# Manual

Version V2.2

## AC60 Series Frequency Inverter

# FOREWORD

Thank you for your using AC60 series frequency inverter.

AC60 series inverter is a new generation of high-performance universal frequency inverter independently developed by our company. With advanced control methods, we can provide products with a high-torque, high-precision, high reliability and wide speed drive. In the benefit of AC60 series' multiple function design, users will be satisfied by the simplified PLC, PID adjustor, programming I/O terminals, RS485 interface, pulse-frequency I/O interface and other specific control functions for particular industries. It offers a highly-integrated solution for equipment matching, facilities upgrading, automation control and other specific industrial application.

AC60 series adopts G/P all-in-one design, which facilitates users in choosing and using the proper model.

This manual is the supporting data sheet for AC60.

This instruction manual includes instructions (messages) of installing wiring, parameters setting, routine maintenance, related matters attention and etc... For the best results and safe operations of the AC60 series, please read carefully and keep this manual properly. Make sure it is handy for the ultimate user of the inverters for reference.

If you need technical support related to the inverter, please contact our company or the dealer from whom you purchased. You can also contact our Customer Service Center. We will try our best to help you.

We are sparing no effort to upgrade our products, and regret for no prior notification if there is any revision to this instruction manual. Pray for your consideration for the inconveniences.

# Contents

# Chapter 1: Safety Precautions

To ensure safety of your health, equipment and property, please read this chapter carefully before using the frequency inverter and act in compliance with the instructions while carrying, installing, debugging, running and overhauling the frequency inverter.

## 1.1 Safety definition

**Danger: it will cause danger of serious injuries and even death while operating against the rules**

**Caution: it will cause danger of minor injuries or equipment destruction while operating against the rules**

**Note: some informations is useful while operating and using frequency inverter.**

## 1.2 Safety Precautions

**●Before installation**

| Warning |
| --- |
| 1. Only qualified personnels are allowed to operate the equipment. Before operating, be sure to read the manual about safety, installation, operation and maintenance carefully. The safe operation depends on proper selections, carrying, installation, operation and maintenance. |

| Warning |
| --- |
| 1. Never use the damaged or incomplete frequency inverters; Otherwise, there will result in injury. |

**●Installation**

| Warning |
| --- |
| 1. Attach the inverter to a metal or other nonflammable material, and keep it away from the combustible material. Fire can result if the inverter is attached to a combustible material.<br>2. Prohibited for any unauthorized frequency transformation; Otherwise, there is a danger of damage of inverter.<br>3. Normal frequency inverter, which is no explosion-proof, can not be installed where contains explosive gas or dust in the environment; Otherwise, there is a danger of explosion. |

| Caution |
| --- |
| 1. When two frequency inverters are installed in the same control cabinet, please pay attention to the installation position to guarantee a good heat dissipation.<br>2. When carrying the frequency inverter， please hold its bottom. |

**•Wiring**

| Warning |
| --- |
| 1. Wire is connected only when the main circuit is cut off, otherwise, there is a danger of electric shock.<br>2. Wire must be connected by electrical engineering personnel only. Otherwise, there is a danger of electric shock.<br>3. Earthing must be reliable. Otherwise, there is a danger of electric shock.<br>4. AC power supply should not be connected with output ports U, V and W; Otherwise, there is a danger of damage to frequency inverter.<br>5. Never fall the bolt, spacer, metal stick, conducting wire or other things inside the frequency inverter; Otherwise, there is a danger of fire or a damage of frequency inverter. |

| Caution |
| --- |
| 1. If the damage to frequency inverter or other equipment is caused by improper wiring and utilization or unauthorized alteration, the user should shoulder all responsibilities.<br>2. Make sure all wirings meet EMC requirement and satisfy local safety standard; Please refer to recommendations in this manual or national standards of wire diameter to avoid accidents.<br>3. Connect the braking resistance or braking unit according to the wiring diagram; Never connect Braking resistance to the terminals of DC bus P（+）、N（-）; Otherwise, it will cause fire or damage to the frequency inverter.<br>4. Electrostatic on human body would damage internal MOSFET seriously,etc. Do not touch the printed circuit boards, IGBT or other internal devices without anti-static measures, otherwise, it will cause malfunction of the frequency inverter.<br>5. Do not connet phase-shift capacitor or LC/RC noise filter to the output circuit of frequency inverter; Otherwise, it will damage the frequency inverter.<br>6. Do not connect the magnetic switch or magnetic contactor to the output circuit of frequency inverter; When frequency inverter is in the operation with load, action of electromagnetic switch or electromagnetic contactor can make inverter overcurrent protection function act, that will damage frequency inverter seriously.<br>7. Do not disassemble the front panel cover, it only needs to disassemble the terminal cover |

when wiring.

8. Never do any pressure test on frequency inverter;Otherwise, it will damage the frequency inverter.

**●Before electrification**

| Warning |
| --- |
| 1. Make sure that voltage class of power supply is consistent with rated voltage and then check whether the wiring is correct and firm, and whether there is short circuit in peripherals circuit. Otherwise, it will damage frequency inverter and other equipments.<br>2. Before switching on the input power, make sure that the cover has been fixed well. Otherwise, it will cause electric shock.<br>3. For the frequency inverters whose storage is more than one year, when electrifying, the voltage should be raised by booster from low to high. Otherwise, it will damage the frequency inverter. |

| Caution |
| --- |
| 1.Check all periphery fittings are wired properly according to the handbook; Otherwise, it will cause accidents. |

**●After electrification**

| Warning |
| --- |
| 1. After electrified, never open the cover, make wiring, and check up; Otherwise, it will cause the danger of electric shock.<br>2.After electrified, never contact internal wiring board and its parts. Otherwise, it will cause the danger of electric shock.<br>3.Do not operate or touch frequency inverter with wet hand. Otherwise, there is danger of damage to frequency inverter and electric shock. |

| Caution |
| --- |
| 1. Set the parameter of frequency inverter cautiously; Otherwise, it will damage equipment. |

**●Operation**

| Warning |
| --- |
| 1. Before running, check and confirm the application range of the machine and equipments once more; Otherwise, it will cause accidents.<br>2. Do not touch the cooling fan and braking resistance to check the temperature; Otherwise, it may occur a burn injury.<br>3.Unprofessional workers are banned to check the signals while the inverter is running ; Otherwise, it will cause injuries and damage the equipment. |

| Caution |
| --- |
| 1. Do not turn off the equipment by switching off power; Please cut off the power supply after the electric machine stopping running; Otherwise, it will damage the frequency inverter.<br>2. Please avoid anything dropping into the inverter when it is running; Otherwise, it will cause electric shock. |

**●Maintenance**

| Warning |
| --- |
| 1. Do not maintain and repair the equipment with electric; Otherwise, it will cause electric shock.<br>2. Before maintaining and repairing the frequency inverter, please make sure the indicator light of power supply has completely gone out; Otherwise, it may cause electric shock and damage the frequency inverter.<br>3.Unprofessional workers are not allowed to conduct the frequency inverter maintenance; Otherwise it may cause electric shock and damage the frequency inverter. |

**1.3 Cautions in utilization**

1. The general motor running at a low speed decreases its lifelime for a terrible heat dissipation. If low speed running needs to last for a long time, the special motor matching inverter should be chosen or the load should be lightened.
2. When using the frequency inverter, the temperature rise of motor is a little higher comparing to the power frequency operation individually. It is normal phenomena.
3. In application of AC60 series frequency inverter, you have to check all machine insulation to prevent damage to the equipment. Moreover, when the motor works in harsh environment, please inspect the electrical insulation periodically to ensure the safety of the system.
4. If the motor adapter is not consistent with frequency inverter's rating current ( The rating current of the motor is far smaller than that of frequency inverter), please adjust the protective value to ensure safe running.
5. In occasions such as load raising, usually there is negative torque and frequency inverter breaks off for overcurrent or overvoltage. In this case, you should consider to choose matching brake unit.
6. Frequency inverter, in a certain output frequency range, can meet the load equipments' mechanical resonance. To avoid it, you can set up jumping frequency.
7. As output voltage of the inverter is pulse-wave type, if there is capacity which can improve power factor or pressure-sensitive resistance which used for thunder-proof in the voltage output side, the frequency inverter will break off or its parts will be damaged, so be sure to dismantle them. Moreover, it is proposed not install switch parts like air switch and contactor (if it is necessary to install switch on output side, please make sure the output electricity of frequency inverter is zero when the switche is working)
8. At over 1,000 meters altitude, the inverter's heat dissipation function worsened due to the thin air, it is necessary to derate using.

   9. The inverter output voltage is pulse wave type. If use digital multimeter measurement it, deviation of the reading will be large. And the deviation is different by using different type of digital multimeter. Usually, while RMS 380V, digital multimeter reading is around 450V.

**1.4 Cautions in disposal**

When you dispose frequency inverter, please pay attention to:

1. Electrolytic capacitor: the electrolytic capacitor of main circuit or the printing plate may explode when they are burned.
2. Plastic: plastic incineration may generate toxic gases.
3. Dispose method: please dispose as industrial waste.

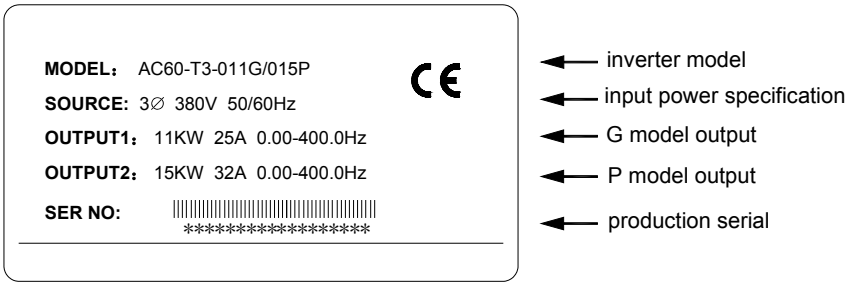
# Chapter 2: Purchase Inspections and Products Specification

**2.1 Purchase inspection**

1. Before unpacking, please confirm whether there is any damage occurred during transportation.
2. Check whether the details on the nameplate of frequency inverter are in accordance with your order.
3. AC60 series frequency inverter have undergone a rigorous testing and quality control before leaving factory. Please check all of qualified certification, product manual and warranty cards.
4. Please check the frequency inverter to ensure it without any internal damage. If it has obvious damage, please do not operate machine and timely contact the manufacturer or distribution company, in order to avoid the accidents.

**2.2 Nameplate and models illustration**

1. Nameplate illustrate



2. Models illustration

AC60 - T 3 - 015 G /018 P

| inverter series | |
|---|---|
| AC60 | general format |
| AC61 | injrction molding machine |
| AC62 | draw bench |

| code | voltage class |
|---|---|
| T | three phase |
| S | single phase |

| code | voltage class |
|---|---|
| 2 | 220V |
| 3 | 380V |
| 6 | 660V |
| 11 | 1140V |

| code | inverter type |
|---|---|
| G | general format |
| P | blower and water pump |
| Z | plastic machine |
| L | draw bench |
| H | mid inverter governor |

| code | fit power of motor（kW） |
|---|---|
| 7R5 | 7.5 |
| 011 | 11 |
| 015 | 15 |
| 018 | 18 |
| 022 | 22 |
| 030 | 30 |

**2.3 Product technique specifications**

| Items | | Specifications |
|---|---|---|
| Power | Voltage frequency | Single phase 220V 50/60Hz<br>Three phase 220V 50/60Hz<br>Three phase 380V 50/60Hz<br>Three phase 660V 50/60Hz<br>Three phase 1140V 50/60Hz |
| | Allowable fluctuations | Voltage: ±15%, frequency: ±5% |
| Control | Frequency control range | G:0-400Hz P:0-400Hz Z: 0-400Hz、<br>L:0-400Hz H:0-2000Hz |
| | Output frequency accuracy | ±0.5% of max frequency |
| | Frequency setting resolution | 0.01Hz: Press UP and Down keys of keyboard<br>0.2Hz: Potentiometers analog input |
| | Voltage /Frequency (V/F) characteristics | 50% to 100% of rated voltage and 25 to 400Hz( 3000Hz) are adjustable separately |
| | Carrier frequency | 1.0-15.0KHz,Random carrier modulation |

| | | |
|---|---|---|
| | Torque upgrade | 0～25.0% adjustable,auto torque boost,random V/F curve optional |
| | Maximum Capacity | G,H,L model: 150% for one minute, 180% for 2s, 200% instant jump.<br>Z model: 150% for one minute, 180% for 30s ,250% instant jump.<br>P model: 120% for one minute, 150% instant jump. |
| | Acceleration and Deceleration time | 0.1-6500s |
| | Rated output voltage | Take advantage of the power supply voltage compensation function, if motor rated voltage is 100%,the voltage can be set in the 50 -100% scope(the voltage output should not exceed the input voltage ) |
| | Automatic voltage regulation function | When the grid voltage fluctuates, output voltage variation is little and possible to keep V/F constant. |
| | Automatic energy-saving operation | According to the load conditions, optimize the V / F curves automatically to implement energy saving operation |
| | Standard functions | PID control, Acceleration and deceleration time adjustable, Acceleration and deceleration mode variable, Carrier frequency adjustment, Torque boost, Current limiting, Speed tracking and power fall restart, Frequency jumping, Frequency fluctuation limit control, Program running, Multi-steps speed, Pendulum frequency operation, RS485, Analog output, Pulse output frequency |
| | Brake | Dynamic braking, DC braking |
| | Frequency setting input | Keyboard number settings, keyboard potentiometer, external terminal VS1 : 0 ~ 10V, external terminal VS2: - 10V - 10V, the external terminal AS : 4~20mA, RS485 and signal composition and terminal options |
| | Signal Feedback input | External terminal VS1 : 0~10V, external terminal VS2:-10V~10V, external terminal AS : 4~20mA, RS485, frequency pulse input |
| | Input order signals | Start, stop, forward and reverse rotating, jog, multi-steps speed, free stop, reset, acceleration and deceleration time choice, frequency reference settings channels choice, external malfunctions alarm |
| | External output signal | Relay output, the collector output, 0-10V output, 4-20mA output, the frequency pulse output |
| Protection function | | Overvoltage, undervoltage, current-limiting, overcurrent, overload, electronic thermal relays, overheat, over voltage stall, data protection |

| | | |
|---|---|---|
| Display | Setting | Function number,data |
| | Running | Output frequency, give frequency,output current, input voltage, output voltage, motor speed, PID feedback, quantitative PID, module temperature, input and output terminal |
| | Fault | Overvoltage, undervoltage, overcurrent, short circuit, defaultphase,overload, overheat, voltage stall, current limiting, data protection is damaged, current fault operating conditions, historical fault |
| Condition | Installation site | Indoor, elevation of not more than 1000 m, no corrosive gases and direct sunlight |
| | Temperature, humidity | -10—+40℃， 20%—90%RH（No condensation） |
| | Vibration | Below 20Hz less than 0.5g |
| | Storage Temperature | -25—+65℃ |
| | Installation mode | Wall-mounted type, closet type |
| | Protection degree | IP20 |
| | Cooling Mode | Forced air-cooling |

## 2.4 Inverter rated output current

| Input current | 220V | 380V | 660V | 1140V |
|---|---|---|---|---|
| Rated power | Rated output current(A) | | | |
| 0.4 | 2.5 | | | |
| 0.75 | 4 | 2.3 | | |
| 1.5 | 7 | 3.7 | | |
| 2.2 | 10 | 5.0 | | |
| 3.7 | 16 | 8.5 | | |
| 5.5 | 20 | 13 | | |
| 7.5 | 30 | 17 | 10 | |
| 11 | 42 | 25 | 15 | |
| 15 | 55 | 32 | 18 | |
| 18.5 | 70 | 38 | 22 | |
| 22 | 80 | 45 | 28 | |
| 30 | 110 | 60 | 35 | |
| 37 | 130 | 75 | 45 | 25 |
| 45 | 160 | 90 | 52 | 31 |
| 55 | 200 | 110 | 63 | 38 |
| 75 | 260 | 150 | 86 | 52 |
| 93 | 320 | 180 | 98 | 58 |
| 110 | 380 | 210 | 121 | 75 |
| 132 | 420 | 250 | 150 | 86 |
| 160 | 550 | 310 | 175 | 105 |
| 185 | 600 | 340 | 198 | 115 |
| 200 | 660 | 380 | 218 | 132 |
| 220 | 720 | 415 | 235 | 144 |
| 250 | | 470 | 270 | 162 |
| 280 | | 510 | 330 | 175 |
| 315 | | 600 | 345 | 208 |
| 355 | | 670 | 380 | 220 |
| 400 | | 750 | 430 | 260 |
| 500 | | 860 | 540 | 325 |
| 560 | | 990 | 600 | 365 |
| 630 | | 1100 | 680 | 400 |

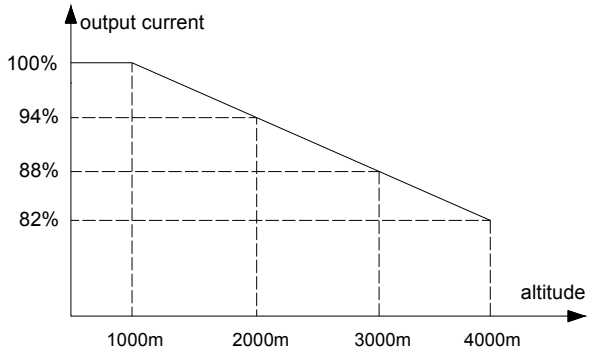
# Chapter 3: Installation

**3.1 Installation environment requirements**

1.Ambient temperature: -10℃~40℃, good ventilation and heat dissipation. If the temperature is higher than 40 ℃. The frequency inverter should be derated to use.

2. Avoid vibration, free of direct sunlight and away from heat sources.

3. Inverter installed under the altitude of 1000m can output rated power. It needs be derated to use when the altitude is more than 1,000 m . Pls refer specific figures as below :




relationship between the altitude and rated current of frequency inverter

4. Humidity should be lower than 90% (no condensation); Avoid high temperature and high humidity.

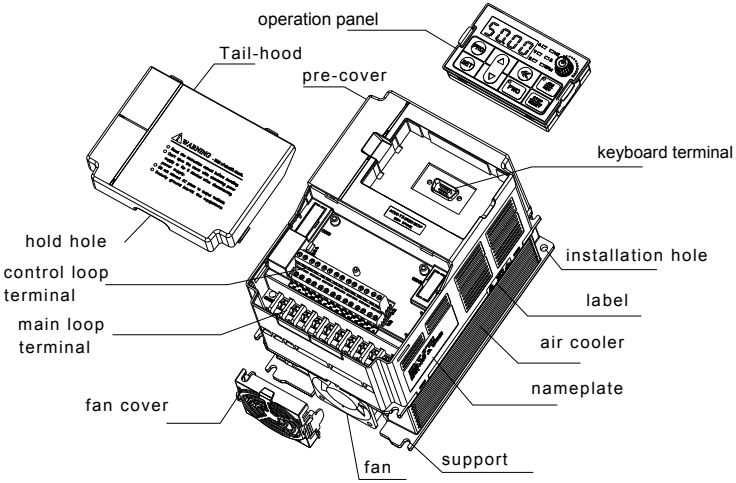
5. Be away from oil, salt and corrosive gases.

6. Prevent inverter from intrusion of water drop, steam, dust, wooland metal dust.

7. Prevent electromagnetic interference, away from sources of interference.

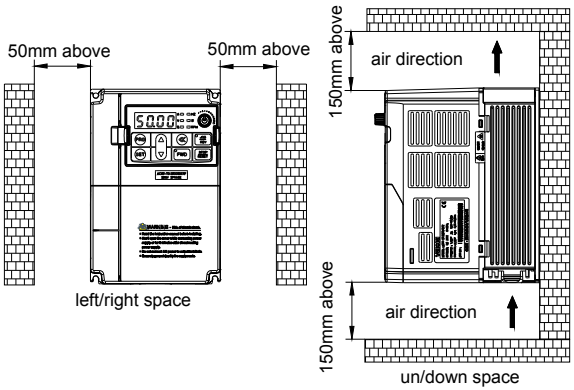
8.Prohibit using of flammable and explosive gases, liquids or solids in a dangerous environment.

### 3.2 Products appearance and component names



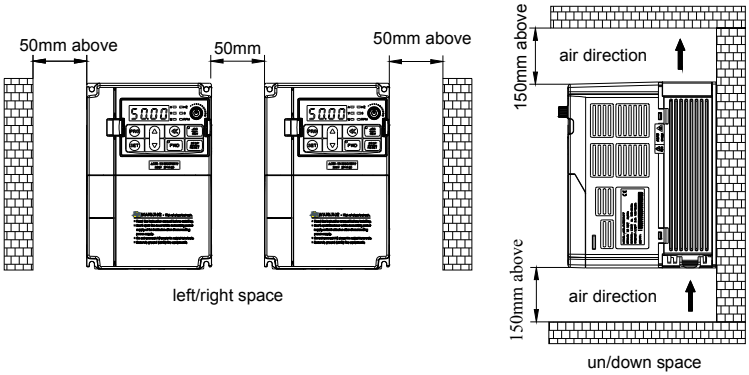

### 3.3 Mounting direction and space

Frequency inverter should be installed in a well-ventilated indoor place, and adapt wall-mounted or closet-style vertical installation. Enough space with the surrounding adjacent items or baffle (wall) shound be preserved.



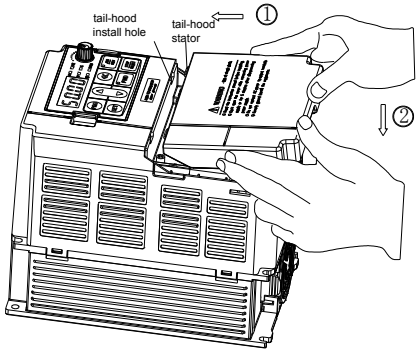

Installation for one frequency inverter

When several frequency inverters are installed in one cabinet, you should pay attention to the uniformity of each frequency inverter heat dissipation. While it adopts vertical juxtaposition installation, you should install deflector plate to avoid the heat of below inverter flows through the above inverter

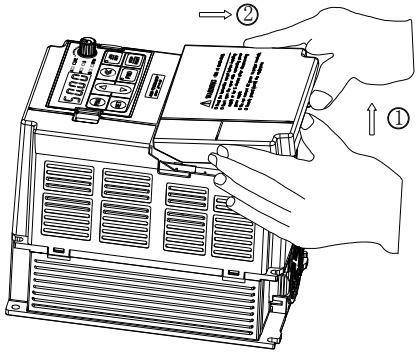



Installation for multi frequency inverter

**3.4 The removal of the tail-hood and installation**



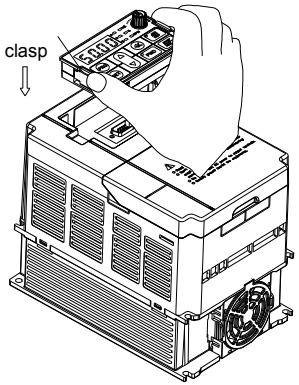

Installation: First hold the tail-hood upwardly inclines around 15 degrees and inserts the top fixed flat into the fixed hole in the front cover. Then slightly press the tail-hood downward. While you hear "Ka",it means that the tail-hood is into the place.



Dismantlement: At the tail of the frequency inverter, there is a special dismantlement hole design. Put your fingers into the hole, upwardly pull the cover with a little force until the buckle between the tail-hood and the crust tear off, and then removed tail-hood down.

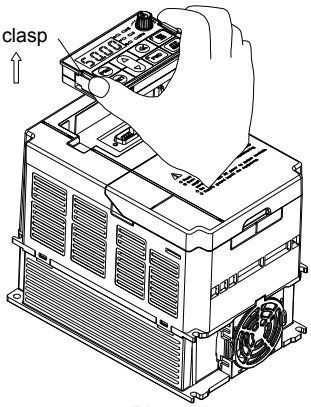
**3.5 The removal of the keyboard and installation**

Installation : Put down the keyboard aimed at keyboard installation groove, maintain the keyboard and cover parallel, press the keyboard down with uniform strength until you hear "Ka" which means the installation of the keyboard in place. Please do not tilt the installation of the keyboard.




Installation the keyboard

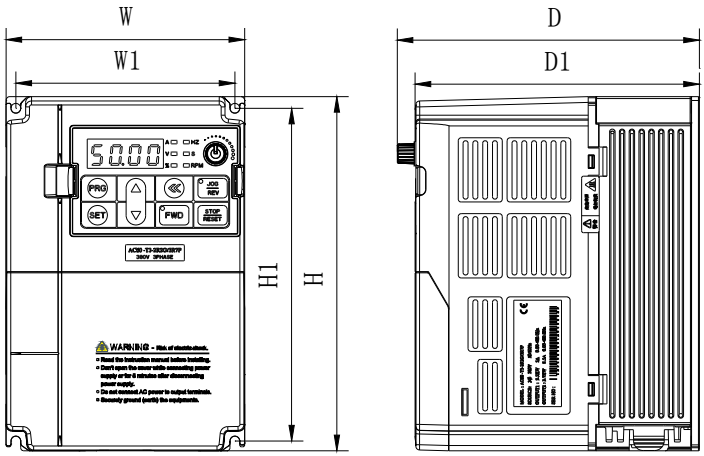
Dismantlement: Put your finger into the keyboard dismantlement hole and pull the keyboard out.




Dismantlement the keyboard

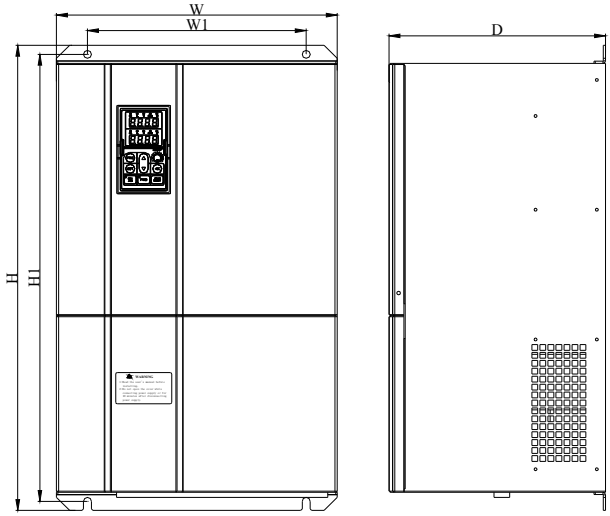
### 3.6 Installation size（unit:mm）

3.6.1 Installation size of machine with plastic cover




| **Frequency inverter**<br>G: Constant torque load<br>P: Fans&pump load | W | W1 | H | H1 | D | D1 | **Installation aperture** |
|---|---|---|---|---|---|---|---|
| AC60-S2-R40G | 122 | 112 | 182 | 171 | 154.5 | 145 | ф5 |
| AC60-S2-R75G | | | | | | | |
| AC60-S2-1R5G | | | | | | | |
| AC60-T3-R75G/1R5P | | | | | | | |
| AC60-T3-1R5G/2R2P | | | | | | | |
| AC60-T3-2R2G/3R7P | | | | | | | |
| AC60-S2-2R2G | 159 | 147.2 | 246 | 236 | 157.5 | 148 | ф5.5 |
| AC60-S2-3R7G | | | | | | | |
| AC60-T3-3R7G/5R5P | | | | | | | |
| AC60-T3-5R5G/7R5P | | | | | | | |
| AC60-T3-7R5G/011P | 195 | 179 | 291 | 275 | 167.5 | 158 | ф7 |
| AC60-T3-011G/015P | | | | | | | |

3.6.2 Wall-mounted machines installation size

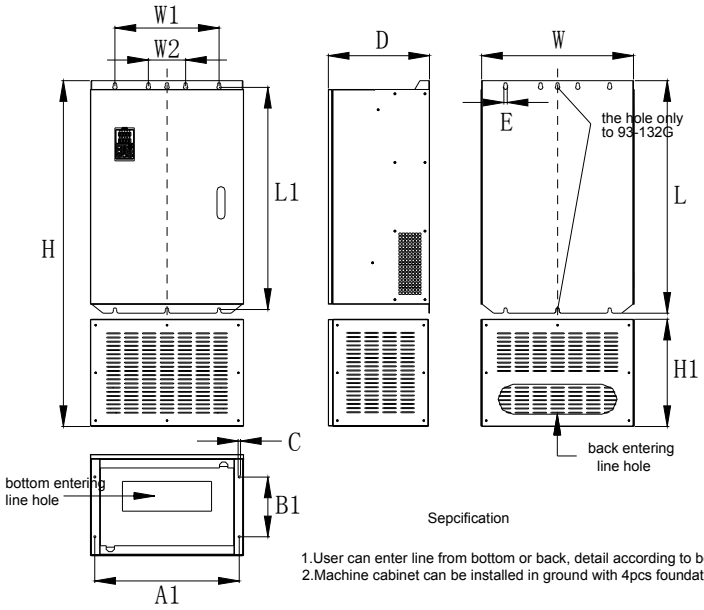



Installation aperture

dimension mark mode(2)

| Frequency inverter<br>G: Constant torque load<br>P: Fans&pump load | W | W1 | H | H1 | D | Installation aperture |
|---|---|---|---|---|---|---|
| AC60-T3-015G/018P | 238 | 180 | 390 | 377 | 212 | ϕ7 |
| AC60-T3-018G/022P | 281 | 200 | 496 | 476 | 256 | ϕ9 |
| AC60-T3-022G/030P | | | | | | |
| AC60-T3-030G/037P | | | | | | |
| AC60-T3-037G/045P | 353 | 200 | 600 | 578 | 286 | ϕ11 |
| AC60-T3-045G/055P | | | | | | |
| AC60-T3-055G/075P | 380 | 300 | 645 | 620 | 297 | ϕ11 |
| AC60-T3-075G/093P | | | | | | |

3.6.3 Wall-mounted & Cabinet-mounted machines installation size




Sepcification

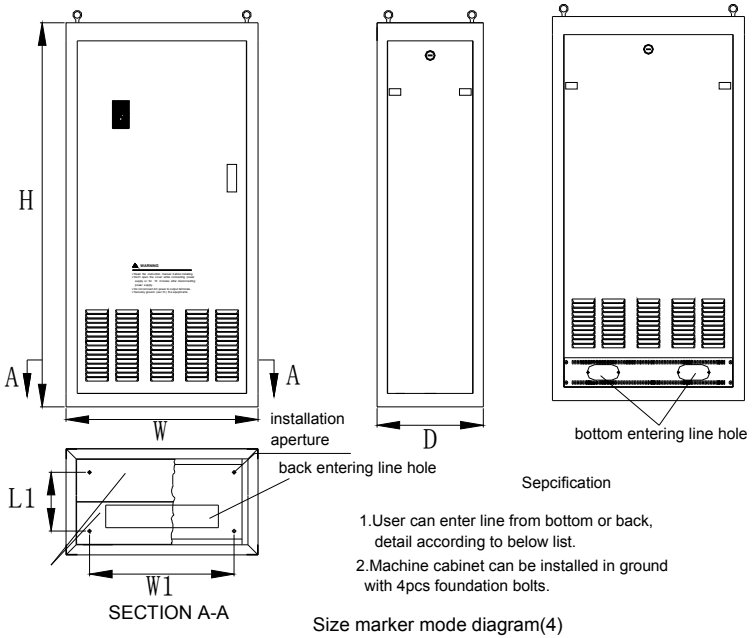
1.User can enter line from bottom or back, detail according to below list.
2.Machine cabinet can be installed in ground with 4pcs foundation bolts.

Size marker mode diagram(3)

| **Frequency inverter**<br>G: Constant torque load<br>P: Fans&pump load | **H** | **H1** | **L** | **L1** | **W** | **W1** | **W2** | **D** | **E** | **A1** | **B1** | **C** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AC60-T3-093G/110P | 1200 | 450 | 780 | 755 | 515 | 350 | -- | 340 | φ11 | 486 | 200 | φ9 |
| AC60-T3-110G/132P | | | | | | | | | | | | |
| AC60-T3-132G/160P | | | | | | | | | | | | |
| AC60-T3-160G/185P | 1588 | 440 | 1188 | 1155 | 600 | 450 | 150 | 370 | φ13 | 565 | 250 | φ9 |
| AC60-T3-185G/200P | | | | | | | | | | | | |
| AC60-T3-200G/220P | 1748 | 550 | 1238 | 1205 | 700 | 580 | 220 | 380 | φ15 | 665 | 250 | φ9 |
| AC60-T3-220G/250P | | | | | | | | | | | | |

In the table, H is the height of whole machine plus bottom section. The customers can choose installation type according to demand. Cabinet, lean against the well, or other installation types are ok. And you can also choose hang-style machine and bottom section which consist the cabinet machine installed directly in installation slot or ground.

3.6.4 Cabinet-style machines installation size

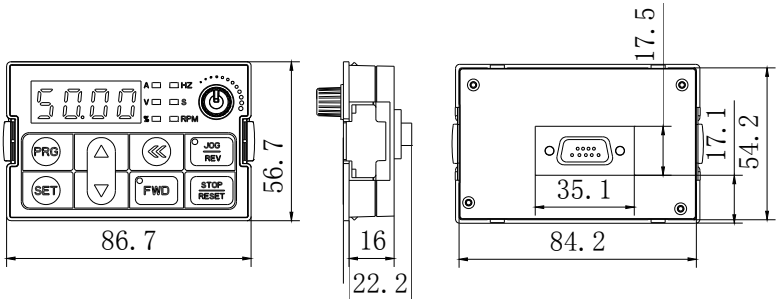



Size marker mode diagram(4)

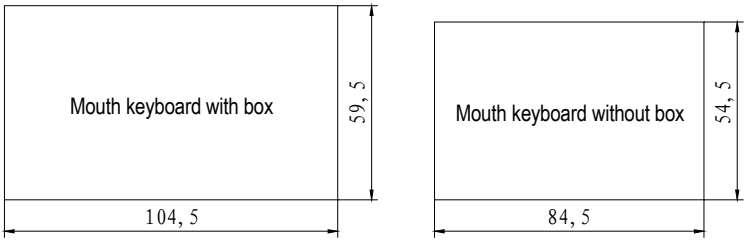
| **Frequency inverter**<br>G: Constant torque load<br>P: Fans&pump load | **W** | **W1** | **H** | **L1** | **D** | **Installation aperture** |
|---|---|---|---|---|---|---|
| AC60-T3-250G/280P | 760 | 540 | 1700 | 270 | 485 | ф13 |
| AC60-T3-280G/315P | | | | | | |
| AC60-T3-315G/355P | 808 | 540 | 1800 | 270 | 485 | ф13 |
| AC60-T3-355G/400P | | | | | | |
| AC60-T3-400G/450P | 1200 | 900 | 2200 | 320 | 550 | ф13 |
| AC60-T3-450G/500P | | | | | | |
| AC60-T3-500G/560P | | | | | | |
| AC60-T3-560G/630P | | | | | | |

### 3.7 Operation keyboard size

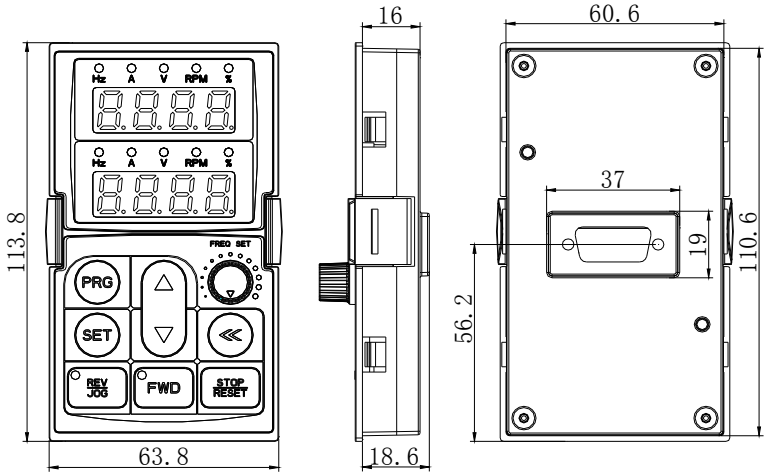
3.7.1. Single display keyboard size



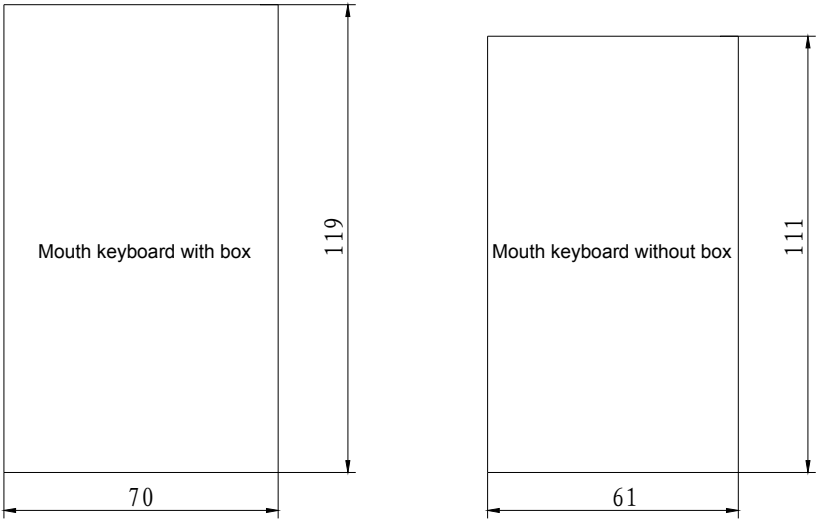

3.7.2 AC60 series inverter mouth for 1 line LED keyboard dimension



3.7.2 Double display keyboard size




3.7.4 AC60 series inverter mouth for 2 line LED keyboard dimension



# Chapter 4: Frequency Inverter Wiring

**4.1 Wiring attentions**

1. Wiring job can only be done by qualified professional personnel.
2. Before open the machine, make sure the power is safely cut off more than 10 minutes, otherwise there is a danger of shocking.
3. Absolutely prohibit the power input terminals to be connected to the output terminals U, V and W; Absolutely prohibit short circuit between the frequency inverter output terminals; Absolutely prohibit short-circuit between output terminals and grounding terminals of the inverter.
4. In order to minimize the impact of electromagnetic interference, when the electromagnetic contactors and relays are very close to inverter, you should consider the installation of surge absorption device.
5. When the peripheral equipment(filter 、reactor)of inverter are installed, first, use the 1,000 volts MΩ megger to measure the grounding insulation resistance to ensure it not less than 4 MΩ.
6. Can not install the progressive phase capacitance and resistor-capacitor absorbing device in the output terminals U, V and W, because the frequency inverter' voltage output is PWM pulse wave. If there is capacity which can improve power factor or pressure-sensitive resistance which used for thunder-proof in the voltage output side, the frequency inverter will break off or its parts will be damaged, so it is necessary to dismantle them.
7. In order to reduce the leakage current of the earth, the motor cables should be as short as possible. When the carrier frequency is less than 3KHz, the largest distance between frequency inverter and motor should be less than 50 meters; When the carrier frequency is greater than 4KHz, you should appropriately reduce this distance; In order to restrain interference of the frequency inverter output side to the other equipments, you are better to install a special noise filter at the output side of the frequency inverter and lay the output cables through the metal tubes.
8. If the frequency inverter needs to frequently start, do not cut off the power, you should operate it through the control terminals (COM / FWD. REV) or keyboard.
9. As analog signals are very easily to be interfered, isolation device or shield lines are needed for the external control wires of the inverter and the ground terminals of shield lines are needed to be connected to the metal case(ground terminals) of the inverter.
10. Control cables、 power cables should be separated from the motor cables. Generally there should be a sufficient distance between them, especially between the parallel cables that extend for a long distance; When signal cables have to pass through the power cables, they should be orthogonal crossing.
11. Main circuit wiring and wire diameter specifications have to be in accordance with national laws.
12. Pls switch motor or switch power after inverter stopping output.
13. While dismantling or changing motor, you must cut off the input power of inverter.
14. In order to avoid accidents, ground terminal E or ⏚ must be reliably grounded (ground

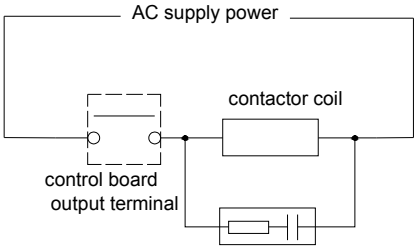
impedance should be kept below 10 Ω). Otherwise there is a risk of leakage current. For frequency inverter ground point, you should be better to adopt the special ground pole. You can also use the share ground pole, but never use tandem ground line.

15.Pls do not change three phase frequency inverter input into two phase. Otherwise there may be malfunction. If you have only two-phase power, please choose single-phase power frequency inverter.

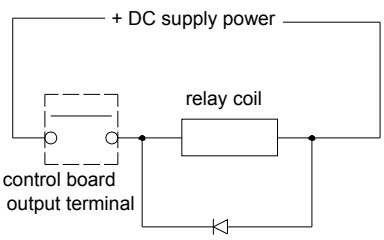
16.The frequency inverter can't be used in the occasions where voltage of power grid exceeds the enable input voltage. If the power grid voltage exceeds the inverter voltage limit, please supply power to frequency inverter with transformer.

17.The wire length between the frequency inverter and the braking unit should not exceed five meters; The wire length between braking unit and braking resistance should not exceed 5 meters.

18. If the frequency inverter output terminals drive inductive loads, such as electromagnetic relays, contactors, etc., surge voltage absorption circuit should be added, such as RC absorption circuit(be careful that the leakage current should be lower than persistent current of the control electromagnetic relays or contactor), pressure-sensitive resistance or freewheel diode(be used in DC electromagnetic circuit, but the polarity of the diode must be paid attention to). The absorption circuit components must be as close to the relays or the ends of the winding of the contactor as possible; Shown as below:



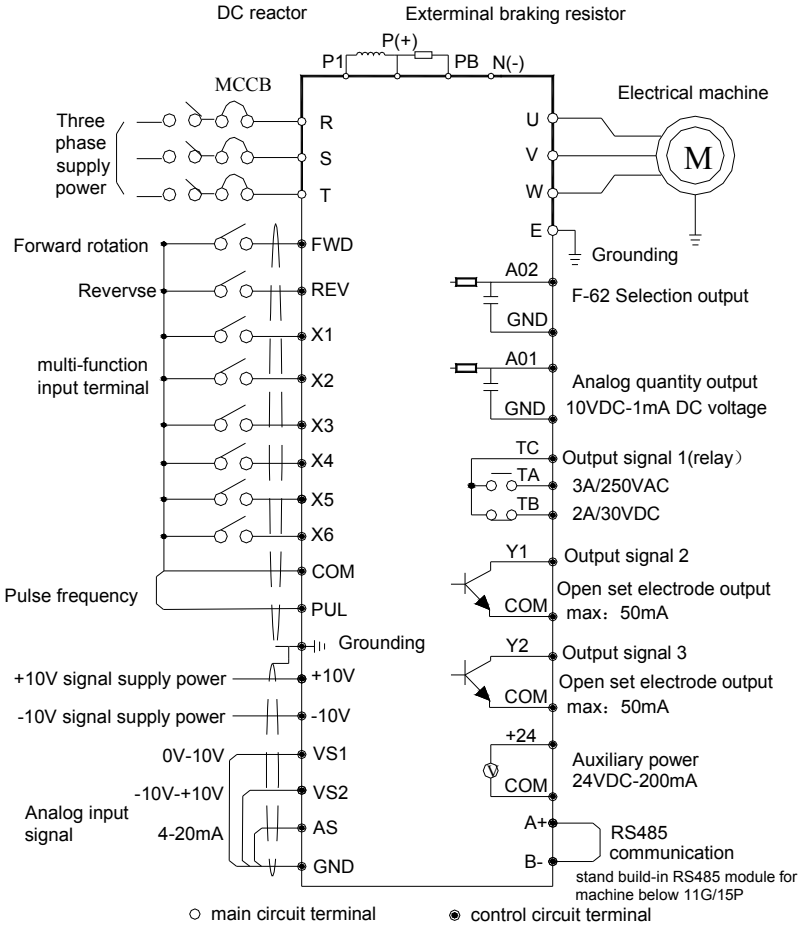

RC resistor capacitor absorption circuit




DC absorption circuit

### 4.2 Basic wiring diagram of inverter

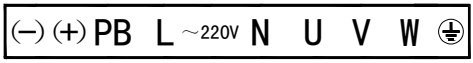
The following diagram includes two parts: main circuit and control circuit.




Frequency converter basic wiring diagram

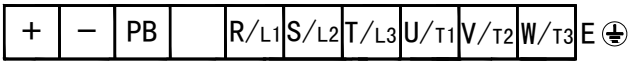
**4.3 Main circuit terminals**

4.3.1 AC60 series single-phase 220V(s2) input machine main circuit terminals

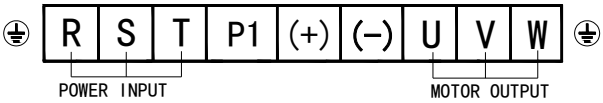



4.3.2 AC60 series three-phase 380V（T3）0.75G/1.5P～11G/15P machine main circuit terminals

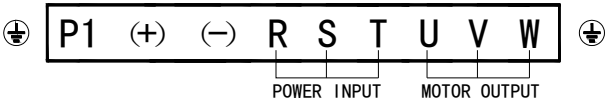

4.3.3 AC60 series three-phase 380V（T3）15G/18P machine main circuit terminals



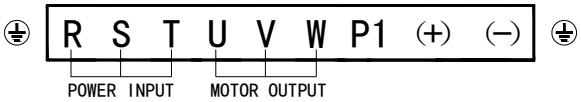

4.3.4 AC60 series three-phase 380V（T3）18G/22P～75G/093P machine main circuit terminals




4.3.5 AC60 series three-phase 380V（T3）93G/110P～110G/132P machine main circuit terminals

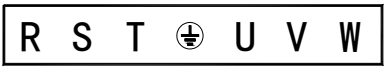



4.3.6 AC60 series three-phase 380V（T3）132G/160P (Wall-mounted & Cabinet-mounted) machine main circuit terminals




4.3.7 AC60 series three-phase380V（T3）160G/185P～220G/250P(Wall-mounted & Cabinet-mounted) machine main circuit terminals


4.3.8 AC60 series three-phase380V（T3）250G/280P～355G/400P (Cabinet-style) machine main circuit terminals



4.3.9 AC60 series three-phase380V（T3）400G/560P～560G/630P(Cabinet-style) machine main circuit terminals


4.3.10 Terminal functions detailed description

| Terminal name | Functions description |
|---|---|
| L | Single-phase AC 220V power input terminal |
| N | |
| R | Three-phase AC power input terminal |
| S | |
| T | |
| E/⏚ | Earth terminal |
| P1, (+) | Terminals for external DC reactor |
| (+),PB | Terminals for external braking resistance |
| (+) | Anode output terminal for DC bus |
| (-) | Cathode output terminal for DC bus |
| U | Terminals connect to three-phase AC motor |
| V | |
| W | |

**Tips : Maybe different number or sequence of main circuit terminals for inverters with different series or different power.**

**4.4 Electrical specifications recommendation**

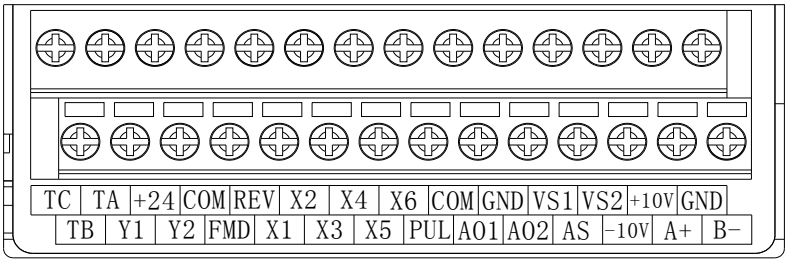
| Type | Rated current（A） | Motor (KW) | Electromagnetic contactor (A) | Opening switch (A) | Main circuit specification |
|---|---|---|---|---|---|
| AC60-T3-R75G/1R5P | 2.3 | 0.75 | 10 | 10 | 2 |
| AC60-T3-1R5G/2R2P | 3.7 | 1.5 | 10 | 10 | 2 |
| AC60-T3-2R2G/3R7P | 5 | 2.2 | 10 | 10 | 2 |
| AC60-T3-3R7G/5R5P | 8.5 | 3.7 | 20 | 20 | 4 |
| AC60-T3-5R5G/7R5P | 13 | 5.5 | 20 | 30 | 4 |
| AC60-T3-7R5G/011P | 17 | 7.5 | 30 | 30 | 6 |
| AC60-T3-011G/015P | 25 | 11 | 30 | 50 | 8 |
| AC60-T3-015G/018P | 32 | 15 | 35 | 60 | 10 |
| AC60-T3-018G/022P | 38 | 18 | 50 | 75 | 16 |

| | | | | | |
|---|---|---|---|---|---|
| AC60-T3-022G/030P | 45 | 22 | 50 | 100 | 16 |
| AC60-T3-030G/037P | 60 | 30 | 80 | 125 | 25 |
| AC60-T3-037G/045P | 75 | 37 | 80 | 150 | 25 |
| AC60-T3-045G/055P | 90 | 45 | 100 | 200 | 30 |
| AC60-T3-055G/075P | 110 | 55 | 180 | 225 | 30 |
| AC60-T3-075G/093P | 150 | 75 | 180 | 300 | 50 |
| AC60-T3-093G/110P | 180 | 93 | 250 | 350 | 50 |
| AC60-T3-110G/132P | 210 | 110 | 250 | 400 | 60 |
| AC60-T3-132G/160P | 250 | 132 | 400 | 500 | 80 |
| AC60-T3-160G/185P | 310 | 160 | 400 | 600 | 80 |
| AC60-T3-185G/200P | 340 | 185 | 500 | 600 | 100 |
| AC60-T3-200G/220P | 380 | 200 | 600 | 600 | 100 |
| AC60-T3-220G/250P | 415 | 220 | 600 | 800 | 150 |
| AC60-T3-250G/280P | 470 | 250 | 600 | 800 | 150 |
| AC60-T3-280G/315P | 510 | 280 | 600 | 1000 | 150 |
| AC60-T3-315G/355P | 600 | 315 | 800 | 1000 | 200 |

Above reference data are based on the G-type machine. For P-type machine, please choose accessories with suitable specifications according to actual need and referring to the same power of G-type machine listed above to.

**4.5 Control circuit terminals**

4.5.1 Sequence of control terminals



4.5.2 Control terminals menu

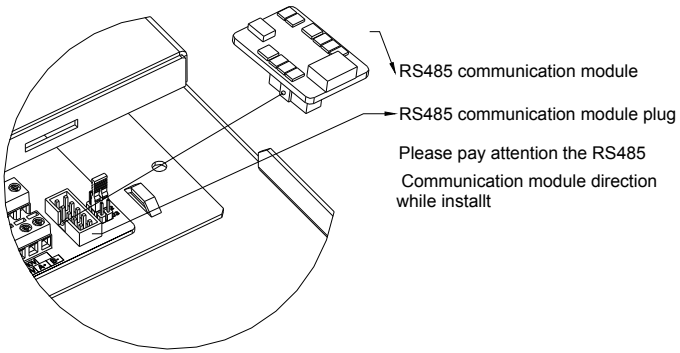
| Category | Terminal | name | Function |
|---|---|---|---|
| Control signal | COM | Common terminal | |
| | FWD | Forward turn command | Short connect with (COM)is workable |
| | REV | Reverse turn command | Short connect with (COM)is workable |
| | X1 | Multifunction input terminalsX1 | Short connect with (COM) is workable Multifunction input terminals,please refer to parameters［**F-01～F-06**］to set the definitions by program. |
| | X2 | Multifunction input terminalsX2 | |
| | X3 | Multifunction input terminalsX3 | |
| | X4 | Multifunction input terminalsX4 | |
| | X5 | Multifunction input terminalsX5 | |
| | X6 | Multifunction input terminalsX6 | |
| | PUL | Pulse frequency input signal | 0KHz-50KHz，Amplitude 8～24V. |
| Output signal | TA,TB, TC | Output signal 1 | **(TA-TC)**Normally open,**(TB-TC)**Normally close (programmable setting motion targets). |
| | Y1 | Output signal 2 | Open collector output，programmable setting motion targets.maximum output DC24v/50mV |
| | Y2 | Output signal 3 | |
| Analog output& input signal | GND | Output common terminal | |
| | +10V | Signal power | Maximum output +10V/50mA. |
| | -10V | Signal power | Maximum output -10V/50mA. |
| | VS1 | Voltage input signal | **(VS1)**terminal 0V～10V. |
| | VS2 | Voltage input signal | **(VS2)**terminal -10V～10V. |
| | AS | Voltage input signal | **(AS)**terminal 4～20mA . |
| | A01 | Analog output signal 1 | **(A01)**terminal 0V～10V. |
| | A02 | Output signal 2 | 0V ～ 10V,0V ～ 20V,4 ～ 20mA,frequency pulse output;By choosing of [F-62] and the terminal jumper J1, J2 and J3. |
| Auxiliary power | +24 | Power anode terminals | Maximum output 24V/200mA. |
| | COM | Common terminal | |
| Communi cation | A+ | Communication Interface | RS485 Communication Interface. |
| | B- | Communication Interface | |

**4.6 RS485 communication modules and specification of control panels jumper**

4.6.1 AC60 series frequency inverter have powerful communications capabilities that enable frequency inverter communication with PC or PLC etc.equipment. Besides, a set of AC60 series frequency inverter communicate to control up to 31 sets of AC60 series frequency inverter;

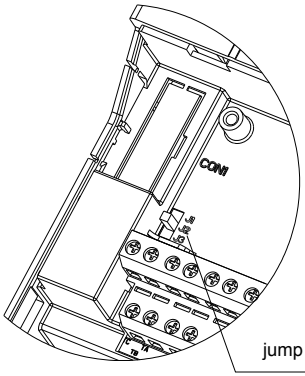
Machines whose power is under AC60-T3-011G/015P have build-in RS485 communication module. Users can use the function directly. For machines whose power is higher than AC60-T3-015G/018P, RS485 communication module is optional accessories; Please buy the RS485 communication module while ordering.

Communication wire must be shield twisted-pair,which is separated from the control wires. RS485 communication modules are plug-in type installation. RS485 communication modules plug-in type installation as shown in the following fig.:

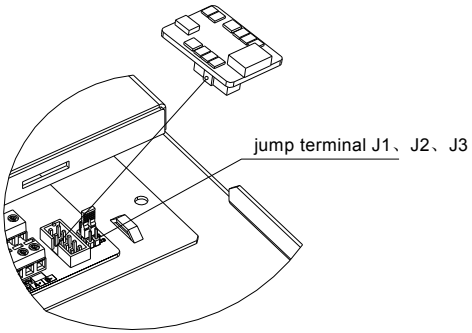



4.6.2 On the right side of the connection terminal in the controlboard, there are a group of jumper terminals J1, J2 and J3 which are chose to work with software to decide A02 output mode. Usage details are shown in the following fig.:

| Jumper name | Details specification |
|---|---|
| J1 | Terminal**(A02)**output selection， when［**F-62**］sets as “0”,J1 should short connect,**(A02)** output pulse frequency. |
| J2 | Terminal**(A02)**output selection,when［**F-62**］set as “1”or“2”,J2 should short connect,**(A02)**output 0～20mA as 4～20mA. |
| J3 | Terminal**(A02)**output selection,when［**F-62**］set as “3”,J3 should short connect,**(A02)**output 0V～10V. |



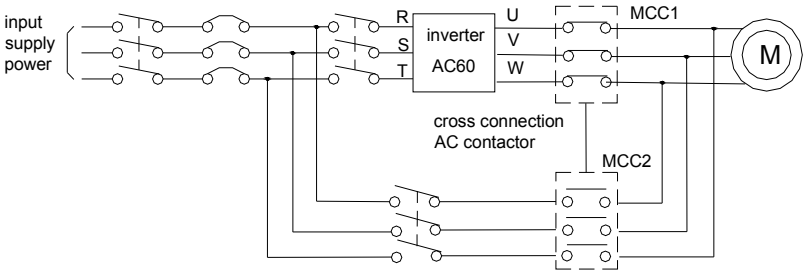

ıtrol borad jumper of machine below AC60-T3-011G/015P




ocntrol borad jumper of machine above AC60-T3-015G/018P

**4.7 Backup circuit**

If the frequency inverter breaks off for fault, it will occur great loss or other unexpected fault. Please add this circuit standby to ensure safety.



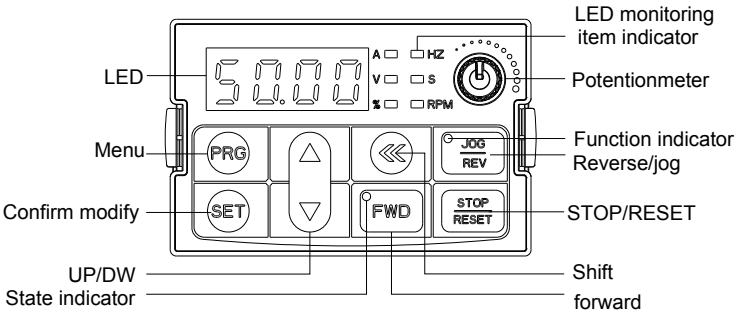

backup circuit diagram

# Chapter 5: Keyboard Operation and Usage

**5.1 Keyboard layout and function specification**

AC60 series frequency inverter has two kinds of keyboards: the single display type for machine below 011G/015P and the double display type for machine above 015G/018P.

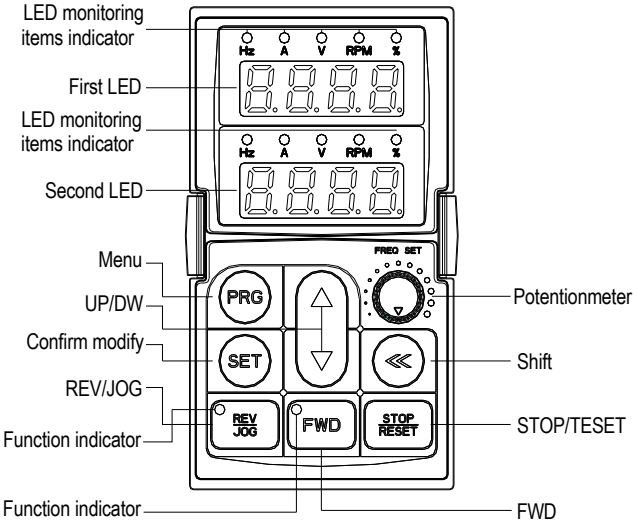
5.1.1 Single display keyboard layout and function specification



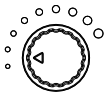

| Key | Key name | Key functions |
|---|---|---|
| PRG | Menu key | Enter menu while standby or running.Press this key to return while modifying parameter. While standby or running, press for 1 sec to enter monitoring interface. |
| SET | Confirm/modify key | Press it to modify parameter while in menu interface.Press again to confirm aftr modification. While standby or running, press it to change LED monitoring items at stop |
| △ ▽ | Up/down key | Select parameter group in menu interface. Modify parameter while in modify interface. Modify given frequency or PID or given torque while at standby or running monitoring state(Set by keyboard while frequency or PID torque being given) |
| ≪ | Shift key | Select digit of function modified by up/down key；Select parameter digits modified by up/dowm key. Change LED monitoring items while being standby or running |
| FWD | Forward key | While run/stop is controlled by keyboard, press this key, the inverter forward rotate. |

| | | |
|---|---|---|
| JOG/REV | Jog/Reverse key | While run/stop is controlled by keyboard, press it, machine will reverse if this key is defined as REVERSE, and machine will jog if this key is defined as JOG. |
| STOP/RESET | Stop/Reset key | Machine stops if press it while run/stop is controlled by keyboard. Its efficiency range is defined via function F-07. Inverter reset if press it in fault state(no reset if fault is not solved) |
|  | Keyboard Potentiometer | Can be used as input channel for given frequency, upper frequency limit, gived torque, given PID or PID feedback setting. |

5.1.2 Double display keyboard layout and function specification




| Key | Key name | Key functions |
|---|---|---|
| PRG | Menu key | Enter menu while standby or running.Press this key to return while modifying parameter. While standby or running, press for 1 sec to enter monitoring interface. |

| | | |
|---|---|---|
|  | Confirm/modifykey | Press it to modify parameter while in menu interface.Press again to confirm aftr modify. While standby or running, press it to change LED monitoring items at stop |
|  | Up/down key | Select parameter group in menu interface. Modify parameter while in modify interface. Modify given frequency or PID or given torque while at standby or running monitoring state(Set by keyboard while frequency or PID torque being given) |
|  | Shift key | Select digit of function no modified by up/down key;Select parameter digits modified by up/dowm key. Change LED monitoring items while standby or running. |
|  | Forward key | While run/stop is controlled by keyboard, press this key, the inverter forward rotate. |
|  | Jog/Reverse key | While run/stop is controlled by keyboard, press it, machine will reverse if this key is defined as REVERSE and machine will jog if this key is defined as JOG. |
|  | Stop/Reset key | Machine stops if press it while run/stop is controlled by keyboard. Its efficiency range is defined via function no F-07. Inverter reset if press it in fault state(no reset if fault is not solved) |
|  | Keyboard Potentiometer | Can be used as input channel for given frequency, upper frequency limit, gived torque, given PID or PID feedback setting. |

**5.2 Indicating lamp meaning specification**

5.2.1 Single display keyboard indicating lamp meaning specification

| Name | | state | meaning |
|---|---|---|---|
| Unit indicators | Hz | Flashing | 4 digital display value is given frequency. |
| | Hz | On | 4 digital display value is output frequency. |
| | A | On | 4 digital display value is output current actual value. |
| | V | On | 4 digital display value is input voltage. |
| | V | Flashing | 4 digital display value is output voltage. |
| | RPM | On | When "Hz" indicator and the "A" indicator light at the same time, the 4 digital display value is the motor speed. |
| | % | Flashing | When the "A" indicator and the "V" indicator flashing at the same time, the 4 digital display value is given PID value. |
| | % | On | When the "A" indicator and the "V" indicator light at the same time, the 4 digital display is the value of PID feedback. |
| Status indicators | FWD | On | Frequency inverter forward operation. |
| | FWD | Flashing | Frequency inverter reverse operation. |
| | FWD | Off | Frequency inverter is close-down |
| Function indicators | REV/JOG | On | This key is defined as the jog function key. |
| | REV/JOG | Off | This key is defined as the reverse function key. |

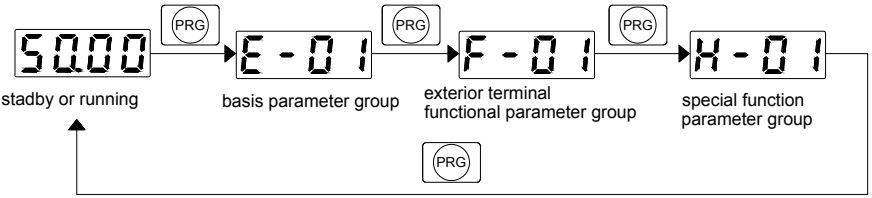
5.2.2 Double line keyboard indicating lamp meaning specification

| Name | | State | Meaning |
|---|---|---|---|
| Unit indicators | Hz | Flashing | 4 digital display value is given frequency. |
| | Hz | On | 4 digital display value is output frequency. |
| | A | On | 4 digital display value is output current actual value. |
| | V | On | 4 digital display value is input voltage. |
| | V | Flashing | 4 digital display value is output voltage. |
| | RPM | On | 4 digital displays value is the motor speed. |
| | % | Flashing | 4 digital display value is given PID. |
| | % | On | 4 digital display is the value of feedback of PID. |
| Status indicators | FWD | On | Frequency inverter forward operation. |
| | FWD | flashing | Frequency inverter reverse operation. |
| | FWD | Off | Frequency inverter is close-down |
| Function indicators | REV/JOG | On | This key is defined as the jog function key. |
| | REV/JOG | Off | This key is defined as the reverse function key. |

### 5.3 Keyboard operation modes

5.3.1 Menu'structure and operation

The parameter setting of the AC60 series frequency inverter adopts three groups of menus structure, which enable the user to inquire and modify the parameters quickly. Three groups of menu are basic parameter、external terminal function parameter and special function parameter. The operation modes are shown as the following fig:



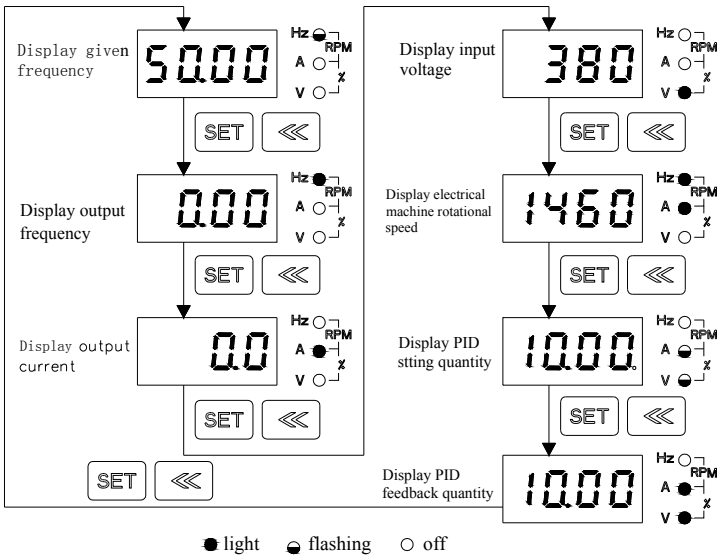

advance/retreat and three group menus switch operation process diagram

**Tips: The operation procedure and method of both two kinds of keyboard are all the same.**

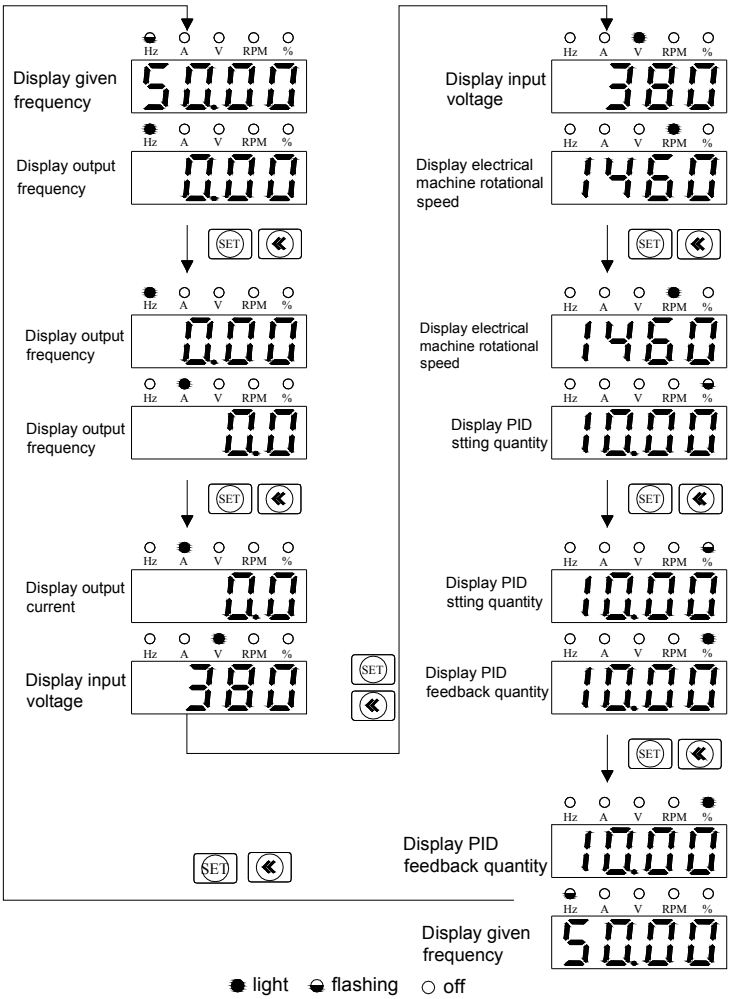
5.3.2 Switch of display mode

The AC60 series frequency inverter under stopping state or operation state can display various monitoring parameters by the LED nixie tube. Inverter with two kinds of keyboard both can set the concrete display parameters by [E-06,E-07]under stopping state or operation state.They both can set the unidirectional switch cycle of the display parameters by the SET key and shifting key. The operation modes are shown as the following fig:

1. Single display keyboard cycle switch the display of monitoring parameter mode:



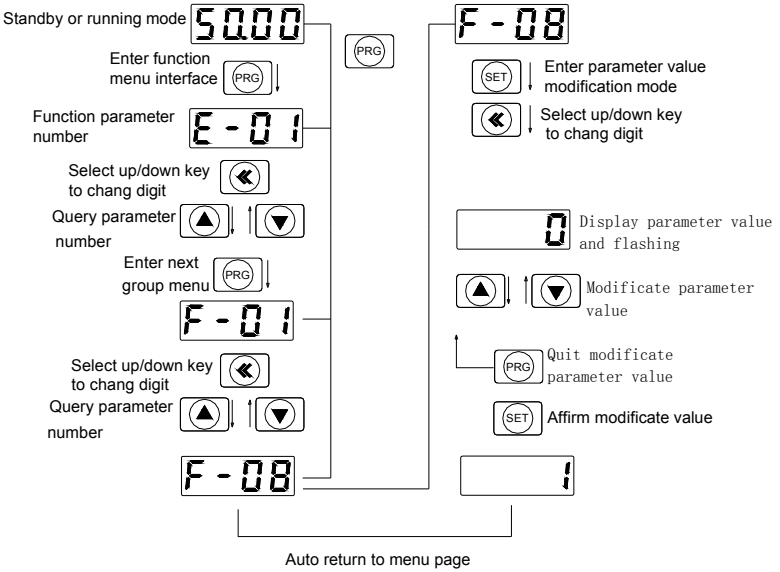
2. Double display keyboard cycle switch the display of monitoring parameter mode:



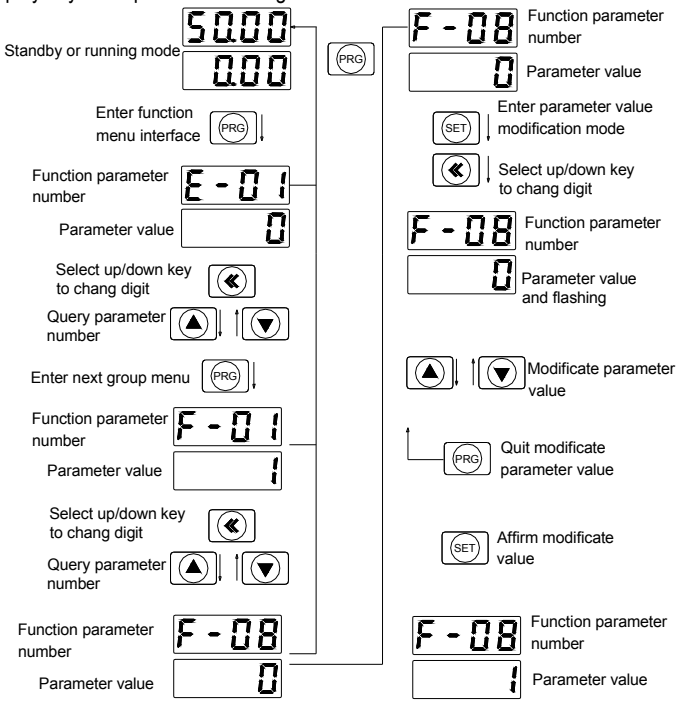

5.3.3 Parameter setting mode

Perfect performance of the frequency inverter is on the premise that the AC60 series frequency inverter parameters are set properly. Take parameters **[F-08]** modification as an example as follow (Terminal operational control mode is changed from the standard operational control mode to the second-line-style operational control mode), to introduce parameters setting method of AC60 series frequency inverter with single display keyboard or double display keyboard.

1. Single display keyboard parameter setting mode:




2. Double display keyboard parameter setting mode:



# Chapter 6: Functional Parameter Table

"●": Means that the parameter can be revised during frequency inverter in a running state;

"○": Means that the parameter can not be revised during frequency inverter in a running state;

"×": Means that the parameters can only be read and can not be changed;

"–": Means that the parameter is only set by the manufacturer;

"※": Means that the parameter is related to the type of the frequency inverter.

**6.1 Basic parameters**

| serial number | Function description | Range of settings and definition | Factory setting | Modify limitation | Reference page | Communication code |
|---|---|---|---|---|---|---|
| E-01 | Running commands reference channel selection | 0:Keyboard control<br>1:Terminal control<br>2:RS485communication port control | 0 | ○ | 53 | 101H |
| E-02 | Frequency reference main channel selection | 0:Keyboard number setting<br>1:Keyboard potentiometer<br>2:Terminal VS1 voltage signal，0～10V<br>3:Terminal AS current signal，4～20mA<br>4 :Terminal VS2 voltage signal -10～10V<br>5:Terminal pulse signal<br>6:RS485 communication port<br>7:Ascend,descent control<br>8:Normal PID running<br>9:Constant pressure PID control<br>10:Program running<br>11:Swing frequency running<br>12:Terminal selection | 1 | ○ | 53 | 102H |
| E-03 | Frequency reference auxiliary channel selection | 0:keyboard number setting<br>1:Keyboard potentiometer<br>2:Terminal VS1 voltage signal, 0～10V<br>3:Terminal AS current signal,4～20mA<br>4:Terminal VS2 voltage signal, -10～10V<br>5:Terminal pulse signal<br>6:RS485 communication port | 0 | ○ | 56 | 103H |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 7:Ascend,descent control<br>8:Normal PID running<br>9:Constant pressure PID control<br>10:Program running | | | | |
| E-04 | Frequency reference channel gain | 0.01～5.00 | 1.00 | ○ | 57 | 104H |
| E-05 | Frequency reference channels combinations mode | 0:Main channel valid, auxiliary channel invalid<br>1:Auxiliary channel valid， main channel invalid<br>2:Both channels arbitrary nonzero value valid, the main channel prior<br>3:Main channel(K×auxiliary channel)<br>4:Main channel(K×auxiliary channel)<br>5:MAX[Main channel, (K×auxiliary channel)]<br>6:MIN[Main channel, (K×auxiliary channel)]<br>7:Auxiliary channel +(K×Main channel)<br>8:Auxiliary channel -(K×Main channel)<br>9:MAX[(K×Main channel), auxiliary channel]<br>10:MIN[(K×Main channel), auxiliary channel] | 0 | ○ | 57 | 105H |
| E-06 | Keyboard first display monitoring selections | 0:Given frequency<br>1:Output frequency<br>2:Output current<br>3:Input voltage<br>4:Output voltage<br>5:Mechanical speed<br>6:PID given value<br>7:PID feedback value | 0 | ● | 58 | 106H |
| E-07 | Keyboard second display monitoring selections | | 1 | ● | 58 | 107H |
| E-08 | Keyboard REV/JOG key function options | 0:REV<br>1:JOG | 0 | ● | 59 | 108H |
| E-09 | Maximum frequency | 0.50～400.0Hz | 50.0 | ○ | 59 | 109H |
| E-10 | Upper limit of frequency | Upper limit of frequency～ Maximum frequency | 50.0 | ● | 59 | 10AH |
| E-11 | Lower limit of frequency | 0.00～Upper limit of frequency | 0.00 | ● | 59 | 10BH |

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|---|---|---|---|---|---|---|
| E-12 | Lower limit frequency running mode | 0:stop<br>1:run according to lower limit frequency | 1 | ● | 59 | 10CH |
| E-13 | Acceleration time 1 | 0.1～6500.0 second | ※ | ● | 60 | 10DH |
| E-14 | Deceleration time 1 | 0.1～6500.0 second | ※ | ● | 60 | 10EH |
| E-15 | Acceleration&Deceleration mode | 0:Straight line<br>1:S Curve | 0000 | ● | 61 | 10FH |
| E-16 | Keyboard number given frequency | Lower limit frequency～Upper limit frequency | 50.00 | ● | 61 | 110H |
| E-17 | V/F mode | 0:Constant torque curve<br>1:Drop torque curve 1(1.5times)<br>2:Drop torque curve 2(1.7times)<br>3:Drop torque curve 3(2.0times)<br>4:Auto-defined curve | 0 | ○ | 62 | 111H |
| E-18 | Torque upgrade | 0.0%:auto<br>0.1%～25.0% | ※ | ● | 62 | 112H |
| E-19 | Reserve | | | | | 113H |
| E-20 | Carrier frequency | 0.7KHz～15.0KHz | ※ | ● | 63 | 114H |
| E-21 | Carrier Characteristics | LED single digit: Carrier frequency associated with the output frequency setting<br>0:Output frequency correlation invalid<br>1:Input Frequency correlation valid<br>LED 10 digit: Carrier temperature correlative setting<br>0:Module temperature Correlation invalid<br>1:Module temperature Correlation valid<br>LED 100 digit: PWM mode options<br>0:Fixed PWM<br>1:Random PWM<br>LED 1000 digit: reserved | 0010 | ● | 64 | 115H |
| E-22 | Slip frequency compensation | 0～200% | 0 | ○ | 64 | 116H |
| E-23 | Energy-saving running option | 0:Invalid<br>1:Valid | 0 | ○ | 65 | 117H |
| E-24 | Auto voltage regulation function (AVR) | 0:Invalid<br>1:Global valid<br>2:Only deceleration invalid | 0 | ● | 65 | 118H |

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|---|---|---|---|---|---|---|
| E-25 | Jog frequency | 0.00Hz～upper limit frequency | 5.00 | ● | 66 | 119H |
| E-26 | Jog acceleration time | 0.1～6500.0 second | 2.0 | ● | 66 | 11AH |
| E-27 | Jog deceleration time | 0.1～6500.0 second | 2.0 | ● | 66 | 11BH |
| E-28 | Start-up frequency | 0.00～60.00Hz | 0.50 | ○ | 66 | 11CH |
| E-29 | Start-up frequency duration | 0.0～20.0 second | 0.0 | ○ | 66 | 11DH |
| E-30 | Start-up mode selection | 0:Start by start-up frequency<br>1:Firstly DC braking,then start from the start-up frequency<br>2: Speeck tracking restart | 0 | ○ | 67 | 11EH |
| E-31 | Power fail restart options | 0:Invalid<br>1:Valid | 0 | ● | 68 | 11FH |
| E-32 | Power fail restart waiting time | 0.0～10.0 second | 0.5 | ● | 68 | 120H |
| E-33 | Free stop frequency | 0.00～60.00Hz | 0.00 | ● | 69 | 121H |
| E-34 | Shut donw mode | 0:Deceleration close-down<br>1:Free Close-down | 0 | ● | 69 | 122H |
| E-35 | DC braking voltage | 0.0～15.0% | 5.0 | ● | 69 | 123H |
| E-36 | DC braking time for stop | 0.0～30.0 second | 0.0 | ● | 69 | 124H |
| E-37 | DC braking initial frequency for stop | 0.00～60.00Hz | 0.00 | ● | 69 | 125H |
| E-38 | DC braking time for startup | 0.0～10.0 second | 0.0 | ● | 69 | 126H |
| E-39 | Jumping frequency 1 | 0.00～400.0Hz(Fmax) | 0.00 | ● | 70 | 127H |
| E-40 | Jumping frequency 2 | 0.00～400.0Hz(Fmax) | 0.00 | ● | 70 | 128H |
| E-41 | Jumping frequency 3 | 0.00～400.0Hz(Fmax) | 0.00 | ● | 70 | 129H |
| E-42 | Jumping frequency range | 0.00～5.00Hz | 0.00 | ● | 70 | 12AH |
| E-43 | Fault auto-restore times | 0:close<br>1～3:open | 0 | ● | 71 | 12BH |
| E-44 | Fault auto-restore waiting times | 0.1～20.0 second | 1.0 | ● | 71 | 12CH |
| E-45 | Warm-up time | 0.0～6500 second | 0.0 | ● | 72 | 12DH |
| E-46 | Running direction options | 0:Comply with the default direction<br>1:Contra with the default direction<br>2: Forbidden reverse running | 0 | ○ | 72 | 12EH |
| E-47 | Positive/Negative rotation dead time | 0.0～10.0 second | 0.0 | ● | 73 | 12FH |
| E-48 | Cooling fan running options | 0: Fans runs after power on<br>1: Fans runs relate with | ※ | ● | 73 | 130H |

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|---|---|---|---|---|---|---|
| | | temperature in stop mode, fans runs during running mode<br>2:fans stop when stop mode, fans runs relate with temperature in run mode. | | | | |
| E-49 | Frequency inverter protection mode options | LED 0 digit: overvoltage stall protection options<br>0:invalid 1:valid<br>LED 10 digit:earth short-circuit protection detection<br>0:invalid 1:valid<br>LED 100 digit:nput Open-Phase protection options<br>0:invalid 1:valid<br>LED 1000 digit:inverter over-loading and over-temperature protection options<br>0:free close-down<br>1:current limiting running | 0※11 | ● | 74 | 131H |
| E-50 | Electronic heat-sensitive coefficient setting values | 30%～120%(Less than 30, the functional invalid) | 0 | ● | 75 | 132H |
| E-51 | Stall protection current limitation values. | 100%～250% | 160 G<br>120 P | ● | 75 | 133H |
| E-52 | Stall protection bus voltage values | 110～150% | 128% | ● | 76 | 134H |
| E-53 | Energy-consumed braking action voltage values | 110～150% | 122% | ● | 76 | 135H |
| E-54 | Dynamic braking action ratio | 0～100% | 80% | ● | 76 | 136H |
| E-55 | Bus undervoltage protection values | 60～90% | 65% | ● | 77 | 137H |
| E-56 | Motor rated voltage | 100～1140V | ※ | ○ | 77 | 138H |
| E-57 | Motor rated current | 0.1～1000A | ※ | ○ | 77 | 139H |
| E-58 | Motor rated frequency | 25.00～400.0Hz | 50.00 | ○ | 77 | 13AH |
| E-59 | Motor rated rotating speed | 0～65000 | 1460 | ● | 77 | 13BH |
| E-60 | Frequency inverter output voltage ratio | 50～100% | 100% | ○ | 78 | 13CH |

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|---|---|---|---|---|---|---|
| E-61 | G/P models setting | 0:G model<br>1:P model | 0 | ○ | 78 | 13DH |
| E-62 | Speed tracking stability time | 0.20～10.00 seconds | 0.60 | ● | 78 | 13EH |
| E-63 | Parameters change protection | 0:all parameters can be changed<br>1:only keyboard numbers setting can be changed<br>2:all the parameters prohibit being changed | 0 | ● | 78 | 13FH |
| E-64 | Parameter initialization | 0:No operation<br>1:restore factory setting<br>2:clear fault memory<br>3: Pamemerats of VFD sent to keypad and storage<br>4:Parameters of keypad sending to VFD and storage | 0 | ○ | 79 | 140H |
| E-65 | Factory password | 0～9999 | 0 | ● | 79 | 141H |
| E-66 | Information inquiry | 0:no operation<br>1:state monitoring inquiries<br>2:fault information inquiries | 0 | ● | 79 | 142H |
| E-67 | Disturbance restrain optio | LED 0 digit:restrain over-voltage disturbance<br>0:invalid 1:valid<br>LED 10 digit:restrain SC disturbance<br>0:invalid 1:valid<br>LED 100 digit:restrain over-current disturbance<br>0:invalid 1:valid<br>LED 1000 digit:reserved | 0001 | ● | 83 | 143H |

**6.2 Exterior terminal functional parameters Exterior terminals parameter:**

| serial number | Function description | range of setting and meaning | Factory setting | Modification limitation | Reference page | Communication coding |
|---|---|---|---|---|---|---|
| F-01 | Input signal options 1（X1） | 0:invalid<br>1:positive jog operation<br>2:Negative jog operation<br>3:free stop<br>4:fault reset<br>5:multi-step speed contol1<br>6:multi-step speed contol2 | 1 | ○ | 83 | 201H |

| | | | | | | |
|---|---|---|---|---|---|---|
| F-02 | Input signal options 2（X2） | 7:multi-step speed contol3<br>8:multi-step speed contol4<br>9:ascend/descent running frequency increase progressively UP<br>10:ascend /descent Running frequency decrease progressively DW<br>11:trilinear operation mode control<br>12:PID control cancel<br>13:exterior fault alarm<br>14:acceleration and deceleration time selection terminal 1<br>15:acceleration and deceleration time selection terminal 2<br>16:frequency setting channel selection terminal1<br>17:frequency setting channel selection termina2<br>18:frequency setting channel selection terminal3<br>19:frequency setting channel selection terminal4<br>20:program running suspension<br>21:program running restart<br>22:timer trigger terminal<br>23:timer reset terminal<br>24:Counter reset terminal<br>25:Counter clock input terminal | 2 | ○ | 83 | 202H |
| F-03 | Input signal options 3（X3） | | 3 | ○ | 83 | 203H |
| F-04 | Input signal options 4（X4） | | 4 | ○ | 83 | 204H |
| F-05 | Input signal options 5（X5） | | 5 | ○ | 83 | 205H |
| F-06 | Input signal options 6（X6） | | 6 | ○ | 83 | 206H |
| F-07 | Input signal action mode selection | LED 0 digit:free close-down restore mode<br>0:after the disconnection, restore the original order<br>1:after the disconnection, no restore the original order | 1001 | ○ | 85 | 207H |

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|---|---|---|---|---|---|---|
| | | LED 10 digit:ascend /descent terminal control frequency setting<br>0:UP / DW terminals regulate after running<br>1:back to the last shutdown instantaneous frequency, then UP / DW regulate<br>2:First to [F-70], then UP / DW regulate<br>LED 100 digit:keyboard STOP/RESET button effective range selection<br>0:only keyboard control effective<br>1:all control mode effective<br>LED 1000 digit:after fault reset, terminal operation mode selection<br>0:erminal control can restart directly<br>1:terminal control,first close-down before startup | | | | |
| F-08 | Terminal operation control mode selection | 0:standard operation control<br>1:double-line operation mode control 1.<br>2:trilinear operation mode control 2.<br>2:trilinear operation mode control 3. | 0 | ○ | 86 | 208H |
| F-09 | 1 step speed setting 1X | 0.00Hz～upper limit frequency | 20.00 | ● | 88 | 209H |
| F-10 | 2 step speed setting 2X | | 10.00 | ● | 88 | 20AH |
| F-11 | 3 step speed setting 3X | | 15.00 | ● | 88 | 20BH |
| F-12 | 4 step speed setting 4X | | 20.00 | ● | 88 | 20CH |
| F-13 | 5 step speed setting 5X | | 25.00 | ● | 88 | 20DH |
| F-14 | 6 step speed setting 6X | | 30.00 | ● | 88 | 20EH |
| F-15 | 7 step speed setting 7X | | 35.00 | ● | 88 | 20FH |
| F-16 | 8 step speed setting 8X | | 40.00 | ● | 88 | 210H |
| F-17 | 9 step speedsetting 9X | | 45.00 | ● | 88 | 211H |
| F-18 | 10 step speed setting 10X | | 50.00 | ● | 88 | 212H |

| | | | | | | |
|---|---|---|---|---|---|---|
| F-19 | 11 step speed setting 11X | 0.00Hz～upper limit frequency | 30.00 | ● | 88 | 213H |
| F-20 | 12 step speed setting 12X | | 35.00 | ● | 88 | 214H |
| F-21 | 13 step speed setting 13X | | 40.00 | ● | 88 | 215H |
| F-22 | 14 step speed setting 14X | | 45.00 | ● | 88 | 216H |
| F-23 | 15 step speed setting 15X | | 50.00 | ● | 88 | 217H |
| F-24 | Acceleration time2 | 0.1～6500.0 seconds | ※ | ● | 89 | 218H |
| F-25 | Deceleration time2 | | ※ | ● | 89 | 219H |
| F-26 | Acceleration time3 | | ※ | ● | 89 | 21AH |
| F-27 | Deceleration time3 | | ※ | ● | 90 | 21BH |
| F-28 | Acceleration time4 | | ※ | ● | 90 | 21CH |
| F-29 | Deceleration time4 | | ※ | ● | 90 | 21DH |
| F-30 | Relay output terminal TA,TB,TC | 0:zero frequency (standby mode)<br>1:fault jump alarm 1(fault auto-restoration period alarm)<br>2:fault jump alarm 2(fault auto-restoration period no alarm<br>3:frequency arrive detection<br>4:frequency level signal detection<br>5:be operating<br>6:reverse operation<br>7:frequency undervoltage<br>8:overload pre-alarm<br>9:output frequency reach upper frequency limit<br>10:output frequency reach lower frequency limit<br>11:exterior fault shut-down<br>12:timer times up<br>13:Counter reach maximum value | 1 | ● | 90 | 21EH |
| F-31 | Output terminal Y1 | | 4 | ● | 90 | 21FH |

| | | | | | | |
|---|---|---|---|---|---|---|
| F-32 | Output terminal Y2 | 14:Counter reach setting value<br>15:PID feedback quantity upper limit alarm<br>16:PID feedback quantity lower limit alarm<br>17:sensor disconnect<br>18:program operation cycle period accomplish<br>19:program operation step accomplish | 7 | ● | 90 | 220H |
| F-33 | Frequency range can be detected | 0.00～50.00Hz | 1.00 | ● | 92 | 221H |
| F-34 | Output frequency detection range | 0.00～400.0Hz | 30.00 | ● | 92 | 222H |
| F-35 | Output frequency detection delay time | 0.0～20.0 second | 0.0 | ● | 92 | 223H |
| F-36 | Overload pre-alarm range | 50～200% | 150 | ● | 92 | 224H |
| F-37 | Overload pre-alarm delay time | 0.0～20.0 second | 1.0 | ● | 92 | 225H |
| F-38 | Timer setting values | 1～65000 second | 1 | ● | 93 | 226H |
| F-39 | Counter maximum Value | 1～65000 | 1000 | ● | 93 | 227H |
| F-40 | Counter setting Value | 1～Counter maximum value | 100 | ● | 93 | 228H |
| F-41 | VS1 terminal input Voltage lower limit | 0.00V～［F-42］ | 0.50 | ● | 93 | 229H |
| F-42 | VS1 terminal input Voltage upper limit | ［F-41］～10.00V | 9.50 | ● | 93 | 22AH |
| F-43 | VS1 terminal input Voltage gain | 0.01～5.00 | 1.00 | ● | 93 | 22BH |
| F-44 | VS2 terminal input Voltage lower limit | -10.0V ～ ［F-45］ | 0.5 | ● | 94 | 22CH |
| F-45 | VS2 terminal input voltage upper limit | ［F-44］～10.0V | 9.5 | ● | 94 | 22DH |
| F-46 | VS2 terminal input Voltage gain | 0.01～5.00 | 1.00 | ● | 94 | 22EH |
| F-47 | VS2 terminal input Zero offset | -1.00V～1.00V | 0.00 | ● | 94 | 22FH |

| | | | | | | |
|---|---|---|---|---|---|---|
| F-48 | VS2 terminal input Bipolar adjust&direction control | 0:both invalid 1:both valid 2:bipolar adjust valid,but direction control invalid | 0 | ● | 94 | 230H |
| F-49 | VS2 terminal input bipolar control zero hysteresis band | 0.00V～3.00V | 0.20 | ● | 94 | 231H |
| F-50 | AS terminal input current lower limit | 0.00mA～［F-51］ | 4.20 | ● | 96 | 232H |
| F-51 | AS terminal input current upper limit | ［F-50］～20.0mA | 19.50 | ● | 96 | 233H |
| F-52 | AS terminal input current gain | 0.01～5.00 | 1.00 | ● | 96 | 234H |
| F-53 | Impulse input frequency lower limit | 0.00KHz～［F-54］ | 0.00 | ● | 96 | 235H |
| F-54 | Impulse input frequency upper limit | ［F-53］～50.00KHz | 10.00 | ● | 96 | 236H |
| F-55 | Impulse input frequency gain | 0.01～5.00 | 1.00 | ● | 97 | 237H |
| F-56 | Input frequency lower limit setting | 0.00Hz～［F-57］ | 0.00 | ● | 97 | 238H |
| F-57 | Input frequency upper limit setting | ［F-56］～maximum frequency | 50.00 | ● | 97 | 239H |
| F-58 | Input signal Characteristics selection | LED 0 digit:VS1 input characteristic selection<br>0:positive characteristic<br>1:negative characteristic<br>LED 10 digit:AS input Characteristic selection<br>0:positive characteristic<br>1:negative characteristic<br>LED 100 digit:VS2 input Characteristic selection<br>0:positive characteristic<br>1:negative characteristic<br>LED 1000 digit:impulse input characteristic selection<br>0:positive characteristic<br>1:negative characteristic | 0000 | ● | 97 | 23AH |
| F-59 | Terminal analog input filter time constant | 0.01～5.00 second | 0.50 | ● | 98 | 23BH |

| | | | | | | |
|---|---|---|---|---|---|---|
| F-60 | Output terminal(AO1) selection | 0:output signal close<br>1:output frequency/speed<br>2:output current<br>3:given frequency/speed<br>4:PID given quantity<br>5:PID feedback quantity<br>6:DC bus voltage<br>7:output voltage | 1 | ● | 98 | 23CH |
| F-61 | Output terminal(AO2) selection | | 3 | ● | 98 | 23DH |
| F-62 | (AO2)output signal selection | 0:frequency pulse output<br>1:0～20mA<br>2:4～20mA<br>3:0～10V | 3 | ● | 99 | 23EH |
| F-63 | (AO1)output signal gain | 25%～200% | 100 | ● | 100 | 23FH |
| F-64 | (AO2)output signal gain | 25%～200% | 100 | ● | 100 | 240H |
| F-65 | (AO1)output signal zero adjustment | -10.0%～10.0% | 0 | ● | 100 | 241H |
| F-66 | (AO2)output signal Zero adjustment | -10.0%～10.0% | 0 | ● | 100 | 242H |
| F-67 | Keyboard potentiometer input voltage lower limit | 0.00V～[F-68] | 0.20 | ● | 100 | 243H |
| F-68 | Keyboard potentiometer input voltage upper limit | ［F-67］～5.50V | 4.8 | ● | 100 | 244H |
| F-69 | Keyboard potentiometer gain | 0.50～5.00 | 1.00 | ● | 100 | 245H |
| F-70 | Ascend/descend terminal preset frequency | 0.00Hz～frequency upper limit | 0.00 | ● | 100 | 246H |
| F-71 | Reserve | | | | 101 | 247H |

**6.3 Special function parameters Special functions parameter**

| Series number | Function description | Range of setting values and meaning | Factory setting | Modification limitation | Reference page | Communication coding |
|---|---|---|---|---|---|---|
| H-01 | Free-setting voltage V1 | 0.0% ～［H-03］ | 3.0 | ○ | 101 | 301H |
| H-02 | Free-setting frequency F1 | 0.0Hz～［H-04］ | 1.00 | ○ | 101 | 302H |
| H-03 | Free-setting voltage V2 | ［H-01～H-05］ | 28.0 | ○ | 101 | 303H |
| H-04 | Free-setting frequency F2 | ［H-02～H-06］ | 10.00 | ○ | 101 | 304H |
| H-05 | Free-setting voltage V3 | ［H-03～H-07］ | 55.0 | ○ | 101 | 305H |
| H-06 | Free-setting frequency F3 | ［H-04～H-08］ | 25.00 | ○ | 101 | 306H |

| | | | | | | |
|---|---|---|---|---|---|---|
| H-07 | Free-setting voltage V4 | ［H-05～H-09］ | 80.0 | ○ | 101 | 307H |
| H-08 | Free-setting frequency F4 | ［H-06～H-10］ | 37.50 | ○ | 101 | 308H |
| H-09 | Free-setting voltage V5 | ［H-07］～100.0% | 100.0 | ○ | 101 | 309H |
| H-10 | Free-setting frequency F5 | ［H-08］～maximum frequency | 50.00 | ○ | 101 | 30AH |
| H-11 | PID output characteristic | 0:positive characteristic<br>1:negative characteristic | 0 | ○ | 102 | 30BH |
| H-12 | PID controller signal reference source | 0:keyboard potentiometer<br>1:PID keyboard number given<br>2:exterior terminal VS1:0～10V<br>3:exterior terminal AS:4～20mA<br>4:exterior terminal VS2 (Bipolar Failure)<br>5:exterior terminal pulse signal<br>6:RS485 interface setting | 1 | ○ | 103 | 30CH |
| H-13 | PID controller feedback signal source | 0:exterior terminal VS1:0～10V<br>1:exterior terminal AS:4～20mA<br>2:exterior terminal VS2 (bipolar failure)<br>3:exterior terminal pulse signal | 1 | ○ | 103 | 30DH |
| H-14 | PID preset frequency | 0.00HZ～upper frequency limit | 0.00 | ● | 103 | 30EH |
| H-15 | PID preset frequency operation time | 0.1～6500.0 second | 0.0 | ● | 103 | 30FH |
| H-16 | PID keyboard number given | 0.0～100.0% | 50.0 | ● | 104 | 310H |
| H-17 | Feedback channel gain | 0.01～5.00 | 1.00 | ● | 104 | 311H |
| H-18 | Sensor maximum measuring range | 1.0～100.0 | 100.0 | ● | 104 | 312H |
| H-19 | Proportion gain P | 0.1～100.0 | 20.0 | ● | 105 | 313H |
| H-20 | integral time I | 0.1～100.0 second | 2.0 | ● | 105 | 314H |
| H-21 | Differential gain D | 0.0～10.0 | 0.0 | ● | 105 | 315H |
| H-22 | Sampling period | 0.01～60.00 second | 0.10 | ● | 105 | 316H |
| H-23 | PID control deviation limit | 0.0～20.0% | 0.0 | ● | 105 | 317H |
| H-24 | Start Threshold | 0.0%～dormancy Threshold | 0.0 | ● | 106 | 318H |
| H-25 | Dormancy Threshold | Start Threshold～100.0% | 100.0 | ● | 106 | 319H |
| H-26 | Alarm upper limit value | Alarm lower limit value～100.0% | 100.0 | ● | 107 | 31AH |
| H-27 | Alarm lower limit value | 0.0%～Alarm upper limit value | 0.0 | ● | 107 | 31BH |

| | | | | | | |
|---|---|---|---|---|---|---|
| H-28 | Sensor disconnection detection values | 0.0～20.0% | 0.0 | ● | 107 | 31CH |
| H-29 | Sensor disconnection alarm operation selection | 0:Continued operation<br>1:close-down | 0 | ● | 107 | 31DH |
| H-30 | Upper limit demarcative values | lower limit demarcative values～100.0% | 100.0 | ● | 108 | 31EH |
| H-31 | lower limit demarcative value | 0.0%～Upper limit demarcative values | 0.0 | ● | 108 | 31FH |
| H-32 | Program run mode | 0:single cycle (time in seconds)<br>1:continuous cycle (time in seconds)<br>2:single cycle,continuous running (time in seconds)<br>3:single cycle (time in minute)<br>4:continuous cycle (time in minute)<br>5:single cycle,continuous running(time in minute) | 0 | ○ | 108 | 320H |
| H-33 | Program breakpoint restore mode selection | 0:operation according to the first step speed<br>1:re-timing and running according to the be interrupted running frequency<br>2:running according to the residue time after being interrupted running frequency | 0 | ○ | 109 | 321H |
| H-34 | In program run state, power off storage selection | 0:Power off without storage<br>1:Power off with storage | 0 | ○ | 110 | 322H |
| H-35 | First step speed direction and ace&dece time | 0:Forward Rotating; acceleration time 1/deceleration time 1<br>1:Forward Rotating; acceleration time 2/deceleration time 2<br>2:Forward Rotating; acceleration time 3/deceleration time 3<br>3:Forward Rotating; acceleration time 4/deceleration time 4<br>4:Reverse Rotating; | 0 | ● | 110 | 323H |
| H-36 | Second step speed direction and ace&dece time | | 1 | ● | 110 | 324H |
| H-37 | Third step speed direction and ace&dece time | | 2 | ● | 110 | 325H |
| H-38 | Fourth step speed direction and ace&dece time | | 3 | ● | 110 | 326H |
| H-39 | Fifth step speed direction and ace&dece time | | 4 | ● | 110 | 327H |
| H-40 | Sixth step speed direction and ace&dece time | | 5 | ● | 110 | 328H |

| | | | | | | |
|---|---|---|---|---|---|---|
| H-41 | Seventh step speed direction and ace&dece time | acceleration time 1/deceleration time 1<br>5:Reverse Rotating; acceleration time2/ deceleration time 2<br>6:Reverse Rotating acceleration time 3/deceleration time 3<br>7:Reverse Rotating; acceleration time 4/deceleration time 4 | 6 | ● | 110 | 329H |
| H-42 | Eighth step speed direction and ace&dece time | | 7 | ● | 110 | 32AH |
| H-43 | Ninth step speed direction and ace&dece time | | 0 | ● | 111 | 32BH |
| H-44 | Tenth step speed direction and ace&dece time | | 1 | ● | 111 | 32CH |
| H-45 | Eleventh step speed direction and ace&dece time | | 2 | ● | 111 | 32DH |
| H-46 | Twelfth step speed direction and ace&dece time | | 3 | ● | 111 | 32EH |
| H-47 | 13th step speed direction and ace&dece time | | 4 | ● | 111 | 32FH |
| H-48 | 14th step speed direction and ace&dece time | | 5 | ● | 111 | 330H |
| H-49 | 15th step speed direction and ace&dece time | | 6 | ● | 111 | 331H |
| H-50 | First step speed operation time T1 | 0.0～6000 second(minute) | 10.0 | ● | 111 | 332H |
| H-51 | 2nd step speed operation time T2 | | 10.0 | ● | 111 | 333H |
| H-52 | 3rd step speed operation time T3 | | 10.0 | ● | 111 | 334H |
| H-53 | 4th step speed operation time T4 | | 10.0 | ● | 111 | 335H |
| H-54 | 5th step speed operation time T5 | | 10.0 | ● | 117 | 336H |
| H-55 | 6th step speed operation time T6 | | 10.0 | ● | 111 | 337H |
| H-56 | 7th step speed operation time T7 | | 10.0 | ● | 111 | 338H |
| H-57 | 8th step speed operation time T8 | | 10.0 | ● | 111 | 339H |
| H-58 | 9th step speed operation time T9 | | 10.0 | ● | 111 | 33AH |
| H-59 | 10th step speed operation time T10 | | 10.0 | ● | 111 | 33BH |
| H-60 | 11th step speed operation time T11 | | 10.0 | ● | 111 | 33CH |
| H-61 | 12th step speed operation time T12 | | 10.0 | ● | 112 | 33DH |
| H-62 | 13th step speed operation time T13 | | 10.0 | ● | 112 | 33EH |

| | | | | | | |
|---|---|---|---|---|---|---|
| H-63 | 14th step speed operation time T14 | | 10.0 | ● | 112 | 33FH |
| H-64 | 15th step speed operation time T15 | | 10.0 | ● | 112 | 340H |
| H-65 | Differential frequency △f in swing frequency operation | 0.00～20.00Hz | 2.00 | ● | 112 | 341H |
| H-66 | Linkage main station setting | 0:this machine is linkage slave station<br>1:main station mode 1<br>2: main station mode 2 | 0 | ● | 113 | 342H |
| H-67 | Machine addresses | 1～247 | 1 | ● | 113 | 343H |
| H-68 | Data format | 0:non verifying(N,8,1)<br>1:even verifying(E,8,1)<br>2:odd verifying(O,8,1)<br>3:non verifying(N,8,2) | 3 | ○ | 113 | 344H |
| H-69 | Baud rate | 0:1200 bps<br>1:2400bps<br>2:4800 bps<br>3:9600bps<br>4:19200bps | 3 | ○ | 113 | 345H |
| H-70 | Communication setting frequency ratio | 0.01～5.00 | 1.00 | ● | 113 | 346H |
| H-71 | Communications timeout time | 0.0～6500.0 second | 10.0 | ● | 113 | 347H |
| H-72 | RS485 Communication disconnection action mode | 0:close-down<br>1:Continued operation | 0 | ● | 114 | 348H |
| H-73 | Response delayed | 0.001～1.000 second | 0.005 | ● | 114 | 349H |
| H-74 | Moment stop deceleration voltage lower | 0%～200% | 20% | ● | 114 | 34AH |
| H-75 | Moment stop deceleration voltage upper | 0%～200% | 90% | ● | 114 | 34BH |
| H-76 | Moment stop deceleration benefit | 0.01～10.00 | 2.00 | ● | 114 | 34CH |
| H-77 | Voltage recover steady time | 0.0～100.0s | 2.0s | ● | 114 | 34DH |
| H-78 | reserved | | | | 114 | 34EH |
| H-79 | reserved | | | | 114 | 34FH |
| H-80 | reserved | | | | 114 | 350H |

# Chapter 7: Function Parameters Detailed Specification

**7.1 Basic parameters detailed specification**

| E-01 | Running command reference channel selection | Range :0～2 | Factory setting:0 |
|---|---|---|---|

Select channels which are used to accept operation and stop orders and the running direction. When restore factory setting,the setting values can not be changed.

0:Keyboard control The operation,stop and direction of the frequency inverter is controlled by the rotating operation keys FWD , reverse operation or jog keys REV / JOG and parking key STOP / RESET above the Keyboard. REV / JOG key parameters is defined as reversion when the [E-08] set to "0", is defined as jog when the parameters **[E-08]** set to "1", see **[E-08]**.

1:Terminal control The operation, stop and direction of the frequency inverter is controlled by whether connect the control terminal: Forward Rotating **(FWD)**or reverse**(REV)** to **(COM)**or not.

2:RS485 Communication The operation,stop and direction of the frequency inverter is control by the signal which receive by the RS485 communication port.

**Attention:When the fault reset,the STOP / RESET button above the keyboard,control terminal reset order ,S485 communication port are effective reset orders.**

**Tips：1.hen program control, (VS2) terminal input bipolar adjustment, and direction control are valid([F-48] setting is 1),the operation direction of the frequency inverter can not be control by this orders channel.**

**2.he STOP / RESET key above the keyboard is function selectable. Under exterior terminal control or communication control, it can be defined as urgent stop key, please reference the parameters [F-07]; Under exterior terminal operation control, if use STOP / RESET to stop, the exterior terminal operation orders will be blocked while the inverter close-down at the same time. At this moment, you need to unlock exterior terminal close-down order, then the exterior operation order will be valid again. It is same with the communication control.**

**3.Under keyboard control, the direction order of the exterior terminals (REV) precede over the direction order of the keyboard; that is, when (REV) and (COM) is connected, the operation direction given by the keyboard order is conversed, and restore the original operation direction after disconnection.**

| E-02 | Frequency reference main channel selection | range：0～12 | Factory Setting: 1 |
|---|---|---|---|

It is used to select the main input channel for the frequency inverter given frequency, which directly controls or affects the output frequency. Terminal**(VS2)**voltage signal and program control channel will

also directly control the operation direction of the frequency inverter. When restoring the factory settomg, the parameter values will not be changed.

0:Keyboard number given The given frequency of the main channel is determined and amended by the parameters **[E-16]**. When inverter is on operating state or close down state , the current setting values of the parameters **[E-16]** can directly be amended through the Up-down key.

1:Keyboard potentiometer The given frequency of the main channel is determined and amended by the potentiometer above the keyboard.

2::Terminal VS1 voltage signal 0～10V The given frequency of the main channel is determined and amended by the input analog quantity of the control terminal **(VS1)**;If you want more detail about the corresponding relation of the input analog quantity and frequency and input analog quantity filtering time ,please refer to parameter ［**F-41,F-42,F-43,F-56,F-57,F-58**］.

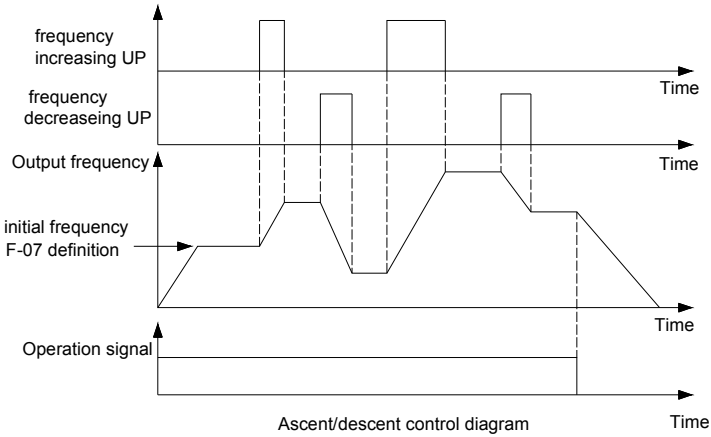
3:Terminal AS current signal 4～20mA The given frequency of the main channel is determined and amended by the input analog quantity of the control terminal **(VS);** If you want more detail about the corresponding relation of the input analog quantity and frequency and input analog quantity filtering time ,please refer to parameter ［**F-50,F-51,F-52,F-56,F-57, F-58**］.

4:Terminal VS2 voltage signal -10～10V The given frequency of the main channel is determined and amended by the input analog quantity of the control terminal **(VS2);** If you want more detail about the corresponding relation of the input analog quantity and frequency, the direction of the inverter and input analog quantity filtering time ,please refer to parameter ［**F-44,F-45,F-46,F-47,F-48,F-49,F-56,F-57,F-58**］.

5:Terminal pulse signal The given frequency of the main channel is determined and amended by the pulse signal input of the control terminal **(PUL);** If you want more detail about the corresponding relation of the input analog pulse signal and frequency, please refer to parameter ［**F-53,F-54,F-55,F-56,F-57,F-58**］.

6:RS485 communication port The given frequency of the main channel is controlled by the signal which is received through the RS485 communication port**(A+)and(B-)**.

7:Ascend, descend control The given frequency of the main channel is controlled by whether connect the frequency ascending terminal UP and descending terminal DW to (COM) or not. Any one of multi-function terminal **(X1～X6)** can be separately defined as frequency ascending terminal or descending terminal , please refer to parameter ［**F-01～F-06**］for more detail；Ascend and descend can carry out the initial frequency mode setting, please refer to parameter［**F-07**］**LED "10" digit** options and ［**F-70**］




Ascent/descent control diagram

8:Normal PID operation If you select this channel, it can constitute normal PID closed-loop control system. The parameter**[H-16]** can be modified by Up-down key.

9:Constant pressure PID control If select this channel, it can constitute constant pressure PID control(constant pressure supply water etc.)closed-loop control system.The parameter**[H-16]** can be modified by Up-down key.

10:Program running The given frequency of the main channel and the running direction of the frequency inverter is controlled by the process of simple PLC which inside the frequency inverter, maximum process control is 15 steps speed; Details sees parameters **[E-13, E-14, F-09 ~ F-29, H-32 ~ H-64].**

Program running command as start or stop is decided by the given value of the running order given channel.

When one step speed running time is set as “0”, the running program will skip over this step. It is easy to set up all steps speed of program running.

When the parameter **[E-46]** is set as "2" and forbid reverse; if running direction is set as reverse in a step speed, then the frequency inverter works with "0" frequency when arriving at that section speed.

Program running and multi-step speed operation are designed to achieve inverter variable-speed operation under a certain laws. Among the multi-step operation, multi-steps speed switch and running direction change are achieved through the different combinations of exterior multi steps speed control terminal**(such as X1,X2,X3,X4)**and**(FWD),(REV)**with**(COM)**. Not only a circle of multi-step frequency can be defined in the function parameter, but also multi-step frequency operation time、direction and circulating mode can be defined in the function parameter.

11:Swing frequency running Output frequency periodically changes by pre-set dece&acce time. This function is particularly compliant to the system of the textile industry in which the rotational speed changes according to the diameter difference between the before and behind copper tube.

12:Terminal selection The main channel for given frequency is selected by the frequency selection terminal, refer to the parameter［**F-01～F-06**］The corresponding relationship of terminal

mode and frequency setting channel is shown in the follow diagram:

| Frequency Setting selection terminal 4 | Frequency Setting selection terminal 3 | Frequency Setting selection terminal 2 | Frequency Setting selection terminal 1 | Frequency setting channel |
|---|---|---|---|---|
| OFF | OFF | OFF | OFF | Keyboard number setting |
| OFF | OFF | OFF | ON | keyboard potentiometer |
| OFF | OFF | ON | OFF | Terminal**(VS1)**voltage signal |
| OFF | OFF | ON | ON | Terminal**(AS)**current signal |
| OFF | ON | OFF | OFF | Terminal**(VS2)**voltage signal |
| OFF | ON | OFF | ON | Terminal pulse signal |
| OFF | ON | ON | OFF | RS485 communication port |
| OFF | ON | ON | ON | ascend ,descend control |
| ON | OFF | OFF | OFF | Normal PID operation |
| ON | OFF | OFF | ON | constant pressure control |
| ON | OFF | ON | OFF | Program run |
| ON | OFF | ON | ON | swing frequency operation |

**Tips:Valid frequency selection terminals combinations are 0 to 11 (10 digits). If not in this range, frequency inverter output 0 frequency; "OFF" in the table means corresponding terminal and (COM) disconnected. "ON" means corresponding terminal and (COM) short connect.**

| **E-03** | **Frequency reference auxiliary channel selection** | **range：0 ～ 10** | **Factory Setting:0** |
|---|---|---|---|

［**E-03**］is use to select the auxiliary input channels of the give frequency. If you need more details about the combination method of the auxiliary channel and the main channel, please refer to **[E-05].**

0:Keyboard number given The given frequency of the auxiliary channel is determined and amended by the Up/down key on the keyboard or parameters［**E-16**］

1:Keyboard potentiometer The given frequency of the auxiliary channel is determined and amended by the potentiometer on the keyboard.

2:Terminal VS1 voltage 0～10V The given frequency of the auxiliary channel is determined and amended by the control panel analog quantity input terminal **(VS1).**

3:Terminal AS current 4～20mA The given frequency of the auxiliary channel is determined and amended by the control panel analog quantity input terminal **(AS).**

4:Terminal VS2 voltage -10～10V The given frequency of the auxiliary channel is determined and amended by the control panel analog quantity input terminal **(VS2).**

5:Terminal pulse signal The given frequency of the auxiliary channel is determined and amended by the control panel signal input terminal **(PUL).**

6:RS485 communication port The given frequency of the auxiliary channel is control by the signal which is received through the RS485 communication port**(A+)and(B-)**..

7:Ascend 、descend control The given frequency of the auxiliary channel is control by the connection and disconnection between the frequency ascending terminal UP, descending terminal DW and(COM); Any one of multi-function terminal **(X1～X6)** can separately be defined as frequency ascending terminal and descending terminal , please refer to parameter **［F-01～F-06］** for more detail;For the initial frequency mode setting in ascend and descend control, please refer to **［F-07］ LED "10"**digit options and **［F-70］**

8:Normal PID operation If you select this channel, it can constitute normal PID closed-loop control system and parameter**[H-16]**setting can be set by Up/down key on the keyboard.

9:Constant pressure PID control If you select this channel, it can constitute constant pressure PID closed-loop control system and parameter**[H-16]**setting can be set by Up/down key on the keyboard.

10:Program run The given frequency of the auxiliary channel and the travel direction of the frequency inverter is controlled by the process of simple PLC inside the frequency inverter, maximum process control 15 sections speed; Details sees parameters **[E-13 ,E-14, F-09 ~ F-29, H-32 ~ H-64].**

**Tips:The main frequency given channel and the auxiliary frequency given channel can be set as the same channel. In such circumstances, the corresponding relationships between the frequency setting values and input signal are rather special, so it needs to take consider of the both characteristic. The main frequency given channel and the auxiliary frequency after Synthesizing are still limited by the upper limit frequency and lower frequency.**

| | | | |
|---|---|---|---|
| **E-04** | **Frequency reference channel gain** | **Range:0.01～5.00** | **Factory Setting: 1.00** |
| **E-05** | **Frequency reference channel combination** | **Range:0 ～ 10** | **Factory Setting:0** |

**Frequency given channel gain is** used to amplify or shrink the frequency input channel signal, to adjust the frequency value of the main channel and that of the auxiliary channel by proportion.

**Frequency given channel combination** are used to select the constitution method of main frequency input channel and auxiliary channel of the frequency inverter. "K" represents **［E-04］** setting values, "MAX" means the great one, and "MIN" means the little one.

0:main channel is valid, auxiliary channel is invalid.

1:auxiliary channel valid， main channel invalid

2:both channel non “0” value valid, main channel priority
3:main channel + (K×auxiliary channel)
4:main channel – (K×auxiliary channel)
5:MAX[main channel ,(K×auxiliary channel)]
6:MIN[main channel ,(K×auxiliary channel)]
7:auxiliary channel +(K×main channel)
8:auxiliary channel -(K×main channel)
9:MAX[(K×main channel), auxiliary channel]
10:MIN[(K×main channel), auxiliary channel]

**Tips: 1. the terminal VS2 is special only in multi-channels cases.**

**A:when no input bipolar adjustment and no direction control for terminal VS2 ([F-48]is “0”), the combination is according to [E-05] setting.**

**B: when opened input bipolar adjustment and no direction control for terminal VS2 ([F-48]is “1”), polarity frequency gived by (VS2) and frequency gived by another channel carry out symbol calculate based on the combination method selected. After calculation, the absolute value is frequency value and the symbol decides the motor direction.**

**C:When VS2 opened bipolar adjustment without direction control([F-48]is “2”), polarity frequency gived by (VS2) and frequency gived by another channel carry out symbol calculate based on the combination method selected. After calculation, the absolute value is frequency value, and [E-01] decides the motor direction.**

**2. while swing frequency operation, jog or multi-steps speed operation, auxiliary channel can not be combined.**

| | | | |
|---|---|---|---|
| **E-06** | **Keyboard first display monitoring selections** | **Range :0～7** | **Factory setting :0** |
| **E-07** | **Keyboard second display monitoring selections** | **Range :0～7** | **Factory setting :1** |

Apart used to choose the monitoring items displayed in two LED on the keyboard. In the monitoring state, the upper LED monitoring item and the lower monitoring item can also be directly modified through the SET key and OFFSET key.

0: given frequency 1:output frequency
2: input current 3: input voltage
4: output voltage 5: mechanical speed
6: PID given quantitative 7: PID feedback quantitative

When there is only one LED on the keyboard, it is invalid to modify the lower LED monitoring function by the［**E-07**］and offset key.

| E-08 | Keyboard REV/JOG key function selection | Range :0,1 | Factory setting:0 |
|---|---|---|---|

Used to select the keyboard keys REV / JOG functions.

0: Reverse This key is defined as reverse key(at this moment ,keyboard functional indicator REV / JOG do not light). When the operation order given channel is set as keyboard control, press this key ,frequency inverter will reverse.

1: Jog This key is defined as jog key(at this moment ,keyboard functional indicator REV / JOG light). When the operation given channel is set as keyboard control , press this key ,frequency inverter will jog operate.

| E-09 | Maximum frequency | Range:0.50～400.0Hz | FactorySetting:50.0 |
|---|---|---|---|
| E-10 | Upper frequency limit | Range:Lower frequency limit ～Maximum frequency | Factory Setting:50.0 |
| E-11 | Lower frequency limit | Range:0.00～Upper frequency limit | Factory Setting:0.00 |
| E-12 | Lower frequency limit Operation mode | Range:0,1 | Factory Setting:1 |

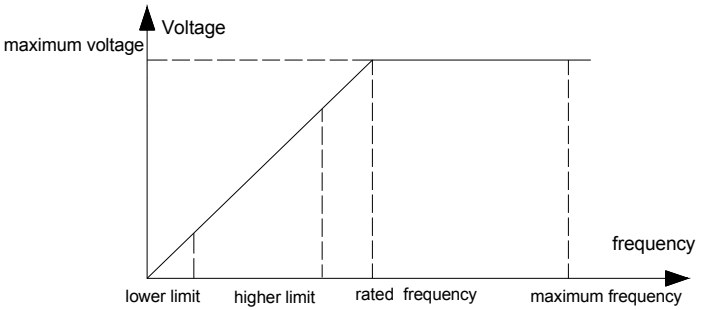
**Maximum frequency** is the highest frequency that inverter allows to set, as well as the basis of acceleration and deceleration time setting.

**Upper frequency limit** is the frequency inverter output frequency upper limit value which is set base on the highest speed of mechanical machine. When the given frequency is higher than limit, actual running frequency is upper frequency limit.

**Lower frequency limit** is the lower limit value of the frequency inverter output frequency. When the given frequency is lower than the lower limit, the actual running frequency is determined by the **［E-12］**

Maximum frequency, upper frequency limit and lower frequency limit should be cautiously set base on the nameplate parameter of actual control motor and the need of the running conditions.

Except of upper limit and lower limit, the output frequency while inverter running are limited by the parameterized value of the start-up frequency、free stop frequency、 close up DC braking initial frequency、 jump frequency and so on. The relation between maximum frequency 、upper frequency limit and lower frequency limit is shown as the follow fig.




Relationship between lower,higher limit frequency and maximum frequency

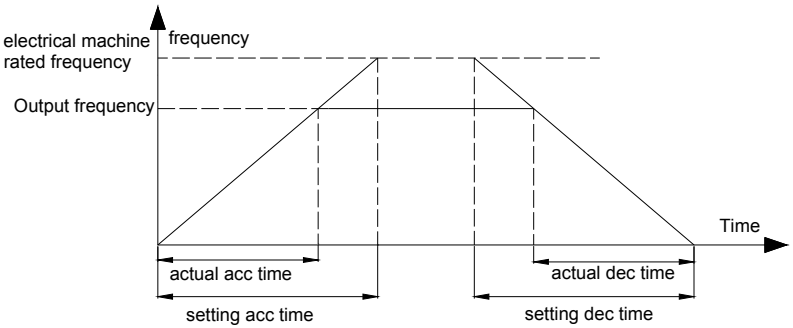
**Attention: the lower frequency limit range is invalid for jog frequency operation. Only the upper frequency limit range is valid for the jog frequency operation.**

If the lower frequency operation mode **[E-12]** is "0", when actual given frequency is lower than lower frequency limit, frequency inverter operates as 0.00Hz. If the lower frequency operation mode **[E-12]** is "1",when actual given frequency is lower than lower frequency limit, frequency inverter operates as lower frequency limit.

| | | | |
|---|---|---|---|
| **E-13** | **Acceleration time 1** | **Range:0.1～6500.0second** | **Factory Setting:※** |
| **E-14** | **Deceleration time 1** | **Range:0.1～6500.0second** | **Factory Setting:※** |

**Acceleration time 1** is the time consumed while the output frequency accelerate from 0.00Hz to the maximum frequency.

**Deceleration time 1** is the time consumed while the output frequency decelerate from the maximum frequency to 0.00Hz.



Without annotate circumstances, usually take the acceleration and deceleration time 1 as the default acceleration and deceleration time. Acceleration time is only valid for normal speed up, barring start DC braking time and start-up frequency duration; Deceleration time is only valid for the normal speed down, barring stop DC braking time;

If you choose other acceleration&deceleration time group, you must choose through the control terminal. When in the program running , it is defined as the first type of acceleration&deceleration time. Please refer to ［**F-24～F-29**］ for another three types;

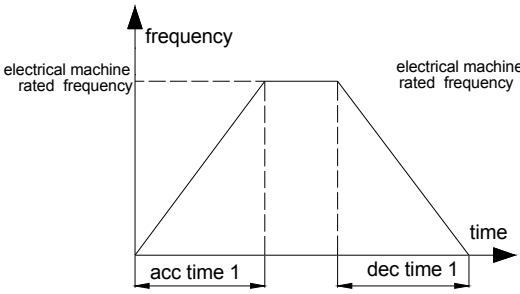
Jog acceleration/deceleration time is set by ［**E-26,E-27**］

| **E-15** | **Acceleration,Deceleration mode** | **Range:0,1** | **Factory setting: 0000** |
|---|---|---|---|

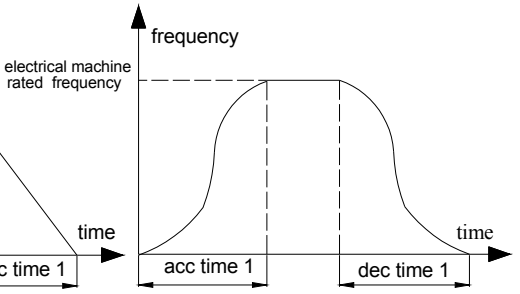
**Acceleration&deceleration mode** This series frequency inverter provide two kinds of acceleration&deceleration modes that both are valid for the normal startup/close down, positive/negative turning and acceleration/decelerate process.

0: Beeline Generally applicable to common type load

1: S curve S acceleration&deceleration curve is supplied to mitigate the noise, vibration and decrease start-stop impact while acceleration/deceleration, or supplied to diminish torque while low frequency, or supplied to accelerate in short-time while high frequency.




beeline acceleration/deceleration time diagram




S curve acceleration/deceleration time diagram

| **E-16** | **Keyboard number given frequency** | **Range :lower frequency limit～ upper frequency limit** | **Factory Setting: 50.0** |
|---|---|---|---|

When frequency given channel is keyboard number given,this parameter is used to set and amend given frequency.

There is short-cut: Frequency can be amend through the keyboard up/down key in the running or standby state, and press the set key to confirm. Parameters revised by this short-cut do not save

while power cutting.

| E-17 | V/F curve mode | Range :0～4 | Factory Setting:0 |
|---|---|---|---|
| E-18 | Torque boost | Range :0.0%～25.0% | Factory Setting: ※ |

**V/F curve mode** Used to select the type of V/F curve, in order to meet the need of different load characteristic; This series frequency inverter supply four kinds of fixed V/F curve and one kind of auto-definition V/F curve. Constant torque curve is optional for general load and descend torque curve is optional for square torque load such as water pumps, etc..

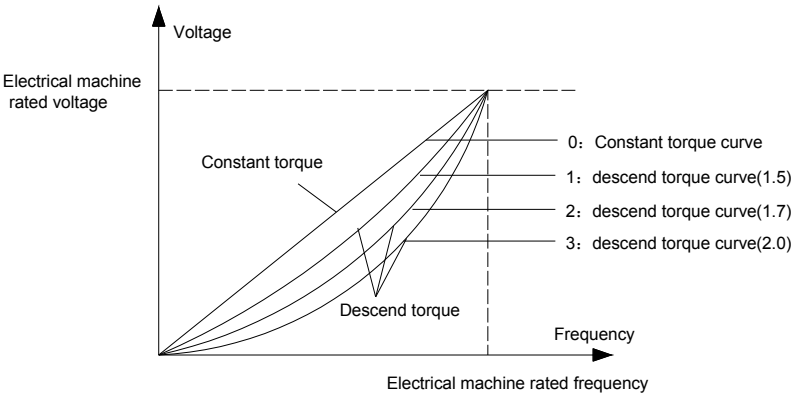
0：constant torque curve

1：descend torque curve(1.5 time)

2：descend torque curve(1.7 time)

3：descend torque curve(2.0 time)

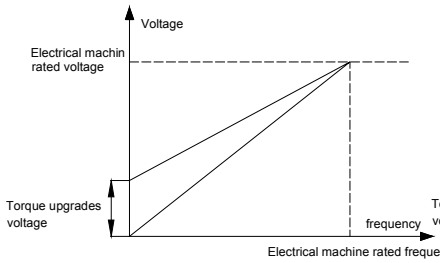
4：auto-definition curve: In this state , operation by the auto-definition curve , ［**E-18**］function invalid,users can set appropriateV/Fcurves according to the load characteristics; see ［**H-01～H-10**］**.**



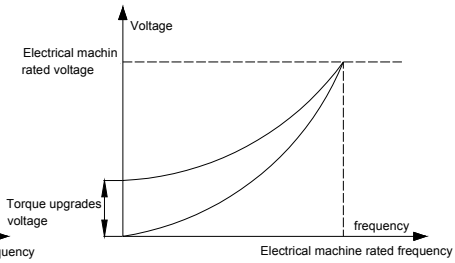

V/F curve diagram

**Torque boost** Boost compensation for the output voltage can improve the low-frequency torque characteristic of the frequency inverter. Please choose the torque enhance value according to the size of load. If the torque is enhanced too much, motor is possible overexcitation operation and overheated easily. Even worse, current fault protection will occur, or the inverter can not start normally.

When torque upgrade is set as 0.0%, frequency inverter is auto torque upgrade. Low frequency torque voltage upgrade compensation changes by follow the change of the motor stator current. The greater the stator current, the higher lower frequency torque voltage upgrades.




Constant torque curve upgrade diagram




Descend torque curve upgrade diagram

| E-20 | Carrier frequency | Range:0.07KHz～15.0KHz | Factory Setting: ※ |
|---|---|---|---|

This function is mainly used to improve situation of the noise and vibration which occur during the inverter operation possiblly. When the carrier frequency is high, the current waveform is very ideal and the motor noise is very small. It is very applicable for the place need silent operation. But at this time, the switch of the main components loss is large and machine generates large heat while efficiency decreasing and effort reducing. Meanwhile, radio interference is large. Another question of high carrier frequency operation is capacitive leakage current increasing. If there is leakage protection devices, it may cause maloperation, and may also give rise to overcurrent. When frequency carrier is low, it is contrary to the phenomenon mentioned above.

Different motors response to carrier frequency differently. The motor need to be adjusted according to the actual situation to gain the best carrier frequency. With the increase of the electrical capacity, smaller carrier frequency should be selected.

Our company reserved the right to restrict the maximum carrier frequency.

| Carrier frequency | Motor noise | jammer | Switch loss |
|---|---|---|---|
| 0.7KHz | high | low | low |
| 8.0KHz | ⇕ | ⇕ | ⇕ |
| 15.0KHz | low | high | high |

Below 3.7KW: When the carrier frequency is 6 KHz, rated current is the maximum output current.

5.5KW-22KW: When the carrier frequency is 3 KHz, rated current is the maximum output current.

30KW-75KW: When the carrier frequency is 2 KHz, rated current is the maximum output current.

Above 93KW: When the carrier frequency is 1.5 KHz, rated current is the maximum output current.

**Tips:In order to obtain better control characteristics, the ration of the carrier frequency to maximum frequency of the inverter is proposed not less than 36. If long-term work in the low frequency , frequency inverter is proposed to reduce the carrier frequency to reduce**

**the impact of the dead time**

| E-21 | Carrier characteristic | Range:0000～1111 | Factory setting: 0010 |
|---|---|---|---|

**LED 0 digit:correlative setting of carrier and output frequency**

0:Output frequency correlation invalid

1:Output frequency correlation valid

When the correlation between carrier and output frequency is valid, frequency inverter can auto-adjust the carrier frequency according to the output frequency. This function can improve low frequency performance of the frequency inverter, and can enhance torque. If cooperatively used with the torque upgrade function, the low frequency permance will be more outstanding.

**LED 10 digit:Carrier temperature correlative setting**

0:module temperature correlation is invalid

1:module temperature correlation is valid

When inverter temperatures rise, frequency inverter automatically reduces the carrier frequency; When inverter temperature reduces, carrier frequency will rise. This function can help the frequency inverter to reduce the switch loss of the power device to prevent alarms frequently for inverter overheat fault.

**LED 100 digit:PWM mode selection**

0:Fixed PWM mode　　Motor noise frequency is fixed.

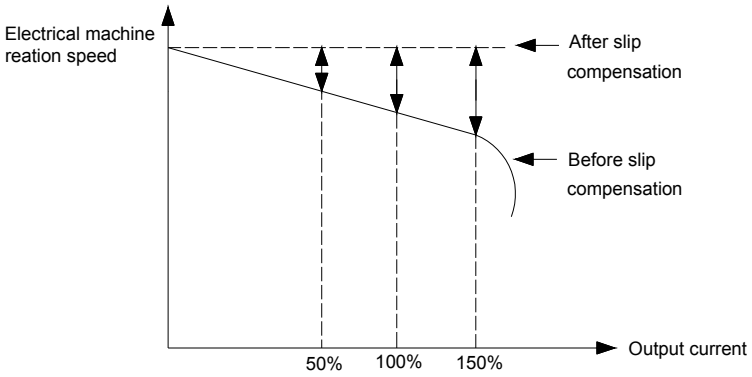
1:Random PWM mode

This mode enables the harmonic spectrum of inverter output voltage evenly distributing in a wide frequency range to inhibit the electrical noise and vibration effectively.

**LED 1000 digit:Reserved**

| E-22 | Slip frequency compensation | Range :0.0%～200% | Factory setting: 0.0% |
|---|---|---|---|

This function enables that the output frequency of the frequency inverter automatically adjust in the setting range according to the change of the load; Dynamic compensate the slip frequency, thereby,it enables the motor maintaining a constant rotate speed to reduce the load change impact on the motor speed effectively.




Slip frequency compensation diagram

If cooperate with automatic torque upgrade functions, the low frequency torque characteristic of inverter will be significantly improved. Slip frequency compensation amount should base on motor rated slip; The compensation value should not be set too high.

| E-23 | Energy saving operation selection | Range :0,1 | Factory setting:0 |
|---|---|---|---|

0:Invalid

1:Valid

In operation, inverter can auto-calculate the best output voltage to load according to the load condition to save the electricity. Electricity saving function works by reducing output voltage,enhancing the power factor and motor efficiency.

| E-24 | Automatic Voltage Regulation | Range :0,1,2 | Factory setting:0 |
|---|---|---|---|

0:Invalid

1:Omnidistance valid

2:Only invalid in deceleration

The output voltage automatic control function is AVR function. When the AVR function is invalid, the output voltage changes along with the input voltage. When AVR function is valid, so long as minimum value of the input voltage undulation is higher than the output voltage setting (motor rated voltage), it enables the output voltage maintaining the setting value. When the voltage supply is lower than the rated output voltage, the output voltage will reduce along with the input voltage drop.

| | | | |
|---|---|---|---|
| **E-25** | **Jog frequency** | **Range:0.00Hz～upper limit frequency** | **Factory setting: 5.00Hz** |
| **E-26** | **Jog acceleration time** | **Range:0.1～6500.0 second** | **Factory setting: 2.0 second** |
| **E-27** | **Jog deceleration time** | **Range:0.1～6500.0 second** | **Factory setting: 2.0 second** |

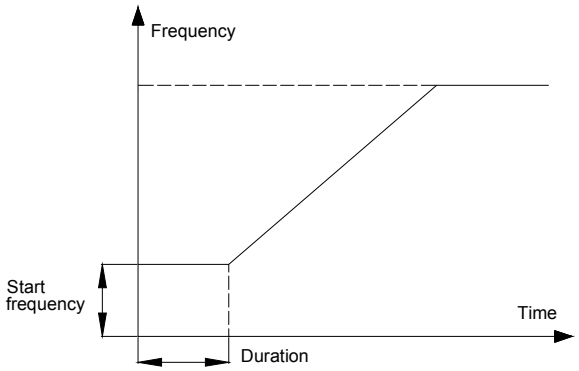
The jog frequency has the highest control priority (terminal jog). Namely under any condition, when jog instruction is valid, the inverter immediately run from the current running frequency to the jog frequency based on jog accelerates/decelerates time. The jog accelerates/decelerates time is defined as same as accelerates/decelerates time, which can be controled through the keyboard,control terminal or jog operation order of RS485

**Attention: The setting value of the jog running frequency is only limited by the upper frequency limit. Only terminal jog priority level is not limited by the operation order channles, the other jog orders, only when it is the same with the operation order channel, have the priority. Such as the keyboard jog operation is valid only when the keyboard control running.**

| | | | |
|---|---|---|---|
| **E-28** | **Start-up frequency** | **Range:0.00～60.00Hz** | **Factory setting: 0.50Hz** |
| **E-29** | **Start-up frequency duration** | **Range:0.0～20.0 second** | **Factory setting: 0.0 second** |

**The start-up frequency** is the initial output frequency while the inverter start-up. With appropriate start-up frequency setting, it can have a higher starting torque to supply some start-up power for some certain load which have big static friction in stopped state. If the setting value is too high, sometimes, it will appear tripping phenomenon.

**The start-up frequency duration** is the running time under the start-up frequency.




Start frequency and duration diagram

**Tips: In the process of frequency inverter startting and speeding up, when the given frequency is lower than start-up frequency, frequency inverter output is zero.**

| E-30 | Start-up selection | Range:0～2 | Factory setting:0 |
|---|---|---|---|

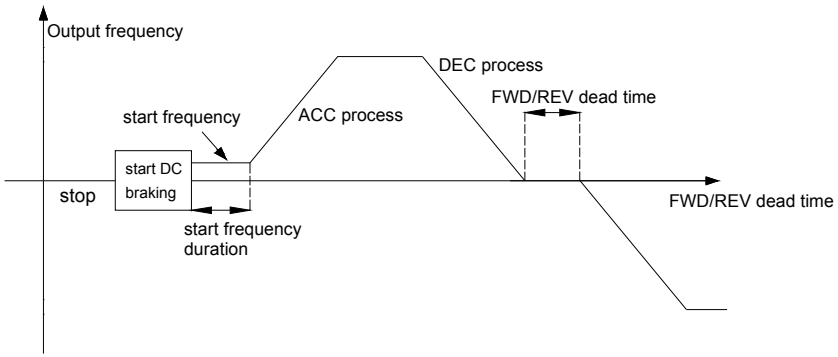
0: Start by the start-up frequency **[E-28]** means the start-up frequency setting and **[E-29]** means start-up frequency duration setting to control frequency inverter start; It is suitable for the situation with big static friction torque and small load inertia, or the situation where it need to coordinate with exterior machinery braking devices. That is occasion where the motor shaft can maintain static before the motor restart after close down.

1: DC braking first, then start-up frequency Firstly, DC braking voltage **[E-35]** and DC braking time **[E-38]** give the motor with load a certain DC braking energy (namely electromagnetic brake), then start by start-up frequency; It is suitable for the small inertial load occasion with forward rotating or reversing phenomenon in the stop state.

2: Speed track to restart Frequency inverter detects the motor speed firstly, then runs from the origin speed to the given frequency according to the acceleration / deceleration time. While the frequency inverter free stops or instantaneous power off restarts, regardless it tracks speed to restart or not, frequency inverter will restart at the speed detected. This function specially suits for restart after all kinds fault reset.

**Attention:When the machine running direction is opposite to the output direction, the speed track to restart function is strictly prohibited to use. It can not restart until it totally stops. It also can restart by start-up frency after DC braking.**

**Tips:In normal FOR/REV switch process or the process of frequency setting change, it both starts from 0.00Hz or stops to 0.00Hz.**




| E-31 | Power off restart selection | Range:0,1 | Factory setting:0 |
|---|---|---|---|
| E-32 | Power off restart waiting time | Range:0.0～10.0 second | Factory setting: 0.5second |

**Power off restart selection:**

0: Invalid While the frequency inverter is electrified after power off, it must receive the operation order before running.

In the keyboard control or RS485 operational control state, if frequency inverter power off, it will clean the operation command automatically.

In the exterior terminal control state, if power off, after electrify, the control command of the exterior terminal **(FWD/REV)** is invalid; The control command is valid only when the running order reset operation on the exterior terminal is detected.

Must after detecting the operation of the exterior control terminal having reset running command, then the control command is valid.

1.Valid If the frequency inverter is at the running state before power off, after power on,frequency inverter will automatically start by the speed tracking to start mode after setting waiting time(set by the［**E-32**］). During the waiting time between power off and restart, frequency inverter will not accept any operation order, but if input the stop order in this period, frequency inverter will be out of the speed track to restart mode.

**Attention: the power off restart function enables the frequency inverter automatic start operating after power on. Therefore there is huge contingency, please be cautious to use this function for the sake of person and equipment safety.**

**Power off restart waiting time:** When the ［**E-31**］setting is valid ,after frequency inverter power on, it will start to run while the ［**E-32**］ setting time passed.

The principles of this time setting is based on the factors such as the work resume preparation time of equipments which correlate with the frequency inverter after power supplying restore.

| | | | |
|---|---|---|---|
| **E-33** | **Free stop frequency** | **Range :0.00～60.0Hz** | **Factory setting: 0.00Hz** |

While the frequency inverter receives the stop order in the deceleration stop mode, it will decelerate to the free stop frequency according to the deceleration time, then stops output and the motor free stops.

**Tips: This function is valid only while stopping ,invalid in the process of FOR/REV switching.**

| | | | |
|---|---|---|---|
| **E-34** | **Shut down mode** | **Setting range :0,1** | **Factory setting:0** |

0:Deceleration stop According to the setting time and deceleration mode, frequency inverter will stop output frequency and close down motor after the frequency inverter decelerating to the free stop frequency.

During the deceleration stop process, when the given frequency is smaller than the DC braking initial frequency(please refer to **［E-37］**), if the close down DC braking function is seleced, the output frequency of frequency inverter will jump to zero, and the frequency inverter will stop work after the DC braking finishing. Otherwise, the frequency inverter will decelerate to free stop frequency, and stop work. While stop, if the setting value of the DC braking initial frequency **［E-37］** smaller than the setting value of the free stop frequency, after decelerating to free stop frequency, frequency inverter will stop output and will not carry on the DC braking.

During the process of decelerating stop, the machines with built-in braking unit(below 15G/18.5P)can connect with the external braking resistor(optional). If the DC bus voltage exceeds the **［E-53 ］** dynamic braking action voltage value, frequency inverter will output the pulse voltage by setting dynamic braking ration **［E-54］** ; The machines without built-in braking unit(above 18.5G/22P) can choose external braking unit and braking resistor. This mode is mainly suitable for occasions need quick braking.

1: Free stop After receiving the stop order, frequency inverter will block the output and motor will free run to stop. If users choose this method, frequency inverter generally coordinate with the external mechanical brake to fulfill quick stop.

| | | | |
|---|---|---|---|
| **E-35** | **DC braking voltage** | **Range :0.0%～15.0%** | **Factory setting : 5.0%** |
| **E-36** | **DC braking time in stop stage** | **Range :0.0～30.0 second** | **Factory setting : 0.0 second** |
| **E-37** | **DC braking initial frequency in stop stage** | **Range :0.00～60.0Hz** | **Factory setting : 0.00Hz** |
| **E-38** | **DC braking time in start stage** | **Range :0.0～10.0 second** | **Factory setting : 0.0 second** |

**DC braking voltage** is the braking voltage gived by the frequency inverter to the motor in the DC braking stage. This numerical value is based on the frequency inverter rated voltage input.

DC braking function can provide “0” speed torque. Normally it is used to enhance the stop accuracy and fulfill quick stop, but it can not be used in the deceleration braking in normal operation; Once start DC braking, frequency inverter will stop output. If the DC braking current is set too high , it easily occur overcurrent fault during the frequency inverter stopping.

**DC braking time in stop stage** is the duration of the DC braking voltage while stop. If the braking time is 0.0 second, there is no DC braking process. Namely DC braking function is invalid.

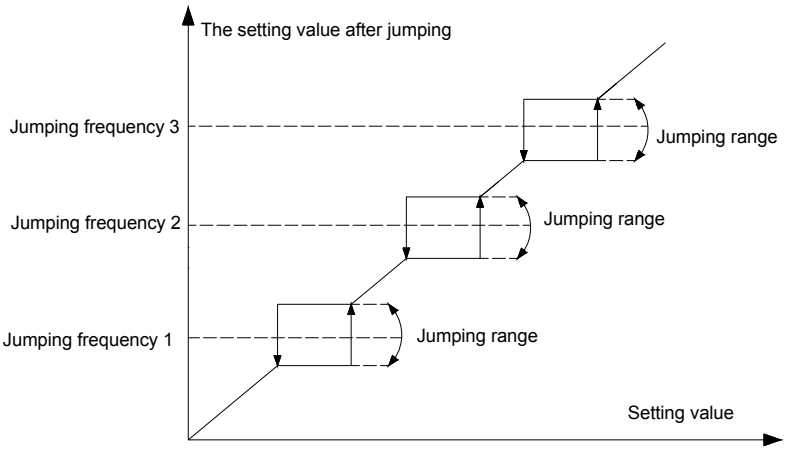
**DC braking initial frequency in stop stage** is that frequency when the frequency inverter decelerate, frequency inverter will stop output and start DC braking function. If the ouput frequency is less than the DC braking initial frequency in stop stage while running, the frequency inverter will stop output and start DC braking while stopping.

**DC braking time in start stage** is the sustained time of the DC braking voltage in the start stage; There is DC braking function in start stage only when the parameter [**E-30**] choose“1”. If braking time is 0.0 second, there is not DC braking process.

| | | | |
|---|---|---|---|
| **E-39** | **Jump frequency1** | **Range :0.00～400.0Hz** | **Factory setting: 0.00Hz** |
| **E-40** | **Jump frequency 2** | **Range :0.00～400.0Hz** | **Factory setting” 0.00Hz** |
| **E-41** | **Jump frequency 3** | **Range :0.00～400.0Hz** | **Factory setting: 0.00Hz** |
| **E-42** | **Jump frequency range** | **Range :0.00～5.00Hz** | **Factory setting: 0.00Hz** |

When frequency inverter runs with load, in order to avoid the output frequency meeting the resonance frequency point of the mechanical load, user can use the jump frequency. Frequency inverter can set three jump points to execute the jump. After setting the jump frequency, even if the given frequency of the frequency inverter is on the resonance frequency point of the mechanical frequency load, the output frequency of frequency inverter will be adjusted automatically outside the resonance frequency point of the mechanical frequency load to avoid operating in the resonance point.

**Jumping frequency range:** Jumping frequency range is the frequency fluctuation range which is based on the jumping frequency.




Jumping frequency and jumping range relationship

**Tips:1. During the process of acceleration and deceleration, the output frequency of frequency inverter will normally overlap the jumping frequency district. Do not set three overlap or nested jumping frequency ranges.**

**2. Jumping frequency is valid for jog, multi-step speed and swing frequency operation.**

| | | | |
|---|---|---|---|
| **E-43** | **Fault auto-restore times** | **Range :0～3** | **Factory setting:0** |
| **E-44** | **Fault auto-restore waiting time** | **Range:0.1～20.0 second** | **Factory setting: 1.0second** |

**Fault auto-restore times:** 0: closed This function is closed, it has not automatic reset function, only can be reset manually.

1-3 open This function is open, 1-3 is the times of auto-restore after fault (defined as the most auto-restore times after the each fault)

During the frequency inverter operating, load undulation, power grid voltage fluctuation or other accidental factors may bring fault stop. In order to guarantee the system work continuous, the frequency inverter is allowed to automatically reset while meeting the following type of faults: overvoltage, overcurrent, overload etc, and restore operation anew. In the procedure of auto-restore, frequency inverter will restore operating by the mode of speed track to restart. If the frequency inverter can not be succeed to restore operation within the setting times, then frequency inverter will start fault protection and stop output. Fault auto-restore can be most set as 10 times, frequency inverter will clear history records and accumulate the times of fault restore from 0 again after the frequency inverter normally running over 10 minutes. Suggested the user set the times of fault auto-restore as 1 ~ 2.

During the fault auto-restore period, users can choose fault output terminal to act or not. see

［F-30,F-31,F-32］

**Fault auto-restore waiting time** This parameter is defined as the waiting time from the frequency inverter fault appearing to each restore time.

**Attention: 1. this function is valid only for faults such as overload, overcurrent、modules fault, overvoltage, undervoltage etc. It is invalid for the other faults.**

**2. No reset before the fault beibng solved; No reset if temperature over 70℃.**

**Tips: users should be cautious to consider the start characteristic of the mechanical devices during the manipulation. In occasions where it can not start with load or it must alarm immediately while frequency inverter has no output, please think carefully before use this function.**

| | | | |
|---|---|---|---|
| **E-45** | **Warm-up time** | **Range :0.0～6500 second** | **Factory setting: 0.0second** |

Begin to time while the frequency inverter is well prepared to transmit power. After reaching to the warming-up time, frequency inverter can accept the rotation control order. After electrifying, start to backward and count in unit of sec on the screen.

| | | | |
|---|---|---|---|
| **E-46** | **Operation direction selection** | **Range :0～2** | **Factory setting:0** |

0: Consistent with the default direction Actual rotation direction is the same with the requirement. The actual direction will not be adjusted;

1: Opposite to the default direction Actual rotation direction is opposite to the requirement. The actual direction will be adjusted;

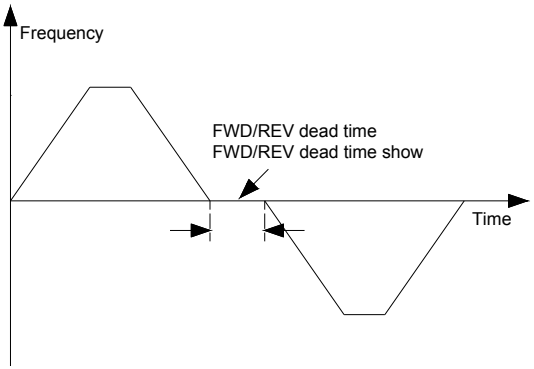
2: Prohibit the reverse operation When this parameter is set as prohibition, all the reverse order of the operation order channel(operation panel、exterior terminal、RS485 communication、bipolar VS2 and program running) are invalid.

**Attention: 1. when choose the reverse prohibition,if the bipolar control receives the reverse frequency order,frequency inverter will operate as "0" frequency, it is the same in the program operational control,if the setting direction of a certain step speed is reverse,frequency inverter will operate as "0"frequency in this stage.**

**2. All the reverse order will switch to operation order automatically and frequency inverter will operate as the forward rotating direction.**

| E-47 | FOR/REV dead time | Range :0.0～10.0 second | Factory setting: 0.0 second |
|---|---|---|---|

This function is defined as the waiting time in 0.0Hz while frequency inverter in the transition process from forward rotating to reverse, or from reverse to forward rotating. The FOR/REV dead time is set for the devices with large inertia load and dead zone when change the direction.




Positive and negative rotation dead zone time diagram

| E-48 | Cooling fan running options | Range :0,1,2 | Factory setting:※ |
|---|---|---|---|

Be used to select the fan running mode.

**0: After frequency inverter electrify, fan operates.** Regardless whatever is the module temperature, fan operates after the frequency inverter electrifying.

**1:The fan running is related to the temperature while stop mode. Fan runs while machine running** While the frequency inverter in the close down state, whether fan runs or not, it relates to the temperature, fan operates when the temperature is over 45 degree Celsius and fan stops when the temperature is lower than 40 degree Celsius. Fan runs immediately when the frequency inverter running.

**2:When frequency inverter stop, fan stops. And fan running relates to the temperature** While the frequency inverter is in operation, whether fan runs or not, it relates to the module temperature. Fan operates when the temperature is over 45 degree Celsius and stops when the temperature is lower than 40 degree Celsius. Fan stops running immediately when the frequency inverter is close down.

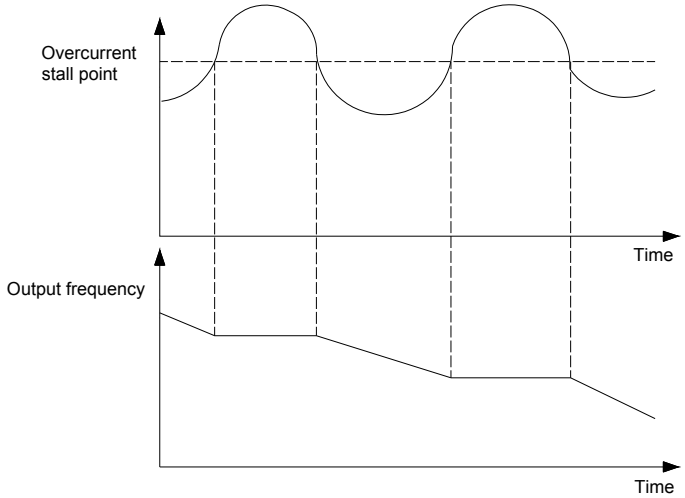
**Tips: the proper use of this function can effectively prolong the life of cooling fans.**

| E-49 | Frequency protection mode selection | Range :0000～1111 | Factory setting: 0※11 |
|---|---|---|---|

**LED 0 digit: over voltage stall protection selection**

0: Invalid 1: Valid

When the frequency inverter decelerates, as a result of the load inertial influence, voltage generated by the motor will be feedbacked to frequency inverter interior, which will lead the DC bus voltage of the frequency inverter rises and over the maximum permission values. If no measures are taken to solve the problem, voltage protection will works. If user start the overvoltage stall protection function, when the inverter finds DC bus voltage is too high, frequency inverter deceleration will be ceased (to halt the decline in output frequency). The frequency inverter will not implement the deceleration again until the DC bus voltage is below the protection value.




Stall proctection current limit aplitude diagram

**LED 10 digit: Power on grounding short circuit protection detection**

0:Invalid 1:Valid

Can select frequency inverter detects whether there is grounding short circuit while power on.

**LED 100 digit: Input Open-Phase protection selection**

0:Invalid 1:Valid

Frequency inverter detects the input side of three-phase AC to see whether there is open-phase. If there is open-phase fault, frequency inverter will report “Err1” and stop output. The motor free stops. And fault output terminal will act.

This function is valid only for 7.5P or above power machine of AC60 series. The factory setting of this parameter is set based on the concrete types. This function is invalid for 5.5G or below power machine.

**LED 1000 digit:Inverter overload ,overheat protection mode selection**

0:Free stop 1:Current limit running

This parameter stipulates the protection mode when the frequency inverter occurs overload and overheat.

Free stop mode is that frequency inverter stops output immediately, and alarm for“OL2”or“OH”fault.

Current limit running mode is frequency inverter will run as output current limit mode while in overload, overheat situation. If the current is over the limiting value, frequency will reduce the output frequency to reduce the load current; When the inverter overload, pre-alarm signal can be output by the output terminal［**F-30～F-32**］

While overload and overheat, limiting current value=rated current×100%

| | | | |
|---|---|---|---|
| **E-50** | **Electronic heat-sensitive coefficient setting values** | **Range :30%～120%** | **Factory setting: 0%** |

Motor long-time overload running will generate serious heat; This parameter is used to set the coefficient of the thermal relay protection to the motor with load. It can be set as 100%. If the rated current of motor with load does not match the rated current of the inverter,right thermal relay protection to motor will be set by this parameter.

The factory setting of overload capacity of frequency inverter:

G model:150 %×rated current;1 minute

P model:120 %×rated current;1 minute

The setting value of this parameter can be determined by the following formula:

**Electronic thermal coefficient = motor rated current / frequency inverter rated output current**

**Attention:when frequency inverter operates with multi parallel motors, the thermal relay protection function of frequency inverter will be invalid. In order to protect the motors effectively,please instal thermal protection relay in the lead-in-end of each motors.**

| | | | |
|---|---|---|---|
| **E-51** | **Stall protection current limiting amplitude** | **Range :100%～250%** | **Factory setting: 160G/120P** |

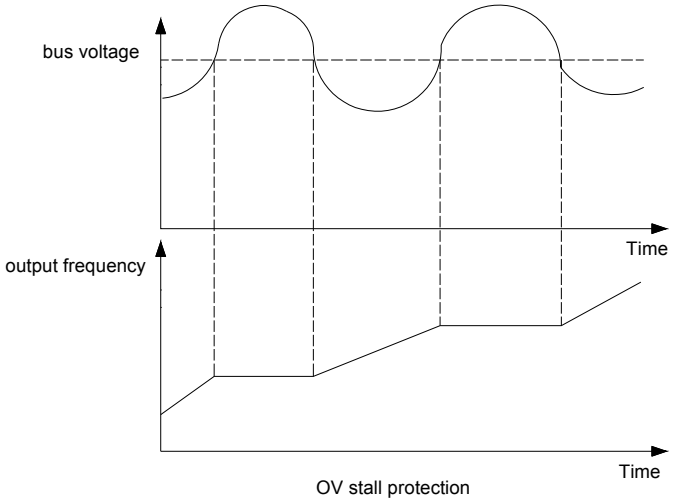
This parameter is defined as the ratio of stall protection current value to motor rated current value ration.

G model factory setting: 160%

P model factory setting: 120%

Stall protection current limit function is real-time monitoring the load current during acceleration, auto-limit it is not to exceed the current limit setting value(frequency inverter controls the output

current by stopping acceleration or reducing output frequency), to prevent the fault trip which caused by excessive current. This function is especially suitable for some loads with larger inertia or drastic change.



OV stall protection

The fiducial value of this parameter is frequency rated current; If use this function, the acceleration time maybe prolonged. During the frequency inverter start process, if frequency inverter can not accelerate to the given frequency as expected and fluctuates in a relative changeless frequency range, it shows that the limiting current function is in action. At this moment, user should lighten the load or adjust correlation parameter.

| | | | |
|---|---|---|---|
| **E-52** | **Stall protection bus voltage value** | **Range :110%～150%** | **Factory setting: 128%** |

This parameter is defined as the ratio of the stall protection voltage amplitude to frequency DC bus voltage rated value.

Frequency inverter DC bus voltage rated value=frequency inverter input rated voltage×1.414

This parameter stipulates the threshold of the overvoltage stall protection during the machine acceleration. While DC side pumping voltage led by deceleration exceeds this parameter settings, the inverter will auto-prolong the deceleration time.

| | | | |
|---|---|---|---|
| **E-53** | **Energy-consumed braking action voltage values** | **Range:110%～150%** | **Factory setting: 122%** |
| **E-54** | **Energy-consumed braking action ratio** | **Range:0%～100%** | **Factory setting: 80%** |

**Energy-consumed braking action voltage values** is defined as this: while frequency inverter DC bus voltage rises and excesses the frequency rated voltage**[E-53]** setting, frequency inverter dynamic braking starts to act. The voltage of frequency inverter has to be 20V lower than the **[E-53]**setting while stopping energy-consumed braking. Please be careful to set this value.

This function is only valid for the machine with build-in braking modules;

Machines below 15G/18P of AC60 series frequency inverter have standard braking modules. Machines below 5.5G/7.5G have standard braking modules and braking resistor. Braking unit and braking resistor are optional parts of other machine. Customer can select it if need. Machines below 3.7G with 220V input have standard braking modules, but do not have resistors. Customers need to buy the braking resistor separately if necessary.

**Dynamic braking action ratio** This parameter is used to define the average value of the voltage on braking resistor when the braking unit acts. The voltage on braking resistor is PWM wave. And duty ratio equates to dynamic braking action ratio. The bigger action ratio is, the quicker energy release and the effect will be more obvious, meanwhile, braking resistor will consume more power. the users should consider to set this parameter synthetically according to resistance value of the braking resistor, power and the required braking effect.

| | | | |
|---|---|---|---|
| **E-55** | **Bus under-voltage protection value** | **Range :60%～90%** | **Factory setting: 65%** |

This parameter stipulates lower voltage limit of the DC side during the frequency inverter working normally. In partial situations where power supply is relatively low,user should reduce the undervoltage protection value to guarantee the frequency inverter working normally.

**Attention: When the power supply voltage is excessively low, output torque of the machine will drop.For the constant power load and the constant torque load,the excessive low power supply voltage will increase the frequency input and output current, thus the reliability of the frequency inverter operation will be reduced.**

| | | | |
|---|---|---|---|
| **E-56** | **Motor rated voltage** | **Range :100～1140V** | **Factory setting:※** |
| **E-57** | **Motor rated current** | **Range :0.1～1000A** | **Factory setting:※** |
| **E-58** | **Motor rated frequency** | **Range :25.00～400.0Hz** | **Factory setting:50.00Hz** |
| **E-59** | **Motor rated speed** | **Range :0～65000** | **Factory setting:1460r/min** |

Set the nameplate parameters of the motor under controlled. Pls set the parameters strictly according to the nameplate. Or the machine can not work normally.

| E-60 | Inverter output voltage ratio | Range :50%～100% | Factory setting: 100% |
|---|---|---|---|

It is the ratio of frequency inverter output voltage to frequency inverter rated output voltage. This function is used to adjust the output voltage of the frequency inverter, in order to meet the need of V/F characteristic.

**Frequency inverter output voltage=frequency inverter rated output voltage×frequency output voltage ratio**

| E-61 | G/P modules setting | Range :0 ,1 | Factory setting:0 |
|---|---|---|---|

When reset the factory setting, this parameter setting values will not be changed.

0:G model,suitable for constant torque load.

1:P model, suitable for variable torque(such as fan,water pump load).

The AC60 series frequency inverter adopts G/P in one mode. The power of the motor adaptor used in the constant torque load (G model) is one level lower than that used in fan water pump load(P model).

| E-62 | Speed tracking stability time | Range:0.20～10.00second | Factory setting: 0.60second |
|---|---|---|---|

This parameter is defined as the stable operation time while the frequency inverter detects the frequency during the period of tracking the speed.

For large inertia load, lengthening the speed tracking stability time properly can reduce the instant impact current while speed tracking starting.

| E-63 | Parameter change protection | Range:0 ～ 2 | Factory setting:0 |
|---|---|---|---|

0:All the parameters changeable Except for the parameters only for inquiry, any other parameters can be changed(please attention: some parameters only can be changed in the stop state, some parameters can not be changed in any circumstance).

1:Only keyboard number given parameter changeable Except for the keyboard number given frequency and keyboard number PID given quantitative parameter, any other parameter can not be changed.

2:All the parameter prohibit being changed All the parameters of frequency inverter unchangeable；When users need to change the parameter，They have to change this parameter as “0”or“1”.

| E-64 | Parameter initialize | Range:0 ～ 4 | Factory setting:0 |
|---|---|---|---|

0:Not operation

1:Restore factory setting values After parameters are restored to the factory setting values, the function parameters are restored to the factory default values.

2: Clear record of fault, Clear all receord of history fault

3: Parametrers of VFD sending to keypad and storage, Copy parameters of VFD to keypad and keep storing.

4: Sending paramtof keypad to VFD, Download parameters of keypad to VFD.

**Note: 1. When inverter place in running status, fault status and no parameters keeping in keypad, it is unable to copy parameters of keypad to VFD.**

**2. If pull out keypad when copy parameters of VFD to it, it need redo copy operation.**

**3. When copying parameters of keypad to VFD, if pull out keypad from VFD, please redo copy operation again.**

**4. When copying parameters of VFD to keypad, the current status can't be storage, when copying parameters of keypad to VFD, all key is invalid during copy operation.**

**5. During copy operation, when keypad show E.CPE( parameters copy abnormal), the copy operation is stop, it need redo copy again and return to monitor status with press PRG button.**

**6. It will appears E.EDI when version of software is incompatible, it is impossible to copy parameters of keypad to VFD.**

**Tips: Restore factory setting operation will not affect the current setting of the parameters [E-01,E-02,E-46,E-61]**

| E-65 | Factory password | Range :0～9999 | Factory setting:0 |
|---|---|---|---|

Manufacturer inquiry parameters.

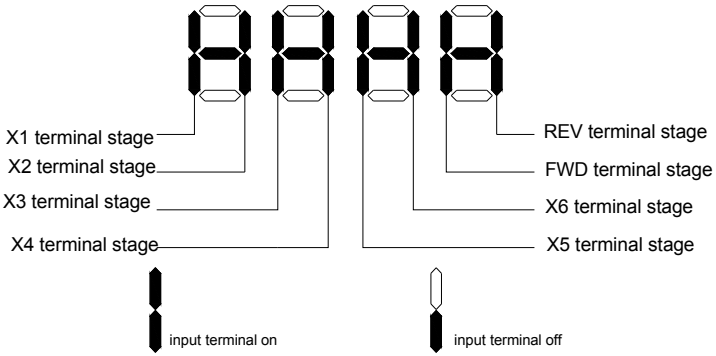
| E-66 | Information inquiry | Range :0 ～ 2 | Factory setting:0 |
|---|---|---|---|

0:No operation

1:State monitoring inquiry Select this function to enter monitoring menu(group C parameters),and inquire each state parameters of the frequency inverter. In the monitoring state, you can long press (1 second) PRG key and directly enter the state of the group C parameters which namely is the state monitoring.

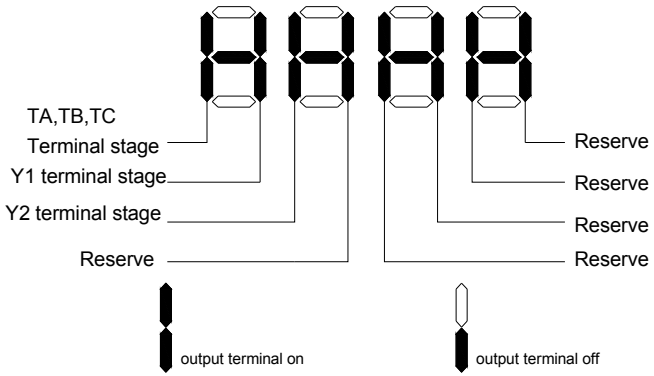
| Monitoring code | Content | Units | Communication code |
|---|---|---|---|
| C-1 | Given frequency | 0.01HZ | C01H |
| C-2 | Output frequency | 0.01HZ | C02H |
| C-3 | Output current | 0.1A | C03H |
| C-4 | Input voltage | V | C04H |
| C-5 | Output voltage | V | C05H |
| C-6 | Mechanical speed | RPM | C06H |
| C-7 | PID given quantitative | % | C07H |
| C-8 | PID feedback quantitative | % | C08H |
| C-9 | Module temperature | ℃ | C09H |
| C-10 | Accumulative operation time | hour | C0AH |
| C-11 | Accumulative operation time after latest power on | Min | C0BH |
| C-12 | Output current percentage | % | C0CH |
| C-13 | Step operation remainder time percentage | % | C0DH |
| C-14 | Input terminals connect/disconnect status | See belowing diagram | C0EH |
| C-15 | Output terminals connect/disconnect status | See belowing diagram | C0FH |
| C-16 | Terminal VS1 input value | 0.1v | C10H |
| C-17 | Terminal AS input value | 0.1mA | C11H |
| C-18 | Terminal VS2 input value | 0.1v | C12H |
| C-19 | Terminal pulse input value | ※ | C13H |
| C-20 | Counter record | ※ | C14H |
| C-21 | DC bus voltage | V | C15H |
| C-22 | Analog output A01 | 0.01V | C16H |
| C-23 | Frequency/voltage/current output A02 | ※ | C17H |
| C-24 | Reserved | -- | C18H |
| C-25 | Inverter power grade | Kw | C19H |
| C-26 | Inverter rated voltage | V | C1AH |
| C-27 | Inverter rated current | 0.1A | C1BH |
| C-28 | Software version | ※ | C1CH |

Input terminal connect/disconnect state schematic diagram




input terminal on/off state

Output terminal connect/disconnect state schematic diagram




output terminal on/off state

2: Fault information inquiry

After inquiry setting, can set LED display below information circularly by the keyboard up/down keys.

| Serial number | Definition | Remark | Communication code |
|---|---|---|---|
| Er.01 | The latest fault information | For details, pls see fault information code table | E01H |
| Er.02 | The cumulative running time before the latest fault | Units: hour | E02H |

| | | | |
|---|---|---|---|
| Er.03 | Output frequency while the latest fault | Units:Hz | E03H |
| Er.04 | DC bus voltage while the latest fault | Units:V | E04H |
| Er.05 | Output current while the latest fault | Units:A | E05H |
| Er.06 | Output voltage while the latest fault | Units:V | E06H |
| Er.07 | Module temperature while the latest fault | Units:℃ | E07H |
| Er.08 | Running direction while the latest fault | 0.Forward 1.reverse | E08H |
| Er.09 | Running status while the latest fault | 0.close down 1.stable speed 2.acceleration 3.deceleration | E09H |
| Er.10 | Protection status while the latest fault | 0. Normal 1.only voltage amplitude limit 2. only current amplitude limit 3.both voltage and current amplitude limit | E0AH |
| Er.11 | Input terminal status while the latest fault | See above chart | E0BH |
| Er.12 | Output terminal status while the latest fault | See above chart | E0CH |
| Er.13 | The late one fault information | | E0DH |
| Er.14 | The late two fault information | | E0EH |
| Er.15 | The late three fault Information | | E0FH |

Fault information code table:

| Serial number | Keyboard display content | Fault information |
|---|---|---|
| 0 | ---- | No fault |
| 1 | L.U.1 | When close down, power voltage is too low(fault annal will not note) |
| 2 | L.U.2 | When operation, power voltage is too low |
| 3 | o.U.1 | Accelerate overvoltage |
| 4 | o.U.2 | Decelerate overvoltage |
| 5 | o.U.3 | Constant speed overvoltage |
| 6 | o.U.4 | Close-down overvoltage |
| 7 | o.C.1 | Accelerate overcurrent |
| 8 | o.C.2 | Decelerate overcurrent |
| 9 | o.C.3 | Constant speed overcurrent |
| 10 | o.L.1 | Motor overload |
| 11 | o.L.2 | Inverter overload |

| | | |
|---|---|---|
| 12 | Sc | System fault |
| 13 | o.H. | Inverter interior overheat |
| 14 | SEn | Feedback sensor fault(fault annal will not note) |
| 15 | Err1 | Input side open-phase |
| 16 | Err2 | Output grounding |
| 17 | Err3 | Current measure fault(fault annal will not note) |
| 18 | Err4 | Inverter exterior fault |
| 19 | Err5 | Swing frequency running parameter setting Error |
| 20 | Err6 | Keyboard communication fault(fault annal will not note) |
| 21 | LIFE | Reserved（Seek the technical support,fault annal will not note） |
| 22 | 93SE | Storage fault(fault annal will not note) |
| 23 | E.PAn | On theKeyboard communication fault(fault annal will not note) |
| 24 | E.CPE | Copy and abnormal(fault annal will not note) |

| | | | |
|---|---|---|---|
| **E-67** | **Disturbance restrain** | **Range :0000 ～ 0111** | **Factory setting: 0001** |

**LED 0 digit: restrain overvoltage disturbance**

0: invalid

1: valid, while valid, the inverter judges overvoltage alarm and restrains disturbance. Only alarm for real error signal, maybe delay alarm time. Use carefully.

LED 10 digit: restrain SC disturbance

0: invalid

1: valid while valid, the inverter judges SC alarm and restrains disturbance. Only alarm for real error signal, maybe delay alarm time. Use carefully.

**LED 100 digit: restrain overcurrent disturbance**

0: invalid

1: valid while valid, the inverter judges overcurrent alarm and restrains disturbance. Only alarm for real error signal, maybe delay alarm time. Use carefully.

**LED 1000 digit: reserved**

**7.2 External terminal parameters detailed description**

| | | | |
|---|---|---|---|
| **F-01** | **Input signal selection1(X1)** | **Range:0 ～ 25** | **Factory setting:1** |
| **F-02** | **Input signal selection12(X2)** | **Range :0 ～ 25** | **Factory setting:2** |
| **F-03** | **Input signal selection13(X3)** | **Range :0 ～ 25** | **Factory setting:3** |
| **F-04** | **Input signal selection14(X4)** | **Range: 0 ～ 25** | **Factory setting:4** |
| **F-05** | **Input signal selection15(X5)** | **Range :0 ～ 25** | **Factory setting:5** |
| **F-06** | **Input signal selection16(X6)** | **Range :0 ～ 25** | **Factory setting:6** |

Separately define control terminal**(X1-X6)**functions. Short connect with the terminal**(COM)**is valid.

| Setting value | Definition | Function description |
|---|---|---|
| 0 | Invalid(can reelection) | This port is unused |
| 1 | Forward jog operation | Jog order input port. Terminal jog orders have the highest priority |
| 2 | Reverse jog operation | |
| 3 | Free stop | Free stop order input port |
| 4 | Fault reset | When breakdown, exterior reset order input port |
| 5 | Multi-step speed control 1 | The multi-step speed commands input port. The code combination realizes 15 steps of speed; The multi-step speed commands has priority only next to the jog command; |
| 6 | Multi-step speed control 2 | |
| 7 | Multi-step speed control 3 | |
| 8 | Multi-step speed control 4 | |
| 9 | Ascend/descend running frequency ascending UP | Realize the ascend, descend control function, valid when［**E-02**］or［**E-03**］is set as"7" |
| 10 | Ascend/descend running frequency descending DW | |
| 11 | Trilinear operation control | Trilinear operation control is defined as "D(X)terminal,please refer to［**F-08**］ |
| 12 | PID control cancel | Cancel PID operation when it is PID control operation, then the PID given signal is given frequency, frequency inverter operates according to this frequency; |
| 13 | Exterior fault alarm | Input port of exterior fault signal |
| 14 | Acceleration/deceleration time selection terminal 1 | See the below fig. |
| 15 | Acceleration/deceleration time selection terminal 2 | |

| | | |
|---|---|---|
| 16 | Frequency main channel selection terminal 1 | When［**E-02**］selection is "12",frequency input main channels are selected by the terminals; Four terminals can combined out 0～11,separately corresponding to the［**E-02**］0～11 frequency input channels; |
| 17 | Frequency main channel selection terminal 2 | |
| 18 | Frequency main channel selection terminal 3 | |
| 19 | Frequency main channel selection terminal 4 | |
| 20 | Program pause | During the program running, if this signal is valid, enable the program running pause, frequency inverter output as 0, after signal disappear, frequency inverter continues to operate according to the state before pause; |
| 21 | Program restart | During the program running, if this signal is valid, it enables the program running restart, starting to run from the first stage; |
| 22 | Timer trigger terminal | Terminal for start timer to record,see［**F-38**］ |
| 23 | Timer reset terminal | Clear the time records of the timer |
| 24 | Counter reset terminal | Clear the count records of the counter |
| 25 | Counter clock input terminal | see［**F-39,F-40**］ |

Acceleration/deceleration time selection check list

| Terminal 2 | Terminal 1 | Acceleration/deceleration time selection |
|---|---|---|
| OFF | OFF | Acceleration time 1 and deceleration time 1 |
| OFF | ON | Acceleration time 2 and deceleration time 2 |
| ON | OFF | Acceleration time 3 and deceleration time 3 |
| ON | ON | Acceleration time 4 and deceleration time 4 |

Short connect with **(COM)**is "ON",disconnection is "OFF"

| **F-07** | **Input signal action mode selection** | **Range :0000 ～ 1121** | **Factory setting: 1001** |
|---|---|---|---|

**LED 0 digit:Free stop terminal restore mode**

0:After disconnection, restore the original order

1:After disconnection, not restore the original order

This function is used to select whether it carries out (operate) original order while free stop terminal disconnect after connecting.

**LED 10 digit::Ascending/ descending terminal control initial frequency setting**

0:After operation, adjust as UP/DW terminal and have no frequency record after power off.

1: Adjust as UP/DW terminal with frequency record after power off . While power on again, run to the latest stop instant frequency(check and amend the instant frequency through［**F-70**］), and then adjust as UP/DW.

2: Firstly run to the pre-set frequency ［**F-70**］ ,then adjust as UP/DW.

**LED 100 digit: Selection of the valid range of the keyboard STOP/RESET keys.**

0:Only valid when controlled by keyboard

1:All the control methods are valid This function is very suitable for the non-keyboard controlled emergent close down

**Attention: If select "all the control methods are valid", namely, when terminal control or RS485 control, press down the stop key to stop the frequency inverter, frequency inverter will be in the stop and locking state. At this moment, if you want to use the terminal or RS485 operation order channel to restart the frequency again, you must send the stop order by the selected channel. The frequency inverter can rerun after unlock.**

**LED 1000 digit:After fault reset, terminal operation mode selection**

0:Terminal control to power on directly

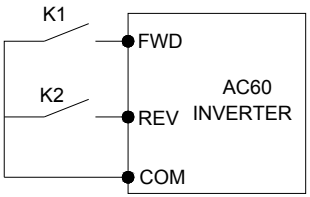
1:Terminal control to power off firstly, then start

**Attention:when the frequency inverter fault alarms, three running order given channels can send valid reset signal to the frequency inverter. If the frequency inverter adopts the terminal control mode, after frequency inverter reset by receiving the other two channels' reset signal, this parameter can be used to select whether to carry on the terminal operation order.**

| F-08 | Terminal operation control mode | Range :0 ～ 2 | Factory setting :0 |
|---|---|---|---|

0:Standard rotational control

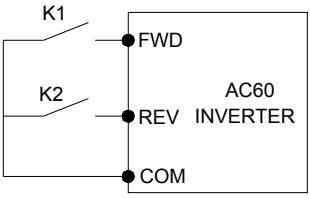
| K1 | K2 | running order |
|---|---|---|
| 0 | 0 | STOP |
| 1 | 0 | FWD |
| 0 | 1 | REV |
| 1 | 1 | STOP |




0: Standard running control

1:Double linear rotational control

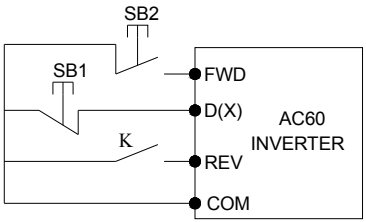
| running control K1 | direction control K2 | running order |
|---|---|---|
| 0 | 0 | STOP |
| 1 | 0 | FWD |
| 1 | 1 | REV |
| 0 | 1 | STOP |




1: 2-line running control

2:Three linear rotational controls 1

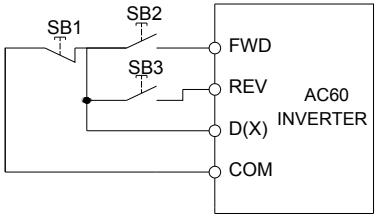
| K | running order |
|---|---|
| 0 | FWD |
| 1 | REV |




2: 3-line running control 1

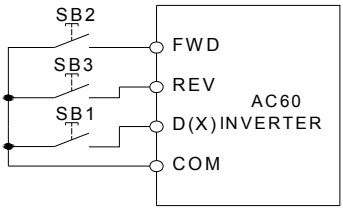
In three linear control operation, **"SB1"** is normal closed running button, **"SB2"** is normal opened running button, both **"SB1"**and "**SB2**"are pulse edges effective; **"K"** is the operation direction selection button; **"D (X)"** is the multi-function terminal; **(X1 - X6)** are defined as the terminals of the three-linears operational control (11) function.

3:Three linear rotational controls 2




3: 3-line running control 2

4:Three linear rotational controls 3



| | | | |
|---|---|---|---|
| **F-09** | **1 step speedsetting 1X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 20.00Hz** |
| **F-10** | **2 step speed setting 2X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 10.0Hz** |
| **F-11** | **3 step speed setting 3X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 15.0Hz** |
| **F-12** | **4 step speed setting 4X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 20.0Hz** |
| **F-13** | **5 step speed setting 5X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 25.0Hz** |
| **F-14** | **6 step speed setting 6X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 30.0Hz** |
| **F-15** | **7 step speed setting 7X** | **Range :0.00Hz～upper limit frequency** | **Leave factory Value:35.0Hz** |
| **F-16** | **8 step speed setting 8X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 40.0Hz** |
| **F-17** | **9 step speed setting 9X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 45.0Hz** |
| **F-18** | **10 step speed setting 10X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 50.0Hz** |
| **F-19** | **11 step speed setting 11X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 30.0Hz** |
| **F-20** | **12 step speed setting 12X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 35.0Hz** |
| **F-21** | **13 step speed setting 13X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 40.0Hz** |
| **F-22** | **14 step speed setting 14X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 45.0Hz** |
| **F-23** | **15 step speed setting 15X** | **Range :0.00Hz～upper limit frequency** | **Factory setting: 50.0Hz** |

Set the program running and the running frequency of the fifteen step speed of multi-step speed control.

Multi-step speed control has the priority only next to the jog. If users choose the multi-step speed running mode, they need to set more than four multi-function input terminals as multi-step control terminal. **(ON/OFF)**between the four terminals and **(COM)** determines the running step speed. Its operation and direction is controlled by the running signal and direction given by the operation given channel［**E-01**］. And its acceleration, deceleration time is controlled by the acceleration, deceleration

time 1 default. Or concrete acceleration, deceleration time is selected by **[F-01]~[F-06]**.

In the swing frequeny control mode, need to define the **[F-09]** and **[F-10]** ;or **[F-09]** and **[F-10]** setting requirement, pls refer to **[H-65]** . If there is wrong setting, frequency inverter will report fault"Err5".

**Tips: 1,ulti-step speed running are not limited by the lower frequency limit, but are sill limited by the upper frequency limit.**

**2,hen the program running, output frequency is limited by upper, lower limit frequency. When the given frequency is less than the lower frequency limit, it will run as the [E-12] lower frequency limit.**

Short connect with**(COM)**is "ON", disconnection with**(COM)**is "OFF".

| **Multi-step speed control terminal** 4 | **Multi-step speed control terminal** 3 | **Multi-step speed control terminal** 2 | **Multi-step speed control terminal** 1 | **Terminal** / **Step speed** |
|---|---|---|---|---|
| OFF | OFF | OFF | ON | 1X |
| OFF | OFF | ON | OFF | 2X |
| OFF | OFF | ON | ON | 3X |
| OFF | ON | OFF | OFF | 4X |
| OFF | ON | OFF | ON | 5X |
| OFF | ON | ON | OFF | 6X |
| OFF | ON | ON | ON | 7X |
| ON | OFF | OFF | OFF | 8X |
| ON | OFF | OFF | ON | 9X |
| ON | OFF | ON | OFF | 10X |
| ON | OFF | ON | ON | 11X |
| ON | ON | OFF | OFF | 12X |
| ON | ON | OFF | ON | 13X |
| ON | ON | ON | OFF | 14X |
| ON | ON | ON | ON | 15X |

| | | | |
|---|---|---|---|
| **F-24** | **Acceleration time 2** | **Rang:0.1～6500.0 second** | **Factory setting: ※ second** |
| **F-25** | **Deceleration time 2** | **Rang:0.1～6500.0 second** | **Factory setting: ※ second** |
| **F-26** | **Acceleration time 3** | **Rang:0.1～6500.0 second** | **Factory setting: ※ second** |

| | | | |
|---|---|---|---|
| **F-27** | **Deceleration time 3** | **Rang:0.1～6500.0 second** | **Factory setting: ※ second** |
| **F-28** | **Acceleration time 4** | **Rang:0.1～6500.0 second** | **Factory setting: ※ second** |
| **F-29** | **Deceleration time 4** | **Rang:0.1～6500.0 second** | **Factory setting: ※ second** |

During swing frequency control, it needs to define the acceleration&deceleration time 2, the setting requirement for details, please refer to **［H-65］.**

During the program running, define the second ～fourth acceleration&deceleration time separately as the first acceleration&deceleration time; The acceleration&deceleration time of program running is determined by the parameter**[H-35] ～[H-49].**

Multi-step speed acceleration&deceleration time is determined by the terminal **[F-01] ～[F-06]**.

| | | | |
|---|---|---|---|
| **F-30** | **Relay output terminal （TA,B,C）** | **Range: ～ 19** | **Factory setting :1** |
| **F-31** | **Output terminal Y1** | **Range: ～ 19** | **Factory setting :4** |
| **F-32** | **Output terminal Y2** | **Range: ～ 19** | **Factory setting :7** |

| Setting value | Definition | Function description |
|---|---|---|
| 0 | Zero frequency(tandby state) | When the frequency inverter is running,and the output is 0.0Hz, it outputs signal. |
| 1 | Fault jump alarm 1 | When there is frequency fault(U,L,C,C,U2,H etc.),cluding auto-restore period, it outputs signal |
| 2 | Fault jump alarm 2 | When there is frequency fault(U,L,C,C,U2,H etc.)ot including auto-restore period, it outputs signal |
| 3 | Frequency arriving detection | When the output frequency of frequency inverter reaches or gets close to a certain range of the given frequency(his range determined by the parameter**［F-33］**),e output signal is valid, otherwise, output signal is invalid. |
| 4 | Frequency level detection | When the output frequency of frequency inverter is over the frequency detection level, it outputs valid signal after **［F-35］** delay time setting**.** When the output frequency of frequency inverter is lower than the frequency detection level, it outputs invalid signal after **［F-35］** delay time setting**.** |

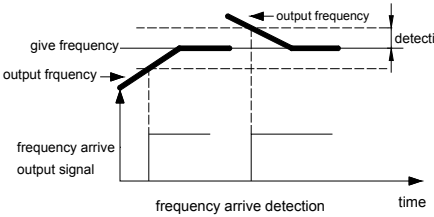
| | | |
|---|---|---|
| 5 | Running | When frequency inverter is in the running state, it outputs signal. |
| 6 | Reversal running | When frequency inverter reverse, it outputs signal. |
| 7 | Inverter undervoltage | When the frequency inverter displays “LU” for low voltage, it outputs signal. |
| 8 | Overload pre-alarm | When the output current of frequency inverter reach［**F-36**］and［**F-37**］setting values,t outputs signal. |
| 9 | Output frequency reach upper limit frequency | When the inverter runs to the upper frequency limit, it outputs signal. |
| 10 | Output frequency reach lower limit frequency | When the inverter runs to the lower frequency limit, it outputs signal. |
| 11 | Exterior fault stop | When the exterior fault input signal of frequency inverter is valid, and the frequency inverter stops, this terminal outputs valid signal. |
| 12 | Timer times up | When reaching the setting time of frequency build-in timer, this terminal output a 500ms wide valid pulse signal. |
| 13 | Counter reach maximum values | When the counter reaching the maximum values, output terminal output a valid signal with width equal to exterior clock period. And the counter clear to “0”. |
| 14 | Counter reach setting values | When the counter reaches the setting values, the terminal output valid signal. When counter further counts to surpass the maximum values and the counter clear to zero, this output signal abolishes. |
| 15 | PID feedback quantitative upper limit alarm | When the PID feedback quantity reaching the alarming upper limit［**H-26**］is detected，it outputs signal. |
| 16 | PID feedback quantitative lower limit alarm | When the PID feedback quantity reaching the alarming lower limit［**H-27**］, it outputs signal. |
| 17 | Sensor disconnect | While the frequency inverter detects the feedback signal in PID control mode, if the feedback signal is smaller than［**H-28**］,what means the sensor disconnects, it outputs signal. |
| 18 | Program running cycle completed | When program finishes the periodic running, it output 500ms low level signal. |
| 19 | Program running step completed | When program finishes the step running, it outputs 500ms low level signal. |

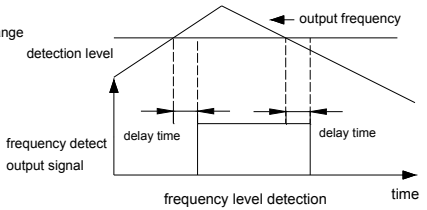
**Tips: relay output terminal TA-TC is normal close, TB-TC disconnect is normal open. Low level Y1, Y2 output terminal, connected with (24V) terminal, output 24V voltage which is valid signal.**

| | | | |
|---|---|---|---|
| **F-33** | **Frequency reach detection amplitude** | **Range:0.00～50.00Hz** | **Factory setting: 1.00 Hz** |
| **F-34** | **Output frequency level detection** | **Range:0.00～400.0Hz** | **Factory setting: 30.00 Hz** |
| **F-35** | **Output frequency detection delay time** | **Range:0.0～20.0second** | **Factory setting: 0.0 second** |

When the output frequency of frequency inverter reaches the given frequency, it outputs signal; **[F-33]** function, detection amplitude can be adjusted.

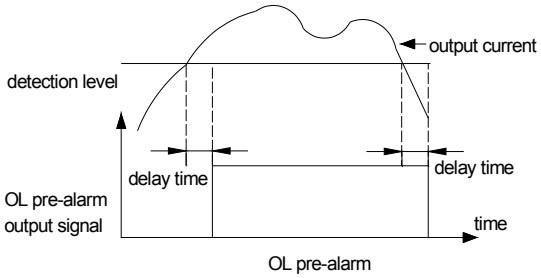
**Output frequency level detection parameter** is used to set the frequency detection level. When the output frequency is over the**[F-34]**setting value，by the delay time parameter**[F-35]**setting, it outputs signal. When the output frequency is lower than **[F-34]** setting values, by the delay time parameter **[F-35]** setting, it outputs signal.




| | | | |
|---|---|---|---|
| **F-36** | **Overload pre-alarm level** | **Range: 50%～200%** | **Factory setting: 150%** |
| **F-37** | **Overload pre-alarm delay time** | **Rang: 0.0～20.0second** | **Factory setting: 1.0 second** |

If the output current continues to be over the setting level of the parameter **[F-36]** , after the delay time **[F-37]** , the output terminal outputs valid signal. In the same way, when the output current is lower than the setting level of**[F-36]** setting, after the delay time**[F-37]**, the output terminal outputs invalid signal.



| | | | |
|---|---|---|---|
| **F-38** | **Timer setting value** | **Range:0.1～65000 second** | **Factory setting: second** |

This parameter is used to time for the frequency inverter. The timer start-up is accomplished by the exterior trigger terminal of the timer(trigger terminal is selected by **［F-01～F06］**). Timing from receiving the exterior trigger signal, while reaching the timed time, it outputs width is 500ms pulse signal by the corresponding output terminal.

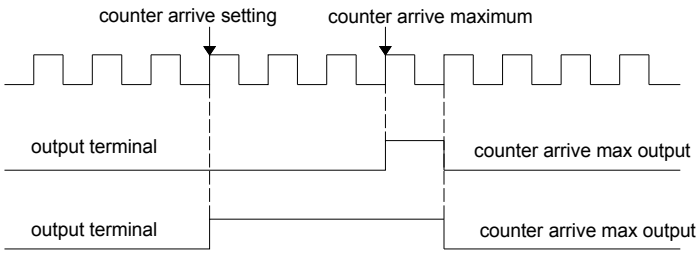
| | | | |
|---|---|---|---|
| **F-39** | **Counter maximum value** | **Range: 1～65000** | **Factory setting: 1000** |
| **F-40** | **Counter setting value** | **Range: 1～counter maximum value** | **Factory setting: 100** |

This parameter stipulates the counting action of the interior counter, clock terminal of the counter is selected by the parameter **［F-01～F-06］**

When the count value to the exterior clock reaches **［F-39］** setting value, in the corresponding output terminal, it outputs a valid signal with a width equal to exterior clock cycle. The output signal stops while the next count signal inputting.

When the count value to the exterior clock reaches **［F-40］** setting value, in the corresponding output terminal, it outputs a valid signal. While it reached **［F-39］** and the counter clear to zero, this output valid signal abolishes.

The clock cycle is required to be greater than 3ms; And the minimum pulse width is 1.5ms.




| | | | |
|---|---|---|---|
| **F-41** | **VS1 terminal input voltage lower limit** | **Range: 0.00V～［F-42］** | **Factory setting: 0.50V** |
| **F-42** | **VS1 terminal input voltage upper limit** | **Range:［F-41］～10.00V** | **Factory setting: 9.50V** |
| **F-43** | **VS1 terminal input voltage gain** | **Range: 0.01～5.00** | **Factory setting: 1.00** |

**VS1 terminal input voltage lower limit** This function defines the minimum signal of the analog input terminal**(VS1)** receiving. Frequency inverter will automatically filter the voltage signal which value is lower than it.

**VS1 terminal input voltage upper limit** This function defines the maximum signal of the analog input terminal**(VS1)**receiving. Frequency inverter will automatically filter the voltage signal which value is lower than it **.**

**VS1 terminal input voltage gain** This function is used to amplify or reduce the (VS1) terminal input analog value.

| | | | |
|---|---|---|---|
| **F-44** | **VS2 terminal input voltage lower limit** | **Range: -10.00V～［F-45］** | **Factory setting: 0.50V** |
| **F-45** | **VS2 terminal input voltage upper limit** | **Range:［F-44］～10.00V** | **Factory setting: 9.50V** |
| **F-46** | **VS2 terminal input voltage gain** | **Range: 0.01～5.00** | **Factory setting: 1.00** |
| **F-47** | **VS2 terminal input zero offset** | **Range: -1.00V～1.00V** | **Factory setting: 0.00V** |
| **F-48** | **VS2 terminal input bipolar adjust and direction control** | **Range: 0,1,2** | **Factory setting:0** |
| **F-49** | **VS2 terminal input bipolar control zero hysteresis band** | **Range:0.00V～3.00V** | **Factory setting: 0.20V** |

**VS2 terminal input voltage lower limit** This function defines the minimum signal of receiving by the analog input terminal**(VS2)**. Frequency inverter will automatically filters the voltage signal which value is lower than it.

**VS2 terminal input voltage upper limit** This function defines the maximum signal of receiving by the analog input terminal**(VS2)**. Frequency inverter will automatically filters the voltage signal which value is higher than it.

**VS2 terminal input voltage gain S2** This function is used to amplify or reduce the (VS2) terminal analog value.

**VS2 terminal input zero offset** This function is used to adjust the **(VS2)**terminal zero point in the bipolar control mode; Its adjustment direction is opposite to the actual zero point. If the actual input voltage is +0.5V, at this moment, users should set the zero offset as -0.5V to let the voltage corresponding to the zero voltage(only valid when **［F-48］** is set as "1"or "2")

**VS2 terminal input bipolar adjust and direction control**

0: Bipolar adjust and direction control both invalid: the output frequency is determined by the input voltage of terminal**(VS2).**

1: Bipolar adjust and direction control both valid: the output frequency of frequency inverter is

determined by the absolute value of amplitude of the input voltage of terminal**(VS2).** While output phase sequence (machine direction)is determined by the polar of the input voltage terminal**(VS2)**, frequency inverter neglects its direction turning setting orders only except this order. When the voltage **(VS2)**> 0,frequency inverter outputs positive phase sequence, machine forward rotates. When voltage **(VS2)**< 0,frequency inverter outputs negative phase sequence, machine reverses.

When the parameter ［**E-46**］ is set as "2" prohibit reverse, if**(VS2)**<0, machine reverse, frequency inverter will operates as "0"frequency.

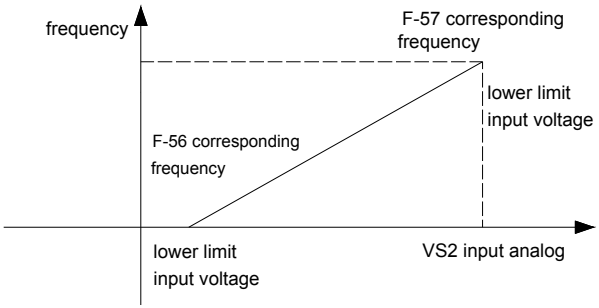
The Bipolar analog input signal (-10V～0V～+10V)is stipulated as following: 0V ~ +10V step is corresponding to [F-56]input frequency lower limit setting ~ **[F-57]** input frequency upper limit setting, forward rotation;

0V ~ -10V step is corresponding to **[F-56]**input frequency lower limit setting ~ **[F-57]** input frequency upper limit setting,, reverse.

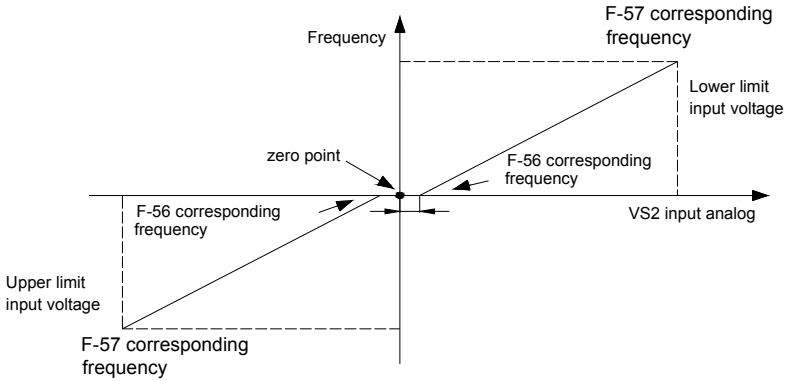
**Tips: In two channels combination, bipolar signal will carry out signed calculation based on the combination mode selection. Negative voltage and frequency DW signal are negative signal. All other input signals of VS2 are positive signal. If calculation result is positive, the machine forward rotates; If the calculation result is negative,machine reverses.**

2: Bipolar adjust valid, direction control invalid: In two channels combination, it used to add or reduce frequency of another channel. It carries out signed calculation while combination. If the result is positive, machine runs according to**[E-01]**given direction. If the result is negative, the output frequency is "0". Bipolar signal takes part in frequency calculation, do not change or decide the direction of the machine.

**VS2 terminal input bipolar control zero hysteresis band** This function is used in the bipolar control mode to adjust the **(VS2)** terminal zero point corresponding voltage range. If the zero point range is set as -1V～+1V,the hysteresis width should be set as 1V.(only valid when it is set as "1"in ［**F-48**］)




VS2 unipolar control diagram




VS2 bipolar control diagram

**Tip : When (VS2) is used as PID given or feedback channel, the function of bipolar is invalid. At this moment, the usage of (VS2) terminal is the same with the (VS1) terminal. Namely,when (VS2) <0, frequency inverter deems the input of this port is 0.**

| | | | |
|---|---|---|---|
| **F-50** | **AS terminal input current lower limit** | **Range:0.00mA～［F-51］** | **Factory setting: 4.20mA** |
| **F-51** | **AS terminal input current upper limit** | **Range ：［F-50］～20.00mA** | **Factory setting: 19.50mA** |
| **F-52** | **AS terminal input current gain** | **Range:0.01～5.00** | **Factory setting:1.00** |

**AS terminal input current lower limit** This function defines the minimum signal which received by the analog input terminal**(AS)**,frequency inverter will automatically filters the current signal whose value is lower than this value; For example, if the factory setting of this value "4.00"， 4.00～20.00mA input current can realize.

**AS terminal input current upper limit** This function defines the maximum signal which received by the analog input terminal**(AS)**, frequency i nverter will automatically filters the current signal whose value is higher than this value.

**AS terminal input current gain** This function is used to amplify or reduce the **(AS)**terminal.

| | | | |
|---|---|---|---|
| **F-53** | **Pulse input frequency lower limit** | **Range :0.0KHz～［F-54］** | **Factory setting: 0.0KHz** |
| **F-54** | **Pulse input frequency upper limit** | **Range:［F-53］～50.0KHz** | **Factory setting: 10.0 KHz** |

| | | | |
|---|---|---|---|
| **F-55** | **Pulse input frequency gain** | **Range:0.01～5.00** | **Factory setting:1.00** |

**Terminal input frequency lower limit** This function defines the minimum frequency received by the analog input terminal**(PUL)**. Frequency inverter will automatically filter the frequency whose value is lower than it;

**Terminal input frequency upper limit** This function defines the maximum frequency received by the analog input terminal**(PUL)**. Frequency inverter will automatically filter the frequency whose value is higher than it.

**Terminal input frequency gain** This function is used to amplify or reduce the **(PUL)** terminal input signal.

| | | | |
|---|---|---|---|
| **F-56** | **Terminal input lower limit setting frequency** | **Range:0.00Hz～［F-57］** | **Factory setting: 0.00Hz** |
| **F-57** | **Terminal input upper limit setting frequency** | **Range:［F-56］～maximum frequency** | **Factory setting: 50.00 Hz** |

These two parameters stipulate the corresponding relation between the exterior input analog quantity, upper/lower limit of the pulse signal and the frequency.

| | | | |
|---|---|---|---|
| **F-58** | **Input signal characteristic selection** | **Range:0000～1111** | **Factory setting:0000** |

**LED 0 digit:VS1 input characteristic selection**

0: Positive characteristic 1: Negative characteristic

**LED 10 digit:AS input characteristic selection**

0：Positive characteristic 1: Negative characteristic

**LED 100 digit： VS2 input characteristic selection**

0: Positive characteristic 1: Negative characteristic

**Tips: when(VS2)opens bipolar function([F-48]is set as "1" or "2"), this parameter is invalid.**

**LED 1000 digit:Impulse input characteristic selection**

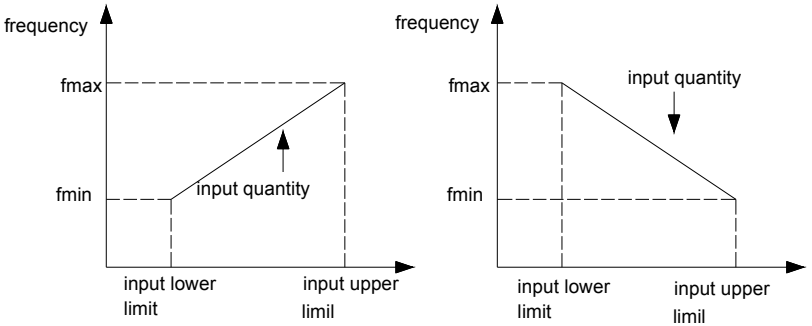
0:Positive characteristic 1:Negative characteristic

In positive characteristic stage, lower limit of exterior analog input quantity and the pulse signal corresponds to **[ F-56 ]**, upper limit of exterior analog input quantity and the pulse signal corresponds to **[ F-57 ]**.

When in negative characteristic stage, lower limit of exterior analog input quantity and the pulse signal corresponds to **[ F-57 ]**, upper limit of exterior analog input quantity and the pulse signal corresponds

to**[ F-56 ].**

As shown in the chart **[F-56]** (fmin), the biggest analog input and the pulse signal corresponding frequency setting means their upper limit value corresponding frequency setting, As shown in the chart **[ F-57 ]** (fmax).




Relationship between frequency setting and input quantity

| | | | |
|---|---|---|---|
| **F-59** | **Terminal analog input filtering time constant** | **Range:0.01～5.00 second** | **Factory setting:0.50 second** |

This is defined as the size of the input analog quantity signal filtering to eliminate the interference signal. The longer filtering time is, the stronger anti-interfere ability is, but the respond speed slower down; The shorter filter time is, the weaker anti-interfere ability is, but the respond speed become faster;

| | | | |
|---|---|---|---|
| **F-60** | **Output terminal(AO1) selection** | **Range:0 ～ 7** | **Factory setting:1** |
| **F-61** | **Output terminal(AO2) selection** | **Range:0 ～ 7** | **Factory setting:3** |

**(AO1)**output signal is voltage signal 0～10V.

**(AO2)**output signal is determined by［**F-62**］.

0:Output signal close

1:Output frequency/speed

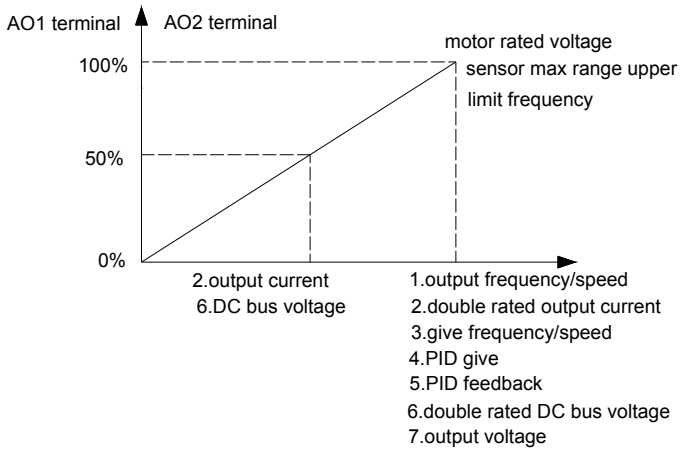
2:Output current

3:Given frequency/speed

4:PID given quantity

5:PID feedback quantity

6:DC bus voltage
7:Output voltage



AO1/AO2 port and output quantity relationship

**Tips: when (AO2)port is frequency pulse output or 4～20mA output, "0%"corresponding output quantity is not zero.**

| F-62 | (AO2) output signal selection | Range: 0 ～ 3 | Factory setting: 3 |
|---|---|---|---|

0:Frequency pulse output Factory settings is 0.2KHz～10.0KHz;
1 :0～20mA
2 :4～20mA
3 :0～10V

**Tips: after the software selecting the output mode, user need to select the short connect mode of the terminal pin J1,J2,J3. The concrete selection ways as follows:**
**When select frequency pulse output mode, pls short connect J1, disconnect J2 and J3.**
**When select 0～20mA or 4～20mA output mode, pls short connect J2, disconnect the J1 and J3.**
**When select 0～10V output mode, pls short connect J3, disconnect the J1 and J2.**
**While frequency inverter leaving factory, both software and hardware are defaulted as 0～10V output mode. If user needs to change, please change both software and hardware at the same time according to the actually output.**

| | | | |
|---|---|---|---|
| **F-63** | **(AO1)output signal gain** | **Range:25%～200%** | **Factory setting: 100%** |
| **F-64** | **(AO2)output signal gain** | **Range:25%～200%** | **Factory setting: 100%** |

Used to adjust the analog quantity of **(AO1)**terminal and numerical value of**(AO2)**output signal.

| | | | |
|---|---|---|---|
| **F-65** | **(AO1)output signal zero adjust** | **Range:-10%～10%** | **Factory setting: 0.0** |
| **F-66** | **(AO2)output signal zero adjust** | **Range:-10%～10%** | **Factory setting: 0.0** |

They are used to adjust the output signal zero point of**(AO1)**terminal and**(AO2)**terminal. It is invalid to adjust this value when**(AO2)** is frequency pulse output.

| | | | |
|---|---|---|---|
| **F-67** | **Keyboard potentiometer input voltage lower limit** | **Range:0.00V～［F-68］** | **Factory setting: 0.20V** |
| **F-68** | **Keyboard potentiometer input voltage upper limit** | **Range:［F-67］～5.50V** | **Factory setting: 4.80V** |
| **F-69** | **Keyboard potentiometer gain** | **Range:0.50～5.00** | **Factory setting: 1.00** |

**Keyboard potentiometer input voltage lower limit** This function defines the minimum signal which the keyboard potentiometer has received. Frequency inverter will automatically filters the signal whose value is lower than it;

**Keyboard potentiometer input voltage upper limit** This function defines the maximum signal which the keyboard potentiometer has received. Frequency inverter will automatically filters the signal whose value is upper than it;

**Keyboard potentiometer gain** This function is used to amplify or reduce keyboard potentiometer input analog quantity.

**Tips: Keyboard potentiometer input voltage upper limit is corresponding to frequency upper limit［E-10］,Keyboard potentiometer input voltage lower limit is corresponding to 0.00Hz.**

| | | | |
|---|---|---|---|
| **F-70** | **Ascend/descend terminal preset frequency** | **Range:0.00Hz～frequency upper limit** | **Factory setting: 0.00Hz** |

During the ascend/descend control, frequency inverter input the initial frequency after running. Only valid when ［**F-07**］ LED 10 digit is set as “1”or“2”.

When the ［**F-07**］ LED 10 digit is set as“1”, this parameter will save the instantaneous frequency at stop in ascend/descend process, which can be reviewed or modified after stop.

When the ［**F-07**］ LED 10 digit is set“2”, user can preset the initial output frequency for frequency inverter running during the ascending/descending process control by this parameters.

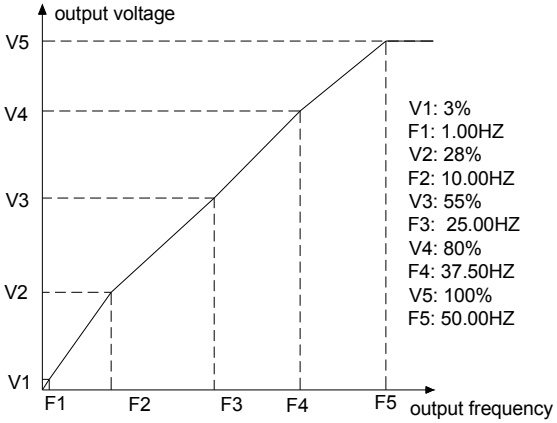
| | |
|---|---|
| **F-71** | **Reserved** |

**7.3 Special function parameters detailed specification**

| | | | |
|---|---|---|---|
| **H-01** | **Free-setting voltage V1** | **Range:0.0%～［H-03］** | **Factory setting:3.0%** |
| **H-02** | **Free-setting frequency F1** | **Range:0.00Hz～［H-04］** | **Factory setting: 1.00Hz** |
| **H-03** | **Free-setting voltage V2** | **Range:［H-01～H-05］** | **Factory setting:28.0%** |
| **H-04** | **Free -setting frequency F2** | **Range:［H-02～H-06］** | **Factory setting: 10.00Hz** |
| **H-05** | **Free-setting voltage V3** | **Range:［H-03～H-07］** | **Factory setting:55.0%** |
| **H-06** | **Free-setting frequency F3** | **Range:［H-04～H-08］** | **Factory setting: 25.00Hz** |
| **H-07** | **Free-setting voltage V4** | **Range:［H-05～H-09］** | **Factory setting:80.0%** |
| **H-08** | **Free-setting frequency F4** | **Range:［H-06～H-10］** | **Factory setting: 37.50Hz** |
| **H-09** | **Free-setting voltage V5** | **Range:［H-07］～100.0%** | **Factory setting: 100.0%** |
| **H-10** | **Free-setting frequency F5** | **Range:［H-08］～maximum frequency** | **Factory setting: 50.00Hz** |

Free-setting V/F curve:

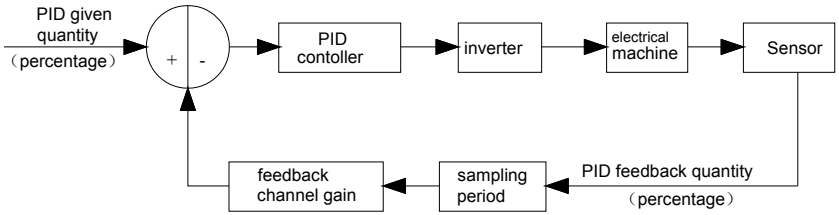
Users set the 1st / 2nd / 3rd/ 4th / 5th voltage percentage of V / F curves, base on frequency inverter rated output voltage 100%, corresponding to the F1/F2/F3/F4/F5 frequency points. Users set the 1st / 2nd / 3rd/ 4th / 5th frequency values of V / F curves, corresponding to the V1/V2/V3/V4/V5.




This parameter setting must satisfy the following conditions:
0≤F1≤F2≤F3≤F4≤F5≤ maximum frequency upper limit;0≤V1≤V2≤V3≤V4≤V5≤100%
V1,V2,V3,V4,V5 is based on the frequency rated output voltage.

| H-11 | PID output characteristic | Range:0,1 | Factory setting:0 |
|---|---|---|---|

PID control is a common method used in the process control. By series calculation on the difference between the feedback quantity of controlled object and the frequency PID given quantity, such as proportion, integral, differential,and so on, it adjusts the output frequency of frequency inverter and constitutes negative feedback PID adjustment to achieve the goal that control abject stable with the PID given quantity.




PID control diagram

0:Positive characteristic Suitable for occasions that maintains the PID balance by reducing the frequency inverter output frequency while the PID feedback quantity is greater than PID given quantity. Such as constant pressure water supply, gas supply and take-up tension control.
1:Negative characteristic Suitable for occasions that maintains the PID balance by enhancing the frequency inverter output frequency while the PID feedback quantity is greater than PID given

quantity. Such as central air-conditioning constant control and pay-off tension control.

While frequency inverter receiving the operation order, frequency inverter will automatically control output frequency after calculation for the given signal and feedback signal of the terminal according to the PID setting control mode.

While the PID controls to cancel the terminal closure, frequency inverter will convert the given signal to output frequency directly without PID adjustment.

| H-12 | PID controller given sources | Range:0 ～ 6 | Factory setting:1 |
|---|---|---|---|

0：Keyboard potentiometer Given by the keyboard potentiometer analog signal.

1：PID keyboard number given When applied to normal PID，setting by the［**H-16**］.

2：Exterior terminal VS1 Given analog signal by the exterior terminal（**VS1**）（0V～10V）.

3：Exterior terminal AS Given analog signal by the exterior terminal（**AS**）（4～20mA）.

4：Exterior terminal VS2 Given analog signal by the exterior terminal（**VS2**）.（[F-48] can not be "1"or "2"）.

5：Exterior pulse signal Given （**PUL**）pulse frequency signal by the exterior exterminal.

6：RS485 interface Given signal by RS485 communication interface.

| H-13 | PID controller feedback signal sources | Range:0 ～ 3 | Leave factory Value:1 |
|---|---|---|---|

0. Exterior terminal**(VS1)** feedback analog signal by exterior terminal**(VS1)**（0V～10V）.

1. Exterior terminal**(AS)** feedback analog signal by exterior terminal**(AS)**（4～20mA）.

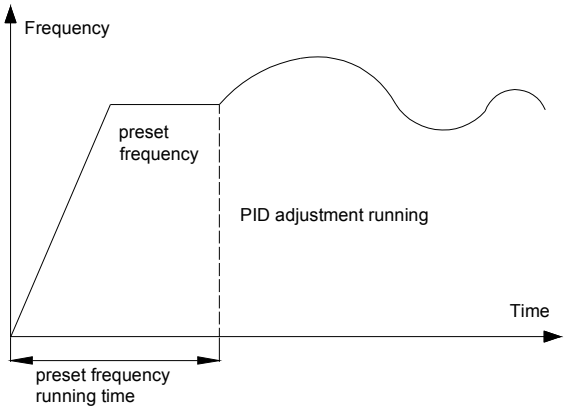
2. Exterior terminal**(VS2)** feedback analog signal by exterior terminal**(VS2)**.（[F-48] can not be "1"or "2"）.

3. Exterior pulse signal feedback**(PUL)**pulse frequency signal by exterior terminal.

**Attention: PID controller given signal source and PID controller feedback signal source can not be set as the same channel; otherwise, PID can not work normally.**

| H-14 | PID preset frequency | Range:0.00Hz ～ frequency upper limit | Factory setting: 0.00 Hz |
|---|---|---|---|
| H-15 | PID preset frequency operation time | Range：0.1～6500.0 second | Factory setting: 0.0 second |

This function is defined as this: after PID running , frequency inverter will accelerate to the PID preset frequency ［**H-14**］ according to the acceleration /deceleration time 1 firstly and run for PID preset frequencies running time **[H-15]** , then run according to the PID closed-loop characteristics.




PID preset frequency running time diagram

| H-16 | PID keyboard number given | Range:0.0%～100.0% | Factory setting: 50.0% |
|---|---|---|---|

Only while ［**H-12**］ setting is"1", this parameter is valid;Take the sensor largest range **[H-18]** as a benchmark;When this parameter is changed, PID given value of monitoring target will automatically change synchronously.

| H-17 | Feedback channel gain | Range:0.01～5.00 | Factory setting:1.00 |
|---|---|---|---|

This function is used to amplify or reduce the input analog quantity of feedback channel.

| H-18 | Sensor maximum range | Range :1.0～100.0 | Factory setting: 100.0 |
|---|---|---|---|

This function is used to adjust the display data of PID given quantity and PID feedback quantity

$$\text{Actual LED display value}=\frac{\text{given (feedback) signal value} - \text{lower input limit}}{\text{upper input limit} - \text{input lower limit}} * \text{sensor largest range}$$

For example, in pressure control, the display value is the actual value of the pressure while it is set as the maximum pressure of the sensor.

Assume external voltage terminal (VS1) is a feedback signal input channels, when set (VS1) upper limit voltage as 9V, the lower limit voltage is 0.5V; the feedback voltage is 4.5V, the largest range of the sensor is 20mpa

$$\text{Nixie light display value}=(4.5-0.5)*20/(9-0.5)=9.4\text{mpa}$$

| | | | |
|---|---|---|---|
| **H-19** | **Proportion gain P** | **Range:0.1～100.0** | **Factory setting: 20.0** |
| **H-20** | **Integral time constant I** | **Range:0.1～100.0second** | **Factory setting: 2.0second** |
| **H-21** | **Differential gain D** | **Range:0.0 ～ 10.0** | **Factory setting:0.0** |

The adjustable parameters, which are control by PID，should be set based on actual characteristics of the system.

Proportion gain P is the parameter which determines the impact degree of deviations cause by P action. When gain is large, it responds quickly, but vibrates. When gain is small, respond will delay.

Integral time constant I decides the I action effect. When integral time is large, it responds slowly; Besides, the control power to the exterior disturbance is getting weaker. When integral is small, it responds fast. Frequency inverter will vibrate if the integral is too small.

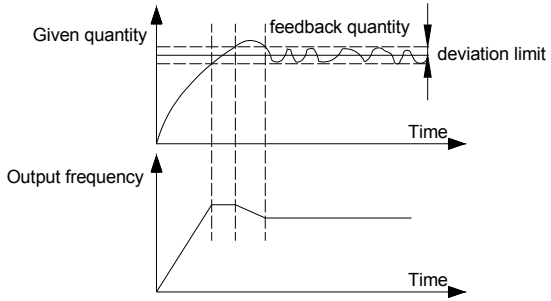
Differential gain D; when the deviation of PID feedback quantity and PID given quantity changes, The output and the change rate of deviation are proportionally adjusted. This adjustment is only related to the direction and size of the deviation change and has nothing to do with the direction and size of the deviation itself. While the feedback signal changes, differential adjustment is used to adjust according to the change trend to restrain the change of feedback signal.Please be careful to use the differential adjustment. Because it easily amplies the system disturbance, especially disturbance with higher changing frequency.

| | | | |
|---|---|---|---|
| **H-22** | **Sampling period** | **Range:0.01～60.00 second** | **Factory setting: 0.10 second** |

This parameter is only valid for the sampling period of feedback quantity. The adjuster calculates for one time in each sampling period. The shorter sampling period is, the quicker it responds.

| | | | |
|---|---|---|---|
| **H-23** | **PID control deviation limit** | **Range:0.0%～20.0%** | **Factory setting:0.0%** |

It is the maximum offset of PID feedback quantity to PID given quantity; When the feedback quantity is within this range, PID stops adjusting and the output remains. Rationally using this function is conducive to adjust the contradiction between the accuracy and stability of the system output.



PID control dievation limit diagram

| | | | |
|---|---|---|---|
| **H-24** | **Start threshold** | **Range:0.0%～sleep threshold** | **Factory setting: 0.0%** |
| **H-25** | **Dormancy threshold** | **Range: start threshold～100.0%** | **Factory setting: 100.0%** |

**Start threshold:** After the frequency inverter enterring dormant state, PID feedback quantity must be lower than the start threshold, then the frequency inverter can restart again; If the start threshold is set too high, the frequency inverter maybe frequently start and stop; If it is too low, there will be undervoltage fault. This parameter is defined as percentage of the largest range of the sensor that the PID feedback quantity accounts for.

**Dormancy threshold**: It is used to adjust the standard of system dormancy while being not used (while no water in water supply system). Namely, inverter carries out dormancy detection anytime. When it detects that PID feedback quantity is higher than or equal to the dormant threshold and stay the setting value for a while, frequency inverter will start dormancy detection. In the dormancy detection process, if the feedback is higher than the dormancy threshold, the output frequency will be reduced to lower limit slowly and wait for while, then reduces to 0. It enters the dormancy state. If the feedback is lower than the dormancy threshold, the dormancy detection is over. The inverter enter the state of PID adjustment. The lower parameter setting, the more easily the system enters the dormancy state. When this parameter is set as 100.0%, system will not enter dormancy state. This parameter is defined as percentage of the largest range of the sensor that the PID feedback quantity accounts for. It is valid only in constant pressure PID control.

| | | | |
|---|---|---|---|
| **H-26** | **Alarm upper limit value** | **Range:alarm lower limit value～100.0%** | **Factory setting: 100.0%** |
| **H-27** | **Alarm lower limit value** | **Range:0.0%～alarm upper limit value** | **Factory setting: 0.0%** |

While PID feedback reaches or exceeds the setting value, if any output terminals［**F-30～F-32**］is set as "15"（PID feedback quantity upper limit alarming, it outputs alarm signal; This parameter is defined as percentage of the largest range of the sensor that the PID feedback quantity accounts for.

While PID feedback reaches or under the setting value, if any output terminals［**F-30～F-32**］is set as "16"（PID feedback quantity upper limit alarming, it outputs reaching signal; This parameter is defined as percentage of the largest range of the sensor that the PID feedback quantity accounts for.

This function is valid only in using the constant PID control.

| | | | |
|---|---|---|---|
| **H-28** | **Sensor disconnection detection** | **Range:0.0%～20.0%** | **Factory setting: 0.0%** |
| **H-29** | **Sensor disconnection alarm operation selection** | **Range :0,1** | **Factory setting:0** |

When the frequency inverter is in the PID control mode, this function is valid; If the detection feedback signal is less than **[H-28],** the sensor is deemed to be open circuit. At this moment ,if any one of output terminal ［**F-30～F-32**］ is set as "17" (sensor disconnect), the output signal is valid; This parameter is defined as the percentage of the sensor maximum range that the feedback signal accounts for.

**Sensor disconnection alarm running selection**

0:Continuous operation

1:Close down

In the process of PID adjustment,while system detects sensor open circuit, this parameter is used to choose whether frequency inverter stop working. If choose working on ,frequency inverter will cancel closed-loop control, seeing PID given values as frequency output; If choose closing down, when the system detects the alarm which is mentioned above, the inverter will stop outputing and display the malfunction information immediately.

The feedback sensor malfunction is displayed as "SEn". When it detects the PID feedback quantity is greater than the setting of **[H-28]**, the feedback sensor fault is deemed to be vanish, and system restores PID closed-loop control.

| | | | |
|---|---|---|---|
| **H-30** | **upper limit demarcative value** | **Rang: lower limit demarcative value～100.0%** | **Factory setting: 100.0%** |
| **H-31** | **lower limit demarcative value** | **Rang:0.0%～upper limit demarcative value** | **Factory setting: 0.0%** |

PID given quantity is restricted by this parameter in the range of upper、lower limit demarcative value. this parameter is defined as the ratio of upper,lower limit demarcative value to maximum range. This function is only valid in the closed-loop control mode.

| | | | |
|---|---|---|---|
| **H-32** | **Program running mode** | **Range :0 ～ 5** | **Factory setting:0** |

0:Signal cycle (time in seconds)

While receiving running instructions, the frequency inverter starts to operat from the 1st step speed. The direction and acceleration\deceleration time are selected by parameter **[H-35 ~ H-49]**; Run time is set up by parameter **[H-50 ~ H-64]**;

The unit time is second.While the first step time up, it shifts to the next step speed. The time,direction and acceleration\deceleration time of each step speed can be set; While finishing the 15th section speed running, frequency inverter will output "0" frequency. If running time of one step is zero, it will skip over the step during running.

1: continuous cycle (time in seconds)

After the frequency inverter finishing 15th section speed running, return to the 1st step speed to begin to work for uninterrupted cycles. Running direction and acceleration\deceleration time are selected by the parameter **[H-35 ~ H-49]**; Run time is set up by parameter **[H-50 ~ H-64]**, the unit time is second.

2: signal cycle, continuous running (time by second)

After finishing a single cycle running, the frequency inverter does not close down. It works on at the final step speed whose running time is not zero. Running direction and acceleration\deceleration time are selected by the parameter **[H-35 ~ H-49]**; Run time is set up by parameter **[H-50 ~ H-64]**, the unit time is second.

3:signal cycle (time in minutes)

Direction and acceleration\deceleration time are selected by parameter **[H-35 ~ H-49]**; Running time is set up by parameter **[H-50 ~ H-64]**; The unit time is minute. The others are identical with mode "0".

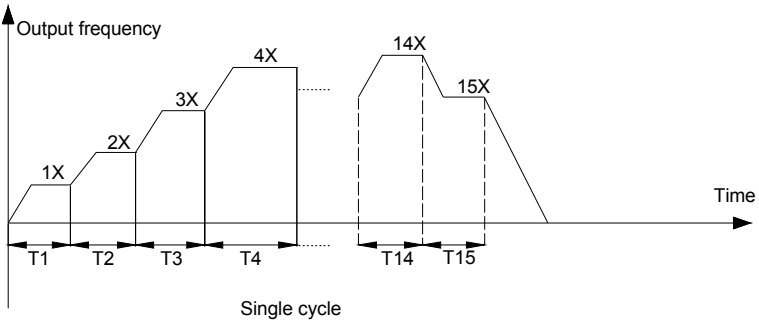
4: continuous cycle (time in minutes)

Running direction and acceleration\deceleration time are selected by the parameter **[H-35 ~ H-49]**; Running time is set up by parameter **[H-50 ~ H-64]**; The unit time is minute; The others are identical with mode "1".

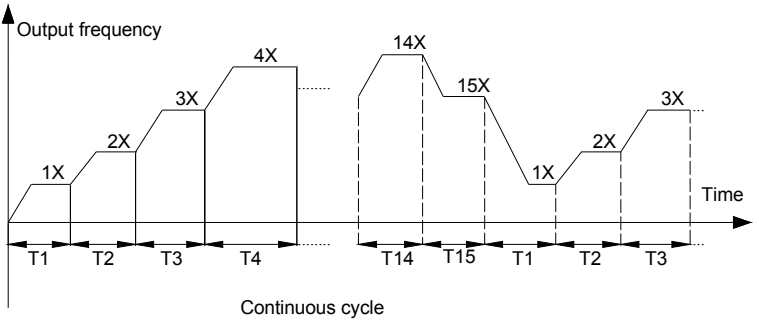
5: Signal cycle, continuous running (time in minutes)

Running direction and acceleration\deceleration time are selected by the parameter **[H-35 ~ H-49]**; Running time is set up by parameter **[H-50 ~ H-64]**; The unit time is minute; The others are identical

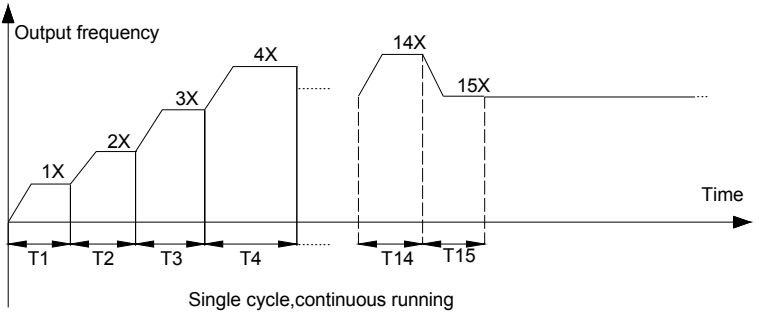
with mode "1".




Single cycle




Continuous cycle




Single cycle,continuous running

| H-33 | Program run breakpoint restore mode selection | Range:0,1,2 | Factory setting:0 |
|---|---|---|---|

0:Running at the first step speed

1: Continue to run as the breakpoint operation frequency and time again.

2: Continue to run as the breakpoint operation frequency for the residual time.

This parameter defines the operation mode of restart after braking off in running process because of various cause (closing down, malfunction, power failure etc.).
If selects the "0" mode, the frequency inverter will begin again at the first step speed.
If selects the “1" mode, frequency inverter will continue to run as the breakpoint operation frequency and time again.
If selects the “2" mode, frequency inverter will continue to run as the breakpoint operation frequency for the residual time.

| H-34 | In run state, power down memory selection | Range:0,1 | Factory setting:0 |
|---|---|---|---|

0:Power down without storage
1:Power down with storage
This parameter is defined as: when the program operation is selected, whether to store the program running state while power down (running step no, step remaining time, acceleration\deceleration time and running direction and so on). If the power down with storage mode is selected, in coordination with the parameter **[H-33]**,it can define the recover mode of program run after electrify next time. If need to ensure that, after restoring from power down, the frequency inverter continues the state before power down, this parameter should be set as “1”.

| H-35 | 1 step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:0 |
|---|---|---|---|
| H-36 | 2 step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:1 |
| H-37 | 3 step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:2 |
| H-38 | 4.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:3 |
| H-39 | 5.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:4 |
| H-40 | 6.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:5 |
| H-41 | 7.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:6 |
| H-42 | 8.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:7 |

| | | | |
|---|---|---|---|
| H-43 | 9.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:0 |
| H-44 | 10.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:1 |
| H-45 | 11.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:2 |
| H-46 | 12.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:3 |
| H-47 | 13.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:4 |
| H-48 | 14.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:5 |
| H-49 | 15.step speed direction and acceleration, deceleration time | Range :0～7 | Factory setting:6 |

During the program running, rotation direction and acceleration/deceleration time of 15 steps can be set up respectively.

| Setting value series | Definition details |
|---|---|
| 0 | Forward; acceleration time 1/deceleration time 1 |
| 1 | Forward; acceleration time 2/deceleration time 2 |
| 2 | Forward; acceleration time 3/deceleration time 3 |
| 3 | Forward; acceleration time 4/deceleration time 4 |
| 4 | Reverse; acceleration time 1/deceleration time 1 |
| 5 | Reverse; acceleration time 2/deceleration time 2 |
| 6 | Reverse; acceleration time 3/deceleration time 3 |
| 7 | Reverse; acceleration time 4/deceleration time 4 |

| | | | |
|---|---|---|---|
| H-50 | 1 step speed operation time T1 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-51 | 2 step speed operation time T2 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-52 | 3 step speed operation time T3 | Range :0.0～6000.0 | Factory setting：10.0 |
| H-53 | 4 step speed operation time T4 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-54 | 5 step speed operation time T5 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-55 | 6 step speed operation time T6 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-56 | 7 step speed operation time T7 | Range :0.0～6000.0 | Factory setting :10.0 |
| H-57 | 8 step speed operation time T8 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-58 | 9 step speed operation time T9 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-59 | 10 step speed operation time T10 | Range :0.0～6000.0 | Factory setting:10.0 |
| H-60 | 11 step speed operation time T11 | Range :0.0～6000.0 | Factory setting:10.0 |

| | | | |
|---|---|---|---|
| **H-61** | **12 step speed operation time T12** | **Range :0.0～6000.0** | **Factory setting:10.0** |
| **H-62** | **13 step speed operation time T13** | **Range :0.0～6000.0** | **Factory setting:10.0** |
| **H-63** | **14 step speed operation time T14** | **Range :0.0～6000.0** | **Factory setting:10.0** |
| **H-64** | **15 step speed operation time T15** | **Range :0.0～6000.0** | **Factory setting:10.0** |

Set up 15 steps speed running time respectively, the time unit is determined by the［**H-32**］setting.

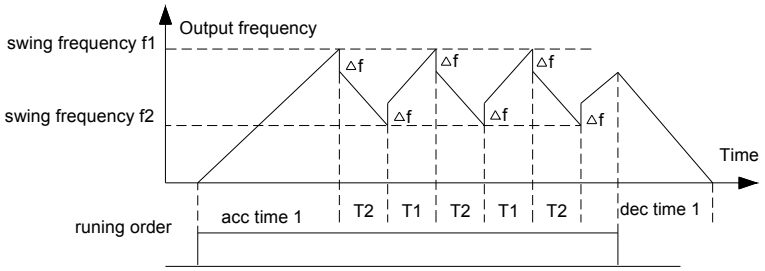
| | | | |
|---|---|---|---|
| **H-65** | **Differential frequency △f in swing frequency operation** | **Range:0.00Hz～20.00Hz** | **Factory setting: 2.00Hz** |

During the swing frequency running, the FOR/REV switch function will be forbidden. It can only be gave operation direction again after closing down. f1 is the setting value of **[F-09]**; f2 is the setting value of **[F-10]**; Acceleration time T1 of the amplitude is the setting value of **[F-24]**; And the acceleration time T2 of the amplitude is the setting value of **[F-25]**.

The acceleration/deceleration time in swing frequency running is acceleration\deceleration time 1. While using the swing frequency running function, frequency inverter will run on the setting acceleration time of the acceleration\deceleration time 1 to the f1 setting frequency, then begin swing frequency running. While stopping, frequency inverter will run on acceleration\deceleration time 1 from the running frequency to stop. Acceleration\deceleration time of the amplitude is acceleration\deceleration time 2. It is defined as the same as acceleration\deceleration time 1.

The parameter settings in the swing frequency running should satisfy the following formula request, otherwise, display "Err5".

$$\begin{cases} f1 > f2 + \triangle f \\ f2 \geq 0.50Hz \\ 0 \leq \triangle f \leq 20.00Hz \end{cases}$$




swing frequency running diagram

| H-66 | Linkage main station setting | Range :0,1 | Factory setting:0 |
|---|---|---|---|

0:This frequency inverter is linkage slave station

1:Main station control mode 1: Send the setting frequency and run command of main station to the slave one.

Main station control mode 2 : Send the output frequency and run command of main station to the slave one.

When the local machine as the main station has linkage control function, it can control other AC60 frequency inverters synchro operation in the network.

| H-67 | This machine address | Setting range:1～247 | Factory setting:1 |
|---|---|---|---|

This parameter defines local communication address if local machine as slave machine. If local machine as host machine, this parameter is meanless.

| H-68 | Data format | Range:0,1,2,3 | Factory setting:3 |
|---|---|---|---|

0:NO checking(N,8,1) 1:Even checking(E,8,1)

2:Odd checking(O,8,1) 3:NO checking(N,8,2)

| H-69 | Baud rate | Range:0 ～ 4 | Factory setting:3 |
|---|---|---|---|

0:1200bps 1:2400bps

2:4800bps 3:9600bps

4:19200bps

| H-70 | Communication setting frequency ratio | Range:0.01～5.00 | Factory setting:1.00 |
|---|---|---|---|

The frequency instruction which is send out by superordinate machine multiplies this parameter; The result is this machine's setting frequency. Frequency instruction of superordination machine can be revised proportionally.

| H-71 | Communication overtime time | Range :0.0～6500.0 second | Factory setting: 10.0 second |
|---|---|---|---|

If the time lag between a communication and the next communication exceeds communication

overtime time, it is considered there is communication disconnection fault , malfunction disconnection action mode is decided by the［**H-72**］**.**

| | | | |
|---|---|---|---|
| **H-72** | **RS485 communication disconnection action mode** | **Range :0,1** | **Factory setting:0** |

0:Close down

1:Maintain original state After the communication fault being detected, system continues working according to the state confirmed in the lastest communication.

| | | | |
|---|---|---|---|
| **H-73** | **Response delay** | **Range:0.000～1.000 second** | **Factory setting: 0.005second** |

This parameter defines the intermediate time lag between the frequency inverter receiving the data and responding data back to the superordinate machine. If the response delay time is shorter than the system handling time, the response time should be with the system as standard; If the response delay time is longer than the system handling time, after system processing the data, it waits until the response delay time is up, then sends data to the superordinate machine.

| | | | |
|---|---|---|---|
| **H-74** | **Limit of instant DEC lowest voltage** | **Range:0%～200%** | **Factory setting:20%** |
| **H-75** | **Limit of instant DEC highest voltage** | **Range:0%～200%** | **Factory setting:90%** |
| **H-76** | **Instant DEC gain** | **Range:0.01～10.00** | **Factory setting:2.00** |
| **H-77** | **Renew stable voltage time** | **Range:0.0～100.0 second** | **Factory setting: 2.0second** |

While the inverter reduces output frequency under instant power off or voltage down case, this function compensate the voltage by feedback energy to maintain the inverter running in short time.

While the input voltage is lower than **[H-74],** the inverter begin to DEC, bus voltage rises. While the voltage arrives **[H-75]**, the inverter stops DEC and runs the time as **[H-77]** at the current speed, then ACC to speed as setting.

**[H-76]** is DEC gain. If it is large, the voltage will rise quickly, which suits for small inertia load. If it is small, the voltage will rise slowly, which suits for big inertia load.

| | |
|---|---|
| **H-78/H-79/H-80** | **Reversed** |

# Chapter 8: Abnormality Diagnoses and Processing

**8.1 Fault information and troubleshooting**

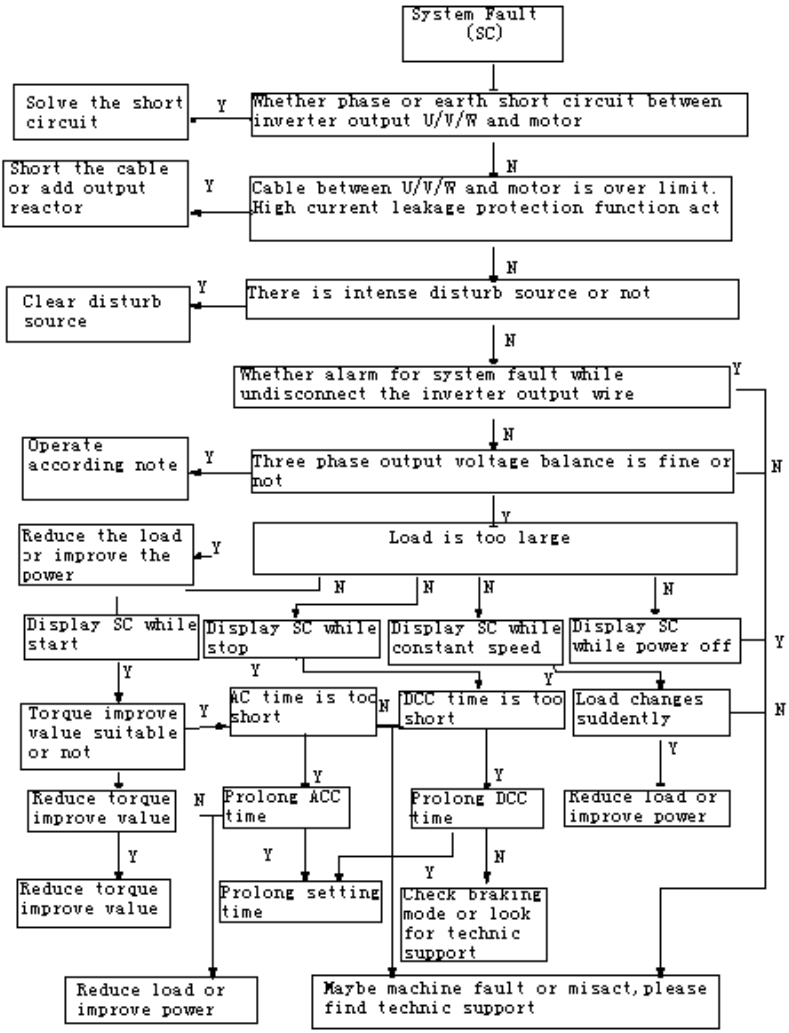
| Fault code | Type of fault | Probable Causes | Corrective Actions |
|---|---|---|---|
| S.C | System fault | 1.The acceleration time is set too short;<br>2.Shorted Inverter phase-to-phase or phase to ground;<br>3.Module failure;<br>4.Disturbance; | 1.Increase the acceleration time;<br>2.Check the peripheral device,reset after troubleshooting;<br>3.Ask for technical support;<br>4. Check peripheral device、grounding line,shield line grounding condition, distance condition of terminals and control motor; |
| o.C.1 | Acc over current | 1.Acc time is too short;<br>2. Restart the machine in running when momentary stop occurs;<br>3. V/F curve setup is not suitable or torque is boosted too high;<br>4.Frequency inverter capacity is too low; | 1. Increase the acceleration time;<br>2.restart after the machine totally stop or set［**E-30**］as"2";<br>3. Reset V/F curve or torque boost value;<br>4. Select frequency inverter with proper capacity; |
| o.C.2 | Dec over current | 1.Deceleration time is too short;<br>2.Potential load or inertia is too big;<br>3. Frequency inverter capacity is too low; | 1. Increase the deceleration time<br>2.Connect external resistor or braking unit;<br>3.Select frequency inverter with proper capacity; |
| o.C.3 | Over current at constant speed | 1.Load change suddenly<br>2. Network voltage is too low. | 1. Check the load change condition and eliminate it;<br>2.Check the input power; |
| o.U.1 | Acc over voltage | 1.Supply voltage overrun<br>2. Restart the machine in running（no tracking start） | 1.Check the network voltage and correct the fault;<br>2. Restart after the machine totally stop or set［**E-30**］as"2"; |
| o.U.2 | Dec over voltage | 1.Dec time is too short;<br>2. Potential load or inertia is too big;<br>3. Supply voltage overrun; | 1. Increase the deceleration time;<br>2. Decrease potential load, or amplify the frequency inverter capacity, or install more braking unit;<br>3.Check the network voltage，troubleshooting; |

| | | | |
|---|---|---|---|
| o.U.3 | Over voltage at constant speed | 1.Supply voltage overrun;<br>2.Input voltage is abnormal; | 1.Check the network voltage and correct the fault;<br>2.Install input reactor; |
| o.U.4 | Close down over voltage | 1.Supply voltage overrun | 1. Check the network voltage and correct the fault;<br>2. Ask for technical support; |
| o.L.1 | Motor overload | 1. V/F curve setup or torque boost is not suitable<br>2. Network voltage is relatively low;<br>3. Motor overload protection parameter is set improperly；<br>4. Motor block rotor operation or heavy load;<br>5.Universal motor works at low speed with heavy load for a long time; | 1. Reset V/F curve or torque boost value;<br>2.Check the input power;<br>3.Check［**E-57**］setting;<br>4.Adjust load or select and use frequency inverter with matching capacity grade;<br>5. When requiring long time and low speed work, please use Variable frequency motor; |
| o.L.2 | Frequency inverter over load | 1.Heavy load;<br>2.Acc time is set too Short;<br>3. Restart the motor in running when momentary stop occurs;<br>4. V/F curve setup or torque boost is not suitable; | 1. Select frequency inverter with proper capacity;<br>2. Increase the acceleration time;<br>3. Restart after the motor completely stop or set［**E-30**］as“2”;<br>4. Reset V/F curve or torque boost value; |
| o.H. | Frequency inverter inner overheat | 1. Too high ambient temperature;<br>2. Damaged fan;<br>3. Blocked air duct;<br>4.Carrier frequency is too big; | 1. Ameliorate periphery environment；<br>2.Replace fan;<br>3. Clear air duct,improve the frequency inverter periphery ventilation and dissipation environment;<br>4.Check［**E-20**］and［**E-21**］setting; |
| LU1 | under voltage of supply power at stop | 1.Supply power is too Low;<br>2.Voltage detection circuit abnormal; | 1.check the supply voltage and correct the fault;<br>2. Ask for technical support; |
| LU2 | under voltage of supply | 1.Supply power is too Low;<br>2.Capacity of power | 1.Check the supply voltage and correct the fault;<br>2.Improve power supply system; |

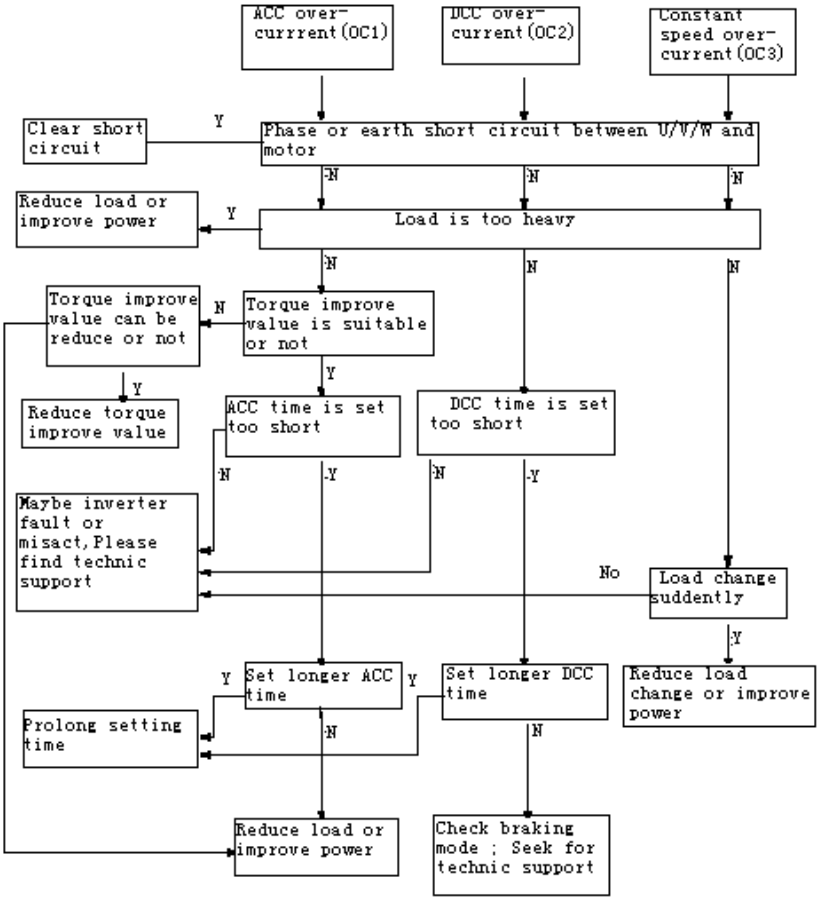
| | | | |
|---|---|---|---|
| | power at running | network is too small,or instantaneous surge current inside power network is too big;<br>3.DC main contactor inside the frequency inverter is not close; | 3. Ask for technical support; |
| SEn | Feedback sensor fault | In PID running mode, when the analog feedback channel is selected and the feedback signal is lower than［**H-28**］setting value, alarm | 1. Check wiring and re-wire again;<br>2.Adjust the feedback signal input type; |
| Err1 | Open-phase at input terminals | Open-phase in frequency inverter three phase input terminals. | Check three phase input power and three phase input power wiring |
| Err2 | Output grounding | Frequency inverter has device grounding short circuit at the output side; | Check peripheral device、grounding line、motor insulation； |
| Err3 | Current detecting fault | 1.Detecting circuit fault；<br>2.Damaged HALL component; | 1. Ask for technical support;<br>2. Ask for technical support; |
| Err4 | Frequency inverter external fault | External terminal action | Check external device; |
| Err5 | Swing frequency running parameters setting error | User set the swing running parameter not correctly; | Reset the swing frequency running parameters; |
| Err6 | Keyboard communication fault | 1.Keyboard wiring fault;<br>2.Keyboard communication component damaged; | 1.Check the keyboard wiring;<br>2.Ask for technical support; |
| 93SE | Memorizer fault | 1. Read/write error of control parameters;<br>2. EPROM is damaged; | 1.Frequency inverter re-electrify;<br>2.Ask for technical support; |
| LIFE | Reserved | -- | 1.Ask for technical support; |

## 8.2 Fault diagnosis

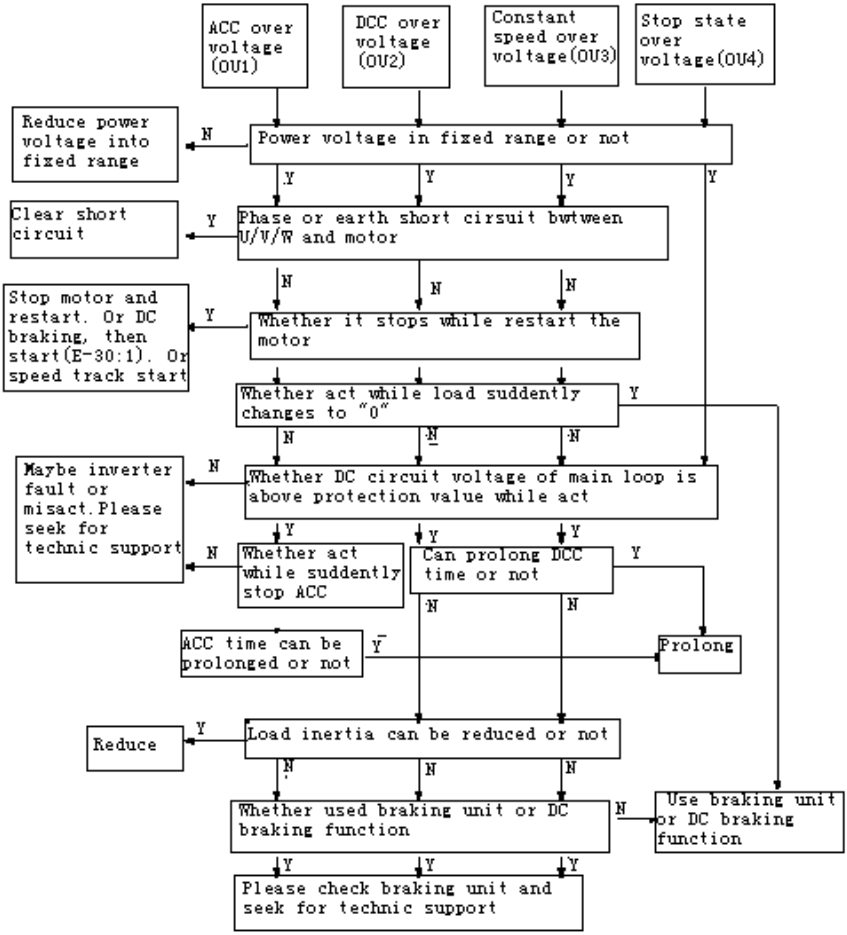
8.2.1 System fault



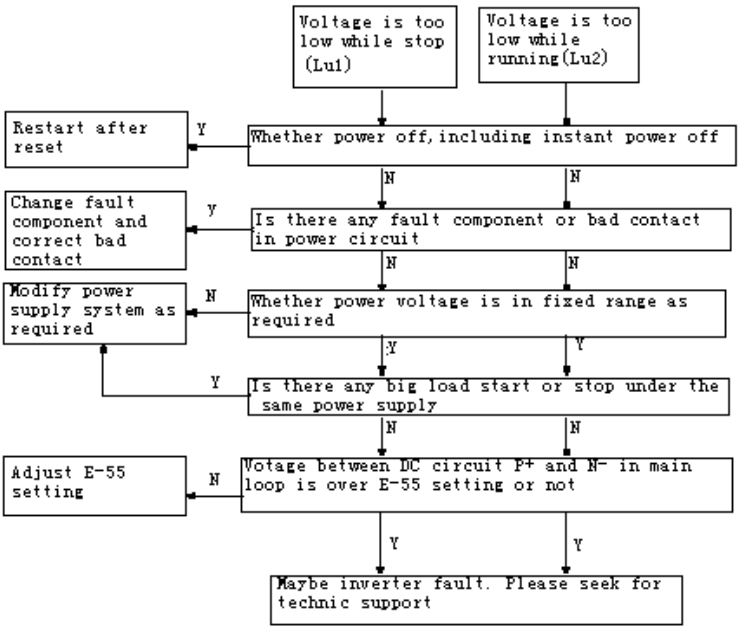
8.2.2 Over current



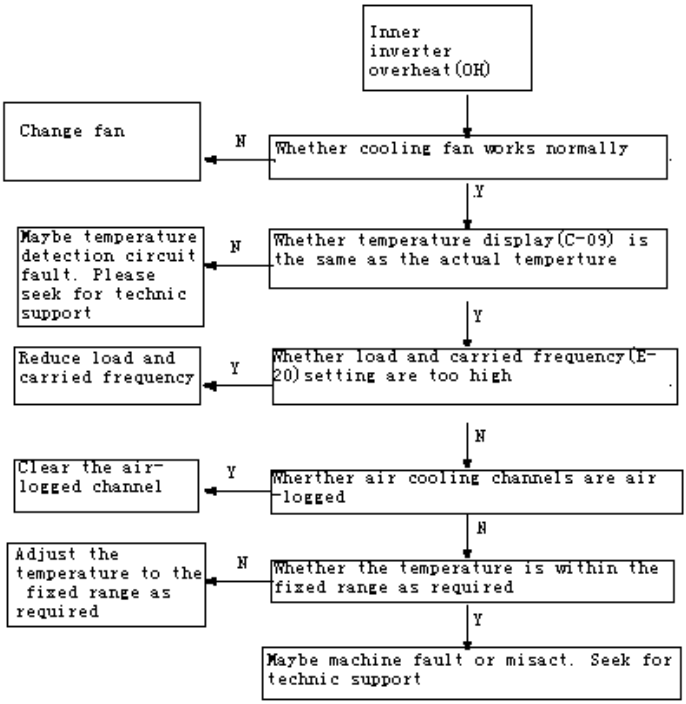
8.2.3 Over voltage



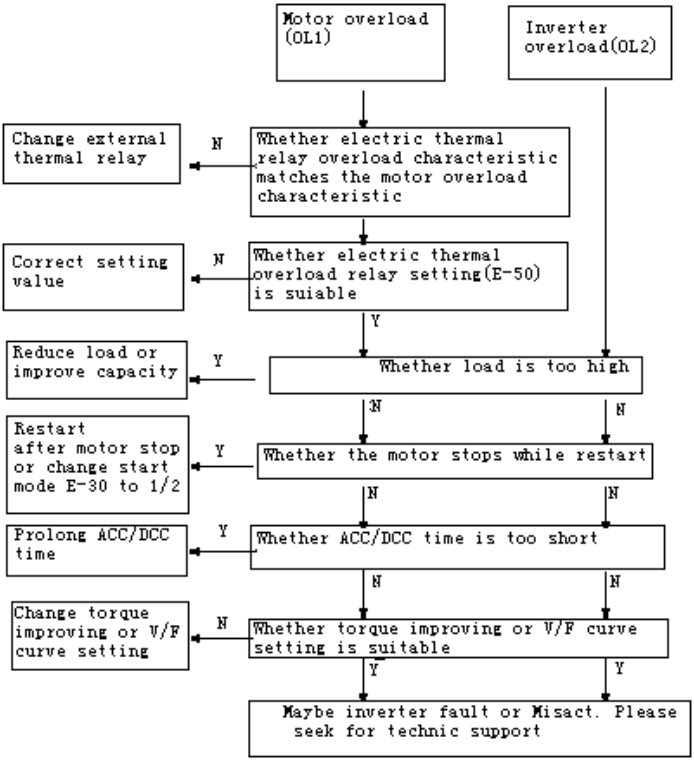
8.2.4 Supply voltage is too low



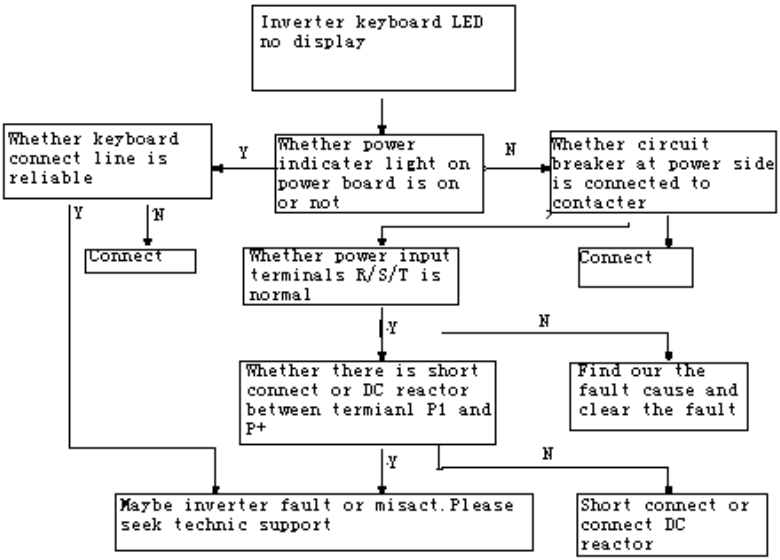
8.2.5. Inner inverter over heat



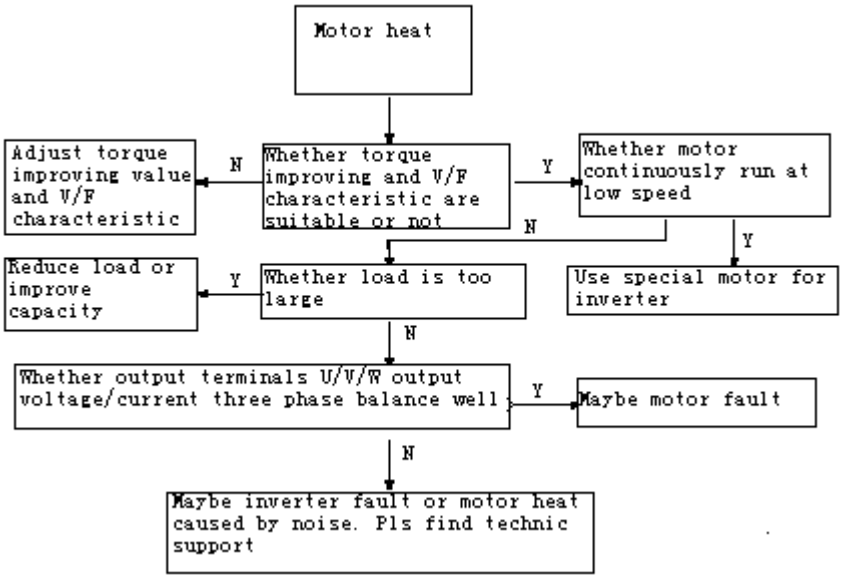
8.2.6.Over load



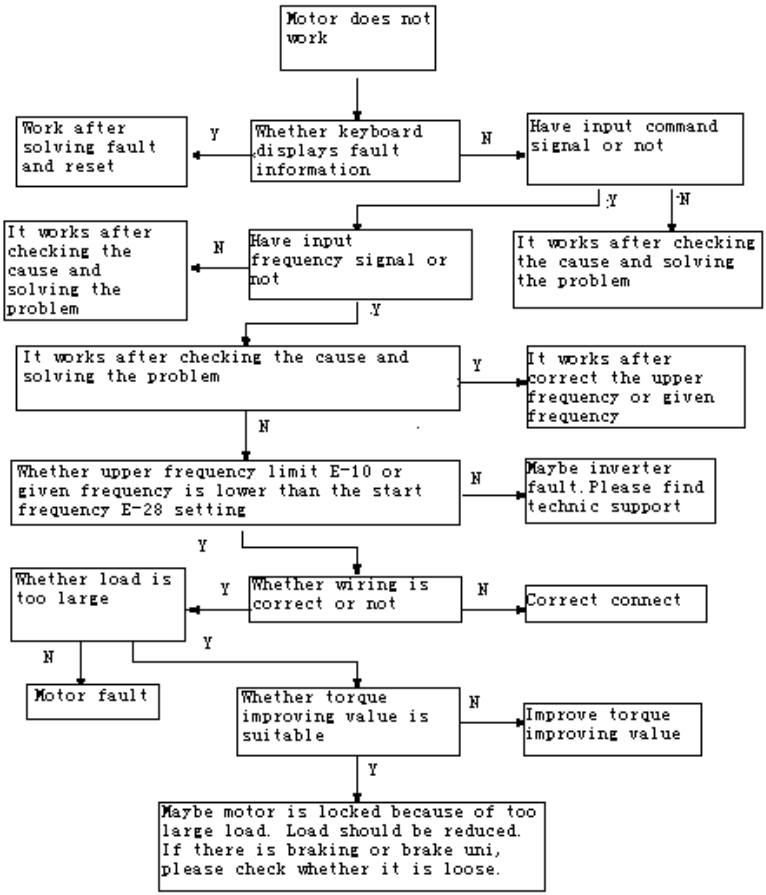
8.2.7.No display




8.2.8.Motor heat



8.2.9.Motor does not rotate



# Chapter 9: Overhaul and Maintenance

## 9.1 Inspection and maintenance

During frequency inverter normal operation, except for daily inspections, periodic (As required,such as machine overhaul or inspections at least every six months) inspections must be performed according to the following table, to prevent trouble before it happens.

| Inspection period | Inspection part | Inspection items | Inspection content | Inspection methods | Criteria |
|---|---|---|---|---|---|
| At any time | Display | LED display | If display is abnormal | Vision | Affirm by the operation state |
| At any time | Cooling system | Fan | If there is abnormal vibration and abnormal noise. | Visual examination and listening | No abnormal |
| At any time | Noumenon | Surrounding environment | Temperature humidity,dust, harmful gas | Visual examination Smelling feeling | By 2-1 term |
| At any time | Input terminal | Voltage | If input, output voltage is abnormal | Detect R,S,T and U,V,W terminal | according to the standards regulation |
| periodic | Main circuit | panorama | If the fastener loosen , whether having the hot shot trail , whether having discharging or not phenomenon,dust are too much, if the wind way is blocked up | Visual tighten,clean | No abnormal |
| | | Electrolitic capacitor | If surface is abnormal | Visual | No abnormal |
| | | Wire conductive bar | Whether loosen | Visual | No abnormal |
| | | Terminal | Whether the bolt or screw loosen | tighten | No abnormal |

During the examination, not allowed to dismantle or rock a component for no reason, even pull off a connector assembly. Otherwise, it can not run or enter malfunction display state. And it will bring faults

of the component, even damage the main switch component IGBT module.

While needing to measure, user should pay attention to various different meters which may reach very different results. Pointer voltmeter is recommended to use to measure input voltage. Rectifier voltmeter is recommended to use to measure output voltage. Pliers galvanometer is recommended to use to measure input and output current. And electrodynamics wattmeter is recommended to use to measure power.

**9.2 Component must be periodically replaced**

In order to guarantee the frequency inverter stable operation, except for periodic maintenance, the inner components which bear long-term mechanical wear should be periodic replaced---including the cooling fan, main circuit filter capacitor for energy caching and exchange, printed circuit board. In general continuous using, users must replace them according to below regulation. Also it depends the concrete conditions such as the usage environment, load condition and frequency inverter current situation.

| Component name | Replace year criteria |
|---|---|
| Cooling fan | 2—3 year |
| Filter capacitor | 4—5 year |
| printed circuit board | 8—10 year |

**9.3 Storage and safekeeping**

If the frequency inverter is not in use immediately after purchased, and need to be temporarily stored or long-term stored up, pls obey belowing rules:

9.3.1 Frequency inverter should be stored in the place with standard temperature range, fine ventilation and no humidity, dust or metal dust.

9.3.2 If frequency inverter has not been put into use yet for more than 1 year, user should charge it to restore the characteristic of the inner main circuit filter capacitor. During charging, user can use the pressure regulator to elevate the input voltage of the frequency inverter slowly to the rated input voltage. The charging time should be above 1-2 hours. At least test once a year as narrated above.

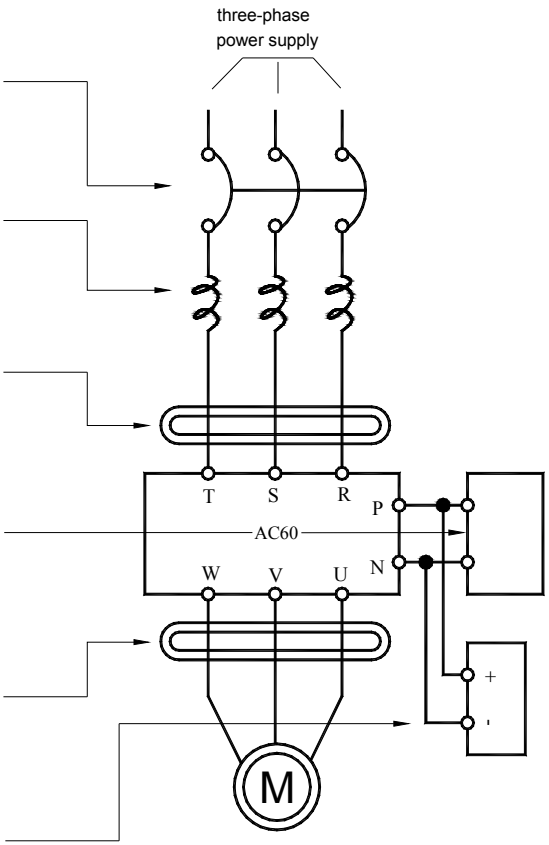
9.3.3 Frequency inverters are not allowed to be carried out the pressure testing, otherwise, it will lead to frequency inverter life lessening or damage. Before the insulation testing, user should use 500 MΩvolt megger measures the frequency inverter. Its insulation resistance should not smaller than 4MΩ.

**9.4 Measurement and judgment**

When using the general amperemeters to measure current, the current in the input end will has imbalance phenomenon. Generally the difference within 50% is regular. If using general multimeter to measure the output three-phase voltage, due to being limited by the disturbance of carrier frequency and multimeter frequency response, the read data, which maybe inaccurate,can be for reference only.

# Chapter 10: Optional Parts

This series of products can be added ancillary equipment by users according to service conditions and the diverse requirements, please refer to wiring sketch map as below:

| explanation | name | configuration |
|---|---|---|
| pls choose proper model,whose rated current isn't lea than 1.5times of frequency converter. | air switch |  |
| it is used for improving input power factor | AC reactor | |
| It is used for minishing wireless disturbing which the frequency converter produced. | noise -filter | |
| you can use when the moment can't meet to need. It suit to the big inertia load and often brake. | braking unit | |
| it is used for minishing wireless disturbing which the frequency converter produced.and the short-connection is not use. | noise -filter | |
| when instantaneous power cut is more than 20ms and need to run normally | electric capacitance case | |

**10.1 AC reactor**

AC reactor can suppress higher harmonic of the frequency inverter input current and improve the power factor of frequency inverter obviously. It is suggested that AC reactor should be used under following situations.

10.1.1 When the AC reactor is used in the frequency inverter, the ratio of power source capacity and frequency inverter capacity is above 10:1.

10.1.2 There are thyristor load or power compensating factor device with ON/OFF controller on the same power supply.

10.1.3 The three-phase power supply voltage unbalance is big(≥3%).

**10.2 Noise filter**

This filter is used to suppress the conduction of electromagnetic disturbance noise that produced by the frequency inverter and restrain the external radio interference as well as instantaneous impact and surging to this machine. Filters should be as close as possible to frequency inverter.

On account of this occasion that with high demand on preventing radio interference,that there is equipment whose anti-interference ability is insufficient according with CE, UL and CSA standard usage, this filter should be used without exception.

**10.3 Braking unit and braking resistor**

AC60 series machines below 15 G/18P have the inner braking unit. Their maximum braking torque is 50%. Users buy the matching braking resistor separately according to the following table.

| Frequency inverter specification | Frequency inverter power（KW） | Braking resistor value（Ω） | Braking resistor power（W） |
|---|---|---|---|
| 220V | 0.75 | 200 | 120 |
| | 1.5 | 100 | 300 |
| | 2.2 | 70 | 300 |
| | 3.7 | 40 | 500 |
| | 5.5 | 30 | 500 |
| 380V | 0.75 | 750 | 120 |
| | 1.5 | 400 | 300 |
| | 2.2 | 250 | 300 |
| | 3.7 | 150 | 500 |
| | 5.5 | 100 | 500 |
| | 7.5 | 75 | 780 |
| | 11 | 50 | 1200 |
| | 15 | 40 | 1560 |

If the above build-in braking needs bigger braking torque, please purchase the braking unit , please refer to the braking unit manual.

Other middle/high-power machines do not have build-in braking. If users need the braking function, pls also purchase the braking units.

**10.4 Capacitance box**

This optional part is specially used in the occasion which need continue operation when it lasts for a long time after power instantaneous failure (longer than 20ms).

When ordering a frequency inverter, buyer needs to declare the actual load size , continuous running time after the power failure,and choose a right type.

Installation of this accessory has influent on some individual parameters, therefore it is not recommended the users to outfit by themselves. Please contact with the supply manufacturer when necessary.

# Chapter 11: Quality Guarantee

This product quality guarantee is processed as follows:

**11.1 Users can enjoy the following "three guarantee" service from the day of buying products if you meet product quality problems:**

11.1.1 We guarantee for repair, return and replacement for one month after delivery;

11.1.2 We guarantee for repair and replacement for two months after delivery;

11.1.3 We guarantee for repair for eighteen months after delivery;

11.1.4 The articles above do not apply to export.

**11.2 No matter where you purchase products, you can enjoy lifelong paid service.**

**11.3 The agency,dealer, provider can provide "three guarantee" service after being authorized by our company.**

**11.4 When quality problems appears, our company only undertakes "three guarantee" service as 11.1 and 11.2 responsibility above. If user needs more responsibility guarantee, please insure the product by cooperation with the insurance company.**

**11.5 The malfunctions, caused by the reasons mentioned as below, can only enjoy the paid service even if the product under warranty.**

11.5.1The malfunctions caused by faulty operations which are not in compliance with this user manual;

11.5.2 The malfunctions caused by unauthorized transform or beyond the range of use.

11.5.3 User has not paid off the payment according to the contract;

11.5.4 The malfunctions caused by the earthquake, fire, flood, lightning, or abnormal voltage, etc;

**11.6 As for the "three guarantee" service, the product must be returned back to our company and can only be replaced or mend after responsibility belonging confirmed.**

# Chapter 12: Appendix

**Appendix one: RS485 communication protocol**

**1. Communication protocol**

The AC60 series frequency inverter can select the RS485 communication interface. The ModBus communication protocol of international standard is adopted for master-slave communication. The consumer can carry out centralized control by PC/PLC, upper machine, main station frequency inverter etc (Setting of the frequency inverter control command, running frequency, relative function parameters modification, frequency inverter working state and malfunction information monitoring etc.) to adapt to the special application requirements.

**2. Protocol content**

This ModBus serial communication protocol defines asynchronous transfer information content and formats used in the serial communication. Including: host machine roll poling and broadcasting、slave machine responsive format; Content of the data frame of host machine organizes including: slave machine address (or the broadcast address), demand to act function code、data and error checking etc. Slave machines' responding adopts the identical structure. The contents including: action being affirmed, back to data, error checking and so on. During the period of slave machine receiving frame if mistakes happen, or the action that the host machine demands are not be accomplished, it will organize one frame of malfunction information as response and feedback to host machine.

**3. Application styles**

AC60 series frequency inverter is connected to "single host and many slave machines" control network with RS232/RS485 master line.

**4. Bus configuration**

(1)Interface mode

RS485 hardware interface

(2)Transmission mode

Asynchronous serial，half-duplex transmission mode: The host machine and slave machine can only one sends the data and another one receives data at the same time. Data in serial asynchronous communication process is dispatched one frame by one frame in the format of message.

(3)Topology structure

Single host machine with many slave machines form the system. Setting range of slave machine's address is 1 ~247. 0 is broadcast communication address. The address of each slave machines in the network is unique. This is the basis to ensure ModBus serial communication.

**5. Protocol specification**

The AC60 series frequency inverter communication protocol is that a kind of master-slave ModBus communication protocol of synchronization serial, Only one equipment (host machine) can build up

the protocol in the network (can be called "inquiry/ order "). Other equipments (slave machines) can only respond to the host machine “inquiry/order” by providing data, or make corresponding action according to the “inquiry /command” of host machine. Host machine here is the personal computer (PC), the host station frequency inverter, industrial control equipment or programmable logic controller (PLC) etc. Slave machine here is the AC60 series frequency inverter or other control equipment with identical communication protocol. The host machine can carry out communication with one slave machine, or announce broadcast information to all the slave machines. Slave machine have to return one piece of information (is called responding to) while visiting "Inquire / command” of the host machine alone. But slave machine unnecessarily feedback responding information to the host machine while the host machine send the broadcast information.

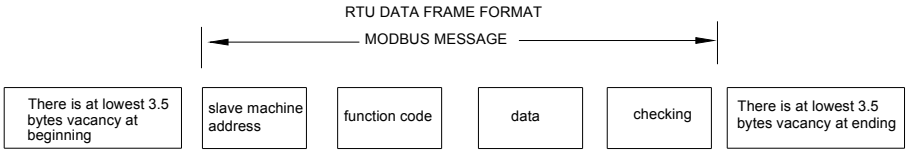
**5.1 Communication frame structure**

The ModBus protocol communication data format of the AC60 series frequency inverter is RTU (long-range terminal unit) mode, communication data format is as follows:

The byte composition: Include initiation bit, 8 data bit, check bit and stop bit.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Start bit | Bit1 | Bit2 | Bit3 | Bit4 | Bit5 | Bit6 | Bit7 | Bit8 | No check bit<br>Even check bit<br>Odd check bit | Ending bit |

In RTU mode, it always begins with transmission time pause gap of at least 3.5 bytes. With various character and time under the Baud rate, it is very easy to realize the transmission time of 3.5 bytes. The successive order of the following transmission data domains: slave machine address,operation command code,data and CRC checking bit. Transmission byte of each domain is sexadecimal 0...9,A...F. Network equipment detects the network bus unceasingly, including the pause gap time. While receiving the first domain (address information), each network equipment carries out decoding to judge whether the byte is sent to it. While the final byte transmission is completed, there will be an at least 3.5 bytes transmission time pause gap to indicate that this frame is over. Then a new information’ transmission can begin.



One frame message must be transmitted as a continued data flow, if there is a pause over 1.5 byte before the end. The receiving equipment will clear the half-baked information. And the next byte will be considered as the address domain of a new frame. Similarly, if the interval between a new frame start-up and the former frame is smaller than 3.5 byte time, the receiving equipment will think that it is the former one frame continuation. Because of the jumbled frame, finally CRC checking value is incorrect, what leads to the communication mistake.

RTU frame' standard structure:

| Frame START | Transmission time of 3.5 bytes |
|---|---|
| slave machine address domain ADDR | Communication address:<br>0～247(decimal) (0 is broadcast address) |
| Function domain CMD | 03H:read slave machine parameter<br>06H: write slave machine parameter<br>08H:circuit auto-detection |
| Data domain<br>DATA（N-1）<br>…<br>DATA（0） | parameter address,parameter number,parameter values |
| CRC CHK low-order | Detecting value:16 bit CRC Detecting value |
| CRC CHK high-order | |
| Frame ending END | transmission time of 3.5 bytes |

**5.2 Command code and communication data description**

5.2.1 Command code:03H,read N word (can continue reading 5 words at most).

For example：The frequency inverter whose slave machine address is 01 H, memory initial address is 01 H [(E-01]), read continuously 3 words, then the structure of that frame is described as follows:

RTU host machine command information

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 01H |
| Command code | 03H |
| Start address high-order | 01H |
| Start addres low-order | 01H |
| Data number high-order | 00H |
| Data number low-order | 03H |
| CRC CHK low-order | 55H |
| CRC CHK high-order | F5H |
| END | Transmission time of 3.5 bytes |

RTU Slave machine responding information(normal)

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 01H |
| Command code | 03H |
| Byte number low-order | 06H |
| Data address 0101H high-order | 00H |
| Data address 0101H low-order | 02H |
| Data address 0102H high-order | 00H |
| Data address 0102H low-order | 00H |
| Data address 0103H high-order | 00H |
| Data address 0103H low-order | 06H |
| CRC CHK low-order | 89H |
| CRC CHK high-order | 30H |
| END | Transmission time of 3.5 bytes |

RTU Slave machine responding information(abnormal)

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 01H |
| Command code | 03H |
| Error code | 04H |
| CRC CHK low-order | 21H |
| CRC CHK high-order | 33H |
| END | Transmission time of 3.5 bytes |

5.2.2 Command code:06H,write a word(Word)

Function: write a word data in the designated data address. It can be used to revise the frequency inverter parameters.

For instance: 5000 (1388 H) is written into the 0110 H [(E-16]) address of slave frequency inverter with address 02 H. Then the structure of this frame is described as follows:

RTU host machine order information

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 02H |
| Command code | 06H |
| Write data address high-order | 01H |
| Write data address low-order | 10H |
| Data content high-order | 13H |
| Data content low-order | 88H |
| CRC CHK low-order | 84H |
| CRC CHK high-order | 96H |
| END | Transmission time of 3.5 bytes |

RTU Slave machine responding information(normal)

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 02H |
| Command code | 06H |
| Write data address high-order | 01H |
| Write data address low-order | 10H |
| Data content high-order | 13H |
| Data content low-order | 88H |
| CRC CHK low-order | 84H |
| CRC CHK high-order | 96H |
| END | Transmission time of 3.5 bytes |

RTU Slave machine responding information(abnormal)

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 02H |
| Command code | 86H |
| Error code | 01H |
| CRC CHK low-order | 73H |
| CRC CHK high-order | A0H |
| END | Transmission time of 3.5 bytes |

5.2.3 Command code：08H, circuit auto-detection

Function: Send back the slave machine responding information which is identical with the host machine command information. It is used to check whether the signal transmission between the host machine and slave machine is regular or not. The checking code and the data can be set freely.

RTU Host machine command information

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 01H |
| Command code | 08H |
| Detecting code high-order | 00H |
| Detecting code low-order | 00H |
| Data high-order | 13H |
| Data low-order | 88H |
| CRC CHK low-order | EDH |
| CRC CHK high-order | 5DH |
| END | Transmission time of 3.5 bytes |

RTU Slave machine responding information(normal)

| START | Transmission time of 3.5 bytes |
|---|---|
| Slave machine address | 01H |
| Command code | 08H |
| Detecting code high-order | 00H |
| Detecting code low-order | 00H |
| Data high-order | 13H |
| Data low-order | 88H |
| CRC CHK low-order | EDH |
| CRC CHK high-order | 5DH |
| END | Transmission time of 3.5 bytes |

RTU Slave machine responding information(abnormal)

| START | Transmission time of 3.5 bytes |
|---|---|
| slave machine address | 01H |
| Command code | 88H |
| Error code | 03H |
| CRC CHK low-order | 06H |
| CRC CHK high-order | 01H |
| END | Transmission time of 3.5 bytes |

5.2.4 Communication frame error check mode

The standard ModBus serial network adopts two kinds of error check mode: odd/even checking which is used to check every character and CRC detecting which is used to check one frame of data.

1.Odd-even checking

The users can configure the controller with odd or even checking, or no checking, what will determine how to set odd/even checking in every character.

If odd /even checking have been allocated, "1" bit will be accounted to the bit number of each character (7 bits in ASCII mode, 8 bits in RTU). For instance, the RTU character frame contains the following 8 bits: 1 1 0 0 0 1 0 1

There are 4 bits with number"1". If using the even checking, odd/even checking bit of the frame will be 0, then there are still 4 bits with number"1". If using odd checking, odd/even checking bit of the frame will be 1, then there are 5 bits with number"1".

If odd/even checking has not been allocated, there will be no checking bit during the transmission, and no checking detection.One additional stop bit will be filled into the character frame in transmission.

2,CRC-16(cycle redundant check)

While the RTU frame form in use; the frame has included the frame error detecting domain which calculates base on the CRC method. The CRC domain checks the content of the entire frame. The CRC domain is two bytes, containing binary values of 16 bits. It is added to the frame after calculated

by the transmission equipment. The receiving equipment calculates CRC who receives frame again, and compares it with the value of the receiving CRC domain. If both CRC value are not equal, it means the transmission has mistake.

CRC is firstly stored in 0xFFFF. Then a program is used to process the continuous 6 or above bytes in the frame and the value of current registers. Only 8Bit in every character is valid to CRC. Start bit、stop bit and parity check bit are invalid.

In the process of CRC coming out, each 8 characters independently XOR with register content. The result moves to lowest effective bit, and then the highest effective bit is filled with "1". LSB is extracted to be detected. If LSB is 1, the register independently XOR with the preset value. If LSB is 0, don't need XOR. This entire process needs to repeat 8 times. After the last bit (the eighth bit) is accomplished, next 8 bits byte will independently XOR with register content. All the final bytes in the frame are CRC value after processed.

This CRC operation method adopts the international standard CRC checking rule. Users can consult the relevant standard CRC operation while editing the CRC algorithm to compile out the CRC calculation program which is really meet the requirements.

Now here provide the user a simple CRC operation function (with C language programming):

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

5.2.5 Communication data address definition

This part is the address definition of communication data. It is used to control the frequency inverter running and fetch frequency inverter mode information and frequency inverter relevant function parameter setting.

(1)AC60 serial function parameter address express rules

Take frequency inverter function parameter serial numbers as register address which are divided into the high byte and the low byte two parts. The high byte expresses the function parameter group serial numbers. The low byte expresses the inner serial numbers of each function parameter group. All need to be changed to hexadecimal.

Address domain high byte definition:

x1xxH:basic parameter group (E group)

x2xxH:external terminal parameter group(F group)

x3xxH:dedicated function parameter group (H group)

xCxxH: monitoring parameter group (C group)

xExxH: fault information group (ER group)

Attention: due to possibility that the parameters are frequently rewrited exists in the communication, EEPROM are frequently stored, and then its lifetime is cut down. As for the consumer, some function is unnecessarily to store in the communication mode, only require to change the value of RAM inner, can satisfy the usage requirement .When AC60 communication protocol stipulates that should use writing order (06 H), If the parameter function code address domain highest bit is 0, merely write in the frequency inverter RAM, power down without storing. If the parameter function code address high four bit is 1, write in EEPROM, namely power off with storing.

For instance, rewriting the function parameter **[E-16]**, not depositing to EEPROM, address expresses for 0110H, depositing to EEPROM, address expresses for 1110 H.

merely write in RAM， power off without storage

| START | Propagation time of 3.5 bytes |
|---|---|
| slave machine address | 02H |
| Command code | 06H |
| Write data address high-order | 01H |
| Write data address low-order | 10H |
| Data content high-order | 13H |
| Data content low-order | 88H |
| CRC CHK low-order | 84H |
| CRC CHK high-order | 96H |
| END | Propagation time of 3.5 bytes |

Write in EEPRAM,power off storage

| START | Propagation time of 3.5 bytes |
|---|---|
| slave machine address | 02H |
| Command code | 06H |
| Write data address high-order | 11H |
| Write data address low-order | 10H |
| Data content high-order | 13H |
| Data content low-order | 88H |
| CRC CHK low-order | 84H |
| CRC CHK high-order | 96H |
| END | Propagation time of 3.5 bytes |

（2）Address specification of other functions:

| Function declaration | Address definition | Data meaning specification | | | R/W characteristic |
|---|---|---|---|---|---|
| Communication given frequency | 3000H | Communication giving frequency value, power off without storage. | | | W/R |
| Communication order setting | 3001H | 0000H:No order | | | W |
| | | 0001H:Forward running | | | |
| | | 0002H:reverse running | | | |
| | | 0003H:forward jog | | | |
| | | 0004H:reverse jog | | | |
| | | 0005H:speed-down to stop | | | |
| | | 0006H:free close down | | | |
| | | 0007H:malfunction reset | | | |
| Frequency inverter state | 3002H | Bit0 | 0: stop | 1:running | R |
| | | Bit1 | 0:non acceleration | 1:acceleration | |
| | | Bit2 | 0:non deceleration | 1:deceleration | |
| | | Bit3 | 0:forward direction | 1:reverse | |
| | | Bit4 | 0:inverternormal | 1:inverter fault | |
| Frequency inverter fault code | 3003H | current frequency inverter fault code （refer to fault code table） | | | R |

5.2.6 frequency inverter fault code table:

| Fault code | Keyboard display content | Fault information |
|---|---|---|
| 0 | ---- | No fault |
| 1 | L.U.1 | Supply power is too low while stop |
| 2 | L.U.2 | Supply power is too low during running |
| 3 | o.U.1 | Acceleration overvoltage |
| 4 | o.U.2 | Deceleration overvoltage |
| 5 | o.U.3 | Constant speed overvoltage |
| 6 | o.U.4 | Close-down overvoltage |
| 7 | o.C.1 | Acceleration overcurrent |
| 8 | o.C.2 | Deceleration overcurrent |
| 9 | o.C.3 | Constant speed overcurrent |
| 10 | o.L.1 | Motor overload |
| 11 | o.L.2 | Frequency inverter overload |
| 12 | Sc | System fault |
| 13 | o.H. | Frequency inverter inner overheating |
| 14 | Sen | Feedback sensor fault |
| 15 | Err1 | Missing phase at input side |
| 16 | Err2 | Output grounding |
| 17 | Err3 | Current detection fault |
| 18 | Err4 | Frequency inverter exterior fault |
| 19 | Err5 | Swing frequency running parameter setting fault |
| 20 | Err6 | Keyboard communication fault |
| 21 | LIFE | Reserved（ask for technique support） |
| 22 | 93SE | Storage error |

5.2.7 Error meaning of slave machine responding abnormal information:

| Error code | Specification |
|---|---|
| 1 | Command code error |
| 2 | Communication transmission error |
| 3 | CRC checking error |
| 4 | Illegal address |
| 5 | Illegal data |

| | |
|---|---|
| 6 | Parameter can be changed during running |
| 7 | System is locked |
| 8 | Frequency inverter is busy（EEPROM is storing） |
| 9 | Parameter overrun |
| 10 | Reserved parameter can not be changed |
| 11 | Read parameter byte error |