SC300 Motion Controller

(Version 1.1   2009-4-28)

Operation Manual

Zolix Zolix Instruments Co., Ltd.

Thanks for using Zolix products ！

Please read this Operation Manual carefully before using. Contact Zolix office in Beijing or local office if you have any questions and suggestions.

Directory

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1. SC300 Description

The **SC300** motion controller is a new product for controlling orientating position in X, Y or Z axis. It can also control many types of stepping motors (use corresponding drivers). It provides the controlling communicating protocol and many commands. It has characteristics as following:

● Very long distance can be controlled

● The absolute position and the relative position can be displayed

● Stages can be controlled to move forward or backward and to the zero position

● Speed, distance and acceleration can be set arbitrarily

● Position limit switches fitted

Model explanation: **SC300-XY**

SC300:　　　model

X= 1，2，3　the amount of axes

Y= A　　　　denotes that the driver is 1.5A and microsteps are 2, 4, 8, 16, 32, and 64.

Y= B　　　　denotes that the driver is 3.5A and microsteps are 2, 4, 8, 16, 32, and 64, 128

2. Specifications

| Frequency range of output pulse	200～20 kHz		
Power	AC187V～242V		
Maximum number of axes	3 (X, Y, Z)		
Distance	-999999 ～ 9999999 (steps)		
Microstep	SC300-XA	2，4，8，16，32，64	
	SC300-XB	2，4，8，16，32，64，128	
Speed	400pps ～ 18 kpps		
Acceleration and deceleration mode	Triangle or trapezium		
Display	8 digit LED		
Computer Interface	RS232		
Outline dimension	380×350×120 mm		
Ambient operation temperature	-10～+45℃		
Relative humidity	40％ ～ 80％		
Weight	6 kg		

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3. Function Introduction

（1） Front panel
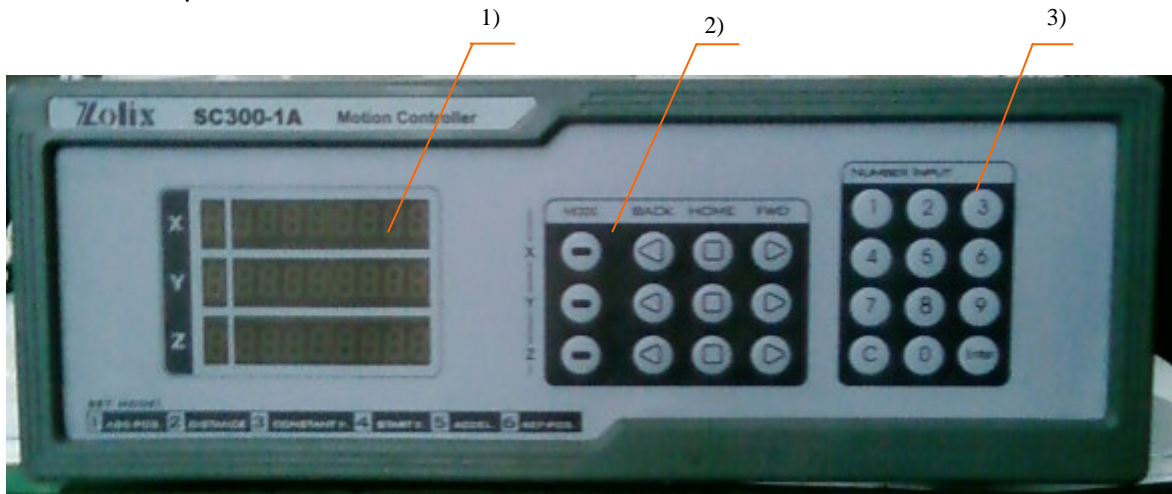
1) Display: 'X' denotes x axis, 'Y' denotes y axis and 'Z' denotes z axis. The first green digit denotes the work style and the later seven red digits denote parameters.

2) Control Buttons: include mode MODE, move forward FWD, go back to zero HOME, move backward BACK.

3) Number input: change MODE and in order to set parameters in order.

（2） Rear Panel (SC300-XA)
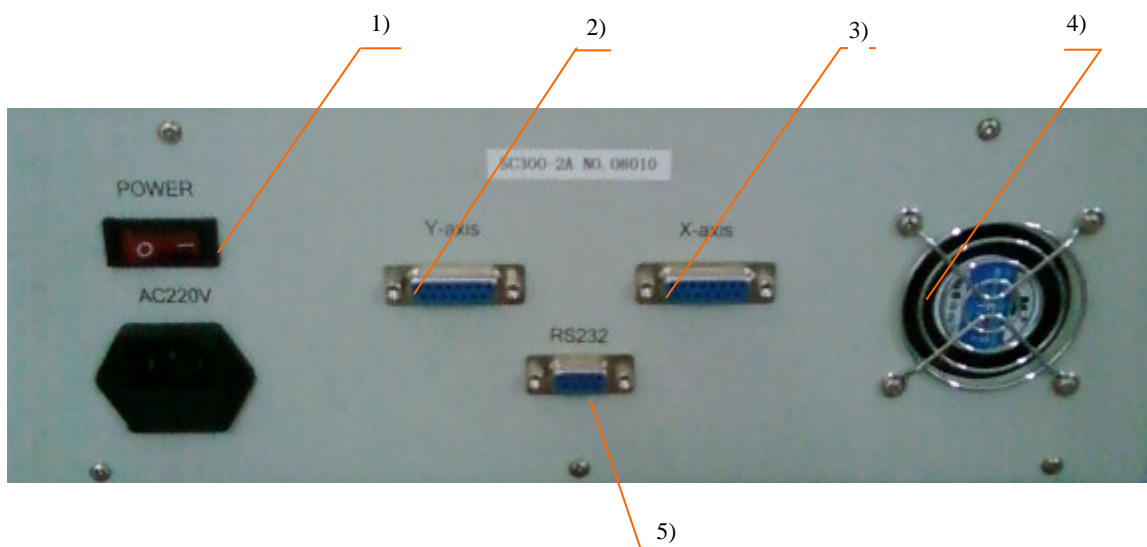
1) Power switch

2) Y-axis: Controlling interface of the motor of y axis
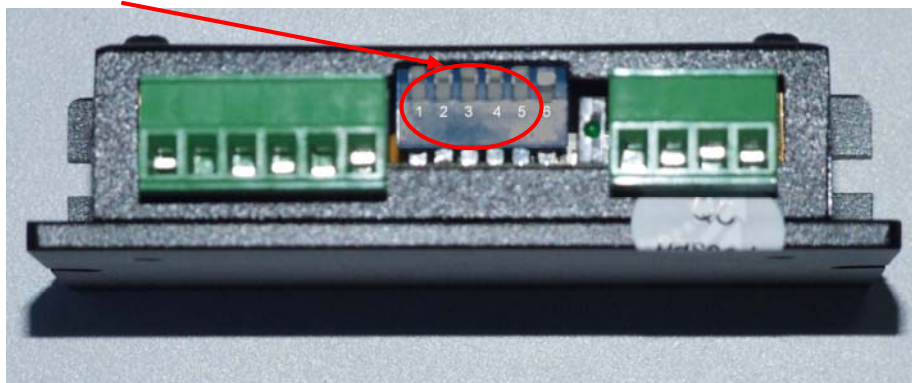
3) X-axis: Controlling interface of the motor of x axis

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4) Fan

5) RS232 interface

Note: If you have the SC300-XA, which has a default microstep of 8, and want to change the microstep, you must open the SC300 case and set the microstep and current according to the form printed on the driver.

The driver (M415B):

The switch:

Current setting should follow: Microstep setting should follow:

PK Current	SW1	SW2	SW3
0.21A	OFF	ON	ON
0.42A	ON	OFF	ON
0.63A	OFF	OFF	ON
0.84A	ON	ON	OFF
1.05A	OFF	ON	OFF
1.26A	ON	OFF	OFF
1.50A	OFF	OFF	OFF

MSTEP	SW4	SW5	SW6
1	ON	ON	ON
2	OFF	ON	ON
4	ON	OFF	ON
8	OFF	OFF	ON
16	ON	ON	OFF
32	OFF	ON	OFF
64	ON	OFF	OFF

If you have the SC300-XB, which has a default microstep of 8, and want to change the microstep, you must open the SC300 case and set the microstep and current according to the form printed on the driver.

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The driver (MA335):

The switch:
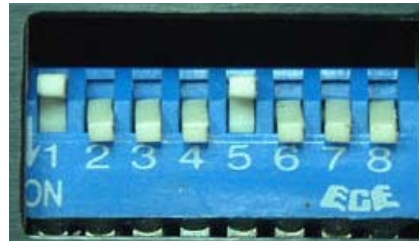
Current setting should follow: Microstep setting should follow:

Current SW1—SW3 (8 levels):			
Current	SW1	SW2	SW3
1.3A	on	on	on
1.6A	off	on	on
1.9A	on	off	on
2.2A	off	off	on
2.5A	on	on	off
2.9A	off	on	off
3.2A	on	off	off
3.5A	off	off	off

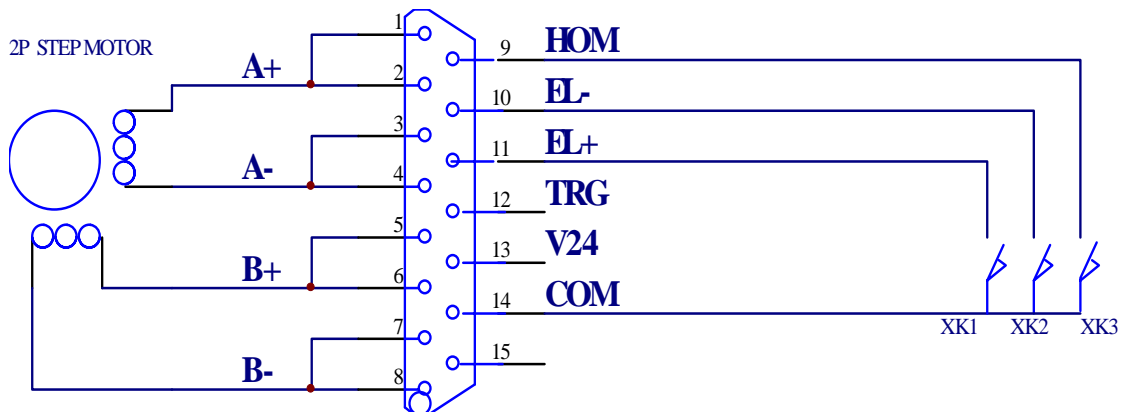| Microstep SW5—SW8			
Micro	SW5	SW6	SW7	SW8
2	off	on	on	on
4	on	off	on	on
8	off	off	on	on
16	on	on	off	on
32	off	on	off	on
64	on	off	off	on
128	off	off	off	on
5	on	on	on	off
10	off	on	on	off
20	on	off	on	off
25	off	off	on	off
40	on	on	off	off
50	off	on	off	off
100	on	off	off	off
125	off	off	off	off

（3） Motor interface details:

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4. Operation Guide

(1) Operating mode introduction

The SC300 has six operating modes which can be changed by MODE and Number input. The default mode is 1 when power on.

Mode 1 (Absolute position): Displays the absolute position parameters, in unit of step size. The reference position is mechanical zero.

Mode 2 (Displacement): Displays displacement parameters. Unit is step size.

Mode 3 (Speed): Displays the speed in PPS (pulses/sec).

Mode 4 (Initial speed): Displays the initial speed in PPS.

Mode 5 (Acceleration): Display the acceleration in PPSS (pulses/sec/sec).

Mode 6 (Comparative position): Displays comparative position parameters and the unit is step size. The reference position is the zero, which is set by user.

(2) Changing the mode: press button MODE continuously, it will range from mode 1 to mode 6.

(3) Setting displacement parameters: set the mode 2 for every axis and input parameters through Number Input. Then press Enter . Pressing C clears the last digit number.

(4) Setting top_speed: set the mode 3 for every axis and input parameters through Number Input. The parameters will be stored in the internal storage, and the data is not lost when the SC300 is rebooted. Then press Enter . Pressing C clears the last digit number.

(5) Setting init_speed: set the mode 4 for every axis and input parameters through Number Input. Then press Enter . The parameters will be stored in the internal storage, and the data is not lost when the SC300 is rebooted. Pressing C clears the last digit number.

(6) Setting acc_speed: set the mode 5 for every axis and input parameters through Number Input. Then press Enter . The parameters will be stored in the internal storage, and the data is not lost when the SC300 is rebooted. Pressing C clears the last digit number.

(7)   Go back to the mechanical zero position: set the mode 1 for the axis and press down the | Home | button.

(8)   Go back to the comparative zero position: set the mode 6 for the axis and press down the | Home | button.

(9)   Setting the comparative zero position (set by user): set the mode 6 for the axis and press down | FWD | or | BACK |.

Press | 1 | to set the comparative position of axis X to 0.

Press | 4 | to set the comparative position of axis Y to 0.

Press | 7 | to set the comparative position of axis Z to 0.

