工业缝纫机数控交流伺服系统简易操作说明

1. 产品说明

1.1 产品介绍

1.1.1 产品介绍

工业缝纫机数控交流伺服系统，采用全新结构设计，体积小巧，结构紧凑，外形美观，安装灵活方便。

电路设计采用驱动与主控分离的设计技术，有效隔断电源驱动电路给主控电路带来的干扰，使得伺服系统具有比同类产品更为优秀的稳定性及更长的使用寿命。优化各类控制类性能的工作效率的同时，降低了整体功耗，因此更为省电，发热量更小。具有电路保护功能，防止电源短路烧毁电路。

深度优化了系统的控制算法，使其具有比传统控制方式更高的精度控制，更快的响应速度等工作特点。本系统具有极为方便的上针位调整方法，大大减少了上针位的调整时间，使得调试、装机流程变得极其简单。

1.2 产品组成

伺服系统组成包括：

1. 主控部分：伺服主控箱，操作面板，脚踏控制器，永磁伺服电机。
2. 附件部分：操作面板安装支架，操作面板安装螺丝，电源线，固定螺丝。

请查阅产品组成清单，并且仔细检查包装箱内的产品部件，如有遗漏，请尽快与供应商联系。

1.3 技术规格

项目名称	指标
额定输入电压	220V±10%
额定输入频率	50/60HZ
额定输出功率	750W
电机最大转速	5000rpm
输出最大扭矩	3.5Nm

产品组成清单

编号	名称	单位	数量
1	主控箱	台	1
2	操作面板	个	1
3	脚踏板控制器	个	1
4	交流永磁伺服电机	台	1
5	操作面板安装支架	个	1
6	使用说明书	本	1
7	电源线	根	1
8	球节连杆	套	1
9	固定螺丝	袋	1

2. 操作说明

2.1 面板说明

操作面板图示 / 液晶显示图示

按键显示功能对照表

功能	按键	说明	显示屏图标
功能参数编辑键	P	进入或退出功能参数的编辑：在缝纫模式状态时按键2~3秒进入参数编辑状态；在参数编辑状态下按下键2~3秒退出参数编辑状态返回缝纫模式状态	—
参数查看保存键	S	对所选参数号内容进行查看和保存；选择好参数号后按此键可以进行查看和保存操作，修改参数值后此键则退出并保存参数	—
速度增减键	▲	加速键，提高运行速度	—
	▼	减速键，降低运行速度	—
参数增减键	(+)	增大参数数值	—
	(−)	减小参数数值	—
针数设定选择键		参数设定切换键	—
触发自动功能键		触发自动功能激活时，显示屏显示图标（只在定长缝中有效）	
停针位置选择键		选择上针位停位，默认状态为上针位停位，当显示屏显示图标时表示选择上针位停位	
慢速启动设定键		慢速启动设定，当显示屏显示图标时，启动慢速启动功能	
中途停车自动抬压脚设定键		设置中途停车时是否自动抬压脚，当显示屏显示图标时，激活中途停车自动抬压脚功能	
剪线后自动抬压脚设定键		剪线后自动抬压脚，当显示屏显示图标时，激活剪线后自动抬压脚功能	
连续回缝设定键		连续回缝功能设定，当显示屏显示图标时，激活连续回缝（W缝）功能	
自由缝设定键		自由缝功能设定，当显示屏显示图标时，激活自由缝功能	
起始回缝设定键		起始单回缝、B段缝功能设定，设置AB段回缝，当显示屏显示图标时，激活起始双回缝功能	
终止回缝设定键		终止单回缝、C段缝功能设定，设置CD段显示相应图标；终止双回缝功能设定，当显示屏显示图标时，激活终止双回缝功能	
定长缝设定键		多段缝功能键，交替设置四段缝，七段缝，自定义多段缝模式，显示屏显示相应图标	
剪线开关		设定是否剪线功能，当显示屏显示图标时，激活剪线功能	
提针与补针		执行补针，提针功能，详见功能说明	—
速度显示	—	显示当前电机速度档位	

2.2 操作模式选择

2.2.1 缝纫模式

正常对系统上电后，默认进入缝纫模式。在缝纫模式时，用户可以在已设定好技术参数的情况下选择使用各种缝纫功能。在此模式下，用户可以依据需要切换各种缝纫功能进行缝制工作，但是无法对系统各类技术参数进行修改和设置。

2.2.2 用户参数设置模式

在用户参数设置模式中，可以根据缝制需要调整各类功能的技术参数，参数设定步骤如下：

1. 在缝纫模式下按P键2~3秒进入用户参数设置模式。
2. 进入用户参数模式后默认从参数号选择页面，同时可以通过+ -键来选择参数号。
3. 选择好参数号后按下S键进入参数修改界面进行参数值查看，可以通过+ -键来设置参数值。
4. 设置参数值后按S键保存参数值并退出至参数号选择界面5. 按P键2~3秒 退出系统参数设置模式，返回一般缝纫模式。

用户参数表

参数号	名称	出厂值	范围	说明
Fn-01	最高转速(r/min)	3600	100~5000	最高转速设定
Fn-02	加速曲线调整(%)	80	10~100	控制器的加速度斜率调整
Fn-03	起始回缝速度(r/min)	1800	150~2800	起始回缝的速度设定
Fn-04	终止回缝速度(r/min)	1800	150~2800	终止回缝的速度设定
Fn-05	连续回缝速度(r/min)	1800	150~2800	连续回缝的速度设定
Fn-06	慢速启动速度(r/min)	300	150~2800	慢速启动的速度设定
Fn-07	慢速启动的针数(针)	2	0~99	慢速启动的针数设定
Fn-08	定长自动缝纫速度(r/min)	3200	300~4500	触发自动功能键按下时的速度设定
Fn-09	定长缝后自动执行终止回缝功能	1	0~1	1：在执行完最后一段定长缝后，将自动执行终止回缝；0：关闭该功能
Fn-10	点动倒缝针功能模式选择	1	0~1	手按车头回缝键的动作方式：1：JUKI方式；0：BROTHER方式
Fn-11	起始回缝运行模式	1	0~1	
Fn-12	起始回缝结束模式	1	0~1	
Fn-13	起始回缝补针-1	60	1~150	起始回缝A段补针
Fn-14	起始回缝补针-2	60	1~150	起始回缝B段补针
Fn-15	终止回缝运行模式	1	0~1	
Fn-16	终止回缝补针-1	60	1~150	终止回缝C段补针
Fn-17	终止回缝补针-2	60	1~150	终止回缝D段补针
Fn-18	连续回缝运行模式	1	0~1	
Fn-19	连续回缝补针-1	60	1~150	连续回缝A,C段补针
Fn-20	连续回缝补针-2	60	1~150	连续回缝B,D段补针
Fn-21	停针位置选择	1	0~1	当以外部操作面板时的功能设定，1（上针停）/0（下停针）
Fn-22	慢速起缝功能设定	1	0~1	当以外部操作面板时的功能设定，1（启动）/0（关闭）
Fn-23	剪线自动抬压脚设定	1	0~1	当以外部操作面板时的功能设定，1（启动）/0（关闭）
Fn-24	中途停车自动抬压脚	1	0~1	当以外部操作面板时的功能设定，1（启动）/0（关闭）
Fn-25	触发功能设定	1	0~1	当以外部操作面板时的功能设定，1（启动）/0（关闭）

