# E53.B1L-K Compact Piezo Controller

## User Manual

Version: V1.0 Date: 2025.05


This manual describes the following products:

- E53.B1L-K compact piezo controller

# Declaration

| **Declaration!** |
| --- |
| ➢ This user manual is only applicable to the E53.B1L-K compact piezo 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.<br>➢ 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.<br>➢ There is high voltage inside, do not open the case without permission.<br>➢ Do not connect or disconnect input, output, or sensor cables with power on.<br>➢ Please keep surface clean and dry, and don't operate in humid or static environment.<br>➢ 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. |
| **Cautious!** |
| ➢ The E53.B1L-K compact 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. |

# Declaration

| **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.<br>➢ It is strongly recommended that you do not touch any parts that connect to the high voltage output.<br>➢ Special Note: If you connect it with other products in addition to our company, please follow the general accident prevention procedures.<br>➢ 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.<br>➢ 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. |

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# 1. Overview

## 1.1 Features

- E53.B1L-K is only used to drive capacitive loads (such as piezo actuators). It cannot be used to drive inductive loads.
- E53.B1L-K can be used for static and dynamic operating applications.
- E53.B1L-K with LVDT sensor can use servo operation mode.
- **Particular attention**: E53.B1L-K can't be used in the user manuals of other products with the same name.

## 1.2 Safety instructions

The design and production of E53.B1L-K compact piezo 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.

## 1.3 Typical characteristics

- 1 channel small size;
- Peak current 1.1A;
- Output voltage range 0~150V;
- Bandwidth(-3dB) 10kHz;
- Servo control(LVDT sensor);
- Output short circuit protection;
- Analog signal control;

## 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, 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.B1L-K compact piezo 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 (e.g. E53.B1L-K) or series (e.g. compact piezo 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.

# 2. Introduction

The 1-channel E53.B1L-K compact piezo controller is an analog signal integrated controller. Its small size and compact structure make it suitable for use in environments with limited space. It has closed-loop servo function and is specially developed and designed for driving piezo products equipped with LVDT sensors. Its body has a heat dissipation area that can quickly dissipate the generated heat.

## 2.1 Classification

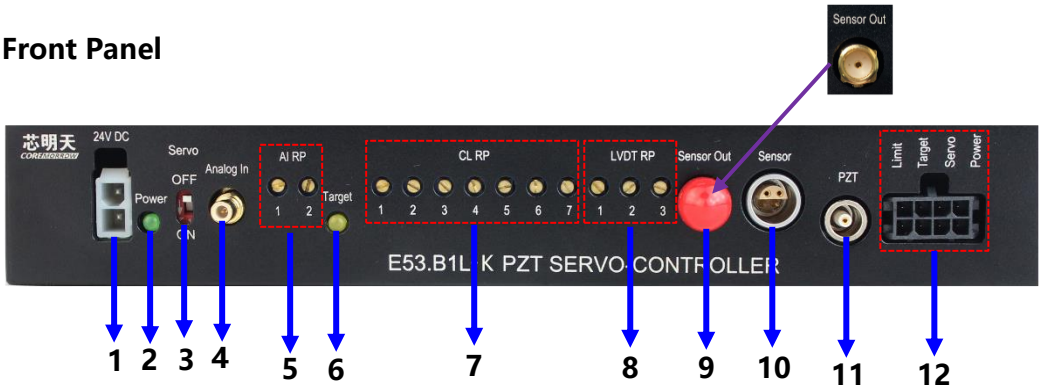
| Model | Description |
|---|---|
| E53.B1L-K | 1 channel, servo control, LVDT sensor, analog signal control |

