

 ZR6005

电机软起动器使用手册

AC Semiconductor Motor Controllers and Starters User's Manual



湖北正集电气有限公司
HUBEI ZHENGJI ELECTRIC CO.LTD.

安全规范及注意事项

Safety regulations and precautions

1、本产品的错误使用可能造成产品永久故障，因此必须严格遵守本手册的操作规程、国家和行业的相关标准以及安全规范。

Improper use of this product may cause permanent product failure. Therefore, you must strictly comply with the operation procedures of this manual, relevant national and industry standards, and safety regulations.

2、安装、维护或指导安装、维护软起动装置应由有相关经验的专业技术人员负责。

Installation, maintenance or guidance The installation and maintenance of the soft starter shall be carried out by professional technicians with relevant experience.

3、软起动器内部存在危险电压，进行维护工作之前必须将软起动器从电源上完全切断。

There is dangerous voltage inside the soft starter. The soft starter must be completely cut off from the power supply before maintenance work.

4、使用设备前，必须保证电源和负载与本产品的参数相互匹配。

Before using the device. The power supply and load must be matched to the parameters of this product.

5、为了保证人身安全，本产品外壳在使用时必须良好接地。

In order to ensure personal safety, the outer casing of this product must be well grounded when in use.

6、禁止使用兆欧表等高压测试设备测试本产品的绝缘性能。

It is forbidden to test the insulation performance of this product by using high-voltage test equipment such as meg-ohmmeter.

7、将交流电源接至设备输出端将造成本产品的严重损坏。

Connecting the AC power to the output of the device will cause serious damage to the product.

8、禁止在软起动器输出侧接电力电容器。

It is forbidden to connect the power capacitor to the output side of the soft starter.

9、试图修复损坏的设备有可能造成设备的永久性损坏，请与供货商或本公司直接联系维修。

Trying to repair damaged equipment may cause permanent damage to the equipment. Please contact the supplier or the company for repair.

10、外接控制端子已有相应的电源配置，不应将有源的信号送入该端口，否则可能造成产品的不可修复性损坏。

The external control terminal has a corresponding power supply configuration. Active signals should not be sent to this port, as this may cause irreparable damage to the product.

11、本产品即使处在停止状态，输出侧仍然带有危险的电压，因此要安全的切断电源,必须在软起动器之前安装交流接触器、隔离开关或断路器等电器。

Even if the product is in a stopped state, the output side still carries dangerous voltage, so it is necessary to cut off the power supply safely. Appliances such as AC contactors, disconnectors or circuit breakers must be installed before the soft starter.

12、即使软起动器处在停止状态，也禁止检查电动机，一个意外的操作有可能使停止的电动机重新起动。

Even if the soft starter is in the stop state, it is forbidden to check the motor. An unexpected operation may restart the stopped motor.

13、操作设备前，请详细阅读产品随机附带的使用手册。

Please read the instruction manual supplied with the product before operating the equipment.

14、本手册只能应用于其配套的设备，本公司的产品将会不断升级和改良，恕不另行通知。使用者如需了解产品近期的最新技术数据请与本公司直接联系。

This manual can only be applied to its supporting equipment. The company's products will be continuously upgraded and improved. Without notice. Users should contact the company directly if they need to know the latest technical data of the product.

目录 contents

1 产品描述 product description	1
1.1 软起动机概述 Soft Starter Overview	1
1.2 性能特点 Performance characteristics	1
1.3 主要产品标准 Main product standards	1
1.4 产品型号说明 Product Model Description	2
1.5 标称电流 Nominal current	2
1.6 订货须知 Ordering Information	3
1.7 购入检查 purchase inspection	3
2 设备安装 device installation	4
2.1 安装布置 Installation and layout	4
2.2 控制电缆和端接 control cable and termination	4
2.3 通风和散热 ventilation and heat dissipation	4
3 通用技术参数 General technical parameters	6
4 线路连接 Line connection	7
4.1 软起动机主回路接线示意图 Soft starter main circuit wiring diagram	8
4.2 软起动机控制端子接线示意图 Soft starter control terminal wiring diagram	9
4.3 软起动机控制端子说明 soft starter control terminal description	8
4.4 控制电路布线 Control circuit wiring	9
5 控制面板与基本操作 Control panel and basic operations	10
5.1 操作盒和各功能按键 operation box and each function	10
5.2 基本操作 basic operations	10
5.3 参数设置及说明 parameter settings and description	12
5.4 设置注意事项 Settings Precautions	14
5.5 启动设置项说明 Startup Settings Description	15
6 运行使用 Running use	19
6.1 试运行检查及注意事项 Trial operation check and precautions	19
6.2 软起显示界面说明 Soft Start Display Interface Description	20
6.3 日常维护注意事项 Daily Maintenance Precautions	22
7 故障显示说明 Fault display description	23

7.1 故障显示及解决办法 Fault display and solution.....	23
8 热过载保护功能与说明 Thermal overload protection function and description	25
9 通讯功能与说明 Communication function and description	25
9.1 命令码及通讯数据描述 Command Code and Communication Data Description	26
9.2 通讯数据地址定义 Communication Data Address Definition	29
9.3 控制命令寄存器和软起动器状态寄存器说明 Control Command Registers and Soft Starter Status Registers Description.....	30
9.4 通讯数据结构举例 Example of a communication data structure.....	30
10 外形结构及尺寸图 Outline structure and dimension drawing.....	33
11 面板、操作盒拆卸及安装 Panel, operation box removal and installation	33
11.1 操作盒的拆卸 Disassembly of the operation box	34
11.2 操作盒在柜门上安装 The box is installed on the cabinet door.....	34
保修协议 Warranty agreement	35
保修卡 Warranty Card	36

1 产品描述 product description

1.1ZR6005系列软起动器概述 ZR6005 Soft Starter Overview

ZR6005系列软起动器是本公司为了简化现场用户的软起动柜成套工艺，降低成套工作量而研发及生产的一款高集成度产品。本产品将软起动器的起停控制，状态指示，设置操作等功能集成到一个可通过网线方便引出的液晶操作盒上实现，从而大大降低现场成套的工作量。用户只需将本产品连接于断路器及电机之间，便可实现电机的软起软停控制，同时实现对电机运行的全方位保护。

ZR6005 Soft starter is a highly integrated product developed and produced by our company to simplify the complete set of soft starter process for on-site users and reduce the workload. This product will start and stop the soft starter, status indication. The functions such as setting operation are integrated into a liquid crystal operation box that can be easily taken out through the network cable, thereby greatly reducing the workload of the field set. Users only need to connect this product between the circuit breaker and the motor to realize the soft start and soft stop control of the motor and realize the all-round protection of the motor operation.

1.2 性能特点 Performance characteristics

- 高清液晶显示，人机界面极为友好。

HD LCD display, the human-machine interface is extremely friendly.

- 操作盒通过延长线可直接安装于电气柜门，且操作盒具有电压电流实时同界面显示，同时具有三色状态显示灯。面板操作起停及复位，从而将软起动柜的成套工作量简化到最低。

The operation box can be directly installed in the electrical cabinet door through the extension cable, and the operation box has real-time display with voltage and current, and has a three-color status display lamp. The panel operation starts and stops and resets, thus simplifying the workload of the soft start cabinet to a minimum.

- 五种软起动模式可供选择，适用于工业领域多种负载需要。

Five soft-start modes are available for a wide range of load needs in the industrial sector.

- 完善的保护功能：热过载保护，过电流保护。缺相保护，三相不平衡，过压欠压保护，过热保护等。

Perfect protection function: thermal overload protection, over current protection. Phase loss protection, three-phase unbalance, over-voltage and under-voltage protection, overheat protection, etc.

- 完善的外围信号输出：一路旁路输出，一路故障继电器输出，两路可编程继电器输出。便于实现与其他设备的连锁控制，同时具有 4-20mA 模拟信号及 RS485 通讯接口(采用 MODBUSRTU 通讯协议)。可以通过上位机进入参数设置、操作及监测，实现高智能化控制。

Perfect peripheral signal output: one bypass operation, one fault relay output, two programmable relay outputs. It is easy to realize interlocking control with other equipment, and has 4-20mA analog signal and RS485 communication interface (using MODBUSRTU communication protocol). High-intelligence control can be realized by entering the parameter setting, operation and monitoring through the host computer.

- 全数字化设计，可通过修改多个相应参数来调整起动特性。

Fully digital design with adjustable start-up characteristics by modifying multiple corresponding parameters.

- 旁路运行，功耗近乎为零。且运行中无谐波输出。节能环保。

Bypass operation, power consumption is almost zero. And no harmonic output in operation. Energy saving and environmental protection.

1.3 主要产品标准 Main product standards

ZR6005系列软起动器全系列符合以下国际、国内产品标准：

ZR6005 Soft starters meet the following international and domestic product standards;

- IEC 60947-4-2: Low-voltage switchgear and controlgear' Part 4-2:

Contactors and motor-starters AC semiconductor motor controllers and starters;

- GB14048.6-2002: 低压开关设备和控制设备、接触器和电动机起动器、第二部分交流半导体电动机控制器和起动器；

GB14048.6-2002: Low voltage switchgear and control equipment, contactors and motor starters,

Part 2 AC semiconductor motor controllers and starters;

●JB/T 10251-2001：交流电动机电力电子软起动装置；

JB/T 10251-2001: AC motor power electronic soft starter;

●GB14048.1-2000：低压开关设备和控制设备总则；

GB14048.1-2000: General rules for low-voltage switchgear and control equipment;

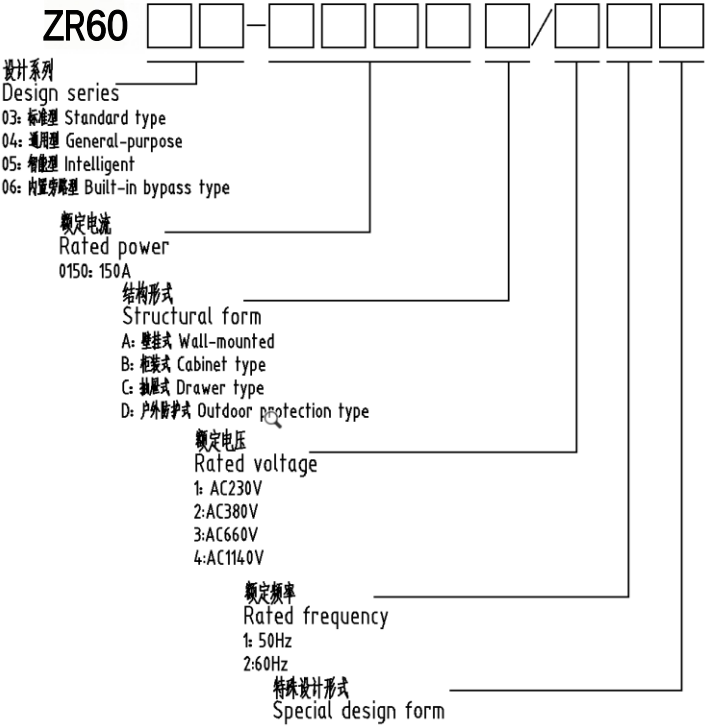
●GB3797-89：电控设备、第二部分装有电子器件的电控设备。

GB3797-89: electronic control equipment, the second part of the electronic control equipment equipped with electronic devices.

