | | | | |
|--|---------------------------------|--------|----------|--------------------|------------|------------|----------|-------------|---------------|----------------|
| = -3 Device (AM800-CPU1808TP/TH) | General | a Ad | d 📑 Edi | z Zelete Collapse | Display Al | - Load Pds | 121 PD 0 | Assion IV P | 00 Config PDD | Len Out(Byta): |
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| = gld. Network Configuration | | Input | OutPut | Name | Index | Subindex | Size | Type | Flag | SM |
| therCAI Corng | Startup parameters(SDO Setting) | + 12 | Output | Outputs | 16#1600 | 16#00 | 6.0 | | Editable | 2 |
| - All marian | Online | 190 | 54 | Control Command | 16#2173 | 16#12 | 2.0 | UDVT | | |
| = C top | | | 10 | VD12 Punc Selc | 16#25A1 | 16#12 | 2.0 | UINT | | |
| | CoE Online | | 14 | VDI1 Func Selc | 16#2841 | 16#11 | 2.0 | UDVT | | |
| | Exe sations | | | Written Freq | 14#2073 | 16#11 | 2.0 | INT | | |
| Tack Config ration | EDE saturiga | | Input | Inputs | 16#1A00 | 16#00 | 8.0 | | Editable | 3 |
| | EtherCAT 1/0 Mepping | | 10 | Inverter State | 16#2070 | 16#45 | 2.0 | UDNT | | |
| A ETLERCAT ENVELAT THE | and the second second | | 49 | Ganeratrie Voltage | 16#2070 | 16#13 | 2.0 | UDNT | | |
| a SQ ManTark | Status | | 40 | Running Frg | 16#2870 | 16#11 | 2.0 | UDVT | | |
| - Minic and | | | 19 | Output Pro | 16#2070 | 16#46 | 2.0 | INT | | |
| Softwaren Ganeral Aus Prod Soft-SPEIZ (J) (Hyl Social SCI Produle) C PTRSCAT, LEPort AT Name) Instruction (Horston, Levin, J) 1.07) | | | | | | | | | | |

Scan the devices.

* # X 🕺 Network Configuration 🔄 Inst*DSDIN 🧐 Device 🗴 Contact Con Radius and Rec PLC SETTINGS A 64453442/1682/ Driver: TCP/3* IP-Address localitact Cancel

Download the project to the PLC.



View TPDO data and write RPDO data in real time through EtherCAT I/O mapping.

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Parameter values can be viewed and directly written in through the online CoE.

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| T PersistentVers | | * 16#1C33:16#00 | SM input parameter | RO | USDIT |
| SoftMotion General Axis Pool | | Image: 16#2070:16#00 | monitoring Disp | RO | USINT |
| HIGH_SPEED_JO (High Speed IO Module) | | * 16#2073:16#00 | Control Pera | RO | USINT |
| ETHERCAT (EtherCAT Mester) | | * 15#20A0:15#00 | Torque Ctrl | EV/ | USENT |
| - 😳 🚮 InsMD500N (MD500_1Axis_V1.07) | | * 15#20A1:16#00 | VD1/VD0 | RQ | USINT |
| | | * 16#20A2:16#00 | Motor 2 Parameters | RO | USINT |
| | | * 16#20A5:16#00 | Control Optimization | RO | USDAT |
| | | T. 16+7016-16+00 | ALC and Sotting | 00 | INDA |

| Build | - | O error(s) | 🕐 0 warning(s) | 5 message(s) | - | Expressio |
|--|---------|------------|----------------|--------------|---|-----------|
| Description | Project | ٥ | bject | Position | | |
| typify code | | | | | | |
| generate code | | | | | | |
| generate global initializations | | | | | | |
| generate code initialization | | | | | | |
| generate relocations | | | | | | |
| Size of generated code: 1177340 bytes | | | | | | |
| Size of global data: 214580 bytes. | | | | | | |
| Total allocated memory size for code and | | | | | | |
| Memory area 0 contains Data, 3nput, Ou | | | | | | |
| Hemory area 3 contains Memory: size: 5 | | | | | | |
| Build complete - 0 errors, 0 warnings : re | | | | | | |

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Colline from device

Value 131474

InsMDS00

3.5 Using the MD500-ECAT Card with Omron's Master Station

Omron's NX701 master station is used as an example to describe how to use the MD500-ECAT card with the MD500 AC drive.