(10) Setting the pulse:

Press the | FWD | button of X, Y or Z axis and the stage will move forward.

Press the | BACK | button of X, Y or Z axis and the stage will move backward.

Note: X and Y or X and Z can move at the same time, but Y and Z cannot.

(11) Stop the stage moving: Pressing down the | MODE | button of X, Y or Z axis can stop moving in corresponding direction.

Note：

The top_speed, init_speed and acc_speed have the function of protecting power losing. The three parameters will be stored in the internal storage by SC300 motion controller after setting them. And these parameters will not lose if you restart the SC300.

5. Communication Protocol and Commands Explanations

（1） RS232 data transmission format:

Baudrate:　　19200

Data format:　no parity bit, 8 data bits, 1 stop bit (N，8，1)

（2） Command format

1st Byte	2nd Byte	3rd Byte	4th Byte	Nth Byte	(N+1)th Byte	Mth Byte
Command		Separator	Parameter1	Separator	Parameter2	Ending character

Command is made up of two characters.

Separator is ","

Parameter

Ending character: return character '↓' . It 's ASCII =0x0d (Hex) or 13 (Dec)

（3） Inquiring parameters

Command from PC to SC300 :　　VE↓　　　　　　// version

Command from SC300 to PC:　　 SC300_V1.0↓

Command from PC to SC300 :　　TY↓　　　　　　// model of controller

Command from SC300 to PC:　　 SC300↓

Command from PC to SC300 :　　ID↓　　　// the ID number of controller

Command from SC300 to PC:　　 ID0000↓

（4） Setting the speed of the axis

Command from PC to SC300 : VX,top_speed↓　　// X axis

Command from PC to SC300 : VY,top_speed↓　　// Y axis

Command from PC to SC300 : VZ,top_speed↓　　// Z axis

Command from SC300 to PC:　OK↓

　　　　　　　　　　　　　　　E0↓　　//Error 0

　　　　　　　　　　　　　　　E1↓　　//Error 1

The "top_speed" is the speed of the stage moving.

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（**5**） **Setting the acceleration:**

Command from PC to SC300 :   AX,acc_speed ↓   // X axis

Command from PC to SC300 :   AY,acc_speed ↓   // Y axis

Command from PC to SC300 :   AZ,acc_speed ↓   // Z axis

Command from SC300 to PC: OK ↓

                                                        ER ↓

The "acc_speed" is the acceleration of the stage moving.

（**6**） **Setting the initial speed**

Command: PC → SC300

Command from PC to SC300 : FX,init_speed ↓   // X axis

Command from PC to SC300 : FY,init_speed ↓   // Y axis

Command from PC to SC300 : FZ,init_speed ↓   // Z axis

Command from SC300 to PC: OK ↓

                                                        ER ↓

The "init_speed" is the initial speed of the stage moving.

（**7**） **Stop moving**

Command from PC to SC300 : SPX ↓ //stop the stage moving in the X direction

Command from PC to SC300 : SPY ↓ //stop the stage moving in the Y direction

Command from PC to SC300 : SPZ ↓ //stop the stage moving in the Z direction

Command from SC300 to PC: ?X,x ↓ // the stage position in the X direction

                                        ?Y,y ↓ // the stage position in the Y direction

                                        ?Z,z ↓ // the stage position in the Z direction

                                        ER ↓   // Error

（**8**） **Go back to the mechanical zero position**

Command from PC to SC300 :   HX ↓   //Go to the zero position of X axis

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Command from PC to SC300 :   HY ↓   //Go to the zero position of Y axis

Command from PC to SC300 :   HZ ↓   //Go to the zero position of Z axis

Command from SC300 to PC: ?X,0 ↓   // the zero position of X axis

                             ?Y,0 ↓   // the zero position of Y axis

                             ?Z,0 ↓   // the zero position of Z axis

                             ER ↓   // Error

（**9**） **Controlling moving**

Command from PC to SC300:

+X,n ↓   //increase the displacement n in X direction.

+Y,n ↓   // increase the displacement n in Y direction.

+Z,n ↓   // increase the displacement n in Z direction.

-X,n ↓   // decrease the displacement n in X direction.

-Y,n ↓   // decrease the displacement n in Y direction.

-Z,n ↓   // decrease the displacement n in Z direction.

