

# SD638 风冷系列伺服驱动器

## 用户手册 简略版

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SD638 Series Servo Driver (Air-cooled)  
User Manual Brief Version  
(中英文版 V1.1)





## 前 言

感谢您选用本公司的 **SD638** 风冷系列伺服驱动器产品！

本手册为 **SD638** 风冷系列伺服驱动器用户手册(简略版)。仅适用于 **1BX\_SD638\*\*\*\*\*** 系列下各型号产品。

本手册提供给使用者选型、安装、参数设置、现场调试及故障诊断的相关注意事项及指导。请妥善保管本手册，以备随时查阅。

在使用前请认真阅读和理解本手册中的各项内容，以确保正确的使用，不正确的使用将造成运行不正常或使用寿命的缩短，甚至直接损坏产品。

开箱确认（当您收到产品后请进行如下检查工作）：

- 1) 包装箱是否完整、是否存在破损和受潮等现象？如有问题，请立即与本公司或您的供货商联系。
- 2) 包装箱外部机型标识是否与所订购机型一致？如有差错，请立即与本公司或您的供货商联系。
- 3) 拆开包装后，检查机器铭牌是否与包装箱外部机型标识一致？如有出入，请立即与本公司或您的供货商联系。



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# 第一章 安全注意事项

## 1.1 安全信息定义

**危险:** 如不遵守相关要求, 就会造成严重的人身伤害, 甚至死亡。

**警告:** 如不遵守相关要求, 可能造成人身伤害或者设备损坏。

**禁止:** 如不遵守相关要求, 可能造成设备损坏。









**高温:** 如不遵守相关要求, 可能导致人身伤害。

**注意:** 如不遵守相关要求, 可能导致中等程度的人身伤害。



**培训并合格的专业人员:** 是指操作本设备的工作人员必须经过专业的电气培训和安全知识培训并且考试合格, 已经熟悉本设备的安装, 调试, 投入运行以及维护保养的步骤和要求, 并能避免产生各种紧急情况。

## 1.2 警告标识


警告用于对可能造成严重的人身伤亡或设备损坏的情况进行警示, 给出建议以避免发生危险。本手册中使用下列警告标识:

标识	名称	说明	简写
 危险	危险	如不遵守相关要求, 就会造成严重的人身伤害, 甚至死亡。	
 警告	警告	如不遵守相关要求, 可能造成人身伤害或者设备损坏。	
 禁止	静电敏感	如不遵守相关要求, 可能造成 PCBA 板损坏。	
 高温	注意 高温	伺服驱动器底座产生高温, 禁止触摸。	
 注意	注意	如不遵守相关要求, 可能导致中等程度的人身伤害。	注意

## 1.3 安全指导

	<ul style="list-style-type: none"> <li>◆ 只有经过培训并合格的人员才允许进行相关操作。</li> <li>◆ 禁止在电源接通的情况下进行接线，检查和更换器件等作业。进行接线及检查之前，必须确认所有输入电源已经断开，并等待不短于伺服驱动器上标注的时间（10 分钟）或者确认直流母线电压低于 36V。等待时间表如下：</li> </ul> <table border="1" data-bbox="292 341 934 424"> <thead> <tr> <th colspan="2">伺服驱动器机型</th> <th>至少等待时间</th> </tr> </thead> <tbody> <tr> <td>380V</td> <td>5.5kW-11kW</td> <td>5 分钟</td> </tr> </tbody> </table>	伺服驱动器机型		至少等待时间	380V	5.5kW-11kW	5 分钟
伺服驱动器机型		至少等待时间					
380V	5.5kW-11kW	5 分钟					
	<ul style="list-style-type: none"> <li>◆ 严禁对伺服驱动器进行未经授权的改装，否则可能引起火灾，触电或其他伤害。</li> </ul>						
	<ul style="list-style-type: none"> <li>◆ 机器运行时，散热器底座可能产生高温，禁止触摸，以免烫伤。</li> </ul>						
	<ul style="list-style-type: none"> <li>◆ 伺服驱动器内电子元器件为静电敏感器件，在相关操作时，必须做好防静电措施。</li> </ul>						

### 1.3.1 搬运和安装


	<ul style="list-style-type: none"> <li>◆ 选择合适的搬运和安装工具，保证伺服驱动器的正常安全运行，避免人身伤害。安装人员必须采取机械防护措施保护人身安全，如穿防砸鞋，穿工作服等。</li> <li>◆ 搬运安装过程中要保证伺服驱动器不遭受到物理性冲击和振动。</li> <li>◆ 搬运时不要只握住前盖板，以免造成脱落。</li> <li>◆ 禁止将伺服驱动器安装在易燃物上，并避免伺服驱动器紧密接触或粘附易燃物。</li> <li>◆ 请按接线图连接制动选配件（制动电阻，制动单元或者回馈单元）。</li> <li>◆ 禁止用潮湿物品或身体部位接触伺服驱动器，否则有触电危险。</li> <li>◆ <b>R/S/T</b> 为电源输入端，<b>U/V/W</b> 为输出电机端，请正确连接输入动力电缆和电机电缆，否则会损坏伺服驱动器。</li> </ul>
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#### 注意：

- ◆ 必须安装在避免儿童和其他公众接触的场所。
- ◆ 防止螺丝、电缆、及其他导电物体掉入伺服驱动器内部。
- ◆ 如果安装地点海拔高于2000m，伺服驱动器将不能满足IEC61800-5-1中低电压保护的要求。
- ◆ 伺服驱动器运行时泄漏电流可能超过 3.5mA，务必采用可靠接地并保证接地电阻小于 10Ω，PE 接地导体的导电性能和相导体的导电能力相同（采用相同的截面积）。
- ◆ 请在合适的环境下使用（详见章节 3.1）。

### 1.3.2 调试和运行


	<ul style="list-style-type: none"> <li>◆ 在进行伺服驱动器端子接线操作之前，必须切断所有与伺服驱动器连接的电源，电源切断后的等待时间不短于伺服驱动器上标示的时间。</li> <li>◆ 伺服驱动器在运行时，内部有高电压，禁止对伺服驱动器进行除键盘设置之外的任何操作。</li> <li>◆ 本设备不可作为“紧急停车装置”使用。</li> <li>◆ 本设备不能作为电机紧急制动使用，必须安装机械抱闸装置。</li> </ul>
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#### 注意：

- ◆ 不要频繁的断开和闭合伺服驱动器输入电源。
- ◆ 在使用过程中，若驱动器掉电，必须等驱动器完全掉电（键盘电源指示灯熄灭）后才能上电，否则，驱动器可能工作异常。
- ◆ 如果伺服驱动器经过长时间保存后再使用，使用前必须进行检査、电容整定（参见“维护和硬件故障诊断”）和试运行。
- ◆ 伺服驱动器在运行前，必须盖上前盖板，否则会有触电危险。
- ◆ 如果伺服驱动器被损坏或者缺少元器件，禁止运行。

### 1.3.3 保养、维护和元件更换


	<ul style="list-style-type: none"> <li>◆ 伺服驱动器的维护，检査或部件更换必须由经过培训并且合格的专业人员进行。</li> <li>◆ 在进行伺服驱动器端子接线操作之前，必须切断所有与伺服驱动器连接的电源，电源切断后的等待时间不短于伺服驱动器上标示的时间。</li> <li>◆ 保养、维护和元器件更换过程中，必须采取措施以避免螺丝、电缆等导电物体进入伺服驱动器内部。</li> </ul>
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#### 注意：

- ◆ 请用合适的力矩紧固螺丝。
- ◆ 保养、维护和元器件更换时，必须避免伺服驱动器及元器件接触或附带易燃物品。
- ◆ 不能对伺服驱动器进行绝缘耐压测试，不能使用兆欧表测试伺服驱动器的控制回路。
- ◆ 保养、维护和元器件更换过程中，必须对伺服驱动器以及内部器件做好防静电措施。

### 1.3.4 报废后的处理

	<ul style="list-style-type: none"> <li>◆ 伺服驱动器内元器件含有重金属，报废后必须将伺服驱动器作为工业废物处理，否则可能造成人身伤害和环境污染。</li> </ul>
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## 第二章 产品信息

### 2.1 产品铭牌

以 3 相 380V 输入的 5.5kW 驱动器为例：

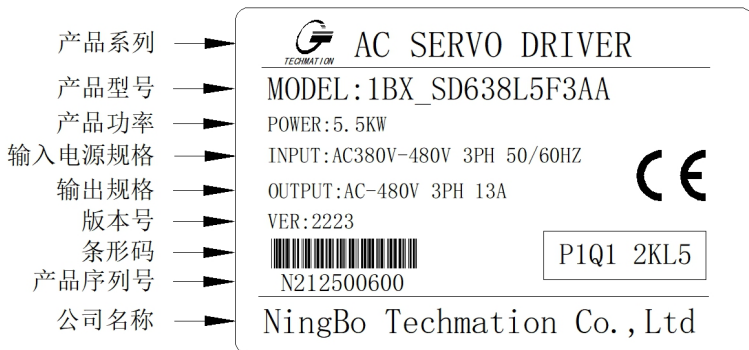
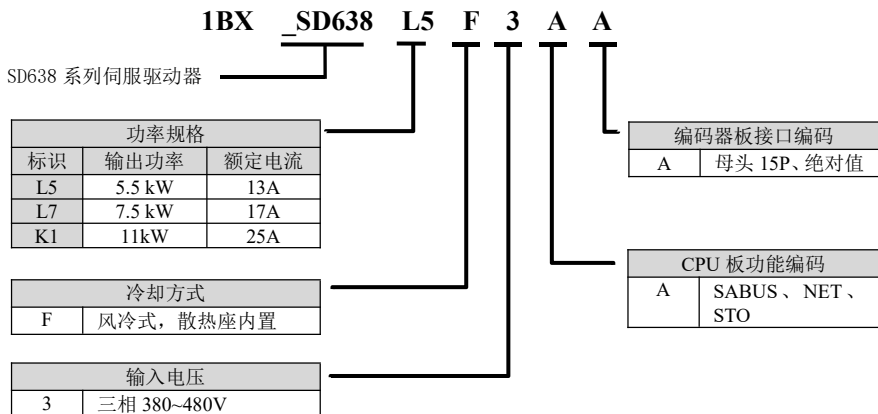


图 2-1 SD638 系列伺服驱动器铭牌

型号说明：产品型号末四位标识代表 SD638 驱动器功率规格，如 1BX\_SD638L5F3，L5 代表 5.5kW。

### 2.2 SD638 系列驱动器命名规则



## 2.3 技术规格

功能描述	规格指标	
功率输入	输入电压 (V)	AC 3PH 380~480V (允许波动范围-15%~+10%, AC 323~528V, 380V 驱动器)
	输入频率 (Hz)	50Hz 或 60Hz, 允许波动范围 47~63Hz
功率输出	输出电压 (V)	0~480V
	输出电流 (A)	请参考“额定值”
	输出功率 (kW)	请参考“额定值”
控制性能	控制方式	闭环矢量控制, V/F 控制
	电机类型	交流永磁同步电机
	控制模式	位置模式
	最大输出频率	300Hz
	指令设定方式	模拟量设定; NET; SABUS;
	过载能力	最大 2.0 倍
外围接口	端子模拟量输入分辨率	不大于 10mV
	端子开关量输入分辨率	不大于 1ms
	模拟量输入	3 路, DC0~10V
	数字开关量输入	6 路, 公共端 (内部或外部供电 24V)
	数字开关量输出	4 路, 公共端 (24V)
保护功能	故障保护功能: 过流、过压、欠压、过温、过载、短路保护功能	
通讯功能	NET; SABUS	
其它	安装方式	支持壁挂式
	运行环境温度	-10~50℃, 40℃ 以上降额使用
	防护等级	IP20
	冷却方式	风冷规格: 风冷
	存储温度	-20~70℃
	制动单元	内置, 其他选配外置
	制动电阻	选配外置 (参考附录 A: 外围选配件)

## 第三章 机械与电气安装

### 3.1 安装环境

#### ◆ 电气控制柜内的安装

伺服驱动器必须安装在防护良好的电气控制柜内，并防止接触腐蚀性、易燃性气体，防止导电物体、金属粉尘、油雾及液体进入内部。

#### ◆ 温/湿度环境

应保证伺服驱动器在热对流和热辐射的条件下，周围温度在50℃以下，湿度在90%RH以下。存储温度需在70℃以下。

#### ◆ 振动环境

采用各种防振措施，保证伺服驱动器不受振动影响，振动保证在0.6G（5.8m/s<sup>2</sup>）以下。

#### ◆ 干扰

伺服驱动器附近有干扰设备时，对伺服驱动器的电源线以及控制线有很大的干扰，可能使驱动器产生误动作。此时应该加入电源滤波器以及其它各种抗干扰措施，保证驱动器的正常工作。特别需要注意的是驱动器的控制信号线比较容易受到干扰，要有合理的走线和屏蔽措施。

如有特殊安装要求，请事先咨询和确认。

### 3.2 安装方法

#### ◆ 安装方式

安装在室内、通风良好的场所，垂直纵向安装，禁止水平安装或横向安装。

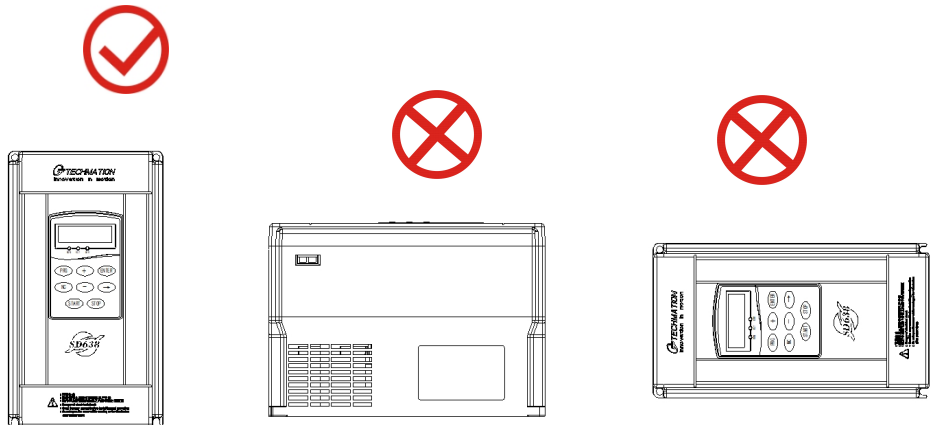


图 3-1 SD638系列伺服驱动器安装方向

### ◆ 安装间隔

需根据驱动器的不同功率等级，预留不同的安装空间和间隔空间。

单台驱动器安装示意：

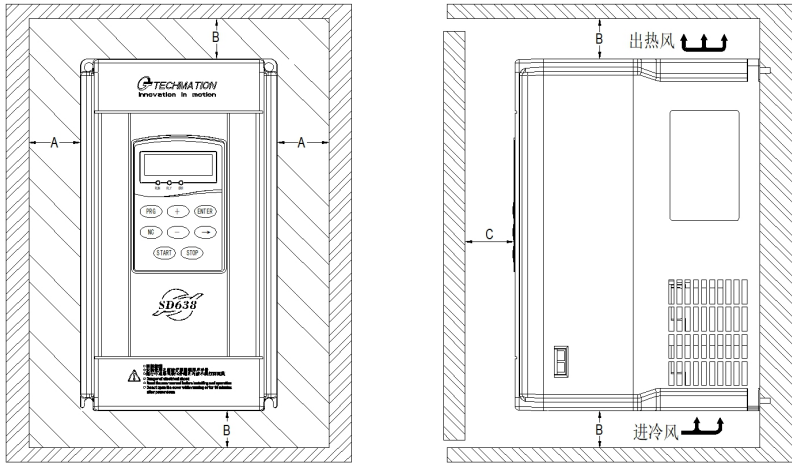


图 3-2 单台安装示意图

功率等级	空间要求 (mm)		
	5.5kW~11kW	A≥10	B≥100

多台伺服驱动器安装时，优先采用并排安装；在需要上下安装的情况，要求安装隔热导流板。

多台并排安装示意：

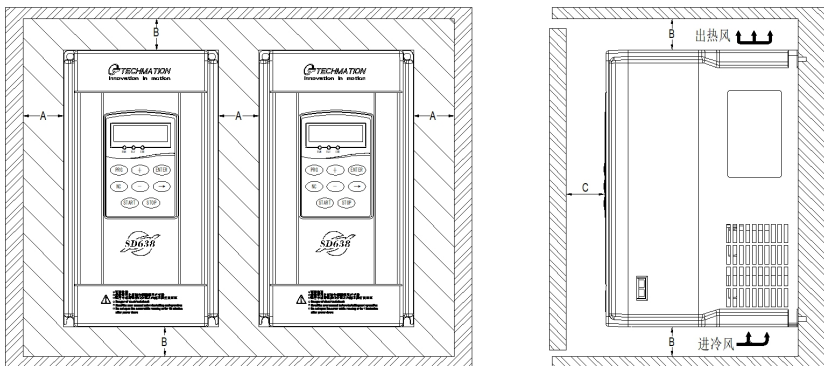


图 3-3 多台并排安装示意图

功率等级	空间要求 (mm)		
	5.5kW~11kW	A $\geq$ 10	B $\geq$ 100

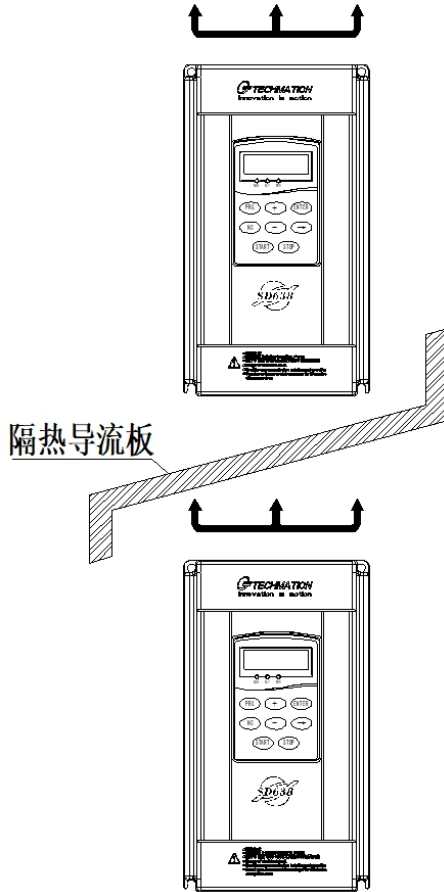


图 3-4 多台上下安装示意图

◆ 电控箱风扇要求

电控箱需安装进出排气风扇。进排气风扇装于下侧，且需增加防尘棉，根据现场环境，定期清理或者更换防尘棉；出排气风扇装于电控箱上侧，无需安装防尘棉。

### 3.3 安装尺寸

380V 伺服驱动器的安装尺寸如图 3-5 所示：

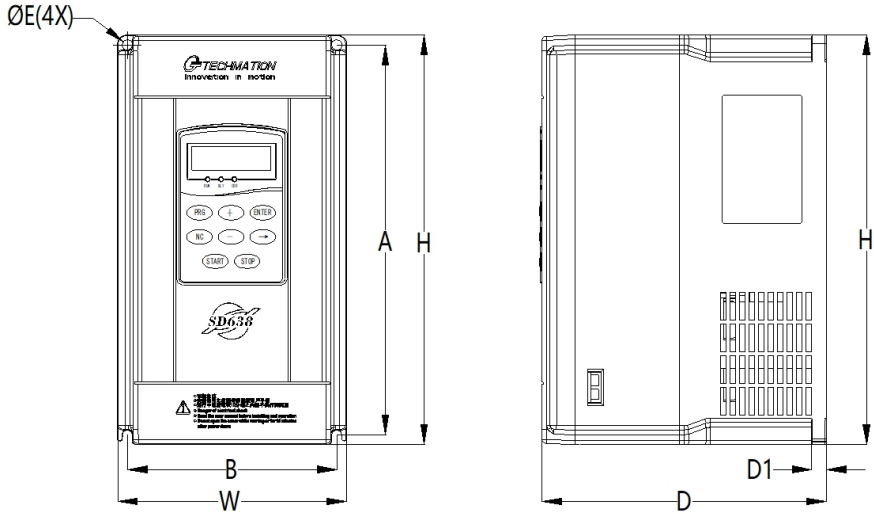


图 3-5 380V 5.5~11KW 伺服驱动器安装尺寸图

伺服驱动器安装尺寸								
机器型号 (380V 额定功率)	外形尺寸 (mm)				安装孔位 (mm)		安装孔径 (mm)	重量 (kg)
	W	D	H	D1	A	B	E	
5.5/7.5 /11kW	140	175	250	9.2	238	128	6.5	3.5

### 3.4 主回路端子及配线

#### 3.4.1 主回路端子类型

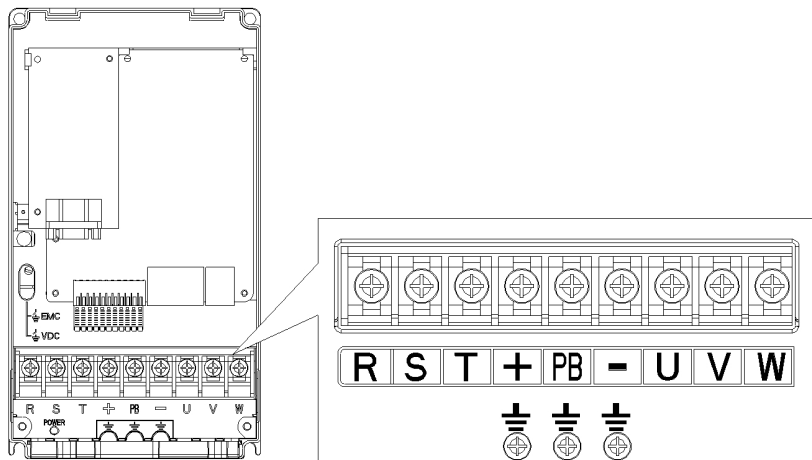



图 3-6 5.5~11KW 主回路端子

符号	端子名称	功能描述
R	电源输入 R 端子	三相交流电源输入端子，与电网连接。
S	电源输入 S 端子	
T	电源输入 T 端子	
U	U 相输出端子	驱动器三相输出端子，与电机的输入端子相连。
V	V 相输出端子	
W	W 相输出端子	
+	直流母线正端	PB、+ 之间连接外部制动电阻。
PB	内部制动管端子	
-	直流母线负端	与外部直流电源的负端相连。
	接地(PE)端子	安全保护接地端子，必须可靠接地，接地线电阻小于 0.1 欧姆。

#### 3.4.2 主回路配线

在配线时，请务必遵守下述的注意事项：

- ◆ 请勿使主回路电缆和输入输出信号用电缆/编码器电缆使用同一套管，也不要将其绑扎在一起。接线时，主回路电缆和输入输出信号用电缆/编码器电缆应离开30cm以上，距离太近会导致误动作。
- ◆ 制动电阻配线距离应小于5m，且使用耐高温线。制动电阻周围需远离可燃物，避免制动电阻过热引

燃可燃物。

- ◆ 即使关闭电源，伺服驱动器内也可能残留有高电压。为了防止触电，在5分钟之内请勿触摸电源端子。

## 3.5 控制端子及配线

### 3.5.1 控制端子示意图

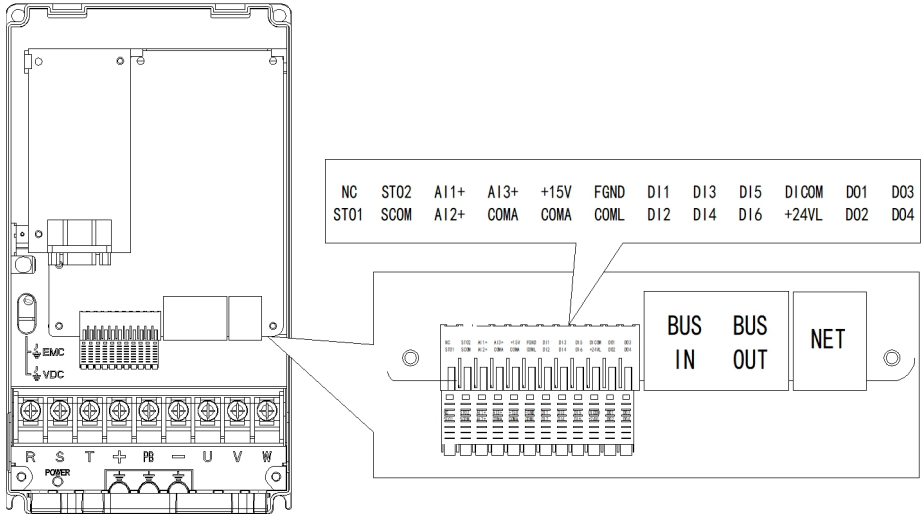


图 3-7 控制端子示意图

使用弘讯电脑控制时，可选择使用 SABUS 全数位通讯，故此时 IO 可无需接线

### 3.5.2 模拟量输入/输出端子说明

符号	端子名称	端子说明	备注
NC	空脚	无定义与内部硬件连接	
STO1	安全开关 1 输入	STO1 和 STO2 需要一起生效，否则驱动器在使能时将产生 152 报警	如果您不使用 STO 功能，请将 STO1 和 STO2 一起生效。有效状态要求 STO1/STO2 和 SCOM 之间为 24V。
STO2	安全开关 2 输入		
SCOM	STO 参考地	STO1/STO2 基准地	支持 24V 和 0V 输入

符号	端子名称	端子说明	备注
AI1+	模拟量输入通道 1	模拟量指令输入端，可自由配置指令信号，默认为速度模拟量指令	最大可识别电压：10V 对应的地端子为 COMA
AI2+	模拟量输入通道 2	模拟量指令输入端，可自由配置指令信号，默认为压力模拟量指令	
AI3+	模拟量输入通道 3	模拟量指令输入端，可自由配置指令信号，默认为反馈压力模拟量输入	
COMA	模拟量输入地	模拟量输入负端，压力传感器负端。	
+15V	模拟量 15V 输出电源	向外部提供 15V 电源，最大输出电流 100mA。	此 15V 供电外部压力传感器
COMA	15V 输出电源地		

