Preface

Thank you for using EXPERT high performance general vector control drive manufactured by Himel.

This series drive is a general-purpose drive based on flux vector algorithm control. It has a series of practical functions such as motor parameter self-identification, big torque at low frequency, wobble frequency control, droop control, simple PLC, fixed length control and flexible frequency set mode, and can achieve a variety of frequency combinations setting and RS485 communication.

Before using the drive, the drive user and the relevant technicians shall read the User Manual carefully to ensure the correct installation and operation of the drive and its optimal performance.

The User Manual is subject to change without prior notice. The new edition shall prevail.

High performance general vector drive

User Manual

Edition Code： V1.5

Danger

The drive must be earthed reliably, If not, there is a potential risk of personal injury in the unit.

Intended Readers

The User Manual is intended for the following people to read:

Drive installation personnel, engineers and technicians (electrical engineers and electrical operators), and designers, etc.

Please ensure the User Manual is to be received by end user.

Conventions

Sign Convention

Note The operation not in accordance with requirements may cause moderate injury or minor injury.

Danger The operation not in accordance with requirements may cause death or serious injury.

- Contents -

Chapter1 Product specification and order notification

1.1 Confirmation of product

After unpacking, please check whether the drive is scratched or damaged in course of carrying, and whether the rated value on the nameplate is in line with your order requirement. If finding any problems, please contact supplier or us.

Model description

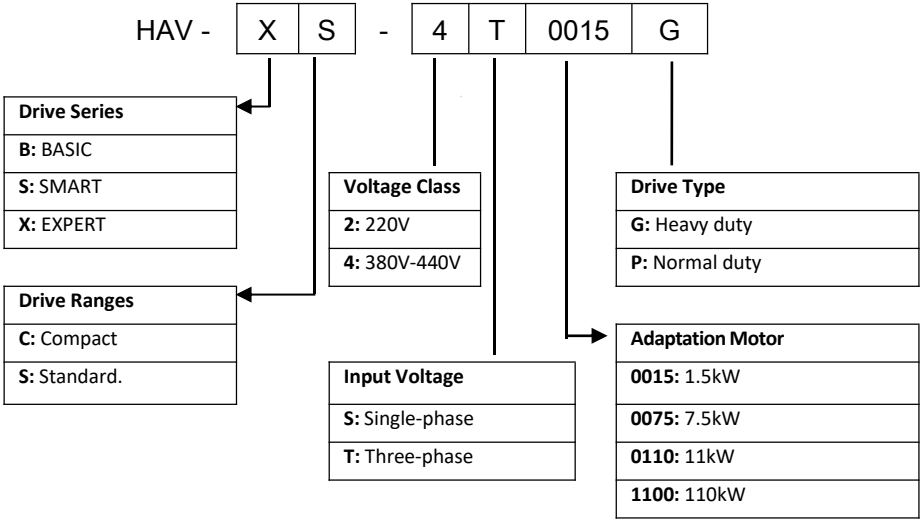


Diagram1-1 Naming rules

Heavy duty (G): Dedicated mode for applications requiring a significant overload (up to 150% for 60 s) with a motor power no higher than the drive nominal power derated by one rating

Normal duty (P): Dedicated mode for applications requiring a slight overload (up to 120% for 60 s) with a motor power no higher than the drive nominal power

There is a nameplate with drive model and rated value stuck on the top or the lower part of right plate of drive case, the information in it as follows:

Diagram1-2 Nameplate

1.2 Safety attentions

- **Check after having received product**

Warning

1. **The damaged drive or the drive lack of parts can't be installed.**
   Otherwise, danger of injury would be caused.

- **Installing**

Warning

1. **When carrying, please hold the bottom of drive.**
   Only the panel is held, the drive would fall off and such that you would be injured.
2. **Please install it on metallic plate not apt to be burned.**
   Install it on the flammable material, there would be fire caused.
3. **If two or more drives are installed in the same control cabinet, please mount a fan and keep the air inlet temperature at below 40℃.**
   If too hot, there would be fire or other accidents caused.

- **Connection**

Danger

1. **Please make sure the input power supply has been cut off before connecting.** Otherwise, danger of electric shock and fire would be caused.
2. **Lease invites electric engineering technicians to connect the wire.**
   Otherwise, danger of electric shock and fire would be caused.
3. **The earthing terminal must be earthed reliably. (Class 380V: Suitable for earthing 3).**
   Danger of electric shock and fire would be caused.
4. **After electrifying the emergency stop terminal, please check the operation is available.**
   Otherwise, danger of injury would be caused. (The connection responsibility is borne by user)
5. **Please never touch output terminal directly, connect drive output terminal to enclosure, or give the short connection among output terminals.**
   Otherwise, danger of electric shock and short circuit would be caused.

Warning

1. **Please make sure that AC main circuit power supply is identical with the rated voltage of drive.**
   Otherwise, danger of injury and fire would be caused.
2. **Never conduct withstand voltage test for drive.**
   Otherwise, damage of semiconducting elements would be caused.
3. **Please connect the braking resistor or braking unit according to diagram.**
   Otherwise, danger of fire would be caused
4. **Please fasten the terminal by the screwdriver with specified torque.**
   Otherwise, danger of fire would be caused.
5. **Never connect the input power line to terminals U, V, W.**
   Such that, the voltage is applied to output terminal, the inner of drive would be damaged.
6. **Never connect the phase-shift capacitor and LC/RC noise filter to output circuit.**
   Otherwise, the drive inner would be damaged.
7. **Never connect electromagnetic switch and electromagnetic contactor to output circuit.**
   When the drive is running with the load, the surge current caused by operation of electromagnetic switch and electromagnetic contactor would cause over current protection circuit operation of drive.

- **Maintaining and checking**

Danger

1. **Never touch the connection terminal of drive as the terminal has high voltage.**
   Otherwise, danger of electric shock would be caused.
2. **Before electrifying, please install the terminal enclosure reliably, and must cut off the power before disassembling the enclosure.**
   Otherwise, danger of electric shock would be caused.
3 **Laypeople are not allowed to maintain and check.**
   Otherwise, danger of electric shock would be caused.

Warning

1. **As CMOS integrated circuit is mounted on keyboard plate, control circuit plate, driving circuit plate, please pay special attention when using.**
   Once the circuit plate is touched by finger, the integrated chip on circuit plate would be damaged for electrostatic induction.
2. **In electrifying, never change the connecting wire or disassemble the connecting wire of terminal.**
   In running, please never check the signal. Otherwise, the equipment would be damaged.

1.3 Attentions of use

Please pay attention following points when using EXPERT series drive.

1.3.1 Constant-torque and low-speed running

In case that the drive with common motor runs at low speed for a long time, the life of motor would be affected for the poor heat radiation. So if it is needed low-speed & constant-torque long time running, professional drive must be selected.

1.3.2 Confirmation of motor insulation

When using EXPERT series drive with motor, please check up the insulation of motor to protect equipment. In addition, if the motor is used in the harsh environment, it is very necessary to check up the insulation of motor regularly, so as to protect the safety of system.

1.3.3 Negative-torque running

In the occasions with strict requests for motor acceleration/deceleration time , the drive would generate over current or over voltage fault and it would trip, in case of this, a braking resistor shall be mounted.

1.3.4 Mechanical resonance point of load device

In the certain output frequency range, the drive is likely to meet the mechanical resonance point of load device, if that, the jumping frequency must be set to avoid this point.

1.3.5 Capacitor or pressure sensitive element that improves power factor

If there is a capacitor or varistor for lightning protection that improves power factor

mounted on the output side, they shall be removed, otherwise, the drive would trip for fault or the parts would be damaged, because output voltage of drive is the type of impulse wave. In addition, on the output side, it is suggested that air switch and contactor would not be installed either, shown as diagram 1-4. (If the switch unit has to be mounted on the side of output, the output current of drive must be zero when the switch operates.)

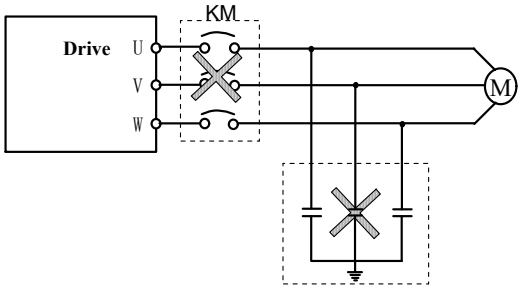


Diagram 1-3 Drive output side never mounted with a capacitor

1.3.6 Run at over 50Hz.

If the drive has to run at over 50Hz, the applicable speed range of motor bearing and mechanical equipment must be guaranteed in addition to considering the vibration and noise of motor, and please inquire before drive runs.

1.3.7 Electronic heat protection value of motor

When a motor chosen is applicable, the drive can provide the motor with heat protection. If the motor doesn't match with the rated capacity of drive, the protection value must be adjusted or other protection measures must be taken, to guarantee the motor runs safely.

1.3.8 Altitude and derating use

If the drive runs in area of over 1000m altitude, it must be de-rated by reason that the heat radiation of drive gets poor for rarefied air. Diagram 1-5 shows the relation between rated current of drive and altitude.

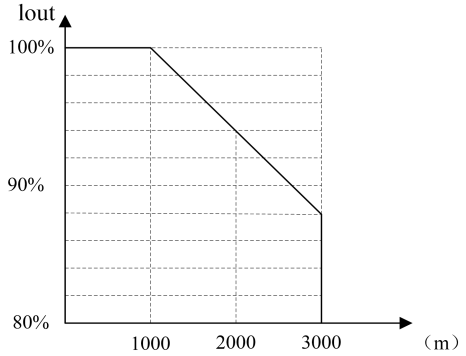


Diagram 1-4 Relation between rated output current of drive and altitude

1.3.9 Protection degree

Protection degree IP 20 of the drive is got in the state of use or keyboard display.

1.4 Rejection attentions

Before scrapping the drive, please pay attention following information:

When burning, the electrolytic capacitor of main circuit and electrolytic capacitor of printed board are likely to explode, and the plastic part will produce noxious gas. Therefore, the drive shall be handled as the industrial rubbish.

1.5 Drive series model

The drive has two voltage class 220V and 380V (The input voltage range of 220V: 180V-220VAC; The input voltage range of 380V: 380V-440V.) The applicable motor power range is 380V:0.75KW~280KW;220V:0.75-2.2KW. EXPERT series drive model is shown as table1-1 and 1-2.

Table 1-1 Drive Model 380V

Model (G: Heavy duty)	Rated Capacity (KVA)	Rated output current (A)	Matching motor (kW)
4T0007G	1.5	2.5	0.75
4T0015G	2.7	4.1	1.5
4T0022G	3.7	5.5	2.2
4T0040G/4T0055P	4.1/8.5	9.6/13	3.7/5.5
4T0055G/4T0075P	8.5/11	13/17	5.5/7.5
4T0075G/4T0110P	11/17	17/25	7.5/11
4T0110G/4T0150P	17/21	25/32	11/15
4T0150G/4T0185P	21/24	32/37	15/18.5
4T0185G/4T0220P	24/30	37/45	18.5/22
4T0220G/4T0300P	30/40	45/60	22/30
4T0300G/4T0370P	40/50	60/75	30/37
4T0370G/4T0450P	50/60	75/90	37/45
4T0450G/4T0550P	60/72	90/110	45/55
4T0550G/4T0750P	72/100	110/157	55/75

4T0750G/4T0900P	100/116	157/180	75/90
4T0900G/4T1100P	116/138	180/214	90/110
4T1100G/4T1320P	138/167	214/256	110/132
4T1320G/4T1600P	167/200	256/307	132/160
4T1600G/4T1850P	200/230	307/340	160/185
4T1850G/4T2000P	230/250	340/385	185/200
4T2000G/4T2200P	250/280	385/430	200/220
4T2200G/4T2500P	280/317	430/465	220/250
4T2500G/4T2800P	317/355	465/525	250/280
4T2800G/4T3150P	355/450	525/590	280/315
4T3150G/4T3550P	450/500	600/645	315/355
4T3550G/4T4000P	500/570	645/750	355/400
4T4000G/4T4500P	570/640	750/850	400/450
4T4500G/4T5000P	640/715	850/920	450/500
4T5000G/4T5600P	715/800	920/1050	500/560
4T5600G/4T6300P	800/900	1050/1150	560/630
4T6300G/4T7100P	900/1015	1150/1350	630/710
4T7100G/4T8500P	1015/1215	1350/1630	710/850
4T8500G	1215	1630	850

Table 1-2 220V Drive model

Model (G: Constant torque)		Rated Capacity(kVA)	Rated output current(A)	Matching motor(kW)
220V Single	2S0007G	0.8	5.0	0.75
	2S0015G	1.6	7.8	1.5
	2S0022G	2.4	10.8	2.2

Remind: If you need other power range drive, please consult with the factory before ordering!

1.6 Specifications

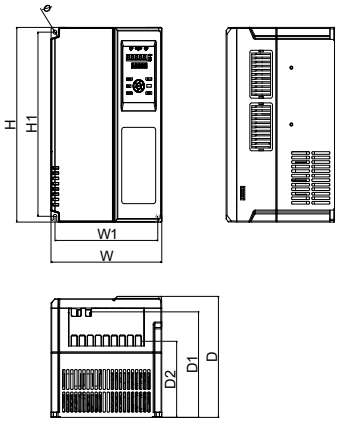
Table 1-3 Product technical specifications

Item		Description
Input	Rated voltage/ Frequency	Three-phase, 380V-440VAC；50Hz/60Hz （0.75kW-450kW）; Three-phase, ，380VAC；50Hz/60Hz （500kW-850kW）
		Single, 200V-220VAC；50Hz/60Hz
	Allowed voltage range	Voltage:380V(-15%)～440V（+10%）, 200V(-10%)～220v（+10%）;Voltage unbalance rate:< 3%;Frequency:±5%
Output	Rated voltage（V）	0～Input voltage
	Frequency	0Hz～550Hz
	Overload capacity	G type:150% rated current for 60s ;P type:120% rated current for 60s
Main control function	Control mode	Open-loop vector mode, V/F mode
	Range of speed regulation	1：100
	starting torque	150% rated torque when 0.5Hz
	Speed control accuracy	≤±0.5% rated synchronous speed
	Frequency accuracy	Digital set :max. frequency×±0.01% Analog set：max.frequency×±0.2%
	Frequency resolution	Digital set :0.01Hz ;Analog set：max. frequency×0.1%
	Torque rise	Auto torque ascension,manuall torque ascension 0.1%～30.0%
	V/F curve	Four ways:1 kind of user set V/F curve way、3 kinds of drop torque characteristic curve way(2.0 times power，1.7 times power，1.2 times power
	Acceleration/deceleration curve	Two ways:line acceleration/deceleration、S curve acceleration/deceleration; four acceleration/deceleration time，with the unit of time（minute/second） optional ,max.time set 60 hours
	DC braking	DC braking start frequency:0.00Hz～60.00Hz;braking time:0.0～30.0s;braking current: 0.0～100.0%

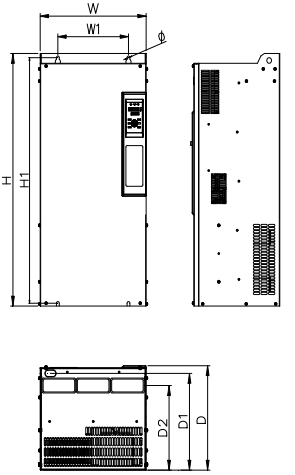
Item		Description
	Jogging	Jog frequency range:0.10Hz ~ 50.0Hz
	Multi-speed operating	It can be realized by interior-PLC or control terminal
	Built-in PID	Be convenient to make closed-loop control system
	Auto energy-saving running	According to load condition, V/F curve can be optimized automatically to get the aim of energy-saving running.
	Auto voltage adjustment	when rhe voltage of network changes,the output voltage can be automatically kept constant
	Auto current limiting	During the operation, the current is automatically limited to prevent frequent flow to falut trip
	Auto carrier adjustment	According to the load characteristics ,automatically adjust the carrier frequency
Customized function	Textile swing frequency	Textile swing frequency control,it can realize the function of fixed and variable swing frequency
	Fixed length control	Length reached stop function
	Sagging function	Applicable to multiple drives drive one load
	Instant stop/non-stop control	when power-supply off instantly,it can realize keep running through control bus voltage
	Binding function	Running command channel and frequency input channal can be binded and change at same time
Running function	Running command channel	Operation panel,control terminal and communication port , can be switched through many ways
	Frequency input channel	Digial input, analog voltage input,analog current input, pulse input,communication port input,can be switched through many ways
	Auxiliary frequency input channel	Realize flexible auxiliary frequency fine-turing and frequency combination operation
	Pulse output terminal	0 ~ 50KHz pulse square wave signal output,can realize output setting frequency and output frequency ect.
	Analog output terminal	2 ways analog output,0 ~ 10v、0 ~ 20mA to get output of physical quantity such as setting frequency and output frequency

Item		Description
Operating panel	Double row LED display	It can display 20 kinds of parameters such as setting frequency,output frequency,output voltage,output current and so on
	Key Locked and function choose	Define the function scope of part of the keys,in case of mistake operation
protection function		Phase-loss protection(optional),over current protection,over voltage protection,under voltage protection,over heat protection,over load
Environment	Service location	Indoor,not suffer from sun,dust,corrosive gas,oil fog,steam and so on
	Altitude	Below 1000m，If the altitude is above 1000m, please derate 1% for every additional 100m.，the highest usable altitude is 3000m
	Environment temperature	- 10℃～ + 40℃, derate above 40℃，derate 1.5% for every additional 1℃，the highest ambient temperature is 50℃；
	Humidity	Less than 95%RH，no condensation
	Vibration	Less than 5.9m/s2
	Storage temperature	- 20℃～ + 60℃
	Pollution degree	PD2
Structure	Protection class	IP20
	Cooling way	Froced air cooling
Installation Way		Wall-hanging,Cabinet, Trough-wall installation
Distribution System		TN、TT
efficiency		≥95%

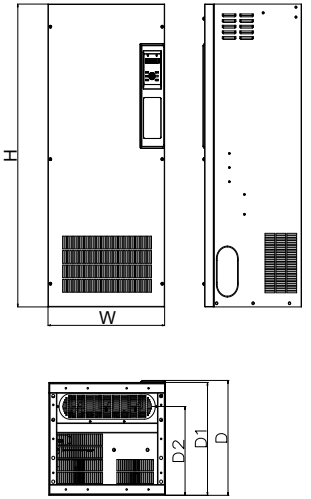
1.7 Outline size



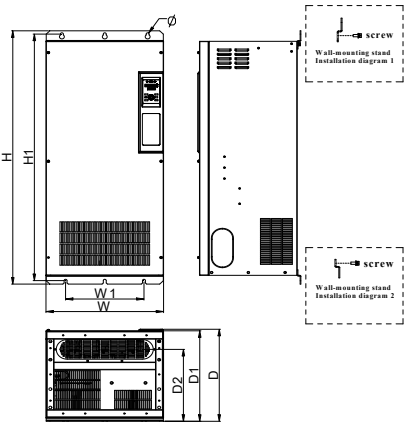
(a) A sizes



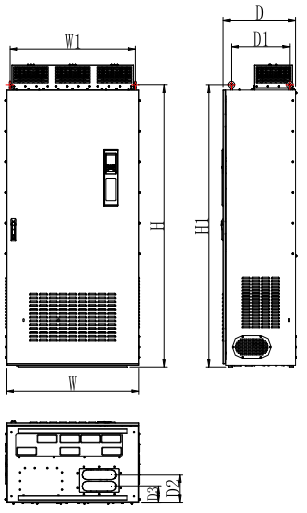
(b)B sizes



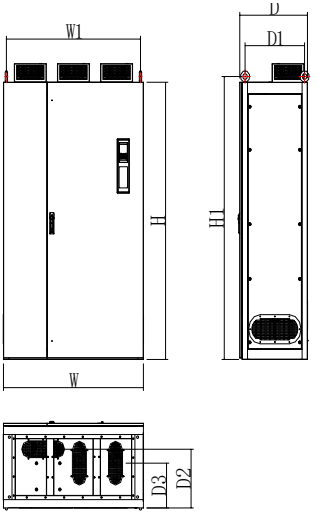
(c)C sizes



(d)Wall-mounting sizes



(e)E sizes



(f) F sizes

Table 1-4 Drive Exterior and Mounting Dimensions b(mm)

Model	W	W1	H	H1	D	D1	D2	D3	Mounting Holes(Φ)	Refer
4T0007G	120	109	215	204	158	133	85		5.5	(a)
2S0007G										
4T0015G										
2S0015G										
4T0022G										
2S0022G										
4T0040G/4T0055P										
4T0055G/4T0075P	150	138	259	248	183	176	150		5.5	(a)

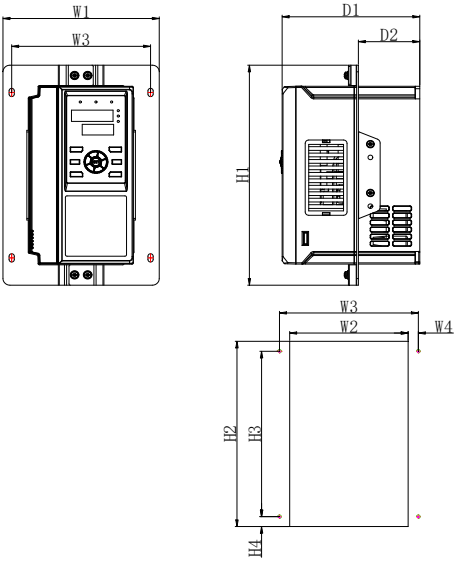
4T0075G/4T0110P										
4T0110G/4T0150P	205	188	322	305	219	210	168		6.5	(a)
4T0150G/4T0185P										
4T0185G/4T0220P	235	218	370	350	237	230	200		7	(a)
4T0220G/4T0300P										
4T0300G/4T0370P	305	200	490	470	270	235	207		10	(b)
4T0370G/4T0450P										
4T0450G/4T0550P	320	197	560	543	302	275	237		10	(b)
4T0550G/4T0750P										
4T0750G/4T0900P										
4T0900G/4T1100P	355	240	678	659	307	257	257		11	(b)
4T1100G/4T1320P										
4T1320G/4T1600P										
4T1600G/4T1850P	450	300	900	875	372	345	300		12	(b)
4T1850G/4T2000P										
4T2000G/4T2200P	480	-	1070	-	412	400	313	-	-	(c)
4T2200G/4T2500P										
4T2500G/4T2800P	525	-	1300	-	438	425	335	-	-	(c)
4T2800G/4T3150P										

4T3150G/4T3550P										
4T3550G/4T4000P	635	-	1480		467	460	356	-	-	(c)
4T4000G/4T4500P										
4T4500G/4T5000P										
4T2000G/4T2200P (Wall-mounting)	480	320	1158	1127	421	414	329	-	12	(d)
4T2200G/4T250 (Wall-mounting)										
4T2500G/4T2800 (Wall-mounting)	525	400	1388	1357	447	440	350	-	12	(d)
4T2800G/4T3150 (Wall-mounting)										
4T3150G/4T3550 (Wall-mounting)										
4T3550G/4T4000 (Wall-mounting)	635	450	1577	1538	482	475	371	-	16	(d)
4T4000G/4T4500 (Wall-mounting)										
4T4500G/4T5000 (Wall-mounting)										
4T5000G/4T5600P	950	900	1812	1845	490.5	388.5	276	154	Counter machine	(e)
4T5600G/4T6300P										
4T6300G/4T7100P										
4T7100G/4T8500P 4T8500G	1200	1150	1900	1939	580.5	510	402.5	307	Counter machine	(f)

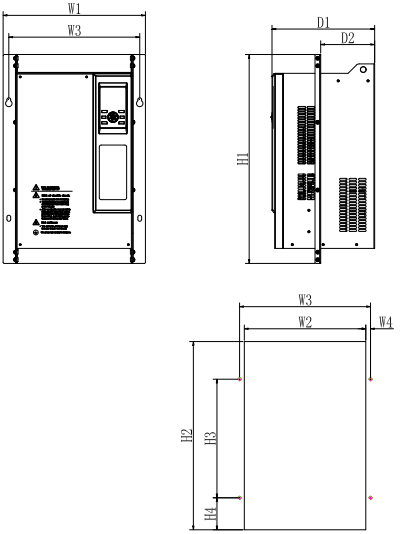
Note: 1.Optional base for 4T0300G/4T0370P ~ 4T1850G/4T2000P.
2.Need to match wall-mounted stand for wall-mounted design of 4T2200G/4T2500P ~ 4T2800G/4T315

1.8 Optional Components dimensions

1.8.1 Optional accessories embedded mounting bracket dimensions



(1) Plastic structure embedded mounting bracket



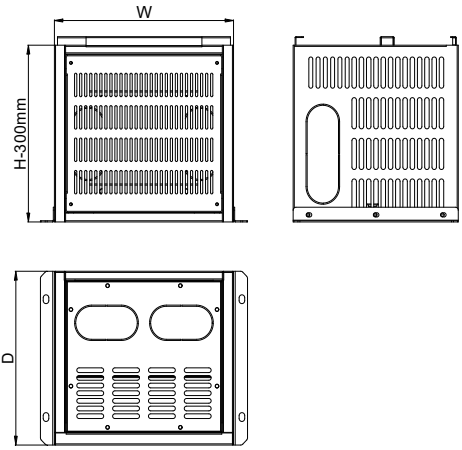
(2) Sheet Metal structure embedded mounting bracket

Table 1-5 Embedded mounting bracket dimensions **(mm)**

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Mounting Holes(Φ)	Refer.
4T0007G	180	136	160	12	266	224	200	12	158	70	6	(1)
2S0007G												
4T0015G												
2S0015G												
4T0022G												
2S0022G												
4T0040G/ 4T0055P												
4T0055G/ 4T0075P	210	168	190	11	310	270	230	20	176	82	6	(1)
4T0075G/ 4T0110P												
4T0110G/ 4T0150P	270	226	246	10	370	332	250	41	210	101	7	(1)
4T0150G/ 4T0185P												
4T0185G/ 4T0220P	299	256	275	9	420	380	280	50	230	116	7	(1)
4T0220G/ 4T0300P												
4T0300G/ 4T0370P	375	320	345	13	555	500	315	85	270	142	10	(2)
4T0370G/ 4T0450P												
4T0450G/ 4T0550P	390	335	360	13	625	575	365	98	302	116	10	(2)
4T0550G/ 4T0750P												
4T0750G/ 4T0900P												

Model	W1	W2	W3	W4	H1	H2	H3	H4	D1	D2	Mounting Holes(Φ)	Refer.
4T0900G/ 4T1100P	435	375	409	17	743	698	450	163	314	178	10	(2)
4T1100G/ 4T1320P												
4T1320G/ 4T1600P												
4T1600G/ 4T1850P	540	470	505	18	960	920	610	150	372	164	12	(2)
4T1850G/ 4T2000P												

1.8.2 Optional base dimension



Remark: The base W and D are the same with the corresponding drive size, please refer to table 1-4, and H is fixed 300mm.

Table1-6 Base selection

Pedestal Model	Adaptation
4T0370-DZ	4T0300G/4T0370P~4T0370G/4T0450P
4T0750-DZ	4T0450G/4T0550P~4T0750G/4T0900P
4T1100-DZ	4T0900G/4T1100P~4T1320G/4T1600P
4T1600-DZ	4T1600G/4T1850P~4T1850G/4T2000P

1.8.3 Keyboard Size

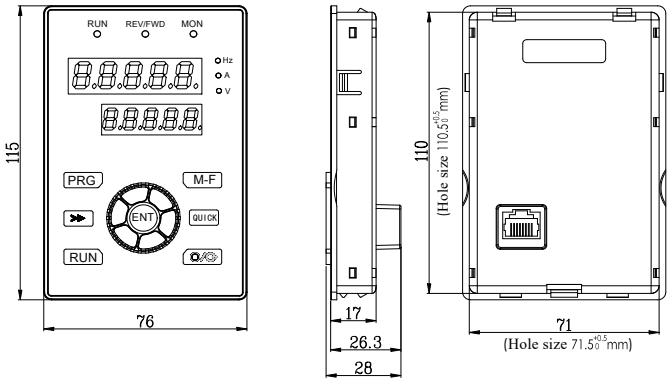


Diagram 1-5 Keyboard Size

1.9 Breaking Resistor

Energy-consumption braking resistor is provided as shown in table 1-5,1-6 and the installation of braking resistor wire is provided as shown in 1-2.

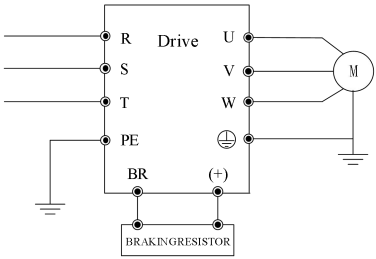


Diagram 1-6 Connection between drive and braking unit

NOTE:

(1)Braking resistor power derating coefficient had better not more than 30%, otherwise there is the risk of fire.

(2)The device of 22kw and below 22kw are matched with built-in breaking unit , the device of 30KW and above need to be connected with braking unit outside.

(3)Wiring of braking resistor should be less than 5m;The braking resistor would have temperature rise due to feedback energy consumption during dynamic braking, please ensure the safety protection and good ventilation.

Braking resistance value and power are selected according to the actual situation,

the greater of the system inertia, the shorter of the deceleration time, the more frequent braking, then the greater of braking resistor power and smaller of resistance value. Table 1-5,1-6 is recommended according to general applications(Breaking Utilization rate FC.01 is 10%)

Table 1-7 Select table of braking resistor (380V)

Model No.	Applicable motor Power (KW)	Resistor Resistance (Ω)	Resistor Power (W)
4T0007G	0.75	≥500	100
4T0015G	1.5	≥300	200
4T0022G	2.2	≥200	200
4T0040G/4T0055P	3.0	≥200	300
4T0055G/4T0075P	5.5	≥80	750
4T0075G/4T0110P	7.5	≥50	1100
4T0110G/4T0150P	11	≥50	1500
4T0150G/4T0185P	15	≥45	1800
4T0185G/4T0220P	18.5	≥45	2200
4T0220G/4T0300P	22	≥24	3000

Table 1-8 Select table of braking resistor (220V)

Model No.	Applicable motor Power (KW)	Resistor Resistance (Ω)	Resistor Power (W)
2S0007G	0.75	≥150	100
2S0015G	1.5	≥100	200
2S0022G	2.2	≥75	300

Chapter2 Installation and Wiring of Drive

2.1 Installation environment of drive

2.1.1 Installation environment condition

(1) The drive shall be installed indoors of perfect ventilation, and the environment temperature shall be in the range of -10℃~40℃, in case that the temperature exceeds 40℃, the external air-blast cooling or derating shall be used.

(2) Avoid being installed in location where suffers from the sun, dust, floatation fiber and metallic power

(3) Never to be installed in location where corrosive and explosive gas has

(4) The humidity shall be lower than 90%RH, no condensation

(5) The drive shall be installed in the location where the plane fixed vibration is less 5.9 m/s 2

(6) The drive had better be kept far away from the electro-magnetic interference device

2.1.2 Installation direction and space

(1) Shall be installed vertically usually

(2) The installation space and min distance are shown as diagram2-1

(3) As shown in diagram 2-2, there shall be baffler mounted among them, when several drives are installed vertically.

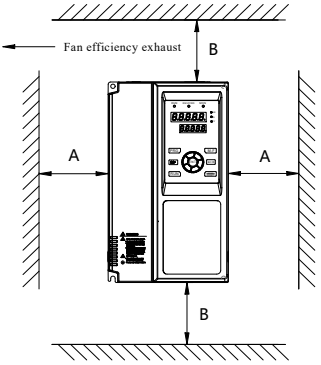


Diagram2-1 Installation space

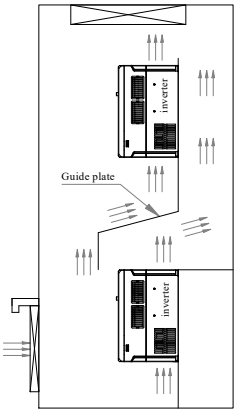


Diagram 2-2 Installation of multi drives

Table 2-1 Installation space condition

Drive type	Installation space(mm)	
	A	B
4T0007G ~ 4T0370G/4T0450P	≥50	≥100
4T0450G/4T0550P ~ 4T8500G	≥50	≥200

2.1.3 Drive Installation Method and Steps

series according to different power levels, there are two kinds of plastic and sheet metal structure; Depending on the different installation application, series has two installation methods of wall-mounted and embedded

1. Plastic structure wall- mounted installation

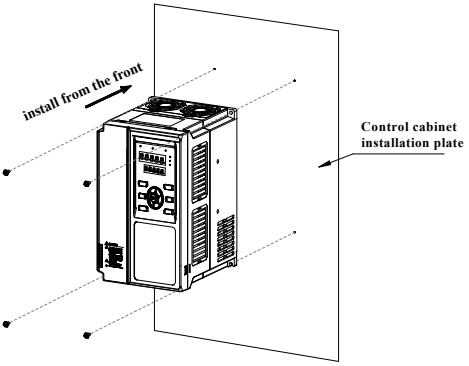


Diagram2-3 Plastic structure wall-mounted installation

2. Plastic structure embedded mounting.

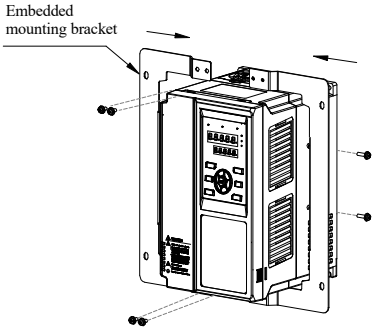


Diagram2-4 Plastic structure embedded mounting bracket installation

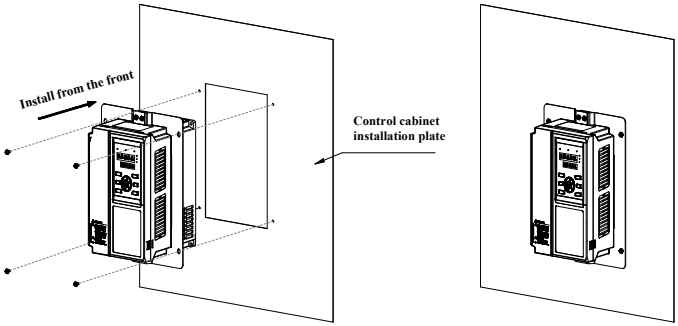


Diagram2-5 Plastic structure embedded mounting

3. Sheet metal structure wall-mounted installation

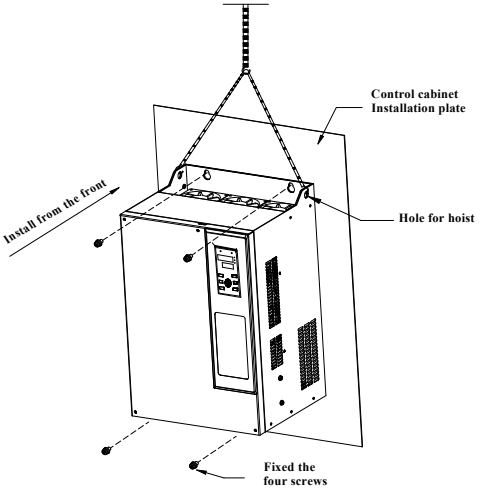


Diagram2-6 Sheet metal structure wall-mounted installation

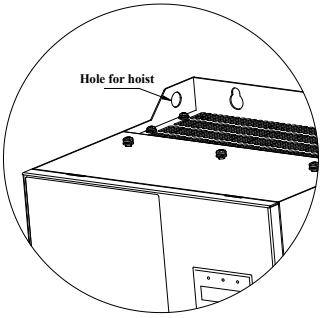


Diagram2-7 Hoisting diagram of sheet metal structure

Table 2-2 Wall hanging mounting bracket selection

Wall hanging mounting bracket Model	Adaptation
HAVXS-4T2200-BGZJ	HAVXS-4T2000G/4T2200P~ 4T2200G/4T2500P
HAVXS-4T2800-BGZJ	HAVXS-4T2500G/4T2800P~4T2800G/4T3150P
HAVXS-4T4500-BGZJ	HAVXS-4T3550G/4T4000P~HAVXS-4T4500G/4T5000P

4. Sheet metal structure embedded mounting

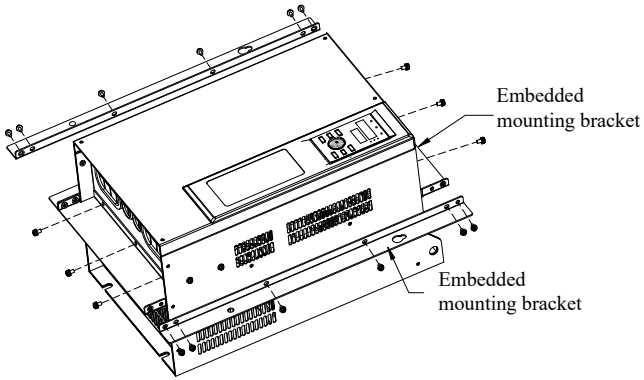


Diagram2-8 Sheet metal structure install schematic external bracket diagram

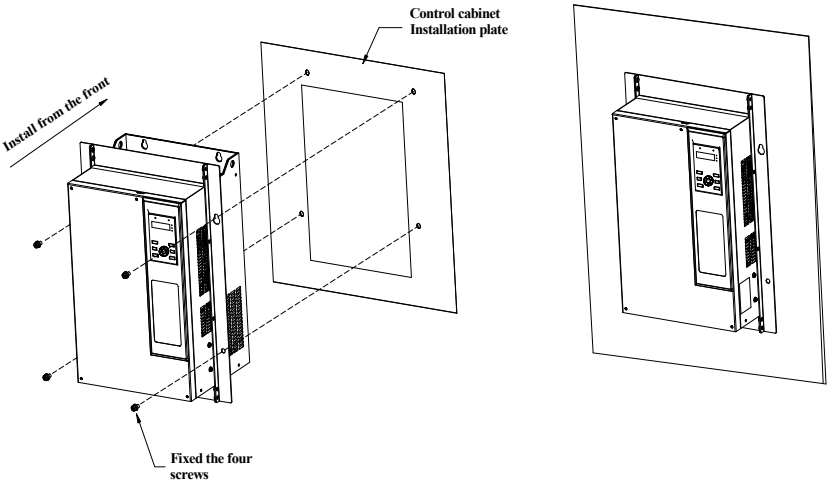


Diagram2-9 Sheet metal structure embedded mounting diagram

Table 2-3 Embedded mounting bracket selection

Embedded mounting bracket model	Adaptation
HAV-XS-4T0040-QRZJ	HAV-XS-4T0007G/2S0007G~ 4T0040G/4T0055P
HAV-XS-4T0075-QRZJ	HAV-XS-4T0055G/4T0075P~ 4T0075G/4T0110P
HAV-XS-4T0150-QRZJ	HAV-XS-4T0110G/4T0150P~4T0150G/4T0185P
HAV-XS-4T0220-QRZJ	HAV-XS-4T0185G/4T0220P~4T0220G/4T0300P
HAV-XS-4T0370-QRZJ	HAV-XS-4T0300G/4T0370P~ 4T0370G/4T0450P
HAV-XS-4T0750-QRZJ	HAV-XS-4T0450G/4T0550P~ 4T0750G/4T0900P
HAV-XS-4T1320-QRZJ	HAV-XS-4T0900G/4T1100P~ 4T1320G/4T1600P
HAV-XS-4T1600-QRZJ	HAV-XS-4T1600G/4T1850P~ 4T1850G/4T2000P

2.2 Disassembling and installation of drive panel

2.2.1 Cover plate disassembly and installation of plastic enclosure drive

- Disassemble Cover Plate

  Shown as diagram 2-10, push out the hooks on the left and right sides of the cover from inside at 1 direction with tools, then lift the panel from direction 2

- Install Cover Plate

  Shown as diagram 2-11, Align the groove above the cover with card buckle on the enclosure, press down the cover plate from direction 1, until we hear a "click" sound

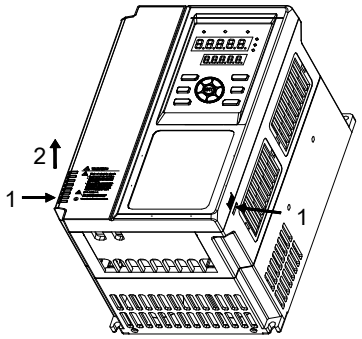


Diagram2-10 Disassembly of cover

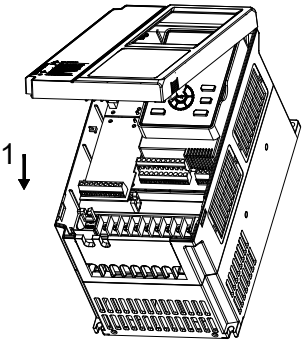


Diagram2-11 Installation of cover

2.2.2 Cover plate disassembly and installation of Sheet metal drive enclosure

- Disassemble Cover Plate

Shown as diagram 2-12, Disassemble mounting screw at Cover plate 1, then

lift the panel from 2 direction

◆ Install Cover Plate

Shown as diagram 2-13, Card buckle on cover embedded groove of the drive enclosure, according to the direction 1 install cover plate, then tighten the screws at the cover 2.

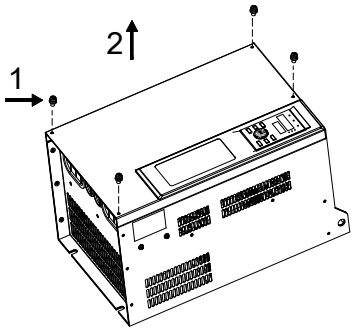


Diagram2-12 Disassembly of cover

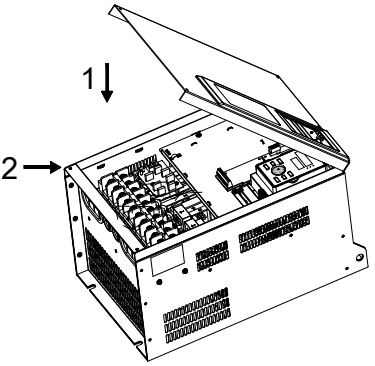


Diagram2-13 Installation of cover

2.2.3 . Operation panel disassembly and installation

◆ **Disassemble Cover Plate**

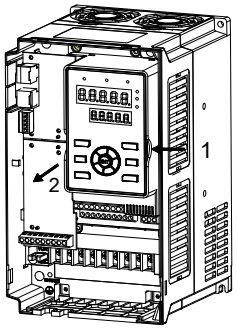
Pls refer to the diagram 2-10 to 2-13

◆ **Disassemble operation panel**

According to the diagram2-14, Press down on the groove 1 on both sides of the operation panel with your fingers, and then take out the operation panel body along the direction 2

◆ **Install Operation Panel**

Shown as the diagram 2-15, Press down operation panel from direction 1,until hear a “click” sound. Never to install operation panel from any other direction, otherwise will lead to poor contact of operation panel



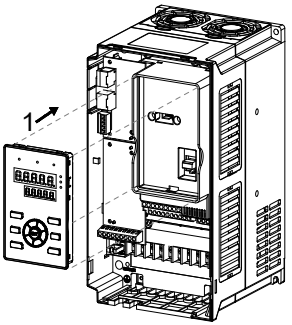


Diagram2-14 Operation panel disassemblyDiagram2-15 Operation panel installation

2.3 Attention Of Wiring

Warning

1. Before connecting, please make sure the power supply has been cut off for more than 10min, otherwise, there would be electric shock danger.
2. Never to connect the power line to the output terminals U,V,W of drive.
3. Because there is leakage current in the drive, the drive and motor must be grounded safely, the ground wire shall be copper conductor of more than 3.5mm² (refer to diagram3-1), and the grounding resistance shall be less than 10Ω.
4. User shall not conduct the withstand voltage test for the drive as it has passed this test before leaving factory.
5. Between drive and motor shall not be installed with electro-magnetic contactor and absorbing capacitor or another resistance--capacitance absorbing implements as diagram 1-4
6. To take the convenience for over-current protection of input side and power failure maintenance, the drive shall be connected to power supply through intermediate breaker.

Danger

1. Make sure the power supply of drive has been cut off thoroughly, all LED lamps of Keyboard has went out, and wait for 10 min, confirm the DC current voltage value between the drive main circuit terminal (+) (-) to drop below DC36V, till now, can perform the wiring operation.
2. Only the qualified professional who has been trained and authorized can perform the wiring operation.
3. Please pay attention that before energizing, check whether the voltage class of drive is identical with the supply voltage, otherwise, it would be result in person casualty and damage of device.

2.4 Wiring OF Main Circuit Terminal

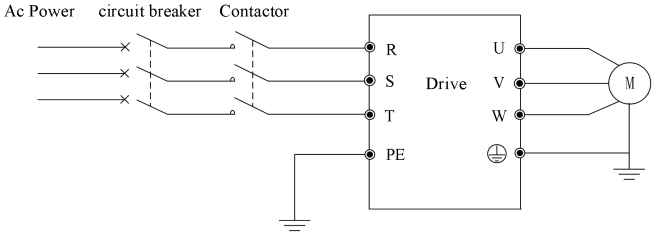


Diagram2-16 Main circuit basic wiring

2.4.1 Connection of drive and option

(1) Between power grid and drive, Breaking device like isolating switch shall be installed for Human safety and compulsive power cutting during Maintaining the device

(2) The supply circuit of drive must be Mounted With the fuse or circuit breaker with over current Protection, to avoid the spread of fault.

(3) When the power supply quality of Power Grid is not quite high, an AC input reactor shall Be mounted additionally. The AC reactor also Can improve the power factor of input side

(4) The contactor is only for control of power supply

(5) EMI filter on the input side: The EMI can be used to prevent high-frequency conductivity and radio-frequency Interference from the drive power line.

(6) EMI filter on the output side:
The EMI filter can be used to prevent radio-frequency interference noise from output side of drive and leakage current from conductor

(7) Ac output reactor:
When the wire connecting drive to motor is

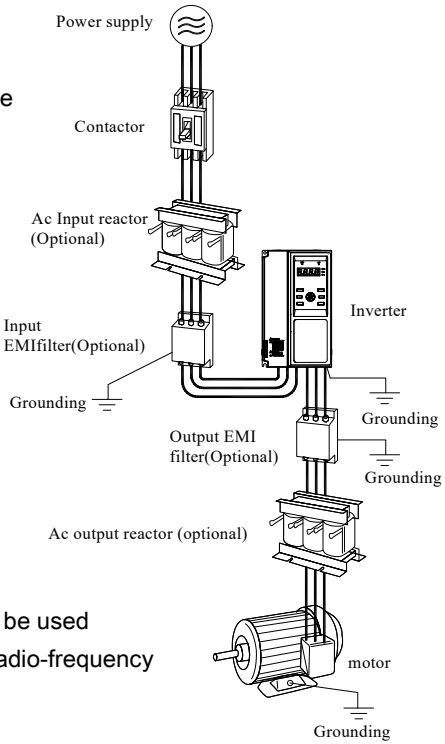


Diagram 2-17 Connection of drive and option

50m, AC output reactor had better be mounted to
Reduce the leakage current and prolong the service life of motor. When installing, please consider the Voltage drop problem of AC output reactor; Or the input/output voltage of drive is stepped up or the motor is derated to protect the motor.

(8) Safe grounding wire

The drive and motor must be earthed separately for safely as there is leakage current in the drive, the grounding resistance shall be less than 10Ω. The grounding wire shall be as short as possible, and its diameter shall be in line with the standard given in table3-2.(Only two kinds of conductors are provided with the same metal, the value in the table can be correct, if not, the sectional area of protective conductor is determined with equivalent conductive factor method and referred to table 3-2)

Table2-4 Sectional area of protective conductor

Corresponding conductor sectional area(mm^2)	Min sectional area of corresponding grounding conductor(mm^2)
S ≤ 16	S
16 < S ≤ 35	16
35 < S	S/2

2.4.2 Power Grid system requirement

This product is suitable for the grid system with neutral grounding. If it is used in the IT system, the varistor group jumper shall be removed, as shown in the VDR screw, otherwise may cause damage to the drive

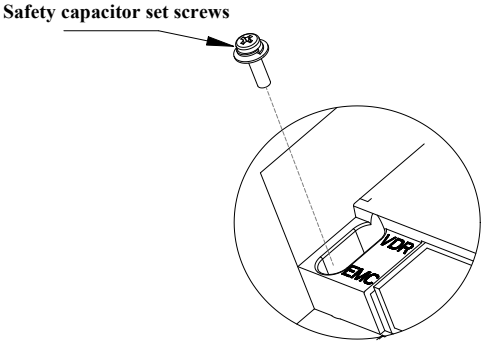


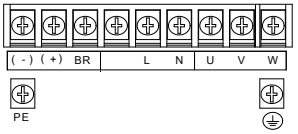
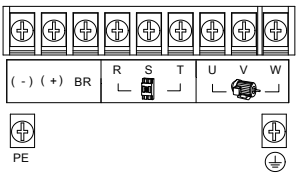
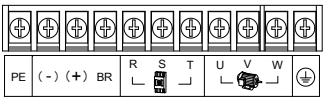
Diagram2-18 Location diagram of safety capacitor (EMC) short crew

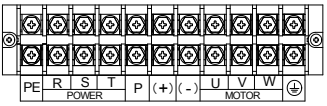
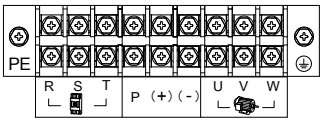
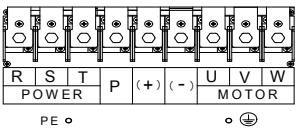
The varistor group integrated inside of drive is connected by default, If leakage protection switch action when the whole machine is powered on, the safety

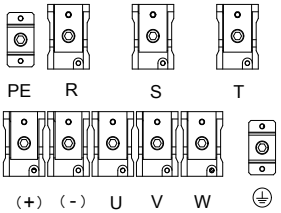
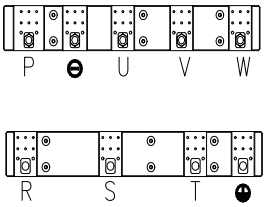
capacitor group jumper screw shall be removed, as shown in the EMC screw, disconnect the safety capacitor group

2.4.3 The wiring of main circuit terminal

(1) Input/output terminal of main circuit shown as table 2-5

Application model	Terminal of main circuit	Terminal name	Function description
2S0007G 2S0015G 2S0022G		L、N	Single AC 220V input terminal
		U、V、W	3-phase AC output
		(+)、BR	Braking resistor connection
		⏚	Motor grounding
		PE	Protect grounding
		(+)、(-)	DC positive and negative bus output,external braking unit
4T0007G 4T0015G 4T0022G 4T0040G/4T0055 4T0055G/4T0075P 4T0075G/4T0110P 4T0110G/4T0150P 4T0150G/4T0185P		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		(+)、BR	Braking resistor connection
		⏚	Motor grounding
		(+)、(-)	DC positive and negative bus output,external braking unit
		PE	Protect grounding
4T0185G/4T0220P 4T0220G/4T0300P		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		(+)、BR	Braking resistor connection
		(+)、(-)	DC positive and negative bus output,external braking unit

		⏚	Motor grounding
		PE	Protect grounding
Application model	Terminal of main circuit	Terminal name	Function description
4T0300G/4T0370P 4T0370G/4T0450P		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		P、(+)	External connect DC reactor
		(+)、(-)	DC positive and negative bus output,external braking
		⏚	Motor Grounding
		PE	Protect Grounding
4T0450G/4T0550P 4T0550G/4T0750P		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		P、(+)	External connect DC reactor
		(+)、(-)	DC positive and negative bus output,external braking unit
		⏚	Motor Grounding
		PE	Protect Grounding
4T0750G/4T0900P 4T0900G/4T1100P 4T1100G/4T1320P 4T1320G/4T1600P 4T1600G/4T1850P 4T1850G/4T2000P		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		P、(+)	External connect DC reactor
		(+)、(-)	DC positive and negative bus output,external braking unit
		⏚	Motor grounding

		PE	Protect grounding
4T2000G/4T2200P 4T2200G/4T2500P 4T2500G/4T2800P 4T2800G/4T3150P 4T3150G/4T3550P 4T3550G/4T4000P 4T4000G/4T4500P 4T4500G/4T5000P		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		(+)、(-)	DC positive and negative bus output,external braking unit
		⏚	Motor grounding
		PE	Protect grounding
4T5000G/4T5600P 4T5600G/4T6300P 4T6300G/4T7100P 4T7100G/4T8500P 4T8500G		R、S、T	3-phase AC 380v input
		U、V、W	3-phase AC output
		P	External connect DC reactor
		⊖	DC Bus“-”terminal
		⏚	Motor grounding

(2)Table2-6 The selection of main circuit cable diameter, protection circuit breaker QF or fuse as following

Model	Circuit breaker	Fuse (A)	Input/output wire (mm^2)	Control wire (mm^2)
4T0007G	10	10	1.5	1.0
2S0007G	10	10	1.5	1.0
4T0015G	10	10	1.5	1.0
2S0015G	20	16	2.5	1.0
4T0022G	16	10	2.5	1.0
2S0022G	32	20	2.5	1.0
4T0040G/4T0055P	20/25	16/25	2.5/4	1.0
4T0055G/4T0075P	25/40	25/32	4/6	1.0
4T0075G/4T0110P	40/63	32/38	6/10	1.0
4T0110G/4T0150P	63/63	38/40	10/10	1.0
4T0150G/4T0185P	63/100	40/50	10/16	1.0
4T0185G/4T0220P	100/100	50/65	16/16	1.0
4T0220G/4T0300P	100/125	65/80	16/25	1.0
4T0300G/4T0370P	125/160	80/95	25/25	1.0
4T0370G/4T0450P	160/200	95/115	25/35	1.0
4T0450G/4T0550P	200/200	115/170	35/35	1.0
4T0550G/4T0750	200/250	170/205	35/70	1.0
4T0750G/4T0900P	250/315	205/245	70/70	1.0
4T0900G/4T1100P	315/400	245/300	70/95	1.0
4T1100G/4T1320P	400/400	300/300	95/150	1.0
4T1320G/4T1600P	400/630	300/410	150/185	1.0
4T1600G/4T1850P	630/630	410/475	185/240	1.0
4T1850G/4T2000P	630/630	410/475	185/240	1.0
4T2000G/4T2200P	630/800	475/475	240/150×2	1.0
4T2200G/4T2500P	800/800	475/620	150×2/150×2	1.0
4T2500G/4T2800P	800/1000	620/620	150×2/150×2	1.0

4T2800G/4T3150P	1000/1000	620/800	185×2/185×2	1.0
4T3150G/4T3550P	1250/1250	1000/1000	185×2/185×2	1.0
4T3550G/4T4000P	1250/1600	1000/1400	185×2/185×2	1.0
4T4000G/4T4500P	1600/1600	1400/1400	240×2/240×2	1.0
4T4500G/4T5000P	1600/2000	1400/1600	240×2/240×2	1.0
4T5000G/4T5600P	2000/2000	1600/1600	185×3/185×3	1.0
4T5600G/4T6300P	2000/2500	1600/1800	185×3/185×3	1.0
4T6300G/4T7100P	2500/2500	1800/1800	240×3/240×3	1.0
4T7100G/4T8500P	2500/2900	1800/2000	240×3/240×3	1.0
4T8500G	2900	2000	240×4/240×4	1.0

2.5 Control circuit configuration and wiring

2.5.1 Layout of control circuit terminal as follows:

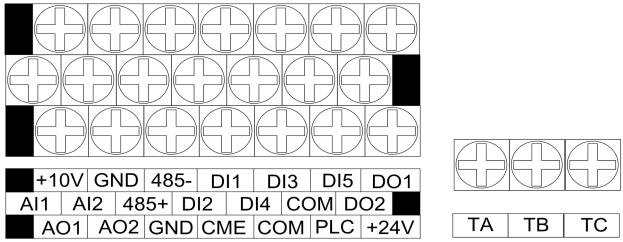


Diagram2-19 4T0040G/4T0055P and below control board terminals arrangement

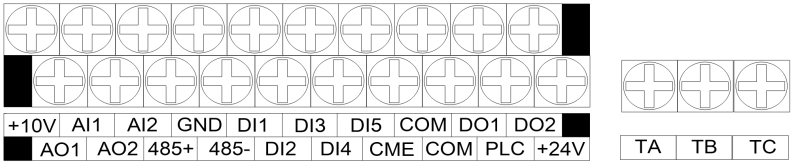


Diagram 2-20 4T0055G/4T0075P and above control board terminals arrangement

2.5.2 CN3 function description,shown as table 2-7

Type	Terminal no.	Name	Terminal function description	Specification
Communication	485+	RS485 Communication	RS485 different signal positive terminal	Standard RS485 communication interface,

	485-		RS485 different signal negative terminal	
Multi-function Output terminal	DO1 DO2	Open collector Output terminal	Programmable is defined Switch output terminals with multiple functions, detail refer to output terminal function introduction of F6.11,F6.12 (Common port: COM)	Optical coupling isolation output Working voltage:9 ~ 30V Max output current :50mA
	DO3	Open collector Output terminal	Programmable is defined Switch output terminals with multiple functions, detail refer to output terminal function introduction of F6.33 (Common port: CME)	Optical coupling isolation output Working voltage:9 ~ 30V Max output current :50mA (Remark: By extend card)
Relay output terminal	TA TB TC	Programmable relay output terminal	Normal：TA-TB normally closed;TA-TC normally open; Action：TA-TB normally open;TA-TC normally closed (Detail refer to F6.13)	Rating of contact NO：5A 250VAC NC：3A 250VAC
	RA RB RC	Programmable relay output terminal	Normal：RA-RB normally closed;RA-RC normally open; Action：RA-RB normally open;RA-RC normally closed (Detail refer to F6.34)	Rating of contact NO：5A 250VAC NC：3A 250VAC Remark: By extend card
Analog input	AI1	Analog input AI1	Accept the input of analog voltage (Reference ground：GND)	Input voltage range：0 ~ 10V (input impedance：100KΩ) Resolution：1/1000
	AI2	Analog input AI2	Accept input of analog current and voltage (Reference ground：GND) Selected by Jumper pin J3	Input current range：0 ~ 20mA (input impedance：165Ω) Resolution：1/1000
	AI3	Analog input AI3	Accept differential analog voltage input ; PT100/PT1000 input(Reference ground：P_GND)	Input voltage range：-10V~+10V (Remark: By extend card)

Analog output	AO1	Analog output	Provide analog voltage output, Corresponding to 12 kinds of physical quantities,output frequency as factory default (refer to F6.24/F6.27)	Voltage output range：0～10V Current output range：0～20mA
	AO2	Analog output	Provide analog voltage output, Corresponding to 12 kinds of physical quantities,output frequency as factory default (refer to F6.25/F6.28)	Voltage output range：0～10V Current output range：0～20mA (Remark: By extend card)
Multi-function input terminal	DI1	Multi-function input terminal 1	Programmable multi-function switch output terminals is referred to introduction about input terminal function(Switch input and output) on Chapter 6 terminals function parameters (Common port:COM) (Detail refer to F6.00-6.04))	
	DI2	Multi-function input terminal 2		
	DI3	Multi-function input terminal 3		
	DI4	Multi-function input terminal 4		
	DI5	Multi-function input terminal 5		
	DI6	Multi-function input terminal 1	Programmable multi-function switch output terminals is referred to introduction about input terminal function(Switch input and output) on Chapter 6 terminals function parameters (Common port:COM) (Detail refer to F6.05-6.08'F6.32)	(Remark: By extend card)
	DI7	Multi-function input terminal 2		
	DI8	Multi-function input terminal 3		
	DI9	Multi-function input terminal 4		
	DI10	Multi-function input terminal 5		
Power supply	10V	+10V Power suppy	Provide +10V power supply for external	Max output current:50mA

	GND	+10V power common terminal	Analog signal and reference ground of +10v power supply	Mutual inner isolation shall be produced between COM and GND
	COM	+24Vpower common terminal	Input/output public terminal of digital signal	
	+24V	+24V power supply	Digital signal power supply	Max output current:200mA
	PLC	Multi-function input public terminal	DI1—DI5 public terminal	Short circuit with 24v as factory default
	CME	Digital output common terminal	Multi-function output terminal DO1,DO2 common terminal	Short circuit with COM as factory default

2.5.3 The wiring of analog input

The terminals of AI1 and AI2 accept the input of analog signal .Input voltage (0 ~ 10V)or input current (0 ~ 20mA)are selected by the function code of F5.12.Terminal wiring as follows diagram2-18

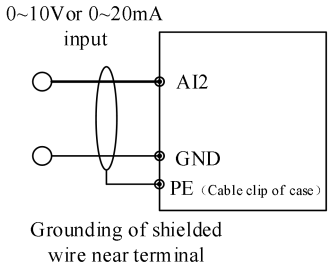


Diagram2-21 Wiring for analog input terminal

2.5.4 Drive control circuit wiring

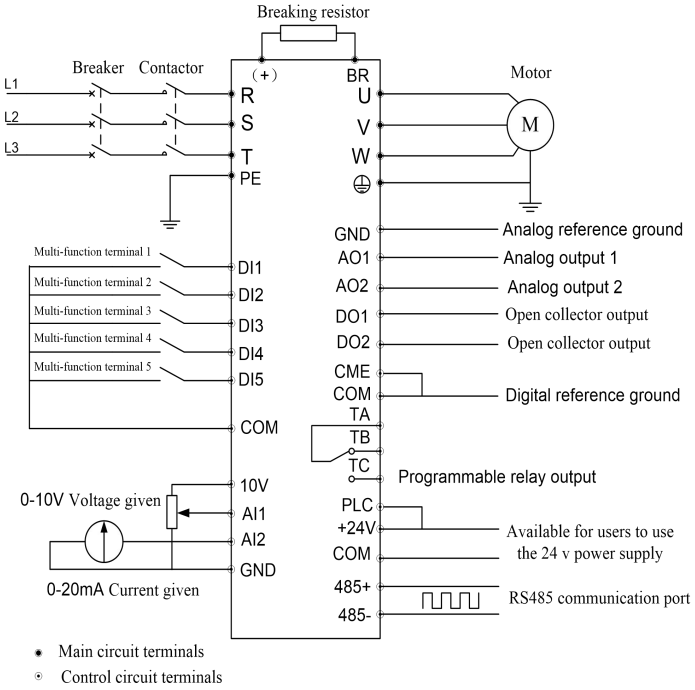
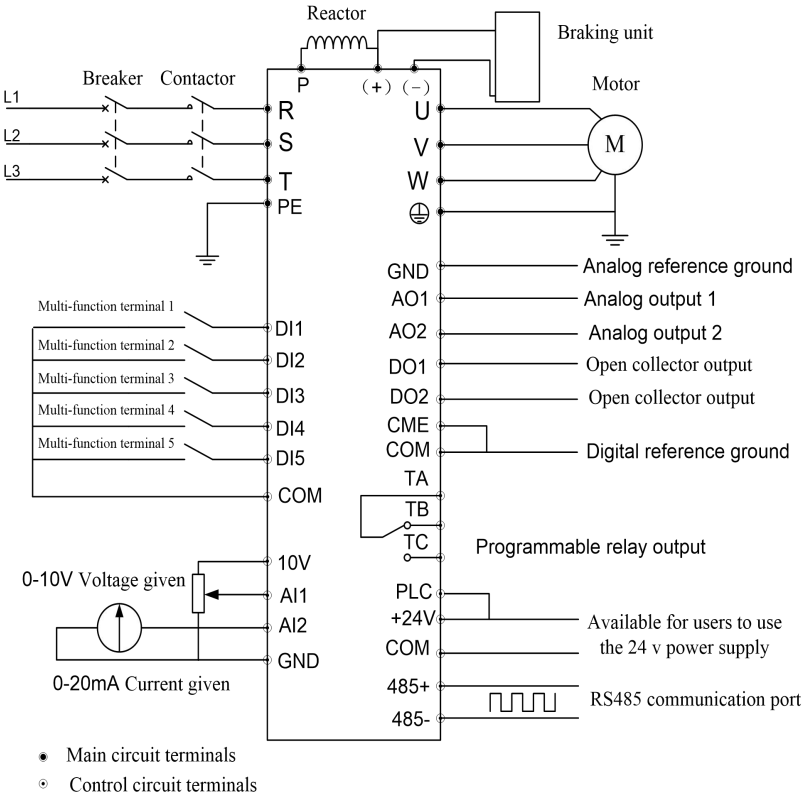


Diagram2-22 Diagram of wiring for basic running

Application model：4T0220G/0300P and below

📖 Introduction: Analog output AO1; AO2 can output voltage or output current. Set by parameter F6.29 ,AO1 and AO2 default to output 0 ~ 10V, the corresponding physical output set by parameter F6.24.



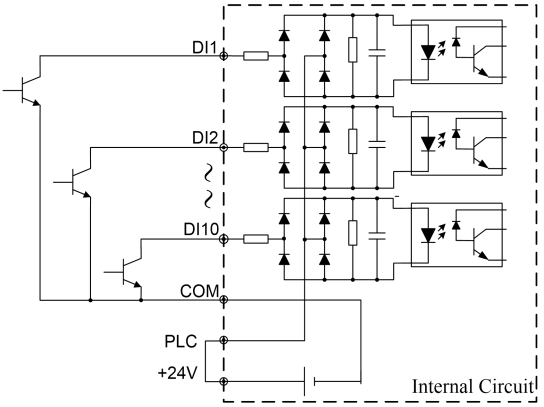
Diagrm2-23Wiring for basic running

Application model: 4T0300G/0370P and above

Explanation: The power more than 4T2000G/4T2200P with built-in DC reactor

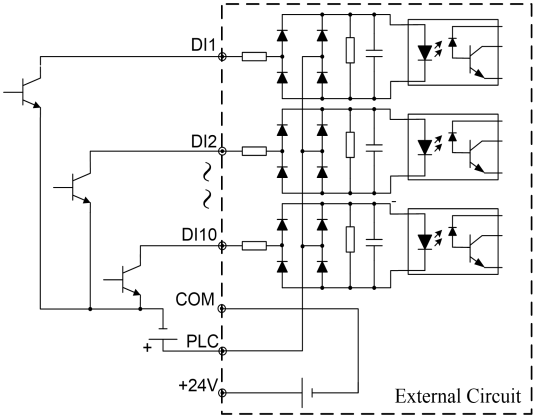
2.5.5 Signal input terminal wiring

Description for NPN and PNP model switch terminal, shown as diagram 2-24 to diagram 2-27



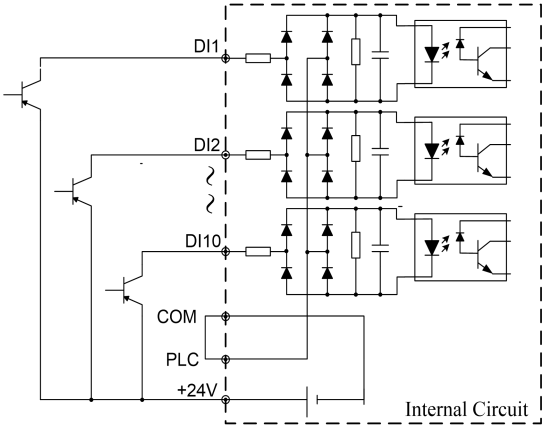
The terminals of DI6-DI10 on the extend card

Diagram2-24 Internal power supply NPN figure (OC)



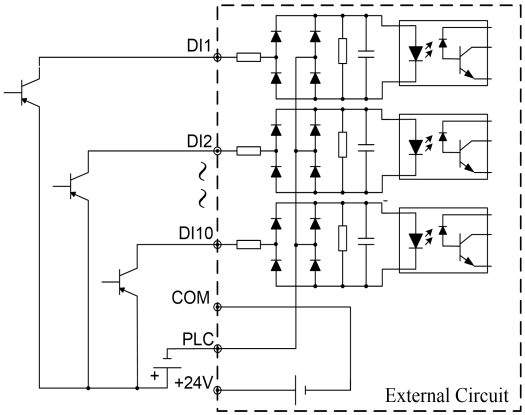
The terminals of DI6-DI10 on the extend card

Diagram2-25 External power supply NPN figure (OC)



The terminals of DI6-DI10 on the extend card

Diagram2-26 Internal power supply PNP figure (OE)



The terminals of DI6-DI10 on the extend card

Diagram2-27 External power supply PNP figure (OE)

Chapter3 Drive's operation and instruction

3.1 Keypad button function description

The drive operation panel is provided with 8 keys, each function definition of the key is shown in table3-1.

Table 3-1 operation panel function table

Keys	Name	Icon	Function explanation
PRG	Edit/Exit Key	PRG	Entry or exit programming status
▶▶	Shift/monitor key	▶▶	In the edit state, you can choose to set the data modification bit; in other state, switch display monitoring parameters
ENT	Confirm key	ENT	Enter menu or data confirmation
	Rotating encoder		Increment or decrement of data or function code
M-F	Multi-functional key	M-F	According to F0.01 set effective, ex factory value: point action control
RUN	Operation key	RUN	In the operation keyboard mode, the button drive operation
O/↻	Stop/ reset key	O/↻	When the drive is in the normal operation condition, if the frequency innverter operates the instruction channel to set the keyboard to stop the effective way, presses this key frequency change to stop according to the set way. When the drive is in fault state, press the key to reset the drive and return to normal shutdown state.
QUICK	Reserved	QUICK	

Tip: keys RUN, M-F, STOP/RESET characteristics are also restricted by the function code FC.31.

3.2 LED digital tube and indicator light description

<table>
<tr><th colspan="2">Project</th><th colspan="2">Function Explanation</th></tr>
<tr><td rowspan="10">Display function</td><td>Digital display</td><td colspan="2">Display the current running state parameters and setting parameters.
Note: when the parameter exceeds four digits, only the first four digits are displayed.</td></tr>
<tr><td rowspan="9">LED Indicator light</td><td>Hz; A; V</td><td>Current digital display parameters corresponding to the physical unit (current A, voltage V, frequency)
The rate is Hz</td></tr>
<tr><td rowspan="3">L/R</td><td>The indicator light, indicating that the drive is in the operating panel control state;</td></tr>
<tr><td>When the indicator light is off, the drive is in the terminal control state;</td></tr>
<tr><td>The indicator flashes, indicating that the drive is running in the serial state.</td></tr>
<tr><td>A</td><td>When the LED indicator A is on, the digital tube display parameter unit is current ampere.</td></tr>
<tr><td>V</td><td>When the LED indicator V is on, digital display parameter unit voltage volts.</td></tr>
<tr><td>Hz</td><td>When the LED indicator V is on, the digital tube displays the parameter unit frequency hz.</td></tr>
<tr><td colspan="2">When the LED indicator Hz and V light, digital display parameters as a percentage.</td></tr>
<tr><td colspan="2">When the LED indicator Hz and A light, digital display parameters for speed.</td></tr>
<tr><td colspan="2">When the LED indicator V and A light, digital display parameters for linear speed.</td></tr>
<tr><td colspan="2">When the LED indicator lights V, A and Hz light, digital display parameters for temperature.</td></tr>
</table>

Chapter4 Function Parameters

4.1 Symbol Description：

×—means that the parameter cannot be modified during the operation process

○—means that the parameter can be modified during the operation process

●—shows actually detected parameter which cannot be modified

*—shows manufacturer retention parameter which is forbidden to modify

4.2 Function parameter table

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F0 group System management parameter					
F0.00	Parameter write protection	0：All the data is allowed to be modified; 1：Forbidden to modify except for direct setting frequency and this function code; 2：Forbidden to modify except for this function code	1	0	○
F0.01	Multifunction key selection	0：JOG function 1：Remote switchover function 2：Forward/reverse switch 3：Clearing the increment of UP/DOWN frequency setting	1	0	○
F0.02	Parameter initialization	0：No operation 1：Clear fault memory information (U0.26～U0.36) 2：Recover to factory setting (except for F0 group and F3.00-F3.12)	1	0	×
F0.03	Parameter copy	0：No action 1：Parameter upload 2：Parameter download 3：Parameter download(except for F0,FF groupF1.08 and F3.00-F3.11)	1	0	*
F0.04	User code	0：No password Others：password protection	1	0	○
F0.05	Quick function parameters display selection	0: Invalid 1: Display feedback pressure	1	0	×
F0.06	Reserved	-	-	-	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F0.07	Quick parameters group display selection	LED units digit：first parameter display selection 0: Output frequency (before compensation) 1: Output frequency (after compensation) 2: Setting frequency (Hz) 3: Output current(A) 4: Running speed (RPM) 5: Setting speed (RPM) 6: Reserved 7: Reserved 8: Output power (KW) 9: Output torque (%) A: Output voltage (V) B: DC bus voltage (V) C: AI1(V) D: AI2(V) E: Analog closed loop feedback F: Analog closed loop setting LED tens digit：second parameter display selection 0~F: ditto LED hundreds digit：third parameter display selection 0~F: ditto LED thousands digit：fourth parameter display selection 0~F: ditto	0	0x2020	○
F0.08	Double row LED second line running display parameter selection	Display U0 group parameters setting range:0~16	0	3	○
F1 group Basic operation parameter					
F1.00	Control mode	0:Reserved 1：V/F control 2：Sensor-less vector control 3：Sensor vector control	1	1	×
F1.01	Run command channel selection	0：Keypad command channel 1：Terminal run command channel 2：Serial port run command channel	1	0	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F1.02	Frequency given channel selection	0：Digital setting 1, keypad ▲▼ regulating 1：Digital setting 2, terminal UP/DN regulating 2：Digital setting 3, serial port setting 3：AI1 setting 4：AI2 setting 5：Terminal pulse setting 6：Reserved 7：AI3(Expansion card)	1	0	○
F1.03	Numerical frequency control	LED units digit： 0：Setting frequency power off storage 1：Setting frequency power off no storage LED tens digit： 0：Stop setting frequency keeping 1：Stop setting frequency recovery	1	00	○
F1.04	Torque limit selection	0~7	1	0	×
F1.05	Torque limit initial value	0.0~100.0%	0.1	100%	×
F1.06	Maximum output frequency	F1.09~550.00Hz	0.01Hz	50.00Hz	×
F1.07	Operation frequency digit setting	Upper limiting frequency ~ lower limiting frequency	0.01Hz	50.00Hz	○
F1.08	Model selection	0：G type 1：P type	1	0	×
F1.09	Upper limiting frequency	Lower limiting frequency ~ maximum frequency	0.01Hz	50.00Hz	○
F1.10	Lower limiting frequency	0.00 ~ upper limiting frequency	0.01Hz	0.00Hz	○
F1.11	Acceleration time 1	0.1 ~ 600.0 Note： default unit second; refer to FC.09 for units of acceleration and deceleration time selection 0.75-11kw：6.00s 15kw-55kw：20.00s 75kw-90kw：60.00s 110kw and above:120.00s	0.1s	6.0s	○
F1.12	Deceleration time 1				
F1.13	Reserved				
F1.14	Reserved				
F1.15	Reserved				
F1.16	Reserved				