Command from SC300 to PC:

?X,x ↓   //the current position of the stage in X direction

?Y,y ↓   // the current position of the stage in Y direction

?Z,z ↓   // the current position of the stage in Z direction

ER ↓

（**10**） **Inquiring the current position of the stage**

Command from PC to SC300:

?X ↓   //inquiring the current position of the stage in X axis

?Y ↓   // inquiring the current position of the stage in Y axis

?Z ↓   // inquiring the current position of the stage in Z axis

Command from SC300 to PC:

?X,x ↓   // the current position x of the stage in X axis

?Y,y ↓   // the current position y of the stage in Y axis

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?Z,z↓   // the current position z of the stage in Z axis

ER↓

'x' is the value of the position, as well as y and z.

（**11**） **Inquiring the top_speed**

Command from PC to SC300:

XV↓   //inquiring the top_speed of the stage moving in X axis.

YV↓   // inquiring the top_speed of the stage moving in Y axis.

ZV↓   // inquiring the top_speed of the stage moving in Z axis.

Command from SC300 to PC:

XV,top_speed↓   //the top_speed of the stage moving in X axis.

YV,top_speed↓   // the top_speed of the stage moving in Y axis.

ZV,top_speed↓   // the top_speed of the stage moving in Z axis.

ER↓

（**12**） **Inquiring the initial speed**

Command from PC to SC300:

XF↓   // inquiring the initial speed of the stage moving in X axis.

YF↓   // inquiring the initial speed of the stage moving in Y axis.

ZF↓   // inquiring the initial speed of the stage moving in Z axis.

Command from SC300 to PC:

XF,init_speed↓   // the initial speed of the stage moving in X axis.

YF,init_speed↓   // the initial speed of the stage moving in Y axis.

ZF,init_speed↓   // the initial speed of the stage moving in Z axis.

ER↓

The 'init_speed' is the initial speed.

（**13**） **Inquiring the acceleration**

Command from PC to SC300:

XA↓   // inquiring the acceleration of the stage moving in X axis.

YA↓   // inquiring the acceleration of the stage moving in Y axis.

ZA↓   // inquiring the acceleration of the stage moving in Z axis.

Command from SC300 to PC:

XA,acc_speed ↓　　// the current acceleration of the stage moving in X axis.

YA,acc_speed ↓　　// the current acceleration of the stage moving in Y axis.

ZA,acc_speed ↓　　// the current acceleration of the stage moving in Z axis.

ER ↓

The 'acc_speed' is the acceleration.

（**14**）　**Communicating command:**

Command from PC to SC300:　↓　　//an 'enter'

Command from SC300 to PC:

　OK ↓　　　　　　//denotes communicating is correct

　No response　//denotes communicating is not correct

（**15**）　**Sending out the position parameters initiatively**

When the stage is from moving to quiescence, the SC300 will send parameters of position in the desired axis to the computer.

Command from SC300 to PC:

?X,x ↓　　//the current position of the stage in the X axis direction.

?Y,y ↓　　// the current position of the stage in the Y axis direction.

?Z,z ↓　　// the current position of the stage in the Z axis direction.

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6. Errors

Phenomenon	Possible Reasons	Ways and means
The stage doesn't move	1. Power off 2. Cable connection error 3. The stage has not been moved to the zero position. 4. Direction error	1. Turn on the power of the SC300 2. Connect the cable again 3. Firstly move the stage to the zero position 4. Select the movement direction again
The displacement is not the setting	Input error steps	Input correct steps again
The speed of the stage is not correct	1. Select the error speed. 2. There is something in the screw or guide. 3. Low lubrication 4. Overloading	1. Input the correct speed again 2. Return the product back to Zolix 3. Add lubrication 4. Decrease the load
Big noise	1. There is something in the screw or guide. 2. Low lubrication 3. The stage is not fixed up tightly on the table.	1. Return the product back to Zolix 2. Add lubrication 3. Tighten screws
The stage cannot stop after touching the limit switch	The limit switch is invalid	1.Check up the line on the limit switch 2. Return it back to Zolix.
After sending "HX↓", the stage move in reverse direction and doesn't stop while the limit switch is reached.	The limit switch on the zero position is faulty.	1.Check up the line on the switch 2. Return it back to Zolix.
The stage moving in one direction is not correct.	1. The driver is faulty. 2. The controlling software is faulty.	1. Change the driver. 2. Amend the software 3. Use the Zolix's software

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7. Formulas Introduction

Total steps per one rotate =360 / step angle

Resolution: The displacement produced with one pulse

Linear stage: Resolution = screw_pitch（mm ）/(total_steps_per_rotation * microstep)

Rotary stage: Resolution=360/((total_steps_per_rotation*microstep*moderate_ratio)

The actual speed of the stage (mm/s)= pulse_speed * resolution

(The pulse speed is the desired speed and its value is from 50 to 20000.)

Transform amount of pulse to angle:

Rotating angle (°) =resolution * amout_of_pulse

Transform angle to amount of pulse:

Amount of pulse = angle/resolution

Transform amount of pulse to displacement:

Displacement (mm) =resolution * amount_of_pulse

Transform displacement to amount of pulse:

Amount of pulse =displacement/resolution

8. Unpacking Procedures

（1）Visual examination

Please do the following inspection for all packing box

Check whether the packaging is intact outside the equipment, there are situations, such as damage, soaks, out of shape, etc..

Have above-mentioned situation please report immediately to Zolix or representatives

（2）Unpacking procedures

Please open the packing box and make sure not to use heavy-duty tools or opens roughly. With the proper tool according to the direction shown on the packing box so as not to cause inside equipment to be damaged.

（3）After unpacking

Please check equipment appearance for damage or corrosion, etc..

Based on contract and packing list, check specification, mode, and quantity.

Have above-mentioned situation please report immediately to Zolix or representatives

Please keep the packing box for at least 6 months in order to return or for transportation.

9. Warning

Warning!!!

Never open the case when it is in operation!

10. Certifications and Warranty

Zolix Instruments Corporation (Zolix) certifies that this instrument has been thoroughly tested and inspected and found to meet the specifications given by Zolix when it was shipped from the factory.

Zolix Instruments Corporation (Zolix) instruments and accessories are warranted for a period of one full year from date of delivery to be free from defects in material and to conform to the specifications given by Zolix. The corporation's obligation under this warranty is limited to servicing or adjusting an instrument returned to the factory, prepaid, and to repairing at the factory any part or parts thereof All purchased items carry the original manufacturers' warranty.

Zolix Instruments Corporation shall not be liable for consequential damages resulting from accident, alteration, and improper installation, operation on low or excessive voltages or use in violation of the operating instructions given by Zolix.

If any defect appears within the warranty period, the purchaser shall promptly notify Zolix No material will be accepted for repair or replacement without prior authorization from Zolix Upon such authorization and in accordance with instructions of Zolix, parts, materials or equipment for which repair or replacement is requested shall be returned to Zolix for examination, with shipping charges prepaid by the purchaser. Final determination as to whether a product or part is actually defective rests with Zolix Instruments Corporation.

In such cases where necessary repairs are not covered by this warranty, an estimate of repair charges will be submitted to the purchaser before servicing the equipment.

Zolix Instrument Corporation reserves the right to make changes or improvements upon its products without imposing any obligations upon it to install the same upon its products previously manufactured.

This warranty is expressly in lieu of all other obligations or liabilities on the part of Zolix, and Zolix neither assumes, nor authorizes any other person to assume for them other obligations or liability in connection with the sale of equipment manufactured by Zolix Instruments Corporation.

11. CE Declaration of Conformity

$$C\,\epsilon$$

Manufactured by: Zolix Instrument Co., Ltd

Applicable Standards: Generic Immunity   EN 50082-1 : 1992

Generic Emission   EN 50081-1 : 1992

Electrical Safety Standards   EN 61010-1 : 1993

Zolix Instrument Co., Ltd **certifies that this equipment conforms to the protection requirements of the above Directives.**

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12. Package List

Model: ☐**SC300-1A** ☐**SC300-1B**

☐**SC300-2A** ☐**SC300-2B**

☐**SC300-3A** ☐**SC300-3B**

Name: **SC Series Motion Controller**

Serial Number: _____

Products List

No.	Product Name	Amount
1	Motion Controller	1

No.	Accessories	Amount
1	Standard Power Supply Cable	1
2	Cable（DB15-DB9）	☐1 ☐2 ☐3
3	RS232 Cable	1
4	CD	1

No.	Tools and Facilities	Amount

No.	Documents	Amount
1	**SC300** SC Series Motion Controller Operation Manual	1
2	Conformity certificate	1

Checker Name and Checking Date:

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 WARNING

Before using this product, please read the Operation Manual and all warnings in the manual provided.

Never open the case when it is in operation!

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FAX: +86 10 56370118
Email: info@zolix.com.cn   http://www.zolix.com.cn