### 3.5.3 开关量输入输出端子说明

符号	端子名称	端子说明	备注
FGND	外壳接地	屏蔽接地端子	
+24VL	数字量 24V 电源输出	向外提供数字量 24V 电源，最大输出电流 50mA。	COML（数字）与 COMA（模拟）通路，均为 COM
COML	24V 电源输出地		
DICOM	开关量输入公共端	DI1~DI6 输入端子公共端，公共端与 DI 端子间有 24V 时，输入有效。	只支持内部或外部 24V 接 DICOM
DI1	开关量输入 1	开关量输入端子 1，端子功能可自由配置，参数标识 57103，默认功能：伺服使能	1.可接受 0~9V 电压输入 2.该端子为光耦输入，只支持 NPN 接法； 3.对应的公共端为 DICOM
DI2	开关量输入 2	开关量输入端子 2，端子功能可自由配置，参数标识 57104，默认功能：故障清除	
DI3	开关量输入 3	开关量输入端子 3，端子功能可自由配置，参数标识 57105，默认功能：正转	
DI4	开关量输入 4	开关量输入端子 4，端子功能可自由配置，参数标识 57106，默认功能：反转	

符号	端子名称	端子说明	备注
DI5	开关量输入 5	开关量输入端子 5, 端子功能可自由配置, 参数标识 57107, 默认功能: 归零到达	
DI6	开关量输入 6	开关量输入端子 6, 端子功能可自由配置, 参数标识 57108, 默认功能: 归零	
DO1	开关量输出 1	开关量输出端子 1, 端子功能可自由配置, 参数标识 57109, 默认功能: 警报输出	晶体管输出, 公共端为+24V <sub>L</sub> , 输出有效时, 与公共端形成 24V 电压
DO2	开关量输出 2	开关量输出端子 2, 端子功能可自由配置, 参数标识 57110, 默认功能: 工位一到达	
DO3	开关量输出 3	开关量输出端子 3, 端子功能可自由配置, 参数标识 57111, 默认功能: 工位二到达	
DO4	开关量输出 4	开关量输出端子 4, 端子功能可自由配置, 参数标识 57112, 默认功能: 归零完成	

### 3.5.4 通讯端子说明

符号	端子名称	端子说明	备注
BUS IN	SABUS 输入端子	SABUS 通讯端子	
BUS OUT	SABUS 输出端子		
NET	EtherNET 通讯端子	EtherNET 通讯接口	连接 PC 工具调试或与上位机通讯

### 3.5.5 外部电源及 STO 信号接线

STO 逻辑:

STO1 和 STO2 信号是否相同	STO1 信号	STO2 信号	使能	是否报警	如何清除警报
相同	有效	有效	OK	无	/
相同	无效	无效	NG	无	首先让 STO1 和 STO2 同时无效, 再将 STO1 和 STO2 同时有效
不同	有效	无效	NG	警 报 E001 52	在 CPU 板正常工作状态下, 让 STO1 和 STO2 同时无效, 再将 STO1 和 STO2 同时有效
不同	无效	有效	NG		

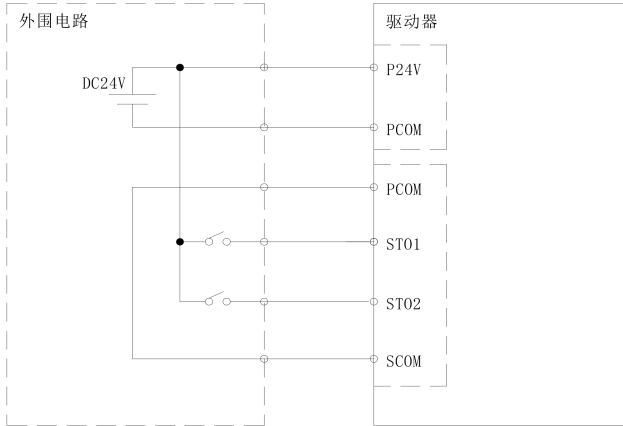


图 3-8 外部电源开关共 PCOM

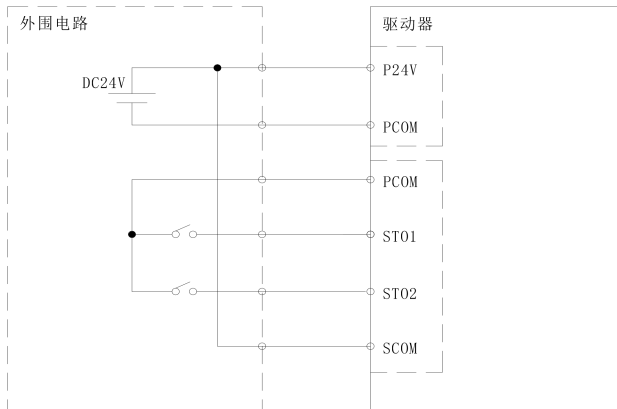


图 3-9 外部电源开关共 P24V

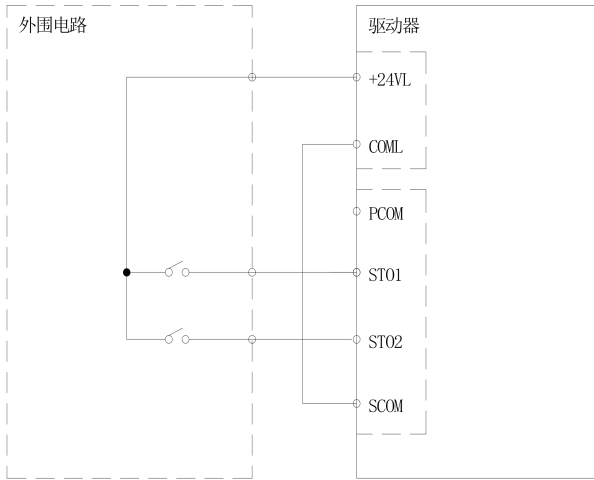


图 3-10 内部电源开关共 COML

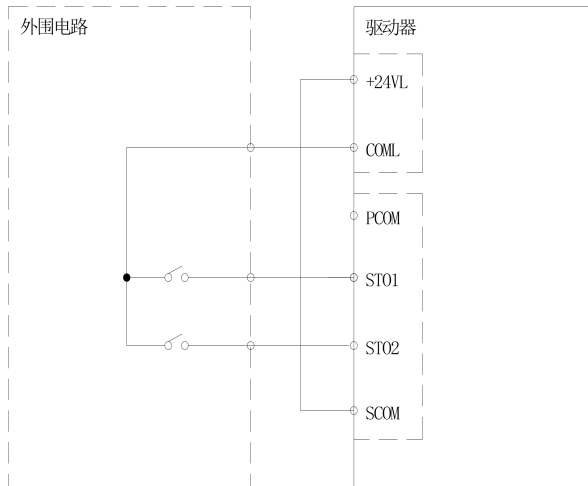


图 3-11 内部电源开关共+24VL

### 3.5.6 数字开关输入输出量信号接线

数字开关量输入信号有 DI1、DI2、DI3、DI4、DI5、DI6，下图以 DI1 信号为例说明。

输入信号低电平有效，请根据使用的电源按下图接线。本驱动器提供内部 24V 电源。

采用外部 24V 电源的接法：

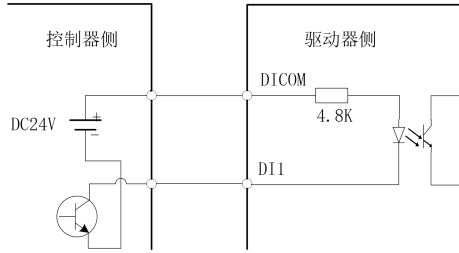


图 3-12 外部电源 NPN 晶体管输入接法  
(本手册提供的接线图纸以此方法接线)

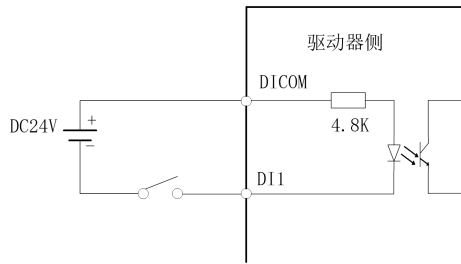


图 3-13 外部电源按键开关（继电器）接法

采用内部自带 24V 的接法:

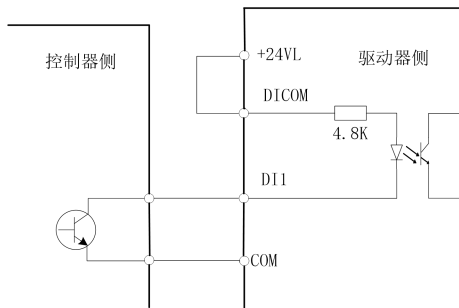


图 3-14 内部电源共 COM 接法

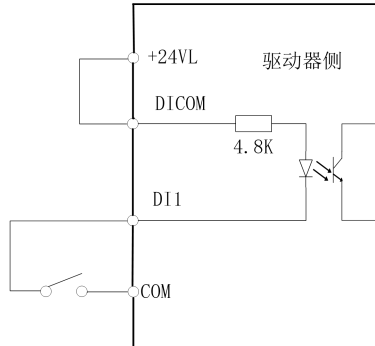


图 3-15 内部电源按键开关（继电器）接法

数字开关量输出信号有 DO1、DO2、DO3、DO4，下图以 DO1 信号为例说明。

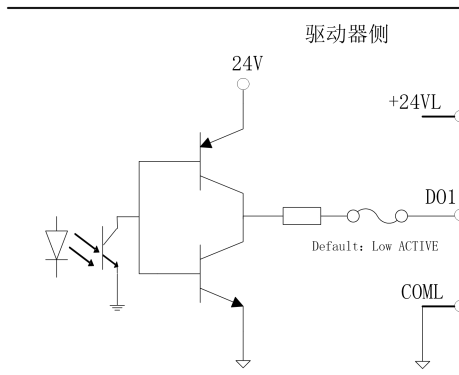


图 3-16 晶体管 DO1 输出示意图

### 3.5.7 模拟输入量信号接线

模拟输入量信号有 AI1、AI2 和 AI3，接收 0~10V 电压输入信号。一般需要用双绞屏蔽电缆，而且配线距离尽量短，不要超过 20m。

在某些模拟信号受到严重干扰的场合，需另外加装滤波电容器和铁氧体磁芯，如下图所示。

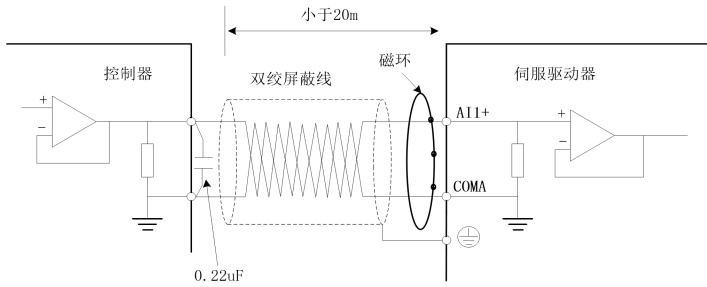


图 3-17 模拟量输入接线示意图

### 3.6 编码器信号接线

编码器信号接线要求是双绞屏蔽线，编码器信号通过一个 DB15 母端子（绝对值）与驱动器连接，端子引脚图如下：

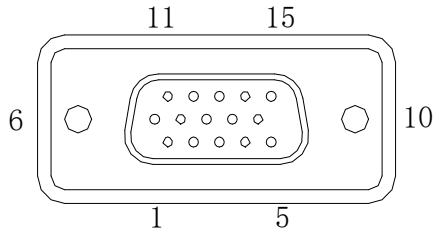


图 3-18 15P 母编码器端子示意图

15P 母（绝对值）编码器信号端子引脚信号定义：

引脚	信号定义	说明
3	DATA +	RS485 数字串行数据信号
4	DATA -	
13	+5V	编码器供电
15	0V	
5	KTY84	KTY84 温度传感器信号
14		
屏蔽层	/	接外壳

## 第四章 界面操作

### 4.1 键盘简介

键盘的用途是对本驱动器进行监控操作，通过键盘可以实现状态监视和参数修改功能。

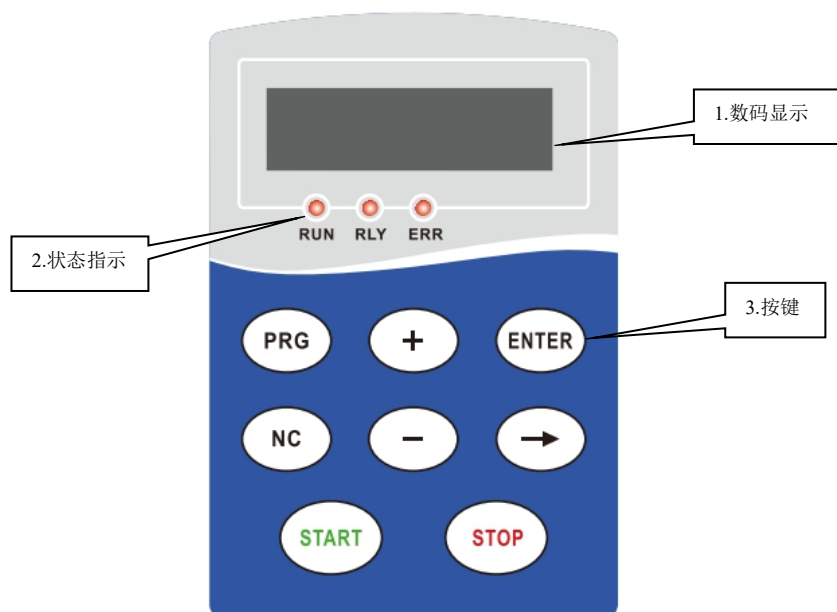
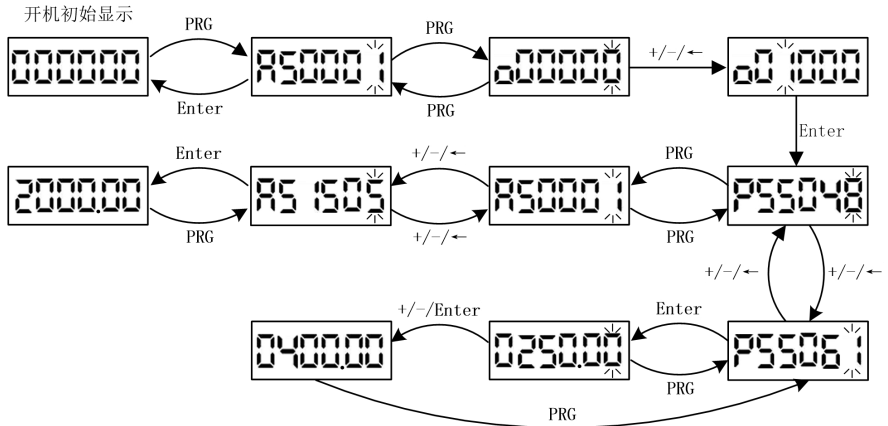


图 4-1 键盘示意图

按键的功能定义参考表。

序号	名称	说明					
1	数码显示	LED 显示符与数字/字母对照:					
		显示符	字母	显示符	字母	显示符	字母
			0		1		2
			3		4		5
			6		7		8
			9		A		b
			C		d		E
			F		H		I
			L		N		n
			O		P		r
			T		U		.
	-						
2	状态指示灯	RUN	运行状态指示灯, 当此灯闪烁运行时, 表示CPU工作正常。				
		RLY	主继电器吸合指示灯, 此灯亮, 说明母线电压达到软启动, 已正常吸合继电器, 此灯灭, 说明主继电器未吸合, 禁止使能。				
		ERR	警报指示灯, 此灯亮, 说明存在有故障报警。				
3	按键		模式键	用于组别A组、O组、P组、E组之间的切换			
			设置键	设定参数确认及清除报警			
			递增键	数据或参数码的递增; 在监控模式下, 可正序循环选择显示参数			
			递减键	数据或参数码的递减; 在监控模式下, 可反序循环选择显示参数			
			右移位键	参数设置模式下, 可以选择参数的修改位			
			运行键	伺服试运行操作			
			停止键	可用于伺服停止操作; 故障报警时, 切换到E组, 按该键可以清除报警显示。			

## 4.2 菜单操作说明



## 4.3 状态说明

- 1) 首位 A 闪烁: CPU 板正常工作
- 2) 首位 A 闪烁, 同时最下面一横常亮: 使能状态
- 3) Finish: 动作执行完成后显示, 比如 AI 零漂/马达寻零/静态自学习/动态自学习操作正常结束
- 4) Fail: 动作执行失败后显示, 比如 AI 零漂/马达寻零/静态自学习/动态自学习失败
- 5) run: 动作执行过程中显示, 比如 AI 零漂/马达寻零/静态自学习/动态自学习执行过程中
- 6) Unloc: 正确输入密码, 解锁成功时显示
- 7) error: 密码输入失败时显示

## 4.4 权级及参数组别定义

本伺服驱动器共有 4 组参数码 (详见附录快速调试参数码简表), PRG 键可在参数码之间进行切换:

- 1) A 组: 状态监视组, 只读属性, 可查看所有参数但不可修改;
- 2) O 组: 密码输入解锁;
- 3) P 组: 参数修改组, 可读可写, 可查看参数并修改;
- 4) E 组: 警报代码显示组

权级操作说明:

一级权级 (初始权级): 只能在 A 组与 O 组间切换, A 组可查看所有参数, 但不可修改。

二级权级：O 组输入密码“00 1000”即进入二级权级，解锁后，只能在 A 组与 P 组间切换，可查看 A 组所有参数，P 组可修改部分参数；长按“PRG”键 3.5 秒，重新锁住，返回至初始权级状态。

三级权级：O 组输入密码“00 1234”（初始，可自定义密码）即进入三级权级，解锁后，只能在 A 组与 P 组间切换，可查看 A 组所有参数，修改 P 组所有参数；长按“PRG”键 3.5 秒，重新锁住，返回至初始权级状态。

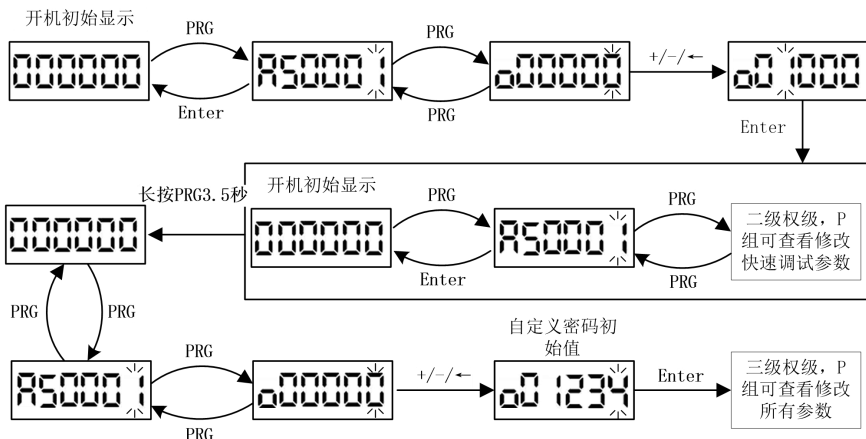


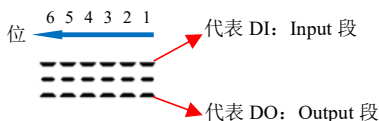
图 4-2 权级解密操作流程

## 4.5 特殊状态显示（用来判断 IO 信号）

A50024（驱动器 IO 状态）为特殊状态显示，以数码管段亮来表示相关位有效，如下说明：

当无输入输出状态时，六位数码管显示： $\overline{\text{---}}$ ；某位输入有效时显示： $\overline{\text{---}}$ ；某位输出有效时显示： $\overline{\text{---}}$ ；当所有输入输出都有效时，六位数码管显示： $\overline{\text{---}}$ ；

其显示定义：



举例：A50024 显示  $\overline{\text{---}}$ ，表示 DI1 有效，DO3 有效。

## 第五章 伺服系统调试（位置模式）

### 5.1 工作原理

#### 5.1.1 两工位工作原理

机器由电机带动减速机，减速机驱动转盘（从动轮），实现转盘在工位 1 与工位 2 之间正反 180 度转动，示意图如下：

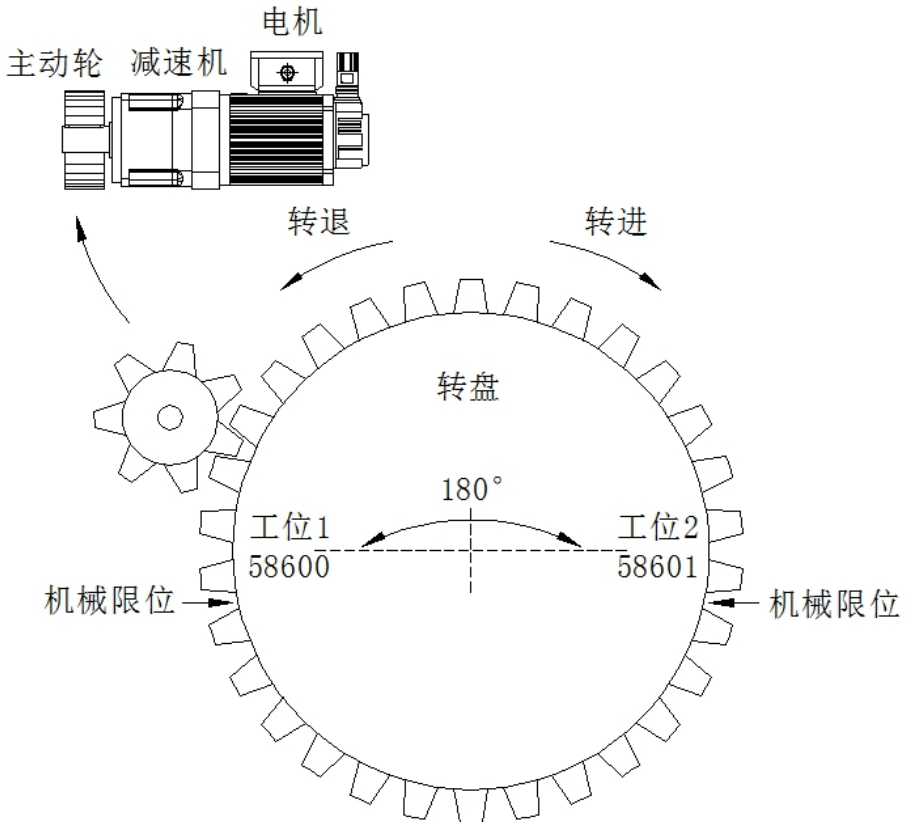


图 5-1 两工位工作示意图

### 5.1.2 三工位工作原理

机器由电机带动减速机，减速机驱动转盘每次旋转 120 度，转盘三工位单方向的控制（正反方向均可控制），示意图如下：

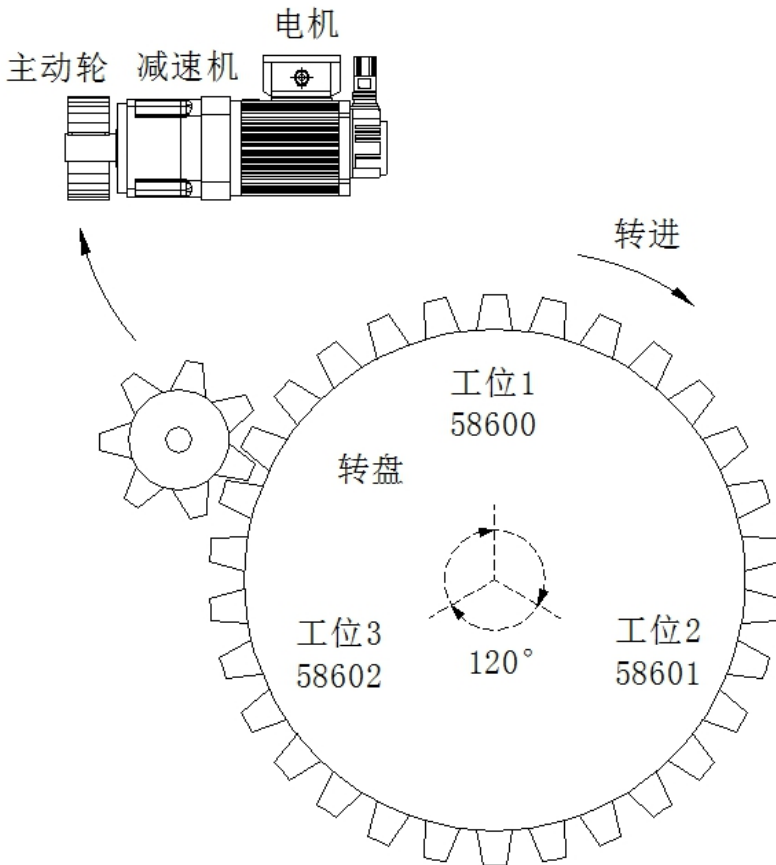


图 5-2 三工位工作示意图

转盘理论定位精度：

例：转盘主动轮直径为 200mm，那么其周长为  $\pi D=628\text{mm}$ ；若输出单位增量（58412）=360000（转盘转一圈所需的脉冲数）；