1.4 产品型号说明 Product Model Description

举例：ZR6005-0015A/21 表示 ZR6005系列软起动器、额定电流 15A、额定功率 7.5kW、A 表示壁挂式，2 表示额定电压 AC380V，1 表示频率为 50Hz。

For example: ZR6005-0015A/21 means ZR6005series soft starter, rated current 15A, rated power7.5kW,A stands for wall-mounted, 3 indicates the rated voltage AC380V, 1 indicates that the frequency is 50Hz.



1.5 标称电流 Nominal current

额定功率 rated power (KW)	额定电 流 Rated current (A)	选型举例 (以 380V、50H 为例) Selection example (380V, 50H as an example)	额定功率 rated power (KW)	额定电 流 Rated current (A)	选型举例 (以 380V、50H 为例) Selection example (380V, 50H as an example)
AC380V (400V)			AC380V (400V)		
7.5	15	ZR6005-0015A/21	110	220	ZR6005-0220A/21
11	22	ZR6005-0022A/21	132	265	ZR6005-0265A/21
15	35	ZR6005-0035A/21	160	320	ZR6005-0320A/21
18.5	40	ZR6005-0040A/21	185	370	ZR6005-0370A/21
22	50	ZR6005-0050A/21	200	400	ZR6005-0400A/21
30	65	ZR6005-0065A/21	220	440	ZR6005-0440A/21
37	75	ZR6005-0075A/21	250	500	ZR6005-0500A/21
45	90	ZR6005-0090A/21	280	560	ZR6005-0560A/21
55	110	ZR6005-0110A/21	315	630	ZR6005-0630A/21
75	150	ZR6005-0150A/21	355	710	ZR6005-0710A/21
90	180	ZR6005-0180A/21	400	800	ZR6005-0800A/21

1.6 订货须知 Ordering Information

用户在订货时，应务必在采购合同中注明所需产品的准确型号。

When ordering the product, the user must indicate the exact model of the required product in the purchase counter.

产品型号中的前三项必须在采购合同中注明，后三项可不注明，不注明时，我公司将以默认参数供货，即：电压等级 AC380V，额定频率 50Hz，非特殊设计类型。

The first three items in the product model must be indicated in the purchase contract. The last three items may not be specified. If not specified, our company will supply the default parameters, namely: voltage level AC380V, rated frequency 50Hz. Non-special design type.

本手册中所注明数据主要针对常规产品，对于非常规产品说明，请参见其随机说明书或与我公司联系咨询。

The data indicated in this manual is mainly for regular products. For unconventional product descriptions, please refer to their random instructions or contact us.

用户如有特殊的应用或功能需求，可与我公司直接联系商榷。

If you have special application or functional requirements, you can contact us directly.

1.7 购入检查 purchase inspection

软起动器包装内应含：软起动器一台、用户手册一本、保修凭证一份(附在用户手册后)、产品合格证一份。用户收到软起动器后，应当及时开箱检查，查看货物是否缺损、装箱物品是否齐全，同时仔细核对软起动器上所贴产品标签，确认所收货物型号与订购产品是否一致。如有问题，请尽快与供货商联系。

The soft starter package should contain one soft starter, one user manual, one warranty certificate (attached to the user manual), and a product certificate. After the user receives the soft starter. The box should be checked in time to check whether the goods are defective and the packing items are complete. At the same time, carefully check the label of the product attached to the soft starter to confirm whether the type of the goods received is consistent with the ordered product. If you have any questions, please

contact the supplier as soon as possible.

保修凭证应妥善保管，产品标签应保持干净和可识别，以作为维修服务时的凭证。

Warranty vouchers should be kept in a safe place and the product label should be kept clean and identifiable as a proof of repair service.

2 设备安装 device installation

2.1 安装布置 Installation and layout

● 安装方式：柜内立式安装。

Installation method: vertical installation inside the cabinet.

● 进出线方式：上 6 进线，下 3 出线。

In and out line mode: upper 6 incoming line, lower 3 outgoing line.

● 垂直倾斜度：<5%

Vertical tilt: <5%

2.2 控制电缆和端接 control cable and termination

外接控制端子的位置在软起动器下侧，其上印有端子名称和标志。连接控制电缆时需要先放松接线端子上的紧固螺钉，然后将控制电缆头分别插入到对应的控制端子接线孔内，拧紧紧固螺钉，接好线后应用手轻轻牵动控制电缆，检验是否连接牢固，并采用绝缘保护措施，防止线头与机壳短路。

The position of the external control terminal is on the underside of the soft starter with the terminal name and logo printed on it. When connecting the control cable, you need to loosen the fastening screws on the terminal block, then insert the control cable head into the corresponding control terminal wiring hole, tighten the fastening screw, and after connecting the cable, gently touch the control cable to check whether it is connected. It is sturdy and protected by insulation to prevent short circuit between the wire and the casing.

控制电缆连接端头应使用剥线钳将电缆绝缘保护层适当剥掉，露出约 5mm 长度的线芯。使用针形冷压接线端头则更加适宜。

The cable end of the control cable should be stripped off with a wire stripper to expose a wire core of approximately 5 mm length. It is more appropriate to use a pin-shaped cold-pressed terminal.

注意不要将电缆绝缘保护层压于端子接线孔内，否则将造成接线失效。

Be careful not to laminate the cable insulation protection into the terminal wiring holes, otherwise the wiring will be ineffective.

外接控制端子最大接线能力：2.5mm² (12 AWG)。

Maximum connection capacity of external control terminals: 2.5mm² (12 AWG).

接控制端子最大紧固力矩：0.4N·m(3.5lb·ft)。

Maximum tightening torque of the control terminal: 0.4N·m (3.5lb·ft).

2.3 通风和散热 ventilation and heat dissipation

安装方向与距离：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，并在设备四周留有足够的散热空间。

Installation direction and distance: In order to ensure that the soft starter has good ventilation and heat dissipation conditions during use, the soft starter should be installed vertically and have sufficient heat dissipation space around the device.

为了保证软起动器在使用中具有良好的通风和散热条件，一定要在柜上设置足够的进风口和出风口。各电气元件在柜内的布置不要密度太高，且散热功率大的元器件应置于柜内上部空间，在软起动器的下部不要放置发热功率大的器件。

In order to ensure that the soft starter has good ventilation and heat dissipation conditions in use, it is necessary to set up sufficient air inlet and outlet on the cabinet. The arrangement of each electrical component in the cabinet should not be too high, and the components with large heat dissipation power should be placed in the upper space of the cabinet. Do not place devices with large heating power in the lower part of the soft starter.

一台电气柜内安装有多台软起动器或其它发热元件时，应尽量使它们并排安装或前后安装(图 2.1)。如两台在线运行的软起动器必须上下安装时，应尽量在它们之间装设导流隔板(图 2.2)。

When multiple soft starters or other heating elements are installed in an electrical cabinet, they should be installed side by side or front and rear (Figure 2.1). If two soft-starters for online motion must be installed up and down, a baffle should be installed between them (Fig. 2.2).

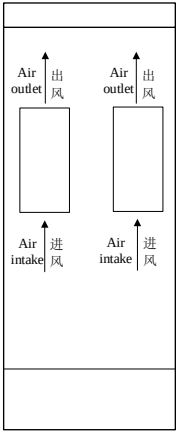


图2.1 并排安装

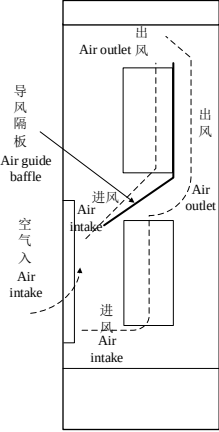


图2.2 上下安装

3 通用技术参数 General technical parameters

适用电机：交流鼠笼电机。转子串电阻后也可用于交流绕线式电机，但起动完成后需将电阻短路。

Applicable motor: AC squirrel cage motor. The rotor string resistor can also be used for AC winding motors, but the resistors must be shorted after starting.

型式：交流半导体电动机控制器和起动器型式 1。

Type: AC semiconductor motor controller and starter type 1.

冷却方式：自然风冷或强制风冷。Cooling method: natural air cooling or forced air cooling.

防护等级：IP20。

Protection level: IP20.

额定绝缘电压：AC690V(AC380V 或 AC660V 等级)。

Rated insulation voltage: AC690V (AC380V or AC660V rating).

工作制：长期工作制、短期或重复短期工作制。

Work system: long-term work system, short-term or repeated short-term work system.

周期工作制：负载因数 $F=40\%$ ，每小时操作循环次数 $S=25$ 。

Periodic working system: load factor $F=40\%$, the number of operating cycles per hour is $S=25$.

反向峰值电压：AC380V'：等级为 1600V、AC660V~等级为 2500V。

Reverse peak voltage: AC380V': grade is 1600V, AC660V~ grade is 2500V.

结构材料：壳体部分为冷轧钢板，控制单元为工程塑料。

Structural material: The shell part is cold-rolled steel plate, and the control unit is engineering plastic.

导体：主电路部分为铜母线，控制部分为 BVR 铜芯聚氯乙烯绝缘电缆。

Conductor: The main circuit part is a copper bus, and the control circuit part is BVR copper core PVC insulated cable.

