



FSC-2A 单轴运动控制器用户使用说明 V1.0

User instructions for FSC-2A single-axis motion controller

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产品简介 Product brief introduction

FSC 单轴运动控制器是本司最新推出的一款经济通用型的单轴运动控制器，采用 ARM Cortex-M3 内核的处理器，能够对步进电机、伺服电机的运动速度及运动距离进行有效精准的控制，且标准配置搭载了可显示运动参数的数码管及可调参数的按键。该控制器可升级为蓝牙的控制配置（需下载安装应用程序，目前仅支持安卓手机端），也可升级为遥控配置（可利用遥控器实现启停的控制），相对于市面上的绝大多单轴控制器，该控制器的调参及应用场景更为简易和灵活，是直线运动产品控制器的不二之选。

FSC single-axis motion controller is the latest economical single-axis motion controller produced by our company. Adopting ARM Cortex-M0 core processor, it can control the moving speed and the travelling distance of step motor and servo motor more precisely, equally equipped with a digital tube which displays motion parameters and with adjusted-parameter-buttons. The bluetooth control is upgraded to be accessible (requiring downloading an application, only available on Android so far), remote control as well (using a remote to start and pause the device). Compared with the most of single-axis on the market, it is more user-friendly to modify the parameters and has more flexible application scenarios, which makes it the best choice among all.

具备功能 Function

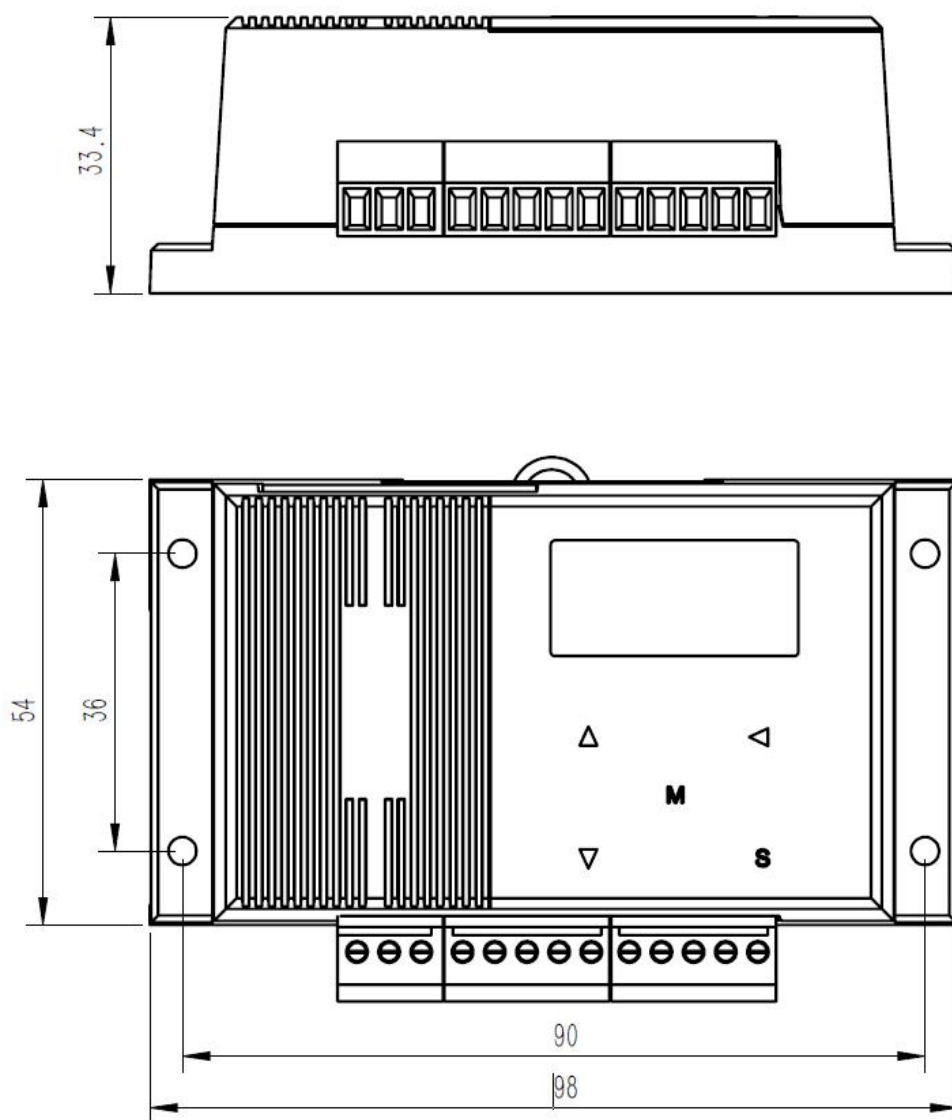
1. 点动运动 inching movement
2. 点位运动（按照坐标走/按照指定的距离走） inching movement(following the coordinate or the fixed route)
3. 往复运动 reciprocating movement
4. 单程运动 single-way movement
5. 实现到点延时 achieving point-triggered delay
6. 运动参数（速度、加速度与距离等）的显示与调节 motion parameters display and modifying (velocity, acceleration and distance etc.)
7. 控制方式可升级为蓝牙或遥控 upgrading to access bluetooth or remote control

