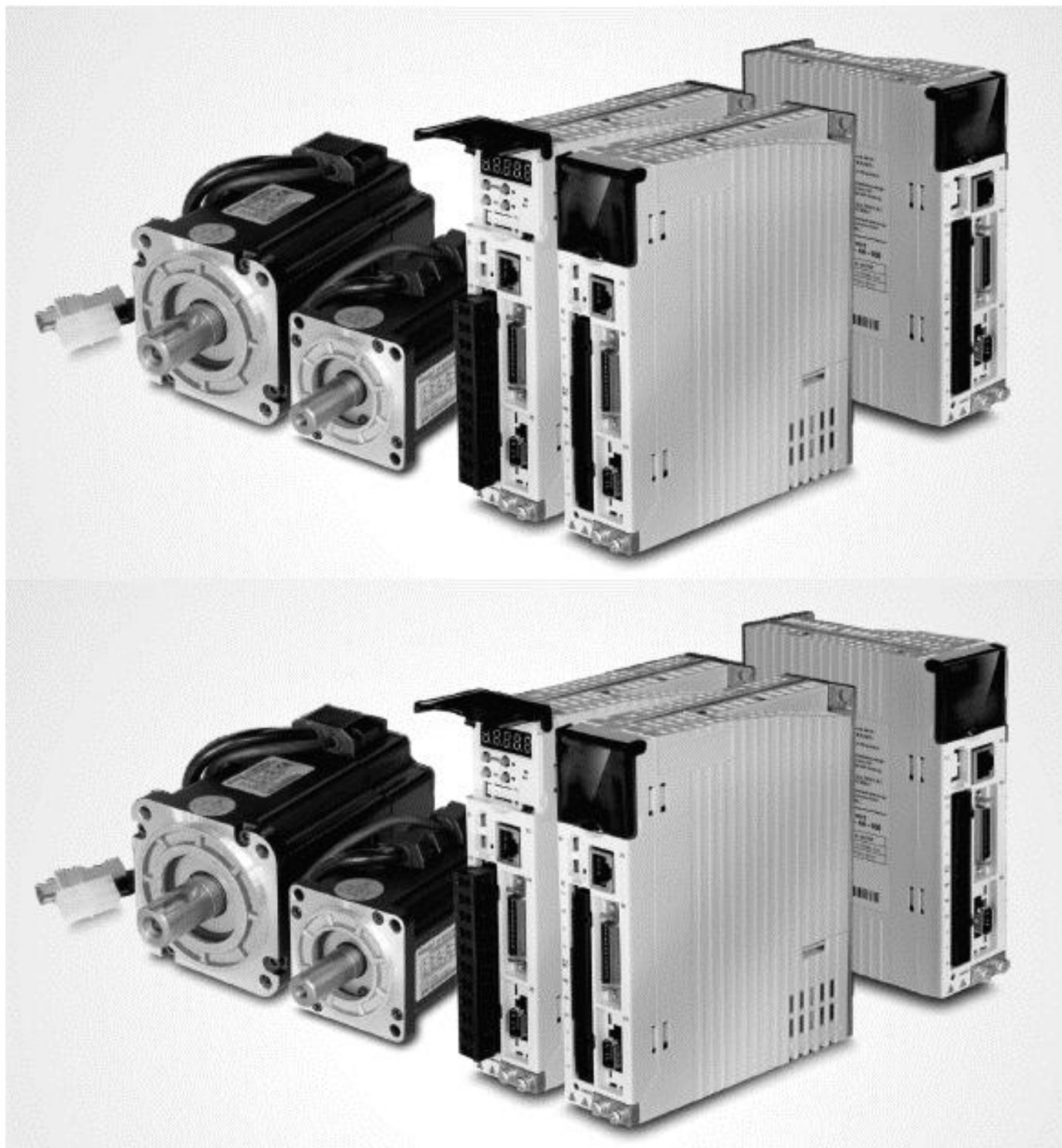


Kinco FD3&CD3 伺服驱动器

使用指南 V2.0



感谢您使用 Kinco 伺服驱动器产品!

Kinco 系列不同型号驱动器的配件各不相同，建议您对产品进行确认。

确认事项	说明
与您所订购的机型是否相符？	请根据驱动器铭牌信息进行确认驱动器型号是否与您所订购的型号一致。
产品配件是否齐全？	请确认驱动器各种端子是否齐全。
产品外观是否有损坏？	请确认产品是否在运输过程中有损坏。

如以上任一项有问题，请与本公司或您的供应商联系。

深圳市步科电气有限公司

www.kinco.cn

1 驱动器安装要求和注意事项

1.1 安装要求

- 请安装于无雨淋和直射阳光的室内控制箱之内，且周围物品注意需为非易燃品
- 本产品符合 EMC 标准 2014/30/EU 和低压标准 2014/35/EU (LVD)
- 无削液、油雾、铁粉、切屑的场所
- 通风良好，干燥无尘的场所
- 无振动的场所

1.2 安装环境

环境	条件
工作温度	0°C-40°C
工作湿度	5-95% (无凝露)
储藏温度	-10°C-70°C (不结冰)
储藏湿度	5-95% (无凝露)
高度	海拔 1000m 以下

1.3 注意事项

- 请勿使用汽油、稀释剂、酒精、酸性或碱性洗涤剂擦拭外壳，以免外壳变色或破损；
- 请确保产品在运输和存储过程中的环境安全，使用原厂包装进行存储和运输；
- 请在熟悉产品相关知识和遵守安全注意事项的前提下对驱动器进行操作；
- 请严格按照图 1-1 所示的安装方式正确安装伺服驱动器；
- 驱动器与电机动力电缆、抱闸线缆以及编码器电缆不能过度拉伸；
- 避免任何异物进入驱动器内，螺丝、金属屑等导电异物或可燃性异物进入驱动器内可能引起火灾和电击，安全起见，请不要使用有损伤或零件损伤的伺服驱动器。

警告！

- **注意电击危险：**
 电缆一定要可靠安装到插头 (X2) 上；
 连接电缆时，务必断开电源；
 接触带电部件会造成严重伤害，并可能导致死亡；
- **本产品使用时一定要安装在电箱内，并且所有保护措施都已启动。**
- **在维护时、维修和清洁工作以及长时间服务中断时，在接触带电部件之前要注意：**
 通过电源开关关闭电气设备的电源，并防止其再次打开；
 电源关闭后，查看设备前面的充电指示灯。如果指示灯熄灭，则可以触碰驱动器。

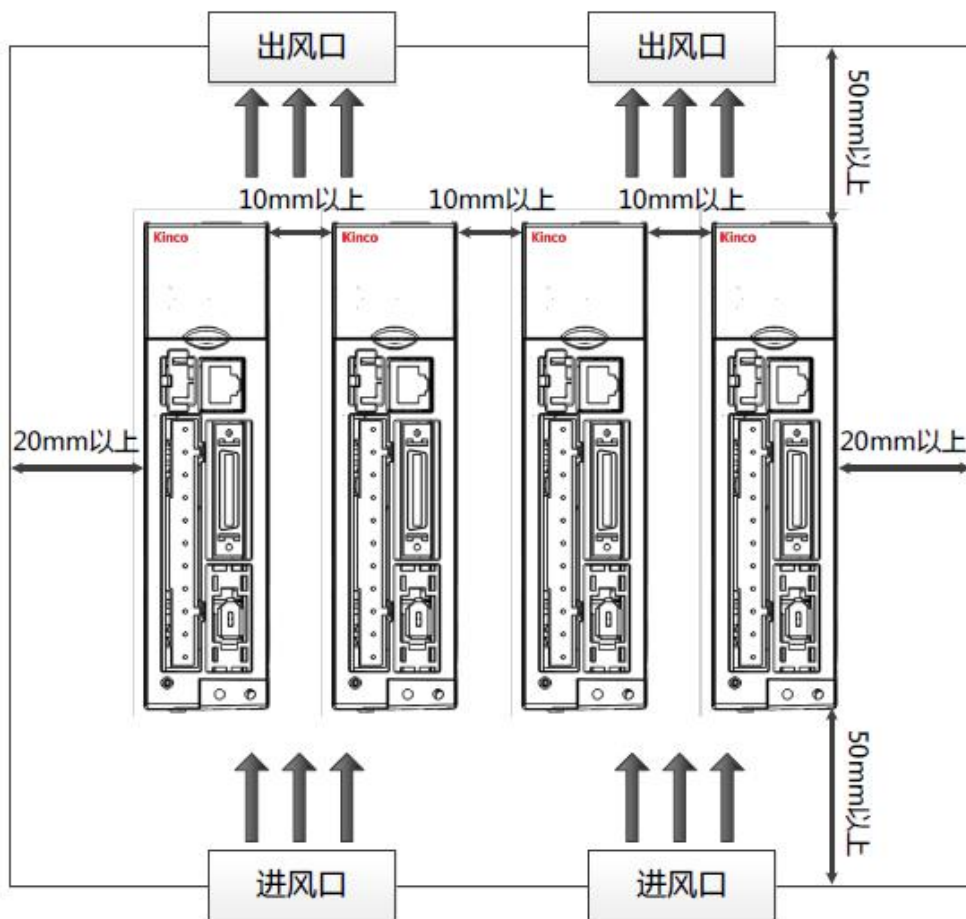


图 1-1 安装方向和距离要求

2 驱动器系统接口及接线

2.1 驱动器外观结构组成说明

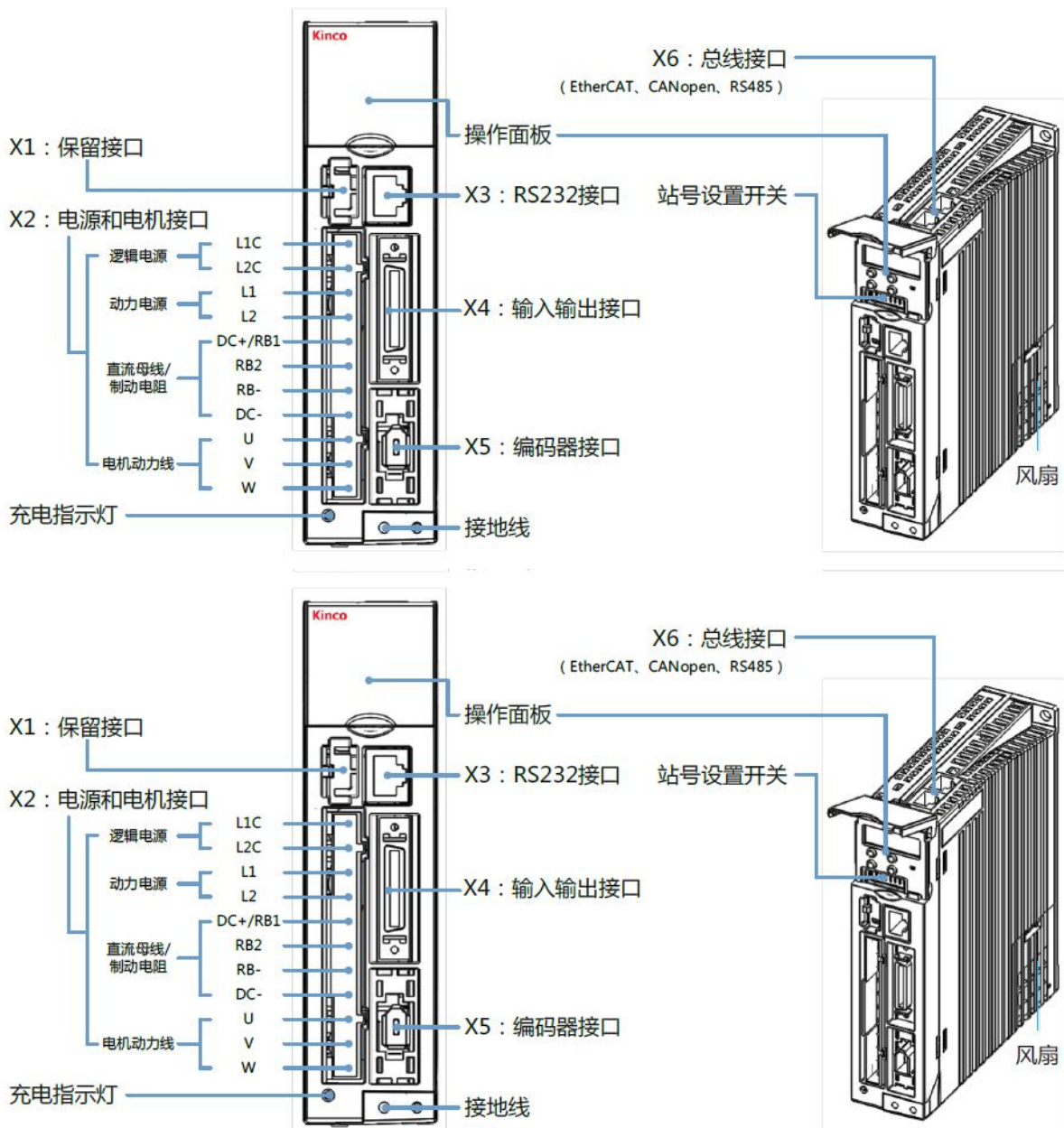


图 2-1413/423 驱动器外观图

注: CD3 驱动器无总线接口。

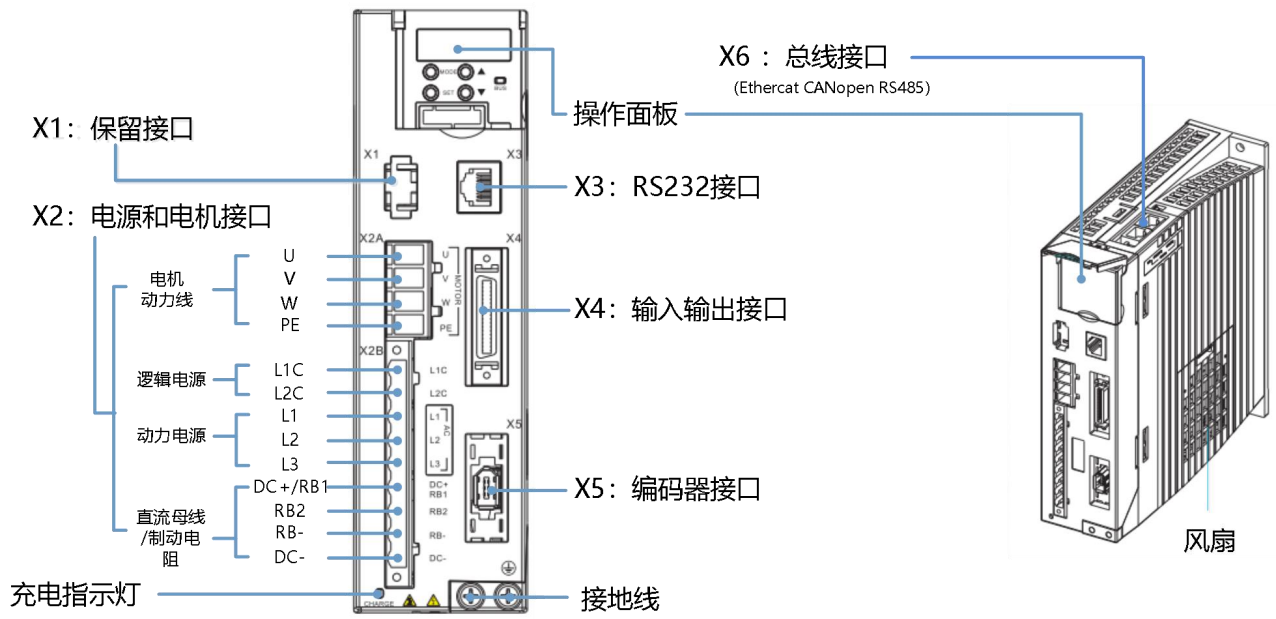


图 2-2 433/623 驱动器外观图

注: CD413/CD423/CD433/CD623 驱动器无总线接口。

2.2 驱动器接线说明

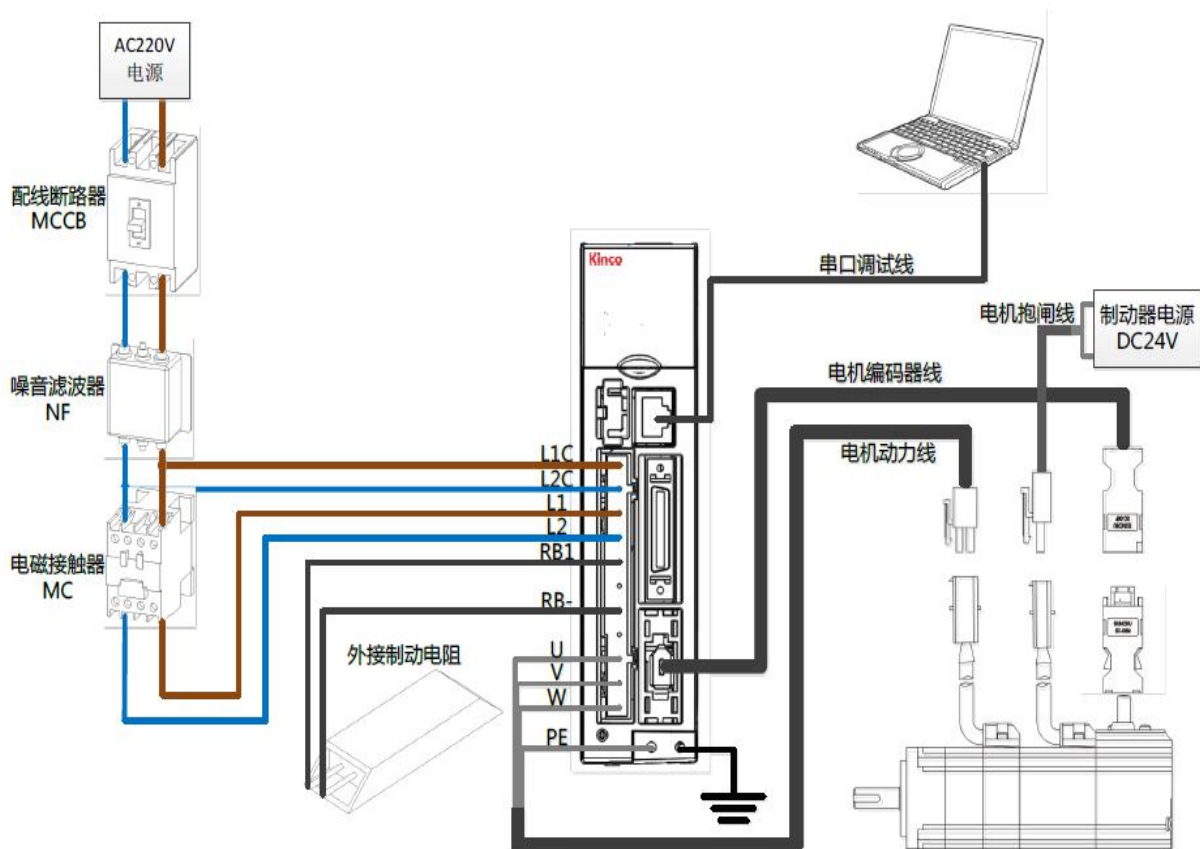
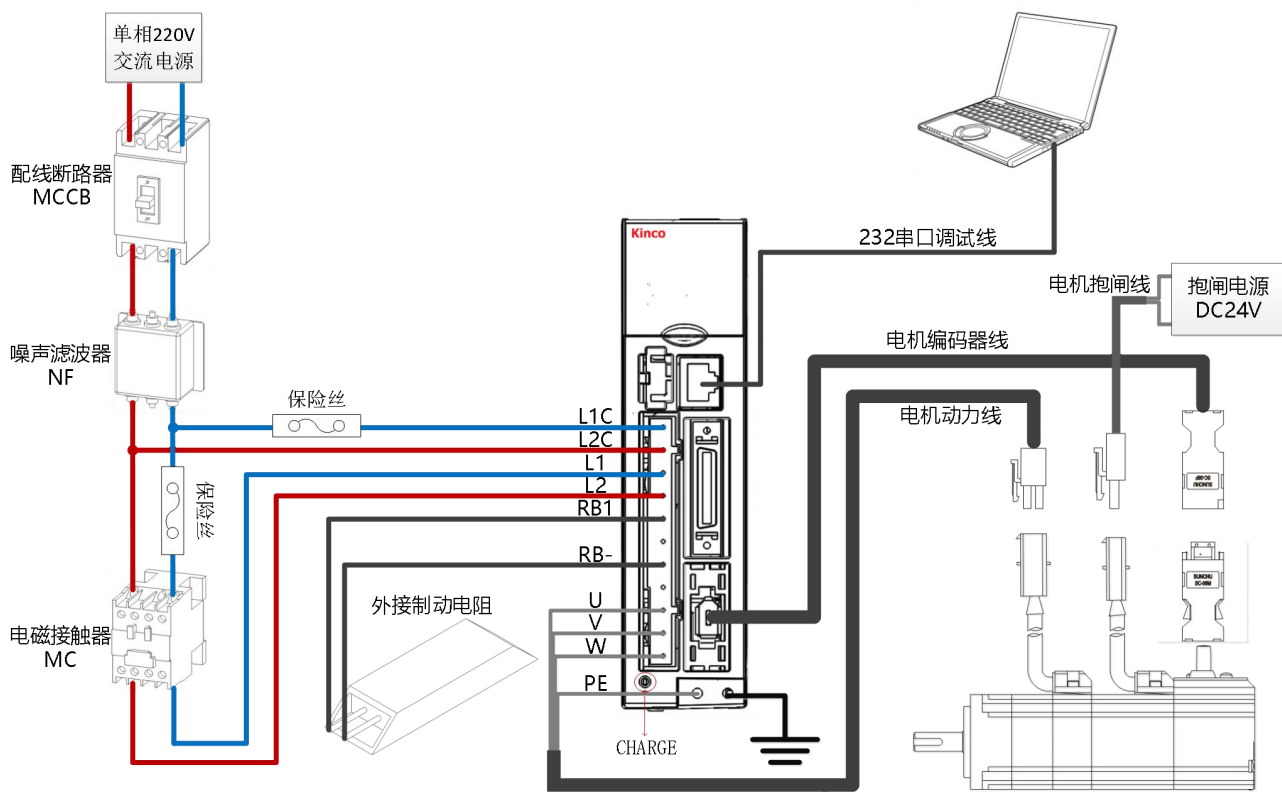


图 2-32-单相 220V 驱动器电源外部接线图

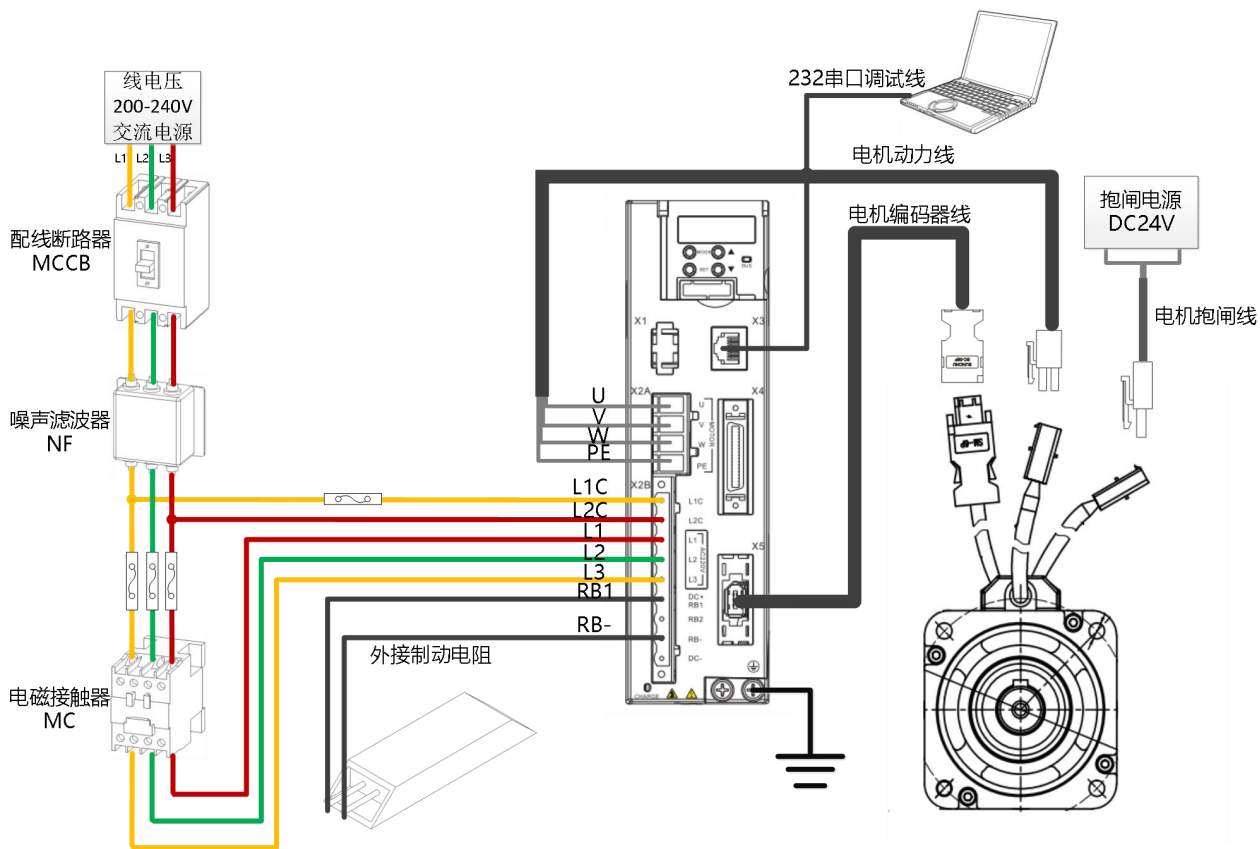


图 2-4 三相 220V 电源外部接线图

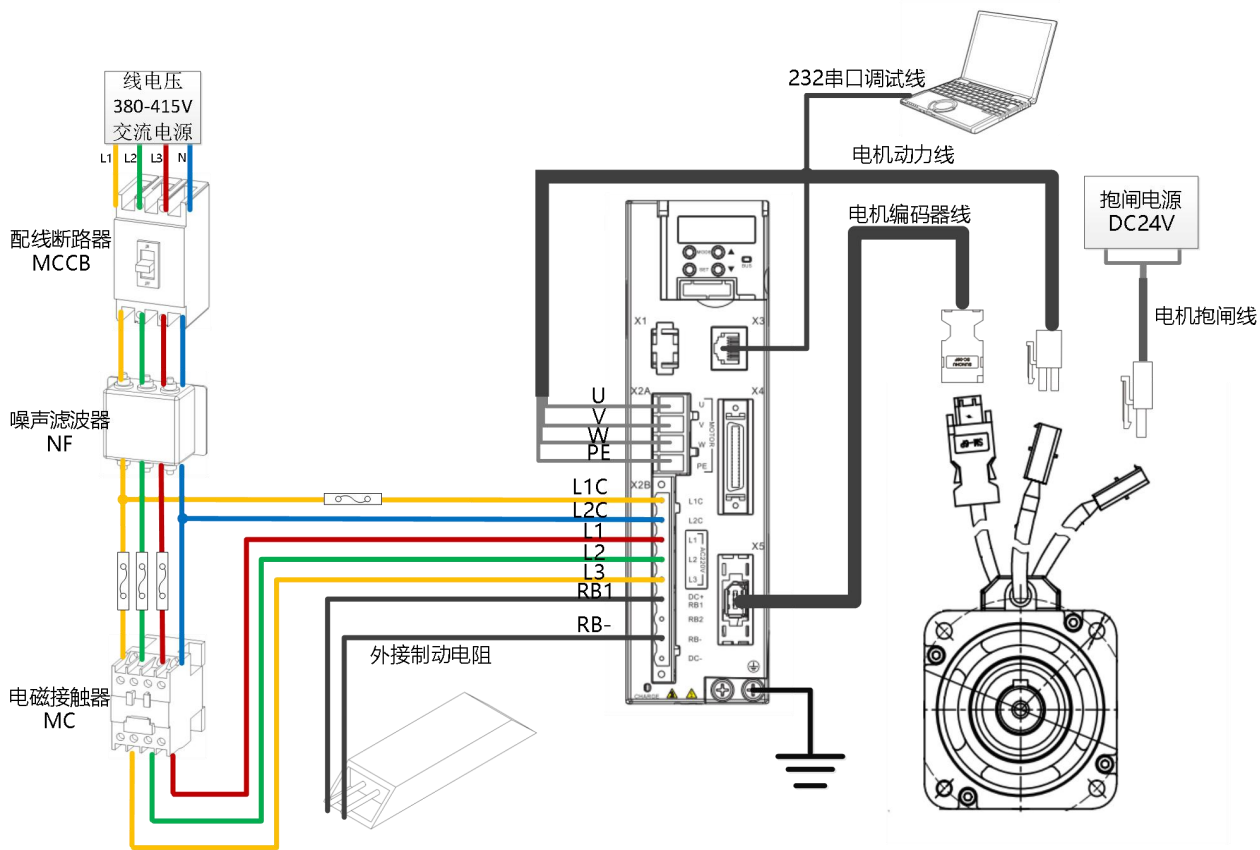


图 2-5 三相 380V 电源外部接线图

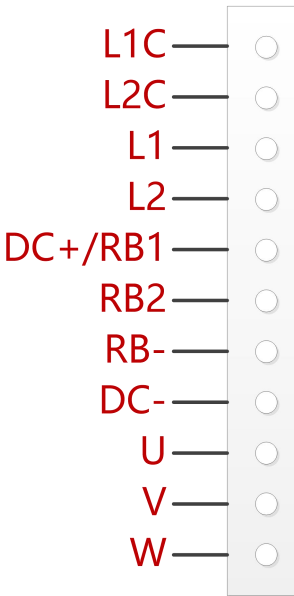
警告!

- 在安装和维护驱动器之前，必须切断所有电源。
- 不要加热连接器。
- 驱动器断电至少十分钟之后才能接触驱动器连接器，测量驱动器直流母线电压，直到电压低于 36V 才可接触。
- 在带电时不要打开驱动器，在操作时要保证所有防护罩和电气柜门已经关闭。
- 一定不要移除安全设施，不要接触带电部分和器件。
- 在驱动器上电之前请务必正确连接 PE 线。

2.3 端口定义说明

2.3.1 电源和电机接口 (X2) 说明

表 2-1 X2 端口定义 (适用于 413/423 驱动器)

		引脚名称	引脚功能
		L1C	控制电源输入 L/N:
L2C	单相线电压 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 0.5A 电源接地: TN - S, TN - C, TN - C - S, TT (不可角接地)		
L1	驱动电源输入 L/N:		
L2	单相线电压 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 750W423@76.0A 413200W@32.0A 电源接地: TN - S, TN - C, TN - C - S, TT (不可角接地)		
DC+	DC+	直流母线输入正端	→ 注意 如使用驱动器内置制动电阻(功率:10W 阻值 100Ω)，则需短接 DC+/RB1 与 RB2。 ⚠ 警告 当平均制动功率大于
/RB1	RB1	外接制动电阻输入端	
RB2		内置制动电阻输入端	
RB-		外接制动电阻输入端	
DC-		直流母线输入负端	

		10W 时 (驱动器报警 0100)，禁止使用内部制动电阻。
	U/V/W	伺服电机 U/V/W 相输出

表 2-1 X2 端口定义 (适用于 433/623 驱动器)

		引脚名称	引脚功能	
		L1C	控制电源输入:	
		L2C	单相线电压 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 0.5A 电源接地: TN - S, TN - C, TN - C - S, TT (不可角接地)	
		L1	433 驱动电源输入: 单相线电压 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 14.0A	
		L2	三相线电压 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 14.0A 623 驱动电源输入: 三相线电压 380 ~ 415VAC +/-10% 50 ~ 60Hz +/-3Hz 623@12.0A 电源接地: TN - S, TN - C, TN - C - S, TT (不可角接地)	
		L3	三相线电压 380 ~ 415VAC +/-10% 50 ~ 60Hz +/-3Hz 12.0A 电源接地: TN - S, TN - C, TN - C - S, TT (不可角接地)	
		DC+ /RB1	DC+ 直流母线输入正端	→ 注意 如使用驱动器内置制动电阻, 则需短接 DC+/RB1 与 RB2。(433 内置 20W, 100Ω 制动电阻; 623 内置 20W, 300Ω 制动电阻) ⚠ 警告 当平均制动功率大于 20W 时 (驱动器报警 0100)，禁止使用内部制动电阻。
		RB1	外接制动电阻输入端	
		RB2	内置制动电阻输入端	
		RB-	外接制动电阻输入端	
		DC-	DC- 直流母线输入负端	
U/V/W		伺服电机 U/V/W 相输出		

2.3.2 RS232 串口 (X3) 说明

表 2-2 X3 端口定义

引脚序号	引脚定义	功能
3	TX	驱动器发送数据
4	GND	信号地
6	RX	驱动器接收数据
其他	NC	保留



2.3.3 外部输入输出连接端口 (X4) 说明

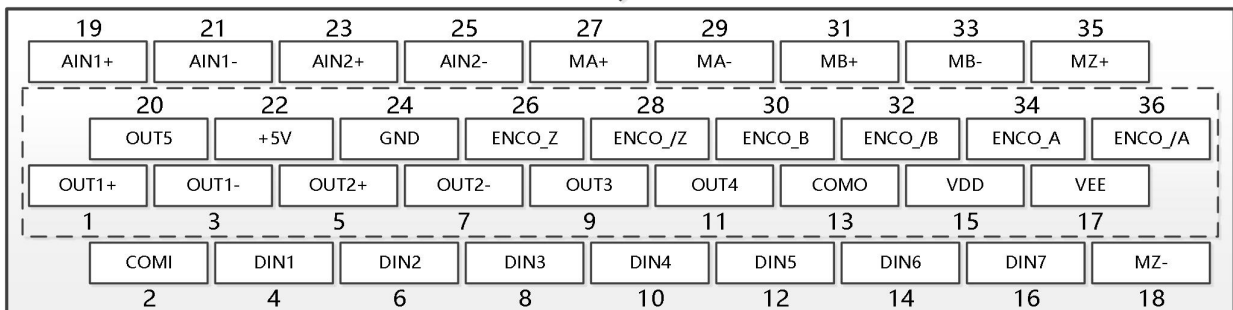


图 2-63 X4 端口定义图

表 2-3 X4 端口引脚定义

引脚名称	引脚功能
DIN1~DIN7	数字信号输入端 高电平: 12.5VDC~30VDC 低电平: 0VDC~5VDC 输入频率: <1KHz
COMI	数字信号输入公共端
OUT1+/OUT1-	数字信号输出端
OUT2+/OUT2-	最大输出电流: 100mA
OUT3/OUT4/OUT5	数字信号输出端

	最大输出电流: 20mA
COMO	OUT3, 4, 5 信号输出公共端
MA+/MA-	脉冲指令输入端
MB+/MB-	输入电压: 3.3V ~ 24V
MZ+/MZ-	最大频率: 500KHz
ENCO_A+/ENCO_A-	编码器输出端
ENCO_B+/ENCO_B-	电压: 高电平=3.4V, 低电平=0.2V
ENCO_Z+/ENCO_Z-	最大电流: +/-20mA 最大频率: 10MHz
AIN1+/AIN1- AIN2+/AIN2-	模拟量输入端 分辨率: 12 位 输入电阻: 350 KΩ 模拟量带宽: 1KHz 输入电压范围: -10V ~ +10V
+5V/GND	5V 电源输出端; 最大电流: 100mA
VDD/VEE	24V 电源输出端 电压范围: 24VDC+/-20% 最大电流: 300mA

图 2-4 显示了带有默认 IO 功能的 X4 接线, 更多的 IO 功能可以通过数字面板或上位机调试软件定义。

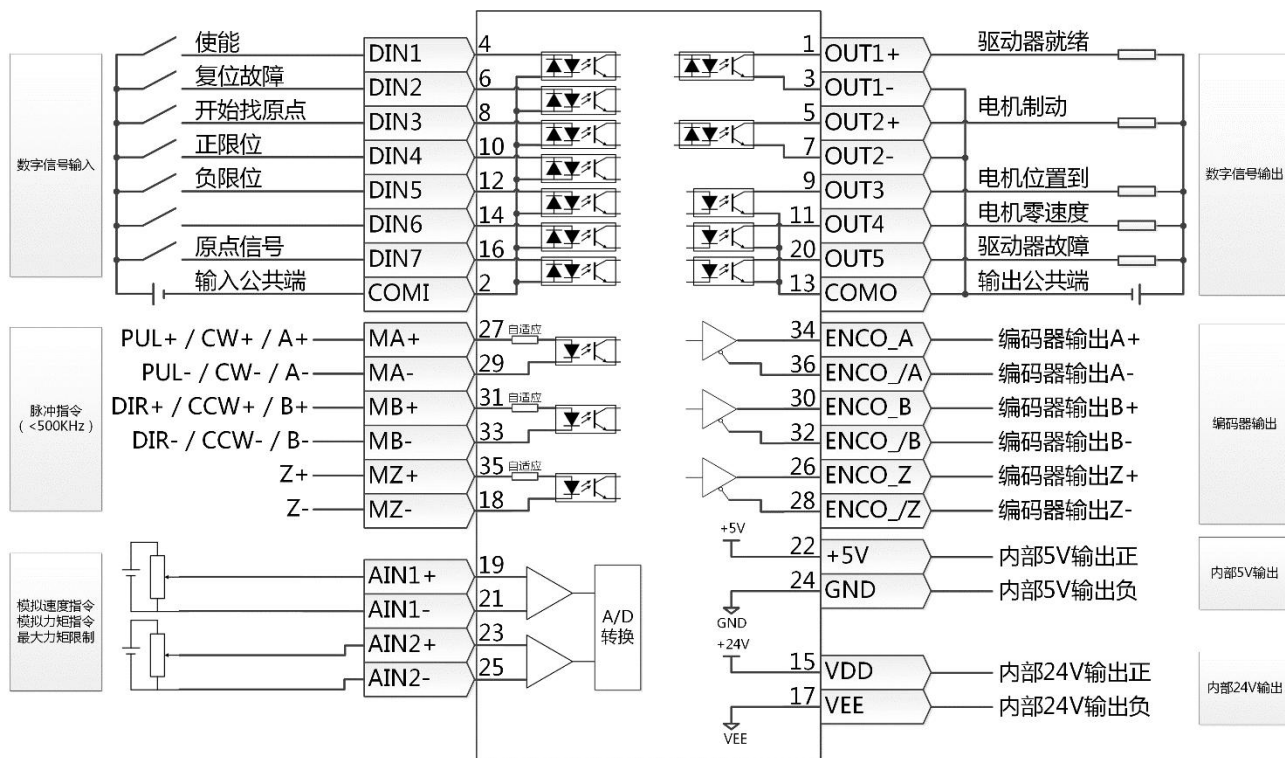


图 2-74 IO 口默认定义

2.3.4 总线通讯接口 (X6) 说明

总线类型	EtherCAT	CANopen	RS485
适用产品	FD413-EA-000 FD423-EA-000 FD433-EA-000 FD613-EA-000 FD623-EA-000	FD413-CA-000 FD423-CA-000 FD433-CA-000 FD613-CA-000 FD623-CA-000	FD413-LA-000 FD423-LA-000 FD433-LA-000 FD613-LA-000 FD623-LA-000
引脚定义			

3 驱动器简易操作流程

3.1 Easy use 功能

Easy Use 功能可以针对典型的应用场景帮助用户快速设定控制环参数，用户可以根据面板菜单按照步骤进行最少的参数设置，免去伺服调试的繁琐步骤，调整后的性能可以满足大部分应用场合；并另外开辟独立区域，方便用户设置常用的重要参数。

3.2 Easy use 操作步骤

1. EASY 流程包含常用参数，请对这些参数逐一进行确认，并且将修改的参数进行保存，然后重启驱动器。EASY 流程执行完后，请运行机器，如果性能理想，则不需要执行 tunE 流程。否则，再执行 tunE 流程
2. tunE 流程为惯量测定流程。通过 tn03 进行惯量测定后，驱动器将根据整定结果更改刚性等级 (tn01)。
3. 请运行机器，如果性能不理想，再通过 tn01 逐级修改刚性等级，请注意一边调整，一边观察机器性能。

注意：

1. 惯量测定有可能导致机器振动，请立刻关闭电源或驱动器。
2. 开启惯量测定会令电机轴在很小的距离内做往复运动，请留出一定机械空间。
3. 执行完 EASY 流程后，强烈建议执行 tunE 流程进行惯量测定，并调整刚性等级。
4. EASY 和 tunE 菜单的设计初衷是使用按键操作解决问题。如果用户使用上位机软件初始化参数或更改电机型号，出于安全考虑，EASY 和 tunE 菜单将只显示 EA00, EA01, tn00 这三个对象。用户必须通过 EA01 重新确认电机型号后，驱动器才会恢复默认值并完整显示 EASY 和 tunE 菜单。

导致自整定失败的原因：

1. 接线错误；
2. 电机型号设置错误；

3. 机械刚性极低;
4. 存在机械间歇;
5. 加减速小于粘性摩擦转矩。

表 3-1 EASY 和 tunE 参数说明

数码管编码	名称	描述	默认值
EA01	电机型号	对于新出厂的驱动器, 电机型号为 00, 数字面板显示为 3030。如果驱动器连接了正确的电机, 电机型号会被驱动器自动识别并保存。驱动器数字面板不会闪烁 FFFF。 对于已经使用过的驱动器, 驱动器会判断连接的电机是否与之前一样, 如不一样, 则数字面板闪烁显示 FFFF。用户需要手动在 EA01 中确认电机型号。	404b
EA02	指令类型	通过修改右边第一位数码管改变指令类型, 请注意, 改变指令类型的同时会更改工作模式和 IO 口的定义。 0: 双脉冲模式 CW/CCW 1: 脉冲方向模式 P/D 2: A/B 相控制模式 6: 通道 1 模拟速度模式 7: 通道 2 模拟速度模式 8: 上位机通讯控制模式 9: 位置表控制模式 指令类型 0-2, 对应工作模式-4; 指令类型 6-7, 对应工作模式为-3; 指令类型 8, 工作模式由通讯控制, 并且需要取消 DIN1, DIN2, DIN3 功能; 指令类型 9, 对应工作模式 1。	1
EA03	电子齿轮分子	当 EA02 写入 0-2 时有效。	1000
EA04	电子齿轮分母	默认十进制显示,超过 10000 的数值以十六进制显示。 注意: 关于十进制和十六进制的显示方法详见使用手册。	1000
EA05	模拟速度因数	当 EA02 写入 6-7 时有效。 模拟输入电压和电机转速的关系, 单位是 rpm/V。 在高分辨率情况下模拟速度因素设置太高有可能无效, 参数需满足以下条件: $-32768 \leq N * ENC / 750 < 32767$ 。 N: 要设置的数值 ENC: 编码器分辨率(OD 0x641003)	300
EA06	报警输出极性 限位开关 应用场合 负载类型	数码管从右到左分别代表: (1) 负载类型, 影响控制环参数: 0: 没有选择; 1: 皮带; 2: 滚珠丝杠。 (2) 应用场合, 影响控制环参数: 0: 点到点模式; 1: CNC 模式; 2: 主从跟随模式。 (3) 限位开关: 0: 默认限位开关设置 (DIN5 和 DIN6); 1: 屏蔽所有限位开关。	1001

数码管编码	名称	描述	默认值
		(4) OUT2 的报警输出极性: 0: 输出常闭; 1: 输出常开。	
EA07	原点模式	详见驱动器使用手册	
EA00	保存参数	写入“1”保存所有参数; 写入“2”保存所有参数并重启驱动器 (更改电机型号后必须重启驱动器); 写入“3”只重启驱动器; 写入“10”初始化参数。 保存参数后, 驱动器根据负载类型与应用场合设置控制环参数。	-
tn01	刚性等级	0-31 级, 决定驱动器速度环带宽与位置环带宽。数值越大, 刚性越高。 如果此参数突然设得很大, 系统增益会发生显著变化, 导致机器有较大冲击。 注: 出于安全考虑, 在编辑状态修改刚性时, 不需要按 SET 确认, 数据也会立即生效, 但只能逐级调整。	皮带: 10 丝杆: 13
tn02	惯量比	负载惯量与电机惯量的比值*0.1, 例如数码管上显示 0050 代表惯量比为 5。驱动器通过惯量比自动计算 K_{Load} , 进而影响速度比例增益, 公式: $K_{vp}=VC_LOOP_BW*K_{Load}/4096$, 其中 VC_LOOP_BW 为速度环带宽 注: 出于安全考虑, 在编辑状态修改惯量比时, 不需要按 SET 确认, 数据也会立即生效, 但只能逐级调整。	皮带: 50 丝杠: 30
tn03	惯量测量	写入“1”使能电机并进行惯量比测量, 此时电机会轻微抖动, 测量成功后将根据惯量比写入刚性等级 4-13, 且 tn03 显示 1。 测定过程包含以下动作: 屏蔽所有外部信号的控制; 工作模式切换为 11; 使能驱动器; 对象 0x2FF00C 设为 11; 电机轴抖动并获取结果; 还原所有外部信号的控制。 若测量失败, tn03 将置-1, -2, -3 或-4, 刚性为 10, 惯量比为 30 (*0.1)	-
tn04	整定距离	整定时轴移动距离*0.01, 例如数码管上显示 0022 代表 0.22 圈, 最大值为 0.4 圈	22
tn00	保存参数	写入“1”保存所有参数; 写入“2”保存所有参数并重启驱动器 (更改电机型号后必须重启驱动器); 写入“3”只重启驱动器; 写入“10”初始化参数。	-

表 3-2 刚性等级表

刚性等级	位置环比例增益 0 [0.01Hz]	速度环比例增益 0 [0.1Hz]	速度反馈滤波截止频率[Hz]	刚性等级	位置环比例增益 0 [0.01Hz]	速度环比例增益 0 [0.1Hz]	速度反馈滤波截止频率[Hz]
0	70	25	18	16	1945	700	464
1	98	35	24	17	2223	800	568
2	139	50	35	18	2500	900	568
3	195	70	49	19	2778	1000	733
4	264	95	66	20	3334	1200	733
5	334	120	83	21	3889	1400	1032
6	389	140	100	22	4723	1700	1032
7	473	170	118	23	5556	2000	1765
8	556	200	146	24	6389	2300	1765
9	639	230	164	25	7500	2700	1765
10	750	270	189	26	8612	3100	1765
11	889	320	222	27	9445	3400	∞
12	1056	380	268	28	10278	3700	∞
13	1250	450	340	29	11112	4000	∞
14	1500	540	360	30	12500	4500	∞
15	1667	600	392	31	13889	5000	∞

3.3 面板操作说明

3.3.1 面板按键说明

数字/点/按键	功能
点①	无
点②	无
点③	在设置参数时，用于区分当前所在对象组和该对象组内地址数据；在实时显示内部 32 位数据时，用于显示当前 32 位数据的高 16 位；在显示错误历史记录时 (F007)，用于显示最早的错误。
点④	在实时显示及调节参数时，用于指示数据显示格式，亮代表十六进制，灭代表十进制；在显示错误历史记录的时候 (F007)，用于指示最新的错误。
点⑤	修改参数时点亮后熄灭表示数据修改确认成功；长亮代表当前显示数据为内部数据；闪烁代表驱动器功率部分处于工作状态。
MODE	用于切换功能菜单； 在修改参数时，短按切换位，长按返回到上一级菜单。
▲	短按缓慢增加设定值，长按快速增加设定值；切换数据项。

▼	短按缓慢减小设定值，长按快速减小设定值；切换数据项。
SET	用于进入菜单；用于查看参数设定值；用于参数设定完成后确认输入参数；在实时显示内部 32 位数据时，长按用于切换高低 16 位。
整体闪烁	驱动器错误，处于报警状态。

3.3.2 面板参数设定流程

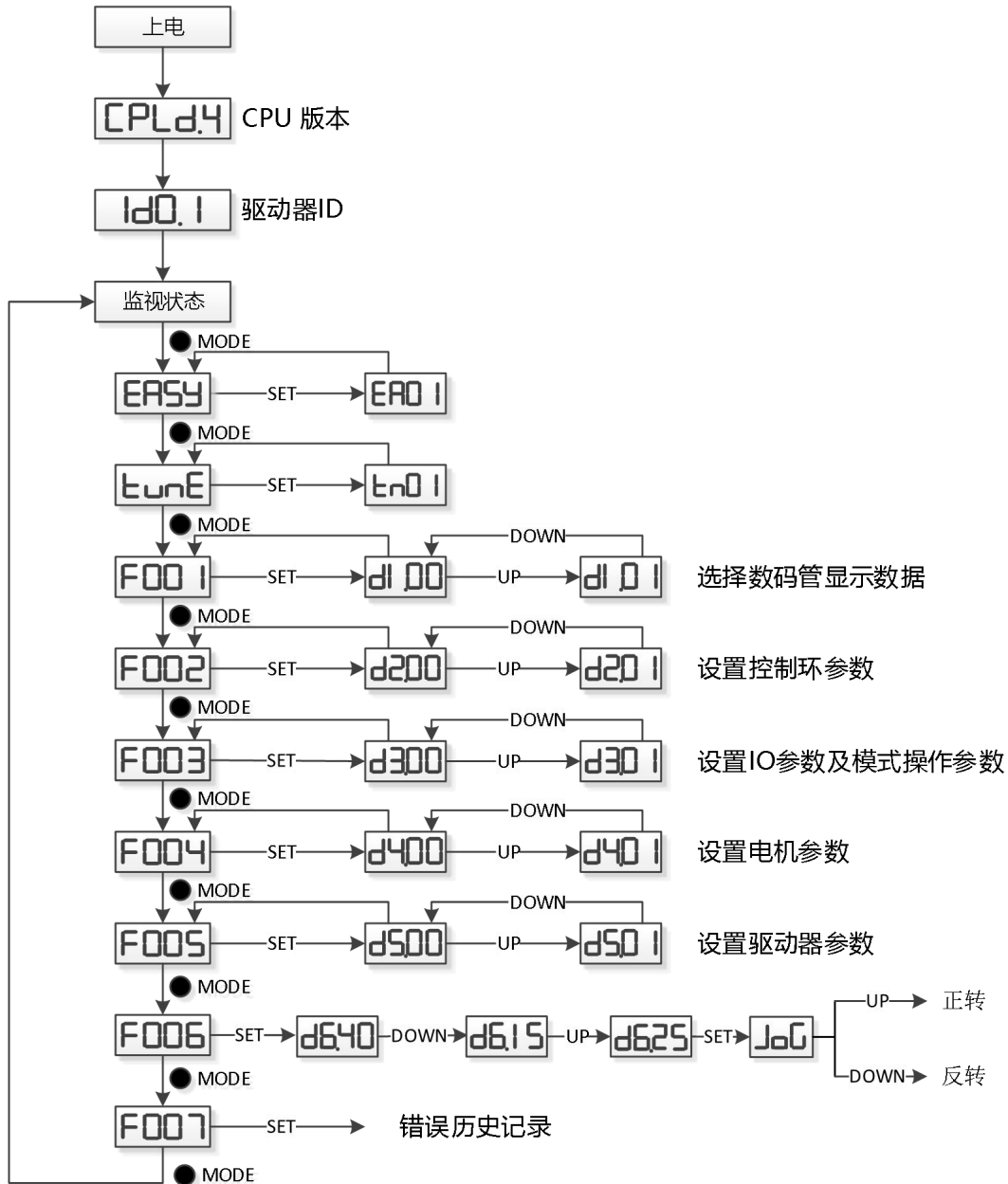


图 3-1 面板参数设定

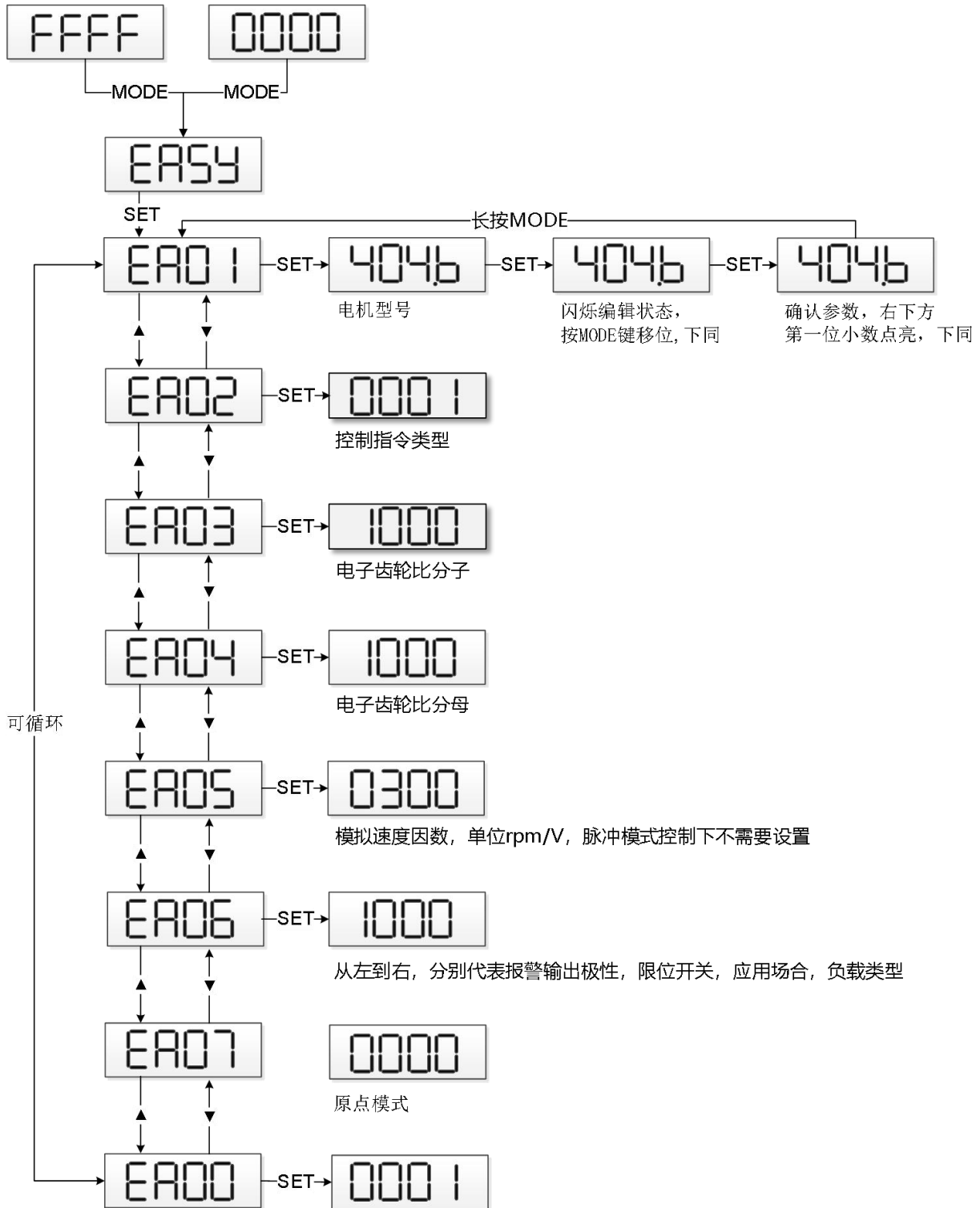


注意

- 通过 F006 可进入点动模式测试电机的基本运行状况，点动模式不受其他工作模式或速

度设定影响, 运行时驱动器处于速度模式, 并按照 30rpm 的转速运行。

3.4 EASY 操作流程说明



写入 "1" 保存所有参数。
 写入 "2" 保存所有参数并重启驱动器 (更改电机型号后必须重启驱动器)。
 写入 "3" 只重启驱动器。
 写入 "10" 初始化参数。

图 3-2 EASY 操作流程图

注意

如果 30s 没有操作，菜单将会自动退出，用户必须重新开始设置。输入的数据会立即生效，但是通过 EA00 才能保存。

3.5 tunE 操作流程说明

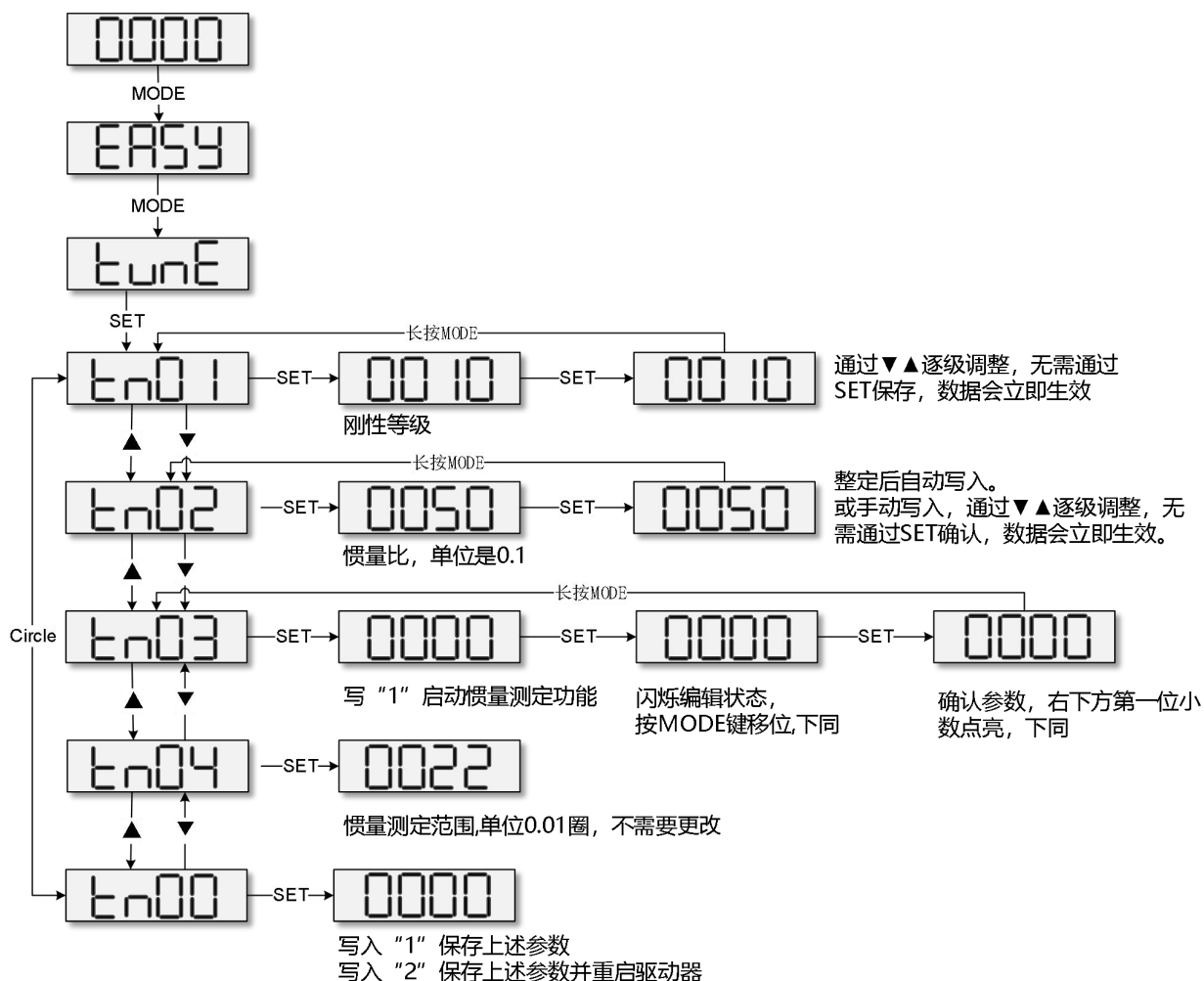


图 3-3 tunE 操作流程图

附注:

- 1、更多有关产品的使用介绍请登录步科官网下载产品使用手册
 下载链接：<http://www.kinco.cn/download/use/servo>
- 2、驱动器上位机软件请登录步科官网进行下载安装
 下载链接：<http://www.kinco.cn/download/software/servo>
- 3、连接上位机软件的 RJ45 接口的 RS232 通讯线如下图所示



Kinco FD3&CD3 Servo Driver User Guidance V2.0



Thank you for using Kinco servo driver!

Different type of Kinco drivers own different components, so we recommend you confirm the product's information.

Confirm matters	Description
Is it compatible with the model you ordered?	Please check the driver's nameplate information to see if the driver's model number matches the one you ordered.
Whether the product's components are complete?	Please check all the terminals of the driver are complete.
Is the appearance of the product	Please confirm whether the product is damaged during

damaged?	transportation.
----------	-----------------

Any one of the above problems exists, please contact our company or your supplier.

Kinco Electric(ShenZhen)Ltd
<https://en.kinco.cn/>

1 Driver installation requirements and precautions

1.1 Installation requirements

- Please install in the indoor control box without rain and direct sunlight, and the surrounding items should be non-flammable
- This product complies with EMC standards 2014/30 / EU and low voltage standards 2014/35 / EU (LVD)
- The installation place should be no cutting fluid, oil mist, iron powder and chip
- The installation place should be ventilated, dry and dust free.
- No vibration of the installation place

1.2 Installation environment

Environment	Condition
Operating temperature	0°C-40°C
Operating humidity	5-95% (No condensation)
Storage temperature	-10°C-70°C (Not frozen)
Storage humidity	5-95% (No condensation)
Altitude	Rated power at 1000 m or below

1.3 Precautions

- Don't use gasoline, thinner, alcohol, acid or alkaline detergent to wipe the shell to avoid discoloration or damage for the shell;
- Please ensure that the environment is safe during transportation and storage. Please use the original packaging for storage and transportation;
- Please be familiar with the product knowledge and safety precautions before operating the driver;
- Please strictly install the servo driver according to the installation method shown in Figure 1-1.
- Driver and motor's power cables, brake cables and encoder cables cannot be over-stretched;
- Avoid any foreign objects entering the driver, conductive foreign objects such as screws and metal chips, or flammable foreign objects entering the driver may cause fire and electric shock. For safety reasons, please do not use the servo driver with damage or parts damaged.

Warning!

- **Beware of electric shock.**

Cable must be securely mounted to plug (X2);

Be sure to disconnect the power when connecting the cables;

Contact with live parts can cause serious damage and may lead to death;

- **This product must be installed in the electric box to use, and all the protective measures have been started.**
- **When servicing, cleaning and prolonged service interruptions, be careful before touching live parts:**

Turn off the power of the electrical equipment by the power switch and prevent it from turning on again;
 After the power is off, check the charge lamp on the front of the unit. If the light is off, you can touch the driver.

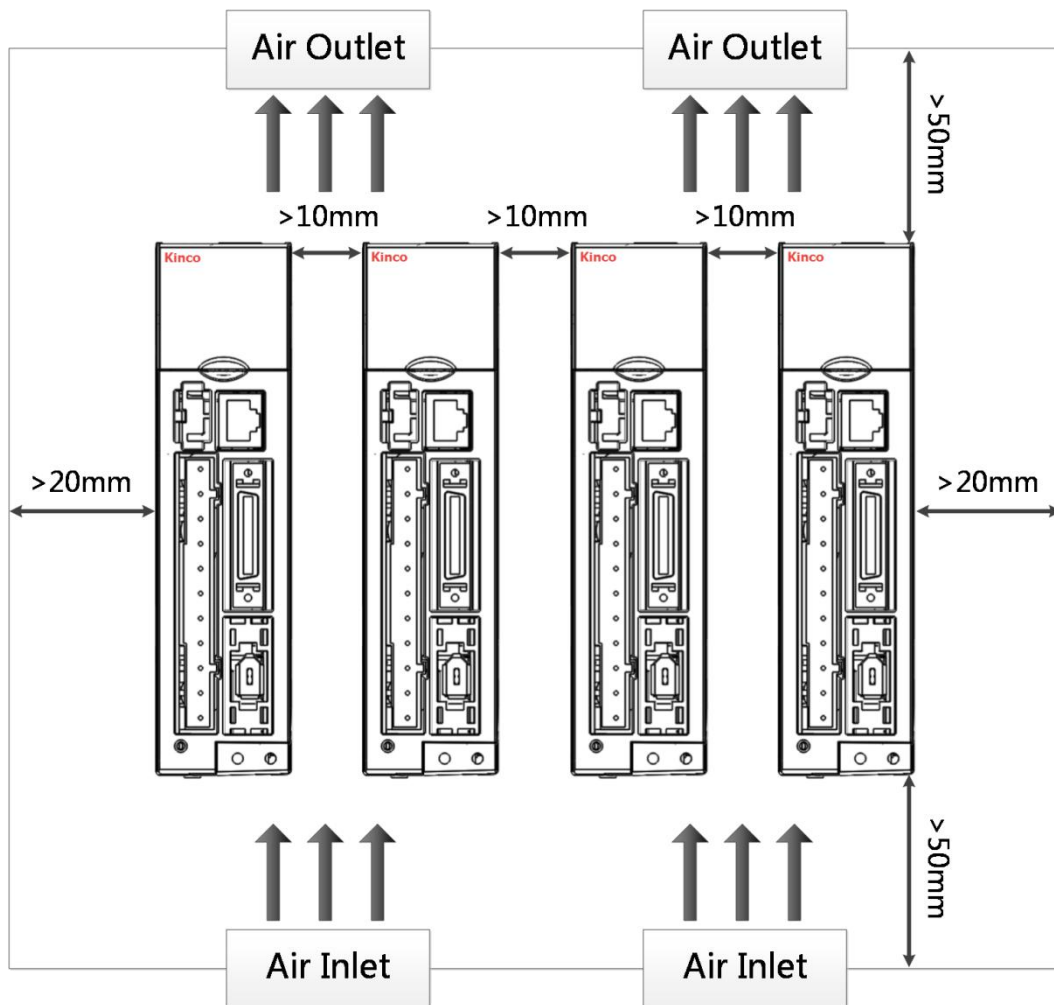


Figure 1-1 Installation Direction and Distance Requirements

2 Driver system interface and wiring

2.1 Appearance instructions

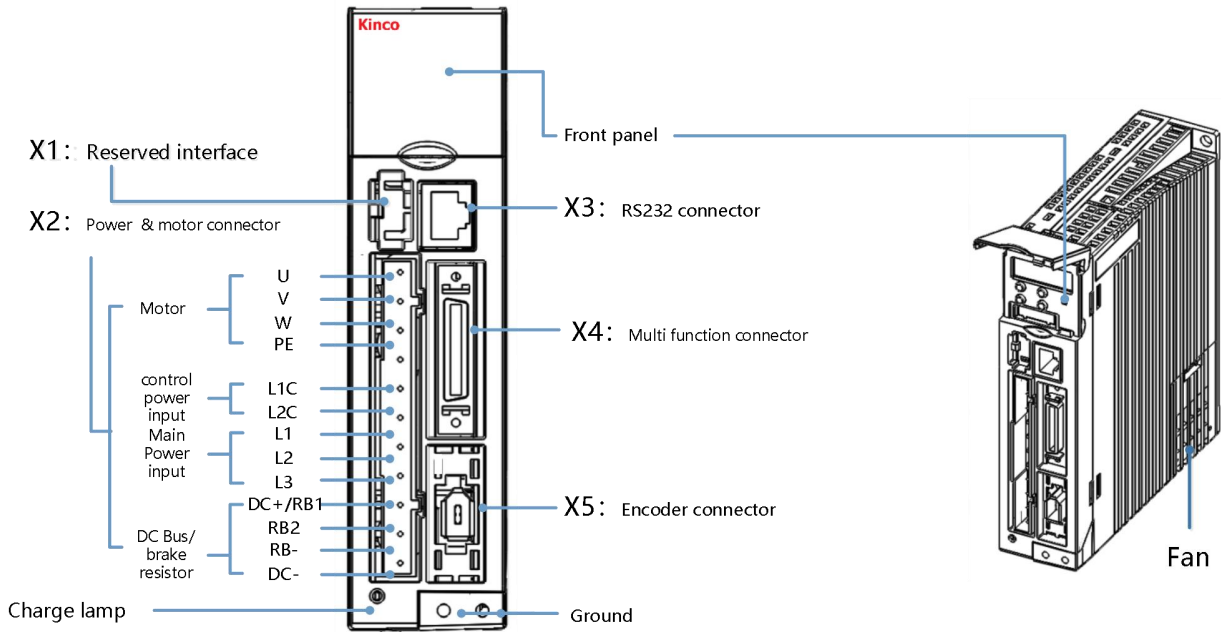


Figure 2-1 413/423 Driver Appearance Drawing

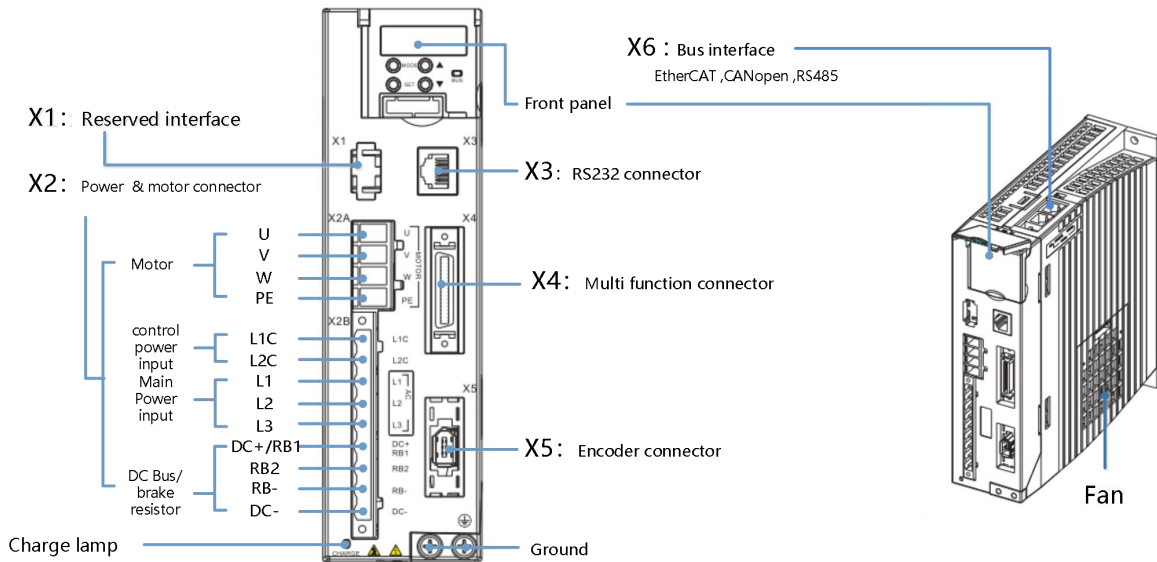


Figure 2-2 433/623 Driver Appearance Drawing
Appearance of the driver

Note: CD413/CD423/CD433/CD623 have no bus interface.

2.2 Driver wiring instructions

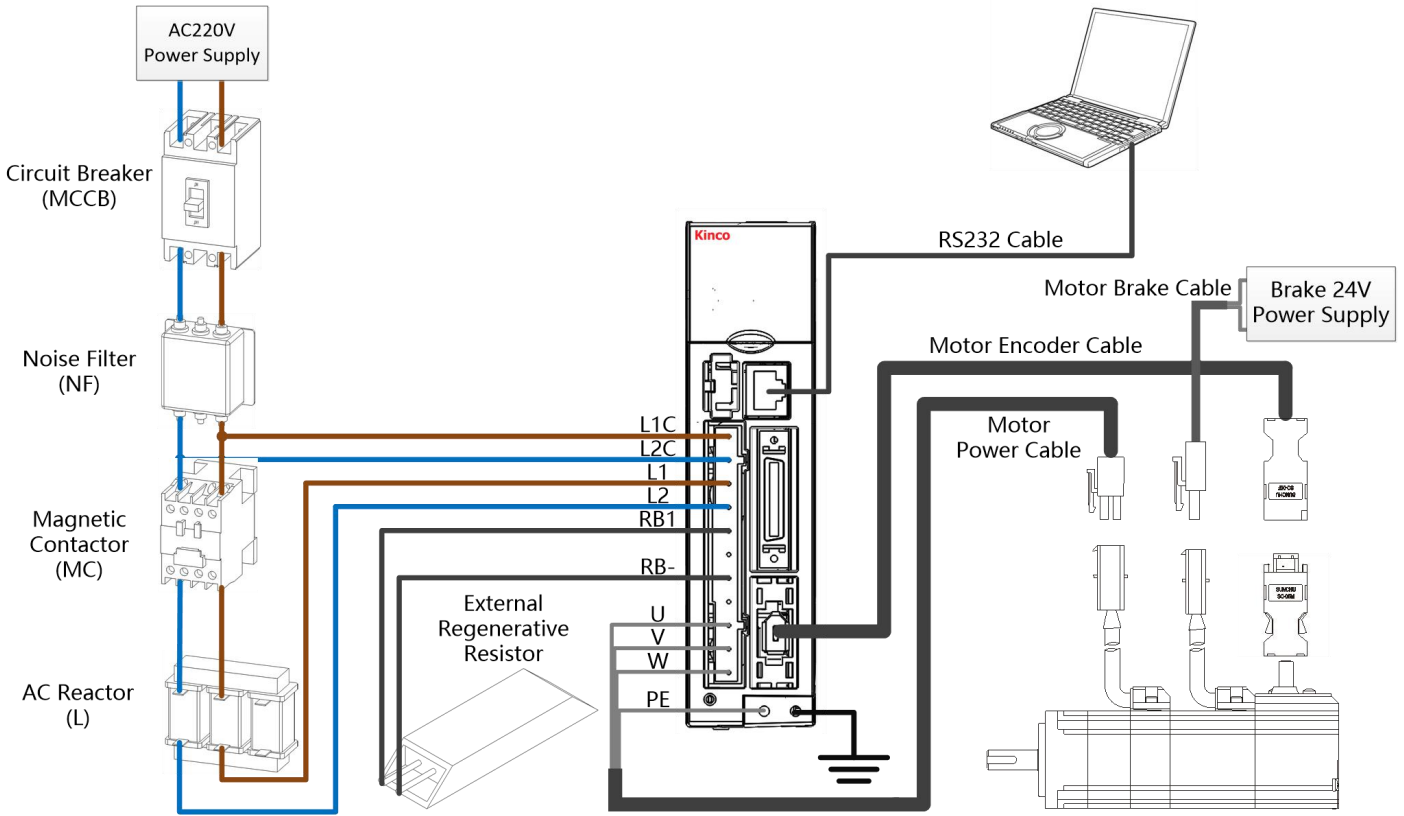


Figure 2-32 413/423-driver external wiring diagram

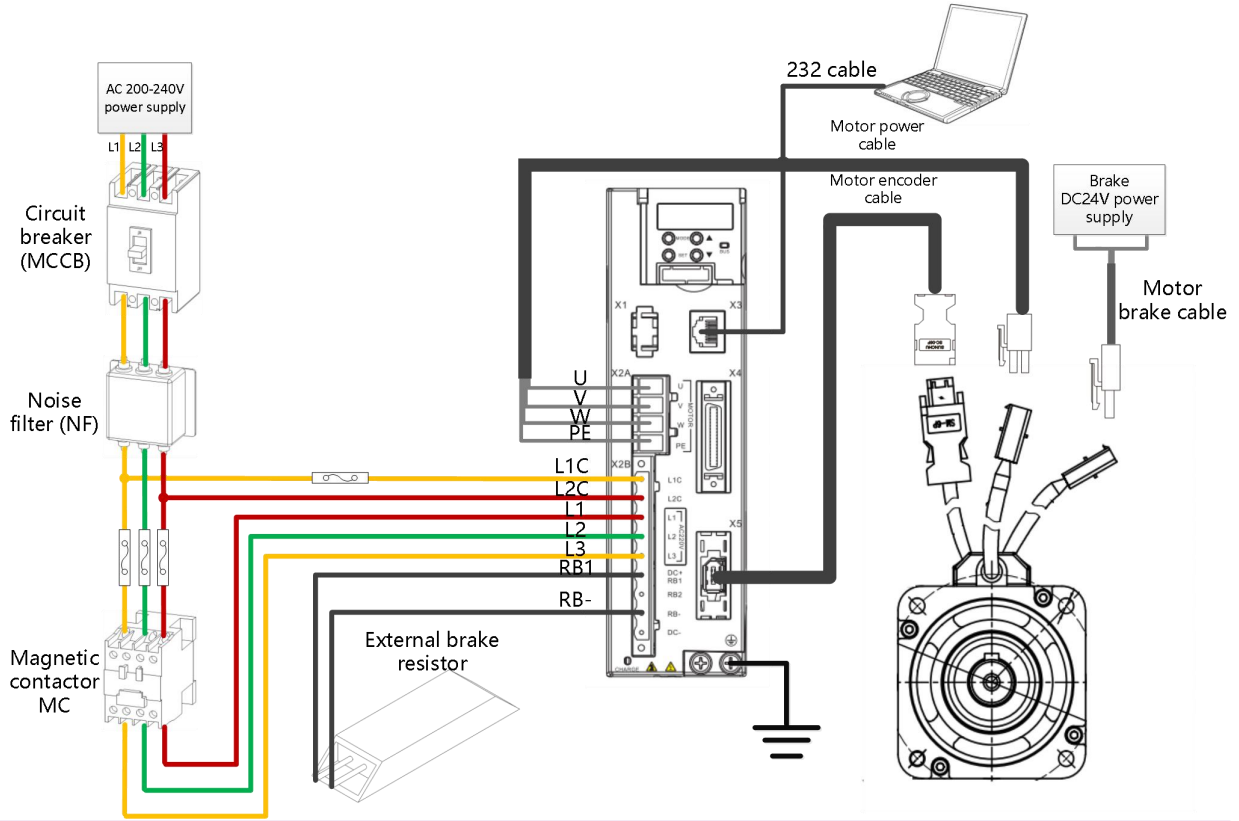


Figure 2-4 433-driver external wiring diagram

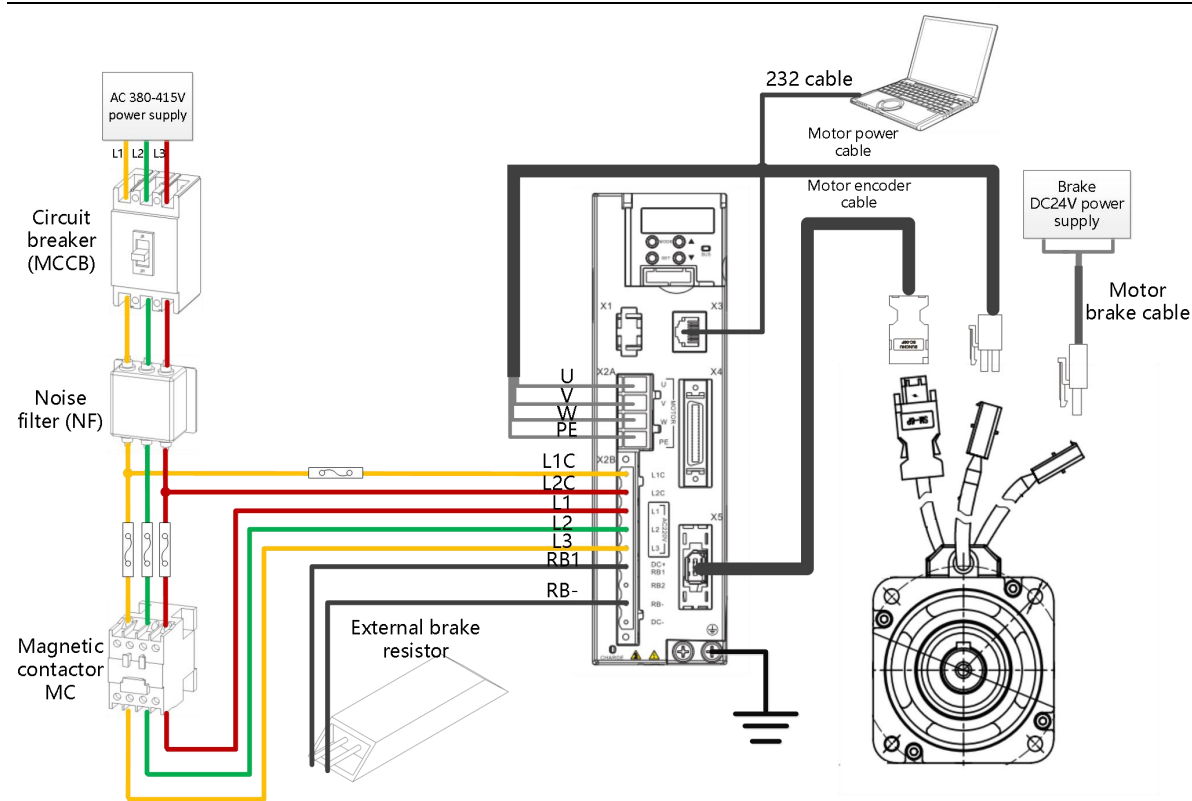


Figure 2-5 623-driver external wiring diagram

Warning!

- Before installing and maintaining the driver, all power must be switched off.
- Don't heat the connector.
- Drive power off for at least ten minutes before touching drive connector, measure drive DC bus voltage until voltage drops below 36V.
- Don't open the driver when the driver is charging; ensure that all protective covers and electrical cabinet doors are closed during operation.
- Don't remove safety equipment; do not touch live parts and components.
- Be sure to connect the PE wire properly before powering on the driver.

2.3 Port definition instructions

2.3.1 Power and motor interface (X2) instructions

Table 2-1 X2 port definition (For 413/423driver)

Pin		Function
L1C		Control power input L/N
L2C		Single phase 200 – 240VAC ±10% <u>50 / 60Hz+/-3Hz</u> <u>50 / 60Hz</u> , 0.5A Supply ground systems: TN-S, TN-C, TN-C-S, TT (not corner earthed).
L1		Driver power input L/N
L2		Single phase 200 – 240VAC ±10%, 50 / 60Hz <u>+/-3Hz</u> <u>423@7.0A</u> <u>413@3.0A</u> Supply ground systems: TN-S, TN-C, TN-C-S, TT (not corner earthed).
DC+	DC+	DC bus+
RB1	RB1	External brake resistor input
RB2		Internal brake resistor input
RB-		External brake resistor input
DC-		DC bus-
U/V/W		U/V/W phase power output for servo motor

L1C — ○

L2C — ○

L1 — ○

L2 — ○

DC+/RB1 — ○

RB2 — ○


RB- — ○

DC- — ○

U — ○

V — ○

W — ○



Information

Short circuit DC+ / RB1 and RB2 if choosing controller internal brake resistor (power: 10 W,100Ω)

→ **Note**

It is forbidden to use the internal brake resistor if the average brake power is more than 10 W(Driver Alarm 0100).

Table 2-1 X2 port definition (For 433/623driver)

<p>U V W PE</p> <p>L1C L2C L1 L2 L3 DC+/ RB1 RB2 RB- DC-</p>	Pin	Function		
	<u>L1C</u>	Control power input L/N		
	<u>L2C</u>	Single phase 200 – 240VAC ±10% 50 / 60Hz+/-3Hz, 0.5A Supply ground systems: TN-S, TN-C, TN-C-S, TT (not corner earthed).		
	<u>L1</u>	<u>433 Driver power input:</u> Single phase 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 14.0A		
	<u>L2</u>	Three-phase 200 ~ 240VAC +/-10% 50 ~ 60Hz +/-3Hz 14.0A <u>623 Driver power input:</u> Three-phase 380 ~ 415VAC +/-10% 50 ~ 60Hz +/-3Hz 623@12.0A		
	<u>L3</u>	Supply ground systems: TN - S, TN - C, TN - C - S, TT (not corner earthed)		
	<u>DC+</u> <u>/RB1</u>	<u>DC+</u> <u>RB1</u>	<u>DC bus+</u> External brake resistor input	Information <u>Short circuit DC+ / RB1 and RB2 if choosing controller internal brake resistor. (433 : 20W\100Ω brake resistor; 623: 20W\300Ω brake resistor)</u>
	<u>RB2</u>	<u>Internal</u> brake resistor input		
	<u>RB-</u>	<u>External</u> brake resistor input		
	<u>DC-</u>	<u>DC bus-</u>		
			Note <u>It is forbidden to use the internal brake resistor if the average brake power is more than 20W(Driver Alarm 0100).</u>	
<u>U/V/W</u>		<u>U/V/W phase power output for servo motor</u>		

2.3.2 RS232 serial port (X3) instructions

Table 2-2 X3 port definition

	Pin number	Definition	Function
	3	TX	Send controller data
	4	GND	Signal ground
	6	RX	Receive controller data
	Others	NC	Reserved

2.3.3 External I / O port (X4) instructions



19	21	23	25	27	29	31	33	35
AIN1+	AIN1-	AIN2+	AIN2-	MA+	MA-	MB+	MB-	MZ+
20	22	24	26	28	30	32	34	36
OUT5	+5V	GND	ENCO_Z	ENCO_Z	ENCO_B	ENCO_B	ENCO_A	ENCO_A
OUT1+	OUT1-	OUT2+	OUT2-	OUT3	OUT4	COMO	VDD	VEE
1	3	5	7	9	11	13	15	17
COMI	DIN1	DIN2	DIN3	DIN4	DIN5	DIN6	DIN7	MZ-
2	4	6	8	10	12	14	16	18

Figure 2-3 X4 port definition

Table 2-3 X4 Port Pin Definitions

PIN	Function
DIN1-DIN7	Digital signal input Vin_H (active): 12.5VDC-30VDC, Vin_L (inactive): 0VDC-5VDC, input freq.: <1KHz
COMI	Common pin of digital input
OUT1+ / OUT1-	Digital signal output
OUT2+ / OUT2-	Maximum output current: 100mA
OUT3 / OUT4 / OUT5	Digital signal output Maximum output current: 20mA
COMO	Common pin of digital output OUT3, 4, 5
MA+ / MA-	Pulse input
MB+ / MB-	Input voltage: 3.3V-24V
MZ+ / MZ-	Maximum frequency: 500KHz

ENCO_A+ / ENCO_A-	Encoder output
ENCO_B+ / ENCO_B-	Voltage: Voh=3.4V, Vol=0.2V
ENCO_Z+ / ENCO_Z-	Maximum current: ±20mA, maximum frequency: 10MHz
AIN1+ / AIN1-AIN2+ / AIN2-	Analog input Resolution: 12 bit, input resistance: 350 KΩ Analog bandwidth: 1KHz, input voltage range: -10V ~+10V
+5V / GND	5VDC power supply output Maximum current: 100mA
VDD/VEE	24VDC power supply output Voltage range: 24VDC ± 20%, maximum current: 300 mA

Figure 2-4 shows the X4 wiring with default IO function. More IO functions can be defined by digital panel or PC debugging software.

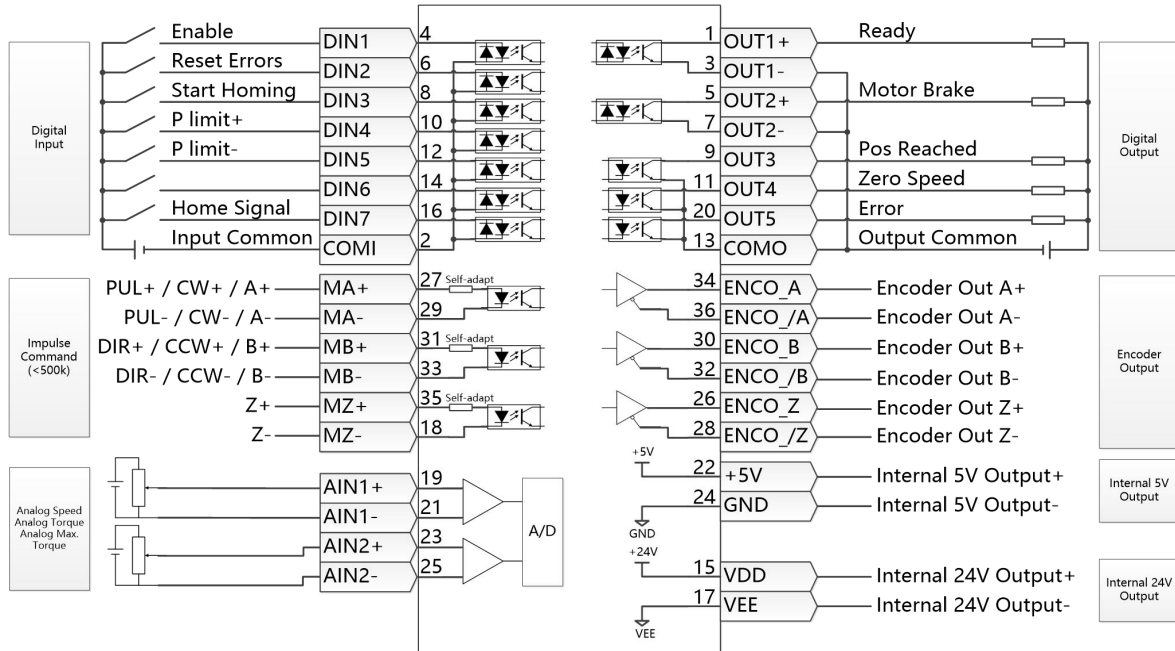
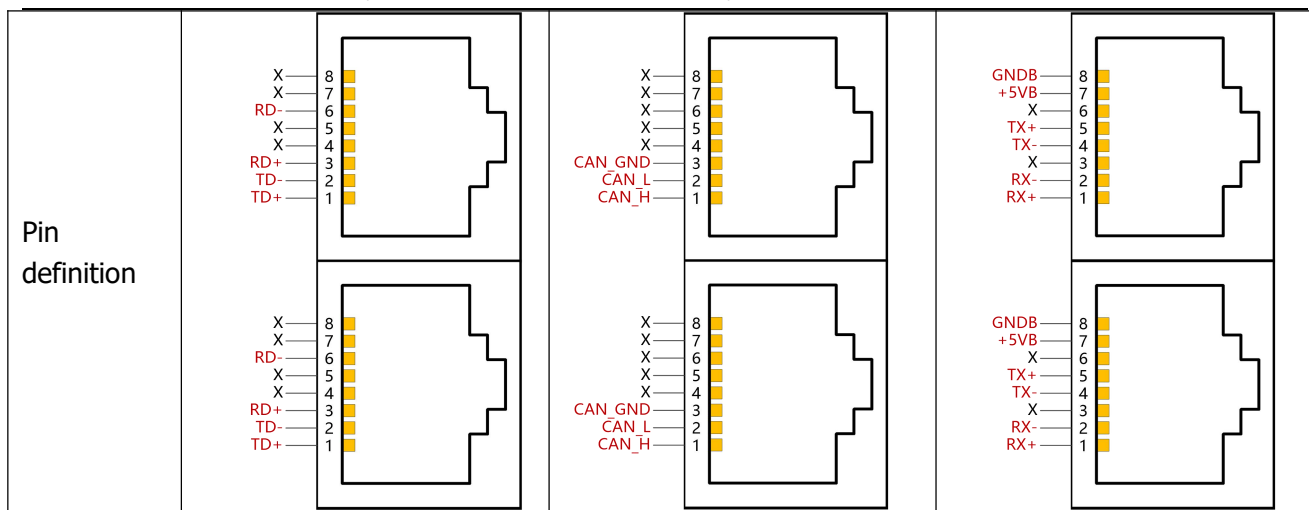


Figure 2-47 IO port default definition

2.3.4 Bus communication interface (X6) instructions

Bus type	EtherCAT	CANopen	RS485
Suitable products	FD413-EA-000	FD413-CA-000	FD413-LA-000
	FD423-EA-000	FD423-CA-000	FD423-LA-000
	FD433-EA-000	FD433-CA-000	FD433-LA-000
	FD613-EA-000	FD613-CA-000	FD613-LA-000
	FD623-EA-000	FD623-CA-000	FD623-LA-000



3 Easy operation process of the Driver

3.1 Easy use function

The Easy Use function helps users quickly set the control loop parameters for typical application scenarios. The user can set the minimum parameters according to the panel menu, eliminating the tedious steps of servo debugging. The adjusted performance can meet most application occasions. And also open up an independent area, convenient for users to set the commonly used important parameters.

3.2 Steps of Easy use

1. The EASY process contains commonly used parameters. Confirm these parameters one by one, save the modified parameters, and then restart the drive. After the EASY process is finished, run the machine and do not need to execute the tunE process if the performance is good. Otherwise, execute the tunE.
2. Process for the determination of inertia process. After an inertia measurement with tn03, the drive changes the stiffness level (tn01) according to the tuning result.
3. Please run the machine, if the performance is not satisfactory, and then by change the tn01 value to modify the rigid level, please adjust the driver while watching the machine performance.

Note:

1. The inertia measurement may cause the machine vibration. In this case, turn off the power or the drive immediately.
2. Turning on the inertia measurement will make the motor shaft in a small distance to do reciprocating motion, please leave a certain mechanical space.
3. After executing the EASY process, it is highly recommended to perform the tunE process for inertia determination and adjust the stiffness level.
4. The EASY and tunE menus were originally designed to solve problems by using key operations. If users use the PC software to initialize the parameters or change the motor model, for safety reasons, EASY and tunE menu will only display EA00, EA01, tn00 these three objects. The user has to reconfirm the motor model with EA01, after this ,the driver will restore the default value and display the EASY and tunE menus completely.

The reason lead to self-tuning failed:

1. Wrong connection;
2. The motor model is set incorrectly;
3. Mechanical rigidity is very low;
4. There is a mechanical break;
5. Acceleration and deceleration less than the viscous friction torque.

Table 3-1 Description of EASY and tunE parameters

LED	Parameter	Description	Default
EA01	Motor Type	<p>For a new motor controller, the set motor type is "00" and "3030" appears at the LED display. If the new motor controller is connected to a valid motor, the motor type is auto-recognized and saved.</p> <p>The motor type saved in the controller and the connected motor type will compared each other later on. If they are different, "FFFF" flashes at the LED display. The user needs to confirm the EA01 value, save motor data and reboot the controller to eliminate this state.</p>	404b
EA02	Command Type	<p>The command type affects controller-internal interface settings, the initial operation mode after power on and the default settings for DIN- and OUT functions (refer to table 4-3).</p> <p>0: CW/CCW pulse train mode Operation mode = -4 1: P/D pulse train mode Operation mode = -4 2: A/B phase control master / slave mode Operation mode = -4 6: Analog velocity mode by AIN1 Operation mode = -3 7: Analog velocity mode by AIN2 Operation mode = -3 8: Communication 9: Position table mode Operation mode = 1</p>	1
EA03	Gear Factor Numerator	Used when EA02 is set to 0-2.	1000
EA04	Gear Factor Denominator	By default, the display shows the values in decimal format. If the number is greater than 9999, the display is in hexadecimal format.	1000
EA05	Analog Speed Factor	<p>Used when EA02 is set to 6 or 7.</p> <p>The relationship between analog input voltage and motor velocity the unit of measure is rpm/V.</p> <p>In the case of high resolution, setting the analog speed factor too high may not be effective. The parameters must meet the following conditions: $-32768 \leq N * ENC / 750 < 32767$.</p> <p>N: The value to set ENC: Encoder resolution (OD 0x641003)</p>	300
EA06	1.Load type 2.Application 3.Limit switch 4. Alarm output polarity	<p>The meaning of each digit of the LED display from right to left.</p> <p>(1) Load type, influences the control loop. 0: No load 1: Belt drive 2: Ball screw</p> <p>(2) Applications, influences the control loop. 0: P2P 1: CNC 2: Master / slave mode</p> <p>(3) Limit switch. 0: Controller default 1: Delete the limit switch function</p> <p>(4) Polarity of OUT5 0: Normally closed contacts</p>	1001

LED	Parameter	Description	Default
		1: Normally open contacts	
EA07	Homing method	See driver manual for details	
EA00	Save Parameters	<p>Write "1" to save control and motor parameters. Write "2" to save control and motor parameters and reboot the servo. Write "3" to reboot the servo. Write "10" to initialize the control parameters. Notice: Users must save control and motor parameters and reboot the controller after changing the motor type in EA01. After saving the parameters, the servo will set the control loop parameters according to the load type and application.</p>	-
tn01	Stiffness	<p>Level of control stiffness from 0 to31 determines the bandwidth (BW) of the velocity loop and the position loop (see table 4-5). The larger the value, the greater the stiffness. If this parameter is too large, gain will change excessively and the machine will become unstable. When setting tn01 via the up and down buttons on the panel, entered values are valid immediately, in order to ensure the input of small change steps.</p>	Belt: 10 Screw: 13
tn02	Inertia_Ratio	<p>Ratio of total inertia and motor inertia (unit: 0.1) for example 30 represent an inertia ratio of 3. This value becomes defaulted by the EASY procedure and measured by the inertia measuring function in the tunE menu (tn03). When setting tn02 by the panel up down buttons, the data will be valid immediately, to ensure the input of small change steps.</p>	Belt: 50 Screw: 30
tn03	Tuning_Method	<p>Writing 1 starts auto-tuning inertia measurement. The controller is enabled and the motor executes an oscillating motion for less than 1s. If tuning is successful, Tuning_Method indicates a value of 1. The measured inertia is used to determine the Inertia_Ratio. Stiffness is set to 4 to 12 depending on the inertia ratio. The control loop parameters are set according to Stiffness and Inertia_Ratio. If the inertia measurement fails, Tuning_Method indicates the fail-reason: 0: The controller could not be enabled by any reason. -1: Inertia cannot be measured due to too little motion or too little current. -2: The measured inertia result is outside the valid range. -3: The resulting Inertia_Ratio value is greater than 250 (inertia ratio > 25). This is a possible result, but the control loop will not be tuned. -4: The resulting Inertia_Ratio value is larger than 500 (inertia ratio > 50). This is an uncertain result.</p>	-

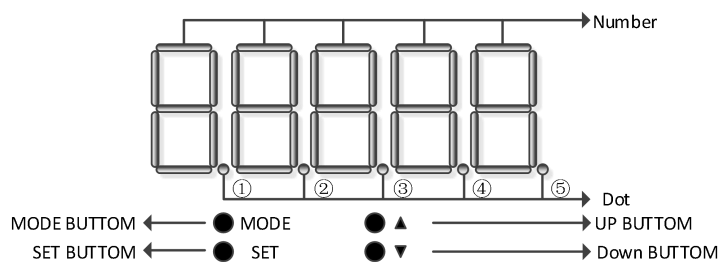
LED	Parameter	Description	Default
		In the cases 0, -1, -2, -4 Inertia_Ratio is set to 30, in the case -3 Inertia_Ratio is set as measured, Stiffness is set to 7-10 In any fail case the control loop parameters are set to Inertia_Ratio of 30 and the set Stiffness values. To make the measured Inertia_Ratio of case -3 become effective, the value of tn02 must be confirmed by SET.	
tn04	Safe_Dist	Inertia measuring distance (unit: 0.01 rev), for example 22 represents 0.22 motor revolutions. The maximum is 0.4 revolutions.	22
tn00	Saving parameters	Write "1" to save control and motor parameters. Write "2" to save control and motor parameters and reboot the servo. Write "3" to reboot the servo. Write "10" to initialize the control parameters. Note: Users must save control and motor parameters and reboot the controller when changing the motor type.	-

Table 3-2 Rigidity Rating Table

Stiffness	Kpp/[0.01Hz]	Kvp/[0.01Hz]	Output filter [Hz]	Stiffness	Kpp/[0.01Hz]	Kvp/[0.01Hz]	Output filter [Hz]
0	70	25	18	16	1945	700	464
1	98	35	24	17	2223	800	568
2	139	50	35	18	2500	900	568
3	195	70	49	19	2778	1000	733
4	264	95	66	20	3334	1200	733
5	334	120	83	21	3889	1400	1032
6	389	140	100	22	4723	1700	1032
7	473	170	118	23	5556	2000	1765
8	556	200	146	24	6389	2300	1765
9	639	230	164	25	7500	2700	1765
10	750	270	189	26	8612	3100	1765
11	889	320	222	27	9445	3400	∞
12	1056	380	268	28	10278	3700	∞
13	1250	450	340	29	11112	4000	∞
14	1500	540	360	30	12500	4500	∞
15	1667	600	392	31	13889	5000	∞

3.3 Panel instructions

3.3.1 Panel button description



Item	Function
Dot ①	N/A
Dot ②	N/A
Dot ③	When setting parameters: distinguishes between the data for the current object group and the object address inside the group. When the internal 32 bit data appears at the display, the display is showing the high 16 bit of the current 32 bit data. Indicates that the earliest error information in the error history is being displayed when the error history record in F007 appears at the display.
Dot④	When setting parameters and displaying real-time data, indicates the format of the data: HEX data when dot 4 is on and DEC data when dot 4 is off. Indicates that the latest error information in the error history is being displayed when the error history record in F007 appears at the display.
Dot⑤	Lights up for a short time: data has been successfully modified when setting parameters. Lights up all the time: internal data is being displayed when real time data appears. The controller’s power stage is operative when dot 5 flickers.
MODE	Switch function menu. When setting parameters, press briefly to switch the setting bit, press and hold to return to the last menu.
▲	Increases the value.
▼	Reduces the value.
SET	Enter menu. Check the values of the parameters. Confirm the setting to access the next step. When the internal 32 bit data appears at the display, press and hold to switch high / low 16 bit.
Overall flash	Error or warning status. Lit up for 1s and dark for 1s indicates a controller error. Continuous flashing (3 consecutive rapid flashes) indicates that the controller is in a warning state.

3.3.2 Panel parameter setting process

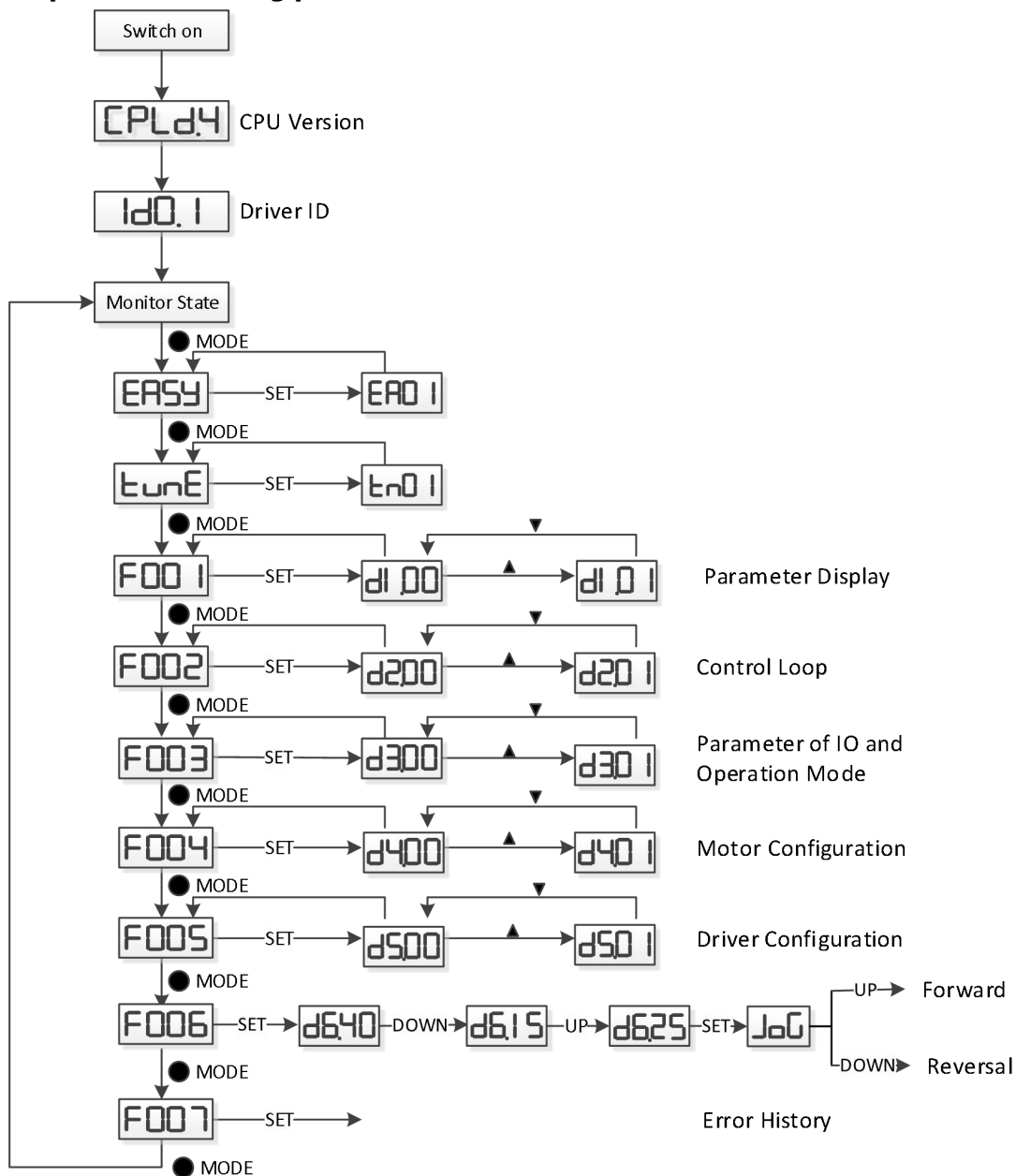


Figure 3-1 panel parameter setting flow



Note:

- Through F006, you can enter the jog mode to test the basic running condition of the motor. The jog mode is not affected by other working modes or speed settings. During operation, the driver is in the speed mode and runs at a speed of 30rpm.

3.4 EASY description of the operation process

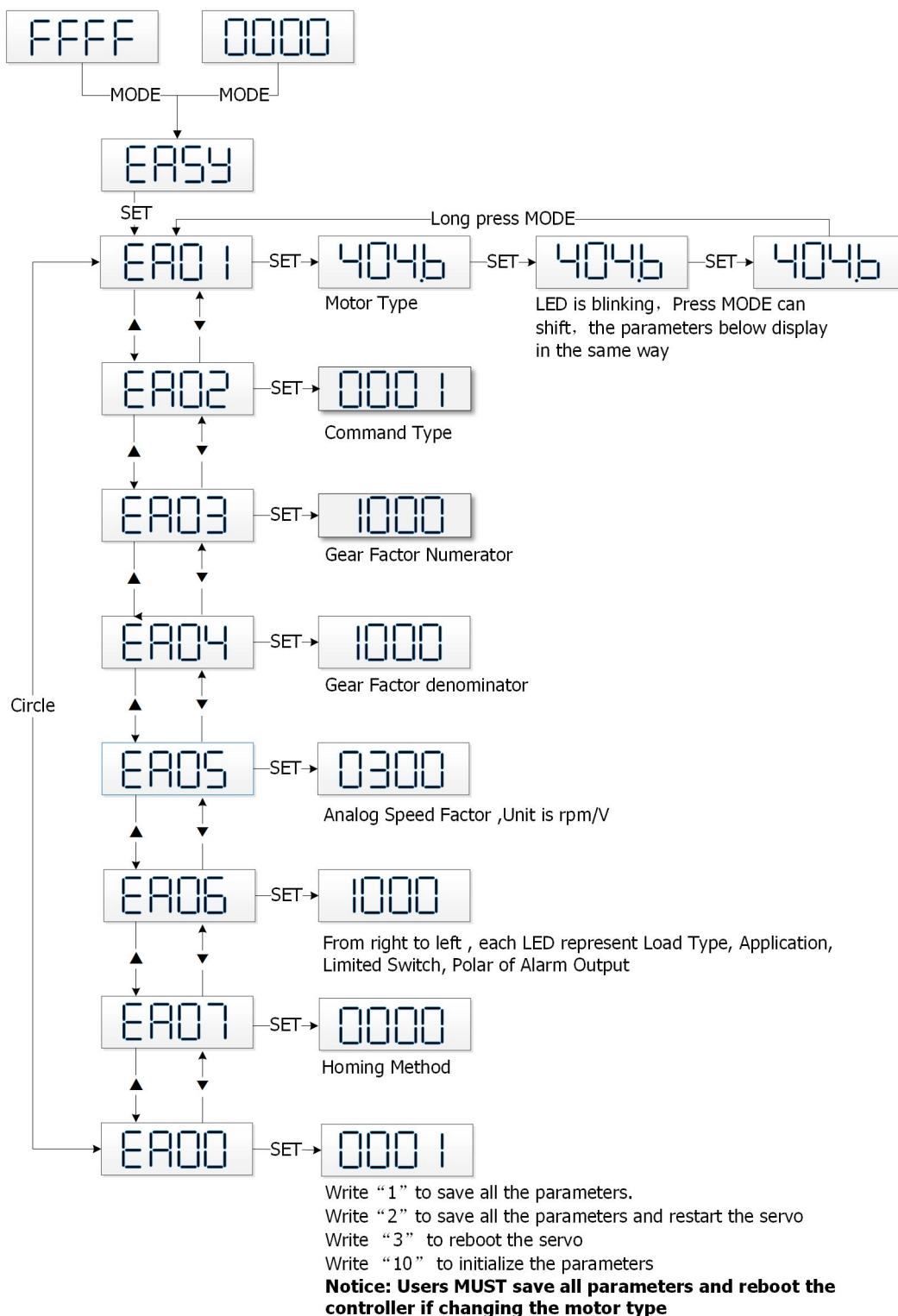


Figure 3-2 EASY operation flow chart

Note

If there is no operation for 30s, the menu will exit automatically and the user must restart the setting. The entered data takes effect immediately, but can be saved by EA00.

3.5 Operation process of tunE

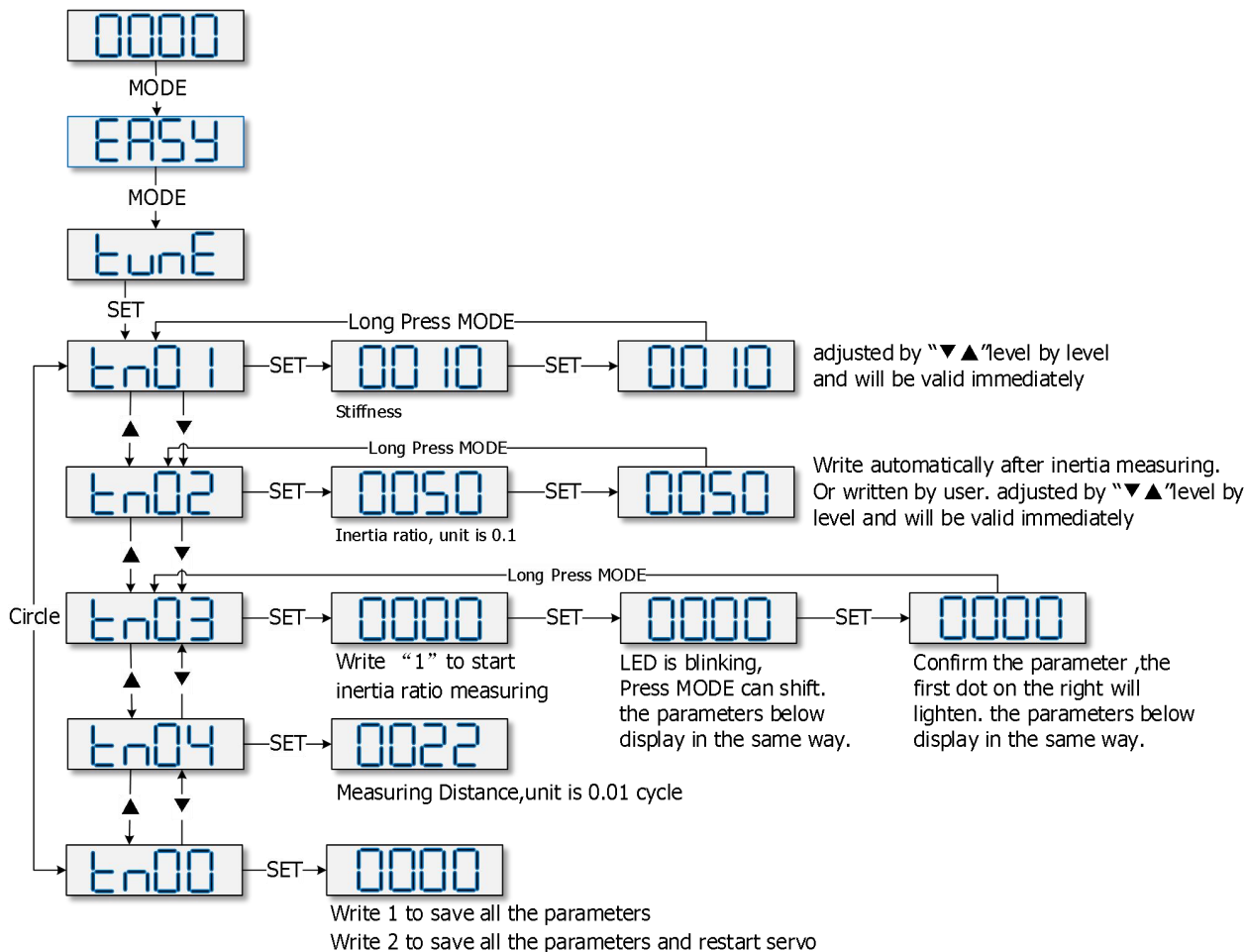


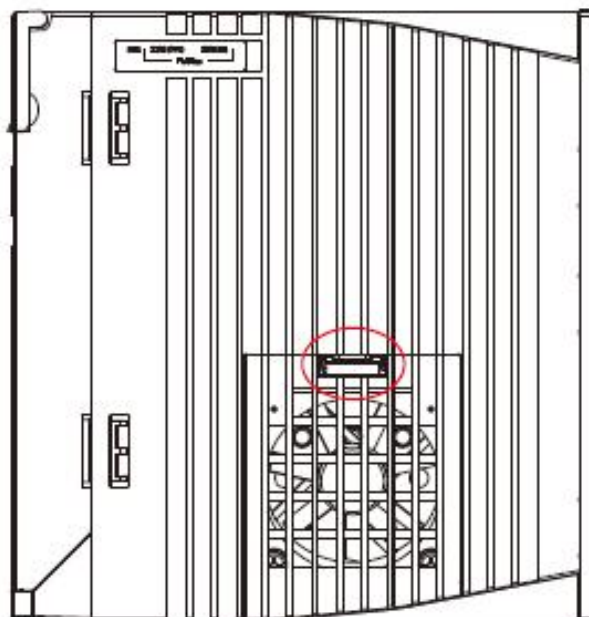
Figure 3-3 tunE operation flow chart

Note:

1. More about the use of products, please visit the official website and download product manuals
 Download link: <http://en.kinco.cn/download/use/servo>
2. PC software of the driver please visit the official website and download and install
 Download link: <http://en.kinco.cn/download/software/servo>
3. The RS232 communication line which is connecting the host computer software is shown in the following figure

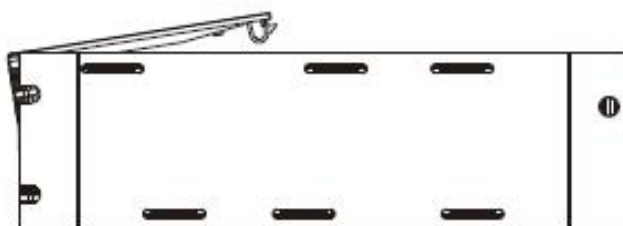


CD&FD433 风扇拆装说明



1, Press fan cover hook along the arrow

1, 沿着箭头方向按压风扇卡勾



2, Rotate the fan cover 10 degrees

2, 将风扇盖旋转10度

