C T 高起动转矩型软起动器说明书

User Manual for CT High Starting Torque Soft Starter

使用前，请详细阅读本说明书

Please read this manual carefully before use

西安西驰电气股份有限公司

Xi’an xichi Electric Co., Ltd.

安全注意事项

CAUTIONS

1) 主回路电源得电后即存在危险电压。
   There is dangerous voltage when main circuit is energized;
2) 不允许将输入端(1L1、3L2、5L3)接到输出端(2T1、4T2、6T3)
   It is disable to connect input terminal (1L1, 3L2, 5L3) to output terminal (2T1, 4T2, 6T3) ;
3) 不允许软起动器输出端(2T1、4T2、6T3)接补偿电容或压敏电阻。
   It is disable to connect compensation capacitor or piezoresistor to output terminal (2T1, 4T2, 6T3) of soft starter;
4) 软起动器与变频器互为备用时，二者输出端要彼此隔离。
   When soft starter and frequency converter are mutually in standby, their output terminals should be isolated from each other.
5) 不要试图修理损坏的器件，请与供货商联系。
   Do not attempt to repair damaged components. Please contact your supplier.
6) 散热器的温度可能较高。
   Radiator’s temperature maybe much higher.
7) 严禁在软起动输出端反送电。
   Do not reversely feed power at output terminal of soft starter.
8) 软起动器在起动或停止状态时，输出侧都存在高压。
   Output terminal remains high voltage either when soft starter is active or in state of rest.

前　言

Foreword

感谢您使用西安西驰电气股份有限公司生产的 CT 电动机软起动器。为了充分发挥软起动器的功能，请您按规程正确操作和使用，并确保操作者的安全，在使用前请详细阅读本《产品说明书》。当您在使用中发现疑难问题而本产品说明书无法提供解答时，请与西安西驰电气股份有限公司或各地代理、经销商联系，我们将竭诚为您服务。

Thank you for choosing CT motor soft starter manufactured by Xi'an Spread Electric Co., Ltd. In order to properly use this soft starter, please read through this Product Manual before starting operation. Please do operate this soft starter in accordance with the instructions for the purpose of ensuring the personal safety. When you have any problem to which the solution is not described in this manual, please contact our agent or dealer. We are always at your service.

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第一章 CT 软起动器的作用及特点
Section 1 Function and Characteristic of CT Soft Starter

CT 软起动器是采用电力电子技术、微处理器技术及现代控制理论技术生产的具有当今国际先进水平的新型起动设备。通过对晶闸管的控制达到有级变频、无级调压、小起动电流、大起动转矩的起动特性。集起动、显示、保护、 数据采集于一体。用户使用较少的元件，就可实现较复杂的控制功能。而中英文界面显示又使得操作更简便。

CT soft starter is a new type of starting equipment with advanced international level which is produced by adopting power electronics technology, microprocessor technology and modern control theory technology. Through the control of the thyristor, the starting characteristics of step frequency conversion, stepless voltage regulation, small starting current and large starting torque are achieved. It integrates start-up, display, protection and data acquisition. Users can implement more complex control functions with fewer components. The Chinese and English interface display makes the operation easier.

1.1 作 用 Functions

- 降低电机的起动电流，减少配电容量，避免增容投资；
- Reduce the motor starting current and the distribution capacity, and avoid capacity investment;
- 减小起动应力，延长电动机及相关设备的使用寿命；
- Reduce the starting stress, extend the life of the motor and related equipment;
- 平稳的起动和软停车避免了传统起动设备的喘振问题、水锤效应；
- Smooth start and soft stop avoid the surge problem and water hammer effect of traditional start-up equipment;
- 多种起动模式及宽范围的电流、电压等设定，可适应多种负载情况；
- A variety of start-up mode and a wide range of current, voltage and other settings can adapt to a variety of load conditions;
- 完善可靠的保护功能，更有效地保护电机及相关设备的安全；
- Perfect and reliable protective function protects motor and related equipment in a more effective manner.

1.2 特 点 Characteristics

◆ **独特的负载应用参数 Unique load application parameters**

内置十种负载类型可供用户选择，针对于每类负载提供独特的起动控制曲 线，最大程度使得软起动与负载进行匹配，以达到最佳的起动、停止效果。

There are ten kinds of built-in load types for users to choose, providing a unique starting control curve for each type of load to maximize the soft start and load matching, in order to achieve the best starting and stopping effect.

◆ **独特的负载应用参数 Unique load application parameters**

内置十种负载类型可供用户选择，针对于每类负载提供独特的起动控制曲线，一定程度使得软起动与负载进行匹配，以达到良好的起动、停止效果。

It is built-in ten types of load for users to choose. It provides a unique start control curve for each type of load to make soft start match the load to a certain extent, so as to achieve a good starting and stopping effect.

◆ **多种起动方式 Multiple start and stopping modes**

电压斜坡起动、线性转矩控制起动、平方转矩控制起动、有级变频控制起动。并可在每种方式下施加可编程突跳起动转矩及起动电流限制。独特的基础算法使得电机起动、停止更加准确、平滑。

Voltage ramp start, linear torque control start, square torque control start, and stepwise frequency control start. Programmable kick start torque and starting current limits can be applied in each mode. The

unique basic algorithm makes the motor start and stop more accurate and smoother.

◆ **先进的通讯功能 Advanced communication function**

配有 RS485 通讯接口，方便用户网络连接控制，提高系统的自动化水平及可靠性。内嵌 Modbus 标准协议，方便组态连接。

Equipped with RS485 communication interface, it is convenient for users to connect and control the network, and improve the automation level and reliability of the system. Embedded Modbus standard protocol for easy configuration and connection.

◆ **模拟信号控制 Analog signal control**

用户可输入 4—20mA 或 0—20mA 标准信号，并可在操作面板上进行模拟量的上、下限设定，实现对电机起、停控制及报警。还可通过软起动器进行数据(压力、温度、流量等)的传输。具有 4—20mA 或 0—20mA 标准模拟信号输出功能。

Users can input 4-20mA or 0-20mA standard signal, and conduct upper and lower limit setting of analog quantity on the operation panel to achieve the start and stop control of motor and alarm. The data (pressure, temperature, flow, etc.) can also be transmitted via a soft starter. It is provided with 4-20mA or 0-20mA standard analog signal output function.

◆ **强大的抗干扰性 Powerful anti-interference property**

所有外部控制信号均采用光电隔离，并设置了不同的抗噪级别，适应在特殊的工业环境中使用。

All external control signals are subject to optoelectronic isolation, and different anti-noise levels are set to adapt to the application in special industrial environments.

◆ **双参数功能 Dual parameter function**

软起动器同时具备两套不同功率电机控制参数两套基本参数，可分别控制两台不同功率的电机。

The soft starter has two sets of motor control parameters with different power. Two sets of basic parameters can control two motors with different power respectively.

◆ **电源频率自适应 Self-adaption of power frequency**

电源频率 50/60Hz 自适应功能，方便用户使用。

Self-adaption of power frequency 50/60 makes user easy to use.

◆ **动态故障记忆 Dynamic fault memory**

最多可以记录 15 次故障。便于查找故障原因。

Up to 15 failures can be recorded, making it easy to find the cause of the malfunction.

◆ **完善的保护功能 Perfect protective function**

全程检测电流及负载参数，具有过压、欠压、三相电压不平衡、过流、过载、欠载、过热、断相、短路、三相电流不平衡、相序检测、漏电、零序检测、 系统异常、晶振异常等微机保护功能。

It detects current and load parameters, having microcomputer protective functions such as overcurrent, overload, underload, overheating, phase failure, short circuit, three-phase current imbalance, phase sequence detection, electric leakage, zero sequence detection, system abnormality and crystal oscillator abnormality.

◆ **友好的人机界面 Friendly human-machine interface**

LCD 液晶显示和导航式操作方式，使参数设定、调整更加便捷，故障及实时监控更加直观。具有中英文两种显示界面。

LCD and navigative operation mode make parameter setting and adjustment more convenient, and fault and real-time monitoring more intuitive. It has two display interfaces in Chinese and English.

第二章 收货检查

Section 2 Acceptance and Inspection

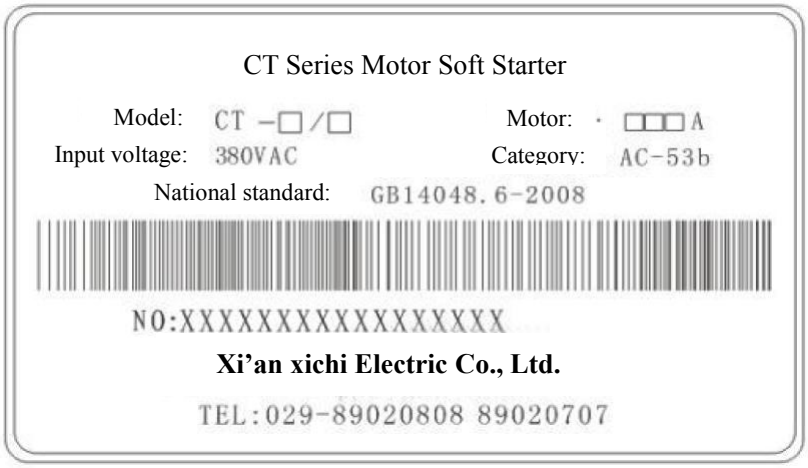
每台软起动器在出厂前均进行了全部功能及运行测试，用户在收到设备并拆封后，请按下列步骤检查。如发现问题，请立即与供货商联系。

Each soft starter has been functionally tested for normal operation before delivery. After user receives the equipment, please carry out inspection as per the following procedures. For any problem found in inspection, please contact your supplier as soon as possible.

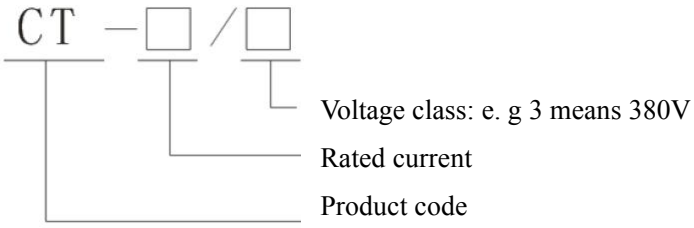
1、检查铭牌以确认收到的产品与订购的产品一致

1. Check nameplate to confirm that the equipment you receive is consistent with the one you ordered.

(1)软起动器铭牌说明 Description of soft starter's nameplate



(2)软起动器型号说明 Description of soft starter's model



(3)软起动器编号说明 Description of soft starter's numbering

NO:XXXXXXXXXXXXXXXX

2、检查产品在运输中是否有损伤，如：外壳凹陷、变形，内部连线、连接件松动等。

2. Check whether product is damaged during transport, such as housing sunken and deformed and inner wiring and connecting fittings are loose.

3、检查是否随机配备产品合格证、保修卡、装箱单、《产品说明书》等。

3. Check whether product certificate, warranty card, package list and user's manual are attached.

4、产品出厂后依据保修卡对产品实行保修。请您在收到货物后，认真填写保修卡并将保修卡寄回西安西驰电气股份有限公司或供货单位。

4. After delivered, the product's after-sale service shall be subject to warranty card. After receiving the product, please fill in warranty card and mail it back to Xi'an Spread Electric Co., Ltd. or your supplier.

第三章 使用条件及安装

Section 3 Service Conditions and Installation

3.1 使用条件 Service conditions

控制电源 Control power	AC110V--AC220V±15%　50/60Hz
三相电源 Three-phase power	标准接线 AC380V、660V、1140V±15% Standard wiring AC380V, 660V, 1140V±15%
标称电流 Nominal current	15A--1000A，共 22 种额定值 15A--1000A, 22 rated values in total
适用电机 Applicable motor	一般鼠笼型异步电机 Ordinary squirrel cage asynchronous motor
起动斜坡方式 Starting ramp mode	电压斜坡起动、线性转矩控制起动、平方转矩控制起动、 有级变频控制起动 Voltage ramp start, linear torque control start, square torque control start, stepwise frequency control start
停车方式 Stopping mode	自由停车、软停车、泵停车、内部制动、外部制动 Free stop, soft stop, pump stop, internal brake, external brake
逻辑输入 Logical input	阻抗 1.8KΩ，电源+15V Impedance 1.8 KΩ, power supply +15V
起动频度 Start frequency	可做频繁或不频繁起动, 可内部进行设置 Frequent or infrequent start available, and it can be set internally
保护功能 Protective function	过压、欠压、三相电压不平衡、过流、过载、欠载、过热、 断相、短路、三相电流不平衡、相序检测、漏电、零序检 测电机温度保护等 Overvoltage, undervoltage, three-phase voltage imbalance, overcurrent, overload, underload, overheating, phase failure, short circuit, three-phase current imbalance, phase sequence detection, electric leakage, zero sequence detection, motor temperature protection, etc.
防护等级 Protection level	IP00, IP20
冷却方式 Cooling type	自然冷却或强迫风冷 Natural cooling or forced air cooling
安装方式 Installation type	壁挂式 Wall mounted
环境条件 Environmental condition	海拔超过 2000 米，应相应降低容量使用 When the sea altitude is above 2,000m, soft starter should be derated for use. 环境温度在-25-+45°C 之间 Ambient temperature: -25-+45°C 相应湿度不超过 95%(20°C±5°C) Relative humidity: less than 95%(20°C±5°C) 无易燃、易爆、腐蚀性气体，无导电尘埃，室内安装，通风良好，振

	动小于 0.5G Free of flammable, explosive and corrosive gas or conductive dust. Good ventilation for indoor installation and vibration is less than 0.5G

3.2 安装方向 Installation direction

为了确保软起动器在使用中具有良好的通风及散热条件，软起动器应垂直安装。

In order to ensure that the soft starter has good ventilation and heat dissipation conditions in use, the soft starter should be installed vertically.

3.3 安装空间 Installation space

在设备周围留有足够的散热空间，为便于维护请将设备与墙壁保持一定距离(见附表三)。如需选用风机，请在我公司网站(www.xichi.cn)下载相关风机尺寸。

Leave enough space around the equipment for heat dissipation. For convenience of maintenance, please keep a certain distance between the equipment and wall (see appendix 3). To choose air blower, please log on our website www.xichi.cn to download air blower's size.

3.4 电路安装 Circuit installation

主回路采用上进下出，导线应保证足够的载流量。外围配件的选用请参见附录二。

Main circuit uses up-in and down-out wiring and cable should be guaranteed to have enough current-carrying capacity. For selection of supportive fittings, please refer to the appendix 2.

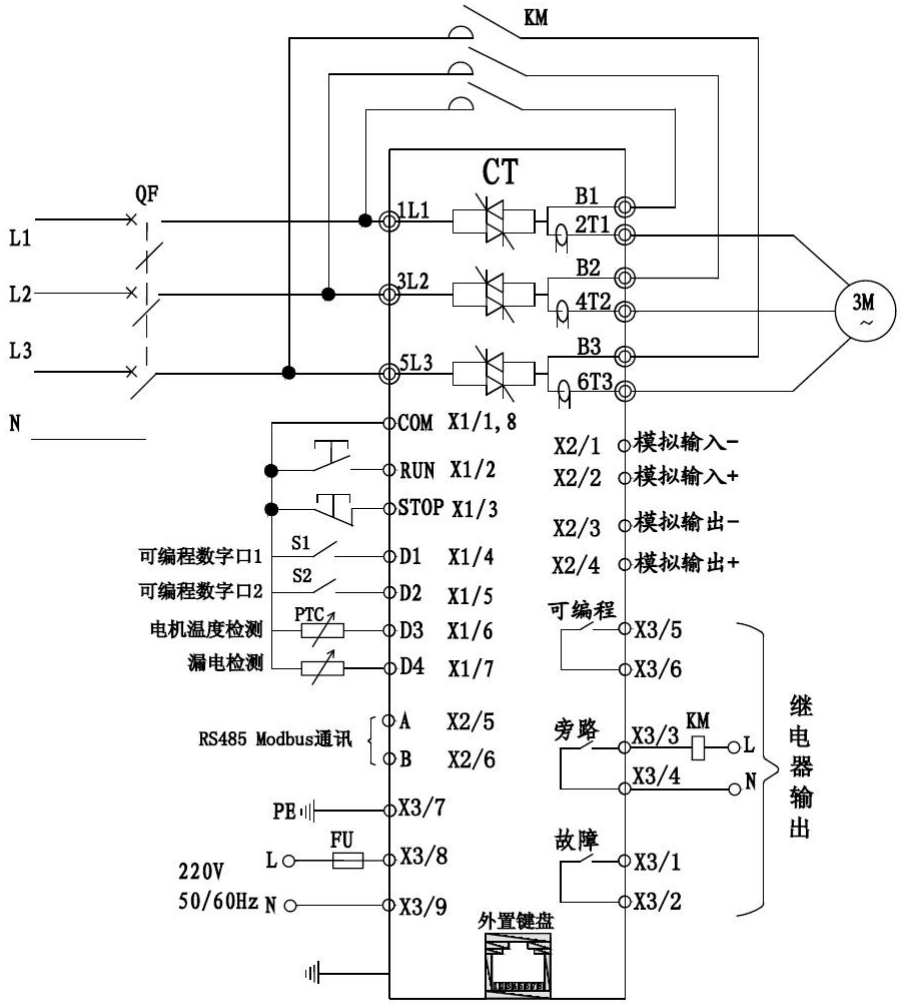
第四章 电路连接

Section 4 Circuit Connection

4.1 基本接线原理图 Basic wiring diagram

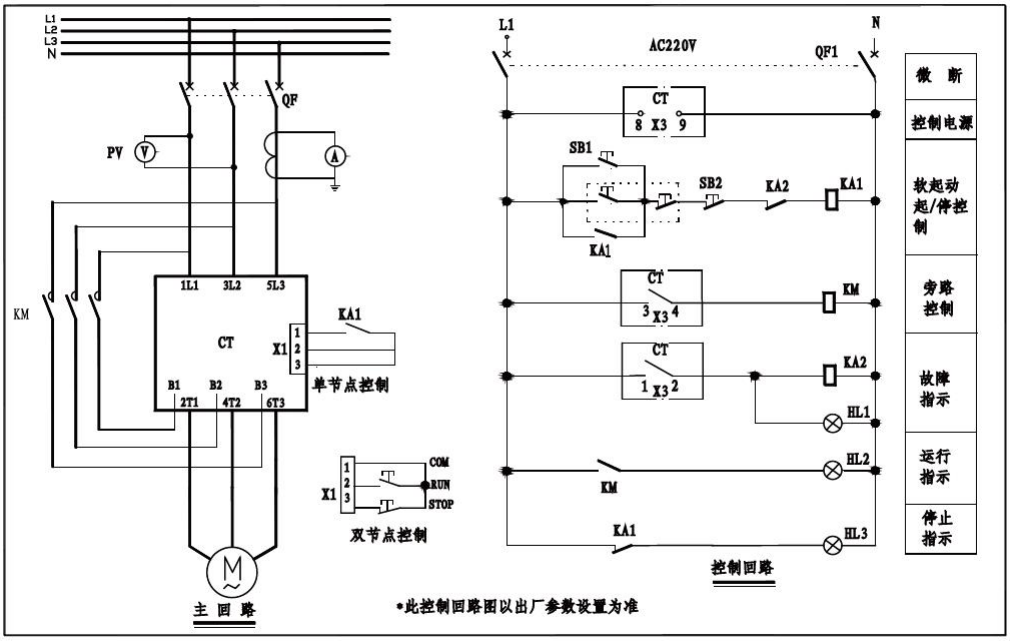
软起动器端子 1L1、3L2、5L3 接三相电源，2T1、4T2、6T3 接电动机、Bl、B2、B3 接旁路接触器。软起动器可通过参数设定选择是否检测相序。当采用旁路接触器时，可通过内置信号继电器 K2 控制旁路接触器。

