

Current

The current screen displays the real-time line current for each phase. If RTD/PT100 and the ground fault protection card are installed, the screen also displays the grounding power supply.

Phase current
000.0A 000.0A 000.0A

Motor power

Motor power screen display motor power(KW,HP,KVA) and power factor.

000.0kW 0000HP
0000kVA - . - - pf

Motor power is use power supply according voltage(parameter 8N) to calculate.

Last time starting information

Last time staring information screen display last staring success' detailed information.

- Staring continuous time (seconds)
- Largest staring current(motor rated current percentage)
- Calculate motor temperature rising range

Last starting 010s
350% FLC temp 5%

Date and time

Date/time screen display current system date and time(24 hours format).if you want to know how to set up time and date,refer to page 18.

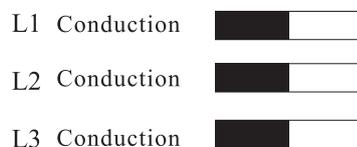
Function chart

Function chart display real time working character.Use parameter 8I~8L select information need to displayed

000.0A 0-400%

Thyristor conduction bar chart

Thyristor conduction bar chart display each phase conduction level



Chapter 7 Repairing Tool

7.1 Test Device Installation

The soft starter can be connected to a small motor for testing. During this test, the soft starter control input and relay output protection settings can be tested. This test mode is not suitable for testing soft start performance or soft stop performance.

The rated current of the test motor shall be at least 2% of the minimum rated current of the soft starter (see page 71 for minimum current and maximum current settings)



Attention

When testing the starter with a small motor, set the parameter 1A motor rating to the allowable minimum.

7.2 Degug Menu

'test menu' provide access to degugg and testing tool
Press ALT,then press tool,open 'tool'.

Debug Menu Navigation

- Press ▲ or ▼ button and turn to next or last option
- Press ► button to open one option to check
- Press ◀ button to return to upper menu
- Press many times to close ◀ menu

Set up date and time

- 1.Press ALT,then press tool,open 'tool'.
 - 2.Turn to date/time screen
 - 3.Press ► button to enter edit mode
 - 4.Press ► and ◀ botton to selection parts of date and time settings.
 - 5.Press ▲ or ▼ button to modify value
 - 6.Press ► button to save change.the soft starter confirm the modification.
- Press ◀ button to cancel modification.

Simulation tool

Software fax tools allow you to test the operation and control circuit of the soft starter when the soft starter is disconnected from the power supply voltage. There are three simulation modes for soft starters.

- Operation simulation Simulate the start, operation and stop of the motor, and confirm that the soft starter and related equipment are installed correctly.
- Protection simulation Simulate the activation of each protection mechanism and confirm the normal response of soft starter and related equipment.
- Output signal simulation Analog output signal, confirm the output and related control circuit work normally.

The simulation tool can be accessed through the debug menu. The simulation function can only be used when the soft starter is in ready state, with control voltage and the operation board is in active state.



Attention

Simulation tool is protected by access password
Default save password is 0000

Operation Simulation

You can press the EXIT button to finish the simulation at any time.

Using operation simulation

1. press ALT, then press the tool to open the tool.
2. turn to the running simulation and press ► button.
3. press the start button, or activate the input. Soft starter simulation before starting check
Close the main contactor (if installed) and run LED flicker.



Be careful

If the power supply voltage is connected, the error message is displayed.
Disconnect the power supply voltage and continue the next step.

4. Press ► button. Soft starter simulation starts, running LED flicker.
5. Press ► button to simulate the soft starter. Running LED is often bright without blinking, bypass relay closure.
6. Press the STOP button, or activate the stop input, and the soft starter simulation stops.

Run LED flicker, bypass relay opens

7. Press ► button, ready LED twinkle, main relay open.
8. Press ► to return to the debug menu.

Protection simulation

Protect the activation of each protection mechanism in simulation, confirm the normal response of soft starter and related equipment.

Using protection simulation

1. press ALT, then press ► tool to open the tool.
2. turn to the protection simulation, press the button.
3. use ▲ and ▼ buttons to select the protection to emulate.
4. press ► button to select the protection selected by simulation.
5. display the screen immediately. The soft starter response depends on the protection settings.
6. use ▲ or ▼ button to choose another simulation, or press ◀ key to exit.



Attention

How to protect the tripping from soft start, then reset before simulating another protection.

If protection setting as "alarm and record" no need to reset.

If protection settings are alarming and log.

Only if press menu store to check the alarm message.

If protection is set to log, the screen does not display any messages,
but adds a record to the log

Running simulation
ready to apply
start signal

Check storage and
continue before running
simulation start

Operation simulation
Be careful!
Power off voltage
Store and continue

Operation simulation
Start X: XX seconds
Store and continue

Operation simulation
Function
Apply stop signal

Operation simulation
Stop X: XX seconds
Store and continue

Operation simulation
Stop it
Store and continue

0.0A

Trip trip
Selected protection

Output signal simulation



The output signal simulates the output signal, confirms that the output and the related control circuit are working properly, and pays attention to setting the output relay as an appropriate function to monitor the operation of the relay if the marking operation (motor temperature and small/large current) is to be tested.

Using output signal simulation

1. press ALT, then press the tool to open the "tools".
2. turn to output signal simulation, press ► button.
3. use ▲ and ▼ buttons to select the function that you want to emulate, then press ► button.
4. use ▲ and ▼ buttons to switch signals.
5. Press ◀ to return to the simulation list.

```
Programmable relay a
OFF
ON
```

Analog output simulation

Analog output simulation ▲ and ▼ button to modify output terminal current

With the current measuring device analog output terminal, use ▲ and ▼ button to adjust the percentage value displayed on the display. The current measured by the current measuring device should be the same as the current displayed on the display.

If the input/output expansion card is installed, the operation of the relay outputs D, E, F and analog output B can also be tested by simulation.

```
Analog output A
0%
4.0mA
```

Temperature sensor status

This screen shows the status of the motor thermistor and RTD/PT100.

S = short circuit
H = heat
C=cold
O=open

```
Temperature sensor status
Thermistor: 0
RTD/PT100s:00000000
S = Shrt H=Hot C=Cld O=Opn
```

Only if install RTD/PT100 and earth error extension card,you can use RTD/PT100 B~G

Number I/O status

This screen display number input and output current status

The first line of screen display start input,stop input,reset input and programmerable input(A and B,I/O extension card input)

The last line of the screen shows programmable output A, fixed run output, programmable outputs B and C, and output on the expansion card (if installed)

```
Digital I / O status
Input: 011000
Output: 0000100
```

Analog output and input status

This screen shows the analog output and the current state of the input
This screen also shows analog output B if an expansion card is installed

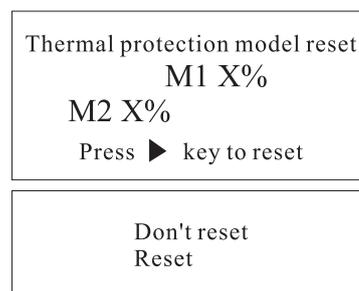
```
Analog I / O status
Input:---- %
Output a: 04. 0ma
```

Reset heat protection model

The soft starter's advanced thermal protection model software continuously monitors motor performance so that the soft starter can calculate the motor temperature at any time and can be successfully started at any time. If the soft starter is configured for use on two motors, the temperature of each motor is modeled separately.

The thermal protection model of the selected motor can be reset if necessary

1. Press ALT, then press Tools to open Tools.
2. Scroll to the reset thermal protection model and press ► button
3. Use ▼ button to select reset, press stop button to confirm.
4. After resetting the thermal protection model, the screen displays a confirmation message and returns to the previous screen.



Be careful

Resetting the motor thermal protection model may be detrimental to the life of the motor and should only be used in the event of an emergency.

7.3 Log Menu

The log menu provides information about events, trips, and starter performance.

Press ALT, then F1 (log) to open log

Open the event log:

- Press ALT, then press F1 (log) to open 'Log'
- Press ► button to open the log
- Press ▲ and ▼ buttons to scroll through the items in each log
- Press ► arrow button to view log details
- Press ◀ arrow button to return to the previous menu

To close the 'Log Menu', press ◀ arrow multiple times

The log menu can only be opened when viewing the monitor screen

Trip log

The trip log stores details of the eight most recent trips, including the trip date and time, Trip 1 is the most recently stored trip, and Trip 8 is the longest trip.

Turn on the trip log:

1. Press ALT, then press F1 (Log) to open 'Log'.
2. Scroll to the trip log and press ► button
3. Use ▲ and ▼ arrows to select the event you want to view and press ► to right-click to display the details.
4. To close the log and return to the home screen, press ◀ arrow multiple times

Performance counter

The event log stores the details of the 99 latest events (operation, warning and trip) of the starter, with a time stamp, including the date and time of the event. Event 1 is the latest stored event, and event 99 is the longest stored event.

Turn on the trip log:

1. Press ALT, then press F1 (Log) to open 'Log'.
2. Scroll to the trip log and press ► button
3. Use ▲ and ▼ arrows to select the event you want to view and press ► to right-click to display the details.
4. To close the log and return to the home screen, press ◀ arrow multiple times

Performance counter

The performance counter stores the starter operating statistics:

- Running hours (service life and counters since last reset)
- Number of starts (service life and counter after last reset)
- Motor kWh (service life and counter after last reset)
- Reset times of thermal protection model

Only when the parameter write protection (parameter 15b) is set to read / write, can the resettable counter (running hours, starting times and motor KWH) be reset.

View calculator

1. Press ALT, then press F1 (log).
2. Scroll to the counter and press ► button
3. Press ▲ and ▼ buttons to scroll through the counter and press ► button to view the details to the right
4. To reset the counter, press ► button and use ▲ and ▼ buttons to select Reset/No Reset. Press the MENU button to confirm the operation. To turn off the calculator, return to the log menu and press ► arrow key.

Chapter 8 Operation

8.1 Command Priority

The starter disable command takes precedence over any other control command, see parameter 6A Input A Function P43
 The emergency run command gives priority to normal control commands, including the auto start/auto stop command, see parameter 15C Emergency Run on P52.
 The auto start/auto stop command takes precedence over the normal control command (local, remote, or via serial communication). See also 3 Auto Start/Stop P39.

8.2 Start, Stop and Reset Commands

There are three ways to control the soft starter

1. Using the buttons on the control panel
2. Input via remote control
3. Connect via serial communication

The L/R (local/remote) button controls whether the soft starter responds to local control (via the operator panel) or remote control (via remote input).

- When the soft starter is in local control mode, the local LED on the control panel illuminates.
- When the soft starter is in remote control mode, the local LED is off.

Control via serial communication network is always enabled in local control mode, enabling or disabling via serial communication network control (parameter 6R remote communication) in remote control mode, optional communication is required for control over serial communication networks Module.

Always enable the STOP button on the control panel.

Control the motor with a soft starter

To soft start the motor, press the start button on the operator panel or activate the start remote input. The motor will start using the starting mode selected in parameter 2A.

To soft stop the motor, press the stop button on the operator panel, or activate stop remote input. The motor will stop in the stop mode selected in parameter 2H1.

To reset the soft starter trip, press the ESET button on the operator panel. Or activate reset remote input.

To allow the motor to coast to a stop regardless of the setting in parameter 2H stop mode, press the local stop and reset buttons simultaneously.

The soft starter will disconnect the power supply of the motor and open the main contactor to stop the motor sliding.

Auto start / auto stop

The soft starter can also be configured to start or stop automatically. The auto start / auto stop operation can only be used in remote mode. In local mode, The starter will ignore all auto start / auto stop settings. To configure the auto start / auto stop operation, use parameter 3A ~3D.

8.3 soft start method

Soft starters provide a variety of ways to control motor starting. Each soft start method uses different main control parameters.

Soft start method	Controlled parameter	Performance parameters affected
Timing voltage ramp	Voltage	Starting current, starting torque, acceleration
Constant current	Electric current	Starting torque, acceleration
Torque control	torque	Starting current, accelerating
Adaptive control	accelerate	Starting current, starting torque

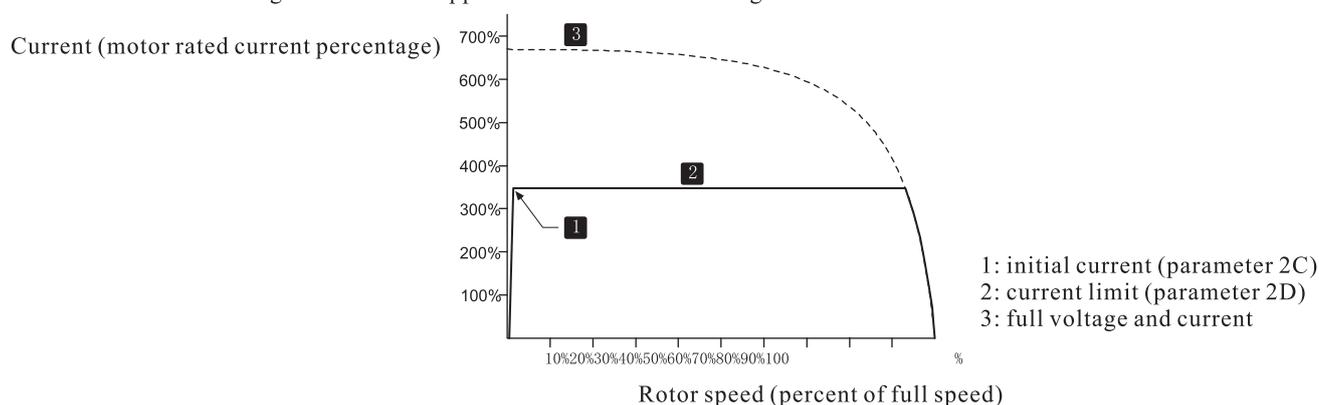
The best effect can be achieved by selecting the soft start method which can directly control the most important application parameters. Soft starters are usually used to limit motor starting current or to control load acceleration and / or deceleration. The soft starter can be set to constant current or adaptive control.

Control	Use
Motor Starting Current	Constant Current
Motor / Load Acceleration	Adaptive Control

Constant current

Constant current is the traditional soft start mode, which increases the current from zero to the specified current, and then remains unchanged until the motor accelerates.

Constant current starting is suitable for applications where the starting current must be controlled below a certain level.



Current slope

The current ramp soft start increases the current from the specified starting current (1) to the maximum limit (3) within the extended period (2).

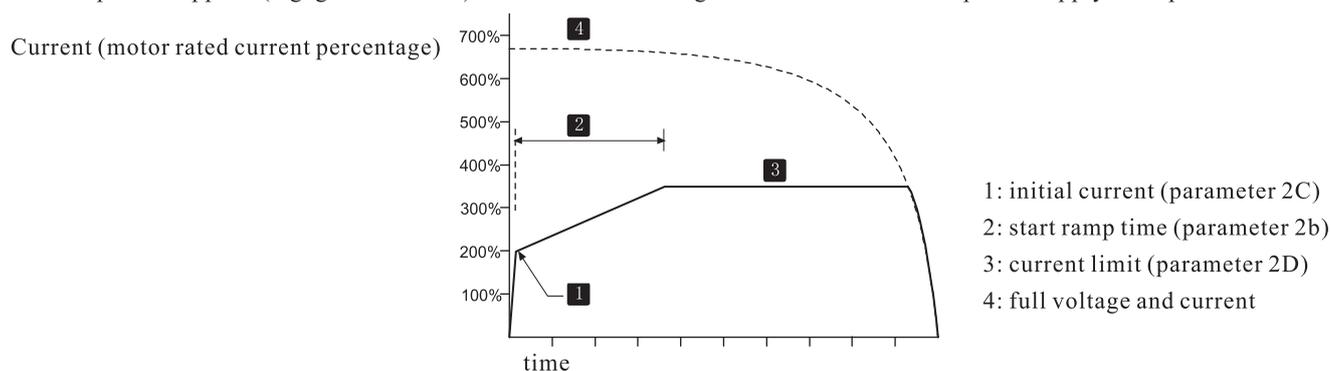
Current ramp starting can be used for the following applications:

- the load for each start is different (e.g. conveyor belt for heavy load start or no load start).

Set the initial current (parameter 2C) to the light load starting current of the motor, and

The current limit (parameter 2D) is set to the motor heavy load starting current.

- the load is easy to unload, but the starting time must be extended (e.g. centrifugal pumps that need to slowly build up line pressure).
- Limited power supplies (e.g. generator sets) and slow load loading allow more time for the power supply to respond.



Adaptive start control

In the soft start mode of adaptive control, the soft starter will adjust the current so that the motor can start with the selected acceleration curve within a specified time.



Look out

The speed of adaptive control starting motor can not be faster than that of direct starting mode.

If the starting ramp time (parameter 2b) is shorter than the direct starting time of the motor, the starting current may reach the direct starting current level.

Each application has a specific starting curve based on load characteristics and motor characteristics. Adaptive control provides three different starting curves, which can meet different application requirements. The selection of the curve matching with the application of the inherent curve will help to make the acceleration process smooth in the whole starting time.

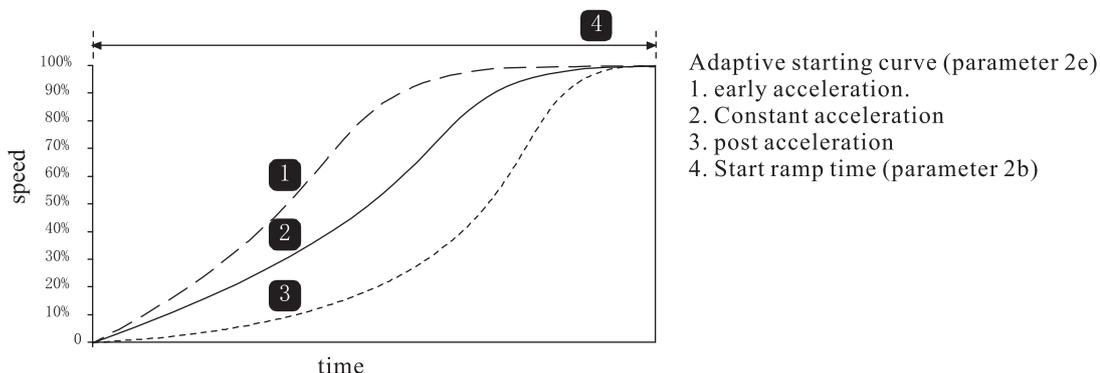
If the adaptive control curve with great difference is selected, the control effect of the inherent curve will be greatly affected.

The soft starter monitors the motor performance every time it starts the motor, so as to improve the soft start control in the future.

- adaptive control

Using adaptive control to control the starting performance:

1. Select adaptive control (parameter 2a) on the start mode menu
2. Set the desired starting ramp time (parameter 2b)
3. Select the desired adaptive starting curve (parameter 2e)
4. Set the starting current limit (parameter 2D) large enough to start successfully. The first adaptive control start is constant current start. In this way, the soft starter can understand the characteristics of the connected motor. In the subsequent adaptive control starting process, the soft starter uses this motor data.



Be careful

Adaptive control controls the load according to the programmed curve. The starting current varies with the selected acceleration curve and the set starting time. .

If a motor connected to a soft starter programmed with adaptive control to start or stop is replaced, or the starter is tested on a different motor before it is actually installed, the starter must learn the characteristics of the new motor. If parameter 1A motor rated current or parameter 2K adaptive control gain is changed, the motor characteristics will be understood again automatically.

- How to select the starting curve of adaptive control
The best curve depends on the exact details of each application. Some loads such as submersible pumps should not be operated at low speed. The early acceleration curve increases the speed rapidly in the starting process, and then controls the acceleration in the remaining starting time.



Look out

Adaptive control can control the speed curve of the motor in the programmed time range. This may result in a larger current than traditional control methods.

- fine tuning adaptive control
If the motor starts or stops unevenly, adjust the adaptive control gain (parameter 2K). The gain setting determines how much gain the soft starter will adjust at the next adaptive control start and stop based on the information from the last start. The gain setting affects both starting and stopping performance.
- If the motor accelerates rapidly at the end of starting or decelerates rapidly at the end of stopping, increase the gain setting by 5% 10%.
- If the motor speed fluctuates during start or stop, slightly decrease the gain setting.



Be careful

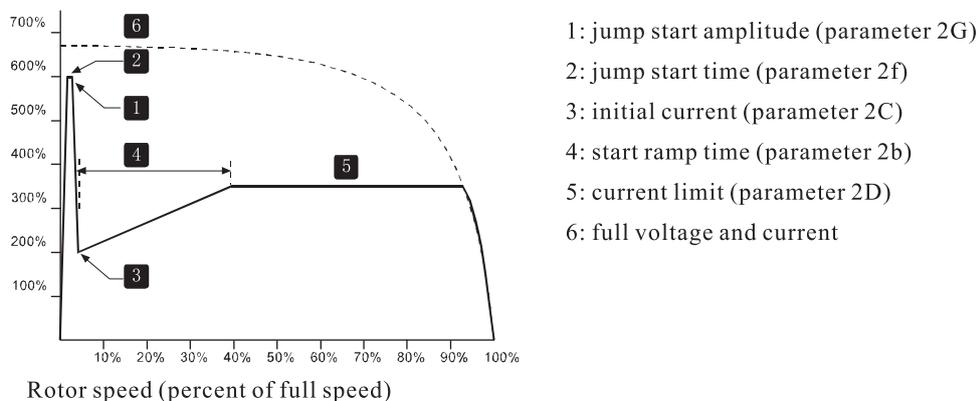
Reset the adaptive control learning record of the starter when changing the gain setting. After changing the gain, start with a constant current for the first time.

Jump start

Jump start provides additional torque for a short time at the start of starting, which can be used with current ramp starting or constant current starting.

Jump starting helps to start loads that require a minimum starting torque but are easy to accelerate later (e.g. flywheel loads such as calendars).

Current (motor rated current percentage)



8.4 Stop Method

The soft starter provides a variety of ways to control the motor stop.

Stopping method	Performance results
Taxi stop	Natural load stop
TVR soft stop	Extend stop time
adaptive control	Extend the stop time according to the selected deceleration curve
braking	Reduce stop time

Soft starters are commonly used in pumping applications to eliminate the destructive effect of water hammer. Adaptive control should be the preferred stop method for these applications.

Taxi stop

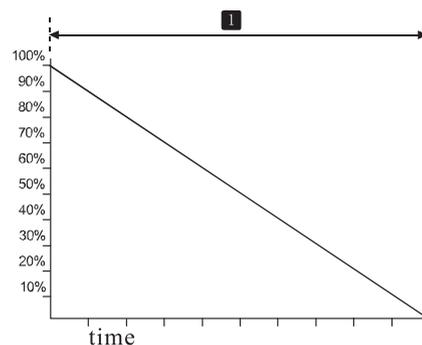
The sliding stop makes the motor slow down at the natural speed and is not controlled by the soft starter. The time required to stop depends on the type of load.

Timing voltage ramp soft stop

The timing voltage ramp gradually reduces the motor voltage over a specified period of time. After stopping the ramp, the load may continue to run.

Timed voltage ramp stop can be used for applications requiring extended stop times or to avoid transient power supply of the generator set.

Voltage (percent of full voltage)



1: stop time (parameter 2I)

Adaptive stop control

In the soft stop mode of adaptive control, the soft starter controls the current to make the motor stop using the selected deceleration curve within the specified time. Adaptive control can be used to extend the stop time of low inertia load. Each application has a specific stop curve based on load characteristics and motor characteristics. Adaptive control provides three different stop curves. Select the adaptive control curve that can best meet the application requirements.



Be careful

The adaptive control does not let the motor decelerate rapidly, and the motor stop speed is not faster than the sliding stop. To shorten the stop time of the large inertia load, use the brake operation.



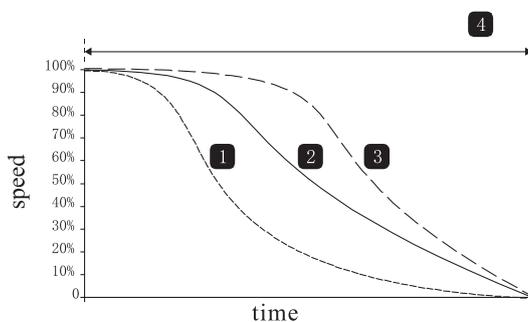
Look out

Adaptive control can control the speed curve of the motor in the programmed time range. This may result in a larger current than traditional control methods.

adaptive control

Use adaptive control to control stop performance:

1. Select adaptive control (parameter 2H) on the stop mode menu
2. Set the desired stop time (parameter 2I)
3. Select the desired adaptive stop curve (parameter 2J)



Adaptive control stop curve (parameter 2J):

1. Early slowdown
2. Constant deceleration
3. After deceleration
4. Stop time (parameter 2I)

The first adaptive control stop is the normal soft stop. In this way, the soft starter can understand the characteristics of the connected motor. This motor data is used by the soft starter during subsequent adaptive control stops.



Be careful

Adaptive control controls the load according to the programmed curve. The stop current varies with the selected deceleration curve and stop time.

If a motor connected to a soft starter programmed with adaptive control to start or stop is replaced, or the starter is tested on a different motor before it is actually installed, the starter must learn the characteristics of the new motor. If parameter 1A motor rated current or parameter 2K adaptive control gain is changed, the soft starter automatically re-understands the motor characteristics.

● Pump stop

The hydraulic characteristics of pumping system are quite different. This difference means that different deceleration curves and stop times are used for different applications. The following table provides the selection principles for the adaptive control deceleration curve, but we recommend that you test three curves to determine the best curve for the application.

Adaptive stop curve	Application
After deceleration	Even if the motor / water pump speed decreases a little, it will lead to a high head system with fast switching of forward flow and reverse flow.
Constant deceleration	The application of medium and low head and large flow with large liquid momentum.
Early deceleration	An open pumping system in which the liquid must return through the pump but the pump does not reverse.

Braking

Braking can shorten the motor stop time.

During braking, the motor can be heard to make more noise. This is a normal motor braking phenomenon.

After selecting the brake, the soft starter will use dc injection method to slow down the motor.

Soft starter brake:

- DC braking contactor is not required.
- control all three phases to evenly distribute the braking current and corresponding heating in the motor.

Look out



If the braking torque is set too high, the motor stops before the end of the braking time, and the motor generates too much heat, which may cause motor damage. Brake torque must be carefully configured to ensure safe operation of the starter and motor.

When the motor stops, the peak current of the direct starting motor will appear due to too much braking torque setting. Make sure that the fuse installed in the branch circuit of the motor is correctly selected.



Look out

The brake operation makes the heating speed of the motor faster than that calculated by the thermal protection model of the motor.

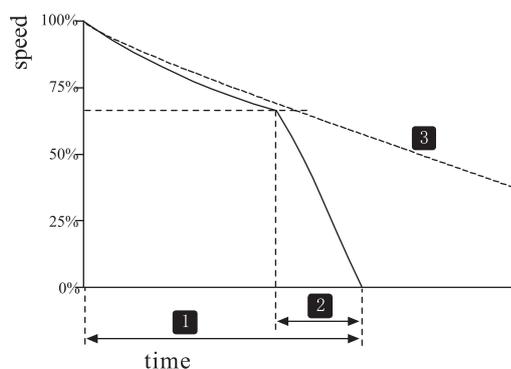
If brake operation is used, install a motor thermistor or set a restart delay long enough (parameter 4m).

Braking is divided into two stages:

- pre braking: moderate braking to reduce the motor speed to the point where full braking can be successfully carried out (about 70% of the speed).
- full braking: provide the maximum braking torque, but the effect is not good when the speed exceeds about 70%.

Equipped with soft starter for braking operation:

1. Set the desired stop time length (1) for parameter 2I. This is the total braking time, which must be set to be more than the braking time (parameter 2m) For a long time, in order to reduce the motor speed to about 70% before braking. If the stop time is too short and the motor fails to brake successfully, the motor will Taxi stop.
2. Set the braking time (parameter 2m) to about a quarter of the programmed stop time. This is the time of the full braking period (2).
3. Adjust the braking torque (parameter 2L) to achieve the desired stopping performance. If the setting is too small, the motor can not stop stably, but will be closed during the braking period After bunching, taxiing stops.



- 1: stop time (parameter 2i)
- 2: braking time (parameter 2m)
- 3: taxi stop time