1) Create a project.

Device: Set it according to the actual controller model.

Version: 1.09 or later version. NX701-1600 only supports 1.10 or later version.



2) Perform communication settings.

mode for the computer and controller.

Select Direct connection via USB. Go to next step if the test is successful.

| New Project - | new_Cont | roller_0 - 9 | Sysmec Studi | o (32bit) | |
|--|--|--------------|--------------|------------|--|
| ie Edit Viev | w Insert | Project | Controller | Simulation | Tools Window |
| X 🖷 🖬 | | c 🖬 | 1 A | | # A 🛛 |
| Luitiview Explor configuration Programming Configuration Programming Configuration Con | er s and Setup ograms Program0 L Section unction Bloc | n0 ks | | | Communi Connectin Dire Ran Ban Solo |
| | | | | | Remote 1 Specify the |
| | | | | | Options Confirm Check Kesponse Set the Re Please set 2 |
| | | | | | <u> </u> |

3) Import the XML configuration file.

Double-click EtherCAT on the left nevigation pane, and then select and right-click on the master device. In the displayed ESI Library dialog box, click Install (File), and select the XML configuration file of the MD500_ECAT card to import the XML file.

| Project P | roperties | |
|---|---|--------|
| Project name | New Project | |
| Author | a3442 | |
| Comment | | |
| Туре | Standard Project | 1 × 1 |
| Category Category Device Version | Device Controller N0761 V - 1600 134 | T T |
| | | Create |

Enter the main interface and choose **Controller > Communications Setup** to set the control

| v Help | | | |
|---|--|--|-----|
| R A & 63 5 5 1 1 | ्र के ह | Q Q V | |
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| | | | _ |
| ications Setup | | | |
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| 1D Address | | - | |
| e remote IP address. | | | |
| USB Com Test Ok | munications Test | hernet Communications Test | |
| m the serial ID when going online. forced refreshing when going offline. | | | |
| e Monitor Time | | | |
| sponse Monitor Time in the communications wi a sufficiently large value when connecting to the (5) | th the Controller (1-36 e Controller via multip | 00sec) le networks, such as VPN connectio | in. |
| | CK | Cancel | |
| | | | |

| New Fraject - new, Cantroller, 5 - Sysmac Budio (D2Dk) | | | 20 |
|---|---|--|---|
| File Edit View Insert Project Controller Simulation Tools Window Help | | | |
| | X X 4 4 4 6 6 8 12 13 | Q Q 71 | |
| Multiview Explorer • 1 InterCat x | Common BRID, 15MDH, 87T | | Taalbax • 1 Al vendors • |
| Image: Section of Control Image: Section of Control Image: Section of Control Image: Section of Control | Comme RR80: S2003F4 eCT COmme RR80: S2003F4 eCT | Egames Studio The selected ESI files will be installed. Do you want to contrave? MISSOO_LAUE, YJ.07.2ml Yw | Construit Serve Tomobal Comparison Serve Tomobal Comparison Dight Tomobal Comparison Dight Tomobal Comparison Optimization Chrone Served Construction Served Constreali |
| 0 The 2 Albana Data | Context 24/CE1x Install (File) Install (Folder) | Conntal Core | Revision : 10 Revision : 10 Vendor :: OMRON Corp Comment : Single phas URL : Open on a brown |

4) Scan the devices.

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Switch the controller to the online running mode.

Observe the controller status in the lower right corner: online, running mode.

| le Edit View Josen Project Controllo Simulation Tools Window Help | |
|---|---|
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| Serter0 | Compation |
| Lik Sector Birds | Conversion |
| I ■ Theo | Counter |
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| | Duta Type Convention |
| | ► FC5 |
| | ► table Tools |
| | ► Math |
| | Motion Control |
| | ► Offer |
| | Program Control |
| | SD Nettory Card |
| | Selection |
| | Sequence Control |
| | Soqueres Irpan |
| | |
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| | |
| Reference Antoniana | |
| T Description I Program I Location I | CHLP4 . 352.168.87, 3 |
| | EBVALM DIN mode |
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| Pitter Chapter Bald | |

Scan the device and add the slave station. Choose Configurations and Setup > EtherCAT on the left nevigation pane. Right click on the master device, and then select **Compare and merge with** Actual Network Configuration to have the controller automatically scan all slave stations in the network (a fault will be reported if any station number is 0). After the scanning is complete, click Apply actual network configuration in the displayed dialog box. Now, the added slave can be viewed on the main interface.

