E53.C1K-K Compact Piezo Motor Controller

User Manual and Software Manual

Version: V2.0 Date: 2024.12

This manual describes the following products:

- E53.C1K-K Compact Piezo Motor Controller

Declaration

- This user manual is only applicable to the E53.C1K-K compact 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 motor 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 ampliffcation 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.C1K-K 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

1. Introduction

1.1 Typical characteristics

- 1 output channel, able to drive 1 piezo motor driven linear actuator
- 24VDC/1A(20~30V)power supply
- Rated output power 9W
- Static power consumption < 5W
- 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.C1K-K: compact piezo motor controller, driving piezo motor, Software control;
- Accept customized according to requirements.

1.4 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, 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.C1K-K Compact Piezo Motor Controller.
- Our company's official website (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.

1.5 User Manual Download

User manual download process instructions

1. Open the website www.coremorrow.com;
2. Search for product model on the website (e.g. E53.C1K-K);
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.

2. Series&Appearance

The E53.C1K-K compact piezo motor controller can achieve real-time communication with the upper computer through USB interface or RS-232/422 interface, and supports secondary development of upper computer software. It has 1 output channel, able to drive 1 piezo motor driven linear actuator, and customers can choose the 4-channel version(Model: E53.C1K-K) according to their usage needs.

2.1 Series

Model	Description
E53.C1K-K	Open loop controller, 1 output channel, digital signal control, USB or RS-232/422 connection

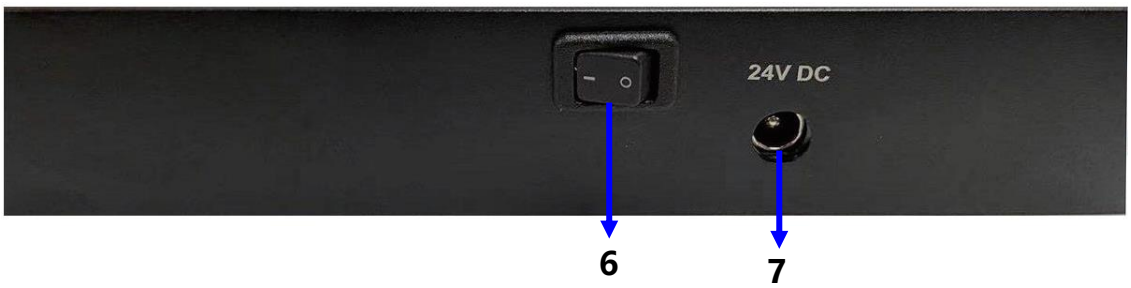
2.2 Appearance and panel introduction

2.2.1 Appearance

2.2.2 panel introduction

Front Panel

Rear Panel



No.	Function	Description
1	Power indicator	If it lights up, the controller is in a powered on operational state; otherwise, it is in a non operational state
2	USB interface	Connect the computer with the controller through USB interface to realize computer control
3	RS-232/422 interface	Connect the computer with the controller through RS-232/422 interface to realize computer control
4	Piezo motor connector	RJ11, Connect to piezo motor
5	Limit indicator	When output current of channel exceeds set value, the corresponding over-current indicator lights up.
6	Switch	Control the power on and off of the piezo controller
7	Power port	Power connector socket, 24VDC interface

3. Power Calculation

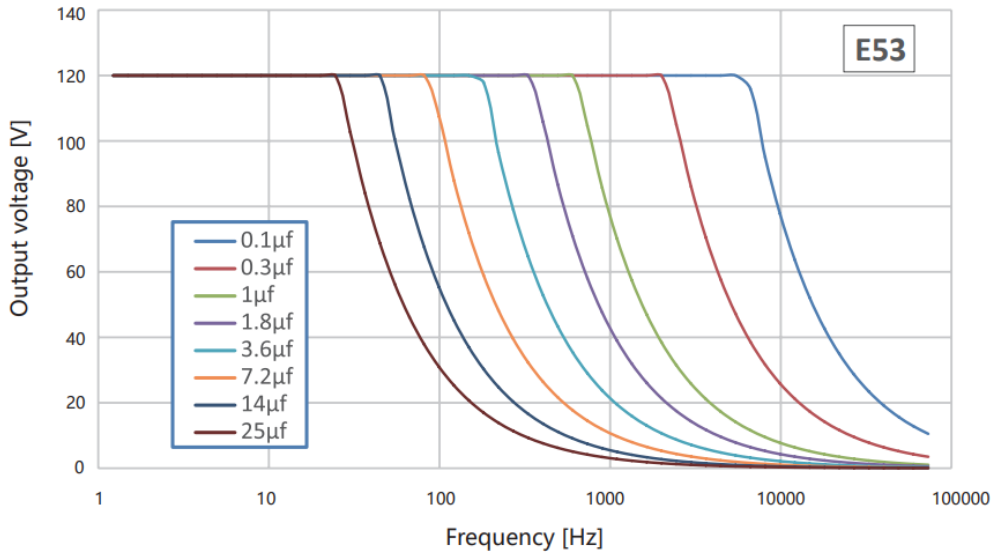
Average output(Sine wave operation mode):