Soft starter's terminals 1L1, 3L2 and 5L3 are connected to three-phase power supply and terminals 2T1, 4T2 and 6T3 connected to electric motor, and Bl, B2, and B3 are connected to bypass contactors. Soft starter's detection of phase sequence can be determined by parameter setting. When the bypass contactor is used, the built-in signal relay K2 can control the bypass contactor.



模拟输入 Analog input　　旁路 Bypass　　可编程数字口 1 Programmable digital port 1
模拟输出 Analog output　　故障 Fault　　电机温度检测 Motor temperature detection
漏电检测 Electric leakage detection　继电器输出 Relay output　外置键盘 External keyboard
RS485 Modbus 通讯 RS485 Modbus communication

4.2 典型应用接线图 Wiring diagram for typical application



主回路	Main circuit	微断	Miniature circuit breaker
单节点控制	Single-node control	控制电源	Control power
双节点控制	Double-node control	软起动启/停控制	Soft starter's start/stop control
旁路控制	Bypass control	故障指示	Fault indication
运行指示	Operation indication	停止指示	Stop indication
控制回路	Control circuit	此控制回路图以出厂参数设置为准	This control circuit diagram is subject to the factory parameter settings

注意：NOTES:

1．上图所示为单节点控制方式。接点闭合软起动器起动，接点打开软起动器停止。但要注意这种接线 LCD 面板起动操作无效。端子 X1\、X1\2、X1\3 起停信号是一个无源节点。

1. The above diagram shows the single-node control mode. When contact closes, soft starter starts, otherwise, it stops. But it needs to be noted that LED panel's start is ineffective with this type of wiring. Terminals 3, 4 and 5 start and stop signal is a passive node.

2．PE 接地线应尽可能短，接于距软起动器最近的接地点，合适的接地点应位于安装板上紧靠软起动器处，安装板也应接地，此处接地为功能地而不是保护接地。

2. PE grounding wire should be as short as possible. It should be connected to an earth connection point close to soft starter. The proper earth connection point should be on installation board and close to soft starter. Installation board should be grounded too. This earth connection is for function rather than protection.

4.3 端子说明 Description of terminals

CT 软起动器有 23 个外引控制端子，为用户实现外部信号控制、远程控制及系统控制提供方便。

CT series soft starter has 23 external control terminals which help user realize external signal control, remote control and system control.

端 子 号			端 子 名 称	说 明
主回路	1L1、3L2、5L3		交流电源输入端子	接三相交流电源，旁路接触器
	B1、B2、B3		旁路接触器端子	接旁路接触器
	2T1，4T2，6T3		软起动输出端子	接三相异步电动机
控制回路	数字输入	X1/1	COM	COM
		X1/2	外控起动端子	X1/1 与 X1/2 短接则起动
		X1/3	外控停止端子	X1/1 与 X1/3 断开则停止
		X1/4	可编程数字口 D1	可通过功能参数 Q04、Q05 设置不同功能
		X1/5	可编程数字口 D2	
		X1/6	数字口 D3	电机温度（PTC）检测
		X1/7	数字口 D4	漏电检测
		X1/8	COM	COM
	模拟输入	X2/1	模拟电流输入负	0-60mA 模拟输入，可通过功能参数 Q06 设置
		X2/2	模拟电流输入正	
	模拟输出	X2/3	模拟电流输入负	0-60mA 模拟输入，可通过功能参数 Q07 设置
		X2/4	模拟电流输入正	
	R485 通讯	X2/5	485 通讯 A	RS485 接口 Modbus 通讯协议
		X2/6	485 通讯 B	
	K1 继电器输出	X3/1	故障输出继电器	输出有效时，K11-K12 闭合,接点容量 AC250V/5A， DC30V/5A
		X3/2		
	K2 继电器输出	X3/3	旁路输出继电器（	输出有效时，K21-K22 闭合,接点容量 AC250V/5A， DC30V/5A
		X3/4		
	K3 继电器输出	X3/5	可编程输出继电器	输出有效时 K31-K32 闭合,接点容量 AC250V/5A， DC30V/5A
		X3/6		
	控制电源	X3/7	PE	接大地
		X3/8	控制电源	AC110V--AC220V±15% 50/60Hz
		X3/9		

Terminal No.			Name of terminal	Description
Main circuit	1L1、3L2、5L3		AC power input terminal	Connected to three-phase AC power supply and bypass contactor
	B1、B2、B3		Bypass contactor terminal	Connected to bypass contactor
	2T1，4T2，6T3		Soft start output terminal	Connected to asynchronous motor
Control circuit	Digital input	X1/1	COM	COM
		X1/2	Externally-controlled start terminal	Start when X1/1 and X1/2 are short circuited
		X1/3	Externally-controlled stop terminal	Stop when X1/1 and X1/3 break
		X1/4	Programmable digital port D1	Different functions can be set through function parameters Q04 and Q05

		X1/5	Programmable digital port D2	
		X1/6	Digital port D3	Motor temperature (PTC) detection
		X1/7	Digital portD4	Electric leakage detection
		X1/8	COM	COM
	Analog input	X2/1	Analog current output –	0-60mA analog input can be set by function parameter Q06
		X2/2	Analog current output +	
	Analog output	X2/3	Analog current output –	0-20mA analog output can be set by function parameter Q07
		X2/4	Analog current output +	
	R485 comm.	X2/5	485 communication A	RS485 interface Modbus communication protocol
		X2/6	485 communication B	
	K1 relay output	X3/1	Fault output relay	When the output is valid, K11-K12 is closed, and the contact capacity is AC250V/5A, DC30V/5A
		X3/2		
	K2 relay output	X3/3	Bypass output relay	When the output is valid, K21-K22 is closed, and the contact capacity is AC250V/5A, DC30V/5A
		X3/4		
	K3 relay output	X3/5	Programmable output relay	When the output is valid, K31-K32 is closed, and the contact capacity is AC250V/5A, DC30V/5A
		X3/6		
	Control power	X3/7	PE	Grounding
		X3/8	Control power	AC110V--AC220V±15% 50/60Hz
		X3/9		

第五章 显示及操作说明

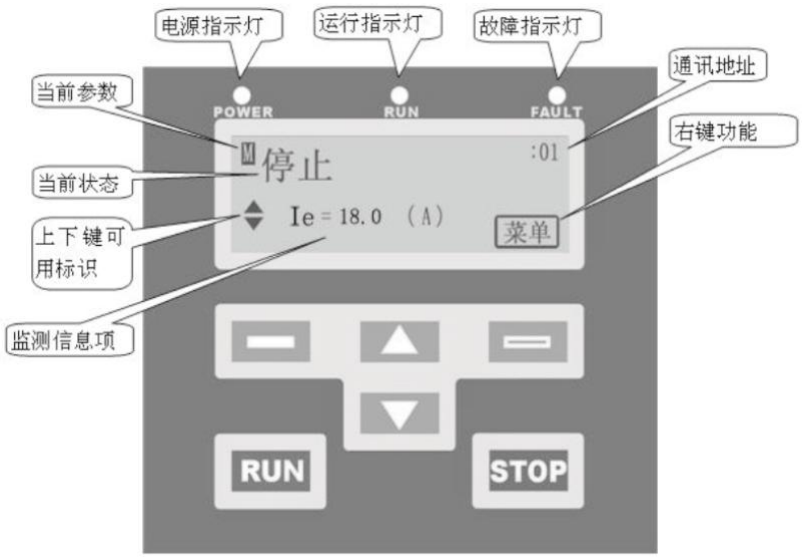
Section 5 Instruction to Display and Operation

人机界面用于软起动器的编程输入和输出设定、保护功能、警告、总线通讯、参数设定、本地控制和显示软起动器的状态信息。

The human-machine interface is used for soft starter programming input and output settings, protection functions, warnings, bus communication, parameter setting, local control and display of soft starter status information.

人机界面由三个部分组成，分别为 LED 指示灯、LCD 液晶显示屏、面膜键盘。如图 5-1 所示。

The man-machine interface consists of three parts which are LED indicator lamp, LCD and keyboard. See Figure 5-1.



当前参数	Current parameters	电源指示灯	Power light
运行指示灯	Running light	故障指示灯	Fault light
当前状态	Current status	通讯地址	Communication address
上下键可用标识	Up/down key available sign	右键功能	Right key’s function
监测信息项	Monitoring information		

图 5-1 面板功能介绍

Fig. 5-1 Introduction to Panel

5.1 面板显示信息说明 Description of information displayed on panel

按 键 Key	作 用 Function
监测信息项 Monitoring information	显示当前测量的信息量。可参考参数表的“实时参数” 菜单。附件 1Display the currently measured information. Refer to the "Real-time Parameters" menu of the parameter table. Attachment 1
上下键可用标识 Up and down keys’ available sign	有该标识，可以通过“上下翻”键浏览“实时参数”项 With this mark, it is able to browse the real-time parameters by up and down keys

当前状态 Current status	说明当前电机处在的状态 It indicates the current status of the motor
当前参数 Current parameters	显示系统当前使用的是“M1”还是“M2”参数(系统共有两套参数可供使用) Display system is currently using the "M1" or "M2" parameters (the system has two sets of parameters available)
电源指示灯 Power light	系统控制电源上电后该指示灯亮 It goes on when the system control power is energized
运行指示灯 Run light	停止状态该灯熄灭；起动完成状态常亮；其他状态为闪烁 It goes off in state of rest; it remains on in state of completing start; it flashes in other states
故障指示灯 Fault light	当系统处于保护或故障状态，该指示灯亮；其他状态该灯熄灭 When the system is in a protected or faulty state, the indicator light is on; it goes off in the other states.
通讯地址 Communication address	显示机器通讯地址，该地址是指外接端子(X2-5/6)上的地址，当使用该端子通讯时，它会闪烁 Displays the machine’s communication address, which is the address on the external terminal (X2-5/6). It flashes when this terminal is used for communication.
右键功能 Right key	显示键盘的“右键”当前功能 Display the current function of the “right key” of keyboard

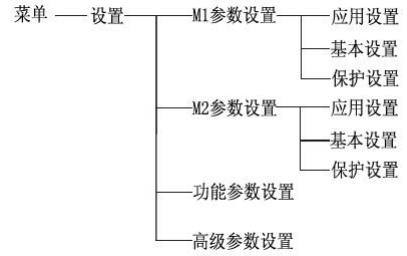
5.2 按键功能说明 Description of keys

符号 Symbol	名称 Name	功能说明 Functional description
	Left	设置参数、保存数据等。液晶屏左下角出现的按钮对应该键 Set parameters and save data. The button shown in the lower left corner of the LCD screen corresponds to the key
	Right	进入菜单、退出菜单、取消选择等。 液晶屏右下角出现按钮对应该键 Enter menu, exit menu or cancel selection. The button shown in the lower right corner of the LCD screen corresponds to the key.
	Up	参数项或数据的增加 Add parameter value or data
	Down	参数项或数据的减小 Minus parameter value or data
	Run	电机起动、点动和宏开启等功能，只有外部端子 X1\1、X1\3 或 X1\3、X1\8 短接且软件使能该键，该键才能起作用 Motor start, jog and macro open function, only the external terminals X1\1 and X1\3 or X1\3、X1\8 are shorted and software enables the key, which then can function
	Stop	完成电机的停止功能，停止方式由软件参数决定 Complete the stop function of the motor and stopping mode is subject to software’s parameter

5.3 菜单及参数设置 Menu and parameter setting

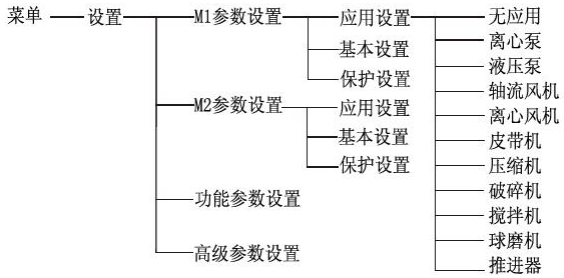
主菜单主要包括以下几个子菜单

The main menu mainly includes the following submenus



菜单—设置	Menu —Settings
M1 参数设置	M1 parameter settings
应用设置	Application settings
基本设置	Basic settings
保护设置	Protection settings
M2 参数设置	M2 parameter settings
应用设置	App settings
基本设置	Basic settings
保护设置	Protection settings
功能参数设置	Functional parameter settings
高级参数设置	Advanced parameter settings

5.4 应用设置（C 参数）Application setting (parameter C)



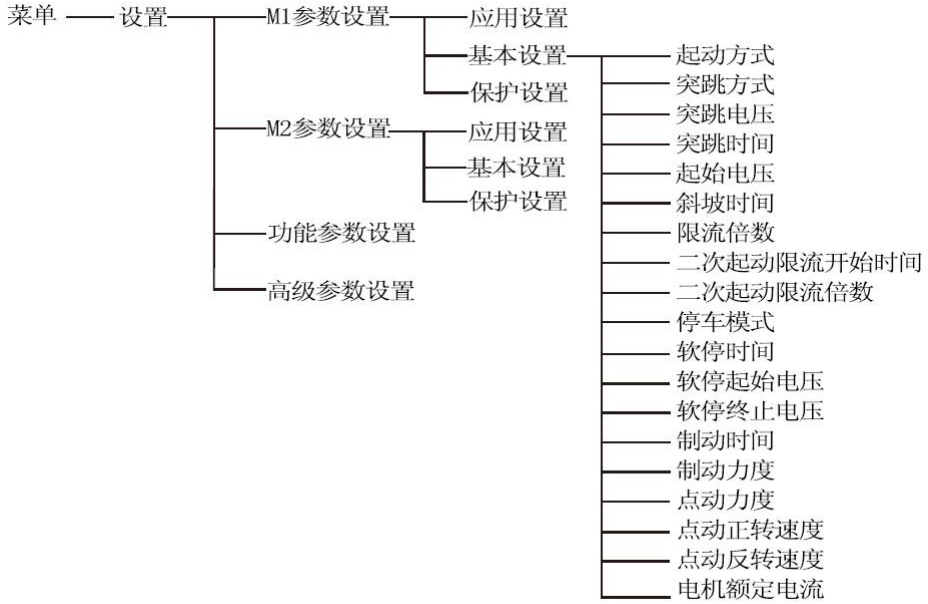
菜单——设置	Menu — Settings
M1 参数设置	M1 parameter settings
应用设置	Application settings
基本设置	Basic settings
保护设置	Protection settings
无应用	No application
M2 参数设置	M2 parameter setting
应用设置	App settings
基本设置	Basic settings
保护设置	Protection settings
离心泵	Centrifugal pump
液压泵	Hydraulic pump
轴流风机	Axial Fan
离心风机	Centrifugal fan

皮带机	Belt conveyor
压缩机	Compressor
破碎机	Crusher
搅拌机	Blender
球磨机	Ball mill
推进器	Thruster
功能参数设置	Functional parameter setting
高级参数设置	Advanced parameter settings

应用设置菜单包含所选择应用的预设参数，在快捷起动中使用。选择应用设置进入该菜单，通过设的存储选择软起动的应用类型。若所用的应用类型不在列表中，则通过基本参数进行设。

The Application Settings menu contains preset parameters for the selected application and is used in quick Start. Select Application Settings to enter the menu, and select the application type of soft start by setting the storage. If the application type is not in the list, set this parameter based on basic parameters.

