Advanced®
CONTROL

User manual

Series M420

Contents

Preface.....3

Chapter1 safety and precautions.....6

1.1 Safety precautions.....6
1.2 Precautions.....8

Chapter 2 Product Information.....11

2.1 Designation Rules.....11
2.2 Nameplate.....错误！未定义书签。
2.3 Series of Inverter M420.....12
2.4 Technical Specifications.....13
2.5 Physical Appearance and Dimensions of Mounting Hole.....16
2.6 Optional Parts.....22
2.7 Routine Repair and Maintenance of inverter.....23
2.8 Instructions on Warranty of Inverter.....25
2.9 Guide to Model Selection.....25
2.10 Guide to Selection of Brake Components.....25

Chapter 3 Mechanical and Electrical Installation.....28

3.1 Mechanical Installation.....28
3.2 Electrical installation.....32

Chapter 4 Operation and Display.....46

4.1 Introduction to Operation and Display Interface.....46
4.2 Description of Function Code Viewing and Modification Methods.....48
4.3 Method of Viewing Status Parameters.....49
4.4 Password Setting.....50
4.5 Automatic Tuning of Motor Parameters.....51

Chapter 5 Parameter Description.....53

5.1 Group F0 Basic Function.....53
5.2 Group F1 start/stop control.....61
5.3 Group F2 V/F Control Parameters.....66
5.4 Group F3 Vector Control Parameters.....69
5.5 Group F4 Motor Parameters.....72
5.6 Group F5 Input Terminal.....74
5.7 Group F6 Output Terminal.....82
5.8 Group F7 Auxiliary function and Man-Machine Interface Function.....85
5.9 Group F8 Communication Parameter Description.....93
5.10 Group F9 Fault and Protection.....95
5.11 Group FA Process Control PID Function.....99
5.12 Group FB Swing Frequency.....102

5.13 Group FC MS Speed Function and Simple PLC Function..... 104
5.14 Group FD,FE (reserved)..... 109
5.15 Group FF Factory Parameter..... 109

Chapter6 EMC(Electromagnetic Compatibility） 110

6.1 Definition..... 110
6.2 Standard Description..... 110
6.3 EMC Guide..... 111

Chapter 7 Fault Diagnosis and Countermeasures.....114

7.1 Fault Alarm and Countermeasures..... 114
7.2 Common Fault and Resolution..... 126

Chapter 8 M420 Series Serial Port Communication Protocol..... 127

8.1 About Protocol..... 127
8.2 Application mode..... 127
8.3 Bus Structure..... 127
8.4 Protocol specification..... 128
8.5 Communication frame structure..... 128
8.6 Cyclical Redundancy Check..... 131
8.7 CMD and Status..... 132

Chapter 9 M420 Options.....135

9.1 DC Reactors..... 135
9.2 Output circuit filters..... 135
9.3 Ferrite ring reactors for reducing radio frequency noise..... 136
9.4 EMC-compliant filter..... 136
9.5 AC Reactor..... 136

Appendix:Function Parameter Table..... 135

Preface

Thank you for purchasing M420 series Flux Vector Control Inverter.

M420 series Inverter which is a new generation of modular can flexibly satisfy customers' individual requirements and industry demand by extension of design on the premise that meet general purpose of the customers , representing the tendency of applying in the future inverters industry.In meeting to the requirements of all kinds of complicated high precision transmission with all functions of built-in universal extended interface, power speed control, torque control ,practical process closed-loop control,simple PLC ,flexible I/O terminal, pulse frequency given ,frequency given channel and run command channel bundled,main auxiliary given control ,swing frequency control ,speed track ,encoder break monitoring, interior break unit ,28 species fault monitoring,more than 16 MS speed control,parameters copies ,etc, at the same time,it provides equipment manufacturer with an all in-one solution of high integration ,on reducing system cost and improving system reliability have a great value.

We offer two sub- modules for user as options ,that is,M420 functional module and High performance modulation magnetic flux vector control inverter functional module ,the modular design will represent the development of inverter in the future .There are different between the two modules shown in Table 1

Tab.1 Difference between M420 and High performance modulation magnetic flux vector control inverter functional modules

	High performance modulation magnetic flux vector control inverter	M420:General Magnetic Flux Vector Control Inverter
Input/Output Internal	6×DI bidirectionalinput，2×AI，2×DO （one high speed port FM ），1×AO ，1×Relay,(expandable)I/O	5×DI （ bidirectional input non-high speed ），2×AI，1×DO，1×AO，1×Relay
Control mode	open loop magnetic flux vector V/F close loop magnetic flux vector open loop torque close loop torque	open loop magnetic flux vector 1 open loop magnetic flux vector 2 V/F open loop torque

control motor	AC asynchronous motor AC permanent magnetic synchronous motor (simple servo motor function available)	AC asynchronous motor
expansion function of specialized industrial module	available	none
I/O expansion card	available	none
PG card	available	none
fixed-length control	available	none
communication function	Modbus(communication standard)Profibus DP(extended by the expansion card)	Modbus(485 communication standard)
switching function of two motor parameters	available	none

compared with traditional voltage vector control ,current vector control gains main advantages as follow :

1、start torque：0.5Hz,180% rated torque（open loop magnetic flux vector control ）;

2 、 Flux-weakening control algorithm,maximum can exceed 2 times the fundamental frequency operation of motor;

3、precise speed control accuracy:open loop magnetic flux vector control ≤±0.5%（rated sync-speed）,close loop magnetic flux vector control ≤±0.2%（rated sync-speed）;

4、more stable speed control stability:open loop magnetic flux vector control ≤±0.3（rated sync-speed,close open flux vector control≤±0.1%（rated sync-speed）;

5、faster torque response performance ≤40ms (open loop magnetic flux vector control)；≤20ms (close loop flux vector control)。

This manual is a guide to the operations of High performance modulation magnetic flux vector control inverter and M420 control module .Regarding the operation of High performance modulation magnetic flux vector control inverter control module ,please read it for details.

This manual provides the user with precautions and instructions concerning the prototyping ,installation,parameter setting,on-site commissioning ,fault diagnosis, routine repair and maintenance of inverter.Please read the instruction manual carefully before the proper use of M420 series Inverter ,and stay keeping it for the future use.The supporting equipment customers shall distribute this manual together with equipment to the final users .

Unpacking and Inspection

Please confirm carefully when unpacking the box:

1、If the model and inverter rated values on the nameplate are the same as your order.The box contains the equipment certificate of conformity ,user manual and warranty card

2、If the product is damaged during the transportation,please contact our company or the supplier immediately if there is any omission or damage.

Fist time use :

The users who use the product for fit time shall read this manual carefully .For any doubt about certain functions and performances,please contact the technical support personnel of our company for help so as to use the product properly.

The information our company provides are subject to change without additional notice due to the constant improvement of the inverter products .

CE

M420 series inverter is accordance with international standards ,and some products have passed in CE standards

IEC/EN61800-5-1:Safety Regulation on Commissionable Electric Drive System

IEC/EN61800-3:Commissional Electric Drive System ,Third Part :Electromagnetic Compatibility Standard and Specific Testing Method for the Products

Chapter1 safety and precautions

Safety definition:

In this manual, safety precautions are divided into two types below:

Danger arising due to improper operations may cause severe hurt or even death.

Danger arising due to improper operations may cause moderate hurt or light hurt or equipment damage.

1.1 Safety precautions

1.1.1 Before Installation:

1. Do not use the damaged inverter or inverter with missing parts. Otherwise, there may be risk of injury.
2. Use the motor with Class B or above insulation. Otherwise, there may be risk of electric shock.

1.1.2 During the Installation:

1. Mount the inverter on incombustible surface like metal, and keep away from famal substances. Otherwise it may cause fire.

2. When more than two inverters are to be installed in one cabinet, due attention shall be paid to the installation locations (refer to Chapter 3 Mechanical and Electrical Installation) to ensure the heat sinking effect.
3. Do not drop the lead wire stub or screw in the inverter. Otherwise it may damage the inverter.

1.1.3 During wiring:

1. Operation shall be performed by the professional engineering technician. Otherwise there will be danger of electric shock!
2. There shall be circuit breaker between the inverter and power supply. Otherwise, there may be free!
3. Make sure the power is disconnected prior to the connection.Otherwise there will be danger of electric shock!
4. The earth terminal shall be earthed reliably. Otherwise there may be danger of electric

shock.

Caution

5. cannot be input power line is connected to the output of the U, V, W. Otherwise the damage caused by frequency converter!
6. ensure line to meet safety standards EMC requirements and the region. The wire diameter please refer to the manual recommended. Otherwise, an accident may occur!
7. The brake resistance can not be directly connected to the DC bus (+), (-) terminals. Otherwise it may cause fire!

1.1.4 Before Power-on:

Danger

1. Please confirm whether the power voltage class is consistent with the rated voltage of the inverter and whether the I/O cable connecting positions are correct,and check whether the external circuit is short circuited and whether the connecting line is from.Otherwise it may damage the inverter.The cover must be well closed prior to the inverter power-on. Otherwise electric shock may be caused.
2. The cover must be well closed prior to the inverter power-on.Otherwise electric shock may be caused!

Caution

3. The inverter is free from dielectric test because this test is performed prior to the delivery. Otherwise accident may occur!
4. Whether all the external fittings are connected correctly in accordance with the circuit provided in this manual.Otherwise accident may occur!

1.1.5 Upon Power-on

Danger

1. Do not open the cover of the inverter upon power-on.Otherwise there will be danger of electric shock!
2. Do not touch the inverter and its surrounding circuit with wet hand.Otherwise there will be danger of electric shock!
3. Do not touch the inverter terminals(including control terminal).Otherwise there will be danger of electric shock!
4. At power-on,the inverter will perform the security check of the external heavy-current circuit automatically.Thus,at this time please do not touch the terminals U, V and W,or the terminals of motor,otherwise there will be danger of electric shock.

Caution

5. If parameter identification is required,due attention shall be paid to the danger of injury arising from the rotating motor.Otherwise accident may occur!
6. Do not change the factory settings at will. Otherwise it may damage the equipment!

1.1.6 During the operation:

Danger

1. Do not close to the machinery and equipment if select restart function. Otherwise,personal injury may be caused!
2. Do not touch the fan or discharge resistor to sense the temperature.Otherwise,you may get burnt!
3. Detection of signals during the operation shall only be conducted by qualified technician. Otherwise, personal injury or equipment damage may be caused!

⚠ Caution

4. During the operation of the inverter, keep items from falling into the equipment.Otherwise, it may damage the equipment!
5. Do not start and shut down the inverter by connecting and disconnecting the contactor. Otherwise, it may damage the equipment!

1.1.7 During Repair

⚠ Danger

1. Do not repair and maintain the equipment with power connection.Otherwise there will be danger of electric shock!

2. be sure to conduct repair and maintenance after the charge LED indictor of the inverter is OFF. Otherwise, the residual charge on the capacitor may cause personal injury!

3. The inverter shall be repaired and maintained only by the qualified person who has received professional training.Otherwise,it may cause personal injury or equipment damage!

1.2 Precautions

1.2.1 Motor Insulation Inspection

When the motor is used for the first time,or when the motor is reused after being kept,or when periodical inspection is performed, it shall conduct motor insulation inspection so as to avoid damaging the inverter because of the insulation failure of the motor windings.The motor wires must be disconnected from the inverter during the insulation inspection.It is recommended to use the 500V megameter, and the insulating resistance measured shall be at least 5MΩ.

1.2.2 Thermal Protection of the Motor

If the ratings of the motor does not match those of the inverter,especially when the rated power of the inverter is higher than the rated power of the motor, the relevant motor protection parameters in the in the inverter shall be adjusted, or thermal relay shall be mounted to protect the motor.

1.2.3 Running with Frequency higher than Standard Frequency

This inverter can provide output frequency of 0Hz to 400Hz. If the user needs to run the inverter with frequency of more than 50Hz, please take the resistant pressure of the mechanical

devices into consideration.

1.2.4 Vibration of Mechanical Device

The inverter may encounter the mechanical resonance point at certain output frequencies,which can be avoided by setting the skip frequency parameters in the inverter.

1.2.5 Motor Heat and Noise

Since the output voltage of inverter is PWM wave and contains certain harmonics, the temperature rise, noise and vibration of the motor will be higher than those when it runs at standard frequency.

1.2.6 Voltage-sensitive Device or Capacitor Improving Power Factor at the Output Side

Since the inverter output is PWM wave,if the capacitor for improving the power factor or voltage-sensitive resistor for lightning protection is mounted at the output side,it is easy to cause instantaneous over current in the inverter,which may damage the inverter.It is recommended that such devices not be used.

1.2.7 Switching Devices like Contactors Used at the Input and Output terminal

If a contactor is installed between the power supply and the input terminal of the inverter, it is not allowed to use the contactor to control the startup/stop of the inverter. If use of such contactor is unavoidable,it shall be used with interval of at least one hour. Frequent charge and discharge will reduce the service life of the capacitor inside the inverter.If switching devices like contactor are installed between the output end of the inverter and the motor, it shall ensure that the on/off operation is conducted when the inverter has no output.Otherwise the modules in the inverter may be damaged.

1.2.8 Use under voltage rather than rated voltage

If the M420 series inverter is used outside the allowable working voltage range as specified in this manual, it is easy to damage the devices in the inverter.

When necessary, use the corresponding step-up or step-down instruments to change the voltage.

1.2.9 Change Three-phase Input to Two-phase Input

It is not allowed to change the M420 series three-phase inverter into two-phase one.Otherwise, it may cause fault or damage to the inverter.

1.2.10 Lightning Impulse Protection

The series inverter has lightning over current protection device, and has certain self-protection capacity against the lightning.In applications where lightning occurs frequently, the user shall install additional protection devices at the front-end of the inverter.

1.2.11 Altitude and Derating

In areas with altitude of more than 1,000 meters, the heat sinking effect of the inverter may turn poorer due to rare air.Therefore, it needs to derate the inverter for use. Please contact our company for technical consulting in case of such condition.

1.2.12 Certain Special Use

If the user needs to use the inverter with the methods other than the recommended wiring diagram in this manual, such as shared DC bus, please consult our company.

1.2.13 Note of Inverter Disposal

The electrolytic capacitors on the main circuit and the PCB may explode when they are burnt. Emission of toxic gas may be generated when the plastic parts are burnt.Please dispose the inverter as industrial wastes.

1.2.14 Adaptable Motor

1) The standard adaptable motor is four-pole squirrel-cage asynchronous induction motor. If such motor is not available, be sure to select adaptable motors in according to the rated current of the motor.In applications where drive permanent magnetic synchronous motor is required, please consult our company;

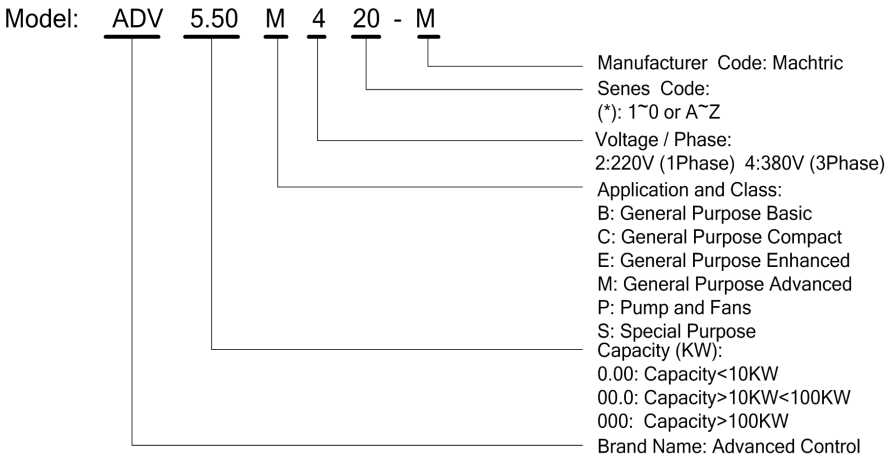
2) The cooling fan and the rotor shaft of the non-variable-frequency motor adopt coaxial connection.When the rotating speed is reduced,the cooling effect will be poorer.Therefore,a powerful exhaust fan shall be installed,or the motor shall be replaced with variable-frequency motor to avoid the over heat of the motor.

3) Since the inverter has built-in standard parameters of the adaptable motors,it is necessary to perform motor parameter identification or modify the default values so as to comply with the actual values as much as possible,or it may affect the running effect and protection performance;

4) The short circuit of the cable or motor may cause alarm or explosion of the inverter.Therefore, please conduct insulation and short circuit test on the newly installed motor and cable.Such test shall also be conducted during routine maintenance. Please note that the inverter and the test part shall be completely disconnected during the test.

Chapter 2 Product Information

2.1 Designation Rules



Nameplate:

Fig.2-2 Nameplate

2.2 Series of Inverter M420

Tab.2-1 M420 Inverter Model and Technical Data

Inverter model	Input voltage(V)	Input current（A）	Output current（A）	Adaptable Motor（kW）
ADV 1.50 M420-M	Three Phase 380V Range: -15% to 20%	5.0/3.4	3.8/2.1	1.5/0.75
ADV 2.20 M420-M		5.8/5.0	5.1/3.8	2.2/1.5
ADV 4.00 M420-M		10.5/5.8	9.0/5.1	4.0/2.2
ADV 5.50 M420-M		14.6/10.5	13.0/9.0	5.5/4.0
ADV 7.50 M420-M		20.5/14.6	17.0/13.0	7.5/5.5
ADV 11.0 M420-M		26.0/22.0	25.0/20.0	11.0/9.0
ADV 15.0 M420-M		35.0/26.0	32.0/25.0	15.0/11.0
ADV 18.5 M420-M		38.5/35.0	37.0/32.0	18.5/15.0
ADV 22.0 M420-M		46.5/38.5	45.0/37.0	22.0/18.5
ADV 30.0 M420-M		62.0/46.5	60.0/45.0	30.0/22.0
ADV 37.0 M420-M		76.0/62.0	75.0/60.0	37.0/30.0
ADV 45.0 M420-M		92.0/76.0	90.0/75.0	45.0/37.0
ADV 55.0 M420-M		113.0/92.0	110.0/90.0	55.0/45.0
ADV 75.0 M420-M		157.0/113.0	152.0/110.0	75.0/55.0
ADV 90.0 M420-M		180.0/157.0	176.0/152.0	93.0/75.0
ADV 110 M420-M	Three Phase 380V Range: -15% to 20%	214.0/180.0	210.0/176.0	110.0/93.0
ADV 132 M420-M		256.0/214.0	253.0/210.0	132.0/110.0
ADV 160 M420-M		307.0/256.0	304.0/253.0	160.0/132.0
ADV 185 M420-M		345.0/307.0	340.0/304.0	185.0/160.0
ADV 200 M420-M		385.0/345.0	380.0/340.0	200.0/185.0
ADV 220 M420-M		430.0/385.0	426.0/380.0	220.0/200.0
ADV 250 M420-M		468.0/430.0	465.0/426.0	250.0/220.0
ADV 280 M420-M		525.0/468.0	520.0/465.0	280.0/250.0

ADV 315 M420-M		590.0/525.0	585.0/520.0	315.0/280.0
ADV 355 M420-M		665.0/590.0	650.0/585.0	355.0/315.0
ADV 400 M420-M		785.0/665.0	725.0/650.0	400.0/355.0
ADV 450 M420-M		883.0/785.0	820.0/725.0	450.0/400.0

2.3 Technical Specifications

Tab.2-2 M420 Inverter Technical Specifications

Item		Specifications
Basic function	Maximum frequency	400Hz
	Carrier Frequency	1k to 15kHz; the carrier frequency will be automatically adjusted according to the load characteristics.
	Input frequency resolution	Digital setting: 0.01Hz Analog setting: maximum frequency ×0.1%
	Control mode	V/F control Vector flux control 1 Vector flux control 2
	Startup torque	for general purpose: 0.5Hz/180% for pump application: 0.5Hz/120%
	Speed adjustment range	1：200（Open loop Vector flux control）
	Speed stabilization precision	Open loop Vector flux control：≤±0.5%
	Speed stabilization precision	Open loop Vector flux control：≤±0.3%
	Torque response	≤40ms(Open magnetic flux vector control)
	Overload capacity	For general purpose: 150% rated current 60s; 180% rated current 3s For pump application: 130% rated current 60s; 150% rated current 3s
	Torque hoist	Automatic torque hoist; manual torque hoist 0.1% to 30.0%
	V/F curve	Linear V/F, Multi-point V/F, and Square V/F

Item		Specifications
	Speed-up and Speed-down curve	Straight line or S curve speed-up and speed-down mode;Two kinds of speed-up and speed-down time;Speed-up and speed-down time ranges between 0.0s to 3000.0min.
	DC brake	DC brake frequency:0.00Hz to maximum frequency; brake time:0.0s to 36.0s,and brake current value: 0.0% to 100.0%.
	Jog control	Jog frequency range:0.00Hz to 50.00Hz;jog speed-up/speed-down time: 0.0s to 3000.0s.
	Simple PLC and MS speed running	It can realize a maximum of 16 segments speed running via the built-in PLC or control terminal.
	Built-in PID	It is easy to realize process-controlled close loop control system.
	（AVR）Auto voltage regulation	It can keep constant output voltage automatically in case of change of mains voltage.
	Torque limit and control	"Shovel" characteristics, the runtime automatic torque limit, prevent frequent over-current trip; closed loop vector model can realize the torque control
Individua-lized function	Peripherals self-detection upon power-on	It can conduct safety detections on the peripherals upon power-on, including earth and short circuit detections.
	Shared DC bus function	It can realize the function that multiple inverters share the DC bus.
	JOG key	Programmable key: Select the command channel switching/forward and reverse rotations/jog operation.
	Textile swing frequency control	Multiple triangular-wave frequency control function.
	CBC Function	Built-CBC algorithm to reduce the probability of over-current converter reported to improve the whole anti-jamming capacity.
	Timing control	Timing control function: Setting time range between 0h to 65535h.
	Keyboard extension line standard	Customers can use standard cable extension the keyboard
Run	Running command channel	Three types of channels:operation panel reference,control terminal reference and serial communication port reference. These channels can be switched in various modes.

Item		Specifications
	Frequency source	There are totally ten types of frequency sources, such as digital reference, analog voltage reference, analog current reference, MS speed, PLC, PID, and serial port reference.
	Auxiliary frequency source	There are ten types of auxiliary frequency sources.It can implement micro tuning and synthesis of auxiliary frequency.
	Input terminal	There are five digital input terminals.It can be compatible with active PNP or NPN input mode. There are two analog input terminals,one of which can be used only as voltage input,while the other can be used as voltage or current input. (It can expand one voltage input terminal)
	Output terminal	One digital output terminal Two relays output terminal One analog output terminal,with optional 0/4mA to 20mA or 0/2V to 10V. It can realize the output of such physical parameters as setting frequency and output frequency.
Display and Keyboard Operation	LED display	The machine has the LED keyboard,and realize parameter settings,status monitoring function.
	LCD display	Optional, / English prompts content
	Parameter Copy	Keyboard can be copied using the parameters to achieve the rapid replication parameter.
	Key lock and function selection	The realization of key part or all of the lock, define the scope of the keys, to prevent mis-operation

Others	Protection function	It can implement power-on motor short-circuit detection, input/output phase loss protection, over current protection, over voltage protection, under voltage protection, overheating protection and overload protection.
	Accessories	LCD Operation Panel、Brake Unit.
environment	Using place	Indoor, and be free from direct sunlight, dust, corrosive gas, combustible gas, oil smoke, vapor, drip or salt.
	Altitude	1000m, derated when above 1000m
	Ambient temperature	-10 ℃ Celsius to +40 ℃ Celsius (Derated when used in the ambient temperature of 40 ℃ Celsius to 50 ℃ Celsius)
	Humidity	Less than 95%RH, without condensing
	Vibration	Less than 5.9 m/s2(0.6g)
	Storage temperature	-20 Celsius to +60 Celsius
	Class of pollution	2
Products Standard	Product implementation of safety standards	IEC61800-5-1:2007
	Implementation of EMC standard	IEC61800-5-1:2007

2.4 Physical Appearance and Dimensions of Mounting Hole

2.4.1 Product Appearance

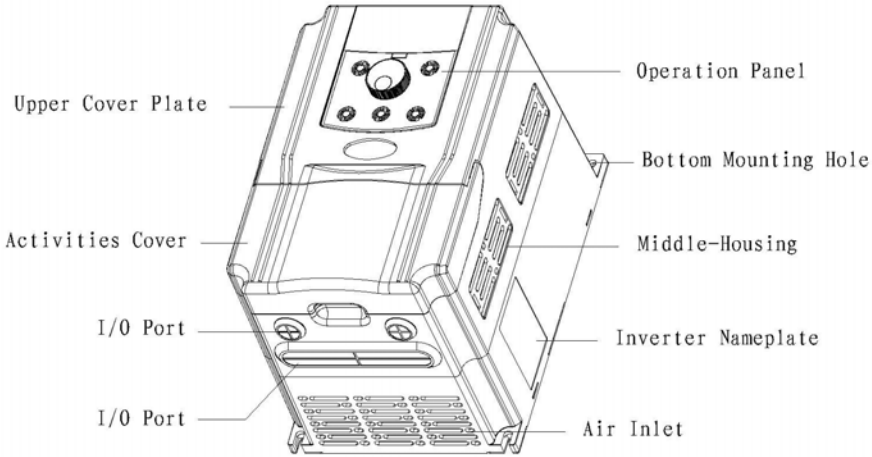


Fig.2-3 Physical Appearance of Inverter

2.4.2 Mounting Hole Dimensions

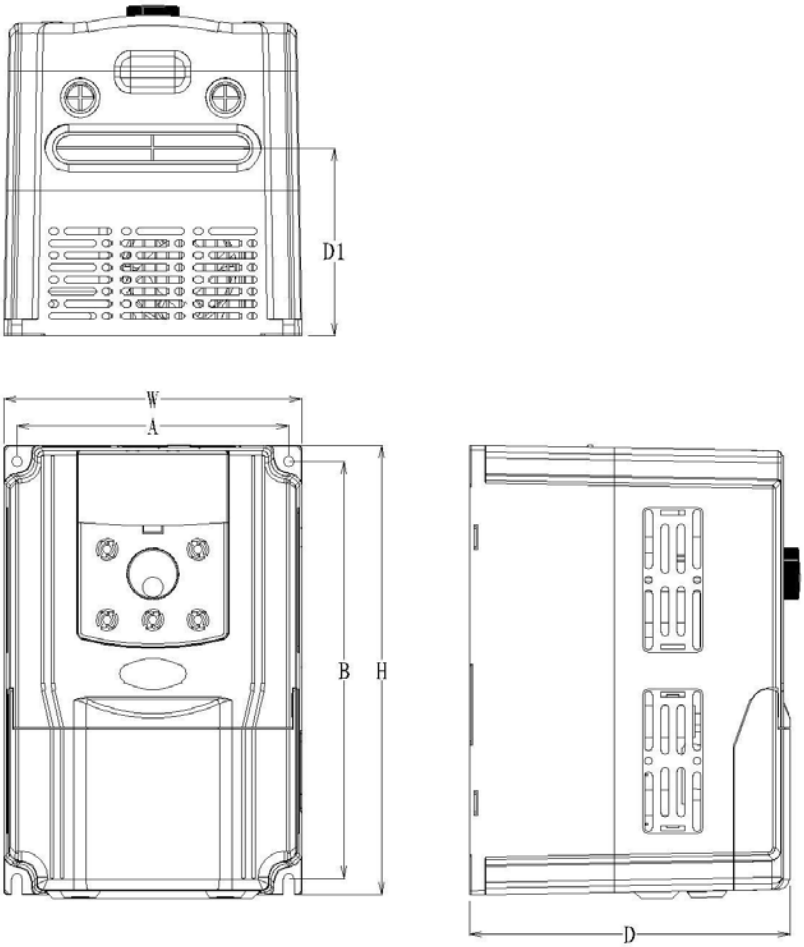


Fig.2-4 Schematic Diagram for Physical Dimensions and Mounting Dimensions

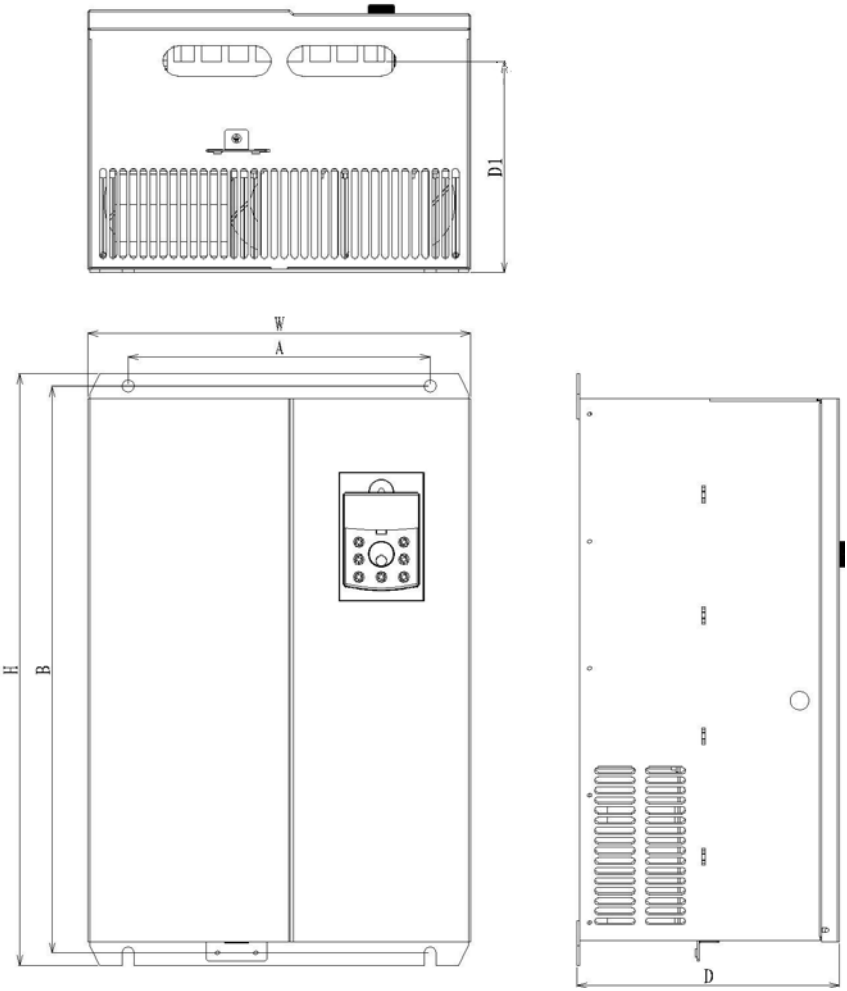


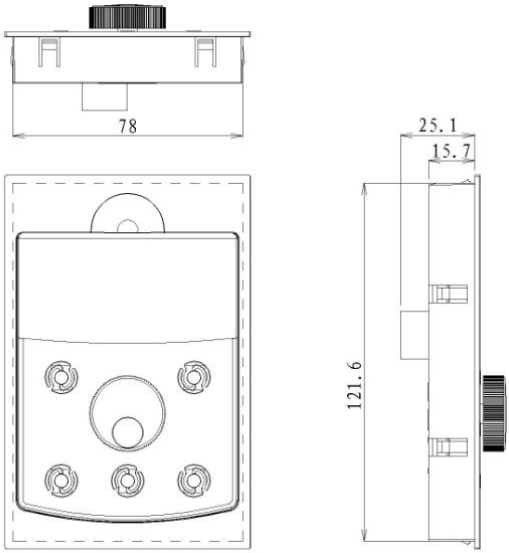
Figure 2-5 sheet metal converter dimension and installation size diagram

Tab. 2-3 Mounting Hole Dimensions of M420 Series Inverter（mm）

Model	Mounting Hole		Physical Dimension			Diameter of Mounting Hole (mm)
	A (mm)	B (mm)	H (mm)	W (mm)	D (mm)	
ADV 1.50 M420-M	135	207	223	148	159	Φ 5.4
ADV 2.20 M420-M						
ADV 4.00 M420-M						
ADV 5.50 M420-M						
ADV 7.50 M420-M	150	226	238	162	165	Φ 5.4
ADV 11.0 M420-M	160	326	340	222	194	Φ 7
ADV 15.0 M420-M						
ADV 18.5 M420-M						
ADV 22.0 M420-M	200	460	485	260	230	Φ 10
ADV 30.0 M420-M						
ADV 37.0 M420-M						
ADV 45.0 M420-M	220	545	565	330	252	Φ 10
ADV 55.0 M420-M						
ADV 75.0 M420-M	300	563	588	380	266	Φ 12
ADV 90.0 M420-M	320	635	660	460	290	Φ 12
ADV 110 M420-M						
ADV 132 M420-M	340	845	875	475	305	Φ 12
ADV 160 M420-M						
ADV 185 M420-M	380	1066	1100	520	355	Φ 12
ADV 200 M420-M						
ADV 185 M420-M(cabinet)	370	855	890	520	355	Φ 12
ADV 200 M420-M(cabinet)						
ADV 220 M420-M	500	1320	1360	700	380	Φ 14

ADV 250 M420-M	500	1320	1360	700	380	φ14
ADV 280 M420-M						
ADV 315 M420-M						
ADV 355 M420-M	750	1300	1350	900	455	ϕ16
ADV 400 M420-M						
ADV 450 M420-M						

2.4.2 **) Physical Dimensions of External Keyboard 2) Mounting Hole Dimensions of External Keyboard**



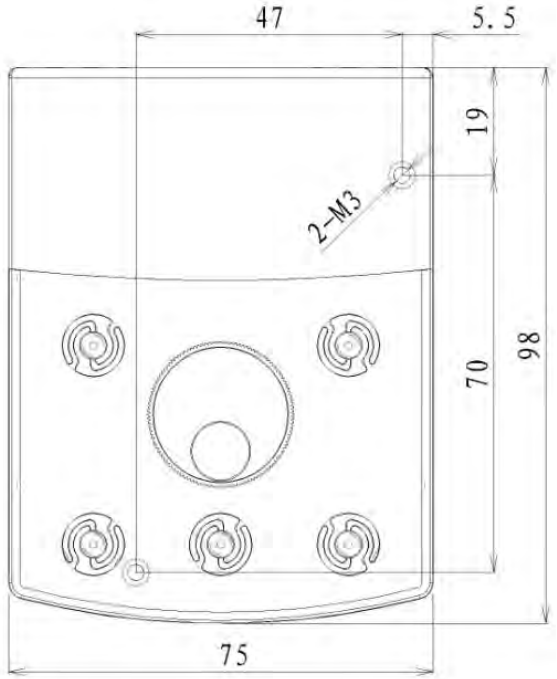


Fig.2-5 Schematic diagram of the keyboard and hole size

2.5 Optional Parts

If the user needs such optional parts, please specify when placing the order.

