E70.D3S-L Multi-channel Piezo Controller

User Manual

Version: V1.0 Date: 2025.04

This manual describes the following products:

- E70.D3S-L multi-channel piezo controller

Declaration

Declaration!
➢ This user manual is only applicable to the E70.D3S-L multi-channel 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. ➢ 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.
Cautious!
➢ The E70.D3S-L multi-channel 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. ➢ 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.

Contents

1. Overview

1.1 Features

- E70.D3S-L is only used to drive capacitive loads (such as piezo nanopositioning stage). It cannot be used to drive inductive loads.
- E70.D3S-L with SGS sensor can use servo operation mode.
- E70.D3S-L can be used for static and dynamic operating applications.
- **Particular attention**: E70.D3S-L can't be used in the user manuals of other products with the same name.

1.2 Safety instructions

The design and production of E70.D3S-L multi-channel 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 piezocontroller, 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 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 E70.D3S-L multi-channel 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.

1.4 User Manual Download

User manual download process instructions:

1. Open the website www.coremorrow.com;
2. Search for product model (e.g. E70.D3S-L) or series (e.g. multi-channel 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 3-channel E70.D3S-L piezo controller can achieve real-time communication with the upper computer through USB interface, RS-232/422 interface and LAN port, and supports secondary development of upper computer software.The controller adopts a dedicated operational amplifier circuit to ensure the output capability of high voltage and high current. By optimizing the sensing servo module, the accuracy and stability of PI adjustment and control are improved, and the reliable anti-interference design ensures the high frequency response of the controller. It can be switched between open and closed loop states through the upper computer software, and parameters such as voltage and displacement can be set. It is suitable for high reliability system fields such as tilt, pitch, yaw/differential drive, and can be used to drive capacitive loads such as piezo nanopositioning stage.

2.1 Classification

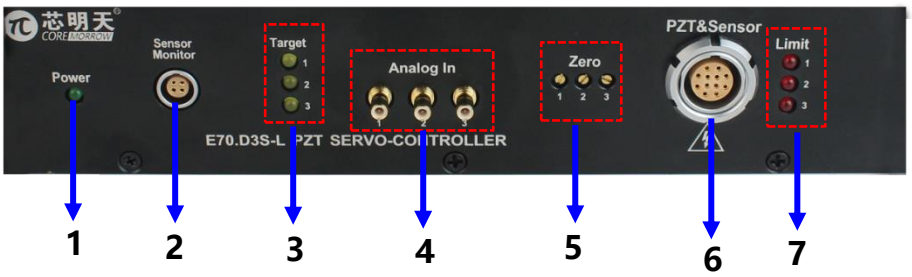
Model	Description
E70.D3S-L	Piezo servo controller, 3 channels, SGS sensor, digital/analog signal control/IO control, USB/Serial port/LAN network port

2.2 Appearance and Panel Introduction

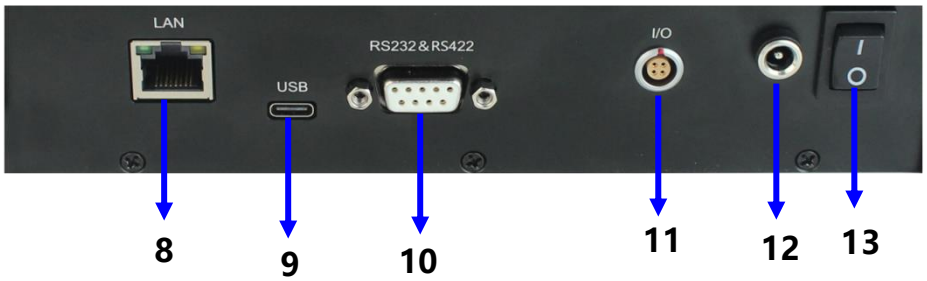
2.2.1 Appearance

2.2.2 Panel introduction

Front Panel



Rear Panel



Note: Some versions of E70.D3S-L multi-channel piezo controller have no IO interface on the rear panel, it does not affect the normal function of the controller. Please confirm with the actual product.