## 2.2 Appearance and Panel Introduction

### 2.2.1 Appearance


### 2.2.2 Panel introduction

**Front Panel**



| No. | Symbol | Model | Function description |
|---|---|---|---|
| 1 | 24V DC | Molex4.2_1x2 | Power input interface: 24V DC voltage supply interface |
| 2 | Power | LED green | Power indicator light: Always on after the power switch is closed |
| 3 | Servo | BP01KE | Servo switch: Switching between open/closed loop |
| 4 | Analog In | SMB | Analog input interface: Analog voltage input interface |
| 5 | AI RP | potentiometer | Analog Input Adjustment Potentiometer: Adjust the correspondence between the analog input signal and the driver output voltage in open-loop state (already adjusted at the factory, generally no adjustment is required) |
| 6 | Target | LED yellow | Target indicator light: On when the controlled displacement deviates from the target value |
| 7 | CL RP | potentiometer | Closed loop parameter adjustment potentiometer: used to adjust the relevant parameters of the controller's closed-loop system; |
| 8 | LVDT RP | potentiometer | LVDT output signal adjustment potentiometer: used to adjust the relevant parameters of LVDT sensor output signal (already adjusted at the factory, generally not required to be adjusted) |
| 9 | Sensor Out | SMA | Sensor output connector: Sensor output signal monitoring end, used to monitor closed-loop displacement, output range 0~10V |
| 10 | Sensor | EPL.0S.304.HLN | LVDT sensor interface: to connect LVDT sensors |
| 11 | PZT | ZPL.00.250.NTN | PZT drive connector: to connect to the piezo ceramic actuators |
| 12 | Status indicator interface | Molex3.0_4x2 | Status indicator light interface: to indicate the working status of the controller |

**Rear Panel**


| No. | Symbol | Model | Function description |
|---|---|---|---|
| 13 | Switch | KCD1-102 | Control the power on and off of the piezo controller |

# 3. Unpacking inspection

The E53.B1L-K piezo controller has been carefully checked for electrical and mechanical aspects before shipment. Please conduct an unpacking inspection when receiving the device.

- After unpacking, please carefully inspect the surface of the contrller's body for any obvious signs of damage. If there is any damage that may occur during transportation, please take photos and keep records, and contact our customer service department promptly;
- Check if all accessories are complete according to the packing list. If there are any missing items, please contact our customer service department in a timely manner;
- Please keep the original packaging materials properly for future maintenance and use.

# 4. Power Calculation

Average output (Sine wave operation mode):

$$P_a \approx U_{p\text{-}p}^2 \cdot f \cdot C_{piezo}$$

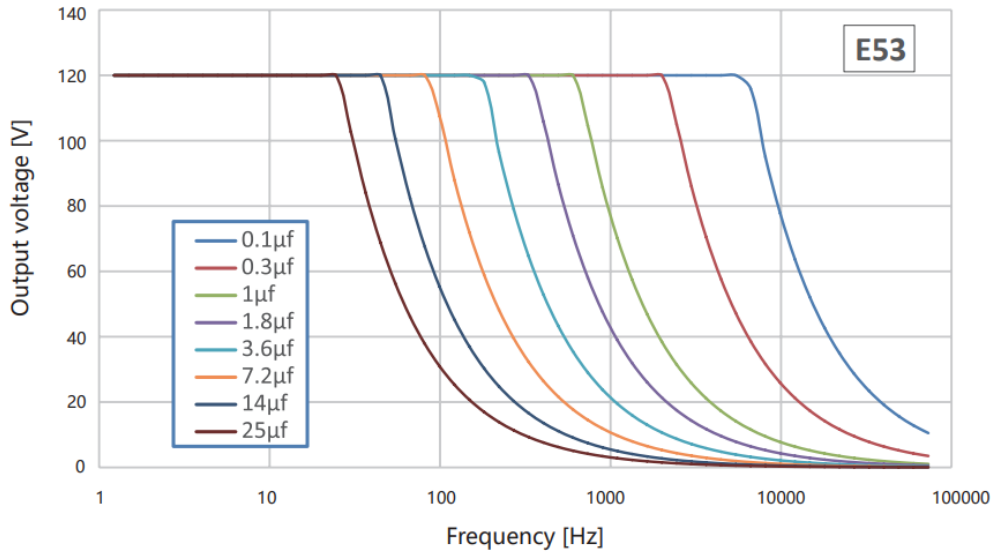
$P_a$ = Average output [W]

$U_{p\text{-}p}$ = Peak and peak drive voltage [V]

f = Operating frequency of the sine wave [Hz]

$C_{piezo}$ = Piezo actuator capacitance [F]

Frequency, Voltage and Load Curves



# 5. Installment

## 5.1 Installation Precautions

**Note**! Incorrect installation of the E53.B1L-K compact piezo controller may result in equipment damage and even endanger the personal safety of operators!