Tab.2-5 M420 Inverters Optional Parts

Name	Model	Function	Remarks
Built-in brake unit	The letter “ B” attached behind the product model	Braking	Built-in as standard
External LED operating panel	M420-LED	External LED display and keyboard	M series universal The RJ45 interface
External LCD operating panel	M420 -LCD	External LCD display and keyboard	The RJ45 interface
Parameter copy k eyboard	M420 -LED2	The copy function keyboard with parameters	M series universal RJ45 interface
Extension cable	M420 -CAB	Standard 8 core cable, can and M420-LED, M4 20-LCD, M420-LED2 connection	For the 1 meters, 3 meters, 5 meters, 10 meters, 4 kinds of specifications
If you need other function module extensions (such as: I/O card, PG card, EPS card and so on), please use theCM580 series inverter, specifying the order function module card when ordering.			

2.6 Routine Repair and Maintenance of inverter

2.7.1 Routine Repair

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

Routine inspection Items include:

1) Whether there is any abnormal change in the running sound of the motor;
2) Whether the motor has vibration during the running;
3) Whether there is any change to the installation environment of the inverter;
4) Whether the inverter cooling fan works normally;
5) Whether the inverter has over temperature;

Routine cleaning:

The inverter shall be kept clean all the time.

The dust on the surface of the inverter shall be effectively removed,so as to prevent the dust

entering the inverter.Especially the metal dust is not allowed.
The oil stain on the inverter cooling fan shall be effectively removed.

2.7.2 Periodic Inspection

Please perform periodic inspection on the places where the inspection is a difficult thing.
Periodic inspection Items include:

1) Check and clean the air duct periodically;
2) Check if the screws are loosened;
3) Check if the inverter is corroded;
4) Check if the wire connector has arc signs;
5) Main circuit insulation test;

Remainder: When using the megameter (DC 500V megameter recommended) to measure the insulating resistance,the main circuit shall be disconnected with the inverter.Do not use the insulating resistance meter to control the insulation of the circuit. It is not necessary to conduct the high voltage test (which has been completed upon delivery).

2.7.3 Replacement of Vulnerable Parts for Inverter

The vulnerable parts of the inverter include cooling fan and filter electrolytic capacitor, whose life depends on the operating environment and maintenance status. Common service life:

Part name	Life time
Fan	2 to 3 years
Electrolytic capacitor	4 to 5 years

The user can determine the term for replacement according to the running time.

1) Cooling fan

Possible causes for damage: bearing wearing and blade aging.

Criteria:Whether there is crack on the blade and whether there is abnormal vibration noise upon startup.

2) Possible causes for damage of filter electrolytic capacitor: Poor input source quality, high ambient temperature, frequent load jumping and burning electrolyte.

Criteria: Whether there is liquid leakage, whether the safe valve has projected, measure the static capacitance, and measure the insulating resistance.

2.7.4 Storage of Inverter

Attention shall be paid to the following points for the temporary and long-term storage of the inverter:

1) Place the inverter back into the packing box following the original package;
2) Long-term storage will degrade the electrolytic capacitor. The product shall be powered up once every 2 years, and the power-up time shall be no less than 5 hours. The input voltage

shall be increased slowly to the rated value with the regulator.

2.7 Instructions on Warranty of Inverter

Free warranty only applies to the inverter itself.

1、Our company will provide 18-month warranty (starting from the leave-factory date as indicated on the barcode) for the fault or damage under normal use conditions.If the equipment has been used for over 18 months, reasonable repair expenses will be charged.

2、Reasonable repair expenses will be charged for the following situations within 18 months:

1) The equipment is damaged because the user fails to comply with the requirements of the user's manual;

2) Damage caused by fire, flood and abnormal voltage;

3) Damage caused when the inverter is used for abnormal function.

The service expenses will be calculated according to the standard of the manufacturer.If there is any agreement, the agreement shall prevail.

2.8 Guide to Model Selection

When selecting inverter, firstly make clear the details regarding the technical requirements for variable frequency speed adjustment of the system, applications of inverter and load characteristics and take into overall consideration the adaptable motor, output voltage, rated output and other factors, and then select the model meeting your requirements and determine the running mode.

The basic principle is that the rated load current of the motor cannot exceed the rated current of the inverter. Generally, the model is selected in accordance with the capacity of the supporting motor as specified in the user's manual, with attention to the comparison of rated currents between

the motor and the inverter. The overload capacity of the inverter makes sense only for the startup and brake processes. If instantaneous overload occurs in the running process, the load speed will vary. If there are higher requirements for the speed precision, please consider a larger one.

2.9 Guide to Selection of Brake Components

Tab.2-5 Selection of Inverter Brake Components

Inverter Model	Recommended Power of Brake Resistor	Recommended Resistance of Brake Resistor	Brake Unit	
ADV 1.50 M420-M	0.3KW	≥300Ω	Built-in as standard	
ADV 2.20 M420-M	0.3KW	≥300Ω		
ADV 4.00 M420-M	0.3KW	≥300Ω		
ADV 5.50 M420-M	0.6KW	≥130Ω		
ADV 7.50 M420-M	1.0KW	≥100Ω		
ADV 11.0 M420-M	1.5KW	≥60Ω	Built-in as standard	
ADV 15.0 M420-M	1.5KW	≥60Ω		
ADV 18.5 M420-M	2KW	≥40Ω		
ADV 22.0 M420-M	2KW	≥40Ω	Built-in as optional	
ADV 30.0 M420-M	2KW	≥40Ω		
ADV 37.0 M420-M	4KW	≥24Ω		

ADV 45.0 M420-M	6KW	≥13.6Ω	Externally connected	BR530-4T075
ADV 75.0 M420-M	6KW	≥13.6Ω		
ADV 90.0 M420-M	6KW	≥13.6Ω		
ADV 110 M420-M	12KW	≥6.8Ω		BR530-4T132
ADV 132 M420-M	12KW	≥6.8Ω		
ADV 160 M420-M	12KW	≥6.8Ω		
ADV 185 M420-M	12KW	≥2*6.8Ω		BR530-4T315
ADV 200 M420-M	12KW	≥2*6.8Ω		
ADV 220 M420-M	12KW	≥2*6.8Ω		
ADV 250 M420-M	12KW	≥2*6.8Ω		
ADV 280 M420-M	12KW	≥2*6.8Ω		
ADV 315 M420-M	12KW	≥2*6.8Ω		
ADV 355 M420-M	12KW	≥2*6.8Ω		BR530-4T450
ADV 400 M420-M	12KW	≥2*6.8Ω		
ADV 450 M420-M	12KW	≥2*6.8Ω		

Caution: ×2 refers to two braking units paralleled with their respective brake resistor; the meaning of ×3 is the same with ×2.

Chapter 3 Mechanical and Electrical Installation

3.1 Mechanical Installation

3.1.1 Installation environment:

1) Ambient temperature: The ambient temperature exerts great influences on the service life of the inverter and is not allowed to exceed the allowable temperature range (-10 ℃ Celsius to 50 ℃ Celsius).

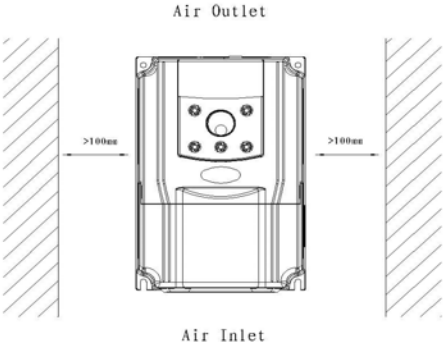
2) The inverter shall be mounted on the surface of incombustible articles, with sufficient spaces nearby for heat sinking. The inverter is easy to generate large amount of heat during the operation. The inverter shall be mounted vertically on the base with screws.

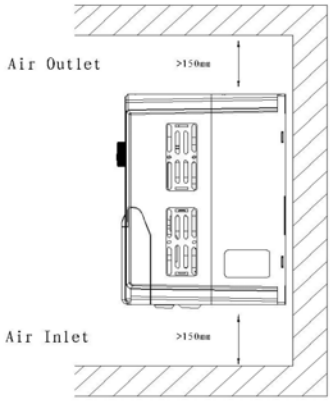
3) The inverter shall be mounted in the place without vibration or with vibration of less than 0.6G, and shall be kept away from such equipment as punching machine.

4) The inverter shall be mounted in locations free from direct sunlight,high humidity and condensate.

5) The inverter shall be mounted in locations free from corrosive gas,explosive gas or combustible gas.

6) The inverter shall be mounted in locations free from oil dirt, dust, and metal powder.





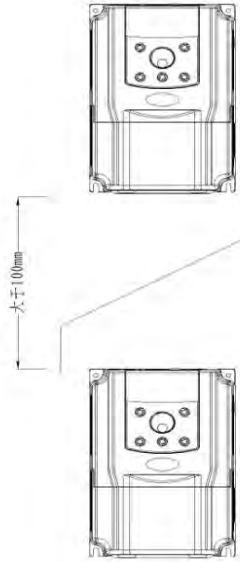


Fig.3-1 M420 Inverter Installation Diagram

3.1.2 Heat sinking shall be taken into account during the installation.Attention shall be paid to the following items:

1) Install the inverter vertically so that the heat may be expelled from the top.However, the equipment cannot be installed upside down. If there are multiple inverters in the cabinet, parallel installation is better. In the applications where up-down installation is required, please install the thermal insulating guide plate referring to the schematic diagrams for standalone installation and up-down installation.

2) The mounting space shall be as indicated as the above diagrams, so as to ensure the heat sinking space of the inverter. However, the heat sinking of other devices in the cabinet shall also be considered.

3) The installation bracket must be made of flame retardant materials.

4) In the applications where there are metal powders, it is recommended to install the radiator outside the cabinet.In this case,the space inside the sealed cabinet shall be large as much as possible.

3.1.3 Under cover remove and installation

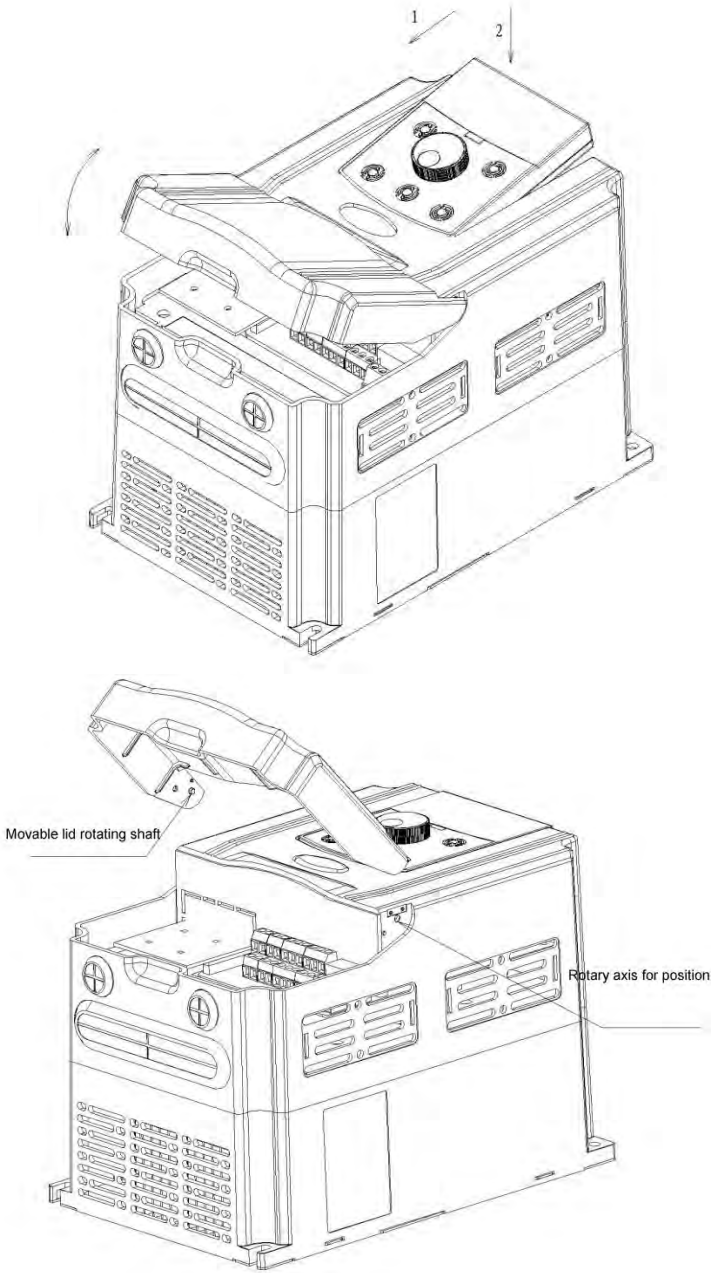


Figure 3-2 plastic shell cover plate removing diagram

9kW CM series inverter adopts sheet metal shell, metal shell cover removing see figure 3-3. Available tools directly turn the screw loose can cover.
Under the cover plate removing, avoid under cover off of equipment and personal injury!

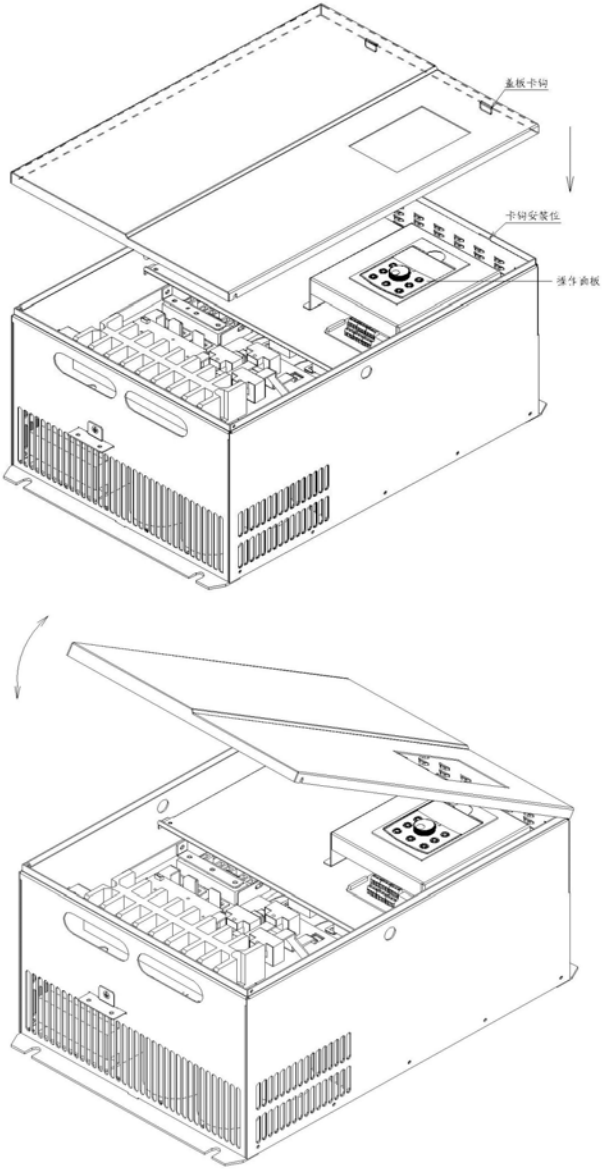


Figure 3-3 sheet metal shell cover plate removing diagram

3.2 Electrical installation

3.2.1 Guide to the selection of peripheral electrical parts

Tab.3-1 Guide to the Selection of Peripheral Electrical Parts of M420 Inverter

Inverter Model	Circuit Breaker (MCCB) (A)	Recommended Contactor (A)	Recommended Input Side Main Circuit Wire (mm²)	Recommended Output Side Main Circuit Wire (mm²)	Recommended Control Circuit Wire (mm²)	PE Wire（mm²）
ADV 1.50 M420-M	10	10	2.5	2.5	1.5	2.5
ADV 2.20 M420-M	16	10	2.5	2.5	1.5	2.5
ADV 4.00 M420-M	16	10	2.5	2.5	1.5	2.5
ADV 5.50 M420-M	25	16	4	4	1.5	4
ADV 7.50 M420-M	32	25	4	4	1.5	4
ADV 11.0 M420-M	40	32	6	6	1.5	6
ADV 15.0 M420-M	50	40	6	6	1.5	6
ADV 18.5 M420-M	50	40	6	6	1.5	6
ADV 22.0 M420-M	63	63	10	10	1.5	10
ADV 30.0 M420-M	80	63	16	16	1.5	16
ADV 37.0 M420-M	100	100	16	16	1.5	16
ADV 45.0 M420-M	125	100	25	25	1.5	25

ADV 55.0 M420-M	160	125	25	25	1.5	25
ADV 75.0 M420-M	180	125	35	35	1.5	25
ADV 90.0 M420-M	200	160	50	50	1.5	25
ADV 110 M420-M	225	160	70	70	1.5	25
ADV 132 M420-M	250	350	120	120	1.5	25
ADV 160 M420-M	315	400	150	150	1.5	25
ADV 185 M420-M	350	400	185	185	1.5	25
ADV 200 M420-M	400	600	150*2	150*2	1.5	25
ADV 220 M420-M	500	600	150*2	150*2	1.5	35
ADV 250 M420-M	630	600	185*2	185*2	1.5	35
ADV 280 M420-M	630	630	185*2	185*2	1.5	35
ADV 315 M420-M	800	800	185*2	185*2	1.5	35
ADV 355 M420-M	800	800	150*3	150*3	1.5	35
ADV 400 M420-M	1000	1000	150*4	150*4	1.5	35
ADV 450 M420-M	1000	1000	150*4	150*4	1.5	35

3.2.2 Use instruction of peripheral electric parts:

Tab.3-1 Guide to the Use Instruction of Peripheral Electric Parts of M420 Inverter

Part Name	Installation Location	Function Description
Circuit breaker	The front-end of the input circuit	Disconnect the power supply in case of downstream equipment is over current.
Contactor	Between the circuit breaker and the inverter input side	Power-on and power-off of the inverter.Frequent power-on/power-off operation on the inverter shall be avoided.
AC input reactor	Input side of the inverter	1.Improve the power factor of the input side. 2.Eliminate the high order harmonics of the input side effectively, and prevent other equipment from damaging due to voltage waveform deformation. 3.Eliminate the input current unbalance due to the unbalance among the phase of input.
EMC input filter	Input side of the inverter	1) Reduce the external conduction and radiation interference of the inverter; 2) Reduce the conduction interference flowing from the power end to the inverter, thus improving the anti-interference capacity of the inverter.
AC output reactor	Between the inverter output side and the motor, close to the inverter	The inverter output side generally has higher harmonic.When the motor is far from the inverter, since there are many capacitors in the circuit, certain harmonics will cause resonance in the circuit and bring in the following results: 1） Degrade the motor insulation performance and damage the motor for the long run. 2) Generate large leakage current and cause frequent inverter protection action. 3) In general, if the distance between the inverter and the motor exceeds 100 meters, output AC reactor shall be installed.

3.2.3 Wiring mode

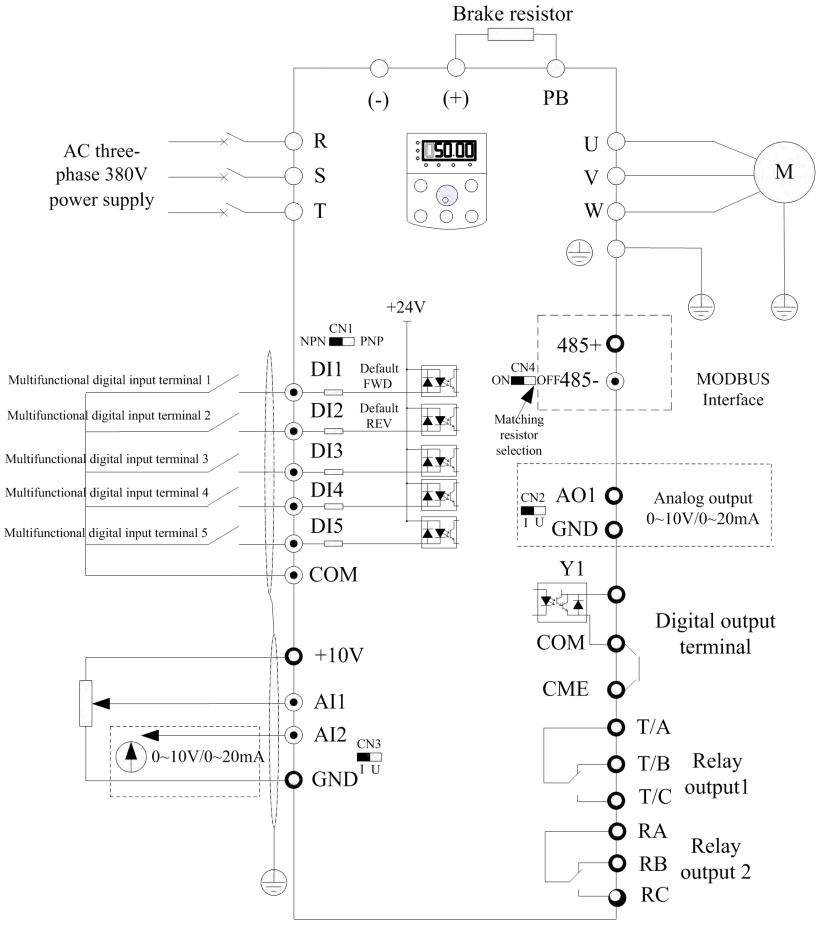


Fig3-4.Inverters of 37KW follow Fig

Note: this figure for ADV 1.50 M420-M ~ ADV 37 M420-M(22 ~ 37KW series inverter braking unit part of the matching function, if there is demand, when ordering please specify)

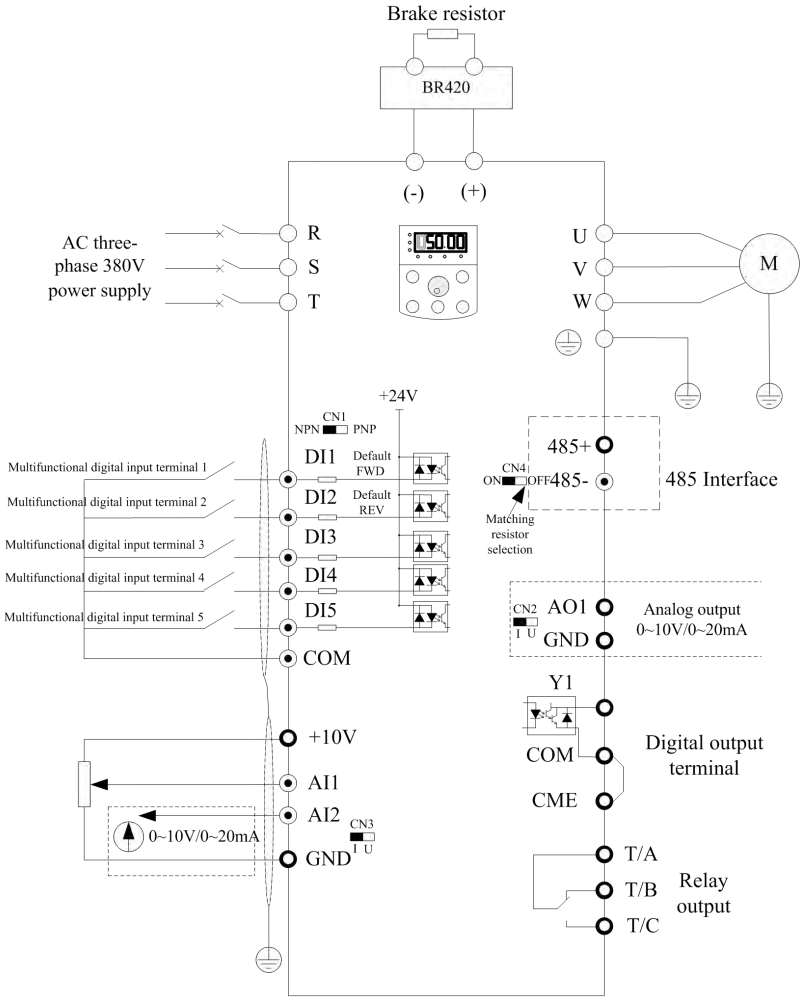


Fig.3-5 Inverters of 45Kw and the more

Note: 22Kw ~ 37Kw if you choose no built-in brake unit connection as shown in Figure 3-5

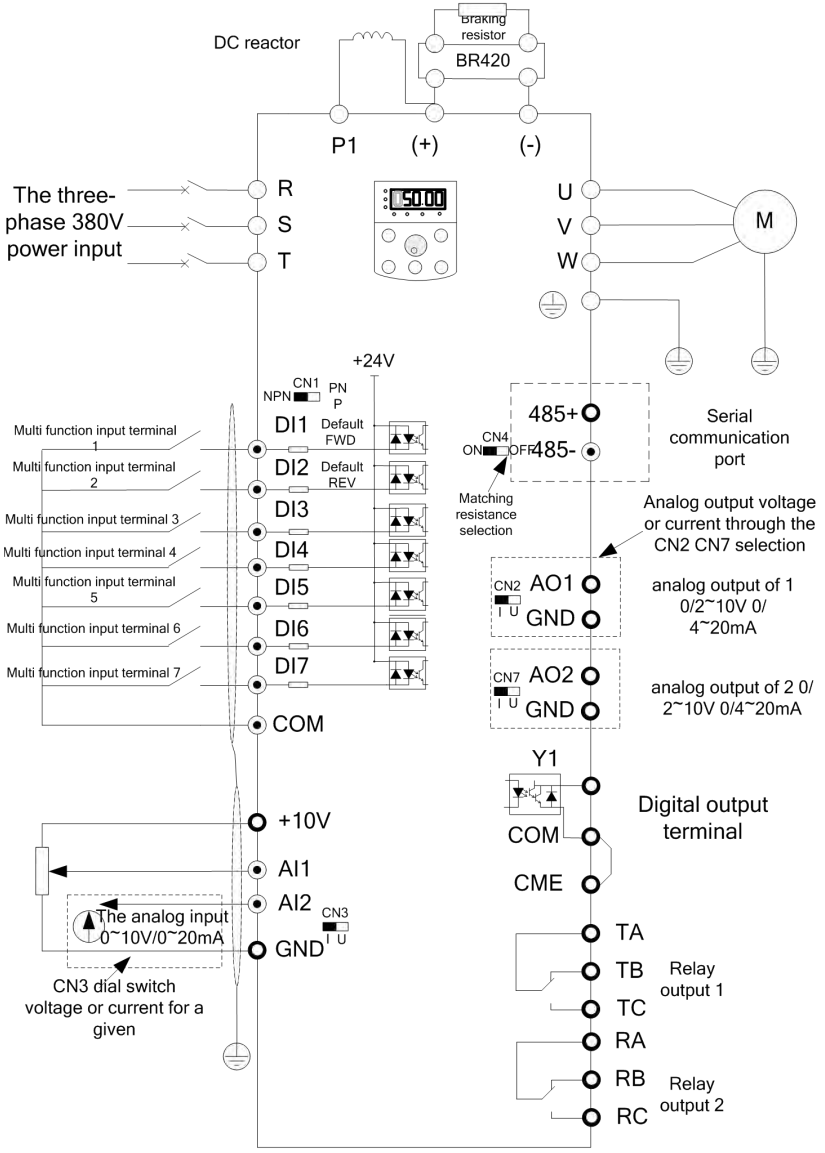


Figure 3-6 90Kw and above three phase inverter

3.2.4 Main Circuit Terminals and Wiring

Danger

1. Make sure that the wiring operation shall be carried out only when the power supply switch is in OFF position, or there may be risk of electric shock..
2. Only the professional technicians who have received training can perform wiring, or it may cause injuries to the equipment and human body.
3. It shall be grounded reliably, or there may be risk of electric shock or fire accident.