No.	Symbol	Model	Function description
1	Power	LED green	Power indicator light: When it is on, the controller is in a powered on and operable state; otherwise, it is in a non operable state
2	Sensor Monitor	EPG.0B.304.HLN	Sensor output signal monitoring terminal. Output range is 0 to 10V
3	Target	LED yellow	When signal is not within range of target position, the target detection abnormal indicator lights up. (TTL, active low)
4	Analog In	SMB	Analog input is used as the target value of the input voltage. The input voltage can be an analog signal generated by computer (such as DA card). You can use signal generator, analog signal source to connect
5	Zero	Potentiometer	Changing mechanical load or temperature changes will cause deviation of sensor zero. No operation is required after zero adjustment. (If servo state works normally, the zero point potential does not need to be adjusted.)
6	PZT&Sensor 	ECG.2B.312.CLV	Output votlage to drive piezo actuator(PZT) Sensor input signal
7	Limit	LED red	When output current of channel exceeds set value, the corresponding over-current indicator lights up
8	LAN	RJ45	Connect the computer to the controller through the ethernet port to achieve digital control of the upper computer
9	USB	Type-C	Connect the computer to the controller through the USB interface to achieve digital control of the upper computer
10	RS-232/422	D-SUB 9Pin	Connect the computer to the controller through the RS-232/422 interface to achieve digital control of the upper computer
11	IO	EPG.0B.304.HLN	I/O control interface, user can set as input or output mode.
12	Power supply	DC-022B(ø2.5)	Power connector socket. Connect via power adapter to the DC power supply
13	Switch	KCD1-102	Control the power on and off of the piezo controller

3. Unpacking inspection

The E70.D3S-L 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]

5. Installment

5.1 Installation Precautions

Note! Incorrect installation of the E70.D3S-L multi-channel 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 Connect power

Connect the controller power interface to the power supply using the power adapter (output range of 24V DC/3A) that comes with the product shipment.

5.4 Cable connection

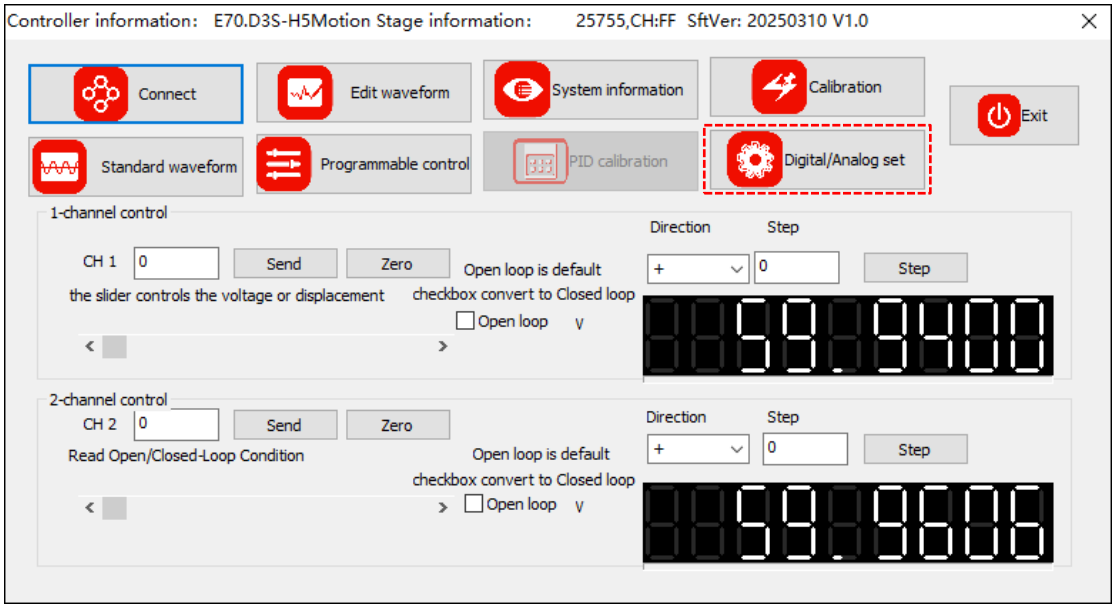
- while power switch keeps disconnected, connect the PZT and Sensor cables of the piezo product to the PZT&Sensor interface of the controller . Note！ the number of the piezo product should correspond to the number of the interface of the controller (note: if the number of pins on the piezo product cable and controller interface is different, an adapter wire should be used for connection).
- Digital signal control mode, connect the controller to the upper computer through the USB cable, RS-232/422 serial port to USB cable, or Ethernet cable provided with the product shipment.
- 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. Operation

The control mode selection and servo mode selection of E70.D3S-L piezo controller need to be carried out through the upper computer software, as follows:

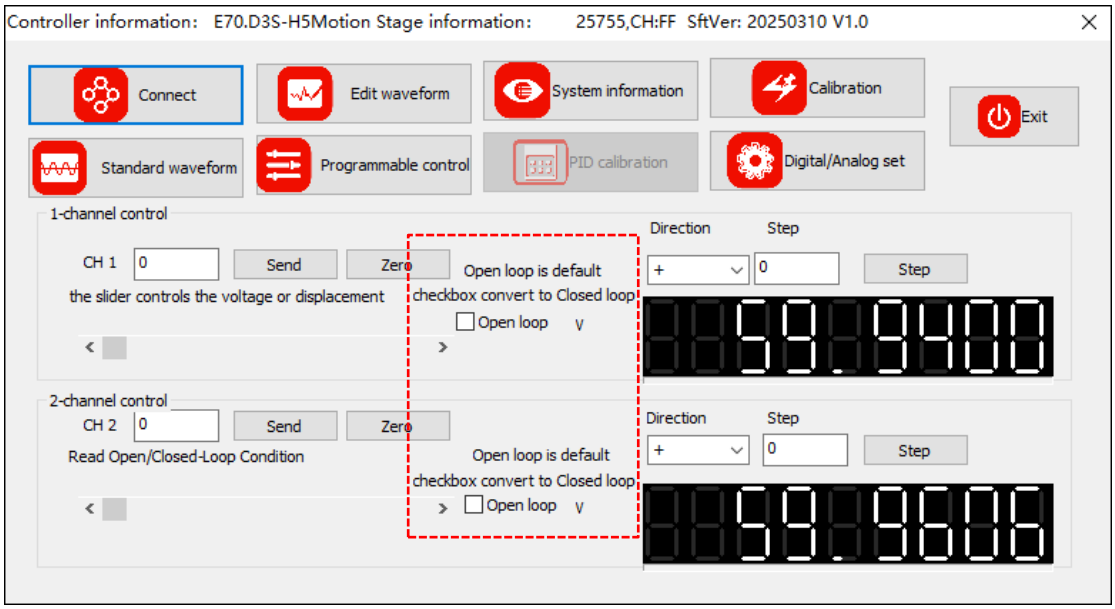
6.1 Control mode selection

Enter the upper computer software operation interface, click the "Digital/Analog set" button, and click the "set up analog control" or "set up digital control" button to select the control mode.



6.2 Servo mode selection

Enter the upper computer software operation interface, click on the marked area to select open-loop/closed-loop servo mode. **Note:** Open loop is default, checkbox convert to Closed loop.


Controller information: E70.D3S-H5Motion Stage information: 25755,CH:FF SftVer: 20250310 V1.0
Connect
Edit waveform
System information
Calibration
Exit
Standard waveform
Programmable control
PID calibration
Digital/Analog set
1-channel control
CH 1
0
Send
Zero
Open loop is default
checkbox convert to Closed loop
Open loop
Direction
Step
+
0
Step
the slider controls the voltage or displacement
59.9400
2-channel control
CH 2
0
Send
Zero
Read Open/Closed-Loop Condition
Open loop is default
checkbox convert to Closed loop
Open loop
Direction
Step
+
0
Step
59.9606

7. Parameter

7.1 Technical Data

Type	E70.D3S-L
Function	Digital and analog piezo controller
Channels	3
Ananog input(V)	0~10(±10V for constant voltage version)
Output voltage(V)	0~120(Optional 0~150)
Input power(W)	56
Peak current(A)	1000/channel
Ave.current(mA)	70/channel
Bandwidth(Hz)	10k/channel
Ripple(mV)	10/channel(2.2μF)
PZT connector	ECG.2B.312.CLV
Control input connector	SMB
Sensor type	SGS
Servo	P.I+Low pass+Notch filter
Sensor output voltage(V)	0~10 (±10V for constant voltage version)
Sensing output connector	EPG.0B.304.HLN
Sensor output ripple(mV)	10
Communication	RS-232/422(D-SUB9), USB(Type-C), Ethernet(RJ45)
Baud rate	9600 , 38400, 57600, 115200
Settable baud rate for Software secondary developmen	9600, 19200, 38400, 57600, 76800, 115200 , 128000, 230400, 256000
Processor	ARM 32 bit
D/A converter	16bit±10V
A/D converter	16bit±10V
I/O interface	1pcs, user can set the input or output
I/O port connector	EPG.0B.304.HLN

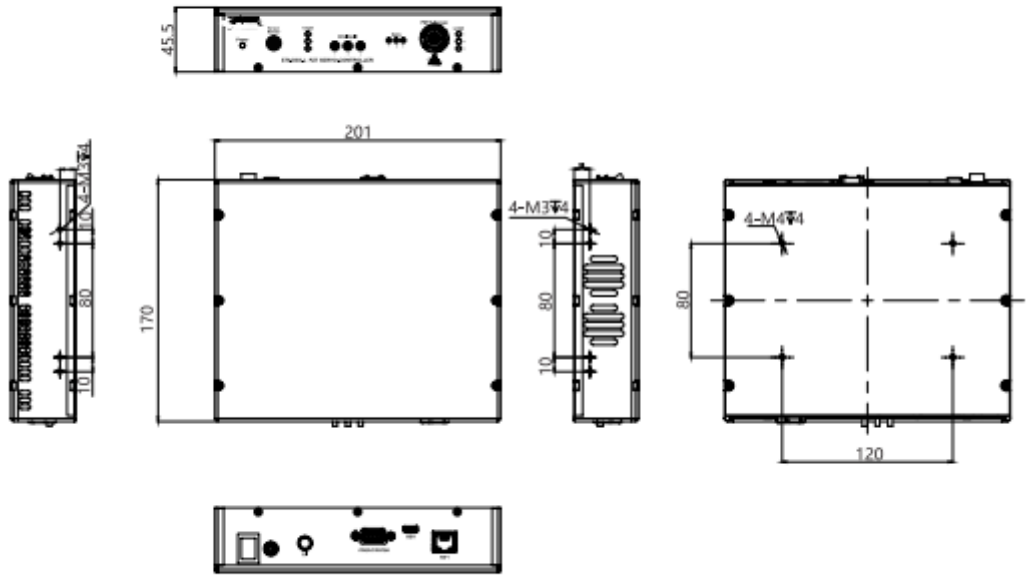
Type	E70.D3S-L
PC software control function	Output voltage and displacement, waveform control, setting parameters
PC software waveform control	Programmable/standard
Secondary development	VC++, Matlab, LabView, DLL dynamic link library functions, etc.
Operating temperature(°C)	0~50
Overcurrent protection	Yes
Static power(W)	13
Cooling	Fan
Size(mm)	201×170×45.5
Mass(g)	1620
Power supply	24V DC 3A
Power interface	DC-022B (ø2.5)
Control mode	Analog/digital signal control