控制电路能耗： $<15W$ 。

Control circuit energy consumption: $<15W$.

效率： $>98\%$ 。

Efficiency: $>98\%$.

海拔： <2000 米，超过 2000 米应降低功率使用。

Altitude: <2000 meters, more than 2000 meters should be reduced power use.

环境温度：工作温度 $-25^{\circ}\text{C} \sim +40^{\circ}\text{C}$ 、存储温度 $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ 。

Ambient temperature: working temperature is $-25^{\circ}\text{C} \sim +40^{\circ}\text{C}$, storage temperature is $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$.

相对湿度： $<50\% \text{RH}(40^{\circ}\text{C})$ ； $<95\% \text{RH}(+20^{\circ}\text{C} \pm 5^{\circ}\text{C})$ ，无凝露

Relative humidity: $<50\% \text{RH}(40^{\circ}\text{C})$ ； $<95\% \text{RH}(+20^{\circ}\text{C} \pm 5^{\circ}\text{C})$, no condensation

安装环境：无易燃、易爆、腐蚀性气体、无导电尘埃，震动小于 $0.5g$ 。

Installation environment: no flammable, explosive, corrosive gas, no conductive dust, vibration less than $0.5g$.

污染程度：3

Pollution degree: 3

使用类别：AC-53b

Use category: AC-53b

额定冲击耐受电压： $2500V$ (AC380V 和 660V 等级)。

Rated impulse withstand voltage: $2500V$ (AC380V and 660V rating).

短路保护电器：低压断路器、协调配合类型 1

Short circuit protection appliance: low voltage circuit breaker, coordination type 1

过电流特性： $61e / 8S$

Over-current characteristics: $61e/8S$

4 线路连接 Line connection

ZR6005系列电机软起动器有两类接线:

There are two types of wiring for the ZR6005 series motor soft starter:

A 主回路接线: 包括三相电源输入和输出主电机接线以及断路器接线(如图 4.1)。

A Main circuit wiring: including three-phase power input and output main motor wiring and circuit breaker wiring (Figure 4.1).

B 控制端子接线: 有 14 个小型接线端子引出, 包括继电器信号输出接口, 起动开关控制线接口, 模拟 4—20mA 和 RS485 输出信号线接口(如图 4.2)。

B Control terminal wiring: There are 14 small terminal terminals that come out, including relay signal output interface, start switch control line interface, analog 4-20mA and RS485 output signal line interface (Figure 4.2).

4.1 软起动器主回路接线示意图 Soft starter main circuit wiring diagram

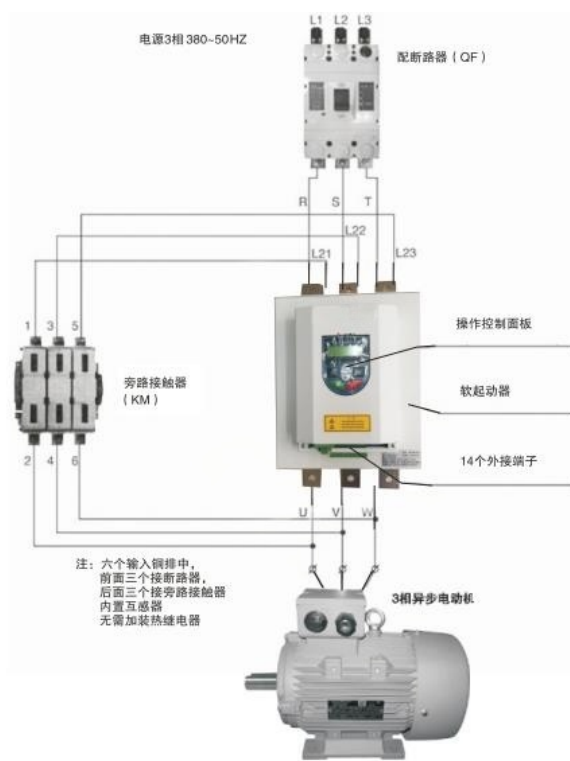


图4.1

4.2 软起动器控制端子接线示意图 Soft starter control terminal wiring diagram

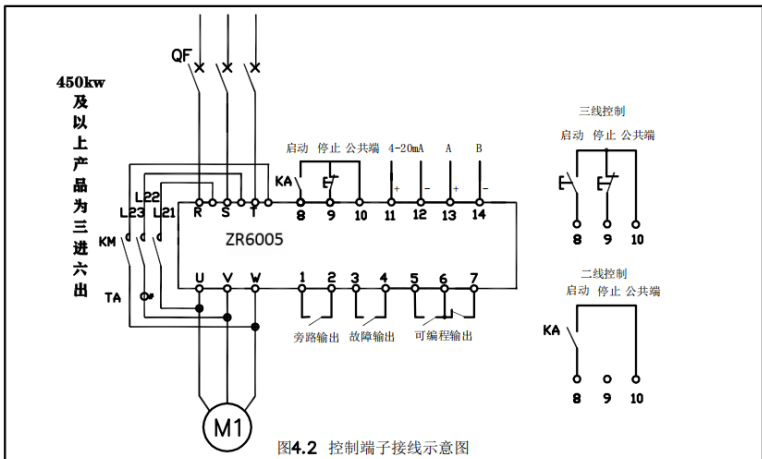
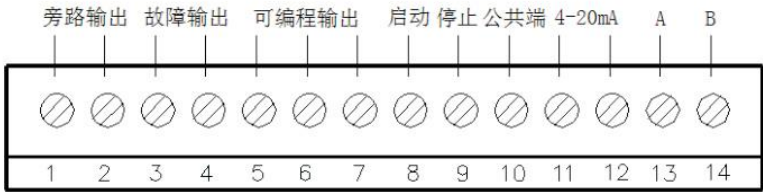


图4.2 控制端子接线示意图

图 4.2 控制端子接线示意图
Figure 4.2 Schematic diagram of control terminal wiring

4.3 软起动器控制端子说明 soft starter control terminal description



端子 1、2 为旁路输出。接点形式为无源常开接点，接点的电气容量为 8A250VAC。当软起动器旁路运行时此接点闭合。

Terminals 1 and 2 are bypass output terminals. The form of contact is passive normally open contact, and the electrical capacity of the contact is 8A250VAC. This contact closes when the soft starter bypass is running.

端子 3、4 为故障输出端子。接点形式为无源常开接点，接点的电气容量为 8A250VAC。当软起动器报出故障时接点闭合。

Terminals 3 and 4 are fault output terminals. The form of contact is passive normally open contact, and the electrical capacity of the contact is 8A250VAC. When a fault is reported as the soft starter, the contact is closed.

端子 5、6、7 为可编程输出端子。接点形式 5、6 为无源常开接点，6、7 为无源常闭接点，接点的电气容量为 8A250VAC。接点状态切换可通过参数界面进行设置，当设置的状态有效时接点切换。

Terminals 5、6 and 7 are programmable output terminals. 5、6 are passive normally open contact, 6、7 are passive normally close contact, and the electrical capacity of the contact is 8A250VAC. The contact state can be set via the parameter interface, when the set state is valid, the contact will switch.

端子 8 为起动端子，当端子 10 和端子 8 接通，软起动器起动（不必自锁）。

Terminal 8 is the starting terminal, when terminal 10 and terminal 8 are connected, the soft starter starts (No self-locking is required).

端子 9 为停机端子，当端子 10 和 9 断开瞬间，软起动器停机（不必自锁）。

Terminal STOP is the stop terminal, when the terminal COM and STOP are disconnected, the soft starter stops (No self-locking is required).

端子 10 为外部控制信号的公共端。

The 10 terminal is the common end of the external control signal.

以上起停控制方式为三线控制方式。二线控制方式参见接线示意图 4.2：端子 8 和端子 10 闭合并保持时为起动信号，断开时为停止信号，端子 9 不接线。

The above start-stop control mode is a three-wire control mode. For the two-wire control mode, see Figure 4.2: Terminals 8 and 10 are started when closed and held, and stopped when they are disconnected, terminal 9 is not wired.

端子 8、9、10 为有源端子，所以外接电路不得引入电源。

Terminals 8, 9 and 10 are active terminals, therefore, the external circuit shall not introduce a power supply.

端子 11 和 12 为 4-20mA 直流模拟信号输出端子。输出模拟量对应 0-2 倍电机额定电流。最大负载电阻为 300Ω。

Terminals 11 and 12 are 4-20mA DC analog signal output terminals. The analog output corresponds to 0-2 times the rated current of the motor. The maximum load resistance is 300 Ω.

端子 13 为 RS485 通讯正极 A。端子 14 为 RS485 通讯负极 B。

Terminal 13 is RS485 communication positive A. Terminal 14 is RS485 communication negative pole B.

4.4 控制电路布线 Control circuit wiring

若软起动器使用现场电磁干扰比较严重，为了防止设备由于受到电磁干扰而工作不正常，控制电路布线时应采取如下一些措施：

If the on-site electromagnetic interference of the soft starter is serious, in order to prevent the equipment from working abnormally due to electromagnetic interference, the following measures should be taken when controlling the circuit wiring;

控制电缆较长时，建议使用屏蔽电缆，电缆的屏蔽层应单端接地；

When the control cable is long, it is recommended to use a shielded cable. The shield of the cable should be grounded at one end.

模拟量与数字量信号电缆分开走线

Analog and digital signal cables are routed separately;

必要时，所有信号电缆均应置于钢管或电缆槽内走线；

All signal cables should be placed in the steel pipe or cable trough if necessary;

信号电缆与动力设备之间应具有尽可能大的隔离距离；

There should be as much isolation distance as possible between the signal cable and the power unit;

对系统提供一个单独的接地回路；

Provide a separate ground loop to the system;

对有屏蔽层均在变送器端接地；

The shielded layer is grounded at the transmitter end;

尽量减少或不设中间端子板及连接点；

Minimize or eliminate intermediate terminal boards and connection points;

管道与电缆槽应可靠接地，并保证整个长度上连续接地。

Pipes and cable ducts should be reliably grounded and grounded continuously over the entire length.