5.5 基本设置（C 参数）Basic setting (Parameter C)



菜单--设置	Menu -- Settings
M1 参数设置	M1 parameter setting
应用设置	Application settings
基本设置	Basic settings
保护设置	Protection settings
M2 参数设置	M2 parameter setting
应用设置	App settings
基本设置	Basic settings
保护设置	Protection settings
起动方式	Starting method
突跳方式	Kick method
突跳电压	Kick voltage
突跳时间	Kick time
起始电压	Initial voltage

斜坡时间	Ramp time
功能参数设置	Functional parameter setting
限流倍数	Current limiting multiple
高级参数设置	Advanced parameter settings
二次起动限流开始时间	Second start current limiting start time
二次起动限流倍数	Secondary starting current limit ratio
停车模式	Parking mode
软停时间	Soft stopping time
软停起始电压	Soft stop start voltage
软停终止电压	Soft-stop final voltage
制动时间	Braking time
制动力度	Braking force
点动力度	Jog power
点动正转速度	Jog forward speed
点动反转速度	Jog reverse speed
电机额定电流	Motor rated current

基本设置用来设置基本的起停控制方式。用户可通过对起动方式的选择， 使得起动曲线与实际负载很好配合，以达到最佳的起动效果。如果设置了突跳电压和突跳时间，在起动开始时将首先施加一个瞬时较大的起动力矩，然后按照所设定的起始电压\电流，斜坡时间进行起动。如果设置了二次起动时间，在达到二次起动所设置的时间后如果还没有起动完成，将会按照所设定的起始电压\起始电流，斜坡时间进行二次起动。在起动过程中，起动电流被限制在 所设置的限流倍数值以下。当限流倍数设定为 500%时，起动过程中的起动电流将不受限制。各种控制方式详见第六章。

Basic Settings are used to set the basic start and stop control mode. Users can choose the starting mode to make the starting curve match the actual load well, so as to achieve the best starting effect. If the kick voltage and kick time are set, an instantaneous large starting moment will be applied at the beginning of the start, and then the start will be performed according to the set initial voltage\current, and ramp time. When the secondary start time is set, if the secondary start is not completed after reaching the time set for the secondary start, the secondary start will be performed according to the set initial voltage\starting current, ramp time. During the starting process, the starting current is limited below the set limit value. When the current limit ratio is set as 500%, the starting current in the starting process will not be limited. The various control methods are detailed in Chapter 6.

注：起动过程中如果有停止命令，则停止只能是自由停车；起动完成后如果有停止命令，则停止可以是自由停车、软停车、泵停车、制动刹车。

Note: If there is a stop command in the starting process, the stop can only be a free stop; If there is a stop command after starting, the stop can be free stop, soft stop, pump stop, and brake stop.

斜坡时间（C06）参数反映的是输出电压的上升速率，它并不代表实际的起动完成的时间，实际起动时间经常受到限流、负载大小及特性等的影响，是一个不确定的值。实际起动完成时间与限流与负载的关系是负载越轻、限流倍数越大、起动完成时间就越小，反之，则起动完成时间就越大。

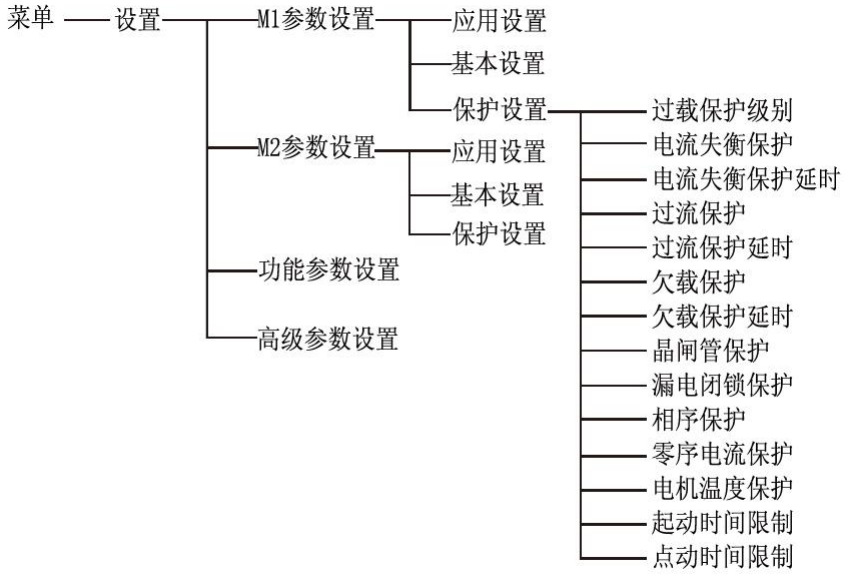
Ramp time (C06) reflects the rise rate of output voltage, and it does not represent the actual start time that is often affected by current limit, load size and characteristics, so it is an uncertain value. The relationship between actual starting completion time and current limiting and load is that the lighter the load is, the larger the current limiting ratio is, the smaller the starting completion time is; otherwise, the larger the starting completion time is.

当斜坡时间设为 0 时，系统会自动给 3 秒斜坡时间。其他起动方式的参数 “初始电压”“斜坡

时间”的功能和上面介绍一样，区别在于输出电压与时间 的曲线不同，后面不再做说明。

When the ramp time is set to 0, the system will automatically give 3 seconds ramp time. The functions of parameters "initial voltage" and "ramp time" of other starting modes are the same as described above. The difference is that the curves of output voltage and time are different, which will not be explained later.

5.6 保护设置（B 参数）Protection settings (Parameter B)



菜单—设置	Menu Settings
M1 参数设置	M1 parameter setting
应用设置	Application settings
基本设置	Basic settings
保护设置	Protection settings
M2 参数设置	M2 parameter setting
应用设置	App settings
基本设置	Basic settings
保护设置	Protection settings
过载保护级别	Overload protection level
电流失衡保护	Current unbalance protection
电流失衡保护延时	Current unbalance protection delay
过流保护	Overcurrent Protection
过流保护延时	Overcurrent protection delay
欠载保护	Underload protection
欠载保护延时	Underload protection delay
晶闸管保护	Thyristor protection
漏电闭锁保护	Leakage locking protection
相序保护	Phase sequence protection
零序电流保护	Zero sequence current protection
电机温度保护	Motor temperature protection
起动时间限制	Start time limit
点动时间限制	Jog time limit
功能参数设置	Functional parameter setting
高级参数设置	Advanced parameter settings

用户可以根据所带电机功率的大小设定电机的额定电流，使得软起动器与电机很好地匹配并能很完善地对电机进行保护。

The user can set the rated current of the motor according to the power of the motor, so that the soft starter can match the motor well and protect the motor perfectly.

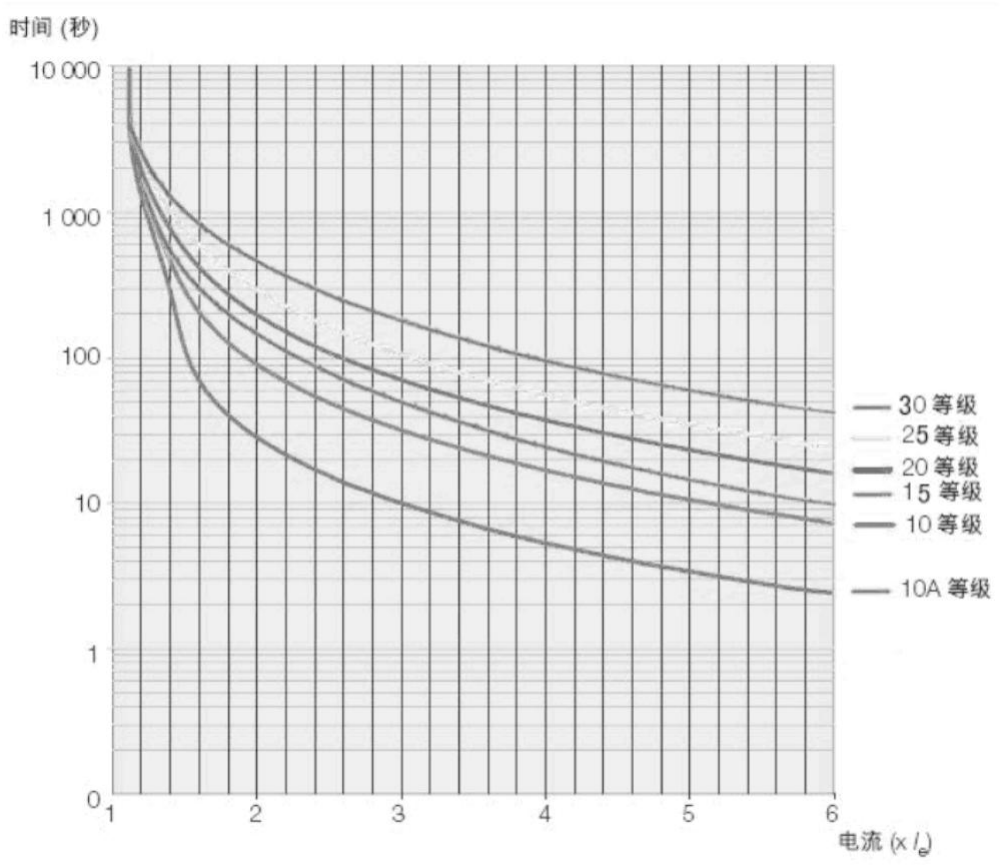
◆ **过载保护 Overload protection**

用于在起动器工作过程中对电机进行保护，防止运行电流过大损坏电机, 该保护可通过参数设置开启或关闭。

It is used to protect the motor during the working process of the starter to prevent the motor from being damaged by excessive running current. The protection can be turned on or off by parameter setting.

过载保护级别设定范围：10A、10、15、20、25、30、OFF。出厂设置为 20 级别。

Overload protection level setting range: 10A, 10, 15, 20, 25, 30, OFF. The factory setting is level 20 .



电子过载的脱扣曲线

时间（秒）Time (S)
30 等级 Level 30
10A 等级 Level 10A
电流 Current

◆ **电流失衡保护 Current imbalance protection**

该保护是针对电机运行过程中三相电流值之间偏差过大而设置的保护功能。在使用时，该值越小三相失衡保护灵敏度越高，因此，该值不宜设置过小, 以免保护过于灵敏，从而影响了设备的正常使用。电流失衡保护设定范围为： (0-100)%,出厂设置为 40%,设置为 100%关闭该保护功能。电流失衡保护 延时设定范围为：0-250S, 出厂设置为 2S。

The protection function is set for the excessive deviation between the three-phase current value during the operation of the motor. In use, the smaller the value, the higher the sensitivity of three-phase imbalance protection. Therefore, do not set the value too small to avoid excessive sensitivity protection, which may affect the normal operation of the device. The current imbalance protection setting range is: (0-100)%, factory setting is 40%, set to 100% to turn off the protection function. The current imbalance protection delay range is 0-250s, and the factory setting is 2S.

◆ **过流保护 Overcurrent protection**

运行过程中的电流超过了所设置的过流保护值，且持续时间超过所设定的过流保护延时时间，则进行保护。过流保护设定范围为：(100—500)%Ie,出厂值为 300%,设置为 100%关闭该保护功能。过流保护延时设定范围为： 0-250S,出厂值为 2S。

If the current during operation exceeds the set overcurrent protection value and the duration exceeds the set overcurrent protection delay time, protection is implemented. The setting range of overcurrent protection is (100-500)%Ie, the factory value is 300%, and set to 100% to disable the protection function. The overcurrent protection delay ranges from 0 to 250S, and the factory default value is 2S.

◆ **欠载保护 Underload protection**

起动完成后，运行过程中的电流低于所设置的欠载保护值，且持续时间超 过所设定的欠载保护延时时间，则进行保护。欠载保护设置范围：(0-99)%Ie, 出厂设置为 0, 设置为 0 时，关闭该功能。欠载保护延时设定范围为：0-250S, 出厂设置为 2S。

After starting, if the current during operation is lower than the set underload protection value and the duration exceeds the set underload protection delay time, protection will be implemented. Underload protection setting range: (0-99)%Ie, factory setting is 0. When this parameter is set to 0, this function is disabled. The underload protection delay ranges from 0 to 250S, and the factory setting is 2S.

◆ **晶闸管保护 Thyristor protection**

晶闸管保护是检测晶闸管是否有直通或触发时不通的现象，如果有则保护，该功能需要使能才可以检测，出厂设置关闭。

Thyristor protection detects whether the thyristor is straight through or blocked when triggered. If there is a thyristor protection, it can be detected only when the function is enabled. The factory setting is disabled.

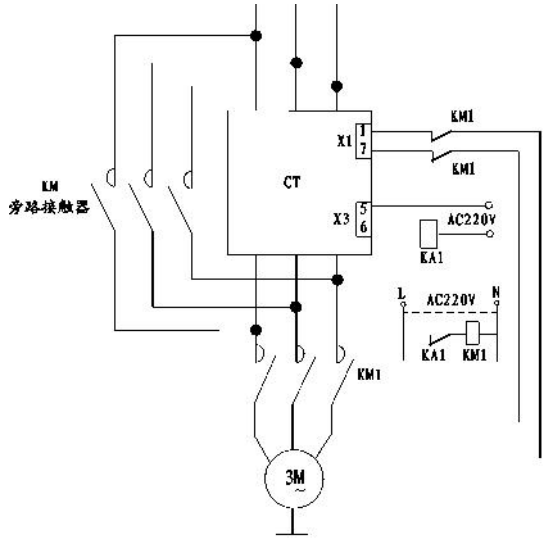
◆ **漏电锁闭保护 Leakage locking protection**

起动前对电机的绝缘程度进行检测，不同的电压等级下，保护值不同。漏 电闭锁保护设置范围：0、禁止；1、允许。该功能的使用需要与继电器输出进 行配合，即需要将输出继电器 K3 输出(参数 Q17)设置为 7(漏电闭锁检测过程 输出)。

Before starting, check the insulation degree of the motor. The protection value is different under different voltage levels. Leakage locking protection setting range: 0. Disable; 1. Allow. The use of this function needs to be coordinated with the output of the relay, that is, the output of the output relay K3 (parameter Q17) needs to be set to 7(leakage locking detection process output).

电压等级	单相对地绝缘电阻
AC380V/660V	W20kQ +20%漏电保护动作
AC1140V	W40kQ +20%漏电保护动作

Voltage class	Single-phase insulation resistance to ground
AC380V/660V	W20kQ +20% Leakage protection acts
AC1140V	W40kQ +20% Leakage protection acts



漏电检测示意图

旁路接触器 Bypass contactor a

漏电检测示意图 Leakage detection diagram

◆ **相序保护 Phase sequence protection**

软起动器可以在任何相序下工作，但若选择了相序保护功能，相序必须为 固定相序。相序保护设定范围为：0、禁止；1、允许。出厂设置为禁止。

The soft starter can work in any phase sequence, but if the phase sequence protection function is selected, the phase sequence must be fixed. The setting range of phase sequence protection is: 0. Disable; 1. Allow. The factory default value is disabled.

◆ **零序电流保护 Zero sequence current protection**

本功能检测三相绕组上是否有漏电。该功能使用比较灵活，应用时，根据传送过来的信号，然后选择“模拟输入”参数“0-60mA”的量程，再设置在量程的百分之多少保护，此参数在“模拟输入上限值”参数中设置，设置完成后，系统会在起动过程中查看输入的值是否达到设定值，如果大于等于“模拟输入 上限值”，将报"零序保护”。接入到模拟输入端的电流要不大于 60mA, 动作电流要不大于 60mA。该保护在系统起动后才检测。

This function detects whether there is leakage current on the three-phase winding. This function is more flexible to use. When applied, select the range of "0-60mA" of the "analog input" parameter according to the transmitted signal, and then set the protection in percent of the range. This parameter is in the "analog input upper limit value” parameter. After the setting is completed, the system will check whether the input value reaches the set value during the startup process. If it is greater than or equal to the “analog input upper limit value”, it will report “zero sequence protection”. The current connected to the analog input terminal should be no more than 60mA, and the operating current should be no more than 60mA. The protection is not detected until the system is started.

◆ **电机温度保护 Motor temperature protection**

本功能是检测埋在电机内部热电阻大小来判断电机是否过热，动作阻值为 3.3K+30%Ω，且是 PTC 型。当系统检测到热电阻阻值小于动作电阻时，系统就会保护。该功能必须先使能才有效，出厂值为关闭。

This function is to detect the size of the thermal resistance buried in the motor to judge whether the motor is overheated, the action resistance value is 3.3K+30%Ω, and it is a PTC type. When the system detects that the resistance of the thermal resistance is less than the action resistance, the system will enable the protection. This function must be enabled first to be effective, and the default value is disabled.