使用领域 Field

目前仅推荐搭配本公司的单根模组或者在数个电机的同步条件下使用。It is only recommended to use matching with the single module of our company or under the condition of multi-motor synchronization.

性能及规格 Specifications and Characteristics

型号 Type	FSC-2A
供电方式 Power Supply Mode	DC24V 供电(Supplied with DC24V)
功耗 Power Consumption	小于 7.2W(Lower than 7.2w)
控制轴数 Number of Axes	单轴(Single-axis)
编码器接口 Interface of Coders	无(None)
可输出脉冲频率 Frequency of Pulse	50HZ~200KHZ
脉冲输出方式 Pulse Output Mode	脉冲+方向 (Pulse+Dir)
加速度模式 Acceleration Mode	梯形加减速(Trapezium AC/DE)
总线拓展 Bus Extension	暂不支持 (Not Supported Yet)
软件操作系统 System	Android 9.0 内存 2G 以上(With More Than 2GB Storage)
尺寸 Size	98*54*33.4



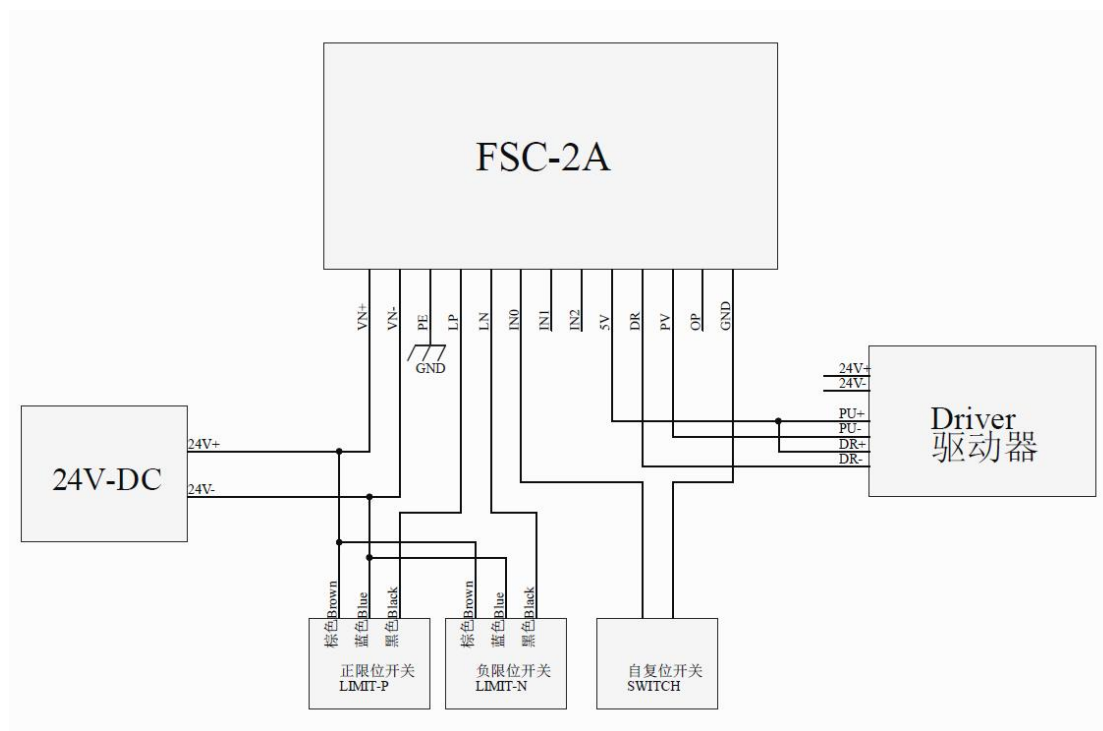
尺寸规格 Size

接口定义 Definition of Interfaces

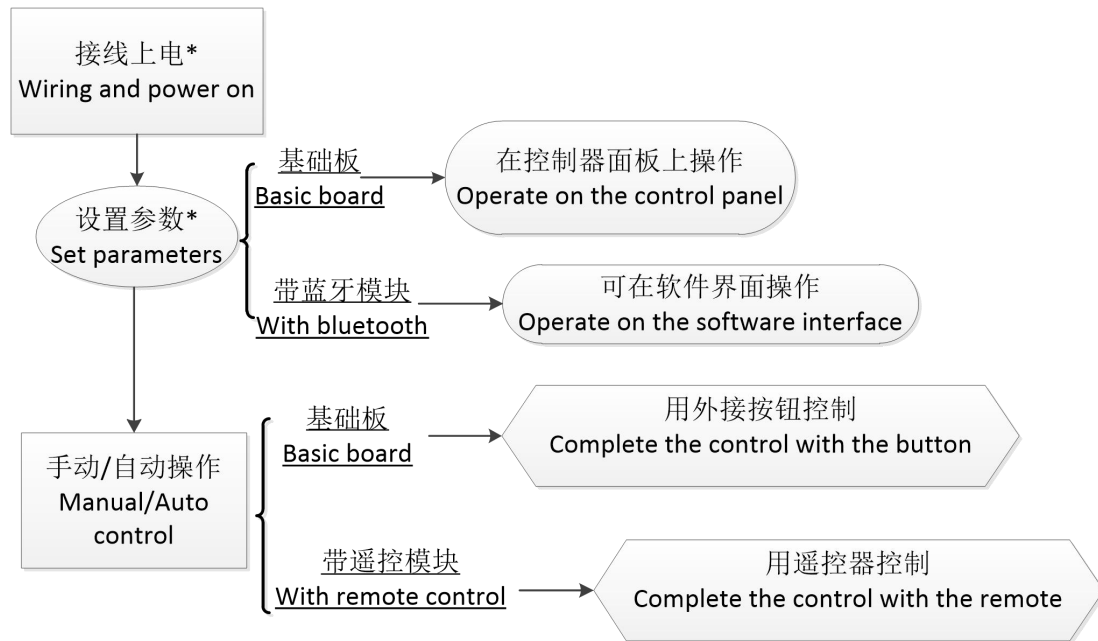
标记符号 Symbol	功能 Function	说明 Brief Instruction
VN+	电源正极输入 Input of positive power supply	支持 24V 直流电源输入 24v DC power supply available
VN-	电源负极 Power negative	直流电源负极 negative DC power supply
PE	控制器接地 Earth Ground	控制器接地 Earth Ground
PV	步进脉冲信号 Pulse signal	输出高电平 4.625-5.5V, 低电平 0-0.6V High level output 4.625-5.5V, low level output 0-0.6V
DR	方向控制信号 Direction control signal	输出高电平 4.625-5.5V, 低电平 0-0.5V High level output 4.625-5.5V, low level output 0-0.5V

5V	隔离电源输出 5V Isolated power output 5V	采用共阳极接法 Adopting common-anode wiring
OP	输出口 Output of Common-anode	输出口 Output
LP	正限位信号端 Positive limit signal port	正向限位开关信号接口 Interface of postive limit switch signal
LN	负限位信号端 Negative limit signal port	反向限位开关信号接口 Interface of negative limit switch signal
IN0	输入信号端 1 Stop signal port	外部开始按键接口 Interface of external stop button
IN1	输入信号端 2 Start signal port	外部停止按键接口 Interface of external start button
IN2	输入信号端 3 Start signal port	可重复定义使用 Multi Function Input
GND	公共地端 Public ground port	限位开关与开始停止开关需接此端口。 limit switch and START and STOP need to connect with this port.

接线示意图 The diagram of wiring



使用步骤 Operation steps



补充说明: Additional information

1.接线上电 Wiring and power on

请参见**接线示意图**。Please check out the **diagram of wiring**.

2.控制器面板介绍 Introduction of control panel

名称 Name	功能 Function
显示器 monitor	四组八段显示器用于显示监视值、参数值及设定值 Four-digit eight-segment displays are used to show monitoring values, parameters and setting values
Shift 键 Shift button	变更数值位数 (在手动 JOG 模式下作为正转使用) Change the number of digits (used as forward rotation in manual JOG mode)
Set 键 Set button	进入选中的模式或者参数确定 (在手动 JOG 模式下作为反转使用) Enter the chosen mode or fix the parameters (used as backward rotation in manual JOG mode)
Mode 键 Mode button	菜单显示界面翻页 (手动 JOG/参数设置/自动控制) Turn the page of display (manual JOG mode/parameters setting/automatic control)
Up 键 Up button	栏目内参数切换/增大数值/运动过程切换监视值 Switch the parameters in the section/increase the figure/ switch the monitor value while working
Down 键 Down bubtton	栏目内参数切换/减小数值/运动过程切换监视值 Switch the parameters in the section/decrease the figure/ switch the monitor value while working

3.参数设置说明 Instruction of parameters setting

上电开机默认进入手动 JOG 模式，数码管显示为：J__，按 Mode 键即可切换至参数设置菜单，在参数设置模式下，数码管显示为：P__。此模式下共有 8 个参数，各个参数通过 Up 和 Down 键切换。Set 按键进入相应的设置界面，Shift 按键移动需要设置的位，当需要更改的位被选中时，该位下的小数点会被点亮。

Manual JOG mode is by default with power on, the digital tube displaying: J __. Press Mode to enter the parameters setting mode.

In this mode, which has 8 parameters ,being able to modify pressing Up and Down buttons, digital tube displays: P___. Press Set button to enter the setting page, to press shift to change the digit of the figure. When the digit is selected, the dot beneath it will be illuminated.

序号 Serial number	内容 content	默认值 Default value	说明 Instruction
P_1	导程 Lead	10mm	填丝杆导程或者皮带轮的周径 The lead of filling rod and perimeter of pulley
P_2	细分比值 Subdivision ratio	25	表示细分倍数，计算方法为当前驱动所设置细分除以 200 It represents subdivision multiple. The calculation method is divided by 200 for the subdivision set by the current driver.
P_3	正转速度	50mm/s	运动正转速度
P_4	加速度 Acceleration	200mm/s ²	运动加速度 Acceleration of moving
P_5	减速度	200mm/s ²	运动减速度
P_6	行程	50mm	产品最大运动行程（自动模式下）
P_7	自动模式下启动方向	0	初始运动方向，1 代表正向，代表反向 Innital moving direction, 0 representing forward, 1 representing reverse.
P_8	控制模式 FSC-2A 无效	0	
P_10	延时	1000ms	
P_15	反转速度	50mm/s	

4. 手动 JOG 操作 Manual JOG operation

上电开机默认进入手动 JOG 模式，数码管显示为：J___，或者按 Mode 键切换至手动 JOG 模式，在此模式下，可通过 Shift 键与 Set 键手动控制电机的正转反转，操作 Up 和 Down 按键可查看监视值即目前运行的速度（mm/s），加速度（mm/s²）。

Manual JOG mode is by default with power on, the digital tube displaying: J___, or press Mode button to enter manual JOG mode. In this mode, Shift and Set buttons are able to control the forward rotaion and backward rotation of the motor. Up and Down buttons are able to monitor the status value, including velocity and acceleration.

5. 自动控制模式 Automatic control mode

参数设置好然后 JOG 下产品运动一切正常后，可通过 Mode 键进入自动模式菜单，数码管显示为：A___，此模式下有三个子模式：A_1、A_2、A_3，子模式之间的切换通过 UP、DOWN 按键实现。

处于子模式时，按下 SET 按键会进入该子模式，再次按下 SET 按键或 MODE 模式切换键均会退出子模式。

自动控制模式一为单段运动，自动控制模式二为单次往返，自动控制模式三为无限往返运动。

A_1：在此子模式时，按下 SET 按键，会显示为 0001，表示处于自动控制模式一。通过外接按键或遥控器可进行启动或停止。运动参数为预设好的值。

A_2：在此子模式时，按下 SET 按键，会显示为 0002，表示处于自动控制模式二。通过外接按键或遥控器可进行启动或停止。运动参数为预设好的值。

A_3：在此子模式时，按下 SET 按键，会显示为 0003，表示处于自动控制模式三。通过外接按键或遥控器可进行启动或停止。运动参数为预设好的值。

注意：当需要取消自动控制模式时，需要通过 Mode 按键切换到 A___ 栏目，再通过 Up 和 Down 键切

换到自动控制子模式，按下 Set 键后再通过外部的停止按键停止当前运动模式。

如果是手机 APP 控制，请参见 FSC-APP 软件操作指南。

After the parameters are set and the product runs well in the manual JOG mode, press *Mode* to enter automatic control mode, with digital tube displaying A___. There are three sub-modes in this mode: A__1, A__2, A__3. These sub-modes can be switched through Up and Down buttons.

After choosing the sub-mode, press the SET button to enter this sub-mode, and press the SET button or the MODE button again to exit the sub-mode.

Automatic control mode one is single fixed travel distance movement, automatic control mode two is single reciprocating motion, automatic control mode three is infinite reciprocating motion.

A__1: In this sub-mode, press the SET button, it will display as 0001, indicating that it is in automatic control mode one. It can be started or stopped by an external button or remote control. The motion parameters are preset values.

A__2: In this sub-mode, press the SET button, it will display as 0002, indicating that it is in automatic control mode two. It can be started or stopped by an external button or remote control. The motion parameters are preset values.

A__3: In this sub-mode, press the SET button, it will display as 0003, indicating that it is in automatic control mode three. It can be started or stopped by an external button or remote control. The motion parameters are preset values.

Notice: When the automatic control mode requires stopping, current sub-mode should be selected through Mode and Up and Down buttons, showing A__X(X could be 1, 2 or 3) on the screen, which matches the sub-mode, then press Set button and external pause button to stop the working pattern, which means that the current sub-code needs to be called out, before making it stop.

For mobile APP control, please refer to the FSC-APP guidance.

拓展模块介绍 Introduction of expanding module

A、遥控模块：Remote module

遥控模块是在原有的基础运动功能上加入遥控功能，使得能用遥控器代替原有的外接按键达到无线远程控制的目的，且遥控距离可达 30 米，启停操作便捷灵活。（但使用需注意）。

使用注意：

1. 穿透能力和抗干扰能力一般，需要减少阻隔和干扰。
2. 如需更换遥控器，则需要重新与遥控器进行对码，对码操作即在模块正确安装并通电的情况下，按住模块上的白色按键两秒，接着模块红灯会闪烁一次，此时按下遥控器的任意按键，便完成了对码操作。

The remote control module is an additional function besides the original basic motion function, which enables a remote in place of external buttons, achieving the goal of long-distance wireless control(within 30 meters) and the flexibility of start and stop operation.

Notice:

1. Penetrating ability and anti-interference ability are average, so the barrier and disturbance needs to be reduced.
2. If a remote wants to be changed, then another remote needs to be re-coded with. When the module is correctly installed and powered on, press the white button on the module for two seconds, then the red light will flash once, then press any key of the remote will accomplish the process.

B、蓝牙模块：Bluetooth module

增加蓝牙模块使得控制卡具有蓝牙功能，可配合我们自主开发的应用程序（目前仅支持安卓手机端），将控制器和手机通过蓝牙进行连接，实现在软件界面上修改运动参数，选择控制模式，最终远程实施运动功能等。且蓝牙的遥控距离可达 10m 且抗干扰强，因此无论是在参数的设置上还是运动的启停上，都能满足客户对便捷灵活应用场景的要求。

Bluetooth control function bases on the bluetooth module, which connects the controller and mobile phone through the app we developed (now only available on Android). To modify the parameters, to choose the working pattern and to operate start or

stop on the app is now all possible. The control distance reaches 10 meters and it has strong anti-interference ability. Whether on the settings of parameters or the start and stop of the motion, the flexibility is being impressively increased.

用户须知 Customer Guidance

使用环境 Using environment	使用场合 Occasion	避免粉尘及腐蚀性气体 (Trying to avoid dust and corrosive gas)
	工作温度 Working Temperature	-20°C~60°C
	湿度 Humidity	< 75%RH 无凝溶 (No condensate)
	保存温度 Preservation Temperature	-20°C~70°C
	抗扰度 Immunity	静电放电抗扰度 (ESD): 空气±15KV 接触±4KV (air±15KV contact±4KV) (GB/T 17626.2-2018/IEC 61000-4-2: 2008 所有接口 all the interfaces) 浪涌 (冲击) 抗扰度 (surge): Line-line ±2KV (GB/T 17626.5-2019/IEC 61000-4-5: 2014 电源接口 power interface)
注意事项 Notes	1.修改参数时, 应注意避免控制卡断电, 一旦发生断电, 所设置的导程、细分、速度等参数会丢失并在下次开机后恢复默认, 且可能导致控制卡芯片损坏。 2.在控制电机运行过程中无法完成控制卡参数修改, 需待电机停止运动后方可。 3.在自动模式运行中无法使用点动功能, 需待电机停止运动后切换到对应的自动控制模式下方即可。 1. While modifying the parameters, try to avoid the power failure of the control card. Once power is cut off, all the settings of lead, subdivisions and velocity will be lost and will return to default after rebooting, which also might cause damage to the chip. 2. It is not feasible to modify the parameters of the control card, when the motor is under working conditions, unless it stops. 3. With automatic mode on, the inching function will be shut down. To activate it, the motor requires to be stopped working and the mode needs to be switched into automatic control mode.	