参数号	名称	出厂值	范围	说明
Fn-26	自动剪线/收线功能设定	1	0~2	0（关闭）/1（启动扫线功能）/2（启动收线功能）
Fn-27	夹线器固定机械角度	180	1~300	夹线器固定角度
Fn-28	夹线器释放角度	300	30~330	夹线器释放角度（张力大小控制）
Fn-36	剪刀零位反转提针控制设定	1	0~1	关闭[0]/开启[1]/剪刀联动关闭[2]
Fn-37	剪刀停车反转提针角度	40	20~90	剪刀停车反转提针角度
Fn-38	脚踏板行程宽度比(%)	100	30~100	脚踏板行程宽度比(%)
	车缝完成件数显示		0~9999	车缝完成件数显示

2.2.3 系统参数设置模式

在系统参数设置模式中，可以根据缝制需要调整各类电磁铁参数以及系统设置，参数设定步骤如下：

1. 在关机状态，按P键同时开启电源为系统上电，系统启动即进入系统参数设置模式。在此模式下，可以对系统参数进行修改，同时也可对这些参数进行设置。
2. 通过+ -键来选择参数号，按下S键进入参数改界面进行参数值查看和修改。
3. 设置参数值后按S键保存参数值并退出至参数号选择界面 4. 按P键2~3秒退出系统参数设置模式，返回一般缝纫模式。

系统参数表

参数号	名称	出厂值	范围	说明
Fn-40	马达转动方向设定			保留
Fn-41	电机停止时，刹车锁住设定	1	0~1	1：电机停止时，刹车锁住车头；0：无作用
Fn-42	自动运行测试功能	0	0~1	该参数设置为1时，自动运转测试开始，按操作面板设置的运转周期模式运行
Fn-43	电机自动运转测试的总限时时间(hr.)	8	1~800	当Fn-42=1时有效，电机自动运转测试的工作时间
Fn-44	测试时电机运转时间(s)	3	1~30	当Fn-42=1时有效，电机自动运转测试运转周期内的工作时间
Fn-45	测试时电机停止时间(s)	3	1~30	当Fn-42=1时有效，自动运转测试运转周期内的停止时间
Fn-46	最低速度设定(r/min)	200	100~500	电机最低速度限制
Fn-47	切线、停车的速度设定(r/min)	300	100~500	切线停车的速度设定
Fn-48	抬压脚、回缝电磁铁全额初输出的动作时间(ms)	300	0~990	抬压脚、回缝电磁铁初始动作时，全额出力的时间设定
Fn-49	回缝电磁铁的周期信号(%)	30	10~90	回缝电磁铁动作时，以周期性的电磁出力维持回缝动作
Fn-50	延迟马达启动，保护抬压脚下放时间(ms)	50	0~990	踩下时延迟启动马达时间，以配合自动抬压脚下放的确认
Fn-51	半后踏释放拨刀设定	0	0~1	1：半后踏时，有拨刀释放动作；0：半后踏时，无拨刀释放动作
Fn-52	安全开关信号形式	0	0~1	1：安全开关为常开，必须保持常开状态；0：安全开关为常闭，必须保持常闭状态
Fn-53	切线动作前延迟机械角度	189	120~250	找到上定位后进至切线时序前所需的切断机械角
Fn-54	切线动作完成前延迟机械角度	360	250~360	切线时序所需的动作角
Fn-55	扫线动作前延时时间(ms)	10	0~980	找到上定位后进至扫线/扫线时序前的间断时间
Fn-56	扫线动作时间(ms)	20	0~990	扫/扫时序的动作时间

参数号	名称	出厂值	范围	说明
Fn-57	抬压脚动作前的延迟时间(ms)	50	0~990	拨/扫时序后完成至抬压脚时序前的间断时间
Fn-58	车缝停止时自动抬压脚上升维持时间(s)	30	1~120	车缝停止时自动抬压脚上升维持时间
Fn-59	上针位停针位置的位置调整(度)	15	1~30	微调修正上针位停车时的角度位置（中心数位为15）：数值增加时会提前停针，数值增加时会延后停针
Fn-60	下针位停针位置的位置调整(度)	180	120~220	微调修正下针位停车时的角度位置：数值减少时会提前停针，数值增加时会延后停针
Fn-61	上电后自动上定位	—	—	关机状态下再次上电后自动找上针位
Fn-62	正常停车速率(%)	325	30~1999	调整正常停车速率
Fn-63	切线停车速率(%)	925	30~1999	调整切线停车速率
Fn-64	回缝保护时间(s)	30	1~120	回缝电磁铁啮合合时间限制，保护电磁铁以及电路安全
Fn-65	低速最大输出扭矩(%)	25	10~80	低速最大输出扭矩
Fn-66	低速启动时间选择(上针位有效)	1	0~5	档位越高，上针位越接近缝纫；0为关闭低速启动时间调整功能
Fn-67	抬压脚电磁铁动作的周期信号(%)	30	10~90	抬压脚电磁铁动作时，以周期性电磁出力维持，避免电磁铁电磁发烫
Fn-68	缝纫机(机头)保养周期时间(hr.)	0	0~9999	设置缝纫机(机头)保养周期时间，当输入【0】时，可关闭保养提示功能
Fn-69	直驱上针位偏移角度(度x10)		0~3600	直驱上针位偏移角度（相对于[Z]信号）
Fn-70	系统故障信息代码			
Fn-71	机头编码器脉冲数取		0~1599	获取机头编码器脉冲数
Fn-72	工作机械角信息(度)		0~359	获取工作机械角信息
Fn-73	电磁铁输出电流(A)		0.000~9.999	获取电磁铁输出电流
Fn-74	脚踏板速度电平(V)		0.000~3.300	获取脚踏板速度电平
Fn-75	伺服系统(IO)输入监视			见注解①
Fn-78	缝纫机(机头)保养期内的累计运行时间(hr.)		0~9999	显示缝纫机保养期内的累计运行时间 当输入【0】时，可以清除累计运行时间，可输入其它数值生效用
Fn-79	执行出厂参数初始化			见章节3.3 出厂参数初始化

注释① 关于 Fn-75 号参数 监视内容的显示说明

伺服系统(IO)输入监视以显示屏中显示阴影字段的显示数字代表其输入的段位名称。不同的段位点亮代表不同的含义，如下表所示：

A[10]	A[07]	A[04]	A[01]
G[11]	G[08]	G[05]	G[02]
D[12]	D[09]	D[06]	D[03]

[01]	脚踏板前踏信号输入
[02]	脚踏板后踏信号输入
[03]	回缝控制开关信号输入
[04]	安全开关信号输入
[05]	(SYNUP)上针位同步输入
[06]	(SYNDN)下针位同步输入
[07]	(Hall1)电机霍尔(U)信号
[08]	(Hall1)电机霍尔(V)信号
[09]	(Hall1)电机霍尔(W)信号
[10]	母线电压过高信号
[11]	
[12]	编码器(Z)信号

2.3 功能操作

2.3.1 回缝功能

以起始单回缝为例，步骤如下：

1. 按下此键，设置起始回缝功能，再次按下此键，则可切换至B段回缝功能。
2. 显示屏显示当前所选择起始单回缝类别，同时可以通过+ -键分别调整A，B段针数，针数设定范围1~15针。
3. 设置好前面图标后，踩下脚踏板将执行所设定的起始回缝针数。

如果想切换设置了定长缝功能键，可以使用针位选择键将参数数值切换到定长缝等功能的针数设置界面，进行针数设定。

2.3.2 自由缝功能

1. 按下自由缝功能键，启动自由缝功能。
2. 屏幕自由缝图标点亮，表示已设定好自由缝功能。
3. 设置好自由缝功能后，踩下脚踏板将执行自由缝。缝纫的起停完全由脚踏板自由控制。

2.3.3 定长缝功能

一般缝模式：

1. 按一段缝功能键，启动一段缝功能。
2. 屏幕一段缝图标点亮，表示已设置好一段缝功能，同时可以通过+ -键分别调整E段针数，针数设定范围0~999针。
3. 设置好一段缝功能后，踩下脚踏板执行一段缝，系统将自动完成所设定的E针数。

四段缝模式：

1. 按四段缝功能键，启动四段缝功能。
2. 屏幕四段缝图标点亮，表示已设置好四段缝，同时可以通过+ -键分别调整E，F段针数，针数设定范围0~99针。
3. 按针位选择键，切换E,F段针数设置界面。
4. 切换好G,H段后，显示屏显示G,H段针数设置界面，同时可以通过+ -键分别调整G,H段针数，针数设定范围0~99针。
5. 设置好G,H段后，踩下脚踏板执行四段缝，系统将自动完成所设定的EFGH段针数。

七段缝模式：

1. 连续按下四段缝功能键，切换到七段缝功能键，显示屏显示当前切换的模式图标。
2. 当屏幕七段缝图标点亮，表示已设置好七段缝，同时可以通过+ -键分别调整E，F段针数，针数设定范围0~99针。
3. 按针位选择键，切换E,F段针数设置界面。
4. 切换好G,H段后，显示屏显示G,H段针数设置界面，同时可以通过+ -键分别调整G,H段针数，针数设定范围0~99针。
5. 设置好G,H段后，踩下脚踏板执行七段缝，系统将自动完成所设定的EFGH段针数。

自定义多段缝模式：

1. 连续按下四段缝功能键，切换到自定义多段缝模式显示屏同时显示当前切换的模式图标。
2. 屏幕自定义多段缝功能图标点亮，显示屏显示PX-XXX，PX表示段位（16进制表示），XXX 表示针数（十进制）。
3. 首先通过+ -键调整段位，设置好需要调整的段位，即可设定当前段位的段位针数。默认P1~P4的针数为15，未使用的段位将段位数设为0，段位可编程段位P1~PF(16进制)共计15段。每个段位针数的取值范围0~999。
4. 设置好P段位后踩下脚踏板执行自定义多段缝，缝纫将自动完成此缝制段位。重复次数由所设定的E段决定。

段位信号采用16进制表示，取值范围P1~PF，共计15段。段位针数采用10进制表示，取值范围0~999针。

2.3.4 剪线功能

1. 按下剪线功能键开启或者关闭剪线功能。
2. 当开启剪线功能时，显示屏点亮剪刀图标，当关闭剪线功能时，显示屏隐藏剪刀图标。

2.3.5 剪线自动抬压脚功能

1. 按下剪线自动抬压脚功能键来开启或者关闭剪线自动抬压脚功能。
2. 当开启剪线自动抬压脚功能时，显示屏点亮自动抬压脚图标，当关闭时，显示屏隐藏剪线自动抬压脚图标。

2.3.6 中途停车自动抬压脚功能

1. 按下中途停车自动抬压脚功能键开启或者关闭中途停车自动抬压脚功能。
2. 当开启中途停车自动抬压脚功能时，显示屏点亮自动抬压脚图标，当关闭时，显示屏隐藏中途停车自动抬压脚图标。

2.3.7 停针位置选择功能

1. 选择停止位置在上针位或者下针位。
2. 当选择上针位停止时，显示屏点亮停针位置选择图标，当选择下针位停止时，显示屏消隐停针位置选择图标。

2.3.8 提针与补针功能

1. 当在自由缝模式下执行提针与补针功能时，系统执行提针或者半针补针动作。
2. 当在定长缝模式下执行提针与补针功能时。

2.3.9 连续回缝功能

1. 按下连续回缝功能键，开启连续回缝功能，显示屏连续回缝图标点亮。
2. 显示屏显示E段重复次数设置界面，同时可以通过+ -键调节段数，数值设定范围1~99次。
3. 按键针位选择键，切换到ABCD段针数设置界面，通过+ -键调整各段所需的针数，各段的取值范围：0~15针。
4. 设置好连续回缝功能后，踩下脚踏板将自动完成连续回缝，重复次数由所设定的E段决定。