故精度为  $\pi D/360000=0.0017\text{mm}$

### 5.1.3 上位机控制时序及注意（两工位）

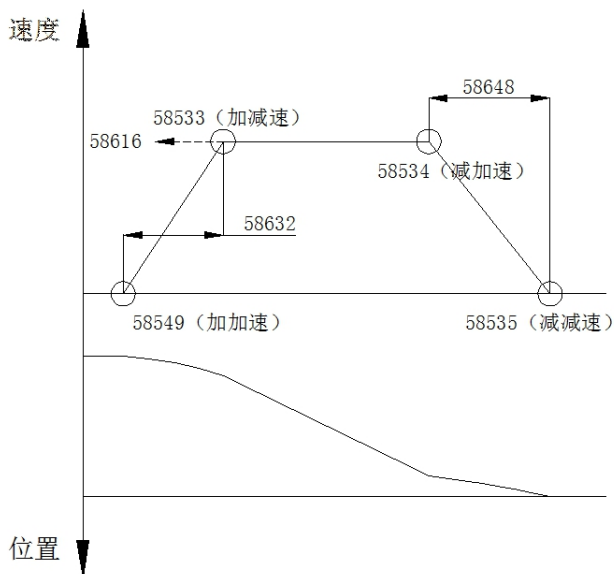


图 5-3 控制时序图（转退）

① 每段规划可设定规划类型（S型和S型自动规划），默认S型自动规划（即加加速、加减速、减加速、减减速自动规划），Jerk值无效，设定位置方式（相对位置或绝对位置），目标位置，规划速度，规划加速度即后续段的连续运动方式，若为S规划，还需设定jerk。多段组合规划时，请不要设定环型组合。需先设定好齿轮比，输出精度等位置相关转化参数，设定规划速度时，可参考58523最大规划速度，其对应最大速度，设定规划速度（58616-58631）超过最大规划速度（58523），默认按最大规划速度规划（58523）。

② 最大规划速度（58523）=（最大转速/60/减速机）\*输出单位增量，即  $51515/60/58410*58411*58412$

③ 加减速设定时，其值越大代表加减速越快，加减速公式如下：

从0加速到最大规划速度所需的时间=规划加速度（58632-58647）/规划速度（58616-58631）

从最大规划速度减速到0所需的时间=规划加速度（58648-58663）/规划速度（58616-58631）

例：加速度（58632-58647）设定规划速度×10，则代表规划时0到最快设定规划速度需耗时0.1s

使能信号决定伺服准备, 触发信号 (即工位信号) 决定了方向, 速度信号决定实际的速度, 三个信号缺一不可, 且逻辑顺序如下图所示。

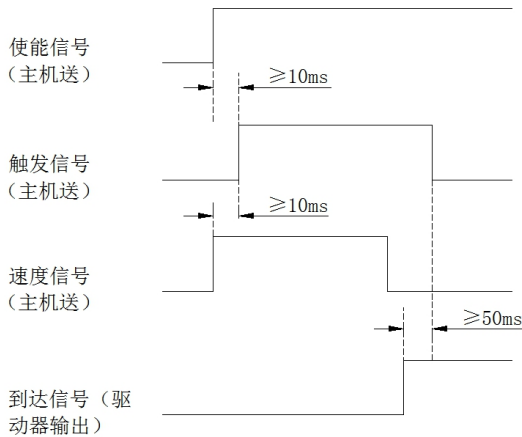


图 5-4 信号控制时序图

注意事项:

- ① 上位机送正反转盘动作时, 必须保证伺服的使能信号至少有 10ms 处理使能的状态, 上位机检测到伺服的 DO 到位信号后, 为确保真正到位, 需上位机送的转盘动作的信号至少延时 50ms 再切;
- ② 上位机送的速度信号 (如 DA) 不可有 ramp; 若上位机有 ramp, 可适当增加 DI 的量化时间 (延迟)
- ③ 在定位缸进后, 使能信号不建议再送, 这个是为了防止机械与软件位置偏差较大而导致电机一直处于出力状态, 从而导致伺服的报警或者机械上的磨损; 若使能一直在, 伺服有到位扭矩切换功能可启用 (在位置在到达范围内切换至低扭矩保持)

#### 5.1.4 转盘工作模式

- ① 位置任务在实际转盘应用中实际上就是工位的概念, 在任务规划中, 规划多少任务则可以运行多少工位, 每个工位可以设定相应的规划方式、目标位置、速度等; 最多支持 16 工位。
- ② 根据客户需求, 目前伺服转盘工作模式分两种: 360°、左右转。
- ③ 360° 工作模式分两工位、三工位、四工位、八工位。
- ④ 左右转工作模式常见的有 180°、120° 或者 90°。

## 5.2 伺服系统调试流程

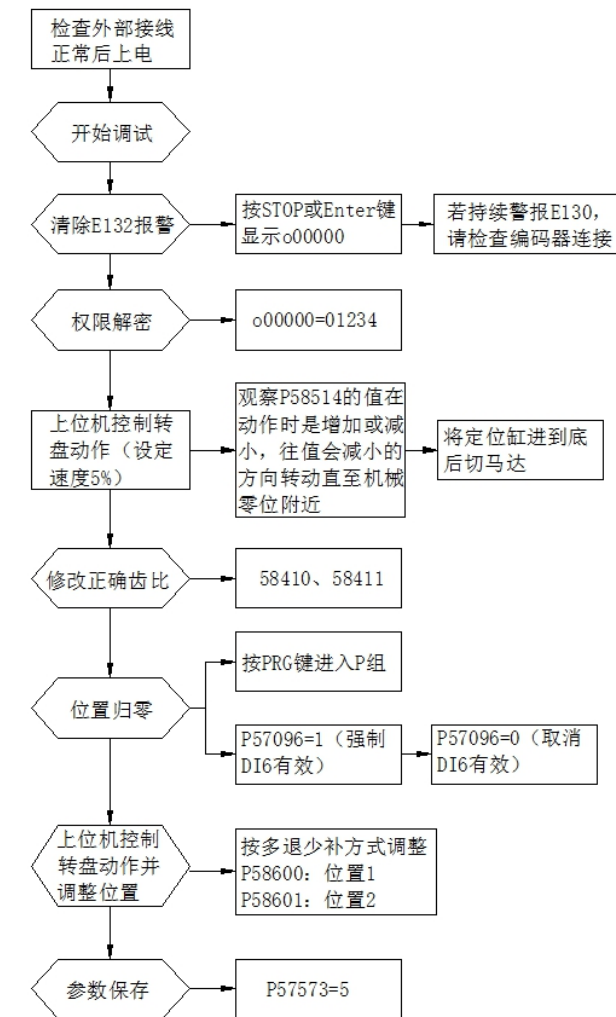


图 5-5 位置调试流程图

## 5.3 手动试运行调试

### 5.3.1 开电确认

驱动器安装好后，确保各连接线尤其是动力线的接线正确（UVW 需要一次对应），如有条件请脱开负载。在确定接线无误的情况下给伺服驱动器上电，按键面板上的“RUN”指示灯变亮并开始闪烁。经过 7S 左右将听到清晰的继电器吸合声，“RLY”指示灯亮，表示伺服上电正常。

### 5.3.2 试运行步骤

步骤	设定参数	参数描述	说明
1) 权限解密	O 组设置为 O01234	解密参数	密码错误将显示“Error”
2) 设定电机参数	P 组: P51500~P51508	电机相关参数	正确设置电机参数
3) 角度学习	P57573=4	学习电机零角度	P52002 为电机角度值 注意: 机械卡死状态下不建议进行该操作
4) 静态自学习	P 组: P56012= 电机额定电流或驱动器额定电流 P57573=21 (启动静态自学习)	学习电机电感电阻参数, 依此算电流环参数	启动静态电机参数自学习, 自学习过程中电机轴会微微转动, 并显示“run--.”, 自学习完成后显示 ‘FInIsH’
5) 参数存储	P57573=5	存储参数	若不执行存储操作, 下次重启后电机数据将恢复

电机相关参数码:

参数	描述	单位
P51500	马达额定电压 $V_n$	V
P51501	马达额定电流 $I_n$	A
P51502	马达额定功率 $P_n$	kW
P51503	马达磁极对数	/
P51505	马达额定转速 $N_n$	rpm
P51507	马达扭矩常数 $K_t$	Nm/A
P51508	马达电压常数 $K_e$	V/krpm

### 5.4 伺服转盘试运行调试

拆掉转盘的机械限位, 并确认所有与转盘有关的机械不会干涉到转盘的动作, 进行位置控制性能调试。

- ① 确定工位模式 (左右方式或者 360 单方向):

58412: 转盘一圈的 counts 数; 58553: 软件位置回零 (360 单方向模式用);

58552: 激活选择位置方式;

- ② 软件归零:

58541 寻零方式为 35 时, 表示当前位置归零;

58541 寻零方式为 19 时, 表示自动寻零;

将机械位置的某个位置定义为零位;

- ③ 试运行: 上位机送使能, 按键面板上最高位 8 和  $_$  闪烁, 此时电机将静止; 当上位机送流量 (建议 5% 以下流量)、动作信号后转盘开始慢速转动;

检查实际转盘运转方向与实际需求的方向是否匹配, 若不匹配, 可将转盘转动至最大位置, 取反 58419 及 51531 (如原先为 0=False, 修改为 1=True); 修改之后重新做归零动作;

- ④ 设定位置调整: 按多退少补的方式调整;

如正转到定位销进时发现转盘以正转方向被硬挤进去, 说明正转工位的设定位置不够, 可适当增

加；

### 5.4.1 运行模式选择

运行模式选择	设定参数	参数描述	说明
1) 控制模式	P55048	控制模式分压力闭环，速度模式、位置模式	1: Speed control mode 4: Pressure control mode 10: Position mode (默认)
2) 控制源	P57133	指令来源，AD、CAN、SABUS	0: AD: (默认) 4: CAN; 5: SABUS
3) 激活选择位置方式	P58552	1-True、0-False	True: 激活 (360 单方向) False: 不激活 (左右方式)

### 5.4.2 位置功能参数设定

设定参数	参数描述	说明
P51515	最大系统速度	设定 AD 指令源时，流量指令 100%时对应电机转速
P58412	输出端单位增量	转盘一圈的 counts
P58553	旋转位置范围	软件位置回零 (360 单方向模式用)
P58411	输出端齿轮比	一级减速与二级减速的总比 (360 度务必根据实际来填，否则有累计误差)。例如减速机 1/7，大小齿轮比 22/255,那么输出端齿轮比=22，电机端齿轮比=1785，及当电机转 1785 圈，转盘转 22 圈
P58410	电机端齿轮比	
P58515	位置跟随偏差门限	关系到 E0120 报警门限，门限设置建议为千分之输出单位增量，时间不超过 1000ms
P58516	位置跟随偏差时间	
P58519	位置到达门限	关系到位置到达 DO 的输出；当实际位置在设定位置±位置到达门限以内并延迟时到达时间，输出位置到达的 DO 信号
P58520	位置到达时间	
P51018	驱动器错误失效使能	Bit3 (TAMAGAWA_ALM)：电池报警屏蔽启用 bit19 (STOP_MOTION_ACTIVE)：位置控制停止走规划，激活后 TASK 中途中断将重新规划设定，规划减速度参考 58539。
P51020	驱动器功能选择	Bit0 (CAN_enable)：通讯使能,通过通讯使能驱动器。 Bit8 (ABS_Muti)：修改绝对位置(360 度转盘禁止使用)，用于防止多圈数位于 0 附近，仅适用于绝对值编码器和位置模式，启用后需要重新归零。 Bit11 (POS_TOR)：位置到位后限制扭矩，用于较大转盘机械定位后防止扭矩较大，而导致的机械上的磨损或者伺服的报警 Bit13 (END_SPEED)：转盘尾段速度激活
P58560	到位扭矩限制延迟	当位置到达设定范围内，且速度在零速门限内，切换至最大扭矩的百分比；1=100%最大扭矩 (55045、55046)
P51545	扭矩限制切换值	
P52507	零速门限	
P52508	零速监测时间	
P58539	停止减速度	

		值越大下降越快
P58559	规划速度来源	0: AD 模式控制 1: DSP 模式控制 (配合我司电脑-NET 通讯)
P58562	DSP54 命令偏移	0: 对应 F1、P1 通道 1: 对应 F2、P2 通道;以此类推 (配合电脑-NET 通讯)
P58541	寻零方式:	35: 当前位置归零, Home(0->1)信号触发一次归零完成 (建议信号维持 100ms)。 19 或 20: 正或反自动寻零。给定 Home(0->1)信号,持续有效,此时转盘按寻零快速设定速度 (58542) 走,直到驱动器接收到 Home Switch 信号,切到慢速速度,走到零点偏移位置 (58557) 后,寻零结束,驱动器输出 Home finish 信号给上位机,此时上位机切掉 Home(0->1)信号。寻零结束 (此时实际位置=0)
P58542	寻零快速速度	配合 P58541 (寻零方式) 19 或 20 时使用
P58543	寻零慢速速度	配合 P58541 (寻零方式) 19 或 20 时使用
P58557	零点偏移	配合 P58541 (寻零方式) 19 或 20 时使用,零点偏移量设定
P57117- P57122	Input1~6 量化时间	DI 延迟时间设定
P58600- P58615	设定位置 (1~16 段)	各段的设定位置
P58616- P58631	规划速度 (1~16 段)	各段的最大设定速度,不超过最大规划速度 (58523)
P58632- P58647	规划加速度 (1~16 段)	各段的加速度 (值越大越快)
P58648- P58663	规划减速度 (1~16 段)	各段的减速度 (值越大越快)
P58663- P58679	规划控制字 (1~16 段)	各段速度规划类型 (T、S 型)

### 5.4.3 位置性能参数设定

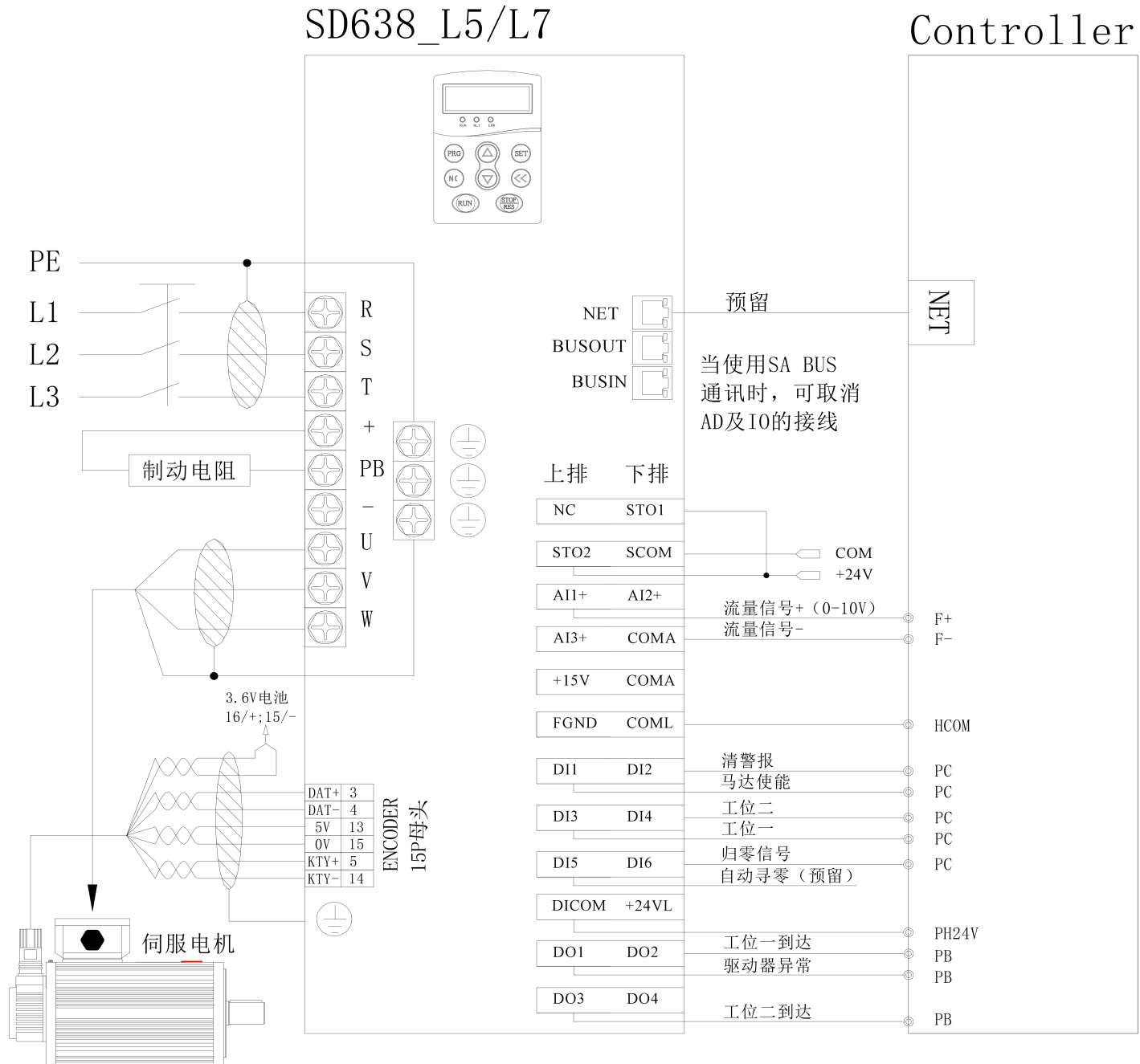
设定参数	参数描述	说明
P55007	速度环 KP	速度比例增益: 速度动态响应调整, 值越大响应越快, 太大会引起震荡
P55008	速度环 KI	速度积分时间: 速度动态稳定性调整, 值越大稳定性越好, 太大会引起震荡
P55042	电流环 KP	电流比例增益 (q 轴): 电流动态响应调整, 值越大响应越快, 太大会引起震荡
P55043	电流环 KI	电流积分时间 (q 轴): 电流动态稳定性调整, 值越大稳定性越好, 太大会引起震荡
P58511	位置环 KP	影响位置跟随控制效果 (起步平顺性以及位置达到的偏差); 越大跟随越快, 位置到达的精度越高, 但动作平顺性越差; 反之跟随越慢, 位置到达的精度越差, 但起步平顺性越好;
P58549	位置控制 Jerk	加加速、加减速、减加速、减减速; 值越大响应越快;

伺服性能调节依运行平顺稳定、低噪音、高定位精度原则进行调节。

## 5.5 标准接线

电动转盘接线图:






电动转盘接线图



## 第六章 故障处理

### 6.1 故障复位

在故障排除之后，通过键盘上的 、数字开关量输入、切断伺服驱动器电源等方式可以清除故障显示、使 ERR 指示灯恢复为常灭状态。具体警报信息显示参数为 A50037。

### 6.2 故障内容及对策

故障代码	名称	原因	对策
E00001	实际电流过大	<ol style="list-style-type: none"> <li>1. RST三相输入与驱动器的输出端UVW接线错误（适用于未使能就产生该警报）；</li> <li>2. 负载突变；</li> <li>3. 驱动器参数设置不当，导致电流震荡至极限；</li> <li>4. 编码器问题引起；</li> <li>5. 电机油泵故障引起；</li> <li>6. 高速时弱磁太多；</li> </ol>	<ol style="list-style-type: none"> <li>1. 检查 RST 及 UVW 接线，是否松动、未接，相序是否正确；</li> <li>2. 设法降低驱动器输出最大电流，增加恒功率功能；</li> <li>3. 适当调整电流环KpKi、过载系数（扭矩上下限）若为急加减速时产生，可增大相关动作的ramp；</li> <li>4. 检查编码器线及旋变板；</li> <li>5. 查看最大电流记录A50503 是否达到极限，检查油泵；</li> <li>6. 高速超转太多，降低最高转速；</li> </ol>
E00003	驱动器过温	<ol style="list-style-type: none"> <li>1. P51008 参数设置错误；</li> <li>2. 风扇是否损坏；</li> <li>3. 是否外部环境温度过高并长时间高负载运行；</li> <li>4. 温度传感器线损坏或检测电路故障；</li> </ol>	<ol style="list-style-type: none"> <li>1. P51008 设定值默认为 90；</li> <li>2. 更换风扇；</li> <li>3. 减小运行环境温度、降低工况；</li> <li>4. 更换温度传感器线，交由专业人员检修电路；</li> </ol>
E00004	马达过温	<ol style="list-style-type: none"> <li>1. 电机感温线类型设定有误</li> <li>2. 过载严重；</li> <li>3. 马达风扇是否故障或供电异常</li> <li>4. 编码器线故障或走线不合理，导致 KTY 信号被干扰</li> </ol>	<ol style="list-style-type: none"> <li>1. 检查 P52500 参数设置，1: KTY，2: PTC；</li> <li>2. 加大马达规格；</li> <li>3. 检查风扇供电，更换马达风扇；</li> <li>4. 更换编码器线或者合理走线</li> </ol>
E00005	母线电压过高	<ol style="list-style-type: none"> <li>1. 母线电压检测异常</li> <li>2. 供电电压过高</li> <li>3. 刹车电阻配置或接线异常</li> <li>4. 刹车惯量太大，减速时间过小；</li> </ol>	<ol style="list-style-type: none"> <li>1. 若量测值与 A50003 偏差大于 15V，请联系专业人员进行检修；</li> <li>2. 若高于标准值 20%，请设法降低电网电压；</li> <li>3. 检查接线，按附件刹车电阻选配表加装刹车电阻；</li> <li>4. 加大减速时间 P53211；</li> </ol>
E00006	马达过速	<ol style="list-style-type: none"> <li>1. P55010、P55011 速度限制范围太小；</li> <li>2. 速度环 Kp、Ki 设定不合理，系统震荡发散；</li> <li>3. 编码器受干扰，导致速度波动</li> </ol>	<ol style="list-style-type: none"> <li>1. 依实际情况设置 P55010、P55011 参数；</li> <li>2. 调整速度环 Kp（P55007）Ki（P55008）；</li> <li>3. 编码器线远离干扰源，线上加磁</li> </ol>

			环等消除高频干扰；
E00007	编码器反馈错误	<ol style="list-style-type: none"> <li>1. 编码器线连接异常</li> <li>2. 编码器线受干扰；</li> <li>3. 旋变板硬件故障；</li> </ol>	<ol style="list-style-type: none"> <li>1. 量测编码器信号阻值：<math>\sin\pm</math>、<math>\text{con}\pm=43\Omega</math>，<math>R\pm=37\Omega</math></li> <li>2. 编码器线远离强电干扰，并加磁环等消除高频干扰；</li> <li>3. 联系专业人员进行检修；</li> </ol>
E00008	压力控制反转错误	<ol style="list-style-type: none"> <li>1. 反转限制时间设置过小；</li> <li>2. 压力传感器损坏或信号干扰；</li> <li>3. 油路结构异常，油压泄不掉；</li> </ol>	<ol style="list-style-type: none"> <li>1. 加大 P55065 设置值；</li> <li>2. 更换压力传感器，更换屏蔽线且屏蔽层接地，增加磁环；</li> <li>3. 持续反转，但油压仍泄不掉，油压表仍有压力留存，检查油路；</li> </ol>
E00009	网络通讯断线	<ol style="list-style-type: none"> <li>1. 仅限于控制源为 DSP54 时才会报警。</li> <li>2. 检查是否连接网线至主机；</li> </ol>	<ol style="list-style-type: none"> <li>1. 检查网络接线</li> </ol>
E00010	制动放电错误	<ol style="list-style-type: none"> <li>1. 进线 RST 电压过高导致母线电压过高，上电后直接达到 P51023 制动限值；</li> <li>2. 母线电压 A50003 与实际量测不符；</li> <li>3. 马达是否处于被动反转状态；</li> <li>4. 使能时报警，请检查刹车电阻选配是否合理或未接；</li> <li>5. 使能时报警，是否刹车惯量太大，减速时间过小；</li> </ol>	<ol style="list-style-type: none"> <li>1. 检查 P51023 参数是否与选用进线电网相匹配；</li> <li>2. 若量测值与 A50003 偏差大于 15V，请联系专业人员进行检修；</li> <li>3. 检查电机轴端是否有其它动力元件在托运，如油压持续反冲；</li> <li>4. 按附件刹车电阻选配表加装刹车电阻；</li> <li>5. 加大减速时间 P53211；</li> </ol>
E00011	驱动器未就绪	<ol style="list-style-type: none"> <li>1. 电网合闸送电后，7S 后才会吸合 Relay，若在此时间内送使能，将导致报警；</li> <li>2. A50003 直流母线电压显示值是否与实际量测值相同；</li> <li>3. 检查母线电压 A50003 是否过低，导致 Relay 不吸合；</li> <li>4. P51003 参数设置不合理；</li> <li>5. 是否强电未送时的 IO 干扰，导致使能有效；</li> </ol>	<ol style="list-style-type: none"> <li>1. 延迟 7S 后再送使能信号；</li> <li>2. 若量测值与 A50003 偏差大于 15V，请联系专业人员进行检修；</li> <li>3. 检查进网 RST 电压是否偏离标准值；</li> <li>4. 依据进网电压合理设置 P51003；</li> <li>5. IO 点增加量化时间；</li> </ol>
E00012	母线电压过低	<ol style="list-style-type: none"> <li>1. P51003 设定错误；</li> <li>2. 进线电网过低或进线电网功率不足，重载下电压被拉低；</li> </ol>	<ol style="list-style-type: none"> <li>1. 正确设置 P51003；</li> <li>2. 检查进线电网电压及电网功率是否满足要求；</li> </ol>
E00014	马达自主学习错误	<ol style="list-style-type: none"> <li>1. 电机参数设置错误；</li> <li>2. 编码器线未接或接线不正确；</li> <li>3. 自主学习限制电流 P56012 是否设置正确；</li> </ol>	<ol style="list-style-type: none"> <li>1. 正确设置电机参数；</li> <li>2. 正确连接编码器线；</li> <li>3. P56012 设置为电机额定或驱动器额定的较小值；</li> </ol>
E00015	堵转/速度控制过饱和	<ol style="list-style-type: none"> <li>1. 检查马达是否能自由旋转，或无负载状态下控制是否正常</li> <li>2. 检查扭力限是否合适：P55046(扭力上限)，P55045(扭力下限)</li> <li>3. 多数出现在多系统的从站：油泵内泄小，或扭矩极限导致（更改控制方式：低速闭环时主转从停；增加内泄或放开扭矩）；</li> </ol>	<ol style="list-style-type: none"> <li>1. 脱离负载运行看是否正常；</li> <li>2. 适当加大 P55046(扭力上限)，P55045(扭力下限)；</li> <li>3. 加大油泵内泄量；</li> </ol>

E00016	I2T 过载保护	1.检查工况，必要时抓曲线分析，驱动器是否长时间超额运行。	1. 机器配置正常，请设法降低生产工况；
E00023	监测电流过大	1. RST三相输入与驱动器的输出端UVW接线错误（适用于未使能就产生该警报）； 2.负载突变 3.驱动器参数设置不当，导致电流震荡至极限； 4.编码器问题引起； 5.电机油泵堵转； 6.高速时弱磁太多；	1.检查 RST 及 UVW 接线，是否松动、未接，相序是否正确； 2.设法降低驱动器输出最大电流，增加恒功率功能； 3.适当调整电流环KpKi、过载系数（扭矩上下限）若为急加减速时产生，可增大相关动作的ramp； 4.检查编码器线及旋变板； 5.查看最大电流记录A50503是否达到极限，检查油泵； 6.高速超转太多，降低最高转速；
E00025	Relay 反馈错误	1.Relay 未吸合并持续有大电流；	1. 上电时检查 Relay 是否有吸合声，RLY 灯是否正常亮起； 2. 检查 Relay 信号线接线是否正常； 3. 检查 Relay 是否正常；
E00030	无实际电压输出	1. 是否驱动器到马达的 UVW 未接线或松动；	1. 检查 UVW 接接线； 2. 硬件故障，联系专业人员进行检修；
E00031	AC 相传感器偏移过大	1.AC 相校正错误 2.硬件故障；	1. 联系专业人员进行检修；
E00101	CAN 节点保护错误	1.CAN接线错误 2.P57501、P57502 设定错误	1. 检查首尾驱动器是否短接 TR 和 CAN- 端子； 2. 检查参数；
E00102	CAN 主站配置错误	1.CAN接线异常 2.主站拨码设定从站个数与实际不符 3.硬件故障	1. 终端电阻是否接好，量测 CAN+ 与 CAN-间阻值为 60Ω； 2. 检测其余从站节点设置，节点是否有遗漏，从站个数与 P57574 对应； 3. 检查每台驱动器 CAN 阻值是否正常（50kΩ左右）；
E00103	CAN 节点重复	1.从站中有相同的节点地址；	1. 检查各台从站节点地址，不允许有重复；
E00104	CAN 从站未使能	从站使能信号信号异常	1. 使能后，观察从站驱动器数码管首位下横是否正常亮；
E00106	CAN 通讯离线	1. CAN 物理接线异常 2.57577 设定错误	1. 检查接线 2. 检查 57577 设定是否与实际吻合
E00107	DSP54 通讯错误	1.网线连接异常	1. 检查网络连线；
E00108	CAN 从站错误	1.请检查该从站的具体错误。 2.请检查 CAN 物理联机是否正常。 3.若从站无错误，则主站与从站断线	1. 排查从站错误；
E00110	EtherCAT 离线	1.网线连接异常或硬件故障 2.主站配置错误	1.检查硬件连接； 2.检查主站及相关配置。

E00120	位置跟随错误	位置设定值(58513)与位置实际值(58514)的偏差超过位置跟随门限(58515), 持续时间大于位置跟随超时时间(58516)	<ol style="list-style-type: none"> <li>1.位置跟随门限(58515)太小。</li> <li>2.位置跟随超时时间(58516)太短。</li> <li>3.位置控制增益(58511)太小</li> <li>4.位置控制增益(58511)太大(位置控制不稳定或振荡)</li> <li>5.负载过大, 导致电流极限</li> </ol>
E00121	位置设定错误	位置控制相关参数设定不正确, 导致task无限循环或多端规划中速度方向变	<ol style="list-style-type: none"> <li>1.设定目标位置或速度超过限制</li> <li>2.连续段的位置或后续端设定不正确</li> </ol>
E00122	位置超过范围	位置控制中位置范围超过编码器多圈范围, 启用51018中的bit2可以启用该功能	检查50044编码器数据里面实际编码器多圈数, 若接近0或4096圈(以马达实际多圈数为准), 可以分离机械结构速度模式运行一段时间或激活51020参数中的ABS_Muti功能, 激活改功能后(sick编码器会自清除)建议驱动器重启后再次归零
E00130	编码器通讯错误	编码器通讯异常, 编码器无数据	<p>检查编码器通讯协议是否匹配</p> <p>检查编码器连接或更换编码器线</p>
E00132	编码器供电电池报警	电池电压低未接或有拆装过	当电机反馈线有拆装过会报, 可清除; 当电池电压约 $\leq 3V$ 以下时报警, 此时需更换电池; 在更换电池后, 建议重做归零动作
E00134	自学习编码器信号错误	寻零或自学习时编码器信号丢失	<ol style="list-style-type: none"> <li>1.检查编码器线或马达线连接是否正常</li> <li>2.检查马达/油泵是否卡死或负载过大无法转动</li> <li>3.寻零时警报适当加大 56005</li> <li>4.自学习时警报适当加大 56012</li> </ol>
E00152	STO 错误	使能时 PWM 强制关断	<ol style="list-style-type: none"> <li>1.检查 STO1、STO2 接线</li> <li>2.在驱动器正常工作即 CPU 运行状态下让 STO1/STO2 均失效, 再同时有效, 即可解除报警</li> </ol>
E00200	自动归零错误	位置控制时, 自动归零功能, 长时间未监测到到位信号 (DI - home Switch)	检查外部信号

## 附录 A 外围选配件

### A.1 断路器和电磁接触器

为了能在系统故障时，有效的切断伺服驱动器的输入电源，可以在输入侧安装电磁接触器控制主回路电源的通断，以保证安全。

驱动器型号	断路器保护电流 (A)	接触器额定工作电流 (A)
SD638L5F3	25	26
SD638L7F3	32	26
SD638K1F3	50	38

### A.2 制动器件

SD638 系列伺服驱动器 11KW（含）以下功率均内置制动单元。请根据具体的现场情况（制动力矩要求和制动使用率要求）来选择制动电阻的阻值和功率。

驱动器型号	制动单元	制动电阻值推荐功率	制动电阻推荐阻值
SD638L5F3	内置标配	≥600W	≥56Ω
SD638L7F3			
SD638K1F3			

### A.3 选择线耳规格

根据不同功率等级，选择不同线径规格动力电缆线及线耳。

动力电缆建议选用带屏蔽层电缆，屏蔽层有效接地。



图 A-1 推荐线耳类型

驱动器型号	推荐动力电缆线径 mm <sup>2</sup>	线耳规格
SD638L5F3	2.5	2-4
SD638L7F3	4	3.5-5
SD638K1F3	6	6-5

## A.4 编码器反馈线

反馈线自带电池盒，推荐使用双绞屏蔽线材，长度不超过 20m，强电线与编码器反馈线建议分开走线，或增加金属管进行隔离，来确保编码器反馈信号的稳定性；

## 附录 B 常用参数表

属性说明：

“RO”：表示该参数码的只能读不能改。

“RW”：表示该参数码在任何情况都能进行读写。

“SW”：表示该参数码可读，但只有在无使能的情况下才能进行修改。

### B.1 状态显示参数

ID	名称	出厂值及说明	单位	最小值	最大值	属性
50001	实际速度（滤波后）	0	rpm	-210000	210000	RO
50003	直流母线电压	540	V	0	63000	RO
50004	输出电压（滤波后）	380	V	0	63000	RO
50006	实际电流（滤波后）	0	A	0	10000	RO
50007	d轴电流	0	A	-10000	10000	RO
50008	q轴电流	0	A	-10000	10000	RO
50012	实际功率（滤波后）	0	kW	0	100000	RO
50014	马达温度	0	℃	-80	200	RO
50015	驱动器温度	0	℃	-80	200	RO
50019	AD1	0	V	-10	10	RO
50020	AD2	0	V	-10	10	RO
50021	AD3	0	V	-10	10	RO
50024	驱动器 IO 点状态	0		0	65535	RO
50025	程序更新时间	0		0	0xFFFFFFFF	RO
50026	程序版本	0		0	0xFFFFFFFF	RO
50037	警报信息	0		0	65535	RO
50502	最大速度记录	0	rpm	-210000	210000	RW
50503	最大电流记录	0	A	-10000	10000	RW
50504	最大扭力记录	0	Nm	-100000	100000	RW

### B.2 控制参数

ID	名称	出厂值及说明	单位	最小值	最大值	属性
55048	控制模式	0: Torque control mode; 1: Speed control mode; 2: V/f control mode; 7: Pressure control mode;		0	8	SW
57133	控制源	0: AD; 1: RS232; 2: DSP54; 3: PC; 4: CAN;		0	5	SW
57573	外部控制命令	4: 寻零				SW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
		5: 参数保存到 ROM 7: 参数初始化 (重置) 21: 静态自学习 22: 动态自学习				
56012	自学习-电流限制	0				RW
51002	驱动器输入电压	400	V	0	63000	SW
51003	直流母线电压下限	380	V	0	900	SW
51004	直流母线电压上限	780	V	0	900	SW
51010	过载倍数	1.6		1	1.7	SW
51021	马达功率限制	0	/	0	10000	SW
51022	马达制动功率限制	0	/	-10000	0	SW
51023	放电门限	730	V	0	900	SW
51500	马达额定电压	0	V	0	63000	RW
51501	马达额定电流	0	A	0	10000	RW
51502	马达额定功率	0	kW	0	100000	RW
51503	磁极对数	4		0	127	SW
51505	马达额定转速	2000	rpm	0	210000	RW
51507	马达扭矩常数	0	Nm/A	0	100	RW
51508	马达电压常数	0	V/krpm	0	63000	RW
51515	最大系统速度	2000	rpm	0	210000	RW
51531	马达反向	1		0	1	SW
52000	编码器类型	1:AbsEncoder; 2:resolver; 3:IncEncoder; 4:sincos encoder;		0	5	SW
52002	零点 offset	270		0	360	SW
52500	马达温度 sensor 类型	0:NONE; 1:KTY84; 2:PTC130-3 3:PTC1000	/	0	5	SW
53210	速度斜坡升时间	80	ms	0	65535	RW
53211	速度斜坡降时间	100	ms	0	65535	RW
55007	速度环 KP	2	Nms/rad	0	10000	RW
55008	速度环 KI	0.0125	s	0	10000	RW
55042	电流环 KP	3	V/A	0	10000	RW
55043	电流环 KI	0.0625	s	0	10000	RW
55045	扭矩下限	0	Nm	-1000	0	RW
55046	扭矩上限	0	Nm	0	1000	RW
55050	压力控制第一组 Kp	1		0	100	SW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
55051	压力控制第一组 Ki	0.005		0	10	SW
55056	压力控制斜坡升时间	50	ms	0	65535	SW
55057	压力控制斜坡降时间	50	ms	0	65535	SW
55061	压力传感器最大压力	250	bar	0	1000	SW
55062	最大系统压力	140	bar	0	1000	SW
55063	底流压力	0	bar	0	1000	SW
55064	底流速度上限	0	%	0	100	SW
55069	压力控制速度下限	-200	rpm	-210000	0	SW
55070	压力特参	20		0	1000	SW
55071	速度特参	10		0	1000	SW
55072	实际警报压力	170	bar	0	10000	SW
57103	Input1 配置	0: No Function: 无功能		0	65535	SW
57104	Input2 配置	1: Enable Motor: 马达使能 2: Reset Alarm: 清除警报		0	65535	SW
57105	Input3 配置	14: Enable Reset: 使能/清除 警报, 使能清除报警功能合用。		0	65535	SW
57106	Input4 配置	16: Motion Task Selection		0	65535	SW
57107	Input5 配置	bit0: task 选择 bit0, 4 个 IO 共同组成 16 个 TASK 选择功能。		0	65535	SW
57108	Input6 配置	17: Motion Task Selection bit1: task 选择 bit1, 4 个 IO 共同组成 16 个 TASK 选择功能。 18: Motion Task Selection bit2: task 选择 bit2, 4 个 IO 共同组成 16 个 TASK 选择功能。 19: Motion Task Selection bit3: task 选择 bit3, 4 个 IO 共同组成 16 个 TASK 选择功能。 20: Activate Motion Task(0->1): task 激活, 激活 TASK, 注意和 TASK 选择的 时序配合。 21: Home(0->1): 寻零激活, 位置模式寻零功能更激活。 24: Home Switch: 寻零开关, 外部寻零时的零点开关信号。 25: Jog1: jog 正向, 位置模 式寸动正。 26: Jog2: jog 反向, 位置模 式寸动反。 40: Postive active: 正向激活,		0	65535	SW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
		转盘正向激活。 41: <b>Negative active</b> : 反向激活, 转盘正向激活。 47: <b>Four to two</b> : 跨工位使能, 转盘跨工位使用, 4 工位变 2 工位使用。				
57109	Output1 配置	0: <b>No Function</b> : 无功能, 强制输出 1。		0	65535	SW
57110	Output2 配置	1: <b>Alarm Output</b> : 警报输出。		0	65535	SW
57111	Output3 配置	12: <b>Target reached</b> : 位置到达, 位置达到门限和时间后输出。 13: <b>Home finish</b> : 寻零完成, 位置寻零完成后输出。 18: <b>Station reach</b> : 工位到达, 位置控制中到达设定位置后输出。 19: <b>Task1 reach</b> : task1 到达, 左工位到达指示 180 度转盘使用。 20: <b>Task2 reach</b> : task2 到达, 右工位达到指示 180 度转盘使用。 21: <b>Task bit0</b> : task-bit0, 4 个输出用来显示当前位置处于哪一个 TASK 之间。 22: <b>Task bit1</b> : task-bit1, 结合工位达到使用, 工位未达到则在两个工位之间。 23: <b>Task bit2</b> : task-bit2, 结合工位达到使用, 工位未达到则在两个工位之间。 24: <b>Task bit3</b> : task-bit3, 结合工位达到使用, 工位未达到则在两个工位之间。 25: <b>Postive reach</b> : 正向达到, 正向任务完成。 26: <b>Negative reach</b> : 反转到达, 反向任务完成。 38: <b>task1 reach</b> : task1 到达, 第 1 个 TASK 到达位置后输出。 39: <b>task2 reach</b> : task2 到达, 第 2 个 TASK 到达位置后输出。 40: <b>task3 reach</b> : task3 到达, 第 3 个 TASK 到达位置后输出。 41: <b>task4 reach</b> : task4 到达, 第 4 个 TASK 到达位置后输		0	65535	SW
57112	Output4 配置			0	65535	SW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
		出。				
57503	节点地址	2		1	126	SW
57568	是否启用 CAN Master 功能	False: 不启用 True: 启用		0	1	SW
57582	主从站个数设定	0		0	65535	SW
58000	AD1 偏移值	0		-10	10	SW
58010	AD2 偏移值	0		-10	10	SW
58020	AD3 偏移值	0		-10	10	SW
58408	速度编码器增量	1		1	4294967 295	SW
58409	速度马达圈数	1		1	4294967 295	SW
58410	减速机电机端圈数	10		1	4294967 295	SW
58411	减速机输出端圈数	1		1	4294967 295	SW
58412	输出端单位增量	36000		1	4294967 295	SW
58413	输出端圈数	1		1	4294967 295	SW
58414	位置转化因子	1		1	4294967 295	RO
58415	速度转化因子	1		1	4294967 295	RO
58416	速度归一化因子 1	1		1	4294967 295	RO
58417	速度归一化因子 2	1		1	4294967 295	RO
58418	加速度转化因子	1		1	4294967 295	RO

ID	名称	出厂值及说明	单位	最小值	最大值	属性
58419	位置控制极性	0		0	255	SW
58500	控制字	0		0	65535	RW
58501	状态字	0		0	65535	RO
58502	操作模式	Block Mode		-128	127	SW
58503	实际操作模式	0		-128	127	RO
58504	位置控制频率	1	khz	1	8	SW
58505	位置设定滤波时间常数	0	ms	0	1000	SW
58506	默认速度因子	0	%	0	200	SW
58507	插补模式 buffer 设定	0		0	16	SW
58511	位置控制 Kp	0	1/s	0	1000000	SW
58512	位置控制积分时间	0	ms	0	100000	SW
58513	设定位置	0		-214748 3648	2147483 647	RO
58514	实际位置	0		-214748 3648	2147483 647	RO
58515	位置跟随偏差门限	0		0	4294967 295	SW
58516	位置跟随偏差时间	0	ms	0	65535	SW
58519	位置到达门限	0		0	4294967 295	SW
58520	位置到达时间	0	ms	0	65535	SW
58521	跟随误差	0		-214748 3648	2147483 647	RO
58522	buffer 剩余设定个数	0		-214748 3648	2147483 647	RO
58523	最大规划速度	0		-214748 3648	2147483 647	RO
58524	实际规划速度	0		-214748 3648	2147483 647	RO
58525	实际规划位置	0		-214748 3648	2147483 647	RO
58526	位置 PID 输出	0		-214748 3648	2147483 647	RO
58527	位置控制默认速度	0		-214748 3648	2147483 647	RO
58528	位置控制总设定速度	0		-214748 3648	2147483 647	RO

ID	名称	出厂值及说明	单位	最小值	最大值	属性
58529	位置控制实际速度	0		-214748 3648	2147483 647	RO
58530	目标位置	0		-214748 3648	2147483 647	SW
58531	最小位置设定	-2147483648		-214748 3648	2147483 647	SW
58532	最大位置设定	2147483647		-214748 3648	2147483 647	SW
58533	加减速 Jerk	0		0	4294967 295	SW
58534	减加速 Jerk	0		0	4294967 295	SW
58535	减减速 Jerk	0		0	4294967 295	SW
58536	尾端规划速度	5	rpm	-1000	1000	SW
58537	尾端规划扭矩电流	10	A	0	1000	SW
58538	尾端规划时间	2500	ms	0	65535	SW
58539	停止减速度	0		0	4294967 295	SW
58540	位置偏移	0		-214748 3648	2147483 647	SW
58541	寻零方式	1		-128	127	SW
58542	寻零快速段速度	5000		0	4294967 295	SW
58543	寻零慢速段速度	300		0	4294967 295	SW
58544	每圈脉冲数	0	count	0	4294967 295	SW
58545	插补时间单位	1		0	255	SW
58546	插补时间指数	-3		-128	63	SW
58547	外部编码器换算系数	0		0	1000000	SW
58548	编码器位置旋转范围	0		-214748 3648	2147483 647	RO
58549	位置控制 Jerk	10000		0	4294967 295	SW
58550	手动速度	500		0	4294967 295	SW
58551	反向间隙补偿	0		-214748 3648	2147483 647	SW
58552	激活旋转位置方式	FALSE		0	1	SW
58553	旋转位置范围	36000		1	2147483 647	SW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
58554	转盘工位设定	0		0	65535	SW
58555	参考点和编码器零点之间的距离	0		-214748 3648	2147483 647	RO
58556	零点位置	0		-214748 3648	2147483 647	SW
58557	零点偏移	0		-214748 3648	2147483 647	SW
58558	多圈余数	0		-214748 3648	2147483 647	RO
58559	规划速度来源	0		0	65535	SW
58560	到位扭矩限制延迟	500	ms	0	65535	SW
58561	任务附加位置	0		-214748 3648	2147483 647	SW
58562	DSP54 命令偏移	0		0	4294967 295	SW
58563	位置 buffer 时间	0	ms	0	65535	SW
58564	转盘模式切换	0		0	65535	SW
58565	寻零扭矩限制	0.5	%	0	100	SW
58566	寻零完成	0		0	1	RO
58567	设定位置延迟	0	ms	0	500	SW
58568	固定任务激活选择	0		0	65535	SW
58600	设定位置 1	180000		-214748 3648	2147483 647	RW
58601	设定位置 2	0		-214748 3648	2147483 647	RW
58602	设定位置 3	0		-214748 3648	2147483 647	RW
58603	设定位置 4	0		-214748 3648	2147483 647	RW
58604	设定位置 5	0		-214748 3648	2147483 647	RW
58605	设定位置 6	0		-214748 3648	2147483 647	RW
58606	设定位置 7	0		-214748 3648	2147483 647	RW
58607	设定位置 8	0		-214748 3648	2147483 647	RW
58608	设定位置 9	0		-214748 3648	2147483 647	RW
58609	设定位置 10	0		-214748 3648	2147483 647	RW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
58610	设定位置 11	0		-214748 3648	2147483 647	RW
58611	设定位置 12	0		-214748 3648	2147483 647	RW
58612	设定位置 13	0		-214748 3648	2147483 647	RW
58613	设定位置 14	0		-214748 3648	2147483 647	RW
58614	设定位置 15	0		-214748 3648	2147483 647	RW
58615	设定位置 16	0		-214748 3648	2147483 647	RW
58616	规划速度 1	180000		0	4294967 295	RW
58617	规划速度 2	180000		0	4294967 295	RW
58618	规划速度 3	0		0	4294967 295	RW
58619	规划速度 4	0		0	4294967 295	RW
58620	规划速度 5	0		0	4294967 295	RW
58621	规划速度 6	0		0	4294967 295	RW
58622	规划速度 7	0		0	4294967 295	RW
58623	规划速度 8	0		0	4294967 295	RW
58624	规划速度 9	0		0	4294967 295	RW
58625	规划速度 10	0		0	4294967 295	RW
58626	规划速度 11	0		0	4294967 295	RW
58627	规划速度 12	0		0	4294967 295	RW
58628	规划速度 13	0		0	4294967 295	RW
58629	规划速度 14	0		0	4294967 295	RW
58630	规划速度 15	0		0	4294967 295	RW
58631	规划速度 16	0		0	4294967 295	RW
58632	规划加速度 1	360000		0	4294967 295	RW
58633	规划加速度 2	360000		0	4294967 295	RW
58634	规划加速度 3	0		0	4294967 295	RW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
58635	规划加速度 4	0		0	4294967 295	RW
58636	规划加速度 5	0		0	4294967 295	RW
58637	规划加速度 6	0		0	4294967 295	RW
58638	规划加速度 7	0		0	4294967 295	RW
58639	规划加速度 8	0		0	4294967 295	RW
58640	规划加速度 9	0		0	4294967 295	RW
58641	规划加速度 10	0		0	4294967 295	RW
58642	规划加速度 11	0		0	4294967 295	RW
58643	规划加速度 12	0		0	4294967 295	RW
58644	规划加速度 13	0		0	4294967 295	RW
58645	规划加速度 14	0		0	4294967 295	RW
58646	规划加速度 15	0		0	4294967 295	RW
58647	规划加速度 16	0		0	4294967 295	RW
58648	规划减速度 1	360000		0	4294967 295	RW
58649	规划减速度 2	360000		0	4294967 295	RW
58650	规划减速度 3	0		0	4294967 295	RW
58651	规划减速度 4	0		0	4294967 295	RW
58652	规划减速度 5	0		0	4294967 295	RW
58653	规划减速度 6	0		0	4294967 295	RW
58654	规划减速度 7	0		0	4294967 295	RW
58655	规划减速度 8	0		0	4294967 295	RW
58656	规划减速度 9	0		0	4294967 295	RW
58657	规划减速度 10	0		0	4294967 295	RW
58658	规划减速度 11	0		0	4294967 295	RW
58659	规划减速度 12	0		0	4294967 295	RW

ID	名称	出厂值及说明	单位	最小值	最大值	属性
58660	规划减速度 13	0		0	4294967 295	RW
58661	规划减速度 14	0		0	4294967 295	RW
58662	规划减速度 15	0		0	4294967 295	RW
58663	规划减速度 16	0		0	4294967 295	RW
58664	规划控制字 1	32768		0	65535	RW
58665	规划控制字 2	32768		0	65535	RW
58666	规划控制字 3	0		0	65535	RW
58667	规划控制字 4	0		0	65535	RW
58668	规划控制字 5	0		0	65535	RW
58669	规划控制字 6	0		0	65535	RW
58670	规划控制字 7	0		0	65535	RW
58671	规划控制字 8	0		0	65535	RW
58672	规划控制字 9	0		0	65535	RW
58673	规划控制字 10	0		0	65535	RW
58674	规划控制字 11	0		0	65535	RW
58675	规划控制字 12	0		0	65535	RW
58676	规划控制字 13	0		0	65535	RW
58677	规划控制字 14	0		0	65535	RW
58678	规划控制字 15	0		0	65535	RW
58679	规划控制字 16	0		0	65535	RW

## 用户手册版本变更记录

日期	变更后版本	资料编号	变更内容
2022-10	V1.0	2022-10-11	第一版
2022-11	V1.1	2022-11-02	修正标准接线图





# Foreword

Thank you for choosing SD638 (Air-cooled) series servo drives products of our company!

This manual is the SD638 (Air-cooled) series servo drives user manual (Brief Version).  
Applicable to 1BX\_SD638\*\*\*\*\* series of products.

This manual provides the user selection, installation, parameter setting, the scene debugging and related matters needing attention and guidance of fault diagnosis. Please keep this manual for consulting at any time.

In order to use correctly, please read carefully and understand all contents of this manual before using. Using improperly will cause abnormal operation or shorten the service life, even direct damage to the product.

Confirming when opening (doing inspection work following when you receive the product)

- 1) Whether is the packing complete? Does be affected with damp? Is there any breakage phenomenon? If you have any question, please contact our company or your supplier immediately.
- 2) Whether is the external packing model identification consistent with the ordered model? If you have any question, please contact our company or your supplier immediately.
- 3) Whether the machine nameplate is consistent with the external packing model identification, checking carefully after packaging? If you have any question, please contact our company or your supplier immediately.



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# Chapter 1. Security Considerations

## 1.1 Safety information definition

**Danger:** indicates severe personal injury or even death will result if proper precautions are not taken.

**Warning:** indicates personal injury or equipment damage may result if proper precautions are not taken.

**Prohibition:** indicates equipment damage may result if proper precautions are not taken










**High temperature:** indicates personal injury may result if proper precautions are not taken

**Note:** indicates moderate personal injury may result if proper precautions are not taken





**Trained and qualified professionals:** refers to the operating staff of the equipment must undergo professional training and electrical safety training and pass the examination, already familiar with procedures and requirements of this equipment 's installation, debugging, operational and maintenance , and can avoid all kinds of emergency situations.

## 1.2 Warning signs


The purpose of the warnings is that does warnings for the possibility of serious injury or damage to the equipment, give advice in order to avoid danger. This manual uses the following warning signs:

Sign	name	Comment	logogram
 Danger	Danger	Severe personal injury or even death will result if proper precautions are not taken.	
 Warning	Warning	personal injury or equipment damage may result if proper precautions are not taken	
 Prohibition	Electrostatic sensitive	PCBA board may damage if proper precautions are not taken.	
 High temperature	High temperature	The base of servo drives dedicated to will produce high temperature, prohibit touching.	
 Note	Caution	moderate personal injury may result if proper precautions are not taken	<b>Caution</b>

## 1.3 Safety instructions

	<ul style="list-style-type: none"> <li>◆ Only trained and qualified personnel are allowed to do related operations.</li> <li>◆ Prohibit wiring, inspecting and replacing components etc when the power is on. Before wiring and checking, you must make sure that all the input power has been disconnected and to wait not less than the marking on the servo drives or to confirm that the DC bus voltage is below 36V. Wait schedule is as follows:</li> </ul> <table border="1" data-bbox="292 427 934 507" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2" style="text-align: center;">servo drives model</th> <th style="text-align: center;">At least waiting time</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">380V</td> <td style="text-align: center;">5.5kW-11kW</td> <td style="text-align: center;">5minutes</td> </tr> </tbody> </table>	servo drives model		At least waiting time	380V	5.5kW-11kW	5minutes
servo drives model		At least waiting time					
380V	5.5kW-11kW	5minutes					
	<ul style="list-style-type: none"> <li>◆ Prohibit unauthorized modification on servo drives, or it may cause fire, electric shock or other injuries.</li> </ul>						
	<ul style="list-style-type: none"> <li>◆ The machine is running, the heat sink base may produce high temperature, prohibit touching in order to avoid scald.</li> </ul>						
	<ul style="list-style-type: none"> <li>◆ Electronic components in the servo drives are electrostatic sensitive devices; anti-static measures must be done in the related operation.</li> </ul>						

### 1.3.1 Handling and installation


	<ul style="list-style-type: none"> <li>◆ Select the appropriate handling and installation tools, and ensure the normal and safe operation of the servo drives to avoid personal injury. The installer must take precautions to protect the personal safety, such as wearing anti-smashing shoes, wearing overalls, etc.</li> <li>◆ In handling the installation process, ensure that the servo drives is not subjected to physical shock and vibration.</li> <li>◆ Do not hold the front cover only when handling to avoid falling.</li> <li>◆ Prohibit installing the servo drives on combustibles and avoid servo drives in contact close or adhere to combustibles.</li> <li>◆ According to the wiring diagram to connect optional braking accessories (braking resistor, braking unit or feedback unit).</li> <li>◆ Prohibit wet objects or body parts from contacting servo drives; otherwise there is the risk of electric shock.</li> <li>◆ R, S, T for power input, U, V, W for motor output, correctly connect the input</li> </ul>
---	--

	<b>power and motor cable, otherwise it will damage the servo drives.</b>
--	--

**Note:**

- ◇ The servo drives must be installed in the places where children and others cannot contact.
- ◇ Prevent the screws, cables, and other conductive objects falling into the inside of servo drives.
- ◇ If the installation altitudes above 2000m, servo drives will not meet IEC61800-5-1 low voltage protection.
- ◇ The leakage currents of servo drives when it works may exceed 3.5mA, to use reliable earth and ground resistance and be sure the ground resistance is less than 10Ω, the conductive performance of PE grounding conductor is the same as the conductive ability of phase conductor (use the same cross-sectional area).
- ◇ Use in the suitable environment (according to section 3.1).


## 1.3.2 Debugging and operation

	<ul style="list-style-type: none"> <li>◆ <b>before doing the servo drives terminal connection, you must cut off all the power supply that connect the servo drives, the waiting time after cutting off the power is not shorter than the time marking on the servo drives.</b></li> <li>◆ <b>When servo drives is running, the internal high voltage will be produced, prohibiting any operation except for the keyboard settings.</b></li> <li>◆ <b>This equipment cannot be used as "emergency stop device".</b></li> <li>◆ <b>This device cannot be used as a motor 'emergency brake, mechanical brake system must be installed.</b></li> </ul>
---	--

**Note:**

- ◇ Do not frequently turn on or off the servo drives input power.
- ◇ If the drives is powered down during use, after the drives fully power-down (keyboard power indicator is off), then power on again, otherwise, the drives will not work.
- ◇ If the servo drives has been stored for long time, then check, capacitance adjust (see "Maintenance and hardware diagnostics") and test run before use.
- ◇ Before servo drives running, you must close the front cover; otherwise there will be danger of electric shock.
- ◇ If the servo drives is damaged or missing components, prohibit operating it.


### 1.3.3 Maintenance and components replacement

	<ul style="list-style-type: none"><li>◆ <b>Trained and qualified professionals only are allowed to do the servo drives maintenance, inspection or parts replacement.</b></li><li>◆ <b>before doing the servo drives terminal connection, you must cut off all the power supply that connect the servo drives, the waiting time after cutting off the power is not shorter than the time marking on the servo drives.</b></li><li>◆ <b>During the maintenance, and components replacement process, measures must be taken to avoid the screws, cables and other conductive objects entering into the inside of servo drives.</b></li></ul>
---	---

**Note:**

- ✧ Please use proper torque fastening screws.
- ✧ During the maintenance, and component replacement, must avoid the servo drives and components contact with or adhere to combustible.
- ✧ Not allowed to do insulation test to the servo drives, and not allowed to test servo drives control loop by a megameter.
- ✧ During the maintenance, and component replacement, anti-static measures must be prepared for the servo drives and internal components.

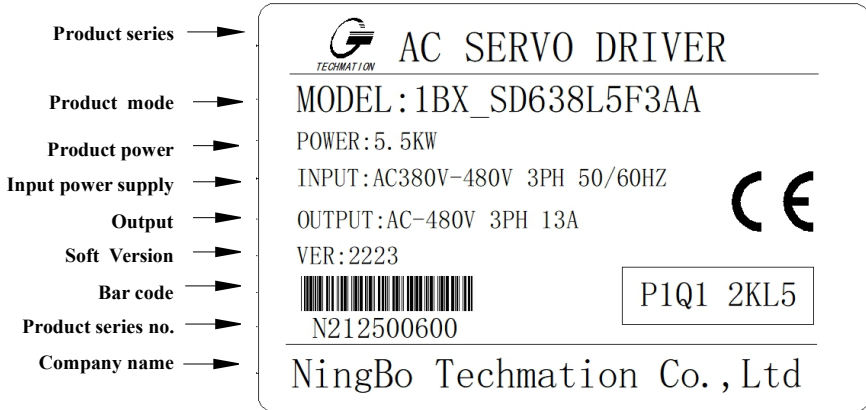
### 1.3.4 Scrap processing

	<ul style="list-style-type: none"><li>◆ <b>The servo drives components contain heavy metals, and after scrap, servo drives is treat as an industrial waste, otherwise it may result in personal injury and environmental pollution.</b></li></ul>
---	---

# Chapter 2. Product Information

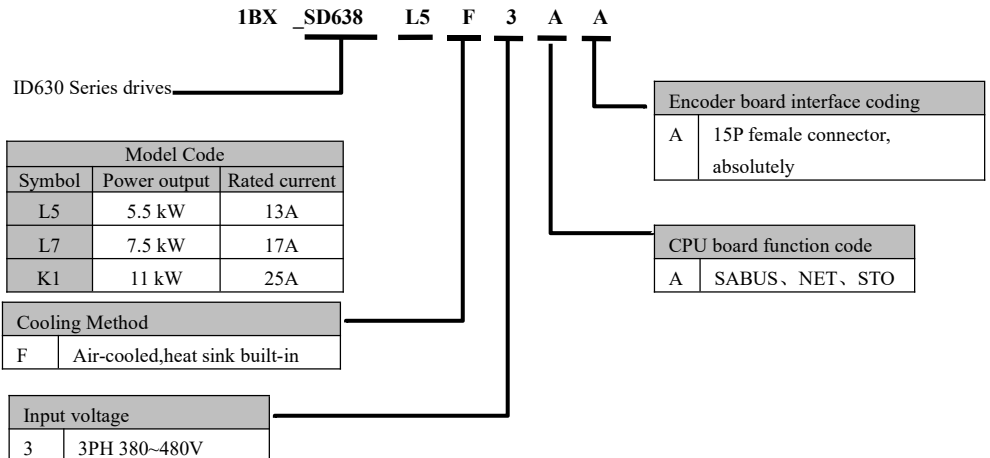
## 2.1 Name Plate

Take 5.5kW Drives with 3PH 380V input for example:



Model instruction : The last identification of product model represents the code of SD638 drives, e.g. in 1BX\_SD638L5F3AA, L5 means 5.5kW.

## 2.2 Model Code for SD638 Drives



## 2.3 Technical Specification for Drives

Function Description	Specification	
Power input	Input voltage (V)	AC 3PH 380~480V (Fluctuation range be allowed: -15%~+10%,AC 323~528V,380V Drivers)
	Input frequency (Hz)	50Hz or 60Hz, Fluctuation range be allowed 47~63Hz
Power output	Output voltage (V)	0~480V
	Output current (A)	Refer to the "ratings".
	Output power (kW)	Refer to the "ratings".
Control performance	Control way	Closed-loop vector control,V/F control
	Motor type	AC permanent magnet synchronous motor
	Control mode	Position mode
	Maximal output frequency	300Hz
	Pressure command type	Analog command (DC0~10V);NET;SABUS
	Over-current capacity	Max. 2.0 times
	Over-load capacity	At 120% rated current, 30 minutes; 150% rated current,90 seconds; 180% rated current,8 seconds;200% rated current, 1 seconds.
Peripheral interface	Input resolution for terminal analog	Less than 10mV
	Input resolution for terminal switch	Less than 1ms
	Analog input	3 ways , DC0~10V
	Digital switch input	6 ways , Public terminal (internal or external power supply 24V)
	Digital switch output	4 ways ,Public terminal(24V)
Protection functions	over-current, over-voltage, under-voltage, over-temperature, phase loss and over-load,etc.	
Communication functions	NET ;SABUS	
Others	Mounting way	Support wall mounting and flange mounting.
	Operation environment temperature	-10~50°C, derating use if it is above 40°C
	Protection class	IP20
	Cooling way	Forced cooling
	Storage temperature	-20~60°C
	Brake unit	Built-in, other options are placed externally.
	Brake resistor	Optional (refer to Appendix A: Peripheral options)

# Chapter 3. Mechanical and Electrical Installation

---

## 3.1 Installation environment

### ◆ Mounted in electrical control cabinet

The servo drives must be mounted in well-protected electrical control cabinet, which prevents it in contact with corrosive and inflammable gases, and prevent conductive object, metal dust, oil mist and liquid into the drives.

### ◆ Temperature/Humidity environment

The servo drives must be guaranteed that in heat convection and heat radiation conditions, the temperature arounding is lower than 50°C and relative humidity is below 90%RH. Storage temperature should be below 70°C.

### ◆ Vibration environment

Various vibration protection measures will be taken to ensure the servo drives will not be affected and the vibration is guaranteed to be less than 0.6G (5.8m/s<sup>2</sup>).

### ◆ Interference

When there are interference equipments surrounding the servo drives, the power line and control wire in servo drives will be greatly interfered, which may lead to malfunction in servo drives. In this case, power filter and other anti-interference measures should be added to ensure normal operation of drives. Special attention should be paid that the control signal line in drives is susceptible to interference, so reasonable wiring and shielding measures must be provided.

For any special installation requirements, please consult with our company for confirmation.

## 3.2 Mounting Methods

### ◆ Mounting Way

It is mounted in a well-ventilated place indoor and adopts vertical mounting. Mounted horizontally or laterally is forbidden.

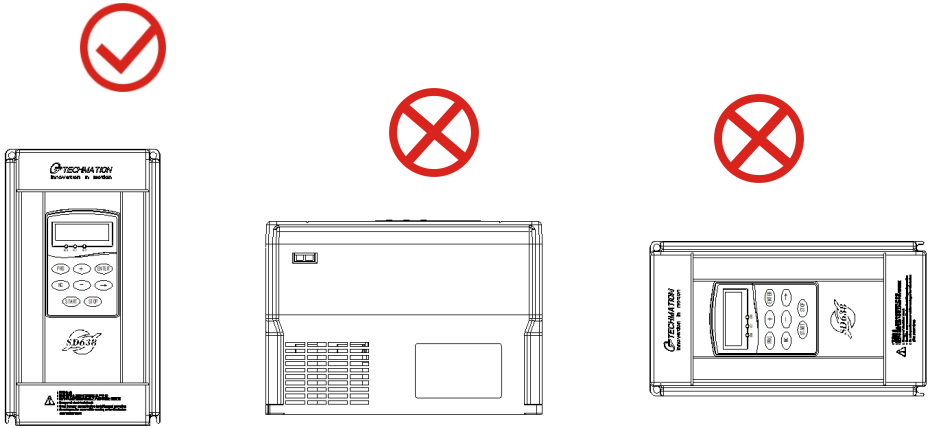


Figure 3-1 Mounting ways of SD638 Series Drives

Signal cabinet installation instructions:

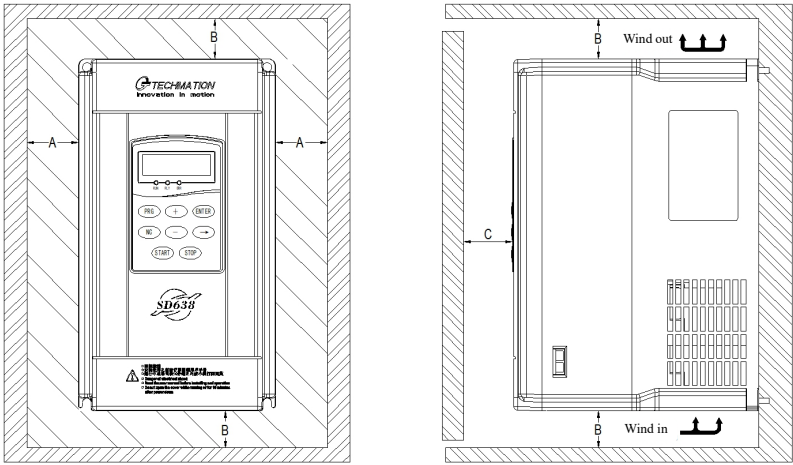


Figure 3-2 Signal Vertical Installation

Power level	Space requirement (mm)		
5.5kW~11kW	A≥10	B≥100	C≥40

Side by side installation is the priority style in the multiple drivers occasion. Thermal baffle felt is indispensable in the up and down installation occasion.

Multiple side by side installation:

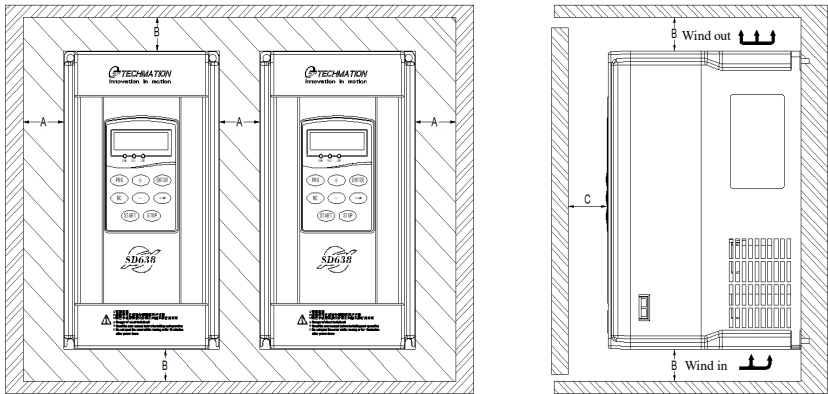


Figure 3-3 Multiple Side by Side Installation

Power level	Space requirement ( mm )		
	5.5kW~11kW	$A \geq 10$	$B \geq 100$

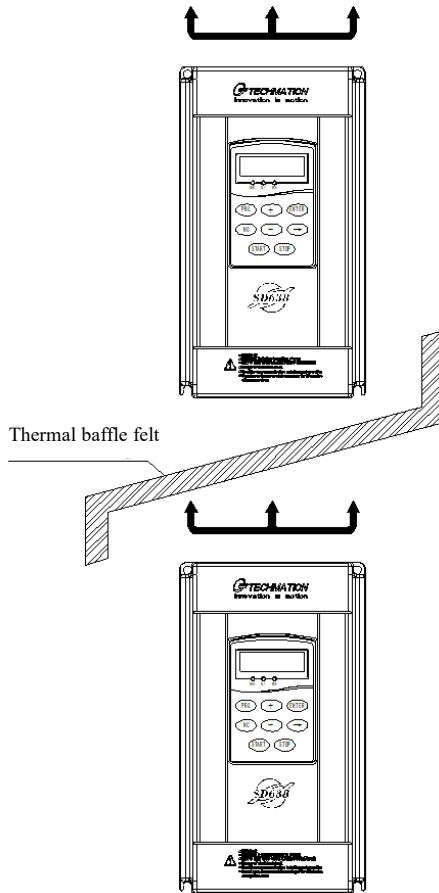


Figure 3-4 Multiple Up and Down Installation

#### ◆ Electric Cabinet Cooling Fan

Air intake and scavenger fans are indispensable for the electric cabinet. Intake fan is installed in the bottom, and needs to install a dust cover. Please clean or change the dust cover regularly. Scavenger fan is installed in the upper, dust cover is needless.

### 3.3 Mounting Dimension

380V Servo drives installation dimensions as shown below:

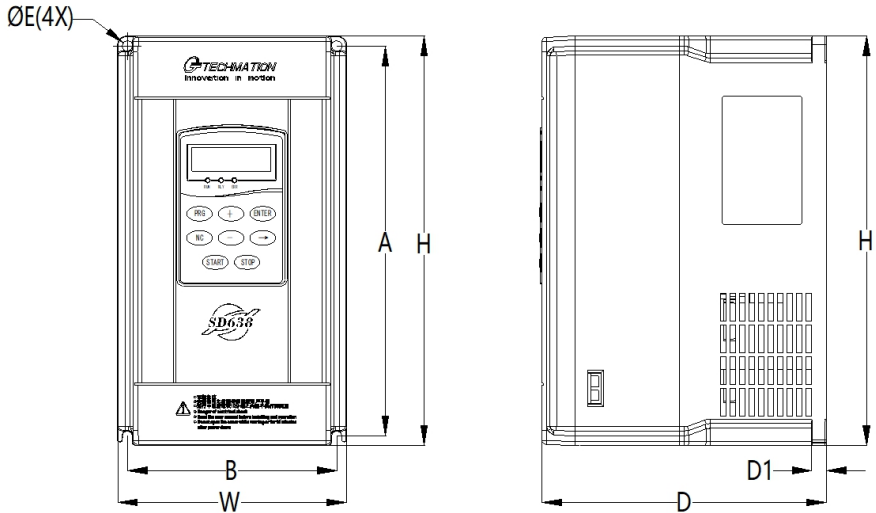


Figure 3-5 Installation Dimension Diagram of 5.5~11kW(380V)

380V Servo drives installation dimensions								
Model (Power rating 380V )	Dimension (mm)				Mounting Hole Site (mm)		Mounting Bore Diameter (mm)	Weight (kg)
	W	D	H	H1	A	B	E	
5.5/7.5/11 kW	140	175	250	9.2	238	128	6.5	3.5

## 3.4 Major Loop Terminal and wiring

### 3.4.1 Major loop terminal type

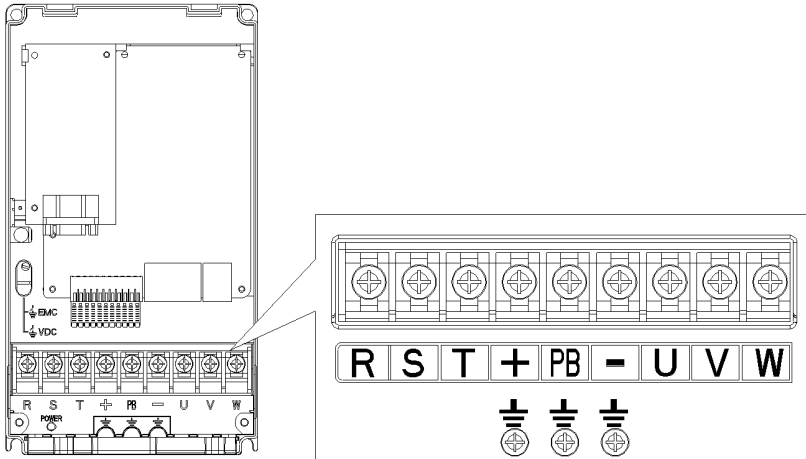



Figure 3-6 5.5-11 kW(380V)Major loop terminal

Symbol	Terminal Name	Function Description
R	Main input terminal R	Three-phase AC major input terminal is connected to the grid.
S	Main input terminal S	
T	Main output terminal T	
U	Output terminal at phase U	The three-phase output terminal of drives is connected to the input terminal.
V	Output terminal at phase V	
W	Output terminal at phase W	
+	DC bus positive terminal	External brake resistor is connected between PB and +.
PB	Terminal of inner brake pipe	
-	DC bus negative terminal	Connect with the negative terminal of external DC mains.
	Grounding terminal (PE)	The grounding terminal for safety protection must be grounded reliably. The grounding resistance is less than 0.1 ohm.

### 3.4.2 Wiring of Major Loop Terminal

Abide by the following matters when wiring is made:

- ◆ Do not make the major loop cable uses the same casing with the cable/encoder cable used for input and output signal or tie such cable together. When wiring is made, a distance of over 30cm will be left between major loop cable and cable/encoder cable used for input and output signal. If it is too close, malfunction will be caused.
- ◆ Brake resistor cable length is less than 5m, and need use high temperature-resistant cable. It is necessary to instal brake resistor far from combustible.
- ◆ Even if the power supply is shut down, high voltage may still exist inside servo drives. To prevent electric shock, please do not touch power supply terminal within 5 minutes.

## 3.5 Control Terminal and wiring

### 3.5.1 Control terminal diagram

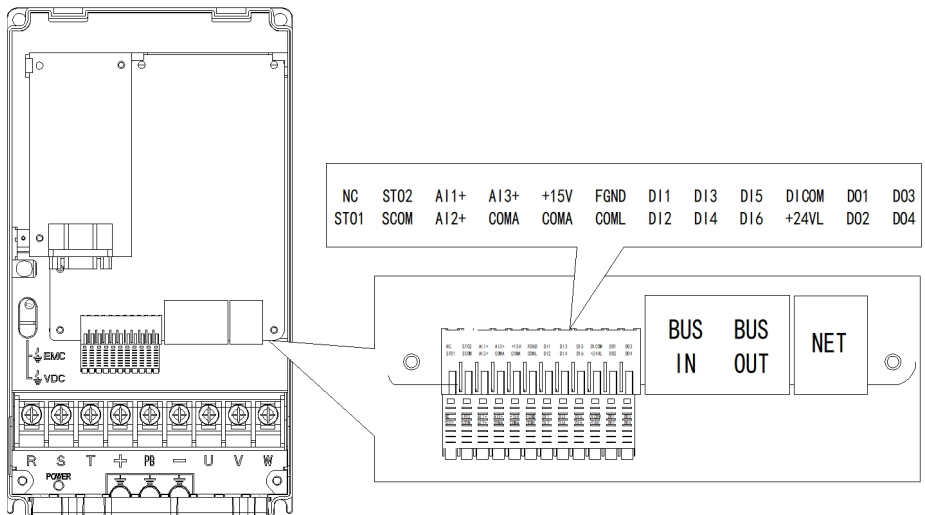


Figure 3-7 Control Terminal

When using our controller, you can choose to use SABUS full digital communication without IO;

### 3.5.2 Description of STO and analog input /output terminals

symbols	Terminal name	Terminal description	Comment
NC	Null	Null	
STO1	STO1 input	STO1 and STO2 need to be effective together, otherwise the driver will alarm 152 when enabled	If you don't use STO function, please effective STO1 and STO2 together. Effective state ask for 24V between STO1/STO2 and SCOM.
STO2	STO2 input		
SCOM	STO reference ground	STO1/STO2 reference ground	24V and 0V input is supported
AI1+	Analog input channel 1	Analog instruction input terminal, free configuration instruction signal, default is Speed analog instruction (Speed Channel).	Maximum identifiable voltage: 10V The corresponding ground terminals are COMA
AI2+	Analog input channel 2	Analog instruction input terminal, free configuration instruction signal, default is Pressure analog instruction (Torque Press Channel).	
AI3+	Analog input channel 3	Analog instruction input terminal, free configuration instruction signal, default is Feedback pressure analog input (Press sensor Channel).	
COMA	Analog input location	Analog input negative end, pressure sensor negative pole.	
+15V	Analog 15V output power	Internal 15V power supply output with maximum output current of 100mA.	This 15V power can be used for pressure sensor
COMA	15V output power source		

### 3.5.3 Description of switch input/output terminals

symbols	Terminal name	Terminal description	Comment
FGND	Earthing of casing	Shield grounding terminal	

symbols	Terminal name	Terminal description	Comment
+24VL	Digital 24V power output	Supply digital 24V power outward with a maximum output current of 50mA.	COML (digital) and COMA (analog) are both COM
COML	24V power COM		
DICOM	Switch input public terminal	The input is effective when there is 24V between the public terminal and DI terminal.	Support only internal or external 24V connection DICOM
DI1	Switch input 1	terminal function can be configured freely, parameter identification 57103, default function: Servo enable	1. 0~9V voltage input is acceptable; 2. The terminal is an optical coupling input, and only NPN connection is supported; 3. The corresponding public terminal is DICOM
DI2	switch input 2	terminal function can be configured freely, parameter identification 57104, default function: Reset alarm.	
DI3	Switch input 3	terminal function can be configured freely, parameter identification 57105, default function: forward	
DI4	Switch input 4	terminal function can be configured freely, parameter identification 57106, default function: reversel	
DI5	switch input 5	terminal function can be configured freely, parameter identification 57107, default function:Return to zero arrival	
DI6	switch input 6	terminal function can be configured freely, parameter identification 57108, default function: Return to zero	
DO1	Switch output 1	Switch output terminal 1, terminal function can be configured freely, parameter identification 57109, default function: alarm output	Transistor output, the common terminal is+24VL, when the output is valid, 24V voltage is formed with the common terminal
DO2	Switch output 2	Switch output terminal 2, terminal function can be configured freely, parameter identification 57110, default function: Station 1 arrivall	
DO3	Switch output 3	Switch output terminal 3, terminal function can be configured freely, parameter identification 57111, default	

symbols	Terminal name	Terminal description	Comment
		function:Station 2 arrivall	
DO4	Switch output 4	Switch output terminal 4, terminal function can be configured freely, parameter identification 57112, default function: Zeroing completel	

### 3.5.4 Description of Communication terminals

symbols	Terminal name	Terminal description	Comment
BUS IN	SABUS Input	SABUS communication terminal	
BUS OUT	SABUS Output		
NET	EtherNET terminal	EtherNET interface	Connect to PC or upper computer

### 3.5.5 Peripheral circuit and STO signal wiring

STO1 and STO2 need get signal together,otherwise drive will alarm or enable signal cut off. If you don't use STO function,please effective STO1 and STO2 together.

STO function Logic:

STO1 and STO2 signal is same or not	STO1 signal	STO2 signal	Enable	Alarm or not	How to clear alarm
Same	Effective	Effective	OK	None	/
Same	Ineffective	Ineffective	NG	Alarm	Invalidate STO1 and STO2 together first,then validate STO1 and STO2 together
Different	Effective	Ineffective	NG		
Different	Ineffective	Effective	NG		

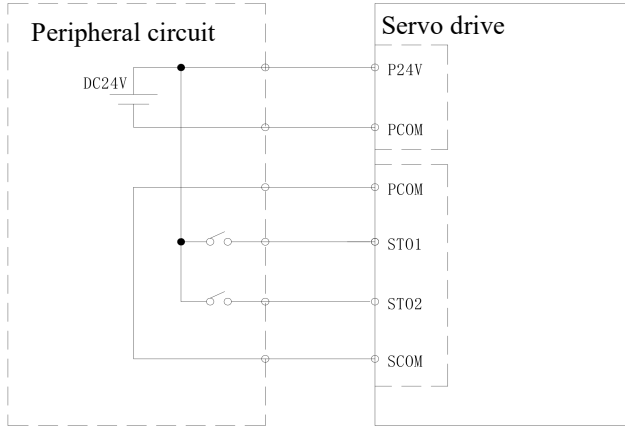


Figure 3-8 External power supply button switch connection common PCOM

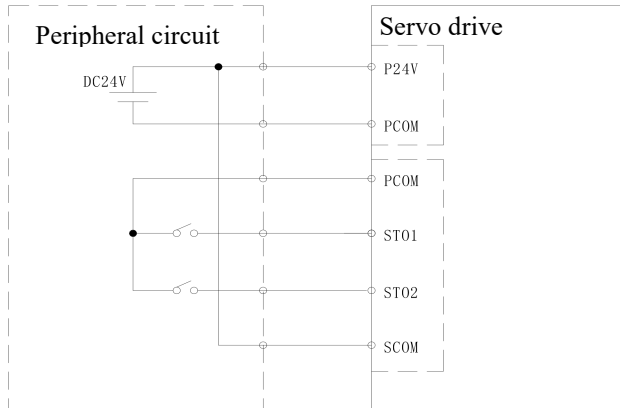


Figure 3-9 External power supply button switch connection common P24V

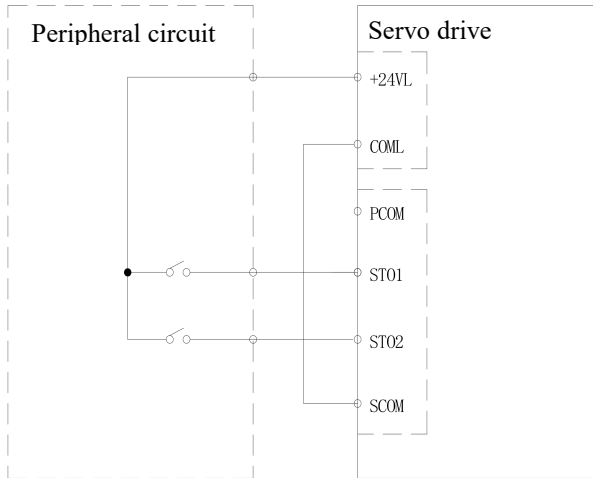


Figure 3-10 Internal power supply button switch connection common COML

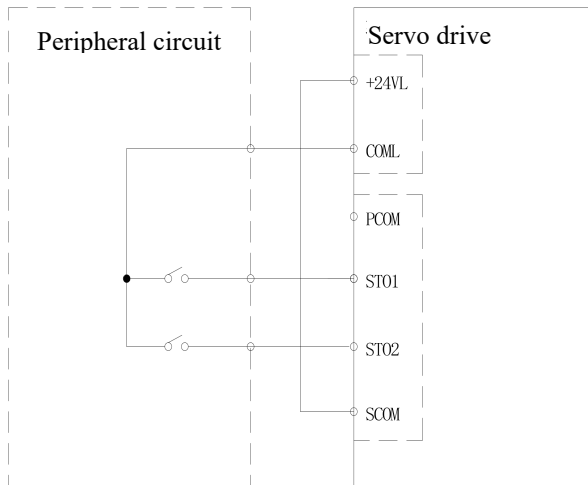


Figure 3-11 Internal power supply button switch connection common +24VL

### 3.5.6 Digital input/output signal wiring

Digital input signal has DI1, DI2, DI3, DI4, DI5 and DI6, take DI1 for example.

The input signal is the output of the transistor. Please connect it according to the power supply as shown below. This drive provides internal 24V power.

Use external 24V power connection:

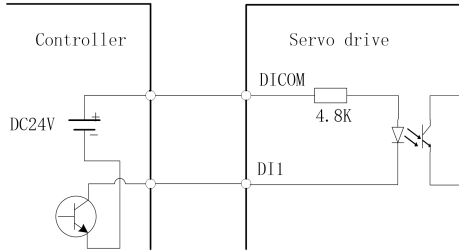


Figure 3-12 External power supply common anode connection  
(the wiring diagrams in this manual provides in this way)

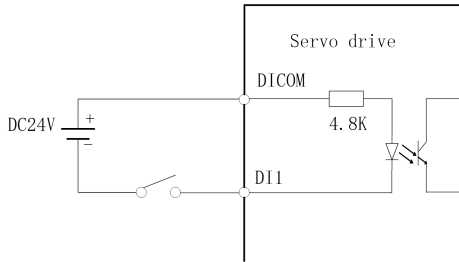


Figure 3-13 External power button switch (relay) connection

Internal 24V power supply wiring connection:

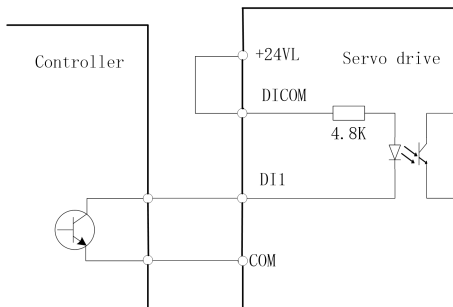


Figure 3-14 Internal power supply common anode connection

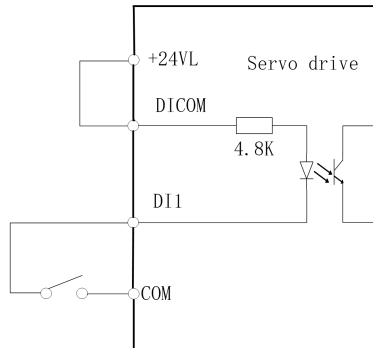


Figure 3-15 Internal power key switch (relay) connection

The digital switch output signals include DO1, DO2, DO3, and DO4. The following figure takes the DO1 signal as an example.

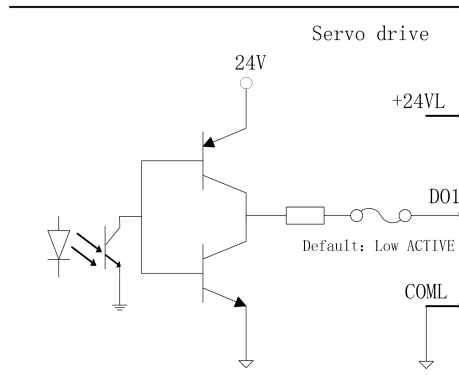


Figure 3-16 Digital output wiring diagram

### 3.5.7 Analog input signal wiring

The analog input signals include AI1, AI2 and AI3, which receive 0~10V voltage input signals.

It is generally necessary to use double-stranded shield cable, and the wiring distance should be as short as possible, not over 20m.

In some situation analog signal is severely disturbed, the filter capacitor and ferrite core should be installed extra, as shown below.

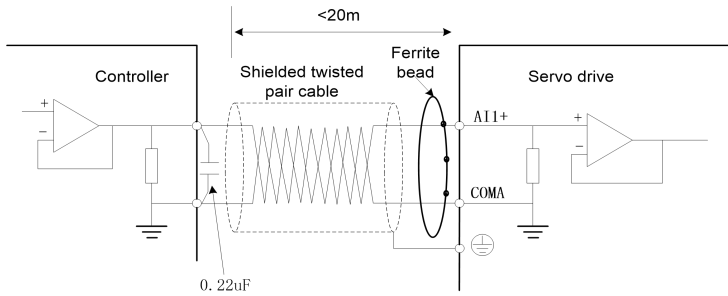


Figure 3-17 Analog Input wiring with filter capacitor and magnet ring diagram

### 3.6 Encoder signal wiring

The encoder wire requires STP, connects to the driver through the DB15 female connector, terminal pins is as follows:

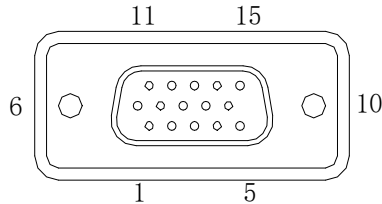


Figure 3-18 15 pin female resolver terminal schematic

15 pin terminal pin signal definitions:

pin	Signal definition	description
3	DATA +	RS485 digital serial data signal
4	DATA -	
13	+5V	Encoder power supply
15	0V	
5	KTY84	KTY84 thermal resistance signal
14		
Shielding layer	/	Grounding shielding layer
Others	Null	Null

# Chapter 4. Keyboard Operation

## 4.1 Introduction of Keyboard

The keyboard is used to facilitate the monitoring of the servo drive. State monitoring and parameter modification can be realized through the keyboard.

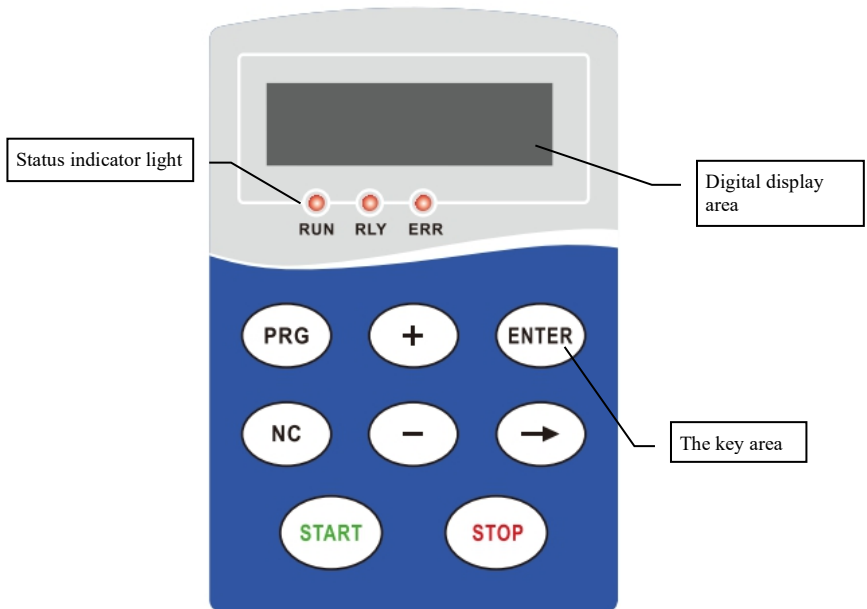








































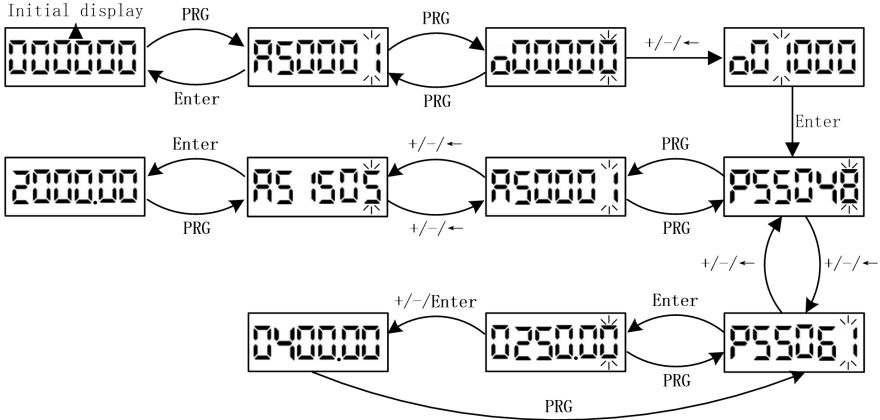
Figure 4-1 keyboard diagram

## Reference table of key functions:

number	Name	Descriptions					
1	Digital display	LED display symbols and numbers / letters contrast:					
			letter		letter		Letter
			0		1		2
			3		4		5
			6		7		8
			9		A		B
			c		d		E
			F		H		L
			L		N		N
			o		P		R
	T		U		.		
	-						
2	Status indication	RUN	Run status indicator light, when this light is flashing run, indicates that the CPU is working normally				
		RLY	The attracting indicator light of the main relay, which is on, indicates that the bus voltage has reached soft start and the relay has been normally closed. This light is off, indicating that the main relay has not been sucked and energy is prohibited				
		ERR	Alarm indicator light, this light is on, indicating that there is a fault alarm.				
3	keypads		Mode key	Used to switch between group A, group O and group P			
			Set key	Setting parameter confirmation			
			Increment key	Increment of data or reference number; In the monitoring mode, display parameters can be selected in a positive sequence loop			
			Decrement key	Decrease of data or reference number; In monitoring mode, display parameters can be selected by reverse sequence loop			
			Right shift key	In parameter setting mode, you can select the modification bit of the parameter			
			Run key	Servo run operation			
			Stop key	Can be used to stop the servo operation; when faults occur, clear faults, press this key to clear the alarm			

number	Name	Descriptions
		display.

### 4.2 Definition of Menu operation



### 4.3 Status description

- 1) First a blinks: CPU board works normally;
- 2) First a blinks, while the bottom one is always on: enable status;
- 3) Finish: display after the action is completed, for example, AI zero drift / motor zero seeking / static self-learning / dynamic self-learning operation ends normally;
- 4) Fail: display after action execution fails, for example AI zero drift / motor zero seeking / static self-learning / dynamic self-learning failure;
- 5) Run: display during action execution, for example AI zero drift / motor zero seeking / static self-learning / dynamic self-learning;
- 6) Unlock: enter the password correctly, and display when unlocking is successful;
- 7) Error: displayed when password input fails;

### 4.4 Level and parameter group definitions

This servo drive has 3 sets of reference Numbers (please refer to the appendix quick reference number summary table for details)



The key can be switched between the reference Numbers:

- 1) group A: state monitoring group, read-only property, all parameters can be viewed but cannot be modified;
- 2) O group: unlock with password input;
- 3) P group: parameter modification group, which can be read and written; parameters can be viewed and

modified;

Level operating instructions:

Primary level (initial level) : can only switch between group A and group O. Group A can view all parameters but cannot be modified.

Level 2: input password "00 1000" in group O, namely enter level 2. After unlocking, only switch between group A and group P. All parameters of group A can be checked. Long press "PRG" key 3.5 seconds, re-lock, return to the initial level state.

Level 3: group O input password "00 1234" (initial, customizable password) is entered into level 3. After unlocking, it can only switch between group A and group P. All parameters of group A can be checked and all parameters of group P can be modified. Long press "PRG" key 3.5 seconds, re-lock, return to the initial level state.

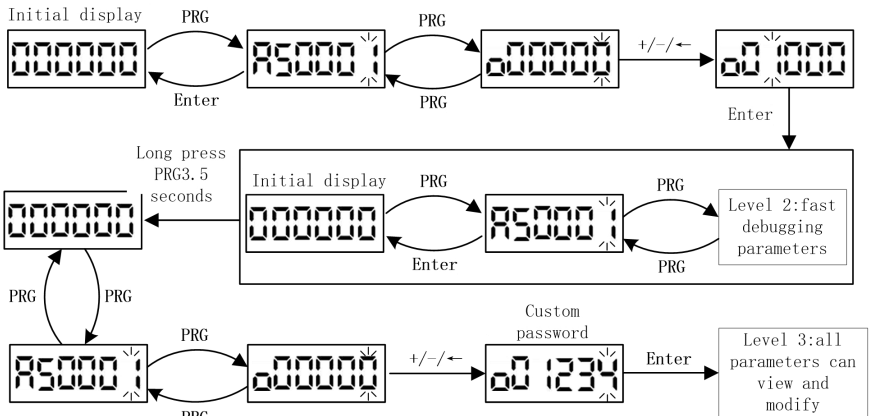


Figure 4-2 weight level decryption operation process

### 4.5 Special status display (used to judge IO signal)

A50024 (driver IO status) is a special status display, and the relevant bits are valid when the digital tube segment is lit, as shown below:

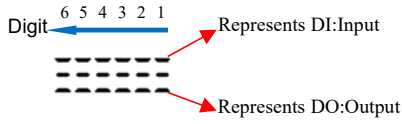
When there is no input and output status, the six digit digital tube displays: ;

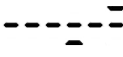
Displayed when an input is valid: ;

Display when a bit output is valid: ;

When all inputs and outputs are valid, the six digit digital tube displays: ;

Display definition:



For example:A50024 displays , indicating DI1 effective,DO3 effective.

# Chapter 5. Debugging of Servo System

## 5.1 working principle

### 5.1.1 Working principle of two stations

The reducer is driven by the motor of the machine, and the reducer drives the rotary table (driven wheel), so that the rotary table can rotate 180 degrees between stations 1 and 2. The schematic diagram is as follows:

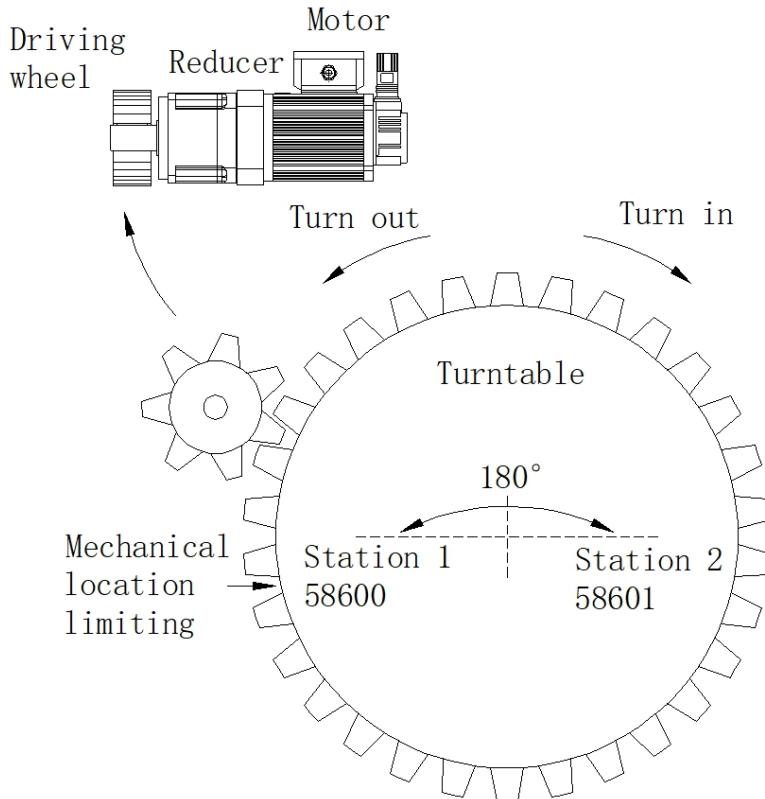


Figure 5-1 Two station work diagram

### 5.1.2 Working principle of Three stations

The machine is driven by the motor. The reducer drives the rotary table to rotate 120 degrees each time. The three stations of the rotary table are controlled in one direction (both positive and negative directions can be controlled). The schematic diagram is as follows:

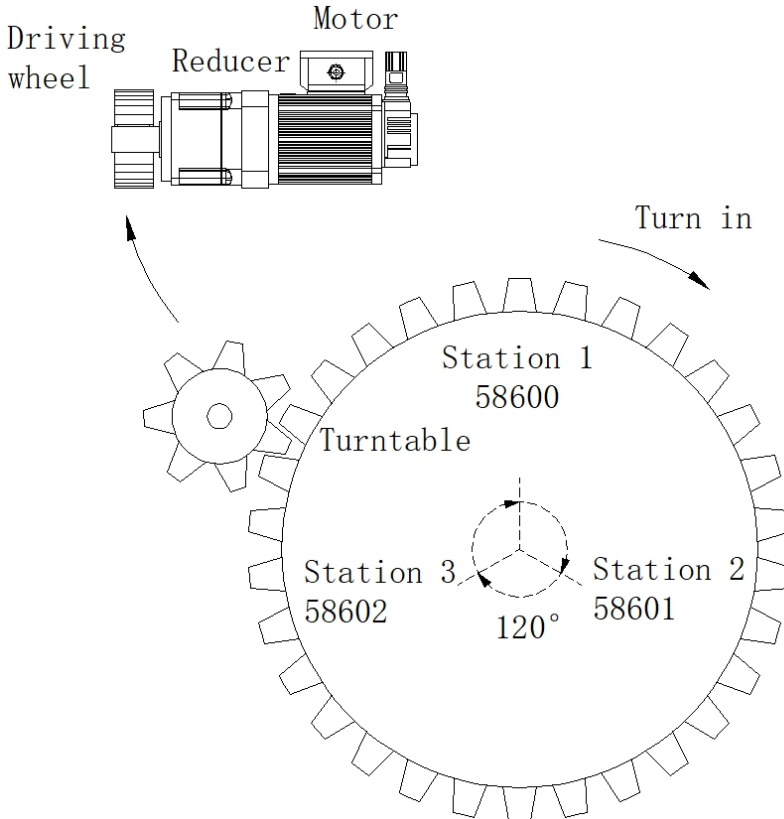


Figure 5-2 Three station work diagram

Theoretical positioning accuracy of rotary table:

For example: if the diameter of the driving wheel of the turntable is 200mm, its circumference is  $\pi D=628\text{mm}$ ; If the output unit increment (58412) = 360000 (the number of pulses required for one revolution of the turntable); Therefore, the accuracy is  $\pi D/360000=0.0017\text{mm}$

### 5.1.3 Controller sequence and attention (two stations)

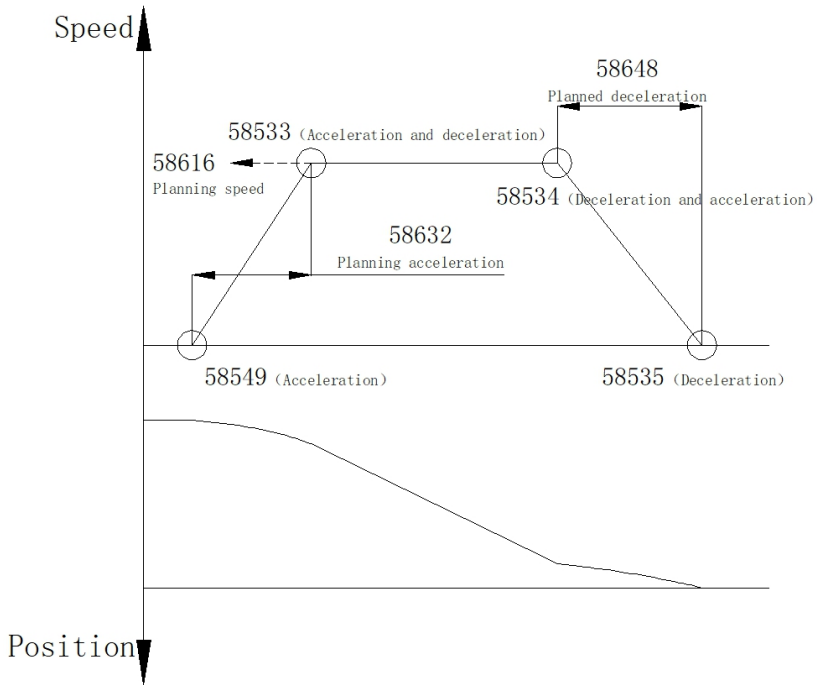


Figure 5-3 Control sequence diagram (transfer back)

① The planning type (S-type and S-type automatic planning) can be set for each planning section. By default, S-type automatic planning (i.e. automatic planning for acceleration, deceleration, deceleration, and deceleration) is set. Jerk value is invalid. Set position mode (relative position or absolute position), target position, planned speed, and planned acceleration are the continuous motion mode of subsequent sections. If it is S-type planning, Jerk must also be set. During multi segment combination planning, please do not set ring type combination. It is necessary to set the position related conversion parameters such as gear ratio and output accuracy. When setting the planned speed, you can refer to the 58523 maximum planned speed, which corresponds to the maximum speed. If the set planned speed (58616-58631) exceeds the maximum planned speed (58523), the maximum planned speed (58523) is used by default;

② Maximum planned speed (58523)=(maximum speed/60/reducer) \* output unit increment, i.e.  $51515/60/58410 * 58411 * 58412$ ;

③ During acceleration and deceleration setting, the greater the value is, the faster the acceleration and deceleration will be. The acceleration and deceleration formula is as follows:

Time required to accelerate from 0 to the maximum planned speed=planned acceleration (58632-58647)/planned speed (58616-58631)

Time required to decelerate from the maximum planned speed to 0=planned acceleration (58648-58663)/planned speed (58616-58631)

Example: Acceleration (58632-58647) sets the planned speed  $\times 10$ , it takes 0.1s from 0 to the fastest

planning speed.

The enable signal determines the servo preparation, the trigger signal (i.e. the station signal) determines the direction, and the speed signal determines the actual speed. Three signals are indispensable, and the logic sequence is shown in the figure below:

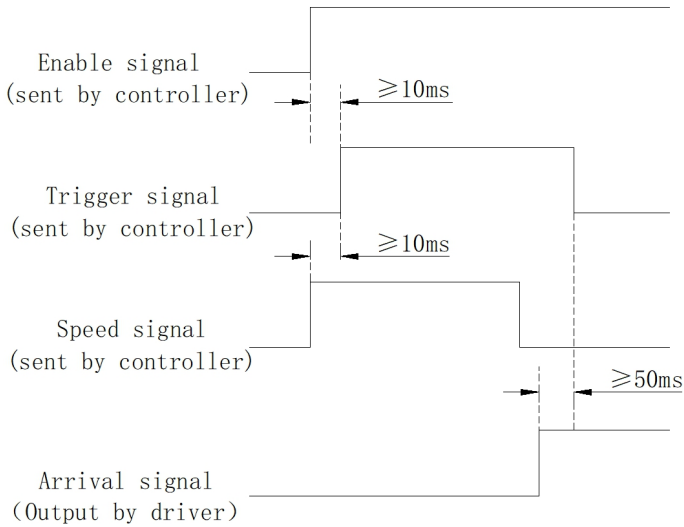


Figure 5-4 Signal control sequence diagram

Note:

- ① When the upper computer sends the positive and negative rotary table action, it must ensure that the servo enable signal has at least 10ms processing enable status. After the upper computer checks the servo DO in place signal, in order to ensure that it is truly in place, the rotary table action signal sent by the upper computer needs to be switched after at least 50ms delay;
- ② The speed signal (such as DA) sent by the upper computer cannot have ramp; If the upper computer has a ramp, the quantization time (delay) of DI can be appropriately increased;
- ③ After the positioning cylinder enters, it is not recommended to send the enable signal again. This is to prevent the large position deviation between the machine and the software from causing the motor to be in the output state all the time, leading to servo alarm or mechanical wear; If the enable is always on, the servo has the in place torque switching function, which can be enabled (switch to low torque holding in the position within the reach range);

### 5.1.4 Rotary table working mode

- ① In actual turntable application, position task is actually the concept of work station. In task planning, the number of work stations can be run according to the number of planned tasks. Each work station can set the corresponding planning method, target position, speed, etc; Up to 16 stations are supported.
- ② According to the customer's requirements, the current working mode of servo rotary table is divided into two types: 360° and left and right rotation.
- ③ The 360° working mode is divided into two stations, three stations, four stations and eight stations.

- ④ The common left and right rotation modes are  $180^\circ$  ,  $120^\circ$  or  $90^\circ$  .

## 5.2 Servo system debugging process

The debugging of servo system mainly includes three aspects: manual trial operation debugging, servo operation debugging and multi-pump combination debugging. The detailed flow chart of the first two aspects is as follows:

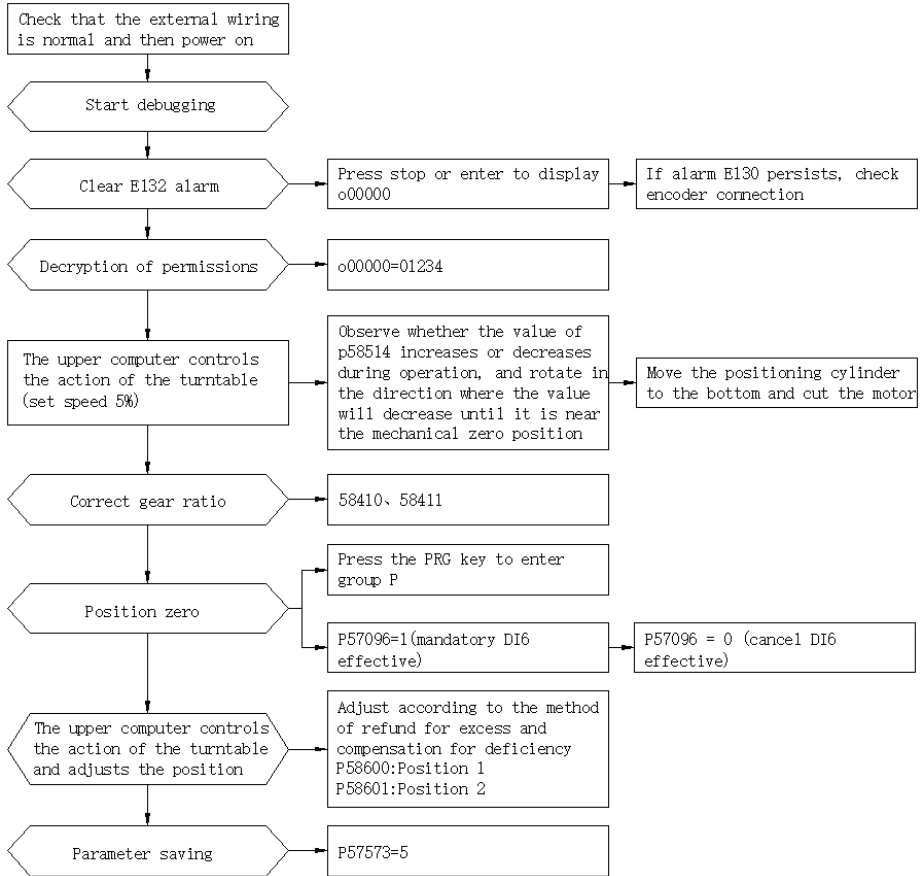


Figure 5-5 servo oil pump debugging flow chart

## 5.3 Manual commissioning

Before the first use of the servo drive, the motor needs to be self-learning operation to learn the motor related parameters for optimal control.

### 5.3.1 Confirm before power on

After the drive is installed, make sure that the cables, especially the power lines, are properly connected. If

possible, please remove the load or unscrew the overflow valve completely.

Power the servo drive on when the connection is confirmed to be correct, and the "RUN" indicator on the button panel lights up and starts flashing.

After about 7S, relay will suck up and the "RLY" light will be on, indicating that the servo power is normal.

### 5.3.2 Trial operation steps

Steps	Parameters setting	Description of Parameters	Instructions
1) Level decryption	Set group O: o01234	Decryption parameters	Password Error will display "Error"
2) Motor parameters setting	Group P: P51500~P51508	Motor correlation parameter	Set motor parameters correctly.
3) Motor Angle learning	P57573=4	Learn zero Angle of motor	P52002 is the motor Angle value.
4) Motor self-learning	Group P: P56012= motor rated current or drive rated current P57573=21 (start static self-learning)	Set self-learning static motor self-learning	Start the static motor parameter self-learning, the motor shaft will rotate slightly in the self-learning process, and the "RUN" will be displayed, then the "Finish" will be displayed when the self-learning is completed.
5) Parameters storage	P57573=5	Storage parameters	If the storage operation is not performed, the motor data will be recovered after the next restart.

Motor reference number:

Parameters	Description	Unit
P51500	Motor rated voltage Vn	V
P51501	Motor rated current In	A
P51502	Motor rating Pn	kW
P51503	Logarithm of motor magnetic poles	/
P51505	Motor rated speed Nn	rpm
P51507	Motor torque constant Kt	Nm/A
P51508	Motor voltage constant Ke	V/krpm

## 5.4 Servo commissioning

Dismantle the mechanical limit of the rotary table, confirm that all the machinery related to the rotary table will not interfere with the motion of the rotary table, and conduct the position control performance commissioning.

- ① Determine the station mode (left-right mode or 360 single direction):

58412: counts of one circle of the turntable; 58553: software position zeroing (for 360 unidirectional mode);

58552: activate position selection mode.

- ② Software zeroing:

When 58541 zeroing mode is 35, it indicates that the current position is zeroed.

When the 58541 zero seeking mode is 19, it means automatic zero seeking.

Define a position of the mechanical position as zero.

- ③ Test run: the controller sends enable, and the highest 8 and \_ Flashing, at this time, the motor will be

stationary; When the controller sends the flow (recommended flow below 5%) and the action signal, the turntable starts to rotate slowly.

Check whether the actual running direction of the rotary table matches the actual required direction. If not, turn the rotary table to the maximum position, and reverse 58419 and 51531 (if it was 0-False, change it to 1-True); Reset to zero after modification.

- ④ Setting position adjustment: adjust according to the method of returning more and compensating less.

If the rotary table is hard pressed in the direction of forward rotation when the positioning pin of forward rotation position enters, it indicates that the set position of forward rotation position is not enough, and it can be increased appropriately

### 5.4.1 Run mode selection

Run selection mode	Parameters	Description of Parameters	Instructions
1) Control mode	P55048	Control mode includes pressure closed loop, speed mode and position mode	1: Speed control mode 4: Pressure control mode 10: Position mode (default)
2) Control source	P57133	Sources of instruction;AD/CAN/SABUS	0: AD; (default) 4: CAN; 5: SABUS;
3) Activate select location mode	P58552	1-True;0-False	True:activation(360 single direction) False:Inactive(left-right mode or)

### 5.4.2 Position function parameter setting

Parameters	Description of Parameters	Instructions
P51515	Maximum system speed	When the AD instruction source is set, the flow instruction is 100% corresponding to the motor speed
P58412	Output end unit increment	Counts of one turn of the turntable
P58411	Output gear ratio	The total ratio of the first stage deceleration and the second stage deceleration (360 degrees must be filled in according to the actual situation, otherwise there will be accumulated error). For example, if the reducer is 1 / 7 and the large and small gear ratio is 22 / 255, then the gear ratio at the output end is 22, the gear ratio at the motor end is 1785, and when the motor rotates 1785 times, the rotary table rotates 22 times
P58410	Gear ratio at motor end	
P58515	Position following deviation threshold	It is related to the alarm threshold of E0120. It is recommended that the threshold should be set in the unit increment of 1000% output, and the time should not exceed 1000ms
P58516	Position following deviation time	
P58519	Position reaches the threshold	Related to the output of the position arrival do; When the actual position is within the set position $\pm$ position arrival threshold and the arrival time is delayed, the do signal of position arrival is output
P58520	Position arrival time	
P58553	Rotation position range	Software position return to zero (for 360 unidirectional mode)
P51018	Drive error failure enable	Bit3 (tamagawa_alm): battery alarm masking enabled
		Bit19 (stop_motion_active): the position control stops the planning. After activation, the task is interrupted halfway

		and the planning setting will be reset. Refer to 58539 for the planned deceleration.
P51020	Drive function selection	Bit0 (CAN_enable): communication enables the driver through communication. Bit8 (ABS_Muti): modify the absolute position (360 degree turntable is prohibited), which is used to prevent the number of multiple turns from being near 0. It is only applicable to the absolute value encoder and position mode. After enabling, it needs to be reset to zero. Bit11 (POS_TOR): the torque is limited after the position is in place. It is used to prevent mechanical wear or servo alarm caused by large torque after mechanical positioning of large rotary table Bit13 (END_SPEED): speed activation at the end of rotary table
P58560	In place torque limit delay	When the position reaches the set range and the speed is within the zero speed threshold, switch to the percentage of the maximum torque; 1=100% maximum torque (55045, 55046)
P51545	Torque limit switching value	
P52507	Zero speed threshold	
P52508	Zero speed monitoring time	
P58539	Stop deceleration	Position control is used in emergency stop. The falling ramp = set value / maximum planned speed, that is, the larger the value, the faster the falling
P58559	Planning speed source	0: AD mode control 1: DSP mode control (cooperate with our controller net communication).
P58562	Dsp54 command offset	0: Corresponding to F1 and P1 channels 1: Corresponding to F2 and P2 channels; And so on (cooperate with our controller net communication)
P58541	Zero finding method:	35: the current position is zeroed, and the home (0 - > 1) signal triggers a zeroing completion (it is recommended that the signal be maintained for 100ms). 19 or 20: positive or negative automatic zero searching. Given the home (0 - > 1) signal, it continues to be valid. At this time, the turntable moves at the fast setting speed (58542) for zero search until the driver receives the home switch signal and switches to the slow speed. After the driver reaches the zero offset position (58557), the zero search ends. The driver outputs the home finish signal to the upper computer, and the upper computer cuts off the home (0 - > 1) signal. End of zero search (actual position = 0 at this time)
P58542	Zero finding fast speed	Used in combination with p58541 (zero seeking mode) 19 or 20
P58543	Zero seeking slow speed	Used in combination with p58541 (zero seeking mode) 19 or 20
P58557	Zero offset	Used with p58541 (zero seeking mode) 19 or 20, zero offset setting
P57117- P57122	Input1~6 quantization time	Ddelay time setting
P58600- P58615	Set position (Section 1-16)	Setting position of each section
P58616- P58631	Planning speed (Section 1-16)	The maximum set speed of each section shall not exceed the maximum planned speed (58523)

P58632- P58647	Planning acceleration (Section 1-16)	Acceleration of each section (the higher the value, the faster)
P58648- P58663	Planned deceleration (Section 1-16)	Deceleration of each section (the higher the value, the faster)
P58663- P58679	Planning control word (Section 1-16)	Speed planning type of each section (type T and S)

### 5.3.3 Position performance parameter setting

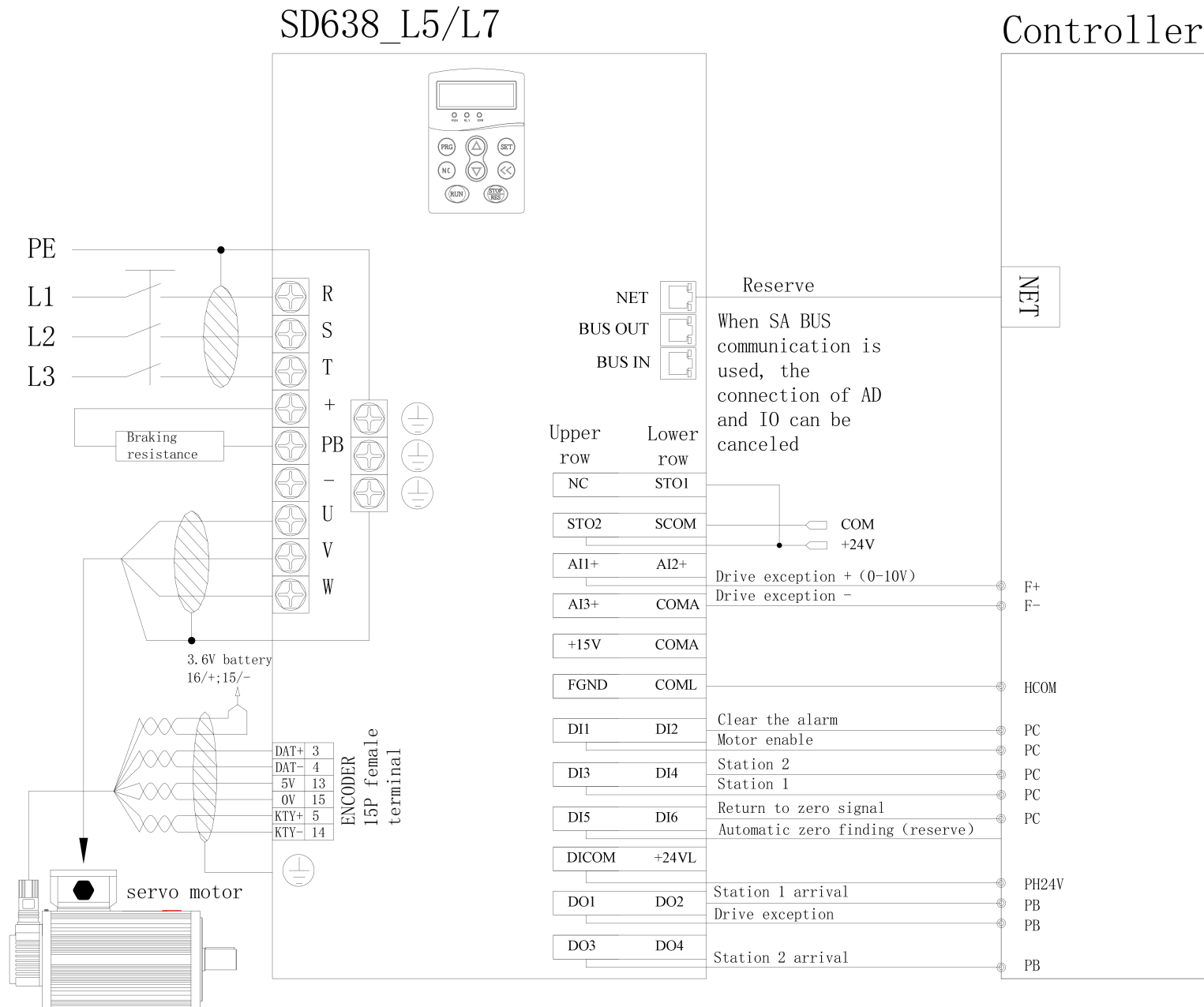
Parameters	Description of Parameters	Instructions
P55007	Speed controller KP	Speed proportional gain: speed dynamic response adjustment, the larger the value, the faster the response, too large cause shock.
P55008	Speed controller KI	Speed integral time: adjust the dynamic stability of the speed. The higher the value, the better the stability
P55042	Current controller KP	Current proportional gain (q axis) : the current dynamic response is adjusted, the higher the value is, the faster the response will be
P55043	Current controller KI	Current integral time (q axis) : the current dynamic stability is adjusted. The higher the value, the better the stability
P58511	Position control KP	Influence the position following control effect (starting smoothness and position deviation); The larger the follow-up speed, the higher the accuracy of position arrival, but the worse the motion smoothness; On the contrary, the slower the following, the worse the accuracy of position arrival, but the better the starting smoothness;
P58549	Position control Jerk	Acceleration, acceleration and deceleration, deceleration and deceleration; The higher the value, the faster the response;

The servo performance is adjusted according to the principle of stable non-divergence, low overshoot, fast response and low noise.

## 5.5 Standard System of Wiring Diagram

The wiring diagram of electric turntable;






The wiring diagram of Single system pressure closed loop



# Chapter 6. Fault tracing

## 6.1 Fault reset

After remedy fault, you can clear fault display by  on panel,digital switch input or power off the drives. Restore the ERR indicator light to a constant state.The specific alarm information display parameter is A50037.

## 6.2 Servo drives fault content and remedy

Fault code	Name	Cause	Solution
E00001	Over current	<ol style="list-style-type: none"> <li>1. RST three-phase input and UVW output wiring error (applicable to generate this alarm without enabling).</li> <li>2. Load jump caused;</li> <li>3. Improper driver parameter setting, resulting in current shock to the limit.</li> <li>4. Encoder problem caused.</li> <li>5. Check whether the motor oil pump is blocked. Monitor the actual current and speed when necessary.</li> <li>6.Check the power supply, observe the DC bus, and see if there is too much weak magnetic field at high speed.</li> </ol>	<ol style="list-style-type: none"> <li>1.Check the RST and UVW connections, whether they are loose, not connected, and whether the order is correct.</li> <li>2.Try to reduce the maximum current output from the drive and enable the power limit function.</li> <li>3.Adjust current loop Kp/Ki and overload coefficient (torque upper and lower limit) properly;</li> <li>If it is caused by rapid acceleration and deceleration, the ramp of related action can be increased.</li> <li>4.Encoder problem caused.</li> <li>5.Check whether the maximum current record A50503 reaches the limit and check the oil pump.</li> <li>6. Too much overspeed at high speed,going to reduce the maximum speed.</li> </ol>

Fault code	Name	Cause	Solution
E00003	Overheating of drive	1. Check parameter Setting of P51008. 2. Does the fan damage. 3. Whether the external environment is too hot and running under high load for a long time. 4. Temperature sensor line damage or detection circuit fault.	1. The default value of P51008 is 90; 2. Replace the fan; 3. Reduce operating environment temperature and operating condition; 4. Replace the temperature sensor line and send it to professional staff to check and repair the circuit;
E00004	Overheating of motor	1. Whether the motor temperature wire type is right, 2. whether the overload is serious; 3. Whether the motor fan fails or the power supply is abnormal 4. Kty signal is disturbed due to encoder line fault or unreasonable routing	1. Check parameter Settings of P52500, 1: KTY, 2: PTC; 2. Increase the specification of the motor; 3. Check the fan power supply and replace the motor fan; 4. Replace the encoder line or route it reasonably
E00005	Overvoltage of DC bus	1. Whether bus voltage detection is abnormal; 2. Supply voltage too high; 3. Check whether the brake resistance configuration or wiring is abnormal; 4. Too much brake inertia and too little deceleration time;	1. If the deviation between measured value and A50003 is greater than 15V, please contact professional staff for maintenance; 2. If the voltage is 20% higher than the standard value, try to reduce the grid voltage; 3. Check the wiring and install brake resistance according to the attached brake resistance fitting table; 4. Increase deceleration time :P53211;
E00006	Overspeed	1. Check whether the speed limit range of P55010 and P55011 is too small; 2. Setting of velocity loop Kp and Ki is not reasonable, and the system oscillates and diverges; 3. The encoder is disturbed, resulting in speed fluctuation.	1. Set parameters of P55010 and P55011 according to actual conditions; 2. Adjust the speed loop Kp (P55007) Ki (P55008); 3. Keep the coder away from the interference source and add magnetic ring on the line to eliminate high-frequency interference;

Fault code	Name	Cause	Solution
E00007	Encoder feedback error	1. The coder line is interfered; 1. Hardware fault of the PCBA;	1. The measurement value encoder signal, $\sin \pm$ 、 $\cos \pm = 43 \Omega$ , $R \pm = 37 \Omega$ . 2. Keep the coder away from strong electrical interference and add magnetic ring to eliminate high-frequency interference. 3. Contact professional staff for maintenance.
E00008	Pressure control reversal error	1. Set the reverse limit time too small; 2. Damage of pressure sensor or signal interference; 3. The oil road structure is abnormal, and the oil pressure cannot be released;	1. Increase the setting value of P55065; 2. Replace the pressure sensor, replace the shielding wire and ground the shielding layer, and add a magnetic ring; 3. Continuous inversion, but the oil pressure still cannot be released, and the oil pressure gauge still has pressure retention, so the oil way is checked;
E00009	Network disconnection	The alarm will only be raised if the control source is DSP54. 1. Check whether to connect the network cable to the host;	1. Check the network wiring;
E00010	Brake discharge error	1. High RST voltage of incoming line leads to high bus voltage, which directly reaches the braking limit of P51023 after power on; 2. The bus voltage A50003 is inconsistent with the actual measurement; 3. Whether the motor is in the passive reverse state; 4. Alarm when enabled, please check whether the brake resistance is properly matched or not connected; 5. Alarm when enabling whether the brake inertia is too large and the deceleration time is too small;	1. Check whether the parameters of P51023 match with the grid selection; 2. If the deviation between measured value and A50003 is greater than 15V, please contact professional staff for maintenance; 3. Check whether the motor shaft end has other power components in shipment, such as oil pressure continuous recoil; 4. Install brake resistance according to the attached brake resistance fitting table; 5. Increase deceleration time P53211;

Fault code	Name	Cause	Solution
E00011	Drive is not ready	<ol style="list-style-type: none"> <li>1. When the power grid is closed, Relay will be sucked after 7S. If enable signal is sent within this time, an alarm will be given;</li> <li>2. Whether the voltage display value of A50003 dc bus is the same as the actual measured value;</li> <li>3. Check whether the bus voltage A50003 is too low, resulting in the disconnection of Relay;</li> <li>4. Unreasonable parameter Settings of P51003;</li> <li>5. Whether the IO interferences when the power is not transmitted with strong power, resulting in effective power;</li> </ol>	<ol style="list-style-type: none"> <li>1. Send enable signal after a delay of 7S;</li> <li>2. If the deviation between measured value and A50003 is greater than 15V, please contact professional staff for maintenance;</li> <li>3. Check whether the incoming RST voltage deviates from the standard value;</li> <li>4. Set P51003 reasonably according to the incoming network voltage;</li> <li>5. IO point increases the quantization time;</li> </ol>
E00012	Bus voltage is too low	<ol style="list-style-type: none"> <li>1. P51003 setting error;</li> <li>2. The incoming power network is too low or the power of incoming power network is insufficient, and the voltage is pulled down under heavy load;</li> </ol>	<ol style="list-style-type: none"> <li>1. Set P51003 correctly;</li> <li>2. Check whether incoming grid voltage and grid power meet the requirements;</li> </ol>
E00014	Motor self-learning error	<ol style="list-style-type: none"> <li>1. Wrong setting of motor parameters;</li> <li>2. The encoder is not connected or the wiring is not correct;</li> <li>3. Whether the self-learning limited current P56012 is set correctly;</li> </ol>	<ol style="list-style-type: none"> <li>1. Set motor parameters correctly;</li> <li>2. Correctly connect the encoder wire;</li> <li>3. P56012 is set to a smaller value of motor rating or driver rating;</li> </ol>
E00015	Oversaturation of stop-over/speed control	<ol style="list-style-type: none"> <li>1. Check whether the motor can rotate freely or whether the control is normal under no-load condition</li> <li>2. Check whether the torque limit is appropriate: P55046(maximum torque), P55045(minimum torque)</li> <li>3. Most of the slave stations occur in multiple systems: small leakage in the oil pump, or the torque limit results (change control mode: when the low speed closed loop is used, the main turn from stop; Increase internal leakage or release torque);</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the normal operation of off-load;</li> <li>2. Appropriately increase P55046(maximum torque) and P55045(minimum torque);</li> <li>3. Increase the leakage of oil pump;</li> </ol>