Note: For the MD500-ECAT card, the station alias can be modified through the parameter Fd-02 or the software tool of the master station (the AC drive software must be updated to the version required in "3.1 Communication Configuration for the MD500-ECAT Card and MD500 AC Drive"). The modified station alias takes effect upon next power-on.





6) Edit the PLC program.



5) Set the parameters.

0 0 0

Switch the controller to the offline mode.

| New Project - new_Controller_0 - Sysmac Studio (32bit) | | | | | | | | | | | | |
|--|---------------------------|-------------|-------------------|-----------------|----------|---------|-------------|-------|-------------|-----|--------|-----|
| ile Edit View Insert Projec | t Controller | Simulatio | n Tools | Window | Help | | _ | | | | | |
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| lultiview Explorer 🛛 👻 🖡 | EAT EtherCAT | at I/O M | ap 🗙 | | | | Offline | | | | | |
| new_Controller_0 🔻 | Position | 💌 🖹 Ether | Poi AT Network | rt Configura | tion | 8 | Descri | ption | F | w/ | Data 1 | уре |
| Configurations and Setup | Node13 | | MD500N | coniguiu | lon | | | | | | | |
| ▼ 200 EtherCAT | | Out | touts Contro | ol Comman | d 2073 1 | 2 | | | w | | UINT | |
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| E CPU/Expansion Packs | | Inp | uts Inverter | State 2070 | 45 | | | | R | | UINT | |
| ► I/O Man | Inputs_Output Frq_2070_46 | | | | | | R | | INT | | | |
| Controller Setup | | | | | | | | | | | | |
| Motion Control Satur | | | | | | | | | | | | |
| Motion Control Setup | | | | | | | | | | | | |
| Cam Data Settings | | | | | | | | | | | | |
| Event Settings | | | | | | | | | | | | |
| Task Settings | | | | | | | | | | | | |
| 🖂 Data Trace Settings | | | | | | | | | | | | |
| Programming | | | | | | | | | | | | |
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| Programs | | | | | | | | | | | | |
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| L 🗗 Section0 | - Monitor type | | | | | | | | | | | |
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| 1 🕱 Function Blocks | | | | | | | | | | | | |





7) Download the program to the controller.

After all the setting and programming are complete, switch over to the online state, and download the program to the controller.



4. Troubleshooting

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The following table describes the faults that may occur during the usage of the MD500-ECAT card and AC drive.

Table 4-1 Fault causes and solutions

| Symptom | Possible Cause | Solution |
|--|---|---|
| munication failure veen the MD500- F card and AC drive | The AC drive does not support EtherCAT communication. The communication configuration of the MD500- ECAT card is incorrect. The MD500-ECAT card hardware is faulty. | Check whether the AC drive supports EtherCAT communication. Set the EtherCAT communication parameters correctly. Replace the MD500-ECAT card. |
| 6 communication r reported by the AC e during running | The communication data is abnormal. The network cable is damaged or connected incorrectly. The AC drive suffers external interference. | Check whether the EtherCAT master station program is normal. Check whether the network cable is connected correctly. Replace the network cable if required. Use the Cat5e shielded twisted pair (STP) network cable as required. Check that the MD500-ECAT card is grounded correctly. Eliminate the external interference. Contact the agent or Inovance for technical support if necessary. |

The MD500-ECAT card can be replaced directly when a slave node is faulty (only the MD500-ECAT card is faulty) without performing device configuration again.

Prerequisites for directly replacing the MD500-ECAT card:

1. Ensure that the wiring sequence is consistent before and after replacing the MD500-ECAT card.

be consistent.

3. If a station alias has been configured for the original MD500-ECAT card, the alias of the new device must be consistent with that of the original device.

- 2. The internal XML file versions of the original MD500-ECAT card and new MD500-ECAT card must

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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