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

In the above formula:

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

Frequency, Voltage and Load Curves



4. Parameter

4.1 Technical Data

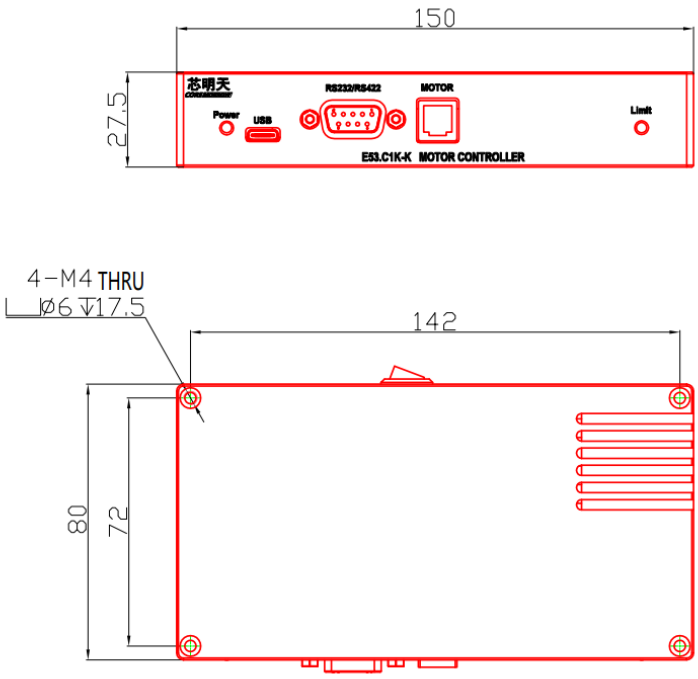
Type	E53.C1K-K	Units
Channels	1	
Power supply	24VDC/1A(20V~30V)	V
Static power consumption	<5	W
Processor	32bit 480MHz	
D/A converter	16bit	
Communication interface	Type-C, RS-422, RS-232	
Rated output power	9	W
Operating temperature	0~50	℃
PZT connector	RJ11	
Communication connector	DB9, Type-C	
Size	150×80×27.5	mm^3
Mass	360	g±5%

4.2 Environmental conditions

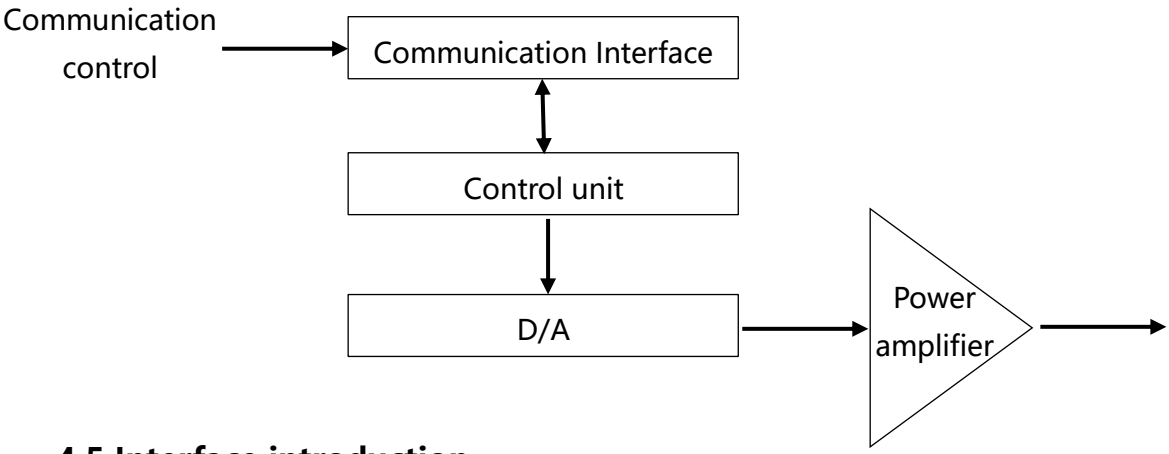
The operating environment of E53.C1K-K compact piezo motor controller:

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

4.3 Drawing

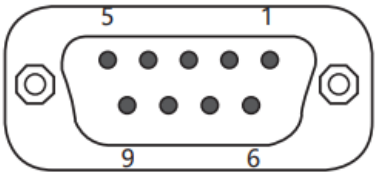


4.4 Driving Principle



4.5 Interface introduction

① RS-232/422(D-Sub9)

No.	Pin Definition	
1	Null	
2	RS-232 TxD	
3	RS-232 RxD	
4	Null	
5	GND	
6	RS-422 RxD+	
7	RS-422 RxD-	
8	RS-422 TxD-	
9	RS-422 TxD+	

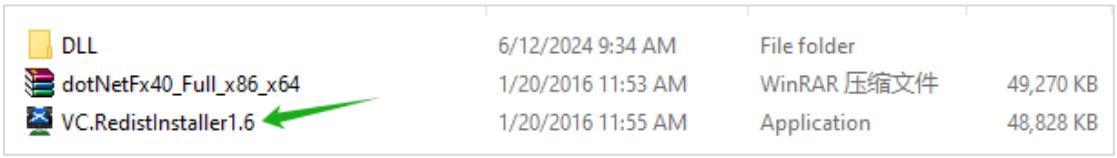
② Piezo motor connector(RJ11)

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

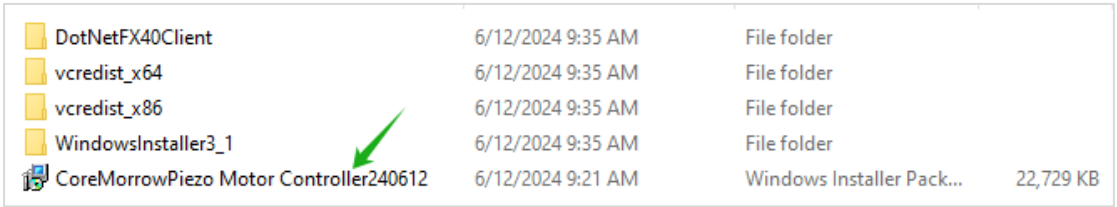
5. Software Introduction

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. Step 1, click on the"1.Software operating environment "folder and click on the "VC.RedistInstaller1.6.exe"application to configure the software running environment to prevent software installation failure.



Then, enter the "4.Control Software" folder, click to install " CoreMorrowPiezo Motor Controller240612.msi", double-click to install the upper computer operation software, select the next step during the installation process, and finally click Finish to complete the installation of the controller driver software. (Note: With the continuous updates and iterations of the upper computer software version, the version number in the name will change according to the actual situation)



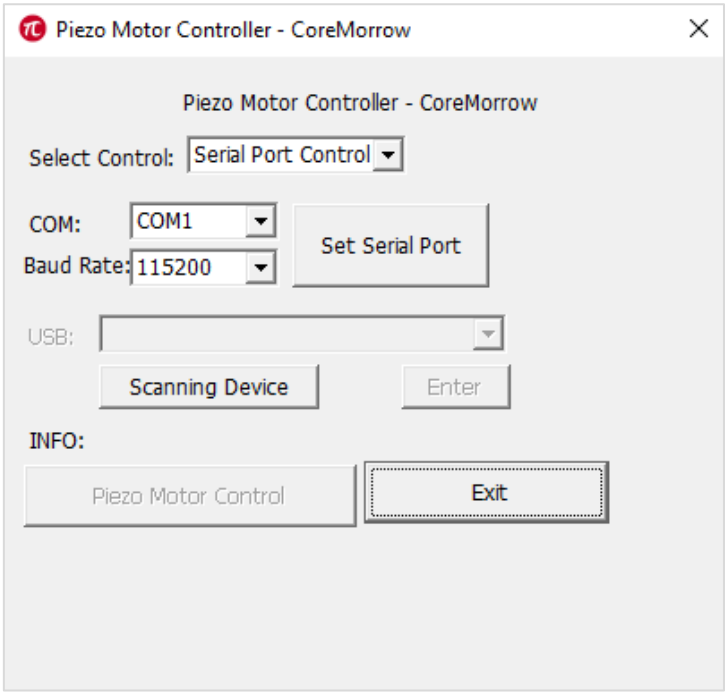
After installation, the desktop of the upper computer will display the software icon of the controller. Before use, click on the icon on the system desktop to enter the establishing communication connections interface between the upper computer

and the controller.

5.2 Introduction to Establishing Communication Connections

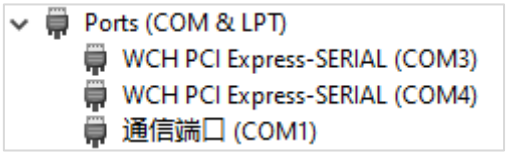
E53.C1K-K has two types of interfaces: USB or RS-232/422, so there are two corresponding control options: Serial port control and USB control. The specific introduction is as follows:

1) **Serial port control**:



Establish a communication connection using the RS-232/422 serial port to USB cable included with the controller, and select serial port control in the "Select Control":

a) COM: Select the corresponding COM port according to the actual situation. The confirmation method for the Win10 serial port is as follows: Win10→This PC→Properties→Device Manager→Ports(COM & LPT) to view;

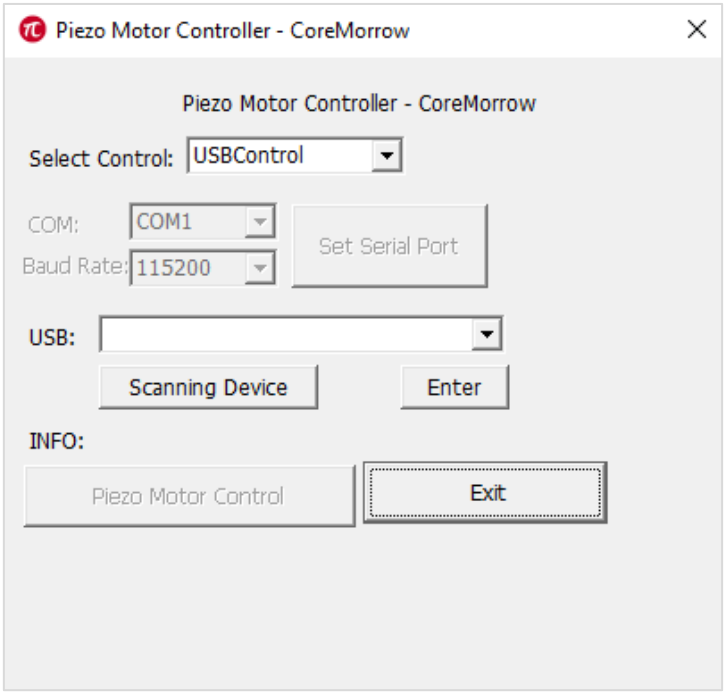


b) Baud Rate: Default is 115200, no need to select;

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 enter the upper computer software operation interface;

2) **USB control**:

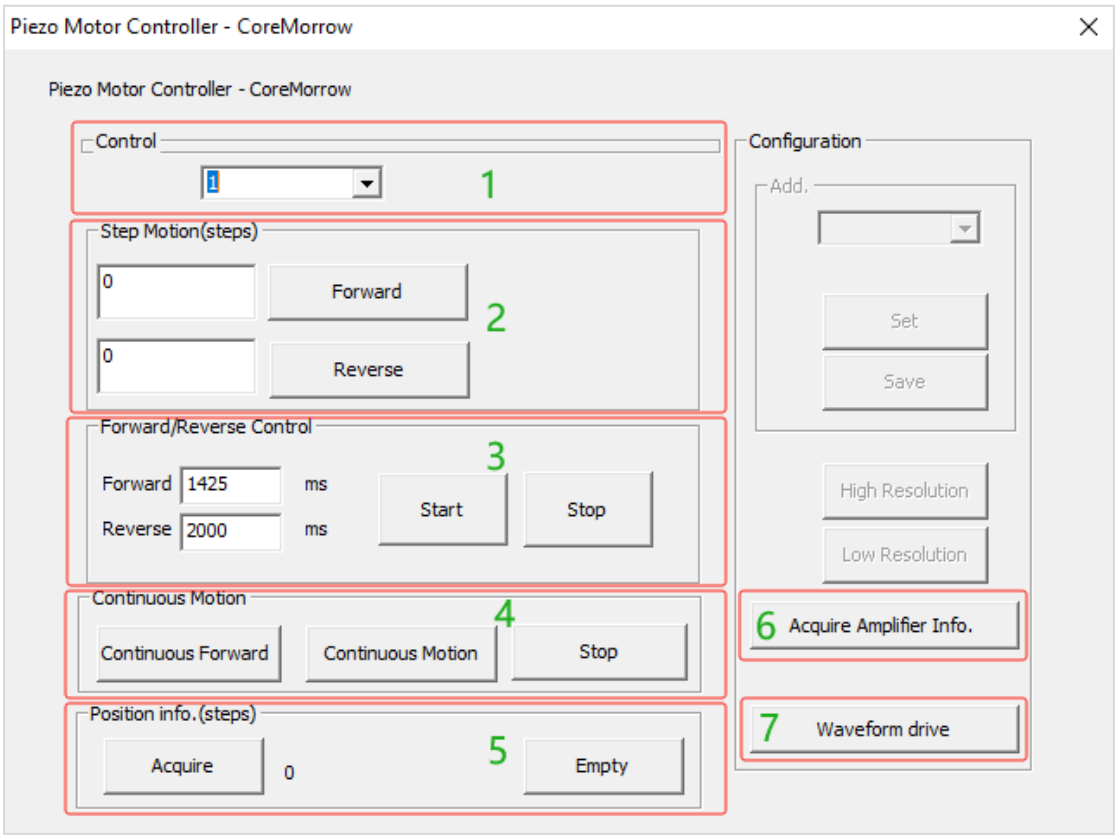
Establish a communication connection using the USB cable included with the controller, and select USB control in the "Select Control":



In this situation, both COM and baud rate are in gray and cannot be selected. Click "Scanning Device", and the system will automatically display in the corresponding USB text box that the upper computer already has a USB device. Confirm the USB device corresponding to the controller, click "Enter" to establish a connection

between the controller and the upper computer, and enter the upper computer software operation interface;

5.3 Introduction to the operating interface



The entire operation interface can be divided into the following 7 areas, which are described in detail as follows:

1) **Control**: piezo motor controller, with 4 channels to choose from, only channel 1 has control function.

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 5.4 Motion direction of the Piezo Motor Driven Linear Actuator)

3) **Forward/Revserse 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;

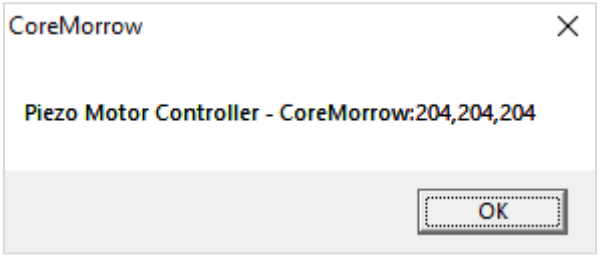
Stop: Stop the current movement of the linear piezo motor;

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



7) **Waveform drive**: Click to set the output waveform of the controller (note: it is factory set and cannot be changed by the user; this function can be used for troubleshooting).

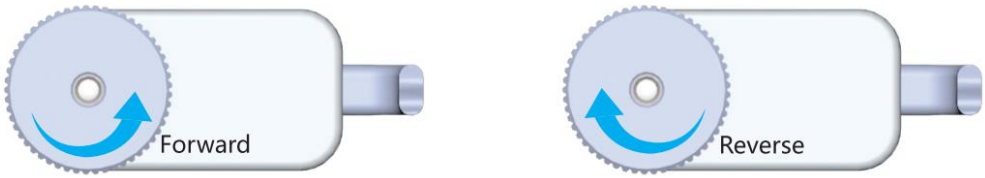
5.4 Motion direction of the Piezo Motor Driven Linear Actuator

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 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: 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.C1K-K 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.C1K-K 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 controlle 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

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