Caution

1. Make sure that the input power supply and the rated value of the inverter shall be consistent, or it may damage the inverter.
2. Make sure that the motor is compatible with the inverter,or the motor may be damaged or inverter protection may be caused.
3. Do not connect the power supply to the U, V, W terminals, or it may damage the inverter.
4. Do not connect the brake resistor to the DC bus terminals (+) and (-) directly, or there may be fire accident.

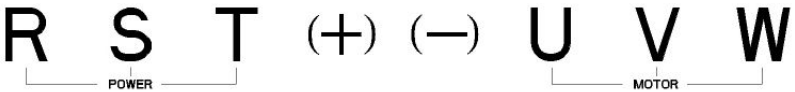
3.2.4.1 Description of main circuit terminals of single-phase inverter:

Terminals	Name	Description
L1、L2	Single-phase power input terminal	Connect to the AC single-phase 220V power supply
(+)、(-)	Negative and positive terminals of DC bus	Shared DC bus input point
(+)、PB	Connecting terminal of braking resistor	Connect to the braking resistor
U、V、W	Output terminal of inverter	Connect to the three-phase motor
⏚	Grounding terminal	Grounding terminal

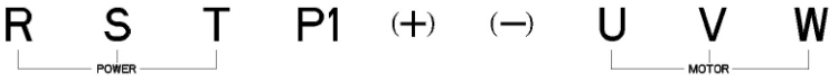
3.2.4.2 Description of main circuit terminals of three-phase inverter:

The three-phase 11kW main circuit terminal identification

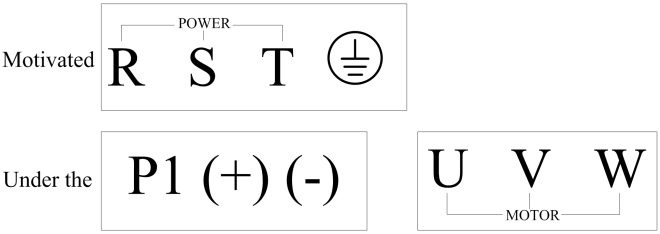
Three-phase 15 ~ 18.5kW main circuit terminal identification



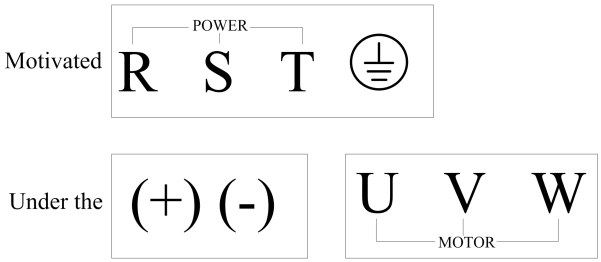
Three-phase 22 ~ 75kW main circuit terminal identification(safety grounding terminals in the main circuit is a prominent position)



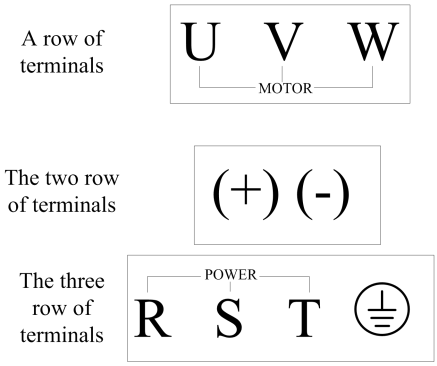
Three-phase 75 ~ 93kW main circuit terminal identification(safety grounding terminals in the main circuit is a prominent position)



Three-phase 132 ~ 160kW main circuit terminal identification



Three-phase 185 ~ 315kW main circuit terminal identification(160KW above the built-in DC reactor)



Three-phase 350 ~ 450kW main circuit terminal identification

Terminals	Name	Description
R、S、T	Three-phase power input terminal	Connect to the AC three-phase 380V power supply
(+)、(-)	Negative and positive terminals of DC bus	Shared DC bus input point (Connect to the external brake unit above 45KW)
(+)、PB	Connecting terminal for brake resistor.	Connection points for the brake unit of of below 45KW
U、V、W	Output terminal of inverter	Connect to three-phase motor
⏚	Grounding terminal	Grounding terminal

3.2.4.3 Wiring Precautions

a) Input power supply terminals L1, L2, R, S or T:

There is no sequence requirement for the wiring at the Input side of the inverter.

b) DC bus (+) and (-) terminals:

The DC bus (+) and (-) terminals still have residual voltage at the time of power-off. Do not touch the equipment until the charge LED is OFF and the voltage measured with multimeter is less than 36V.

When selecting external brake components for the inverter of above 37kW,note that the connecting polarity must be correct, or the inverter may be damaged and even fire accident may occur.

The wire length of the brake unit shall not be longer than 10 meters.Twisted wires or pair wires shall be used and connected in parallel.

Do not connect the braking resistor directly to the DC bus,otherwise, the inverter may be damaged, and fire may be caused.

c) Connecting terminals (+) and PB of brake resistor:

The connecting terminals of the brake resistor are enabled only for the inverter of below ADV 45.0 M420-M with built-in brake unit.

The recommended wiring distance for the brake resistor shall be less than 5m.Otherwise, the inverter may be damaged.

Connecting terminals P and (+) of external reactor:

When assembling the inverter of above 90kw with external reactor, it needs to remove the connector between terminals of P and (+) and connect the reactor between them instead.

d) Inverter output sides U, V and W:

The inverter output side cannot connect to the capacitor or surge absorber, otherwise, the frequent inverter protection may be caus ed, or the inverter may be damaged.

If the wire between the motor and the inverter is too long, electrical resonance may be caused due to the influence of the distributed capacitance, thus damaging the motor insulation or produce large leakage current to trigger inverter over current protection. When the length of the motor cable is longer than 100 meters, AC output reactor shall be installed.

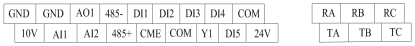
e) Grounding terminal ⏚:

The terminal must be grounded reliably, and the resistance of the ground wire must be less than 0.1Ω. Otherwise, fault may be caused, or the inverter may be damaged.

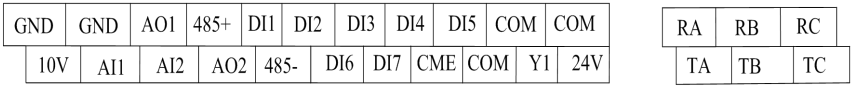
Do not share the grounding terminal ⏚ and terminal N of zero line of the power supply.

3.2.5 Control Terminals and Wiring

3.2.5.1 The terminals of the control circuit are arranged as shown in the following diagram:



Three phase 380V 37KW control terminal diagram



three phase 380V 45KW above control terminal diagram

3.2.5.2 Function Description of Control Terminal

Tab.3-3 Function Description of M420 Inverter Control Terminal

Type	Terminal	Terminal Name	Function Description
Power supply	+10V-GND	External terminal of 10V power supply	Provide +10V power supply for external units, with maximum output current of 10mA. It is generally used as the operating power supply for the external potentiometer. The potentiometer resistance range is 1kΩ to 5kΩ.

Type	Terminal	Terminal Name	Function Description
	24V-COM	External terminal of 24V power supply	Provide +24V power supply for external units. It is generally used as the operating power supply for digital input/output terminal and the external sensor. Maximum output current: 200mA
Analog input	AI1-GND	Analog input terminal 1	1、Input voltage range: DC 0V to 10V (can be customized as non-standard -10VDC to +10VDC) 2、Input impedance: 20kΩ
	AI2-GND	Analog input terminal 2	1、Input voltage range: DC 0V to 10V (can be customized as non-standard -10VDC to +10VDC)/0mA to 20mA, the selection of which depends on Key Cn3 on the control panel. 2、Input impedance: 20kΩ at the time of voltage input;500Ω at the time of current input.
Digital Input	DI1-COM	Digital Input 1	1, optical coupling isolation, compatible with bipolar input,through the DI dial switch, the factory for NPN mode 2,Input impedance: 3.3k 3, level input voltage range: 9 ~ 30V (DI6 DI7 terminal function only for three-phase 380V 45KW above
	DI2-COM	Digital Input 2	
	DI3-COM	Digital Input 3	
	DI4-COM	Digital Input 4	
	DI5-COM	Digital Input 5	
	DI6-COM	Digital Input 6	
	DI7-COM	Digital Input 7	
Analog output	AO1-GND	Analog Output 1	The voltage or current output is determined by Key Cn3 on the control panel. Output voltage range: 0V to 10V Output current range: 0mA to 20mA (AO2 terminal function only for three-phase 380V45KW above)
	AO2-GND	Analog Output 2	
Digital Output	Y1-CME	Digital output 1	Optical coupling isolation,dual polarity open collector output Output voltage range: 0V to 24V Output current range: 0mA to 50mA

Type	Terminal	Terminal Name	Function Description
Communication interface	485+ -485-	The Modbus communication interface	The Modbus communication interface, can dial switch CN4 to choose whether or not to require communication matching resistor. For a Profibus communication function, select the CM580 series inverter, and chooses the Profibus DP card.

Relay output	T/A-T/B	Normally closed terminal	Contact driving capacity: AC250V,3A,COS ϕ=0.4 DC 30V，1A
	T/A-T/C	Normally open terminal	
Relay output 2	RA-RB	The normally closed terminal	Contact driving ability: AC250V，3A，COS ϕ=0.4。 DC30V，1A
	RA-RC	Normally open terminal	
Keyboard extension interface	CN6	External keyboard interface	External keyboard, keyboard interface parameter copy, remove the biaxial crystal head, you can use standard network extension.

3.2.5.3 Description of Connection of control terminals:

A. Analog input terminal:

Since the weak analog voltage signal is easy to suffer external interferences, it needs to employ shielded cable generally and the length shall be no longer than 20 meters, as shown in Fig. 3-5. In case the analog signal is subject to severe interference, and analog signal source side shall be installed with filter capacitor or ferrite magnetic core.

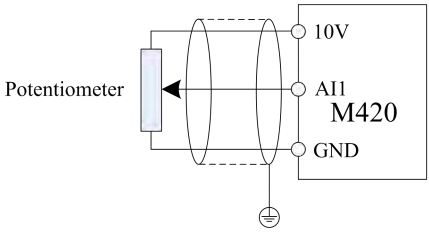


Fig.3-7 Schematic Diagram for Connection of Input Terminal of Analog Signal

B. Digital input terminal:

It needs to employ shielded cable generally, with cable length of no more than 20 meters. When active driving is adopted, necessary filtering measures shall be taken to prevent the interference to the power supply.

It is recommended to use the contact control mode.

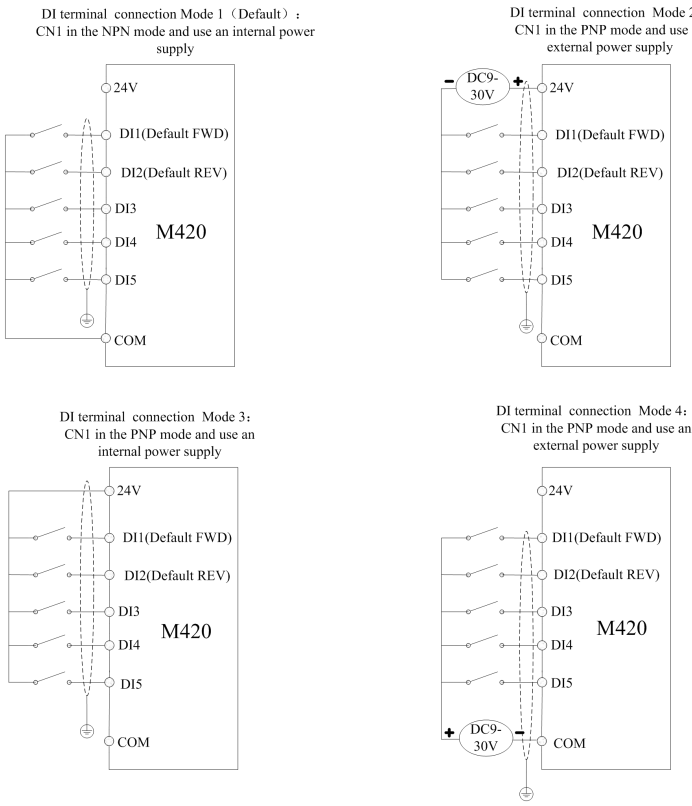


Fig 3-8 Four different wiring diagram

C. Digital output terminal:

When the digital output terminal needs the drive relay, absorption diode shall be installed at the two sides of the relay coil. Otherwise it may damage DC 24 power supply easily.

Caution:The absorption diode shall be installed with correct polarity,as shown in Fig.3-9. Otherwise,when there the digital output terminal has output,the DC 24V power supply and output circuit will be damaged immediately.

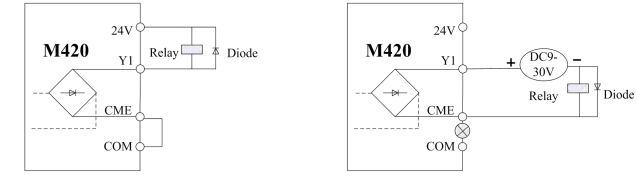


Fig.3-9 Schematic diagram for connection of digital output terminal

Chapter 4 Operation and Display

4.1 Introduction to Operation and Display Interface

Function parameter modification,inverter working status mini tore and inverter running control(start/stop) can be changed on operation panel.Refer to outline and function as shown in Table 4-1

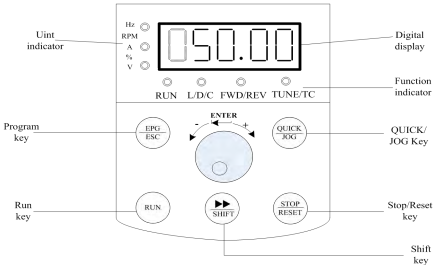
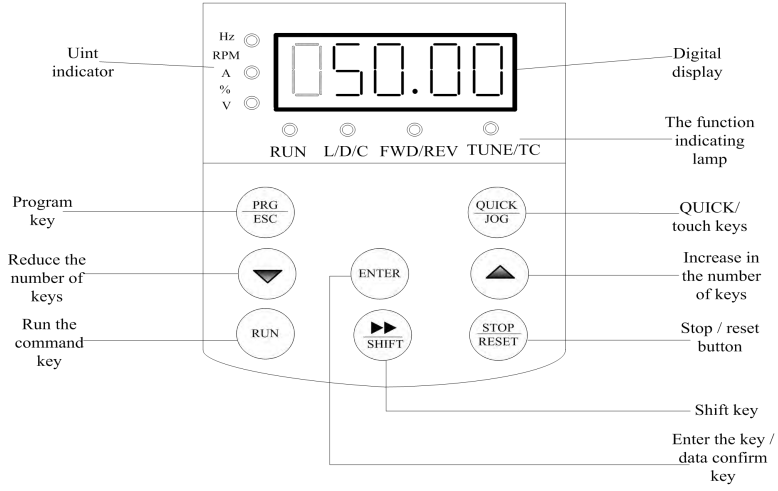


Figure 4-1 schematic diagram of operation panel 1 (standard LED keyboard



1)

Schematic diagram of operation panel 2 (with the LED keyboard 2, such as the need to choose the keyboard, to declare in order)

1 keyboard and keyboard 2 switching operation mode: while pressing the PRG key and wait for STOP to appear "----" release, switching success

4.1.1 Description of Function LED Indictor

LED Symbol	Unit	Implication	Colour

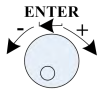
LED Symbol		Unit	Implication	Colour
Unit LED	Hz	Freq.Unit	LED on——indicates frequency	Green
	A	Current Unit	LED on——indicates current	Green
	V	Voltage Unit	LED on——indicates voltage	Green
	RPM	Speed Unit	LED on ——indicates speed	Green
	%	Percent	LED on——indicates percentage values	Green
Function LED	RUN	running status LED	LED on——in status of running for inverter Light off——in status of stop for inverter	Green
	L/D/C	control mode LED	LED off——in status of keyboard control mode for inverter LED on——in status of terminal control mode for inverter LED flash——in status of remoted communication control mode	Red
	FWD/REV	running direction LED	LED off——in status of forward rotation LED on——in status of reverse running	Red
	TUNE/TC	tuning/torque LED	LED on——in status of tuning Both LED and RUN LED are on——tuning	Red

4.1.2 Digital display zone:

Five digits LED display is able to show setup frequency ,output frequency ,various mini toring data and alarm code. According to function code F7-29/F7-30 ,the user can freely set the data in need ,all the details are shown as function code F7-29/F7-30

4.1.3 Key Button Description

Tab.4-1Keyboard function table

Button	Name	Function
PRG/ESC	Program/ Exit	entry or exit ,return to primary menu
	ENTER	entry into the menu interface ,confirm the setup parameters
	increase (+)	Increase in the data or function code
	decrease (-)	Decrease in the data or function code
》	shift key	select the displayed parameters in turn on the sto display interface and running display interface ,and select the modification digit of parameters when modifying parameters.
RUN	Run key	used in running operation under keyboard control mode
STOP/RESET	STOP/RESET	In the status of running ,pressing it can stop the running operation;in fault alarm ,can reset operation,this barton cara teristic is limited by the function code F7-02
QUICK/JOG	QUICK/JOG	F7-28 is to set 0 it indicates quick key, F7-28 is to set 1,it shows Jog key,then pressing this key shows in reverse

4.2 Description of Function Code Viewing and Modification Methods

The operation panel of the M420 inverter adopts there level menu structure to carry out operation such as parameter setting

The three-level menu includes function parameter set (level 1 menu) →Function code (level 2 menu) →Function code setup value (level 3). Refer to Fig.4-2 for the operation procedure.

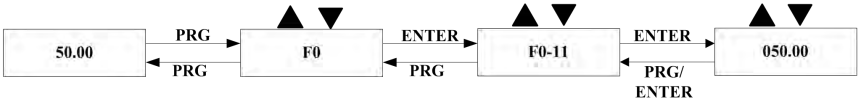


Fig .4-2 the operation procedure of three-level menu

Caution: when operation on level 3 menu,press PRG key or Enter key to return to level 2 menu. The difference between them is described as follows :Pressing Enter key will save the setup parameter and return to the level 2 menu ,and then automatically shift to the next function code ,while pressing PRG key will directly return to level 2 menu without saving the parameter,and it will return to the current function code.

Example:Modify the function code F2-02 from 50.00H2 to 20.00H2 (the bold-type work indicated the flashing bit)

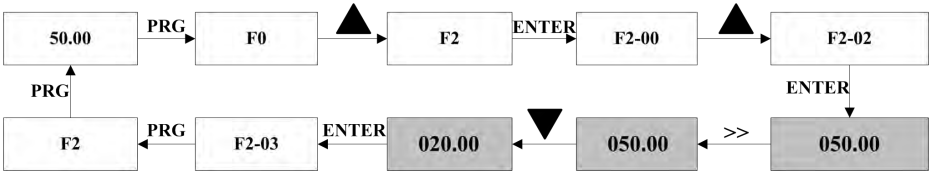


Fig.4-3 Example of parameter editing operation

Caution:in level 3 menu,if the parameter has no flashing bit ,it indicates that the function code cannot be modified. The possible reasons include:

1 ） the function code is an unchangeable parameter such as actual detection parameter,running record parameter,etc.

2）the function code is an unchageable in running ,and can be modified in stop

4.3 Method of Viewing Status Parameters

In stop or running ,it can display multiple status parameters,and select whether to display the parameter through the function codes F7-29(Led running parameters) and F7-30 (stop parameter) in accordance with binary bits.For the meaning of binary bits ,refer to Chapter 6 F7-29 and F7-30

In status of stop,there are seven stop status parameters for selection,namely:setup frequency ,bus voltage,DI input status,DO output status,analog input A11 voltage,PLC running step,the displaying of the selected parameters can be switched by pressing shift key in sequence(displaying of parameters are converted into binary system by F7-30)

In running , there are thirteen running parameters displayed , five parameters are displayed for running frequency ,setup frequency ,bus voltage,output voltage and output current ,other eight parameters for output power ,DI input status, DO output status,analog input A11 voltage ,analog input A12 voltage ,PID setup,PID feedback and PLC,These parameters are displayed in accordance with the selection of F7-29 (converted into binary system).The displaying of the selected parameters can be switched by the button in sequence

When the inverter is restarted on power off,the displayed parameters are the selected parameters before the power off.

4.4 Password Setting

The inverter provides password protection function .When F7-49 is set to non-zero value, it indicates the user password.Prior to password setting , please press OK key when all parameters in F7-49 are set to '0', and then flashing LED shows that it is time to set password . Common menu cannot be entered until user password is correct,otherwise '0' will be displayed,and the last flashing LED points out that the user can not be able to enter the menu until the password is correct

To cancel the password protection function ,enter with password and set F7-49 to 0

The user password are free from parameters in the shortcut menu that will be viewed in the protection of password

Note:if the user forgets password so that this inverter can not work ,please contact the manufacturer.

Refer to the specific password operation diagram as follows:

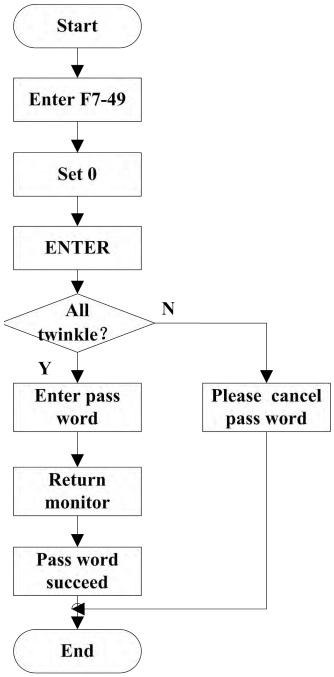


Fig.4-4: password setting process

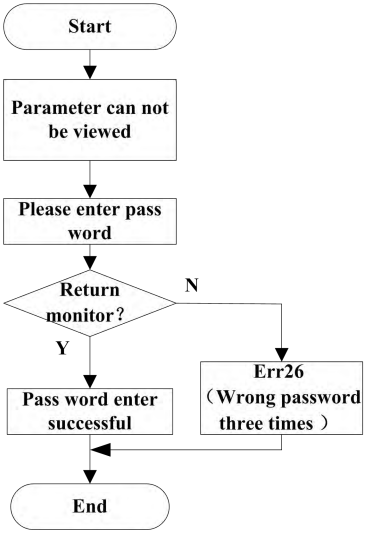


Fig.4-5: password cancel process

4.5 Automatic Tuning of Motor Parameters

To select the vector control running mode ,it must input the nameplate parameter of the motor accurately prior to the running of inverter,The M420 inverter will select standard motor parameters matching the nameplate parameter;depending on the motor parameters ,the vector control mode must acquire the accurate parameters of the controlled motor to ensure the good control performance

the procedures for the automatic tuning of motor parameters are described below

First,select the command source (F0-04)as the command channel of the operation panel

Second,input the following parameters in accordance with the actual motor parameters

Second,input the following parameters in accordance with the actual motor parameters

F4-01:Rated motor power F4-02: Rated motor voltage

F4-04:Rated motor current F4-05:Rated motor Frequency

F4-06:Rated motor speed

If the motor can be completely disconnected with the load,select 2 (complete tuning)in F4-00,and then press RUN key on the keyboard panel,the inverter will automatically calculate the following parameters

F4-07: no-load current F4-08:stator resistance

F4-09: Rotor resistance F4-10:mutual inductive reactance

F4-11:Leakage inductive reactance

Finally, complete the automatic tuning of motor parameters

If the motor cannot be totally disconnected with the load ,select 1 (static tuning without rotation)in F4-00,and then press RUN key on the keyboard panel

Note: A suggestion from factory said that customer to select the way of complete tuning which is able to help you acquire the motor parameters more accurately.

Chapter 5 Parameter Description

5.1 Group F0 Basic Function

F0-00	**Software version**	Factory default value	#.##
	setup range		

This parameter is provided only for the user to view the software version and cannot be modified

F0-01	**Model display**		Factory default value	model dependent
	setup range	0	For general purpose	
		1	For pump application	

This parameter is provided only for the user to view the model and cannot be modified

0: applied to the constant torque of the designated rated parameters

1: applied to the variable torque loads(fan and pump loads) of the designated rated parameters

F0-02	**Rated current**	Factory default value	model dependent
	setup range	0.1A～3000.0A	

This parameter is provided only for the user to view the rated current and cannot be modified

F0-03	**Control mode**		factory default value	1
	Set up range	0	（SVC1）open loop flux vector control 1	
		1	(SVC2) open loop flux vector control 2	
		2	V/F control	

0:open loop vector control 1

This vector control is not sensitive to motor parameters , general, static tuning of motor parameters can be stable and reliable running,and most of motor parameter can be connected automatically in the process of running.such as no-load current ,lowest running frequency for 1H2,and is only for running below the fundamental frequency. It is application to the general high-performance control applications where on inverter can only drive on motor

1:open vector control 2

It is applicable to the general high-performance control applications including machine tool,centrifugal machine,wire drawing machine,and injection molding machine ,all of them can run the flux –weakening control below the fundamental frequency, one inverter can only drive one motor

2：V/F control

It is applicable to the applications where the load requirement are rather low or one inverter drives multiple motors such as fan and pump load,and can be used in the application where one inverter drive multiple motors.

Prompt :motor parameter identification must be conducted when selecting the vector control mode. Only when correct motor parameters are provided can vector control mode be taken advantage of,Better performance can be achieved by adjusting the speed regulator parameters(Group F3).

F0-04	**Command souse selection**		factory default value	0
	setup range	0	operation panel command channel	
		1	terminal command channel	
		2	serial port communication command channel	

Select control command channel for inverter

The inverter control command includes start ,stop,forward rotation ,reverse rotation and Jog.

0:operation panel command channel(LED OFF)

Perform running command control with key on the operation panel such as RUN ,STOP/RES key

1:Terminal command channel (LED ON)

Perform running command control by the multifunctional input terminals ,such as FWD、REV、JOGF、JOGR,etc.

2： Serial port command channel (LED flashes)

The running command is sent by the host computer via communication mode.

F0-06	**Main frequency source X**		Factory default value	0
	Set up range	0	digital setup UP、DOWN(non-recorded)	
		1	digital setup UP、DOWN(recorded)	
		2	AI1	
		3	AI2	
		4	MS speed	

		5	PLC
		6	PID
		7	Fixed communication

select the input channel for main reference frequency of the inverter.There are eight types of main reference frequency channels:

0:digital setup(non-recorded)

The initial value is the value of F0-11"Digital Setup Present Frequency"

It can change the setup frequency value of the inverter through the key ▲and ▼on the keyboard (or UP and DOWN of multifunction input terminals)

Non-recorded means that the setup frequency value is recovered to the value of F0-11 Digital Setup Present Frequency"in case of inverter power supply failure.

1:digital setup (recorded)

The initial value is the value of FO-11 Digital Setup Present Frequency"

It can change the setup frequency value of the inverter through the key ▲and ▼on the keyboard (or UP and DOWN of multifunction input terminals)

Recorded means that the setup frequency upon restart of inverter due to power failed remains the same

2：AI1

3：AI2

It means that the frequency is determined by the analog input terminal, M420 Driver offers two analog input terminals ,that is ,A11and A12 ,and A11 is the voltage input from 0V to 10V,the other is the current input from 4mA to 20mA.all of them can be selected by the CN3 jumper on the control board.

4、MS speed

Select MS speed running mode in need of setting Goup F5 'Input Terminal and Group FC "MS speed and PLC parameters to determine the relative relationship between the reference signal and the reference frequency.

5、Simple PLC

Select the simple PLC mode in need of setting to Group FC "MS speed and "PLC" para mete to determine the reference frequency when the frequency source is simple PLC ,

6、PID

Select the process PID control. In the meantime, it needs to set Group FA "PID Function" .The running frequency of the inverter is that after PID functions. Regarding PID reference source ,reference quantity,and feedback source.Please check the Group FA 'PID

Function

7、Communication reference

It means that the main frequency source is given by the host computer via communication mode(M420 series serial communication protocol for details)

F0-07	**Auciliary Frequency source Y selection**		Factory default value	0
	setup range	0	non-recorded	
		1	digital setup UP、DOWN(recorded)	
		2	AI1	
		3	AI2	
		4	MS speed	
		5	PLC	
		6	PID	
		7	communication reference	

When the auxiliary frequency source is used as independent frequency reference channel ,it is used in the same way as the main frequency source X

when the auxiliary frequency source is used as overlap reference (i.e.frequency source selection switching from X plus Y or X to X puls Y) ,special points as follows:

1、When the auxiliary frequency source is the digital reference ,the present frequency (FO-11) has no action in need of adjusting the main reference frequency through the key ▲and ▼on the keyboard (or UP and DOWN of multifunction input terminals)

2、When the auxiliary frequency source is the analog input reference (A11,A12) 100% of input setup is relative to the auxiliary frequency source range(refer to F0-08-F0-09).In need to adjust the main reference frequency ,please set the corresponding setup range of analog input to "-n%to n%(refer to F5-15 and F5-24)

Prompt :there is difference between the auxiliary frequency source Y selection and the main frequency source X set up value ,that is to say,the main and auxiliary frequency sources cannot use the same frequency reference channel.

F0-08	**Auciliary Frequency source Y relative value selection**		Factory default value	0
	setup range	0	Relatively maximum frequency	
		1	Relatively frequency source X	
F0-09	**Auxiliary Frequency source Y**		Factory default value	0%
	setup range		0%～100%	

When the frequency source selection is the frequency overlap reference (F0-10 is set to 1or 3),it is used to determine the adjustment range of the auxiliary frequency source.F0-08 is used to determine the relative object of that range. For relatively maximum frequency(F0-14),its range is fixed, if it is relative to the maximum frequency X,and its range will vary with the main frequency X.

F0-10	**Frequency source selection**		Factory default value	0
	setup range	0	X main frequency source X	
		1	Y main frequency source X+auxiliary frequency source Y	
		2	Switching between the main frequency source X and the auxiliary frequency source Y	
		3	Switching between the main frequency source X and (the main frequency source X+ the auxiliary frequency source Y)	
		4	Switching between the auxiliary frequency source Y (the main frequency source X+ the auxiliary frequency source Y)	
		5	Maximum of the main frequency source X and of the auxiliary frequency source Y	

This parameter is used to select the frequency reference channel .Frequency reference is realized through combination of the main frequency source and the auxiliary frequency source

When 1 is selected,the frequency source “main frequency source X+ the auxiliary frequency source Y can realize frequency overlapping function.

When 2 is selected,it can switch between the main frequency source X and the auxiliary frequency source Y through the multifunctional input terminal”Frequency Source Switching”

When 3 is selected,it can switch between the main frequency X and (main frequency source X puls auxiliary frequency source Y by he multifunctional input terminal”Frequency Source Switching

When 4 is selected ,it can switch between the auxiliary frequency source Y and (main frequency source X puls auxiliary frequency source Y)through the multifunctional input terminal”Frequency Source Switching”

In this way, it can realize mutually switching between the frequency reference modes such as switching between PID running and common running ,simple PLC and common running ,analog setup and command running.

When 5 is selected ,it can operate by choosing the maximum of frequency source between the

main frequency source and auxiliary frequency source

F0-11	**Preset frequency**	factory default value	50.00Hz
	setup range	0.00 to max.frequency F0-14(active when the frequency source selection mode is digital setup)	

When the main frequency source is selected as “Digital setup” or “Terminal UP/DN”,this function code is the initial value of frequency digital setup of the inverter.

F0-13	**Running direction**	Factory default value	0
	setup range	0	direction is consistent
		1	Direction is reverse
		2	no reverse

Through modifying this function code, it can change the rotary direction of the motor without changing any other parameters ,The role of this function is to act the conversion of the motor rotary direction by adjusting any two lines of the motor (U ,V and W).

Prompt :After parameter initialization,the motor running direction will restore to the original status ,this action shall be carefully performed in the application where the rotary direction of the motor is not allowed to change on system commissioning.

F0-14	**Maximum frequency**		factory default value	50.00Hz
	setup range		50.00Hz～400.00Hz	
F0-15	**Frequency source of upper limit**		factory default value	0
	setup range	0	F0-16 setup	
		1	AI1	
		2	AI2	
		3	communication setup	

It is used to define the source of frequency upper limit that can be from digital setup (F0-16) and from analog input channel.when the analog input is to set the frequency upper limit .100%of analog input setup is relative to F0-14.

For example,in case of torque control ,the speed control is inactive.To avoid occurrence of broken materials,it can use the analog value to set the frequency upper limit.when the inverter runs at the frequency upper limit, the torque control is inactive,and the inverter continues running with frequency upper limit.

F0-16	**Frequency upper**	factory default value	50.00Hz
	setup range	frequency lower limit F0-18 to maximum frequency F0-14	
F0-17	**Frequency upper limit offset**	factory default value	0.00Hz
	setup range	0.00Hz to maximum frequency F0-14	

When the frequency upper limit is analog value reference ,this parameter is used as analog value offset ,its reference value is F0-14.the addition of offset frequency and analog setup value of frequency upper limit are used as the final setup value of frequency upper limit.

F0-18	**Frequency lower limi**	factory default value	0.00Hz
	setup range	0.00Hz to frequency upper limit F0-16	

The inverter starts from the start frequency.If the reference frequency is lower than frequency lower limit in the running process ,the inverter will keep running under frequency lower limit until it stop s or the reference frequency is higher than the frequency lower limit.

F0-23	**Speed-up time 1**	factory default value	20.0s
	setup range	0.0s～3000.0s	
F0-24	**Speed –down time 1**	factory default value	20.0s
	setup range	0.0s～3000.0s	

speed-up time 1 refers to the time t1 require for the inverter to speed up from 0H2 to the maximum output frequency (F0-14)

Speed-down time 1 refers to the time t2 require for the inverter to speed down from the maximum output frequency to 0H2.

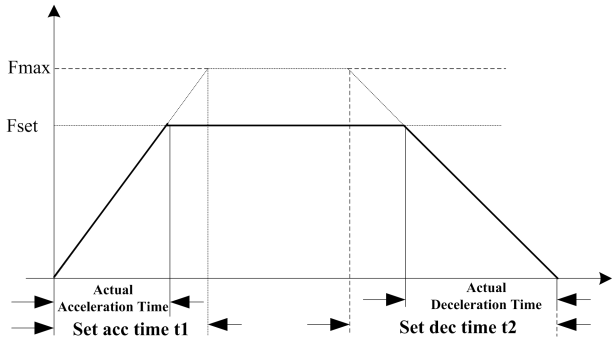


Fig. 5-1 Schematic diagram for acceleration /deceleration time

Pay attention to the difference between the actual acceleration /deceleration time and the setup acceleration /deceleration time.

there are totally four groups of acceleration /deceleration time for selection.

Group 1：F0-23、F0-24;

Group 2：F7-03、F7-04;

Group 3：F7-05、F7-06;

Group 4：F7-07、F7-08;

It can select the acceleration /deceleration time through multifunctional digital input terminals（F5-00～F5-04）

F0-25	**The over modulation function selection**	Factory value	1
	The setting range	0: the over modulation function invalid 1: over modulation function	

The over modulation function for grid voltage is too low or heavy load situations, improve the inverter output voltage effective value

F0-26	**Carrier frequency**	factory default value	model dependent
	setup range	1.0kHz～15.0kHz	

This function is used to adjust the carrier frequency of the inverter.By adjusting the carrier frequency ,the motor noise can be down,.and the resonance of the mechanical system ca be avoided ,so that the leakage current to the Earth and the interference of the inverter can be reduced

When the carrier frequency is low,the output current higher harmomic component will increase,the motor loss will increase,and the motor temperature rise will also increase.

When the carrier frequency is high ,this motor loss is reduced,and the motor temperature is decreased,but both inverter loss and temperature rise will increase and so will the interference.

the adjustment of carrier frequency will have influences on the following:

carrier frequency	low → high
motor noise	high → low
output current waveform	poor → good
motor temperature rise	high → low
Inverter temperature rise	low → high
leakage current	low → high
external radiation interference	Low → high

Inverter power	carrier frequency range	carrier frequency
1.5Kw～7.5Kw	1.0kHz～15.0kHz	6.0kHz
11Kw～90Kw	1.0kHz～15.0kHz	4.0kHz
110Kw～700Kw	1.0kHz～15.0kHz	2.0kHz

Cautions: the inverter runs above the carrier frequency , each which of increasing 1KH2,it is used in need to decrease 5%

F0-27	**Carrier frequency adjustment selection**		factory default value	0
	setup range	0	fixed PWM,carrier frequency temperature adjustment inactive	
		1	random PWM, carrier frequency temperature adjustment inactive	
		2	PWM,carrier frequency temperature adjustment inactive	
		3	random PWM, carrier frequency temperature adjustment active	

The PWM carrier frequency adjustment mode offer two types,fixed and random.The motor noise with random PWM has wide frequency range,and with fixed PWM has fixed frequency.

When the carrier frequency temperature adjustment remains active ,the inverter can automatically adjust the carrier frequency according to its temperature.This function can reduce the possibility of the inverter alarm because of its overheating

F0-28	**Parameter initialization**	factory default value		0
	setup range	0	none	
		1	restore factory default value	
		2	previous user parameters upon power failure	
		3	fault record	

5.2 Group F1 start/stop control

F1-00	**Start mode**		factory default value	0
	setup range	0	direct start (when DC break time is non- zero value, perform DC braking before getting start)	
		1	speed tracking restart	

0:Direct start

If the DC brake time is set to 0,it will start at the start frequency.

When the DC brake time is non-zero value ,it can perform DC braking before getting start ,which suits for the applications where reverse rotation is likely to occur when small loads are getting start

1:Speed tracking restart

First of all ,the inverter makes an estimate of motor speed and direction ,then starts at the frequency in accordance with the tracked motor speed.the rotating motor is running smoothly without surge.

It is suitable for the restart upon transient power failure of large loads.

F1-01	**Start model**		factory default value	0
	setup range	0	beginning from the frequency on power failure	
		1	beginning from zero speed	
		2	beginning from maximum frequency	

to complete the speed tracking process within the shortest time ,and then to select the mode of inverter tracking motor speed.

0:to track from the frequency on power failure ,generally ,it selects this mode.

1:this mode is used to track from zero frequency and restart after a long period of power supply off .

2:This mode is used to track from the maximum frequency, and is suitable for the general power generating loads.

F1-02	**Speed tracking maximum current**	factory default value	100%
	setup range	30%～180%	
F1-03	**Speed tracking fastness and slowness**	factory default value	20
	setup range	1～100	

In speed tracking restart ‘s mode ,to select its fastness and slowness.the higher this parameter value is ,the faster the tracking speed is ,but too high value may result in reliable tracking.

F1-04	**Start up frequency**	factory default value	0.00Hz
	setup range	0.00Hz～10.00Hz	
F1-05	**Start frequency retention time**	factory default value	0.0s
	setup range	0.0s～36.0s	
F1-06	**DC break current at start**	factory default value	0%
	setup range	0%～100%	
F1-07	**DC break time at start**	factory default value	0.0s
	setup range	0.0s～36.0s	

DC break at start is used when the motor is getting to restart after stoping completely

If the start mode is the direct start, the inverter firstly performs DC break in accordance with the DC brake current at start,and then starts running after setting to DC brake time at start.if it is set to 0,the inverter directly starts without passing through the DC brake.

The higher the DC brake current is ,the higher the brake force is The DC brake current at start is regarded as the percentage of rated current for inverter.

F1-09	**S curve acceleration start time**	factory default value	0.00s
	setup range	0.00～25.00s	
F1-10	**S-curve acceleration end time**	factory default value	0.00s
	setup range	0.00s～25.00s	
F1-11	**S curve acceleration start time**	factory default value	0.00s
	setup range	0.00s～25.00s	
F1-12	**S-curve deceleration end time**	factory default value	0.00s
	setup range	0.00s～25.00s	

This parameters is used to set the drives with non-impact slow start at the beginning to start acceleration .the acceleration/deceleration curve will adjust S-curve acceleration/deceleration at the different degree by setup value.Using the S-curve slow acceleration /deceleration ,the drives can make the different acceleration /deceleration curve based on the original of its time.

acceleration time=0,S-curve function is inactive.

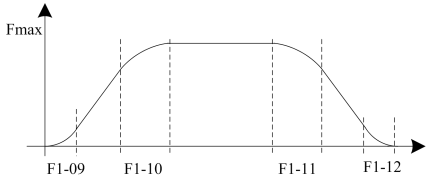


Fig. 5-2 Schematic Diagram for S-curve Acceleration/deceleration

F1-13	**Stop model**		factory default value	0
	setup range	0	deceleration stop	
		1	free stop	

0: deceleration stop

After the stop command,the inverter reduces the output frequency according to deceleration mode and the defined acceleration /deceleration time ,and will stop after the the frequency drops to zero

1:free stop

After the stop command ,the inverter will end the output immediately.The load will is free to stop according to the mechanical inertia.

F1-14	**Brake beginning frequency at stop**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	
F1-16	**DC brake current at stop**	factory default value	0%
	setup range	0%～100%	
F1-17	**DC brake time at stop**	factory default value	0.0s
	setup range	0.0s～36.0s	

DC brake beginning frequency at stop :In the process of the deceleration stop , when it reach this frequency,the DC brake stop begins

DC brake current at stop :it refers to the additive DC brake quantity.The higher this value is ,the better the DC brake effect is.

DC brake time at stop :it refers to the additive time of DC brake quantity.when this value is zero,it shows there is no DC brake process,and the inverter will stop according to the given

deceleration stop

F1-18	**Brake use ration**	factory default value	100%
	setup range	0%～100%	

It is enabled for the inverter with built-in unit,and used to adjust the brake effect of the bake unit

F1-19	**Power interruption restart**		factory default value	0
	setup range	0	inactive	
		1	Start from stop frequency	
		2	Start from minimum frequency	
		3	direct start	
F1-20	**Permission time on power supply off**		factory default value	1.0s
	setup range		0.1s～5.0s	
F1-21	**Power interruption recovery waiting time**		factory default value	1.0s
	setup range		0.1s～5.0s	

After its power off , the inverter is getting recovery whether to start as options .When F1-19 is to set 0,it shows that the inverter can not automatically restart until running command is sent ,the other setting values ,within permissible time(F1-20)for its power failure and waiting time(F1-21) for its power recovery,the inverter will restart according to setting mode.

F1-23	**Transient stop/ non-stop function selection**		factory default value	1
	setup range	0	Invalid	
		1	Valid	

F1-24	**Transient stop/ non-stop frequency reduction rate**		factory default value	1
	setup range	0	Select speed-down time 1（F0-23/F0-24）	
		1	Select speed-down time 2（F7-03/F7-04）	
		2	Select speed-down time 3（F7-05/F7-06）	
		3	Select speed-down time 4（F7-07/F7-08）	

When the application situation has no electrical source ,taking advantage of this function makes motor speed down to zero in deceleration mode,meanwhile, the inverter can restart in recovery time

5.3 Group F2 V/F Control Parameters

This group function is only for V/F control（F0-03＝2）, not for the vector control.

V/F control is applicable to the general loads such as fan and pump or the applications where one inverter drives multiple motors or the inverter power is one level lower or higher than the motor power

F2-00	**Curve setup**		factory default value	0
	setup range	0	straight V/F curve	
		1	multiple point V/F curve	
		2	square VF curve	

The fan and pump load can select square V/F control

0: straight V/F curve,it is suitable for common constant torque load

1: multiple point V/F curve ,it is suitable for the special loads such as dehydrator and center fugal machine.

2:square V/F curve.it is suitable for the centrifugal loads such as fan and pump.

F2-01	**Torque boose**	factory default value	3.0%
	setup range	0.0%～30.0%	
F2-02	**Cut off frequency of torque boose**	factory default value	30.00Hz
	setup range	0.00Hz～maximum output frequency	

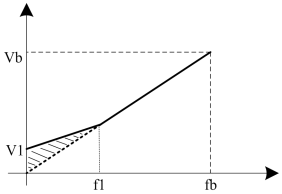
To compensate the low frequency torque characteristic of V/F control ,it can boost the output voltage of the inverter at the time of low frequency

the torque boose is set to be large ,which cause motor over heat and the inverter over current.In general, the torque boost shall not exceed 8%.

Adjusting this parameter effectively can avoid over current on star up.For the relatively large loads,it is recommend to increase this parameter.For the small loads ,this parameter value can be decrease.

When the torque boost is set to 0.0,the inverter can adopt auto-torque boost.

Cutoff frequency of torque boost :under this frequency ,the torque boost is active.If it exceeds this setup frequency ,the torque boost is inactive.Refer to Fig. 5-3 for details.



V1:Manual Torque Boost Voltage
Vb:Maximum Output Voltage
f1:Cutoff Frequency of Torque Boost
fb:Rated Running Frequency

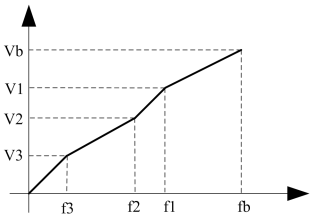
Fig.5-3 Diagram for Manul Torque Boost

F2-03	**V/F Frequency Point 1 F1**	factory default value	40.00Hz
	setup range	0.00Hz～rated frequency for motor	
F2-04	**V/F voltage Point 1 V1**	factory default value	300.0V
	setup range	0.0V～380.0V/0.0V～220.0V	
F2-05	**V/F Frequency Point 2 F2**	factory default value	20.00Hz
	setup range	0.00Hz～rated frequency for motor	
F2-06	**V/F voltage Point 2 V2**	factory default value	170.0V
	setup range	F1～380.0V/220.0V	
F2-07	**V/F Frequency Point 3 F3**	factory default value	5.00Hz
	setup range	V2～rated frequency for motor	
F2-08	**V/F voltage Point 3 V3**	factory default value	42.0V
	setup range	F2～380.0V/220.0V	

F2-03～F2-08 Six parameters define MS V/F curve.

The setup value of V/F curve is generally set in accordance with the load caracteristics of the motor.

Caution: V1>V2>V3，F1>F2>F3.In case of low frequency ,higher setup voltage can make motor overheat and even burned,and make the inverter over current or current protection .



fb: Motor rated frequency F4-05
Vb:Motor rated voltageF4-02

Fig.5-4 schematic diagram for V/F curve setup

F2-09	**Slip compensation coefficient**	factory default value	0.0%
	setup range	0.0%～200.0%	

It is enable only for V/F control.Setting this parameter can compensate the slip in the V/F control mode due to load and reduce the change of rotation speed of the motor following the load change.In general 100% corresponds to the rated slip of the motor with rated load.Slip coefficient adjustment can refer to the following principles:when the load is rated load and the slip compensation coefficient is set to 100%,the rotation speed of the motor in the inverter is close to the given speed.

F2-10	**Magnetic brake gain**	factory default value	80%
	setup range	0%～200.0%	

In the V/F control mode, when it needs fast stop and there is no brake resistor,selecting ‘inactive only at the time of deceleration’can greatly reduce the possibility of overvoltage fault alarm.When there is brake resistor or it has not need for fast deceleration ,select “active”

F2-11	**Oscillation suppression gain**	factory default value	20
	setup range	0～100	

Select “0” for this gain when the motor has no oscillatin.Only when the motor has obvious oscillation and cannot run normally can this gain be properly increased.The bigger than gain is ,the better oscillation suppression result will be.The method of selecting this gain is to select the smallest one on the premise that there is effective oscillation suppresion measure,so as to ease the negative effect on the VF operation.

In the process of no-load or light load running,the motor can properly adjust output voltage so as to reach the purpose of auto-energy saving by the test of load current . This feature is active for loads such as fan and pump

5.4 Group F3 Vector Control Parameters

Group F2 function code is only for the vector control,that is to say , F0-03＝0 shown active, F0-03＝1shown inactive.

F3-00	**Switching frequency F1**	factory default value	5.00Hz
	setup range	0.00Hz～F3-02	
F3-02	**switching frequency F2**	factory default value	10.00Hz
	setup range	F3-00～The maximum frequency	
F3-04	**Speed proportional gain of 1**	factory default value	1.00
	setup range	0.001～9.999	
F3-05	**Speed integral time 1time**	factory default value	0.500s
	setup range	0.001～9.999s	
F3-06	**Speed proportional gain of 2**	factory default value	0.800
	setup range	0.001～9.999	
F3-07	**Speed integral time 2**	factory default value	1.000s
	setup range	0.001s～9.999s	

The speed dynamic response characteristics of the vector control can be adjusted by setting the proportional coefficient and integration time of the speed regulator.Increasing the proportinal gain or reducing the integration time can accelerate the dynamic response of the speed loop.whatever the proportinal gain is too large or the integration time is too short can cause the oscilltion of the system.

Proposed adjustment method:

If the factory default parameters can not meet the requirements ,the relevant parameters values can be subject to fine tuning.On

increasing the proportional gain ,it ensures no oscillation to the system .and then reducing the integration time to make the system both quick response characteristic and small overshoot

Caution:Prior to setting PI parameters,please set F3-15 (system inertia)to appropriate value.Or,improper PI parameter setting may result in the large speed overshoot ,and even in voltage fault when the vershoot drops.

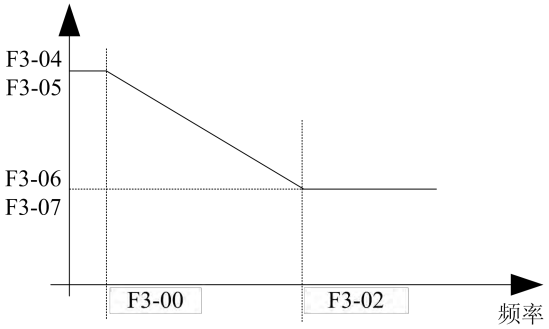


Fig.5-5 Switching diagram of the speed loop PI parameter

F3-10	**Flux weakening curve gain**	factory default value	100%
	setup range	20%～150%	

Entering into output in flux weakening area, the user may adjust F3-10.

mainly aimed at axia's application ,adjustment method;

1. motor comes to maximum frequency
2. checking the output
3. adjusting the parameters F3-10 so that output voltage comes to motor rated voltage
4. The larger value ,the bigger output voltage

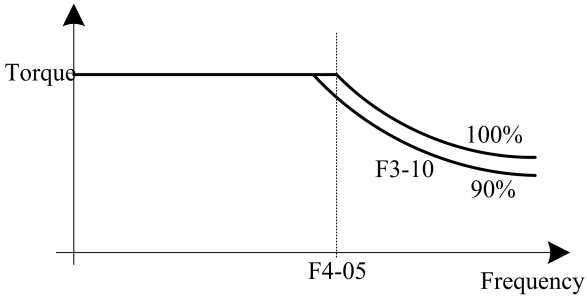


Fig.5-6 Schematic diagram of the gain curve of a weak magnetic

F3-15	**System inertia value**	factory default	64

		value	
	setup range	1～65535(0.0001kg*m^2)	

This parameter which is for motor load inertia needs to set an appropriate value before the motor runs,can cause the system unstable because of its value is too big or too small,at this time it can adjust the speed loop proportional gain and inter gration time to increase the system performance

F3-16	**Torque boost at low frequency**	factory default value	100%
	setup range	0%～200%	

This parameter is used in vector control 1 starting torque boost at low frequency ,the larger its value,the higher low frequency torque ,but all of this may cause no-load current too higher. In the case of driving the load , the smaller its value is , the lower motor temperature rise is at the low frequency .

F3-17	**Slip compensation coefficient**	factory default value	100%
	setup range	50%～200%	

For the speedless sensor vector control,this parameter is used to adjust the stabilizing speed precision for motor,when the speed is too large ,this parameter needs to be decreased, on the contrary,it needs to be enlarged.

F3-18	**Time constant of speed command**	factory default value	0.000s
	setup range	0.000s～0.100s	

F3-19	**Time constant of speed loop**	factory default value	0.000s
	setup range	0.000s～0.100s	

In the vector control mode, the output of speed loop regulator is a torque current command.This parameter is used to filter the torque command ,generally, is in no need to adjust,and the filter time can be increased in case of huge speed fluctuation,In case of oscillation of motor ,,this parameter shall be decreased properly.,

The time constant of speed loop filter is low,and the output torque on the inverter may be change a lot,but its response is quick.

F3-20	**Torque upper limit source**		factory default value	0
	setup range	0	F3-21	
		1	AI1	
		2	AI2	
		3	communication setup	

F3-21	**Torque upper limit**	factory default value	180%
	setup range	0%～200%	

F3-20 is used to select the setup source of torque upper limit ,when setting via the analog value,100% of the analog input setup corresponds to F3-21,and the setup 100% of F3-21 corresponds to the rated torque of the motor matching the inverter

F3-24	Vector AVR	factory default value	1
	setup range	0～2	

F3-24 is used for vector control AVR processing, 0: the whole effective, 1: the whole is invalid, only 2:deceleration is invalid. When the AVR is invalid, can make the speed faster, but more current, easy over voltage occasions during deceleration, suggest that F3-24 is set to 1 or 2. In the inverter configuration of brake unit orenergy feedback unit occasions, suggest that F3-24 is set to 0

5.5 Group F4 Motor Parameters

F4-00	**Motor tuning selection**		factory default value	0
	setup range	0	none	
		1	static tunning	
		2	complete tuning	

Caution:Prior to tuning ,it must set the correct motor rated parameters (F4-01～F4-06)

0: None ,that is ,No-Tuning

1:Static tunning ,it is suitable for this occasion that on which motor and load is hard to take off so as to not get the rotary tunning

Operation description:setting this function code to 1 and then pressing the RUN key with

confirmation ,the inverter will operate static tuning

2: complete tuning

To ensure the dynamic control performance on the inverter,please select the rotary tunning,the motor must be disconnected with the loads (i.e.no-load)in the process of the rotary tuning.

Upon selection of rotary tuning ,the inverter will conduct static tuning at first.at the end of static tunning ,the motor will accelerate to 80% of the rated motor frequency in accordance with the setup acceleration time of F4-12 and maintain for a period of time. Then the motor will decelerate to zero speed in accordance with the setup acceleration time of F4-13,by this time the rotary tuning is finished.

Operation description :setting this function code to 2 and pressing RUN key with

confirmation ,then the inverter will operate rotary tuning

tuning operation description

When F4-00 is set to 1or 2 ,press ENTER key ,'TUNE will be displayed and flashed,then press RUN key to operate parameter tuning,at this time the displayed TUNE stops flashing. After the tuning is completed ,the display will return back to stop status interface ,In the process of tuning, pressing this STOP key can be stopped

The value of F4-00 will automatically restore to 0 at the end of tuning.

F4-01	**Rated power**	factory default value	model dependent
	setup range	0.4kw～1000.0kw	
F4-02	**Rated voltage**	factory default value	380V
	setup range	0V～440V	
F4-03	**Motor poles**	factory default value	4
	setup range	2～64	
F4-04	**Rated current**	Factory default	Model dependent
	setup range	0.00A～3000.0A	
F4-05	**Rated frequency**	factory default value	50.00Hz
	setup range	0.00Hz～max frequency	
F4-06	**Rated rotation speed**	factory default value	1460rpm
	setup range	0 rpm～30000rpm	
F4-07	**No load current**	factory default value	model dependent
	setup range	0.1A～1500.0A	

F4-08	**Stator resistance**	factory default value	model dependent
	setup range	0.001Ω～65.535Ω	
F4-09	**Rotor resistance**	factory default value	model dependent
	setup range	0.001Ω～65.535Ω	
F4-10	**Mutual inductive reactance**	factory default value	model dependent
	setup range	0.1mH～6553.5mH	
F4-11	**Leakage inductive reactance**	factory default value	model dependent
	setup range	0.01 mH～65.535mH	
F4-12	**Complete tuning acceleration**	factory default value	5000
	setup range	1～60000	
F4-13	**Complete tuning deceleration**	factory default value	5000
	setup range	1～60000	

caution

1、Please set this parameters according to the nameplate parameters of the motor

2、It needs accurate motor parameter to ensure the excellent control performance of the vector control. Accurate parameter identification comes from the correct setting of the rated motor parameters.

3、In order to ensure the control performance ,please carry out motor configuration in accordance with the standard adaptable motor on the inverter.If there is huge difference between the motor power and the power of standard adaptable motor,the control performance on the inverter will decrease obviously.

5.6 Group F5 Input Terminal

The standard unit of M420 series inverter has 5 multi functional digital input terminals and 2 analog input terminals.if the system needs more input/output terminals ,M420 series inverter is the best choice.

F5-00	**DI1 terminal function selection**	factory default value	1（forward rotation）
F5-01	**DI2 terminal function selection**	factory default value	2（reverse rotation）

F5-02	**DI3 terminal function selection**	factory default value	9（fault-reset）
F5-03	**DI4 terminal function selection**	factory default value	12（MS speed 1）
F5-04	**DI5 terminal function selection**	factory default value	13（MS speed 2）
F5-05	**DI6 terminal function selection**	factory default value	0 (non functional)
F5-06	**DI7 terminal function selection**	factory default value	0 (non functional)

This parameter is applied to set the functions on multifunctional digital input terminals

setup value	function	description
0	none	Even when there is signal input, the inverter still has no action. The no operation function can be set on the unused terminals so as to prevent error
1	Forward rotation (FWD)	Control the forward rotation and reverse rotation of the inverter via the external terminals.
2	Reverse rotation (REV)	
3	Three-line mode running control	This terminal is used to confirm that the inverter running mode is three-line control mode For detailed description, please refer to F5-11 three-line control mode function code.
4	Forward rotation Jog (FJOG)	FJOG refers to Jog forward rotation, while RJOG refers to Jog reverse rotation. For details regarding frequency and Jog acceleration/deceleration time during the Jog running, refer to F7-00, F7-01 and F7-02 function codes.
5	Reverse rotation Jog (RJOG)	
6	Terminal UP	When the frequency is given by the external terminals, it is used as increment and decrement commands of frequency modification When the frequency source is set to digital setup, it can be used to adjust the setup frequency.
7	Terminal DOWN	
8	Free stop	The inverter locks the output, and the motor stop process is beyond the inverter control. It is the general method adopted when there is huge load and no requirement for the stop time. This mode is the same as the meaning of coast to stop as described in F7-26.

setup value	function	description
9	Fault reset (RESET)	External fault reset function. It is the same as the function of RESET key on the keyboard. Using this function can realize long-distance fault reset.
10	Running pause	The inverter decelerates to stop, but al l the running parameters are al l in the memory status, such as PLC parameter, swing frequency parameter and PID parameter. After this signal disappears, the inverter restores to the status before stopping.
11	External fault normally open input	After the external fault signal is sent to the inverter, the inverter reports fault and stops.
12	MS speed terminal 1	It can realize 16S speed through the combination of digital status of these four terminals. Refer at attached table 1 for the MS speed function ion description.
13	MS speed terminal 2	
14	MS speed terminal 3	
15	MS speed terminal 4	
16	Speed-up/speed-down time selection terminal 1	It can select four types of speed-up/speed-down time through the combination of digital status of these two terminals. Refer to table 2.
17	Speed-up/speed-down time selection terminal 2	
18	Frequency source switching	When the frequency source selection (F0-10) is set to 2, it performs switching between main frequency source X and auxiliary frequency source Y via this terminal. When the frequency source selection (F0-10) is set to 3, it performs switching between main frequency source X and (main frequency X plus auxiliary frequency source Y) via this terminal. When the frequency source selection (F0-10) is set to 4, it performs switching between auxiliary frequency source X and (main frequency X plus auxiliary frequency source Y) via this terminal.
19	UP and DOWN setup clear (terminal and keyboard)	When the frequency reference is digital frequency reference, this terminal can be used to clear the frequency value modified by UP/DOWN and thus restore the reference frequency to the setup value of

setup value	function	description
		F0-11.
20	Running command switching terminal	When the command source (F0-04) is set to 1, it performs switching between terminal control and keyboard control via this terminal. When the command source (F0-04) is set to 2, it performs switching between communication control and keyboard control via this terminal.
21	Speed-up/speed-down active	Protect the inverter from affecting by the external signals (except stop command), and maintain the current frequency
22	PID Pause	PID is inactive temporarily, and the inverter maintains the current frequency output.
23	PLC status reset	PLC pauses during the execution process. When it resumes running, it can effectively restore to the initial status of simple PLC via this terminal.
24	Swing frequency pause	The inverter output with central frequency. Swing frequency pauses.
25	Timer trigger input	Closing time depends on F7-39,See details F7-39～F7-40
26	Brake command	This terminal is enabled, and the inverter directly switches to the DC brake status.
27	External fault normally closed input	After the external fault signal is sent to the inverter, the inverter reports fault and stops.

Table 1 MS Speed Function Description

K_4	K_3	K_2	K_1	Frequency Setup	Corresponding Parameter
OFF	OFF	OFF	OFF	MS speed 0	FC-00
OFF	OFF	OFF	ON	MS speed 1	FC-01
OFF	OFF	ON	OFF	MS speed 2	FC-02
OFF	OFF	ON	ON	MS speed 3	FC-03
OFF	ON	OFF	OFF	MS speed 4	FC-04
OFF	ON	OFF	ON	MS speed 5	FC-05
OFF	ON	ON	OFF	MS speed 6	FC-06
OFF	ON	ON	ON	MS speed 7	FC-07

K_4	K_3	K_2	K_1	Frequency Setup	Corresponding Parameter
ON	OFF	OFF	OFF	MS speed 8	FC-08
ON	OFF	OFF	ON	MS speed 9	FC-09
ON	OFF	ON	OFF	MS speed 10	FC-10
ON	OFF	ON	ON	MS speed 11	FC-11
ON	ON	OFF	OFF	MS speed 12	FC-12
ON	ON	OFF	ON	MS speed 13	FC-13
ON	ON	ON	OFF	MS speed 14	FC-14
ON	ON	ON	ON	MS speed 15	FC-15

Table 2 MS Speed Function Description

Terminal 2	Terminal 1	Speed-up/speed-down time selection	Corresponding Parameter
OFF	OFF	Speed-up time 1	F0-23、F0-24
OFF	ON	Speed-up time 2	F7-03、F7-04
ON	OFF	Speed-up time 3	F7-05、F7-06
ON	ON	Speed-up time 4	F7-07、F7-08

F5-10	**DI filter time**	Factory default value	10ms
	Setup range	0ms～100ms	

It is used to set the sensitivity of DI terminal.If the digital input terminal is vulnerable to interferences and may cause error action, it can increase this parameter value to enhance the anti-interference capability. However, this operation will reduce the sensitivity of DI terminal.

F5-11	**Terminal command mode**		Factory default value	0
	Setup range	0	Two-line mode 1	
		1	Two-line mode 2	
		2	Three-line mode 1	
		3	Three-line mode 2	

This parameter defines four different modes of controlling the operation of the inverter via the external terminals.

0: Two-line running mode 1: This mode is the most commonly used two-line mode. The forward/reverse rotation of the motor is decided by the commands of FWD and REV terminals.

K1	K2	Running Commanc
0	0	Stop
1	0	Forward Rotation
0	1	Reverse Rotation
1	1	Stop

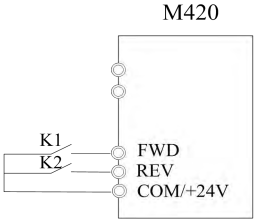


Fig.5-7 Two-line Running Mode 1

1: Two-line running mode 2: When this mode is adopted, REV is enabled terminal. The direction is determined by the status of FWD.

K1	K2	Running Commanc
0	0	Stop
1	0	Stop
0	1	Forward Rotation
1	1	Reverse Rotation

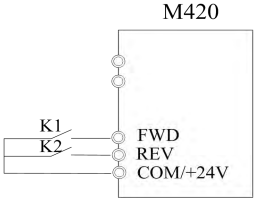


Fig.5-8 Three-line Running Mode 2

2: Three-line running mode 1: In this mode, Dln is enabled terminal, and the direction is controlled by FWD and REV respectively. However, the pulse is enabled through disconnecting The signal of Din terminal when the inverter stops

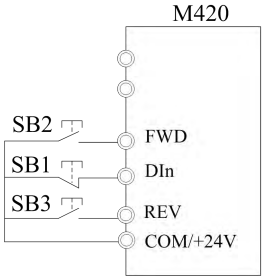


Fig.5-9 Three-line Running Mode 1

Where:

SB1: Stop button

SB2: Forward rotation button

SB3: Forward rotation button

Dln is multifunctional input terminals of DI1 to DI5.In this way, it shall define the corresponding terminal functions as No.3 function “Three-line Mode Running Control”.

3: Three-line running mode 2: In this mode, Dln is enabled terminal, and the running command is given by FWD, while the direction is determined by the status of REV. Stop command is performed through disconnecting the DIn signal.

K	Running Direction Selection
0	Forward Rotation
1	Reverse Rotation

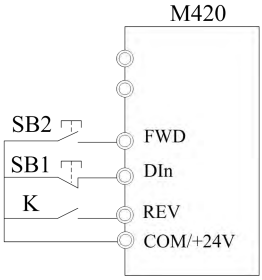


Fig.5-10 Three-line Running Mode 2

Where :

SB1: Stop button

SB2: Running button

Dln is multifunctional input terminals of DI1 to DI5. In this way, it shall define the corresponding terminal functions as No.3 function “Three-line Mode running Control”.

F5-12	**Terminal UP/DOWN Speed**	Factory default value	1.00Hz/s
	Setup range	0.01Hz/s～100.00Hz/s	

Terminals UP/DOWN is used to adjust the change rate when setting the frequency.

F5-15	**AI1 minimum input**	Factory default value	0.00V
	Setup range	0.00V～10.00V	
F5-16	**AI1 minimum input corresponding setup**	Factory default value	0.0%
	Setup range	-100.00%～100.0%	
F5-17	**AI1 maximum input**	Factory default value	10.00V
	Setup range	0.00V～10.00V	
F5-18	**AI1 maximum input corresponding**	Factory default value	100.0%

	setup		
	Setup range	-100.00%～100.0%	
F5-19	**AI1 input filter time**	Factory default value	0.10s
	Setup range	0.00s～10.00s	

The above function codes define the relationship between the analog input voltage and analog input setup value. When the analog input voltage exceeds the setup maximum input or minimum input range, the excess part will be calculated as maximum input or minimum input. When the analog input is current input, 1mA current equals to 0.5V voltage.

In difference applications, 100% of analog input corresponds to different nominal values. Refer to all the application parts for details.

Several setting examples are shown in the following figures:

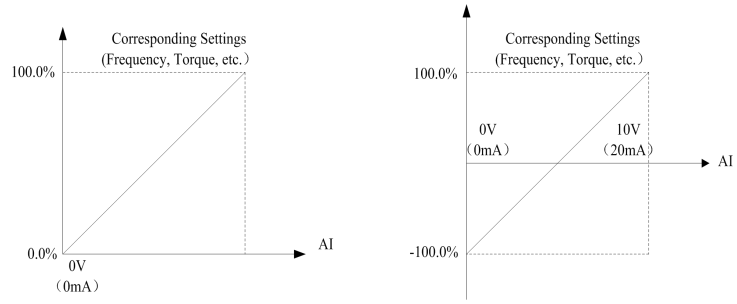


Fig.5-11 Corresponding Relationship between Analog Reference and Setting

F5-20	**AI2 minimum input**	Factory default value	0.00V
	Setup range	0.00V～10.00V	
F5-21	**AI2 minimum input corresponding setup**	Factory default value	0.0%
	Setup range	-100.00%～100.0%	
F5-22	**AI2 maximum input**	Factory default value	10.00V
	Setup range	0.00V～10.00V	
F5-23	**AI2 maximum input corresponding setup**	Factory default value	100.0%
	Setup range	-100.00%～100.0%	
F5-24	**AI1 input filter time**	Factory default value	0.10s
	Setup range	0.00s～10.00s	

5.7 Group F6 Output Terminal

The standard unit of M420 series inverter has a multifunctional digital input terminal , multifunctional relay output terminal and analog output terminal,if need more relay output terminals and analog output terminals.the M420 series is the best choice .

F6-00	**Control board RELAY 1 output selection**	factory default value	2
F6-01	**Control RELAY2 board relay output selection**	factory default value	1
F6-02	**Y1 output selection**	factory default value	1

The multifunctional digital output terminal function is for selection as follows

setup value	Function	Description
0	None	no function
1	In running	Express the inverter is running with output frequency (0 value as option) given ON signal
2	Fault output	The inverter is in trouble to output ON signal
3	Frequency Level detection FDT arrival	Refer to function code F7-22、F7-23 for details
4	Frequency arrival	Refer to F7-24 for details
5	In zero speed	The inverter output frequency is less than the start frequency so as to output ON signal
6	Motor overload pre-alarm	To judge according to overload predicted values before the motor electronic thermal protection take action, to exceed the predicted values for ON signal.Motor overload parameter is set to F9-00～F9-02
7	Inverter overload pre-alarm	After checking the inverter overload,to move up early 10s before the protection occurs, and to output ON signal

8	PLC cycle finished	To send a pulse signal with width of 250ms as simple PLC running at the end of one-time cycle
9	Running time off	The accumulated running time on the inverter is more than the setting time on F8-17 for ON signal
10	In frequency limited	When the setting frequency exceeds the upper or lower frequency ,and the inverter output frequency reach the upper or lower frequency,it gives ON signal.
11	Ready for running	The main circuit and control circuit 'S power is established the inverter is in running without protection to send ON signal
12	AI1>AI2	The analog input AI1 value is more than the other AI2 's for ON signal
13	Frequency upper limit arrival	the running frequency comes to the upper frequency
14	Frequency lower limit arrival	the running frequency comes to the lower frequency
15	Under voltage status output	in the status of under voltage
16	Communication setting	communication setting
17	Timer output function	When the set input terminal of a timer input function time after the F7-39.this terminal is closed effective,such as invalid invalid after F7-41 input terminal is disconnected this.

F6-09	**AO1 output selection**	factory default value	0
F6-10	**AO2 output selection**	factory default value	0

Standard output of the analog output (zero offset is 0, gain is one) is 0～20mA or 0～20mA the corresponding value range is shown in the below table:

setup value	function	range

0	Running frequency	0～maximum output frequency
1	Setup frequency	0～maximum output frequency
2	Output current	0～2 times of the motor rated current
3	Output power	0～2 times of the rated power
4	Output voltage	0～1.2 times of the inverter rated voltage
5	AI1	0～10V
6	AI2	0～10V/0～20mA
7	Communication setup	refer to<M420 series inverter communication protocol> shown as Appendix for details

F6-12	**AO1 offset coefficient**	factory default value	0.0%
	setup range	−100. 0%～100. 0%	
F6-13	**AO1 gain**	factory default value	1. 00
	setup range	−10. 00～10. 00	
F6-17	**AO2 bias coefficient**	factory default value	0. 0%
	setup range	−100. 0%～100. 0%	
F6-18	**AO2 gain**	factory default value	1. 00
	setup range	−10. 00～10. 00	

if ‘b” represents zero offset,k represents gain , Y represents actual output,and X represents standard output,the actual output is =kX＋b

AO1 and A02 zero offset efficients 100% corresponds to 10V（20mA Standard output

refers to the output of 0 to 10V（20mA）corresponding to analog output of 0 to Maximum

It is generally used to correct the zero drift of the analog output and the output amplitude deviation and also can be defined as any necessary output curve.

For example ,if the analog output is the running frequency ,it is expected to output 8V （16mA）,when the frequency is 0,and output 3V（6mA ）at the maximum frequency ,the gain shall be set to “-0.50”,and the zero offset shall be set to “80%”

5.8 Group F7 Auxiliary Function and Man-Machine Interface Function

F7-00	**Jog running frequency**	factory default value	6.00Hz
	setup range	0.00Hz～maximum frequency	
F7-01	**Jog speed up time**	factory default value	20.00s
	setup range	0.00s～3000.0s	
F7-02	**Jog speed down time**	factory default value	20.00s
	setup range	0.00s～3000.0s	

.it is used to define the reference frequency and speed up/down time of the inverter on jogging the Jog process is getting to started and to stop according to the start mode 0（F1-00，direct start ）and the stop mode 0（F1-13,speed down time to stop）.

The Jog speed-up time means the time required for the inverter to accelerate from H2 to the maximum output frequency（F0-14）

The Jog speed-down time means the time required for the inverter to decelerate from the maximum output frequency（F0-14）to 0H2

F7-03	**Speed up time 2**	factory default value	20.00s
	setup range	0.0s～3000.0s	
F7-04	**Speed down time 2**	factory default value	20.00s
	setup range	0.0s～6500.0s	
F7-05	**Speed up time 3**	factory default value	20.00s
	setup range	0.0s～6500.0s	
F7-06	**Speed-down time 3**	factory default value	20.00s
	setup range	0.0s～6500.0s	
F7-07	**Speed up time 4**	factory default value	20.00s
	setup range	0.0s～6500.0s	
F7-08	**Speed-down time 4**	factory default value	20.00s
	setup range	0.0s～6500.0s	

Speed up/down time choose F0-23 , F0-24 and the above three types of speed up/down time ,all of its meaning is the same .Refer to F0-23 and F0-24 for the detail

To select speed-up/down time 1to 4 in the process of running on the inverter by the different combination of multi- functional digital input terminal DI , all the details are shown in F5-00～F5-04.

F7-09	**Skip frequency 1**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	
F7-10	**Skip frequency 2**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	
F7-11	**Skip frequency 3**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	
F7-12	**Skip frequency 4**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	
F7-13	**Skip frequency 5**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	
F7-14	**Skip frequency 6**	factory default value	0.00Hz
	setup range	0.00Hz～maximum frequency	

When the setup frequency is within the skip frequency range, the actual running frequency will be in the skip frequency boundary close to the setup frequency.

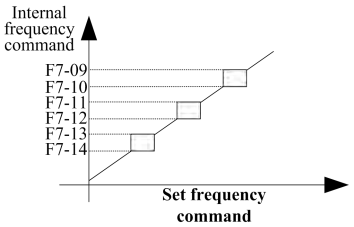


Fig.5-12 Schematic Diagram of Skip Frequency

F7-15	**Forward/Reverse rotation dead-zone time**	factory default value	0.0s
	setup range	0.0s～3000.0s	

During the setting of forward/reverse rotation on the inverter,the transition time in the output zero frequency position is shown is the following figure

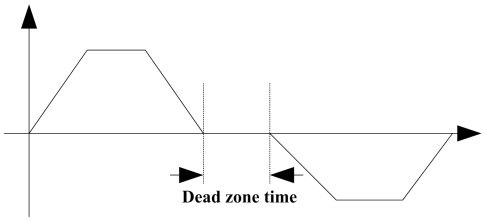


Fig.5-13 Schematic Diagram for Forward/Reverse Rotation Dead Zone Time

F7-16	**Rotate knob precision keyboard**	factory default value	0
	setup range	0～7	

Set the value	The rotary knob accuracy
0	Restricted by the F7-25
1	0.1Hz
2	1Hz
3	2Hz
4	4Hz
5	5Hz
6	8Hz
7	10Hz

F7-17	**Setup frequency is lower than frequency lower limit action**	factory default value	0
	setup range	0	run with the frequency lower limit
		1	stop
		2	run with zero speed

To select the status of running on the inverter when the setup frequency is lower than the frequency lower limit.

In order to avoid the motor running with low speed, it can use this function to stop

F7-18	**Droop control**	factory default value	0.00Hz
	setup range	0.00Hz～10.00Hz	

When the multiple inverters drive the same load,due to the different speed,the unbalanced load distribution causes the inverter with faster speed to endure heavier load.The droop control characteristic makes the speed droop change along with the addition load ,which lead to balanced load distribution

F7-19	**The delay time for frequency is lower than the lower limit at stop**	factory default value	300.0s
	setup range	0.0s～600.0s	

It is used to select in the status of stop when the setup frequency is lower than the frequency lower limited action, and to delay F7-19 action time

F7-20	**Setup running time**	factory default value	0h
	setup range	0h～65535h	

the multifunctional digital DO on the inverter outputs the signal of running time arrival when the accumulated running time （F7-34、F7-35）comes to this setup's.

F7-22	**Frequency test value(FDT level)**	factory default value	50.00Hz
	setup range	0.00Hz～maximum frequency	
F7-23	**Frequency test hysteresis(FDT hysteresis)**	factory default value	5.0%
	setup range	0.0%～100.0%（FDT level）	

It is used to set the test value of out put frequency and hysteresis value on removing on the output action

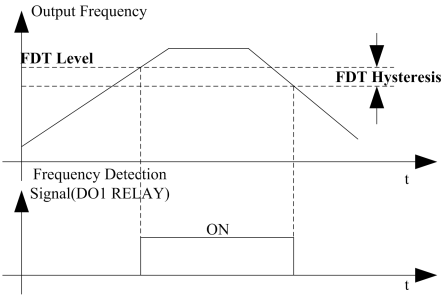


Fig.5-14 Schematic Diagram of FDT Level

F7-24	**Frequency arrival test amplitude**	factory default value	0.0%
	setup range	0.0%～100.0% maximum frequency	

when the output frequency on the inverter reaches the setup frequency value ,this function can be used to adjust the test amplitude .as shown the following figure.

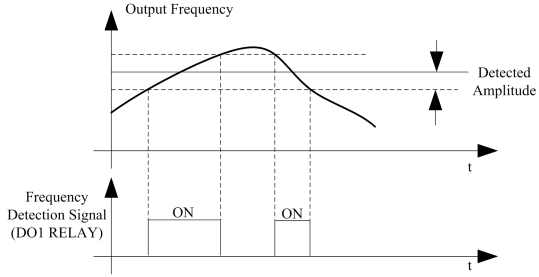


Fig.5-15 Schematic Diagram for Test Amplitude

F7-25	**Keyboard encoder accelera tion level**	factory default value	0
	setup range	0～2	

Used to adjust the keyboard encoder acceleration level, 0-- >2 accelerates more quickly, when the adjusting knob speed of keyboard is not used, please adjust this parameter to reach more convenient effect。

F7-26	**Running time to action selection**		factory default value 0
	setup range	0	keep running
		1	stop

F7-27	**STOP/RESET Function**		factory default value 0
	setup range	0	active in keyboard control mode
		1	stop function is active under terminal control
		2	stop reset function is active under terminal control
		3	both stop and fault reset on stop key are active under terminal control

F7-28	**Keyboard JOG function**		factory default value	0
	setup range	0	Jog function key	
		1	switching function key on forward/reverse rotation	

F7-29	**LED operation display parameters**		factory default value	4095
	setup range	1～16383	Meanings of lower 8 digits bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0 Run frequency Digit set frequency Bus voltage Output voltage Output current Output power DI input state DO output state Meanings of higher 8 digits bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 AI1 voltage(v) AI2 voltage(v) PID setting PID feedback PLC steps Linear speed Reserved Reserved If the above parameter need to be displayed during the operation,please set the corresponding position to 1,change the binary numbers into decimal numbers and set them in F7-29	
F7-30	**LED stop display parameters**		factory default value	63
	setup range	1 ～ 511	Meanings of lower 8 digits bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0 Digital preset frequency bus voltage DI state DO state AI1 input value AI2 input value PLC stage PID settings Meanings of higher 8 digits bit15 bit14 bit13 bit12 bit11 bit10 bit9 bit8 PID feedback Retain Retain Retain Retain Retain Retain Retain If the above parameters need to be displayed in the status of stop ,please set the corresponding position to 1 and change the binary numbers into decimal numbers and set them in F7-30.	
F7-31	**Load speed display**		factory default value	1.000

	coefficient		
	setup range	0.001～10.000	

The output frequency on the inverter and load speed have a correspondence with eath other by the parameter, the need to display the load speed is to set , load speed=120*running frequency*F7-31/motor pole-pairs numbers

F7-32	**Radiator temperature**	factory default value	-
	setup range	0℃～100℃	

IGBT module ‘s temperature is displayed ,the different IGBT over-temperature protection value may be different

F7-34	**Accumulated running time (minutes)**	factory default value	0
	setup range	0～1440	
F7-35	**Accumulated running time (days)**	factory default value	0
	setup range	0～65535	

To recoder the motor running time (the inverter drive enabled) is to set 0 and cancel ,when the running time is less than 60s as shown no-recoder

F7-36	**Fan control selection**		factory default value 1
	setup range	0	fan keeps running
		1	stop running for one minute and stop
		2	action with start /stop on the driver
		3	checking the temperature on radiator to reach 50℃ and then restart

F7-37	**Water supply sleeping function**	factory default value	0
	setup range	0	invalidation
		1	validation

This function is active ,and when the frequency is less than the lower limit frequency

operation action (F7-17),it is used to select stop ,when frequency running comes to the lower limit (F0-18),and the target frequency is less than the lower limit's,after the time on F7-19,it is used to stop.; when the target frequency is higher than the lower limit's ,inverter will restart after the time on F7-38

F7-38	**Wake up pressure difference**	factory default value	3.0%
	setup range	0.0%～100.0%	

The above parameters are used to realize the wake-up function water applications.
This parameter is used to determine the minimum pressure of awakening, setting percentage for a given pressure.
The lower limit value = PI given value - wake up wake pressure difference; pressure difference = PI * F7-38.when PID value regulator feedback is less than the lower limit value (pressure value is less than the lower limit value) inverter start running out of hibernation, generally set at 3% ~ 10%.

Supply sleep setting procedure:
1, select the source frequency F0-06 = 6, PID given.
2, select the lower frequency F0-18 = dormancy frequency value, used to set the resting frequency.
3, select the lower frequency F7-17 = 1, below the lower frequency down.
4, setting the minimum frequency of operation delay time F7-18
5, the selection of the water dormancy function on F7-37 = 1, is 1 water dormancy function effect.
6, choose the sleep wakeup value F7-38 = calculated according to the differential pressure value, for example,given 3 kilograms force, pressure is less than 2.5kilograms of wake sleep function, FA-01=30.0%, F7-38 = 16%.
7, set the PID (FA) group of parameters.
Note: in the process of using PID, the start time frequency from 0 according to the acceleration and deceleration time acceleration, after the arrival of the PID target value of switching to PID PID complete control, adjust the timeless than the acceleration and deceleration time according to the acceleration and deceleration time.

F7-39	**Timing time in the status of DI -on**	factory default value	2.0s
	setup range	0.0s～6000.0s	
F7-40	**Timing time in the status of DI-off**	factory default value	2.0s
	setup range	0.0s～6000.0s	

When the timer input terminal 'connected " is longer than F7-39. its function output is connected.
When the timer input terminal 'disconnected' is longer than F7-40,its function output is not connected.

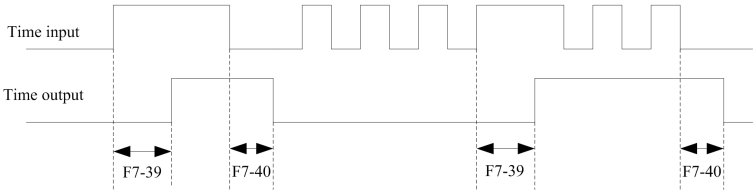


Fig.5-16 Timer input and output action diagram

F7-41	**Starting protection function**	factory default value	1
	setup range	0	invalidation （direct start when starting terminal command is valid）
		1	Validation

this parameters is used to improve the protection coefficient ,if set to 1,there ae two functions

1） When the running command is existed under power on ,it must be first to remove the running command and then delete running protection

2）The running command is still existed when the inverter's fault is to reset ,it must be first to remove the running command and then delete running protection

these ways can prevent the motor auto-running under no awareness from happening dangerous ,if set to 0 and the running command is existed under power on ,the inverter will directly start after setting time on F7-42

F7-42	**Delay time for direct start upon power**	factory default value	1.0s
	setup range	1.0s～60.0s	

F7-49	**User password**	factory default value	0
	setup range	0～65535	

The user sets the password with this function. The setting methods refer to Password Setting on Charpt 4 Operation and Display

5.9 Group F8 Communication Parameter Description

F8-00	**Baud rate**			factory default value	5
	setup range	0	300BPS		

		1	600BPS
		2	1200BPS
		3	2400BPS
		4	4800BPS
		5	9600BPS
		6	19200BPS
		7	38400BPS

This parameter is used to set the the data transfer rate between the host computer and the inverter.

Caution: The baud rate of the host computer and the inverter must be consistent.Otherwise, communication is impossible. The higher baud rate is, the faster communication is.

F8-01	**Data format**		factory default value	0
	setup range	0	No check:data format<8,N,2>	
		1	Even parity check :data format <8,E,1>	
		2	Odd parity check :data format<8,O,1>	

The data format of the host computer and the inverter setup must be consistent, otherwise, communication is impossible.

F8-02	**Local addr.**		factory default value	1
	setup range	0～247,0 is broadcast address		

The function code used to identify the local address of the inverter.The local address is unique (except the broadcast address), which can realize the broadcast function of host computer.

Caution: When the local address is set to zero, that is the broadcast address, which can only receive and perform the broadcast address of host computer but not respond to the host computer.

F8-03	**Response delay**	factory default value	10ms
	setup range	0ms～20ms	

Response delay: It refers to the interval time from the inverter finishes receiving data to sending data to the host machine.If the response delay is less than the system processing time, then the response based on the time delay of the system processing time.If the response delay is more than the system processing time, after the system processes the data, it should be delayed to wait until the response delay time is up, then sending data to host machine.

F8-04	**Communication overtime**		factory default value	0.0s
	setup range	0.0s(Invalid)～60.0s		

When the function set to 0.0 s, the communication overtime parameter is invalid.When the function set to 0.0 s, the communication overtime parameter is invalid. At normal circumstances, it will be set as invalid. If in the continuous communication system, set the second parameter, you can monitor the communication status.

F8-05	**The selection of the mode of communication**		factory default value	1
	setup range	0	Model free manufacturers	
		1	The standard MODBUS protocol	

5.10 Group F9 Fault and Protection

F9-00	**Motor overload protection selection**		Factory default value	1
	Setup range	0	Inactive	0: The inverter has no overload protection for the motor, and thermal relay is installed before the motor.
		1	Active	1: The inverter has overload protection function for the motor. Refer toF9-01 for the protection value.

F9-01	**Motor overload protection gain**	Factory default value	1.00
	Setup range 0.20～10.00	The motor overload protection is inverter time-lag curve; 220%×(F9-01)× rated motor current: one minute; 150%×(F9-01)× rated motor current: 60 minutes.	

F9-02	**Motor over load pre-warning coefficient**		Factory default value	80%
	Setup range	50% ～ 100%	The reference for this value is the motor over load cur rent . When the inverter detects that the output current reaches (F9-02)× motor overload current and lasts time as specified by the reverse time-lag	

			curve, it outputs pre-warning signal from DO or relay

F9-03	**Stall gain over voltage**		Factory default value	50%
	Setup range	0% ～ 100%	I t adjusts the inverter ’s capacity in suppressing the stall over voltage. The bigger the value is, the stronger the suppressing capacity is. For the load with small inertia, the value should be small. Otherwise, the dynamic response of the system will be slow. For the load with large inertia, the value should be large. Otherwise, the suppressing result will be poor, and over voltage fault may occur.	

F9-04	**Stall protection voltage over voltage**		Factory default value	130%
	Setup range	120% ～ 150%	Select the protection point for function of stall over voltage. When the value is exceeded, the inverter starts executing the protection function for stall over voltage.	

F9-05	**Stall gain over current**		Factory default value	80%
	Setup range	0% ～ 100%	It adjusts the inverter’s capacity in suppressing the stall over current. The bigger the value is, the stronger the suppressing capacity is. For the load with small inertia, the value should be small. Otherwise, the dynamic response of the system will be slow. For the load with large inertia, the value should be large. Otherwise, the suppressing result will be poor, and over voltage fault may occur.	

F9-06	**Stall protection current over current**		Factory default value	180%
	Setup range	100% ～ 200%	Select the protection point for function of stall over current. When the value is exceeded, the inverter starts executing the protection function for stall over current.	

F9-07	**The overload protection of the**	Factory default	100%

	motor current coefficient		value	
	Setup range	10%～100%	Motor overload protection current coefficient F9.07 × motor rated current (F4-04), the default protection is 220% × motor rated current 1 minutes, such as: F9-07 is set to 50%, the motor overload protection to 110% x motor rated current for 1 minutes.	

F9-11	**Fault auto reset times**		Factory default value	0
	Setup range	0～3	When the inverter selects fault auto reset, it is used to set the times of auto reset. If this value is exceeded, the inverter will stop because of failure and wait for maintenance	

F9-12	**Fault relay action selection during the fault auto reset**		Factory default value	1
	Setup range	0: No action 1: Action	After the failure auto reset function is selected, this parameter can be set to determine if it needs the action of the faulty relay so as to shield the fault alarm caused and ensure the continuous operation of the equipment during the failure reset.	

F9-13	**Fault auto reset interval**		Factory default value	1.0s
	Setup range	0.1s ～ 100.0s	The waiting time of the inverter from the fault alarm to auto reset.	

F9-14	**Input phase failure protection selection**		Factory default value	1
	Setup range	0: Inactive 1: Active	Select whether to provide protection for input phase failure.	

F9-15	**Output phase failure protection selection**		Factory default value	1
	Setup range	0: Inactive 1: Active	Select whether to provide protection for output phase failure.	

F9-16	**First fault type**	0～31
F9-17	**Second fault type**	
F9-18	**Three fault type**	

It is used to record the fault types of inverter for the most recent three times: 0 indicates no fault, while 1 to 31 indicates ERR01 to ERR31. Refer to Chapter 7 for details.

F9-19	**Most recent fault type**	0～31
F9-20	**Frequency upon fault**	Display the frequency upon fault for the most recent one time.
F9-21	**Current upon fault**	Display the current upon fault for the most recent one time.
F9-22	**Bus voltage upon fault**	Display the bus voltage upon fault for the most recent one time.
F9-23	**Input terminal status upon fault**	This value is a decimal number. Display the status of all the digital input terminals upon fault for the most recent one time, with sequence of: bit4 bit3 bit2 bit1 bit0 T4 T3 T2 T1 T0 DI4 DI3 DI2 DI1 DI0 It will be displayed in decimal number converted from each digit status. When the input terminal is ON, the corresponding value is 1. When the input terminal is OFF, the value is 0. It can know the details regarding digital output signal via this value.

F9.24	**Output terminal upon fault**	Display the status of all the digital input terminals upon fault for the most recent one time, with sequence of: bit1 bit0 T1 T0 DO0 REL1 It will be displayed in decimal number converted from each digit status. When the input terminal is ON, the corresponding value is 1. When the input terminal is OFF, the value is 0. It can know the details regarding digital output signal via this value.

5.11 Group FA Process Control PID Function

PID control is a general method of process control. It adjusts the output frequency through proportional, integral and differential calculations of the difference between the feedback signal of the controlled quantity and the signal of the target quantity, and constitutes the feedback system so as to stabilize the controlled quantity at the target quality. It is applicable to such process controls as flow control, pressure control and temperature control. The basic principle framework of control is shown as follows:

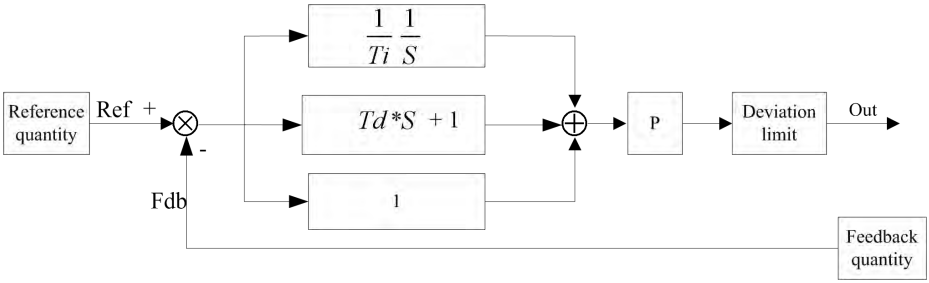


Fig.5-17 Process PID principle framework

FA-00	**PID reference source**		Factory default value	0
	Setup range	0	FA-01	
		1	AI1	
		2	AI2	

		3	Communication setup

When the frequency source selects PID, i.e. F0-06 or F0-07=6, this group of function is enabled. (Please refer to F0-06 and F0-07).

This parameter decides the target quantity reference channel of the process PID.

The setup target quantity of the process PID is relative value, and the setup 100% is relative to the 100% of feedback signal of the controlled system.

The PID range (FA-06) is not essential because the system will always calculate according to the relative value (0 to 100%) no matter how the range is set. However, if PID range is set, it can view the actual values relative to the reference and feedback of PID via the display parameters on the keyboard.

FA-01	**PID keyboard reference**	Factory default value	50.0%
	Setup range	0.0%～100.0%	

When FA-00=0 is selected, the target source is keyboard reference. It needs to set this parameter. The benchmark value of this parameter is system feedback quantity.

FA-02	**PID reference change duration**	Factory default value	0.0s
	Setup range	0.0s～3000.0s	

PID reference changes according to this parameter value, which corresponds to the time taken for the PID reference to change from 0% to 100%.

FA-03	**PID feedback source**		Factory default value	0
	Setup range	0	AI1	
		1	AI2	
		2	AI1－AI2	
		3	Communication setup	

This parameter is used to select the PID reference channel.

FA-04	**PID action direction**		Factory default value	0
	Setup range	0	Positive action	
		1	Reverse action	

Positive action: When the feedback signal is higher than the PID reference, it needs to reduce the output frequency of the inverter to balance the PID. The winding tension PID control is the example.

Reverse action: When the feedback signal is higher than the PID reference, it needs to increase the output frequency of the inverter to balance the PID. The unwinding tension PID control is the example.

FA-05	**PID reference feedback range**		Factory default value	1000
	Setup range	0～65535	PID reference feedback range is a non-dimensional unit. It is used to display the PID reference an	
FA-06	**Proportional gain P**		Factory default value	20.0
	Setup range		0.0～100.0	
FA-07	**Integration time l**		Factory default value	2.00s
	Setup range		0.01s～10.00s	
FA-08	**Differential time D**		Factory default value	0.000s
	Setup range		0.00s～10.00s	

Proportional gain P: It decides the adjustment intensity of the whole PID regulator. The higher the P is, more powerful the adjustment intensity is. When this parameter is 100, indicating the deviation between PID feedback quantity and the reference quantity is 100%, the adjustment amplitude of the PID regulator on the output frequency command is maximum frequency (the integral and differential functions are neglected).

Integration time I: It decides the speed of PID regulator adjusting the deviation between the PID feedback quantity and the reference quantity. Integration time is the time within which the integration regulator (the proportional and differential functions are neglected) performs continuous adjustment and the adjustment quantity reaches maximum frequency (F0-09) when the deviation between the PID feedback quantity and reference quantity is 100%. The shorter the integration time is, more powerful the adjustment intensity is.

Differential time D: It decides the intensity of PID regulator adjusting the change rate of deviation between the PID feedback quantity and the reference quantity. Differential time is the time within which if the feedback quantity changes 100%, the adjustment quantity reaches maximum frequency (F0-09) (proportional and integral functions are neglected). The longer the differential time is, more powerful the adjustment intensity is.

FA-09	**Cutoff frequency of reverse rotation**	Factory default value	0．00Hz
	Setup range	0.00Hz～maximum frequency	
FA-10	**Deviation limit**	Factory default value	0.01%
	Setup range	0.00%～100.00%	

Deviation limit: When the PID feedback deviation is within this range, the PID stops adjustment;

5.12 Group FB Swing Frequency

The swing frequency function is applicable to the textile and chemical fiber fields and the applications where traversing and winding functions are required.

The swing frequency function means that the output frequency of the inverter swings up and down with the setup frequency (frequency command is selected by F0-06 or F0-07) as the center. The trace of running frequency at the time axis is shown in the figure below, of which the swing amplitude is set by FB-00 and FB-01. When FB-01 is set to 1, indicating the swing amplitude is 0, the swing frequency is disabled.

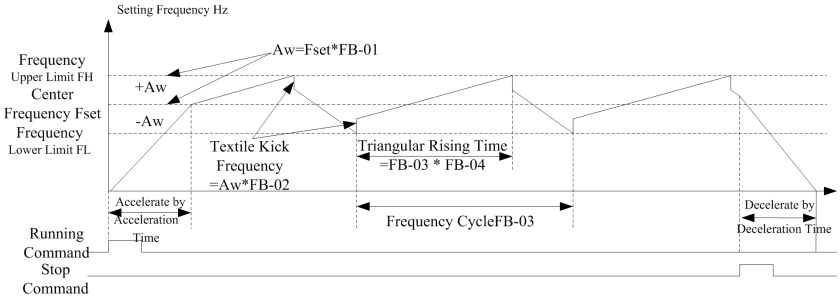


Fig.5-18 Swing Frequency Working Diagram

FB-00	**Swing frequency setup mode**	Factory default value	0
	Setup range 0	Relative to the central frequency	
	Setup range 1	Relative to maximum frequency	

This parameter is used to select the benchmark quantity of the swing amplitude.

0: Relative to the central frequency (F0-07 or F0-06 frequency source selection), and it is variable swing amplitude system. The swing amplitude varies with the central frequency (setup frequency).

1: Relative to the maximum frequency (F0-14 maximum output frequency), and it is fixed swing amplitude system. The swing amplitude is fixed.

FB-01	**Swing frequency amplitude**	Factory default value	0.0%
	Setup range	0.0%～100.0%	
FB-02	**Kick frequency amplitude**	Factory default value	0.0%
	Setup range	0.0%～50.0%	

This parameter is used to determine the values of swing amplitude and kick frequency. The swing frequency is limited by the frequency upper limit and frequency lower limit.

The swing amplitude is relative to the central frequency (variable swing amplitude, select FB-00=0): swing amplitude AW=frequency source F0-07 times swing amplitude FB-01.

The swing amplitude is relative to the maximum frequency (fixed swing amplitude, select FB-00=1): swing amplitude AW=maximum frequency F0-12 times swing amplitude FB-01.

Kick frequency=swing amplitude AW times kick frequency amplitude FB-02. That is the value of kick frequency relative to the swing amplitude when the swing frequency is running.

If the swing amplitude relative to the central frequency (variable swing amplitude, select FB-00=0) is selected, the kick frequency is a variable value.

If the swing amplitude relative to the maximum frequency (fixed swing amplitude, select FB-00=1) is selected, the kick frequency is a fixed value.

FB-03	**Swing frequency cycle**	Factory default value	10.0s
	Setup range	0.0s～3000.0s	
FB-04	**Time constant of triangular wave boost**	Factory default value	50.0%
	Setup range	0.0%～100.0%	

Swing frequency cycle: It refers to the time of a complete cycle of swing frequency.

FB-04 Time constant of triangular wave boost is relative to FB-03 swing frequency cycle.

Triangular wave boost time =swing frequency cycle FB-03 × time constant of triangular wave boost FB-04 (unit: s)

Triangular wave falling time =swing frequency cycle FB-03 × (1-time constant of triangular wave boost FB-04 (unit: s)

5.13 Group FC MS Speed Function and Simple PLC Function

Simply PLC function which is to perform automatic control on MS frequency logic through the inverter with the built-in PLC can set running time ,running direction and running frequency so as to satisfy the process requirements.

M420 series general magnetic flux vector control inverter can implement 16-segment variable control,and has four types of acceleration/deceleration time for selection

When the setup PLC completes one cycle,it can output one ON signal through the multifunctional output terminal Y1 and multifunctional RELAY1.all the details shown as F6-00～F6-02

When the frequency source select F0-06、F0-07、F0-10 as MS speed running mode ,and need setting FC-00～FC-15 to make sure its characteristics.

FC-00	**MS Speed 0**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-01	**MS Speed 1**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-02	**MS Speed 2**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-03	**MS Speed 3**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-04	**MS Speed 4**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-05	**MS Speed 5**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-06	**MS Speed 6**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-07	**MS Speed 7**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-08	**MS Speed 8**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-09	**MS Speed 9**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	

FC-10	**MS Speed 10**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-11	**MS Speed 11**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-12	**MS Speed 12**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-13	**MS Speed 13**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-14	**MS Speed14**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	
FC-15	**MS Speed 15**	factory default value	0.0Hz
	setup range	negative maximum frequency to maximum frequency	

Caution:The symbols on FC-00～FC-15 determine the running direction of simple PLC,if they are negative values ,it indicates they are in revise direction.

The Simple PLC is shown as follows

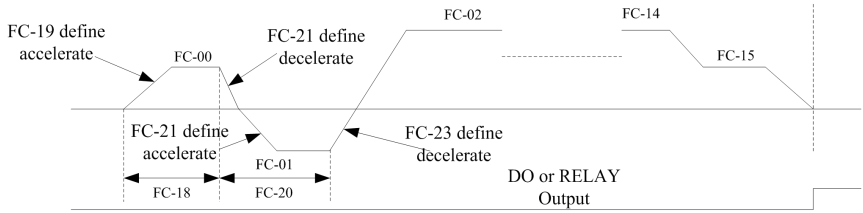


Fig.5-19 Schematic Diagram of Simple PLC

FC-16	**PLC running mode**		factory default value	0
	setup range	0	stop at the end of one-time running	
		1	keep final value at the end of one-time running	
		2	constant circulation	
FC-17	**PLC power off memory selection**		factory default value	0
	setup range	0	power off without memory	
		1	power off with memory	
		2	Power.off memory and not fro m the stopping point start	
		3	Power off memory and began to carry out from stopping point	

0:stop at the end of one-time running

The inverter will automatically stop after the completion of one single cycle,and can not restart until another running command is given

1:keep final values at the end of one-time running

The inverter will automatically keep the running frequency and the direction on the last one segment after the completion of one single cycle.

2:constant circulation

The inverter will automatically start the next cycle after the completion of one cycle.and can not stop will stop command is given.

3: power down memory and began to carry out from stopping point

Power off memory and stop after the restart from downtime PLC segment.

FC-18	**PLC Segment 0 Running Time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-19	**PLC Segment 0 speed-up /down time**	factory default values	0
	setup range	0～3	
FC-20	**PLC Segment 1 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-21	**PLC Segment 1 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-22	**PLC Segment 2 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-23	**PLC Segment 2 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-24	**PLC Segment 3 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-25	**PLC Segment 3 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-26	**PLC Segment 4 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-27	**PLC Segment 4 Speed up /down**	factory	0

	time	default values	
	setup range	0～3	
FC-28	**PLC Segment 5 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-29	**PLC Segment 5 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-30	**PLC Segment 6 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-31	**PLC Segment 6 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-32	**PLC Segment 7 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-33	**PLC Segment 7 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-34	**PLC Segment 8 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-35	**PLC Segment 8 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-36	**PLC Segment 9 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-37	**PLC Segment 9 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-38	**PLC Segment 10 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-39	**PLC Segment 10 Speed up /down time**	factory default values	0
	setup range	0～3	
FC-40	**PLC Segment 11 running time**	factory default values	0.0s(h)
	setup range	0.0s(h)～6553.5s(h)	
FC-41	**PLC Segment 11 Speed up /down**	factory default	0

	time		values	
	setup range		0～3	
FC-42	**PLC Segment 12 running time**		factory default values	0.0s(h)
	setup range		0.0s(h)～6553.5s(h)	
FC-43	**PLC Segment 12 Speed up /down time**		factory default values	0
	setup range		0～3	
FC-44	**PLC Segment 13 running time**		factory default values	0.0s(h)
	setup range		0.0s(h)～6553.5s(h)	
FC-45	**PLC Segment 13 Speed up /down time**		factory default values	0
	setup range		0～3	
FC-46	**PLC Segment 14 running time**		factory default values	0.0s(h)
	setup range		0.0s(h)～6553.5s(h)	
FC-47	**PLC Segment 14 Speed up /down time**		factory default values	0
	setup range		0～3	
FC-48	**PLC Segment 15 running time**		factory default values	0.0s(h)
	setup range		0.0s(h)～6553.5s(h)	
FC-49	**PLC Segment 14 Speed up /down time**		factory default values	0
	setup range		0～3	
FC-50	**PLC Running time unit selection**		factory default values	0
	setup range	0	s	
		1	h	

FC-51	**A multi speed priority modes**		factory default values	0
	setup range	0	A multi speed not priority	
		1	A multi speed priority	

FC-52	**Multi speed acceleration and deceleration time selection priority**		factory default values	0
	setup range	0	Acceleration and deceleration time 1	
		1	Acceleration and deceleration time 2	
		2	Acceleration and deceleration time 3	
		3	Acceleration and deceleration time 4	

defined every running time of 16 programs

5.14 Group FD,FE (reserved)

5.15 Group FF Factory Parameter

FE-00	**When running the top monitoring display parameters**		factory default values	0
	setup range	0	With the normal F7-29 settings	
		1	Display speed	
		2	Display PID feedback value	
		3	Display PLC stage	
		4	Display PID given value	

This parameter is used to display the top monitoring parameters of running

FE-01	**When stopping top monitoring display parameters**		factory default values	0
	setup range	0	With the normal F7-30 settings	
		1	Display speed	
		2	Display PID feedback value	
		3	Display PLC stage	
		4	Display PID given value	

5.16 Group FF manufacturers parameter group

FF-00	**Factory parameter password**	factory default values	******

Chapter6 EMC(Electromagnetic Compatibility）

6.1 Definition

Electromagnetic compatibility is the ability of the electric equipment to run in the electromagnetic interference environment and implement its function stably without any interference on the electromagnetic interference environment

6.2 Standard Description

In accordance with the requirements of the national standard GB/T12668.3,the inverter needs to comply with electromagnetic interference and anti-electromagnetic interference requirements.

the existing products at our company are in accordance with the latest international standard -IEC/EN61800-3.

2004(Adjustablespeedelectricalpowerdrivesystemspart3:EMC requirements and specific test methods),which is equivalent to GB/T12668.3.

IEC/EN61800-3 assesses the inverter in terms of electromagnetic interference and anti-electronic interference. Electromagnetic interference mainly tests the radiation interference, conduction interference and harmonics interference on the inverter (required for the inverter for civil use)Anti-electromagnetic interference mainly tests the conduction interference rejection, radiation interference rejection, surge interference rejection, fast and mutable pulse group interference rejection, ESD interference rejection and power low frequency end interference rejection (specific test items including: 1. Interference rejection tests of input voltage sag, interrupt and change; 2. Phase conversion interference rejection test; 3. Harmonic input interference rejection test; 4. Input frequency change test; 5. Input voltage unbalance test; 6. input voltage fluctuation test).

In accordance with the above requirements of IEC/EN61800-3 to be tested ,our products are installed and used according to Section 6.3 and have a good electromagnetic compatibility in general industry environment

6.3 EMC Guide

6.3.1 Harmonic Effect

Higher harmonics of power supply may damage the inverter .Thus ,at some places where mains quality is rather poor ,it is recommended to install AC input reactor.

6.3.2 Precautions on Electromagnetic Interference and Installation

There are two kinds of electromagnetic interferences .one is interference of electromagnetic noise in the surrounding environment on the inverter,and the other is interference of inverter on the surrounding equipment.

installation precautions:

A、 the earth wire of the inverter and other electric products shall be well grounded.

B、 the power input and output power cables on the inverter and weak current signal cables (e.g. control line) shall not arranged in parallel and vertical arrangement is preferable.

C、 it is recommended that the output power cables of the inverter employ shield cables or steel pipe shielded cables ,all of its shielding layer be grounded reliably,the lead cables of the equipment suffering interferences are recommended to employ twisted –pair shielded control cables and its shielding layer be grounded reliably.

D、 When the length of motor cable is longer than 100 meters,it needs to install output filter or reactor

6.3.3 Handing method for the interference of the surrounding equipment on the inverter

generally these reason for electromagnetic interference on the inverter is that at some places nearby inverter where plenty of relays ,contactors and electromagnetic brakes shall be installed .when the inverter has error action due to the interferences ,the following measures ca be taken:

A、 install surge suppressor on the devise generating interference

B、 install filter at the input end of the inverter ,refer to Section 7.3.6 the specific operations

C、 the control signal cable of the inverter and cable of detection line shall employ shielded cable and the shielding layers shall be earted reliably.

6.3.4 Handing method for the interference of inverter on the surrounding equipment

these interference include two types :one is the radiation interference of the inverter.and the other is the conduction interference of the inverter.these two types of interferences cause the surrounding electric equipments which suffer elector magneitc or electrostatic induction.the surrounding equipments hereby produce error action,For the different interferences,their solutions are shown as follows:

A、 For the measuring meters ,receivers and sensors ,this signals are generally weak ,if they which are placed nearby the inverter or together with the inverter in the same control cabinet are easy to suffer interference and to generate error actions .Suggestions to be handled with following methods: put in places far away from the interference source;do not arrange the signal cables with the power cables in parallel and never bind them together； both the signal cables and power cables employ shielded cables and are well earthed; install ferrite magnetic ring(with suppressing frequency of 30h2 to 1000h2)at the output side of the inverter and wind it 2～3 cycles;install EMC output filter in more severe conditions.

B、 when both the equipment suffering interference and the inverter make use of the same power supply,it many cause conduction interference .if the above method cannot remove the interference ,it can install EMC filter between the inverter and the power supply (refer to Section 7.3.6 for the prototyping operation)

C、 the surrounding equipment is separately earthed,which can avoid the interference caused by the leakage current of the inverter's earth wire when common earth mode is adopted.

6.3.5 Leakage current and handling：

There are two forms of leakage current when using the inverter. One is leakage current to the earth, and the other is leakage current between the cables.

1) Factors influencing the leakage current to the earth and the solutions:

There are distributed capacitance between the lead cables and the earth. The larger the distributed capacitance is, the larger the leakage current will be. The distributed capacitance can be reduced by effectively reducing the distance between the inverter and the motor. The higher the carrier frequency is, the larger the leakage current will be. The leakage current can be reduced by reducing the carrier frequency. However, reducing the carrier frequency may result in addition of motor noise. Note that additional installation of reactor is also an effective method to remove the leakage current.

The leakage current may increase following the addition of circuit current. Therefore, when the motor power is high, the corresponding leakage current will be high too.

2) Factors of producing leakage current between the cables and solutions:

There is distributed capacitance between the output cables of the inverter. If the current passing the lines has higher harmonic, it may cause resonance and thus result in leakage current. If

thermal relay is used, it may generate error action.

The solution is to reduce the carrier frequency or install output reactor. It is recommended that thermal relay not be installed before the motor when using the inverter, and that electronic over current protection function of the inverter be used instead.

6.3.6 Precautions for Installing EMC input filter at the input end of power supply

1) When using the inverter, please follow its rated values strictly. Since the filter belongs to Classification I electric appliances, the metal enclosure of the filter shall be large and the metal ground of the installing cabinet shall be well earthed and have good conduction continuity. Otherwise there may be danger of electric shock and the EMC effect may be greatly affected.

2) Through the EMC test, it is found that the filter ground must be connected with the PE end of the inverter at the same public earth. Otherwise the EMC effect may be greatly affected.

3) The filter shall be installed at a place close to the input end of the power supply as much as possible.

Chapter 7 Fault Diagnosis and Countermeasures

7.1 Fault Alarm and Countermeasures

M420 series inverter has 28 pieces of warning information and protection function.in case of abnormal fault,the protection function will be invoked ,the inverter will stop output,and the faulty relay contact of the inverter will start,and the fault code will displayed on the display panel of the inverter.Before consulting the service department,the user can perform self-check according to the prompts of this chapter ,analyze the fault cause and find out the solutions.If the fault is the same as the following dotted frame,please consult the agents of inverter or our company directly.

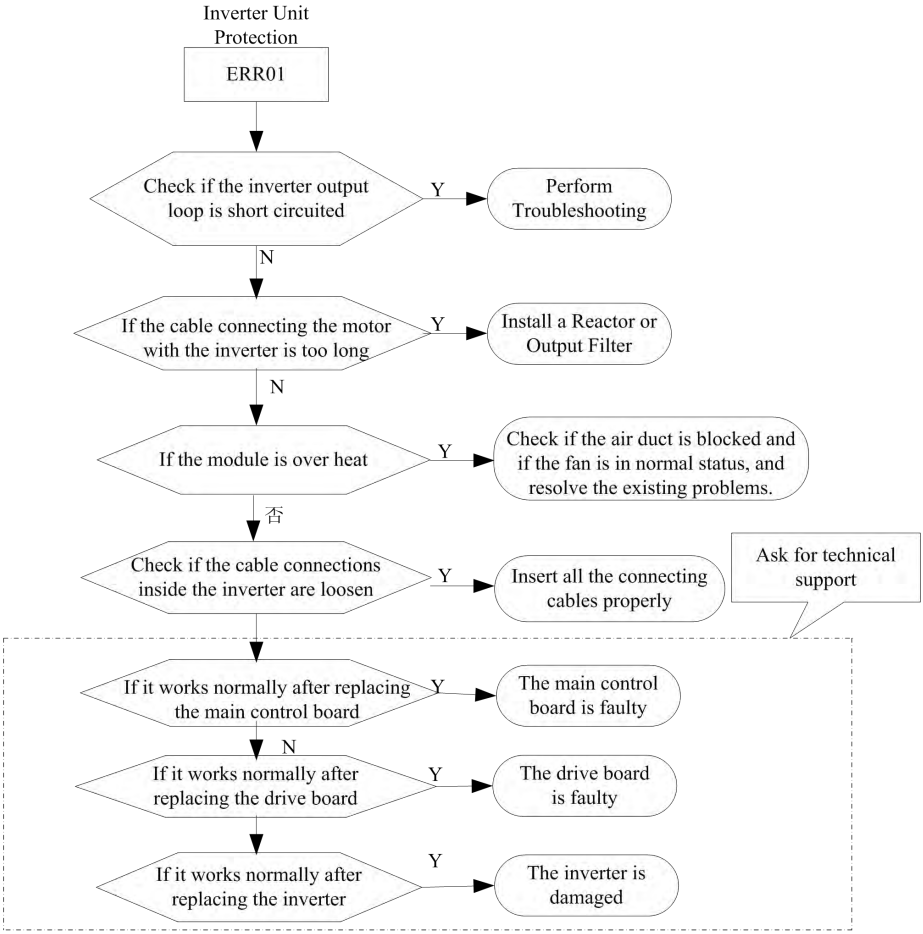


Fig.7-1 Inverter unit protection（Err01）

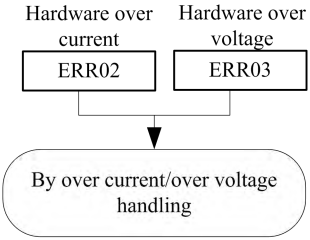


Fig.7-2 Hardware protect(ERR02、ERR03)

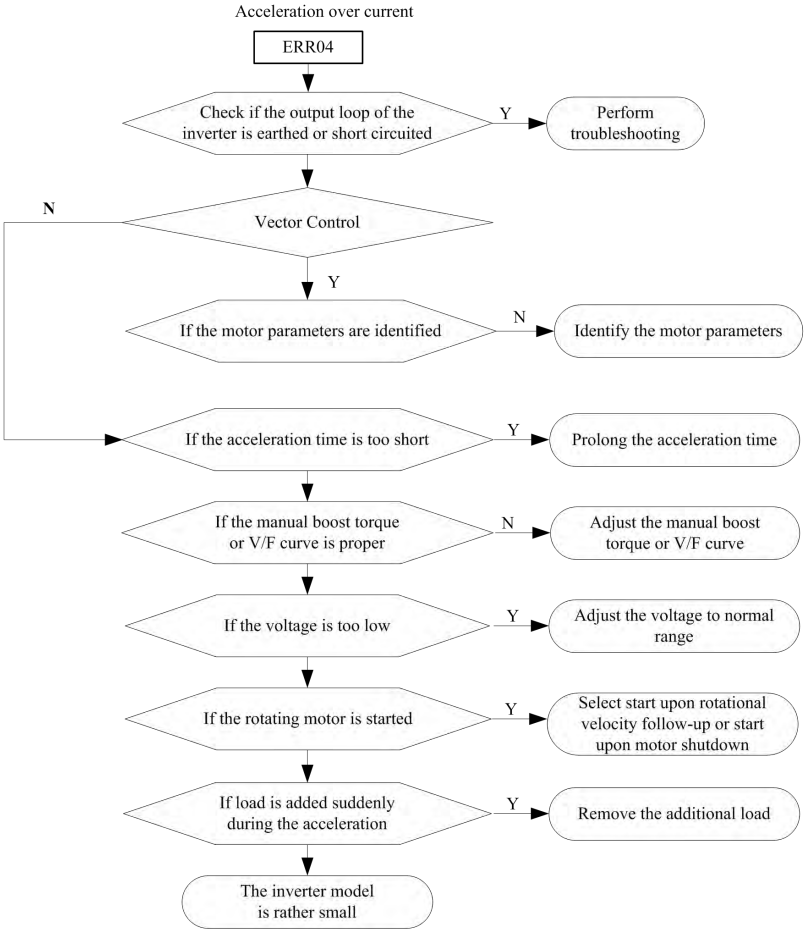


Fig.7-3 Acceleration over current（Err04）

Fig.7-4 Deceleration /Stop over current（Err05/Err07）

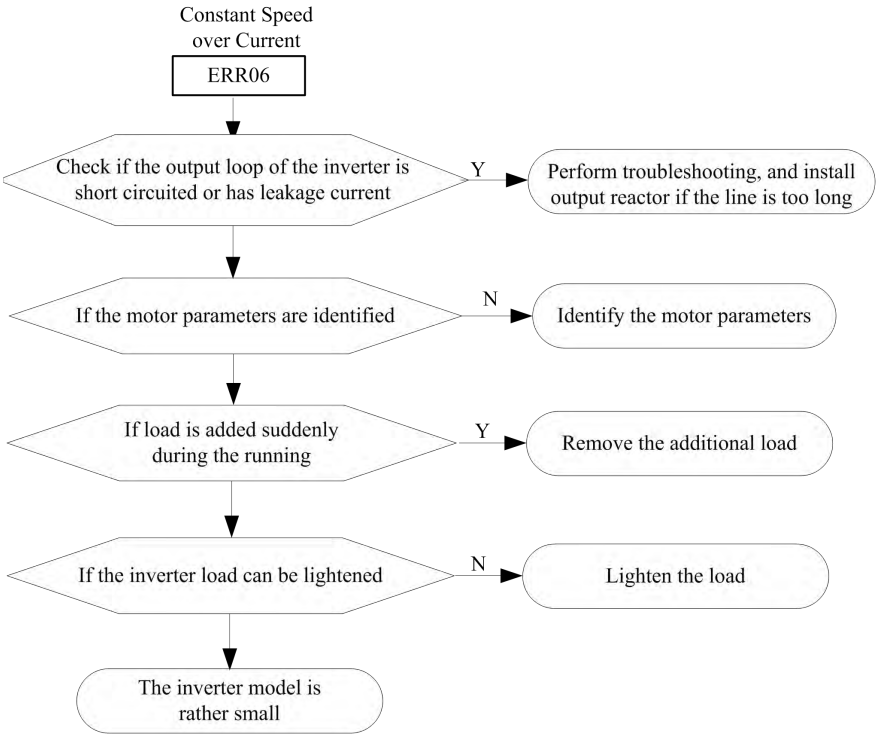


Fig.7-5 Constant speed over current（Err06）

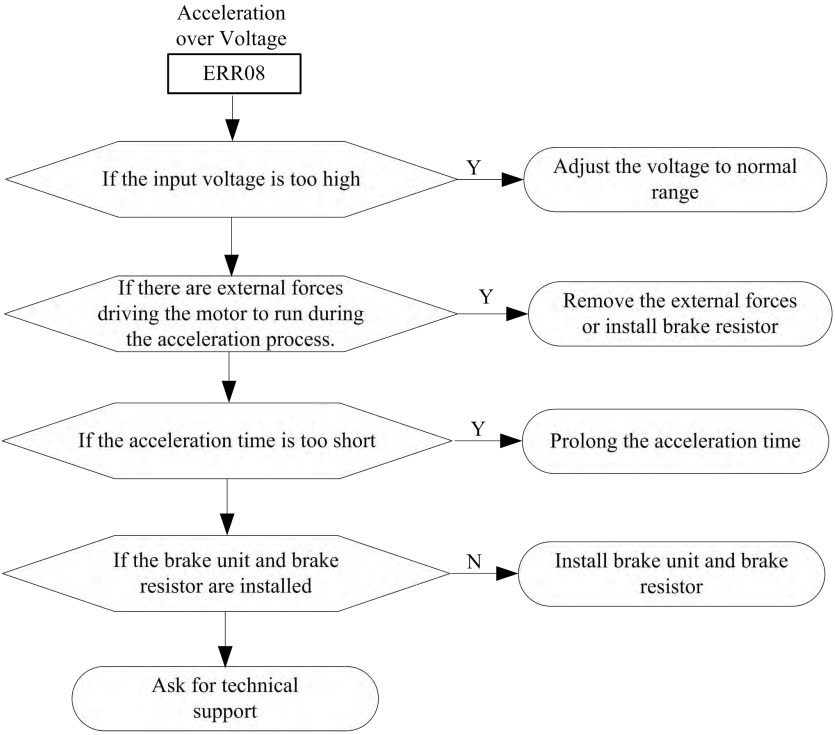


Fig.7-6 Acceleration over voltage（Err08）

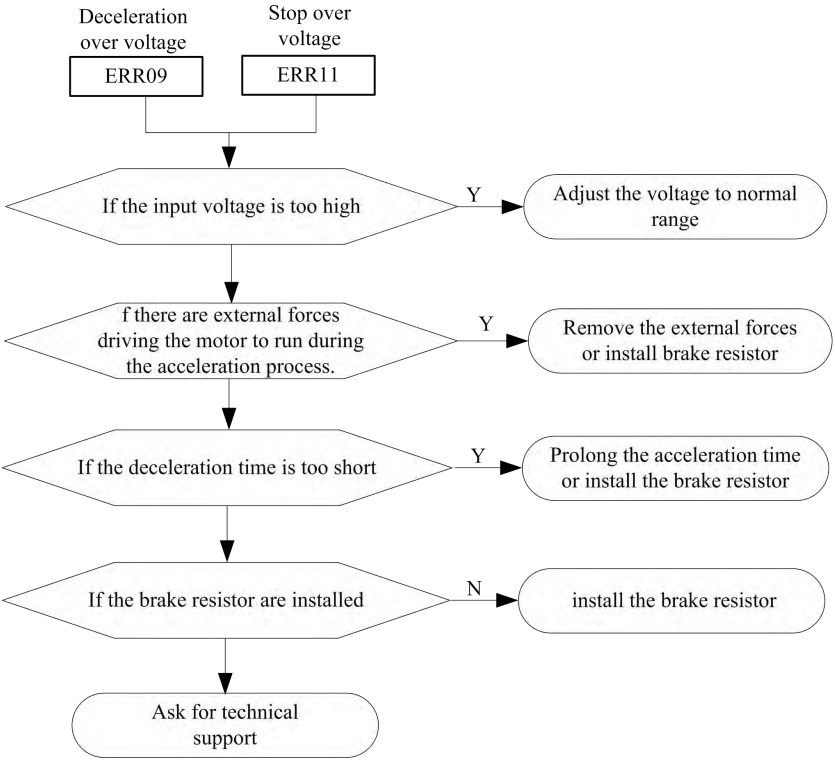


Fig.7-7 Deceleration /Stop over voltage（Err09/Err11）

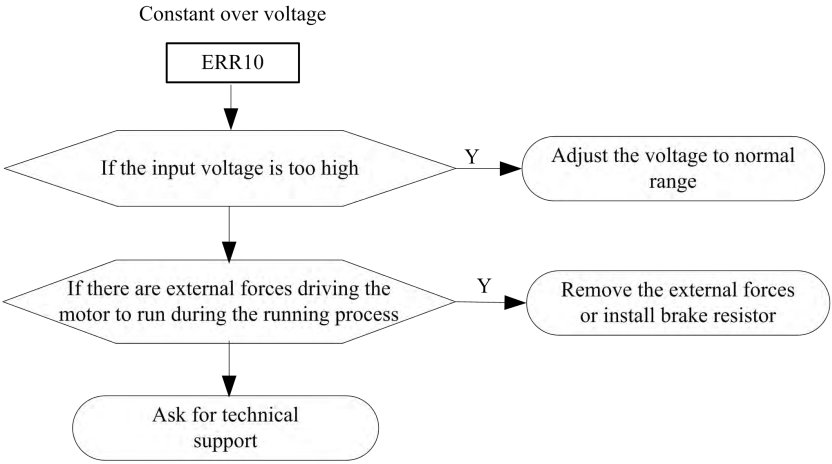


Fig.7-8 Constant over voltage（Err10）

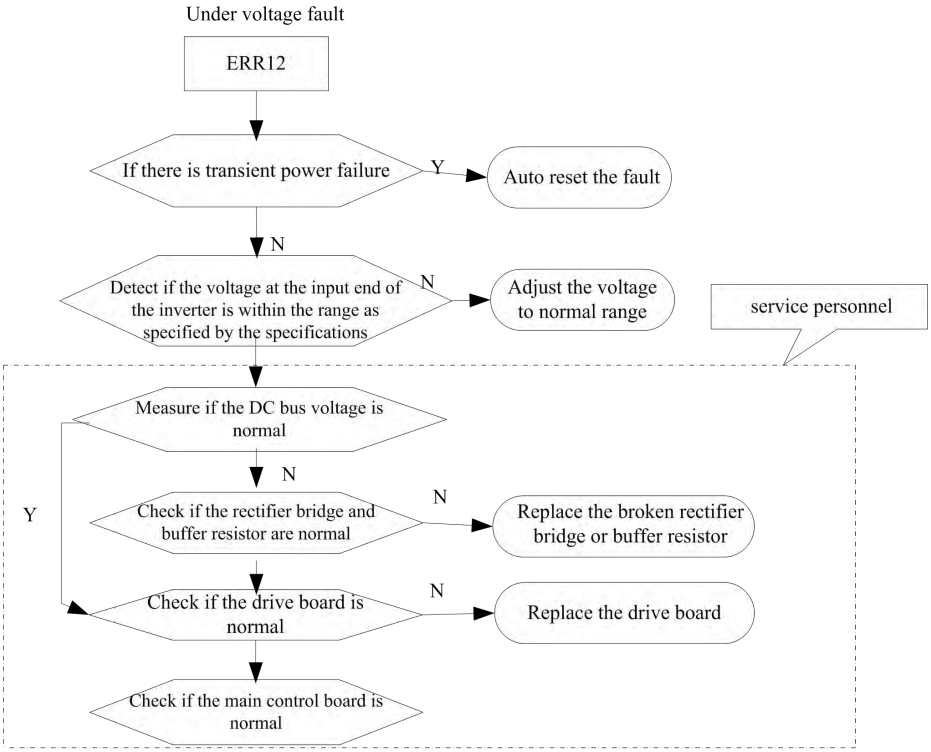


Fig.7-9 Under voltage fault（Err12）

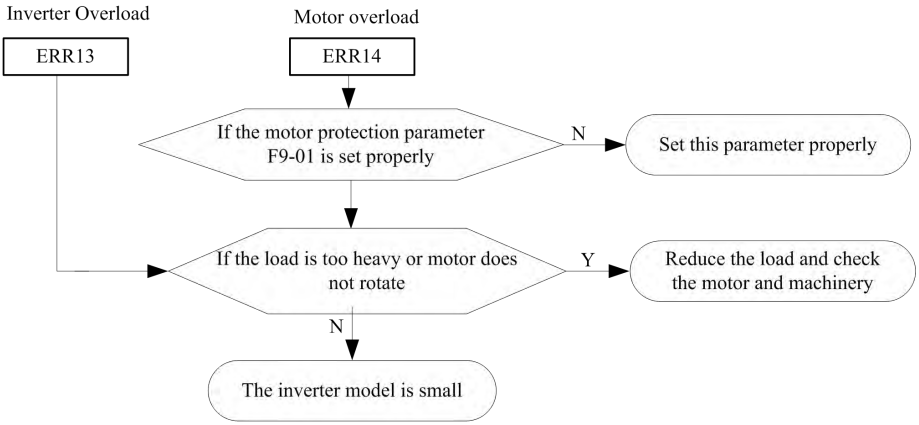


Fig.7-10 Inverter/Motor overload（Err13/Err14）

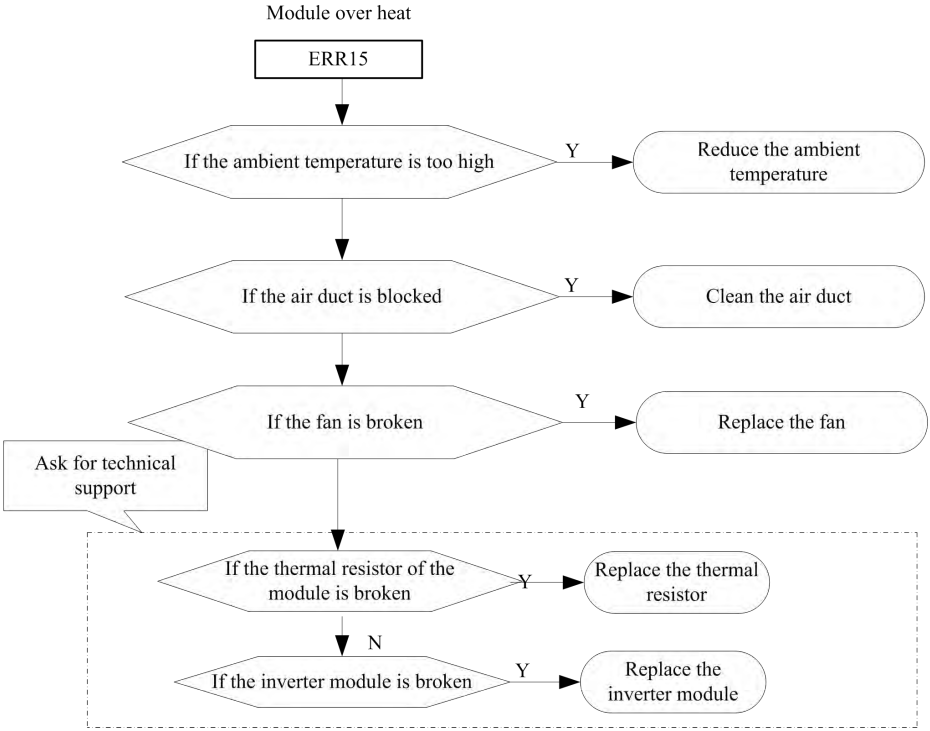


Fig.7-11 Module over heating（Err15）

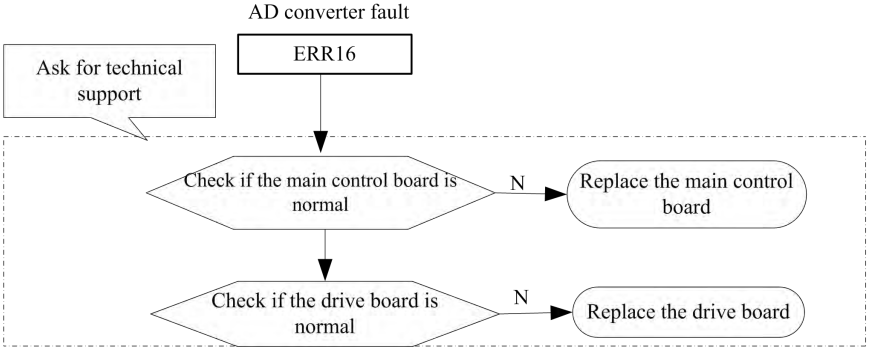


Fig.7-12 AD converter fault（Err16）

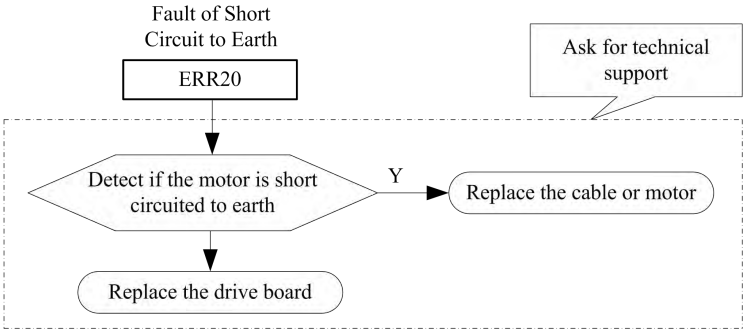


Fig.7-12 Earth short circuit fault（Err20）

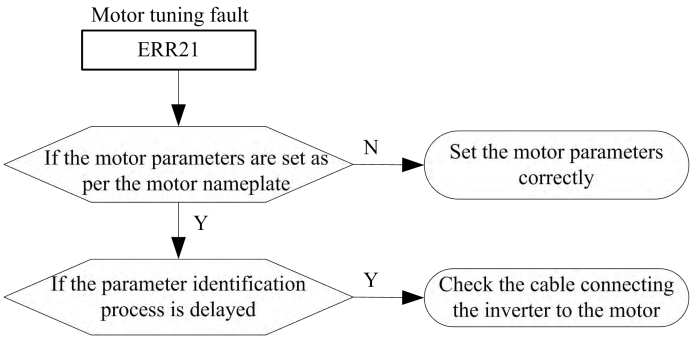


Fig.7-15 Motor tuning fault（Err21）

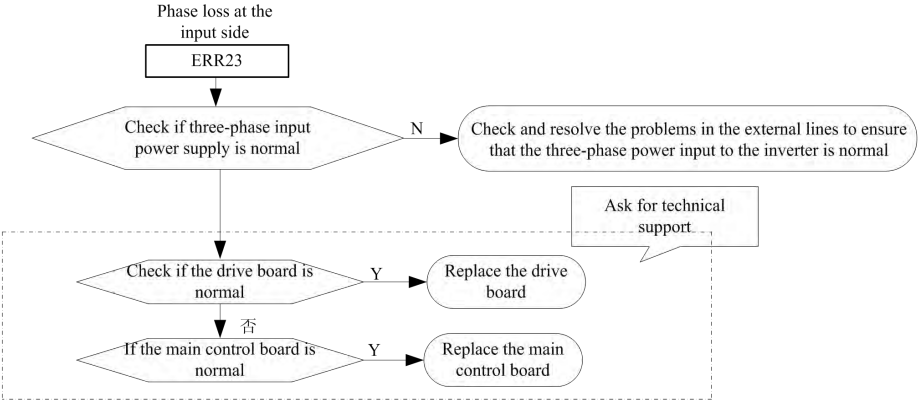


Fig.7-16 Phase loss at input side（Err23）

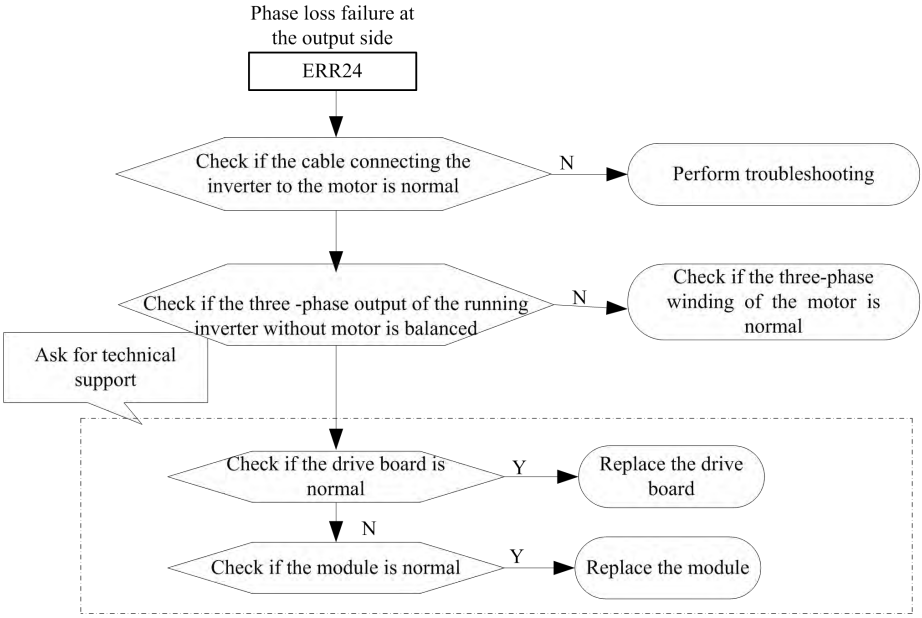


Fig.7-17 Phase failure at output sideErr24）

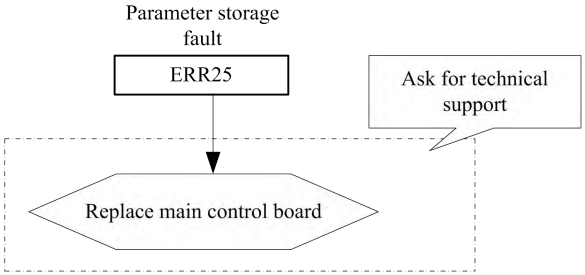


Fig.7-18 Parameter storage fault（Err25）

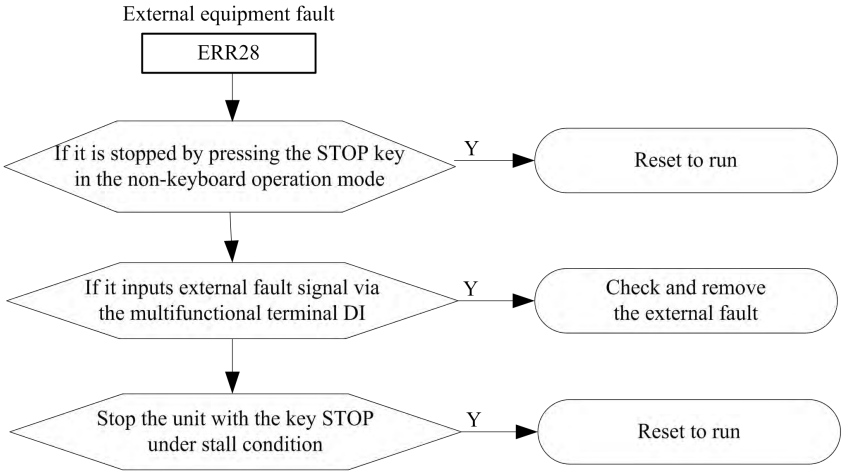


Fig.7-19 External equipment fault(Err28)

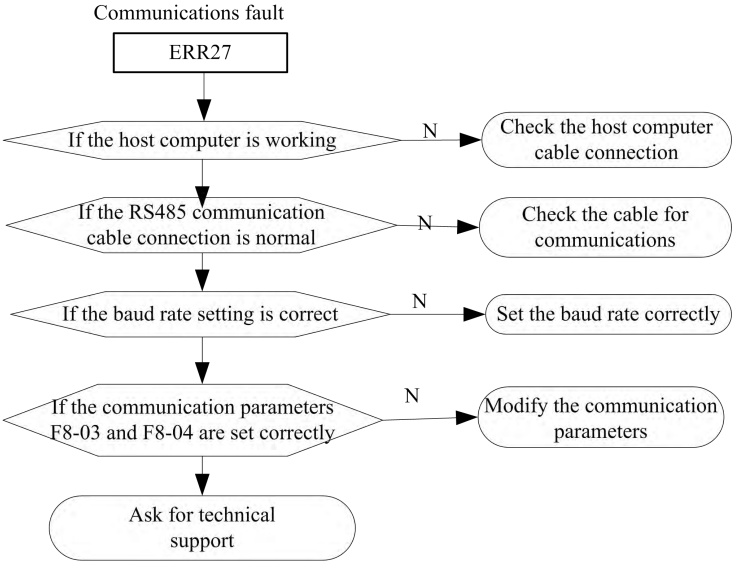


Fig.7-20 Communication fault(Err27)

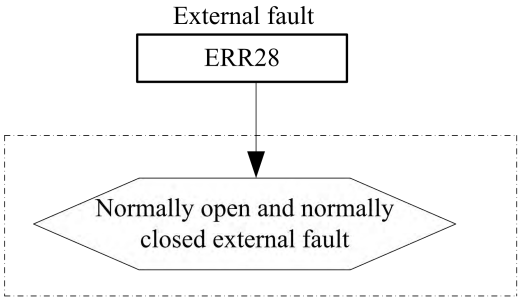


Figure 7-21 external failure (Err28)

7.2 Common Fault and Resolution

During the inverter using process,the following faults may occur. Please conduct simple fault analysis by referring to the methods below:

1、No display or upon power-on

1）Check the input power supply.

2）Check the three-phase rectifier bridge is intact. Please ask for technical support if the damage.

2、The motor does not rotate upon inverter running.

1）Replace the motor or remove the mechanical fault.

2）Check and reset the parameters.

3） Please ask for technical support if none voltage output.

3、The motor does not rotate 3, inverter operation:

1) is there a three-phase output equilibrium between check U, V, W. If there is, is the motor line or itself is damaged, or the motor due to mechanical causes blockage. Please exclude.

2) has an output but the three-phase imbalance, should damage to the transducer drive plate or output module, please seek service.

3) if there is no output voltage, may be damage to the drive plate or output module, please seek service.

4、 power inverter display normal, run after the power air switch tripping:

1) between the output module and check whether there is a short circuit. If yes, please seek service.

2) the existence of short circuit or ground between check motor wire. If yes,please exclude.

3) if the trip is occasionally and between the motor and inverter distance,consider adding AC

Chapter 8 M420 Series Serial Port Communication Protocol

M420 series inverters adopt MODBUS communication protocol,and provide RS485 communication interface for user who can realize centralized control by computer or PLC ,set running command of the inverter and modify or read function code parameters ,working status and fault information on the inverter.

8.1 About Protocol

This serial communication protocol defines the transmission information and use format in the series communication and it includes master-polling (or broadcasting) format, master coding method and the content includes function code of action, transferring data and error checking. The response of slave is the same structure, and it includes action confirmation, returning it data and error checking etc. If slave takes place the error while it is receiving the information or cannot finish the action demanded by master, it will send one fault signal to master as a response.

8.2 Application mode

The inverters access to PC/ PLC control network with RS485 BUS' single primly

8.3 Bus Structure

8.3.1Interface Mode

RS485 hardware Interface

8.3.2 Transmission mode

Asynchronous serial half-duplex transmission mode.at the same time , master computer and slave computer,only one can send the data ,and the other can receive it .The data, in the process

of series asynchronous communication, is to be sent by frame and frame in the form of message.

8.3.3 Topological structure

In Single-master system, the setup range of slave address is 0 to 247. Zero refers to broadcast communication address. The address of slave must is exclusive in the network. That is one condition of one slave machine.

8.4 Protocol specification

M420 series inverter communication protocol is a asynchronous serial master-slave communication protocol, in the network, only one equipment, and master can build a protocol, (Named as “Inquire/Command”).Other equipments, slave’s response “Inquire/Command” of master only by providing the data or doing the action according to the master’s “Inquiry/Command”. Here, master is Personnel Computer, Industrial Machine or Programmable logical controller, and the slave is inverter. Master not only visits some slave, but also sends the broadcast information to all the slaves. For the single master “Inquiry/Command”, all of slaves will return a signal that is a response;for the broadcast information provided by master, slave needs not feedback a response to master machine.

8.5 Communication frame structure

ModBus protocol communication data format of M420 series of inverter is shown as following:
（In RTU mode, messages start with a interval of at least 3.5 character times. The first field then transmitted is the device address.The allowable characters transmitted for all fields are hexadecimal 0 ... 9, A ... F. Networked devices monitor the network bus continuously, including during the silent intervals. When the first field (the address field) is received, each device decodes it to find out if it is the addressed device. Following the last transmitted character, a similar interval of at least 3.5 character times marks the end of the message. A new message can begin after this interval).
The entire message frame must be transmitted as a continuous stream. If a silent interval of more than 1.5 character times occurs before completion of the frame, the receiving device flushes the incomplete message and assumes that the next byte will be the address field of a new message. Similarly, if a new message begins earlier than 3.5-character times following a previous message, the receiving device will consider it a continuation of the previous message. This will set an error, as the value in the final CRC field will not be valid for the combined messages. A typical message frame is shown below.

RTU frame format:

START	>= 3.5-character time
ADDR	Communication addr. : 0 to 247
CMD	03: Read slave parameters 06: Write slave parameters
DATA（N-1）	Function code parameter address, the number of function code parameter, Function code parameter,etc.
DATA（N-2）	
……..	
DATA0	
CRC CHK low order	Detection Value: CRC value
CRC CHK high order	
finish	>=3.5-character time

CMD AND DATA

Command code: 03H reads N words. (There are 12 characters can be read at the most.)

START	Slave Addr	CMD	High Addr	Low Addr	High Function Code Number	Low Function Code Number	High CRC	Low CRC	END
>= 3.5-character time	1～247	03	Address_H	Address_L	00	N<=12	*	*	>= 3.5-character time

For example: The inverter start address F0-03 of the slave 01 continuously reads two consecutive values.

Mast send:

START	Slave Addr	CMD	High Addr	Low Addr	High Function Code Number	Low Function Code Number	High CRC	Low CRC	END
>= 3.5-character time	0x01	0x03	0xf0	0x03	0x00	0x02	0x07	0x0B	>= 3.5-character time

Slave return

STA RT	Slav e Addr	C M D	H i g h A d d r	F0-03L o w A d d r	High F0-03	Low F0-04	High F0-04	CRC	Hi gh CR C	E N D
3.5-chara cter time	0x 01	0x 03	0x 04	0x 04	0x 00	0x 01	0x 00	0x 43	0x 07	3.5-character time

the control mode of F0-03 to VF (F0-03=1), run the command source toterminal control (F0-04=1) is the reply data

STA RT	Slave Addr	C M D	H i g h A d d r	F0-03 L o w A d d r	High F0-03	Low F0-04	High F0-04	CRC	Hi gh CR C	END
>= 3.5ch aracte r time	0x 01	0 x 0 3	0x 04	0x 00	0x 01	0x 00	0x 01	0x D3	0x 07	>=3.5-charac ter tim

Command Code：06H，write a word.

STA RT	Slave Addr	C M D	H i g h A d d r	L o w A d d r	High Write Data	Low Write Data	High CRC	Low CRC	END
>= 3.5-chara cter time	1～ 247	0 6	Add ress _H	Add ress _L	Data_H	Data_L	*	*	>=3.5-charac ter time

For example:Write 0x01 into F0-03 which slave address is 1.

Mast Send

START	Slave	C	H	L	High	Low	High	Low	END

	Addr	MD	high Addr	low Addr	Write Data	Write Data	CRC	CRC	
>= 3.5-character time	0x01	06	0xf0	0x03	0x00	0x01	0x8B	0x0A	>= 3.5-character time

Slave return

START	Slave Addr	CMD	High Addr	Low Addr	High Write Data	Low Write Data	High CRC	Low CRC	END
>= 3.5-character time	0x01	06	0xf0	0x03	0x00	0x01	0x8B	0x0A	>= 3.5-character time

Action： It will return error if no successful.

8.6 Cyclical Redundancy Check

In RTU mode, messages include an error-checking field that is based on a CRC method. The CRC field checks the contents of the entire message. The CRC field is two bytes, containing a 16-bit binary value. The CRC value is calculated by the transmitting device, which appends the CRC to the message. The receiving device recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error results.

The CRC is started by 0xFFFF.Then a process begins of applying successive eight-bit bytes of the message to the current contents of the register.Only the eight bits of data in each character are used for generating the CRC.Start and stop bits,and the parity bit,do not apply to the CRC.

During generation of the CRC,each eight-bit character is exclusive O Red with the register contents.Then the result is shifted in the direction of the least sign ifcant bit (LSB), with a zero field into the most sign ifcant bit (MSB) position.The LSB is extracted and examined.If the LSB was a 1, the register is then exclusive O Red with a preset,fixed value.If the LSB was a 0, no exclusive OR takes place. This process is repeated until eight shifts have been performed. After the last (eighth) shift, the next eight-bit byte is exclusive O Red with the register's current value,and the process repeats for eight more shifts as described above. The final contents of the register, after all the bytes of the message have been applied, is the CRC value.

When the CRC is appended to the message, the low-order byte is appended first, followed by the high-order byte.

```
Unsigned int Crc_Cal_Value (Unsigned int *data, Unsigned int length)
{
    Unsigned int crcValue = 0xffff;
    int    i;
    while (length--)
    {
        Crc Value ^= *data++;

        for (i = 8 – 1; i >= 0; i--)
        {
            if (crc Value & 0x0001)
            {
                Crc alue = (crcValue >> 1) ^ 0Xa001;
            }
            else
            {
                Crc Value = crcValue >> 1;
            }
        }
    }
    return (crcValue);
}
```

8.7 CMD and Status

Stop/start parameter（0x1000）

Parameter addr.	Parameter description
1000	Communication setup value(-10000 to 10000)(Decimal)
100x	0001:Baud rate set value
	0002:Running frequency
	0003:Bus voltage
	0004:Output voltage
	0005:Output current
	0006:Output power
	0007:DI input fag
	0008:Do output fag

For example: 0x01 0x03 0x10 0x02 read the operating frequency of 0x000x01 +CRC check.

At the same time read operation frequency, voltage, output voltage

0x01 0x03 0x10 0x02 0x00 0x03 +CRC check.

The control command input to the inverter (2000) (write only)

Command Word Address	Parameter description
2000	0001：Forward operation
	0002：Reverse operation
	0003：Forward jog
	0004：Reverse jog
	0005：Free stop
	0006：Speed-down stop
	0007：Fault rise
	1000：Reset factory setting
	1001：Clear the fault history

Read inverter status :(read-only)（0x3000）

Status Sord Address	Status Word Function
3000	0001：Forward operation
	0002：Reverse operation
	0003：Stop

For example: 0x01 0x30 0x00 0x00 0x01+CRC (Read inverter status)

Parameters locking password checksum: (If the return is the 8888H, it indicates the password checksum pass)

Password Address	Contents of Input password
4000	*****

Parameter locking command :(write-only)

Address of locking password command	Contents of locking password command

5000	0x0001

Digital output terminal control: (write-only)

Address of locking password command	Contents of locking password command
6000	BIT0：RELAY1 output control
	BIT1：Y1 output control
	BIT2: FMR output selection
	BIT3: expansion card relay RELAY1 output selection
	BIT4: Y2 output selection

Analog output AO1 control: (write-only)

Address of locking password command	Contents of locking password command
7000	0～7FFF refers to 0% ～100%

Inverter fault description: (read only)

Inverter fault address	Inverter fault information
8000	0000：Reserve
	Consistent with fault code display
8001	0000：No fault
	0001：Password error
	0002：Command error
	0003：CRC checksum error
	0004：Invalid address
	0005：Invalid parameter
	0006：Parameter change invalid
	0007：The system is locked

Prompt, in case of Read-only, the data must be 0x01 after the command is sent.

Chapter 9 M420 Options

9.1 DC Reactors

A DCR is mainly used for power supply normalization and for supplied power-factor reformation (for reducing harmonic components).

1) For power supply normalization

- Use a DCR when the capacity of a power supply transformer exceeds 500 kVA and is 10 times or more than the rated inverter capacity.

In this case, the percentage-reactance of the power source decreases, and harmonic components and their peak levels increase. These factors may break rectifiers or capacitors in the converter section of inverter, or decrease the capacitance of the capacitor (which can shorten the inverter's service life).

- Also use a DCR when there are thyristor-driven loads or when phase-advancing capacitors are being turned ON/OFF.
- DCR is also necessary when the interphase unbalance factor of the commercial power supply is more than 2%.

$$\text{unbalance } (\%) = \frac{\text{max. voltage (B)} - \text{min. voltage (B)}}{\text{average voltage of three phases (B)}} \times 67$$

2) For supplied power-factor reformation (harmonic component reduction). Generally a capacitor is used to reform the power factor of the load, however, it cannot be used in a system that includes an inverter. Using a DCR increases the reactance of inverter's power source so as to decrease harmonic components on the power source lines and reform the power factor of inverter. Using a DCR reforms the input power factor to approximately 90 to 95%.

9.2 Output circuit filters

Include an output circuit filter in the inverter power output (secondary) circuit to:

1) Suppress the voltage fluctuation at the motor input terminals This protects the motor from insulation damage caused by the application of high voltage surge currents by the 400 V class of inverters.

2) Suppress leakage current from the power output lines (due to harmonic components) This reduces the leakage current when the motor is hooked by long power feed lines. It is recommended that the length of the power feed line be kept to less than 400 m.

3) Minimize emission and/or induction noise issued from the power output lines. Output circuit filters are effective in reducing noise from long power feed lines, such as those used in plants, etc.

Note: Use an output circuit filter within the allowable carrier frequency range. Otherwise, the filter will overheat.

9.3 Ferrite ring reactors for reducing radio frequency noise

An ferrite ring reactor is used to reduce radio noise emitted by the inverter. An ferrite ring reactor suppresses the outflow of high frequency harmonics caused by IGBT transistors switching operation of the power supply.
If wiring length between the inverter and motor is less than 65.6ft (20 m), insert an ferrite ring reactor to the power supply (primary) lines; if it is more than 65.6ft (20 m), insert it to the power output (secondary) lines of the inverter.

9.4 EMC-compliant filter

A special filter for making the inverter in conformity with Europe's EMC directives.

9.5 AC Reactor

This optional feature must be connected to the primary side (commercial power supply side) of the inverter, when the inter-phase unbalance factor of the commercial power supply is 2% to 3%.

$$\text{unbalance } (\%) = \frac{\text{max. voltage (B)} - \text{min. voltage (B)}}{\text{average voltage of three phases (B)}} \times 67$$

In case the inter-phase unbalance factor of the commercial power supply exceeds 3%, you would need to use DC reactors.

Appendix:Function Parameter Table

If F7-41 is set to non-zero value, it means parameter protection password is set, and the parameter menu cannot be entered until correct password is input. To cancel the password, it needs to set F7-41 to "0".

The parameters in the shortcut menu are free from password protection.

The symbols in the function table are described as follows:

"☆": It indicates that the parameter setup value can be modified when the inverter is in Stop status and running status.

"★": It indicates that the parameter setup value cannot be modified when the inverter is in the running status.

"○": It indicates that the numerical value of the parameter is the actually measured value, which cannot be modified.

"●": It indicates this parameter is "Factory default parameter" and can be set only by the manufacturer.

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
Group F0 Basic Function					
F0-00	Software version	-	-	#.#	●
F0-01	Model display	0：for general purpose 1：for pump application	1	0	●
F0-02	Rated current	-	0.1A	Model dependent	●
F0-03	control mode	0：open loop flux vector control 1 1：open loop flux vector control 2 2：V/F control 3:open loop torque control (reserved)	1	1	★
F0-04	command source selection	0：operation panel command channel（LED OFF） 1：terminal command channel（LED ON） 2：Serial port command channel（LED flashes）	1	0	☆
F0-06	Main frequency source X	0：digital setup UP、DOWN(non-recorded) 1：digital setup UP、DOWN(recorded) 2：AI1 3：AI2 4：MS speed 5：PLC 6：PID 7：Fixed communication	1	1	★

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F0-07	Auciliary Frequency source Y selection	0：digital setup UP、DOWN(non-recorded) 1：digital setup UP、DOWN(recorded) 2：AI1 3：AI2 4：MS speed 5：PLC 6：PID 7：Fixed communication	1	0	★
F0-08	Auailiary Frequency source Y relative value selection	0：Relatively Maximum frequency 1：Relatively frequency source X	1	0	☆
F0-09	Auxiliary Frequency source Y	0%～100%	1%	100%	☆
F0-10	Frequency source selection	0：main frequency source X 1：Y main frequency source X+auxiliary frequency source Y 2：Switching between the main frequency source X and the auxiliary frequency source Y 3：Switching between the main frequency source X and (the main frequency source X+ the auxiliary frequency source Y) 4：Switching between the auxiliary frequency source Y (the main frequency source X+ the auxiliary frequency source Y) 5：Maximum of the main frequency source X and of the auxiliary frequency source Y	1	0	★
F0-11	Preset frequency	0.00Hz～0.00 to max.frequency F0-14	0.01Hz	50.00Hz	☆
F0-13	Running direction	0：direction is consistent 1：direction is reverse 2：no reverse	1	0	★

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F0-14	Maximum frequency	50.00Hz～400.00Hz	1	50.00	★
F0-15	frequency source of upper limit	0：F0-16 setup 1：AI1 2：AI2 3：communication setup	1	0	★
F0-16	frequency upper	frequency lower limit F0-18 to maximum frequency F0-14	0.01Hz	50.00Hz	☆
F0-17	Frequency upper limit offset	0.00Hz to maximum frequency F0-14	0.01Hz	0.00Hz	☆
F0-18	frequency lower limit	0.00Hz to frequency upper limit F0-16	0.01Hz	0.00Hz	☆
F0-23	speed-up time 1	0.0s～3000.0s	0.1s	20.0s	☆
F0-24	speed–down time 1	0.0s～3000.0s	0.1s	20.0s	☆
F0-25	The over modulation function selection	0: the over modulation function is invalid 1: the over modulation function	0	1	★
F0-26	Carrier frequency	1.0kHz～15.0kHz	0.1kHz	Type determination	☆
F0-27	arrier frequency adjustment selection	0：fixed PWM,carrier frequency temperature adjustment inactive 1：random PWM, carrier frequency temperature adjustment inactive 2：PWM,carrier frequency temperature adjustment inactive 3：random PWM, carrier frequency temperature adjustment active	1	2	☆
F0-28	parameter initialization	0：none 1：restore factory default value 2：previous user parameters upon power failure 3：fault record	1	0	★
Group F1 start/stop control					
F1-00	start mode	0：direct start 1：speed tracking restart	1	0	★

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F1-01	start model	0：beginning from stop frequency 1：beginning from zero speed 2：beginning from maximum frequency	2	0	★
F1-02	speed tracking maximum current	30%～180%	1%	100%	☆
F1-03	speed tracking fastness and Slowness	1～100	1	20	☆
F1-04	Start up frequency	0.00Hz～10.00Hz	0.01Hz	0.00Hz	★
F1-05	start frequency retention time	0.0s～36.0s	0.1s	0.0s	★
F1-06	DC break current at start	0%～100%	%	0%	★
F1-07	DC break time at start	0.0～36.0s	0.1s	0.0s	★
F1-09	S curve acceleration start time	0.00s～25.00s	0.01s	1.00s	★
F1-10	S-curve acceleration end time	0.00s～25.00s	0.01s	1.00s	★
F1-11	S curve acceleration start time	0.00s～25.00s	0.01s	1.00s	★
F1-12	S-curve deceleration end time	0.00s～25.00s	0.01s	1.00s	★
F1-13	Stop model	0：deceleration stop 1：free stop	1	0	☆
F1-14	brake beginning frequency at stop	0.00Hz～F0-14	0.01Hz	0.00Hz	☆
F1-16	DC brake current at stop	0%～100%	1%	0%	★
F1-17	DC brake time at stop	0.0s～36.0s	0.1s	0.0s	★
F1-18	Brake use ration	0%～100%	%	100%	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F1-19	power interruption restart	0：Inactive 1：Start from stop frequency 2：Start from minimum frequency 3：Direct start	1	0	★
F1-20	permission time on power supply off	0.0s～5.0s	0.1s	1.0s	☆
F1-21	power interruption recovery waiting time	0.0s～50.0s	0.1s	1.0s	☆
F1-23	Transient stop/ non-stop function selection	0：Invalid 1：Valid	1	0	☆
F1-24	Transient stop/ non-stop frequency reduction rate	0: the acceleration and deceleration time 1 1: the acceleration and deceleration time 2 2: the acceleration and deceleration time 3 3: the acceleration and deceleration time 4	1	1	★
Group F2 V/F Control Parameters					
F2-00	curve setup	0：Straight V/F curve 1：Multiple point V/F curve 2：Square VF curve	0	0	★
F2-01	Torque boose	0.0%～30.0%	0.1%	1.0%	☆
F2-02	cut off frequency of torque boose	0.00Hz～maximum output frequency	0.01Hz	30.00Hz	★
F2-03	V/F Frequency Point 1 F1	0.00Hz～rated frequency for motor	0.01Hz	0.00Hz	★
F2-04	V/F voltage Point 1 V1	0.0V～380.0V	0.1V	228.0V	★

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F2-05	V/F Frequency Point 2 F2	0.00Hz～rated frequency for motor	0.01Hz	15.00Hz	★
F2-06	V/F voltage Point 2 V2	0.0V～380.0V	0.1V	114V	★
F2-07	V/F Frequency Point 3 F3	0.00Hz～rated frequency for motor	0.01Hz	5.00Hz	★
F2-08	V/F voltage Point 3 V3	0.0V～380.0V	0.1V	38.0V	★
F2-09	slip compensation coefficient	0.0%～200.0%	0.1%	0.0%	☆
F2-10	Magnetic brake gain	0%～200%	1%	80%	☆
F2-11	Oscillation suppression gain	0～100	1	20	☆
Group F3 Vector Control Parameters					
F3-00	switching frequency F1	0.00Hz～F3-02	0.01Hz	5.00	☆
F3-02	switching frequency F2	The maximum frequency of F3-00 ~ (F0-14)	0.01Hz	10.00	☆
F3-04	Speed loop proportional gain of 1	0.001～9.999	0.001	1.000	☆
F3-05	Speed loop integral time 1	0.001s～9.999s	0.001s	0.500s	☆
F3-06	Speed loop proportional gain of 2	0.001～9.999	0.001	0.800	☆
F3-07	Speed loop integral time 2	0.001s～9.999s	0.001s	1.000s	☆
F3-10	flux weakening curve gain	20%～150%	1%	100%	☆
F3-16	torque boost at low frequency	0%～200%	1%	100%	☆
F3-17	Slip compensation coefficient	50%～200%	1%	100%	☆
F3-18	time constant of speed command	0ms～65535ms	1ms	10ms	★

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F3-19	time constant of speed loop	0.000s～0.100s	s	0.000s	☆
F3-20	torque upper limit source	0：F3-21 1：AI1 2：AI2 3：communication setup	1	0	☆
F3-21	Torque upper limit	0.0%～200.0%	0.1%	180.0%	☆
F3-24	Vector AVR	0: whole process The entire 1: is invalid 2: only deceleration is invalid	1	1	☆
Group F4 Motor Parameters					
F4-00	Motor tuning selection	0：None 1：Static tunning 2：complete tuning	1	0	★
F4-01	Rated power	0.4kw～1000.0kw	0.1kw	model dependent	★
F4-02	Rated voltage	0V～440V	1V	model dependent	★
F4-03	Motor poles	2～64	2	4	★
F4-04	Rated current	0.1A～3000.0A	0.1A	model dependent	★
F4-05	Rated frequency	0.00Hz～F0-14	0.01Hz	50.00	★
F4-06	Rated rotation speed	0rpm～30000rpm	1rpm	model dependent	★
F4-07	No load current	0.1A～1500.0A	0.1A	model dependent	☆
F4-08	Stator resistance	0.001Ω～65.535Ω	0.001Ω	model dependent	☆
F4-09	Rotor resistance	0.001Ω～65.535Ω	0.001Ω	model dependent	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F4-10	Mutual inductive reactance	0.1mH～655.35 mH	0.1 mH	model dependent	☆
F4-11	Leakage Inductive reactance	0.01mH～65.535mH	0.01 mH	model dependent	☆
F4-12	Complete tuning acceleration	1～60000	1	5000	☆
F4-13	Complete tuning deceleration	1～60000	1	5000	☆
Group F5 Input Terminal					
F5-00	DI1 terminal function selection	0：None 1：Forward rotation (FWD) 2：Reverse rotation (REV) 3：Three-line mode running control 4：Forward rotation Jog (FJOG) 5：Reverse rotation Jog (RJOG) 6：Terminal UP 7：Terminal DOWN 8：Free stop 9：Fault reset (RESET) 10：Running pause 11：External fault normally open input 12：MS speed terminal 1 13：MS speed terminal 2 14：MS speed terminal 3 15：MS speed terminal 4 16：Speed-up/speed-down time selection terminal 1 17：Speed-up/speed-down time selection terminal 2 18：Frequency source switching 19：UP and DOWN setup clear (terminal and keyboard) 20：Running command switching terminal	1	1	★
F5-01	DI2 terminal Function selection		1	2	★
F5-02	DI3 terminal function selection		1	9	★
F5-03	DI4 terminal Function selection		1	12	★
F5-04	DI5 terminal function selection		1	13	★
F5-05	D16 terminal function selection		1	0	★

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F5-06	DI7 terminal function selection	21：Speed-up/speed-down active 22：PID Pause 23：PLC status reset 24：Swing frequency pause 25: Timer trigger input 26: Brake command 27: External fault normally closed input	1	0	★
F5-10	DI filter time	1ms～100ms	1ms	10ms	☆
F5-11	Terminal command mode	0：Two-line mode 1 1：Two-line mode 2 2：Three-line mode 1 3：Three-line mode 2	1	0	★
F5-12	Terminal UP/DOWN Speed	0.01Hz/s～100.00Hz/s	0.01Hz/s	1.00Hz/s	☆
F5-15	AI1 minimum input	0.00V～10.00V	0.01V	0.00V	☆
F5-16	AI1 minimum input corresponding setup	-100.0%～100.0%	0.1%	0.0%	☆
F5-17	AI1 maximum input	0.00V～10.00V	0.01V	10.00V	☆
F5-18	AI1 maximum input corresponding setup	-100.0%～100.0%	0.1%	100.0%	☆
F5-19	AI1 input filter time	0.00s～10.00s	0.01s	0.10s	☆
F5-20	AI2 minimum input	0.00V～10.00V	0.01V	0.00V	
F5-21	AI2 minimum input corresponding setup	-100.0%～100.0%	0.1%	0.0%	☆
F5-22	AI2 maximum input	0.00V～10.00V	0.01V	10.00V	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F5-23	AI2 maximum input corresponding setup	-100.0%～100.0%	0.1%	100.0%	☆
F5-24	AI1 input filter time	0.00s～10.00s	0.01s	0.10s	☆
Group F6 Output Terminal					
F6-00	Control board RELAY 1 output selection	0：None 1：In running 2：Fault output 3：Frequency Level detection FDT arrival 4：Frequency arrival 5：In zero speed 6：Motor overload pre-alarm 7：Inverter overload pre-alarm 8：PLC cycle finished 9：Running time off 10：In frequency limited 11：Ready for running 12：AI1>AI2 13：Frequency upper limit arrival 14：Frequency lower limit arrival 15：Under voltage status output 16：Communication setting 17: Timer output function	1	2	☆
F6-01	Control board RELAY 2 output selection		1	1	
F6-02	Y1 output selection		1	1	☆
F6-09	AO1 output selection	0：Running frequency 1：Setup frequency 2：Output current 3：Output power 4：Output voltage 5：AI1 6：AI2 7：Communication setup	1	0	☆
F6-10	AO2 output selection		1	0	☆
F6-12	AO1 offset coefficient	-100.0%～100.0%	0.1%	0.0%	☆
F6-13	AO1 gain	-10.00V～10.00V	0.01V	1.00V	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F6-17	AO2 bias coefficient	-100.0%～100.0%	0.1%	0.0%	☆
F6-18	AO2 gain	-10.00～10.00	0.01V	1.00	☆
Group F7 Auxiliary function and Man-Machine Interface Function					
F7-00	Jog running frequency	0.00Hz～maximum frequency	0.01Hz	6.00Hz	☆
F7-01	Jog speed up time	0.0s～3000.0s	0.1s	20.0s	☆
F7-02	Jog speed down time	0.0s～3000.0s	0.1s	20.0s	☆
F7-03	Speed up time 2	0.0s～3000.0s	0.1s	20.0s	☆
F7-04	Speed down time 2	0.0s～3000.0s	0.1s	20.0s	☆
F7-05	Speed up time 3	0.0s～3000.0s	0.1s	20.0s	☆
F7-06	Speed down time 3	0.0s～3000.0s	0.1s	20.0s	☆
F7-07	Speed up time 4	0.0s～3000.0s	0.1s	20.0s	☆
F7-08	Speed down time 4	0.0s～3000.0s	0.1s	20.0s	☆
F7-09	Slip frequency 1	0.00Hz～maximum frequency	0.01Hz	0.00Hz	☆
F7-10	Slip frequency 2	0.00Hz～maximum frequency	0.01Hz	0.00Hz	☆
F7-11	Slip frequency 3	0.00Hz～maximum frequency	0.01Hz	0.00Hz	☆
F7-12	Slip frequency 4	0.00Hz～maximum frequency	0.01Hz	0.00Hz	☆
F7-13	Slip frequency 5	0.00Hz～maximum frequency	0.01Hz	0.00Hz	☆
F7-14	Slip frequency 6	0.00Hz～maximum frequency	0.01Hz	0.00Hz	☆
F7-15	Forward/Reverse rotation dead-zone time	0.0s～3000.0s	0.1s	0.0s	
F7-16	Rotate knob precision keyboard	0: Restricted by the F7-25 1：0.1Hz 2：0.5Hz 3：1Hz 4：2Hz 5：4Hz 6：5Hz 7：8Hz 8：10Hz	1	0	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F7-17	Setup frequency is lower than frequency lower limit action	0：run with the frequency lower limit 1：stop 2：run with zero speed	1	0	☆
F7-18	Droop control	0.00Hz～10.00Hz	0.01Hz	0.00Hz	☆
F7-19	The delay time for frequency is lower than the lower limit at stop	0.0s～600.0s	0.1s	300.0s	☆
F7-20	Setup running time	0h～65535h	1h	65535h	☆
F7-22	Frequency test value(FDT level)	0.00Hz～maximum frequency	0.01Hz	50.00Hz	☆
F7-23	Frequency test hysteresis(FDT hysteresis)	0.0%～100.0%（FDT level）	0.1%	5.0%	☆
F7-24	Frequency arrival test amplitude	0.0%～100.0% maximum frequency）	0.1%	0.0%	☆
F7-25	Keyboard encoder acceleration level	0～2	1	0	☆
F7-26	Running time to action selection	0：keep running 1：stop	1	0	★
F7-27	STOP/RESET Function	0：active in keyboard control mode 1：stop function is active under terminal control 2：stop reset function is active under terminal control 3：both stop and fault reset on stop key are active under terminal control	1	0	☆
F7-28	Keyboard JOG function	0：Jog function key 1：switching function key on forward/reverse rotation	1	0	★
F7-29	LED operation display parameters	1～16383	1	4095	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F7-30	LED stop display parameters	1～127	1	127	☆
F7-31	Load speed Display coefficient	0.001～10.000	0.001	1.000	☆
F7-32	Radiator temperature	0℃～100℃	1℃	The measured values	●
F7-34	Accumulated running time (minutes)	0～1440	1min	0	●
F7-35	Accumulated running time (days)	0～65535	1day	0	●
F7-36	Fan control selection	0：fan keeps running 1：stop running for one minute and stop 2：action with start /stop on the driver 3：checking the temperature on radiator to reach 50℃ and then restart	1	1	☆
F7-37	Water supply Sleeping function	0：invalidation 1：validation	1	0	☆
F7-38	Wake up dormant water value	0.0%～100.0%	0.1%	3.0%	☆
F7-39	Timing time in the status of DI-on	0.0s～6000.0s	0.1s	2.0s	☆
F7-40	Timing time in the status of DI-off	0.0s～6000.0s	0.1s	2.0s	☆
F7-41	Starting protection function	0：invalidation (start terminal command effective direct start) 1：valid	1	1	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F7-42	Delay time for direct start upon power	1.0s～60.0s	0.1s	1.0s	☆
F7-49	User password	0～65535	1	00000	☆
Group F8 Communication Parameter Description					
F8-00	Baud rate	0：300BPS 1：600BPS 2：1200BPS 3：2400BPS 4：4800BPS 5：9600BPS 6：19200BPS 7：38400BPS	1	5	☆
F8-01	Data format	0：No check:data format<8,N,2> 1：Even parity check :data format <8,E,1> 2：Odd parity check :data format<8,O,1>	1	0	☆
F8-02	Local addr.	0～247(0 is broadcast address)	1	1	☆
F8-03	Response delay	0ms～20ms	1ms	10ms	☆
F8-04	Communication overtime	0.0s～60.0s	0.1s	0.0s	☆
F8-05	The selection of the mode of communication	0～1	1	1	☆
Group F9 Fault and Protection					
F9-00	Motor overload protection selection	0：Inactive 1：Active	1	1	☆
F9-01	Motor overload protection gain	0.20～10.00	0.01	1.00	☆
F9-02	Motor over load pre-warning coefficient	50%～100%	1%	80%	☆
F9-03	Stall gain over voltage	0%～100%	1	50%	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F9-04	Stall protection voltage over voltage	120%～150%	1%	130%	☆
F9-05	Stall gain over current	0～100	1	20	☆
F9-06	Stall protection current over current	100%～200%	1%	180%	☆
F9-07	Machine overload current protection coefficient	10%～100%	1%	100%	☆
F9-11	Fault auto reset times	0～3	1	0	☆
F9-12	Fault relay action selection during the fault auto reset	0：No action 1：Action	1	0	☆
F9-13	Fault auto reset interval	0.1s～100.0s	0.1s	1.0	☆
F9-14	Input phase failure protection selection	0：Inactive 1：Active	1	1	☆
F9-15	Output phase failure protection selection	0：Inactive 1：Active	1	1	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F9-16	First fault type	0：None 1：Inverter Unit Protection（ERR01） 2：Hardware Over Current（ERR02） 3：Hardware Over Voltage（ERR03） 4：Acceleration Over Current（ERR04） 5：Deceleration Over Current（ERR05） 6：Constant Speed Over Current（ERR06） 7：Stop Over Current（ERR07） 8：Acceleration Over Voltage（ERR08） 9：Deceleration Over Voltage（ERR09） 10：Constant Speed Over Voltage（ERR10） 11：Stop Over Voltage(ERR11） 12：Under voltage fault（ERR12） 13：Inverter Overload（ERR13） 14：Motor Overload（ERR14） 15：Module Over Heat（ERR15） 16：AD Converter Fault（ERR16） 17：IU Fault Current Detection（ERR17） 18：IV Fault Current Detection（ERR18） 19：IW Fault Current Detection（ERR19） 20：Earth Short Circuit Fault（ERR20） 21：Motor Tuning Fault（ERR21） 22：Reserve（ERR22） 23：Phase Loss At The Input Side（ERR23） 24：Phase failure at output side（ERR24） 25：Parameter Storage Fault (ERR25) 26：Wrong Password Three Times	—	—	●
F9-17	Second fault type		—	—	●
F9-18	Three fault type		—	—	●

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
F9-19	Most recent fault type	(ERR26) 27：Communications Fault (ERR27) 28：External equipment fault (ERR28)	—	—	●
F9-20	Frequency upon fault	—	—	—	●
F9-21	Current upon fault	—	—	—	●
F9-22	Bus voltage upon fault	—	—	—	●
F9-23	Input terminal status upon fault	—	—	—	●
F9-24	Output terminal upon fault	—	—	—	●
Group FA Process Control PID Function					
FA-00	PID reference source	0：FA-01 1：AI1 2：AI2 3：Communication setup	1	0	☆
FA-01	PID keyboard reference	0.0%～100.0%	0.1%	50.0%	☆
FA-02	PID reference change duration	0.0s～3000.0s	0.1s	0.0s	☆
FA-03	PID feedback source	0：AI1 1：AI2 2：AI1-AI2 3：Communication setup	1	0	☆
FA-04	PID action direction	0：Positive action 1：Reverse action	1	0	☆
FA-05	PID reference feedback range	0～65535	1	1000	☆
FA-06	Proportional gain P	0.0～100.0	0．1	20．0	☆
FA-07	Integration time I	0.01s～10.00s	0.01s	2.00s	☆
FA-08	Differential time D	0.00s～10.00s	0.01s	0.00s	☆
FA-09	Cutoff frequency of reverse rotation	0.00Hz～maximum frequency	0.01Hz	0．00Hz	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
FA-10	Deviation limit	0.0%～100.0%	0.1%	0.0%	☆
Group FB Swing Frequency					
FB-00	Swing frequency setup mode	0：Relative to the central frequency 1：Relative to maximum frequency	0	0	☆
FB-01	Swing frequency amplitude	0.0%～100.0%	0.1%	0.0%	☆
FB-02	Kick frequency amplitude	0.0%～50.0%	0.1%	0.0%	☆
FB-03	Swing frequency cycle	0.1s～3000.0s	0.1s	10.0s	☆
FB-04	Time constant of triangular wave boost	0.1%～100.0%	0.1%	50.0%	☆
Group FC MS Speed Function and Simple PLC Function					
FC-00	MS Speed 0	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-01	MS Speed 1	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-02	MS Speed 2	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-03	MS Speed 3	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-04	MS Speed 4	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-05	MS Speed 5	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-06	MS Speed 6	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-07	MS Speed 7	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-08	MS Speed 8	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-09	MS Speed 9	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-10	MS Speed 10	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-11	MS Speed 11	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
FC-12	MS Speed 12	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-13	MS Speed 13	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-14	MS Speed 14	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-15	MS Speed 15	negative maximum frequency to maximum frequency	0.1Hz	0.0Hz	☆
FC-16	PLC running mode	0：stop at the end of one-time running 1：keep final value at the end of one-time running 2：constant circulation	1	0	☆
FC-17	PLC power off memory selection	0: power down without memory and shutdown recovery 0segment 1: power down memory and shutdown recovery 0 segment 2: power down without memory and began to carry out from stopping point 3: power down memory and began to carry out from stopping point	0	0	☆
FC-18	PLC Segment 0 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-19	PLC Segment 0 speed-up /down time	0～3	1	0	☆
FC-20	PLC Segment 1 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-21	PLC Segment 1 speed-up /down time	0～3	1	0	☆
FC-22	PLC Segment 2 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-23	PLC Segment 2 speed-up /down time	0～3	1	0	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
FC-24	PLC Segment 3 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-25	PLC Segment 3 speed-up /down time	0～3	1	0	☆
FC-26	PLC Segment 4 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-27	PLC Segment 4 speed-up /down time	0～3	1	0	☆
FC-28	PLC Segment 5 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-29	PLC Segment 5 speed-up /down time	0～3	1	0	☆
FC-30	PLC Segment 6 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-31	PLC Segment 6 speed-up /down time	0～3	1	0	☆
FC-32	PLC Segment 7 Running Time	0.0～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-33	PLC Segment 7 speed-up /down time	0～3	1	0	☆
FC-34	PLC Segment 8 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-35	PLC Segment 8 speed-up /down time	0～3	1	0	☆
FC-36	PLC Segment 9 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-37	PLC Segment 9 speed-up /down time	0～3	1	0	☆
FC-38	PLC Segment 10 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
FC-39	PLC Segment 10 speed-up /down time	0～3	0.1s（h）	0.0s（h）	☆
FC-41	PLC Segment 11 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-41	PLC Segment 11 speed-up /down time	0～3	1	0	☆
FC-42	PLC Segment 12 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-43	PLC Segment 12 speed-up /down time	0～3	1	0	☆
FC-44	PLC Segment 13 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-45	PLC Segment 13 speed-up /down time	0～3	1	0	☆
FC-46	PLC Segment 14 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-47	PLC Segment 14 speed-up /down time	0～3	1	0	☆
FC-48	PLC Segment 15 Running Time	0.0s(h)～6553.5s(h)	0.1s（h）	0.0s（h）	☆
FC-49	PLC Segment 15 speed-up /down time	0～3	1	0	☆
FC-50	PLC Running time unit selection	0：s 1：h	1	0	☆
FC-51	A multi speed priority modes	0: multi speed not priority 1: multi speed priority	1	0	☆

Function code	Name	Setup Range	Minimum Unit	Factory Default Value	Change
FC-52	Multi speed acceleration and deceleration time selection priority	0～3	1	0	☆
Group FD Reserve					
FE group of enhanced functional group					
FE-00	When running the top monitoring display parameters	0: and normal F7-29 settings 1: display speed 2: display PID feedback value 3: display PLC stage 4: shows PID a given value	1	0	☆
FE-01	When stopping top monitoring display parameters	0: and normal F7-30 settings 1: display speed 2: display PID feedback value 3: display PLC stage 4: shows PID a given value	1	0	☆
Group FF Factory Parameter					
FF-00	Factory Parameter Password	******	*	******	☆