



NJR5-D Series Soft Starter

User Manual

Preface

Thank you for choosing the NJR5-D Series Soft Starter from Zhejiang Chint Electrics Co., Ltd.!

The NJR5-D series soft starter is an externally bypassed soft starter with its input power voltage (main circuit voltage) classified as AC220V, AC380V, AC460V, AC575V, and AC690V. It features strong load adaptability, stable and reliable operation, and is widely used in motor drive equipment in metallurgy, petroleum, fire protection, mining, water supply, municipal, food, cement, petrochemical, and other industries. It is the most advanced replacement product for star-delta starting and autotransformer reduced-voltage starting.

The NJR5-D Series Soft Starter is a three-phase AC asynchronous motor (hereinafter referred to as "motor") soft starter designed based on power electronics, microprocessor technology, and modern control theory. By controlling the three-phase anti-parallel thyristors connected between the power supply and the controlled motor, the device achieves motor soft start, soft stop, and other functions. It effectively controls the motor's starting current and starting torque.

To ensure the soft starter works at its best, please read the User Manual carefully before use. For your safety and proper use, the contents marked with "  " , "  " in the User Manual must be carefully read and followed. If you have any doubts during use, please contact our company. Our professional staff are happy to be of service to you.

The company will continuously optimize and improve the NJR5-D Series Soft Starter. Any changes related to the manual will be reflected in Appendix C Version Change Record.



: There is a risk of electric shock; stay alert.



: Pay attention to potential risks and follow safety signage information.



Safety Warning

1) When the soft starter and the frequency converter outputs are used as standby for each other, the output terminals of both must be isolated from each other. (That is, before the frequency converter runs the motor, ensure the output terminal of the soft starter and the input terminal of the motor and the output terminal of the frequency converter are all disconnected; likewise, before the soft starter runs the motor, ensure the output terminal of the frequency converter and the input terminal of the motor and the output terminal of the soft starter are all disconnected.)

2) When the power supply is connected to the input side of the soft starter but no load is connected, even in stop status, there may be an induced voltage at the output, which is caused by the leakage current of the thyristors and is a normal phenomenon; the induced voltage will disappear after connecting the motor.

3) If reactive power compensation equipment or purely capacitive devices are needed in the power distribution circuit to improve the power factor, they should be connected to the input side of the soft starter. It is strictly forbidden to connect them directly to the output side, otherwise it will cause damage to the soft starter.

4) The product is strictly prohibited from being installed in environments containing flammable, explosive, or strongly corrosive gases and condensation.

5) After the product is powered on, it is strictly forbidden to touch the conductive parts of the product or operate the product with wet hands.

6) During installation, maintenance, and servicing, ensure that the circuit is completely powered off.

7) Children are strictly forbidden from playing with the unpacked product or packaging materials.

8) Sufficient space and safety distance should be reserved around the product during installation.

9) When installing the product, the standard cables (including bus bars) and peripheral component configurations must be used.

10) To avoid dangerous accidents, installation and fixation of the product must be strictly carried out according to the requirements specified in the manual.

11) After unpacking the product, check for damage and verify all items are complete.

12) When installing external live wires to the product, insulate the wire parts to prevent accidental electric shock.

13) The product has passed dielectric strength tests before leaving the factory; to prevent electrical leakage from the enclosure, ensure that the grounding terminal is reliably grounded.

14) The closing and releasing of the bypass contactor must be entirely controlled by the K1 relay of the soft starter. Especially during voltage ramp soft stop or braking stop, if the bypass contactor is not released via the K1 relay of the soft starter, the upstream switch may trip during the voltage ramp soft stop or braking stop process.



Universal Warning Symbol:

Used to alert users to potential hazards. All safety information accompanying this symbol must be followed to avoid possible injury.

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1 Main Uses, Scope of Application, and Features

1.1 Unboxing Inspection

Check whether the nameplate model of this unit matches your order form;

Check if the soft starter is damaged during transport. If any damage is found, please contact the supplier immediately.

1.2 Main Uses

Mainly used for soft start and soft stop of motors. By controlling starting voltage and current, motors can start smoothly and reliably, thereby reducing the impact on equipment during startup, minimizing damage to equipment, and extending service life. Meanwhile, the soft starter also provides basic protection functions as a comprehensive motor protector.

1.3 Scope of Application

Applicable to typical squirrel-cage three-phase asynchronous motors. Motor load types primarily include: fans, pumps, compressors, ball mills, crushers, and similar loads.

1.4 Features

1.4.1 Performance Aspects

1) Seven starting modes: including conventional current, enhanced current, conventional voltage, enhanced voltage, linear torque, square torque, and frequency division. According to load characteristics, select different starting methods and parameter settings to achieve optimal motor startup performance.

2) Stable impulse starting: When switching from impulse to normal start, the current transitions smoothly, without abrupt changes, extending the lifespan of transmission equipment.

3) Torque control: Real-time control of the output torque of the soft starter. During the soft start process, the motor speed increases more smoothly.

4) Low-speed forward and reverse functions: By adjusting the SCR trigger angle, the product allows low-speed forward and reverse switching functionality, suitable for certain applications such as pump cleaning.

5) Braking stop function: By injecting DC current into the motor, rapid stopping is achieved for some applications.

6) Wide power supply: When under current, the power supply frequency range is 35Hz~60Hz, making it more suitable for generator applications.

1.4.2 Functional Aspects

1) Secondary current limiting function: In heavy load conditions, if the motor cannot start after primary current limiting, secondary current limiting (with a larger ratio than the primary) can be selected to start the motor, ultimately enabling full-speed operation.

2) Equipped with 2nd and 3rd motor parameter functions: When starting 2-3 motors in sequence, parameters for the 2nd and 3rd motors can be selected and controlled according to the logic input of external control terminal signals IN1 and IN2. The motors are started, stopped, and protected against overload according to the 2nd and 3rd motor parameters, which is especially suitable for scenarios where one drive controls two or three motors, or for dual-speed motors.

3) Multiple protections: Provides protections such as input phase loss, output phase loss, phase imbalance, running overload, starting current limit timeout, main circuit overvoltage, main circuit

undervoltage, load stall/short circuit, excessive starting time, and too frequent starts. These effectively protect both the soft starter and connected motor.

4) It has two types of analog current outputs: 4mA~20mA and 0mA~20mA, making it more compatible with industrial automation devices or instruments.

5) Built-in 485 communication interface: adopts standard Modbus protocol to realize communication between the soft starter and the upper computer, greatly improving the degree of automation.

6) Preheating function: Applies static preheating current to the motor stator while the motor is not rotating, improving motor starting characteristics.

7) Inner delta connection capability: The soft starter is connected in series with the windings of motors using delta connection, forming an inner delta circuit. Thus, for the same rated motor power, the current through the winding and soft starter is 1.732 times ($\sqrt{3}$). After measuring the current, you can select a soft starter with a lower current rating. For example, a 55 kW soft starter can carry a 90 kW motor.

1.4.3 User Experience Aspects

1) Easy user commissioning: After selecting the load type (see F200, F300, or F400), the relevant starting parameters of the motor will be automatically configured, facilitating user commissioning.

2) High operability: Uses LCD display with a friendly interface for convenient operation.

3) Records 10 fault events: Records the operational status, product temperature, working current and voltage at the moment the fault occurred, assisting fault troubleshooting, analysis, and resolution.

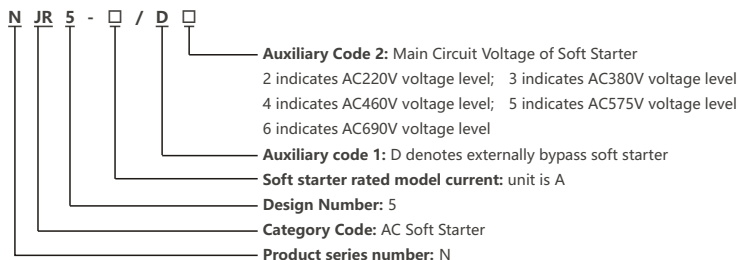
4) Function parameter modification record: Through FE group, users can quickly review modification information of function parameters, making after-sales support easier.

1.4.4 Stability Aspects

1) The PCBA is coated with three-proof paint for protection, greatly improving product stability.

2) Enhanced EMC design, resistant to higher EMS disturbances, high stability.

1.5 Model Specifications and Their Meaning



Example 1: NJR5-110/D6 indicates a soft starter with a rated operating current of 110A and a main circuit voltage of AC690V.

Example 2: NJR5-110/D3 indicates a soft starter with a rated operating current of 110A and a main circuit voltage of AC380V.

Selection principles:

1) For heavy loads, it is recommended to choose one size larger;

2) If altitude exceeds 1000m, derate accordingly: for altitudes above 1000m and below 3000m, reduce current rating 0.5% per 100m; above 3000m, special customization required.

1.6 Product Selection Comparison Table

Refer to Tables 1.1a), 1.1b), 1.1c, 1.1d), and 1.1e).

Table 1.1a) Selection Correspondence Table for NJR5-15/D2~NJR5-1600/D2

Product Model	Rated Voltage	Rated Current of Soft Starter Model	Adapted Motor Rated Current	Adapted Motor Rated Power
NJR5-15/D2	AC220V	15A	15A	4kW
NJR5-22/D2	AC220V	22A	22A	5.5kW
NJR5-30/D2	AC220V	30A	29A	7.5kW
NJR5-37/D2	AC220V	37A	36A	11kW
NJR5-44/D2	AC220V	44A	42A	11kW
NJR5-60/D2	AC220V	60A	57A	15kW
NJR5-74/D2	AC220V	74A	70A	18.5kW
NJR5-90/D2	AC220V	90A	84A	22kW
NJR5-110/D2	AC220V	110A	103A	30kW
NJR5-150/D2	AC220V	150A	140A	37kW
NJR5-180/D2	AC220V	180A	167A	45kW
NJR5-220/D2	AC220V	220A	207A	55kW
NJR5-264/D2	AC220V	264A	248A	75kW
NJR5-320/D2	AC220V	320A	300A	90kW
NJR5-370/D2	AC220V	370A	349A	110kW
NJR5-440/D2	AC220V	440A	404A	110kW
NJR5-500/D2	AC220V	500A	459A	132kW
NJR5-560/D2	AC220V	560A	514A	160kW
NJR5-630/D2	AC220V	630A	579A	160kW
NJR5-710/D2	AC220V	710A	634A	200kW
NJR5-800/D2	AC220V	800A	720A	200kW
NJR5-900/D2	AC220V	900A	810A	250kW
NJR5-1000/D2	AC220V	1000A	900A	250kW
NJR5-1120/D2	AC220V	1120A	1050A	280kW
NJR5-1260/D2	AC220V	1260A	1140A	315kW
NJR5-1420/D2	AC220V	1420A	1250A	355kW
NJR5-1600/D2	AC220V	1600A	1460A	400kW

Table 1.1b) NJR5-15/D3~NJR5-1600/D3 Selection Comparison Table

Product Model	Rated Voltage	Rated Current of Soft Starter Model	Adapted Motor Rated Current	Adapted Motor Rated Power
NJR5-15/D3	AC380V	15A	15A	7.5kW
NJR5-22/D3	AC380V	22A	22A	11kW
NJR5-30/D3	AC380V	30A	29A	15kW
NJR5-37/D3	AC380V	37A	36A	18.5kW
NJR5-44/D3	AC380V	44A	42A	22kW
NJR5-60/D3	AC380V	60A	57A	30kW
NJR5-74/D3	AC380V	74A	70A	37kW
NJR5-90/D3	AC380V	90A	84A	45kW
NJR5-110/D3	AC380V	110A	103A	55kW
NJR5-150/D3	AC380V	150A	140A	75kW
NJR5-180/D3	AC380V	180A	167A	90kW
NJR5-220/D3	AC380V	220A	207A	110kW
NJR5-264/D3	AC380V	264A	248A	132kW
NJR5-320/D3	AC380V	320A	300A	160kW
NJR5-370/D3	AC380V	370A	349A	185kW
NJR5-440/D3	AC380V	440A	404A	220kW
NJR5-500/D3	AC380V	500A	459A	250kW
NJR5-560/D3	AC380V	560A	514A	280kW
NJR5-630/D3	AC380V	630A	579A	315kW
NJR5-710/D3	AC380V	710A	634A	355kW
NJR5-800/D3	AC380V	800A	720A	400kW
NJR5-900/D3	AC380V	900A	810A	450kW
NJR5-1000/D3	AC380V	1000A	900A	500kW
NJR5-1120/D3	AC380V	1120A	1050A	560kW
NJR5-1260/D3	AC380V	1260A	1140A	630kW
NJR5-1420/D3	AC380V	1420A	1250A	710kW
NJR5-1600/D3	AC380V	1600A	1460A	800kW

Table 1.1c) NJRS-15/D4~NJRS-1600/D4 Selection Comparison Table

Product Model	Rated Voltage	Rated Current of Soft Starter Model	Adapted Motor Rated Current	Adapted Motor Rated Power
NJRS-15/D4	AC460V	15A	15A	9kW
NJRS-22/D4	AC460V	22A	22A	15kW
NJRS-30/D4	AC460V	30A	29A	18.5kW
NJRS-37/D4	AC460V	37A	36A	22kW
NJRS-44/D4	AC460V	44A	42A	30kW
NJRS-60/D4	AC460V	60A	57A	37kW
NJRS-74/D4	AC460V	74A	70A	45kW
NJRS-90/D4	AC460V	90A	84A	55kW
NJRS-110/D4	AC460V	110A	103A	75kW
NJRS-150/D4	AC460V	150A	140A	90kW
NJRS-180/D4	AC460V	180A	167A	110kW
NJRS-220/D4	AC460V	220A	207A	132kW
NJRS-264/D4	AC460V	264A	248A	150kW
NJRS-320/D4	AC460V	320A	300A	185kW
NJRS-370/D4	AC460V	370A	349A	220kW
NJRS-440/D4	AC460V	440A	404A	250kW
NJRS-500/D4	AC460V	500A	459A	280kW
NJRS-560/D4	AC460V	560A	514A	315kW
NJRS-630/D4	AC460V	630A	579A	355kW
NJRS-710/D4	AC460V	710A	634A	400kW
NJRS-800/D4	AC460V	800A	720A	450kW
NJRS-900/D4	AC460V	900A	810A	560kW
NJRS-1000/D4	AC460V	1000A	900A	560kW
NJRS-1120/D4	AC460V	1120A	1050A	630kW
NJRS-1260/D4	AC460V	1260A	1140A	710kW
NJRS-1420/D4	AC460V	1420A	1250A	800kW
NJRS-1600/D4	AC460V	1600A	1460A	900kW

Table 1.1d) NJR5-15/D5~NJR5-1600/D5 Selection Comparison Table

Product Model	Rated Voltage	Rated Current of Soft Starter Model	Adapted Motor Rated Current	Adapted Motor Rated Power
NJR5-15/D5	AC575V	15A	15A	11kW
NJR5-22/D5	AC575V	22A	22A	18.5kW
NJR5-30/D5	AC575V	30A	29A	22kW
NJR5-37/D5	AC575V	37A	36A	30kW
NJR5-44/D5	AC575V	44A	42A	30kW
NJR5-60/D5	AC575V	60A	57A	45kW
NJR5-74/D5	AC575V	74A	70A	55kW
NJR5-90/D5	AC575V	90A	84A	75kW
NJR5-110/D5	AC575V	110A	103A	75kW
NJR5-150/D5	AC575V	150A	140A	110kW
NJR5-180/D5	AC575V	180A	167A	132kW
NJR5-220/D5	AC575V	220A	207A	160kW
NJR5-264/D5	AC575V	264A	248A	185kW
NJR5-320/D5	AC575V	320A	300A	250kW
NJR5-370/D5	AC575V	370A	349A	280kW
NJR5-440/D5	AC575V	440A	404A	315kW
NJR5-500/D5	AC575V	500A	459A	355kW
NJR5-560/D5	AC575V	560A	514A	400kW
NJR5-630/D5	AC575V	630A	579A	450kW
NJR5-710/D5	AC575V	710A	634A	500kW
NJR5-800/D5	AC575V	800A	720A	560kW
NJR5-900/D5	AC575V	900A	810A	630kW
NJR5-1000/D5	AC575V	1000A	900A	800kW
NJR5-1120/D5	AC575V	1120A	1050A	800kW
NJR5-1260/D5	AC575V	1260A	1140A	900kW
NJR5-1420/D5	AC575V	1420A	1250A	1000kW
NJR5-1600/D5	AC575V	1600A	1460A	1200kW

Table 1.1e) NJR5-15/D6~NJR5-1600/D6 Selection Comparison Table

Product Model	Rated Voltage	Rated Current of Soft Starter Model	Adapted Motor Rated Current	Adapted Motor Rated Power
NJR5-15/D6	AC690V	15A	15A	11kW
NJR5-22/D6	AC690V	22A	22A	18.5kW
NJR5-30/D6	AC690V	30A	29A	22kW
NJR5-37/D6	AC690V	37A	36A	30kW
NJR5-44/D6	AC690V	44A	42A	37kW
NJR5-60/D6	AC690V	60A	57A	55kW
NJR5-74/D6	AC690V	74A	70A	75kW
NJR5-90/D6	AC690V	90A	84A	90kW
NJR5-110/D6	AC690V	110A	103A	110kW
NJR5-150/D6	AC690V	150A	140A	132kW
NJR5-180/D6	AC690V	180A	167A	160kW
NJR5-220/D6	AC690V	220A	207A	200kW
NJR5-264/D6	AC690V	264A	248A	250kW
NJR5-320/D6	AC690V	320A	300A	315kW
NJR5-370/D6	AC690V	370A	349A	355kW
NJR5-440/D6	AC690V	440A	404A	400kW
NJR5-500/D6	AC690V	500A	459A	400kW
NJR5-560/D6	AC690V	560A	514A	500kW
NJR5-630/D6	AC690V	630A	579A	560kW
NJR5-710/D6	AC690V	710A	634A	630kW
NJR5-800/D6	AC690V	800A	720A	710kW
NJR5-900/D6	AC690V	900A	810A	800kW
NJR5-1000/D6	AC690V	1000A	900A	900kW
NJR5-1120/D6	AC690V	1120A	1050A	900kW
NJR5-1260/D6	AC690V	1260A	1140A	1000kW
NJR5-1420/D6	AC690V	1420A	1250A	1200kW
NJR5-1600/D6	AC690V	1600A	1460A	1400kW

2 Normal Usage, Installation, Transport, and Storage Conditions

2.1 Normal Usage, Transport, and Storage Conditions

- 1) Operating temperature is between -10°C and $+40^{\circ}\text{C}$. For $+40^{\circ}\text{C} \sim +50^{\circ}\text{C}$, derating is required; for each 1°C increase, current is derated by 2%.
- 2) Storage temperature is between -25°C and $+70^{\circ}\text{C}$.
- 3) Relative humidity does not exceed 95% ($+20^{\circ}\text{C} \sim +65^{\circ}\text{C}$).
- 4) No condensation, no flammable or explosive gases, no conductive dust, and good ventilation.
- 5) If altitude exceeds 1000m, derate accordingly: for altitudes above 1000m and below 3000m, reduce current rating 0.5% per 100m; above 3000m, special customization required.
- 6) The soft starter should avoid vibration as much as possible.
- 7) If the on-site temperature is below -10°C or power has not been supplied for 18 months, the unit should be energized for more than 30 minutes before use.

2.2 Installation Conditions

In order to ensure good ventilation and heat dissipation for the soft starter during operation, it should be installed vertically, and sufficient space should be left around the device for heat dissipation, as shown in Figure 2.1. Only qualified professionals are permitted to install the soft starter. Please read this manual carefully before installation.

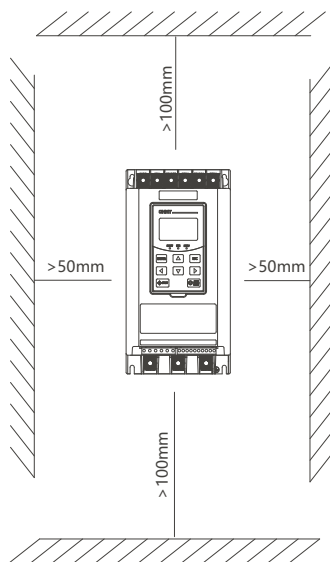


Figure 2.1 Installation Clearance Around Product

3 Main Technical Parameters and Performance

3.1 Technical Parameters and Performance

Table 3.1 Main Technical Parameters and Performance

Serial Number	Technical Parameters	Specifications and Performance Indicators
1	Main Power Supply Voltage	NJR5-□/D2: AC220V (-10%~+15%) (i.e., AC198V~AC264V) NJR5-□/D3: AC380V (-15%~+15%) (i.e., AC323V~AC437V) NJR5-□/D4: AC460V (-10%~+10%) (i.e., AC414V~AC504V) NJR5-□/D5: AC575V (-10%~+10%) (i.e., AC517V~AC633V) NJR5-□/D6: AC690V (-10%~+10%) (i.e., AC621V~AC759V)
2	Main Power Supply	1. When starting as current (more suitable for generator scenarios): 35Hz~60Hz. 2. When starting as non-current: 50Hz±2Hz, 60Hz±2Hz.
3	Control Power Supply Voltage	NJR5-□/D2 and NJR5-□/D3: Control power supply voltage is equal to the main power supply voltage. NJR5-□/D4, NJR5-□/D5, and NJR5-□/D6: AC220V (-10%~+15%).
4	Control Power Supply	50Hz±2Hz, 60Hz±2Hz
5	Applicable Motor	Standard squirrel cage three-phase asynchronous motor
6	Pollution Degree	Category 3
7	Rated Insulation Voltage	NJR5-□/D2, NJR5-□/D3: AC660V NJR5-□/D4, NJR5-□/D5, NJR5-□/D6: AC1000V
8	Rated Impulse Withstand Voltage	8kV
9	Cooling	Natural cooling
10	Starting Frequency	The number of starts per hour can be set. It is recommended not to exceed 10 times/hour (the heavier the load, the fewer the number of starts. If starting is necessary, ensure the temperature of both the motor and soft starter is relatively low). Note: If a starting current limit overtime protection or running overload protection occurs, restarting is only allowed after 30 minutes.
11	Vibration Resistance	Vibration less than 0.5g
12	EMC Equipment Level	Class A (Industrial Grade)
13	Initial Voltage	30%Ue ~ 70%Ue
14	Start Limit Current	50%Ie ~ 500%Ie
15	Overload Protection Class	Level 2, 10A Level, Level 10, Level 20, and Level 30
16	Relay Output	Three relay outputs: bypass relay K1, programmable status relay K2, programmable fault relay K3.
17	Digital Input	Two programmable digital inputs: Programmable input terminal IN1 and programmable input terminal IN2. Three digital inputs: start signal RUN, stop signal STOP, and emergency stop signal EMS.
18	Analog Output	One analog output, with two selectable types: 4mA~20mA and 0mA~20mA.

4 Structural Features and Working Principle

4.1 General Structure and Working Principle

4.1.1 General Structure Diagram

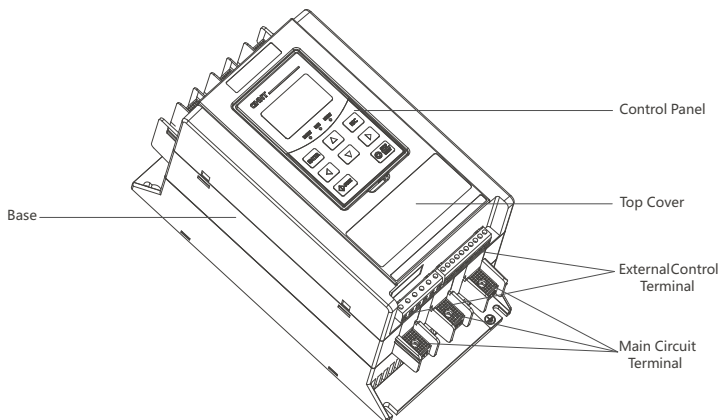


Figure 4.1 General Structure Diagram

4.1.2 Working Principle

The main circuit of the NJR5-D Series Soft Starter uses six anti-parallel thyristors connected in series to the stator circuit of the AC motor. By controlling the firing angle of the thyristors via microprocessor MCU, the motor's input voltage is adjusted to achieve soft start. After start-up is completed, the bypass contactor is closed and the system enters bypass operation. For the specific working principle diagram, see Figure 4.2.

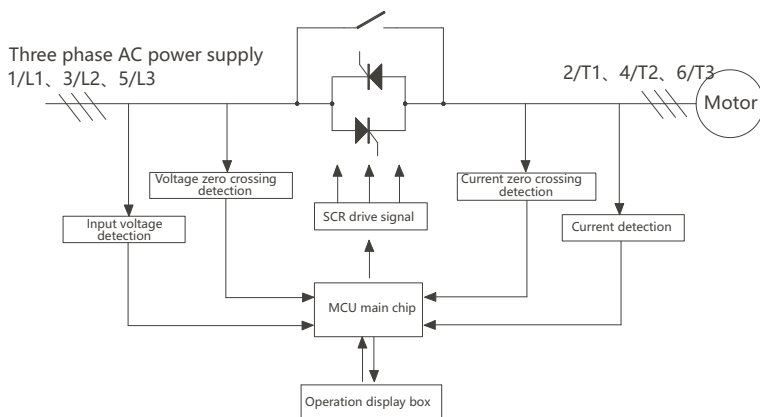


Figure 4.2 Working Principle

4.2 Structure, Function and Working Principle of Main Components or Functional Units

4.2.1 Basic Wiring Diagram

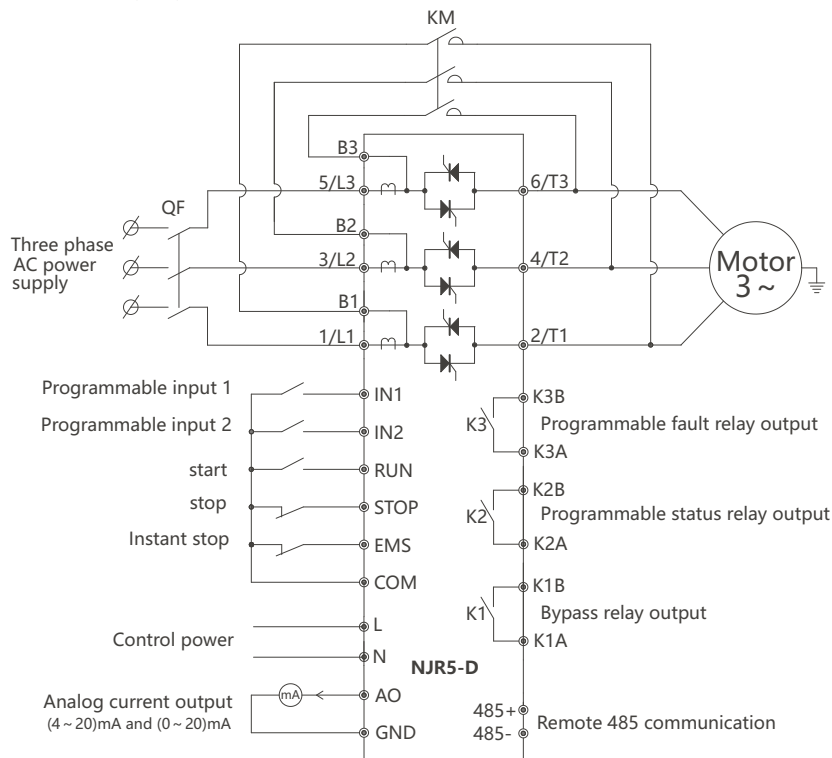


Figure 4.3 Basic Wiring Diagram

Note 1: For NJR5-□/D2 and NJR5-□/D3 products, there is no need to connect external control power supply terminals L and N, as control power is directly supplied internally from the main power supply; for NJR5-□/D4, NJR5-□/D5, and NJR5-□/D6 products, the control power supply terminals L and N must be connected, as the control power needs to be supplied separately from an external source.

Note 2: Under default function parameter conditions, when external control terminals are used to control starting and stopping, with the STOP terminal and COM terminal closed, after power-up, a start command will only be issued when the RUN terminal and COM terminal transition from open to closed. If upon power-up the RUN, STOP, and COM terminals are always closed, no start command will be received.

Note 3: The circuit breaker QF must be installed and located inside the cabinet. The rated current of the circuit breaker is recommended to be 1.2 times the rated current of the soft starter model.

Note 4: By modifying the setting value of function parameter F500 about relay output valid state, you can confirm whether K2 and K3 relays are valid in closed state or in open state. See F500 parameter introduction for details.

4.2.2 Main Circuit Terminal Definitions

1/L1, 3/L2, 5/L3	This is the input terminal of the soft starter, and also the input terminal of the three-phase AC power supply.
2/T1, 4/T2, 6/T3	This is the output terminal of the soft starter, and also the input terminal of the three-phase asynchronous motor.
B1, B2, B3	This connects to the bypass device, and also serves as the input terminal of the bypass device.



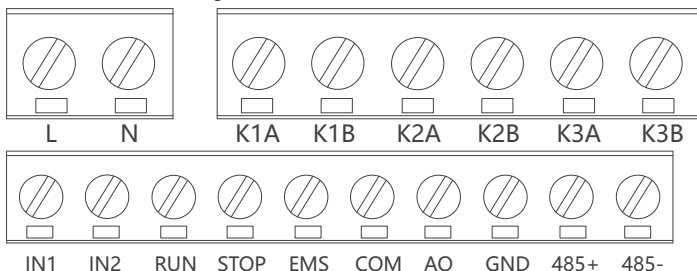
When connecting an external bypass, it is required that the device input terminals B1, B2, B3 and the output terminals 2/T1, 4/T2, 6/T3 correspond one-to-one, as shown in Figure 4.3. Incorrect wiring will cause a power short circuit when switching to bypass, which may damage the entire system.

4.2.3 Control Terminal Definitions

Terminal Name	Terminal Definition	Detailed Description
L	Control power input terminal L	Input voltage is AC220V (-10%~+15%), Only NJR5-□/D4, NJR5-□/D5, and NJR5-□/D6 products have L and N control power supply terminals; NJR5-□/D2 and NJR5-□/D3 do not have these terminals.
N	Control power input terminal N	
K1A, K1B	Bypass relay K1 (normally open)	Contact capacity: 5A/250VAC When the soft starter switches to bypass operation, the K1A and K1B terminals become closed. Note: If the coil current of the controlled device exceeds 5A, be sure to add an intermediate relay.
K2A, K2B	Programmable status relay K2 (normally open)	Contact capacity: 3A/250VAC This function is determined by function parameters F500 and F513. When the tens digit of F500 is 0, the state is valid when terminals K2A and K2B are closed; when it is 1, the state is valid when terminals K2A and K2B are open. Example: When the tens digit of F500 is set to 0 and F513 is set to 2 (Bypass State), terminals K2A and K2B will be closed when the soft starter enters bypass operation, and open in all other operating states; when the tens digit of F500 is set to 1 and F513 is set to 2 (Bypass State), K2A and K2B will be open in bypass operation and closed in any other operating state. Note: If the coil current of the controlled device exceeds 3A, be sure to add an intermediate relay.
K3A, K3B	Programmable fault relay K3 (normally open)	Contact capacity: 3A/250VAC This function is determined by function parameters F500 and F514. When the ones digit of F500 is 0, the state is valid when terminals K3A and K3B are closed; when it is 1, the state is valid when terminals K3A and K3B are open. Example: When the ones digit of F500 is set to 0 and F514 is set to 0 (Any fault), the K3A and K3B terminals will be closed when the soft starter has any fault, and open in the event of no fault; when the ones digit of F500 is set to 1 and F514 is set to 0 (Any fault or), the K2A and K2B terminals will be open when the soft starter has any fault, and K3A and K3B will remain closed if there is no fault. Note: If the coil current of the controlled device exceeds 3A, be sure to add an intermediate relay.

Terminal Name	Terminal Definition	Detailed Description
IN1	Programmable input terminal IN1	Referenced to COM; function determined by parameter F501. Note: This terminal is a dry contact; it is strictly forbidden to introduce external AC or DC power sources.
IN2	Programmable input terminal IN2	Referenced to COM; function determined by parameter F502. Note: This terminal is a dry contact; it is strictly forbidden to introduce external AC or DC power sources.
RUN	Start terminal RUN	Referenced to COM.
STOP	Stop terminal STOP	When external control starting is allowed, if RUN, STOP, and COM terminals are all closed for a time longer than the values set in F507 and F509, a start command will be issued; when the STOP terminal opens for longer than the value set in F510, a stop command will be issued. Note: This terminal is a dry contact; it is strictly forbidden to introduce external AC or DC power sources.
EMS	Emergency stop terminal EMS	Referenced to COM. When EMS terminal and COM terminal are open for longer than the value set in parameter F512, "Emergency stop terminal open circuit" fault is reported. Note: This terminal is a dry contact; it is strictly forbidden to introduce external AC or DC power sources.
COM	External control common terminal COM	This is the common terminal for RUN, STOP, IN1, IN2, and EMS signal input.
AO	Analog output terminal AO	Referenced to GND. The output type of the analog output AO is determined by parameter F600, and the output function of the analog output AO is determined by F601. For details, refer to the descriptions of function parameters F600, F601, and F602.
GND	GND of internal chip operation	The operating ground of the main chip of the product, which is also the ground for the analog output AO, and at the same time serves as the ground for RS485 communication.
485+	RS485 communication terminal 485+	485+ connects to the positive differential terminal of the host computer.
485-	RS485 communication terminal 485-	485- connects to the negative differential terminal of the host computer.

4.2.4 Control terminal schematic diagram



	Maximum torque: 0.5N·m		Cable: AWG13~AWG22 0.3mm ² ~2.5mm ²
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Figure 4.4 Control terminal schematic diagram

4.2.5 Basic wiring schematic diagram

Three-phase AC input power supply

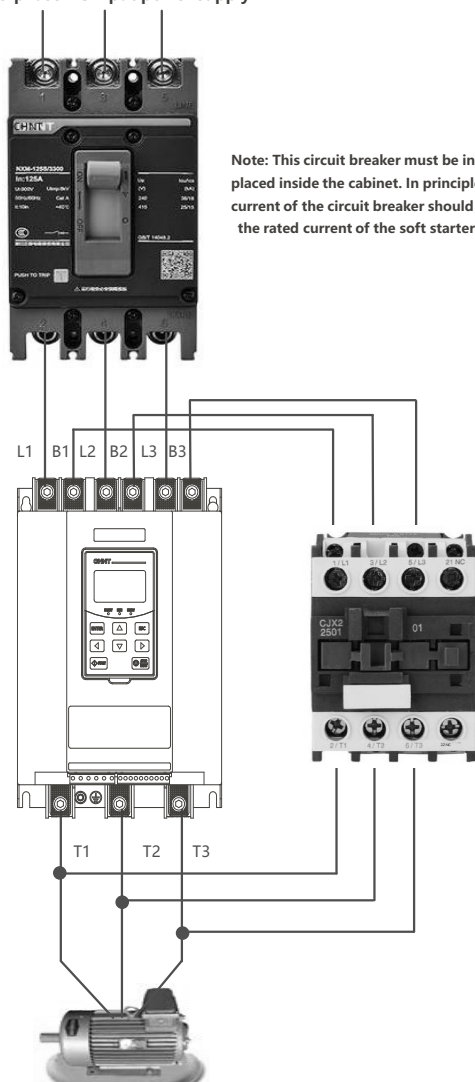
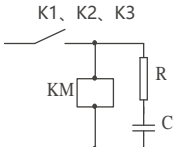


Figure 4.5 Basic wiring schematic diagram

4.2.6 Main circuit wiring precautions

Safety Level	Precautions
	It is strictly forbidden to connect capacitors directly to the output terminals (2/T1, 4/T2, 6/T3) of the soft starter!
	It is strictly forbidden to apply an AC power supply exceeding the specified voltage range to the L and N control power supply!
	The main circuit cable (copper bar) should be selected according to relevant standards. See Appendix A for recommended values!
	When installation standards require incoming circuit residual current devices for protection, a residual current circuit breaker that avoids accidental tripping during power-up must be used. Check its compatibility with other protective devices!
	It is not recommended to use ON/OFF switching of the main circuit power supply to control the running and stopping of the soft starter. Once the soft starter is powered on, use the external control terminal on the soft starter, the operation panel, or remote communication to control soft start or stop!
	The soft starter must be grounded to comply with current leakage regulations, and the enclosure must be reliably grounded. If several soft starters are connected to the same ground wire during installation, each soft starter must be grounded separately!
	Power cables should be isolated from weak signal (detector, PLC, measuring instrument) circuits, recommended separation is more than 20mm, and their routing should be as perpendicular as possible!

4.2.7 Control circuit wiring precautions

Safety Level	Precautions
	It is forbidden to introduce external power to any terminal except K1A, K1B, K2A, K2B, and K3A, K3B! If there is an operation command after power-up or manual fault reset, the motor will start!
	When laying control wires (weak current) and power wires (strong current), a distance should be maintained between them, recommended to be greater than 20mm; if they cross each other, the wiring should be routed as perpendicular as possible! When K1, K2, and K3 are used to control external devices, it is recommended to connect an RC snubber circuit in parallel across the coil ends of the devices to effectively suppress the surge voltage generated during device operation and improve system reliability! As shown below:  R: $10\Omega \sim 100\Omega$; C: $0.01\mu\text{F} \sim 1\mu\text{F}$

5 Appearance, mounting dimensions, and weight

5.1 Soft starter appearance and mounting dimensions

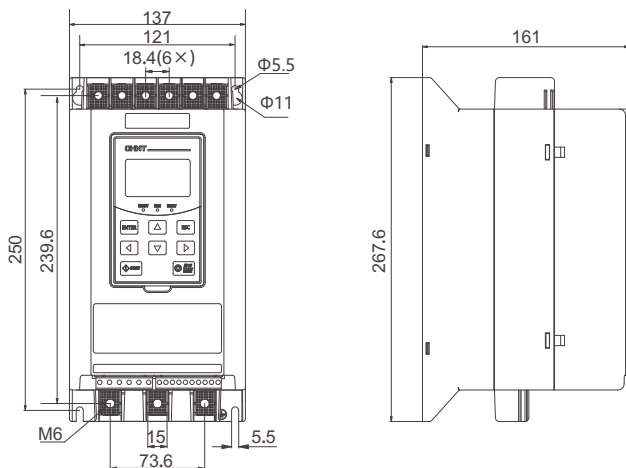


Figure 5.1 NJR5-15/D2~NJR5-60/D2, NJR5-15/D3~NJR5-60/D3, NJR5-15/D4~NJR5-60/D4, NJR5-15/D5~NJR5-60/D, NJR5-15/D6~NJR5-60/D6 overall appearance and installation dimensions diagram

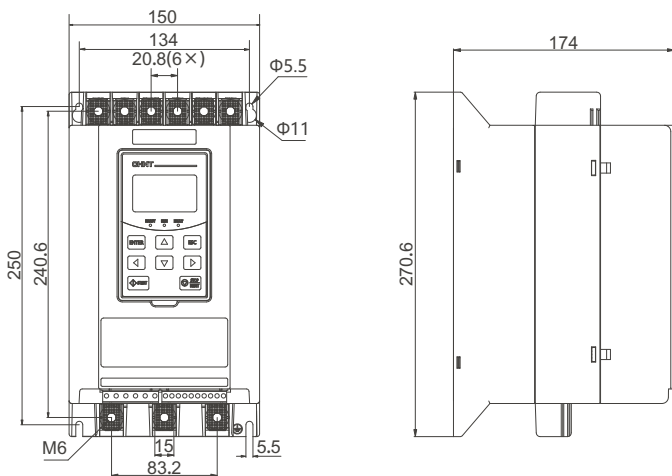


Figure 5.2 NJR5-74/D2~NJR5-110/D2, NJR5-74/D3~NJR5-110/D3, NJR5-74/D4~NJR5-110/D4, NJR5-74/D5~NJR5-110/D, NJR5-74/D6~NJR5-110/D6 overall appearance and installation dimensions diagram

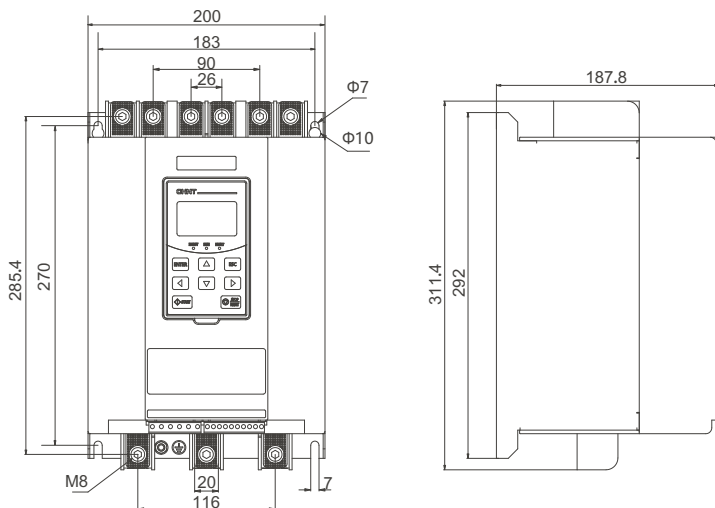


Figure 5.3 NJR5-150/D2~NJR5-180/D2, NJR5-150/D3~NJR5-180/D3, NJR5-150/D4~NJR5-180/D4, NJR5-150/D5~NJR5-180/D, NJR5-150/D6~NJR5-180/D6 overall appearance and installation dimensions diagram

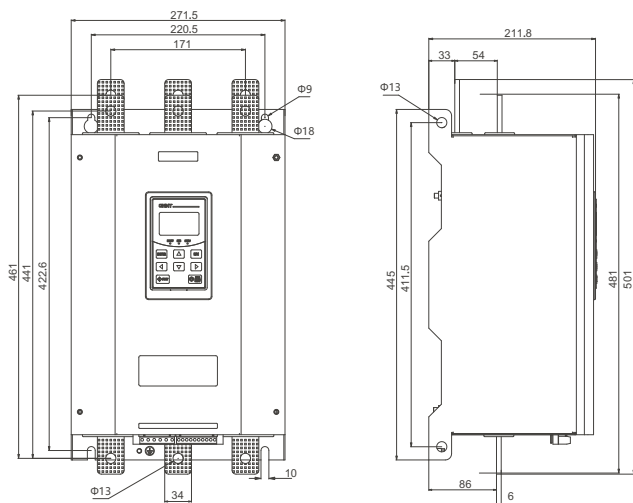


Figure 5.4 NJR5-220/D2~NJR5-440/D2, NJR5-220/D3~NJR5-440/D3, NJR5-220/D4~NJR5-440/D4, NJR5-220/D5~NJR5-440/D, NJR5-220/D6~NJR5-440/D6 overall appearance and installation dimensions diagram

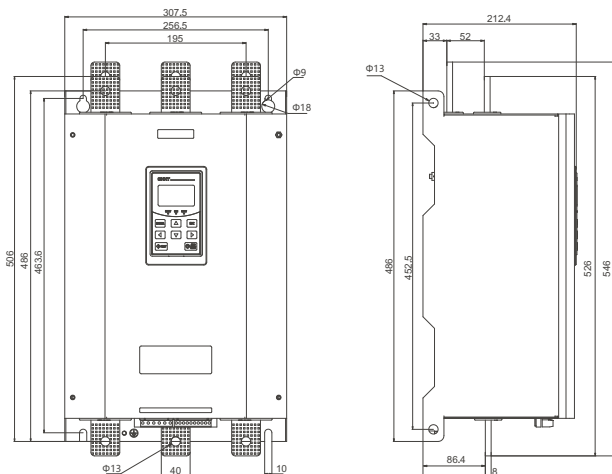


Figure 5.5 NJR5-500/D2~NJR5-630/D2, NJR5-500/D3~NJR5-630/D3, NJR5-500/D4~NJR5-630/D4, NJR5-500/D5~NJR5-630/D, NJR5-500/D6~NJR5-630/D6 overall appearance and installation dimensions diagram

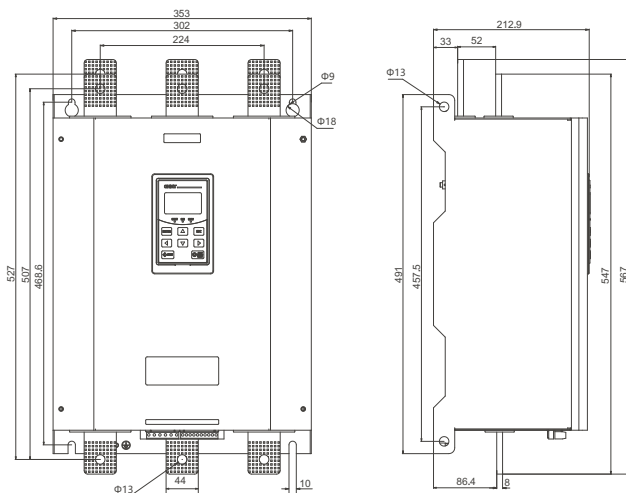


Figure 5.6 NJR5-710/D2~NJR5-800/D2, NJR5-710/D3~NJR5-800/D3, NJR5-710/D4~NJR5-800/D4, NJR5-710/D5~NJR5-800/D, NJR5-710/D6~NJR5-800/D6 overall appearance and installation dimensions diagram

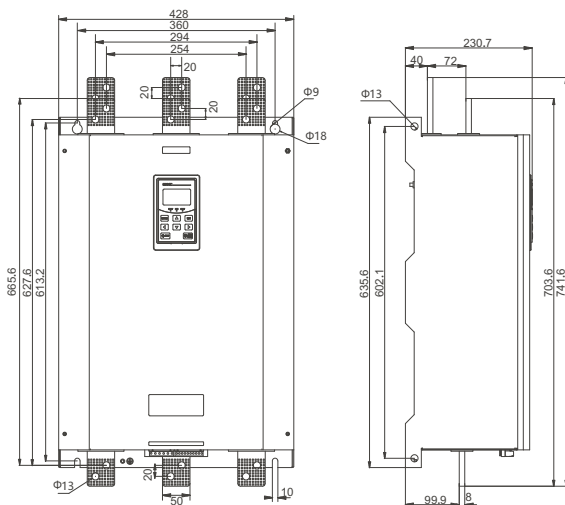


Figure 5.7 NJR5-900/D2~NJR5-1120/D2, NJR5-900/D3~NJR5-1120/D3, NJR5-900/D4~NJR5-1120/D4, NJR5-900/D5~NJR5-1120/D5, NJR5-900/D6~NJR5-1120/D6 overall appearance and installation dimensions diagram

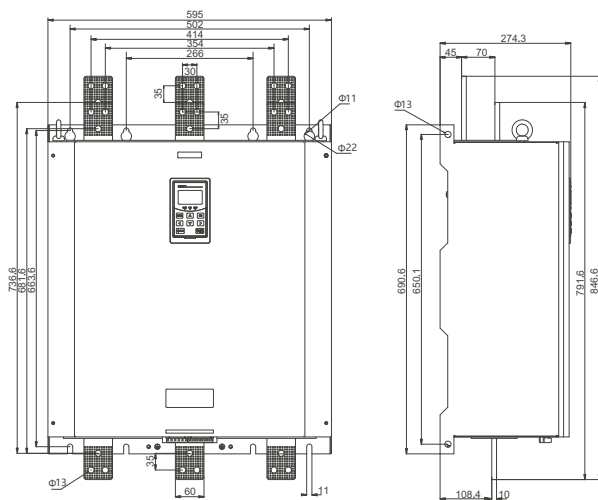


Figure 5.8 NJR5-1260/D2~NJR5-1600/D2, NJR5-1260/D3~NJR5-1600/D3, NJR5-1260/D4~NJR5-1600/D4, NJR5-1260/D5~NJR5-1600/D5, NJR5-1260/D6~NJR5-1600/D6 overall appearance and installation dimensions diagram

5.2 Soft starter weight

Table 5.1 Soft starter weight and main terminal tightening torque

Model	Net Weight	Gross Weight	Main terminal screw specifications	Main terminal tightening torque (N·m)	Remarks									
NJR5-15/D2/D3	3.0kg	3.4kg	M6	4 ~ 6	Figure 5.1									
NJR5-22/D2/D3														
NJR5-30/D2/D3														
NJR5-37/D2/D3														
NJR5-44/D2/D3	3.4kg	3.8kg				M6	4 ~ 6	Figure 5.1						
NJR5-60/D2/D3														
NJR5-15/D4/D5/D6	3.2kg	3.6kg							M6	4 ~ 6	Figure 5.1			
NJR5-22/D4/D5/D6														
NJR5-30/D4/D5/D6														
NJR5-37/D4/D5/D6														
NJR5-44/D4/D5/D6	3.5kg	3.9kg										M6	4 ~ 6	Figure 5.1
NJR5-60/D4/D5/D6														
NJR5-74/D2/D3	3.8kg	4.5kg	M6	4 ~ 6	Figure 5.2									
NJR5-90/D2/D3	4.2kg	4.9kg												
NJR5-110/D2/D3														
NJR5-74/D4/D5/D6														
NJR5-90/D4/D5/D6	4.7kg	5.4kg				M6	4 ~ 6	Figure 5.2						
NJR5-110/D4/D5/D6														
NJR5-150/D2/D3	8.6kg	9.5kg	M8	9.0 ~ 11	Figure 5.3									
NJR5-180/D2/D3														
NJR5-150/D4/D5/D6														
NJR5-180/D4/D5/D6														
NJR5-220/D2/D3	19.0kg	20.1kg	M10	18 ~ 23	Figure 5.4									
NJR5-264/D2/D3														
NJR5-320/D2/D3														
NJR5-370/D2/D3														
NJR5-440/D2/D3														
NJR5-220/D4/D5/D6														
NJR5-264/D4/D5/D6														
NJR5-320/D4/D5/D6														
NJR5-370/D4/D5/D6														
NJR5-440/D4/D5/D6	24.0kg	25.5kg	M10	18 ~ 23	Figure 5.5									
NJR5-500/D2/D3														
NJR5-560/D2/D3														
NJR5-630/D2/D3														
NJR5-500/D4/D5/D6														
NJR5-560/D4/D5/D6														
NJR5-630/D4/D5/D6														

Model	Net Weight	Gross Weight	Main terminal screw specifications	Main terminal tightening torque (N·m)	Remarks
NJR5-710/D2/D3	28.0kg	38.5kg	M12	31.4 ~ 39.5	Figure 5.6
NJR5-800/D2/D3					
NJR5-710/D4/D5/D6					
NJR5-800/D4/D5/D6					
NJR5-900/D2/D3	52.1kg	68.0kg	M12	31.4 ~ 39.5	Figure 5.7
NJR5-1000/D2/D3					
NJR5-1120/D2/D3					
NJR5-900/D4/D5/D6					
NJR5-1000/D4/D5/D6					
NJR5-1120/D4/D5/D6	82.2kg	102.0kg	M12	31.4 ~ 39.5	Figure 5.8
NJR5-1260/D2/D3					
NJR5-1420/D2/D3					
NJR5-1600/D2/D3	83.4kg	103.9kg			
NJR5-1260/D4/D5/D6					
NJR5-1420/D4/D5/D6					
NJR5-1600/D4/D5/D6					

6 Installation, commissioning, and operation

6.1 Installation precautions

Before installing the soft starter, carefully read the installation conditions, parameters, and other requirements described in the preceding chapters.

6.2 Pre- and post-power-on checks

6.2.1 Pre-power-on inspection

- 1) Check whether the wiring is correct and secure, and confirm that the grounding terminal is properly grounded;
- 2) Confirm that there are no short circuits between terminals or by any live parts to ground;
- 3) Confirm the motor model matches the soft starter;
- 4) Check whether the motor insulation meets the requirements;
- 5) Use a multimeter to check for short circuits in the three-phase input power supply terminals 1/L1, 3/L2, and 5/L3.

6.2.2 Post-power-on inspection

- 1) After powering on, the operation panel should enter the "Status" display;
- 2) Check whether the functional parameter F201, the rated current of the motor, is consistent with the rated current on the motor nameplate. If there is a mismatch, please correct it; otherwise, it may cause the motor to be damaged.
- 3) When the soft starter is powered on with no motor connected to the output, there is an induced voltage at 2/T1, 4/T2, 6/T3 outputs. This is a normal phenomenon; the induced voltage will disappear after connecting the motor.

6.3 Test run method

- 1) Make sure that the main power supply voltage value, the rated voltage value of the motor, and the FA31 main circuit voltage level selection are all consistent.
- 2) After confirming there are no abnormalities, carry out the test run. The factory default is local operation panel and external control terminals;
- 3) Check whether the motor starting and running direction meets the requirements;
- 4) Check whether the motor rotation is stable (no vibration or whistling);
- 5) If motor startup is insufficient, adjust function parameter F202 for first motor starting, F204 for first motor current limit multiple, F207 for first motor initial voltage, and F208 for first motor soft start time factor, etc.
- 6) If the ambient temperature is below -10°C or the equipment has not been powered for 18 months, apply power for more than 30 minutes before running the equipment;
- 7) ⚠ If any abnormality or fault occurs during the operation of the soft starter or motor, operation should be immediately stopped, and the cause should be checked according to the actual fault situation.
- 8) ⚠ If a fault protection such as "start current limit timeout" or "operation overload" is reported during the soft start process, the motor temperature may be high at this time. Sufficient cooling time should be given to the motor (generally more than 30 minutes) before restarting, otherwise it may cause motor damage.
- 9) ⚠ After the soft starter is powered on, do not open the cover to avoid electric shock, and do not touch any control terminals or main circuit terminals.

6.4 Structure, function, working principle, and technical improvement features of the main components or functional units.

6.4.1 Figure 6.1a): Operation panel schematic diagram.

6.4.2 Figure 6.1b): Installation (cabinet door opening) dimensions for operation panel; the operation panel can be installed directly on the cabinet door panel.

Note: If the operation panel is installed directly on the cabinet door panel, the thickness of the cabinet door panel (including paint thickness) must be less than 2mm. Otherwise, it will be difficult to snap in place.

6.4.3 Figure 6.2a): Mounting bracket schematic diagram. The operation panel can be installed inside the bracket.

6.4.4 Figure 6.2b): Installation (cabinet door opening) dimensions for supporting plate; the supporting plate (including operation panel) can be installed on this cabinet door panel.

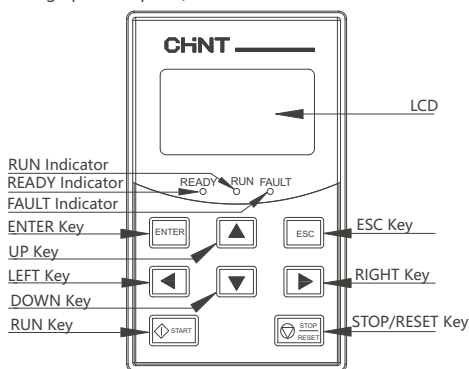


Figure 6.1a) Operation panel schematic diagram

Figure 6.1b) Operation panel installation (cabinet door cut-out) size diagram

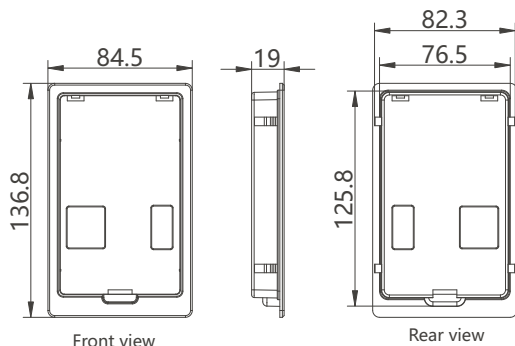
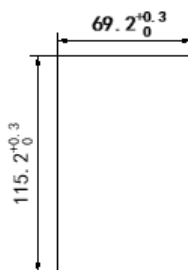


Figure 6.2a) Mounting bracket schematic diagram

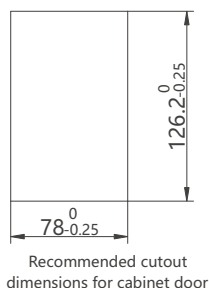


Figure 6.2b) Mounting bracket installation (cabinet door cut-out) size diagram

The operation panel can be installed directly onto the cabinet door panel or it can be mounted to the cabinet door panel via the supporting plate. When installing the operation panel on the cabinet door panel, remove the operation panel from the product cover and connect it using an extended external cable, with a maximum length of 10 meters. If it exceeds 10 meters, special customization is required.

6.4.5 Description of the functions of the operation panel keys.

"START" key: Used for starting operation.

"STOP/RESET" key: Used for stopping operation or fault reset.

"ENTER" key: Used to enter the function parameter group menu and also to confirm and save modified function parameter data.

Up key/Down key: Used for page switching in menu selection to display menu contents; used to increase or decrease the parameters when setting specific data. In the main interface, used to switch between various monitoring interfaces.

Left key/Right key: Used to select the data setting position when setting specific parameter values. In the main interface, the right key is used to clear fault information, and the left key is used to restore parameters to factory default values.

"ESC" key: Used to return to the previous menu or to discard parameter setting values.

6.4.6 Description of the operation panel indicator lights functions.

Indicator light.	Description.
"READY" indicator light	In standby status, the "READY" indicator light stays on. During start-up countdown, the "READY" indicator light flashes. When not in the above statuses, the "READY" indicator is off.
"RUN" indicator light	In bypass operation status, the "RUN" indicator light stays on. During soft start, soft stop, braking, low-speed forward, low-speed reverse, and preheating status, the "RUN" indicator light flashes. When not in the above statuses, the "RUN" indicator is off.
"FAULT" indicator light	In fault status, the "FAULT" indicator light stays on. In standby, the "FAULT" indicator light flashes. When not in the above statuses, the "FAULT" indicator is off.
Note: The LCD backlight activation time is determined by function parameter F801, which controls the automatic LCD backlight off time.	

6.5 Description of functional parameter settings.

The operation instructions mainly cover five aspects: restoring factory settings for parameters, fault reset, fault record inquiry, parameter modification record inquiry, and functional parameter setting. Refer to Figure 6.3a) for restoring factory settings, Figure 6.3b) for fault reset, Figure 6.3c) for fault record inquiry, Figure 6.3d) for parameter modification record inquiry, and Figure 6.3e) for functional parameter setting.

If no operation key is pressed for more than 1 minute in the setting state, the system will automatically exit the setting state.

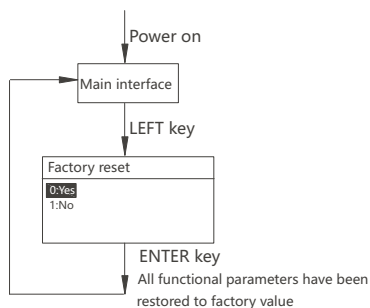


Figure 6.3a) Parameter Factory Reset Setting

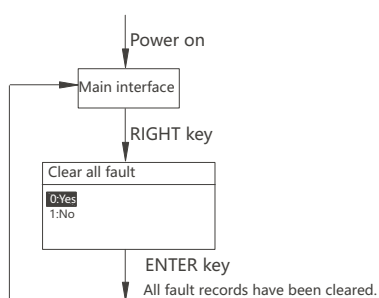


Figure 6.3b) Fault Reset Setting

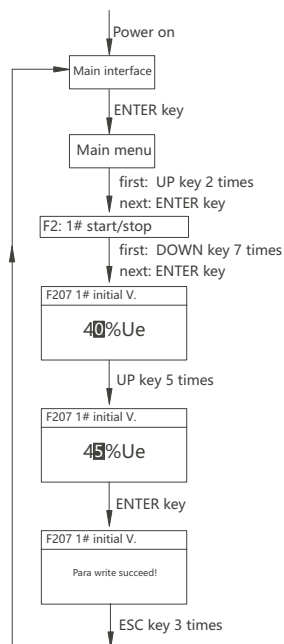
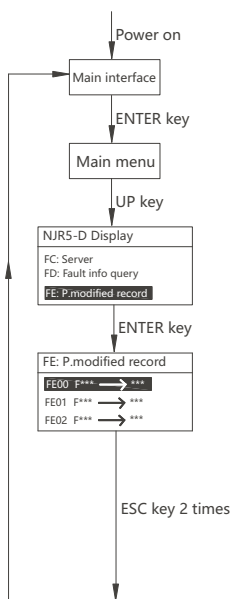
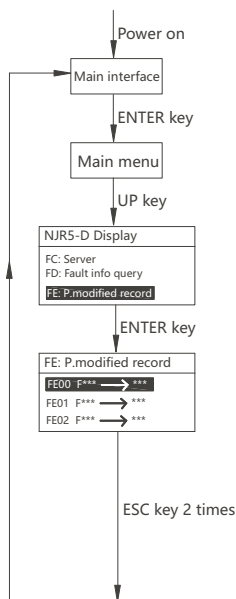


Figure 6.3c) Fault record query Figure 6.3d) Modification record query Figure 6.3e) Function parameter setting

6.6 Description of fault information.

When there are fault records, enter the FD group and check fault information FD00~FD09. In the FD00~FD09 operation interface, press the "ENTER" key to enter the fault information set interface, which contains the following. For details, see Figure 6.4.

- ① Temperature at the product point when the fault occurred.
- ② Type of fault for this occurrence.
- ③ The phase voltages of the three phases at the moment when the fault occurred (from left to right are the phase voltages of L1, L2, and L3 respectively);
- ④ Operating state before the occurrence of the fault.
- ⑤ The current of each phase at the moment when the fault occurred (from left to right are the phase currents of L1, L2, and L3 respectively).

FD00 Fault info 00	
①	②
③	④
⑤	

Figure 6.4 Detailed fault information record.

6.7 Definition and description of functional parameters.

6.7.1 Description of unit/symbol meanings (see Table 6.1).

Table 6.1 Description of unit/symbol meanings.

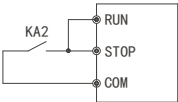
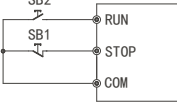
Unit/Symbol name.	Meaning.
V	Voltage unit: Volt.
A	Current unit: Ampere.
kW	Power unit: Kilowatt.
kvar	Reactive power unit: Kilovar.
kVA	Apparent power unit: Kilovolt-ampere.
MWH	Electrical energy unit: Megawatt-hour.
kWH	Electrical energy unit: Kilowatt-hour.
Hz	Unit: Hertz.
kH	Time unit: Kilohour.
H	Time unit: Hour.
s	Time unit: Second.
ms	Time unit: Millisecond.
μs	Time unit: Microsecond.
°C	Temperature unit: Celsius degree.
RPM	Speed unit: rotations per minute.
Un	Voltage symbol: Rated model voltage of the soft starter main circuit.
Ue	Voltage symbol: Main power supply voltage, which is also the rated motor voltage.
Us	Voltage symbol: Rated model voltage of the soft starter control circuit.
In	Current symbol: Rated model current of the soft starter.
Ie	Current symbol: Rated motor current.
Te	Torque symbol: Rated motor torque.
SS	Soft starter.
SCR	"SCR" is the abbreviation of thyristor

6.7.2 Description of functional parameters.

The function parameter table includes group F0 (manufacturer parameter group, not introduced as F0 is a manufacturer group), group F1 (start/stop control group), group F2 (first motor start/stop group), group F3 (second motor start/stop group), group F4 (third motor start/stop group), group F5 (external control input/output group), group F6 (analog output group), group F7 (protection/parameter group), group F8 (HMI group), group F9 (communication parameter group), group FA (status information query group), group FB (enhanced group), group FC (service group), group FD (fault information query group), and group FE (parameter modification record group), totaling 15 function groups. See Table 6.2 for details.

Note: Functional parameters can only be modified in status or fault status; modification in other statuses is invalid.

Table 6.2 Description of functional parameters.

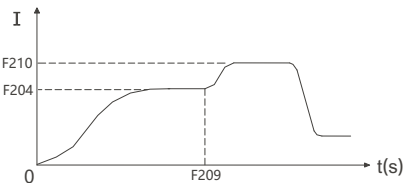
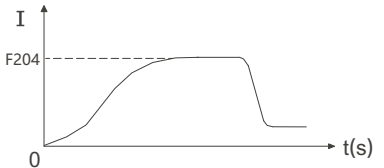
Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F1 group: Start/stop control group				
F100	Stt/Stp channel	0: Ext ctrl terminal 1: Local panel 2: Remote communicate 3: External + Local 4: External + Remote 5: Local + Remote 6: Ext + Local + Remot 7: Forbid start	3: External + Local	Selecting "External Control Terminal" means starting or stopping is realized by closing or opening the circuit between the external control terminals RUN, STOP, and COM. Selecting "Local Panel" means starting or stopping via 485 communication with the local operation panel. Selecting "Remote Communication" means using terminals 485+ and 485- for 485 communication with the upper computer. By selecting different start/stop channels, the motor can be started or stopped accordingly. When external control terminals are enabled, two-wire and three-wire control are available. For wiring details, see Figures 6.5a and 6.5b:  Figure 6.5a Two-wire control Two-wire control: Start when KA2 is closed, stop when KA2 is opened.  Figure 6.5b Three-wire control Three-wire control: Start when SB2 (pulse signal) is pressed, stop when SB1 (pulse signal) is pressed.
F101	Start delay	(1 ~ 999) s	1s	After receiving a valid start signal, the motor will start only after the delay time set by F101. The motor gradually accelerates until it switches to bypass operation. During the start delay, the " " indicator light on the operation panel keeps flashing until the delay ends.
F102	Sequen start num	0: One motor 1: Two motor 2: Three motor	0: One motor	0 indicates the soft starter only starts One motor. 1 indicates the soft starter sequentially starts two motors (the parameters for the first and second motors can be set according to the actual motors via groups F2 and F3). 2 indicates the soft starter sequentially starts three motors (the parameters for the first, second, and third motors can be set according to the actual motors via groups F2, F3, and F4).

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F103	Low fwd strength	(10 ~ 100)%	40%	When function parameter F501 or F502 is set to "5: Low forward" or "6: Low reverse", and when external control terminal IN1 or IN2 is closed with COM, the motor will run at low speed according to the intensity, speed, or direction set by F103~F106. Note 1: If the motor speed does not reach the set speed, you can appropriately increase F103 or F105. Note 2: If excessive motor vibration is observed while using this function, please stop using it immediately.
F104	Low fwd speed	0: 15% rated speed 1: 7% rated speed	0:15% rated speed	
F105	Low rev strength	(10 ~ 100)%	40%	
F106	Low rev speed	0: 20% rated speed 1: 10% rated speed	0: 20% rated speed	
F107	M.preheat capaci	(0.01 ~ 96.00) kW	Depends on the rated model current of the soft starter	The output power when the soft starter is heating the motor; the specific heating effect relates to the motor stator resistance, the power grid voltage, etc. The greater the F107 setting value, the better the heating effect. The default preheating capacity setting value differs for products with different power.
F108	M.preheat time	(1 ~ 1800)s	60s	After receiving a single valid preheating command, preheating is allowed up to the upper time limit set. Once the motor preheating time is exceeded, preheating stops automatically. Another valid preheating command is required to resume preheating. When the preheating function is needed, set F501 or F502 to 7, and preheating will be enabled only after external control terminal IN1 or IN2 is closed with COM. Note 1: If F107 and F108 are set too high, the motor windings may be burned, so the setting value must be chosen carefully. Note 2: The motor preheating function should be used only when the motor is stationary.

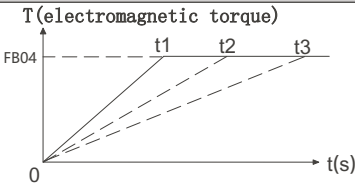
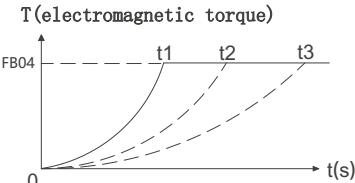
Group F2: First motor start/stop group

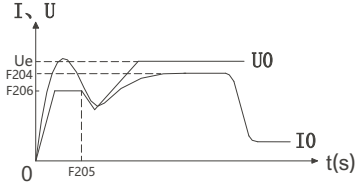
Note: By default at the factory, group F2 function parameters are enabled while group F3 and F4 function parameters are disabled.

F200	1# load type sel	0: No application 1: Deep well pump 2: Centrifugal pump 3: Hydraulic pump 4: Axial flow fan 5: Centrifugal fan 6: Mixer 7: Compressor 8: Crusher 9: Ball mill 10: Belt conveyor 11: Propeller	0: No application	0 means settings are based on default parameters. Nonzero values indicate that when different load applications are selected, the basic related starting parameters are automatically set as follows:					
				Serial Number	Load Type	Start mode	Current Limiting Multiple	Initial Voltage	Soft Start Time Inter-factor
				1	Deep Well Pump	Normal V.mode	400% Ie	50%	6s
				2	Centrifugal Pump		350% Ie	40%	10s
				3	Hydraulic Pump		350% Ie	40%	10s
				4	Axial Flow Fan		350% Ie	40%	10s
				5	Centrifugal Fan		350% Ie	40%	10s
				6	Agitator		400% Ie	50%	10s
				7	Compressor		300% Ie	40%	10s
				8	Crusher	Normal I.mode	350% Ie	70%	4s
				9	Ball Mill		450% Ie	70%	4s
				10	Belt Conveyor	Linear	300% Ie	40%	10s
				11	Propeller	Torque	300% Ie	40%	10s

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
				Note: The above is for reference only. Specific adjustments should be based on actual load conditions. If the transformer capacity is small, gradually increase the current limiting multiple from the smaller value to an appropriate level. Ensure that the motor can start and the upstream breaker does not trip.
F201	1# rated current	(1 ~ 1600)A	Actual Motor Rated Value	Rated current of the first motor, for the specific rated current at delivery, refer to the applicable motor rated current in Tables 1.1a)~1.1e).
F202	1# start mode	0: Normal I.mode 1: Enhance I.mode 2: Normal V.mode 3: Enhance V.mode 4: Linear torque mode 5: Square torque mode 6: Freq division mode	2: Normal V.mode	1. Description of Conventional Current and Enhanced Current 1) This starting mode is more suitable for applications where the power grid fluctuates significantly (such as generator power supply fluctuating between 35Hz and 60Hz). 2) This startup has strong starting capability and is more suitable for heavy load applications. Enhanced current has stronger starting capability than conventional current. 3) The soft start ability or effect in this starting mode is only related to the setting values of F204 (first motor current limit multiple), F209 (first motor second-stage current limit time), and F210 (first motor second-stage current limit multiple). The higher the current limit multiple, the stronger the starting ability, and the shorter the whole soft start process, but a higher capacity of transformer is required. 4) The starting waveform when the secondary current limiting function is active is shown in Figure 6.6a; when the secondary current limiting function is inactive, see Figure 6.6b.  Figure 6.6a Soft start current waveform 1  Figure 6.6b Current soft start waveform 2

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
				2. Description of Conventional Voltage and Enhanced Voltage 1) This starting mode is more suitable for applications where the power grid fluctuates very little (within a range of $\pm 2\text{Hz}$). 2) Enhanced voltage has stronger starting capability than conventional voltage. 3) The soft start ability or effect in this starting mode is not only related to the setting values of F204 (first motor current limit multiple), F209 (first motor second-stage current limit time), and F210 (first motor second-stage current limit multiple), but also to F207 (first motor initial voltage) and F208 (first motor soft start time factor). The higher the current limit multiple, the stronger the starting ability and the shorter the starting time; the higher the initial voltage, the stronger the starting ability and the shorter the starting time; the smaller the soft start time factor, the stronger the starting ability and the shorter the starting time. 4) The starting waveform diagram for this startup is shown in Figure 6.7. Figure 6.7 Soft Start Waveform Under Voltage In Figure 6.7, U_0 indicates the initial voltage. The larger the F207 setting value, the larger this value, and the greater the initial starting torque; t_1, t_2, t_3, and t_4 are the F208 set values ($t_1 < t_2 < t_3 < t_4$). The smaller the value, the faster the soft starter output voltage rises and the faster the motor accelerates. Note: The starting current is also limited during the voltage soft start process. 3. Description of Linear Torque and Square Torque 1) This startup is more suitable for applications requiring high smoothness during load starting. 2) This starting mode is more suitable for applications where the power grid fluctuates very little (within a range of $\pm 2\text{Hz}$). 3) The soft start ability or effect in this starting mode is not only related to the setting values of F204 (first motor current limit multiple), F209 (first motor second-stage current limit time), and F210 (first motor second-stage current limit multiple), but also to F208 (first motor soft start time factor) and FB04 (first motor torque limit level). 4) The soft start waveform under linear torque is shown in Figure 6.8, and the soft start waveform under square torque is shown in Figure 6.9.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
				 Figure 6.8 Soft Start Waveform Under Linear Torque In Figure 6.8, during soft starting, the output electromagnetic torque of the soft starter increases linearly with time. t_1, t_2, and t_3 are the F208 setting values ($t_1 < t_2 < t_3$). When the soft start time reaches the F208 first motor soft start time factor setting, the output electromagnetic torque reaches the FB04 first motor torque limit level setting.  Figure 6.9 Soft Start Waveform Under Square Torque In Figure 6.9, during soft starting, the output electromagnetic torque of the soft starter increases exponentially with time (square exponent). t_1, t_2, and t_3 are the F208 setting values ($t_1 < t_2 < t_3$). When the soft start time reaches the F208 first motor soft start time factor setting, the output electromagnetic torque reaches the FB04 first motor torque limit level setting. Note: Torque has dual limiting function, i.e., it is restricted both by the current limiting value and the torque limiting level. 4. Frequency Division Description 1) This starting mode is more suitable for applications where the power grid fluctuates very little (within a range of $\pm 2\text{Hz}$). 2) In the early stage of soft start, startup is performed with 1/4 of the grid frequency, and in the later stage, startup is carried out in parallel with the grid using conventional voltage.
F203	1# stop mode	0: Free stop 1: Brake stop 2: V.ramp soft stop	0: Free stop	Selection of the shutdown method for the first motor. 0 means free stop, i.e. inertia stop. 1 indicates brake stop; the brake stop time is determined by the setting value of F213. Since only two phases carry current during brake stop and the third phase does not, insufficient power grid capacity may cause three-phase imbalance, so use with caution. 2 indicates soft stop, which is the reverse process of soft start. The soft stop time is determined by the setting value of F211 (first motor soft stop time factor), and the current limit multiple of soft stop is 0.5 times the setting value of F204.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F204	1# limit I.times	(50 ~ 500)%Ie	350%Ie	When the soft start current of the first motor reaches the current limit, the output voltage stabilizes, and when the current drops below the limit, the voltage continues to rise.
F205	1# jump time	(0.0 ~ 2.0)s	0.0s	0 means the first motor will not jump during startup; Nonzero means the first motor will jump during startup.
F206	1# jump voltage	(50 ~ 100%)Ue	80%Ue	The voltage applied to the first motor at the instant of starting. The waveform of sudden current jump during start-up is shown in Figure 6.10. Here, U0 represents the output voltage and I0 represents the output current.  Figure 6.10 Current jump start waveform
F207	1# initial V.	(30 ~ 70)%Ue	40%Ue	The voltage level applied to the first motor at the instant of startup.
F208	1# start time	(2 ~ 60)s	10s	When the first motor receives the start signal, voltage or torque at the motor input increases gradually. Note: The soft start time factor is not the total duration of the soft starter's entire start process. The higher the set value, the slower the output current and voltage rise; conversely, the lower the value, the faster the output current and voltage rise.
F209	1# 2nd I. bgn T.	(0 ~ 60)s	0s	0 means secondary current limit for the first motor is disabled; Nonzero indicates the start time of the first motor's secondary current limit.
F210	1# 2nd I. times	F204 ~ 650%Ie	450%Ie	This indicates the current limit value for the second-stage current limiting of the first motor. Generally, the second-stage current limit multiple should not exceed 500%Ie. For special heavy loads (such as vibration screens), the value can be set above 500%Ie.
F211	1# soft stp time	(2 ~ 60)s	10s	The first motor receives the stop signal, and the voltage or torque at the motor input terminal gradually brings the motor to a stop. This is effective when the function parameter F203 is set to "2: V.ramp soft stop". Note: The soft stop time factor is not the total duration of the soft starter's entire soft stop process. The higher the set value, the longer the soft stop process and the slower the voltage decreases; conversely, the lower the value, the shorter the soft stop and the faster the voltage decreases.
F212	1# sft stp endV.	(20 ~ 80)%Ue	30%Ue	The voltage level at the end of the first motor's stopping process; this is effective when the function parameter F203 is set to "2: V.ramp soft stop".
F213	1# brake stop T.	(2 ~ 60)s	10s	The entire brake stop time; this is only effective when the function parameter F203 is set to "1: Brake stop". When the first motor receives the stop signal, DC current is supplied to the motor input, gradually slowing down and stopping the motor.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F214	1# brk strength	(20 ~ 100)%	40%	The greater the braking strength, the greater the braking current, and the better the stopping effect. Note: The greater the braking strength, the better the braking effect, but mechanical vibration may increase. Use caution when making adjustments.
Group F3: Second motor start/stop group				
Note: The group F3 function parameters are only valid when the second motor is selected (see function parameters F102, F501, and F502 for details).				
F300	2# load type sel	0: No application 1: Deep well pump 2: Centrifugal pump 3: Hydraulic pump 4: Axial flow fan 5: Centrifugal fan 6: Mixer 7: Compressor 8: Crusher 9: Ball mill 10: Belt conveyor 11: Propeller	0: No application	The function is the same as function parameter F200.
F301	2# rated current	(1 ~ 1600)A	Actual Motor Rated Value	Rated current of the second motor.
F302	2# start mode	0: Normal I.mode 1: Enhance I.mode 2: Normal V.mode 3: Enhance V.mode 4: Linear torque mode 5: Square torque mode 6: Freq division mode	2: Normal V. mode	The function is the same as function parameter F202.
F303	2# stop mode	0: Free stop 1: Brake stop 2: V.ramp soft stop	0: Free stop	The function is the same as function parameter F203.
F304	2# limit I.times	(50 ~ 500)%le	350%le	The function is the same as function parameter F204.
F305	2# jump time	(0.0 ~ 2.0)s	0.0s	The function is the same as function parameter F205.
F306	2#jump voltage	(50 ~ 100)%Ue	80%Ue	The function is the same as function parameter F206.
F307	2# initial V.	(30 ~ 70)%Ue	40%Ue	The function is the same as function parameter F207.
F308	2# start time	(2 ~ 60)s	10s	The function is the same as function parameter F208.
F309	2# 2nd I. bgn T.	(0 ~ 60)s	0s	The function is the same as function parameter F209.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F310	2# 2nd l. times	F304 ~ 650%le	450%le	The function is the same as function parameter F210.
F311	2# soft stp time	(2 ~ 60)s	10s	The function is the same as function parameter F211.
F312	2# sft stp endV.	(20 ~ 80)%Ue	30%Ue	The function is the same as function parameter F212.
F313	2# brake stop T.	(2 ~ 60)s	10s	The function is the same as function parameter F213.
F314	2# brk strength	(20 ~ 100)%	40%	The function is the same as function parameter F214.
Group F4: Third motor start/stop group				
Note: The group F3 function parameters are only valid when the third motor is selected (see function parameters F102, F501, and F502 for details).				
F400	3# load type sel	0: No application 1: Deep well pump 2: Centrifugal pump 3: Hydraulic pump 4: Axial flow fan 5: Centrifugal fan 6: Mixer 7: Compressor 8: Crusher 9: Ball mill 10: Belt conveyor 11: Propeller	0: No application	The function is the same as function parameter F200.
F401	3# rated current	(1 ~ 1600)A	Actual Motor Rated Value	Rated current of the third motor.
F402	2# start mode	0: Normal I.mode 1: Enhance I.mode 2: Normal V.mode 3: Enhance V.mode 4: Linear torque mode 5: Square torque mode 6: Freq division mode	2: Normal V.mode	The function is the same as function parameter F202.
F403	3# stop mode	0: Free stop 1: Brake stop 2: V.ramp soft stop	0: Free stop	The function is the same as function parameter F203.
F404	3# limit l. times	(50 ~ 500)%le	350%le	The function is the same as function parameter F204.
F405	3# jump time	(0.0 ~ 2.0)s	0.0s	The function is the same as function parameter F205.
F406	3# jump voltage	(50 ~ 100)%Ue	80%Ue	The function is the same as function parameter F206.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F407	3# initial V.	(30 ~ 70)%Ue	40%Ue	The function is the same as function parameter F207.
F408	3# start time	(2 ~ 60)s	10s	The function is the same as function parameter F208.
F409	3# 2nd l. bgn T.	(0 ~ 60)s	0s	The function is the same as function parameter F209.
F410	3# 2nd l. times	F404 ~ 650%le	450%le	The function is the same as function parameter F210.
F411	3# soft stp time	(2 ~ 60)s	10s	The function is the same as function parameter F211.
F412	3# sft stp endV.	(20 ~ 80)%Ue	30%Ue	The function is the same as function parameter F212.
F413	3# brake stop T.	(2 ~ 60)s	10s	The function is the same as function parameter F213.
F414	3# brk strength	(20 ~ 100)%	40%	The function is the same as function parameter F214.
Group F5: External control input/output group				
F500	Rly valid status	0x00, 0x01, 0x10, 0x11	0x00	Ones digit (rightmost digit): used to set the output relay K3 validity. When set to 0, the state is valid when terminals K3A and K3B are closed; when set to 1, the state is valid when terminals K3A and K3B are open; Tens digit (leftmost digit): used to set the output relay K2 validity. When set to 0, the state is valid when terminals K2A and K2B are closed; when set to 1, the state is valid when terminals K2A and K2B are open; Note: All values are hexadecimal numbers.
F501	IN1 function sel	0: None 1: External Fault 2: 2# Start/Stop Valid 3: 3# Start/Stop Valid 4: Fault reset 5: Low forward 6: Low reverse 7: Motor preheat sel	1: External Fault	Referenced to COM. 0 indicates that the function of input terminal IN1 or IN2 is invalid; 1 indicates that an "external fault" will be reported when input terminal IN1 or IN2 is effectively closed with COM; 2 indicates that when input terminal IN1 or IN2 is effectively closed with COM, the second motor is selected and the function parameter settings of group F3 are effective; 3 indicates that when input terminal IN1 or IN2 is effectively closed with COM, the third motor is selected and the function parameter settings of group F4 are effective; 4 indicates that when input terminal IN1 or IN2 is effectively closed with COM, the current fault with reset condition will be reset; 5 indicates that when input terminal IN1 or IN2 is effectively closed with COM, low-speed forward running is enabled; 6 indicates that when input terminal IN1 or IN2 is effectively closed with COM, low-speed reverse running is enabled; 7 indicates that when input terminal IN1 or IN2 is effectively closed with COM, the function parameter settings of F107 and F108 are effective, entering the motor preheating state.
F502	IN2 function sel		4: Fault reset	Example 1: How to enable low-speed forward run using the IN1 terminal. In this state, first set F501 to "5: Low forward", and then effectively close terminal IN1 with COM. In this way, while terminal IN1 and

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
				COM are effectively closed, the motor will run forward at low speed, and after IN1 and COM are disconnected, the motor will stop freely. Example 2: How to accomplish sequential soft starting for two motors (i.e.: one drives two). Refer to Appendix B.2.1 and B.2.2 for peripheral circuit configuration. In this state, first set the corresponding function parameters in groups F2 and F3 according to the nameplate of the first and second motors and the site conditions, then set F102 to "1: Two motor", F501 to "2: 2# Start/Stop Valid", and then press the start button SB2 to start the first motor. After the first motor soft start is finished, press the start button SB4 to achieve the soft start of the second motor. Example 3: How to accomplish sequential soft starting for three motors (i.e.: one drives three). Refer to Appendix B.2.3 and B.2.4 for peripheral circuit configuration. In this state, first set the corresponding function parameters in groups F2, F3, and F4 according to the nameplate and site conditions of the first, second, and third motors, then set F102 to "2: Three motor", F501 to "2: 2# Start/Stop Valid", F502 to "3: 3# Start/Stop Valid". Finally, press the start button SB2 to start the first motor. After the first motor soft start is finished, press the start button SB4 to achieve the soft start of the second motor. After the second motor soft start is finished, press the start button SB6 to achieve the soft start of the third motor. Note 1: When using the one-to-two or one-to-three configuration, F203, F303, and F403 must be set to "0: free stop". Note 2: Effective closure means that a signal is detected when the IN1 or IN2 terminal changes from open (open time greater than the F504 or F506 setting) to closed (closure time set by F503 or F505). If IN1 or IN2 is shorted with COM before power-on, the signal will be invalid. Note 3: The setting values for F503 and F505 must be at least 100 ms less than the setting value for F507.
F503	IN1 close delay	(1 ~ 200)ms	50 ms	Only when the IN1 terminal closure time exceeds this setting value will it be considered valid action.
F504	IN1 open delay	(1 ~ 200)ms	50 ms	Only when the IN1 terminal opening time exceeds this setting value will it be considered valid action.
F505	IN2 close delay	(1 ~ 200)ms	50 ms	Only when the IN2 terminal closure time exceeds this setting value will it be considered valid action.
F506	IN2 open delay	(1 ~ 200)ms	50 ms	Only when the IN2 terminal opening time exceeds this setting value will it be considered valid action.
F507	RUN close delay	(1 ~ 20000)ms	200 ms	Only when the RUN terminal closure time is greater than this setting value is the action considered valid.
F508	RUN open delay	(1 ~ 20000)ms	100 ms	Only when the RUN terminal opening time is greater than this setting value is the action considered valid.
F509	STOP close delay	(1 ~ 20000)ms	200 ms	Only when the STOP terminal closure time is greater than this setting value is the action considered valid.
F510	STOP open delay	(1 ~ 20000)ms	100 ms	Only when the STOP terminal disconnection time exceeds this set value is the action considered valid.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F511	EMS close delay	(1 ~ 200)ms	100 ms	Only when the EMS terminal closure time exceeds this set value is the action considered valid.
F512	EMS open delay	(1 ~ 200)ms	10 ms	Only when the EMS terminal disconnection time exceeds this set value is the action considered valid.
F513	K2 output sel	0: Ready status 1: Soft Start Stat 2: Bypass status 3: Soft stop stat 4: Fault status 5: Brake status 6: Low fwd status 7: Low rev status 8: Sstt + Bypass 9: Sstt + Byp + Sstop 10: Bypass + Soft stop 11: Preheat status	2: Bypass status	The programmable state relay K1 output is determined by parameters F500 and F513. When the tens digit (leftmost digit) of F500 is 0, the state is valid when K2A and K2B terminals are closed; when it is 1, the state is valid when K2A and K2B terminals are open. Example: When the tens digit of F500 is set to "0" and F513 is set to "2: bypass status", K2A and K2B terminals are closed in bypass state, and open in other states. When the tens digit of F500 is set to "1" and F513 is set to "2: bypass status", K2A and K2B terminals are open in bypass state, and closed in any other operating state.
F514	K3 output sel	0: Any fault/alarm 1: Over load 2: Lock rotor/short 3: Limit I.timeout 4: Unbalance of I. 5: Output phas loss 6: Input phase loss 7: Frequency wrong 8: SCR short 9: SS over hot 10: Motor over hot 11: Δ connect wrong 12: Main circuit OV. 13: Main circuit UV. 14: Ctrl circuit OV. 15: Ctrl circuit UV. 16: CPU run timeout 17: EMS opened fault 18: Too many starts 19: Too long stt tim 20: Parameter wrong 21: External fault 22: Communi timeout 23: SS OH.alarm 24: Under load alarm 25: Over load alarm	0: Any fault/alarm	The output function of the fault relay K3 is determined by parameters F500 and F514. When the ones digit of F500 is 0, the state is valid when terminals K3A and K3B are closed; when it is 1, the state is valid when K3A and K3B are open. Example: When the ones digit of F500 is set to "0" and F514 is set to "0: any fault/alarm", K3A and K3B terminals are closed for any fault, and open when there is no fault; When the ones digit of F500 is set to "1" and F514 is set to "0: any fault/alarm", K2A and K2B terminals are open for any fault, and K3A and K3B are closed when there is no fault.

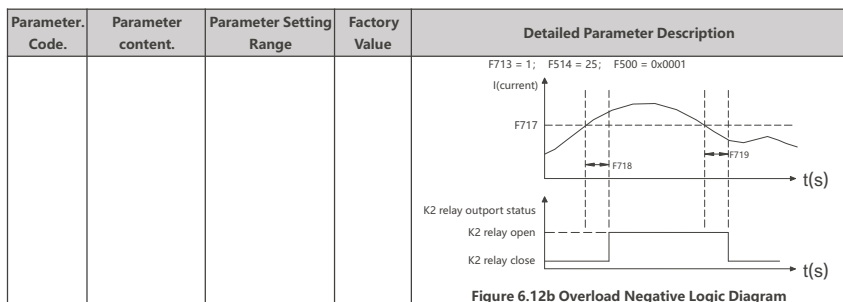
Parameter. Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description		
Group F6: Analog Output Group						
F600	Analog out type	0: 4mA ~ 20mA 1: 0mA ~ 20mA	0: 4mA ~ 20mA	See Table 6.3 for analog output current.		
				Table 6.3 Analog Output Current		
				F600 Analog AO output type	F601 Analog AO output function	Analog output current (mA)
				0:4mA ~ 20mA	0: Motor current Max = 500% Ie	4+3.2×I÷Ie
					1: Motor current Max = 200% Ie	4+8×I÷Ie
					2: Motor current Max = 100% Ie	4+16×I÷Ie
					3: Main circuit voltage [V]	4+16×U÷1000
					4: Soft starter temperature [°C]	4+16×C÷100
					5: Power Factor	4+16×λ
					6: Electromagnetic torque [100%Te]	4+16×T÷300
				7: External Ammeter	4+16×I÷Am	
				1:0mA ~ 20mA	0: Motor current Max = 500% Ie	4×I÷Ie
					1: Motor current Max = 200% Ie	10×I÷Ie
					2: Motor current Max = 100% Ie	20×I÷Ie
					3: Main circuit voltage [V]	20×U÷1000
					4: Soft starter temperature [°C]	20×C÷100
					5: Power Factor	20×λ
					6: Electromagnetic torque [100%Te]	20×T÷300
				7: External Ammeter	20×I÷Am	
				Where “I” is the current motor current value, “U” is the current main circuit voltage value, “C” is the current soft starter temperature value, “λ” is the current power factor value, “T” is the current electromagnetic torque value, and “Am” is the rated value (maximum range) of the external ammeter.		
Note 1: The analog output current refers to the DC current output from terminal AO, forming a current loop with terminal GND. The unit is mA.						
Note 2: When analog voltage output is required, simply connect a 250Ω resistor in parallel between the AO and GND terminals.						

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
F601	Analog out func	0: Motor $I_{max}=500\%I_e$ 1: Motor $I_{max}=200\%I_e$ 2: Motor $I_{max}=100\%I_e$ 3: Main Voltage[V] 4: SS temperature [°C] 5: Power factor 6: Elec torque[100%Te] 7: External ammeter	1: Motor $I_{max}=200\%I_e$	0 means that when the current value is 5 times the rated motor current, it corresponds to the maximum value set by F6.00, while 0A corresponds to the minimum value set by F600. 1 means that when the current value is 2 times the rated motor current, it corresponds to the maximum value set by F6.00, while 0A corresponds to the minimum value set by F600. 2 means that when the current value is 1 times the rated motor current, it corresponds to the maximum value set by F6.00, while 0A corresponds to the minimum value set by F600. 3 means that when the main circuit voltage is AC 1000V, it corresponds to the maximum value set by F6.00, while 0V corresponds to the minimum value set by F600. 4 means the maximum value set by F6.00 corresponds to a soft starter temperature of 100 °C, and the minimum value corresponds to 0 °C. 5 means the maximum value set by F6.00 corresponds to a motor power factor of 1.0, and the minimum value corresponds to 0 for F600. 6 means when electromagnetic torque/motor rated torque = 300% corresponds to the maximum value of F6.00, and 0 corresponds to the minimum value of F600. 7 means the set value of the rated (maximum range) of the external ammeter for F602 corresponds to the maximum value of F600, and 0 corresponds to the minimum value of F600.
F602	Ammeter rate set	(1 ~ 20000) A	Depends on the rated current of the product model	This is the set value of the rated (maximum range) for the external ammeter (usually a pointer ammeter 6C2). It is valid only when F601 is set to 7, and the external ammeter can be connected in series between the analog output terminal AO and GND of the soft starter. Example Description: 1) When the user selects the 150A/4-20mA pointer ammeter parameter, F600 needs to be set to "0: 4~20mA", F601 to "7: External ammeter", and F602 to 150A. When the average value of the three-phase output current of the soft starter is 150A, the analog output of the soft starter is 20mA, and the pointer ammeter indicates 150A; when the average value of the three-phase output current of the soft starter is 0A, the analog output is 4mA, and the pointer ammeter indicates 0A. 2) When the user selects the 150A/0-20mA pointer ammeter parameter, F600 needs to be set to "1: 0~20mA", F601 to "7: External ammeter", and F602 to 150A. When the average value of the three-phase output current of the soft starter is 150A, the analog output of the soft starter is 20mA, and the pointer ammeter indicates 150A; when the average value of the three-phase output current of the soft starter is 0A, the analog output is 0mA, and the pointer ammeter indicates 0A.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
Group F7: Protection/Parameter Group				
F700	OL.protect grade	0: Level 2 1:10A Level 2: Level 10 3: Level 20 4: Level 30	2: Level 10	Setting for the motor running overload protection level. The higher the set overload level, the longer it takes to trigger the "Running Overload Fault" and the "Start Current Limiting Timeout Fault".
F701	OL.hot accumulat	0 ~ 5	0	0 means that the overload thermal integration value (i.e.: I ² t) is accumulated. 1 means the overload thermal integral value does not accumulate. When the load current is less than 1.1 times the rated motor current, the current thermal integral value will be reset to zero. 2 means the overload thermal integral value does not accumulate. When the load current is less than 1.2 times the rated motor current, the current thermal integral value will be reset to zero. 3 means the overload thermal integral value does not accumulate. When the load current is less than 1.3 times the rated motor current, the current thermal integral value will be reset to zero. 4 means the overload thermal integral value does not accumulate. When the load current is less than 1.4 times the rated motor current, the current thermal integral value will be reset to zero. 5 means the overload thermal integral value does not accumulate. When the load current is less than 1.5 times the rated motor current, the current thermal integral value will be reset to zero. Note: When F701 is set to 1~5, the motor may be damaged. Please use with caution.
F702	Main OV.protect	(100 ~ 130)%Ue	120%Ue	In any state (except fault state), when the main circuit voltage is detected to be greater than the value set by F702 and the time exceeds the value set by F703, the product will report a "main circuit overvoltage" fault. Note: Due to space limitations, the LCD display box will show "Main Circuit Overvoltage Filter Time".
F703	Main OV.filter T	(0.1 ~ 10.0)s	3.0s	
F704	Main UV.protect	(60 ~ 90)%Ue	80%Ue	In any state (except fault state), when the main circuit voltage is detected to be less than the value set by F704 and the time exceeds the value set by F705, the product will report a "main circuit undervoltage" fault. Note 1: To improve soft start performance, the main circuit undervoltage fault will not be reported during the soft start process. Note 2: Due to space limitations, the LCD display box will show "Main Circuit Undervoltage Filter Time".
F705	Main UV.filter T	(0.1 ~ 10.0)s	3.0s	
F706	Lockrotor prot I	(600 ~ 750)%Ie	700%Ie	When the detected current is greater than the value set by F706 and the duration exceeds the value set by F707, the product will report a "locked rotor/short circuit" fault.
F707	Lockrotor time	(0.1 ~ 5.0)s	3.0s	
F708	I.unbalance degr	(10 ~ 50)%	30%	During soft start, bypass operation, low-speed forward rotation, and low-speed reverse rotation, when the value of each phase current is greater than 5% Ie, if the three-phase current unbalance (when the time equals the value set by F709) is greater than the value set by F708, a "three-phase unbalance fault" will be reported.
F709	I.unbalance time	(1.0 ~ 20.0)s	3.0s	

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
				That is, when $100\% - (I_{\min} \div I_{\max})\% >$ the value set by F708 and the duration exceeds the value set by F709, a "three-phase unbalance fault" will be reported. Note: $I_{\min}$ indicates the phase current with the minimum value, and $I_{\max}$ indicates the phase current with the maximum value.
F710	Start times	0 ~ 10	0	If the number of starts within one hour exceeds the set value, an "Excessive Start Attempts" fault will be reported. If set to 0, there is no limit. Note: When a start current limiting timeout fault or running overload fault occurs, there will be a 30 minute waiting period before the next start is possible.
F711	SS OH.protection value	(75°C ~ 90)°C	80°C	In any state (except fault state), if the temperature of the soft starter's heat sink exceeds the overheating protection set value, "SS over hot fault" protection will be triggered and the unit will shut down. The default factory value for products above 150A is 85°C; The default factory value for products at or below 150A is 80°C.
F712	SS OH.alarm value	(65°C ~ 74)°C	70°C	In any state (except fault state), when the soft starter temperature is detected to be higher than the value set by F712, "SS over hot fault" will be reported. In the "SS over hot fault" state, if the temperature is detected to be 2 °C lower than the F712 set value, the "SS over hot fault" will be automatically cleared. The default factory value for products above 150A is 74°C; The default factory value for products at or below 150A is 70°C. Note: The unit will not shut down in the "Soft Start Overheating" state; however, if an "SS over hot fault" has already been reported in this state, soft starting is not possible.
F713	UL & OL alarm OE	0: Close OL & UL alarm 1: Only open OL alarm 2: Only open UL alarm	0: Close OL & UL alarm	0 Means both overload alarm and underload alarm are disabled. 1 Means overload alarm is enabled, but underload alarm is disabled. 2 Means underload alarm is enabled, but overload alarm is disabled.
F714	UL alarm value	(10 ~ 90)%le	50%le	When F713 is set to "2: Only open UL alarm", in bypass operation, if the motor current detected within the F715 set time is less than the value set by F714, the product will report "underload". If parameter F714 is set to "0" or "24", the K2 relay will operate and the product will not stop. After "underload" occurs, if the detected motor current is greater than or equal to the value set by F714 for the duration set by F716, "underload" will be automatically cleared and K3 relay will return. The positive logic diagram for underload is shown in Figure 6.11a, and the negative logic diagram for underload is shown in Figure 6.11b. By setting the function parameters F500, F514, F713, F714, F715, and F716 and using the relay K2 output for combined control, the load of the belt conveyor can be adjusted.
F715	UL check time	(0.1 ~ 60.0)s	2.0s	
F716	UL remove time	(0.1 ~ 60.0)s	2.0s	

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
				F713 = 2; F514 = 24; F500 = 0x0000 Figure 6.11a Underload positive logic diagram F713 = 2; F514 = 24; F500 = 0x0001 Figure 6.11b Underload Negative Logic Diagram
F717	OL.I.alarm value	(70 ~ 200)%le	100%le	When F713 is set to "1: Only open OL alarm", in bypass operation, if the detected motor current exceeds the value set by F717 within the duration set by F718, the product will report "overload". If function parameter F514 is set to "0" or "25", the K2 relay will operate and the product will not stop. After "overload" occurs, if the detected motor current is less than or equal to F717 for the duration set by F719, "overload" will be automatically cleared and the K3 relay will return. The positive logic diagram for overload is shown in Figure 6.12a, and the negative logic diagram for overload is shown in Figure 6.12b. By setting the function parameters F500, F514, F713, F717, F718, and F719 and using the relay K2 output for combined control, the load of the belt conveyor can be adjusted.
F718	OL.I.check time	(0.1 ~ 60.0)s	2.0s	
F719	OL.I.remove time	(0.1 ~ 60.0)s	2.0s	
				F713 = 1; F514 = 25; F500 = 0x0000 Figure 6.12a Overload positive logic diagram



Group F8: Human-Machine Interface Group

F800	Parameter lock	0: Unlocked 1: Locked	0: Unlocked	When local panel communication is valid: Allow or prohibit modification of function code parameters on the display screen (except for factory parameters); When remote communication is valid, the parameter lock function is invalid.
F801	LCD light cls T.	(0 ~ 600)s	30s	0: Indicates the LCD backlight is always on (1 ~ 600)s: Represents the time in seconds that the LCD backlight will turn off after no key operation according to the F801 set value.
F802	Language select	0: Chinese 1: English	0: Chinese	The user can switch the display content between Chinese and English as needed

Group F9: Communication Parameter Group

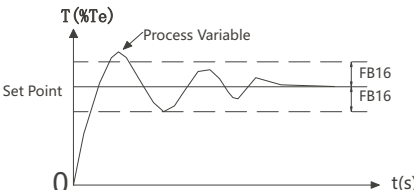
F900	SS comm address	1 ~ 247	1	Indicates the communication address of this soft starter in the entire communication system
F901	Comm baud rate	0: 4.8kbps 1: 9.6kbps 2: 19.2kbps	1:9.6kbps	Baud rate for remote communication
F902	Comm data format	0: 8-1-N RTU 1: 8-1-E RTU 2: 8-1-O RTU 3: 8-1-N ASCII 4: 8-1-E ASCII 5: 8-1-O ASCII	0: 8-1-N RTU	Communication data format 8-1-N RTU: 8 data bits + 1 stop bit + no parity RTU 8-1-E RTU: 8 data bits + 1 stop bit + even parity RTU 8-1-O RTU: 8 data bits + 1 stop bit + odd parity RTU 8-1-N ASCII: 8 data bits + 1 stop bit + no parity ASCII 8-1-E ASCII: 8 data bits + 1 stop bit + even parity ASCII 8-1-O ASCII: 8 data bits + 1 stop bit + odd parity ASCII
F903	Comm timeout tim	(0.1 ~ 60.0)s	2.0s	If no communication data is detected for a duration exceeding the value set by F903, the host computer will report a communication timeout fault.

Group FA: Status Information Query Group

FA00	Firmware version	X.XX	/	Current mainboard and display board software version numbers
FA01	FM.update(Y)	XXXX Year	/	Current mainboard and display board software upgrade date (year)
FA02	FM.update(M&D)	XX Month XX Day	/	Current mainboard and display board software upgrade date (month, day)

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
FA03	L1 Phase current	(0 ~ 65535)A	/	Measured value.
FA04	L2 Phase current	(0 ~ 65535)A	/	Note: For soft starter rated model currents of 630A or below, the displayed value has one decimal point; for products above 630A, the displayed value is an integer.
FA05	L3 Phase current	(0 ~ 65535)A	/	
FA06	L1 Phase voltage	(0.0 ~ 1000.0)V	/	Measured value
FA07	L2 Phase voltage	(0.0 ~ 1000.0)V	/	
FA08	L3 Phase voltage	(0.0 ~ 1000.0)V	/	
FA09	L1&L2 line V.	(0.0 ~ 1500.0)V	/	Measured value
FA10	L1&L3 line V.	(0.0 ~ 1500.0)V	/	
FA11	L2&L3 line V.	(0.0 ~ 1500.0)V	/	
FA12	L1 radiator T.	(0 ~ 100)°C	/	Measured value, the temperature of the radiator, which is also the temperature of the soft starter.
FA13	L2 radiator T.	(0 ~ 100)°C		Note: For soft starter rated model currents of 180A or above, the temperatures of the 1/L1, 3/L2, and 5/L3 three-phase heat sinks are displayed; for products below 180A, only the temperature of the 3/L2 phase heat sink is displayed.
FA14	L3 radiator T.	(0 ~ 100)°C		
FA15	Power frequency	(0 ~ 100)Hz	/	Measured value
FA16	Power factor	0.00 ~ 1.00	/	Measured value
FA17	Active power[kW]	(0.0 ~ 6500.0)kW	/	Measured value
FA18	Reactive P[kvar]	(0.0 ~ 6500.0)kvar	/	Measured value
FA19	Apparent P[kVA]	(0.0 ~ 6500.0)kVA	/	Measured value
FA20	Electroma torque	(0.0 ~ 300.0)%	/	Measured value
FA21	Max I.of running	(0 ~ 65535)A	/	Measured value
FA22	Max I.of start	(0 ~ 65535)A	/	Measured value
FA23	Times of started	0 ~ 60000	/	Measured value
FA24	Pwr consu H[MWH]	(0 ~ 9999)MWH	/	Measured value, for reference only, cannot be used as the standard for electricity billing
FA25	Pwr consu L[kWH]	(0.0 ~ 999.9)kWH	/	Measured value, for reference only, cannot be used as the standard for electricity billing
FA26	Running T.H[kH]	(0 ~ 9999)kH	/	Measured value
FA27	Running T.L[H]	(0.0 ~ 999.9)H	/	Measured value
FA28	Power on T.H[kH]	(0 ~ 9999)kH	/	Measured value
FA29	Power on T.L[H]	(0.0 ~ 999.9)H	/	Measured value

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
FA30	Total fault num	0 ~ 60000	/	Measured value
FA31	Power V.degree	0: AC220V 1: AC380V 2: AC460V 3: AC575V 4: AC690V	1:AC380V	Determined by factory parameters
FA32	Pwr phase sequen	Positive phase sequence, Negative phase sequence, Not detected	/	Measured phase sequence of the power grid
FA33	Motor connec dir	Internal delta forward connection,Internal triangle reverse wiring method,Not detected	/	Measured connection direction between soft starter and motor
FA34	Inner DC bus V.	DC (0 ~ 1000) V	/	Measured value Refers to the DC voltage value after rectification by the switching power supply circuit on the main board of the soft starter, which is numerically equal to 1.414 times the AC supply voltage to the main board.
FA35	Ext termi status	00000b ~ 11111b	/	Indicates whether the external control input terminals IN1, IN2, RUN, STOP and EMS are closed or open with COM; the corresponding bit is 0 when closed, and 1 when open. From left to right, the status of IN1, IN2, RUN, STOP, and EMS terminals corresponds in order.
FB group: Enhanc group				
FB00	Bypass change TD	(1 ~ 20)s	1s	In soft start mode, after the motor speed is detected to reach full speed, there will be a delay for the FB00 set value time before switching to bypass operation mode.
FB01	1# rated pwr[kW]	(0 ~ 10000)kW	Equals F004 value	Rated power setting value of the first motor (unit: kW). When starting with linear torque or square torque, please enter it accurately.
FB02	1# rated speed	(0 ~ 10000)RPM	1440RPM	Rated speed of the first motor, must be entered accurately when starting with linear or square torque.
FB03	1# loss gain	(20 ~ 500)%	100%	Effective when starting with linear or square torque, it is the stator resistance loss gain for the first motor.
FB04	1# tor lim times	(50.0 ~ 300.0)%Te	150.0%Te	Effective when starting with linear or square torque, it is the upper torque limit setting for starting the first motor. The larger this value, the easier the motor starts.
FB05	2# rated pwr[kW]	(0 ~ 10000)kW	Equals F004 value	Rated power of the second motor, must be entered accurately when starting with linear or square torque.
FB06	2# rated speed	(0 ~ 10000)RPM	1440RPM	Rated speed of the second motor, must be entered accurately when starting with linear or square torque.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
FB07	2# loss gain	(20 ~ 500)%	100%	Effective when starting with linear or square torque, it is the stator resistance loss gain for the second motor.
FB08	2# tor lim times	(50.0 ~ 300.0)%Te	150.0%Te	Effective when starting with linear or square torque, it is the upper torque limit setting for starting the second motor. The larger this value, the easier the motor starts.
FB09	3# rated pwr[kW]	(0 ~ 10000)kW	Equals F004 value	Rated power of the third motor, must be entered accurately when starting with linear or square torque.
FB10	3# rated speed	(0 ~ 10000)RPM	1440RPM	Rated speed of the third motor, must be entered accurately when starting with linear or square torque.
FB11	3# loss gain	(20 ~ 500)%	100%	Effective when starting with linear or square torque, it is the stator resistance loss gain for the third motor.
FB12	3# tor lim times	(50.0 ~ 300.0)%Te	150.0%Te	Effective when starting with linear or square torque, it is the upper torque limit setting for starting the third motor. The larger this value, the easier the motor starts.
FB13	Torque mode Kp	1 ~ 10	4	Effective when starting as linear or quadratic torque. The proportional gain of the torque PI regulator; only proportional gain Kp is used for adjustment and cannot completely eliminate the deviation. To eliminate the residual deviation, integration time Ti can be used to form closed-loop control. The smaller Ti is, the faster the response to changes in deviation, but if too small, oscillation may occur. Generally, it does not need to be changed.
FB14	Torque mode Ti	500 ~ 10000	1000 (Number of power grid cycles)	Effective when starting as linear or quadratic torque. The integration time of the torque PI regulator. Generally, this does not need to be changed.
FB15	Tor sampl period	1 ~ 100	1 (Number of power grid cycles)	Effective when starting as linear or quadratic torque. The torque PI regulator's torque sampling period. The sampling period is the feedback sampling period; the closed-loop regulator operates once per sampling period. The greater the sampling period, the slower the response. Generally, this does not need to be changed.
FB16	Tor deviate lim	(0.0 ~ 10.0)% Te	1.0%Te	When the detected deviation between the current electromagnetic torque and the set torque is within the range of the value set by FB16, the PI regulator will not adjust. See Fig. 6.13 for details. Generally, this does not need to be changed.  Fig. 6.13 PI adjustment diagram
FB17	Fan run time set	(1 ~ 600) s	120s	After the product stops (i.e. the motor has no current), the fan will continue to run for the FB17 set value time before shutting down. Note: The main body of this series of products does not contain a fan; this function is not involved.

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
FB18	L.mod back value	(0 ~ 200) μ s	20 μ s	Only valid when starting with conventional or enhanced current. Normally, there is no need to modify this.
FB19	L.cur rise limit	(10 ~ 50%)Ie	10%Ie	
FC Group: Service group				
FC00	L1 V.adjust coe	(90 ~ 110)%Ue	104% Ue	This is the proportional coefficient for L1 phase voltage calibration, and cannot be restored to factory settings.
FC01	L2 V.adjust coe	(90 ~ 110)%Ue	104% Ue	This is the proportional coefficient for L2 phase voltage calibration, and cannot be restored to factory settings.
FC02	L3 V.adjust coe	(90 ~ 110)%Ue	104% Ue	This is the proportional coefficient for L3 phase voltage calibration, and cannot be restored to factory settings.
FC03	L1 I.adjust coe	(90 ~ 110)%Ie	100% Ie	FC03 is the proportional coefficient for L1 phase current calibration, FC04 is the constant for L1 phase current calibration, and neither can be restored to factory settings.
FC04	L1 I.ad constant	(0 ~ 10)%Ie	0% Ie	If the error value between the current displayed on the soft starter operation panel and the actual motor current is proportional to the actual current value (increases or decreases as actual value does), then set FC03; if the error value is independent of the actual current value and remains constant, set FC04. Note: For some power models, the default factory value of FC03 is not equal to 100% Ie.
FC05	L2 I.adjust coe	(90 ~ 110)%Ie	100% Ie	The function is the same as FC03 and FC04.
FC06	L2 I.ad constant	(0 ~ 10)%Ie	0% Ie	
FC07	L3 I.adjust coe	(90 ~ 110)%Ie	100% Ie	The function is the same as FC03 and FC04.
FC08	L3 I.ad constant	(0 ~ 10)%Ie	0%Ie	
FC09	AO adjust coe	(90 ~ 110)%	97%	This is the proportional coefficient for analog output calibration and cannot be restored to factory settings.
FC10	AO adjust const	(0 ~ 10)%	0%	This is the constant for analog output calibration and cannot be restored to factory settings.
FD Group: Fault information query group				
FD00	Fault information 0	----		The following information is recorded for each fault/event in sequence: Fault/name (1 byte), phase radiator temperature (1 byte, integer), operating status (2 bytes), L1 phase current (2 bytes, integer), L2 phase current (2 bytes, integer), L3 phase current (2 bytes, integer), L1 phase voltage (2 bytes, integer), L2 phase voltage (2 bytes, integer), L3 phase voltage (2 bytes, integer), total 16 bytes, recording 10 fault information entries. Note: Each piece of information contains 16 bytes, that is, 8 words. Therefore, when reading fault information, the number of data words read at one time must be a multiple of 8.
FD01	Fault information 1			
FD02	Fault information 2			
FD03	Fault information 3			
FD04	Fault information 4			
FD05	Fault information 5			
FD06	Fault information 6			
FD07	Fault information 7			
FD08	Fault information 8			
FD09	Fault information 9			

Parameter Code.	Parameter content.	Parameter Setting Range	Factory Value	Detailed Parameter Description
FE Group: Parameter modification record group				
FE00	Modification information 0			A total of 20 parameter modification records are stored. Each fault information record contains 6 bytes, with details as follows: The 1st and 2nd bytes indicate the code value of the modified functional parameter. The 3rd and 4th bytes indicate the setting value of the modified functional parameter after modification. The 5th and 6th bytes indicate the attribute of the modified functional parameter (including unit and magnification). Lower bits 0-4: unit; lower bits 5-7: magnification. Note: Each record contains 6 bytes, which means 3 words. Therefore, when reading fault information, the amount of words read at one time must be an integer multiple of 3.
FE01	Modification information 1			
FE02	Modification information 2			
FE03	Modification information 3			
FE04	Modification information 4			
FE05	Modification information 5			
FE06	Modification information 6			
FE07	Modification information 7			
FE08	Modification information 8			
FE09	Modification information 9			
FE10	Modification information 10			
FE11	Modification information 11			
FE12	Modification information 12			
FE13	Modification information 13			
FE14	Modification information 14			
FE15	Modification information 15			
FE16	Modification information 16			
FE17	Modification information 17			
FE18	Modification information 18			
FE19	Modification information 19			

7 RS485 communication

The soft starter provides an RS485 communication interface, using the international standard Modbus protocol for master-slave communication. Users can achieve centralized control via computer, PLC, or special communication devices, and set soft starter operating commands, modify or read parameter codes, monitor work status and fault information via this protocol.

7.1 Communication connection

The communication interface uses RS485 asynchronous communication. The data frame sending order is high byte first, low byte after (except CRC code, which is low byte first, high byte after). Each single byte is transmitted with the least significant bit first, most significant bit last. The connection diagram for a single soft starter and computer is shown in Figure 7.1; multiple soft starters and computer connection is shown in Figure 7.2. The soft starter external control terminals "485+" and "485-" are connected via twisted pair to the host's (upper computer) 485+ and 485-.

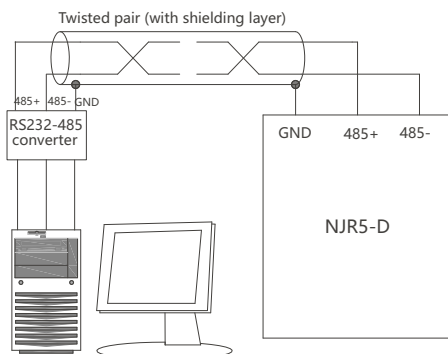


Figure 7.1 Connection between a soft starter and a computer

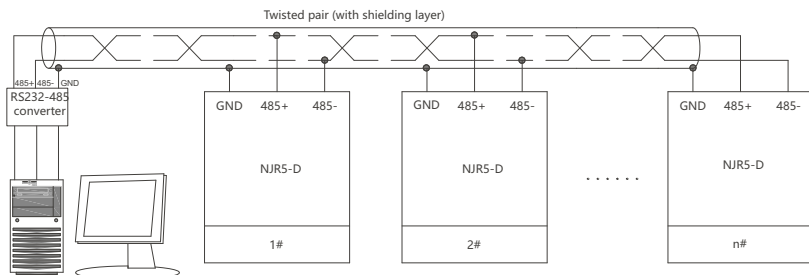


Figure 7.2 Connection between multiple soft starters and a computer

Note 1: Generally, the soft starter's 485+ and 485- terminals do not need to connect terminal resistors. If the distance is long, a terminal resistor (with a resistance value of about 120Ω) can be connected between the 485+ and 485- terminals of the soft starter at the farthest end.

Note 2: To reduce external interference with the communication signal, it is recommended to use twisted pair shielded wire for communication connections. If the bus length is long, connect the "GND" terminal on the soft starter control terminal block to the shield of the twisted pair shielded wire.

7.2 Protocol content

The slave address can be set in the range of 1~247, 0 is the broadcast address. In both single master-multiple slave and single master-single slave systems, each slave on the network must have a unique address. Modbus protocol is supported. This serial communication protocol defines the contents and formats of asynchronous transmission frames in serial communication, and supports both RTU and ASCII formats.

For RTU communication, each 8-bit byte in a message contains two 4-bit hexadecimal characters. The advantage is that the character density is higher, resulting in a higher throughput than ASCII under the same baud rate. The maximum RTU frame for NJR5-D soft starter is 256 bytes.

For ASCII communication, two ASCII characters are used to transmit one 8-bit byte in the message. ASCII is used when the device does not support RTU. The maximum ASCII frame for NJR5-D soft starter is 256 characters. Common ASCII character code values can be found in Table 7.1.

Table 7.1 Common character corresponding ASCII code values

Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'
ASCII code value	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Character	'A'	'B'	'C'	'D'	'E'	'F'	': '	'CR'	'LF'	
ASCII code value	0x41	0x42	0x43	0x44	0x45	0x46	0x3A	0x0D	0x0A	

7.3 Protocol format

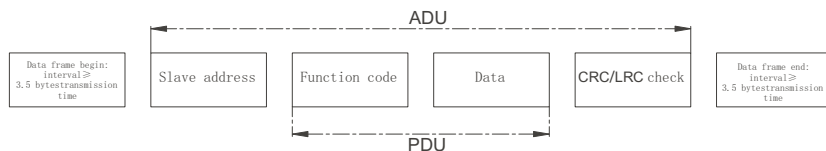


Figure 7.3 Protocol format diagram

ADU (Application Data Unit) is the application data unit, PDU (Protocol Data Unit) is the protocol data unit. The 16-bit CRC/LRC check code is obtained after checking the data of the first three parts of the ADU. The CRC check code is used in RTU, with the low byte first and the high byte last, while the LRC check code is used in ASCII, with the high byte first and the low byte last.

7.3.1 RTU frame standard structure

The RTU frame standard structure is shown in Table 7.2. The information of a frame must be transmitted as continuous data. If a transmission interval greater than 1.5 bytes occurs before the entire frame transmission is finished, the receiving device (usually referring to the lower-level device) will clear this incomplete information and mistakenly consider the following byte as the address part of a new frame. Likewise, if the interval between the start of a new frame and the previous frame is less than 3.5 bytes of transmission time, the receiving device will regard it as a continuation of the previous frame. Due to frame disorder, the final CRC check value will be incorrect.

Table 7.2 RTU frame standard structure

Frame Header START	T1--T2--T3--T4 (4-byte transmission time)
Slave address ADDR	Communication address: 1~247 (single byte, decimal, 0 is the broadcast address)
Operation function CMD	0x03: Read the value of a single or multiple slave parameter registers (single byte, hexadecimal) 0x04: Read the value of a single or multiple slave parameter attribute registers (single byte, hexadecimal, the number of registers must be a multiple of 5) 0x06: Write the value of a single slave parameter register (single byte, hexadecimal) 0x10: Write the values of multiple slave parameter registers (single byte, hexadecimal)
Data DATA(N-1) ...DATA(0)	2N bytes of data, this part is the core content of communication (2N bytes)
CRC check	CRC check value, with a dedicated checking program (two bytes)
Frame end END	T1--T2--T3--T4 (4-byte transmission time)

7.3.2 ASCII frame standard structure

For the standard structure of ASCII frames, see Table 7.3. In ASCII, the frame header is ":" (0x3A), and the frame end is "CR LF" (0x0D 0x0A). In ASCII, except for the frame header and end, all other data bytes are sent in ASCII code format (see Table 7.1), with the high 4-bit nibble sent first, then the low 4-bit nibble. The check code uses LRC check, covering the three parts from the slave address to the data information. The check code is the complement of the sum of all the characters involved in the check.

Table 7.3 ASCII frame standard structure

Frame Header START	": "
Slave address ADDR	Communication address: 1~247. The slave address (8-bit data) is represented by two ASCII codes.
Operation function CMD	0x03: Read the value of a single or multiple slave parameter registers (single byte, hexadecimal) 0x04: Read the value of a single or multiple slave parameter attribute registers (single byte, hexadecimal, the number of registers must be a multiple of 5) 0x06: Write the value of a single slave parameter register (single byte, hexadecimal) 0x10: Write the values of multiple slave parameter registers (single byte, hexadecimal); each function code (8 data bits) consists of two ASCII codes
Data DATA(N-1) ...DATA(0)	2N bytes of data, this part is the core content of communication (2N bytes), each data bit (8-bit data) is represented by two ASCII codes.
CRC check	LRC check value, consists of two data bits, each data bit (8-bit data) is represented by two ASCII codes.
Frame end END	Fixed and composed of two ASCII codes: 0x0D and 0x0A

7.4 Checksum generation

The frame check mainly includes two parts: bit check per byte and frame data check. Frame data check includes CRC check (RTU) and LRC check (ASCII).

7.4.1 Byte parity check

The user can select different parity checks as needed, or select no parity. This will affect the parity bit setting of each byte.

Even parity means: before data transmission, an even parity bit is attached to indicate whether the number of "1"s in the transmitted data is odd or even. If even, the parity bit is "0"; otherwise it is "1", so that the parity remains unchanged.

Odd parity means: before data transmission, an odd parity bit is attached to indicate whether the number of "1"s in the transmitted data is odd or even. If odd, the parity bit is "0"; otherwise it is "1", so that the parity remains unchanged.

For example, to transmit "11001110", there are 5 "1"s in the data. If using even parity, the even parity bit is "1". If using odd parity, the odd parity bit is "0". During data transmission, the parity bit is calculated and placed in the corresponding position in the frame. The receiving device should also perform parity checking. If the parity of the received data does not match the preset, it is considered a communication error.

7.4.2 CRC Check---CRC (Cyclical Redundancy Check)

Using the RTU frame format, the frame includes an error detection field calculated based on the CRC method. The CRC field checks the entire content of the frame. The CRC field is two bytes, containing a 16-bit binary value. It is calculated by the transmitting device and added to the frame. The receiving device recalculates the CRC of the received frame and compares it with the value in the received CRC field. If the two CRC values are not equal, it indicates a transmission error.

CRC is first initialized to 0xFFFF, then a procedure is called to process more than 6 consecutive bytes in the frame with the value currently in the register. Only the 8-bit data in each character is valid for the CRC; start bit, stop bit, and parity bit are invalid. In the process of CRC generation, each 8-bit character is exclusively XORED with the contents in the register, and the result is shifted toward the least significant bit, with valid bits filled with 0. The LSB is extracted to check; if the LSB is 1, the register is exclusively XORED with a preset value; if the LSB is 0, it is not done. This process is repeated 8 times. After the last (8th) bit is completed, the next 8-bit byte is exclusively XORED with the current register value. The final value in the register is the CRC after all bytes in the frame are processed. This CRC calculation method uses the international standard CRC check rule. When editing the CRC algorithm, users can refer to relevant standards to write a CRC calculation program that truly meets the requirements. Below is a simple CRC calculation function for users' reference (written in C):

Unsigned int crc_cal_value(unsigned char * data_value, unsigned char data_length)

```
{
    int i;
    unsigned int crc_value = 0xffff;
    while(data_length-->0)
    {
        crc_value ^= *data_value++;
        for(i = 0; i < 8; i++)
        {
            if((crc_value & 0x0001) & 1) crc_value = (crc_value >> 1) ^ 0xa001;
            else crc_value = crc_value >> 1;
        }
    }
    return(crc_value);
}
```

In ladder logic, CKSM calculates the CRC value based on the frame content, and a lookup table method can also be used. This method is simple to program and operates quickly, but occupies more ROM space. Please use cautiously in cases requiring limited program space.

7.4.3 ASCII Check (LRC Check)

The check code (LRC Check) is calculated by adding the slave address, function code and data in the ADU, then taking the lower 8 bits and then the complement code. LRC check calculation process: $0x01 + 0x03 + 0x01 + 0x00 + 0x00 + 0x01 = 0x06 \rightarrow$ The complement of $0x06$ is $0xfa \rightarrow 0xfa$ corresponds to ASCII codes $0x46$ and $0x41$.

7.5 Function code description

Mainly describes the commonly used function RTU data format and application in the Modbus protocol. For ASCII format, only the information header and check need to be changed to LRC in the data format, and each data byte in the RTU packet is split into two data bytes for sending. The NJR5-D series supports function codes $0x03$, $0x04$, $0x06$, and $0x10$.

7.5.1 $0x03$ function code

Read the value of single or multiple slave parameter registers. The NJR5-D series soft starter (assuming slave address = 1, i.e. $F900 = 1$) can use this function code to read relevant parameter values. For example: read the function parameter $F100$ (now the setting value of $F100$ is 3) to get its current value. RTU and ASCII examples are shown in Table 7.4 and Table 7.5.

Table 7.4 $0x03$ function code (RTU)

Host command information		Slave response information	
Start	3.5 bytes transmission interval time	From address	3.5 bytes transmission interval time
Slave address	$0x01$	Slave address	$0x01$
Function code	$0x03$	Function code	$0x03$
Register start address high byte	$0x01$	Number of bytes	$0x02$
Register start address low byte	$0x00$	Register address $0x0100$ high byte	$0x00$
High byte of the number of registers	$0x00$	Register address $0x0100$ low byte	$0x03$
Low byte of the number of registers	$0x01$	CRC check code low byte	$0xF8$
CRC check code low byte	$0x85$	CRC check code high byte	$0x45$
CRC check code high byte	$0xF6$	End	3.5 bytes transmission interval time
End	3.5 bytes transmission interval time		

Table 7.5 $0x03$ function code (ASCII)

Host command information		Slave response information	
Start	$0x3A$	Start	$0x3A$
Slave address	$0x30$	Slave address	$0x30$
	$0x31$		$0x31$
Function code	$0x30$	Function code	$0x30$
	$0x33$		$0x33$
High byte of the register start address	$0x30$	Number of bytes	$0x30$
	$0x31$		$0x32$
Low byte of the register start address	$0x30$	Register address $0x0100$ high byte	$0x30$
	$0x30$		$0x30$
High byte of the number of registers	$0x30$	Register address $0x0100$ low byte	$0x30$
	$0x30$		$0x33$
Low byte of the number of registers	$0x30$	LRC check code high byte	$0x46$
	$0x31$	LRC check code low byte	$0x37$

Host command information		Slave response information	
LRC check code high byte	0x46	End	0x0D
LRC check code low byte	0x41		0x0A
End	0x0D		
	0x0A		

Note: The sending order of the CRC check code is high byte first, low byte later. The sending order of the LRC check code is low byte first, high byte later.

7.5.2 0x04 function code

Function code 0x04 is used to read the attribute of this parameter, which means reading the attribute of this parameter, and the number of readings must be a multiple of 5. Each attribute contains 5 pieces of 16-bit data, the definitions are shown in Table 7.6. For example: reading the current attribute of parameter F201 (when the value of F201 is 15A), in RTU and ASCII see Table 7.7 and Table 7.8 respectively.

Table 7.6 Meaning of Register Parameters

Property of slave parameter register value	Meaning.												
First attribute word	Maximum value of register parameter												
Second attribute word	Minimum value of register parameter												
Third attribute word	Current value of register parameter												
Fourth attribute word	<table border="1"> <thead> <tr> <th>Bit number</th><th>Meaning.</th></tr> </thead> <tbody> <tr> <td>Bits 14-15</td><td>Reserved</td></tr> <tr> <td>Bits 11-13</td><td>Modification attribute 0x00: Read/write, generally for functional parameters 0x02: Read only, such as current temperature display. 0x04: Manufacturer permission required to write, such as soft starter rated model current</td></tr> <tr> <td>Bits 8-10</td><td>Data type 0x01: 8-bit unsigned integer data 0x02: 16-bit unsigned integer data</td></tr> <tr> <td>Bits 5-7</td><td>Amplification factor 0x00: Multiply by 1 0x01: Multiply by 0.1 0x02: Multiply by 0.01 0x03: Multiply by 0.001 0x04: Multiply by 0.0001 0x05: Multiply by 0.00001</td></tr> <tr> <td>Bits 0-4</td><td>Unit 0x00: No unit 0x01: Voltage (V) 0x02: Current (A) 0x03: Power (kW) 0x04: Reactive power (kvar) 0x05: Apparent power (kVA) 0x06: Electricity consumption (MWH) 0x07: Electricity consumption (kWH) 0x08: Frequency(Hz) 0x09: Time (kH) 0x0A: Time (H) 0x0B: Time (s) 0x0C: Time (ms) 0x0D: Time (μs) 0x0E: Temperature (°C) 0x0F: Soft starter main circuit rated voltage percentage (%Un) 0x10: Motor rated voltage percentage (%Ue)</td></tr> </tbody> </table>	Bit number	Meaning.	Bits 14-15	Reserved	Bits 11-13	Modification attribute 0x00: Read/write, generally for functional parameters 0x02: Read only, such as current temperature display. 0x04: Manufacturer permission required to write, such as soft starter rated model current	Bits 8-10	Data type 0x01: 8-bit unsigned integer data 0x02: 16-bit unsigned integer data	Bits 5-7	Amplification factor 0x00: Multiply by 1 0x01: Multiply by 0.1 0x02: Multiply by 0.01 0x03: Multiply by 0.001 0x04: Multiply by 0.0001 0x05: Multiply by 0.00001	Bits 0-4	Unit 0x00: No unit 0x01: Voltage (V) 0x02: Current (A) 0x03: Power (kW) 0x04: Reactive power (kvar) 0x05: Apparent power (kVA) 0x06: Electricity consumption (MWH) 0x07: Electricity consumption (kWH) 0x08: Frequency(Hz) 0x09: Time (kH) 0x0A: Time (H) 0x0B: Time (s) 0x0C: Time (ms) 0x0D: Time (μs) 0x0E: Temperature (°C) 0x0F: Soft starter main circuit rated voltage percentage (%Un) 0x10: Motor rated voltage percentage (%Ue)
Bit number	Meaning.												
Bits 14-15	Reserved												
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Bits 8-10	Data type 0x01: 8-bit unsigned integer data 0x02: 16-bit unsigned integer data												
Bits 5-7	Amplification factor 0x00: Multiply by 1 0x01: Multiply by 0.1 0x02: Multiply by 0.01 0x03: Multiply by 0.001 0x04: Multiply by 0.0001 0x05: Multiply by 0.00001												
Bits 0-4	Unit 0x00: No unit 0x01: Voltage (V) 0x02: Current (A) 0x03: Power (kW) 0x04: Reactive power (kvar) 0x05: Apparent power (kVA) 0x06: Electricity consumption (MWH) 0x07: Electricity consumption (kWH) 0x08: Frequency(Hz) 0x09: Time (kH) 0x0A: Time (H) 0x0B: Time (s) 0x0C: Time (ms) 0x0D: Time (μs) 0x0E: Temperature (°C) 0x0F: Soft starter main circuit rated voltage percentage (%Un) 0x10: Motor rated voltage percentage (%Ue)												

Property of slave parameter register value	Meaning.	
		0x11: Soft starter control circuit rated voltage percentage (%Us) 0x12: Percentage of rated soft starter model current (%In) 0x13: Motor rated current percentage (%Ie) 0x14: Motor rated torque percentage (%Te) 0x15: Percentage (%) 0x16: Motor rated speed (RPM)
Fifth attribute word	Reserved	

Table 7.7 0x04 function code (RTU)

Host command information		Slave response information	
Start	3.5 bytes transmission interval time	Start	3.5 bytes transmission interval time
Slave address	0x01	Slave address	0x01
Function code	0x04	Function code	0x04
Register start address high byte	0x02	Number of bytes	0x0A
Register start address low byte	0x01	Parameter F201 first attribute word high byte	0x00
High byte of the number of registers	0x00	Parameter F201 first attribute word low byte	0x0F
Low byte of the number of registers	0x05	Parameter F201 second attribute word high byte	0x00
CRC check code low byte	0x60	Parameter F201 second attribute word low byte	0x03
CRC check code high byte	0x71	Parameter F201 third attribute word high byte	0x00
End	3.5 bytes transmission interval time	Parameter F201 third attribute word low byte	0x0F
		Parameter F201 fourth attribute word high byte	0x01
		Parameter F201 fourth attribute word low byte	0x02
		Parameter F201 fifth attribute word high byte	0x00
		Parameter F201 fifth attribute word low byte	0x02
		CRC check code low byte	0xD6
		CRC check code high byte	0x71
		End	3.5 bytes transmission interval time

Table 7.8 0x04 function code (ASCII)

Host command information		Slave response information	
Start	0x3A	Start	0x3A
Slave address	0x30	Slave address	0x30
	0x31		0x31
Function code	0x30	Function code	0x30
	0x34		0x34
High byte of the register start address	0x30	Number of bytes	0x30
	0x32		0x41
Low byte of the register start address	0x30	Parameter F201 first attribute word high byte	0x30
			0x30
	0x31	Parameter F201 first attribute word low byte	0x30
High byte of the number of registers	0x30	Parameter F201 second attribute word high byte	0x30
			0x30
	0x30	Parameter F201 second attribute word low byte	0x30
Low byte of the number of registers	0x30	Parameter F201 third attribute word high byte	0x30
			0x30
	0x35	Parameter F201 third attribute word low byte	0x30
LRC check code high byte	0x46	Parameter F201 fourth attribute word high byte	0x30
			0x31
LRC check code low byte	0x33	Parameter F201 fourth attribute word low byte	0x30
			0x32
End	0x0D	Parameter F201 fifth attribute word high byte	0x30
			0x30
	0x0A	Parameter F201 fifth attribute word low byte	0x30
		LRC check code high byte	0x43
		LRC check code low byte	0x42
	End		0x0D
			0x0A

7.5.3 0x06 function code

Write one word of data to the slave register, that is, set the value of a single parameter. For example: write data "2" to parameter F100. RTU and ASCII examples are shown in Table 7.9 and Table 7.10.

Table 7.9 0x06 function code (RTU)

Host command information		Slave response information	
Start	3.5 bytes transmission interval time	From address	3.5 bytes transmission interval time
Slave address	0x01	Slave address	0x01
Function code	0x06	Function code	0x06
Register start address high byte	0x01	Register start address high byte	0x01
Register start address low byte	0x00	Register start address low byte	0x00
High byte of register content	0x00	High byte of register content	0x00
Low byte of register content	0x02	Low byte of register content	0x02
CRC check code low byte	0x09	CRC check code low byte	0x09
CRC check code high byte	0xF7	CRC check code high byte	0xF7
End	3.5 bytes transmission interval time	End	3.5 bytes transmission interval time

Table 7.10 0x06 function code (ASCII)

Host command information		Slave response information	
Start	0x3A	Start	0x3A
Slave address	0x30	Slave address	0x30
	0x31		0x31
Function code	0x30	Function code	0x30
	0x36		0x36
High byte of the register start address	0x30	High byte of the register start address	0x30
	0x31		0x31
Low byte of the register start address	0x30	Low byte of the register start address	0x30
	0x30		0x30
High byte of register content	0x30	High byte of register content	0x30
	0x30		0x30
Low byte of register content	0x30	Low byte of register content	0x30
	0x32		0x32
LRC check code high byte	0x46	LRC check code high byte	0x46
LRC check code low byte	0x36	LRC check code low byte	0x36
End	0x0D	End	0x0D
	0x0A		0x0A

7.5.4 0x10 function code

Write multiple words of data continuously to slave registers, that is, set the values of multiple consecutive parameters. For example: write data "0x03" and "0x02" to parameters F100 and F101. See Table 7.11 and Table 7.12 for RTU and ASCII formats respectively.

Table 7.11 0x10 function code (RTU)

Host command information		Slave response information	
Start	3.5 bytes transmission interval time	From address	3.5 bytes transmission interval time
Slave address	0x01	Slave address	0x01
Function code	0x10	Function code	0x10
Register start address high byte	0x01	Register start address high byte	0x01
Register start address low byte	0x00	Register start address low byte	0x00
High byte of the number of register words	0x00	High byte of the number of register words	0x00
Low byte of the number of register words	0x02	Low byte of the number of register words	0x02
Number of register bytes	0x04	CRC check code low byte	0x40
High byte of register word content	0x00	CRC check code high byte	0x34
Low byte of register word content	0x03	End	3.5 bytes transmission interval time
High byte of register word content	0x00		
Low byte of register word content	0x02		
CRC check code low byte	0x8F		
CRC check code high byte	0xFE		
End	3.5 bytes transmission interval time		

Table 7.12 0x10 function code (ASCII)

Host command information		Slave response information	
Start	0x3A	Start	0x3A
Slave address	0x30	Slave address	0x30
	0x31		0x31
Function code	0x31	Function code	0x31
	0x30		0x30
Register start address high byte	0x30	Register start address high byte	0x30
	0x31		0x31
Register start address low byte	0x30	Register start address low byte	0x30
	0x30		0x30
High byte of the number of register words	0x30	High byte of the number of register words	0x30
	0x30		0x30
Low byte of the number of register words	0x30	Low byte of the number of register words	0x30
	0x32		0x32
Number of register bytes	0x30	LRC check code high byte	0x45
	0x34	LRC check code low byte	0x43
High byte of register word content	0x30	End	0x0D
	0x30		0x0A

Host command information		Slave response information
Low byte of register word content	0x30	
	0x33	
High byte of register word content	0x30	
	0x30	
Low byte of register word content	0x30	
	0x32	
LRC check code high byte	0x45	
LRC check code low byte	0x33	
End	0x0D	
	0x0A	

7.6 Description of function exception codes

If the operation request fails, the PDU reply is the error code and exception code. The error code equals the function code + 0x80, and the exception code indicates the specific cause of the error. See Table 7.13 for a list of exception codes.

Table 7.13 Exception Code Definition

Exception code (Hexadecimal)	Meaning shown
0x01	Illegal function code: The soft starter received a function code it does not support.
0x02	Illegal register address: The soft starter received a data address that is not allowed. Example: Read data from register address 0xFF00 (actually there is no register address 0xFF00) Host sends data (hex): 01 03 FF 00 00 01 87 1E Slave responds data (hex): 01 83 02 C0 F1 
0x03	Illegal register data value: PDU data count is not accurate.
0x10	Checksum error: The soft starter received data with a checksum error.
0x11	Function parameter cannot be written: Function parameters can only be written in state or fault status, cannot be written in other statuses.
0x12	Function parameter value out of range: The set value of the function parameter exceeds the allowed range.
0x15	Enterprise password permission: Enterprise password is required for read and write operations.

7.7 Communication function

7.7.1 Functional Parameter Communication Address

R/W means the function parameter or control command parameter can be read and written; R means the function parameter or control command parameter can only be read; W means the function parameter or control command parameter can only be written. See Table 7.14 for details.

Table 7.14 Functional Parameter Communication Address

Parameter Code	Parameter content.	Read/Write Attribute	Communication Address
F100	Start/Stop Channel	R/W	0x0100
F101	Start Delay	R/W	0x0101
F102	Sequen start num	R/W	0x0102
F103	Low fwd strength	R/W	0x0103
F104	Low fwd speed	R/W	0x0104
F105	Low rev strength	R/W	0x0105
F106	Low rev speed	R/W	0x0106
F107	M.preheat capaci	R/W	0x0107
F108	M.preheat time	R/W	0x0108
F200	1# load type sel	R/W	0x0200
F201	1# rated current	R/W	0x0201
F202	1# start mode	R/W	0x0202
F203	1# stop mode	R/W	0x0203
F204	1# limit I.times	R/W	0x0204
F205	1# jump time	R/W	0x0205
F206	1# jump voltage	R/W	0x0206
F207	1# initial V.	R/W	0x0207
F208	1# start time	R/W	0x0208
F209	1# 2nd I.bgn T.	R/W	0x0209
F210	1# 2nd I.times	R/W	0x020A
F211	1# soft stp time	R/W	0x020B
F212	1# sft stp endV.	R/W	0x020C
F213	1# brake stop T.	R/W	0x020D
F214	1# brk strength	R/W	0x020E
F300	2# load type sel	R/W	0x0300
F301	2# rated current	R/W	0x0301
F302	2# start mode	R/W	0x0302
F303	2# stop mode	R/W	0x0303
F304	2# limit I.times	R/W	0x0304
F305	2# jump time	R/W	0x0305
F306	2# jump voltage	R/W	0x0306
F307	2# initial V.	R/W	0x0307
F308	2# start time	R/W	0x0308
F309	2# 2nd I.bgn T.	R/W	0x0309
F310	2# 2nd I.times	R/W	0x030A
F311	2# soft stp time	R/W	0x030B
F312	2# sft stp endV.	R/W	0x030C
F313	2# brake stop T.	R/W	0x030D
F314	2# brk strength	R/W	0x030E
F400	3# load type sel	R/W	0x0400
F401	3# rated current	R/W	0x0401
F402	3# start mode	R/W	0x0402

Parameter Code	Parameter content.	Read/Write Attribute	Communication Address
F403	3# stop mode	R/W	0x0403
F404	3# limit I.times	R/W	0x0404
F405	3# jump time	R/W	0x0405
F406	3# jump voltage	R/W	0x0406
F407	3# initial V.	R/W	0x0407
F408	3# start time	R/W	0x0408
F409	3# 2nd I.bgn T.	R/W	0x0409
F410	3# 2nd I.times	R/W	0x040A
F411	3# soft stp time	R/W	0x040B
F412	3# sft stp endV.	R/W	0x040C
F413	3# brake stop T.	R/W	0x040D
F414	3# brk strength	R/W	0x040E
F500	Rly valid status	R/W	0x0500
F501	IN1 function sel	R/W	0x0501
F502	IN2 function sel	R/W	0x0502
F503	IN1 close delay	R/W	0x0503
F504	IN1 open delay	R/W	0x0504
F505	IN2 close delay	R/W	0x0505
F506	IN2 open delay	R/W	0x0506
F507	RUN close delay	R/W	0x0507
F508	RUN open delay	R/W	0x0508
F509	STOP close delay	R/W	0x0509
F510	STOP open delay	R/W	0x050A
F511	EMS close delay	R/W	0x050B
F512	EMS open delay	R/W	0x050C
F513	K2 output sel	R/W	0x050D
F514	K3 output sel	R/W	0x050E
F600	Analog out type	R/W	0x0600
F601	Analog out func	R/W	0x0601
F602	Ammeter rate set	R/W	0x0601
F700	OL.protect grade	R/W	0x0700
F701	OL.hot accumulat	R/W	0x0701
F702	Main OV.protect	R/W	0x0702
F703	Main OV.filter T	R/W	0x0703
F704	Main UV.protect	R/W	0x0704
F705	Main UV.filter T	R/W	0x0705
F706	Lockrotor prot I	R/W	0x0706
F707	Lockrotor time	R/W	0x0707
F708	I.unbalance degr	R/W	0x0708
F709	I.unbalance time	R/W	0x0709
F710	Start times	R/W	0x070A
F711	SS OH.prote val	R/W	0x070B
F712	SS OH.alarm val	R/W	0x070C

Parameter Code	Parameter content.	Read/Write Attribute	Communication Address
F713	UL & OL alarm OE	R/W	0x070D
F714	UL.I.alarm value	R/W	0x070E
F715	UL.I.check time	R/W	0x070F
F716	UL.I.remove time	R/W	0x0710
F717	OL.I.alarm value	R/W	0x0711
F718	OL.I.check time	R/W	0x0712
F719	OL.I.remove time	R/W	0x0713
F800	Parameter lock	R/W	0x0800
F801	LCD light cls T.	R/W	0x0801
F802	Language select	R/W	0x0802
F900	SS comm address	R/W	0x0900
F901	Comm baud rate	R/W	0x0901
F902	Comm data format	R/W	0x0902
F903	Comm timeout tim	R/W	0x0903
FA00	Firmware version	R	0x0A00
FA01	FM.update(Y)	R	0x0A01
FA02	FM.update(M&D)	R	0x0A02
FA03	L1 Phase current	R	0x0A03
FA04	L2 Phase current	R	0x0A04
FA05	L3 Phase current	R	0x0A05
FA06	L1 Phase voltage	R	0x0A06
FA07	L2 Phase voltage	R	0x0A07
FA08	L3 Phase voltage	R	0x0A08
FA09	L1&L2 line V.	R	0x0A09
FA10	L1&L3 line V.	R	0x0A0A
FA11	L2&L3 line V.	R	0x0A0B
FA12	L1 radiator T.	R	0x0A0C
FA13	L2 radiator T.	R	0x0A0D
FA14	L3 radiator T.	R	0x0A0E
FA15	Power frequency	R	0x0A0F
FA16	Power factor	R	0x0A10
FA17	Active power[kW]	R	0x0A11
FA18	Reactive P[kvar]	R	0x0A12
FA19	Apparent P[kVA]	R	0x0A13
FA20	Electroma torque	R	0x0A14
FA21	Max I.of running	R	0x0A15
FA22	Max I.of start	R	0x0A16
FA23	Times of started	R	0x0A17
FA24	Pwr consu H[MWH]	R	0x0A18
FA25	Pwr consu L[kWH]	R	0x0A19
FA26	Running T.H[kH]	R	0x0A1A
FA27	Running T.L[H]	R	0x0A1B
FA28	Power on T.H[kH]	R	0x0A1C

Parameter Code	Parameter content.	Read/Write Attribute	Communication Address
FA29	Power on T.L[H]	R	0x0A1D
FA30	Total fault num	R	0x0A1E
FA31	Power V.degree	R	0x0A1F
FA32	Pwr phase sequen	R	0x0A20
FA33	Motor connec dir	R	0x0A21
FA34	Inner DC bus V.	R	0x0A22
FA35	Ext termi status	R	0x0A23
FB00	Bypass change TD	R/W	0x0B00
FB01	1# rated pwr[kW]	R/W	0x0B01
FB02	1# rated speed	R/W	0x0B02
FB03	1# loss gain	R/W	0x0B03
FB04	1# tor lim times	R/W	0x0B04
FB05	2# rated pwr[kW]	R/W	0x0B05
FB06	2# rated speed	R/W	0x0B06
FB07	2# loss gain	R/W	0x0B07
FB08	2# tor lim times	R/W	0x0B08
FB09	3# rated pwr[kW]	R/W	0x0B09
FB10	3# rated speed	R/W	0x0B0A
FB11	3# loss gain	R/W	0x0B0B
FB12	3# tor lim times	R/W	0x0B0C
FB13	Torque mode Kp	R/W	0x0B0D
FB14	Torque mode Ti	R/W	0x0B0E
FB15	Tor sampl period	R/W	0x0B0F
FB16	Tor deviate lim	R/W	0x0B10
FB17	Fan run time set	R/W	0x0B11
FB18	I.mod back value	R/W	0x0B12
FB19	I.cur rise limit	R/W	0x0B13
FC00	L1 V.adjust coe	R/W	0x0C00
FC01	L2 V.adjust coe	R/W	0x0C01
FC02	L3 V.adjust coe	R/W	0x0C02
FC03	L1 I.adjust coe	R/W	0x0C03
FC04	L1 I.ad constant	R/W	0x0C04
FC05	L2 I.adjust coe	R/W	0x0C05
FC06	L2 I.ad constant	R/W	0x0C06
FC07	L3 I.adjust coe	R/W	0x0C07
FC08	L3 I.ad constant	R/W	0x0C08
FC09	AO adjust coe	R/W	0x0C09
FC10	AO adjust const	R/W	0x0C0A
FD00	Fault info 00	R	0x0D00
FD01	Fault info 01	R	0x0D01
FD02	Fault info 02	R	0x0D02
FD03	Fault info 03	R	0x0D03
FD04	Fault info 04	R	0x0D04

Parameter Code	Parameter content.	Read/Write Attribute	Communication Address
FD05	Fault info 05	R	0x0D05
FD06	Fault info 06	R	0x0D06
FD07	Fault info 07	R	0x0D07
FD08	Fault info 08	R	0x0D08
FD09	Fault info 09	R	0x0D09
FE00	Modified Record 00	R	0x0E00
FE01	Modified Record 01	R	0x0E01
FE02	Modified Record 02	R	0x0E02
FE03	Modified Record 03	R	0x0E03
FE04	Modified Record 04	R	0x0E04
FE05	Modified Record 05	R	0x0E05
FE06	Modified Record 06	R	0x0E06
FE07	Modified Record 07	R	0x0E07
FE08	Modified Record 08	R	0x0E08
FE09	Modified Record 09	R	0x0E09
FE10	Modified Record 10	R	0x0E0A
FE11	Modified Record 11	R	0x0E0B
FE12	Modified Record 12	R	0x0E0C
FE13	Modified Record 13	R	0x0E0D
FE14	Modified Record 14	R	0x0E0E
FE15	Modified Record 15	R	0x0E0F
FE16	Modified Record 16	R	0x0E10
FE17	Modified Record 17	R	0x0E11
FE18	Modified Record 18	R	0x0E12
FE19	Modified Record 19	R	0x0E13

Note: For soft starter models with rated current not greater than 630A (including 630A), the three-phase current value contains one decimal place; for soft starter models with rated current greater than 630A, the three-phase current value is an integer. The current values read via communication are the same.

7.7.2 Communication address of control command class

The communication address of the control command class is shown in Table 7.15.

Table 7.15 Communication addresses of control commands

Control command	Meaning.	Read/Write Attribute	Communication Address
Start/stop command	0x00AA: start; 0x0055: stop Note: Receiving a stop command also means that the current fault will be reset simultaneously.	W	0x3201
Restore factory settings	0x00AA: recover; 0x0055: not recover	W	0x3202
Clear faults	0x00AA: fault reset; 0x0055: fault not reset	W	0x3203
Manufacturer authorization enable	Reserved	W	0x3204

Control command	Meaning.	Read/Write Attribute	Communication Address
Read current operating status	0x0001: status 0x0002: soft start status 0x0004: bypass operation status 0x0008: soft stop status, including voltage ramp soft stop and torque ramp soft stop 0x0010: fault status 0x0020: braking status 0x0040: low-speed forward rotation status 0x0080: low-speed reverse rotation status 0x0100: preheating status	R	0x4201
Read current fault or alarm	0x0000: no fault 0x0001: Running overload fault 0x0002: Lockrotor/short circuit fault 0x0003: Start current limiting timeout fault 0x0004: Three-phase unbalance fault 0x0005: Output phase loss fault 0x0006: Input phase loss fault 0x0007: Frequency error fault 0x0008: Thyristor short-circuit fault 0x0009: Soft starter overheating fault 0x000a: Motor overheating fault 0x000b: Bypass switch fault 0x000c: Main circuit overvoltage fault 0x000d: Main circuit undervoltage fault 0x000e: Control voltage overvoltage fault 0x000f: Control voltage undervoltage fault 0x0010: Mainboard operation timeout fault 0x0011: Instantaneous stop open-phase fault 0x0012: Excessive starts fault 0x0013: Start time too long fault 0x0014: Parameter error fault 0x0015: External fault 0x0016: Communication timeout fault 0x0017: Overheating alarm 0x0018: Underload alarm	R	0x4202
Start countdown value:	1s ~ 999s	R	0x4203
Fault release countdown:	0s ~ 1800s Only valid when running overload or starting current limit overtime fault occurs; invalid for other faults.	R	0x4204

7.8 Modbus Communication Example

Before communication, set the relevant communication function parameters, and then make sure the communication addresses, baud rates, data formats, etc., of the upper and lower computers are consistent.

Example 1: The soft starter model is NJR5-150/D4, slave address is 0x01, and the current three-phase currents of the soft starter need to be read.

Data sent by the host: 01 03 0A 03 00 03 F6 13

Data Received by Host: 01 03 06 02 E0 02 E2 02 DF 40 37

The data received by the host (slave) is the response from the slave (slave); in this communication, 02 E0 represents L1 phase current, 02 E2 represents L2 phase current, and 02 DF represents L3 phase current.

Since $0x02E0=736$, and NJR5-150/D4 rated model current is 150A, which is less than or equal to 630A, the display values have one decimal place. Therefore, actual current of L1 phase = 73.6A, L2 phase = 73.8A, L3 phase = 73.5A.

Example 2: The soft starter model is NJR5-800/D4, slave address is 0x01, and the current three-phase currents of the soft starter need to be read.

Data sent by the host: 01 03 0A 03 00 03 F6 13

Data Received by Host: 01 03 06 02 E0 02 E2 02 DF 40 37

The data received by the host (slave) is the response from the slave (slave); in this communication, 02 E0 represents L1 phase current, 02 E2 represents L2 phase current, and 02 DF represents L3 phase current.

Since $0x02E0=736$, and NJR5-800/D4 rated model current is 1000A, which is greater than 630A, the display values are integers. Therefore, actual current of L1 phase = 736A, L2 phase = 738A, L3 phase = 735A.

Example 3: The slave address of the soft starter is 0x01, and remote starting is done via communication in two steps.

Step 1: Set the F100 start/stop channel to "2" (actually, setting it to 4~6 is also possible; for this example, set it to "2").

Data Sent by Host: 01 06 01 00 00 02 09 F7

Data Received by Host: 01 06 01 00 00 02 09 F7

In this way, the function parameter F100 is set to "2" (00 02 represents the value "2").

Step 2: The host sends the soft start command to the soft starter.

Data sent by the host: 01 06 32 01 00 AA 56 CD

Data received by the host: 01 06 32 01 00 AA 56 CD

Send the start command 00 AA to the communication address 32 01 for the start/stop command, so that the soft starter receives the start command via communication and starts softly.

8 Fault analysis and troubleshooting

8.1 Maintenance

Disconnect the power supply before maintaining the product. Maintenance, disassembly, and repair must be carried out by professionals only.

- Check whether the terminal screws are loose;
- Check if the wires are damaged or aged;
- Check if there are marks on the copper busbar or conductor parts.

8.2 Fault protection description

The NJR5-D series soft starters feature comprehensive protection functions, ensuring the safe use of the soft starter and the motor; when a fault protection occurs, the soft starter stops immediately. Protection levels and parameters should be properly set according to different situations during use.

8.2.1 Running overload fault protection

After switching to bypass operation, according to the standard overload protection curve requirements specified by IEC60947-4-2 (see Figure 8.1), continuously calculate the integral value of $\int X^2 \cdot T \cdot K$ (where X represents the current ratio to the motor rated current; T represents the current sampling period; K is the motor overload protection coefficient, related to function parameter F700 motor overload protection class, higher overload protection class means smaller K value). When the integral value of $\int X^2 \cdot T \cdot K$ exceeds the overload protection value, "Overload fault" will be reported. Typical trip time table is shown in Table 8.1.

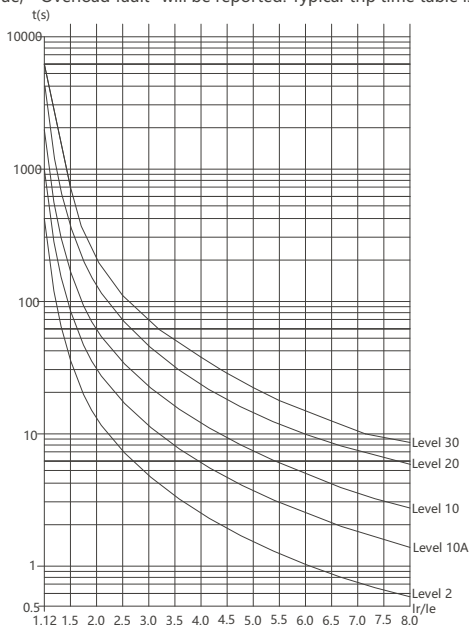


Figure 8.1 Standard thermal overload protection curve

Table 8.1 Typical trip time table

	Trip time for standard application (Level 10)				Trip time for heavy-duty application (Level 20)			
Current	200%I _e	300%I _e	400%I _e	500%I _e	200%I _e	300%I _e	400%I _e	500%I _e
Time	60s	23s	14s	8s	120s	46s	28s	15s

Note: After the “running overload fault” protection is reported, you must wait 30 minutes before restarting.

8.2.2 Locked-rotor/short-circuit fault protection

Locked-rotor/short-circuit protection includes load locked-rotor protection and load short-circuit protection.

1) Locked-rotor fault protection

During soft starting, soft stopping, bypass operation, low-speed forward, low-speed reverse or braking state, if the detected effective current is greater than the F706 stall protection current setting value and the duration exceeds the F707 stall protection time setting value, “Lock rotor/short fault” will be reported.

2) Short-circuit fault protection

If a current peak larger than 11 times the rated motor current of the soft starter is detected during soft start, soft stop, bypass operation, low-speed forward, low-speed reverse or braking status, “Lock rotor/short fault” will be reported immediately.

Note: Due to the long turn-off time of the thyristor (determined by the inherent characteristics of the thyristor turn-off), there is a possibility of thyristor burnout in the event of a short-circuit fault.

8.2.3 Start current limit overtime fault protection

During soft start, soft stop, low-speed forward or low-speed reverse state, continuously calculate the integral value of $\int I^2 \cdot T$. When the integral value of $\int I^2 \cdot T$ exceeds the limit current timeout value, “Limit I. timeout fault” will be reported. The specific relationship between time of startup current limit timeout protection and current is shown in Table 8.2, where I_r is the actual current value, I_e is the motor rated current value.

Note 1): When the soft start time exceeds 80 seconds, “Too long stt tim fault” will be reported.

Note 2): After the “start current limit overtime fault” protection is reported, you must wait 30 minutes before restarting.

Table 8.2 Overtime current limit protection time table

F700 Setting Value Actual Current I _r	0: Level 2	1:10A Level	2: Level 10	3: Level 20	4: Level 30
500% I _e	25s	25s	25s	30s	40s
450% I _e	31s	31s	31s	37s	49s
400% I _e	39s	39s	39s	46s	62s
350% I _e	51s	51s	51s	61s	81s
300% I _e	69s	69s	69s	83s	111s
250% I _e	100s	100s	100s	120s	160s

8.2.4 Three-phase unbalance protection

During soft start, bypass operation, low-speed forward rotation, and low-speed reverse rotation, when the value of each phase current is greater than 5% I_e, and $I_{\min} / I_{\max} < (100 - \text{value set by F708})\%$ and the duration exceeds the parameter F709 setting for three-phase current unbalance time, “Unbalance of I. fault” will be reported.

Note 1: I_{min} indicates the phase current with the minimum value, and I_{max} indicates the phase current with the maximum value.

Note 2): When the input phase loss fault occurs, it may also report a three-phase unbalance fault.

8.2.5 Output phase loss fault protection

1) If, during pre-start, one phase of the motor is not connected to the output terminal of the soft starter, an "output phase loss fault" will be reported.

2) During soft start, bypass operation, low-speed forward, and low-speed reverse, if all phase currents are greater than 5% I_e , and $I_{min} / I_{max} < 40\%$ condition lasts more than 0.5 seconds, "Output phase loss fault" will be reported.

Note 1): I_{min} refers to the smallest phase current, I_{max} refers to the largest phase current.

Note 2): When the input phase loss fault occurs, it may also report a three-phase unbalance fault.

8.2.6 Input phase loss fault protection

During pre-start, if no input voltage is detected for one or several phases within 1 second, "Input phase loss fault" will be reported.

8.2.7 Frequency wrong fault protection

1) When starting is not current (including conventional and enhanced current), "Frequency wrong fault" will be reported if the power grid is detected to be outside the range of $50\text{Hz} \pm 2\text{Hz}$ or $60\text{Hz} \pm 2\text{Hz}$.

2) When starting with current (including normal current and enhanced current), error faults will not be detected.

8.2.8 Thyristor short-circuit fault protection

During low-speed forward or low-speed reverse, if all phase currents are greater than 5% I_e and any phase thyristor is detected short-circuited, "SCR short Fault" will be reported.

8.2.9 Soft starter overheat protection

In any state (except for fault state), if the current soft starter temperature exceeds the function parameter F711 soft starter overheat protection value, "SS over hot fault" will be reported. In the "SS over hot fault" state, if the temperature drops 2°C below the F711 setting, the "SS over hot fault" will be automatically cleared.

8.2.10 Main circuit overvoltage fault protection

In any state (except for fault state), if the line voltage is detected to be greater than the function parameter F702 main circuit overvoltage protection value and the duration exceeds the function parameter F703 main circuit overvoltage filter time, "Main circuit OV. fault" will be reported.

8.2.11 Main circuit undervoltage fault protection

In any state (except for fault state), if the line voltage is detected less than the function parameter F704 main circuit undervoltage protection value and the duration exceeds the function parameter F705 main circuit undervoltage filter time, "Main circuit UV. fault" will be reported.

8.2.12 Main board operation timeout fault

When the internal polling cycle of the main board software exceeds the set time, "CPU run timeout fault" will be reported.

8.2.13 Instantaneous stop terminal open circuit fault protection

In any state (except for fault state), if the disconnection time between terminal EMS and COM exceeds the function parameter F512 EMS terminal disconnection delay time, "EMS opened fault" will be reported; when the connection time exceeds the function parameter F511 EMS terminal connection delay time, "EMS opened fault" will be cleared.

8.2.14 Too many starts protection

1) When function parameter F710 soft start setting value equals 0, "Too many starts fault" will not be reported;

2) When function parameter F710 soft start setting value is greater than 0, if the number of starts within one hour exceeds the F710 soft start setting value, "Too many starts fault" will be reported.

8.2.15 Too long start times protection

If the cumulative soft start time exceeds 80 seconds, "Too long stt tim fault" will be reported.

8.2.16 Parameter error fault protection

1) If function parameters (readable and writable except FA and FD group parameters) exceed the parameter setting range, "Parameter wrong fault" will be reported. In the "Parameter wrong fault" state, once all readable and writable parameters return within the set range, "Parameter wrong fault" will be automatically cleared.

2) If the value of function parameter F501 input terminal IN1 function selection is equal to the value of function parameter F502 input terminal IN2 function selection, and the value of function parameter F501 is 1, 2, 3, 4, 5, or 6, "Parameter wrong fault" will be reported. In the state of "Parameter wrong fault", if F501 is not equal to F502, or if both F501 and F502 are set to "0", "Parameter wrong fault" will be automatically cleared.

8.2.17 External fault protection

1) When function parameter F501 input terminal IN1 function selection is set to "1: External fault", and the IN1 terminal signal is detected to change from open (open time greater than the value set by function parameter F504 IN1 terminal opening delay time) to closed (closure time greater than the value set by function parameter F503 IN1 terminal closure delay time), an "External fault" will be reported. In the "external fault" state, when the IN1 terminal signal open time is detected to be greater than the value set by F504, "External fault" will be cleared automatically.

2) When function parameter F502 input terminal IN2 function selection is set to "1: External fault", and the IN2 terminal signal is detected to change from open (open time greater than the value set by function parameter F506 IN2 terminal opening delay time) to closed (closure time greater than the value set by function parameter F505 IN2 terminal closure delay time), "External fault" will be reported. In the "external fault" state, when the IN2 terminal signal open time is detected to be greater than the value set by F506, "External fault" will be cleared automatically.

8.2.18 Soft starter overheat protection

In any state (except for fault state), if the soft starter temperature exceeds the function parameter F712 soft starter overheat setting value, "SS over hot fault" will be reported. In the "Soft Starter Overheat Fault" state, if the temperature drops 2°C below the F712 setting, "SS over hot fault" will be automatically cleared.

Note: The system will not stop in the "soft starter overheat" state. If "soft starter overheat" is already reported in this state, soft start cannot be performed.

8.2.19 Underload alarm

When F713 is set to "2: Only open UL.alarm", and during online operation, if the motor current detected within the F715 setting time is less than the F714 setting value, the product reports "Under load alarm"; If function parameter F514 is set to "0" or "24", then K2 relay will act and the product will not stop running. After "Under load alarm" occurs, if the motor current detected within the F716 setting time is greater than or equal to the F714 setting value, "Under load alarm" will be automatically cleared and the K2 relay will reset.

The positive logic underload diagram is shown in Figure 6.11a of Chapter 6, and the negative logic underload diagram is shown in Figure 6.11b of Chapter 6.

Note: The system will not stop during underload.

8.2.20 Overload alarm

When F713 is set to "1: Only open OL.alarm", during online operation, if the motor current detected within the F718 setting time exceeds the F717 setting value, the product reports "Over load alarm"; If function parameter F514 is set to "0" or "25", then the K2 relay will act and the product will not stop running. After "Over load alarm" occurs, if the motor current detected within the F719 setting time is less than or equal to the F717 setting value, "Over load alarm" will be automatically cleared and the K2 relay will reset.

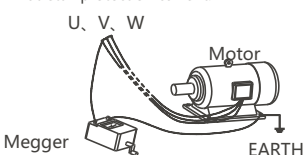
The positive logic overload diagram is shown in Figure 6.12a of Chapter 6, and the negative logic overload diagram is shown in Figure 6.12b of Chapter 6.

Note: The system will not stop during overload.

8.3 Analysis of common fault causes and troubleshooting methods

When an abnormality occurs in the soft starter, load motor, or power distribution equipment, the fault protection function will be activated. The LCD screen of the soft starter operation panel will display the fault name and related information. Please refer to Table 8.3 for details.

Table 8.3 Analysis of common fault causes and troubleshooting methods

Fault Name	Fault Cause Analysis	Troubleshooting Methods
Operation overload fault	1. Is the load too heavy or does the load current frequently exceed the rated current of the motor? 2. The motor rated current setting is incorrect.	1. Check whether the load is too heavy (fan or water pump loads can be adjusted via the channel valve opening), check whether the bypass operation current exceeds the setting value of function parameters F201, F301 or F401 for the motor rated current; 2. Check whether the setting values of function parameters F201, F301 or F401 for the motor rated current are too low; 3. Check whether the motor current often exceeds the rated motor current during bypass operation. 4. Check whether there is a large deviation between the soft starter current value and the actual current value. 5. Seek technical support.
Locked rotor/short-circuit fault	1. Is the load too heavy or does the load current frequently exceed the rated current of the motor? 2. The motor rated current setting is incorrect. 3. Motor winding is short-circuited to ground or insulation is poor. 4. Phase-to-phase short circuit or poor insulation between motor windings.	1. Check whether the motor is locked (blocked). 2. Check whether there is a phase-to-phase short circuit between the motor windings. 3. Detect whether the motor winding is short-circuited to ground. See the following figure for the inspection method. 4. Check whether the displayed current is within the setting value range for F706 stall protection current.  5. Seek technical support.

Fault Name	Fault Cause Analysis	Troubleshooting Methods
Start current limit timeout fault	1. Is the load too heavy? 2. Check whether the setting values of function parameters F204, F304 and F404 for the motor current limit multiples are too low. 3. Check whether the setting values of function parameters F207, F307 and F407 for the motor initial voltage are too low. 4. Check whether the setting values of function parameters F208, F308 and F408 for motor soft start time factor are too high. 5. Is the power transformer capacity insufficient?	1. Check whether the load is too heavy (for fan and water pump loads, the load can be adjusted by adjusting the opening of the flow control valve). 2. Check whether the setting values of function parameters F204, F304 and F404 for the motor current limit multiples are too low. 3. Check whether the setting values of function parameters F207, F307 and F407 for the motor initial voltage are too low. 4. Check whether the setting values of function parameters F208, F308 and F408 for motor soft start time factor are too high. 5. Check whether insufficient power capacity causes excessive voltage drop during soft start. Normally, the power supply capacity should be more than 2.5 times the motor power. 6. Seek technical support.
Three-phase unbalance fault	1. Poor output circuit or motor connection lines. 2. Whether the three-phase input voltage of the grid is balanced. 3. Abnormal thyristor (SCR). 4. Main board of the soft starter is abnormal.	1. Check whether the output circuit and motor connection lines are normal. 2. Check whether the three-phase input voltage of the grid is balanced. 3. Check whether the thyristor is abnormal. When power is off, use the continuity gear of a multimeter to measure whether there is continuity between main circuit terminals R and U, S and V, T and W respectively. Continuity indicates abnormal thyristor. Additionally, when power is off, use a multimeter to check whether the resistance between the G and K terminals of each thyristor is normal and consistent. 4. Replace the main board. 5. Seek technical support.
Output phase loss fault	1. Poor output circuit or motor connection lines. 2. Whether the three-phase input voltage of the grid is balanced, and whether there is a phase loss at the input. 3. Abnormal thyristor (SCR). 4. Main board of the soft starter is abnormal.	1. Check whether the three-phase input power and load motor are normal. 2. Check whether the soft starter's input and output wiring are reliable; if there are circuit breakers and contactors in the main circuit, check whether each phase of the circuit breakers and contactors is reliably closed or engaged. 3. Check whether the three-phase input voltage of the grid is balanced. 4. Check whether the thyristor is abnormal. When power is off, use the continuity gear of a multimeter to measure whether there is continuity between main circuit terminals R and U, S and V, T and W respectively. Continuity indicates abnormal thyristor. Additionally, when power is off, use a multimeter to check whether the resistance between the G and K terminals of each thyristor is normal and consistent. 5 Replace the main board. 6. Seek technical support.

Fault Name	Fault Cause Analysis	Troubleshooting Methods
Input phase loss fault	1 Abnormal three-phase input power supply or input circuit breaker. 2 When powered by generator, output voltage is abnormal. 3 Thyristor abnormality. 4. Main board of the soft starter is abnormal.	1 Check whether the three-phase input power supply is normal or whether the wiring is poor. 2 Check whether the power grid is within the normal range. 3. Check whether the thyristor is abnormal. When power is off, use the continuity gear of a multimeter to measure whether there is continuity between main circuit terminals R and U, S and V, T and W respectively. Continuity indicates abnormal thyristor. Additionally, when power is off, use a multimeter to check whether the resistance between the G and K terminals of each thyristor is normal and consistent. 4. Replace the main board. 5. Seek technical support.
Error fault	1 Generator power is insufficient or unstable. 2 Power grid input exceeds normal range. 3 Soft starter main board abnormality.	1 Check whether the generator output to the power grid is stable and within the normal range. 2 For occasions not powered by generator, check whether the power grid exceeds the normal range. 3 Seek technical support.
Thyristor short circuit fault	1 Whether the thyristor is short circuited. 2 Poor connection between load motor and soft starter. 3 Main board failure.	1 Check whether the thyristor is short circuited. 2 Check whether the connection between the load motor and the soft starter is poor. 3 Seek technical support.
Soft starter overheating fault	1. Is the load too heavy? 2 Whether starting is too frequent. 3 Whether the soft start process is too long.	1 Check whether the load is too heavy (for loads such as fans and pumps, you can adjust the opening of pipeline valves to regulate the load). 2 Check whether there are too many starts. 3 Whether the soft start process is too long, causing serious product problems; it is possible to appropriately increase the starting current limit multiple, initial voltage setting value, and appropriately decrease the soft start time factor setting value to improve starting capability, thereby solving excessive soft start process and serious issues. 4 Check whether the parameters of the soft starter and load motor match. 5 Check whether the soft starter overheating protection value is set reasonably; it can be set to the maximum value. 6. Seek technical support.
Motor overheating fault	1. Is the load too heavy? 2 Whether starting is too frequent. 3 Whether the soft start process is too long.	1 Check whether the load is too heavy (for loads such as fans and pumps, you can adjust the opening of pipeline valves to regulate the load). 2 Check whether there are too many starts. 3 Whether the soft start process is too long, causing serious product problems; it is possible to appropriately increase the starting current limit multiple, initial voltage setting value, and appropriately

Fault Name	Fault Cause Analysis	Troubleshooting Methods
		decrease the soft start time factor setting value to improve starting capability, thereby solving excessive soft start process and serious issues. 4 Check whether the parameters of the soft starter and load motor match. 5 Check whether the soft starter overheating protection value is set reasonably; it can be set to the maximum value. 6. Seek technical support.
Main circuit overvoltage fault	1 Whether the three-phase input voltage of the power grid is too high. 2 Whether the three-phase input voltage of the power grid fluctuates greatly. 3 Whether there is a super strong interference source.	1 Check whether the voltage of the three-phase input power grid is too high. 2. Check whether the setting value for function parameter F702 main circuit overvoltage protection is set too low, and whether function parameter F703 main circuit overvoltage filter time is too short. 3 Check whether there are super strong interfering loads such as intermediate frequency furnace around the product. 4 Seek technical support.
Main circuit undervoltage fault	1 Whether the three-phase input voltage of the power grid is too low. 2 Whether the three-phase input voltage of the power grid fluctuates greatly. 3 Whether there is a super strong interference source.	1 Check whether the voltage of the three-phase input power grid is too low. 2. Check whether the setting value for function parameter F704 main circuit undervoltage protection is set too high, and whether function parameter F705 main circuit undervoltage filter time is too short. 3 Check whether there are super strong interfering loads such as intermediate frequency furnace around the product. 4 Seek technical support.
Excessive start fault	Starts within one hour exceed the setting value of function parameter F710 soft start.	Check whether the continuous starts within one hour exceed the setting value of function parameter F710 soft start (when F710 is greater than "0").
Excessive start time fault	1. Is the load too heavy? 2. Check whether the setting values of function parameters F204, F304 and F404 for the motor current limit multiples are too low. 3. Check whether the setting values of function parameters F207, F307 and F407 for the motor initial voltage are too low. 4. Check whether the setting values of function parameters F208, F308 and F408 for motor soft start time factor are too high. 5. Is the power transformer capacity insufficient?	1 Check whether the load is too heavy (for loads such as fans and pumps, you can adjust the opening of pipeline valves to regulate the load). 2. Check whether the setting values of function parameters F204, F304 and F404 for the motor current limit multiples are too low. 3. Check whether the setting values of function parameters F207, F307 and F407 for the motor initial voltage are too low. 4. Check whether the setting values of function parameters F208, F308 and F408 for motor soft start time factor are too high. 5. Check whether insufficient power capacity causes excessive voltage drop during soft start. Normally, the power supply capacity should be more than 2.5 times the motor power. 6. Seek technical support.

Fault Name	Fault Cause Analysis	Troubleshooting Methods
Parameter error fault	1 Check whether settings of all readable/writable functional parameters exceed parameter setting range. 2. Check whether the setting values of function parameters F501 and F502 are accurate.	1 Check whether the functional parameter settings are within the parameter setting range or restore parameters to factory default values. 2. Check whether the setting values of function parameters F501 and F502 are accurate. 3 Seek technical support.
External fault	1. Check whether the setting values of function parameters F501 and F502 are correct. 2. Whether external control terminals IN1 and IN2 are connected correctly.	1. Check whether the setting values of function parameters F501 and F502 are correct. 2 Check whether the external terminals IN1 and IN2 are connected correctly. 3 Seek technical support.
Momentary stop terminal disconnect fault	1. Poor connection or not shorted between external control terminals EMS and COM. 2 Soft starter main board problem.	1. Check whether the external control terminal EMS is disconnected from the COM terminal. 2 Check whether the normally closed contact of other protection device connected to that terminal is reliably closed. 3 Seek technical support.
Soft starter overheating	1. Is the load too heavy? 2 Whether starting is too frequent. 3 Whether the soft start process is too long.	1 Check whether the load is too heavy (for loads such as fans and pumps, you can adjust the opening of pipeline valves to regulate the load). 2 Check whether there are too many starts. 3 Whether the soft start process is too long, causing serious product problems; it is possible to appropriately increase the starting current limit multiple, initial voltage setting value, and appropriately decrease the soft start time factor setting value to improve starting capability, thereby solving excessive soft start process and serious issues. 4 Check whether the parameters of the soft starter and load motor match. 5 Check whether the soft starter overheating protection value is set reasonably; it can be set to the maximum value. 6. Seek technical support.
Underload alarm	1. Check whether the setting value of the functional parameter F714 underload current is too high. 2 Is the motor load current too small? 3 The displayed current on the soft starter is less than the actual current.	1. Check whether the setting value of the functional parameter F714 underload current is too high. 2 Check whether the load is too light. 3 Seek technical support.

Fault Name	Fault Cause Analysis	Troubleshooting Methods
Overload alarm	1. Check whether the setting value of the functional parameter F717 overload current is too low. 2 Is the motor load current too large? 3 The displayed current on the soft starter is greater than the actual current.	1. Check whether the setting value of the functional parameter F717 overload current is too low. 2 Check whether the load is too heavy. 3 Seek technical support.

8.4 Analysis of Causes and Troubleshooting Methods for Common Abnormal Phenomena

The analysis of causes and troubleshooting methods for abnormal phenomena are shown in Table 8.4.

Table 8.4 Analysis of Causes and Troubleshooting Methods for Common Abnormal Phenomena

Common Abnormal Phenomena	Fault Cause Analysis	Troubleshooting Methods
The external control terminal cannot start	1. The setting value of the functional parameter F100 for start/stop channel is incorrect. 2. The terminals RUN, STOP and COM are not closed or have poor contact.	1. Check whether the setting of parameter F100 is correct. 2. Check whether the terminals STOP, RUN, and COM are properly and reliably connected; 3 Seek technical support.
Remote communication cannot start	1. The setting value of the functional parameter F100 for start/stop channel is incorrect. 2 Abnormal connection between terminals 485+ and 485- and the 485+ and 485- of the upper computer. 3 Communication address, baud rate, data format, etc. do not match with the upper computer.	1. Check whether the setting of parameter F100 is correct. 2 Check whether terminals 485+ and 485- are reliably connected to the 485+ and 485- of the upper computer. 3 Check whether the communication address, baud rate, data format, etc. match with the upper computer. 4 Seek technical support.
Sudden stop during bypass operation	1. Whether the external control terminals RUN, STOP, and COM are unexpectedly disconnected or have poor contact. 2 Faults occurred during bypass operation. 3 Soft starter main board abnormality.	1. When external control start/stop is enabled, check whether external control terminals RUN, STOP, and COM are unexpectedly disconnected or have poor contact. 2. Check whether the intermediate relay for control terminals RUN, STOP, and COM is reliably closed or open, especially in situations with severe vibration. 3. During bypass operation, check if there is an unexpected action of the intermediate relay for RUN, STOP, and COM due to grid voltage drop. 4. Check whether there is any fault information on the operation interface or whether any new faults have appeared in functional parameter FD00. 5. Seek technical support.

Common Abnormal Phenomena	Fault Cause Analysis	Troubleshooting Methods
During soft start, the motor speed cannot increase	1. Is the load too heavy? 2. Check whether the setting values of function parameters F204, F304 and F404 for the motor current limit multiples are too low. 3. Check whether the setting values of function parameters F207, F307 and F407 for the motor initial voltage are too low. 4. Check whether the setting values of function parameters F208, F308 and F408 for motor soft start time factor are too high. 5. Is the power transformer capacity insufficient?	1 Check whether the load is too heavy (for loads such as fans and pumps, you can adjust the opening of pipeline valves to regulate the load). 2. Check whether the setting values of function parameters F204, F304 and F404 for the motor current limit multiples are too low. 3. Check whether the setting values of function parameters F207, F307 and F407 for the motor initial voltage are too low. 4. Check whether the setting values of function parameters F208, F308 and F408 for motor soft start time factor are too high. 5. Check whether insufficient power capacity causes excessive voltage drop during soft start. Normally, the power supply capacity should be more than 2.5 times the motor power. 6. Seek technical support.

9 Warranty Period and Protection

9.1 Warranty Period

From the date of purchase by the user: 12 months, or from the date of manufacture: 18 months, whichever comes first. The following situations are not covered by the warranty:

- Damage caused by improper use, storage, or maintenance by the user;
- Damage caused by force majeure (fire, flood, earthquake, abnormal voltage, etc.);
- Damage caused by improper selection or using the soft starter for abnormal functions;
- Damage caused by disassembly or repair by non-company appointed organizations or personnel, or self-disassembly/repair;
- The product exceeds the warranty period.

9.2 Protection

For protection, when this product or its parts are discarded, it is strictly forbidden to disassemble by yourself or discard, landfill, or incinerate with household garbage. Please recycle through compliant channels, such as: contacting the designated local electronic waste recycling station or hazardous waste treatment agency, or processing through the national electronic waste recycling system.

Risk warning and disposal requirements for main product accessory recycling are shown in Table 9.1.

Table 9.1 Risk Warning and Disposal Requirements for Main Product Accessory Recycling

Serial Number	Component Type	Recycling Value and Risk	Disposal Requirements
1	Flame-retardant engineering plastic parts(Such as housing, cover, etc.)	Low recycling value, incineration will release strong carcinogens, mixing with general plastics will contaminate the entire batch of recycled materials	Must be sorted and recycled separately! Please hand over to professional agencies for harmless treatment or chemical recycling. Mixing with general plastics or incineration is strictly prohibited.
2	Ordinary engineering plastic parts(Such as handles, internal structural parts, etc.)	Recyclable (ABS, PC, PA, etc.)	Can be classified as general plastic recycling, cleaned, crushed, granulated and then reused
3	Thermosetting plastic parts(Such as base, pedestal, etc.)	Difficult to degrade and recycle	Requires professional treatment; incineration is prohibited
4	Metal parts	High recycling value (silver, copper, iron, aluminum, etc.)	It is recommended to disassemble and recycle by professionals
5	Rubber parts	Difficult to degrade, some are recyclable	Requires professional treatment; incineration is prohibited
6	Printed Circuit Board (PCB)	Containing heavy metals (lead, cadmium, etc.) and other precious metals	High-risk components! Must be professionally treated; private disassembly is strictly prohibited
7	Electronic components	Contains semiconductors, rare metals, and some harmful substances	Disassembly by a professional institution is required; capacitors and other components may retain high voltage.
8	Standard parts (fasteners)	Metal material is recyclable	Classify as metal for recycling after disassembly
9	Wire	Copper/aluminum conductor is recyclable	Peel off outer insulation and sort for recycling
10	Labels, packaging, and printed materials	Recyclable	Recommended to recycle separately

Appendix A Recommended Peripheral Device Configuration Table

Soft starter model	Adapted Motor Rated Current	Device model	Circuit breaker model	Cable or copper busbar (mm ²)		Short-circuit current	Fuse (SCPD)
NJR5-15/D2	15A	CJX2-25	NM1-63S/25	4	/	Reserved	Reserved
NJR5-22/D2	22A	CJX2-32	NM1-63S/32	6	/	Reserved	Reserved
NJR5-30/D2	29A	CJX2-40	NM1-63S/40	10	/	Reserved	Reserved
NJR5-37/D2	36A	CJX2-50	NM1-63S/50	10	/	Reserved	Reserved
NJR5-44/D2	42A	CJ40-63	NM1-63S/63	16	/	Reserved	Reserved
NJR5-60/D2	57A	CJ40-80	NM1-100S/80	25	/	2kA	RS711B/80A
NJR5-74/D2	70A	CJ40-100	NM1-100S/100	25	/	Reserved	Reserved
NJR5-90/D2	84A	CJ40-125	NM1-250S/125	25	/	Reserved	Reserved
NJR5-110/D2	103A	CJ40-160	NM1-250S/160	35	/	3kA	RS711/125A
NJR5-150/D2	140A	CJ40-200	NM1-250S/200	50	/	Reserved	Reserved
NJR5-180/D2	167A	CJ40-250	NM1-250S/250	70	/	5kA	RS711/200A
NJR5-220/D2	207A	CJ40-250	NM1-400S/250	95	25×3	Reserved	Reserved
NJR5-264/D2	248A	CJ40-315	NM1-400S/315	120	30×3	Reserved	Reserved
NJR5-320/D2	300A	CJ40-400	NM1-400S/400	185	30×4	Reserved	Reserved
NJR5-370/D2	349A	CJ40-400	NM1-630S/400	240	30×4	Reserved	Reserved
NJR5-440/D2	404A	CJ40-500	NM1-630S/500	300	35×4	7.5kA	RS713/500A
NJR5-500/D2	459A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-560/D2	514A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-630/D2	579A	CJ40-630	NM1-800S/700	2×240	40×6	10kA	RS714/700A
NJR5-710/D2	634A	CJ40-800	NM1-800S/800	2×240	40×8	Reserved	Reserved
NJR5-800/D2	720A	CJ40-1000	NM1-1250S/1000	2×300	40×8	10kA	RS714/900A
NJR5-900/D2	810A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1000/D2	900A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1120/D2	1050A	NC8-1260	NXA-16N16-M	3×300	50×10	12kA	RS714/1250A
NJR5-1260/D2	1140A	NC8-1450	NXA-16N16-M	4×240	60×10	Reserved	Reserved
NJR5-1420/D2	1250A	NC8-1700	NXA-20N20-M	4×240	60×10	Reserved	Reserved
NJR5-1600/D2	1460A	NC8-1700	NXA-20N20-M	4×300	60×12	15kA	RS714/900A Two in parallel
NJR5-15/D3	15A	CJX2-25	NM1-63S/25	4	/	Reserved	Reserved
NJR5-22/D3	22A	CJX2-32	NM1-63S/32	6	/	Reserved	Reserved
NJR5-30/D3	29A	CJX2-40	NM1-63S/40	10	/	Reserved	Reserved
NJR5-37/D3	36A	CJX2-50	NM1-63S/50	10	/	Reserved	Reserved
NJR5-44/D3	42A	CJ40-63	NM1-63S/63	16	/	Reserved	Reserved
NJR5-60/D3	57A	CJ40-80	NM1-100S/80	25	/	2kA	RS711B/80A
NJR5-74/D3	70A	CJ40-100	NM1-100S/100	25	/	Reserved	Reserved
NJR5-90/D3	84A	CJ40-125	NM1-250S/125	25	/	Reserved	Reserved
NJR5-110/D3	103A	CJ40-160	NM1-250S/160	35	/	3kA	RS711/125A
NJR5-150/D3	140A	CJ40-200	NM1-250S/200	50	/	Reserved	Reserved
NJR5-180/D3	167A	CJ40-250	NM1-250S/250	70	/	5kA	RS711/200A
NJR5-220/D3	207A	CJ40-250	NM1-400S/250	95	25×3	Reserved	Reserved

Soft starter model	Adapted Motor Rated Current	Device model	Circuit breaker model	Cable or copper busbar (mm ²)		Short-circuit current	Fuse (SCPd)
NJR5-264/D3	248A	CJ40-315	NM1-400S/315	120	30×3	Reserved	Reserved
NJR5-320/D3	300A	CJ40-400	NM1-400S/400	185	30×4	Reserved	Reserved
NJR5-370/D3	349A	CJ40-400	NM1-630S/400	240	30×4	Reserved	Reserved
NJR5-440/D3	404A	CJ40-500	NM1-630S/500	300	35×4	7.5kA	RS713/500A
NJR5-500/D3	459A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-560/D3	514A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-630/D3	579A	CJ40-630	NM1-800S/700	2×240	40×6	10kA	RS714/700A
NJR5-710/D3	634A	CJ40-800	NM1-800S/800	2×240	40×8	Reserved	Reserved
NJR5-800/D3	720A	CJ40-1000	NM1-1250S/1000	2×300	40×8	10kA	RS714/900A
NJR5-900/D3	810A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1000/D3	900A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1120/D3	1050A	NC8-1260	NXA-16N16-M	3×300	50×10	12kA	RS714/1250A
NJR5-1260/D3	1140A	NC8-1450	NXA-16N16-M	4×240	60×10	Reserved	Reserved
NJR5-1420/D3	1250A	NC8-1700	NXA-20N20-M	4×240	60×10	Reserved	Reserved
NJR5-1600/D3	1460A	NC8-1700	NXA-20N20-M	4×300	60×12	15kA	RS714/900A Two in parallel
NJR5-15/D4	15A	CJX2-25	NM1-63S/25	4	/	Reserved	Reserved
NJR5-22/D4	22A	CJX2-32	NM1-63S/32	6	/	Reserved	Reserved
NJR5-30/D4	29A	CJX2-40	NM1-63S/40	10	/	Reserved	Reserved
NJR5-37/D4	36A	CJX2-50	NM1-63S/50	10	/	Reserved	Reserved
NJR5-44/D4	42A	CJ40-63	NM1-63S/63	16	/	Reserved	Reserved
NJR5-60/D4	57A	CJ40-80	NM1-100S/80	25	/	2kA	RS711B/80A
NJR5-74/D4	70A	CJ40-100	NM1-100S/100	25	/	Reserved	Reserved
NJR5-90/D4	84A	CJ40-125	NM1-250S/125	25	/	Reserved	Reserved
NJR5-110/D4	103A	CJ40-160	NM1-250S/160	35	/	3kA	RS711/125A
NJR5-150/D4	140A	CJ40-200	NM1-250S/200	50	/	Reserved	Reserved
NJR5-180/D4	167A	CJ40-250	NM1-250S/250	70	/	5kA	RS711/200A
NJR5-220/D4	207A	CJ40-250	NM1-400S/250	95	25×3	Reserved	Reserved
NJR5-264/D4	248A	CJ40-315	NM1-400S/315	120	30×3	Reserved	Reserved
NJR5-320/D4	300A	CJ40-400	NM1-400S/400	185	30×4	Reserved	Reserved
NJR5-370/D4	349A	CJ40-400	NM1-630S/400	240	30×4	Reserved	Reserved
NJR5-440/D4	404A	CJ40-500	NM1-630S/500	300	35×4	7.5kA	RS713/500A
NJR5-500/D4	459A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-560/D4	514A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-630/D4	579A	CJ40-630	NM1-800S/700	2×240	40×6	10kA	RS714/700A
NJR5-710/D4	634A	CJ40-800	NM1-800S/800	2×240	40×8	Reserved	Reserved
NJR5-800/D4	720A	CJ40-1000	NM1-1250S/1000	2×300	40×8	10kA	RS714/900A
NJR5-900/D4	810A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1000/D4	900A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1120/D4	1050A	NC8-1260	NXA-16N16-M	3×300	50×10	12kA	RS714/1250A
NJR5-1260/D4	1140A	NC8-1450	NXA-16N16-M	4×240	60×10	Reserved	Reserved
NJR5-1420/D4	1250A	NC8-1700	NXA-20N20-M	4×240	60×10	Reserved	Reserved

Soft starter model	Adapted Motor Rated Current	Device model	Circuit breaker model	Cable or copper busbar (mm ²)		Short-circuit current	Fuse (SCPd)
NJR5-1600/D4	1460A	NC8-1700	NXA-20N20-M	4×300	60×12	15kA	RS714/900A Two in parallel
NJR5-15/D5	15A	CJX2-25	NM1-63S/25	4	/	Reserved	Reserved
NJR5-22/D5	22A	CJX2-32	NM1-63S/32	6	/	Reserved	Reserved
NJR5-30/D5	29A	CJX2-40	NM1-63S/40	10	/	Reserved	Reserved
NJR5-37/D5	36A	CJX2-50	NM1-63S/50	10	/	Reserved	Reserved
NJR5-44/D5	42A	CJ40-63	NM1-63S/63	16	/	Reserved	Reserved
NJR5-60/D5	57A	CJ40-80	NM1-100S/80	25	/	2kA	RS711B/80A
NJR5-74/D5	70A	CJ40-100	NM1-100S/100	25	/	Reserved	Reserved
NJR5-90/D5	84A	CJ40-125	NM1-250S/125	25	/	Reserved	Reserved
NJR5-110/D5	103A	CJ40-160	NM1-250S/160	35	/	3kA	RS711/125A
NJR5-150/D5	140A	CJ40-200	NM1-250S/200	50	/	Reserved	Reserved
NJR5-180/D5	167A	CJ40-250	NM1-250S/250	70	/	5kA	RS711/200A
NJR5-220/D5	207A	CJ40-250	NM1-400S/250	95	25×3	Reserved	Reserved
NJR5-264/D5	248A	CJ40-315	NM1-400S/315	120	30×3	Reserved	Reserved
NJR5-320/D5	300A	CJ40-400	NM1-400S/400	185	30×4	Reserved	Reserved
NJR5-370/D5	349A	CJ40-400	NM1-630S/400	240	30×4	Reserved	Reserved
NJR5-440/D5	404A	CJ40-500	NM1-630S/500	300	35×4	7.5kA	RS713/500A
NJR5-500/D5	459A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-560/D5	514A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-630/D5	579A	CJ40-630	NM1-800S/700	2×240	40×6	10kA	RS714/700A
NJR5-710/D5	634A	CJ40-800	NM1-800S/800	2×240	40×8	Reserved	Reserved
NJR5-800/D5	720A	CJ40-1000	NM1-1250S/1000	2×300	40×8	10kA	RS714/900A
NJR5-900/D5	810A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1000/D5	900A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1120/D5	1050A	NC8-1260	NXA-16N16-M	3×300	50×10	12kA	RS714/1250A
NJR5-1260/D5	1140A	NC8-1450	NXA-16N16-M	4×240	60×10	Reserved	Reserved
NJR5-1420/D5	1250A	NC8-1700	NXA-20N20-M	4×240	60×10	Reserved	Reserved
NJR5-1600/D5	1460A	NC8-1700	NXA-20N20-M	4×300	60×12	15kA	RS714/900A Two in parallel
NJR5-15/D6	15A	CJX2-25	NM1-63S/25	4	/	Reserved	Reserved
NJR5-22/D6	22A	CJX2-32	NM1-63S/32	6	/	Reserved	Reserved
NJR5-30/D6	29A	CJX2-40	NM1-63S/40	10	/	Reserved	Reserved
NJR5-37/D6	36A	CJX2-50	NM1-63S/50	10	/	Reserved	Reserved
NJR5-44/D6	42A	CJ40-63	NM1-63S/63	16	/	Reserved	Reserved
NJR5-60/D6	57A	CJ40-80	NM1-100S/80	25	/	2kA	RS711B/80A
NJR5-74/D6	70A	CJ40-100	NM1-100S/100	25	/	Reserved	Reserved
NJR5-90/D6	84A	CJ40-125	NM1-250S/125	25	/	Reserved	Reserved
NJR5-110/D6	103A	CJ40-160	NM1-250S/160	35	/	3kA	RS711/125A
NJR5-150/D6	140A	CJ40-200	NM1-250S/200	50	/	Reserved	Reserved
NJR5-180/D6	167A	CJ40-250	NM1-250S/250	70	/	5kA	RS711/200A
NJR5-220/D6	207A	CJ40-250	NM1-400S/250	95	25×3	Reserved	Reserved

Soft starter model	Adapted Motor Rated Current	Device model	Circuit breaker model	Cable or copper busbar (mm ²)		Short-circuit current	Fuse (SCPD)
NJR5-264/D6	248A	CJ40-315	NM1-400S/315	120	30×3	Reserved	Reserved
NJR5-320/D6	300A	CJ40-400	NM1-400S/400	185	30×4	Reserved	Reserved
NJR5-370/D6	349A	CJ40-400	NM1-630S/400	240	30×4	Reserved	Reserved
NJR5-440/D6	404A	CJ40-500	NM1-630S/500	300	35×4	7.5kA	RS713/500A
NJR5-500/D6	459A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-560/D6	514A	CJ40-630	NM1-630S/630	2×185	40×5	Reserved	Reserved
NJR5-630/D6	579A	CJ40-630	NM1-800S/700	2×240	40×6	10kA	RS714/700A
NJR5-710/D6	634A	CJ40-800	NM1-800S/800	2×240	40×8	Reserved	Reserved
NJR5-800/D6	720A	CJ40-1000	NM1-1250S/1000	2×300	40×8	10kA	RS714/900A
NJR5-900/D6	810A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1000/D6	900A	CJ40-1000	NM1-1250S/1250	3×240	50×8	Reserved	Reserved
NJR5-1120/D6	1050A	NC8-1260	NXA-16N16-M	3×300	50×10	12kA	RS714/1250A
NJR5-1260/D6	1140A	NC8-1450	NXA-16N16-M	4×240	60×10	Reserved	Reserved
NJR5-1420/D6	1250A	NC8-1700	NXA-20N20-M	4×240	60×10	Reserved	Reserved
NJR5-1600/D6	1460A	NC8-1700	NXA-20N20-M	4×300	60×12	15kA	RS714/900A Two in parallel

B.2 One-to-Two Basic Wiring Diagram

B.2.1 Main circuit diagram for dual drive

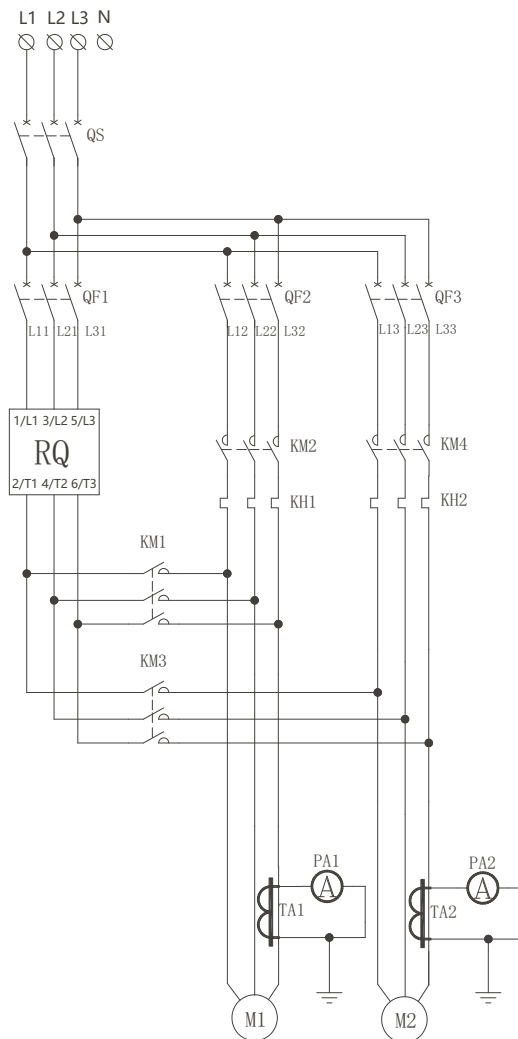


Figure B.2.1 Main circuit diagram for dual drive

B.2.2 Control circuit diagram for dual drive

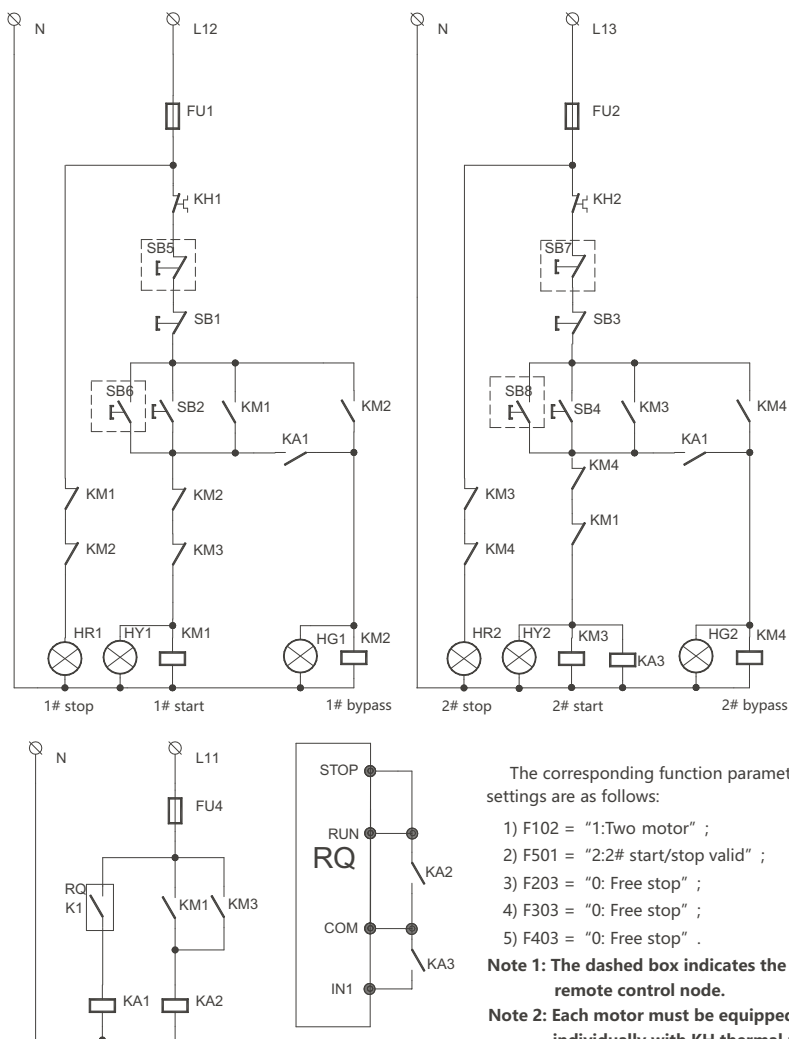


Figure B.2.2 Control circuit diagram for dual drive

B.3 One-to-Three Basic Wiring Diagram

B.3.1 Main circuit diagram for three-drive

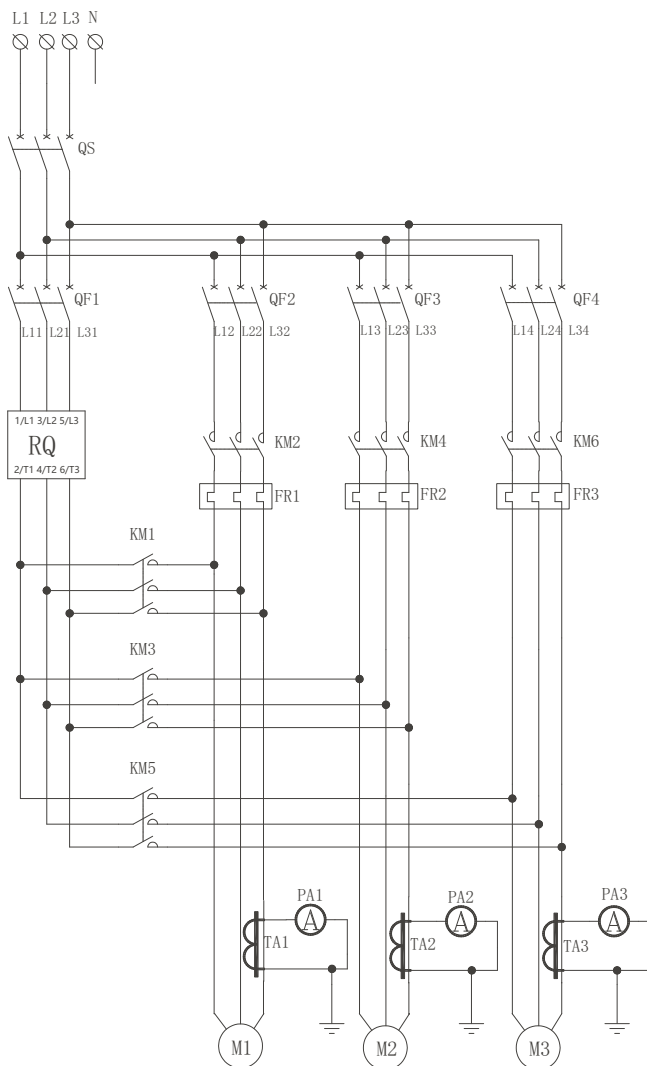


Figure B.3.1 Main circuit diagram for three-drive

Appendix C Version Change Record Table

Date of revised version	Revised version number	Modification details
2026-6	V1.00	First edition released

CHNT

QC PASS

NJR5-D Series
Soft Starter
GB/T 14048.6
EN 60947-4-2

Check 05

Test date: Please see the packing

ZHEJIANG CHINT ELECTRICS CO., LTD.

CHNT

CHINT ELECTRICS

NJR5-D Series Soft Starter User Manual

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