◆ **起动时间限制 Starting time limit**

用于设定起动过程的最大允许时间。起动时间限制设定范围为:10—120S, 出厂值为 60S。

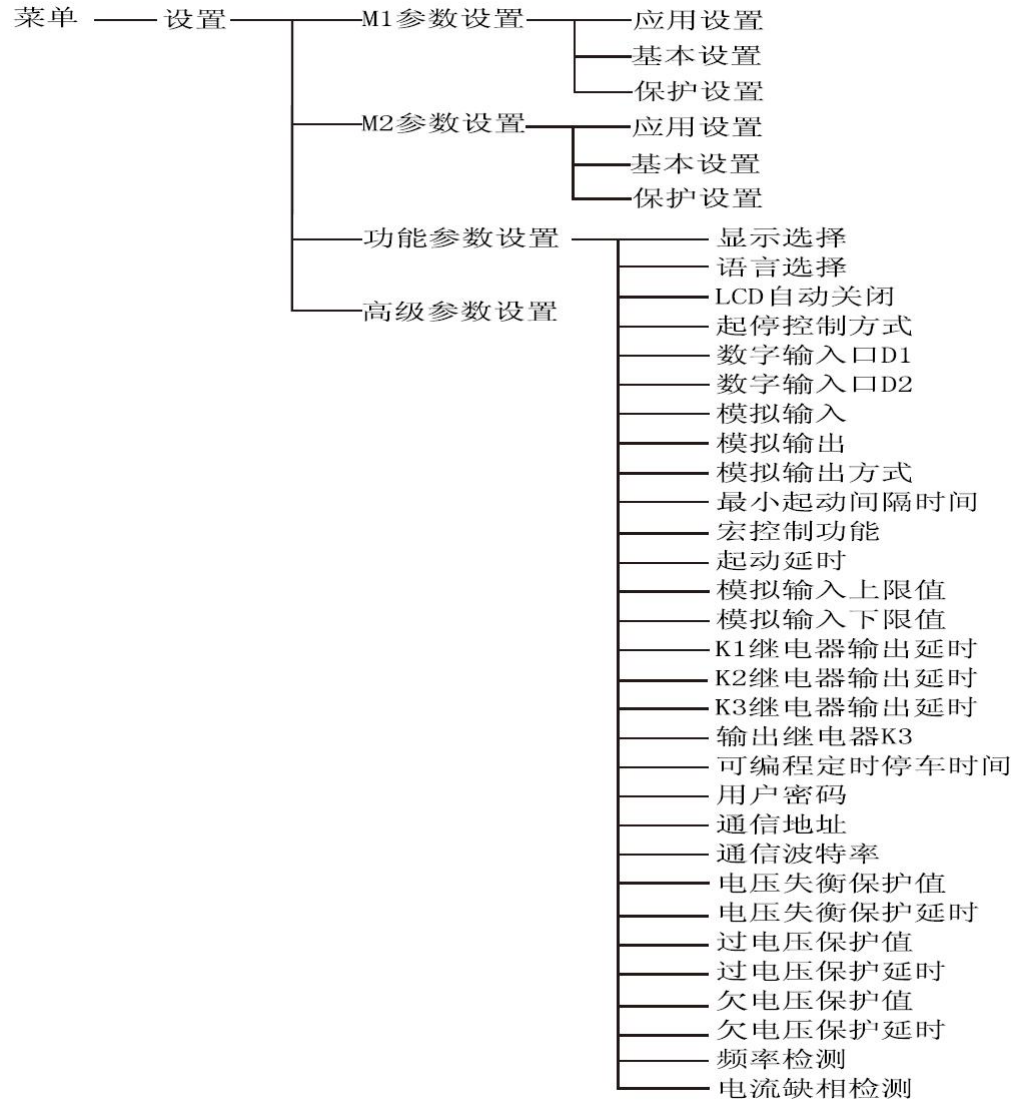
It is used to set the maximum allowable time for the start-up process. The setting range of the starting time limit is 10—120S, and the factory default value is 60S.

◆ **点动时间限制 Jog time limit**

用于设定点动过程的最大允许时间。点动时间限制设定范围为：0-60S, 出厂值为 60S。

It is used to set the maximum allowable time for the Jog process. The setting range of the Jog time limit is 10—120S, and the factory default value is 60S.

5.7 功能参数设置（Q 参数）Functional parameter setting (Parameter Q)



菜单--设置-	Menu Settings-
M1 参数设置	M1 parameter setting
应用设置	Application settings
基本设置	Basic settings
保护设置	Protection settings
M2 参数设置	M2 parameter setting
应用设置	App settings
基本设置	Basic settings
保护设置	Protection settings
功能参数设置	Functional parameter setting
高级参数设置	Advanced parameter settings
显示选择	Show selection
语言选择	language selection
LCD 自动关闭	LCD turns off automatically
起停控制方式	Start-stop control
数字输入口 D1	Digital input port D1
数字输入口 D2	Digital input port D2
模拟输入	Analog input
模拟输出	Analog output
模拟输出方式	Analog output method
最小起动间隔时间	Minimum start interval
宏控制功能	Macro control function
起动延时	Start delay
模拟输入上限值	Analog input upper limit value
模拟输入下限值	Analog input lower limit value
K1 继电器输出延时	K1 relay output delay
K2 继电器输出延时	K2 relay output delay
K3 继电器输出延时	K3 relay output delay
输出继电器 K3	Output relay K3
可编程定时停车时间	Programmable timed stopping time
用户密码	User password
通信地址	Contact address
通信波特率	Communication baud rate
电压失衡保护值	Voltage unbalance protection value
电压失衡保护延时	Voltage unbalance protection delay
过电压保护值	Over voltage protection value
过电压保护延时	Overvoltage protection delay
欠电压保护值	Under voltage protection value
欠电压保护延时	Undervoltage protection delay
频率检测	Frequency detection
电流缺相检测	Current phase loss detection

◆ **显示选择 Display selection**

设置显示选择参数后，所选择的显示项将作为默认的显示项进行显示。显示选择参数设定范围为：0、电机额定电流；1、平均电流；2、L1 相电流；3、L2 相电流；4、L3 相电流；5、模拟口值%；

6、输出电压%；7、L1-L2 相电压；8、L2-L3 相电压；9、L3-L1 相电压。出厂设置为 1。

After setting the display selection parameters, the selected display item will be displayed as the default display item. Display selection parameter setting range: 0. rated motor current; 1. average current; 2. L1 phase current; 3. L2 phase current; 4. L3 phase current; 5. Analog port value %; 6. Output voltage %; 7. L1-L2 phase voltage; 8. L2-L3 phase voltage; 9. L3-L1 phase voltage. The factory setting is 1.

◆ **语言选择 Language selection**

用于选择当前的显示语言。参数设定范围为：0、中文；1、英文。出厂值为 0。

Used to select the current display language. The parameter setting range is: 0, Chinese; 1, English. The factory value is 0.

◆ **LCD 自动关闭 LCD turns off automatically**

LCD 背光可在设定的时间内自动关闭。参数设定范围为：0-255Min， 出厂值为 15。设定为 0 时背光不关闭。

The LCD backlight can be automatically turned off within a set time. The parameter setting range is: 0-255Min, and the default value is 15. When set to 0, the backlight does not turn off.

◆ **起停控制方式 Start-stop control mode**

参数 Q03 用来选择软起动器的起动\停止控制方式，在任何一种起动\停止控制方式下，用户均可通过外控接线端子进行起动\停止的控制。

Parameter Q03 is used to select the start\stop control mode of the soft starter. In any start\stop control mode, users can control the start\stop through the external control terminal.

◆ **数字口 D1\D2 Digital interface D1\D2**

软起动器有两个可编程的数字输入口(D1\D2)，可用作不同的目的，互相独立。数字口 D1(Q04 参数)出厂值为 0(M2 参数选择)，数字口 D2(Q05 参数)出厂值为 1(故障复位)。

The soft starter has two programmable digital inputs (D1\D2), which can be used for different purposes independently of each other. The factory value of digital port D1 (parameter Q04) is 0 (parameter M2 selection), and the factory value of digital port D2 (parameter Q05) is 1 (fault reset).

1. M2 参数选择：软起动器具有两套控制参数项，用户可以通过闭合 D 1\D 2 与 COM 端实现对第二套基本功能项的选择(D 1\D 2 设置为 M 2 参数选择) 。断开为 M1 套参数项。
   M2 parameter selection: The soft starter has two sets of control parameter items. The user can select the second set of basic function items by closing D 1\D 2 and COM terminal (D 1\D 2 is set as M2 parameter selection). When disconnected, it is M1 parameter item.
2. 故障清除：通过闭合 D 1\D 2 与 COM 端以清除当前故障， 故障清除后若起动命令存在则软起动器再次起动。
   Fault clearing: Clear the current fault by closing D1\D 2 and COM terminal. After the fault is cleared, if the start command exists, the soft starter will start again.
3. 点动正转：通过闭合 D 1\D 2 与 COM 端进行点动控制， 数字口闭合软起动点动运行，断开软起动器停止。点动过程依照所设定的点动力度(C16)、点动正转速度(C17)、点动时间限制(B13)进行控制。
   Jog forward: Jog control is performed by closing D1\D2 and COM terminal, the digital port is closed for soft start jog operation, and the soft starter is disconnected to stop. The jog process is controlled according to the preset jog power (C16), jog forward rotation speed (C17), and jog time limit (B13).
4. 点动反转：通过闭合 D 1\D 2 与 COM 端进行点动控制， 数字口闭合软起动点动运行，断开软起动器停止。点动过程依照所设定的点动力度(C16)、点动反转速度(C18)、点动时间限制(B13)进行控制。

Jog reversal: Jog control is performed by closing D1\D2 and COM terminal, the digital port is closed for soft start jog operation, and the soft starter is disconnected to stop. The jog process is controlled according to the set jog power (C16), jog reverse speed (C18), and jog time limit (B13).

5. 急停控制输入：当 D1\D2 设置为急停控制输入时，通过断开 D1\D2 与 COM 端实现软起动器急停且 LCD 面板处于急停显示界面。

   Emergency stop control input: When D1\D2 is set as emergency stop control input, the soft starter emergency stop is realized by disconnecting D1\D2 and COM terminal and the LCD panel is in the emergency stop display interface.

6. 延时继电器控制输入：当 D1\D2 设置为延时继电器控制输入时，相应的可编程继电器 K 3 输出(参数 Q 17) 应设置为可编程延时输出。当 D 1\D 2 与 COM 端闭合时，对应的继电器就会有输出(继电器输出延时参数 Q16 时间到)。

   Delay relay control input: When D1\D2 are set as delay relay control input, the corresponding programmable relay K3 output (parameter Q17) should be set as programmable delay output. When D1\D2 and COM terminal are closed, the corresponding relay will have output (relay output delay parameter Q16 time expires).

注：闭合接点宏控制、断开接点宏控制见宏控制功能说明。

Note: For macro control of closed contact and macro control of open contact, see the description of macro control function.

◆ **模拟输入、输出 Analog input and output**

系统有模拟输入模拟输出功能，模拟输出功能主要是把测量的平均电流按 0~20mA 或 4~20mA 输出。输出量程由参数“模拟输出方式”决定，并且只有给了起动命令后才按照设定的参数进行模拟输出。

The system has analog input and analog output function. The analog output function is mainly to output the measured average current as 0~20mA or 4~20mA. The output range is determined by the parameter "analog output mode", and the analog output is performed according to the set parameters only after the start command is given.

模拟输入功能必须与其他功能配合使用，应用时在“模拟输入方式(Q06)”参数中选择相应的量程，量程决定模拟量输入的百分比，这个百分比可以在监控状态中通过“上下翻”键查到，即“Ai=%”的值。

The analog input function must be used in conjunction with other functions. When applying, select the corresponding range in the "analog input mode (Q06)" parameter. The range determines the percentage of the analog input. This percentage can be checked by the "up and down" keys in the monitoring state, namely the value of "Ai=%".

◆ **最小起动间隔时间 Minimum start interval**

两次起动操作的最小间隔时间。起动完成后，起动间隔时间计时器按照所设定的最小起动间隔时间(Q09 参数)进行倒计时。如果倒计时时间没有减到 0，则不能进行再次起动。如果起动间隔时间计时器不等于 0 时起动，软起会提示起动频繁故障。复位故障后，通过面板 Ts(起动间隔时间计时器)可以查询距下次允许起动的时间。参数设定范围为 0-60Min， 出厂值为 0(关闭起动间隔限制)。

Minimum time between two start operations. After the start is completed, the start interval timer counts down according to the set minimum start interval time (Q09 parameter). If the countdown time is not reduced to 0, the restart cannot be performed. If the start interval timer is not equal to 0 when starting, soft start will prompt frequent starting fault. After resetting the fault, users can query the time until the next allowed start through the Ts(start interval timer) panel. Parameter setting range is 0-60min, factory value is 0(disable the start interval limit).

◆ **宏控制功能 Macro control function**

用户可以通过对宏的选择来实现对软起动器自动起\停的控制(需通过按面板上的 RUN 键将宏打开) 。

Users can control the automatic start/stop of the soft starter by selecting the macro (the macro needs to be opened by pressing the RUN key on the panel).

7. 无宏控制：软起动的起动\停止不受宏的控制。
   No macro control: The start/stop of soft start is not controlled by macro.
8. 数字口一接点宏控制：控制起动器宏起/停(按下键盘上的 RUN 键) ，根据参数 Q04 的设置：(设置为闭合接点宏控制：数字口 D1 闭合，且 Q11 所设置的起动延时时间到，软起动器起动。如果在这个过程中数字口断开，软起动停止， LCD 界面上显示宏停。断开接点宏控制：数字口 D1 断开，且 Q11 所设置的起动延时时间到，软起动器起动。如果在这个过程中数字口闭合，软起动停止，界面上显示宏停。可通过断开数字口 D1 进行再次起动。只有按下键盘上的 STOP 键， 才能使系统处于停止状态)。
   Contact macro control of Digital port 1: Control starter's macro start/stop (press RUN key on keyboard). According to the setting of parameter Q04: Set to closed contact macro control: digital port D1 is closed, and the start delay time set by Q11 expires, the soft starter starts. If the digital port is disconnected during this process, the soft start stops, and the LCD displays the macro stop. Disconnect contact macro control: the digital port D1 is disconnected, and the start delay time set by Q11 expires, the soft starter starts. If the digital port is closed during this process, the soft start stops and the interface displays macro stop. It can be restarted by disconnecting the digital port D1. Only press the STOP key on the keyboard to make the system stop.
9. 数字口二接点宏控制：控制起动器宏起/停(按下键盘上的 RUN 键) ，根据参数 Q05 的设置：(设置为闭合接点宏控制：数字口 D2 闭合，且 Q11 所设置的起动延时时间到，软起动器起动。如果在这个过程中数字口断开，软起动停止， LCD 界面上显示宏停。断开接点宏控制：数字口 D 2 断开，且 Q 11 所设置的起动延时时间到，软起动器起动。如果在这个过程中数字口闭合，软起动停止，界面上显示宏停。可通过断开数字口 D2 进行再次起动。只有按下键盘上的 STOP 键，才能使系统处于停止状态) 。
   Contact macro control of Digital port 2: Control starter's macro start/stop (press RUN key on keyboard). According to the setting of parameter Q05: Set to closed contact macro control: digital port D2 is closed, and the start delay time set by Q11 expires, the soft starter starts. If the digital port is disconnected during this process, the soft start stops, and the LCD displays the macro stop. Disconnect contact macro control: the digital port D2 is disconnected, and the start delay time set by Q11 expires, the soft starter starts. If the digital port is closed during this process, the soft start stops and the interface displays macro stop. It can be restarted by disconnecting the digital port D2. Only press the STOP key on the keyboard to make the system stop.
10. 模拟正输入宏控制：使用模拟口宏控制功能，根据参数 Q12、Q13 所设置的模拟输入上限值，模拟输入下限值进行控制。达到模拟上限值时，控制器开始起动，低于下限时停止，否则处于“宏停”状态。(必须按下键盘上的 RUN 键且 Q 11 所设置的起动延时时间到。宏条件不满足， 界面上显示宏停)
    Analog positive input macro control: Use the analog macro control function to perform control according to the analog input upper limit and the analog input lower limit set by parameters Q12 and Q13. When the analog upper limit is reached, the controller starts and stops when it is lower than the lower limit, otherwise it is in the state of "macro stop". (The RUN key on the keyboard must be pressed and the start delay time set by Q11 expires. If the macro condition is not met, it will display that macro is off.
11. 模拟负输入宏控制：使用模拟口宏控制功能，根据参数 Q12、Q13 所设置的模拟输入上限值，

模拟输入下限值进行控制。达到模拟下限值时，控制器开始起动，高于上限时停止，否则处于“宏停”状态。(必须按下键盘上的 RUN 键且 Q 11 所设置的起动延时时间到。宏条件不满足， 界面上显示宏停) 。

Analog negative input macro control: Use the analog macro control function to perform control according to the analog input upper limit and the analog input lower limit set by parameters Q12 and Q13. When the analog lower limit is reached, the controller starts and stops when it is higher than the upper limit, otherwise it is in the state of "macro stop". (The RUN key on the keyboard must be pressed and the start delay time set by Q11 expires. If the macro condition is not met, it will display “macro stop”.

