Preface

Thank you for selecting FST-650 series frequency inverter from our company.

The FST-650 Drive is a series of high performance general frequency inverter with three kinds of control methods—V/F control, open-loop flux vector control, closed loop vector control, torque control. It has abundant parameter functions including pulse frequency setting, multi-step speed and simple PLC setting, PID setting, wobble control, non-stop at momentary power failure, auto voltage regulation and so on. It is applicable in many situations which needs accurate speed control, fast torque response speed and high start torque.

In order to make good use of the product and insure the user's safety, please read through the manual before installing or operating the FST-650 inverter, and keep it carefully after your reading.
When you have any questions that is not answered in this manual, please contact the local dealers or our company, our professional staff will be ready for you. Please keep on paying attention to our products.

The information herein is subject to change without notice.

Contents

Application Guide

The safe operation depends on proper delivery, installation, operation and maintenance. Please pay attention to relevant safety tips before these actions.

WARING

Points out potential danger which, if not avoided, may cause physical injury or death.

WARNING

- When shut off the power, don't touch circuit board or other components before the charging indicator extinguishes.
- Prohibiting wiring in the power transmission process, don't check the circuit board components or signals when operation.
- Please don't disassembling or change the internal wiring circuits or components.
- The grounding terminals must be correctly grounded. 220V level: the third kind ground, 440V level: special grounding.

CAUTION

Points out potential danger which, if not avoided, may result in mild or moderate physical injury and damage to the equipment.

CAUTION

- Please do not give pressure tests to the internal components of the inverter, these semiconductor components is vulnerable to high voltage damage.
- Do not connect output terminal U,V,W to AC power supply.
- The IC of CMOS on the circuit is vulnerable to be affected or damaged，please do not touch main circuit.

Chapter 1- Inspections

CAUTION

Please don't install the damaged inverters or those lack of components.
There are the risk of injury

Our products have been strictly inspected before they leave the factory, however, due to the transportation or other unexpected circumstances, please check the products carefully after purchasing.

1.1 Inspectation Items

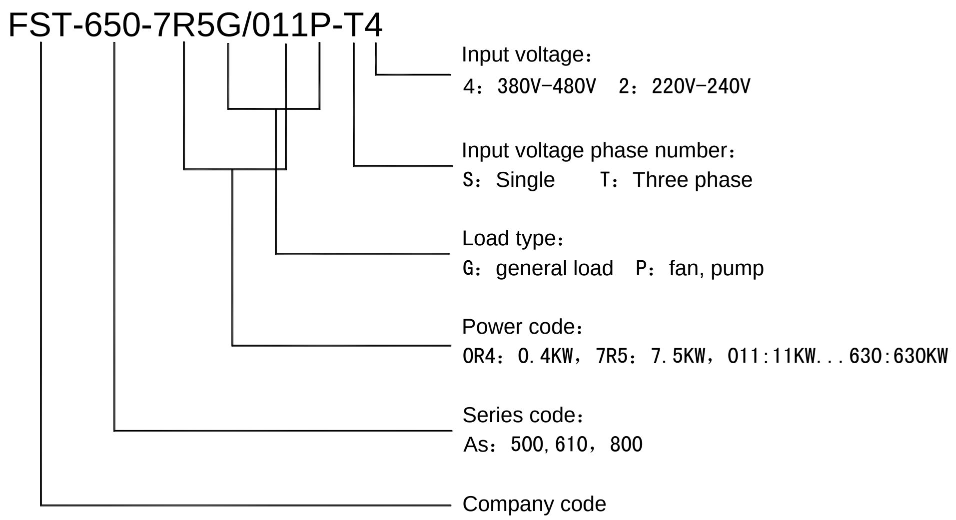
Please confirm the following items:

Confirmed items	Confirmed methods
The consistance of the products' type and model	Please check the nameplate on the side.
If there are damaged parts	Check the overall appearance and whether the goods are damaged.
If the screws or other fastening parts are loose	When nesessary,check with a screwdriver
Instruction, certification and other accessories	FST-650 instructions and corresponding accessories.

If there are any unusual circumstances, please contact distributor or our company directly.

1.2 Nameplate data

1.2.1 Inverter model description

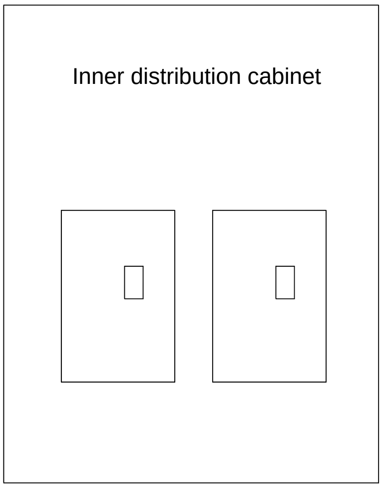


Chapter 2- Installation

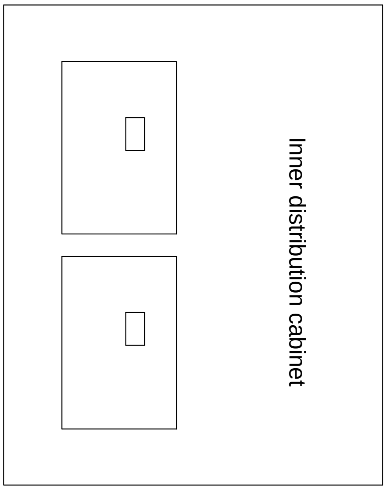
2.1 Environmental conditions

The environmental conditions have direct effect on inverter's normal functions and service life, therefore the installation environment must meet the following conditions:

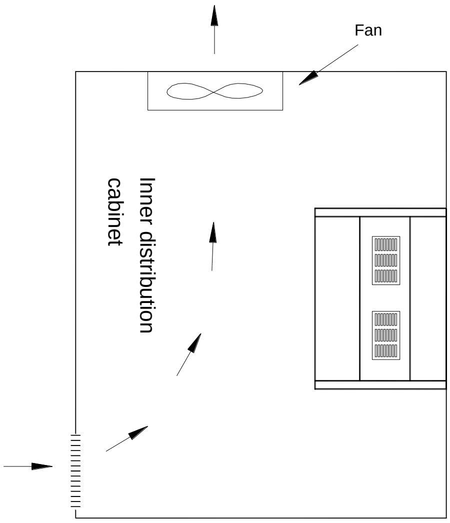
- Ambient Temperature: cabinet open type (－10～45℃/+14～113℉)
  Antresia hanging type (－10～40℃/+14～104℉)
- Avoid rains and moisture.
- Avoid direct sunlight.
- Prevent from oil mist and salt erosion.
- Prevent from corrosive liquids and gases.
- Avoid dust, cotton and metallic particles in the air.
- Away from radioactive substances and flammable materials.
- Prevent from electromagnetic interference (welding machine, dynamic machine)
- Avoid vibration (punching machine), if not, please add shockproof gaskets to reduce vibration.
- When several inverters are situated in the control installation cabinet, please make sure that the location is good for heat dissipation, and please add extra cooling fan in order to make the ambient temperature below 45℃.
-



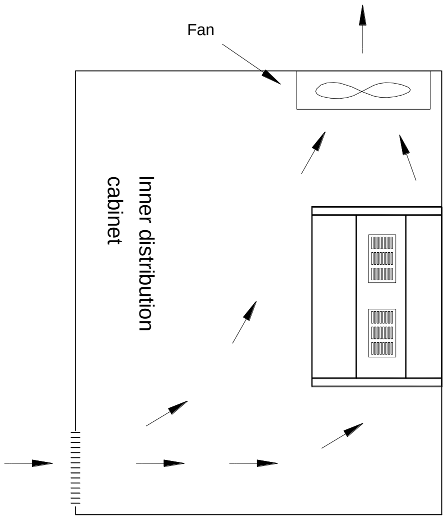
Correct configuration



Wrong configuration

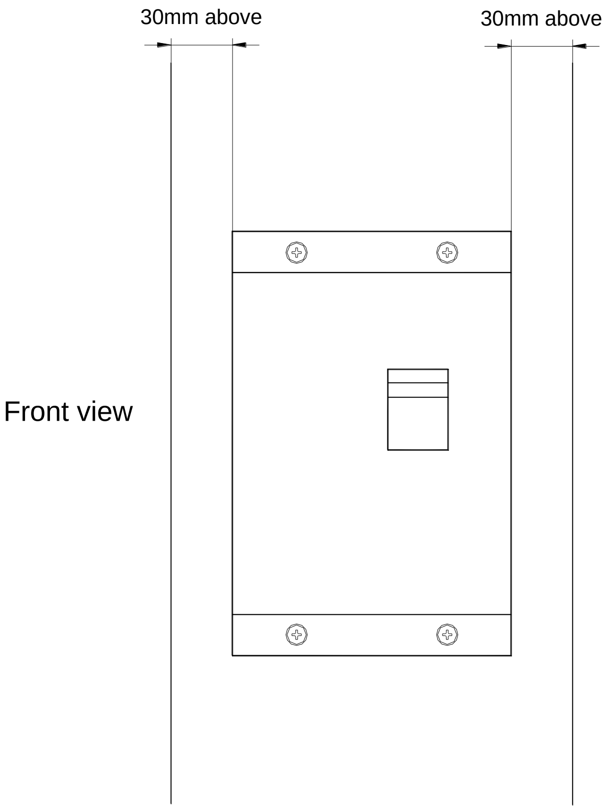


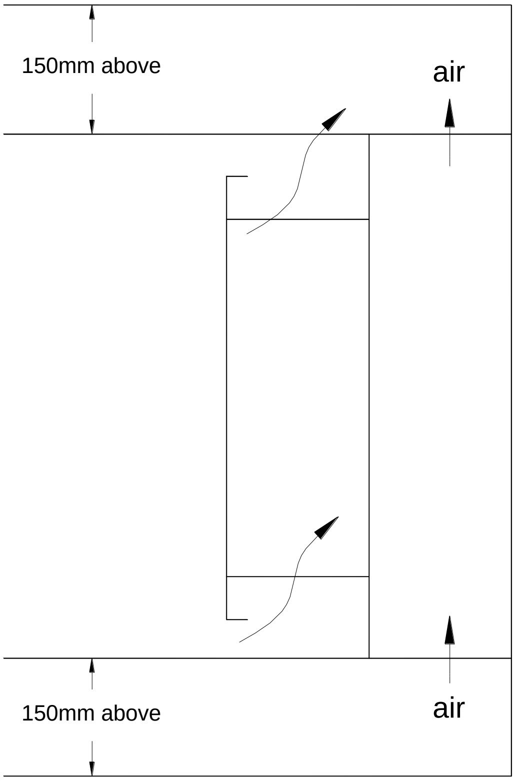
Wrong configuration



Right configuration

- When installation, please let the front side ahead, the top side upward in order for heat radiation.
- The installation space must comply with the following rules (if situated in the cabinet or the ambient environment permits, the dust cover can be removed for cooling ventilation)





side view

Intake air temperature

*open chassis

- 10℃ to + 45℃

*NEMA

- 10℃ to + 40℃

Chapter 3- Wiring

3.1 wiring terminal diagram

3.1.1 the main circuit terminal

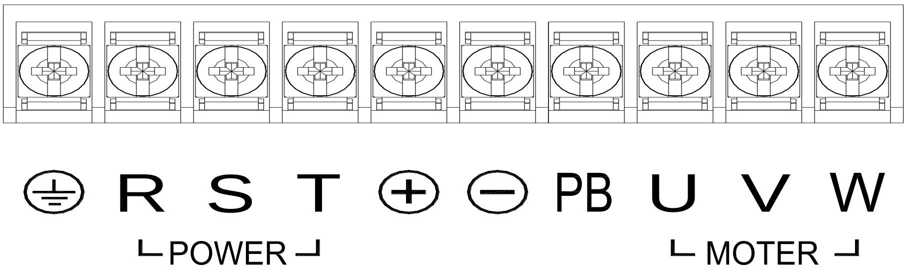


Fig. 3-1　0R7~5R5KW standard main circuit terminal

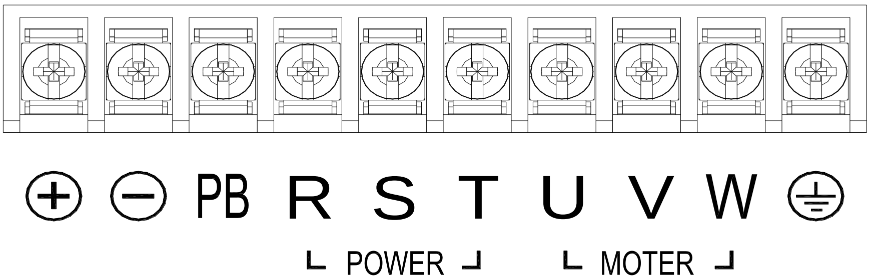


Fig. 3-2　7R5~15kW standard main circuit terminal

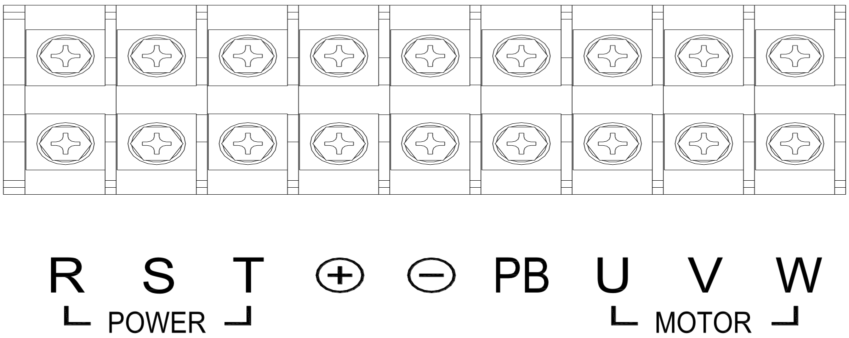


Fig. 3-3 18.5~30kW standard main circuit terminal

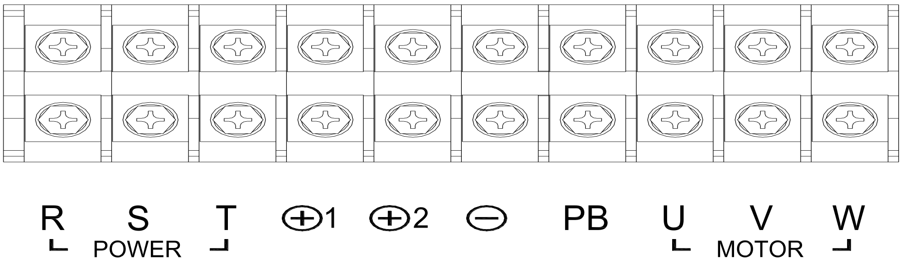


Fig. 3-4 37~55kW standard main circuit terminal

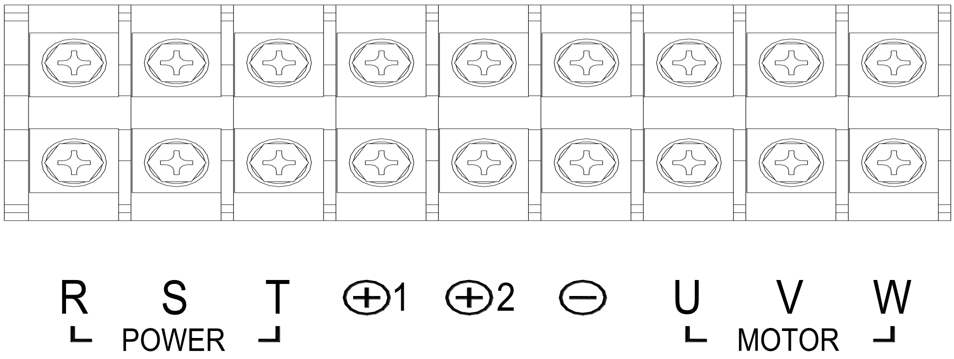


Fig. 3-5 75~200kW standard main circuit terminal

The functions of main circuit terminals are stated as below:

Terminal name	Function description
R、S、T	three phases input terminal
(+)、(-)	External brake unit reserved terminal
(+)、PB	External brake resistor reserved terminal
(+) 1、(+) 2	External DC reactor reserved terminal
(-)	Negative DC bus output terminal
U、V、W	Three phase AC output terminal
⏚	Grounding terminal

3.1.2 Control circuit terminal:

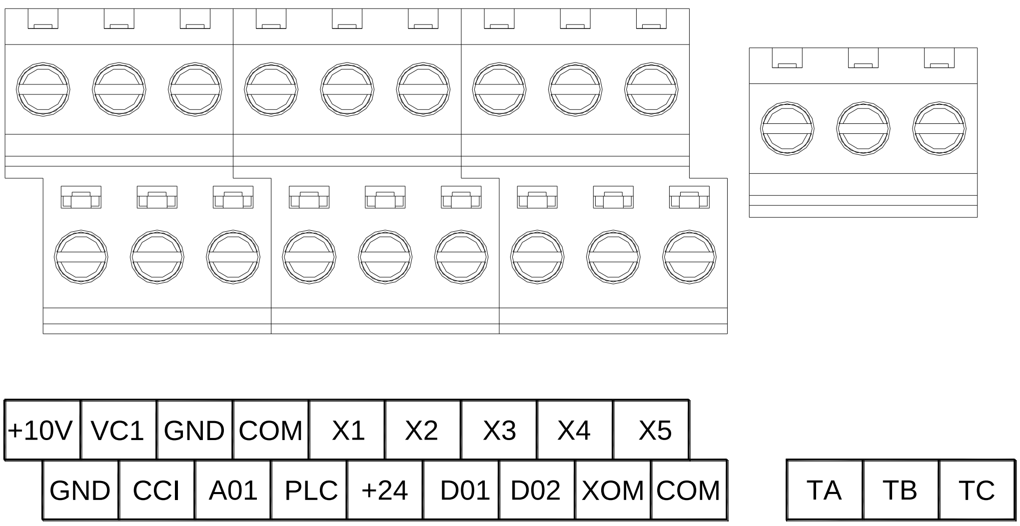
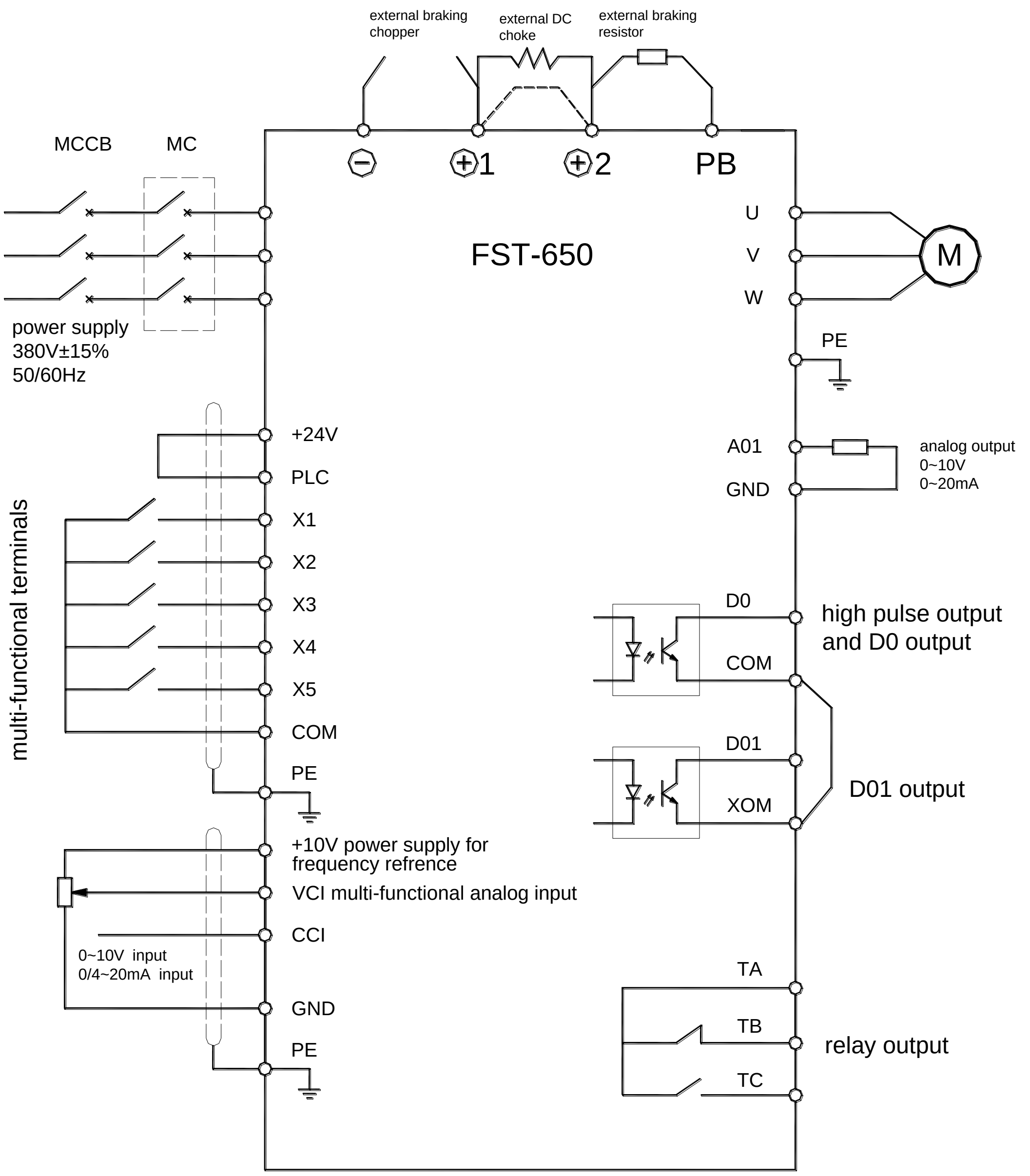


Fig. 3-6 FST-650 series standard control circuit terminal

3.1.3 Wiring



Wiring diagram

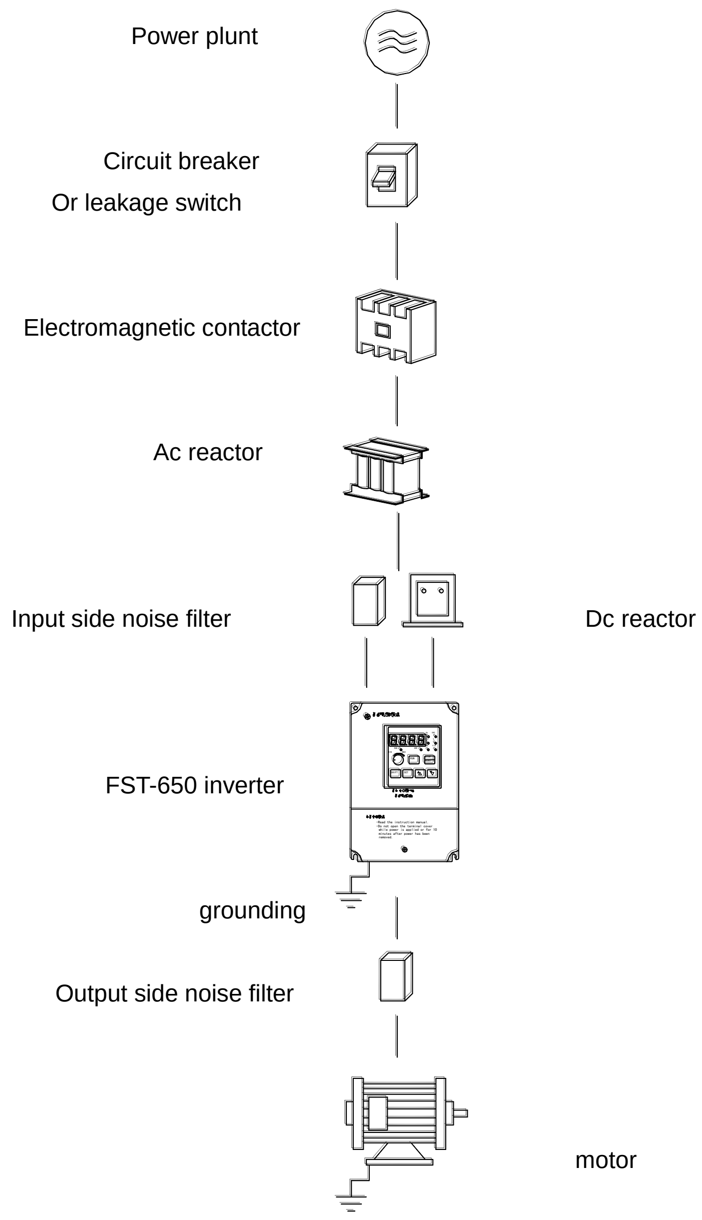
3.1.4 Panel terminal description

Terminal name	Terminal usages and description
X1~X4	Switch input terminal, form bipolar coupling isolation input Input voltage range: 9~30V Input impedance: 2.4kΩ
X5	High speed pulse or switch input, form bipolar coupling isolation input withPLC and COM. Pulse input frequency range: 0~100kHz Input voltage range: 9~30V
PLC	User can access power to the external power directly (and COM), the +24V power supplied by this machine is also available, when FST-650 series inverter leaves factory, the default is 24V and PLC short circuit. When using external power, please disconnect it from 24V.
+24V	Provide positive 24V power for this machine(current:150mA)
COM	The public side of 24V
VCI	Analog input, voltage range: -10~10V Input impedance: 22kΩ
CCI	Analog input, voltage（0~10V）/current（0~20mA）can be optional through J1 Input impedance: 10kΩ（voltage input）/500Ω（current input）
+10V	Provide positive 10V power for this machine.
GND	The reference zero potential for positive 10V (Note: GND and COM is isolated.)
D0	High speed pulse or collector open circuit input terminal, its corresponding pubblic terminal is COM Output frequency range: 0~100 kHz
A01	Analog output terminal, among which A01 can select voltage or current output through jumper J2;. Output range: voltage (0~10V）/current（0~20mA）
TA、TB、TC	T relay output, TA public terminal, TB closed, TC open. Contact capacity: AC250V/3A，DC30V/1A

3.1.5 Control board jumper description

Terminal name	Terminal usage and description
J1-CCI	Analog input voltage (0~10V) / current (0~20mA) switch. V:voltage I:Current
J2-A01	Analog output voltage (0~10V) / current (0~20mA) output switch. V:voltage I:Current

3.2 The peripherals application and precautions



Connection of Periferal equipments

Power:

- Please notice that if the voltage level is correct, to avoid damaging the inverter.
- Circuit breaker and leakage switch must be installed between ac power and inverter.

Circuit breaker and leakage switch:

- The circuit breaker and leakage switch applied for power switch control must accord with inverter's rated voltage and current, in order to protect the inverter.
- Circuit breaker and leakage switch can not be used as the run/stop function of inverter.
- Please add leakage circuit breaker, in order to avoid malfuntioning and protect the user's safety.

Electromagnetic contactor:

- It is unneccessory for general use, but when it is used as the function of external control, automatic restart after power is off, or using the brake controller, the electromagnetic contactor should be added on one side.
- Electromagnetic contactor can not be used as the run/off switch function.

AC reactor:

- When using high-capacity (above 600KVA) power, the inverter below 220V/380V 15KW should be added an extra AC reactor to improve the power.

Input side noise filter:

- When there is inductance load around the inverter, it must be added.

FST-650 inverter:

- Input power terminal R, S, T have no phase sequence and they can randomly changed and connected.
- Output terminal U, V, W are connected to motors. When the inverter is forward, the motor is reversal, we can swap any two of U, V, W terminals.
- Output terminal U, V, W can not be connected to AC power to avoid damaging the inverter.
- Grounding terminal should be grounded correctly, 220V: the third type grounding, 400V: special grounding.

Output side noise filter:

- To reduce higher harmonic produced by inverter, and to avoid impact on communication equipment nearby.

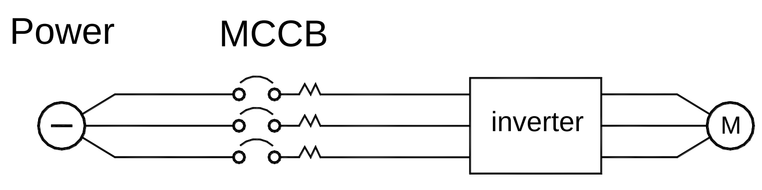
Motor:

- Please use three-phase induction motor with suited capacity.
- When one inverter drives several motors, please consider that the current produced by several motors should be less than the capacity of inverter.
- Do not install phase capacitor between inverter and motor.
- The inverter and motor should be grounded respectively.

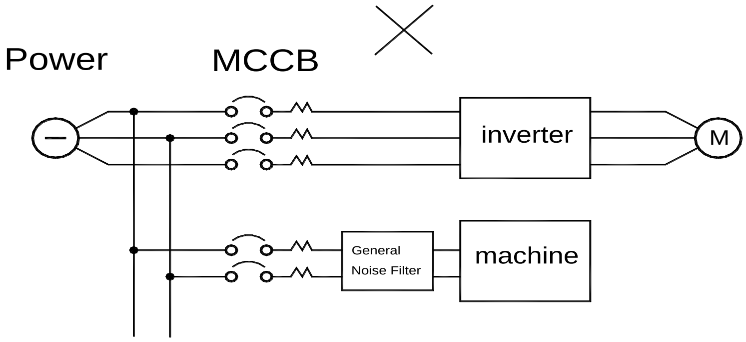
External wiring should be in accordance with the following details. When completing the wiring, you must check whether it is correct. (You can not use the control loop buzzer to check the wiring)

(A) The main circuit loop wiring must be isolated or be far away from other high voltage wire or large current power line, in order to above noise interference, please refer to the following picture.

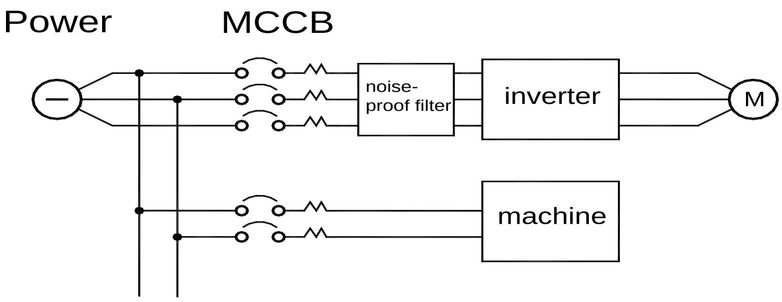
- Inverter use single power loop.

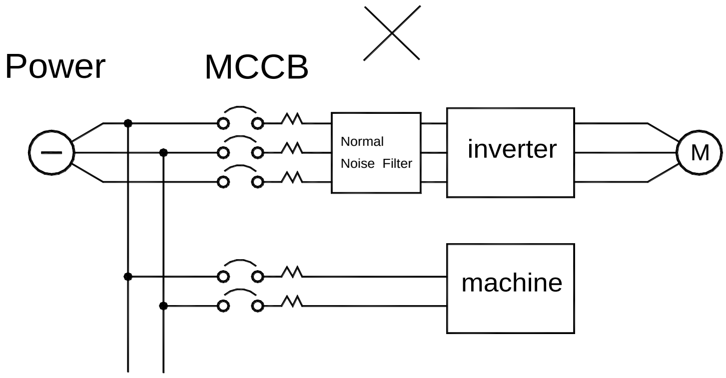


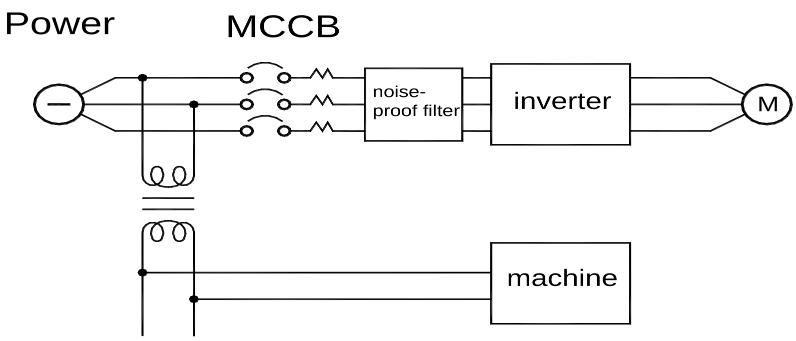
- The normal noise filter has little effect, so it can't be used.



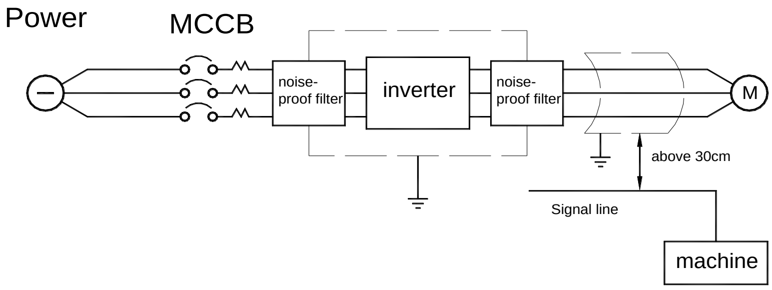
- When the inverter shares circuit loop with other machines, please install with noise filter or isolation transformer.







- Adding noise filter on the main circuit loop can restrain transmission interference, in order to avoid radiated interference, please add metal cube and keep it more than 30cm to other machine control signal lines.

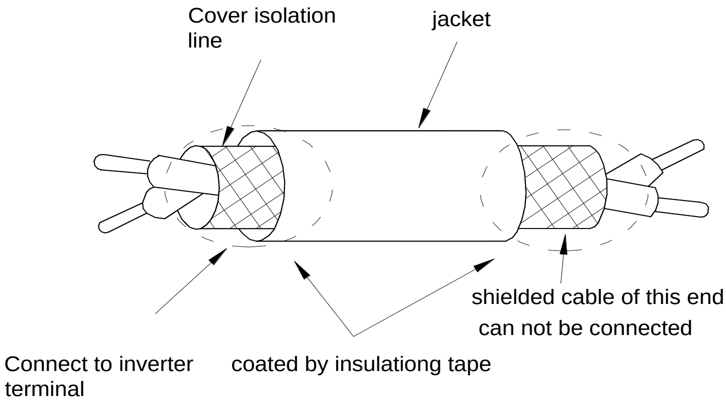


- When the wiring distance is too long between inverter and motor, please consider the voltage drop of the wire, voltage drop between phases(V)= $\sqrt{3}$ ×wire resistance(Ω/km) ×wire length(m) ×current×10^{-3} and carrier numbers should be adjusted by wire distance.

The distance between inverter and motor	Less than 50M	Less than 100M	More than 100M
Allowing carrier numbers	Less than 15KHz	Less than 10KHz	Less than 5KHz
Parameter F0.15 setting number	15.0	10.0	5.0

(B) Control loop wire must be isolated or far away from main circuit loop control wire, other high voltage wire and large current power line, in order to avoid noise interference.

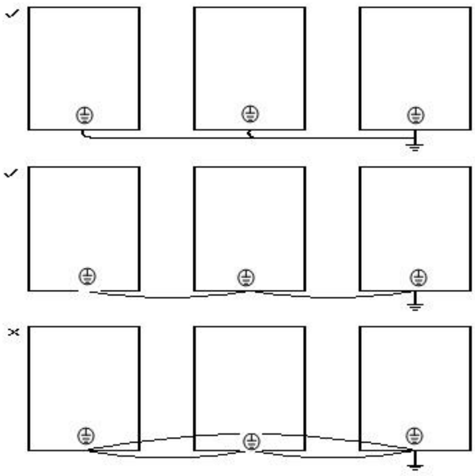
- Control loop wiring terminal TA, TB, TC, TA1, TB1, TC1(contact output) must be seperated from wiring with other terminals.
- In order to prevent false operation from noise interference, the control loop wiring must use shielding wire, please refer to the following picture, when using it, connect shielding wire to terminal PE.
  Wiring distance can not be more than 50m.



(C) The grounding terminal must be correctly grounded. 220V: the third type of grounding, 380V: special grounding.

- Grounding wiring should subject to electrical equipment technology, and grounding wire should be as short as possible.
- Grounding wiring can not grounded with the other large current load together, they should be respectively grounded.

- When several inverters are grounded at the same time, do not form a ground loop.



(D) Wire specifications, the wiring diameter's selection of main circuit loop and control loop should be in accordance with electrician law, in order to ensure safety.

(E) After finishing wiring work, please check whether the wiring is correct, whether the wire is worn and whether the screw terminal is fastened .

Chapter 4- Kepyad operation

4.1 keyboard description

4.1.1 keyboard diagram

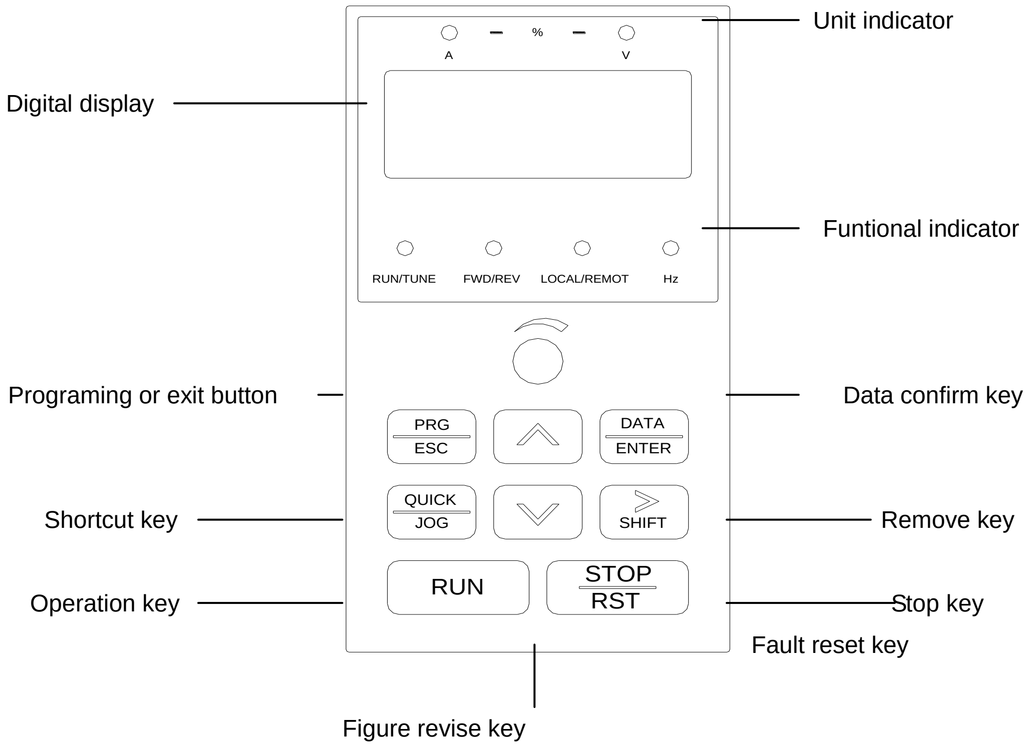


Fig 4-1 keyboard diagram

4.1.2 key function description

Key symbol	name	Function description
PRG/ESC	Programming key	Enter or exit of first level menu
DATA/ENT	Confirm key	Gradually enter menu screen, set parameters to confirm
▲	UP increasing key	Increment of data and function code
▼	DOWN decreasing key	Decrement of data and function code
≫ SHIFT	Right shift key	When in the downtime or operation interface, it can shift right to choose display parameters in a circle; when modifying parameters, it can select parameter's modified bit.
RUN	Operation key	When under keyboard operation, it can be used.
STOP/RST	stop/reset key	Under the running state, it can stop operation; constraited by F7.02, Under fault alarm condition, all control mode can be reset by this key.

Key symbol	name	Function description
QUICK	Quick multifunction key	According to value of FP.03 change the diffierence mode

4.1.3 indicator description

1) function indicator description:

Indicator name	Indicator description
RUN	Run state indicator： When the light is off, the inverter shutdown; when the light flikers, the inverter stay in parameter self-learning; when the light is on, the inverter is operating.
FWD/REV	Forward and reverse indicator: When the light is off, the inverter stays in the forward state; when the light is on, the inverter stays in the reverse state.
LOCAL/REMOT	Control mode indicator: When the light is off, it stays in the keyboard control mode; when the light flickers, it stays in terminal control mode; when the light is on, it stays in remote communication control mode.
TUNE/TC	Adjust/torque control/ fault indicating lamp, light on is torque control,light blink slow is adjusting,,light blink fast is fault status

2) unit indicator description:

Indicator name	Indicator description
Hz	Frequency unit
A	Current unit
V	Voltage unit

4.2 Detailed functions description

F0 Group Basic Function

Function Code	Name	Setting Range
F0.00	Inverter model	1-2 [1]

The inverter model is set by different load

1: G model

2: P model

Function Code	Name	Setting Range
F0.01	Speed Control model	0-2 [2]

This parameter is used to select the speed control mode of the inverter.

0: Sensorless flux vector control

It indicates open-loop vector control, and is applicable to high-performance control applications such as machine tool, centrifuge, wire drawing machine and injection moulding machine. One AC drive can operate only one motor.

1: Closed-loop vector control

It is applicable to high-accuracy speed control or torque control applications such as high-speed paper making machine, crane and elevator. One AC drive can operate only one motor. An encoder must be installed at the motor side, and a PG card matching the encoder must be installed at the AC drive side.

2:Voltage/Frequency (V/F) control

It is applicable to applications with low load requirements or applications where one AC drive operates multiple motors, such as fan and pump.

Note:

If vector control is used, motor auto-tuning must be performed because the advantages of vector control can only be utilized after correct motor parameters are obtained. Better performance can be achieved by adjusting speed regulator parameters in group F2 (or groups A2, A3, and A4 respectively for motor 2, 3, and 4).

Function Code	Name	Setting Range
F0.02	Command source selection	0-2 [0]

The control commands of inverter include start,stop, forward run, reverse run, jog and fault reset and so on.

0. Keypad (LED extinguished);

Both RUN and STOP/RST key are used for running command control. If Multifunction key QUICK/JOG is set as FWD/REV switching function, it will be used to change the rotating orientation. In running status. pressing RUN and STOP/RST in the same time will cause the inverter coast to stop.

1. Terminal (LOCAL/REMOT LED lights on)

The operation including forward run. reverse run. forward jog. reverse jog etc. It can be controlled by multifunctional input terminals.

2: Communication (LOCAL/REMOT LED flickering)

Commands are given from host computer. If this parameter is set to 2, a communication card (Modbus RTU, PROFIBUS-DP card, CANlink card, user programmable card or CANopen card) must be installed.

– If a PROFIBUS-DP card is selected and PZD1 data is valid, commands are given by means of PZD1 data.
– If a user programmable card is selected, commands are written to A7-08 by means of the programmable card.
– If any other card is selected, commands are written by means of the communication address 0x2000.

Function Code	Name	Setting Range
F0.03	Frequency X command selection	0-9 [0]

It is used to select the setting channel of the main frequency. You can set the main frequency in the following 10 channels:

• 0: Digital setting (non-retentive at power failure)

The initial value of the set frequency is the value of F0-08 (Preset frequency). You can change the set frequency by pressing △ and ▽ on the operation panel (or using the UP/DOWN function of input terminals)

When the AC drive is powered on again after power failure, the set frequency reverts to the value of F0-08.

• 1: Digital setting (retentive at power failure)

The initial value of the set frequency is the value of F0-08 (Preset frequency). You can change the set frequency by pressing keys △ and ▽ on the opreation panel (or using the UP/DOWN function of input termianals)

When the AC drive is powered on again after power failure, the set frequency is the value memorized at the moment of the last power failure.

• 2: Analog VCI setting

• 3: Analog CCI setting meaning the frequency setted by analog terminal,FST-650 approvide 2 analog input terminal,the VCI is -0~10V voltage input,and CCI is 0–10 V voltage input or 4–20 mA current input, determined by jumper J1

• 4: ACI (0–10 V voltage input)

The frequency is set by analog input. The Drive control board provides two analog input (AI) terminals (VCI, CCI). Another AI terminal (ACI) is provided by the I/O extension card.

• 5: Pulse setting (X5)

The frequency is set by X5 (high-speed pulse). The signal specification of pulse setting is 9–30 V (voltage range) and 0–100 kHz (frequency range). The corresponding value 100% of pulse setting corresponds to the value of F5.00=0

• 6: Multi-reference

In multi-reference mode, need to set the group F4 and FC to confirmed setting frequency.

• 7: Simple PLC

When the simple programmable logic controller (PLC) mode is used as the frequency source. You can set FC group “simple PLC and multi speed control group” to confirm given frequency and running direction, even holding time and acceleration/deceleration time of the 16 frequency references. For details, refer to the descriptions of Group FC.

- 8: PID

  The output of PID control is used as the running frequency. PID control is generally used in on-site closed-loop control, such as constant pressure closed-loop control and constant tension closed-loop control.

  When applying PID as the frequency source, you need to set parameters of PID function in group FA.

- 9: Communication setting

  The frequency is set by means of communication.

  If the AC drive is a slave in point-point communication and receives data as the frequency source, data transmitted by the master is used as the set frequency. For details, see the description of group A8.

  If PROFIBUS-DP communication is valid and PZD1 is used for frequency setting, data transmitted by PDZ1 is directly used as the frequency source. The data format is -100.00% to 100.00%. 100% corresponds to the value of F0-10 (Maximum frequency).

  In other conditions, data is given by the host computer through the communication address 0x1000. The data format is -100.00% to 100.00%. 100.00% corresponds to the value of F0-10 (Maximum frequency).

  The FST-650 supports four host computer communication protocols: Modbus, PROFIBUS-DP, CAN open and CANlink. They cannot be used simultaneously.

  If the communication mode is used, a communication card must be installed. The FST-650 provides four optional communication cards and you can select one based on actual requirements. If the communication protocol is Modbus, PROFIBUS-DP or CANopen, the corresponding serial communication protocol needs to be selected based on the setting of F0-28.

The CANlink protocol is always valid

Function Code	Name	Setting Range
F0.04	Frequency Y command source	0-9 [0]

0: Digital setting (non-retentive at power failure)

1: Digital setting (retentive at power failure)

2: VCI

3: CCI

4: ACI

5: Pulse setting (X5)

6: Multi-reference

7: Simple PLC 8: PID

9: Communication setting

When Y frequency command is the only frequency reference channel. its application is the same with X frequency command. For details. please refer to F0.03.

Function Code	Name	Setting Range
F0.05	Scale of frequency Y command	0-1 [0]

0: Maximum output frequency. 100% of Y frequency setting corresponds to the maximum output frequency

1: X frequency command. 100% of Y frequency setting corresponds to the maximum output frequency. Select this setting if it needs to adjust on the base of X frequency command

Note: F0.05 is used when the frequeny Y is superimposed.

Function Code	Name	Setting Range
F0.06	Range of auxiliary frequency Y for X and Y operation	0%–150%

When frequency source chosed frequency superimposed, F0.05 and F0.06 can control the auxiliary frequency adjust range.

Function Code	Name	Setting Range
F0.07	Frequency source selection	Unit's digit /0-4 [0] Ten digit/0-3[0]

Unit's digit (Frequency source selection)

0: Main frequency source X 1: X and Y operation

(operation relationship determined by ten's digit)

2: Switchover between X and Y

3: Switchover between X and "X and Y operation"

4: Switchover between Y and "X and Y operation"

Ten's digit (X and Y operation relationship)

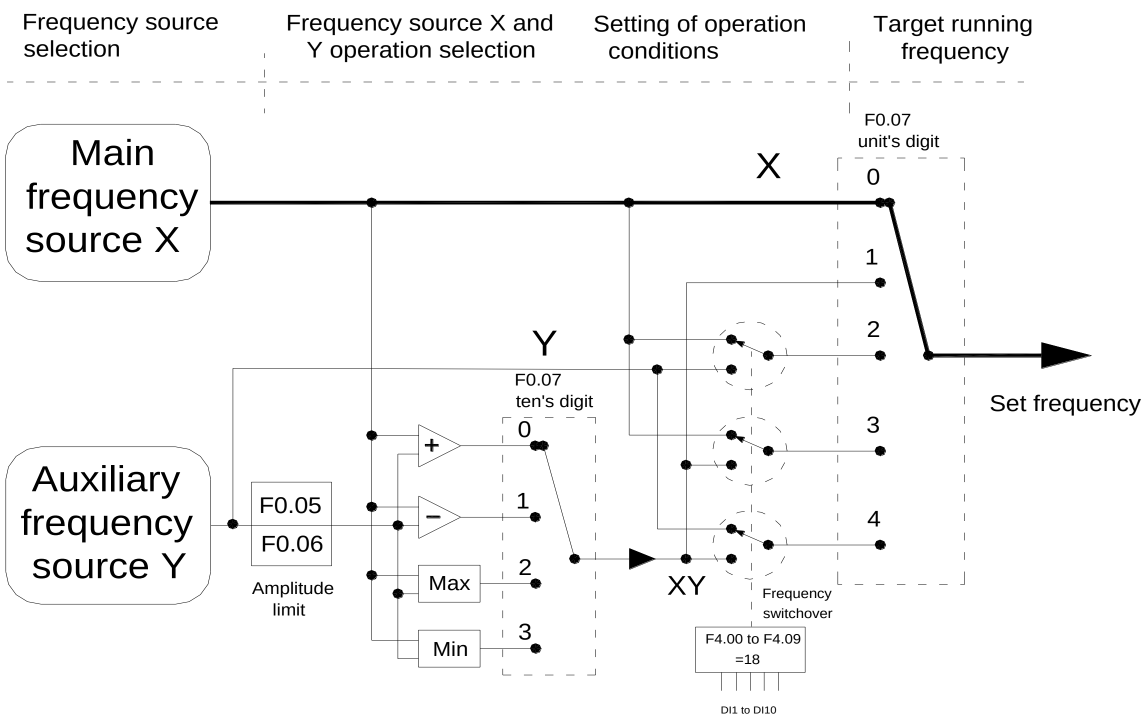
0: X+Y

1: X-Y

2: Maximum

3: Minimum

It is used to select the frequency setting channel. If the frequency source involves X and Y operation, you can set the frequency offset in F0-21 for superposition to the X and Y operation result, flexibly satisfying various requirements.



Function Code	Name	Setting Range
F0.08	Preset frequency	0.00-F0.10 [50.00Hz]

When Frequency X command source is set to be Keypad, this parameter is the initial value of inverter reference frequency.

Function Code	Name	Setting Range
F0.09	Rotation direction	0-1[0]

0: Same direction

1: Reverse direction

This parameter is used to set the Max Output frequency of the inverter. It is the basis of frequency setting and the speed of ACC/DEC. Please pay attention to it.

Function Code	Name	Setting Range
F0.10	Maximum frequency	50.00H~500.00HZ[50.00Hz]

When the frequency source is AI, pulse setting (X5), or multi-reference, 100% of the input corresponds to the value of this parameter.

Function Code	Name	Setting Range
F0.11	Source of frequency upper limit	0-5 [0]

0: Set by F0-12 1: VCI

2: VCI

3: CCI

4: Pulse setting (X5)

5: Communication setting

It is used to set the source of the frequency upper limit, including digital setting (F0-12), AI, pulse setting or communication setting. If the frequency upper limit is set by means of VCI, CCI, ACI, X5 or communication, the setting is similar to that of the main frequency source X. For details, see the description of F0.03.

For example, to avoid runaway in torque control mode in winding application, you can set the frequency upper limit by means of analog input. When the AC drive reaches the upper limit, it will continue to run at this speed.

Function Code	Name	Setting Range
F0.12	Frequency upper limit	Frequency lower limit (F0.14) to maximum frequency (F0.10)

This parameter is used to set the frequency upper limit.

Function Code	Name	Setting Range
F0.13	Frequency upper limit offset	0.00 Hz to maximum frequency (F0.10)

If the source of the frequency upper limit is analog input or pulse setting, the final frequency upper limit is obtained by adding the offset in this parameter to the frequency upper limit set in F0-11.

Function Code	Name	Setting Range
F0.14	Frequency lower limit	0.00 Hz to frequency upper limit (F0.12)

If the frequency reference is lower than the value of this parameter, the AC drive can stop, run at the frequency lower limit, or run at zero speed, determined by F8.14.

Function Code	Name	Setting Range
F0.15	Carrier frequency	0.5–16.0 kHz

It is used to adjust the carrier frequency of the AC drive, helping to reduce the motor noise, avoiding the resonance of the mechanical system, and reducing the leakage current to the earth and interference generated by the AC drive.

If the carrier frequency is low, output current has high harmonics, and the power loss and temperature rise of the motor increase.

If the carrier frequency is high, power loss and temperature rise of the motor declines. However, the AC drive has an increase in power loss, temperature rise and interference.

Carrier frequency	Low	High
Motor noise	Large	Small
Output current waveform	Bad	Good
Motor temperature rise	High	Low
AC drive temperature rise	Low	High
Leakage current	Small	Large
External radiation interference		

Function Code	Name	Setting Range
F0.16	Carrier frequency adjustment with temperature	0–1

0: No

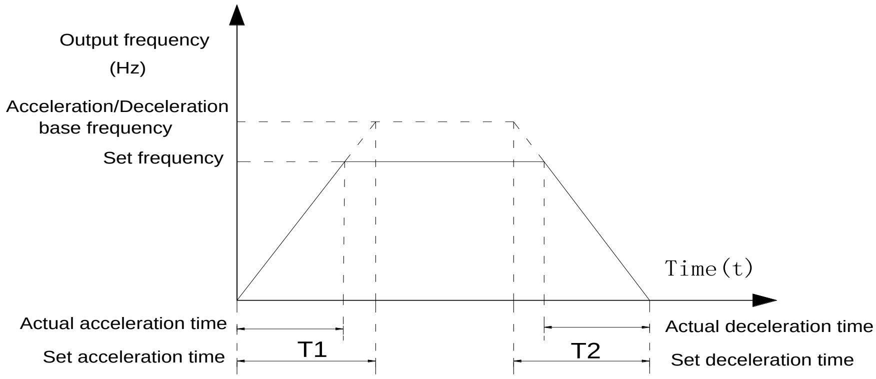
1: Yes

It is used to set whether the carrier frequency is adjusted based on the temperature. The AC drive automatically reduces the carrier frequency when detecting that the heatsink temperature is high. The AC drive resumes the carrier frequency to the set value when the heatsink temperature becomes normal. This function reduces the overheat alarms

Function Code	Name	Setting Range
F0.17	Acceleration time 0	0.00–650.00s (F0.19 = 2) 0.0–6500.0s (F0.19 = 1) 0–65000s (F0.19 = 0)
F.018	Deceleration time 0	0.00–650.00s (F0.19 = 2) 0.0–6500.0s (F0.19 = 1) 0–65000s (F0.19 = 0)

Acceleration time indicates the time required by the AC drive to accelerate from 0 Hz to "Acceleration/Deceleration base frequency" (F0-25), that is, t1 in Figure

Deceleration time indicates the time required by the AC drive to decelerate from "Acceleration/Deceleration base frequency" (F0-25) to 0 Hz, that is, t2 in Figure



The FST-610 provides totally four groups of acceleration/deceleration time for selection. You can perform switchover by using a DI terminal.

- Group 1: F0.17, F0.18
- Group 2: F8.03, F8.04
- Group 3: F8.05, F8.06
- Group 4: F8.07, F8.08

Function Code	Name	Setting Range
F0.19	ACC/DEC unit of time	0~2

0: seconds

1: 0.1 seconds

2:0.01 seconds

Function Code	Name	Setting Range
F0.21	Frequency offset of auxiliary frequency source for X and Y operation	0.00 Hz to maximum frequency (F0.10)

This parameter is valid only when the frequency source is set to "X and Y operation". The final frequency is obtained by adding the frequency offset set in this parameter to the X and Y operation result.

Function Code	Name	Setting Range
F0.23	Retentive of digital setting frequency upon power failure	0~1[0]

0: Not retentive

1: Retentive

This parameter is valid only when the frequency source is digital setting.

If F0-23 is set to 0, the digital setting frequency value resumes to the value of F0-08 (Preset frequency) after the AC drive stops The modification by using keys UP/DOWN or the terminals UP/DOWN function is clear

If F0-23 is set to 1, the digital setting frequency value is the set frequency at the moment when the AC drive stops. The modification by using keys UP/DOWN or the terminals UP/DOWN function remains effective.

Function Code	Name	Setting Range
F0.24	Motor parameter group selection	0~1[0]

0: Motor parameter group 1

1: Motor parameter group 2

The FST-650 can drive two motors at different time. You can set the motor nameplate parameters respectively, independent motor auto-tuning, different control modes, and parameters related to running performance respectively for the four motors.

Motor parameter group 1 corresponds to groups F1 and F2. Motor parameter groups 2 correspond to groups A2.

You can select the current motor parameter group by using F0-24 or perform switchover between the motor parameter groups by means of a DI terminal. If motor parameters selected by means of F0-24 conflict with those selected by means of DI terminal, the selection by DI is preferred.

Function Code	Name	Setting Range
F0.25	Acceleration/Deceleration time base frequency	0~2[0]

0: Maximum frequency (F0-10)]

1: Set frequency

2: 100 Hz

The acceleration/deceleration time indicates the time for the AC drive to increase from 0 Hz to the frequency set in F0-25. If this parameter is set to 1, the acceleration/deceleration time is related to the set frequency. If the set frequency changes frequently, the motor's acceleration/deceleration also changes.

Function Code	Name	Setting Range
F0.26	Base frequency for UP/DOWN modification during running	0~1[0]

This parameter is valid only when the frequency source is digital setting.

It is used to set the base frequency to be modified by using keys UP and DOWN or the terminal UP/DOWN function, if the running frequency and setting frequency are different,there will be a large difference between the AC drive's performance during the acceleration/ deceleration process.

Function Code	Name	Setting Range
F0.27	Binding command source to frequency source	Unit's digit 0-9 [0] Ten's digit 0-9 [0] Hundred's digit 0-9 [0]

0: No binding

1: Frequency source by digital setting

2: VCI

3: CCI

4: ACI

5: Pulse setting (X5)

6: Multi-reference

7: Simple PLC

8: PID

9: Communication setting

Ten's digit (Binding terminal command to frequency source) 0-9(same as unit’s digit)

Hundred's digit (Binding communication command to frequency source) 0-9(same as unit’s digit)

It is used to bind the three running command sources with the nine frequency sources, facilitating to implement synchronous switchover.

For details on the frequency sources, see the description of F0-03 (Main frequency source X selection).

Different running command sources can be bound to the same frequency source

If a command source has a bound frequency source, the frequency source set in F0-03 to F0-07 no longer takes effect when the command source is effective

Function Code	Name	Setting Range
F0.28	Serial communication protocol	0-1 [0]

The FST-650 supports Modbus, PROFIBUS-DP bridge and CANopen bridge. Select a proper protocol based on the actual requirements.

F1 Group Motor Parameters

Function Code	Name	Setting Range
F1.00	Motor model	0-1 [0]

0: General asynchronous motor

1: Frequency asynchronous motor

Function Code	Name	Setting Range
F1.01	Rated Motor power	0.4~1000.0kW [Depend on model]
F1.02	Rated motorvoltage	1-2000V
F1.03	Rated motor current	0.01–655.35 A (AC drive power ≤ 55 kW) 0.1–6553.5 A (AC drive power > 55 kW)
F1.04	0.01 Hz to maximum frequency	0-800V [Depend on model]
F1.05	Rated motor rotational speed	1–65535 RPM

Set the parameters according to the motor nameplate no matter whether V/F control or vector control is adopted.

To achieve better V/F or vector control performance, motor auto-tuning is required. The motor auto-tuning accuracy depends on the correct setting of motor nameplate parameters.

Reset F1.0 can initialize F1.06~F1.10 automatically.

Function Code	Name	Setting Range
F1.06	Motor stator resistance (asynchronous motor)	0.001–65.535 Ω(AC drive power ≤ 55 kW) 0.0001–6.5535 Ω(AC drive power > 55 kW)
F1.07	Motor rotor resistance (asynchronous motor)	0.001–65.535 Ω(AC drive power ≤ 55 kW) 0.0001–6.5535 Ω(AC drive power > 55 kW)
F1.08	Leakage inductive reactance (asynchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55 kW)
F1.09	Mutual inductive reactance (asynchronous motor)	0.1–6553.5 mH (AC drive power ≤ 55 kW) 0.01–-655.35 mH (AC drive power > 55 kW)
F1.10	No-load current (asynchronous motor)	0.01 to F1-03 (AC drive power ≤ 55 kW) 0.1 toF1-03 (AC drive power > 55 kW)

The parameters in F1-06 to F-10 are asynchronous motor parameters. These parameters are unavailable on the motor nameplate and are obtained by means of motor auto-tuning. Only F1-06 to F1-08 can be obtained through static motor auto-tuning. Through complete motor auto-tuning, encoder phase sequence and current loop PI can be obtained besides the parameters in F1-06 to F1-10.

Each time "Rated motor power" (F1-01) or "Rated motor voltage" (F1-02) is changed, the AC drive automatically restores values of F1-06 to F1-10 to the parameter setting for the common standard Y series asynchronous motor.

If it is impossible to perform motor auto-tuning onsite, manually input the values of these parameters according to data provided by the motor manufacturer

Function Code	Name	Setting Range
F1.27	Encoder pulses per revolution	1–65535 [1024]

This parameter is used to set the pulses per revolution ABZ or UVW incremental encoder. In CLVC mode, the motor cannot run properly if this parameter is set incorrectly.

Function Code	Name	Setting Range
F1.28	Encoder Type	0-4 [0]

0: ABZ incremental encoder

1: UVW incremental encoder

2: Resolver

3: SIN/COS encoder

4: Wire-saving UVW encoder

The FST-650 supports multiple types of encoder. Different PG cards are required for different types of encoder. Select the appropriate PG card for the encoder used. Any of the five encoder types is applicable to synchronous motor. Only ABZ incremental encoder and resolver are applicable to asynchronous motor.

After installation of the PG card is complete, set this parameter properly based on the actual condition. Otherwise, the AC drive cannot run properly.

Function Code	Name	Setting Range
F1.30	A/B phase sequence of ABZincrementalencoder	0-1 [0]

0: Forward

1: Reserve

This parameter is valid only for ABZ incremental encoder (F1-28 = 0) and is used to set the A/B phase sequence of the ABZ incremental encoder.

It is valid for both asynchronous motor and synchronous motor. The A/B phase sequence can be obtained through "Asynchronous motor complete auto-tuning" or "Synchronous motor no-load auto-tuning".

Function Code	Name	Setting Range
F1.31	Encoder installation angle	0.0°–359.9° [0.0°]
F1.32	U, V, W phase sequence of UVW encoder	0-1 [0]

0: Forward

1: Reverse

Function Code	Name	Setting Range
F1.33	UVW encoder angle offset	0.0°–359.9° [0.0°]

F1.34	Number of pole pairs of resolver	1–65535[0]

If a resolver is applied, set the number of pole pairs properly.

Function Code	Name	Setting Range
F1.36	Encoder wire-break fault detection time	0.0s: No action 0.1–10.0s [0]

This parameter is used to set the time that a wire-break fault lasts. If it is set to 0.0s, the AC drive does not detect the encoder wire-break fault. If the duration of the encoder wire-break fault detected by the AC drive exceeds the time set in this parameter, the AC drive reports Err20.

Function Code	Name	Setting Range
F1.37	Auto-tuning selection	0-3 [0]

0: No auto-tuning

1: Asynchronous motor static auto-tuning1

2: Asynchronous motor dynamic auto-tuning

3. Asynchronous motor static auto-tuning2

It is applicable to scenarios where complete auto-tuning cannot be performed because the asynchronous motor cannot be disconnected from the load.

Before performing static auto-tuning, properly set the motor type and motor nameplate parameters of F1-00 to F1-05 first. The AC drive will obtain parameters of F1-06 to F1-08 by static auto-tuning.

Set this parameter to 1, and press RUN Then, the AC drive starts static auto-tuning.

To perform this type of auto-tuning, ensure that the motor is disconnected from the load. During the process of complete auto-tuning, the AC drive performs static auto-tuning first and then accelerates to 80% of the rated motor frequency within the acceleration time set in F0-17. The AC drive keeps running for a certain period and then decelerates to stop within deceleration time set in F0-18.

The Asynchronous motor static auto-tuning2 use for no Encoder type,the motor is in stactic and auto tuning motor peramters.set this pramaters to 3 and press RUN, Asynchronous motor static auto-tuning2

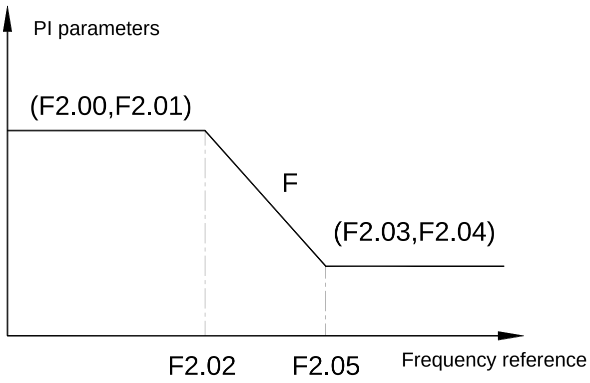
F2 Group Vector Control Parameters

Function Code	Name	Setting Range
F2.00	Speed loop proportional gain 1	0-100 [30]
F2.01	Speed loop integral time 1	0.01-10.00s[0.05s]
F2.02	Switchover frequency 1	0.00 to F2.05[5.00Hz]
F2.03	Speed loop proportional gain 2	0-100[20]
F2.04	Speed loop integral time 2	0.01-10.00[1.00]
F2.05	Switchover frequency 2	F2-02 to maximum output frequency[10.00Hz]

Speed loop PI parameters vary with running frequencies of the AC drive.

- If the running frequency is less than or equal to "Switchover frequency 1" (F2-02), the speed loop PI parameters are F2-00 and F2-01.

- If the running frequency is equal to or greater than "Switchover frequency 2" (F2-05), the speed loop PI parameters are F2-03 and F2-04.
- If the running frequency is between F2-02 and F2-05, the speed loop PI parameters are obtained from the linear switchover between the two groups of PI parameters, as shown in Figure.



The speed dynamic response characteristics in vector control can be adjusted by setting the proportional gain and integral time of the speed regulator.

To achieve a faster system response, increase the proportional gain and reduce the integral time. Be aware that this may lead to system oscillation.

The recommended adjustment method is as follows:

If the factory setting cannot meet the requirements, make proper adjustment. Increase the proportional gain first to ensure that the system does not oscillate, and then reduce the integral time to ensure that the system has quick response and small overshoot.

Note:Improper PI parameter setting may cause too large speed overshoot, and overvoltage fault may even occur when the overshoot drops

Function Code	Name	Setting Range
F2.06	Vector control slip gain	50%-200% [100%]

For SFVC, it is used to adjust speed stability accuracy of the motor. When the motor with load runs at a very low speed, increase the value of this parameter; when the motor with load runs at a very large speed, decrease the value of this parameter.

For CLVC, it is used to adjust the output current of the AC drive with same load

Function Code	Name	Setting Range
F2.07	Time constant of speed loop filter	0.000s-1.000s [0.005s]

In the vector control mode, the output of the speed loop regulator is torque current reference. This parameter is used to filter the torque references. It need not be adjusted generally and can be increased in the case of large speed fluctuation. In the case of motor oscillation, decrease the value of this parameter properly.

If the value of this parameter is small, the output torque of the AC drive may fluctuate greatly, but the response is quick.

Function Code	Name	Setting Range
F2.09	Torque upper limit source in speed control mode	0-7 [0]

0: F2.10

1: VCI

2: CCI
3: ACI
4: Pulse setting (X5)
5: Communication setting
6:MIN(VCI,CCI)
7.MAX(VCI,CCI)

Function Code	Name	Setting Range
F2.10	Digital setting of torque upper limit in speed control mode	0.0-200.0% [150.0%]

Function Code	Name	Setting Range
F2.11	Torque upper limit source in speed control mode	0-8 [0]

0: F2.10
1: VCI
2: CCI
3: ACI
4: Pulse setting (X5)
5: Communication setting
6:MIN(VCI,CCI)
7.MAX(VCI,CCI)
8.F2.12 setting

Function Code	Name	Setting Range
F2.12	Digital setting of torque upper limit in speed control mode(generate electricity)	0.0-200.0% [150.0%]

In the speed control mode, the maximum output torque of the AC drive is restricted by F2.09. If the torque upper limit is analog, X5 pulse or communication setting, 100% of the setting corresponds to the value of F2.10, and 100% of the value of F2.10 corresponds to the AC drive rated torque.
For details on the VCI, CCI and ACI setting, see the description of the AI curves in group F4.
For details on the pulse setting, see the description of F4.28 to F4.32.
When the AC drive is in communication with the master, if F2.09 is set to 5 “communication setting”, F2.10 “Digital setting of torque upper limit in speed control mode” can be set via communication from the master.
In other conditions, the host computer writes data -100.00% to 100.00% by the communication address 0x1000, where 100.0% corresponds to the value of F2.10. The communication protocol can be Modbus, CANopen, CANlink or PROFIBUS-DP.

Function Code	Name	Setting Range
F2.13	Excitation adjustment proportional gain	0–60000 [2000]
F2.14	Excitation adjustment integral gain	0–60000 [1300]
F2.15	Torque adjustment proportional gain	0–60000 [2000]

F2.16	Torque adjustment integral gain	0–60000 [1300]

These are current loop PI parameters for vector control. These parameters are automatically obtained through "Asynchronous motor complete auto-tuning" or "Synchronous motor no-load auto-tuning", and need not be modified.

The dimension of the current loop integral regulator is integral gain rather than integral time.

Note that too large current loop PI gain may lead to oscillation of the entire control loop. Therefore, when current oscillation or torque fluctuation is great, manually decrease the proportional gain or integral gain here.

Function Code	Name	Setting Range
F2.20	Maximum output voltage factor	100-110% [105%]

The maximum output voltage factor meaning the inverter maximum output voltage improving capacity,increase F2.20 can improve motor weak magnetic fileds maximum load capacity.But motor current wave increase,and motor calorific value increase; or reducing F2.20 can lower the motor weak magnetic fileds maximum load capacity,motor current wave and motor calorific value, as usual no need adjust.

Function Code	Name	Setting Range
F2.21	Maximum torque coefficient of weak magnetic fields	50-200% [100%]

When motor running over rated frequency the perameter will valid

Function Code	Name	Setting Range
F2.22	Power limit	0-3[0]

0:Invalid

1:Valid

3.Constant speed valid

4:Decelerate speed valid

Function Code	Name	Setting Range
F2.23	Power upper limit	0-200% [0]

In the application of CAM load,Rapid accelerate and decelerate, load suddenly unloaded, and no brake resistance, power limit can reduce motor bus voltage too urgent.can avoild over voltage fault,F2.23 is Motor rated power percentage.when F2.22 over voltage，reduce F2.23.

F3 Group V/F Control Parameters

Group F3 is valid only for V/F control.

The V/F control mode is applicable to low load applications (fan or pump) or applications where one AC drive operates multiple motors or there is a large difference between the AC drive power and the motor power.

Function Code	Name	Setting Range
F3.00	V/F curve setting	0-11 [0]

0: Linear V/F

1: Multi-point V/F

2: Square V/F

3: 1.2-power V/F

4: 1.4-power V/F
6: 1.6-power V/F
8: 1.8-power V/F
9: Reserved
10: V/F complete separation
11: V/F half separation

- 0: Linear V/F, It is applicable to common constant torque load.
- 1: Multi-point V/F,It is applicable to special load such as dehydrator and centrifuge. Any such V/F curve can be obtained by setting parameters of F3-03 to F3-08.
- 2: Square V/F,It is applicable to centrifugal loads such as fan and pump.
- 3 to 8: V/F curve between linear V/F and square V/F
- 10: V/F complete separation,In this mode, the output frequency and output voltage of the AC drive are independent. The output frequency is determined by the frequency source, and the output voltage is determined by "Voltage source for V/F separation" (F3-13). It is applicable to induction heating, inverse power supply and torque motor control.
- 11: V/F half separation,In this mode, V and F are proportional and the proportional relationship can be set in F3-13. The relationship between V and F are also related to the rated motor voltage and rated motor frequency in Group F1.

Assume that the voltage source input is X (0 to 100%), the relationship between V and F is:V/F = 2 x X x (Rated motor voltage)/(Rated motor frequency)

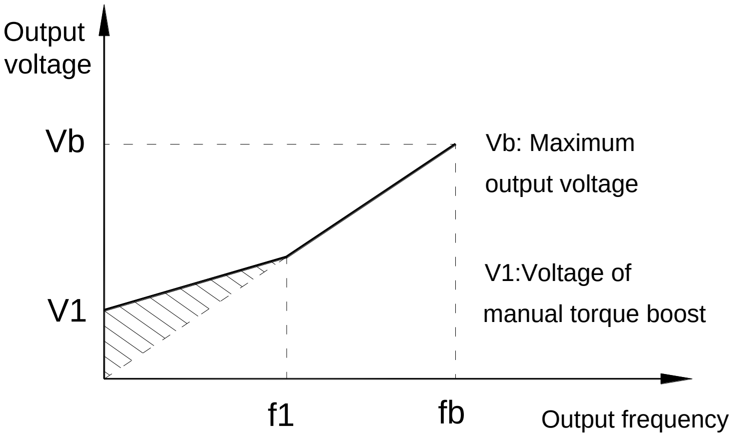
Function Code	Name	Setting Range
F3.01	Torque boost	0%–30%[Model dependent]

Function Code	Name	Setting Range
F3.02	Cut-off frequency of torque boost	0.00 Hz to maximum output frequency[50]

To compensate the low frequency torque characteristics of V/F control, you can boost the output voltage of the AC drive at low frequency by modifying F3-01.

If the torque boost is set to too large, the motor may overheat, and the AC drive may suffer overcurrent. If the load is large and the motor startup torque is insufficient, increase the value of F3-01. If the load is small, decrease the value of F3-01. If it is set to 0.0, the AC drive performs automatic torque boost. In this case, the AC drive automatically calculates the torque boost value based on motor parameters including the stator resistance.

F3-02 specifies the frequency under which torque boost is valid. Torque boost becomes invalid when this frequency is exceeded, as shown in the following figure.



f1: Cut off frequency of manual torque boost   fb: Rated running frequency

Function Code	Name	Setting Range
F3.03	Multi-point V/F frequency 1 (F1)	0.00 Hz to F3.05[0.00Hz]
F3.04	Multi-point V/F voltage 1 (V1)	0.0%–100.0%[0.0%]
F3.05	Multi-point V/F frequency 2 (F2)	F3.03 to F3.07[0.00]
F3.06	Multi-point V/F voltage 2 (V2)	F3.05 to rated motor frequency
F3.07	Multi-point V/F frequency 3 (F3)	F3.05 to rated motor frequency (F1.04)[0.00] Note: The rated frequencies of motors 2 is respectively set in A2-04,
F3.08	Multi-point V/F voltage 3 (V3)	0.0%–100.0%[0.0%]

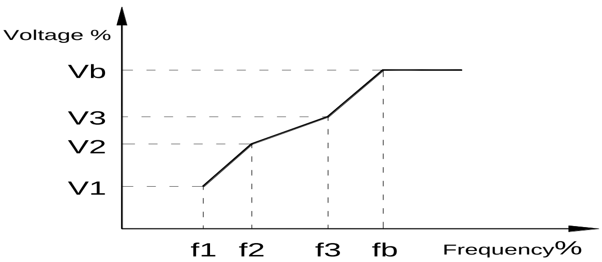
These six parameters are used to define the multi-point V/F curve.

The multi-point V/F curve is set based on the motor's load characteristic. The relationship between voltages and frequencies is:

V1 < V2 < V3, F1 < F2 < F3

At low frequency, higher voltage may cause overheat or even burnt out of the motor and overcurrent stall or overcurrent protection of the AC drive.

Setting of multi-point V/F curve



V1-V3: 1st, 2nd and 3rd voltage percentages of multi-point V/F   F1-F3: 1st, 2nd and 3rd voltage percentages of multi-point V/F

Vb: Rated motor voltage   Fb: Rated motor running frequency

Function Code	Name	Setting Range
F3.09	V/F slip compensation gain	0.0-200.0%[0.00%]

This parameter is valid only for the asynchronous motor.

It can compensate the rotational speed slip of the asynchronous motor when the load of the motor increases, stabilizing the motor speed in case of load change. If this parameter is set to 100%, it indicates that the compensation when the motor bears rated load is the rated motor slip. The rated motor slip is automatically obtained by the AC drive through calculation based on the rated motor frequency and rated motor rotational speed in group F1.

Generally, if the motor rotational speed is different from the target speed, slightly adjust this parameter.

Function Code	Name	Setting Range
F3.10	V/F over-excitation gain	0-200 [64]

During deceleration of the AC drive, over-excitation can restrain rise of the bus voltage, preventing the overvoltage fault. The larger the over-excitation is, the better the restraining result is.

Increase the over-excitation gain if the AC drive is liable to overvoltage error during deceleration. However, too large over-excitation gain may lead to an increase in the output current. Set F3-09 to a proper value in actual applications.

Set the over-excitation gain to 0 in the applications where the intertia is samll and the bus voltage will not rise during motor deceration or where there is a braking resistor.

Function Code	Name	Setting Range
F3.11	V/F oscillation suppression gain	0-100 [40]

Set this parameter to a value as small as possible in the prerequisite of efficient oscillation suppression to avoid influence on V/F control.

Set this parameter to 0 if the motor has no oscillation. Increase the value properly only when the motor has obvious oscillation. The larger the value is, the better the oscillation suppression result will be.

When the oscillation suppression function is enabled, the rated motor current and no-load current must be correct. Otherwise, the V/F oscillation suppression effect will not be satisfactory.

Function Code	Name	Setting Range
F3.13	Voltage source for V/F separation	0-8 [0]
F3.14	Voltage digital setting for V/F separation	0 V to rated motor voltage [0]

0: Digital setting (F3.14)

1: VCI

2: CCI

3: ACI

4: Pulse setting (X5)

5: Multi-reference

6: Simple PLC 7: PID

8: Communication setting

100.0% corresponds to the rated motor voltage (F1.02, A4.02, A5-02, A6.02).

V/F separation is generally applicable to scenarios such as induction heating, inverse power supply and motor torque control.

If V/F separated control is enabled, the output voltage can be set in F3.14 or by means of analog, multi-reference, simple PLC, PID or communication. If you set the output voltage by means of non-digital setting, 100% of the setting corresponds to the rated motor voltage. If a negative percentage is set, its absolute value is used as the effective value.

- 0: Digital setting (F3.14)

  The output voltage is set directly in F3.14.

- 1: VCI; 2: CCI; 3: ACI

  The output voltage is set by AI terminals.

- 4: Pulse setting (X5)

The output voltage is set by pulses of the terminals X5

Pulse setting specification:volatge range 9-30V,frequency range 0-100khz,

- 5: Multi-reference

  If the voltage source is multi-reference, parameters in group F4 and FC must be set to determine the corresponding relationship between setting signal and setting voltage. 100.0% of the multi-reference setting in group FC corresponds to the rated motor voltage.

- 6: Simple PLC

  If the voltage source is simple PLC mode, parameters in group FC must be set to determine the setting output voltage.

- 7: PID

  The output voltage is generated based on PID closed loop. For details, see the description of PID in group FA.

- 8: Communication setting

  The output voltage is set by the host computer by means of communication.

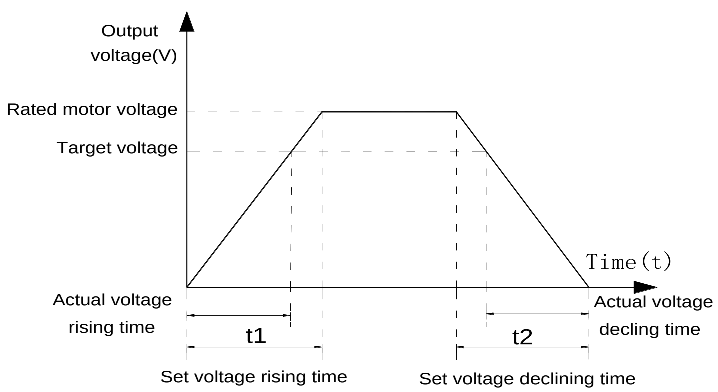
The voltage source for V/F separation is set in the same way as the frequency source. For details, see F0-03. 100.0% of the setting in each mode corresponds to the rated motor voltage. If the corresponding value is negative, its absolute value is used.

Function Code	Name	Setting Range
F3.15	Voltage rise time of V/F separation	0-1000.0s [0]
F3.16	Voltage decline time of V/F separation	0-1000.0s [0]

F3-15 indicates the time required for the output voltage to rise from 0 V to the rated motor voltage shown as t1 in the following figure.

F3-16 indicates the time required for the output voltage to decline from the rated motor voltage to 0 V, shown as t2 in the following figure.

Figure Voltage of V/F separation



Function Code	Name	Setting Range
F3.17	Stop method of V/F separation	0-1 [0]

0:the frequency /voltage reduce to 0 alone

V/F separation output voltage according to Voltage decline time(F3.15) reduce to 0V.

V/F separation output frequency according to deline time F0.18 reduce to 0V at same time.

1.frquency reduce after the voltage reduce to 0

V/F separation output voltage according to Voltage decline time(F3.15) reduce to 0V.

V/F separation output frequency according to deline time F0.18 reduce to 0V at same time.

Function Code	Name	Setting Range
F3.18	Over current stall current	50-200% [150%]
F3.19	Over current stall restrain	0-1[1]

0:Enabled

1:Disable

Function Code	Name	Setting Range
F3.20	Over current stall restrain gain	0-100 [20]
F3.21	Multiplier Over current stall compensation factor	50-200% [50%]

Function Code	Name	Setting Range
F3.22	Over voltage stall protection voltage	200.0-2000.0V[Model dependend]

220V,380V,760V,480V,850V,690V,1250V,1140V,1900V,

Function Code	Name	Setting Range
F3.23	Over voltage stall protection	0-1[1]

0:Disabled

1:Enabled

Function Code	Name	Setting Range
F3.24	Over voltage stall restrain frequency gain	0-100 [30]
F3.25	Over voltage stall restrain voltage gain	0-100 [30]

Increase F3.24 can improve the bus voltage the control effect,but the output frequency the output frequency can be affected,if output frequency fluctuation is bigger,can adjust F3.24, if increase F3.25,can reduce the bus voltage.

Function Code	Name	Setting Range
F3.26	Over voltage stall biggest Rising frequency limit	0-50Hz[5Hz]

When connect brake resistance or brake unit,set the F3.11 to 0,if not 0,the running current will be over current, set the F3.23 to 0, if not 0,the decelerate time will be delay.

Function Code	Name	Setting Range
F3.27	Slip compensation constant time	0.1-10.0s[0.5s]

The set value is too small,the large inertia load easy over voltage faults (Err07), slip compensation response value more small the response more faster

F4 Input terminals 1

The FST-650 provides five X terminals (X5 can be used for high-speed pulse input) and two analog input terminals. The optional extension card provides another five X terminals (X6 to X10)

Function Code	Name	Setting Range
F4.00	X1 function selection	1: Forward RUN[Standard]
F4.01	X2 function selection	4: Forward JOG [Standard]
F4.02	X3 function selection	9: Fault reset [Standard]
F4.03	X4 function selection	12: Multi-reference terminal 1[Standard]
F4.04	X5 function selection	13: Multi-reference terminal 2 [Standard]
F4.05	X6 function selection	0 [Extended]
F4.06	X7 function selection	0 [Extended]
F4.07	X8 function selection	0 [Extended]
F4.08	X9 function selection	0 [Extended]
F4.09	X10 function selection	0 [Extended]

The following table lists the functions available for the X terminals.

Table Functions of X terminals

Value	Function	Description
0	No function	Set 0 for reserved terminals to avoid malfunction.
1	Forward RUN (FWD)	The terminal is used to control forward or reverse RUN of the AC drive.
2	Reverse RUN (REV)	
3	Three-line control	The terminal determines three-line control of the AC drive. For details, see the description of F4.11.
4	Forward JOG (FJOG)	FJOG indicates forward JOG running, while RJOG indicates reverse JOG running. The JOG frequency, acceleration time and deceleration time are described respectively in F8.00,
5	Reverse JOG (RJOG)	
6	Terminal UP	If the frequency is determined by external terminals, the terminals with the two functions are used as increment and decrement commands for frequency modification. When the frequency source is digital setting, they are used to adjust the frequency.
7	Terminal DOWN	
8	Coast to stop	The AC drive blocks its output, the motor coasts to rest and is not controlled by the AC drive. It is the same as coast to stop described in F6.10.

Value	Function	Description
9	Fault reset (RESET)	The terminal is used for fault reset function, the same as the function of RESET key on the operation panel. Remote fault reset is implemented by this function.
10	RUN pause	The AC drive decelerates to stop, but the running parameters are all memorized, such as PLC, swing frequency and PID parameters. After this function is disabled, the AC drive resumes its status before stop.
11	Normally open (NO) input of external fault	If this terminal becomes ON, the AC drive reports Err15 and performs the fault protection action. For more details, see the description of F9-47.
12	Multi-reference terminal 1	The setting of 16 speeds or 16 other references can be implemented through combinations of 16 states of these four terminals.
13	Multi-reference terminal 2	The setting of 16 speeds or 16 other references can be implemented through combinations of 16 states of these four terminals.
14	Multi-reference terminal 3	
15	Multi-reference terminal 4	
16	Terminal 1 for acceleration/ deceleration time selection	Totally four groups of acceleration/deceleration time can be selected through combinations of two states of these two terminals.
17	Terminal 2 for acceleration/ deceleration time selection	
18	Frequency source switchover	The terminal is used to perform switchover between two frequency sources according to the setting in F0.07.
19	UP and DOWN setting clear (terminal, operation panel)	If the frequency source is digital setting, the terminal is used to clear the modification by using the UP/ DOWN function or the increment/decrement key on the operation panel, returning the set frequency to the value of F0.08.
20	Command source switchover terminal	If the command source is set to terminal control (F0.02 = 1), this terminal is used to perform switchover between terminal control and operation panel control. If the command source is set to communication control (F0.02 = 2), this terminal is used to perform switchover between communication control and operation panel control.
21	Acceleration/Deceleration prohibited	It enables the AC drive to maintain the current frequency output without being affected by external signals (except the STOP command).
22	PID pause	PID is invalid temporarily. The AC drive maintains the current frequency output without supporting PID adjustment of frequency source.

Value	Function	Description
23	PLC status reset	The terminal is used to restore the original status of PLC control for the AC drive when PLC control is started again after a pause.
24	Swing pause	The AC drive outputs the central frequency, and the swing frequency function pauses.
25	Counter input	This terminal is used to count pulses.
26	Counter reset	This terminal is used to clear the counter status.
27	Length count input	This terminal is used to count the length.
28	Length reset	This terminal is used to clear the length.
29	Torque control prohibited	The AC drive is prohibited from torque control and enters the speed control mode.
30	Pulse input (enabled only for X5)	X5 is used for pulse input.
31	Reserved	Reserved.
32	Immediate DC braking	After this terminal becomes ON, the AC drive directly switches over to the DC braking state.
33	Normally closed (NC) input of external fault	After this terminal becomes ON, the AC drive reports Err15 and stops.
34	Frequency modification forbidden	If X terminal is avalid,then allow frequency modification., if X terminal unavalid, then forbid frequency modification.
35	Reverse PID action direction	After this terminal becomes ON, the PID action direction is reversed to the direction set in FA.03.
36	External STOP terminal 1	In operation panel mode, this terminal can be used to stop theAC drive, equivalent to the function of the STOP key on the operation panel.
37	Command source switchover terminal 2	It is used to perform switchover between terminal control and communication control. If the command source is terminal control, the system will switch over to communication control after this terminal becomes ON.
38	PID integral pause	After this terminal becomes ON, the integral adjustment function pauses. However, the proportional and differentiation adjustment functions are still valid
39	Switchover between main frequency source X and preset frequency	After this terminal becomes ON, the frequency source X is replaced by the preset frequency set in F0.08.

Value	Function	Description
40	Switchover between auxiliary frequency source Y and preset frequency	After this terminal is enabled, the frequency source Y is replaced by the preset frequency set in F0.08.
41	Motor selection terminal 1	Switchover among the four groups of motor parameters can be implemented through the four state combinations of these two terminals.
42	Reserved	Reserved
43	PID parameter switchover	If the PID parameters switchover performed by means of DI terminal (FA.18 = 1), the PID parameters are FA.05 to FA.07 when the terminal becomes OFF; the PID parameters are FA.15 to FA-17 when this terminal becomes ON.
44	User-defined fault 1	If these two terminals become ON, the AC drive reports Err27 and Err28 respectively, and performs fault protection actions
45	User-defined fault 2	
46	Speed control/Torque control switchover	This terminal enables the AC drive to switch over between speed control and torque control. When this terminal becomes OFF, the AC drive runs in the mode set in A0.00. When this terminal becomes ON, the AC drive switches over to the other control mode.
47	Emergency stop	When this terminal becomes ON, the AC drive stops within the shortest time. During the stop process, the current remains at the set current upper limit. This function is used to satisfy the requirement of stopping the AC drive in emergency state.
48	External STOP terminal 2	In any control mode (operation panel, terminal or communication), it can be used to make the AC drive decelerate to stop. In this case, the deceleration time is deceleration time 4.
49	Deceleration DC braking	When this terminal becomes ON, the AC drive decelerates to the initial frequency of stop DC braking and then switches over to DC braking state.
50	Clear the current running time	When this terminal becomes ON, the AC drive's current running time is cleared. This function must be supported by F8-2 and F8-53.
51	Switchover between two-line mode and three-line mode	It is used to perform switchover between two-line control and three-line control. If F4 -11 is set to Two-line mode 1, the system switches over to three-line mode 1 when the DI allocated with this function becomes ON
52	Reverse forbidden	

The four multi-reference terminals have 16 state combinations, corresponding to 16 reference values, as listed in the following table

Table State combinations of the four multi-reference terminals

K4	K3	K2	K1	Reference Setting	Corresponding Parameter
OFF	OFF	OFF	OFF	Reference 0	FC.00
OFF	OFF	OFF	ON	Reference 1	FC.01
OFF	OFF	ON	OFF	Reference 2	FC.02
OFF	OFF	ON	ON	Reference 3	FC.03
OFF	ON	OFF	OFF	Reference 4	FC.04
OFF	ON	OFF	ON	Reference 5	FC.05
OFF	ON	ON	OFF	Reference 6	FC.06
OFF	ON	ON	ON	Reference 7	FC.07
ON	OFF	OFF	OFF	Reference 8	FC.08
ON	OFF	OFF	ON	Reference 9	FC.09
ON	OFF	ON	OFF	Reference 10	FC.10
ON	OFF	ON	ON	Reference 11	FC.11
ON	ON	OFF	OFF	Reference 12	FC.12
ON	ON	OFF	ON	Reference 13	FC.13
ON	ON	ON	OFF	Reference 14	FC.14
ON	ON	ON	ON	Reference 15	FC.15

If the frequency source is multi-reference ,the vaule 100% if FC-00 to FC.15 corresponds to the vaule of F0.10 (Maximum frequency)

Besides the multi-speed function, the multi-reference can be also used as the PID setting source or the voltage source for V/F separation, satisfying the requirement on switchover of different setting values.

Two terminals for acceleration/deceleration time selection have four state combinations, as listed in the following table.

Tble State combinations of two terminals for acceleration/deceleration time selection

Terminal 2	Terminal 1	Acceleration/Deceleration Time Selection	Corresponding Parameters
OFF	OFF	Acceleration/Deceleration time 1	F0.17, F0.18
OFF	ON	Acceleration/Deceleration time 2	F8.03, F8.04
ON	OFF	Acceleration/Deceleration time 3	F8.05, F8.06
ON	ON	Acceleration/Deceleration time 4	F8.07, F8.08

Two motor selection terminals have four state combinations, corresponding to four motors, as listed in the following table.

Table State combinations of two motor selection terminals

Terminal 1	Selected Motor	Corresponding Parameters
OFF	Motor 1	Group F1, Group F2
ON	Motor 2	Group A2

Function Code	Name	Setting Range
F4.10	DI filter time	0.000-1.000S [0.010S]

It is used to set the software filter time of DI terminal status. If DI terminals are liable to interference and may cause malfunction, increase the value of this parameter to enhance the anti-interference capability. However, increase of DI filter time will reduce the response of DI terminals.

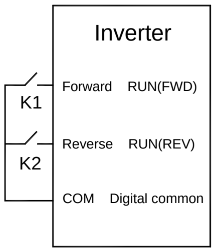
Function Code	Name	Setting Range
F4.11	Terminal command mode	0-3 [0]

This parameter is used to set the mode in which the AC drive is controlled by external terminals.

0: Two-line mode 1, This is the most commonly used model of two lines. Such as F4.11=0,F4.00=1,F4.01=2

Figure Setting of two-line mode 1

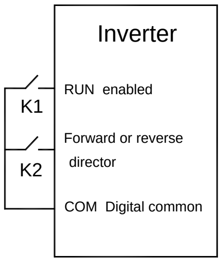
K1	K2	RUN Command
OFF	OFF	STOP
ON	OFF	FWD RUN
OFF	ON	REV RUN
ON	ON	KEEP



1: Two-line mode 2

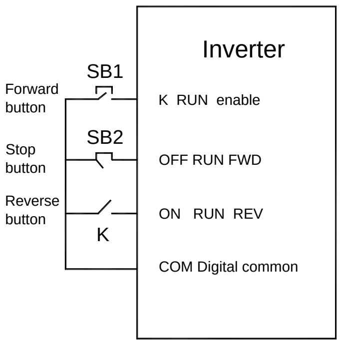
Figure setting of two-line mode 2

K1	K2	RUN Command
OFF	OFF	STOP
ON	OFF	FWD RUN
OFF	ON	STOP
ON	ON	REV RUN

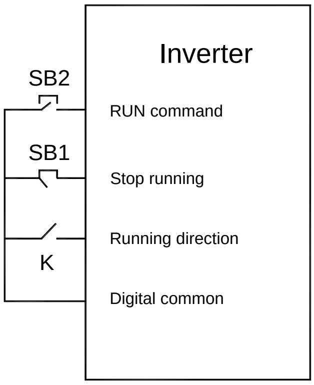


2: Three-line mode 1

Figure setting of three-line mode 1



3: Three-line mode 2



As shown in the preceding figure, if SB1 is ON, the AC drive starts running when SB2 is pressed to be ON; the AC drive instructs forward rotation when K is OFF and instructs reverse rotation when K is ON. The AC drive stops immediately after SB1 becomes OFF. During normal startup and running, SB1 must remain ON. The AC drive's running
state is determined by the final actions of SB1, SB2 and K.

Function Code	Name	Setting Range
F4.12	Terminal UP/DOWN rate	0.01–65.535 Hz/s[1.00Hz/s]

It is used to adjust the rate of change of frequency when the frequency is adjusted by means of terminal UP/DOWN.

Function Code	Name	Setting Range
F4.13	AI curve 1 minimum input	0.00 V to F4.15[0.00V]
F4.14	Corresponding setting of AI curve 1 minimum input	-100.00%–100.0%[100.0%]
F4.15	AI curve 1 maximum input	F4-.3 to 10.00 V[10.00V]
F4.16	Corresponding setting of AI curve 1 maximum input	-100.00%–100.0%[100.0%]
F4.17	CCI filter time	0.00–10.00s[0.10S]

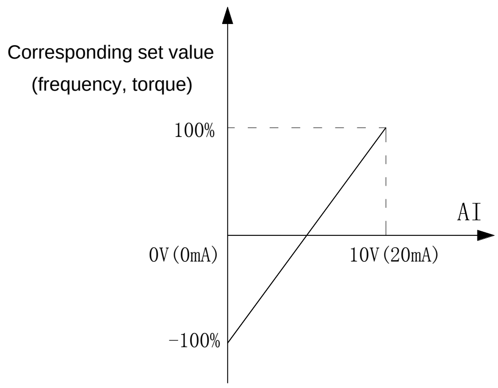
These parameters are used to define the relationship between the analog input voltage and the corresponding setting. When the analog input voltage exceeds the maximum value (F4.15), the maximum value is used. When the analog input voltage is less than the minimum value (F4.13), the value set in F4.34 (Setting for AI less than minimum input) is used.

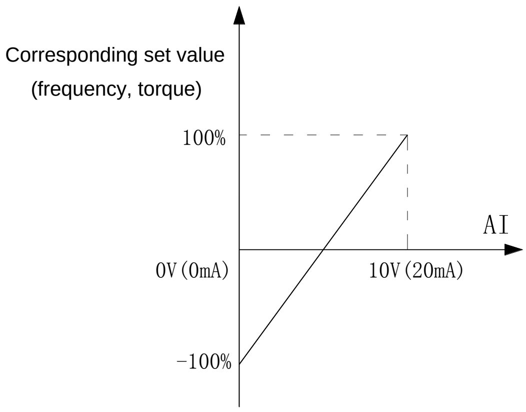
When the analog input is current input, 1 mA current corresponds to 0.5 V voltage.

F4.17 (AI filter time) is used to set the software filter time of AI. If the analog input is liable to interference, increase the value of this parameter to stabilize the detected analog input. However, increase of the AI filter time will slow the response of analog detection. Set this parameter properly based on actual conditions.

In different applications 100% if analog input corresponds to different nominal values.For
details, refer to the description of different applications.

Two typical setting examples are shown in the following figure.





Function Code	Name	Setting Range
F4.18	AI curve 2 minimum input	0.00 V to F4.20[0.00V]
F4.19	Corresponding setting of AI curve 2 minimum input	-100.00%–100.0%[100.0%]
F4.20	AI curve 2 maximum input	F4.18 to 10.00 V[10.00V]
F4.21	Corresponding setting of AI curve 2 maximum input	-100.00%–100.0%[100.0%]
F4.22	CCI filter time	0.00–10.00s[0.10S]

Function Code	Name	Setting Range
F4.23	AI curve 3minimum input	0.00 V to F4.25[0.00V]
F4.24	Corresponding setting of AI curve 3 minimum input	-100.00%–100.0%[100.0%]
F4.25	AI curve 3 maximum input	F4.23 to 10.00 V[10.00V]
F4.26	Corresponding setting of AI curve 3 maximum input	-100.00%–100.0%[100.0%]
F4.27	ACI filter time	0.00–10.00s[0.10S]

The method of setting CCI and ACI functions is similar to that of setting VCI function

Function Code	Name	Setting Range
F4.28	X5 terminal Pulse minimum input	0.00 kHz to F4.30[0.00khz]
F4.29	X5 terminal Corresponding setting of pulse minimum input	-100.00%–100.0%[0.0%]
F4.30	X5 terminal Pulse maximum input	F4.28 to 50.00KHZ[50.0KHZ]
F4.31	X5 terminal Corresponding setting of pulse maximum input	-100.00%–100.0%[100.0%]
F4.32	X5 terminal Pulse filter time	0.00–10.00s[0.10S]

These parameters are used to set the relationship between X5 pulse input and corresponding settings. The pulses can only be input by X5. The method of setting this function is similar to that of setting VCI function.

Function Code	Name	Setting Range
F4.33	AI curve selection	321[1-5]

Unit's digit (VCI curve selection)

Curve 1 (2 points, see F4.13 to F4.16)

Curve 2 (2 points, see F4.18 to F4.21)

Curve 3 (2 points, see F4.23 to F4.26)

Curve 4 (4 points, see A6.00 to A6.07)

Curve 5 (4 points, see A6.08 to A6.15)

Ten's digit (CCI curve selection)

Curve 1 to curve 5 (same as VCI)

Hundred's digit (ACI curve selection)

Curve 1 to curve 5 (same as ACI)

The unit's digit, ten's digit and hundred's digit of this parameter are respectively used to select the corresponding curve of VCI, CCI and ACI. Any of the five curves can be selected for VCI, CCI and ACI Curve 1, curve 2 and curve 3 are all 2-point curves, set in group F4. Curve 4 and curve 5 are both 4-point curves, set in group A6.

The Drive provides two AI terminals as standard. ACI is provided by an optional extension card.

Function Code	Name	Setting Range
F4.34	Setting for AI less than minimum input	000[0-1]

Unit's digit (Setting for CCI less than minimum input)

0: Minimum value

1: 0.0%

Ten's digit (Setting for VCI less than minimum input)

0, 1 (same as CCI)

Hundred's digit (Setting for ACI less than minimum input)

0, 1 (same as VCI)

This parameter is used to determine the correponding setting when the analog input voltage is less than the minimum value, The unit's digit, ten's digit and hundred's digit of this parameter respectively correspond to the setting for VCI, CCI and ACI.

If the value of a certain digit is 0, when analog input voltage is less than the minimum input, the corresponding setting of the minimum input (F4.14, F4.19, F4.24) is used.

If the value of a certain digit is 1, when analog input voltage is less than the minimum input, the corresponding value of this analog input is 0.0%.

Function Code	Name	Setting Range
F4.35	X1 delay time	0.0–3600.0s[0.0S]
F4.36	X2 delay time	0.0–3600.0s[0.0S]
F4.37	X3 delay time	0.0–3600.0s[0.0S]

These parameters are used to set the delay time of the AC drive when the status of DI terminals changes.

Currently, only X1, X2 and X3 support the delay time function

Function Code	Name	Setting Range
F4.38	X valid mode selection 1	00000[0-1]

Unit's digit (X1 valid mode)

0: High level valid

1: Low level valid

Ten's digit XI2 valid mode)

0, 1 (same as X1)

Hundred's digit (X3 valid mode)

0, 1 (same as X1)

Thousand's digit (X4 valid mode)

0, 1 (same as X1)

Ten thousand's digit (X5 valid mode)

0, 1 (same as X1)

Function Code	Name	Setting Range
F4.39	X valid mode selection 2	00000[0-1]

Unit's digit (X6 valid mode)

0, 1 (same as X1)

Ten's digit (X7 valid mode)

0, 1 (same as X1)

Hundred's digit (X8 state)

0, 1 (same as X1)

Thousand's digit (X9 valid mode)

0, 1 (same as X1)

Ten thousand's digit (X10 valid mode)

0, 1 (same as X1)

There parameters are used to set the vaild mode of X terminal

0: High level valid

The X terminal is valid when being connected with COM, and invalid when being disconnected from COM.

- 1: Low level valid

The X terminal is invalid when being connected with COM, and invalid when being disconnected from COM.

F5 Group Output Terminals

The FST-650 provides an analog output (AO) terminal, a digital output (DO) terminal, a relay terminal and a FM terminal (used for high-speed pulse output or open-collector switch signal output) as standard. If these output terminals cannot satisfy requirements, use an optional I/O extension card that provides an AO terminal (AO2), a relay terminal (relay 2) and a DO terminal (DO2).

Function Code	Name	Setting Range
F5.00	DO output mode	0-1 [0]

The DO terminal is programmable multiplexing terminal. It can be used for high-speed pulse output , with maximum frequency of 100.00 kHz. Refer to F5.06 for relevant functions. It can also be used as open collector switch signal output

Function Code	Name	Setting Range
F5.01	DO function (open (open -collector output terminal)	0-41 [0]
F5.02	Relay function (TA-TB-TC)	0-41 [2]
F5.03	Extension card relay function (TA1-TB1-TC1)	0-41 [0]
F5.04	DO1 function selection (open-collector output terminal)	0-41 [1]
F5.05	xtension card DO2 function	0-41 [4]

These five parameters are used to select the functions of the five digital output terminals. T/A-T/B-T/C and T/A1-T/B1-T/C1 are respectively the relays on the control board and the extension card.
The functions of the output terminals are described in the following table.

Value	Function	Description
0	No output	The terminal has no function.
1	AC drive running	When the AC drive is running and has output , the terminal becomes ON.
2	Fault output (stop)	When the AC drive stops due to a fault, the terminal becomes ON.
3	Frequency-level detection FDT1 output	Refer to the descriptions of F8.19 and F8.20.
4	Frequency reached	Refer to the descriptions of F8.21.
5	Zero-speed running (no output at stop)	If the AC drive runs with the output frequency of 0, the terminal becomes ON. If the AC drive is in the stop state, the terminal becomes OFF.
6	Motor overload pre-warning	The AC drive judges whether the motor load exceeds the overload pre-warning threshold before performing the protection action. If the pre-warning threshold is exceeded, the terminal becomes ON. For motor overload parameters, see the descriptions of F9.00 to F9.02.
7	AC drive overload pre-warning	The terminal becomes ON 10s before the AC drive overload protection action is performed.
8	Set count value reached	The terminal becomes ON when the count value reaches the value set in FB.08.
9	Designated count value reached	The terminal becomes ON when the count value reaches the value set in FB.09.
10	Length reached	The terminal becomes ON when the detected actual length exceeds the value set in FB.05.
11	PLC cycle complete	When simple PLC completes one cycle, the terminal outputs a pulse signal with width of 250 ms.
12	Accumulative running time reached	If the accumulative running time of the AC drive exceeds the time set in F8.17, the terminal becomes ON.

Value	Function	Description
13	Frequency limited	If the set frequency exceeds the frequency upper limit or lower limit and the output frequency of the AC drive reaches the upper limit or lower limit, the terminal becomes ON.
14	Torque limited	In speed control mode, if the output torque reaches the torque limit, the AC drive enters the stall protection state and meanwhile the terminal becomes ON.
15	Ready for RUN	If the AC drive main circuit and control circuit become stable, and the AC drive detects no fault and is ready for RUN, the terminal becomes ON.
16	VCI larger than CCI	When the input of VCI is larger than the input of CCI, the terminal becomes ON
17	Frequency upper limit reached	If the running frequency reaches the upper limit, the terminal becomes ON.
18	Frequencylower limit reached (nooutput at stop)	if the running frequency reaches the lower limit, the terminal becomes ON. In the stop state, the terminal becomes OFF.
19	Under voltage state output	If theAC drive is in undervoltage state, the terminal becomes ON.
20	Communication setting	Refer to the communication protocol.
21	Reserved	Reserved.
22	Reserved	Reserved.
23	Zero-speed running 2 (having output at stop)	If the output frequency of the AC drive is 0, the terminal becomes ON. In the state of stop, the signal is still ON.
24	Accumulative power-on time reached	If theAC drive accumulative power-on time (F7.13) exceeds the value set in F8.16, the terminal becomes ON.
25	Frequencylevel detection FDT2 output	Refer to the descriptions of F8.28 and F8.29.
26	Frequency 1 reached	Refer to the descriptions of F8.30 and F8.31.
27	Frequency 2 reached	Refer to the descriptions of F8.32 and F8.33.
28	Current 1 reached	Refer to the descriptions of F8.38 and F8.39.
29	Current 2 reached	Refer to the descriptions of F8.40 and F8.41.
30	Timing reached	If the timing function (F8.42) is valid, the terminal becomes ON after the current running time of the AC drive reaches the set time.
31	VCI input limit exceeded	If VCI input is larger than the value of F8.46 (VCI input voltage upper limit) or lower than the value of F8-45 (VCI input voltage lower limit), the terminal becomes ON
32	Load becoming 0	If the load becomes 0, the terminal becomes ON.

Value	Function	Description
33	Reverse running	If theAC drive is in the reverse running state, the terminal becomes ON
34	Zero current state	Refer to the descriptions of F8.28 and F8.29.
35	Module temperature reached	If the heatsink temperature of the inverter module (F7.07) reaches the set module temperature threshold (F8.47), the terminal becomes ON.
36	Software current limit exceeded	Refer to the descriptions of F8.36 and F8.37
37	Frequency lower limit reached (having output at stop)	If the running frequency reaches the lower limit, the terminal becomes ON. In the stop state, the signal is still ON.
38	Alarm output	If a fault occurs on the AC drive and the AC drive continues to run, the terminal outputs the alarm signal.
39	Motor overheat warning	If the motor temperature reaches the temperature set in F9.58 (Motor overheat warning threshold), the terminal becomes ON. You can view the motor temperature by using U0-34.
40	Current running time reached	If the current running time of AC drive exceeds the value of F8.53, the terminal becomes ON.
41	Fault output	Fault of free stop and undervoltage no output

Function Code	Name	Setting Range
F5.06	DO function selection	0~16 [0]
F5.07	AO1 function selection	0~16 [0]
F5.08	AO2 function selection	0~16 [0]

The output pulse frequency of the DO terminal ranges from 0.01 kHz to "Maximum FMP output frequency" (F5.09). The value of F5.09 is between 0.01 kHz and 100.00 kHz.

The output range of AO1 and AO2 is 0–10 V or 0–20 mA. The relationship between pulse and analog output ranges and corresponding functions is listed in the following table.

Table Relationship between pulse and analog output ranges and corresponding functions

Value	Function	Range (Corresponding to Pulse or Analog Output Range 0.0%–100.0%)
0	Running frequency	0 to maximum output frequency
1	Set frequency	0 to maximum output frequency
2	Output current	0 to 2 times of rated motor current
3	Output torque (absolute value)	0 to 2 times of rated motor torque
4	Output power	0 to 2 times of rated power
5	Output voltage	0 to 1.2 times of rated AC drive voltage

6	X5 Pulse input	0.01–100.00 kHz
7	VCI	0–10 V
8	CCI	0–10 V (or 0–20 mA)
9	ACI	0–10 V
10	Length	0 to maximum set length
11	Count value	0 to maximum count value
12	Communication setting	0.0%–100.0%
13	Motor rotational speed	0 to rotational speed corresponding to maximum output frequency
14	Output current	0.0–1000.0 A
15	Output voltage	0.0–000.0 V
16	Output torque (actual value)	-2 times of rated motor torque to 2 times of rated motor torque

.

Function Code	Name	Setting Range
F5.09	D0 Maximum output frequency	0.01–100.00 kHz[50.00KHZ]
F5.10	AO1 offset coefficient	-100.0%–100.0%[0.0%]
F5.11	AO1 gain	-10.00–10.00[1.00]
F5.12	AO2 offset coefficient	-100.0%–100.0%[0.00%]
F5.13	AO2 gain	-10.00–10.00[1.00]

These parameters are used to correct the zero drift of analog output and the output amplitude deviation. They can also be used to define the desired AO curve.

If "b" represents zero offset, "k" represents gain, "Y" represents actual output, and "X" represents standard output, the actual output is: Y = kX + b.

The zero offset coefficient 100% of AO1 and AO2 corresponds to 10 V (or 20 mA). The standard output refers to the value corresponding to the analog output of 0 to 10 V (or 0 to 20 mA) with no zero offset or gain adjustment.

For example, if the analog output is used as the running frequency, and it is expected that the output is 8 V when the frequency is 0 and 3 V at the maximum frequency, the gain shall be set to -0.50, and the zero offset shall be set to 80%.

Function Code	Name	Setting Range
F5.17	D0 output delay time	0.0–3600.0s[0.0S]
F5.18	Relay 1 output delay time	0.0–3600.0s[0.0S]
F5.19	Relay 2 output delay time	0.0–3600.0s[0.0S]
F5.20	D01 output delay time	0.0–3600.0s[0.0S]
F5.21	D02 output delay time	0.0–3600.0s[0.0S]

These parameters are used to set the delay time of output terminals D0, relay 1, relay 2, DO1 and DO2 from status change to actual output.

Function Code	Name	Setting Range
F5.22	D0 valid mode selection	0-1[00000]

Unit's digit (D0 valid mode)
0: Positive logic
1: Negative logic
Ten's digit (Relay 1 valid mode)
0, 1 (same as D0)
Hundred's digit (Relay 2 valid mode)
0, 1 (same as D0)
Thousand's digit (D01 valid mode)
0, 1 (same as D0)
Ten thousand's digit (D02 valid mode)
0, 1 (same as D0)
It is used to set the logic of output terminals D0, relay 1, relay 2,D01 and D02

- 0: Positive logic
  The output terminal is valid when being connected with COM, and invalid when being disconnected from COM.
- 1: Positive logic
  The output terminal is invalid when being connected with COM, and valid when being disconnected from COM.

F6 Group Start/Stop Control

Function Code	Name	Setting Range
F6.00	Start mode	0~2 [0]

- 0: Direct start
  - If the DC braking time is set to 0, the AC drive starts to run at the startup frequency.
  - If the DC braking time is not 0, the AC drive performs DC braking first and then starts to run at the startup frequency. It is applicable to small-inertia load application where the motor is likely to rotate at startup.
- 1: Rotational speed tracking restart
  The AC drive judges the rotational speed and direction of the motor first and then starts at the tracked frequency. Such smooth start has no impact on the rotating motor. It is applicable to the restart upon instantaneous power failure of large-inertia load. To ensure the performance of rotational speed tracking restart, set the motor parameters in group F1 correctly.
- 2: Pre-excited start (asynchronous motor)
  It is valid only for asynchronous motor and used for building the magnetic field before the motor runs. For pre-excited current and pre-excited time, see parameters of F6-05 and F6-06.
  - If the pre-excited time is 0, the AC drive cancels pre-excitation and starts to run at startup frequency.
  - If the pre-excited time is not 0, the AC drive pre-excites first before startup, improving the dynamic response of the motor.

Function Code	Name	Setting Range
F6.01	Rotational speed tracking mode	0-2 [0]

0：from frequency at stop

It is the commonly selected mode.

- 1: From zero frequency

  It is applicable to restart after a long time of power failure.

- 2: From the maximum frequency

  It is applicable to the power-generating load.

Function Code	Name	Setting Range
F6.02	Rotational speed tracking speed	0-100 [20]

In the rotational speed tracking restart mode, select the rotational speed tracking speed. The larger the value is, the faster the tracking is. However, too large value may cause unreliable tracking.

Function Code	Name	Setting Range
F6.03	Startup frequency	0.00-10.00Hz [0.00Hz]
Function Code	**Name**	**Setting Range**
F6.04	Startup frequency holding time	0.0–100.0s[0.0s]

To ensure the motor torque at AC drive startup, set a proper startup frequency. In addition, to build excitation when the motor starts up, the startup frequency must be held for a certain period.

The startup frequency (F6-03) is not restricted by the frequency lower limit. If the set target frequency is lower than the startup frequency, the AC drive will not start and stays in the standby state.

During switchover between forward rotation and reverse rotation, the startup frequency holding time is disabled. The holding time is not included in the acceleration time but in the running time of simple PLC.

Function Code	Name	Setting Range
F6.05	Startup DC braking current/Pre-excited current	0%–100%[0%]
F6.06	Startup DC braking time/Pre-excited time	0.0–100.0s[0.0s]

Startup DC braking is generally used during restart of the AC drive after the rotating motor stops. Pre-excitation is used to make the AC drive build magnetic field for the asynchronous motor before startup to improve the responsiveness.

Startup DC braking is valid only for direct start (F6.00 = 0). In this case, the AC drive performs DC braking at the set startup DC braking current. After the startup DC braking time, the AC drive starts to run. If the startup DC braking time is 0, the AC drive starts directly without DC braking. The larger the startup DC braking current is, the larger the braking force is.

If the startup mode is pre-excited start (F6.00 = 3), the AC drive builds magnetic field based on the set pre-excited current. After the pre-excited time, the AC drive starts to run. If the pre-excited time is 0, the AC drive starts directly without pre-excitation.

The startup DC braking current or pre-excited current is a percentage relative to the base value.

- If the rated motor current is less than or equal to 80% of the rated AC drive current, the base value is the rated motor current.
- If the rated motor current is greater than 80% of the rated AC drive current, the base value is 80% of the rated AC drive current.

Function Code	Name	Setting Range
F6.07	Acceleration/ Deceleration mode	0–2[0]

It is used to set the frequency change mode during the AC drive start and stop process.

- 0: Linear acceleration/deceleration

  The output frequency increases or decreases in linear mode. The MD380 provides four group of acceleration/deceleration time, which can be selected by using F4.00 to F4.08.

- 1: S-curve acceleration/deceleration A

  The output frequency increases or decreases along the S curve. This mode is generally used in the applications where start and stop processes are relatively smooth, such as elevator and conveyor belt. F6-08 and F6-09 respectively define the time proportions of the start segment and the end segment.

- 2: S-curve acceleration/deceleration B

  In this curve, the rated motor frequency f_b is always the inflexion point. This mode is usually used in applications where acceleration/deceleration is required at the speed higher than the rated frequency.

Function Code	Name	Setting Range
F6.08	Time proportion of S-curve start segment	0.0% to (100.0% – F6.09) [30%]
F6.09	Time proportion of S-curve end segment	0.0% to (100.0% – F6.08) [30%]

These two parameters respectively define the time proportions of the start segment and the end segment of S-curve acceleration/deceleration. They must satisfy the requirement: F6.08 + F6.09 ≤ 100.0%.

In Figure 6.12, t1 is the time defined in F6.08, within which the slope of the output frequency change increases gradually. t2 is the time defined in F6.09, within which the slope of the output frequency change gradually decreases to 0. Within the time between t1 and t2, the slope of the output frequency change remains unchanged, that is, linear acceleration/ deceleration.

Figure S-curve acceleration/deceleration A

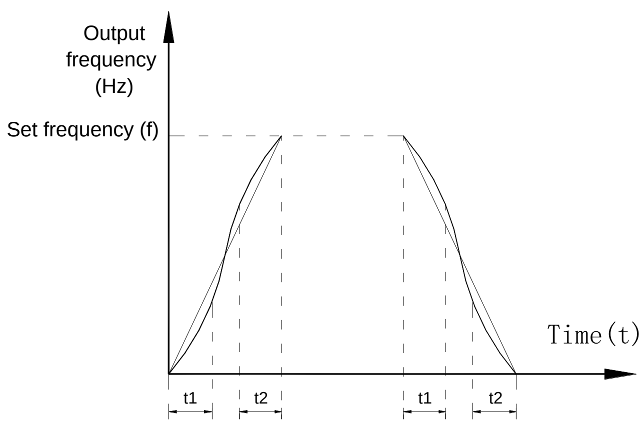
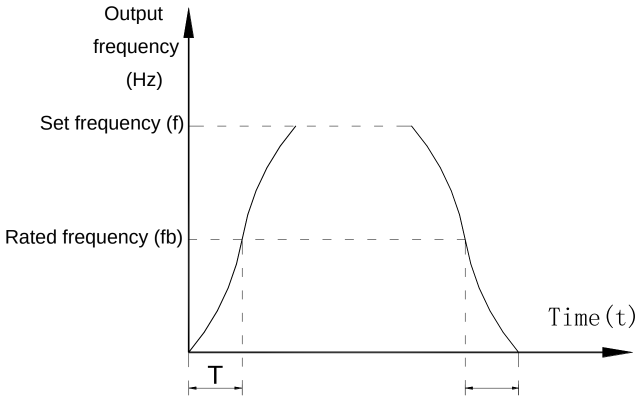


Figure S-curve acceleration/deceleration B



Function Code	Name	Setting Range
F6.10	Stop mode	0-1[0]

- 0: Decelerate to stop

  After the stop command is enabled, the AC drive decreases the output frequency according to the deceleration time and stops when the frequency decreases to zero.
- 1: Coast to stop

  After the stop command is enabled, the AC drive immediately stops the output. The motor will coast to stop based on the mechanical inertia.

Function Code	Name	Setting Range
F6.11	Initial frequency of stop DC braking	0.00 Hz –F0.10 [0.00Hz]
F6.12	Waiting time of stop DC braking	0.0–36.0s[0.0s]
F6.13	Stop DC braking current	0%–100%[0%]
F6.14	Stop DC braking time	0.0–36.0s[0.0s]

- F6.11 (Initial frequency of stop DC braking)

During the process of decelerating to stop, the AC drive starts DC braking when the running frequency is lower than the value set in F6-11.

- F6.12 (Waiting time of stop DC braking)

When the running frequency decreases to the initial frequency of stop DC braking, the AC drive stops output for a certain period and then starts DC braking. This prevents faults such as overcurrent caused due to DC braking at high speed.

- F6.3 (Stop DC braking current)

This parameter specifies the output current at DC braking and is a percentage relative to the base value.

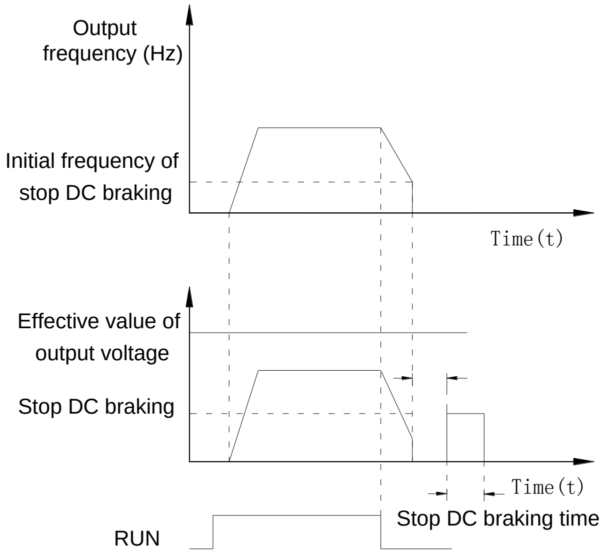
– If the rated motor current is less than or equal to 80% of the rated AC drive current, the base value is the rated motor current.

– If the rated motor current is greater than 80% of the rated AC drive current, the base value is 80% of the rated AC drive current.

- F6.14 (Stop DC braking time)

This parameter specifies the holding time of DC braking. If it is set to 0, DC braking is cancelled.

The stop DC braking process is shown in the following figure.



Function Code	Name	Setting Range
F6.15	Brake use ratio	0%–100%[100%]

It is valid only for the AC drive with internal braking unit and used to adjust the duty ratio of the braking unit. The larger the value of this parameter is, the better the braking result will be. However, too larger value causes great fluctuation of the AC drive bus voltage during the braking process

Function Code	Name	Setting Range
F6.18	Rotational speed tracking current	30%–200%[depend motor]
F6.21	Demagnetization time	0.0-0.5S[depend motor]

F7Group Operation Panel and Display

Function Code	Name	Setting Range
F7.01	MJOG Key function selection	0-4 [0]

MJOG key refers to multifunctional key. You can set the function of the MJOG key by using this parameter. You can perform switchover by using this key both in stop or running state.

- 0: This key is disabled.
- 1: Switchover between operation panel control and remote command control (terminal or communication)

You can perform switchover from the current command source to the operation panel control (local operation). If the current command source is operation panel control, this key is invalid.

- 2: Switchover between forward rotation and reverse rotation

You can change the direction of the frequency reference by using the MF.K key. It is valid only when the current command source is operation panel control.

- 3: Forward MJOG

You can perform forward FJOG by using the MJOG key.

- 4: Reverse MJOG

You can perform reverse RJOG by using the MJOG key.

Function Code	Name	Setting Range
F7.02	STOP/RESET key function	0-1 [0]
F7.03	LED display running parameters 1	0000-FFFF [1F]

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10
PID Setting	Load Speed	Length Value	Count Value	ACI Voltage	CCI Voltage
BIT9	BIT8	BIT7	BIT6	BIT5	BIT4
VCI Voltage	DO Output Status	DI Input Status	Output Torque	Output Power	Output Current
BIT3	BIT2	BIT1	BIT0		
Output Voltage	Bus voltage	Setting frequency(KHz)	Running Frequency		

If a parameter needs to be displayed during the running, set the corresponding bit to 1, and set F7.03 to the hexadecimal equivalent of this binary number.

Function Code	Name	Setting Range
F7.04	LED display running parameters 2	0000-FFFF [0]

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10
Auxiliary frequency Y display (Hz)	Main frequency X display (Hz)	Encoder feedback speed (Hz)	Communication setting value	X5 Pulse setting frequency (Hz)	Current running time(Minute)
BIT9	BIT8	BIT7	BIT6	BIT5	BIT4
Current power-on time (Hour)	Linear speed	ACI voltage before correction	VCC voltage before correction	VCI voltage before correction	Remaining Running time
BIT3	BIT2	BIT1	BIT0		
Running frequency 2	X5 Pulse setting frequency (kHz)	PLC Stage	PID feedback		

If a parameter needs to be displayed during the running, set the corresponding bit to 1, and set F7.03 to the hexadecimal equivalent of this binary number

These two parameters are used to set the parameters that can be viewed when the AC drive is in the running state. You can view a maximum of 32 running state parameters that are displayed from the lowest bit of F7.03.

Function Code	Name	Setting Range
F7.05	LED display stop parameters	0000-FFFF [0]

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10
Reserved	Reserved	Reserved	X5Pulse setting frequency KHz	PID setting	Load speed

BIT9	BIT8	BIT7	BIT6	BIT5	BIT4
PLC stage	Length value	Count value	ACI voltage (V)	CCI voltage (V)	VCI voltage (V)
BIT3	BIT2	BIT1	BIT0		
Do output status	Di input status	Bus voltage (V)	Set frequency (Hz)		

Function Code	Name	Setting Range
F7.06	Load speed display coefficient	0.0001-6.5000 [1.0000]

This parameter is used to adjust the relationship between the output frequency of the AC drive and the load speed. For details, see the description of F7-12.

Function Code	Name	Setting Range
F7.07	Heatsink temperature of inverter modulet	-20~100.0°C [-]

It is used to display the insulated gate bipolar transistor (IGBT) temperature of the inverter module, and the IGBT overheat protection value of the inverter module depends on the model.

Function Code	Name	Setting Range
F7.08	Product number	[-]
F7.09	Accumulative running time	0–65535 h[-]
F7.10	Software version	[-]
F7.11	emporary software version	[-]

Function Code	Name	Setting Range
F7.12	Number of decimal places for load speed display	0–3 [1]

0: 0 decimal place

1: 1 decimal place

2: 2 decimal places

3: 3 decimal places

F7.12 is used to set the number of decimal places for load speed display. The following gives an example to explain how to calculate the load speed:

Assume that F7.06 (Load speed display coefficient) is 2.000 and F7.12 is 2 (2 decimal places). When the running frequency of the AC drive is 40.00 Hz, the load speed is 40.00 x 2.000 = 80.00 (display of 2 decimal places).

If the AC drive is in the stop state, the load speed is the speed corresponding to the set frequency, namely, "set load speed". If the set frequency is 50.00 Hz, the load speed in the stop state is 50.00 x 2.000 = 100.00 (display of 2 decimal places)

Function Code	Name	Setting Range
F7.13	Accumulative power-on time	0–65535 h [0]

It is used to display the accumulative power-on time of the AC drive since the delivery. If the time reaches the set power-on time (F8.17), the terminal with the digital output function 24 becomes ON.

Function Code	Name	Setting Range
F7.14	Accumulative power consumption	0–65535 kWh [0]
F7.15	Performance software temporary version	[-]
F7.16	Functionality software temporary version	[-]

F8 Group Enhanced Function

Function Code	Name	Setting Range
F8.00	JOG running frequency	0-f0.10[2.00Hz]
F8.01	JOG acceleration time	0.0–6500.0s[20s]
F8.02	JOG deceleration time	0.0–6500.0s[20s]

These parameters are used to define the set frequency and acceleration/deceleration time of the AC drive when jogging. The startup mode is "Direct start" (F6.00 = 0) and the stop mode is "Decelerate to stop" (F6.10 = 0) during jogging.

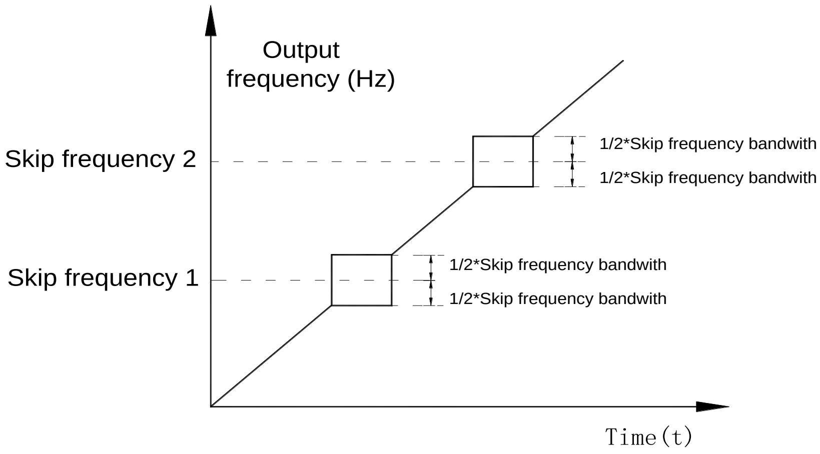
Function Code	Name	Setting Range
F8.03	Acceleration time 2	0.0–6500.0s[Depend on Model]
F8.04	Deceleration time 2	0.0–6500.0s[Depend on Model]
F8.05	Acceleration time 3	0.0–6500.0s[Depend on Model]
F8.06	Deceleration time 3	0.0–6500.0s[Depend on Model]
F8.07	Acceleration time 4	0.0–6500.0s[Depend on Model]
F8.08	Deceleration time 4	0.0–6500.0s[Depend on Model]

The FST-650 provides a total of four groups of acceleration/deceleration time, that is, the preceding three groups and the group defined by F0.17 and F0.18. Definitions of four groups are completely the same. You can switch over between the four groups of acceleration/deceleration time through different state combinations of DI terminals. For more details, see the descriptions of F4.01 to F4.05.

Function Code	Name	Setting Range
F8.09	Skip frequency 1	0.00 Hz to F0.10 [0.00Hz]
F8.10	Skip frequency 2	0.00 Hz to F0.10 [0.00Hz]
F8.11	Frequency jump amplitude	0.00 Hz to F0.10 [0.00Hz]

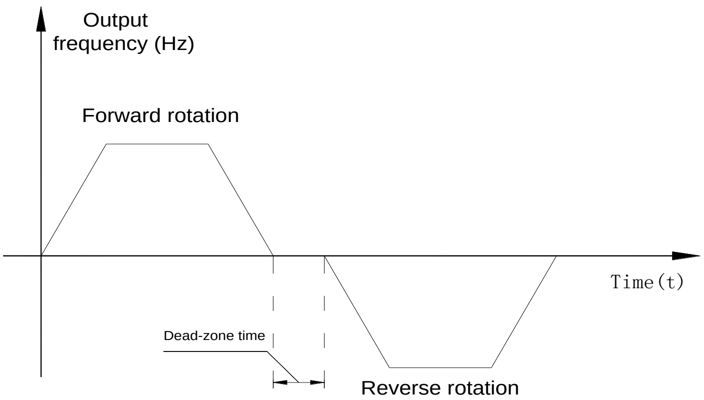
If the set frequency is within the frequency skip range, the actual running frequency is the skip frequency close to the set frequency. Setting the skip frequency helps to avoid the mechanical resonance point of the load.

The FST-650 supports two skip frequencies. If both are set to 0, the frequency skip function is disabled. The principle of the skip frequencies and skip amplitude is shown in the following figure.



Function Code	Name	Setting Range
F8.12	Forward/Reverse rotation dead-zone time	0.0–3000.0s [0.0S]

It is used to set the time when the output is 0 Hz at transition of the AC drive forward rotation and reverse rotation, as shown in the following figure.



Function Code	Name	Setting Range
F8.13	Reverse control	0-1 [0]

0: Enabled

1: Disabled

It is used to set whether the AC drive allows reverse rotation. In the applications where reverse rotation is prohibited, set this parameter to 1.

Function Code	Name	Setting Range
F8.14	Running mode when set frequency lower than frequency lower limit	0-2 [0]

0: Run at frequency lower limit

1: Stop

2: Run at zero speed

It is used to set the AC drive running mode when the set frequency is lower than the frequency lower limit. The MD380 provides three running modes to satisfy requirements of various applications..

Function Code	Name	Setting Range
F8.15	Droop control	0.00–10.00 Hz [0.00Hz]

This function is used for balancing the workload allocation when multiple motors are used to drive the same load. The output frequency of the AC drives decreases as the load increases. You can reduce the workload of the motor under load by decreasing the output frequency for this motor, implementing workload balancing between multiple motors.

Function Code	Name	Setting Range
F8.16	Accumulative power-on time threshold	0–65000 h[0h]

If the accumlative power on time F7.13 reaches the value set in this paramter, the corresponding DO terminal becomes ON.

For example, combining virtual DI/DO functions, to implement the function that the AC drive reports an alarm when the actual accumulative power-on time reaches the threshold of 100 hours, perform the setting as follows:

1) Set virtual DI1 to user-defined fault 1: A1-00 = 44.
2) Set that the valid state of virtual DI1 is from virtual DO1: A1-05 = 0000.
3) Set virtual DO1 to power-on time reached: A1-11= 24.
4) Set the accumulative power-on time threshold to 100 h: F8.16 = 100 h.

Then, the AC drive reports Err27 when the accumulative power-on time reaches 100 hours.

Function Code	Name	Setting Range
F8.17	Accumulative running time threshold	0–65000 h[0h]

It is used to set the accumulative running time threshold of the AC drive. If the accumulative running time (F7.09) reaches the value set in this parameter, the corresponding DO terminal becomes ON.

Function Code	Name	Setting Range
F8.18	Startup protection	0–1[0]

0: No

1: Yes

This parameter is used to set whether to enable the safety protection. If it is set to 1, the AC drive does not respond to the run command valid upon AC drive power-on (for example, an input terminal is ON before power-on). The AC drive responds only after the run command is cancelled and becomes valid again.

In addition, the AC drive does not respond to the run command valid upon fault reset of the AC drive. The run protection can be disabled only after the run command is cancelled.

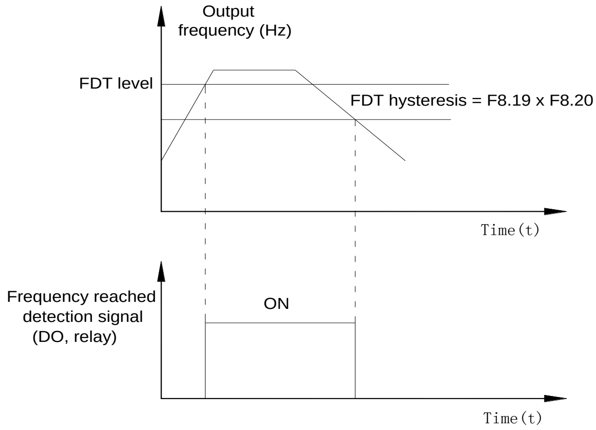
In this way, the motor can be protected from responding to run commands upon power-on or fault reset in unexpected conditions.

Function Code	Name	Setting Range
F8.19	Frequency detection value (FDT1)	0.00 Hz –F0.10[50.00Hz]
F8.20	Frequency detection hysteresis (FDT hysteresis 1)	0.0%–100.0%(FDT1 level)[5.0%]

If the running frequency is higher than the value of F8.19, the corresponding DO terminal becomes ON. If the running frequency is lower than value of F8.19, the DO terminal goes OFF

These two parameters are respectively used to set the detection value of output frequency and hysteresis value upon cancellation of the output. The value of F8-20 is a percentage of the hysteresis frequency to the frequency detection value (F8.19).

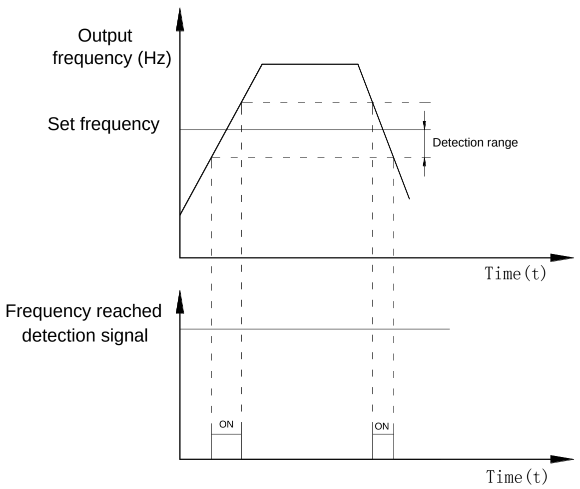
The FDT function is shown in the following figure.



Function Code	Name	Setting Range
F8.21	Detection range of frequency reached	0.00–100%[0.0%]

If the AC drive running frequency is within the certain range of the set frequency, the corresponding DO terminal becomes ON.

This parameter is used to set the range within which the output frequency is detected to reach the set frequency. The value of this parameter is a percentage relative to the maximum frequency. The detection range of frequency reached is shown in the following figure.



Function Code	Name	Setting Range
F8.22	Jump frequency during acceleration/deceleration	0–1 [0]

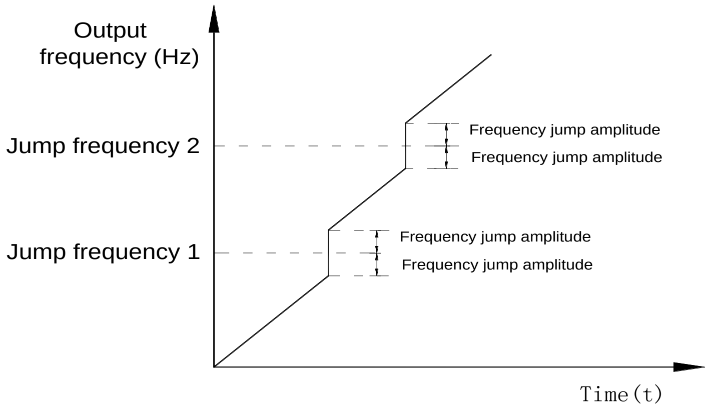
0: Disabled

1: Enabled

It is used to set whether the jump frequencies are valid during acceleration/deceleration.

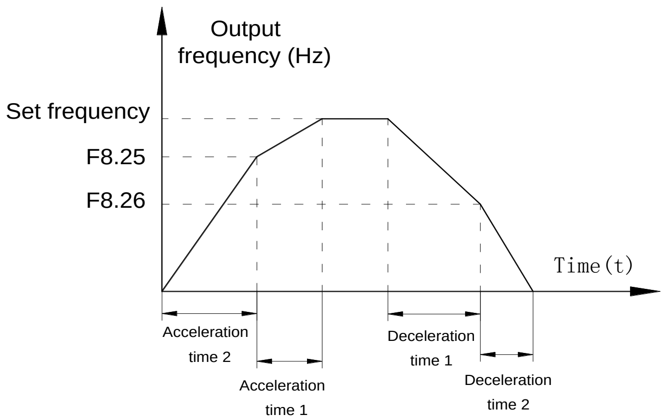
When the jump frequencies are valid during acceleration/deceleration, and the running frequency is within the frequency jump range, the actual running frequency will jump over the set frequency jump amplitude (rise directly from the lowest jump frequency to the highest jump frequency). The following figure shows the diagram when the jump frequencies are valid during acceleration/deceleration.

Figure Diagram when the jump frequencies are valid during acceleration/deceleration



Function Code	Name	Setting Range
F8.25	Frequency switchover point between acceleration time 1 and acceleration time 2	0.00 Hz - F0.10 [0.00Hz]
F8.26	Frequency switchover point between deceleration time 1 and deceleration time 2	0.00 Hz - F0.10 [0.00Hz]

This function is valid when motor 1 is selected and acceleration/deceleration time switchover is not performed by means of X terminal. It is used to select different groups of acceleration/ deceleration time based on the running frequency range rather than X terminal during the running process of the AC drive.



During acceleration, if the running frequency is smaller than the value of F8.25, acceleration time 2 is selected. If the running frequency is larger than the value of F8.25, acceleration time 1 is selected.

During deceleration, if the running frequency is larger than the value of F8.26, deceleration time 1 is selected. If the running frequency is smaller than the value of F8.26, deceleration time 2 is selected.

Function Code	Name	Setting Range
F8.27	Terminal JOG preferred	0-1 [0]

0: Disabled

1: Enabled

It is used to set whether terminal JOG is preferred.

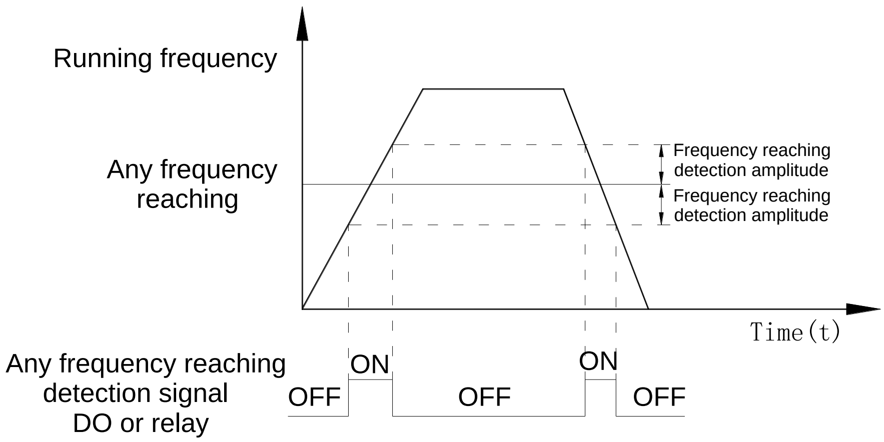
If terminal JOG is preferred, the AC drive switches to terminal JOG running state when there is a terminal JOG command during the running process of the AC drive.

Function Code	Name	Setting Range
F8.28	Frequency detection value (FDT2)	0.00-F0.10 [50.00Hz]
F8.29	Frequency detection hysteresis (FDT hysteresis 2)	0.0-100.0%[5.0%]

The frequency detection function is the same as FDT1 function. For details, refer to the descriptions of F8.19 and F8.20.

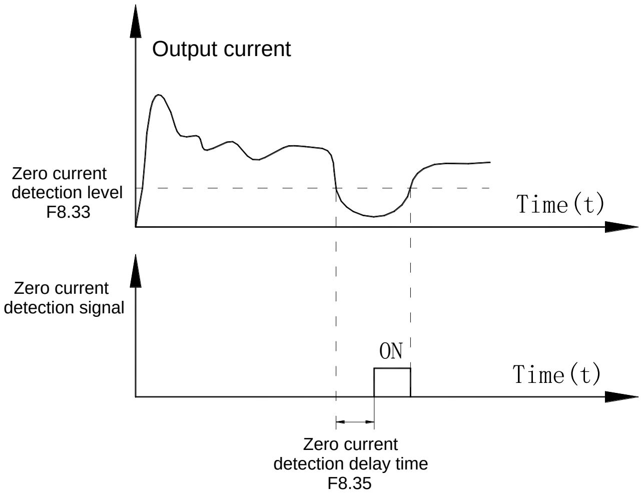
Function Code	Name	Setting Range
F8.30	Any frequency reaching detection value 1	0.00-F0.10 [50.00Hz]
F8.31	Any frequency reaching detection amplitude 1	0.0-100.0%[0.0%]
F8.32	Any frequency reaching detection value 2	0.00-F0.10 [50.00Hz]
F8.33	Any frequency reaching detection amplitude 2	0.0-100.0%[0.0%]

If the output frequency of the AC drive is within the positive and negative amplitudes of the any frequency reaching detection value, the corresponding DO becomes ON.
The FST-650 provides two groups of any frequency reaching detection parameters, including frequency detection value and detection amplitude, as shown in the following figure.



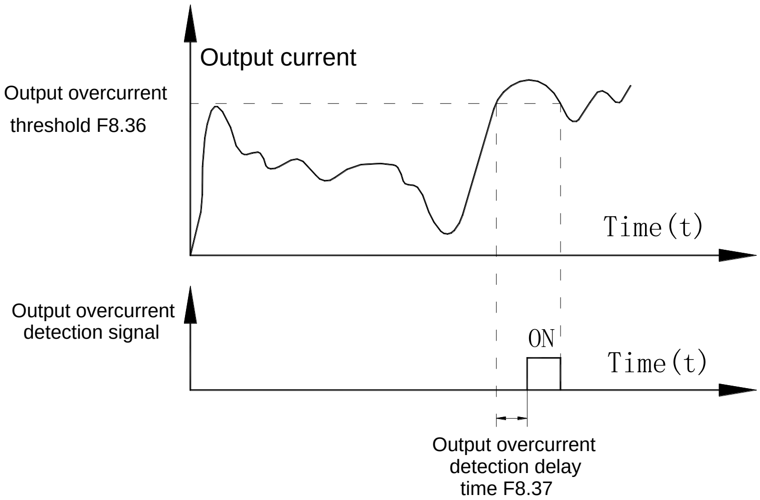
Function Code	Name	Setting Range
F8.34	Zero current detection level	0.0%–300.0% [5.0%]
F8.35	Zero current detection delay time	0.00–600.00s[0.10s]

If the output current of the AC drive is equal to or less than the zero current detection level and the duration exceeds the zero current detection delay time, the corresponding DO becomes ON. The zero current detection is shown in the following figure.
Figure Zero current detectio



Function Code	Name	Setting Range
F8.36	Output overcurrent threshold	0.1%-300.0%[200.0%]
F8.37	Output overcurrent detection delay time	0.00–600.00s[0.0s]

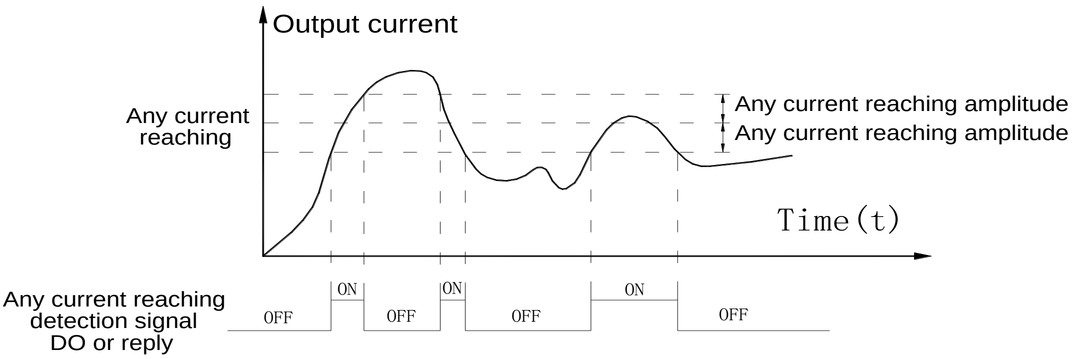
If the output current of the AC drive is equal to or higher than the overcurrent threshold and the duration exceeds the detection delay time, the corresponding DO becomes ON. The output overcurrent detection function is shown in the following figure.



Function Code	Name	Setting Range
F8.38	Any current reaching 1	0.0%-300.0%[100.0%]
F8.39	Any current reaching 1 amplitude	0.0%-300.0%[0.0%]
F8.40	Any current reaching 2	0.0%-300.0%[100.0%]
F8.41	Any current reaching 2 amplitude	0.0%-300.0%[0.0%]

If the output current of the AC drive is within the positive and negative amplitudes of any current reaching detection value, the corresponding DO becomes ON.

The FST-650 provides two groups of any current reaching detection parameters, including current detection value and detection amplitudes, as shown in the following figure.



Function Code	Name	Setting Range
F8.42	Timing function	0-1[0]

0: Disabled

1: Enabled

Function Code	Name	Setting Range
F8.43	Timing duration source	0-3[0]

0: F8-44

1: VCI

2: CCI

3: ACI

(100% of analog input corresponds to the value of F8.44)

Function Code	Name	Setting Range
F8.44	Timing duration	0.0–6500.0 min[0.0min]

These parameters are used to implement the AC drive timing function.

If F8.42 is set to 1, the AC drive starts to time at startup. When the set timing duration is reached, the AC drive stops automatically and meanwhile the corresponding DO becomes ON.

The AC drive starts timing from 0 each time it starts up and the remaining timing duration can be queried by U0.20.

The timing duration is set in F8.43 and F8.44, in unit of minute.

Function Code	Name	Setting Range
F8.45	VCI input voltage lower limit	0.00 V to F8.46[3.10v]
F8.46	VCI input voltage upper limit	F8.45 to 10.00 V[6.80v]

These two parameters are used to set the limits of the input voltage to provide protection on the AC drive. When the VCI input is larger than the value of F8.46 or smaller than the value of F8.45, the corresponding DO becomes ON, indicating that VCI input exceeds the limit.

Function Code	Name	Setting Range
F8.47	Module temperature threshold	0–100 °C[75 °C]

When the heatsink temperature of the AC drive reaches the value of this parameter, the corresponding DO becomes ON, indicating that the module temperature reaches the threshold.

Function Code	Name	Setting Range
F8.48	Cooling fan control	0-1[0]

0: Fan working during running

1: Fan working continuously

It is used to set the working mode of the cooling fan. If this parameter is set to 0, the fan works when the AC drive is in running state. When the AC drive stops, the cooling fan works if the heatsink temperature is higher than 40°C, and stops working if the heatsink temperature is lower than 40°C.

If this parameter is set to 1, the cooling fan keeps working after power-on.

Function Code	Name	Setting Range
F8.49	Wakeup frequency	(F8.51)- (F0.10)[0.00 Hz]
F8.50	Wakeup delay time	0.0–6500.0s[0.0s]
F8.51	Dormant frequency	0.00 Hz - F8.49[0.00 Hz]
F8.52	Dormant delay time	0.0–6500.0s[0.0s]

These parameters are used to implement the dormant and wakeup functions in the water supply application.

When the AC drive is in running state, the AC drive enters the dormant state and stops automatically after the dormant delay time (F8.52) if the set frequency is lower than or equal to the dormant frequency (F8.51).

When the AC drive is in dormant state and the current running command is effective, the AC drives starts up after the wakeup delay time (F8.50) if the set frequency is higher than or equal to the wakeup frequency (F8.49).

Generally, set the wakeup frequency equal to or higher than the dormant frequency. If the wakeup frequency and dormant frequency are set to 0, the dormant and wakeup functions are disabled.

When the dormant function is enabled, if the frequency source is PID, whether PID operation is performed in the dormant state is determined by FA.28. In this case, select PID operation enabled in the stop state (FA.28 = 1).

Function Code	Name	Setting Range
F8.53	Current running time reache	0.0–6500.0 min[0.0 min]

If the current running time reaches the value set in this parameter, the corresponding DO becomes ON, indicating that the current running time is reached.

Function Code	Name	Setting Range
F8.54	Output power correction coefficient	0.00%–200 .0%[100.0%]

When the output power (U0.05) is not equal to the required value, you can perform linear correction on output power by using this parameter

Group F9: Fault and Protection

Function Code	Name	Setting Range
F9.00	Motor overload protection selection	0-1[0]

0: Disabled

The motor overload protective function is disabled. The motor is exposed to potential damage due to overheating. A thermal relay is suggested to be installed between the AC drive and the motor

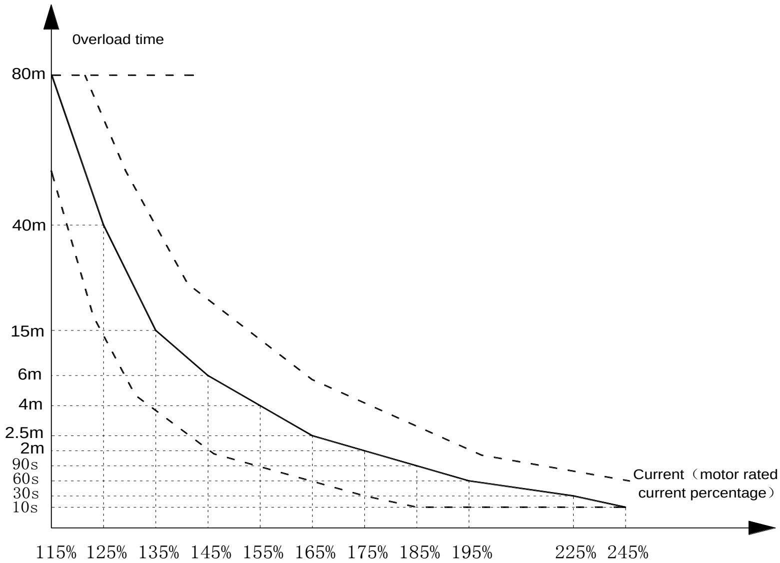
1: Enabled

The motor overload protective function is enabled. More details in F9.01,F9.02.

Function Code	Name	Setting Range
F9.01	Motor overload protection gain	0.20–10.00 [1.00]
F9.02	Motor overload warning coefficient	50%–120%[80%]

The AC drive judges whether the motor is overloaded according to the inverse time-lag curve of the motor overload protection.

The inverse time-lag curve of the motor overload protection is:



1) When motor running current reach to 175% times as rated current for 2 minutes, ac drive would report overload fault(Err11); when motor running current reach to 115% times as rated current for 80 minutes, ac drive would report overload fault(Err11). For example, the motor rated current is 100A, when motor running current reaches to 125A (125% times as 100A), if set FB.01 to 1.00, ac drive would report overload fault after 40 minutes; if set FB.01 to 1.20, ac drive would report overload fault after40*1.2=48 minutes. The longest overload time is 80 minutes, shortest is 10 seconds.

2) Motor overload protection modify example: Motor should run 2 minutes under 150% rated current before report overload fault. From the picture we can see that 150%(I) current is between 145%(I1) and 155%(I2), ac drive report overload fault after 6 minutes under 145% current, 4 minutes under 155% current. So it will be after 5 minutes under 150% current:

T=T1+(T2-T1)*(I-I1)/(I2-I1)=4+(6-4)*(150%-145%)/(155%-145%)=5(minutes)

Thereby if need ac drive report overload fault after 2 minutes running under 150% rated current, motor overload protection gain should be set:

F9.01=2÷5=0.4

Attention: Set F9.01 properly based on the actual overload capacity. If the value of F9.01 is set too large, damage to the motor may result because the motor overheats but the AC drive does not report the alarm.

3) Motor overload warning coefficient: When motor overload detection level reached to setting value, the multi-function output terminal DO or fault relay output motor overload pre-alarm signal, this parameter is

counted on the time percentage of certain overload point when ac drive continues running without warning.

This function is used to give a warning signal to the control system via DO before motor overload protection. This parameter is used to determine the percentage, at which pre-warning is performed before motor overload. The larger the value is, the less advanced the pre-warning will be.

When the accumulative output current of the AC drive is greater than the value of the overload inverse time-lag curve multiplied by F9.02, the DO terminal on the AC drive allocated with function 6 (Motor overload pre-warning) becomes ON.

Function Code	Name	Setting Range
F9.07	Short-circuit to ground upon power-on	0–1 [1]

0: Disabled

1: Enabled

It is used to determine whether to check the motor is short-circuited to ground at power-on of the AC drive. If this function is enabled, the AC drive's UVW will have voltage output a while after power-on.

Function Code	Name	Setting Range
F9.08	Braking unit operation initial voltage	200.0-2000.0V [model dependand]

Built-in braking unit operation intial voltage Vbreak, set this voltage value refer to

800≥Vbreak≥(1.414Vs+30)

Vs- Input AC voltage

Attention: Improper setting of this voltage may cause abnormal operation of built-in braking unit.

Function Code	Name	Setting Range
F9.09	Fault auto reset times	0-20 [0]

It is used to set the times of fault auto resets if this function is used. After the value is exceeded, the AC drive will remain in the fault state.

Function Code	Name	Setting Range
F9.10	DO action during fault auto reset	0-1 [0]

It is used to decide whether the DO acts during the fault auto reset if the fault auto reset function is selected.

Function Code	Name	Setting Range
F9.11	Time interval of fault auto reset	0.1s–100.0s [1.0s]

It is used to set the waiting time from the alarm of the AC drive to fault auto reset.

Function Code	Name	Setting Range
F9.12	Input phase loss protection/contactor energizing protection selection	0–1 [1]

Unit's digit: Input phase loss protection

Ten's digit: Contactor energizing protection

0: Disabled

1: Enabled

Function Code	Name	Setting Range
F9.13	Output phase loss protection selection	0–1 [1]

It is used to determine whether to perform output phase loss protection. If select 0, when output phase happened, it won't warning, the actually current is bigger than display showed, there's risk, pls be careful.

Function Code	Name	Setting Range
F9.14	1st fault type	0–99
F9.15	2nd fault typ	
F9.16	3rd (latest) fault type	

It is used to record the types of the most recent three faults of the AC drive. 0 indicates no fault. For possible causes and solution of each fault, refer to Chapter 8.

Function Code	Name	Setting Range
F9.17	Frequency upon 3rd fault	It displays the frequency when the latest fault occurs.
F9.18	Current upon 3rd fault	It displays the current when the latest fault occurs.
F9.19	Bus voltage upon 3rd fault	It displays the bus voltage when the latest fault occurs.
F9.20	DI status upon 3rd fault(Latest)	It displays the status of all DI terminals when the latest fault occurs. The sequence is as follows: BIT0-BIT9 corresponding X1-X10 If a X is ON, the setting is 1. If theX is OFF, the setting is 0. The value is the equivalent decimal number converted from the X status.
F9.21	Output terminal status upon 3rd fault	It displays the status of all output terminals when the latest fault occurs. The sequence is as follows: BIT0-BIT4 orresponding DO REL1 REL2 D01 D02 If an output terminal is ON, the setting is 1. If the output terminal is OFF, the setting is 0. The value is the equivalent decimal number converted from the DI statuses.
F9.22	AC drive status upon 3rd fault	Reserved
F9.23	Power-on time upon 3rd fault	It displays the present power-on time when the latest fault occurs.

F9.24	Running time upon 3rd fault	It displays the present running time when the latest fault occurs
F9.27	Bus voltage upon 2nd fault	Same as F9.17–F9.24.
F9.28	DI status upon 2nd fault	Same as F9.17–F9.24.
F9.29	Bus voltage upon 2nd fault	Same as F9.17–F9.24.
F9.30	DI status upon 2nd fault	Same as F9.17–F9.24.
F9.31	Output terminal status upon 2nd fault	Same as F9.17–F9.24.
F9.32	AC drive status upon 2nd fault	Same as F9.17–F9.24.
F9.33	Power-on time upon 2nd fault	Same as F9.17–F9.24.
F9.34	Running time upon 2nd fault	Same as F9.17–F9.24.
F9.37	Frequency upon 1st fault	Same as F9.17–F9.24.
F9.38	Current upon 1st fault	Same as F9.17–F9.24.
F9.39	Bus voltage upon 1st fault	Same as F9.17–F9.24.
F9.40	DI status upon 1st fault	Same as F9.17–F9.24.
F9.41	Output terminal status upon 3rd fault	Same as F9.17–F9.24.
F9.42	AC drive status upon 1st fault	Same as F9.17–F9.24.
F9.43	Power-on time upon 1st fault	Same as F9.17–F9.24.
F9.44	Running time upon 1st fault	Same as F9.17–F9.24.

Function Code	Name	Setting Range
F9.47	Fault protection action selection 1	0-2[00000]

Unit's digit (Motor overload, Err11)

0: Coast to stop

1: Stop according to the stop mode

2: Continue to run

Ten's digit (Power input phase loss, Err12)

Same as unit's digit

Hundred's digit (Power output phase loss, Err13)

Same as unit's digit

Thousand's digit (External equipment fault, Err15)

Same as unit's digit

Ten thousand's digit (Communication fault, Err16)

Same as unit's digit

Function Code	Name	Setting Range
F9.48	Fault protection action selection 2	0-2[00000]

Unit's digit (Encoder fault, Err20)

0: Coast to stop

1: Switch over to V/F control, stop according to the stop mode

2: Switch over to V/F control, continue to run
Ten's digit (EEPROM read-write fault, Err21)
0: Coast to stop
1: Stop according to the stop mode
Hundred's digit: reserved
Thousand's digit (Motor overheat, Err25)
Same as unit's digit in F9.47
Ten thousand's digit (Accumulative running time reached)
Same as unit's digit in F9.47

Function Code	Name	Setting Range
F9.49	Fault protection action selection 3	0-2[00000]

Unit's digit (User-defined fault 1, Err27)
Same as unit's digit in F9.47
Ten's digit (User-defined fault 2, Err28)
Same as unit's digit in F9.47
Hundred's digit (Accumulative power-on time reached, Err29)
Same as unit's digit in F9.47
Thousand's digit (Load becoming 0, Err30)
0: Coast to stop
1: Stop according to the stop mode
2: Continue to run at 7% of rated motor frequency and resume to the set frequency if the load recovers
Ten thousand's digit (PID feedback lost during running, Err31)
Same as unit's digit in F9.47

Function Code	Name	Setting Range
F9.50	Fault protection action selection 4	0-2[00000]

Unit's digit (Too large speed deviation, Err42)
Same as unit's digit in F9.47
Ten's digit (Motor over-speed, Err43)
Same as unit's digit in F9.47
Hundred's digit (Initial position fault, Err51)
Same as unit's digit in F9.47
Thousand's digit (Speed feedback fault, Err52)
Same as unit's digit in F9.47
Ten thousand's digit: Reserved

Function Code	Name	Setting Range
F9.54	Frequency selection for continuing to run upon fault	0-4[0]

0: Current running frequency
1: Set frequency
2: Frequency upper limit
3: Frequency lower limit
4: Backup frequency upon abnormality

Function Code	Name	Setting Range
F9.55	Backup frequency upon abnormality	0.0%–100.0% [100.0%]

If a fault occurs during the running of the AC drive and the handling of fault is set to "Continue to run", the AC drive displays A** and continues to run at the frequency set in F9.54.

The setting of F9.55 is a percentage relative to the maximum frequency.

Function Code	Name	Setting Range
F9.56	Type of motor temperature sensor	0–2 [0]

0: No temperature sensor

1: PT100

2: PT1000

Function Code	Name	Setting Range
F9.57	Motor overheat protection threshold	0–200°C [110°C]
F9.58	Motor overheat warning threshold	0–200°C [90°C]

The signal of the motor temperature sensor needs to be connected to the optional I/O extension card. ACI on the extension card can be used for the temperature signal input. The motor temperature sensor is connected to ACI and PGND of the extension card. The ACI terminal of the FST-650 supports both PT100 and PT1000. Set the sensor type correctly during the use. You can view the motor temperature via U0.34.

If the motor temperature exceeds the value set in F9.57, the AC drive reports an alarm and acts according to the selected fault protection action.

If the motor temperature exceeds the value set in F9.58, the DO terminal on the AC drive allocated with function 39 (Motor overheat warning) becomes ON.

Function Code	Name	Setting Range
F9.59	Action selection at instantaneous power failure	0–2 [0]

0: Invalid

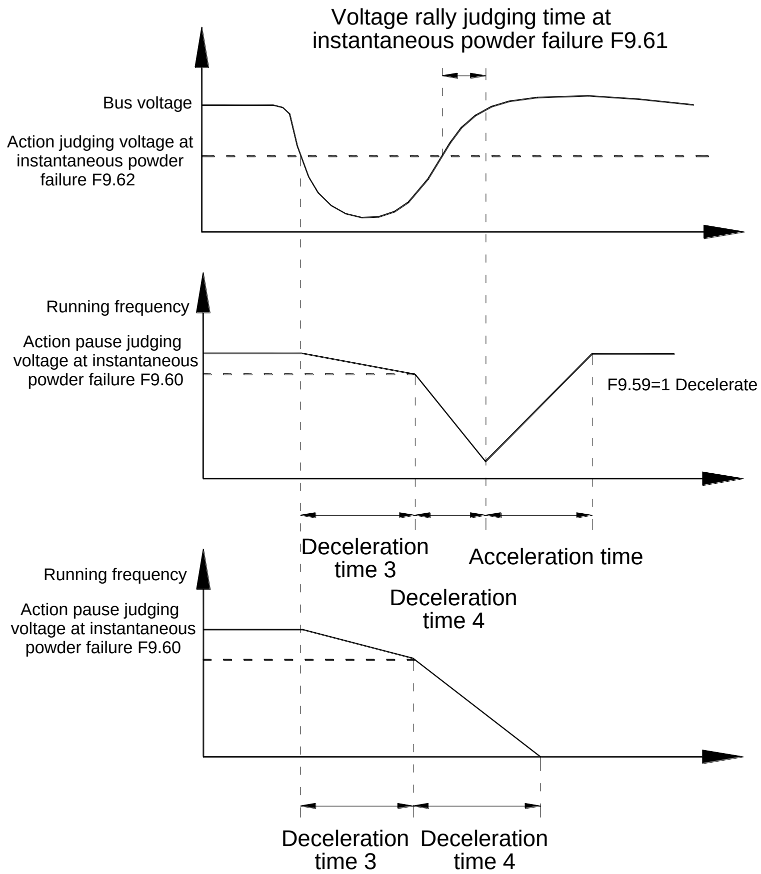
1: Decelerate

2: Decelerate to stop

Upon instantaneous power failure or sudden voltage dip, the DC bus voltage of the AC drive reduces. This function enables the AC drive to compensate the DC bus voltage reduction with the load feedback energy by reducing the output frequency so as to keep the AC drive running continuously.

- If F9.59 = 1, upon instantaneous power failure or sudden voltage dip, the AC drive decelerates. Once the bus voltage resumes to normal, the AC drive accelerates to the set frequency. If the bus voltage remains normal for the time exceeding the value set in F9.61, it is considered that the bus voltage resumes to normal.
- If F9.59 = 2, upon instantaneous power failure or sudden voltage dip, the AC drive decelerates to stop.

AC drive action diagram upon instantaneous power failure



Function Code	Name	Setting Range
F9.60	Action pause judging voltage at instantaneous power failure	80.0%–100.0% [85.0%]
F9.61	Voltage rally judging time at instantaneous power failure	0.00–100.00s[0.50S]
F9.62	Action judging voltage at instantaneous power failure	60.0%–100.0%[80.0%]

Function Code	Name	Setting Range
F9.63	Protection upon load becoming 0	0–1 [0]

0: Disabled

1: Enabled

Function Code	Name	Setting Range
F9.64	Detection level of load becoming 0	0.0%–100.0% [10.0%]
F9.65	Detection time of load becoming 0	0.0–60.0s[1.0s]

If protection upon load becoming 0 is enabled, when the output current of the AC drive is lower than the detection level (F9.64) and the lasting time exceeds the detection time (F9.65), the output frequency of the AC drive automatically declines to 7% of the rated frequency. During the protection, the AC drive automatically accelerates to the set frequency if the load resumes to normal.

Function Code	Name	Setting Range
F9.67	Over-speed detection value	0.0%–50.0% [20.0%]
F9.68	Over-speed detection time	0.0–60.0s[1.0s]

This function is valid only when the AC drive runs in the CLVC mode.

If the actual motor rotational speed detected by the AC drive exceeds the maximum frequency and the excessive value is greater than the value of F9.67 and the lasting time exceeds the value of F9.68, the AC drive reports Err43 and acts according to the selected fault protection action.

If the over-speed detection time is 0.0s, the over-speed detection function is disabled.

Function Code	Name	Setting Range
F9.69	Detection value of too large speed deviation	0.0%–50.0% [20.0%]
F9.70	Detection time of too large speed deviation	0.0–60.0s[5.0s]

This function is valid only when the AC drive runs in the CLVC mode.

If the AC drive detects the deviation between the actual motor rotational speed detected by the AC drive and the set frequency is greater than the value of F9.69 and the lasting time exceeds the value of F9.70, the AC drive reports Err42 and according to the selected fault protection action.

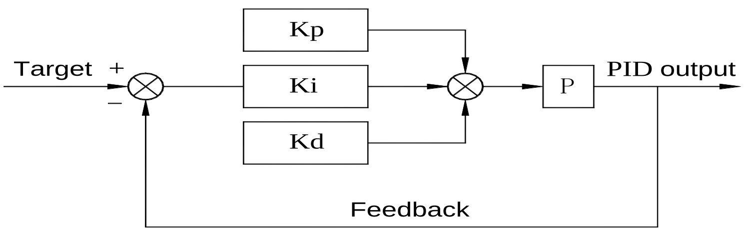
If F9.70 (Detection time of too large speed deviation) is 0.0s, this function is disabled.

Function Code	Name	Setting Range
F9.71	Instantaneous power failure gain Kp	0–100 [40]
Function Code	**Name**	**Setting Range**
F9.72	Instantaneous power failure integral coefficient Ki	0–100 [30]
F9.73	Instantaneous power failure deceleration time	0–300.0s [20.0s]

Group FA: Process Control PID Function

PID control is a general process control method. By performing proportional, integral and differential operations on the difference between the feedback signal and the target signal, it adjusts the output frequency and constitutes a feedback system to stabilize the controlled counter around the target value. It is applied to process control such as flow control, pressure control and temperature control. The following figure shows the principle block diagram of PID control.

Figure Principle block diagram of PID control



Function Code	Name	Setting Range
FA.00	PID setting source	0–6 [0]

0: FA.01

1: VCI

2: CCI

3: ACI

4: Pulse setting (X5)

5: Communication setting

6: Multi-reference

Function Code	Name	Setting Range
FA.01	PID digital setting	0.0%–100.0% [50.0%]

FA.00 is used to select the channel of target process PID setting. The PID setting is a relative value and ranges from 0.0% to 100.0%. The PID feedback is also a relative value. The purpose of PID control is to make the PID setting and PID feedback equal.

Function Code	Name	Setting Range
FA.02	PID feedback source	0–8 [0]

0:VCI

1: CCI

2: ACI

3: VCI–CCI

4: Pulse setting (X5)

5: Communication setting

6: VCI + CCI

7: MAX (|VCI|, |CCI|)

8: MIN (|VCI|, |CCI|)

This parameter is used to select the feedback signal channel of process PID.

The PID feedback is a relative value and ranges from 0.0% to 100.0%.

Function Code	Name	Setting Range
FA.03	PID action direction	0–1 [0]

0: Forward action

1: Reverse action

- 0: Forward action

  When the feedback value is smaller than the PID setting, the AC drive's output frequency rises. For example, the winding tension control requires forward PID action.

- 1: Reverse action

  When the feedback value is smaller than the PID setting, the AC drive's output frequency reduces. For example, the unwinding tension control requires reverse PID action.

  Note that this function is influenced by the DI function 35 "Reverse PID action direction".

Function Code	Name	Setting Range
FA.04	PID setting feedback range	0–65535 [1000]

This parameter is a non-dimensional unit. It is used for PID setting display (U0.15) and PID feedback display (U0.16).

Relative value 100% of PID setting feedback corresponds to the value of FA.04. If FA.04 is set to 2000 and PID setting is 100.0%, the PID setting display (U0.15) is 2000.

Function Code	Name	Setting Range
FA.05	Proportional gain Kp1	0.0–100.0 [20.0]
FA.06	Integral time Ti1	0.01–10.00s[2.00s]
FA.07	Differential time Td1	0.00–10.000[0.000s]

- FA.05 (Proportional gain Kp1)

  It decides the regulating intensity of the PID regulator. The higher the Kp1 is, the larger the regulating intensity is. The value 100.0 indicates when the deviation between PID feedback and PID setting is 100.0%, the adjustment amplitude of the PID regulator on the output frequency reference is the maximum frequency.
- FA.06 (Integral time Ti1)

  It decides the integral regulating intensity. The shorter the integral time is, the larger the regulating intensity is. When the deviation between PID feedback and PID setting is 100.0%, the integral regulator performs continuous adjustment for the time set in FA.06. Then the adjustment amplitude reaches the maximum frequency.
- FA.07 (Differential time Td1)

  It decides the regulating intensity of the PID regulator on the deviation change. The longer the differential time is, the larger the regulating intensity is. Differential time is the time within which the feedback value change reaches 100.0%, and then the adjustment amplitude reaches the maximum frequency.

Function Code	Name	Setting Range
FA.08	Cut-off frequency of PID reverse rotation	0.00–F0.10 [2.00Hz]

In some situations, only when the PID output frequency is a negative value (AC drive reverse rotation), PID setting and PID feedback can be equal. However, too high reverse rotation frequency is prohibited in some applications, and FA.08 is used to determine the reverse rotation frequency upper limit.

Function Code	Name	Setting Range
FA.09	PID deviation limit	0.0%–100.0% [0.0%]

If the deviation between PID feedback and PID setting is smaller than the value of FA.09, PID control stops. The small deviation between PID feedback and PID setting will make the output frequency stabilize, effective for some closed-loop control applications.

Function Code	Name	Setting Range
FA.10	PID differential limit	0.00%–100.00% [0.10%]

It is used to set the PID differential output range. In PID control, the differential operation may easily cause system oscillation. Thus, the PID differential regulation is restricted to a small range.

Function Code	Name	Setting Range
FA.11	PID setting change time	0.00–650.00s [0.00s]

The PID setting change time indicates the time required for PID setting changing from 0.0% to 100.0%. The PID setting changes linearly according to the change time, reducing the impact caused by sudden setting change on the system

Function Code	Name	Setting Range
FA.12	PID feedback filter time	0.00–60.00s [0.00s]
FA.13	PID output filter time	0.00–60.00s [0.00s]

FA.12 is used to filter the PID feedback, helping to reduce interference on the feedback but slowing the response of the process closed-loop system.

FA.13 is used to filter the PID output frequency, helping to weaken sudden change of the AC drive output frequency but slowing the response of the process closed-loop system

Function Code	Name	Setting Range
FA.15	Proportional gain Kp2	0.0–100.0 [20.0s]
FA.16	Integral time Ti2	0.01–10.00s [2.00s]
FA.17	Differential time Td2	0.000–10.000s[0.000S]

Function Code	Name	Setting Range
FA.18	PID parameter switchover condition	0–3 [0]

0: No switchover

1: Switchover via X terminal

2: Automatic switchover based on deviation

3:Automatic switchover based on running frequency

Function Code	Name	Setting Range
FA.19	PID parameter switchover deviation 1	0.0%–FA.20 [20.0%]
FA.20	PID parameter switchover deviation 2	FA.19 -100.0%[80.0%]

In some applications, PID parameters switchover is required when one group of PID parameters cannot satisfy the requirement of the whole running process.

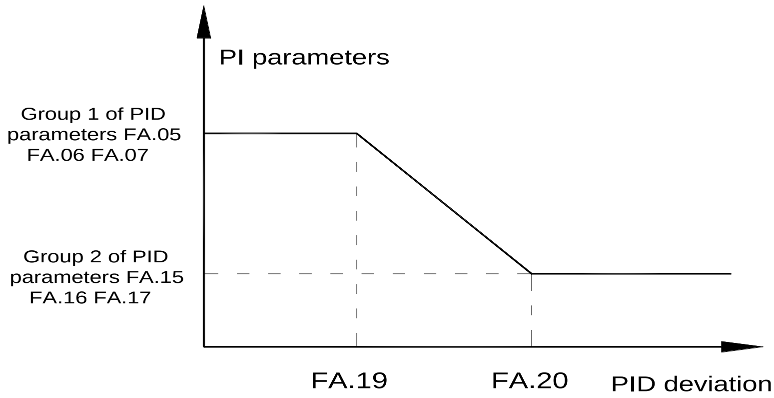
These parameters are used for switchover between two groups of PID parameters. Regulator parameters FA.15 to FA.17 are set in the same way as FA.05 to FA.07.

The switchover can be implemented either via a DI terminal or automatically implemented based on the deviation.

If you select switchover via a DI terminal, the DI must be allocated with function 43 "PID parameter switchover". If the DI is OFF, group 1 (FA.05 to FA.07) is selected. If the DI is ON, group 2 (FA.15 to FA.17) is selected.

If you select automatic switchover, when the absolute value of the deviation between PID feedback and PID setting is smaller than the value of FA.19, group 1 is selected. When the absolute value of the deviation between PID feedback and PID setting is higher than the value of FA-20, group 2 is selected. When the deviation is between FA.19 and FA.20, the PID parameters are the linear interpolated value of the two groups of parameter value.

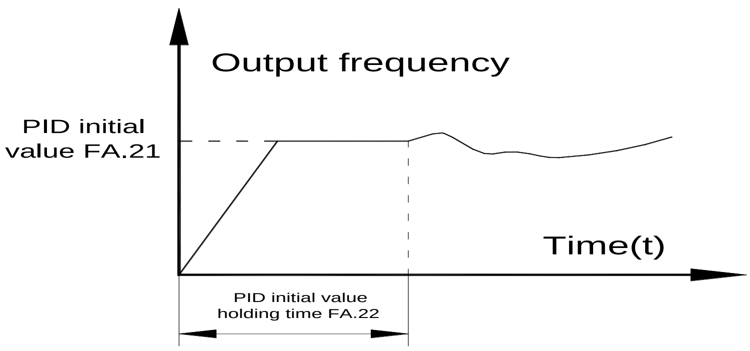
Figure PID parameters switchover



Function Code	Name	Setting Range
FA.21	PID initial value	0.0%–100.0%[0.0%]
FA.22	PID initial value holding time	0.00–650.00s[0.00s]

When the AC drive starts up, the PID starts closed-loop algorithm only after the PID output is fixed to the PID initial value (FA.21) and lasts the time set in FA.22.

Figure PID initial value function



Function Code	Name	Setting Range
FA.23	Maximum deviation between two PID outputs in forward direction	0.0%–100.0%[1.00%]
FA.24	Maximum deviation between two PID outputs in reverse direction	0.0%–100.0%[1.00%]

This function is used to limit the deviation between two PID outputs (2 ms per PID output) to suppress the rapid change of PID output and stabilize the running of the AC drive.

FA.23 and FA.24 respectively correspond to the maximum absolute value of the output deviation in forward direction and in reverse direction.

Function Code	Name	Setting Range
FA.25	PID integral property	0–1[00]

Unit's digit (Integral separated)

0: Invalid

1: Valid

Ten's digit (Whether to stop integral operation when the output reaches the limit)

0: Continue integral operation

1: Stop integral operation

- Integral separated

If it is set to valid, , the PID integral operation stops when the DI allocated with function 38 "PID integral pause" is ON In this case, only proportional and differential operations take effect.
If it is set to invalid, integral separated remains invalid no matter whether the DI allocated with function 38 "PID integral pause" is ON or not.

• Whether to stop integral operation when the output reaches the limit

If "Stop integral operation" is selected, the PID integral operation stops, which may help to reduce the PID overshoot.

Function Code	Name	Setting Range
FA.26	Detection value of PID feedback loss	0.0%: Not judging feedback loss 0.1%–100.0%[0.0%]
FA.27	Detection time of PID feedback loss	0.0–20.0s

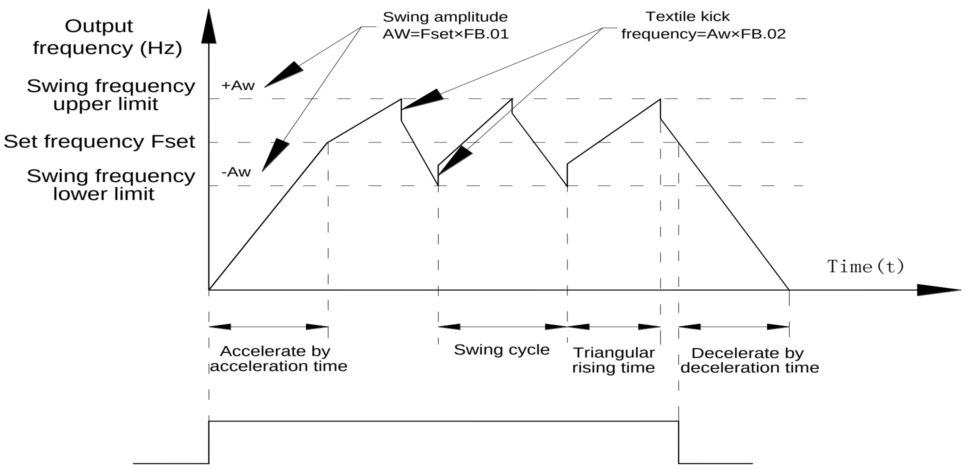
These parameters are used to judge whether PID feedback is lost.
If the PID feedback is smaller than the value of FA.26 and the lasting time exceeds the value of FA.27, the AC drive reports Err31 and acts according to the selected fault protection action.

Function Code	Name	Setting Range
FA.28	PID operation at stop	0-1[0]

It is used to select whether to continue PID operation in the state of stop. Generally, the PID operation stops when the AC drive stops.

Group FB: Swing Frequency, Fixed Length and Count

The swing frequency function is applied to the textile and chemical fiber fields and the applications where traversing and winding functions are required.
The swing frequency function indicates that the output frequency of the AC drive swings up and down with the set frequency as the center. The trace of running frequency at the time axis is shown in the following figure.
The swing amplitude is set in FB.00 and FB.01. When FB.01 is set to 0, the swing amplitude is 0 and the swing frequency does not take effect.
Figure Swing frequency control



Function Code	Name	Setting Range
FB.00	Swing frequency setting mode	0-1[0]

0: Relative to the central frequency

1: Relative to the maximum frequency

This parameter is used to select the base value of the swing amplitude.

- 0: Relative to the central frequency (F0.07 frequency source selection)

It is variable swing amplitude system. The swing amplitude varies with the central frequency (set frequency).

- 1: Relative to the maximum frequency (F0.10 maximum output frequency)

It is fixed swing amplitude system. The swing amplitude is fixed.

Function Code	Name	Setting Range
FB.01	Swing frequency amplitude	0.0%–100.0%[0.0%]
FB.02	Jump frequency amplitude	0.0%–50.0%[50.0%]

This parameter is used to determine the swing amplitude and jump frequency amplitude. The swing frequency is limited by the frequency upper limit and frequency lower limit.

- If relative to the central frequency (FB.00 = 0), the actual swing amplitude AW is the calculation result of F0.07 (Frequency source selection) multiplied by FB.01.
- If relative to the maximum frequency (FB.00 = 1), the actual swing amplitude AW is the calculation result of F0.10 (Maximum frequency) multiplied by FB.01.

Jump frequency = Swing amplitude AW x FB.02 (Jump frequency amplitude).

- If relative to the central frequency (FB.00 = 0), the jump frequency is a variable value.
- If relative to the maximum frequency (FB.00 = 1), the jump frequency is a fixed value.

The swing frequency is limited by the frequency upper limit and frequency lower limit.

Function Code	Name	Setting Range
FB.03	Swing frequency cycle	0.0–3000.0s[10.0S]
FB.04	Triangular wave rising time coefficient	0.0%–100.0%[50.0%]

FB.03 specifies the time of a complete swing frequency cycle.

FB.04 specifies the time percentage of triangular wave rising time to FB.03 (Swing frequency cycle).

- Triangular wave rising time = FB.03 (Swing frequency cycle) x FB.04 (Triangular wave rising time coefficient, unit: s)
- Triangular wave falling time = FB.03 (Swing frequency cycle) x (1 – FB.04 Triangular wave rising time coefficient ,unit: s)

Function Code	Name	Setting Range
FB.05	Set length	0–65535m[1000m]
FB.06	Actual length	0–65535m[0m]
FB.07	Number of pulses per meter	0.1–6553.5[100.0]

The preceding parameters are used for fixed length control.

The length information is collected by X terminal. FB.06 (Actual length) is calculated by dividing the number of pulses collected by the X terminal by FB.07 (Number of pulses each meter).

When the actual length FB.06 exceeds the set length in FB.05, the DO terminal allocated with function 10 (Length reached) becomes ON.

During the fixed length control, the length reset operation can be performed via the X terminal allocated with function 28. For details, see the descriptions of F4.00 to F4.09.

Allocate corresponding X terminal with function 27 (Length count input) in applications. If the pulse frequency is high, X5 must be used.

Function Code	Name	Setting Range
FB.08	Set count value	0–65535[1000]
FB.09	Designated count value	0–65535[1000]

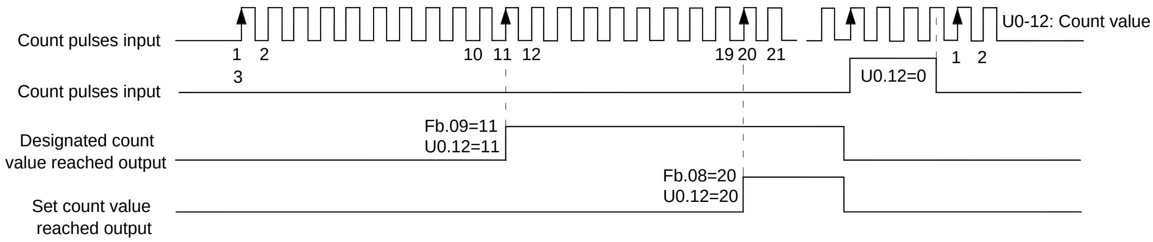
The count value needs to be collected by X terminal. Allocate the corresponding X terminal with function 25 (Counter input) in applications. If the pulse frequency is high, X5 must be used.

When the count value reaches the set count value (FB.08), the DO terminal allocated with function 8 (Set count value reached) becomes ON. Then the counter stops counting.

When the counting value reaches the designated counting value (FB.09), the DO terminal allocated with function 9 (Designated count value reached) becomes ON. Then the counter continues to count until the set count value is reached.

FB.09 should be equal to or smaller than FB.08.

Figure reaching the set count value and designated count value



Group FC: Multi-Reference and Simple PLC Function

Function Code	Name	Setting Range
FC.00	Reference 0	-100.0%–100.0%[0.0%]
FC.01	Reference 1	-100.0%–100.0%[0.0%]
FC.02	Reference 2	-100.0%–100.0%[0.0%]
FC.03	Reference 3	-100.0%–100.0%[0.0%]
FC.04	Reference 4	-100.0%–100.0%[0.0%]
FC.05	Reference 5	-100.0%–100.0%[0.0%]
FC.06	Reference 6	-100.0%–100.0%[0.0%]
FC.07	Reference 7	-100.0%–100.0%[0.0%]
FC.08	Reference 8	-100.0%–100.0%[0.0%]
FC.09	Reference 9	-100.0%–100.0%[0.0%]
FC.10	Reference 10	-100.0%–100.0%[0.0%]
FC.11	Reference 11	-100.0%–100.0%[0.0%]
FC.12	Reference 12	-100.0%–100.0%[0.0%]

FC.13	Reference 13	-100.0%–100.0%[0.0%]
FC.14	Reference 14	-100.0%–100.0%[0.0%]
FC.15	Reference 15	-100.0%–100.0%[0.0%]

Multi-reference can be the setting source of frequency, V/F separated voltage and process PID. The multi-reference is relative value and ranges from -100.0% to 100.0%.

As frequency source, it is a percentage relative to the maximum frequency. As V/F separated voltage source, it is a percentage relative to the rated motor voltage. As process PID setting source, it does not require conversion.

Multi-reference can be switched over based on different states of X terminal. For details, see the descriptions of group F4.

Function Code	Name	Setting Range
FC.16	Simple PLC running mode	0–2[0]

0: Stop after the AC drive runs one cycle

1: Keep final values after the AC drive runs one cycle

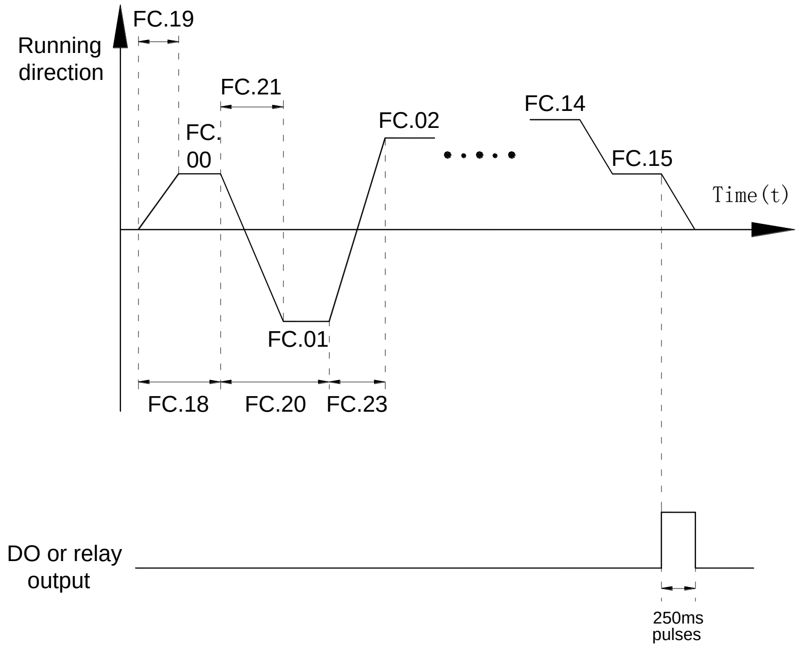
2: Repeat after the AC drive runs one cycle

- 0: Stop after the AC drive runs one cycle
  The AC drive stops after running one cycle, and will not start up until receiving another command.
- 1: Keep final values after the AC drive runs one cycle
  The AC drive keeps the final running frequency and direction after running one cycle.
- 2: Repeat after the AC drive runs one cycle
  The AC drive automatically starts another cycle after running one cycle, and will not stop until receiving the stop command.

Simple PLC can be either the frequency source or V/F separated voltage source.

When simple PLC is used as the frequency source, whether parameter values of FC.00 to FC.15 are positive or negative determines the running direction. If the parameter values are negative, it indicates that the AC drive runs in reverse direction

figure 6-32 Simple PLC when used as frequency source



Function Code	Name	Setting Range
FC.17	Simple PLC retentive selection	0–1[00]

PLC retentive upon power failure indicates that the AC drive memorizes the PLC running moment and running frequency before power failure and will continue to run from the memorized moment after it is powered on again. If the unit's digit is set to 0, the AC drive restarts the PLC process after it is powered on again.

PLC retentive upon stop indicates that the AC drive records the PLC running moment and running frequency upon stop and will continue to run from the recorded moment after it starts up again. If the ten's digit is set to 0, the AC drive restarts the PLC process after it starts up again.

Function Code	Name	Setting Range
FC.18	Running time of simple PLC reference 0	0.0–6500.0s (h)[0.0s(h)]
FC.19	Acceleration/deceleration time of simple PLC reference 0	0-3[0]
FC.20	Running time of simple PLC reference 1	0.0–6500.0s (h)[0.0s(h)]
FC.21	Acceleration/deceleration time of simple PLC reference 1	0-3[0]
FC.22	Running time of simple PLC reference 2	0.0–6500.0s (h)[0.0s(h)]
FC.23	Acceleration/deceleration time of simple PLC reference 2	0-3[0]
FC.24	Running time of simple PLC reference 3	0.0–6500.0s (h)[0.0s(h)]
FC.25	Acceleration/deceleration time of simple PLC reference 3	0-3[0]
FC.26	Running time of simple PLC reference 4	0.0–6500.0s (h)[0.0s(h)]
FC.27	Acceleration/deceleration time of simple PLC reference 4	0-3[0]
FC.28	Running time of simple PLC reference 5	0.0–6500.0s (h)[0.0s(h)]
FC.29	Acceleration/deceleration time of simple PLC reference 5	0-3[0]
FC.30	Running time of simple PLC reference 6	0.0–6500.0s (h)[0.0s(h)]
FC.31	Acceleration/deceleration time of simple PLC reference 6	0-3[0]
FC.32	Running time of simple PLC reference 7	0.0–6500.0s (h)[0.0s(h)]
FC.33	Acceleration/deceleration time of simple PLC reference 7	0-3[0]
FC.34	Running time of simple PLC reference 8	0.0–6500.0s (h)[0.0s(h)]
FC.35	Acceleration/deceleration time of simple PLC reference 8	0-3[0]
FC.36	Running time of simple PLC reference 9	0.0–6500.0s (h)[0.0s(h)]
FC.37	Acceleration/deceleration time of simple PLC reference 9	0-3[0]
FC.38	Running time of simple PLC reference 10	0.0–6500.0s (h)[0.0s(h)]
FC.39	Acceleration/deceleration time of simple PLC reference 10	0-3[0]
FC.40	Running time of simple PLC reference 11	0.0–6500.0s (h)[0.0s(h)]
FC.41	Acceleration/deceleration time of simple PLC reference 11	0-3[0]
FC.42	Running time of simple PLC reference 12	0.0–6500.0s (h)[0.0s(h)]
FC.43	Acceleration/deceleration time of simple PLC reference 12	0-3[0]
FC.44	Running time of simple PLC reference 13	0.0–6500.0s (h)[0.0s(h)]

FC.45	Acceleration/deceleration time of simple PLC reference 13	0-3[0]
FC.46	Running time of simple PLC reference 14	0.0–6500.0s (h)[0.0s(h)]
FC.47	Acceleration/deceleration time of simple PLC reference 14	0-3[0]
FC.48	Running time of simple PLC reference 15	0.0–6500.0s (h)[0.0s(h)]
FC.49	Acceleration/deceleration time of simple PLC reference 15	0-3[0]

Function Code	Name	Setting Range
FC.50	Time unit of simple PLC running	0-1[0]

0: s (second)

1: h (hour)

Function Code	Name	Setting Range
FC.51	Reference 0 source	0-6[0]

0: Set by FC.00

1: VCI

2: CCI

3: ACI

4: X5

5: PID

6: Set by preset frequency (F0.08), modified via terminal UP/DOWN

It determines the setting channel of reference 0. You can perform convenient switchover between the setting channels. When multi-reference or simple PLC is used as frequency source, the switchover between two frequency sources can be realized easily.

Group FD: Communication Parameter

Please reference (FST-650 Communication Protocol)

Group FE: User-Defined Function Codes

Function Code	Name	Setting Range
FE.00	User-defined function code 0	F0.00 to FP.xx, A0.00 to Ax.xx, U0.00 to U0.xx U3.00 to U3..xx [U3.17]
FE.01	User-defined function code 1	Same as FE.00 [U3.16]
FE.02	User-defined function code 2	Same as FE.00 [FE.00]

Function Code	Name	Setting Range
FE.03	User-defined function code 3	Same as FE.00 [FE.00]
FE.04	User-defined function code 4	Same as FE.00 [FE.00]
FE.05	User-defined function code 5	Same as FE.00 [FE.00]
FE.06	User-defined function code 6	Same as FE.00 [FE.00]
FE.07	User-defined function code 7	Same as FE.00 [FE.00]
FE.08	User-defined function code 8	Same as FE.00 [FE.00]
FE.09	User-defined function code 9	Same as FE.00 [FE.00]
FE.10	User-defined function code 10	Same as FE.00 [FE.00]
FE.11	User-defined function code 11	Same as FE.00 [FE.00]
FE.12	User-defined function code 12	Same as FE.00 [FE.00]
FE.13	User-defined function code 13	Same as FE.00 [FE.00]
FE.14	User-defined function code 14	Same as FE.00 [FE.00]
FE.15	User-defined function code 15	Same as FE.00 [FE.00]
FE.16	User-defined function code 16	Same as FE.00 [FE.00]
FE.17	User-defined function code 17	Same as FE.00 [FE.00]
FE.18	User-defined function code 18	Same as FE.00 [FE.00]
FE.19	User-defined function code 19	Same as FE.00 [FE.00]
FE.20	User-defined function code 20	Same as FE.00 [FE.00]
FE.21	User-defined function code 21	Same as FE.00 [FE.00]
FE.22	User-defined function code 22	Same as FE.00 [FE.00]
FE.23	User-defined function code 23	Same as FE.00 [FE.00]
FE.24	User-defined function code 24	Same as FE.00 [FE.00]
FE.25	User-defined function code 25	Same as FE.00 [FE.00]
FE.26	User-defined function code 26	Same as FE.00 [FE.00]
FE.27	User-defined function code 27	Same as FE.00 [FE.00]
FE.28	User-defined function code 28	Same as FE.00 [FE.00]
FE.29	User-defined function code 29	Same as FE.00 [FE.00]
FE.30	User-defined function code 30	Same as FE.00 [FE.00]
FE.31	User-defined function code 31	Same as FE.00 [FE.00]

FE is user-defined parameter group. You can select the required parameters from all FST-650functions codes and add them into this group, convenient for view and modification.

Group FE provides a maximum of 30 user-defined parameters. If "FE.00" is displayed, it indicates that group FE is null. After you enter user-defined function code mode, the displayed parameters are defined by FE.00 to FE.31 and the sequence is consistent with that in group FE.

Group FP: User Password

Function Code	Name	Setting Range
FP.00	User password	0–65535[0]

If it is set to any non-zero number, the password protection function is enabled. After a password has been set and taken effect, you must enter the correct password in order to enter the menu. If the entered password is incorrect you cannot view or modify parameters.

If FP.00 is set to 00000, the previously set user password is cleared, and the password protection function is disabled.

Function Code	Name	Setting Range
FP.01	Restore default settings	0/1/2/4/501[0]

0: No operation

1: Restore factory settings except motor parameters

2: Clear records

4: Restore user backup parameters

501: Back up current user parameters

- 1: Restore default settings except motor parameters

  If FP.01 is set to 1, most function codes are restored to the default settings except motor parameters, frequency reference resolution (F0.22), fault records, accumulative running time (F7.09), accumulative power-on time (F7.13) and accumulative power consumption (F7.14).

- 2: Clear records

  If FP.01 is set to 2, the fault records, accumulative running time (F7.09), accumulative power-on time (F7.13) and accumulative power consumption (F7.14) are cleared.

- 4: Back up current user parameters

  If FP.01 is set to 4, the current parameter settings are backed up, helping you to restore the setting if incorrect parameter setting is performed.

- 501: Restore user backup parameters

  If FP.01 is set to 501, the previous backup user parameters are restored.

Function Code	Name	Setting Range
FP.02	AC drive parameter display property	0-1[11]

Unit's digit (Group U display selection)

0: Not display

1: Display

Ten's digit (Group A display selection)

0: Not display

1: Display

Function Code	Name	Setting Range
FP.03	Individualized parameter display property	0-1[00]

Unit's digit (User-defined parameter display selection)

0: Not display

1: Display

Ten's digit (User-modified parameter display selection)

0: Not display

1: Display

The setting of parameter display mode aims to facilitate you to view different types of parameters based on actual requirements. The drive provides the following three parameter display modes.

Three parameter display modes provided by the drive

If one digit of FP.03 is set to 1, you can switch over to different parameter display modes by pressing key "QUICK" By default, the AC drive parameter display mode is used.

The display codes of different parameter types are shown in the following table.

Table 6-10 Display codes of different parameter types

	Display Code
AC drive parameter	-bASE
User-defined parameter	-USEr
User-modified parameter	--C--

The FST650 provides display of two types of individualized parameters: user-defined parameters and user-modified parameters.

- You-defined parameters are included in group FE. You can add a maximum of 32 parameters, convenient for commissioning.

  In user-defined parameter mode, symbol "u" is added before the function code. For example, F1.00 is displayed as uF1.00.

- You-modified parameters are grouped together, convenient for on-site troubleshooting. In you-modified parameter mode, symbol "c" is added before the function code. For example, F1.00 is displayed as uF1.00.

Function Code	Name	Setting Range
FP.04	Parameter modification property	0-1[0]

0: Modifiable

1: Not modifiable

It is used to set whether the parameters are modifiable to avoid mal-function. If it is set to 0, all parameters are modifiable. If it is set to 1, all parameters can only be viewed.

Group A0: Torque Control and Restricting Parameters

Function Code	Name	Setting Range
A0.00	Speed/Torque control selection	0-1 [0]

0: Speed control

1: Torque control

It is used to select the AC drive's control mode: speed control or torque control.

The drive provides X terminal with two torque related functions, function 29 (Torque control prohibited) and function 46 (Speed control/Torque control switchover). The two X terminal need to be used together with A0-00 to implement speed control/torque control switchover.

If the X terminal allocated with function 46 (Speed control/Torque control switchover) is OFF, the control mode is determined by A0.00. If the X terminal allocated with function 46 is ON, the control mode is reverse to the value of A0.00.

However, if the X terminal with function 29 (Torque control prohibited) is ON, the AC drive is fixed to run in the speed control mode.

Function Code	Name	Setting Range
A0.01	Torque setting source in torque control	0-7 [0]

0: Digital setting (A0.03)

1:VCI

2: CCI

3: ACI

4:X5

5: Communication setting

6: MIN (VCI, C C I)

7: MAX (VCI, C C I)

A0.01 is used to set the torque setting source. There are a total of eight torque setting sources.

The torque setting is a relative value. 100.0% corresponds to the AC drive's rated torque. The setting range is -200.0% to 200.0%, indicating the AC drive's maximum torque is twice of the AC drive's rated torque.

If the torque setting is positive, the AC drive rotates in forward direction. If the torque setting is negative, the AC drive rotates in reverse direction.

- 0: Digital setting (A0.03)

  The target torque directly uses the value set in A0.03.
- 1: VCI
- 2: CCI
- 3: ACI

The target torque is decided by analog input. The FST650 control board provides two AI terminals (VCI, CCI). Another AI terminal (ACI) is provided by the I/O extension card. VCI is 0–10 V voltage input, CCI is 0–10 V voltage input or 4–20 mA current input decided by jumper J8 on the control board, and ACI is -10 V to +10 V voltage input.

The FST650 provides five curves indicating the mapping relationship between the input voltage of VCI, CCI and ACI and the target frequency, three of which are linear (point-point) correspondence and two of which are four-point correspondence curves

You can set the curves by using function codes F4.13 to F4.27 and function codes in group A6, and select curves for VCI, CCI and ACI in F4.33.

When AI is used as frequency setting source, the corresponding value 100% of voltage/ current input corresponds to the value of A0.03.

- 4: Pulse setting (X5)

The target torque is set by X5 (high-speed pulse). The pulse setting signal specification is 9–30 V (voltage range) and 0–100 kHz (frequency range). The pulse can only be input via X5. The relationship (which is a two-point line) between X5 input pulse frequency and the corresponding value is set in F4.28 to F4.31. The corresponding value 100.0% of pulse input corresponds to the value of A0.03.

- 5: Communication setting

The target torque is set by means of communication.

If the AC drive is a slave in point-point communication and receives data as torque source, data transmitted by the master is used as the setting value. For details, see the description of group A8.

If PROFIBUS-DP communication is valid and PZD1 is used for torque setting, data transmitted by PDZ1 is directly used as the torque source. The data format is -100.00% to 100.00%. 100% corresponds to the value of A0.03.

In other conditions, data is given by host computer through the communication address 0x1000. The data format is -100.00% to 100.00%. 100% corresponds to the value of A0.03.

The FST650 supports four host computer communication protocols:Modbus, PROFIBUS-DP, CANopen and CANlink. They cannot be used simultaneously.

If the communication mode is used, a communication card must be installed. The FST650 provides four optional communication cards and you can select one based on actual requirements. If the communication protocol is Modbus, PROFIBUS-DP or CANopen, the corresponding serial communication protocol needs to be selected based on the setting of F0.28.

The CANlink protocol is always valid.

Function Code	Name	Setting Range
A0.03	Torque digital setting in torque control	-200.0%–+200.0% [150.0%]

Function Code	Name	Setting Range
A0.05	Forward maximum frequency in torque control	0.00Hz-F0.10[50.00Hz]
A0.06	Reverse maximum frequency in torque control	0.00Hz-F0.10[50.00Hz]

The two parameters are used to set the maximum frequency in forward or reverse rotation in torque control mode.

In torque control, if the load torque is smaller than the motor output torque, the motor's rotational speed will rise continuously. To avoid runaway of the mechanical system, the motor maximum rotating speed must be limited in torque control.

You can implement continuous change of the maximum frequency in torque control dynamically by controlling the frequency upper limit

Function Code	Name	Setting Range
A0.07	Acceleration time in torque control	0.00–650.00s [0.00s]
A0.08	Deceleration time in torque control	0.00–650.00s [0.00s]

In torque control, the difference between the motor output torque and the load torque determines the speed change rate of the motor and load. The motor rotational speed may change quickly and this will result in noise or too large mechanical stress. The setting of acceleration/deceleration time in torque control makes the motor rotational speed change softly.

However, in applications requiring rapid torque response, set the acceleration/deceleration time in torque control to 0.00s. For example, two AC drives are connected to drive the same load. To balance the load allocation, set one AC drive as master in speed control and the other as slave in torque control. The slave receives the master's output torque as the torque command and must follow the master rapidly. In this case, the acceleration/deceleration time of the slave in torque control is set to 0.0s.

Group A1: Virtual X /Virtual DO

Function Code	Name	Setting Range
A1.00	VX1 function selection	0-59 [0]
A1.01	VX2 function selection	0-59 [0]
A1.02	VX3 function selection	0-59 [0]
A1.03	VX4 function selection	0-59 [0]
A1.04	VX5 function selection	0-59 [0]

VX1 to VX5 have the same functions as X terminals on the control board and can be used for digital input. For more details, see description of F4.00 to F4.09.

Function Code	Name	Setting Range
A1.05	VX state setting mode	0-1 [00000]

Unit's digit (VX1)

0: Decided by state of VX

1: Decided by A1.06

Ten's digit (VX2)

0, 1 (same as VX1)

Hundred's digit (VX3)

0, 1 (same as VX1)

Thousand's digit (VX4)

0, 1 (same as VX1)

Ten thousand's digit (VX5)

0, 1 (same as VX1)

Function Code	Name	Setting Range
A1.06	VX state selection	0-1 [00000]

Unit's digit (VX1)

0: Invalid

1: Valid

Ten's digit (VX2)

0, 1 (same as VX1)

Hundred's digit (VX3)

0, 1 (same as VX1)

Thousand's digit (VX4)

0, 1 (same as VX1)

Ten thousand's digit (VX5)

0, 1 (same as VX1)

Different from DI terminals, VX state can be set in two modes, selected in A1.05:

- Decided by state of VDOx

  Whether the state a VX is valid is determined by the state of the corresponding VDO and VXx is uniquely bound to VDOx (x is between 1 and 5). For example, to implement the function that the AC drive reports an alarm and stops when the VX input exceeds the limit, perform the following setting: 1) Allocate VX1 with function 44 "User-defined fault 1" (A1.00 = 44). 2) Set A1.05

to xxx0.

3) Allocate VDO1 with function 31 "VCI input limit exceeded" (A1.11 = 31).

When the VCI input exceeds the limit, VDO1 becomes ON. At this moment, VX1 becomes ON and the AC drive receives you-defined fault 1. Then the AC drive reports Err27 and stops.

• Decided by A1.06

The VX state is determined by the binary bit of A1.06. For example, to implement the function that the AC drive automatically enters the running state after power-on, perform the following setting:

1) Allocate VX1 with function 1 "Forward RUN (FWD)" (A1.00 = 1).
2) Set A1.05 to xxx1: The state of VX1 is decided by A1.06.
3) Set A1.06 to xxx1: VX1 is valid.
4) Set F0.02 to 1: The command source to terminal control.
5) Set F8.18 to 0: Startup protection is not enabled.

When the AC drive completes initialization after power-on, it detects that VX1 is valid and VX1 is allocated with the function of forward RUN. That is, the AC drive receives the forward RUN command from the terminal. Therefore, The AC drive starts to run in forward direction.

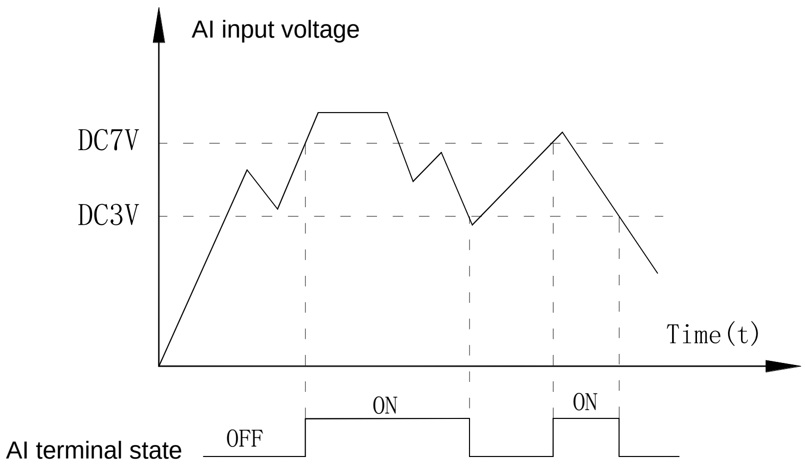
Function Code	Name	Setting Range
A1.07	Function selection for VCI used as DI	0-59 [0]
A1.08	Function selection for CCI used as DI	0-59 [0]
A1.09	Function selection for ACI used as DI	0-59 [0]
A1.10	State selection for AI used as DI	0-1 [000]

Unit's digit (VCI)
0: High level valid
1: Low level valid
Ten's digit (CCI)
0, 1 (same as unit's digit)
Hundred's digit (ACI)
0, 1 (same as unit's digit)

The functions of these parameters are to use AI as DI. When AI is used as DI, the AI state is high level if the AI input voltage is 7 V or higher and is low level if the AI input voltage is 3 V or lower. The AI state is hysteresis if the AI input voltage is between 3 V and 7 V. A1.10 is used to determine whether high level valid or low level valid when AI is used as DI.

The setting of AIs (used as DI) function is the same as that of DIs. For details, see the descriptions of group F4.

The following figure takes AI input voltage as an example to describe the relationship between AI input voltage and corresponding DI state.



Function Code	Name	Setting Range
A1.11	VDO1 function selection	0-40 [0]
A1.12	VDO2 function selection	0-40 [0]
A1.13	VDO3 function selection	0-40 [0]
A1.14	VDO4 function selection	0-40 [0]
A1.15	VDO5 function selection	0-40 [0]
A1.16	VDO1 output delay	0.0–3600.0s [0.0S]
A1.17	VDO2 output delay	0.0–3600.0s [0.0S]
A1.18	VDO3 output delay	0.0–3600.0s [0.0S]
A1.19	VDO4 output delay	0.0–3600.0s [0.0S]
A1.20	VDO5 output delay	0.0–3600.0s [0.0S]
A1.21	VDO state selection	0-1 [00000]

VDO functions are similar to the DO functions on the control board. The VDO can be used together with VXx to implement some simple logic control.

- If VDO function is set to 0, the state of VDO1 to VDO5 is determined by the state of X1 to X5 on the control board. In this case, VDOx and Xx are one-to-one mapping relationship.
- If VDO function is set to non-0, the function setting and use of VDOx are the same as DO in group F5.

The VDOx state can be set in A1.21. The application examples of VXx involve the use of VDOx, and see the examples for your reference.

Group A2 : Motor 2 Parameters

The FST650 can switch over the running among four motors. For the four motors, you can:

- Set motor nameplate parameters respectively
- Perform motor parameter auto-tuning respectively
- Select V/F control or vector control respectively

- Set encoder-related parameters respectively
- Set parameters related to V/F control or vector control independently

Groups A2,respectively motor2. The parameters of the three groups are the same. Here we just list the parameters of group A2 for reference.

All parameters in group A2 have the same definition and usage as parameters of motor 1. For more details, refer to the descriptions of motor 1 parameters.

Function Code	Name	Setting Range
A2.00	Motor type selection	0-1 [0]

0: Common asynchronous motor

1: Variable frequency asynchronous motor

Function Code	Name	Setting Range
A2.01	Rated motor power	0.1–1000.0 kW [Model dependent]
A2.02	Rated motor voltage	1–2000 V [Model dependent]
Function Code	**Name**	**Setting Range**
A2.03	Rated motor current	0.01–655.35 A (AC drive power ≤ 55 kW) 0.1–6553.5 A (AC drive power > 55 kW) [Model dependent]
A2.04	Rated motor frequency	0.01 Hz to maximum frequency [Model dependent]
A2.05	Rated motor rotational speed	1–65535 RPM [Model dependent]
A2.06	Stator resistance (asynchronous motor)	0.001–65.535 Ω(AC drive power ≤ 55 kW) 0.0001–6.5535 Ω(AC drive power > 55 kW) [Model dependent]
A2.07	Rotor resistance (asynchronous motor)	0.001–65.535 Ω(AC drive power ≤ 55 kW) 0.0001–6.5535 Ω(AC drive power > 55 kW) [Model dependent]
A2.08	Leakage inductive reactance (asynchronous motor)	0.01–655.35mH (AC drive power ≤ 55 kW) 0.001–65.535mH(AC drive power > 55 kW) [Model dependent]
A2.09	Mutual inductive reactance (asynchronous motor)	0.1–6553.5 mH (AC drive power ≤ 55 kW) 0.01–655.35 mH (AC drive power > 55 kW) [Model dependent]
A2.10	No-load current (asynchronous motor)	0.01 A to A2-03 (AC drive power ≤ 55 kW) 0.1 A to A2-03 (AC drive power > 55 kW) [Model dependent]
A2.27	Encoder pulses per revolution	1–65535[1024]
A2.28	Encoder type	0-4 [0]

0: ABZ incremental encoder

1: UVW incremental encoder

2: Resolver

3: SIN/COS encoder

4: Wire-saving UVW encoder

Function Code	Name	Setting Range
A2.29	Speed feedback PG selection	0–2 [0]

0:local PG

1:Extend PG

2: X5

Function Code	Name	Setting Range
A2.30	A, B phase sequence of ABZ incremental encoder	0–1 [0]

0: Forward

1: Reserve

Function Code	Name	Setting Range
A2.31	Encoder installation angle	0.0°–359.9° [0.0°]
Function Code	**Name**	**Setting Range**
A2.32	U, V, W phase sequence of UVW encoder	0-1[0]

0: Forward

1: Reverse

Function Code	Name	Setting Range
A2.33	UVW encoder angle offset	0.0°–359.9° [0.0°]
A2.34	Number of pole pairs of resolver	1–65535 [1]
A2.36	Encoder wire-break fault detectiontime	0.0s: No action 0.1-10.0S [0.0S]
A2.37	Auto-tuning selection	0-3 [0]

0: No auto-tuning

1: Asynchronous motor static auto-tuning1

2: Asynchronous motor complete auto-tuning

3: Synchronous motor with-load auto-tuning2

Function Code	Name	Setting Range
A2.38	Speed loop proportional gain 1	0–100 [30]
A2.39	Speed loop integral time 1	0.01–10.00s [0.050S]
A2.40	Switchover frequency 1	0.00 to A2-43 [5.00Hz]
A2.41	Speed loop proportional gain 2	0–100 [15]
A2.42	Speed loop integral time 2	0.01–10.00s [1.00s]
A2.43	Switchover frequency 2	A2-40 –F0.10 [10.00Hz]
A2.44	Vector control slip gain	50%–200% [100%]

Function Code	Name	Setting Range
A2.45	Constant of SVC torque filter	1-31 [28]
A2.47	Torque upper limit source in speed control mode	0-7 [0]

0: A2.48
1: VCI
2: CCI
3: ACI
4:X5
5: Via communication
6: MIN(VCI,CCI)
7: MAX(VCI,CCI)

Function Code	Name	Setting Range
A2.48	Digital setting of torque upper limit in speed control mode	0.0%–200.0% [150.0%]
A2.51	Excitation adjustment proportional gain	0–60000 [2000]
A2.52	Excitation adjustment integral gain	0–60000 [1300]
A2.53	Torque adjustment proportional gain	0–60000 [2000]
A2.54	Torque adjustment integral gain	0–60000 [1300]
A2.55	Speed loop integral property	Unit's digit: Integral separated 0: Disabled1: Enabled [0]
A2.59	Weak Sectors Max torque coefficient	50.0%–200.0% [100.0%]
A2.60	Generated power upper limit	0-3[0] 0:invalid 1: entire valid 2. constant speed valid 3. decelerate valid
A2.61	Generated power limit	0-200%[Model dependent]
A2.62	Motor 2 control mode	0-2 [0]

0: Sensorless flux vector control (SVC)
1: Closed-loop vector control (FVC)
2: Voltage/Frequency (V/F) control

Function Code	Name	Setting Range
A2.63	Motor 2 acceleration/ deceleration time	0-4 [0]

0: Same as motor 1
1: Acceleration/Deceleration time 1
2: Acceleration/Deceleration time 2
3: Acceleration/Deceleration time 3
4: Acceleration/Deceleration time 4

Function Code	Name	Setting Range
A2.64	Motor 2 torque boost	0.0%: Automatic torque boost 0.1%–30.0% [Model dependent]
A2.66	Motor 2 oscillation suppression gain	0-100 [Model dependent]

Group A5: Control Optimization Parameters

Function Code	Name	Setting Range
A5.00	DPWM switchover frequency upper limit	5.00–F0.10 Hz [8.00Hz]

This parameter is valid only for V/F control.

It is used to determine the wave modulation mode in V/F control of asynchronous motor. If the frequency is lower than the value of this parameter, the waveform is 7-segment continuous modulation. If the frequency is higher than the value of this parameter, the waveform is 5-segment intermittent modulation.

The 7-segment continuous modulation causes more loss to switches of the AC drive but smaller current ripple. The 5-segment intermittent modulation causes less loss to switches of the AC drive but larger current ripple. This may lead to motor running instability at high frequency. Do not modify this parameter generally.

For instability of V/F control, refer to parameter F3.11. For loss to AC drive and temperature rise, refer to parameter F0.15.

Function Code	Name	Setting Range
A5.01	PWM modulation mode	0–1 [0]

This parameter is valid only for V/F control.

Synchronous modulation indicates that the carrier frequency varies linearly with the change of the output frequency, ensuring that the ratio of carrier frequency to output frequency remains unchanged. Synchronous modulation is generally used at high output frequency, which helps improve the output voltage quality.

At low output frequency (100 Hz or lower), synchronous modulation is not required. This is because asynchronous modulation is preferred when the ratio of carrier frequency to output frequency is high.

Synchronous modulation takes effect only when the running frequency is higher than 85 Hz. If the frequency is lower than 85 Hz, asynchronous modulation is always used.

Function Code	Name	Setting Range
A5.02	Dead zone compensation mode selection	0–1 [1]

Generally, you need not modify this parameter. Try to use a different compensation mode only when there is special requirement on the output voltage waveform quality or oscillation occurs on the motor.

Function Code	Name	Setting Range
A5.03	Random PWM depth	0-10[0]

The setting of random PWM depth can make the shrill motor noise softer and reduce the electromagnetic interference. If this parameter is set to 0, random PWM is invalid

Function Code	Name	Setting Range
A5.04	Rapid current limit	0–1 [1]

The rapid current limit function can reduce the AC drive's overcurrent faults at maximum, guaranteeing uninterrupted running of the AC drive.

However, long-time rapid current limit may cause the AC drive to overheat, which is not allowed. In this case, the AC drive will report Err40, indicating the AC drive is overloaded and needs to stop.

Function Code	Name	Setting Range
A5.05	Current detection compensation	0–100 [5]

It is used to set the AC drive current detection compensation. Too large value may lead to deterioration of control performance. Do not modify it generally.

Function Code	Name	Setting Range
A5.06	Undervoltage threshold	200–2000 [Model dependent]

It is used to set the undervoltage threshold of Err09. The undervoltage threshold 100% of the AC drive of different voltage classes corresponds to different nominal values, as listed in the following table.

Table 6-11 Overvoltage thresholds for different voltage classes

Voltage Class	Nominal Value of Undervoltage threshold
Single-phase 220 V	200 V
Three-phase 220 V	200 V
Three-phase 380 V	350 V
Three-phase 480 V	450 V
Three-phase 690 V	650 V
Three-phase 1140 V	1100 V

Function Code	Name	Setting Range
A5.07	SFVC optimization mode selection	1–2 [2]
A5.08	Dead-zone time adjustmen	100%–200%[150%]

It is only valid for 1140 V voltage class.

You can modify the value of this parameter to improve the voltage utilization rate. Too small value may system instability. Do not modify it generally.

Function Code	Name	Setting Range
A5.09	Overvoltage threshold	200.0–2200.0V[Model dependent]

It is used to set the overvoltage threshold of the AC drive. The default values of different voltage classes are listed in the following table.

Table 6-12 Overvoltage thresholds for different voltage classes

Voltage Class	Default Overvoltage Threshold
Single-phase 220 V	400.0 V
Three-phase 220 V	400.0 V
Three-phase 380 V	810.0 V

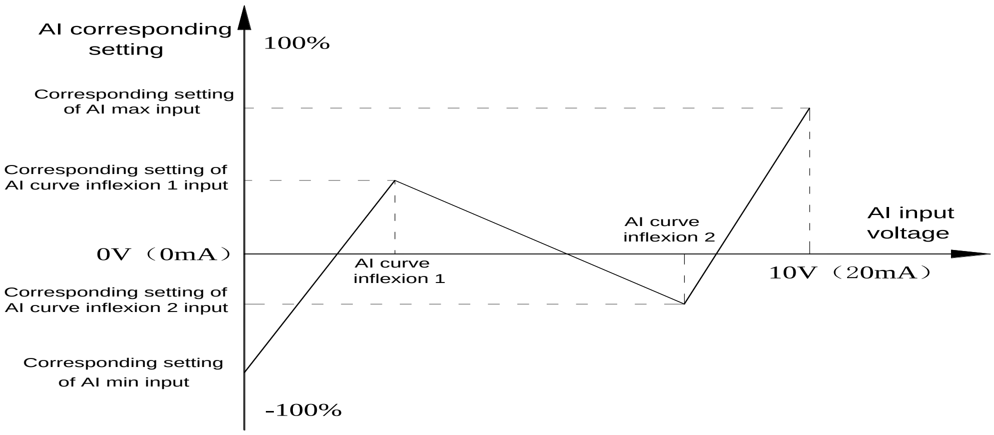
Three-phase 480 V	890.0 V
Three-phase 690 V	1300.0 V

The default value is also the upper limit of the AC drive's internal overvoltage protection voltage. The parameter becomes effective only when the setting of A5.09 is lower than the default value. If the setting is higher than the default value, use the default value.

Group 6:AI Curve Setting

Function Code	Name	Setting Range
A6.00	AI curve 4 minimum input	-10.00 V to A6.02 [0.00V]
A6.01	Corresponding setting of AI curve 4 minimum input	-100.0%–100.0% [0.0%]
A6.02	AI curve 4 inflexion 1 input	A6.00 to A6.04 [3.00V]
A6.03	Corresponding setting of AI curve 4 inflexion 1 input	-100.0%–100.0% [30.0%]
A6.04	AI curve 4 inflexion 1 input	A6.02 to A6.06 [6.00V]
A6.05	Corresponding setting of AI curve 4 inflexion 1 input	-100.0%–100.0% [60.0%]
A6.06	AI curve 4 maximum input	A6.06 to 10.00 V [10.00V]
A6.07	Corresponding setting of AI curve 4 maximum input	-100.0%–100.0% [100.0%]
A6.08	AI curve 5 minimum input	-10.00 V to A6.10 [0.00V]
A6.09	Corresponding setting of AI curve 5 minimum input	-100.0%–100.0% [0.00%]
A6.10	AI curve 5 inflexion 1 input	A6.08 to A6.12 [3.00V]
A6.11	Corresponding setting of AI curve 5 inflexion 1 input	-100.0%–100.0%[30.0%]
A6.12	AI curve 5 inflexion 1 input	A6.10 to A6.14 [3.00V]
A6.13	Corresponding setting of AI curve 5 inflexion 1 input	-100.0%–100.0% [60.0%]
A6.14	AI curve 5 maximum input	A6.12 to 10.00 V [10.0V]
A6.15	Corresponding setting of AI curve 5 maximum input	-100.0%–100.0% [100.0%]

The function of curve 4 and curve 5 is similar to that curve 1 to curve 3, but curve 1 to curve 3 are lines, and curve 4 and curve 5 are 4-point curves, implementing more flexible corresponding relationship. The schematic diagram of curve 4 and curve 5 is shown in the following figure.



When setting curve 4 and curve 5, note that the curve's minimum input voltage, inflexion 1 voltage, inflexion 2 voltage and maximum voltage must be in increment order.

F4.33 (AI curve selection) is used to select curve for VCI to AC

Function Code	Name	Setting Range
A6.24	Jump point of VCI input correspondingsetting	-100.0%–100.0% [0.0%]
A6.25	Jump amplitude of VCI input corresponding setting	0.0%–100.0% [0.5%]
A6.26	Jump point of CCI input corresponding setting	-100.0%–100.0% [0.0%]
A6.27	Jump amplitude of CCI input corresponding setting	0.0%–100.0% [0.5%]
A6.28	Jump point of ACI input corresponding setting	-100.0%–100.0% [0.0%]
A6.29	Jump amplitude of ACI input corresponding setting	0.0%–100.0% [0.5%]

The AI terminals (VCI to ACI) of the FST650 all support the corresponding setting jump function, which fixes the AI input corresponding setting at the jump point when AI input corresponding setting jumps around the jump range.

For example, VCI input voltage jumps around 5.00 V and the jump range is 4.90–5.10 V. VCI minimum input 0.00 V corresponds to 0.0% and maximum input 10.00 V corresponds to 100.0%. The detected VCI input corresponding setting varies between 49.0% and 51.0%.

If you set A6.16 to 50.0% and A6.17 to 1.0%, then the obtained VCI input corresponding setting is fixed to 50.0%, eliminating the fluctuation effect.

Group A7: User Programmable Function

Group A8: Point-point Communication

Function Code	Name	Setting Range
A8.00	Point-point communication selection	0–1 [0]

0: Disabled

1: Enabled

It is used to decide whether to enable point-point communication.

Point-point communication indicates direct communication between two or more FST650AC drives by using CANlink. The master gives target frequency or target torque to one or multiple slaves according to its own frequency or torque signal.

If multiple AC drives are connected by using CANlink cards, the terminal resistor of the CANlink card connected to the end AC drive shall be switched on.

If point-point communication is enabled, the CANlink communication addresses of the AC drives are automatically matched without special setting.

The point-point communication rate is set in FD.00.

Function Code	Name	Setting Range
A8-.2	Slave and master information exchange	0–1 [011]

Unit's digit

0:follow master commend

1:not follow master commend

Ten's digit

0:send fault information

1:not send fault information

Hundred's digit

0:no warning salve off

1:warning slave off

Function Code	Name	Setting Range
A8.03	Data frame selection	0–1 [0]

0: Master slave control frame

1: Droop control frame

Function Code	Name	Setting Range
A8.04	Zero offset of	-100.00%–100.00% [0.00%]
A8.05	Gain of received data	-10.00–10.00 [1.00]

These two parameters are used to adjust data received from the master and define the torque reference relationship between the master and the slave.

If "b" expresses the zero offset of received data, "k" expresses the gain, and "y" expresses the actually used data. The actually used data can be obtained based on the formula:

$y = kx + b$

The value y ranges from -100.00% to 100.00%

Function Code	Name	Setting Range
A8.06	Point-point communication interruption detection time	0.0–10.00 [1.0S]

It is used to set the point-point communication interruption time at which this fault is detected. If it is set to 0, it indicates no detection.

Function Code	Name	Setting Range
A8.07	Master data sending cycle	0.001–10.000s [0.001s]

It is used to set the data sending cycle of the master in point-point communication.

Function Code	Name	Setting Range
A8.08	Zero offset of received data (frequency)	-100.00%–100.00 [0.00%]
A8.09	Gain of received data (frequency)	-10.00–10.00 [1.00]

These two parameters are used to adjust data received from the master and define the frequency reference relationship between the master and the slave.

If "b" expresses the zero offset of received data, "k" expresses the gain, and "y" expresses the actually used data. The actually used data can be obtained based on the formula:

$y = kx + b$

The value y ranges from -100.00% to 100.00%.

Function Code	Name	Setting Range
A8.11	Windows	0.2–10Hz[0.50Hz]

When under master and slave control mode this parameter valid

Group AC: AI/AO Correction

Function Code	Name	Setting Range
AC.00	VCI measured voltage 1	0.500–4.000 V [Factory-corrected]
AC.01	VCI displayed voltage 1	0.500–4.000 V [Factory-corrected]
AC.02	VCI measured voltage 2	6.000–9.999 V [Factory-corrected]
AC.03	VCI displayed voltage 2	6.000–9.999 V [Factory-corrected]
AC.04	CCI measured voltage 1	0.500–4.000 V [Factory-corrected]
AC.05	CCI displayed voltage 1	0.500–4.000 V[Factory-corrected]
AC.06	CCI measured voltage 2	6.000–9.999 V [Factory-corrected]
AC.07	CCI displayed voltage 2	-9.999–10.000 V [Factory-corrected]
AC.08	ACI measured voltage 1	-9.999–10.000 V [Factory-corrected]
AC.09	ACI displayed voltage 1	-9.999–10.000 V [Factory-corrected]
AC.10	ACI measured voltage 2	-9.999–10.000 V [Factory-corrected]
AC.11	ACI displayed voltage 2	-9.999–10.000 V [Factory-corrected]

These parameters are used to correct the AI to eliminate the impact of AI zero offset and gain.

They have been corrected upon delivery. When you resume the factory values, these parameters will be restored to the factory-corrected values. Generally, you need not perform correction in the applications Measured voltage indicates the actual output voltage value measured by instruments such as the multimeter. Displayed voltage indicates the voltage display value sampled by the AC drive. For details, refer to U0.21, U0-22 and U0.23.

During correction, send two voltage values to each AI terminal, and save the measured values and displayed values to the function codes AC.00 to AC.11. Then the AC drive will automatically perform AI zero offset and gain correction.

If the input voltage and the actual voltage sampled by the AC drive are inconsistent, perform correction on site. Take VCI as an example. The on-site correction is as follows:

1) Send a voltage signal (approximately 2 V) to VCI.
2) Measure the VCI voltage and save it to AC.00.
3) View the displayed value of U0.21 and save the value to AC.01.
4) Send a voltage signal (approximately 8 V) to VCI.
5) Measure VCI voltage and save it to AC.02.
6) View the displayed value of U0.21 and save the value to AC.03.

At correction of CCI and ACI, the actually sampled voltage is respectively queried in U0.22 and U0.23. For VCI and CCI, 2 V and 8 V are suggested as the correction voltages. For ACI, -8 V and 8 V are suggested.

Function Code	Name	Setting Range
AC.12	AO1 target voltage 1	0.500–4.000 V [Factory-corrected]
AC.13	AO1 measured voltage 1	0.500–4.000 V [Factory-corrected]
AC.14	AO1 target voltage 2	6.000–.999 V [Factory-corrected]
AC.15	AO1 measured voltage 2	6.000–9.999 V [Factory-corrected]

Function Code	Name	Setting Range
AC.16	AO2 target voltage 1	0.500–4.000 V [Factory-corrected]
AC.17	AO2 measured voltage 1	0.500–4.000 V [Factory-corrected]
AC.18	AO2 target voltage 2	6.000–9.999 V [Factory-corrected]
AC.19	AO2 measured voltage 2	6.000–9.999 V [Factory-corrected]
AC.20	CCI measured current 1	0.000–20.000 mA [Factory-corrected]
AC.21	CCI sampling current 1	0.000–20.000 mA [Factory-corrected]
AC.22	CCI measured current 2	0.000–20.000 mA [Factory-corrected]
AC.23	CCI sampling current 2	0.000–20.000 mA[Factory-corrected]
AC.24	AO1 ideal current 1	0.000–20.000 mA [Factory-corrected]
AC.25	AO1 sampling current 1	0.000–20.000 mA [Factory-corrected]
AC.26	AO1 ideal current 2	0.000–20.000 mA [Factory-corrected]
AC.27	AO1 sampling current 2	0.000–20.000 mA [Factory-corrected]

These parameters are used to correct the AO.

They have been corrected upon delivery. When you resume the factory values, these parameters will be restored to the factory-corrected values. You need not perform correction in the applications.

Target voltage indicates the theoretical output voltage of the AC drive. Measured voltage indicates the actual output voltage value measured by instruments such as the multimeter.

Group U0: Monitoring Parameters

Group U0 is used to monitor the AC drive's running state. You can view the parameter values by using operation panel, convenient for on-site commissioning, or from the host computer by means of communication (address: 0x7000-0x7044).

U0.00 to U0.31 are the monitoring parameters in the running and stop state defined by F7.03 and F7.04. For more details, see Table

Function Code	Name	Setting Range
U0.00	Running frequency	0.00–500Hz
U0.01	Set frequency	0.00–500Hz

These two parameters display the absolute value of theoretical running frequency and set frequency. For the actual output frequency of the AC drive, see U0.19.

Function Code	Name	Setting Range
U0.02	Bus voltage	0.0–3000.0 V

It displays the AC drive's bus voltage.

Function Code	Name	Setting Range
U0.03	Output voltage	0–1140 V

It displays the AC drive's output voltage in the running state.

Function Code	Name	Setting Range
U0.04	Output current	0.00–655.35 A (AC drive power ≤ 55 kW) 0.0–6553.5 A (AC drive power > 55 kW)

It displays the AC drive's output current in the running state.

Function Code	Name	Setting Range
U0.05	Output power	0–32767

It displays the AC drive's output power in the running state

Function Code	Name	Setting Range
U0.06	Output torque	-200.0%–200.0%

It displays the AC drive's output torque in the running state.

Function Code	Name	Setting Range
U0.07	X teminal state	0–32767

It displays the current state of X terminals. After the value is converted into a binary number, each bit corresponds to a X. "1" indicates high level signal, and "0" indicates low level signal. The corresponding relationship between bits and Xs is described in the following table.

Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	Bit9
X1	X2	X3	X4	X5	X6	X7	X8	X9	X10
Bit10	Bit11	Bit12	Bit13	Bit10	Bit11	Bit12	Bit13	Bit14	Bit15
VX1	VX2	VX3	VX4	VX1	VX2	VX3	VX4	VX5	

Function Code	Name	Setting Range
U0.08	DO state	0–1023

It indicates the current state of DO terminals. After the value is converted into a binary number, each bit corresponds to a DO. "1" indicates high level signal, and "0" indicates low level signal. The corresponding relationship between bits and DOs is described in the following table.

Corresponding relationship between bits and DOs

Bit0	Bit1	Bit2	Bit3	Bit4	Bit5
DO	Relay 1	Relay 2	DO1	DO2	VDO1
Bit6	Bit7	Bit8	Bit9	Bit10	Bit11
VDO2	VDO3	VDO4	VDO5		

Function Code	Name	Setting Range
U0.10	CCI voltage (V)/current (mA)	0.00–10.57 V 0.00–20.00 mA

When F4.40 is set to 0, CCI sampling data is displayed in the unit of V.

When F4.40 is set to 1, CCI sampling data is displayed in the unit of mA.

Function Code	Name	Setting Range
U0.14	Load speed	0–65535

For more details, see the description of F7.12.

Function Code	Name	Setting Range
U0.15	PID setting	0–65535
U0.16	PID feedback	0–65535

They display the PID setting value and PID feedback value.

- PID setting = PID setting (percentage) x FA.04
- PID feedback = PID feedback (percentage) x FA.04

Function Code	Name	Setting Range
U0.18	X5 Input pulse frequency	0.00–100.00 kHz

It displays the high-speed pulse sampled frequency of X5, in minimum unit of 0.01 kHz.

Function Code	Name	Setting Range
U0.19	Feedback speed	-320.00–320.00Hz -500.0–500.0 Hz

It displays the actual output frequency of the AC drive.

- If F0.22 (Frequency reference resolution) is set to 1, the display range is -3200.00– 3200.00 Hz.
- If F0.22 (Frequency reference resolution) is set to 2, the display range is -5000.00Hz– 500.00 Hz

Function Code	Name	Setting Range
U0.20	Remaining running time	0.0–6500.0 min

It displays the remaining running time when the timing operation is enabled. For details on timing operation, refer to F8.42 to F8.44.

Function Code	Name	Setting Range
U0.21	VCI voltage before correction	0.00–10.57 V
U0.22	CCI voltage (V)/ current (mA) before correction	0.00–10.57 V 0.00–20.00 mA
U0.23	ACI voltage before correction	-10.57–10.57 V

They display the AI sampleding voltage/current value of AI. The actually used voltage/ current is obtained after linear correction to reduce the deviation between the sampled voltage/current and the actual input voltage/current.

For actual corrected voltage, see U0.09, U0.10 and U0.11. Refer to group AC for the correction mode.

Function Code	Name	Setting Range
U0.24	VCI voltage before correction	0–65535 m/min

It displays the linear speed of the X5 high-speed pulse sampling. The unit is meter/minute.

The linear speed is obtained according to the actual number of pulses sampled per minute and FB.07 (Number of pulses per meter).

Function Code	Name	Setting Range
U0.27	Pulse input frequency	0–65535 Hz

It displays the X5 high-speed pulse sampling frequency, in minimum unit of 1 Hz. It is the same as U0.18, except for the difference in units.

Function Code	Name	Setting Range
U0.28	Communication setting value	-100.00%–100.00%

It displays the data written by means of the communication address 0x1000.

Function Code	Name	Setting Range
U0.29	Encoder feedback speed	-320.00–320.00 Hz/-500.0–500.0 Hz

It displays the motor running frequency measured by the encoder.

- If F0.22 (Frequency reference resolution) is 1, the display range is -3200.0–3200.0 Hz.
- If F0.22 (Frequency reference resolution) is 2, the display range is -500.00–500.00 Hz.

Function Code	Name	Setting Range
U0.30	Main frequency X	0.00–500.00 Hz
U0.31	Auxiliary frequency Y	0.00–500.00 Hz
U0.32	Motor temperature	0–200 ℃

It displays the motor temperature obtained by means of ACI sampling. For the motor temperature detection, see F9.56.

Function Code	Name	Setting Range
U0.35	Target torque	-200.0%–200.0%

It displays the current torque upper limit.

Function Code	Name	Setting Range
U0.36	Resolver position	0–4095

It displays the current resolver position.

Function Code	Name	Setting Range
U0.37	Power factor angle	-

It displays the current power factor angle.

Function Code	Name	Setting Range
U0.38	ABZ position	0–65535

It displays the phase A and B pulse counting of the current ABZ or UVW encoder. This value is four times the number of pulses that the encoder runs. For example, if the display is 4000, the actual number of pulses that the encoder runs is 4000/4 = 1000.

The value increase when the encoder rotates in forward direction and decreases when the encoder rotates in reverse direction. After increasing to 65535, the value starts to increase from 0 again. After decreasing to 0, the value starts to decrease from 65535 again.

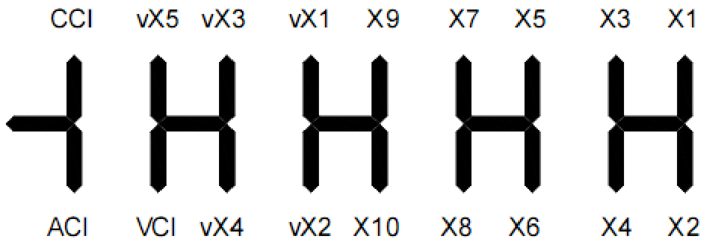
You can check whether the installation of the encoder is normal by viewing U0.38.

Function Code	Name	Setting Range
U0.39	Target voltage upon V/F separation	0 V to rated motor voltage
U0.40	Output voltage upon V/F separation	0 V to rated motor voltage

They display the target output voltage and current actual output voltage in the V/F separation state. For V/F separation, see the descriptions of group F3

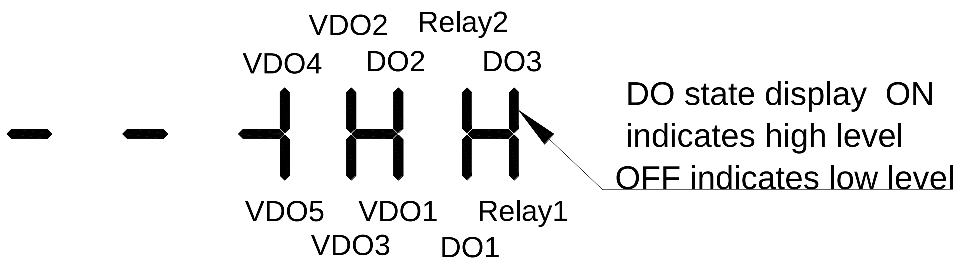
Function Code	Name	Setting Range
U0.41	X terminals state visual display	-

It displays the X terminals state visually and the display format is shown in the following figure.



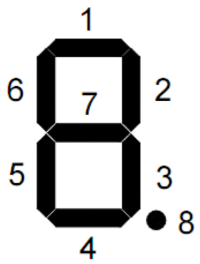
Function Code	Name	Setting Range
U0.42	DO state visual display	-

It display the DO state visually and the display format is shown in the following figure.



Function Code	Name	Setting Range
U0.43	X function state visual display 1	-

It displays whether the X functions 1-40 are valid. The operation panel has five 7-segment LEDs and each 7-segment LED displays the selection of eight functions. The 7-segment LED is defined in the following figure.



X function display, on indicates valid, off indicates invalid

the 7-segment LED display functions 1-8, 9-16, 17-24, 25-32 and 33-40 respectively from right to left.

Function Code	Name	Setting Range
U0.44	X function state visual display 2	-

It displays whether the X functions 41–59 are valid. The display format is similar to U0.43. The 7-segment LEDs display functions 41–48, 49–56 and 57–59, respectively from right to left

Function Code	Name	Setting Range
U0.58	Phase Z counting	0–65535

It displays the phase Z counting of the current ABZ or UVW encoder. The value increases or decreases by 1 every time the encoder rotates one revolution forwardly or reversely.

You can check whether the installation of the encoder is normal by viewing U0.58.

Function Code	Name	Setting Range
U0.59	Current set frequency	-100.00%–100.00%
U0.60	Current running frequency	-100.00%–100.00%

It displays the current set frequency and running frequency. 100.00% corresponds to the AC drive's maximum frequency (F0.10).

Function Code	Name	Setting Range
U0.61	AC drive running state	-100.00%–100.00%

It displays the running state of the AC drive. The data format is listed in the following table:

<table>
<tr><td rowspan="5">U0.61</td><td>Bit0</td><td rowspan="2">0: Stop
1: Forward
2: Reverse</td></tr>
<tr><td>Bit1</td></tr>
<tr><td>Bi2</td><td rowspan="2">0: Constant 1: Accelerate
2: Decelerate</td></tr>
<tr><td>Bit3</td></tr>
<tr><td>Bit4</td><td>0: Bus voltage normal
1: Undervoltage</td></tr>
</table>

Function Code	Name	Setting Range
U0.62	Current fault code	0–99

It displays the current fault code.

Function Code	Name	Setting Range
U0.63	Sent value of point-point communication	-100.0%–100.0%
U0.64	Slave quantity of point-point communication	0-63

It displays the data at point-point communication. U0.63 is the data sent by the master, and U0.64 is the quantity of the salve that master can check .

Function Code	Name	Setting Range
U0.65	Torque upper limit	-200.00%–200.00%

It displays the current setting torque upper limit.

Function Code	Name	Setting Range
U0.66	Communication Expansion Card model	100: CANOpen 200: Profibus-DP 300: CANLink
U0.67	Communication expand	-
U0.68 U0.68	DP card AC drive status DP card AC drive status	bit0- Running status bit1- Running direction bit2- AC drive fault or not bit3-Reach target frequency bit4~bit7- Reserved bit8~bit15-Fault code
U0.69	Transport DP card speed	0.00-F0.10

U0.70	Transport DP card rotary	0~65535
U0.71	Current of communication card	-
U0.72	Communication card fault status	-
U0.73	Motor NO	0: Motor 1 /1: Motor 2
U0.74	AC drive output torque	-300.00%–300.00%

U0.68	Bit0	0:STOP 1:RUN
	Bit1	0:FORWARD 1:REVERSE
	Bit2	0:NO FAULT 1:FAULT
	Bit3	0:NOT REACH TARGET FREQUENCY 1:REACH TARGET FREQUENCY
	Bit4	-
	Bit5	-
	Bit6	-
	Bit7	-
	Bit8~ Bit15	FAULT CODE

Chapter 5 Troubleshooting

5.1 Fault and Troubleshooting

Fault Name	Display	Possible Causes	Solutions
Inverter unit protection	Err01	1: The output circuit is grounded or short circuited. 2: The connecting cable of the motor is too long. 3: The module overheats. 4: The internal connections become loose. 5:The main control board is faulty. 6: The drive board is faulty. 7: The inverter module is faulty.	1: Eliminate external faults. 2: Install a reactor or an output filter. 3: Check the air filter and the cooling fan. 4: Connect all cables properly. 5: Contact the agent or our company
Overcurrent during acceleration	Err02	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The acceleration time is too short. 4: Manual torque boost or V/F curve is not appropriate. 5: The voltage is too low. 6: The startup operation is performed on the rotating motor. 7: A sudden load is added during acceleration. 8: The AC drive model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the acceleration time. 4: Adjust the manual torque boost or V/F curve. 5: Adjust the voltage to normal range. 6: Select rotational speed tracking restart or start the motor after it stops. 7: Remove the added load. 8: Select an AC drive of higher power class.
Overcurrent during deceleration	Err03	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The deceleration time is too short. 4: The voltage is too low. 5: A sudden load is added during deceleration. 6: The braking unit and braking resistor are not installed.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Increase the deceleration time. 4: Adjust the voltage to normal range. 5: Remove the added load. 6: Install the braking unit and braking resistor.

Fault Name	Display	Possible Causes	Solutions
Overcurrent at constant speed	Err04	1: The output circuit is grounded or short circuited. 2: Motor auto-tuning is not performed. 3: The voltage is too low. 4: A sudden load is added during operation. 5: The AC drive model is of too small power class.	1: Eliminate external faults. 2: Perform the motor auto-tuning. 3: Adjust the voltage to normal range. 4: Remove the added load. 5: Select an AC drive of higher power class.
Overvoltage during acceleration	Err05	1: The input voltage is too high. 2: An external force drives the motor during acceleration. 3: The acceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install a braking resistor. 3: Increase the acceleration time. 4: Install the braking unit and braking resistor.
Overvoltage during deceleration	Err06	1: The input voltage is too high. 2: An external force drives the motor during deceleration. 3: The deceleration time is too short. 4: The braking unit and braking resistor are not installed.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor. 3: Increase the deceleration time. 4: Install the braking unit and braking resistor.
Overvoltage at constant speed	Err07	1: The input voltage is too high. 2: An external force drives the motor during deceleration.	1: Adjust the voltage to normal range. 2: Cancel the external force or install the braking resistor.
Control power supply fault	Err08	The input voltage is not within the allowable range.	Adjust the input voltage to the allowable range
Undervoltage	Err09	1: Instantaneous power failure occurs on the input power supply. 2: The AC drive's input voltage is not within the allowable range. 3: The bus voltage is abnormal. 4: The rectifier bridge and buffer resistor are faulty. 5: The drive board is faulty. 6: The main control board is faulty.	1: Reset the fault. 2: Adjust the voltage to normal range. 3: Contact the agent or our company

Fault Name	Display	Possible Causes	Solutions
AC drive overload	Err10	1: The load is too heavy or locked-rotor occurs on the motor. 2: The AC drive model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an AC drive of higher power class.
Motor overload	Err11	1: F9-01 is set improperly. 2: The load is too heavy or locked-rotor occurs on the motor. 3: The AC drive model is of too small power class.	1: Set F9-01 correctly. 2: Reduce the load and check the motor and the mechanical condition. 3: Select an AC drive of higher power class
Power input phase loss	Err12	1: The three-phase power input is abnormal. 2: The drive board is faulty. 3: The lightening board is faulty. 4: The main control board is faulty.	1: Eliminate external faults. 2: Contact the agent or our company
Power output phase loss	Err13	1: The cable connecting the AC drive and the motor is faulty. 2: The AC drive's three-phase outputs are unbalanced when the motor is running. 3: The drive board is faulty. 4: The module is faulty.	1: Eliminate external faults. 2: Check whether the motor three-phase winding is normal. 3: Contact the agent or our company
Module overheat	Err14	1: The ambient temperature is too high. 2: The air filter is blocked. 3: The fan is damaged. 4: The thermally sensitive resistor of the module is damaged. 5: The inverter module is damaged.	1: Lower the ambient temperature. 2: Clean the air filter. 3: Replace the damaged fan. 4: Replace the damaged thermally sensitive resistor. 5: Replace the inverter module.
External equipment fault	Err15	1: External fault signal is input via X. 2: External fault signal is input via virtual I/O.	Reset the operation.
Communication fault	Err16	1: The host computer is in abnormal state. 2: The communication cable is faulty. 3: F0-28 is set improperly. 4: The communication parameters in group FD are set improperly.	1: Check the cabling of host computer. 2: Check the communication cabling. 3: Set F0-28 correctly. 4: Set the communication parameters properly.

Fault Name	Display	Possible Causes	Solutions
Contactor fault	Err17	1: The drive board and power supply are faulty. 2: The contactor is faulty.	1: Replace the faulty drive board or power supply board. 2: Replace the faulty contactor.
Current detection fault	Err18	1: The HALL device is faulty. 2: The drive board is faulty.	1: Replace the faulty HALL device. 2: Replace the faulty drive board.
Motor auto-tuning fault	Err19	1: The motor parameters are not set according to the nameplate. 2: The motor auto-tuning times out.	1: Set the motor parameters according to the nameplate properly. 2: Check the cable connecting the AC drive and the motor.
Encoder fault	Err20	1: The encoder type is incorrect. 2: The cable connection of the encoder is incorrect. 3: The encoder is damaged. 4: The PG card is faulty.	1: Set the encoder type correctly based on the actual situation. 2: Eliminate external faults. 3: Replace the damaged encoder. 4: Replace the faulty PG card.
EEPROM read-write fault	Err21	The EEPROM chip is damaged.	Replace the main control board.
AC drive hardware fault	Err22	1: Overvoltage exists. 2: Overcurrent exists.	1: Handle based on overvoltage. 2: Handle based on overcurrent.
Short circuit to ground	Err23	The motor is short circuited to the ground.	Replace the cable or motor.
Accumulative running time reached	Err26	The accumulative running time reaches the setting value.	Clear the record through the parameter initialization function.
User-defined fault 1	Err27	1: The user-defined fault 1 signal is input via X.terminal 2: User-defined fault 1 signal is input via virtual I/O.	Reset the operation.
User-defined fault 2	Err28	1: The user-defined fault 2 signal is input via X terminal 2: The user-defined fault 2 signal is input via virtual I/O.	Reset the operation.

Fault Name	Display	Possible Causes	Solutions
Accumulative power-on time reached	Err29	The accumulative power-on time reaches the setting value.	Clear the record through the parameter initialization function.
Load becoming 0	Err30	The AC drive running current is lower than F9-64.	Check that the load is disconnected or the setting of F9-64 and F9-65 is correct.
PID feedback lost during running	Err31	The PID feedback is lower than the setting of FA-26.	Check the PID feedback signal or set FA-26 to a proper value.
Pulse-by-pulse current limit fault	Err40	1: The load is too heavy or locked-rotor occurs on the motor. 2: The AC drive model is of too small power class.	1: Reduce the load and check the motor and mechanical condition. 2: Select an AC drive of higher power class.
Motor switchover fault during running	Err41	Change the selection of the motor via terminal during running of the AC drive	Perform motor switchover after the AC drive stops.
Too large speed deviation	Err42	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed. 3: F9-69 and F9-70 are set incorrectly.	1: Set the encoder parameters properly. 2: Perform the motor auto-tuning. 3: Set F9-69 and F9-70 correctly based on the actual situation.
Motor over-speed	Err43	1: The encoder parameters are set incorrectly. 2: The motor auto-tuning is not performed.3: F9-69 and F9-70 are set incorrectly.	1: Set the encoder parameters properly. 2: Perform the motor auto-tuning. 3: Set F9-69 and F9-70 correctly based on the actual situation.
Motor overheat	Err45	1: The cabling of the temperature sensor becomes loose. 2: The motor temperature is too high.	1: Check the temperature sensor cabling and eliminate the cabling fault. 2: Lower the carrier frequency or adopt other heat radiation measures.
Initial position fault	Err51	The motor parameters are not set based on the actual situation.	Check that the motor parameters are set correctly and whether the setting of rated current is too small.
Brake pipe protection fault	Err60	Brake resistance be shorted or brake moudle abnormal	Check the brake resistance or Contact the agent or company for technical support

5.2 Common Faults and Solutions

You may come across the following faults during the use of the AC drive. Refer to the following table for simple fault analysis

Troubleshooting to common faults of the AC drive

SN	Fault	Possible Causes	Solutions
1	There is no display at power-on.	1: There is no power supply to the AC drive or the power input to the AC drive is too low. 2: The power supply of the switch on the drive board of the AC drive is faulty. 3: The rectifier bridge is damaged. 4: The control board or the operation panel is faulty. 5: The cable connecting the control board and the drive board and the operation panel breaks.	1: Check the power supply. 2: Check the bus voltage. 3: Re-connect the 8-core and 28-core cables. 4: Contact the agent or company for technical support.
2	“HC” is displayed at power-on.	1: The cable between the drive board and the control board is in poor contact. 2: Related components on the control board are damaged. 3: The motor or the motor cable is short circuited to the ground. 4: The HALL device is faulty. 5: The power input to the AC drive is too low.	1: Re-connect the 8-core and 28-core cables. 2: Contact the agent or company for technical support.
3	Err23” is displayed at power-on.	1: The motor or the motor output cable is short-circuited to the ground. 2: The AC drive is damaged.	1: Measure the insulation of the motor and the output cable with a megger. 2: Contact the agent or company for technical support.
4	The AC drive display is normal upon power-on. But “HC” is displayed after running and stops immediately.	1:The cooling fan is damaged or locked-rotor occurs. 2: The external control terminal cable is short circuited.	1: Replace the damaged fan. 2: Eliminate external fault.
5	Err14 (module overheat) fault is reported frequently.	1: The setting of carrier frequency is too high. 2: The cooling fan is damaged, or the air filter is blocked. 3: Components inside the AC drive are damaged (thermal coupler or others).	1: Reduce the carrier frequency (F0-15). 2: Replace the fan and clean the air filter. 3: Contact the agent or company for technical support.

Chapter 6- MAINTENANCE

WARNING

- Maintenance must be performed according to designated maintenace methods
- Maintenance inspection and replacement of parts must be performed only by certified person
- After turning off the main circuit power supply,wait for 10 minutes before maintenance or inspection
- Do not directly touch components or devices of PCB board, otherwise inverter can be damaged by electrostatic
- After maintenance, all screws must be tightened

6.1 Daily Maintenance

In order to prevent the fault of inverter to make it operate smoothly in high-performance for a long time. user must inspect the inverter periodically (within half year). The following table indicates the inspection content.

Checking item	Content
Temperature/Humidity	Ensure the temperature is among 0℃~40℃. and the humidity is among 20-90%
Oil fog and dust	Ensure that there is no oil fog. dust and condensation in the inverter.
The inverter	Ensure there is no abnormal heating. and abnormal vibration to the inverter.
The fan	Ensure the fan rotates normally and there is no foreign objection in the inverter.
Input power supply	Ensure the voltage and frequency of the power supply is in the allowed range.
The motor	Ensure there is no abnormal vibration. heating noise and phase loss.

6.2 Periodic Maintenance

Customer should check the inverter every 6 months according to the actual environment.

Checking item	Content	Method
Screws of the external terminals	Check if the screw is loose or not.	Tighten up
PCB board	Dust and dirtiness	Clear the sundries with dry compressed air.
The fan	Check if the accumulative time of abnormal noise and vibrato exceeds 20.000 hours.	1.clear the sundries 2.change the fan
Electrolytic capacitance	Check if the color has changed and if it smelly	Change the electrolytic capacitance.
Heat sink	Dust and dirtiness	Clear the sundries with dry compressed air.
Power components	Dust and dirtiness	Clear the sundries with dry compressed air.

6.3 Replacement of wearing parts

Fans and electrolytic capacitors are wearing parts; please make periodic replacement to ensure long term. safety and failure-free operation. The replacement periods are as follows:

♦ Fan: Must be replaced when using up to 20.000 hours;

♦ Electrolytic Capacitor: Must be replaced when using up to 30.000-40. 000 hours.

Chapter 7- COMMUNICATION PROTOCOL

7.1 FST-650 Communication Data Address Definition

ST-650 series AC drive supports Modbus-RTU、CANopen、CANlink、Profibus-DP four kind of communication protocol. the user programmable card and point-to-point communication are derived CANlink agreement.Host computer through these communication protocols can be achieved on the inverter control, monitoring and function parameters to modify the view operation. FST-650 communication data can be divided into functional code data, non-functional code data, which includes running commands, operating status, operating parameters, alarm information

7.1.1 FST-650 Function Code Data

The drive Function code data	F Grope read and write）	F0、F1、F2、F3、F4、F5、F6、F7、F8、F9、FA、FB、FC、FD、FE、FF
	A Grope read and write）	A0、A1、A2、A3、A4、A5、A6、A7、A8、A9、AA、AB、AC、AD、AE、AF

Function code data communication address is defined as follows:

1, when reading the function code data for communication

For F0 ~ FF, A0 ~ AF group, The address of the higher 16 bits are functional group NO., the lower 16 bits are the NO. of function code in the functional group.

F0.16 function parameter, its communication address is F010H, among them F0H represents the function parameter of F0 group, 10H represents the hexadecimal data format of function code No. 16 in functional group

AC.08 function parameter, its communication address is AC08, among them ACH stands for the function parameter of AC group, 08H is the hexadecimal data format of function code number 8 in function group

2, when writing function code data for communication

For the function code data of F0 ~ FF, the communication address is 16 bits high. According to whether to write to EEPROM, it is divided into 00 ~ 0F or F0 ~ FF. The lower 16 bits are the serial number of the function code in the function group directly.

Write function parameters F0.16, do not write to EEPROM, the communication address is 0010H; need to write to the EEPROM, the communication address F010H.

For the function code data of A0 ~ AF group, the communication address is 16 bits high. According to the need to write EEPROM, it is divided into

40 ~ 4F or A0 ~ AF, the lower 16-bit function code directly in the functional group number, for example as follows:

Write function parameters AC.08, do not need to write to the EEPROM, the communication address is 4C08H; need to write EEPROM, the communication address is AC08H.

7.1.2 FST-650 NON-Function Code Data

The drive Non-function code data	Status data read only）	monitoring parameter group U, the AC drive fault description, the AC drive running status
	Control parameter(write only)	Control command, communication setting value, digital output terminal control, analog output AO1 control, analog output AO2 control, high-speed pulse (DO) output control, parameter initialization

1, Status data

Status data is divided into monitoring parameters grope U, AC drive fault description, inverter running status.

U group parameter monitoring parameters

The monitoring data of group U are described in Chapter 5 and Chapter 6, and their addresses are defined as follows:

U0 ~ UF, its communication address high 16 bits are 70 ~ 7F,the low 16 bits are the serial numbers of the monitoring parameters in the group, for example :

U0.11, communication address is 700BH.

AC drive Fault description

When the communication Reads the AC drive fault description, the communication address is fixed to 8000H, the host reads the address data, then can get:

The current fault code of the AC drive and the fault code are defined in Chapter 5 F9.14 Function Code.

AC drive running status

When the communication Reads the AC drive running status, the communication address is fixed to 3000H, the host reads the address data, then can get:

The current running status of the AC drive,the definition as follows:

AC drive running status address	Read the status word definition
3000H	1：Run forward
	2：Run reverse
	3：Stop

2, Control parameters

Control parameters are divided into control commands, digital output terminal control, analog output AO1 control, analog output AO2 control, high-speed pulse output control

Control command

When F0.02 (command source) is set to 2: communication control, the host can control the related commands such as start and stop of the inverter through the communication address. The control commands are defined as follows:

Control command address	Command function
2000H	1：Run forward
	2：Run reverse
	3：Forward jog
	4：Reverse jog
	5：Coast to stop
	6：Decelerate to stop
	7：Fault reset

3,Communication setting

Communication setting Main user FST650 middle frequency source, torque upper limit source, VF separation voltage source, PID reference source, PID feedback source are selected as the given data of the given communication. Its communication address is 1000H, when the host sets the communication address value, the data range is -10000 ~ 10000, corresponding to the given value -100.00% ~ 100.00%

Digital output terminal control

When the digital output terminal function is selected as 20: communication control, the host computer through the communication address, can realize the control of AC drive the digital output terminal, defined as follows:

Digital output terminal control address	Commend content
2001H	BIT0：DO1 output control BIT1：DO2 output control BIT2：RELAY1 output control BIT3：RELAY2 output control BIT4：DO output control BIT5：VDO1 BIT6：VDO2 BIT7：VDO3 BIT8：VDO4 BIT9：VDO5

Analog output AO1, AO2, high-speed pulse output DO control

When the analog output AO1, AO2, high-speed pulse output DO output function is selected as 12: communication setting, the host through the communication address, can realize the control of AC drive analog, high-speed pulse output , defined as follows：

Output Control Address		Commend content
AO1	2002H	0 ~7FFF represent 0％~ 100％
AO2	2003H	
Pulse output	2004H	

4,Parameter initialization

When you want to achieve initialize operation of the AC drive parameters through the host computer, you need use this function.

If FP.00 (user password) is not 0, firstly you need verify password through the communication, after verification, in 30 seconds, the host computer initializes the parameters.

The user's password verification address is 1F00H, and write the correct user password directly to the address，then the password verification finish。

Communication parameters for the initialization address is 1F01H, the data content is defined as follows:

Parameter Initializes communication address	Command function
1F01H	1：Restore factory parameters
	2：Clear the log information
	4：Restore the user backup parameters
	501：Backs up the user's current parameters

7.2 FST-650 Modbus communication protocol

FST-650 series AC drive provides RS485 communication interface, and supports Modbus-RTU slave communication protocol. Users can achieve centralized control through the computer or PLC, through the communication protocol to set the AC drive running command, modify or read the function code parameters, read the working status of the AC drive and fault information.

7.2.1 Protocol content

The serial communication protocol defines the content and using format of the serial communication . It includes: host polling (or broadcast) format; host coding methods, including: the requirements action function code , transmission data and error checking. The response from the slave is also the same structure, including: action confirmation, return data and error checking. If the slave occurs error when it receives message or can not complete the action requested by the host, it will send a fault message as a response to the host.

7.2.1.1 Application

The AC drive access the “Single-master multi-slave” PC/PLC control network which has RS485 Modbus and as the slave.

7.2.1.2 BUS structure

(1) Hardware interface

Need to insert the RS485 expansion card FST-650TX1 hardware on the AC drive.

(2) Topological structure

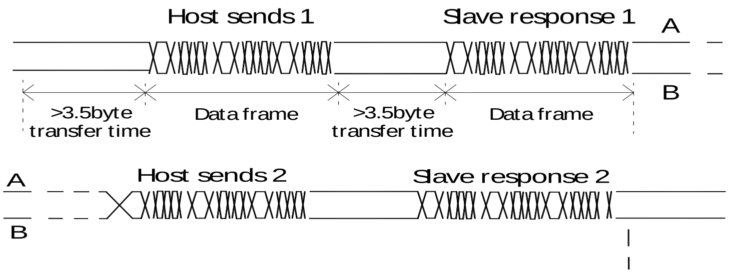
Single-master multi-slave system. Each communication device in the network has a unique slave address. One of them is the communication host (usually PC, PLC, HMI, etc.), initiates communication and reads or writes the parameters to the slave.

Other devices are the communication slaves, in response to the host query or communication operation.One time only one device can send data, while the other devices are receiving.

Slave address setting range is 1 ~ 247, 0 is the broadcast communication address. The address of the slave in the network must be unique.

(3) communication transmission

Asynchronous serial, half-duplex transmission.The data in the serial asynchronous communication process as a form of message one time can only send one frame.In MODBUS-RTU agreement when the communication line idle time is longer than 3.5Byte transmission time that means a new start of a communication frame.

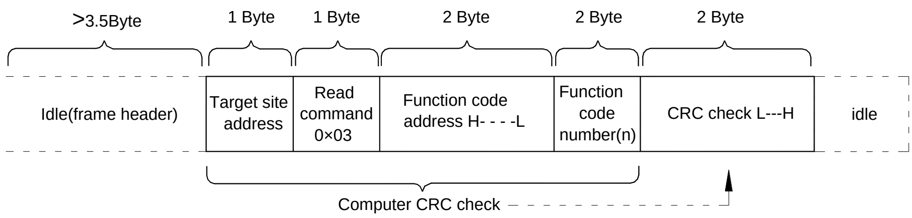


FST-650 series AC drive built-in communication protocol is Modbus-RTU slave communication protocol, can respond to the host's "query / command", or according to the host's "query / command" to make the appropriate action and response communication data . Host can be a personal computer (PC), industrial control equipment or programmable logic controller (PLC), etc., the host can either communicate to a slave, or send broadcast information to all the slaves.

7.2.2 Protocol Format

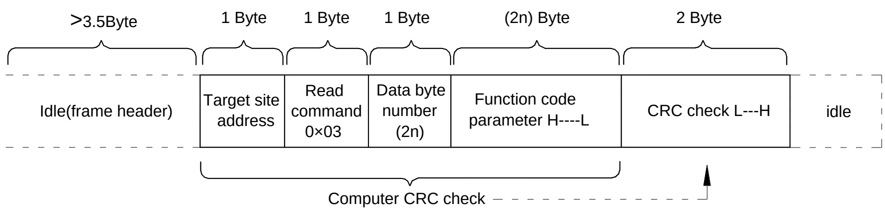
FST-650 series AC drive Modbus-RTU protocol communication data format is as follows, the AC drive supports only Word-type parameter read or write, the corresponding communication read operation command is Ox03; write operation command is 0x06, does not support byte or bit Read and write operations:

The master reads command frame:

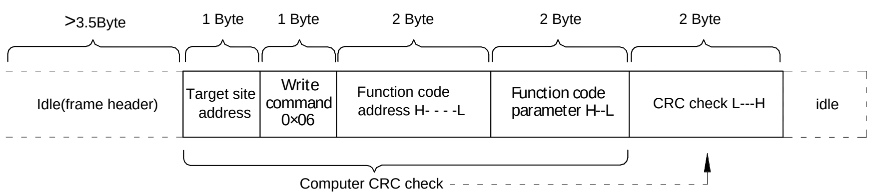


In theory, the host can read several function codes at a time (n can be up to 12), but pay attention to be not over the last function code of the group. Otherwise, it will reply the error

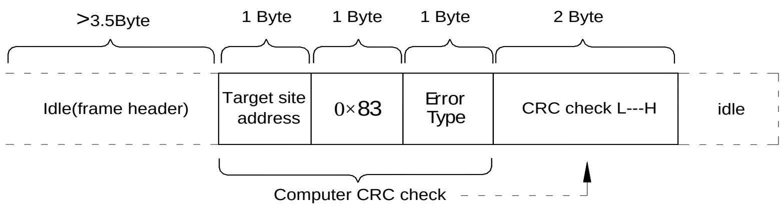
The slave reads command frame:



The master write command frame:



The slave write command frame:



If the slave detects a communication frame error, or if the read or write is otherwise unsuccessful, the error frame is acknowledged.

Error type： 01：Command code error 02：address error 03：data error 04：command can not be processed

Data frame field description:

START	More than 3.5 bytes idle time between frames
ADR	Communication address range：1 ～ 247；0 ＝broadcast address
CMD	03：read slave parameter；06：write slave parameter
CMD ADR H	Parameter address in the AC drive is hexadecimal notation, divided into function code and non-function code (such as running status parameter, running command, etc.). See address definition. Function code Address L when transmitting, the high byte in front, low byte in the post.
CMD ADR L	
CMD NO H	The number of function codes read in this frame. If 1, it means reading 1 function code. When transmitting, the high byte is first and the low byte is followed. This protocol can only overwrite one function code at a time, without this field.
CMD NO L	
DATA H	The data to be responded, or the data to be written,When transmitting , with the high byte first and the low byte being the last。
DATA L	
CRC CHK LOW Byte	Detected value: CRC16 Check value. When transmitting, the low byte first and the high byte second. CRC CHK high-bit calculation method is described in this section CRC check.
CRC CHK HIGH Byte	
END	3.5 bytes idle time

CRC check：

The CRC (Cyclical Redundancy Check) uses the RTU frame format, and the message includes an error detection field based on the CRC method. The CRC field detects the contents of the entire message. The CRC field is two bytes and contains a 16-bit binary value. It is calculated by the transmission device to be added to the message. The receiving device recalculates the CRC of the received message and compares it with the value in the received CRC field. If the two CRC values are not equal, then the transmission has an error. CRC is first stored 0xFFFF, and then call a process will message in the 8-bit bytes and the value of the current register for processing. Only the 8Bit data in each character is valid for the CRC, the start and stop bits, and the parity bit are invalid. During CRC generation, each 8-bit character is individually or differently than the register contents (XOR). The result is shifted to the least significant bit and the most significant bit is padded with zeros. LSB is extracted and detected. If LSB is '1', the register is exclusive or different from the preset value. If LSB is 0, it will not be executed. The whole process is repeated 8 times. After the last bit (8th bit) is completed, the next 8-bit byte will be separate from the current value of the register. The value in the final register is the CRC value after all the bytes in the message have been executed. When the CRC is added to the message, the low byte is first added and then the high byte.The following are C language source code for CRC checking:

```
unsigned int crc_chk_value（unsigned char *data_value,unsigned char length）
{
unsigned int crc_value=0xFFFF;
    int i;
    while（length--）          {
            crc_value^=*data_value++;
            for（i=0;i<8;i++）         {
              if（crc_value&0x0001）
    {
            crc_value=（crc_value>>1）
^0xa001;
              }
              Else
              {
              crc_value=crc_value>>1;
              }
           }
        }
        return（crc_value）;
}
```

Address definition of communication parameters

Read and write function code parameters (some function codes can not be changed, only for manufacturers using or monitoring).

7.2.3 Function Code Parameter Address Identification rule

The function code group number and label for the parameter address that rule:

High byte: F0 to FF (F group), A0 to AF (group A), 70 to 7F (U group)

Low byte: 00 ~ FF

For example, if you want to access the function code F3.12, the function code access address is 0xF30C;

Note: FF group: can not read the parameters, and can not change the parameters; U group: only read, can not change the parameters.

Some parameters can not be changed while the inverter is running; some parameters can not be changed regardless of the status of the inverter.

Change the function code parameters, but also pay attention to the parameters of the scope, units, and related instructions.

Function code NO	Communication access address	Communication Modify the function code address in RAM
F0~FE	0xF000~0xFEFF	0x0000 ~0x0EFF
A0~AC	0xA000~0xACFF	0x4000~0x4CFF
U0	0x7000~0x70FF	

Note that since the EEPROM is frequently stored, the service life of the EEPROM is reduced. Therefore, some function codes do not need to be stored in the communication mode, only change the value in the RAM. If it is a group F parameter, to achieve this function, change the high-bit F of function code address into 0.If it is a group of parameters, to achieve this function, change high-bit A of the function address into 4.

The corresponding function code address is as follows:

High byte: 00 ~ 0F (F group), 40 ~ 4F (A group)

Low byte: 00 ~ FF

Such as:

Function code F3.12 is not stored in the EEPROM, the address is expressed as 030C;

Function code A0.05 is not stored in the EEPROM, the address is expressed as 4005;.

For all parameters, you can also use the command code 07H to achieve the function.

Stop / Run Parameters section:

Parameter address	Parameter description
1000H	Comunication setting value (decimalism)-10000~10000
1001H	Running freqeuncy
1002H	Bus voltage
1003H	Output voltage
1004H	Output current
1005H	Output power
1006H	Output torque
1007H	Running speed
1008H	X terminals input symbol;
1009H	DO output symbol
100AH	VCI voltage
100BH	CCI voltage
100CH	ACI voltage
100DH	Count value input
100EH	Length input
100FH	Load speed
1010H	PID setting
1011H	PID feedback

1012H	PLC step
1013H	X5 terminals unit:0.1Hz
1014H	Feedback speed，unit:0.1Hz
1015H	Remaining runtime
1016H	VCI Preregulation voltage
1017H	CCI Preregulation voltage
1018H	ACI Preregulation voltage
1019H	Line speed
101AH	The current power-on time
101BH	The current running time
101CH	X5 input pules frequency，unit:1Hz
101DH	Communication setting value
101EH	Actual feedback speed
101FH	Main frequency X
1020H	Auxiliary frequency Y

Note:

The communication setting value is a percentage of the relative value, 10000 corresponds to 100.00%, -10000 corresponds to -100.00%.

For the data of the frequency dimension, the percentage is the percentage of the maximum frequency (F0.10); for the data of the torque dimension, the percentage is F2.10, A2.48 (the upper limit of the torque is set numerically, Respectively, corresponding to the first and second motor).

Control command input to the AC drive: (write only)

Command word address	Command function
2000H	1：Forward running
	2：Reverse running
	3：Forward jog
	4：Reverse jog
	5：Coastal stop
	6：Deceleration stop
	7：Fault reset

Read drive status: (read-only)

Status word address	Status word function
3000H	0001：forward running
	0002：reverse running
	0003：stop

Parameter lock password verification: (If the return is 8888H, which means that the password check passed)

Password address	Password contents
1F00H	*****

Digital output terminal control: (write only)

Command address	Command contents
2001H	BIT0：DO1 output control BIT1：DO2 output control BIT2：RELAY1 output control BIT3：RELAY2 output control BIT4：DO output control BIT5：VDO1 BIT6：VDO2 BIT7：VDO3 BIT8：VDO4 BIT9：VDO5

Analog output AO1 control: (write only)

Command address	Command contents
2002H	0~7FFF represents 0％~100％

Analog Output AO2 Control: (write only)

Command address	Command contents
2003H	0~7FFF represents 0％~100％

Pulse (X5) Output Control: (write only)

Command address	Command contents
2004H	0~7FFF represents 0％~100％

The AC Drive fault description:

The AC Drive Fault address	The AC Drive fault information
8000H	0000：No fault 0001：Reserve 0002：Accelerated overcurrent 0003：Decelerated overcurrent 0004：Constant speed overcurrent 0005：Accelerated overvoltage 0006：Decelerated overvoltage 0007：Constant speed overvoltage

8000H	0008：Buffer resistance overload fault 0009：Undervoltage fault 000A：The AC drive overload 000B：Motor overload 000C：Input phase loss 000D：output phase loss 000E：module overheat 000F：external fault 0010：communication error 0011：contactor error 0012： Current detection fault 0013：Motor tuning fault 0014：Encoder / PG card fault 0015：Parameter read and write exception 0016：The AC drive hardware fault 0017：Motor ground short fault 0018：reserved 0019：reserved 001A：Running time arrives 001B: User - defined fault 1 001C: User - defined fault 2 001D: Power-up time is reached 001E：Out of load 001F：PID feedback is lost during running 0028： Fast current limit timeout fault 0029：Switch the motor fault during running 002A: The speed deviation is too large 002B：Motor over speed 002D： Motor overtemperature 005A：The encoder line number setting is incorrect 005B：Missing encoder 005C：Initial position error 005E：Speed feedback error

7.2.4 FD Grope Communication Parameter Description

Fd-00	Baud rate	Factory default	6005
	RANGE	Digit：MODBUS Baud rate	
		0：300BPS 1：600BPS 2：1200BPS 3：2400BPS 4：4800BPS 5：9600BPS 6：19200BPS 7：38400BPS 8：57600BPS 9：115200BPS	

This parameter is used to set the data transfer rate between host and AC drive. Note that the host and the AC drive must set the same baud rate, otherwise, communication cannot be carried out. The higher the baud rate, the faster the communication speed.

Fd-01	Data Format	Factory default	0
	Setting range	0：No parity: Data format <8,N,2> 1：Even parity: data format <8,E,1> 2：Odd parity: data format <8,O,1> 3：No parity: Data format <8-N-1>	
Fd-02	Native address	Factory default	1
	Setting address	1~247，0 broadcast address	

When the native address is stetted to 0, is the broadcast address, to achieve PC broadcast function. Local address is unique (except broadcast address), which is to achieve the host computer and inverter point-to-point communication.

Fd-03	Response delay	Factory default	2ms
	Setting range	0~20ms	

Response delay: refers to the middle interval time from AC drive Data reception ends to send data to the host. If the response delay is less than the system processing time, the response delay is based on the system processing time. If the response delay is longer than the system processing time, after processing the data, the system waits until the response delay time is reached before sending data to the upper computer.

Fd-04	Communication overtime time	Factory default	0.0 s
	Setting range	0.0 s（invalid）；0.1~60.0s	

When the function code is set to 0.0 s, the communication timeout parameter is invalid. When the function code is set to a valid value, the communication error (Err16) is reported if the interval between the primary communication and the next communication exceeds the communication timeout. Normally, it is set to invalid. If the secondary parameters are set in the system for continuous communication, the communication status can be monitored.

Fd-05	Communication protocol selection	Factory default	0
	Setting range	0：Non-standard Modbus-RTU protocol； 1：Standard Modbus-RTU protocol	

Fd-05 = 1: Selects the standard Modbus protocol.

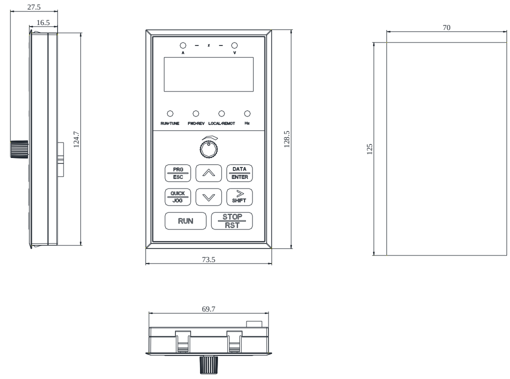
Fd-05 = 0: When read command, the slave returns one byte more than the standard Modbus protocol, refer to "5 Communication Data Structure" in this protocol.

Fd-06	Communication Read current resolution	Factory fault	0
	Setting range	0：0.01A； 1：0.1A	

Used to determine the unit of output current when the communication reads the output current

Appendix A Installation and Dimensions

A.1 Keypad dimension



FST-650 keypad dimension

dimension for installation hole

A.2 The AC drive installation dimension

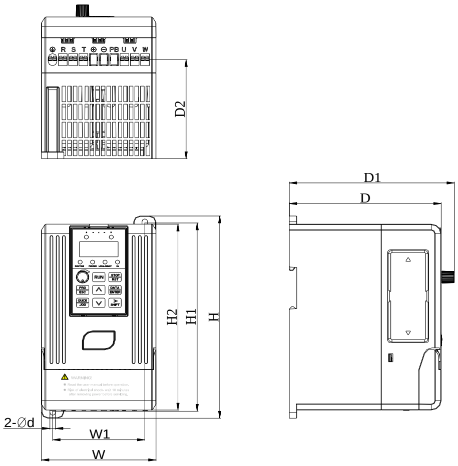


Fig 1

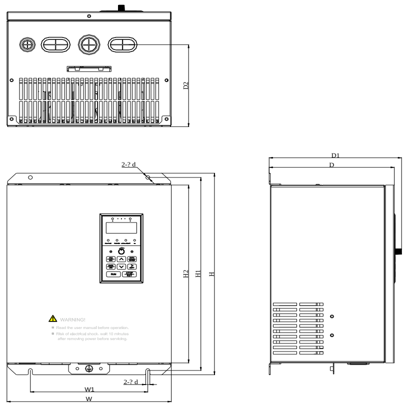


Fig 2

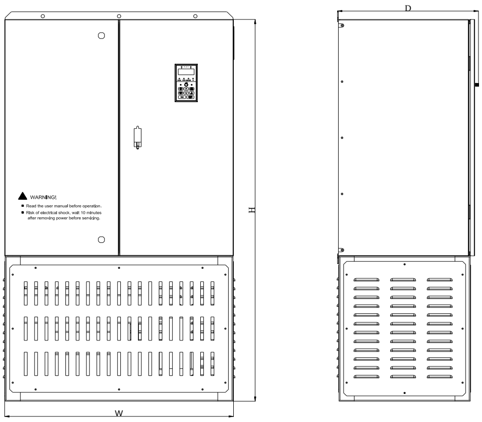
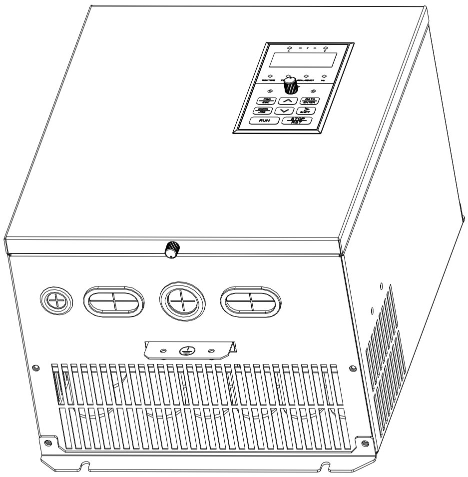


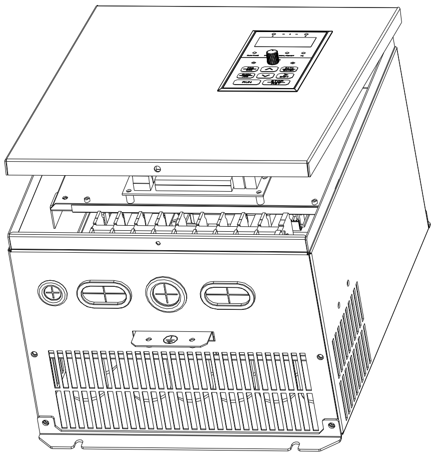
Fig3

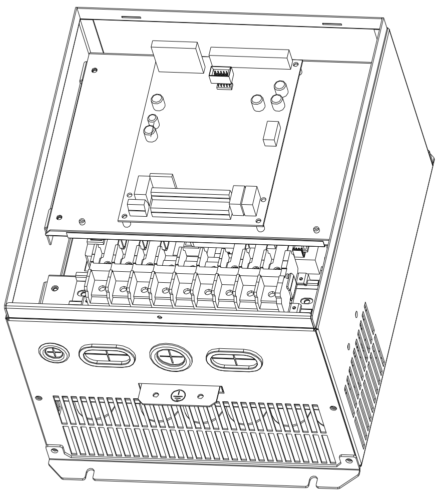
Model no.	W	W1	H	H1	H2	D	D1	D2	d	Fig
FST-650-0R7G/1R5PT4	92	74	174	162	160	122	132	85	4.5	1
FST-650-0R4T2/S2										
FST-650-1R5G/2R2PT4										
FST-650-0R7T2/S2										
FST-650-2R2G/4R0PT4										
FST-650-1R5T2/S2										
FST-650-4R0G/5R5PT4	135	110	265	255	240	155	165	123	7	2
FST-650-2R2T2/S2										
FST-650-5R5G/7R5PT4										
FST-650-4R0T2/S2										
FST-650-7R5G/011PT4	200	140	345	330	300	190	205	110	7	2
FST-650-011G/015PT4										
FST-650-015G/018PT4										
FST-650-018G/022PT4	280	200	375	360	330	210	225	150	7	2
FST-650-022G/030PT4										
FST-650-030G/037PT4										
FST-650-037G/045PT4	340	200	530	510	480	240	255	190	10	2
FST-650-045G/055PT4										
FST-650-055G/075PT4										
FST-650-075G/090PT4	400	240	650	590	550	280	295	230	12	2
FST-650-090G/110PT4										
FST-650-110G/132PT4										
FST-650-132G/160PT4	500	400	770	740	700	345	360	210	12	2
FST-650-160G/185PT4										
FST-650-185G/200PT4										
FST-650-200G/220PT4										
FST-650-132G/160PT4	Free standing type：1000*500*360									3
FST-650-160G/185PT4										
FST-650-185G/200PT4										
FST-650-200G/220PT4										
FST-650-220G/245PT4	750	500	860	830	805	450	465	260	12	2
FST-650-245G/280PT4										
FST-650-280/315PT4										
FST-650-315G/355PT4										
FST-650-220G/245PT4	Free standing type : 1300*750*465									3
FST-650-245G/280PT4										
FST-650-280/315PT4										
FST-650-315G/355PT4										
FST-650-355G/400PT4	950	800	1000	970	950	500	515	315	13	2
FST-650-400G/455PT4										
FST-650-455G/500PT4										
FST-650-500G/560PT4										

FST-650-355G/400PT4	Free standing type: 1500*950*515									3
FST-650-400G/455PT4										
FST-650-455G/500PT4										
FST-650-500G/560PT4										
FST-650-560G/630PT4	1050	900	1040	1010	990	500	515	315	13	2
FST-650-630GT4										
FST-650-560G/630PT4	Free standing type: 1600*1050*515									3
FST-650-630GT4										

A.3 The assembly and detachment of Panel







Appendix B AC drive accessories selection

B.1 Specification of breaker cable contactor and reactor

B1.1 Specification of breaker cable and contactor

Inverter module	Circuit Breaker（A）	Input / Output copper cable (mm^2)	The rated current A of contactor（voltage 380or220V）
FST-650-1R5G/2R2PT4	16	2.5	10
FST-650-2R2G/4R0PT4	16	2.5	10
FST-650-4R0G/5R5PT4	25	4	16
FST-650-5R5G/7R5PT4	25	4	16
FST-650-7R5G/011PT4	40	6	25
FST-650-011G/015PT4	63	6	32
FST-650-015G/018PT4	63	6	50
FST-650-018G/022PT4	100	10	63
FST-650-022G/030PT4	100	16	80
FST-650-030G/037PT4	125	25	95
FST-650-037G/045PT4	160	25	120
FST-650-045G/055PT4	200	35	135
FST-650-055G/075PT4	200	35	170
FST-650-075G/090PT4	250	70	230
FST-650-090G/110PT4	315	70	280
FST-650-110G/132PT4	400	95	315
FST-650-132G/160PT4	400	150	380
FST-650-160G/185PT4	630	185	450
FST-650-185G/200PT4	630	185	500
FST-650-200G/220PT4	630	240	580
FST-650-220G/250PT4	800	150x2	630
FST-650-250G/280PT4	800	150x2	700
FST-650-280G/315PT4	1000	185x2	780
FST-650-315G/350PT4	1200	240x2	900
FST-650-350G/400PT4	1280	240x2	960
FST-650-400G/450PT4	1380	185x3	1035
FST-650-500G/560PT4	1720	185x3	1290

B1.2 Specification of input/output AC reactor and DC reactor

Inverter module	Input AC reactor		Output AC reactor		DC reactor	
	Circuit （A）	Inductance（mH）	Circuit （A）	Inductance （uH）	Circuit （A）	Inductance （mH）
FST-650-1R5G/2R2PT4	5	3.8	5	1.5	6	11
FST-650-2R2G/4R0PT4	7	2.5	7	1	6	11
FST-650-4R0G/5R5PT4	10	1.5	10	0.6	12	6.3
FST-650-5R5G/7R5PT4	15	1.0	15	0.25	23	3.6
FST-650-7R5G/011PT4	20	0.75	20	0.13	23	3.6
FST-650-011G/015PT4	30	0.60	30	0.087	33	2
FST-650-015G/018PT4	40	0.42	40	0.066	33	2
FST-650-018G/022PT4	50	0.35	50	0.052	40	1.3
FST-650-022G/030PT4	60	0.28	60	0.045	50	1.08
FST-650-030G/037PT4	80	0.19	80	0.032	65	0.80
FST-650-037G/045PT4	90	0.16	90	0.030	78	0.70
FST-650-045G/055PT4	120	0.13	120	0.023	95	0.54
FST-650-055G/075PT4	150	0.10	150	0.019	115	0.45
FST-650-075G/090PT4	200	0.12	200	0.014	160	0.36
FST-650-090G/110PT4	250	0.06	250	0.011	180	0.33
FST-650-110G/132PT4	250	0.06	250	0.011	250	0.26
FST-650-132G/160PT4	290	0.04	290	0.008	250	0.26
FST-650-160G/185PT4	330	0.04	330	0.008	340	0.18
FST-650-185G/200PT4	400	0.04	400	0.005	460	0.12
FST-650-200G/220PT4	490	0.03	490	0.004	460	0.12
FST-650-220G/250PT4	490	0.03	490	0.004	460	0.12
FST-650-250G/280PT4	530	0.03	530	0.003	650	0.11
FST-650-280G/315PT4	600	0.02	600	0.003	650	0.11
FST-650-315G/350PT4	660	0.02	660	0.002	800	0.06
FST-650-350G/400PT4	400*2	0.04	400*2	0.005	460*2	0.12
FST-650-400G/450PT4	490*2	0.03	490*2	0.004	460*2	0.12
FST-650-500G/560PT4	530*2	0.03	530*2	0.003	650*2	0.11

B1.2 Specification of input/output filter

Inverter module	Input filter	Output filter
FST-650-1R5G/2R2PT4	INF-1R5	ONF-1R5
FST-650-2R2G/004PT4	INF-2R2	ONF-2R2
FST-650T4R0G/5R5PT4	INF-4R0	ONF-4R0
FST-650-5R5G/7R5PT4	INF-5R5	ONF-5R5
FST-650-7R5G/011PT4	INF-7R5	ONF-7R5
FST-650-011G/015PT4	INF-011	ONF-011
FST-650-015G/018PT4	INF-015	ONF-015
FST-650-018G/022PT4	INF-018	ONF-018
FST-650-022G/030PT4	INF-022	ONF-022
FST-650-030G/037PT4	INF-030	ONF-030
FST-650-037G/045PT4	INF-037	ONF-037
FST-650-045G/055PT4	INF-045	ONF-045
FST-650-055G/075PT4	INF-150	ONF-150
FST-650-075G/090PT4	INF-075	ONF-075
FST-650-090G/110PT4	INF-090	ONF-090
FST-650-110G/132PT4	INF-110	ONF-110
FST-650-132G/160PT4	INF-132	ONF-132
FST-650-160G/185PT4	INF-160	ONF-160
FST-650-185G/200PT4	INF-185	ONF-185
FST-650-200G/220PT4	INF-200	ONF-200
FST-650-220G/250PT4	INF-220	ONF-220
FST-650-250G/280PT4	INF-250	ONF-250
FST-650-280G/315PT4	INF-280	ONF-280
FST-650-315G/350PT4	INF-315	ONF-315
FST-650-350GT4/400PT4	INF-350	ONF-350
FST-650T-400GT4/450PT4	INF-400	ONF-400

B.2 Breaker resistor/unit selection

B2.1 Selection reference

When all the control devices driven by the inverters need quick braking .The braking units need to consume the energy which is feed backed to the DC bus. In FST-650 series inverters. The inverters below 15Kw (including 15kW) are embedded with braking units and the inverters above 18.5kW (including 18.5kW) should select external braking units.

It is necessary to select proper braking resistor according to the inverter capacity. In the application with 100% braking torque and 10% utilization rate of the braking unit. The braking resistor and braking unit are shov/n as below. For the load which works in the braking state for a long time. it is necessary to adjust the braking power according to the braking torque and utilization rate of the braking. Counting at a long working time. the power of the braking resistor is:

P= (P8.32)2 /R. R is the braking resistor

B.2.1.1 The utilization and selection for the inverters of 220V

Inverter capacity kw(HP)	Braking unit		Braking unit (100% of the braking torque. 10% of the utilization rate)		
	Specification	Number	Equivalent braking resistor	Equivalent braking power	Number
1.5（2）	Embedded	1	130Ω	260W	1
2.2（3）		1	80Ω	260W	1
4（5）		1	48Ω	400W	1
5.5（7.5）		1	35Ω	550W	1
7.5（11）	DBU-055-T2	1	26Ω	780W	1
11（15）		1	17Ω	1100W	1
15（20）		1	13Ω	1800W	1
18.5（25）		1	10Ω	2000W	1
22（30）		1	8Ω	2500W	1
30（40）	DBU-055-T2	2	13Ω	1800W	2
37（50）		2	10Ω	2000W	2
45（60）		2	8Ω	2500W	2
55（75）		2	6.5Ω	3000W	2

B.2.1.2 The utilization and selection for the inverters of 380V

Inverter capacity kw(HP)	Braking unit		Braking unit (100% of the braking torque. 10% of the utilization rate)		
	Specification	Number	Equivalent braking resistor	Equivalent braking power	Number
1.5（2）	Embedded	1	400Ω	260W	1
2.2（3）		1	150Ω	390W	1
4（5）		1	150Ω	390W	1
5.5（7.5）		1	100Ω	520W	1
7.5（11）		1	50Ω	1040W	1
11（15）		1	50Ω	1040W	1
15（20）		1	40Ω	1560W	1
18.5（25）	DBU-055-T4	1	20Ω	6000W	1
22（30）		1	20Ω	6000W	1
30（40）		1	20Ω	6000W	1
37（50）		1	13.6Ω	9600W	1
45（60）		1	13.6Ω	9600W	1
55（75）		1	13.6Ω	9600W	1
75（100）		2	13.6Ω	9600W	2
90（120）		2	13.6Ω	9600W	2
110（150）		2	13.6Ω	9600W	2
132（180）	DBU-160-T4	1	4Ω	30000W	1
160（215）		1	4Ω	30000W	1
185（250）	DBU-220-4	1	3Ω	40000W	1
200（270）		1	3Ω	40000W	1
220（300）		1	3Ω	40000W	1
250（340）	DBU-315-T4	1	2Ω	60000W	1
280（380）		1	2Ω	60000W	1
315（430）		1	2Ω	60000W	1
350（470）	DBU-220-T4	2	3Ω	40000W	2
400（540）		2	3Ω	40000W	2
500（680）	DBU-315-T4	2	2Ω	60000W	2
560（760）		2	2Ω	60000W	2

Inverter capacity kw(HP)	Braking unit		Braking unit (100% of the braking torque. 10% of the utilization rate)		
	Specification	Number	Equivalent braking resistor	Equivalent braking power	Number
630（860）		2	2Ω	60000W	2

Note:

Select the resistor and power of the braking unit according to the data our company provided.

The braking resistor may increase the braking torque of the inverter. The resistor power in the above table is designed on 100% braking torque and 10% braking usage ratio. If the users need more braking torque, the braking resistor can decrease properly and the power needs to be magnified.

In the cases where it needs frequent braking (the utilization rate exceeds10%). It is necessary to increase the power of the braking resistor according to the situation.

When using the external braking units. please see the instructions of the energy braking units to set the voltage degree of the braking unit. Incorrect voltage degree may affect the normal running of the inverter.

B2.2 Connection

B2.2.1 Connection of Braking resistor

For D size and lower inverter. Please refer to the figure B-1

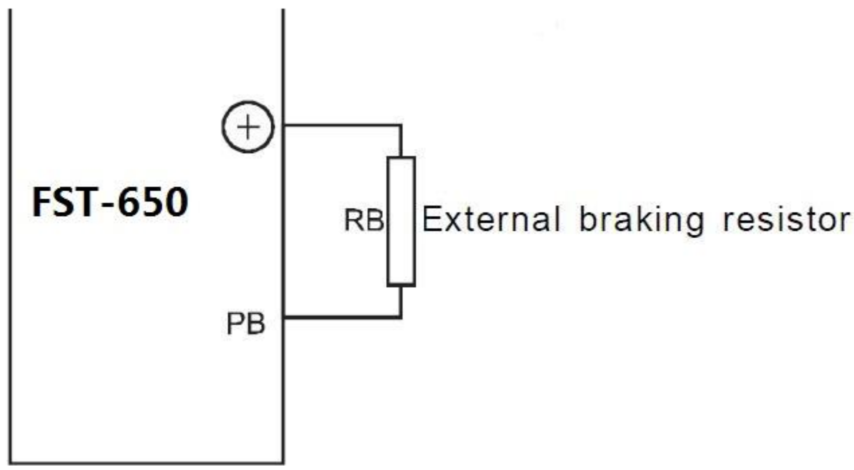
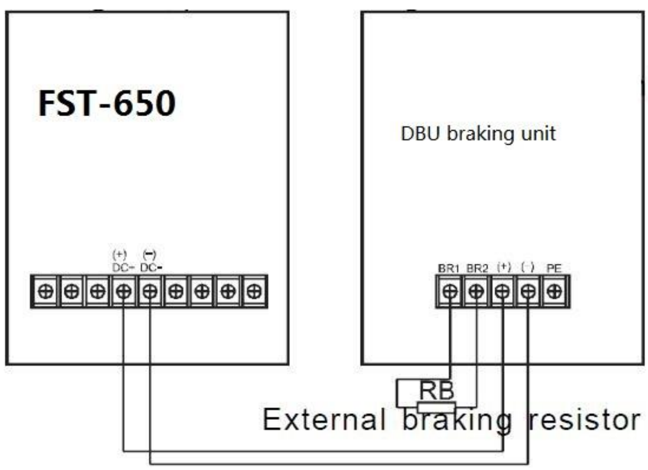


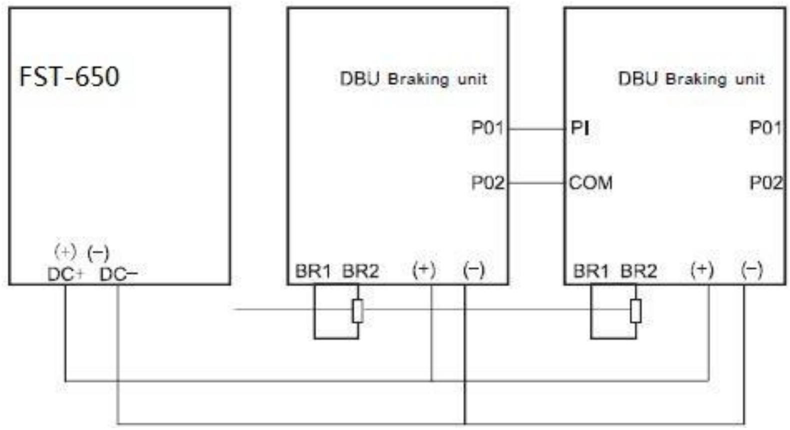
Figure B-1 Connection of Braking resistor

B.2.2.2 Connection of Braking unit. Please refer to figure B-2.



B.2.2.3. Parallel connection of braking unit

Because the limit of the braking unit. it is necessary to apply parallel connection of braking unit. And the connection is as figure



APPREDIX C: Function Code Table

If FP-00 is set to a non-zero number, parameter protection is enabled. You must enter the correct user password to enter the menu.

To cancel the password protection function, enter with password and set FP-00 to 0.

Group F and Group A are standard function parameters. Group U includes the monitoring function parameters.

The symbols in the function code table are described as follows:

"☆": The parameter can be modified when the AC drive is in either stop or running state.

"★": The parameter cannot be modified when the AC drive is in the running state.

"●": The parameter is the actually measured value and cannot be modified.

"*": The parameter is factory parameter and can be set only by the manufacturer.

Standard Function Parameters

Function Code	Parameter Name	Setting Range	Default	Property
F0 Group:Basic Function				
F0.00	G/P type display	1: G type (constant torque load) 2: P type (variable torque load e.g. fan and pump)	Model dependent	★
F0.01	Motor 1 control mode	0: Sensorless flux vector control (SFVC) 1: Closed-loop vector control (CLVC) 2: Voltage/Frequency (V/F) control	2	★
F0.02	Command source selection	0: Operation panel control (LED off) 1: Terminal control (LED on) 2: Communication control (LED blinking)	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
F0.03	Main frequency source X selection	0: Digital setting (non-retentive at power failure) 1: Digital setting (retentive at power failure) 2: VCI 3: CCI 4: ACI 5: Pulse setting (X5) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication setting	0	★
F0.04	Auxiliary frequency source Y selection	The same as F0-03 (Main frequency source X selection)	0	★
F0.05	Range of auxiliary frequency Y for X and Y operation	0: Relative to maximum frequency 1: Relative to main frequency X	0	☆
F0.06	Range of auxiliary frequency Y for X and Y operation	0%–150%	100%	☆
F0.07	Frequency source selection	Unit's digit (Frequency source selection) 0: Main frequency source X 1: X and Y operation (operation relationship determined by ten's digit) 2: Switchover between X and Y3: Switchover between X and "X and Y operation" 4: Switchover between Y and "X and Y operation" Ten's digit (X and Y operation relationship) 0: X+Y 1: X-Y 2: Maximum 3: Minimum	00	☆
F0.08	Preset frequency	0.00 to maximum frequency (valid when frequency source is digital setting)	50.00 Hz	☆
F0.09	Rotation direction	0: Same direction 1: Reverse direction	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
F0.10	Maximum frequency	50.00–320.00 Hz	50.00 Hz	★
F0.11	Source of frequency upper limit	0: Set by F0-12 1: VCI 2: CCI 3: ACI 4: Pulse setting (X5) 5: Communication setting	0	★
F0.12	Frequency upper limit	Frequency lower limit (F0-14) to maximum frequency (F0-10)	50.00 Hz	☆
F0.13	Frequency upper limit offset	0.00 Hz to maximum frequency (F0-10)	0.00 Hz	☆
F0.14	Frequency lower limit	0.00 Hz to frequency upper limit (F0-12)	0.00 Hz	☆
F0.15	Carrier frequency	0.5–16.0 kHz	Model dependent	☆
F0.16	Carrier frequency adjustment with temperature	0: No 1: Yes	1	☆
F0.17	Acceleration time 1	0.00–650.00s (F0-19 = 2) 0.0–6500.0s (F0-19 = 1) 0–65000s (F0-19 = 0)	Model dependent	☆
F0.18	Deceleration time 1	0.00–650.00s (F0-19 = 2) 0.0–6500.0s (F0-19 = 1) 0–65000s (F0-19 = 0)	Model dependent	☆
F0.19	Acceleration/Deceleration time unit	0:1s 1: 0.1s 2: 0.01s	1	★
F0.21	Frequency offset of auxiliary frequency source for X and Y operation	0.00 Hz to maximum frequency (F0-10)	0.00 Hz	☆
F0.22	Frequency reference resolution	1: 0.1 Hz 2: 0.01 Hz	2	★
F0.23	Retentive of digital setting frequency upon power failure	0: Not retentive 1: Retentive	2	☆
F0.24	Motor parameter group selection	0: Motor parameter group 1 1: Motor parameter group 2 2: Motor parameter group 3 3: Motor parameter group 4	0	★

Function Code	Parameter Name	Setting Range	Default	Property
F0.25	Acceleration/Deceleration time base frequency	0: Maximum frequency (F0-10) 1: Set frequency 2: 100 Hz	0	★
F0.26	Base frequency for UP/ DOWN modification during running	0: Running frequency 1: Set frequency	0	★
F0.27	Binding command source to frequency source	Unit's digit (Binding operation panel command to frequency source) 0: No binding 1: Frequency source by digital setting 2: VCI 3: CCI 4: ACI 5: Pulse setting (X5) 6: Multi-reference 7: Simple PLC 8: PID 9: Communication setting Ten's digit (Binding terminal command to frequency source) 0–9, same as unit's digit Hundred's digit (Binding communication command to frequency source) 0–9, same as unit's digit	000	☆
F0.28	Serial communication protocol	0: Modbus protocol 1: Profibus-DP bridge 2: CANopen bridge	0	☆
F1 Group:Motor Parameters				
F1.00	Motor type selection	0: Common asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnetic synchronous motor	1	★
F1.01	Rated motor power	0.1–1000.0 kW	Model dependent	★
F1.02	Rated motor voltage	1–2000 V	Model dependent	★

Function Code	Parameter Name	Setting Range	Default	Property
F1.03	Rated motor current	0.01–655.35 A (AC drive power ≤ 55 kW)	Model dependent	★
F1.04	Rated motor frequency	0.01 Hz to maximum frequency	Model dependent	★
F1.05	Rated motor rotational speed	1–65535 RPM	Model dependent	★
F1.06	Stator resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55	Model dependent	★
F1.07	Rotor resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55	Model dependent	★
F1.08	Leakage inductive reactance (asynchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55	Model dependent	★
F1.09	Mutual inductive reactance (asynchronous motor)	0.1–6553.5 mH (AC drive power ≤ 55 kW) 0.01–-655.35 mH (AC drive power > 55	Model dependent	★
F1.10	No-load current (asynchronous motor)	0.01 to F1-03 (AC drive power ≤ 55 kW) 0.1 to F1-03 (AC drive power > 55 kW)	Model dependent	★
F1.16	Stator resistance (synchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW)	Model dependent	★
F1.17	Shaft D inductance (synchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW)	Model dependent	★
F1.18	Shaft Q inductance (synchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55	Model dependent	★
F1.20	Back EMF (synchronous motor)	0.1–6553.5 V	Model dependent	★
F1.27	Encoder pulses per revolution	1–65535	1024	★
F1.28	Encoder type	0: ABZ incremental encoder 1: UVW incremental encoder 2: Resolver 3: SIN/COS encoder 4: Wire-saving UVW encoder	0	★
F1.30	A/B phase sequence of ABZ incremental	0: Forward 1: Reserve	0	★
F1.31	Encoder installation	0.0°–359.9°	0.0°	★

Function Code	Parameter Name	Setting Range	Default	Property
F1.32	U, V, W phase sequence of UVW	0: Forward 1: Reverse	0	★
F1.33	UVW encoder angle offset	0.0°–359.9°	0.0°	★
F1.34	Number of pole pairs of resolver	1–65535	1	★
F1.36	Encoder wire-break fault detection time	0.0s: No action 0.1–10.0s	0.0s	★
F1.37	Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor static auto-tuning 2: Asynchronous motor complete auto-tuning 11: Synchronous motor with-load auto-tuning 12: Synchronous motor no-load	0	★
F2 Group Vector Control Parameters				
F2.00	Speed loop proportional gain 1	0–100	30	☆
F2.01	Speed loop integral time 1	0.01–10.00s	0.50s	☆
F2.02	Switchover frequency 1	0.00 to F2-05	5.00 Hz	☆
F2.03	Speed loop proportional gain 2	0–100	20	☆
F2.04	Speed loop integral time 2	0.01–10.00s	1.00s	☆
F2.05	Switchover frequency 2	F2-02 to maximum output frequency	10.00 Hz	☆
F2.06	Vector control slip gain	50%–200%	100%	☆
F2.07	Time constant of speed loop filter	0.000–0.100s	0.000s	☆
F2.08	Vector control over-excitation gain	0–200	64	☆
F2.09	Torque upper limit source in speed control mode	0: F2-10 1: VCI 2: CCI 3: ACI 4: Pulse setting (X5) 5: Communication setting	0	☆
F2.10	Digital setting of torque upper limit in speed control mode	0.0%–200.0%	150.0%	☆
F2.11	Torque upper limit source in speed control model	0:F2.10 1:VCI 2:CCI 3:ACI 4:X5 setting 5:communication setting 6Min(vci,cci) 7Max(vci cci) 8:F2.12 setting	0-8[0]	☆

Function Code	Parameter Name	Setting Range	Default	Property
F2.12	Digital setting of torque upper limit in speed control model	0.0-200.0%	150.0%	☆
F2.13	Excitation adjustment proportional gain	0–60000	2000	☆
F2.14	Excitation adjustment integral gain	0–60000	1300	☆
F2.15	Torque adjustment proportional gain	0–60000	2000	☆
F2.16	Torque adjustment integral gain	0–60000	1300	☆
F2.17	Speed loop integral property	Unit's digit: integral separation 0: Disabled 1: Enabled	0	☆
F2.18	Field weakening mode of synchronous motor	0: No field weakening 1: Direct calculation 2: Automatic adjustment	1	☆
F2.19	Field weakening depth of synchronous motor	50%–500%	100%	☆
F2.20	Maximum field weakening current	1%–300%	50%	☆
F2.21	Field weakening automatic adjustment gain	10%–500%	100%	☆
F2.22	Power limit	0:Invalid 1:Valid 3.Constant speed valid 4:Decelerate speed valid	0	☆
F2.23	Power upper limit	0-200%	100%	☆
F3 Group V/F Control Parameters				
F3.00	V/F curve setting	0: Linear V/F 1: Multi-point V/F 2: Square V/F 3: 1.2-power V/F 4: 1.4-power V/F 6: 1.6-power V/F 8: 1.8-power V/F 9: Reserved 10: V/F complete separation 11: V/F half separation	0	★

Function Code	Parameter Name	Setting Range	Default	Property
F3.01	Torque boost	0.0% (fixed torque boost) 0.1%–30.0%	Model dependent	☆
F3.02	Cut-off frequency of torque boost	0.00 Hz to maximum output frequency	50.00 Hz	★
F3.03	Multi-point V/F frequency 1 (F1)	0.00 Hz to F3-05	0.00 Hz	★
F3.04	Multi-point V/F voltage 1 (V1)	0.0%–100.0%	0.0%	★
F3.05	Multi-point V/F frequency 2 (F2)	F3.03 to F3.07	0.00 Hz	★
F3.06	Multi-point V/F voltage 2 (V2)	0.0%–100.0%	0.0%	★
F3.07	Multi-point V/F frequency 3 (F3)	F3-05 to rated motor frequency (F1-04) Note: The rated frequencies of motors 2, 3, and 4 are respectively set in A2-04, A3-04, and A4-04.	0.00 Hz	★
F3.08	Multi-point V/F voltage 3 V3	0.0%–100.0%	0.0%	★
F3.09	V/F slip compensation gain	0%–200.0%	0.0%	☆
F3.10	V/F over-excitation gain	0–200	64	☆
F3.11	V/F oscillation suppression gain	0–100	Model dependent	☆
F3.13	Voltage source for V/F separation	0: Digital setting (F3-14) 1: VCI 2: CCI 3: ACI 4: Pulse setting (X5) 5: Multi-reference 6: Simple PLC 7: PID 8: Communication setting 100.0% corresponds to the rated motor voltage (F1-02, A4-02, A5-02, A6-02).	0	☆
F3.14	Voltage digital setting for V/ F separation	0 V to rated motor voltage	0 V	☆
F3.15	Voltage rise time of V/F separation	0.0–1000.0s It indicates the time for the voltage rising from 0 V to rated motor voltage.	0.0s	☆
F3.16	Voltage decline time of V/F separation	0.0–1000.0s It indicates the time for the voltage to decline from rated motor voltage to 0 V.	0.0s	☆

<table>
<tr><th>Function Code</th><th>Parameter Name</th><th>Setting Range</th><th>Default</th><th>Property</th></tr>
<tr><td>F3.17</td><td>Stop mode selection upon V/F separation</td><td>0: Frequency and voltage declining to 0 independently
1: Frequency declining after voltage declines to 0</td><td>0</td><td>☆</td></tr>
<tr><td colspan="5">F4 Group Input terminals 1</td></tr>
<tr><td>F4.00</td><td>X1 function selection</td><td rowspan="5">0: No function
1: Forward RUN (FWD) 2: Reverse RUN (REV) 3: Three-line control
4: Forward JOG (FJOG) 5: Reverse JOG (RJOG) 6: Terminal UP
7: Terminal DOWN 8: Coast to stop
9: Fault reset (RESET) 10: RUN pause
11: Normally open (NO) input of external fault
12: Multi-reference terminal 1 13: Multi-reference terminal 2
14: Multi-reference terminal 3 15: Multi-reference terminal 4
16: Terminal 1 for acceleration/ deceleration time selection
17: Terminal 2 for acceleration/ deceleration time selection
18: Frequency source switchover
19: UP and DOWN setting clear (terminal, operation panel)
20: Command source switchover terminal 1
21:Acceleration/Deceleration prohibited
22: PID pause
23: PLC status reset 24: Swing pause 25: Counter input 26: Counter reset
27: Length count input 28: Length reset
29: Torque control prohibited</td><td>1</td><td>★</td></tr>
<tr><td>F4.01</td><td>X2 function selection</td><td>4</td><td>★</td></tr>
<tr><td>F4.02</td><td>X3 function selection</td><td>9</td><td>★</td></tr>
<tr><td>F4.03</td><td>X4 function selection</td><td>12</td><td>★</td></tr>
<tr><td>F4.04</td><td>X5 function selection</td><td>13</td><td>★</td></tr>
</table>

Function Code	Parameter Name	Setting Range	Default	Property
F4.05	X6 function selection	30: Pulse input (enabled only for X5) 31:Reserved 32: Immediate DC braking 33: Normally closed (NC) input of external fault 34: Frequency modification forbidden 35: Reverse PID action direction 36: External STOP terminal 1 37: Command source switchover terminal 2 38: PID integral pause 39: Switchover between main frequency source X and preset frequency 40: Switchover between auxiliary frequency source Y and preset frequency 41: Motor selection terminal 1 42: Motor selection terminal 2 43: PID parameter switchover 44: User-defined fault 1 45: User-defined fault 2 46: Speed control/Torque control switchover 47: Emergency stop 48: External STOP terminal 2 49: Deceleration DC braking 50: Clear the current running time 51: Switchover between two-line mode and three-line mode 52–59: Reserved	U	★
F4.06	X7 function selection		0	★
F4.07	X8 function selection		0	★
F4.08	X9 function selection		0	★
F4.09	X10 function selection		0	★
F4.10	DI filter time	0.000–1.000s	0.010s	☆
F4.11	Terminal command mode	0: Two-line mode 1 1: Two-line mode 2 2: Three-line mode 1 3: Three-line mode 2	0	★
F4.12	Terminal UP/DOWN rate	0.01–65.535 Hz/s	1.00 Hz/s	☆
F4.13	AI curve 1 minimum input	0.00 V to F4-15	0.00 V	☆
F4.14	Corresponding setting of AI curve 1 minimum input	-100.00%–100.0%	0.0%	☆
F4.15	AI curve 1 maximum input	F4-13 to 10.00 V	10.00 V	☆
F4.16	Corresponding setting of AI curve 1 maximum input	-100.00%–100.0%	100.0%	☆

Function Code	Parameter Name	Setting Range	Default	Property
F4.17	VCI filter time	0.00–10.00s	0.10s	☆
F4.18	AI curve 2 minimum input	0.00 V to F4-20	0.00 V	☆
F4.19	Corresponding setting of AI curve 2 minimum input	-100.00%–100.0%	0.0%	☆
F4.20	AI curve 2 maximum input	F4-18 to 10.00 V	10.00 V	☆
F4.21	Corresponding setting of AI curve 2 maximum input	-100.00%–100.0%	100.0%	☆
F4.22	CCI filter time	0.00–10.00s	0.10s	☆
F4.23	AI curve 3 minimum input	0.00 V to F4-25	0.00 V	☆
F4.24	Corresponding setting of AI curve 3 minimum input	-100.00%–100.0%	0.0%	☆
F4.25	AI curve 3 maximum input	F4-23 to 10.00 V	10.00 V	☆
F4.26	Corresponding setting of AI curve 3 maximum input	-100.00%–100.0%	100.0%	☆
F4.27	ACI filter time	0.00–10.00s	0.10s	☆
F4.28	X5 Pulse minimum input	0.00 kHz to F4.30	0.00 kHz	☆
F4.29	X5 Corresponding setting of pulse minimum input	-100.00%–100.0%	0.0%	☆
F4.30	X5 Pulse maximum input	F4.28 to 50.00 kHz	50.00 kHz	☆
F4.31	X5 Corresponding setting of pulse maximum input	-100.00%–100.0%	100.0%	☆
F4.32	X5 Pulse filter time	0.00–10.00s	0.10s	☆
F4.33	AI curve selection	Unit's digit (VCI curve selection)		
		Curve 1 (2 points, see F4-13 to F4-16) Curve 2 (2 points, see F4-18 to F4-21) Curve 3 (2 points, see F4-23 to F4-26) Curve 4 (4 points, see A6-00 to A6-07) Curve 5 (4 points, see A6-08 to A6-15)		
		Ten's digit (CCI curve selection)		
		Curve 1 to curve 5 (same as VCI)		
		Hundred's digit (ACI curve selection)		
		Curve 1 to curve 5 (same as VCI)		
		Unit's digit (Setting for VCI less than minimum input)		
		0: Minimum value 1: 0.0%		

F4.34	Setting for AI less than minimum input	Ten's digit (Setting for CCI less than minimum input)		
		0, 1 (same as VCI)		
		Hundred's digit (Setting for ACI less than minimum input)		
		0, 1 (same as VCI)		
F4.35	DI1 delay time	0.0–3600.0s	0.0s	★
F4.36	DI2 delay time	0.0–3600.0s	0.0s	★
F4.37	DI3 delay time	0.0–3600.0s	0.0s	★
F4.38	DI valid mode selection 1	Unit's digit (DI1 valid mode) 0: High level valid 1: Low level valid Ten's digit (DI2 valid mode) 0, 1 (same as DI1) Hundred's digit (DI3 valid mode) 0, 1 (same as DI1)	00000	★
F4.38	DI valid mode selection 1	Thousand's digit (DI4 valid mode) 0, 1 (same as DI1) Ten thousand's digit (X5 valid mode) 0, 1 (same as DI1)	00000	★
F4.39	DI valid mode selection 2	Unit's digit (DI6 valid mode) 0, 1 (same as DI1) Ten's digit (DI7 valid mode) 0, 1 (same as DI1) Hundred's digit (DI8 state) 0, 1 (same as DI1) Thousand's digit (DI9 valid mode) 0, 1 (same as DI1) Ten thousand's digit (DI10 valid mode) 0, 1 (same as DI1)	00000	★

Function Code	Parameter Name	Setting Range	Default	Property
F5 Group Output Terminals				
F5.00	FM terminal output mode	0: Pulse output 1: Switch signal output (	0	☆
F5.01	D0 function (open-collector output terminal)	0: No output 1: AC drive running 2: Fault output (stop) 3: Frequency-level detection FDT1 output 4: Frequency reached 5: Zero-speed running (no output at stop) 6: Motor overload pre-warning 7: AC drive overload pre-warning 8: Set count value reached 9: Designated count value reached 10: Length reached 11: PLC cycle complete 12: Accumulative running time reached 13: Frequency limited 14: Torque limited 15: Ready for RUN 16: VCI larger than CCI 17: Frequency upper limit reached 18: Frequency lower limit reached (no output at stop) 19: Undervoltage state output 20: Communication setting 21: Reserved 22: Reserved 23: Zero-speed running 2 (having output at stop) 24: Accumulative power-on time reached 25: Frequency level detection FDT2 output 26: Frequency 1 reached 27: Frequency 2 reached 28: Current 1 reached 29: Current 2 reached 30: Timing reached	2	☆
F5.02	Relay function (T/A-T/B-T/C)		2	☆
F5.03	Extension card relay function (P/A-P/B-P/C)		0	☆
F5.04			0	☆

F5.05	O1 function selection (open-collector output terminal)	31: VCI input limit exceeded 32: Load becoming 0 33: Reverse running 34: Zero current state 35: Module temperature reached 36: Software current limit exceeded 37: Frequency lower limit reached (having output at stop) 38: Alarm output 39: Motor overheat warning 40: Current running time reached 41: Fault output (There is no output if it is the coast to stop fault and undervoltage occurs.)	1	☆
F5.06	FMP function selection	0: Running frequency 1: Set frequency 2: Output current 3: Output torque (absolute value) 4: Output power 5: Output voltage 6: Pulse input 7: VCI 8: CCI 9: ACI 10: Length 11: Count value 12: Communication setting 13: Motor rotational speed 14: Output current 15: Output voltage 16: Output torque (actual value)	0	☆
F5.07	AO1 function selection		0	☆
F5.08	AO2 function selection		1	☆
F5.09	Maximum D0 output frequency	0.01–100.00 kHz	50.00 kHz	☆
F5.10	AO1 offset coefficient	-100.0%–100.0%	0.0%	☆
F5.11	AO1 gain	-10.00–10.00	1.00	☆

Function Code	Parameter Name	Setting Range	Default	Property
F5.12	AO2 offset coefficient	-100.0%–100.0%	0.00%	☆
F5.13	AO2 gain	-10.00–10.00	1.00	☆
F5.17	D0 output delay time	0.0–3600.0s	0.0s	☆
F5.18	Relay 1 output delay time	0.0–3600.0s	0.0s	☆
F5.19	Relay 2 output delay time	0.0–3600.0s	0.0s	☆
F5.20	DO1 output delay time	0.0–3600.0s	0.0s	☆
F5.21	DO2 output delay time	0.0–3600.0s	0.0s	☆
F5.22	DO valid mode selection	Unit's digit (D0 valid mode) 0: Positive logic 1: Negative logic Ten's digit (Relay 1 valid mode) 0, 1 (same as DO) Hundred's digit (Relay 2 valid mode) 0, 1 (same as DO) Thousand's digit (DO1 valid mode) 0, 1 (same as DO) Ten thousand's digit (DO2 valid mode) 0, 1 (same as DO)	00000	☆
F6 Group Start/Stop Control				
F6.00	Start mode	0: Direct start 1: Rotational speed tracking restart 2: Pre-excited start (asynchronous motor)	0	☆
F6.01	Rotational speed tracking mode	0: From frequency at stop 1: From zero speed 2: From maximum frequency	0	★
F6.02	Rotational speed tracking speed	1–100	20	☆
F6.03	Startup frequency	0.00–10.00 Hz	0.00 Hz	☆
F6.04	Startup frequency holding time	0.0–100.0s	0.0s	★
F6.05	Startup DC braking current/ Pre-excited current	0%–100%	0%	★
F6.06	Startup DC braking time/ Pre-excited time	0.0–100.0s	0.0s	★

Function Code	Parameter Name	Setting Range	Default	Property
F6.07	Acceleration/Deceleration mode	0: Linear acceleration/ deceleration 1: S-curve acceleration/ deceleration A 2: S-curve acceleration/ deceleration B	0	★
F6.08	Time proportion of S-curve start segment	0.0% to (100.0% – F6-09)	30.0%	★
F6.09	Time proportion of S-curve end segment	0.0% to (100.0% – F6-08)	30.0%	★
F6.10	Stop mode	0: Decelerate to stop 1: Coast to stop	0	☆
F6.11	Initial frequency of stop DC braking	0.00 Hz to maximum frequency	0.00 Hz	☆
F6.12	Waiting time of stop DC braking	0.0–36.0s	0.0s	☆
F6.13	Stop DC braking current	0%–100%	0%	☆
F6.14	Stop DC braking time	0.0–36.0s	0.0s	☆
F6.15	Brake use ratio	0%–100%	100%	☆
F7 Group Operation Panel and Display				
F7.01	MJOG Key function selection	0: MJOG key disabled 1: Switchover between operation panel control and remote command control (terminal or communication) 2: Switchover between forward rotation and reverse rotation 3: Forward JOG 4: Reverse JOG	0	★
F7.02	STOP/RESET key function	0: STOP/RESET key enabled only in operation panel control 1: STOP/RESET key enabled in any operation mode	1	☆
F7.03	LED display running parameters 1	0000–FFFF Bit00: Running frequency 1 (Hz) Bit01: Set frequency (Hz) Bit02: Bus voltage (V) Bit03: Output voltage (V) Bit04: Output current (A) Bit05: Output power (kW) Bit06: Output torque (%) Bit07: X input status	1F	☆

Function Code	Parameter Name	Setting Range	Default	Property
F7.03	LED display running parameters 1	Bit08: DO output status Bit09: VCI voltage (V) Bit10: CCI voltage (V) Bit11: ACI voltage (V) Bit12: Count value Bit13: Length value Bit14: Load speed display Bit15: PID setting	1F	☆
F7.04	LED display running parameters 2	0000–FFFF Bit00: PID feedback Bit01: PLC stage Bit02: X5 Pulse setting frequency (kHz) Bit03: Running frequency 2 (Hz) Bit04: Remaining running time Bit05: VCI voltage before correction (V) Bit06: CCI voltage before correction (V) Bit07: ACI voltage before correction (V) Bit08: Linear speed Bit09: Current power-on time (Hour) Bit10: Current running time (Min) Bit11:X 5Pulse setting frequency (Hz) Bit12: Communication setting value Bit13: Encoder feedback speed (Hz) Bit14: Main frequency X display (Hz) Bit15: Auxiliary frequency Y display (Hz)	0	☆
F7.05	LED display stop parameters	0000–FFFF Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: DI input status Bit03: DO output status Bit04: VCI voltage (V) Bit05: CCI voltage (V) Bit06: ACI voltage (V) Bit07: Count value Bit08: Length value Bit09: PLC stage Bit10: Load speed Bit11: PID setting Bit12: X5 Pulse setting frequency (kHz)	33	☆

Function Code	Parameter Name	Setting Range	Default	Property
F7.06	Load speed display coefficient	0.0001–6.5000	1.0000	☆
F7.07	Heatsink temperature of inverter module	0.0–100.0°C	-	★
F7.08	Temporary software version	-	-	★
F7.09	Accumulative running time	0–65535 h	-	★
F7.10	Product number	-	-	★
F7.11	Software version	-	-	★
F7.12	Number of decimal places for load speed display	0: 0 decimal place 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1	☆
F7.13	Accumulative power-on time	0–65535 h	0 h	★
F7.14	Accumulative power consumption	0–65535 kWh	-	★
F8 Group Enhanced Function				
F8.00	JOG running frequency	0.00 Hz to maximum frequency	2.00 Hz	☆
F8.01	JOG acceleration time	0.0–6500.0s	20.0s	☆
F8.02	JOG deceleration time	0.0–6500.0s	20.0s	☆
F8.03	Acceleration time 2	0.0–6500.0s	Model dependent	☆
F8.04	Deceleration time 2	0.0–6500.0s	Model dependent	☆
F8.05	Acceleration time 3	0.0–6500.0s	Model dependent	☆
F8.06	Deceleration time 3	0.0–6500.0s	Model dependent	☆
F8.07	Acceleration time 4	0.0–500.0s	Model dependent	☆
F8.08	Deceleration time 4	0.0–6500.0s	Model dependent	☆
F8.09	Jump frequency 1	0.00 Hz to maximum frequency	0.00 Hz	☆
F8.10	Jump frequency 2	0.00 Hz to maximum frequency	0.00 Hz	☆
F8.11	Frequency jump amplitude	0.00 Hz to maximum frequency	0.00 Hz	☆
F8.12	Forward/Reverse rotation dead-zone time	0.0–3000.0s	0.0s	☆
F8.13	Reverse control	0: Enabled 1: Disabled	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
F8.14	Running mode when set frequency lower than	0: Run at frequency lower limit 1: Stop 2: Run at zero speed	0	☆
F8.15	Droop control	0.00–10.00 Hz	0.00 Hz	☆
F8.16	Accumulative power-on time threshold	0–65000 h	0 h	☆
F8.17	Accumulative running time threshold	0–65000 h	0 h	☆
F8.18	Startup protection	0: No 1: Yes	0	☆
F8.19	Frequency detection value (FDT1)	0.00 Hz to maximum frequency	50.00 Hz	☆
F8.20	Frequency detection hysteresis (FDT hysteresis 1)	0.0%–100.0% (FDT1 level)	5.0%	☆
F8.21	Detection range of frequency reached	0.00–100% (maximum frequency)	0.0%	☆
F8.22	Jump frequency during acceleration/deceleration	0: Disabled1: Enabled	0	☆
F8.25	Frequency switchover point between acceleration time 1	0.00 Hz to maximum frequency	0.00 Hz	☆
F8.26	Frequency switchover point between deceleration time 1	0.00 to maximum frequency	0.00 Hz	☆
F8.27	Terminal JOG preferred	0: Disabled1: Enabled	0	☆
F8.28	Frequency detection value (FDT2)	0.00 to maximum frequency	50.00 Hz	☆
F8.29	Frequency detection hysteresis (FDT hysteresis	0.0%–100.0% (FDT2 level)	5.0%	☆
F8.30	Any frequency reaching detection value 1	0.00 Hz to maximum frequency	50.00 Hz	☆
F8.31	Any frequency reaching detection amplitude 1	0.0%–100.0% (maximum frequency)	0.0%	☆
F8.32	Any frequency reaching detection value 2	0.00 Hz to maximum frequency	50.00 Hz	☆
F8.33	Any frequency reaching detection amplitude 2	0.0%–100.0% (maximum frequency)	0.0%	☆
F8.34	Zero current detection level	0.0%–300.0% (rated motor current)	5.0%	☆
F8.35	Zero current detection delay time	0.00–600.00s	0.10s	☆
F8.36	Output overcurrent threshold	0.0% (no detection) 0.1%–300.0% (rated motor current)	200.0%	☆

Function Code	Parameter Name	Setting Range	Default	Property
F8.37	Output overcurrent detection delay time	0.00–600.00s	0.00s	☆
F8.38	Any current reaching 1	0.0%–300.0% (rated motor current)	100.0%	☆
F8.39	Any current reaching 1 amplitude	0.0%–300.0% (rated motor current)	0.0%	☆
F8.40	Any current reaching 2	0.0%–300.0% (rated motor current)	100.0%	☆
F8.41	Any current reaching 2 amplitude	0.0%–300.0% (rated motor current)	0.0%	☆
F8.42	Timing function	0: Disabled 1: Enabled	0	☆
F8.43	Timing duration source	0: F8-44 1: VCI 2: CCI 3: ACI (100% of analog input corresponds to the value of F8-44)	0	☆
F8.44	Timing duration	0.0–6500.0 min	0.0 min	☆
F8.45	VCI input voltage lower limit	0.00 V to F8-46	3.10 V	☆
F8.46	VCI input voltage upper limit	F8-45 to 10.00 V	6.80 V	☆
F8.47	Module temperature threshold	0–100°C	75°C	☆
F8.48	Cooling fan control	0: Fan working during running 1: Fan working continuously	0	☆
F8.49	Wakeup frequency	Dormant frequency (F8-51) to maximum frequency (F0-10)	0.00 Hz	☆
F8.50	Wakeup delay time	0.0–6500.0s	0.0s	☆
F8.51	Dormant frequency	0.00 Hz to wakeup frequency (F8-49)	0.00 Hz	☆
F8.52	Dormant delay time	0.0–6500.0s	0.0s	☆
F8.53	Current running time reached	0.0–6500.0 min	0.0 min	☆
F8.54	Output power correction coefficient	0.00%–200 .0%	100.0%	☆
F9 Group Fault and Protection				
F9.00	Motor overload protection selection	0:Disabled 1:Enabled	1	☆
F9.01	Motor overload protection gain	0.20–10.00	1.00	☆

Function Code	Parameter Name	Setting Range	Default	Property
F9.02	Motor overload warning coefficient	50%–100%	80%	☆
F9.03	Overvoltage stall gain	0 (no stall overvoltage)–100	0	☆
F9.04	Overvoltage stall protective voltage	120%–150%	130%	☆
F9.05	Overcurrent stall gain	0–100	20	☆
F9.06	Overcurrent stall protective current	100%–200%	150%	☆
F9.07	Short-circuit to ground upon power-on	0: Disabled 1: Enabled	1	☆
F9.09	Fault auto reset times	0–20	0	☆
F9.10	DO action during fault auto reset	0: Not act 1: Act	0	☆
F9.11	Time interval of fault auto reset	0.1s–100.0s	1.0s	☆
F9.12	Input phase loss protection/ contactor energizing protection selection	Unit's digit: Input phase loss protection Ten's digit: Contactor energizing protection	11	☆
F9.13	Output phase loss protection selection	0: Disabled 1: Enabled	1	☆
F9.14	1st fault type	0: No fault 1: Reserved 2:Overcurrent during acceleration 3: Overcurrent during deceleration 4: Overcurrent at constant speed 5: Overvoltage during acceleration 6: Overvoltage during deceleration 7: Overvoltage at constant speed 8: Buffer resistance overload 9: Undervoltage 10: AC drive overload	-	★

F9.15	2nd fault type	11: Motor overload 12:Power input phase loss 13: Power output phase loss 14: Module overheat 15: External equipment fault 16: Communication fault 17: Contactor fault 18: Current detection fault 19: Motor auto-tuning fault 20: Encoder/PG card fault 21: EEPROM read-write fault 22: AC drive hardware fault 23: Short circuit to ground 24: Reserved 25: Reserved 26:Accumulative running time reached 27: User-defined fault 1 28: User-defined fault 2 29: Accumulative power-on time reached 30: Load becoming 0 31: PID feedback lost during running 40: With-wave current limit fault 41: Motor switchover fault during running 42: Too large speed deviation 43: Motor over-speed 45: Motor overheat	-	★
F9.16	3rd fault type(Latest)	3rd (latest) fault type		
F9.17	Frequency upon 3rd fault	-	-	★
F9.18	Current upon 3rd fault	-	-	★
F9.19	Bus voltage upon 3rd fault	-	-	★
F9.20	DI status upon 3rd fault	-	-	★
F9.21	Output terminal status upon 3rd fault	-	-	★
F9.22	AC drive status upon 3rd fault	-	-	★
F9.23	Power-on time upon 3rd fault	-	-	●
F9.24	Running time upon 3rd fault	-	-	★
F9.27	Frequency upon 2nd fault	-	-	★
F9.28	Current upon 2nd fault	-	-	★
F9.29	Bus voltage upon 2nd fault	-	-	★

Function Code	Parameter Name	Setting Range	Default	Property
F9.30	DI status upon 2nd fault	-	-	★
F9.31	Output terminal status upon 2nd fault			
F9.32	Frequency upon 2nd fault	-	-	★
F9.33	Current upon 2nd fault	-	-	★
F9.34	Bus voltage upon 2nd fault	-	-	★
F9.37	DI status upon 1st fault	-	-	★
F9.38	Output terminal status upon 1st fault	-	-	★
F9.39	Frequency upon 1st fault	-	-	★
F9.40	Current upon 1st fault	-	-	★
F9.41	Bus voltage upon 3rd fault	-	-	★
F9.42	DI status upon 1st fault	-	-	★
F9.43	Output terminal status upon 1st fault	-	-	★
F9.44	Frequency upon 1st fault	-	-	★
F9.47 F9.47	Fault protection action selection 1 Fault protection action selection 1	Unit's digit (Motor overload, Err11) 0: Coast to stop 1: Stop according to the stop mode 2: Continue to run Ten's digit (Power input phase loss, Err12) Same as unit's digit Hundred's digit (Power output phase loss, Err13) Same as unit's digit Thousand's digit (External equipment fault, Err15) Same as unit's digit Ten thousand's digit (Communication fault, Err16) Same as unit's digit	00000 00000	☆ ☆
		Unit's digit (Encoder fault, Err20)		

F9.48	Fault protection action selection 2	0: Coast to stop 1: Switch over to V/F control, stop according to the stop mode 2: Switch over to V/F control, continue to run	00000	☆
		Ten's digit (EEPROM read-write fault, Err21)		
		0: Coast to stop 1: Stop according to the stop mode		
F9.48	Fault protection action selection 2	Hundred's digit: reserved	00000	☆
		Thousand's digit (Motor overheat, Err25)		
		Same as unit's digit in F9-47		
		Ten thousand's digit (Accumulative running time reached)		
		Same as unit's digit in F9-47		
F9.49 F9.49	Fault protection action selection 3 Fault protection action selection 3	Unit's digit (User-defined fault 1, Err27)	00000 00000	☆ ☆
		Same as unit's digit in F9-47		
		Ten's digit (User-defined fault 2, Err28)		
		Same as unit's digit in F9-47		
		Hundred's digit (Accumulative power-on time reached, Err29)		
		Same as unit's digit in F9-47		
		Thousand's digit (Load becoming 0, Err30)		
		0: Coast to stop 1: Stop according to the stop mode 2: Continue to run at 7% of rated motor frequency and resume to the set frequency if the load recovers		
		Ten thousand's digit (PID feedback lost during running, Err31)		
		Same as unit's digit in F9-47		

Function Code	Parameter Name	Setting Range	Default	Property
F9.50	Fault protection action selection 4	Unit's digit (Too large speed deviation, Err42) Same as unit's digit in F9-47 Ten's digit (Motor over-speed, Err43) Same as unit's digit in F9-47 Hundred's digit (Initial position fault, Err51) Same as unit's digit in F9-47 Thousand's digit (Speed feedback fault, Err52) Same as unit's digit in F9-47 Ten thousand's digit: Reserved	00000	☆
F9.54	Frequency selection for continuing to run upon fault	0: Current running frequency 1: Set frequency 2: Frequency upper limit 3: Frequency lower limit 4: Backup frequency upon abnormality	0	☆
F9.55	Backup frequency upon abnormality	0.0%–100.0% (maximum frequency)	100.0%	☆
F9.56	Type of motor temperature sensor	0: No temperature sensor 1: PT100 2:PT1000	1	☆
F9.57	Motor overheat protection threshold	0–200°C	110°C	☆
F9.58	Motor overheat warning threshold	0–200°C	90°C	☆
F9.59	Action selection at instantaneous power failure	0: Invalid 1: Decelerate 2: Decelerate to stop	0	☆
F9.60	Action pause judging voltage at instantaneous power failure	80.0%–100.0%	90.0%	☆
F9.61	Voltage rally judging time at instantaneous power failure	0.00–100.00s	0.50s	☆
F9.62	Action judging voltage at instantaneous power failure	60.0%–100.0% (standard bus voltage)	80.0%	☆
F9.63	Protection upon load becoming 0	0: Disabled 1: Enabled	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
F9.64	Detection level of load becoming 0	0.0%–100.0% (rated motor current)	10.0%	☆
F9.65	Detection time of load becoming 0	0.0–60.0s	1.0s	☆
F9.67	Over-speed detection value	0.0%–50.0% (maximum frequency)	20.0%	☆
F9.68	Over-speed detection time	0.0–60.0s	1.0s	☆
F9.69	Detection value of too large speed deviation	0.0%–50.0% (maximum frequency)	20.0%	☆
F9.70	Detection time of too large speed deviation	0.0–60.0s	5.0s	☆
FA Group Process Control PID Function				
FA.00	PID setting source	0: FA.01 1: VCI 2:CCI 3:ACI 4: Pulse setting (X5) 5: Communication setting 6: Multi-reference	0	☆
FA.01	PID digital setting	0.0%–100.0%	50.0%	☆
FA.02	PID feedback source	0: VCI 1: CCI 2: ACI 3: VCI – CCI 4: Pulse setting (X5) 5: Communication setting 6: VCI + CCI 7: MAX (VCI, CCI) 8: MIN (VCI, CCI)	0	☆
FA.03	PID action direction	0: Forward action 1: Reverse action	0	☆
FA.04	PID setting feedback range	0–65535	1000	☆
FA.05	Proportional gain Kp1	0.0–100.0	20.0	☆
FA.06	Integral time Ti1	0.01–10.00s	2.00s	☆
FA.07	Differential time Td1	0.00–10.000	0.000s	☆
FA.08	Cut-off frequency of PID reverse rotation	0.00 to maximum frequency	2.00 Hz	☆
FA.09	PID deviation limit	0.0%–100.0%	0.0%	☆

Function Code	Parameter Name	Setting Range	Default	Property
FA.10	PID differential limit	0.00%–100.00%	0.10%	☆
FA.11	PID setting change time	0.00–650.00s	0.00s	☆
FA.12	PID feedback filter time	0.00–60.00s	0.00s	☆
FA.13	PID output filter time	0.00–60.00s	0.00s	☆
FA.14	Reserved	-	-	☆
FA.15	Proportional gain Kp2	0.0–100.0	20.0	☆
FA.16	Integral time Ti2	0.01–10.00s	2.00s	☆
FA.17	Differential time Td2	0.000–10.000s	0.000s	☆
FA.18	PID parameter switchover condition	0: No switchover 1: Switchover via X5 2: Automatic switchover based on deviation	0	☆
FA.19	PID parameter switchover deviation 1	0.0% to FA-20	20.0%	☆
FA.20	PID parameter switchover deviation 2	FA-19 to 100.0%	80.0%	☆
FA.21	PID initial value	0.0%–100.0%	0.0%	☆
FA.22	PID initial value holding time	0.00–650.00s	0.00s	☆
FA.23	Maximum deviation between two PID outputs in forward	0.00%–100.00%	1.00%	☆
FA.24	Maximum deviation between two PID outputs in reverse	0.00%–100.00%	1.00%	☆
FA.25	PID integral property	Unit's digit (Integral separated)		
		0: Invalid 1: Valid		
		Ten's digit (Whether to stop integral operation when the output reaches		
		0: Continue integral operation 1: Stop integral operation		
FA.26	Detection value of PID feedback loss	0.0%: Not judging feedback loss 0.1%–100.0%	0.0%	☆
FA.27	Detection time of PID feedback loss	0.0–20.0s	0.0s	☆

Function Code	Parameter Name	Setting Range	Default	Property
FA.28	PID operation at stop	0: No PID operation at stop 1: PID operation at stop	0	☆
FA.26	Detection value of PID feedback loss	0.0%: Not judging feedback loss 0.1%–100.0%	0.0%	☆
FA.27	Detection time of PID feedback loss	0.0–20.0s	0.0s	☆
FA.28	PID operation at stop	0: No PID operation at stop 1: PID operation at stop	0	☆
FB Group Swing Frequency, Fixed Length and Count				
FB.00	Swing frequency setting mode	0: Relative to the central frequency 1: Relative to the maximum frequency	0	☆
FB.01	Swing frequency amplitude	0.0%–100.0%	0.0%	☆
FB.02	Jump frequency amplitude	0.0%–50.0%	0.0%	☆
FB.03	Swing frequency cycle	0.0–3000.0s	10.0s	☆
FB.04	Triangular wave rising time coefficient	0.0%–100.0%	50.0%	☆
FB.05	Set length	0–65535 m	1000 m	☆
FB.06	Actual length	0–65535 m	0 m	☆
FB.07	Number of pulses per meter	0.1–6553.5	100.0	☆
FB.08	Set count value	1–65535	1000	☆
FB.09	Designated count value	1–65535	1000	☆
FC Group Multi-Reference and Simple PLC Function				
FC.00	Reference 0	-100.0%–100.0%	0.0%	☆
FC.01	Reference 1	-100.0%–100.0%	0.0%	☆
FC.02	Reference 2	-100.0%–100.0%	0.0%	☆
FC.03	Reference 3	-100.0%–100.0%	0.0%	☆
FC.04	Reference 4	-100.0%–100.0%	0.0%	☆
FC.05	Reference 5	-100.0%–100.0%	0.0%	☆
FC.06	Reference 6	-100.0%–100.0%	0.0%	☆
FC.07	Reference 7	-100.0%–100.0%	0.0%	☆
FC.08	Reference 8	-100.0%–100.0%	0.0%	☆
FC.09	Reference 9	-100.0%–100.0%	0.0%	☆
FC.10	Reference 10	-100.0%–100.0%	0.0%	☆
FC.11	Reference 11	-100.0%–100.0%	0.0%	☆
FC.12	Reference 12	-100.0%–100.0%	0.0%	☆
FC.13	Reference 13	-100.0%–100.0%	0.0%	☆

Function Code	Parameter Name	Setting Range	Default	Property
FC.14	Reference 14	-100.0%–100.0%	0.0%	☆
FC.16	Simple PLC running mode	0: Stop after the AC drive runs one cycle 1: Keep final values after the AC drive runs one cycle 2: Repeat after the AC drive runs one cycle	0	☆
FC.17	Simple PLC retentive selection	Unit's digit (Retentive upon power failure)		
		0: No 1: Yes		
		Ten's digit (Retentive upon stop)		
		0: No 1: Yes		
FC.18	Running time of simple PLC reference 0	0.0–6553.5s (h)	0.0s (h)	☆
FC.19	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.20	Running time of simple PLC reference 1	0.0–6553.5s (h)	0.0s (h)	☆
FC.21	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.22	Running time of simple PLC reference 2	0.0–6553.5s (h)	0.0s (h)	☆
FC.23	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.24	Running time of simple PLC reference 3	0.0–6553.5s (h)	0.0s (h)	☆
FC.25	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.26	Running time of simple PLC reference 4	0.0–6553.5s (h)	0.0s (h)	☆
FC.27	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.28	Running time of simple PLC reference 5	0.0–6553.5s (h)	0.0s (h)	☆
FC.29	Acceleration/deceleration time of simple PLC reference	0–3	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
FC.30	Running time of simple PLC reference 6	0.0–6553.5s (h)	0.0s (h)	☆
FC.31	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.32	Running time of simple PLC reference 7	0.0–6553.5s (h)	0.0s (h)	☆
FC.33	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.34	Running time of simple PLC reference 8	0.0–6553.5s (h)	0.0s (h)	☆
FC.35	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.36	Running time of simple PLC reference 9	0.0–6553.5s (h)	0.0s (h)	☆
FC.37	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.38	Running time of simple PLC reference 10	0.0–6553.5s (h)	0.0s (h)	☆
FC.39	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.40	Running time of simple PLC reference 11	0.0–6553.5s (h)	0.0s (h)	☆
FC.41	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.42	Running time of simple PLC reference 12	0.0–6553.5s (h)	0.0s (h)	☆
FC.43	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.44	Running time of simple PLC reference 13	0.0–6553.5s (h)	0.0s (h)	☆
FC.45	Acceleration/deceleration time of simple PLC reference	0–3	0	☆
FC.46	Running time of simple PLC reference 14	0.0–6553.5s (h)	0.0s (h)	☆
FC.47	Acceleration/deceleration time of simple PLC reference	0–3	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
FC.48	Running time of simple PLC reference 15	0.0–6553.5s (h)	0.0s (h)	☆
FC.49	Acceleration/deceleration time of simple PLC reference 15	0–3	0	☆
FC.50	Time unit of simple PLC running	0: s (second)1:h (hour)	0	☆
FC.51	Reference 0 source	0: Set by FC.00 1: VCI 2: CCI 3: ACI 4: Pulse setting X5 5.: PID 6: Set by preset frequency (F0.08), modified via terminal UP/ DOWN	0	☆
FD Group Communication Parameter				
FD.00	Baud rate	Unit's digit (Modbus baud rate) 0: 300 BPs 1: 600 BPs 2: 1200 BPs 3: 2400 BPs 4: 4800 BPs 5: 9600 BPs 6: 19200 BPs 7: 38400 BPs 8: 57600 BPs 9: 115200 BPs Ten's digit (PROFIBUS-DP baud rate) 0: 115200 BPs 1: 208300 BPs 2: 256000 BPs 3: 512000 Bps Hundred's digit (reserved) Thousand's digit (CANlink baud rate) 0: 20 1: 50 2:100 3:125 4: 250 5: 500 6: 1 M	6005 6005	☆ ☆

Function Code	Parameter Name	Setting Range	Default	Property
FD.01	Data format	0: No check, data format <8,N,2> 1: Even parity check, data format <8,E,1> 2: Odd Parity check, data format <8,O,1> 3: No check, data format <8,N,1> Valid for Modbus	0	☆
FD.02	Local address	0: Broadcast address 1–247 Valid for Modbus, PROFIBUS-DP and CANlink	1	☆
FD.03	Response delay	0–20 ms Valid for Modbus	2 ms	☆
FD.04	Communication timeout	0.0s (invalid) 0.1–60.0s Valid for Modbus, PROFIBUS-DP and CANopen	0.0s	☆
FD.05	Modbus protocol selection and PROFIBUS-DP data format	Unit's digit: Modbus protocol		
		0: Non-standard Modbus protocol 1: Standard Modbus protocol		
		Ten's digit: PROFIBUS-DP data format		
		0: PPO1 format 1: PPO2 format 2: PPO3 format 3: PPO5 format		
FD.06	Communication reading current resolution	0: 0.01A 1: 0.1A	0	☆
FD.08	CANlink communication timeout time	0.0s: Invalid 0.1–60.0s	0	☆
FE Group User-Defined Function Codes				
FE.00	User-defined function code 0		F0-10	☆
FE.01	User-defined function code 1		F0-02	☆
FE.02	User-defined function code 2		F0-03	☆
FE.03	User-defined function code 3		F0-07	☆
FE.04	User-defined function code 4		F0-08	☆

FE.05	User-defined function code 5	F0-00 to FP-xx A0-00 to Ax-xx U0-xx to U0-xx	F0-17	☆
FE.06	User-defined function code 6		F0-18	☆
FE.07	User-defined function code 7		F3-00	☆
FE.08	User-defined function code 8		F3-01	☆
FE.09	User-defined function code 9		F4-00	☆
FE.10	User-defined function code		F4-01	☆
FE.11	User-defined function code		F4-02	☆
FE.12	User-defined function code		F5-04	☆
FE.13	User-defined function code		F5-07	☆
FE.14	User-defined function code		F6-00	☆
FE.15	User-defined function code		F6-10	☆
FE.16	User-defined function code		F0-00	☆
FE.17	User-defined function code		F0-00	☆
FE.18	User-defined function code		F0-00	☆
FE.19	User-defined function code		F0-00	☆
FE.20	User-defined function code		F0-00	☆
FE.21	User-defined function code		F0-00	☆
FE.22	User-defined function code		F0-00	☆
FE.23	User-defined function code		F0-00	☆
FE.24	User-defined function code		F0-00	☆
FE.25	User-defined function code		F0-00	☆
FE.26	User-defined function code		F0-00	☆
FE.27	User-defined function code		F0-00	☆
FE.28	User-defined function code		F0-00	☆
FE.29	User-defined function code		F0-00	☆
FP Group User Password				
FP.00	User password	0–65535	0	☆
FP.01	Restore default settings	0: No operation 01:Restore factory settings except motor parameters 02: Clear records 04: Restore user backup parameters 501: Back up current user parameters	0	★

Function Code	Parameter Name	Setting Range	Default	Property
FP.02	AC drive parameter display property	Unit's digit (Group U display selection) 0: Not display 1: Display Ten's digit (Group A display selection) 0: Not display 1: Display	11	★
FP.03	Individualized parameter display property	Unit's digit (User-defined parameter display selection) 0: Not display 1: Display Ten's digit (User-modified parameter display selection) 0: Not display 1: Display	00	☆
FP.04	Parameter modification property	0: Modifiable 1: Not modifiable	0	☆
A0 Group Torque Control and Restricting Parameters				
A0.00	Speed/Torque control selection	0: Speed control 1: Torque control	0	★
A0.01	Torque setting source in torque control	0: Digital setting (A0-03) 1: VCI 2: CCI 3: ACI 4: Pulse setting (X5) 5: Communication setting 6: MIN (VCI, CCI) 7: MAX (VCI, CCI) Full range of values 1–7 corresponds to the digital setting of A0-03.	0	★
A0.03	Torque digital setting in torque control	-200.0%–200.0%	150.0%	☆
A0.05	Forward maximum frequency in torque control	0.00 Hz to maximum frequency (F0-10)	50.00 Hz	☆
A0.06	Reverse maximum frequency in torque control	0.00 Hz to maximum frequency (F0-10)	50.00 Hz	☆
A0.07	Acceleration time in torque control	0.00–65000s	0.00s	☆

Function Code	Parameter Name	Setting Range	Default	Property
A0.08	Deceleration time in torque control	0.00–65000s	0.00s	☆
A1 Group Virtual DI /Virtual DO				
A1.00	VX1 function selection	0–59	0	★
A1.01	VX2 function selection	0–59	0	★
A1.02	VX3 function selection	0–59	0	★
A1.03	VX4 function selection	0–59	0	★
A1.04	VX5 function selection	0–59	0	★
A1.05	VDI state setting mode	Unit's digit (VX1) 0: Decided by state of VDOx 1: Decided by A1.06 Ten's digit (VX2) 0, 1 (same as VX1) Hundred's digit (VX3) 0, 1 (same as VX1) Thousand's digit (VX4) 0, 1 (same as VX1) Ten thousand's digit (VX5) 0, 1 (same as VX1)	00000	★
A1.06	VDI state selection	Unit's digit (VX1) 0: Invalid 1: Valid Ten's digit (VX2) 0, 1 (same as VX1) Hundred's digit (VX3) 0, 1 (same as VX1) Thousand's digit (VX4) 0, 1 (same as VX1) Ten thousand's digit (VX5) 0, 1 (same as VX1)	00000	★
A1.07	Function selection for VCI used as DI	0–59	0	★
A1.08	Function selection for CCI used as DI	0–59	0	★
A1.09	Function selection for ACI used as DI	0–59	0	★

Function Code	Parameter Name	Setting Range	Default	Property
A1.10	State selection for AI used as DI	Unit's digit (VCI) 0: High level valid 1: Low level valid Ten's digit (CCI) 0, 1 (same as unit's digit) Hundred's digit (ACI) 0, 1 (same as unit's digit)		
A1.11	VDO1 function selection	0: Short with physical Xx internally 1–40: Refer to function selection of physical DO in group F5.	0	☆
A1.12	VDO2 function selection	0: Short with physical Xx internally 1–40: Refer to function selection of physical DO in group F5.	0	☆
A1.13	VDO3 function selection	0: Short with physical Dix internally 1–40: Refer to function selection of physical DO in group F5.	0	☆
A1.14	VDO4 function selection	0: Short with physical Xx internally 1–40: Refer to function selection of physical DO in group F5.	0	☆
A1.15	VDO5 function selection	0: Short with physical Xx internally 1–40: Refer to function selection of physical DO in group F5.	0	☆
A1.16	VDO1 output delay	0.0–3600.0s	0.0s	☆
A1.17	VDO2 output delay	0.0–3600.0s	0.0s	☆
A1.18	VDO3 output delay	0.0–3600.0s	0.0s	☆
A1.19	VDO4 output delay	0.0–3600.0s	0.0s	☆
A1.20	VDO5 output delay	0.0–3600.0s	0.0s	☆
A1.21	VDO state selection	Unit's digit (VDO1) 0: Positive logic 1: Reverse logic Ten's digit (VDO2) 0, 1 (same as unit's digit) Hundred's digit (VDO3) 0, 1 (same as unit's digit)		

		Thousand's digit (VDO4) 0, 1 (same as unit's digit) Ten thousand's digit (VDO5) 0, 1 (same as unit's digit)		
A2 Group Motor 2 Parameters				
A2.00	Motor type selection	0: Common asynchronous motor 1: Variable frequency asynchronous motor 2: Permanent magnetic synchronous motor	0	★
A2.01	Rated motor power	0.1–1000.0 kW	Model depende	★
A2.02	Rated motor voltage	1–2000 V	Model depende	★
A2.03	Rated motor current	0.01–655.35 A (AC drive power ≤ 55 kW) 0.1–6553.5 A (AC drive power > 55	Model depende	★
A2.04	Rated motor frequency	0.01 Hz to maximum frequency	Model depende	★
A2.05	Rated motor rotational speed	1–65535 RPM	Model depende	★
A2.06	Stator resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55 kW)	Model dependent	★
A2.07	Rotor resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55 kW)	Model dependent	★
A2.07	Rotor resistance (asynchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55 kW)	Model dependent	★
A2.08	Leakage inductive reactance (asynchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55 kW)	Model dependent	★
A2.09	Mutual inductive reactance (asynchronous motor)	0.1–6553.5 mH (AC drive power ≤ 55 kW) 0.01–655.35 mH (AC drive power > 55 kW)	Model dependent	★

Function Code	Parameter Name	Setting Range	Default	Property
A2.10	No-load current (asynchronous motor)	0.01 A to A2-03 (AC drive power ≤ 55 kW) 0.1 A to A2-03 (AC drive power > 55 kW)	Model dependent	★
A2.16	Stator resistance (synchronous motor)	0.001–65.535 Ω (AC drive power ≤ 55 kW) 0.0001–6.5535 Ω (AC drive power > 55 kW)	Model dependent	★
A2.17	Shaft D inductance (synchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55 kW)	Model dependent	★
A2.18	Shaft Q inductance (synchronous motor)	0.01–655.35 mH (AC drive power ≤ 55 kW) 0.001–65.535 mH (AC drive power > 55 kW)	Model dependent	★
A2.20	Back EMF (synchronous motor)	0.1–6553.5 V	Model depende	★
A2.27	Encoder pulses per revolution	1–65535	1024	★
A2.28	Encoder type	0: ABZ incremental encoder 1: UVW incremental encoder 2: Resolver 3: SIN/COS encoder 4: Wire-saving UVW encoder	0	★
A2.29	Speed feedback PG selection	0:local PG 1:Extend PG 2: X5 Pulse input	0	★
A2.30	A, B phase sequence of ABZ incremental encoder	0: Forward 1: Reserve	0	★
A2.31	Encoder installation angle	0.0°–359.9°	0.0°	★
A2.32	U, V, W phase sequence of UVW encoder	0: Forward 1: Reverse	0	★
A2.33	UVW encoder angle offset	0.0°–359.9°	0.0°	★
A2.34	Number of pole pairs of resolver	1–65535	1	★

Function Code	Parameter Name	Setting Range	Default	Property
A2.36	Encoder wire-break fault detection time	0.0s: No action 0.1–10.0s	0.0s	★
A2.37	Auto-tuning selection	0: No auto-tuning 1: Asynchronous motor static auto-tuning 2: Asynchronous motor complete auto-tuning 11: Synchronous motor with-load auto-tuning	0	★
A2.38	Speed loop proportional gain 1	0–100	30	☆
A2.39	Speed loop integral time 1	0.01–10.00s	0.50s	☆
A2.40	Switchover frequency 1	0.00 to A2-43	5.00 Hz	☆
A2.41	Speed loop proportional gain 2	0–100	15	☆
A2.42	Speed loop integral time 2	0.01–10.00s	1.00s	☆
A2.43	Switchover frequency 2	A2-40 to maximum output frequency	10.00 Hz	☆
A2.44	Vector control slip gain	50%–200%	100%	☆
A2.45	Time constant of speed loop filter	0.000–0.100s	0.000s	☆
A2.46	Vector control over-excitation gain	0–200	64	☆
A2.47	Torque upper limit source in speed control mode	0: A2-48 1: VCI 2: CCI 3: ACI 4: Pulse setting (X5) 5: Via communication 6: MIN(VCI,CCI) 7: MIN(VCI,CCI)	0	☆
A2.48	Digital setting of torque upper limit in speed control mode	0.0%–200.0%	150.0%	☆
A2.51	Excitation adjustment proportional gain	0–60000	2000	☆
A2.52	Excitation adjustment integral gain	0–60000	1300	☆
A2.53	Torque adjustment proportional gain	0–60000	2000	☆

Function Code	Parameter Name	Setting Range	Default	Property
A2.54	Torque adjustment integral gain	0–60000	1300	☆
A2.55	Speed loop integral property	Unit's digit: Integral separated 0: Disabled 1: Enabled	0	☆
A2.56	Field weakening mode of synchronous motor	0: No field weakening 1: Direct calculation 2: Adjustment	0	☆
A2.57	Field weakening degree of synchronous motor	50%–500%	100%	☆
A2.58	Maximum field weakening current	1%–300%	50%	☆
A2.59	Weak Sectors Max torque coefficient	50.0%–200.0%	100%	☆
A2.60	Generated power upper limit	0:invalid 1: entire valid 2. constant speed valid 3. decelerate valid	0	☆
A2.61	Generated power limit	0-200%	Model dependent	☆
A2.62	Motor 2 control mode	0: Sensorless flux vector control (SVC) 1: Closed-loop vector control (FVC) 2: Voltage/Frequency (V/F) control	0	☆
A2.63	Motor 2 acceleration/ deceleration time	0: Same as motor 1 1: Acceleration/Deceleration time 1 2: Acceleration/Deceleration time 2 3: Acceleration/Deceleration time 3 4: Acceleration/Deceleration time 4	0	☆
A2.64	Motor 2 torque boost	0.0%: Automatic torque boost 0.1%–30.0%	Model depende	☆
A2.66	Motor 2 oscillation suppression gain	0–100	Model depende	☆
A5 Group Control Optimization Parameters				
A5.00	DPWM switchover frequency upper limit	0.00–15.00 Hz	12.00 Hz	☆
A5.01	PWM modulation mode	0: Asynchronous modulation 1: Synchronous modulation	0	☆

Function Code	Parameter Name	Setting Range	Default	Property
A5.02	Dead zone compensation mode selection	0: No compensation 1: Compensation mode 1 2: Compensation mode 2	1	☆
A5.03	Random PWM depth	0: Random PWM invalid 1–10	0	☆
A5.04	Rapid current limit	0: Disabled1: Enabled	1	☆
A5.05	Current detection compensation	0–100	5	☆
A5.06	Undervoltage threshold	60.0%–140.0%	100.0%	☆
A5.07	SFVC optimization mode selection	0: No optimization 1: Optimization mode 1 2: Optimization mode 2	1	☆
A5.08	Dead-zone time adjustment	100%–200%	150%	☆
A5.09	Overvoltage threshold	200.0–2500.0 V	2000.0 V	☆
A6 Group AI Curve Setting				
A6.00	AI curve 4 minimum input	-10.00 V to A6-02	0.00 V	☆
A6.01	Corresponding setting of AI curve 4 minimum input	-100.0%–100.0%	0.0%	☆
A6.02	AI curve 4 inflexion 1 input	A6-00 to A6-04	3.00 V	☆
A6.03	Corresponding setting of AI curve 4 inflexion 1 input	-100.0%–100.0%	30.0%	☆
A6.04	AI curve 4 inflexion 1 input	A6-02 to A6-06	6.00 V	☆
A6.05	Corresponding setting of AI curve 4 inflexion 1 input	-100.0%–100.0%	60.0%	☆
A6.06	AI curve 4 maximum input	A6-06 to 10.00 V	10.00 V	☆
A6.07	Corresponding setting of AI curve 4 maximum input	-100.0%–100.0%	100.0%	☆
A6.08	AI curve 5 minimum input	-10.00 V to A6-10	0.00 V	☆
A6.09	Corresponding setting of AI curve 5 minimum input	-100.0%–100.0%	0.0%	☆
A6.10	AI curve 5 inflexion 1 input	A6-08 to A6-12	3.00 V	☆
A6.11	Corresponding setting of AI curve 5 inflexion 1 input	-100.0%–100.0%	30.0%	☆
A6.12	AI curve 5 inflexion 1 input	A6-10 to A6-14	6.00 V	☆
A6.13	Corresponding setting of AI curve 5 inflexion 1 input	-100.0%–100.0%	60.0%	☆
A6.14	AI curve 5 maximum input	A6-14 to 10.00 V	10.00 V	☆
A6.15	Corresponding setting of AI curve 5 maximum input	-100.0%–100.0%	100.0%	☆

Function Code	Parameter Name	Setting Range	Default	Property
A6.24	Jump point of VCI input corresponding setting	-100.0%–100.0%	0.0%	☆
A6.25	Jump amplitude of VCI input corresponding setting	0.0%–100.0%	0.5%	☆
A6.26	Jump point of CCI input corresponding setting	-100.0%–100.0%	0.0%	☆
A6.27	Jump amplitude of CCI input corresponding setting	0.0%–100.0%	0.5%	☆
A6.28	Jump point of ACI input corresponding setting	-100.0%–100.0%	0.0%	☆
A6.29	Jump amplitude of ACI input corresponding setting	0.0%–100.0%	0.5%	☆
A7 Group User Programmable Function				
A7.00	User programmable function selection	0: Disabled 1: Enabled	0	★
A7.01	Selection of control mode of the output terminals on the control board	Unit's digit: DO1 0: Controlled by the AC drive 1: Controlled by the user programmable card Ten's digit: relay (TA-TB-TC) Same as unit's digit Hundred's digit: DO1 Same as unit's digit Thousand's digit D0 Same as unit's digit Ten thousand's digit: AO1 Same as unit's digit	0	★
A7.02	AI/AO function selection of the user programmable card	0: ACI (voltage input), AO2 (voltage output) 1: ACI (voltage input), AO2 (current output) 2: ACI (current input), AO2 (voltage output) 3: ACI (current input), AO2 (current output) 4: ACI (PTC input), AO2 (voltage output) 5: ACI (PTC input), AO2 (current output) 6: ACI (PTC100 input), AO2 (voltage output) 7: ACI (PTC100 input), AO2 (current output)	0	★

Function Code	Parameter Name	Setting Range	Default	Property
A7.03	D0 output	0.0%–100.0%	0.0%	☆
A7.04	AO1 output	0.0%–100.0%	0.0%	☆
A7.05	Digital output	Binary setting Unit's digit: Ten's digit: Relay1 Hundred's digit: DO	1	☆
A7.06	Frequency setting through the user programmable card	-100.00% to 100.00%	0.0%	☆
A7.07	Torque setting through the user programmable card	-200.00% to 200.00%	0.0%	☆
A7.08	Command given by the user programmable card	1: Forward RUN 2: Reverse RUN 3: Forward JOG 4: Reverse JOG 5: Coast to stop 6: Decelerate to stop 7: Fault reset	0	☆
A7.09	Faults given by the user programmable card	0: No fault 80–89: Fault codes	0	☆
A8 Group Point-point Communication				
A8.00	Point-point communication selection	0: Disabled 1: Enabled	0	☆
A8.01	Master and slave selection	0: Master 1: Slave	0	☆
A8.02	Slave following master command selection	0: Slave not following running commands of the master 1: Slave following running commands of the master	0	☆
A8.03	Usage of data received by slave	0: Torque setting1: Frequency setting	0	☆
A8.04	Zero offset of received data (torque)	-100.00%–100.00%	0.00%	★
A8.05	Gain of received data (torque)	-10.00–10.00	1.00	★
A8.06	Point-point communication interruption detection time	0.0–10.0s	1.0s	☆
A8.06	Point-point communication interruption detection time	0.0–10.0s	1.0s	☆
A8.07	Master data sending cycle	0.001–10.000s	0.001s	☆

Function Code	Parameter Name	Setting Range	Default	Property
A8.08	Zero offset of received data zero offset (frequency)	-100.00%–100.00%	0.00%	★
A8.09	Gain of received data gain (frequency)	-10.00–10.00	1.00	★
A8.11	window	0.20–10.00Hz	0.5Hz	★
AC Group AI/AO Correction				
AC.00	VCI measured voltage 1	0.500–4.000 V	Factory correcte	☆
AC.01	VCI displayed voltage 1	0.500–4.000 V	Factory correcte	☆
AC.02	VCI measured voltage 2	6.000–9.999 V	Factory correcte	☆
AC.03	VCI displayed voltage 2	6.000–9.999 V	Factory correcte	☆
AC.04	CCI measured voltage 1	0.500–4.000 V	Factory correcte	☆
AC.05	CCI displayed voltage 1	0.500–4.000 V	Factory correcte	☆
AC.06	CCI measured voltage 2	6.000–9.999 V	Factory correcte	☆
AC.07	CCI displayed voltage 2	6.000–9.999 V	Factory correcte	☆
AC.08	ACI measured voltage 1	9.999–10.000 V	Factory correcte	☆
AC.09	ACI displayed voltage 1	9.999–10.000 V	Factory correcte	☆
AC.10	ACI measured voltage 2	9.999–10.000 V	Factory correcte	☆
AC.11	ACI displayed voltage 2	9.999–10.000 V	Factory correcte	☆
AC.12	AO1 target voltage 1	0.500–4.000 V	Factory correcte	☆
AC.13	AO1 measured voltage 1	0.500–4.000 V	Factory correcte	☆
AC.14	AO1 target voltage 2	6.000–9.999 V	Factory correcte	☆

Function Code	Parameter Name	Setting Range	Default	Property
AC.15	AO1 measured voltage 2	6.000–9.999 V	Factory correcte	☆
AC.16	AO2 target voltage 1	0.500–4.000 V	Factory correcte	☆
AC.17	AO2 measured voltage 1	0.500–4.000 V	Factory correcte	☆
AC.18	AO2 target voltage 2	6.000–9.999 V	Factory correcte	☆
AC.19	AO2 measured voltage 2	6.000–9.999 V	Factory correcte	☆
AC.20	CCI measured current 1	0.000–20.000 mA	Factory correcte	☆
AC.21	CCI sampling current 1	0.000–20.000 mA	Factory correcte	☆
AC.22	CCI measured current 2	0.000–20.000 mA	Factory correcte	☆
AC.23	CCI sampling current 2	0.000–20.000 mA	Factory correcte	☆
AC.24	AO1 ideal current 1	0.000–20.000 mA	Factory correcte	☆
AC.25	AO1 sampling current 1	0.000–20.000 mA	Factory correcte	☆
AC.26	AO1 ideal current 2	0.000–20.000 mA	Factory correcte	☆
AC.27	AO1 sampling current 2	0.000–20.000 mA	Factory correcte	☆

C.2 Monitoring Parameters

Function Code	Parameter Name	Min. Unit	Communication Address
U0.00	Running frequency (Hz)	0.01 Hz	7000H
U0.01	Set frequency (Hz)	0.01 Hz	7001H
U0.02	Bus voltage	0.1 V	7002H
U0.03	Output voltage	1 V	7003H
U0.04	Output current	0.01 A	7004H
U0.05	Output power	0.1 kW	7005H
U0.06	Output torque	0.1%	7006H
U0.07	DI state	1	7007H
U0.08	DO state	1	7008H
U0.09	VCI voltage (V)	0.01 V	7009H
U0.10	CCI voltage (V)/current (mA)	0.01 V/0.01 mA	700AH
U0.11	ACI voltage (V)	0.01 V	7007BH
U0.12	Count value	1	700CH
U0.13	Length value	1	700DH
U0.14	Load speed	1	700EH
U0.15	PID setting	1	700FH
U0.16	PID feedback	1	7010H
U0.17	PLC stage	1	7011H
U0.18	X5 Input pulse frequency (Hz)	0.01 kHz	7012H
U0.19	Feedback speed	0.01 Hz	7013H
U0.20	Remaining running time	0.1 Min	7014H
U0.21	VCI voltage before correction	0.001 V	7015H
U0.22	CCI voltage (V)/current (mA) before correction	0.01 V/0.01 mA	7016H
U0.23	ACI voltage before correction	0.001 V	7017H
U0.24	Linear speed	1 m/Min	7018H
U0.25	Accumulative power-on time	1 Min	7019
U0.26	Accumulative running time	0.1 Min	701AH
U0.27	X5 Input pulse frequency	1 Hz	701BH

Function Code	Parameter Name	Min. Unit	Communication Address
U0.28	Communication setting value	0.01%	701CH
U0.29	Encoder feedback speed	0.01 Hz	701DH
U0.30	Main frequency X	0.01 Hz	701EH
U0.31	Auxiliary frequency Y	0.01 Hz	701FH
U0.32	Viewing any register address value	1	7020H
U0.33	Synchronous motor rotor position	0.1°	7021H
U0.34	Motor temperature	1°C	7022H
U0.35	Target torque	0.1%	7023H
U0.36	Resolver position	1	7024H
U0.37	Power factor angle	0.1°	7025H
U0.38	ABZ position	1	7026H
U0.39	Target voltage upon V/F separation	1 V	7027H
U0.40	Output voltage upon V/F separation	1V	7028H
U0.41	X terminals state visual display	1	7029H
U0.42	DO state visual display	1	702AH
U0.43	X terminals function state visual display 1	1	702BH
U0.44	X terminals function state visual display 2	1	702CH
U0.45	Fault information	1	702DH
U0.58	Phase Z counting	1	703AH
U0.59	Current set frequency	0.01%	703BH
U0.60	Current running frequency	0.01%	703CH
U0.61	AC drive running state	1	703DH
U0.62	Current fault code	1	703EH
U0.63	Sent value of point-point communication	0.01%	703FH
U0.64	Received value of point-point communication	0.01%	7040H
U0.65	Torque upper limit	0.1%	7041H

Function Code	Parameter Name	Min. Unit	Communication Address
U.0.66	Communication Expansion Card model	100: CANOpen 200: Profibus-DP 300: CANLink	7042H
U0.67	Communication expand	-	
U0.68	DP card AC drive status	bit0- Running status bit1- Running direction bit2- AC drive fault or not bit3-Reach target frequency bit4~bit7- Reserved bit8~bit15-Fault code	7043H
U0.69	Transport DP card speed	0.00-F0.10	7044H
U0.70	Transport DP card rotary	0~65535	7045H
U0.71	Current of communication card	-	-
U0.72 U0.63	Communication card fault status	-	-
U0.73	Motor NO	0: Motor 1 1: Motor 2	7046H
U0.74	AC drive output torque	-300.00%–300.00%	7047H