

# PT500软启动器使用手册

PT500 soft starter Use manual



# 前 言

感谢您使用PT500软启动器。

本说明书提供给用户警示事项、使用条件与安装要求、控制面板与操作、保护功能与说明、远控软件使用说明、异常诊断、日常维护及安全使用等相关注意事项。为了保证正确地安装及操作本软启动器，请在装机之前，详细阅读本使用说明书。

如在使用过程中还存在疑难问题，请联络本公司的各地经销商或直接与本公司联系，我们的专业人员乐于为您服务。

请将此说明书交给最终用户并妥善保管本说明书，这对今后的维护、保养以及其它应用的场合都有所裨益。如在保修期间内发生问题，请填写保修卡后传真给经销商或本公司。

本产品在改进的同时，资料可能有所变动，恕不另行通知。如要获取最新资料，请登陆本公司网站查阅。

## 警示事项：

感谢您选用智能化电机软启动器产品，我们将以优异性能回报您的厚爱！

在本软启动器产品的安装、使用、维护过程中必须注意以下事项：

- △ 安装前请务必详细阅读本操作说明。
- △ 必须由专业技术人员安装本软启动器。
- △ 必须让电动机的规格与本软启动器相匹配。
- △ 严禁在软启动器输出端(U、V、W)接电容器。
- △ 安装后裸露的接线端子必须用绝缘胶带包好。
- △ 软启动器或相关的其他设备应可靠接地。
- △ 设备维修时必须切断输入电源。
- △ 不得私自拆卸、改装、维修本产品。

只有训练有素的人员允许操作本装置，使用前请详细阅读本说明书中有关安全、安装、操作和维修部分。本设备的安全运行取决于正确的运输、安装、操作和维护！

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## 第一章 PT500系列软启动器概况

### 1-1. 产品特点

PT500系列智能化电机软启动器是融合了最新的电机控制理论和专有电机保护技术及先进软件技术的新型设备,是早期用于电动机起动的星/三角转换、自耦降压、磁控降压等起动设备的理想替代产品;其性能是目前市场上多数没有采用智能起动控制技术的普通软启动器所无法比拟的。

#### 1-2. PT500系列软启动器的主要作用

第一:有效降低了电动机的起动电流;可减少配电容量,避免电网增容投资。

第二:减小了电动机及负载设备的起动应力;延长了电动机及相关设备的使用寿命。

第三:软停机功能有效地解决了惯性系统的停车喘振问题;是传统起动设备无法实现的。

第四:具有六种独特的起动模式;以适应复杂的电机和负载情况,达到完美的起动效果。

第五:具有完善可靠的保护功能;有效地保护了电动机及相关生产设备的使用安全。

第六:电动机软启动器智能化、网络化技术的应用使得电机控制技术适应了飞速发展的电力自动化技术的更高要求。

#### 1-3. PT500系列软启动器的主要特点

##### •完美的人性化设计:

外形美观和结构合理的和谐统一。

功能完善和操作简便的和谐统一。

牢固可靠和结构紧凑的和谐统一。

工业产品精益求精的艺术化设计。

##### •可靠的质量保证:

采用计算机模拟设计。

SMT贴片生产工艺。

优异的电磁兼容性能。

整机出厂前的高温老化、振动试验。

##### •完善可靠的保护功能:

失压、欠压、过压保护。

软启动器过热、电机欠载、起动时间过长保护。

输入缺相、输出缺相、三相不平衡保护。

起动过流、运行过载、负载短路保护。

##### •自主知识产权的产品:

外观设计专利。

自主软件著作权。

专有的电机起动和保护技术。

独有的检测调试设备和工艺。

##### •迅捷周到的售后服务:

可靠的性能和质量奠定优质服务的基础。

提供优秀完善的配套设计方案。

及时周到的使用咨询。

根据用户意见不断提高产品性能。

## 第二章 产品型号说明与开箱检查

每台PT500系列软启动器在出厂前均进行了严格的检验和性能测试。用户在收到产品并拆封后,请按下列步骤检查,如发现问题,请及时与供货商联系。

### 2-1. 开箱检查步骤

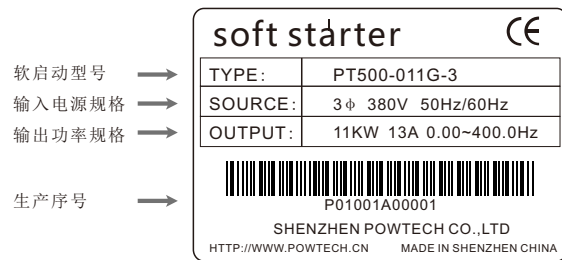
确认软启动器运输过程中无任何损坏(机体上的损伤或缺口)。

检查内部含本机、使用说明书一本、保修卡一张。

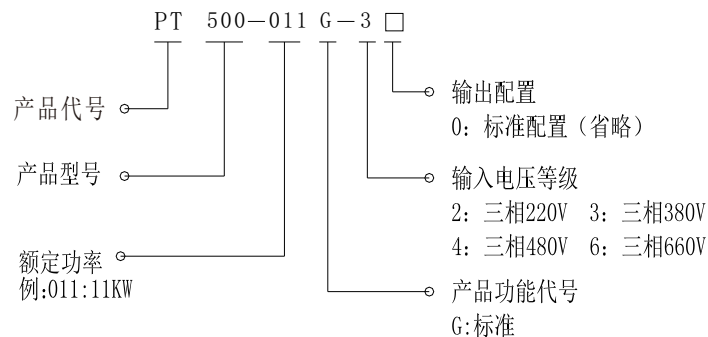
核对产品外壳上的规格标牌,确认您收到的货物与您订购的产品相符。

如果您订购了软启动器的选配件,请确认收到的选配件是您所需要的。

### 铭牌说明



### 型号说明



## 第三章 使用条件与安装要求

PT500系列软启动器应符合下述使用条件与安装方法要求;否则,性能将不予保证,严重时甚至会造成软启动器寿命缩短直至损坏。

### 3-1. 软启动器的使用条件

3-1-1. 供电电源: 市电、自备电站、柴油发电机组三相交流380V、480V或660V±15%、50Hz或60Hz,电源容量必须满足软启动器对电动机的起动要求。

3-1-2. 适用电机: 鼠笼式三相异步电动机,电机额定功率应与软启动器额定功率匹配。

3-1-3. 起动频度: 没有要求,具体次数视负载情况而定。

3-1-4. 冷却方式: 自然风冷。

3-1-5. 防护等级: IP20。

3-1-6. 环境条件: 海拔3000米以下,环境温度-25℃至+40℃之间,相对湿度90%RH以下,无凝露,无易燃、易爆、易腐蚀性气体,无导电性尘埃,室内通风良好、震动小于0.5G的地方。

本公司可为用户提供在特殊条件下使用的产品,如防爆型、低温型、高压型软启动器,其使用条件另行说明。

### 3-2. 软启动器的安装要求

安装方向与距离: 为了确保软启动器在使用中具有良好的通风及散热条件,软启动器应垂直安装,并在设备四周留有足够的散热空间,如图3.1、图3.2,图中为允许的最小距离。

软启动器在柜内安装时,除上述要求外,还须选用上、下通风良好的柜体。

3-3-5. PT500系列5R4 (250kW-400kW)软启动器外型及安装尺寸如图3.6

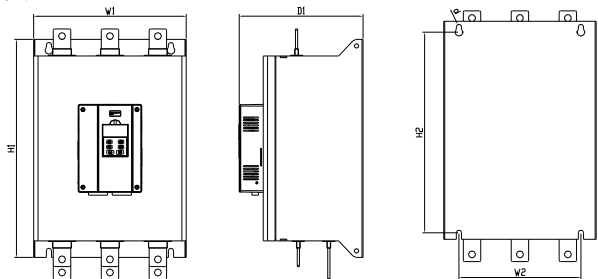


图3.6

规格型号	额定功率 (KW)	额定电流 (A)	外型尺寸			安装尺寸			净重 (kg)
			H1	W1	D	H2	W2	d	
PT500-250G-3	250	500	500	350	284	460	280	M9	<31
PT500-280G-3	280	560	500	350	284	460	280	M9	<31
PT500-320G-3	320	640	500	350	284	460	280	M9	<31
PT500-400G-3	400	800	500	350	284	460	280	M9	<31

第四章 接线方法和外接端子

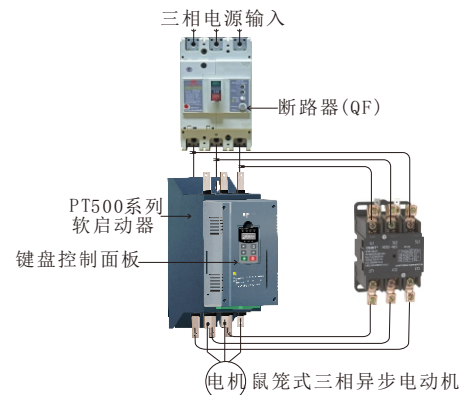
PT500系列软启动器有三类接线:

主回路接线: 包括三相电源输入和输出至电机接线以及进线断路器、旁路接触器接线。

外接端子接线: 由12个小型接线端子引出, 包括输入、输出控制线和模拟输出信号线。

通讯接线: 一个RJ-45标准网线插座和一个DB9插座用于连接计算机或计算机网络。

4-1. 软启动器基本接线示意图



注: 六个输出铜排中, 前面三个接电机, 后面三个接旁路接触器

4-2. 软启动器外接端子说明

外接端子如图所示:

P01	P02	D01	D02	E01	E02	EMS	STOP	RUN	COM	I01	I02
-----	-----	-----	-----	-----	-----	-----	------	-----	-----	-----	-----

4-2-1. 端子 P01、P02为旁路输出:用于控制旁路接触器, 为常开无源触点, 起动成功时闭合。触点容量为: AC250V/5A。

4-2-2. 端子 D01、D02 为可编程继电器输出:输出方式与功能由设置项PJ设定, 为常开无源触点。触点容量为: AC250V/5A。

4-2-3. 端子 E01、E02为故障输出: 软启动器发生故障或失

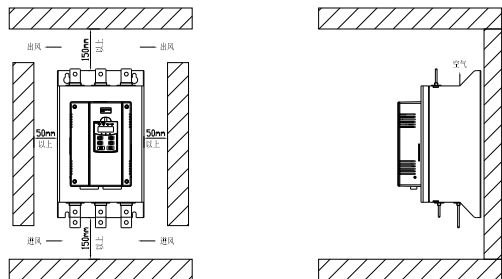


图3.1

图3.2

### 3-3. 软启动器的外型与安装尺寸

3-3-1. 额定功率和额定电流是指软启动器的最大额定值。一般情况下，适配电机的相应参数应不大于此值。

3-3-2. PT500系列5R1 (5.5kW-55kW)软启动器外型及安装尺寸如图3.3

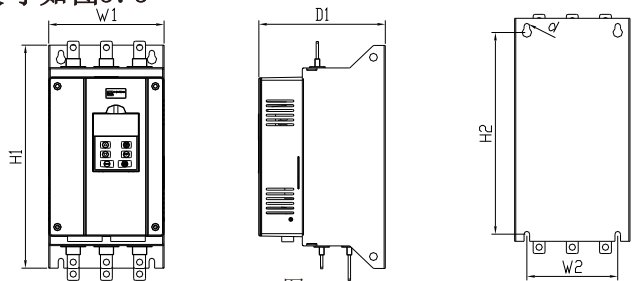


图3.3

规格型号	额定功率 (KW)	额定电流 (A)	外型尺寸			安装尺寸			净重 (kg)
			H1	W1	D	H2	W2	d	
PT500-5R5G-3	5.5	11	282	146	162	247	129	M6	<3.5
PT500-7R5G-3	7.5	15	282	146	162	247	129	M6	<3.5
PT500-011G-3	11	22	282	146	160	255	115	M6	<3.5
PT500-015G-3	15	30	282	146	160	255	115	M6	<3.5
PT500-018G-3	18.5	37	282	146	160	255	115	M6	<3.5
PT500-022G-3	22	44	282	146	160	255	115	M6	<3.5
PT500-030G-3	30	60	282	146	160	255	115	M6	<3.5
PT500-037G-3	37	74	282	146	160	255	115	M6	<3.5
PT500-045G-3	45	90	282	146	160	255	115	M6	<3.5
PT500-055G-3	55	110	282	146	160	255	115	M6	<3.5

3-3-3. PT500系列5R2 (75kW-115kW)软启动器外型及安装尺寸如图3.4

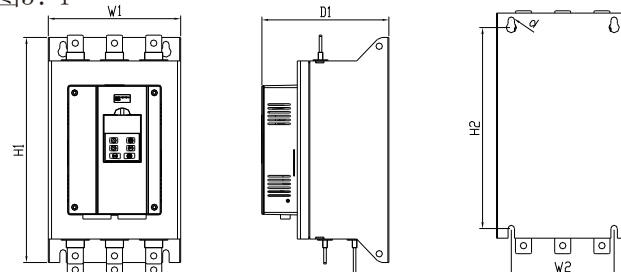


图3.4

规格型号	额定功率 (KW)	额定电流 (A)	外型尺寸			安装尺寸			净重 (kg)
			H1	W1	D	H2	W2	d	
PT500-075G-3	75	150	350	206	198	313	160	M8	<20
PT500-090G-3	90	180	350	206	198	313	160	M8	<20
PT500-115G-3	115	230	350	206	198	313	160	M8	<20

3-3-4. PT500系列5R3 (132kW-200kW)软启动器外型及安装尺寸如图3.5

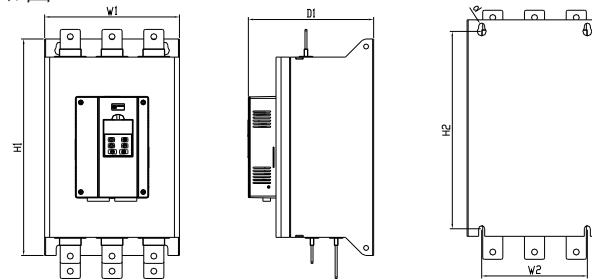


图3.5

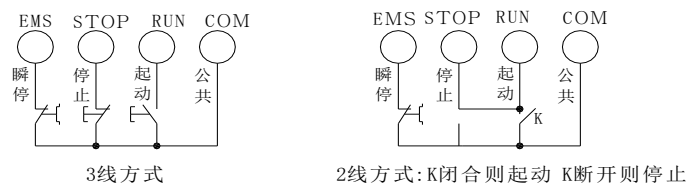
规格型号	额定功率 (KW)	额定电流 (A)	外型尺寸			安装尺寸			净重 (kg)
			H1	W1	D	H2	W2	d	
PT500-132G-3	132	264	430	268	249	392	210	M9	<23
PT500-160G-3	160	320	430	268	249	392	210	M9	<23
PT500-185G-3	185	370	430	268	249	392	210	M9	<23
PT500-200G-3	200	400	430	268	249	392	210	M9	<23



电时闭合，工作正常时开路，为无源触点。触点容量为：AC250V/0.5A。

4-2-4. 端子 EMS为瞬停输入：软启动器正常工作此时端子必须与端子10 短接。若此端子与端子 10 开路时，软启动器无条件停止工作,处于故障保护状态。此端子可受控于外部保护装置的常闭输出点。设置项PC设为0 (初级保护)时，此端子功能被禁止。

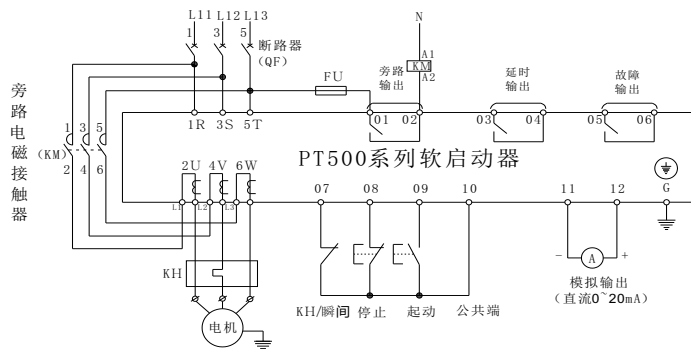
4-2-5. 端子 STOP、RUN、COM 为外控起动、停止按钮输入接线端子。有两种接法，即 3 线方式和 2 线方式。可根据需要选择连接，如图所示。



4-2-6. 端子I01、I02为0~20mA直流模拟输出：用于实时监视电机电流,满度20mA时指示电机电流为软启动器标称额定电流的4倍,可外接 0~20mA直流电流表观察,该输出负载电阻最大值为300Ω。

4-2-7. 外接端子线切勿接错,否则有可能导致本软启动器损坏。

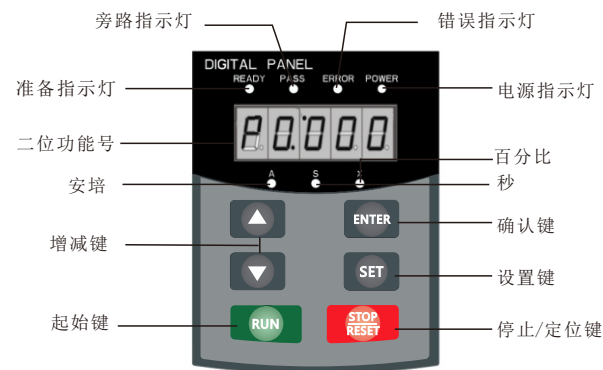
4-2-8. PT500系列软启动器主回路接线简图



## 第五章 控制面板与操作

PT500系列软启动器共有5种工作状态:准备、运行、故障、起动和停止。准备、运行、故障均有相应的状态指示灯,起动时显示××××,软停时显示—×××,其中×××××表示电机电流。

### 5-1. 键盘操作方法



5-1-1. 开机状态: 只有在准备指示灯亮且显示PT500或READY时按起动键才可起动电机。初次上电时显示PT500表示欧科传动有限公司PT500系列软启动器, 否则显示READY 表示准备。

5-1-2. 延时状态: 准备或故障状态指示灯闪动表示间隔延时; 显示dE××× 且倒计时表示起动延时。

5-1-3. 起动和停止键: 在软启过程中, 显示器显××××, 指示起动电流值, 此时只有停止键起作用, 不能进入设置和帮助提示菜单, 同时准备、运行、故障三个指示灯均不亮。在软停过程中, 显示器显示 ××××, 指示电机电流值, 此时只有起动键起作用, 不能进入设置和帮助提示菜单, 同时准备、运行、故障三个指示灯均不亮。停止键兼有复位故障状态的功能。



5-1-4. 设置键:在非帮助状态下,按设置键进入设置菜单,显示PX;XXX;再按设置键,冒号闪动,表示可以修改冒号后面的参数.在冒号闪动时按确认键,若数据已被修改,则显示good,并连响两声,表示新数据已被保存,然后退出.若不想保存新数据,则按设置键,冒号停止闪动同时恢复原来的数据,再按确认键退出.也可按停止键直接退出。

5-1-5. 确认键:在非设置状态下,按确认键进入帮助菜单,显示HX:XXX,再按确认键退出.也可按停止键退出.在设置状态下,按确认键保存新数据并退出设置状态。

5-1-6. 增减键:在设置菜单中,冒号不闪时按增减键可改变功能号;冒号闪动时按增减键则改变数据,按住增/减键超过1秒时,数据将快速连续增减.在帮助菜单中按增减键改变功能号及相应的提示信息内容.在旁路运行指示灯亮时,且未进入设置和帮助菜单,则显示AXXXX,表示电机运行电流,此时按增减键,可依次选择显示PXXXX或HXXXX.其中PXXXX表示电机视在功率;HXXXX表示电机过载热平衡系数,当HXXXX指示值大于100%时,将过载保护,显示Err08。

5-1-7. 当数据大于999时,最后一位小数点亮,表示尾数+0。

5-1-8. 按键操作有效时将有声响提示,否则说明本状态下此键无效。

5-1-9. 外控端子接于3线方式时,外控起动按钮和停止按钮分别与控制面板上的起动键和停止键功能等效。

5-1-10. 控制面板采用超强抗干扰设计,允许外引距离大于3米。

5-1-11. 键盘数码显示区说明

显示字母	对应字母	显示字母	对应字母	显示字母	对应字母
0	0	1	1	2	2
3	3	4	4	5	5
6	6	7	7	8	8
9	9或g	A	A或R	b	B
C	C	d	d或D	E	E
F	F	H	H	J	J
L	L	N	N	U	U或V
o	o	P	P	r	r
Y	Y	RUN	RUN	VER	Ver
READY	READY	GOOD	good	ERR	Err

## 5-2. 功能参数设置与说明

功能参数设置代码如下表

设置代码说明				
代码	名称	设定范围	出厂值	说明
P0	起始电压	30-70%	30%	电压斜坡模式有效;电流模式起始电压为40%。
P1	软启时间	2-60S	16S	限流模式无效。
P2	软停时间	0-60S	0S	设为0时自由停车;一拖二接线时请设为0。
P3	起动延时	0-999S	0S	用倒计时方式延时,设为0时不延时,立即起动。
P4	编程延时	0-999S	0S	用于可编程继电器输出。
P5	间隔延时	0-999S	0S	过热解除时也延时;延时间状态指示灯闪动提示。
P6	起动限制电流	50-500%	280%	限流模式有效;电压斜坡模式限流值最大为400%。
P7	最大工作电流	50-200%	100%	P6、P7参数的输入方式由P8决定。
P8	输入显示方法	0-3	1	详见5.5其它设置项说明
P9	欠压保护	40-90%	80%	低于设定值时保护。
PA	过压保护	100-140%	120%	高于设定值时保护。
PB	起动模式	0-5	1	0限流1电压;2突跳+限流;3突跳+电压;4电流斜坡;5双闭环。

设置代码说明				
代码	名称	设定范围	出厂值	说明
PC	输出保护允许	0-4	4	0 初级; 1 轻载; 2 标准; 3 重载; 4 高级
PD	操作控制方式	0-7	0	设为7时禁止起动或停止操作, 详见5.5其它设置项说明。
PE	重起动允许	0-13	0	详见5.4自动重起功能。
PF	参数修改允许	0-3	1	详见5.5其它设置项说明。
PH	通讯地址	0-64	0	用于多台软启动器与上位 机多机通讯。
PJ	编程输出	0-19	7	详见5.3可编程继电器输出功能。
PL	软停限流	20-100%	80%	详见7.3.1软停机模式。
PP	电机额定电流		额定值	用于输入电机标称额定电流。
PU	电机欠载保护		0	详见5.5其它设置项说明。
备注: 1. 设置项P7最大工作电流是根据电机的负载轻重在PP设置数基础上计算的可持续运行的最大电流,超过此值将做反时限热保护。 2. 设置状态下若超过2分钟没有按键操作,将自动退出设置状态。 3. 在软启和软停过程中不能设置参数,其他状态下均可设置参数。 4. 按着确认键(PRG)上电开机,可使设置参数(PJ除外)恢复出厂值。				

### 5-3. 可编程继电器输出功能

可编程继电器输出功能有两种工作方式,即可编程时序输出方式和可编程状态输出方式。

5-3-1. 设置项PJ为0~4(10~14)时,可编程输出工作于时序输出方式,设定输出的起始时刻如下表:

PJ 设置的数值	0(10)	1(11)	2(12)	3(13)	4(14)
编程输出时刻	发起动命令时	开始起动时	旁路运行时	发停止命令时	停机完成时

5-3-1-1. 此工作方式包含一个999秒定时器,由设置项P4设定.若P4不为0,则按设置项PJ设定的起始时刻开始计时,计时到则输出改变状态,若设置项P4为0则立即改变输出状态.该输出的复位时刻是在按P4设置时间延时结束且在准备状态下再维持1秒时。

5-3-1-2. 可编程时序输出方式是以一次起动过程为控制周期的,如果再次起动电机则自动中断上次编程输出过程并重新启动该过程。

5-3-2. 设置项PJ为5~9(15~19)时,可编程输出工作于状态输出方式,设定的工作状态输出如下表:

PJ 设置的数值	5(15)	6(16)	7(17)	8(18)	9(19)
输出指示状态	电机故障状态	运行状态	准备状态	起动状态	旁路状态

5-3-2-1. 可编程状态输出方式用于指示软启动器的工作状态,此方式下设置项P4设置的时间无效.设置项PJ出厂值为7,即指示软启动器的准备工作状态,此状态下可起动电机;可编程输出为故障状态时,是指电机类故障(Err05/Err06/Err07/Err08/Err12/Err15),它不同于⑤/⑥号故障输出端子的功能;运行状态是指非准备或故障状态,它包括起动、旁路、软停三个过程。

5-3-2-2. 当PJ>9时,可编程输出(③/④号外接端子)的复位状态由常开变为闭合,即反相输出.灵活运用可编程继电器输出功能,可有效地简化外围控制逻辑线路。

### 5-4. 自动重起动功能

5-4-1. 当设置项PE为1~9时,将允许自动重起动功能.此功能仅外控2线方式有效,并且不受外控允许设置项PD的控制.按两线方式接线且置于闭合起动状态时:

5-4-2. 上电后延时60秒自动起动。

5-4-3. 发生故障停机后,经延时60秒后自动重新起动,但当设置项P5的设置时间大于60秒时,则按P5设置时间延时。延时期间状态指示灯闪动。

5-4-4. 包括上电起动和发生故障后重新起动在内共可自动起动n次, n为设置项PE设定值。自动重起动方式必须重新上电开机才能生效,且每次重新上电都再次生效。

5-4-5. 当设置项PE为10时,禁止失电保护功能:上电时,若外控起动端子已处于闭合状态,则自动起动电机,即允许上电起动。

5-4-6. 当设置项PE为11时,发生故障后可再起:当外控⑦号瞬停端子未被禁止(设置项PC>0),或发生过瞬停、过热、欠压等故障并恢复时,不需复位即可再次起动电机。

5-4-7. 当设置项PE为12时,禁止失电保护功能且故障后可再起。

5-4-8. 当设置项PE为13时,运行状态记忆恢复功能:即在旁路运行状态下断电且再来电时,软启动器会自动起动恢复旁路运行状态。

5-4-9. 警告:本软启动器具备失压保护功能,即断电且来电后,无论外控端子处于何种位置,均不会自行起动,以免造成伤害事故。但当自动重起动功能允许、禁止失电保护、允许运行状态记忆恢复功能时,失电保护功能都将失效!

## 5-5. 其它设置项说明

5-5-1. 设置项P8用于选择输入和显示方式,如下表:

P8设置数值	0	1	2	3
P6/P7输入方式	电流数值	百分比	电流数值	百分比
运行显示方式	电流数值	电流数值	百分比	百分比

设置项P6、P7为百分比输入方式时,是指设置项PP设置的电机电流数值的百分比。

5-5-2. 设置项PD用于选择电机起动控制方式,如下表:

数值	0	1	2	3	4	5	6	7
键盘	1	1	0	0	1	1	0	0
外控	0	1	1	1	1	0	0	0
通信	0	0	0	1	1	1	1	0

(1)表中1为允许,0为禁止。例如若起动后不允许意外停止,或维修时不允许意外起动,可把此项设为7,则禁止所有起动或停止操作。

(2)当外控允许时,外控端子⑧/⑩之间必须接一常闭按钮开关或短接,否则无法起动电机。

5-5-3. 设置项PF为参数修改允许选择项,有三种选择:

(1)设置项PF为0时,除设置项PF外,禁止修改任何参数。

(2)设置项PF为1时,禁止修改设置项P4、P7、P8、PE、PH、PJ、PL、PU的参数。

(3)设置项PF为2时,允许修改所有设置项的参数。

5-5-4. 设置项PU用于设定电机欠载保护功能。

5-5-4-1. 设置项PU<10时,禁止电机欠载保护功能。

5-5-4-2. 欠载保护电流范围为电机额定电流的10%~90%,由设置项PU的十位数确定。

5-5-4-3. 欠载保护延时范围为5~90秒,由设置项PU的个位数乘以10确定,当PU的个位数为0时,保护动作延时为5秒。例如设置项PU=42,则表示欠载电流为40%,保护动作延时为20秒。

## 5-6. 帮助信息及说明

帮助信息提示如下表:

显示	说明
AC:XXX	3位数字电压表,用于监测三相交流电源电压。
022-3	提示本软启动器规格为22KW-380/50Hz
H1:E05	提示最后发生过的故障信息Err05。
H2:E01	提示曾发生过的故障信息Err01。

显示	说明
AC:XXX	3位数字电压表,用于监测三相交流电源电压。
H3:E06	提示曾发生过的故障信息Err06。
H9:E00	提示没有故障信息。
Uer3.0	提示本产品软件版本为Ver3.0。 随着软件升级,版本随着增加。
LXXXX	成功起动次数总计。
RUNXX	上次软启动(起动成功)所用时间(秒)。
注: H1~H9用递推的方式储存新近发生过的9个故障信息	

(1)在非软启和软停状态,且未进入设置状态时,按确认键可进入帮助菜单,再按增、减键可选择提示信息。

(2)在帮助状态下按确认键或停止键可退出帮助状态。

## 第六章 保护功能与说明

PT500系列软启动器具有完善的保护功能以保护软启动器和电动机的使用安全。在使用中,应根据不同的情况恰当地设置保护级别和保护参数。

### 6-1. 保护功能及其参数

6-1-1. 软启动器过热保护:温度升至 $80^{\circ}\text{C}\pm 5^{\circ}\text{C}$ 时保护动作,当温度降至 $55^{\circ}\text{C}$ 时(最低),过热保护解除。

6-1-2. 输入缺相保护滞后时间: $< 3$ 秒。

6-1-3. 输出缺相保护滞后时间: $< 3$ 秒。

6-1-4. 三相不平衡保护滞后时间: $< 3$ 秒。以各相电流偏差大于 $50\%\pm 10\%$ 为基准,当负载电流低于软启动器标称额定值的30%时,判定基准偏差将增大。

6-1-5. 起动过流保护时间:持续大于设置项P7最大工作电流5倍时的保护时间见表6.1。

6-1-6. 运行过载保护时间:以设置项P7最大工作电流为基准作反时限热保护,脱扣保护时间曲线如图6.1。

6-1-7. 电源电压过低保护滞后时间:当电源电压低于极限值40%时,保护动作时间 $< 0.5$ 秒,否则低于设定值时保护动作时间 $< 3$ 秒。

6-1-8. 电源电压过高保护滞后时间:当电源电压高于极限值140%时,保护动作时间 $< 0.5$ 秒;否则高于设定值时保护动作时间 $< 3$ 秒。

6-1-9. 负载短路保护滞后时间: $< 0.1$ 秒,电流为软启动器标称额定电流的10倍以上。本保护不能替代熔断式短路保护装置。

6-1-10. 电机欠载保护:电流范围为电机额定电流的10%~90%,保护动作延时为5~90秒。

以上时间参数是从检测到有效信号开始到发出脱扣保护指令为止,参数仅供参考。PT500系列软启动器所列的所有保护功能均可通过实际的或模拟的方法进行验证,若不符合用户的要求,则应另加专用保护装置,以确保安全。

## 6-2. 保护级别设定说明

6-2-1. 为了适应不同的应用场合, PT500系列软启动器设有五个保护级别, 分别为0:初级、1: 轻载、2: 标准、3: 重载、4: 高级, 由设置项PC设定, 其中:

6-2-1-1. 初级保护禁止了外接瞬停端子功能, 同时仅保留了过热、短路和主回路故障保护, 适用于需无条件紧急起动的场合, 如消防系统等。

6-2-1-2. 轻载、标准、重载三个保护级别具备完全的保护功能, 区别在于电机过载热保护时间曲线不同。其电机热保护时间参数见表6. 1和图6. 1。

6-2-1-3. 高级保护在起动时的保护标准更为严格, 其他保护功能参数与标准保护设置相同。

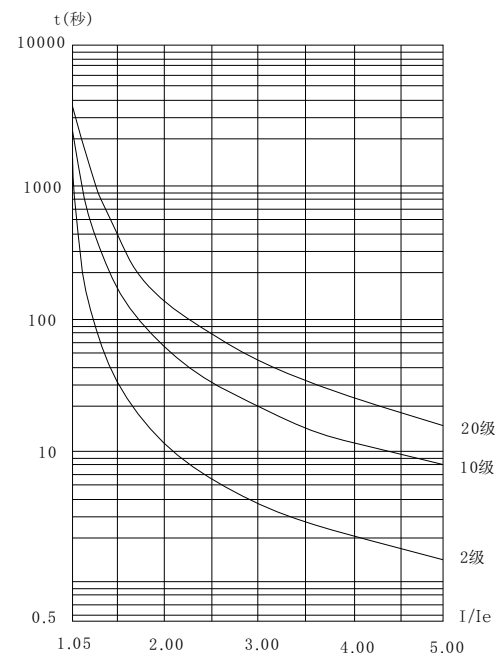
6-2-2. 按设置项PC设定的不同保护级别及热保护时间如下表:

PC设置	0 (初级)	1 (轻载)	2 (标准)	3 (重载)	4 (高级)	说明								
运行过载保护级别	无	2级	10级	20级	10级	按IEC60947-4-2标准								
起动过流保护时间	无	3秒	15秒	30秒	15秒	按起动电流超过F7设置5倍计								
运行过载脱扣时间列表	电流倍数(I/I <sub>e</sub> )	3	4	5	3	4	5	3	4	5	3	4	5	表中数值为典型值
	脱扣时间(秒)	4.5	2.3	1.5	2.3	1.2	0.75	4.6	2.3	1.5	2.3	1.2	0.75	

应按电机标牌上的额定电流数值输入设置项PP, 否则当设置项P6、P7的输入方式为百分比方式(由设置项P8设定)时, 起动电流和保护电流会有较大偏差。

设置项PP设定的电机电流不能低于软启动器标称电流的20%。当PP设定的电机电流较小时, 保护脱扣动作的灵敏度误差将增大。

6-2-3. 按IEC60947-4-2标准的电机热保护脱扣时间曲线如下:





### 第七章 试运行与应用

通电运行前应按下下列条款仔细检查：

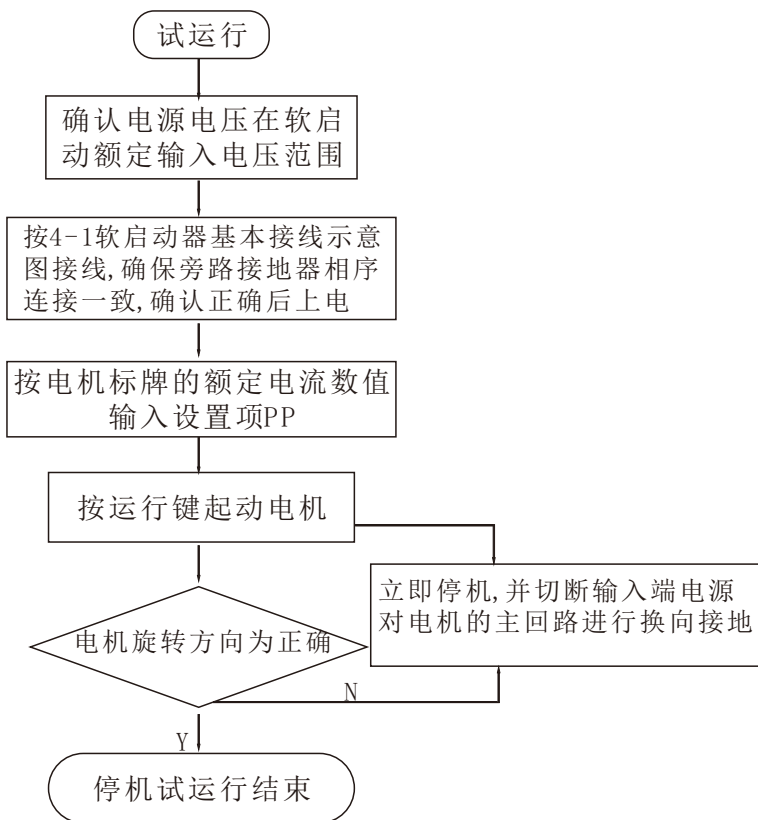
软启动器额定功率是否与电动机相匹配。

电动机绝缘性能是否符合要求。

输入输出主回路接线是否正确。

所有接线端子的螺丝是否拧紧。

#### 7-1. 通电试运行



7-1-1. 如果电机起动状态不理想,可参考7.2软启动器的起动模式及应用一节选择恰当的起动模式。

7-1-2. 若电动机起动力矩不够,可改变起始电压(电压方式时)或限流值(电流方式时),提高电动机起动转矩。

7-1-3. 软启动器通电后,请勿打开上盖,以免触电。

7-1-4. 在通电试运行过程中,如发现异常现象,如异常声音冒烟或异味等,应迅速切断电源并查清原因。

7-1-5. 若上电后或起动时故障指示灯亮且显示ErrXX,可按所显示的故障代码对应故障原因及处理一章查找原因。

7-1-6. 按停止键或外控停止按钮可复位故障状态。

注意：

1、当环境温度低于-10℃时,应通电预热30分钟以上再起动。

2、当软启动器起动电机成功时,面板中间的运行状态指示灯点亮,表示已处于旁路运行状态。若此时旁路接触器未吸合导致电机停止运行时,应检查旁路接触器及相关接线是否有误或接触不良。

#### 7-2. PT500系列软启动器的起动模式及应用

PT500系列软启动器有六种起动模式以适应各种复杂的电机和负载情况,用户可根据不同的应用情况进行选择。

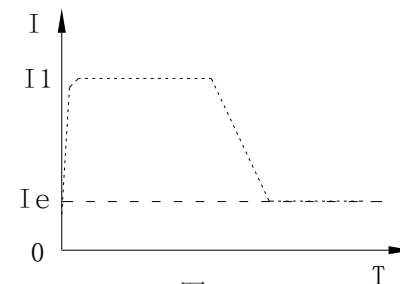


图7.1

### 7-2-1. 限电流起动模式

设置项PB为0时设定起动模式为此模式。

图7.1给出了限电流起动模式的电机电流变化波形。其中I1为设定的起动限流值,当电机起动时,输出电压迅速增加,直到电机电流达到设定的限流值I1,并保持电机电流不大于该值,然后随着输出电压的逐渐升高,电机逐渐加速,当电机达到额定转速时,旁路接触器吸合,输出电流迅速下降至电机额定电流I<sub>e</sub>或以下,起动过程完成。

当电机负载较轻或设定的限流值较大时,起动时的最大电流也可能达不到设定的限流值时属正常。

限电流起动模式一般用于对起动电流有严格限制要求的场合。

### 7-2-2. 电压斜坡起动模式

设置项PB为1时设定起动模式为此模式。图7.2给出了电压斜坡起动的输出电压波形。其中U1为起动时的初始电压值,当电机起动时,在电机电流不超过额定值400%的范围内,软启动器的输出电压迅速上升至U1,然后输出电压按所设定的起动参数逐渐上升,电机随着电压的上升不断平稳加速,当电压达到额定电压U<sub>e</sub>时,电机达到额定转速,旁路接触器吸合,起动过程完成。

起动时间t是根据标准负载在标准实验条件下所得的控制参数,PT500系列软启动器以此参数为基准,通过控制输出电压使电机平稳加速以完成起动过程,并非机械地控制时间t而不论电机加速是否平稳。鉴于此,在负载较轻时,起动时间往往小于设定的起动时间,只要能顺利起动则属正常。

一般而言,电压斜坡起动模式适用于对起动电流要求不严而对起动平稳性要求较高的场合。

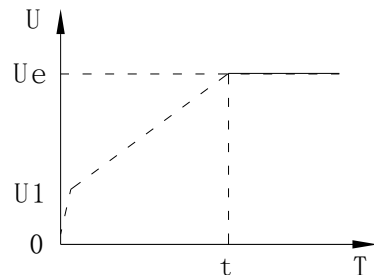


图7.2

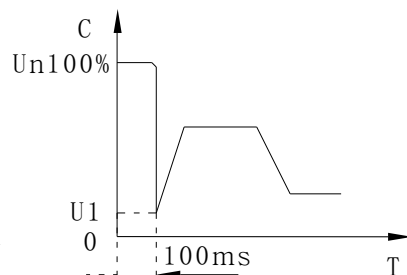


图7.3

### 7-2-3. 突跳起动模式

设置项PB为2或3时设定起动模式为此模式。

图7.3和图7.4给出了突跳起动模式的输出变化波形。在某些重载场合下,由于机械静摩擦力的影响而不能起动电机时,可选用此种起动模式。在起动时,先对电机施加一个较高的固定电压并持续有限的一段时间,以克服电机负载的静摩擦力使电机转动,然后按限电流(图7.3)或电压斜坡(图7.4)的方式起动。

在用此模式前,应先用非突跳模式起动电机,若电机因静摩擦力太大不能转动时,再选用此模式;否则应避免采用此模式起动,以减少不必要的大电流冲击。

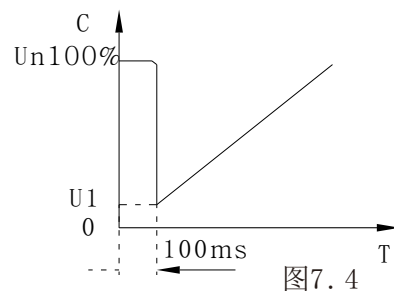


图7.4

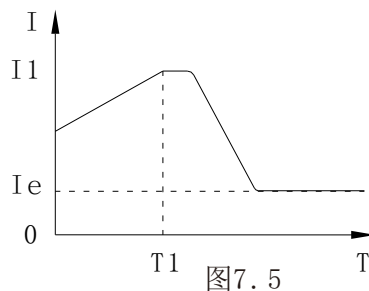


图7.5



#### 7-2-4. 电流斜坡起动模式

设置项PB为4时设定起动模式为此模式。

图7.5为电流斜坡起动模式的输出电流波形,其中I1为P6设置的限流值, T1为P1设置的时间值。

电流斜坡起动模式具有较强的加速能力,适用于两极电机,也可在一定范围内缩短起动时间。

#### 7-2-5. 电压限流双闭环起动模式

设置项PB为5时设定起动模式为此模式。

电压限流双闭环起动模式采用电压斜坡和限电流双闭环回路控制,是一种既要求起动较平稳又要求严格限流的综合起动模式,它采用了估算电机工作状态的预测算法。

该起动模式的输出电压波形将根据电机和负载情况的不同而有所变化。

### 7-3. PT500系列软启动器的停机模式及应用

PT500系列软启动器有两种停机模式,即软停机模式和自由停机模式。

#### 7-3-1. 软停机模式

设置项P2不为0时设定停机模式为此模式。

在这种停机模式下,电动机的供电由旁路接触器切换到软启动器的晶闸管输出,软启动器的输出电压由全压开始逐渐减小,使电机转速平稳降低,以避免机械震荡,直到电机停止运行。软停机时的输出截止电压等同于起动时的起始电压。

软停机模式可减少和消除水泵类负载的喘振。

软停机模式可用设置项PL设定软停限流值,减少软停时的大电流冲击,注意此软停限流值是在起动限流值基础上计算的百分比。

#### 7-3-2. 自由停机模式

设置项P2为0时设定停机模式为此模式。

在这种停机模式下,软启动器接到停止命令后立即断开旁路接触器并禁止软启动器晶闸管的电压输出,电动机依负载惯性逐渐停机。在一拖二(多)接线方式时,应把软启动器的停机模式设为此,以避免输出切换时的缺相故障报告。

一般情况下,如无必要软停机,则应选择自由停机模式,以延长软启动器的使用寿命。

自由停机模式完全禁止了瞬时输出,可避免特殊应用场合的瞬时大电流冲击。

### 7-4. 特殊应用

#### 7-4-1. 并联电机的起动

如果不超过软启动器的额定功率限制,电机可以并联连接(电机电流的总和不能超过根据应用类型选定的软启动器的额定电流),但此时应另外提供对每个电机的热保护装置。

#### 7-4-2. 双速电机的起动

PT500系列软启动器可以配合双速电机起动,在由低速变高速之前必须经过延时去磁期,以避免在线路和电机之间产生非常大的反相电流。

#### 7-4-3. 很长的电缆

由于电缆的电阻原因,很长的电机电缆会导致电压的降落,如果电压降落十分明显,它将会影响电流损耗和起动转矩,在选择电机和软启动器时必须考虑这一点。

#### 7-4-4. 并联在同一条电源线路上的软启动器

如果在同一条电源线路上安装了若干个软启动器,则在变压器至软启动器的线路中间应安装进线电抗器。电抗器应安装在每个进线断路器和软启动器之间。

#### 7-4-5. 电涌保护器(SPD)的使用

在可能导致雷击或其它原因在应用系统中引起过压、过流浪涌干扰的场所应考虑安装电涌保护器,详细应用方法请参

阅欧科传动有限公司《电涌保护器(SPD)》产品样本或其它有关资料。

7-5. 应用举例

各种不同负载情况下的参数设置举例如表7. 2, 表中数据仅供参考, 应根据实际情况作相应调整。

负载种类	起动时间(秒)	初始电压	电压起动(最大限流值)	限流起动
球磨机	30	60%	4	4.5
风机	26	30%	4	3.5
离心泵	16	40%	4	2.5
活塞式压缩机	16	40%	4	3
提升机械	16	60%	4	3.5
搅拌机	16	50%	4	3
破碎机	16	50%	4	3.5
螺旋压缩机	16	40%	4	3
螺旋传送带	20	40%	4	2
轻载电机	16	30%	4	3
皮带运输带	20	40%	4	2.5
热泵	16	40%	4	3

第八章 故障原因及处理

故障代码及处理方法如下表:

显示	说明	问题及处理方法
Err00	故障已解除	刚发生过欠压/过压或过热/瞬停端子开路等故障, 现已正常, 此时准备灯亮, 复位后可起动电机。
Err01	外接瞬停端子开路	把外接瞬停端子 ⑦与公共端子⑩短路连接, 或接于其它保护装置的常闭触点。
Err02	软启动器过热	起动过于频繁或电机功率与软启动器不匹配。
Err03	起动时间过长大于 60秒	起动参数设置不合适或负载太重 电源容量不足等。
Err04	输入缺相	检查输入或主回路故障、旁路接触器是否卡在闭合位置及可控硅是否开路等。
Err05	输出缺相	检查输出或主回路故障、旁路接触器是否卡在闭合位置及可控硅是否短路等。
Err06	三相不平衡	检查输入三相电源及负载电机是否异常。
Err07	起动过流	负载是否过重或电机功率与软启动器不匹配。
Err08	运行过载保护	负载是否过重或设置项7、PP参数设置不当。
Err09	电源电压过低	检查输入电源电压或设置项9参数设置不当。
Err10	电源电压过高	检查输入电源电压或设置项A参数设置不当。
Err11	设置参数出错	修改设置或按着确认键上电开机恢复出厂值。
Err12	负载短路	检查负载或可控硅是否短路或负载过大。
Err13	自动重起动接线错误	检查外控起动与停止端子是否未接于2线方式。
Err14	外控停止端子接线错误	当允许外控方式时, 外控停止端子处于开路状态, 从而无法起动电机。
Err15	电机欠载	检查电机主轴及负载故障。
备注: 有些故障现象是相互关联的, 如报告Err02软启动器过热时和起动过流或负载短路等有可能相关, 因此, 查故障时, 应综合全面考虑, 准确判断故障点。		

## 第九章 软启动型号规格及选件

## 10-1. PT500系列软启动器（5.5KW-55KW）外围配件的规格参考列表：

软启动器型号	额定功率(KW)	额定电流(A)	配套的断路器型号(QF)	配套的旁路接触器型号(M)	一次线规格
PT500-5R5G-3	5.5	11	CM1-63L/16	CJ20-25	2.5mm <sup>2</sup> 电缆线
PT500-7R5G-3	7.5	15	CM1-63L/20	CJ20-25	4mm <sup>2</sup> 电缆线
PT500-011G-3	11	22	CM1-63L/32	CJ20-40	6mm <sup>2</sup> 电缆线
PT500-015G-3	15	30	CM1-63L/40	CJ20-63	10mm <sup>2</sup> 电缆线
PT500-018G-3	18.5	37	CM1-63L/50	CJ20-63	10mm <sup>2</sup> 电缆线
PT500-022G-3	22	44	CM1-63L/63	CJ20-63	16mm <sup>2</sup> 电缆线
PT500-030G-3	30	60	CM1-63L/80	CJ20-100	25mm <sup>2</sup> 电缆线
PT500-037G-3	37	74	CM1-63L/100	CJ20-160	35mm <sup>2</sup> 电缆线
PT500-045G-3	45	90	CM1-63L/125	CJ20-160	35mm <sup>2</sup> 电缆线
PT500-055G-3	55	110	CM1-63L/160	CJ20-160	35mm <sup>2</sup> 电缆线

备注:额定功率和额定电流是指软启动器的最大额定值。

## 10-2. PT500系列软启动器（75KW-400KW）外围配件的规格参考列表：

软启动器型号	额定功率(KW)	额定电流(A)	配套的断路器型号(QF)	配套的旁路接触器型号(M)	一次线规格
PT500-075G-3	075	150	CM1-225L/180	CJ20-250	25*4mm <sup>2</sup> 铜排
PT500-090G-3	090	180	CM1-225L/225	CJ20-250	25*4mm <sup>2</sup> 铜排
PT500-115G-3	115	230	CM1-225L/315	CJ20-400	25*4mm <sup>2</sup> 铜排
PT500-132G-3	132	260	CM1-400L/315	CJ20-400	40*4mm <sup>2</sup> 铜排
PT500-160G-3	160	320	CM1-400L/350	CJ20-630	40*4mm <sup>2</sup> 铜排
PT500-185G-3	185	370	CM1-400L/400	CJ20-630	40*4mm <sup>2</sup> 铜排
PT500-200G-3	200	400	CM1-400L/500	CJ20-630	40*4mm <sup>2</sup> 铜排
PT500-250G-3	250	500	CM1-630L/630	CJ20-630	40*5mm <sup>2</sup> 铜排
PT500-280G-3	280	560	CM1-630L/630	CJ29-1000A	40*5mm <sup>2</sup> 铜排
PT500-320G-3	320	640	CM1-630L/700	CJ29-1000A	40*5mm <sup>2</sup> 铜排
PT500-400G-3	400	800	CW1-1000/3	CJ29-1000A	40*5mm <sup>2</sup> 铜排

备注:额定功率和额定电流是指软启动器的最大额定值,配套的断路器和旁路接触器的规格应与电机规格相匹配。

## 第十章 品质保证

本产品的品质保证依下列规定办理：

## 10-1. 确属制造者责任的品质保证具体内容

## 10-1-1. 在国内使用时以(出货之日起计算)

※出货后一个月内包退、包换、包修。

※出货后三个月内包换、包修。

※出货后12个月内包修。

10-1-2. 出口海外(不含国内)时,出货后六个月内在购买地负责包修。

10-2. 无论何时、何地使用的本公司品牌的产品,均享受有偿终身服务。

10-3. 本公司在全国各地的销售、生产、代理单位均可对本产品提供售后服务,其服务条件为

10-3-1. 需依本公司与经销代理所签订的合约内容有关售后服务责任标准。

10-3-2. 可以有偿向欧科传动有限公司的各经销代理单位请求作售后服务(不论是否保修)。

10-4. 本产品出现品质或产品事故的责任,最多只承担1-1或

10-4-1. 条款的责任,若用户需要更多的责任赔偿保证,请自行事先向保险公司投保财物保险。

10-5. 本产品的保修期为出货日期起一年。

10-6. 若属下述原因引起的故障,即使在保修期内,也属有偿修理

10-6-1. 不正确的操作(依使用说明书为准)或未经允许自行修理或改造引起的问题。

10-6-2. 超出标准规范要求使用软启动器造成的问题。

10-6-3. 购买后跌损或搬运不当造成的损坏。

10-6-4. 因环境不良所引起的器件老化或故障。

6-5、由于地震、火灾、风水灾害、雷击、异常电压或其它自然灾害及灾害相伴原因引起的损坏。

6-6、在运输过程中的损坏(注:运输方式由客户指定,本公司协助代为办理货物移转的手续)。

6-7、制造厂家标示的品牌、商标、序号、铭牌等毁损或无法辨认时。

6-8、未依购买约定付清款项。

6-9、对于安装、配线、操作、维护或其他使用情况不能客观实际描述给本公司的服务单位。

7、对于包退、包换、包修的服务,须将货退回本公司,经确认责任归属后,方可予以退换或修理。

6-5、由于地震、火灾、风水灾害、雷击、异常电压或其它自然灾害及灾害相伴原因引起的损坏。

6-6、在运输过程中的损坏(注:运输方式由客户指定,本公司协助代为办理货物移转的手续)。

6-7、制造厂家标示的品牌、商标、序号、铭牌等毁损或无法辨认时。

6-8、未依购买约定付清款项。

6-9、对于安装、配线、操作、维护或其他使用情况不能客观实际描述给本公司的服务单位。

7、对于包退、包换、包修的服务,须将货退回本公司,经确认责任归属后,方可予以退换或修理。

## Introduction

Thank you for choosing PT500 soft starter.

This manual supply for user warming, service conditions and installation requirements, control panel and operation, protection function and instructions, remote control software instructions, abnormal diagnose, daily maintenance, safe usage and other relevant attention matters. In order to ensure that is correct install and operate this soft starter, before installation, please read this use manual detail.

Please contact with dealers of our company in various places or directly contact with our company if there is any difficult during your usage; and our professionals are glad to service for you!

Please submit this manual to ultimate user and ask the user to keep it properly, which will be beneficial for later maintenance and other applied occasions. If there are some problems during the warranty period, please fill in the warranty card and fax it to the dealer or our company.

The information may be changed during the improving period of this project without prior notice. Please consult Powtech website if you want to obtain the latest information.

### Warning items:

Thank you for choosing intelligent motor soft starter products , As you appreciation we will demonstrate excellent performance to you in return!

During the process of installation, use and maintenance of the soft starter products, please mind the following return:

- ⚠ Before installation, please must read the user manual in detail.
- ⚠ The soft starter must be installed by the professional and technician .
- ⚠ The motor specification must match the soft starter.
- ⚠ Strictly prohibit connect the capacitor from the output terminal (U.V.W) of soft starter.
- ⚠ After installation bare terminals must be wrapped with insulation tape.
- ⚠ The soft start and relevant equipment must be connected with the ground reliably.
- ⚠ Must cut down the input power during maintenance.
- ⚠ Do not disassembling, modification and maintenance of this product.

This device is only allowed to be operated by the staff with qualified training. Please carefully read the content about safety, installation, operation and maintenance in this manual before use. Safe operation of this device depends on the correct transportation, installation, operation and maintenance.

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## Chapter 1 PT500 series soft starter general situation

### 1-1. Product feature

The PT500 series intelligent motor soft starter is a blend of the latest electric mechanical control System theory and proprietary motor protection technology and advanced software technology of new equipment, is used for motor starting early star/triangle conversion, auto voltage step-down, magnetic control step-down starting equipment such as the ideal alternative products; Its performance is on the market at present most did not adopting intelligent starting control technology of common soft starter can't reach.

### 1-2. The main effect of PT500 series soft starter

No. 1: Effectively reduce the starting current of the motor; Can reduce the distribution capacity,

Avoid grid expansion investment.

No. 2: Reduce the stress of starting motor and load equipment; Extend the service life of motor and related equipment.

No. 3: Soft stop function can effectively solve the inertial system of parking surge problem; The traditional starting equipment cannot be achieved.

No. 4: With six unique starting mode; To adapt to the complex motor and overload, achieve perfect start effect.

No. 5: Has a complete and reliable protection function; Effectively protect the motor and related production equipment safety.

No. 6: The application of the intelligent motor soft starter, network technology to make electricity machine control technology to adapt to the rapid development of electric power automation technology in the higher requirements.

### 1-3. Main feature of PT500 series soft starter

Perfect the humanized design

- 

- The harmony of beautiful appearance and reasonable structure.
- The harmony of functional and easy to operate.
- The harmony of solid reliable and compact structure.
- Artistic design of industrial products keep improving.
- Reliable quality guarantee;
- The computer simulation design.
- SMT production process.
- Good electromagnetic compatibility performance.
- High temperature aging, vibration test of the machine before delivery.
- The perfect and reliable protection function:
  - Loss of pressure, under voltage, over voltage protection.
  - The temperature of Soft starter is too high, motor under load, starting time is too long.
  - Input phase, the output phase, three-phase imbalance protection.
  - Starting over current, overload operation and load short circuit protection.
- The product of independent intellectual property rights:
  - Patent of appearance design.
  - Software copyright independently.
  - Proprietary motor starting and protection technology.
  - Unique to detect debug equipment and process.
- Quick and thoughtful after-sales service:
  - Reliable performance lay the foundation of quality service and quality.
  - Provide good perfect supporting design scheme.
  - The use of timely and thoughtful advice.
  - Constantly improve the product performance according to user's opinion.



### Chapter 2 Product Model Description and Unpacking Inspection

Each PT500 soft starter passes the strict inspection and performance testing in the factory.

Please check the following steps after receiving the product and unpacking.

If any problems, please contact with the supplier in time.

#### 2-1. Unpacking Checking Steps

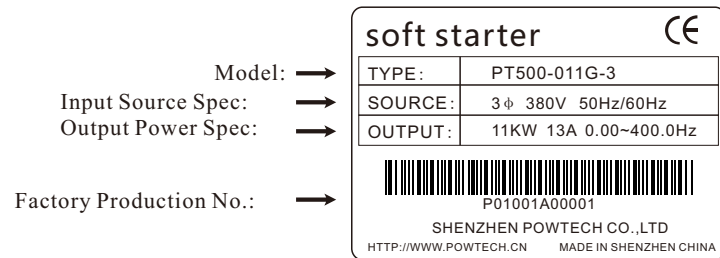
Please confirm the soft starter without any damage during transport.

Please check the package including product, user manual and warranty card.

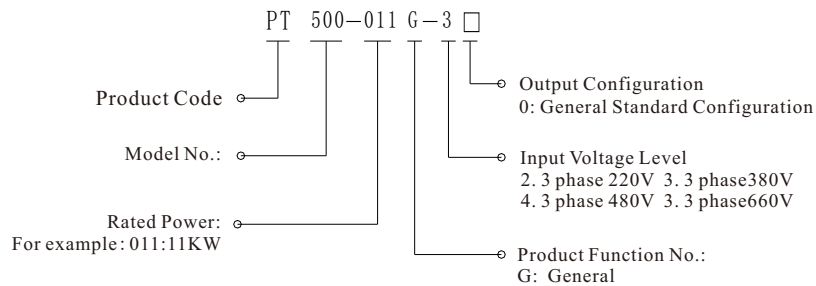
Please check the specification name plate if it's the same as your order.

If you order soft starter with other attached options, please confirm it once receiving.

#### Nameplate Description



#### Model Description



### Chapter 3 Conditions of Use and Requirements of installation

Pt500 series soft starter should be used and installed as the following requirements.

Otherwise it will make damage and shorten lifespan of soft starter without warranty.

#### 3-1. Soft starter Conditions of use

3-1-1. Power supply source: 380VAC/480VAC/660VAC±15%/50Hz or 60Hz from Main City power, Captive power plant and Diesel generator set. The power capacity should meet the starting requirement for soft starter running electric motor.

3-1-2. Applicable motor: Three phase squirrel cage induction ac motor, The rated power of motor should match to the soft start.

3-1-3. Start Frequency: It is up to the loading type.

3-1-4. Cooling method: Natural air cooling.

3-1-5. Protection class: Ip20

3-1-6. Environment condition: Altitude below 3000meters, Ambient temperature from -25℃ to +40℃

Relative humidity below 90%RH, Non-condensing, non-flammable, explosive, corrosive gases, non-conductive dust, well-ventilated room and where vibrations less than 0.5KG

POWTECH can provide users with the products such as anti-explosion, low temperature, high voltage soft starter under special conditions of using, terms will be noted.

#### 3-2. Installation requirements of Soft starter

Installation direction and distance: To ensure the soft starter with good ventilation and cooling conditions, it should be mounted vertically and then surrounded with sufficient space for heat dissipation device, shown the minimum allowed distance in Figure 3.1 and 3.2.

Based on the above requirements, it should be also use good up and down ventilated cabinet when installation of soft starter.

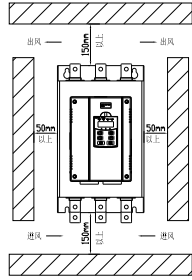


Figure 3.1

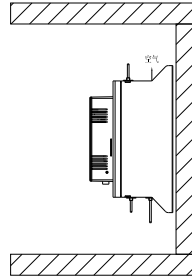


Figure 3.2

3-3. Soft starter appearance and installation dimension

3-3-1. Rated power and rated current should be the maximum rated value of soft starter.

3-3-2. PT500 series 5R1(5.5KW-55KW) soft starter appearance of installation as shown in figure3.3

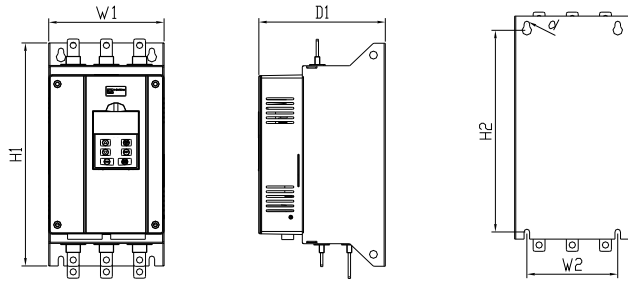


Figure 3.3

Model Spec	Rated power (KW)	Rated current (A)	Appearance size			Installation dimension			Net weight (kg)
			H1	W1	D	H2	W2	d	
PT500-5R5G-3	5.5	11	282	146	162	247	129	M6	<3.5
PT500-7R5G-3	7.5	15	282	146	162	247	129	M6	<3.5
PT500-011G-3	11	22	282	146	160	255	115	M6	<3.5
PT500-015G-3	15	30	282	146	160	255	115	M6	<3.5
PT500-018G-3	18.5	37	282	146	160	255	115	M6	<3.5
PT500-022G-3	22	44	282	146	160	255	115	M6	<3.5
PT500-030G-3	30	60	282	146	160	255	115	M6	<3.5
PT500-037G-3	37	74	282	146	160	255	115	M6	<3.5
PT500-045G-3	45	90	282	146	160	255	115	M6	<3.5
PT500-055G-3	55	110	282	146	160	255	115	M6	<3.5

3-3-3. PT500 series 5R2(75KW-115KW) soft starter appearance of installation as shown in figure3.4

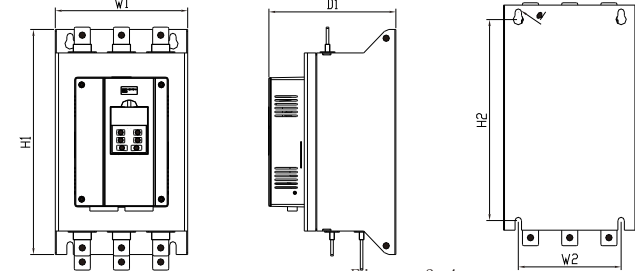


Figure 3.4

Model Spec	Rated power (KW)	Rated current (A)	Appearance size			Installation dimension			Net weight (kg)
			H1	W1	D	H2	W2	d	
PT500-075G-3	75	150	350	206	198	313	160	M8	<20
PT500-090G-3	90	180	350	206	198	313	160	M8	<20
PT500-115G-3	115	230	350	206	198	313	160	M8	<20

3-3-4. PT500 series 5R3(132KW-200KW) soft starter appearance of installation as shown in figure3.5

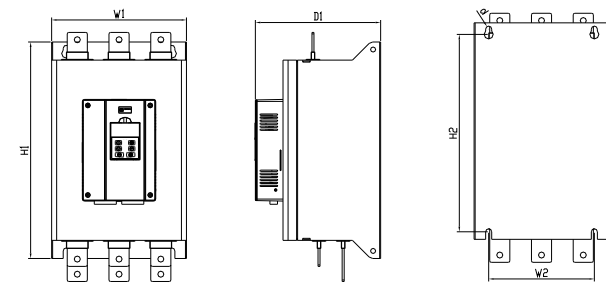


Figure 3.5

Model Spec	Rated power (KW)	Rated current (A)	Appearance size			Installation dimension			Net weight (kg)
			H1	W1	D	H2	W2	d	
PT500-132G-3	132	264	430	268	249	392	210	M9	<23
PT500-160G-3	160	320	430	268	249	392	210	M9	<23
PT500-185G-3	185	370	430	268	249	392	210	M9	<23
PT500-200G-3	200	400	430	268	249	392	210	M9	<23

3-3-5. PT500 series 5R4(250KW-400KW) soft starter appearance of installation as shown in figure3.6

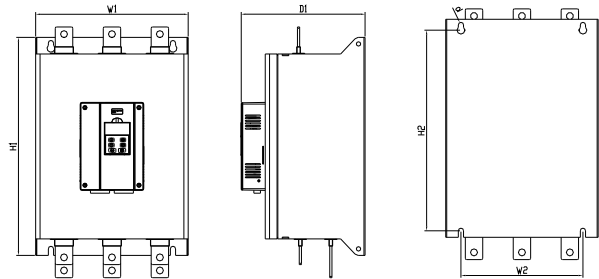


Figure 3. 6

Model Spec	Rated power (KW)	Rated current (A)	Appearance size			Installation dimension			Net weight (kg)
			H1	W1	D	H2	W2	d	
PT500-250G-3	250	500	500	350	284	460	280	M9	<31
PT500-280G-3	280	560	500	350	284	460	280	M9	<31
PT500-320G-3	320	640	500	350	284	460	280	M9	<31
PT500-400G-3	400	800	500	350	284	460	280	M9	<31

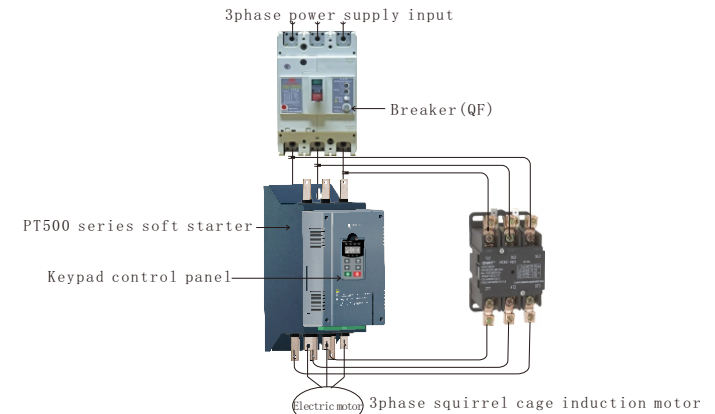
### Chapter 4 Wiring and external terminals

PT500 series soft starter has three types of wiring:

**Main circuit wiring:** 3phase ac power input and output to electric motor wiring and line breaker/bypass contactor wiring.

**External terminals wiring:** 12pcs small terminals leads, including input output control line and analog output signal line

**Communication wiring:** one RJ-45 standard net cable socket and one DB9 socket connecting to computer or computer network.



Note: There are six copper outputs, the front three to motor then following three to bypass contactor.

#### 4-2. The soft starter description of external terminals

P01	P02	D01	D02	E01	E02	EMS	STOP	RUN	COM	I01	I02
-----	-----	-----	-----	-----	-----	-----	------	-----	-----	-----	-----

4-2-1. Terminal P01、 P02 bypass output : control bypass contactor ,normally open passive contact and close once running successfully. Contact capacity:AC250V/5A

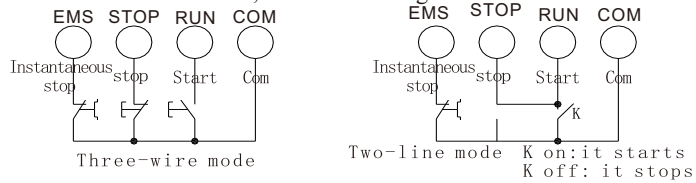
4-2-2. Terminal D01、 D02 programmable relay output: output way and function up to P J setting, normally open passive contact. Contact capacity: AC250V/5A

4-2-3. Terminals E01 and E02 are fault output terminals: when soft-Starter fails or the power failure closed,open for normal working.Contact capacity: AC250V/0.5A.

4-2-4. The instant stop input terminal EMS : When soft Starter works, this terminal must connect with terminal 10. If this terminal with terminal 10 is disconnected, soft-Starter stopped is unconditional working in fault-protected. This terminal can be controlled by external Protective devices normally closed output.Set the PC 0(primary protection), this Terminal features are prohibited.

4-2-5.terminals STOP, RUM, COM are for the external control start and stop button input connectionWire terminals. There are two configurations, namely, 3-wire and 2-wire mode. According to need

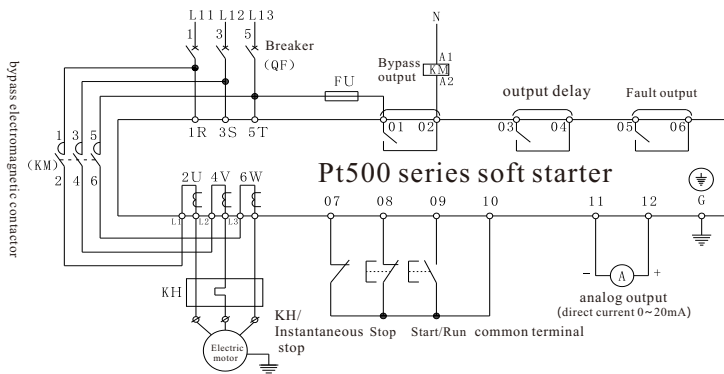
To select the connection, as shown in Fig.



4-2 -6 Terminals I01 and I02 are 0 ~ 2 0 mA DC analog output for real-time monitoring motor current. When the motor current is full-scale 2 0mA, it means that it's 4 times of the rated current of soft starter. External 0 ~ 2 0 mA dc ammeter observation, the Maximum of output load resistance is 3 0 Ω.

4-2-7 external terminals do not pick the wrong line, or they may cause damage to the soft starter.

4-2-8 PT 5 0 0 series soft starter main circuit wiring diagram

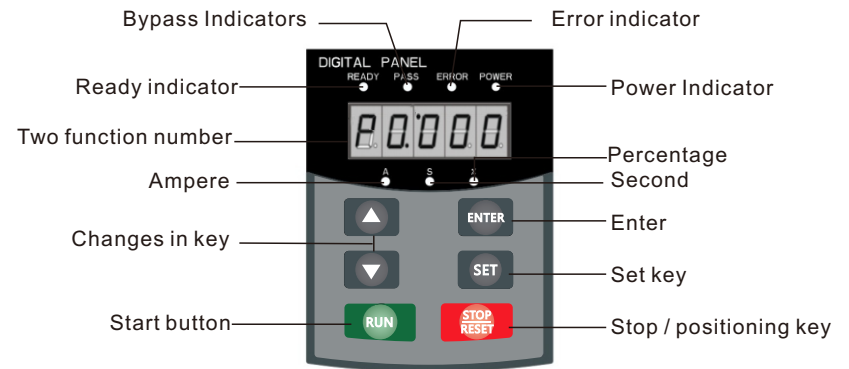


### Chapter V Control Panel and Operation

There are five operating states in PT 5 0 0 series soft starter : ready, running, fault,

Start and stop. Ready, running, fault status indicators are appropriate, since Start displays × × × ×, soft stop displays - × × ×, where × × × × indicates motor current.

#### 5-1 Keyboard Operation



5-1-1 Boot state: only lights and displays in preparation for PT500 or READY. When you press the start button to start the motor. Initial displays Powtech PT500 soft starter, or it indicates Ready

5-1-2 Delay Status: ready or fault status indicator flashes indicates the interval delay; displaying d E × × × and start the countdown, indicates the start delay.

5-1-3. starting and stopping key: in soft restart process, the display shows xxxx, Indicates the starting current value, only the stop button works, it can not enter setup and Helpful hints menu, as well as Ready, Operation, Fault three indicators are not light. In Soft-stop process, the display shows xxxx, indicates that the motor current value . At this time only the starter key works and cannot enter setup and helpful hints menu and Ready, Run, Fault indicators are not light. Stop button can reset failed state functions.

5-1-4. set button: in a State of non-help, press the set key to enter the Setup menu, display PX; XXX; Then press set key, colon flashing, which shows that it can be modified after the colon Parameters. When colon flashing, press the confirmation key, if the data has been modified, it displays Good and even rings twice, meaning that new data has been saved, and then exits. If you do not want to With the new data, pressing the set key, the colon stops flashing and restore your original data, Then press the Enter key to exit. You can also press the stop key to exit.

5-1-5. confirmation key: in non-setting State, press the Confirm button to access the Help menu, Display H X:XXX, and then press ENTER to quit. You can also press stop key exit. When in setting Mode, press the Confirm button to save the new data and exit the setting State.

5-1-6. Increase or decrease-key: in the Setup menu, When colon does not flash, pressing the increase or decrease-key to change Feature number; When colon flashing, pressing increase or decrease-key keys to change the data; When pressing the plus/minus keys ultra 1 seconds, the data will increase or decrease in rapid succession. In Help menu change Functions and corresponding hint information by pressing the increase or decrease in key. In bypass operation when the indicator light is on and does not enter setup and help menus, AXXXX displays motor current, At this time pressing the button increases or decreases-key, you can select PXXXX or HXXXX displaying. PXXXX shows the power of motor; HXXXX shows coefficient of thermal equilibrium of motor overload; when HXXXX indicates that the value is greater than 100%, overload protection works displaying Err08.

5-1-7. when the data is greater than 999, the last decimal point lights, representing the mantissa +0.

5-1-8. key actions will provide the audible alert, or key is not valid at the state.

5-1-9. When external control terminals are for 3-wire mode, functions of external control-start button and stop button with the start button and stop button on the Control Panel are equivalent.

5-1-10. Control Panel using Super anti-jamming design and allows drainage of distance more than 3 m.

5-1-11. Description of the keyboard digital display

Display letters	Corresponding letters	Display letters	Corresponding letters	Display letters	Corresponding letters
0	0	1	1	2	2
3	3	4	4	5	5
6	6	7	7	8	8
9	9org	R	AorR	B	B
C	C	D	dorD	E	E
F	F	H	H	J	J
L	L	N	N	U	UorV
O	o	P	P	R	r
Y	Y	RUN	RUN	VER	Ver
READY	READY	GOOD	good	ERR	Err

## 5-2. Functional parameter settings description

Function set code table below

Description of setting code				
Code	Name	Setting rang	Default	Description
P0	Start voltage	30-70%	30%	Voltage Ramp mode is active; Starting voltage is 40% in current mode.
P1	Time for softstart	2-60S	16S	Limiting mode is invalid.
P2	Time for soft stop	0-60S	0S	Set 0 for free stop time; Set 0 for one with two wiring
P3	Start delay	0-999S	0S	When in a countdown delay, it does not delay if set 0 but start at once.
P4	Programming delay	0-999S	0S	For programmable relay outputs.
P5	Interval delay	0-999S	0S	Desuperheating also delay; delay During the status led flashing prompt.
P6	Starting current limitation	50-500%	280%	Limiting mode is active; voltage ramp. The maximum current limit mode is 400%
P7	Max current	50-200%	100%	Input parameter of P6 and P7 are determined by P8.
P8	Enter display method	0-3	1	Check 5.5 for other setting description
P9	Undervoltage protection	40-90%	80%	Protection works when it is lower than the set value.
PA	vervoltage protection	100-140%	120%	Protection works when it is higher than the set value.
PB	Start mode	0-5	1	0 limiting 1 voltage; 2 jumps+limiting; 3 sudden Jump+ voltage; 4 current ramp; 5 double of closed loop.

Description of setting code				
Code	Name	Setting rang	Default	Description
PC	Out protection allow	0-4	4	0 primary; 1 light load; 2 standard; 3 Heavy loaded; 4 Advanced
PD	Control mode	0-7	0	Set 7 for start or stop operation, check 5.5 for Item Description
PE	Restart allows	0-13	0	Item 5.4 automatic restart function for detail
PF	Parameter modification allowed	0-3	1	Item 5.5 for detail
PH	Communication adreesss	0-64	0	For multi-machine communication with the host machine multiple soft starters
PJ	Programming out	0-19	7	Item 5.4 programmable repay output function for detail
PL	Soft stop limiting	20-100%	80%	Item 7.3.1 soft stop for detail
PP	Motor rated current		Rated value	Used to enter the motor nominal rated current.
PU	Motor under load protection		0	Item 5.5 other setting for deta

Note:  
 1 Set Item P7 maximum operating current is based on the severity of the motor load in the PP setting for the calculation of the maximum current, when it exceeds this value, it will make the inverse time thermal protection  
 2 If there is no key operation more than two minutes, it will automatically exit the setting state.  
 3 It can not set parameters in soft start and soft stop process but parameters can be set in other states  
 4. Pressing the Enter key (PRG) on electric power, can set parameters (except PJ) to restore factory default

### 5-3. programmable relay output function

In programmable relay output function there are two ways of working: programmed timing transmission Mode and programmable output mode.

5-3-1. When setting the PJ 0~4 (1 0~1 4), programmable output work in Sequence output mode, set the starting time of the output is as follows:

Numerical PJ settings	0 (10)	1 (11)	2 (12)	3 (13)	4 (14)
Programmed output time	When initiating action command	Begin to start	Pass-by running	Stop command	Shutdown completed

5-3-1-1. this work contains a 999 second timer, set by P4 Setting item. If P4 is not 0, then press set PJ set, starting at the beginning of time, when the time is reach, the output changes state, if you set P4=0, it immediately changes the output state. The output reset time is according to the setting time of P4 is ended for time delay and ready Again for 1 second.

5-3-1-2. programmable output mode is the time series with a starting process control Cycle, if the starter motor is automatically interrupted again last time programming your output process and To restart the process.

5-3-2. setting the PJ 5~9 (15~19) for programmable output state Output mode, and setting operating condition output is as follows:

Numerical PJ settings	5 (15)	6 (16)	7 (17)	8 (18)	9 (19)
Output indicates the status	Motor fault state	Running State	Ready state	Start state	Bypass status

5-3-2-1. programmable output mode is used to indicate the State of soft Starter, At this mode setting the time P4 is not valid. Set PJ the factory value is 7, which Indicates that the readiness status of the soft-starter, and it can start motor in this State; In programmable output of the failed State, it refers to a class of motor failure (Err05/Err06/Err07 Err08/Err12/Err15), it differs from the failure output terminal⑤/⑥; Running state is indicates the un-ready or a failed State, it includes three procedures :starting, bypass and soft Stopping.

5-3-2-2. When PJ> 9, the reset state of the programmable output (③/④ external terminals) from open position into a closed state, called the inverting output. Flexible use of programmable relay output can effectively simplify the external control logic.

#### 5-4. Automatic restart function

5-4-1. When setting items PE 1 to 9, it will allow the automatic restart function This function can be effective in only 2-wire mode external control , and is not allowed to set the items outside the control of PD control when by two-wire connection and placed in a closed starting state:

5-4-2. 60 seconds automatic power-on delay start

5-4-3 after the occurrence of downtime, through the delay restart automatically after 60 seconds, but when setting items P5 longer than 60 seconds, press the P5 to set the time delay. Status indicator flashes during the delay.

5-4-4. Including electric starting and re-starting after a total failure it can start n times, n is the value of the setting item PE. Automatic restart mode must be re-Power-on boot to take effect, and each re-power take effect again.

5-4-5 when setting item PE is 10, it's the prohibit power failure protection function: When on the power, if the outside starting control terminal has been in the closed state, which allows the electric starter.

5-4-6. When set PE to 11, starting again after a failure: when the external control ⑦ instantaneous stop terminals is not restricted (set PC>0) or an instantaneous stop, thermal Overvoltage, and under voltage fault recovery, once again, you do not need to reset to start motor.

5-4-7. When set PE to 12, the the power failure protection ban function and fault Starts again.

5-4-8. When set PE to 13, runs memory recovery features: in the state of pass-by running and off-on power, soft starter will automatically start the recovery Bypass operation.

5-4-9. Warning: the soft starter with under-voltage protection, ie, power off and on, regardless of external control terminals at which location, will not be starting on their own, so as not to Injury accidents. But when the automatic starting feature allows, against power failure protection, Allow status memory recovery feature, power failure protection feature will be invalidated!

#### 5-5 Other Settings Item Description .

5-5-1 P8 is used to select the input setting items and display mode as following table:

P8 settings	0	1	2	3
P6/P7 input method	Value of current	Percentage	Value of current	Percentage
Running display method	Value of current	Value of current	Percentage	Percentage

5-5-2. set item PD for selecting motor starting control method as the following

Numerical	0	1	2	3	4	5	6	7
Keyboard	1	1	0	0	1	1	0	0
External control	0	1	1	1	1	0	0	0
Communication	0	0	0	1	1	1	1	0

(1) In tables 1 to enable, 0 to disable, for example after starting if it is not allowed to unexpected stop, or service does not allow unexpected start, you can set this to 7, then disable all start Or operation stopping.

(2) When the external control permit, it must be connected between an external control buttons normally closed terminal ⑧/⑩ switch or connected, or it can not start the motor.

5-5-3. PF to modify the parameters setting item allows you to select items, there are three options:

(1) Set items PF to 0, in addition to setting items PF, do not modify any parameters.

(2) Set to PF items to 1, prohibited modify settings item P4, P7, P8, PE, PH, PJ, PL, PU parameters.

(3) Setting item PF is 2, which allows you to modify the parameters of all setting items.

5-5-4. Set Item PU is used to set the motor underload protection.

5-5-4-1. When Set Item PU <10, the prohibition Motor underload protection.

5-5-4-2. Underrun protection current range is 10% to 90% of the motor rated current which is determined by the setting items of ten digits of PU.

5-5-4-3. Underrun protection delay ranges are from 5 to 90 seconds, the setting items of a PU Digit multiplied by 10 to determine when a digit is 0 and PU protective action delay is 5 seconds. For example, If the setting item PU = 42, it means that the current 40% underrun protection action delay of 20 seconds.

5-6. Help information and instructions

The help message in the following table:



Display	Instructions
A C : X X X	Three digital voltmeter, used to monitor the three-phase ac power supply voltage.
0 2 2 - 3	Showing this soft start device specification is 22kw-380/50Hz
H 1 : E05	Showing the Finally happened fault information is Err05
H 2 : E01	Showing there was a fault information Err01
H 3 : E06	Showing there was a fault information Err06
H 9 : E00	Showing there is no fault information
Uer 3.0	Showing the product software version:Ver3.0 As software upgrade, version along with the increase.
L X X X X	Total number of successful start .
R U N X X	Last soft start ( start successfully ) takes the time ( in seconds ) .
Note:H1~H9Using recursive way to store the newly happened 9 fault information	

(1) In the non soft start and soft stop state, and did not enter the settings, press confirm key

To access the help menu, click add, minus the keys to select prompt information.

(2) To help state stop press confirm key or key to exit help state.

## Chapter 6: Protection function and Instructions

P T 5 0 0 series soft start equipment with perfect protection function to protect the security of the use of soft starter and motor. In use, should be properly set protection levels according to different situations and protection parameters.

### 6-1. Protection function and its parameters

6-1-1. Soft starter overheating protection, temperature rise to  $80^{\circ}\text{C}\pm 5^{\circ}\text{C}$  protection action, when the temperature dropped to  $55^{\circ}\text{C}$  (minimum), overheating protection remove.

6-1-2. The input Default Phase lag time of protection:<3 second

6-1-3. The output Default Phase lag time of protection:<3 second

6-1-4. Three-phase imbalance protection lag time < 3 second In each phase current deviation is greater than  $5\% \pm 1\%$  as the benchmark, when the load current is less than the soft starter nominal rating of 30%, determine the benchmark deviation will increase.

6-1-5. Time is running overload : the setting items P 7 maximum operating current as a benchmark for inverse time thermal protection , protection tripping time curve shown in table 6.1 .

6-1-6. Starting overcurrent time : Continuing greater protection time setting items P 7 5 times the maximum operating current in Figure 6.1 .

6-1-7. Supply voltage is too low to protect lag time : when the supply voltage drops below 40% limit, Protection time < 0.5 seconds , otherwise the protection time is less than the set value < 3 seconds .

6-1-8. Supply voltage is too high to protect the lag time : when the supply voltage is higher than the limit value 140 % , protection time < 0 5 seconds ; otherwise protective action time is higher than the set value < 3 seconds .

6-1-9. load short-circuit protection lag time: < 0.1 seconds, current nominal rated current is more than 10 times of the soft starter. This protection can not replace the fuse type short-circuit protection device.

6-1-10. Motor underload protection: current range of 10% ~ 90% of the motor rated current protection action delay of 5 ~ 90 seconds.

Parameters at the above time starts after detected signals effectively unwind buckle protection instruction, parameters are for reference only. Listed PT500 series soft starter all protection function can be validated through actual or simulated method, if do not conform to the requirements of the users, you should add special protection device, in order to ensure safety.

6-2. The level of protection and seting Description In order to adapt to different applications , PT500 series soft starter offers five levels of protection , namely is 0 : Junior 1: light load , 2 : Standard 3 : Heavy Duty 4 : Advanced, the setting items PC settings, Including:

6-2-1-1. Primary protection prohibits the external terminals instantaneous stop function, while retaining only the overheating, short circuit and main circuit fault protection for the unconditional urgent need to start applications, such as fire protection systems..

6-2-1-2. Light load, standards, overload protection level three have complete protection function, the difference is that the motor overload thermal protection time curve are different. The motor thermal protection time parameters are shown in table 6.1 and Figure 6.1.

6-2-1-3. Advanced protection when starting the stricter standards and other protection function parameters are the same as the standard protection Settings.

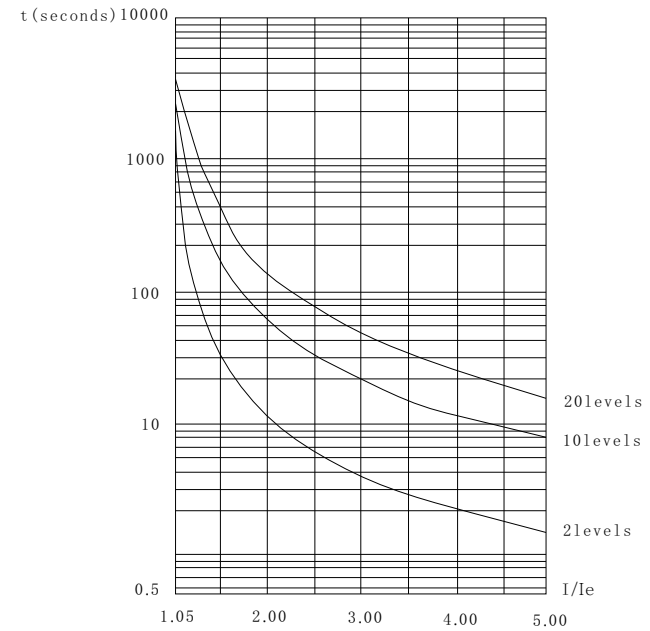
6-2-2. According to set up a PC set different level of protection and thermal protection time table as follows:

PC setting	0 (Junior load)	1 (light load)	2 (Standard load)	3 (Heavy load)	4 (Advanced)	setting specification
Run overload protection level	NO	2levels	10levels	20levels	10levels	According to standard IEC60947-4-2
Starting time over-current protection	NO	3seconds	15seconds	30seconds	15seconds	According to the starting current 5 times more than $I_F$ sets
Run over load tripping time list	Current ratio ( $I/I_e$ ) Trip time (in )	3 4 5 4.5 2.3 1.5	3 4 5 2.3 1.2 7.5	3 4 5 4.6 2.3 1.5	3 4 5 2.3 1.2 7.5	The value in the table is typical values

Should be according to the rated current of motor's nameplate input the setting item PP, Otherwise when setting item P6 and P7 input way as the percentage (by setting item P8), Starting current and protection current will have larger deviation.

The setting item PP setting of motor current not less than 20% of the soft starter nominal current. When PP setting of motor current is small, the sensitivity of protection tripping action error will increase.

6-2-3. According to IEC60947-4-2 standard motor thermal protection tripping time curve is as follows:



## Chapter 7 Trial operation and application

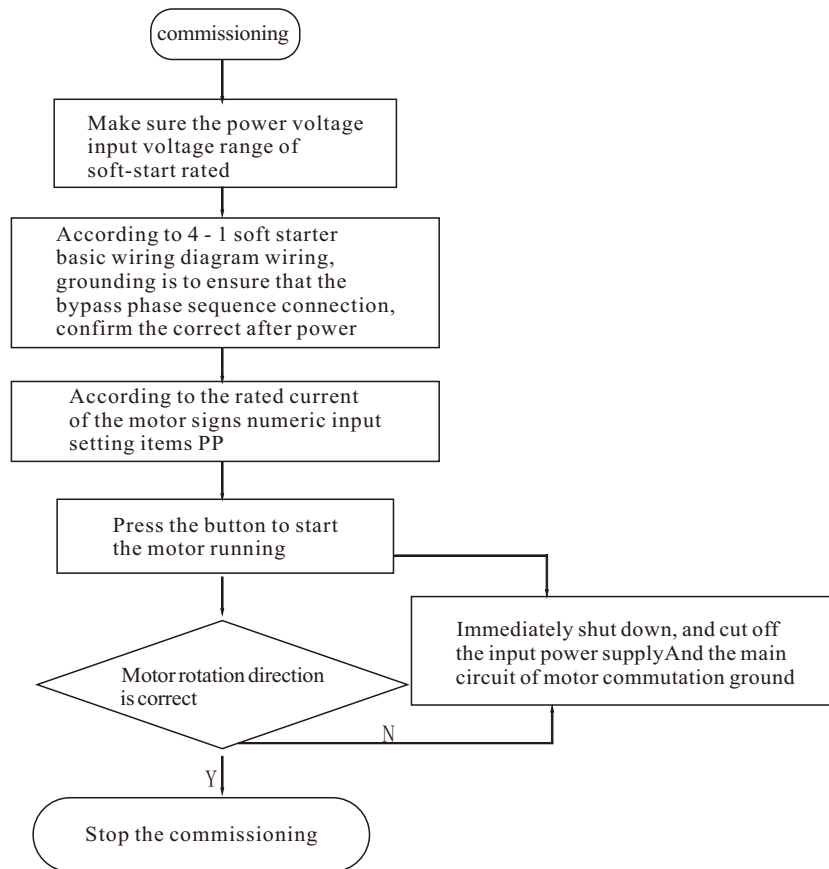
Before power run according to the following terms and conditions carefully checked :

Soft starter matches the rated power of the motor phases.

Motor insulation meets the requirements .

Input and output of the main circuit wiring is correct.

Are all terminals and tighten the screws .



7-1-1. If the motor starting state is not ideal, can reference 7.2 section the starting mode and application , select the appropriate starting mode.

7-1-2. If the motor starting torque is not enough, can change the starting voltage(Voltage way ) or current limiting value(Current way), increase the starting torque of the motor.

7-1-3. After the soft starter is energized , do not open the cover, to avoid electric shock.

7-1-4. During the commissioning , such as abnormal phenomena, such as abnormal sound or smell smoke , you should cut off the power and quickly find out the reason .

7-1-5. If after power on or starting a fault indicator and display Err X X, according to fault code shown in the corresponding chapter of the cause of the problem and find the reason.

7-1-6. Press stop button or stop button control can reset the fault state. Note:

1. When the environmental temperature under  $-10\text{ }^{\circ}\text{C}$  when, should live preheat starting again more than 30 minutes.

2. When the soft starter starter motor is successful, middle panel operational status indicator light that is already in the bypass operation. If the bypass contactor and not lead to motor to stop running, check the bypass contactor and related wiring errors or poor contact.

7-2. PT500 series soft starter starter model and application

PT500 series soft starter has six starters modes to accommodate a variety of complex motor and load , the user can choose according to different applications .

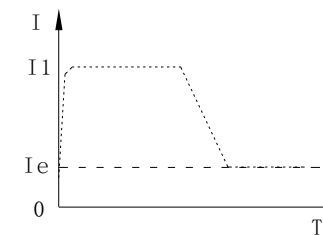


Figure 7.1

#### 7-2-4. Current Ramp start mode

PB set start mode setting items this mode is 4:00 .

Figure 7.5 is the output current waveform Current Ramp start mode , where I1 is set P6 set limit value , the time value T1 is set to P1 .

Current Ramp start mode has strong acceleration for bipolar motors can also be within a certain range to shorten start-up time .

#### 7-2-5. Voltage limiting dual closed-loop start mode

PB set start mode setting items this mode is 5:00 .

Voltage limiting dual closed-loop start mode using the voltage ramp and current limiting dual closed-loop control is a requirement both start demanding more stable and integrated starter -limiting mode , which uses a prediction algorithm to estimate the state of electrical work .

The output voltage waveform of the starting mode will vary depending on the motor and load conditions.

#### 7-3. PT500 series soft starter shutdown mode and application

PT500 Series soft starter has two shutdown modes, soft- shutdown mode and freewheel mode.

##### 7-3-1. Soft shutdown mode

P2 setting items shutdown mode is not set to this mode is 0:00 .

In this shutdown mode, the electric motor powered by a bypass contactor is switched to the soft starter thyristor output , the output voltage of the soft starter to start the whole pressure gradually decreases, so that the motor speed smoothly reduced to avoid mechanical shocks, until motor stops running. cutoff voltage output equivalent to a soft shutdown threshold voltage when starting .Soft stop mode can reduce and eliminate surge and pump loads.

PL percentage terms set soft stop limiting value , reducing the impact of high current soft stop time , pay attention to this soft stop limit value is calculated on the basis of the starting current limit soft- shutdown mode settings available .

##### 7-3-2. Freewheel mode

P2 setting items set down mode this mode is 0:00 .

Under normal circumstances, if not necessary soft stop , you should select freewheel mode to extend the life of the soft starter .

Freewheel mode completely banned instantaneous output , to avoid large transient current impact of special applications.

#### 7-4. Special Applications

##### 7-4-1. Shunt motor starter

If the soft starter does not exceed the rated power limit , the motor can be connected in parallel ( the sum of the motor current must not exceed the soft starter application type selected rated current ) , but this should additionally provide thermal protection for each motor .

##### 7-4-2. double speed motor starter

PT500 Series soft starter can be used with two-speed motor starters , you must go through before in the high-speed low- latency becomes demagnetized period to avoid the motor between the lines and have a very large inverter current.

##### 7-4-3. Very long cable

Due to reasons of the cable resistance , very long motor cables can cause the voltage drop if the voltage drop is very obvious , it will affect the current loss and starting torque , the choice of motor and soft starter must take this into account .

##### 7-4-4. Parallel on the same power line soft starter

If on the same power line installed several soft start, then in the middle of the transformer to the soft starter circuit should be installed into the line reactor . Reactors should be installed between each line breaker and soft starter .

##### 7-4-5. Surge protector (SPD) for use

May result in lightning or other causes in the application system overvoltage, overcurrent, place the surge interference should consider installing a surge protector, detailed application methods, see Shen Zhen Powtech " surge protector (SPD) " product samples , or other relevant information.

### 7-2-1. Current limit starting mode

PB is set to 0 when setting items start mode this mode.

Figure 7.1 shows the motor current waveform current limit starting mode .

Among  $I_1$  is the current limit value is set to start when starting the motor , the output voltage increases rapidly ,Until the motor current reaches the current limit set by  $I_1$ , and keep the motor current is not greater than this value is then gradually increased as the output voltage gradually accelerate the motor , when the motor reach the rated speed , the bypass contactor closes,output current drops rapidly to the motor rated current  $I_e$  or less , the starting process is completed.

When the motor is lightly loaded or set the current limit is larger, the maximum power at start when the motor is lightly loaded or set the current limit is larger, the maximum power at start normal flow may also reach the current limit is less than the set time .

Current limit starting mode is generally used for starting current requirements of the occasion , there are strict restrictions.

### 7-2-2 . Voltage ramp start mode

PB set start mode setting items this mode is 1:00 . Figure 7.2 shows the voltage ramp start of the output voltage waveform. Wherein the initial value of the voltage  $U_1$  is the starting time ,When starting the motor , the motor current does not exceed 400% of rated range,Soft starter output voltage rises rapidly to  $U_1$ , and the output voltage according to the set

The start parameter is gradually increased with the rise of the motor voltage is continuously smooth acceleration when the voltage reaches the rated voltage  $U_e$ , the motor rated speed , the bypass contactor closes ,

Starting the process is complete .

Starting time  $t$  is based on the resulting standard load control under standard test conditions parameters , PT500 series soft starter this parameter as a benchmark, by controlling the output power pressure to complete the motor starting process smooth acceleration , not mechanically control the time  $t$  and regardless of whether the motor accelerates smoothly .In view of this , when the load is light , the starting time is often less than the set start time , as long as it is normal smooth start.

In general, the voltage ramp start mode applies strict requirements on the starting current and the high stability of the starting requirements occasion.

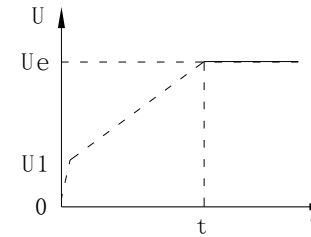


Figure 7.2

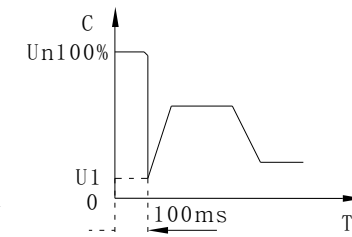


Figure 7.3

### 7-2-3 . Kickstart mode

PB is set to 2 or 3 items when setting the starting mode this mode.

Figure 7.3 and Figure 7.4 shows the output waveform changes Kickstart model.Under some heavy duty applications , due to the effects of mechanical static friction can not start the motor ,such start mode can be selected . When starting, the motor is applied to a first higher and a fixed voltage for a limited period of time , to overcome static friction motor load.force the motor rotation , then press the current limit ( Figure 7.3 ) or the voltage ramp ( Figure 7.4)Way to start.

Before using this mode , you should use a non- starter motor kick mode, if the motor due to static friction can not rotate too much force when wiping , then use this mode ; otherwise should avoid using this mode start to reduce unnecessary large current impact .

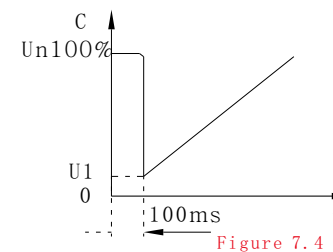


Figure 7.4

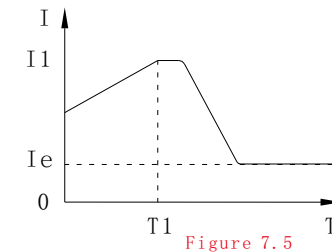


Figure 7.5

## 7-5 . Application examples

Parameters under various load conditions , for example as shown in Table 7.2 , the data in the table are for reference only and should be adjusted according to the actual situation.

In this shutdown mode , the soft starter bypass contactor is disconnected after receiving the stop command immediately and ban soft starter thyristor voltage output of the motor according to the load inertia gradually shut down. When one for two ( and more ) wiring, should be soft starter set to this shutdown mode to avoid phase fault reporting output switching.

Type of load	Starting time (in seconds)	initial voltage	voltage starting (maximum current limit value)	current-limiting starting
Ball mill	30	60%	4	4.5
Fan	26	30%	4	3.5
Centrifugal pump	16	40%	4	2.5
Piston-type compressors	16	40%	4	3
Lifting machine	16	60%	4	3.5
Mixer	16	50%	4	3
Crusher	16	50%	4	3.5
Screw compressor	16	40%	4	3
Spiral conveyor	20	40%	4	2
Light duty motor	16	30%	4	3
Belt conveyor belt	20	40%	4	2.5
Heat pump	16	40%	4	3

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## Chapter 8 Trouble shooting and treatment

Fault code and processing methods in the following table :

**A. run the stop command input**

**B. Monitoring operating status**

**C. Real-time tracking ( table shows operating information )**

**D. function code once read, write, save documents.**

Show	Description	Problems and Treatment methods
Err00	Fault has been released	Just happened undervoltage/overvoltage and overheating instantaneous stop terminal open circuit fault, is now in normal, at this time to light, reset after starting motor.
Err01	External instantaneous stop terminals open circuit	Make External instantaneous stop terminals (2) and the common terminal (10) shorted Connected, or connected to the normally closed contact of other protective devices.
Err02	Soft start overheating	Starting too often or does not match the motor power and soft start
Err03	Starting time greater than 60 seconds	Starting inappropriate parameter settings or load too heavy, Power capacity is inadequate.
Err04	Input phase	Check the main circuit output or failure, the bypass contactor is stuck in the closed position and the SCR is short circuit.
Err05	Output phase	Check the main circuit output or failure, the bypass contactor is stuck in the closed position and the SCR is short circuit.
Err06	Unbalanced	Check input phase power supply and load on the motor is abnormal
Err07	Starting over current	Load is too heavy or does not match the motor power and soft start.
Err08	Running overload	Load is too heavy or setting item P7, PP parameters set incorrectly
Err09	Power supply voltage is too low	Check input supply voltage or setting item P9 parameter set incorrectly
Err10	Power supply voltage is too high	Check input supply voltage or improper setting item PA parameter settings.
Err11	Set parameters error	Modify settings or pressing the Enter key on the electrical power to restore the factory values.
Err12	Load short	Check the load or thyristor short circuit or overload.
Err13	Automatic restart wiring error	Check the start and stop of external control terminals are not connected to 2
Err14	Stop outside the control terminal wiring error	When allowing external control mode, external control terminal stop in the open state, which can not start the motor.
Err15	Motor under load	Check the motor shaft and load faults.
<p>Note: Some of the fault phenomena are interrelated, as reported Err02 overheating and soft starters Starting over current or short circuit may load related, so when the check fails, consideration should be comprehensive, Accurately determine the point of failure.</p>		

## Chapter 9 soft start model specifications and options

**9-1. PT500 series soft starter (5.5 KW - 55 KW) peripheral parts of the specification reference list :**

Soft start Model	Rated power (KW)	Rated Current (A)	Supporting the circuit breaker models (QF)	Supporting the bypass contactor Model (KM)	A line specifications
PT500-5R5G-3	5.5	11	CM1-63L/16	CJ20-25	2.5mm <sup>2</sup> copper
PT500-7R5G-3	7.5	15	CM1-63L/20	CJ20-25	4mm <sup>2</sup> copper
PT500-011G-3	11	22	CM1-63L/32	CJ20-40	6mm <sup>2</sup> copper
PT500-015G-3	15	30	CM1-63L/40	CJ20-63	10mm <sup>2</sup> copper
PT500-018G-3	18.5	37	CM1-63L/50	CJ20-63	10mm <sup>2</sup> copper
PT500-022G-3	22	44	CM1-63L/63	CJ20-63	16mm <sup>2</sup> copper
PT500-030G-3	30	60	CM1-63L/80	CJ20-100	25mm <sup>2</sup> copper
PT500-037G-3	37	74	CM1-63L/100	CJ20-160	35mm <sup>2</sup> copper
PT500-045G-3	45	90	CM1-63L/125	CJ20-160	35mm <sup>2</sup> copper
PT500-055G-3	55	110	CM1-63L/160	CJ20-160	35mm <sup>2</sup> copper

Note: rated power and rated current is the maximum rating of the soft starter , matching circuit and bypass contactor should match the specifications of the motor specifications.

**10-2. PT500 series soft starter (75KW-400KW) peripheral parts of the regulation grid reference list :**

Soft start Model	Rated power (KW)	Rated Current (A)	Supporting the circuit breaker models (QF)	Supporting the bypass contactor Model (KM)	A line specifications
PT500-075G-3	075	150	CM1-225L/180	CJ20-250	25*4mm <sup>2</sup> copper
PT500-090G-3	090	180	CM1-225L/225	CJ20-250	25*4mm <sup>2</sup> copper
PT500-115G-3	115	230	CM1-225L/315	CJ20-400	25*4mm <sup>2</sup> copper
PT500-132G-3	132	260	CM1-400L/315	CJ20-400	40*4mm <sup>2</sup> copper
PT500-160G-3	160	320	CM1-400L/350	CJ20-630	40*4mm <sup>2</sup> copper
PT500-185G-3	185	370	CM1-400L/400	CJ20-630	40*4mm <sup>2</sup> copper
PT500-200G-3	200	400	CM1-400L/500	CJ20-630	40*4mm <sup>2</sup> copper
PT500-250G-3	250	500	CM1-630L/630	CJ20-630	40*5mm <sup>2</sup> copper
PT500-280G-3	280	560	CM1-630L/630	CJ29-1000A	40*5mm <sup>2</sup> copper
PT500-320G-3	320	640	CM1-630L/700	CJ29-1000A	40*5mm <sup>2</sup> copper
PT500-400G-3	400	800	CW1-1000/3	CJ29-1000A	40*5mm <sup>2</sup> copper

## Chapter 10 Quality Warranty

The product quality guarantee in accordance with the following provisions:

10-1. Quality guarantee indeed specific content producer responsibility:

10-1-1. In the aboard use to ( calculated from the date of shipment )

※ Shipment within one month after the refund, replacement , repair kits

※ Shipment within three months after the replacement, repair kits .

※ After the ship repair within 15 months.

10-1-2. Export overseas ( excluding domestic ) when shipped in the six months after the purchase to be responsible for repair .

10-2. No matter when, where, using the company's brand products are enjoying a lifetime of paid services .

10-3. The company 's sales in the country , production, agent, can provide service for this product ,its conditions of service for the

10-3-1 . To be the standard of liability under this contract service companies and content distribution agent signed on .

10-3-2. Each unit can be paid to the distribution agent Stephen Transmission Co. requests for service (whether the warranty ) .

10-4. This product has the quality or product liability accident , up to 1-1 or

10-4-1. only assume responsibility for the terms , if the user needs more responsibility indemnity insurance in advance at your own contents insurance to insurance companies .

10-5. The warranty period for this product is one year from the date of shipment .

10-6. If the fault is caused by the following reasons , even during the warranty period , it is paid to repair.

10-6-1. Incorrect operation ( depending on usage manual) or unauthorized repair or alteration caused problems.

10-6-2 . Beyond the standard specifications require the use of soft starter causing problems.

10-6-3, After the purchase or loss or damage caused by improper handling .



10-6-4. The device caused by adverse environmental aging or failure.

10-6-5. Due to the earthquake, fire, wind, flood , lightning, abnormal voltage or other natural disasters and disasters caused damage accompanied reasons .

10-6-6. Damaged in transit (Note : transport specified by the customer , the company helps to handle the goods transfer ) .

10-6-7. The manufacturer's label brands, trademarks , serial number, nameplate when damaged or illegible .

10-6-8. Failing to pay the agreed purchase amount .

10-6-9. For the installation, wiring , operation, maintenance , or other use of objective reality can not be described to the company 's service units.

10-7. For refund, replacement , repair services , goods returned to the Company shall , upon confirmation accountability before be returned or repaired.