◆ **输出继电器 K3 Output relay K3**

CT 软起动器的主控板上有三个继电器，其中有两个分别做为故障输出、旁路输出。另一个继电器输出可编程，用户可根据实际需要对 Q17 参数进行设置。出厂设置为 7(漏电闭锁检测输出)。

There are three relays on the main control board of the CT soft starter, two of which are used as fault output and bypass output respectively. Another relay output is programmable, and users can set the parameters Q17 according to actual needs. The factory setting is 7 (leakage locking detection output).

参数 Q14、Q15、Q16 用于设置继电器的输出延时，参数设置范围为 0-250S，出厂设置为 0.

Parameters Q14, Q15, Q16 are used to set the output delay of the relay. The parameter setting range is 0-250S, and the factory setting is 0.

0. 全压输出：软起动器输出电压达到额定电压时输出闭合(所设置的延时时间到)。

Full voltage output: When the output voltage of the soft starter reaches the rated voltage, the output will be closed (the set delay time expires).

1. 起动过程输出：软起动器处于起动过程时输出闭合(所设置的延时时间到)。如果延时时间未到就已经全压，则不进行输出。

Start process output: the output is closed when the soft starter is in the start process (the set delay time expires). If the full voltage is reached before the delay time expires, no output will be performed.

2. 软停过程输出：软起动器处于软停车过程时输出(所设置的延时时间到，且其值必须小于参数 C11 所设置的软停时间)。

Soft stop process output: output when the soft starter is in the soft stop process (the set delay time expires, and its value must be less than the soft stopping time set by parameter C11).

3. 故障时输出：软起动器检测到故障时输出闭合(所设置的延时时间到)。

Output at fault: The output is closed when the soft starter detects a fault (the set delay time expires).

4. 刹车时输出：软起动器处于外部制动刹车时输出(所设置的延时时间到，且其值必须小于参数 C14 所设置的制动时间)。

Output when braking: output when the soft starter is under external braking (the set delay time expires, and its value must be less than the braking time set by parameter C14).

5. 运行过程输出：软起动处于起动和运行过程时输出(所设置的延时时间到)。

Running process output: output when the soft start is in the starting and running process (the set delay time is up).

6. 可编程延时输出：参数 Q04\Q05 必须设置为延时继电器控制输入，所设置的延时时间到，继电器输出。

Programmable delay output: parameter Q04\Q05 must be set as delay relay control input. When the set delay time expires, the relay will output.

7. 漏电闭锁检测输出：参数 B08 必须设置为漏电闭锁保护允许，漏电检测输入端 X1\7 检测到有漏电，继电器输出(在此方式下，继电器延时时间必须设置为 0)。

Leakage locking detection output: Parameter B08 must be set to allow leakage locking protection. When the leakage detection input X1\7 detects leakage, the relay will output (in this mode, the relay delay time must be set to 0).

◆ **可编程定时停车时间 Programmable timed stopping time**

需要设定该参数时，最小设定量为 0.1h，指当软起动器运行后，在指定时间到后按照设定的停车方式进行停车。参数设定范围为 0-999.9h，出厂设置为 0。

When this parameter needs to be set, the minimum set value is 0.1h, which means that when the soft starter runs, it will stop according to the set stopping mode after the specified time. The parameter setting range is 0-999.9h, and the factory setting is 0.

◆ **用户密码 User password**

用户可通过设定用户密码对设备进行保护，避免外界对参数进行修改等操作。参数设定范围为 0-65535，出厂值为 0。

Users can protect the device by setting a user password to avoid operations such as modification of parameters by the outside world. The parameter setting range is 0-65535, and the factory default value is 0.

◆ **通信 Communication**

在进行网络通讯时， 可连接 32 台设备， 并可通过 LCD 显示屏右上角查看当前设备的通讯地址。用户可通过对波特率、通讯地址的设定以达到自动通讯的目的。通信地址设定范围为 1-32，出厂值为 1。通信波特率设定范围为：0、600；1、1200；2、2400；3、4800；4、9600；5、19200，出厂值为 4(9600)。

During network communication, 32 devices can be connected, and the communication address of the current device can be viewed through the upper right corner of the LCD. Users can achieve the purpose of automatic communication by setting the baud rate and communication address. The communication address setting range is 1-32, and the factory default value is 1. The communication baud rate setting range is 0. 600; 1.1200; 2. 2400; 3. 4800; 4. 9600;

◆ **电压失衡保护 Voltage imbalance protection**

该保护是针对三相主电源电压之间偏差过大而设置的保护功能。在使用时，该值越小三相失衡保护灵敏度越高，因因此，该值不宜设置过小，以免保护过于灵敏，从而影响了设备的正常使用。电玉失衡保护设定范围为：(0 一 100)%，出厂设置为 70%，设置为 100%关闭该保护功能。电压失衡保护延时设定范围为：0-250S，出厂值为 2S。

This protection is a protection function set against excessive deviation between the three-phase main power voltage. In use, the smaller the value, the higher the sensitivity of the three-phase imbalance protection. Therefore, this value should not be set too small, so as to avoid the protection being too sensitive, thus affecting the normal use of the equipment.

◆ **过压保护 Overvoltage protection**

主电源电压超过所设定的过压保护值，且过电压保护延时时间到则保护。过电压保护值范围为：(100-150)%，设置为 100%关闭该功能，出厂值为 150%。过电压保护延时范围为：0-250S，出厂值为 2S。

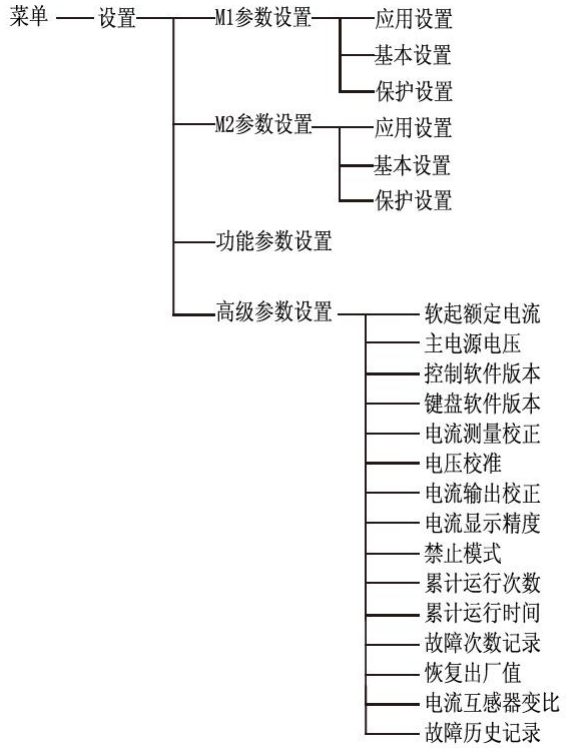
When the main power supply voltage exceeds the set overvoltage protection value, and the overvoltage protection will be enabled when the overvoltage protection delay time expires. The range of overvoltage protection value is (100-150)%, set it to 100% to turn off this function, and the factory value is 150%. Overvoltage protection delay range is 0-250S, the factory default value is 2S.

◆ **欠压保护 Undervoltage protection**

主电源电压低于所设定的欠压保护值，且欠电压保护延时时间到则保护。欠电压保护值范围为：(20-100)%，设置为 100%关闭该功能，出厂值为 70%。过电压保护延时范围为：0-250S，出厂值为 2S。

The main power supply voltage is lower than the set under-voltage protection value, and the undervoltage protection will be enabled when the under-voltage protection delay time expires. The range of under-voltage protection value is (20-100)%, set it to 100% to turn off this function, and the factory value is 70%. Overvoltage protection delay range is 0-250S, the factory default value is 2S.

5.8 记录参数设置（H 参数）Record parameter setting (parameter H)



菜单——设置	Menu --- Settings
M1 参数设置	M1 parameter setting
应用设置	Application settings
基本设置	Basic settings
保护设置	Protection settings
M2 参数设置	M2 parameter setting
应用设置	App settings
基本设置	Basic settings
保护设置	Protection settings
功能参数设置	Functional parameter setting
高级参数设置	Advanced parameter settings
软起额定电流	Soft start rated current
主电源电压	Mains voltage
控制软件版本	Control software version
键盘软件版本	Keyboard software version
电流测量校正	Current measurement correction
电压校准	Voltage calibration
电流输出校正	Current output correction
电流显示精度	Current display accuracy
禁止模式	Disable mode
累计运行次数	Cumulative run times

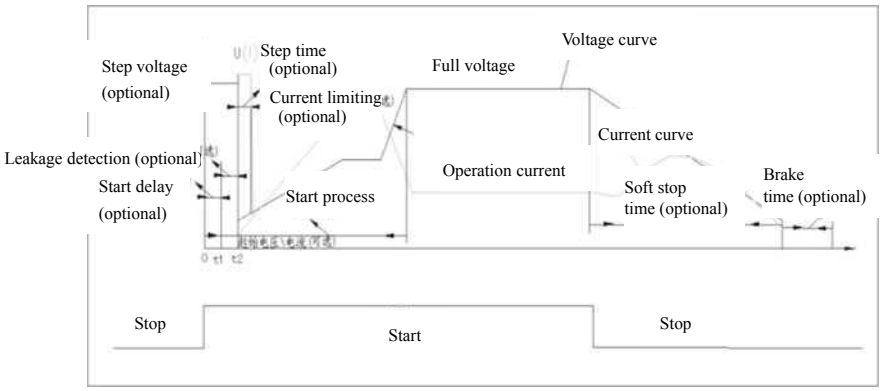
累计运行时间	Cumulative running time
故障次数记录	Failure times record
恢复出厂值	Restore factory defaults
电流互感器变比	Current transformer ratio
故障历史记录	Fault history

显示记录参数项记录软起动器的工作及状态信息，此功能项用户不可修改。

Display and record parameter items and record the work and status information of the soft starter. This function item cannot be modified by the user.

第六章 软起动器的控制模式

Section 6 Control Mode of Soft Starter



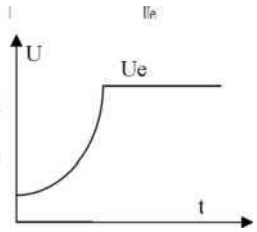
软起\软停电压(电流)特性曲

Characteristic curve of soft start/stop voltage (current)

CT 软起动器有多种起动方式：电压斜坡控制、线性转矩控制、平方转矩控制、有级变频控制；多种停车方式：自由停车、软停车、制动刹车，软停+制动刹车，还具有点动功能。用户可根据负载不同及具体使用条件选择不同的起动方式和停车方式。

CT soft starter has a variety of starting methods, including voltage ramp control, linear torque control, square torque control, step frequency conversion control; and a variety of stopping methods, including free stop, soft stop, brake stop, soft stop + brake stop, as well as jog function. Users can choose different starting and stopping methods according to different loads and specific conditions of use.

6.1 电压斜坡起动 Voltage ramp start



当使用电压斜坡起动时，加载至电机两端的输出电压会呈线性增加同时输出电流以一定的速率增加，当起动电流增加至限幅值 Im 时，电流保持不变，即系统的限流功能，其他起动也有相同的功能，后面不再累述。如果电流低于限流值时，系统会继续移相，直至起动完成。

When the voltage ramp is used to start, the output voltage loaded to both ends of the motor will increase linearly, and the output current will increase at a certain rate at the same time. When the starting current increases to the limit value Im, the current remains unchanged, that is, the current limiting function of the system, and other startups have the same function, which will not be described later. If the current falls below the current limit, the system will continue to phase shift until the start is complete.

应用时涉及的主要参数如下表：

The main parameters involved in the application are as follows:

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C01	起动方式 Starting method	0∽3	0	0
C05	起始电压	20~100%U	———	30%

	Initial voltage	e		
C06	斜坡时间 Ramp time	0 ∽120S	——	10
C07	限流倍数 Current-limiting multiple	100∽500%Ie	——	350%

6.2 线性转矩控制 Linear torque control

当使用线性转矩起动时，加载至电机两端的输出电压会被控制，输出电压 曲线如右图，输出转矩会按预设的最佳曲线逐渐增加从而使电机起动，这种起动方式适用于负载逐渐变重的场合。

To start with linear torque, the output voltage applied to both ends of the motor will be controlled. The output voltage curve is as shown on the right, and the output torque will gradually increase according to the preset optimal curve to start the motor. This starting method is suitable for occasions where the load gradually becomes heavier.

应用时涉及的主要参数如下表:

The main parameters involved in the application are as follows:

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C01	起动方式 Starting method	0∽3	1	0
C05	起始电压 Initial voltage	20∽100%Ue	—	30%
C06	斜坡时间 Ramp time	0 ∽120S	—	10
C07	限流倍数 Current-limiting multiple	100∽500%Ie	—	350%

6.3 平方转矩控制 Square torque control

当使用平方转矩起动时，加载至电机两端的输出电压会被控制，输出电压 曲线如右图，输出转矩会按预设的最佳曲线逐渐增加从而使电机起动，这种起 动方式适用于转矩逐渐变轻的场合。

应用时涉及的主要参数如下表：

To start with square torque, the output voltage applied to both ends of the motor will be controlled. The output voltage curve is shown on the right, and the output torque will gradually increase according to the preset optimal curve to start the motor. This starting method is suitable for occasions where the load gradually becomes heavier.

应用时涉及的主要参数如下表:

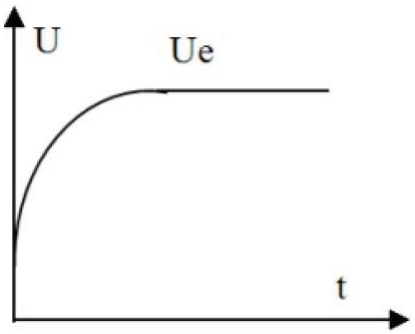
The main parameters involved in the application are as follows:

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C01	起动方式 Starting method	0∽3	1	0

C05	起始电压 Initial voltage	20∽100%Ue	—	30%
C06	斜坡时间 Ramp time	0 ∽120S	—	10
C07	限流倍数 Current-limiting multiple	100∽500%Ie	—	350%

6.4 有级变频控制 Step frequency control

有级变频起动是在起动过程中，软起动器先在四分频上加速，当速度 达到四分频的额定转速时，然后再跳到工频上起动，四分频使用电压斜坡起动, 工频使用转矩斜坡起动，这种起动方式主要应用在大惯量负载中。



Step frequency starting means that the soft starter first accelerates on the quarter frequency during the starting process. When the speed reaches the rated speed of the quarter frequency it then jumps to the power frequency to start. The quarter frequency uses a voltage ramp to start, and the power frequency uses torque ramp starting, which is mainly used in large inertia loads.

应用时涉及的主要参数如下表:

The main parameters involved in the application are as follows:

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C01	起动方式 Starting method	0∽3	1	0
C05	起始电压 Initial voltage	20∽100%Ue	—	30%
C06	斜坡时间 Ramp time	0 ∽120S	—	10
C07	限流倍数 Current-limiting multiple	100∽500%Ie	—	350%

6.5 突跳功能 Kick function

突跳功能主要应用在静态阻力比较大的负载电动机上，通过施加一个瞬时 较大的起动力矩以克服大的静摩擦力矩。该模式下输出电压迅速达到设定的突 跳电压，当达到预先设定的突跳时间后降为起始电压，再根据所设定的起始电 压、斜坡时间平稳起动，直至起动完成。突跳有两种方式，分别为降压突跳和低频突跳，低频突跳比电压突跳的输出转矩会大，且电流冲击小。

The kick function is mainly applied to the load motor with relatively large static resistance. It can overcome the large static friction torque by applying an instantaneous large starting torque. In this mode, the output voltage quickly reaches the preset kick voltage, and when it reaches the preset kick time, it drops to the initial voltage, and then starts smoothly according to the set initial voltage and ramp time until the start is completed. There are two types of kicking, namely, the voltage step-down kicking and the

low-frequency kicking. The output torque of low-frequency kicking is larger than that of voltage step-down kicking, and the current impact is smaller.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C01	起始电压 Initial voltage	(20~100%)Ue	1	30%
C05	突跳方式 Kicking method	0—1	—	0
C06	突跳电压 Kicking voltage	20～100%Ue	—	20%
C07	突跳时间 Kicking time	0～2000mS	—	0

使用突跳转矩起动模式时必须与其它软起动方式配合使用，而且要设置突跳电压和突跳时间。Step torque starting mode must be used together with other soft starting modes and it is required to set step voltage and step time.

6.6 二次启动 Secondary starting

为了解决某些负载在现场起动困难问题，所以系统具有二次起动的功能。主要机理是：当起动时间大于参数“二次起动限流开始时间(C08)”，且控制系统还处于限流状态时，系统会按“二次起动限流倍数(C09)”的值进行限流， 即放大了限流倍数，所以设置这个值应该比“限流倍数(C07) ”参数的值略大。

In order to solve the problem that some loads are difficult to be started on site, the system has the function of secondary starting. The main mechanism is that when the starting time is greater than the parameter " starting time of secondary starting current limiting (C08)", and the control system is still in the current limiting state, the system will limit the current according to the value of "secondary starting current limiting multiple (C09)". The current limiting multiple is amplified, so this value should b set slightly larger than the value of the "current limiting multiple (C07)" parameter.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C08	二次起动限流开始时间 Starting time of secondary starting current limiting	0~60S, 0 时禁止	0	0
C09	二次起动限流倍数 Secondary starting current limiting multiple	100～500%Ie	400%	400

6.7 自由停车 Free stop

软起动器接到停机指令后，首先封锁旁路接触器的控制继电器并随即封锁主电路晶闸管的输出，电动机依负载惯性自由停机。

After the soft starter receives the stop command, it first disconnects the control relay of bypass contactor and blocks the output of thyristor on main circuit consequently. The motor will stop freely by the load inertia.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default

C10	停车模式 Stopping mode	0-4	0	0

6.8 软停车 Soft stop

在该方式下停机，软起动器首先断开旁路接触器，软起动器的输出电压在设定的软停车时间内逐渐降至所设定的软停终止电压值，使加在电机端的电压逐渐减小，以减小突然停机有些负载对电机带来的冲击。

To stop in this mode, the soft starter first disconnects the bypass contactor, and the output voltage of the soft starter gradually drops to the preset soft stop final voltage value within the set soft stopping time, so that the voltage applied to the motor gradually decreases, so as to reduce the impact of some loads on the motor caused by sudden stop.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C10	停车模式 Stopping mode	0～4	1	0
C11	停车时间 Stopping time	0～120S	---	10
C12	软停起始电压 Initial voltage of soft stop	60∽100%Ue	——	80%
C13	软停终止电压 Final voltage of soft stop	0∽60%Ue	——	20%

6.9 泵停车 Pump stop

在该方式下停机，软起动器首先断开旁路接触器，软起动器的输出电压在设定的软停车时间内逐渐降至所设定的软停终止电压值，泵停车是软停的特殊一种，主要针对泵类负载设计的软停车。

To stop in this mode, the soft starter first disconnects the bypass contactor, the output voltage of the soft starter gradually drops to the set soft stop termination voltage value within the set soft stop time, and the pump stops by soft stop A special kind of soft stop mainly designed for pump loads.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C10	停车模式 Stopping mode	0～4	1	0
C11	停车时间 Stopping time	0～120S	---	10
C12	软停起始电压 Initial voltage of soft stop	60∽100%Ue	——	80%
C13	软停终止电压 Final voltage of soft stop	0∽60%Ue	——	20%

6.10 内部制动刹车 Internal brake stop

当软起动器设置了制动时间和选择了内部制动后，软起动器在停止时变会制动停车，缩短停车

时间。本制动功能对于小电机有良好的效果，对于大电机, 制动效果并不理想，另外受负载影响比较大。所以在应用时，设置参数就非常重要了，如果电机越大、负载的惯性越大，那么制动时间就应该设置越长。

When the soft starter is set with braking time and internal brake is selected, the soft starter will brake and stop when it stops to shorten the stopping time. This braking function has a good effect for small motors, but for large motors, the braking effect is not ideal, and it is greatly affected by the load. Therefore, in application, it is very important to set the parameters. If the motor is larger and the inertia of the load is larger, the braking time should be set longer.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C10	停车模式 Stopping mode	0～4	3	0
C14	停车时间 Stopping time	0 ～120S	—	0
C15	制动力度 Braking force	10～100%	—	30%

6.11 外部制动刹车 External braking stop

外部制动功能必须外部接一个制动单元，然后由控制系统给提供一个控制信号，信号由继电器 K3 输出，所以使用该功能必须把输出继电器 K3 的参数设定为“刹车时输出”。信号保持时间由“制动时间”参数决定，同时务必注意 K3 继电器输出延时对系统的影响。

The external braking function must be connected to a braking unit externally, and then the control system will provide a control signal, which is output by the relay K3. To use this function, the parameter of the output relay K3 must be set to "output when braking". The signal holding time is determined by the "braking time" parameter, and at the same time, be sure to pay attention to the influence of output delay of the relay K3 on the system.

应用时涉及的主要参数如下表:

The main parameters involved in the application are as follows:

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C10	停车模式 Stopping mode	0～4	3	0
C14	制动时间 Braking time	0 ～120S	—	10
C17	输出继电器 K3 Output relay K3	0～7	4	7
C16	K3 继电器输出延时 Output delay of relay K3	0～250S		0

6.12 点动 Jog

点动有两种：点动正转和点动反转，且各有两个速度选择，见参数，点动力度决定点动时输出的转矩，数值越大，输出转矩越大。

There are two types of Jog, namely Jog forward and Jog reverse, and each has two speed options, see the parameters for details. The Jog strength determines the output torque when Jog, the larger the value, the greater the output torque.

应用时涉及的主要参数如下表：

The main parameters involved in the application are as follows:

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
C16	点动力度 Jog strength	10—100%	—	30%
C17	点动正转速度 Jog forward speed	0、15%额定转速 0. 15% rated speed 1、7%额定转速 1. 7% rated speed	—	0
C18	点动反转速度 Jog reversal speed	0、20%额定转速 0. 20% rated spped 1、10%额定转速 1. 10% rated speed	—	0
B 13	点动时间限制 Jog time limit	0——60S	—	60

第七章 故障检测与排除

Section 7 Fault detection and Clearing

8.1 故障代码表 Fault code table

软起动器用黄色的 LED 指示灯指示有故障发生,并在 LCD 显示屏上显示相 应的故障信息。有 19 种保护功能，当软起动器保护功能动作时，软起动器立即停机，LCD 液晶显示屏显示当前故障。

The soft starter uses the yellow LED indicator to indicate the occurrence of a fault, and displays the corresponding fault information on the LCD. There are 19 kinds of protection functions. When the soft starter protection function is activated, the soft starter will stop immediately, and the LCD displays the current fault.

故障代码及处理方法一览表

List of fault codes and treatment methods

代码 Code	故障名称 Fault	故障原因 Cause of fault	处理方法 Handling method
01	主电源缺相 Phase loss of main power supply	在起动或进行中缺相? Missing phase in start-up or operation	1、检查三相电源是否可靠 1. Check that the three-phase power supply is reliable
02	相序错误 Phase sequence error	相序接反 Reverse phase sequence	1、调整三相主电源相序。 0、设置 B09 参数为不检测相序。 1. Adjust the phase sequence of the three-phase main power supply. 0. Set B09 to not detect phase sequence.
03	参数丢失 Parameter lost	设定参数丢失? The set parameter is lost	1、检查各功能项设置并重新设定。 1. Check the function settings and reset them.
04	过载保护 Overload protection	经过一定时间后，电流仍然过高，导致电机过载。 After a certain time, the current is still too high, causing the motor to overload.	1、 检查并改正造成过载的原因， 检查限流倍数是否设置的过低。 2、 检查起动时间是否设置的过长。 3、 检查电机过载保护级别是否设置合理。 4、 检查电机额定电流是否设置正确。 1. Check and correct the cause of the overload, and check whether the current limiting multiple is set too low. 2. Check whether the starting time is set too long. 3. Check that the motor overload protection level is set properly. 4. Check that the rated current of the motor is set correctly.
05	运行过流 Running overcurrent	负载突然加重？ 负载波动太大？A sudden increase in load? Too much load fluctuation?	1、 调整负载运行状况 2、 检查 B03 参数项是否设置过小。 1. Adjust the load operation status

			2. Check whether the parameter item B03 is set too small.
06	欠载保护 Underload protection	电机运行电流低于额定电流 Motor's running current is lower than rated current	1、 检查欠载原因，并作出更正。 2、 检查设定是否根据运行条件。 1. Check the cause of underload and make corrections. 2. Check that the setting is in accordance with the operating conditions.
07	相电流不平衡 Phase current imbalance	三相电流不平衡 Three-phase current is imbalanced	1、检查是否三相电流不平衡超过 了 B01 项参数所设定的不平衡保护级别。 2、调整负载运行状况。 1. Check whether the three-phase current unbalance exceeds the unbalance protection level set by the parameter B01. 2. Adjust the load operation status.
08	过压保护 Overvoltage protection	主回路电压过高 Main circuit voltage is too high	1、 检查主回路电压是否过高。 2、 检查过电压保护值 Q24 参数是否设置正确。 1. Check whether the main circuit voltage is too high. 2. Check that the overvoltage protection value parameter Q24 is set correctly.
09	欠压保护 Undervoltage protection	主回路电压过低 Main circuit voltage is too low	1、 检查主回路电压是否过低。 2、 检查过电压保护值 Q26 参数是否设置正确。 1. Check whether the main circuit voltage is too low. 2. Check that the overvoltage protection value parameter Q26 is set correctly.
10	相电压失衡 Phase voltage imbalance	三相电源电压不平衡 Three-phase power voltage is imbalanced	1、 检查主回路电压是否三相不平衡。 2、 检查电压失衡保护值 Q23 参数是否设置正确。 1. Check whether the three-phase voltage of the main circuit is unbalanced. 2. Check whether the voltage unbalance protection value parameter Q23 is set correctly.
11	SCR 异常 SCR abnormal		1、 晶闸管是否短路 1. Whether the thyristor is short-circuited
12	漏电闭锁 Leakage locking		检查三相绕组对地绝缘 Check the insulation of the three-phase windings to ground
13	起动超时 Start timeout	起动时间过长 Starting time is too long	1、 检查限流倍数是否设置过小。 2、 起动时间限制 B12 参数是否设置过小。 1. Check whether the current limiting

			multiple is set too small. 2. Whether the parameter B12 of the starting time limit is set too small.
14	可控硅过热 SCR overheated	内部散器过热？机器通风不畅 Internal diffuser overheated? Poor ventilation of the machine	1、 检查风机是否可靠工作。 2、 降低起动频度。 3、 检查控制电源电压是否过低。 1. Check whether the fan works reliably. 2. Reduce the starting frequency. 3. Check whether the control power supply voltage is too low.
15	电机温度 Motor temperature	电机内部的 PTC 热敏电阻检测到电机温度过高。 The PTC thermistor inside the motor has detected that the motor temperature is too high.	1、 检查 PTC 回路是否闭合，输入是否连接上。 2、 检查并改正造成温度过高的原因。 3、 待电机足够冷却后再重新启动。 1. Check whether the PTC circuit is closed and whether the input is connected. 2. Check and correct the cause of overheating. 3. Restart after the motor has cooled down enough.
16	起动频繁 Frequent start	起动过频 The start is too frequent	1、起动频次超过了所设定的最小起动间隔时间参数 Q09。 1. The start frequency exceeds the set minimum start interval time parameter Q09.
17	频率故障 Frequency fault	频率超出范围 The frequency exceeds the range	1、检查并更改电源频率。 Check and change the power frequency.
18	零序保护 Zero sequence protection		1、检查三相漏电是否超过设计值。 1. Check whether the three-phase leakage exceeds the design value.
19	点动超时 Jog timeout	点动时间过长 The Jog time is too long	1、点动时间超过了所设定的点动时间限制 B13 参数。 1. The Jog time exceeds the set Jog time limit parameter B13.

故障检测时间一览表　List of fault detection time

*注：在那个状态检测在对应的状态用√表示

*Note: Tick in corresponding state which is detected

No.	Fault	Initializing	Stop state	Ready to start	Start process	Running process	条件 Condition
01	主电源缺相 Phase loss of main power			√	√	√	-

02	相序错误 Phase sequence error			√			-
03	参数丢失 Parameter lost	√					-
04	过载保护 Overload protection					√	-
05	过流保护 Overcurrent protection					√	-
06	欠流保护 Undercurrent protection					√	-
07	相电流不平衡 Phase current imbalance					√	-
08	过压保护 Overvoltage protection				√	√	-
09	欠压保护 Undervoltage protection			√			
10	相电压失衡保护 Phase voltage unbalance protection				√		-
11	SCR 异常 SCR abnormal			√	√	√	-
12	漏电锁闭保护 Leakage locking protection				√	√	-
13	起动超时保护 Start timeout protection			√			-
14	SCR 过热 SCR overheated			√			-
15	电机温度保护 Motor’s temp. protection						
16	起动频率 Start frequency						
17	频率故障 Frequency fault						

18	零序保护 Zero sequence protection						
19	点动超时 Jog timeout						
20	系统异常 System abnormal						

8.2 故障记录 Fault records

起动器最多可记录最近 15 次故障，供用户以后分析使用。

The starter can record the most recent 15 faults for the user to analyze and use later.

8.3 故障显示 Fault display

软起动器处于故障状态时，通过∧键可以浏览记录的故障。序号 E0 代表最新的故障记录，在 LCD 面板上可以显示前三次故障(E1、E2、E3)，历史故障记录可通过显示记录功能项进行查阅。

User may read fault records by pressing key ∧ when soft starter is in failure state. Code E0 represents the latest fault. User can read the latest three faults (E1, E2, E3) on LCD panel and read record history through displaying and recording parameter.

8.4 故障清除 Fault clearing

故障具有记忆性，在故障排除后，通过按键复位键或外接清除故障输入 （DI、D2 多功能输入）端子进行复位，使软起动器恢复到起动准备状态。

第 8 章 日常维护

Section 9 Daily Maintenance

1、灰尘：如果灰尘太多，将降低软起动器的绝缘等级，可能使软起动器不能正常工作。

1. Dust: Too much dust is likely to reduce insulation level of soft starter and make soft starter unable to properly operate.

(1) 用清洁干燥毛刷轻轻刷去灰尘。

Adopt clean and dry brush to brush over the dust.

(2) 用压缩空气吹去灰尘。

Adopt compressed air to blow dust away.

2、结露：如果结露，将降低软起动器的绝缘等级，可能使软起动器不能正常工作。

2. Dewing: Dewing is likely to reduce insulation level of soft starter and make soft starter unable to properly operate.

(1) 用电吹风或电炉吹干。

Adopt electric drier or electric heater to blow dry.

(2) 配电间去湿。

Dehumidification of distribution room

3、定期检查元器件是否完好，是否能够正常工作。

3. Check the elements so as to confirm whether they are in good condition and whether they are able to properly operate.

4、检查软起动器的冷却通道，确保不被赃物和灰尘堵塞。

4. Check the cooling channel of soft starter to prevent it from being blocked by dirt and dust.

维护检查必须在切断软起动器进线侧所有电源后进行！

Maintenance inspection shall be carried out after all powers on the side of the incoming line of soft starter are cut off!

第九章 通信说明

Section 9 Communication

CT 电机软起动器，提供 RS485 通信接口，采用国际标准的 Modbus RTU 通讯协议进行主从通讯。用户可通过 PC/PLC、控制上位机等实现集中控制，以适应特定的应用要求。

CT motor soft starter is equipped with RS485 communication port, adopting international standard Modbus communication protocol for master-slave communication. User may implement centralized control by PC/PLC and upper computer control to satisfy requirement of application in special condition.

9.1 协议内容 Protocol

该 Modbus 串行通信协议定义了串行通信中异步传输的帧内容及从机应答帧的使用格式，主机组织的帧内容包括：从机地址、执行命令、数据和错误校验等。从机的响应也是采用相同的结构，内容包括：运行确认、返回数据和错误校验等。如果从机在接收帧时发生错误，或不能完成主机要求的动作，它将组织一个故障帧作为响应反馈给主机。

Modbus serial communication protocol defines frame content and slave response frame format of asynchronous transmission in serial communication, frame content of master includes: slave address, command of execution, data and error checkout etc. slave response also adopts the same architecture, including: operational qualification, returning data and error checkout. If slave has an error in receiving frames or fails to complete task required by master, it shall organize an error frame as response and feedback to master.

9.2 总线结构 Bus structure

(1) 接口方式 Interface mode

RS485 硬件接口 RS485 hardware interface

(2) 传输方式 Transmission mode

异步串行，半双工传输方式。在同一时刻主机和从机只能有一个发送数据而另一个接收数据。数据在串行异步通信过程中，是以报文的形式，一帧一帧发送。

Asynchronous serial, half-duplex transmission mode: at the same time, one sends data while the other receives data for master and slave machines. Data in serial asynchronous communication shall be transmitted in the form of message frame by frames.

(3) 拓朴结构 Topological structure

单主机多从机系统。从机地址的设定范围为 1～32，网络中的每个从机的地址具有唯一性。这是保证 ModBus 串行通信的基础。

Single-master multi-slave system: Setting range of slave address is from 1 to 32, every slave in network has unique address, which shall be the base for ModBus serial communication.

9.3 协议说明 Description of protocol

CT 软起动器通信协议是一种异步串行的主从 ModBus 通信协议，网络中只有一个设备能够建立协议。其它设备只能通过提供数据响应主机的“查询/命令”，或根据主机的“查询/命令”做出相应的动作。主机在此是指个人计算机(PC)，工业控制设备或可编程逻辑控制器(PLC)等。从机是指 CT 软起动器或其他的具有相同通讯协议的控制设备。

Communication protocol for CT soft starter is asynchronous serial master-slave ModBus communication protocol. There is only one device able to set up protocol in network. The other devices shall only respond to “Inquiry/order” of master by data or function by “Inquiry/order” of master. Master means personal computer (PC), industrial control equipment or programmable logical control (PLC). Slave

means CT soft starter or other control equipment having the same communication protocol.

9.4 通讯帧结构 Communication frame structure

CT 软起动器的 ModBus 协议通信数据格式为 RTU(远程终端单元)模式。RTU 模式中，每个字节的格式如下：

Data format of ModBus protocol for CMC-LX soft starter is RTU (Remote terminal unit) mode. Each byte in RTU mode is as follows:

编码系统：8 位二进制， 十六进制 0—9、A—F，每个 8 位的帧域中，包括两个十六进制字符。

Coding system: 8-digit binary system, hexadecimal system 0—9 and A—F, each 8-digit frame domain contains two hexadecimal characters.

在此模式下，新的总是以至少 3.5 个字节的传输时间静默，作为开始。在以波特率计算传输速率的网络上，3.5 个字节的传输时间可以轻松把握。紧接着传输的数据域依次为：从机地址、操作命令码、数据和 CRC 校验字，每个域传输字节都是十六进制的 0…9，A…F。网络设备始终监视着通讯总线的活动，即使在静默间隔时间内。当接收到第一个域(地址信息)，每个网络设备都对该字节进行确认。随着最后一个字节的传输的完成，又有一段类似的 3.5 个字节的传输时间间隔，用来表示本帧的结束，在此以后，将开始一个新帧的传送。

In this mode, new one is always silent in transmission time of no less than 3.5 bytes as start. In network to calculate transmission rate based on baud rate, it is easy to control in transmission time of 3.5 bytes. The next data domain in transmission: slave address, operating command code, data and CRC check word, byte in transmission in every domain is hexadecimal 0…9, A…F.

Network device is always monitoring the operation of communication bus even in silent interval time. When receiving first domain (Address information) , each network device shall affirm the byte, with the completion of the transmission of the last byte, there is a similar transmission time interval of 3.5 bytes to indicate the end of the frame. After this, the transmission of a new frame will begin.

一个帧的信息必须以一个连续的数据流进行传输，如果整个帧传输结束前超过 1.5 个字节以上的间隔时间，接收设备将清除这些不完整的信息。

A frame information shall be transmitted in a continuous data stream, if interval time before completion of entire frame transmission exceeds 1.5 bytes, receiving device shall remove this incomplete information.

9.5 状态控制字说明 Description of status control word

状态控制字反映了软起动器的状态，由一个字来表示。

Status control word reflects the state of soft starter and it is expressed by a word.

状态字低八位定义：Definition of status word’s low 8 bits

位功能 **Bit function**	主状态 **Major state**			次状态 **Sub-state**					说明 **Description**
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
停止 **Stop**	**0**			**0**					正常停 Normal stop
				1					急停 Emergency stop
编辑 **Edit**	**1**			**0**					进入编辑 Enter edit(0x20)
				1					用户参数修改允许 User’s parameter modification allowed
				2					管理参数修改允许 Management parameter modification allowed

运行 **Running**	**2 (0x40)**	**0**	进入起动状态 Enter start state (0x40)
		1	起动延时 Start delay
		2	漏电检测 Leakage detection
		3	突跳 Kick
		4	斜坡过程 Ramp process
		5	限流过程 Current limiting process
		6	起动完成 Start finished
		7	软停 Soft start
		8	内部制动 Internal braking
		9	外部制动 External braking
		10	刹车倒计时 Brake countdown
		11	宏停止 Macro stop
		12	自由停 Free stop
		13	分频起动 Frequency division start
		14	泵停 Pump stop
点动 **Inching**	**3 (0x60)**	**0**	进入点动状态 Enter inching state (0x60)
		1	点动延时 Jog delay
		2	点动正转、快速 Jog forward, fast
		3	点动正转、慢速 Jog forward, slow
		4	点动反转，快速 Jog reversal, fast
		5	点动反转，慢速 Jog reversal, slow
故障 **Fault**	**4(0x80)**	**0**	(0x80)
		1	主电源缺相 Phase loss of main power
		2	相序错误 Phase sequence error
		3	参数丢失 Parameter lost
		4	过载保护 Overload protection
		5	过流保护 Overcurrent protection
		6	欠流保护 Undercurrent protection
		7	相电流不平衡 Phase current imbalance
		8	过压保护 Overvoltage protection
		9	欠压保护 Undervoltage protection
		10	相电压失衡保护 Phase voltage imbalance protection

		11	SCR 异常 SCR abnormal
		12	漏电闭锁保护 Leakage locking protection
		13	起动超时保护 Start timeout protection
		14	SCR 过热 SCR overheated
		15	电机温度保护 Motor temperature protection
		16	起动频繁 Frequent start
		17	频率故障 Frequency fault
		18	零序保护 Zero sequence protection
		19	点动超时 Jog timeout
		20	系统异常 System abnormal

状态字高八位定义：Definition of high eight bits of status word

Bit / Function	Main state								Description
	7	6	5	4	3	2	1	0	
显示精度 Display accuracy								0	不显示小数点 Do not display decimal
								1	Display decimal 显示小数点
M1\M2 parameter 参数							0		M1 parameter 参数
							1		M2 parameter 参数
通讯状态 Communication state						0			通讯正常 Communication normal
						1			通讯中断 Communication failure
总线 Bus					0				总线允许 Bus allowed
					1				总线禁止 Bus disable
键控 Key control				0					键控允许 Key control permitted
				1					键控禁止 Key control disabled (0x10)
内部禁止 Internal disabled			0						未禁止 Non-disabled
			1						禁止(解密)（0x20） Disabled (deciphering)
密码锁定 Password locked		0							锁定 Locked
		1							未锁定 Unlocked

9.6 地址说明 Address explanation

名称 Name	变量类型 Variable type	寄存器编号 Register no.	数据 Data type	R/W 特性 R/W feature
Soft start working state	I/O integer	0000	Uint	R
Current fault 1	I/O integer	0001	Uint	R
Current failure 2	I/O integer	0002	Uint	R
Current failure 3	I/O integer	0003	Uint	R
Motor rated current	I/O integer	0004	Uint	R

Motor average current	I/O integer	0005	Uint	R
L1 phase current	I/O integer	0006	Uint	R
L2 phase current	I/O integer	0007	Uint	R
L3 phase current	I/O integer	0008	Uint	R
Analog input port value%	I/O integer	0009	Uint	R
The output voltage%	I/O integer	0010	Uint	R
L1-L2 line voltage	I/O integer	0011	Uint	R
L2-L3 line voltage	I/O integer	0012	Uint	R
L3-L1 line voltage	I/O integer	0013	Uint	R
IO port status	I/O integer	0014	Uint	R
Start interval countdown	I/O integer	0015	Uint	R
Start countdown time	I/O integer	0016	Uint	R

M1 基本参数项

名称 Name	变量类型 Variable type	寄存器编号 Register no.	数据 Data type	R/W 特性 R/W feature
Application parameter selection	I/O 整数	0020	Uint	R/W
Starting method	I/O 整数	0021	Uint	R/W
Kick method	I/O 整数	0022	Uint	R/W
Kick voltage	I/O 整数	0023	Uint	R/W
Kick time	I/O 整数	0024	Uint	R/W
Initial voltage	I/O 整数	0025	Uint	R/W
Ramp time	I/O 整数	0026	Uint	R/W
Current limiting multiple	I/O 整数	0027	Uint	R/W
Second start current limiting start time	I/O 整数	0028	Uint	R/W
Secondary starting current limit multiple	I/O 整数	0029	Uint	R/W
Stopping mode	I/O 整数	0030	Uint	R/W
Soft stop time	I/O 整数	0031	Uint	R/W
Soft stop start voltage	I/O 整数	0032	Uint	R/W
Soft-stop termination voltage	I/O 整数	0033	Uint	R/W
Braking time	I/O 整数	0034	Uint	R/W
Braking force	I/O 整数	0035	Uint	R/W
Jog force	I/O 整数	0036	Uint	R/W
Jog forward speed	I/O 整数	0037	Uint	R/W
Jog reversal speed	I/O 整数	0038	Uint	R/W
Motor rated current	I/O 整数	0039	Uint	R/W
Overload protection level	I/O 整数	0050	Uint	R/W
Current unbalance protection	I/O 整数	0051	Uint	R/W
Current unbalance protection delay	I/O 整数	0052	Uint	R/W
Overcurrent protection	I/O 整数	0053	Uint	R/W
Overcurrent protection delay	I/O 整数	0054	Uint	R/W
Underload protection	I/O 整数	0055	Uint	R/W
Underload protection delay	I/O 整数	0056	Uint	R/W

Thyristor Protection	I/O 整数	0057	Uint	R/W
Leakage locking protection	I/O 整数	0058	Uint	R/W
Phase sequence protection	I/O 整数	0059	Uint	R/W
Zero sequence current detection	I/O 整数	0060	Uint	R/W
Motor Temperature Protection (PTC)	I/O 整数	0061	Uint	R/W
Start time limit	I/O 整数	0062	Uint	R/W
Jog time limit	I/O 整数	0063	Uint	R/W

M2 基本参数项

M2 Basic parameters

名称 Name	变量类型 Variable type	寄存器编号 Register no.	数据 Data type	R/W 特性 R/W feature
Application parameter selection	I/O integer	0070	Uint	R/W
Starting method	I/O integer	0071	Uint	R/W
Kick method	I/O integer	0072	Uint	R/W
Kick voltage	I/O integer	0073	Uint	R/W
Kick time	I/O integer	0074	Uint	R/W
Initial voltage	I/O integer	0075	Uint	R/W
Ramp time	I/O integer	0076	Uint	R/W
Current limiting multiple	I/O integer	0077	Uint	R/W
Second start current limiting start time	I/O integer	0078	Uint	R/W
Secondary starting current limit multiple	I/O integer	0079	Uint	R/W
Stopping mode	I/O integer	0080	Uint	R/W
Soft stop time	I/O integer	0081	Uint	R/W
Soft stop start voltage	I/O integer	0082	Uint	R/W
Soft-stop termination voltage	I/O integer	0083	Uint	R/W
Braking time	I/O integer	0084	Uint	R/W
Braking force	I/O integer	0085	Uint	R/W
Jog force	I/O integer	0086	Uint	R/W
Jog forward speed	I/O integer	0087	Uint	R/W
Jog reversal speed	I/O integer	0088	Uint	R/W
Motor rated current	I/O integer	0090	Uint	R/W
Overload protection level	I/O integer	0100	Uint	R/W
Current unbalance protection	I/O integer	0101	Uint	R/W
Current unbalance protection delay	I/O integer	0102	Uint	R/W
Overcurrent protection	I/O integer	0103	Uint	R/W
Overcurrent protection delay	I/O integer	0104	Uint	R/W
Underload protection	I/O 整数	0105	Uint	R/W
Underload protection delay	I/O 整数	0106	Uint	R/W
Thyristor Protection	I/O 整数	0107	Uint	R/W
Leakage locking protection	I/O 整数	0108	Uint	R/W
Phase sequence protection	I/O 整数	0109	Uint	R/W

Zero sequence current detection	I/O 整数	0110	Uint	R/W
Motor Temperature Protection (PTC)	I/O 整数	0111	Uint	R/W
Start time limit	I/O 整数	0112	Uint	R/W
Jog time limit	I/O 整数	0113	Uint	R/W

高级参数项

Advanced parameter

名称 Name	变量类型 Variable type	寄存器编号 Register no.	数据类型 Data type	R/W 特性 R/W feature
Display selection	I/O integer	0120	Uint	R/W
Language selection	I/O integer	0121	Uint	R/W
LCD auto-off time	I/O integer	0122	Uint	R/W
Start-stop control method	I/O integer	0123	Uint	R/W
Digital input port D1 function	I/O integer	0124	Uint	R/W
Digital input port D2 function	I/O integer	0125	Uint	R/W
Analog input	I/O integer	0126	Uint	R/W
Analog output	I/O integer	0127	Uint	R/W
Analog output method	I/O integer	0128	Uint	R/W
Minimum start interval	I/O integer	0129	Uint	R/W
Macro control selection function	I/O integer	0130	Uint	R/W
Start delay	I/O integer	0131	Uint	R/W
Analog input upper limit value	I/O integer	0132	Uint	R/W
Analog input lower limit value	I/O integer	0133	Uint	R/W
K1 relay output delay	I/O integer	0134	Uint	R/W
K2 relay output delay	I/O integer	0135	Uint	R/W
K3 relay output delay	I/O integer	0136	Uint	R/W
Output relay K3	I/O integer	0137	Uint	R/W
Programmable timed stop time	I/O integer	0138	Uint	R/W
User password	I/O integer	0139	Uint	R/W
Communication address	I/O integer	0140	Uint	R/W
Communication baud rate	I/O integer	0141	Uint	R/W
Voltage unbalance protection value	I/O integer	0142	Uint	R/W
Voltage unbalance protection delay	I/O integer	0143	Uint	R/W
Over voltage protection value	I/O integer	0144	Uint	R/W
Overvoltage protection delay	I/O integer	0145	Uint	R/W
Under voltage protection value	I/O integer	0146	Uint	R/W
Undervoltage protection delay	I/O integer	0147	Uint	R/W
Frequency detection	I/O integer	0148	Uint	R/W
Current phase loss detection	I/O integer	0154	Uint	R/W

记录功能项 N

Recording item N

名称 Name	变量类型 Variable type	寄存器编号 Register no.	数据 Data type	R/W 特性 R/W feature
Soft start rated current	I/O integer	0161	Uint	R
Mains voltage	I/O integer	0162	Uint	R
Control software version	I/O integer	0163	Uint	R
Keyboard software version	I/O integer	0164	Uint	
Current measurement correction	I/O integer	0165	Uint	R
Voltage calibration	I/O integer	0166	Uint	R
Current output correction	I/O integer	0167	Uint	R
Current display accuracy	I/O integer	0168	Uint	R
Disable mode	I/O integer	0169	Uint	R
Unblock encryption	I/O integer	0170	Uint	R
Number of start runs allowed	I/O integer	0171	Uint	R
Allow startup runtime	I/O integer	0172	Uint	R
Cumulative running times record	I/O integer	0173	Uint	R
Cumulative running time record	I/O integer	0174	Uint	R
Failure times record	I/O integer	0175	Uint	R
Restore factory defaults	I/O integer	0176	Uint	R
Current transformer ratio	I/O integer	0177	Uint	R
未定义参数 Undefined parameter	I/O integer	0178	Uint	R
Undefined parameter	I/O integer	0179	Uint	
Undefined parameter	I/O integer	0180	Uint	
Undefined parameter	I/O integer	0181	Uint	R
Fault history 1	I/O integer	0182	Uint	R
Fault history 2	I/O integer	0183	Uint	R
Fault history 3	I/O integer	0184	Uint	R
Fault history 4	I/O integer	0185	Uint	R
Fault history 5	I/O integer	0186	Uint	R
Fault history 6	I/O integer	0187	Uint	R
Fault history 7	I/O integer	0188	Uint	R
Fault history 8	I/O integer	0189	Uint	R
Fault history 9	I/O integer	0190	Uint	R
Fault history10	I/O integer	0191	Uint	R
Fault history101	I/O integer	0192	Uint	R

Fault history12	I/O integer	0179	Uint	R
Fault history13	I/O integer	0180	Uint	R
Fault history14	I/O integer	0181	Uint	R
Fault history15	I/O integer	0182	Uint	R

控制命令数据

Control command data

名称 Item	功能码 (十六进制) Function code (Hexadecimal)	寄存器编号 (十六进制) Register number (Hexadecimal)	数据 Data type	R/W 特性 R/W feature
停止 Stop	06	200	129	W
运行 Run	06	202	131	W
复位 Reset	06	203	132	W
进编辑 Enter edit	I/O 整数	0204	0x0085	W
出编辑 Exit edit	I/O 整数	0205	0x0086	W
密码设置 Password setup	I/O 整数	0206	Password value	W
电流校正 Current calibration	I/O 整数	0207	0x0001 means plus 1	W
			0x000FF means minus 1	

注意事项 Notice

(1) 多机通信时，CT 软起动器的地址具有唯一性，即任何两台软起动器的地址不能相同(通过参数 C20 进行设置)。

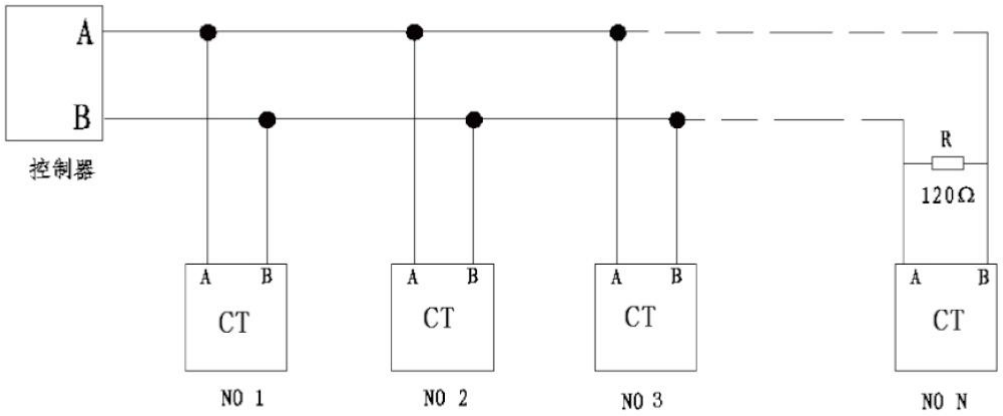
(2) Multi-computer communication, CT soft starter address is unique, any two soft starters shall not be identical in address (To be set by parameter C20).

(3) CT 软起动器的通信波特率必须与控制器的波特率相同(通过参数 C21 进行设置)。

(4) Communication baud rate for CT soft starter shall be identical to that of control (To be set by parameter 21)

(5) 多台 CT 软起动器通讯时，应该在最末的一台上 AB 两端接 120 欧电阻。

(6) In case of multiple CT soft starters are in communication, 120 Ω resistor shall be connected to both ends of AB on the final soft starter.



控制器 Controller

第十一章 附表说明

Section 11 Appendix

附录一：CT 整体参数表格 Appendix 1: General Parameters of CT

ID	Secondary menu	Range of parameter	Factory default	Remark
	Ml application parameter			
C00	Selection of application parameters	0. No application 1. centrifugal pump 2. Hydraulic pump 3. Axial flow fan 4. Centrifugal fan 5. Belt conveyor 6. Compressor 7. Crusher & mixer 9. Ball mill, 10. Propeller	0	
C01	Starting method	0. Voltage ramp control 1. Linear torque control 2. Square torque control 3. Step variable frequency starting control (applicable to heavy load and constant torque load)	0	
C02	Kick method	0. Voltage step-down kicking 1. Low frequency kicking	0	
C03	Kick voltage	20∽100%Ue	20%	
C04	Kick time	0 ∽2000mS	0	
C05	Initial voltage	20∽100%Ue	30%	
C06	Start time	0 ∽120S	10	
C07	Current limiting multiple	100∽500%Ie	350%	
C08	Initial time of secondary start current limiting	0∽60S, disable at 0	0	
C09	Secondary starting current	100∽500%Ie	400%	

	limit multiple			
C 10	Stopping mode	0. Free stop 1. Soft stop 2. Pump stop 3. Internal brake 4. External brake		
C 11	Soft stop time	0~120S	10	
C 12	Soft stop start voltage	60~100%Ue	80%	
C 13	Soft-stop termination voltage	0~60%Ue	20%	
C 14	Braking time	0~120S Disable at 0	10	
C 15	Braking force	10~100%	30%	
C 16	Jog force	10~100%	30%	
C 17	Jog forward speed	0. 15% rated speed 1. 7% rated speed (low speed)	0	
C 18	Jog reversal speed	0. 20% rated speed 1. 10% rated speed (low speed)	0	
C 19	Motor rated current	15~9999A		
C 20-C 29	Undefined parameter			
	M1 protection parameters			
B00	Overload protection level	10A、10、15、20、25、30、0FF	20	Set to OFF = 6
B01	Current unbalance protection	0~100%	40%	Set to 100% to disable this function
B02	Current unbalance protection delay	0~250S	2	Set to 100% to disable this function
B03	Overcurrent Protection	100~500%Ie	300%	Set to 0 to disable this function
B04	Overcurrent protection delay	0~250S	2	set to OFF = 6
B05	Underload protection	0~99%Ie	0	Set to 100% to disable this function
B06	Underload protection delay	0~250S	2	
B07	Thyristor protection	0. Disable 1. Enable	0	
B08	Leakage locking protection	0. Disable 1. Enable	0	
B09	Phase sequence protection	0. Disable 1. Enable	0	
B10	Zero sequence current detection	0. Disable 1. Enable	0	
B11	Motor Temperature Protection (PTC)	0. Disable 1. Enable	0	
B12	Start time limit	0-250S	60	

B13	Jog time limit	0-60S	60	
B14~ B19	Undefined parameter			
	M2 application parameters			
C00	Selection of application parameters	0. No application 1. centrifugal pump 2. Hydraulic pump 3. Axial flow fan 4. Centrifugal fan 5. Belt conveyor 6. Compressor 7. Crusher & mixer 9. Ball mill, 10. Propeller	0	
	M2 basic parameters			
C01	Starting method	0. Voltage ramp control 1. Linear torque control 2. Square torque control 3. Step variable frequency starting control (applicable to heavy load and constant torque load)		
C02	Kick method	0. Voltage step-down kicking 1. Low frequency kicking		
C03	Kick voltage	20∽100%Ue		
C04	Kick time	0 ∽2000mS		
C05	Initial voltage	20∽100%Ue		
C06	Start time	0 ∽120S		
C07	Current limiting multiple	100∽500%Ie		
C08	Initial time of secondary start current limiting	0∽60S, disable at 0		
C09	Secondary starting current limit multiple	100∽500%Ie		
C10	Stopping mode	0. Free stop 1. Soft stop 2. Pump stop 3. Internal brake 4. External brake		
C 11	Soft stop time	0~120S	10	
C 12	Soft stop start voltage	60~100%Ue	80%	
C 13	Soft-stop termination voltage	0~60%Ue	20%	
C 14	Braking time	0~120S Disable at 0	10	
C 15	Braking force	10~100%	30%	
C 16	Jog force	10~100%	30%	
C 17	Jog forward speed	0. 15% rated speed 1. 7% rated speed	0	
C 18	Jog reversal speed	0. 20% rated speed 1. 10% rated speed	0	
C 19	Motor rated current	15~9999A		
C 20-C	Undefined parameter			

29				
	M2 protection parameters			
B00	Overload protection level	10A、10、15、20、25、30、0FF	20	Set to OFF = 6
B01	Current unbalance protection	0~100%	40%	Set to 100% to disable this function
B02	Current unbalance protection delay	0~250S	2	Set to 100% to disable this function
B03	Overcurrent Protection	100~500%Ie	300%	Set to 0 to disable this function
B04	Overcurrent protection delay	0~250S	2	set to OFF = 6
B05	Underload protection	0~99%Ie	0	Set to 100% to disable this function
B06	Underload protection delay	0~250S	2	
B07	Thyristor protection	0. Disable 1. Enable	0	
B08	Leakage locking protection	0. Disable 1. Enable	0	
B09	Phase sequence protection	0. Disable 1. Enable	0	
B10	Zero sequence current detection	0. Disable 1. Enable	0	
B11	Motor Temperature Protection (PTC)	0. Disable 1. Enable	0	
B12	Start time limit	0-250S	60	
B13	Jog time limit	0-60S	60	
B14~B19	Undefined parameter			
	Functional parameter setup			
Q00	Display selection	0-Motor rated current 1- Average current 2-L1 phase current 3-L2 phase current 4-L3 phase current 5-Analog port value% 6-Output voltage% 7-L1-L2 line voltage 8-L2-L3 line voltage 9-L3-L1 line voltage	1	
Q01	Language selection	0-Chinese 1-English		
Q02	LCD auto-off time	0-255Min	1	0 for normal on
Q03	Start-stop control mode	0-keyboard control disabled /communication control disabled	3	

		1-Keyboard control enabled/communication control enabled 2-Keyboard control disabled/communication control enabled 3-Keyboard control enabled /communication control enabled 4-Keyboard Jog forward 5-Keyboard Jog reversal		
Q04	Function of digital input port D1	0-M2 parameter selection 1-Fault reset 2-Jog forward 3-Jog reversal 4-Closed contact macro control 5-Disconnected contact macro control 6- Emergency stop control input 7- Delay (time) relay control input	0	
Q05	Function of digital input port D2	0-M2 parameter selection 1-Fault reset 2-Jog forward 3-Jog reversal 4-Closed contact macro control 5-Disconnected contact macro control 6- Emergency stop control input 7- Delay (time) relay control input	1	
Q06	Analog input	0-0~20mA 1-4~20mA 2-0~60mA	1	
Q07	Analog output	0-0~20mA 1-4~20mA	1	
Q08	Analog output method	0-Average current output 1(0~200%Ie) 1- Average current output 2 (0~400%Ie)	0	
Q09	Minimum start interval	0-60 minutes	0	
Q10	Macro control selection	0 - No macro control 1-Digital port 1 macro control 2-Digital port 2 macro control 3- Analog positive input macro control	0	

		4- Analog negative input macro control		
Q11	Start delay	0~250S	0	
Q12		0~100%	80	
Q13		0~100%	20	
Q14		0~250S	0	
Q15		0~250S	0	
Q16		0~250S	0	
Q17	Output relay K3	0-Full voltage output 1-Start process output 2- Soft stop process output 3 - Output at fault 4- Output in braking 5- Run process output 6- Programmable delay (time relay output 7- Leakage locking detection process output	7	
Q18	Programmable timed stop time	0---999.9h (valid when RUN off)	0	
Q19	User password	0---65535	0	
Q20	Communication address	1-32	1	
Q21	Communication baud rate	0-600 1-1200 2-2400 3-4800 4-9600 5-19200(Pbs)	4	Set to be completely off
Q22	Voltage unbalance protection value	0~100%	70%	
Q23	Voltage unbalance protection delay	0~250S	2	
Q24	Over voltage protection value	100~150%	150%	Set to be completely off
Q25	Overvoltage protection delay	0~250S	2	
Q26	Under voltage protection value	20~100%	70%	
Q27	Undervoltage protection delay	0~250S	2	
Q28	Frequency detection	0~2 =0 self-adaption =1 50HZ=2 60HZ	0	
Q29-Q33	Undefined parameter			
Q34	Current phase loss detection	0~1=0 Enable =1 Off	0	
Q35-Q39	Undefined parameter			

	Advanced parameter setting			
H01	Soft start rated current	159999A	180	
H02	Mains voltage	0-380V 1-660V 2-1140V	0	
H03	Control software version	0----9999		
H04	Keyboard software version	0----9999		
H05	Current measurement correction	0-2000	1000	
H06	Voltage calibration	0----9999		
H07	Current output correction	0-2000	1020	
H08	Current display accuracy	0-no decimal point 1-with decimal point	1	
H09	Disable mode	0. No prohibition 1. The number of operations to prohibition 2. Running time to prohibition 3. Times and times are prohibited at the same time	0	
H10	Unblock encryption	0----9999		
H11	Number of startup allowed	0----9999	0	
H12	Allow startup runtime	0----9999	0	
H13	Record of cumulative running times	Unchangeable	0	After the start is completed once, the parameter is incremented by 1
H14	Record of cumulative running time	Unchangeable	0	
H15	Record of failure times	Unchangeable	0	
H16	Restore factory defaults	Command parameters		
H17	Current transformer ratio	50, 100, 200, 300, 400, 500, 600, 800, 1000, 1500		
H18~H20	Undefined parameter	Unchangeable		
H21-H35	Fault history	Unchangeable		History fault 1-15

附表二：规格型号及附件选用(以 380V 为例)

Appendix 2: Specification and Accessories (with 380V as an example)

适配电机 Motor (KW)	软起动器型号 Model of soft starter	额定电流(A) Rated current (A)	旁路接触器型号 Model of bypass contactor	一次线规格(铜线) Primary line specification (copper line)
7.5	CT-0018/3	18	CJ X 4-25	4mm2
11	CT-0024/3	24	CJ X 4-32	6mm2
15	CT-0030/3	30	CJ X 4-32	10mm2
18.5	CT-0039/3	39	CJ X 4-40	10mm2
22	CT-0045/3	45	CJ X 4-50	16mm2
30	CT-0060/3	60	CJ X 4-63	25mm2
37	CT-0076/3	76	CJ X 4-80	35mm2
45	CT-0090/3	90	CJ X 4-95	35mm22
55	CT-0110/3	110	CJ X 4-115F	35mm
75	CT-0150/3	150	CJ X 4-150F	50mm2
90	CT-0180/3	180	CJ X 4-185F	30×3 copper bar
110	CT-0218/3	218	CJ X 4-225F	30×3 copper bar
132	CT-0260/3	260	CJ X 4-265F	30×4 copper bar
160	CT-0320/3	320	CJ X 4-330F	30×4 copper bar
185	CT-0370/3	370	CJ X 4-400F	40×4 copper bar
220	CT-0440/3	440	CJ X 4-500F	40×4 copper bar
250	CT-0500/3	500	CJ X 4-500F	40×4 copper bar
280	CT-0560/3	560	CJ X 4-630F	40×4 copper bar
315	CT-0630/3	630	CJ X 4-630F	40×5 copper bar
400	CT-0780/3	780	JW CJ 20-800	50×5 copper bar
470	CT-0920/3	920	JW CJ 20-1000	50×6 copper bar
530	CT-1000/3	1000	JW CJ 20-1000	50×6 copper bar

订货须知 Instruction to order

- 用户在订货时，请将产品型号、规格、负载情况及使用条件通知供货方，以便正确选择产品。
- To place an order, please provide product model, specification, load and application condition to your supplier;
- 软起动器标准配置含电流互感器，用户需按照上表所列规格型号合理选用旁路接触器。
- The standard configuration of the soft starter includes a current transformer, and the user needs to select a bypass contactor reasonably according to the specifications and models listed in the table above.
- 主电源为 AC660V、AC1140V 时附件的选用同样是以控制器的电流为准。
- When the main power supply is AC660V and AC1140V, the selection of accessories is also based on

the current of the controller.

- 上表中的附件仅供参考。
- The attachments in the table above are for reference only.

附表三：不同应用的基本设置(以下设置仅供参考)

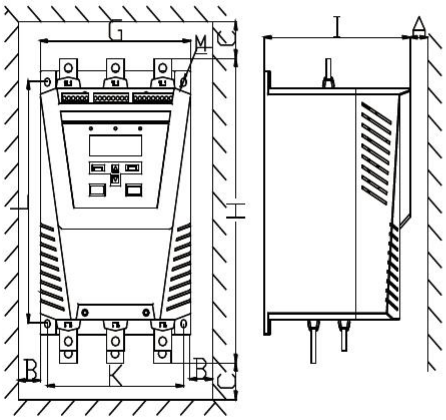
Appendix 3: Basic Setting of Different Applications (for reference)

负载种类 Load type	初始电压 Initial voltage (%)	起动斜坡时间 Starting ramp time, sec	停止斜坡时间 Stop ramp time sec	电流限制 Current limit ILIM
船前推进器 Ship propeller	30	10	0	2.5
离心风机 Centrifugal fan	50	20	0	3.5
离心泵 Centrifugal pump	30	6	6	3
活塞式压缩机 Piston compressor	40	15	0	3
提升机械 Lifting device	30	15	6	3.5
搅拌机 Mixer	40	15	0	3.5
破碎机 Crusher	50	15	6	3.5
螺旋压缩机 Screw compressor	40	15	0	3.5
螺旋传送带 Spiral conveyor belt	40	10	6	3.5
空载电机 Idling motor	25	10	0	2.5
皮带传送带 Belt conveyor	50	15	10	3.5
热泵 Heat pump	30	15	6	3
自动扶梯 Elevator	30	10	0	3
气泵 Gas pump	30	10	0	2.5

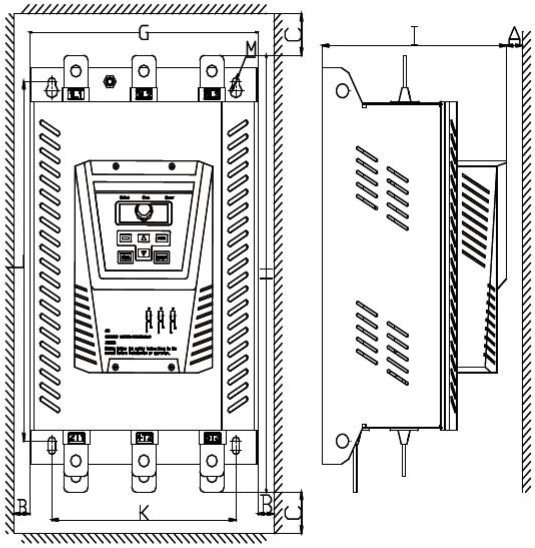
附表四：软起动器外形及开孔尺寸(单位：mm 以 380V 为例)

Appendix 4: Dimensions and Hole Size of Soft Starter (unit: mm, taking 380V as an example)

Model	G	H	I	K	L	M	A	B	C	GW（kg）
CT-0018~0045	172	320	167	156	240	6	20	10	100	4.5
CT-0060~0090	172	320	167	156	240	6	20	10	100	4.7
CT-0110~0150	172	320	167	156	240	6	20	10	100	5.1
CT-0180~0370	285	474	230	230	390	9	20	10	100	20.6
CT-0440~0630	320	512	230	270	415	9	20	10	100	25.6
CT-0780~1000	400	647	230	330	495	9	20	10	100	37.6



Product of 150A and below



Product of 180A and above

附表五：软起动器选型

Appendix 5 Model Selection of Soft Starter

No.	Rated current （A）	380V		660V		1140V	
		Power (KW)	Size(mm)	Power (KW)	Size (mm)	Power (KW)	Size (mm)
1	18	7.5	F005	15	F005	22	F005
2	24	11		22		33	
3	30	15		30		45	
4	39	18.5		37		55	
5	45	22		45		65	
6	60	30		55		90	
7	76	37		75		110	
8	90	45		90		135	
9	110	55		110		165	
10	150	75		132	F006	225	
11	180	90	F006	160		280	F006
12	218	110		200		344	
13	260	132		250		400	
14	320	160		300		505	F007
15	370	185		350		584	
16	440	220	F007	400	F007	695	
17	500	250		456		789	
18	560	280		500		884	F008
19	630	315		560	F008	995	
20	780	400	F008	700			
21	920	470					
22	1000	530					

注：尺寸 F005:172×320×167、F006:285×474×230、F007:320×512×230、F008:400×647×230(宽×高×厚)

Note: Dimensions F005:172×320×167, F006:285×474×230, F007:320×512×230, F008:400×647×230(W × H × T)

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