- Installation and using of the controller should be close to the power source, so that the power plug can be easily and quickly disconnected from the main power source.
- Use included power cord to connect the controller and the piezo product.
- If power cord provided by our company must be replaced, please use power cord with large enough size and effective grounding.

## 5.2 Ensure ventilation

**Note**! Please ensure ventilation during the installation and use of the equipment, as overheating caused by high temperatures may result in equipment damage.

- Ensure that the heat dissipation area of the surrounding environment is adequately cooled. When the temperature of the heat dissipation surface of the piezocontroller is greater than 50℃, it is recommended to take external heat dissipation measures to improve the stability of the controller.
- Ensure that the surrounding environment has sufficient ventilation equipment and the temperature is within the normal operation temperature (0-50℃).

## 5.3 Power connection

Connect the controller power interface to the power supply using the power

adapter that comes with the product shipment. Before use, make sure the power switch is in the disconnected state.

## 5.4 Cable connection

- While power switch keeps disconnected, connect the PZT and Sensor cables of the piezo product to the PZT and Sensor interface of the controller separately. Note! the number of the piezo product should correspond to the number of the interface of the controller (note: if the number of pins on the piezo product cable and controller interface is different, an adapter wire should be used for connection).
- Analog signal control mode, when the signal source (signal generator, analog signal source, DA control card, etc.) output is 0, connect the SMB cable to the Analog In interface of the controller.

# 6. Parameter

## 6.1 Technical Data

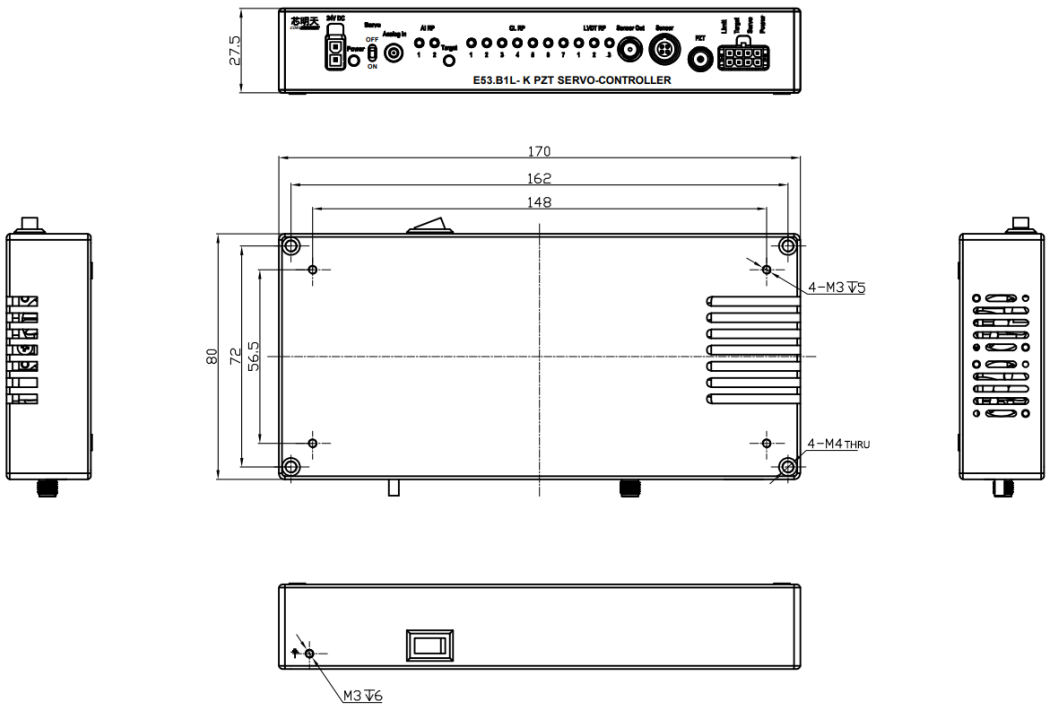
| Type | E53.B1L-K |
|---|---|
| Channels | 1 |
| Nominal analog input(V) | 0~10 |
| Nominal output voltage(V) | 0~150 |
| Peak current(mA) | 1100 |
| Ave. current(mA) | 70 |
| Bandwidth(-3dB, kHz) | 10k |
| Ripple(mVpp) | 10(loading 2.2μF) |
| PZT connector | ZPL.00.250.NTN |
| Control input connector | SMB |
| Servo control | |
| Sensor type | LVDT |
| Servo | Analog P-I+band stop+low pass |
| Sensor connector | EPL.0S.304.HLN |
| Sensor out connector | SMA |
| Others | |
| Operating temperature(°C) | 0~50 |
| Output short-circuited current (mA) | 70 |
| Overcurrent indication | Lights, when ave.current>70mA |
| Static power(W) | 4 |
| Dimensions(mm) | L170×H27.5×D80 |
| Mass(g) | 385 |
| Power supply | 24V(20~30V) DC 1.5A(36W) |
| Power interface | Molex4.2_1x2 |
| Target indicator | Molex3.0_4x2 |

