VM1000 AC Drive

User Manual

Version Code :VM1000-E2016-04-1MB

Preface

Thank you for choosing SAJ VM1000 AC drive.

This user manual provides you with technical specification, installation instruction and detailed function parameters of VM 1000.Before installation, operation, maintenance or inspection, please read this manual carefully.

Special warning: Please be sure to read and understand the warnings and precautions in this manual before using VM 1000 and make sure the certificate of relative electrical engineers is line with the provisions of the labor supervision department, and the electrics and environment conditions is in conformity with the country's standard.

Make sure the wiring is correct before it is power-on; before normally operating and using this product, make sure the motor rotation meets the requirements by debugging it.

When installing, using or maintaining the product, if it needs a consultation for product functions, performance, other technical issues as well as safety precautions, please contact our customer service center according to the hotline in the manual.

China service hotline: **400-159-0088**

Content

Precautions

The Definition of Manual Warning Signs

In this manual, there are three kinds of warning signs that is respectively corresponding to three kinds of precautions; once violated, it will probably cause person injury to different degree.

⚠ DANGER: it indicates that it will probably cause death or severe physical injuries if violate the correct instruction.

⚠ WARNING: it indicates that it could cause personal moderate injuries, minor injuries or damage to the equipment if violates the correct instructions..

⚠ NOTE: it indicates that it would cause error or using equipment insecurely if violates the correct instruction.

The Definition of Product Warning Signs

The product warning signs are right under the case cover.

⚠ It indicates that there is high voltage in the product

⚠ +10 minutes time delay, which indicates that it needs to wait for capacitor discharging after power off

Before Installation

Before opening, please confirm that:(1) model and rated values on the nameplates is same as the goods you order; products, certification accessories, user manual and warranty card are complete and have not been damaged;(2) Whether the products are damaged or destroyed with water etc.; If there is damages,losses or other abnormal phenomenon,please contact our company or your suppliers to solve problems

Warning

◎Do not install or operate the VFD if it is damaged or has missing parts. Otherwise it may result in equipment damage or physical injuries.

Installation

Warning

◎Please hold the bottom of VFD when installing or moving it. In case that the VFD is broken or damaged; only holding the shell is not allowed.

◎Keep the VFD away from heat, inflammable and explosive goods; Install VFD on the metal or other nonflammable objects.

◎If the VFD is mounted in an electric cabinet or other enclosed objects, fans or other cooling device should be installed inside the cabinet; Setting ventilation opening to ensure ambient temperature is below 40℃. Otherwise it may be damaged because of high temperature.

Danger

◎Wiring must be completed by qualified electrical engineers. Otherwise it can cause an electrical shock or VFD damage.

◎Before wiring, make sure the power supply is de-energized. Otherwise it will cause an electrical shock or a fire.

◎Make sure the ground terminal ⏚ is grounded safely and correctly. Otherwise there will be a risk of electrical shock on the shell of VFD.

◎Do not touch the main circuit terminal, and the main circuit terminals of the VFD are not allowed to contact the shell. Otherwise it may cause an electrical shock.

◎Braking resistor of the connection terminal is （+）and PB. Do not connect the other terminals; Otherwise it may cause a fire.

Wiring

Warning

◎Before connecting, make sure the voltage rating and phase number of VFD is conformed to the input power voltage, phase number; Otherwise it may cause a fire or physical injuries.

◎Never connect the AC input power supply to the output terminals V, U, W of VFD; Otherwise it will cause damage to the VFD and you are not guaranteed to enjoy the warranty services.

◎Never conduct a pressure test on VFD； Otherwise it will cause damage to the VFD.

◎The main circuit wiring of the VFD and the control loop wiring should be separated or vertical crossed, otherwise the control signal will be interfered.

◎The cable connected to the main circuit terminals should be use lugs with isolated casing.

◎If the length of cable between the VFD and the motor is over 50 meters, an output reactor is recommended so as to protect the VFD and motor.

Operation

Danger

◎Turn on the input AC power after the wiring of VFD is completed and the front cover is installed. Do not dismantle the front cover when operating; otherwise it will lead to an electric shock.

◎When VFD is set with the function of fault automatic reset or auto-restart after power failure, protection measures for equipment system should be taken in advance. Otherwise it will cause physical injuries.

◎The key “RUN/STOP” may be lose efficacy because some function had been set, a separate emergency power switch can be installed in the VFD control system; Otherwise it may cause damage or physical injuries.

◎Though the VFD terminal is in stop state, the terminal is electrified after power on. Do not touch; otherwise there will be a risk of electric shock.

Warning

◎Do not use the breaker to control the stop/start of AC drive, or it may damage to the AC drive.

◎Because the acceleration time is short when AC drive makes motor operates from low to high speed, make sure the motor and mechanical equipment is within the permitted range

before operation,or it will damage the equipment.

◎The temperature of heat sink and braking resistor is high. Please do not touch. Otherwise, it may cause burns.

◎When leaving factory, the preset parameters of AC drive have met most of the operational requirements of equipment. If not necessary, do not arbitrarily change the parameters. Even some devices have some special requirements; you can only modify the necessary parameters. Otherwise, arbitrary modification may damage the equipment.

Maintenance and Inspection

Danger

◎When power on, do not touch the connection terminals. Otherwise it may cause an electrical shock.

◎Only qualified electrical engineering personnel can maintain, replace and inspect the SPD.

◎Wait at least 10 minutes after the power failure, or make sure that is no residual voltage before carry out maintenance and inspection, otherwise it may cause damage.

Note

◎PCB board has CMOS integrated circuit, do not touch, otherwise the static electricity may damage PCB board.

Others

Danger

◎It is strictly forbidden to transform the VFD, otherwise it may cause casualties. After arbitrarily changing VFD, will no longer enjoy the warranty service.

Signs, Abbreviation and Brandmark statement

■ Signs

Protective Earthing: PE

Signal Ground: GND

Shield: SHIELD

■ Name Abbreviation

1. In this user manual, VM1000 AC drive has another name or abbreviation：Variable frequency drive, VM1000, inverter, speed controller, VFD product and product.

2. VFD parameter is as follows：function parameters, function code, parameters code

3. SAJ, Sanjing Electric、SAJ Electric are all the standard abbreviation of Guangzhou Sanjing Electric Co. Ltd

4. Common Technical Terms,Similar or Equal Name:

Voltage frequency ratio control mode: VF control

Open-loop vector control mode: SVC control

Three-phase induction motor: asynchronous motor, squirrel-cage asynchronous motor

■ Trademark

1. Modbus® is the trademark of Schneider Electric

2. SAJ® is the trademark of Guangzhou Sanjing Electric Co. Ltd

3. Other trademark that may occur or product names belong to respective owners

Chapter 1 Product Information

1.1 Production Introduction

The Usage of VM1000 AC drive

VM1000 AC drive is the new generation product with high performance and multi usages, which usually apply in the regular three-phase induction motor for speed control. Power range is 11~110kW;It can select V/F control mode or SVC control mode.

Key Design Points

Design Points	Instruction
Control performance and function	1.Product adopts: large capacity power module,high accuracy detection hardware and brandnew control platform 2.Function upgrade: mainly includes torque control,S curve,given frequency,vector control, V/F separation, Two groups of PID parameters，input、output and auxiliary function，faults protection and user-defined protection action 3. Meanwhile,it maintain the compatibility for previous products
Input/Output and communication interface	Support 5 common inputs, 1 high-speed pulse input, 1 high-speed pulse output(also work as open collector output DO), 2 relay output, 2 analogue output, 2 analogue input, 1 RS485 communication interface
G/P load types	Whole series support heavy load(G) and normal load(P) rating characteristics. G load type: typical constant torque load, such as conveyor, lift, crane, etc. P load type: typical variable torque load, such as pump and fan.
Structure design	Structure optimization, dimension decrease, good heat dissipation, industrial protection, simple case

Wiring installation	1. Main circuit adopt increased superior terminal array，large power type and independent terminal,and equipped with dual GND ports. 2. Control terminal is vertical arranged on the left of the control board and print with PCB logo.
New keyboard design	1. Adopt potentionmeter of electrical impulse,standard keyboard adopts 5 bits digital tube to display and match LED lights; 2. Common keyboard supports short distance installation externally, and adopts LCD keyboard to realize long-distance external leading by cables
Faults detection	Faults type and strategy are more refined, user can define faults protection action
EMC Level	standard product satisfy IEC61800-3 C3 requirements external filter satisfy IEC61800-3 C2 requirements

Table 1-1 Product Key Design

1.2 Technical Specification Table

Item		Specification
Personalized Function	High frequency	V/F control：0 ～ 1000Hz；vector control：0 ～ 400Hz
	Carrier frequency	0.5kHz ～ 16kHz； it can adjust load frequency automatically according to the load character
	Control mode	V/F control；SVC control；Torque control
	Starting torque	G load type：0.5Hz/150%（SVC） P load type：0.5Hz/100%
	Speed adjustable range	1：100 （SVC）
	Speed-holding precision	±0.5%（SVC）
	Torque control Accuracy	±5%（SVC）
	Overload capacity	G load type：60s for150% rated current；1s for180% rated current

		P load type：60s for120% rated current;1s for 180% rated current
	Torque boost	0.0% auto torque boost； customized torque boost 0.1% ～ 30.0%
	V/F curve	Three types: Linear, multipoint square V/F curve
	V/F separation	Whole separation,semi separation
	Acceleration and deceleration Time	Linear mode and S curve acceleration and deceleration time；Four kinds of acceleration and deceleration time; the range of acceleration and deceleration time is 0.0 ～ 6500.0s
	DC braking	Braking time: 0.0s ～ 100.0s;Braking action current value: 0.0% ～ 100.0%
	JOG control	JOG frequency range：0.00Hz ～max frequency；JOG acceleration and deceleration time 0.0s ～ 6500.0s
	Simple PLC,multi-speed control	16 section speed(at most) can be realized by integrated PID and control terminals
	Integrated PID	It is convenient to realize closed-loop control system
	AVR	When grid voltage changes，it keeps output voltage constant automatically.
	Control of overvoltage, overcurrent, speed stall	The current and voltage are limited automatically during the running process so as to avoid frequent tripping due to overvoltage/overcurrent.
	Rapid current limit	Decrease overcurrent at max, protect VFD to operate regularly
	Torque limit and control	It can limit the torque automatically and prevent frequent over current tripping during the running process.
	Power peripheral and safety self-checking	To realize self checking of peripheral equipment at power on, such as grounding fault, short circuit fault, etc.
	MF.K Key	Programmable:command channel switch,forward rotation and reverse rotation/JOG function selection

	Textile swing frequency control	control function of multiple triangular-wave frequency
	Timing control	Timing control: setting time range: 0h ～ 65535h
Running	Operation command channel	Three channels: operation panel given, control terminal given, and communication given. It can be switched by various methods.
	Frequency source	There are 10 frequency sources in total: digital setting, analog voltage setting, analog current setting, pulse setting and serial communication port setting etc. It can be switched by these frequency sources in various methods.
	Auxiliary frequency source	There are ten auxiliary frequency sources. It can implement fine tuning of auxiliary frequency and frequency synthesis.
	Input terminal	There are 6 digital input terminals. One of them can be used as high speed pulse input, which can reach 100KHz at max. All of them support supports active PNP and NPN input. 2 analog input (AI) terminals, one of which only supports voltage input and the other supports voltage input or current input
	Output terminal	1.High-speed pulse output terminal (open-collector) that supports 0–100 kHz square wave signal output, which can realize the output of setting frequency and output frequency 2 relay output terminal 2 analog output (AO) terminal that supports 0/4mA–20 mA current output or 0/2V–10 V voltage output, which can realize the output of setting frequency and frequency etc.
Display and keyboard operation	LED display	Displayed parameters
	LCD display	Optional; operation content indicated.
	Parameters copy	Iit can be achieved parameters' fast copy via LCD keypad option
	Key locking and function selection	It can lock the keys partially or completely and define the function range of some keys so as to prevent mis-operation.
	Protection function	Motor short-circuit detection at power-on, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheat protection and overload

		protection etc.
	Accessories selection	LCD operation panel, braking unit etc.
Environment	Installation location	Indoor, free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapour, drip or salt.
	Altitude	Lower than 1000m,higher than 1000m ,it is used at derating
	Ambient temperature	-10°C to +40°C (de-rated if the ambient temperature is between 40°C and 50°C)
	Humidity	Less than 95%RH, without condensing
	Vibration	Less than 5.9m/s2(0.6g)
	Storage temperature	－ 40℃～＋ 70℃

Table 1-2 Technical Specification

1.3 Product nameplate

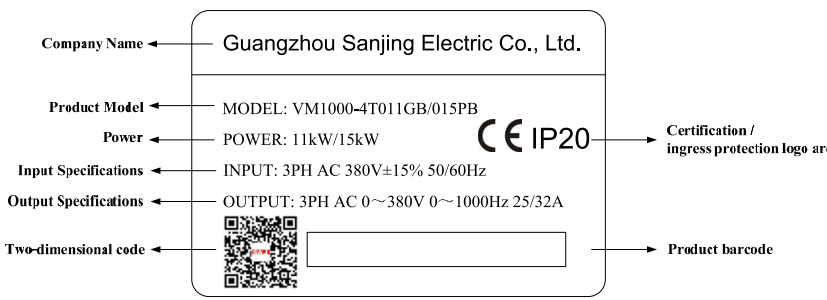

Figure 1-1 Product nameplate

1.4 Model Description

VM1000 – 4 T 18R5G/022P

① ② ③ ④ ⑤

Field	Sign	Sign Instruction	Specification
Product abbreviation	①	Product abbreviation	VM1000：General vector control variable frequency drive, "Vector Master" series
Voltage class	②	Voltage class	2：220VAC； 4：380VAC
input power phase	③	Sign of power phase	S：single-phase ； T：three-phase
Rated power 1	④	Power of G load type	18R5-18.5kW，R represents decimal point G—constant torque load B—built-in braking unit
Rated power 2	⑤	Power of P load type	022-22kW P—variable torque load B—built-in braking unit

Table 1-3 VM1000 Field Annotation

1.5 Dimension of AC Drive

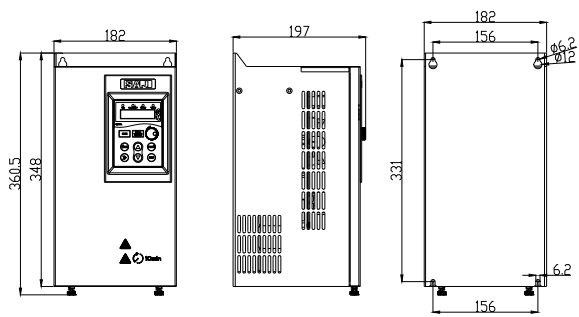

Table 1-2 11kW-15kW Installation Dimension

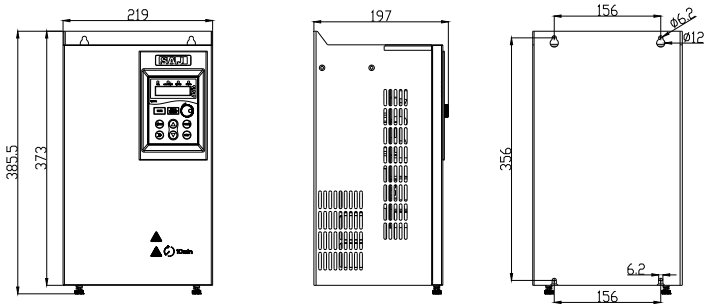

Table 1-3 18.5kW-22kW Installation Dimension

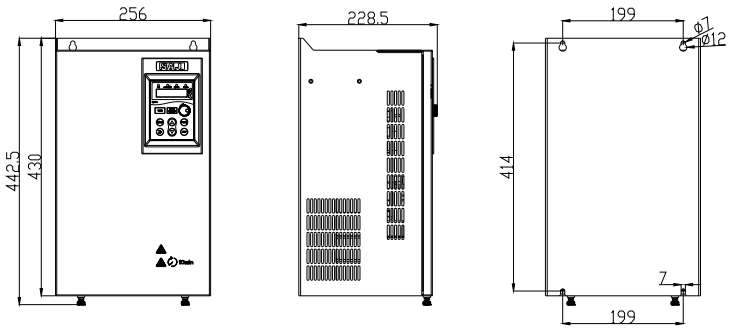

Table 1-4 30kW-37kW Installation Dimension

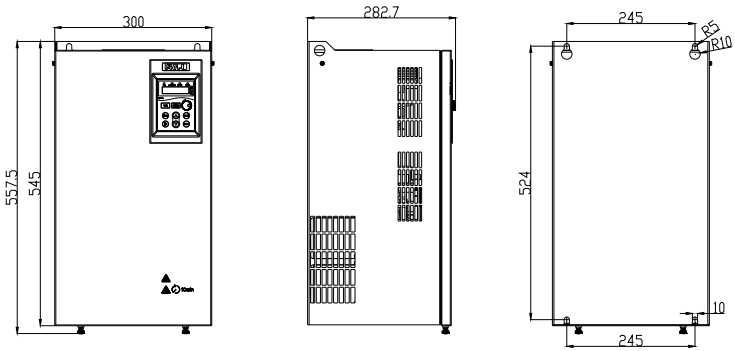

Table 1-5 45kW-55kW Installation Dimension

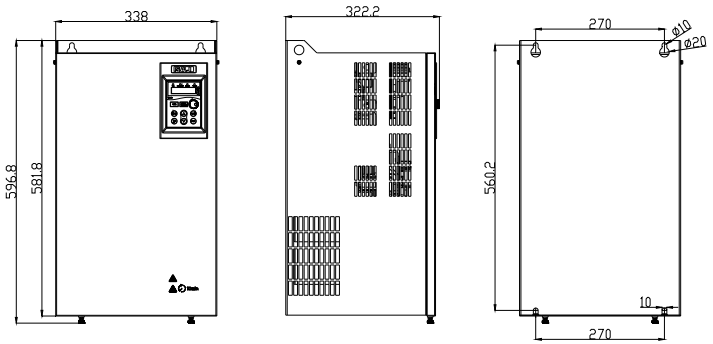

Table 1-6 75kW-110kW Installation Dimension

1.6 Dimension of Keyboard

VM1000 operation keyboard is directly plug in the control board socket and is buttoned on the keyboard tray.There is a keyboard frame for the the front cover. After installation, the frame is fixed around operation keyboard. Please refer to 2-1.

If keyboard needs to be extended externally, please cut a rectangle hole on the control panel or the door carbinet for the keyboard installation according to the following dimension.

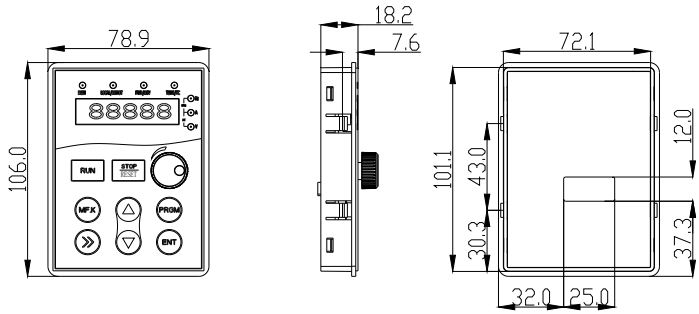

Table 1-7 Keyboard Dimension

■ Dimension Instruction

(1) There are four keyboard buckles; the distance between bottom and keyboard surface is 7.6mm

(2)When cutting a rectangle hole for keyboard, it suggests adding 1mm more for the length and width based on the dimension in this picture. Namely is Length 101.1mm is increased to 102.1mm, and width 72.1mm is increased to 73.1mm.

■ Cover of Keyboard Window

It can select one window panel for installing keyboard externally in order to cover the AC drive keyboard window.

1.7 Specification of Selecting Products

VFD Module (G/P load type)	Rated Power（kW）	power capacity	input current	Output current	Fitted Motor G/P	
		kVA	A	A	kW	HP
VM1000-4T011GB/015PB	11/15	17/21	26/35	25/32	11/15	15/20
VM1000-4T015GB/18R5PB	15/18.5	21/24	35/38.5	32/37	15/18.5	20/25
VM1000-4T18R5GB/022PB	18.5/22	24/30	38.5/46	37/45	18.5/22	25/30
VM1000-4T022GB/030PB	22/30	30/40	46.5/62	45/60	22/30	30/40
VM1000-4T030G/037P	30/37	40/57	62/76	60/75	30/37	40/50
VM1000-4T037G/045P	37/45	57/69	76/92	75/91	37/45	50/60
VM1000-4T045G/055P	45/55	69/85	92/113	91/110	45/55	60/70
VM1000-4T055G/075P	55/75	85/114	113/157	112/150	55/75	70/100
VM1000-4T075G/090P	75/90	114/134	157/180	150/170	75/90	100/125
VM1000-4T090G/110P	90/110	134/160	180/214	170/210	90/110	125/150
VM1000-4T0110G/132P	110/132	160/185	214/240	210/250	110/132	150/180

Table 1-4 Specification of Selecting Products

1.8 Maintenance

1.8.1 Routine Maintenance

The influence of the ambient temperature, humidity, dust and vibration will cause the aging of the devices in the AC drive, which may cause potential faults or reduce the service life of the AC drive. Therefore, it is necessary to carry out routine and periodic maintenance.

(1) Routine maintenance involves checking:

• Whether the motor sounds abnormally during running

• Whether the motor vibrates excessively during running

• Whether the installation environment of the AC drive changes.

• Whether the AC drive's cooling fan works normally

• Whether the AC drive overheats

(2) Routine cleaning involves:

• Keep the AC drive clean all the time.

• Remove the dust, especially metal powder on the surface of the AC drive, to prevent

the dust from entering the AC drive.

• Clear the oil stain on the cooling fan of the AC drive.

1.8.2 Periodic Inspection

Perform periodic inspection in places where inspection is difficult.

Periodic inspection involves:

• Check and clean the air duct periodically.

• Check whether the screws become loose.

• Check whether the AC drive is corroded.

• Check whether the wiring terminals show signs of arcing;

1.8.3 The Replacement of Vulnerable Components

The vulnerable components of the AC drive are cooling fan and filter electrolytic capacitor. Their service life is related to the operating environment and maintenance status. Generally, the service life is shown as follows:

Components name	Lifetime
Fan	2 ～ 3 Year
Electrolytic capacitor	4 ～ 5 Year

Table 1-5 Lifetime of Wearing Parts

User can decide the replacing time according to its operation

(1) Cooling Fan

Damage causes: bearing wear, leaf aging

Judge standard: whether there is crack on the fan blase; whether there is abnormal vibrating when turn on

(2) Filter Electrolytic Capacitor

Damage causes: the quality of input power is bad; the ambient temperature is relatively high; frequent load jump, electrolyte aging

Judge standard: Whether there is liquid leakage or protrusion of safety valve or not, electrostatic capacitance and insulation resistance measurement.

1.8.4 Storage of the AC Drive

For storage of the AC drive, pay attention to the following two aspects:

(1) Pack the AC drive with the original packing box provided by SAJ

(2) Long-term storage degrades the electrolytic capacitor. Thus, the AC drive must be energized once every 2 years, each time lasting at least 5 hours. The input voltage must be increased slowly to the rated value with the regulator.

Chapter 2 Installation

2.1 Mechanical Installation

2.1.1VM1000 Structure

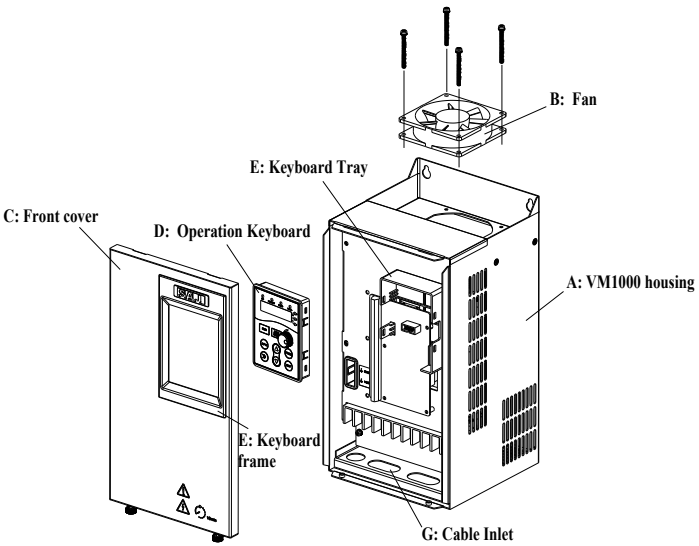

Figure 2-1 VM1000 Structure

2.1.2 Removal Steps

（1）Example of Cover Removal and Installation

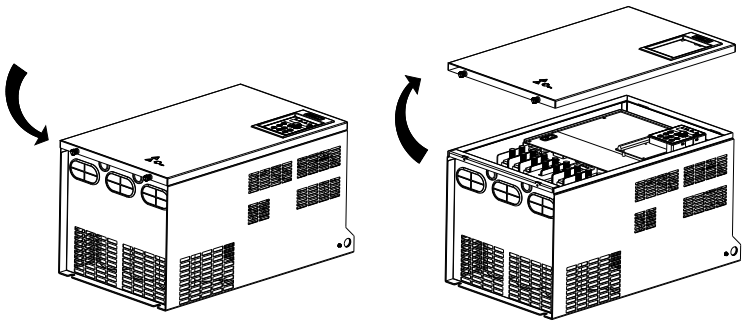

Figure2-2 Cover Removal

（2）Keyboard Removal Example

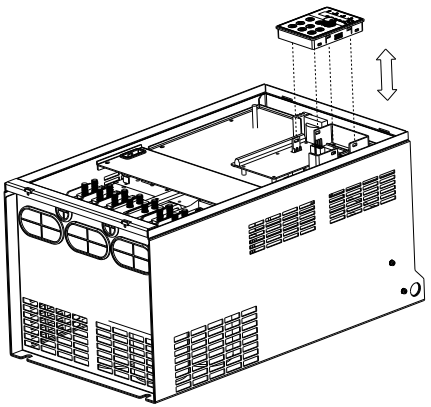

Figure2-3 Keyboard Removal

（3）Fan Removal Example

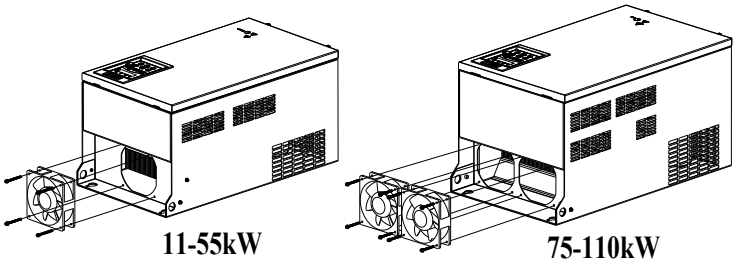

Figure 2-4 Fan Removal

2.1.3 Environment Requirements

VFD is power electrical equipment. In order to use regularly, make sure the operation and storage environment meets the requirements. The following is the detailed index sheet. If there are other items that involves with electric installation, please refer to relative national or regional standards.

Item	Index Instruction
Installation places and Precaution	Installation place: VM1000's ingress protection is IP20. With power input and high voltage output, it needs to be installed in indoors or equivalent places. In order to keep away from accidental contact, invasion and prevent rats and insects, it is suggested to install in the distribution box that has sufficient protection effect or control box. AC drive need to be installed on the surface of incombustible object such as support, panel and solid architectural facade, and fix the AC drive with screws and bolts. Since a great amount of heat will be generated when VFD is running there needs to have sufficient space around for heat dissipation. If necessary, it also needs to equip with mandatory ventilation and heat dissipation devices. Because the channel for ventilation and heat dissipation is designed vertically, the VFD needs to be installed horizontally other than horizontally or transversely.

	Free from direct sunlight, high humidity and condensation Free from corrosive, explosive and flammable gas Free from oil dirt, dust and metal powder
Environmental temperature	When VFD is with normal rated load, the permitted environmental temperature is -10℃+~40℃, service in derated capacity for 40℃~50℃. Notes: 1) Derate 4% capacity for every 1℃ increased. 2) If the ambient temperature is too low, it needs to take measures to increase the temperature.
Humidity	≤95%RH, no water condensation Notes: If there is condensation may occur due to environmental factors, install electrical heating device in the control cabinet.
Storage temperature	-40℃～ 70℃。
Altitude	Lower than 1000m, use according to the normal load standard Higher than 1000m, it needs derating. Derate 1% capacity every 100m.
Vibration	Please install in the place that is not easy to generate vibration. Vibration should not exceed 0.6G. Special Notes: 1. Do not be installed on the punching machine etc; 2. Do not use as VOBC (Vehicle on Board Controller); 3. When it is applied to moving equipment like cranes etc., ensure VFD is installed according to the stability of equipment and make sure VFD won't occur uncontrollable shaking or other abnormal condition.

Table 2-1 Index List for Environmental Requirements

2.1.4 Installation Guide

(1) Single-drive Installation

It needs to keep space around the VFD in order to have abundant airflow. Requirements of recommended spatial distance are shown as table 2-2

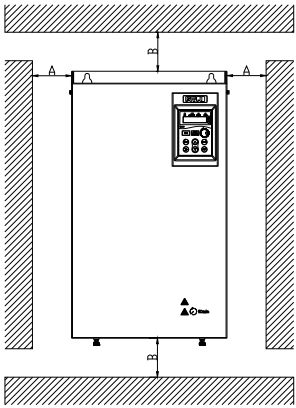

Figure 2-5 Spatial Distances

Power Level	Dimension	
	B	A
11kW-15kW	≥ 100mm	no requirements
18.5kW-37kW	≥ 200mm	≥ 50mm
45kW-110kW	≥ 300mm	≥ 50mm

Table 2-2 Recommended Spatial Distance

(2) Top/Bottom Installation

Insulation guide plate needs to be installed between two VFDs so as to separate airflow. Refer to the requirements of recommended spatial distance.The picture below is the example of Insulation guide plate.

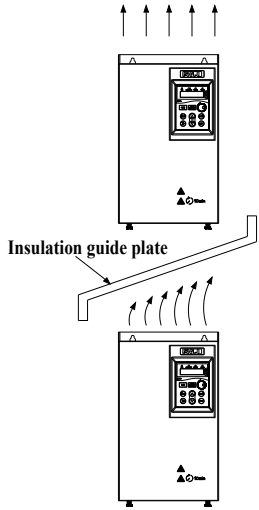

Figure 2-6 Diagram of Insulation Guide Plate

When two VFDs or more are installed side by side, increase 50mm at least for every two; increase 100mm at least for the left and right, top and bottom

(3) Installation Method

Wall-mounting（11～110kW）

(4) Protection requirements

① Complete water-proof measures

② Preventing insects invasion,including adopt anti-rats and anti-pests measures

2.2 Electrical wiring

2.2.1 Electrical Operation Condition

VM1000 AC drive is applicable to the low-voltage power electrical system. Make sure that the following conditions meet the requirements when conducting wiring. If necessary, please refer to relative national or regional standards.

Item	Instruction
Power distribution system	Three-phase four-wire system, three-phase five-wire system
Voltage and frequency range	380VAC，50/60Hz
Power range	Voltage：Three phase 380VAC, permitted fluctuation range ±15%， Frequency：50/60Hz, permitted fluctuation range ±5%
GND requirements	The protective earthing,signal ground should be separately wired
Leakage protection	With the VFD installed, power distribution line, it can not use circuit breaker with leakage protection etc.As for the VFD application, please complete equipment grounding measures to ensure the security.
Short-circuit protection	VFD power supply need to connect with the circuit breaker with short circuit protection or rapid fuse protector
Start/stop control	Under normal situation, VFD conduct start /stop control by its panel, control terminals and other methods. Usually, it is not suggested to adopt contactor as the switch device at VFD power-supply side, nor use it as motor's start/stop control device at VFD output side. If it is done and contactor is disconnected when operating, it will easily damage VFD. Notes: Some industries or equipment (such as elevator) is required to use contactor as security isolation device at VFD power-supply side and output side, which is in conformity with the above requirements.

Table 2-3 Electrical Running Condition

2.2.2 Electrical Safety Precautions

When installing, operating or maintaining VFD and other relative equipment, it needs to take measures to prevent static electricity and electricity shock .Please refer to precautions in this manual.

2.2.3 Product Electrical Components

The electrical components are as shown on the picture below

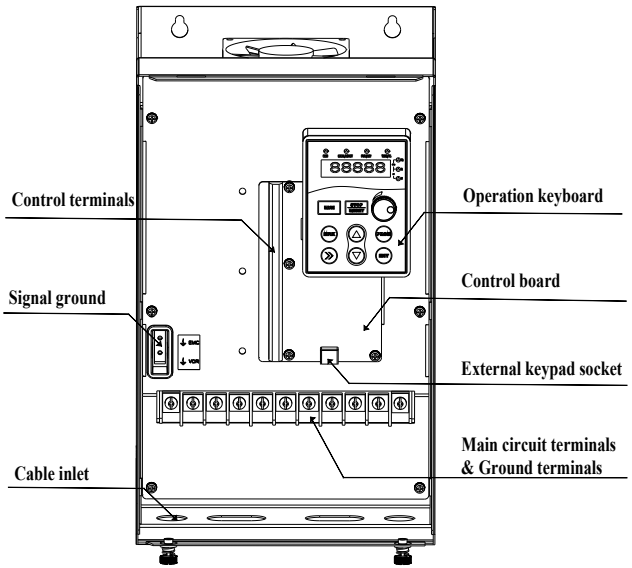

Figure 2-7 Electrical Components

2.2.4 Main Circuit Wiring

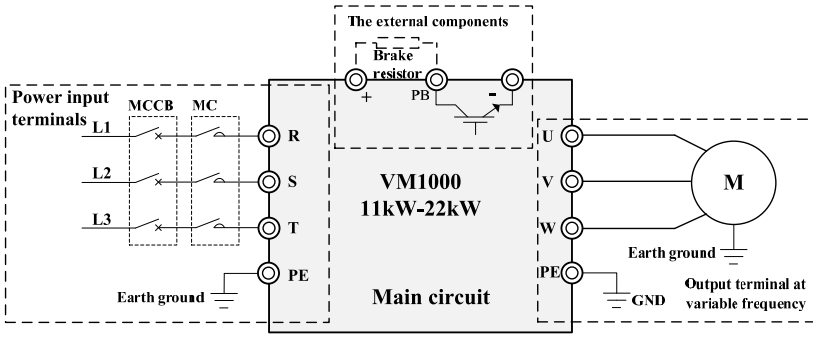

Figure 2-8 11～22kW Main Circuit Wiring

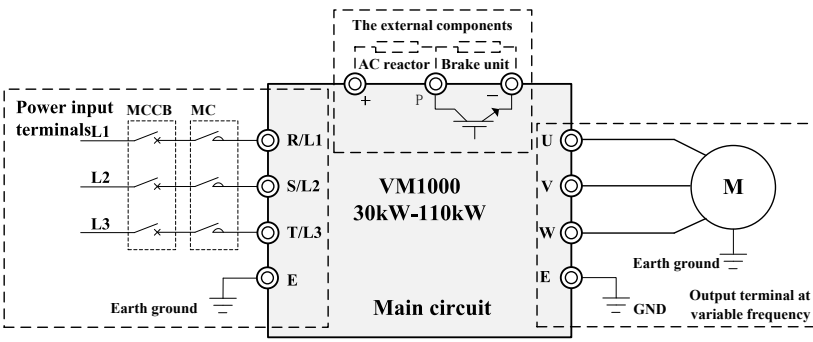

Figure 2-9 30～110kW Main Circuit Wiring

（1）11～15kW Main Circuit Terminals

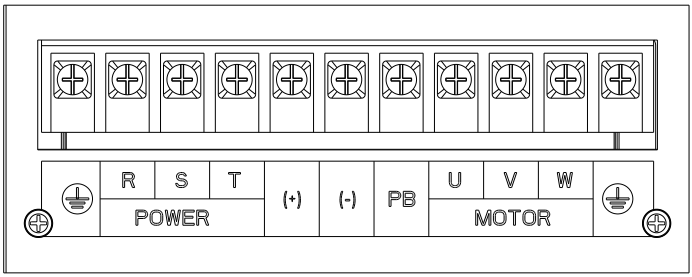

Figure 2-10 11～15kW Main Circuit Terminals

（2）18.5～22kW　Main Circuit Terminals

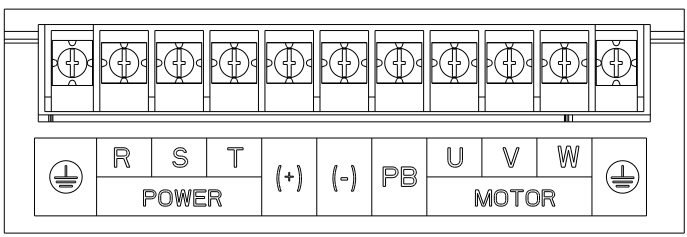

Figure 2-11 18.5～22kW Main Circuit Terminals

（3）30～37kW　Main Circuit Terminals

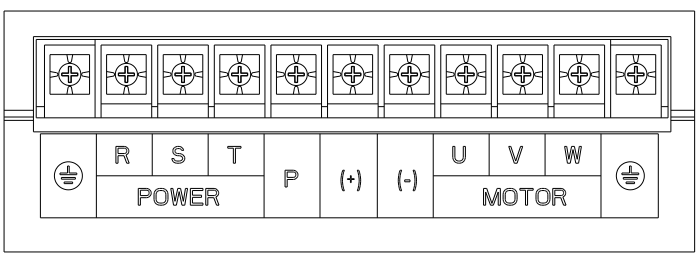

Figure 2-12 30～37kW Main Circuit Terminals

（4）45～55kW　Main Circuit Terminals

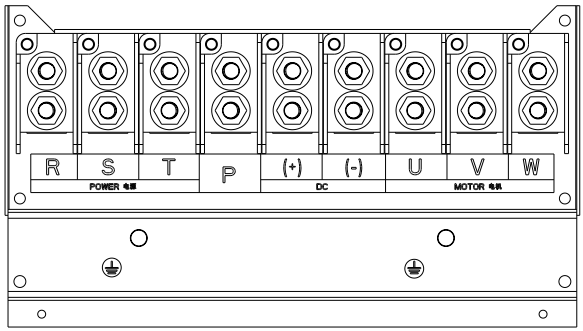

Figure 2-13 45～55kW Main Circuit Terminals

（5）75～110kW Main Circuit Terminals

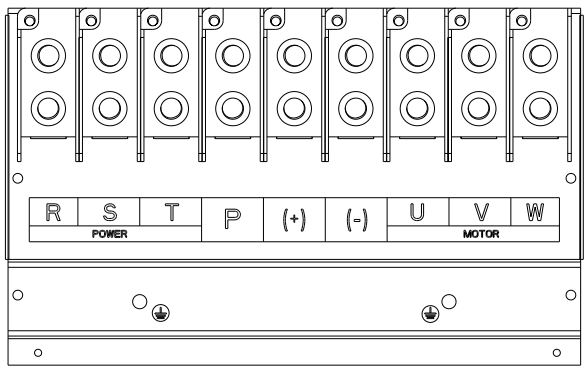

Figure 2-14 75～110kW Main Circuit Terminals

（6）Main circuit terminal and function are as shown on the table below

Terminal sign	Name	Instruction
R、S、T	Three phase power supply input terminals	Connect to three phase AC power supply
(+)、(-)	Positive and negative AC bus terminals	Common DC bus input point(connect the external braking unit to AC drive of 30kw or above)
(+)、PB	Connecting terminals of brake resistor	Connect to braking resistor for AC drive of 22kw and below
P、(+)	Connecting terminals of external reactor	Connect to an external reactor
U、V、W	VFD output terminals	Connect to a three-phase motor
⏚	Grounding terminal	Ground Terminals

Table 2-4 Main Circuit Terminals and Function

（7）Wiring Precautions

A: Input Power R、S、T

The cable connection on the input side of the AC drive has no phase sequence requirement.

B: DC bus terminals (+), (-)

Terminals (+) and (-) of DC bus have residual voltage after the AC drive is switched off. Before touching the equipment, wait until power indicator goes off and make sure it is lower than 36V. Otherwise, you may get electric shock.

— connecting external braking components for the AC drive of 30 kW or above.

Do not reverse poles (+) and (-). Otherwise, it may damage the AC drive and even cause a fire.

— The cable length of the braking unit shall be no longer than 10 m. Use twisted pair wire or pair wires for parallel connection.

— Do not connect the braking resistor directly to the DC bus. Otherwise, it may damage the AC drive and even cause fire.

C: Braking resistor connecting terminals (+)、PB

The connecting terminals of the braking resistor are effective only for the AC drive of 22kw and configured with the built-in braking unit.

The cable length of the braking resistor shall be less than 5 m. Otherwise, it may damage the AC drive.

D: External reactor connecting terminals P、（+）

For the AC drive of 33 kW and above, it support external DC reactor. Remove the jumper bar across terminals P and (+) and install the reactor between the two terminals.

E: AC drive output terminals U, V, W

The capacitor or surge absorber cannot be connected to the output side of the AC drive. Otherwise, it may cause frequent AC drive fault or even damage the AC drive.

If the motor cable is too long, electrical resonance will occur due to the existance of distributed capacitance. This will damage the motor insulation or generate higher leakage current, causing the AC drive to trip in overcurrent protection. If the motor cable is greater than 50m, an AC output reactor should be installed close to the AC drive.

F: PE Terminal

This terminal must be reliably connected to the main earthing conductor and resistance range must less than 0.1 Ω. Otherwise, it may cause mal-function or even damage to the AC drive.

Do not connect the earthing terminal to the neutral conductor of the power supply.

Notes: The peripheral circuit includes breakers, braking resistor, braking unit and wiring specification guide such as optional guidance, please see Appendix A.

2.2.5 Control circuit wiring

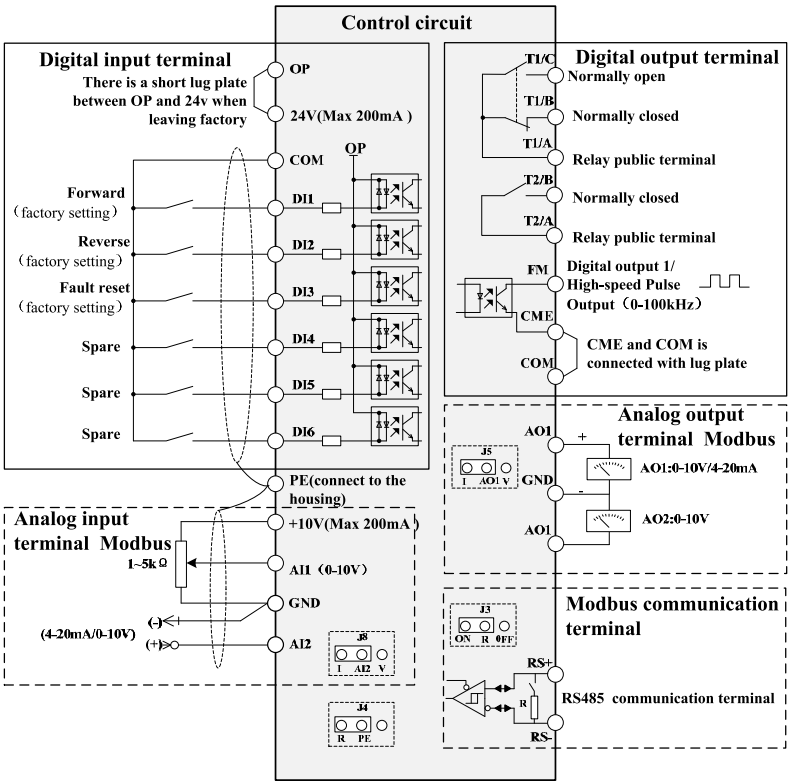

Figure 2-15 Control Circuit Wiring

（1）Control Terminals Diagram

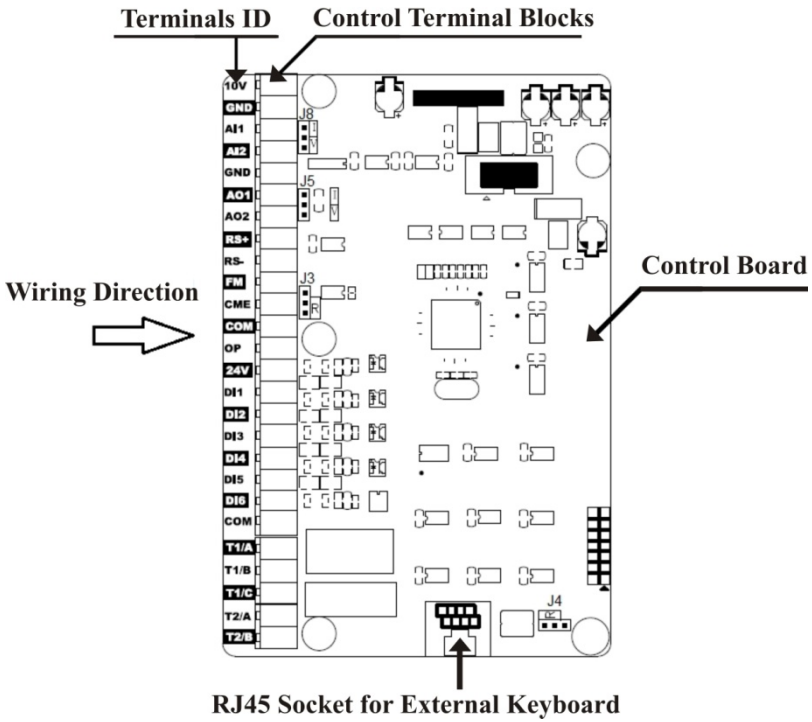

Figure2-16 Control Terminals

（2）Control terminals and functions

Type	Terminal	Name	Function description
Power supply	+10V-GND	+10 V power supply for external connection.	Provide +10 V power supply to external unit. Maximum output current: 10 mA. Generally, it provides power supply to external, potentiometer with resistance range of 1–5 kΩ.
	+24V-COM	+24 V power supply for external connection	Provide +24 V power supply to external unit. Generally, it is used as power supply for digital input, output terminals and external sensor. The max output current: 200mA
	OP	Input terminal of external power supply	Connect with +24 V power supply or COM by choosing lug plate on the control board. Factory default is connecting to +24 V. When using external signal to drive DI1～DI6, OP needs to be connected with external power supply after removing the default lug plate among terminals OP-24V.
Analog input	AI1-GND	analog input 1	1.input voltage range:DC 0V ～ 10V 2.input impedance 22kΩ
	AI2-GND	analog input 2	1.Input range:DC 0V ～ 10V/4mA ～ 20mA,decided by J8 jumper on control board. 2. input impedance 22kΩ,current input 500Ω
Digital input	DI1	Digital input 1	1.Optical coupling isolation, 2.compatible with dual polarity input Impedance: 2.4 kΩ 3.Voltage range for level input: 9–30 V
	DI2	Digital input 2	
	DI3	Digital input3	
	DI4	Digital input4	
	DI5	Digital input5	

	DI6	High-speed pulse input	Except for DI1~DI5, it can also work as High-speed pulse input Max input frequency：100kHz
analog output	AO1-GND	analog output 1	A01 is decided by J5 jumper on the control board, A02 is voltage input output voltage：0V ～ 10V output current：0mA ～ 20mA
	AO2-GND	analog output 2	
Digital output	FM-CME	Digital output 1/ High-speed pulse output	Optical coupling isolation, dual polarity open collector output Output voltage range: 0–24 V Output current range: 0–50 mA Note that CME and COM are internally insulated, but they are shorted by jumper externally. In this case DO1 is driven by +24 V by default. If you want to drive DO1 by external power supply, remove the jumper.
Relay output	T1/A-T1/B	Normally closed terminal	Contact driving capacity： AC250V，3A，COSØ=0.4。 DC 30V，1A
	T1/A-T1/C	Normally open terminal	
	T2/A-T2/B	Normally open terminal	
Communication terminal and socket	RS+		RS485 differential signal+
	RS-		RS485 differential signal-
	RJ45 socket		External LCD keyboard interface

Table 2-5 Control Terminal and Function

（3）Wiring Standard of Control Terminal

According to the input signal and internal design of terminals, there are A, B, C three conditions as following.

A： Analog input terminal

Weak analog voltage signals are easy to suffer external interference, and therefore the shielded cable must be used and the cable length should be less than 20 m, as shown in following picture2-17. In applications where the analog signal suffers severe interference, install filter capacitor or ferrite magnetic core at the analog signal source,as shown in following picture 2-18.

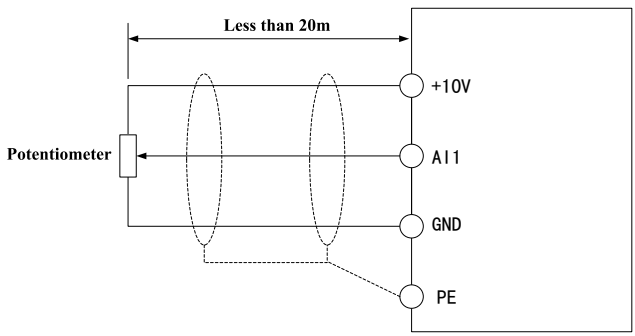

Figure 2-17 Analog input terminals

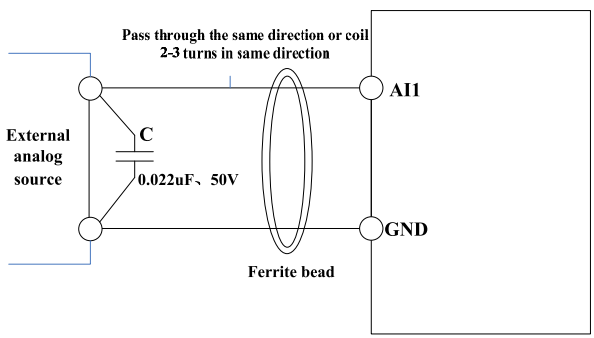

Figure 2-18 Analog input terminals handling

B：Digital Input Terminal

Generally, select shielded cable no longer than 20 m. When active driving is adopted, necessary filtering measures shall be taken to prevent the interference to the power supply. It is recommended to use mechanical contact input for control.

SINK Wiring

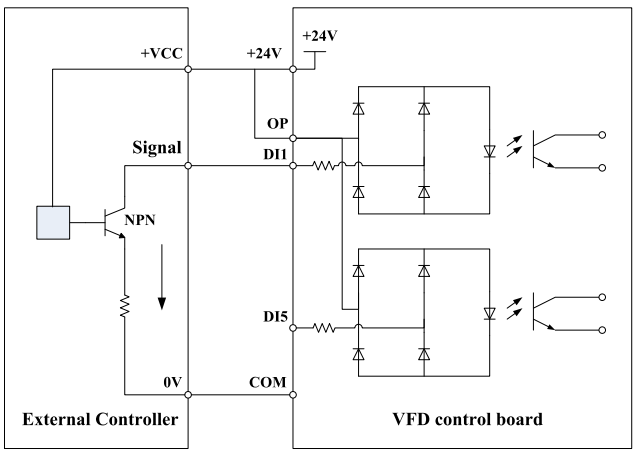

Figure 2-19 SINK Wiring

Sink wiring is the most commonly used wiring mode. To apply external power supply, remove jumpers between +24 V and OP and connect the positive pole of external power supply to OP and negative pole to COM.

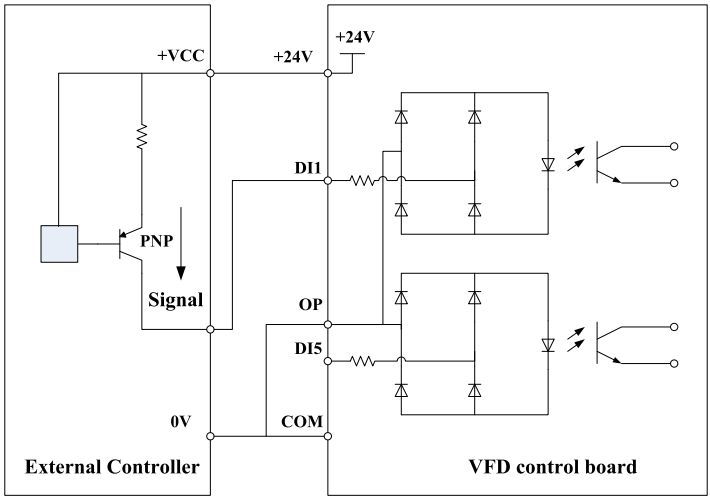

Figure 2-20 Source Wiring

To source wiring, OP must be changed to connect to COM(for example by lug plate), and connect +24v to public terminal of external controller.If using external power, it also needs to connect the negative pole of external power to OP.

C：Digital Output Terminal

When the digital output terminal needs to drive the relay, an absorption diode shall be installed between two sides of the relay coil. Otherwise, it may cause damage to the 24 VDC power supply.

Do not reverse the polarity of the absorption diode during installation, as shown in Figure2-21. Otherwise, the 24 VDC power supply will be damaged immediately once there is digital output.

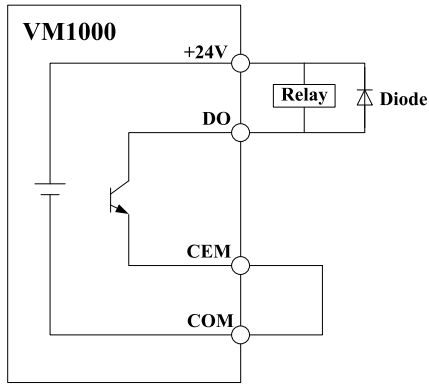

Figure 2-21 Wiring of Digital Output Terminal

2.3 Electro Magnetic Compatibility

2.3.1 Eletromagnetic Interference and Installation Precautions

The electromagnetic interference includes two situations: one is electromagnetic noise from the surroundings having interference on VFD; the other interference is the interference to other equipment generating by VFD.

Precautions：

(1)VFD and other electrical product should be well grounded.

(2)Try not to install the power input and output cables of the AC drive and weak-current signal cables (such as control cable) in parallel. Install vertically if it has conditions.

(3) It is recommended to use shield cable in the VFD output power or and the shielding should be grounded completely.For the extension cable of interfered equipment, it is suggested to use twisted shield cable and shielding should be well grounded.

(4) If motor cable is longer than 50m, it requires to install output filter and reactor.

2.3.2 Solutions of Interfering VFD by Electromagnetic Equipment

Generally, the reason that VFD has an influence on electromagnetic is there are a large number of relays, contactors, or electromagnetic brakes around VFD.When VFD is interfered and malfunction, the following methods are recommended:

① Install a surge suppressor for the part that generates interference

②Install a filter at VFD intput side, refer to 2.3.5 for more details

③Use shield cables in VFD control signal line and detection cable, shielding should be well grounded.

2.3.3 Solutions of interfering peripheral equipments by VFD

Noise in this part is classified into two kinds：One is VFD radiated interference；The other one is VFD conducted interference. Both kinds of interference generate eletro magnetic and electrostatic induction around the equipment, which result in equipment malfunction. Refer to the following solutions according to various interference situations

(1)Generally the signal of meter, receiver and sensor etc for measuring is relatively weak. If they are closed to VFD or in the same cabinet, it will cause interference and malfunction to them easily.It is suggested to adopt the following solutions:Try to keep away from the interference source;Do not arrange signal cable and power cable in parallel,especially, do not tie together.Signal cable and power cable should use shield cable and ground well;Install ferrite ring on VFD output side(suppressing frequency range from 30～1000MHz), and coil 2 ～ 3 turns. For bad conditions, it can install an EMC output filter as option.

(2) When the equipment and VFD use same power, it will cause conducted interference. If the solutions above can not eliminate interference, it needs to install EMC filter between VFD and power (For model selection, refer to 2.3.5)

(3) Peripheral equipment ground independently, which can eliminate interference that caused by leakage current of VFD ground cable when it is in common -ground.

2.3.4 Leakage Current and Handling

There are two forms of leakage current while using VFD: one is earth leakage current,the other is leakage current between cable and cable.

(1) Factors that influenced earth leakage current and solutions

There exists distributed capacitance between wire and earth.The bigger the distributed capacitance, the larger the leakage current.It can decrease the carrier frequency in order to decrease leakage current. However, to decrease carrier frequency will increase motor noise. Please note that the installation of the reactor is also an effective way to solve the leakage current.

Leakage current increases with the loop current. When motor power is high, the corresponding leakage current is high.

(2) The factors that caused leakage current between cable and cable and solutions

There exists distributed capacitance in VFD output circuits. It is likely to cause resonance and bring about leakage current if the current in the circuits contains higher harmonics. If thermal relay is put into use at this time, it will cause malfunction.

Solutions: decrease carrier frequency or install output reactor. When using VFD, it is suggested to use its electronic overload protection, and do not install a thermal relay before the motor.

Precautions of installing EMC input filter at power input side

①Notes：Strictly comply with the ratings when using the EMC filter. The EMC filter is category I electric apparatus, and therefore, the metal housing ground of the filter should be in good contact with the metal ground of the installation cabinet on a large area, and requires good conductive continuity. Otherwise, it will result in electric shock or poor EMC effect.

②As result of EMC test, it founds that the ground of the EMC filter and the PE conductor of the AC drive must be tied to the same common ground. Otherwise, the EMC effect will be affected seriously.

③The EMC filter should be installed as closely as possible to the power input side of the AC drive.

Chapter 3 Panel Display and Operation

3.1 Introduction of Operation&Display Interface

You can modify the parameters, monitor the working status and start or stop the VFD by operating the operation panel. Its shape and functions are as shown in the following figure.

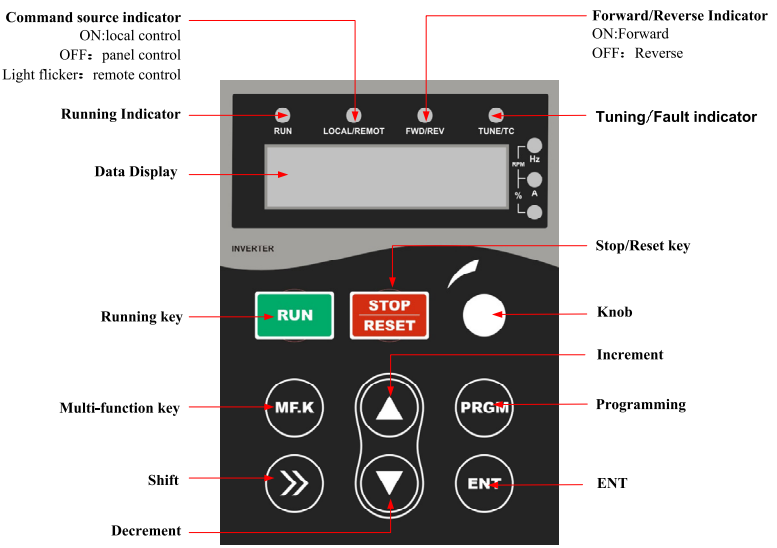

Figure 3-1 Operation Panel

（1）Indicator Instruction

RUN: ON indicates that the AC drive is in the running state, and OFF indicates that the AC drive is in the stop state.

LOCAL/REMOT: Keyboard operation, terminal operation and remote operation (communication control) indicators. OFF indicates keyboard operation control; ON indicates terminal operation control, FLICKER indicates remote operation control

FWD/REV： ON indicates reverse rotation, and OFF indicates forward rotation.

TUNE/TC： When the indicator is ON, it indicates the auto-tuning state. When the indicator is blinking, it indicates the fault state.

（2）Unit Indicators

Hz: unit of frequency

A: unit of current

V: unit of voltage

RPM（Hz+A）: unit of rotational speed

%（A+V）: Percentage

（3）Digital Display

The 5-digit LED display is able to display the set frequency, output frequency, monitoring data and alarm codes.

（4）Pulse Electronic Knob

VDF panel has a pulse electronic knob. It can be used as frequency reference. When using this configuration of the drive knob as frequency source, turning it clockwise is the increased setting and counterclockwise is reduced setting. There are icons on the panel to present you operation direction.

（5）Keys and Functions of Operation Panel

Key	Name	Function
PRG	Programming	Enter Level I menu; exit one level from present sub-menu.
ENT	Confirm	Enter the sub-menu display level by level; confirm the parameter setting.
△	Increment	Increase data or function code.
	Decrement	Decrease data or function code.
》	Shift	Select the displayed parameters in cyclic turn when in the stop or running state, and select the digit to be modified when modifying parameters.
RUN	RUN	Start the AC drive in the operation panel control mode.
STOP/ RESET	Stop/Reset	Stop the AC drive when it is in the running state and perform the reset operation when it is in the fault state. The functions of this key are restricted in F7-02.
MF.K	Multi-function key	Select function switchover according to the setting of F7.01.

Table 3-1 Keypad Instruction

3.2 Function Code Viewing, Modification Instruction

The operation panel of VM1000 adopts three level menus to conduct parameter setting.

The three-level menu is：function code group (Level I) →function code (Level II) → function code setting value (level III), as shown figure 3-2.

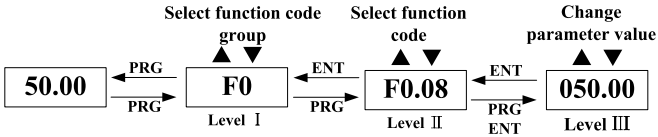

Table 3-2 Operation Flowchart of Three-level Menu

Instruction: In Level III, you can return to Level II by pressing PRG or ENTER. The difference between them is: it will save the parameter setting, return to Level Two, and then shift to the next function code by pressing ENT. While you press PRG, the system will directly return to Level Two without saving the parameter setting.

For example: Modify F4.02 from 10.00Hz to 15.00Hz

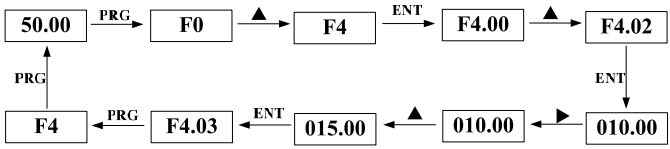

Table 3-3 Flowchart of Function Code Modification

In Level III: if there is no flicker bit in parameters, it indicates the function code can not be modified. The possible reason is:

a. The function code is unchangeable parameters. eg: actual detection parameters, running record parameters.

b. Function code can not be modified at running statue. It can be modified after stopping.

3.3 Viewing Methods of Status Parameters

In stop or running status, it can separately demonstrate various status parameters by using "》". Whether parameters are displayed is determined by the binary bits of values converted from the values of F7.03(parameter 1 LED displayed at running), F7.04(parameter 2 LED displayed at running), and F7.05(parameter 3 LED displayed at stop) in the hexadecimal format

In stop status, a total of 12 status parameters can be displayed: setting frequency, bus voltage, DI input status, DO output status, Analog inputAI1 voltage, Analog inputAI2 voltage, actual count value, actual length value, PLC (running steps), load speed, PID setting, PULSE input frequency and three reserved parameters. Pressing "》" to select the parameters.

In running status, there are 29 status parameters: running frequency, setting frequency, bus voltage, output voltage,output current are default display.Other display parameters:output power, output torque, DI input status, DO output status, analog input AI1 voltage, analog input AI2 voltage, analog input AI3 voltage,actual count value, actual length value,linear speed, PID setting, PID feedback are displayed by the binary bits of values converted from the values of F7.03, F7.04. Pressing "》"and then switch the keys sequencely to display the selected parameter.

When VFD is power-on again, the display parameters are defaulted as the selected parameters before power off.

3.4 Password Setting

VM1000 offer protection function of user password. When FE.00 set as nonzero, namely user password, the password come into effect after exiting the function code editing. Press PRG again, it will indicate ".....". User password must be correctly input in order to access common menu. Otherwise, it cannot enter.

If you want to cancel code protection function, it needs to use passwords to enter and set FE.00 as 0.

Chapter 4 Quick Debugging Guide

4.1 Preparation and Examination Before Commissioning Operation

VM1000 is the electrical appliance that used in motor drive and speed adjustment. Therefore, it needs to make a preparation for electric and mechanic conditions before operating, and examine the commissioning operation. The following table 4-1 is relevant items

Item	Instruction
Stabilization & Installation of VM 1000	In case loose wiring caused by moving or damages incurred by equipment drop, VFD should be installed firmly. Please refer to 2.1.3 and 2.1.4 to confirm the installation. For temporary power-on operation, like product detection test, VFD should be placed on the platform stably and can't be operated for a long time.
Input connection in main circuit	1. Be sure input voltage and capacity is conform to the requirements of VFD rated value.Please refer to the nameplate in 1.3 and data in 1.6 section 2. Be sure cable connection is correct and firm, meanwhile, the cable specification is complied with the reference data of cable selection in Section 3 of Annex A.
Output connection in main circuit	1. Make sure the rated voltage of motor is corresponding to the output rated value of VFD; make sure the connection is stable and secure. 2. Be sure cable connection is correct, meanwhile, the cable specification is complied with the reference data of cable selection in Section 3 of Annex A.
Motor installation condition	1. Make sure the installation of motor is stable and secure, and is corresponding to the requirements of mechanical design. The motor that is not securely installed will likely cause an accident. 2. For the idle motor or the motor with a load, ensure that the start will not cause damage to persons and equipment. Even if the test running should be in the same case. For those equipment that prohibit reversed rotation, it must remove the coupling between motor and mechanical first.,After confirming rotation is correct by commissioning operation, it can restore the mechanical connection. 3. In the torque control mode of VFD,it needs to ensure that there will be no

	danger of runaway in motor and equipment, while it needs to set and examine vfd max frequency of torque control rotation correspondingly (F3.12 and F3.13). NOTE: Runaway refers to a state that is out of control because of a sudden and rapid acceleration with no load. 4. Make sure that the insulation of the motor is normal. When testing motor insulation, VFD output wiring must be disconnected. Please refer to safety precautions in the manual.
Mechanical safety inspection	1. Make sure there are enough security measures for the drive motor and machine. 2. It is suggested to conduct no-load test in the first operation,
Control circuit connection	1. Adopt the cable selection which is conforming to A.3. 2. For the wiring of control circuit, please refer to 2.2.5 for design and inspection.
VFD parameters	Please check that the drive parameter settings is corresponding to mechanical design or control mode required by product testing.If not, it will likely result in accidents after starting. For the drives applied in vector control mode, it also need for auto-tuning of motor parameters, Please refer to Section 4.5.

Table 4-1 Examination of Commissioning Operation

After completion of commissioning operation, it can be energized and conduct subsequent tests in accordance with the formal operation of electrical safety standards

4.2 Panel Operation

（1）Application

It usually adopt panel operation for the single-drive VFD which doesn't need external operating or control devices as well as regular product inspection. At the same time, it can use a knob or digital setting in the frequency setting principal.

（2）Typical Wiring

Only after main circuit wiring, it can be operated by panel, including start/stop.

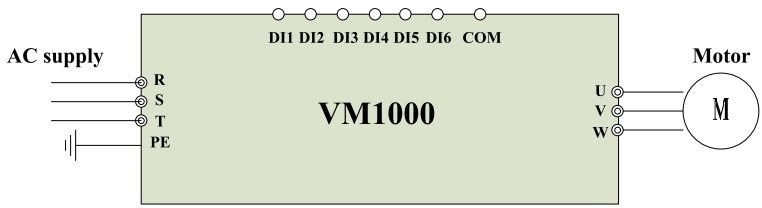

Figure 4-1 VFD Main Circuit Wiring

（3）VFD Parameter Setting

Function code	Name	Setting	Instruction	Notes
F0.00	Control Mode Selection	1 V/F control	Setting factory value as 1, adopt V/F control.When debugging, except rated value of motor, the other motor parameters don't need to be adjust. 2. If it is changed as 0, vector control, please refer to section 4.5 to conduct auto-tuning of motor parameter.	When it is in simple application, keep the factory setting value unchanged

F0.01	Control Command Source	0：Command channel of operation panel (light off)	The factory value is 0,it can implement start/stop control by panel operation	Remain unchanged
F0.03	Master Frequency Reference X Selection	0:Eletronic potentiometer(non-retentive at power off) 1: Digital setting (retentive at power off) ……	When the factory value is set as 0, conduct the frequency given by the EVR of control panel It can be changed as 1, namely to modify the F0.08 frequency given value by operation panel	When using eletronic potentiometer, keep the factory value unchanged
F0.08	Setting Frequency	0.00Hz ～max frequency F0.10	When F0.03 is set as 1, it needs to set this parameters as running given frequency.	
F0.09	Running direction selection	0：Forward 1：Reverse	When the running direction of motor is not corresponding with the use requirements, the rotate direction can be changed by modifying this parameters	To modify this parameters is equivalent to commutation and wiring of motor
F0.10	Max output frequency	50.00Hz ～ 400.00Hz（V/F at max is1000.0Hz)	In accordance with the motor nameplate, ensure that the VFD output does not exceed the rating of the motor. NOTE: Under certain circumstances, the motor can be adjusted according to frequency range allowed by motor.	Factory value 50.00Hz

Table 4-2 Common Parameters Setting of Operation Panel

Other parameters that may be adjusted: F0.18 acceleration time 1, F0.19 deceleration time 1 etc.

（4）Steps of Panel Operation

Step	Operation	Panel display	Indicator	Note
Start	Press “Run” Key	5- digit LED display become non-flicker from flicker when operating	RUN indicator become lighter	Refer to 3.1
Viewing running status	Press “”key, switch display status in turn	there are four items of default display：running frequency,setting frequency,bus voltage,output current	Turn on the Hz,A,V separately or turn them on in group	Refer to 3.1
Stop	Press “STOP/RESET”	5- digit LED display become flicker from non-flicker	RUN Light off	Refer to 3.1

Table 4-3 Panel Operation Procedure

4.3 Start/Stop control of terminal forward rotation

（1）Application

VFD common control mode is start/stop control. Generally, it is used in conveyor, fan, and pump etc.

（2）Typical Wiring

In the control circuit, it can adopt 2 wiring or 3 wiring. The following is 2 wiring scheme

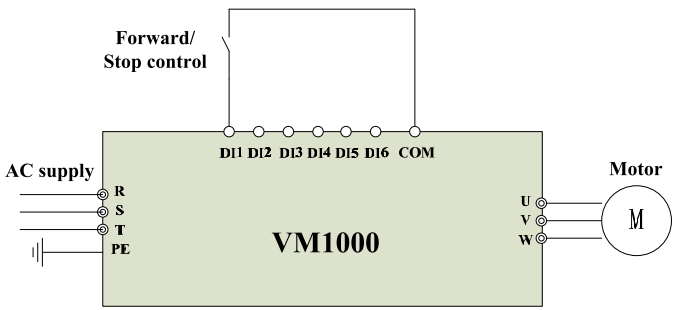

Figure 4-2 Start/Stop Control of Forward

（3）VM 1000 Parameter Setting

In F0 group, except F0.01, other parameter can refer to Table 4-2

Function code	Name	Setting	Instruction	Note
F0.01	Control Command Source	0: Keypad(with LOCAL/REMOTE light off) 1: Terminals(with LOCAL/REMOTE light on) 2: Communication(with LOCAL/REMOTE LED	1. Modify the setting as 1, namely conduct the start and stop control by terminal input signal 2. Terminals(with LOCAL/REMOTE	

		flashing)	light on)	
F5.00	DI1 terminal function	Setting range：0～50 1 indicates: forward rotation(FWD)	Factory value has been set as 0, namely adopt two wiring control mode 1	Factory value remain unchanged
F5.16	Terminal control mode	Setting range：0～3 0 indicates: 2 wiring scheme 1	Factory value has been set as 0, namely adopt two wiring control mode 1	Factory value remain unchanged

Table 4-4 Common Parameters Setting of FWD Start/Stop

（4）Operation Procedure

Steps	Operation	Panel display	Indicator	Note
Start	Connect DI1 and COM Usually, it adopts one manual switch or PLC output	5- digit LED display become non-flicker from flicker when operating	RUN Lights on	Refer to 3.1
Viewing running status	Press “”key, switch display status in turn	There are four items of default display：running frequency,setting frequency,bus voltage,output current	Turn on the Hz,A,V separately or turn them on in group	Refer to 3.1
Stop	Disconnect DI1 and COM	5- digit LED display become flicker from non-flicker	RUN Light off	Refer to 3.1

Table 4-5 Running Procedures of FWD Start/Stop

4.4 Common Control Guideline

4.4.1 Multi- step Speed Control

(1) Multi-step Speed

It indicates the selection of VFD preset out frequency is completed by the DI input terminals. It supports a maximum of 16 preset value.Usually, this mode is used for switching multiple operation speed in turn. It often applied in escalator,conveyor and large washing equipment etc.

(2) Typical wiring

The following is the wiring diagram of multi- step speed mode that adopt DI2 and DI3

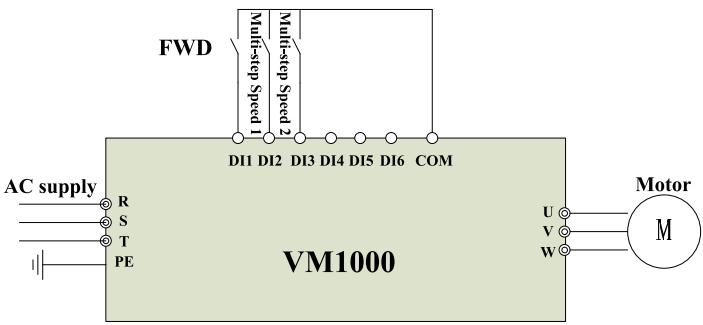

Figure 4-3 VM1000 FWD Multi-step Speed Control

(3) Parameter setting

This application is the control terminal control; start/stop can be 2-wire or 3-wire. Control parameters can be found in the above Table 4-4. Table 4-6 is the parameter example of Figure 4-3 that adopts two DI terminals at 4- step speed

Function code	Name	Setting	Instruction	Note
F5.01	DI2 terminal function	Setting range:0～50 12～15 indicates multi-step speed 1～4	Modify the setting as 12, namely DI2 is Multi-step speed 1	
F5.02	DI3 terminal function	Setting range:0～50 12～15 indicates multi-step speed 1～4	Modify the setting as 13, namely DI3 is Multi-step speed 2	
FD.00	Multi-step speed 0	-100.0%~100.0% (100.0% refers to maximum frequency F0.10)	Setting according to the applied requirements	
FD.01	Multi-step speed 1	-100.0% ～ 100.0%	Setting according to the applied requirements	
FD.02	Multi-step speed 2	-100.0% ～ 100.0%	Setting according to the applied requirements	
FD.03	Multi-step speed 3	-100.0% ～ 100.0%	Setting according to the applied requirements	

Table 4-6 FWD Control Parameter at Multi-step Speed

4.4.2 PID control

(1)PID control

It refers to PID algorithm- a control mode that is used for conducting process adjustment on controlled objects. In this mode, the VFD output is used to adjust some physical quantities such as speed, temperature, pressure, flow, etc., and the corresponding target values can be set via digital, analog given, and other communications given. It is often used in variable frequency air compressor, draw-bench, constant-pressure water supply, HVAC, and so on.

(2)Typical wiring

The following the water supply system wiring diagram that adopts given digital and analog feedback

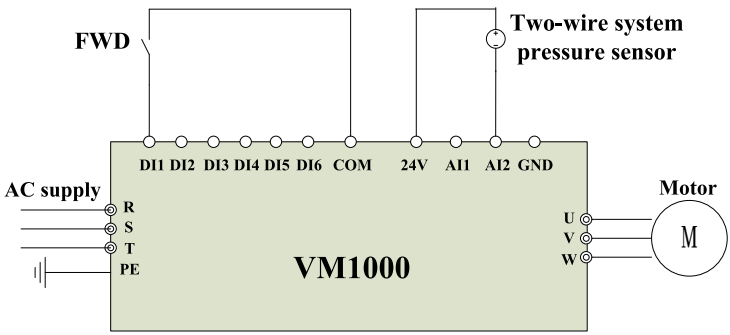

Figure 4-4 VM1000 PID Control

(3) Parameters setting

This control application is terminal control, which start and stop is 2-wire or 3-wire. The master frequency needs to be modified as PID. Part of the control parameters can be found in the above Table 4-4. The following Table 4-7 is the PID para example in Figure 4-4 that adopts AI2 analog feedback.

Function code	Name	Setting	Instruction	Notes
F0.03	Master Frequency Reference X Selection	0: Eletronic potentiometer (non-retentive at power off)…… 8：PID 9:Communication given	Modify the setting as 8; adopt PID output as master frequency reference	
F5.23	AI2 lower	0.00V ～ F5.20	Setting according to the	Used for checking

	limit		applied requirements	analog signal
F5.24	AI2 setting value corresponding to AI2 lower limit	-100.0% ～ +100.0%	Setting according to the applied requirements	Used for checking analog signal
F5.25	AI2 upper limit	F5.18 ～ +10.00V	Setting according to the applied requirements	Used for checking analog signal
F5.26	AI2setting value corresponding to AI2 upper limit	-100.0% ～ +100.0%	Setting according to the applied requirements	Used for checking analog signal
F9.00	PID given source	setting range：0～6 0 indicates function code F9.01 given	Factory value has been set as 0, namely set F9.01 as digital setting	Keep the factory value unchanged
F9.01～ F9.32	other parameters in PID group	-100.0% ～ 100.0%	Set and adjust according to the applied requirements	Some parameters need to be adjusted in order to get the proper value

Table 4-7 VM1000 PID Control Parameters

4.5 Auto-tuning of Motor Parameters

Selection of vector control mode：Before the drive operates ,you must input the exact nameplate parameters of motor, the standard motor parameters is equipped with 8000H inverter according to parameters on the nameplate; vector control has a high dependence on motor parameters.In order to get good control performance,it must receive the correct parameters of controlled motor.

Procedures of motor auto tuning are as follows:

First, the control command source (F0.02) is selected as keypad.

Then input the following parameters according to the actual motor parameters (according to the current motor selection):

F2.00: GP Type Display Selection

F2.01: motor rated power

F2.02: motor rated voltage

F2.03: motor rated current

F2.04: motor rated frequency

F2.05: motor rated speed

If the motor is completely disconnected from the load, select 2 in F2.11 (auto-tuning completely), and then press the “RUN ”on the keypad , the VFD will automatically calculate following parameter of the motor:

F2.06: asynchronous motor stator resistance

F2.07: asynchronous motor rotor resistance

F2.08: asynchronous motor leakage inductance

F2.09: asynchronous mutual inductance

F2.10: Motor no load current

The motor parameter automatic tuning above is completed

If the motor can not be completely disconnected with load, select 1 in the F2.11 (static auto tuning), and then press the RUN key on the keyboard.

If VFD will measure the stator resistance, rotor resistance and leakage inductance instead of the mutual inductive reactance and load current,the user can calculate these two parameters on their own according to the motor nameplate. The parameters that used for calculating motor nameplate are: rated voltage U, rated current I, rated frequency and power factor η:

The calculation methods of motor no-load current and motor mutual inductance is as follows: Lσ indicates motor leakage inductance.

no-load current : $I_o = I * \sqrt{1-\eta^2}$

calculation of mutual inductance: $L_m = \frac{u}{2\sqrt{3}\pi f * Io} - L\sigma$

Io：no-load current

Lm：mutual inductance

Lσ：leakage inductance

4.6 Faults Query and Reset step

（1）Faults Status and Reset

In start/stop and running status, the VFD will access to fault status subject to various internal and external constraints or internal abnormalities. When security conditions and the devices permit, you need to reset the fault manually so as to return to normal standby status. Also, automatic fault reset function can be set on the VFD.

（2）Faults Query and Reset Steps

Steps	Operation	Panel display	Indicator	Note
Viewing fault status	Viewing fault code	Failure panel displays fault codes beginning with an E, and flashes to remind	TUNE/TC Lights flash	Indicator refer to 3.1 Fault code refer to 8.1
Viewing fault record	1. Viewing E0 parameters for the latest fault information 2. E1 ~ E4 are historical fault information	In fault status, it can not only check fault information but also enter and view various parameters, modify parameter values.	——	
Reset	Deal with the the influence of failure, confirm the cause of the malfunction and eliminate it. 2. Press the "STOP / RESET" button and reset 1	Under the qualified conditions, the error code is no longer displayed and return to the stop/standby status.	TUNE/TC Lights off	Indicator refer to 3.1

Table 4-8 Faults Query and Reset Step

4.7 Parameters Restore as Factory Value

Before restoring the parameters as factory value, please confirm the recovery does not pose a safety hazard to the equipment (such as control failure), nor lost some parameters after the commissioning. If necessary, it should make records. Note: You can copy the parameters by LCD keypad.

Steps:

(1) Turn on F0 group; enter F0.20 (parameter initialization).

(2) Select 1 is factory parameters restoring (not including the motor parameters and record values)

(3) Select 2 is recorded value clearance, including a variety of accumulated data such as running time.

Chapter 5 Function Code Datasheet

(1)Parameter Protection

When FE-00 is set to a non-zero number, parameter protection code is enabled. You must use the correct user password to enter the menu.If you cancel the code, it needs to set FE.00 as 0.The parameters in shortcut menu is not included in the code protection.

(2)Symbol and Legend

The modification method of parameters in function code are marked with graphic symbols. The descriptions are as follows:

"☆": The parameter can be modified when the AC drive is in either stop or running state.

"★": The parameter cannot be modified when the AC drive is in the running state.

"●": The parameter is the actually measured value and cannot be modified.

"◎": The parameter is factory parameter and can be set only by the manufacturer.

Function code	Description	Set range	Unit	Default	Modification level
F0 Group: Basic Parameters					
F0.00	Control Mode Selection	0: Sensorless Vector Control(SVC) 1: V/F Control	1	1	★
F0.01	Control Command Source	0: Keypad(with LOCAL/REMOTE light off) 1: Terminals(with LOCAL/REMOTE light on) 2: Communication(with LOCAL/REMOTE flashing)	1	0	☆

Function code	Description	Set range	Unit	Default	Modification level
F0.02	Base frequency for UP/ DOWN modification during running	0：Running Frequency 1：Preset Frequency	1	1	★
F0.03	Master Frequency Reference X Selection	0：Digital setting of F0.08 Preset Frequency(Adjustable by pulse knob & Up/Down keys, non-retentive at power off) 1：Digital setting of F0.08 Preset Frequency(Adjustable by pulse knob & Up/Down keys modification, retentive at power off) 2：AI1 3：AI2 4：Reserved 5：PULSE Input（DI6） 6：Multi-Step Speed Input Frequency References 7：Simple PLC 8：PID 9：Communication	1	0	★
F0.04	Auxiliary Frequency Reference Y Selection	As the same as F0.03	1	0	★
F0.05	Auxiliary Frequency Reference Y's Range Reference while in superposition of X and Y.	0：Refer to Maximium Frequency 1：Refer to Frequency Reference X.	1	0	☆

Function code	Description	Set range	Unit	Default	Modification level
F0.06	Auxiliary Frequency Reference Y's Scope Setting while in superposition of X and Y	0%~150%	1%	100%	☆
F0.07	Frequency References Superposition Selection	Units: Frequency Reference Selection 0: Master Frequency Reference X 1: Calculation of Master with Auxiliary Frequency Reference(Calculation defined by setting of tens) 2: Switching between Master and Auxiliary Frequency Reference. 3: Switching between Master and Calculation of Master with Auxiliary Frequency Reference 4: Switching between Auxiliary and Calculation of Master with Auxiliary Frequency Reference Tens: Calculation Definision of Master and Auxiliary 0: Master+Auxiliary 1: Master-Auxiliary 2: Maximium Value between the Two 3: Minimium Value between the Two	11	0	☆
F0.08	Preset Frequency	0.00Hz~Maximium Frequency F0.10	0.01Hz	50.00Hz	☆
F0.09	Running Direction Selection	0：Forward 1：Reverse	1	0	☆

Function code	Description	Set range	Unit	Default	Modification level
F0.10	Maximium Output Frequency	50.00Hz~400.00Hz (Maximium 1000.0Hz Under V/F Control Mode)	0.01Hz	50.00Hz	★
F0.11	Upper Limit Frequency Reference Selection	0：F0.12 Setting 1：AI1 2：AI2 3：Reserved 4：PULSE Input 5：Communication	1	0	★
F0.12	Upper Limit of Running Frequency	Minimium Running FrequencyF0.14~Maximium Output FrequencyF0.10	0.01Hz	50.00Hz	☆
F0.13	Bias of Upper Limit of Running Frequency	0.00Hz~Maximium Output Frequency F0.10	0.01Hz	0.00Hz	☆
F0.14	Lower Limit of Running Frequency	0.00Hz~Upper Limit of Running Frequency F0.12	0.01Hz	0.00Hz	☆
F0.15	The function of lower limit frequency	When the frequency reference is lower than the Lower Limit of Running Frequency, 0 : Running at lower limit frequency 1: Stop 2: Sleep		0	☆
F0.16	Carrier Frequency	0.5kHz~16.0kHz	0.01 kHz	Rated Model Dependent	☆
F0.17	Reserved				

Function code	Description	Set range	Unit	Default	Modification level
F0.18	Acceleration Time 1	0.0s~6500.0s	0.1s	Rated Model Dependent	☆
F0.19	Deceleration Time 1	0.0s~6500.0s	0.1s	Rated Model Dependent	☆
F0.20	Restore Default Setting	0:No operation 1: Restore to factory setting 2:Fault record clearing	1	0	★
F0.21	Parameter lock option	0: Unlock parameter 1: Lock parameter	1	0	☆
F0.22	Retentive option of digital setting frequency upon power off	0: Non-retentive 1: Retentive	1	1	★
F0.23	Acceleration/Deceleration Time Unit	0：1s 1：0.1s 2：0.01s	1	1	★
F0.24	Base Frequency Reference of Acceleration/Deceleration Time	0：Maximium Running Frequency（F0.10） 1：Setting Frequency Source 2：100Hz	1	0	★
F0.25	Cooling fan Control	0: Keep running during main output is on. 1: Keep running when the drive is power on.	1	0	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F0.26	Resolution of Frequency Command	1：0.1Hz 2：0.01Hz	1	2	★
F1 Group: Start and Stop Parameters					
F1.00	Start Mode	0: Direct start 1: Rotator speed tracking and start 2: Asynchronous motor pre-excite and start	1	0	☆
F1.01	Rotator speed tracking method	0: From the frequency at power off 1: From zero speed 2: From maximum frequency	1	0	★
F1.02	Rotator tracking speed	1~100	1	20	☆
F1.03	Start frequency	0.00~10.00Hz	0.01Hz	0.00Hz	☆
F1.04	Holding time of start frequency	0.0s~100.0s	0.1s	0.0s	★
F1.05	DC braking/pre-exciting current before start	0%~100%	1%	0%	★
F1.06	DC braking/pre-exciting time before start	0.0s~100.0s	0.1s	0.0s	★
F1.07	Acceleration/Deceleration mode	0: Linear 1: S-curve A 2: S-curve B	1	0	★
F1.08	S-curve beginning segment time ratio	0.0%~(100.0%.F1.09)	0.10%	30.00%	★

Function code	Description	Set range	Unit	Default	Modifi-cation level
F1.09	S-curve ending segment time ratio	0.0%~(100.0%.F1.08)	0.10%	30.00%	★
F1.10	Stop mode	0: Decelerate to stop 1: Coast to stop	1	0	☆
F1.11	Trigging frequency of DC braking at stop	0.00Hz~Maximum Frequency	0.01Hz	0.00Hz	☆
F1.12	Waiting time before DC braking at stop	0.0s~100.0s	0.1s	0.0s	☆
F1.13	DC braking current at stop	0%~100%	1%	0%	☆
F1.14	DC braking time at stop	0.0s~100.0s	0.1s	0.0s	☆
F1.15	Applying ratio of braking unit	0%~100%	1%	100%	☆
F2 Group: Motor Parameters					
F2.00	Drive model	0:General model (Constant torque style‘s loads) 1:Pump model (Fan & Pump style's loads)	1	Rated Model Dependent	●
F2.01	Motor rated power	0.1kW~400.0kW	0.1kW	Rated Model Dependent	★
F2.01	Motor rated Voltage	1V~440V	1V	Rated Model Dependent	★

Function code	Description	Set range	Unit	Default	Modification level
F2.03	Motor rated current	0.01A~655.35A（<=55kW） 0.1A~6553.5A（>55kW）	0.01A/ 0.1A	Rated Model Dependent	★
F2.04	Motor rated frequency	0.00Hz~Maximum Frequency	0.01Hz	Rated Model Dependent	★
F2.05	Motor rated rotation speed	1rpm~36000rpm	1rpm	Rated Model Dependent	★
F2.06	Asynchronous motor stator resistance	0.001Ω~65.535Ω （<=55kW） 0.0001Ω~6.5535Ω（>55kW）	0.001Ω / 0.0001 Ω	Rated Model Dependent	★
F2.07	Asynchronous motor rotator resistance	0.001Ω~65.535Ω （<=55kW） 0.0001Ω~6.5535Ω（>55kW）	0.001Ω / 0.0001 Ω	Rated Model Dependent	★
F2.08	Asynchronous motor leakage inductance	0.01mH~655.35mH （<=55kW） 0.001mH~65.535mH （>55kW）	0.01m H/ 0.001m H	Rated Model Dependent	★
F2.09	Asynchronous motor mutual inductance	0.01mH~6553.5mH （<=55kW） 0.01mH~655.35mH （>55kW）	0.1mH/ 0.01m H	Rated Model Dependent	★
F2.10	Motor no-load current	0.01A~F2.03 （<=55kW） 0.1A~F2.03 （>55kW）	0.01A/ 0.1A	Rated Model Dependent	★

Function code	Description	Set range	Unit	Default	Modifi-cation level
F2.11	Motor parameters autotuning	0: No autotuning 1: Static autotuning(with load) 2: Autotuning completely(no load)	1	0	★
F2.12-F2.37	Reserved				
F3 Group: Vector Control Parameters					
F3.00	Proportional gain 1 of speed loop	1~100	1	30	☆
F3.01	Integral time 1 of speed loop	0.01s~10.00s	0.01s	0.50s	☆
F3.02	Switch frequency 1	0.00~F3.05	0.01Hz	5.00Hz	☆
F3.03	Proportional gain 2 of speed loop	1~100	1	20	☆
F3.04	Integral time 2 of speed loop	0.01s~10.00s	0.01s	1.00s	☆
F3.05	Switch frequency 2	F3.02~Maximum frequency	0.01Hz	10.00Hz	☆
F3.06	Coefficient of slip compensation in vector control mode	50%~200%	1%	100%	☆
F3.07	Filter time constant of speed loop	0.000s ～ 0.100s	0.001s	0.000s	☆
F3.08	Torque upper limit for speed control mode	0.0%~200.0%	0.10%	150.00%	☆

Function code	Description	Set range	Unit	Default	Modification level
F3.09	Speed/torque control mode selection	0: Speed control mode 1: Torque control mode	100.00 %	0.00%	★
F3.10	Torque upper limit reference source in torque control mode	0：Digital setting 1：AI1 2：AI2 3：Reserved 4：PULSE setting 5：Communication setting 6：MIN(AI1,AI2) 7：MAX(AI1,AI2)	100.00 %	0.00%	★
F3.11	Torque upper limit for torque control mode	-200.0%~200.0%	0.10%	150.00%	☆
F3.12	Max. forward frequency for torque control mode	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	☆
F3.13	Max. reverse frequency for torque control mode	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	☆
F3.14	Acceleration time for torque control	0.00s~650.00s	0.01s	0.00s	☆
F3.15	Deceleration time for torque control	0.00s~650.00s	0.01s	0.00s	☆
F3.16	Torque stiffness coefficient	10.0%~120.0%	0.001	1	☆
F3.17	Proportional gain of M axis current loop	0~60000	1	2000	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F3.18	Integral gain of M axis current loop	0~60000	1	1300	☆
F3.19	Proportional gain of T axis current loop	0~60000	1	2000	☆
F3.20	Integral gain of T axis current loop	0~60000	1	1300	☆
F3.21	Speed loop integral seperation	0: Invalid 1: Valid	1	0	☆
F4 Group: V/F Control Parameters					
F4.00	V/F curve & mode selection	0: Linear V/F curve 1: Multi-point V/F curve 2: Square V/F curve 3~9: Reserved 10: V/F complete seperation mode 11: V/F half seperation mode	1	0	★
F4.01	Torque boost	0.0%：Automatic torque boost 0.1%~30.0% (Invalid when in V/F seperation mode	0.10%	Rated Model Dependent	☆
F4.02	Torque boost cut-off frequency	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	★
F4.03	Multi-point V/F curve's frequency point 1	0.00Hz~F4.05	0.01Hz	0.00Hz	★
F4.04	Multi-point V/F curve's voltage point 1	0.0%~100.0%	0.10%	0.00%	★

Function code	Description	Set range	Unit	Default	Modifi-cation level
F4.05	Multi-point V/F curve's frequency point 2	F4.03~F4.07	0.01Hz	0.00Hz	★
F4.06	Multi-point V/F curve's voltage point 2	0.0%~100.0%	0.10%	0.00%	★
F4.07	Multi-point V/F curve's frequency point 3	F4.05~Motor rated freqency(F2.04)	0.01Hz	0.00Hz	★
F4.08	Multi-point V/F curve's voltage point 3	0.0%~100.0%	0.10%	0.00%	★
F4.09	Coefficient of slip compensation in V/F control mode	0.0%~200.0%	0.10%	0.00%	☆
F4.10	V/F over-excitation gain	0 ～ 200	1	64	☆
F4.11	Oscillation suppression gain	0 ～ 100	1	Rated Model Dependent	☆
F4.12	Voltage reference in V/F seperation mode	0: Digital Setting (F4.13) 1: AI1 2: AI2 3: Reserved 4: PULSE input（DI6） 5: Multi-step speed input 6：Simple PLC 7：PID 8：Communication, 100.0% refers to motor rated voltage.	1	0	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F4.13	Digital setting for voltage reference in V/F seperation mode	0V~Motor rated voltage	1V	0V	☆
F4.14	Voltage rising time for V/F seperation mode	0.0s~1000.0s (Time from 0V to motor rated voltage.)	0.1s	0.0s	☆
F5 Group: Input Terminals Parameters					
F5.00	DI1 terminal function	0: No function 1: Run forward(FWD) 2: Run reverse(REV) 3: 3-wire control 4: Jog forward (FJOG) 5: Jog reverse (RJOG) 6: UP command 7: DOWN command 8: Coast to stop 9: Fault reset (RESET) 10: Pause running 11: External fault input N. O. 12: Multi-step speed terminal 1 13: Multi-step speed terminal 2 14: Multi-step speed terminal 3 15: Multi-step speed terminal 4 16: Acceleration/Deceleration Time Selection Terminal 1 17: Acceleration/Deceleration Time Selection Terminal 2 18: : Frequency Reference Switching Terminal 19: Reset UP/DOWN Frequency Setting(Both keypad and terminals)	1	1	★
F5.01	DI2 terminal function		1	2	★
F5.02	DI3 terminal function		1	9	★

Function code	Description	Set range	Unit	Default	Modifi-cation level
F5.03	DI4 terminal function	20: Control Command Switching Terminal 1 21: Acceleration/deceleration prohibited 22: PID Control Pause 23：Simple PLC Running Status Reset 24：Swing Frequency Pause 25: Counter Input 26: Counter Reset 27: Length Counting Input 28: Length Counting Reset 29: Torque Control Prohibit 30：PULSE Input(High Frequency Input, DI6 terminal only) 31: Reserved 32: DC Brake Instantly 33: External Fault Input N.C. 34: Frequency Setting Taking Effect（If no terminal is set to this value, the function is in effect defaultly) 35: PID Control Output Reverse 36: External Stop terminal 1 37: Control Command Switching terminal 2 38: PID Integration Pause 39: Switching terminal, between Frequency Reference X and Preset Frequency 40: Switching terminal, between Frequency Reference Y and Preset Frequency 41~42: Reserved 43: PID Parameter Switching Terminal 44: User Defined Fault 1 44: User Defined Fault 2	1	0	★
F5.04	DI5 terminal function		1	0	★
F5.05	DI6 terminal function		1	0	★

Function code	Description	Set range	Unit	Default	Modification level
F5.06 -F0.09	Reserved	46: Speed/Torque Control Mode Switching 47: Emergency Stop 48: External Stop Terminal 2 49: Decelerating and DC Braking 50: Time Clearing of Present Running 51~59: Reserved			
F5.10	VDI terminal function		1	0	★
F5.11~ F5.14	Reserved				
F5.15	DI filter time	0.000s~1.000s	0.001s	0.010s	☆
F5.16	Terminal control mode	0: 2-wire control mode 1 2: 2-wire control mode 2 3: 3-wire control mode 1 4: 3-wire control mode 2	1	0	★
F5.17	Frequency changing rate through UP/ DOWN terminal adjusting	0.01Hz~ 6553.5Hz	0.01Hz	0.10Hz	☆
F5.18	AI1 lower limit	0.00V~F5.20	0.01V	0.00V	☆
F5.19	Setting value corresponding to AI1 lower limit	-100.0% ～ +100.0%	0.10%	0.00%	☆
F5.20	AI1 upper limit	F5.18 ～ +10.00V	0.01V	10.00V	☆
F5.21	Setting value corresponding to AI1 upper limit	-100.0% ～ +100.0%	0.10%	100.00%	☆
F5.22	AI1 filter time	0.00s ～ 10.00s	0.01s	0.10s	☆

Function code	Description	Set range	Unit	Default	Modification level
F5.23	AI2 lower limit	0.00V ～ F5.25	0.01V	0.00V	☆
F5.24	Setting value corresponding to AI2 lower limit	-100.0% ～ +100.0%	0.10%	0.00%	☆
F5.25	AI2 upper limit	F5.23 ～ +10.00V	0.01V	10.00V	☆
F5.26	Setting value corresponding to AI2 upper limit	-100.0% ～ +100.0%	0.10%	100.00%	☆
F5.27	AI2 filter time	0.00s ～ 10.00s	0.01s	0.10s	☆
F5.28	PULSE input lower limit	0.00kHz ～ F5.30	0.01kHz	0.00kHz	☆
F5.29	Setting value corresponding to PULSE input lower limit	-100.0% ～ 100.0%	0.10%	0.00%	☆
F5.30	PULSE input upper limit	F5.28 ～ 100.00kHz	0.01kHz	50.00kHz	☆
F5.31	Setting value corresponding to PULSE input upper limit	-100.0% ～ 100.0%	0.10%	100.00%	☆
F5.32	PULSE filter time	0.00s ～ 10.00s	0.01s	0.10s	☆
F5.33	DI1 ON delay	0.0s ～ 3600.0s	0.1s	0.0s	★
F5.34	DI2 ON delay	0.0s ～ 3600.0s	0.1s	0.0s	★
F5.35	DI1 OFF delay	0.0s ～ 3600.0s	0.1s	0.0s	★

Function code	Description	Set range	Unit	Default	Modification level
F5.36	DI2 OFF delay	0.0s ～ 3600.0s	0.1s	0.0s	★
F5.37	DI input ON status setting 1	0: High level 1: Low level Unit: DI1 Tens: DI2 Hundreds: DI3 Thousands: DI4 Tens thousands: DI5	11111	0	★
F5.38	DI input ON status setting 2	0: High level 1: Low level Unit: DI6 Tens: Reserved Hundreds: Reserved Thousands: Reserved Tens thousands: Reserved	11111	0	★
F6 Group: Output Terminals Parameters					
F6.00	FM terminal output selection	0: Pulse output(FMP) 1: Open collector discrete output(FMR)	1	0	☆
F6.01	FMR open collector output function	0: No output 1: AC drive running 2: Fault output (stop) 3: Frequency-level detection FDT1 output 4: Frequency reached 5: Zero-speed running (no output at stop) 6: Motor overload pre-warning 7: AC drive overload pre-warning 8: Set count value reached 9: Designated count value reached 10: Length reached	1	0	☆
F6.02	Relay 1 output function		1	2	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F6.03	Relay 2 output function	11: PLC cycle complete 12: Accumulative running time reached 13: Frequency limited 14: Torque limited 15: Ready for Run 16: AI1>AI2 17: Frequency upper limit reached 18: Frequency lower limit reached (no output at stop) 19: Undervoltage state output 20: Communication setting 21: Reserved 22: Reserved 23: Zero-speed running 2 (having output at stop) 24: Accumulative power-on time reached 25: Frequency level detection FDT2 output 26: Frequency 1 reached 27: Frequency 2 reached 28: Current 1 reached 29: Current 2 reached 30: Timing reached 31: AI1 input limit exceeded 32: Load loss 33: Reverse running 34: Zero current state 35: Module temperature reached 36: Software current limit exceeded 37: Frequency lower limit reached (having output at stop) 38: Alarm output(Keep running) 39: Motor overheat warning 40: Current running time reached 41: User defined output 1 42: User defined output 2	1	1	☆
F6.04 ~F6.05	Reserved				
F6.06	VDO output function		1	0	☆
F6.07~ F6.10	Reserved				

Function code	Description	Set range	Unit	Default	Modifi-cation level
F6.11	FMP output options	0: Running frequency 1: Target frequency 2: Output current 3: Output torque 4: Output power 5: Output voltage 6: Pulse input(100% correspond to 100.0kHz) 7: AI1 8: AI2 9: Reserved 10: Length counting value 11: Couter value 12: Communication frequency reference 13: Motor rotating speed 14: Output current(100% correspond to rated current) 15: Output voltage(100% correspond to rated voltage) 16: Reserved	1	0	☆
F6.12	AO1 output options		1	0	☆
F6.13	AO2 output options		1	1	☆
F6.14	FMP output maximum frequency	0.01kHz~100.00kHz	0.01kHz	50.00kHz	☆
F6.15	AO1 zero offset coefficient	-100.0%~100.0%	0.10%	0.00%	☆
F6.16	AO1 gain	-10.00~10.00	0.01	1	☆
F6.17	AO2 zero offset	-100.0%~100.0%	0.10%	0.00%	☆

Function code	Description	Set range	Unit	Default	Modification level
	coefficient				
F6.18	AO2 gain	-10.00~10.00	0.01	1	☆
F6.19	FMR close delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.20	Relay 1 close delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.21	Relay 2 close delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.22	VDO close delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.23	FMR open delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.24	Relay 1 open delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.25	Relay 2 open delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.26	VDO open delay	0.0s ～ 3600.0s	0.1s	0.0s	☆
F6.27	Output ON status setting	0: Positive 1: Negtive Units: FMR Tens: Relay 1 Hundreds: Relay 2 Thousands: Reserved Ten thousands: Reserved	11111	0	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F6.28	Test value selection for user defined output (EX) 1	0: Running frequency 1: Target frequency 2: DC bus voltage 3: Output voltage 4: Output current 5: Output Power 6: Output torque 7~8: Reserved 9: AI1 input value 10: AI2 input value 11: Reserved 12: Couter value 13: Length counting value		0	☆
F6.29	Comparison method of user defined output 1	Units: comparison test method 0: Equal(EX==X1) 1: Equal or greater than 2: Equal or less than 3: Interval comparison(X1 ≤ EX ≤ X2) 4: Bits test(EX & X1 = X2 Tens: Output method 0: False value output 1: True value output		0	☆
F6.30	User defined dead interval 1	0 ～ 65535		0	☆
F6.31	User defined output 1 comparison value X1	0 ～ 65535		0	☆
F6.32	User defined output 1 comparison value X2	0 ～ 65535		0	☆

Function code	Description	Set range	Unit	Default	Modification level
F6.33	Test value selection for user defined output (EX) 2	0: Running frequency 1: Target frequency 2: DC bus voltage 3: Output voltage 4: Output current 5: Output Power 6: Output torque 7~8: Reserved 9: AI1 input value 10: AI2 input value 11: Reserved 12: Couter value 13: Length counting value		0	☆
F6.34	Comparison method of user defined output 2	Units: comparison test method 0: Equal(EX==X3) 1: Equal or greater than 2: Equal or less than 3: Interval comparison(X3 ≤ EX ≤ X4) 4: Bits test(EX & X3 = X4 Tens: Output method 0: False value output 1: True value output		0	☆
F6.35	User defined dead interval 2	0 ～ 65535		0	☆
F6.36	User defined output 2 comparison value X3	0 ～ 65535		0	☆
F6.37	User defined output 2 comparison value X4	0 ～ 65535		0	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F7 Group: Keypad & Display Interface Parameters					
F7.00	LCD yeypad parameter copy	0: No operation 1: Local parameters will be copied to LCD keypad 2: LCD keypad will download parameters to local drive.	1	0	●
F7.01	MF.K key function	0: No function 1: Switching control command source between keypad and remote control(Remote control include communication and terminals command). 2: Switching rotation between FWD & REV 3: Jog Forward 4: Jog Reverse	1	0	★
F7.02	STOP/RESET key stop function	0: Only valid in keypad control command mode 1: Always valid in any control command mode	1	1	☆
F7.03	Running status LED display selection 1	0000~FFFF Bit00: Running frequency(Hz) Bit01: Target frequency(Hz) Bit02: DC bus voltage(V) Bit03: Output voltage(V) Bit04: Output current(A) Bit05: Output Power(kW) Bit06: Output torque(%) Bit07: DI input status Bit08: DO output status Bit09: AI1 input value(V) Bit10: AI2 input value(V) Bit11: Reserved Bit12: Counter value	1111	17	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
		Bit13: Length counting value Bit14: Load speed display Bit15: PID setting value			
F7.04	Running status LED display selection 2	0000~FFFF Bit0: PID feedback Bit1: Current step of PLC running Bit2: Feedback speed, unit 0.1Hz Bit3: Feedback speed Bit4: Running time left Bit5: AI1 voltage before correction Bit6: AI2 voltage before correction Bit7: Reserved Bit8: Line speed Bit9: Time since current power on Bit10: Time of current running Bit11: PULSE input frequency, Unit 1Hz Bit12: Setting of communication Bit13: Reserved Bit14: Master frequency reference X display Bit15: Auxiliary frequency reference Y display	1111	0	☆
F7.05	Stop status LED display selection	0000~FFFF Bit00: Target frequency(Hz) Bit01: DC bus voltage(V) Bit02: DI input status Bit03: DO output status Bit04: AI1 input value(V) Bit05: AI2 input value(V) Bit06: Reserved Bit07: Counter value Bit08: Length counting value	1111	33	☆

Function code	Description	Set range	Unit	Default	Modification level
		Bit09: Current step of PLC running Bit10: Load speed display Bit11: PID setting value Bit12: PULSE input frequency, Unit 0.01kHz?			
F7.06	Load speed display ratio	0.0001 ～ 6.5000	0.0001	0.3	☆
F7.07	Heat sink temperature of inverter Power module	0.0℃～ 100℃	0.1℃	.	●
F7.08	Heat sink temperature of rectifier bridge	0.0℃～ 100℃	0.1℃	.	●
F7.09	Accumulative running time	0h ～ 65535h	1h	.	●
F7.10	Product number	-		.	●
F7.11	Firmware version	-		.	●
F7.12	Number of decimal places for load speed display	0: 0 decimal place 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places	1	0	☆
F7.13	Accumulative power-on time	0h~65535h	1h	.	●
F7.14	Accumulative consumed electric energy(kWh)	0~65535 kWh	1kWh	.	●

Function code	Description	Set range	Unit	Default	Modifi-cation level
F8 Group: Auxiliary Function Parameters					
F8.00	Jog frequency	0.00Hz~Maximum Frequency	0.01Hz	2.00Hz	☆
F8.01	Jog acceleration time	0.0s ～ 6500.0s	0.1s	20.0s	☆
F8.02	Jog deceleration time	0.0s ～ 6500.0s	0.1s	20.0s	☆
F8.03	Acceleration time 2	0.0s ～ 6500.0s	0.1s	Rated Model Dependent	☆
F8.04	Deceleration time 2	0.0s ～ 6500.0s	0.1s	Rated Model Dependent	☆
F8.05	Acceleration time 3	0.0s ～ 6500.0s	0.1s	Rated Model Dependent	☆
F8.06	Deceleration time 3	0.0s ～ 6500.0s	0.1s	Rated Model Dependent	☆
F8.07	Acceleration time 4	0.0s ～ 6500.0s	0.1s	Rated Model Dependent	☆
F8.08	Deceleration time 3	0.0s ～ 6500.0s	0.1s	Rated Model Dependent	☆
F8.09	Jump frequency 1	0.00Hz~Maximum Frequency	0.01Hz	0.00Hz	☆
F8.10	Jump frequency 2	0.00Hz~Maximum Frequency	0.01Hz	0.00Hz	☆

Function code	Description	Set range	Unit	Default	Modification level
F8.11	Jump frequency width	0.00Hz~Maximum Frequency	0.01Hz	0.00Hz	☆
F8.12	FWD/REV switchover dead zone time	0.0s~3000.0s	0.1s	0.0s	☆
F8.13	Reverse option	0: Reverse allowed 1: Reverse Prohibited	1	0	☆
F8.14	Carrier Frequency adjusting by temperature	0: Disable 1: Enable	1	1	☆
F8.15	Droop control	0.00Hz~10.00Hz	0.01Hz	0.00Hz	☆
F8.16	Accumulative power-on time threshold	0h ～ 65000h	1h	0h	☆
F8.17	Accumulative running time threshold	0h ～ 65000h	1h	65000h	☆
F8.18	Drive startup protection	0: Disable 1: Enable	1	0	☆
F8.19	Frequency detection value (FDT1)	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	☆
F8.20	Frequency detection hysteresis (FDT 1)	0.0%~100.0% (FDT1 Level)	0.10%	5.00%	☆
F8.21	Detection width of frequency reached	0.0% ～ 100.0% (Maximum frequency)	0.10%	0.00%	☆

Function code	Description	Set range	Unit	Default	Modification level
F8.22	Jump frequency validity during acceleration/deceleration	0: Invalid 1: Valid	1	0	☆
F8.23	Option as accumulative running time reached	0: operation continue 1: Error code alarm	1	0	★
F8.24	Acting option as accumulative power-on time reached	0: operation continue 1: Error code alarm	1	0	★
F8.25	Frequency point for switchover between acceleration time 1 and acceleration time 2	0.00Hz~Maximum Frequency	0.01Hz	0.00Hz	☆
F8.26	Frequency point for switchover between deceleration time 1 and deceleration time 2	0.00Hz~Maximum Frequency	0.01Hz	0.00Hz	☆
F8.27	Terminal jogging priority	0: Disable 1: Enable	1	1	☆
F8.28	Frequency detection value (FDT2)	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	☆
F8.29	Frequency detection hysteresis (FDT 2)	0.0%~100.0% (FDT2 Level)	0.10%	5.00%	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F8.30	Given frequency reached 1	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	☆
F8.31	Given frequency reached detection width 1	0.0%~100.0% (Maximum frequency)	0.10%	0.00%	☆
F8.32	Given frequency reached 2	0.00Hz~Maximum Frequency	0.01Hz	50.00Hz	☆
F8.33	Given frequency reached detection width 2	0.0%~100.0% (Maximum frequency)	0.10%	0.00%	☆
F8.34	Zero current detection level	0.0%~300.0%, 100.0% is corresponding to motor rated current, No output in stop status.	0.10%	5.00%	☆
F8.35	Zero current detection time	0.01s ～ 600.00s	0.01s	0.10s	☆
F8.36	Programm over current setting	0.0%: No detection 0.1%~300.0% Motor rated current	0.10%	200.00%	☆
F8.37	Programm over current detection time	0.00s ～ 600.00s	0.01s	0.00s	☆
F8.38	Given current reached 1	0.0% ～ 300.0% Motor rated current	0.10%	100.00%	☆
F8.39	Given current reached detection width 1	0.0% ～ 300.0% Motor rated current	0.10%	100.00%	☆
F8.40	Given current reached 2	0.0% ～ 300.0% Motor rated current	0.10%	100.00%	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F8.41	Given current reached detection width 2	0.0% ～ 300.0% Motor rated current	0.10%	100.00%	☆
F8.42	Timing operation	0: Disable 1: Enable	1	0	☆
F8.43	Timing reference	0: F8.44 Timing setting 1: AI1 2: AI2 3: reserved	1	0	☆
F8.44	Timing setting	0.0Min ～ 6500.0min	0.1min	0.0min	☆
F8.45	AI1 input voltage lower limit	0.00V~F8.46	0.01V	3.10V	☆
F8.46	AI1 input voltage upper limit	F8.45~10.00V	0.01V	6.80V	☆
F8.47	inverter Power module temperature reached	0℃~100℃	1℃	75℃	☆
F8.48	Rapid current limiting function	0: Disable 1: Enable	1	1	☆
F9 Group: PID parameters					
F9.00	PID reference source	0: Preset value(F9.01) 1: Analog terminal AVI 2 Analog terminal ACI 3: Communication interface 4: Muli-function digital input terminals	1	0	☆
F9.01	PID preset value	0.0%~100.0%	0.10%	50.0%	☆

Function code	Description	Set range	Unit	Default	Modification level
F9.02	PID feedback selection	0: AI1 1: AI2 2: Reserved 3: AI1-AI2 4: PULSE input（DI6） 5: Communication 6: AI1+AI2 7: MAX(|AI1|, |AI2|) 8: MIN(|AI1|, |AI2|)	1	0	☆
F9.03	PID control characteristic	0: Positive 1: Negative	1	0	☆
F9.04	PID reference & feedback range	0 ～ 65535	1	1000	☆
F9.05	Proportional gain P1	0.0~100.0	0.1	20	☆
F9.06	Integral time I1	0.01s~10.00s	0.01s	2.00s	☆
F9.07	Differential time D1	0.000s~10.000s	0.001s	0.000s	☆
F9.08	PID reverse output frequency limit	0.00~Maximum frequency	0.01Hz	2.00Hz	☆
F9.09	PID control deviation limit	0.0%~100.0%	0.10%	0.00%	☆
F9.10	PID differential limit	0.00%~100.00%	0.01%	0.10%	☆
F9.11	PID reference gradual effect time	0.00~650.00s	0.01s	0.00s	☆
F9.12	PID feedback filter time	0.00~60.00s	0.01s	0.00s	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F9.13	PID output filter time	0.00~60.00s	0.01s	0.00s	☆
F9.14	Proportional gain P2	0.0~100.0	0.1	20	☆
F9.15	Integral time I2	0.01s~10.00s	0.01s	2.00s	☆
F9.16	Differential time D2	0.000s~10.000s	0.001s	0.000s	☆
F9.17	PID control parameter switching function	0: No switching 1: Switching by DI terminal 2: Switching by deviation	1	0	☆
F9.18	PID control parameter switching deviation 1	0.0%~F9.19	0.10%	20.00%	☆
F9.19	PID control parameter switching deviation 2	F9.18~100.0%	0.10%	80.00%	☆
F9.20	PID initial output value	0.0%~100.0%	0.10%	0.00%	☆
F9.21	PID initial output time	0.00~650.00s	0.01s	0.00s	☆
F9.22	Maximum positive deviation limit of output interval	0.00% ～ 100.00%	0.01%	1.00%	☆
F9.23	Maximum positive deviation limit of output interval	0.00%~100.00%	0.01%	1.00%	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
F9.24	PID integral option	Units: Seperated Integral calculation 0: Disable 1: Enable Tens: Output reaching limit and stopping integral 0: Continue integral 1: Stop integral	11	0	☆
F9.25	PID feedback loss detection	0.0%: No detection 0.1% ～ 100.0%	0.10%	0.00%	☆
F9.26	PID feedback loss detection time	0.0s~20.0s	0.1s	0.0s	☆
F9.27	PID option at stop	0: No calculation cotinue at stop 1: Calculation continue at stop	1	0	☆
F9.28	PID auxiliary function	0: Normal PID 1: PID with sleeping function	1	0	☆
F9.29	PID sleeping threshold	0.0%~100.0%	0.10%	60.00%	☆
F9.30	PID sleeping delay	0.0~3600.0s	0.1s	3.0s	☆
F9.31	PID wakeup threshold	0.0%~100.0%	0.10%	20.00%	☆
F9.32	PID wakeup delay	0.0~3600.0s	0.1s	3.0s	☆
FA Group: Protection Parameters and Fault Record					
FA.00	Motor overload protection	0: Disable 1: Enable	1	1	☆
FA.01	Motor overload protection gain	0.20~10.00	0.01	1	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
FA.02	Motor overload warning coefficient	50%~100%	1%	80%	☆
FA.03	Over-voltage stall gain	0~100	1	0	☆
FA.04	Over-voltage stall protection voltage	120%~150%	1%	130%	☆
FA.05	Over-current stall gain	0~100	1	20	☆
FA.06	Over-current stall Protection currnet	100%~200%	1%	150%	☆
FA.07	Protecton against short-circuit to ground at power on	0: Disable 1: Enable	1	1	☆
FA.08	Fault auto reset times	0~20	1	0	☆
FA.09	Options for fault output DO during fault auto reset	0: Disable 1: Enable	1	0	☆
FA.10	Fault auto reset interval	0.1s~100.0s	0.1s	1.0s	☆
FA.11	Input phase-loss protection	0: Disable 1: Enable	1	1	☆
FA.12	Output phase-loss protection	0: Disable 1: Enable	1	1	☆

Function code	Description	Set range	Unit	Default	Modification level
FA.13	Fault protection action option 1	0: Coast to stop 1: Stop as setting of stop mode 2: Operation continue Units: Motor overload(Err11) Tens: Input phase-loss(Err12) Hundreds: Output phase-loss(Err13) Thousands: External fault(Err15) Tens of Thousand: Communication Error(Err16)	11111	0	☆
FA.14	Fault protection action option 2	0: Coast to stop 1: Stop as setting of stop mode 2: Operation continue Units: Reserved Tens: Parameter Re-write failure(Err21) Hundreds: Reserved Thousands: Reserved Tens of Thousand: accumulative running time reached(Err16)	11111	0	☆
FA.15	Fault protection action option 3	0: Coast to stop 1: Stop as setting of stop mode 2: Operation continue Units: User defined fault 1 (Err27) Tens: User defined fault 2 (Err28) Hundreds: Reserved Thousands: Load loss(Err30) Tens of Thousand: PID feedback loss during operation(Err31)	11111	0	☆

Function code	Description	Set range	Unit	Default	Modification level
FA.16	Fault protection action option 4	0: Coast to stop 1: Stop as setting of stop mode 2: Operation continue Units: Motor speed deviation too large (Err42) Tens: Motor over speed (Err43) Hundreds: Initial position error(E51) Thousands: Reserved) Tens of Thousand: Reserved	11111	0	☆
FA.17	Reserved				
FA.18	Under-voltage setting	60.0%~140.0%	0.10%	100.00%	☆
FA.19	Over-voltage setting	200.0V~2500.0V	0.1V	810	☆
FA.20	Frequency option for continuing to run upon fault	0: Current running frequency 1: Selected frequency reference 2: Upper limit frequency 3: Lower limit frequency 4: Preset backup freqency in abnormal condition	1	0	☆
FA.21	Preset backup freqency in abnormal condition	0.0%~100.0%(Current target frequency)	0.10%	100.00%	☆
FA.22	Action at instantaneous power failure	0: No action 1: Deceleration 2: Deceleration and stop	1	0	☆
FA.23	Action pause voltage at instantaneous power failure	80.0%~100.0%	0.10%	90.00%	☆

Function code	Description	Set range	Unit	Default	Modification level
FA.24	Voltage recoverring time at instantaneous power failure	0.00s~100.00s	0.01s	0.50s	☆
FA.25	Action start voltage at instantaneous power failure	60.0%~100.0%(Standard DC bus voltage)	0.10%	80.00%	☆
FA.26	Load loss protection	0: Disable 1: Enable	1	0	☆
FA.27	Load loss detection level	0.0~100.0%	0.10%	10.00%	☆
FA.28	Load loss detection time	0.0~60.0s	0.1s	1.0s	☆
FA.29	Decimal place of frequency at fault	1: 1 decimal place 2: 2 decimal place Units: Frequency decimal place of the last fault Tens: Fequency decimal place of the fault before last Hundreds: Fequency decimal place of the second fault before last	1	222	●
FB Group: Swing frequency, length control and counter control					
FB.00	Swing frequency setting mode	0: Relative to center frequency 1: Relative to Maximum frequency	1	0	☆
FB.01	Swing frequency range	0.0%~100.0%	0.10%	0.00%	☆
FB.02	Skip frequency range	0.0%~50.0%	0.10%	0.00%	☆

Function code	Description	Set range	Unit	Default	Modification level
FB.03	Swing frequency cycle	0.1s~3000.0s	0.1s	10.0s	☆
FB.04	Triangle wave rising time coefficient of swing frequency	0.1%~100.0%	0.10%	50.00%	☆
FB.05	Length setting	0m~65535m	1m	1000m	☆
FB.06	Actual length	0m~65535m	1m	0m	☆
FB.07	Pulse per meter, unit: 0.1	0.1~6553.5	0.1	100	☆
FB.08	Counter setting	1~65535	1	1000	☆
FB.09	Designated counter value	1~65535	1	1000	☆
FC Group: RS485 Communication Parameters					
FC.00	Local address	1~247, 0 refers to the broadcast address	1	1	☆
FC.01	Baud rate selection	0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS	1	5	☆

Function code	Description	Set range	Unit	Default	Modification level
FC.02	Data bit check	0: No check (8, N, 2) 1: Even parity check (8, E, 1) 2: Odd parity check (8, O, 1) 3: No check (8, N, 1)	1	0	☆
FC.03	Communication response delay time	0ms~20ms	1ms	2	☆
FC.04	Communication timeout fault time	0.0 (invalid), 0.1~60.0s	0.1s	0	☆
FC.05	Current resolution of communication	0: 0.01A 1: 0.1A	1	0	☆
FD Group:Multi-step Speed and Simple PLC Parameters					
FD.00	Multi-step speed 0	-100.0%~100.0% (100.0% refers to maximum frequency F0.10)	0.10%	0.00%	☆
FD.01	Multi-step speed 1	-100.0%~100.0%	0.10%	0.00%	☆
FD.02	Multi-step speed 2	-100.0%~100.0%	0.10%	0.00%	☆
FD.03	Multi-step speed 3	-100.0%~100.0%	0.10%	0.00%	☆
FD.04	Multi-step speed 4	-100.0%~100.0%	0.10%	0.00%	☆
FD.05	Multi-step speed 5	-100.0%~100.0%	0.10%	0.00%	☆
FD.06	Multi-step speed 6	-100.0%~100.0%	0.10%	0.00%	☆
FD.07	Multi-step speed 7	-100.0%~100.0%	0.10%	0.00%	☆
FD.08	Multi-step speed 8	-100.0%~100.0%	0.10%	0.00%	☆
FD.09	Multi-step speed 9	-100.0%~100.0%	0.10%	0.00%	☆
FD.10	Multi-step speed 10	-100.0%~100.0%	0.10%	0.00%	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
FD.11	Multi-step speed 11	-100.0%~100.0%	0.10%	0.00%	☆
FD.12	Multi-step speed 12	-100.0%~100.0%	0.10%	0.00%	☆
FD.13	Multi-step speed 13	-100.0%~100.0%	0.10%	0.00%	☆
FD.14	Multi-step speed 14	-100.0%~100.0%	0.10%	0.00%	☆
FD.15	Multi-step speed 15	-100.0%~100.0%	0.10%	0.00%	☆
FD.16	Simple PLC operation method	0:Stop after sigle operation 1:Keep the f inal value af ter single operation 2:Operation in cycles	1	0	☆
FD.17	Memory option of simple PLC	**Units:** 0: Non-retentive at power-off 1: Retentive at power-off **Tens:** 0: Non-retentive at stop 1: Retentive at stop	11	0	☆
FD.18	0th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.19	Acceleration time of 0th step	0~3	1	0	☆
FD.20	1st step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.21	Acceleration time of 1st step	0~3	1	0	☆
FD.22	2nd step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆

Function code	Description	Set range	Unit	Default	Modification level
FD.23	Acceleration time of 2nd step	0~3	1	0	☆
FD.24	3rd step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.25	Acceleration time of 3rd step	0~3	1	0	☆
FD.26	4th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.27	Acceleration time of 4th step	0~3	1	0	☆
FD.28	5th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.29	Acceleration time of 5th step	0~3	1	0	☆
FD.30	6th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.31	Acceleration time of 6th step	0~3	1	0	☆
FD.32	7th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.33	Acceleration time of 7th step	0~3	1	0	☆
FD.34	8th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.35	Acceleration time of 8th step	0~3	1	0	☆

Function code	Description	Set range	Unit	Default	Modifi-cation level
FD.36	9th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.37	Acceleration time of 9th step	0~3	1	0	☆
FD.38	10th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.39	Acceleration time of 10th step	0~3	1	0	☆
FD.40	11th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.41	Acceleration time of 11th step	0~3	1	0	☆
FD.42	12th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.43	Acceleration time of 12th step	0~3	1	0	☆
FD.44	13th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.45	Acceleration time of 13th step	0~3	1	0	☆
FD.46	14th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆
FD.47	Acceleration time of 14th step	0~3	1	0	☆
FD.48	15th step running time	0.0s(h)~6553.5s(h)	0.1s(h)	0.0s(h)	☆

Function code	Description	Set range	Unit	Default	Modification level
FD.49	Acceleration time of 15th step	0~3	1	0	☆
FD.50	PLC operation time unit	0: s 1: h 2: min	1	0	☆
FD.51	Multi-step speed 0 frequency reference	0: Function parameter FD.00 setting 1: AI1 2: AI2 3: Reserved 4: Pulse Input 5: PID 6: Digital setting of F0.08 Preset Frequency(Adjustable Up/Down keys)	1	0	☆
FE Group: Parameter Management					
FE.00	User Password	0~65535	1	0	☆
FE.01	Fault Record times display	0~15	1	5	☆
FF Group: Reserved ◎					
E0 Group: Record of the last fault					
E0.00	Code of the last fault	0: No faults 1: Reserved 2: Overcurrent at acceleration(Err02) 3: Overcurrent at deceleration(Err03) 4: Overcurrent at constant speed(Err04)	—	—	•

Function code	Description	Set range	Unit	Default	Modification level
E0.00	Code of the last fault	5: Overvoltage at acceleration(Err05) 6: Overvoltage at deceleration(Err06) 7: Overvoltage at constant speed(Err07) 8: Buffer resistance overload(Err08) 9: Undervoltage fault(Err09) 10: Ac drive overload(Err10) 11: Motor overload(Err11) 12: Phase loss at input(Err12) 13: Phase loss at output(Err13) 14: Module overheat(Err14) 15: External fault(Err15) 16: Abnormal communication(Err16) 17: Contactor abnormal(Err17) 18: Current detection fault(Err18) 19: Motor tuning fault(Err19) 21: Abnormal para reading and writing(Err21) 22: Drive hardware fault(Err22) 23: Motor short circuit to ground(Err23) 24: Reserved(Err24) 25: Reserved(Err25) 26: Running time reached(Err26) 27: User-defined fault 1(Err27) 28: User-define fault 2(Err28)	—	—	•

Function code	Description	Set range	Unit	Default	Modifi-cation level
		29: Power-on time reached(Err29) 30: Load loss(Err30) 31: PID feedback loss at running time(Err31) 40: Time-out fault of rapid current limit(Err40) 41: Reserved			
E0.01	Running frequency at the last fault	—	—	—	●
E0.02	Current at the last fault	—	—	—	●
E0.03	DC bus voltage at the last fault	—	—	—	●
E0.04	Digital input status at the last fault	—	—	—	●
E0.05	Digital output status at the last fault	—	—	—	●
E0.06	Drive Status at the last fault	—	—	—	●
E0.07	Timing result at the last fault(from power on)	—	—	—	●
E0.08	Timing result at the last fault(from Starting)	—	—	—	●
E0.09	Reserved	—	—	—	●

Function code	Description	Set range	Unit	Default	Modifi-cation level
E0.10	Reserved	—	—	—	●
E1 ～ E4 Group: Record of the four faults before the last					

Chapter 6 VM1000 Communication Application

VM1000 series provides RS485 communication interface and supports MODBUS communication protocol. Through computer or PLC, users can achieve centralized control, set VFD operation command, modify or read function code parameters, read the working status and fault information etc.

6.1 The Content of Protocol

The serial communication protocol defines the information content and use format of transmitting the serial communication, which includes: host “polling” (or broadcasting) format; The encoding method of host includes: function code of requiring action, data transmission, and error checking etc.If error occurred in the slave drive while receiving the information or can not complete the requested action form the host, it will organize a fault message as a response to the host.

6.2 Application

VFD is connectted to the "Single-host and multi-slave" PC / PLC control network with RS485.

6.3 Bus Structure

(1) Interface: RS485 hardware interface

(2) Transmission mode: asynchronous serial, half-duplex transmission mode. At the same moment, there is only one can transmit data while the other receive data in master and slave. During the asynchronous serial communication, data is sent frame by frame based on the packets.

(3) Topology: In single-host and multi-slave system, slave address range from 1 to 31, 0 is broadcast communication address. Network slave address must be unique.

6.4 Protocol Instruction

VM1000 series inverter communication protocol is an asynchronous serial master-slave ModBus communication protocol. Only one device (the host) can build a protocol (referred to as "Inquire / Command") in the network. Other devices (slaves) can only respond to the host by providing the data "inquiry / command", or make the appropriate action based on the host "inquiry / command." The host refers to the personal computer (PC), industrial control equipment or programmable logic controller (PLC) The slave means VM1000. Master can not only communicate with a slave individually, but also broadcast information to the entire lower auxiliary. For the master that access "inquiry / command" solely, slaves will feedback a message (called a response). For broadcast information provided by master, slave needs not feedback and response to the host.

6.5 Communication Frame Description

In RTU mode, information is sent with 3.5 character of interval of times at least. In diverse character time of network baud rate, it is much easier to realize it. The first transmission domain is the device address. The transmission characters that can be used is hexadecimal 0 ... 9, A ... F. Network devices monitor the network- bus constantly, including the pause at time interval. When the first field (the address field) is received, each device decodes it and judges whether it is sent to its own. After the last transmitted character, a times pause of 3.5 character （at least） marks the end of the message. After this pause, a new message can begin.

The entire message frame must be used as a continuous flow of output. If it exceed times pause of 1.5 characters, the receiving device will keep renewing the incomplete message and assumes that the next byte is the address field of a new message. Likewise, if a new message start within 3.5 character and continue in the previous information, the receiving device will consider it as a continuation of the previous message. Because the final CRC field value is not correct, this will cause an error.

RTU format is as follows:

START	Time of 3.5 character
ADR	Communication address：1~247
CMD	03： Read auxiliary parameters； 06： Write auxiliary

	parameters
DATA（N-1）	Data content： Para address of function code，parameter bit of function code，parameter value of function code
DATA（N-2）	
……	
DATA0	
CRCCHK High Bit	Detection value：CRC
CRCCHK Low Bit	
END	Time of 3.5 character

Table 6-1 RTU Format

Reading the Data from Auxiliary Register:

Example 1: The slave address is the start address of 01VFD, F002 continuously read two consecutive values.

Command Information of the Host:

ADR	01H
CMD	03H
High bit of starting address	F0H
Low bit of starting address	02H
High bit of register number	00H
Low bit of register number	02H
CRCCHK low bit	The CPCCHK is still need to be calculated
CRCCHK high bit	

Table 6-2 The Host Reading Command Frame Format

Responding Information of Auxiliary:

ADR	01H
CMD	03H
Byte number	04H
F002H high bit	00H
F002H low bit	00H
F003H high bit	00H
F003H high bit	01H
CRCCHK low bit	The CPCCHK is still need to be calculated
CRCCHK high bit	

Table 6-3 The Auxiliary Reading the Frame Format of Responding Information

Register Data that is Written in the Auxiliary :

Example 2: Write the 5000(1388H) in the auxiliary address from F00AH of 02H VFD.

Command information of host：

ADR	02H
CMD	06H
High bit of data address	F0H
Low bit of data address	0AH
High bit of data content	13H
Low bit of data content	88H
CRCCHK low bit	The CPCCHK is still need to be calculated
CRCCHK high bit	

Table 6-4 The Host Written into Command Frame Format

Responding Information of Auxiliary:

ADR	02H
CMD	06H
High bit of data address	F0H
Low bit of data address	0AH
High bit of data content	13H
Low bit of data content	88H
CRCCHK LOW BIT	The CPCCHK is still need to be calculated

Table 6-5 The Auxiliary Written into Responding Information Frame Format

Checking Mode -CRC:

When using RTU frame format, the message contains error detection domain that based on CRC. CRC field checks the contents of the whole message. CRC field is two bytes and includes a 16-bit binary value. After calculated by the transmission equipment, it is added to the message. The receiving device recalculates the CRC that received message, and compares it with the value that received in the CRC field. If the two CRC values are not equal, it means that the transmission is not correct. CRC is first stored in 0xFFFF, then invoke a continuous procedure to process the message with 8-bit byte and the current value of register. Only each character 8Bit data is valid for CRC, while start/ stop bits and the parity check bits are invalid. In CRC, each 8-bit character is different from the register contents or (XOR). The result moves to the least significant bit and most significant bit is filled with 0. If LSB is 1, the register is independently different from preset value. If LSB is 0, it will not implement. The whole procedure is repeated eight times. After completing the last bit (the 8th bit), the next 8-bit byte is different from the current value of register again. The final value of the register is the CRC value of all bytes in the message after the execution. When CRC is added to the message, the low byte will be added first and followed by the high byte.

When CRC is added to the message, the low byte will be added first and followed by the high byte.The simple function of CRC is as follows：

```
unsigned int crc_chk_value(unsigned char *data_value,unsigned char length)
{
        unsigned int crc_value = 0xFFFF;
        int i;

        while(length--)
        {
                crc_value ^= *data_value++;
                for(i=0;i<8;i++)
                {
                        if(crc_value&0x0001)
                        {
                                crc_value = (crc_ value>>1) ^ 0xa001;
                        }
                        else
                        {
                                crc_value = crc_ value >> 1;
                        }
                }
        }
        return(crc_value);
}
```

Address definition of communication parameters: this part is the content of the communication, which is used to control the VFD operation, VFD status and related parameters setting (some function code can not be changed, only for factory use).

The rule of function code's parameters address: high byte (F0 ~ FF), the low byte (00 ~ FF); Like F3.12, the address is expressed as F30C.

Note: FF Group: Neither it can be readable parameters, nor modified parameters; Therefore, some parameters can not be modified when VFD is at running status; No matter in what status, some parameters can not be changed; When changing the function code parameters, it still need to pay attention to the parameter range, unit and related instructions.

In addition, the life of the EEPROM is shortening since the EEPROM is stored frequently. Therefore, you have only to change the value of RAM under communication mode. It is no need to store some function code. (it can be achieved as long as the high bit F of the function code address is changed into 0.The address can only represent the writing RAM, can not act as the reading action. When reading, it is invalid address).

6.6 Register Address

stop/running parameters:

Parameter Address	Parameter Description
1000	communication setting value(decimal system)
1001	running frequency
1002	bus voltage
1003	output voltage
1004	output current
1005	output power
1006	output torque
1007	running speed
1008	DI input symbol
1009	DO output symbol
100A	AI1 voltage
100B	AI2 voltage
100C	reserved
100D	count value input
100E	length input
100F	load speed
1010	PID setting
1011	PID feedback

1012	PLC step
1013	PLUSE input frequency，Units 0.01KHz
1014	feedback speed, Units 0.1Hz
1015	The rest of running time
1016	AI1 voltage before correcting
1017	AI2voltage before correcting
1018	reserved
1019	linear speed
101A	power-on time
101B	running time
101C	PLUSE input frequency，Units 1Hz
101D	communication setting value
101E	actual feedback speed
101F	main frequency x display
1020	auxiliary frequency display

Table 6-6 Stop/Running Parameter Address

Note: The communication seting value is the percentage of relative value, 10000 corresponds to 100.00%, - 10000 corresponds to -100.00%. For the data on the frequency dimension, this percentage is a relative maximum frequency (F0-10) percentage; torque data dimension, which is the percentage of F2-10 (Digital torque limit setting)

Control Command Input into VFD(writing only) :

The address of command word	Command function
2000	0001： Forward rotation
	0002： Reversed rotation
	0003： Forward JOG
	0004： Reversed JOG
	0005： Stop by deceleration
	0006： Stop automatically
	0007： fault rest

Table 6-7 Control Command Function

Reading VM1000 Status (reading only) :

The address of command word	Command function
3000	0001： forward rotation
	0002： reversed rotation
	0003： stop

Table 6-8 Information Sheet of Reading VM1000 Status

Parameter Lock Password Checking:

If it is 8888H after returning，namely it means the password checking has passed

Code address	The content of input code
1F00	*****

Table 6-9 Password Checking Address and Format

Terminal Control of Digital Input:

The address of command word	The content of command
2001	BIT0~BIT1： reserved
	BIT2：RELAY1 output control
	BIT3：RELAY2 output control
	BIT4：FMR output control
	BIT5：VDO
	BIT6~BIT9： reserved

Table 6-10 Digital Output Control

A01 Analog Output Control （writing only）:

Command address	Command content
2002	0 ～ 7FFF indicates 0%～ 100%

Table 6-11 A01 Analog Output Control

A02 Analog output Control （writing only）:

Command address	Command content
2003	0 ～ 7FFF indicates 0%～ 100%

Table 6-12 A02 Analog output Control

Pulse Output Control （writing only）:

command address	command content
2004	0 ～ 7FFF indicates 0%～ 100%

Table 6-13 Pulse Output Control

Fault Description of VM1000 :

Fault address	Fault information
8000	0000： no faults 0001： reserved 0002： overcurrent at acceleration 0003： overcurrent at deceleration 0004： overcurren at constant speed 0005： overvoltage at acceleration 0006：overvoltage at deceleration 0007： overvoltage at constant speed 0008： buffer resistance overload 0009： undervoltage fault 000A： ac drive overload 000B： motor overload 000C： phase loss at input 000D： phase loss at output 000E： module overheat 000F： external fault 0010： abnormal communication 0011： contactor abnormal 0012： current detection fault 0013： motor tuning fault 0015： abnormal para reading and writing 0016： reserved 0017： Short circuit to ground 001A： running time reached 001B: user-defined fault 1 001C: user-define fault 2 001D: power-on time reached 001E： reserved

	001F： PID feedback loss at running time 0028： time-out fault of rapid current limit 0029： reserved

Table 6-14 VM1000 Fault Information

Data Description of Communication Fault(Fault Code) :

communication fault address	description of fault function
8001	0000： no fault 0001： password error 0002： command code error 0003： CRC checking error 0004： invalid address 0005： invalid parameters 0006： invalid parameters modification 0007： 0008： EEPROM under operation

Table 6-15 Datasheet of Communication Faults

Instruction of F Group Communication Parameters :

FC-00	address of AC drive	factory value	1
	setting range	00~31	

When the local address is set as 0, namely broadcast address,realize the broadcast function of the upper machine（except broadcast address). This is the basis for realizing point to point communication between upper machine and VFD.

FC-01	Baud rate	Factory value	5
	Setting range	0	300BPS
		1	600BPS

		2	1200BPS
		3	2400BPS
		4	4800BPS
		5	9600BPS
		6	19200BPS
		7	38400BPS

This parameter is used to set the data transfer rate between the host computer and the drive. Note: the baud rate of host computer and the drive must be the same. Otherwise, communication can not be conducted.The bigger the Baud, the faster the communication.

FC-02	Baud rate	Factory value	0
	Setting range	0	no checking :data format <8,N,2>
		1	even checking: data format <8,E,1>
		2	odd check: data format <8,O,1>
		3	no check: data format<8-N-1>

The baud rate of host computer and the drive must be the same. Otherwise, communication can not be conducted.

FC-03	Response delay	Factory value	10ms
	Setting range	0~20ms	

Response delay: it refers to the time interval that AC drive sent the data to host after receiving data.If the response delay is less than the system processing time, the response delay will be subject to the system processing time.If the response delay time longer than the system processing, it needs wait until the response delay time send the data to host machine after data has been processed.

FC-04	communication overtime	Factory value	0.0 s
	Setting range	0.0 s（invalid），0.1~60.0s	

When the function code is set to 0.0 s, the communication timeout parameter is invalid.

When the function code is set to a valid value, if the time interval between the communication and the next communication exceeds the communication time-out, the system will alarm communication error (Err16). Typically, it is set as invalid. In the continuous communication system, you can monitor the communication status if the second parameter is set.

FC-05	Communication Read Current Resolution	Factory value	0
	Setting range	0	0.01A
		1	0.1A

It is used to determine the output unit of current value when communication reads output current.

Chapter 7 Faults and Solutions

7.1 Fault Code Table

In VM1000, there are a lot of warning information and protection functions. Once the abnormal failure occurred, the protection function is activated and the VFD output is stopped. The fault code is displayed on AC drive display panel. Before seeking for service, users can conduct a detection on your own , analyze problems and find out the solutions according to this chapter. If it belongs to the reasons mentioned in the dashed box, please seek services, or contact the agent or SAJ-electric.

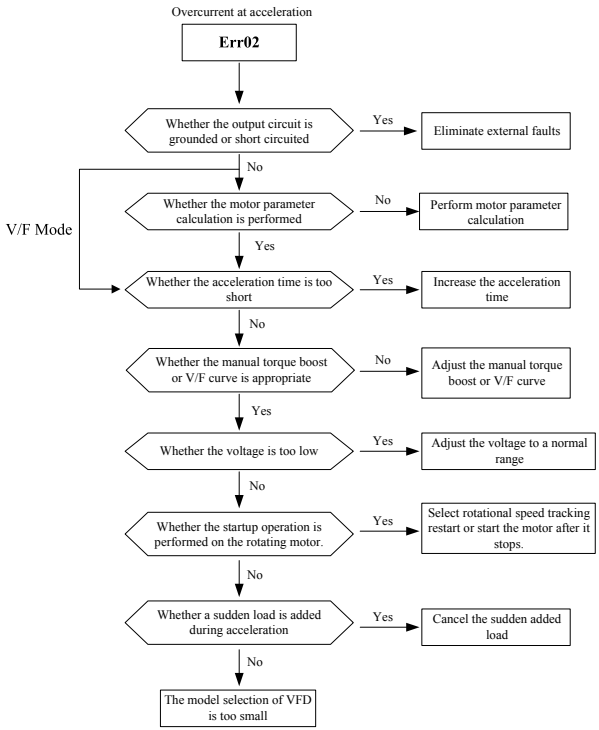

Figure 7-1 Overcurrent at acceleration (Err02)

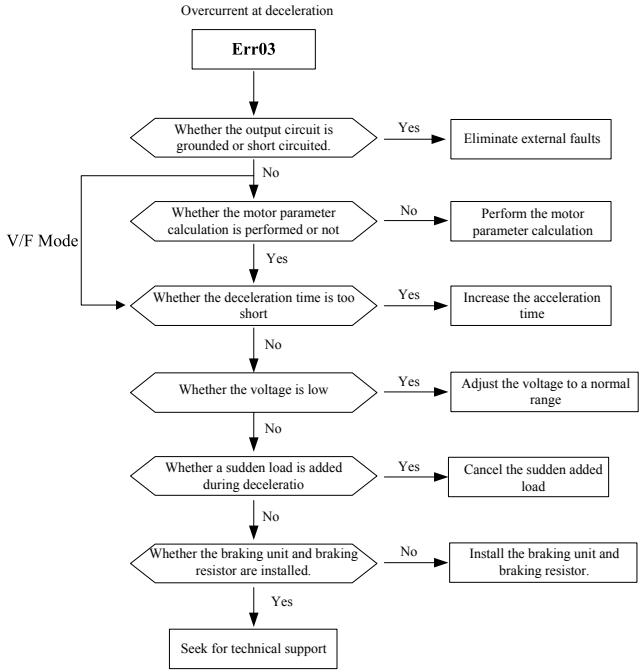

Figure 7-2 Overcurrent deceleration (Err03)

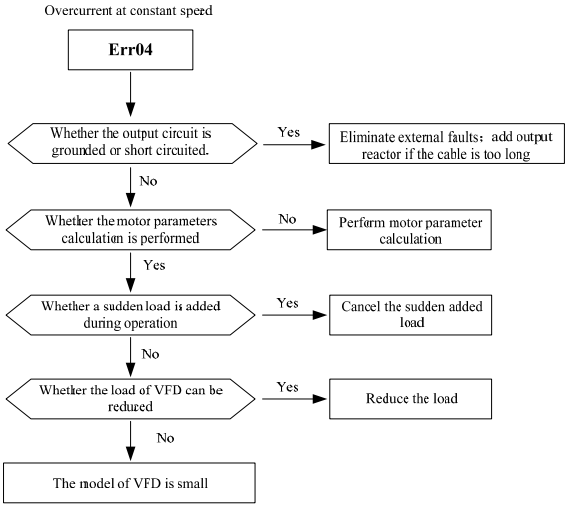

Figure 7-3 Overcurrent at constant speed (Err04)

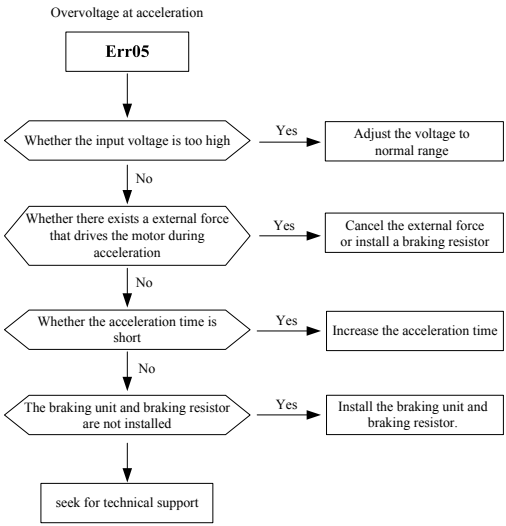

Figure 7-4 Overvoltage at acceleration (Err05)

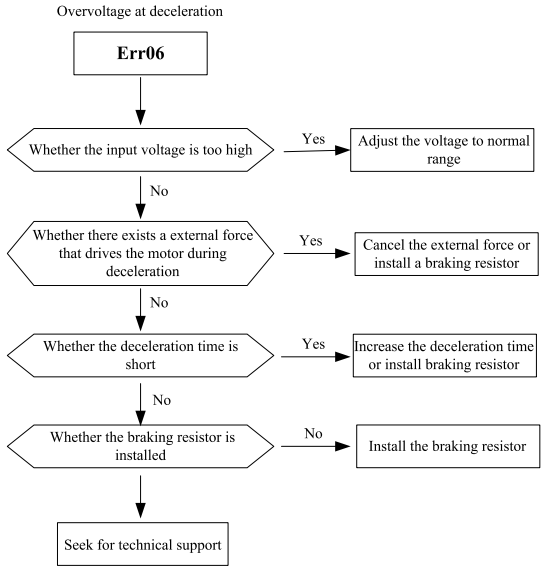

Figure 7-5 Overvoltage at deceleration (Err06)

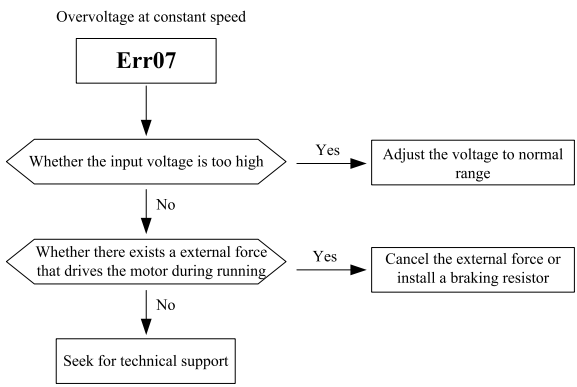

Figure 7-6 Overvoltage at constant speed (Err07)

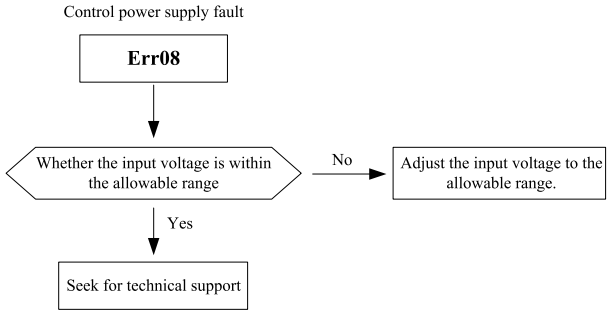

Figure 7-7 Control power supply fault (Err08)

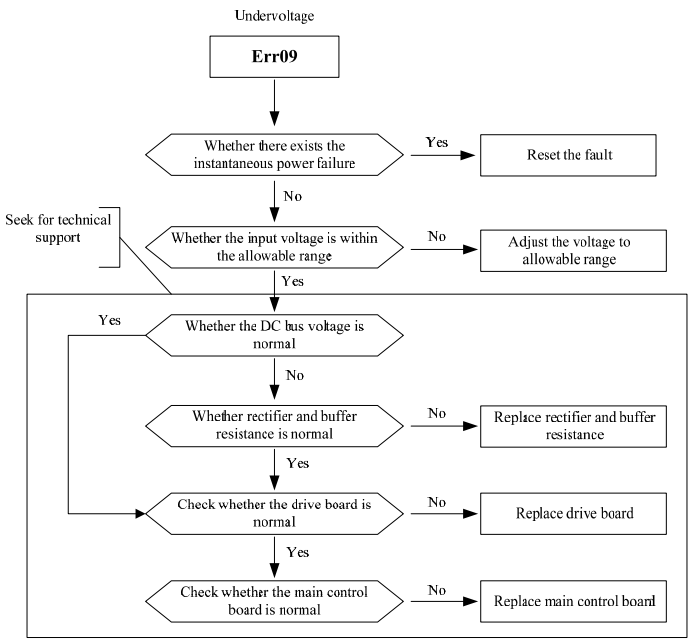

Figure 7-8 Undervoltage (Err09)

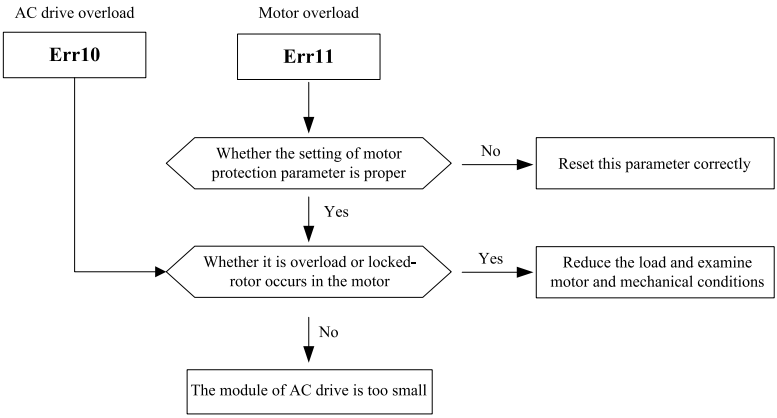

Figure 7-9 AC drive overload / Motor overload (Err10/Err11)

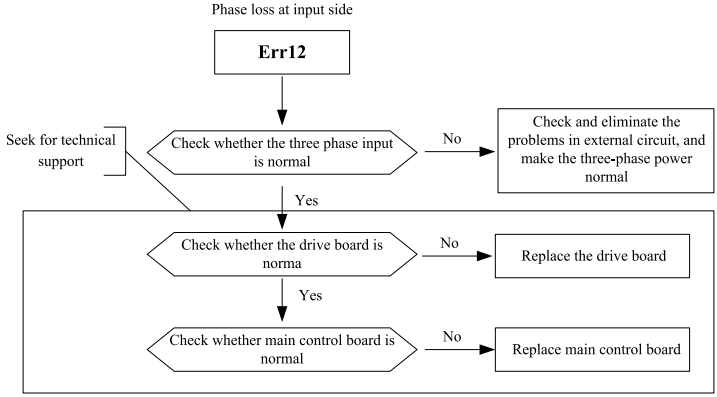

Figure 7-10 Phase loss at input side (Err12)

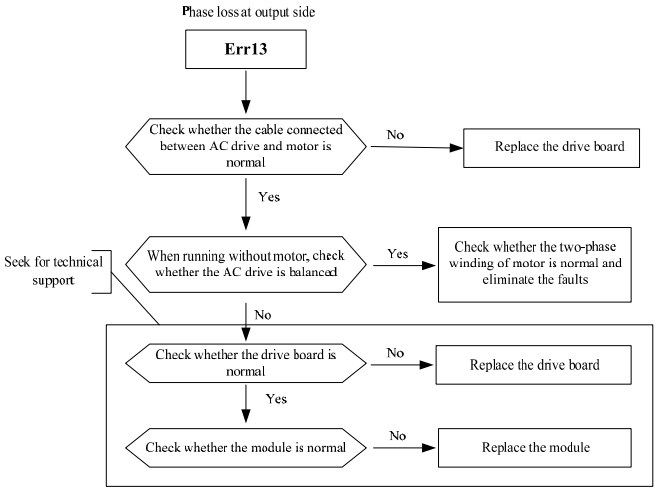

Figure 7-11 Phase loss at output side (Err13)

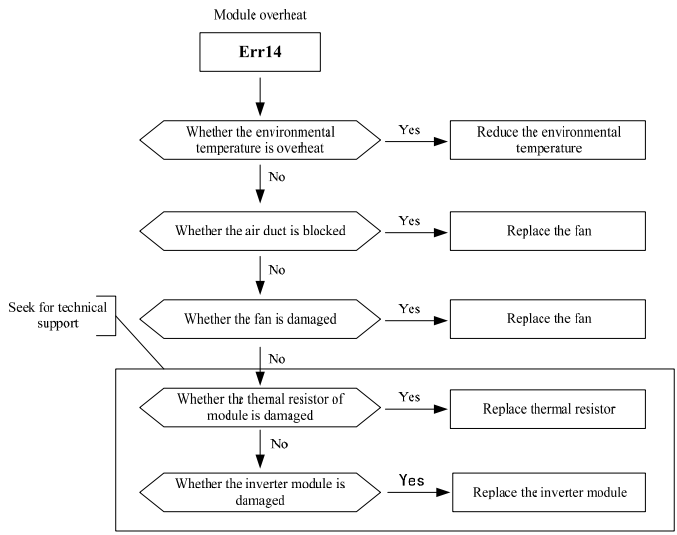

Figure 7-12 Module overheat (Err14)

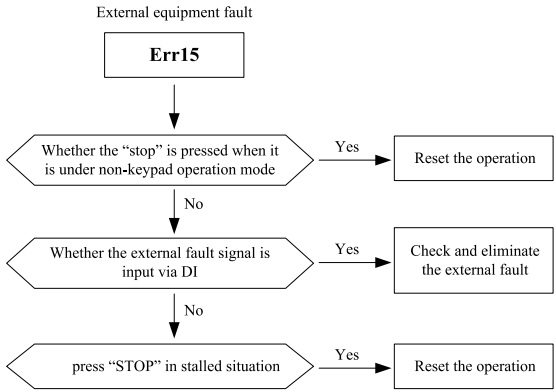

Figure 7-13 External cquipment fault (Err15)

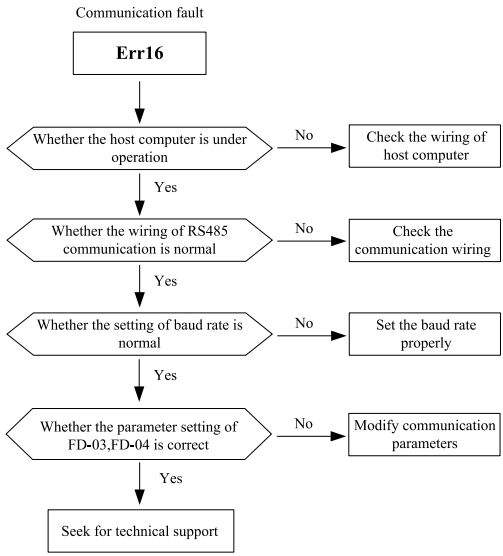

Figure 7-14 Communication fault (Err16)

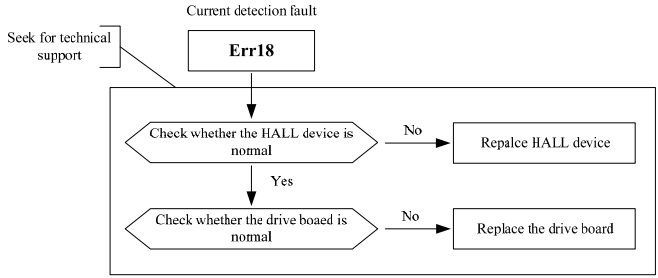

Figure 7-15 Current detection fault (Err18)

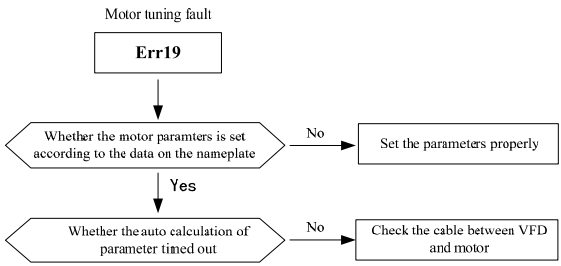

Figure 7-16 Motor tuning fault (Err19)

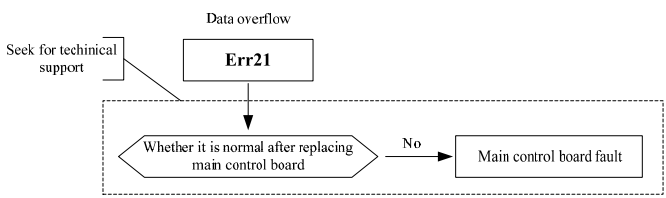

Figure 7-17 Data overflow (Err21)

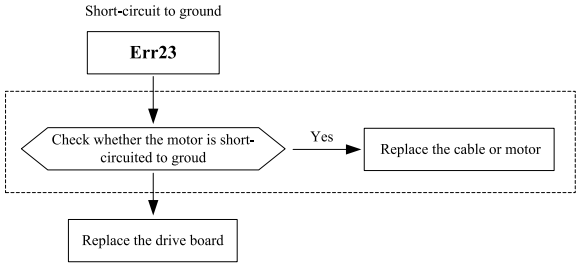

Figure 7-18 Short-circuit to ground (Err23)

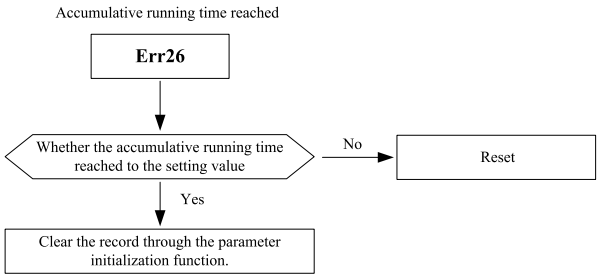

Figure 7-19 Accumulative running time reached (Err26)

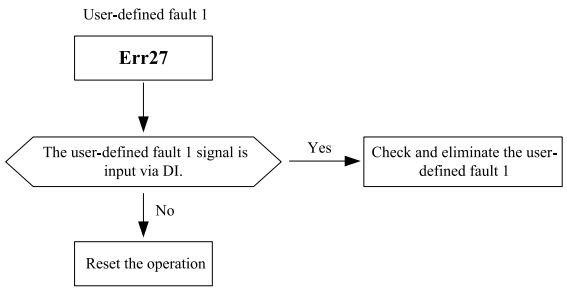

Figure 7-20 User-defined fault 1 (Err26)

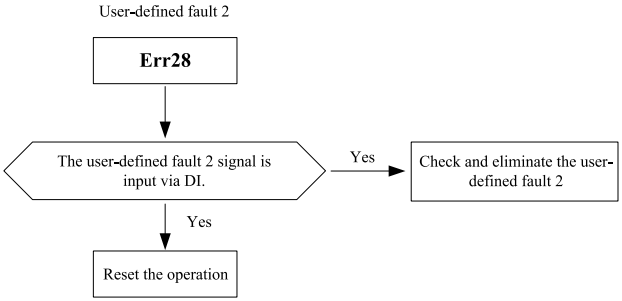

Figure 7-21 User-defined fault 2 (Err28)

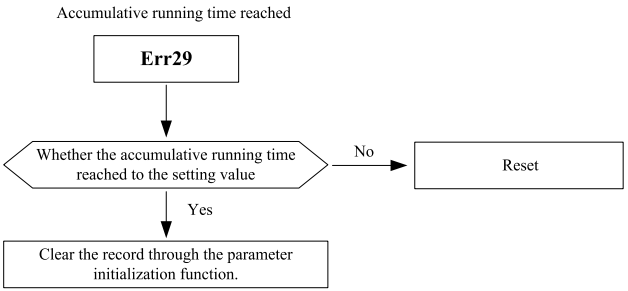

Figure 7-22 Accumulative running time reached (Err29)

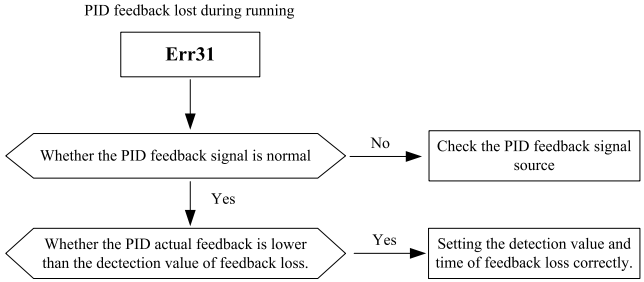

Figure 7-23 PID feedback lost during running (Err31)

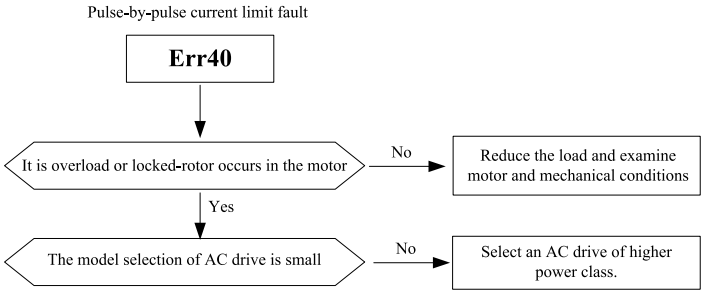

Figure 7-24 Pulse-by-pulse current limit fault (Err31)

7.2 Troubleshooting and Solution

The following faults may occur when using VFD, please conduct the simple fault analysis by referring to the following method:

No.	Fault Phenomenon	Possible reasons	Solutions
1	No display at power-on	The input power of VFD is not connected. The connection between 8-core wires on control board and the drive board is poor. Internal components in the VFD are damaged	Check input power. Pull and plug 8-core cable again. Seek for manufacturers services.
2	Display HC at power on	The connection between 4-core wire between control board and the drive board is poor. Other components in the VFD are damaged	Pull and plug the 4-core wire again Seek for manufacturers services
3	Display Err23 alarm at power on	The motor or the output line is short-circuited to ground. The AC drive is damaged.	Use tramegger to measure the insulation between the motor and output wire. Seek for manufacturers services
4	AC drive display normally at power-on；display HC and stop immediately after running	Fan is damaged or stalled	Replace the fan
5	Report ERR14 frequently(module overheat)	The setting of carrier frequency is too high. Fan is damaged and the air duct is blocked. The internal components of	Reduce the carrier frequency (F0.16). Replace the fan, clean up the air duct. Seek for manufacturers

No.	Fault Phenomenon	Possible reasons	Solutions
		VFD is damaged (thermal coupling or other)	services
6	Motor stop rotating after VFD operates	Motor damage or stalling. Incorrect parameter setting (primarily is motor parameters in F2 group)	Replace motor or clear mechanical failure. Check and reset F2 parameters
7	DI terminal is invalid	Parameter setting error. short-circuit sheet between OP and + 24V is loose. Control board fault.	Check and re-set the related parameters of F5 group . Rewiring. Manufacturers seek services.
8	When it is closed-loop vector control, the motor speed can not be improved.	Code disk is damaged or wrong connections. The internal components of VFD is damaged.	Replace the code disk, reconfirmed wiring. Seek for service.
9	The VFD frequently reports the fault of overcurrent and overvoltage	Motor parameter setting wrong. The acceleration and deceleration time is inappropriate. Load fluctuations.	Reset parameters of F2 group or conduct motor tuning. Set the appropriate acceleration and deceleration time. Seek for manufacturers services.

Appendix A -Selection of External Electrical Components

A.1 VM1000 External Electrical Connection Diagram

Table A-1 is the lists and instruction of various external electrical components.

Components Name	Installation	Instruction
Air switch	Front-end of input circuit	The power is disconnected when the downstream equipment is overcurrent.
Contactor	Between the open space and the input side of the AC drive	In VFD power-on or power-off operation, it should be avoided operating ON/OFF frequently (less than twice per minute) or starting operations through direct contact.
AC input reactor	Input side of AC drive	Improving the power factor at input side;effectively eliminating high harmonics at the input side; preventing from damaging other equipment incurred by voltage waveform distortion ; eliminating the imbalance of input current caused by the imbalance of power phase.
EMC input filter	Input side of AC drive	Reducing the external conduction and radiation interference incurred by VFD; Reducing the the drive conductive interference from power supply side to VFD and improving anti-interference capability of the AC drive.
DC reactor	DC reactor is external option,which is connected between “+ “and “P”(applicable for 30~110kw)	Improving the power factor at input side; improve the overall efficiency and thermal stability of AC drive. Effectively eliminate the influence caused by higher harmonic at input side and reduce the external conduction and radiation interference.

AC output reactor	Between the output side and the AC drive. To install close to the AC drive.	The output side of AC drive generally has more higher harmonics. When the distance between the motor and the drive is relative far, the line has a larger distributed capacitance. If harmonic resonance may occur in the loop,it will cause two influences: damage motor insulationand damage the motor if it last for a long time, it will damage the motor; generate a greater leakage current and cause frequent protection. Usually the distance between VFD and the motor is more than 100m. It is recommended to install output AC reactor.

Table A-1 VM1000 External Electrical Components

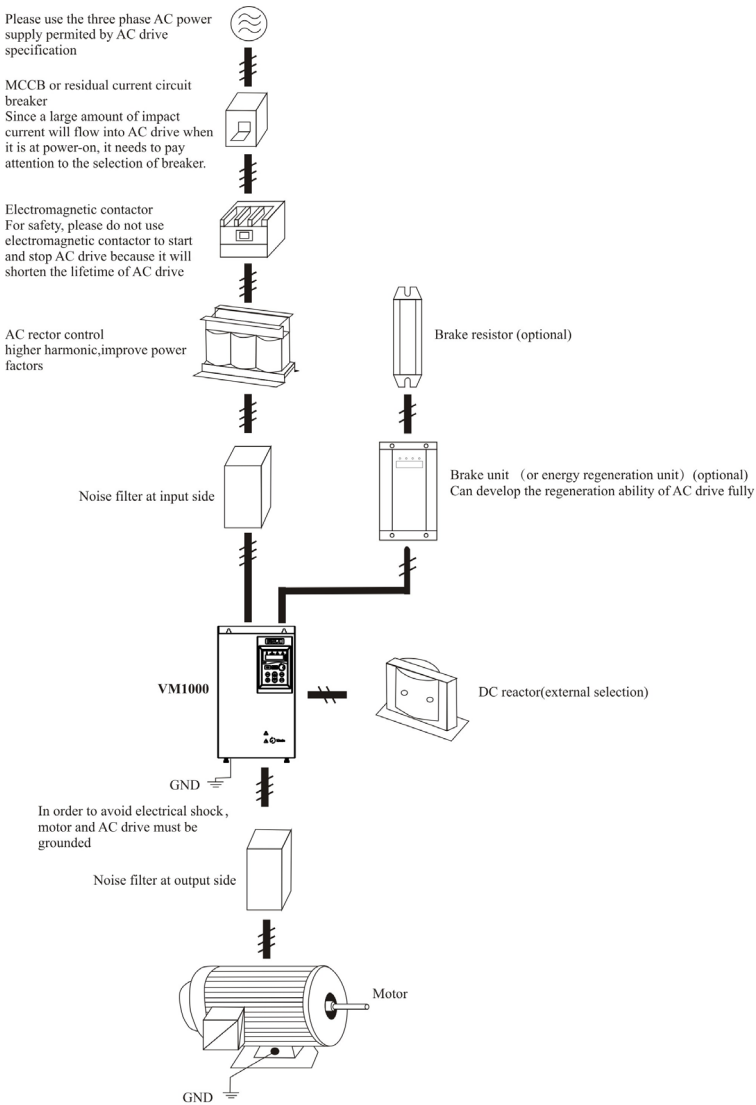

Figure A-1 VM1000 External Electrical Connection Diagram

A.2 Selection Guide of Braking Components

Table A-2 is the guide data. Users can select different resistance and power according to the actual situation, (but resistance must not be less than the value recommended in the table, while the power can be greater than the value recommended in the table.) The selection of braking resistor needs to be determined according to the the power of the motor in the actual application system. Also,this selection is related to the system inertia,the deceleration time, potential energy load. Users need to decide according to the real situation.The bigger the system inertia, the shorter the deceleration time. If the brake is more frequently,users need to select the higher power and smaller resistance.

The Selection of Resistance

When it is under braking, the braking resistor will consume almost all the regenerative energy of the motor .

According to the formula: U * U / R = Pb

Formula U ---- braking voltage of systematic stable brake

(Different systems adopt different brake voltage. For 380VAC,the systems typically adopt 700V)

Pb ---- braking power

Power Selection of Brake Resistor

Theoretically, the braking resistor power is consistent with braking power. Considering it derate to 70%.

According to the formula: 0.7 * Pr = Pb * D

Pr ---- resistor power

D ---- braking frequency (regeneration process accounts for the proportion of total working process)

Elevator ----- 20% to 30%

Uncoil and Coil ----20% to 30%

Centrifuge ------- 50% to 60%

Accidental braking load 5%

Generally adopt 10%

Model NO.	Recommended Power of Brake Resistor	Recommended Resistance of Brake Resistor	Brake Unit
VM1000-4T011GB	800W	≥43Ω	standard built-in
VM1000-4T015GB	1000W	≥32Ω	standard built-in
VM1000-4T18R5G	1300W	≥25Ω	standard built-in
VM1000-4T022G	1500W	≥22Ω	standard built-in
VM1000-4T030G	2500W	≥16Ω	external
VM1000-4T037G	4kW	≥12.6Ω	external
VM1000-4T045G	4.5kW	≥9.4Ω	external
VM1000-4T055G	5.5kW	≥9.4Ω	external
VM1000-4T075G	7.5kW	≥6.3Ω	external
VM1000-4T090G	4.5kW×2	≥9.4Ω×2	external
VM1000-4T110G	5.5kW×2	≥9.4Ω×2	external

Table A-2 Configuration Advice of Braking Components

Note：×2 indicates two brake units with brake resistors are used in parallel，×3 and other number can be concluded by analogy.

A.3 Selection of Air Switch,Contactor or Cable

Model NO.	Air Switch（MCCB）（A）	Recommended contactor （A）	Main Circuit Wire at input side	Main Circuit Wire at output side	Control Circuit Wire mm2
VM1000-4T011GB	63	40	4	4	1
VM1000-4T015GB	63	40	6	6	1
VM1000-4T18R5GB	100	63	6	6	1.5
VM1000-4T022GB	100	63	10	10	1.5
VM1000-4T030G	125	100	16	10	1.5
VM1000-4T037G	160	100	16	16	1.5
VM1000-4T045G	200	125	25	25	1.5
VM1000-4T055G	200	125	35	25	1.5
VM1000-4T075G	250	160	50	35	1.5
VM1000-4T090G	250	160	70	35	1.5
VM1000-4T110G	350	350	120	120	1.5

Table A-3 Distribution Supply and Cable selection

Appendix B-Manual Revision Record

Date of Issue (1)	Document Code	Item Number	Revision Content	Documentation
April 8th,2016	VM1000-C201602-4MB	Manual edition	V1.0 version	

Note(1): The date of issue will be subject to the time of archiving electronic documents or lauch date.

Guangzhou Sanjing Electric CO., LTD.

TEL: 400-159-0088 www.saj-electric.com

ADD: SAJ Innovation Park, No.9, Lizhishan Road, Science City,
Guangzhou High-tech Zone, Guangdong, P.R.China