7.2 Environmental conditions

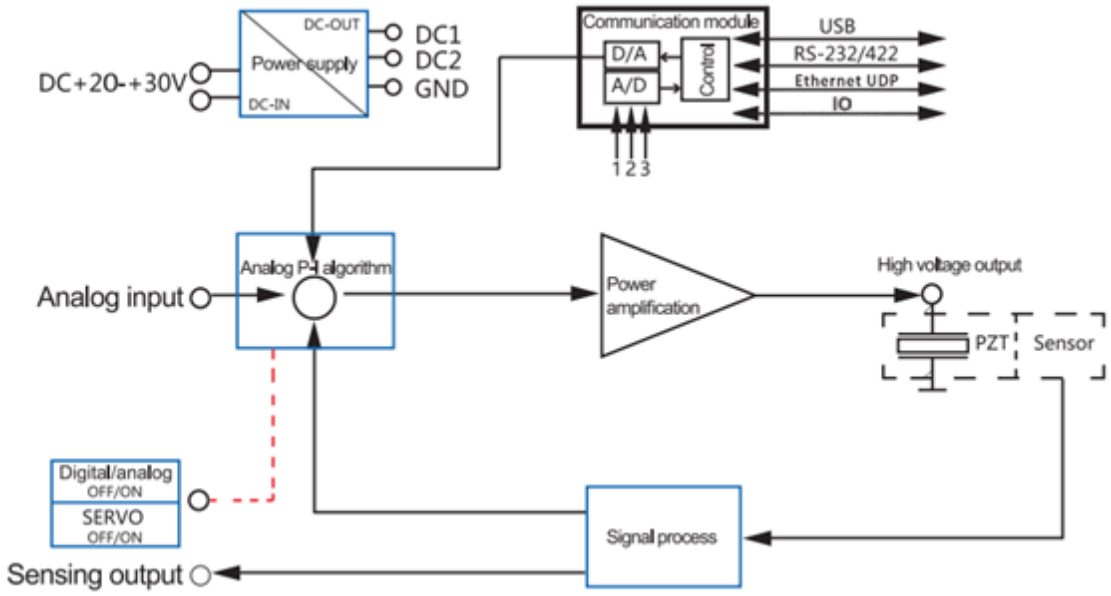
The operating environment of E70.D3S-L multi-channel piezo controller:

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

7.3 Drawing



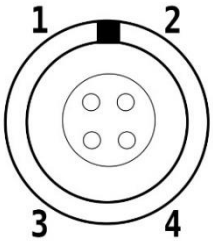
7.4 Driving Principle



7.5 Interface introduction

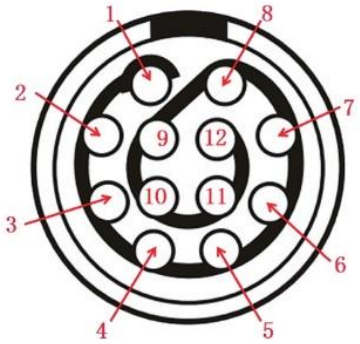
7.5.1 Sensor Monitor interface (EPG.0B.304.HLN)

Pin No.	Definition
1	Sensor output ch1
2	Sensor output ch2
3	Sensor output ch3
4	GND



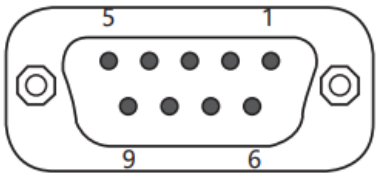
7.5.2 PZT&Sensor interface (ECG.2B.312.CLV)

Pin No.	Definition
1	-input ch1
2	Sensor GND
3	Sensor +10V
4	HV-GND
5	PZT OUTPUT ch3
6	PZT OUTPUT ch2
7	PZT OUTPUT ch1
8	+input ch1
9	-input ch2
10	-input ch3
11	+input ch3
12	+input ch2



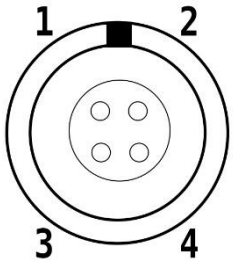
7.5.3 RS-232/422 interface (D-Sub 9pin)

Pin No.	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+



7.5.4 IO interface (EPG.0B.304.HLN)

Pin No.	Definition
1	EXIO_OUT1
2	EXIO_OUT1
3	EXIO_OUT3
4	GND



8. Cleaning, Transportation and Storage

8.1 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.

8.2 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.

9. Service and Maintenance

9.1 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

9.2 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.

10. 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: