



XI'AN XICHI ELECTRIC CO., LTD.

Headquarters address: 15/F, Block B, Xi'an National Digital Publishing
Base, No.996 Tianguqi Road, High-tech Zone, Xi'an, China

Factory address: No.2 West Qinlingsi Road, Caotang Technology
Industrial Base, High-tech Zone, Xi'an, China

Tel: +86-29-88626546

Web: www.xichielectric.com

Email: info@xichielectric.com

NO.:TDOC-LX-T-ZHEN

[Technical Manual]

For safe use of this product, please read
the technical manual carefully.



CMC-LX Soft Starter

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)或(B1、B2、B3)。

It is forbidden to connect input terminal (1L1, 3L2, 5L3) to output terminal (2T1, 4T2, 6T3) or (B1, B2 and B3);

(3) 不允许软起动器输出端(2T1、4T2、6T3) 和(B1、B2、B3)接补偿电容或压敏电阻。

It is forbidden 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.

目录 Table of Contents

安全注意事项 CAUTIONS	1
目录 TABLE OF CONTENTS	2
前言 FOREWORD.....	4
第一章 CMC-LX 软起动器的作用及特点	5
SECTION 1 FUNCTION AND CHARACTERISTIC OF CMC-LX SOFT STARTER	5
1.1 作用 FUNCTION	5
1.2 特点 CHARACTERISTICS	5
第二章 收货检查.....	7
SECTION 2 GOODS ACCEPTANCE AND INSPECTION	7
第三章 使用条件及安装	9
SECTION 3 SERVICE CONDITIONS AND INSTALLATION	9
3.1 使用条件 SERVICE CONDITIONS	9
3.2 安装方向 INSTALLATION DIRECTION	10
3.3 安装空间 INSTALLATION SPACE	10
3.4 电路安装 CIRCUIT INSTALLATION.....	10
第四章 电路连接.....	11
SECTION 4 CIRCUIT CONNECTION.....	11
4.1 基本接线原理图 BASIC WIRING DIAGRAM	11
4.2 三角形内接连接图 DELTA INTERNAL CONNECTION DIAGRAM	12
4.3 典型应用接线图 WIRING DIAGRAM FOR TYPICAL APPLICATION.....	13
4.4 端子说明 DESCRIPTION OF TERMINAL.....	14
第五章 显示及操作说明	16
SECTION 5 INSTRUCTION TO DISPLAY AND OPERATION	16
5.1 面板示意图 PANEL VIEW	16
5.2 按键功能说明 DESCRIPTION OF KEY FUNCTIONS.....	17
5.3 显示状态说明 DESCRIPTION OF DISPLAY STATE	18
5.4 修改参数项操作流程 FLOW OF MODIFYING PARAMETERS	18
第六章 软起动器的控制模式.....	19
SECTION 6 CONTROL MODE OF SOFT STARTER	19
6.1 电流斜坡起动 CURRENT RAMP START	19
6.2 电压斜坡起动 VOLTAGE RAMP START	20
6.3 突跳转矩软起动 STEP TORQUE SOFT START	20
6.4 自由停车 FREE STOP	21
6.5 软停车 SOFT STOP.....	21
6.6 泵停车 PUMP STOP.....	21
第七章 参数项及其说明	23
SECTION 7 PARAMETERS AND DESCRIPTION	23
7.1 起停控制参数菜单 L000-L016 共 17 个参数 START/STOP CONTROL PARAMETER MENU TOTALING	

17 PARAMETERS L000-L016.....	23
7.2 电机保护参数菜单 L100-L116 共 17 个参数 MOTOR'S PROTECTION PARAMETER MENU	
TOTALING 17 PARAMETERS L100-L116	24
7.3 端口设置参数 L200-L216 共 17 个参数 PORT SETTING PARAMETER TOTALING 17 PARAMETERS	
L200-L216.....	25
7.4 厂家参数 L300-L316 共 17 个参数 MANUFACTURER'S PARAMETER TOTALING 17 PARAMETERS	
L300-L316.....	26
7.5 功能说明 FUNCTION DESCRIPTION	26
第八章 故障检测与排除	30
SECTION 8 FAULT DETECTION AND CLEARANCE	30
8.1 故障代码表 FAULT CODE TABLE	30
8.2 故障复位 FAULT RESETTING	32
第九章 通讯控制	33
SECTION 9 COMMUNICATION CONTROL	33
9.1 协议内容 PROTOCOL.....	33
9.2 总线结构 BUS STRUCTURE	33
9.3 协议说明 DESCRIPTION QOF PROTOCOL.....	34
9.4 通讯帧结构 COMMUNICATION FRAME STRUCTURE	34
9.5 地址说明 DESCRIPTION OF ADDRESS.....	35
9.6 控制命令参数地址 CONTROL COMMAND PARAMETER ADDRESS	38
9.7 功能码概述 DESCRIPTION OF FUNCTION CODE	38
9.8 通讯时间间隔 COMMUNICATION TIME INTERVAL	39
9.9 注意事项 NOTICE.....	39
9.10 通讯故障代码分析 ANALYSIS OF COMMUNICATION FAULT CODE	40
第十章 日常维护.....	41
SECTION 10 DAILY MAINTENANCE.....	41
附表一：软起标准接线规格型号及附件选用(以 380V 为例).....	42
APPENDIX 1: SELECTION OF SOFT STARTER'S STANDARD WIRING SPECIFICATIONS, MODELS	
AND ACCESSORIES (TAKING 380V AS AN EXAMPLE)	42
附表二：CMC-LX 附件安装使用说明	44
APPENDIX 2: INSTRUCTIONS TO INSTALLATION OF ACCESSORIES OF CMC-LX SOFT STARTER ..	44
附表三：软起器外形及开孔尺寸(单位：MM 以 380V 为例).....	45
APPENDIX : DIMENSION AND HOLE SIZE OF SOFT STARTER (UNIT: MM, WITH 380V AS AN	
EXAMPLE)	45
附表四：软起器选型	47
APPENDIX 4: MODEL SELECTION OF SOFT STARTER	47

前言 Foreword

感谢选择西安西驰电气股份有限公司生产的 CMC-LX 系列电动机软起 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，确保操作者的安全，在使用前请仔细阅读本手册。当您在使用中发现疑难 问题而本技术手册无法提供解答时，请与西安西驰电气股份有限公司或各地理、经销商联系，我们将竭诚为您服务。

Thank you for choosing CMC-LX motor soft starter manufactured by Xi'an Spread Electric Co., Ltd. In order to properly use this soft starter, please read through the User's 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 agents or dealers. We are always at your service.

第一章 CMC-LX 软起动器的作用及特点

Section 1 Function and Characteristic of CMC-LX Soft Starter

1.1 作用 Function

CMC-LX 系列电机软起动器是一种将电力电子技术，微处理器和自动控制相结合的新型电机起动、保护装置。它能无阶跃地平稳起动/停止电机，避免因采用直接起动、星/三角起动、自耦降压起动等传统起动方式起动电机而引起的机械与电气冲击等问题，并能有效地降低起动电流及配电容量，避免增容投资。同时 CMC-LX 系列软起动器内部集成电流互感器，用户无需外接。

CMC-LX series motor soft starters are a sort of new type motor starting protector combining electronic technology, microprocessor and automation. It is able to stably start and stop motor without step change, which perfectly avoids mechanical and electrical impact as a result of using direct start, Y- Δ start and auto-induction voltage-reduced start to start motor and can effectively reduce starting current and distribution capacity. At the same time, as CMC-LX series soft starters have current transformer and contactor built inside, user does not need to externally connect the both to soft starter.

1.2 特点 Characteristics

- **SCR 触发闭环控制算法 SCR triggering close-loop control algorithm**

SCR 闭环控制功能，专为标准负载和重型负载特殊设计。

The SCR close-loop control is specially designed for standard load and heavy load.

用户可根据负载情况选择限流起动和电压斜坡起动，实现绝对平滑的无转矩震荡起动效果。

User can choose current-limit start or voltage ramp start according to load conditions so as to realize absolutely smooth start without torque oscillation.

- **控制精度高实时高效 High control precision**

采用高性能的 Cortex-M3 32 位内核 CPU 执行中心控制，速度快、精度高、抗干扰能力强。

Adoption of high-performance Cortex-M3 32-bit inner core CPU for central control with features of fast speed, high precision and strong capability of anti-interference.

- **优美的外观 Beautiful appearance**

专利保护的主回路三进六出结构，内置电流互感器方案，接线方便、可靠性高。

Three-in and six-out structure of main circuit under patent protection and built-in current transformer with easy wiring and high reliability.

- **可配的标准 MODBUS-RTU 协议 Standard MODBUS-RTU protocol**

用户在订货时可根据现场需要，选配带标准 MODBUS-RTU 通讯协议或不带。

When placing an order, user can choose the model with or without standard MODBUS-RTU communication protocol according to the need of application.

- **全耐火材料 Fireproof material**

90KW 以下为全塑壳结构，采用阻燃 ABS 材料加工而成，90KW 及以上功率段上盖为塑壳

结构、主框架采用敷铝锌板材料加工而成，具有耐热、抗腐蚀特性。

The product of below 90KW is in plastic structure made with inflaming retarding ABS material; for the product of 90KW and above, the upper cover is in plastic structure and main frame is made of aluminium-zinc plate with features of heatproof and corrosion resistance.

- **集成先进的保护功能 Integrated with advanced protective function**

具有输入输出缺相、过载、过流、相电流不平衡、晶闸管过温等保护功能，全方位对电机及相关设备进行保护。

Protective functions of phase failure, overload, overcurrent, phase current unbalance, thyristor overheat to protect motor and other equipment.

- **可外引面板 Movable panel**

可通过机身接口将面板外引至设备操作面进行远程操作，方便现场使用。

The panel can be moved to equipment operating surface through machine interface for remote control.

- **维护简单 Easy maintenance**

由4位数码显示组成的监控信号编码系统，24小时监控系统设备的工作状况，同时提供快速故障诊断。

The monitor signal coding system consists of 4-digit display monitors working state of the equipment for 24 hours and provides fast fault diagnosis.

第二章 收货检查

Section 2 Goods Acceptance and Inspection

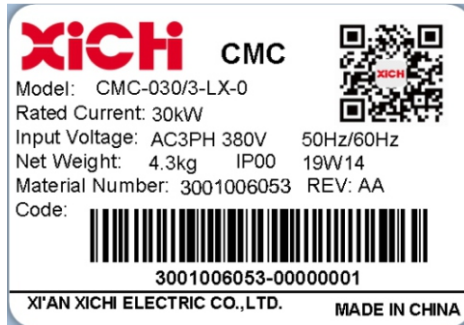
每台软起动机在出厂前均进行了全部功能及运行测试，用户在收到设备并拆封后，请按下列步骤检查。如发现问题，请立即与供货商联系。

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

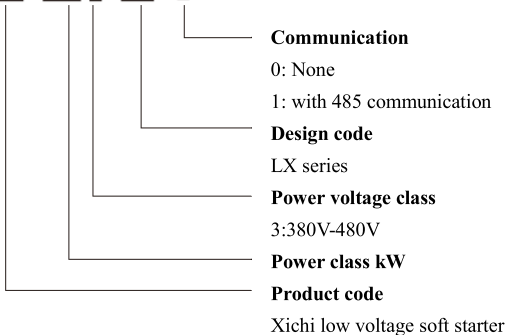
1. Check nameplate to confirm that the equipment you receive is consistent with the one you ordered.

(1)软起动机铭牌说明 Description of soft starter's nameplate



(2)软起动机型号说明 Description of soft starter's model

CMC - 008/3 - LX - 0



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、《CMC-LX 软起动技术手册》等。
3. Check whether product certificate, warranty card, package list and Technical Manual for CMC-LX soft starter are provided with the product.

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	外接型 External type	AC110V-10% --220V+15%， 50/60Hz
	内置型 Built-in type	Internal integrated control power supply, no need of external connection
三相电源 Three-phase power	标准接线 AC380V±15% Standard wiring AC380V±15% 内三角接线 AC380V±30% Inner delta wiring AC380V±15%	
标称电流 Nominal current	18A--1200A，共 23 种额定值 18A--1200A, 23 rated values in total	
适用电机 Applicable motor	一般鼠笼型交流异步电机 Ordinary squirrel cage AC asynchronous motor	
起动斜坡方式 Start ramp mode	电压斜坡起动、电流斜坡起动 voltage ramp start and current ramp start	
停车方式 Stop mode	自由停车、软停车 Free stop and soft stop	
逻辑输入 Logical input	阻抗 1.8KΩ，电源+24V Impedance 1.8 KΩ, power supply +24V	
起动频度 Start frequency	可做频繁或不频繁起动,建议每小时起动≤10 次 Frequent or infrequent start available, start is advised not to exceed 10 times each other	
保护功能 Protective function	缺相、过流、SCR 保护、过热、相电流不平衡 Phase failure, overcurrent, SCR protection, overheat and phase current imbalance,	
防护等级 IP	IP00	
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 2km，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。

To ensure that soft starter has good ventilation and heat dissipation conditions during operation, soft starter should be vertically mounted.

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，电缆线应保证足够的载流量。外围配件的选用请参见附表一。

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 Appendix 1.

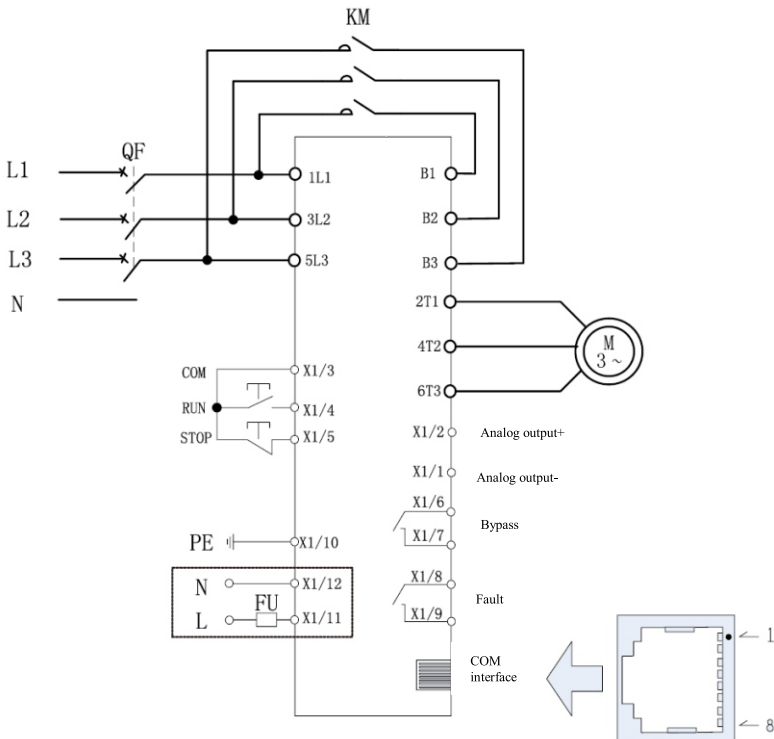
第四章 电路连接

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。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，接触器一边接软起动器 1L1、3L2、5L3，另一边接 B1、B2、B3。

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. Soft starter's detection of phase sequence can be determined by parameter setting. When bypass contactor is used, one end of contactor is connected to terminals 1L1, 3L2, 5L3 of soft starter and the other end connected to terminals B1, B2, B3.



接线原理图 Wiring Schematic Diagram

注：1.控制电源内置时，无 L、N 接线端子

2. 通讯接口是功能选配口，采用光纤 RJ45 的联结接口，如图所示。从上到下依次是 1 脚到 8 脚。具体端子定义请参考端子说明。

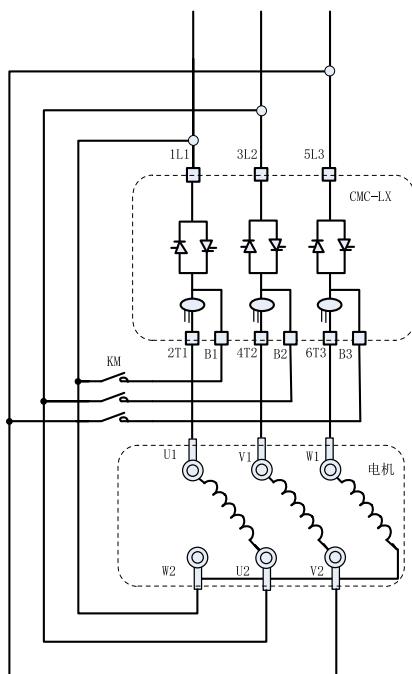
NOTE: 1. There are no terminals L and N when the control power supply is built in.

2. The communication interface is a functional optional interface, using optical fiber RJ45 connection interface, as shown in the figure. It is pin 1 to 8 from top to bottom. For specific terminal definition, please refer to the terminal description.

4.2 三角形内接连接图 Delta internal connection diagram

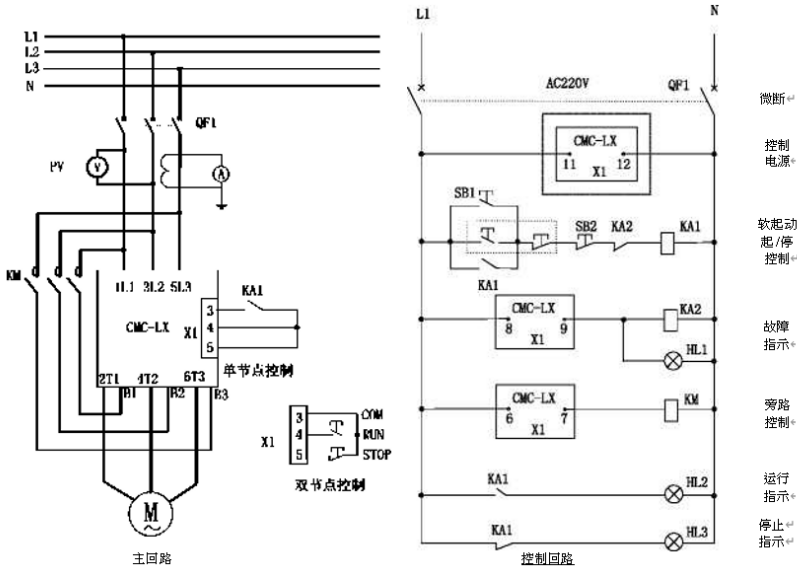
若用户使用三角形内接连接时，用户必须严格按照下图进行连接，否则有可能导致电机或软起损坏。本机在启动前会对电机接线进行判断，若接线错误软起会报接线错误故障。

When adopting delta inner connection, user must strictly connect in accordance with the following diagram, otherwise, motor or soft starter may be damaged. Before starting, soft starter will detect motor's wiring. If wiring is false, soft starter will indicate fault of false wiring.



三角形内接 Delta internal connection

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



注意：NOTES:

1. 控制电源内置时，无 X1 的 11、12 接线端子；

There are no terminals 11 and 12 of X1 when the control power supply is built in;

2. 单节点接线：停机状态下 X1/4 与 X1/3 断开，X1/5 与 X1/4 短接；

单节点控制：接点闭合软起动启动，接点打开软起动停止；

双节点接线：停机状态下 X1/4 与 X1/3 断开，X1/5 与 X1/3 短接；

双节点控制：X1/4 端输入脉冲软起动启动，X1/5 端输入脉冲软起动停止。

Single node wiring: under shutdown state, X1/4 is disconnected with X1/3, and X1/5 is short-circuited with X1/4;

Single node control: when contact is closed soft starter starts; when contact is open soft starter stops;

Two-node wiring: in the shutdown state, X1/4 is disconnected with X1/3, and X1/5 is short-circuited with X1/3;

Dual-node control: when X1/4 end inputs pulse soft starter starts; when X1/5 end inputs pulse soft starter stops.

3. 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。

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.

4.4 端子说明 Description of terminal

CMC-LX 系列软起动器有 10-12 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。

CMC-LX series soft starters have 10-12 external control terminals which help user realize external signal control, remote control and system control.

端子号 Terminal No.		端子名称 Name of terminal	说明 Description		
主回路 Main circuit	1L1, 3L2, 5L3	主回路电源输入 Main circuit power input	接三相交流电源, 旁路接触器 Connected to three-phase AC power supply and bypass contactor		
	2T1, 4T2, 6T3	主回路电源输出 Main circuit power output	接三相异步电动机 Connected to three-phase asynchronous motor		
	B1, B2, B3	旁路接触器 Bypass contactor	接旁路接触器 Connected to bypass contactor		
控制回路 Control circuit	X1/1	模拟输出 - (AO-) Analog output - (AO-)	0-20mA 或 4-20mA 0-20mA or 4-20mA 输出负载阻抗 (150-500Ω) Output load impedance (150-500Ω)		
	X1/2	模拟输出+ (AO+) Analog output+ (AO+)			
	X1/3	COM			公共端 Common terminal
	X1/4	外控起动 (RUN) Externally-controlled start (RUN)	X1/4 与 X1/3 短接则起动 Start when X1/4 and X1/3 are short circuited		
	X1/5	外控停止 (STOP) Externally-controlled stop (STOP)	X1/5 与 X1/3 断开则停止 Stop when X1/5 breaks from X1/3		
	X1/6	旁路输出继电器 (K11、K12)	输出有效时 K11-K12 闭合 K11-K12 close when output is effective 接点容量 AC250V/5A, DC30V/5A Contact capacity AC250V/5A, DC30V/5A		
	X1/7	旁路输出继电器 (K11、K12)			
	X1/8	故障输出继电器 (K21、K22)			
	X1/9	故障输出继电器 (K21、K22)	输出有效时 K21、K22 闭合 K21-K22 close when output is effective 接点容量 AC250V/5A, DC30V/5A Contact capacity AC250V/5A, DC30V/5A		
	X1/10	PE	PE		
	X1/11	L	控制电源 Control power	AC110V-10% - AC220V+15%	
	X1/12	N			
通讯接口 COM interface	1, 2	GND	电源地 Power GND	选配 RJ45 接口定义配合第四章基本接线原理图使用 Optional RJ45 interface definition is used in conjunction with the basic wiring schematic diagram in Section 4	
	3, 4	A+	RS485		
	5, 6	B-			
	7, 8	+24V	电源正 Power source+		

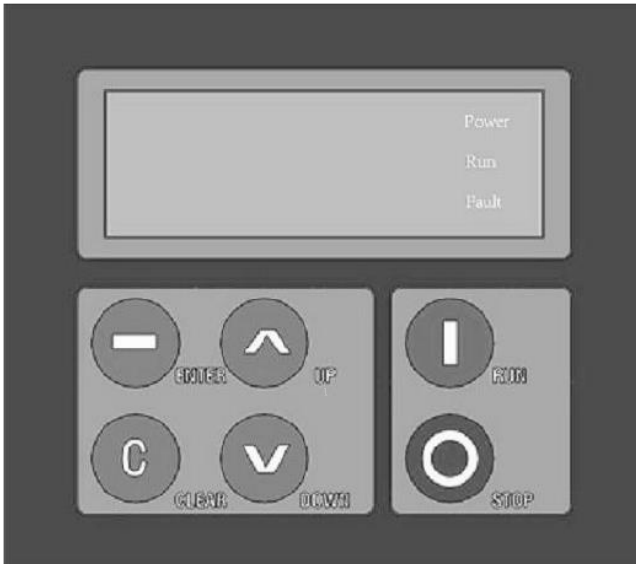
注：控制电源内置时，无 XI 的 11、12 接线端子。

Note: There are no terminals 11 and 12 of X1 when the control power supply is built in.

第五章 显示及操作说明

Section 5 Instruction to Display and Operation

5.1 面板示意图 Panel view



起动过程、全压、软停过程中 LED 面板上都显示平均电流。面板的上面有 3 个 LED 指示灯。

LED1 标识符为 POWER，主板电压正常时常亮；

LED2 标识符为 RUN，在起动过程中是闪烁的，起动完成后常亮；

LED3 标识符为 FAULT，当故障时点亮。

During start, full voltage and soft stop, LED panel indicates average current. There are three LED indicator lamps on panel.







LED1 indicates POWER and it is normally on when main board's voltage is normal; LED2 indicates RUN and it flashes during start or stop. It is normally on after start finishes;

LED3 indicates FAULT and it lights up when there is fault.

面板独立使用时，面板下面有同样功能的指示灯提示用户工作状态。

When panel is separately used, it provides indicator lamps with the same function under the panel to indicate working state.

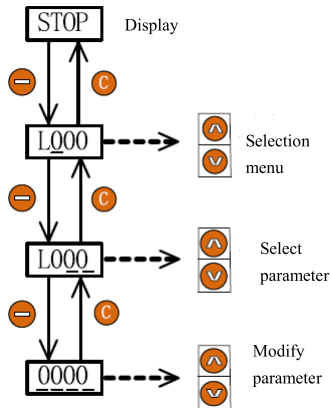
5.2 按键功能说明 Description of key functions

符号 Symbol	名称 Name	功能说明 Functional description
	确认键 Enter	进入菜单项，确认需要修改数据的参数项 Enter menu to confirm parameters needed to be modified
	递增键 Add	参数项或数据的递增操作（运行时可校准电流） Increase parameter or data value (available to calibrate current in operation)
	递减键 Minus	参数项或数据的递减操作（运行时可校准电流） Decrease parameter or data value (available to calibrate current in operation)
	返回键 Back	确认修改的参数数据、退出参数项、退出参数菜单 Enter modified parameter, exit parameter and parameter menu
	起动键 Start	键操作有效时，用于“起动”操作；并且端子排 X1 的 3、5 端子短接 When the key operation is effective, it is used for “Start” and X1’s terminals 3 and 5 of terminal block are short circuited
	停止键 Stop	键操作有效时，用于“停止”操作；也可用于“故障复位”操作（长安 4s 以上） When the key operation is effective, it is used for “stop”; also for “fault reset” (long press above 4s)

5.3 显示状态说明 Description of display state

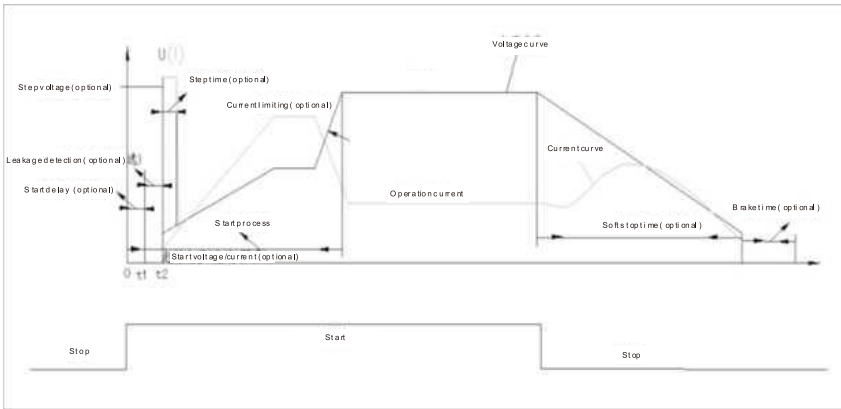
序号 No.	显示符号 Symbol	状态含义 State	说明 Description
1	STOP	停止状态 Stop state	设备处于停止状态 Equipment is in stop state
2	L000	编程 Programming	此时可阅览和设定参数 Check and set parameters
3	7001	起动倒计时 Start countdown	设备处于起动倒计时状态 Equipment is in start countdown state
4	Er01	故障 Faulty state	设备处于故障状态 Equipment is in fault condition
5	-01-	起动间隔时间 Start interval	设备处于起动间隔倒计时状态 Equipment is in start interval countdown state

5.4 修改参数项操作流程 Flow of modifying parameters



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)特性曲线

Characteristic curve of soft start/stop voltage (current)

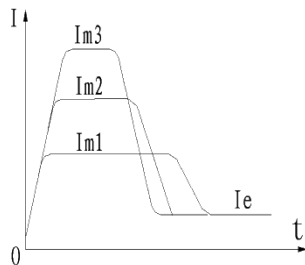
CMC-LX 系列软起动器有多种起动方式：电流斜坡起动、电压斜坡起动；多种停车方式：自由停车、软停车。用户可根据负载不同及具体使用条件选择不同的起动方式和停车方式。

CMC-MX series soft starters have multiple start modes including voltage ramp start and current ramp start; multiple stop modes including free stop and soft stop. User can choose different start and stop modes according to different loads and specific application conditions.

6.1 电流斜坡起动 Current ramp start

使用电流斜坡起动模式时，软起动器得到起动指令后，其输出电流将按照设定曲线增加，直至输出电流达到设定电流限幅值 I_m ，输出电流不再增大，电动机运转加速持续一段时间后电流开始下降，输出电压迅速增加，直至全压输出，起动过程完成。

When current ramp start mode is selected, after soft starter receives command to start, its output current will increase as per the given curve until output current reaches limit value I_m of the given current, and output current will no longer increase. After electric motor runs and accelerates for a period of time, current starts to decrease and output voltage rapidly increases until total voltage output and start process completes.



参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
L000	起动方式 Start type	电压斜坡 电流斜坡 0. voltage ramp 1. current ramp	1	0
L004	斜坡时间 Ramp time	0~120S	0	10
L005	限流倍数 Current-limiting times	100~500%Ie	---	350%

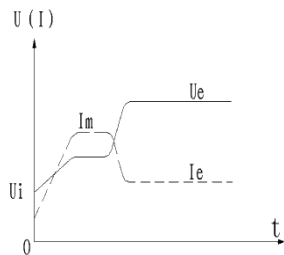
注：“---”表示用户自己根据需要进行设定(下同)。

NOTE: “---” means that user can set value according to the need (the same below).

6.2 电压斜坡起动 Voltage ramp start

这种起动方式适用于大惯性负载，而对起动平稳性要求比较高的场合，可大大降低起动冲击及机械应力。

This start mode is applicable to load with big inertia, and the application requiring high tranquility can largely reduce start impact and mechanical stress.



参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
L000	起动方式 Start type	0: 电压斜坡 1: 电流斜坡 0. voltage ramp 1. current ramp	0	0
L003	起始电压/电流 Initial voltage/current	20~100%U _e / 20~100%I _e	---	30%
L004	斜坡时间 Ramp time	0~120S	---	10
L005	限流倍数 Current-limiting times	100~500%I _e	---	350%

6.3 突跳转矩软起动 Step torque soft start

突跳转矩软起动主要应用在静态阻力比较大的负载电机上，通过施加一个瞬时较大的起动转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，再根据所设定的起始电压、斜坡时间平滑起动，直至起动完成。

Step torque soft start is mainly used for loaded motor with large stiction by applying an instant greater start torque to overcome the great stiction torque. In this mode, output voltage rapidly reaches the preset step voltage. After it reaches the preset step time, it smoothly starts according to preset Initial voltage and ramp time until start finishes.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
L000	起动方式 Start type	0: 电压斜坡 1: 电流斜坡 0. voltage ramp 1. current ramp	--	0
L001	突跳电压 Step voltage	20~100%Ue	---	20%
L002	突跳时间 Step time	0~2000ms	---	0
L003	起始电压/电流 Initial voltage/current	20~100% Ue 20~100% Ie	---	30%



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值。Step torque start mode must be used together with other soft start modes and it is required to set step voltage and step time.

6.4 自由停车 Free stop

当停车时间(L008)设置为零时为自由停车模式，当软起动器接到停机指令后，软起动器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。

When soft stop time (L008) is set to zero, free stop mode is enabled. When soft starter receives command to stop, soft starter blocks bypass contactor's control relay and subsequently blocks output of main circuit's thyristor, then motor freely stops by inertial load.

6.5 软停车 Soft stop

当停车时间设定不为零时，在全压状态下停车则为软停车，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，软停车过程结束起动器转为自由停车。

When stop time is set to non-zero, it is soft stop in full voltage condition. To stop in this mode, soft starter firstly breaks bypass contactor, then output voltage of soft starter gradually reduces to soft stop final voltage within the given soft stop time. After soft stop process finishes, starter converts to free stop.

6.6 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, and the output voltage of the soft starter gradually drops to the set soft stop final voltage value within the set soft stop time. The pump stop is a special kind of soft stop, which is mainly designed for pump load.

参数 Parameter	名称 Name	范围 Range	设定值 Set value	出厂值 Factory default
L007	起动方式 Start type	0: 自由停车 1: 软停车 2: 泵停车 0. Free stop 1. Soft stop 2. Pump stop	2	0
L008	停车时间 Stop time	0~120s	10	0
L009	停车终止电压 Stop final voltage	20~80%Ue	30%	30%

第七章 参数项及其说明

Section 7 Parameters and Description

CMC-LX 系列软起动器的参数按照功能可以分为四类：起停控制参数 L0、保护参数 L1、端口设置参数 L2、厂家参数 L3。

Parameters for CMC-LX series soft starters are divided into four categories in terms of function, including start/stop control parameter L0, protection parameter L1, port setting parameter L2, and manufacturer's parameter L3.

7.1 起停控制参数菜单 L000-L016 共 17 个参数 Start/stop control parameter menu totaling 17 parameters L000-L016

参数 Parameter	名称 Name	范围 Range	出厂值 Factory default
L000	起动方式 Start mode	0、电压斜坡 1、电流斜坡 0. Voltage ramp 1. Current ramp	0
L001	突跳电压 Step voltage	20~100%Ue	20%
L002	突跳时间 Step time	0~2000mS	0
L003	起始电压 Initial voltage/current	20~100%Ue / 20~100%Ie	30%
L004	斜坡时间 Ramp time	0~120S	10
L005	限流倍数 Current-limit times	100~500%Ie	350%
L006	起动延时 Start time delay	0----120S	0
L007	停车方式 Stop mode	0、自由停车 1、软停车 2、泵停车 0. free stop 1. soft stop 2. pump stop	0
L008	停车时间 Stop time	0~120S	0
L009	停车终止电压 Stop final voltage	20~80% Ue	30%

L010	二次起动允许 Second start permit	0~60S	0
L011	二次限流倍数 Secondary current- limit times	150~500%Ie	400%
L012- L016	未定义参数 Undefined parameter	0-9999	0

7.2 电机保护参数菜单 L100-L116 共 17 个参数 Motor's protection parameter menu totaling 17 parameters L100-L116

参数 Parameter	名称 Name	范围 Range	出厂值 Factory default
L100	电机额定电流 Rated current of motor	15~9999	--
L101	运行过流保护设定 Overcurrent protection setting	100~500%Ie	150%
L102	运行过流时间 Overcurrent duration	0~10S	2
L103	相电流不平衡保护 Phase current unbalanced protection	0~100%	70%
L104	电流不平衡时间 Current unbalanced time	0-10S	2
L105	过载保护级别 Overload protection class	10A, 10, 15, 20, 25, 30, OFF	20
L106	SCR 保护 SCR protection	0. OFF 1. On	0
L107	相序检测 Phase sequence detection	0. OFF 1. On	0
L108	频率选择 Frequency selection	0. 50HZ 1. 60HZ	0
L109	起动时间限制 Start time limit	10~250	80
L110	电机接线方式 Motor wiring type	0、外接 1、内接 2、未定义(内接直起) 0-external wiring 1-internal wiring 2-undefined (internal-wiring direct start)	0
L111	起动时间间隔 Start interval	0-60	0
L112- L116	未定义参数 Undefined parameter	—	—

7.3 端口设置参数 L200-L216 共 17 个参数 Port setting parameter totaling 17

parameters L200-L216

参数 Parameter	名称 Name	范围 Range	出厂值 Factory default
L200	控制选择 Control selection	0、键盘控制 1、通讯控制 2、键盘、通讯控制 0.Keyboard control 1.Communication control 2.Keyboard and communication control 说明：上述在端子双接点接法时有效 Note: the above is available when double contacts are connected	0
L201- L203	未定义参数 Undefined parameter	0~9999	0
L204	通讯地址 Communication address	1~32	1
L205	波特率 Baud rate	0. 1200 1. 2400 2. 4800 3. 9600 4. 19200	3
L206	制造商参数 Manufacturer's parameter	——	——
L207	制造商参数 Manufacturer's parameter	——	——
L208	模拟输出方式 Analog output mode	0. 4~20mA corresponds to 0~2Ie 1. 4~20mA corresponds to 0~4Ie 2. 0~20mA corresponds to 0~2Ie 3. 0~20mA corresponds to 0~4Ie 注：Ie 是电机额定电流 Note: Ie is motor's rated current	0
L209~ L213	未定义参数 Undefined parameter	——	——
L214	0mA/4mA calibration	——	——
L215	20mA calibration	——	——
L216	模拟输出模式 Analog output mode	1. 4mA 校准 1. 4mA calibration 2. 20mA 校准 2. 20mA calibration 3. 工作模式 3. Working mode	3

7.4 厂家参数 L300-L316 共 17 个参数 Manufacturer's parameter totaling 17

parameters L300-L316

参数 Parameter	名称 Name	范围 Range	出厂值 Factory default
L300	软起额定电流 Rated current for soft start	15~9999	--
L301	软件版本 Software version	注释当前的软件版本号 Mark the current software version number	
L302	电流显示精度 Current display precision	0、无小数点 1、一位小数点 0. No decimal point 1. One decimal point	--
L303	电流校正 Current correction	1~255	--
L304	制造商参数 Manufacturer's parameter	0~9999	--
L305	制造商参数 Manufacturer's parameter	--	--
L306	制造商参数 Manufacturer's parameter	--	--
L307	制造商参数 Manufacturer's parameter	--	--
L308	制造商参数 Manufacturer's parameter	--	--
L309	制造商参数 Manufacturer's parameter	0~9999	--
L310- L316	未定义参数 Undefined parameter	0~9999	--

7.5 功能说明 Function description

- **起停控制参数 L0**（起停控制模式说明见第六章）

Start/stop control parameter L0 (for description of start control mode, refer to Section 6)

用户可以通过参数 L000 进行起动曲线的选择，使得起动曲线与实际负载很好配合，以达到良好的起动效果。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，斜坡时间进行起动。如果参数 L010 的值不为零，在起动达到该设定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，斜坡时间进行二次起动，直至起动完成。在起动过程中，起动电流被限制在参数 L005 所设置的值以下，二次起动电流限制在参数 L011 值以下。

User may select start curve by parameter L000 to enable start curve to properly match actual load so as to ensure optimal start. If step voltage and step time are given, a greater instantaneous starting torque shall be applied to the initial start and then it shall start based on the given initial voltage and ramp time. If parameter L010 is not zero, when start is still not completed within the given time, second start shall be made based on initial voltage and ramp time till start is completed. During start process, start current is limited to the range below the value of parameter L005, and second start current is limited to the range below the value of parameter L011.

注：当起动方式选择为电压斜坡起动时，相应的参数 L003 代表起始电压；

Note: When the voltage ramp start mode is selected to start, the corresponding parameter L003 shall be initial voltage.

参数 L004 斜坡时间的长短可决定在什么时间内将起动转矩升高到最终转矩。当斜坡时间较长时，就会在电机起动过程中产生较小的加速转矩。这样就可实现较长时间的电机软加速，应当选择斜坡时间的长短，使电机能够进行软加速，一直到达其额定转速为止。当加速时间在完成电机加速之前结束时，就会在一定的时间内将转矩限制到所设置的极限转矩。因此，这里的斜坡时间表示了转速变化的速率，并不完全等同于电机的起动时间。

Parameter L004 ramp time determines the time at which the starting torque is up to final torque. If ramp time is longer, smaller accelerating torque shall be generated in starting process of motor, in this way, the motor shall be subject to soft acceleration in longer time, thus, ramp time shall be properly selected to make motor able to be subject to soft acceleration till its rated speed is achieved. If acceleration time is over before completion of motor acceleration, the torque shall be limited to the set ultimate torque in specified time. Accordingly, the ramp time indicates rate of change of rotary speed, it is not completely equal to starting time of motor.

● 保护参数 L1

Protection parameter L1

用户可以根据所带电机功率的大小设定 L100 (电机的额定电流)，使得软起动器与电机很好的匹配并能很完善地对电机进行保护。运行过程中的电流超过了参数 L101 所设定的过流保护值，且持续时间大于 L102 所设定的值软起动器将会进行过流保护。超过了参数 L105 所设置的电子热过载等级和脱扣时间，软起动器将会进行过载保护。保护的同时将会在界面上显示相应的故障类型，便于用户查找。

User can set L100 (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. If the current during operation exceeds the overcurrent protection value set by parameter L101, and the duration is longer than the value set by parameter L102, the soft starter will carry out overcurrent protection. If electronic thermal overload grade and tripping time set by parameter L105 are exceeded, soft starter shall carry out overcurrent protection, with fault category displayed on interface to make it easy for user to find the fault.

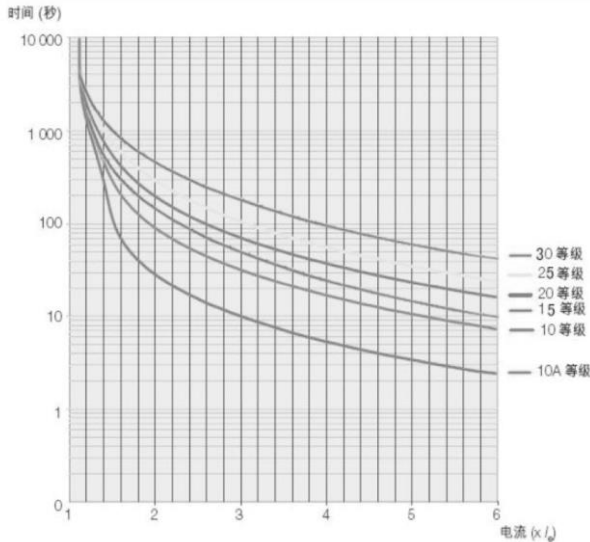
注：电机额定电流不要低于控制器 50%的额定电流

Note: Motor's rated current should not be less than 50% of the controller's rated current.

如果在使用过程中对电源相序没有要求，则将参数 L107 设置为不检测相序，否则将其设置为检测相序。如果在使用过程中对 SCR 不进行保护，则将参数 L106 设置为 0, 否则将其设置为 1。如果用户使用相电流不平衡保护，用户可对参数 L103, L104 进行设置。

If there is no requirement on the phase sequence of the power supply during use, set parameter

L107 to not detect the phase sequence; otherwise, set it to detect the phase sequence. If SCR is not protected during use, set parameter L106 to 0; otherwise, set it to 1. If user uses the phase current imbalance protection, the user can set the parameter L103, L104.



电子热过载脱扣时间曲线表
Electronic thermal overload trip time curve

● 端口设置参数 L2

Port setting parameter L2

起动/停止: 可通过 L200 进行选择。参数 L006 配合起动功能项进行起动, 如果设置了起动延时, 在给出有效的起动命令后, 当 L006 所设置的延时时间延时完成, 软起动器开始起动。

Start/Stop: start/stop can be selected through L200. Parameter L006 cooperates with starting function to start. If start time delay is given, when time delay set by parameter L009 is over after effective command to start is given, soft starter shall start.

模拟输出: L208 用来设置模拟输出对应的电流值。用户可根据需要选择 4—20mA 对应 0—2Ie 或者 0—4Ie, 0-20mA 对应 0—2Ie 或者 0—4Ie。

Analog output: L208 is used to set current value for analogy output. User may select 0--2Ie or 0--4Ie for 4-20mA and 0--2Ie or 0--4Ie for 0-20mA as required.

注: 1、L216=1, L208=0 或 1, 调节 L214 对 4mA 进行校正。

2、L216=1, L208=2 或 3, 调节 L214 对 0mA 进行校正。

3、L216=2, 调节 L215 对 20mA 进行校正。

4、校正结束后将 L216 还原成 3。

NOTE: 1. L216=1, L208=0 or 1, adjust L214 to calibrate 4mA.

2. L216=1, L208=2 or 3, adjust L214 to correct 0mA.

3. L216=2, adjust L215 to calibrate 20mA.

4. After the calibration is over, restore L216 to 3.

内三角功能：L110 设置电机接线方式，0 为外接方式，1 或 2 为内接启动方式。当设置为 1 时本机启动前先检测内三角接线是否正确，然后再执行内三角接线启动命令；当设置为 2 时本机不检测接线是否正确，直接按照内三角的控制方式启动。

Internal delta function: motor connection mode is set through L110. 0 is external connection mode, 1 or 2 is start mode of internal connection. When it is set to 1, the machine first checks whether the inner delta wiring is correct before starting, and then executes the inner delta wiring start command; when it is set to 2, the machine does not detect whether the wiring is correct, and starts directly according to the inner delta control mode.

通讯功能：本机支持 Modbus-RTU 标准通讯模式，L204 可设置本机通讯地址，L205 可设置本机通讯波特率。具体参数地址详见第九章节！

Communication function: This soft starter supports Modbus RTU standard communication mode. The communication address may be set through L204 and the communication baud rate may be set through L205. Detailed parameter address is as shown in Section 9.

- **厂家参数 L3**

Manufacturer's parameter L3

此项参数记录软起动器的工作及状态信息，用户不可修改。

This parameter records the working and status information of the soft starter and cannot be modified.


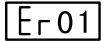
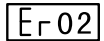
第八章 故障检测与排除

Section 8 Fault detection and Clearance

8.1 故障代码表 Fault code table

当软起动器保护功能动作时，软起动器立即停机，显示屏显示当前故障。用户可根据故障代码进行故障分析处理。

When the protection function of the soft starter is activated, the soft starter stops immediately and the display shows the current fault. Users can analyze and process the fault according to the fault code.

显示 Display	通讯代码 Comm code	状态说明 State	处理方法 Disposal
	---	电机无反应 The motor does not work	1、检查端子 X1/3、X/5 是否短接。 2、检查控制电路接线是否正确，控制开关是否正常。 3、检查控制电源电压是否过低。 4、参数 L200 设置错误。 1. Check whether terminals X1/3 and X/5 are short-circuited. 2. Check whether the control circuit wiring is correct and whether the control switch is normal. 3. Check whether the control power supply voltage is too low. 4. Parameter L200 is incorrectly set.
无显示 No display	---	---	1、检查端子 X1/11、X1/12 是否接线。 2、检查控制电源是否正常。 1. Check whether terminals X1/11 and X1/12 are connected. 2. Check whether the control power supply is normal.
	0x01	电机起动缺相 Lack of phase when the motor starts	1、检查三相电源各相电压是否缺相。 1. Check whether the voltage of each phase of the three-phase power supply is phase deficient.
	0x02	可控硅过热 Overheat of thyristor	1、检查安装环境是否通风良好且垂直安装。 2、检查散热器是否过热或过热保护开关是否断开。 3、起动频次过高，降低起动频次。

显示 Display	通讯代码 Comm code	状态说明 State	处理方法 Disposal
			<p>4、控制电源过低。起动过程电源跌落过大。</p> <p>1. Check whether environment in which the soft starter is installed has good ventilation and whether it is vertically installed.</p> <p>2. Check whether radiator is overheated or whether overheating protection switch is disconnected.</p> <p>3. Start frequencies are too high and reduce starting frequencies.</p> <p>4. Control power is too low, power drops too much in starting process.</p>
E_r03	0x03	<p>起动失败 Start failure</p>	<p>1、逐一检查各项工作参数设定值，核实设置的参数值与电机实际参数是否匹配。</p> <p>2、起动失败（L109 设定时间内未完成）检查限流倍数是否设定过小</p> <p>1. Check each set value for working parameters and verify whether the set parameter value matches with actual parameter value.</p> <p>2. Starting failure (it is incomplete within time set by L109), check whether current limiting magnification is too small.</p>
E_r04	0x04	<p>软起动器输入与输出短路 Short circuit between input and output of soft starter</p>	<p>检查可控硅是否击穿或损坏。 Check whether thyristor is damaged</p>
		<p>SCR 故障 (L106 设置为 1) SCR fault (L106 is set as 1)</p>	<p>1、检查软起动器输出端与电机是否正确且可靠的连接。</p> <p>2、判断电机内部是否开路。</p> <p>3、检查可控硅是否击穿或损坏。</p> <p>4、检查进线是否缺相。</p> <p>1. Check whether output of soft starter is properly and reliably connected to motor.</p> <p>2. Check whether there is open circuit in motor</p> <p>3. Check whether thyristor is broken and damaged.</p> <p>4. Check whether incoming line is phase loss.</p>

显示 Display	通讯代码 Comm code	状态说明 State	处理方法 Disposal
E _r 05	0x05	限流功能失效 Current limiting function failure	1、查看参数 L100 的设置是否正确。 1. Check whether setting of parameter L100 is correct
		电机运行过流 Motor shows over current in operation	1、检查软起动器输出端连接是否有短路。 2、负载是否突然加重 3、负载是否波动太大 1. Check whether connection of soft starter's output terminal is short circuited. 2. Load increases suddenly. 3. Fluctuation of load is too large.
E _r 06	0x06	电子热过载 Electronic thermal overload	1、是否超载运行? 1. Whether operation is overloaded.
E _r 07	0x07	相序错误 Wrong phase sequence	1、检查进线相序, L107 设置是否正确。 1. Check the phase sequence of incoming line and whether L107 is correctly set.
E _r 08	0x08	相电流不平衡 Phase current imbalance	1、检查主回路电流或者电压是否平衡 1. Check whether current or voltage in main circuit is balanced. 2、参数 L103 设置是否正确。 2. Check whether the parameter L103 is correctly set.
E _r 09	0x09	频率故障 Frequency failure	1、检查输入端三相电输入源频率; 1. Check the three-phase power input source frequency at the input end; 2、L108 设置是否正确; 2. L108 is set correctly.
E _r 10	0x0A	参数丢失 Parameter loss	1、重新上电后报此故障请联系厂家 1. If there is such problem after power on again, please contact the manufacturer
E _r 11	0x0B	接线错误 Wiring error	1、检查接线、L110 设置是否正确。 1. Check wiring and setting of L110.

8.2 故障复位 Fault resetting

故障具有记忆性, 故在故障排除后, 通过按键 STOP(长按 2 秒以上)进行复位, 使软起动器恢复到起动准备状态。

The fault is memorable, so after the fault is eliminated, reset the soft starter by pressing the STOP button (long press for more than 2 seconds) to restore the soft starter to the start-ready state.

第九章 通讯控制

Section 9 Communication Control

CMC-LX 系列电机软起动器提供 RS485 通信接口，采用国际标准的 Modbus 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。

CMC-LX series motor soft starters are provided with RS485 communication interface and adopt international standard Modbus communication protocol for master-slave communication. Users can control the host computer through PC/PLC to achieve centralized control to meet specific application requirements.

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。

The Modbus serial communication protocol defines the format of the frame content transmitted asynchronously in serial communication and the frame format of the slave reply. The frame content organized by the master includes the address of the slave, the execution command, the data and the error check, etc. The response of the slave machine is also the same structure, including run confirmation, return data and error check. If the slave machine makes an error in receiving the frame, or fails to complete the action requested by the master, it organizes a fault frame as a response and feeds it back to the host.

9.2 总线结构 Bus structure

(1) 接口方式:RS485 硬件接口

Interface mode: 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, only one of the master and the slave sends data and the other receives data. In the serial asynchronous communication process, data is sent frame by frame in the form of messages.

(3) 拓扑结构 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

CMC-LX 系列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 CMC-LX 软起动器或其他的具有相同通讯协议的控制设备。

Communication protocol for CMC-LX series soft starters are 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 CMC-LX soft starter or other control equipment having the same communication protocol.

9.4 通讯帧结构 Communication frame structure

CMC-LX 系列软起动器的 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 series soft starters are 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, a new one always silently starts with a transmission time of at least 3.5 bytes. On a network where the transmission rate is calculated at the baud rate, the transmission time of 3.5 bytes can be easily grasped. The following data fields are transmitted in sequence are slave address, operation command code, data and CRC check word. The transmission bytes of each field are hexadecimal 0...9, A...F. The network equipment always monitors the activity of the communication bus, even during the silent interval. When the first field (address information) is received, each network device confirms the byte. As the transmission of the last byte is completed, 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。

The information of a frame must be transmitted in a continuous data stream. If the interval of more than 1.5 bytes is exceeded before the end of the transmission of the entire frame, the receiving

device will clear these incomplete information.

9.5 地址说明 Description of address

名称 Name	变量类型 Type of variable	寄存器编号 Number of register	数据类型 Type of data	R/W 特性 R/W feature
启动方式 Start mode	I/O integer	1	Uint	R/W
突跳电压 Step voltage	I/O integer	2	Uint	R/W
突跳时间 Step time	I/O integer	3	Uint	R/W
起始电压/电流 Initial voltage/current	I/O integer	4	Uint	R/W
斜坡时间 Ramp time	I/O integer	5	Uint	R/W
限流倍数 Current limit times	I/O integer	6	Uint	R/W
启动延时 Start time delay	I/O integer	7	Uint	R/W
停车方式 Stop mode	I/O integer	8	Uint	R/W
停车时间 Stop time	I/O integer	9	Uint	R/W
停车终止电压 Stop final voltage	I/O integer	10	Uint	R/W
二次启动允许 Second start permit	I/O integer	11	Uint	R/W
二次限流倍数 Second current limit times	I/O integer	12	Uint	R/W
电机额定电流 Rated current of motor	I/O integer	18	Uint	R/W
运行过流保护设定 Setting of operation overcurrent protection	I/O integer	19	Uint	R/W
运行过流时间 Operation overcurrent time	I/O integer	20	Uint	R/W
相电流不平衡保护 Phase current imbalanced protection	I/O integer	21	Uint	R/W
电流不平衡时间 Current imbalance time	I/O integer	22	Uint	R/W
过载保护级别 Overload protection level	I/O integer	23	Uint	R/W

名称 Name	变量类型 Type of variable	寄存器编号 Number of register	数据类型 Type of data	R/W 特性 R/W feature
SCR 保护 SCR protection	I/O integer	24	Uint	R/W
相序检测 Phase sequence detection	I/O integer	25	Uint	R/W
频率选择 Frequency selection	I/O integer	26	Uint	R/W
起动时间限制 Start time limit	I/O integer	27	Uint	R/W
电机接线方式 Motor's wiring mode	I/O integer	28	Uint	R/W
起动时间间隔 Start interval	I/O integer	29	Uint	R/W
控制选择 Control selection	I/O integer	35	Uint	R/W
从机地址 Slave address	I/O integer	39	Uint	R/W
波特率 Baud rate	I/O integer	40	Uint	R/W
模拟输出方式 Analog output mode	I/O integer	43	Uint	R/W
0mA/4mA 校正 0mA/4mA calibration	I/O integer	51	Uint	R/W
软起额定电流 Rated current of soft start	I/O integer	52	Uint	R
软件版本 Software version	I/O integer	53	Uint	R
电流显示精度 Current display precision	I/O integer	54	Uint	R
电流校正 Current correction	I/O integer	55	Uint	R
软起工作状态 Operating status word of soft start	I/O integer	141	Uint	R
故障代码 Fault code	I/O integer	142	Uint	R
电机平均电流 Average current of motor	I/O integer	146	Uint	R
启动倒计时时间 Count down time for start	I/O integer	152	Uint	R
启动时间间隔倒计时时间 Start interval countdown time	I/O integer	153	Uint	R

说明：软起工作状态字定义

Note: Definition of operating status word of soft start

状态字高八位始终为 0,低八位定义如下：

The high 8 bits of the status word are always 0, and the low 8 bits are defined as follows:

功能 Function	主状态 Main state			次状态 Substate					说明 Description
	7	6	5	4	3	2	1	0	
停止 Stop	0			0					正常停 Normal stop
				1					急停 Emergent stop
				2					起动过频 Frequent start
				4					内部禁止 Internally forbidden
编辑 Edit	1			0					进入编辑 (0x20) 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 Run	2 (0x40)			0					进入起动状态 (0x40) Enter start state (0x40)
				1					起动延时 Start delay
				2					未定义 Undefined
				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
				8-11					未定义 Undefined
				12					自由停 Free stop
				13					未定义 Undefined
				14					泵停 Pump stop
故障 Fault	4 (0x80)			15					全压 (判断起动完成) Full voltage (start judged to be finished)
				0					(0x80)
				1					主电源缺相 Phase loss of main power
				2					SCR 过热 SCR overheated
				3					起动超时保护 Start timeout protection
				4					SCR 异常 SCR abnormal
				5					过流保护 Overcurrent protection
				6					过载保护 Overload protection
				7					相序错误 Phase sequence error
				8					相电流不平衡 phase current imbalance
				9					频率故障 Frequency fault
10					参数丢失 Parameter missing				

		11	接线错误 Wiring error
--	--	----	-------------------

9.6 控制命令参数地址 Control command parameter address

名称 Name	变量类型 Variable type	寄存器编号 (十进制) Register no. (decimal)	数据(十进制) Data (decimal)	R/W 特性 R/W feature
停止 Stop	I/O 整数 I/O integer	200	200	W
起动 Start	I/O 整数 I/O integer	202	202	W
复位 Reset	I/O 整数 I/O integer	203	203	W

注：若控制命令无效，查看参数 L200 是否开启通讯控制功能；查看端子 X1/3 和 X1/5 是否短接。

Note: if control command is invalid, please check parameter L200 to see whether communication control function is activated, and check whether terminal X1/3 and X1/5 are short circuited.

9.7 功能码概述 Description of function code

(1) 功能码“03”-读多个（单次≤50 个）保持寄存器（16 进制）

(1) Function code “03” - Read multiple (single ≤50) registers (hexadecimal)

主机发送数据 Data from host	字节数 Number of byte	例程 Routine	从机返回数据 Slave return data	字节数 Number of byte	例程 Routine
从机地址 Slave address	1	0x01	从机地址 Slave address	1	0x01
功能码 Function code	1	0x03	功能码 Function code	1	0x03
起始地址 H Initial address H	1	0x00	返回字节数 Number of return byte	1	0x02
起始地址 L Initial address L	1	0x6D	数据 H Data H	1	0x41
数据长度 H Data length H	1	0x00	数据 L Data L	1	0x00
数据长度 L Data length L	1	0x01	CRC_L	1	0x88
CRC_L	1	0x15	CRC_H	1	0x14
CRC_H	1	0xD7			

(2) 功能码“06”写单个寄存器（16 进制）

(2) Function code “06”- Write single register (hexadecimal)

主机发送数据 Data from host	字节数 Number of byte	例程 Routine	从机返回数据 Slave return data	字节数 Number of byte	例程 Routine
从机地址 Slave address	1	0x01	从机地址 Slave address	1	0x01
功能码 Function code	1	0x06	功能码 Function code	1	0x06
起始地址 H Initial address H	1	0x00	地址 H Address H	1	0x00
起始地址 L Initial address L	1	0x01	地址 L Address L	1	0x01
数据 H Data H	1	0x00	数据 H Data H	1	0x00
数据 L Data L	1	0x1E	数据 L Data L	1	0x1E
CRC_L	1	0x58	CRC_L	1	0x58
CRC_H	1	0x02	CRC_H		0x02

注：用 06 命令对软起动机进行修改参数时软起动机必须是处于停止或者编辑状态，其他状态均不能成功修改。对某个参数进行修改时，修改的参数必须是说明书规定的范围，如果超出此范围则不能成功修改。

Note: When the 06 command is used to modify the parameters of the soft starter, the soft starter must be in a stopping or editing state, and other states cannot be successfully modified. When a parameter is to be modified, the modified parameter must be within the range specified in the manual. If it exceeds this range, it cannot be modified successfully.

9.8 通讯时间间隔 Communication time interval

(1) “03”命令使用时间间隔：时间间隔=（17+寄存器个数*2）*8/波特率*1000*1.2ms；例如：9600 波特率，读取 1 个寄存器值， $t = (17+1*2) * 8/9600 * 1000 * 1.2 = 19\text{ms}$ 。

(1) “03” command service time interval: Time interval=（17+number of register *2）*8/baud rate*1000*1.2ms；Example: 9600 baud rate, read 1 register value, time interval =（17+1*2）*8/9600*1000*1.2=19ms.

(2) “06”命令使用时间间隔：时间间隔=20*8/波特率*1000*1.2ms；例如：9600 波特率，时间间隔=20*8/9600*1000*1.2=20ms。

(2) “06” command service time interval: Time interval=20*8/baud rate*1000*1.2ms；Example: 9600 baud rate, time interval =20*8/9600*1000*1.2=20ms

9.9 注意事项 Notice

多机通信时，CMC-LX 系列软起动机器的地址具有唯一性，即任意两台软起动机器的地址不能相同(可通过 L204 进行设置)。CMC-LX 系列软起动机器的通信波特率必须与控制器的波特率相

同(可通过 L205 设置)。多台 CMC-LX 系列软起动器通讯时, 应该在最末的一台上 AB 两端接 120 欧的终端电阻。

In multi-machine communication, the address of CMC-LX series soft starters are unique, that is, the addresses of any two soft starters cannot be the same (able to be set through L204). The communication baud rate of CMC-LX series soft starters must be the same as the baud rate of the controller (able to be set by L205). When multiple CMC-LX series soft starters communicate, the 120 ohm terminal resistance should be connected to both ends of AB on the last one.

9.10 通讯故障代码分析 Analysis of communication fault code

(1) 写地址错误: 设备地址+0x86+0x02+CRC

(1) Error in writing address: device address +0x86+0x02+CRC

①地址超出 68; ②不是规定的可写寄存器; ③不是在停止或编辑状态; ④写控制命令时通讯控制启停没有开启;

a. Address exceeds 59; b. Not the defined writable register; c. not the stopping or editing state; d.

Communication control start/stop fails to open in writing control command.

(2) 写数据错误: 设备地址+0x86+0x03+ CRC

(2) Error in writing data: Device address +0x86+0x03+CRC

①在规定的可写寄存器写入超出规定的范围; ②发送启动命令时命令数据不对;

a. Data written in specified writable register is beyond the defined range of data

b. Command data is wrong in sending start command.

(3) 读地址错误: 设备地址+0x83+0x02+ CRC

(3) Error in reading address: device address +0x83+0x02+CRC

①读的地址超出 68

a. Read address exceeds 68.

(4) 功能码错误: 设备地址+(0x80+错误功能码)+0x01+ CRC

(4) Function code error: device address +(0x80+erroneous function code)+0x01+CRC

①功能码不是软起动器所规定

a. Function code is not the function code defined for soft starter.

第十章 日常维护

Section 10 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。

(1) Use clean and dry brush to brush over the dust.

(2) 用压缩空气吹去灰尘。

(2) Use 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。

(1) Use electric drier or electric heater to blow dry.

(2) 配电间去湿。

(2) 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. Regularly check whether the components are in good condition and whether they can work normally.

4、检查软起动器的冷却通道，确保不被脏物和灰尘堵塞。

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!

附表一：软起标准接线规格型号及附件选用(以 380V 为例)

Appendix 1: Selection of soft starter's standard wiring specifications, models and accessories (taking 380V as an example)

Applicable motor (KW)	Model of soft starter	Rated current (A)	Model of bypass contactor	Size of primary line (copper line)
7.5	CMC-008/3-LX	18	CJX4-25	4 mm ²
11	CMC-011/3-LX	24	CJX4-32	6 mm ²
15	CMC-015/3-LX	30	CJX4-32	10 mm ²
18.5	CMC-018/3-LX	39	CJX4-40	10 mm ²
22	CMC-022/3-LX	45	CJX4-50	16 mm ²
30	CMC-030/3-LX	60	CJX4-63	25 mm ²
37	CMC-037/3-LX	76	CJX4-80	35 mm ²
45	CMC-045/3-LX	90	CJX4-95	35 mm ²
55	CMC-055/3-LX	110	CJX4-115F	35 mm ²
75	CMC-075/3-LX	150	CJX4-150F	50 mm ²
90	CMC-090/3-LX	180	CJX4-185F	30×4 copper bar
110	CMC-110/3-LX	218	CJX4-225F	30×4 copper bar
132	CMC-132/3-LX	260	CJX4-265F	30×4 copper bar
160	CMC-160/3-LX	320	CJX4-330F	30×4 copper bar
185	CMC-185/3-LX	370	CJX4-400F	30×4 copper bar
220	CMC-220/3-LX	440	CJX4-500F	40×5 copper bar
250	CMC-250/3-LX	500	CJX4-500F	40×5 copper bar
280	CMC-280/3-LX	560	CJX4-630F	40×5 copper bar
315	CMC-315/3-LX	630	CJX4-630F	40×5 copper bar
400	CMC-400/3-LX	780	JWCJ20-800	50×8 copper bar
470	CMC-470/3-LX	920	JWCJ20-1000	50×8 copper bar
530	CMC-530/3-LX	1000	JWCJ20-1000	50×8 copper bar
630	CMC-630/3-LX	1200	CKJ7-1600A/1140V	50×8 copper bar

标准接线指电动机绕组三角型或者星型连接，晶闸管连接在电源与电动机之间。内三角接线是指电动机绕组三角形-晶闸管与绕组串联。内三角控制主要的优点是可以降额选用软起器，内三角接法中流过软起和电机的电流是线电流的 $1/\sqrt{3}$ 。上表采用余量选用软起器，按照线电流/1.5 倍的额定电流来选用。用户在选用过程中可按照实际情况进一步降额选用软起器。

Standard wiring means delta or star connection in motor winding, and the thyristor is connected between power supply and motor. Internal delta connection means delta-thyristor and winding are in series in motor winding. The advantage of internal delta is to derate in selection of soft starter, the current in soft starter and motor inner delta connection is $1/\sqrt{3}$ of line current. Soft starter is selected according to rated current of line current/1.5 times in the above mentioned list. User may further

derate in selection of soft starter according to practical situation.

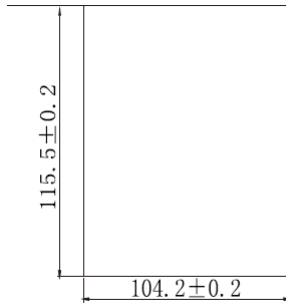
订货须知

- 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 specify the product model, specification, load and application condition to your supplier;

特殊说明：若客户需要键盘盒外置，需要跟厂家订购外置键盘盒的安装附件。键盘盒外置时需要将‘外置键盘盒固定附件’卡在门板上，门板开孔尺寸是：115.5(高)×104.2(宽)，如图所示。具体安装步骤请参考附表二。

Special note: If client needs keyboard panel to be externally placed, it is necessary to order the mounting fittings from manufacturer. When keyboard panel is externally placed, it needs to lock the mounting fittings of external keyboard panel onto door panel with its hole size of 115.5(H) × 104.2(W), which is as shown in the following figure. For specific installation steps, please refer to attached table 2.



- 软起动器标准配置含内置电流互感器,用户无需外接电流互感器。






As the standard configuration of soft starter contains built-in current transformer, user does not need to externally connect the both.

- 上表中的附件仅供参考。

Accessories shown in above table are only for reference.

附表二：CMC-LX 附件安装使用说明

Appendix 2: Instructions to installation of accessories of CMC-LX soft starter

		<p>CMC-LX 软起动器“外置键盘盒固定附件”安装步骤如下： The installation steps of external the keyboard panel fixing accessory for CMC-LX soft starter is as follows: 将键盘盒固定附件卡在门板上，如图 1； 1. Lock the keyboard panel's fixing accessory onto door panel, as is shown in figure 1. 将软起动器上的键盘盒取下，并将其背面的对角自攻钉拆下，如图 2； 2. Remove the keyboard panel from soft starter and tapping screws at the back of keyboard panel, as shown in figure 2. 将键盘盒插入步骤 1 所固定好的键盘盒固定附件内，如图 3 3. Insert the keyboard panel into fixing accessory finished in step 1, as shown in figure 3. 用 M3X15 自攻钉在门板背面将键盘对角固定；如图 4 4. Use M3X15 tapping screws to fix the keyboard panel at the back of door panel, as shown in figure 4. 将键盘盒连接线连接到键盘盒的 DB9 母头；如图 5； 5. Connect the keyboard panel cable to the keyboard panel's DB9 female terminal, as shown in figure 5; 至此，附件安装完成 7. The installation of CMC-LX soft starter's accessories is then completed.</p>
<p>Fig. 1</p>	<p>Fig. 2</p>	
 <p>图 3</p>		
<p>Fig. 3</p>	<p>Fig. 4</p>	
		<p>注:安装附件清单如下： 键盘盒固定附件 1 个/台 十字圆头自攻螺钉 M3*15 2 个/台 外置键盘盒连接线 1 根/台 △配件均在附件包装袋内，安装前请先核对数量。 Note: The list of installation accessories is as follows: Keyboard panel fixed accessory 1pc /set Cross head tapping screws M3*15 2 pcs/set Cable for external keyboard panel 1pc /set Accessories are in the attached bag, please check the number before installation.</p>
<p>Fig. 5</p>		

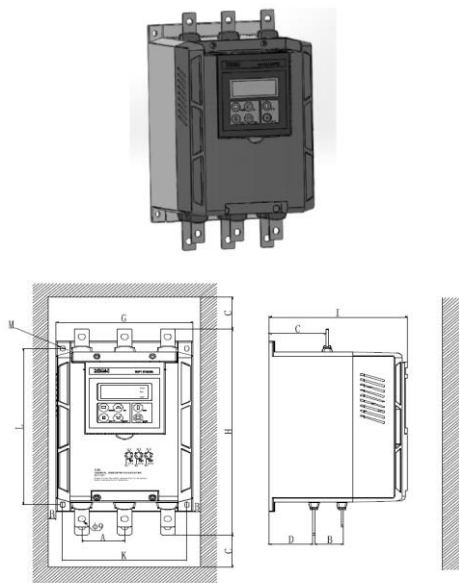
附表三：软起动器外形及开孔尺寸(单位：mm 以 380V 为例)

Appendix : Dimension and Hole Size of Soft Starter (Unit: mm, with 380V as an example)

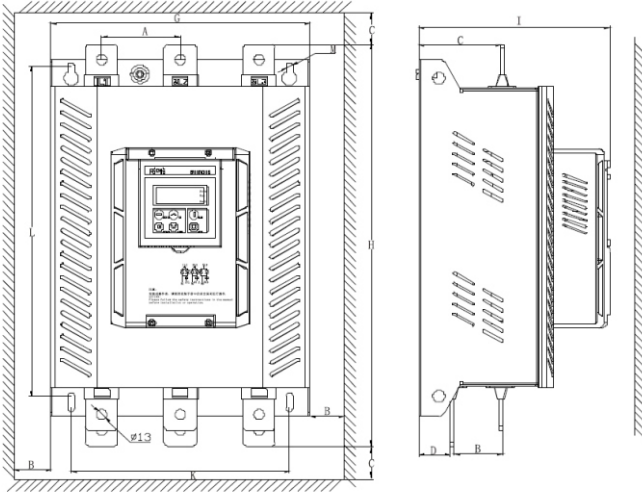
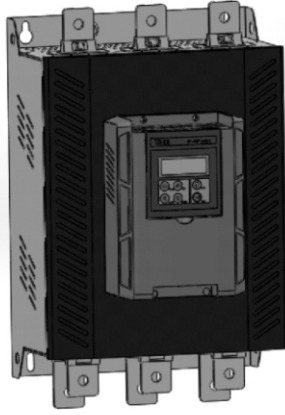
Model	Structure No.	G	H	I	K	L	M	A	B	C	D	Gross weight (kg)
CMC-008~075/ 3-LX	F005	172	320	172	156	240	6	54	35	72	55	5.1
CMC-090~185/ 3-LX	F006	285	474	235	230	390	9	85	61	101	39	19.9
CMC-220~315/ 3-LX	F007	320	512	235	270	415	9	97.5	60	101	39	25.8
CMC-400~630/ 3-LX	F008	400	652	235	330	500	9	120	57	101	39	51.5

尺寸备注：宽(G) X 高(H) X 厚(I)

Size: Width (G)xHeight(H)xThickness (I)



F005 型结构
Structure of F005



F006、F007、F008 型结构
Structures of F006, F006 and F008

附表四：软起动器选型

Appendix 4: Model Selection of Soft Starter

No.	Rated current (A)	380V	
		Applicable power (KW)	Size (mm)
1	18	7.5	F005
2	24	11	
3	30	15	
4	39	18.5	
5	45	22	
6	60	30	
7	76	37	
8	90	45	
9	110	55	
10	150	75	
11	180	90	F006
12	218	110	
13	260	132	
14	320	160	
15	370	185	
16	440	220	F007
17	500	250	
18	560	280	
19	630	315	F008
20	780	400	
21	920	470	
22	1000	530	
23	1200	630	

我们同时提供以下产品:

We also offer the following products:

低压软起动器、软起动柜

Low-voltage soft starter and soft start cabinet

低压变频器、变频控制柜

Low-voltage frequency converter and frequency conversion control cabinet

高压固态软起动装置

High-voltage solid-state soft starter

高低压防爆软起动产品

High and low voltage explosion-proof soft start products

高压变频调速装置

High voltage frequency conversion speed regulating device

高低压调功系列产品

High and low voltage power regulation products

有源滤波器、有源滤波柜

Active filter and active filter cabinet

高低压无功补偿装置

High and low voltage reactive power compensation device

自动化系统集成产品

Automation system integration products