2.3.10 慢速启动功能

1. 开启慢速启动功能或者关闭慢速启动功能，显示屏慢启动图标点亮。
2. 开启慢速启动功能后，踩踏脚踏板时，系统将以慢速执行启动针数，之后开始正常缝制。

2.3.11 针迹补偿调整方法

当在使用回缝和连续回缝时，如果正缝和倒缝的针迹出现差异，可以通过调整倒缝电磁铁延时进行针迹补偿。以下将以起始回缝为例进行说明，其中，A=4, B=4：

出现现象	调整方法
	A段针数超出设定数值，或A段最后一针变长、B段第一针变短，造成执行完B段针数后无法回到起始点时：适当增大Fn-13号参数。
	A段针数少于设定数值，或A段最后一针变短、B段第一针变长，造成执行完B段针数后超出起始点时：适当减小Fn-13号参数。
	B段针数超出设定数值，或B段最后一针变长、后续缝纫的第一针变短，造成执行完B段针数后超出起始点时：适当增大Fn-14号参数。
	B段针数少于设定数值，或B段最后一针变短、后续缝纫的第一针变长，造成执行完B段针数后无法回到起始点时：适当减小Fn-14号参数。

■ 终止回缝，以及连续回缝可参照上述方法调整
■ 终止回缝补偿参数：Fn-16，Fn-17。连续回缝补偿参数：Fn-19，Fn-20。

3. 辅助功能

3.1 上针位设置与调整

3.1.1 数字模式

当Fn-83=0时，上针位定位模式为数字模式，设置方法如下：

（注意，数字模式时，第一次上机以及更换电机后都需要重新设置上针位！）

1. 在关机状态，按住S键，同时开启电源为系统上电。系统启动即进入特殊功能设置模式，进入特殊功能设置模式后，屏幕显示上针位代码选择界面，同时以+ -键进入选择代码号。
2. 将功能代码设定为：8080 即为进行上针位设定的代码。
3. 手动转轮转动至轮针位设置到所需上针位的位置。
4. 调整好后，按S键即可执行上针位的设定，听到四声短促报警表示完成上针位的设定。步骤(3)所调针位就被设为上针位。

3.1.2 磁钢模式

当Fn-83=1时，上针位定位模式为磁钢模式，设置方法如下：

（注意，磁钢模式时，上针位设置好后，只要手柄、电机未被拆卸、移动过，都无需重新设上针位。）

1. 上电后，观察针位位置。通过调节手柄的磁钢调节螺丝，调整上针位。
2. 踩下脚踏板，观察上针位停车位置。
3. 边调整边观察，上针位直至达到用户要求为止。

3.2 参数复制粘贴功能

1. 在关机状态，按住S键，同时开启电源为系统上电，系统启动后即进入特殊功能设置模式，进入特殊功能设置模式后，屏幕显示功能代码选择界面，同时以+ -键来选择代码号。
2. 功能代码设定为：0011 即为执行参数粘贴复制功能的代码。
3. 按下 触发自动功能键，将执行粘贴动作，即将操作面板内存中的参数粘贴到主控箱的参数内存中。
4. 按下 剪刀键，将执行复制动作，即从主控箱的参数内存中将参数复制到操作面板的参数内存中。

3.3 出厂参数初始化

1. 首先进入系统参数模式，系统参数模式的进入方法参见"2.2.3 系统参数设置模式"章节。
2. 进入系统参数模式后，将参数号调整到Fn-79，按S键进入参数设置，屏幕显示代码输入界面。
3. 在代码输入界面上输入不同的代码并执行不同的恢复方式，如右表所示。

恢复参数方式的执行代码

输入(1111)：从默认区恢复参数
输入(2222)：从常规(Flash)区恢复参数
输入(5555)：操作面板恢复默认参数

3.4 加工件数统计

在一般缝纫模式下，长按S键，显示屏将显示如左图所示的加工件数统计。每一次缝纫周期结束后，记为完成一件加工件。

3.5 电机实时速度监视

在用户参数模式或系统参数设置模式界面下长按加速调节键 ▲，将做为电机转速监视功能。

4. 故障处理与维修

当系统出现错误时，将以错误警报形式显示于显示屏上，用户可根据提示代码将进行对应的故障处理。如果出现用户无法解决的故障，请及时与有技术人员联系，报警显示代码(Err-01)，故障代码对应含义及解决方法如下表：

Err.01

故障代码	代码含义	解决方法
Err-0	输入信号自检错误（上电脚踏板故障测试）	1.检查脚踏板的信号是否连接正常 2.检查脚踏板归中复位
Err-2	EEPROM读/写数据错误	更换EEPROM
Err-3	EEPROM内置参数错误	上电复位
Err-4	过流、过压、超温、欠压	1.关机30秒后重新上电检查是否正常。2.电机功率模块可能发生故障。3.检查重新上电电压是否瞬间可用
Err-5	直流母线电压超压	1.关机30秒后重新上电检查是否正常。2.检查电网电压是否正常
Err-6	电磁铁供电电源过流	1.关机30秒后重新上电检查是否正常。2.检查电磁铁线圈是否连接正常
Err-7	堵转	关闭系统，检查缝纫机机械结构是否正常
Err-8	电机编码器信号错误	1.检查电机编码器线路是否连接正常
Err-9	同步器错误	1.检查电机同步信号线是否连接正常
Err-E	缝纫机(机头)保养提示	缝纫机运行时间达到前设置的保养周期，请对机头进行保养维护后，进入Fn-67参数设置0清除累计运行时间。
Err-F	安全开关警告	1.机头被翻开。2.检查安全开关线路是否连接正常。

1. Introduction

1.1 Abstract

Industrial sewing machine servo control system adopts new mechanical design with small volume, compact structure, beautiful shape and installation flexibility. Its circuit design isolates the driver and main control, and so prevents the control circuit from interference of driver. Finally, it has the excellence stability and reliability. With optimized SMPS designation, it archives the good efficiency and lower consumption with lower heat. The system has the perfect protective circuits which prevent it from burned circuit because of short circuit of power supply.

The system, with built-in advanced algorithm, has the higher precision and faster response time. It is designed with feasible method to adjust the needle stop position which cuts down the time to fix the needle position and facilitates the debugging and installation of the machine.

1.2 Composition

Servo control system consists of the following parts:

1. Main parts: Servo control cabinet, operation panel, pedal controller, permanent magnet AC servo motor.
2. Accessories: stand of operation panel, user manual, power supply cable, pedal connecting rod, screws.

Please check the packed parts according the packing list at the first time opening the carton, if any lack, contact the distributor asap.

1.3 Technology Specification

Parameter	Specifcation
Rated input voltage	220V±10%
Rated input frequency	50/60HZ
Rated output power	750W
Maximum motor rotation speed	5000rpm
Maximum output torque	3.5Nm

Item	Name	Unit	Qty.
1	Servo control cabinet	pcs	1
2	Operation panel	pcs	1
3	Pedal controller	pcs	1
4	permanent magnet AC servo motor	pcs	1
5	Stand of operation panels	pcs	1
6	User manual	book	1
7	Power supply cable	pcs	1
8	Pedal connecting rod	set	1
9	screw	bag	1

2. Operation description

2.1 Panel description
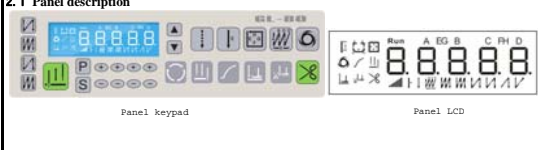
Panel keypad

Panel LCD

Key function definition:

Function	Key	Description	Icon on LCD
Function parameter edit	P	Enter function parameter edit after pressing the key for 2~3S in the operation mode; Quit function parameter edit mode after press the key for 2~3 S in the edit mode.	—
Setting parameter check and save	S	After setting the function code, press this key to check the preset parameter and then can edit the parameter accordingly; When the parameter is fixed, press this key to save the setting and quit.	—
Speed increase/decrease	▲	Increase the sewing speed	—
	▼	Slow down the sewing speed.	—
Parameter increase/decrease	＋	Increase the parameter	—
	－	Decrease the parameter	—
Stitch setting		Press this key to change the line section.	—
Auto function		Automatic function for constant stitch sewing.	
Needle stop position selection		Select needle up/down stop position. The default is up position when the related icon is lighting on the panel LCD.	
Slow launch setting		Set slow launch function. When the related icon is display on the panel, the function is activated.	
Auto lift presser foot after pause		Set presser foot auto-lifting after pause function. When the related icon is display on the panel, the function is activated.	
Auto lift presser foot after trimming		Set presser foot auto-lifting after trimming function. When the related icon is display on the panel, the function is activated.	
Consecutive reverse sewing		Set consecutive reverse sewing function. When the related icon is display on the panel, the function is activated.	
Sewing as you please		Set sewing as you please function. When the related icon is display on the panel, the function is activated.	
Start back-tracking sewing		Set start single back-tracking sewing function, and its section A&B or B parameters. When the an icon is display on the panel, the related function is activated.	
		Set start and back-tracking sewing function. When the related icon is display on the panel, the function is activated.	
End back-tracking sewing		Set end single back-tracking sewing function, and its section C&D or C parameters. When an icon is display on the panel, the related function is activated.	
		Set end dual back-tracking sewing function. When the related icon is display on the panel, the function is activated.	
Constant stitch sewing		Execute section E constant stitch sewing	
		Set multi-section sewing function, press the function key to switchover between four section sewing, seven section sewing and user-defined multi-section. When an icon is display on the panel, the related function is activated.	
Line trimming		When this function is selected, and this icon will be displayed on the panel LCD, and so line trimming function is activated.	
Lift and fill needle		Actuate lift and fill needle function	—
Speed display		Display the sewing speed grade	

2.2 Operation mode selection

2.2.1 Sewing mode

The machine enters into sewing mode as default setting after powering on. In the sewing mode, the user can select various kinds of sewing function after setting technology parameter. In the sewing mode, the users can switchover between various kinds of sewing function according to their need, but can't modify and set all the system technology parameters.

2.2.2 User parameter setting mode

In user parameter setting mode, users can adjust various kinds of sewing function parameter. It can be set as the following steps:

1. Press key P for 2~3S in the sewing mode to Enter into user parameter setting mode.
2. Press +/- to select the required function ID.
3. Press key S to check and modify the related parameter. Press +/- to set the required parameter.
4. After fixing the parameter, press key S to save the setting and quit the interface.
5. Press key P for 2~3S to quit the user parameter setting mode and recovery to sewing mode.

User parameter table:

No.	Items	Default	Range	Contents
Fn – 01	Maximum sewing speed (r/min)	3600	100~5000	Maximum speed adjustments
Fn – 02	Set accelerated curve (%)	80	10~100	Set the acceleration slope
Fn – 03	Start Back-Tacking Speed (r/min)	1800	150~2800	Set Start Back-Tacking Speed
Fn – 04	End Back-Tacking Speed (r/min)	1800	150~2800	Set End Back-Tacking speed
Fn – 05	Bar-Tacking Speed (r/min)	1800	150~2800	Set Bar-Tacking speed
Fn – 06	Slow Start Speed (r/min)	300	150~2800	Set slow start speed
Fn – 07	Number of Stitches For Slow Start	2	0~99	Set slow start speed
Fn – 08	Automatic Constant-Stitch Sewing Speed (r/min)	3200	300~4500	Speed adjustment for automatic constant-stitch sewing
Fn – 09	Automatic End Back-Tacking sewing	1	0~1	1: After last seam of Constant Stitch sewing, it will automatic execute the End Back-Tacking sewing function. When turned on, the Stitch-Correction is invalid. 0: Automatic End Back-Tacking will not execute after last seam, but can be done by pedal manually
Fn – 10	Back-Tacking Mode selection	1	0~1	1: JUKI mode (Back-tacking sewing is executed whenever machine is stopped or running). 0: BROTHER mode (Back-tacking sewing is executed when machine is running, needle filling is executed when stop).
Fn – 11	Start Back-Tacking Running Mode selection	1	0~1	1: Automatically perform actions 0: Could be arbitrarily stop and start.
Fn – 12	Ending Mode Of Star Back-Tacking	1	0~1	1:Start Back-Tacking is completed automatically continued for next actions 0: After the number of stitches is completed, the action stop automatically.
Fn – 13	Start Back-Tacking compensation –1	60	1~150	Compensation for A part of Start Back-Tacking
Fn – 14	Start Back-Tacking compensation –2	60	1~150	Compensation for B Part of Start Back-Tacking
Fn – 15	End Back-Tacking Running Mode selection	1	0~1	1: Automatically perform actions 0: Could be arbitrarily stop and start.
Fn – 16	End Back-Tacking compensation –1	60	1~150	Compensation for C part of end Back-Tacking
Fn – 17	End Back-Tacking compensation –2	60	1~150	Compensation for D part of end Back-Tacking
Fn – 18	Bar-Tacking Running Mode selection	1	0~1	1: Automatically perform actions 0: Could be arbitrarily stop and start.
Fn – 19	Bar-Tacking compensation –1	60	1~150	Compensation for A,C part of Bar-Tacking
Fn – 20	Bar-Tacking compensation –2	60	1~150	Compensation for B,D part of Bar-Tacking
Fn – 21	Needle stop Position Selection	1	0~1	Valid only when the operation panel is disconnected, 1(UP)/ 0 (DOWN)
Fn – 22	Slow Start Function Selection	0	0~1	Valid only when the operation panel is disconnected, 1(ON)/ 0 (OFF)
Fn – 23	Automatic Foot Lift After Trimming Function Selection	0	0~1	Valid only when the operation panel is disconnected, 1(ON)/ 0 (OFF)
Fn – 24	Automatic Foot Lift When Pause	0	0~1	Valid only when the operation panel is disconnected, 1(ON)/ 0 (OFF)
Fn – 25	Automatic Function Selection	0	0~1	Valid only when the operation panel is disconnected, 1(ON)/ 0 (OFF)

Fn – 26	Wipe Thread Function / Clamp Thread Function Selection	1	0~2	0 (OFF) 1 (Wipe Thread Function (ON)) 2 (Clamp Thread Function (ON))
Fn – 27	Clamp start angle	180	1~300	Clamp start angle
Fn – 28	Clamp release angle	300	30~330	Clamp release angle (Thread length control)
Fn – 36	Reverse needle lifting control mode	0	0~2	OFF[0]/ON[1]/Linked switch [2]
Fn – 37	Reverse needle lifting angle	40	20~90	Reverse needle lifting angle
Fn – 38	Pedal stroke ratio (%)	100	30~100	Pedal stroke ratio (%)
Fn – 39	Finished Sewing Piece Counter	0	0~9999	Display the quantity of finished sewing piece

2.2.3 System parameter setting mode

In system parameter setting mode, it's available to adjust kinds of the parameter of the electromagnets and system setting. Details parameter can be set according the following steps.

1. Long press key P, in the same time turn on the power. Switch from off to enter into system parameter setting mode. In this mode, both system parameter and user parameter can be modified.
2. Press +/- to select the required function ID, press key S to enter parameter modification interface to check and modify the parameter.
3. After fix the parameter, press key S to save the setting and quit.
4. Long press key P for 2~3S to quit the system parameter setting mode and recovery to normal sewing mode.

System parameter table:

No.	Items	Default	Range	Contents
Fn – 40	Direction of Motor Rotation	—	—	Reserved
Fn – 41	Motor Brake Function	0	0~1	1: When motor stopped, Keep it locked / 0; No effect.
Fn – 42	Auto running for test function	0	0~1	1: enable 0: disable When the parameter set as 1, the machine will start auto running as sewing function set on the operation panel.
Fn – 43	Motor auto-running full time(hr.)	8	1~800	Only valid when Fn = 42=1, set the full time for motor auto-running
Fn – 44	Motor auto-running on cycle time(s)	3	1~30	Only valid when Fn = 42=1, set the motor on time for each running cycle.
Fn – 45	Motor auto-running off cycle time(s)	3	1~60	Only valid when Fn = 42=1, set the motor off time for each running cycle.
Fn – 46	The minimum speed (r/min)	200	100~700	Adjust the minimum speed of the motor
Fn – 47	Thread trimming speed(r/min)	300	100~500	Speed is too low may lead to unusual thread, the speed is too high may lead to unstable positioning control
Fn – 48	Foot lifter and back-tracking electromagnet operation time to full output (ms)	300	0~990	Foot lifter and back-tracking electromagnet operation time to full output
Fn – 49	Back-tracking electromagnet operation duty cycle (%)	30	10~90	Back-tracking electromagnet operate in duty cycle to save the electricity and protect the electromagnet from over-heat.
Fn – 50	Motor starting delay time (ms)	50	0~990	Delay the start time, with automatic presser foot down
Fn – 51	Half step release Foot Lift			1: ON / 0: OFF
Fn – 52	Safety switch signal selection	0	0~1	1: Keep ON / 0: Keep OFF
Fn – 53	Trimming operation delay before the mechanical angle (degrees)	189	120~250	The degrees between UP position and thread trimming action
Fn – 54	Completion of the mechanical angle of the thread trimming action required	360	250~360	Completion of the mechanical angle of the thread trimming action required
Fn – 55	Thread take action before the delay time n (ms)	10	0~980	The time between UP position and Thread take action
Fn – 56	Thread take action time (ms)	70	0~9990	Completion of the thread take-up action required time

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Fn – 57	The time before Foot lifter action (ms)	50	0~990	The time between Thread take action and Foot lifter action
Fn – 58	Foot lifter action to maintain the time (s)	30	1~120	Foot lifter action to maintain the time
Fn – 59	UP needle position adjustment (degrees)	15	1~30	UP needle position adjustment (15 is the central location)
Fn – 60	Down needle position adjustment (degrees)	180	120~220	Down needle position adjustment
Fn – 61	Power on and positioning	—	—	Reserved
Fn – 62	The rate of normal stop (‰)	325	30~1999	Set the rate of normal stop
Fn – 63	The rate of thread trimming stop (‰)	925	30~1999	Set the rate of thread trimming stop
Fn – 64	Hold time of Back-tacking (s)	30	1~120	Forced shut-down after hold time.
Fn – 65	Low-speed maximum output torque (%)	25	10~80	Low-speed maximum output torque
Fn – 66	Low-speed start-up time Selection (UP position enable)	1	0~5	The higher the gear, and start to accelerate the faster (0:OFF)
Fn – 67	Foot lifter electromagnet operation duty cycle (%)	30	10~90	Foot lifter electromagnet operate in duty cycle to save the electricity and protect the electromagnet from over-heat.
Fn – 68	Sewing machine maintenance cycle (hr.)	0	0~9999	Set the sewing machine maintenance cycle time. Input [0], turn off the maintenance prompt function.
Fn – 69	Direct drive UP position deviation angle (degrees x10)	0	0~3600	Direct drive UP position deviation angle (Relative to [Z] signal)
Fn – 70	System fault information code	—	—	
Fn – 71	Encoder pulse number	—	0~1599	Display encoder pulse number.
Fn – 72	Mechanical angle information (degrees)	—	0~359	Display mechanical angle.
Fn – 73	Output current for electromagnet(A) (A)	—	0.000 ~ 9.999	Display output current for electromagnet
Fn – 74	The pedals speed level (V)	—	0.000 ~ 3.300	Display the pedals speed level
Fn – 75	Input monitoring of the servo system [①]	—	—	See note ①
Fn – 78	Total running time of the sewing machine during the maintenance cycle (hr.)	—	0~9999	Display the total running time of the sewing machine during the maintenance cycle. Input [0], you can clear the total running time.
Fn – 79	Reset to factory initial parameter	—	—	See Section 4.3

Note ① Description of the contents of Fn-75 Parameter monitoring
Different spots-light represents a different meaning. The following table shown below:

A[10]	A[07]	A[04]	A[01]
G[11]	G[08]	G[05]	G[02]
D[12]	D[09]	D[06]	D[03]

[01]	Pedal Forward signal input
[02]	Pedal backward signal input
[03]	Back-Tacking control switch input
[04]	The safety control switch input
[05]	(SYNUP) UP position input
[06]	(SYNDN) down position input
[07]	(Hall) (U) signal
[08]	(Hall) (v) signal
[09]	(Hall) (w) signal
[10]	Bus voltage is too high signal
[11]	Encoder (Z) signal
[12]	

2.3 Functions operation

2.3.1 Back-tracking sewing function

Check start-back-tracking sewing steps as following:
1. Press the related key to set starts back-tracking Sewing. When press the key consecutively, and it Will set as (1) start back-tracking sewing, (2)Section B sewing, (3)closing alternatively.
2. Adjust the stitches for section A and B by pressing +/-, and the number of stitches can be set between 0 and 15.
3. End back-tracking sewing, start back-tracking dual sewing, end back-track dual sewing can be operated according the above steps.

2.3.2 Sewing as you please

1. Press sewing as you please function key to activate the function.
2. The related icon is displayed on the panel to hint setting ok sewing as you please.
3. After setting ok, push the pedal to execute the sewing as you please.

2.3.3 Constant stitch sewing

One section mode:
1. Press one section constant stitch sewing function key to activate one section sewing.
2. The related icon is lighted on the panel to hint setting ok one section mode. In the same time, press +/- to set stitches of section E which range from 0 to 999, push the front part of the pedal to execute one section sewing function and the machine will finish the section E sewing as set.

Four section sewing mode:
1. Press four section sewing function key to activate four section sewing.
2. The related icon is lighted on the panel to hint four section sewing mode setting ok, then press +/- to set the number of section E and F stitches respectively which range from 0 to 99.
3. Press stitch selection key to change to interface where to set the number of section G and H stitches.
4. After change to the section G and H setting interface, press +/- to set the number of section G and H stitches which ranges from 0 to 99.
5. After setting four sections sewing function, the machine will execute four section sewing and complete section E, F, G, H sewing when push the front part of the pedal.

Seven section sewing mode:
1. Press four section sewing function key continuously until seven section sewing icon is display.
2. The related icon is lighted on the panel to hint seven section sewing mode setting ok, Then press +/- to set the number of section E and F stitches respectively which range from 0 to 99.
3. Press stitch selection key to change to Interface where to set the number of section G and H stitches.
4. After change to the section G and H setting interface, press +/- to set the number of section G and H stitches which Ranges from 0 to 99.
5. After setting seven sections sewing function, the machine will execute four section sewing and complete section E, F, G, H sewing when push the front part of the pedal.

User-defined multi-section sewing mode:
1. Press four section sewing function key continuously until User-defined multi-section sewing icon is display.
2. When user-defined multi-section sewing icon is lighted on the panel, and it hint the related function is set ok, in the Same time, PX.XXX is displayed on the panel which PX is standing for section NO. (in HEX) and XXX for the number Of stitches(in DEC.).
3. At first press +/- to set the section NO. and then to set the number of stitch for the selected section. When user-defined multi-section sewing ode is activated, the default number of stitch for section P1~P4 is 15, the number of stitch for unused section can be set to 0.The sections can be set from P1 to PF which adds up to 15 sections.
4. After setting user-defined multi-section sewing function, the machine will execute user-defined multi- section sewing and complete the set sections sewing when push the front part of the pedal.
Section NO. is indicated in HEX, and it ranges from P1 to PF which adds up to 15 sections.
The number of section stitch is indicated in DEC, and it ranges from 0 to 999.

2.3.4 Thread trimming function

1. Press thread trimming function to open or close the related function.
2. The icon will be lighted on the panel when the function is open, and the icon disappears when the function is closed.

2.3.5 Presser auto lifting function after trimming

1. Push presser auto lifting after trimming function key to open or close presser auto lifting function.
2. When the function is open, the related icon will be lighted on the panel; and the icon disappears when closed.

2.3.6 Press auto lifting function when pause

1. Push presser auto lifting function with pause trimming function key to open or close presser auto lifting function.
2. When the function is open, the related icon will be lighted on the panel; and the icon disappears when closed.

2.3.7 Needle stop position selection function

1. Press the function key to set needle stop on the up position or down position.
2. When the up position is selected, the icon is Lighted on the panel; the icon will disappear when down position is selected. Up stop position is system default setting, and the icon is lighted on the panel. When the icon is not on the panel, down stop position is set

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2.3.8 Lifting and filling the needle function

1. When the function is set under sewing as you please mode, the machine will execute needle lifting or half-stitch filling.
2. When the function is set under constant stitch mode, and the machine will execute needle lifting while press the function at the moment of the machine is paused.
The needle lifting is pressed while finished each section sewing,
The machine will execute needle filling function.

2.3.9 Consecutive back-tracking sewing function

1. Press the related key to open the function. The icon will be lighted.
2. In the same time the repeat turn E setting interface is displayed on the panel, then press +/- to adjust the number, which ranges from 1 to 99.
3. Press stitch selection key to enter into section A, B, C, D stitch setting interface.
4. After setting the consecutive back-tracking sewing function, push the front part of the pedal to complete the consecutive backing tracking sewing, the repeat turn is fixed by parameter E.
Once the function is activated, the machine will not stop until completing all the steps of consecutive back-tracking sewing.
The machine will stop as soon as the rear part of the pedal is pushed during sewing and the set consecutive back-tracking will be canceled.

2.3.10 Slow start function

1. Press the related key to open or close the function. The related icon is lighted when open, disappeared when close.
2. When slow start function is opened, the machine will start slowly to sewing the start stitches while the front part of the pedal is pushed, and then operate normally.

2.3.11 Stitch tracking remedial measure

The following description is based on A=4, B=4 for dual start back-tracking sewing remediation:

Issue description	Remedial measure
	The stitch number of section A is beyond the set value, or the length of section A last stitch is increased, the length of section B first stitch is decreased, which cause the final stitch of B can't overlap with the initial stitch of section A. Measure: Turn up the parameter of Fn-13 properly.
	The stitch number of section A is less than the set value, or the length of the section A last stitch is decreased, the length of section B first stitch increased, which cause the final stitch of section B is over the initial stitch of section A. Measure: Turn down the parameter of Fn-13 properly.
	The stitch number of section B is beyond the set value, or the length of the section B last stitch is increased, the length of following section first stitch decreased, which cause the final stitch of section B is over the initial stitch of section A. Measure: Turn up the parameter of Fn-14 properly.
	The stitch number of section B is less than the set value, or the length of the section B last stitch is decreased, the length of following section first stitch increased, which cause the final stitch of section B can't overlap with the initial stitch of section A. Measure: Turn down the parameter of Fn-14 properly.

■ Back-tracking sewing. Consecutive back-tracking sewing can refer to the above set of steps.
■ Back-tracking sewing compensation: Fn-16. Fn-17. Consecutive back-tracking sewing compensation: Fn-19. Fn-20.

3. Auxiliary function

3.1 Needle up stop position

3.1.1 Digital mode

When Fn-83=0, needle positioning mode setting method is digital mode, as follows:
(Note, in digital mode, the first time using machine as well as the replacement of equipment is required reset the position.)
1. Long press key S, in the same time turn on the power switch from off to enter into special function setting mode. , press +/- to select the required function ID.
2. Set the function ID as 8080, and enter into needle up stop position auto setting.
3. Rotate the hand wheel to adjust the needle to the up position.
4. After adjustment, press S to save the setting. In this time, four short tones is heard and hint finishing the setting. The position adjusted in the fore step is the set up stop position.
Repeat the fore step to set the suitable position.

3.1.2 Magnet steel mode

When Fn-83=1, needle positioning mode setting method is magnet steel mode, as follows:
(note, in magnetic mode, on the needle position is set up, as long as the hand wheel, motor is not disassembled, moved, the needle position no need to be reset.)
1. Power on, observe the needle position, by adjusting the magnetic steel adjusting screw on the hand wheel, adjusting the needle position.
2. Step on the foot pedal, observe the needle a needle stop position.
3. Adjustment of needle position until it reaches the requirement of users.

3.2 Parameter copy and paste function

1. Long press key S, in the same time turn on the power switch from off to enter into special function setting mode. , press +/- to select the required function ID.
2. Set the function ID as 0011 to enter into copy and paste function
3. Press auto function key to execute copy and paste function, which mean copy the parameters saved in panel memory and paste them to main controller parameter memory.
Press line trimming function key to copy the parameters in main controller memory to panel parameter memory.

3.3 Factory parameter initialization

1. Refer to clause 2.2.3 to enter system parameter setting mode.
2. Set function ID and into Fn-79 Parameter. Code input interface display on the panel.
3. Set different code to execute factory parameter initialization in different way. Details refer to the right table.

Initialization code and way	
Input (1111): Initialize the parameters from default parameter region.	
Input (2222): Initialize the parameters from flash.	
Input (5555): The keyboard to restore the default parameters	

3.4 The number of processing statistics

Under sewing mode, press S key. The display will show the processing statistics for the number.

3.5 Real-time motor speed monitor

Under user parameter setting mode or system parameter setting mode, press the accelerate adjustment key ▲, the display will show the real-time speed of motor.

4. Troubleshooting and maintenance

When there is error in the system, the error information will display the panel, in the same time, the indicator led will light red. The user can handle the error by the error code according the manual. If the error can't be settled, please contact our technician for support. Error code will be indicated in HEX on the panel. Refer to the following picture for Err-1 display:

Error code	Problem description	Measure
Err-0	Input signal self test error (power on pedal fault detect)	1.Check the connectivity of pedal signal; 2. Release the pedal to neutral position.
Err-2	EEPROM read/write data error	Replace EEPROM
Err-3	EEPROM built-in parameter error	Power-on reset
Err-4	Over-current, over-voltage, over-heat, low-voltage	1. Turn off the machine for at least 30S, then restart. 2. There maybe some malfunction for the motor power control module. 3. Check whether there are transient interference.
Err-5	Detect high voltage on the DC bus	1. Turn off the machine for at least 30S, then restart. 2. Check the power supply voltage.
Err-6	Detect over current for the power supply for electromagnet	1. Turn off the machine for at least 30S, then restart. 2. Turn of the machine, and check the connectivity of the electromagnet circuit.
Err-7	Stalling	Turn off the machine and check the mechanical parts
Err-8	Motor decoder output signal error	Check the motor output signal line whether line is broken or poor contact.
Err-9	Synchronizer self test error	1. Turn off the machine, and check the connectivity of synchronizer. 2.replace synchronizer
Err-E	Machine(head) maintenance prompt	The operation time reaches the maintenance period. Please do maintenance for the head, and then enter FN-67 to reset the accumulated operation time.
Err-F	Safety switch alarming	1. Check whether the head of the machine is turned over. 2. Check the connectivity of the circuit of safety switch.