5 控制面板与基本操作

Control panel and basic operations

5.1 操作盒和各功能按键 operation box and each function button



5.2 基本操作 basic operations

ZR6005系列软起动器采用 122x32 点阵大屏幕夜晶显示模块和六个轻触按键组成操作显示盒，中文/英文显示，可实现软起动器的起、停操作、参数设置、修改、故障查询、故障复位等操作。

ZR6005 series soft starter adopts 122x32 dot matrix large screen night crystal display module and six touch buttons to form the operation display box. Chinese/English display can realize the start and stop operation of soft starter, parameter setting, modification, fault inquiry and fault reset. Wait for the operation.

5.2.1 单键操作 single button operation

起动键：按此键使软起起动。

Start button: Press this button to start the soft start.

停止/复位键：①按此键使运行的软起停止运行。

Stop/Reset button: Press this button to stop the soft start of the operation.

②故障状态下可在故障解除后按此键复位故障。（注：上电缺相故障复位时按此键无效，须解除故障后重新上电。）

In the fault state, press this button to reset the fault after the fault is cleared. (Note: Pressing this button during reset of power failure phase failure is invalid, and must be re-powered after the fault is removed.)

设置键：在准备或故障状态下，按设置键可进入参数菜单，再次按此键可使所显示的参数进入修改编辑状态。

Setting button: In the preparation or fault state, press the setting button to enter the parameter menu. Press this button again to enter the modified editing state.

保存键：参数编辑后，按此键可保存编辑后的参数并退出编辑状态。

Save button: After the parameter is edited, press this button to save the edited parameter and exit the edit state.

▲键，▼键：①在参数菜单界面，可滚动翻阅参数菜单。

▲ key, ▼ key:

Function 1: In the parameter menu interface, you can scroll through the parameter menu.

②在参数编辑状态下，按▲键或▼键，可修改当前功能参数。

Function 2: In the parameter editing state, press ▲ or ▼ to modify the current function parameters.

③在故障状态下，按▲键可翻阅前一次及前2次故障情况。

Function 3: Under the fault state. Press the ▲ key to scroll through the previous and previous 2 fault conditions.

5.2.2 复合键操作(操作时两键同时按下) Composite key operation (two keys are pressed at the same time during operation)

在准备状态下 In the ready state

保存+停止复位：可翻阅历史故障情况。

Save + stop reset: you can read the historical fault condition.

在运行状态下 in the running state

起动+▲：校准运行电流，使显示电流增加。

Start + ▲: Calibrate the operating current so that the display current increases.

起动+▼：校准运行电流，使显示电流减小。

Start + ▼: Calibrate the operating current so that the display current decreases.

在历史故障界面下，保存+停止复位：可退出历史故障界面，返回到准备状态。

Under the historical fault interface, Save + Stop Reset: Exit the history fault interface and return to the ready state.

5.3 参数设置及说明 parameter settings and description

序号 No	界面显示 Interface display	设置范围 Setting range	出厂值 Factory default	单位 unit
1	控制方式 Operator way (OPW)	1 键盘；2 外控；3 键盘+外控；4 通讯。 1 keyboard (KEY)，2 External terminal control (EXT)，3 keyboard + External terminal control (KEY+EXT)，4 communication (COMM)	外控 External terminal control (EXT)	
2	软起动器容量 Soft starter capacity (SCA)	5-1500	额定值 Rating	A
3	电机额定电流 The rated current of the motor (MIE)	5-1500	等同于软起动器，产品到现场后输入电机额定电流 Equivalent to the soft starter, after the product arrives at the site, the rated current of the motor is entered	A
4	起动方式 start mode (STAM)	1、电压斜坡起动；2、电流限流起动；3、点动方式；4 电流斜坡；5 突跳+斜坡起动。 1,Ramp start (VRAM) 2,Current limiting start (CLIM);3 jog mode (JOG);4 current ramp (CRAM); 5. Voltage ramp start with Jump (VRJU)	限流起动 Current limiting start (CLIM)	
5	停车方式 stop mode (STOM)	1 自由停机；2 软停机 1 free stop (FRE) 2 soft stop (SOF)	自由停机 Free stop (FRE)	
6	电压斜坡起动电压 Voltage ramp starting voltage (VRAM)	0-80	30	%
7	电压斜坡起动时间 Voltage ramp start time (CRAM)	1-120	30	S
8	电流限流起动倍数 Current limit starting multiple (CLM)	50-400	400	%
9	点动电压 Jog voltage (VJO)	0-80	30	%
10	软停时间 Soft stop time (SDT)	0-60	0	S
11	突跳电压	0-80	0	%

	Pulse collision jump voltage (PJV)			
12	突跳时间 Pulse conflict skip time (PJT)	0-2000	0	ms
13	电流斜坡限制电 流 Current ramp limiting current (CRLC)	10-400	300	%
14	电流斜坡起动时 间 Current ramp start time (CRT)	0-120	30	S
15	起动过流倍数 Start over-current multiple (SOC)	400-600	400	%
16	运行过流倍数 Running over- current multiple (ROC)	200-400	200	%
17	起动过载曲线 Starting overload curve (SOL)	1-6	4	级
18	运行过载曲线 Running overload curve (ROL)	1-6	2	级
19	电流不平衡度 Current imbalance (CUB)	5-150	50	%
20	过压值 Over-voltage value (OVV)	380-460	440	V
21	欠压值 Under-voltage (UDV)	310-380	320	V
22	运行方式 Operation mode (RMD)	1: 旁路后, 继续触发晶闸管,2 旁路 后, 关闭触发晶闸管 1.After bypassing, continue to trigger the thyristor 2.After bypass, turn off the trigger thyristor	2	

23	可编程继电器 Programmable relay (REL)	1 准备有效; 2 故障有效; 3 起动有效; 4、运行有效; 5、停机有效; 0 无效。 1 Preparation is valid (PRE) 2 fault is valid (FAL) 3 Start is valid (STU) 4.Operation is valid (RUN) 5. Stop is valid; 0 is invalid (DOT; 0 VOI)	0 无效 0 is invalid.	
24	电流校准值 Current calibration value (CCV)	5-300	范围内不定 Indefinite in scope	%
25	电压校准值 Voltage calibration value (VCV)	5-300	范围内不定 Indefinite in scope	%
26	从机地址 Slave address (SLA)	1-63	1	
27	波特率 Baud rate (BAD)	1: 1200 2: 2400 3: 4800 4: 9600 5: 19200	4: 9600	b/s

5.4 设置注意事项 Settings Precautions

每种起动方式都有相关联的起动参数，当设置为其中一种起动方式时，只有与其相关的参数在起动过程中有效。如：

Each startup mode has an associated startup parameter. When set to one of the startup modes, only the parameters associated with it are valid during the startup process. Such as:

和“电压斜坡起动”相关的参数：斜坡起动初始电压，电压斜坡起动时间。

Parameters related to "voltage ramp start": ramp start initial voltage, voltage ramp start time.

和“电流限流起动”相关的参数：限流起动限流倍数。

The parameter related to "current limiting start": current limiting starting current limiting multiple.

“电流斜坡起动”相关的参数：电流斜坡起动时间，电流斜坡限流倍数。

Parameters related to "current ramp start": current ramp start time, current ramp current limit.

和“突跳+电压斜坡起动”相关的参数：电压斜坡初始电压，电压斜坡起动时间，脉冲突跳电压，脉冲突跳时间。

Parameters related to "bump + voltage ramp start": voltage ramp initial voltage, voltage ramp start time, pulse kick voltage, pulse kick time.

和“点动”相关的参数：斜坡起动初始电压。（注：点动试车时，按起动键持续点动，松开起动键停止）。

Parameters related to "jog": ramp start initial voltage. (Note: When jogging the test, press the start button to continue jogging, release the start button to stop).

和“软停车”相关的参数：软停时间，运行方式。（注：需要软停车时必须把运行方式设为“旁路后，继续触发晶闸管。”）

Parameters related to "soft stop": soft stop time, operation mode. (Note: When soft stop is required, the operation mode must be set to "Bypass, continue to trigger the thyristor.")

1、控制模式中当设置为键盘+外控模式时，二次线端子必须正确接线，否则会导致键盘或外控起停无效。

1. When the control mode is set to keyboard + external control mode, the secondary line terminal must be correctly wired, otherwise the keyboard or external control start and stop will be invalid.

2、设置中修改后的参数只有保存成功才能有效，未保存的参数使用无效或者会在重新

上电后丢失。

2. The modified parameters in the settings can only be valid if the save is successful. The unsaved parameters are invalid or will be lost after power-on.

3、设置状态下启动按键无效，运行状态下设置按键无效。

3. The start button is invalid in the setting state, and the setting button is invalid in the running state.

5.5 启动设置项说明 Startup Settings Description

5.5.1 启动方式 Starting method

ZR6005系列软起动器共有以下5种启动方式，用户可根据自己的负载情况进行选择。

ZR6005 series soft starters have the following five starting modes, and users can choose according to their own load conditions.

- 电压斜坡启动 Voltage ramp start
- 电流限流动 Current limit flow
- 电流斜坡启动 Current ramp start
- 点动 Jog
- 脉冲突跳+电压斜坡启动 Pulse kick + voltage ramp start

5.5.2 电压斜坡启动 Voltage ramp start

启动后，软起动器输出电压，快速升至“斜坡启动初始电压”值 U_1 ，然后根据“电压斜坡启动时间”逐步增加输出电压，直到启动完成，如图 5-1。

After starting, the soft starter output voltage quickly rises to the “ramp start initial voltage” value U_1 , and then gradually increases the output voltage according to the “voltage ramp start time” until the start is completed, as shown in Figure 5-1.

电压斜坡启动方式适用于大惯性负载，或对启动电流要求不严，而对启动平稳性要求较高的场合。这种启动方式，可大大降低启动冲击及机械应力。初始电压 U_1 值越大，启动初始转矩越大，但启动瞬间冲击也越大，启动过程的长短和启动时间设定值及负载的轻重有关，和限流倍数无效。

The voltage ramp starting method is suitable for large inertia loads, or where the starting current requirements are not strict, and the requirements for starting stability are high. This starting method can greatly reduce the starting impact and mechanical stress. The larger the initial voltage U_1 value is, the larger the initial starting torque is, but the larger the starting moment is, the length of the starting process is related to the starting time setting value and the weight of the load, and the current limiting multiple is invalid.

和“电压斜坡启动”相关的参数：

Parameters related to "voltage ramp start":

斜坡启动初始电压 (U_1) : 0%~80%

Ramp start initial voltage (U_1): 0% to 80%

电压斜坡启动时间 (t) : 1~120s

Voltage ramp start time (t): 1 ~ 120s

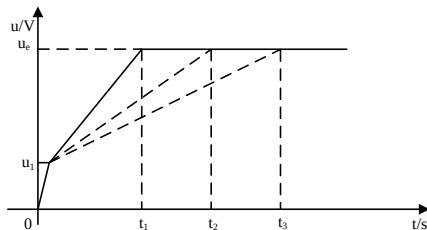


图 5—1
Figure 5-1

5.5.3 电流限流起动 Current limit starting

起动后，电机电流快速升至所设定的电流限流值 I_m ，并保持输出电流不大于该值，使电动机逐渐加速，电压逐渐升高，当电动机接近额定转速时，电机电流迅速下降至额定电流 I_e ，完成起动过程，如图 5-2。

After starting, the motor current quickly rises to the set current limit value I_m , and keeps the output current not greater than this value, so that the motor gradually accelerates and the voltage gradually rises. When the motor approaches the rated speed, the motor current drops rapidly to the rated value. The current I_e completes the starting process, as shown in Figure 5-2.

限流起动方式一般用在对起动电流有严格要求的场合，特别是电网容量小，要限制起动容量时，可根据要求设定限流倍数，一般在 2.5—3 倍之间，设定过小也会造成不能正常起动。采用限流起动时，起动时间和限流倍数大小有关，限流倍数越大，起动时间越短，反之则越长。

The current limiting starting mode is generally used in places where the starting current is strictly required, especially when the power grid capacity is small. When the starting capacity is limited, the current limiting multiple can be set according to requirements, generally between 2.5 and 3 times, and the setting is too small. It will also cause it to start normally. When starting current limiting, the starting time is related to the current limiting multiple. The larger the current limiting multiple, the shorter the starting time, and vice versa.

和“电流限流起动”相关的参数：

Parameters related to “current limit start”:

限流起动限流倍数(I_m): 20%~400%

Current limiting starting current limit (I_m): 20% to 400%

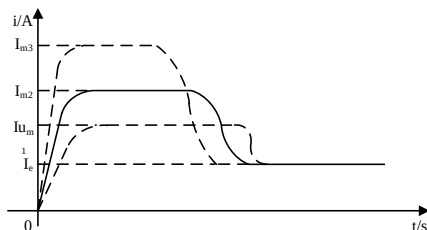


图 5—2
Figure 5-2

5.5.4 电流斜坡起动 Current ramp start

电动机起动后，起动电流设定的电流斜坡起动时间逐步上升直至起动完成；当起动电流达到所设定的电流斜坡限流倍数，则电流保持不变，直至起动完成，如图 5—4。

After the motor is started, the starting current set current ramp start time is gradually increased until the start is completed; when the starting current reaches the set current ramp current limit multiple, the current remains unchanged until the start is completed, as shown in Figure 5.4.

电流斜坡起动一般用于提速要求较快的负载或同步转速较高的电机。

Current ramp start is generally used for speed-increasing loads or motors with higher synchronous speeds.

和“电流斜坡起动”相关的参数：

Parameters related to “current ramp start”:

电流斜坡起动时间 (t): 1~120s

Current ramp start time (t): 1 ~ 120s

电流斜坡限流倍数 (I_m): 20%~400%

Current ramp current limit (I_m): 20% to 400%

5.5.5 突跳+电压斜坡起动 kick + voltage ramp start

对某些静态阻力较大的负载，在起动瞬间需要一个较大的力矩，才能正常起动，可选择

这种起动模式。起动时，软起动器瞬间输出一个较高的电压(突跳电压及时间可设置)，使电机转动，然后再按电压斜坡起动方式起动，直至起动完成，如图 5—5。

For some loads with large static resistance, a large torque is needed at the moment of starting to start normally. This starting mode can be selected. When starting, the soft starter instantaneously outputs a higher voltage (bump voltage and time can be set), so that the motor rotates, and then starts according to the voltage ramp start mode until the start is completed, as shown in Figure 5-5.

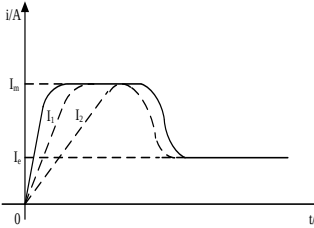


图 5-4
Figure 5-4

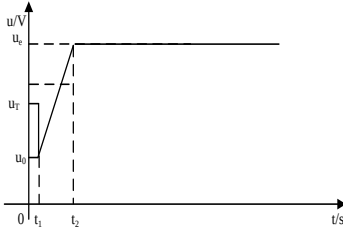


图 5-5
Figure 5-5

这种起动方式主要用于静态阻力较大的负载。使用此方式前，应优先考虑非突跳方式起动，以减少不必要的大电流冲击电网。

This starting method is mainly used for loads with high static resistance. Prior to using this method, priority should be given to non-jumping mode startup to reduce unnecessary high currents from hitting the grid.

和“突跳+电压斜坡起动”相关的参数：

Parameters related to “Jump + voltage ramp start”:

电压斜坡初始电压(U1): 0%—60%

Voltage ramp initial voltage (U1): 0% to 60%

电压斜坡起动时间(t 2): 1~1.20s

Voltage ramp start time (t 2): 1 ~ 1.20s

脉冲突跳电压(UT): 0%~2000%

Pulse kick voltage (UT): 0% ~ 2000%

脉冲突跳时间(t 1): (0—500)ms

Pulse kick time (t 1): (0-500) ms

5.5.6 点动

点动时，软起动器的输出电压迅速增加至初始电压 U1 并保持不变，改变 u1 的设定值，可改变电动机点动时的输出转矩，该功能对试车或某些负载的定位非常方便，如图 5—6。

When the jog is jogged, the output voltage of the soft starter rapidly increases to the initial voltage U1 and remains unchanged. Changing the set value of u1 can change the output torque when the motor is jogging. This function is for the test or some test. The positioning of these loads is very convenient, as shown in Figure 5-6.

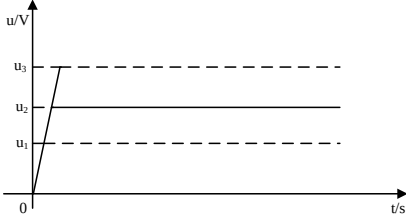


图 5-6
Figure 5-6

5.5.7 停车方式 Parking mode

自由停机 Free stop

当接到停机指令后，软起动机控制旁路接触器断开，同时，封锁主电路晶闸管的输出电压、电动机依惯性逐渐停机。

When the stop command is received, the soft starter controls the bypass contactor to open, and at the same time, the output voltage of the main circuit thyristor is blocked, and the motor is gradually stopped according to the inertia.

软停机 Soft stop

在这种停机模式下，电动机供电由旁路接触器切换到主电路晶闸管，控制输出电压逐渐降低，直至电机平稳停机。

软停时间：1s~60s

In this shutdown mode, the motor power is switched from the bypass contactor to the main circuit thyristor, and the control output voltage is gradually reduced until the motor stops smoothly.

Soft stop time: 1s ~ 60s

6 运行使用 Running use

6.1 试运行检查及注意事项 Trial operation check and precautions

为了安全运行在通电前应按下列条款检查:

For safe operation, check the following terms before powering up:

软起动功率是否与电机功率相符?可进入“运行参数设定”中“电机额定电流”项,按电机铭牌电流值进行设定。

Does the soft start power match the motor power? You can enter the “Motor rated current” item in the “Operation parameter setting” and set it according to the motor nameplate current value.

电动机绝缘是否符合要求?

Does the motor insulation meet the requirements?

主电路输入及输出接线是否正确?

Is the main circuit input and output wiring correct?

所有接线螺母是否拧紧?

Are all wiring nuts tightened?

检查三相进线电源是否正常?

Check whether the three-phase incoming power supply is normal?

试起动时如果电机的起动状态不理想,可对电机的起动模式进行适当的修改。

If the starting state of the motor is not ideal during the test start, the motor's starting mode can be modified as appropriate.

如果电机的起动力矩不够,可提高起始电压(电压模式时)或增大限流值(限流模式时),提高电机的起动力矩。

If the starting torque of the motor is not enough, increase the starting voltage (in voltage mode) or increase the current limit value (in current limiting mode) to increase the starting torque of the motor.

软起动通电后,切勿打开上盖,以防触电。

Do not open the top cover after the soft start is energized to prevent electric shock.

在通电试运行过程中,若发现异常现象,如异常声音、冒烟或异味等,应迅速切断电源并查明原因。

If abnormal phenomena such as abnormal sound, smoke or odor are found during the power-on test run, the power should be turned off quickly and the cause should be ascertained.

强电磁干扰或网线松动均会造成显示屏花屏,重新上电或插紧网线可避免此现象;运行过程中的花屏不影响正常使用,可在停机后再行检查。

Strong electromagnetic interference or loose network cable will cause the display to screen. Re-powering or plugging in the network cable can avoid this phenomenon; the flower screen during operation does not affect normal use, and can be checked after shutdown.

若上电后或起动时,液晶屏显示故障状态,则对应故障信息表查找原因。

If the LCD displays a fault status after power-on or startup, find the cause in the corresponding fault information table.

按停止键或外控停止按钮可对故障状态复位。

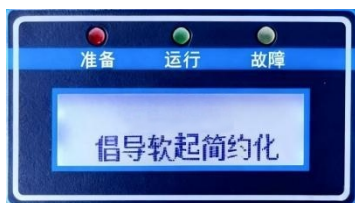
Press the stop button or the external control stop button to reset the fault status.

在软起动器输出未接电机的情况下通电,则 U.V.W 三相有感应电压,属于正常现象,接上电机后此感应电压即可消失。

If the soft starter output is not connected to the motor, then U.V.W three-phase has induced voltage, which is a normal phenomenon. After the motor is connected, the induced voltage disappears.

6.2 软起显示界面说明 Description of soft start display interface

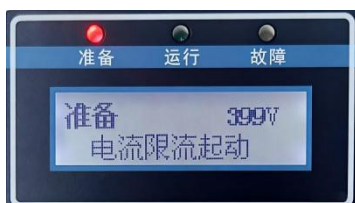
●上电初始界面



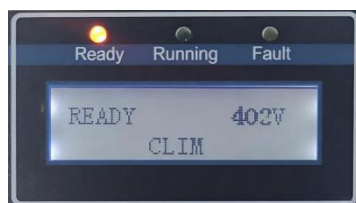
●Power-on initial interface



● 准备状态



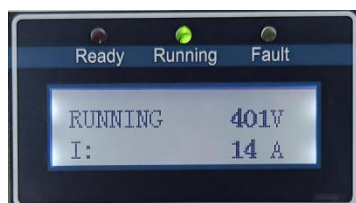
●Readiness



● 运行状态



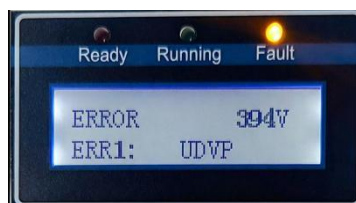
●Operating state



● 故障状态



●Fault status



●启动状态



●Startup status



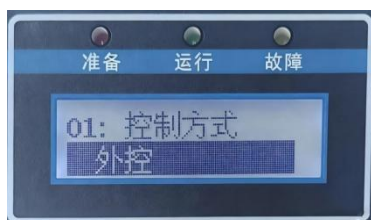
●软停车状态



●Soft stop status



●编辑状态中设置界面



●Setting interface in editing status



●编辑状态中保存界面



●Saving interface in editing status



6.3 日常维护注意事项 Daily Maintenance Precautions

感应电压: 内置旁路型软起动器在输入端接通电源后, 在负载开路时, 即使在停止状态, 其输出端会有感应电压, 这是由晶闸管的漏电流造成, 属于正常现象; 接上电机后此感应电压即可消失, 因此, 使用时应注意触电危险。

Inductive voltage: Built-in contactor soft starter is connected to the power supply. When the load is open, even if it is in the stop state, there will be induced voltage at the output. This is caused by the leakage current of the thyristor. It is normal; This induced voltage disappears after the motor, so be careful of the risk of electric shock when using it.

无功补偿: 在配电电路中如需加装提高功率因数的无功补偿电路, 则无功补偿电容应接在软起动器的输入端, 不得接在其输出端, 否则将会造成软起器的功率器件损坏。

Reactive power compensation: If a reactive power compensation circuit with improved power factor is added in the power distribution circuit, the reactive power compensation capacitor should be connected to the input end of the soft starter, and should not be connected to its output terminal, otherwise it will cause softness. The power device of the starter is damaged.

缘测试: 严禁用兆欧表测量内置旁路型软起动器输入及输出间的绝缘电阻, 否则可能因过压而损坏软起动器的功率器件及控制板。

Insulation test: It is strictly forbidden to measure the insulation resistance between the input and output of Built-in contactor soft starter with meg-ohmmeter. Otherwise, the power device and control board of soft starter may be damaged due to over-voltage.

电路接线: 不能将内置旁路型软起动器的输入和输出接反, 否则可能会损坏软起动器或电机烧毁。

Circuit wiring: The input and output of the Built-in contactor soft starter cannot be reversed, otherwise the soft starter or the motor may be damaged.

外控端子: 内置旁路型软起动器的外控端子启动、停止、公共端不得引入外部电源, 否则会损坏软起动器控制板。

External control terminal: The external control terminal of Built-in contactor soft starter should be started, stopped, and the external terminal should not be connected with external power supply, otherwise the soft starter control board will be damaged.

在粉尘较多的工况场合, 应定期进行粉尘清理, 否则会降低软起动器的绝缘等级和散热效果, 引起故障或损坏。

In the case of dusty working conditions, the dust should be cleaned regularly, otherwise the insulation level and heat dissipation effect of the soft starter will be reduced, causing malfunction or damage.

在潮湿的环境下, 如软起动器长期不用, 在使用前, 必须进行除湿处理(如用电吹风或电炉烘干), 否则会因潮湿或结露, 降低软起动器的绝缘等级, 造成爬电、短路, 损坏软起动器。

In a humid environment, if the soft starter is not used for a long time, it must be dehumidified before use (such as using a hair dryer or an electric oven), otherwise the insulation level of the soft starter will be lowered due to moisture or condensation. Crash, short circuit, damage to the soft starter.

7 故障显示说明 Fault display description

ZR6005系列软起动器，具有完善的保护功能，任何故障都会停机，并显示记忆故障，排除故障后，只有用复位键复位才能重新开机，起动。

ZR6005 series soft starter has perfect protection function, any fault will stop, and display memory fault. After troubleshooting, only reset with reset button can restart and start.

7.1 故障显示及解决办法 Fault display and solution

序 No.	故障显示 Fault display	故障原因 cause of issue	解决办法 Solution
1	上电缺相 Power-on phase loss (POPL)	进线电源缺相？ Incoming line power shortage?	按复位键进行复位。复位不成功时，断电后检查三相电源及隔离断路器。 Press the reset button to reset. When the reset is unsuccessful, check the three-phase power supply and isolation circuit breaker after power failure
2	运行缺相 Running phase loss (RPL)	运行时电源缺相？晶闸管开路？ Is the power supply phase missing during operation? Thyristor open?	检查进线电源是否缺相 检查晶闸管或触发电路 Check if the incoming power is out of phase, Check the thyristor or trigger circuit
3	起动过流 Start over-current (SOC)	限流模式：限流倍数是否合适？ 斜坡模式：起动时间时是否合适？ Current limiting mode: Is the current limiting multiple suitable? Ramp mode: Is it appropriate when starting time?	对前述参数适当调整 初始电压过高 Appropriate adjustment of the aforementioned parameters Initial voltage is too high
4	运行过流 Running over-current (ROC)	负载突然加重？或波动太大？负载加重引起的网压下降？ Suddenly increased load? Or too much fluctuation? The network pressure caused by the load increase is reduced?	调整负载检查电网电压 适当调整电流保护值 Adjust the load to check the grid voltage Adjust the current protection value appropriately
5	起动过载 Starting overload (SOL)	起动中负载过重？ Is the load too heavy during starting?	检查负载是否能适当减少 检查负载级别或适当调整过载保护曲线 Check if the load can be properly reduced, Check the load level or adjust the overload protection curve appropriately
6	运行过载 Running overload (ROL)	电机超载运行？ 反馈不准（显示电流比实际大）？ Is the motor overloaded? Feedback is not accurate (display current is larger than actual)?	调整负载在额定值内，校准键盘电流值 应和实际值一致，检查过载曲线是否合适 Adjust the load within the rated value, The calibration keyboard current value should be consistent with the actual value. Check if the overload curve is suitable
7	电流不平衡 Current imbalance (CUB)	晶闸管触发插座接触不良？晶闸管不通？电机三相电流不平衡？ Bad contact of the thyristor trigger socket? Thyristor is not available? Motor three-phase current imbalance?	检查触发信号或晶闸管 对电源不平衡状况进行处理 Check the trigger signal or thyristor, Handling power imbalances
8	过热保护 Overheating	起动太频繁？旁路接触器触点烧坏？ Start too often? Is the bypass	减少起动频次，检查、更换旁路接触器 Reduce start frequency, Check and replace

	protection (OVT)	contactor contacts burned out?	the bypass contactor
9	过电压保护 Over-voltage protection	三相电源电压高于保护值? Is the three-phase supply voltage higher than the protection value? 控制板电压检测故障? Faulty control board voltage detection?	降低三相电源电压。 Reduce the three-phase supply voltage. 调整过电压保护值。 Adjust the over-voltage protection value. 更换控制板。 Replace the control board.
10	欠电压保护 Under-voltage protection	三相电源电压低于保护值? Is the three-phase supply voltage lower than the protection value? 控制板电压检测故障? Faulty control board voltage detection?	提高三相电源电压。 Increase the three-phase supply voltage. 调整欠电压保护值。 Adjust the under-voltage protection value. 更换控制板。 Replace the control board.

8 热过载保护功能与说明

Thermal overload protection function and description

ZR6005系列软起动器的起动过程和运行均具有电子过载保护功能，并为反时限特性，分为6级，级别越高，保护越严格，即同等过载倍数时，保护功能时间越短，本产品起动过程及运行过载保护出厂时均已设定：

ZR6005 series soft starter has electronic overload protection function and is inverse time characteristic. It is divided into 6 levels. The higher the level, the stricter the protection, that is, the shorter the protection function time, the shorter the protection function time. The starting process and the running overload protection are set at the factory:

电机过载保护特性级别（热态恢复到冷时间为180秒）

Motor overload protection characteristic level（Hot state returns to cold time is 180 seconds）

过载倍数 Overload multiple 过载级别 Overload level	6Ie	5Ie	4Ie	3Ie	2Ie	1.5Ie	1.2Ie	1.05Ie
1	1s	3s	6s	8s	10s	15s	150s	3600s
2	3s	8s	12s	16s	20s	30s	300s	3600s
3	6s	15s	22s	30s	40s	60s	350s	3600s
4	10s	22s	35s	48s	60s	90s	400s	3600s
5	15s	35s	55s	75s	90s	120s	450s	3600s
6	20s	45s	70s	95s	120s	150s	500s	3600s

起动过程过载级别出厂值：5级

Starting process overload level factory value: 5

运行过载级别出厂值：2级

Operating overload level factory value: level 2

在使用时，用户也可根据具体负载要求进行相应调整。

When in use, users can also adjust accordingly according to specific load requirements.

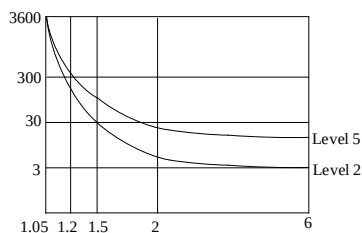


图 8-1 电机过载保护特性曲线

Figure 5-1 Motor overload protection characteristic curve

9 通讯功能与说明

Communication function and description

ZR6005系列软起动器的 MODBUS 通讯协议采用标准 RTU 模式。

The MODBUS communication protocol with ZR6005 series soft starter adopts standard RTU mode.

通讯地址和波特率可以设置。数据格式为 1 个起始位，8 个数据位，1 个校验位（不进行奇偶校验），1 个停止位。

Communication address and baud rate can be set. The data format is 1 start bit, 8 data bits, 1 check bit (no parity check), and 1 stop bit.

RTU 帧的标准结构：

Standard structure of RTU frame:

帧头 START Frame header	T1-T2-T3-T4（3.5 个字节传输时间） （3.5 bytes transmission time）
从机地址 ADDR Slave address ADDR	通讯地址：1H~3FH，当为 0 时为广播地址。 Communication address: 1H~3FH, When it is 0, it is the broadcast place.
功能码 function code	03H：读从机参数。03H: Read slave parameters; 10H 写从机参数。10H write slave parameters
数据 DATA	2*N 个字节的数据 2*N bytes of data
CRC 校验低位 low bytes of CRC check value	CRC 校验值 CRC Check value
CRC 校验高位 high bytes of CRC check value	
帧尾 End of frame	T1-T2-T3-T4（3.5 个字节传输时间） （3.5 bytes transmission time）

9.1 命令码及通讯数据描述 Command Code and Communication Data Description

9.1.1 命令字 03H：从从机中读取 N 个寄存器的数据。

Command Word 03H :Read the data of N registers from the slave.

RTU 主机命令信息 RTU Host command information:

起始，3.5 个字节时间 Start, 3.5 bytes time		T1-T2-T3-T4
从机地址 ADDR Slave address ADDR		01H
功能码 function code		03H
数据区 Data area	寄存器起始地址高位 high bytes of register start address	10H
	寄存器起始地址低位 low bytes of register start address	00H
	数据个数 Number of data	09H
CRC 校验值		CRC check value
结束，3.5 个字节时间 End, 3.5 bytes time		T1-T2-T3-T4

从机地址：从机地址应与主机访问的地址一致。当地址不匹配时，从机将只接收消息，不响应主机。字节：1 个

Slave address: The slave address should be the same as the address accessed by the host. When the addresses do not match, the slave will only receive the message and will not respond to the master. Byte: 1.

功能代码：读命令的功能代码为 03H。字节：1 个。

Function code: The function code of the read command is 03H. Bytes: 1.

数据区：Data area:

起始地址：要读取数据的软起动器内部存储器起始地址。字节：2 个。

Start Address: The start address of the soft starter internal memory to read data. Bytes: 2.

CRC：字节：2 个

CRC: Bytes: 2

从机接收正确的响应帧格式：

The slave receives the correct response frame format:

起始，3.5 个字节时间 Start, 3.5 bytes time		T1-T2-T3-T4
从机地址 Slave address ADDR		01H
功能码 function code		03H
数据区 Data area	字节数量 Number of bytes	12H
	数据值 value	**H ...
CRC 校验值		CRC check value
结束，3.5 个字节时间 End, 3.5 bytes time		T1-T2-T3-T4

从机地址：从机地址应当和主机访问的从机地址一致。字节：1 个。

Slave Address: The address of the slave must be the same as the address of the slave accessed by the host. Bytes: 1.

功能代码：读命令的功能代码为 03H。字节 1 个。

Function code: The function code of the read command is 03H. 1 byte.

数据区：Data area:

字节数：读命令返回数据的字节数量。字节：1 个。

Bytes: The number of bytes of data returned by the read command. Bytes: 1.

数据值：读命令返回的数据值。

Data value: The data value returned by the read command.

CRC 校验：字节 2 个

CRC check: 2 bytes

从机接收错误时的响应帧格式：

Response frame format when the slave receives an error:

起始，3.5 个字节时间 Start, 3.5 bytes time		T1-T2-T3-T4
从机地址 Slave address ADDR		01H
差错码 Error code		83H
异常码 Exception code		01H, 02H, 03H or 04H
CRC 校验值		CRC check value
结束，3.5 个字节时间 Bundle, 3.5 bytes time		T1-T2-T3-T4

从机地址：从机地址应当和主机访问的从机地址一致。字节：1 个。

Slave Address: The address of the slave must be the same as the address of the slave accessed by the host. Bytes: 1.

差错码：83H，表示从机接收错误信息，字节：1 个。

Error code: 83H, indicating that the slave receives the error message, byte: 1.

异常码：表示错误信息。

Exception code: indicates an error message.

字节：1 个

Byte: 1

01H: 非法起始地址或者不支持。
01H: Illegal starting address or unsupported
02H: “起始地址+数据个数”。
02H:"Starting address + number of data"
03H: 不支持的数据个数;
03H: The number of unsupported data;
04H: 接收的 CRC 校验错误或者读多个数据时错误。
04H:The received CRC check is incorrect, or there is an error when reading multiple data.
CRC 校验: 字节: 2 个
CRC check: Bytes: 2

9.1.2 命令 10H: 写 N 个字 (2N 个字节) RTU 主机命令信息
Command 10H (0001 0000b): Write N words (2N bytes)
RTU host command information

起始, 3.5 个字节时间 Start, 3.5 bytes time		T1-T2-T3-T4
从机地址 Slave address ADDR		01H
功能码 CMD function code CMD		10H
数据区 Data area	寄存器起始地址高位 high bytes of register start address	10H
	寄存器起始地址低位 low bytes of register start address	00H
	寄存器数量 N 高位 Number of registers high bytes	00H
	寄存器数量 N 低位 Number of registers low bytes	09H
	字节数 Number of bytes	2*N
	寄存器 1 高位数值 No.1 Register High data	00H
	寄存器 1 低位数值 No.1 Register Low data	03H
	...	...
	寄存器 N 高位数值 No.N Register High data	**H
	寄存器 N 低位数值 No.N Register Low data	**H
CRC 校验值		CRC check value
结束, 3.5 个字节时间 End, 3.5 bytes time		T1-T2-T3-T4

从机地址: 从机地址应与主机访问的地址一致。当地址不匹配时, 从机将只接收消息, 不响应主机。字节: 1 个

Slave address: The slave address should be the same as the address accessed by the host. When the addresses do not match, the slave will only receive the message and will not respond to the master.
Byte: 1.

功能代码: 写命令的功能代码为 10H, 字节: 1 个。

Function code: The function code of the write command is 10H, byte: 1.

数据区: Data area:

起始地址: 待写数据在软起动器内部存储器的起始地址。字节: 2 个。

Start Address: The starting address of the internal memory of the soft starter to be written data.

Bytes: 2.

寄存器数量 N: 待写寄存器的个数。字节: 2 个。

Number of registers N: The number of registers to be written. Bytes: 2.

数据数量: 待写数据的数据个数。字节: 2 个。

Number of data: The number of data to be written. Bytes: 2.

字节量: 待写数据的节数。字节: 1 个。

Bytes: The number of sections of data to be written. Bytes: 1.

数据值: 待写的数据值。字节: 2N 个

Data value: The data value to be written. Bytes: 2N.

CRC 校验: 字节: 2 个。

CRC check: Bytes: 2.

从机接收正确时的响应帧格式:

Response frame format when the slave receives the correct:

起始, 3.5 个字节时间 Start, 3.5 bytes time		T1-T2-T3-T4
从机地址 ADDR Slave address ADDR		01H
功能码 CMD function code CMD		10H
数据区 Data area	寄存器起始地址高位 high bytes of register start address	10H
	寄存器起始地址低位 low bytes of register start address	00H
	寄存器数量 N 高位 Number of registers high bytes	00H
	寄存器数量 N 低位 Number of registers low bytes	09H
CRC 校验值		CRC check value
结束, 3.5 个字节时间 End, 3.5 bytes time		T1-T2-T3-T4

从机地址: 从机地址应当和主机访问的从机地址一致。字节: 1 个。

Slave Address: The address of the slave must be the same as the address of the slave accessed by the host. Bytes: 1.

功能代码: 返回写命令的功能代码 10H。字节: 1 个。

Function code: Returns the function code 10H of the write command. Bytes: 1.

数据区: Data area:

起始地址: 返回已写数据的起始地址。字节: 2 个。

Start Address: Returns the starting address of the written data. Bytes: 2.

数据数量: 返回已写数据的数据个数。

Number of data: Returns the number of data of the written data.

CRC 校验: 字节: 2 个。

CRC check: Bytes: 2.

从机接收错误时的响应帧格式:

Response frame format when the slave receives an error:

起始, 3.5 个字节时间 Start, 3.5 bytes time		T1-T2-T3-T4
从机地址 ADDR Slave address ADDR		01H
差错码 Error code		90H
异常码 Exception code		01H, 02H, 03H or 04H
CRC		CRC 校验 CRC check
结束, 3.5 个字节时间 End, 3.5 bytes time		T1-T2-T3-T4

从机地址：从机地址应当和主机访问的从机地址一致。字节：1 个。

Slave Address: The address of the slave must be the same as the address of the slave accessed by the host. Bytes: 1.

差错码：90H·表示从机接收错误信息。字节：1 个。

Error code: 90H·Indicates that the slave receives an error message. Bytes: 1.

异常码：表示错误信息。字节：1 个。

Exception code: indicates an error message. Bytes: 1.

01H：非法功能码；

01H: Illegal function code;

02H：非法起始地址或者不支持的“起始地址+数据个数”；

02H: illegal start address or unsupported "start address + number of data";

03H：不支持的数据个数

03H: Number of unsupported data

04H：接收的 CRC 校验错误或者读多个数据时错误。

04H:The received CRC check is incorrect, or there is an error when reading multiple data.

CRC 校验：字节 2 个。

CRC check: 2 bytes.

9.2 通讯数据地址定义 Communication Data Address Definition

地址 ADDR	名称 name	读/写 R/w	地址 ADDR	名称 name	读/写 R/w
1000	控制方式 control method	R/W	1015	电流不平衡度 Current imbalance	R/W
1001	起动方式 Starting method	R/W	1016	未定义 Undefined	R
1002	停车方式 Parking mode	R/W	1017	过电压保护值 Over-voltage protection value	R/W
1003	软起动器容量 Soft starter capacity	R	1018	欠电压保护值 Under-voltage protection value	R/W
1004	电动机额定容量 Motor rated capacity	R/W	1019	继电器功能 Relay function	R/W
1005	电流限流起动倍数 Current limit starting multiple	R/W	101a	未定义 Undefined	R
1006	电压斜坡起动初始电压 The initial voltage at the start of the voltage ramp	R/W	101b	从机地址 Slave address	R/W
1007	电压斜坡起动时间 Voltage ramp start time	R/W	101c	波特率 Baud rate	R/W
1008	点动电压 Jog voltage	R/W	101d~ 1027	未定义 Undefined	R
1009	突跳电压 Kick voltage	R/W	1028	控制命令 control commands	W
100a	突跑时间 Running time	R/W	1029	未定义 Undefined	R
100b	电流斜坡限制电流 Current ramp limiting current	R/W	102a	软起动器状态 Soft starter status	R
100c	电流斜坡起动时间 Current ramp start time	R/W	102b	三相平均电流 Three-phase average current	R
100d	软停时间 Soft stop time	R/W	102c	A 相电流 A phase current	R

100e	运行方式 Operation mode	R/W	102d	B 相电流 B phase current	R
100f	电流校准值 Current calibration value	R/W	102e	C 相电流 C phase current	R
1010	电压校准值 Voltage calibration value	R/W	102f	电压值 Voltage value	R
1011	起动过流倍数 Start over-current multiple	R/W	1030~ 1033	未定义 Undefined	R
1012	运行过流倍数 Running over-current multiple	R/W	1034	第一次故障 First failure	R
1013	起动过载级别 Start the overload level	R/W	1035	第二次故障 Second failure	R
1014	运行过载级别 Running overload level	R/W	1036	第三次故障 Third failure	R

注 1：地址为十六进制数据。

Note 1: Addresses are hexadecimal data.

注 2：故障代码的意义见第 7 章表格，表格中的序号即为故障代码。

Note 2: The meaning of the fault code is shown in the table in Chapter 7, and the serial number in the table is the fault code.

9.3 控制命令寄存器和软起动器状态寄存器说明

Control Command Registers and Soft Starter Status Registers Description

9.3.1 控制命令寄存器（只读）Control Command Registers (read 64only)

控制命令寄存器地址 Control command register address	命令功能 Command function
1028H	80H: 停机 Shut down the machine
	40H: 起动 Start the machine
	20H: 故障复位 Reset the fault

9.3.2 软起动器状态寄存器（只读）Soft starter status registers (read only)

软起动器状态寄存器地址 Soft starter status register address	代码意义 Code Meaning
102aH	00H: 待机状态 Standby State
	01H: 起动状态 Startup State
	02H: 运行状态 Operational Status
	03H: 停机状态 Downtime Status
	04H: 参数编辑状态 Parameter editing status
	05H: 故障状态 Fault State

9.4 通讯数据结构举例 Example of a communication data structure

(1) 软起动器地址为 01H，读取内部存储器起始地址为 1002H 开始的 2 个字的数据，主机命令帧的信息见表 A：

The soft starter address is 01H, and the data of the 2 words starting from the internal memory start address is 1002H. The information of the host command frame is shown in Table A:

表 A Table A	START	T1-T2-T3-T4
	ADDR	01H
	CMD	03H
	寄存器起始地址高位 high bytes of register start address	10H
	寄存器起始地址低位 low bytes of register start address	02H

	数据个数高位 High number of data	00H
	数据个数低位 Low number of data	02H
	CRC 低位 CRC Low position	61H
	CRC 高位 CRC High position	0BH
	END	T1-T2-T3-T4

(2) 软起动器地址为 01H，读取内部存储器起始地址为 1000H 开始连续 10 个字的数据，主机命令帧的信息意见表 B

The soft starter address is 01H, and the internal memory start address is 1000H to start data of 10 consecutive words, and the host command frame information comment table B

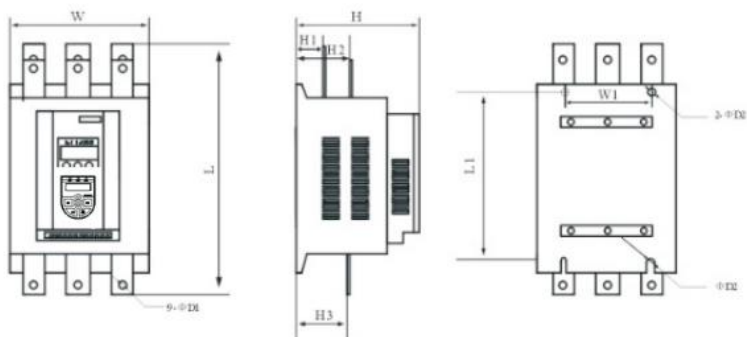
表 B Table B	START	T1-T2-T3-T4
	ADDR	01H
	CMD	03H
	寄存器起始地址高位 high bytes of register start address	10H
	寄存器起始地址低位 low bytes of register start address	00H
	数据个数高位 High number of data	00H
	数据个数低位 Low number of data	0AH
	CRC 低位 CRC Low position	C1H
	CRC 高位 CRC High position	0DH
	END	T1-T2-T3-T4

10 外形结构及尺寸图

Outline structure and dimension drawing

ZR6005系列软起动器外形尺寸:

ZR6005 series soft starter dimensions



规格型号 项目		ZR6005-015A ~ZR605-0110A	ZR600150A	ZR6005-0180A~ ZR6005-0400A	ZR6005-0440A~ ZR6005-0800A	ZR6005-0900A~ ZR6005-1600A
外形尺寸 (mm)	L	275	320	450	488	670
	W	165	220	258	313	435
	H	143	194	230	230	240
安装尺寸 (mm)	W1	155	120	230	250	235
	L1	250	265	339	370	490
	D1	*	Φ 8	Φ 13	Φ 13	Φ 13
	D2	Φ 6	Φ 11	Φ 13	Φ 13	Φ 13
	H1	*	*	38	40	49
	H2	*	*	94	96	98
	H3	*	*	104	108	108
重量 (kg)		<4	<8	<18	<22	<36

11 面板、操作盒拆卸及安装

Panel, operation box removal and installation

11.1 操作盒的拆卸 Disassembly of the operation box

ZR6005系列软启动器的操作盒可以从机器本体外部通过按压卡扣直接取下。

The ZR6005series soft starter operation box can be removed directly from the outside of the machine body by pressing the buckle.

ZR6005系列软启动器的操作盒需要打开机器面板的螺丝(见图 11.2)，直接取下。（见图 11.2）

The ZR6005 series soft starter operation box requires screws to open the machine panel(Figure 11.2), and remove directly (Figure 11.2).

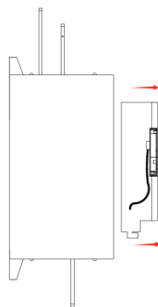


图 11.2

Figure 11.2

11.2 操作盒在柜门上安装 The box is installed on the cabinet door

ZR6005系列软启动器的操作盒可以从机器本体取下来，通过操作盒固有的卡扣结构安装到机柜面板上，需要另外选配的网线连接至操作盒。

The operation box of the ZR6005series soft starter can be removed from the machine body and mounted to the cabinet panel through the inherent snap-on structure of the operation box. Data transmission line to be connected to the operation box.

机柜面板的开孔尺寸（见图 11.4），The opening size of the cabinet panel (Figure 11.4).

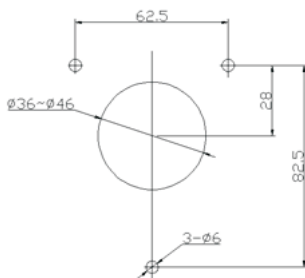


图 11.4

Figure 11.4

保修协议

Warranty agreement

公司产品之保修条例按《产品使用手册》中“质量保证”条款执行。

The warranty regulations for our products are carried out in accordance with the “Quality Assurance” clause of the Product User Manual.

本公司产品保修期为自出厂日期起壹年

The warranty period of the company's products is from the date of manufacture.

1.1 在保修期内，零部件的维修或更换不影响原产品整体的保修期。

1.1 During the warranty period, the repair or replacement of parts does not affect the overall warranty period of the original product.

1.2 当发现产品出现故障时，请先按照使用手册说明详细检查并排除故障，如果故障无法排除，请与本公司或最近的代理商联系。

1.2 When the product is found to be faulty, please check and troubleshoot the fault according to the instructions in the user manual. If the fault cannot be removed, please contact the company or the nearest agent.

1.3 产品在保修期内正常状态下使用，由于非用户原因产生的故障，本公司将提供保修服务。

1.3 The product is used under the normal condition during the warranty period, and the company will provide warranty service for the failure caused by non-user reasons.

若属于下列原因引起的故障，即使在保修期内，也属于有偿修理：

If the fault is caused by the following reasons, even within the warranty period, it is also paid repair:

2.1 错误的安装，调试(依据产品使用手册为准)、未经允许自行修理或改造引起的问题。

2.1 Incorrect installation, commissioning (according to the product manual), problems caused by self-repair or modification without permission.

2.2 超出标准规范要求使用软起动器造成的问题。

2.2 Problems caused by the use of soft starters beyond the requirements of the standard specifications.

2.3 购买后跌损或搬运不当造成的损坏。

2.3 Damage caused by loss or improper handling after purchase.

2.4 因使用环境不良引起的器件老化或故障。

2.4 Aging or malfunction of the device due to poor use of the environment.

2.5 由于地震、火灾、风水灾害、雷击、异常电压或其他自然灾害相关原因引起的损坏。

2.5 Damage caused by earthquakes, fires, wind damage, flood damage, lightning strikes, abnormal voltages or other natural disasters.

2.6 擅自撕毁产品标识(如：铭牌等)；机身编号与保修卡不符。

2.6 Unauthorized tearing of product identification (such as nameplate, etc.); body number does not match the warranty card.

2.7 未依购买约定付清款项。

2.7 The payment was not paid in accordance with the purchase agreement.

保修卡 Warranty Card

客户信息 Customer Information	单位名称 company name			
	单位地址 company address			
	联系人 Contact		联系电话 Contact phone	
	邮编 Zip code		传真 fax	
产品信息 Product Information	产品编号 Product number		产品型号 Product model	
	使用设备 Driven device		匹配电机 Driven motor	
	购买日期 Date of purchase		供货单位 Suppliers	
	联系人 Contact		电话 phone	
故障信息 Fault information				
维修员 Maintenance man		维修日期 Repair date		



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