Operation manual

CHV160A series special inverter for water supply

SHENZHEN INVT ELECTRIC CO., LTD.

Contents

SAFETY PRECAUTIONS

Please read this operation manual carefully before installation, operation, maintenance or inspection.

In this manual, the safety precautions were sorted to "WARNING" or "CAUTION".

WARNING Indicates a potentially hazardous situation which, if not, will result in death or serious injury.

CAUTION Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury and physical damage. This sign is also used for alert of any un-safety operation.

In some cases, the contents of "CAUTION" could cause serious accident. Please follow these important precautions in any situation.

★ **NOTE** is the necessary step to ensure the proper operation.

Warning marks were shown on the front keypad of inverters.
Please follow these indications when using the inverter.

WARNING
●May cause injury or electric shock. **●Please follow the instructions in the manual before installation or operation.** **●Disconnect all power line before opening front cover of unit. Wait at least 5 minute until DC Bus capacitors discharge.** **●Use proper grounding techniques.** **●Never connect AC power to output UVW terminals**

1. INTRODUCTION

1.1 Technology Features

● **Input & output**

- u Input voltage range: 380±15%
- u Input frequency range: 47~63Hz
- u Output voltage range: 0~rated input voltage
- u Output frequency range: 0~400Hz

● **I/O features**

- u Programmable digital input: Provide 8 inputs
- u Programmable analog input: AI1 and AI2, which can accept 0~10V or 0~20mA.
- u Relay output: Provide 3 output terminals. 8 outputs can be extended by Water-supply extension card.
- u Analog output: Provide 2 output terminal(0/4-20mA or 0/2-10V).
- u Communication interface: standard RS485 serial port

● **Main control function**

- u Control mode: V/F control.
- u Overload capacity: 60s with 120% of rated current, 10s with 150% of rated current,
- u Speed adjusting range: 1:100
- u Carrier frequency: 1.0 kHz~16.0 kHz.

● **Functions**

- u Frequency reference source: Digital input, analog input, PID Input,etc.
- u DC braking at starting and stopping
- u Sleep wake function.
- u PID Control Function for water supply or other occasions
- u Programmable digital input and output
- u Skip frequency control function
- u None-Stop when instantaneous power off.
- u Speed Trace Function: Smoothly start the running motor.
- u QUICK/JOG: User defined shortcut key can be realized.
- u Automatic Voltage Regulation Function (AVR):
- u Up to 26 fault protections: Protect from over current, over voltage, under voltage, over temperature, phase failure, over load etc.

1.2 Features of Water Supply System

- Support two kinds of water supply mode: fixed frequency pump mode and circulating pump mode.
- Flexibility control logic to add, subtract pump.
- Up to eight segment pressure settings which change pressure given in different time.
- 16 segment of the pressure given by different combination of input terminals.
- Sleep pump control functions: Support flexible sleep mode, the small sleep pump will start automatically at sleep state in order to maintain sleep pressure effectively. Once meeting the wake-up conditions, the system will come out of hibernation automatically, and stop the small sleep pump.
- Regular rotation control, which can prevent the pump seizing by corrosion effectively, and prevent one pump running all the time. It is suggested that the power of rotation pumps should be fairish, otherwise it will cause the system pressure fluctuating.
- Sewage pump control functions, which is used to detect water level of cesspool and control water level of cesspool.
- Inlet basin water-level detection and control functions, which can detect liquid level of inlet basin, and adjust pressure-given automaticly.
- Ultra- voltage, under-voltage alarm function of pipe network, inverter supports ultra- voltage, under-voltage alarm output functions, which can outputs through programmable relay.
- Set up to motor rated current parameters of no less than seven pumps, and achieve over-current, overload and other protection for the current pump-run.
- Record failure pump: Record failure pump automatically, and if cleared this record, please use function of fault clearance.
- Provides standard RS485 Physics communication mode, using master-slave communication though international standard Modbus communication protocol, electrical parameters in full compliance with international standards, which can be achieved barrier-free communication between CHV160A inverter special for water supply system and the host computer.

1.3 Description of Nameplate

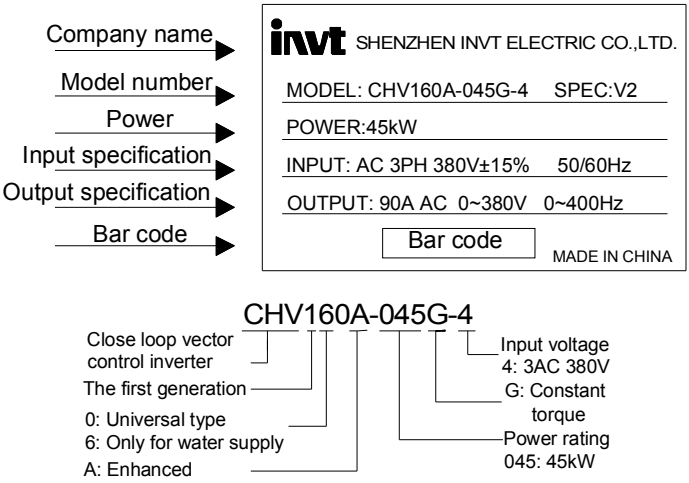


Figure 1.1 Nameplate of inverter

1.4 Working Diagram of CHV160A Water Supply Special Inverter

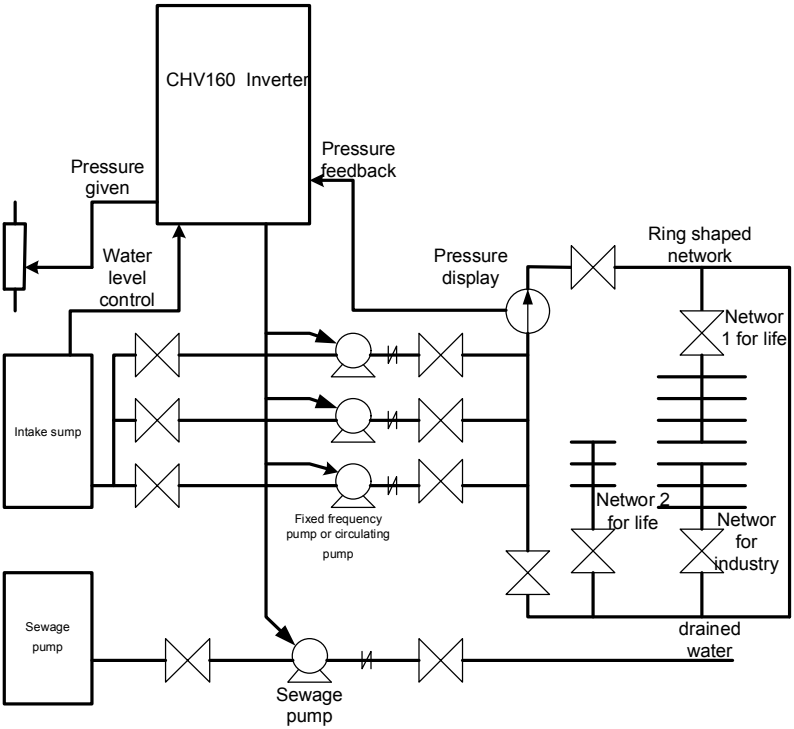


Figure 1.2 Working diagram of the CHV160A water supply special inverter

1.5 Selection Guide

3AC 380V±15%

Model No.	Rated power (kW)	Rated input current (A)	Rated output current (A)
CHV160A-5R5-4	5.5	15.0	13.0
CHV160A-7R5-4	7.5	20.0	17.0
CHV160A-011-4	11.0	26.0	25.0
CHV160A-015-4	15.0	35.0	32.0
CHV160A-018-4	18.5	38.0	37.0
CHV160A-022-4	22.0	46.0	45.0
CHV160A-030-4	30.0	62.0	60.0
CHV160A-037-4	37.0	76.0	75.0

Model No.	Rated power (kW)	Rated input current (A)	Rated output current (A)
CHV160A-045-4	45.0	90.0	90.0
CHV160A-055-4	55.0	105.0	110.0
CHV160A-075-4	75.0	140.0	150.0
CHV160A-090-4	90.0	160.0	176.0
CHV160A-110-4	110.0	210.0	210.0
CHV160A-132-4	132.0	240.0	250.0

1.6 Parts Description

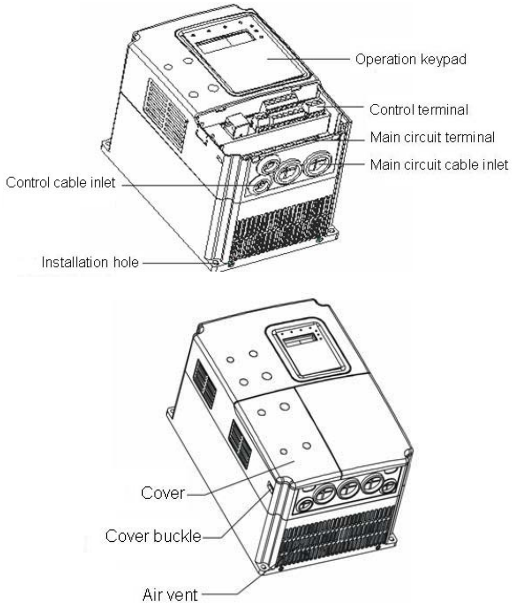


Figure 1.3 Part name of inverter (Less than 18.5kW)

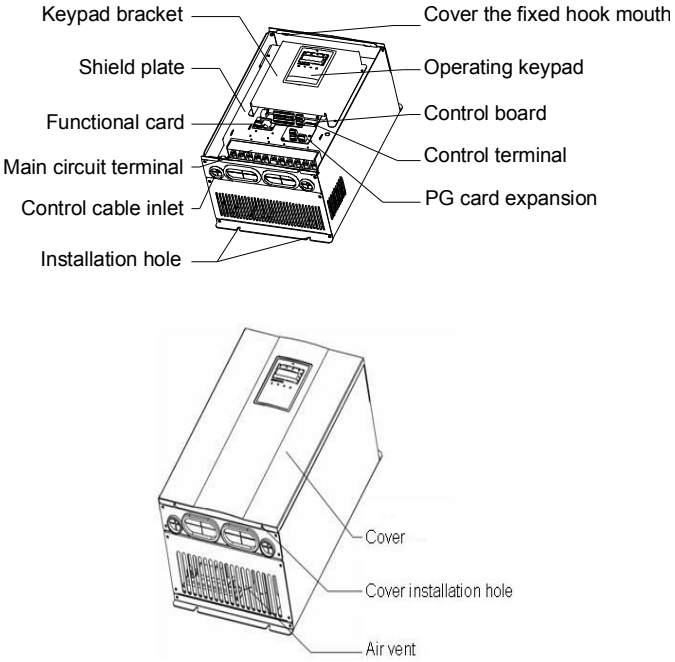


Figure 1.4 Part name of inverter (22kW～132kW)

2. UNPACKING INSPECTION

CAUTION
• **Never install or operate any inverter that is damaged or missing components. Doing so can result in injury.**

Check the following items when unpacking the inverter,

1. Inspect the entire exterior of the Inverter to see if there are any scratches or other damage resulting from shipping.
2. Ensure there is operation manual and warranty card in the packing box.
3. Ensure the nameplate that it is you ordered.
4. Ensure the optional parts are what you need if you ordered any optional parts.

Please contact the local agent if there is any damage of inverter or optional parts.

3. DISASSEMBLE AND INSTALLATION

WARNING

● Any untrained person working on any parts/systems of inverter or any rule in the "Warning" being violated, that will cause severe injury or property damage. Only licensed person, who has been trained on design, installation, commissioning and operation of inverter, is permitted to operate this equipment.

● Input power cable must be connected tightly, and the equipment must be grounded securely.

● Even if the inverter is not in operating situation, the following terminals still have dangerous voltage:

- Power Terminals: R, S, T;
- Motor Connection Terminals: U, V, W.

● Can not install the inverter until discharged completely after the power supply is switched off for 5 minutes.

● The section area of grounding conductor must be no less than that of power supply cable.

CAUTION

● Lift the cabinet by its base; do not lift it by holding its panel. Otherwise the main unit will fall off to result in personal injury.

● Install the inverter on top of the fireproofing material (such as, metal) to prevent fire.

● When need install two or more inverters in one cabinet, cooling fan should be applied to make sure that the air temperature is lower than 45°C. Otherwise it could cause fire or damage the device.

3.1 Environmental Requirement

3.1.1 Temperature

Environment temperature range: -10°C ~ +40°C. Inverter will be derated if ambient temperature exceeds 40°C.

3.1.2 Humidity

Less than 95% RH, without dewfall.

3.1.3 Altitude

Inverter can output the rated power when installed with altitude of lower than 1000m. It

will be derated when the altitude is higher than 1000m. For details, please refer to the following figure:

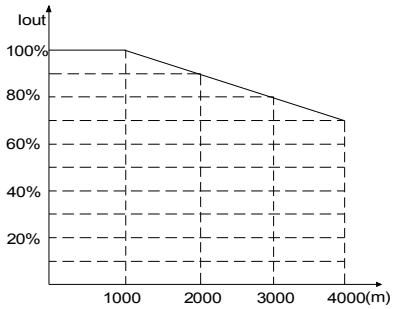


Figure 3.1 Relationship between output current and altitude

3.1.4 Impact and oscillation

It is not allowed that the inverter falls down or suffers from fierce impact or the inverter installed at the place that oscillation frequently. The maximum swing should less than 5.8m/s^2 (0.6g).

3.1.5 Electromagnetic radiation

Keep away from the electromagnetic radiation source.

3.1.6 Water

Do not install the inverter at the wringing or dewfall place.

3.1.7 Air pollution

Keep away from air pollution such as dusty, corrosive gas.

3.1.8 Storage

Do not store the inverter in the environment with direct sunlight, vapor, oil fog and vibration.

4. WIRING

WARNING
● Wiring must be performed by an authorized person qualified in electrical work. ● Do not test the insulation of cable that connects the inverter with high-voltage insulation testing devices. ● Can not install the inverter until discharged completely after the power supply is switched off for 10 minutes. ● Be sure to ground the ground terminal. Ground to 10Ω or less. Otherwise, an electric shock or fire can occur. ● Connect input terminals (R, S, T) and output terminals (U, V, W) correctly. Otherwise it will cause damage the inside part of inverter. ● Do not wire and operate the inverter with wet hands. Otherwise there is a risk of electric shock.
CAUTION
● Check to be sure that the voltage of the main AC power supply satisfies the rated voltage of the Inverter. Injury or fire can occur if the voltage is not correct. ● Connect power supply cables and motor cables tightly.

4.1 Connections of Peripheral Devices

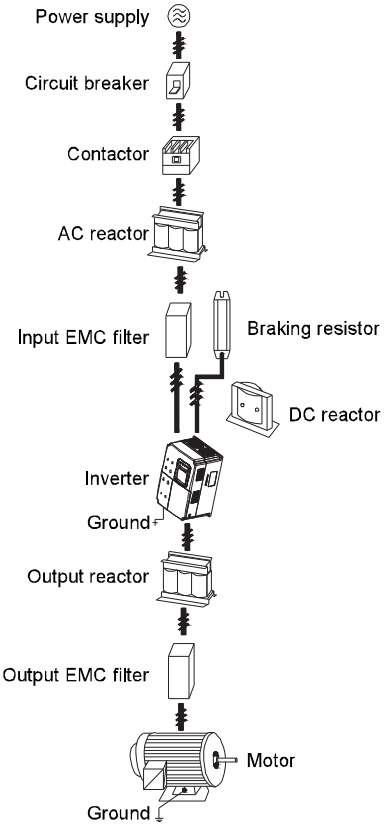


Figure 4.1 Connections of peripheral devices

4.2 Terminal Configuration

4.2.1 Main circuit terminals

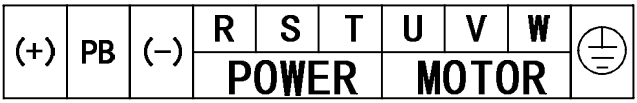


Figure 4.2 Main circuit terminals (5.5～7.5kW)

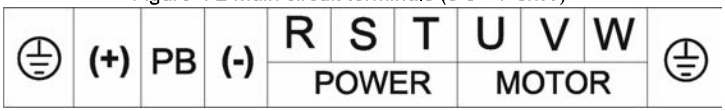


Figure 4.3 Main circuit terminals (11～18.5kW)

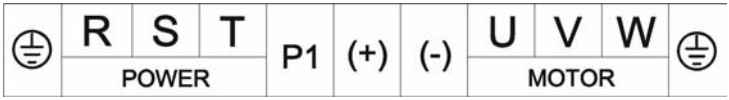


Figure 4.4 Main circuit terminals (22～132kW)

Main circuit terminal functions are summarized according to the terminal symbols in the following table. Wire the terminal correctly for the desired purposes.

Terminal	Description
R、S、T	Terminals of 3 phase AC input
(+)、(-)	Spare terminals of external braking unit
(+)、PB	Spare terminals of external braking resistor
P1、(+)	Terminal of ground
(-)	Terminal of negative DC bus
U、V、W	Terminals of 3 phase AC output
⏚	Terminal of ground

Control Circuit Terminals

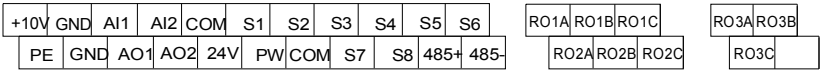


Figure 4.5 Control circuit terminals.

Figure 4.6 terminals on the water supply control card

4.3 Typical Wiring Diagram

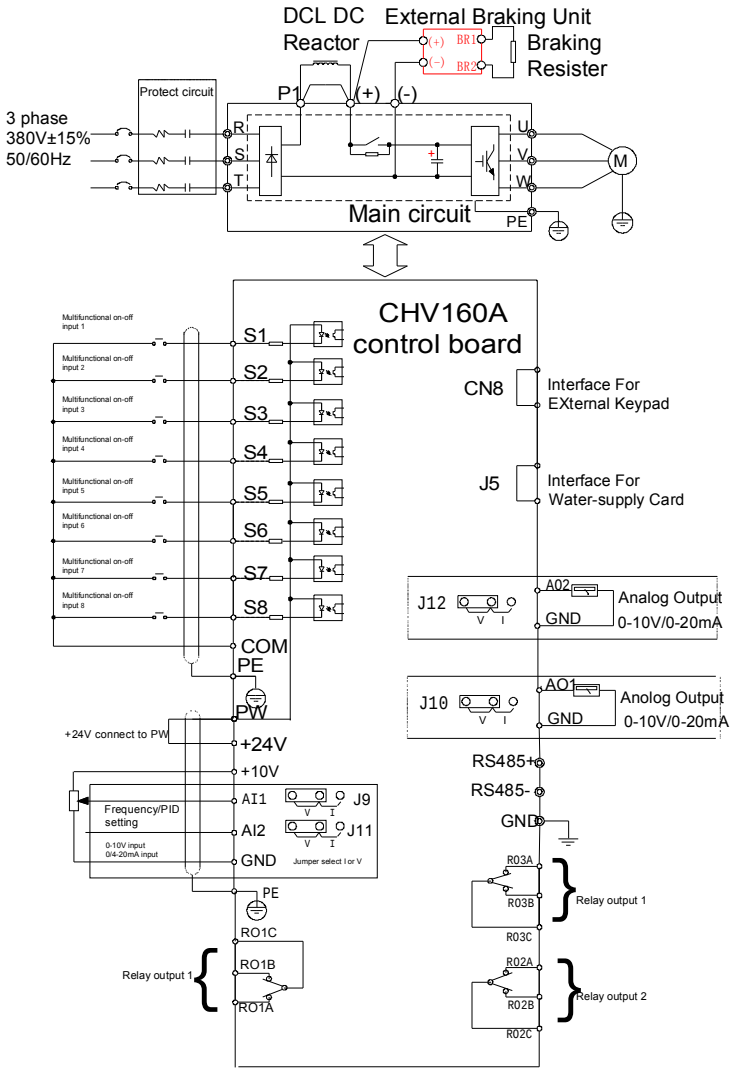


Figure 4.7 Wiring diagram.

4.4 Wiring the Main Circuits

4.4.1 Wiring at the side of power supply

●Circuit breaker

It is necessary to connect a circuit breaker which is compatible with the capacity of inverter between 3ph AC power supply and power input terminals (R, S, T). The capacity of breaker is 1.5~2 times to the rated current of inverter. For details, see <Specifications of Breaker, Cable, and Contactor.

●Contactor

In order to cut off the input power effectively when something is wrong in the system, contactor should be installed at the input side to control the ON-OFF of the main circuit power supply.

●AC reactor

In order to prevent the rectifier damage result from the large current, AC reactor should be installed at the input side. It can also prevent rectifier from sudden variation of power voltage or harmonic generated by phase-control load.

●Input EMC filter

The surrounding device may be disturbed by the cables when the inverter is working. EMC filter can minimize the interference. Just like the following figure.

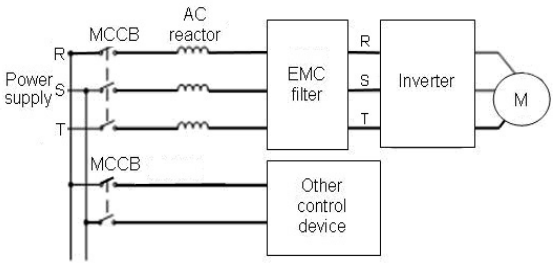


Figure 4.8 Wiring at input side.

4.4.2 Wiring for inverter

●DC reactor

DC reactor is built in CHV190 inverter from 18.5kW~90kW (380V classification) DC reactor can improve power factor, can avoid bridge rectifier damaged due to large-capacity transformer Ershi resulting in larger input current, can avoid rectifier circuit damage caused by sinusoidal.

●Braking unit and braking resistor

• Inverter of 18.5KW and above need connect external braking unit which should be installed at (+) and (-) terminals. The cable between inverter and braking unit should be less than 5m. The cable between braking unit and braking resistor should be less than 10m.

• The temperature of braking resistor will increase because the regenerative energy will be transformed to heat. Safety protection and good ventilation is recommended.

Notice: Be sure that the electric polarity of (+) (-) terminals is right; it is not allowed to connect (+) with (-) terminals directly, Otherwise damage or fire could occur.

4.4.3 Wiring at motor side of main circuit

●Output Reactor

When the distance between inverter and motor is more than 50m, inverter may be tripped by over-current protection frequently because of the large leakage current resulted from the parasitic capacitance with ground. And the same time to avoid the damage of motor insulation, the output reactor should be installed.

●Output EMC filter

EMC filter should be installed to minimize the leakage current caused by the cable and minimize the radio noise caused by the cables between the inverter and cable. Just see the following figure.

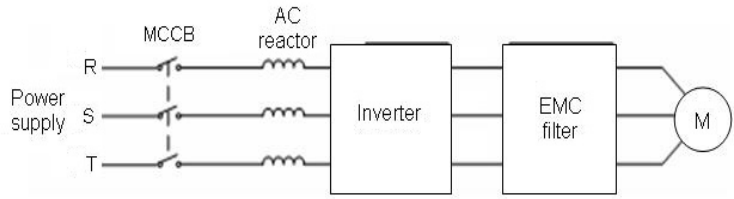


Figure 4.9 Wiring at motor side.

4.4.4 Wiring of regenerative unit

Regenerative unit is used for putting the electricity generated by braking of motor to the grid. Compared with traditional 3 phase inverse parallel bridge type rectifier unit, regenerative unit uses IGBT so that the total harmonic distortion (THD) is less than 4%. Regenerative unit is widely used for centrifugal and hoisting equipment.

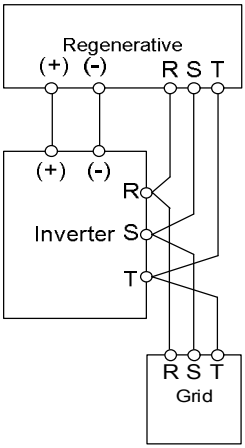


Figure 4.10 Wiring of regenerative unit.

4.4.5 Wiring of Common DC bus

Common DC bus method is widely used in the paper industry and chemical fiber industry which need multi-motor to coordinate. In these applications, some motors are in driving status while some others are in regenerative braking (generating electricity) status. The regenerated energy is automatically balanced through the common DC bus, which means it can supply to motors in driving status. Therefore the power consumption of whole system will be less compared with the traditional method (one inverter drives one motor). When two motors are running at the same time (i.e. winding application), one is in driving status and the other is in regenerative status. In this case the DC buses of these two inverters can be connected in parallel so that the regenerated energy can be supplied to motors in driving status whenever it needs. Its detailed wiring is shown in the following figure:

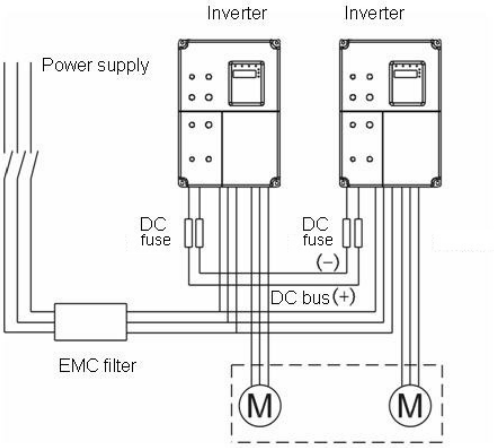


Figure 4.11 Wiring of common DC bus.

Notice: Two inverters must be the same model when connected with Common DC bus method. Be sure they are powered on at the same time.

4.4.5 Ground Wiring (PE)

In order to ensure safety and prevent electrical shock and fire, terminal PE must be grounded with ground resistance. The ground wire should be big and short, and it is better to use copper wire (>3.5mm^2). When multiple inverters need to be grounded, do not loop the ground wire.

4.5 Wiring Control Circuit Terminals

4.5.1 Precautions

- Use shielded or twisted-pair cables to connect control terminals.
- Connect the ground terminal (PE) with shield wire.

The cable connected to the control terminal should leave away from the main circuit and heavy current circuits (including power supply cable, motor cable, relay and contactor connecting cable) at least 20cm and parallel wiring should be avoided. It is suggested to apply perpendicular wiring to prevent inverter malfunction caused by external interference.

4.5.2 Control circuit and extension card terminals

Terminal	Description
S1～S8	ON-OFF signal input, optical coupling with PW and COM. Input voltage range: 9~30V Input impedance: 3.3kΩ

Terminal	Description
PW	External power supply. +24V terminal is connected to PW terminal as default setting. If user need external power supply, disconnect +24V terminal with PW terminal and connect PW terminal with external power supply.
+24V	Provide output power supply of +24V. Maximum output current: 150mA
COM	Common ground terminal for digital signal and +24V (or external power supply).
AI1、AI2	Analog input, 0~10V/0～20mA which can be switched by J9 or J11.
+10V	Supply +10V for inverter.
GND	Common ground terminal of analog signal and +10V. GND must isolated from COM.
AO1、AO2	Provide voltage or current output which AO1can be switched by J10 on the control board and AO2 can be switched by J12 on the extension card. Output range: 0~10V/ 0~20mA.
PE	Ground terminal.
RO1A、RO1B、RO1C	RO1 relay output: RO2C—common; RO2B—NC; RO2A—NO. Contact capacity: AC 250V/3A, DC 30V/1A.
RO2A、RO2B、RO2C	RO2 relay output: RO2C—common; RO2B—NC; RO2A—NO. Contact capacity: AC 250V/3A, DC 30V/1A.
RO3A、RO3B、RO3C	RO3 relay output: RO3C—common; RO3B—NC; RO3A—NO. Contact capacity: AC 250V/3A, DC 30V/1A.
RT1～RT8(A、B)	Eight relay outputs (NO), Contact capacity: AC250V/5A
RS485+,RS485-	RS485 serial communication

4.5.3 Jumper on control board

Jumper	Description
J1、J3、J4	It is prohibited to be connected together, otherwise it will cause inverter malfunction.
J6、J7	Do not change factory default connection of J6J(marked with ATX) and J7 (marked with ARX), otherwise it will cause communication

Jumper	Description
	malfunction.
J9、J11	Switch between (0~10V) voltage input and (0~20mA) current input. V connect to GND means voltage input; I connect to GND means current input. J9 is the jumper of AI1; J11 is the jumper of AI2
J10、J12	Switch between (0~10V) voltage output and (0~20mA) current output. V connect to OUT means voltage output; I connect to OUT means current output. J10 is the jumper of AO1; J12 is the jumper of AO2

4.6 Installation Guidline to EMC Compliance

4. 6.1 General knowledge of EMC

EMC is the abbreviation of electromagnetic compatibility, which means the device or system has the ability to work normally in the electromagnetic environment and will not generate any electromagnetic interference to other equipments.

EMC includes two subjects: electromagnetic interference and electromagnetic anti-jamming.

According to the transmission mode, Electromagnetic interference can be divided into two categories: conducted interference and radiated interference.

Conducted interference is the interference transmitted by conductor. Therefore, any conductors (such as wire, transmission line, inductor, capacitor and so on) are the transmission channels of the interference.

Radiated interference is the interference transmitted in electromagnetic wave, and the energy is inverse proportional to the square of distance.

Three necessary conditions or essentials of electromagnetic interference are: interference source, transmission channel and sensitive receiver. For customers, the solution of EMC problem is mainly in transmission channel because of the device attribute of disturbance source and receiver can not be changed.

4.6.2 EMC features of inverter

Like other electric or electronic devices, inverter is not only an electromagnetic interference source but also an electromagnetic receiver. The operating principle of inverter determines that it can produce certain electromagnetic interference noise. And

the same time inverter should be designed with certain anti-jamming ability to ensure the smooth working in certain electromagnetic environment. The following is its EMC features:

l Input current is non-sine wave. The input current includes large amount of high-harmonic waves that can cause electromagnetic interference, decrease the grid power factor and increase the line loss.

l Output voltage is high frequency PMW wave, which can increase the temperature rise and shorten the life of motor. And the leakage current will also increase, which can lead to the leakage protection device malfunction and generate strong electromagnetic interference to influence the reliability of other electric devices.

l As the electromagnetic receiver, too strong interference will damage the inverter and influence the normal using of customers.

l In the system, EMS and EMI of inverter coexist. Decrease the EMI of inverter can increase its EMS ability.

4.6.3 EMC Installation Guideline

In order to ensure all electric devices in the same system to work smoothly, this section, based on EMC features of inverter, introduces EMC installation process in several aspects of application (noise control, site wiring, grounding, leakage current and power supply filter). The good effective of EMC will depend on the good effective of all of these five aspects.

4.6.3.1 Noise control

All the connections to the control terminals must use shielded wire. And the shield layer of the wire must ground near the wire entrance of inverter. The ground mode is 360 degree annular connection formed by cable clips. It is strictly prohibitive to connect the twisted shielding layer to the ground of inverter, which greatly decreases or loses the shielding effect.

Connect inverter and motor with the shielded wire or the separated cable tray. One side of shield layer of shielded wire or metal cover of separated cable tray should connect to ground, and the other side should connect to the motor cover. Installing an EMC filter can reduce the electromagnetic noise greatly.

4.6.3.2 Site wiring

Power supply wiring: the power should be separated supplied from electrical transformer. Normally it is 5 core wires, three of which are fire wires, one of which is the neutral wire, and one of which is the ground wire. It is strictly prohibitive to use the same line to be both the neutral wire and the ground wire

Device categorization: there are different electric devices contained in one control cabinet, such as inverter, filter, PLC and instrument etc, which have different ability of emitting and withstanding electromagnetic noise. Therefore, it needs to categorize these devices into strong noise device and noise sensitive device. The same kinds of device should be placed in the same area, and the distance between devices of different category should be more than 20cm.

Wire Arrangement inside the control cabinet: there are signal wire (light current) and power cable (strong current) in one cabinet. For the inverter, the power cables are categorized into input cable and output cable. Signal wires can be easily disturbed by power cables to make the equipment malfunction. Therefore when wiring, signal cables and power cables should be arranged in different area. It is strictly prohibitive to arrange them in parallel or interlacement at a close distance (less than 20cm) or tie them together. If the signal wires have to cross the power cables, they should be arranged in 90 angles. Power input and output cables should not either be arranged in interlacement or tied together, especially when installed the EMC filter. Otherwise the distributed capacitances of its input and output power cable can be coupling each other to make the EMC filter out of function.

4.6.3.3 Ground

Inverter must be ground safely when in operation. Grounding enjoys priority in all EMC methods because it does not only ensure the safety of equipment and persons, but also is the simplest, most effective and lowest cost solution for EMC problems.

Grounding has three categories: special pole grounding, common pole grounding and series-wound grounding. Different control system should use special pole grounding, and different devices in the same control system should use common pole grounding, and different devices connected by same power cable should use series-wound grounding.

4.6.3.2 Leakage current

Leakage current includes line-to-line leakage current and over-ground leakage current. Its value depends on distributed capacitances and carrier frequency of inverter. The over-ground leakage current, which is the current passing through the common ground wire, can not only flow into inverter system but also other devices. It also can make leakage current circuit breaker, relay or other devices malfunction. The value of line-to-line leakage current, which means the leakage current passing through distributed capacitors of input output wire, depends on the carrier frequency of inverter, the length and section areas of motor cables. The higher carrier frequency of inverter, the longer of the motor cable and/or the bigger cable section area, the larger leakage current will

occur.

Countermeasure:

Decreasing the carrier frequency can effectively decrease the leakage current. In the case of motor cable is relatively long (longer than 50m), it is necessary to install AC reactor or sinusoidal wave filter at the output side, and when it is even longer, it is necessary to install one reactor at every certain distance.

4.6.3.5 EMC Filter

EMC filter has a great effect of electromagnetic decoupling, so it is preferred for customer to install it.

For inverter, noise filter has following categories:

- Noise filter installed at the input side of inverter;
- Install noise isolation for other equipment by means of isolation transformer or power filter.

4.6.4 If user install inverter and EMI filter according to the installation guideline, we believe inverter system comply with following compliance.

- EN61000-6-4
- EN61000-6-3
- EN61800-3

4.6.5 Notice

- **This type of PDS is not intended to be used on a low-voltage public network which supplies domestic premise;**
- **Radio frequency interference is expected if used on such a network.**

5. OPERATION

5.1 Operating Keypad Description

5.1.1 Keypad schematic diagram

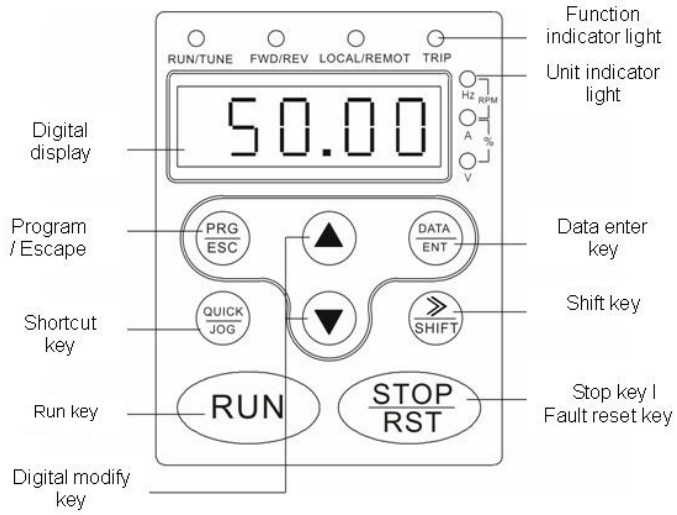


Figure 5.1 Keypad schematic diagrams.

5.1.2 Button function description

Button	Name	Description
PRG ESC	Programming Key	Entry or escape of first-level menu.
DATA ENT	Enter Key	Progressively enter menu and confirm parameters.
▲	UP Increment Key	Progressively increase data or function codes.
▼	DOWN Decrement Key	Progressive decrease data or function codes.
>> SHIFT	Shift Key	In parameter setting mode, press this button to select the bit to be modified. In other modes, cyclically displays parameters by right shift

Button	Name	Description
RUN	Run Key	Start to run the inverter in keypad control mode.
STOP/RST	STOP/RESET Key	In running status, restricted by P7.04, can be used to stop the inverter. When fault alarm, can be used to reset the inverter without any restriction.
QUICK/JOG	Shortcut Key	Determined by Function Code P7.03: 0: Jog operation 1: Switch between forward and reverse 2: Clear the UP/DOWN settings. 3: Quick debugging mode1 (by menu) 4: Quick debugging mode2 (by latest order) 5: Quick debugging mode3 (by non-factory setting parameters)
RUN + STOP/RST	Combination Key	Pressing the RUN and STOP/RST at the same time can achieve inverter coast to stop.

5.1.3 Indicator light description

5.1.3.1 Function indicator light description

Function indicator	Description
RUN/TUNE	Extinguished: stop status Flickering: parameter autotuning status Light on: operating status
FWD/REV	Extinguished: forward operation Light on: reverse operation.
LOCAL/REMOT	Extinguished: keypad control Flickering: terminal control Light on: communication control
TRIP	Extinguished: normal operation status Flickering: overload pre-warning status

5.1.3.2 Unit Indicator light description

Function indicator	Description
Hz	Frequency unit
A	Current unit
V	Voltage unit
RPM	Rotating speed unit
%	Percentage

5.1.3.3 Digital display

Have 5 digit LED , which can display all kinds of monitoring data and alarm codes such as reference frequency, output frequency and so on.

5.2 Operation Process

5.2.1 Parameter setting

Three levels of menu are:

- Function code group (first-level);
- Function code (second-level);
- Function code value (third-level).

Remarks:

Press both the PRG/ESC and the DATA/ENT can return to the second-class menu from the third-class menu. The difference is: pressing DATA/ENT will save the set parameters into the control panel, and then return to the second-class menu with shifting to the next function code automatically; while pressing PRG/ESC will directly return to the second-class menu without saving the parameters, and keep staying at the current function code.

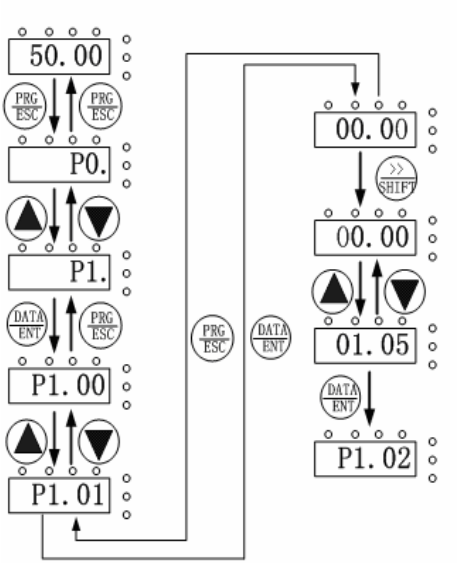


Figure 5.2 Flow chart of parameter setting.

Under the third-class menu, if the parameter has no flickering bit, it means the function code cannot be modified. The possible reasons could be:

- This function code is not modifiable parameter, such as actual detected parameter, operation records and so on;
- This function code is not modifiable in running status, but modifiable in stop status.

5.2.2 Shortcut menu setting

Shortcut menu, in which parameters in common use can be programmed, provides a quick way to view and modify function parameters. In the shortcut menu, a parameter being displayed as "hP0.11" means the function parameter P0.11. Modifying parameters in the shortcut menu has the same effect as doing at normal programming status.

Maximum 16 function parameters can be saved into the shortcut menu, and these parameters can be added or deleted when P7.03 is set to be 0.

5.2.3 Fault reset

If the inverter has fault, it will prompt the related fault information. User can use STOP/RST or according terminals determined by P5 Group to reset the fault. After fault reset, the inverter is at stand-by state. If user does not reset the inverter when it is at fault state, the inverter will be at operation protection state, and can not run.

5.2.4 Parameter copy

For details, please refer to the instructions of LCD keyboard functions

5.2.5 Password Settings:

CHV160A series inverter provides user password protection function. When P7.00 is zero, which is user's password, quitting code editing state can make password protection effective, then pressing PRG/ESC can enter code editing state, "-----" will be showed. Operator must enter a correct.

To cancel password protection function, setting P7.00 to be zero is ok. User's password has no protection to the parameter on shortcut menu.

5.3 Running State

5.3.1 Power-on initialization

Firstly the system initializes during the inverter power-on, and LED displays "8888". After the initialization is completed, the inverter is on stand-by status.

5.3.2 Stand-by

At stop or running status, parameters of multi-status can be displayed. Whether or not to display this parameter can be chosen through Function Code P7.06 (Running status display selection) and P7.07 (Stop status display selection) according to binary bits, the detailed description of each bit please refer to the function code description of P7.06 and P7.07.

In stop status, there are sixteen parameters which can be chosen to display or not. They are: reference frequency, DC bus voltage, PID setting, PID feedback, input terminal status, output terminal status, analog AI1, analog AI2, and some reserved parameters. Whether or not to display can be determined by setting the corresponding binary bit of P7.07. Press the 》/SHIFT to scroll through the parameters in right order.

5.3.3 Operation

In running status, there are twenty one running parameters which can be chosen to display or not. They are: running frequency, reference frequency, DC bus voltage, output voltage, output current, rotating speed, output power, PID setting, PID feedback, input terminal status, output terminal status, analog AI1, analog AI2 and some reserved parameters. Whether or not to display can be determined by setting the corresponding binary bit of P7.06. Press the 》/SHIFT to scroll through the parameters in right order .

5.3.4 Fault

In fault status, inverter will display parameters of STOP status besides parameters of fault status. Press the 》/SHIFT to scroll through the parameters in right order.

6. DETAILED FUNCTION DESCRIPTION

P0 Group--Basic Function

Function Code	Name	Description	Setting Range	Factory Setting
P0.00	Run command	0:Keypad (LED–"LOCAL/REMOT", extinguished) 1:Terminal (LED–"LOCAL/REMOT", flickering) 2:Communication (LED–"LOCAL/REMOT",lights on)	0~2	0

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

0: Keypad (LED—"LOCAL/REMOT", extinguished);

Both RUN and STOP/RST key are used for running command control. If Multifunction key QUICK/JOG is set as FWD/REV switching function (Details refer to instruction of CODE P7.03).

In running status, pressing RUN and STOP/RST in the same time will cause the inverter coast to stop.

1: Terminal (LED –"LOCAL/REMOT", flickering)

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

2: Communication (LED–"LOCAL/REMOT", lights on)

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

Function Code	Name	Description	Setting Range	Factory Setting
P0.01	UP/DOWN setting	0: Valid&Save 1: Valid&Not save 2: Invalid 3: Run valid&Stop reset	0~2	0

0: Valid, save UP/DOWN value when power off.

User can adjust the reference frequency by UP/DOWN. The value of UP/DOWN can be

saved when power off, Once power on next time, it will be.

1: Valid, do not save UP/DOWN value when power off.

User can adjust the reference frequency by UP/DOWN, but the value of UP/DOWN will not be saved when power off.

2: Invalid.

User can not adjust the reference frequency by UP/DOWN. The value of UP/DOWN will be cleared if P0.02 is set to 2.

3: Valid during running, clear when power off

User can adjust the reference frequency by UP/DOWN when inverter is running. When inverter power off, the value of UP/DOWN will be cleared

Notice:

- **UP/DOWN function can be achieved by keypad (∧ and ∨) and multifunctional terminals.**
- **Reference frequency can be adjusted by UP/DOWN.**
- **UP/DOWN has highest priority which means UP/DOWN is always active no matter which frequency command source is.**
- **When the factory setting is restored, the value of UP/DOWN will be cleared.**
- **The function code is invalid when P8.00 is set to be 1.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.02	FREQ SOURCE A	0: Keyboard 1: AI1 2. AI2 3. Communication 4: Multi-Step	0~4	0

0: Keypad: Please refer to description of P0.09.

1: AI1

2: AI2

The reference frequency is set by analog input. AI1 & AI2 are 0-10V voltage inputs or 0(4) ~20mA current input.The input mode is switched by jumpers J9&J11.

Notice:

- **For detailed relationship between analogue input voltage and frequency, please refer to description of P5.12~P5.16.**
- **100% of AI is corresponding to maximum frequency,-100% is correspongding to** reverse maximum frequency**.**

3: Communication

The reference frequency is set through RS485. For details, please refer to Capter 9-Communication protocol.

4:Multi-steps speed

The selection of steps is determined by combination of multi-step speed terminals,and the setting value is determined by P9.18~P9.33,100%- is corresponding to the maximum frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P0.03	FREQ SOURCE B	0:AI1 1:AI2 2:PID	0~2	0

When Frequency B command acts as the independent reference frequency source. The function is the same with that of frequency A command.

Function Code	Name	Description	Setting Range	Factory Setting
P0.04	FREQ B SCALE	0: Maximum frequency 1: Frequency A command	0~1	0

0: reference frequency B = AI1 (%) * P0.04 (maximum frequency).

1: reference frequency B = AI1 (%) * reference frequency A.

Function Code	Name	Description	Setting Range	Factory Setting
P0.05	FREQ SELECTION	0: A 1: B 2: A+B 3: Max(A, B)	0~3	0

This parameter can be used to select the reference frequency command.

0: Only frequency command source A is active.

1: Only Frequency command source B is active.

2: Both Frequency command source A and B are active.

Reference frequency = reference frequency A + reference frequency B.

3: Both Frequency command source A and B are active.

Reference frequency = Max (reference frequency A, reference frequency B).

Notice: The frequency command source can be selected not only P0.05 but also by multifunctional terminals. Please refer to description of P5 Group.

Function Code	Name	Description	Setting Range	Factory Setting
P0.06	Max FREQ	10~400.00Hz	10.0~400.00	50.00Hz

Notice:

- **The frequency reference should not exceed maximum frequency.**
- **Actual acceleration time and deceleration time are determined by maximum frequency. Please refer to description of P0.10 and P0.11.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.07	UP FREQ LIMIT	P0.08~P0.06	P0.08~P0.06	50.00Hz

Notice:

- **Upper frequency limit should not be greater than the maximum frequency (P0.07).**
- **Output frequency should not exceed upper frequency limit.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.08	LOW FREQ LIMIT	0.00Hz~ P0.08	0.00~P0.08	0.00Hz

Notice:

- **Lower frequency limit should not be greater than upper frequency limit (P0.07).**
- **If frequency reference is lower than P0.09, the action of inverter is determined by P1.11. Please refer to description of P1.11.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.09	KEYPAD REF FREQ	0.00 Hz ~ P0.08	0.00~P0.08	50.00Hz

When P0.02 is set to be 0, this parameter is the initial value of inverter reference frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P0.10	ACC TIME	0.0~3600.0s	0.0~3600.0	20.0s
P0.11	DEC TIME	0.0~3600.0s	0.0~3600.0	20.0s

Acceleration time is the time of accelerating from 0Hz to maximum frequency (P0.06).

Deceleration time is the time of decelerating from maximum frequency (P0.06) to 0Hz. Please refer to following figure.

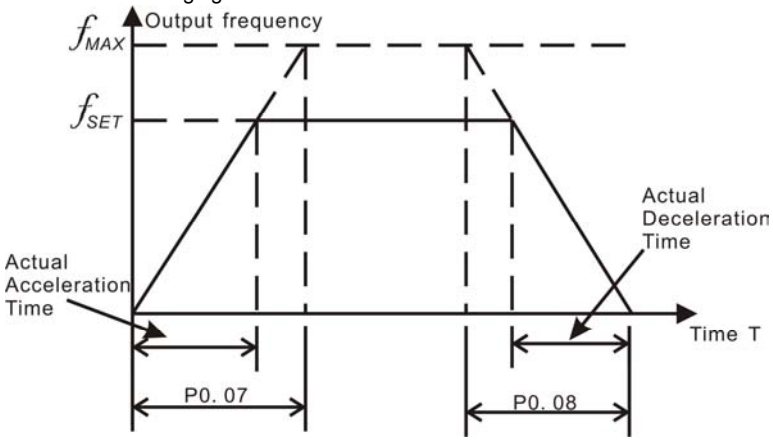


Figure 6.1 Acceleration and Deceleration time.

When the reference frequency is equal to the maximum frequency, the actual acceleration and deceleration time will be equal to the P0.10 and P0.11 respectively.

When the reference frequency is less than the maximum frequency, the actual acceleration and deceleration time will be less than the P0.10 and P0.11 respectively.

The actual acceleration (deceleration) time = P0.10 (P0.11) * reference frequency/P0.06.

Function Code	Name	Description	Setting Range	Factory Setting
P0.12	RUN DIRECTION	0: Default 1: Reverse 2: Forbid reverse	0~2	0

Notice:

- **The rotation direction of motor is corresponding to the wiring of motor.**
- **When the factory setting is restored, the rotation direction of motor may be changed. Please be cautious to use.**
- **If P0.12 is set to 2, user can not change rotation direction of motor by QUICK/JOG or terminal.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.13	CARRIER FREQ	1~16.0kHz	1~16.0kHz	Depend on model

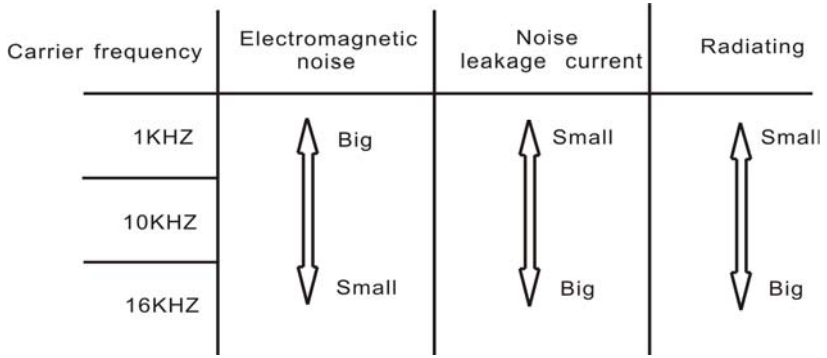


Figure 6.2 Effect of carrier frequency.

Carrier frequency / Model	Highest Carrier Frequency(kHz)	Lowest Carrier Frequency(kHz)	Factory Setting(kHz)
G Model: 4~15kW	16	1	6
G Model: 18.5kW	8	1	2

Carrier frequency will affect the noise of motor and the EMI of inverter.

If the carrier frequency is increased, it will cause better current wave, less harmonic current and lower noise of motor.

Notice:

- **The factory setting is optimal in most cases. Modification of this parameter is not recommended.**
- **If the carrier frequency exceeds the factory setting, the inverter must be derated because the higher carrier frequency will cause more switching loss, higher temperature rise of inverter and stronger electromagnetic interference.**
- **If the carrier frequency is lower than the factory setting, it is possible to cause less output torque of motor and more harmonic current.**

Function Code	Name	Description	Setting Range	Factory Setting
P0.14	RESTORE PARA	0: No action 1: Restore factory setting 2: Clear fault records	0~2	0

0: No action

1: Inverter restores all parameters to factory setting except P2 group.

2: Inverter clear all fault records.

This function code will restore to 0 automatically when complete the function operation，and P2 group will not restore.

Function Code	Name	Description	Setting Range	Factory Setting
P0.15~ P0.19	Reserved	0～65535	0～65535	0

P1 Group--Start and Stop Control

Function Code	Name	Description	Setting Range	Factory Setting
P1.00	START MODE	0: Start directly 1: DC break and start 2: Speed tracking and start	0~2	0

0: Start directly: Start the motor at the starting frequency determined by P1.01.

1: DC braking and start: Inverter will output DC current firstly and then start the motor at the starting frequency. Please refer to description of P1.03 and P1.04. It is suitable for the motor which have small inertia load and may reverse rotation when start.

2: Speed tracking and start: Inverter detects the rotation speed and direction of motor, then start running to its reference frequency based on current speed. This can realize smooth start of rotating motor with big inertia load when instantaneous power off.

Function Code	Name	Description	Setting Range	Factory Setting
P1.01	START FREQ	0.00~10.0Hz	0.00~10.00	1.5Hz
P1.02	HOLD TIME	0.0~50.0s	0.0~50.0	0.0s

Notice:

- **Set proper starting frequency can increase the starting torque.**
- **If the reference frequency is less than starting frequency, inverter will be at stand-by status. The indicator of RUN/TUNE lights on, inverter has no output.**
- **The starting frequency could be less than the lower frequency limits (P0.08).**
- **P1.01 and P1.02 take no effect during FWD/REV switching.**

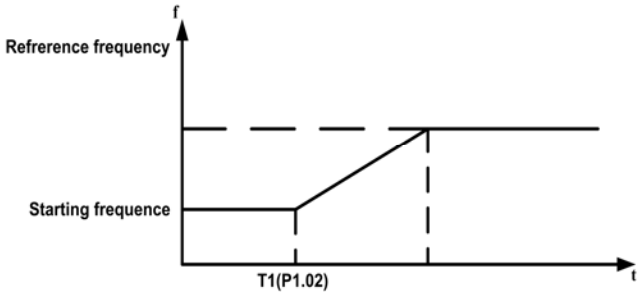


Figure 6.3 Starting diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.03	START BRAK CURR	0.0~150.0%	0.0~150.0	0.0%
P1.04	START BRAK TIME	0.0~50.0s	0.0~50.0	0.0s

When inverter starts, it performs DC braking according to P1.03 firstly, then start to accelerate after P1.04.

Notice:

- **DC braking will take effect only when P1.00 is set to be 1.**
- **DC braking is invalid when P1.04 is set to be 0.**
- **The value of P1.03 is the percentage of rated current of inverter. The bigger the DC braking current, the greater the braking torques.**

Function Code	Name	Description	Setting Range	Factory Setting
P1.05	STOP MODE	0: Deceleration to stop 1: Coast to stop	0~1	0

0: Deceleration to stop

When the stop command takes effect, the inverter decreases the output frequency according to the deceleration mode and the selected acceleration/deceleration time till stop.

1: Coast to stop

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

Function Code	Name	Description	Setting Range	Factory Setting
P1.06	STOP BRAK FREQ	0.00~P0.07	0.00~10.00	0.00Hz
P1.07	STOP BRAK DELAY	0.0~50.0s	0.0~50.0	0.0s
P1.08	STOP BRAK CURR	0.0~150.0%	0.0~150.0	0.0%
P1.09	STOP BRAK TIME	0.0~50.0s	0.0~50.0	0.0s

Starting frequency of DC braking: Start the DC braking when running frequency reaches starting frequency determined by P1.06.

Waiting time before DC braking: Inverter blocks the output before starting the DC braking. After this waiting time, the DC braking will be started. It is used to prevent over-current fault caused by DC braking at high speed.

DC braking current: The value of P1.08 is the percentage of rated current of inverter. The bigger the DC braking current, the greater the braking torque.

DC braking time: The time used to perform DC braking. If the time is 0, the DC braking will be invalid.

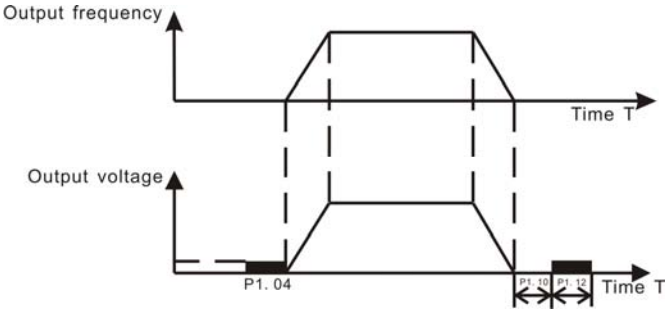


Figure 6.4 DC braking diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.10	FWD/REV DEADTIME	0.0~3600.0s	0.0~3600.0	0.0s

Set the hold time at zero frequency in the transition between forward and reverse running.

It is shown as following figure:

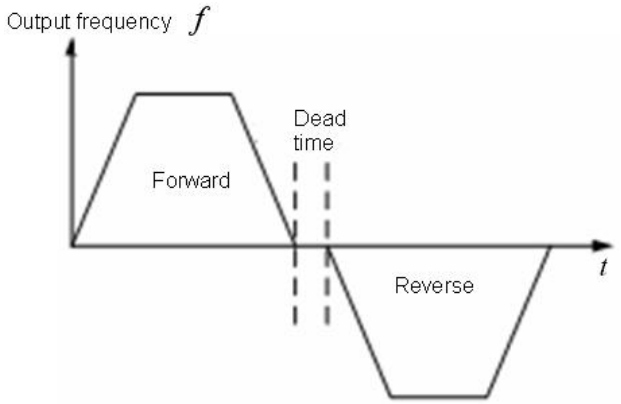


Figure 6.5 FWD/REV dead time diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P1.11	UNDER LIMIT ACT	0~1	0~1	0
P1.12	LIMIT RUN TIME	0～3600s	0～3600	5
P1.13	AWOKE DELAY	0～3600s	0～3600	5

The function code of P1.11determine the running state of inverter when setting frequency is lower than lower frequency limit.

0: UN at lower limit FREQ, Running at the lower frequency limit

1: Run at lower FREQ, then sleep, running at the lower frequency limit, and sleep latency. When P1.11 is set to be 1, inverter will run at lower frequency limit.Once the delay time (P1.12) is over, inverter will coast to stop; When the setting frequency is higer than or equal to the lower frequency limit again, inverter will be waked up and autorun after delay time (P1.13).

Notice: The functions are invalid when P8.00 is set to be 1.

Function Code	Name	Description	Setting Range	Factory Setting
P1.14	RESTART	0: Restart disabled 1: Restart enabled	0~1	0
P1.15	RESTR DELAY TIME	0.0~3600.0s	0.0~3600.0	0.0s

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

1: Enabled: When inverter is running, after power off and power on again, if run command source is keypad control (P0.00=0) or communication control (P0.00=2), inverter will automatically restart after delay time determined by P1.15; if run command source is terminal control (P0.00=1), inverter will automatically restart after delay time determined by P1.15 only if FWD or REV is active.

Function Code	Name	Description	Setting Range	Factory Setting
P1.16	FWD/REV ENABLE	0: Disabled 1: Enabled	0~1	0

Notice:

- **This function only takes effect if run command source is terminal control.**
- **If P1.16 is set to be 0, when power on, inverter will not start even if FWD/REV terminal is active, until FWD/REV terminal disabled and enabled again.**
- **If P1.16 is set to be 1, when power on and FWD/REV terminal is active, inverter will start automatically.**
- **This function may cause the inverter restart automatically, please be cautious.**

Function Code	Name	Description	Setting Range	Factory Setting
P1.17~ P1.19	Reserved	0～65535	0～65535	0

P2 Group--Motor Parameters

Function Code	Name	Description	Setting Range	Factory Setting
P2.00	MOTOR RATE POWER	1.5~900.0kW	1.5~900.0	Depend on model
P2.01	MOTOR RATE FREQ	0.01Hz~P0.07	0.01~P0.07	50.00Hz
P2.02	MOTOR RATE SPEED	0~36000rpm	0~36000	1460rpm
P2.03	MOTOR RATE VOLT	0~3000V	0~3000	380V
P2.04	MOTOR RATE CURR	0.1~2000.0A	0.1~2000.0	Depend on model

Notice: Please set the parameters according to the nameplate of motor.

Function Code	Name	Description	Setting Range	Factory Setting
P2.05	A PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model
P2.06	B PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model
P2.07	C PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model
P2.08	D PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model
P2.09	E PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model
P2.10	F PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model
P2.11	G PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model

The above parameter is corresponding to the motor rated current of each pump, so please set by the motor nameplates.These parameters can effect the overload protection of motor.

Function Code	Name	Description	Setting Range	Factory Setting
P2.12~P2.15	Reserved	0～65535	0～65535	0

P3 Group --PID Control

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

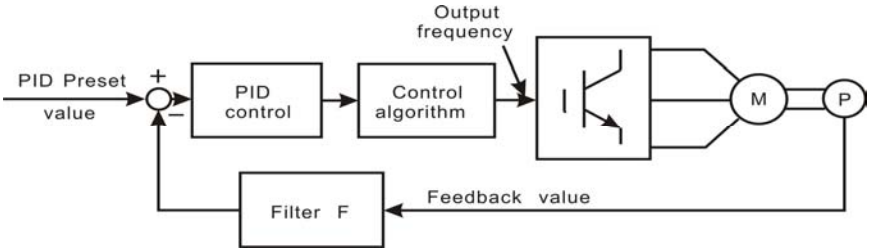


Figure 6.6 PID control diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P3.00	UNIT SEL	0～10	0～10	0

0:MPa 1:kPa 2:Pa 3:℃ 4:A 5:V 6:Hz 7:% 8:rpm 9:h 10:kh

The function is to confirm the units of P3.02~P3.05.-

Function Code	Name	Description	Setting Range	Factory Setting
P3.01	DISPLAY FORMAT	0～4	0～4	3

The function is to display the radix point numbers of maximum value, upper limit value, lower limit value, feedback value of PID.

Function Code	Name	Description	Setting Range	Factory Setting
P3.02	PID MAX	0.001～65.535	0.001~65.535	1.000
P3.03	PID UPPER	P3.04~P3.02	P3.04~P3.02	1.000
P3.04	PID LOWER	P0.000~P3.03	P0.00~P3.03	0.100
P3.05	KEYPAD PID SET	P3.04~P3.03	P3.04~P3.03	0.500

The unit and radix point numbers of parameters are decided by P3.00 and P3.01.

Function Code	Name	Description	Setting Range	Factory Setting
P3.06	PID PRESET	0~5	0~5	0

0: Keypad: Please refers to the value of P3.05.

1:AI1

2:AI2

PID given is set by the analog, and the setting is similar with analog input of P0.02.But the unit is decided by P3.00.

3: Modbus

The reference frequency is set through RS485. For details, please refer to operation manual of communication card.

4: Time water supply

The function parameter is determined by P9.01~P9.17.

5: Multi-press set

PID given is confirmed by the combination of - terminals status (P5 group) and P9.18~P9.33.

When the frequency source is set to be PID or P8.00 = 1(water-supply function is valid), the function will be valid. When the - target value of - PID is a relative percentage, -100% is corresponding to P3.02 (maximum value of PID).

Function Code	Name	Description	Setting Range	Factory Setting
P3.07	PID FEEDBACK	0: AI1 feed 1: AI2 feed 2: AI1-AI2 feed 3: Modbus feed	0~3	0

This parameter is used to select PID feedback source.

Notice:

- **Given value and feedback value of PID is percentage value.**
- **100% of given value is corresponding to 100% of feedback value.**
- **Given source and feedback source must not be same, otherwise PID will be malfunction.**

Function Code	Name	Description	Setting Range	Factory Setting
P3.08	PID OUTPUT	0: Positive 1: Negative	0~1	0

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

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

Function Code	Name	Description	Setting Range	Factory Setting
P3.09	PROPORTION GAIN (Kp)	0.00~100.00	0.00~100.00	0.10

Function Code	Name	Description	Setting Range	Factory Setting
P3.10	INTEGRAL TIME (Ti)	0.01~10.00s	0.01~10.00	0.10s
P3.11	DIFFERENTIA TIME (Td)	0.00~10.00s	0.00~10.00	0.00s

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

Adjusting PID control:

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

1. Enabled PID control (P0.03=2)
2. Increase the proportional gain (Kp) as far as possible without creating oscillation.
3. Reduce the integral time (Ti) as far as possible without creating oscillation.
4. Increase the differential time (Td) as far as possible without creating oscillation.

Making fine adjustments:

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

- Reducing overshooting

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

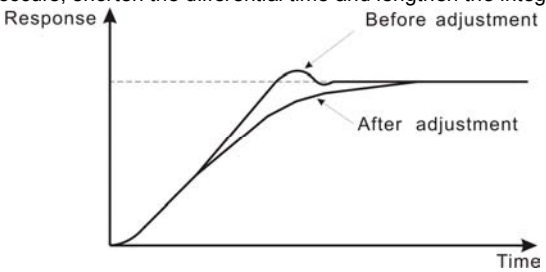


Figure 6.7 Reducing overshooting diagram.

- Rapidly stabilizing control status

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

- Reducing long-cycle oscillation

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

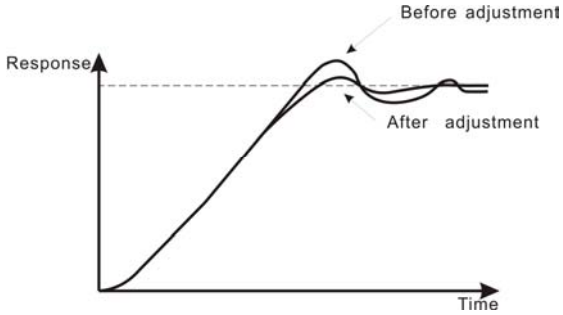


Figure 6.8 Reducing long-cycle oscillation diagram.

l Reducing short-cycle oscillation

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

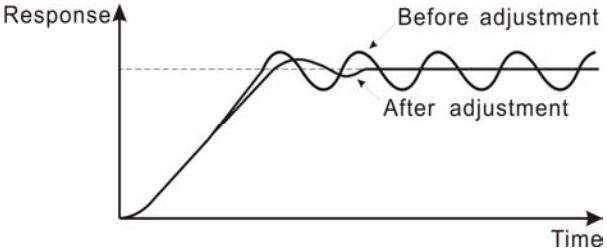


Figure 6.9 Reducing short-cycle oscillation diagram.

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

Function Code	Name	Description	Setting Range	Factory Setting
P3.12	SAMPLING CYCLE (T)	0.01~100.00s	0.01~100.00	0.50s
P3.13	BIAS LIMIT	0.0~100.0%	0.0~100.0	0.0%

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

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

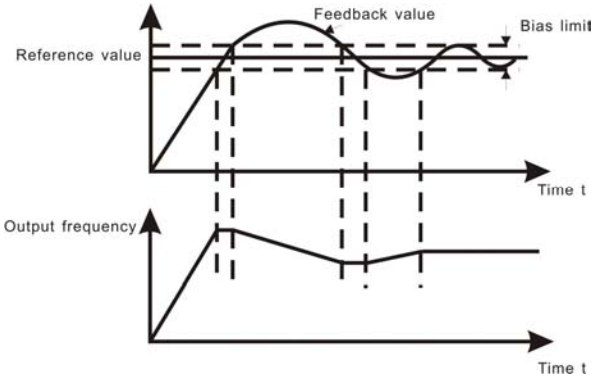


Figure 6.10 Relationship between bias limit and output frequency.

Function Code	Name	Description	Setting Range	Factory Setting
P3.14	OUTPUT FILTER	0.00~10.00s	0.00~10.00	0.00

The bigger the filter time, the better the immunity capability, but the response becomes slow, vice versa.

Function Code	Name	Description	Setting Range	Factory Setting
P3.15	FEEDBACK LOST	0.0~100.0%	0.0~100.0	0.0%
P3.16	FEEDBACK LOST(t)	0.0~3600.0s	0.0~3600.0	1.0s

When feedback value is less than P3.15 continuously for the period determined by P3.16, the inverter will alarm feedback lost failure (PIDE).

Function Code	Name	Description	Setting Range	Factory Setting
P3.17	PID FRQ UPPER	-100.0～100.0%	-100.0~100.0	100.0%
P3.18	PID FRQ LOWER	-100.0～P3.17	-100.0~P3.17	0.0%

100% is corresponding to P0.06 (The maximum frequency).

Notice: When P8.00 =1(Water-supply function is enabled.), the parameters should be positive, ortherwise the system will be abnormal.

Function Code	Name	Description	Setting Range	Factory Setting
P3.19	Reserved	0~65535	0~65535	0

P4 Group--V/F Control

Function Code	Name	Description	Setting Range	Factory Setting
P4.00	V/F CURVE	0: Linear curve 1: User-defined curve 2: 1.3 order torque_stepdown 3: 1.7 order torque_stepdown 4: 2.0 order torque_stepdown	0~4	4

0: Linear curve. It is applicable for normal constant torque load.

1: User-defined curve. It can be defined through setting (P4.03~P4.08).

2~4: Torque_stepdown curve. It is applicable for variable torque load, such as blower, pump and so on. Please refer to following figure.

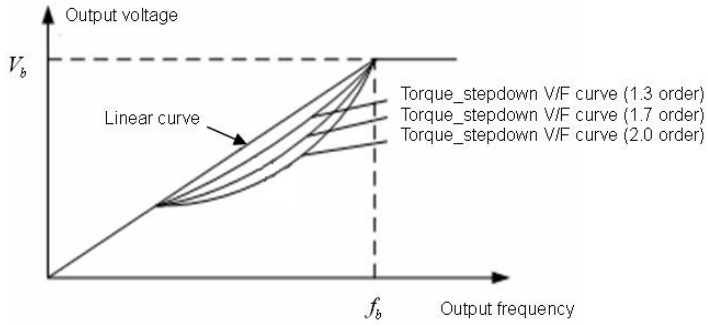


Figure 6.11 Multiple V/F curve diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.01	TORQUE BOOST	0.0%: auto 0.1%~10.0%	0.0~10.0	1.0%
P4.02	BOOST CUT-OFF	0.0%~50.0% (motor rated frequency)	0.0~50.0	20.0%

Torque boost will take effect when output frequency is less than cut-off frequency of torque boost (P4.02). Torque boost can improve the torque performance of V/F control at low speed.

The value of torque boost should be determined by the load. The heavier the load, the larger the value.

Notice: This value should not be too large, otherwise the motor would be over-heat or the inverter would be tripped by over-current or over-load.

If P4.01 is set to 0, the inverter will boost the output torque according to the load automatically. Please refer to following diagram.

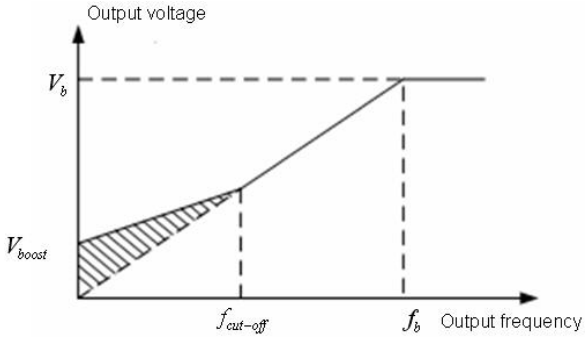


Figure 6.12 Torque boost diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.03	V/F FREQ 1	0.00Hz~ P4.05	0.00~P4.05	5.00Hz
P4.04	V/F VOLTAGE 1	0.0%~100.0%	0.0~100.0	10.0%
P4.05	V/F FREQ 2	P4.03~ P4.07	P4.03~ P4.07	30.00Hz
P4.06	V/F VOLTAGE 2	0.0%~100.0%	0.0~100.0	60.0%
P4.07	V/F FREQ 3	P4.05~ P2.01	P4.05~ P2.01	50.00Hz
P4.08	V/F VOLTAGE 3	0.0%~100.0%	0.0~100.0	100.0%

This function is only active when P4.00 is set to be 1. P4.03~P4.08 are used to set the user-defined V/F curve. The value should be set according to the load characteristic of motor.

Notice:

- **0＜V1＜V2＜V3＜rated voltage.**
- **0＜f1＜f2＜f3＜rated frequency.**
- **The voltage corresponding to low frequency should not be set too high, otherwise it may cause motor overheat or inverter fault.**

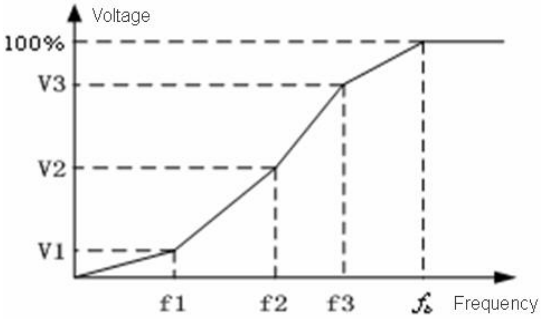


Figure 6.13 V/F curve setting diagram.

Function Code	Name	Description	Setting Range	Factory Setting
P4.09	V/F SLIPCOMP	0.00~10.00Hz	0.00~10.00	0.0Hz

The motor's slip changes with the load torque, which results in the variance of motor speed. The inverter's output frequency can be adjusted automatically through slip compensation according to the load torque. Therefore the change of speed due to the load change can be reduced. The value of compensated slip is dependent on the motor's rated slip which can be calculated as below: $P4.09 = f_b - n*P/60$

Where motor rated frequency (P2.01) is, n is motor rated speed (P2.02), and P is pole pairs of motor.

Function Code	Name	Description	Setting Range	Factory Setting
P4.10	AVR	0: Disabled 1: Enabled all the time 2: Disabled during deceleration	0~2	1

AVR (Auto Voltage Regulation) function ensures the output voltage of inverter stable no matter how the DC bus voltage changes. During deceleration, if AVR function is disabled, the deceleration time will be short but the current will be big. If AVR function is enabled all the time, the deceleration time will be long but the current will be small.

Function Code	Name	Description	Setting Range	Factory Setting
P4.11~ P4.15	Reserved	0~65535	0~65535	0

P5 Group--Input Terminals

The CHV160A series provides 8 multi-function digital input terminals and 2 analog inputs terminals.

Function Code	Name	Description	Setting Range	Factory Setting
P5.00	NO/NC SELECT	0~0xFF	0~0xFF	0

This code is to determine terminal status, normal-open or normal-colsed. When corresponding bit is set to be 1, the terminal is normal-colsed input .This parameter is hex-setting.ON-OFF signal corresponding bit is as follows:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
S8	S7	S6	S5	S4	S3	S2	S1

Function Code	Name	Description	Setting Range	Factory Setting
P5.01	INPUT SELECTION	0: Invalid 1: Valid	0~1	0

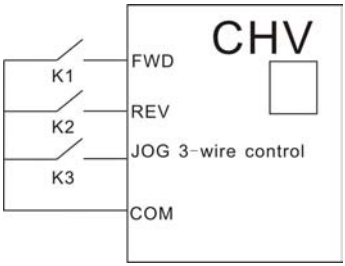
0: ON-OFF signal is input through external input terminals.

1: ON-OFF signal is set through serial communication by host device.

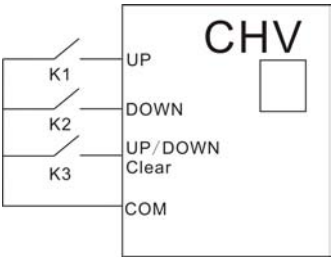
Function Code	Name	Description	Setting Range	Factory Setting
P5.02	S1 FUNCTION	Programmable multifunction terminal	0~55	1
P5.03	S2 FUNCTION	Programmable multifunction terminal	0~55	4
P5.04	S3 FUNCTION	Programmable multifunction terminal	0~55	5
P5.05	S4 FUNCTION	Programmable multifunction terminal	0~55	0
P5.06	S5 FUNCTION	Programmable multifunction terminal	0~55	0
P5.07	S6 FUNCTION	Programmable multifunction terminal	0~55	0
P5.08	S7 FUNCTION	Programmable multifunction terminal	0~55	0

Function Code	Name	Description	Setting Range	Factory Setting
P5.09	S8 FUNCTION	Programmable multifunction terminal	0~55	0

The meaning of each setting is shown in following table.

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td>0</td><td>Invalid</td><td>Please set unused terminals to be invalid to avoid malfunction.</td></tr>
<tr><td>1</td><td>Forward</td><td rowspan="2">Please refer to description of P5.13.</td></tr>
<tr><td>2</td><td>Reverse</td></tr>
<tr><td>3</td><td>jog enable</td><td>Combine with FWD/REV operation to be 3-wire jog control.
 

<table>
<tr><th>K1</th><th>K2</th><th>K3</th><th>Command</th></tr>
<tr><td>ON</td><td>OFF</td><td rowspan="2">OFF</td><td>Forward running</td></tr>
<tr><td>OFF</td><td>ON</td><td>Reverse running</td></tr>
<tr><td>ON</td><td>OFF</td><td rowspan="2">ON</td><td>Forward jogging</td></tr>
<tr><td>OFF</td><td>ON</td><td>Reverse jogging</td></tr>
</table></td></tr>
<tr><td>4</td><td>Coast to stop</td><td>The inverter blocks the output immediately. The motor coasts to stop by its mechanical inertia.</td></tr>
<tr><td>5</td><td>Reset fault</td><td>Resets faults that have occurred. It has the same function as STOP/RST.</td></tr>
<tr><td>6</td><td>Running pause</td><td>When this terminal takes effect, inverter decelerates to stop and save current status, such as PLC, traverse frequency and PID. When this terminal takes no effect, inverter restores the status before pause.</td></tr>
<tr><td>7</td><td>External fault</td><td>Stop the inverter and output a alarm when a fault occurs</td></tr>
</table>

<table>
<tr><th>Setting value</th><th>Function</th><th>Description</th></tr>
<tr><td></td><td>input</td><td>in a peripheral device.</td></tr>
<tr><td>8</td><td>Up command</td><td rowspan="3">The reference frequency of inverter can be adjusted by UP command and DOWN command.
 

Use this terminal to clear UP/DOWN setting. Please refer to description of P5.11.</td></tr>
<tr><td>9</td><td>DOWN command</td></tr>
<tr><td>10</td><td>Clear UP/DOWN</td></tr>
<tr><td>11</td><td>Switch between A and B</td><td rowspan="3"><table>
<tr><th>P0.06
Terminal action</th><th>A</th><th>B</th><th>A+B</th></tr>
<tr><td>11 valid</td><td>B</td><td>A</td><td></td></tr>
<tr><td>12 valid</td><td>A+B</td><td></td><td>A</td></tr>
<tr><td>13 valid</td><td></td><td>A+B</td><td>B</td></tr>
</table></td></tr>
<tr><td>12</td><td>Switch between A and A+B</td></tr>
<tr><td>13</td><td>Switch between B and A+B</td></tr>
<tr><td>14</td><td>Pause PID</td><td>PID adjustment will be paused and inverter keeps output frequency unchanged.</td></tr>
<tr><td>15</td><td>ACC/DEC ramp hold</td><td>Pauses acceleration or deceleration and maintains output frequency. When this terminal is disabled, acceleration/deceleration is restarted.</td></tr>
<tr><td>16</td><td>Multi-step press reference1</td><td rowspan="4">16 steps speed control can be realized by the combination of these four terminals. For details, please refer to following multi-step speed reference terminal status and according step value table.Such as: 0000: select the multi-speed 0; 1111: multi-speed 15. Notice: multi-speed 1 is low bit, and multi-speed 4 is high bit.
<table>
<tr><td>Multi-speed terminal 4</td><td>Multi-speed terminal 3</td><td>Multi-speed terminal 2</td><td>Multi-speed terminal 1</td></tr>
<tr><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr>
</table></td></tr>
<tr><td>17</td><td>Multi-step press reference 2</td></tr>
<tr><td>18</td><td>Multi-step press reference 3</td></tr>
<tr><td>19</td><td>Multi-step press reference 4</td></tr>
</table>

Setting value	Function	Description
20	Manual soft start debugging	Manual soft start of each motor must be corresponding to soft start terminal ,and the status should be 1.(short-connecting with COM)
21	Manual round-robin command	
22~28	Manual soft start of motor A~G	These parameters are to set the variable frequency pumps which need to be soft started. Please used together with the enabled terminal. When the enabled terminal, command of soft start and the running command of inverter are all valid, the motor will be soft started by inverter. And when the frequency reachs to P8.13 (the switching frequency), the motor will switch to be the grid-frequency status. If several commands of soft start are valid at the same time, the inverter will soft start and switch motors according to the closed sequency of each terminal.
29~35	Motor A~G disabled	When the command is valid, relevant motor will be out of switch logic. It's for repair.
36	Inlet reservoir up W LEV ltd	Please refer to P8.27.
37	Inlet reservoir low W LEV ltd	
38	Inlet reser W LEV on W short	
39	Sewage reservoir up W LEV ltd	The signal is a kind of ON-OFF..When the sewage level is higher than upper limit, sewage pump will be switched to run; If it is lower than lower limit, the sewage pump will stop running.
40	Sewage reser low W level ltd	
41	PID switch	When it is valid, PID0 (Defined by P3) will be switched to PID1 (Defined by PD), and the corresponding parameters of PID wll also be switched.

Setting value	Function	Description
42~50	Reserved	

Function Code	Name	Description	Setting Range	Factory Setting
P5.10	Sx FILTER TIMES	0~10	0~10	5

This parameter is used to set filter strength of terminals (S1~S8). When interference is heavy, user should increase this value to prevent malfunction.

Function Code	Name	Description	Setting Range	Factory Setting
P5.11	UP/DOWN RATE	0.01~50.00Hz/s	0.01~50.00	0.50Hz/s

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

Function Code	Name	Description	Setting Range	Factory Setting
P5.12	AI1 LOW LIMIT	0.00V~10.00V	0.00~10.00	0.00V
P5.13	AI1 LOW SETTING	-100.0%~100.0%	-100.0~100.0	0.0%
P5.14	AI1 UP LIMIT	0.00V~10.00V	0.00~10.00	10.00V
P5.15	AI1 UP SETTING	-100.0%~100.0%	-100.0~100.0	100.0%
P5.16	AI1 FILTER TIME	0.00s~10.00s	0.00~10.00	0.10s
P5.17	AI2 LOW LIMIT	0.00V~10.00V	0.00~10.00	0.00V
P5.18	AI2 LOW SETTING	-100.0%~100.0%	-100.0~100.0	0.0%
P5.19	AI2 UP LIMIT	0.00V~10.00V	0.00~10.00	10.00V
P5.20	AI2 UP SETTING	-100.0%~100.0%	-100.0~100.0	100.0%
P5.21	AI2 FILTER TIME	0.00s~10.00s	0.00~10.00	0.10s

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

The analog input AI1 can only provide voltage input, and the range is 0V~10V.

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

Notice: AI1 lower limit must be less or equal to AI1 upper limit.

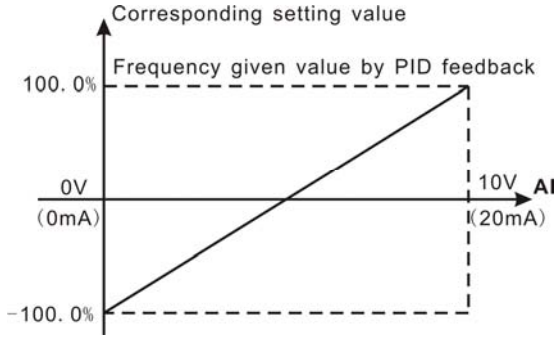


Figure 6.14 Relationship between AI and corresponding setting.

Function Code	Name	Description	Setting Range	Factory Setting
P5.22~ P5.25	Reserved	0~65535	0~65535	0.00V

P6 Group -- Output Terminals

CHV160A series standrad model supplies 3 multifunctional relay output terminals，2 multifunctional analog output terminals. The extension card supplies 8 pump intelligent switched relay output terminals.

Function Code	Name	Description	Setting Range	Factory Setting
P6.00	RO1 SELECTION	Relay output	0~30	3
P6.01	RO2 SELECTION	Relay output	0~30	21
P6.02	RO3 SELECTION	Relay output	0~30	22

Setting Value	Function	Description
0	No output	Output terminal has no function.
1	Run forward	ON: During forward run.
2	Run reverse	ON: During reverse run.
3	Fault output	ON: Inverter is in fault status.
4	Motor overload	Please refer to description of PA.04~PA.06.

Setting Value	Function	Description
5	Inverter overload	Please refer to description of PA.04~PA.06.
6	FDT reached	Please refer to description of PC.10, PC.11.
7	Frequency reached	Please refer to description of PC.12.
8	Zero speed running	ON: The running frequency of inverter is zero.
9	Running time reached	Please refer to description of PC.09.
10	Upper frequency limit reached	ON: Running frequency reaches the value of P0.07.
11	Lower frequency limit reached	ON: Running frequency reaches the value of P0.08.
12	Run ready	ON: Inverter is ready (no fault, power is ON).
13	Motor running	ON: Inverter has output signal.
14	Stop pulse output	Output pulse signal for 2s when running frequency is lower than 0.1Hz.
15	Over press alarm	Output “ON” when the feedback pressure is equal to or greater than PA.14(Over-pressure protection value) and it lasts the delay time set by PA.15.
16	Under press alarm	Output “ON” when the feedback pressure is equal to or less than PA.16(Under-pressure protection value), and it lasts the delay time set by PA.17.
17	Dormant Operation indication	Output “ON” when the dormancy running status
18	Backup pressure operat indica	The terminal will output “ ON” when the system is running with reserved pressure . Please refer to P8.32.
19	Reservoir water short indicat	Output ON when water level of pool is lower than the shortage level.
20	Faulty pump indication	Output ON once there is any pump at fault.
21	H pump control	In water-supply mode, output “ON” means that .H pump has been switched on.H pump is only suitable for grid frequency control.

Setting Value	Function	Description
22	I pump control	In water-supply mode, output “ON” means that .I pump has been switched on.I pump is only suitable for grid frequency control.
23~30	Reserved	Reserved

Function Code	Name	Description	Setting Range	Factory Setting
P6.03	RT1 SELECTION	0~14	0~14	0
P6.04	RT2 SELECTION	0~14	0~14	0
P6.05	RT3 SELECTION	0~14	0~14	0
P6.06	RT4 SELECTION	0~14	0~14	0
P6.07	RT5 SELECTION	0~14	0~14	0
P6.08	RT6 SELECTION	0~14	0~14	0
P6.09	RT7 SELECTION	0~14	0~14	0
P6.10	RT8 SELECTION	0~14	0~14	0

These parameters are to set the output function of relay on water-supply card,the detailsis as follows:

Setting value	Function	Description
0	No function	Terminal is invalid.
1	Connect A for var freq CON	Variable frequency pump needs two control signals: frequency control and grid frequency control,but grid frequency pump ,sewage pump,anddormancy pump need only one control signal :grid frequency control.
2	Connect A for pow freq CON	
3	Connect B for var freq CON	
4	Connect B for pow freq CON	
5	Connect C for var freq CON	
6	Connect C for pow freq CON	
7	Connect D for var freq CON	
8	Connect D for pow freq CON	
9	Connect E for var freq CON	
10	Connect E for pow freq CON	
11	Connect F for var freq CON	
12	Connect F for pow freq CON	
13	Connect G for var freq CON	
14	Connect G for pow freq CON	

Function Code	Name	Description	Setting Range	Factory Setting
P6.11	AO1 SELECTION	Multifunctional analog output	0~14	0
P6.12	AO2 SELECTION	Multifunctional analog output	0~14	0

AO/HDO output functions are indicated in the following table:

Setting Value	Function	Range
0	Running frequency	0~maximum frequency (P0.06)
1	Setting frequency	0~ maximum frequency (P0.06)
2	Motor speed	0~2* rated synchronous speed of motor
3	Output current	0~2* inverter rated current
4	Output voltage	0~2* inverter rated voltage
5	Reserved	
6	Reserved	
7	AI1 voltage/current	0~10V/0~20mA
8	AI2 voltage/current	0~10V/0~20mA
9~15	Reserved	

Function Code	Name	Description	Setting Range	Factory Setting
P6.13	AO1 LOW LIMIT	0.0%~100.0%	0.0~100.0	0.0%
P6.14	AO1 LOW OUTPUT	0.00V ~10.00V	0.00~10.00	0.00V
P6.15	AO1 UP LIMIT	0.0%~100.0%	0.0~100.0	100.0%
P6.16	AO1 UP OUTPUT	0.00V ~10.00V	0.00~10.00	10.00V
P6.17	AO2 LOW LIMIT	0.0%~100.0%	0.0~100.0	0.0%
P6.18	AO2 LOW OUTPUT	0.00V ~10.00V	0.00~10.00	0.00V
P6.19	AO2 UP LIMIT	0.0%~100.0%	0.0~100.0	100.0%
P6.20	AO2 UP OUTPUT	0.00V ~10.00V	0.00~10.00	10.00V

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

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

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

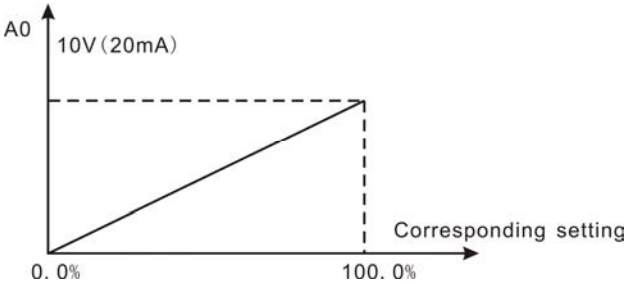


Figure 6.15 Relationship between AO and corresponding setting.

Function Code	Name	Description	Setting Range	Factory Setting
P6.21~ P6.24	Reserved	0~65535	0~65535	0.0%

P7 Group--Display Interface

Function Code	Name	Description	Setting Range	Factory Setting
P7.00	USER PASSWORD	0~65535	0~65535	0

The password protection function will be valid when set to be any nonzero data. When P7.00 is set to be 00000, user's password set before will be cleared and the password protection function will be disabled.

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

Function Code	Name	Description	Setting Range	Factory Setting
P7.01	LANGUAGE SELECT	0: Chinese 1: English	0~1	0

Function Code	Name	Description	Setting Range	Factory Setting
P7.02	PARA COPY	0: Invalid 1: Upload 2: Download	0~2	0

P7.02 will take effect when LCD keypad is used.

1: All value of parameters will be uploaded from inverter to LCD.

2: All value of parameters will be downloaded from LCD to inverter.

Notice: When upload or download operation completes, P7.02 will be set to 0 automatically.

Function Code	Name	Description	Setting Range	Factory Setting
P7.03	QUICK/JOG FUNC	0: Quick debugging mode 1: FDW/REV switch 2: Jog 3: Clear UP/DOWN setting	0~3	0

QUICK/JOG is a multifunctional key, whose function can be defined by P7.03.

0: Quick debugging mode: Please refer to description of Chapter 5.

1: FWD/REV switching: Press QUICK/JOG, the running direction of inverter will reverse. It is only valid if P0.01 is set to be 0.

2: Jog: Press QUICK/JOG, the inverter will jog.

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

Function Code	Name	Description	Setting Range	Factory Setting
P7.04	STOP/RST FUNC	0: Valid when keypad control (P0.01=0) 1: Valid when keypad or terminal control (P0.01=0 or 1) 2: Valid when keypad or COM control (P0.01=0 or 2) 3: Always valid	0~3	0

Notice:

- **The value of P7.04 only determines the STOP function of STOP/RST.**

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

Function Code	Name	Description	Setting Range	Factory Setting
P7.05	KEYPAD DISPLAY	0: Preferential to external keypad 1: Both display&external valid. 2: Both display& local key valid. 3: Both display & Both valid.	0~3	0

0: When external keypad exists, local keypad will be invalid.

1: Local and external keypad display simultaneously, only the key of external keypad is valid.

2: Local and external keypad display simultaneously, only the key of local keypad is valid.

3: Local and external keypad display simultaneously, both keys of local and external keypad are valid.

Notice:

- **This function should be used cautiously, otherwise it may cause malfunction.**
- **When P7.05 is set to be 1, local keypad is valid if external keypad is not connected.**
- **When LCD keypad is connected, P7.05 must be set to be 0.**

Function Code	Name	Description	Setting Range	Factory Setting
P7.06	RUNNING DISPLAY	0~0xFFFF	0~0xFFFF	0x01F9

P7.06 defines the parameters that can be displayed by LED in running status. If Bit is 0, the parameter will not be displayed; If Bit is 1, the parameter will be displayed. Press 》/SHIFT to scroll through these parameters in right order. Press DATA/ENT + QUICK/JOG to scroll through these parameters in left order.

The display content corresponding to each bit of P7.06 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
AI1	Output terminal status	Input terminal status	PID feedback	PID preset	Reserved	Reserved	Rotation speed

BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	AI2

For example, if user wants to display rotation speed, output power, output torque, PID preset and AI1, the value of each bit is as the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
1	0	0	0	1	1	1	1
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
0	0	0	0	0	0	0	0

The value of P7.06 is 008Fh.

Notice: I/O terminal status is displayed in decimal. For details, please refer to description of P7.19 and P7.20.

Function Code	Name	Description	Setting Range	Factory Setting
P7.07	STOP DISPLAY	1~0xFFFF	1~0xFFFF	0xFF

P7.07 determines the display parameters in stop status. The setting method is similar with P7.06.

The display content corresponding to each bit of P7.07 is described in the following table:

BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
AI2	AI1	PID feedback	PID preset	Output terminal status	Input terminal status	DC bus voltage	Reference frequency
BIT15	BIT14	BIT13	BIT12	BIT11	BIT10	BIT9	BIT8
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

Function Code	Name	Description	Setting Range	Factory Setting
P7.08	RECTIFIER TEMP	0~100.0℃		
P7.09	IGBT TEMP	0~100.0℃		
P7.10	MCU VERSION			
P7.11	DSP VERSION			
P7.12	TOTAL RUN TIME	0~65535h		

Rectifier module temperature: Indicates the temperature of rectifier module. Overheat

protection point of different inverter may be different.

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

MCU Software version: Indicates current software version of MCU.

DSP Software version: Indicates current software version of DSP

Accumulated running time: Displays accumulated running time of inverter.

Notice: Above parameters are read only.

Function Code	Name	Description	Setting Range	Factory Setting
P7.13	3rd LATEST FAULT	0~30	0~30	
P7.14	2nd LATEST FAULT	0~30	0~30	
P7.15	CURRENT FAULT	0~30	0~30	

These parameters record three recent fault types. For details, please refer to description of chapter 7.

Function Code	Name	Description	Setting Range	Factory Setting
P7.16	FAULT PREQ	Output frequency at current fault.		
P7.17	FAULT CURR	Output current at current fault.		
P7.18	FAULT DC VOLT	DC bus voltage at current fault.		
P7.19	FAULT Sx STATUS	This value records ON-OFF input terminal status at current fault. The meaning of each bit is as below: BIT7 BIT6 BIT5 BIT4 BIT3 BIT2 BIT1 BIT0 S8 S7 S6 S5 S4 S3 S2 S1 1 indicates corresponding input terminal is ON, while 0 indicates OFF. **Notice: This value is displayed as decimal.**		

<table>
<tr><th>Function Code</th><th>Name</th><th>Description</th><th>Setting Range</th><th>Factory Setting</th></tr>
<tr><td>P7.20</td><td>FAULT DO STATUS</td><td>This value records output terminal status at current fault. The meaning of each bit is as below:
<table><tr><td></td><td>BIT10</td><td>BIT9</td><td>BIT8</td><td>BIT7</td><td>BIT6</td></tr><tr><td></td><td>RT8</td><td>RT7</td><td>RT6</td><td>RT5</td><td>RT4</td></tr><tr><td>BIT5</td><td>BIT4</td><td>BIT3</td><td>BIT2</td><td>BIT1</td><td>BIT0</td></tr><tr><td>RT3</td><td>RT2</td><td>RT1</td><td>RO3</td><td>RO2</td><td>RO1</td></tr></table>1 indicates corresponding output terminal is ON, while 0 indicates OFF.
Notice: This value is displayed as decimal.</td><td></td><td></td></tr>
</table>

Function Code	Name	Description	Setting Range	Factory Setting
P7.21	ERR-PUMP NOTE	0~0x1FF	0~0x1FF	

In constant pressure water-supply mode, if any pump is at fault, the corresponding bit will be 1.When P8.33 is 1,the corresponding type of faulty pump will be invalid,and the faulty pump will stop running,and stop switching

BIT9	BIT8	BIT7	BIT6	BIT5
Reserved	Reserved	Reserved	G pump	F pump
BIT4	BIT3	BIT2	BIT1	BIT0
E pump	D pump	C pump	B pump	A pump

For example: When P7.21=23H=00100011b, it means that pump A, pump B and pump F are at fault.

Function Code	Name	Description	Setting Range	Factory Setting
P7.22~ P7.24	Reserved	0~65535	0~65535	0

P8 Group--Water-supply Function

Function Code	Name	Description	Setting Range	Factory Setting
P8.00	WATER SUPPLY SEL	0~1	0~1	1

0：Disabled

The water-supply logic is invalid.Inverter is in general control mode.

1: Enabled

It is suitable for constant pressure water-supply system.For example: life and production constant pressure water-supply system, municipal water-supply system and sewage processing system. In other familiar systems,such as constant pressure oil-supply,constant pressure HVAC, it is available too.

Notice: when P8.00 is set to be 1, PID is the default as frequency given.and other frequency sources determined by P0.02-P0.05 are invalid.

Function Code	Name	Description	Setting Range	Factory Setting
P8.01	CONVERT-PUMP SEL	0~1	0~1	0

0: Fixed FRQ conversion-pump

Fix one pump as a variable-frequency pump which is drived directly by inverter, and others are grid-frequency pump which are controlled by programmable relay.

So, CHV160A can drive 1 variable-frequency pump and 9 grid-frequency pumps at most.

1: Circular FRQ conversion-pump

Only one pump can be used as an variable frequency pump, and others are as grid-frequency pumps at the same time, the variable frequency pumps can be in turn.

So CHV160A can dirve 4 avariable-frequency pumps and 2 grid-frequency pumps at most.

Function Code	Name	Description	Setting Range	Factory Setting
P8.02	H,I SEL	0~3	0~3	3

0: Disabled

1: H pump enabled

2: I pump enabled

3: H, I both enabled.

Function Code	Name	Description	Setting Range	Factory Setting
P8.03	PUMP A SEL	0~4	0~4	0
P8.04	PUMP B SEL	0~4	0~4	0
P8.05	PUMP C SEL	0~4	0~4	0
P8.06	PUMP D SEL	0~4	0~4	0
P8.07	PUMP E SEL	0~4	0~4	0
P8.08	PUMP F SEL	0~4	0~4	0
P8.09	PUMP G SEL	0~4	0~4	0

0: Pump invalid.

The corresponding pump is not installed or does not work.

1: Variable frequency CON pump

The corresponding pump is started by inverter.When it can not be switched,the pump can adjust the output automatically as variable adjust pump to make sure that the pressure to be constant.

When fulfilling the switching requirement, the pump will switch to run at grid-frequency or stop running.

NOICE: When P8.01=0, and A-G pumps are set as variable frequency pumps,the corresponding pump will be invalid.

2: Power frequency pump

The pump only run at grid-frequency, when the capacity of power network is big enough and the power of pump is less than 15kW, the pumps will be started with total voltage directly.If the power of pump is greater than 18.kW, it is suggested to start with buck start-up mode, such as Star-Delta step-down start, Auto coupling step-down start and soft start, so as to reduce impact on pipe network and power network system.

3: Dedicated dormant pump

When dormancy conditions are fulfilled, the system will be on the dormancy running status, and start the dormancy grid-frequency pump to maintain the pressure of pipe network.The dormancy pump won't be running until the system exits dormancy status.

4: Dedicated dredge pump

It is a grid-frequency pump, when waterlevel of Sewage-pool control function is enabled, and water level sensors are installed correctly, system will start and stop of sewage pump according to the detected water-level signals (which are).

Function Code	Name	Description	Setting Range	Factory Setting
P8.10	PUMP ADD TOLERA	0.0~30.0%	0.0~30.0	10.0%
P8.11	PUMP ADD FREQ	P8.16~P0.07	P8.16~P0.07	50.00Hz
P8.12	PUMP ADD DELAY	0~3600s	0~3600	5s
P8.13	SWITCH FREQUENCY	0.0~P0.07	0.0~P0.07	50.00Hz

The four parameters set the conditions of adding pump.

1: When frequency of variable-frequency pump reach the frequency of P8.11,at the same time, ,pressure feedback value<pressure set value-pressure tolerance,and it lasts for delay time (determined by P8.12),then the system adds pump.

2: 100% of pressure tolerance is corresponding with P3.02 (Maximum of PID).

3: P8.11 is a threshold frequency to add pump.When the pressure conditions are not satisfied, pump-added logic isstarted, which is as follow:

Add variable-frequency pump: Switch current variable-frequency pump to be a grid-frequency pump and start a new variable–frequency pump.

Add grid-frequency pump: Start the pumps using programmable relay ,at the same time, the current variable-frequency pump decelerate to the frequency of minusing pump according to the setted deceleration time determinded by P8.14, and then go on running with PID control.

It can stabilize fluctuate of system pressure and decreace pressure jump when add pump.

4: P8.13 switching frequency of variable-frequency pumps.

In the switch process, there is delay time from disconnecting variable-frequency contactor to closeing grid-frequency contactor, so variable-frequency pump will accelerate to a higher frequency (which is the switch frequency) before switching in order to make up the depreciation of pipe network pressure in the delay time.

The switch process is as follow: Variable-frequency pump accelerates to the switch frequency, stops output and disconnects the contactor,finally closes grid-frequency contactor.

Function Code	Name	Description	Setting Range	Factory Setting
P8.14	VFP DECELER TIME	0.0~100.0%	0.0~100.0	10.0s

The conditions of adding pump are satisfied,if the added pump is grid-frequency pump,the variable-frequency pump should decelerate to the frequency of minusing pump according with the setting deceleration time,and goes on carring out with PID control.In the process,the deceleration time is set by P8.14.

Function Code	Name	Description	Setting Range	Factory Setting
P8.15	PUMP REDU TOLERA	0.0~30.0%	0.0~30.0	10.0%
P8.16	PUMP REDU FRQ	P8.08~P8.11	P8.08~P8.11	5.00Hz
P8.17	PUMP REDU DELAY	0~3600s	0~3600	5s

The three parameters set the conditions of reducing pump.

1: When frequency of variable-frequency pump reach the frequency (determined by P8.16), at the same time, feedback pressure >setting pressure+pressure toleranceand it lasts for delay time (determined by P8.17), then system starts to reduce pump.

2: 100% of the pressure tolerance is corresponding to P3.02 (Maximum of PID).

3: Running frequency of pump reduced

When there are some grid-frequency pumps running, what is more variable-frequency pump decelerate to the frequency of pump reduced, and it last for delay time (determined by P8.17), when these conditions are satisfied, it starts to reduce pump.

Reduce grid-frequency pump: Resect the pump with programmable relay, and the current variable-frequency pump accelerate to the frequency of pump reduced according to the setted acceleration (determined by P8.18), and go on running with PID control.

It can stabilize fluctuate of system pressure when reduces pumps.

Function Code	Name	Description	Setting Range	Factory Setting
P8.18	VFP ACCELER TIME	0.0~100.0%	0.0~100.0	10.0s

When the conditions of reducing pump are satisfied, the system will cut grid-frequency pump off. The variable frequency pump should accelerate to the frequency of pump added according to the acceleration time, and then go on running with PID control. In the

process, the acceleration time of variable frequency pump determined by this code.

Function Code	Name	Description	Setting Range	Factory Setting
P8.19	CLOSE DELAY	0.1~9.9%	0.1~9.9	0.5s
P8.20	TRIP DELAY	0.1~9.9%	0.1~9.9	0.5s

It's considered that there are mechanical delay time when contactor closes or opens,even more there are remanence when vairale frequency pump switch to run at grid frequency which may make the action failure. The parameters above are used to solve these problems.

1: Before inverter enables the next available frequency pump,it will send contactor closing command, there are time difference between command has been sent and the inverter starts to output by reason of mechanical delay,that's contactor closing time.

2: The contactor opening time is time defferece from the inverter outputs coast to stop command to inverter outputs grid-frequency contactor closing command.it normally used for which the power of pump is greater than 45kW and the variable-frequency pump needs to be switched to run at grid frequency,It can minish switching current and improve the success percentage of switching.

Function Code	Name	Description	Setting Range	Factory Setting
P8.21	PID SLEEP SEL	0: Dormancy enabled 1: Running at lower limit FRQ	0~1	0
P8.22	AWOKE TOLERA	P8.10~60.0%	P8.10~60.0	10.0%
P8.23	AWOKE DELAY	0~3600s	0~3600	5s

When dormancy function is available, One-and-only-one available frequency pump is running, and the status is eligible for pump reduced condition (include the delay time of pump reduced), the available frequency pump start to sleep and stand by,the system enters dormancy state. If there is sleep lower power pump, it will start to run automatically and keep running till system exists dormancy state.

In the dormancy state, pressure feedback < setting pressure-pressure tolerance of dormancy awaked, and it lasts for the delay time (determined by P8.23), the dormancy state quits, and dormancy pump stops, variable frequency pump starts.

Notice: 100% of the P8.22 is corresponding with P3.02 (Maximum of PID).

Function Code	Name	Description	Setting Range	Factory Setting
P8.24	PFP ROU-ROB PER	0.0~6553.5	0.0~6553.5	0.0h

The parameter set the timing circulation period of grid-frequency pump.

0: Invalid.

Pumps switching logic is First-In-First-Out.

Not 0: Valid.

The setting value is circulation period.It is sugguested that the function should be selected when capacitys of each grid-frequency pump are almost the same(except sewage pump and dormancy pump).

If there are two or more grid-frequency pumps,so all pumps(except sewage pump and dormancy pump) will join the rotation,no rotation if there is only one grid-frequency pump.

Function Code	Name	Description	Setting Range	Factory Setting
P8.25	VFP ROU-ROB PER	0.0~6553.5	0.0~6553.5	0.0h

The setting is similar with P8.24; please refer it for the details.

Function Code	Name	Description	Setting Range	Factory Setting
P8.26	SW FREQ MANUAL	0~P0.07	0~P0.07	50.00Hz

When use manual soft start, the parameter sets the running frequency of inverter before switching to grid-frequency pump.

Function Code	Name	Description	Setting Range	Factory Setting
P8.27	W IEVEL SI INPUT	0~2	0~2	0

The parameter is set to whether control level of inlet pool or not.

0: No input.

1: Input by digital input termi

The level control signal is switch value.

2: Input by analog input terminal

Level signal input channel is selected by P8.28, and level limit is confirmed by P8.29~P8.31.

Level control mode:

1: When pool level changes from high to low, and the level is higher than lower limit level, system runs with normal setting pressure mode.When the level is lower than lower limit level and higher than water shortage level, system runs with abnormal spare pressure mode (determined by P8.32); when the level is lower than water shortage level, system stop running.

2. When pool level changes from low level to high level, system do not run when the level is lower than the lower limit level, when the level is higher than lower limit level and lower than the upper limit level, system run with spare pressure mode(determined by P8.32); When the level is higher than upper limit level, system returns to run with normal pressure.

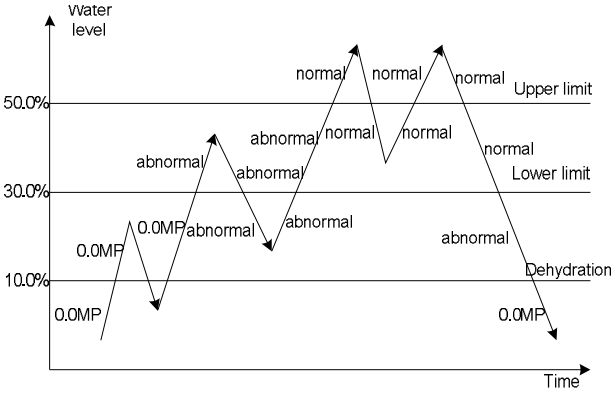


Figure 6.16 Level change and pressure given

Function Code	Name	Description	Setting Range	Factory Setting
P8.28	WL SI ANAL INPUT	0:AI1 input 1:AI2 input 2:Modbus input	0~2	0
P8.29	UP W IEVEL LTD	0.0~100.0%	0.0~100.0	60.0%
P8.30	Low W IEVEL LTD	0.0~P8.29	0.0~P8.29	40.0%
P8.31	SHORTAGE W LEVELshortage level	0.0~P8.30	0.0~P8.30	20.0%

The pressure percentage is relative to 100% of pool feedback pressure.

Function Code	Name	Description	Setting Range	Factory Setting
P8.32	BACKUP PRESSURE	0~100.0%	0~100.0	0.0%

Known by the aforementioned, when the pool level is lower than the lower limit level, spare pressure is needed so as to avoid that the level draw too fast and even that pump run without load.

100% of the P8.22 is corresponding with P3.02 (Maximum of PID).

Function Code	Name	Description	Setting Range	Factory Setting
P8.33	FAULT HANDLING		0-1	0

The function code defines the actions in event of the failure.

0: Breakdown of the entire system.

1: To next VFP. No VFP, then PFP.

Current variable frequency pump (which is) at fault is resected automaticly, and switched to next variable-frequency pump.

If there is only one variable-frequency pump, system stops running.

2: Reserved.

Notice: If the fault automatic reset function is enable, after system resets for times set, if the fault is not cleared out, the system will deal with it according to the mode set by this function code.

Function Code	Name	Description	Setting Range	Factory Setting
P8.34~ P8.39	Reserved	0~65535	0~65535	0

P9 Group--Timing Watering and Multi-given Function Group

Function Code	Name	Description	Setting Range	Factory Setting
P9.00	CURRENT MOMENT	0.00~23.59	0.00~23.59	

Set and display current time, users can modify the parameter to set the time,the meaning is as follows:

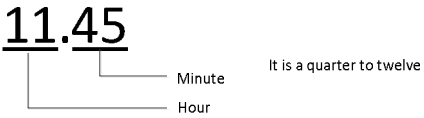


Figure 6.17 meaning of time display

The time is the base standard for setting multi-pressure time, the parameter will update as real-time.

Notice: The system will run constantly when the inveter is power-off, if the clock is stop, please check the battery of control board.

Function Code	Name	Description	Setting Range	Factory Setting
P9.01	PRESSURE STEPS	1~8	1~8	1

The parameter set the segment numbers of pressure, only T1 is the default, namely one pressure segment is effective all day.When several segments are selected, it means multi-segment pressure is effective, and the setting is repeated everyday.

The parameter is for setting the pressure segment and corresponding pressure.

1. Principle of setting time: T1≤T2≤T3≤T4≤T5≤T6≤T7≤T8

2. Segment T1 is the time from threshold T1 to threshold T2, segment T2 is the time from threshold T2 to threshold T3, and so forth, segment T8 is the time from threshold T8 to threshold T1.

3. If threshold of one segment is same as ultimate of previous segment, the segment is invalid, and they are merged as one segment.

4. If the segments are equal, only one segment is effective everyday.

Function Code	Name	Description	Setting Range	Factory Setting
P9.18	MULTI SET 0	0.0～100.0%	0.0～100.0	0.0%
P9.19	MULTI SET 1	0.0～100.0%	0.0～100.0	0.0%
P9.20	MULTI SET 2	0.0～100.0%	0.0～100.0	0.0%
P9.21	MULTI SET 3	0.0～100.0%	0.0～100.0	0.0%
P9.22	MULTI SET 4	0.0～100.0%	0.0～100.0	0.0%
P9.23	MULTI SET 5	0.0～100.0%	0.0～100.0	0.0%
P9.24	MULTI SET 6	0.0～100.0%	0.0～100.0	0.0%
P9.25	MULTI SET 7	0.0～100.0%	0.0～100.0	0.0%
P9.26	MULTI SET 8	0.0～100.0%	0.0～100.0	0.0%

Function Code	Name	Description	Setting Range	Factory Setting
P9.27	MULTI SET 9	0.0～100.0%	0.0～100.0	0.0%
P9.28	MULTI SET 10	0.0～100.0%	0.0～100.0	0.0%
P9.29	MULTI SET 11	0.0～100.0%	0.0～100.0	0.0%
P9.30	MULTI SET 12	0.0～100.0%	0.0～100.0	0.0%
P9.31	MULTI SET 13	0.0～100.0%	0.0～100.0	0.0%
P9.32	MULTI SET 14	0.0～100.0%	0.0～100.0	0.0%
P9.33	MULTI SET 15	0.0～100.0%	0.0～100.0	0.0%

100.0% of pressure given is corresponding to maximum of PID,when P3.06 is set to be 5,the pressure segment is defined by the combination of multi-segment pressure terminals,the corresponding relation between multi-segment pressure and terminals(S1、S2、S3、 S4) is as follow:

S1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
S3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
S4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
Segment	0	1	2	3	4	5	6	7
S1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
S2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
S3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
S4	ON	ON	ON	ON	ON	ON	ON	ON
Segment	8	9	10	11	12	13	14	15

Function Code	Name	Description	Setting Range	Factory Setting
P9.34~ P9.37	Reserved	0~65535	0~65535	0

PA Group--Protection Parameters

Function Code	Name	Description	Setting Range	Factory Setting
PA.00	IN PHASE FALL	0: Disabled 1: Enabled	0~1	1

Function Code	Name	Description	Setting Range	Factory Setting
PA.01	OUT PHASE FALL	0: Disabled 1: Enabled	0~1	1

Notice: Please be cautious to set these parameters as disabled. Otherwise it may cause inverter and motor overheat even damaged.

Function Code	Name	Description	Setting Range	Factory Setting
PA.02	MOTOR OVERLOAD	0: Disabled 1: Normal motor 2: Variable frequency motor	0~2	2

1: For normal motor, the lower the speed, the poorer the cooling effect. Based on this reason, if output frequency is lower than 30Hz, inverter will reduce the motor overload protection threshold to prevent normal motor from overheat.

2: As the cooling effect of variable frequency motor has nothing to do with running speed, it is not required to adjust the motor overload protection threshold.

Function Code	Name	Description	Setting Range	Factory Setting
PA.03	OVERLOAD CURR	20.0%~120.0%	20.0~120.0	100.0%

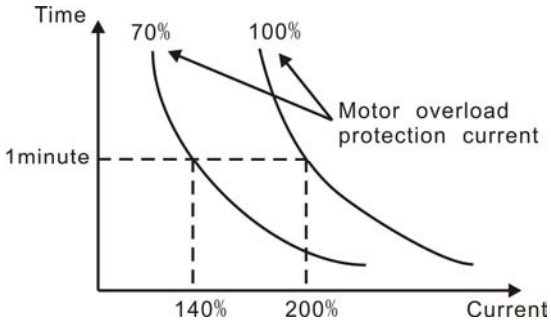


Figure 6.18 Motor overload protection curve.

The value can be determined by the following formula:

Motor overload protection current = (motor rated current / inverter rated current) * 100%.

Notice:

- **This parameter is normally used when rated power of inverter is greater than rated power of motor.**

l **Motor overload protection time: 60s with 200% of rated current. For details, please refer to above figure.**

Function Code	Name	Description	Setting Range	Factory Setting
PA.04	OL WARN CURR	20.0%~150.0%	20.0~150.0	110.0%
PA.05	OL WARN SELECT	0: Always based on I motor 1: Detect based on I motor 2: Always based on I INVE 3: Detect based on I INVE	0~3	0
PA.06	OL WARN DELAY	0.0~30.0s	0.0~30.0	5.0s

The value of PA.05 determines the pre-warning category, such as motor overload (OL1) or inverter overload (OL2).

PA.04 determines the current threshold of pre-warning actionn, it is a percentage of the rated current. When output current of inverter exceeds the value of PA.04 and last the duration determined by PA.06, inverter will output a pre-warning signal. Please refer to following diagram:

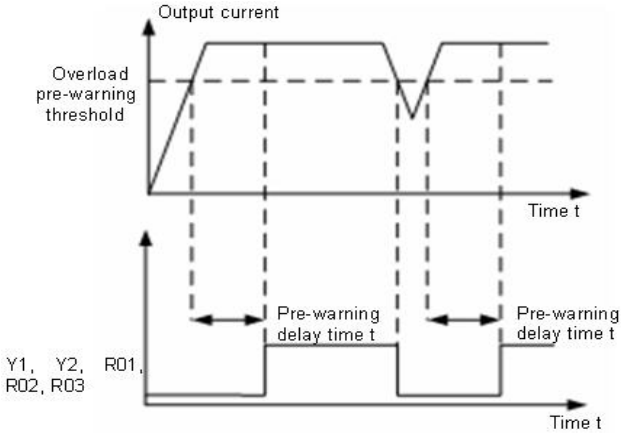


Figure 6.19 Overload pre-warning schematic diagram.

Function Code	Name	Description	Setting Range	Factory Setting
PA.07	TRIPFREE POINT	230.0V~600.0V	230.0~600.0	450.0V

Function Code	Name	Description	Setting Range	Factory Setting
PA.08	TRIPFREE DECRATE	0.00Hz~P0.07	0.00~P0.07	0.00Hz

If Pb.08 is set to be 0, the trip-free function is invalid.

Trip-free function enables the inverter to perform low-voltage compensation when DC bus voltage drops below Pb.07. The inverter can continue to run without tripping by reducing its output frequency and feedback energy via motor.

Notice: If Pb.08 is too big, the feedback energy of motor will be too large and may cause over-voltage fault. If Pb.08 is too small, the feedback energy of motor will be too small to achieve voltage compensation effect. So please set Pb.08 according to load inertia and the actual load.

Function Code	Name	Description	Setting Range	Factory Setting
PA.09	OVER VOLT STALL	0: Protection forbidden 1: Protection permitted	0～1	0
PA.10	OV PROTECT POINT	120～150%	120～150	125

During the process of deceleration, the load inertia may cause the actual that drop rate of motor speed is lower than the output frequency drop rate, and thereby the motor generates electricity and feeds it back to the inverter, causing the inverter bus voltage going up and even bus over-voltage breakdown which then can cause inverter tripping if no provision is made.

Over-voltage stall protection function is to detect the bus voltage and compare it with the stall over-voltage point defined by Pb.10 (relative to the standard bus voltage). If it exceeds the over-voltage stall point, inverter output frequency stop going down, and when the next bus voltage detected is lower than the over-voltage stall point, the inverter continues to decelerate, as shown by following figure.

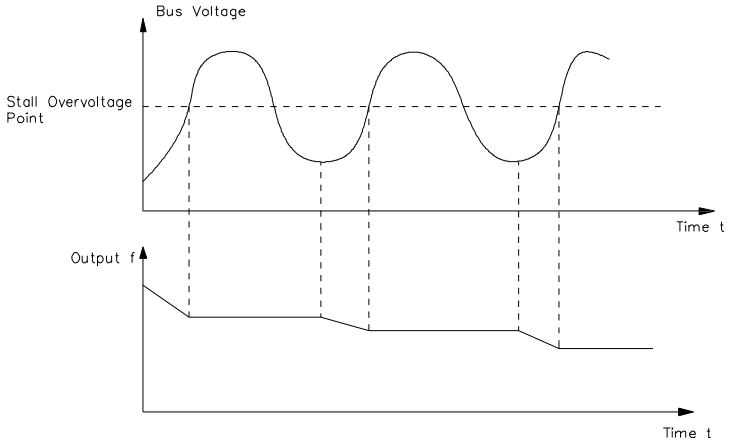


Figure 6.20 Over-voltage stall function

Function Code	Name	Description	Setting Range	Factory Setting
PA.11	OVER CURR	0: Disabled 1: Enabled	0~1	1
PA.12	OC THRESHOLD	100~200%	100~200	160%
PA.13	FREQ DEC RATE	0.00~50.00Hz/s	0.00~50.00	1.00Hz/s

During acceleration of inverter, the actual motor speed rise rate may lower than the output frequency rise rate because of too big load. If no measures to take, inverter will trip caused by over-current.

The principle of over-current protection is to detect the output current of inverter during inverter operation and compare it with over-current stall threshold determined by PA.12. If it exceeds the value of PA.12 during acceleration, inverter will remain output frequency; if it exceeds the value of PA.12 during constant speed running, inverter will decrease output frequency. When output current of inverter is lower than the value of PA.12, inverter will continue to accelerate until output frequency reach frequency reference. Please refer to following diagram.

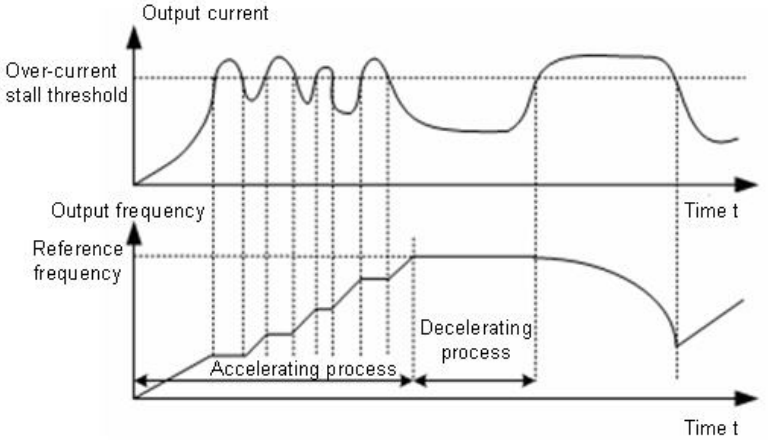


Figure 6.21 Over-current stall function.

Function Code	Name	Description	Setting Range	Factory Setting
PA.14	OVER PRESS VALUE	0.0~100.0%	0.0~100.0	90.0%
PA.15	OVER PRESS DELAY	0~3600	0~3600	500s
PA.16	UNDER PRES VALUE	0.0~100.0%	0.0~100.0	10,0%
PA.17	UNDER PRES DELAY	0~3600	0~3600	500s

The parameters are to set the pressure and judgment time of over-pressure and under pressure.

When the pressure of pipe network reaches the over- pressure threshold (determined by PA.14), and it lasts for delay time (determined by PA.15), the system output alarm signal(OP).After it, when the pressure is lower than the over- pressure threshold and it also lasts for delay time (determined by PA.15), the alarm signal can be eliminated.Under- pressure judgement is similar to over- pressure,and the alarm signal is “UP”.

Function Code	Name	Description	Setting Range	Factory Setting
PA.18~ PA.22	Reserved	0~65535	0~65535	0

Pb Group --Serial Communication

Function Code	Name	Description	Setting Range	Factory Setting
Pb.00	LOCAL ADDRESS	1～247	1～247	1

When the master is writing the frame, if the communication address of the slave is set to be 0 (that is the broadcast communication address), all slaves on the MODBUS bus will receive the frame, but the slaves will not make any response. Note that the slave address should not be set to be 0.

The local communication address is a unique address in the communication network. This is the basis for point-to-point communications between the upper computer and the inverter.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.01	BAUD RATE	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0～5	4

This parameter is used to set the data transmission rate between the upper computer and the inverter.

Notice: The baud rate setting of the upper computer should be the same as that of the inverter. Otherwise, communications cannot be implemented. The higher the baud rate, the faster the communication speed is.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.02	DATA FORMAT	0: No parity (N,8,1) for RTU 1: Even parity (E,8,1) for RTU 2: Odd parity (O,8,1) for RTU 3: No parity (N,8,2) for RTU	0～8	1

Function Code	Name	Description	Setting Range	Factory Setting
		4: Even parity (E,8,2) for RTU 5: Odd parity (O,8,2) for RTU 6: No parity (N,7,1) for ASCII 7: Even parity (E,7,1) for ASCII 8: Odd parity (O,7,1) for ASCII		

The data format setting of the upper computer should be the same as that of the inverter. Otherwise, communications cannot be implemented.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.03	COM DELAY TIME	0～200ms	0～200ms	5ms

Reply delay: refers to the interval time between the end of data receiving of the inverter and the reply data sending of the upper computer. If the reply delay time is less than the system processing time, take the system processing time as reply delay reference. If the reply delay is longer than the system processing time, after data processing, the system has to wait until the reply delay time is reached before sending data to the upper computer.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.04	COM TIMEOUT	0.0～100.0	0.0～100.0	0.0s

If the functional code is set to 0.0s, the communication delay time parameter is disabled. When the functional code is set to be a valid value, if the interval between the current communication and the next communication exceeds the communication delay time, the system will send a communication fault error (CE).

Normally, it is set to be “disabled”. If this parameter is set in a consecutive communication system, communication status can be monitored.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.05	RESPONSE ACTION	0: enabled 1: Disabled	0～1	0

Selecting whether replying or not to master command.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.06	TRANSFERS ERROR	0~3	0~3	1

0: Alarm and coast to stop

1: No alarm continue run

2: Com mode no alarm stop

3: Any mode no alarm stop

Select inverter operating status to shield CE fault and shut down or continuing running, in which way inverter can continue running when communication fault.

Function Code	Name	Description	Setting Range	Factory Setting
Pb.07~ Pb.09	Reserved	0～65535	0～65535	0

PC Group --Enhanced Function

Function Code	Name	Description	Setting Range	Factory Setting
PC.00	JOG REF	0.00~P0.06	0.00~ P0.06	5.00Hz
PC.01	JOG ACC TIME	0.0~3600.0s	0.0~3600.0	20.0s
PC.02	JOG DEC TIME	0.0~3600.0s	0.0~3600.0	20.0s

The meaning and factory setting of P8.06 and P8.07 is the same as P0.10 and P0.11. No matter what the value of P1.00 and P1.05 are, jog will start as start directly mode and stop as deceleration to stop mode.

Function Code	Name	Description	Setting Range	Factory Setting
PC.03	SKIP FREQ 1	0.00~P0.07	0.00~P0.07	0.00Hz
PC.04	SKIP FREQ 2	0.00~P0.07	0.00~P0.07	0.00Hz
PC.05	SKIP FREQ RANGE	0.00~P0.07	0.00~P0.07	0.00Hz

By means of settinzg skip frequency, the inverter can keep away from the mechanical resonance with the load. PC.03 and PC.04 are centre value of frequency to be skipped.

Notice:

- **If PC.05 is 0, the skip function is invalid.**
- **If both PC.03 and PC.04 are 0, the skip function is invalid no matter what PC.05 is.**
- **Operation is prohibited within the skip frequency bandwidth, but changes during acceleration and deceleration are smooth without skip.**
- **The relation between output frequency and reference frequency is shown in following figure.**

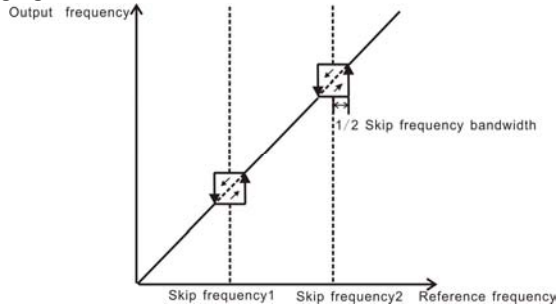


Figure 6.22 Skip frequency diagram.

Function Code	Name	Description	Setting Range	Factory Setting
PC.06	AUTO RESET TIMES	0~3	0~3	0
PC.07	FAULT ACTION	0: Disabled 1: Enabled	0~1	0
PC.08	RESET INTERVAL	0.1~100.0s	0.1~100.0	1.0s

Auto reset function can reset the fault in preset times and interval. When PC.06 is set to be 0, it means “auto reset” is disabled and the protective device will be activated in case of fault.

PC.07 defines if fault relay active or not during auto reset. If continuous production without interruption is needed, please set PC.07=0.

Notice:

- **The fault such as OUT 1, OUT 2, OUT 3, OH1 and OH2 cannot be reset automatically.**

l **If fault has not occurred for ten minutes after the fault is reset, inverter will automatically clear the previous times of auto reset.**

Function Code	Name	Description	Setting Range	Factory Setting
PC.09	RUNNING TIME	0~65535h	0~65535	65535 h

If function of output terminal is set as running time reached, when the accumulated running time reaches the preset running time, it will output an ON-OFF signal.

Function Code	Name	Description	Setting Range	Factory Setting
PC.10	FDT LEVEL	0.00~ P0.06	0.00~ P0.06	50.00Hz
PC.11	FDT LAG	0.0~100.0%	0.0~100.0	5.0%

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

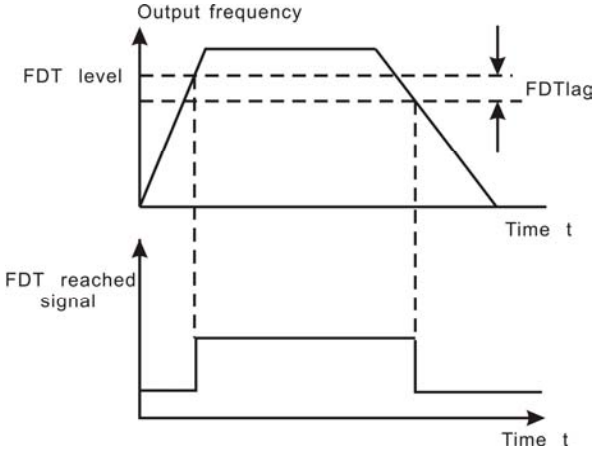


Figure 6.23 FDT Level diagram

Function Code	Name	Description	Setting Range	Factory Setting
PC.12	FAR RANGE	0.0~100.0% (maximum frequency)	0.0~100.0	0.0%

When output frequency is within the detecting range of reference frequency, an ON-OFF signal will be output.

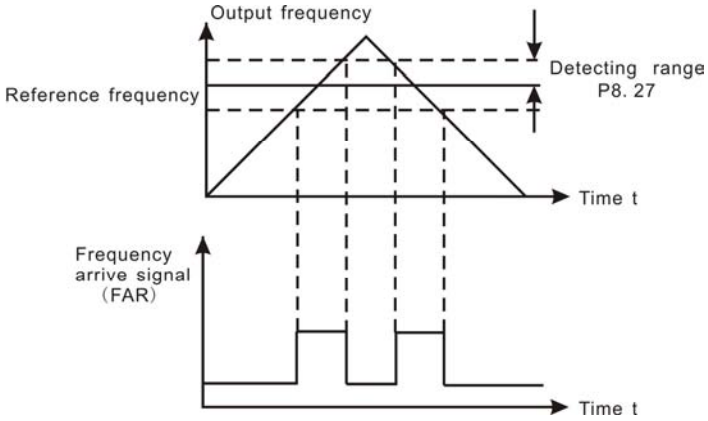


Figure 6.24 Frequency arriving detection diagram.

Function Code	Name	Description	Setting Range	Factory Setting
PC.13	BRAK VOLT	320.0~750.0V	320.0~750.0	700.0V

When the DC bus voltage is greater than the value of PC.13, the inverter will start dynamic braking.

Notice:

- Factory setting is 380V if rated voltage of inverter is 220V.
- Factory setting is 700V if rated voltage of inverter is 380V.
- The value of PC.13 is corresponding to the DC bus voltage at rated input voltage.

Function Code	Name	Description	Setting Range	Factory Setting
PC,14	LO FREQ RESTRAIN	0~10	0~10	2
PC.15	HI FREQ RESTRAIN	0~10	0~10	0

The smaller the value of P8.33 and P8.34, the stronger the restraining effect.

Notice: Most motor may have current oscillation at some frequency point. Please be cautious to adjust these parameters to weaken oscillation.

Function Code	Name	Description	Setting Range	Factory Setting
PC.16~ PC.17	Reserved	0~65535	0~65535	0

Pd Group--PID Enhanced Function

Function Code	Name	Description	Setting Range	Factory Setting
Pd.00	PID SWITCH SEL	0~4	0~4	0

0: Switch disenabled, PID of P3 is the default, and PID of PD is invalid.

1: Switch by terminal, when multi-function terminal for PID switching is valid, PID1 defined by PID is invalid; PID0 defined by P3 is invalid.

2: Switch by AI1

3: Switch by AI2

4: Switch by Modbus

PID comparison switch:

When the comparison value is greater than threshold value of PD.01 and it lasts for the time (determined by PD.02), PID parameter is switched from PID0 to PID1.

When the comparison value is lower than threshold value of PD.01 and it lasts for the time (determined by PD.03).PID parameter is switched from PID1 to PID0.

Function Code	Name	Description	Setting Range	Factory Setting
Pd.01	PID SWITCH POINT	0.0~100.0%	0.0~100.0	50.0%

The parameter set the comparison threshold value of PID switch.

Function Code	Name	Description	Setting Range	Factory Setting
Pd.02	PID-0 TO PID-1 T	0.00~100.00	0.00~100.00	0.50s

When the conditions are meet,switch PID0 to PID1 after the delay time.

Function Code	Name	Description	Setting Range	Factory Setting
Pd.03	PID-1 TO PID-0 T	0.00~100.00	0.00~100.00	0.50s

When PID1 is valid and the conditions are satisfied, switch PID1 to PID0 after the delay time.

Function Code	Name	Description	Setting Range	Factory Setting
Pd.04	PROPORTION GAIN1	0.00~100.00	0.00~100.00	0.10s

Function Code	Name	Description	Setting Range	Factory Setting
Pd.05	INTEGRAL TIME 1	0.01~10.00s	0.01~10.00	0.10s
Pd.06	DIFFERENTI TIME1	0.00~10.00	0.00~10.00	0.00s
Pd.07	SAMPLING CYCLE 1	0.00~10.00s	0.00~10.00	0.00s
Pd.08	BIAS LIMIT 1	0.0~100.0%	0.0~100.0	0.0%
Pd.09	OUTPUT FILTER 1	0.0~3600.0s	0.0~3600.0	1.0s

When PID1 is valid, the parameters are valid, please refer P3 for the details.

Function Code	Name	Description	Setting Range	Factory Setting
Pd.10~ Pd.29	Reserved	0~65535	0~65535	0

PE Group—Factory Setting

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

7. TROUBLE SHOOTINGT

7.1 Fault and trouble shooting

Fault Code	Fault Type	Reason	Solution
OUT1	IGBT Ph-U fault	1. Acc/Dec time is too short. 2. IGBT module fault. 3. Malfunction caused by interference. 4. Grounding is not properly.	1. Increase Acc/Dec time. 2. Ask for support. 3. Inspect external equipment and eliminate interference.
OUT2	IGBT Ph-V fault		
OUT3	IGBT Ph-W fault		
OC1	Over-current when acceleration	Acceleration time is too short.	Increase acceleration time.
		The voltage of power network is lower.	Check the input power.
		The power of inverter is lower.	Select bigger capacity inverter.
OC2	Over-current when deceleration	Deceleration time is too short.	Deceleration time is too short.
		The inertial torque of load is too heavy.	Added suitable energy braking component is in need.
		The power of inverter is lower.	Select bigger capacity inverter.
OC3	Over-current when constant speed running	The mutation and the abnormal of load.	Check the load.
		The voltage of power network is lower.	Check the input power.
		The power of inverter is lower.	Select bigger capacity inverter.
OV1	Over-voltage when acceleration	Abnormal input voltage.	Check the input power
		Restart the rotary motor when power fail suddenly	Avoid restarting the motor.
OV2	Over-voltage	Deceleration time is too	Deceleration time is too

Fault Code	Fault Type	Reason	Solution
	when deceleration	short.	short.
		The inertia of load is too heavy.	Increase the energy braking component
		Abnormal input voltage.	Check the input power.
OV3	Over-voltage when constant speed running	Abnormal change happened in input voltage.	Install input reactor.
		The inertia of load is too heavy.	Added suitable energy braking component is in need.
UV	Bus Undervoltage	The voltage of power network is lower.	Check the input power.
OL1	Motor overload	The voltage of power network is lower.	Check it.
		The rated current of motor isn't correct.	Reset the rated current of motor.
		The mutation of locked rotor or load of motor is too large.	Check the load,and adjust the lifting capacity of torque.
		Motor drive heavy load at low speed for a long time.	Select variable frequency motor.
OL2	Inverter overload	Acceleration time is too short.	Increase acceleration time.
		Restart the rotary motor	Avoid restarting the rotary motor when power fail.
		The voltage of power network is lower.	Check it.
		Load is too heavy	Select bigger capacity inverter.
		The direction of code disc is reverse and running with a low speed for a long time with closed loop vector control.	Adjust the direction of code disc signal.

Fault Code	Fault Type	Reason	Solution
SPI	Input phase failure	Input phases(R,S,T) are failure	Check the input power Check the wiring,and installation,
SPO	Output phase failure	Output phases (U, V, W) are failure.	Check the output wiring.
		Pre-excitation can not be over during pre-excitation if the inverter is disconnected to the motor.	Check the motor and cable.
OH1	Rectifier module overheat	Transient overcurrent	Refer the solution of overcurrent.
		Three output phases has interphase or grounding short-circuit.	Re-wiring.
		The duct is blocked or the fan is damaged.	Dredge the duct or replace the fan
		Ambient temperature is too high.	Install cooling unit.
		The wiring or the plug-in of control board is loose.	Check and wiring again.
		The auxiliary power is damaged,and the drive voltage is undervoltage.	Ask for help.
		The bridge arm of power module is direct.	Ask for help.
		The control board is abnormal.	Ask for help.
OH2	IGBT overheat	The control board is abnormal.	Ask for help.
EF	External fault	Si External fault input terminal take effect.	Inspect external equipment.
CE	Communication fault	Improper baud rate setting.	Set proper baud rate.
		Receive wrong data	Press STOP/RST to

Fault Code	Fault Type	Reason	Solution
			reset, ask for support.
		Communication is interrupted for long time.	Check communication interface wiring.
ITE	Current detection fault	connectors of control board are loose	Check the connectors and re-wiring.
		The auxiliary power is damaged	Ask for support.
		Hall sensor is damaged.	Ask for support.
		Amplifying circuit is abnormal.	Ask for support.
		Autotuning overtime.	Check the wiring and the parameter setting.
OPSE	System fault	Control panel is abnormal for strong interference	Press STOP/RST to reset,ask or add filter on the input side of power.
		Fault of control panel for noise	Press STOP/RST to reset,ask for support.
EEP	EEPROM fault	Read/Write fault of control parameters.	Ask for support
		EEPROM is damaged.	Ask for support
PIDE	PID feedback fault	Wiring is disconnected	Check the feedback wiring
		Feedback source disappear.	Check the feedback source.
BCE	Brake unit fault	Braking circuit failure or brake tube damaged.	Inspect braking unit, replace braking tube.
		Too low resistance of external connected braking resistor.	Increase braking resistance.
-END-	Trial time reached	Trial time which determined by factory reached.	Contact supplier and ask for support.
LCD-E	LCD is	LCD is disconnected,the	Press STOP/RST to

Fault Code	Fault Type	Reason	Solution
	disconnected	upload and download of parameter is carried out.	reset, connect LCD then download or upload parameter.
TI-E	Clock chip fault	Clock chip is damaged.	Ask for support.
	Reserved		

7.2 Common Faults and Solutions

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

No display after power on:

- Inspect whether the voltage of power supply is the same as the inverter rated voltage or not with multi-meter. If the power supply has problem, inspect and solve it.
- Inspect whether the three-phase rectify bridge is in good condition or not. If the rectification bridge is burst out, ask for support.
- Check the CHARGE light. If the light is off, the fault is mainly in the rectify bridge or the buffer resistor. If the light is on, the fault may be lies in the switching power supply. Please ask for support.

Power supply air switch trips off when power on:

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

Motor doesn't move after inverter running:

- Inspect if there is balanced three-phase output among U, V, W. If yes, then motor could be damaged, or mechanically locked. Please solve it.
- If the output is unbalanced or lost, the inverter drive board or the output module may be damaged, ask for support..

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

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

8. MAINTENANCE

WARNING

- **Maintenance must be performed according to designated maintenance methods.**
- **Maintenance, inspection and replacement of parts must be performed only by authorized personnel.**
- **After turning off the main circuit power supply, waiting for 10 minutes before performance maintenance or inspection.**
- **DO NOT directly touch components or devices of PCB board. Otherwise inverter can be damaged by electrostatic.**
- **After maintenance, all screws must be tightened.**

8.1 Daily Maintenance

In order to prevent the fault of inverter to make it operate smoothly in high-performance for a long time, user must inspect the inverter periodically (within half year). The following table indicates the inspection content.

Items to be hecked	Main inspections		Criteria
	Inspection content	Frequency	Means/methods
Operation environment	(1) temperature, humidity (2)dust, vapor, leakage (3)gases	(1)point thermometer, hygrometer (2)observation (3)visual examination and smelling	(1)ambient temperature shall be lower than 40℃, otherwise, the rated values should be decreased. Humidity shall meet the requirement (2)no dust accumulation, no traces of water leakage and no condensate. (3)no abnormal color

Items to be hecked	Main inspections		Criteria
	Inspection content	Frequency	Means/methods
			and smell.
Inverter	⑴vibration ⑵cooling and heating ⑶noise	⑴point thermometer comprehensive observation ⑵listening	⑴smooth operation without vibration. ⑵fan is working in good condition. Speed and air flow are normal. No abnormal heat. ⑶No abnormal noise
Motor	⑴vibration ⑵heat ⑶noise	⑴comprehensive observation Listening ⑵point thermometer ⑶listening	⑴No abnormal vibration and no abnormal noise. ⑵No abnormal heat. ⑶No abnormal noise.
Operation status parameters	⑴power input voltage ⑵inverter output voltage ⑶inverter output current ⑷internal temperature	⑴voltmeter ⑵rectifying voltmeter ⑶ammeter ⑷point thermometer	⑴satisfying the specification ⑵satisfying the specification ⑶satisfying the specification ⑷temperature rise is lower than 40℃

8.2 Periodic Maintenance

Customer should check the drive every 3 months or 6 months according to the actual environment

1. Check whether the screws of control terminals are loose. If so, tighten them with a screwdriver;

2. Check whether the main circuit terminals are properly connected; whether the mains cables are over heated;

3. Check whether the power cables and control cables are damaged, check especially for any wear on the cable tube;
4. Check whether the insulating tapes around the cable lugs are stripped;
5. Clean the dust on PCBs and air ducts with a vacuum cleaner;
6. For drives that have been stored for a long time, it must be powered on every 2 years. When supplying AC power to the drive, use a voltage regulator to raise the input voltage to rated input voltage gradually. The drive should be powered for 5 hours without load.
7. Before performing insulation tests, all main circuit input/output terminals should be short-circuited with conductors. Then proceed insulation test to the ground. Insulation test of single main circuit terminal to ground is forbidden; otherwise the drive might be damaged. Please use a 500V Mega-Ohm-Meter.
8. Before the insulation test of the motor, disconnect the motor from the drive to avoid damaging it.

8.3 Replacement of wearing parts

Fans and electrolytic capacitors are wearing part, please make periodic replacement to ensure long term, safety and failure-free operation. The replacement periods are as follows:

◆Fan: Must be replaced when using up to 20,000 hours;
◆Electrolytic Capacitor: Must be replaced when using up to 30,000~40, 000 hour.

9. COMMUNICATION PROTOCOL

9.1 Interfaces

RS485: asynchronous, half-duplex.

Default: 8-E-1, 19200bps. See Group PC parameter settings.

9.2 Communication Modes

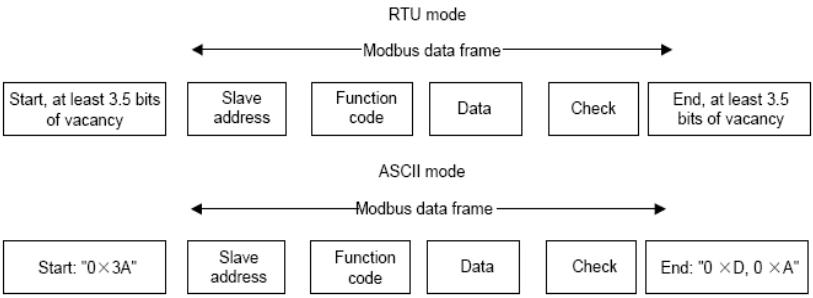
(1) The protocol is Modbus protocol. Besides the common register Read/Write operation, it is supplemented with commands of parameters management.

(2) The drive is a slave in the network. It communicates in 'point to point' master-slave mode. It will not respond to the command sent by the master via broadcast address.

(3) In the case of multi-drive communication or long-distance transmission, connecting a 100~120Ω resistor in parallel with the master signal line will help to enhance the immunity to interference.

9.3 Protocol Format

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



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

RTU mode

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

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

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

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

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

ASCII mode

In ASCII mode, the frame head is “0x3A”, and default frame tail is “0x0D” or “0x0A”. The frame tail can also be configured by users. Except frame head and tail, other bytes will be sent as two ASCII characters, first sending higher nibble and then lower nibble. The data have 7/8 bits. “A”~“F” corresponds to the ASCII code of respective capital letter. LRC check is used. LRC is calculated by adding all the successive bytes of the message except the head and tail, discarding any carriers, and then two’s complementing the result.

Example of Modbus data frame in ASCII mode:

The command frame of writing 0x0003 into address “0x1000” of slave node address 1 is shown in the table below:

LRC checksum = the complement of (01+06+10+00+0x00+0x03) = 0xE5

	Frame head	Node addr.		Command		Data addr.			
Code		0	1	0	6	1	0	0	0
ASCII	3A	30	31	30	36	31	30	30	30
Data to write				LRC		Frame tail			
0	0	0	3	E	5	CR		LF	
30	30	30	33	45	35	0D		0A	

9.4 Protocol function

Different respond delay can be set through drive’s parameters to adapt to different needs. For RTU mode, the respond delay should be no less than 3.5 bytes interval, and for ASCII mode, no less than 1ms.

The main function of Modbus is to read and write parameters. The Modbus protocol supports the following commands:

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

All drive’s function parameters, control and status parameters are mapped to Modbus

R/W data address.

The data address of control and status parameters please refer to the following table.

Parameter Description	Address	Meaning of value	R/W Feature
Control command	1000H	0001H: Forward	W/R
		0002H: Reverse	
		0003H: JOG forward	
		0004H: JOG reverse	
		0005H: Stop	
		0006H: Coast to stop	
		0007H: Reset fault	
Inverter status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Standby	
		0004H: Fault	
Communication setting	2000H	Communication Setting Range (-10000~10000) Note: the communication setting is the percentage of the relative value (-100.00%~100.00%). If it is set as frequency source, the value is the percentage of the maximum frequency (P0.06). If it is set as PID (preset value or feedback value), the value is the percentage of the PID.	W/R
Virtual terminal input function setting	2001H	Setting range: 00H~0FFH. Each bit corresponds to S1~S8,	W/R
Status parameters	3000H	Output speed	R
	3001H	Reference speed	R
	3002H	DC Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Rotation speed	R
	3006H	Reserved	R

Parameter Description	Address	Meaning of value	R/W Feature
	3007H	Reserved	R
	3008H	PID given value	R
	3009H	PID feedback value	R
	300AH	Input terminal status	R
	300BH	Output terminal status.	R
	300CH	Input of AI1	R
	300DH	Input of AI2	R
	300EH	Reserved	R
	300FH ~ 3014H	Reserved	R
	3015H	Torque direction (0: forward, 1: reverse)	R
	3016H	Device code	R
Parameter lock password check address	4000H	****	R
Parameter lock password command address	4001H	55AAH	R
Fault info address	5000H	This address stores the fault type of inverter. The meaning of each value is same as P7.15.	R

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

Protocol data unit format of reading parameters:

Request format:

Protocol data unit	Data length(bytes)	Range
Command	1	0x03

Data Address	2	0~0xFFFF
Read number	2	0x0001~0x0010

Reply format (success):

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

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

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

For details, please refer to the following table:

High byte	Meaning	Low byte	Meaning
00	CHV	01	Universal type
		02	For water supply
		03	Middle frequency 1500HZ
		04	Middle frequency 3000HZ
01	CHE	01	Universal type
		02	Middle frequency 1500HZ
02	CHF	01	Universal type

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

Value	Name	Mean
01H	Illegal command	The command from master can not be executed. The reason maybe: 1. This command is only for new version and this version can not realize. 2. Slave is in fault status and can not execute it.
02H	Illegal data address.	Some of the operation addresses are invalid or not allowed to access.
03H	Illegal value	When there are invalid data in the message framed

Value	Name	Mean
		received by slave. Note: This error code does not indicate the data value to write exceed the range, but indicate the message frame is a illegal frame.
06H	Slave busy	Inverter is busy(EEPROM is storing)
10H	Password error	The password written to the password check address is not same as the password set by P7.00.
11H	Check error	The CRC (RTU mode) or LRC (ASCII mode) check not passed.
12H	Written not allowed.	It only happen in write command, the reason maybe: 1. the data to write exceed the range of according parameter 2. The parameter should not be modified now. 3. The terminal has already been used.
13H	System locked	When password protection take effect and user does not unlock it, write/read the function parameter will return this error.

Protocol data unit format of writing single parameter:

Request format:

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

Reply format (success):

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

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

9.5 Note

- **u** Between frames, the span should not less than 3.5 bytes interval, otherwise, the message will be discarded.
- **u** Be cautious to modify the parameters of PC group through communication, otherwise may cause the communication interrupted.
- **u** In the same frame, if the span between two .near bytes more than 1.5 bytes interval, the behind bytes will be assumed as the start of next message so that communication will failure.

9.6 CRC Check

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

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

9.7 Example

9.7.1 RTU mode, read 2 data from 0004H

The request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	01H
Command	03H

High byte of start address	00H
Low byte of start address	04H
High byte of data number	00H
Low byte of data number	02H
Low byte of CRC	85H
High byte of CRC	CAH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The reply is :

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	01H
Command	03H
Returned byte number	04H
Higher byte of 0004H	00H
Low byte of 0004H	00H
High byte of 0005H	00H
Low byte of 0005H	00H
Low byte of CRC	43H
High byte of CRC	07H
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

9.7.2 ASCII mode, read 2 data from 0004H:

The request command is:

START	':'
Node address	'0'
	'1'
Command	'0'
	'3'
High byte of start address	'0'
	'0'
Low byte of start address	'0'
	'4'
High byte of data number	'0'
	'0'
Low byte of data number	'0'
	'2'

LRC CHK Hi	‘F’
LRC CHK Lo	‘6’
END Lo	CR
END Hi	LF

The reply is

START	‘:’
Node address	‘0’
	‘1’
Command	‘0’
	‘3’
Returned byte number	‘0’
	‘4’
Higher byte of 0004H	‘0’
	‘0’
Low byte of 0004H	‘0’
	‘2’
High byte of 0005H	‘0’
	‘0’
Low byte of 0005H	‘0’
	‘0’
LRC CHK Lo	‘F’
LRC CHK Hi	‘6’
END Lo	CR
END Hi	LF

9.7.3 RTU mode, write 5000(1388H) into address 0008H, slave node address 02.

The request command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	02H
Command	06H
High byte of data address	00H
Low byte of data address	08H
High byte of write content	13H
Low byte of write content	88H
Low byte of CRC	05H

High byte of CRC	6DH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

The reply command is:

START	T1-T2-T3-T4 (transmission time of 3.5 bytes)
Node address	02H
Command	06H
High byte of data address	00H
Low byte of data address	08H
High byte of write content	13H
Low byte of write content	88H
Low byte of CRC	05H
High byte of CRC	6DH
END	T1-T2-T3-T4 (transmission time of 3.5 bytes)

9.7.4 ASCII mode, write 5000(1388H) into address 0008H, slave node address 02.

The request command is:

START	':'
Node address	'0'
	'2'
Command	'0'
	'6'
High byte of data address	'0'
	'0'
Low byte of data address	'0'
	'8'
High byte of write content	'1'
	'3'
Low byte of write content	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'5'

END Lo	CR
END Hi	LF

The reply command is:

START	':'
Node address	'0'
	'2'
Command	'0'
	'6'
High byte of data address	'0'
	'0'
Low byte of data address	'0'
	'8'
High byte of write content	'1'
	'3'
Low byte of write content	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'5'
END Hi	CR
END Lo	LF

9.7.5 Command code 08H(0000 1000) for diagnosis

Sub-function Code	Description
0000	Return to inquire information data

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

The RTU request command is:

START	T1-T2-T3-T4
Node address	01H
Command	08H
High byte of sub-function code	00H
Low byte of sub-function code	00H
High byte of data content	12H
Low byte of data content	ABH
Low byte of CRC	ADH

High byte of CRC	14H
END	T1-T2-T3-T4

The RTU reply command is:

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

The ASCII request command is:

START	':'
Node address	'0'
	'1'
Command	'0'
	'8'
High byte of sub-function code	'0'
	'0'
Low byte of sub-function code	'0'
	'0'
High byte of data content	'1'
	'2'
Low byte of data content	'A'
	'B'
LRC CHK Hi	'3'
LRC CHK Lo	'A'
END Hi	CR
END Lo	LF

The ASCII reply command is:

START	':'
Node address	'0'

	‘1’
Command	‘0’
	‘8’
High byte of sub-function code	‘0’
	‘0’
Low byte of sub-function code	‘0’
	‘0’
High byte of data content	‘1’
	‘2’
Low byte of data content	‘A’
	‘B’
LRC CHK Hi	‘3’
LRC CHK Lo	‘A’
END Hi	CR
END Lo	LF

10. DESCRIPTION OF WATERING EXTENSION CARD

10.1 Description of Model

The model of watering card is CHV00GS.When the watering card is assembled into inverter,night pumps with industrial frequency can be connected when 4 pumps with variable frequency can be connected.It is convenient to control more pumps better.

10.2 External Dimension

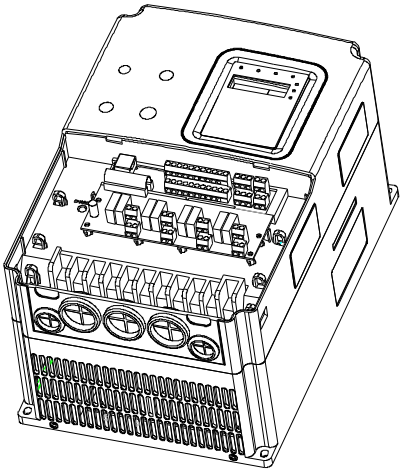


Figure 10.1 Dimensions

10.3 Installation

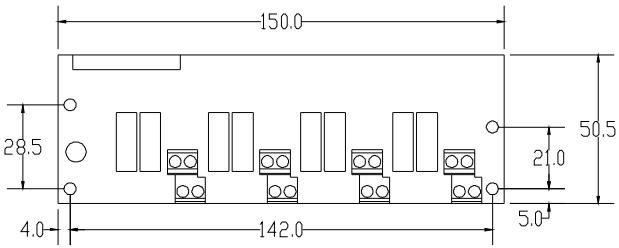


Figure 10.2 Installation figure

APPENDIX A RELATIVE DIMENSION OF INVERTER

A.1 External Dimension

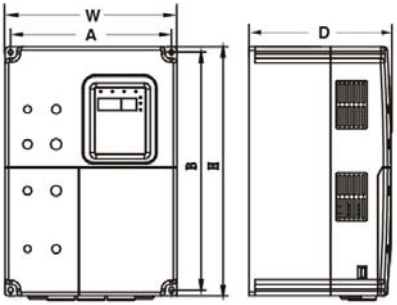


Figure A.1 Dimensions(Less than 18.5kW)

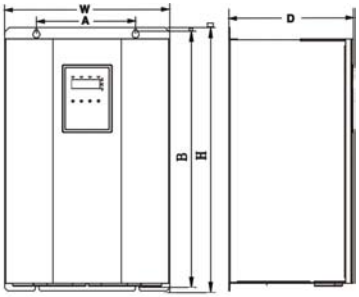


Figure A.2 Dimensions (22kW～132kW)

Power (kW)	Size	A(mm)	B(mm)	H(mm)	W(mm)	D(mm)	Installation Hole(mm)
		Installation Dimension		External Dimension			
5.5~7.5	C	147.5	237.5	250	160	175	5
11～18.5	D	206	305.5	320	220	180	6
22～37	E	176	454.5	467	290	215	6.5
45～75	F	230.0	564.5	577.0	375.0	270.0	7.0
90～132	G	320.0	738.5	755.0	460.0	330.0	9.0

A.2 Installation Space

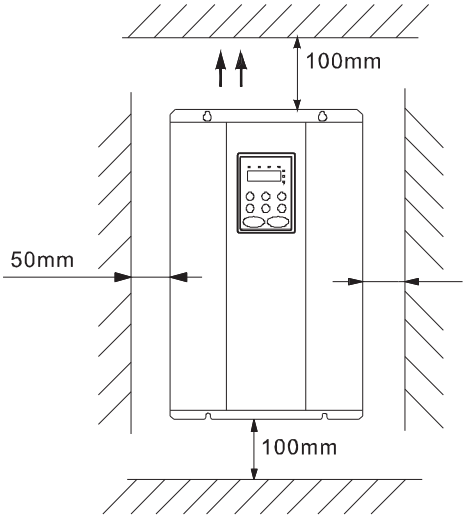


Figure A.3 Safety space

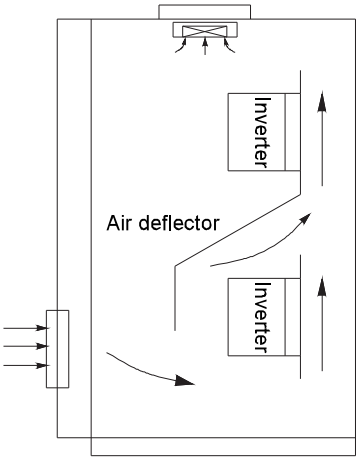


Figure A.4 Installation of multiple inverters.

Notice: Add the air deflector when apply the up-down installation.

A.3 Dimensions of External Keypad

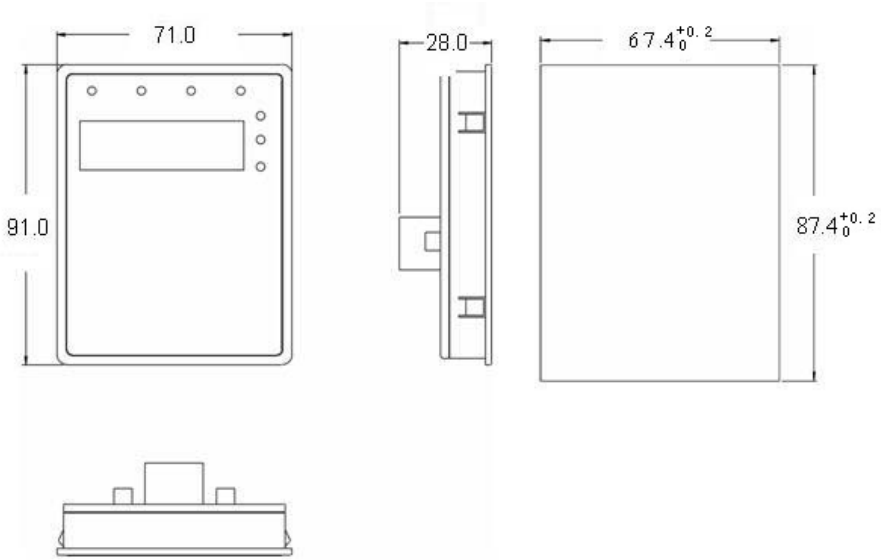


Figure A.5 Dimension of small keypad.

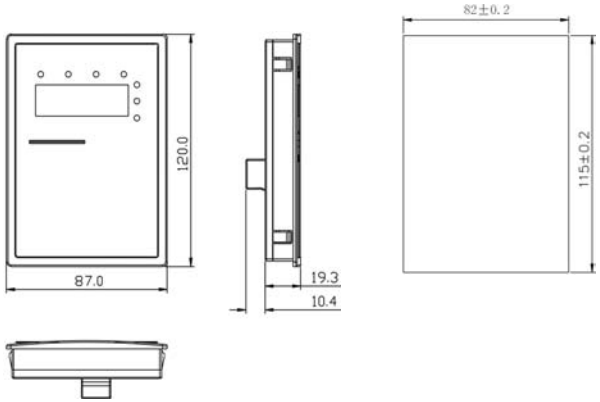


Figure A.6 Dimension of big keypad.

A.4 Disassembly

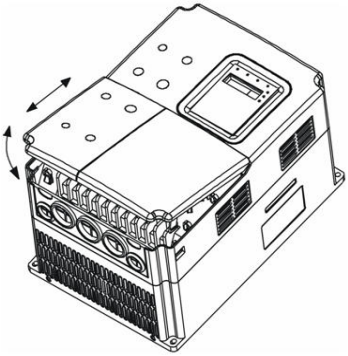


Figure A.7 Disassembly of plastic cover.

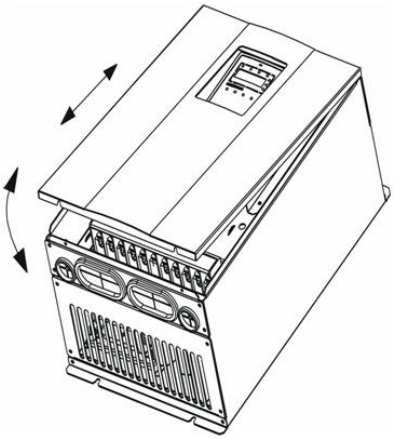


Figure A.8 Disassembly of metal plate cover.

APPENDIX B SPECIFICATIONS OF ACCESSORIES

B.1 Specifications of Breaker, Cable, Contactor and Reactor

B.1.1 Specifications of breaker, cable and contactor

Model No.	Circuit breaker (A)	Input/output cable (mm^2)(Coppery wire)	Rated current of contactor (A)(380V or 220V)
CHV160A-5R5-4	25	4	16
CHV160A-7R5-4	25	4	16
CHV160A-011-4	40	6	25
CHV160A-015-4	63	6	32
CHV160A-018-4	63	6	50
CHV160A-022-4	100	10	63
CHV160A-030-4	100	16	80
CHV160A-037-4	125	25	95
CHV160A-045-4	160	25	120
CHV160A-055-4	200	35	135
CHV160A-075-4	200	35	170
CHV160A-090-4	250	70	230
CHV160A-110-4	315	70	280
CHV160A-132-4	400	95	315

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

Model No.	AC Input reactor		AC Output reactor		DC reactor	
	Current (A)	Inductance (mH)	Current (A)	Inductance (mH)	Current (A)	Inductance (mH)
CHV160A-5R5-4	10	1.5	10	0.6	12	6.3
CHV160A-7R5-4	15	1.0	15	0.25	23	3.6
CHV160A-011-4	20	0.75	20	0.13	23	3.6
CHV160A-015-4	30	0.60	30	0.087	33	2
CHV160A-018-4	40	0.42	40	0.066	33	2
CHV160A-022-4	50	0.35	50	0.052	40	1.3
CHV160A-030-4	60	0.28	60	0.045	50	1.08
CHV160A-037-4	80	0.19	80	0.032	65	0.80
CHV160A-045-4	90	0.16	90	0.030	78	0.70
CHV160A-055-4	120	0.13	120	0.023	95	0.54

Model No.	AC Input reactor		AC Output reactor		DC reactor	
	Current (A)	Inductance (mH)	Current (A)	Inductance (mH)	Current (A)	Inductance (mH)
CHV160A-075-4	150	0.10	150	0.019	115	0.45
CHV160A-090-4	200	0.12	200	0.014	160	0.36
CHV160A-110-4	250	0.06	250	0.011	180	0.33
CHV160A-132-4	250	0.06	250	0.011	250	0.26

APPENDIX C FUNCTION PARAMETERS

CHV series inverter function parameters, which are grouped by functions, have P0-PF total 16 groups among which the PF is the expanded function parameters that user can visit if the inverter has been installed with extension card. Each function group includes a number of function codes, which adopts three-stage menu, for instance, "P8.08"means the 8th function code of P8th function.

For the convenience of setting function code by using operation panel, the function group number is corresponding to Stage 1 menu, the function code is corresponding to Stage 2 menu and the function code parameter is corresponding to Stage 3 menu.

1. The column of function table is described as follows:

The 1st column "Function Code" is the function parameter group and parameter code.

The 2nd column "Name" is the complete name of the function parameter.

The 4th column "Setting Range" is the effective setting value range of the function parameter, shown on the operation panel LCD (liquid crystal display).

The 5th "Default" is the original factory setting value of this function parameter.

The 6th "Modify" is the modification performance of the function parameter (i.e. whether or not it is permitted to modify and the modification conditions), explained as follows,

"○": indicates that the setting value of this parameter can be modified when the inverter is either in stop or operating status;

"◎": means that the setting value of this parameter cannot be modified when the inverter is in operating status;

(Inverter has done the automatic detection restriction to the modification performance of each parameter, helping user to prevent mis-modification.)

The 7th column "LCD Display" is the brief description of function parameter name on the operation panel LCD (liquid crystal display);

2. "Parameter Digital System" is the decimal system. If parameters are expressed in hexadecimal system, the value at each digit is independent when the parameter is edited, and the numeric area of some digits can be hexadecimal (0-F).

3. "LCD Display Description" is only valid when using external LCD operation panel.

4. "Default" indicates the value of the function code after it is refreshed while doing the manipulation of restoring the factory parameters; but the actually detected parameters or record values cannot be refreshed.

5. In order to effectively protect the parameters, the inverter provides the cryptoguard for the function code. After the user's password is set up (i.e. user's password P7.00 parameter is not 0), when the user press PRG/ESC button to enter function code edit status, the system first enters the user's password verification status, displaying "-----", and the operator must input correctly the user's password, otherwise it is impossible to enter. For the parameters that are factory set up, can enter only if a correct factory password is input as required. (Here remind user DO NOT try to modify the factory parameters, and if the parameters are not set up properly, it can cause inverter malfunction or even damage.) At the state that the cryptoguard is not locked, the user's password can be modified at any time, and the one finally input will be the user's password. If P7.00 is set as 0, the user's password can be cancelled; when the power is on, if P7.00 is not 0, parameters are protected by password. When serial communication is used to modify the function parameters, the function of user's password also fellows above rule.

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P0 Group--Basic function						
P0.00	RUN COMMAND	0:Keypad (LED–"LOCAL/REMOT",extinguished) 1:Terminal (LED–"LOCAL/REMOT", flickering) 2:Communication(LED–"LOCAL/REMOT",lights on)	0~2	0	◎	Run command
P0.01	UP/DOWN SETTING	0: Valid&Save 1: Valid&Not save 2: Invalid 3: Run valid&Stop reset	0~2	0	◎	UP/DOWN setting

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P0.02	FREQ SOURCE A	0: Keyboard 1: AI1 2. AI2 3. Communication 4: Multi-Step	0~4	0	◎	FREQ SOURCE A
P0.03	FREQ SOURCE B	0:AI1 1:AI2 2:PID	0~2	0	◎	FREQ SOURCE B
P0.04	FREQ B SCALE	0: Maximum frequency 1: Frequency A command	0~1	0	○	FREQ B SCALE
P0.05	FREQ SELECTION	0: A 1: B 2: A+B 3: Max(A, B)	0~3	0	○	FREQ SELECTION
P0.06	MAX FREQ	10~400.00Hz	10.0~400.00	50.00Hz	◎	Max FREQ
P0.07	UP FREQ LIMIT	P0.08~P0.06	P0.08~P0.06	50.00Hz	○	UP FREQ LIMIT
P0.08	LOW FREQ LIMIT	0.00Hz~ P0.08	0.00~P0.08	0.00Hz	○	LOW FREQ LIMIT
P0.09	KEYPAD REF FREQ	0.00 Hz ~ P0.08	0.00~P0.08	50.00Hz	○	KEYPAD REF FREQ
P0.10	ACC TIME	0.0~3600.0s	0.0~3600.0	20.0s	○	ACC TIME
P0.11	DEC TIME	0.0~3600.0s	0.0~3600.0	20.0s	○	DEC TIME
P0.12	RUN DIRECTION	0: Default 1: Reverse 2: Forbid reverse	0~2	0	◎	RUN DIRECTION
P0.13	CARRIER FREQ	1~16.0kHz	1~16.0	Depend on model	○	CARRIER FREQ
P0.14	RESTORE PARA	0: No action 1: Restore factory	0~2	0	◎	RESTORE PARA

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		setting 2: Clear fault records				
P0.15	Reserved	0～65535	0～65535	0	◎	Reserved
P0.16	Reserved	0～65535	0～65535	0	◎	Reserved
P0.17	Reserved	0～65535	0～65535	0	◎	Reserved
P0.18	Reserved	0～65535	0～65535	0	◎	Reserved
P0.19	Reserved	0～65535	0～65535	0	◎	Reserved
P1 Group--Start and Stop Control						
P1.00	START MODE	0: Start directly 1: DC break and start 2: Speed tracking and start	0~2	0	◎	START MODE
P1.01	START FREQ	0.00~10.0Hz	0.00~10.00	1.5Hz	◎	START FREQ
P1.02	HOLD TIME	0.0~50.0s	0.0~50.0	0.0s	◎	HOLD TIME
P1.03	START BRAK CURR	0.0~150.0%	0.0~150.0	0.0%	◎	START BRAK CURR
P1.04	START BRAK TIME	0.0~50.0s	0.0~50.0	0.0s	◎	START BRAK TIME
P1.05	STOP MODE	0: Deceleration to stop 1: Coast to stop	0~1	0	○	STOP MODE
P1.06	STOP BRAK FREQ	0.00~P0.07	0.00~10.00	0.00Hz	○	STOP BRAK FREQ
P1.07	STOP BRAK DELAY	0.0~50.0s	0.0~50.0	0.0s	○	STOP BRAK DELAY
P1.08	STOP BRAK CURR	0.0~150.0%	0.0~150.0	0.0%	○	STOP BRAK CURR
P1.09	STOP BRAK TIME	0.0~50.0s	0.0~50.0	0.0s	○	STOP BRAK TIME

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P1.10	FWD/REV DEADTIME	0.0~3600.0s	0.0~3600.0	0.0s	○	FWD/REV DEADTIME
P1.11	UNDER LIMIT ACT	0~1	0~1	0	◎	UNDER LIMIT ACT
P1.12	LIMIT RUN TIME	0～3600s	0～3600	5	○	LIMIT RUN TIME
P1.13	AWOKE DELAY	0～3600s	0～3600	5	○	AWOKE DELAY
P1.14	RESTART	0: Restart disabled 1: Restart enabled	0~1	0	○	RESTART
P1.15	RESTR DELAY TIME	0.0~3600.0s	0.0~3600.0	0.0s	○	RESTR DELAY TIME
P1.16	FWD/REV ENABLE	0: Disabled 1: Enabled	0~1	0	○	FWD/REV ENABLE
P1.17	Reserved	0～65535	0～65535	0	◎	Reserved
P1.18	Reserved	0～65535	0～65535	0	◎	Reserved
P1.19	Reserved	0～65535	0～65535	0	◎	Reserved
P2 Group--Motor Parameters						
P2.00	MOTOR RATE POWER	1.5~900.0kW	1.5~900.0	Depend on model	◎	MOTOR RATE POWER
P2.01	MOTOR RATE FREQ	0.01Hz~P0.07	0.01~P0.07	50.00Hz	◎	MOTOR RATE FREQ
P2.02	MOTOR RATE SPEED	0~36000rpm	0~36000	1460rpm	◎	MOTOR RATE SPEED
P2.03	MOTOR RATE VOLT	0~3000V	0~3000	380V	◎	MOTOR RATE VOLT
P2.04	MOTOR RATE CURR	0.1~2000.0A	0.1~2000.0	Depend on model	◎	MOTOR RATE CURR
P2.05	A PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	A PUMP RATE CURR

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P2.06	B PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	B PUMP RATE CURR
P2.07	C PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	C PUMP RATE CURR
P2.08	D PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	D PUMP RATE CURR
P2.09	E PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	E PUMP RATE CURR
P2.10	F PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	F PUMP RATE CURR
P2.11	G PUMP RATE CURR	0.1～2000.0A	0.1~2000.0	Depend on model	◎	G PUMP RATE CURR
P2.12	Reserved	0～65535	0～65535	0	◎	Reserved
P2.13	Reserved	0～65535	0～65535	0	◎	Reserved
P2.14	Reserved	0～65535	0～65535	0	◎	Reserved
P2.15	Reserved	0～65535	0～65535	0	◎	Reserved
P3 Group--PID Control						
P3.00	UNIT SEL	0～10	0～10	0	◎	UNIT SEL
P3.01	DISPLAY FORMAT	0～4	0～4	3	◎	DISPLAY FORMAT
P3.02	PID MAX	0.001～65.535	0.001~65.535	1.000	◎	PID MAX
P3.03	PID UPPER	P3.04~P3.02	P3.04~P3.02	1.000	◎	PID UPPER
P3.04	PID LOWER	P0.000~P3.03	P0.00~P3.03	0.100	◎	PID LOWER
P3.05	KEYPAD PID SET	P3.04~P3.03	P3.04~P3.03	0.500	○	KEYPAD PID SET
P3.06	PID PRESET	0~5	0~5	0	◎	PID PRESET
P3.07	PID FEEDBACK	0: AI1 feed 1: AI2 feed 2: AI1-AI2 feed 3: Modbus feed	0~3	0	◎	PID FEEDBACK
P3.08	PID OUTPUT	0: Positive	0~1	0	○	PID OUTPUT

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		1: Negative				
P3.09	PROPORTION GAIN (Kp)	0.00~100.00	0.00~100.00	0.10	○	PROPORTION GAIN (Kp)
P3.10	INTEGRAL TIME (Ti)	0.01~10.00s	0.01~10.00	0.10s	○	INTEGRAL TIME (Ti)
P3.11	DIFFERENTIA TIME (Td)	0.00~10.00s	0.00~10.00	0.00s	○	DIFFERENTIA TIME (Td)
P3.12	SAMPLING CYCLE (T)	0.01~100.00s	0.01~100.00	0.50s	○	SAMPLING CYCLE (T)
P3.13	BIAS LIMIT	0.0~100.0%	0.0~100.0	0.0%	○	BIAS LIMIT
P3.14	OUTPUT FILTER	0.00~10.00s	0.00~10.00	0.00	○	OUTPUT FILTER
P3.15	FEEDBACK LOST	0.0~100.0%	0.0~100.0	0.0%	○	FEEDBACK LOST
P3.16	FEEDBACK LOST(t)	0.0~3600.0s	0.0~3600.0	1.0s	○	FEEDBACK LOST(t)
P3.17	PID FRQ UPPER	-100.0～100.0%	-100.0~100.0	100.0%	○	PID FRQ UPPER
P3.18	PID FRQ LOWER	-100.0～P3.17	-100.0~P3.17	0.0%	○	PID FRQ LOWER
P3.19	Reserved	0~65535	0~65535	0~65535	◎	Reserved
P4 Group--V/F Control						
P4.00	V/F CURVE	0: Linear curve 1: User-defined curve 2: 1.3 order torque_stepdown 3: 1.7 order torque_stepdown 4: 2.0 order torque_stepdown	0~4	4	◎	V/F CURVE
P4.01	TORQUE	0.0%: auto	0.0~10.0	1.0%	○	TORQUE

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
	BOOST	0.1%~10.0%				BOOST
P4.02	BOOST CUT-OFF	0.0%~50.0% (motor rated frequency)	0.0~50.0	20.0%	◎	BOOST CUT-OFF
P4.03	V/F FREQ 1	0.00Hz~ P4.05	0.00~P4.05	5.00Hz	◎	V/F FREQ 1
P4.04	V/F VOLTAGE 1	0.0%~100.0%	0.0~100.0	10.0%	◎	V/F VOLTAGE 1
P4.05	V/F FREQ 2	P4.03~ P4.07	P4.03~ P4.07	30.00Hz	◎	V/F FREQ 2
P4.06	V/F VOLTAGE 2	0.0%~100.0%	0.0~100.0	60.0%	◎	V/F VOLTAGE 2
P4.07	V/F FREQ 3	P4.05~ P2.01	P4.05~ P2.01	50.00Hz	◎	V/F FREQ 3
P4.08	V/F VOLTAGE 3	0.0%~100.0%	0.0~100.0	100.0%	◎	V/F VOLTAGE 3
P4.09	V/F SLIPCOMP	0.00~10.00Hz	0.00~10.00	0.0Hz	○	V/F SLIPCOMP
P4.10	AVR	0: Disabled 1: Enabled all the time 2: Disabled during deceleration	0~2	1	○	AVR
P4.11	Reserved	0~65535	0~65535	0	◎	Reserved
P4.12	Reserved	0~65535	0~65535	0	◎	Reserved
P4.13	Reserved	0~65535	0~65535	0	◎	Reserved
P4.14	Reserved	0~65535	0~65535	0	◎	Reserved
P4.15	Reserved	0~65535	0~65535	0	◎	Reserved
P5 Group--Input Terminals						
P5.00	NO/NC SELECT	0~0xFF	0~0xFF	0	◎	NO/NC SELECT
P5.01	INPUT SELECTION	0: Invalid 1: Valid	0~1	0	◎	INPUT SELECTION

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P5.02	S1 FUNCTION	0：Invalid 1：Forward 2：Reverse 3：jog enable 4：Coast to stop 5：Reset fault 6：Running pause 7：External fault input 8：Up command 9：DOWN command 10：Clear UP/DOWN 11：Switch between A and B 12：Switch between A and A+B 13：Switch between B and A+B 14：Pause PID 15：ACC/DEC ramp hold 16：Multi-step press reference1 17：Multi-step press reference 2 18：Multi-step press reference 3 19：Multi-step press reference 4 20：Manual soft start debugging 21：Manual	0～50	1	◎	S1 FUNCTION
P5.03	S2 FUNCTION		0～50	4	◎	S2 FUNCTION
P5.04	S3 FUNCTION		0～50	5	◎	S3 FUNCTION
P5.05	S4 FUNCTION		0～50	0	◎	S4 FUNCTION
P5.06	S5 FUNCTION		0～50	0	◎	S5 FUNCTION
P5.07	S6 FUNCTION		0～50	0	◎	S6 FUNCTION
P5.08	S7 FUNCTION		0～50	0	◎	S7 FUNCTION
P5.09	S8 FUNCTION		0～50	0	◎	S8 FUNCTION

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		round-robin command 22~28：Manual soft start of motor A~G 29~35：Motor A~G disabled 36：Inlet reservoir up W LEV ltd 37：Inlet reservoir low W LEV ltd 38：Inlet reser W LEV on W short 39：Sewage reservoir up W LEV ltd 40：Sewage reser low W level ltd 41：PID switch 42~50：Reserved				
P5.10	Sx FILTER TIMES	0~10	0~10	5	○	Sx FILTER TIMES
P5.11	UP/DOWN RATE	0.01~50.00Hz/s	0.01~50.00	0.50Hz/s	○	UP/DOWN RATE
P5.12	AI1 LOW LIMIT	0.00V~10.00V	0.00~10.00	0.00V	○	AI1 LOW LIMIT
P5.13	AI1 LOW SETTING	-100.0%~100.0%	-100.0~100.0	0.0%	○	AI1 LOW SETTING
P5.14	AI1 UP LIMIT	0.00V~10.00V	0.00~10.00	10.00V	○	AI1 UP LIMIT
P5.15	AI1 UP SETTING	-100.0%~100.0%	-100.0~100.0	100.0%	○	AI1 UP SETTING
P5.16	AI1 FILTER TIME	0.00s~10.00s	0.00~10.00	0.10s	○	AI1 FILTER TIME
P5.17	AI2 LOW	0.00V~10.00V	0.00~10.00	0.00V	○	AI2 LOW

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
	LIMIT					LIMIT
P5.18	AI2 LOW SETTING	-100.0%~100.0%	-100.0~100.0	0.0%	○	AI2 LOW SETTING
P5.19	AI2 UP LIMIT	0.00V~10.00V	0.00~10.00	10.00V	○	AI2 UP LIMIT
P5.20	AI2 UP SETTING	-100.0%~100.0%	-100.0~100.0	100.0%	○	AI2 UP SETTING
P5.21	AI2 FILTER TIME	0.00s~10.00s	0.00~10.00	0.10s	○	AI2 FILTER TIME
P5.22	Reserved	0~65535	0~65535	0.00V	◎	Reserved
P5.23	Reserved	0~65535	0~65535	0.00V	◎	Reserved
P5.24	Reserved	0~65535	0~65535	0.00V	◎	Reserved
P5.25	Reserved	0~65535	0~65535	0.00V	◎	Reserved
P6 Group-- Output Terminals						
P6.00	RO1 SELECTION	0：No output 1：Run forward 2：Run reverse 3：Fault output 4：Motor overload 5：Inverter overload 6：FDT reached 7：Frequency reached 8：Zero speed running 9：Running time reached 10：Upper frequency limit reached 11：Lower frequency limit reached 12：Run ready	0～30	3	○	RO1 SELECTION
P6.01	RO2 SELECTION		0～30	21	○	RO2 SELECTION
P6.02	RO3 SELECTION		0～30	22	○	RO3 SELECTION

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		13：Motor running 14：Stop pulse output 15：Over press alarm 16：Under press alarm 17：Dormant Operation indication 18：Backup pressure operat indica 19：Reservoir water short indicat 20：Faulty pump indication 21：H pump control 22：I pump control 23~30：Reserved				
P6.03	RT1 SELECTION	0：No function 1：Connect A for var freq CON 2：Connect A for pow freq CON 3：Connect B for var freq CON 4：Connect B for pow freq CON 5：Connect C for var freq CON 6：Connect C for	0～14	0	◎	RT1 SELECTION
P6.04	RT2 SELECTION		0～14	0	◎	RT2 SELECTION
P6.05	RT3 SELECTION		0～14	0	◎	RT3 SELECTION
P6.06	RT4 SELECTION		0～14	0	◎	RT4 SELECTION
P6.07	RT5 SELECTION		0～14	0	◎	RT5 SELECTION

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P6.08	RT6 SELECTION	pow freq CON 7：Connect D for var freq CON 8：Connect D for pow freq CON 9：Connect E for var freq CON 10：Connect E for pow freq CON 11：Connect F for var freq CON 12：Connect F for pow freq CON 13：Connect G for var freq CON 14：Connect G for pow freq CON 1：Connect A for var freq CON	0～14	0	◎	RT6 SELECTION
P6.09	RT7 SELECTION		0～14	0	◎	RT7 SELECTION
P6.10	RT8 SELECTION		0～14	0	◎	RT8 SELECTION
P6.11	AO1 SELECTION	0：Running frequency 1：Setting frequency 2：Motor speed 3：Output current 4：Output voltage 5：Reserved 6：Reserved 7：AI1 voltage/current 8：AI2 voltage/current 9~15：Reserved	0～15	0	○	AO1 SELECTION
P6.12	AO2 SELECTION		0～15	0	○	AO2 SELECTION
P6.13	AO1 LOW	0.0%~100.0%	0.0~100.0	0.0%	○	AO1 LOW

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
	LIMIT					LIMIT
P6.14	AO1 LOW OUTPUT	0.00V ~10.00V	0.00~10.00	0.00V	○	AO1 LOW OUTPUT
P6.15	AO1 UP LIMIT	0.0%~100.0%	0.0~100.0	100.0%	○	AO1 UP LIMIT
P6.16	AO1 UP OUTPUT	0.00V ~10.00V	0.00~10.00	10.00V	○	AO1 UP OUTPUT
P6.17	AO2 LOW LIMIT	0.0%~100.0%	0.0~100.0	0.0%	○	AO2 LOW LIMIT
P6.18	AO2 LOW OUTPUT	0.00V ~10.00V	0.00~10.00	0.00V	○	AO2 LOW OUTPUT
P6.19	AO2 UP LIMIT	0.0%~100.0%	0.0~100.0	100.0%	○	AO2 UP LIMIT
P6.20	AO2 UP OUTPUT	0.00V ~10.00V	0.00~10.00	10.00V	○	AO2 UP OUTPUT
P6.21	Reserved	0~65535	0~65535	0.0%	◎	Reserved
P6.22	Reserved	0~65535	0~65535	0.0%	◎	Reserved
P6.23	Reserved	0~65535	0~65535	0.0%	◎	Reserved
P6.24	Reserved	0~65535	0~65535	0.0%	◎	Reserved
P7 Group--Display Interface						
P7.00	USER PASSWORD	0~65535	0~65535	0	○	USER PASSWORD
P7.01	LANGUAGE SELECT	0: Chinese 1: English	0~1	0	○	LANGUAGE SELECT
P7.02	PARA COPY	0: Invalid 1: Upload 2: Download	0~2	0	◎	PARA COPY
P7.03	QUICK/JOG FUNC	0: Quick debugging mode 1: FDW/REV switch 2: Jog 3: Clear UP/DOWN	0~3	0	◎	QUICK/JOG FUNC

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		setting				
P7.04	STOP/RST FUNC	0: Valid when keypad control (P0.01=0) 1: Valid when keypad or terminal control (P0.01=0 or 1) 2: Valid when keypad or COM control (P0.01=0 or 2) 3: Always valid	0~3	0	○	STOP/RST FUNC
P7.05	KEYPAD DISPLAY	0: Preferential to external keypad 1: Both display&external valid. 2: Both display& local key valid. 3: Both display & Both valid.	0~3	0	○	KEYPAD DISPLAY
P7.06	RUNNING DISPLAY	0~0xFFFF	0~0xFFFF	0x01F9	○	RUNNING DISPLAY
P7.07	STOP DISPLAY	1~0xFFFF	1~0xFFFF	0xFF	○	STOP DISPLAY
P7.08	RECTIFIER TEMP	0~100.0℃			●	RECTIFIER TEMP
P7.09	IGBT TEMP	0~100.0℃			●	IGBT TEMP
P7.10	MCU VERSION				●	MCU VERSION
P7.11	DSP VERSION				●	DSP VERSION

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P7.12	TOTAL RUN TIME	0~65535h			●	TOTAL RUN TIME
P7.13	3rd LATEST FAULT	0~30	0~30			3rd LATEST FAULT
P7.14	2nd LATEST FAULT		0~30			2nd LATEST FAULT
P7.15	CURRENT FAULT		0~30			CURRENT FAULT
P7.16	FAULT PREQ				●	FAULT PREQ
P7.17	FAULT CURR				●	FAULT CURR
P7.18	FAULT DC VOLT				●	FAULT DC VOLT
P7.19	FAULT Sx STATUS				●	FAULT Sx STATUS
P7.20	FAULT DO STATUS				●	FAULT DO STATUS
P7.21	ERR-PUMP NOTE	0~0x1FF	0~0x1FF		●	ERR-PUMP NOTE
P7.22	Reserved	0~65535	0~65535	0	◎	Reserved
P7.23	Reserved	0~65535	0~65535	0	◎	Reserved
P7.24	Reserved	0~65535	0~65535	0	◎	Reserved
P8 Group–Water-supply Function						
P8.00	WATER SUPPLY SEL	0~1	0~1	1	◎	WATER SUPPLY SEL
P8.01	CONVERT-PUMP SEL	0~1	0~1	0	◎	CONVERT-PUMP SEL
P8.02	H,I SEL	0~3	0~3	3	◎	H,I SEL
P8.03	PUMP A SEL	0~4	0~4	0	◎	PUMP A SEL
P8.04	PUMP B SEL		0~4	0	◎	PUMP B SEL

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P8.05	PUMP C SEL		0~4	0	◎	PUMP C SEL
P8.06	PUMP D SEL		0~4	0	◎	PUMP D SEL
P8.07	PUMP E SEL		0~4	0	◎	PUMP E SEL
P8.08	PUMP F SEL		0~4	0	◎	PUMP F SEL
P8.09	PUMP G SEL		0~4	0	◎	PUMP G SEL
P8.10	PUMP ADD TOLERA	0.0~30.0%	0.0~30.0	10.0%	○	PUMP ADD TOLERA
P8.11	PUMP ADD FREQ	P8.16~P0.07	P8.16~P0.07	50.00Hz	○	PUMP ADD FREQ
P8.12	PUMP ADD DELAY	0~3600s	0~3600	5s	○	PUMP ADD DELAY
P8.13	SWITCH FREQUENCY	0.0~P0.07	0.0~P0.07	50.00Hz	○	SWITCH FREQUENCY
P8.14	VFP DECELER TIME	0.0~100.0%	0.0~100.0	10.0s	○	VFP DECELER TIME
P8.15	PUMP REDU TOLERA	0.0~30.0%	0.0~30.0	10.0%	○	PUMP REDU TOLERA
P8.16	PUMP REDU FRQ	P8.08~P8.11	P8.08~P8.11	5.00Hz	○	PUMP REDU FRQ
P8.17	PUMP REDU DELAY	0~3600s	0~3600	5s	○	PUMP REDU DELAY
P8.18	VFP ACCELER TIME	0.0~100.0%	0.0~100.0	10.0s	○	VFP ACCELER TIME
P8.19	CLOSE DELAY	0.1~9.9%	0.1~9.9	0.5s	○	CLOSE DELAY
P8.20	TRIP DELAY	0.1~9.9%	0.1~9.9	0.5s	○	TRIP DELAY
P8.21	PID SLEEP SEL	0: Dormancy enabled 1: Running at lower	0~1	0	◎	PID SLEEP SEL

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		limit FRQ				
P8.22	AWOKE TOLERA	P8.10~60.0%	P8.10~60.0	10.0%	○	AWOKE TOLERA
P8.23	AWOKE DELAY	0~3600s	0~3600	5s	○	AWOKE DELAY
P8.24	PFP ROU-ROB PER	0.0~6553.5	0.0~6553.5	0.0h	◎	PFP ROU-ROB PER
P8.25	VFP ROU-ROB PER	0.0~6553.5	0.0~6553.5	0.0h	◎	VFP ROU-ROB PER
P8.26	SW FREQ MANUAL	0~P0.07	0~P0.07	50.00Hz	◎	SW FREQ MANUAL
P8.27	W IEVEL SI INPUT	0~2	0~2	0	◎	W IEVEL SI INPUT
P8.28	WL SI ANAL INPUT	0:AI1 input 1:AI2 input 2:Modbus input	0~2	0	◎	WL SI ANAL INPUT
P8.29	UP W IEVEL LTD	0.0~100.0%	0.0~100.0	60.0%	○	UP W IEVEL LTD
P8.30	Low W IEVEL LTD	0.0~P8.29	0.0~P8.29	40.0%	○	Low W IEVEL LTD
P8.31	SHORTAGE W LEVELshortage level	0.0~P8.30	0.0~P8.30	20.0%	○	SHORTAGE W LEVELshortage level
P8.32	BACKUP PRESSURE	0~100.0%	0~100.0	0.0%	○	BACKUP PRESSURE
P8.33	FAULT HANDLING		0-1	0	◎	FAULT HANDLING
P8.34	Reserved	0~65535	0~65535		◎	Reserved
P8.35	Reserved	0~65535	0~65535		◎	Reserved

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
P8.36	Reserved	0~65535	0~65535		◎	Reserved
P8.37	Reserved	0~65535	0~65535		◎	Reserved
P8.38	Reserved	0~65535	0~65535		◎	Reserved
P8.39	Reserved	0~65535	0~65535		◎	Reserved
P9 Group--Timing watering and multi-given function group						
P9.00	CURRENT MOMENT	0.00~23.59	0.00~23.59	0.00	○	CURRENT MOMENT
P9.01	PRESSURE STEPS	1~8	1~8	1	○	PRESSURE STEPS
P9.02	Threshold T1	0.00～23.59	0.00～23.59	0.00	○	Threshold T1
P9.03	Pressure of segment T1	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T1
P9.04	Threshold T2	P9.02～23.59	P9.02～23.59	0.00	○	Threshold T2
P9.05	Pressure of segment T2	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T2
P9.06	Threshold T3	P9.04～23.59	P9.04～23.59	0.00	○	Threshold T3
P9.07	Pressure of segment T3	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T3
P9.08	Threshold T4	P9.06～23.59	P9.06～23.59	0.00	○	Threshold T4
P9.09	Pressure of segment T4	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T4
P9.10	Threshold T5	P9.08～23.59	P9.08～23.59	0.00	○	Threshold T5
P9.11	Pressure of segment T5	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T5
P9.12	Threshold T6	P9.10～23.59	P9.10～23.59	0.00	○	Threshold T6
P9.13	Pressure of segment T6	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T6
P9.14	Threshold T7	P9.12～23.59	P9.12～23.59	0.00	○	Threshold T7
P9.15	Pressure of segment T7	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of segment T7
P9.16	Threshold T8	P9.14～23.59	P9.14～23.59	0.00	○	Threshold T8
P9.17	Pressure of	0.0～100.0%	0.0～100.0%	0.0%	○	Pressure of

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
	segment T8					segment T8
P9.18	MULTI SET 0	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 0
P9.19	MULTI SET 1	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 1
P9.20	MULTI SET 2	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 2
P9.21	MULTI SET 3	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 3
P9.22	MULTI SET 4	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 4
P9.23	MULTI SET 5	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 5
P9.24	MULTI SET 6	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 6
P9.25	MULTI SET 7	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 7
P9.26	MULTI SET 8	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 8
P9.27	MULTI SET 9	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 9
P9.28	MULTI SET 10	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 10
P9.29	MULTI SET 11	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 11
P9.30	MULTI SET 12	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 12
P9.31	MULTI SET 13	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 13
P9.32	MULTI SET 14	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 14
P9.33	MULTI SET 15	0.0～100.0%	0.0～100.0	0.0%	○	MULTI SET 15
P9.34	Reserved	0~65535	0~65535		◎	Reserved
P9.35	Reserved	0~65535	0~65535		◎	Reserved
P9.36	Reserved	0~65535	0~65535		◎	Reserved
P9.37	Reserved	0~65535	0~65535		◎	Reserved
PA Group--Protection Parameters						
PA.00	IN PHASE FALL	0: Disabled 1: Enabled	0~1	1	○	IN PHASE FALL
PA.01	OUT PHASE FALL	0: Disabled 1: Enabled	0~1	1	○	OUT PHASE FALL

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
PA.02	MOTOR OVERLOAD	0: Disabled 1: Normal motor 2: Variable frequency motor	0~2	2	◎	MOTOR OVERLOAD
PA.03	OVERLOAD CURR	20.0%~120.0%	20.0~120.0	100.0%	○	OVERLOAD CURR
PA.04	OL WARN CURR	20.0%~150.0%	20.0~150.0	110.0%	○	OL WARN CURR
PA.05	OL WARN SELECT	0: Always based on I motor 1: Detect based on I motor 2: Always based on I INVE 3: Detect based on I INVE	0~3	0	◎	OL WARN SELECT
PA.06	OL WARN DELAY	0.0~30.0s	0.0~30.0	5.0s	○	OL WARN DELAY
PA.07	TRIPFREE POINT	230.0V~600.0V	230.0~600.0	450.0V	○	TRIPFREE POINT
PA.08	TRIPFREE DECRATE	0.00Hz~P0.07	0.00~P0.07	0.00Hz	○	TRIPFREE DECRATE
PA.09	OVER VOLT STALL	0: Protection forbidden 1: Protection permitted	0～1	0	○	OVER VOLT STALL
PA.10	OV PROTECT POINT	120～150%	120～150	125	○	OV PROTECT POINT
PA.11	OVER CURR	0: Disabled 1: Enabled	0~1	1	○	OVER CURR
PA.12	OC THRESHOL	100~200%	100~200	160%	○	OC THRESHOLD

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
	D					
PA.13	FREQ DEC RATE	0.00~50.00Hz/s	0.00~50.00	1.00Hz/s	○	FREQ DEC RATE
PA.14	OVER PRESS VALUE	0.0~100.0%	0.0~100.0	90.0%	○	OVER PRESS VALUE
PA.15	OVER PRESS DELAY	0~3600	0~3600	500s	○	OVER PRESS DELAY
PA.16	UNDER PRES VALUE	0.0~100.0%	0.0~100.0	10,0%	○	UNDER PRES VALUE
PA.17	UNDER PRES DELAY	0~3600	0~3600	500s	○	UNDER PRES DELAY
PA.18	Reserved	0~65535	0~65535	0	◎	Reserved
PA.19	Reserved	0~65535	0~65535	0	◎	Reserved
PA.20	Reserved	0~65535	0~65535	0	◎	Reserved
PA.21	Reserved	0~65535	0~65535	0	◎	Reserved
PA.22	Reserved	0~65535	0~65535	0	◎	Reserved
Pb Group --Serial Communication						
Pb.00	LOCAL ADDRESS	1～247	1～247	1	○	LOCAL ADDRESS
Pb.01	BAUD RATE	0: 1200BPS 1: 2400BPS 2: 4800BPS 3: 9600BPS 4: 19200BPS 5: 38400BPS	0～5	4	○	BAUD RATE
Pb.02	DATA FORMAT	0: No parity (N,8,1) for RTU 1: Even parity	0～8	1	○	DATA FORMAT

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
		(E,8,1) for RTU 2: Odd parity (O,8,1) for RTU 3: No parity (N,8,2) for RTU 4: Even parity (E,8,2) for RTU 5: Odd parity (O,8,2) for RTU 6: No parity (N,7,1) for ASCII 7: Even parity (E,7,1) for ASCII 8: Odd parity (O,7,1) for ASCII				
Pb.03	COM DELAY TIME	0～200ms	0～200ms	5ms	○	COM DELAY TIME
Pb.04	COM TIMEOUT	0.0～100.0	0.0～100.0	0.0s	○	COM TIMEOUT
Pb.05	RESPONSE ACTION	0: enabled 1: Disabled	0～1	0	○	RESPONSE ACTION
Pb.06	TRANSFERS ERROR	0~3	0~3	1	○	TRANSFERS ERROR
Pb.07	Reserved	0～65535	0～65535	0	◎	Reserved
Pb.08	Reserved	0～65535	0～65535	0	◎	Reserved
Pb.09	Reserved	0～65535	0～65535	0	◎	Reserved
PC Group--Enhanced function						
PC.00	JOG REF	0.00~P0.06	0.00~ P0.06	5.00Hz	○	JOG REF
PC.01	JOG ACC TIME	0.0~3600.0s	0.0~3600.0	20.0s	○	JOG ACC TIME
PC.02	JOG DEC TIME	0.0~3600.0s	0.0~3600.0	20.0s	○	JOG DEC TIME

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
PC.03	SKIP FREQ 1	0.00~P0.07	0.00~P0.07	0.00Hz	○	SKIP FREQ 1
PC.04	SKIP FREQ 2	0.00~P0.07	0.00~P0.07	0.00Hz	○	SKIP FREQ 2
PC.05	SKIP FREQ RANGE	0.00~P0.07	0.00~P0.07	0.00Hz	○	SKIP FREQ RANGE
PC.06	AUTO RESET TIMES	0~3	0~3	0	○	AUTO RESET TIMES
PC.07	FAULT ACTION	0: Disabled 1: Enabled	0~1	0	○	FAULT ACTION
PC.08	RESET INTERVAL	0.1~100.0s	0.1~100.0	1.0s	○	RESET INTERVAL
PC.09	RUNNING TIME	0~65535h	0~65535	65535 h	○	RUNNING TIME
PC.10	FDT LEVEL	0.00~ P0.06	0.00~ P0.06	50.00Hz	○	FDT LEVEL
PC.11	FDT LAG	0.0~100.0%	0.0~100.0	5.0%	○	FDT LAG
PC.12	FAR RANGE	0.0~100.0% (maximum frequency)	0.0~100.0	0.0%	○	FAR RANGE
PC.13	BRAK VOLT	320.0~750.0V	320.0~750.0	700.0V	○	BRAK VOLT
PC,14	LO FREQ RESTRAIN	0~10	0~10	2	○	LO FREQ RESTRAIN
PC.15	HI FREQ RESTRAIN	0~10	0~10	0	○	HI FREQ RESTRAIN
PC.16	Reserved	0～65535	0～65535	0	◎	Reserved
PC.17	Reserved	0～65535	0～65535	0	◎	Reserved
PC.18	Reserved	0～65535	0～65535	0	◎	Reserved
PC.19	Reserved	0～65535	0～65535	0	◎	Reserved
Pd Group--PID Enhanced Function						
PD.00	PID SWITCH SEL	0~4	0~4	0	◎	PID SWITCH SEL
PD.01	PID SWITCH POINT	PD.01	PID SWITCH POINT	PD.01	○	PID SWITCH POINT

Function Code	Name	Description	Setting Range	Factory Setting	Modify	LCD Display
PD.02	PID-0 TO PID-1 T	0.00~100.00	0.00~100.00	0.50s	○	PID-0 TO PID-1 T
PD.03	PID-1 TO PID-0 T	0.00~100.00	0.00~100.00	0.50s	○	PID-1 TO PID-0 T
PD.04	PROPORTION GAIN1	0.00~100.00	0.00~100.00	0.10s	○	PROPORTION GAIN1
PD.05	INTEGRAL TIME 1	0.01~10.00s	0.01~10.00	0.10s	○	INTEGRAL TIME 1
PD.06	DIFFERENTI TIME1	0.00~10.00	0.00~10.00	0.00s	○	DIFFERENTI TIME1
PD.07	SAMPLING CYCLE 1	0.00~10.00s	0.00~10.00	0.00s	○	SAMPLING CYCLE 1
PD.08	BIAS LIMIT 1	0.0~100.0%	0.0~100.0	0.0%	○	BIAS LIMIT 1
PD.09	OUTPUT FILTER 1	0.0~3600.0s	0.0~3600.0	1.0s	○	OUTPUT FILTER 1
PD.10~PD.29	Reserved	0~65535	0~65535		◎	Reserved
PE.00	Factory password	0～65535	0～65535	*****	●	Factory password

APPENDIX D WATERING STANDARD WIRING DIAGRAM

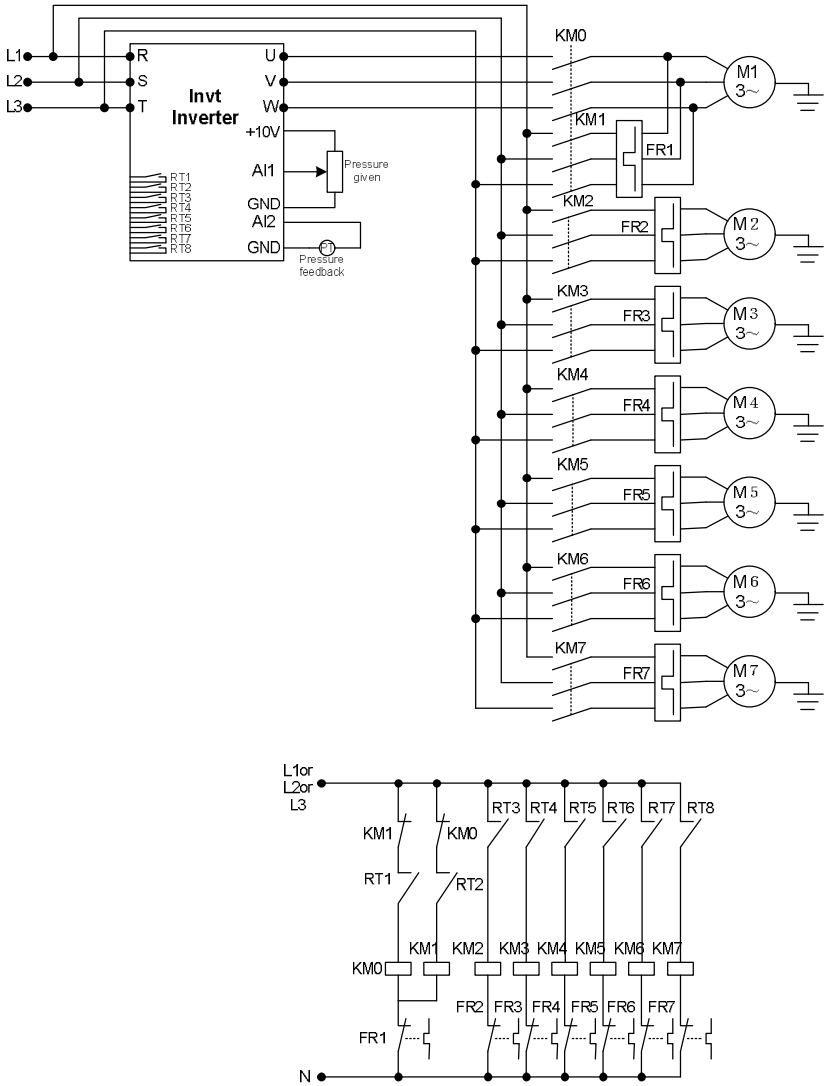


Figure D.1 Standard wiring diagram of one variable-frequency pump

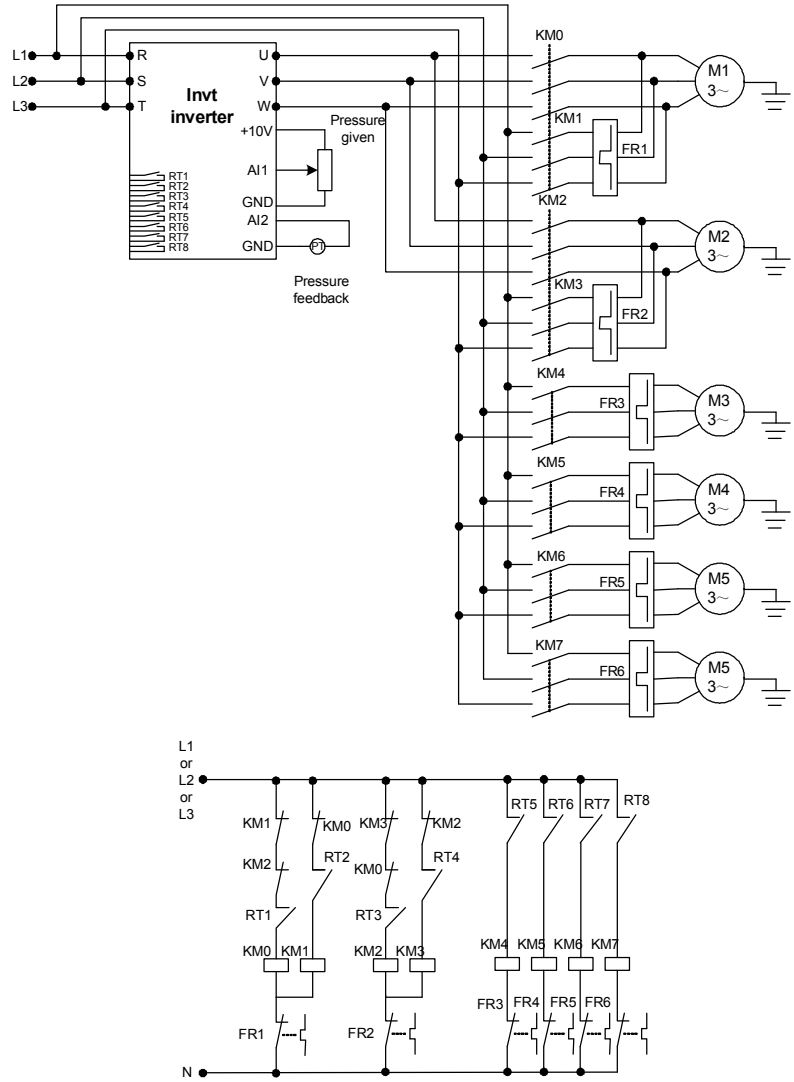


Figure D.2 Standard wiring diagram of two variable-frequency pumps

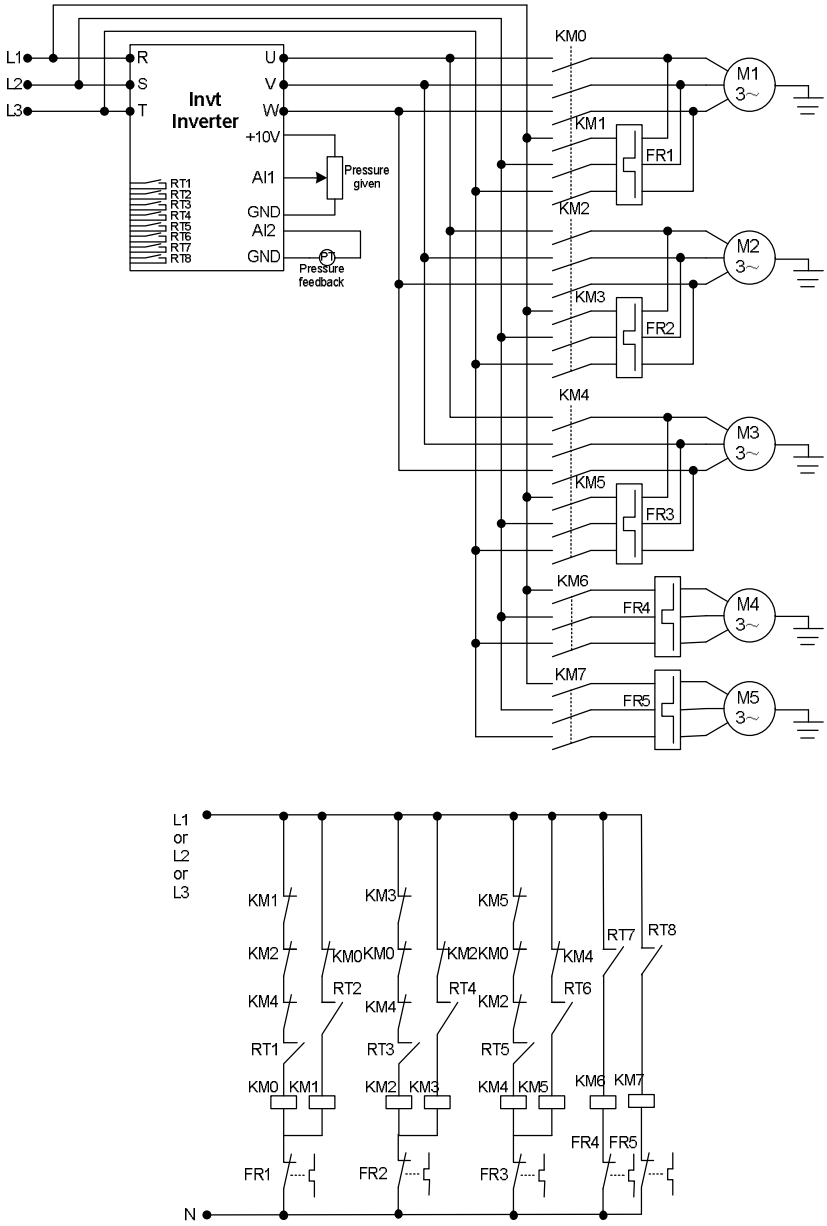


Figure D.3 Standard wiring diagram of three variable-frequency pumps

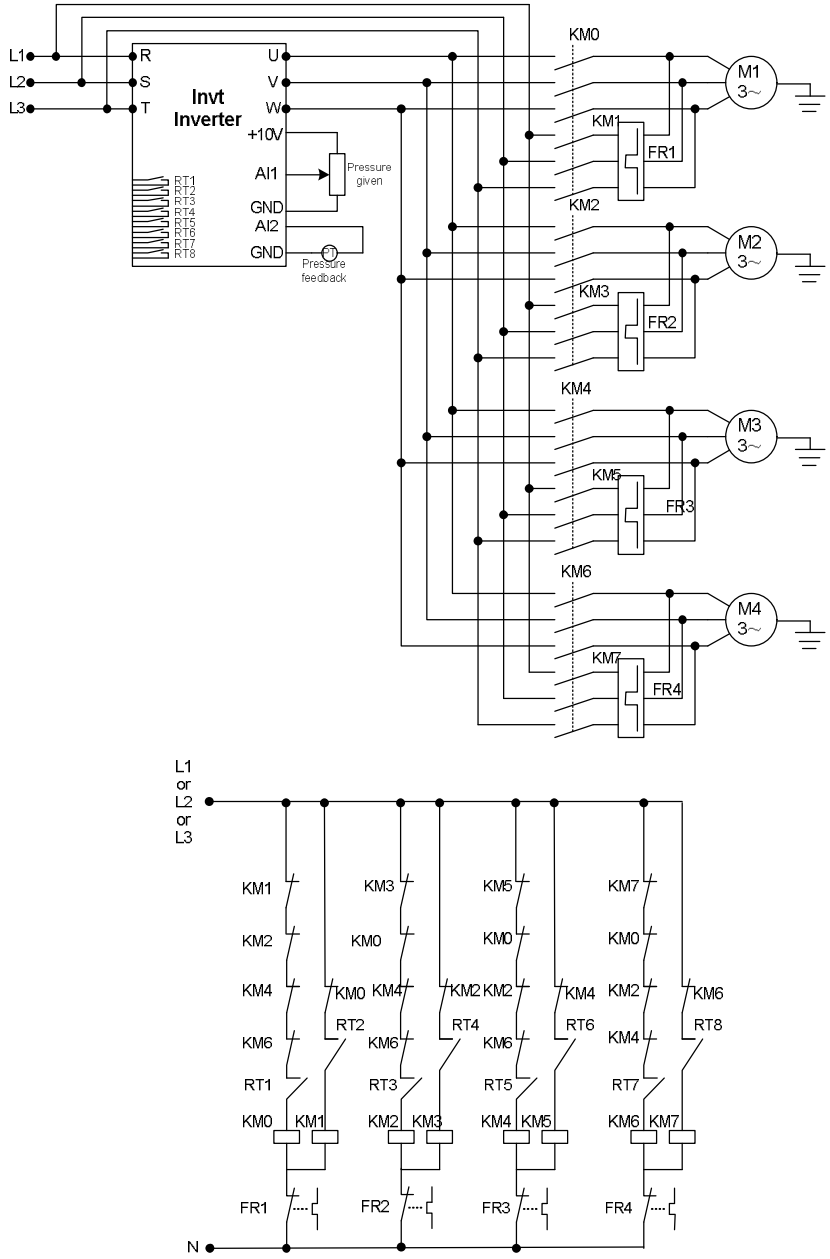


Figure D.4 Standard wiring diagram of four variable-frequency pump

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