## 6.2 Environmental conditions

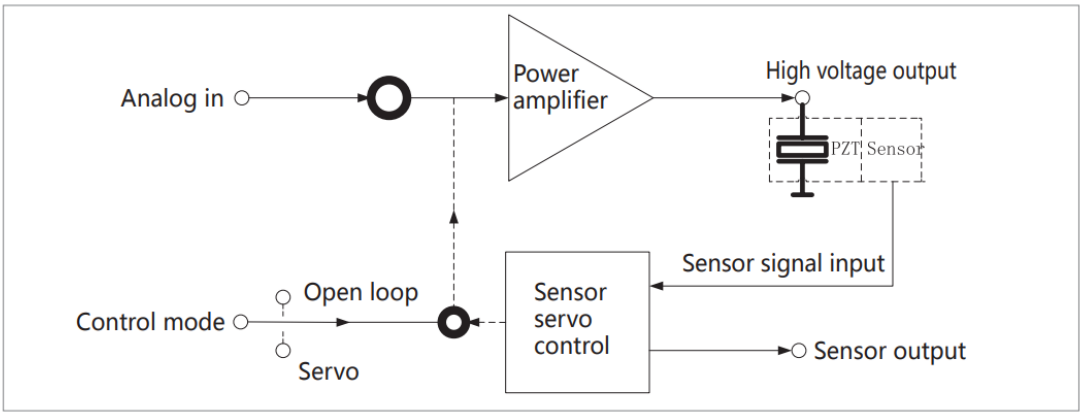
The operating environment of E53.B1L-K compact piezo controller :

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

## 6.3 Drawing

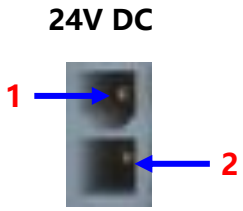


## 6.4 Driving Principle



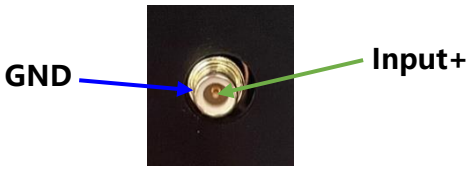

## 6.5 Interface introduction

### 6.5.1 Power interface (Molex4.2_1x2)

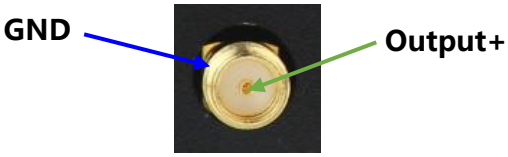



| No. | Function | Description |
|---|---|---|
| 1 | Power supply - | 24V DC, - |
| 2 | Power supply + | 24V DC, + |

### 6.5.2 Analog In interface (SMB)




### 6.5.3 Sensor Out interface (SMA)



6.5.4 Sensor connector interface (EPL.0S.304.HLN)


| Pin No. | Pin Definition | Wire Connection |
|---|---|---|
| 1 | EXC2 | Excitation signal |
| 2 | +INPUT | Secondary output positive terminal |
| 3 | -INPUT | Secondary output negative terminal |
| 4 | EXC1 | Excitation signal |

6.5.5 Status indicator interface (Molex3.0_4x2)


| Marking | Function | No. | Description |
|---|---|---|---|
| Limit | Overcurrent indicator, ON: 5V/OFF: 0V | ① | Output+ |
| | | ② | Output- |
| Target | Target indicator, ON: 5V/OFF: 0V | ③ | Output+ |
| | | ④ | Output- |
| Servo | Non-servo/servo indicator, non-: 5V/OFF<br>Servo: 0V | ⑤ | Output+ |
| | | ⑥ | Output- |
| Power | Power indicator ON: 24V/OFF: 0V | ⑦ | Output+ |
| | | ⑧ | Output- |

## 6.6 Introduction to Potentiometer Functions

### 6.6.1 AI RP


| Marking | No. | Function | Description |
|---|---|---|---|
| AI RP | 1 | Analog input zero potentiometer | Zero point adjustment of analog input signal |
| | 2 | Analog input amplification potentiometer | Adjustment of amplification factor for analog input signal |

### 6.6.2 CL RP


| Marking | No. | Function | Description |
|---|---|---|---|
| CL RP | 1 | Bandstop filter adjustable potentiometer | Adjustment of bandstop filtering parameters during closed-loop operation to enhance system stability |
| | 2&3 | Low pass filter adjustment potentiometer | Low pass filtering parameter adjustment during closed-loop, used to filter out high-frequency noise |
| | 4 | Closed loop integral adjustment potentiometer | Adjustment of deviation integral parameter during closed-loop, used to adjust step response |
| | 5 | Closed loop proportional adjustment potentiometer | Adjustment of deviation ratio parameter during closed-loop, used to adjust step response |
| | 6 | Sensor amplification potentiometer | Adjustment of amplification factor for sensing signals |
| | 7 | Sensor zeroing potentiometer | Zero point adjustment of sensing signals |

### 6.6.3 LVDT RP


| Marking | No. | Function | Description |
|---|---|---|---|
| LVDT RP | 1 | LVDT output signal bias potentiometer | Level bias adjustment of LVDT output signal |
| | 2 | LVDT output signal amplification potentiometer | Level and amplitude adjustment of LVDT output signal |
| | 3 | LVDT output signal phase-shifting amplifier | Phase adjustment of LVDT output signal |

# 7. Cleaning, Transportation and Storage

## 7.1 Cleaning measures

**Note!** The PCB board of controller 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 controller before cleaning.
- Prevent cleaning fluid and any liquid from entering the controller to avoid short circuits.
- The surface of the controller and the front&rear panel of the controller, please do not use an organic solvent for surface wiping.

## 7.2 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.
- This product 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 This product is not used for a long time, the instrument should be packaged and stored.
- This product 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.

# 8. Service and Maintenance

## 8.1 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

## 8.2 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.

# 9. Contact us

**CoreMorrow Ltd.**

Tel: +86-0451-86268790 Fax: 0451-86267847

Website: www.coremorrow.com Email: info@coremorrow.com

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

**After-sale service:**

Emai: info@coremorrow.com

**CoreMorrow Official and CTO WeChat are below**: