



CT3000 Series Variable Frequency Drive

USER'S MANUAL



NEW WEST TECHNOLOGIES LTD.

SINCE-1991

Prior to use, please read this user's manual carefully.

CAUTION: Please keep this user's manual for future reference.

CT3000 Series Variable Frequency Drive

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1. PRELUDE

Thank you for using CT3000 series Variable Frequency Drive (Hereinafter referred to as VFD) manufactured by New West Technologies Ltd. (Hereinafter referred to as NWT).

CT3000 series VFD, independently developed by our company, is a universal vector control one that owns high quality, multiple functions and low noise .

This User's Manual offers complete introduction of installation and use of the VFD, setting of function parameters, fault treatment and maintenance etc for CT3000 series VFD. Please read this manual carefully before using in order to guarantee correct installation and use of the VFD .

This manual is an accessory along with the machine. Please keep it properly for the future use for repair and maintenance.

1.1. Checking before use

When opening the box, please carefully check and confirm:

If the product inside together with the quality certificate, user's manual and warranty card;

Please check the "Model" column on the side of the machine, and re-confirm if the product and your order are consistent;

If there's any damage, scratch or dirt (damages caused during transportation are not within the company's warranty)、product missing or some other questions, please contact the dealer you purchased the product or the sales department of NWT immediately.

Note: Do not install the VFD if you find the product is damaged or component missing, otherwise it may cause death or large safety incident.

2. SAFETY REQUIREMENT AND CAUTIONS

2.1. Warning signs and meanings

This manual has used the following signs which means there is an important parts of security. While observing against the rules, there is a danger of injury even death or machine system damage.



Danger: Wrong operation may cause serious injury or death



Wrong operation may cause death or large safety incident



Caution: Wrong operation may cause slight injury or damage to equipment.

Please read the user's manual carefully before installation, only professionally trained persons can be allowed to operate the equipment. "Professional trained persons" means the workers must be familiar with installation, wiring, running and maintenance. The operator must follow all the safety instructions to operate the machine.

If any physical injury or death or damage to the devices for ignoring to the safety precautions in the manual, our company will not be responsible for any damages and we are not legally bound in any manner.

2.2. Safety operation

2.2.1 Machine checking



Do not install the VFD if you find the product is damaged or component missing, otherwise it may cause death or large safety incident.

2.2.2 Mechanical installation



Please install the VFD on metal or fire-retardant material in case of fire.

Please keep the VFD away from combustible materials.

Do not install the VFD in the environment of explosive gas.



Please hold the bottom of the VFD when installing and transport to prevent the machine from falling.

The installation platform must be strong enough to hold the VFD in case the machine falling and lead to damage

Please install the VFD in the safe place with less vibration, avoid direct sunlight, no water splashing.

When installing two or more VFDs in one cabinet, please ensure all the machines get good heat dissipation.

Take measures to avoid screws, cables and other conductive matters fall into the VFD during maintenance and component replacement.

2.2.3 Electric installation



Danger

Only professional electrical engineer was allowed to install the machine, otherwise there is a risk of electric shock.

There must be a circuit breaker between the VFD and input power, otherwise it may cause fire.

Before wiring, make sure the VFD is power-off, and all the charging indicator is completely extinguished, otherwise there is a risk of electric shock.

The PE terminal must be properly grounded in case of the risk of electric shock.



Caution

According to the power level of the VFD, please select the appropriate power cable for it, otherwise an accident may occur.

Don't connect the input power to the out terminals (U, V, W) of the VFD, otherwise it will cause damage to the drive system.

When connecting the output terminals (U, V, W), pay attention to the rotation direction of the motor.

Please make sure the connection and wiring meets the EMC requirement and the safety standards of the local area, otherwise an accident may occur.

Do not connect the braking resistor between the DC bus (+) and (-) terminals, otherwise it may cause fire.

Except control terminal T1A - T1B - T1C and T2A - T2B - T2C, all other terminals are forbidden to connect to the AC 220V signal. Otherwise it will cause damage to the VFD.

2.2.4 Precautions before power- on



Danger

Do not carry out any voltage-endurance test as all the products have past the test before leaving the factory.

Do not touch the driver and circuits with wet hands before and after power-on. Otherwise there is a risk of electric shock.

All covers must be installed and closed before powering on, otherwise there is a risk of electric shock.

Do not open the protective cover after power-on in case the risk of electric shock.

Do not touch any input and output terminals of the VFDs after power-on, otherwise there is a danger of electric shock.



Caution

Before powering on, please confirm if the input voltage is consistent with the VFD's rated voltage, whether the wiring of the power input terminal(R,S,T) and output terminals(U,V,W) are correct, checking if there is short circuit for drive circuit.

The wiring of all accessories (like DC reactor, Braking resistor) must follow the instruction of this manual, otherwise it may cause an accident.

Do not change the parameters reserved by the manufacturer, otherwise it may cause damage to the equipment.

2.2.5 Running



Danger

Do not touch the cooling fan and discharge resistance to test the temperature when the machine is running, otherwise it may cause burn.

Only professional technician was allowed to detect VFD's signals during operation, otherwise it may cause personal injury or equipment damage.



Caution

During operation, metal or other debris should be prevented from falling into the equipment, otherwise the equipment may be damaged.

Do not use the contactor to start or stop the drive system of the VFD, otherwise it may cause equipment damage.

2.2.6 Maintenance and replacement of components



Danger

Only qualified electricians are allowed to perform the maintenance and must do the job according to the maintenance instruction.

The input power of the VFD must be cut off before maintenance. After at 10 minutes of discharge, the maintenance work can be carried out.

When plugged and unplugged the devices, make sure the power is off.

Take measures to avoid screws, cables and other conductive materials to fall into the VFD during maintenance and component replacement



Caution

Do not touch the components on the PCB board directly, static electricity is easy to damage the VFD.

After finish the work of repair, all the screws must be tightened.

When replacing the fan, pay attention to the rotation direction of the fan.

After replacing the control board, some parameter must be setting before the machine start again, otherwise there is damage to the equipment.

2.2.7 Scrap disposition



Caution

There are heavy metals in the VFD. Treat it as industrial effluent.

When the life cycle ends, the product should enter the recycling system. Dispose of it separately at an appropriate collection point instead of placing it in the normal waste stream.

3. MODEL AND SPECIFICATIONS

3.1. Nameplate

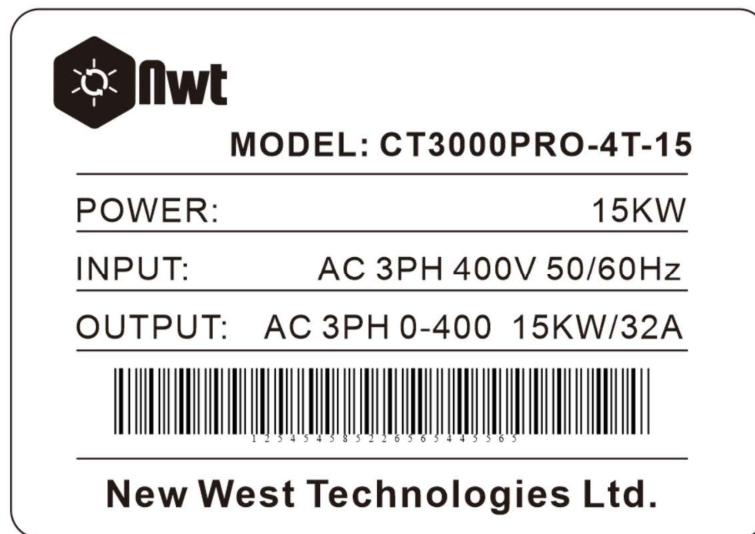


Figure 3.1 Nameplate example

3.2. Model description of VFD

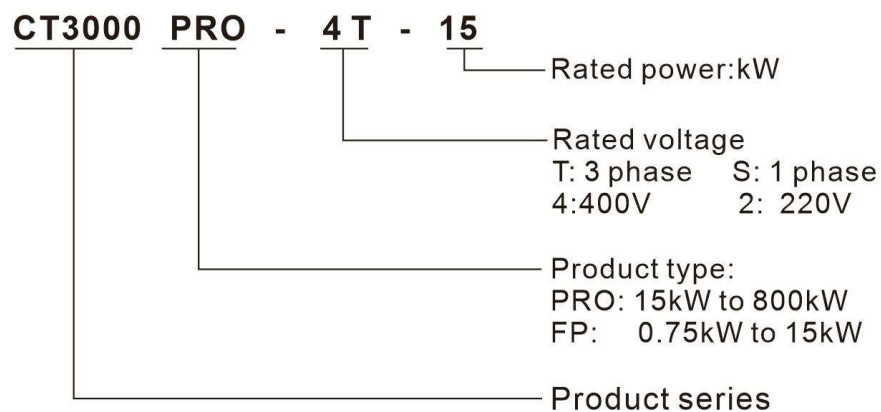


Figure 3.2 Model description of VFD

3.3. Model of VFD

Table 3.1 Model of CT3000 FP series VFD (Three-phase 400V class)

Model	Motor power (kW)	Line current (A)	Rated output current (A)	Maximum transient current for 60s (A)
CT3000 FP-4T-A75	0.75	3.6	2.3	3.5
CT3000 FP-4T-1A5	1.5	6.4	4.1	6.2
CT3000 FP-4T-2A2	2.2	8.7	5.5	8.3
CT3000 FP-4T-4	4	14	9.4	14.1
CT3000 FP-4T-5A5	5.5	20.7	12.6	18.9
CT3000 FP-4T-7A5	7.5	26.5	18.5	25.5
CT3000 FP-4T-11	11	36.6	24.6	37

Table 3.2 Model of CT3000 PRO series VFD (Three-phase 400V class)

Model	Motor power (kW)	Line current (A)	Rated output current (A)	Maximum transient current for 60s (A)
CT3000 PRO-4T-15	15	40	32	48
CT3000 PRO-4T-18A5	18.5	47	38	57
CT3000 PRO-4T-22	22	56	45	68
CT3000 PRO-4T-30	30	70	60	90
CT3000 PRO-4T-37	37	80	75	113
CT3000 PRO-4T-45	45	94	92	138
CT3000 PRO-4T-55	55	128	115	173
CT3000 PRO-4T-75	75	160	150	225
CT3000 PRO-4T-90	90	190	180	270
CT3000 PRO-4T-110	110	225	215	323
CT3000 PRO-4T-132	132	265	260	390
CT3000 PRO-4T-160	160	310	305	458
CT3000 PRO-4T-185	185	355	350	525
CT3000 PRO-4T-200	200	385	380	570
CT3000 PRO-4T-220	220	430	425	638
CT3000 PRO-4T-250	250	485	480	720
CT3000 PRO-4T-280	280	545	530	795
CT3000 PRO-4T-315	315	610	600	900
CT3000 PRO-4T-355	355	665	650	975
CT3000 PRO-4T-400	400	785	725	1088
CT3000 PRO-4T-500	500	885	860	1290
CT3000 PRO-4T-560	560	950	950	840
CT3000 PRO-4T-630	630	1100	1100	945
CT3000 PRO-4T-710	710	1230	1230	1300
CT3000 PRO-4T-800	800	1400	1400	1380

3.4. Technical specifications

Table 3.3: Technical Parameters of CT3000 Series VFD

ITEM		SPECIFICATIONS
Main Input	Rated voltage and frequency	3-phase 400V class: 380V-480V, 50Hz/60Hz
	Allowable value of change	Voltage: 380V-15% ~ 480V+10%; Frequency: $\pm 15\%$
Main output	Output voltage	Maximum output voltage equals to input voltage
	Output frequency	0.5 Hz to 400 Hz
	Overload capacity	150% of rated output current for 60s, 200% of rated output current for 2s
Control performance	Modulation mode	3-phase PWM, 2-phase PWM
	Control mode	V/f control for constant torque, V/f control for quadratic load, vector control without PG (open loop control), Energy-saving
	Setting method of run command	Outer terminal, keyboard panel or serial communication
	Setting method of speed command	Analog setting, keyboard, serial communication, UP/DOWN speed setting from external terminal
	Speed setting resolution	Keyboard: 0.1 Hz
		Analog setting: 0.05/50Hz (10bit)
	Speed control precision	V/f control: $\pm 2\%$
		vector control without PG (open loop control): $\pm 0.2\%$
	Speed control range	V/f control 1:40
		vector control without PG (open loop control): 1:200
Analog input	Acceleration and Deceleration Time	0-3200.0s
	switching frequency	1.5 kHz ~ 12 kHz, according to junction temperature automatically reduce the switching frequency
	Number	2 ways: AI1、AI2
Analog output	Type	DC voltage or DC current
	Maximum input range	AI1: 0 to 5VDC, 0 to 10VDC, 0.4 to 20mA DC receivable AI2: 0 to 10VDC or PTC probe input receivable
	Maximum input range	Voltage output: 0 to 10V, Current output: 0/4 to 20mA

ITEM		SPECIFICATIONS
logic input	Number	CT3000 FP series(0.75kW-11kW):LI, LI2, LI3, LI4, LI5, LI6 CT3000 PRO series (15kW-800kW):LI, LI2, LI3, LI4, LI5, LI6 ,LI7, LI8
	Type	Source or Sink
	Maximum input range	0-24VDC
logic output	Number	0.75kW-11kW: pulse signal output1、2 (LO1-CLO1、LO2-CLO2) , relay output1、2 (T1A-T1B-T1C、T2A-T2B-T2C) 15kW-500kW:pulse signal output (LO-CLO) , relay output 1、2 (T1A-T1B-T1C、T2A-T2B-T2C)
	pulse signal output	OC, output frequency、current output、act other function
	relay output	RA-RB-RC, including a NO contact and a NC contact Maximum switch capacity: T1A-T1C/T2A-T2C: 5A @ 250VAC, or 5A@ 30VDC T1B-T1C/T2B-T2C: 3A @ 250VAC or 3A @ 30VDC
Serial communication interface		RS485 interface supports Modbus protocol.
Display	4-digit LED digital display	For display of frequency setting, output frequency, fault code and parameter setting etc.
Environment	Standard	Development of CT3000 series VFD follows strict international standards and relevant recommended IEC and EN standards for control devices, especially IEC/EN61800-5-1 and IEC/EN61800-3.
	Altitude	Dreading unnecessary when altitude is 1000m or below (Dreading necessary at altitude higher than 1000m)
	Ambient environment	CT3000 FP : Reliable operation at -10 ~ 50°C without debating. When top protective cover is taken off, the environment temperature can be as high as +50 °C. Above +50 °C, the current drops by 2.2% for each rise of 1 °C in temperature. CT3000 PRO: Reliable operation at -10 ~ 40°C without dreading. Storage: -25 ~ 70°C
	Humidity	No condensed water or drip at 5 ~ 95%, In accordance with IEC60068-2-3
	Impact strength	15gn for continuous 11ms, In accordance with IEC/EN60068-2-27
	Maximum antipollution capacity	Class 2, in accordance with IEC/EN61800-5-1
Structure	Protection level	Top: IP41 (without removing the protective top cover). Other parts: IP20
	Cooling Method	Forced Air cooling
Installation method		Wall mounted



CAUTION

- Please fasten the terminal screw with specified torque. If the connection of the main circuit wires becomes loose, fire may occur due to the overheat at the connection of the wire.
- Do not apply wrong voltage to the main circuit power supply. Otherwise there is risk of electric shock.
- Do not make combustible in close contact with the VFD or attach combustible to the VFD . Otherwise there is risk of fire. Please install the VFD on metal or other flame retardant objects.



WARNING

- When using PCB, be sure to follow processes specified by the electrostatic protection measures (ESD). Otherwise internal circuit may be damaged due to static electricity.
- Please follow the instruction of this manual to correctly replace the cooling fan. If the installation direction is wrong, the cooling function cannot be brought into play and it may result in damage of the VFD. When installing the cooling fan to the VFD, be sure to make the side with label upward.
- For the VFD with 2 cooling fans, be sure to replace them together in order to extend the service life of the product to the maximum extent.
- Never disassemble or install the motor when the VFD outputs voltage. Otherwise the VFD may be damaged.
- When wiring the control circuit, do not use cables other than shielded wire. Otherwise it may result in abnormal action of the VFD. Please use shielded and double-stranded wire and connect its shielded layer to the grounding terminal PE of the VFD.
- Nonprofessional shall not perform wiring in case damaging the VFD.
- Please do not attempt to change the circuit of the loop. Otherwise it may damage the VFD. The required repair does not belong to the guarantee scope of our company.
- NWT bears no responsibility if your company or the end user makes reconstruction to the product.
- After the wiring of the VFD with other machine is finished, make sure that all wiring is correctly performed. Otherwise it may damage the VFD.
- Please make the wiring according to correct phase sequence. Inconsistency of the phase sequence may result in reverse rotation of the motor.
- Connect the output terminals U, V and W of the VFD to the input terminals U, V and W of the motor respectively. At this time make sure that the phase sequences of the motor terminals and VFD terminals are in consistency.
- In consideration of the service life of internal relay contact and the electrolytic capacitor, make sure that the maximum frequency for powering on and off does not exceed once every 30 minutes.
- Try best to perform running and stop of the motor according to the running/stop operation of the VFD.
- Do not try to operate damaged machine in case of acceleration of the damage. If the VFD has obvious damage or some component is lost, do not connect it or operate it.

3.5.1. Daily inspection

3.5.1.1. Routine inspection

Content of routine inspection:

- Whether screws of the control terminals are loose. Use screwdriver of proper size to fasten them.
- Whether there is poor contact at the main circuit terminals, and whether there is overheat trace at connection of cables or the copper bar and at the screws.
- Whether there is damage on the power cables and the control cables, especially if there is trace of crack and cut on the external insulation layers.
- Whether the joint of power cable and cold-compression terminals is loose, and whether (tape) at the joint is aging or falling.
- Thoroughly clean the dust at the PCBs and the wind duct. Make sure to take anti-static measures when perform cleaning.
- Before conducting insulation test to the VFD, be sure to firstly disassemble all connection wires between the VFD and the power supply and between the VFD and the motor, reliably short connect all input and output terminals of main circuit with conducting wire, then conduct earth test.
- Use qualified 500 V megger (or corresponding voltage shift position of insulation test instrument) to perform insulation test. Do not use faulty instrument; It is strictly prohibited to perform earth insulation test by connecting only one single main circuit terminal, otherwise there is risk of damaging the VFD.
- Never perform insulation test to control terminals. Otherwise it may damage the VFD. After the test BE SURE TO disassemble all the conducting wires that short connect all main circuit terminals.
- Before conducting insulation test to the motor, be sure to disconnect all conducting wires between the motor and the VFD, then individually perform test to the motor. Otherwise there is risk of damaging the VFD.
- The insulation binder Daily inspection
- The routine inspection items of NWT's VFD are shown in table 3.7. To avoid deterioration of the VFD 's function and damage to the product, please make the confirmation of the following items every day.

Table 3.7 Table of items of daily inspection

Inspection object	Main points of inspection			Judgment standard
	Content of inspection	Period	Inspection means	
Operation environment	Temperature and humidity	Any time	Point thermometer and hygrometer	The environment temperature is lower than 55°C. Otherwise the VFD should be derated. Humidity complies with requirement of the environment.
	Dust, vapor and dripping leak		Observation	No dust, trace of water leakage or dewdrop
	Gas		Observation and sniffing	No abnormal color or smell

Inspection object	Main points of inspection			Judgment standard
	Content of inspection	Period	Inspection means	
VFD	vibration	Any time	Synthetic observation	Smooth operation without vibration
	Heat radiation and heat generation		Point thermometer and synthetic observation	Fan operates normally with normal wind speed and air volume, and without abnormal heat generation.
	Noise		Listening	No abnormal noise
Motor	Vibration	Any time	Synthetic observation and listening	No abnormal vibration and noise
	Heat generation		Point thermometer	No abnormal heat generation
	Noise		Listening	No abnormal noise

Inspection object	Main points of inspection	Judgment standard	Inspection object	Main points of inspection
	Content of inspection	Period	Inspection means	
Running status parameter	Power supply input voltage	Any time	Voltmeter	In accordance with requirement of the specifications
	VFD output voltage		Rectifier type voltmeter	In accordance with requirement of the specifications
	VFD output current		Amperemeter	In accordance with requirement of the specifications
	Internal temperature		Point thermometer	Temperature rise < 40°C

3.5.2. Periodic inspection

The periodic inspection items of NWT's VFD are shown in table 3.7. Normally it is better to make a periodic inspection every 3 or 6 months. In practice, please determine actual inspection frequency in combination with application condition of the VFD and working environment. Periodic inspection helps to prevent deterioration of performance and damage of the product.

Table3.8Table of items of periodic inspection

Inspection items	Content of inspection	Measures to fault
Main circuit		
Whole body	Make inspection with megameter (between the main circuit terminals and the grounding terminals).	Take proper measures (fastening etc)
	Whether there is component decolored due to overheat or aging.	Replace the damaged component.
	Whether there is damage or deformation to component	If there is damaged place impossible to be repaired or replaced, replace the whole VFD.
	Whether there is dirt, rubbish or dust.	Confirm the door of the control cabinet contains the VFD is firmly closed. If it is difficult to make cleaning, please replace the seriously dirty part. Clean with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)
Conductor and wire	Whether wires and connection are decolored, damaged, or aged due to overheat.	Replace damaged wire.
	Whether there is breakage, crack or decoloring on the wire sheath.	
Terminal block	Whether there is fray, damage or loosening in the connecting terminals.	If screw or terminal is damaged when fastened, replace it.
Electromagnetic contactor and relay	Whether there is abnormal noise when it works.	Confirm the coil voltage respectively under two situations: the voltage exceeds or does not exceed the reference value.
	Whether there is aging or crack on the wire sheath of the coil due to overheat.	Replace damaged electromagnetic contactor, relay or PCB.
Braking resistor (optional)	Whether the insulator is decolored due to overheat.	Slight decoloring is not abnormal.
		When decoloring is detected, confirm whether there is bad wiring.
Electrolytic capacitor	Whether there is liquid leak, decoloring or crack.	If there is damaged place impossible to be repaired or replaced, replace the whole VFD.
	Whether the safety valve is exposed and whether the capacitor swells or cracks, or there is liquid leak.	
Diode and IGBT	Whether there is rubbish or dust.	Clean with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)

Motor		
Action inspection	Whether vibration and operation noise is acutely abnormal.	Stop the motor and contact specialized service personnel.
Control circuit		
Whole body	Whether there is fray, damage or improper connection at the connecting terminals.	If screw or terminal is damaged when fastened, replace it.
	Whether the screw is loose.	If it is impossible to repair or replace the terminals of the PCB, replace the VFD
PCB	Whether there is abnormal smell, decoloring, severe rust, whether the connectors are correctly installed and whether there is dust and oil mist.	Re-install connectors.
		If the PCB cannot be cleaned with anti-static cloth or dust cleaner, replace it.
		Do not apply solvent to the PCB.
		Clean rubbish and dust with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)
		If there is damaged place impossible to be repaired or replaced, replace the whole VFD.
Cooling system		
Cooling fan	Whether there is abnormal noise and vibration in the motor of the cooling fan.	Sweep or replace the cooling fan.
	Whether there is damaged or missing blade.	
Cooling fin	Whether there is rubbish and dust or dirt.	Clean rubbish and dust with dry air. (Pressure: $39.2 \times 10^4 \sim 58.8 \times 10^4$ Pa)
Ventilation vent	Whether air inlet and outlet are blocked or there is foreign body attached.	Clear obstacle and dust.
Indicator		
Keyboard panel	Whether LED indication is correct.	If there is bad situation in LED or the operation keys, contact NWT's distributors or sales offices.
	Whether the operation part is polluted.	Clean it.

3.5.3. Maintenance

3.5.3.1. Standard for replacement of component

To ensure reliable running of the VFD, besides periodic maintenance, replace the following internal components periodically: components withstanding long-term mechanical wear, all cooling fans and main circuit filter capacitor used for energy storage and exchange. For normal continuous application, make the replacement according to the following table. Please also consider the concrete situation such as application environment, load situation and VFD status etc.

Table 3.9 Service life reference of main components of the VFD

Name of component	Service time
Fan	30,000~40,000 hours
Electrolytic capacitor	40,000~50,000 hours
Relays RA-RB-RC	Approx. 100,000 times

3.5.3.2. Storage and safekeeping

After purchase of the VFD if it is not put into use immediately and has to be kept for a short time or stored for a long time, follow the following instructions:

- Store the VFD at places with temperature range specified by the standard, with no moisture, dust and metal powder but with good ventilation.
- If the VFD has not been used more than 1 year, perform charging experiment to it so as to restore the characteristics of main circuit filter capacitor inside the VFD . During charging, slowly raise the input voltage with a voltage regulator until to the rated input voltage. The switching on time should be more than 1-2 hours. The above experiment should be done at least one time a year.
- Do not perform voltage withstanding test at will. Otherwise it will reduce the service time of the VFD. For the insulation test, it is suggested to make measurement with 500 V megameter before the test. The insulation resistance should not be lower than 4MΩ.

Table 3.10 Storage environment

Environment characteristics	Requirement	Note	
Ambient temperature	-25°C ~+70°C	The temperature is < 30°C for long time storage in case of deterioration of the capacitor.	Avoid dewing and freezing environment resulted from drastic change of temperature.
Relative humidity	5~95% without condensation or dripping water	Adopt plastic film for sealing and desiccant etc.	
Storage environment	There is no direct sunshine, dust, corrosive gas, flammable gas, oil, vapor, gas, dripping water and vibration, and there is less salt.		

3.5.3.3. Measurement and judgment

When using ordinary current clamp meter to measure current, there is imbalance of current at the input side. Discrepancy within 50% is normal. If the discrepancy is 70%, notify the manufacturer for replacing the rectifier bridge, or check if the discrepancy of 3-phase voltage exceeds 5 V.

Normally avometer is used to measure 3-phase voltage. Due to the interference of carrier frequency, the readings are not accurate and can be used only for reference. The output voltage should not be higher than the valid value of voltage at the input side. If the voltage exceeds the value, it shows that the avometer is interfered and the output is not abnormal.

4. INSTALLATION AND WIRING

4.1. Installation of VFD



DANGER

- Please install the VFD on metal or other incombustible. Otherwise there is danger of fire.
- Do not place combustible nearby in case of danger of fire.
- Do not install the VFD in the environment with explosive gas. Otherwise there is danger of explosion.



CAUTION

- Please hold the bottom of the VFD during transportation. Otherwise there is danger of personal injury or damage to the VFD if the main body falls.
- The load carrying capacity of the platform should be taken into consideration during installation. Otherwise there is danger of injury or damage to the VFD if the main body falls.
- Please install the VFD in the safe place with less vibration, direct sunshine, no water splashing.
- Please guarantee the heat sink performance when doing the installation for two or more VFDs in one cabinet.
- Do not allow outside small parts, such as screw, washer or metal rod to fall inside the VFD. Otherwise there is risk of fire and damage of the VFD.

4.2. Installation environment

The installation environment is very important for bringing the performance of the VFD into full play and maintaining its functions for a long time. Please install the VFD in the environment shown in the following table.

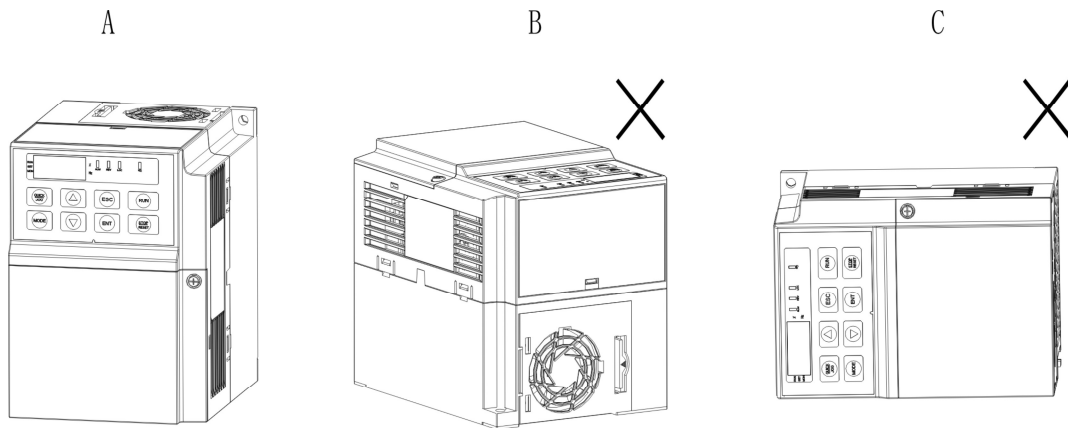
Table 4.1 Installation environment of the VFD

ENVIRONMENT	CONDITION
Installation site	Indoors
Ambient temperature	• -11kW and below: -10°C ~ +50°C • 15kW and above: -10°C ~ +40°C • To raise the reliability of the machine, please use the inverter at the place where there is no drastic change of temperature. • When the inverter is employed in such enclosed space as control cabinet, please use fan or air conditioner for cooling in case the inside temperature surpasses the ambient temperature. • Avoid freezing in the inverter.

ENVIRONMENT	CONDITION
Humidity	Below 95%RH Avoid dew in the VFD
Storage temperature	-25°C ~ +70°C
Environment	The VFD should be mounted at the following sites, where: • There is no oil mist, corrosive gas, flammable gas or dust; • It is not easy for metal powder, oil, water or other foreign substance to get inside the VFD (DO NOT mount the VFD on wood or other flammable body); • There is no radioactive material and flammable object; • There is no harmful gas and liquid; • There is little salt corrosion; • There is no direct exposure to sunshine.
Altitude	1000m or below
Vibration resistance	$\leq 5.9\text{m/s}^2$
Installation direction	BE SURE TO install the VFD in vertical direction so as not to reduce the cooling effect of the VFD.

Instruction of VFD installati on position

BE SURE TO install the VFD in vertical direction as shown in the following Figure 4.1 so as not to reduce the cooling effect of the VFD.



A — Vertical installation
Correct installation

B — Horizontal installation
Wrong installation

C — Transverse installation
Wrong installation

Figure 4.1 VFD installation direction

When installing an individual VFD, be sure to follow the installation instruction shown in Figure 4.2 in order to insure ventilation and wiring space necessary for the VFD. Please keep the back of the VFD close to the wall and mount the VFD. In this way the cooling air around the radiation fins moves freely to ensure cooling effect.

Installation space of the VFD (individual VFD)

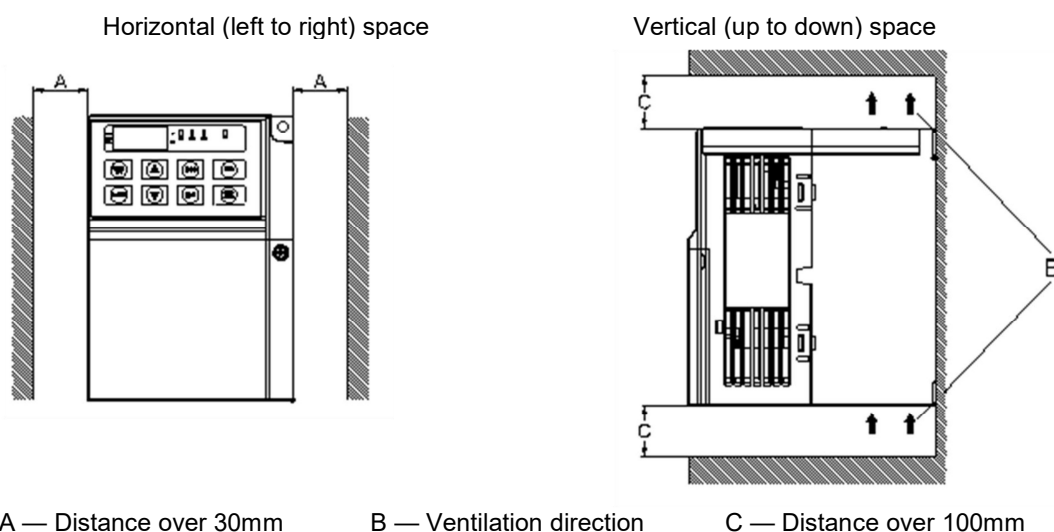


Figure 4.2 Installation interval and distance for individual VFD

For installation of more than one VFD inside the control cabinet, side-by-side installation is normally adopted. The cabinet is equipped with air inlet, air outlet and special cooling fan. See Figure 4.3.

For vertical installation, airflow guidance separators should be installed among the VFD to achieve better heat dissipation effect.

Installation space of the VFD (side-by-side)

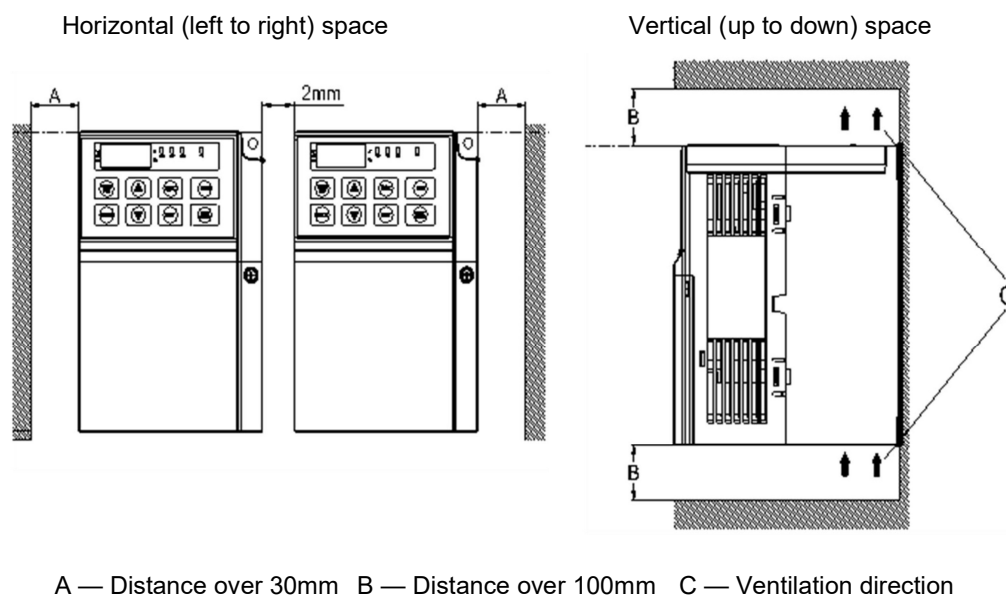


Figure 4.3 Installation interval and distance of multiple VFD

4.2.1. Installation method of VFD

- Refer to Figure 4.4 for confirmation of mounting holes on the VFD.
- Fix the upper screws of the VFD. Take care not to fasten them firmly, but to leave a space of several millimeters for the convenience of fixing the lower screws.
- Fix the lower screws and secure all the screws.

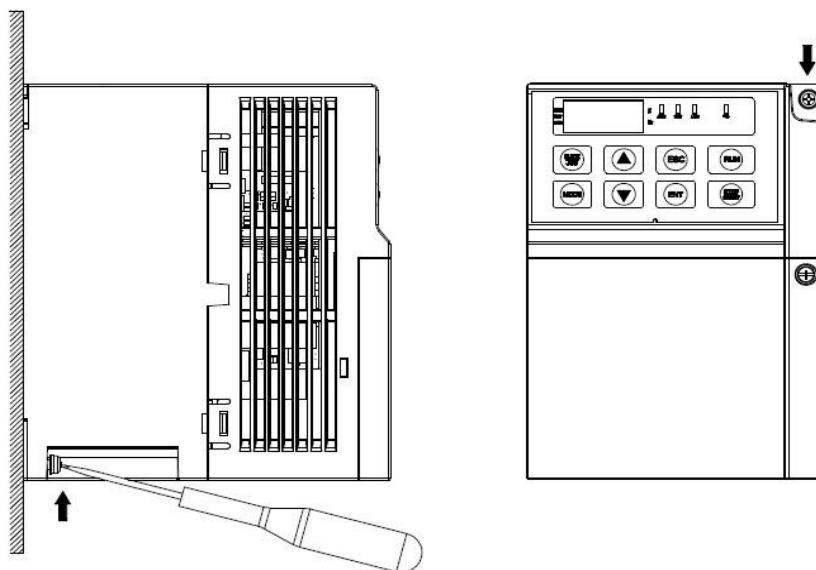


Figure 4.4 Installation method of VFD

4.2.2. Disassembly/installation of the cover

Dis-assembly of the VFD cover: Loosen screws of the cover to disassemble it. Take off the outlet board and install the input power supply and motor wire bundle as shown in Figure 4.5.

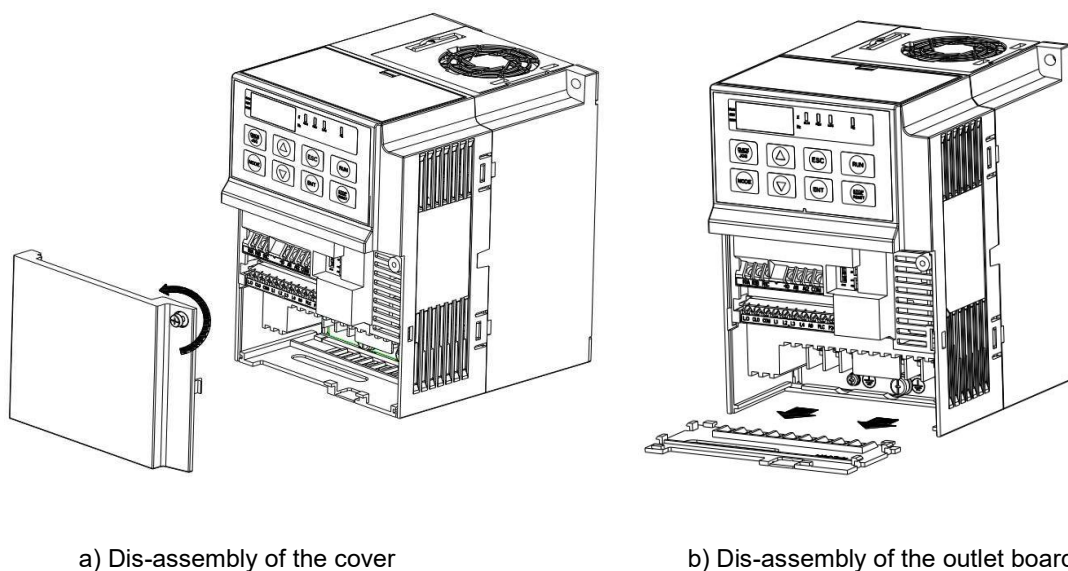


Figure 4.5 Dis-assembly of the VFD cover

Installation of the VFD cover: After finishing the wiring and confirming correct connection of all wires, put the outlet board back to its original position, close the cover and fasten the screws.

4.3. Wiring of the VFD



WARNING

- Before wiring the VFD, please confirm that input power supply is completely disconnected. Otherwise there is risk of electric shock.
- Only professional engineering personnel can perform the wiring in case of the risk of electric shock.
- The earthing terminal PE must be properly grounded in case of the risk of electric shock.
- Do not touch directly the wiring terminals with hand and never allow the output wire to contact the enclosure of the VFD. Otherwise there is risk of electric shock.
- Do not connect power supply to the output terminals U, V and W in case of damage to the VFD.

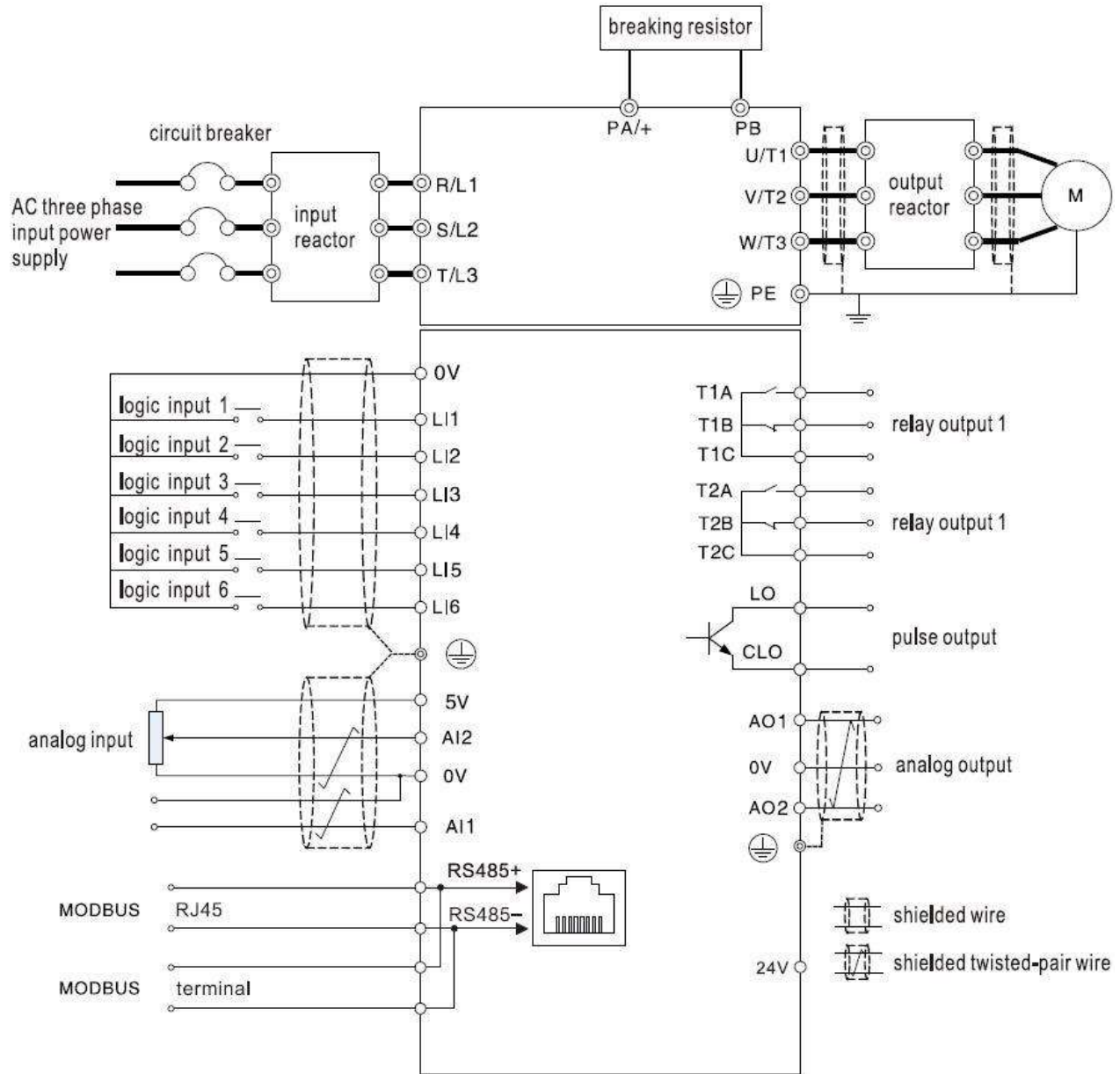


CAUTION

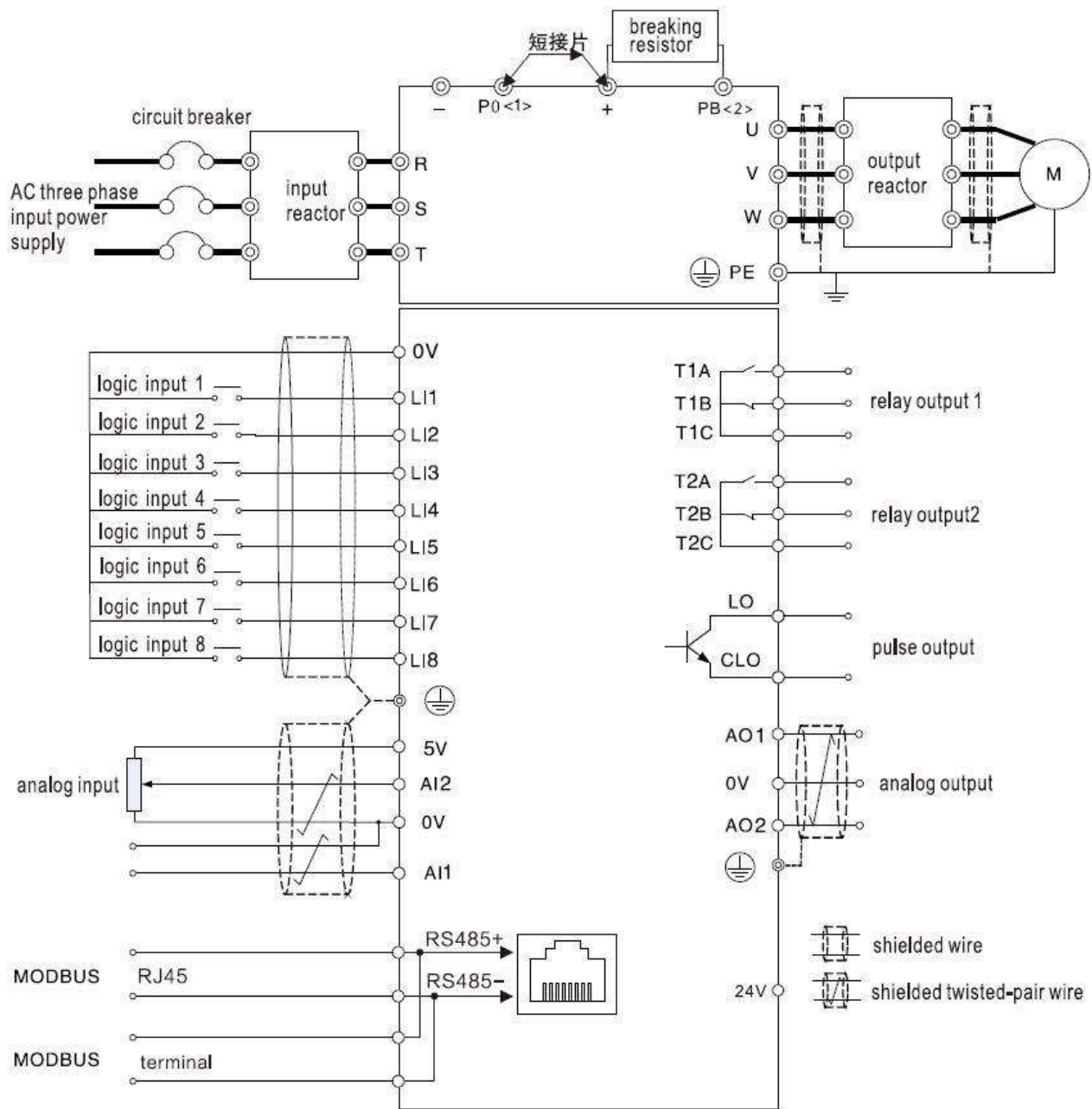
- Please confirm the voltage of the AC main circuit power supply is in conformity with the rated voltage of the VFD. Otherwise there is risk of fire and personal injury.
- Please correctly select proper cable way in according to power level or it possibly will cause the accident.
- Don't connect input power supply to output terminal U, V, W of the VFD or it will destroy the drive.
- Please notice motor rotating direction when connecting output terminal U, V, W.
- Please be sure to follow safety standard and EMC standard when wiring or it will cause the accident.
- Please correctly connect the braking resistances according to the diagram. Otherwise there is risk of fire.
- Don't connect AC 220 signal for the other control terminal except T1A-T1B-T1C or T2A-T2B-T2C or it will cause damage.

Basic operation wiring diagram

Please refer to Figure 4.6 for wiring of the VFD . Make only wiring of the main circuit to start the motor when the VFD is operated with keyboard panel.



(a) Basic wiring diagram of CT3000 FP



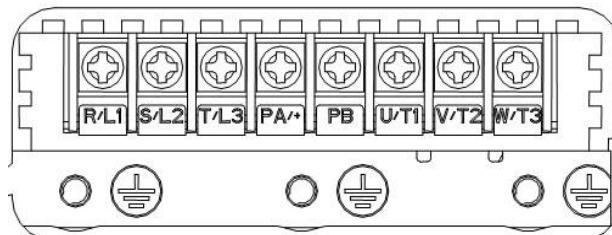
(b) Basic wiring diagram of CT3000 PRO

Figure 4.6 Basic wiring diagram of the VFD

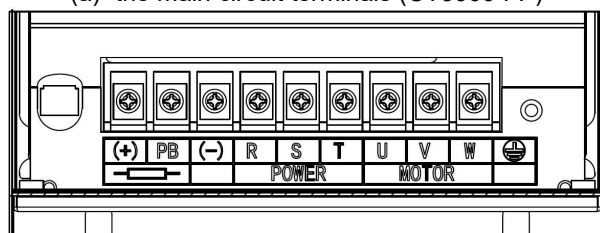
1. Input voltage signal or current signal can be selected with AI1. The type of input signal can be set by the dial switch S3 on the control board.
2. Correct connection must be followed when external braking resistor is required.
3. In the diagram, "◎" means main circuit terminal, and "○" means control terminal.

Wiring of the main circuit

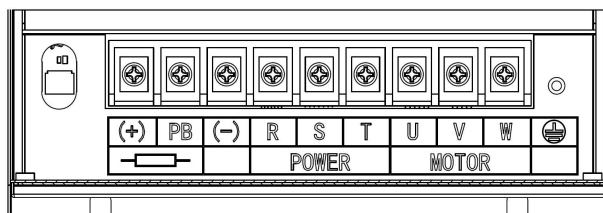
The arrangement of the main circuit terminals is shown in Figure 4.7.



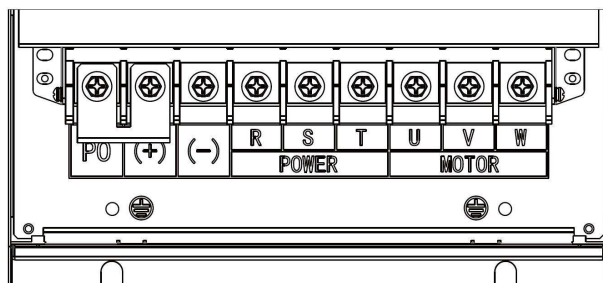
(a) the main circuit terminals (CT3000 FP)



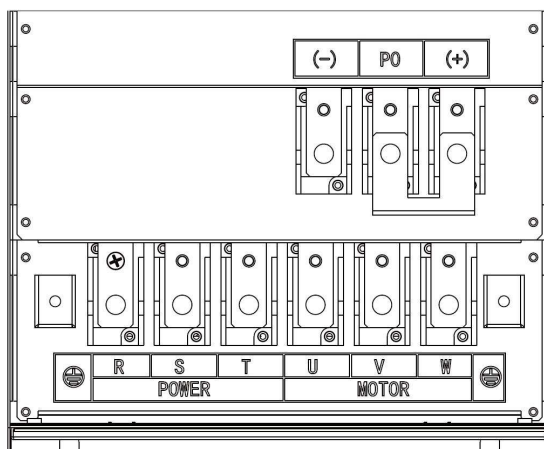
(b) the main circuit terminals (CT3000 PRO:15kW and 22kW)



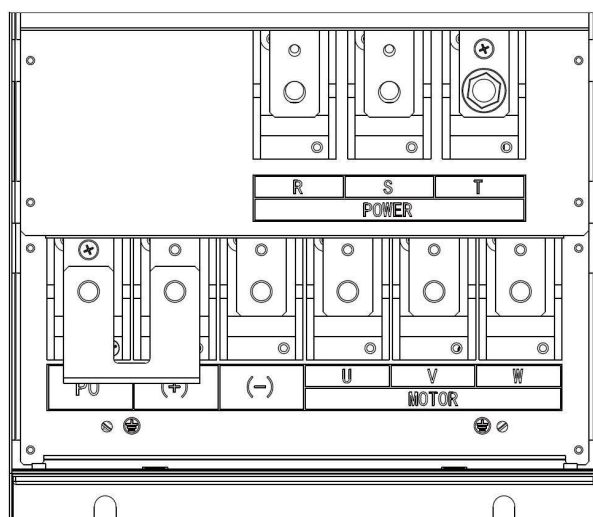
(c) the main circuit terminals (CT3000 PRO:30kW and 37kW)



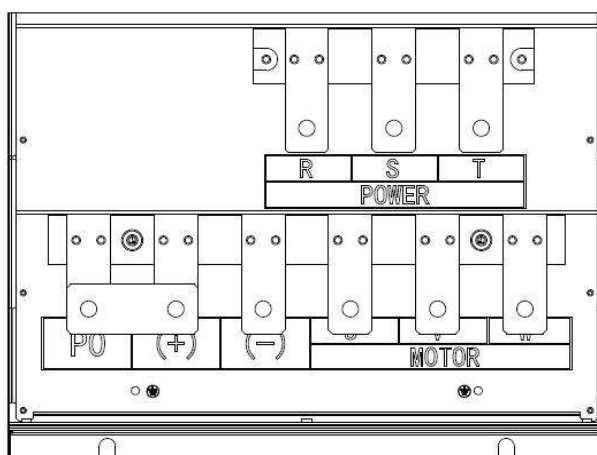
(d) the main circuit terminals (CT3000 PRO:45-55kW)



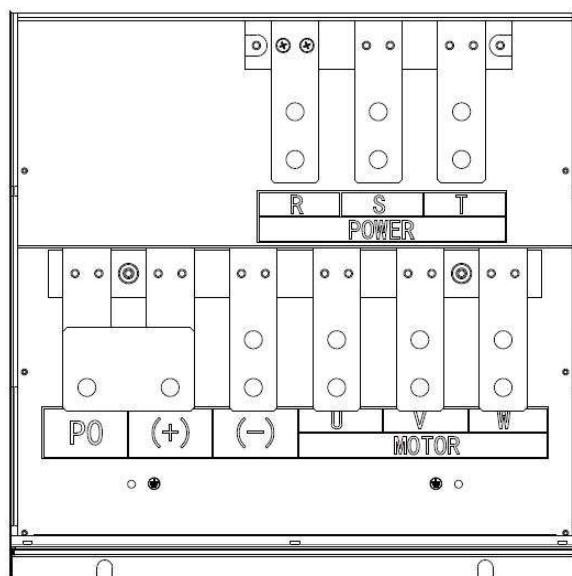
(e) the main circuit terminals (CT3000 PRO:75-110kW)



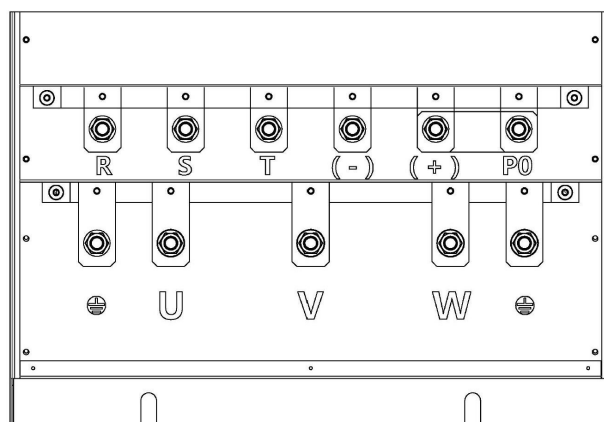
(f) the main circuit terminals (CT3000 PRO:132-160kW)



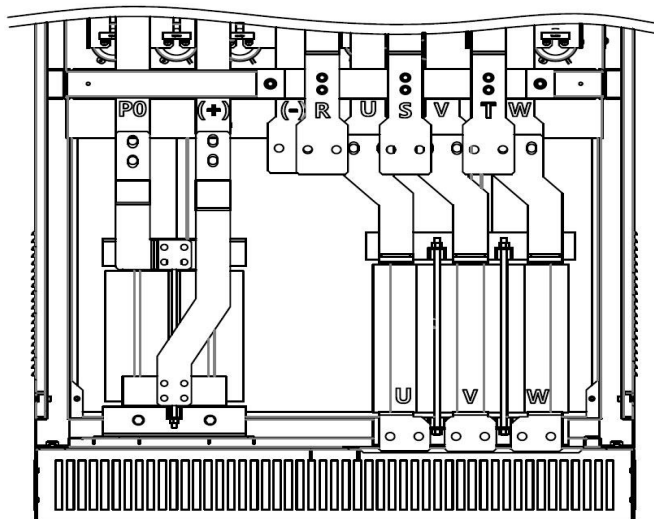
(g) the main circuit terminals (CT3000 PRO:185-220kW)



(h) the main circuit terminals (CT3000 PRO:250-315kW)



(i) the main circuit terminals (CT3000 PRO:350-500kW)



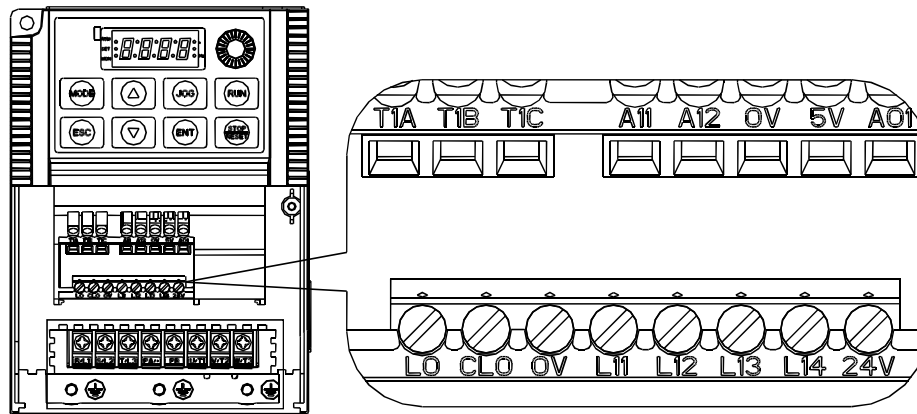
(j) the main circuit terminals (CT3000 PRO:560-800kW)

Figure 4.7 Diagram of the main circuit terminals of the VFD

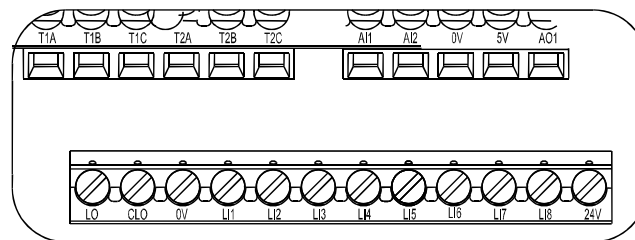
Table 4.2 Description of main circuit terminals

Code of terminal	Terminal	Function
R/L1	Power input for main circuit	3-phase, AC power input terminal, 380V, 50Hz/60Hz
S/L2		
T/L3		
U	Output of VFD	Terminal for connection to motor
V		
W		
+、-	DC bus terminal	DC bus terminal, connect to braking unit etc “+” is the positive terminal of DC bus, “-” is the negative terminal
PA/+	Connection of braking resistor	Terminal for connection to braking resistor
PB		
PA/+、+	DC power input	PA (+) is the positive terminal of DC power input, PC is the negative terminal
	Grounding	Terminal for grounding
		400V level: grounding resistance is 4Ω or below.

4.3.1. Wiring of the control circuit



(a) the control circuit terminals (CT3000 FP)



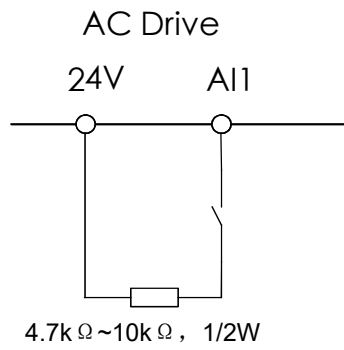
(b) the control circuit terminals (CT3000 PRO)

Figure 4.8 Diagram of the control circuit terminals of the VFD

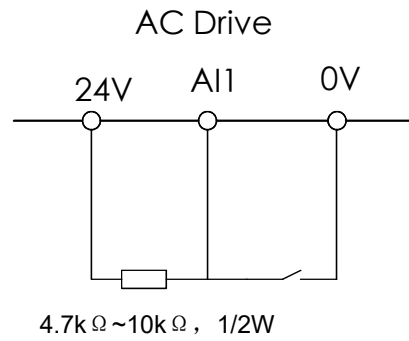
Table 4.3 Description of Control terminals function

Symbol	Item	Function
0V		public terminal of the control circuit
5V	5V output voltage	Commonly used as working voltage of the external potentiometer Maximum current:10mA accuracy:±5%
24V	24V output voltage	Commonly used as working voltage of the logic input terminal Maximum current:100mA accuracy:±20%
AI1	Voltage/Current Analog input Or programmable logic input	Multifunction programmable analog input: accuracy:10 bit Analog voltage input:0 ~ +5 V or 0 ~ +10 V Analog current input:4~20 mA changing parameter setting, the AI1 can also be used as a programmable logic input terminal. If that, a resistor (4.7kΩ~10kΩ, 1/2W) should be added between 24v-AI1; And move the AI1 dip switch to the 10V position. Shown as Figure3.8

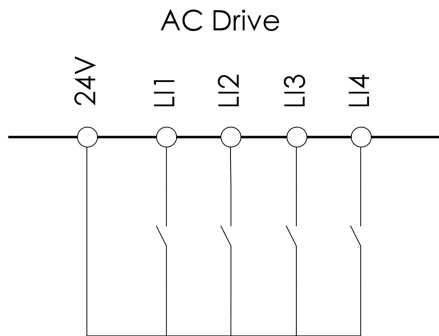
Symbol	Item	Function
AI2	Voltage Analog input Or programmable logic input	Analogy voltage input: accuracy:10 bit Maximum range: 0 ~ +10 V
		changing parameter setting, the AI2 can also be used as a programmable logic input terminal. If that, a resistor (4.7k Ω ~10k Ω , 1/2W) should be added between 24v-AI2 ; And move the VIA dip switch to the 10V position. connection method refers to AI1.
LI1~LI8	programmable logic input	+24 V Power supply
		Positive Logic(source): port voltage< 5 V, input invalid (OFF), port voltage > 11V, input invalid (ON); Negative Logic (sink): port voltage > 16 Vinous invalid OFF port voltage < 10 Vinous invalid ON;
		Logic input connection diagram refers to Figure 3.9.
AO1	Voltage/Current Analog Output1	Ana log voltage output: 0 ~ +10 V Analog voltage output: x ~ 20 mA
AO2	Voltage/Current Analog Output2	Analog voltage output: 0 ~ +10 V Analog voltage output: x ~ 20 mA
LO1	Pulse output collector1	Maximum current:100mA Maximum voltage:30V
CLO1	Pulse output emitter1	
LO2	Pulse output collector2	Maximum current:100mA Maximum voltage:30V
CLO2	Pulse output emitter2	
T1A	Relay 1--Normally open (NO) contact	Largest switching capacity: T1A-T1C:5A @ 250VAC,5A @ 30VDC T1B-T1C:3A @ 250VAC,3A @ 30VDC
T1B	Relay 1--Normally closed (NC)contact	
T1C	Relay 1--Public contacts	
T2A	Relay 2--Normally open (NO) contact	Largest switching capacity: T2A-T2C:5A @ 250VAC,5A @ 30VDC T2B-T2C:3A @ 250VAC,3A @ 30VDC
T2B	Relay 2--Normally closed (NC)contact	
T2C	Relay 2--Public contacts	
T5	RS485 communication port	4nd feet is positive port of RS485 differential signa, 5nd feet is the negative port of RS485 difference signal.



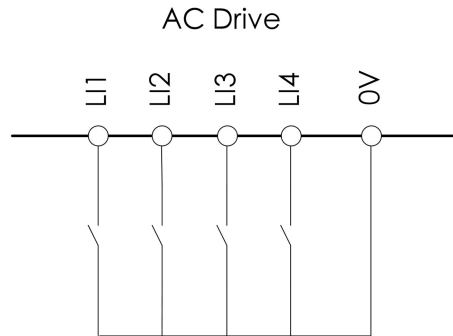
(a) Positive Logic – source



(b) Negative Logic – sink



(c) Positive Logic – source



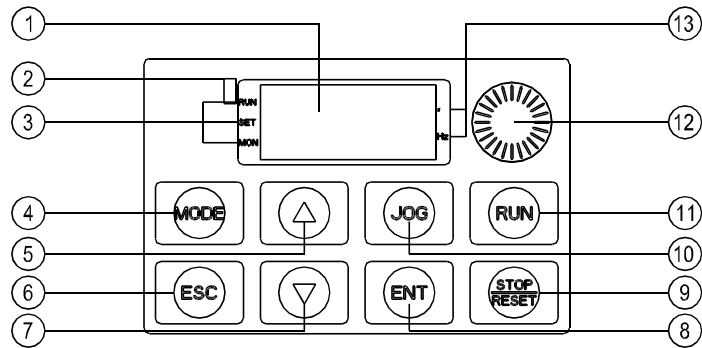
(d) Negative Logic – sink

Figure 4.8 Wiring diagram when AI1 is logic input terminal

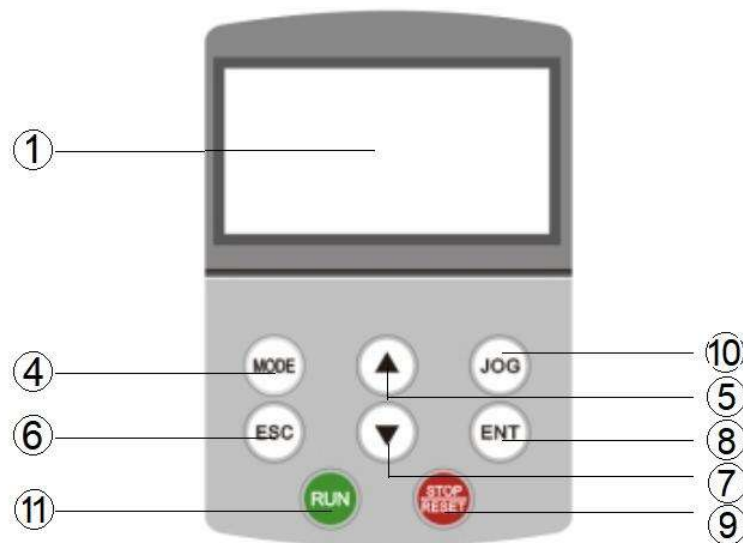
5. BASIC OPERATION AND TRIAL RUNNING

5.1. Appearance of keyboard panel

User of this series VFD can perform different operations through keyboard panel, including run/stop, display of different data, parameter value setting, fault display and reset etc. The following is description of the keyboard panel.



LED keyboard panel (CT3000 FP)



LCD keyboard panel (CT3000 PRO)

Figure 5.1 Each part of the keyboard panel

Table 5.1 Description and function of each part of the keyboard panel

No.	Item	Symbol	Function
1	Display	—	To display frequency or parameter etc using LCD or LED.
2	Charging indication lamp	CHARGE	On – there is residual voltage in the VFD DC bus Off – there is no residual voltage in the VFD DC bus
3	Mode indication lamp	RUN	On – VFD 's operation demands and frequency instructions are all effective Flashing – VFD 's operation demands are effective, but frequency instructions are ineffective Off – there are no operation demands in VFD
		SET	On – parameter setting mode Flashing – parameter setting mode, or shortcut menu. Off – parameter setting mode, or other modes except parameter verification mode
		MON	On – state monitoring mode Flashing – in the process of fault record retrieving Off – non state monitoring mode
4	MODE key	MODE	To select keyboard display mode or return to MODE from submenu
5	UP key	▲	To increase parameter number or parameter set value
6	ESCAPE key	ESC	To return to the previous state before the pressing of the ENT key
7	DOWN key	▼	To reduce parameter number or parameter set value
8	ENTER key	ENT	Press the key to display or confirm different modes, parameters or set values
9	STOP key	STOP	Press the key to stop the VFD. The key becomes a RESET key when fault is discovered
10	JOG key	JOG	Default is shortcut menu 3. See parameter <i>F 700</i> for Settings
11	RUN key	RUN	To run the VFD
12	Speed control knob	-----	To adjust speed
13	UNIT indication lamp	%	On – Unit of the displayed number is percentage
		Hz	On – unit of the displayed number is Hz

5.2. Basic operation of panel

5.2.1. Running model selection

CT3000 VFD include four running models: Powering-on default mode、Parameter setting mode、Status monitoring mode and Parameter verifying mode. Any mode can be realized by the MODE Key, showed as Figure 5.2:

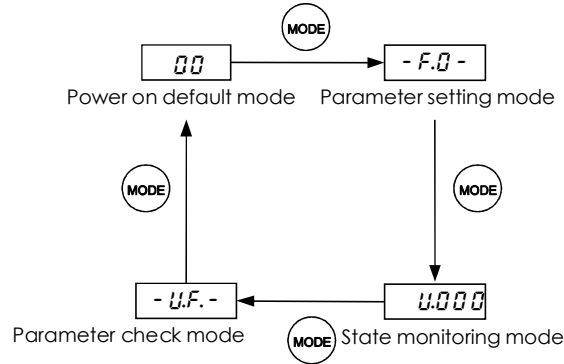


Figure 5.2 Structure of VFD Mode switch

<1>: when F618=1, show parameter setting mode

5.2.2. Powering-on default mode

The display data is the current output frequency under Powering-on default mode, so directly use ▲ or ▼ key to modify the digital frequency setting, then press the ENT key to save the modified data and return Powering-on default mode, or press the ESC key to give up the modification and return the Powering-on default mode. As showed as Figure 5.3

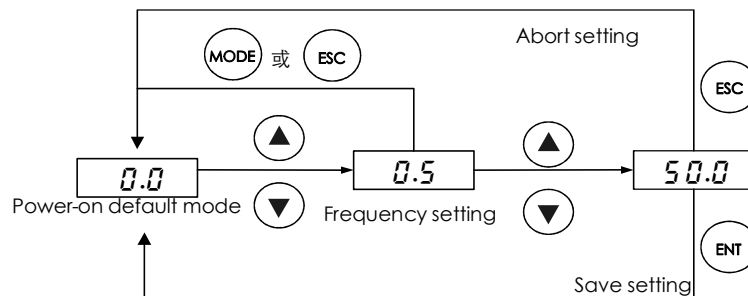


Figure 5.3 Powering-on default mode Navigation

Here the display data type can be set freely under the Powering-on default mode, showed in the parameter *F610*

5.2.3. Parameter setting Mode

There are 10 groups function parameters from *F0* group to *F9* group, each group includes different numbers function parameter. The Parameter setting value can be modified by ▲ or ▼ key and ENT key, or give up the modification by ESC key, as showed as Figure 5.4

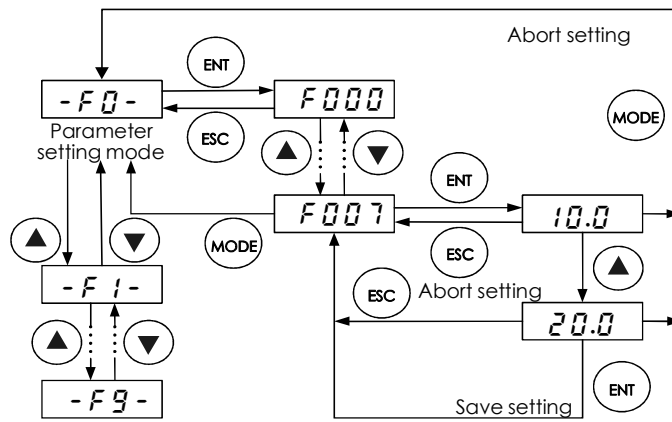


Figure 5.4 Parameter Setting Mode navigation

5.2.4. Status monitoring mode

The status monitoring mode can be used to monitor the current running status of VFD , or check the fault record, the operation shows as the Figure 5.5

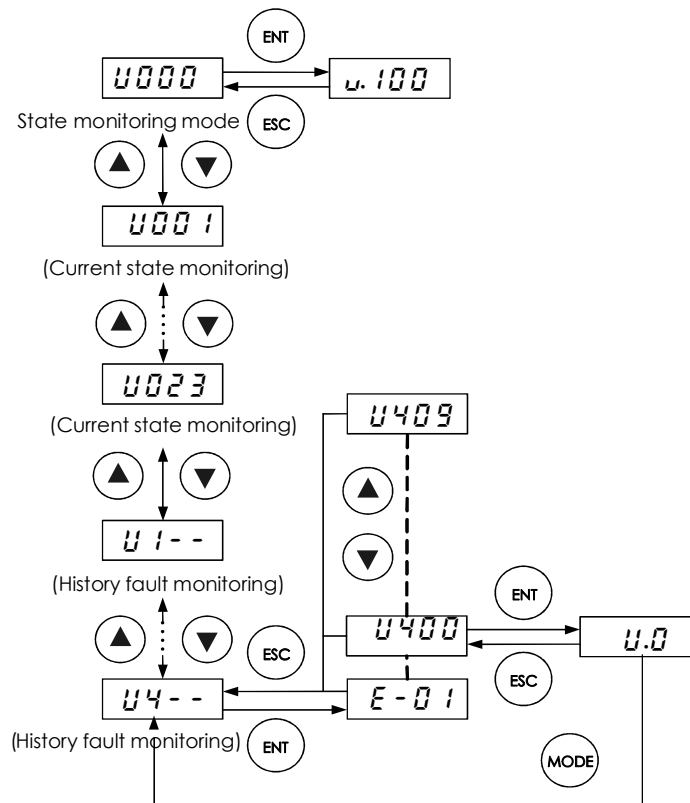


Figure 5.5. State monitoring mode navigation

Here: Monitoring parameter only can be used to check, cannot be modified or set.

5.2.5. Parameter verifying mode

When $F518=1$, use MODE key to switch to parameter calibration mode. Under this mode, we can see all different parameters from the default value. The setup method for these parameters is the same to other parameter setup way. Please see figure 5.6.

Remarks: no other display only "-UF-" when pressing the ENT key without change to any parameter

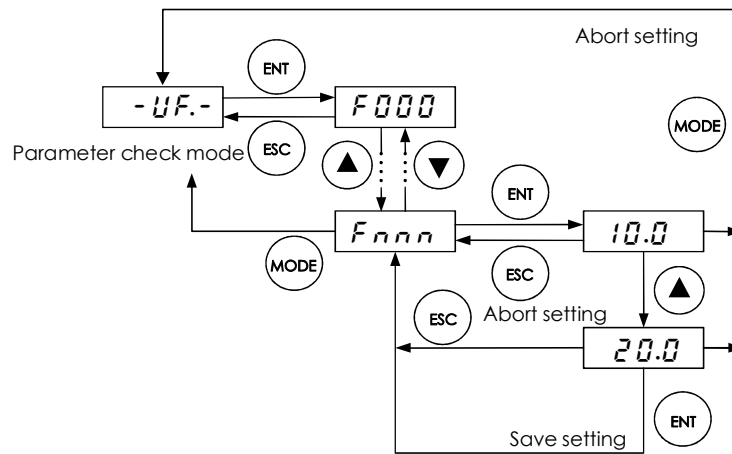


Figure 5.6 Parameter verifying mode navigation

5.2.6. JOG

Under the powering-on mode, when $F700=1$, press the Jog key then enter the Jog state. Jog represents forward jog and -jog represents reverse jog. Switch between forward/reverse jog can be realized through UP/DOWN keys on the keyboard panel.

5.3. Power on and confirmation of display status

Before switching on the VFD, please do confirm the following items.

Table 5.2 Items to be confirmed prior to switching on the VFD

Item	Description
Confirmation of input power supply voltage	Please confirm if the power supply is correctly connected (3-phase, 380VAC ~ 480VAC, 50/60 Hz) Please confirm if the power supply input terminals R/L1, S/L2 and T/L3 are properly connected. Please confirm whether the VFD and the motor are correctly grounded.
Confirmation of connection of VFD main circuit output terminals with motor	Please confirm the output terminals of the VFD U, V and W are reliably connected with the 3-phase input terminals of the motor.
Confirmation of the connection of the VFD control circuit terminals	Please confirm the control circuit terminals of the VFD are reliably connected with other control devices.
Confirmation of the state of the VFD control terminals	Please confirm that all control circuit terminals are in the state OFF (The VFD does not run when powered on).
Confirmation of the state of the load	Please confirm the condition of the motor load (namely the status of connection with mechanical system).

After the VFD is switched on, the keyboard panel enters into Powering-on mode. The displayed value type at Powering-on mode is determined by the setting value of parameter $F510$.

5.3.1. Local control mode

CT3000 series VFD provide two control modes: local and remote. The mode is set with parameter $F501$.

At local control mode, both the command source and frequency setting source of the VFD are set through the keyboard panel:

1. Command source is given through RUN and STOP keys in order to run or stop the motor.
2. Frequency is given by UP and DOWN keys. Under Powering-on mode, directly press UP key to increase given frequency or DOWN key to reduce given frequency.

Motor rotation direction: Press down the ENT key, then press UP key to set the motor rotation direction as FORWARD; Press down the ENT key, then press DOWN key to set the motor rotation direction as REVERSE. Parameter *F 5 2 2* is used to limit the ability of the motor to rotate only in a single direction.

Fault reset: When fault occurs in the VFD, the keyboard panel displays the fault code under Powering-on mode. At this time press the STOP key and the keyboard panel displays *R - 0 0*. Then press the STOP key again to finish fault reset function. Please see parameter *F 6 0 0*.

Note 1: During the reverse rotation of the motor or when there is instruction of reverse rotation, the function indication lamp REV on the keyboard panel is on.

Note 2: Under local control mode, the function indication lamp LOC on the keyboard panel is on.

4.3.2 Remote control mode

Under remote control mode, the command source and frequency setting source of the VFD are set through parameters *F 0 0 2* and *F 0 0 3* respectively. The command source and frequency setting source can be combined in any way. For example, when *F 0 0 2* = 1, *F 0 0 3* = 3, the control effect of the inveter is the same as under the local control mode.

Example 1: Two-wire control running

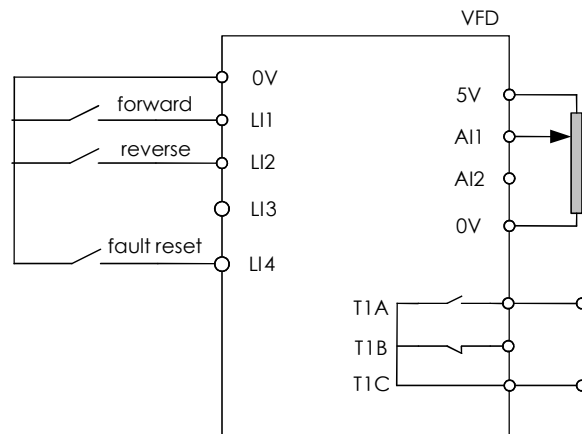


Figure 5.7 Example of wiring for two-wire control running

Table 5.3 Parameter configuration of two-wire control running

Code	Parameter	Set Value	Set Value
<i>F 0 0 2</i>	Selection of run command	0	0
<i>F 0 0 3</i>	Selection of frequency command selection	1	1
<i>F 3 0 0</i>	AI1 input function (analog or logic selection)	0	0
<i>F 3 0 1</i>	L1 logic input function	2	2
<i>F 3 0 2</i>	L2 logic input function	3	3
<i>F 3 0 3</i>	L3 logic input function	30	10
<i>F 3 0 5</i>	Logic input mode setting	0	0

<i>F 306</i>	Logic input type selection	1	1
<i>F 309</i>	Forced- effective Logic input function selection	1	1
<i>F 310</i>	Forced- effective Logic input function selection 2	0	0
<i>F 522</i>	Prohibit motor reverse	0	0
<i>F 523</i>	Motor stop type	0	2

Note: When two-wire control is applied, logic input function 30 must be disabled.

Example 2: Three-wire control running (Negative logic)

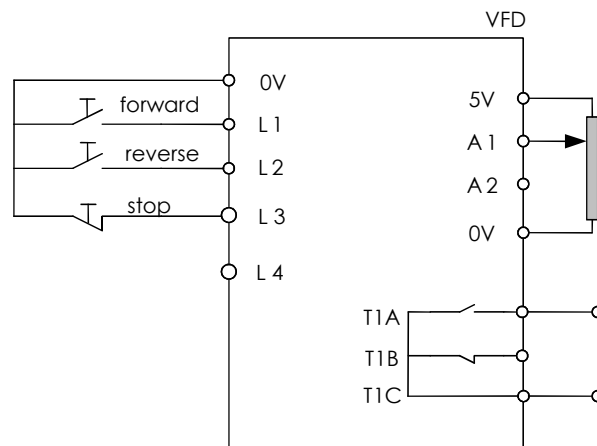


Figure 5.8 Example of wiring for three-wire control running

Table 5.4 Parameter configuration of 3-wire control running

Code	Parameter	Set Value	Set Value
<i>F002</i>	Selection of run command	0	0
<i>F003</i>	Selection of frequency command selection	1	1
<i>F300</i>	A11 input function (analog or logic selection)	0	0
<i>F301</i>	L1 logic input function	2	2
<i>F302</i>	L2 logic input function	3	3
<i>F303</i>	L3 logic input function	30	30
<i>F305</i>	Logic input mode setting	0	0
<i>F306</i>	Logic input type selection	1	1
<i>F309</i>	Forced- effective Logic input function selection	1	1
<i>F310</i>	Forced- effective Logic input function selection 2	0	0
<i>F522</i>	Prohibit motor reverse	0	0
<i>F523</i>	Motor stop type	0	3

Example 3: Three-wire control running (Negative logic, motor stops freely)

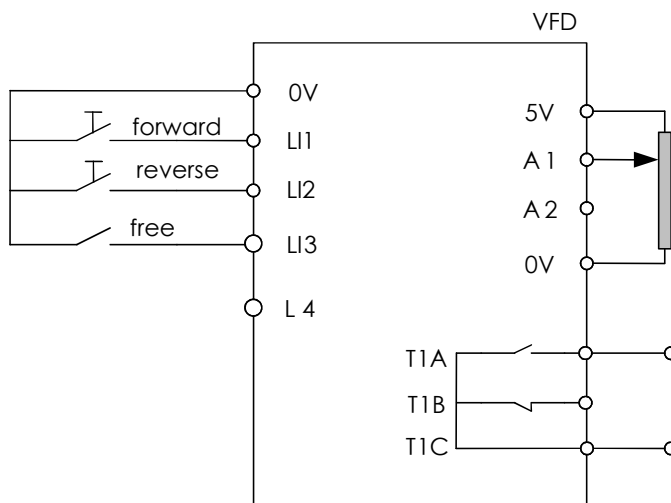


Figure 5.9 Example of wiring for 4-20mA control running

Table 5.5 Parameter configuration of Three-wire control running (Negative logic, Free stop)

Code	Parameter	Set Value
<i>F002</i>	Selection of run command	0
<i>F003</i>	Selection of frequency command selection	1
<i>F300</i>	AI1 input function (analog or logic selection)	0
<i>F301</i>	L1 logic input function	2
<i>F302</i>	L2 logic input function	3
<i>F303</i>	L3 logic input function	34
<i>F305</i>	Logic input mode setting	0
<i>F306</i>	Logic input type selection	1
<i>F309</i>	Forced- effective Logic input function selection	1
<i>F310</i>	Forced- effective Logic input function selection 2	30
<i>F522</i>	Prohibit motor reverse	0

Example 4: UP/DOWN acceleration and deceleration(Negative logic)

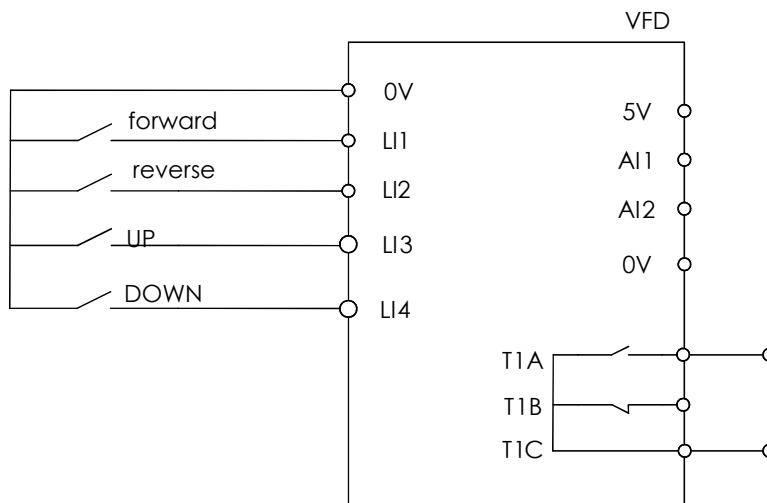


Figure 5.10 Example of wiring for three-wire control running

Table 5.6 Parameter configuration of UP/DOWN acceleration and deceleration(Negative logic)

Code	Parameter	Set Value
<i>F002</i>	Selection of run command	0
<i>F003</i>	Selection of frequency command selection	5
<i>F301</i>	L1 logic input function	2
<i>F302</i>	L2 logic input function	3
<i>F303</i>	L3 logic input function	23
<i>F304</i>	L4 logic input function	24
<i>F306</i>	Logic input type selection	1
<i>F309</i>	Forced- effective Logic input function selection	1
<i>F310</i>	Forced- effective Logic input function selection 2	0
<i>F522</i>	Prohibit motor reverse	0

Example 5: Multistep speed control running (Negative logic)

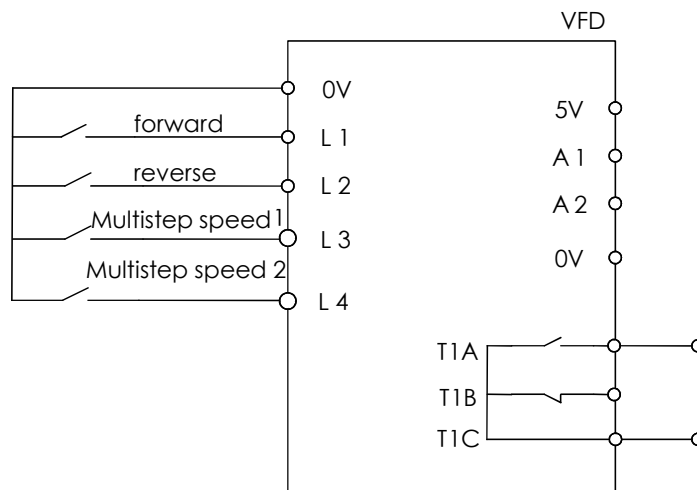


Figure 5.11 Example of wiring for multistep speed control running

Table 5.7 Parameter configuration of multistep speed control running

Code	Parameter	Set Value
<i>F002</i>	Selection of run command	0
<i>F003</i>	Selection of frequency command selection	5
<i>F301</i>	L1 logic input function	2
<i>F302</i>	L2 logic input function	3
<i>F303</i>	L3 logic input function	23
<i>F304</i>	L4 logic input function	24
<i>F306</i>	Logic input type selection	1
<i>F309</i>	Forced- effective Logic input function selection	1
<i>F310</i>	Forced- effective Logic input function selection 2	0
<i>F522</i>	Prohibit motor reverse	0
<i>F000</i>	VFD frequency digital setting	Equal to multistep speed 0
<i>F716</i>	Multistep speed 1	Multistep speed 1
<i>F717</i>	Multistep speed 2	Multistep speed 2
<i>F718</i>	Multistep speed 3	Multistep speed 3

Remarks: *F000* setup method-power on to display 0.0 and then directly press Up & Down key to *F000*. Then press ENT to save the set.

Example 6: JOG control

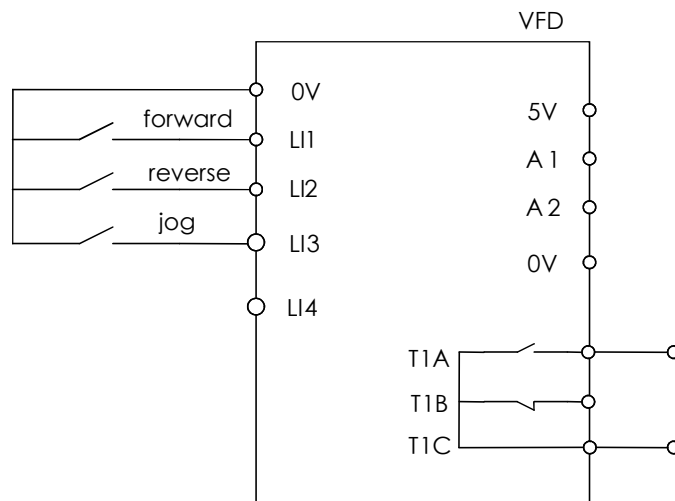


Figure 5.12 Example of wiring for JOG control

Table 5.8 Parameter configuration of JOG control (Negative logic)

Code	Parameter	Set Value
<i>F002</i>	Selection of run command	0
<i>F301</i>	L1 logic input function	2
<i>F302</i>	L2 logic input function	3
<i>F303</i>	L3 logic input function	4
<i>F306</i>	Logic input type selection	1
<i>F309</i>	Forced- effective Logic input function selection	1
<i>F310</i>	Forced- effective Logic input function selection 2	0
<i>F522</i>	Prohibit motor reverse	0
<i>F701</i>	Jog frequency	Set by yourself
<i>F702</i>	Jogging stop mode	Set by yourself

6. DETAILED PARAMETER DESCRIPTION

6.1. Basic parameter group

NO.	Parameter Name	Setting Range	Default
<i>F000</i>	Operation frequency of keypad	<i>F009~F008</i>	0.0

When power on, the VFD displays the operation frequency (when operation stopped, “0.0” is displayed, see *F510*). Then press the ▲ key or the ▼ key to change the operation frequency (even during operation).

Press ▲ move the frequency up. Press ▼ move the frequency down, Press the ENT key to save the operation frequency *F000*, and the set frequency are displayed alternately.

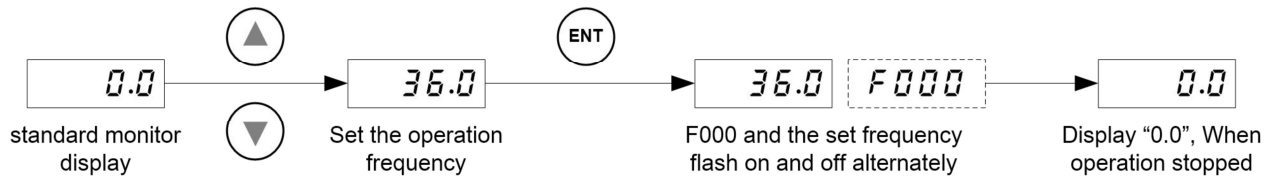


Figure 6.1 Procedure of setting *F000*

Note1: when set *F003*=3, *F000* is effective as the frequency command.

Note2: Pressing the ▲key or the ▼ key will change the operation frequency even during operation.

NO.	Parameter Name	Setting Range	Default
<i>F001</i>	V/f control mode selection	0~3	0

0: V/f constant. When one single VFD is required to drive more than one motor, please select V/f control mode if motor automatic tuning can not be correctly performed or there is no other access to acquire parameters of controlled motor. To increase the torque further, increase the setting value of the manual torque boost.

1: Variable torque. This is appropriate for load characteristics of such things as fans, pumps and blowers in which the torque in relation to load rotation speed is proportional to its square.

2: Sensor-less vector control. Using sensor-less vector control with a standard motor will provide the highest torque at the low speed ranges.

(1) Provides large starting torque.

(2) Effective when stable operation is required to move smoothly up from the low speeds.

(3) Effective in elimination of load fluctuations caused by motor slippage.

3: Energy saving mode. Energy can be saved in all speed areas by detecting load current and flowing the optimum current that fits the load.

Note: To use vector control and automatic energy saving, motor constant setting (motor tuning) is required.

NO.	Parameter Name	Setting Range	Default
<i>F002</i>	Command mode selection 1	0~2	1

0: Terminal board. ON and OFF of an external signal Runs and stops operation.

1: Keypad. Press the <RUN> and <STOP> keys on the keypad to start and stop.

2: Serial communication. Run and stop through serial communication.

Note: When under local control (*F501*=0), *F002* setting is ignored, Keypad is always effective.

NO.	Parameter Name	Setting Range	Default
<i>F003</i>	Frequency setting mode selection 1	0~8	3

0: Built-in potentiometer.

1: AI1 input. Frequency command is set by means of a signal from an external input device (AI1 terminal: 0-5V, 0-10Vdc or 4-20mAdc).

2: AI2 input. An external signal (AI2 terminal: 0-10Vdc) is used to specify a frequency command.

3: Keypad (*F000*). Press the <▲> key or the <▼> key on either the keypad or the expansion panel (optional) to set frequency.

4: Serial communication. Frequency command is set by commands from an external control unit.

5: UP/DOWN setting from external contact. Terminals are used to specify an up/down frequency command.

6: AI1+AI2.

7: PID setting of keypad.

8: Simple PLC running option

Note 1: When under local control (*F501*=0), *F003* setting is ignored, and *F000* is always effective.

Note 2: In the case when there is no valid frequency command (e.g, frequency command is under starting frequency setting *F503*), the motor does not run even if the VFD receives the run command. At this time the RUN led on the keypad blinks.

Note 3: When *F003* = 7, use *F830* or f916 as the main PID setting.

NO.	Parameter Name	Setting Range	Default
<i>F004</i>	Command mode selection 2	0~2	0

Setting method is the same as *F002*.

Note: Switching operation between *F002* and *F004* can be set input terminal function 67 (or 68) beforehand to an input contact terminal. When switching the terminal operation mode to panel operation mode:

If *F502* = 1, the motor will keep the running status before switch operation.

If *F502* = 0, the motor stops regardless the running status before the switch operation.

NO.	Parameter Name	Setting Range	Default
<i>F005</i>	Frequency setting mode selection 2	0~8	2

Setting method is the same as *F003*.

Note: About switching between *F003* and *F005* operation, see *F006*.

NO.	Parameter Name	Setting Range	Default
<i>F006</i>	Frequency priority selection	0~3	0

0: Switch between *F003* and *F005*

When *F006* =0, switch between two frequency /PID given source *F003* or *F005* with a logical input;

1: Switch is disabled

When *F006* =1, the switch is disabled

At this point, if $F021=0$, take $F003$ as the frequency /PID given channel; otherwise, determine the frequency /PID given source according to the setting of $F021$

2: Switch between $F003$ and $F021$ selected frequency /PID source

When $F021=0$, frequency /PID given source is determined by $F003$.

When $F021 \neq 0$, switch between $F003$ and the given source of $F021$ selected frequency /PID with a logical input

3: Switch between $F005$ and $F021$ selected frequency /PID source

When $F021=0$, frequency /PID given source is determined by $F003$.

When $F021 \neq 0$, switch between $F005$ and the given source of $F021$'s selected frequency /PID with a logical input

Note: To use this feature, a logical input must be defined as function 20, given the frequency /PID source switch

When the defined logic input is OFF, the frequency /PID given source is determined by $F003$

When the defined logical input is ON, the u.f.d. determines the frequency /PID given source by $F005$ or $F021$

NO.	Parameter Name	Setting Range	Default
$F007$	Maximum frequency	30.0 ~ 400.0 Hz	50.0
$F008$	Upper limit frequency	0.5 Hz ~ $F007$	50.0
$F009$	Lower limit frequency	0.0 Hz ~ $F008$	0.0

$F007$ sets the range of frequencies output by the VFD (maximum output values). This frequency is used as the reference for acceleration/deceleration time.

$F008$ and $F009$ set the upper and lower limit frequency that determines motor rotation speed range.

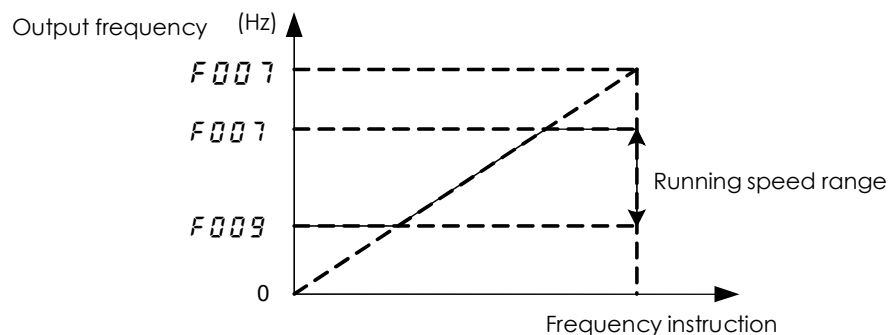


Figure 6.2 Relation of $F007$, $F008$, $F009$ and running speed

Note1: Set $F007$, $F008$, $F009$ carefully. The motor output frequency is affected not only by these three parameters, but also by start frequency, DC braking initial frequency and skip frequency.

Note 2: The following condition must be true when setting up these parameters: $F009 \leq F008 \leq F007$.

NO.	Parameter Name	Setting Range	Default
$F010$	Acceleration time 1	0.0 ~ 3200 s	varies by model
$F011$	Deceleration time 1	0.0 ~ 3200 s	varies by model

$F010$ sets the time that it takes for the VFD output frequency to go from 0Hz to maximum frequency $F007$.

F011 programs the time that it takes for the VFD output frequency to get from maximum frequency *F007* to 0Hz.

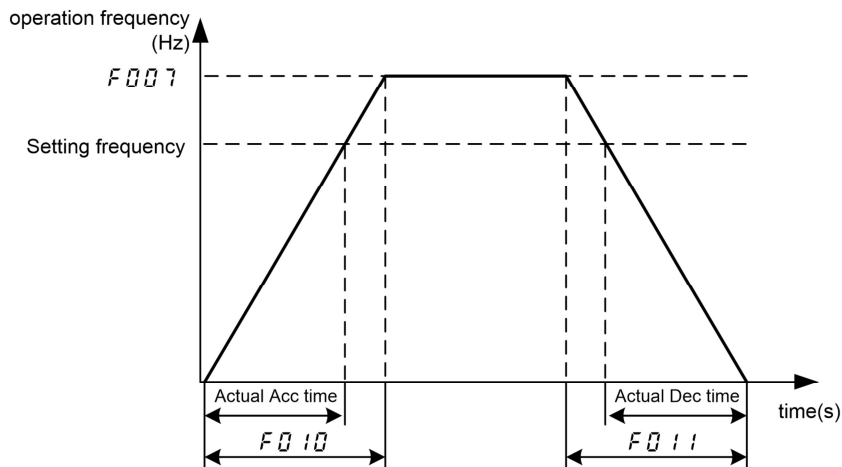


Figure 6.3 Definition of acceleration/deceleration time

When the acceleration/deceleration time is set at 0.0 seconds, the VFD speed increases or reduces within 0.1 seconds.

If the programmed value is shorter than the optimum acceleration/deceleration time determined by load conditions, overcurrent stall or overvoltage stall function may make the acceleration/deceleration time longer than the programmed time. If an even shorter acceleration/deceleration time is setted, there may be an over current trip or overvoltage trip for VFD protection.

Note: See *F518*, *F520*, *F519* and *F521*.

NO.	Parameter Name	Setting Range	Default
<i>F012</i>	PWM carrier frequency	1.5 ~ 12.0 kHz	varies by model

Increase of the switching frequency may reduce the magnetic noise of the motor. However, enhancement of switching frequency will increase heat dissipation. In the event of increase of switching frequency, the capacity of the *u.F.d.* may require corresponding derating. Normally it is unnecessary to change the parameter because we have done the reasonable setup when ex-factory.

PWM carrier frequency	motor's magnetic noise	Leakage Current	Inverter heat dissipation
2kHz	increase	decrease	decrease
4kHz	↑	↑	↑
12kHz	decrease	increase	increase

Figure 6.4 Impact on VFD performance by changing carrier frequency

Table 6.1 default carrier frequency value of different model capacity

Model	Max. of F300 (kHz)	Min. of F300 (kHz)	default of F300 (kHz)
0.4 ~ 11 kW	12.0	1.5	4.0
15 ~ 30 kW	8.0	1.5	4.0
37 ~ 500 kW	4.0	1.5	4.0

Note: Although the electromagnetic noise level is reduced, the motor acoustic noise may be increased.

NO.	Parameter Name	Setting Range	Default
F013	Carrier frequency control mode selection	0~1	1

0: Carrier frequency not reduced automatically

1: Carrier frequency reduced automatically.

Reduction of rated current will be required if the PWM carrier frequency is set high.

When the PWM carrier frequency is set high, selecting “Carrier frequency not reduced automatically” may causes the VFD to be tripped (overheat) more easily than selecting “Carrier frequency reduced automatically “.

Switching frequency level will be automatically controlled in case of overheat trip in the VFD. If the VFD detects upcoming overheat fault, it will lower the switching frequency to reduce the heat dissipation from the drive. With the temperature tending to normal, the switching frequency will return to the level selected by **F012**.

NO.	Parameter Name	Setting Range	Default
F014	Random PWM mode	0~1	0

0: Disable.

1: Enable. The random mode reduces motor electromagnetic noise by changing the PWM pattern.

NO.	Parameter Name	Setting Range	Default
F015	Automatic acceleration/deceleration	0~2	0

0: Disabled (manual).

1: Automatic (at acceleration & deceleration)

2: Automatic (only at acceleration)

Adjusts the acceleration/deceleration time automatically within the range of 1/8 to 8 times as long as the time set with the (**F010** or **F011**), depending on the current rating of the VFD.

When automatically setting acceleration/deceleration time, always change the acceleration /deceleration time so that it conforms to the load. The acceleration/deceleration time changes constantly with load fluctuations. For VFD that requires a fixed acceleration/deceleration time, use the manual settings (**F010** and **F011**), and set **F015** = 0.

Setting acceleration/deceleration time (**F010** and **F011**) in conformance with mean load allows optimum setting that conforms to further changes in load.

Use this parameter after actually connecting the motor.

When the VFD is used with a load that fluctuates considerably, it may fail to adjust the acceleration or deceleration time in time, and therefore may be tripped.

Note: Manual acceleration and deceleration time may still be restrained by motor current amplitude limit (See *F 10 7*) and overvoltage fault protection (See *F 4 15*) and overvoltage fault operation level. function (See *F 4 16*).

NO.	Parameter Name	Setting Range	Default
<i>F 0 16</i>	Factory reserved		

NO.	Parameter Name	Setting Range	Default
<i>F 0 17</i>	Parameter setting macro function	0~19	0

0: Default value.

1: 2-wire control (Negative logic mode, ramp stop).

2: 3-wire control (Negative logic mode, ramp stop).

3: External input UP/DOWN setting (Negative logic mode, slowdown stop).

4 ~ 16: Factory reserved

17: PID sleep & Wake Control (*F 0 0 3* =7 *F 9 1 0* =0.1s *F 9 1 1* =75.0% *F 9 1 5* =5.0s *F 9 1 9* =38.0Hz)

18: PID basic control (*F 0 0 2* =1 *F 0 0 3* =7 *F 3 6 7* =1 *F 5 2 3* =2 *F 9 0 0* =1 *F 9 1 7* =100 *F 9 1 8* =20)

19: Factory reserved

Note 1: All the setup is available only under remote control mode (*F 6 0 1* =1) or it cannot recover to the default value even you setup *F 0 1 7* =0. After setting *F 6 0 1* =1, *F 0 1 7* will recover to 0. If we request 2-wire control mode, we just set *F 0 1 7* =1 and confirm the VFD is under remote control mode.

Note 2: Negative logic means the common point of all input terminal is connected to "0V" terminal on VFD, while positive logic mode connected to "24V" terminal, see *F 3 0 6*.

Note 3: 1ST LED Display on the left is the value for *F 0 1 7* last setting

NO.	Parameter Name	Setting Range	Default
<i>F 0 18</i>	Factory reserved		
<i>F 0 20</i>	Factory reserved		

NO.	Parameter Name	Setting Range	Default
<i>F 0 2 1</i>	Primary and secondary frequencies /PID are given	0 ~ 4	0

0: Single channel given

When *F 0 0 6* =0, switch between two frequency /PID given source *F 0 0 3* or *F 0 0 5* with a logical input;

When *F 0 0 6* ≠0, frequency /PID given source is determined by *F 0 0 3*.

1: *F 0 0 3* + *F 0 0 5*

When *F 0 0 6* =0/1, take the sum of frequency /PID given by *F 0 0 3* and *F 0 0 5* as the final given, and its value is limited by upper and lower limits.

When *F 0 0 6* =2, switch between *F 0 0 3* and (*F 0 0 3* + *F 0 0 5*) with a logical input;

When *F 0 0 6* =3, switch between *F 0 0 5* and (*F 0 0 3* + *F 0 0 5*) with a logical input.

2: $F003-F005$

When $F006=0/1$, the difference between the frequency /PID given by $F003$ and $F005$ is taken as the final given value, and its value is limited by the upper and lower limits.

When $F006=2$, switch between $F003$ and $(F003-F005)$ with a logical input;

When $F006=3$, switch between $F005$ and $(F003-F005)$ with a logical input.

3: $\text{MAX}(F003, F005)$

When $F006=0/1$, the maximum value of frequency /PID given by $F003$ and $F005$ is taken as the final given value, which is limited by upper and lower limits.

When $F006=2$, switch between $F003$ and $\text{MAX}(F003, F005)$ with a logical input;

When $F006=3$, switch between $F005$ and $\text{MAX}(F003, F005)$ with a logical input.

4: $\text{MIN}(F003, F005)$

When $F006=0/1$, the minimum value of frequency /PID given by $F003$ and $F005$ is taken as the final given value, which is limited by upper and lower limits.

When $F006=2$, switch between $F003$ and $\text{MIN}(F003, F005)$ with a logical input;

When $F006=3$, switch between $F005$ and $\text{MIN}(F003, F005)$ with a logical input.

NO.	$F021$	$F006$	Final frequency setting
1	0	0	Switch between $F003$ and $F005$ with logical input
2	0	1/2/3	$F003$
3	1/2/3/4	0/1	$F021$ The selected given source
4	1/2/3/4	2	Switch between $F003$ and the given source selected by $F021$ with logical input
5	1/2/3/4	3	Switch between $F005$ and the given source selected by $F021$ with logical input

Example 1: when $F003+F005$ operation and $F005=3/7$, press $\blacktriangle \blacktriangledown$ button to adjust the frequency /PID of $F003$ channel, and can increase or decrease.

- The set remains unchanged when the machine stops; When the power is off, it is not saved. After the power is on, it is the original set of $F003$ channel. Set to:

Frequency given: $F900=0$, $F003=\text{any}$, $F005=3$, $F021=1$, $F024=1$ or 4.

PID given: $F900 \neq 0$, $F003=\text{any}$, $F005=7$, $F021=1$, $F024=1$ or 4.

- When the machine stops or power is switched off, the set is not saved, and the original set of $F003$ channel is restored. Set to:

Frequency given: $F900=0$, $F003=\text{any}$, $F005=3$, $F021=1$, $F024=2$ or 5.

PID given: $F900 \neq 0$, $F003=\text{any}$, $F005=7$, $F021=1$, $F024=2$ or 5.

Example 2: when $F003 \pm F005$ is calculated and $F005=5$, the frequency /PID of $F003$ channel can be adjusted directly through UP/DOWN function, and can be increased or decreased. (Applicable to both frequency setting and PID setting)

- The set remains unchanged when the machine stops;

Set as: $F003 = \text{any}$, $F005 = 5$, $F021 = 1 \text{ or } 2$, $F023 = 25$, $F303 = 23$, $F304 = 24$, $F323 = 25$;

It is suggested to set $F324 = 4$ to decide whether to save after power off.

- Do not save when shutdown and power down, restore to the original $F003$ channel.

Set to: $F003 = \text{any}$, $F005 = 5$, $F021 = 1 \text{ or } 2$, $F023 = 25$, $F303 = 23$, $F304 = 24$, $F323 = 25$ (must be $F323 = F023$ based on $F324 = 6$), $F324 = 4$, $F310 = 75$.

NO.	Parameter Name	Setting Range	Default
$F022$	$F005$ frequency given coefficient	0.0~ 100.0%	100.0 %
$F023$	$F005$ frequency bias given	0.0Hz~400.0Hz	0.0Hz

When $F021 = 1$ ($F003 + F005$) or 2 ($F003 - F005$) and $F005 = 0$ (keyboard panel potentiometer), or 1 (AI1), or 2 (AI2), or 5 (UP/DOWN), $F022$ and $F023$ are used to adjust the given amount of $F005$.

Example 1: Processing with a given frequency

The final frequency of $F005$ channel is given = (the original frequency of $F005$ channel is given - $F023$) * $F022$.

Example 2: processing given by PID (note: consider the original $F005$ as a given frequency here)

The final frequency PID given for $F005$ channel = $F022 * F917 * (\text{the original frequency given for } F005 \text{ channel} - F023) / F007$.

Note: The final frequency /PID given for $F005$ channel may be positive or negative.

NO.	Parameter Name	Setting Range	Default
$F024$	Lower limit selection and $F005 = 3/7$ setting	0~ 5	0

$F024$ contains two features:

Function 1: Select the lower limit value of panel potentiometer/ $F000$ /UP_DOWN;

Function 2: When selecting $F021 = 1$ ($F003 + F005$) and $F005 = 3$ (given frequency) or 7 (PID given), press ▲▼ button to adjust the treatment method of given frequency

$F024$	Panel potentiometer/ $F000$ /UP_DOWN given lower limit selection	When $F021 = 1$ ($F003 + F005$) and $F005 = 3/7$, press ▲▼ button to adjust a given treatment
0	(1) Frequency given: $F009$ (2) PID given: $F917 * F009 / F007$	Press button ▲▼ to adjust the value of $F000$ and use $F000$ as the given source of $F005$
1		Press button ▲▼ to adjust $F003$ channel on the given basis, give keep the same when stop; When the power is off, it is not saved. After the power is on, it is the original set of $F003$ channel.
2		Press button ▲▼ to adjust $F003$ channel on the given basis, don't save the given when stop and power off, restore to the original given of $F003$ channel.

<i>F024</i>	Panel potentiometer/ <i>F000</i> /UP_DOWN given lower limit selection	When <i>F021</i> = 1 (<i>F003</i> + <i>F005</i>) and <i>F005</i> = 3/7, press ▲▼ button to adjust a given treatment
3	0.0Hz	Press button ▲▼ to adjust the value of <i>F000</i> and use <i>F000</i> as the given source of <i>F005</i>
4		Press button ▲▼ to adjust <i>F003</i> channel on the given basis, give keep the same when stop; When the power is off, it is not saved. After the power is on, it is the original set of <i>F003</i> channel.
5		Press button ▲▼ to adjust <i>F003</i> channel on the given basis, don't save the given when stop and power off, restore to the original given of <i>F003</i> channel.

NO.	Parameter Name	Setting Range	Default
<i>F099</i>	Manufacturer reserve (same as <i>F020</i>)	-	-

6.2 Motor and its protection parameter group

NO.	Parameter Name	Setting Range	Default
<i>F100</i>	Auto-tuning	0~2	0

0: Auto-tuning disabled (use of internal parameters).

1: Application of individual settings of *F203* (after execution: 0).

2: Auto-tuning enabled (after execution: 0).

When auto-tuning, set the following parameters at least, as specified on the nameplate of the motor:

F101~*F104*.

Set *F100* to 2 before the start of operation. Tuning is performed at the start of the motor then.

Check to be sure that the setting of the parameter *F101* and that of the parameter *F102* agree with the base frequency (rated rotational speed) and base frequency voltage (rated voltage) of the motor to be operated, respectively. If not, set the parameters correctly.

When using the VFD to control the operation of a motor smaller in capacity by one grade or more, be sure to set the motor rated current setting parameter (*F103*) properly.

Vector control may not operate properly if the motor capacity differs from the applicable rated capacity of the VFD by more than two grades.

If current waveforms oscillate during operation, increase the speed control stability factor (*F208*). This is effective in suppressing oscillation.

Precautions on auto-tuning:

(1) Conduct auto-tuning only after the motor has been connected and operation completely stopped. If auto-tuning is conducted immediately after operation stops, the presence of a residual voltage may result in abnormal tuning.

(2) Voltage is applied to the motor during tuning even though it barely rotates. During tuning, "tun1" is displayed on the keypad.

(3) Tuning is performed when the motor starts for the first time after *F 100* is set to 2.

Tuning is usually completed within three seconds. If it is aborted, the motor will trip with the display of *E - 46* and no constants will be set for that motor.

(4) High-speed motors, high-slip motors or other special motors cannot be auto-tuned.

(5) Provide cranes and hoists with sufficient circuit protection such as mechanical braking. Without sufficient circuit protection, the resulting insufficient motor torque during tuning could create a risk of machine stalling/falling.

(6) If auto-tuning is impossible or an "*E - 46*" auto-tuning error is displayed.

(7) If the VFD is tripped during auto-tuning because of an output phase failure (*E - 47*), check if the VFD is connected to the correctly. A check for output phase failures is made during auto-tuning, regardless of the setting of the output phase failure detection mode selection parameter (*F 405*).

NO.	Parameter Name	Setting Range	Default
<i>F 101</i>	Base frequency 1	25.0~400.0 Hz	50.0
<i>F 102</i>	Base frequency voltage1	50~660V	varies by model
<i>F 103</i>	Motor rated current	varies by model	varies by model
<i>F 104</i>	Motor rated speed	100~15000 rpm	varies by model

Set *F 101*~*F 104*, as specified on the nameplate of the motor

Note 1: Please set according to the motor nameplate parameters. Excellent control performance of vector control requires accurate motor parameters.

Note 2: VFD provides parameter self-learning function. Accurate parameter self-learning comes from the correct input of motor nameplate parameters. In order to ensure the control performance, please try to ensure the inverter and the motor power match, otherwise, the inverter control performance will be significantly reduced.

Note 3: When the rated power of the field VFD is greater than the rated power of the motor, the motor overload protection should be enabled to prevent the motor from burning out. The motor overload protection function must set the following parameters:

- 1) *F 106* or *F 110* is set as the rated current of the motor nameplate.
- 2) *F 401*=0 or 4, set to enable overload protection of ordinary motor or forced air-cooled motor.
- 3) *F 402* sets motor overload time, which defaults to 300 seconds.

NO.	Parameter Name	Setting Range	Default
<i>F 105</i>	Motor no-load current	10.0~100.0%	varies by model

Set the ratio of the no-load current of the motor to the rated current. Enter the value in % that is obtained by dividing the no-load current by the rated current.

NO.	Parameter Name	Setting Range	Default
<i>F 106</i>	Motor electronic thermal protection level 1	varies by model	varies by model

Set the motor rated current specified on the nameplate of the motor to *F 106*. This parameter allows selection of the appropriate electronic thermal protection characteristics according to the particular rating and characteristics of the motor.

Note: If *F 603*=1, *F 106* displays in amperes/volts. If *F 603*=0, *F 106* displays in % term. The 100% standard value is the rated output current indicated on the nameplate.

NO.	Parameter Name	Setting Range	Default
<i>F 107</i>	stall prevention level 1	varies by model	varies by model

This parameter adjusts the output frequency by activating a current stall prevention function against a current exceeding the *F 107* specified level.

Note 1: Do not set *F 107* under the rated motor no-load current. Otherwise the VFD will determine that it is performing motor braking and increase the frequency applied to the motor.

Note 2: If *F 603*=1, *F 107* displays in amperes/volts. If *F 603*=0, *F 107* displays in % term. The 100% standard value is the rated output current indicated on the nameplate.

Note 3: When VFD current is exceeding the *F 107* specified level:

- Output frequency is adjusted current exceeding the *F 107* specified level.
- During an OC alarm status, (that is, when there is a current flow in excess of the stall prevention level), the output frequency changes. At the same time, “- - -” is displayed flashing on and off.

NO.	Parameter Name	Setting Range	Default
<i>F 108</i>	Base frequency 2	25.0~400.0 Hz	50.0
<i>F 109</i>	Base frequency voltage 2	50~660 V	varies by model
<i>F 110</i>	Motor electronic-thermal protection level 2	varies by model	varies by model
<i>F 111</i>	Stall prevention level 2	varies by model	varies by model

Setting method is the same as *F 101*、*F 102*、*F 106*、*F 107*.

Use the above parameters to switch the operation of two motors with a single VFD and to select motor V/F characteristics (two types) according to the particular needs or operation mode.

The *F 001* (V/F control mode selection) parameter is enabled only for motor1. If motor 2 is selected, V/F control will be given constant torque characteristics.

NO.	Parameter Name	Setting Range	Default
<i>F 112~F 115</i>	Factory reserved		

NO.	Parameter Name	Setting Range	Default
<i>F 120</i>	Default setting	0~9	0

0: -

1: Standard default setting (Initialization)

2: Save user-defined parameters

3: Call user-defined parameters

4: Trip record clear

5: Cumulative operation time clear

6: Cumulative fan operation time record clear

7: Initialization of type information

8: P-type rating. (Nomal duty, for variable torque load characteristic like pumps and fans).

9: G-type rating. (Heavy duty, for constant torque load characteristic).

Note1: This function will be displayed as 0 during reading on the right. This previous setting is displayed on the left. Example: 1 0. $F 120$ cannot be set during the VFD operating. Always stop the VFD first and then program.

Note 2: Even set $F 120=1$, $F 300$, $F 333$, $F 334$, $F 335$, $F 336$, $F 348$, $F 349$ will not be reset to their factory default settings.

Note 3: G-type and P-type: G-type refers to applications requiring constant torque output, while P-type applications with variable torque needs. The drive allows the user to select G-type or P-type ratings for the VFD depending on the application. Fans, pumps, and blowers should use P-type ($F 120 = 8$), and other applications generally use G-type ($F 120 = 9$). Differences between G-type ratings and P-type ratings for the drive include rated input and output current, overload capacity, carrier frequency, and current limit.

Duty types	Stall prevention level	overload tolerance	First digit of u000 display
G-type (heavy duty)	150%	150% rated output current for 60 s	"g" (e.g. g100)
P-type(Normal duty)	120%	120% rated output current for 60 s	"p" (e.g. p100)

Note 4:when set $F 120=1$, the default setting is for G-type rating.

6.3 Motor control parameter group

NO.	Parameter Name	Setting Range	Default
$F 201$	Supply voltage correction (limitation of output voltage)	0~3	3

0: Supply voltage uncorrected, output voltage limited.

1: Supply voltage corrected, output voltage limited.

2: Supply voltage uncorrected, output voltage unlimited.

3: Supply voltage corrected, output voltage unlimited.

If $F 201$ is set to "0" or "2", the output voltage will change in proportion to the input voltage.

Even if the base frequency voltage ($F 102$) is set above the input voltage, the output voltage will not exceed the input voltage.

The rate of voltage to frequency can be adjusted according to the rated motor capacity. For example, setting $F 201$ to "0" or "1" prevents the output voltage from increasing, even if the input voltage changes when operation frequency exceeds the base frequency.

When the V/F control mode selection parameter ($F 001$) is set to any number between 2 and 3, the supply voltage is corrected regardless of the setting of $F 201$.

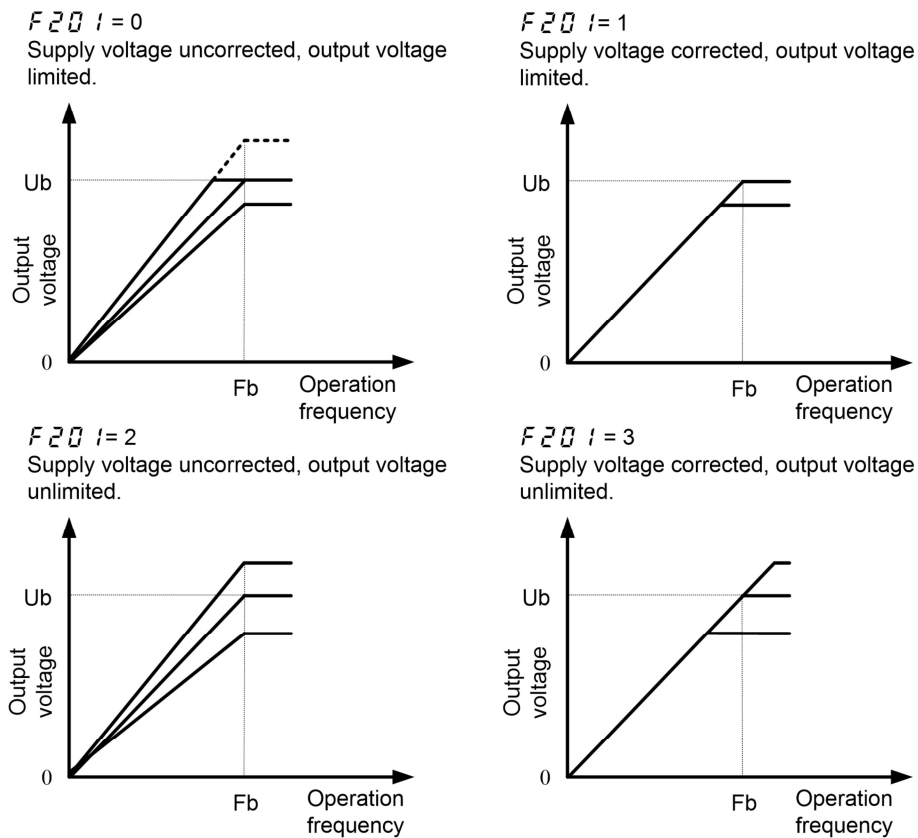


Figure 6.5 Description of voltage correct and voltage limit

NO.	Parameter Name	Setting Range	Default
$F202$	Voltage boost 1	0.0~30.0%	varies by model
$F203$	Torque boost	0.0~30.0%	varies by model

If torque is inadequate at low speeds, increase torque by raising the torque boost rate with these two parameters. Perform adjustments according to the actual operation.

$F202$ is effective when $F001$ is set to 0 (V/F constant) or 1 (square reduction).

$F203$ is effective when $F001$ is set to 2 (SVC mode).

Note: Be careful not to increase the voltage boost or torque boost rate too much because it could cause an overcurrent trip or $E - 45$ at startup.

NO.	Parameter Name	Setting Range	Default
$F204$	Slip frequency gain	0~150 %	50

Set the compensation gain for the slipping of the motor. A higher slip frequency gain reduces motor slipping correspondingly.

Note1: After setting $F104$, set $F204$ to adjust in detail.

NO.	Parameter Name	Setting Range	Default
$F205$	Exciting current coefficient	100~130 %	100

$F205$ is used to fine adjust the magnetic field increase rate in low-speed range. To increase the torque in low-speed range, specify a larger value for $F205$.

Note: This parameter should be adjusted only when enough torque cannot be obtained, even though auto-tuning ($F100 = 2$) was made after the setting of the parameters $F204$ and $F203$. Note also that adjusting this parameter may cause an increase in the no-load current in low-speed range. If the no-load current exceeds the rated current, do not adjust this parameter.

NO.	Parameter Name	Setting Range	Default
$F206$	Voltage boost 2	0~30 %	varies by model

Setting method is the same as $F202$.

NO.	Parameter Name	Setting Range	Default
$F207$	Speed control response coefficient	1~150	40
$F208$	Speed control stability coefficient	1~100	20

Use these two parameters to adjust the speed of response and stability to the frequency command.

How to make adjustments according to the moment of inertia of the load:

The moment of inertia of the load (including that of the motor shaft) was set at the factory on the assumption that it would be three times as large as that of the motor shaft. If this assumption does not hold, calculate the values to be entered in $F207$ and $F208$, using the following equations. $F207 = 40 \times \sqrt{a/3}$, $F208 = 20 \times \sqrt{a/3}$, Where 'a' is the times by which the moment of inertia of the load is larger than that of the motor. After the above adjustments, if necessary, make fine adjustments as described below.

- To increase(reduce) the response speed: Increase (reduce) the setting of $F207$.
- If overshooting or hunting occurs: Increase the setting of $F208$.
- If reduction gears or the like squeak: Increase the setting of $F208$.
- If an over-voltage trip occurs on completion of acceleration: Increase the setting of $F208$.

Note 1: When making the above adjustments, increase or decrease settings in steps of 10% or so while checking how things change.

Note 2: Depending on the settings of $F207$ and $F208$, the frequency may exceed the upper-limit frequency if the VFD is set so as to accelerate the load in the shortest possible time.

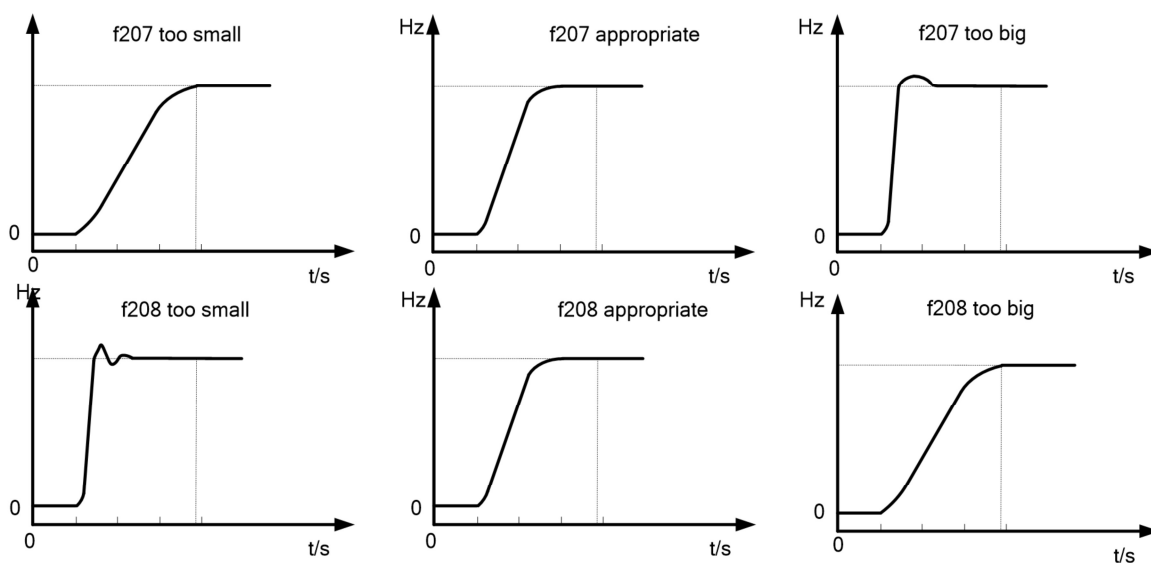


Figure 6.6 Relations of speed response and $F207$, $F208$

NO.	Parameter Name	Setting Range	Default
<i>F209</i>	Stall prevention control coefficient 1	10~250%	100

Use this parameter along with *F210* adjusts characteristics in a region in which the frequency is above the base frequency (region where the field is weak). If a heavy load is applied instantaneously (or transiently), the motor may stall before the load current reaches the current set with the stall prevention level 1 parameter (*F107*). In many cases, this kind of stall can be avoided by gradually reducing the setting of *F209*.

NO.	Parameter Name	Setting Range	Default
<i>F210</i>	Stall prevention control coefficient 2	50~150%	100

Using this parameter along with *F209* adjusts characteristics in a region in which the frequency is above the base frequency (region where the field is weak).

* How to make adjustments in a region (region where magnetic field is weak) above the base frequency:

A drop in supply voltage may cause fluctuations of the load current or vibration of the motor. In some cases, such phenomena can be eliminated by changing the setting of *F210* to between 80 and 90. However, this may cause an increase in load current, so that it is also necessary to adjust the setting of the electronic thermal protective level 1 parameter (*F105*) properly according to the motor capacity.

NO.	Parameter Name	Setting Range	Default
<i>F211</i>	Maximam voltage adjustment coefficient	90~120%	104

Specify a larger value for *F211* to secure as high an output voltage as possible in a region (region where magnetic field is weak) above the base frequency. Setting *F211* to a larger value may cause the motor to vibrate or gears to squeak. If such a phenomenon occurs, do not adjust this parameter.

NO.	Parameter Name	Setting Range	Default
<i>F212</i>	Waveform switching adjustment coefficient	0.1~14.0kHz	14.0

Specify a larger value for *F212* if switching from a waveform to another resulting in a considerable increase in vibration and noise in middle-speed range (region between the start frequency and the base frequency). If no improvement can be made by specifying a larger value, do not adjust this parameter.

NO.	Parameter Name	Setting Range	Default
<i>F213 - F216</i>	Factory reserved		

NO.	Parameter Name	Setting Range	Default
<i>F217</i>	Multipoint profile V/F patter	0~2	0

0: factory reserved. 1: factory reserved.

2: Enable multipoint profile V/F patter.

The drive utilizes a set V/f pattern (*F217* = 2) to determine the appropriate output voltage level for each relative to the frequency reference.

NO.	Parameter Name	Setting Range	Default
<i>F218</i>	Point 1 output frequency (F1)	0~ <i>F220</i>	10.0

NO.	Parameter Name	Setting Range	Default
<i>F 2 1 9</i>	Point 1 output frequency voltage (V1)	0~100%	20.0
<i>F 2 2 0</i>	Point 2 output frequency (f2)	<i>F 2 1 8 ~ F 2 2 0</i>	20.0
<i>F 2 2 1</i>	Point 2 output frequency voltage (V2)	0~100%	40.0
<i>F 2 2 2</i>	Point 3 output frequency (f3)	<i>F 2 2 0 ~ F 1 0 1</i>	30.0
<i>F 2 2 3</i>	Point 3 output frequency voltage (V3)	0~100%	60.0

Set up the V/f pattern with *F 2 1 8 ~ F 2 2 3* as shown in according to the load characteristic.

Note 1: The following condition must be true when setting up the V/f pattern : $V1 < V2 < V3$, $F1 < f2 < f3$.

Note: Too high voltage output at low speed will cause a serious motor heat dissipation problem, or stall prevention alarm, or over current trip.

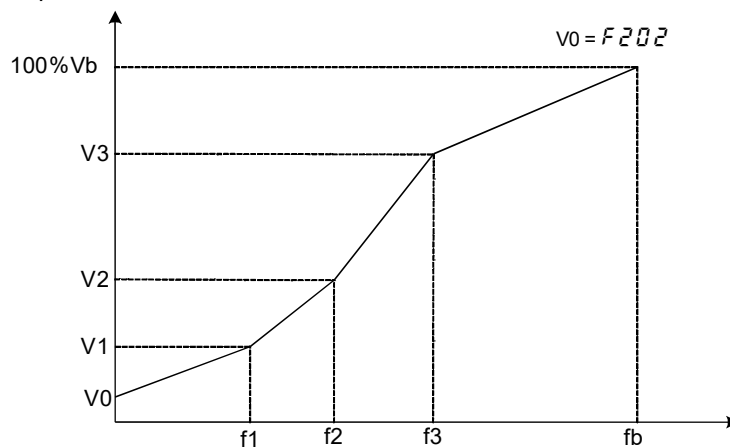


Figure 6.7 Multipoint profile V/F patter (*F 2 1 7* =2)

NO.	Parameter Name	Setting Range	Default
<i>F.2 2 5</i>	Motor speed factor	1~999	420

6.4 Process PID parameter group

NO.	Parameter Name	Setting Range	Default
<i>F 3 0 0</i>	AI1 terminal function selection	0~2	0

0: AI1 - analog input

1: AI1 - contact input (Sink mode)

2: AI1 - contact input (Source mode)

This parameter allows you to choose between analog signal input and contact signal input for the AI1 terminal.

When using the AI1 terminal as analog input, be sure *F 3 0 5* is configured right (0~5VDC, 0~10VDC, or 0~20mA).

When using the AI1 terminal as contact input terminals in sink logic connection, be sure to insert a resistor between the 24V terminal and the VIA terminal. (Recommended resistance: 4.7k Ω ~10k Ω 1/2W).

Note1: Not valid when capacity rating is at 15kw or above.

NO.	Parameter Name	Setting Range	Default
<i>F301</i>	Input terminal function for LI1	0~75	2
<i>F302</i>	Input terminal function for LI2	0~75	3
<i>F303</i>	Input terminal function for LI3	0~75	0
<i>F304</i>	Input terminal function for LI4	0~75	10

Use the above parameters to send signals from an external programmable controller to various control input terminals to operate and/or set the VFD. The desired contact input terminal functions can be selected.

Table 6.2 Description of input terminal function

Input terminal function NO.	Function name	Description
0	No function is assigned	Disabled
1	Standby terminal	ON: Ready for operation OFF: Coast stop (gate off)
2	Forward run command	2-wire operation ON: Forward run OFF: Slowdown stop
		3-wire operation OFF→ON: forward run.
3	Reverse run command	2-wire operation ON: Reverse run. OFF: Slowdown stop
		3-wire operation OFF→ON: Reverse run.
4	Jog run mode	ON: Jog run OFF: Jog run canceled
5	Acceleration/deceleration 2 pattern selection	ON: Acceleration/deceleration 2 OFF: Acceleration/deceleration 1 or 3
6	Preset-speed command 1	Selection of 15-speed with LI1 to LI4 (4 bits)
7	Preset-speed command 2	
8	Preset-speed command 3	
9	Preset-speed command 4	
10	Reset command	ON: Acceptance of reset command ON → OFF: Trip reset
11	Trip stop command from external input device	OFF: No Trip ON: <i>E-43</i> Trip stop according to the stop mode set by <i>F403</i>
13	DC braking command	OFF: No DC braking command ON: DC braking started. DC braking current level and DC braking time is set by <i>F507</i> and <i>F508</i> respectively.

Input terminal function NO.	Function name	Description
14	PID control disabling	OFF: PID control enabled. ON: PID control disabled. The input terminal function of PID control disabling is used for switching between PID control and open-loop control. Clearance of PID integral value function can also be used.
15	Permission of parameter editing	ON: Parameter editing permitted OFF: Parameter editing prohibited (If $F 700 = 1$)
16	Combination of standby and reset commands	ON: Simultaneous input from standby and reset commands
17	Frequency source switching to AI1	ON: Frequency source switched to AI1 OFF: Frequency source as per $F 003$
18	Combination of forward run and jog run	ON: Forward jog operation
19	Combination of reverse run and jog run	ON: Reverse jog operation
20	Frequency setting source switching	ON: The VFD follows the speed setting set by $F 005$ (when $F 011 = 1$). OFF: The VFD follows the speed setting set by $F 003$.
21	No.2 Switching of V/F setting	ON: No.2 V/F setting ($F 001=0$, $F 108$, $F 109$, $F 110$, $F 206$) OFF: No.1 V/F setting($F 001$, $F 101$, $F 102$, $F 106$, $F 202$)
22	No.2 motor switching	ON: No.2 motor($F 001=0$, $F 108$, $F 109$, $F 110$, $F 111$, $F 206$, $F 518$, $F 519$, $F 511$) OFF: No.1 motor ($F 001$, $F 010$, $F 011$, $F 101$, $F 102$, $F 106$, $F 107$, $F 202$, $F 510$)
23	Frequency UP signal input from external contacts	ON: Increase in frequency
24	Frequency DOWN signal input from external contacts	ON: Reduction in frequency
25	Frequency UP/DOWN cancellation signal input from external contacts	OFF→ON: Resetting of UP/DOWN frequency by means of external contacts
26	inversion of trip stop command from external device	OFF: $E - 43$ Trip stop according to the stop mode set by $F 403$
27	Thermal trip stop signal input from external device	ON: $E - 25$ Trip stop

Input terminal function NO.	Function name	Description
28	inversion of thermal trip stop signal input from external device	OFF: $E - 25$ Trip stop
29	Forced switching from remote to local control	Enabled when remote control is exercised ON: Local control (setting of cmod, $F002$ 、 $F003$ 和 $F005$) OFF: Remote control
30	Operation holding (stop of 3-wire operation)	ON: forward /reverse run held, 3-wire operation OFF: Slowdown stop
31	Forced switching of command mode and terminal board command	ON: Terminal board operation OFF: Setting of $F002$
32	Display cancellation of the cumulative power amount (kWh)	ON: Monitor display cancellation of the cumulative power amount (kWh)
33	Fire-speed control see $F419$	ON: Fire-speed operation (preset speed operation frequency $F730$) OFF: Normal operation
34	Coast stop (gate off)	ON: Coast stop (gate off)
35	Inversion of Reset	ON: Acceptance of reset command OFF→ ON: Trip reset
36	Forced switching of stall prevention level 2	ON: Enabled at the value of $F111$ OFF: Enabled at the value of $F107$
37	PID control integral value clear PID control integral value clear	ON: PID control integral value always zero OFF: PID control permitted
38	inversion of PID error signal	ON: PI error input = feedback – setting OFF: PI error input = setting – feedback
39	Forward running command + Acc&Dec curve 2	ON: 电机正向运行，按加减速曲线2沿斜坡加速 ON: Motor forward running, follow Acc&Dec curve 2 to do the ramp acceleration
40	Reverse running command + Acc&Dec curve 2	ON: Motor reverse running, follow Acc&Dec curve 2 to do the ramp acceleration
41	Forward running command + Multi-speed section 1	ON: Motor forward running and activate multi-speed section 1
42	Reverse running command + Multi-speed section 1	ON: Motor reverse running and activate multi-speed section 1

Input terminal function NO.	Function name	Description
43	Forward running command + Multi-speed section 2	ON: Motor forward running and activate multi-speed section 2
44	Reverse running command + Multi-speed section 2	ON: Motor reverse running and activate multi-speed section 2
45	Forward running command + Multi-speed section 3	ON: Motor forward running and activate multi-speed section 3
46	Reverse running command + Multi-speed section 3	ON: Motor reverse running and activate multi-speed section 3
47	Forward running command + Multi-speed section 4	ON: Motor forward running and activate multi-speed section 4
48	Reverse running command + Multi-speed section 4	ON: Motor reverse running and activate multi-speed section 4
49	Multi-speed section 1 + Acc&Dec curve 2	ON: activate Acc&Dec curve 2 and multi-speed section 1 at the same time
50	Multi-speed section 2 + Acc&Dec curve 2	ON: activate Acc&Dec curve 2 and multi-speed section 2 at the same time
51	Multi-speed section 3 + Acc&Dec curve 2	ON: activate Acc&Dec curve 2 and multi-speed section 3 at the same time
52	Multi-speed section 4 + Acc&Dec curve 2	ON: activate Acc&Dec curve 2 and multi-speed section 4 at the same time
53	Forward running command+Multi-speed section 1+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, forward running command and multi-speed section 1 at the same time
54	Reverse running command+Multi-speed section 1+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, reverse running command and multi-speed section 1 at the same time
55	Forward running command+Multi-speed section 2+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, forward running command and multi-speed section 2 at the same time
56	Reverse running command+Multi-speed section 2+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, reverse running command and multi-speed section 2 at the same time
57	Forward running command+Multi-speed section 3+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, forward running command and multi-speed section 3 at the same time
58	Reverse running command+Multi-speed section 3+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, reverse running command and multi-speed section 3 at the same time
59	Forward running command+Multi-speed section 4+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, forward running command and multi-speed section 4 at the same time

Input terminal function NO.	Function name	Description
60	Reverse running command+Multi-speed section 4+ Acc&Dec curve 2	ON: activate Acc&Dec curve 2, reverse running command and multi-speed section 4 at the same time
61	UP/DOWN speed clean up+ fault reset	When it is OFF to ON, clean up UP/DOWN speed input setup frequency level
62	Running permission+ Forward running command (only 2-wire control)	ON: Activate running permission and forward running command at the same time.
63	Running permission+ reverse running command (only 2-wire control)	ON: Activate running permission and reverse running command at the same time.
64	Acc&dec curve 3	ON: Motor follows acceleration curve 3
65	Acce/Dece curve 3 + Forward running command	ON: Activate forward running and acce/dece curve 3 command at the same time.
66	Acce/Dece curve 3 + Reverse running command	ON: Activate reverse running and acce/dece curve 3 command at the same time.
67	Command source switch	OFF: command source press <i>F002</i> ON: command source press <i>F002</i>
68	Command source + frequency source switch	OFF: Command source press <i>F002</i> and frequency source press <i>F003</i> ON: Command source press <i>F004</i> and frequency source press <i>F005</i>
69	Three-wire control stop reverse	OFF: Ready for running ON: decelerate along the ramp until stop
70	Reset when simple PLC stops	OFF: Command source is <i>F002</i> ON : Command source is <i>F004</i>
71	Simple PLC time out	OFF: Invalid ON: Effective
72	Simple PLC pause	OFF: Invalid ON: Effective
73	PID control + frequency given source switch	OFF: Control disable + set <i>F005</i> for the given frequency source ON: Control disable + set <i>F003</i> for the given frequency source
74		OFF: Control disable + set <i>F005</i> for the given frequency source ON: Control disable + set <i>F003</i> for the given frequency source
75	(UP/DOWN) stop speed clearance	ON: (UP/DOWN) stop speed clear effective OFF: (UP/DOWN) stop speed clearance is invalid

Note1: AI1 and AI2 could be used as contact input terminals (see *F300*, *F308*, *F313* and *F314*).

Note 2: The difference between 2-wire control and 3-wire operation configuration lies in whether logic input function 30 (3-wire control shutdown input) is used.

NO.	Parameter Name	Setting Range	Default
<i>F 305</i>	AI1 voltage-current input selection	0~2	0

0:0~5V voltage signal input.

1:0~10V voltage signal input.

2: 0-20mA(4-20mA) current signal input.

Note: AI2 only accept 0~10VDC voltage signal input, setting value of *F 305* will not change the characteristic of AI2.

NO.	Parameter Name	Setting Range	Default
<i>F 306</i>	sink/soruce mode selection	0~1	1

0: Source (Positive) logic terminal mode.

1: Sink (Negative) logic terminal mode

NO.	Parameter Name	Setting Range	Default
<i>F 307</i>	AO voltage-current output selection	0~1	1

0: Current signal output.

1: Voltage signal output.

NO.	Parameter Name	Setting Range	Default
<i>F 308</i>	Input terminal function of AI1	0~75	0

When *F 300* disabled, the set value of *F 308* cannot be read out.

When *F 300* set at 1or 2, AI1 is enabled, and can be used as a contact input terminal.

NO.	Parameter Name	Setting Range	Default
<i>F 309</i>	Always-active terminal selection 1	0~75	1
<i>F 310</i>	Always-active terminal selection 2	0~75	0

F 309 and *F 310* specifies an input terminal function that is always to be kept active (ON).

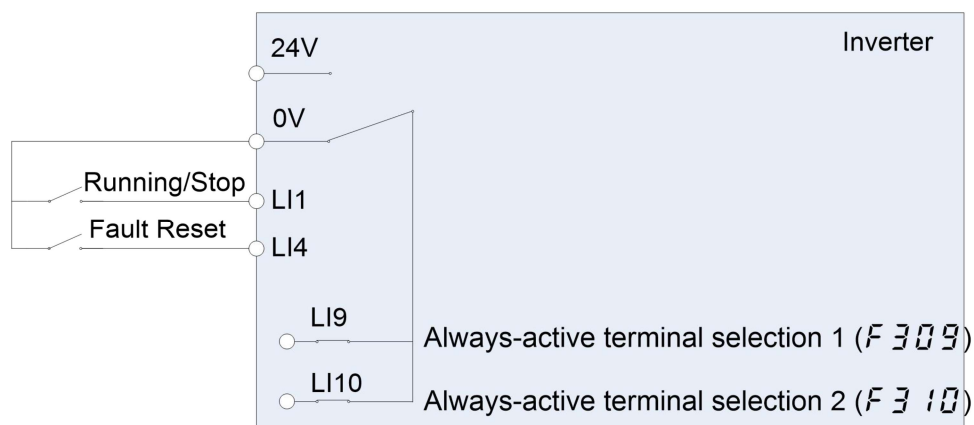


Figure 6.8 Always active terminal function

Note 1: Use *F 3 0 9* and *F 3 1 0* to assign input terminal function to LI9, LI10. LI9 and LI10 are virtual input contact terminal which are always activated. See Figure 6.8.

NO.	Parameter Name	Setting Range	Default
<i>F 3 1 1</i>	Output terminal function A of LO1-CLO1	0~255	4
<i>F 3 1 2</i>	Output terminal function B of LO1-CLO1	0~255	255

The set method is same as *F 3 1 5*.

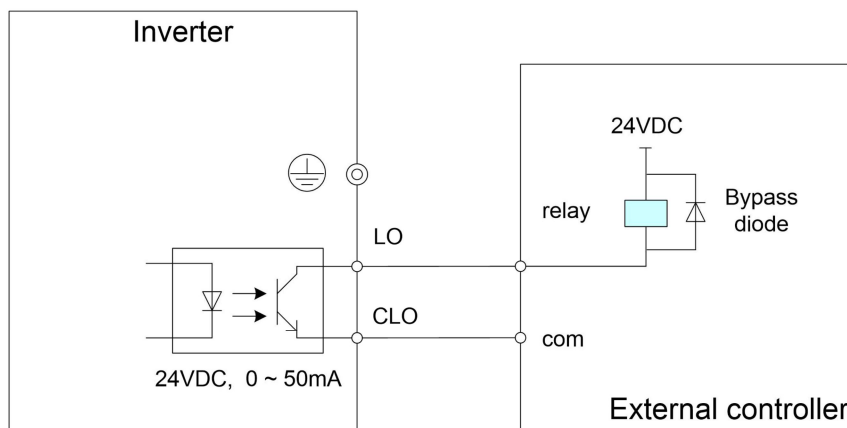


Figure 6.9 Output of LO-CLO wiring example

F 3 1 2 could be used to remind of assisted status signal.

NO.	Parameter Name	Setting Range	Default
<i>F 3 1 3</i>	AI1 terminal function selection	0	0

0: AI2 - analog input

1: AI2 - contact input (Sink)

2: AI2 - contact input (Source)

NO.	Parameter Name	Setting Range	Default
<i>F 3 1 4</i>	Input terminal function of AI2	0~75	0

The set method is same as *F 3 0 1~F 3 0 4*.

NO.	Parameter Name	Setting Range	Default
<i>F 3 1 5</i>	Output terminal function A of T1	0~255	40

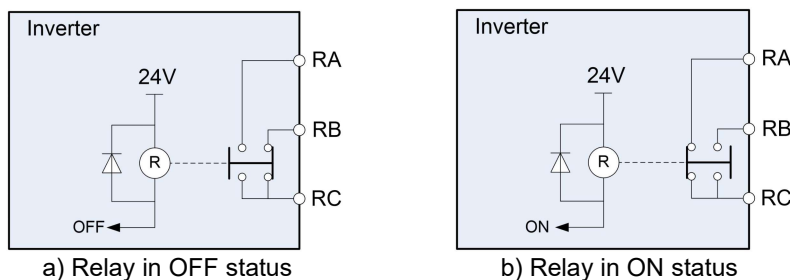


Figure 6.10 Description of relay status

Table 6.3 Description of output terminal function

Logic output Function Settings	Relay state	Operation
0	OFF	Output frequency $\leq$ lower limit frequency setting of $F009$
	ON	Output frequency $>$ lower limit frequency setting of $F009$
2	OFF	Output frequency $<$ upper limit frequency setting of $F008$
	ON	Output frequency $=$ upper limit frequency setting of $F008$
4	OFF	Output frequency $<$ setting of $F337$
	ON	Output frequency $\geq$ setting of $F337$
6	OFF	Output frequency $>$ (set frequency + $F339$), or $<$ (set frequency - $F339$)
	ON	(frequency - $F339$) $<$ output frequency $<$ (set frequency + $F339$)
8	OFF	Output frequency $>$ ($F338+F339$), or $<$ ($F338-F339$)
	ON	($F338-F339$) $<$ Output frequency $<$ ($F338+F339$)
10	OFF	Output frequency $\leq F338-F339$
	ON	Output frequency $\geq F338+F339$
12	OFF	Frequency commanded by $F003$ or $F005 \neq$ AI1 value
	ON	Frequency commanded by $F003$ or $F005 =$ AI1 value
14	OFF	Frequency commanded by $F003$ or $F005 \neq$ AI2 value
	ON	Frequency commanded by $F003$ or $F005 =$ AI2 value
16	OFF	AI1 value $\leq F340-F341$
	ON	AI1 value $\geq F340+F341$
18	OFF	AI2 value $\leq F342-F343$
	ON	AI2 value $\geq F342+F343$
20	OFF	Terminal other than AI2 selected as frequency command
	ON	AI2 selected as frequency command
22	OFF	Operation stopped
	ON	When operation frequency is output or during ($R - 07$)
24	OFF	Not for ready for operation
	ON	Ready for operation (Input function of standby and run are not ON)
26	OFF	forward run
	ON	reverse run
28	OFF	remote control mode
	ON	local control mode
30	OFF	No VFD fault (no fault output during automatic fault reset attempt)
	ON	VFD fault
32	OFF	Torque current is equal to or less than $F412 - F413$
	ON	Torque current is equal to or larger than $F412$ set value and longer than $F414$ set time.
34	OFF	The output current is equal to or larger than $F408+F409$
	ON	The output current is equal to or less than $F408$ for $F410$ set time

Logic output Function Settings	Relay state	Operation
36	OFF	When VFD is not significant trip
	ON	When VFD is significant trip
38	OFF	When VFD is not insignificant trip
	ON	When VFD is insignificant trip
40	OFF	No VFD fault
	ON	VFD fault (out of order during automatic fault reset attempt)
42	OFF	alarm off
	ON	alarm on
44	OFF	calculated value of motor overload level < 50%
	ON	calculated value of motor overload level ≥ 50%
46	OFF	calculated value of brake resister overload level < 50%
	ON	calculated value of brake resister overload level ≥ 50%
48	OFF	Torque curren < (F 4 12*70% - F 4 13)
	ON	Torque curren ≥ F 4 12*70%
50	OFF	Cumulative operation time < F 4 28 setting
	ON	Cumulative operation time ≥ F 4 28 setting
52	OFF	Calculation for parts replacement time is shorter than the preset time (internally preset)
	ON	Calculation for parts replacement time is equal to or longer than the preset time (internally preset)
54	OFF	Nomal condition
	ON	PTC detected value ≥ 60% of protection level
56	OFF	Other than undervoltage detected
	ON	Undervoltage detected
58	OFF	Mechanical brake release
	ON	Mechanical brake not release
60	OFF	Motor is not in acceleration state
	ON	Motor is in acceleration state
62	OFF	Motor is not in deceleration state
	ON	Motor is in deceleration state
64	OFF	Motor is not in acceleration or deceleration state
	ON	Motor is in acceleration or deceleration state
66	OFF	Heat sink temperature still not reach alarm value
	ON	Heat sink temperature reaches alarm value
68	OFF	PLC recycle is under running
	ON	After completing one PLC recycle, then export one On-pulse
70	OFF	Under running at one PLC section
	ON	After completing one PLC section, then export one On-pulse

Logic output Function Settings	Relay state	Operation
72	OFF	The converter is not ready
	ON	The converter is ready to receive the running signal
74~79	OFF	Not used
	ON	Not used
80	OFF	LI1 input is invalid
	ON	LI1 input is valid
82	OFF	LI2 input is invalid
	ON	LI2 input is valid
84	OFF	PID feedback pressure equal to or below F627 - F628
	ON	PID feedback pressure is equal to or higher than F627 + F628
86	OFF	PID feedback pressure is equal to or below F918
	ON	PID feedback pressure is equal to or higher than F918 + F628
88~253	OFF	Not used
	ON	Not used
254	OFF	Relay Output always OFF
255	ON	Relay Output always ON

Note 1: Inversion logic can be obtained by add 1 to the output terminal function number. Example: $F315=3$ is the inversion logic action of $F315=2$.

Note 2: Output terminal function is available for LO1-CLO1、LO2-CLO2 ($F311$ 、 $F312$ 、 $F373$ 、 $F374$) 和 T1, T2 ($F315$ 、 $F359$ 、 $F360$).

Note 3: Significant trip including follows: $E-02$, $E-03$, $E-05$, $E-06$, $E-07$, $E-12$, $E-25$, $E-31$, $E-32$, $E-33$, $E-36$, $E-41$, $E-42$, $E-43$, $E-46$. Insignificant trip including follows: $E-01$, $E-11$, $E-21$, $E-22$, $E-24$.

NO.	Parameter Name	Setting Range	Default
$F316$	Output terminal logic selection of LO1-CLO1	0~1	0

0: $F311$ AND $F312$. The logical product (AND) of $F311$ and $F312$ will be output to LO1-CLO1.

1: $F311$ OR $F312$. The logical sum (OR) of $F311$ and $F312$ will be output to LO1-CLO1.

NO.	Parameter Name	Setting Range	Default
$F317$	LO1-CLO1 output delay	0~60.0 s	0.0

$F317$ specified the time of LO1-CLO1 output delay.

NO.	Parameter Name	Setting Range	Default
$F318$	Relay 1 closing delay time	0~60.0 s	0.0

$F318$ specifies the closing delay time of relay 1 normally open contact

NO.	Parameter Name	Setting Range	Default
<i>F 3 1 9</i>	External contact input - UP response time	0.0~10.0s	0.1
<i>F 3 2 0</i>	External contact input - UP frequency steps	0.0 Hz ~ <i>F 0 0 7</i>	0.1
<i>F 3 2 1</i>	External contact input - DOWN response time	0.0~10.0s	0.1
<i>F 3 2 2</i>	External contact input - DOWN frequency steps	0.0 Hz ~ <i>F 0 0 7</i>	0.1

These functions take effect when *F 0 0 3* or *F 0 0 5* is set to 5. Two input contact terminals are required to adjust the frequency command: one is used to increase the frequency command (see input terminal function 23), and the other is used to reduce the frequency command (see input terminal function 24). Use an input contact terminal to clear the frequency setting that accumulated by the UP/DOWN operation (see input terminal function 25).

Use *F 3 1 9*~*F 3 2 2* set the frequency incremental/decremental gradient.

Frequency command incremental gradient = *F 3 2 0*/*F 3 1 9* setting time

Frequency command decremental gradient = *F 3 2 2*/*F 3 2 1* setting time

NO.	Parameter Name	Setting Range	Default
<i>F 3 2 3</i>	Initial up/down frequency	0.0 Hz ~ <i>F 0 0 7</i>	0.0

To adjust the frequency starting at a specified frequency other than 0.0 Hz (default initial frequency) after turning on the VFD , specify the desired frequency using *F 3 2 3* (initial up/down frequency).

NO.	Parameter Name	Setting Range	Default
<i>F 3 2 4</i>	Change of the initial up/down frequency	0~6	0

<i>F 3 2 4</i> Set	Whether <i>F 3 2 3</i> is saved when power is lost	<i>F 3 2 3</i> reset option
0	Do not save, <i>F 3 2 3</i> will not change every time the power is switched off or switched on.	<i>F 3 2 3</i> restores to <i>F 0 0 9</i> when reset with logical input function 25 (special reset) or 75 (stop reset).
1	Save, <i>F 3 2 3</i> is set to the last received frequency given when power is lost.	
2	Do not save, <i>F 3 2 3</i> will not change every time the power is switched off or switched on.	The <i>F 3 2 3</i> is restored to 0.0Hz when reset by the logical input function 25 (dedicated reset) or 75 (shutdown reset).
3	Save, <i>F 3 2 3</i> is set to the last received frequency given when power is lost.	
4	Do not save, <i>F 3 2 3</i> will not change every time the power is switched off or switched on.	<i>F 3 2 3</i> returns to its original value when it is reset by the logical input function 25 (dedicated reset) or 75 (shutdown reset).
5	Save, <i>F 3 2 3</i> is set to the last received frequency given when power is lost.	
6	Record the initial value of <i>F 3 2 3</i> , see note for details.	

Note: If *F 3 2 3* needs to return to its original value (i.e. : *F 3 2 4* =4 or 5) when it is reset through the logical input terminal function 25 or 75, it must set *F 3 2 4* =6 after setting *F 3 2 3*, or set *F 3 2 3* on the basis of *F 3 2 4* =6 to record the original value of *F 3 2 3*, otherwise the frequency after reset may be incorrect.

Example: when given a frequency through a single channel UP/DOWN, the frequency is not saved for each shutdown and power outage, and the frequency is restored to the original given frequency of $F323$.

◇ Settings are: $F003=5$, $F021=0$, $F023=25$, $F303=23$, $F304=24$, $F310=75$,

$F323=25$ ($F323$ must be set on $F324=6$ and $F323=F023$), $F324=4$.

NO.	Parameter Name	Setting Range	Default
$F325$	AI1 input point 1 setting	0~100%	0
$F326$	AI1 input point 1 frequency	0.0~400.0 Hz	0.0
$F327$	AI1 input point 2 setting	0~100%	100
$F328$	AI1 input point 2 frequency	0.0~400.0 Hz	50.0
$F329$	AI2 input point 1 setting	0~100%	0
$F330$	AI2 input point 1 frequency	0.0~400.0 Hz	0.0
$F331$	AI2 input point 2 setting	0~100%	50
$F332$	AI2 input point 2 frequency	0.0~400.0 Hz	50.0

These parameters adjust the output frequency according to the externally applied analog signal (0-5Vdc voltage, 0-10Vdc voltage, 4-20mA dc current) and the entered command for setting an external contact frequency, see figure 5.11.

Note 1: Do not set the same value to $F325$ and $F327$ (or $F329$ and $F331$), otherwise $A-05$ will alarmed.

Note 2: when adjust 4-20mA dc current input, set 20(%) to $F325$ ($F327$).

Note 3: analog input signal bias and slope could further adjust with the parameter between $F333$ and $F336$

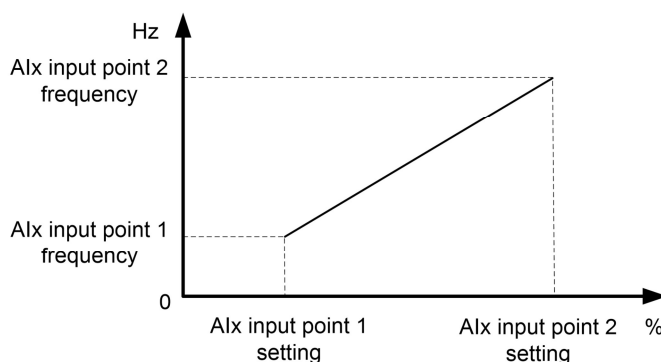


Figure 6.11 Relation between analog input and frequency setting

NO.	Parameter Name	Setting Range	Default
$F333$	AI1 input bias	0~255	varies by model
$F334$	AI1 input gain	0~255	varies by model
$F335$	AI2 input bias	0~255	varies by model
$F336$	AI2 input gain	0~255	varies by model

To fine adjust the frequency command characteristics for AI1/AI2 input, use the Parameters $F333$ to $F336$.

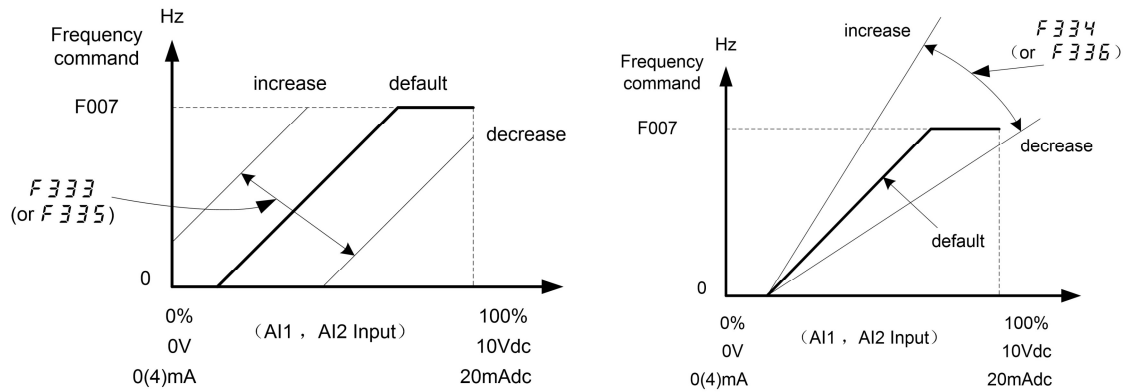


Figure 6.12 Calibration of analog input

Note 1: If you want to reduce the leeway, set $F470$ or $F472$ to a larger value. Note that specifying a too large value may cause an output frequency to be output, even though the operation frequency is 0 (zero) Hz.

Note 2: If you want to adjust the VFD so that it will output the maximum frequency at the maximum voltage and current input, set $F471$ or $F473$ to a smaller value. Note that specifying a too small value may cause the operation frequency not to reach the maximum frequency, even though the maximum voltage and current input are applied.

NO.	Parameter Name	Setting Range	Default
$F337$	Low-speed signal output frequency	0.0 Hz ~ $F007$	0.0

When the output frequency exceeds the setting of $F337$, an ON signal will be generated. This signal can be used as an electromagnetic brake excitation/release signal.

This signal can also be used as an operation signal when $F337$ is set to 0.0Hz, because an ON signal is put out if the output frequency exceeds 0.0Hz.

If the VFD is so set, the signal will be put out through the open collector OUT(LO-CLO) and RELAY output terminals.

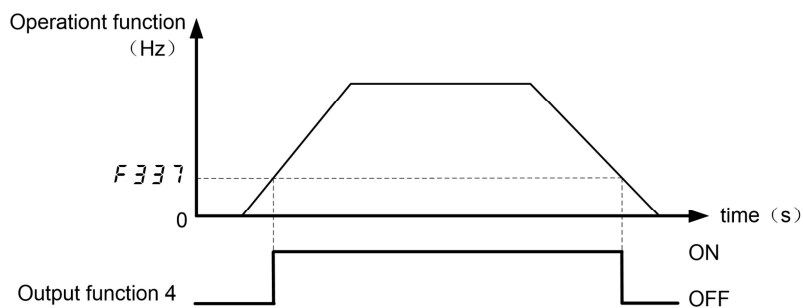


Figure 6.13 Description of Low-speed signal output frequency

NO.	Parameter Name	Setting Range	Default
$F338$	Speed reach detection output frequency	0.0 Hz ~ $F007$	0.0
$F339$	Speed reach detection band	0.0 Hz ~ $F007$	2.5

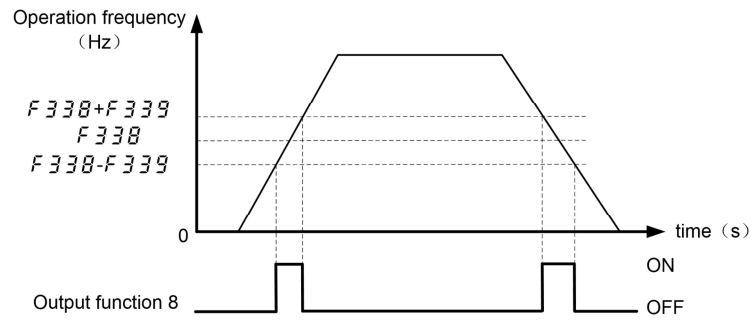


Figure 6.14 Description of Speed reach detection output frequency

NO.	Parameter Name	Setting Range	Default
<i>F340</i>	AI1 input reach detection level	0~100 %	0
<i>F341</i>	AI1 input reach detection band	0~20 %	3

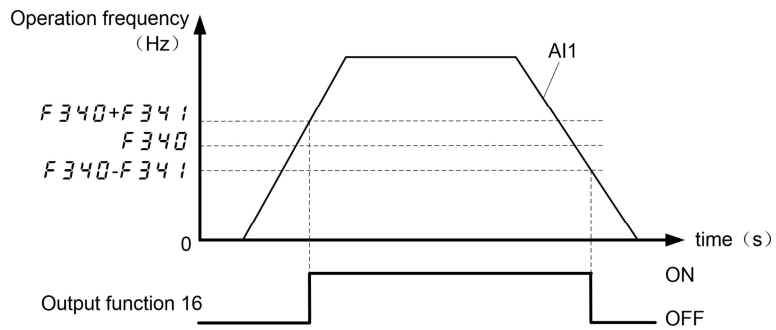


Figure 6.15 Description of AI1 input reach output

NO.	Parameter Name	Setting Range	Default
<i>F342</i>	AI2 input reach detection level	0~100 %	0
<i>F343</i>	AI2 input reach detection band	0~20 %	3

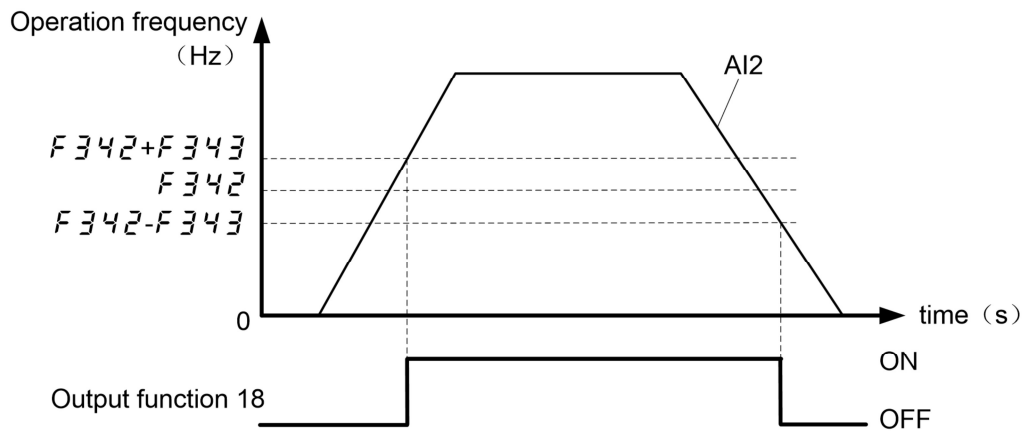


Figure 6.16 Description of AI2 input reach output

NO.	Parameter Name	Setting Range	Default
<i>F344</i>	Frequency command agreement detection range	0.0 Hz ~ <i>F007</i>	2.5

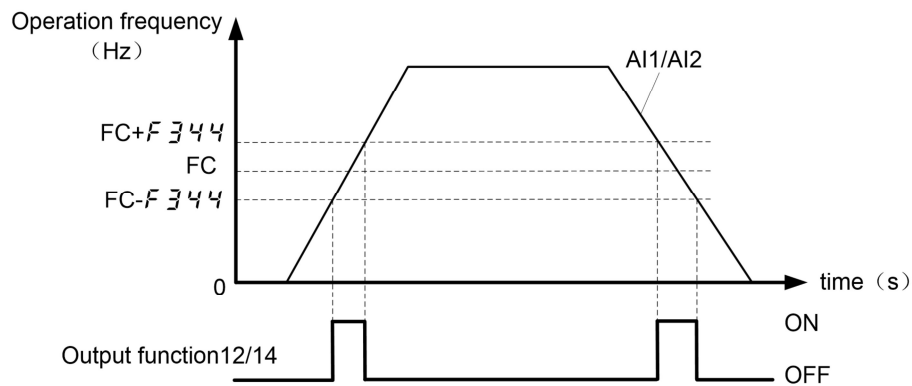


Figure 6.17 Description Frequency command agreement detection output

If the frequency command value specified using *F003* (or *F005*) almost agrees with the frequency command value from the VA and VIB terminal with an accuracy of $\pm F344$, an ON or OFF signal will be sent out.

Note: This function can be used, for example, to send out a signal indicating whether the amount of processing and the amount of feedback agree with each other when the PID function is in use. For an explanation of the PID function.

NO.	Parameter Name	Setting Range	Default
<i>F345</i>	Logic output/pulse train output selection (LO1-CLO1)	0~1	0

0: Logic output 1: Pulse train output

NO.	Parameter Name	Setting Range	Default
<i>F346</i>	Pulse train output function selection (LO1 –CLO1)	0~14	0

Table 6.4 Pulse train output function selection

<i>F346</i>	Description	Reference of max. value
0	Output frequency	<i>F007</i>
1	Output current	185% of VFD rated current
2	Set frequency (Before PID)	<i>F007</i>
3	Frequency setting value (After PID)	<i>F007</i>
4	DC voltage	150% of VFD rated voltage
5	Output voltage command value	150% of VFD rated voltage
6	Input power	185% of VFD capacity
7	Output power	185% of VFD capacity
8	AI1 Input value	5V /10V/20mA
9	AI2 Input value	10V
10	Torque	250% of motor rated torque
11	Torque current	250% of motor rated torque current
12	Motor cumulative load factor	100%
13	VFD cumulative load factor	100%
14	PBR (braking reactor) cumulative load factor	100%

Note : When item of $F 346$ reaches “Reference of max. value”, the number of pulse train set by $F 346$ are sent to output terminals (LO1-CLO1).

NO.	Parameter Name	Setting Range	Default
$F 347$	Maximum numbers of pulse train	500~1600	800

Note: The ON pulse width is maintained constant. The ON pulse width is fixed at a width that causes the duty to reach 50% at the maximum pulse number set with $F 347$. Therefore, the duty is variable. For example, the ON pulse width is approximately 0.6 ms when $F 347 = 800$, approximately 0.5ms when $F 347 = 1000$, or approximately 0.3 ms when $F 347 = 1600$.

NO.	Parameter Name	Setting Range	Default
$F 348$	AO1 selection	0~18	0

The signal of internal calculated value can output from the AO1 terminal. Analog voltage output signal is default. Switching to 0-20mAdc (4-20mAdc) output current can be made by setting $F 307$ to 0.

Table 6.5 AO selection parameters

$F 348$	Description	maximum value
0	Output frequency	Maximum frequency $F 007$
1	Output current	185% of invter rated current
2	Set frequency (betore PID)	Maximum frequency $F 007$
3	Frequency setting value (after PID)	Maximum frequency $F 007$
4	DC voltage	150% of VFD rated voltage
5	Output voltage command value	150% of VFD rated voltage
6	Input power	185% of VFD rated voltage
7	Output power	185% of VFD rated voltage
8	AI1 input	(1023)
9	AI2 input	(1023)
10	Torque	250% of VFD rated torque
11	Torque current	250% of VFD rated torque current
12	Motor cumulative load factor	100%
13	VFD cumulative load factor	100%
14	brake resistor cumulative load factor	100%
15	Serial communication data	—
16	$F 374 = 0\% \sim 185\%$ corresponds to the range of AO	—
17	$F 374 = 0\% \sim 185\%$ corresponds to the range of AO	—
18	$F 374 = 0\% \sim 185\%$ corresponds to the range of AO	—

NO.	Parameter Name	Setting Range	Default
<i>F 3 4 9</i>	Analog output voltage scaling (AO1)	1~1280	464
<i>F 3 5 0</i>	Inclination characteristic of analog output	0~1	1
<i>F 3 5 1</i>	Bias of analog output	0~100%	0

The analog output characteristic can be adjusted by using the parameter *F 3 4 9*, *F 3 5 0* and *F 3 5 1*, see figure 5.18.

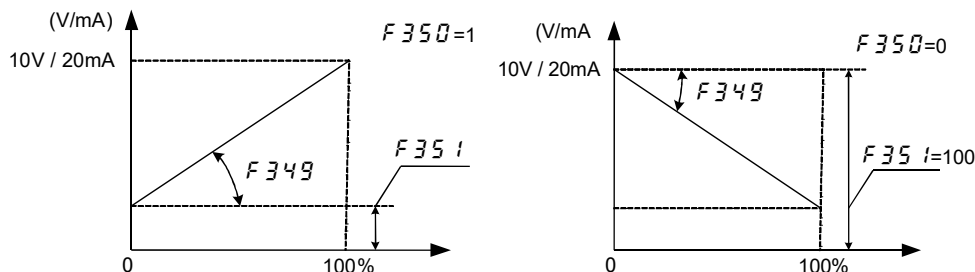


Figure 6.18 Description of *F 3 4 9*, *F 3 5 0* and *F 3 5 1*

Default output signals from AO1 terminals are analog voltage signals. Their standard setting range is from 0 to 10Vdc. Using these parameters, you can calibrate the output to 4-20mA or 20-4mA.

Note 1: To switch to 0-20mA (4-20mA) output, set *F 3 0 7* = 0.

Note 2: Only when *F 3 4 8* = 16, set value of *F 3 4 9* displays.

Note 3: When enters *F 3 4 9*, operation frequency is displayed (*F 3 4 8* = 0), then press the ▲ key or the ▼ key to adjust *F 3 4 9*. If a meter is connected to AO1, the meter reading will change at this time (*F 3 4 9* will change too) but be careful because there will be no change in the VFD's digital LED (monitor) indication.

NO.	Parameter Name	Setting Range	Default
<i>F 3 5 2</i>	output frequency when AO1 = 0V	0 Hz ~ <i>F 0 0 7</i>	0.0
<i>F 3 5 3</i>	output frequency when AO1 = 10V	0 Hz ~ <i>F 0 0 7</i>	0.0

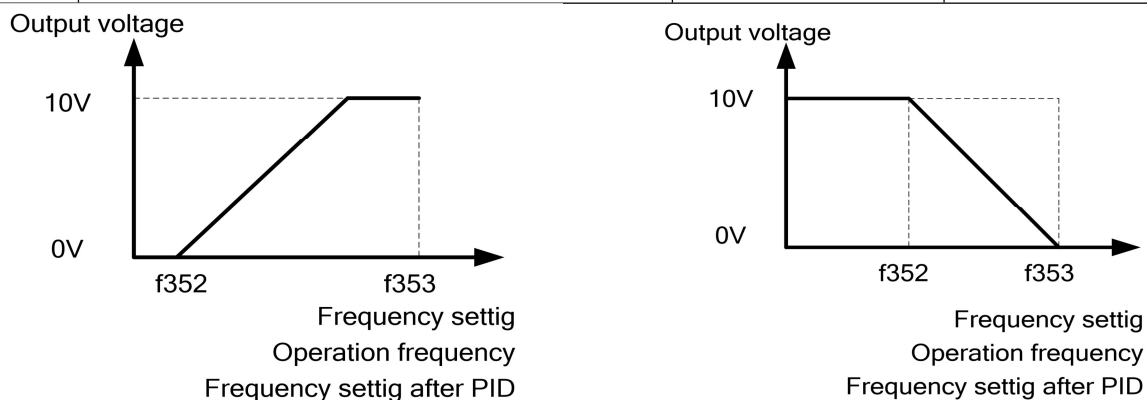


Figure 6.19 Description of *F 3 5 2* and *F 3 5 3* setting

Note: When *F 3 4 8* is set to 0 (or 2,3), if *F 3 5 2* or *F 3 5 3* are not set to 0 at same time, *F 3 5 0* and *F 3 5 1* will not be effective..

NO.	Parameter Name	Setting Range	Default
<i>F 3 5 4</i>	Analog Output Voltage Bias Calibration (AO1)	0~255	126

For details of $F 354$, see parameter $F 348$.

Note: This parameter cannot be reset by $F 120 = 1$.

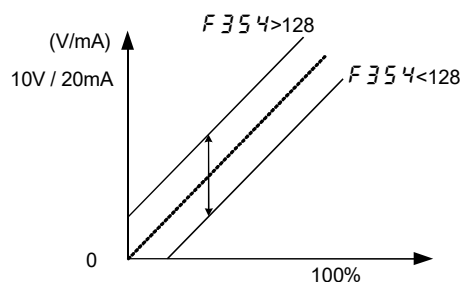


Figure 6.20 Description of $F 354$

NO.	Parameter Name	Setting Range	Default
$F 355$	Input terminal function for LI5	0~75	0
$F 356$	Input terminal function for LI6	0~75	0
$F 357$	Input terminal function for LI7	0~75	0
$F 358$	Input terminal function for LI8	0~75	0

The set method is same as $F 301 \sim F 304$.

Note1: Only valid when capacity rating is at 15kw or above.

NO.	Parameter Name	Setting Range	Default
$F 359$	Main functions of Relay 2	0~255	0
$F 360$	Relay 2 auxiliary functions	0~255	0
$F 361$	Relay 2 main and secondary functional logic relationship	0~1	0
$F 362$	Relay 2 closing delay time	0~60.0s	0.0

The set method is same as $F 315$.

NO.	Parameter Name	Setting Range	Default
$F 363$	Input terminal active mode	00~FF	00

This parameter is 8-bit binary-hexadecimal display (0x00~0xFF), and corresponds from right to left to the setting bits for LI1~LI8, with the setting options for each:

0: Input terminal function active when input terminal is OFF.

1: Input terminal function inactive when input terminal is ON.

NO.	Parameter Name	Setting Range	Default
$F 364$	Input terminal filter time	0~200	0

A unit of filtering time constant 1 corresponds to 2ms.

NO.	Parameter Name	Setting Range	Default
$F 365$	Output terminal function B of T1	0~ 69	0

The set method is same as *F 3 15*.

NO.	Parameter Name	Setting Range	Default
<i>F 3 6 6</i>	Output terminal logic selection of T1	0~1	0

The set method is same as *F 3 16*.

0: With, *F 3 15* and *F 3 16* must satisfy the request at the same time, then relay one acts.

1: Or, *F 3 15* or *F 3 16* either satisfy the request, then relay one acts.

NO.	Parameter Name	Setting Range	Default
<i>F 3 6 7</i>	Terminal run detection selection at power on	0~1	0

0: Disable, when power on, VFD will not supply to the motor even if the input terminal (to which forward/reverse run function is assigned) is ON, Only open the input terminal and re-close it will start the motor.

1: Enable. when power on, VFD will supply to the motor on the detection of the forward/reverse run terminal is ON.

NO.	Parameter Name	Setting Range	Default
<i>F 3 6 8</i>	AO2 voltage-current output selection	0~1	0

0: Current signal output.

1: Voltage signal output.

NO.	Parameter Name	Setting Range	Default
<i>F 3 6 9</i>	AO2 selection	0~16	0
<i>F 3 7 0</i>	Analog output current scaling (AO2)	1~1280	375
<i>F 3 7 1</i>	Inclination characteristic of analog output	0~1	1
<i>F 3 7 2</i>	Bias of analog output	0~100%	0

The Settings of *F 3 6 9*, *F 3 7 1* and *F 3 7 2* are shown in the corresponding parameters of AO1, *F 3 4 8*, *F 3 5 0* and *F 3 5 1*.

For detailed description of *F 3 7 0*, see parameter *F 3 4 8*.

Note: Parameter *F 3 7 0* cannot be reset by *F 1 2 0* = 1.

NO.	Parameter Name	Setting Range	Default
<i>F 3 7 3</i>	Analog Output current Bias Calibration (AO2)	0~255	107
<i>F 3 7 4</i>	Percentage of AO monitored values	0~250%	0

1) AO1-0 ~ 10V calibration is as follows:

F 3 0 7 = 1, *F 3 4 8* = 18/17/16 Inverter stop state, set *F 3 7 4* = 1%, adjust the value of *F 3 5 4*, so that the actual output voltage is 0.1V. Then set *F 3 7 4* = 100%/150%/185% and adjust the value of *F 3 4 9* to make the actual output voltage 10V.

After calibration is completed, *F 3 4 8* modifies back to the internal functional variables that need to be monitored.

2) Ao1-4 ~ 20mA calibration is as follows:

$F 307 = 0$, $F 351 = 20\%$, $F 348 = 18/17/16$ Inverter stop state, set $F 374 = 0\%$, adjust the value of $F 432$, make the actual output current is 4mA. Then set $F 374 = 100\%/150\%/185\%$ and adjust the value of $F 431$ so that the actual output current is 20mA.

After calibration is completed, $F 348$ modifies back to the internal functional variables that need to be monitored.

3) AO2-0 ~ 10V calibration is as follows:

$F 368 = 1$, $F 369 = 18/17/16$ Inverter stop state, set $F 374 = 1\%$, adjust the value of $F 434$, make the actual output voltage is 0.1V. Then set $F 374 = 100\%/150\%/185\%$ and adjust the value of $F 433$ to make the actual output voltage 10V.

After calibration is completed, $F 369$ modifies back to the internal functional variables that need to be monitored.

4) AO2-4 ~ 20mA calibration is as follows:

$F 368 = 0$, $F 372 = 20\%$, $F 369 = 18/17/16$ Inverter stop state, set $F 374 = 0\%$, adjust the value of $F 373$, make the actual output current is 4mA. Then set $F 374 = 100\%/150\%/185\%$ and adjust the value of $F 370$ so that the actual output current is 20mA.

After calibration is completed, $F 369$ modifies back to the internal functional variables that need to be monitored.

Note: Parameters $F 349 \sim F 373$ cannot be reset by $F 120 = 1$.

NO.	Parameter Name	Setting Range	Default
$F 375$	Output terminal logic selection of LO2-CLO2	0~1	0

0: $F 373$ AND $F 374$. The logical product (AND) of $F 373$ and $F 374$ will be output to LO2-CLO2.

1: $F 373$ OR $F 374$. The logical sum (OR) of $F 373$ and $F 374$ will be output to LO2-CLO2.

NO.	Parameter Name	Setting Range	Default
$F 376$	LO2-CLO2 output delay	0~60.0 s	0.0

$F 376$ specified the time of LO2-CLO2 output delay.

6.5 Fault protection parameter group

NO.	Parameter Name	Setting Range	Default
$F 400$	Retry selection (Selecting the number of times)	0~10	0

0: disabled

1~10 times.

This parameter resets the VFD automatically when the VFD gives an alarm. During the retry mode, the motor speed search function operated automatically as required and thus allows smooth motor restarting.

Protective operation detection relay signals (T1A-T1B-T1C or T2A-T2B-T2C terminal signals) are not sent during use of the retry function.

To allow a signal to be sent to the protective action detection relay (TxA, B and C terminals) even during the retry process, assign the output terminal function 36 or 37 to $F 315$.

A virtual cooling time is provided for overload tripping ($E - 21$, $E - 22$). In this case, the retry function will operate after the virtual cooling time and retry time.

In the event of tripping caused by an overvoltage ($E - 11$), the retry function will not be activated until the voltage in the DC section comes down to a normal level.

In the event of tripping caused by overheating ($E - 24$), the retry function will not be activated until the temperature in the VFD comes down low enough for it to restart operation.

Keep in mind that when $F429$ is set to 1 (trip retained), the retry function will not be performed, regardless of the setting of $F400$.

During retrying, the blinking display will alternate between $R - 08$ and the monitor display specified by status monitor display mode selection parameter $F610$.

The number of retries will be cleared if the VFD is not tripped for the specified period of time after a successful retry. "A successful retry" means that the VFD output frequency reaches the command frequency without causing the VFD to re-trip.

Retry available fault including overcurrent ($E - 01$, $E - 04$), overvoltage ($E - 11$), overheat ($E - 24$), overload ($E - 21$, $E - 22$), and momentary power failure.

The retry function will be canceled at once if tripping is caused by an unusual event other than the retry available fault. This function will also be canceled if retrying is not successful within the specified number of times.

"Function be canceled" means VFD will be tripped and stop supply to motor.

The interval time is proportional relation with retry times. The first retry is 1sec, the second retry is 2 sec and the 10th retry is 10sec.

retry time	1	2	3	4	5	6	7	8	9	10
success time	1s	2s	3s	4s	5s	6s	7s	8s	9s	10s

Before all fault reset attempts are finished:

The output terminal to which output terminal function 40 (or 41) is assigned will not indicate the fault.

The output terminal to which output terminal function 38 (or 39) is assigned can be used to indicate the appearance of automatically retry available fault.

The output terminal to which output terminal function 30 (or 31) is assigned can be used to indicate any type of the fault in the VFD even if during the the period of retry.

NO.	Parameter Name	Setting Range	Default
$F401$	Electronic-thermal protection characteristic selection	0~7	0

Table 6.6 Description of $F401$

$F401$	motor type	overload tripped enable	overload stall
0	Standard motor	YES	NO
1		YES	YES
2		NO	NO
3		NO	YES
4	Special motor (forced cooling)	YES	NO
5		YES	YES
6		NO	NO
7		NO	YES

Overload stall: This is an optimum function for equipment such as fans, pumps and blowers with variable torque characteristics that the load current decreases as the operating speed decreases. When the VFD detects an overload, this function automatically lowers the output frequency before the motor overload trip $\mathcal{E} - \mathcal{Z} \text{ I}$ is activated. This function operates a motor at frequencies that allow the load current to keep its balance so that the VFD can continue operation without being tripped.

Note: Do not use the overload stall function with loads having constant torque characteristics (such as conveyor belts in which load current is fixed with no relation to speed).

NO.	Parameter Name	Setting Range	Default
$F 402$	Motor 150%-overload time limit	10~2400s	300

Parameter $F 403$ is used to set the time elapsed before the motor trips under a load of 150% (overload trip $\mathcal{E} - \mathcal{Z} \text{ I}$) within a range of 10 to 2400 seconds.

NO.	Parameter Name	Setting Range	Default
$F 403$	Emergency stop selection	0~2	0
$F 404$	emergency braking time	0~20.0 s	1.0

0: Free stop 1: Ramp stop 2: Emergency DC braking

These parameters allow you to specify how to stop operation using an external control device when an external trip occurs. When operation stopped, the trip $\mathcal{E} - \mathcal{Y} \text{ I}$ displayed. When setting $F 403 = 2$ (emergency DC braking), set also $F 507$ (DC braking rate) and $F 404$ (emergency braking time). Assigning the trip stop function (input terminal function 11 or 27) to the contact input terminal.

Note 1: Emergency stopping via the specified terminal is possible, even during panel operation.

Note 2) If DC braking is not needed to bring the motor to a stop under normal conditions, although $F 403$ is set to 2 (emergency DC braking), set the DC braking starting frequency ($F 505$) at 0.0 Hz.

NO.	Parameter Name	Setting Range	Default
$F 405$	Input phase failure detection	0~1	0

0: Disabled, No tripping.

1: Enabled, Phase failure detection is enabled during operation.

This parameter detects VFD input Phase failure. If the abnormal voltage status of main circuit capacitor persists for few minutes or more, the tripping function will be activated.

Therefore, input phase failures cannot always be detected. A trip information $\mathcal{E} - \mathcal{Y} \text{ I}$ will be displayed. If the power capacity is larger than the VFD capacity (more than 200kVA or more than 10 times), detection errors may occur. If this actually happens, install an AC or DC reactor.

Note1: Setting $F 405 = 0$ (input phase failure detection: disabled) may result in a breakage of the capacitor in the VFD main circuit if operation is continued under a heavy load in spite of the occurrence of an input phase failure.

Note2: Parameter $F 405$ is invalid for single-phase input model.

NO.	Parameter Name	Setting Range	Default
$F 406$	Output phase failure detection mode selection	0~5	0

0: Disabled.

1: At start-up (Only one time after power is turned on).

2: At start-up (each time).

3: During operation.

4: At start-up and during operation.

5: Detection of cutoff on output side.

F 406=0: No tripping.

F 406=1: With the power on, the phase failure detection is enabled only at the start of the first operation. The VFD will trip if the Phase failure status persists for one second or more.

F 406=2: The VFD checks for output phase failures each time it starts operation. The VFD will trip if the Phase failure status persists for one second or more.

F 406=3: The VFD checks for output phase failures during operation. The VFD will trip if the Phase failure status persists for one second or more.

F 406=4: The VFD checks for output phase failures at the start of and during operation. The VFD will trip if the Phase failure status persists for one second or more.

F 406=5: If it detects an all-phase failure, it will restart on completion of reconnection. The VFD does not check for output phase failures when restarting after a momentary power failure.

Note1: A check for output phase failures is made during auto-tuning, regardless of the setting of this parameter.

Note2: Set *F 406*=5 to open the motor-VFD connection by switching commercial power operation to VFD operation. Detection errors may occur for special motors such as high-speed motors.

NO.	Parameter Name	Setting Range	Default
<i>F 407</i>	Small current trip/alarm selection	0~1	0

0: Alarm only. A small current alarm can be put out by setting the output terminal function selection parameter.

1: Tripping. The VFD will trip if a current below the current set with *f408* flows for the period of time specified with *F 410*. Trip information is displayed as "*E - 06*".

NO.	Parameter Name	Setting Range	Default
<i>F 408</i>	undercurrent detection current	0~100%	0.00
<i>F 409</i>	under current detection current hysteresis	1~20%	10
<i>F 410</i>	undercurrent detection time	0~255s	0

If a current smaller than the *F 408* specified value flows for more than the *F 410* specified time. When tripping is selected (see *F 407*), enter the detection time to tripping. Trip information is displayed as "*E - 12*". See figure 5.21.

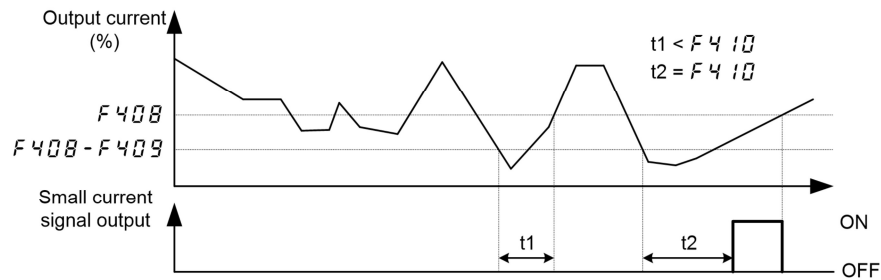


Figure 6.21 Description of small current

Note: The 100% standard value of f408 and $F409$ is the rated output current indicated on the motor nameplate.

NO.	Parameter Name	Setting Range	Default
$F411$	Over torque/over current indicator selection	0~5	0

0: Over-torque alarm: (70%)

- When the torque current reaches 70% of $F412$, the relay with function set as 48 will immediately operate;
- When the torque current reaches 100% of $F412$ and the duration reaches $F414$, the function is set as relay operation of 32;
- When the above relay (function is 48 or 32) operates, the panel will not operate and the converter will not stop.

1: Over-torque fault

- When the torque current reaches 70% of $F412$, the relay with function set as 48 will immediately operate, but the panel will not operate, and the converter will not stop;
- When the torque current reaches 100% of $F412$ and the duration reaches $F414$, the function is set as relay action of 32 and the converter reports the fault $E-07$;

2. Over-torque alarm: (100%)

- When the torque current reaches 100% of $F412$, the relay with function set as 48 will immediately operate;
- When the torque current reaches 100% of $F412$ and the duration reaches $F414$, the function is set as relay operation of 32;
- When the above relay (function is 48 or 32) operates, the panel will not operate and the converter will not stop.

3: Over-current alarm: (70%)

- When the output current reaches 70% of $F412$, the relay with function set as 48 will immediately operate;
- When the output current reaches 100% of $F412$ and the duration reaches $F414$, the function is set as relay operation of 32;
- When the above relay (function is 48 or 32) operates, the panel will not operate and the converter will not stop.

4: Overcurrent fault

- When the output current reaches 70% of $F412$, the relay with function set as 48 will immediately operate, but the panel will not operate, and the inverter will not stop;
- When the output current reaches 100% of $F412$ and the duration reaches $F414$, the function is set as relay action of 32 and the VFD reports the fault $E-07$;

5: Overcurrent alarm: (100%)

- When the output current reaches 100% of $F412$, the relay with function set as 48 will immediately operate;

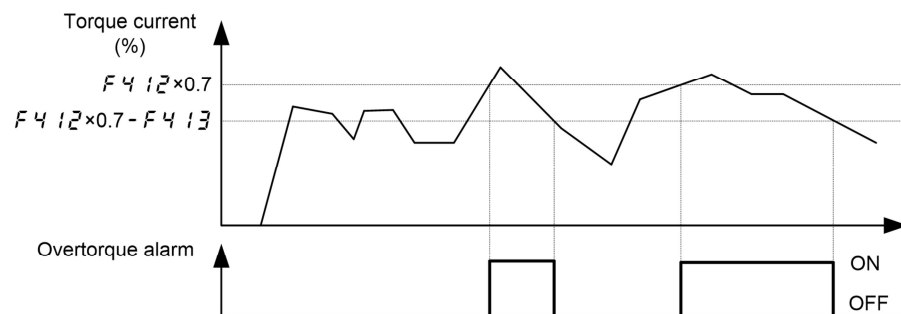
- When the output current reaches 100% of $F412$ and the duration reaches $F414$, the function is set as relay operation of 32;
- When the above relay (function is 48 or 32) operates, the panel will not operate and the converter will not stop.

NO.	Working conditions		Operating conditions and operation of the converter
	Torque current	Output current	
1	$F411=0$	$F411=3$	No action on the panel, the inverter does not stop.
2	$F411=1$	$F411=4$	Torque/output current reached $F412$, and the duration reached $F414$, the panel reported failure $E-07$, the VFD stopped.
3	$F411=2$	$F411=5$	No action on the panel, the inverter does not stop.

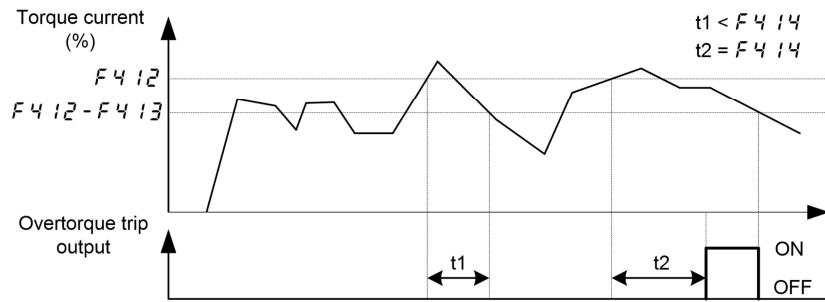
NO.	Working conditions		Working conditions	
	Torque current	Torque current	Relay (Function 48)	Relay (Function 32)
1	$F411=0$	$F411=3$	When the torque/output current reaches 70% of $F412$, the relay operates immediately.	The torque/output current reaches 100% of $F412$ and the duration reaches $F414$. The relay operates.
2	$F411=1$	$F411=4$		
3	$F411=2$	$F411=5$	When the torque/output current reaches 100% of $F412$, the relay operates immediately.	

NO.	Parameter Name	Setting Range	Default
$F412$	Over-torque detection level	0~250%	130
$F413$	Over-torque detection level hysteresis	0~100%	10
$F414$	Over-torque detection time	0.0~10.0s	0.5

Use the $F411$ parameter to trip the VFD or to output the alarm if a torque current exceeding the $F412$ -specified level flows for more than the $F414$ -specified time. Trip information is displayed as " $E-07$ ".



a) Over-torque detection alarm output



b) Over-torque detection trip output

Figure 6.22 Description of Over-torque detection

Note 1: Output over-torque detection alarm by assigning the output terminal function 48 to T1 (T2、LO1-CLO1 or LO2-CLO2). Output over-torque detection trip by assigning the output terminal function 32 to T1 (T2、LO1-CLO1 or LO2-CLO2).

Note 2: The 100% standard value of *F 4 12* and *F 4 13* is the rated output current indicated on the motor nameplate.

NO.	Parameter Name	Setting Range	Default
<i>F 4 15</i>	Overvoltage limit operation	0~3	2

0: Enabled. When the VFD detects the upcoming overvoltage fault, it takes one of the following measures to avoid overvoltage: to increase deceleration time, to keep motor speed or raise motor speed.

1: Disabled

2: Enabled (Quick deceleration). The VFD will increase the voltage to the motor (over-excitation control) to increase the amount of energy consumed by the motor when the voltage reaches the overvoltage protection level, and therefore the motor can be decelerated more quickly than normal deceleration.

3: Enabled (Dynamic quick deceleration). the VFD will increase the voltage to the motor(over-excitation control) to increase the amount of energy consumed by the motor as soon as the motor begins to slow down, and therefore the motor can be decelerated still more quickly than quick deceleration.

Note: When motor speed falls, the VFD absorbs regenerative energy from the load and the motor. This often brings DC bus overvoltage fault. If *F 4 15* is set to 3, this portion of engery will not be fed back to the VFD , but converted to heat dissipation into the motor. In this case the motor intensely gives out heat.

NO.	Parameter Name	Setting Range	Default
<i>F 4 16</i>	Overvoltage limit operation level	100~150%	130

F 4 16 specifies the Overvoltage limit operation level.

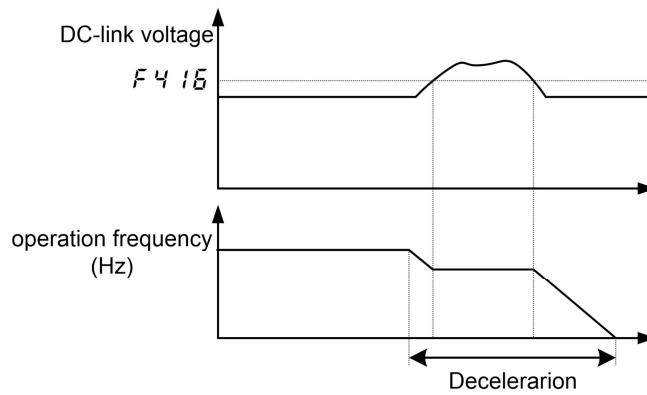


Figure 6.23 Description of overvoltage limit operation level

NO.	Parameter Name	Setting Range	Default
<i>F 4 1 7</i>	Undervoltage trip/alarm selection	0~2	0

0: Alarm only (detection level below 60%), The VFD is stopped. However, it is not tripped.

1: Tripping (detection level below 60%). VFD is stopped. It is also tripped

2: Alarm only (detection level below 50%, input reactor needed)

NO.	Parameter Name	Setting Range	Default
<i>F 4 1 8</i>	Instantaneous power failure coast stop selection	0~2	0

0: disabled

1: factory reserved

2: Coast stop.

Coast stop in the event of momentary power failure: If a momentary power failure occurs during operation, the VFD coast stops forcibly. When operation is stopped, the message “*A - 0 5*” is displayed (alternately) on the keypad. After the forced coast stop, the VFD remains static until you put off the operation command momentarily.

NO.	Parameter Name	Setting Range	Default
<i>F 4 1 9</i>	Forced fire-speed control function	0~1	0

0: Disabled.

1: Enabled.

To enable forced speed mode, set *F 4 1 9* to 1, and allocate input terminal function 33 to a input contact terminal. If *F 4 1 9* is set to 1 and input terminal function 33 is ON, the VFD will run at the frequency set by *F 7 3 0*. At this time,

Put OFF the input terminal function 33 will not stop the VFD .

The following VFD trip will not make it stop, but automatic restart is performed.: *E - 0 1*, *E - 0 4*, *E - 1 1*, *E - 2 1*, *E - 2 2*, *E - 2 3*, *E - 2 4*.

When the VFD is under local running mode, the VFD can only be stopped by powering off.

Note 1: The motor running direction is forward and the VFD runs according to the frequency command of the setpoint of *F 7 3 0*.

Note 2: The following operations will not make the VFD or motor stop: disabling function 33, press STOP key or light trip occurs.

NO.	Parameter Name	Setting Range	Default
<i>F 420</i>	Detection of output short-circuit during start-up	0~3	0

0: Each time (standard pulse)

1: Only one time after power is turned on (standard pulse)

2: Each time (short-time pulse)

3: Only one time after power is turned on (short-time pulse)

Note 1: when the phase resistor of the motor is small (motor capacity is large, short-time pulse is recommended).

NO.	Parameter Name	Setting Range	Default
<i>F 421</i>	Motor electric-thermal protection retention selection	0~1	0

0: disabled. If the VFD is turned on and off, its motor thermal state memory (used for overload computation) will be cleared.

1: Enabled. Even if the frequency inverter is turned off, the motor thermal state memory of the frequency inverter is still retained. If motor overload fault *E - 22* occurs in the VFD, the motor can be restarted only after a period of cooling time (computed by the VFD).

NO.	Parameter Name	Setting Range	Default
<i>F 422</i>	AI1 input loss	0~100%	0

0: Disabled. The VFD will not monitor the signal state on the analog input terminal AI1.

1~100: Fault detection level. If signal on AI1 drops below the selected fault detection level and this low signal level lasts 300 ms or more, fault occurs in the inverter. The keyboard panel will display fault code *E - 38*.

NO.	Parameter Name	Setting Range	Default
<i>F 423</i>	Activation of the VFD during 4-20mA signal loss	0~4	0

0: No measures.

1: Coast stop.

2: switch to Fallback speed. To switch to fallback speed *F 424*. The duration is as long as the fault life time and the running command is still valid.

3: Speed maintaining. To maintain the speed at the time when fault occurs in the VFD. The duration is as long as the fault life time and the running command is still valid.

4: Slowdown stop.

NO.	Parameter Name	Setting Range	Default
<i>F 424</i>	Fallback speed	0.0 Hz ~ <i>F.004</i>	0.0

See *F 423* = 2.

NO.	Parameter Name	Setting Range	Default
<i>F 425</i>	PTC thermal selection	0~2	0

0: Disabled

1: Enabled (trip mode), If the PTC probe triggers the signal of fault, the VFD enters into fault state and displays “E - 25”.

2: Enabled (alarm mode), if the PTC probe triggers the signal of fault, the VFD will trigger fault signal and continues running.

This function is used to protect motor from overheating using the signal of PTC built-in motor. Setting *F 425* to 1 or 2 can convert control terminal AI2 to a PTC motor thermal probe input. The wiring is shown in the following figure.

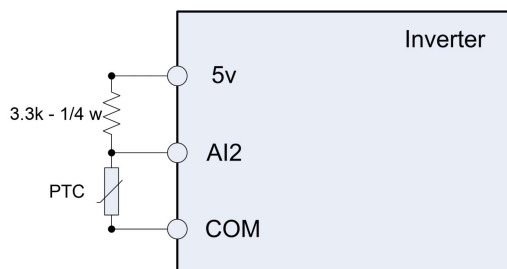


Figure 6.24 PTC wiring example

Note: PTC resistance must be connected in from AI2 terminal. One 3.3k-1/4 W resistance must be externally connected between 5 V and AI2.

NO.	Parameter Name	Setting Range	Default
<i>F 426</i>	Resistor value for PTC detection	100~9999 Ω	3000

NO.	Parameter Name	Setting Range	Default
<i>F 428</i>	Cumulative operation time alarm setting	0.0~999.9	610.0

This parameter allows you to set the VFD so that it will put out an alarm signal (Output terminal function = 50) after a lapse of the cumulative operation time set with *F 428*.

Note: 0.1=10h.

NO.	Parameter Name	Setting Range	Default
<i>F 429</i>	VFD trip retention selection	0~1	0

0: Clearing. The fault occurs and after the VFD is turned off and on,

If the fault cause has been eliminated, the inveter will be reset and can be started.

The information of just eliminated fault will be transmitted to the fault history record.

If the fault cause has not been eliminated yet, the fault will be displayed again and the running information related to the fault will be transmitted to the fault history record.

The information of the 4th from last fault will be eliminated from the fault history record.

1: Maintaining. The fault occurs and after the VFD is turned off and on,

If the fault cause has been eliminated, the inveter will be reset and can be started. The information of just eliminated fault will be transmitted to the fault history record.

If the fault cause has not been eliminated yet, original fault codes and all running data can be inquired as current fault under monitoring mode.

The information of the 4th from last fault will be reserved in the fault history record.

Automatic fault reset will be disabled.

NO.	Parameter Name	Setting Range	Default
<i>F 430</i>	Heat sink temperature reaches the alarm value	0~100 °C	60

When the heat sink temperature reaches the setting value of *F 430*, the VFD could output one alarm signal via logic output or relay output. Please refer to logic output function 66.

NO.	Parameter Name	Setting Range	Default
<i>F 431</i>	Analog output current scaling (AO1)	1~1280	377

NO.	Parameter Name	Setting Range	Default
<i>F 432</i>	Analog Output current Bias Calibration (AO1)	0~255	108

NO.	Parameter Name	Setting Range	Default
<i>F 432</i>	Analog output voltage scaling (AO2)	1~1280	463

NO.	Parameter Name	Setting Range	Default
<i>F 434</i>	Analog output voltage bias calibration (AO2)	0~255	126

See parameter *F 348* for detailed description of *F 431~F 433*.

Note: Parameters *F 431~F 433* cannot be reset by *F 120* = 1.

NO.	Parameter Name	Setting Range	Default
<i>F 435</i>	Running time 2 (ROM)	0~65534	----

This parameter is used to display the current running time, not the cumulative running time. After stopping, the running time 2 is automatically reset. The default unit is minutes. Minutes or seconds can be selected through parameter *F 752*.

6.6 Fault protection parameter group

NO.	Parameter Name	Setting Range	Default
<i>F 500</i>	Auto-restart control selection	0~4	0

0: Disabled

1: At auto-restart after momentary stop

2: When turning standby (input terminal function =1) on or off

3: At auto-restart or when turning standby (input terminal function =1) on or off

4: At start-up

5~7: factory reserved

8: First DC braking and then start. DC braking current level and braking time follow *F507* and *F508*

The *F500* parameter detects the rotating speed and rotational direction of the motor during coasting in the event of momentary power failure, and then after power has been restored, restarts the motor smoothly (motor speed search function).

This parameter also allows commercial power operation to be switched to VFD operation without stopping the motor. During operation, "A - 08" is displayed. During the retry mode see *F400*), the motor speed search function operated automatically as required and thus allows smooth motor restarting.

At restart, it takes about 300 ms for the VFD to check to see the number of revolutions of the motor. For this reason, the start-up takes more time than usual. Use this function when operating a system with one motor connected to one VFD. This function may not operate properly in a system configuration with multiple motors connected to one VFD.

Setting *F500* =1, (3): This function operates after power has been restored following detection of an undervoltage by the main circuits and control power.

Setting *F500* =2, (3): This function operates after the standby terminal((input terminal function =1) connection has been opened first and then connected again.

Setting *F500* =4, a motor speed search is performed each time operation is started. This function is useful especially when the motor is not operated by the VFD but it is running because of external force.

Setting *F500* = 0 (Disabled) and disabling the retry function (*F400*=0), when apply the VFD to crane or hoist. Such machines may have its load moved downward during the above waiting time from input of the operation starting command to the restart of the motor.

NO.	Parameter Name	Setting Range	Default
<i>F501</i>	auto-stop time limit for lower-limit frequency operation	0.0~600.0s	0.1

0: disabled (0.0) . None.

1: Enabled (0.1~600.0s) . If operation is carried out continuously at a frequency below the lower-limit frequency (*F009*) for the period of time set with *F501*, the VFD will enter into sleep mod and automatically slow down the motor to a stop. At that time, "A - 10" is displayed (alternately) on the keypad. This function will be canceled if a frequency command above the lower-limit frequency (*F009*) +0.2Hz.

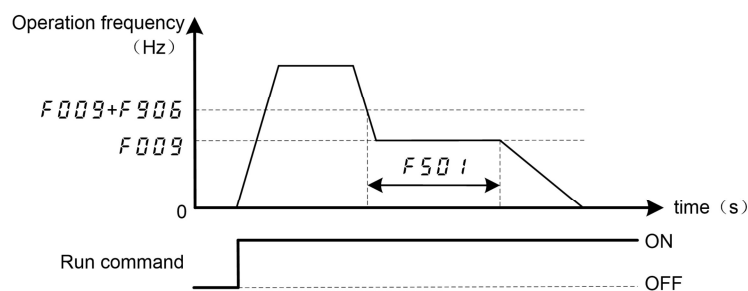


Figure 6.25 Description of sleep mode

Note: This function is enabled even at the start of operation and during switching between forward and reverse run.

NO.	Parameter Name	Setting Range	Default
<i>F502</i>	Bumpless operation selection	0~1	1

0: disabled.

1: enabled.

When switching from remote mode to local mode using *F501*, the status of start and stop, and operating frequency at remote mode are moved to local mode. By contraries, when switching from local mode to remote mode, they are not moved to remote mode.

Table 6.7 *F502* description

<i>F502</i> setting	switching between remote mode and local mode	description
0	Remote → Local	motor stops
	Local → Remote	run immediately with run command and frequency setting under remote control.
1	Remote → Local	motor runs continuesly with original run command and frequency setting under remote control.
	Local → Remote	run immediately with run command and frequency setting under remote control.

E.g, when *F501*=1, the VFD runs at 20 Hz of frequency setting under remote control mode. If switched to local mode (make *F713*=0), the VFD continues to run at 20 Hz under local control mode.

NO.	Parameter Name	Setting Range	Default
<i>F503</i>	Starting frequency setting	0.5~10.0Hz	0.5

The frequency set with *F503* is put out as soon as operation is started. Use the *F503* parameter when a delay in response of starting torque according to the acceleration/deceleration time is probably affecting operation. Setting the starting frequency to a value from 0.5 to 3Hz is recommended (*F503* is usually set to the motor rated slip frequency). The occurrence of an overcurrent can be suppressed by setting this frequency below the rated slippage of the motor.

Rated slip frequency can be calculated with the parameters written on the nameplate of the motor:

$$f_s = f_0 - \frac{n_N * P}{60}$$

P —— pole pairs. n_N —— motor rated speed (rpm) .

f_0 —— base frequency (Hz) . f_s —— motor rated slip frequency (Hz) .

NO.	Parameter Name	Setting Range	Default
<i>F504</i>	Operation starting frequency	0.0 Hz ~ <i>F007</i>	0.0
<i>F505</i>	Operation starting frequency hysteresis	0.0 Hz ~ <i>F007</i>	0.0

The Run/stop of operation can be controlled simply with these two parameters. The VFD begins accelerating after the frequency setting signal has reached point B. Deceleration ends when the frequency setting signal decreases below point A.

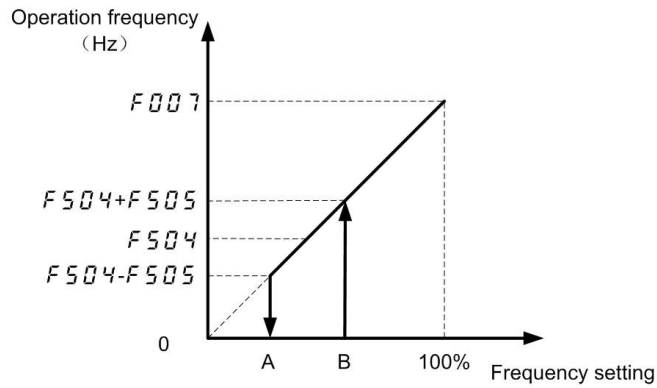


Figure 6.26 Description of Operation starting frequency

NO.	Parameter Name	Setting Range	Default
<i>F506</i>	DC braking starting frequency	0.0 Hz ~ <i>F007</i>	0.0
<i>F507</i>	DC braking current	varies by model	varies by model
<i>F508</i>	DC braking time	0.0~20.0 s	1.0

A large braking torque can be obtained by applying a direct current to the motor. These parameters set the direct current to be applied to the motor, the application time and the starting frequency. During DC braking, *A - 07* displays.

DC braking can be activated by two methods as follows:

Auto matically DC braking: when operation frequency decreases below *F506*, DC braking is activated.

Input terminal signal: when the input terminal function 13 is ON, DC braking is activated.

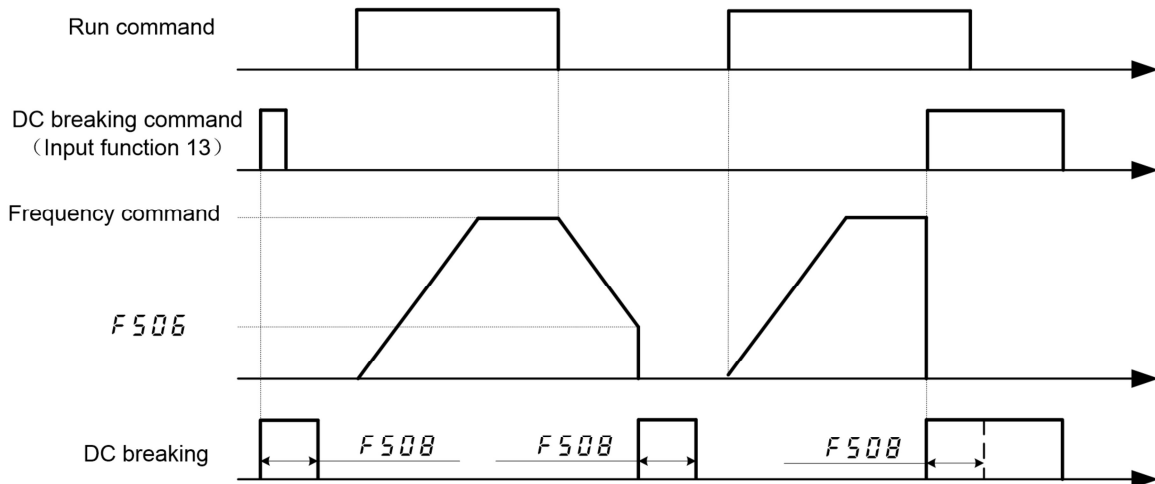


Figure 6.27 DC braking sequence

Note1: During DC braking, the overload protection sensitivity of the VFD increases. The DC braking current may be adjusted automatically to prevent tripping.

Note 2: During DC braking, the carrier frequency is 6 kHz or less irrespective of the setting of parameter *F012* (PWM carrier frequency).

NO.	Parameter Name	Setting Range	Default
<i>F510</i>	Acceleration/deceleration 1 pattern	0~3	0

0: Linear, Linear, applied to most occasions.

- 1: S-type curve 1, for the need to minimize the slope time while minimizing the impact of the occasion.
- 2: S-curve 2, can be used for high-speed main Main axis where the acceleration needs to be reduced when the motor is running above its rated operating frequency (weak magnetic field, output electromagnetic torque decreases).
- 3: Elevator acceleration / deceleration curve.

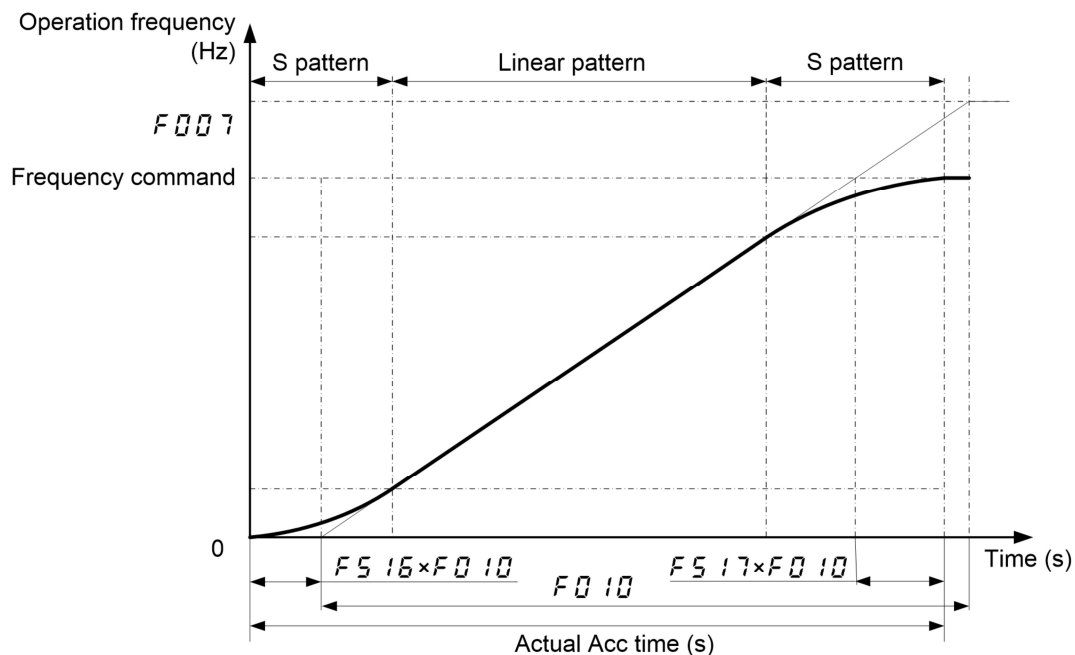


Figure 6.28 S-pattern acceleration/deceleration 1

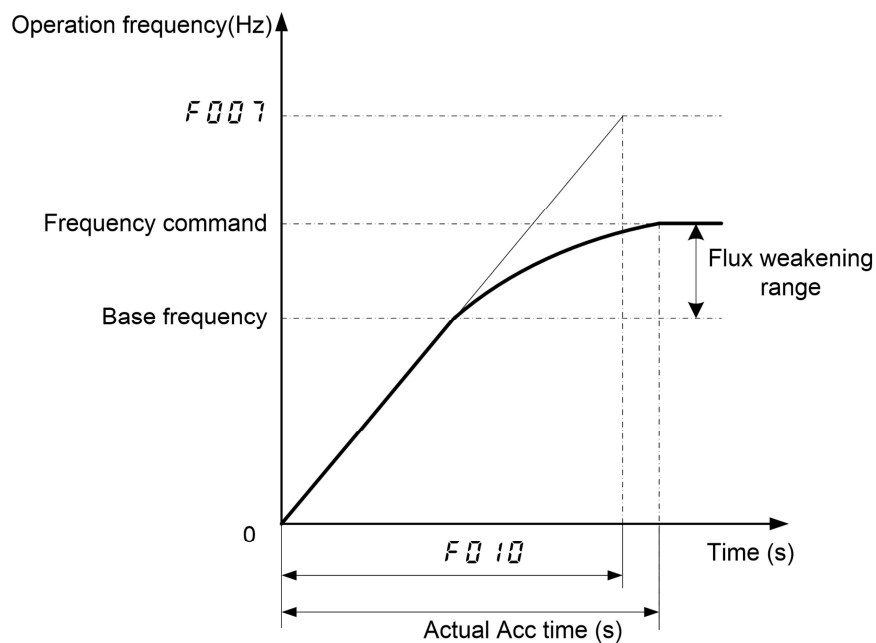


Figure 6.29 S-pattern acceleration/deceleration 2

LI1	LI4	LI3	LI2	Reference speed(frequency)selected	Acceleration/deceleration times
OFF	OFF	OFF	OFF	Speed 0 0.00Hz	<i>F518</i>
ON	OFF	OFF	OFF	Speed 1 (Run speed defined) defined by <i>F003</i>	<i>F518</i>
ON	OFF	OFF	ON	Speed 2 (Run speed defined) defined by <i>F716</i>	<i>F010</i>
ON	OFF	ON	OFF	Speed 3 (Maintenance speed) defined by <i>F717</i>	<i>F010/F011</i>
ON	OFF	ON	ON	Speed 4 (Creep speed) defined by <i>F718</i>	<i>F011</i>
ON	ON	OFF	OFF	Speed 5 (Run speed defined) defined by <i>F719</i>	<i>F518</i>
ON	ON	OFF	ON	Speed 6 (Run speed defined) defined by <i>F720</i>	<i>F010</i>
ON	ON	ON	OFF	Speed 7 (Maintenance speed) defined by <i>F721</i>	<i>F010/F011</i>
ON	ON	ON	ON	Speed 8 (Creep speed) defined by <i>F722</i>	<i>F011</i>

Figure 6.30 Speed selection table

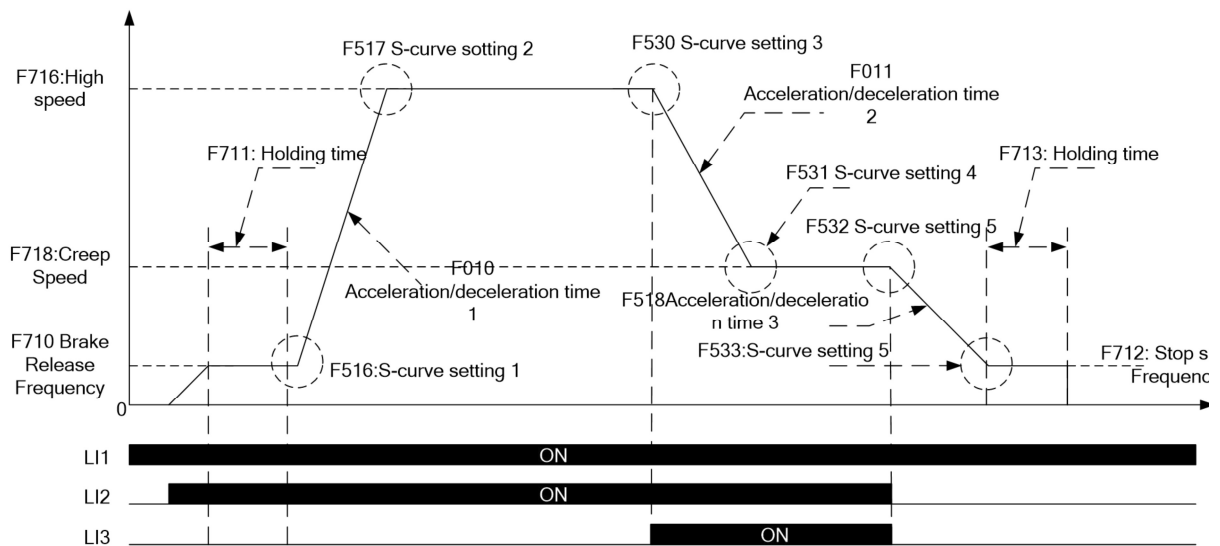


Figure 6.31 Elevator acceleration / deceleration curve

NO.	Parameter Name	Setting Range	Default
<i>F511</i>	Acceleration/deceleration 2 pattern	0~2	0
<i>F512</i>	Acceleration/deceleration 3 pattern	0~2	0

NO.	Parameter Name	Setting Range	Default
<i>F5 13</i>	Acceleration/deceleration 1 and 2 switching frequency	0.0 Hz ~ <i>F008</i>	0.0
<i>F5 14</i>	Acceleration/deceleration 2 and 3 switching frequency	0.0 Hz ~ <i>F008</i>	0.0

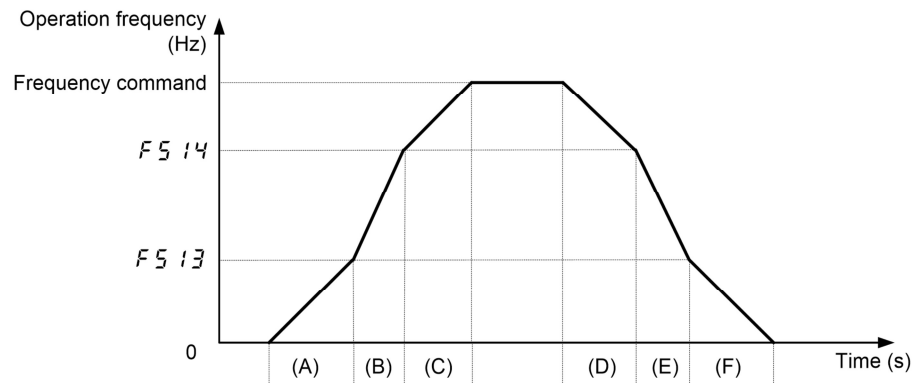


Figure 6.32 Acc/Dec parameters switching automatically

When set *F5 13* ≠ 0 and the VFD output frequency increases above (or decreases below) *F5 13* setting, *F5 18* (or *F5 19*) is effective.

Note:

(A) and (F) according to Acc/Dec 1; (B) and (E) according to Acc/Dec 2; (C) and (D) according to Acc/Dec 3.

NO.	Parameter Name	Setting Range	Default
<i>F5 15</i>	Selecting an acceleration/deceleration pattern	1~3	1

1: Acc/Dec 1, *F0 10*, *F0 11* and *F5 10* are valid.

2: Acc/Dec 2, *F5 18*, *F5 19* and *F5 11* are valid.

3: Acc/Dec 3, *F5 20*, *F5 21* and *F0 12* are valid.

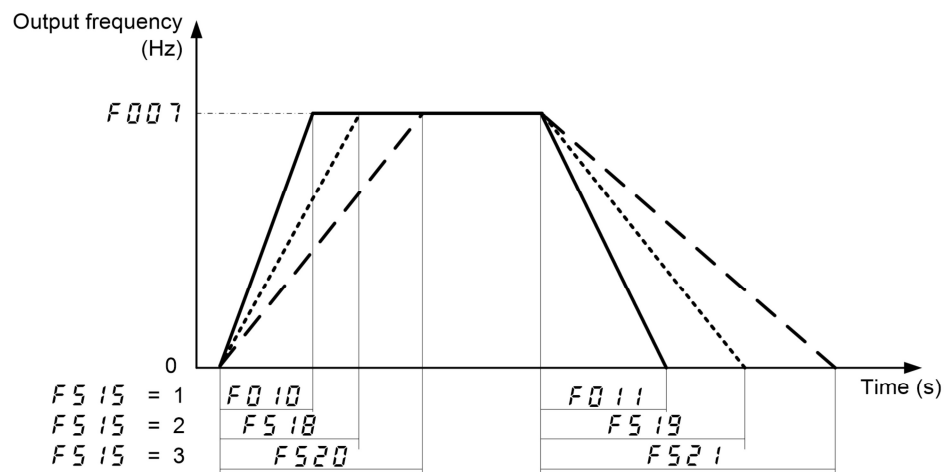


Figure 6.33 Acc/Dec parameters description

NO.	Parameter Name	Setting Range	Default
<i>F5 16</i>	S-pattern lower-limit adjustment amount	0~50 %	10
<i>F5 17</i>	S-pattern upper-limit adjustment amount	0~50 %	10

F5 16 and *F5 17* are used to adjust the relative proportion of the upper arc and lower arc of the S curve against the complete acceleration/deceleration time.

NO.	Parameter Name	Setting Range	Default
<i>F5 18</i>	Acceleration time 2	0.0~3200s	20.0
<i>F5 19</i>	Deceleration time 2	0.0~3200s	20.0
<i>F5 20</i>	Acceleration time 3	0.0~3200s	20.0
<i>F5 21</i>	Deceleration time 3	0.0~3200s	20.0

Three acceleration times and three deceleration times can be specified individually. A method of selection or switching can be selected from among the following:

- 1) Selection by means of parameters, see *F5 15*
- 2) Switching by changing frequencies, see *F5 13*、*F5 14*
- 3) Switching by means of terminals, see input terminal function 5, 64.

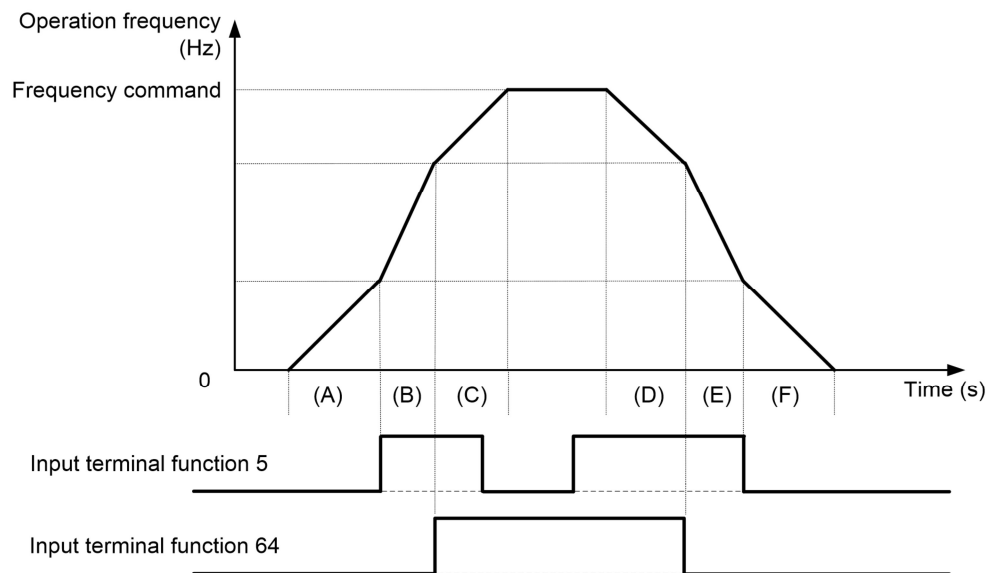


Figure 6.34 Using input contact terminal select Acc/Dec

Tabel 6.8 Using input contact terminal select Acc/Dec

input terminal function 64	input terminal function 5	Acc/Dec selection
0	0	Acc/Dec1
0	1	Acc/Dec 2
1	0	Acc/Dec 3
1	1	Acc/Dec 3

Tabel 6.9 Using input contact terminal and switching frequency select Acc/Dec

Frequency command	Input terminal function 5	Input terminal function 64	Acc/Dec selection
$F_c \leq F513$	0	0	ACC1
	1	0	ACC2
	0	1	ACC1
	1	1	ACC2
$F513 < F_c \leq F514$	0	0	ACC2
	1	0	ACC1
	0	1	ACC2
	1	1	ACC1
$F514 < F_c$	0	0	ACC3
	1	0	ACC3
	0	1	ACC3
	1	1	ACC3

Note:

(A) and (F) according to Acc/Dec 1; (B) and (E) according to Acc/Dec 2; (C) and (D) according to Acc/Dec 3.

NO.	Parameter Name	Setting Range	Default
$F522$	Reverse-run prohibition	0~2	0

0: Forward/reverse run permitted.

1: Reverse run prohibited.

2: Forward run prohibited.

NO.	Parameter Name	Setting Range	Default
$F523$	stop pattern	0~3	2

0: Ramp stops. If $F506 \sim F508$ is set effectively, the inverter will perform DC braking.

1: The keyboard stops freely. When the command channel is the keyboard panel, the motor stops freely.

2: Free stop is controlled by wire 2. When the operation command is controlled by wire 2 at terminal 2, the motor will be stopped freely.

3: Free stop of wire control; free stop of motor when the operation command is terminal 3 wire control.

Note 1: No matter whether the DC braking parameters are valid or not, the inverter cannot perform DC braking during free stop.

Note 2: As long as the setting of $F523$ is not free stop in the corresponding mode, the VFD will slow down and stop.

NO.	Parameter Name	Setting Range	Default
$F526$	Positive and negative operation is preferred	0~4	1

0: When positive and negative commands are given at the same time, the converter will run in reverse

- 1: The inverter stops when positive and negative commands are given at the same time
- 2: When the positive and negative commands are given at the same time, the inverter runs according to the commands given first.
- 3: When the positive and negative commands are given at the same time, the converter will run according to the commands given after both.
- 4: At the same time, the inverter runs as the forward and reverse rotation command.

NO.	Parameter Name	Setting Range	Default
<i>F527</i>	regenerative braking selection	0~2	2

0: Disabled

1: Enabled (with resistor overload protection)

2: Enabled (without resistor overload protection)

Connect an external braking resistor in the following cases to enable dynamic braking function:

- 1) When decelerating the motor abruptly or if overvoltage tripping ($E - I$) occurs during deceleration stop.
- 2) When a continuous regenerative status occurs during downward movement of a lift or the winding-out operation of a tension control machine.
- 3) When the load fluctuates and a continuous regenerative status results even during constant speed operation of a machine such as a press.

Note 1: To connect a dynamic braking resistor, set the overvoltage limit operation parameter *F415* = 1(Disabled).

NO.	Parameter Name	Setting Range	Default
<i>F528</i>	regenerative braking resistance	1.0~1000.0 Ω	20.0
<i>F529</i>	regenerative braking resistor capacity	0.01~30.0 kw	0.12

NO.	Parameter Name	Setting Range	Default
<i>F530</i>	Positive and negative dead zone time	0.0~25.0s	0

F530 is only used for switching directions when running commands that are valid. The *F530* setting is invalid if you first clear the run command and then change the direction of the run.

Note 1: When frequency is set by AI1 and *F754* = 1 (curve 2) :

(1) After the VFD receives the stop command and stops, if the given frequency is 0Hz, start first and then adjust the output frequency. No matter the given frequency is positive or reverse, start directly regardless of dead zone time;

(2) The direction of 0Hz is consistent forward, that is, before is positive rotation, and 0Hz is positive rotation; Before is reversal, 0Hz is reversal. Therefore, in the running process, after the given frequency changes to 0Hz and the motor stops rotating, if the frequency in the same direction is given again before the shutdown, the dead zone time is ignored and the motor starts directly. However, the final effect may be affected by the fluctuation of a given voltage when a potentiometer is used for a given frequency.

Note 2: *F530* is also valid except when AI1 sets the frequency and *F754* = 1 (curve 2). But there are two caveats:

(1) *F530* has no effect on inching at present. For example, when *F002*=0, *F301*=2, *F302*=19 and *F525*=3 are set, the inverted inching is triggered by forward running of LI1, and then LI2 is closed at the same time. At this time, the dead zone setting time of *F530* is invalid, and there will be no pause at 0Hz when switching forward and backward.

(2) The direction of 0Hz is not kept consistent forward.

NO.	Parameter Name	Setting Range	Default
<i>F531</i>	Modbus protocol selection for HMI RS485 communication port	0~1	0

0: HMI RS485 communication port is the standard MODBUS protocol

1: HMI RS485 communication port is DisplayModBus protocol (select this protocol when using Chinese panel or Display)

NO.	Parameter Name	Setting Range	Default
<i>F532</i>	Acceleration / deceleration S - curve lower limit 3	0~50 %	10
<i>F533</i>	Acceleration / deceleration S - curve upper limit 3	0~50 %	10

F530/F532, F531/F533 similar to *F516* and *F517* used to modify the relative proportions of upper and lower arcs of the S-curve to the entire acceleration / deceleration time.

6.7 Keyboard panel parameter group

NO.	Parameter Name	Setting Range	Default
<i>F600</i>	Prohibition of panel reset operation	0~1	0

0: Permitted

1: Prohibited

This parameter can prohibited/ permitted the reset operation by <STOP> key.

NO.	Parameter Name	Setting Range	Default
<i>F601</i>	Switching between remote control and Local control	0~2	1

0: Local control mode, Start and stop, and frequency setting are effective only by keypad keys. *F002~F005* is invalid.

1: remote control mode, Start and stop, and frequency setting follow the selection of *F002, F003*.

2. JOG key function is set in coordination with *F700*. See parameter *F700* for details.

Note: When *F700*=0, and *F601*=0/2, JOG key is for local/remote switching function, setting of *F601* is invalid, JOG key action shall prevail, see parameter *F700* for details.

NO.	Parameter Name	Setting Range	Default
<i>F602</i>	Password check/input	0~9999	0

1. When *F772*=0, the password protection function is invalid: no matter what *F602* value is, any parameter can be modified;

2. When *F772*≠0, the password protection function takes effect:

(1) If *F602*≠*F772*, only the given frequency of *F602* itself and the keyboard in the default state of power on can be modified;

(2) If $F602 = F772$, any parameter can be modified; However, after the time set by $F773$, $F602$ automatically reset to 0, and the protection parameter was modified. If you want to continue modifying the parameters, you need to enter the password again via $F602$.

3. When the password protection function is effective, if $F602 \neq F772$, the value of $F772$ will be displayed as "----"; If $F602 = F772$, the normal password Settings are displayed when viewing the value of $F772$.

4. When the password protection function is effective and $F602 = F772$, if $F773 = 0$, $F602$ is always effective and will not reset automatically.

NO.	Parameter Name	Setting Range	Default
$F603$	Current/voltage display mode	0~1	1

0: %, display in percentage terms.

1: A (ampere)/V (volt), display in amperes/volts.

These parameters are used to change the unit of monitor display. Like current monitor and Voltage monitor display. (% $\leftrightarrow$ A (ampere)/V (volt))

Note1: $F603$ converts the following parameter settings: Motor electronic-thermal protection level 1 and 2 ($F106$, $F110$), DC braking current ($F507$), Stall prevention level 1 and 2 ($F107$, $F111$), Small current detection current ($F408$).

Note2: Base frequency voltage 1 and 2 ($F102$, $F109$) always displayed in the unit of V.

NO.	Parameter Name	Setting Range	Default
$F604$	Frequency free unit magnification	0.00~200.0	0.00

0.00: Free unit display disabled (display of frequency).

0.01-200.0: Value displayed = actual frequency [$\times$] $F604$.

e.g., output frequency = 50Hz, if $F604=30.0$, Value displayed on the panel is 1500.

Note: This parameter displays the VFD output frequency as the value obtained by multiplying it by a positive number. This does not mean that the actual motor speed or line speed is indicated with accuracy.

NO.	Parameter Name	Setting Range	Default
$F605$	Factory reserved	0~1	0

NO.	Parameter Name	Setting Range	Default
$F606$	Inclination characteristic of free unit display	0~1	1

0: Negative inclination (downward slope)

1: Positive inclination (upward slope)

NO.	Parameter Name	Setting Range	Default
$F607$	Bias of free unit display	0.00Hz ~ $F007$	0.00

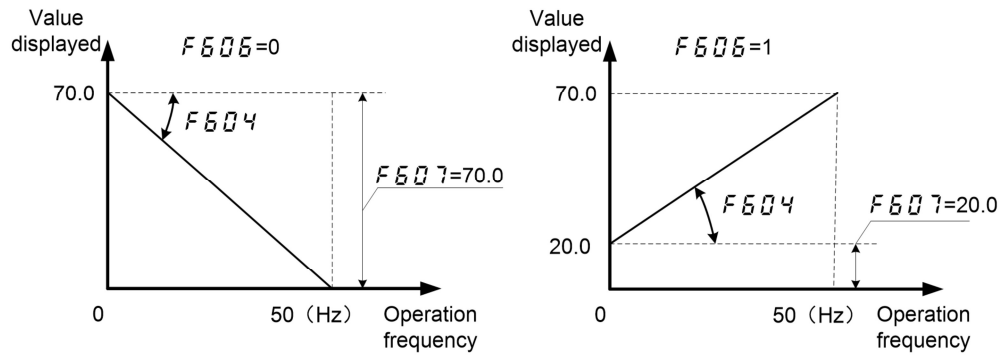


Figure 6.35 Description of freeunit

If $F604$ is not set as 0.00 , value displayed is obtained as follows:

- When $F605=0$, value displayed = $F604 \times (F607 - \text{actual frequency value})$
- When $F605=1$, value displayed = $F604 \times (F607 + \text{actual frequency value})$

NO.	Parameter Name	Setting Range	Default
$F608$	Free step 1 (pressing a panel key once)	0.00 Hz ~ $F007$	0.00

0.00: disabled. 0.01~ $f007$: enabled.

Under normal conditions, the frequency command value from the keypad increases in steps of 0.1 Hz each time you press the ▲ key.

If $F608$ is not 0.00, the frequency command value will increase by the value with $F608$ each time you press the ▲ key. Similarly, it will decrease by the value set with $F608$ each time you press the ▼ key. In this case, the output frequency displayed in standard monitor mode changes in steps of 0.1 Hz, as usual.

The frequency ($F000$) set on the keypad changes in steps of 10.0 Hz: $0.0 \rightarrow 20.0 \rightarrow \dots 50.0$ (Hz), each time you press the ▲ key. This function comes in very handy when operating the load at limited frequencies that change in steps of 1Hz, 5Hz, 10Hz, and so on

NO.	Parameter Name	Setting Range	Default
$F609$	Free step 2 (panel display)	0~255	0

0: disabled. 1~255: enabled.

When $F608$ is not 0.00, and $F609$ is not 0 (disabled):

Output frequency displayed in standard monitor mode = Internal output frequency $\times F609 \div F608$.

Example: When $F608 = 1.00$ (Hz), and $F609 = 1$: Each time you press the ▲ key, the frequency setting changes in steps of 1Hz: $0 \rightarrow 1 \rightarrow 2 \rightarrow \dots \rightarrow 50$ (Hz) and also the value displayed on the keypad changes in steps of 1. Use these settings to hide decimal fractions.

The settings of $F609$ and $f608$ have no effect when the free unit selection ($F604$) is enabled.

NO.	Parameter Name	Setting Range	Default
$F610$	Standard monitor display selection	0~15	11

0: Output frequency (Hz(free))

1: Frequency command (Hz(free))

- 2: Output current(%/A)
 3: VFD rated current (A)
 4: VFD load (%)
 5: Output power (kW)
 6: Stator frequency (Hz (free))
 7: Communication data display
 8: Output speed
 9: Communication counter
 10: Normal communication counter
 11: Stop - given frequency (F 900 =0) /PID given (F 900 ≠0), run - output frequency
 12:running speed (output frequency * F 225)
 13: Average speed (multi-step average speed)
 14: Step-speed number (currently running step-speed number)
 15: Running time 2 (it's not cumulative running time)

Note: parameter F 5 10 determines the default display value type of the keyboard panel in the power on mode.

NO.	Parameter Name	Setting Range	Default
F 5 11	Panel running order clear selection	0~1	1

0: Clear (when standby terminal OFF) . 1: Keep (when standby terminal OFF) .

Note 1: When F 5 11=0, Put OFF the standby terminal (see input function 1) will stop the motor..

NO.	Parameter Name	Setting Range	Default
F 5 12	Panel operation prohibition (F000)	0~1	0

0: Permitted 1: Prohibited

This parameter can prohibited/permitted set panel operation frequency(F 000) by key ▲ and ▼.

NO.	Parameter Name	Setting Range	Default
F 5 13	Prohibition of panel operation (RUN/STOP keys)	0~1	0

0: Permitted. 1: Prohibition.

NO.	Parameter Name	Setting Range	Default
F 5 14	Prohibition of panel emergency stop operation	0~1	0

0: Permitted. 1: Prohibition.

NO.	Parameter Name	Setting Range	Default
F 5 15	Integral output power retention selection	0~1	1

0: (clear), with the main power off, not retention of integral output power values.

1: (memory), with the main power off, retention of integral output power values.

NO.	Parameter Name	Setting Range	Default
<i>F617</i>	Integral output power display unit selection	0~3	varies by model

0: 1kWh. 1: 10kWh. 2: 100kWh. 3: 1000kWh.

NO.	Parameter Name	Setting Range	Default
<i>F618</i>	Search and resetting of changed parameters selection	0~1	0

0: Disable. Not display “-UF-” parameter group. 1: Enable. Display “-UF-” parameter group.

Users can automatically searches for those parameters that are programmed with values different from the standard default setting and displays them in the “-UF-” parameter group. Parameter setting can also be changed within this group.

NO.	Parameter Name	Setting Range	Default
<i>F619</i>	VFD internal temperature monitoring		
<i>F620</i>	VFD internal temperature monitoring		
<i>F621</i>	LCD contrast control	15-40	25
<i>F622</i>	Factory reserved		

NO.	Functional description		
<i>F623</i>	Additional function		
Bit	Description	0	1
0	The upper fan runs by itself	OFF	ON
1	Output positive power monitoring	OFF	ON
2-15	Factory reserved		

NO.	Parameter Name	Setting Range	Default
<i>F624</i>	Keyboard panel displays 2	Same as <i>F610</i>	2
	Quick Monitoring 1	Same as <i>F610</i>	
<i>F625</i>	Keyboard panel displays 3	Same as <i>F610</i>	1
	Quick Monitoring 2	1 ~ 8: check <i>F610</i> 9: PID is given 10: PID feed back 11-15:check <i>F610</i>	
<i>F626</i>	Keyboard panel displays 4	Same as <i>F610</i>	5
	Quick Monitoring 2	1 ~ 8: see f610 9: PID is given 10: PID feedback 11-15:check <i>F610</i>	

- Quick monitoring:

Fast monitoring is mainly used for LED panels (including: single LED, double LED).

In the default state of power-on, parameters set by *F 5 10*, *F 5 24*, *F 5 25* and *F 5 26* can be displayed by switching ENT button. (If it is a double LED panel, switch the display on the first row)

F 5 24 has the same options as *F 5 10*;

Options (1-8) of *F 5 25* and *F 5 26* are the same as those of *F 5 10*. Option 9 is given PID and option 10 is PID feedback, as follows:

- 0: Motor working frequency (Hz or customized display).
- 1: Speed given (Hz or customized display). (marked with the letter F)
- 2: Motor current (% or A). (identified by letter C)
- 3: Rated current of VFD (A). (identified by letter C)
- 4: VFD thermal state (%).
- 5: Output power (kW).
- 6: Internal speed given (Hz or custom display after PID function).
- 7: Serial communication data.
- 8: Output speed (RPM).
- 9: PID given pressure. (identified by letter G)
- 10: PID feedback pressure. (marked with letter B)

- Multi-line monitoring:

Multi-line monitoring is mainly used for LCD panels and double LED panels.

The parameter *F 5 24* determines the type of value displayed by default on the second line of the keyboard panel when in power-on mode.

The parameter *F 5 25* determines the type of value displayed by default on the third line of the keyboard panel when in power-on mode.

The parameter *F 5 26* determines the type of value displayed by default on the fourth row of the keyboard panel in power-on mode.

NO.	Parameter Name	Setting Range	Default
<i>F 5 27</i>	Relay output -PID feedback check out	0.00~99.99	0.00
<i>F 5 28</i>	Relay output -PID feedback to detect bandwidth	0.00~99.99	0.00

F 5 27 and *F 5 28* mainly cooperate with relay function [84] to realize pressure reduction pump control;

F 5 28 is also used in the relay function [86] to monitor the status of feedback pressure.

NO.	Parameter Name	Setting Range	Default
<i>F 5 29</i>	Factory reserved	-	-

6.8 Additional function parameter group

NO.	Parameter Name	Setting Range	Default
<i>F 700</i>	Panel JOG mode selection	0~1	0

JOG key for multifunctional reuse key, *F700* and *F601* can be set together to achieve the following functions: forward/reverse switch, local/remote switch, shortcut menu function (default), inching function.

NO.	<i>F 700</i>	<i>F 601</i>	JOG key function
1	0	0	Local/remote switching, power off to maintain; (Local sign: SET and MON lights on at the same time)
2	0	1	Non-function
3	0	2	Local/remote switching, power outage recovery default Settings; (Local sign: SET and MON lights on at the same time)
4	1	0 / 1 / 2	Inching function
5	2	0 / 1 / 2	Shortcut Menu 1
6	3	0 / 1 / 2	Shortcut Menu 2
7	4	0 / 1 / 2	Shortcut Menu 3
8	5	0 / 1 / 2	Same as <i>F 700</i> =4.
9	6	0 / 1 / 2	Positive and negative switching (no LED identification)

Note: When JOG key is for local/remote switching function, the setting of *F 601* is invalid, and JOG key action shall prevail.

NO.	Parameter Name	Setting Range	Default
<i>F 701</i>	jog run frequency	0.0~20.0	5.0

NO.	Parameter Name	Setting Range	Default
<i>F 702</i>	Jog stopping pattern	0~2	0

0: Slow down stop. 1: coast stop. 2: DC braking.

Use the jog run parameters to operate the motor in jog mode. Input of a jog run signal generates a jog run frequency output at once, irrespective of the designated acceleration time.

NO.	Parameter Name	Setting Range	Default
<i>F 703</i>	Jump frequency 1	0.0 Hz ~ <i>F 007</i>	0.0
<i>F 704</i>	Jumping width 1	0.0~30.0 Hz	0.0
<i>F 705</i>	Jump frequency 2	0.0 Hz ~ <i>F 007</i>	0.0
<i>F 706</i>	Jumping width 2	0.0~30.0 Hz	0.0
<i>F 707</i>	Jump frequency 3	0.0 Hz ~ <i>F 007</i>	0.0

<i>F 708</i>	Jumping width 3	0.0~30.0 Hz	0.0
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Resonance due to the natural frequency of the mechanical system can be avoided by jumping the resonant frequency during operation. During jumping, hysteresis characteristics with respect to the jump frequency are given to the motor.

Do not set the jump parameters, if multiple jump frequency setting width overlapped.

During acceleration or deceleration, the jumping function is disabled for the operation frequency.

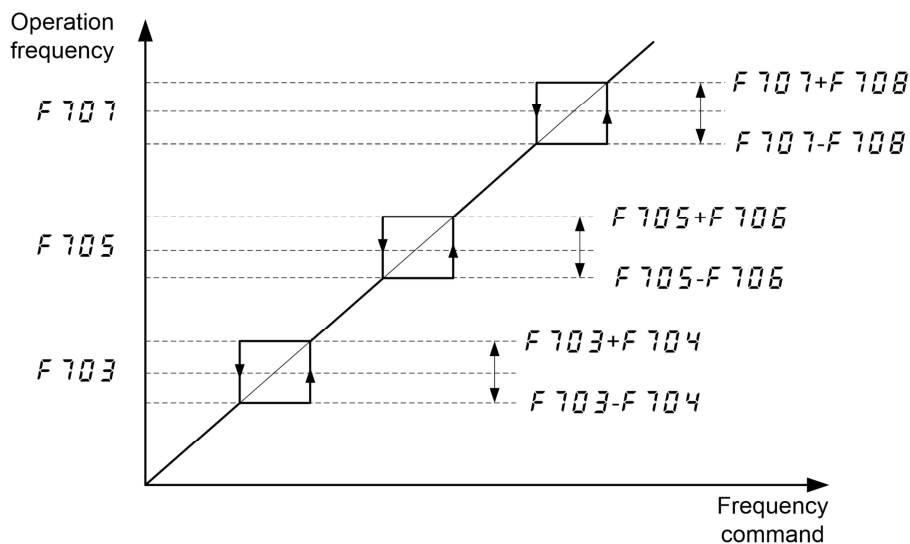


Figure 6.36 Description of jump frequency

NO.	Parameter Name	Setting Range	Default
<i>F 709</i>	Braking mode selection	0 ~3	0

0: OFF .

1: Forward direction.

2: Reverse direction.

3: Same set direction to *F 522* .

NO.	Parameter Name	Setting Range	Default
<i>F 710</i>	Braking Release frequency	0.0~20.0 Hz	3.0
<i>F 711</i>	Braking Release time	0.0 ~25.0s	0.5
<i>F 712</i>	Braking Creeping frequency	0.0~20.0 Hz	3.0
<i>F 713</i>	Braking Creeping time	0.0 ~25.0s	1.0

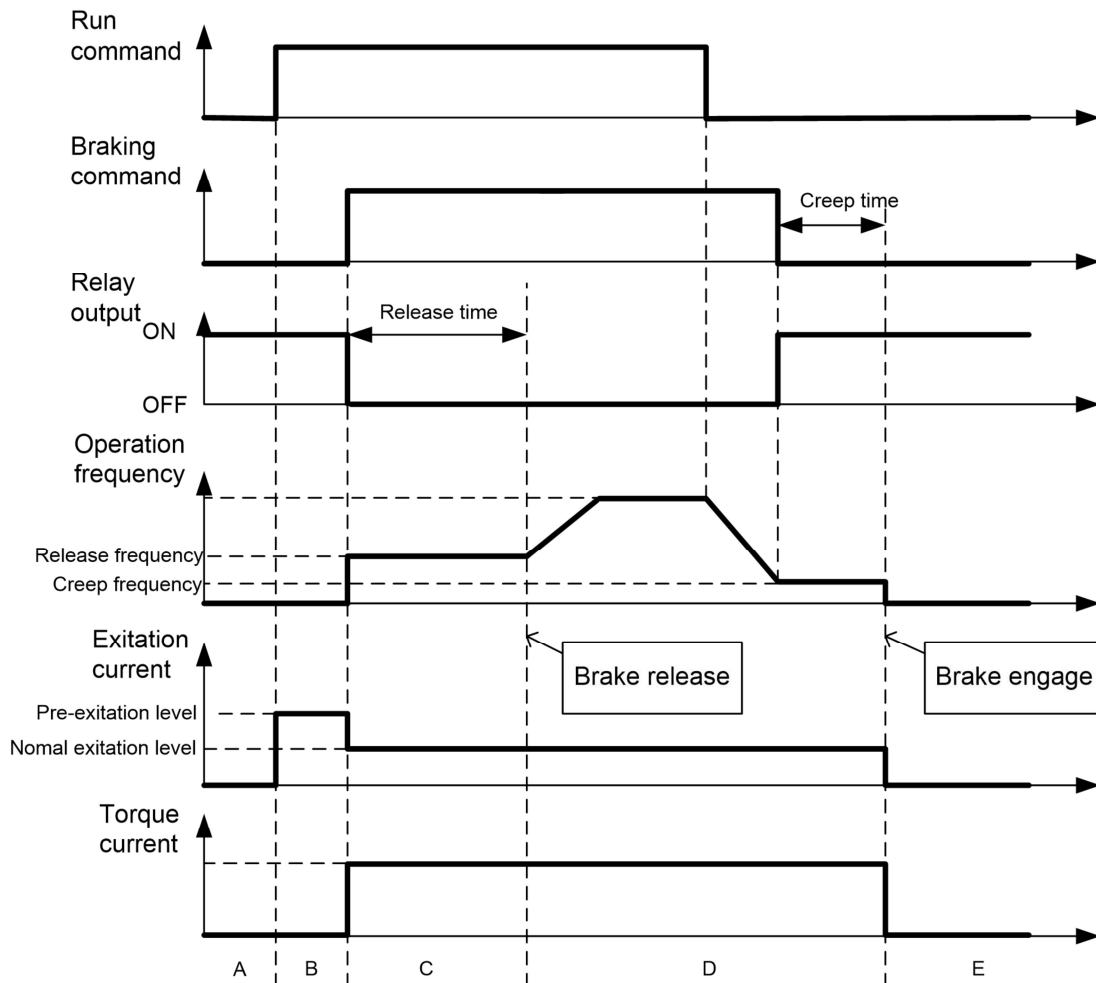


Figure 6.37 Description of braking mode sequence

NO.	Parameter Name	Setting Range	Default
<i>F 7 1 4</i>	Droop control gain	0~100%	0
<i>F 7 1 5</i>	Droop control insensitive torque band	0~100%	10

The droop control function refers to the function of operating the power-running motor at operating frequency F_1 (Hz) that is lower than command frequency F_0 (Hz) by droop frequency Δf (Hz) when the torque current is T_1 (%). The droop frequency Δf can be calculated, using the following expression.

$$\text{Droop frequency } \Delta f \text{ (Hz)} = F_{101} \times F_{714} \times (\text{Torque current } T_1 - f_{715})$$

When the torque current is above the specified droop insensitive torque band (*F 7 1 5*), the frequency is reduced during power running or increased during regenerative braking.

The above figure shows an example of the operating frequency during power running. During regenerative braking, control is performed in such a way as to increase the frequency.

The droop function is activated above the torque current set with *F 7 1 5*.

The amount of droop frequency Δf varies depending on the amount of torque current T_1 .

Note: If the base frequency exceeds 100Hz, count it as 100Hz. Control is exercised between the starting frequency (*F 5 0 3*) and the maximum frequency (*F 0 0 7*).

[An example of calculation]

Parameter setting: Base frequency $F 101 = 60$ (Hz), droop gain $F 714 = 10$ (%)

Droop insensitive torque band $F 715 = 30$ (%)

Droop frequency Δf (Hz) and operating frequency $F1$ when command frequency $F0$ is 50 (Hz) and torque current $T1$ is 100 (%) are as follows.

Droop frequency Δf (Hz) = $V1 \times F 714 \times (T1 - F 715)$

$= 60$ (Hz) $\times 10$ (%) $\times (100$ (%) $- 30$ (%))

$= 4.2$ (Hz)

Operation frequency $F1$ (Hz) = $F0 - \Delta f = 50$ (Hz) $- 4.2$ (Hz) $= 45.8$ (Hz)

NO.	Parameter Name	Setting Range	Default
$F 716$	Preset-speed 1	$F 009 \sim F 008$	3.0
$F 717$	Preset-speed 2	$F 009 \sim F 008$	6.0
$F 718$	Preset-speed 3	$F 009 \sim F 008$	9.0
$F 719$	Preset-speed 4	$F 009 \sim F 008$	12.0
$F 720$	Preset-speed 5	$F 009 \sim F 008$	15.0
$F 721$	Preset-speed 6	$F 009 \sim F 008$	18.0
$F 722$	Preset-speed 7	$F 009 \sim F 008$	21.0
$F 723$	Preset-speed 8	$F 009 \sim F 008$	24.0
$F 724$	Preset-speed 9	$F 009 \sim F 008$	27.0
$F 725$	Preset-speed 10	$F 009 \sim F 008$	30.0
$F 726$	Preset-speed 11	$F 009 \sim F 008$	33.0
$F 727$	Preset-speed 12	$F 009 \sim F 008$	36.0
$F 728$	Preset-speed 13	$F 009 \sim F 008$	39.0
$F 729$	Preset-speed 14	$F 009 \sim F 008$	45.0
$F 730$	Preset-speed 15	$F 009 \sim F 008$	50.0

A maximum of 15 speed steps can be selected just by switching an external contact signal. Multi-speed frequencies can be programmed anywhere from the lower limit frequency $F 009$ to the upper limit frequency $F 008$.

Use the input terminal function selection to allocate "Preset-speed command 1" to "Preset-speed command 4" terminal. For more information, see table 5.8.

Table 5.8 Relation between Preset-speed command and Preset-speed

Setting Frequency	Preset-speed command 4	Preset-speed command 3	Preset-speed command 2	Preset-speed command 1
preset-speed commands are invalid	0	0	0	0
Preset-speed 1	0	0	0	1
Preset-speed 2	0	0	1	0

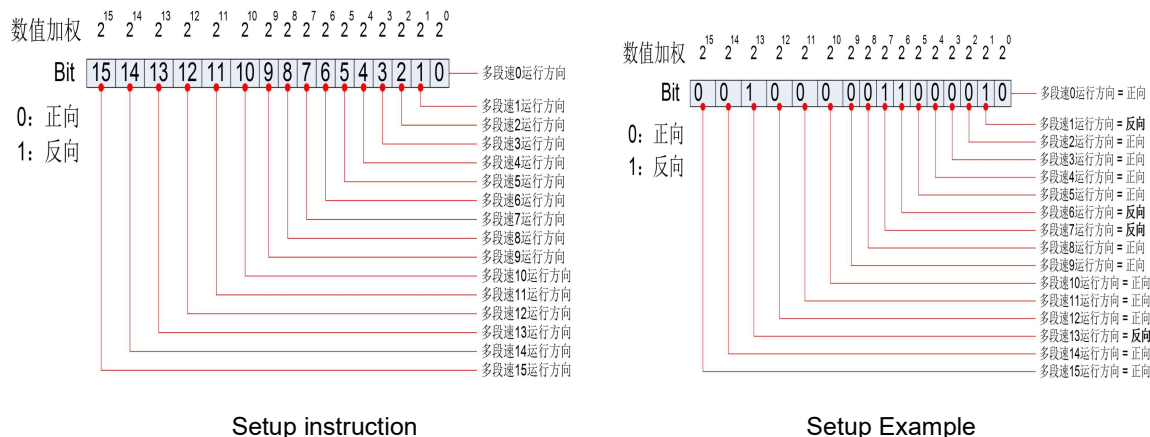
Preset-speed 3	0	0	1	1
Preset-speed 4	0	1	0	0
Preset-speed 5	0	1	0	1
Preset-speed 6	0	1	1	0
Preset-speed 7	0	1	1	1
Preset-speed 8	1	0	0	0
Preset-speed 9	1	0	0	1
Preset-speed 10	1	0	1	0
Preset-speed 11	1	0	1	1
Preset-speed 12	1	1	0	0
Preset-speed 13	1	1	0	1
Preset-speed 14	1	1	1	0
Preset-speed 15	1	1	1	1

NO.	Parameter Name	Setting Range	Default
<i>F 731</i>	Factory reserved		
<i>F 732</i>	Multi-speed 0 run time	0~6500.0s(min)	0.0
<i>F 733</i>	Multi-speed 1 run time	0~6500.0s(min)	0.0
<i>F 734</i>	Multi-speed 2 run time	0~6500.0s(min)	0.0
<i>F 735</i>	Multi-speed 3 run time	0~6500.0s(min)	0.0
<i>F 736</i>	Multi-speed 4 run time	0~6500.0s(min)	0.0
<i>F 737</i>	Multi-speed 5 run time	0~6500.0s(min)	0.0
<i>F 738</i>	Multi-speed 6 run time	0~6500.0s(min)	0.0
<i>F 739</i>	Multi-speed 7 run time	0~6500.0s(min)	0.0
<i>F 740</i>	Multi-speed 8 run time	0~6500.0s(min)	0.0
<i>F 741</i>	Multi-speed 9 run time	0~6500.0s(min)	0.0
<i>F 742</i>	Multi-speed 10 run time	0~6500.0s(min)	0.0
<i>F 743</i>	Multi-speed 11 run time	0~6500.0s(min)	0.0
<i>F 744</i>	Multi-speed 12 run time	0~6500.0s(min)	0.0
<i>F 745</i>	Multi-speed 13 run time	0~6500.0s(min)	0.0
<i>F 746</i>	Multi-speed 14 run time	0~6500.0s(min)	0.0
<i>F 747</i>	Multi-speed 15 run time	0~6500.0s(min)	0.0

Multi-step speed 0 means *F 000* setup value. when PLC is running

NO.	Name	Range	Default
F 748	PLC speed direction choice	0 ~65535	0

Setup method: Running direction follows the parameter, i.e. Turn 16bit Binary number into decimal system value.



Parameter setup value

$$\begin{aligned}
 F\ 748 &= Bit15 * 2^{15} + Bit14 * 2^{14} + \dots + Bit1 * 2^1 + Bit0 * 2^0 \\
 &= 0 * 2^{15} + 0 * 2^{14} + 1 * 2^{13} + \dots + 1 * 2^7 + 1 * 2^6 + \dots + 1 * 2^1 + 0 * 2^0 \\
 &= 8192 + 128 + 64 + 2 = 8386
 \end{aligned}$$

Times square quick solution table

$$\begin{aligned}
 2^{15} &= 32768, \quad 2^{14} = 16384, \quad 2^{13} = 8192, \quad 2^{12} = 4096, \quad 2^{11} = 2048, \quad 2^{10} = 1024, \quad 2^9 = 512, \quad 2^8 = 256, \\
 2^7 &= 128, \quad 2^6 = 64, \quad 2^5 = 32, \quad 2^4 = 16, \quad 2^3 = 8, \quad 2^2 = 4, \quad 2^1 = 2, \quad 2^0 = 1
 \end{aligned}$$

NO.	Name	Range	Default
F 749	Simple PLC running mode choice	0 ~2	0

0: Stop after one-time running. The drive completes one cycling running and then automatically stop. Need one more running command to restart.

1: Run one time and keep final value running. The drive automatically keeps the final running frequency and direction after one single cycling running.

2: Cycling running. The drive will automatically come into next cycling after fulfilling one cycle until there is stop command.

Logic output function.

NO.	Name	Range	Default
F 750	Simple PLC restart mode choice	0 ~2	0

0: Run from the first paragraph. If the machine stops during operation (by stop command, fault), it will start from the first section after starting again.

1: Continue operation from the frequency of interruption time. If the machine stops during operation (by stop command, failure), the inverter will automatically record the running time of the current stage, and automatically

enter this stage after starting again, and continue the operation of the remaining time at the frequency defined in this stage.

NO.	Name	Range	Default
<i>F 75 1</i>	Simple PLC power-off memory choice	0 ~1	0

0: Don't memorize power-off history. 1: Memorize power-off history.

PLC power-off memory means recording PLC running phase and running frequency before powering-off.

NO.	<i>F 75 0</i>	<i>F 75 1</i>	Power off state	Power up again, run time status
1	0	0	Downtime	Run from the first section of the PLC
			Running	Run from the first section of the PLC
2	1	0	Downtime	Run from the first section of the PLC
			Running	Run from the first section of the PLC
3	0	1	Downtime	Run from the first section of the PLC
			Running	Run from the time of power outage frequency
4	1	1	Downtime	Run from the down frequency
			Running	Run from the time of power outage frequency

NO.	Name	Range	Default
<i>F 75 2</i>	Simple PLC running time unit choice	0 ~1	0

0: Second (s)

1: Minute (min)

NO.	Name	Range	Default
<i>F 75 3</i>	Nonstandard function selection	0~65535	0

0: Standard features

1~65535: Non-standard functions.

Note 1: This parameter shall be effective if the VFD is switched on after power off.

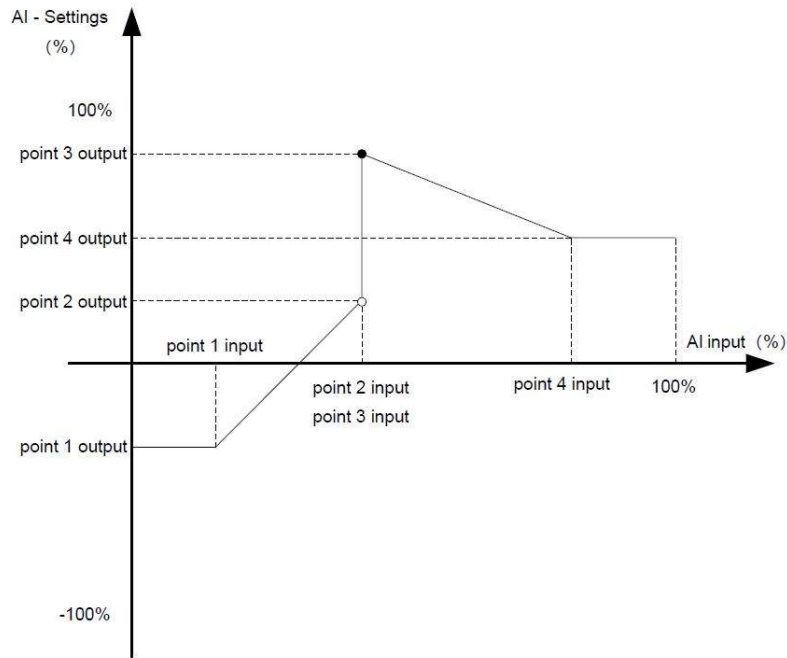
Note 2: This parameter cannot be reset by *F 12 0* = 1.

NO.	Name	Range	Default
<i>F 75 4</i>	AI1 curve selection	0~1	0

0: Curve 1 (point 2, see *F 32 5* ~ *F 32 8*)

1: Curve 2 (4 points, see *F 75 5* ~ *F 75 8*)

AI1 has two setting curves, which can be selected by parameter *F 75 4*. Where curve 1 is a 2-point line and curve 2 is a 4-point curve (as shown in the figure below).



When the corresponding frequency of AI1 is set through the 4-point curve in the figure above:

(1) The frequency set by AI1 can be positive or negative. When is positive, the operation can be reversed; when is negative, the operation can be reversed. In addition, *F 530* can set the dead zone time during the forward reverse switch.

(2) When AI1 input < *F 755*, the output frequency is *F 756*;

When AI1 inputs > *F 761*, the output frequency is *F 762*.

(3) Step is allowed to occur at a given frequency of AI1.

NO.	Name	Range	Default
<i>F 755</i>	AI1 curve 2 set point 1 input	0.0 ~ 100.0%	0.0%
<i>F 756</i>	AI1 curve 2 sets point 1 output	-100% ~ 100%	0.0%
<i>F 757</i>	AI1 curve 2 set point 2 input	0.0 ~ 100.0%	30.0%
<i>F 758</i>	AI1 curve 2 sets point 2 output	-100% ~ 100%	30.0%
<i>F 759</i>	AI1 curve 2 set point 3 input	0.0 ~ 100.0%	60.0%
<i>F 760</i>	AI1 curve 2 sets point 3 output	-100% ~ 100%	60.0%
<i>F 761</i>	AI1 curve 2 set point 4 input	0.0 ~ 100.0%	100.0%
<i>F 762</i>	AI1 curve 2 sets point 4 output	-100% ~ 100%	100.0%
<i>F 763</i>	LI1 effective delay	6500.0 ~ 0.0 s	0.0
<i>F 764</i>	LI1 invalid delay	6500.0 ~ 0.0 s	0.0
<i>F 765</i>	LI2 effective delay	6500.0 ~ 0.0 s	0.0
<i>F 766</i>	LI2 invalid delay	6500.0 ~ 0.0 s	0.0

NO.	Name	Range	Default
<i>F 767</i>	AI1 filtering coefficient	0.00 -10.00	0.30
<i>F 768</i>	AI2 filtering coefficient	0.00 -10.00	0.30
<i>F 769</i>	AO1 filtering coefficient	0.00 -10.00	0.00
<i>F 770</i>	AO2 filtering coefficient	0.00 -10.00	0.00

Note: *F 767* and *F 768* are filtering coefficients of analog input AI1 and AI2. By increasing the value appropriately, the anti-interference ability of analog input can be enhanced, but its sensitivity will be weakened.

F 769 and *F 770* are filter coefficients of ANALOG output AO1 and AO2. Increasing this value can enhance the stability of analog output, but weaken its sensitivity.

NO.	Name	Range	Default
<i>F 771</i>	Enable Reverse Jog frequency	0.0~20Hz	0.0

0: Reverse inching frequency is forbidden. At this time, press *F 701* for inching frequency, the inching acceleration time is 0.1s (not adjustable), and the deceleration time is *F 011*.

0.1~20.0: enable reverse inching frequency. At this point, press *F 701* for inching frequency and *F 518* and *F 519* for inching deceleration time. For reverse inching, the inching frequency is *F 771*, and the reverse inching acceleration and deceleration time is *F 520* and *F 521*.

NO.	Name	Range	Default
<i>F 772</i>	Password Setting	0~9999	0
<i>F 773</i>	Password duration	0~9999	5

See parameter *F 602* for detailed description of *F 772* and *F 773*.

6.9 Communication function parameter group

NO.	Parameter Name	Setting Range	Default
<i>F 800</i>	Modbus baud rate	0~1	1

0: 9600 bps. 1: 19200 bps. 2: 4800 bps. 3: 2400 bps. 4: 1200 bps.

Remarks: it only works after re-power on if we decide to modify *F 800*.

NO.	Parameter Name	Setting Range	Default
<i>F 801</i>	Modbus parity	1	1

0: NONE, datum format : < 8, N, 2 >. 1: EVEN, datum format :< 8, E, 2 >. 2: ODD, datum format :< 8, O, 2 >.

Remarks: it only works after re-power on if we decide to modify *F 801*.

NO.	Parameter Name	Setting Range	Default
<i>F 802</i>	Modbus address	0~247	1

NO.	Parameter Name	Setting Range	Default
<i>F 803</i>	Modbus timeout	0~100	0

0: timeout check disabled. 1-100: 1=1s.

NO.	Parameter Name	Setting Range	Default
<i>F804</i>	Modbus transger waiting time	0~2.00s	0.00

NO.	Parameter Name	Setting Range	Default
<i>F805</i>	Modbus behaviour on communication fault	0~4	4

0: VFD stop, communication command, frequency mode open(by *F002*, *F003*)

1: None (continued operation) 2: Deceleration stop 3: Coast stop

4: Communication error (*E - 33* trip) or Network error (*E - 35* trip)

NO.	Parameter Name	Setting Range	Default
<i>F806</i>	Number of motor poles for communication	1~8	2

The parameter setup will place the influence upon the display of *U010*.

NO.	Parameter Name	Setting Range	Default
<i>F813</i>	Module writes data 1	0~6	1
<i>F814</i>	Module writes data 2	0~6	3

0: Off

1: Communication command control (FA05)

2: Reservations

3: Communication frequency setting (FA08)

4 ~ 6: reservations

Note: (1) the setting of *F813-F814* must be switched on after power off until the LED display is black.

(2) Block first address is 1813H (hexadecimal 1813).

NO.	Parameter Name	Setting Range	Default
<i>F815</i>	Module datas read 1	0~21	1
<i>F816</i>	Module datas read 2	0~21	2
<i>F817</i>	Module datas read 3	0~21	12
<i>F818</i>	Module datas read 4	0~21	18
<i>F819</i>	Module datas read 5	0~21	8

0: Off

1: Status Information (FD03)

2: Output frequency (FD12)

3: Output current (FE08)

4: Output voltage (FE10)

5: Fault information (FC39)

6: PID feedback value (FA36)

7: Input terminal information (FD01)

8: Output terminal information (FD02)

9: AI1 input (FE30)

- 10: AI2 input (FE31)
- 11: Motor speed (FE50)
- 12: Absolute value of output current (E002), unit 0.01a
- 13: Absolute value of output voltage (E006), unit V
- 14: Absolute value of input voltage of DC bus (E009), unit V
- 15: PID given value (FA35)
- 16: Output torque (FE20), 0.01% of rated torque per unit motor
- 17: Input power (FE28), 0.01kW
- 18: Output power (FE29), 0.01kW
- 19: Input power accumulation/input electric energy (FE44), the unit is determined according to the parameter *F517*
- 20: Output power accumulation/output electric energy (FE45), the unit is determined according to the parameter *F517*
- 21: Cumulative running time (FE17), unit h (hours)
- Note: (1) the setting of f815-f819 must be switched on after power off until the LED display is black.
- (2) Block first address 1815H (hexadecimal 1815)
- (3) The range of the number of registers read is 2-5 (2-5).

NO.	Parameter Name	Setting Range	Default
<i>F821</i>	Factory reserved		
<i>F822</i>	Factory reserved		
<i>F823</i>	Factory reserved		
<i>F824</i>	Factory reserved		
<i>F825</i>	Factory reserved		
<i>F826</i>	Factory reserved		
<i>F827</i>	Factory reserved		
<i>F828</i>	Factory reserved		
<i>F829</i>	Factory reserved		

NO.	Parameter Name	Setting Range	Default
<i>F830</i>	PID setting of keypad	0~100%	0.0

F830=100% can make the sensor output the maximum value.

The 100% standard value of *F830* is the measurement range of sensor. If the measurement range of pressure sensor is 0.0~1.6Mpa for example, set *F830* =100% means that pressure setting is 1.6Mpa.

Note 1: When *F900*=0, *F830* is not effective.

Note 2: *F830* is completely corresponded to *F915*. When one has changed, the other will automatically updated.

6.10 Process PID parameter group

PID control is a common method used in process control. By carrying out proportional, integral and differential operations on the deviation between the feedback signal of the controlled quantity and the target quantity, the output frequency of the inverter can be adjusted to form a negative feedback system to stabilize the controlled quantity on the target quantity. Suitable for flow control, pressure control, temperature control and other process control. The control basic principle block diagram is as follows:

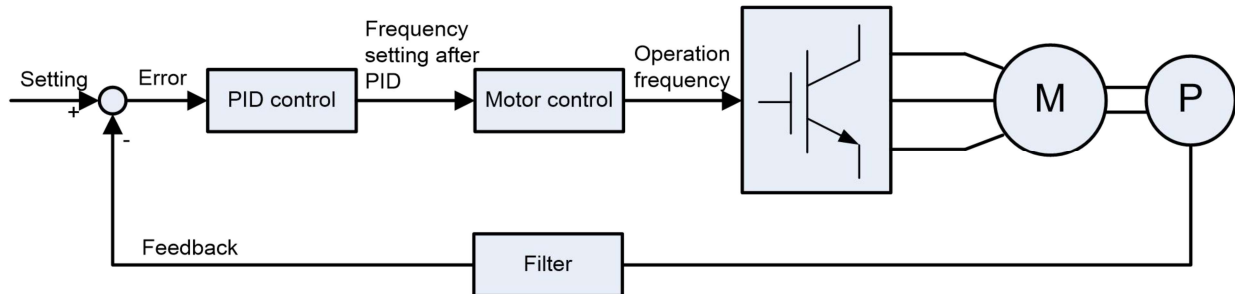


Figure 6.38 Block diagram of PID process control

F 900~F 916 define built-in process PID control function parameters of the VFD. The block diagram of process PID control function is shown as below:

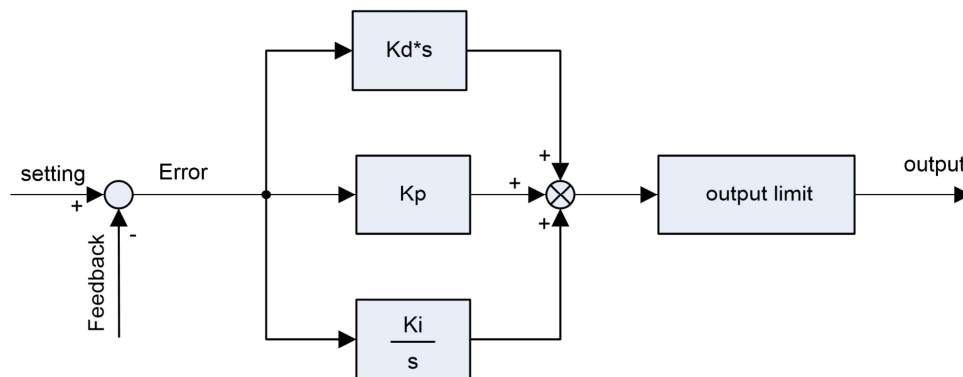


Figure 6.39 Block diagram of built-in PID controller

PID dormancy mode (the priority is reduced in order) :

- Pressure dormancy (key parameter: *F 912*)
- Sleep at lower frequency (key parameter: *F 009*)
- PID wake-up mode (the priority is reduced in order) :
- Deviation wake-up (key parameter: *F 907*)
- Feedback value wake-up (key parameter: *F 908*)
- Pressure wake-up (key parameter: *F 911*)
- Frequency wake-up (key parameters: *F 009, F 906*)

NO.	Parameter Name	Setting Range	Default
<i>F 900</i>	PID control enabled/disabled	0~2	0

0: Disabled 1: Enabled (Feedback: AI1) 2: Enabled (Feedback: AI2)

Note 1: The control parameter for enabling or disabling THE PID function is *F 900*, not *F 003* for the given PID source selection parameter.

Note 2: PID given source (*F 003*) and feedback source (*F 900*) cannot be set to the same channel.

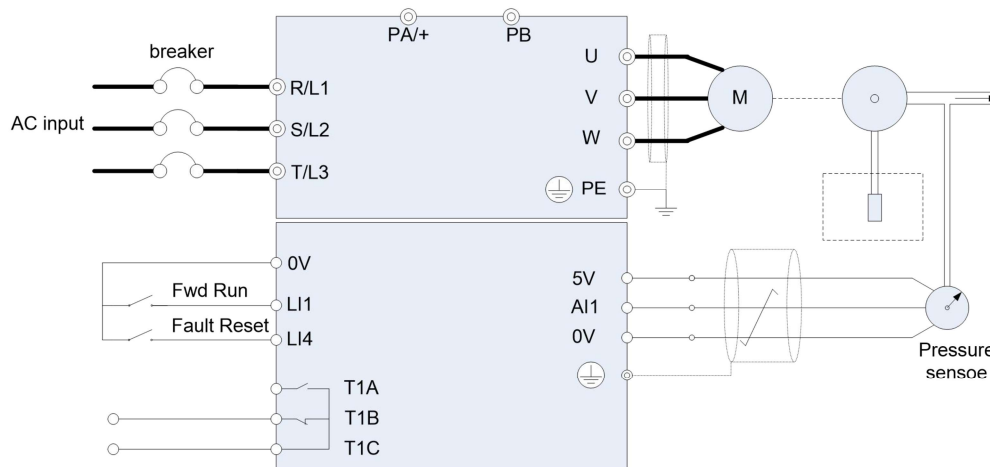


Figure 6.40 PID wiring example

Process quantity input data (frequency or percentage term) and feedback input data can be combined as follows for the PID control. See table 6.9.

Table 6.9 PID setting and PID feedback

PID given source		PID feedback source
<i>F 003</i> (<i>F 005</i>) setting	Given source	<i>F 900</i> setting
0	built-in potentiometer	<i>F 900</i> =1: AI1, 0~5VDC or 0~10V DC or 4~20mA DC. <i>F 900</i> =2: AI2, 0~10V DC.
1	AI1	
2	AI2	
3	Keyboard panel (given frequency) - not recommended	
4	Communication setting (given frequency)	
5	UP/DOWN from external contact	
6	-	
7	Keyboard panel (PID given) - <i>F 918</i>	
- (when under remote control, <i>F 002</i> =0)	Multistep speed setting	

Note 1: *F 003* is the multiplexing parameter for the given source of frequency and PID

When *F 900* =0 (PID is disabled), *F 003* is the given source of frequency;

When *F 900* ≠0 (PID enabled), *F 003* is the given source for THE PID.

Note 2: The control parameter for enabling or disabling PID functionality is *F 900*, not *F 003*.

Note 3: When the given PID source is *F 003*=7, you can set THE PID by default by ▼ or by parameter *F 918*. The two methods have the same effect.

Note 4: With the relevant parameters such as *F 021*, the given parameters of *F 003* (main set) and *F 005* (secondary set) can be calculated as the final PID to achieve the primary and secondary operation function given by PID. For details, please see parameters *F 021*~*F 024* and *F 006*.

NO.	Parameter Name	Setting Range	Default
<i>F901</i>	Proportional gain	0.01~100.0	varies by model
<i>F902</i>	Integral gain	0.01~100.0	varies by model
<i>F903</i>	Differential gain	0.00~2.55	0.00

The control effect of *F901*: The greater the setpoint is, the smaller the deviation between target value and feedback value after stability is. However, excessively large setpoint may arouse vibration in the controlled object and make it unstable. Furthermore, if the setpoint is small, the deviation between target value and feedback value after stability becomes greater.

The control effect of *F902*: Any residual deviation after proportional gain tuning can be cleared with time through integral gain function. Higher integral gain can realize rapid response to process deviation, but may result in instability such as oscillation.

The control effect of *F903*: Differential gain will tune the response time of the VFD according to the rapid change during the process. Unnecessary raise of differential gain value may result in greater fluctuation of the motor speed and make the system unstable.

NO.	Parameter Name	Setting Range	Default
<i>F904</i>	PID controls wait/delay time	0~2400s	0

When *F904* $\neq 0$, the VFD will not enter the PID control immediately when starting, and the PID will only be enabled after the time delay set by *F904*.

During the time set by *F904*, PID is disabled, *F003* is switched to select channel for the given source of frequency, and the motor is accelerated to the speed corresponding to the given source. For example, when *F003* = 7, the corresponding output frequency = $F007 * F918 / F917$.

NO.	Parameter Name	Setting Range	Default
<i>F905</i>	PI regulator deviates the input signal to take the reverse/direction	0~1	0

0: Disable/positive. PID feedback < timing, VFD output increases; On the contrary, the output frequency of the converter decreases.

1: Enable/react. PID feedback < timing, VFD output decreased; On the contrary, the output frequency of the converter increases.

Note: PID regulator negation is performed in two ways: Make *F905* = 1, or define logic input function as 38 and the corresponding terminal is closed.

Note: PID regulator can be inverted in two ways. Let *F905* = 1, or define the logical input function as 38 and close the corresponding input terminal.

NO.	Parameter Name	Setting Range	Default
<i>F906</i>	Sleep mode awakening hysteresis bandwidth	0.0 Hz ~ <i>F007</i>	0.2
<i>F907</i>	Sleeping mode awakening threshold based on PI deviation	0.0 Hz ~ <i>F007</i>	0.0
<i>F908</i>	Sleeping mode awakening threshold based on PI feedback	0.0 Hz ~ <i>F007</i>	0.0
<i>F910</i>	wake up delay	0~600.0s	0.0
<i>F911</i>	Auto wake up level	0~100.0%	0.0

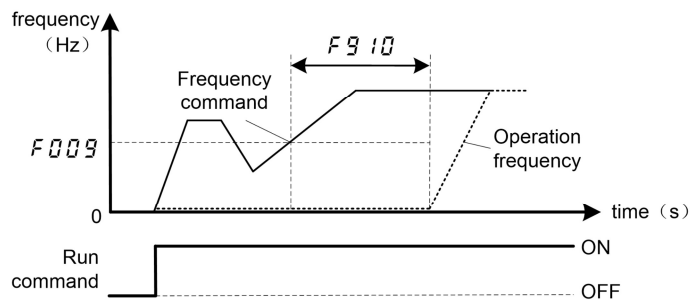


Figure 6.41 description of wake up from sleep mode

There are three types of wakeup: deviation wakeup, threshold wakeup (absolute value or percentage) and frequency wakeup. $F905 = 0$ (deviation signal is taken to reverse disable/positive effect) is described below.

(1) Deviation wake-up: If the following conditions are met, the VFD will quit the sleep state.

- (given - feedback) > wake-up bias (parameter $F907$);
- The state duration $\geq$ wake control/delay time ($F910$).

(2) Threshold awakening: If the following conditions are met, the converter will quit the sleep state.

- feedback > wake-up threshold (parameter $F908$ or ($F918 * F911\%$));
- The state duration $\geq$ wake control/delay time ($F910$).

(3) Frequency awakening: If the following conditions are met, the VFD will enter the sleep state.

- Operating frequency $\geq$ sleep frequency ($F919$) + wake frequency hysteresis bandwidth ($F906$);
- The duration of the two states above $\geq$ wake control/delay time ($F910$).

Note 1: priority is: bias to wake up > threshold (absolute value) to wake up > threshold (percentage) to wake up > frequency, that is, only when high-priority parameter =0, will the low-priority wake-up mode be entered.

Note 2: The absolute value of $F907$ and $F908$ is adopted. When it is pressure signal, 1.00 means 1.0mpa.

Note 3: The percentage of $F911$ is adopted, and the reference value of 100% is PID given to $F918$.

Note 4: $F906$ cannot be 0 when sleeping through the lower frequency, otherwise there may be misoperation.

NO.	Parameter Name	Setting Range	Default
$F909$	sleeping mode action	0~1	0

0: Motor slowdown to a stop.

1: Motor keep running at the speed setting by $F009$.

NO.	Parameter Name	Setting Range	Default
$F912$	Dormancy threshold (percentage)	0~100%	0.0
$F915$	Sleep control/delay time	0~600.0s	0.1
$F919$	Dormancy frequency	0.0 Hz ~ $F008$	0.0
$F920$	Dormancy tolerance	0.0~25.0%	0.0

There are two ways of dormancy: feedback threshold dormancy (percentage) and frequency dormancy. $F905 = 0$ (deviation signal is taken to reverse disable/positive effect) is described below.

(1) Feedback threshold sleep:

When the > dormancy threshold is fed back ($F918 * F912\%$), and the duration $\geq$ dormancy time ($F915$), it will enter the dormancy state.

(2) Frequency dormancy: when the following three conditions are met at the same time, the VFD will enter the sleep state.

- Feedback $\geq (F918 - F918 * F920\%)$;
- Output frequency $\leq$ sleep frequency $F919$;
- The simultaneous duration of the above two is $\geq$ sleep time $F915$.

Note 1: priority: threshold hibernation > frequency dormancy (that is, only when the dormancy threshold $F912=0$, enter the frequency dormancy mode).

Note 2: When $F915=0$, the sleep function is disabled.

Note 3: Both $F912$ and $F920$ are set in percentages, and the reference value corresponding to 100% is GIVEN by PID $F918$.

NO.	Parameter Name	Setting Range	Default
$F913$	Upper limit of PID	0~100%	100.0
$F914$	Lower limit of PID	0~ $F913$	0.0

When $F900 \neq 0$, $F913$ and $F914$ are valid, and the given PID is limited to $F913 \sim F914$.

Example: With $F918$ set to timing, the value of $F918$ itself may be out of the range of $[F914, F913]$, but the final actual given will be limited to $[F914, F913]$.

The setting of $F913$ and $F914$ adopts percentage, and the reference value corresponding to 100% is sensor range $F917$.

NO.	Parameter Name	Setting Range	Default
$F916$	PID given control deviation	0.0~100.0%	0.0
$F917$	Sensor range	0.00 ~ 99.99	1.00
$F918$	PID given	0.00 ~ $F917$	0.00

Both $F917$ and $F918$ are set in absolute value. When is the pressure signal, 1.00 represents 1.0mpa.

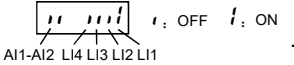
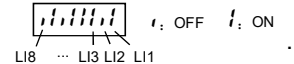
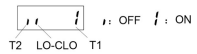
$F916$ is the maximum allowable deviation of the feedback from the given. Within the range of deviation, the PID controller stops working, and the accuracy and stability of the PID system can be adjusted by setting the value reasonably.

The setting of $F916$ USES a percentage, and the reference value of 100% is PID given to $F918$. Therefore, the allowable deviation range of actual pressure is: $[F918 - F918 * F916\%, F918 + F918 * F916\%]$.

6.11 Monitoring function parameter group

Table 6.10 Status monitor mode

NO.	Parameter Name	Description
$U000$	CPU1 Version	E.g: $\underline{U100}$, G-type, v= g; P-type, v= p;
$U001$	Operation frequency	Value is displayed in Hz/free unit. See $F604$.

U002	Direction of rotation	☐ Forward run, ☐ Reverse run.
U003	frequency command value	Value is displayed in Hz/free unit. See F504.
U004	load current	The VFD output current (%/A) is displayed.
U005	input voltage (AC RMS)	The VFD input voltage (%/V) is displayed.
U006	output voltage (AC RMS)	The VFD output voltage command (%/V) is displayed.
U007	Input terminal status indicated	11kW or below:  15kW or above: 
U008	Output terminal status indicated	 , without T2 at 11kW or below
U009	cumulative operation time	(0.01=1 hour, 1.00=100 hours)
U010	Output speed	Displays the motor speed (min-1) by calculating with output frequency and pole numbers.
U011	Rated current	The rated current of the VFD (A) is displayed.
U012	Torque current	The torque current (%/A) is displayed.
U013	Load current	The VFD output current (load current) (%/A) is displayed.
U014	Torque	The torque (%) is displayed.
U015	Input power	The VFD input power (kW) is displayed.
U016	Output power	The VFD output power (kW) is displayed.
U017	PID feedback	The PID feedback value is displayed. (Hz/free unit)
U018	Frequency command value (PID-computed)	The PID-computed frequency command value is displayed. (Hz/free unit)
U019	Integral input power	The integrated amount of power (kWh) supplied to the VFD is displayed.
U020	Integral output power	The integrated amount of power (kWh) supplied from the VFD is displayed.
U021	Communication counter	Displays the counter numbers of communication through the network.
U022	Normal state communication counter	Displays the counter numbers of communication only at normal state in the all communication through network.
U023	Cpu2 version	v 1 0

U024	Parts replacement alarm information	ON: Needs to be replaced
U025	Cpu1 revision	
U026	PID setting	Displayed in % term.
U027	PID feedback	Displayed in % term.
U1--	Past trip 1	Enter into the display of detailed information on past trip 1
U2--	Past trip 2	Enter into the display of detailed information on past trip 2

7. FAULT DIAGNOSIS AND MEASURES

7.1. Fault code, cause and measures

When fault (failure) occurs, the VFD takes the following actions: The keyboard panel blinks to display the fault code, the VFD stops output and the motor freely stops.

Table 6.1 Fault display and measures

Code of fault	Type of fault	Possible cause	Measures (troubleshooting)
<i>E - 01</i>	Overcurrent protection	- Acceleration time is too short. - V/f parameter is wrongly set. - When the VFD starts, the load is still in rotation. - VFD is supplying power to low-impedance motor. - Interphase short circuit or earthing failure. - Abrupt fluctuation of the load	- Increase acceleration parameter (<i>F010</i> or <i>F618</i>) and the deceleration time (<i>F011</i> or <i>F519</i>) - Select the correct setpoint for V/f. - Adopt forward/reverse speed tracking and restart function (STR function). - Tune the switching frequency. - Check wiring to see if there is Interphase short circuit or earthing failure. - Reduce fluctuation of the load
<i>E - 02</i>	Interphase short circuit	- Interphase output is short circuit. - Motor impedance is too low.	Confirm the wiring and insulation status.
<i>E - 03</i>	Starting overcurrent	- earthing failure - IGBT unit damage	- Confirm whether the wiring and device are earthing - Connect with factory
<i>E - 04</i>	Earthing fault	- earthing failure - IGBT unit damage	- Confirm whether the wiring and device are earthing - Connect with factory
<i>E - 06</i>	Underload fault	VFD's output current is lower than low current detection threshold.	Check whether <i>F407</i>~<i>F410</i> are correctly set.
<i>E - 07</i>	Overtorque fault	The motor estimates that the torque has reached the level set by <i>F412</i>.	- Adjust the settings of <i>F411</i>~<i>F414</i>. - Confirm the load status.
<i>E - 11</i>	Undervoltage fault	- Abnormal fluctuation of input voltage; Power network capacity higher than 200 kVA; There is switchable capacitor to improve power factor on the power network; Machine that SCRs is connected to the power network. - VFD starts the load already in rotation.	- Install input reactor or use braking resistance. - Adopt forward/reverse speed tracking and restart function (STR function) (<i>F500</i> = 1) - Set <i>F418</i> = 2.

Code of fault	Type of fault	Possible cause	Measures (troubleshooting)
<i>E - 11</i>	Undervoltage fault	- There is possible phase failure. - The deceleration time is too short.	- Determine the cause of output phase failure (such as poor connection, open circuit of output or open circuit of motor winding) and correct it. - Increase the deceleration time (<i>F011</i> or <i>F519</i>). - Enable overvoltage fault protection (<i>F415</i>).
<i>E - 12</i>	DC bus undervoltage fault	Input voltage is too low.	- Check input voltage. - Set <i>F417</i> to select alarm or tripping. - Adopt forward/reverse speed tracking and restart function (STR function) (<i>F500</i> = 1) - Set <i>F418</i> = 2.
<i>E - 21</i>	VFD overload	- Acceleration time is too short. - DC braking current level is too high. - V/f parameter is wrongly set. - When the VFD starts, the load is still in rotation. - The load is too large.	- Increase acceleration parameter <i>F010</i> or <i>F518</i>. - Decrease the setting of <i>F507</i> or <i>F508</i>. - Correctly set V/f parameter. - Set parameter <i>F418</i> = 2. - Adopt one VFD with higher rated power.
<i>E - 22</i>	Motor overload	- V/f parameter is wrongly set. - The motor is blocked. - The motor continues to run at low speed. - The load applied to the motor is too large.	- Correctly set V/f parameter. - Check the load.
<i>E - 23</i>	Braking resistor overload	Improper specification selection for braking resistor	Select competent braking resistor. Prohibit braking resistor overload protection <i>F527</i> =2
<i>E - 24</i>	VFD overheat fault	- VFD 's cooling fan does not work. - Environment temperature is too high. - Certain ventilation opening is blocked. - There is heat source near the VFD .	- Reset the VFD 's fault after cooling and restart the VFD . - Expand the free space around the VFD ; Remove all heat sources near the VFD to lower the environment temperature.
<i>E - 25</i>	Motor PTC overheating fault	External PTC embedded in the motor winding indicates existence of motor overheating.	- Correct motor overheating. - Check whether PTC is working properly. - Check logic input functions 27 and 28.

Code of fault	Type of fault	Possible cause	Measures (troubleshooting)
<i>E - 31</i>	EEPROM fault	• Data writing and read errors occur. • The VFD has power failure during parameter reset.	• Power on the VFD to eliminate the fault. If the fault can not be eliminated, contact NWT or its distributor for maintenance or repair of the VFD .
<i>E - 32</i>	Control board fault	• Control board cannot work	• Connect manufacturer to maintain
<i>E - 33</i>	Communication fault	• Network communication error.	• Check network control devices and cables. • Check the setting of communication overtime parameter <i>F803</i>. • Check remote keyboard panel cable.
<i>E - 34</i>	Current sensor fault	• The current sensor is in abnormal status.	• Replace the VFD .
<i>E - 35</i>	Network fault	• Network error	• Check network control devices and cables.
<i>E - 36</i>	VFD type error	• VFD hardware fault	• <i>F120</i>=7 • If error is still, connect manufacturer to maintain
<i>E - 38</i>	AI1 signal Loss	• AI1 analog signal level is lower than the level set by the parameter <i>F422</i>.	• Check signal on AI1 to eliminate the cause of signal loss. • Confirm whether <i>F422</i> is correctly set.
<i>E - 39</i>	VFD inside communication error	• communication error between keyboard and control board CPU	• Connect manufacturer to maintain
<i>E - 41</i>	Input phase failure	• The input side of the main circuit is phase failure. • The inside component of the VFD is in abnormal state.	• Determine the cause of input phase failure and correct it. • Set <i>F405</i> = 0.
<i>E - 42</i>	Output phase failure	• The output side of the main circuit is phase failure.	• Determine the cause of input phase failure (such as poor connection, open circuit of output or open circuit of motor winding) and correct it. • Set <i>F406</i> = 0.
<i>E - 43</i>	Emergency stop fault	• Use the keyboard panel to perform stop operation when the motor works under remote mode.	• Perform fault reset.
<i>E - 45</i>	Torque boost is too large	• Setting of torque boost parameter <i>F203</i> is too high. • Motor impedance is too low.	• Repeat self-tuning of the VFD and downward tune parameter <i>F203</i>.

Code of fault	Type of fault	Possible cause	Measures (troubleshooting)
<i>E - 46</i>	Self-setting error	• Confirm whether motor rated parameter settings are correct. • The motor capacity is far smaller than that of the VFD . • Cable of the motor is too thin. • Motor is still in rotation when the self-setting starts.	• Correctly set motor rated parameters. • Use VFD with larger capacity. • Apply thicker cable of the motor. • Confirm the motor has stopped before the self-setting begins.
<i>E - 98</i>	Pull-out keypad communication fault	• Communication fault between pull-out keypad and internal CPU	• Please contact us
<i>E - 99</i>	Big power display communication fault	• Communication fault for VFD above 15kw(including) display keypad and internal CPU	• Please contact us

7.2. Description of alarm and indication code

Table 6.2 Alarm display and measures

Code	Description	Cause	Measures
<i>A - 00</i>	Fault reset is acceptable.	Under fault code display state, press STOP key and <i>A - 00</i> is displayed.	Press the STOP key again and the fault is eliminated.
<i>A - 01</i>	Undervoltage indication	Insufficient input voltage	Check the 3-phase input power supply. If the power supply is normal, the VFD has to be repaired.
<i>0.0</i> (flash)	"Running ready" is invalid	Under remote control mode the corresponding terminal to the logic input function 1 is not closed.	Configure one logic input function as 1, and close this terminal.
<i>A - 05</i>	Abnormal setting of frequency point	Frequency points at point 1 and point 2 are set too closely.	Do not set <i>F 325</i> and <i>F 327</i> too closely. Do not set <i>F 329</i> and <i>F 331</i> too closely.
<i>A - 06</i>	Free stop action during transient power failure.	<i>F 418</i> is set to 2 and transient power failure occurs.	Input running signal to the VFD again or reset the VFD .
<i>A - 07</i>	In DC braking	DC braking function is activated.	If the code disappears in several seconds, the VFD comes back to normal.
<i>A - 08</i>	In running retrial	The VFD is in the process of restart. Forward/reverse speed tracking and restart function (STR function) is activated.	The alarm code is momentarily displayed then disappears, and the VFD restarts.
<i>A - 10</i>	In low speed sleep	See parameter <i>F 501</i> .	Disabled This function or raise the frequency instruction to <i>F 006 + F 906</i> .

Code	Description	Cause	Measures
<i>A - 11</i>	Key fault on the keyboard	Certain key on the keyboard panel is continuously pressed more than 20 s or the panel is damaged.	If all keys are released but the alarm does not disappear, the VFD has to be repaired.
<i>A - 12</i>	In the process of parameter initialization	See parameter <i>F. 120</i> .	If the alarm code is momentarily displayed and then disappears, the VFD comes back to normal.
<i>A - 13</i>	Loss of analog signal	Analog input terminal detection level is lower than the setting level of <i>F 422</i> .	Check analog input terminal
<i>E 1</i>	Exceeding displayed digit number by 1 digit	Displayed digit number exceeds 4 digits.	Try to reduce the setpoint of <i>F 422</i> .
<i>EUn 1</i>	In the process of self-setting	VFD is performing self-setting.	If the alarm code is momentarily displayed and then disappears, the VFD comes back to normal.

Table 6.3 Display of early warning code

Code	Type	Description
<i>- - - L</i>	Overcurrent early warning	VFD is in current amplitude limiting state. See parameters <i>F 107</i> and <i>F 111</i> .
<i>- - U -</i>	Overvoltage early warning	VFD approaches overvoltage fault. See parameters <i>F 415</i> and <i>F 416</i> .
<i>- L - -</i>	Overload early warning	This code is displayed when the motor or VFD overload counter exceeds 50%.
<i>H - - -</i>	Overheat early warning	VFD approaches overheat fault.

Note: Early warning types can occur simultaneously. E.g, when overheat early warning and overcurrent early warning happen in the same time, the corresponding code is *H - - L*.

7.3. Restart of the VFD after fault occurs

After failure occurs in the VFD , it can be restarted only when the cause of the failure has been eliminated. Please follow the undermentioned operations to realize fault reset of the VFD .

1 When the command source of the VFD is keyboard panel (under local control mode, or under remote mode and *F 002* = 1), press STOP key on the keyboard panel after the fault is eliminated. The keyboard will display *A - 00*. Press the STOP key again, and the VFD realizes fault reset. At this moment it is allowable toto re-supply power to the motor.

2 When the VFD is under remote control mode and *F 002* = 0, set the input function configuration of any logic input terminal to 10. Then the VFD can use this terminal to perform fault reset.

3 When the VFD is under remote control mode and *F 002* = 2, fault reset is realized through remote communication devices. See *Appendix A: Serial communication*.

4 Switch off the VFD and power it on again.

Note: When the fault is motor or frequency overload (*E - 21* or *E - 22*), VFD reset function can not be performed if computed cooling time is not up. The computed cooling time is specified as: *E - 21*, 30 seconds after the fault occurs; *E - 22*, 120 seconds after the the fault occurs.

8. APPENDIX A: SERIAL COMMUNICATION

Serial communication is the information exchange channel of the VFD with upper computer. Through serial communication, users can use personal computer or industrial control equipment (such as PLC etc) as host to set VFD (slave)'s running frequency or command, modify or read data, read working state and fault information etc and realize remote or centralized control of the VFD .

CT3000 series VFD adopt RS-485 bus and Modbus protocol for serial communication.

A1. RS-485 bus

The hardware circuit of serial communication for CT3000 series VFD follows RS-485 standard and a RJ45 interface is provided. Here RS-485 two-wire wiring method is adopted. The array sequence of the corresponding pins of RJ45 interface is shown as below:

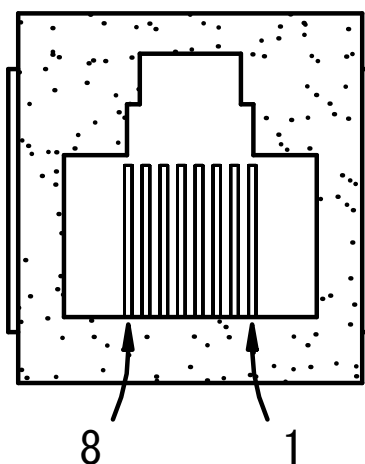


Figure A.1 RJ45 front view

Table A.1 Pin output signal allocation

Pin	Signal description
1	Reserved
2	Common port (signal ground & power ground)
3	Reserved
4	A (RS-485)
5	B (RS-485)
6	Reserved
7	+24 V
8	Common port (signal ground & power ground)

RS-485 two-wire wiring method is half-duplex serial communication. At the same moment the host and slave can not simultaneously transmit or receive data. Only one transmits data and another receives them.

RS-485 two-wire wiring method supports bus-type topological structure. At most 32 nodes can be connected to the same bus. Normally master-slave communication method is adopted in the RS-485 communication network, namely, one master commands as many as 31 slaves.

Under the circumstance of multi-computer communication or long-distance communication, it is suggested to connect the signal ground of the master station with the common port of the VFD to raise the anti-interference ability of communication.

A2. Modbus protocol

Modbus is a master-slave communication protocol. The master governs the whole communication process. Only when the master sends command to the slave, the slave executes the actions or/and send feedback information to the master. Otherwise the slave performs no operation and the slave can not communicate with each other directly.

There are two kinds of dialogues between the master and slaves:

(1) Point-to-point: Master sends command individually to a certain slave which executes action or/and sends feedback information.

When the master command is correct, the slave executes corresponding actions and transmits feedback of result information to the master.

When the master command is false, the slave transmits feedback of error information to the master but executes no actions.

(2) Broadcast mode: The master sends command to all slaves which execute action but send no feedback information.

Modbus protocol has two kinds of transmission patterns: Modbus RTU and Modbus ASCII. CT3000 series VFD supports Modbus RTU.

A2.1 Description of Modbus-RTU message format

When the Modbus-RTU mode is used for communication, the communication information (message) is represented directly with hexadecimal code (1-9, A-F). Two hexadecimal codes form one byte. The message format is shown as below:

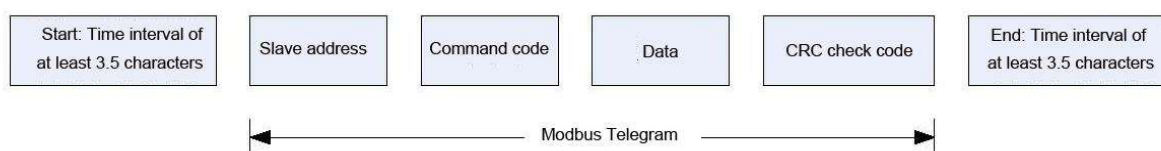


Figure A.2 Modbus Message Format

As shown in Figure A.2, during the communication process, the master and slave determine the start and end of Modbus message according to time interval of at least 3.5 characters. The message includes the complete data information to be transmitted: in the sequence of slave address, command code, data and CRC code. Its length varies with the change of the command code.

The message of Modbus-RTU is classified into three types and two formats:

- 1) Request (Interrogation) message: Command request message transmitted by master to slave;
 - 2) Normal response message: The slave's feedback message when the master's command is correct.
 - 3) Error response message: The slave's feedback message when the master's command is false / invalid.
- 1) and 2) have the same format, while 3) adopts other format.

1. Format of request message and normal response message.

Table A.2 Format of request message and normal response message

Number	Name	Function
1	Slave address	- Configured from 0 to 247 - All slaves execute command but provide no feedback information; If slave address is set to 1~247, the dialog is point-to-point mode. All address-matching slaves execute command and provide feedback information. - Under the point-to-point mode, when the matching slave responses, it sends back the slave address of itself.
2	Command code	- CT3000 series VFD supports part of command codes of Modbus protocol. - All slaves execute command code and the matching slave responses code include: 03H:Read one word (2 bytes) 06H:Write one word (2 bytes) - During error response, the feedback command code of the slave = the request command code of the master + 80H.
3	Data	This part is the main content of communication and the core of data exchange. Its content and length vary with the variation of the command codes. See the following concrete descriptions of every command code.
4	CRC code	Cyclical redundancy check (CRC) code is used for error detection of received data done by the receiving equipment and for judging whether the received data are correct. Please refer to “A2.3 Cyclical redundancy check (CRC)” for generation of CRC code. Note: CRC code first sends low bytes then high bytes. Except this, all messages of Modbus-RTU adopt the transmission sequence of “high bytes first - then low bytes”.

A2.2 Detailed message description of different commands

A2.2.1 Read N words (2*N bytes) -- command code 03H

1. Master request message

Table A.3 Command code 03H host query message format

Slave address	Command code	Communication address		Read word number		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		High byte	Low byte	High byte	Low byte	High byte	Low byte
	03H			00H	01H		

- Slave address and CRC code: See “Table A.2”.
- Command code: 03H, request to read N words (2*N bytes) of the slave machine. Notice that N is at most 5.
- Communication address: The address of read data. This is not the real physical address for data storage, but a number corresponding to the data. Every control, state or monitoring parameter of CT3000 series VFD corresponds to a communication address. See “A2.5 Communication parameter”.

4) Read word number: The length of the read data with the word (2 bytes) as the count unit. When current request asks for reading one word, it is set to 0001H.

2. Message of slave normal response

Table A.4 Command code 03H of slave machine normal reply message

Slave address	Command code	Read bytes number	Read bytes number 2		...	Read bytes number N		CRC code	
1 byte	1 byte	1 byte	2 bytes		...	2 bytes		2 bytes	
			High byte	Low byte	...	High byte	Low byte	High byte	Low byte
	03H				...				

- 1) Slave address and CRC code: See "A2.2".
- 2) Command code: 03H. The same as the master request command code.
- 3) Read word number: The length of the read data with byte as the count unit. When current master requests to read one word, set read byte number transmitted from the slave to 02H.

Note: The count unit of the length of the read data is different from that of request message.

- 4) Read data: Data corresponding to the communication address in the request message.

Note: Read data firstly sends high byte then low byte in an opposite direction to CRC code.

3. Slave error response message

Table A.5 Slave error response message of Command code 03H

Slave address	Command code	Error code	CRC code	
1 byte	1 byte	1 byte	2 bytes	
			Low byte	High byte
	83H			

- 1) Slave address and CRC code: See "A2.2".
- 2) Command code: 83H. It is = 03H + 80H.
- 3) Error code. For detail see "A2.4 Error code".
- 4) Example: Read upper limit frequency.

Master request message: 01 03 00 08 00 01 05 C8

Normal response message: 01 03 02 13 88 B5 12 (Suppose that current upper limit frequency is 50 Hz)

Error response message: 01 83 03 01 31 (Suppose that read word number is altered from 0001 to 0002)

A2.2.2 Write one word (2 bytes) — Command code 06H

1. Master request message

Table A.6 Format of master request message

Slave address	Command code	Communication address		Write data		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		High byte	Low byte	High byte	Low byte	Low byte	High byte
	06H						

- 1) Slave address and CRC code: See “Table A.2”.
- 2) Command code: 06H. Request to write 1 word (2 bytes) of the slave.
- 3) Communication address: The address of read data. This is not the real physical address for data storage, but a number corresponding to the data. Every control, state or monitoring parameter of CT3000 series VFD corresponds to a communication address. See “A2.5 Communication parameter”.
- 4) Write data: Request data written by the slave.

2. Slave normal response message

Table A.7 Slave normal response message

Slave address	Command code	Communication address		Write data		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		High byte	Low byte	High byte	Low byte	Low byte	High byte
	06H						

Slave’s normal response message is the same as the master’s request message.

3. Slave error response message

Table A.8 Format of slave error response message

Slave address	Command code	Error code	CRC code	
1 byte	1 byte	1 byte	2 bytes	
			Low byte	High byte
	86H			

- 1) Slave address and CRC code: See “Table A.2”.
- 2) Command code: 86H. It is = 06H + 80H.
- 3) Error code. For detail see “A2.4 Error code”.
4. Example: To write upper limit frequency

Master request message: 01 06 00 08 13 24 05 23 (Suppose that the set upper limit frequency is 49 Hz)

Normal response message: 01 06 00 08 13 24 05 23

Error response message: 01 86 04 43 A3 (Suppose current writing operation cannot be performed)

A2.2.3 Write multiple words (2*N bytes) -- command code 10H

1.Host query message

Table A.9 Format of host query message in command code 10H

Slave address	Command code	Communication address		Write words		Write data	Write 1		...	Write N		CRC code	
1 byte	1 byte	2 bytes		2 bytes		1 byte	2 bytes		...	2 bytes		2 bytes	
		Low byte	High byte	Low byte	High byte		Low byte	High byte	...	Low byte	High byte	Low byte	High byte
	10H								...				

(1) Slave address and CRC check code: see Table A.2.

(2) Command code: 10H, N words (2*N bytes) of the request write slave machine. Notice that N is at most 5.

(3) Communication first address: the first address to write data. The address is not the actual physical address of the data, but a number corresponding to the data. Each control, state and monitoring parameter of the converter corresponds to a communication address, see "A2.5 Communication Parameters" for details.

(4) Write words: the number of slave words written.

(5) Number of bytes written: Number of bytes written by slave = number of words written *2.

(6) Write data 1~ write data N: The data requested to be written from the machine.

2.The slave answers the message normally

Table A.10 Command code 10H for slave normal reply message format

Slave address	Command code	Communication address		Write data		CRC code	
1 byte	1 byte	2 bytes		2 bytes		2 bytes	
		Low byte	High byte	Low byte	High byte	Low byte	High byte
	10H						

(1) Slave address and CRC check code: see Table A.2.

(2) Command code: 10H, which is consistent with the request command code of the host.

(3) Communication first address: The same as the communication first address of the host.

(4) Write words: the same as the number of words written by the host.

3.Slave machine error response message

Table A.11 Format of slave error response message in command code 10H

Slave address	Command code	Error code	CRC code	
1 byte	1 byte	1 byte	2 bytes	
			Low byte	High byte
	90H			

(1) Slave address and CRC check code: see Table A.2.

(2) Command code: 90H, namely the sum of 10H and 80H.

(3) Error code: see "A2.4 Error code" for details.

4.Example: Write five consecutive parameters starting with the *F 300* parameter

Host query message: 01 10 03 00 05 0A 00 01 00 03 00 04 00 01 00 00 0B 9D AE

(Suppose *F 300*=1;*F 301* = 3;*F 302* = 4;*F 303* = 1;*F 304* =11 five parameters)

Normal reply message: 01 10 03 00 00 05 00 4E

Error response message: 01 90 03 0C 01 (assuming incorrect data setting)

A2.3 Cyclic redundancy check (CRC)

Modbus-RTU's communication message uses cyclic redundancy check (CRC) for transmission error check.

During each communication, the sender computes CRC code of transmitted data according to CRC rules, then sends the data by attaching the CRC code to them; After receiving the data, the receiver re-computes the CRC code according to the same rules. The computed content does not include the received CRC code. The receiver compares the re-calculated CRC code with the received code. If they are not the same, the transmitted data are determined to be false.

CT3000 series VFD adopts CRC16 rule for message check of serial communication. Every CRC code consists of 2 bytes, including 16-bit binary value. The calculation is as follows:

- 1) Initialize CRC register (16 bit) to 0xFFFF;
 - 2) Perform XOR to the first byte (slave address) and the low 8 bits of the register, and then put the computed result back to CRC register;
 - 3) Make a right shift by 1 bit to the content of CRC register and fill in the highest bit with 0;
 - 4) Check the shift-out bit after right shift;
 - If the shift-out bit is 0, repeat 3), namely, make another right shift;
 - If the shift-out bit is 1, make XOR to CRC register and 0xA001, and put the computed result back to the CRC register;
 - 5) Repeat steps 3) and 4) until 8 right shifts are made. Implement the same procedure to all the 8-bit data;
- Repeat steps 2) ~ 5) to implement the processing of the next byte in the message;
- 7) After all the bytes in the message are computed according to the above procedures, the content in the CRC register is the CRC code.

After the CRC code is acquired through the above-mentioned method, attach it to the transmitted data and send them. It is necessary to exchange the high and low bytes of the CRC code, namely, to send the low byte firstly and then the high byte.

There are two methods to compute CRC code with software: table look-up and on-line computation. Computation speed of the table look-up is fast but its table data occupy considerable space; On-line computation method requires no table data. It saves space but needs much time. Suitable computation method is selected according to concrete circumstance during application.

A2.4 Error code

When the slave is not able to implement master's request, the slave gives feedback of corresponding error code to indicate cause of the current error. Refer to the following table for the concrete meaning of error code.

Table A.12 Description of error code

Error code	Description
01	Command code error
	Command code other than 03H 06 and 10H is set in the request message
02	Communication address error
	- Visited communication address does not exist. - The register corresponding to the communication address does not permit performance of the action demanded by the current command code.
03	Data setting error
	- Written data exceeds the allowable range of the register. - Improper setting of certain parameter in the request message.
04	Unable to continue implementing the master's request.
	- Error occurs during the process of writing data. - Currently the register corresponding to the communication address does not permit performance of the action demanded by the command code.

A2.5 Communication parameter

1. Control parameter

Control parameters are edited through serial communication in order to realize VFD 's function setting, running frequency setting, start/stop control and logic/analog output setting.

1) Basic parameters

Basic parameters consist of 10 groups: F0 – f9. They are used to control the function setting of the VFD . Their detailed description, communication addresses and value ranges are shown in “5. Detailed description of parameters”.

Note: The communication address of the basic parameter corresponds to its display code. However, it is required to change F at the highest bit to 0;

Example: The display code of parameter “Running command selection” is *F001*, so the corresponding communication address is 0001;

Another example: The display code of parameter “Default keyboard panel display value” is *F702*, so the corresponding communication address is 0702.

2) Communication control word (Communication address: *F005*)

3) Communication running frequency setting (Communication address: *F008*)

Table A.13 Detailed description of communication control word

Bit	Description of function	0	1	Default value
0	JOG	NO-JOG	Jog frequency	0
1	Forward/reverse rotation	Forward rotation	Reverse rotation	0
2	Running/stop	Stop	Running	0
3	Free stop	No action	Free stop	0

Bit	Description of function	0	1	Default value
4	Emergency stop	No action	Emergency stop	0
5	Fault reset	No action	Reset	0
6	Given frequency by communication	Disable	Enable	0
7	Given code by communication	Disable	Enable	0
8	Multi-speed 1	OFF	ON	0
9	Multi-speed 2	OFF	ON	0
10	Multi-speed 3	OFF	ON	0
11	Multi-speed 4	OFF	ON	0
12	Motor parameter switch	1nd Motor Parameter	2nd Motor Parameter	0
13	PID control Disabling	Enabling PID control	Disabling PID control	0
14	Acceleration/ deceleration curve switch	Acceleration/ deceleration curve 1	Acceleration/ deceleration curve 2	0
15	DC braking	No DC braking	DC braking start	0

Table A.14 Communication running frequency setting

Bit	Description of function	Default
0-15	Running frequency data of communication setting. Hexadecimal setting: 50Hz→(50Hz)×100 = 5000→1388Hz It is if setting: 50Hz, write 1388H in the FA08 address	0.0

4) Communication analog output setting (Communication address: FA16)

Table A.15 Communication analog output setting

Bit	Description of function	Lower limit	Upper limit	Default
0-15	Analog output data of communication setting (in correspondence with analog output function 10)	0 (0000H)	1023 (03FFH)	0

2. Monitoring parameter

Monitoring parameters can be read through serial communication to see the running state of the converter. The following table is the description of monitoring parameters.

Table A.16 Monitoring parameters 1

No.	Communication address	Description of function	Unit	Note
1	FD03	Real-time running state	-	See table A.18 for details
2	FD12	Real-time running frequency	0.01 Hz	
3	FE18	Actual output frequency	0.01 Hz	
4	FE09	DC bus input voltage	0.01 %	

No.	Communication address	Description of function	Unit	Note
5	FE10	Output voltage	0.01 %	
6	FE08	Output current	0.01 %	
7	FE20	Output torque	0.01 %	
8	FE29	Output power	0.01 kW	
9	FE50	Motor speed (estimated)	1 rpm	
10	FE11	Logic input	-	See Table A.19 for details
11	FE12	Logic output	-	See Table A.20 for details
12	FE30	Logic input AI1 (10-bit accuracy)	-	Range (0-1023)
13	FE31	Logic input AI2 (10-bit accuracy)	-	Range (0-1023)
14	FC39	Fault monitoring	-	See A.21 for details
15	FE41	VFD rated current		

Table A.17 Monitoring parameter specification 2

No.	Communication address	Description of function	Unit	Note
1	E000	Real-time running state	-	See table A.18 for details
2	E001	Real-time running frequency	0.01Hz	
3	E002	output current	0.01A	
4	E003	Fault monitoring	-	See Table A.21 for details
5	E004	PID given		
6	E005	PID feedback		
7	E006	output voltage	V	
8	E007	Motor speed (estimated)	1rpm	
9	E008	Output torque	0.01%	
10	E009	DC bus input voltage	V	
11	E010	Input power	0.01kW	
12	E011	Output power	0.01kW	
13	E012	Input power accumulates	W.h	
14	E013	Output power accumulation	W.h	

No.	Communication address	Description of function	Unit	Note
15	E014	Cumulative running time	h(小时)	
16	E015	Logic input	-	See Table A.19 for details
17	E016	Logic output	-	See Table A.20 for details
18	E017	Analog input AI1 (10-bit precision)	-	Range (0-1023)
19	E018	Analog input AI2 (10-bit precision)	-	Range (0-1023)

Table A.18 Real-time running state monitoring

Communication address	Description of function		
FD03	Real-time running state monitoring		
Bit	Description	0	1
0	Reserved	-	-
1	Fault	No fault	Tripping
2-8	Reserved	-	-
9	Forward/reverse rotation	Forward rotation	Reverse rotation
10	Running/stop	Stop	Running
11-15	Reserved	-	-

Table A.19 Logic input state monitoring

Communication address	Description of function		
FE11	Logic input state monitoring		
Bit	Description	0	1
0	Terminal L1	OFF	ON
1	Terminal L2	OFF	ON
2	Terminal L3	OFF	ON
3	Terminal L4	OFF	ON
4	Terminal L5	OFF	ON
5	Terminal L6	OFF	ON
6	Terminal L7 or As AI1 during logic input	OFF	ON
7	Terminal L8 or As AI1 during logic input	OFF	ON
8-15	Reserved	-	-

Table A.20 Logic Output state monitoring

Communication address	Description of function		
FE12	Logic output state monitoring		
Bit	Description	0	1
0	Terminal LO1-CLO1	OFF	ON
1	Relay T2	OFF	ON
2	Relay T1	OFF	ON
3-15	Reserve	-	-

Table A.21 Fault monitoring

Communication address	Description of function	
FC39	Fault monitoring	
Value	Corresponding fault	Panel display
0000H	No fault	<i>nErr</i>
0001H	Acceleration overcurrent	<i>E-01</i>
0002H	Deceleration overcurrent	<i>E-01</i>
0003H	Constant speed overcurrent	<i>E-01</i>
0008H	Input phase failure	<i>E-41</i>
0009H	Output phase failure	<i>E-42</i>
000AH	Acceleration overvoltage	<i>E-11</i>
000BH	Deceleration overvoltage	<i>E-11</i>
000CH	Constant speed overvoltage	<i>E-11</i>
000DH	VFD overload	<i>E-21</i>
000EH	Motor overload	<i>E-22</i>
0010H	Overheat tripping	<i>E-24</i>
0011H	Emergency tripping	<i>E-43</i>
0012H	EEPROM error 1 (write error)	<i>E-31</i>
0013H	EEPROM error 2 (Read error)	<i>E-31</i>
0014H	EEPROM error 3 (Internal error)	<i>E-31</i>
0018H	External communication error	<i>E-33</i>
001AH	Current detection fault	<i>E-34</i>
001EH	Undervoltage	<i>E-12</i>

9. APPENDIX B: CONCISE PARAMETER LIST

[-F0-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F000</i>	Operation frequency of keypad	<i>F009~F008</i>	0.0	○	
<i>F001</i>	V/F control mode selection	0: V/F constant 1: Variable torque 2: Sensor-less vector control 3: Energy saving	0	●	
<i>F002</i>	Command mode selection 1	0: Terminal board 1: Keypad 2: Serial communication	1	●	
<i>F003</i>	Frequency setting mode selection 1	0: Built-in potentention meter 1: AI1 input 2: AI2 input 3: Keypad(Given frequency) 4: Serial communication (Given frequency) 5: UP/DOWN setting 6: AI1+AI2 7: PID setting of keypad (PID given) 8: Simple PLC running	3	●	
<i>F004</i>	Command mode selection 2	0: Terminal board 1: Keypad 2: Serial communication	0	○	
<i>F005</i>	Frequency setting mode selection 2	0: Built-in potentention meter 1: AI1 input 2: AI2 input 3: Keypad(Given frequency) 4: Serial communication (Given frequency) 5: UP/DOWN speed given 6: AI1+AI2 7: PID setting of keypad (PID given) 8: Simple PLC running option	2	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F006</i>	Frequency /PID given source conversion	0: Switch between <i>F003</i> and <i>F005</i> 1: Switch is disabled 2: Switch between <i>F003</i> and <i>F021</i> selected frequency /PID source 3: Switch between <i>F005</i> and <i>F021</i> selected frequency /PID source	0	○	
<i>F007</i>	Maximum frequency	30.0~400.0 Hz	50.0	●	
<i>F008</i>	Upper limit frequency	0.5 Hz ~ <i>F007</i>	50.0	○	
<i>F009</i>	Lower limit frequency	0.0 Hz ~ <i>F008</i>	0.0	○	
<i>F010</i>	Acceleration time 1	0.1~3200 s	varies by model	○	
<i>F011</i>	Deceleration time 1	0.1~3200 s	varies by model	○	
<i>F012</i>	PWM carrier frequency	1.5k~12.0 kHz	varies by model	○	
<i>F013</i>	Carrier frequency control mode selection	0: not reduced automatically 1: reduced automatically	1	●	
<i>F014</i>	Random PWM mode	0: Disable. 1: Enable.	0	○	
<i>F015</i>	Automatic acceleration/deceleration	0: Disabled (manual). 1: Automatic (at acceleration & deceleration) 2: Automatic (only at acceleration)	0	●	
<i>F016</i>	Factory reserved	-	-		
<i>F017</i>	Parameter setting mQDo function	0: Default value. 1: 2-wire control (Negative logic mode, ramp stop). 2: 3-wire control (Negative logic mode, ramp stop). 3: External input UP/DOWN setting (Negative logic mode, slowdown stop). 4 ~ 16: Factory reserved 17: PID sleep & Wake Control (<i>F003</i> =7 <i>F910</i> =0.1s <i>F911</i> =75.0% <i>F915</i> =5.0s <i>F919</i> =38.0Hz) 18: PID basic control (<i>F002</i> =1 <i>F003</i> =7 <i>F367</i> =1 <i>F523</i> =2 <i>F900</i> =1 <i>F917</i> =100 <i>F918</i> =20) 19: Factory reserved	0	●	
<i>F018</i>	Factory reserved	-	-		
<i>F020</i>	Factory reserved	-	-		

NO.	Parameter Name	Setting Range	default	WRT	
<i>F021</i>	Primary and secondary frequencies /PID are given	0: Single channel given 1: $F003 + F005$ 2: $F003 - F005$ 3: MAX ($F003, F005$) 4: MIN ($F003, F005$)	0	○	
<i>F022</i>	$F005$ frequency given coefficient	0.0~ 100.0%	100.0 %		
<i>F023</i>	$F005$ frequency bias given	0.0Hz~400.0Hz	0.0Hz		
<i>F024</i>	Lower limit selection and $F005 = 3/7$ setting	0~ 5	0		
<i>F099</i>	Factory reserved	Same as <i>F020</i>			

[-F1-]

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F100</i>	Auto-tuning	0: Auto-tuning disabled 1: Application of individual settings of <i>F203</i> 2: Auto-tuning enabled	0	●	
<i>F101</i>	Base frequency 1	25.0~400.0 Hz	50.0	●	
<i>F102</i>	Base frequency voltage1	50~660 V	varies by model	●	
<i>F103</i>	Motor rated current	0.1~200.0 A	varies by model	●	
<i>F104</i>	Motor rated speed	100~15000 rpm	varies by model	●	
<i>F105</i>	Motor no-load current	10.0~100.0%	varies by model	●	
<i>F106</i>	Motor electronic thermal protection level 1	varies by model	varies by model	○	
<i>F107</i>	stall prevention level 1	varies by model	varies by model	●	
<i>F108</i>	Base frequency 2	25.0~400.0 Hz	50.0	●	
<i>F109</i>	Base frequency voltage 2	50~660V	varies by model	●	
<i>F110</i>	Motor electronic-thermal protection level 2	varies by model	varies by model	○	
<i>F111</i>	Stall prevention level 2	varies by model	varies by model	○	
<i>F112</i>	factory reserved	-			
<i>F113</i>	factory reserved	-			
<i>F114</i>	factory reserved	-			
<i>F115</i>	factory reserved	-			

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 120</i>	Default setting	0: - 1: Standard default setting (Initialization) 2: Save user-defined parameters 3: Call user-defined parameters 4: Trip record clear 5: Cumulative operation time clear 6: Cumulative fan operation time record clear 7: Initialization of type information 8: P-type rating. 9: G-type rating.	0	●	

[-f2-]

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 201</i>	Supply voltage correction	0: Supply voltage uncorrected, output voltage limited. 1: Supply voltage corrected, output voltage limited. 2: Supply voltage uncorrected, output voltage unlimited. 3: Supply voltage corrected, output voltage unlimited.	3	●	
<i>F 202</i>	Voltage boost 1	0.0~30.0%	varies by model	○	
<i>F 203</i>	Torque boost	0.0~30.0%	varies by model	○	
<i>F 204</i>	Slip frequency gain	0~150%	50	○	
<i>F 205</i>	Exciting current coefficient	100~130	100	●	
<i>F 206</i>	Voltage boost 2	0~30%	varies by model	○	
<i>F 207</i>	Speed control response coefficient	1~150	40	●	
<i>F 208</i>	Speed control stability coefficient	1~100	20	●	
<i>F 209</i>	Stall prevention control coefficient 1	10~250	100	●	
<i>F 210</i>	Stall prevention control coefficient 2	50~150	100	●	
<i>F 211</i>	Maximum voltage adjustment coefficient	90~120%	104	●	
<i>F 212</i>	Waveform switching adjustment coefficient	0.1~14kHz	14.0	●	
<i>F 213 ~ F 216</i>	factory reserved				

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F217</i>	multipoint profile V/F patter	0: factory reserved. 1: factory reserved. 2: Enable multipoint profile V/F patter.	0	•	
<i>F218</i>	point 1 output frequency (F1)	0~ <i>F220</i>	10.0	•	
<i>F219</i>	point 1 output frequency voltage (V1)	0~100%	20.0	•	
<i>F220</i>	point 2 output frequency (f2)	<i>F218</i> ~ <i>F220</i>	20.0	•	
<i>F221</i>	point 2 output frequency voltage (V2)	0~100%	40.0	•	
<i>F222</i>	point 3 output frequency (f3)	<i>F220</i> ~ <i>F101</i>	30.0	•	
<i>F223</i>	point 3 output frequency voltage (V3)	0~100%	60.0	•	
<i>F225</i>	Speed factor	1~999	420	•	

[-f3-]

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F300</i>	AI1 terminal function selection	0: AI1 - analog input 1: AI1 - contact input (Sink mode) 2: AI1 - contact input (Source mode)	0	•	
<i>F301</i>	Input terminal function for LI1	0: No function is assigned 1: Standby terminal 2: Forward run command 3: Reverse run command 4: Jog run mode 5: Acceleration/deceleration 2 pattern selection 6: Preset-speed command 1 7: Preset-speed command 2 8: Preset-speed command 3 9: Preset-speed command 4 10: Reset command 11: Trip stop command from external input device 13: DC braking command 14: PID control disabling 15: Permission of parameter editing 16: Combination of standby and reset commands 17: Frequency source switching to AI1 18: Combination of forward run and jog run	2	•	
<i>F302</i>	Input terminal function for LI2		3	•	
<i>F303</i>	Input terminal function for LI3		0	•	
<i>F304</i>	Input terminal function for LI4		10	•	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 304</i>	Input terminal function for LI4	19: Combination of reverse run and jog run 20: Frequency setting source switching 21: No.2 Switching of V/F setting 22: No.2 motor switching 23: Frequency UP signal input from external contacts 24: Frequency DOWN signal input from external contacts 25: Frequency UP/DOWN cancellation signal input from external contacts 26: inversion of trip stop command from external device 27 Thermal trip stop signal input from external device 28: inversion of thermal trip stop signal input from external device 29: Forced switching from remote to local control 30: Operation holding (stop of 3-wire operation) 31: Forced switching of command mode and terminal board command 32: Display cancellation of the cumulative power amount (kWh) 33: Fire-speed control seeF419 34: Coast stop (gate off) 35: Inversion of Reset 36: Forced switching of stall prevention level 2 37: PID control integral value clear PID control integral value clear 38: inversion of PID error signal 39: Forward running command + Acc&Dec curve 2 40: Reverse running command + Acc&Dec curve 2 41: Forward running command + Multi-speed section 1 42: Reverse running command + Multi-speed section 1 43: Forward running command + Multi-speed section 2 44: Reverse running command + Multi-speed section 2 45: Forward running command + Multi-speed section 3 46: Reverse running command + Multi-speed section 3 47: Forward running command + Multi-speed section 4	10	•	

NO.	Parameter Name	Setting Range	default	WRT	User setting
F 304	Input terminal function for LI4	48: Reverse running command + Multi-speed section 4 49: Multi-speed section 1 + Acc&Dec curve 2 50: Multi-speed section 2 + Acc&Dec curve 2 51: Multi-speed section 3 + Acc&Dec curve 2 52: Multi-speed section 4 + Acc&Dec curve 2 53: Forward running command +Multi-speed section 1+ Acc&Dec curve 2 54: Reverse running command +Multi-speed section 1+ Acc&Dec curve 2 55: Forward running command +Multi-speed section 2+ Acc&Dec curve 2 56: Reverse running command +Multi-speed section 2+ Acc&Dec curve 2 57: Forward running command +Multi-speed section 3+ Acc&Dec curve 2 58: Reverse running command +Multi-speed section 3+ Acc&Dec curve 2 59: Forward running command +Multi-speed section 4+ Acc&Dec curve 2 60: Reverse running command +Multi-speed section 4+ Acc&Dec curve 2 61: UP/DOWN speed clean up+ fault reset 62: Running permission+ Forward running command (only 2-wire control) 63: Running permission+ reverse running command (only 2-wire control) 64: Acc&dec curve 3 65: Acce/Dece curve 3 + Forward running command 66: Acce/Dece curve 3 + Reverse running command 67: Command source switch 68: Command source + frequency source switch 69: Three-wire control stop reverse 70: Reset when simple PLC stops 71: Simple PLC time out 72: Simple PLC pause 73/74: PID control + frequency given source switch 75:(UP/DOWN) stop speed clearance	10	•	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 305</i>	AI1 voltage-current input selection	0:0~5V voltage signal input. 1:0~10V voltage signal input. 2: 0-20mA(4-20mA) current signal input.	0	•	
<i>F 306</i>	sink/soruce mode selection	0: Source (Positive) logic terminal mode. 1: Sink (Negative) logic terminal mode	1	•	
<i>F 307</i>	AO voltage-current output selection	0: Current signal output. 1: Voltage signal output.	1	•	
<i>F 308</i>	Input terminal function of AI1	<i>F 301~F 304</i>	0	•	
<i>F 309</i>	Always-active terminal selection 1	<i>F 301~F 304</i>	1	•	
<i>F 310</i>	Always-active terminal selection 2	<i>F 301~F 304</i>	0	•	
<i>F 311</i>	Output terminal function A of LO1-CLO1	<i>F 315</i>	4	•	
<i>F 312</i>	Output terminal function B of LO1-CLO1	<i>F 315</i>	255	•	
<i>F 313</i>	AI2 terminal function selection	0: AI2 - analog input 1: AI2 - contact input (Sink) 2: AI2 - contact input (Source)	0	•	
<i>F 314</i>	Input terminal function of AI2	<i>F 301~F 304</i>	0	•	
<i>F 315</i>	Output terminal function A of T1 (T1A-T1B-T1C)	0: Output frequency higher than lower limit frequency 2: Output frequency equals to upper limit frequency 4: Output frequency is higher or equal to <i>F 337</i> 6: (set frequency - <i>F 339</i>) < output frequency < (set frequency + <i>F 339</i>) 8: (<i>F 338</i> - <i>F 339</i>) < output frequency < (<i>F 338</i> + <i>F 339</i>) 10: Output frequency higher or equal to <i>F 338</i> + <i>F 339</i> 12: <i>F.003</i> or <i>F.005</i> source supply given speed=AI1 signal 14: <i>F.003</i> or <i>F.005</i> source supply given speed=AI2 signal 16: AI1's value higher or equal to <i>f340</i> + <i>F 341</i> 18: AI2's value is higher or equal to <i>F 342</i> + <i>F 343</i>	40	•	

NO.	Parameter Name	Setting Range	default	WRT	User setting
F315	Output terminal function A of T1 (T1A-T1B-T1C)	20: AI2 is the speed given source 22: VFD forward motor power supply (acceleration, deceleration, constant speed or DC braking) 24: Ready for running of the VFD (running permission and running command available) 26: Motor reverse running 28: Under local mode for VFD 30: Fault happened in the VFD 32: Evaluated motor torque is at f412 level time is still less than f414 set value. 34: Motor current is less than f408 and its lasting time is over f410 setting. 36: Fault occurred and could not reset. 38: Fault occurred but it could reset. 40: Fault occurs in the VFD 42: Alarm occurs 44: Motor heating status has reached 50% of motor overload fault level. 46: DC braking resistor status has reached 50% DC braking resistor overload fault level. 48: Evaluated motor torque reaches f412*70% 50: Run time≥f428 set value 52: The equipment sends maintenance alarm warning. (Fan, PCB or capacitor needs replacement.) 54: PTC heating sensor needle has detected motor temperature reaching 60% of trip level. 56: Undervoltage alarm is valid. 58: Brake pull 60: In the process of motor acceleration process 62: In the process of motor deceleration 64: In the process of motor deceleration or acceleration 66: Heat sink temperature has reached alarm value	40	•	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 3 15</i>	Output terminal function A of T1 (T1A-T1B-T1C)	68: One PLC recycle completes 70: One PLC speed section completes 72: The inverter is ready to receive the running signal 74~79: unused 80: LI1 input is valid 82: LI2 input is valid 84: PID feedback pressure equal to or higher than <i>F 5 2 7</i> + <i>F 5 2 8</i> 86: PID feedback pressure equal to or higher than <i>F 9 1 8</i> + <i>F 5 2 8</i> 88~253: Unused 254: Relay constant output OFF 255: Relay constant output ON	40	●	
<i>F 3 16</i>	Output terminal logic selection of LO1-CLO1	0: And logic 1: Or logic	0	●	
<i>F 3 17</i>	LO1-CLO1 output delay	0.0~60.0 s	0.0	○	
<i>F 3 18</i>	Relay 1 closing delay	0.0~60.0 s	0.0	○	
<i>F 3 19</i>	External contact input - UP response time	0.0~10.0 s	0.1	○	
<i>F 3 20</i>	External contact input - UP frequency steps	0.0 Hz ~ <i>F 0 0 7</i>	0.1	○	
<i>F 3 2 1</i>	External contact input - DOWN response time	0.0~10.0 s	0.1	○	
<i>F 3 22</i>	External contact input - DOWN frequency steps	0.0 Hz ~ <i>F 0 0 7</i>	0.1	○	
<i>F 3 23</i>	Initial up/down frequency	0.0 Hz ~ <i>F 0 0 7</i>	0.0	○	
<i>F 3 24</i>	Change of the initial up/down frequency	0/2/4: disabled 1/3/5: enabled	1	○	
<i>F 3 25</i>	AI1 input point 1 setting	0~100%	0	○	
<i>F 3 26</i>	AI1 input point 1 frequency	0.0~400.0 Hz	0.0	○	
<i>F 3 2 7</i>	AI1 input point 2 setting	0~100%	100	○	
<i>F 3 28</i>	AI1 input point 2 frequency	0.0~400.0 Hz	50.0	○	
<i>F 3 29</i>	AI2 input point 1 setting	0~100%	0	○	
<i>F 3 30</i>	AI2 input point 1 frequency	0.0~400.0 Hz	0.0	○	
<i>F 3 3 1</i>	AI2 input point 2 setting	0~100%	50	○	
<i>F 3 32</i>	AI2 input point 2 frequency	0.0~400.0 Hz	50.0	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 333</i>	AI1 input bias	0~255	varies by model	○	
<i>F 334</i>	AI1 input gain	0~255	varies by model	○	
<i>F 335</i>	AI2 input bias	0~255	varies by model	○	
<i>F 336</i>	AI2 input gain	0~255	varies by model	○	
<i>F 337</i>	Low-speed signal output frequency	0.0 Hz ~ <i>F 007</i>	0.0	○	
<i>F 338</i>	Speed reach detection output frequency	0.0 Hz ~ <i>F 007</i>	0.0	○	
<i>F 339</i>	Speed reach detection band	0.0 Hz ~ <i>F 007</i>	2.5	○	
<i>F 340</i>	AI1 input reach detection level	0~100%	0	○	
<i>F 341</i>	AI1 input reach detection band	0~20%	3	○	
<i>F 342</i>	AI2 input reach detection level	0~100%	0	○	
<i>F 343</i>	AI2 input reach detection band	0~20%	3	○	
<i>F 344</i>	Frequency command agreement detection range	0.0 Hz ~ <i>F 007</i>	2.5	○	
<i>F 345</i>	Logic output/pulse train output selection (LO1-CLO1)	0: Logic output 1: Pulse train output	0	●	
<i>F 346</i>	Pulse train output function selection (LO - CLO)	0: Output frequency 1: Output current 2: Set frequency (Before PID) 3: Frequency setting value (After PID) 4: DC voltage 5: Output voltage command value 6: Input power 7: Output power 8: AI1 Input value 9: AI2 Input value 10: Torque 11: Torque current 12: Motor cumulative load factor 13: Inverter cumulative load factor 14: PBR (braking reactor) cumulative load factor	0	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
F 347	Maximum numbers of pulse train	500~1600	800	○	
F 348	AO1 selection	0:Output frequency 1:Output current 2:Set frequency (before PID) 3:Frequency setting value (after PID) 4:DC voltage 5:Output voltage command value 6:Input power 7:Output power 8:AI1 input 9:AI2 input 10:Torque 11:Torque current 12:Motor cumulative load factor 13:Inverter cumulative load factor 14:brake resistor cumulative load factor 15:Serial communication data 16:185% proofread 17:150% proofreading 18:100% proofread	0	○	
F 349	AO1 gain adjustment	1~1280	varies by model	○	
F 350	Inclination characteristic of analog output	0: Negative 1: Positive	1	○	
F 351	Bias of analog output	0~100%	0	○	
F 352	output frequency when AO1 = 0V	0 Hz ~F.007	0.0	○	
F 353	output frequency when AO1 = 10V	0 Hz ~F.007	0.0	○	
F 354	AO1 bias	0~255	128	○	
F 355	Analog Output Voltage Bias Calibration (AO1)	F 301~F 304 (15kW and above)	0	●	
F 356	Input terminal function for LI6	F 301~F 304 (15kW and above)	0	●	
F 357	Input terminal function for LI7	F 301~F 304 (15kW and above)	0	●	
F 358	Input terminal function for LI8	F 301~F 304 (15kW and above)	0	●	
F 359	Output terminal function A of T2	See F 315	0	●	
F 360	Relay 2 auxiliary functions	See F 315	255	●	
F 361	Output terminal logic selection of T2	0: And Logic (15kW and above) 1: Or Logic	0	●	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 362</i>	Relay 2 closing delay	0~60.0s (15kW and above)	0.0	●	
<i>F 363</i>	Input terminal active mode	8 bits - hexadecimal display, each option: 0: Closure is valid 1: Disconnect effective			
<i>F 364</i>	Logical input terminal filtering	0~200	0		
<i>F 365</i>	Relay output 1 assistant function	<i>F 315</i>	255		
<i>F 366</i>	Relay output 1 function logic relation	0~1	0		
<i>F 367</i>	Terminal run detection selection at power on	0: disable 1: enable	0		
<i>F 368</i>	Analog output signal type (AO2)	0: Current signal output 1: Voltage signal output	1	●	
<i>F 369</i>	Analog output function selection (AO2)	<i>F 348</i>	0	○	
<i>F 370</i>	Analog output current scaling (AO2)	1~1280	Based on machine model	○	
<i>F 371</i>	AO2 Analog output slope	0: Negative slope 1: Positive slope	1	○	
<i>F 372</i>	AO2 Analog output bias	0~100%	0	○	
<i>F 373</i>	Analog Output current Bias Calibration (AO2)	0~255	4	●	
<i>F 374</i>	Percentage of AO monitored values	0~250%	0	●	
<i>F 375</i>	Relay 1 disconnect delay	0~60.0s	0.0	●	
<i>F 376</i>	Relay 2 disconnect delay	0.0~60.0s	0.0	●	

[-f4-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 400</i>	Retry selection	0: disabled 1~10 times.	0	●	
<i>F 401</i>	Electronic-thermal protection characteristic selection	0: Trip enable, stall disable (standard motor) 1: Trip enable, stall enable (standard motor) 2: Trip disable, stall disable (standard motor)	0	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 4 0 1</i>	Electronic-thermal protection characteristic selection	3: Trip disable, stall enable (standard motor) 5: Trip enable, stall disable (forced cooling motor) 6: Trip enable, stall enable (forced cooling motor) 7: Trip disable, stall disable (forced cooling motor) 8: Trip disable, stall enable (forced cooling motor)	0	○	
<i>F 4 0 2</i>	Motor 150%-overload time limit	10-2400 s	300	○	
<i>F 4 0 3</i>	Emergency stop selection	0: Coast stop 1: Slowdown stop 2: Emergency DC braking	0	●	
<i>F 4 0 4</i>	emergency braking time	0.0-20.0 s	1.0	○	
<i>F 4 0 5</i>	Input phase failure detection	0: Disabled, No tripping. 1: Enabled	0	●	
<i>F 4 0 6</i>	Output phase failure detection mode selection	0: Disabled 1: At start-up (Only one time after power is turned on) 2: At start-up (each time) 3: During operation 4: At start-up + during operation 5: Detection of cutoff on output side	0	●	
<i>F 4 0 7</i>	Small current trip/alarm selection	0: Alarm 1: trip	0	○	
<i>F 4 0 8</i>	Small current detection current	0~100%	0.00	○	
<i>F 4 0 9</i>	Small current detection current hysteresis	1~20%	10	○	
<i>F 4 1 0</i>	Small current detection time	0-255 s	0	○	
<i>F 4 1 1</i>	Over-torque trip/Overcurrent indication	0: Over-torque alarm (70%) 1: Over-torque fault 2: Over-torque alarm (100%) 3: Over-current alarm (70%) 4: Overcurrent fault 5: Overcurrent alarm (100%)	0	○	
<i>F 4 1 2</i>	Over-torque detection level	0~250%	130	○	
<i>F 4 1 3</i>	Over-torque detection level hysteresis	0~100%	10	○	
<i>F 4 1 4</i>	Over-torque detection time	0.0~10.0 s	0.5	○	
<i>F 4 1 5</i>	Overvoltage limit operation	0: Enabled. speed. 1: Disabled 2: Enabled (Quick deceleration). 3: Enabled (Dynamic quick deceleration).	2	●	

NO.	Parameter Name	Setting Range	default	WRT	User setting
F 4 1 6	Overvoltage limit operation level	100-150%	130	●	
F 4 1 7	Undervoltage trip/alarm selection	0: Alarm only (detection level below 60%) 1: Tripping (detection level below 60%). 2: Alarm only (detection level below 50%)	0	●	
F 4 1 8	Instantaneous power failure coast stop selection	0: disabled 1: factory reserved 2: Coast stop.	0	●	
F 4 1 9	Forced fire-speed control function	0: Disabled. 1: Enabled.	0	○	
F 4 2 0	Detection of output short-circuit during start-up	0: Each time (standard pulse) 1: Only one time after power is turned on (standard pulse) 2: Each time (short-time pulse) 3: Only one time after power is turned on (short-time pulse)	0	●	
F 4 2 1	Motor electric-thermal protection retention selection	0: disabled. 1: Enabled.	0	○	
F 4 2 2	AI1 input loss	1~100%	0	○	
F 4 2 3	Activation of the VFD during 4-20mA signal loss	0: No measures. 1: Coast stop. 2: switch to Fallback speed. 3: Speed maintaining. 4: Slowdown stop.	0	●	
F 4 2 4	Fallback speed	0.0 Hz ~ F 0 0 7	0.0	○	
F 4 2 5	PTC thermal selection	0: Disabled 1: Enabled (trip mode) 2: Enabled (alarm mode)	0	○	
F 4 2 6	Resistor value for PTC detection	100-9999Ω	3000	○	
F 4 2 8	Cumulative operation time alarm setting	0.0-999.9 h (0.1=10 hour)	610.0	○	
F 4 2 9	VFD trip retention selection	0: clearing 1: maintaining	0	○	
F 4 3 0	Heat sink temperature reaches the alarm value	0 ~100℃	60	●	
F 4 3 1	Analog output current scaling (AO1)	1~1280			
F 4 3 2	Analog Output current Bias Calibration (AO1)	0~255			
F 4 3 3	Analog output voltage scaling (AO2)	1~1280			
F 4 3 4	Analog Output Voltage Bias Calibration (AO2)	0~255			
F 4 3 5	Running time 2 (ROM)	0~65535	- - -		

[-f5-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F500</i>	Auto-restart control selection	0: Disabled 1: At auto-restart after momentary stop 2: When turning standby (input terminal function =1) on or off 3: At auto-restart or when turning standby (input terminal function =1) on or off 4: At start-up 5~7: Factory reserved 8: DC braking and then start.	0	●	
<i>F501</i>	auto-stop time limit for lower-limit frequency operation	0.0: disable 0.1-600.0 s	0.1	○	
<i>F502</i>	Bumpless operation selection	0: disabled. 1: enabled.	1	○	
<i>F503</i>	Starting frequency setting	0.5~10.0 Hz	0.5	○	
<i>F504</i>	Operation starting frequency	0.0 Hz ~ <i>F007</i>	0.0	○	
<i>F505</i>	Operation starting frequency hysteresis	0.0 Hz ~ <i>F007</i>	0.0	○	
<i>F506</i>	DC braking starting frequency	0.0 Hz ~ <i>F007</i>	0.0	○	
<i>F507</i>	DC braking current	varies by model	varies by model	○	
<i>F508</i>	DC braking time	0.0~20.0 s	1.0	○	
<i>F510</i>	Acceleration/deceleration 1 pattern	0: Linear 1: S pattern 1 2: S pattern 2 3: Elevator acceleration / deceleration curve	0	○	
<i>F511</i>	Acceleration/deceleration 2 pattern	0: Linear 1: S pattern 1 2: S pattern 2	0	○	
<i>F512</i>	Acceleration/deceleration 3 pattern	0: Linear 1: S pattern 1 2: S pattern 2	0	○	
<i>F513</i>	Acceleration/deceleration 1 and 2 switching frequency	0.0 Hz ~ <i>F008</i>	0.0	○	
<i>F514</i>	Acceleration/deceleration 2 and 3 switching frequency	0.0 Hz ~ <i>F008</i>	0.0	○	
<i>F515</i>	Selecting an acceleration/deceleration pattern	1: Acc/Dec 1 2: Acc/Dec 2 3: Acc/Dec 3	1	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
F516	S-pattern lower-limit adjustment amount	0~50%	10	○	
F517	S-pattern upper-limit adjustment amount	0~50%	10	○	
F518	Acceleration time 2	0.0~3200 s	20.0	○	
F519	Deceleration time 2	0.0~3200 s	20.0	○	
F520	Acceleration time 3	0.0~3200 s	20.0	○	
F521	Deceleration time 3	0.0~3200 s	20.0	○	
F522	Reverse-run prohibition	0: Forward/reverse run permitted. 1: Reverse run prohibited. 2: Forward run prohibited.	0	●	
F523	stop type	0: Ramp shutdown 1: Free shutdown of keyboard 2: 2 line control free stop 3: 2 line control free stop	2	○	
F526	Positive and negative operation is preferred	0: Forward + reverse ->reverse 1: forward + reverse -> GT;downtime 2: Forward + reverse -> GT;Let me give you the direction 3: Forward + reverse -> GT;In the direction given by 4: Forward + reverse -> GT;positive	1	○	
F527	regenerative braking selection	0: Disabled 1: Enabled (with resistor overload protection) 2: Enabled (without resistor overload protection)	2		
F528	regenerative braking resistance	1.0~1000.0Ω	20.0	●	
F529	regenerative braking resistor capacity	0.01~30.0 kW	0.12	●	
F530	Positive and negative dead zone time	0.0~25.0s	10	○	
F531	Acceleration / deceleration S - curve upper limit 2	0~50 %	10	●	
F532	Acceleration / deceleration S - curve lower limit 3	0~50 %	10	●	
F533	Acceleration / deceleration S - curve upper limit 3	0~50 %	10	●	

[-f6-]

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 6 0 0</i>	Prohibition of panel reset operation	0: Permitted 1: Prohibited	0	○	
<i>F 6 0 1</i>	Switching between remote control and Local control	0: Local control mode 1: remote control mode 2. JOG function is set with <i>F 7 0 0</i>	1	○	
<i>F 6 0 2</i>	Password check/input	0~9999	0	○	
<i>F 6 0 3</i>	Current/voltage display mode	0: % 1: A (ampere)/V (volt),	1	○	
<i>F 6 0 4</i>	Frequency free unit magnification	0: unit is Hz 0.01-200.0: free unit	0.00	○	
<i>F 6 0 5</i>	Factory reserved	-	0	●	
<i>F 6 0 6</i>	Inclination characteristic of free unit display	0: Negative inclination (downward slope) 1: Positive inclination (upward slope)	1	○	
<i>F 6 0 7</i>	Bias of free unit display	0.00 Hz ~ <i>F 0 0 7</i>	0.00	○	
<i>F 6 0 8</i>	Free step 1 (pressing a panel key once)	Disabled: 0.00 Enabled: 0.01 Hz ~ <i>F 0 0 7</i>	0.00	○	
<i>F 6 0 9</i>	Free step 2 (panel display)	0: disabled 1~255: enabled	0	○	
<i>F 6 1 0</i>	Standard monitor display selection	0: Output frequency(Hz(free)) 1: Frequency command(Hz(free)) 2:Output current(%/A) 3:VFD rated current (A) 4:VFD load (%) 5:Output power (kW) 6: Stator frequency (Hz (free)) 7:communication data display 8: Output speed 9: Communication counter 10: Normal communication counter 11: Stop - given frequency (<i>F 9 0 0</i> =0)/given PID (<i>F 9 0 0</i> ≠0), Run - output frequency 12: running speed (output frequency * <i>F 2 2 5</i>) 13: Average speed (multi-step average speed) 14: Step-speed number (currently running ste- speed number) 15: Running time 2 (it's not cumulative running time)	11	○	
<i>F 6 1 1</i>	panel running order clear selection	0: clear 1: keep	1	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F612</i>	Panel operation prohibition (F000)	0: Permitted 1: Prohibited	0	○	
<i>F613</i>	Prohibition of panel operation (RUN/STOP keys)	0: Permitted. 1: Prohibition.	0	○	
<i>F614</i>	Prohibition of panel emergency stop operation	0: Permitted. 1: Prohibition.	0	○	
<i>F616</i>	Integral output power retention selection	0: (clear) 1: (memory)	1	○	
<i>F617</i>	Integral output power display unit selection	0: 1kWh. 1: 10kWh. 2: 100kWh. 3: 1000kWh.	varies by model	○	
<i>F618</i>	Search and resetting of changed parameters selection	0: disable 1: enable	0	○	
<i>F619</i>	factory reserved	VFD internal temperature monitoring 1			
<i>F620</i>	factory reserved	VFD internal temperature monitoring 2			
<i>F621</i>	LCD contrast control	15~40	25		
<i>F622</i>	factory reserved				
<i>F623</i>	Bit0: Fan self-running	0: The fan works when the converter is running 1: The fan works when the inverter is powered on	0	○	
	Bit1: Positive power monitoring	0: Monitoring both positive and negative power 1: Monitor only positive power			
<i>F624</i>	Keyboard panel displays 2	Same as <i>F610</i>	2	○	
	Quick Monitoring 1	Same as <i>F610</i>			
<i>F625</i>	Keyboard panel displays 3	Same as <i>F610</i>	1	○	
	Quick Monitoring 2	1 ~ 8: check <i>F610</i> 9: PID is given 10: PID feedback 11-15: check <i>F610</i>			
<i>F626</i>	Keyboard panel displays 4	Same as <i>F610</i>	5	○	
	Quick Monitoring 2	1 ~ 8: check <i>F610</i> 9: PID is given 10: PID feedback 11-15: check <i>F610</i>			
<i>F627</i>	Relay output -PID feedback check out	0.00~99.99	0.00		
<i>F628</i>	Relay output -PID feedback to detect bandwidth	0.00~99.99	0.00		
<i>F629</i>	Factory reserved				

[-f7-]					
NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 700</i>	JOG key function setting	0~6	5	○	
<i>F 701</i>	jog run frequency	0.0~20.0 Hz	5.0	○	
<i>F 702</i>	Jog stopping pattern	0: Slow down stop. 1: coast stop. 2: DC braking.	0	●	
<i>F 703</i>	Jump frequency 1	0.0 Hz ~ <i>F 007</i>	0.0	○	
<i>F 704</i>	Jumping width 1	0.0 ~30.0 Hz	0.0	○	
<i>F 705</i>	Jump frequency 2	0.0 Hz ~ <i>F 007</i>	0.0	○	
<i>F 706</i>	Jumping width 2	0.0~30.0 Hz	0.0	○	
<i>F 707</i>	Jump frequency 3	0.0 Hz ~ <i>F 007</i>	0.0	○	
<i>F 708</i>	Jumping width 3	0.0~30.0 Hz	0.0	○	
<i>F 709</i>	Braking mode selection	0~3	0	●	
<i>F 710</i>	Release frequency	<i>F 503</i> ~20.0Hz	3.0	○	
<i>F 711</i>	Release time	0~25.0s	0.5	○	
<i>F 712</i>	Creeping frequency	<i>F 503</i> ~20.0Hz	3.0	○	
<i>F 713</i>	Creeping time	0~25.0s	1.0	○	
<i>F 714</i>	Droop gain	0~100%	0	○	
<i>F 715</i>	Droop insensitive torque band	0~100%	10	○	
<i>F 716</i>	Preset-speed 1	<i>F 009</i> ~ <i>F 008</i>	3.0	○	
<i>F 717</i>	Preset-speed 2	<i>F 009</i> ~ <i>F 008</i>	6.0	○	
<i>F 718</i>	Preset-speed 3	<i>F 009</i> ~ <i>F 008</i>	9.0	○	
<i>F 719</i>	Preset-speed 4	<i>F 009</i> ~ <i>F 008</i>	12.0	○	
<i>F 720</i>	Preset-speed 5	<i>F 009</i> ~ <i>F 008</i>	15.0	○	
<i>F 721</i>	Preset-speed 6	<i>F 009</i> ~ <i>F 008</i>	18.0	○	
<i>F 722</i>	Preset-speed 7	<i>F 009</i> ~ <i>F 008</i>	21.0	○	
<i>F 723</i>	Preset-speed 8	<i>F 009</i> ~ <i>F 008</i>	24.0	○	
<i>F 724</i>	Preset-speed 9	<i>F 009</i> ~ <i>F 008</i>	27.0	○	
<i>F 725</i>	Preset-speed 10	<i>F 009</i> ~ <i>F 008</i>	30.0	○	
<i>F 726</i>	Preset-speed 11	<i>F 009</i> ~ <i>F 008</i>	33.0	○	
<i>F 727</i>	Preset-speed 12	<i>F 009</i> ~ <i>F 008</i>	36.0	○	
<i>F 728</i>	Preset-speed 13	<i>F 009</i> ~ <i>F 008</i>	39.0	○	
<i>F 729</i>	Preset-speed 14	<i>F 009</i> ~ <i>F 008</i>	45.0	○	
<i>F 730</i>	Preset-speed 15	<i>F 009</i> ~ <i>F 008</i>	50.0	○	
<i>F 731</i>	factory reserved				
<i>F 732</i>	Multi-speed 0 run time	0~65000.0s(min)	0.0		
<i>F 733</i>	Multi-speed 1 run time	0~65000.0s(min)	0.0		
<i>F 734</i>	Multi-speed 2 run time	0~65000.0s(min)	0.0		

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 735</i>	Multi-speed 3 run time	0~65000.0s(min)	0.0		
<i>F 736</i>	Multi-speed 4 run time	0~65000.0s(min)	0.0		
<i>F 737</i>	Multi-speed 5 run time	0~65000.0s(min)	0.0		
<i>F 738</i>	Multi-speed 6 run time	0~65000.0s(min)	0.0		
<i>F 739</i>	Multi-speed 7 run time	0~65000.0s(min)	0.0		
<i>F 740</i>	Multi-speed 8 run time	0~65000.0s(min)	0.0		
<i>F 741</i>	Multi-speed 9 run time	0~65000.0s(min)	0.0		
<i>F 742</i>	Multi-speed 10 run time	0~65000.0s(min)	0.0		
<i>F 743</i>	Multi-speed 11 run time	0~65000.0s(min)	0.0		
<i>F 744</i>	Multi-speed 12 run time	0~65000.0s(min)	0.0		
<i>F 745</i>	Multi-speed 13 run time	0~65000.0s(min)	0.0		
<i>F 746</i>	Multi-speed 14 run time	0~65000.0s(min)	0.0		
<i>F 747</i>	Multi-speed 15 run time	0~65000.0s(min)	0.0		
<i>F 732</i>	Multi-speed 0 run time	0~65000.0s(min)	0.0		
<i>F 733</i>	Multi-speed 1 run time	0~65000.0s(min)	0.0		
<i>F 734</i>	Multi-speed 2 run time	0~65000.0s(min)	0.0		
<i>F 735</i>	Multi-speed 3 run time	0~65000.0s(min)	0.0		
<i>F 736</i>	Multi-speed 4 run time	0~65000.0s(min)	0.0		
<i>F 737</i>	Multi-speed 5 run time	0~65000.0s(min)	0.0		
<i>F 738</i>	Multi-speed 6 run time	0~65000.0s(min)	0.0		
<i>F 739</i>	Multi-speed 7 run time	0~65000.0s(min)	0.0		
<i>F 740</i>	Multi-speed 8 run time	0~65000.0s(min)	0.0		
<i>F 741</i>	Multi-speed 9 run time	0~65000.0s(min)	0.0		
<i>F 742</i>	Multi-speed 10 run time	0~65000.0s(min)	0.0		
<i>F 743</i>	Multi-speed 11 run time	0~65000.0s(min)	0.0		
<i>F 744</i>	Multi-speed 12 run time	0~65000.0s(min)	0.0		
<i>F 745</i>	Multi-speed 13 run time	0~65000.0s(min)	0.0		
<i>F 746</i>	Multi-speed 14 run time	0~65000.0s(min)	0.0		
<i>F 747</i>	Multi-speed 15 run time	0~65000.0s(min)	0.0		
<i>F 748</i>	PLC speed direction option	0~65535	0		
<i>F 749</i>	Simple PLC running mode	0: run one time and then stop 1: run one time and keep running at the final value 2: recycle running	0		
<i>F 750</i>	Simple PLC restart mode selection	0: start running from the first phase 1: keep running from the interrupt frequency	0		
<i>F 751</i>	Simple PLC Power drop memory selection	0: no memory for power drop 1: memory for power drop	0		

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 752</i>	Simple PLC running time unit selection	0: second (s) 1: min	0		
<i>F 753</i>	Nonstandard function selection	0~65535	0	○	
<i>F 754</i>	AI1 curve selection	0: Curve (Point 2) 1: Curve (Point 4)	0	○	
<i>F 755</i>	AI1 curve 2 set point 1 input	0.0 ~ 100.0%	0.0%	○	
<i>F 756</i>	AI1 curve 2 sets point 1 output	-100% ~ 100%	0.0%	○	
<i>F 757</i>	AI1 curve 2 set point 2 input	0.0 ~ 100.0%	30.0%	○	
<i>F 758</i>	AI1 curve 2 sets point 2 output	-100% ~ 100%	30.0%	○	
<i>F 759</i>	AI1 curve 2 set point 3 input	0.0 ~ 100.0%	60.0%	○	
<i>F 760</i>	AI1 curve 2 sets point 3 output	-100% ~ 100%	60.0%	○	
<i>F 761</i>	AI1 curve 2 set point 4 input	0.0 ~ 100.0%	100.0%	○	
<i>F 762</i>	AI1 curve 2 sets point 4 output	-100% ~ 100%	100.0%	○	
<i>F 763</i>	LI1 effective delay	6500.0 ~ 0.0 s	0.0	○	
<i>F 764</i>	LI1 invalid delay	6500.0 ~ 0.0 s	0.0	○	
<i>F 765</i>	LI2 effective delay	6500.0 ~ 0.0 s	0.0	○	
<i>F 766</i>	LI2 invalid delay	6500.0 ~ 0.0 s	0.0	○	
<i>F 767</i>	AI1 filtering coefficient	0.00 -10.00	0.30	○	
<i>F 768</i>	AI2 filtering coefficient	0.00 -10.00	0.30	○	
<i>F 769</i>	AO1 filtering coefficient	0.00 -10.00	0.00	○	
<i>F 770</i>	AO2 filtering coefficient	0.00 -10.00	0.00	○	
<i>F 772</i>	Password Setting	0~9999	0	○	
<i>F 773</i>	Password duration	0~9999 min	5	○	
<i>F 813</i>	Module writes data 1	0: Off	1	○	
<i>F 814</i>	Module writes data 2	1: Communication command control (FA05) 2: Reservations 3: Communication frequency setting (FA08) 4 ~ 6: reservations	3	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F815</i>	Module dates read 1	0: Off	1	○	
<i>F816</i>	Module dates read 2	1: Status Information (FD03)	2	○	
<i>F817</i>	Module dates read 3	2: Output frequency (FD12)	12	○	
<i>F818</i>	Module dates read 4	3: Output current (FE08)	18	○	
<i>F819</i>	Module dates read 5	4: Output voltage (FE10) 5: Fault information (FC39) 6: PID feedback value (FA36) 7: Input terminal information (FD01) 8: Output terminal information (FD02) 9: AI1 input (FE30) 10: AI2 input (FE31) 11: Motor speed (FE50) 12: Absolute value of output current (<i>E002</i>), unit 0.01a 13: Absolute value of output voltage (<i>E005</i>), unit V 14: Absolute value of input voltage of DC bus (<i>E009</i>), unit V 15: PID given value (FA35) 16: Output torque (FE20), 0.01% of rated torque per unit motor 17: Input power (FE28), 0.01kW 18: Output power (FE29), 0.01kW 19: Input power accumulation/input electric energy (FE44), the unit is determined according to the parameter <i>F517</i> 20: Output power accumulation/output electric energy (FE45), the unit is determined according to the parameter <i>F517</i> 21: Cumulative running time (FE17), unit h (hours)	8	○	

[-f8-]

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F800</i>	Modbus baud rate	0: 9600 bps 1: 19200 bps 2: 4800 bps 3: 2400 bps 4: 1200 bps	1	○	
<i>F801</i>	Modbus parity	0: NONE 1: EVEN 2: ODD	1	○	
<i>F802</i>	Modbus address	0-247	1	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F803</i>	Modbus timeout	0: timeout check disabled. 1-100s	0	○	
<i>F804</i>	Modbus transger waiting time	0~2.00 s	0.00	○	
<i>F805</i>	Modbus behaviour on communication fault	0: VFD stop, communication command, frequency mode open(by <i>F002</i> , <i>F003</i>) 1: None (continued operation) 2: Deceleration stop 3: Coast stop 4: Communication error (<i>E - 33</i> trip) or Network error (<i>E - 35</i> trip)	4	○	
<i>F806</i>	Number of motor poles for communication	1~8	2	○	
<i>F821</i>	factory reserved				
<i>F822</i>	factory reserved				
<i>F823</i>	factory reserved				
<i>F824</i>	factory reserved				
<i>F825</i>	factory reserved				
<i>F826</i>	factory reserved				
<i>F827</i>	factory reserved				
<i>F828</i>	factory reserved				
<i>F829</i>	factory reserved				
<i>F830</i>	PID setting of keypad	0~100%	0.0	○	

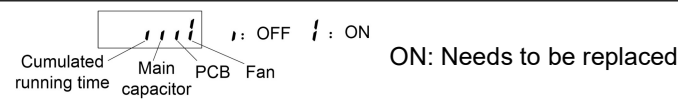
[-f9-]					
NO.	Parameter Name	Setting Range	Default	WRT	User setting
<i>F900</i>	PID control setting	0: Disabled, 1: Enabled (Feedback: AI1) 2: Enabled (Feedback: AI2)	0	○	
<i>F901</i>	Proportional gain (P control)	0.01~100.0	varies by model	○	
<i>F902</i>	Integral gain	0.01~100.0	varies by model	○	
<i>F903</i>	Differential gain	0.00~2.55	0.00	○	
<i>F904</i>	PID control waiting time	0~2400 s	0	○	
<i>F905</i>	PID regulator diviation input signal negation/Direction	0: disable/Direct action 1: enable/Reaction	0	○	
<i>F906</i>	Sleep mode awakening hysteresis bandwidth	0.0 Hz ~ <i>F007</i>	0.2	○	
<i>F907</i>	Sleeping mode awakening threshold based on PI deviation	0.0 Hz ~ <i>F917</i>	0.0	○	

NO.	Parameter Name	Setting Range	default	WRT	User setting
<i>F 908</i>	Sleeping mode awakening threshold based on PI feedback	0.0 Hz ~ <i>F 917</i>	0.0	○	
<i>F 909</i>	sleeping mode action	0: Motor slowdown to a stop. 1: Motor keep running at lower limit frequency.	0	●	
<i>F 910</i>	wake up delay	0~600.0s	0.0	●	
<i>F 911</i>	Auto wake up level	0~200.0%	0.0	○	
<i>F 912</i>	Auto sleep level	0~200.0%	100	○	
<i>F 913</i>	Upper limit of PID setting	0~100%	100	●	
<i>F 914</i>	Lower limit of PID setting	0~ <i>F 913</i>	0	●	
<i>F 915</i>	Delay control of sleep mode	Disable: 0.0 Enable: 0.1-600.0 s	0.1	○	
<i>F 916</i>	PID control deviation limit	0~100%	0.0	○	
<i>F 917</i>	Sensor range	0.00~99.99	1.00		
<i>F 918</i>	PID adjustment	0.00~ <i>F 917</i>	0.00		
<i>F 919</i>	Sleeping frequency	0.0Hz~ <i>F 008</i>	0.0		
<i>F 920</i>	Sleeping threshold tolerance	0.0~25.0%	0.0		

Note 1: in the volume of “WRT”, “○”: means writable at stop or running status.; “●”: means unwritable at stop or running status;

Note 2: we can obtained modbus parameter address by replacing 'F.' of '0'. E.g. *F 908*'s address is 0x0908.

NO.	Parameter Name	Description
<i>U000</i>	CPU1 Version	E.g:  , G-type, v= g; P-type, v= p;
<i>U001</i>	Operation frequency	Value is displayed in Hz/free unit. See <i>F 604</i> .
<i>U002</i>	Direction of rotation	 Forward run,  Reverse run.
<i>U003</i>	frequency command value	Value is displayed in Hz/free unit. See <i>F 604</i> .
<i>U004</i>	load current	The VFD output current (%/A) is displayed.
<i>U005</i>	input voltage (AC RMS)	The VFD input voltage (%/V) is displayed.
<i>U006</i>	output voltage (AC RMS)	The VFD output voltage command (%/V) is displayed.
<i>U007</i>	Input terminal status indicated	11kW or below:  : OFF : ON AI1-AI2 LI4 LI3 LI2 LI1 15kW or above:  : OFF : ON LI8 ... LI3 LI2 LI1
<i>U008</i>	Output terminal status indicated	 : OFF : ON, without T2 at 11kW or below T2 LO-CLO T1

NO.	Parameter Name	Description
U009	cumulative operation time	(0.01=1 hour, 1.00=100 hours)
U010	Output speed	Displays the motor speed (min-1) by calculating with output frequency and pole numbers.
U011	Rated current	The rated current of the VFD (A) is displayed.
U012	Torque current	The torque current (%/A) is displayed.
U013	Load current	The VFD output current (load current) (%/A) is displayed.
U014	Torque	The torque (%) is displayed.
U015	Input power	The VFD input power (kW) is displayed.
U016	Output power	The VFD output power (kW) is displayed.
U017	PID feedback	The PID feedback value is displayed. (Hz/free unit)
U018	Frequency command value (PID-computed)	The PID-computed frequency command value is displayed. (Hz/free unit)
U019	Integral input power	The integrated amount of power (kWh) supplied to the VFD is displayed.
U020	Integral output power	The integrated amount of power (kWh) supplied from the VFD is displayed.
U021	Communication counter	Displays the counter numbers of communication through the network.
U022	Normal state communication counter	Displays the counter numbers of communication only at normal state in the all communication through network.
U023	Cpu2 version	U 10
U024	Parts replacement alarm information	
U025	Cpu1 revision	
U026	PID setting	Displayed in % term.
U027	PID feedback	Displayed in % term.
U1--	Past trip 1	Enter into the display of detailed information on past trip 1
U2--	Past trip 2	Enter into the display of detailed information on past trip 2
U3--	Past trip 3	Enter into the display of detailed information on past trip 3
U4--	Past trip 4	Enter into the display of detailed information on past trip 4

10. APPENDIX C: BRAKE UNIT/RESISTANCE SELECTION

VFD type	Brake unit		Brake resistance		
	description	QTY	VALUE	POWER	QTY
CT3000 FP-4T-A75	BUILD-IN	1	750 Ω	110W	1
CT3000 FP-4T-1A5		1	400 Ω	260W	1
CT3000 FP-4T-2A2		1	250 Ω	320W	1
CT3000 FP-4T-4		1	150 Ω	400W	1
CT3000 FP-4T-5A5		1	100 Ω	520W	1
CT3000 FP-4T-7A5		1	75 Ω	1040W	1
CT3000 FP-4T-11		1	50 Ω	1040W	1
CT3000 PRO-4T-15		1	40 Ω	1500W	1
CT3000 PRO-4T-18A5		1	40 Ω	1500W	1
CT3000 PRO-4T-22		1	20 Ω	8kW	1
CT3000 PRO-4T-30		1	20 Ω	8kW	1
CT3000 PRO-4T-37		1	13.6 Ω	10kW	1
CT3000 PRO-4T-45	CT -CBU4045	1	13.6 Ω	10kW	1
CT3000 PRO-4T-55	CT -CBU4055	1	12 Ω	12kW	1
CT3000 PRO-4T-75	CT-CBU4075	1	10 Ω	20kW	1
CT3000 PRO-4T-90	CT-CBU4110	1	6.8 Ω	30kW	1
CT3000 PRO-4T-110		1	6.8 Ω	30kW	1
CT3000 PRO-4T-132	CT-CBU4160	1	5 Ω	40kW	1
CT3000 PRO-4T-160		1	5 Ω	40kW	1
CT3000 PRO-4T-185	CT-CBU4220	1	3.2 Ω	60kW	1
CT3000 PRO-4T-200		1	3.2 Ω	60kW	1
CT3000 PRO-4T-220		1	3.2 Ω	60kW	1
CT3000 PRO-4T-250	CT-CBU4300	1	2.5 Ω	80kW	1
CT3000 PRO-4T-280		1	2.5 Ω	80kW	1
CT3000 PRO-4T-315		1	2.5 Ω	80kW	1
CT3000 PRO-4T-355	CT-CBU4220	2	3.2 Ω	60kW	2
CT3000 PRO-4T-400		2	3.2 Ω	60kW	2
CT3000 PRO-4T-500	CT-CBU4300	2	2.5 Ω	80kW	2
CT3000 PRO-4T-560	CT-CBU4220	3	3.2 Ω	60KW	3
CT3000 PRO-4T-630	CT-CBU4220	3	3.2 Ω	60KW	3
CT3000 PRO-4T-710	CT-CBU4220	3	3.2 Ω	60KW	3
CT3000 PRO-4T-800	CT-CBU4220	3	3.2 Ω	60KW	3



NEW WEST TECHNOLOGIES LTD.

Suite no. 19/20, 5th Floor Landmark Plaza
5/6 Jail Road Lahore Pakistan
Tel: +92 42 35715206 | 35712991 | 35775565
Fax: +92 42 35715292
Email: info@nwtlimited.com
Web: www.nwtlimited.com

