



## E53.C50K-H Multi-channel Piezo Motor Controller

### User Manual and Software Manual

Version: V1.0     Date: 2025.06



The contents of this manual include:

- The basic information of E53.C50K-H multi-channel piezo motor controller
- Introduction to the upper computer software of E53.C50K-H

### Declaration

- This user manual is only applicable to the E53.C50K-H multi-channel piezo motor controller produced and sold by CoreMorrow. To avoid potential dangers that may threaten the safety of users' lives and property, please read this manual carefully before use. If you find any unclear or incorrect descriptions, please provide timely feedback to our company.
- This product can only be used within the specified environmental range. Please refer to the instructions in the manual during use. If there are any problems, please contact our company for technical support. If the product is not operated according to this manual or disassembled and modified by oneself, the company will not be responsible for any consequences arising therefrom.

### Notice!

- Do not touch any exposed ends of the product and its accessories.
- There is high voltage inside, do not open the case without permission.
- Do not connect or disconnect input, output, or sensor cables with power on.
- Please keep surface clean and dry, and don't operate in humid or static environment.
- After use, output voltage should be cleared to zero before turning off the controller switch, such as switching the servo state to the open-loop state.

### Danger!

- The piezo controller described in this manual is a high-voltage device capable of outputting high currents, which can cause serious or even fatal damage if not used properly.
- It is strongly recommended that you do not touch any parts that connect to the high voltage output.
- Special Note: If you connect it with other products in addition to our company, please follow the general accident prevention procedures.
- Operating the high-voltage amplification requires training professional operators.

### Warning!

- To avoid damage to the core PZT device, it is necessary to ensure that the positive and negative poles of PZT are connected correctly before applying voltage to the two poles of PZT. At the same time, the operating voltage must be within the allowable voltage range of PZT to avoid exceeding it and causing permanent damage to PZT devices.
- The modification or maintenance of the instrument must be carried out by personnel authorized by our company, and the corresponding original parts of our company must be used. If the instrument is damaged due to improper maintenance or improper use, our company will not be held responsible.

### Cautious!

- The E53.C50K-H piezo controller housing is a heat dissipation conductor and needs to be installed in an area with a 3cm air circulation area on a horizontal plane or on a plane with a heat dissipation device to avoid damage to the controller.

# Contents

|                                            |           |
|--------------------------------------------|-----------|
| <b>1. Introduction .....</b>               | <b>1</b>  |
| 1.1 Typical characteristics .....          | 1         |
| 1.2 Typical applications .....             | 1         |
| 1.3 Order information .....                | 1         |
| 1.4 Features.....                          | 1         |
| 1.5 User Manual Notes .....                | 2         |
| 1.6 User Manual Download.....              | 2         |
| 1.7 Safety instructions.....               | 3         |
| <b>2. Series&amp;Appearance.....</b>       | <b>5</b>  |
| 2.1 Series.....                            | 5         |
| 2.2 Appearance and panel introduction..... | 5         |
| <b>3. Power Calculation.....</b>           | <b>7</b>  |
| <b>4. Parameter .....</b>                  | <b>8</b>  |
| 4.1 Technical Data.....                    | 8         |
| 4.2 Environmental conditions.....          | 8         |
| 4.3 Drawing.....                           | 9         |
| 4.4 Driving Principle.....                 | 9         |
| 4.5 Interface introduction .....           | 10        |
| <b>5. Software Introduction .....</b>      | <b>11</b> |
| 5.1 Installation Introduction .....        | 11        |

|                                                                  |           |
|------------------------------------------------------------------|-----------|
| 5.2 Introduction to Establishing Communication Connections ..... | 11        |
| 5.3 Introduction to the operating interface .....                | 13        |
| <b>6. Cleaning, Transportation and Storage .....</b>             | <b>21</b> |
| 6.1 Cleaning measures.....                                       | 21        |
| 6.2 Transportation and storage .....                             | 21        |
| <b>7. Service&amp;Maintenance.....</b>                           | <b>23</b> |
| 7.1 Disposal .....                                               | 23        |
| 7.2 After-sales and maintenance.....                             | 23        |
| <b>8. Contact us.....</b>                                        | <b>24</b> |

# 1. Introduction

## 1.1 Typical characteristics

- Output channel: 50, can drive up to 50 Piezo motor driven linear actuators through switching modes, and can drive up to 13 Piezo motor driven linear actuators simultaneously
- 24VDC/15A(20~30V)power supply
- Rated output power 120W
- Software control
- Compact open-loop piezo controller

## 1.2 Typical applications

- Driving piezo motor driven linear actuator
- Driving displacement stage of piezo driven linear actuator
- Driving optical frame of piezo driven linear actuator
- Driving optical frame of piezo motor
- Driving tip/tilt stage of piezo motor

## 1.3 Order information

- E53.C50K-H: piezo motor controller, driving piezo motor, software control;
- Accept customized according to requirements.

## 1.4 Features

- E53.C50K-H is only used to drive capacitive loads (such as piezo motor driven

linear actuator). It cannot be used to drive inductive loads.

- E53.C50K-H can be used for static and dynamic operating applications.
- **Particular attention:** E53.C50K-H can't be used in the user manuals of other products with the same name.

## 1.5 User Manual Notes

- The contents described in user manual are standard product descriptions, special product parameters are not described in detail in this manual.
- When using the piezo controller, the user manual should be placed near the system for easy reference in time. If the user manual is lost or damaged, please contact our customer service department.
- If your user manual is incomplete, it will miss a lot of important information, may cause serious or fatal injuries, and cause property damage.
- You have read and understood the contents of the user manual before installing and operating the E53.C50K-H multi-channel piezo motor controller.
- Our company's official website ([www.coremorrow.com](http://www.coremorrow.com)) provides the latest user manual download.
- Only authorized professionals who meet the technical requirements can install, operate, maintain and clean the controller.

## 1.6 User Manual Download

User manual download process instructions

1. Open the website [www.coremorrow.com](http://www.coremorrow.com);

2. Search for product model (e.g. E53.C50K-H) or series (e.g. piezo motor controller) on the website;
3. Click on the corresponding product to open the product details page;
4. On the product details page, scroll down to "Downloads";
5. Click on the desired file to download.

**Be careful!** If the manual is lost or there are problems downloading, please contact our customer service department.

## 1.7 Safety instructions

The design and production of E53.C50K-H multi-channel piezo motor controller is based on nationally recognized safety standards. Improper human operation may cause damage to this product and even endanger the life and property safety of the user. The operator is responsible for the correct installation and operation of the piezo controller.

- Please read the user manual carefully before use, refer to the manual content for equipment operation, and avoid accidents caused by improper operation.
- Only authorized and qualified professional technicians are allowed to install, operate, maintain, and clean piezo controllers.
- When disassembling the piezo controller, it is necessary to ensure that the power supply has been disconnected to avoid touching live parts and causing electric shock.
- When operating in a bare state, do not touch any internal components of the

device.

- Before use, please ensure that the protective grounding wire is correctly connected to avoid the possibility of leakage. Failure to connect or connect correctly may result in electric shock accidents.

## 2. Series&Appearance

The E53.C50K-H multi-channel piezo motor controller is an 50-channel Piezo motor driven linear actuator drive controller independently developed, designed, and produced by CoreMorrow. It can drive up to 50 Piezo motor driven linear actuators through switching modes, and can drive up to 13 Piezo motor driven linear actuators simultaneously. Not only it has 50 output channels, but also a compact size with a maximal dimension of 310×156×113mm<sup>3</sup>, which is suitable for batch driving piezo motors in space-limited environments. The body has a heat-dissipating area that quickly conducts the heat generated. The number of output channels can be customized according to customer needs.

### 2.1 Series

| Model      | Description                                                                                        |
|------------|----------------------------------------------------------------------------------------------------|
| E53.C50K-H | Open loop controller, 50-channel (switching control), digital signal control, RS-422 communication |

### 2.2 Appearance and panel introduction

#### 2.2.1 Appearance



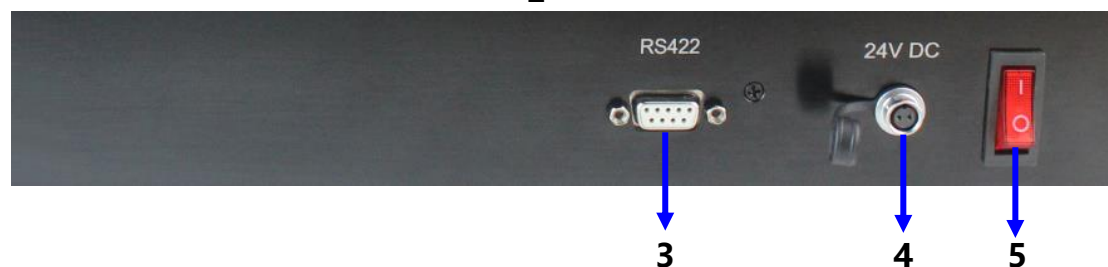


### 2.2.2 panel introduction

Front Panel



Rear Panel



| No. | Function               | Model     | Description                                                                                   |
|-----|------------------------|-----------|-----------------------------------------------------------------------------------------------|
| 1   | Over-current indicator | LED red   | Light on when controller in overcurrent state                                                 |
| 2   | PZT interface          | RJ11-4P4C | Actuator connector, channel 1 to 50                                                           |
| 3   | RS-422                 | D-Sub 9   | Connect the computer with the controller through RS-422 interface to realize computer control |
| 4   | Power interface        | SF812-S2  | Power connector socket, 24V DC interface                                                      |
| 5   | Power switch           | KCD3      | Control the power on and off of the piezo controller                                          |

### 3. Power Calculation

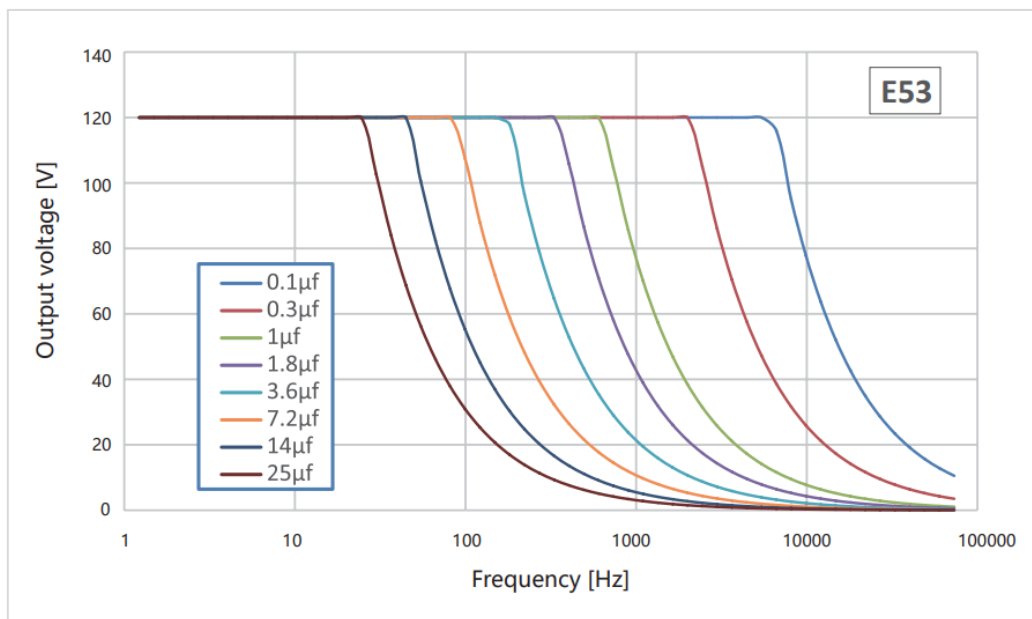
Average output(sine wave operation mode):

$$P_a \approx U_{p-p} \cdot U_s \cdot f \cdot C_{\text{piezo}}$$

In the above formula:

- $P_a$ : Average output [W]
- $U_{p-p}$ : Peak and peak drive voltage [V]
- $U_s$ : Drive voltage [V](( $V_{s+}$ )-( $V_{s-}$ ))
- $f$ : Operating frequency of the sine wave [Hz]
- $C_{\text{piezo}}$ : Piezo actuator capacitance [F]

Frequency, Voltage and Load Curves



## 4. Parameter

### 4.1 Technical Data

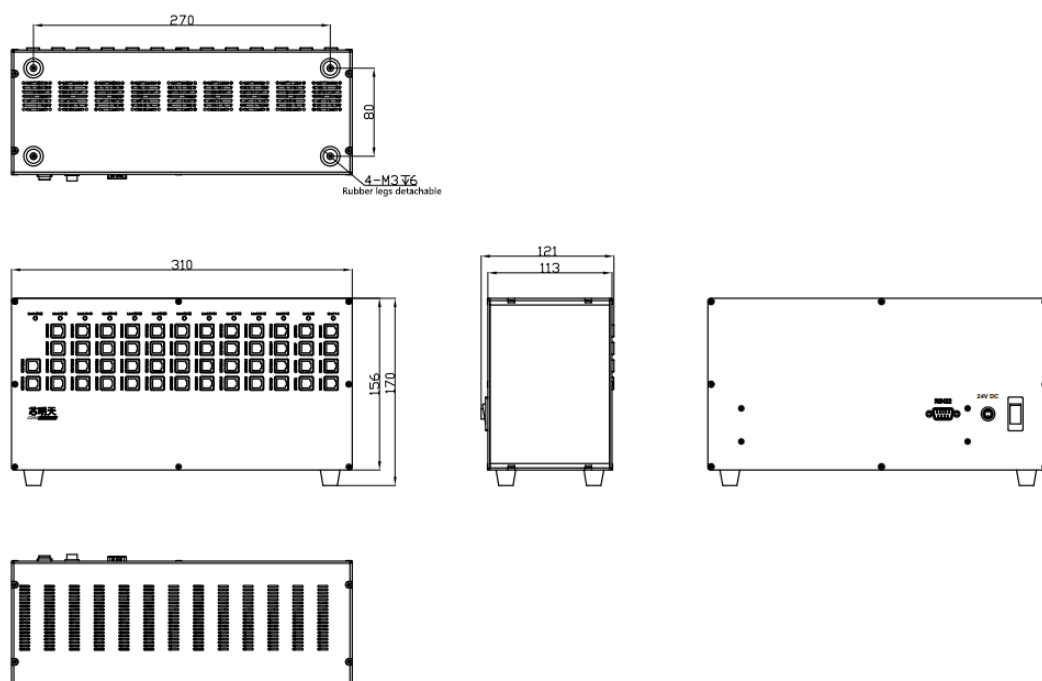
| Type                        | E53.C50K-H            |
|-----------------------------|-----------------------|
| Function                    | Digital controller    |
| Channels                    | 50                    |
| Static power consumption(W) | 54                    |
| Processor                   | 32bit 168MHz          |
| D/A converter               | 16bit                 |
| Communication interface     | RS-422                |
| Communication connector     | D-Sub9                |
| Rated output power(W)       | 120                   |
| Operating temperature(°C)   | 0~50                  |
| PZT connector               | RJ11                  |
| Current limit               | Short-circuited proof |
| Power supply                | 24VDC/15A(20V~30V)    |
| Power Interface             | SF812-S2              |
| Size(mm)                    | 310×156×113           |
| Mass(kg)                    | 4.3                   |

### 4.2 Environmental conditions

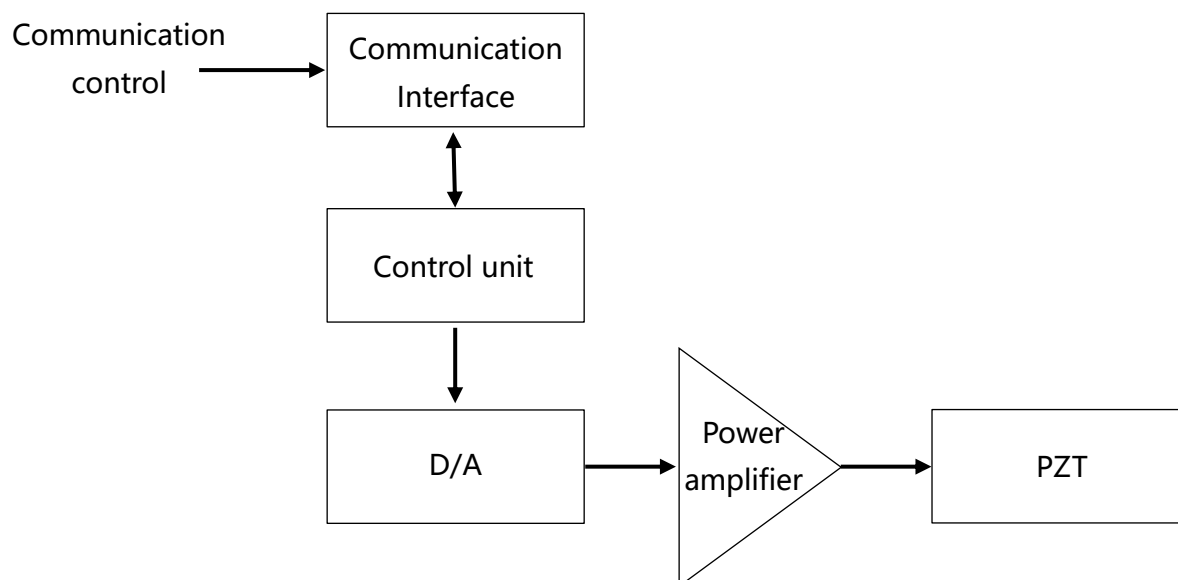
The operating environment of E53.C50K-H multi-channel piezo motor controller:

| Environmental conditions | Condition description |
|--------------------------|-----------------------|
| Application              | For room use only     |
| Environment humidity     | 30%~70%               |
| Operating temperature    | 0~50°C                |
| Storage temperature      | -10~85°C              |

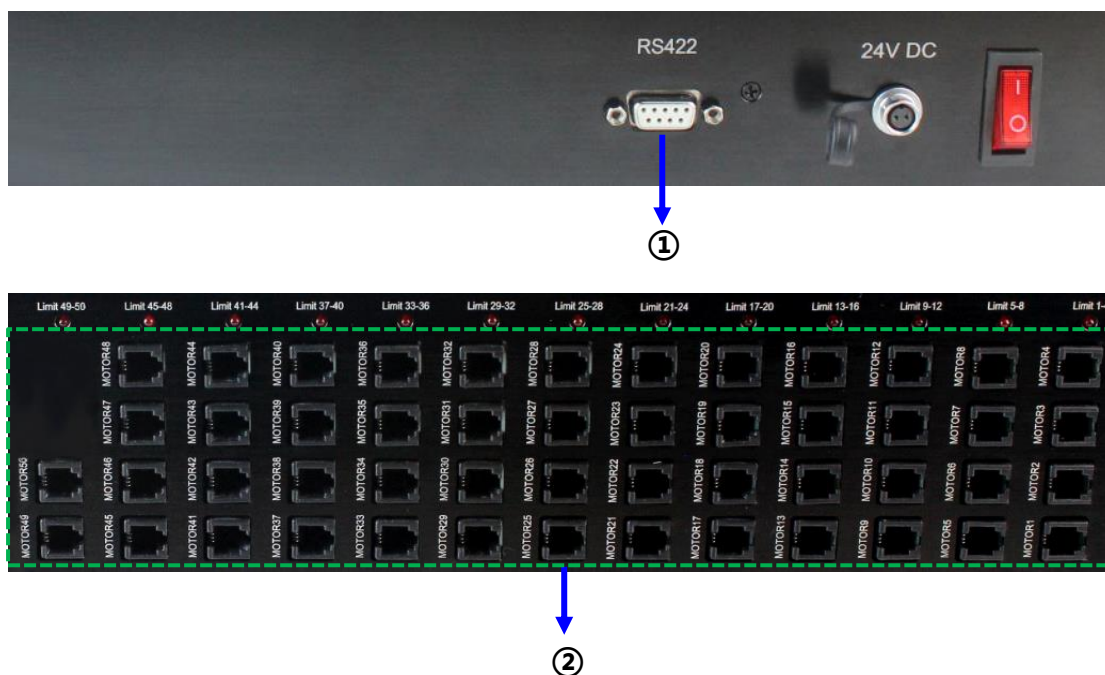
### 4.3 Drawing



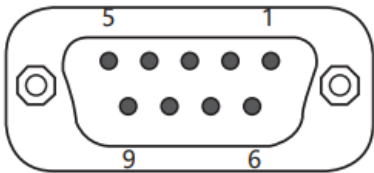
### 4.4 Driving Principle



## 4.5 Interface introduction



① RS-422(D-Sub9)

| No. | Pin Definition |  |
|-----|----------------|--------------------------------------------------------------------------------------|
| 1~4 | Null           |                                                                                      |
| 5   | GND            |                                                                                      |
| 6   | RS-422 RxD+    |                                                                                      |
| 7   | RS-422 RxD-    |                                                                                      |
| 8   | RS-422 TxD-    |                                                                                      |
| 9   | RS-422 TxD+    |                                                                                      |

② Piezo motor connector(RJ11)

| No. | Pin Definition            |  |
|-----|---------------------------|---------------------------------------------------------------------------------------|
| 1   | Drive electrode negative- |                                                                                       |
| 2   | Drive electrode positive+ |                                                                                       |
| 3   | Drive electrode negative- |                                                                                       |
| 4   | Drive electrode positive+ |                                                                                       |

## 5. Software Introduction

### 5.1 Installation Introduction

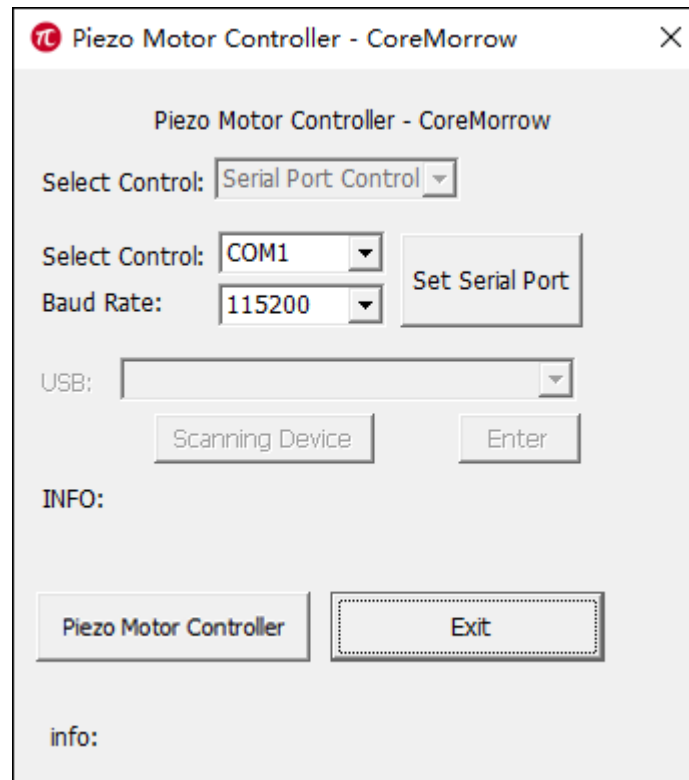
Firstly, open the USB drive that comes with the product shipment, click to enter the corresponding software compression package, and enter the decompressed folder. Click on the "CoreMoveControl.exe" to enter the establishing communication connections interface between the upper computer and the controller.

|                                                                                     |                      |                  |                  |          |
|-------------------------------------------------------------------------------------|----------------------|------------------|------------------|----------|
|    | Dll                  | 2025/5/30 10:03  | 文件夹              |          |
|    | CoreM2               | 2017/12/12 11:00 | ICO 图片文件         | 10 KB    |
|    | CoreMoveControl      | 2025/6/3 15:03   | 应用程序             | 701 KB   |
|    | CoreMoveControl.ilkk | 2025/6/3 15:03   | ILK 文件           | 2,171 KB |
|   | CoreMoveControl.pdb  | 2025/6/3 15:03   | PDB 文件           | 7,051 KB |
|  | dll                  | 2021/1/26 11:06  | WinRAR ZIP 压缩... | 6,692 KB |
|  | libusb.h             | 2017/10/30 11:41 | H 文件             | 71 KB    |
|  | libusb-1.0.dll       | 2017/10/30 11:42 | 应用程序扩展           | 176 KB   |
|  | libusb-1.0.lib       | 2017/10/30 11:41 | LIB 文件           | 48 KB    |
|  | mfc100d.dll          | 2016/10/14 19:46 | 应用程序扩展           | 6,891 KB |
|  | mfc100ud.dll         | 2010/3/18 9:15   | 应用程序扩展           | 6,831 KB |
|  | mfc140ud.dll         | 2015/6/25 23:34  | 应用程序扩展           | 8,113 KB |
|  | MFC42D.DLL           | 1998/6/17 0:00   | 应用程序扩展           | 297 KB   |
|  | MFCN42D.DLL          | 1998/6/17 0:00   | 应用程序扩展           | 61 KB    |
|  | MFCO42D.DLL          | 1998/6/17 0:00   | 应用程序扩展           | 809 KB   |
|  | msvcr100d.dll        | 2010/9/6 13:22   | 应用程序扩展           | 1,433 KB |
|  | pdf-1                | 2015/3/27 15:08  | ICO 图片文件         | 17 KB    |
|  | ucrtbased.dll        | 2015/6/9 16:47   | 应用程序扩展           | 1,609 KB |
|  | vcruntime140d.dll    | 2022/8/29 14:47  | 应用程序扩展           | 111 KB   |
|  | word-1               | 2015/3/27 15:00  | ICO 图片文件         | 17 KB    |
|  | XMT_DLL_NET.dll      | 2020/11/5 9:51   | 应用程序扩展           | 86 KB    |
|  | XMT_DLL_NET.h        | 2020/11/5 9:51   | H 文件             | 35 KB    |
|  | XMT_DLL_NET.lib      | 2020/11/5 9:51   | LIB 文件           | 34 KB    |
|  | XMT_DLL_USB.dll      | 2021/6/10 10:48  | 应用程序扩展           | 105 KB   |
|  | XMT_DLL_USB.h        | 2021/6/10 10:47  | H 文件             | 44 KB    |
|  | XMT_DLL_USB.lib      | 2021/6/10 10:48  | LIB 文件           | 44 KB    |

### 5.2 Introduction to Establishing Communication Connections

The communication interface of E53.C50K-H is RS-422, and the corresponding

control selection is serial port control. The specific introduction is as follows:

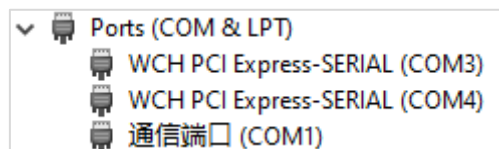


Establish a communication connection using the RS-422 serial port to USB cable included with the controller, Select Control defaults to serial port control, no need to select:

a) COM: Select the corresponding COM port according to the actual situation.

The confirmation method for the Win10 operating system serial port is as follows:

Win10→This PC→Properties→Device Manager→Ports(COM & LPT) to view;



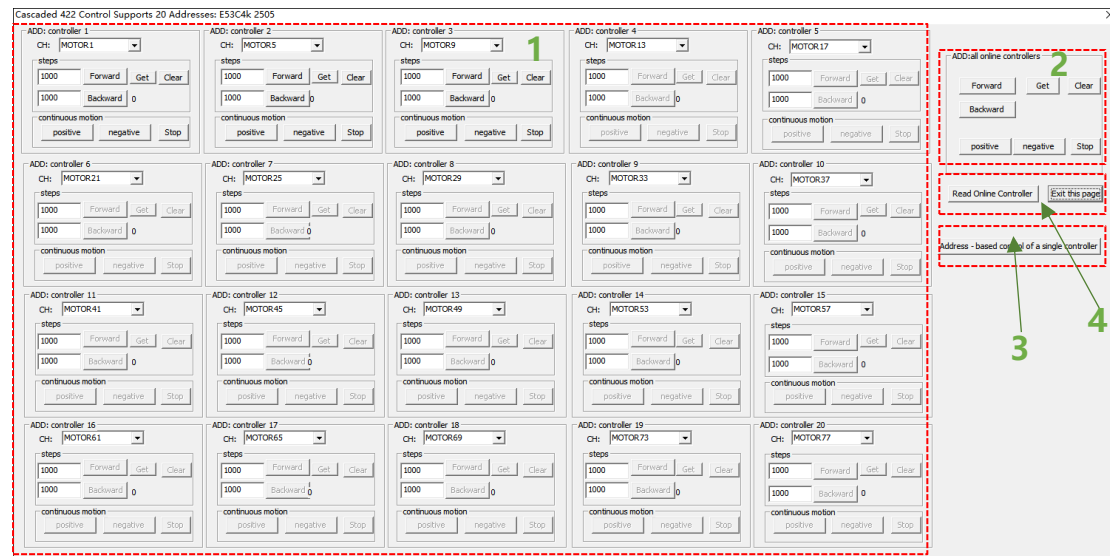
b) Baud Rate: Default is 115200, no need to select;

After completing the selection of COM and baud rate, click "Set Serial Port" to establish a connection between the controller and the upper computer, and then

click “Piezo Motor Controller” to enter the upper computer software operation interface;

### 5.3 Introduction to the operating interface

The upper computer software operation interface is as follows:



The entire operation interface can be divided into the following 4 areas, which are described in detail as follows:

- 1) Piezo motor driven linear actuator control page** (consistent operation mode of 1-13 address controllers): There are a total of 13 addresses, each of which can control 4 output channels. When the address controller is online (connected to PZT), its interface will become a normal clickable state; (Note: A single address can only control one channel at a time, and the entire controller can simultaneously control 13 channels corresponding to 13 addresses, The addresses 14~20 are in gray and cannot be clicked);
- 2) Piezo motor driven linear actuator multi address simultaneous control page:**

Click to control all online controllers simultaneously;

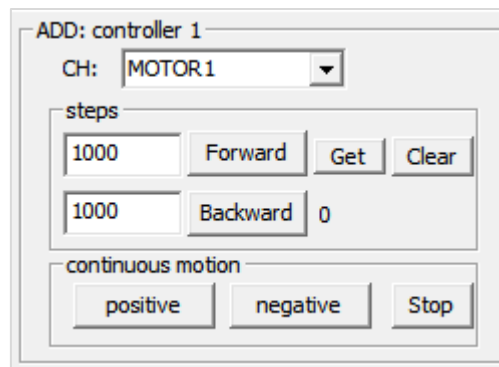
3) **Single controller address control page**: Click and select address to perform single address controller control;

4) **Read online controller and exit this page**: Read the status and quantity of online controllers and exit the upper computer software;

The corresponding buttons for each region are described as follows:

### 5.3.1 Piezo motor driven linear actuator control page

The software control of E53. C50K-H piezo motor controller is divided into a total of 13 control addresses (address 1 to address 13), and each controller address corresponds to 4 output channels that can be controlled (address 13 can control 2 output channels).



1) **Select control channel(CH):** piezo motor controller, with 4 channels to choose from, one channel can be operated at a time.

2) **steps**: Enter the number of "steps" from current position that you wish the piezo motor driven linear actuator to realize, and click "**Forward**" or "**Backward**" to control it to move along the direction according to the number of "steps". (Note: the displacement of 1 step is about 30nm, for the definition of forward/backward

direction, please refer to section 5.3.5 Motion direction of the Piezo Motor Driven Linear Actuator).

**Get:** Count the piezo motor driven linear actuator steps corresponding to current channel.

**Clear:** Clear the current steps, zero setting;

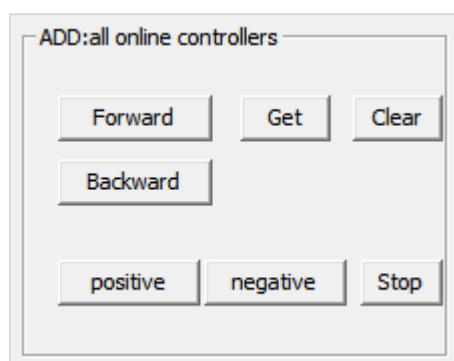
3) **continuous motion:** When the corresponding button is clicked, the linear piezo motor moves continuously in a certain direction from the current position until the stop button is clicked. (Note: the motor will stop moving when it reaches the mechanical limit, and it will continue to make a running sound if the stop button is not clicked, so please click the stop button in time.)

**Positive:** When clicked, the piezo screw moves continuously forward from the current position;

**Negative:** When clicked, the piezo screw moves in the opposite direction to the "Positive" . Control and stop likewise;

**Stop:** Stop the current movement of the linear piezo motor;

### 5.3.2 Multi address simultaneous control page

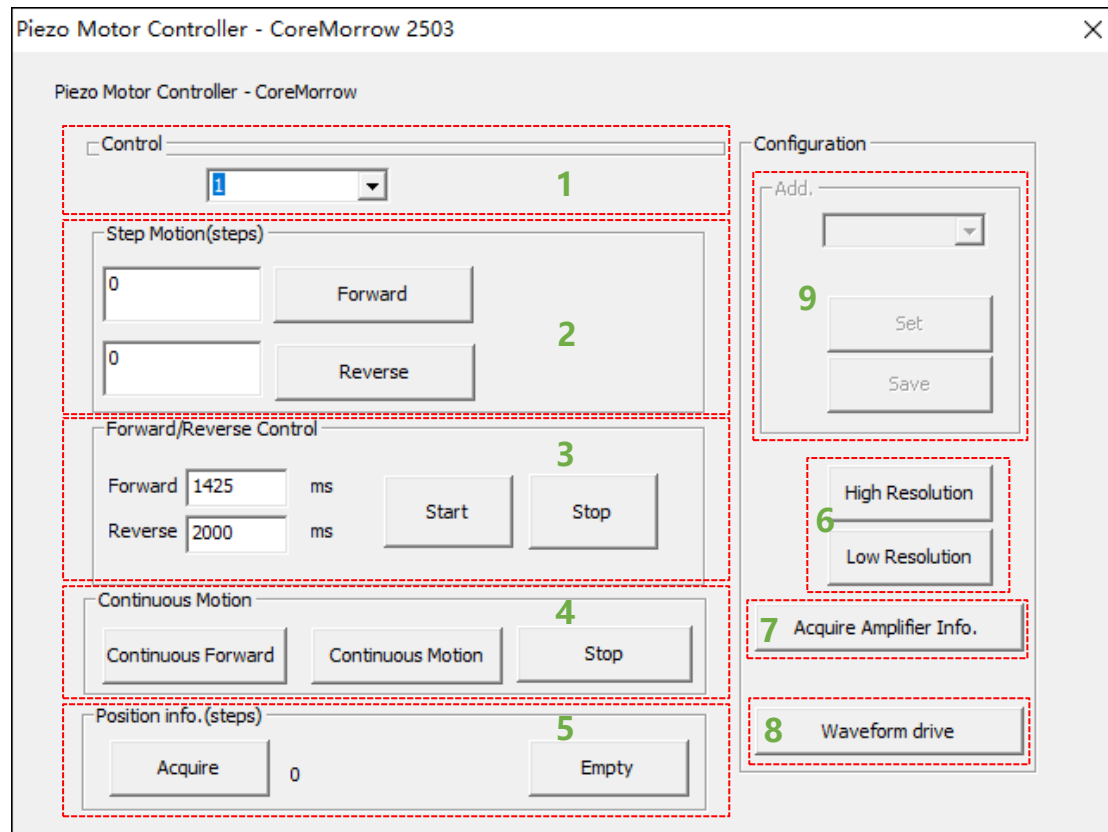


Clicking a single button can complete the control of "Forward", "Backward", "Get",

"Clear", "positive", "negative", and "Stop" for all online controllers; (Note: The functions of each button are consistent with those in 5.3.1)

### 5.3.3 Single controller address control page

Click to enter the following control page:



The entire operation interface can be divided into the following 9 areas, which are described in detail as follows:

- 1) **Control**: piezo motor controller, with 4 channels to choose from, one channel can be operated at a time.
- 2) **Step Motion(steps)**: Enter the number of "steps" from current position that you wish the piezo screw to realize, and click "forward" or "reverse" to control it to move along the direction according to the number of "steps". (Note: the

displacement of 1 step is about 30nm, for the definition of forward/reverse direction, please refer to section 5.3.5 Motion direction of the Piezo Motor Driven Linear Actuator).

3) **Forward/Reverse Control:** Enter the desired time of forward/reverse movement of the linear piezo motor here, and click "Start" to realize the movement according to the entered value, and click "Stop" to stop the current operation of the linear piezo motor.

**Start:** Start the linear piezo motor movement;

**Stop:** Stop the current movement of the linear piezo motor;

4) **Continuous Motion:** When the corresponding button is clicked, the linear piezo motor moves continuously in a certain direction from the current position until the stop button is clicked. (Note: the motor will stop moving when it reaches the mechanical limit, and it will continue to make a running sound if the stop button is not clicked, so please click the stop button in time.)

**Continuous Forward:** When clicked, the piezo screw moves continuously forward from the current position;

**Continuous Motion:** When clicked, the piezo screw moves in the opposite direction to the "continuous forward" . Control and stop likewise;

**Stop:** Stop the current movement of the linear piezo motor;

5) **Position info.(steps):**

**Acquire:** Count the piezo motor driven linear actuator steps corresponding to current channel.(Note: During the motor movement, the number on the right side

of the button will be updated in a 1-second cycle for statistical analysis).

**Empty:** Clear the current steps, zero setting;

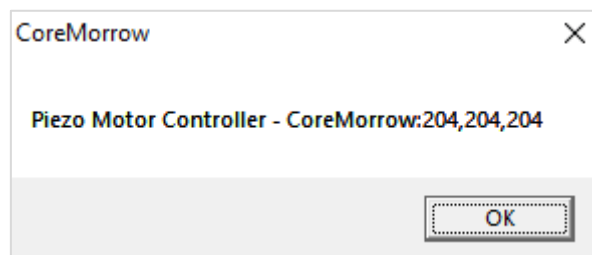
6) **High resolution:** The unit step distance is smaller, the positioning is more accurate, but at the same time, the motion speed is very slow.

**Low resolution:** The unit step distance is larger and the motion speed is faster, but the positioning accuracy is lower than that of high-resolution mode.

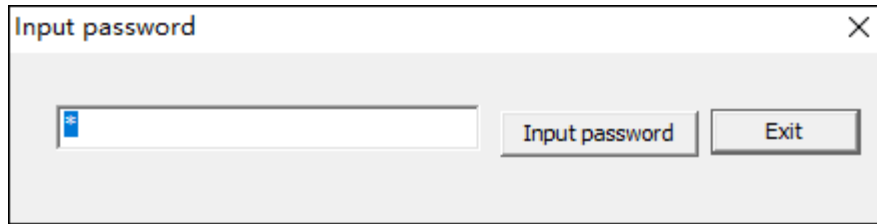
(Note 1: It is recommended to first move to the extreme target position with low resolution. If you are not satisfied with the current accuracy, you can switch to high resolution to obtain a finer unit step distance. When the displacement of a single movement is large, it is recommended to switch back to low resolution to obtain faster movement speed.)

(Note 2: After switching between high and low resolutions, our company's supporting upper computer will automatically send a command to reset the open-loop counting cycle to the lower computer. If the user engages in secondary development, they need to reset it themselves because the high and low resolution counting methods are different.)

7) **Acquire Amplifier Info.:** Click on it for controller information;



8) **Waveform drive:** After clicking, a password input interface will pop up:

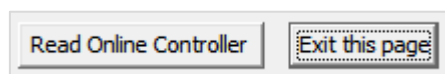


After entering the password, you will enter the waveform drive debugging interface of the piezo motor controller. (Note: This page is generally used for debugging controllers. The controller has been calibrated according to customer requirements before leaving the factory, and customers do not need to debug it themselves.)



9) **Configuration**: Click to select an address, which can control the output channel for that address. There are a total of 13 addresses to choose from, Among them, addresses 1-13 are valid;

### 5.3.4 Read online controller and exit this page



Read Online Controller: Click to refresh the controller that is currently online;

Exit this page: Click to disconnect from the upper computer and close this operation page;

### 5.3.5 Motion direction of the Piezo Motor Driven Linear Actuator

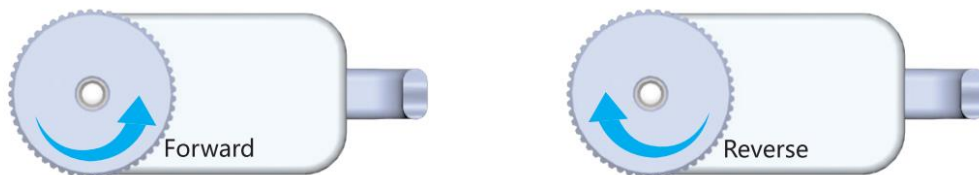
Explanation: The motion direction of piezo motor driven linear actuator in this section is combined with the operation interface of the upper computer software.

The forward/reverse(backward) buttons are the operation interface buttons of the upper computer software. For specific information and the actual direction of actuator, please refer to the following.

instructions:

**Forward:** The counterclockwise movement of the actuator in the top-down direction;

**Reverse(Backward):** The clockwise movement of the actuator in the top-down direction.



Motion direction of the Piezo Motor Driven Linear Actuator

## 6. Cleaning, Transportation and Storage

### 6.1 Cleaning measures

**Note!** The PCB board of the function module in the E53.C50K-H system is an ESD (electrostatic discharge) sensitive device. Take precautions against any static build-up of these devices before use to avoid contact with circuit component leads and PCB wiring. Before touching any electronic components, the body first touches the grounding conductor to discharge static electricity, ensuring avoiding that any type of conductive particles (metal, dust or debris, pencil lead, screws) enter the device. Be careful not to drop the equipment when cleaning, to avoid any form of mechanical shock!

- Disconnect the power plug of the E53.C50K-H system before cleaning.
- Prevent cleaning fluid and any liquid from entering the system module to avoid short circuits.
- The surface of the system chassis and the front panel of the module, please do not use an organic solvent for surface wiping.

### 6.2 Transportation and storage

- This product is packed in carton. Transportation must be carried out under product packaging conditions, and direct rain and snow, direct contact with corrosive gases and strong vibrations should be avoided during transportation.
- The instrument can be transported under various conditions of normal transportation, and should avoid damp, load, collision, extrusion, irregular

placement and other adverse conditions during transportation.

- If the instrument is not used for a long time, the instrument should be packaged and stored.
- The instrument should be stored in a non-corrosive atmosphere and in a well ventilated, clean room.
- In the process of transportation, storage and use, attention should be paid to fire prevention, shockproof, waterproof and moisture proof.

## 7. Service&Maintenance

### 7.1 Disposal

- Waste products should be disposed according to national and local rules and regulations. In order to fulfill our responsibility as a product manufacturer, we will dispose all old equipments on the market in an environmentally friendly manner.
- If you have equipment that cannot be disposed, you can ship it to CoreMorrow. However, the shipping costs will be borne by the sender. We do not accept freight collect shipments.

Address: Building I2, No.191 Xuefu Road, Nangang District, Harbin, HLJ, China

Tel: +86-451-86268790



### 7.2 After-sales and maintenance

- The controller does not contain user repairable parts.
- The controller for any service need to provide product number and repair must be returned to factory.
- Any attempt to remove any part of the controller system will not be covered by warranty.
- The controller is a precision instrument and should be handled with care.
- In case of problems, please record the fault and contact the dealer or manufacturer, so that professional technicians can repair.

## 8. Contact us

### CoreMorrow Ltd.

Tel: +86-451-86268790

Fax: +86-451-86267847

Website: [www.coremorrow.com](http://www.coremorrow.com)

Email: [info@coremorrow.com](mailto:info@coremorrow.com)

Address: Building I2, No.191 Xuefu Road, Nangang District, Harbin, HLJ, China

### After-sale service:

Email: [info@coremorrow.com](mailto:info@coremorrow.com)

CoreMorrow Official and CTO WeChat are below:

