新 百 特

BTGT 系列高压固态软起动装置

BTGT series high voltage solid state soft starting device

产品使用说明书

Product instruction manual

（版本 V1.00）

(version V1.00)

湖北新百特自动化设备有限公司

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在安装、运行、维护高压交流电动机软起动装置之前，请仔细阅读本手册！

Please read this manual carefully before installing, running and maintaining high voltage ac motor.

注意事项

Matters needing attention

本产品设计依据GB11022-2011类设备等级标准要求。

this product design based on GB11022-2011 grade standard requires such equipment.

进一步的信息详见技术说明。

further information as shown in the technical specifications.

危险事项

Dangerous items

如不按规定操作可能导致危害人生安全的事故。

if not in accordance with the operation may result in endanger life safety accidents.

高压交流电动机软起动装置接入电源后，柜内会带高电压。但即使在电机停止运行状态，其输入端仍带有高电压。柜内带有电磁锁，必须断开软起动装置的前级输入电源，确认软起动装置与高压断开后，方可打开软起动装置的前、后大门。在对软起动装置的高压部分进行任何维护、维修之前，必须将软起动装置的高压部分可靠接地。

high voltage ac motor soft starting device plugged into a power supply, rack with high voltage. But even when the motor stops running, the input is still high voltage. Off with electromagnetic lock inside ark, soft starting device of input power level before, after confirm the soft starting device and high voltage disconnect, can open the doors of the soft starting device before and after. Before any maintenance or repair of the high-pressure part of the soft starting device, the high voltage part of the soft starting device must be grounded reliably.

软起动装置的微机控制器和二次控制回路使用AC 220V电源，接触微机控制器接线端及二次控制回路接线端有触电的危险。

soft starting device of the microcomputer controller and the second control circuit using AC 220 v power supply, microcomputer controller contact terminal and a second control circuit terminal there is risk of electric shock.

软起动装置的柜体必须可靠接地。

cabinet put oneself in another's position of soft starting device must be

reliable grounding.

警告事项

cautions

如不按规定操作可能导致危害设备安全的事故。

if not in accordance with the operation may lead to endanger the safety of the equipment accident.

用于提高电机功率因数的无功补偿装置接入时，可能损坏软起动装置的可控硅元件，用户如需接入无功补偿装置，请务必在订购软起动装置时向厂家说明。

used to improve the reactive power compensation device of power factor of the motor access, may damage the soft starting device of thyristor, if users need access to the reactive power compensation device, please be sure to soft starting device in order to the manufacturer instructions.

软起动装置的输入、输出端不得接反，否则将损坏软起动装置。

soft starting device may not pick up the input and output end, otherwise will damage the soft starting device.

固态软起动器起动时可控硅元件会发热，设备每次起动间隔时间应不少于为15分钟，否则会损坏元件。

solid-state soft starter thyristor get hot when starting, equipment starting time interval should not less than 15 minutes every time, otherwise it will damage the components.

软起动装置工作环境为室内、常温、无污染及腐蚀，用户有特殊的要求请在订购时向厂家说明。

soft starting device for indoor environment, room temperature, free from contamination and corrosion, users have special requirements please inform the factory when ordering.

由于产品在不断更新,本公司保留改进产品设计及修改相关技术说明而不预先通知的权利!有需要请与我们联系索取最新技术资料。

The company reserves the right to improve product design and revise relevant technical specifications without prior notice because the products are constantly updated. Please contact us for the latest technical information.

目录

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第一章 概述

Chapter 1 Overview

1、产品简介

1, product introduction

软起动装置是高压交流电动机起动的设备，它的主要构成是接于电源与被控电机间的三相反并联晶闸管组件及其电子控制装置。BTGT系列高压固态软起动装置是由多个晶闸管串并联而成，通过控制晶闸管的触发角来控制输出电压的大小，可以满足电机起动过程中不同电压和电流要求。在电机起动过程中，BTGT系列高压固态软起动装置按照预先设定的起动曲线，增加电机的端电压，使电机平滑加速，从而减少电机起动对电网、电机和相连设备的电气和机械冲击。当电机起动达到正常转速后，旁路真空接触器或断路器接通，电机起动完成。电机运行过程中，软起动装置继续监控电机，实时测量电机电流、电压，并提供各种故障保护。

Soft starting device is the high voltage ac motor starting equipment, its main composition is connected into the power between the charged with motor and three instead of parallel thyristor components and electronic control unit. BTGT series high voltage solid-state soft starting device is composed of multiple thyristor series parallel, by controlling the thyristor trigger Angle to control the size of the output voltage, can satisfy the motor starting process in different voltage and current requirements. In the process of motor starting, BTGT series high voltage solid soft starting device according to the preset curve starting, increase the voltage of the motor, the motor smooth acceleration, so as to reduce motor starting on the grid, and connected equipment electrical and mechanical shock. When the motor starts up to normal speed, the bypass vacuum contactor or circuit breaker is connected, and the motor starts to finish. During the operation of the motor, the soft starting device continues to monitor the motor, measuring the electric current, voltage and all kinds of fault protection in real time.

2、性能指标

2, performance indicators

类别category	说明Explanation
交流电压AC voltage	AC3kV/6kV/10kV，±10%-15%；
负载类型Load type	三相高压交流异步电机、同步电机 Three - phase high - voltage AC induction motor, synchronous
频率frequency	50Hz/60Hz ± 2Hz
主回路组成 Main circuit	3kV,12SCRS；6kV,18SCRS；10kV，30SCRS；
瞬时过压保护 Transient overvoltage protection	均压保护器和阻容吸收网络 Pressure protection and resistance absorption network
冷却方式 cooling method	自然冷却 Natural cooling
控制方式 control method	三线制 Three-wire
环境条件 Environmental conditions	环境温度：-10-40℃，海拔：不超过2000米，相对湿度：不超过85% Ambient temperature: -10-40 deg.] C, altitude: not more than 2000 m, the relative humidity: not more than 85%

3、工作原理

3, the working principle

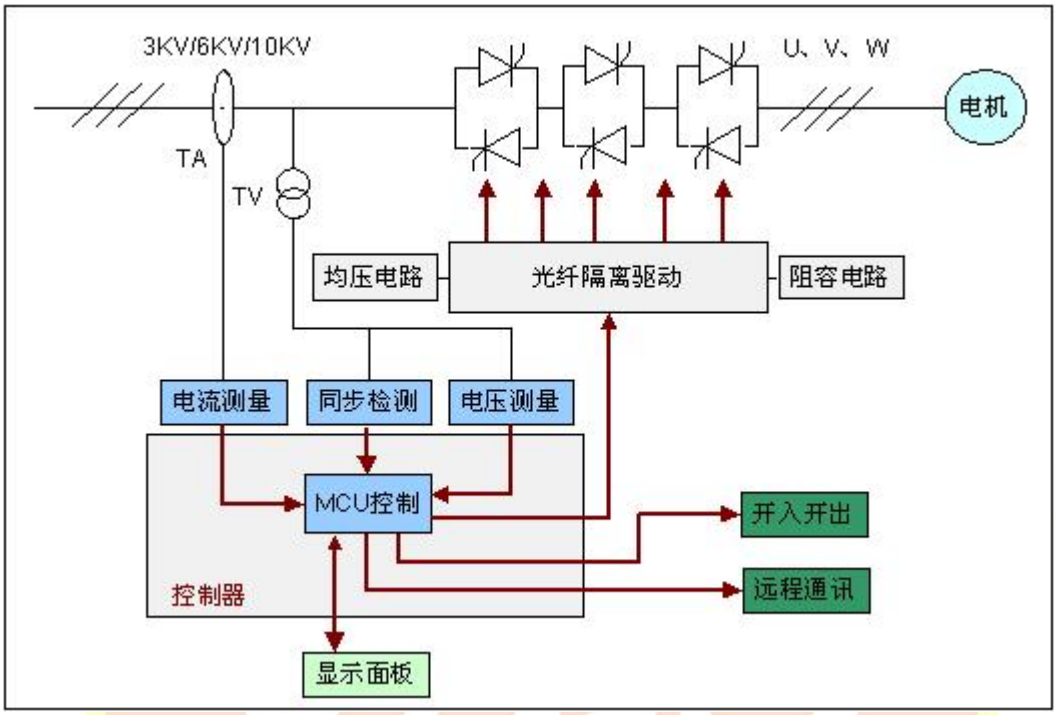

图1.1 高压软起动器原理框图

Figure 1.1 High voltage soft starter block diagram

软起动装置检测到外部起动命令时，由微处理器检测到同步信号后，对主回路可控硅相位角触发进行控制，逐渐增加电机端的电流和电压，从而平滑起动电机。在此过程中，RC 阻容吸收单元吸收可控硅反向关断时的尖峰电压；均压电阻擎制可控硅电压，保证串联回路中每只可控硅电压相等。光纤触发保证了控制器与高压可控硅之间的电气隔离，同时保证了触发信号不受电磁干扰。

When the soft start device detects the external start command, after the microprocessor detects the synchronization signal, the main circuit thyristor phase angle trigger control, and gradually increase the motor side of the current and voltage, so smooth start the motor. In this process, the RC RC absorber absorbs the peak voltage at the time of thyristor reverse turn-off; the voltage-controlled thyristor voltage ensures that each thyristor voltage in the series circuit is equal. Fiber triggering ensures electrical isolation between the controller and the high voltage thyristor, while ensuring that the trigger signal is not subject to

electromagnetic interference.

4、控制系统

4, the control system

BTGT系列高压固态软起动器控制系统由微控制器、脉冲放大、取能触发三部分组成。

1）微控制器部分

微控制器由CPU控制板、光纤触发板、电源板、采样板和显示屏组成，板上装有MCU微处理器，可以实现光电隔离的开入开出控制、电压电流信号采集、通讯接口、同步信号检测与控制，显示屏通讯与控制、保护功能。

显示屏选用触摸屏，内置菜单。按照不同配置要求触摸屏可使用7寸、10.1寸等。可进行参数设置及显示。

2）脉冲放大部分

脉冲放大部分是将24V直流电源调制成脉冲电流，调制信号由微控制器控制，通过光纤传输，实现了微控制器和脉冲放大部分的电气隔离。

3）取能触发部分

脉冲电流通过脉冲变压器时，二次侧可感应出电流，将感应电流调制成脉冲触发信号用于可控硅触发，最终实现了整组可控硅触发。脉冲放大部分和取能触发部分电磁感应连接，实现了电气隔离。

BTGT series of high-voltage solid-state soft starter control system by the microcontroller, pulse amplification, take the trigger three parts.

1) microcontrollers section

The micro controller is composed of a CPU control board, a fiber trigger board, a power board, a sampling plate and a display screen. The MCU is equipped with an MCU microprocessor, which can realize the opening and closing control of the photoelectric isolation, the voltage and current signal acquisition, the communication interface, Signal detection and control, display communication and control, protection.

Display screen selection of touch screen, built-in menu. According to the different configuration requirements touch screen can use 7 inch, 10.1 inch and

so on. Can be set and display parameters.

2) Pulse magnification section

Pulse amplification part of the 24V DC power supply is modulated into pulse current, the modulation signal controlled by the microcontroller, through the optical fiber transmission, to achieve the micro-controller and pulse amplifier part of the electrical isolation.

3) take the trigger part

Pulse current through the pulse transformer, the secondary side can sense the current, the induced current modulation pulse trigger signal for the trigger trigger, and ultimately the whole set of SCR trigger. Pulse amplification part and take the trigger part of the electromagnetic induction connection, to achieve the electrical isolation.

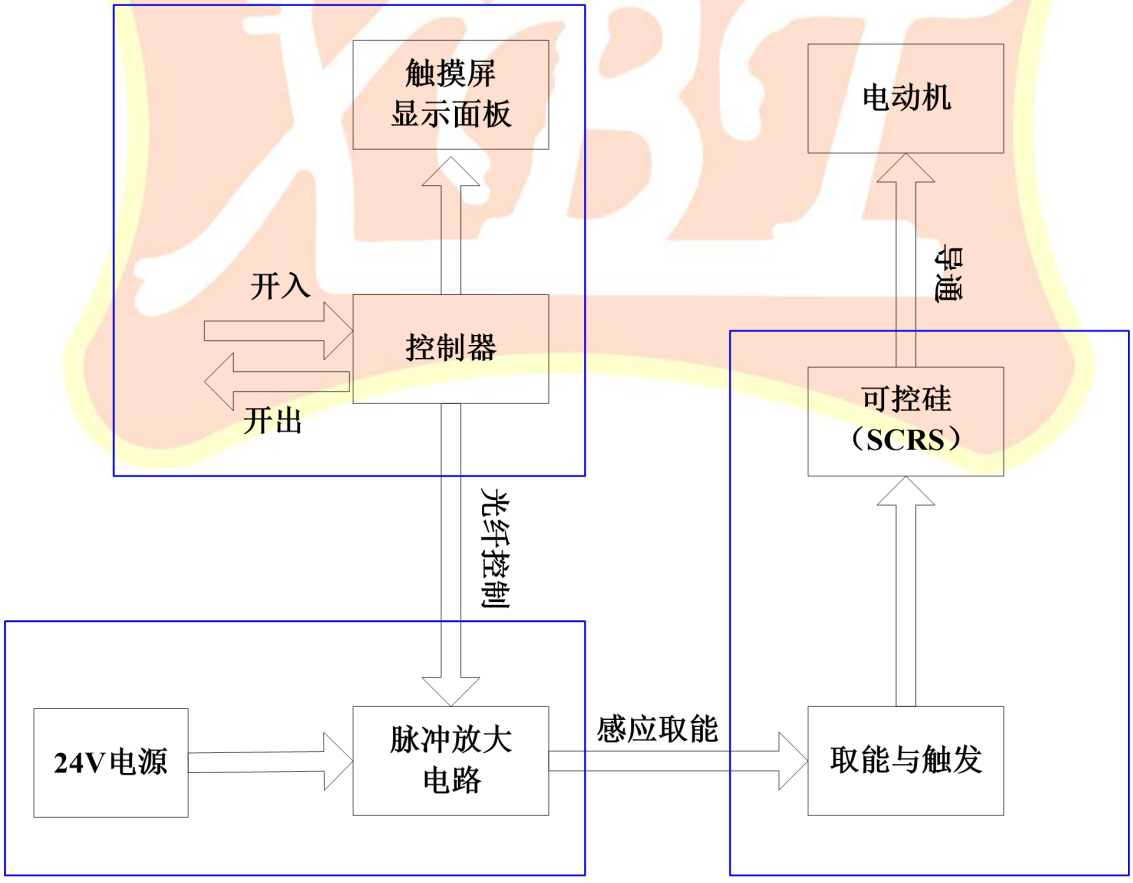

图1.2　控制系统框图

Figure 1.2 Block diagram of the control system

5、结构设计

5, structural design

BTGT 系列高压固态软起动装置设计为柜式结构。柜体框架为 50 角钢焊接而成，坚固牢靠。柜体设计为柜底进出线方式，在投入运行前，只需要将高压固态软起动装置串联接入高压开关柜和高压电动机之间即可。具体电气一次方案图见图 1.3。

BTGT series of high-voltage solid-state soft starter device designed for the cabinet structure. The cabinet frame is made of 50 angle welded steel, solid and reliable. The cabinet is designed for the bottom of the cabinet, before the operation, only need to high-voltage solid-state soft-start device connected in series between high-voltage switchgear and high-voltage motor can be. The specific electrical diagram is shown in Figure 1.3.

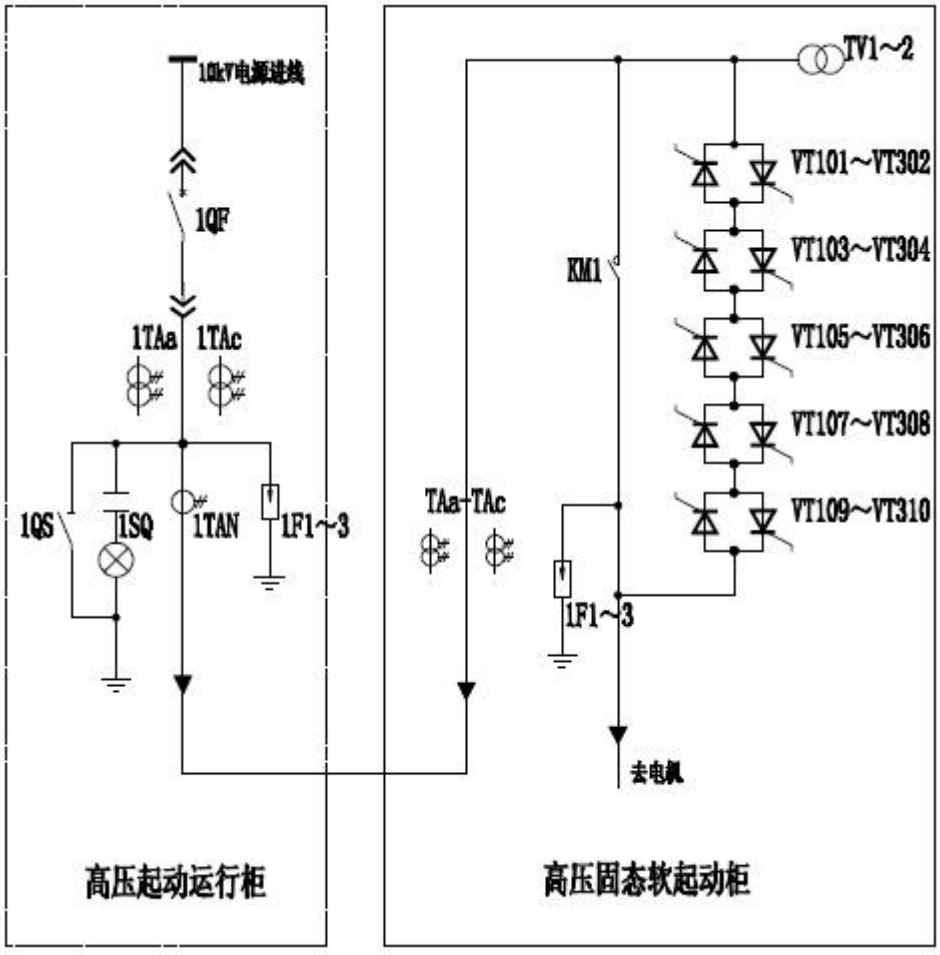

图 1.3 高压固态软起动装置方案图

Figure 1.3 Schematic diagram of high-voltage solid-state soft starter

BTGT 系列高压固态软起动装置主要一次器件包括：真空交流接触器或真空断路器、串联晶闸管模块、过电压保护器、高压电流互感器、高压电压互感器、软起动控制器、电源模块等。启动装置内部结构简单，各部分模块化，维护检修简单方便。器件在柜内的布置图见图 1.4。

BTGT 系列高压固态软起动柜结构设计紧凑合理，维护方便。柜体尺寸可以根据用户要求做适当调整。

BTGT series of high-voltage solid-state soft starter main device includes: vacuum AC contactor or vacuum circuit breakers, series thyristor module, over-voltage protection, high-voltage current transformers, high voltage voltage transformers, soft starter controller, power modules. Start the internal structure of the device is simple, the various parts of the modular, maintenance and easy maintenance. The arrangement of the device in the cabinet is shown in Figure 1.4.

BTGT series of high-voltage solid-state soft start cabinet structure design compact and easy to maintain. Cabinet size can be adjusted according to user requirements.

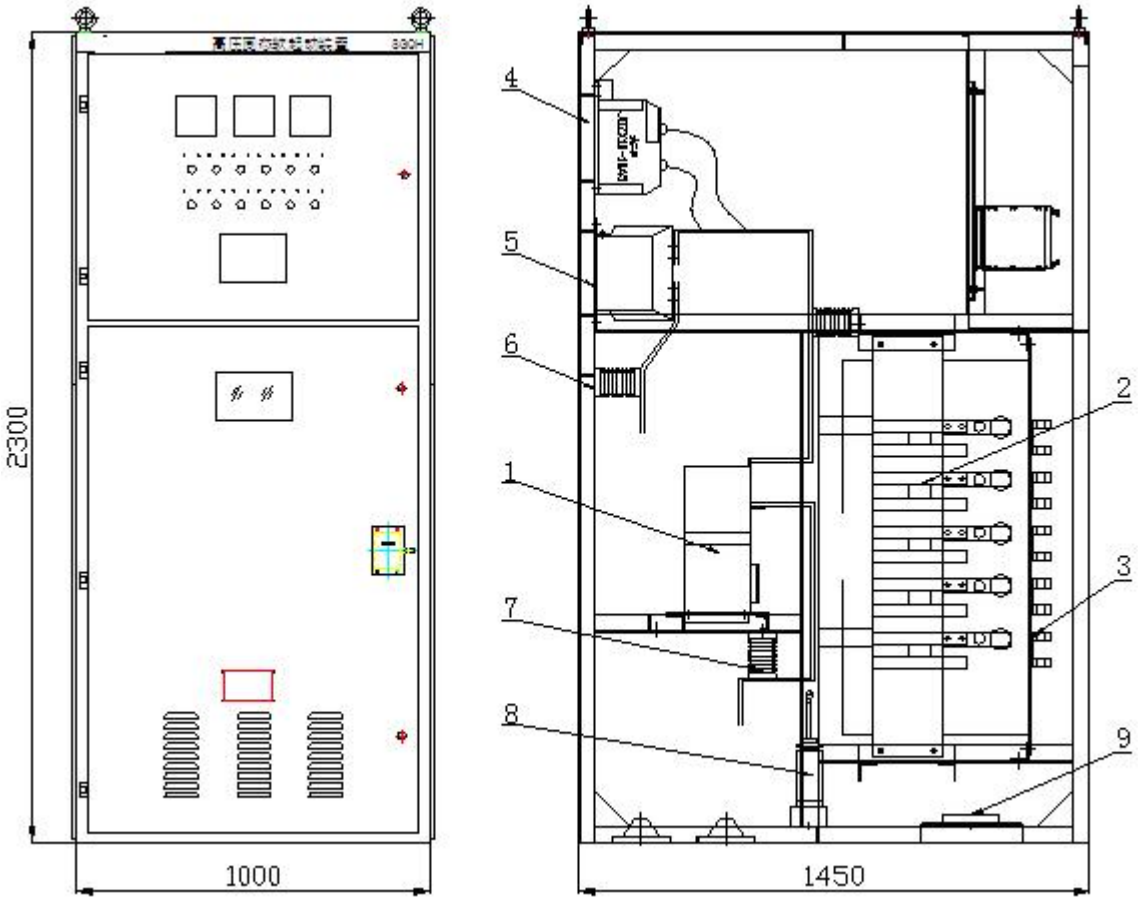

图 1.4　固态软起动装置内部布置图

Figure 1.4 Solid-state soft-start device internal layout

1、真空接触器 2、晶闸管模块 3、取能模块 4、电压互感器 5、电流互感器

6、传感器　7、绝缘子　8、过电压保护器　9、电源模块

1, the vacuum contactor 2, thyristor module 3, take the energy module 4, the voltage transformer 5, the current transformer

6, the sensor 7, insulator 8, over-voltage protection 9, the power module

第二章 功能与选型

Chapter 2 Function and Selection

1、产品选型

1, product selection

型号 model	电压等级 Voltage level	额定电流 Rated current	柜体尺寸 Cabinet size

	（kV）	(A)	H高mm	W宽mm	D深mm
BTGT-350/3	3	80	2300	1000	1500
BTGT-650/3	3	160	2300	1000	1500
BTGT-900/3	3	220	2300	1250	1500
BTGT-1150/3	3	280	2300	1250	1500
BTGT-1500/3	3	360	2300	1250	1500
BTGT-1500以上(the above)	3	＞360	预定Booked		
BTGT-700/6	6	80	2300	1000	1500
BTGT-130/6	6	160	2300	1000	1500
BTGT-1800/6	6	220	2300	1000	1500
BTGT-2300/6	6	280	2300	1000	1500
BTGT-3150/6	6	360	2300	1000	1500
BTGT-3000/6以上 (the above)	6	＞360	预定Booked		
BTGT-850/10	10	60	2300	1000	1500
BTGT-1100/10	10	80	2300	1000	1500
BTGT-2000/10	10	140	2300	1000	1500
BTGT-2200/10	10	160	2300	1000	1500
BTGT-2750/10	10	200	2300	1000	1500
BTGT-3050/10	10	220	2300	1000	1500
BTGT-3800/10	10	280	2300	1000	1500
BTGT-5000/10	10	360	2300	1000	1500
BTGT-5000/3以上(the above)	10	＞360	预定Booked		

注：1）额定电流指适用电机的额定电流，配套电机额定电流应不超过该型装置所对应额定电流。

2）电机额定电流超过360A时，柜体尺寸请联系厂家。

3）高压软起动柜内包含旁路接触器，有其它特殊要求请提出。

Note: 1) rated current refers to the motor rated current, matching motor rated current should not exceed the type of device corresponding to the rated current.

2) When the motor rated current exceeds 360A, please contact the

manufacturer for cabinet size.

3) High voltage soft start cabinet includes bypass contactor, there are other special requirements please put forward.

2、功能说明

2, functional description

2.1、保护功能

2.1, protection function

1）过压保护，欠压保护：电压超出设定电压范围时，保护动作并发出信号。

2）过流保护：起动或运行过程中电流过大，超过设定电流值，保护动作并发出信号。

3）电流不平衡：三相电流不平衡会导致电机抖动和发热，三相电流不平衡值超过设定范围时，保护动作并发信号。

4）起动超时：电机起动时间超过设定时限时，保护动作并发信号。

5）过载保护：电机运行过程中，发生过载时，保护动作并发信号。

6）欠载保护：电机运行过程中，发生欠载或失载，保护动作并发信号。

1) overvoltage protection, undervoltage protection: voltage exceeds the set voltage range, the protection action and send a signal.

2) over-current protection: start or run the process of excessive current, more than set the current value, protection action and send a signal.

3) current imbalance: three-phase current imbalance will lead to motor jitter and heat, three-phase current unbalance value exceeds the set range, the protection action concurrent signal.

4) Start-up time: When the motor starts longer than the set time limit, the protection action is signaled.

5) overload protection: motor running process, the occurrence of overload, the protection action and signal.

6) Underload protection: During operation of the motor, underload or loss occurs, protection action is generated.

2.2、测量功能

2.2, measurement functions

1）电压测量：电网线电压测量

2）电流测量：电机A、B、C三相电流检测。

1) Voltage measurement: measurement of power line voltage

2) current measurement: motor A, B, C three-phase current detection.

2.3、通讯接口

2.3 Communication Interface

1）显示通讯：显示板选用触摸屏，RS232通讯方式。

2）外部通讯：外部设备与控制器通讯，RS485通讯方式，标准MODBUS协议。

1) display communication: display panel selection touch screen, RS232 communication.

2) external communication: external device and controller communication, RS485 communication, standard MODBUS protocol.

2.4、开入与开出

2.4, open and out

1）开入量8点，光电隔离，无源开入。

2）开出量7点，触点容量10A/250VAC，无源开出。

1) the amount of 8 points, optoelectronic isolation, no power into.

2) out of 7 points, contact capacity of 10A / 250VAC, no power out.

2.5、操作界面

2.5, the user interface

1）触摸屏显示，触摸操作。

2）转换开关与操作按钮：直起/软起，本柜/远程2个转换开关，起动、停止、直接起动、急停4个按钮。

3）状态指示灯：电源、备妥、起动/软停、旁路/运行、故障、旁路分6个指示灯。

注：以上为标准配置，特殊情况可按用户需求调整。

1) touch-screen display, a touch operation.

2) Transfer switch and operation button: straight up / soft start, the cabinet / remote two switch, start, stop, direct start, emergency stop four buttons.

3) Status indicator: power, ready, start / soft stop, bypass / run, fault, bypass points 6 lights.

Note: The above is the standard configuration, special circumstances can be adjusted according to user needs.

第三章 安装与调试

Chapter 3 Installation and Commissioning

1、运输、储存及开箱检查

1, transport, storage and out of the box inspection

1.1、吊装与运输主要事项

1.1, lifting and transportation of the main issues

1）设备在包装时采用简包装，用户有其它要求时另行协商。

2）设备运输过程中，设备及包装体必须用绳索或其它固定物稳固固定在运输工具上，不得倾斜松散，设备运输过程中的固定必须按照包装上的固定图示来紧固。在运输中必须有足够妥善的防水措施，以确保设备在运输过程中的安全。

3）设备在吊运时，一般采用机械起吊，吊运时要注意设备的重心位置，吊运必须采用全部四点吊装，不得用2个吊点进行起吊作业。吊运和吊装过程中均应保证设备的平稳，不得倾斜、晃动。如设备用叉车搬运，在使用叉车时，必须按照包装体上的叉车孔进行叉运。设备放置时，必须选择平整、坚实地段摆放设备，松软地面必须加垫木板。

1) The equipment is packaged in a simple package, the user has other requirements when consultation.

2) During the transportation of the equipment, the equipment and the packing body must be firmly fixed on the conveyer with rope or other fixtures, and shall not be tilted loose. The fixing of the equipment and equipment must be fastened according to the fixed icon on the packaging. In the transport must be properly adequate waterproof measures to ensure the safety of equipment in the transport process.

3) equipment in the lifting, the general use of mechanical lifting, lifting

the equipment should pay attention to the location of the center of gravity, lifting must be used all four hanging, not with two lifting points for lifting operations. Lifting and lifting process should ensure that the equipment is smooth, not tilted, shaking. If the equipment is to be transported by forklift, the forklift must be forked in accordance with the forklift hole on the package. Equipment placed, you must choose a flat, solid place placed equipment, soft ground must be added mat board.

1.2、储存

1.2, storage

1）保持原本的包装方式。

2）储存的位置必须是平整坚实的地方，能够避免阳光暴晒及雨、水淋湿。放在室外需要加盖防雨和防暴晒设施。

3）不要与其它物品拥挤放置。

4）储存时间无特殊要求下没有时限。

1) to maintain the original packaging.

2) the location of the storage must be flat and solid place, to avoid sun exposure and rain, water wet. On the outside need to be covered with rain and anti-exposure facilities.

3) Do not place with other items crowded.

4) Storage time No special requirements No time limit.

1.3、开箱与检查

1.3 Unpacking and inspection

1）确认所定的型号规格和所收到的货一致。

2）仔细的开箱并检查是否在运输过程中被损坏，如果有损坏请与厂家联系。

3）检查所提供的设备产品合格证、使用说明书、设备出厂报告、图纸、备品备件等是否齐全。

4）检查是否在运输和搬运过程中有机械部件松动或断线、接线松动现象，接线松动会影响产品使用。

5）在起动之前要检查额定电压和电流是否正确。

1) Confirm that the specified model specifications are consistent with the goods received.

2) carefully out of the box and check whether the damage in the transport process, if there is damage, please contact the manufacturer.

3) Check the equipment provided by the product certification, instruction manual, equipment factory reports, drawings, spare parts, etc. are complete.

4) Check whether the mechanical parts in the transport and handling process loose or broken, loose wiring, loose wiring will affect the use of the product.

5) Check that the rated voltage and current are correct before starting.

2、柜体安装与连接

2, cabinet installation and connection

1）根据现场布局确定设备摆放空间，柜体下面电缆沟用水泥进行表面处理，保持其可靠耐用。

2）设置必要的预埋件。

3）安装前将设备空间打扫干净，并保证空间干燥。

4）设备吊装到位，用地脚螺栓固定或焊接在固定地槽钢上。

5）一次电缆和控制电缆的安装与连接。

1) According to the layout of the site to determine the equipment placed space, the cable below the cable trench with surface treatment, to maintain its reliable and durable.

2) set the necessary embedded parts.

3) Clean the equipment space before installation and ensure that the space is dry.

4) Equipment hoisting in place, with anchor bolts fixed or welded in fixed ground steel.

5) Installation and connection of cable and control cable.

3、绝缘测试

3, insulation test

绝缘电阻测试：测试前短接旁路接触器三相输入输出，短接可控硅两端（所有散热器连在一起），触发板上的触发端子短接。

Insulation resistance test: before the test short-circuit contactor three-phase input and output, short-circuit thyristor at both ends (all radiators together), the trigger board trigger terminal shorted.

用2500V兆欧表测量回路与地的绝缘电阻1分钟，绝缘电阻测量值可参考下表：

With 2500V megger measuring circuit and the insulation resistance of 1 minute, insulation resistance measurements can refer to the following table:

环境温度℃ Ambient temperature	10	20	30	40
绝缘电阻MΩ Insulation resistance	900	450	220	110

工频耐压测试：在绝缘电阻测试基础上，拆掉过压保护器，用工频耐压测试仪做耐压测试AC30kV(6kV时AC25kV)，测试1分钟，测试通过为正常。

试验完毕后，重新安装好过压保护器，并拆除短接线。

Power frequency withstand voltage test: Insulation resistance test based on the removal of overvoltage protection, with frequency withstand voltage tester to do pressure test AC30kV (6kV AC25kV), test 1 minute, the test passed as normal.

After the test, reinstall the overvoltage protector and remove the short wire.

4、低压灯泡测试

4, low pressure light bulb test

试验步骤如下：

1）断开高压软起动装置进线和出线；

2）将三相三线AC380V接在进线侧，出线侧接3只Y型连接的白纸灯泡。

3）三相三线AC380V接到控制器AC采样板UA/UB/UC上，用于同步信号采集及电压测量，注意接线时与进线时相序一致。

4）软起动柜控制电源为AC220V，上电后控制器、触摸屏均处于工作状态。

5）转换开关切换到本柜和直起，按直起起动按钮，旁路开关直接吸合，灯泡立刻点亮。

6）转换开关切换到本柜和软起，在触摸屏设置好各项参数，按起动按钮，灯泡逐渐点亮，直到全亮后旁路开关吸合，起动过程完毕。

7）前面调速过程正常，则高压固态软起动装置具备正式带电试验条件。

The test procedure is as follows:

1) disconnect the high voltage soft start device into the line and outlet;

2) will be three-phase three-wire AC380V connected to the line side, outlet side of the three Y-connected white paper bulbs.

3) Three-phase three-wire AC380V connected to the controller AC sampling board UA / UB / UC, for synchronous signal acquisition and voltage measurement, pay attention to wiring and line phase sequence.

4) soft start cabinet control power supply AC220V, after power on the controller, touch screen are in working condition.

5) switch to switch to the cabinet and straight up, press the start button, the bypass switch directly pull, the light immediately lit.

6) switch to switch to the cabinet and soft, set the parameters in the touch screen set, press the start button, the light bulb gradually lit until the full light after the bypass switch pull, start the process is completed.

7) in front of the normal speed control process, the high-voltage solid-state soft start device with a formal test conditions.

5、高压接线及起动

5, high-voltage wiring and starting

1）灯泡试验完毕后拆除试验电源及器件，接好高压固态软起动设备的进出高压电缆，接线时注意接线相序。

2）接线完毕后，前端送电，装置电压值显示正常，各指示灯指示正常。按照工况条件设置好起动参数，停机参数，保护参数，此时备妥灯亮，故障灯不亮则可以进行起动。

3）首次起动时将保护值设置尽量小，动作时间设置尽量短，以便起动过程中有故障可快速灵敏的跳闸。

4）转换开关切换至本柜和软起位置，按起动按钮，电机开始起动，可以持续观察指针电流表或触摸屏显示电流值，起动电流开始减小后旁路接触器吸合，起动完成。若起动中

存在任何故障，控制器动作跳闸，以保护软起动设备和电机。若起动过程中电流出现非正常波动，按停机或紧急按钮停机，直到排除故障后再起动。

1) After the lamp is finished, remove the test power supply and the device, connect the high voltage solid state soft start device into and out of the high voltage cable, wiring attention line sequence.

2) After the wiring is completed, the front power transmission, the device voltage value shows normal, the indicator light indicates normal. In accordance with the working conditions set the starting parameters, shutdown parameters, protection parameters, then ready to light, the fault light is not bright can start.

3) The first time to start the protection value set as small as possible, the action time set as short as possible in order to start the process can be quickly and easily faulty trip.

4) switch to switch to the cabinet and soft starting position, press the start button, the motor starts to start, you can continue to observe the pointer ammeter or touch screen display current value, start the current began to reduce the bypass contactor pull, start to complete. If there is any fault in the start-up, the controller trips to protect the soft-start device and the motor. If the current during the start of abnormal fluctuations in the current, press the stop or emergency button to stop, until the troubleshooting and then start.

第四章 起动与停机

Chapter 4 Start and Stop

BTGT系列高压固态软起动装置是高压设备，有潜在的能伤害人的电压，正常的起动与停机必须经由相应电气技术人员或经过专业培训的人来操作。

BTGT series of high-voltage solid-state soft-start device is a high-voltage equipment, there are potential to damage the human voltage, the normal start and stop must be through the corresponding electrical technical personnel or professional training to operate.

1、起动初始步骤

请在起动前做如下检查：

1）查看带电显示器检查软起动装置是否已通高压电。

2）查看触摸屏检查各项参数和状态是否显示正确。

3）检查各指示灯指示是否正常。

1, start the initial steps

Please check the following before starting:

1) Check the live display Check that the soft starter has reached high voltage.

2) Check the touch screen to check whether the parameters and status are displayed correctly.

3) Check whether the indicator light is normal.

2、起动参数设置

针对绝大多数负载，出厂设定参数能满足使用需求，但不一定完全适合现场条件。故在参数设定时根据现场负载情况将参数做适当调整。调整规则如下：**电机不能起动或起动过慢，增加初始电压；电机达不到全速或起动时间过长，增加限流值。**

2, start the parameter settings

For most of the load, factory settings parameters to meet the needs, but not necessarily fully suitable for site conditions. So the parameters set according to the site load conditions to make appropriate adjustments to the parameters. The adjustment rules are as follows: **The motor can not start or start too slowly, increase the initial voltage; the motor does not reach full speed or start time is too long, increase the current limit.**

2.1、起动电压

出厂设定：40%Ue

设定范围：30%-80%Ue

起动电压设置必须合理，电机才能立即产生一个足够大的起动转矩，初始电压过高电机受起动转矩冲击，存在机械部件损伤；初始电压过低，电机起动转矩不够，处于堵转状态，增加电机发热。

2.1, starting voltage

Factory setting: 40% Ue

Setting range: 30% -80% Ue

The starting voltage setting must be reasonable, the motor can immediately produce a large enough starting torque, the initial voltage is too high motor by the starting torque shock, there is mechanical parts damage; initial voltage is too low, the motor starting torque is not enough, in the locked state, Increase the motor fever.

2.2、起动时间

出厂设定：30S

设定范围：5-60S

调整斜坡时间可以改变达到限流的时间或当电流值无法达到限流值时，通过改变限流值可以改变到达全电压的时间。

起动时间设定为30S不代表电机30S完成起动。它仅表示从初始上电到电机电流下降到额定电流以下这一过程中，程序按照30S设定的电压上升斜率。同样的参数，负载不一样起动时间肯定是不一样的。如起动时间设置为30S，负载轻低于20秒就起动完成，负载重超过30S才能起动完成。

装置起动时，电机实际起动时间在20-30S之间是较为合理的，过短或过长的起动时间都属于起动效果欠佳，应该调整起动时间。

2.2, start time

Factory setting: 30S

Setting range: 5-60S

Adjust the ramp time to change the time to reach the current limit or when the current value can not reach the current limit, by changing the current limit can change the time to reach full voltage.

Start time set to 30S does not mean that the motor 30S to complete the start. It only indicates that the voltage from the initial power-up to the motor current drops below the rated current during the process, the program is set at 30S. The same parameters, the load is not the same starting time is certainly not the same. If the start time is set to 30S, the load is less than 20 seconds to start the start,

load more than 30S to start to complete.

When the device starts, the actual starting time of the motor is between 20-30S is more reasonable, too short or too long starting time are the starting effect is poor, should adjust the starting time.

2.3、电流限流

出厂设定：350%

设定范围：150%-400%

限流作用主要是抑制峰值电流，减轻对电网的冲击。电机起动后，电流上升到限流值后并保持，电流不再上升。限流值需根据电机负载情况设置，必须保证电机能够成功起动，但是电机起动时间过短，则起动效果不好，是限流值设置过高造成的，应减小限流值。对于负荷剧烈变化的情况，不要把限流值设定太低，否则会引起电机堵转或起动时间过长。

2.3, current limiting

Factory setting: 350%

Setting range: 150% -400%

Current limiting is mainly to suppress the peak current, reduce the impact on the power grid. After the motor starts, the current rises to the current limit and remains, and the current does not rise again. The current limit must be set according to the motor load, must ensure that the motor can be successfully started, but the motor starting time is too short, the starting effect is not good, the current limit is set too high, should reduce the current limit. For drastic changes in the load, do not set the current limit is too low, otherwise it will cause the motor stall or start too long.

3、软停参数设置

软停机是SYGR系列固态软起动设备的特性，它可以使停机时的输出电压缓慢减小，从而在停机过程中提供一个递减的输出转矩。这样可以使停机时间延长，减小负载停机时的机械冲击，软起动设备的起动和停机应在电机正常负载下调试。软停机功能用在离心式水泵中，可以避免正常停车时水锤现象造成阀门的损坏。

在供水系统中，因水的重力而产生的水压称为“水头压力”，水泵可以根据负载的情况提供相应的动力以克服水头压力，从而实现供水。当水泵停止时，泵提供的动力突然为0，

上部水压将使水倒流，安全阀是防止水倒流的装置，倒流的水被安全阀隔断，将产生很强的振动波，振动的声音称为“水锤”，振动波沿着管路传播，对所遇到的管路、阀门等相关设备造成严重破坏。

使用软停机功能后，停机过程中，泵动力逐渐减小，当输出动力仅比端部压力小时，阀门因反作用力而关闭，此过程中水不会产生振动波，水锤现象基本消失。

注意：软停机仅用于离心式水泵中，且管道入水口和出水口有一定的高程和压力差，管道高程比较小时，可以不用软停机功能。其它场合请慎用软停机功能。

3, soft stop parameter settings

The soft stop is a feature of the SYGR series of solid state soft starter devices that allows the output voltage at shutdown to be slowly reduced to provide a reduced output torque during shutdown. This will allow the downtime to be extended to reduce the mechanical shock at the time of load shutdown. The start and stop of the soft start device should be commissioned under normal motor load. Soft stop function used in the centrifugal pump, you can avoid the normal water hammer when the phenomenon caused by damage to the valve.

In the water supply system, the water pressure due to the gravity of the water is called the "head pressure", and the pump can provide the corresponding power according to the load to overcome the head pressure to achieve water supply. When the pump stops, the pump provides a sudden power of 0, the upper water pressure will make the water back, the safety valve is to prevent water back flow device, the reverse flow of water is cut off by the safety valve, will produce a strong vibration wave, vibration sound As "water hammer", vibration waves along the pipeline spread, encountered by the pipeline, valves and other related equipment caused serious damage.

When the soft stop function is used, the pump power is gradually reduced. When the output power is only smaller than the end pressure, the valve is closed due to the reaction force. During this process, the water does not produce vibration wave, and the water hammer phenomenon basically disappears.

Note: soft stop only for centrifugal pumps, and the pipeline inlet and outlet

have a certain height and pressure difference, the pipeline elevation is relatively small, you can not soft stop function. For other occasions, please use the soft stop function.

3.1、截止电压

出厂设定：30%Ue

设定范围：20%-60%Ue

软停时，可控硅全压输出，旁路接触器分闸。降速开始时，输出电压从全压逐渐下降到截止电压，以达到软停机目的。

3.1, cut-off voltage

Factory setting: 30% Ue

Setting range: 20% -60% Ue

Soft stop, the SCR full pressure output, bypass contactor gate. At the beginning of the deceleration, the output voltage gradually drops from the full pressure to the cut-off voltage to achieve the purpose of soft stop.

3.2、软停时间

出厂设定：10S

设定范围：5-30S

软停时间可以调整它对应从软停开始到软停结束时所经历的时间。

同样软停时间不表示实际软停时间，它在程序控制中仅表示软停电压下降的斜率。时间软件实际根据试验结果再调整获得。

3.2, soft stop time

Factory setting: 10S

Setting range: 5-30S

The soft stop time can be adjusted for the time it elapses from the soft stop to the end of the soft stop.

The same soft stop time does not represent the actual soft stop time, it only shows the slope of the soft stop voltage drop in program control. The time software is actually adjusted according to the test results.

4、正常起、停顺序

4.1、本柜/远方转换开关置于“本柜”档，直起/软起转换开关置于“软起”档。

4.2、接通控制电源，检查电源指示、状态指示、控制器、触摸屏等是否正常。

4.3、接三相高压电源，观察指针电压表和触摸屏电压显示是否正确。

4.4、在备妥指示灯亮时，按本柜起动按钮，状态指示灯由备妥灯转换成起动灯亮。

4.5、起动完成后，旁路接触器合闸，状态指示灯由起动灯转换成运行灯亮。若起动过程中有故障，起动停止，故障灯亮，触摸屏报警并显示故障名称。

4.6、停机时，按停机按钮，电机按照直接停机或软停机方式停机。

4.7、在起动、运行、停机过程中，有意外故障可直接按急停按钮，软起动设备立刻停止工作，触发停止、旁路接触器或前级开关跳闸。

4, normal, stop sequence

4.1, the cabinet / remote switch placed in the "cabinet" file, straight up / soft start switch placed in the "soft" file.

4.2, turn on the control power, check the power indicator, status indication, controller, touch screen, etc. is normal.

4.3, then three-phase high-voltage power supply, observe the pointer voltage meter and touch screen voltage display is correct.

4.4, in the ready indicator light, according to the cabinet start button, the status indicator light from the switch to start light.

4.5, after the completion of the start, bypass contactor closing, the status indicator from the starting light into a running light. If there is a fault during start-up, start stop, fault light, touch screen alarm and display fault name.

4.6, stop, press the stop button, the motor in accordance with the direct shutdown or soft stop mode shutdown.

4.7, in the start, run, stop the process, there are unexpected failures can be directly by the emergency stop button, soft start device immediately stop working, trigger stop, bypass contactor or front switch trip.

第五章 用户菜单与设置

Chapter 5 User Menu and Settings

BTGT 系列高压固态软起动设备显示界面采用 7 寸或 10 寸高性能工业触摸屏，具有 65536 色彩显示以及 800*480 点位的高分辨率，画面显示更加细腻逼真。

BTGT series of high-voltage solid-state soft start device display interface with 7-inch or 10-inch high-performance industrial touch screen, with 65536 color display and 800 * 480 dot high resolution, the screen display more delicate and realistic.

图 5.1 显示主界面

Figure 5.1 shows the main interface

PWR（黄）：当触摸屏上电后，该指示灯点亮；

CPU（绿）：当触摸屏上电且自检正常后，该指示灯点亮；

COM（红）：该灯为通讯指示灯，当触摸屏与软起动装置通讯正常时，指示灯闪烁频率很快；当触摸屏与软起动装置通讯中断时，指示灯闪烁频率很慢，同时触摸屏中间会出现通讯中断的白色条框。

PWR (yellow): when the touch screen power, the indicator light;

CPU (green): When the touch screen power and self-test is normal, the indicator light;

COM (red): the lights for the communication indicator, when the touch screen

and the soft start device communication is normal, the indicator light flashing frequency is very fast; when the touch screen and soft starter communication interruption, the indicator light flashing frequency is very slow, while the middle of the touch screen A white frame with communication interruption.

1、主界面说明

主界面有日期、时间、星期、线电压、三相电流、起动方式、停机方式、控制方式、运行状态、公司信息等显示，以及系统设置、起动设置、停机设置、保护设置、故障查询等操作按钮组成。

1, the main interface description

The main interface is the date, time, week, line voltage, three-phase current, start mode, stop mode, control mode, running status, company information display, and system settings, start settings, shutdown settings, protection settings, troubleshooting Button composition.

系统电压：软起动设备进线侧 A、C 两相的线电压有效值；

System voltage: soft start device into the line side A, C two-phase line voltage RMS;

三相电流：软起动设备在起动、运行、软停过程中，A、B、C 各相电流的有效值；

Three-phase current: soft start device in the start, run, soft stop process, A, B, C current value of each phase;

起动方式：软起动设备当前所选择的起动方式，如：电压斜坡、限流斜坡、突跳斜坡；

Start mode: Soft start device The currently selected starting mode, such as: voltage ramp, current limit slope, sudden jump slope;

停机方式：软起动设备当前所选择的停机方式，如：自由停机、软停机；

Shutdown: soft start device currently selected downtime, such as: free stop, soft stop;

控制方式：当前操作软起动设备起停的控制方式，如：线控、遥控；

Control mode: the current operation of the soft start device start and stop the control mode, such as: wire, remote control;

运行状态：软起动设备当前所处的工作状态，如：备妥、起动、运行、软停、故障；

Operating status: the working state of the soft starter device, such as: ready, start, run, soft stop, fault;

2、系统设置

2, the system settings

点击主界面的系统设置按钮，进入系统参数设置界面；系统设置界面如图 5.2：

Click on the main interface of the system settings button, enter the system parameter settings interface; system settings interface as shown in Figure 5.2:

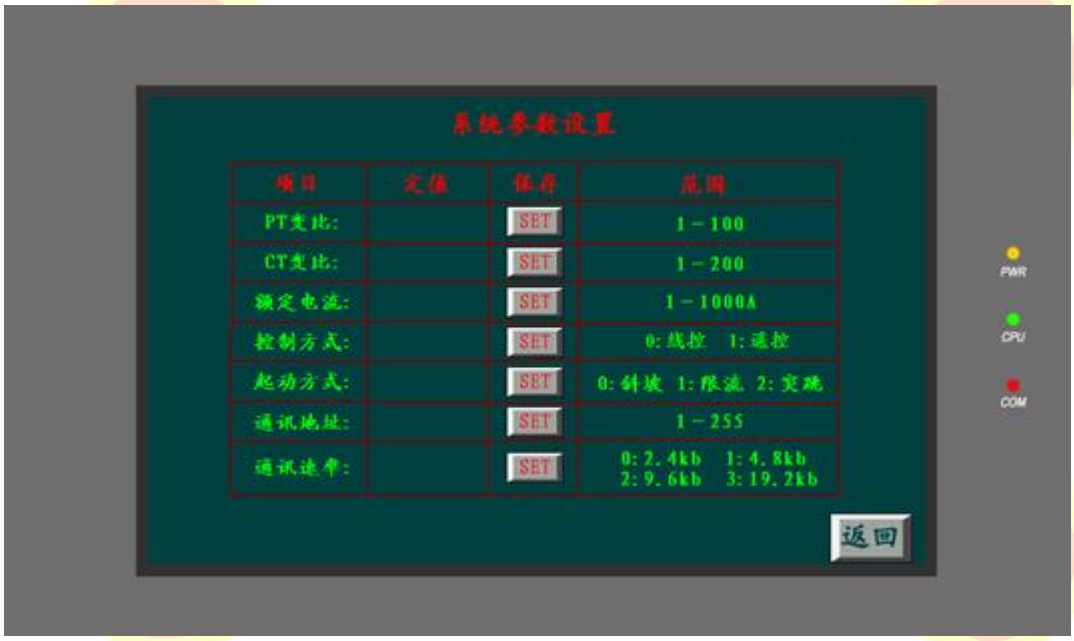

图 5.2 系统参数设置界面

Figure 5.2 System parameter setting interface

参数设置见本章 5.7、参数设置操作说明。

The parameter settings are described in Section 5.7, Parameter Setting Operation Instructions.

PT 变比：系统默认值为 100，参数设置范围是 1-100，设置值为电压互感器实际变比；

PT ratio: the system default value is 100, the parameter setting range is 1-100, the setting value is the actual transformation ratio of the voltage transformer;

CT 变比：系统默认值为 20，参数设置范围是 1-800，设置值为电流互感器实际变比；

CT ratio: the system default value is 20, the parameter setting range is 1-800, the setting value is the actual transformation ratio of the current transformer;

额定电流：系统默认值为 100，参数设置范围是 1-1000A，设置值为点击额定电流值(此额定电流为电动机的额定电流)；

Rated current: the system default value is 100, the parameter setting range is 1-1000A, the setting value is the click current rating (this rated current is the rated current of the motor);

控制方式：系统默认值为 0，参数设置范围是 0-1（0：线控；1：遥控），本柜控制时选择 0，通讯方式遥控时选择 1；

Control mode: the system default value is 0, the parameter setting range is 0-1 (0: wire control; 1: remote control), our cabinet control selection 0, communication mode remote control 1;

起动方式：系统默认值为 0，参数设置范围是 0-2，（0：斜坡；1：限流；2：突跳），对绝大多数负载来说，推荐设置为 1（限流起动）；

Start mode: the system default value is 0, the parameter setting range is 0-2, (0: ramp; 1: current limit; 2: sudden jump), for the vast majority of load, the recommended setting is 1 (current limit start) ;

通讯地址：系统默认值为 1，参数设置范围是 1-255；不使用通讯时设置为默认值，有通讯连接时根据通讯网络设置地址；

Communication address: the system default value is 1, the parameter setting range is 1-255; do not use the communication set to the default value, there is a communication connection according to the communication network to set the address;

通讯速率：系统默认值为 2，参数设置范围是 0-3，（0：2.4kb；1：4.8kb；2：9.6kb；3：19.2kb），设置值跟主站通讯速率相同。

Communication rate: the system default value is 2, the parameter setting range

is 0-3, (0: 2.4kb; 1: 4.8kb; 2: 9.6kb; 3: 19.2kb), the setting value is the same as the master station communication speed.

3、起动设置

3, start the settings

点击主界面的起动设置按钮，进入起动参数设置界面；起动设置界面如图 5.3：

Click on the main interface to start the set button, enter the startup parameter settings interface; start settings interface as shown in Figure 5.3:

图 5.3 起动参数设置

Figure 5.3 Start parameter settings

本设备起动方式分三种，分别是电压斜坡、限流斜坡和突跳斜坡。

The device starts in three ways, namely, voltage ramp, current limiting slope and sudden jump slope.

3.1、电压斜坡起动

3.1, voltage ramp start

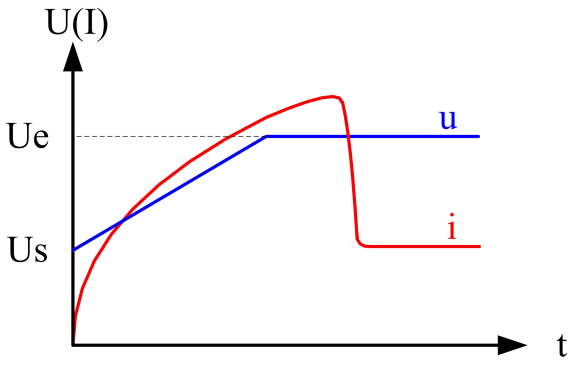

图 5.4 电压斜坡起动时电压和电流图

Figure 5.4 Voltage and current at voltage ramp start

电压斜坡起动时，电压从初始电压开始按照一定比率上升，直到全压，在此过程中，电流由于电机端电压和转速变化呈上升趋势，但电流变化非线性上升，最大电流值跟电机负载存在关系。

When the voltage ramp is started, the voltage rises from the initial voltage at a certain rate until the full pressure. During this process, the current increases due to the motor terminal voltage and the speed change, but the current changes non-linearly rise and the maximum current value is present with the motor load relationship.

电压斜坡包含初始电压和起动时间两个参数；

The voltage ramp contains two parameters: the initial voltage and the starting time.

初始电压：系统默认值为 40，参数设置范围是 30-80%，系统电压的百分比；

Initial voltage: the system default value is 40, the parameter setting range is 30-80%, the system voltage percentage;

起动时间：系统默认值为 30，参数设置范围是 10-120S，起动时间为电压上升到全压时间，即电压上升斜率，并非起动全过程时间，因为同一参数下不同负载起动时间也是不一样的。

Start time: the system default value is 30, the parameter setting range is 10-120S, the starting time is the voltage rise to the full pressure time, that is,

the voltage rise slope, not the whole process time, because the same parameters under different load start time is not the same The

3.2、限流斜坡起动

3.2, current limit ramp start

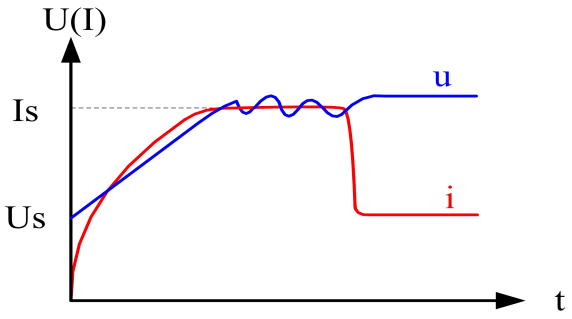

图 5.5 限流斜坡起动时电压和电流图

Figure 5.5 Voltage and current at start-up ramp

限流斜坡起动时，电压从初始电压开始按照一定比率上升，带电流到达设定限流值时，调节电压值，保持实时电流值不超过限流值，直到起动完成。

When the current limit ramps start, the voltage rises from the initial voltage according to a certain ratio. When the current reaches the set current limit value, adjust the voltage value and keep the real-time current value not exceed the current limit until the start is completed.

限流斜坡包含限流倍数、初始电压和起动时间等参数；

The current limiting slope includes parameters such as current limit, initial voltage and start time.

限流倍数：系统默认值为 350，参数设置范围是 150-400%，即电机额定电流的百分比；

Current limit: the system default value of 350, the parameter setting range is 150-400%, that is, the motor rated current percentage;

初始电压：系统默认值为 40，参数设置范围是 30-80%，即系统电压的百分比；

The initial voltage: the system default value is 40, the parameter setting range is 30-80%, that is, the percentage of the system voltage;

起动时间：系统默认值为 30，参数设置范围是 10-120S，起动时间为电压上升到全压

时间，并非起动全过程时间，因为同一参数下不同负载起动时间也是不一样的。

Start time: the system default value is 30, the parameter setting range is 10-120S, the starting time is the voltage rise to the full pressure time, not the whole process time, because the same parameter under different load start time is not the same.

3.3、突跳斜坡起动

3.3, sudden jump ramp start

突跳斜坡起动用于初始静摩擦比较大的场合，起动初始给一个突跳电压以克服初始转矩，让电机转起来，突跳完后按照电压斜坡起动。

突跳斜坡起动是秒冲突跳电压+电压斜坡起动方式的组合。

The sudden start of the ramp is used for initial static friction, starting with a sudden jump voltage to overcome the initial torque, let the motor turn up, jump after the start in accordance with the voltage ramp.

Burst ramp start is a combination of seconds to the collision voltage + voltage ramp start mode.

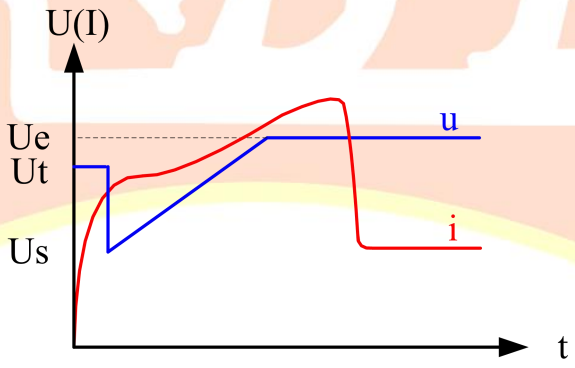

图 5.6 突跳斜坡起动时电压和电流图

Figure 5.6 Voltage and current at start-up ramp

突跳斜坡包含突跳电压、持续时间、初始电压和起动时间等参数；

The sudden jump slope includes parameters such as sudden jump voltage, duration, initial voltage and starting time.

突跳电压：系统默认值为 60，参数设置范围是 50-80%，系统电压的百分比；

Bounce voltage: the system default value is 60, the parameter setting range

is 50-80%, the system voltage percentage;

持续时间：系统默认值为 500，参数设置范围是 300-3000ms，突跳电压所保持的时间；

Duration: The system default value is 500, the parameter setting range is 300-3000ms, the time of the jumping voltage is kept;

初始电压：系统默认值为 40，参数设置范围是 30-80%，系统电压的百分比；

Initial voltage: the system default value is 40, the parameter setting range is 30-80%, the system voltage percentage;

起动时间：系统默认值为 30，参数设置范围是 10-120S，起动时间为电压上升到全压时间，并非起动全过程时间，因为同一参数下不同负载起动时间也是不一样的。

Start time: the system default value is 30, the parameter setting range is 10-120S, the starting time is the voltage rise to the full pressure time, not the whole process time, because the same parameter under different load start time is not the same.

4、停机设置

4, stop setting

点击主界面的**停机设置**按钮，进入停机参数设置界面；停机设置界面如图 5.7：

Click on the main interface of the **shutdown settings button**, enter the shutdown parameter settings interface; shutdown settings interface Figure 5.7:

图 5.7 停机参数设置

Figure 5.7 Stop parameter settings

本设备停机方式分两种，分别是自由停机和软停机。

There are two ways to stop the device, namely, free stop and soft stop.

4.1、自由停机

以直接断开断路器或接触器方式停机。

4.1, free stop

To disconnect directly from the circuit breaker or contactor.

4.2、软停机

软停机是在停机过程中，控制电机输出端电压，电机缓慢减速至停机，相对于自由停机，停机时间更长。

4.2, soft stop

Soft stop is in the process of stopping, control the motor output voltage, the motor slow down to downtime, relative to the free stop, downtime longer.

停机方式：系统默认值为 0，参数设置范围是 0-1，（0：自由停机；1：软停机）；

Stop mode: the system default value is 0, the parameter setting range is 0-1, (0: free stop; 1: soft stop);

软停截止电压：系统默认值为 30，参数设置范围是 20-60%，系统电压的百分比；

Soft stop voltage: the system default value is 30, the parameter setting range is 20-60%, the system voltage percentage;

软停时间：系统默认值为 10，参数设置范围是 5-30S，输出电压下降至软停截止电压的时间，非电机停机到电机停机转动的时间；

Soft stop time: the system default value is 10, the parameter setting range is 5-30S, the output voltage drops to the soft stop voltage off time, non-motor downtime to the motor downtime rotation time;

5、保护设置

5, protection settings

点击主界面的**保护设置**按钮，进入保护参数设置界面；保护设置界面如图 5.8：

Click on the main interface of **the protection settings button,** enter the protection parameter settings interface; protection settings interface as shown in Figure 5.8:

图 5.8 保护参数设置 1 Figure 5.8 Protection parameter setting 1

起动超时保护：系统默认值为 50，参数设置范围是 20-130S；电机在起动时间内未起动完成，停止起动，需检查起动参数设置是否合理，造成起动无法完成。

Start time-out protection: the system default value is 50, the parameter

setting range is 20-130S; the motor does not start within the starting time, stop the start, check the starting parameter setting is reasonable, causing the start can not be completed.

起动过流保护：系统默认值为 500，参数设置范围是 300-700%，电机额定电流的百分比；起动过程中电流超过该保护值后，停止起动。

Start overcurrent protection: the system default value is 500, the parameter setting range is 300-700%, the motor rated current percentage; start during the current exceeds the protection value, stop the start.

运行过流保护：系统默认值为 120，参数设置范围是 80-200%，电机额定电流的百分比；电机运行过程中电流值超过该保护值后，延时跳闸。

Running overcurrent protection: the system default value is 120, the parameter setting range is 80-200%, the motor rated current percentage; motor running process current value exceeds the protection value, the delay trip.

运行过流延时定值：系统默认值为 10，参数设置范围是 0-120S，电机运行电流超过运行过流定值后，延时跳闸时间；若延时时间内运行过流值下降，保护解除。

Running over-current delay setting: the system default value is 10, the parameter setting range is 0-120S, the motor running current exceeds the running over-current value, the delay trip time; if the delay time running over-current value, Release.

电流不平衡定值：系统默认值为 20，参数设置范围是 0-80%，电机额定电流的百分比；电机三相电流不平衡度超过 20%，延时跳闸。

Current unbalance value: the system default value is 20, the parameter setting range is 0-80%, the motor rated current percentage; motor three-phase current imbalance of more than 20%, delay trip.

电流不平衡延时定值：系统默认值为 10，参数设置范围是 0-120S，电机运行三相电流差值超过不平衡电流定值后，延时跳闸时间；若延时时间内不平衡电流下降，保护解除。

Current unbalance delay setting: the system default value is 10, the parameter

setting range is 0-120S, the motor running three-phase current difference exceeds the unbalanced current setting, the delay trip time; if the delay time unbalanced current Descent, protection lifted.

失载定值：系统默认值为 60，参数设置范围是 0-80%，电机额定电流的百分 比；电机运行过程中，运行电流低于设定失载定值，延时跳闸。此保护常用于皮带等负荷，由于故障等造成失载。

Loss of value: The default setting is 60, the parameter setting range is 0-80%, the percentage of the motor rated current; This protection is often used for belt and other loads, due to failure caused by loss.

失载延时定值：系统默认值为 10，参数设置范围是 0-120S，电机三相运行电流小于失载定值后，延时跳闸时间；若延时时间内失载故障消失，保护解除。

Loss of time setting: the system default value is 10, the parameter setting range is 0-120S, the motor three-phase running current is less than the loss setting value, the delay trip time; If the fault occurs in the delay time, the protection is released。

过压定值：系统默认值为 120，参数设置范围是 0-150%，系统额定电压的百分比；系统电压超过设定过压值，延时跳闸。

Overvoltage setting: The system default value is 120, the parameter setting range is 0-150%, the system rated voltage percentage; system voltage exceeds the set overvoltage value, delay trip.

过压延时定值：系统默认值为 10，参数设置范围是 0-120S，系统电压高于过压定值后，延时跳闸时间；

Overvoltage delay setting: the system default value is 10, the parameter setting range is 0-120S, the system voltage is higher than the overpressure value, the delay trip time;

欠压定值：系统默认值为 80，参数设置范围是 60-100%，系统额定电压的百分比；系统电压低于设定过压值，延时跳闸。

Undervoltage setting: the system default value is 80, the parameter setting range is 60-100%, the system rated voltage percentage; system voltage is lower than the set overvoltage value, delay trip.

欠压延时定值：系统默认值为 10，参数范围是 0-120S，系统电压低于欠压定值后，延时跳闸时间；

Undervoltage delay setting: the system default value is 10, the parameter range is 0-120S, the system voltage is lower than the undervoltage setting, the delay trip time;

点击下一页进入下一页保护参数设置界面，点击上一页回到上一页保护参数设置面。

Click **next page** to enter the next page protection parameter settings interface, click **on the previous page** to return to the previous page protection parameter settings surface.

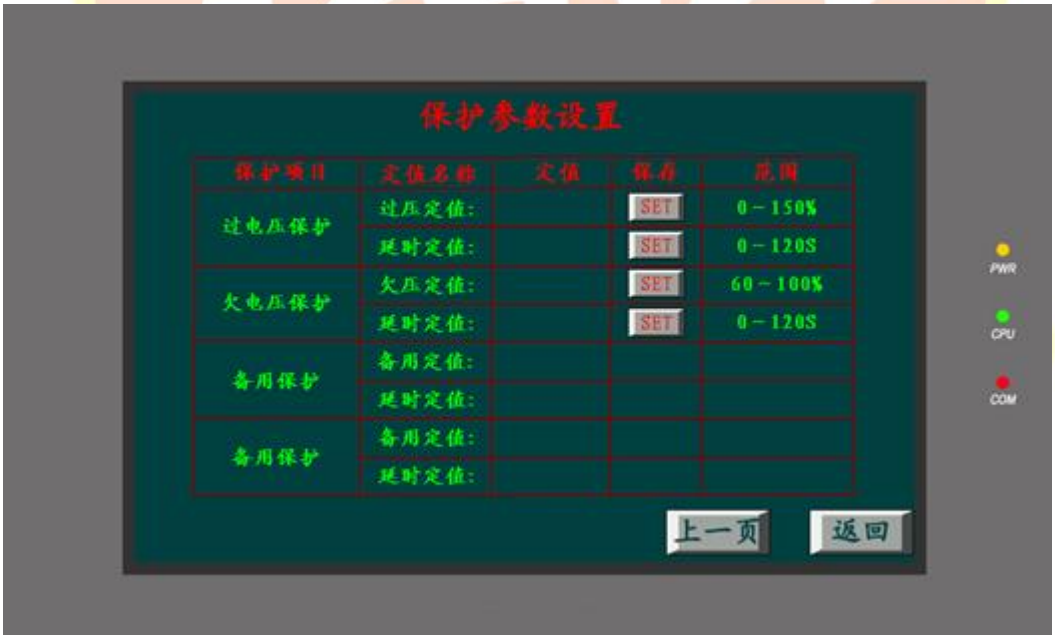

图 5.9 保护参数设置 2　Figure 5.9 Protection parameter setting 2

6、故障查询

6, fault query

点击主界面的故障设置按钮，进入故障参数设置界面；故障设置界面如图 5.10：

每条故障都包括：序号、日期、故障时间、复位时间、故障信息；当故障记录较多时，可以通过右侧绿色导航条和上下三角按钮翻看历史。

Click on the main interface of the fault settings button, enter the fault parameter settings interface; fault settings interface shown in Figure 5.10:

Each fault includes: serial number, date, fault time, reset time, fault information; when the fault records more, you can right side of the green navigation bar and the upper and lower triangle button to look at history.

图 5.10 故障状态查询 Figure 5.10 Fault status query

复位按钮：当出现故障后，可以点击复位按钮对故障进行复位，也可通过柜体前操作面板上的停机按钮进行复位。

Reset button: When a fault occurs, you can reset the fault by clicking the reset button or reset it by using the stop button on the front panel of the cabinet.

7、参数设置操作说明

7, parameter settings operating instructions

用手指点击对应的参数项定值框，就会出现一个定值输入操作小键盘，通过小键盘修改参数，输入完成后，按“ENTER”即退出小键盘，而后再点击对应的 SET 按钮保存所修改的参数即可。注：当点击触屏上面的按钮及参数框时，会发出“滴”的响声，若没听到

“滴”声，则没点击成功，请多点击几次，直至听到响声。

参数设置时请不要设置超过规定的范围。

Click on the corresponding parameter item to set the value of the box, there will be a value input operation keypad, through the keypad to modify the parameters, input is completed, press "ENTER" to exit the keypad, and then click the corresponding SET button to save the Modify the parameters can be. Note: When you click on the button and the parameter box above the touch screen, it will issue a "drop" sound, if not heard "drops" sound, then no success, please click a few times until you hear the sound.

Do not set the parameter range beyond the specified range.

图 5.11 参数设置操作界面

Figure 5.11 Parameter setting operation interface

第六章 软起动控制器

Chapter 6 Soft Start Controller

BTGT系列高压固态软起动控制器是我公司专为高压固态软起动器开发的具有国内先进水平的高压软起动器控制器，具有技术先进、通用性好、扩展方便等特点。

BTGT series of high-voltage solid-state soft-start controller is my company for high-pressure solid-state soft starter developed with the domestic advanced level of high-voltage soft starter controller, with advanced technology, versatility, easy to expand and so on.

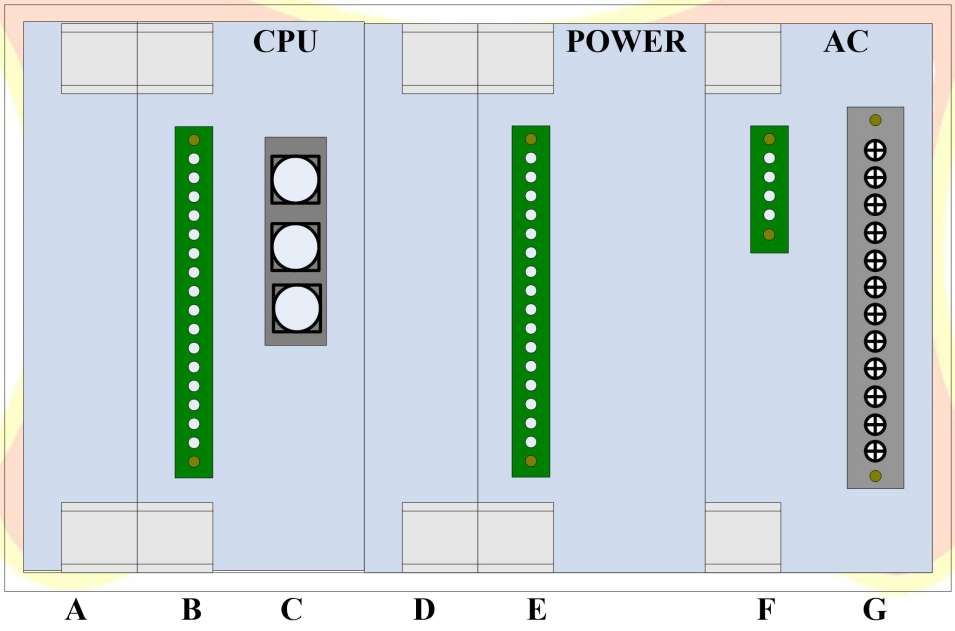

图 6.1 BTGT 系列高压固态软起动控制器端子图

Figure 6.1 SYGR series of high-voltage solid-state soft-start controller terminal diagram

软起动控制器端子说明如下：

The soft starter controller terminals are described below:

1、开入与通讯

用于外部控制信号的输入，开入端子为B1-B9。

B1：起动输入信号，开入后软起动开始起动,点动开入信号。

B2：停机、软停或复位输入信号，开入后按照设定的参数工作，自由停机则直接跳旁路接触器，软停则软停过程完成后跳旁路接触器，点动开入信号。

B3：故障输入信号，外部故障给软起动器后，直接跳旁路开关，点动开入信号。

B4：备用输入信号，点动开入信号。

B5：备用输入端子，点动开入信号。

B6：备用输入端子，点动开入信号。

B7：备用输入端子，点动开入信号。

B8：备用输入信号，点动开入信号。

B9：输入信号公共端。

B10-B12：232RX/232TX/GND，通讯端子，用于控制器与显示触摸屏通讯。

B13：备用端子。

B14-B15：RS485A/RS485B通讯端子，用于与外部设备通讯。

B16：备用端子。

注：开入为点动信号，触点接通到释放整个过程完毕后，开入有效。触点信号持续保持而不释放，开入点无效。

1, open and communication

For the input of the external control signal, the input terminal is B1-B9.

B1: start the input signal, start after the soft start to start, jog drive signal.

B2: stop, soft stop or reset the input signal, according to set the parameters after the work, free stop directly jump bypass contactor, soft stop is the soft stop process is completed after the jump bypass contactor, jogging signal The

B3: fault input signal, external fault to the soft starter, the direct jump bypass switch, jog drive signal.

B4: Standby input signal, jog input signal.

B5: Standby input terminal, jog input signal.

B6: Standby input terminal, jog input signal.

B7: Standby input terminal, jog input signal.

B8: standby input signal, jog input signal.

B9: Input signal common.

B10-B12: 232RX / 232TX / GND, communication terminal for communication between controller and display touch screen.

B13: spare terminal.

B14-B15: RS485A / RS485B communication terminal for communication with external devices.

B16: spare terminal.

Note: the opening for the jog signal, contact to release the entire process is completed, the opening is valid. The contact signal remains on hold without release, and the entry point is invalid.

2、光纤触发

C1：TXA，A相触发控制信号。

C2：TXB，B相触发控制信号。

C3：TXC，C相触发控制信号。

2, fiber trigger

C1: TXA, A phase trigger control signal.

C2: TXB, B phase trigger control signal.

C3: TXC, C phase trigger control signal.

3、电源与开出

E1：AC220V，L。

E2：AC220V，N。

E3-E4：备用。

E5:备妥信号输出，备妥状态下有信号输出。

E6：起动/软停信号输出，在起动或软停过程中有信号输出。

E7：旁路/运行信号输出，在运行状态时有信号输出。

E8：故障信号输出，出现故障时有信号输出。

E9：信号输出公共端。

E10-E11：旁路接触器合闸出口，旁路合闸时接点输出。

E12-E13：旁路接触器分闸出口，停机或故障时旁路分闸接点输出。

E14-E15：备用出口。

E16：备用端子。

注：分合闸出口保持3秒，其它状态出口根据状态持续输出。

3, power and out

E1: AC220V, L.

E2: AC220V, N.

E3-E4: Standby.

E5: ready signal output, ready to signal output.

E6: start / soft stop signal output, in the start or soft stop process signal output.

E7: bypass / run signal output, in the running state when the signal output.

E8: fault signal output, there is a signal output failure.

E9: Signal output common.

E10-E11: bypass contactor closing outlet, bypass closing contact output.

E12-E13: Bypass contactor Trip outlet, stop or fault bypass switch output.

E14-E15: Spare export.

E16: spare terminal.

Note: The sub-closing outlet is kept for 3 seconds, and the other status outputs are continuously output according to the status.

4、交流采集

F1：UA，电压互感器二次侧UA电压信号,用于电压测量和同步检测。

F2：UB，电压互感器二次侧UB电压信号,用于电压测量和同步检测。

F3：UC，电压互感器二次侧UC电压信号,用于电压测量和同步检测。

F4：UN，电压互感器二次侧UN电压信号。

G1-G2：IA-IA’，电流互感器二次侧IA电流信号,用于A相电流测量。

G3-G4：IB-IB’，电流互感器二次侧IB电流信号,用于B相电流测量。

G5-G6：IC-IC’，电流互感器二次侧IC电流信号,用于C相电流测量。

G7-G12：备用。

4, exchange collection

F1: UA, voltage transformer secondary side UA voltage signal for voltage measurement and synchronous detection.

F2: UB, voltage transformer secondary side UB voltage signal for voltage measurement and synchronous detection.

F3: UC, voltage transformer secondary side UC voltage signal for voltage measurement and synchronous detection.

F4: UN, voltage transformer secondary side UN voltage signal.

G1-G2: IA-IA ', current transformer secondary side IA current signal for A-phase current measurement.

G3-G4: IB-IB ', current transformer secondary side IB current signal for B-phase current measurement.

G5-G6: IC-IC', current transformer secondary side IC current signal for C phase current measurement.

G7-G12: Standby.

第七章 通讯协议

Chapter 7 Communication Protocol

BTGT系列高压固态软起动装置外部使用MODBUS-RTU通讯协议，MODBUS协议详细定义了校验码、数据序列等，这些都是特定数据交换的必要内容，MODBUS协议在一根通讯线上使用主从应答式连接（半双工），当计算机的寻址到一台唯一的终端设备号后，终端设备发出应答信号给主机。

MODBUS协议只允许在主机（PC、触摸屏）和终端设备之间通讯，不允许在终端设备之间的数据交换。

BTGT series of high-voltage solid-state soft starter external use MODBUS-RTU communication protocol, MODBUS protocol defines the check code, data sequence, etc., these are the necessary content for specific data exchange, MODBUS protocol in a communication line using the master and slave response (Half-duplex), when the

computer's addressing to a unique terminal device number, the terminal device sends a response signal to the host.

The MODBUS protocol only allows communication between the host (PC, touch screen) and the terminal device, and does not allow data exchange between the end devices.

1、传输方式

信息传输为异步方式，并以字节为单位，在主机和从机之间传递的通讯数据包含1个起始位、8个数据位、无奇偶校验位、1个停止位。

1, transmission mode

The information is transmitted in asynchronous mode, and in bytes, the communication data transferred between the master and the slave contains one start bit, eight data bits, no parity bit, and one stop bit.

2、信息帧格式

2, information frame format

地址码 address code	功能码 function code	数据区 Data area	CRC校验码 CRC check code
1字节 1 byte	1字节 1 byte	N字节 N byte	2字节 2 byte

地址码：由1个字节组成，本设备使用地址号1-127。多个设备连接一台主机时，每台设备地址编号必须唯一。

Address code: consists of 1 byte, the device uses address number 1-127. When multiple devices are connected to a host, each device address number must be unique.

功能码：终端需执行的功能，下表列出了软起动控制所支持的功能码。

Function code: The function to be executed by the terminal. The following table lists the function codes supported by the soft start control.

功能 function	定义 definition	备注 Remarks

01H	读取线圈状态 Read coil status	用于读取设备的开关量状态 Used to read the switch status of the device
04H	读数据寄存器 Read data register	用于读取设备的模拟量数据 Used to read the analog data of the device
06H	预置单寄存器 Preset single register	用于设备起停控制 Used for equipment start and stop control

数据区：数据区包含了终端执行特定功能所响应的数据。

CRC校验码：用于校验所接收数据是否正确。

Data area: The data area contains the data that the terminal performs to respond to a specific function.

CRC check code: used to verify the received data is correct.

3、通讯应用

3, communication applications

读开关量Read the amount of switch

地址码 Address Code	功能码 Function Code	起始地址 Start Address	寄存器数量 Register Number	CRC校验码 CRC Check Code
01	01	00 80	0030	3DF6

读模拟量Read analogue

地址码 Address Code	功能码 Function Code	起始地址 Start Address	寄存器数量 Register Number	CRC校验码 CRC Check Code
01	04	00 90	0004	F1E4

遥控起动命令Remote start command

地址码 Address Code	功能码 Function Code	起始地址 Start Address	写入数据 Write data	CRC校验码 CRC Check Code
01	06	00 FF	00EE	39B6

遥控停机命令Remote stop command

地址码 Address Code	功能码 Function Code	起始地址 Start Address	寄存器数量 Register Number	CRC校验码 CRC Check Code
01	06	00 FF		79A3

4、数据点表

4, data points table

4.1、开关量

4.1, switch volume

寄存器地址 Register Address	名称 Name	寄存器地址 Register Address	名称 Name
80.00	起动开入Start into	80.08	备用开入Standby
80.01	停机开入Stop on	80.09	备用开入Standby
80.02	备用开入Standby	80.0a	备用开入Standby
80.03	备用开入Standby	80.0b	备用开入Standby
80.04	备用开入Standby	80.0c	备用开入Standby
80.05	备用开入Standby	80.0d	备用开入Standby
80.06	备用开入Standby	80.0e	备用开入Standby
80.07	备用开入Standby	80.0f	备用开入Standby
81.00	备妥状态Ready state	81.08	备用状态Standby state
81.01	起动状态Start state	81.09	备用状态Standby state
81.02	运行状态Operating state	81.0a	备用状态Standby state
81.03	故障状态Fault state	81.0b	备用状态Standby state
81.04	软停状态Soft stop state	81.0c	备用状态Standby state
81.05	备用状态Standby state	81.0d	备用状态Standby state
81.06	备用状态Standby state	81.0e	备用状态Standby state
81.07	备用状态Standby state	81.0f	备用状态Standby state
82.00	外部故障External failure	82.08	备用故障Standby failure

82.01	起动超时Start timeout	82.09	备用故障Standby failure
82.02	起动过流Start overcurrent	82.0a	备用故障Standby failure
82.03	运行过流Running overcurrent	82.0b	备用故障Standby failure
82.04	三相电流不平衡Three-phase current is not balanced	82.0c	备用故障Standby failure
82.05	电机失载Motor loss	82.0d	备用故障Standby failure
82.06	过电压Overvoltage	82.0e	备用故障Standby failure
82.07	欠电压Undervoltage	82.0f	备用故障Standby failure

4.2、模拟量

4.2, analog

寄存器地址 Register Address	名称 Name	倍率 Magnification	名称 Name
90H	电压Voltage	×PT变比× PT ratio	无符号数Unsigned number
91H	A相电流 A phase current	×CT变比× CT ratio	无符号数Unsigned number
92H	B相电流 B phase current	×CT变比× CT ratio	无符号数Unsigned number
93H	C相电流 C phase current	×CT变比× CT ratio	无符号数Unsigned number

第八章 维护与故障处理

Chapter 8 Maintenance and Troubleshooting

1、日常维护

BTGT系列高压固态软起动装置设计为免维护产品，然而和其它电子设备一样，产品应定期检查是否有尘土污染、受潮以及工业生产污染。它会引起高压放电以及影响SCR的散热器散热。每年要检查螺栓是否有松动，并使用合适的力矩扭紧螺丝。根据生产厂家的技术手册检查真空接触器的气隙间隔是否合乎要求。

长期停放，清洁柜面、仪表、指示灯；检查电缆外壳接地、清洁绝缘垫、清洁柜内。检查接地，清洁并检查避雷器，测量接地电阻，清洁并检查电缆套管和支持绝缘子。

1, routine maintenance

BTGT series of high-voltage solid-state soft starter designed to maintain maintenance products, but other electronic equipment, the product should be regularly checked whether there is dust pollution, moisture and industrial production pollution. It can cause high pressure discharge and affect the heat dissipation of the SCR radiator. Check the bolt for loosening every year and tighten the screws with the appropriate torque. According to the manufacturer's technical manual to check whether the air gap spacing of the vacuum contactor is satisfactory.

Long-term parking, cleaning counter, instrument, light; check the cable shell ground, clean insulation pad, cleaning cabinet. Check the grounding, clean and inspect the arrester, measure the grounding resistance, clean and inspect the cable bushing and support the insulator.

2、故障分析

当故障发生时，显示屏和指示灯会有相应的故障指示，在重新起动电机时，务必要处理已出现的故障。遇到故障无法处理时，应及时联系厂家协助解决。

2, failure analysis

When the fault occurs, the display and indicator light will have a corresponding fault indication, be sure to deal with the fault has occurred when restarting the motor. Failure to deal with failure, should promptly contact the manufacturers to help solve.

故障现象 Fault phenomenon	故障原因 Cause of the malfunction	解决方法 Solutions
晶闸管短路 Thyristor short circuit	晶闸管击穿 Thyristor breakdown	断前级高压电，连好接地线，用万用表通断检测可控硅散热器两端，通则可控硅击穿，需更换。 Off the pre-high voltage, even the ground wire, with a multimeter on-off detection of thyristor radiator at both ends, through the

		SCR breakdown, need to be replaced.
起动超时 Start timeout	起动参数设置不合理 Start parameter setting unreasonable	起动时间设置过短，起动电压设置过低 The start time setting is too short and the starting voltage setting is too low
运行中电流不平衡 The current is running unbalanced	1）电流互感器二次接线故障 2）控制板电流测量 1) Secondary fault of current transformer 2) Control panel current measurement	1）检查电流互感器二次接线 2）更换控制板 1) Check the current transformer secondary wiring 2) Replace the control board
起动中电流不平衡 The current is unbalanced during start-up	1）电流互感器二次接线故障 2）控制板电流测量 3）触发丢失 1) Secondary fault of current transformer 2) Control panel current measurement 3) Trigger is lost	1）检查电流互感器二次接线 2）检查或更换控制板 3）试验状态下检测触发板指示灯，不亮更换触发板。 1) Check the current transformer secondary wiring 2) Check or replace the control board 3) Test the trigger plate indicator in the test state, do not turn off the trigger plate.
过载 overload	参数设置不合理、电机过载或堵转。Parameter settings unreasonable,motor overload or stall.	1）调整参数 2）改变电机运行负载。 1) adjust the parameters 2) Change the motor running load.
失压 Lose weight	1）电网无电压 2）电压互感器二次回路接线故障 3）控制板电压测量故障	1）停机 2）检测电压互感器二次接线 3）检查更换控制板 1) stop

	1) No voltage on the grid 2) voltage transformer secondary circuit wiring failure 3) Control panel voltage measurement failure	2) detection voltage transformer secondary wiring 3) Check to replace the control panel
电机不起动 The motor does not start	1）控制器没上电 2）控制回路故障 3）控制板故障 4）起动命令无效 5）起动限制 1) The controller is not powered up 2) Control circuit failure 3) Control panel failure 4) The start command is invalid 5) start limit	1）检测控制器电源 2）检查控制回路接线 3）检查或更换控制板 4）检查起动命令是否开入 5）程序设定电机起动最小间隔时间为 12 分钟 1) Detect the controller power supply 2) Check the control circuit wiring 3) Check or replace the control board 4) Check whether the start command is on 5) Program setting Motor start minimum interval of 12 minutes
触摸屏通讯故障 Touch screen communication failure	通讯接线问题或通讯故障 Communication wiring problems or communication faults	检测通讯接线或通讯口是否正常。 Check whether the communication wiring or communication port is normal.

注意：在软起动装置停机内部检查时，需断开前级电源，连好接地线。阻容电路放电完毕后再操作（停机约 15 分钟），用万用表测量可控硅两端电压，保证在安全范围内，以免触电。

Note: In the soft start device shutdown internal inspection, the need to disconnect the power supply, even the ground wire. Resistance capacitor circuit

discharge after the operation (stop about 15 minutes), with a multimeter to measure the voltage across the SCR to ensure that the safety range, so as not to electric shock.

第九章 质保和售后服务

Chapter 9 Warranty and after-sales service

1、质保期限

BTGT系列高压固态软起动装置质量保证期为12个月，从调试完成后开始计算，或是从发货日期起18个月计算，二者先到者为准。在质保期内因设备质量问题造成器件损坏或不能正常使用的，厂家负责及时免费修理或更换元件。

1, warranty period

BTGT series of high-voltage solid-state soft-start device quality assurance period of 12 months, from the start of the calculation after the start, or from the date of shipment 18 months, both prevail. In the warranty period due to equipment quality problems caused by damage to the device or can not be used normally, the manufacturer is responsible for timely repair or replacement parts free of charge.

2、保修细则

1）我公司产品在质保期内免费维修；因人为操作失误，自然灾害（如火灾、水灾、地

震、台风等）类等等造成的损失不在此范围内。

2）在质保期外，我公司对所生产产品提供终身免费技术咨询及有偿维修服务。

2, the warranty rules

1) Our products are free of charge during the warranty period; losses due to man-made errors, natural disasters (such as fire, flood, earthquake, typhoon, etc.) are not included.

2) in the warranty period, the company's products to provide life-long free technical advice and paid maintenance services.

3、维修指南

1）根据产品说明书进行检查并维修故障。

2）当无法判断原因时，请及时与我公司技术支持部门取得联系，反馈故障现象，或根据我公司技术人员的指导方法进行现场检查，以准确判断故障原因，及时处理问题。

3）当指导仍不能解决问题时，我方将根据用户描述或已获知的情况作出判断，并尽快派人到现场服务。保修期外的现场服务，用户应先支付服务费用。

3, maintenance guide

1) Check and repair the fault according to the product manual.

2) When the reasons can not be judged, please contact with our technical support department, feedback failure phenomenon, or in accordance with the guidance of our company's technical staff on-site inspection to accurately determine the cause of the failure to deal with the problem in a timely manner.

3) When the guidance still can not solve the problem, we will be based on user description or has been informed of the situation to make judgments, and as soon as possible to send people to the field service. Warranty outside the field service, the user should pay the cost of service.

4、联系方式

公司：湖北新百特自动化设备有限公司

地址：湖北省襄阳市高新区追日路9号

服务电话：0710-3222070

传真：0710-3230452

4, contact information

Company: Hubei Xinbaite Automation Equipment Co., Ltd.

Address: No. 9 North Han Industrial Park Hubei Xiangyang zhuiri Road

Service Tel: 0710-3222070

Fax: 0710-3230452

附录appendix

附录1、订货须知

1）有选型手册，列出所选软起动装置型号

2）提供电机参数，如额定电压、额定功率、额定电流等及负载类型，我公司为客户提供选型。

3）用户提供柜体颜色要求，没要求默认柜体颜色为RAL7032。

Appendix 1, Ordering Information

1) Select a manual that lists the selected soft starter models

2) to provide motor parameters, such as rated voltage, rated power, rated current and load type, our company to provide customers with selection.

3) the user to provide cabinet color requirements, did not require the default cabinet color for the RAL7032.

附录2、常用电机的软起动装置参数设置表

Appendix 2, the common motor soft start device parameter setting table

负载类型Load type	起始电压（%）Starting voltage (%)	起动时间（S）Start time (S)	最大限制电流（nIe）Maximum current limit (nIe)
船舶推进器 Ship propeller	30	25	2.8
离心风机 Centrifugal fan	30	45	3.5
离心泵 Centrifugal pump	35	30	3
活塞式压缩机 Piston Compressor	30	30	3
提升机械 Lifting machinery	35	30	3.5

搅拌机 Mixer	35	30	3.5
破碎机 Crusher	40	30	3.5
螺旋压缩机 Screw compressor	30	30	3.2
螺旋皮带机 Spiral belt machine	30	25	3.5
空载电机 No load motor	30	25	2.5
皮带传送机 Belt conveyor	30	30	3.5
气泵 air pump	30	30	3.2

注：电机软起动时，并非起动电流越小软起动效果越好，而是在可接受的电流下电机起动平稳，机械冲击小，发热小，这种情况称之为起动效果良好。电机软起动从起动到旁路时间在15秒至25秒之间，过短或过长的起动时间都是软起动效果不好的表现。

以上设置仅供参考，设置完成后起动，观察效果，再调整起始电压、起动时间和最大限制电流倍数，以达到最优起动效果。

Note: motor soft start, not the starting current, the smaller the soft start effect is better, but in the acceptable current motor starting smooth, small mechanical shock, heat is small, this situation is called the starting effect is good. Motor soft start from start to bypass time between 15 seconds to 25 seconds, too short or too long starting time are soft start effect is not good performance.

The above settings are for reference only, start after the start, observe the effect, and then adjust the starting voltage, start time and maximum limit of multiple times to achieve the optimal starting effect.