Fault code	Name	Cause	Solution
E00016	I2T overload protection	1. Check the working condition, grasp the curve analysis when necessary, and check whether the drive is overrunning for a long time.	1. The machine is configured normally, please try to reduce the production condition;
E00023	Excessive monitoring current	<ol style="list-style-type: none"> <li>1. The UVW wiring at the output end of the RST three-phase input and the power drive integrated machine is wrong (applicable to the alarm generated without enabling);</li> <li>2. Sudden load change</li> <li>3. Inappropriate parameter setting of the integrated drive unit, causing the current to vibrate to the limit;</li> <li>4. Encoder problem;</li> <li>5. The motor oil pump is blocked;</li> <li>6. Too much field weakening at high speed;</li> </ol>	<ol style="list-style-type: none"> <li>1. Check whether the RST and UVW wiring is loose or not, and whether the phase sequence is correct;</li> <li>2. Try to reduce the maximum output current of the integrated drive and increase the constant power function;</li> <li>3. Properly adjust the current ring KpKi and overload coefficient (upper and lower limits of torque). If it is generated during rapid acceleration and deceleration, the ramp of relevant actions can be increased;</li> <li>4. Check encoder wire and rotary transformer plate;</li> <li>5. Check whether the maximum current record A50503 reaches the limit and check the oil pump;</li> <li>6. The maximum speed is reduced due to too much high speed overrun;</li> </ol>
E00025	Relay feedback error	1. There is a large current in the unsucked merger of Relay;	<ol style="list-style-type: none"> <li>1. Check whether Relay has sound absorption and RLY lights are normally on when power on;</li> <li>2. Check whether the wiring of Relay signal line is normal;</li> <li>3. Check whether the Relay is normal;</li> </ol>
E00030	No actual voltage output	<ol style="list-style-type: none"> <li>1. Whether the drive to the motor's UVW is not connected or loose;</li> <li>2. Whether IGBT is damaged;</li> </ol>	<ol style="list-style-type: none"> <li>1. UVW line is not connected or is misconnected with RST;</li> <li>2. IGBT fault, contact professional staff for maintenance;</li> </ol>
E00031	Overmigration of current sensor	<ol style="list-style-type: none"> <li>1. Recalibrate AC phase;</li> <li>2. Hardware fault detection;</li> </ol>	1. Contact professional staff for maintenance;

Fault code	Name	Cause	Solution
E00101	CAN node protection error	Mechanism: no node protection data received within specified time (refer to standard 402) 1. Whether the wiring or block error (120 $\Omega$ resistor whether access) 2. Whether P57501 and P57502 are set correctly	1. Check whether the front-end driver is short of the tr-c and can-terminals; 2. Check parameters;
E00102	CAN master station configuration error	1. Check whether the CAN connection is normal;	1. The resistor is connected and the resistance value between measurement CAN + and CAN - for 60 $\Omega$ ; 2. Detect the setting of other slaver station nodes and whether there is any omission of nodes, and the number of slave stations corresponds to P57574; 3. Check whether CAN resistance of each driver is normal;(about 50k $\Omega$ )
E00103	CAN node duplication	1. Have the same node address from the station;	1. Check the address of each slave station node, no duplication is allowed;
E00104	Slaver drives of CAN have no enabling	The enabling signal of slave station is abnormal;	1. After enabling, observe whether the drive from the EN station is on.
E00106	CAN communication offline	1.Check CAN physics online 2.Check the 57577 Settings	1. Check the wiring; 2.Check whether the 577 setting is consistent with the actual situation;
E00107	DSP54 communication error	1.Check that the network physics is online	1. Check the network wiring.
E00108	Slaver CAN error	1.Please check the specific error of the slave station. 2. Please check CAN physical online is normal. 3. If there is no error at the slave station, the master station and the slave station will be disconnected	1. Check the slave station error;

Fault code	Name	Cause	Solution
E00110	EtherCAT offline	1. Abnormal network cable connection or hardware failure; 2. Master station configuration error;	1. Check the hardware connection; 2. Check the master station and related configuration.
E00120	Position follow error	The deviation between the position setting value (58513) and the actual position value (58514) exceeds the position following window (58515), and the duration is greater than the position following timeout (58516)	1. The position following window (58515) is too small. 2. The position follow timeout (58516) is too short. 3. The position control gain (58511) is too small 4. The position control gain (58511) is too large (the position control is unstable or oscillating) 5. Current limit caused by excessive load
E00121	Position setting error	Incorrect setting of relevant parameters of position control leads to infinite cycle of task or change of speed direction in multi terminal planning	1. Set the target position or speed beyond the limit 2. The position of the continuous segment or the subsequent end is set incorrectly
E00122	Position out of range	If the position range in position control exceeds the encoder's multi turn range, enabling bit2 in 51018 can enable this function	Check the actual encoder multiple turns in the 50044 encoder data. If it is close to 0 or 4096 turns (depending on the actual multiple turns of the motor), you can separate the mechanical structure speed mode for a period of time or activate ABS in the 51020 parameters_Muti function, after activating the function (the sick encoder will automatically clear), it is recommended to reset the drive to zero again after restart
E00130	Encoder communication error	The encoder communication is abnormal, and the encoder has no data	1. Check whether the encoder communication protocol matches 2. Check encoder connection or replace encoder cable

Fault code	Name	Cause	Solution
E00132	Encoder power supply battery alarm	Low battery voltage, not connected or disassembled	<ol style="list-style-type: none"> <li>1. When the motor feedback line has been disassembled, it can be cleared;</li> <li>2. When the battery voltage is less than or equal to 3V, an alarm is given, and the battery needs to be replaced; After replacing the battery, it is recommended to reset to zero</li> </ol>
E00134	Self learning encoder signal error	Encoder signal loss during zero searching or self-learning	<ol style="list-style-type: none"> <li>1. Check whether encoder cable or motor cable are connected normally</li> <li>2. Check whether the motor/oil pump is stuck or the load is too large to rotate</li> <li>3. Increase 56005 appropriately when searching for zero</li> <li>4. The alarm is appropriately increased during self-learning 56012</li> </ol>
E00152	STO error	PWM forced off when enabled	<ol style="list-style-type: none"> <li>1. Check STO1 and STO2 wiring.</li> <li>2. When the driver is working normally, that is, the CPU is running, and STO1/STO2 fails at the same time, then it is valid at the same time, the alarm can be removed.</li> </ol>
E00200	Automatic zeroing error	During position control, it has the function of automatic zeroing, and the in place signal is not detected for a long time (DI - home Switch)	Check external signals

# Appendix A: Peripheral Options

## A.1 Breaker and electromagnetic contactor

In order to cut off the servo drives input power effectively when a system failure occurs, an electromagnetic contactor can be installed on the input side to control main circuit power on and off, to ensure safety.

Drives Model	circuit breaker (A)	the Rated operational current of the Contactor (A)
SD638L5F3	25	26
SD638L7F3	32	26
SD638K1F3	50	38

## A.2 Braking components

Braking unit is built in the SD638 series servo drive( $\leq 90\text{kW}$ ). Braking resistor connection is required, the resistance value and power of braking resistor shall be set according to specific field situations (brake moment requirements and braking utilization rate)

Model of drive	Braking unit	Braking resistance value and recommended power	Recommended resistance value of braking resistor
SD638L5F3	Built-in	$\geq 600\text{W}$	$\geq 56\Omega$
SD638L7F3			
SD638K1F3			

## A.3 Diameter of Power Cable and Cable Lug Type

Choose the diameter of power cable and cable lug type depend on the power level.

Power cable recommend to use shielded wire and the shilding layer need ground connection.



Figure A-1 Cable Lug Type Recommend

Driver Type	Diameter of Power Cable mm <sup>2</sup>	Cable Lug Type
SD638L5F3	2.5	2-4
SD638L7F3	4	3.5-5
SD638K1F3	6	6-5

#### A.4 Encoder feedback line

The feedback line has its own battery box. It is recommended to use twisted pair shielding wire with a length of no more than 20m. It is recommended to separate the strong wire from the encoder feedback line, or add a metal tube for isolation to ensure the stability of the encoder feedback signal;

# Appendix B Function codes

"Properties" symbol on the function code description are explained as follows:

"RO" : means that the reference number can only be read and cannot be changed.

"RW": means that the reference number can be read and written in any situation.

"SW": indicates that the parameter is readable, but can only be modified if there is no enable.

## B.1 Status display parameters

ID	Description	Default value	unit	min	max	Pro
50001	Actual speed after actual value smooth	0	rpm	-210000	210000	RO
50003	Actual DC link voltage	540	V	0	63000	RO
50004	Output voltage	380	V	0	63000	RO
50006	Abolute current	0	A	0	10000	RO
50007	Current actual value,field-generating	0	A	-10000	10000	RO
50008	Current actual value,torque-generating	0	A	-10000	10000	RO
50012	Actual power value,smoothed	0	kW	0	100000	RO
50014	Motor temperatures	0	°C	-80	200	RO
50015	Drive temperatures	0	°C	-80	200	RO
50019	AD1 input voltage	0	V	-10	10	RO
50020	AD2 input voltage	0	V	-10	10	RO
50021	AD3 input voltage	0	V	-10	10	RO
50024	Drive IO status	0		0	65535	RO
50025	Program update datetime	0		0	0xFFFFFFFF	RO
50026	Program version	0		0	0xFFFFFFFF	RO
50037	Alarm status	0		0	65535	RO
50502	Max speed record	0	rpm	-210000	210000	RW
50503	Max current record	0	A	-10000	10000	RW
50504	Max torque record	0	Nm	-100000	100000	RW

## B.2 Control parameters

ID	Description	Default value	unit	min	max	Pro
55048	Control mode	0:Torque control mode; <b>1:Speed control mode;</b> 2:V/f control mode; 7:Pressure control mode;		0	8	SW
57133	Control source	<b>0:AD;</b> 1:RS232; 2:DSP54; 3:PC; 4:CAN;		0	5	SW

ID	Description	Default value	unit	min	max	Pro
57573	External control command	4:Zero 5:save to rom 7:reset 21:Stationary measurement 22:Turning measurement				SW
56012	Identification current limit	0				RW
51002	Drive line supply voltage	400	V	0	63000	SW
51003	DC link voltage undervoltage threshold	380	V	0	900	SW
51004	DC link voltage overvoltage threshold	780	V	0	900	SW
51010	Over loading ratio	1.6		1	1.7	SW
51021	Motor power limit	0	/	0	10000	SW
51022	Motor brake power limit	0	/	-10000	0	SW
51023	Regen voltage threshold	730	V	0	900	SW
51500	Motor rated voltage	0	V	0	63000	RW
51501	Motor rated current	0	A	0	10000	RW
51502	Motor rated power	0	kW	0	100000	RW
51503	Motor pole pair	4		0	127	SW
51505	Motor rated speed	2000	rpm	0	210000	RW
51507	Motor-toque constant,actual value	0	Nm/A	0	100	RW
51508	Motor voltage constant	0	V/krpm	0	63000	RW
51515	Max motor speed	0	rpm	0	210000	RW
51531	Motor direction reverse	1		0	1	SW
52000	Encoder type	1:AbsEncoder; <b>2:resolver;</b> 3:IncEncoder; 4:sincos encoder;		0	5	SW
52002	Encoder,angular commutation offset	270		0	360	SW
52500	Motor temperature sensor type	0:NONE; 1:KTY84; 2:PTC130-3 3:PTC1000	/	0	5	SW
53210	Ramp up time of speed ramp function generator	80	ms	0	65535	RW
53211	Ramp down time of speed ramp function generator	100	ms	0	65535	RW
55007	Speed controller P gain	2	Nms/rad	0	10000	RW
55008	Speed controller reset time	0.0125	s	0	10000	SW
55042	Current controller P gain	3	V/A	0	10000	SW

ID	Description	Default value	unit	min	max	Pro
55043	Current controller reset time	0.0625	s	0	10000	SW
55045	Current controller P gain adaption, lower torque limit	0	Nm	-1000	0	SW
55046	Current controller P gain adaption, upper torque limit	0	Nm	0	1000	SW
55050	Kp1 of pressure control	1		0	100	SW
55051	Ki1 of pressure control	0.005		0	10	SW
55056	Ramp up time of pressure control	50	ms	0	65535	SW
55057	Ramp down time of pressure control	50	ms	0	65535	SW
55061	Max pressure of pressure sensor	250	bar	0	1000	SW
55062	Max pressure setting of pressure control	140	bar	0	1000	SW
55063	Min flux of pressure control	0	bar	0	1000	SW
55064	Speed limit of min flux of pressure control	0	%	0	100	SW
55069	Pressure control speed lower limit	-200	rpm	-210000	0	SW
55070	Pressure special parameter	20		0	1000	SW
55071	Speed special parameter	10		0	1000	SW
55072	Actual alarm pressure	170	bar	0	10000	SW
57103	Input1 configuration	0: No Function: No function 1: Enable Motor: motor enable 2: Reset Alarm: Clear the alarm 14: Enable Reset: Enable/clear the alarm, and enable the alarm clearing function. 16: Motion Task Selection bit0: task Select bit0. The four IOs together form 16 TASK selection functions. 17: Motion Task Selection bit1: task selects bit1. The four IOs together form 16 TASK selection functions. 18: Motion Task Selection bit2: task Select bit2. The four IOs together form 16 TASK selection functions. 19: Motion Task Selection bit3: task Select bit3. The four IOs together form 16 TASK selection functions. 20: Activate Motion Task (0 ->1): activate task,		0	65535	SW
57104	Input2 configuration			0	65535	SW
57105	Input3 configuration			0	65535	SW
57106	Input4 configuration			0	65535	SW
57107	Input5 configuration			0	65535	SW
57108	Input6 configuration			0	65535	SW

ID	Description	Default value	unit	min	max	Pro
		<p>activate TASK, and pay attention to the timing selected by TASK.</p> <p>21: Home (0 -&gt;1): Zero searching is activated, and the zero searching function of position mode is more activated.</p> <p>24: Home Switch: Zero finding switch, the zero point switch signal for external zero finding.</p> <p>25: Jog1: Jog forward, position mode inching forward.</p> <p>26: Jog2: Jog reverse, position mode inching reverse.</p> <p>40: Positive active: positive activation, rotary table positive activation.</p> <p>41: Negative active: Reverse activation, positive activation of rotary table.</p> <p>47: Four to two: cross station enable, rotary table cross station use, 4 station change to 2 station use.</p>				
57109	Output1 configuration	0: No Function: No function, forced output 1.		0	65535	SW
57110	Output2 configuration	1: Alarm Output: Alarm output.		0	65535	SW
57111	Output3 configuration	12: Target reached: output when the position reaches the threshold and time.		0	65535	SW
57112	Output4 configuration	<p>13: Home finish: The zero searching is completed, and the position zero searching is output.</p> <p>18: Station reach: when the station arrives, it will output after reaching the set position in position control.</p> <p>19: Task1 reach: When task1 arrives, the left station indicates that the 180 degree turntable is used.</p> <p>20: Task2 reach: When task2 arrives, the right station reaches the indicated 180 degree turntable for use.</p> <p>21: Task bit0: task-bit0.</p>		0	65535	SW

ID	Description	Default value	unit	min	max	Pro
		<p>The four outputs are used to display which TASK the current position is between.</p> <p>22: Task bit1: task-bit1, which can be used in combination with the work station. If the work station is not reached, it is between two work stations.</p> <p>23: Task bit2: task-bit2, which can be used in combination with the work station. If the work station is not reached, it is between two work stations.</p> <p>24: Task bit3: task-bit3, which can be used in combination with the work station. If the work station is not reached, it is between two work stations.</p> <p>25: Positive reach: positive reach, positive task completion.</p> <p>26: Negative reach: Reverse arrival. The reverse task is completed.</p> <p>38: task1 reach: When task1 arrives, the first TASK is output.</p> <p>39: task2 reach: When task2 arrives, the second TASK is output.</p> <p>40: task3 reach: When task3 arrives, the third TASK is output.</p> <p>41: task4 reach: When task4 arrives, the fourth TASK is output.</p>				
57503	CAN bus address/mode ID	2		1	126	SW
57568	Enable CAN master	<b>False: unable</b> True: enable		0	1	SW
57582	CAN master number	0		0	65535	SW
58000	AD1 offset	0		-10	10	SW
58010	AD2 offset	0		-10	10	SW
58020	AD3 offset	0		-10	10	SW
58408	Speed encoder increment	1		1	4294967 295	SW
58409	Speed motor turns	1		1	4294967 295	SW

ID	Description	Default value	unit	min	max	Pro
58410	Number of motor end turns of reducer	10		1	4294967 295	SW
58411	Number of gear reducer output end turns	1		1	4294967 295	SW
58412	Output unit increment	36000		1	4294967 295	SW
58413	Output end turns	1		1	4294967 295	SW
58414	Position conversion factor	1		1	4294967 295	RO
58415	Speed conversion factor	1		1	4294967 295	RO
58416	Velocity normalization factor 1	1		1	4294967 295	RO
58417	Velocity normalization factor 2	1		1	4294967 295	RO
58418	Acceleration conversion factor	1		1	4294967 295	RO
58419	Position control polarity	0		0	255	SW
58500	Control word	0		0	65535	RW
58501	Status word	0		0	65535	RO
58502	Operating mode	Block Mode		-128	127	SW
58503	Actual operation mode	0		-128	127	RO
58504	Position control frequency	1	khz	1	8	SW
58505	Position setting filter time constant	0	ms	0	1000	SW
58506	Default speed factor	0	%	0	200	SW
58507	Interpolation mode buffer setting	0		0	16	SW
58511	Position control Kp	0	1/s	0	1000000	SW
58512	Position control integration time	0	ms	0	100000	SW
58513	Set position	0		-214748 3648	2147483 647	RO
58514	Actual position	0		-214748 3648	2147483 647	RO
58515	Position following deviation threshold	0		0	4294967 295	SW
58516	Position follow deviation time	0	ms	0	65535	SW
58519	Position reaching threshold	0		0	4294967 295	SW

ID	Description	Default value	unit	min	max	Pro
58520	Location arrival time	0	ms	0	65535	SW
58521	Following error	0		-214748 3648	2147483 647	RO
58522	Number of buffers remaining	0		-214748 3648	2147483 647	RO
58523	Maximum planning speed	0		-214748 3648	2147483 647	RO
58524	Actual planning speed	0		-214748 3648	2147483 647	RO
58525	Actual planned location	0		-214748 3648	2147483 647	RO
58526	Position PID output	0		-214748 3648	2147483 647	RO
58527	Position control default speed	0		-214748 3648	2147483 647	RO
58528	Position control total set speed	0		-214748 3648	2147483 647	RO
58529	Position control actual speed	0		-214748 3648	2147483 647	RO
58530	Target Location	0		-214748 3648	2147483 647	SW
58531	Minimum position setting	-2147483648		-214748 3648	2147483 647	SW
58532	Maximum position setting	2147483647		-214748 3648	2147483 647	SW
58533	Acceleration and deceleration Jerk	0		0	4294967 295	SW
58534	Deceleration Jerk	0		0	4294967 295	SW
58535	Deceleration Jerk	0		0	4294967 295	SW
58536	End planning speed	5	rpm	-1000	1000	SW
58537	Planned torque current at tail end	10	A	0	1000	SW
58538	End planning time	2500	ms	0	65535	SW
58539	Stop deceleration	0		0	4294967 295	SW
58540	Position offset	0		-214748 3648	2147483 647	SW
58541	Zero searching method	1		-128	127	SW
58542	Speed of zero finding fast section	5000		0	4294967 295	SW
58543	Speed of zero finding slow speed section	300		0	4294967 295	SW
58544	Number of pulses per cycle	0	count	0	4294967 295	SW

ID	Description	Default value	unit	min	max	Pro
58545	Interpolation time unit	1		0	255	SW
58546	Interpolation time index	-3		-128	63	SW
58547	External encoder conversion factor	0		0	1000000	SW
58548	Encoder position rotation range	0		-2147483648	2147483647	RO
58549	Position Control Jerk	10000		0	4294967295	SW
58550	Manual speed	500		0	4294967295	SW
58551	Reverse clearance compensation	0		-2147483648	2147483647	SW
58552	Activate rotation position mode	FALSE		0	1	SW
58553	Rotation position range	36000		1	2147483647	SW
58554	Rotary table station setting	0		0	65535	SW
58555	Distance between reference point and encoder zero point	0		-2147483648	2147483647	RO
58556	Zero position	0		-2147483648	2147483647	SW
58557	Zero shift	0		-2147483648	2147483647	SW
58558	Multi turn remainder	0		-2147483648	2147483647	RO
58559	Planning speed source	0		0	65535	SW
58560	In place torque limit delay	500	ms	0	65535	SW
58561	Task attachment location	0		-2147483648	2147483647	SW
58562	DSP54 command offset	0		0	4294967295	SW
58563	Position buffer time	0	ms	0	65535	SW
58564	Turntable mode switching	0		0	65535	SW
58565	Zero seeking torque limit	0.5	%	0	100	SW
58566	Zero finding completed	0		0	1	RO
58567	Set position delay	0	ms	0	500	SW
58568	Fixed task activation selection	0		0	65535	SW
58600	Set position 1	180000		-2147483648	2147483647	RW

ID	Description	Default value	unit	min	max	Pro
58601	Set position 2	0		-214748 3648	2147483 647	RW
58602	Set position 3	0		-214748 3648	2147483 647	RW
58603	Set position 4	0		-214748 3648	2147483 647	RW
58604	Set position 5	0		-214748 3648	2147483 647	RW
58605	Set position 6	0		-214748 3648	2147483 647	RW
58606	Set position 7	0		-214748 3648	2147483 647	RW
58607	Set position 8	0		-214748 3648	2147483 647	RW
58608	Set position 9	0		-214748 3648	2147483 647	RW
58609	Set position 10	0		-214748 3648	2147483 647	RW
58610	Set position 11	0		-214748 3648	2147483 647	RW
58611	Set position 12	0		-214748 3648	2147483 647	RW
58612	Set position 13	0		-214748 3648	2147483 647	RW
58613	Set position 14	0		-214748 3648	2147483 647	RW
58614	Set position 15	0		-214748 3648	2147483 647	RW
58615	Set position 16	0		-214748 3648	2147483 647	RW
58616	Planning speed 1	180000		0	4294967 295	RW
58617	Planning speed 2	180000		0	4294967 295	RW
58618	Planning speed 3	0		0	4294967 295	RW
58619	Planning speed 4	0		0	4294967 295	RW
58620	Planning speed 5	0		0	4294967 295	RW
58621	Planning speed 6	0		0	4294967 295	RW
58622	Planning speed 7	0		0	4294967 295	RW
58623	Planning speed 8	0		0	4294967 295	RW
58624	Planning speed 9	0		0	4294967 295	RW
58625	Planning speed 10	0		0	4294967 295	RW

ID	Description	Default value	unit	min	max	Pro
58626	Planning speed 11	0		0	4294967 295	RW
58627	Planning speed 12	0		0	4294967 295	RW
58628	Planning speed 13	0		0	4294967 295	RW
58629	Planning speed 14	0		0	4294967 295	RW
58630	Planning speed 15	0		0	4294967 295	RW
58631	Planning speed 16	0		0	4294967 295	RW
58632	Planned acceleration 1	360000		0	4294967 295	RW
58633	Planned acceleration 2	360000		0	4294967 295	RW
58634	Planned acceleration 3	0		0	4294967 295	RW
58635	Planned acceleration 4	0		0	4294967 295	RW
58636	Planned acceleration 5	0		0	4294967 295	RW
58637	Planned acceleration 6	0		0	4294967 295	RW
58638	Planned acceleration 7	0		0	4294967 295	RW
58639	Planned acceleration 8	0		0	4294967 295	RW
58640	Planned acceleration 9	0		0	4294967 295	RW
58641	Planned acceleration 10	0		0	4294967 295	RW
58642	Planned acceleration 11	0		0	4294967 295	RW
58643	Planned acceleration 12	0		0	4294967 295	RW
58644	Planned acceleration 13	0		0	4294967 295	RW
58645	Planned acceleration 14	0		0	4294967 295	RW
58646	Planned acceleration 15	0		0	4294967 295	RW
58647	Planned acceleration 16	0		0	4294967 295	RW
58648	Planned deceleration 1	360000		0	4294967 295	RW
58649	Planned deceleration 2	360000		0	4294967 295	RW
58650	Planned deceleration 3	0		0	4294967 295	RW

ID	Description	Default value	unit	min	max	Pro
58651	Planned deceleration 4	0		0	4294967 295	RW
58652	Planned deceleration 5	0		0	4294967 295	RW
58653	Planned deceleration 6	0		0	4294967 295	RW
58654	Planned deceleration 7	0		0	4294967 295	RW
58655	Planned deceleration 8	0		0	4294967 295	RW
58656	Planned deceleration 9	0		0	4294967 295	RW
58657	Planned deceleration 10	0		0	4294967 295	RW
58658	Planned deceleration 11	0		0	4294967 295	RW
58659	Planned deceleration12	0		0	4294967 295	RW
58660	Planned deceleration13	0		0	4294967 295	RW
58661	Planned deceleration14	0		0	4294967 295	RW
58662	Planned deceleration15	0		0	4294967 295	RW
58663	Planned deceleration16	0		0	4294967 295	RW
58664	Planning control word 1	32768		0	65535	RW
58665	Planning control word 2	32768		0	65535	RW
58666	Planning control word 3	0		0	65535	RW
58667	Planning control word 4	0		0	65535	RW
58668	Planning control word 5	0		0	65535	RW
58669	Planning control word 6	0		0	65535	RW
58670	Planning control word 7	0		0	65535	RW
58671	Planning control word 8	0		0	65535	RW
58672	Planning control word 9	0		0	65535	RW
58673	Planning control word 10	0		0	65535	RW
58674	Planning control word 11	0		0	65535	RW
58675	Planning control word 12	0		0	65535	RW

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ID	Description	Default value	unit	min	max	Pro
58676	Planning control word 13	0		0	65535	RW
58677	Planning control word 14	0		0	65535	RW
58678	Planning control word 15	0		0	65535	RW
58679	Planning control word 16	0		0	65535	RW

## Recording of changed version

Date	Changed version	Information number	Modification content
2022-10	V1.0	20221011	First edition
2022-11	V1.1	20221102	Correction of standard wiring diagram







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