Preface

Thank you for selecting FST-610 series frequency inverter from Shenzhen Anyhertz Drive Co., Ltd.

The FST-610 Drive is a series of high performance general frequency inverter with three kinds of control methods—V/F control, vector control without PG, 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, read through the manual before installing or operating the FST-610 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.

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

WARING

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.

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

CAUTION

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

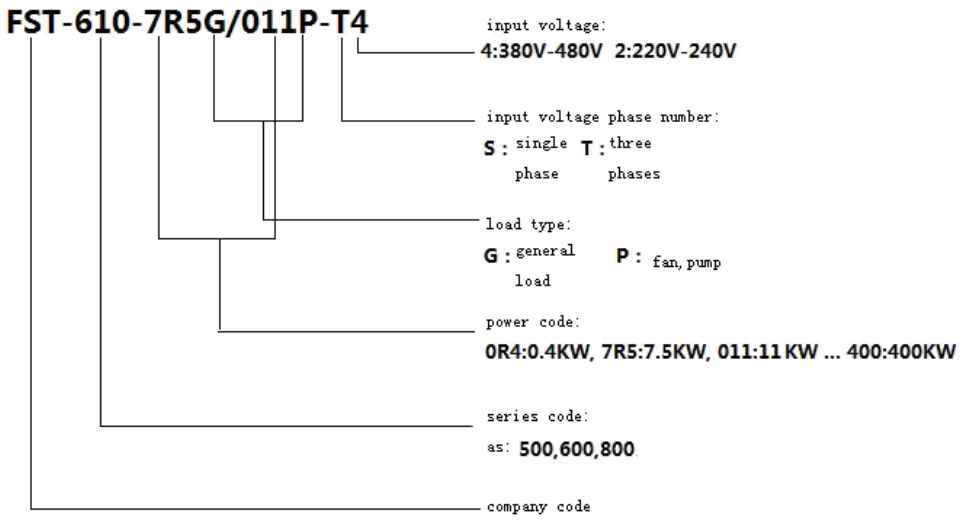
Please confirm the following items:

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-610 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

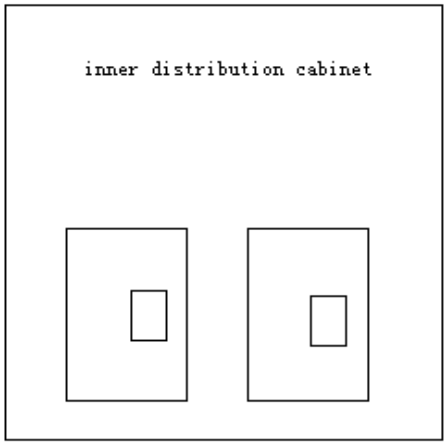


Chapter 2- Installation

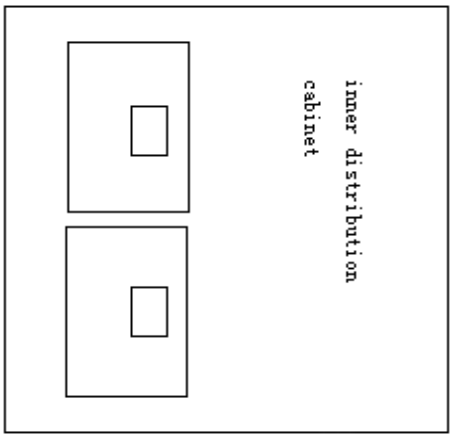
2.1 Environmental conditions

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

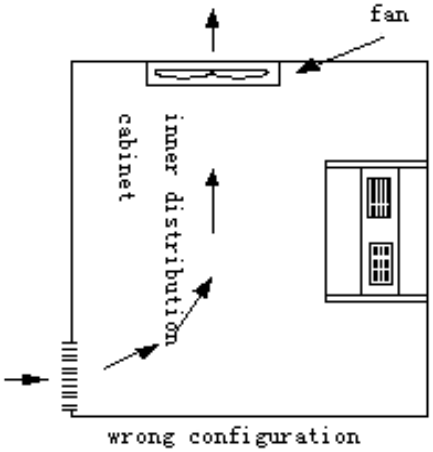
- Ambient Temperature: cabinet open type (－10～45℃/+14～113℉)
  Antresia hanging type (－10～40℃/+14～104℉)
- Avoid rains and moisture.
- Avoid direct sunlight.
- Prevent from oil mist and salt erosion.
- Prevent from corrosive liquids and gases.
- Avoid dust, cotton and metallic particles in the air.
- Away 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℃.
-

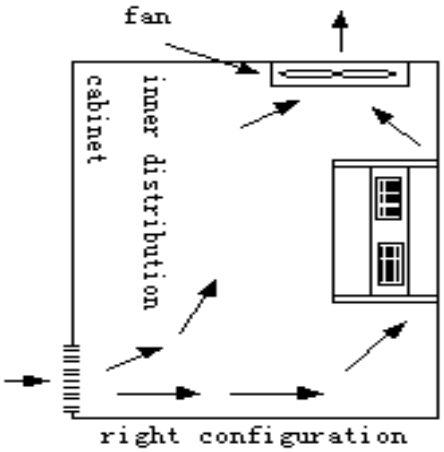


correct configuration

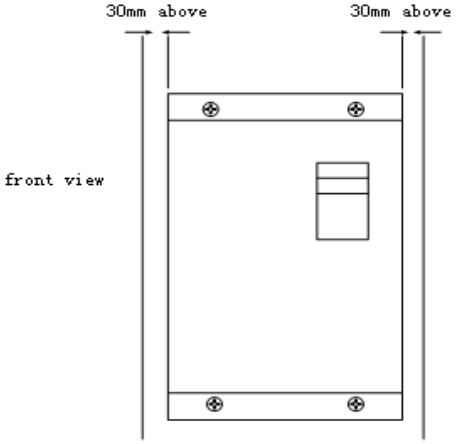


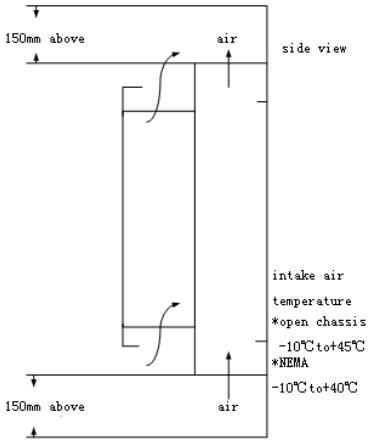
wrong configuration





- 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)





Chapter 3- Wiring

3.1 wiring terminal diagram

3.1.1 the main circuit terminal

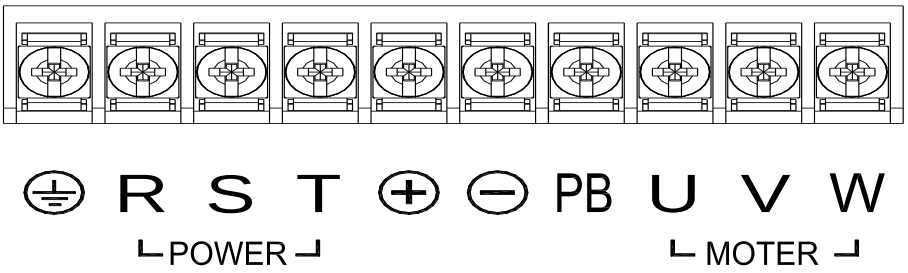


Fig. 3-1 0R7~5R5KW standard main circuit terminal

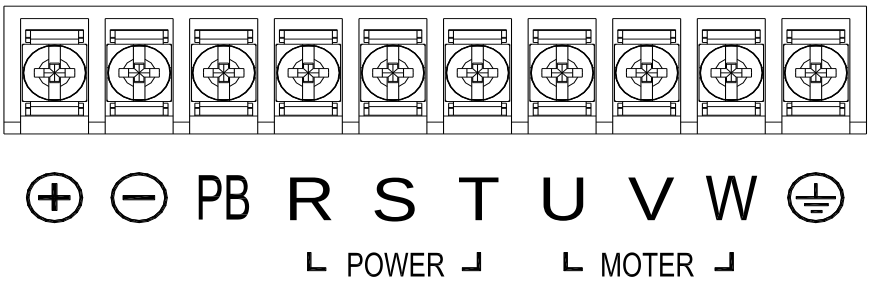


Fig. 3-2 7R5~15kW standard main circuit terminal

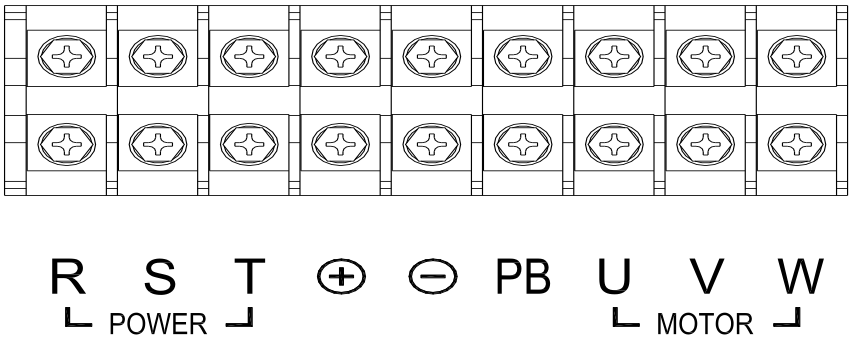


Fig. 3-3 18.5~30kW standard main circuit terminal

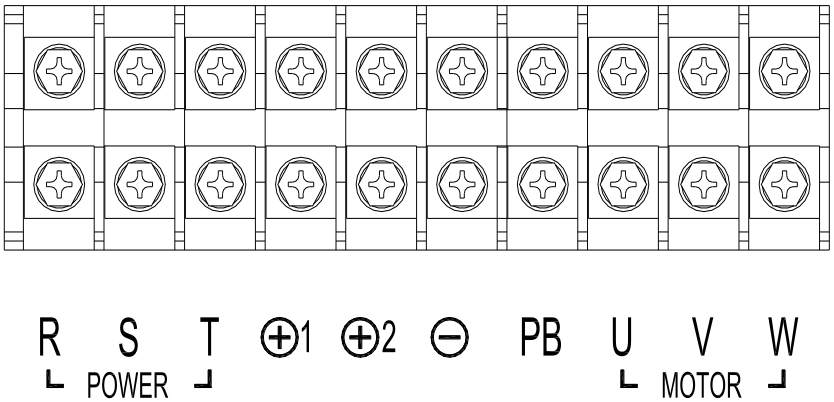


Fig. 3-4 37~55kW standard main circuit terminal

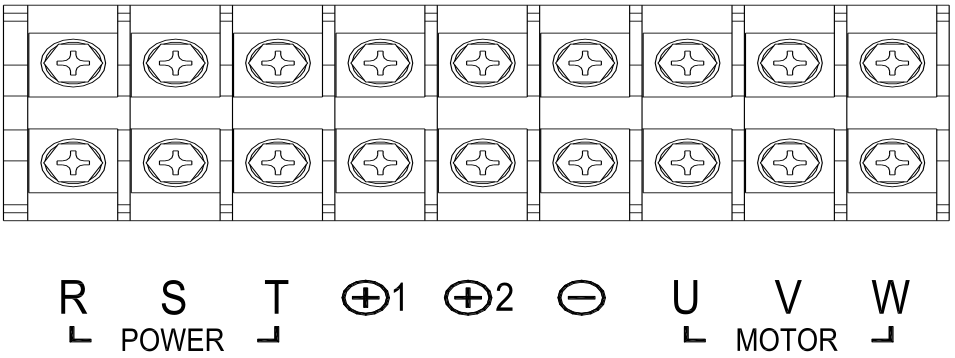


Fig. 3-5 75~200kW standard main circuit terminal

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
P1、（+）	External DC reactor reserved terminal
（-）	Negative DC bus output terminal
U、V、W	Three phase AC output terminal
⏚	Grounding terminal

3.12 Control circuit terminal:

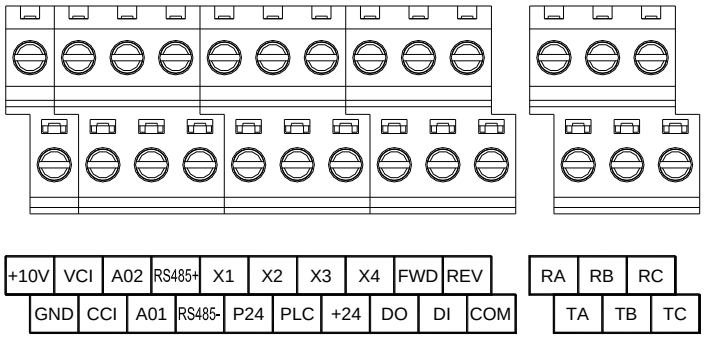


Fig. 3-5 FST-610 series standard control circuit terminal（5.5KW or below）

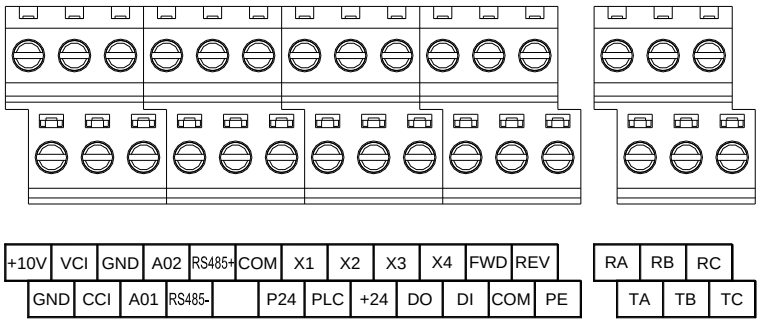


Fig. 3-6 FST-610 series standard control circuit terminal（7.5KW or above）

3.1.3 Wiring

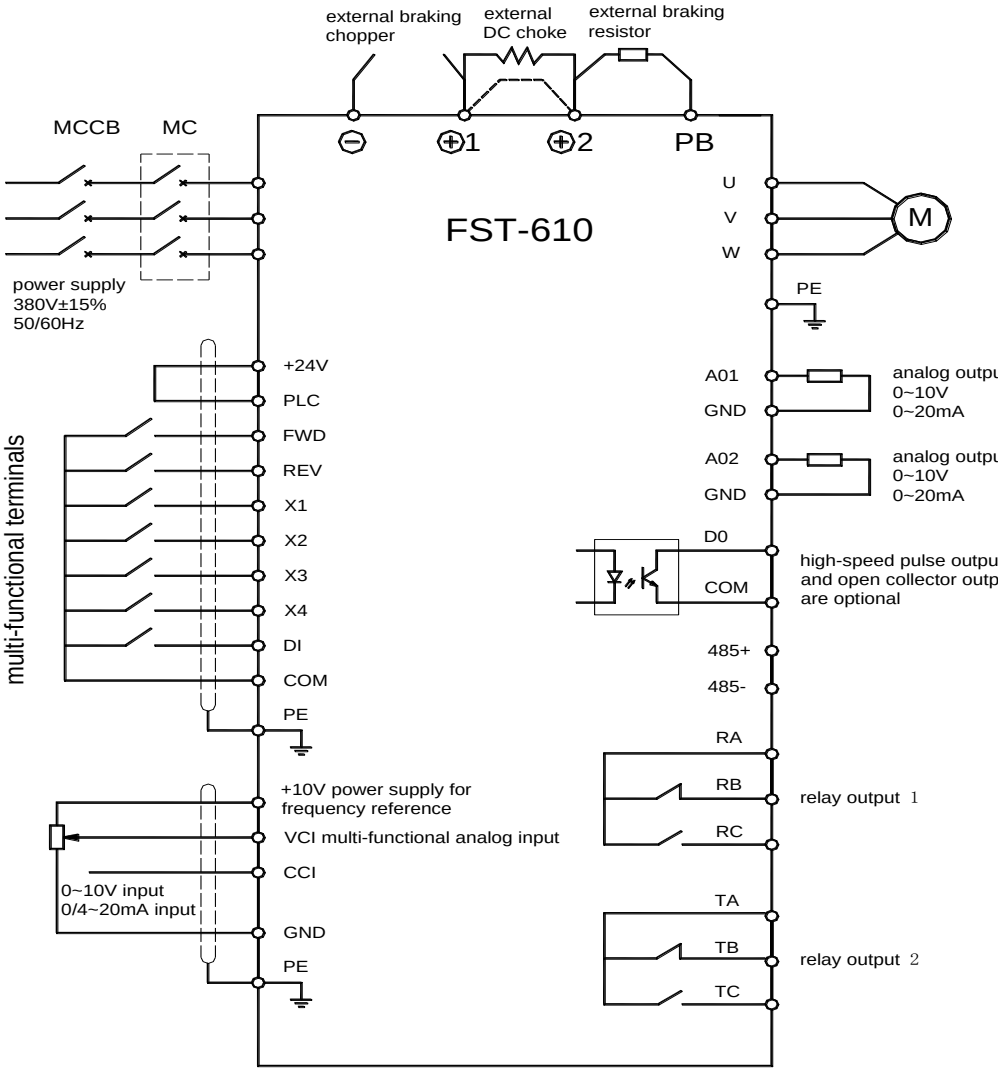


Fig 3-7 Wiring diagram

3.1.4 Panel terminal description

Terminal name	Terminal usages and description
FWD,REV,X1~X4	Switch input terminal, form bipolar coupling isolation input Input voltage range: 9~30V Input impedance: 3.3kΩ
DI	High speed pulse or switch input, form bipolar coupling isolation input withPLC and COM. Pulse input frequency range: 0~50kHz Input voltage range: 9~30V Intut resistor: 1.1kΩ
PLC	User can access power to the external power directly (and COM), the +24V power supplied by this machine is also available, when FST-610 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: 20kΩ
CCI	Analog input, voltage（0~10V）/current（0~20mA）can be optional through J16 Input impedance: 10kΩ（voltage input）/250Ω（current input）
+10V	Provide positive 10V power for this machine.
GND	The reference zero potential for positive 10V (Note: GND and COM is isolated.)
DO	High speed pulse or collector open circuit input terminal, its corresponding pubblic terminal is COM Output frequency range: 0~50 kHz
AO1、AO2	Analog output terminal, among which AO1 can select voltage or current output through jumper J15; AO2 can select voltage or current output through jumper J17. Output range: voltage (0~10V）/current（0~20mA）
	Analog output terminal, among which AO1 can select voltage or current output through jumper J15; AO2 can select voltage or current output through jumper J14. Output range: voltage（0~10V）/current（0~20mA）
RA、RB、RC	R relay output, RA public terminal, RB closed, RC open. Contact capacity: AC250V/3A，DC30V/1A
TA、TB、TC	T relay output, TA public terminal, TB closed, TC open. Contact capacity: AC250V/3A，DC30V/1A
485+、485-	485 communication interface, the positive and negtive terminal of 485 differential signal, for 485 communication interface, please use twisted pair or shielded cable.

3.1.5 Control board jumper description

Terminal name	Terminal usage and description
J0	Resistor selection for 485 yes:connect no：disconnect。
J1	Analog input voltage (0~10V) / current (4~20mA) switch.

Terminal name	Terminal usage and description
J2, J3	Analog output voltage (0~10V) / current (4~20mA) output switch.

3.2 The peripherals application and precautions

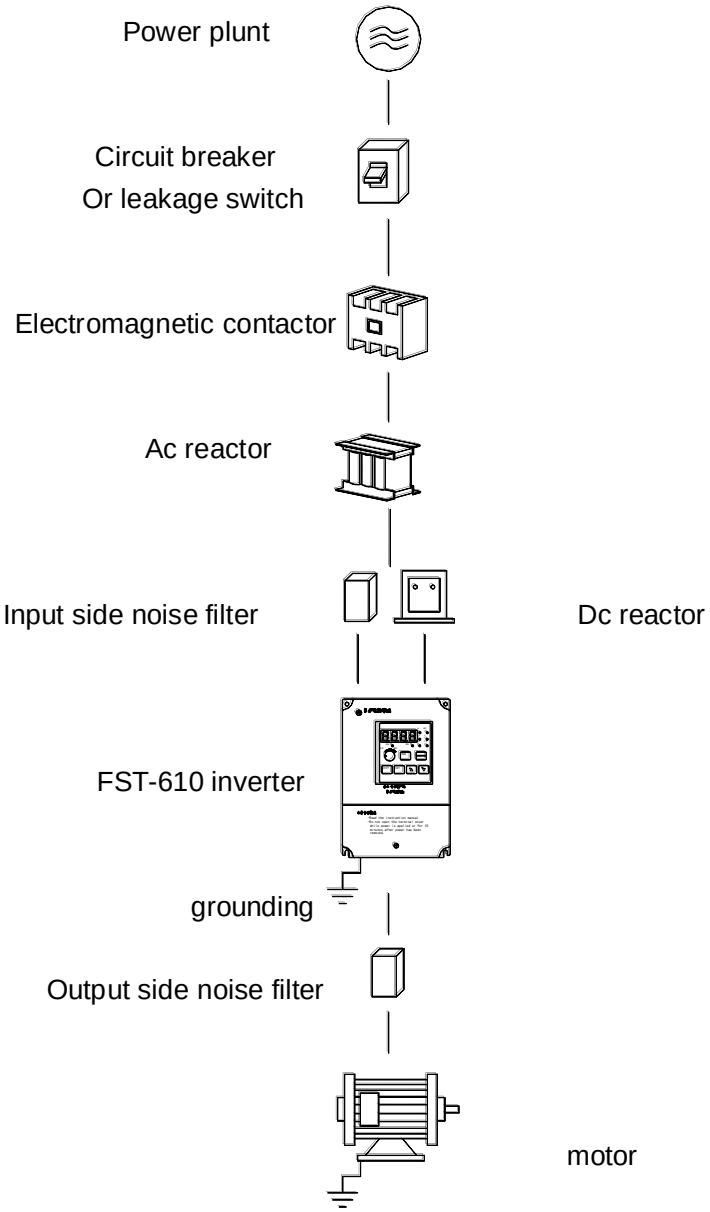


Fig. 3-8 Connection of Periferal equipments

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-610 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.

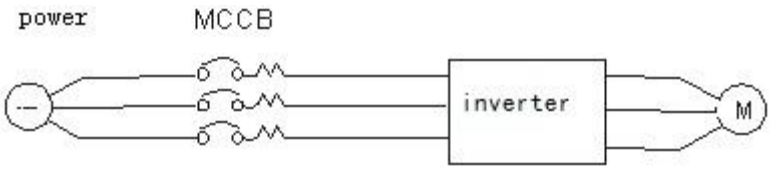
Motor:

- 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.

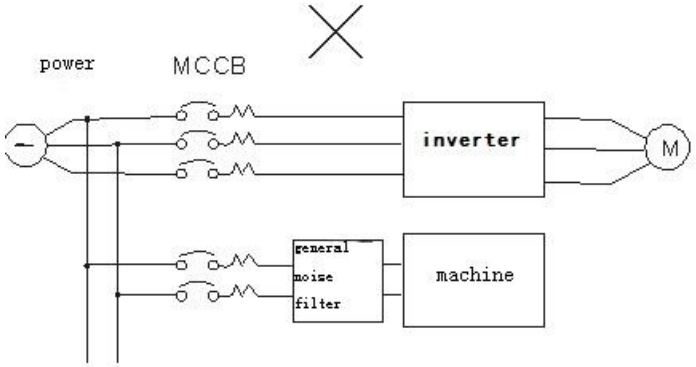
External wiring should be in accordance with the following details. When completing the wiring, you must check whether it is correct. (You can not use the control loop buzzer to check the wiring)

(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.

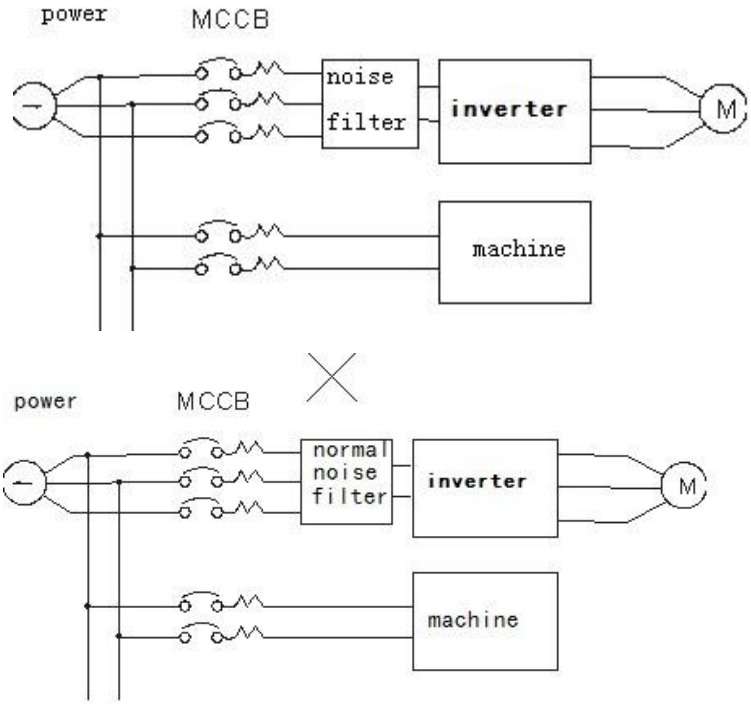
- Inverter use single power loop.

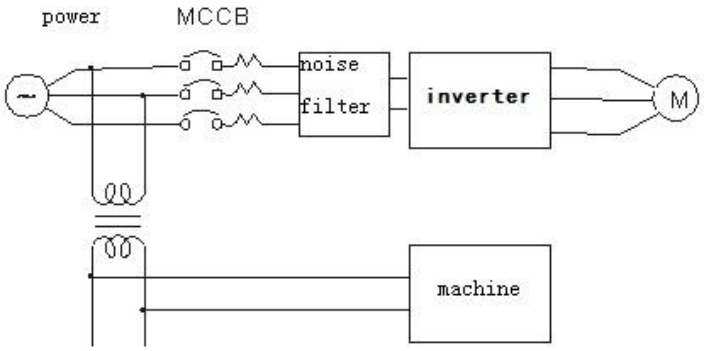


- The normal noise filter has little effect, so it can't be used.

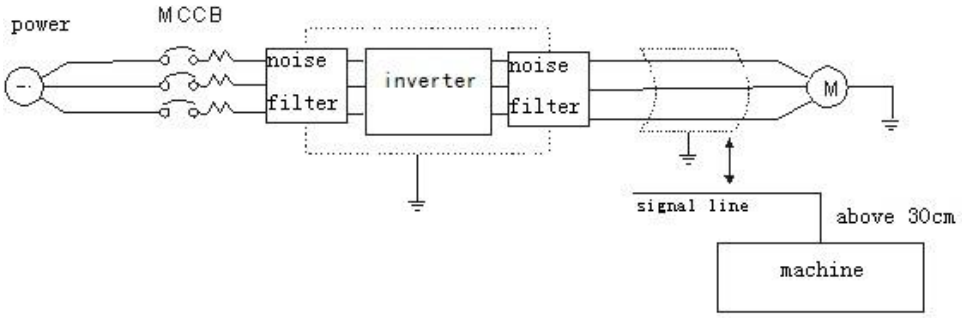


- When the inverter shares circuit loop with other machines, please install with noise filter or isolation transformer.





- 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.

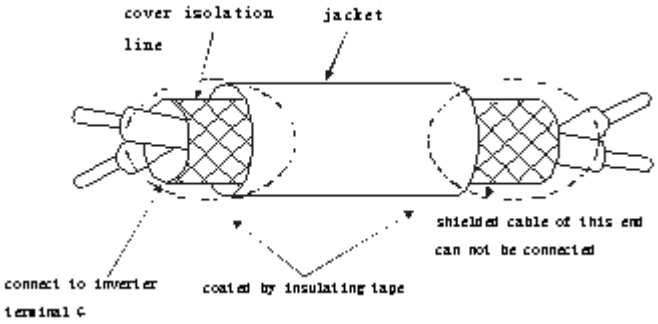


- When the wiring distance is too long between inverter and motor, please consider the voltage drop of the wire, voltage drop between phases(V)= $\sqrt{3}$ ×wire resistance(Ω/km) ×wire length(m) ×current×10^{-3} and carrier numbers should be adjusted by wire distance.

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 F0.16 setting number	15.0	10.0	5.0

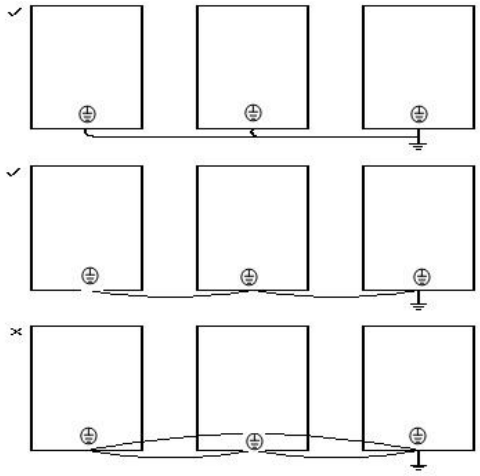
(B) Control loop wire must be isolated or far away from main circuit loop control wire, other high voltage wire and large current power line, in order to avoid noise interference.

- Control loop wiring terminal TA, TB, TC, RA, RB, RC(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

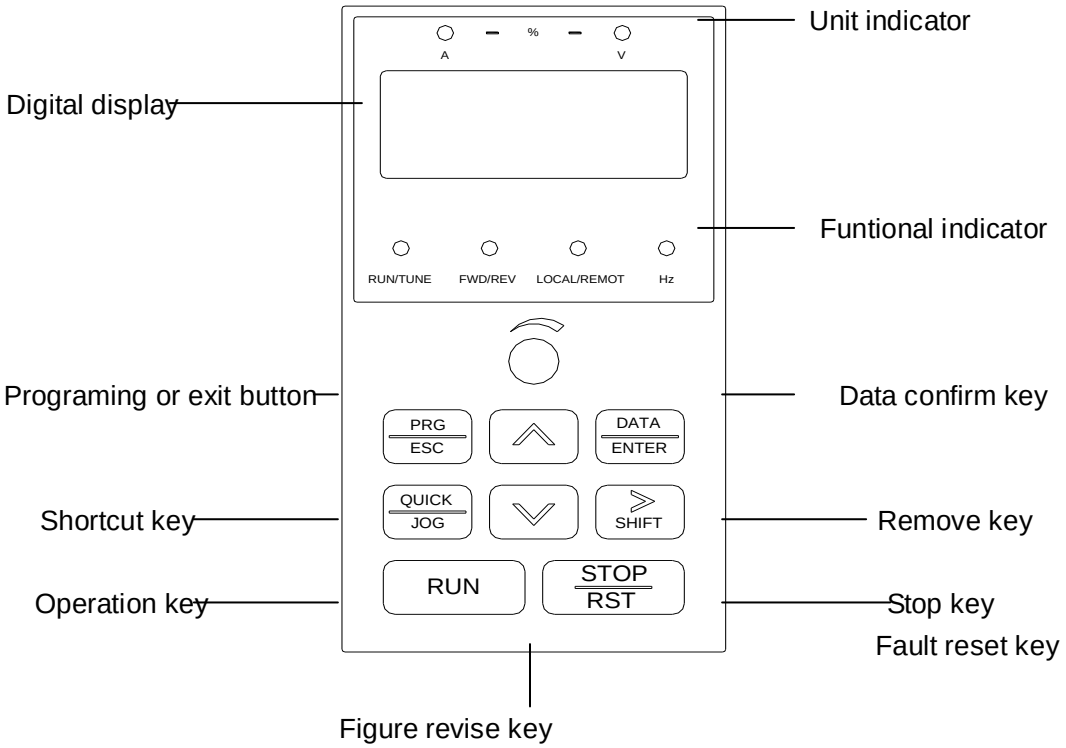


Fig 4-1 keyboard diagram

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.

Key symbol	name	Function description
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.
QUICK/JOG	Quick multifunction key	The funtion of this key is confirmed by F7.01 0：clear UP/DOWN settings, clear the frequency value set by UP/DOWN 1：jog operation 2：reversing switch key
RUN + STOP/RST	Combination	Press RUN and STOP/RST at the same time, the inverter will stop free

4.1.3 indicator description

1) function indicator description:

Indicator name	Indicator description
RUN/TUNE	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.

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	0-1 [0]

The inverter model is set by different load

0: G model

1: P model

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

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

0: V/F control: It is only suitable for motor commissioning cases where needs not high accuracy or the cases where one inverter drives multiple motors.

1: Vector control without PG: That is open-loop vector control, it is suitable for debugging occasions or VVVF occasions where needs high accuracy. This mode is applied in the universal high performance cases where the pulse encoder is not installed or the cases where requires high torque at low speed and high speed accuracy. One inverter only drives one motor. Such as machine tool, centrifugal machine, drawing machine and injection molding machine.

2. Torque control (vector control without PG): That is open-loop vector control, it is suitable for the application which requires high accuracy .

Note:

When selecting vector control mode, set right parameters of nameplate and encoder of the motor. And complete motor parameter autotuning before running so as to get the right motor parameters. Only proper motor parameter can achieve the high performance of vector control.

Adjust F3 group can optimize the performance of vector control.

Function Code	Name	Setting Range
F0.02	Run command source	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 (F7.01 为 2), 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 flickering)

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 lights on)

The operation of inverter can be controlled by host through communication.

Function Code	Name	Setting Range
F0.03	Frequency X command selection	0-8 [0]

Select Frequency X command input channel and there are 9 main given frequency channels.

0: Keypad: Set the frequency by the keypad through modifying F0.08.

1: Panel potentiometer

2: Analog VCI

3: Analog CCI

Set the frequency through analog input terminals. FST-610 series inverters provide 2 ways analog input terminal in its standard configuration. of which VCI is -10V-10V voltage input; CCI is 0~10V/0(4) -20mA input. The current/voltage can be shifted by J1.

Note: when CCI selects 0~20mA input. 20mA corresponds to 5V.

100.0% of analog input corresponds to the Max. Frequency (function code F0.09).

-100.0% corresponds to the Max. Frequenxy in reverse (function code F0.09).

4: High speed pulse setting (DI)

The reference frequency is set by high speed pulse input. FST-610 series inverters provide 1 way DI input in its standard configuration.

Pulse voltage: 15-30V. Pulse frequency: 0.0-50.0 kHz.

100% of the setting inpluse corresponds to maximal frequency, while -100% corresponds with minus maximal frequency.

Note: pulse can only be input through multi-function terminal DI. And set F5.00=0 to select the function of DI as "setting input".

5: Simple PLC

The inverter will run at simple PLC when selecting this frequency setting method. It is necessary to set the parameter of F9 group to determine the given frequency. running direction and each ACC/DEC time. Please refer to the instruction of F9 group carefully.

6: Multi-stage speed

The inverter will run at multi-stage speed when selecting this frequeny setting method.

The reference frequency is determined by F5 and F9 group. If F0.03 is not multi-stage speed setting then the multi-stage setting has the priority which is lower than the priority of jogging. Only stage 1-15 can be set when multi-stage setting has the priority. So stage 1-15 can be set when F0.03 is multi-stage speed setting.

7: PID control

The running mode is prodecure PID control when selecting this parameter. It is necessary to set FD group. The reference frequency is the result of PID adjustment. For details. please refer to description of FD group.

8: Remote Communication

The frequency command is given by the upper monitor through communication given.

Please refer to MODBUS communication protocol in chapter 7.

Function Code	Name	Setting Range
F0.04	Frequency Y command source	0-2 [0]

0: Analog VCI

1: Analog CCI

2: DI

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: If set CCI to be 0~20mA input, the relative voltage of 20mA is 5V. F0.05 is used when the frequeny Y is superimposed.

Function Code	Name	Setting Range
F0.06	Setting source combination	0-3 [0]

0: X, the current frequency setting channel is X.

1: Y, the current frequency setting channel is Y.

2: X+Y, the current frequency setting channel is X+Y.

Reference frequency = reference frequency X + reference frequency Y.

3: Max(X,Y): Reference frequency = Max (reference frequency X. reference frequency Y).

Note: Combination (0, 1 and 2) can be switched by F5 group.

Function Code	Name	Setting Range
F0.07	Keypad and terminal UP/DOWN setting	0-3 [0]

The frequency can be set by  and terminal UP/DOWN. This setting method have the highest authority and it cab be combined with other setting channel. It is used to adjust the output frequency during the commissioning of controlling system.

0: valid. and the value can be saved when the inverter is powered off. The frequency command can be set and the value can be saved after the inverter is powered off and it will combine with the current frequency when it is repowered on.

1: valid. and the value cannot be saved when the inverter is powered off. The frequency command can be set but the value cannot be saved after the inverter is powered off

2: invalid. the function of "∧". "∨"and terminal UP/DOWN is invalid. and the setting will be cleared automatically.

3: valid during running. The function of "∧". "∨" and terminal UP/DOWN is valid during running and the setting will be cleared automatically when the inverter stops.

Notes: When the factory setting is restored. the value of keypad and UP/DOWN will be cleared.

Function Code	Name	Setting Range
F0.08	Keypad reference frequency	0.00-F0.09 [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	Maximum frequency	10.00-400.00V[50.00Hz]

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	Upper frequency limit	F0.11～F0.09[50.00Hz]

This is the upper limit of the output frequency and it will be less than or equal to the Max. Output frequency.

Function Code	Name	Setting Range
F0.11	Lower frequency limit	0.00-F0.10 [0.00Hz]

This is the lower limit of the output frequency of the inverter.

This parameter can be selected by function code F2.14. If the setting frequency is lower than the upper limit, the inverter will run, stop or hibernate at the lower limit frequency.

The Max Output frequency≥Upper limit of the frequency≥Lower limit of the frequency.

Function Code	Name	Setting Range
F0.12	Running direction selection	0-2 [0]

0: Runs at the default direction. The inverter runs in the practical direction when it is powered on.

1: Runs at the opposite direction. It is used to change motor's steering. This effect equals to the shifting the rotation direction by adjusting either two of the motor wires.

Note: If the parameters are restored, the running direction will be back to its original status. For non-change motor steering occasions where systems are debugging properly, please be careful.

2: Forbid to run in reverse direction. It can be used in some special cases if the reverse running is disabled.

Function Code	Name	Setting Range

F0.13	Acceleration time 0	0.1～3600.0s [Depend on model]
F0.14	Deceleration time 0	0.1-3600.0s [Depend on model]

Acceleration time is the time of accelerating from 0Hz to maximum frequency (F0.09).
Deceleration time is the time of decelerating from maximum frequency (F0.09) to 0Hz.

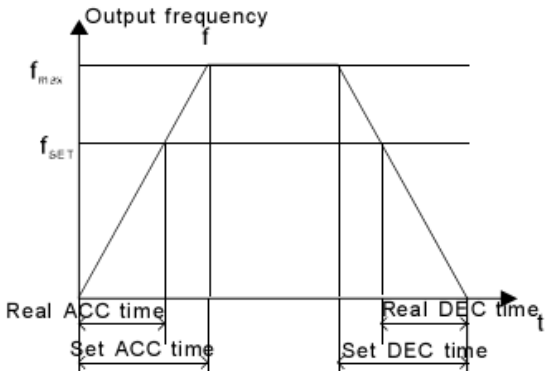


Fig 4.1 Acceleraton and deceleration time

When the reference frequency is equal to the maximum frequency, the actual acceleration and deceleration time will be equal to actual setting.
When the reference frequency is less than the maximum frequency, the actual acceleration and deceleration time will be less than actual setting.
The actual acceleration (deceleration) time = setting ACC/DEC time* (reference frequency/ maximum frequency).
1st group: F0.13. F0.14
2nd group: F8.00. F8.01
3rd group: F8.02. F8.03
4th group: F8.04. F8.05.
The acceleration and deceleration time can be selected by ACC/DEC time of combination of multifunctional digit input terminals.

Function Code	Name	Setting Range
F0.15	ACC/DEC unit of time	0~1

0: second
1: 0.1 second

Function Code	Name	Setting Range
F0.16	Carrier frequency	1.0- 15.0kHz [Depend on model]

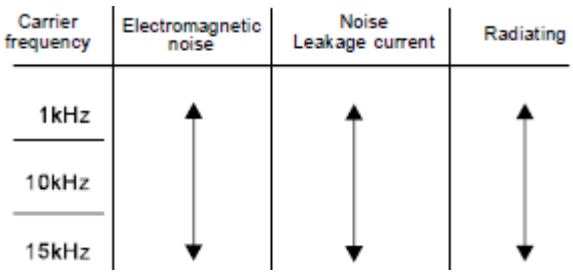


Fig 4.2 Effect of carrier frequency.

The following table is the relationship between power rating and carrier frequency.

Carrier F / Model	Max. Carrier F (kHz)	Min. Carrier F (kHz)	Factory setting (kHz)
0.4kW~11kW	15	1.0	8
15kW-55kW	8	1.0	4
75~630kW	6	1.0	2

The advantage of high carrier frequency: ideal current waveform, little current harmonic wave and motor noise.

The disadvantage of high carrier frequency: increase the switch loss, increase inverter temperature and affect to the output capacity. The inverter needs to derate on high carrier frequency. At the same time, the leakage and electrical magnetic interference will increase.

Applying low carrier frequency is contrary to the above, too low carrier frequency will cause unstable running, torque decreasing and surge.

The manufacturer has set a reasonable carrier frequency when the inverter is in factory. In general, users do not need to change the parameter.

When the frequency used exceeds the default carrier frequency, the inverter needs to derate 20% for each additional 1k carrier frequency.

Function Code	Name	Setting Range
F0.17	Restore parameters	0-2 [0]

0: No action

1: Inverter restores all parameters to factory setting

2: Inverter clears all fault records

This function code will restore to 0 automatically when complete the function operation

F1 Group Motor Parameters

Function Code	Name	Setting Range
F1.00	Motor model	0-2 [0]

0: General asynchronous motor

1: Frequency asynchronous motor

2: PMSM

Function Code	Name	Setting Range

F1.01	Motor rated power	0.4~1000.0kW [Depend on model]
F1.02	Motor rated frequency	10 Hz-F0.09 [50.00Hz]
F1.03	Motor rated speed	0~36000rpm [Depend on model]
F1.04	Motor rated voltage	0-800V [Depend on model]
F1.05	Motor rated current	0.8-2000.0A [Depend on model]

Note: In order to achieve superior performance, please set these parameters according to motor nameplate.

The inverter provides parameters autotuning. Accurate parameters autotune is from the right setting of parameter of motor.

The power rating of inverter should match the motor. If the bias is too big. the control performances of inverter will be deteriorated distinctly.

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

Function Code	Name	Setting Range
F1.06	Motor stator resistance	0.001 -65.535Ω [Depend on model]
F1.07	Motor rotor resistance	0.001-65.535Ω [Depend on model]
F1.08	Motor stator&rotor inductance	0.1-6553.5mH [Depend on model]
F1.09	Motor mutual inductance	0.1-6553.5mH [Depend on model]
F1.10	Current without load	0.1-6553.5A [Depend on model]

After autotuning. the value of F1.06 —F1.10 will be automatically updated. These parameters are the basic parameters for high performance V/F control which have direct impact to the control performance.

Note: Do not change these parameters; otherwise it may deteriorate the control performance of inverter.

Function Code	Name	Setting Range
F1.11	Motor parameters autotuning	0-2 [0]

0: No action.

1: Comprehensive parameter autotuning.

Input right parameters of the motor nameplate (F1.01-F1.05) and do not connect any load to the motor before performing autotuning and ensure the motor is in static and empty status. Otherwise the parameters detected by autotuning will be incorrect.

Set the proper acceleration and deceleration time (F0.13 and F0.14) according to the motor inertia before performing autotuning. Otherwise it may cause over-current and over-voltage fault during autotuning.

Set F1.11 to be 1 then press the DATA/ENT, LED will display "-TUN-" and flickers, press RUN to start the autotuning, and the LED will display "TUN-0" and "TUN-1", " RUN/TUNE " light will flicker. After a few minutes, LED will display "-END-". That means the autotuning is finished and return to the stop status. When "-TUN-" flickers, press PRG/ESC can escape from the parameter autotune. During the autotuning. press the STOP/RST will stop the autotune.

Note: Only keypad can control the autotuning. F1.11 will restore to 0 automatically when the autotuning is finished.

2: Static autotuning

When static autotuning, it is no need disconnecting motor and load. Input motor nameplate parameters(F1.01-F1.05), after autotuning, it will detect stator& rotor resistance and leakage inductance of motor. The Mutual inductance and current without load will not be detected by static autotuning, if needed user should input suitable value according to experience.

F2 Group Start and Stop Control

Function Code	Name	Setting Range
F2.00	Start Mode	0-1 [0]

0: Start directly Start the motor at the starting frequency directly.

1: DC braking and start: Inverter will output DC current firstly and then start the motor at the starting frequency. Please refer to description ofF2.03 and F2.04. It is suitable for the motor which have small inertia load and may reverse rotation when start.

Function Code	Name	Setting Range
F2.01	Starting frequency	0.00～10.00Hz [0.00Hz]
F2.02	Hold time of starting frequency	0.0～50.0s [0.0s]

Set proper starting frequency can increase the starting torque. The inverter runs from the starting frequency(F2.01) and after the holding time(F2.02) of the starting frequency, the inverter will accelerate to the aimed frequency during the ACC time. If the reference frequency is less than starting frequency. the inverter will be at stand-by status. The starting frequency could be less than the lower frequency limits. The starting frequency takes no effect during FWD/REV switching.

Function Code	Name	Setting Range
F2.03	DC Braking current before start	0.0-150.0% [0.0%]

F2.04	DC Braking time before start	0.0-50.0s [0.0s]

During the DC braking before F2.03. the increased current is the percentage to the rated current of the inverter.

DC braking is invalid when F2.04 is set to be 0.

The bigger the DC braking current. the greater the braking torques.

Function Code	Name	Setting Range
F2.05	Acceleration / Deceleration mode	0-1 [0]

The frequency changing method during the running and starting of the inverter.

0: Linear

Output frequency will increase or decrease with fixed acceleration or deceleration time.

1: S curve

Function Code	Name	Setting Range
F2.06	S curve start time proportion	0.0-100.0% [30.0%]

Function Code	Name	Setting Range
F2.07	S curve over time scale	0.0-100.0% [30.0%]

Function Code	Name	Setting Range
F2.08	Stop mode	0-1 [0]

0: Deceleration to stop

When the stop command takes effect, the inverter decreases the output frequency according to F2.05 and the defined deceleration time, the inverter will stop when frequency drops to 0.

1. Coast to stop

When the stop command takes effect, the inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.

Function Code	Name	Setting Range
F2.09	Stop braking starting frequency	0.00-F0.09 [0.00Hz]
F2.10	Stop braking waiting time	0.0-50.0s [0.0s]
F2.11	Stop DC braking current	0.0-150.0% [0.0%]
F2.12	Stop DC braking time	0.0-50.0s [0.0s]

Stop braking starting frequency : During process of deceleration to stop, when reaches this frequency, it begins to stop DC braking. Starting frequency of DC braking is 0 and the DC braking is invalid. The inverter will stop as the setted DEC time.

Stop braking waiting time : Before the starting of stop DC braking, inverter blocks the output. After this waiting time, the DC braking will be started so as to prevent over-current fault caused by DC braking at high speed.

Stop DC braking current: It refers to the added DC braking amount. The bigger the DC braking current is. the greater the braking torque is.
Stop DC braking time: The lasting time which used for DC braking

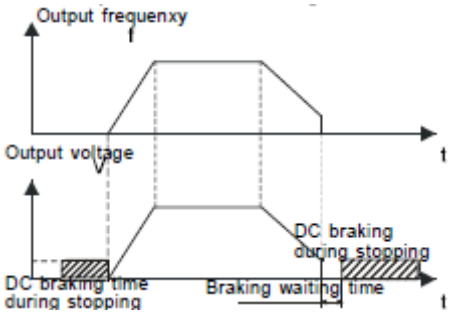


Fig 4.3 DC braking diagram

Function Code	Name	Setting Range
F2.13	Dead time of FWD/REV	0.0-3600.0s [0.0s]

During the process of setting inverter FWD/REV transition, when output frequency is 0 the dead zone time is shown as following figure:

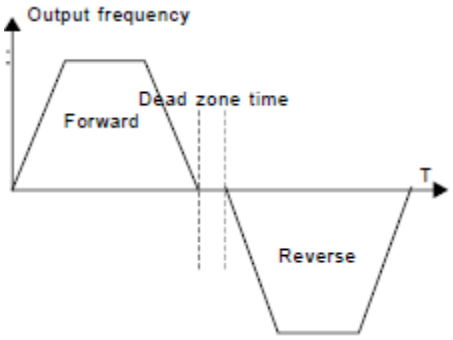


Fig 4.4 FWD/REV dead time diagram.

Function Code	Name	Setting Range
F2.14	Action when running frequency is less than lower frequency limit	0-2 [0]

This function code is used to define the running state when the setting frequency is lower than the lower frequency limit.
0: Running at the lower frequency limit.
1: Stop.
2: Stand-by: Inverter will Coast to stop when the running frequency is less than the lower frequency limit. When the reference frequency is higher than or equal to the lower frequency limit again, the inverter will start to run automatically.
Note: the function is only valid when the lower frequency limit is above 0.

Function Code	Name	Setting Range
F2.15	Delay time for restart	0.0～3600.s [0.0s]

When F2.14 is set to be 2, Inverter will restart after the setting frequency is higher than or equal to the lower frequency limit.

Note: It is valid when F2.14 is set to be 2

Function Code	Name	Setting Range
F2.16	Restart after power off	0-1 [0]

0: Disabled: Inverter will not automatically restart when power on again until run command takes effect.

1: Enabled: When inverter is powered on again after power off, it will restore to the previous running state. Inverter will automatically restart (when terminal controlled, it must be closed in the running state) after delay time determined by F2.17; if it was in the stop before powered off, the inverter will not restart automatically when powered on.

Note: It only applies on the inverter of 7.5kW and above, this function may cause serious consequence, please be cautious.

Function Code	Name	Setting Range
F2.17	Waiting time of restart	0.0-3600.0s [0.0s]

Note: Valid when F2.16=1

Function Code	Name	Setting Range
F2.18	Terminal function examined when power is on	0-1 [0]

The inverter will automatically detect terminal running state if run command source is terminal control.

0: Invalid. When power on, inverter will not start even if FWD/REV terminal is active until FWD/REV terminal disabled and enabled again.

1: Valid. When power on and FWD/REV terminal is active, inverter will start automatically.

Note: This function may cause serious consequence, please use it with cautious.

F3 Group Vector Control

Function Code	Name	Setting Range
F3.00	ASR proportional gain Kp1	0-100 [20]
F3.01	ASR integral time K I 1	0.01 - 10.00s [0.050s]
F3.02	ASR switching point 1	0.00-F3.05 [5.00Hz]
F3.03	ASR proportional gain Kp2	0-100 [25]
F3.04	ASR integral time K I 2	0.01-10.00s [1.00s]

F3.05	ASR switching point 2	F3.02-F0.09 [10.00Hz]

The above parameters are only valid for vector control. Under ASR switching point 1(F3.02), ASR PI parameters are F3.00-F3.01. Under ASR switching point 2(F3.05), ASR PI parameters are F3.03-F3.04. PI parameters are gained by two groups of parameters linear change. For details please refer to following figure.

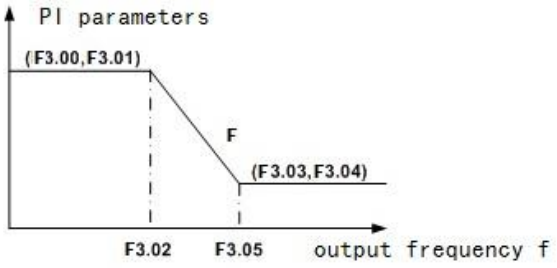


Fig 4.5 PI parameter diagram.

Through setting speed regulator's proportion coefficient and integral time, you can regulate ASR dynamic response characteristics of vector controlled. The system's dynamic response can be faster if the proportion gain Kp is increased.
However. if Kp is too large. the system tends to oscillate.
The system dynamic response can be faster if the integral time K⌋ is decreased;
However. if Kj is too small. the system becomes overshoot and tends to oscillate.
ASR PI parameters have closed relationship with system's inertia, please adjust these parameters according to actual situation.

Function Code	Name	Setting Range
F3.06	Slip compensation rate of VC	50%～200% [100%]

The parameter is used to adjust the slip frequency of vector control and improve the precision of speed control. Properly adjust this parameter can effectively restrain the static speed bias.

Function Code	Name	Setting Range
F3.07	Torque upper limit	0.0-200.0% [Depend on model]

100% setting corresponding to rated current. G model : 150.0%; P model: 120.0%.

Note: Under torque control, F3.07 and F3.09 are all related with torque setting.

Function Code	Name	Setting Range
F3.08	Torque control and torque setting source	0-5 [0]

0: Keypad (F3.09)
1 :VCI
2:CCI
3. DI
4 Multi-step speed
5.Tele-communication setting torque

1~5: Torque control is valid, which defines the torque setting source. When the torque setting is minus. the motor will reverse.
Under speed control mode. output torque matches load torque automatically. but limited by F3.07. If the load is above the set upper limit of the torque. the output torque of the inverter will be limited. and the rotation speed of the motor will change automatically.
Under the torque control mode. the inverter will output torque at the set command. but the output frequency is limited by the upper or lower limit. When the set torque is above the load torque. the output frequency of the inverter will raise to the upper limit frequency; if the set torque is below the load torque. the output frequency of the inverter will decrease to the lower limit frequency. If the output frequency of the inverter is limited. the output torque will be different from the set torque.

Note:

- **Speed control and torque control can be switched by using multi-function input terminals.**
- **1-5: 100% corresponding to twice of rated current of inverter.**
- **When inverter decelerate to stop. Torque control model is switched to speed control mode automatically**

Function Code	Name	Setting Range
F3.09	Keypad torque setting	-200.0-200.0% [50.0%]
F3.10	Upper frequency setting source	0-5 [0]

0. Keypad (F0.08)
1. VCI
2 CCI
3: DI
4 Multi-step speed
5: Communication

Note: 1-4 100% Corresponds to maximum frequency.

F4 Group V/F Control

This group of function codes are valid under V/F control, that is, F0.01=0.

Function Code	Name	Setting Range
F4.00	V/F curve selection	0-4 [0]

0: Linear V/F curve. It is applicable for normal constant torque load.
1: Multidots curve. It can be defined through setting (F4.03~F4.08).
2~4: Multiple power V/F curve. It is applicable for variable torque load, such as blower pump and so on. Please refer to following figure.

Note: Vb= Motor rated voltage fb= Motor rated frequency.

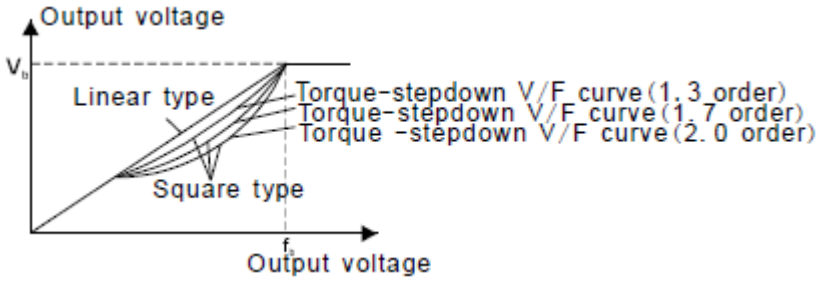


Fig 4.6 V/F curve diagram

Function Code	Name	Setting Range
F4.01	Torque boost	0.0-10.0% [0.0%]
F4.02	Torque boost cut-off	0.0-50.0% [20.0%]

Torque boost will take effect when output frequency is less than cut-off frequency of torque boost (F4.02). Torque boost can improve the torque performance of V/F control at low speed.

The value of torque boost should be determined by the load. The heavier the load, the larger the value is. If the boost is too large, the motor will run in exciting. The efficiency of the motor decreases as the current of the inverter increases and the motor increase the heat-releasing.

When the torque boost is set to 0.0%, the inverter is in the automatic torque boost state.

Cut-off point of torque boost: The torque boost is valid under this point, and the torque boost is invalid when exceeding this set frequency.

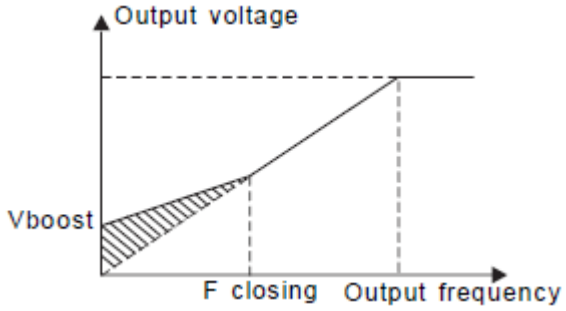


Fig 4.7 Torque boost by hand.

Function Code	Name	Setting Range
F4.03	V/F frequency 1	0.00-F4.05 [0.00Hz]
F4.04	V/F voltage 1	0.0-100.0% [0.0%]
F4.05	V/F frequency 2	F4.03-F4.07 [0.00Hz]
F4.06	V/F voltage 2	0.0-100.0% [0.0%]
F4.07	V/F frequency 3	F4.05-F2.02 [0.00Hz]
F4.08	V/F voltage 3	0.0-100.0% [0.0%]

F4.03-F4.08 are used to set the user-defined V/F curve. The value should be set according to the load characteristic of motor.

Note:

- **V1 <V2 <V3 .**
- **f1<f2<f3.**

• **The voltage corresponding to low frequency should not be set too high, otherwise it may cause motor overheat or inverter fault.**

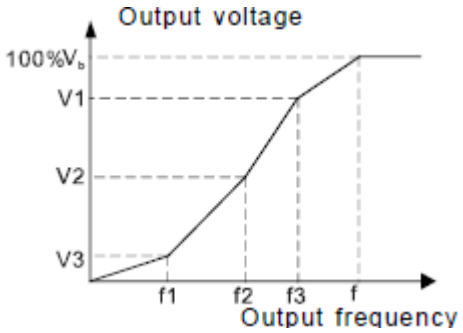


Fig 4.8 V/F curve setting diagram.

Function Code	Name	Setting Range
F4.09	Slip compensation limit	0.0-200% [0.0%]

The slip compensation function calculates the torque of motor according to the output current and compensates for output frequency. This function is used to improve speed accuracy when operating with a load. F4.09 sets the slip compensation limit as a percentage of motor rated slip; the slip compensation limit is calculated as the formula:

F4.09=fb-n*p/60

fb= Motor rated frequency (F1.02)

n= Motor rated speed (F1.03)

p= Motor poles

Function Code	Name	Setting Range
F4.10	Auto energy saving selection	0-1 [0]

0: Disabled

1: Enabled

While there is a light or empty load, it will reduce the inverter output voltage and save energy through detecting the load current.

Note: This function is especially effective to fan and pump.

Function Code	Name	Setting Range
F4.11	Low-frequency threshold of restraining oscillation	0-10 [2]
F4.12	High-frequency threshol of restraining oscillation	0-10 [0]
F4.13	Boundary of restraining oscillation	0.00Hz-F0.03 [30.00Hz]

F4.11-F4.12 are only valid in the V/F control mode. When set F4.11 and F4.12 to be 0. the restraining oscillation is invalid. While set the values to be 1-3 will have the effect of restraining oscillation. When the running frequency is lower than F4.13, F4.11 is valid. when the running frequency higher than F4.13, F4.12 is valid.

Function Code	Name	Setting Range
F4.14	AVR function	0-2 [1]

AVR function is the output voltage automatic adjustment function. When AVR is invalid. the output voltage will change with the intput voltage (or DC bus voltage); when AVR is valid, the output voltage won't change with the input voltage (or DC bus voltage). The range of output voltage will keep constant. If the site requirement is not met, AVR function can be canceled to shorten the DEC time.

F5 Group Input Terminals

There are 7 multi-function digital input terminals and 2 analog input terminals in FST-610 series inverters.

Function Code	Name	Setting Range
F5.00	DI selection	0-1 [0]

0: DI is high-speed input pulse

1: DI is ON-OFF input

Function Code	Name	Setting Range
F5.01	X1 terminal function	0-39 [0]
F5.02	X2 terminal function	0-39 [0]
F5.03	X3 terminal function	0-39 [0]
F5.04	X4 terminal function	0-39 [0]
F5.05	DI terminal ON-OFF input function	0-39 [0]

The meaning of each setting is shown in following table.

Setting value	Function	Description
0	Invalid	Please set unused terminals to be invalid to avoid malfunction
1	Forward	When running command channel is terminal controlled, the operation orders are given by these terminals.
2	Reverse	
3	3-wire control	Please refer to description of F5.09.
4	Jog forward	Please refer to description of F8.06～F8.08.
5	Jog reverse	
6	Coast to stop	The inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia. For large inertia load, it is recommended to use. This method has the same meaning as F2.08.
7	Reset fault	Resets faults that have occurred in distances. It has the same function as STOP/RST.

<table>
<tr><td>8</td><td>Pause running</td><td>When this terminal takes effect, inverter decelerates to stop and save current status, such as PLC, traverse frequency and PID. When this terminal takes no effect, inverter restores the status</td></tr>
<tr><td>9</td><td>External fault input</td><td>It is valid when inverter alarm a fault occurs in a peripheral device and stops.</td></tr>
<tr><td>10</td><td>Up command</td><td rowspan="3">These three functions are used to modify the reference frequency through external terminals. UP is the increasing command. DOWN is the decreasing command. and the Clear UP/DOWN is used to restore to the reference frequency given by the frequenxy command channel.</td></tr>
<tr><td>11</td><td>DOWN command</td></tr>
<tr><td>12</td><td>Clear UP/DOWN</td></tr>
<tr><td>13</td><td rowspan="3">Switch between X and Y</td><td rowspan="3"><table>
<tr><td>F0.06
Terminal action</td><td>X</td><td>Y</td><td>X+Y</td></tr>
<tr><td>13 valid</td><td>Y</td><td>X</td><td></td></tr>
<tr><td>14valid</td><td>X+Y</td><td></td><td>X</td></tr>
<tr><td>15valid</td><td></td><td>X+Y</td><td>Y</td></tr>
</table></td></tr>
<tr><td>14</td></tr>
<tr><td>15</td><td>Switch between X+Y and Y</td></tr>
<tr><td>16</td><td>Multi-step speed reference1</td><td rowspan="4">16 steps speed control can be realized by the combination of these four terminals.
Note: multi-step speed reference 1 is in low position, multi-step speed reference 4 is in high position.</td></tr>
<tr><td>17</td><td>Multi-step speed reference 2</td></tr>
<tr><td>18</td><td>Multi-step speed reference 3</td></tr>
<tr><td>19</td><td>Multi-step speed reference 4</td></tr>
<tr><td>20</td><td>Multi-step speed pause</td><td>Shielding multiple speed selection terminal function, keep the set point maintain in the current state.</td></tr>
<tr><td>21</td><td>ACC/DEC time selection 1</td><td>4 groups of ACC/DEC time can be selected by the combination of these two terminals.</td></tr>
<tr><td>22</td><td>ACC/DEC time selection 2</td><td><table>
<tr><td>ACC/DEC time selection 2</td><td>ACC/DEC time selection 1</td><td>ACC/DEC time</td></tr>
<tr><td>OFF</td><td>OFF</td><td>ACC/DEC time 0 (F0.13、F0.14)</td></tr>
<tr><td>OFF</td><td>ON</td><td>ACC/DEC time 1 (F8.00、F8.01)</td></tr>
<tr><td>ON</td><td>OFF</td><td>ACC/DEC time 2 (F8.02、F8.03)</td></tr>
<tr><td>ON</td><td>ON</td><td>ACC/DEC time 3 (F8.04、F8.05)</td></tr>
</table></td></tr>
</table>

23	Reset simple PLC	Restart simple PLC, clear the previous PLC memory information.
24	Pause simple PLC	PLC pauses in the execution process and runs in current speed section, when this function is cancelled, the PLC will operate continuously.
25	Pause PID	PID adjustment will be paused and inverter keeps output frequency unchanged.
26	Pause traverse operation	Inverter keeps output frequency unchanged. If this terminal is disabled. inverter will continue traverse operation with current frequency.
27	Wobble operation reset	Reference frequency of inverter will be forced as center frequency of wobble operation.
28	Reset counter	Clear the value of counter.
29	Forbid torque control mode	Torque control is forbided and switch inverter to run in speed control mode.
30	Forbid the function of ACC/DEC	ACC/DEC is invalid and maintains output frequency if it is enabled.
31	Counter input	The pulse input terminal of internal counter. Maximum pulse frequency : 200Hz.
32	UP/DOWN invalid temporarily	When this terminal is enabled, UP/DOWN setting can be cleared and restore to the given frequency. When this terminal is disabled, UP/DOWN value before will be valid again.
33-39	Reserved	Reserved

Function Code	Name	Setting Range
F5.06	FWD terminal fuction	0~39 [1]

Function Code	Name	Setting Range
F5.07	REV terminal fuction	0~39 [2]

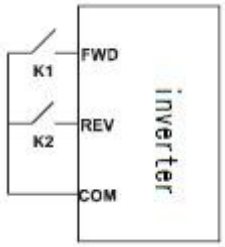
Function Code	Name	Setting Range
F5.08	ON-OFF filter times	0-10 [5]

Set the ON-OFF terminal (FWD, REV, X1-X4), and DI terminal filter times. When interference is heavy user should increase this value to prevent malfunction.

Function Code	Name	Setting Range
F5.09	Terminal control mode	0-3 [0]

This parameter defines four different control modes that control the inverter operation through external terminals.

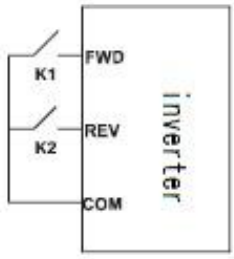
0: 2-wire control mode : Integrate enabling with run direction. The defined FWD and REV terminal command determines the direction.



K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	REV
ON	ON	Maintenance

Fig 4.9 2-wire control mode 1.

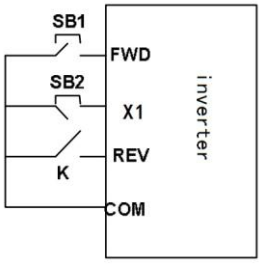
1: 2-wire control mode : Integrate disnabling with run direction, and is determined by FWD terminal. Run direction is determined by REV terminal.



K1	K2	Run command
OFF	OFF	Stop
ON	OFF	FWD
OFF	ON	Stop
ON	ON	REV

Fig 4.10 2-wire control mode 2.

2: 3-wire control mode : X1 is enabling terminal, and running order is made by FWD, the direction is controlled by REV. X1 is normally closed input.



K	Run command
OFF	FWD
ON	REV

Fig 4.11 3-wire control mode1

K: FWD/REV button

SB1: Start button

SB2: Stop button (NC)

X1 is the multifunctional input terminal to set “three wire running control” function

3: 3-wire control mode 2:

X1: Enabling terminal.

SB1. Forward run button

SB2: Stop button (NC)

SB3: Reverse run button

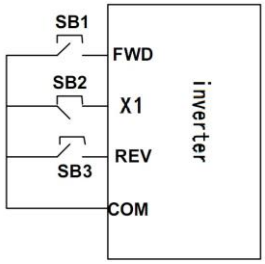


Figure 4.12 3-wire control mode 2.

Note: For 2-wire control mode, when FWD/REV terminal is valid, the stop order will be produced from other sources, the inverter will not run even if FWD/REV terminal is enabled after stop order is cancelled. If to let inverter run again, you should trigger FWD/REV again. Such as PLC single cycle stop, fixed-length stop, terminal controlled valid STOP/RST stop (F7.02).

Function Code	Name	Setting Range
F5.10	UP/DOWN setting change rate	0.01~50.00Hz/s [0.50Hz/s]

This parameter is used to determine how fast UP/DOWN setting changes.

Function Code	Name	Setting Range
F5.11	VCI lower limit	0.00-10.00V [0.00V]
F5.12	VCI lower limit corresponding setting	-100.0-100.0% [0.0%]
F5.13	VCI upper limit	0.00-10.00V [10.00V]
F5.14	VCI upper limit corresponding setting	-100.0-100.0 [100.0%]
F5.15	VCI filter time constant	0.00-10.00s [0.10s]

These parameters determine the relationship between analog input voltage and the corresponding setting value. When the analog input voltage exceeds the range between lower limit and upper limit, it will be regarded as the upper limit or lower limit.

The analog input VCI can only provide voltage input, and the range is 0V-10V.

For different applications. the corresponding value of 100.0% analog setting is different. For details. please refer to description of each application.

Note: Only when corresponding setting is negative, we can input negative value.
VCI lower limit must be less or equal to VCI upper limit.

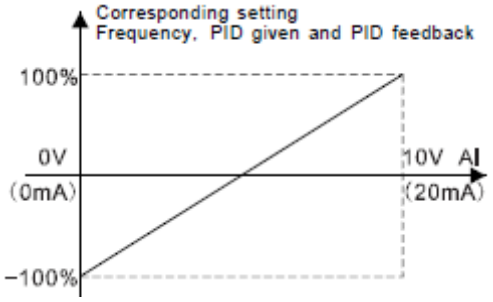


Fig 4.13 Relationship between VCI and correponding setting.

VCI input filter time: adjusting analog input sensitivity. Appropriate increase this value can improve anti interference performance of analogs, however, it can also decrease the sensitivity of analog input.

Function Code	Name	Setting Range
F5.16	CCI lower limit	0.00-10.00V [0.00V]
F5.17	CCI lower limit corresponding setting	-100.0-100.0 [0.0%]
F5.18	CCI upper limit	0.00-10.00V [10.00V]
F5.19	CCI upper limit corresponding setting	-100.0-100.0 [100.0%]
F5.20	CCI filter time constant	0.00-10.00s [0.10s]

Please refer to description of VCI. The analog CCI supports 0-10V/0-20 mA input. When CCI is set as 0~20mA input, the corresponding voltage range is 5V.

Function Code	Name	Setting Range
F5.21	DI lower limit	0.00-50.00kHz [0.00kHz]
F5.22	DI lower limit corresponding setting	-100.0-100.0 [0.0%]
F5.23	DI upper limit	0.00~50.00kHz [50.00kHz]
F5.24	DI upper limit corresponding setting	-100.0-100.0 [100.0%]
F5.25	DI filter time constant	0.00-10.00s [0.10s]

The description of F5.21~F5.25 is similar to VCI and CCI.

F6 Group Output Terminals

There are 2 multi-function relay output terminals. One DO terminal (can be as high speed pulse output or open collector output) and two multi-function analog output terminals in FST-610 series inverters.

Function Code	Name	Setting Range
F6.00	DO selection	0~1 [0]

The output of DO terminal is programmable multiplexing terminal.

0: High-speed pulse output: The maximum pulse frequency is 50.0 kHz. Please refer to description of F6.06.

1: Open collector output: Please refer to description of F6.01.

Function Code	Name	Setting Range
F6.01	DO open collector output selection	0-20 [1]
F6.02	Relay R output	0-20 [2]

	selection	
F6.03	Relay T output selection	0-20 [1]

OC/Relay output functions are indicated in the following table:

Setting Value	Function	Description
0	No output	Output terminal has no function.
1	Running	ON: Run command is ON or voltage is being output.
2	Run forward	ON: During forward run.
3	Run reverse	ON: During reverse run.
4	Fault output	ON: Inverter is in fault status.
5	FDT reached	Please refer to description of FB.07. FB.08.
6	Frequency reached	Please refer to description of FB.09.
7	Zero speed running	ON: The running frequency of inverter and setting frequency are zero.
8	Preset count value reached	Please refer to description of FB.04.
9	Specified count value reached	Please refer to description of FB.05. Counting function refers to F8 group.
10	Overload pre-warming of inverter	According to the "pre-alarm point of the inverter". it will output ON signal when exceeding the pre-alarm time. The details can refer to FA.04-FA.06.
11	Simple PLC step completed	After simple PLC completes one step, inverter will output ON signal for 500ms.
12	PLC cycle completed	After simple PLC completes one cycle. inverter will output ON signal for 500ms.
13	Running time reached	ON: The accumulated running time of inverter reaches the value of FB.06.
14	Upper frequency limit reached	ON: Running frequency reaches upper frequency limit.
15	Lower frequency limit reached	ON: Running frequency reaches lower frequency limit.
16	Ready	ON: Inverter is ready (no fault, power is ON).
17-20	Reserved	Reserved

Function Code	Name	Setting Range
F6.04	AO1 function selection	0-11 [0]
F6.05	AO2 function selection	0-11 [0]
F6.06	DO function selection	0-11 [0]

Standard output of analog is 0-20mA(or 0-10V), AO1 can select current/voltage output through jumper J2, AO2 can select current/voltage output through jumper J3.DO open collector high speed pulse output ranges from 0kHz to 50.0Khz. The relative amount are indicated in the following table:

Setting Value	Function	Range
0	Running frequency	0~Maximum frequency
1	Reference frequency	0~Maximum frequency
2	Running speed	0-2* rated synchronous speed of motor
3	Output current	0-2* inverter rated current
4	Output voltage	0-1.5* inverter rated voltage
5	Output power	0-2* rated power
6	Setting torque	0~2*rated current of motor
7	Output torque	0~2*rated current of motor
8	VCI voltage	0-10V
9	CCI voltage/current	0~10V/0~20mA
10	DI frequency	0.1-50.0kHz

Function Code	Name	Setting Range
F6.07	A01 lower limit	0.0-100.0% [0.0%]
F6.08	A01 lower limit corresponding output	0.00-10.00V [0.00V]
F6.09	A01 upper limit	0.0-100.0% [100.0%]
F6.10	A01 upper limit corresponding output	0.00-10.00V [10.00V]

These parameters determine the relationship between analog output voltage/current and the corresponding output value. When the analog output value exceeds the range between lower limit and upper limit. it will output the upper limit or lower limit.

When analog output is current output, 1 mA is corresponding to 0.5V.

For different applications, the corresponding value of 100.0% analog output is different.

For details, please refer to description of each application.

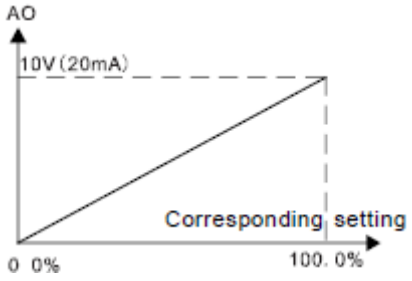


Fig 4.14 Relationship between AO and corresponding setting.

Function Code	Name	Setting Range

F6.11	AO2 lower limit	0.0-100.0% [0.0%]
F6.12	AO2 lower limit corresponding output	0-10.00V [0.00V]
F6.13	AO2 upper limit	0.0-100.0% [100.0%]
F6.14	AO2 upper limit corresponding output	0.00-10.00V [10.00V]
F6.15	DO lower limit	0.0-100.0% [0.0%]
F6.16	DO lower limit corresponding output	0.00-50.00kHz [0.00kHz]
F6.17	DO upper limit	0.0-100.0% [100.0%]
F6.18	DO upper limit corresponding output	0.00-50.00kHz [50.00kHz]

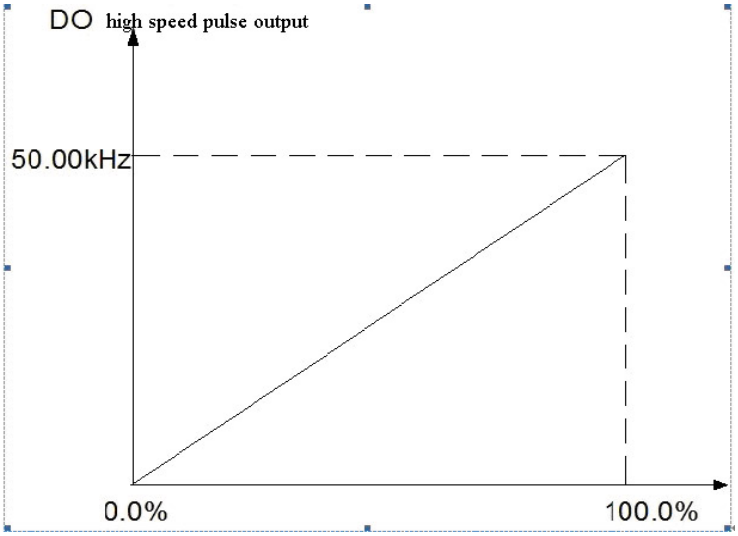


Fig 4.15 Relationship between DO and corresponding setting.

F7 Group Display Interface

Function Code	Name	Setting Range
F7.00	User password	0-65535 [0]

The password protection function will be valid when F7.00 is set to be any nonzero data. When F7.00 is set to be 00000, user's password set before will be cleared and the password protection function will be disabled.

After the password has been set and becomes valid, the user can not access menu if the user's password is not correct. Only when a correct user's password is input, the user can see and modify the parameters. Please keep user's password in mind.

The password protection becomes valid in 1 minute after quitting form the function code editing state. Press PRG/ESC again to the function code editing state. "0.0.0.0.0'will be displayed. Unless using the correct password, the operators cannot enter it.

Function Code	Name	Setting Range
F7.01	QUICK/JOG function selection	0-2 [0]

QUICK/JOG is a multifunctional key. whose function can be defined by the value

0: Clear UP/DOWN setting: Press QUICK/JOG. the UP/DOWN setting will be cleared.

1: Jog: Press QUICK/JOG. the inverter will jog.

2: FWD/REV switching: Press QUICK/JOG. the running direction of inverter will reverse.

It is only valid if F0.09 is set to be 0.

Function Code	Name	Setting Range
F7.02	STOP/RST function selection	0-3 [0]

0: Valid when keypad control
1: Valid when keypad or terminal control
2: Valid when keypad or communication control
3: Always valid

Note:

- **The RESET function of STOP/RST is always valid for fault reset.**

Function Code	Name	Setting Range
F7.03	Running status display selection 1	0~0xFFFF [0x07FF]
F7.04	Running status display selection 2	O-OxFFFF [0x0000]

In the running state, FST610 series inverter's parameter display is affected. There are 16 bit binary number. If one bit is 1, then its corresponding parameter can be running. Press ⟫ /SHIFT to check. If Bit is 0, the parameter will not be displayed. When setting this function code, you should transform binary into hexadecimal and then input this function code.

The display content corresponding to each bit of F7.03 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Output power	Line speed	Rotation speed	Output current	Output voltage	DC bus voltage	Reference frequency	Running frequency

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Step No. of PLC or multi-step	Count value	Torque setting value	Output terminal status	Input terminal status	PID feedback	PID preset	Output torque

Input/ output terminal is displayed by decimal, FWD (DO) corresponds to least significant digit. For example, if input displays 3, it means terminal FWD, REV is closed and the other terminals are disconnected. For details, you can check the description of F7.21, F7.22.

The display content corresponding to each bit of F7.04 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
Reserved	Reserved	Reserved	Load percentage of inverter	Load percentage of motor	DI frequency	CCI	VAI
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Function Code	Name	Setting Range
F7.05	Stop status display selection	0~0xFFFF [0x00FF]

F7.05 determines the display parameters in stop status. The setting method is similar with F7.03.

The display content corresponding to each bit of F7.05 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
CCI	VAI	PID feedback	PID preset	Output terminal status	Input terminal status	DC bus voltage	Reference frequency
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Torque setting value	Step No, of PLC or multi-step	DI frequency

Function Code	Name	Setting Range
F7.06	Coefficient of rotation speed	0.1 -999.9% [100.0%]

This parameter is used to calibrate the bias between actual mechanical speed and rotation speed, it has little effect to actual rpm. The formula is as below:

Actual mechanical speed = 120 * running frequency *F7.06 / Number of poles of motor.

Function Code	Name	Setting Range

F7.07	Coefficient of line speed	0.1 -999.9% [1.0%]

This parameter is used to calculate the line speed based on actual mechanical speed. The formula is as below:

Line speed = actual mechanical speed * F7.07

Function Code	Name	Setting Range
F7.08	Rectify module temperature	0-100.0℃
F7.09	IGBT module temperature	0~100.0℃

Function Code	Name	Setting Range
F7.10	Software version	
F7.11	Inverter rated power	0-3000kW [Depend on model]
F7.12	Inverter rated current	0.0-6000A [Depend on model]
F7.13	Accumulated running time	0~65535h

Rectify module temperature: Indicates the temperature of rectify module. Overheat protection point of different model may be different.

IGBT module temperature: Indicates the temperature of IGBT module. Overheat protection point of different model may be different.

Software version: Indicates current software version.

Accumulated running time: Displays accumulated running time of inverter.

Note: Above parameters are read only.

Function Code	Name	Setting Range
F7.14	Accumulated power time	

Function Code	Name	Setting Range
F7.15	Third latest fault type	0-25
F7.16	Second latest fault type	0-25
F7.17	Latest fault type	0-25

These parameters record three recent fault types. 0 means there is no fault, and 1-25 means there are 25 faults. For details. please refer to fault analysis.

Function Code	Name	Setting Range
F7.18	Output frequency at current fault	
F7.19	Output current at current fault	
F7.20	DC bus voltage at current fault	
F7.21	Input terminal status at current fault	

F7.22	Output terminal status at current fault	

This value is displayed as decimal. This value records all digital input terminal status at current fault. The sequence of each bit is as below:

BIT7	BIT6	BIT5	BIT4
DI		REV	FWD
BIT3	BIT2	BIT1	BIT0
X4	X3	X2	X1

1 indicates corresponding input terminal is ON. while 0 indicates OFF. This value records output terminal status at current fault.

This value is displayed as decimal. The meaning of each bit is as below:

BIT3	BIT2	BIT1	BIT0
Reserved	RO2	RO1	DO

1 indicates corresponding output terminal is ON. while 0 indicates OFF. Notice This value is displayed as decimal.

F8 Group Enhanced Function

Function Code	Name	Setting Range
F8.00	Acceleration time 1	0.1-3600.0s [Depend on model]
F8.01	Deceleration time 1	0.1 ~3600.0s [Depend on model]
F8.02	Acceleration time 2	0.1-3600.0s [Depend on model]
F8.03	Deceleration time 2	0.1-3600.0s [Depend on model]
F8.04	Acceleration time 3	0.1 -3600.0s [Depend on model]
F8.05	Deceleration time 3	0.1-3600.0s [Depend on model]

ACC/DEC time can be seleted among F0.13, F0.14 and the above three groups. Their meanings are the same. Please refer to the relative instructions of F0.13 and F0.14. Select the ACC/DEC time 0~3 through the different combination of the multi-function digital terminals when the inverter runs.

Function Code	Name	Setting Range
F8.06	Jog reference	0.00-F0.09 [Depend on Model]

F8.07	Jog acceletation time	0.1 ~3600.0s [Depend on Model]
F8.08	Jog deceleration time	0.1-3600.0s [Depend on Model]

It is to define jog running frequency and ACC/DEC time. The start and stop mode are: direct start mode and DEC stop mode.

Jog acceleration time refers to the needed time for inverter from 0Hz to maximum output frequency(F0.09).

Jog deceleration time refers to the needed time for inverter from maximum output frequency(F0.09) to 0Hz.

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

When setting frequency is among the range of skip frequency, the actual running frequency will be skip frequency boundary.

By means of setting skip frequency, the inverter can keep away from the mechanical resonance with the load. This inverter can set two skip frequency points. If these two points are both 0, this function will not work.

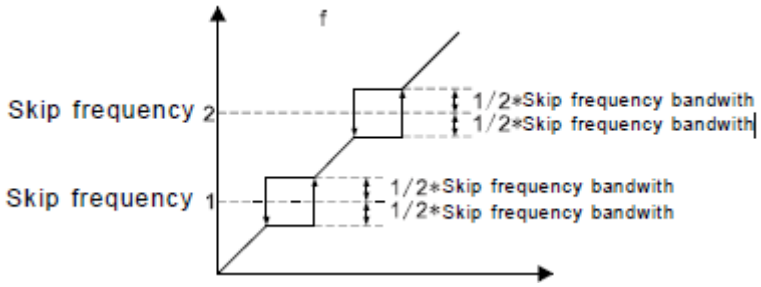


Fig 4.16 Skip frequency diagram.

Function Code	Name	Setting Range
F8.12	Auto reset times	0-3 [0]
F8.13	Reset interval	0.1-100.0s [1.0s]

The times of the fault reset: the inverter set the fault reset times by selecting this function. If the reset times exceeds this set value, the inverter will stop for the fault and wait to be repaired.

The interval time of the fault reset: The interval between the time when the fault occurs and the time when the reset action occurs.

Function Code	Name	Setting Range
F8.14	Brake threshold voltage	115.0-140.0% [Depand on Model]

This function code is to set dynamic braking of origin bus voltage.

Note:

- **Factory setting is 120% if rated voltage of inverter is 220V.**
- **Factory setting is 130% if rated voltage of inverter is 380V.**

• **The 100% value of F8.14 is corresponding to the standard bus voltage at rated input voltage. Appropriate adjust the value can be effective to load for breaking.**

Function Code	Name	Setting Range
F8.15	Cooling fan control	0-1 [0]

0: Normal operation mode: The fan keeps working when the inverter is running. When the inverter stops, whether the fan works or not depends on the module temperature of inverter.
1: The fan keeps working when powering on.

Function Code	Name	Setting Range
F8.16	Overmodulation	0~1 [0]

0: the function is invalid
1: the function is valid
The function is applicable in the instance of low network voltage or heavy load for a time, inverter raises the output voltage with rising utilization rate of bus voltage.

Function Code	Name	Setting Range
F8.17	PWM mode	0-2 [0]

0: PWM mode 1, this is normal PWM mode, in lower frequency the noise is low,in higher frequency the noise is high.
1: PWM mode 2, in this mode the motor's noise is low while temperature raises high, the inverter need to be derated.
2: PWM mode 3, in this mode the motor's noise is high but it is more effective to restrain the oscillation

F9 Group Simple PLC and Multi-step Speed Control

Simple PLC function can enable the inverter to change its output frequency and directions automatically according to programmable controller PLC. It can set running time, direction and frequency to meet the crafts needs.
Simple PLC has 16 steps and 4 ACC/DEC time which can be selected.
When the set PLC finished a cycle, the multi-functional digital output terminal or relay can output ON signal.

Function Code	Name	Setting Range
F9. 00	Simple PLC mode	0-2 [0]

0: Stop after one cycle: Inverter stops automatically as soon as it completes one cycle. and it needs run command to start again.
1: Hold last frequency after one cycle. Inverter holds frequency and direction of last step after one cycle.
2: Circular run: Inverter continues to run cycle by cycle until receive a stop command.

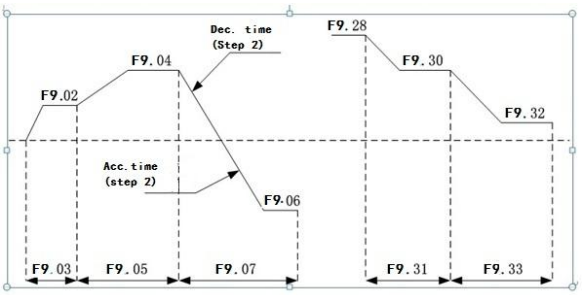


Fig 4.17 Simple PLC operation diagram.

Function Code	Name	Setting Range
F9.01	Simple PLC status saving after power off	0-1 [0]

0: Power loss without memory

1: Power loss memory

PLC record the running stage and frequency when power loss.

Function Code	Name	Setting Range
F9 .02	Multi-step speed 0	-100.0-100.0% [0.0%]
F9. 03	0th Step running time	0.0-6553.5s [0.0s]
F9. 04	Multi-step speed 1	-100.0-100.0% [0.0%]
F9. 05	1 st Step running time	0.0-6553.5s [0.0s]
F9 .06	Multi-step speed 2	-100.0-100.0% [0.0%]
F9 .07	2nd Step running time	0.0-6553.5s [0.0s]
F9. 08	Multi-step speed 3	-100.0-100.0% [0.0%]
F9. 09	3rd Step running time	0.0-6553.5s [0.0s]
F9. 10	Multi-step speed 4	-100.0-100.0% [0.0%]
F9.11	4th Step running time	0.0-6553.5s [0.0s]
F9. 12	Multi-step speed 5	-100.0-100.0% [0.0%]
F9. 13	5th Step running time	0.0-6553.5s [0.0s]
F9. 14	Multi-step speed 6	-100.0-100.0% [0.0%]
F9. 15	6th Step running time	0.0-6553.5s [0.0s]
F9. 16	Multi-step speed 7	-100.0-100.0% [0.0%]
F9. 17	7th Step running time	0.0-6553.5s [0.0s]
F9. 18	Multi-step speed 8	-100.0-100.0% [0.0%]
F9. 19	8th Step running time	0.0-6553.5s [0.0s]
F9. 20	Multi-step speed 9	-100.0-100.0% [0.0%]
F9.21	9th Step running time	0.0~6553.5s [0.0s3
F9. 22	Multi-step speed 10	-100.0-100.0% [0.0%]
F9. 23	10th Step running time	0.0-6553.5s [0.0s]
F9. 24	Multi-step speed 11	-100.0-100.0% [0.0%]
F9. 25	11th Step running time	0.0-6553.5s [0.0s]
F9. 26	Multi-step speed 12	-100.0-100.0% [0.0%]
F9. 27	12th Step running time	0.0-6553.5s [0.0s]

F9. 28	Multi-step speed 13	-100.0-100.0% [0.0%]
F9. 29	13th Step running time	0.0-6553.5s [0.0s]
F9. 30	Multi-step speed 14	-100.0-100.0% [0.0%]
F9.31	14th Step running time	0.0-6553.5s [0.0s]
F9. 32	Multi-step speed 15	-100.0-100.0% [0.0%]
F9. 33	15th Step running time	0.0-6553.5s [0.0s]

100.0% of the frequency setting corresponds to the Max. Frequency(F0.10).

When selecting simple PLC running, set F9.02- F9.33 to define the running and direction of all stages.

Note: The symbol of multi-stage determines the running direction of simple PLC. The negative value means reverse rotation.

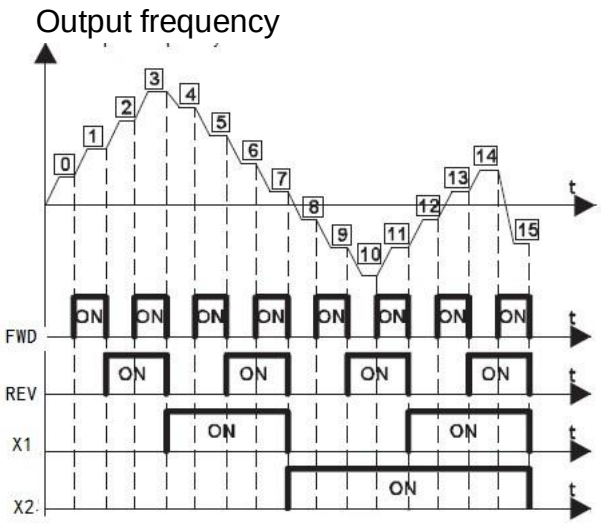


Fig. 4-18 multi-step speed operating logic diagram

Multi-stage speeds are in the range of-Fmax~Fmax and it can be set continuously.

FST-610 series inverters can set 16 stages speed, selected by the combination of multi-stage terminals X1, X2,X3,X4, corresponding to the speed 0 to speed 15.

When X1=X2=X3=X4=OFF, the frequency input manner is selected via code F0.08.

When all X1,X2,X3,X4 terminals aren't off, it runs at multi-stage which takes precedence of keypad, analog value, high-speed pulse, PLC, communication frequency input. Select at most 16 stages speed via the combination code of X1,X2,X3,X4.

The start-up and stopping of multi-stage running is determined by function code F0.08, the relationship between X1,X2,X3,X4 terminals and multi-stage speed is as following:

X1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
X2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
X3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
X4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
stage	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
X1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
X2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
X3	OFF	OFF	OFF	OFF	ON	ON	ON	ON

X4	ON	ON	ON	ON	ON	ON	ON	ON
stage	8	9	10	11	12	13	14	15

Function Code	Name	Setting Range
F9. 34	ACC/DEC time selection for step 0~7	O-FFFF [0]
F9. 35	ACC/DEC time selection for step 8-15	O-FFFF [0]

These parameters are used to determine the ACC/DEC time from one step to next step. There are four ACC/DEC time groups.

Function Code	Binary Digit	Step No.	ACC/DEC Time 0	ACC/DEC Time 1	ACC/DEC Time 2	ACC/DEC Time 3
F9. 34	BIT1 BIT0	0	00	01	10	11
	BIT3 BIT2	1	00	01	10	11
	BIT5 BIT4	2	00	01	10	11
	BIT7 BIT6	3	00	01	10	11
	BIT9 BIT8	4	00	01	10	11
	BIT11 BIT10	5	00	01	10	11
	BIT13 BIT12	6	00	01	10	11
	BIT15 BIT14	7	00	01	10	11
F9 .35	BIT1 BIT0	8	00	01	10	11
	BIT3 BIT2	9	00	01	10	11
	BIT5 BIT4	10	00	01	10	11
	BIT7 BIT6	11	00	01	10	11
	BIT9 BIT8	12	00	01	10	11
	BIT11 BIT10	13	00	01	10	11
	BIT13 BIT12	14	00	01	10	11
	BIT15 BIT14	15	00	01	10	11

After the users select the corresponding ACC/DEC time, the combining 16 binary bit will change into decimal bit, and then set the corresponding function codes.

Function Code	Name	Setting Range
F9.36	Simple PLC restart selection	0-1 [0]

0: Restart from step 1: If the inverter stops during running (due to stop command or fault). it will run from step 1 when it restarts.

1: Continue from interrupted step: If the inverter stops during running (due to stop command or fault), it will record the running time of current step. When inverter restarts, it will resume from interrupted time automatically. For details, please refer to following picture.

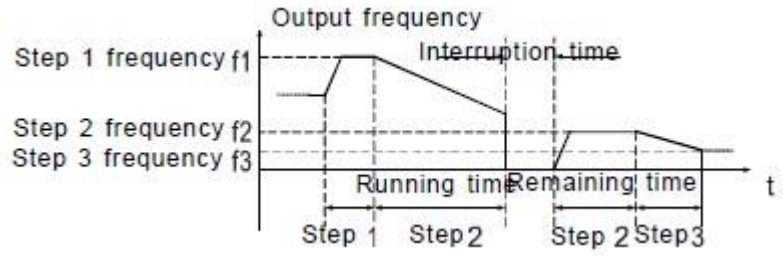


Fig 4.19 Simple PLC continues from interrupted step.

Function Code	Name	Setting Range
F9. 37	Time unit	0-1 [0]

0: Seconds

1: Minutes

This parameter determines the unit of PLC step running time.

FA Group Protedtion Function

Function Code	Name	Setting Range
FA.00	Input phase-failure protection	0-1 [1]
FA.01	Output phase-failure protection	0-1 [1]

0: Disable

1: Enable

Input phase loss protection: select whether to protect the input phase loss

Output phase loss protection: select whether to protect the output phase loss

Function Code	Name	Setting Range
FA.02	Motor overload protection	0-2 [2]

0: No protection. There is no motor overload protection(use cautiously). At this time, inverter has no overload protection for load motor.

1: Common motor (with low speed compensation). As the cooling effect of the common motor is weakened at low speed, the corresponding electronic heating protection is adjusted. The low speed compensation means decrease the motor overload protection threshold whose frequency is below 30Hz.

2: Variable frequency motor (without low speed compensation). As the cooling effect of variable frequency motor has nothing to do with running speed. it is not required to adjust the motor overload protection threshold.

Function Code	Name	Setting Range
FA.03	Motor overload protection current	20.0-120.0% [100.0%]

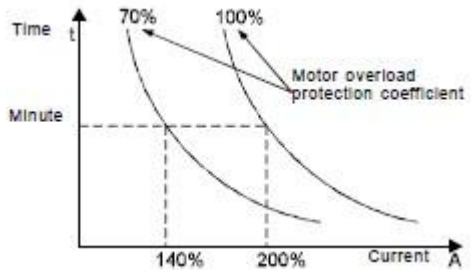


Fig 4.20 Motor overload protection curve.

The value can be determined by the following formula:

Motor overload protection current = (Maximum load current / inverter rated current) *100%

Note:

• This parameter is normally used when rated power of inverter is greater than rated power of motor. This function is to set properly to protect motor.

Function Code	Name	Setting Range
FA.04	Threshold of trip-free	70.0-110.0% [80.0%]
FA.05	Decrease rate of trip-free	0.00HZ-F0.09 [0.00Hz]

100% of FA.04 corresponds to the standard bus voltage. If FA.05 is set to be 0, the trip-free function is invalid.

Trip-free point means when grid is out of power, bus voltage reduce to trip-free, inverter begin to perform low frequency as FA.05, it can continue to run without tripping by reducing its output frequency and feedback energy via motor until powered on.

Note: Appropriate adjust these two parameters can help realize grid switch, and will not cause stop for inverter protection.

Function Code	Name	Setting Range
FA.06	Over-voltage stall protection	0-1 [1]
FA.07	Over-Voltage stall protection voltage	110-150% [120%(220V)]
		110-150%[130%(380V)]

0: Disabled

1: Enabled

During deceleration, the motor's decelerating rate may be lower than that of inverter's output frequency due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in rise of DC bus voltage rise. If no measures taken, the inverter will trip due to over voltage.

During deceleration. the inverter detects DC bus voltage and compares it with over-voltage stall protection point. If DC bus voltage exceeds FA.07. the inverter will stop reducing its output frequency. When DC bus voltage become lower than FA.07, the deceleration continues. As shown in following figure.

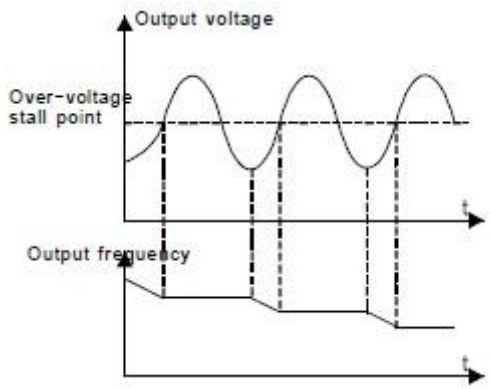


Fig 4.21 Over- stall function.

Function Code	Name	Setting Range
FA.08	Auto current limiting threshold	50-200% [G Model:160% P Model:120%]
FA.09	Frequency decrease rate when current limiting	0.00-50.00Hz/s [10.00Hz/s]
FA.10	Action selection when current limiting	0-1 [0]

0: Enabled

1: Disabled when constant speed

Auto current limiting is used to limit the current of inverter smaller than the value determined by FA.08 in real time. Therefore the inverter will not trip due to surge over-current. This function is especially useful for the applications with big load inertia or step change of load.

FA.08 is a percentage of the inverter's rated current.

FA.09 defines the decrease rate of output frequency when this function is active. If FA.08 is too small, overload fault may occur. If it is too big, the frequency will change too sharply and therefore the feedback energy of motor will be too large and may cause over-voltage fault. This function is always enabled during acceleration or deceleration. Whether the function is enabled in constant speed running is determined by FA.10.

Note:

- **During auto current limiting process, the inverter's output frequency may change; therefore, it is recommended not to enable the function when inverter needs to output stable frequency**
- **During auto current limiting process, if current limiting is too low, the overload capacity will be impacted.**

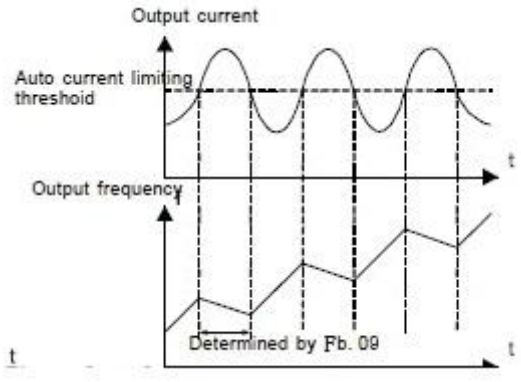


Fig. 4-22 Current limiting protection function

Function Code	Name	Setting Range
FA.11	Selection of overtorque (E-25)	0-4 [1]

0: No detection

1: Valid detection of overtorque during running. then continue running

2: Valid detection of overtorque during running. then warning and stop

3: Valid detection of overtorque during constant speed running. then continue running

4: Valid detection of overtorque during constant speed running. then warning (E-25) and stop.

Function Code	Name	Setting Range
FA.12	Detection level of overtorque	10.0%~200.0% [Depend on the model]

G model: 150%

P model: 120%

This value is depending on model.

Function Code	Name	Setting Range
FA.13	Detection time of overtorque	0.1-60.0s [0.1s]

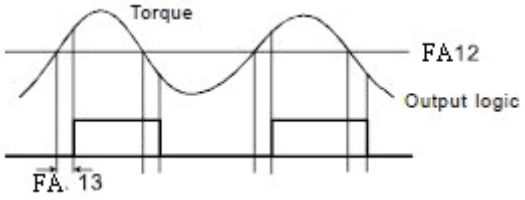


Fig. 4.23 Overtorque control function.

If FA.11 is set to be 2 or 4, and the output torque of inverter reaches to FA.12. and with delay of FA.13, this will output the overtorque. And the TRIP light will reflash. If F6.01 -F6.03 are set to be 10, the output will be valid.

If FA.11 is set to be 2 or 4. when overtorque signal meets the output conditions. inverter proforms warming signal , and meanwhile stops the output.

FB Group Supplementary Function

Function Code	Name	Setting Range
FB.00	Pendulum frequency amplitude	0.0-100.0% [0.0%]
FB.01	Jitter frequency amplitude	0.0-50.0% [0.0%]
FB.02	Rise time of pendulum frequency	0.1-3600.0s [5.0s]
FB.03	Fall time of pendulum frequency	0.1-3600.0s [5.0s]

Pendulum frequency function applies to the industries where need the traverse and convolution function such as textile and chemical fiber industries.

The pendulum frequency function means that the output frequency of the inverter is fluctuated with the set frequency as its center. The route of the running frequency is illustrated as below of which the pendulum frequency is set by FB.00, and when FB.00 is set as 0, the pendulum frequency is 0 with no function.

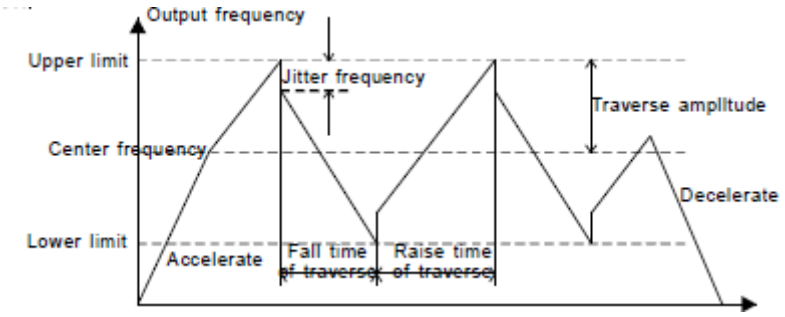


Fig. 4.24 Traverse operation diagram. T

Pendulum frequency amplitude: The pendulum frequency running is limited by upper and low frequency.

The pendulum frequency range relative to the center frequency traverse range AW—center frequency Xtraverse range FB.00.

Sudden jumping frequency =traverse range AW× sudden jumping frequency range FB.01. When run at the pendulum frequency, the value which is relative to the sudden jumping frequency.

The raising time of the pendulum frequency: The time from the lowest point to the highest one.

The declining time of the pendulum frequency : The time from the highest point to the lowest one.

Function Code	Name	Setting Range
FB.04	Preset count value	FB.05-65535 [0]
FB.05	Specified count value	0- FB.04 [0]

Through multi-function ON/OFF input terminal, the counting value can be counted by input pulse signal.

If function of output terminal is set as preset count reached. when the count value

reaches preset count value. it will output an ON-OFF signal. Inverter will clear the counter and restart counting.

If function of output terminal is set as specified count reached. when the count value reaches specified count value. it will output an ON-OFF signal until the count value reaches preset count value. Inverter will clear the counter and restart counting.

Note:

- **Specified count value (FB.05) should not be greater than preset count value (FB.04).**
- **Output terminal can be R01. R02 or DO.**

This function is shown as following figure.

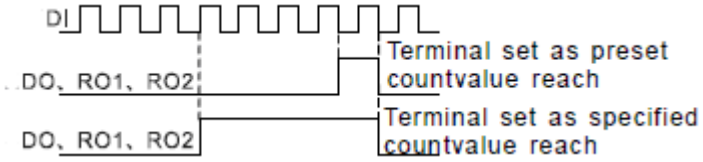


Fig. 4.25 Timing chart for preset and specified count reached.

Function Code	Name	Setting Range
FB.06	Preset running time	0~65535h [65535h]

Pre-set running time of the inverter.

When the accumulative running time achieves the set time. the multi-function digital output terminals will output the signal of "running time arrival".

Function Code	Name	Setting Range
FB.07	FDT level	0.00-F0.09 [50.00Hz]
FB.08	FDT lag	0.0-100.0 [5.0%]

When the output frequency reaches a certain preset frequency (FDT level). output terminal will output an ON-OFF signal until output frequency drops below a certain frequency of FDT level (FDT level - FDT lag). as shown in following figure.

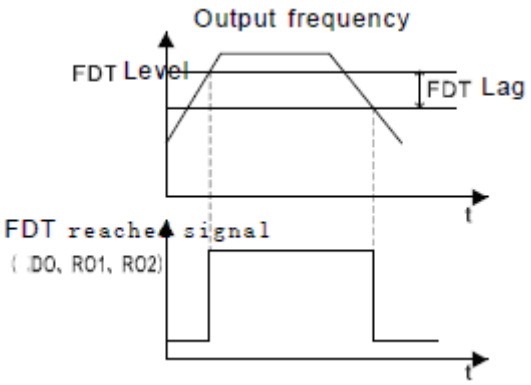


Fig. 4.26 FDT level and lag diagram.

Function Code	Name	Setting Range
FB.09	Frequency arrive detecting range	0.0-100.0% [0.0%]

When output frequency is within the detecting range of reference frequency. an ON-OFF signal will be output. The function can adjust the detecting range.

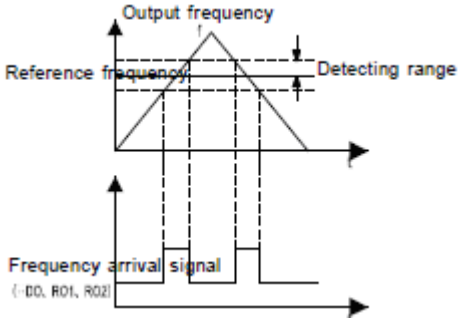


Fig. 4.27 Frequency arriving detection diagram.

Function Code	Name	Setting Range
FB.10	Droop control	0.00～10.00Hz [0.00Hz]

When several motors drive the same load. each motor's load is different because of the difference of motor's rated speed. The load of different motors can be balanced through droop control function which makes the speed droop along with load increase.

When the motor outputs rated torque. actual frequency drop is equal to FB.10. User can adjust this parameter from small to big gradually during commissioning. The relation between load and output frequency is in the following figure.

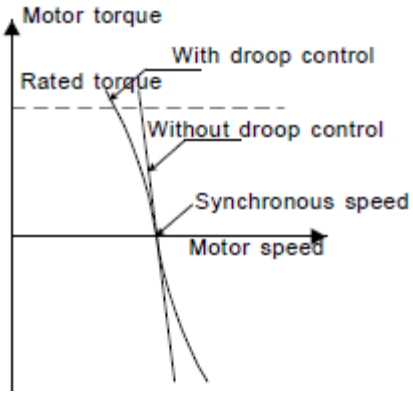


Fig. 4.28 Droop control diagram.

FC Group Serial Communication

Function Code	Name	Setting Range
Fc.00	Local address	0-247 [1]

When the master is writing the frame. the communication address of the slave is set to 0. the address is the communication address. All slaves on the MODBUS fieldbus can receive the frame. but the salve doesn't answer.

The communication of the drive is unique in the communication net. This is the fundamental for the point to point communication between the upper monitor and the drive.

Note: The address of the slave cannot set to 0.

This parameter determines the slave address used for communication with master. The value "0* is the broadcast address.

Function Code	Name	Setting Range
Fc.01	Baud rate selection	0-5 [4]

0: 1200BPS

1:2400BPS

2: 4800BPS

3: 9600BPS

4:19200BPS

5: 38400BPS

This parameter can set the data transmission rate during serial communication.The baud rate between the upper monitor and the inverter must be the same.Otherwise. the communication is not applied. The bigger the baud rate. the quicker the commnication speed.

Function Code	Name	Setting Range
Fc.02	Data format	0-17 [1]

0: RTU. no parity check. (N,8,1) for RTU.

1: RTU. even parity check. (E,8,1) for RTU.

2: RTU. odd parity check. (O,8,1) for RTU.

3: RTU. no parity check. (N,8,2) for RTU.

4: RTU. even parity check. (E,8,2) for RTU.

5 RTU. odd parity check. (O,8,2) for RTU.

This parameter defines the data format used in serial communication protocol

Function Code	Name	Setting Range
Fc.03	Communication delay time	0~200ms [5ms]

This parameter means the interval time when the drive receive the data and sent it to the upper monitor. If the answer delay is shorter than the system processing time. then the answer delay time is the system processing time. if the answer delay is longer than the system processing time. then after the system deal with the data. waits until achieving the answer delay time to send the data to the upper monitor.

Function Code	Name	Setting Range
Fc .04	Communication timeout delay	0.0~100.0s [0.0s]

When the function code is set as 0.0s. the communication overtime parameter is invalid. When the function code is set to a valid value. if the interval time between two

communications exceeds the communication overtime. the system will report "communication faults" (E-15).
Generally. set it as invalid; set the parameter in the continuous communication to monitor the communication state.

Function Code	Name	Setting Range
Fc .05	Communication error action	0-3 [1]

0 When communication error occurs. inverter will alarm and coast to stop.
1 When communication error occurs. inverter will omit the error and continue to run.
2: When communication error occurs. if F0.02=2. inverter will not alarm but stop according to stop mode determined by F2.08. Otherwise it will omit the error.
3 When communication error occurs. inverter will not alarm but stop according to stop mode determined by F2.08.

Function Code	Name	Setting Range
Fc.06	Response action	00-11 [0000]

Unit's place of LED
0 Response to writing
1: No response to writing
Ten's place of LED
0: Reference not saved when power off
1: Reference saved when power off

FD Group PID Control

PID control is a common used method in process control. such as flow. pressure and temperature control. The principle is firstly to detect the bias between preset value and feedback value. then calculate output frequency of inverter according to proportional gain. integral and differential time. Please refer to following figure.

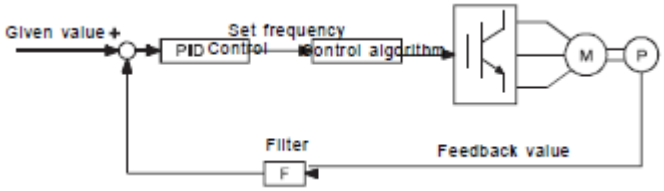


Fig 4.29 PID control diagram.

Note: To make PID take effect. F0.03must be set to be 6.

Function Code	Name	Setting Range
FD.00	PID preset source selection	0-5 [0]

0:Keypad
1:VCI
2: CCI
3: DI

4: Multi-step

5: Communication

When F0.03=6. this function is valid. The parameter determines the target given channel during the PID procures.

These parameters are used to select PID preset and feedback source.

Note:

- **Preset value and feedback value of PID are percentage value.**
- **100% of preset value is corresponding to 100% of feedback value.**
- **Preset source and feedback source must not be same. otherwise PID will be malfunction.**

Function Code	Name	Setting Range
FD.01	Keypad PID preset	0.0-100.0% [0.0%]

Set the parameter when FD.00=0.

The basic value of this parameter is the feedback value.

Function Code	Name	Setting Range
FD.02	PID feedback source selection	0-4 [0]

0: VCI

1: CCI

2: VCI+CCI

3: DI

4: Communication

This parameter is used to select PID feedback source.

The given channel and the feedback channel can not coincide. otherwise. PID can not control effectively.

Function Code	Name	Setting Range
FD.03	PID output characteristic	0-1 [0]

0: Positive. When the feedback value is greater than the preset value. output frequency will be decreased. such as tension control in winding application.

1: Negative. When the feedback value is greater than the preset value. output frequency will be increased. such as tension control in unwinding application.

Function Code	Name	Setting Range
FD.04	Proportional gain (Kp)	0.00-100.00 [0.10]
FD.05	Integral time (T1)	0.00-100.00s [0.10s]
FD.06	Differential time (Td)	0.00-100.00s [0.10s]

Optimize the responsiveness by adjusting these parameters while driving an actual load.

Adjusting PID control:

Use the following procedure to activate PID control and then adjust it while monitoring the response.

1. Enabled PID control (F0.03=6)
2. Increase the proportional gain (Kp) as far as possible without creating oscillation.
3. Reduce the integral time (T1) as far as possible without creating oscillation.

4. Increase the differential time (Td) as far as possible without creating oscillation.

Making fine adjustments:

First set the individual PID control constants. and then make fine adjustments.

- Reducing overshooting

If overshooting occurs. shorten the differential time and lengthen the integral time.

- Rapidly stabilizing control status

To rapidly stabilize the control conditions even when overshooting occurs. shorten the integral time and lengthen the differential time.

- Reducing long-cycle oscillation

If oscillation occurs with a longer cycle than the integral time setting. it means that integral operation is strong. The oscillation will be reduced as the integral time is lengthened.

- Reducing short-cycle oscillation

If the oscillation cycle is short and oscillation occurs with a cycle approximately the same as the differential time setting. it means that the differential operation is strong. The oscillation will be reduced as the differential time is shortened.

If oscillation cannot be reduced even by setting the differential time to 0. then either lower the proportional gain or raise the PID primary delay time constant.

Function Code	Name	Setting Range
FD.07	Sampling cycle (T)	0.01~100.00s [0.10s]
FD.08	Bias limit	0.00-100.00% [0.0%]

Sampling cycle T refers to the sampling cycle of feedback value. The PID regulator calculates once in each sampling cycle. The bigger the sampling cycle is, the slower the response is.

Bias limit defines the maximum bias between the feedback and the preset. PID stops operation when the bias is within this range. Setting this parameter correctly is helpful to improve the system output accuracy and stability.

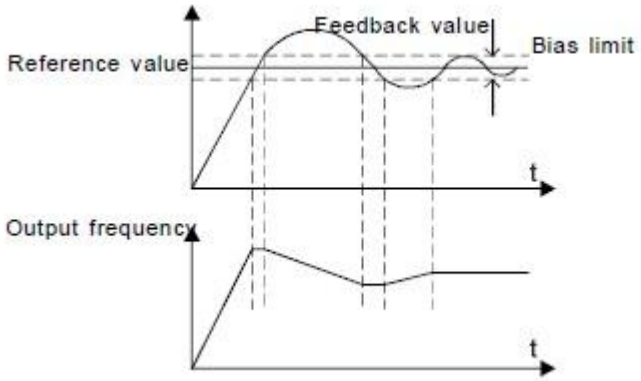


Fig 4.30 Relationship between bias limit and output frequency.

Function Code	Name	Setting Range
FD.09	Feedback lost detecting value	0.0-100.0% [0.0%]
FD.10	Feedback lost detecting time	0.0~3600.0s [1.0s]

When feedback value is less than FD.09 continuously for the period determined by FD.10. the inverter will alarm feedback lost failure (E-22).

Note: 100% of FD.09 is the same as 100% of FD.01.

Function Code	Name	Setting Range
FD.11	Sleep threshhold	0~max.value of frequency【0】
FD.12	Sleep delay time	0~600.00s【1】
FD.13	Wake-up threshhold	0~100%【20%】
FD.14	Wake-up delay time	0~600.00s【1】

FE Group Factory Setting

This group is the factory-set parameter group.It is prohibited for user to modify.

Function Code	Name	Setting Range
FE.00	Factory password	0-65535 [*****]

Chapter 5- TROUBLE SHOOTING

This chapter tells how to reset faults and view fault history. It also lists all alarm and fault messages including the possible cause and corrective actions.

5.1 Fault and Trouble shooting

Fault Code	Fault Type	Reason	Solution
E-01	Over-current When acceleration	1.Acc time is too short. 2.The voltage of the grid is too low. 3.The power of the inverter is too low.	1.Increase Acc time. 2.Check the input power 3.Select bigger capacity inverter.
E-02	Over-current when deceleration	1.Dec time is too short. 2.The torque of the load inertia is big. 3.The power of the inverter is too low.	1. Increase Dec time. 2.Install a proper energy consumption braking components 3. Select bigger capacity inverter.
E-03	Over-current when constant speed running	1 The load transients or is abnormal. 2. The voltage of the grid is too low. 3. The power of the inverter is too low.	1.Check the load or reduce the transient of the load 2.Check the input power supply 3.Select bigger capacity inverter.
E-04	Over-voltage when acceleration	1.The input voltage is abnormal 2.Restart the running motor after sudden power loss.	1 Check the input power 2.Avoid restart-up after stopping
E-05	Over-voltage when deceleration	1.Dec time is too short. 2.The inertia of the load is big. 3.The input voltage is abnormal	1.Increase the Dec time 2.Increase the energy-consuming components 3.Check the input power
E-06	Over-voltage when constant speed running	1.The input voltage changes abnormally. 2.The inertia of the load is big.	1.Install the input reactor 2.Add proper energy-consuming components
E-07	Rectify overheat	1. Sudden overcurrent of the inverter 2.There is direct or indirect short circuit	1. Refer to the overcurrent solution 2. Redistribute 3. Dredge the wind channel

Fault Code	Fault Type	Reason	Solution
E-08	IGBT overheat	between output 3 phase 3.Air duct jam or fan damage 4.Ambient temperature is too high. 5.The wiring of the control panel or plug-ins are loose 6.The assistant power supply is damaged and the drive voltage is undervoltage 7.The bridge arm of the power module is switched on 8.The control panel is abnormal	or change the fan 4. Low the ambient temperature 5. Check and reconnect 6. Ask for service 7. Ask for service 8. Ask for service
E-09	Inverter overload	1.The acceleration is too fast 2.Reset the rotating motor 3.The voltage of the power supply is too low. 4.The load is too heavy.	1.Increase the ACC time 2.Avoid the restarting after stopping. 3.Check the power of the supply line 4.Select an inverter with bigger power
E-10	Motor overload	1.The voltage of the power supply is too low. 2.The motor setting rated current is incorrect. 3.The motor stall or load transients is too strong. 4.The power of the motor is too big.	1.Check the power of the supply line 2.Reset the rated current of the motor 3.Check the load and adjust the torque lift 4.Select a proper motor.
E-11	DC bus Under-voltage	1.The voltage of the grid is low	1.Check the input power supply of the grid
E-12	IGBT short circuit fault	1.Acctime is too short. 2.IGBT module fault. 3.Malfunction caused by interference. 4. Grounding is not properly.	1.Increase Acc time. 2.Ask for support. 3.Inspect external equipment and eliminate interference.
E-13	External fault	S1 External fault input terminal take effect.	1. Check the external device input
E-14	Current detection fault	1.The connection of the control board is not good Assistant power is bad 2.Assistant power is damaged 3.Hoare components is broken 4.The modifying circuit is abnormal.	1.Check and reconnect 2.Ask for service 3.Ask for service 4.Ask for service

Fault Code	Fault Type	Reason	Solution
E-15	Communication fault	1.The baud rate setting is incorrect. 2.Communication fault 3.The communication is off for a long time.	1.Set proper baud rate 2.Press STOP/RST to reset and ask for help 3. Check the communication connection distribution
E-16	Reserved		
E-17	EEPROM fault	1.Error of controlling the write and read of the parameters 2.Damage to EEPROM	1 .Press STOP/RST to reset 2. Ask for service
E-18	Output phase loss	U. V and W phase loss input (or serious asymmetrical three phase of the load)	1. Check the output distribution 2. Check the motor and cable
E-19	Input phase loss	Phase loss or fluctuation of input R. S and T	1.Check input power 2.Check installation distribution
E-20	Autotuning fault	1.The motor capacity does not comply with the inverter capability 2.The rated parameter of the motor does not set correctly. 3.The offset between the parameters from autotune and the standard parameter is huge 4.Autotune overtime	1 .Change the inverter model 2.Set the rating parameters according to the nameplate of the motor 3.Empty the motor and identify again 4.Check the motor wiring and set the parameters
E-21	reserved		
E-22	PID feedback fault	1.PID feedback offline 2.PID feedback source disappear	1 .Check the PID feedback signal wires 2.Check PID feedback source
E-23	reserved		
E-24	reserved		
E-25	Overtorque	1.The acceleration is too fast 2.Reset the rotating motor 3.The voltage of the power supply is too low. 4.The load is too heavy.	1.Increase the ACC time 2.Avoid the restarting after stopping. 3.Check the power of the supply line 4.Select an inverter with bigger power 5.Adjust FA.11 to a proper value

5.2 Common Faults and Solutions

Inverter may have following faults or malfunctions during operation. please refer to the following solutions.

No display after power on:

- Inspect whether the voltage of power supply is the same as the inverter rated voltage or not with multi-meter. If the power supply has problem. inspect and solve it.

- Inspect whether the three-phase rectify bridge is in good condition or not. If the rectification bridge is burst out. ask for support.
- Check the CHARGE light. If the light is off. the fault is mainly in the rectify bridge or the buffer resistor. If the light is on. the fault may be lies in the switching power supply. Please ask for support.

Power supply air switch trips off when power on:

- Inspect whether the input power supply is grounded or short circuit. Please solve the problem.
- Inspect whether the rectify bridge has been burnt or not. If it is damaged. ask for support.

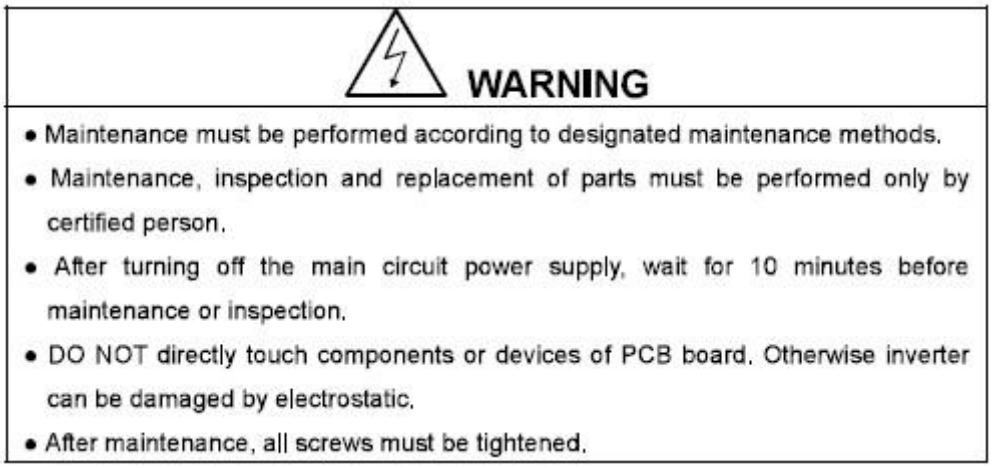
Motor doesn't move after inverter running:

- Inspect if there is balanced three-phase output among U. V. and W. If yes. then motor could be damaged. or mechanically locked. Please solve it.
- Ask for help if the output is unbalanced.
- Ask for help if there is no output voltage.

Inverter displays normally when power on. but switch at the input side trips when running:

- Inspect whether the output side of inverter is short circuit. If yes. ask for support.
- Inspect whether ground fault exists. If yes. solve it.
- If trip happens occasionally and the distance between motor and inverter is too far. it is recommended to install output AC reactor.

Chapter 6- MAINTENANCE



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	Enaure 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	Cherck if the screw is loose or not.	Tjghten up
PCB board	Dust and dirtness	Clear the sundries with dry compressed air.
The fan	Check if the accumulative time of abnormal noise and vibratwn 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 dirtness	Clear the sundries with dry compressed air.
Power components	Dust and dirtness	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 Interfaces

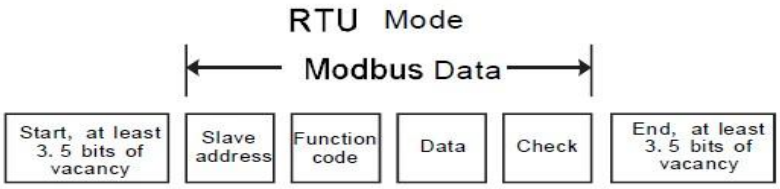
RS485: asynchronous. half-duplex.
Default 8-E-1. 19200bps. See Group FC parameter settings.

7.2 Communication Modes

7.2.1 The protocol is Modbus protocol. Besides the common register Read/Write operation. it is supplemented with commands of parameters management.
7.2.2 The drive is a slave in the network. It communicates in 'point to point' master-slave mode. It will not respond to the command sent by the master via broadcast address.
7.2.3 In the case of multi-drive communication or long-distance transmission. connecting a 100-1200 resistor in parallel with the master signal line will help to enhance the immunity to interference.

7.3 Protocol Format

Modbus protocol supports both RTU. The frame format is illustrated as follows:



Modbus adopts Big Endian" representation for data frame. This means that when a numerical quantity larger than a byte is transmitted. the most significant byte is sent first.

RTU mode

In RTU mode. the Modbus minimum idle time between frames should be no less than 3.5 bytes. The checksum adopts CRC-16 method. All data except checksum itself sent will be counted into the calculation. Please refer to section: CRC Check for more information. Note that at least 3.5 bytes of Modbus idle time should be kept and the start and end idle time need not be summed up to it.

The table below shows the data frame of reading parameter 002 from slave node address 1.

Node addr.	Command	Data addr.		Read No.		CRC	
0x01	0x03	0x00	0x02	0x00	0x01	0x25	OxCA

The table below shows the reply frame from slave node address 1

Node addr.	Command	Bytes No.	Data		CRC	
0x01	0x03	0x02	0x00	0x00	0xB8	0x44

7.4 Protocol function

Different respond delay can be set through drive's parameters to adapt to different needs. For RTU mode. the respond delay should be no less than 3.5 bytes interval.
The main function of Modbus is to read and write parameters. The Modbus protocol supports the following commands:

0x03	Read inverter's function parameter and status parameters
0x06	Write single function parameter or command parameter to inverter

All drive's function parameters. control and status parameters are mapped to Modbus R/Wdata address.
The data address of control and status parameters please refer to the following table.

Parameter Description	Address	Meaning of value	R/W Feature
Control command	1000H	0001H: Forward	W/R
		0002H: Reverse	
		0003H: JOG forward	
		0004H: JOG reverse	
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Reset fault	
		0008H: JOG stop	
Inverter status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Standby	
		0004H: Fault	
		0005H: Status of inverter POFF	
Communication setting	2000H	Communication Setting Range (-10000-10000) Note: the communication setting is the percentage of the relative value (-100.00%~100.00%). If it is set as frequency source. the value is the percentage of the maximum frequency. If it is set as PID (preset value or feedback value). the value is the percentage of the PID.	W/R
	2001H	PID setting. Range 0-1000. 1000 means 100.0%	W/R

	2002 H	PIDfedback. Range 0-1000. 1000 meansl00.0%	W/R
	2003H	Setting value of torque Range.-1000-1000 1000 means 100.0%	W/R
	2004 H	Setting value of upper limit frequency (0-Fmax)	W/R

Parameter Description	Address	Meaning of value	R/W Feature
Status parameters	3000H	Output frequency	R
	3001H	Reference frequency	R
	3002H	DC Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Rotation speed	R
	3006H	Output power	R
	3007H	Output torque	R
	3008H	PID preset value	R
	3009H	PID feedback value	R
	300AH	Input terminal status	R
	300BH	Output terminal status.	R
	300CH	Input of VCI	R
	300DH	Input of CCI	R
	300EH	Reserved	R
	300FH	Reserved	R
	3010H	DI frequency	R
	3011H	Reserved	R
	3012H	Step No. of PLC or multi-step	R
	3013H	Reserved	R
	3014H	External counter input	R
	3015H	Torque setting	R
	3016H	Device code	R
Inveter fault info address	5000H	OXOOH:No fault 0X01H: E-08 0X02H: reserved 0X03H: reserved 0X04H: E-01 0X05H: E-02 0X06H: E-03 0X07H: E-04 0X08H: E-05 0X09H: E-06 OxOA: E-11 OxOB: E-10 OxOC:E-09 OxOD: E-19 OxOE: E-18 OxOF: E-07 0x10: E-08 0x11: E-13	R

Parameter Description	Address	Meaning of value	R/W Feature
Inveter fault info address	5000H	0x12: E-15 0x13: E-14 0x14: E-20 0x15: E-17 0x16: E-22 0x17: reserved 0x18: reserved 0x19: E-25	R

The above shows the format of the frame. Now we will introduce the Modbus command and data structure in details. which is called protocol data unit for simplicity. Also MSB stands for the most significant byte and LSB stands for the least significant byte for the same reason. The description below is data format in RTU mode.

Protocol data unit format of reading parameters:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x03
Data Address	2	0~0xFFFF
Read number	2	0x0001-0x0010

Reply format(success):

Protocol data unit	Data length(bytes)	Range
Command	1	0x03
Returned byte number	2	2* Read number
Content	2* Read number	

If the command is reading the type of inverter (data address 0x3016). the content value in reply message is the device code:

The high 8 bit of device code is the type of the inverter. and the low 8 bit of device code is the sub type of inverter.

If the operation fails. the inverter will reply a message formed by failure command and error code. The failure command is (Command • 0x80). The error code indicates the reason of the error; see the table below.

Value	Name	Mean
01H	Illegal command	The command from master can not be executed. The reason maybe: 1 This command is only for new version and this version can not realize. 2 Slave is in fault status and can not execute it.
02 H	Illegal data address.	Some of the operation addresses are invalid or not allowed to access.

03 H	Illegal value	When there are invalid data in the message framed received by slave. Note: This error code does not indicate the data value to write exceed the range. but indicate the message frame is a illegal frame.
06H	Slave busy	Inverter is busy(EEPROM is storing)
10H	Password error	The password written to the password check address is not same as the password set by F7.00.
11H	Check error	The CRC (RTU mode) check not passed.
12H	Written not allowed.	It only happen in write command. the reason maybe 1 The data to write exceed the range of according parameter 2 The parameter should not be modified now. 3 The terminal has already been used.
13H	System locked	When password protection take effect and user does not unlock it. write/read the function parameter will return this error.

Protocol data unit format of writing single parameter:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x06
Data Address	2	O-OxFFFF
Write Content	2	0~0xFFFF

Reply format (success):

Protocol data unit	Data length(bytes)	Range
Command	1	0x06
Data Address	2	0~0xFFFF
Write Content	2	0~0xFFFF

If the operation fails. the inverter will reply a message formed by failure command and error code. The failure command is (Command—0x80). The error code indicates the reason of the error; see table 1.

7.5 Note:

7.5.1 Between frames. the span should not less than 3.5 bytes interval. otherwise. the message will be discarded.

7.5.2 Be cautious to modify the parameters of PC group through communication. otherwise may cause the communication interrupted.

7.5.3 In the same frame. if the span between two near bytes more than 1.5 bytes interval. the behind bytes will be assumed as the start of next message so that communication will failure.

7.6 CRC Check

For higher speed. CRC-16 uses tables. The following are C language source code for CRC-16.

```
unsigned int crc_cal_va|ue(unsigned char *data_value.unsigned char data_length)
{
int 1:
unsigned int crc_value=Oxffff:
 while(data_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;
        }
  }
 re tu r n (c rc_value);
 }
```

7.7 Example

7.7.1 Command code« 03H(0000 0011). read N words (Word) (the continuous Max. reading is 16 words)

For example. read continuous 2 words from the inverter with the address of 01H. The frame structure is as below:

RTU master command message (from the master to the inverter)

START	T1-T2-T3-T4
ADDR	01 H
CMD	03 H
High bit of the start bit	00 H
Low bit of the start bit	03 H
High bit of data number	00 H
Low bit of data number	02 H
CRC low bit	34 H
CRC high bit	OBH

END	T1-T2-T3-T4

RTU slave response message

START	T1-T2-T3-T4
ADDR	01H
CMD	03 H
Byte number	04 H
Data high bit of address 0004H	13H
Data low bit of address 0004H	88H
Data high bit of address 0005H	13H
Data low bit of address 0005H	88 H
CRC CHK low bit	73 H
CRC CHK high bit	CBH
END	T1-T2-T3-T4

7.7.2 Command code 06H

06H (0000 0110) . write one word(Word)

For example. write 5000 (1388H) to 0006H from the inverter with the address of 02H. the frame structure is as below:

RTU master command message

START	T1-T2-T3-T4
ADDR	02 H
CMD	06H
High bit of writing data address	00 H
Low bit of writing data address	06 H
Data contcnt	13H
Data content	88H
CRC CHK low bit	64 H
CRC CHK high bit	AEH
END	T1-T2-T3-T4

RTU slave response message

START	T1-T2-T3-T4
ADDR	02 H
CMD	06 H
High bit of writing data address	00 H
Low bit of writing data address	06 H
High bit of data content	13H
Low bit of data content	88 H
CRC CHK low bit	64 H
CRC CHK high bit	AEH
END	T1-T2-T3-T4

7.7.3 Command code 08H (0000 1000) for diagnosis

Meaning of sub-function codes:

Sub-function Code	Description
0000	Return to inquire information data

For example: The inquiry information string is same as the response information string when the loop detection to address 01H of driver is carried out.

The RTU request command is:

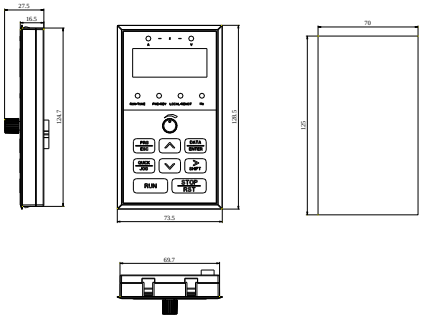
START	T1-T2-T3-T4
ADDR	01H
CMD	08 H
High byte of sub-function code	00 H
Low byte of sub-function code	00 H
High byte of data content	12H
Low byte of data content	ABH
Low byte of CRC	ADH
High byte of CRC	14H
END	T1-T2-T3-T4

The RTU response command is:

START	T1-T2-T3-T4
ADDR	01H
CMD	08 H
High byte of sub-function code	00 H
Low byte of sub-function code	00 H
High byte of data content	12H
Low byte of data content	ABH
Low byte of CRC	ADH
High byte of CRC	14H
END	T1-T2-T3-T4

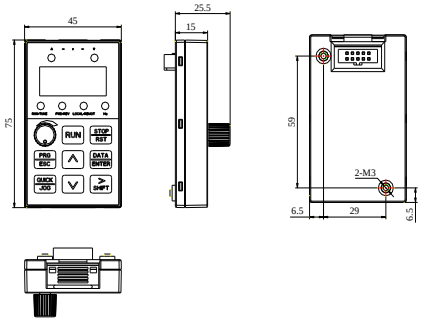
Appendix A Installation and Dimensions

A.1 Kepayd dimensions



FST-610 keypad dimension of bigger size

dimension for installation hole



FST-610 keypad dimension of smaller size

FST-610 dimension for installation hole

A2 Inverter dimensions

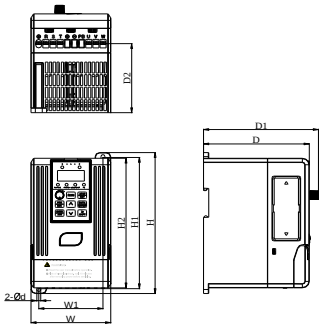


Fig 1

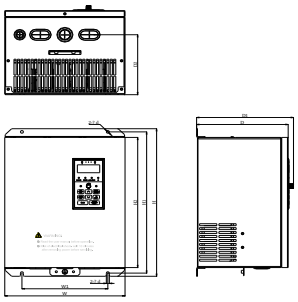


Fig 2

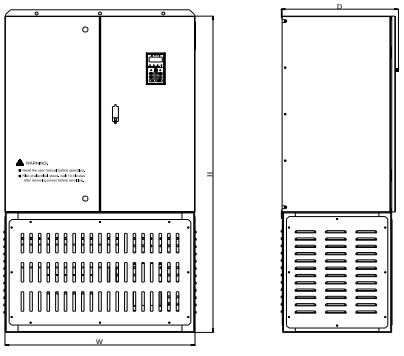
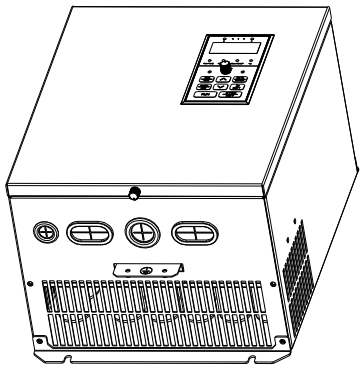


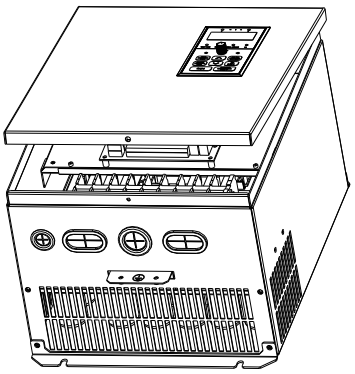
Fig 3

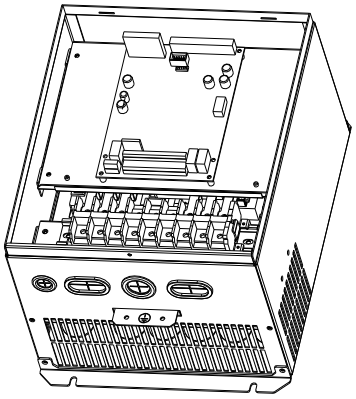
Model no.	W	W1	H	H1	H2	D	D1	D2	d	Fig
FST-610-0R7G/1R5PT4	92	74	174	162	160	122	132	85	4.5	4
FST-610-0R4T2/S2										
FST-610-1R5G/2R2PT4										
FST-610-0R7T2/S2										
FST-610-2R2G/4R0PT4										
FST-610-1R5T2/S2										
FST-610-4R0G/5R5PT4	135	110	265	255	240	155	165	123	7	5
FST-610-2R2T2/S2										
FST-610-5R5G/7R5PT4										
FST-610-4R0T2/S2										
FST-610-7R5G/011PT4	200	140	345	330	300	190	205	110	7	5
FST-610-011G/015PT4										
FST-610-015G/018PT4										
FST-610-018G/022PT4	280	200	375	360	330	210	225	150	7	5
FST-610-022G/030PT4										
FST-610-030G/037PT4										
FST-610-037G/045PT4	340	200	530	510	480	240	255	190	10	5
FST-610-045G/055PT4										
FST-610-055G/075PT4										
FST-610-075G/090PT4	400	240	610	590	550	280	295	230	12	5
FST-610-090G/110PT4										
FST-610-110G/132PT4										
FST-610-132G/160PT4	500	400	770	740	700	345	360	210	12	5
FST-610-160G/185PT4										
FST-610-185G/200PT4										
FST-610-200G/220PT4										
FST-610-132G/160PT4	Cabinet：1000*500*360									6
FST-610-160G/185PT4										
FST-610-185G/200PT4										
FST-610-200G/220PT4										
FST-610-220G/245PT4	750	500	860	830	805	450	465	260	12	5
FST-610-245G/280PT4										
FST-610-280/315PT4										
FST-610-315G/355PT4										
FST-610-220G/245PT4	Cabinet： 1300*750*465									6
FST-610-245G/280PT4										
FST-610-280/315PT4										
FST-610-315G/355PT4										
FST-610-355G/400PT4	950	800	1000	970	950	500	515	315	13	5
FST-610-400G/455PT4										
FST-610-455G/500PT4										
FST-610-500G/560PT4										

FST-610-355G/400PT4	Cabinet: 1500*950*515									6
FST-610-400G/455PT4										
FST-610-455G/500PT4										
FST-610-500G/560PT4										
FST-610-560G/630PT4	1050	900	1040	1010	990	500	515	315	13	5
FST-610-630GT4										
FST-610-560G/630PT4	Cabinet: 1600*1050*515									6
FST-610-630GT4										

A.3 The assembly and detachment of Panel







Appendix B Specifications of Breaker. Cable. Contactor and Reactor

B.1 Specifications of breaker. cable. contactor and reactor

B.1.1 Specifications of breaker. cable and contactor

Inverter moduel	Circuit Breaker(A)	Input/Output copper core cable (mm^2)	The rated current A of contactor (voltage 380 or 220V)
FST-610-1R5G/2R2PT4	16	2.5	10
FST-610-2R2G/3R7PT4	16	2.5	10
FST-610-3R7G/5R5PT4	25	4	16
FST-610-5R5G/7R5PT4	25	4	16
FST-610-7R5G/011PT4	40	6	25
FST-610-011G/015PT4	63	6	32
FST-610-015G/018PT4	63	6	50
FST-610-018 G/022PT4	100	10	63
FST-610-022 G/030PT4	100	16	80
FST-610-030 G/037PT4	125	25	95
FST-610-037 G/045PT4	160	25	120
FST-610-045G/055PT4	200	35	135
FST-610-055G/075PT4	200	35	170
FST-610-075G/090PT4	250	70	230
FST-610-090G/110PT4	315	70	280
FST-610-110G/132PT4	400	95	315
FST-610-132G/160PT4	400	150	380

Inverter moduel	Circuit Breaker(A)	Input/Output copper core	The rated current A of contactor

		cable (mm2)	(voltage 380 or 220V)
FST-610-160G/185PT4	630	185	450
FST-610-185G/200PT4	630	185	500
FST-610-200G/220PT4	630	240	580
FST-610-220G/250PT4	800	150x2	630
FST-610-250G/280PT4	800	150x2	700
FST-610-280G/315PT4	1000	185x2	780
FST-610-315 G/350PT4	1200	240x2	900
FST-610-350GT4	1280	240x2	960
FST-610-400GT4	1380	185x3	1035
FST-610-500GT4	1720	185x3	1290

B.1.2 Specifications of input/output AC reactor and DC reactor

Inverter moduel	Input AC reactor	Output AC reactor
FST-610 -1R5G/2R2PT4	IR-1R5-T4	OR-1 R5-T4
FST-610-2R2G/3R7PT4	IR -2R2-T4	OR-2R2-T4
FST-610-3R7G/5R5PT4	IR-004-T4	OR-004-T4
FST-610-5R 5G/7 R 5 PT4	IR-5R5-T4	OR-5R5-T4
FST-610-7R5G/011 PT4	IR-7R5-T4	OR-7R5-T4
FST-610-011G/015PT4	IR-011-T4	OR-Q11-T4
FST-610-015G/018 PT4	IR-015-T4	OR-015-T4
FST-610-018G/022PT4	IR-018-T4	OR-018-T4
FST-610-022G/030PT4	IR-022-T4	OR-022-T4
FST-610-030G/037PT4	IR-030-T4	OR-030-T4
FST-610-037G/045PT4	IR-037-T4	OR-Q37-T4
FST-610-045G/055PT4	IR-045-T4	OR-045-T4
FST-610-055G/075PT4	IR-055-T4	OR-055-T4
FST-610-075G/090PT4	IR-075-T4	OR-075-T4
FST-610-090G/110PT4	IR-110-T4	OR-HO-T4
FST-610 -110G/132 PT4	IR-110-T4	OR-HO-T4
FST-610-132G/160PT4	IR-132-T4	OR-132-T4
FST-610-160G/185PT4	IR-160-T4	OR-160-T4
FST-610-185G/200PT4	IR-200-T4	OR-200-T4
FST-610-200G/220PT4	IR-200-T4	OR-200-T4
FST-610-2200/250PT4	IR-250-T4	OR-250-T4
FST-610 -2 50G/280PT4	IR-250-T4	OR-250-T4
FST-610-280G/315 PT4	IR-280-T4	OR-280-T4

FST-610-315 G/350PT4	IR-315-T4	OR-315-T4
FST-610-350G/400PT4	IR-350-T4	OR-350-T4
FST-610-400G/450PT4	IR-T400-T4	OR-T400-T4
FST-610-500GT4	IR-500-T4	OR-500-T4

Note: DC reactors are embedded in inverters 18.5~90kw.

B.1.3 Specifications of AC input/output filter

Inverter moduel	Input filter	Output filter
FST-610-1R5GT4/2R2PT4	NFI-005	NFO-005
FST-610-2R2G/3R7PT4	NFI-010	NFO-OIO
FST-610 -3R7G/5R5PT4	NFI-010	NFO-OIO
FST-610-5R5G/7R5PT4	NFI-020	NFO-020
FST-610-7R5G/011PT4	NFI-020	NFO-020
FST-610-011G/015 PT4	NFI-036	N FO-036
FST-610 -015G/018 PT4	NFI-036	NFO-036
FST-610 -018G/022PT4	NFI-050	NFO-050
FST-610 -022G/030PT4	NFI-050	NFO-050
FST-610 -030G/037PT4	NFI-065	NFO-065
FST-610-037G/045PT4	NFI-080	NFO-080
FST-610-045G/055PT4	NFI-100	NFO-IOO
FST-610 -055G/075PT4	NFI-150	NFO-150
FST-610-075G/090PT4	NFI-150	NFO-150
FST-610-090G/110PT4	NFI-200	NFO-200
FST-610 -110G/132PT4	NFI-250	NFO-250
FST-610 -132G/160PT4	NFI-250	NFO-250
FST-610 -160G/185PT4	NFI-300	NFO-300
FST-610 -185G/200PT4	NFI-400	NFO-400
FST-610 -200G/220PT4	NFI-400	NFO-400
FST-610 -220G/250PT4	NFI-600	NFO-6OO

Inverter moduel	Input filter	Output filter
FST-610 -250G/280PT4	NFI-600	N FO-600
FST-610 -280G/315 PT4	NFI-900	N FO-900
FST-610 -315G/350 PT4	NFI-900	N FO-900
FST-610 -350GT4/400PT4	NFI-1200	NFO-1200

FST-610-400GT4/450PT4	NFI-1200	NFO-1200

B.2 Braking resistor/unit selection

B.2.1 Selection reference

When all the control devices driven by the inverter need quick braking. the braking units need to consume the energy which is feedbacked to the DC bus. In FST-610 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 reaistor 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

The 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

The inverter capacity	**Braking unit**	**Braking unit(100% of the braking torque.10% of the utilization rate)**

kW(HP)	Specification	Number	Specification	Number	Specification
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(20)	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-T4	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
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

B.2.2.1 Connection of Braking resistor

For D size and lower inverter. please refer to the figure B-1.

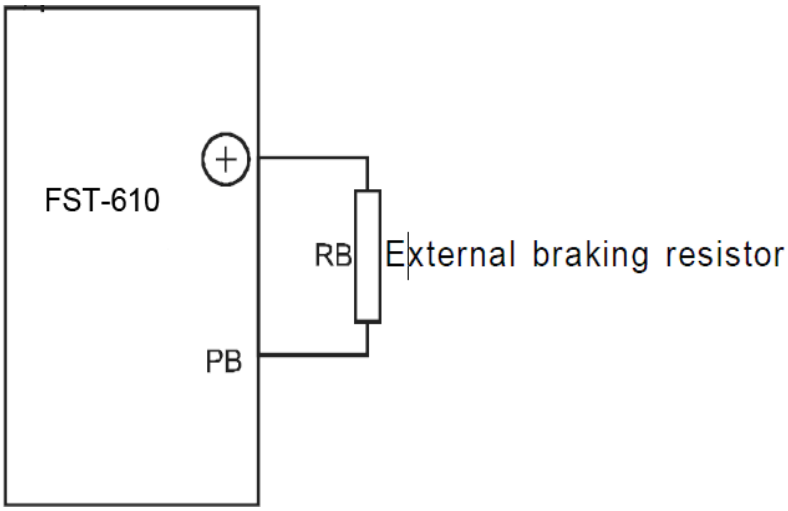


Figure B-1 Connection of Braking resistor

B.2.2.2 Connection of Braking unit. please refer to figure B-2.

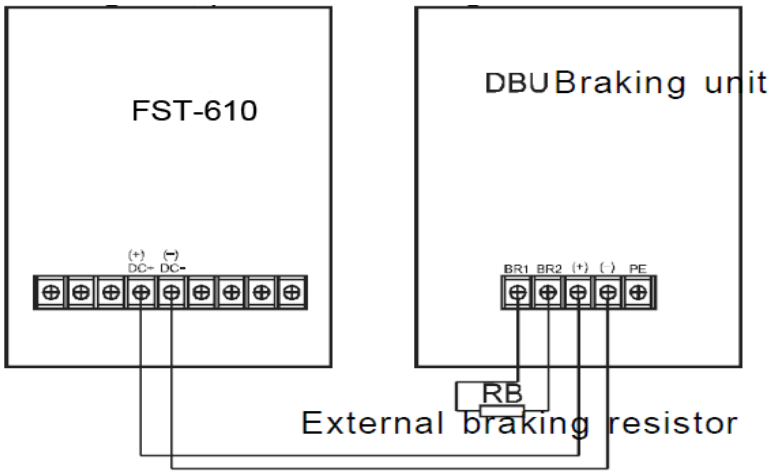


Figure B-2 Connection of braking unit

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 B-3:

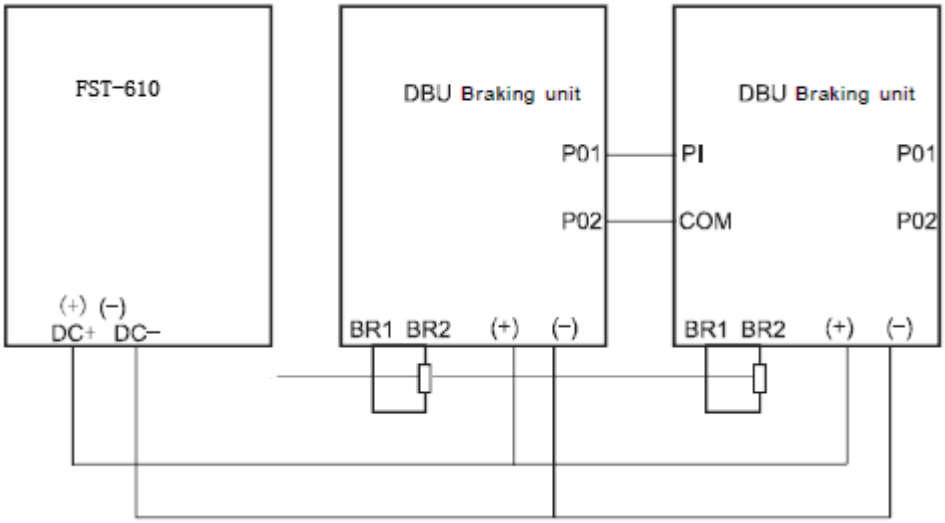


Figure B-3 Parallel connection of braking unit and inverter

Appredix C: LIST OF FUNCTION PARAMETERS

The function parameters of FST-610 series inverters have been divided into 16 groups (FO-FE) according to the function. Each function group contains certain function codes applying 3-class menus. For example. "F8.08 means the eighth function code in the F8 group function. FF group is factory reserved. and users are forbidden to access these parameters.

For the convenience of function codes setting. the function group number corresponds to the first class menu. the function code corresponds to the second class menu and the function code corresponds to the third class menu.

1. Below is the instruction of the function lists:

The first line "Function code": codes of function parameter group and parameters:

The second line "Name": full name of function parameters:

The third line "Detailed illustration of parameters": Detailed illustration of the function parameters

The forth line "Setting range": the effective setting range of the function parameters which will displayed on the LCD:

The fifth line "Factory Setting": the original factory set value of the function parameter;

The sixth line "Modify": the modifying character of function codes (the parameters can be modified or not and the modifying conditions). below is the instruction:

"O": means the set value of the parameter can be modified on stop and running state:

"◎": means the set value of the parameter can not be modified on the running state;

"●": means the value of the parameter is the real detection value which can not be modified.

(The inverter has limited the automatic inspection of the modifying character of the parameters to help users avoid mismodifying)

The seventh line "No.": The serial number of function code. at the same time. it also means the register address during communication.

2. "Parameter radix" is decimal (DEC). if the parameter is expressed by hex. then the parameter is separated form each other when editing. The setting range of certain bits are 0~F (hex).

3. Factory setting" means the function parameter will restore to the default value during default parameters restoring. But the detected parameter or recorded value won't be restored.

4. For a better parameter protection. the inverter provides password protection to the parameters. After setting the password (set F7.00 to any non-zero number). the system

will come into the state of password verification firstly after the user press PRG/ESC to come into the function code editing state. And then "0.0.0.0.0." will be displayed. Unless the user input right password. they cannot enter into the system. For the factory setting parameter zone. it needs correct factory password (remind that the users can not modify the factory parameters by themselves. otherwise. if the parameter setting is incorrect. damage to the inverter may occur). If the password protection is unlocked. the user can modify the password freely and the inverter will work as the last setting one. When F7.00 is set to 0. the password can be canceled. If F7.00 is not 0 during powering on. then the parameter is protected by the password. When modify the parameters by serial communication. the function of the password follows the above rules. too.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
PO Group: Basic Function						
F0.00	Inverter model	0: G model 1: P model	0-1	Depend On model	◎	0.
F0.01	Speed Control model	0: V/F control 1: Sensorless vector control 2: Torque control (sensorless vector control)	0-2	0	◎	1.
F0.02	Run command source	0: Keypad (LED extinguished) 1: Terminal (LED flickering) 2: Communication (LED lights on)	0-2	0	◎	2.
F0.03	Frequency X command source	0: Keypad 1：by potentiometer 2: VCI 3. CCI 4: DI 5. Simple PLC 6: Multi-stage speed 7: PID 8:Remote communication	0-8	0	O	3.
F0.04	Frequency Y command source	0:VCI 1:CCI 2:DI	0-2	0	O	4.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F0.05	Scale of frequency Y command	0: Maximum frequency 1: Frequency X command	0-1	0	O	5.
F0.06	Frequency command selection	0: X 1: Y 2: X+Y 3.X-Y 4: Max (X and Y) 5:Min(X,Y)	0-3	0	O	6.
F0.07	Keypad and terminal UP/DOWN setting	0: Valid. Save UP/DOWN value when power off 1:Valid. do not save UP/DOWN value when power off 2: Invalid 3: Valid during running. clear when stop.	0-3	0	O	7.
F0.08	Keypad reference frequency	0.00-F0.09(the Maximum frequency)	0.00-F0.09	50.00Hz	O	8.
F0.09	Maximum frequency	10.00~400.00Hz	10.00~400.00Hz	50.00Hz	◎	9.
F0.10	Upper frequency limit	F0.11-F0.09(the Maximum frequency)	F0.11-F0.09	50.00Hz	O	10.
F0.11	Lower frequency limit	0.00~F0.10 (Lower frequency limit)	0.00-F0.10	0.00 Hz	O	11.
F0.12	Running direction selection	0: default rotating direction 1: Reverse 2: Forbid reverse	0-2	0	◎	12.
F0.13	Acceleration time 0	0.1-3600.0s	0.1-3600.0	Depend On model	O	13.
F0.14	Deceleration time 0	0.1-3600.0s	0.1-3600.0	Depend On model	O	14.
F0.15	ACC/DEC unit of time	0:second 1:0.1 second	0-1	0	◎	15.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F0.16	Carrier frequency	1-15.0kHz	1-15.0	Depend On model	O	16.
F0.17	Restore parameters	0: No action 1: Restore factory setting 2.Clear fault records	0-2	0	◎	17.
F1 Group: Motor Parameters						
F1.00	Motor model	0: General asynchronous motor 1: Frequency asynchronous motor 2:PMSM	0-2	0	◎	18.
F1.01	Motor rated power	0.4-1000.0kW	0.4-1000.0	Depend On model	◎	19.
F1.02	Motor rated frequency	10 HZ-F0.09	10.00-F0.09	50.00Hz	◎	20.
F1.03	Motor rated speed	0-36000rpm	0-36000	Depend On model	◎	21.
F1.04	Motor rated voltage	0-800V	0-800	Depend On model	◎	22.
F1.05	Motor rated current	0.8-2000.0A	0.8-2000.0	Depend On model	◎	23.
F1.06	Motor stator resistance	0.001-65.535Ω	0.001-65.535	Depend On model	O	24.
F1.07	Motor rotor resistance	0.001-65.535Ω	0.001-65.535	Depend On model	O	25.
F1.08	Motor leakage inductance	0.1-6553.5mH	0.1~6553.5	Depend on model		26
F1.09	Motor mutual inductance;	0.1-6553.5mH	0.1-6553.5	Depend On model	O	27.
F1.10	Current without load	0.01-6553.5A	0.1-6553.5	Depend On model	O	28.
F1.11	Motor parameters	0: No action 1: Rotation autotuning	0-2	0	◎	29.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
	autotuning	2: Static autotuning				
F2 Group: Start and Stop Control						
F2.00	Start Mode	0: Start directly 1: DC braking and start	0-1	0	◎	30.
F2.01	Starting frequency	0.00-10.00Hz	0.00-10.00	0.00Hz	◎	31.
F2.02	Hold time of starting frequency	0.0-50.Os	0.0-50.0	0.0s	◎	32.
F2.03	DC Braking current before start	0.0-150.0%	0.0-150.0	0.0%	◎	33.
F2.04	DC Braking time before start	0.0-50.0s	0.0-50.0	0.0s	◎	34.
F2.05	Acceleration/ Deceleration mode	0: Linear 1: S curve	0-1	0	◎	35.
F2.06	S curve start time proportion	0.0-100.0%	0.0-100.0	30.0%	◎	36.
F2.07	S curve over time proportion	0.0%-100.0%	0.0-100.0	30.0%	◎	37.
F2.08	Stop mode	0: Decelerate to stop 1: Coast to stop	0-1	0	O	38.
F2.09	Starting frequency of DC braking	0.00-F0.09	0.00-F0.09	0.00 Hz	O	39.
F2.10	Waiting time before DC braking	0.0-50.0s	0.0-50.0	0.0s	O	40.
F2.11	DC braking current	0.0-150.0%	0.0-150.0	0.0%	O	41.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F2.12	DC braking time	0.0-50.0s	0.0-50.0	0.0s	O	42.
F2.13	Dead time of FWD/REV	0.0-3600.0s	0.0-3600.0	0.0s	O	43.
F2.14	Action when running frequency is less than lower frequency limit (valid when lower frequency limit is above 0)	0: Running at the lower frequency limit 1: Stop 2: Stand-by	0-2	0	◎	44.
F2.15	Delay time for restart	0.0-3600.0s (valid when F2.14=2)	0.0-3600.0	0	◎	45.
F2.16	Restart after power off	0: Disabled 1: Enabled	0-1	0	O	46.
F2.17	Waiting time of restart	0.0-3600.0s (valid when F2.16=1)	0.0-3600.0	0.0s	O	47.
F2.18	Terminal detection selection when power is on	0: Disabled 1: Enabled	0-1	0	O	48.
F3 Group: Vector Control						
F3.00	ASR proportional gain Kp1	0-100	0-100	20	O	49.
F3.01	ASR integral time Ki1	0.01-10.00s	0.01-10.00	0.50s	O	50.
F3.02	ASR switching point 1	0.00Hz-F3.05	0.00-F3.05	5.00Hz	O	51.
F3.03	ASR proportional gain Kp2	0-100	0-100	25	O	52.
F3.04	ASR integral time K|2	0.01-10.00s	0.01-10.00	1.00s	O	53.
F3.05	ASR switching point 2	F3.02~F0.09 (the Maximum frequency)	F3.02-F0.09	10.00Hz	O	54.
F3.06	Slip	50.0%~200.0%	50-200	100%	O	55.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
	compensation rate of VC					
F3.07	Torque upper limit	0.0-200.0%(the rated current of the inverter)	0.0-200.0	G model: 150.0% P model: 120.0%	O	56.
F3.08	Torque setting source	0:Keypad (corresponds to F3.09) 1 VCI 2:CCI 3:DI 4:Multi-step speed 5: Remote communication (1-5: 100% corresponds to 2 times of the rated current of the inverter)	0-5	0	O	57.
F3.09	Keypad torque setting	-200.0%-200.0%(the rated current of the inverter)	-200.0-200.0	50.0%	O	58.
F3.10	Upper frequency setting source	0: Keypad (F0.08) 1: VCI 2: CCI 3: DI 4: Multi-step 5: Remote communication (1-4: 100% corresponds to the Max. frequency)	0-5	0	O	59.
F4 Group: V/F Control						
F4.00	V/F curve selection	0:Linear curve 1:Multidots curve 2:Torque_stepdown curve (1.3 order) 3:Torque_stepdown curve (1.7 order) 4:Torque_stepdown curve (2.0 order)	0-4	0	◎	60.
F4.01	Torque boost	0.0%: (auto) 0.1%-10.0%	0.0-10.0	0.0%	O	61.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F4.02	Torque boost cut-off	0.0%-50.0% (motor rated frequency)	0.0-50.0	20.0%	◎	62.
F4.03	V/F frequency 1	0.00HZ-F4.05	0.00-F4.05	0.00 Hz	o	63.
F4.04	V/F voltage 1	0.0%-100.0%(the rated voltage of the motor)	0.0-100.0	00.0%	o	64.
F4.05	V/F frequency 2	F4.03~F4.07	F4.03-F4.07	00.00Hz	o	65.
F4.06	V/F voltage 2	0.0%-100.0%(the rated voltage of the motor)	0.0-100.0	00.0%	o	66.
F4.07	V/F frequency 3	F4.05- F1.02(the rated frequency of the motor)	F4.05-F2.02	00.00Hz	o	67.
F4.08	V/F voltage 3	0.0%-100.0%(the rated voltage of the motor)	0.0-100.0	0.0%	o	68.
F4.09	Slip compensation limit	0.00-200.0%	0.0-200.0	0.0%	o	69.
F4.10	Auto energy saving selection	0: Disabled 1: Enabled	0-1	0	◎	70.
F4.11	Low-frequency threshold of restraining osciillation	0-10	0-10	2	O	71.
F4.12	High-frequency threshold of restraining oscillation	0-10	0-10	0	O	72.
F4.13	Boundary of restraining oscillation	0.0-F3.09	0.00-F0.09	30.00 Hz	O	73.
F4.14	AVR function	0: Invalid 1s Valid all the time 2 : Only valid in deceleration	0-2	1	O	74.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F5 Group: Input Terminals						
F5.00	DI selection	0: High speed pulse input 1: ON-OFF input	0-1	0	◎	75.
F5.01	X1 Terminal function	0: Invalid 1: Forward 2: Reverse 3: 3-wire control 4: Jog forward 5: Jog reverse 6: Coast to stop 7: Reset fault 8: Pause running 9: External fault input 10: Up command 11: Down command 12: Clear UP/DOWN 13: Switch between X and Y 14: Switch between X and X+Y 15: Switch between Y and X+Y 16: Multi-step speed reference 1 17: Multi-step speed reference 2 18: Multi-step speed reference 3 19: Multi-step speed reference 4 20: Multi-step speed pause 21: ACC/DEC time	0-39	1	◎	76.
F5.02	X2 Terminal function		0-39	4	◎	77.
F5.03	X3 Terminal function		0-39	7	◎	78.
F5.04	X4 Terminal function		0-39	0	◎	79.
F5.05	DI terminal function		0-39	0	◎	80.
F5.06	FWD terminal function					

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F5.07	REV terminal function	selection ln time 22: ACC/DEC time selection 2 23: Reset simple PLC when stop 24: Pause simple PLC 25: Pause PID 26: Pause traverse operation 27: Reset traverse operation 28: Reset counter 29: Torque control is invalid 30: ACC/DEC ramp hold 31: Counter input 32: UP/DOWN invalid temporarily 33-39: Reserved				
F5.08	ON-OFF filter times	1-10	1-10	5	O	81.
F5.09	Terminal control mode	0: 2-wire control mode 1 1: 2-wire control mode 2 2:3-wire control mode 1 3: 3-wire control mode 2	0-3	0	◎	82.
F5.10	UP/DOWN Settingchange rate	0.01 -50.00Hz/s	0.01-50.00	0.50HZ/S	o	83.
F5.11	VCI lower limit	-10.00V-10.00V	-10.00-10.00	0.00V	o	84.
F5.12	VCI lower limit corresponding setting	-100.0%-100.0%	-100.0-100.0	0.0%	o	85.
F5.13	VCI upper limit	0.00V-10.00V	-10.00-10.00	10.00V	o	86.
F5.14	VCI upper limit corresponding setting	-100.0%-100.0%	-100.0-100.0	100.0%	o	87.
F5.15	VCI filter time constant	0.00V-10.00V	0.00-10.00	10V	o	88.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F5.16	CCI lower limit	0.00V-10.00V	0.00-10.00	0.00v	O	89.
F5.17	CCI lower limit corresponding setting	-100.0%-100.0%	-100.0-100.0	0.0%	o	90.
F5.18	CCI upper limit	0.00V-10.00V	0.00-10.00	10.00 V	o	91.
F5.19	CCI upper limit corresponding setting	-100.0%-100.0%	-100.0-100.0	100.0%	o	92.
F5.20	CCI filter time constant	0.00s-10.00s	0.00-10.00	0.10s	o	93.
F5.21	DI lower limit	0.0 kHz -50.0kHz	0.00-50.00	0.00kHz	o	94.
F5.22	DI lower limit corresponding setting	-100.0%-100.0%	-100.0-100.0	0.0%	o	95.
F5.23	DI upper limit	0.0 KHz-50.0KHz	0.00-50.00	50.00kHz	o	96.
F5.24	DI upper limit corresponding setting	-100.0%-100.0%	-100.0-100.0	100.0%	o	97.
F5.25	DI filter time constant	0.00s-10.00s	0.00-10.00	0.10s	o	98.
F6 Group: Output Terminals						
F6.00	DO selection	0: High-speed pulse output 1: ON-OFF output	0-1	0	O	99.
F6.01	DO ON-OFF output selection	0: No output 1: Running 2: Run forward 3: Run reverse 4: Fault output 5: FDT reached 6: Frequency reached	0-20	1	O	100.
F6.02	Relay R output selection		0-20	2	O	101.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F6.03	Relay T output selection	7: Zero speed running 8: Preset count value reached 9: Specified count value reached 10: Overload pre-alarm 11: Simple PLC step completed 12: PLC cycle completed 13: Running time reached 14: Upper frequency limit reached 15: Lower frequency limit reached 16: Ready 17-20: Reserved	0-20	1	O	102.
F6.04	AO1 function selection	0: Running frequency 1:Reference frequency 2:Rotation speed 3:Output current 4:Output voltage 5: Output power	0~11	0	O	103.
F6.05	AO2 function selection		0~11	0	O	104.
F6.06	DO function selection	6: Output torque 7: VCI voltage 8: CCI voltage/current 9: DI frequency	0-11	0	o	105.
F6.07	A01 lower limit	0.0%-100.0%	0.0-100.0	0.0%	o	106.
F6.08	A01 lower limit corresponding output	0.00V-10.00V	0.00-10.00	0.00v	o	107.
F6.09	A01 upper limit	0.0%-100.0%	0.0-100.0	100.0%	o	108.
F6.10	A01 upper limit corresponding output	0.00V-10.00V	0.00-10.00	10.00v	o	109.
F6.11	A02 lower limit	0.0-100.0%	0.0-100.0	0.0%	o	110.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F6.12	A02 lower limit corresponding output	0-10.00V	0.00-10.00	0.00V	o	111.
F6.13	A02 upper limit	0.0-100.0%	0.0-100.0	100.0%	o	112.
F6.14	A02 upper limit corresponding output	0.00-10.00V	0.00-10.00	10.00V	o	113.
F6.15	DO lower limit	0.00%-100.00%	0.00-100.00	0.00%	o	114.
F6.16	DO lower limit corresponding output	0.000- 50.000kHz	0.000-50.000	0.00kHz	o	115.
F6.17	DO upper limit	0.00%-100.00%	0.00-100.00	100.0%	o	116.
F6.18	DO upper limit corresponding output	0.0- 50.0kHz	0.000-50.000	50.00kHz	O	117.
F7 Group: Human and Machine Interface						
F7.00	User password	0-65535	0-65535	0	O	118.
F7.01	QUICK/JOG function selection	0: Clear UP/DOWN setting 1: Jog 2: FWD/REV switching	0-2	0	O	119.
F7.02	STOP/RST function selection	0: Valid when keypad control (F0.09=0) 1: Valid when keypad or terminal control 2: Valid when keypad or communication control 3: Always valid	0-3	0	O	120.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F7.03	Running Status display selection 1	O-OXFFFF BITO: running frequency BIT1: Reference Frequency BIT2: DC bus voltage BIT3: Output voltage BIT4: Output current BIT5: Rotation speed BIT6: Line speed BIT7: Output power BIT8: Output torque BIT9: PID preset BIT10: PID feedback BIT11: Input terminal status BIT12: Output terminal BIT13: Torque setting value BIT14: Count value BIT15: Step No. of PLC or multi-step	O-OXFFFF	0X07FF	O	121.
F7.04	Running Status display selection 2	0-0XFFFF BIT0: VCI BIT1: CCI BIT2: DI frequency BIT3: Load percentage of motor BIT4: Load percentage of inverter BIT5-15: Reserved	0-0XFFFF	0	O	122.
F7.05	Stop status display selection	O-OXFFFF BIT0: Reference frequency BIT1: DC bus voltage BIT2: Input terminal status BIT3: Output terminal status BIT4: PID preset BIT5: PID feedback BIT6: VCI	0-0XFFFF	0×00FF	O	123.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
		BIT7: CCI BIT8: DI frequency BIT9: Step No. of PLC or multi-step BIT10: Torque setting value BIT11- BIT15: Reserved				
F7.06	Coefficient of rotation speed	0.1-999.9% Actual mechanical speed = 120 * output frequency *F7.06 / Number of poles of motor	0.1-999.9	100.0%	O	124.
F7.07	Coefficient of line speed	0.1-999.9% Line speed = actual mechanical speed * F7.07	0.1-999.9	1.0%	O	125.
F7.08	Rectify module temperature	0-100.0°C			•	126.
F7.09	IGBT module temperature	0-100.0°C			•	127.
F7.10	Software version				•	128.
F7.11	Inverter rated power	0.4-1000.0kW	0.4-1000.0	Depend on model	•	129.
F7.12	Inverter rated current	0.0-2000.0A	0.0-2000.0	Depend on model	•	130.
F7.13	Accumulated running time	0~65535h			•	131.
F7.14	Accumulated power time	0~65535h			•	132.
F7.15	Third latest fault type	0：no fault 1;over current at acceleration （E-01） 2:over current at deceleration（E-02） 3 ： over current at constant speed（E-03）			•	133.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F7.16	Second latest fault type	4:over voltage at acceleration（E-04）			•	134.
F7.17	Latest fault type	5：over voltage at deceleration（E-05） 6:over voltage at constantspeed（E-06） 7：Rectify overheat（E-07） 8：IGBT overheat（E-08） 9：inverter overload（E-09） 10：motor overload（E-10） 11:DC bus under voltage fault （E-11） 12：IGBT short circuit fault（E-12） 13：external fault（E-13） 14：current detection fault（E-14） 15：communication fault（E-15） 16：reserved（E-16） 17：EEFROM operation fault（E-17） 18：output phase loss（E-18） 19：input phase loss（E-19） 20：motor autotuning fault（E-20） 21：reserved（E-21） 22：PID feedback connection fault（E-22） 23：reserved（E-23） 24：reserved（E-24）25: Over torque (E-25)				135.
F7.18	Output frequency at current fault				•	136.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F7.19	Output current at current fault				•	137.
F7.20	DC bus voltage at current fault				•	138.
F7.21	Input terminal status at current fault				•	139.
F7.22	Output terminal status at current fault				•	140.
F8 Group: Enhanced Function						
F8.00	Acceleration time 1	0.1-3600.0s	0.1-3600.0	Depend On model	O	141.
F8.01	Deceleration time 1	0.1-3600.0s	0.1-3600.0	Depend on model	O	142.
F8.02	Acceleration time 2	0.1-3600.0s	0.1-3600.0	Depend on model	O	143.
F8.03	Deceleration time 2	0.1-3600.0s	0.1-3600.0	Depend on model	O	144.
F8.04	Acceleration time 3	0.1-3600.0s	0.1-3600.0	Depend on model	O	145.
F8.05	Deceleration time 3	0.1-3600.0s	0.1-3600.0	Depend on model	O	146.
F8.06	Jog reference	0.00- F0.09	0.00- F0.09	5.00Hz	O	147.
F8.07	Jog acceletation time	0.1 -3600.0s	0.1-3600.0	Depend on model	O	148.
F8.08	Jog deceleration time	0.1-3600.0s	0.1-3600.0	Depend on model	O	149.
F8.09	Skip Frequency 1	0.00- F0.09	0.00- F0.09	0.00 Hz	O	150.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F8.10	Skip Frequency 2	0.00- F0.09	0.00- F0.09	0.00 Hz	O	151.
F8.11	Skip frequency bandwidth	0.00-F0.09	0.00- F0.09	0.00 Hz	O	152.
F8.12	Auto reset times	0~3	0~3	0	O	153.
F8.13	Reset interval	0.1~100.0s	0.1-100.0	1.0s	O	154.
F8.14	Brake threshold voltage	115.0-140.0%(standard DC voltage) (380V inverter)	115.0-140.0	130.0%	O	155.
		115.0-140.0%(standard DC voltage) (220V inverter)	115.0-140.0	120.0%		
F8.15	Cooling fan control	0: Auto stop mode 1: Always working	0-1	0	O	156.
F8.16	Overmodulation	0: Enabled 1: Disabled	0-1	0	O	157.
F8.17	PWM mode	0: PWM mode 1 1: PWM mode 2 2: PWM mode 3	0-1	0	O	158.
F9 Group: Simple PLC and Multi-step Speed Control						
F9.00	Simple PLC mode	0: Stop after one cycle 1: Hold last frequency after one cycle 2: Circular run	0-2	0	O	170.
F9.01	Simple PLC status saving after power off	0: Disabled 1: Enabled	0-1	0	O	171.
F9.02	Multi-step speed 0	-100.0-100.0%	-100.0-100.0	0.0%	O	172.
F9.03	0th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	173.
F9.04	Multi-step speed 1	-100.0-100.0%	-100.0-100.0	0.0%	O	174.
F9.05	1st Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	175.
F9.06	Multi-step speed 2	-100.0-100.0%	-100.0-100.0	0.0%	O	176.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
F9.07	2nd Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	177.
F9.08	Multi-step speed 3	-100.0-100.0%	-100.0-100.0	0.0%	O	178.
F9.09	3rd Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	179.
F9.10	Multi-step speed 4	-100.0-100.0%	-100.0-100.0	0.0%	O	180.
F9.11	4th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	181.
F9.12	Multi-step speed 5	-100.0-100.0%	-100.0-100.0	0.0%	O	182.
F9.13	5tn Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	183.
F9.14	Multi-step speed 6	-100.0-100.0%	-100.0-100.0	0.0%	O	184.
F9.15	6th Step running time	0.0~6553.5s(h)	0.0~6553.5	0.0s	O	185.
F9.16	Multi-step speed 7	-100.0-100.0%	-100.0-100.0	0.0%	O	186.
F9. 17	7th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	187.
F9. 18	Multi-step speed 8	-100.0-100.0%	-100.0-100.0	0.0%	O	188.
F9. 19	8 th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	189.
F9.20	Multi-step speed 9	-100.0-100.0%	-100.0-100.0	0.0%	O	190.
F9.21	9 th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	191.
F9.22	Multi-step speed 10	-100.0-100.0%	-100.0-100.0	0.0%	o	192.
F9.23	10 th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	o	193.
F9.24	Multi-step speed 11	-100.0-100.0%	-100.0-100.0	0.0%	o	194.
F9.25	1111 Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	195.
F9.26	Multi-step speed 12	-100.0-100.0%	-100.0-100.0	0.0%	O	196.
F9.27	12 th Step	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	197.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
	running time					
F9.28	Multi-step speed 13	-100.0-100.0%	-100.0-100.0	0.0%	O	198.
F9.29	13 th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	199.
F9.30	Multi-step speed 14	-100.0-100.0%	-100.0-100.0	0.0%	O	200.
F9.31	14th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	201.
F9. 32	Multi-step speed 15	-100.0-100.0%	-100.0-100.0	0.0%	O	202.
F9.33	15th Step running time	0.0-6553.5s(h)	0.0-6553.5	0.0s	O	203.
F9.34	ACC/DEC time selection for step 0~7	0~0XFFFF	0~0XFFFF	0	O	204.
F9.35	ACC/DEC Time selection for step 8-15	O-OXFFFF	O-OXFFFF	0	O	205.
F9.36	Simple PLC restart selection	0: Restart from step 0 1: Continue from paused step	0-1	0	◎	206.
F9.37	Time unit	0: Second 1: Minute	0-1	0	◎	207.
FA Group: Protection Function						
FA.00	Input phase-failure protection	0: Disable 1: Enable	0-1	1	o	208.
FA.01	Output phase-failure protection	0: Disabled 1: Enabled	0-1	1	o	209.
FA.02	Motor overload protection	0: Disabled 1: Normal motor(with low speed compensation) 2: Variable frequency motor(without low speed compensation)	0-2	2	◎	210.
FA.03	Motor overload protection	20.0% - 120.0% (rated current of the motor)	20.0-120.0	100.0%	o	211.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
	current					
FA.04	Threshold of trip-free	70.0.0-110.0% (standard bus voltage)	70.0-110.0	80.0%	o	212.
FA.05	Decrease rate of trip-free	0.00-F0.09 (the Max. frequency)	0.00-F0.09	0.00H2/S	O	213.
FA.06	Over-voltage stall protection	0: Disabled 1: Enabled	0~1	1	O	214.
FA.07	Over-voltage stall protection point	110~150%	110~150 (220V series)	120%	O	215.
			110~150 (380V series)	130%		
FA.08	Auto current limiting threshold	50-200%	50-200	G model : 160.0% P model: 120.0%	O	216.
FA.09	Frequency decrease rate when current limiting	0.00-50.00Hz/s	0.00-50.00	10.00Hz/s	o	217.
FA.10	Action current limiting selection	0: Enabled 1: Disabled when constant speed	0-1	0	O	218.
FA.11	Selection of overtorque (E-25)	0: No detection 1 : Valid detection of overtorque during running. then continue running 2: Valid detection of overtorque during running. then waring and stop 3: Valid detection of overtorque during constant speed	0-4	1	O	219.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
		running. then continue running 4: Valid detection of overtorque during constant speed running. then waring and stop.				
FA.12	Detection level of overtorque	1.0%-200.0%(relative to the rated current of the motor)	10%-200.0% of inverter's rated current	G model: 150.0% P model:120.0%	O	220.
FA.13	Detection time of overtorque	0.1-60.0s	0.1-60.0	0.1s	O	221.
FB Group: Supplementary Function						
FB.00	Traverse amplitude	0.0-100.0%	0.0-100.0	0.0%	O	229.
FB.01	Jitter frequency	0.0-50.0%	0.0-50.0	0.0%	O	230.
FB.02	Rise time of traverse	0.1-3600.0s	0.1-3600.0	5.0s	O	231.
FB.03	Fall time of traverse	0.1-3600.0s	0.1-3600.0	5.0s	O	232.
FB.04	Preset count value	FB.05-65535	FB.05-65535	0	O	233.
FB.05	Specified count value	0-FB.04	0- FB.04	0	O	234.
FB.06	Preset running time	0-65535h	0-65535	65535h	O	235.
FB.07	FDT level	0.00- F0.09	0.00-F0.09	50.00Hz	O	236.
FB.08	FDT lag	0.0-100.0%	0.0-100.0	5.0%	O	237.
FB.09	Frequency arrive detecting range	0.0-100.0%(maximum frequency)	0.0-100.0	0.0%	O	238.
FB.10	Droop control	0.00~10.00Hz	0.00~10.00	0.00Hz	O	239.
FC Group: Serial Communication						
FC.00	Local address	0-247. 0 stands for the broadcast address	0-247	1	O	222.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
FC.01	Baud rate selection	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0-5	4	O	223.
FC .02	Data format	0: no parity(N,8,1) for RTU 1: Even parity(E,8,1) for RTU 2: Odd partity(0,8,1) for RTU 3. No parity(N,8,2)for RTU 4. Even parity(E,8,2) for RTU 5: Odd parity(0,8,2) for RTU.	0-17	1	O	224.
FC.03	Communication delay time	0-200ms	0-200	5ms	O	225.
FC.04	Communication timeout delay	0.0: Disabled 0.1-100.0s	0.0-100.0	0.0s	O	226.
FC.05	Communication error action	0: Alarm and coast to stop 1: No alarm and continue to run 2: No alarm but stop according to the stop mode. (only for communication control) 3: No alarm but stop according to the stop mode. (all control modes)	0~3	1	O	227.
FC.06	Response action	Unit's place of LED 0: Response to writing 1: No response to writing Ten's place of LED 0: Reference not saved when power off	00-11	00	O	228.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
		1: Reference saved when power off				
FD Group: PID Control						
FD.00	PID preset source selection	0: Keypad 1: VCI 2: CCI 3: DI 4: Multi-step 5: Remote communication	0-5	0	O	159.
FD.01	Keypad PID preset	0.0%-100.0%	0.0-100.0	0.0%	o	160.
FD.02	PID feedback source se lection	0: VCI 1: CCI 2: VCI+CCI 3: DI 4: Communication	0-3	0	o	161.
FD.03	PID output characteristic	0: Positive 1: Negative	0-1	0	o	162.
FD.04	Proportional gain (Kp)	0.00-100.00	0.00-100.00	0.10s	o	163.
FD.05	Integral time (Ti)	0.01-10.00s	0.01-10.00	0.10s	o	164.
FD.06	Differential time (Td)	0.00-10.00s	0.00-10.00	0.00s	o	165.
FD.07	Sampling cycle (T)	0.01 -100.00s	0.00-100.00	0.10s	o	166.
FD.08	Bias limit	0.0-100.0%	0.0-100.0	0.0%	o	167.
FD.09	Feedback Lost detecting value	0.0-100.0%	0.0-100.0%	0.0%	O	168.
FD.10	Feedback Lost detecting time	0.0-3600.0s	0.0-3600.0	1.0s	O	169.
FD.11	Sleep threshold		0	0-max. value of frequency		170
FD.12	Sleep threshold delay time		1	0-600		171

Function Code	Name	Description	Setting Range	Factory Setting	Modify	No.
FD.13	Wake-up threshold		20%	0-100%		172
FD.14	Wake-up threshold delay time		1	0-600		173
FE Group: Factory Function						
FE.00	Factory password	0-65535	0-65535	*****	O	240.