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F1.17	V/F curve setting	0: Linear V/F 1：User setting V/F curve (confirmed by F1.18～F1.23 function code) 2：Reduced torque characteristic curve 1(2.0 hypo-power) 3：Reduced torque characteristic curve 2(1.7 hypo-power) 4：Reduced torque characteristic curve 3(1.2 hypo-power)	1	0	×
F1.18	V/F frequency value F1	0.00～F1.20	0.01Hz	12.50Hz	×
F1.19	V/F voltage value V1	0~F1.21	0.1%	25.0%	×
F1.20	V/F frequency value F2	F1.18~F0.22	0.01Hz	25.00Hz	×
F1.21	V/F voltage value V2	F1.19~ F1.23	0.1%	50.0%	×
F1.22	V/F frequency value F3	F1.20~F3.04	0.01Hz	37.50Hz	×
F1.23	V/F voltage value V3	F1.21～100.0%	0.1%	75.0%	×
F1.24	Running direction setting	0：Forward 1：Reversal	1	0	○
F1.25	Carrier frequency setting	1~15kHz 0.75-11kw：6kHz 15kw-55kw：4kHz 75kw-90kw：3kHz 110kw and above: 2kHz	1kHz		○
F1.26	Carrier frequency automatic adjustment selection	0：Invalid 1：effective	1	1	○
F2 group Start/stop control					
F2.00	Starting mode	LED digits：Start mode 0：Start from start frequency 1：DC braking and start from start frequency 2：Rotate speed tracking LED ten digits :Rotate speed tracking way 0：tracking from stop frequency 1：tracking from maximum frequency	1	00	×
F2.01	Start frequency	0.20～60.00Hz	0.01Hz	0.50Hz	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F2.02	Start frequency duration	0.0 ~ 10.0s	0.1s	0.0s	○
F2.03	Start DC braking current	0.0~100.0% drive rated currency	0.1%	80.0%	○
F2.04	Start DC braking time	0.0 (no action) 0.1~30.0s	0.1s	0.0s	○
F2.05	Acceleration and deceleration mode selection	0：Straight line acceleration and deceleration 1：Reserved	1	0	×
F2.06	Reserved				○
F2.07	Reserved				○
F2.08	Stop mode	0：Decelerate to stop 1：Coast to stop 2：Stop deceleration + DC braking 3：Positioning deceleration stop 4: Decelerate to stop (overpressure stall invalid)	1	0	×
F2.09	Stop DC braking start frequency	0.00 ~ 60.00Hz	0.01Hz	0.00Hz	○
F2.10	Stop DC braking waiting time	0.00 ~ 10.00s	0.01s	0.00s	○
F2.11	Stop DC braking current	0.0 ~ 100.0% drive rated current	0.1%	80.0%	○
F2.12	Stop DC braking time	0.0 (no action) 0.1 ~ 60.0s	0.1s	0.0s	○
F2.13	Deceleration multiple	1.0~109.0	1	5.0	*
F2.14	Acceleration time 2	0.01 ~ 600.00 Note：default unit second; refer to FC.09 for units of acceleration and deceleration time selection	0.1	Model determined	○
F2.15	Deceleration time 2		0.1		○
F2.16	Acceleration time 3		0.1		○
F2.17	Deceleration time 3		0.1		○
F2.18	Acceleration time 4		0.1		○
F2.19	Deceleration time 4		0.1		○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F2.20	Jog operation frequency	0.10 ~ 50.00Hz	0.01Hz	5.00Hz	○
F2.21	Jog interval time	0.0 ~ 100.0s	0.1s	0.0s	○
F2.22	Jog acceleration time	0.1 ~ 600.0s	0.1	Model determined	○
F2.23	Jog deceleration time	0.1 ~ 600.0s	0.1		○
F2.24	Skip frequency 1	0.00 ~ 550.0Hz	0.01Hz	0.00Hz	×
F2.25	Skip frequency 1 range	0.00 ~ 30.00Hz	0.01Hz	0.00Hz	×
F2.26	Skip frequency 2	0.00 ~ 550.0Hz	0.01Hz	0.00Hz	×
F2.27	Skip frequency 2 range	0.00 ~ 30.00Hz	0.01Hz	0.00Hz	×
F2.28	Skip frequency 3	0.00 ~ 550.0Hz	0.01Hz	0.00Hz	×
F2.29	Skip frequency 3 range	0.00 ~ 30.00Hz	0.01Hz	0.00Hz	×
F2.30	Anti-reverse selection	0：Reverse allowed 1：Reverse prohibited	1	0	×
F2.31	Forward and reverse dead time	0 ~ 3600s	0.1s	0.0s	×
F2.32	Zero frequency operation allows selection	0：Zero frequency allows operation 1：zero frequency forbid operation	1	0	×
F3 group Motor parameter					
F3.00	Motor poles	2 ~ 14	2	4	×
F3.01	Rated power	0.4 ~ 999.9kW	0.1kW	Models determined	×
F3.02	Rated current	0.1 ~ 999.9A	0.1A		×
F3.03	Rated speed	1rpm~9999rpm	1rpm	1470rpm	×
F3.04	Rated frequency	1.00 ~ 550.00Hz	0.01Hz	Models determined	○
F3.05	Rated voltage	1~480V	1 V		×
F3.06	No-loading current I0	0.1 ~ 999.9A	0.1mH		×

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F3.07	Stator resistance R1	0.000~50.000Ω	0.001 Ω		○
F3.08	leakage inductive reactanceX	0.0~999.9mH	0.1mH		○
F3.09	Rotor resistance R2	0.000~50.000Ω	0.001 Ω		○
F3.10	Mutual inductance Xm	0.0~999.9mH	0.1mH		○
F3.11	Parameter self-tuning	0：No action 1：Action (motor static) 2：Action (motor rotate)	1	0	×
F3.12	Motor stability factor	0~25.5%	1	3	○
F3.13	Torsion rising limit	0.1%~30.0%	0.1%	10.0%	○
F3.14	Torsion rising cutoff point	0.00~F3.04	0.01Hz	50.00Hz	○
F3.15	Torque rising gain 1	0~2.00	0.01	0.20	○
F3.16	Torque rising Integration time 1	0~10.00	0.01	0.15	○
F3.17	Torque rising frequency switching	0~50.00Hz	0.01	15.00Hz	○
F3.18	Torsion rising gain	0~2.00	0.01	0.40	○
F3.19	Torsion rising integral time	1~10.00	0.01	0.3	○
F3.20	Auto torsion rising limit	0~100.0%	1%	30%	×
F4 group Vector control parameter					
F4.00	Speed filtering time	0.1~20.0ms	0.1	1.0ms	○
F4.01	Speed ring (ASR) proportional gain	0~10.00	0.01	2.00	○
F4.02	Speed ring (ASR) integral time	0.01~10.00	0.01	0.2	○
F4.06	Vector motor stability factor	0~50	1	10	○
F4.08	Vector torque limitation	2~200.0	0.1%	200	*

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F4.10	Torque mode	0~1	1	0	*
F4.12	Current loop proportional gain	0.01~10.00	0.01	0.20	*
F4.13	Current loop integral time	0.01~10.00	0.01	0.20	*
F4.14	Weak magnetic ratio	0.01~10.00	0.01	1.00	*
F4.15	Weak magnetic integral	0.01~10.00	0.01	1.00	*
F4.16	Maximum speed deviation warning	0.01~100.00Hz	0.01	50.00	*
F4.17	Torque command direction	0~1	1	0	*
F5 group Analog quantity terminal parameter					
F5.00	Frequency given curve selection	LED units digit： AI1 frequency curve selection 0：Curve 1 1：Curve 2 LED tens digit： AI2 frequency curve selection 0：Curve 1 1：Curve 2 LED hundreds digit： Pulse frequency curve selection 0：Curve 1 1：Curve 2 LED thousands digit：Expansion card AI3 frequency curve selection 0：Curve 1 1：Curve 2	1	000	○
F5.01	Given channel gain	0.000 ~ 9.999	0.001	1.001	○
F5.02	Given Filter time	0.001 ~ 50.000s	0.001s	0.500s	○
F5.03	Maximum input pulse frequency	0.1 ~ 50.0kHz	0.1kHz	10.0kHz	○
F5.04	Curve 1 minimum given	0.0% ~ F5.06 (Specific value between minimum given value 1 and reference value 10V/20mA/F5.03)	0.1%	0.0%	○
F5.05	Curve 1 minimum given corresponding frequency	0.00 ~ F1.06	1	0.00Hz	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F5.06	Curve 1 maximum given	F5.04 ~ 100.0% (Specific value between maximum given value 1 and reference value 10V/20mA)	0.1%	100.0%	○
F5.07	Curve 1 maximum given corresponding frequency	0.00 ~ F1.06	1	50.00Hz	○
F5.08	Curve 2 minimum given	0.0% ~ F5.10 (Specific value between minimum given value 2 and reference value 10V/20mA)	0.1%	0.1%	○
F5.09	Curve 2 minimum given corresponding frequency	0.00 ~ F1.06	1	0.00Hz	○
F5.10	Curve 2 maximum given	F5.08 ~ 100.0% (Specific value between maximum given value 2 and reference value 10V/20mA/F5.03)	0.1%	100.0%	○
F5.11	Curve 2 maximum given corresponding frequency	0.00 ~ F1.06	1	50.00Hz	○
F5.12	Analog input voltage current type selection	LED digit： AI1 input type selection 0：Voltage 1：Current LED ten digit :AI2 input type selection 0：Voltage 1：Current LED hundreds digit： Reserved	1	000	○
F5.13	Reserved	-	-	0	*
F5.14	Reserved	-	-	0	*

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F6 group Digital quantity terminal parameter					
F6.00	Multifunction input terminal DI1 Function selection	0：No function 1：Multistage frequency terminal 1 2：Multistage frequency terminal 2 3：Multistage frequency terminal 3 4 :Acceleration and deceleration time terminal 1 5 :Acceleration and deceleration time terminal 2 6：External fault normally open input 7：External fault normally close input 8：External reset (○/⟳) input 9：External Forward jog control 10：External reverse jog control 11：Free stop input (FRS) 12：Freq. increasing command (UP) 13：Freq. decreasing command (DOWN) 14：Simple PLC pause command 15：Acceleration and deceleration forbidden command 16：Three-line operation control 17：External interruption normally open contact input 18：External interruption normally close contact input 19：Stop DC braking input command DB 20：Closed loop invalid	1	36	×
F6.01	Multifunction input terminal DI2 Function selection			37	
F6.02	Multifunction input terminal DI3 Function selection			8	
F6.03	Multifunction input terminal DI4 Function selection	21：PLC invalid 22：Frequency source selection 1 23：Frequency source selection 2 24：Frequency source selection 3 25：Frequency switch to AI2 26：Frequency switch to AI3 27：Command switch to terminal 28：Command source selection 1 29：Command source selection 2 30：Multistage closed-loop given	1	1	×
F6.04	Multifunction input terminal DI5 Function selection			2	

F6.05	Multifunction input terminal DI6 Function selection	terminal 1 31：Multistage closed-loop given terminal 2 32：Multistage closed-loop given terminal 3 33：Reserved 34：Reserved 35 :External stop command (Effective to all the control modes, stop according to the current stop mode) 36：FWD terminal function 37：REV terminal function 38：Drive running prohibited 39：Length reset 40：Auxiliary given frequency reset 41：PLC stop memory reset 42：Counter reset signal input 43：Counter trigger signal input 44：Length counting input (only for DI4 setting) 45：Pulse frequency input(only for DI4; DI5 setting) 46：Single phase speed measurement input(only for DI4 setting) 47：Reserved 48：Reserved 49：Multiple frequency terminals4 50：Reserved 51：Frequency Source switching 52 :Deceleration stop command input 53 :Position reached input signal(only for DI4 setting)		3	
F6.06	Multifunction input terminal DI7 Function selection			9	
F6.07	Multifunction input terminal DI8 Function selection			0	
F6.08	Expansion card multifunctional input terminal DI9 function selection			0	
F6.09	FWD/REV operation mode setting	0：Two-wire control mode 1 1：Two-wire control mode 2 2：Three-line operation control 1 - self-hold function (additional any terminal among DI1 ~ DI10) 3：Three-line operation control 2 - self-hold function (additional any terminal among DI1 ~ DI10)	1	0	×
F6.10	UP/DN rate	0.01 ~ 99.99Hz/s	0.01 Hz/s	1.00Hz/s	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F6.11	Open collector output terminal DO1	0：Drive running indication (RUN) 1：Frequency arrival signal (FAR) 2：Frequency level detection signal (FDT1) 3：Frequency level detection signal (FDT2) 4：Overload detection signal (OL) 5：Stop for undervoltage block (LU) 6：External fault halt (EXT) 7：Frequency upper limit (FHL) 8：Frequency lower limit (FLL) 9：Drive zero-speed running 10：Simple PLC stage running completion instruction	1	0	×
F6.12	Open collector output terminal DO2	11：PLC circulation completion indication 12：Reach setting count value 13：Reach specified count value 14：Setting length arrival indication 15：Drive running preparation completed (RDY) 16：Drive fault 17：Upper computer switching signal 18：Reserved 19：Reach setting accumulated running time 20：Output frequency (0~F1.06 maximum) 21：Reserved 22：Setting frequency (0 ~ F1.06 maximum) 23：Output current(0 ~ 2*drive rated current) 24：Output current(0 ~ 2*Motor rated current) 25：Output torque(0 ~ 2*Tem)	1	1	×

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F6.13	Relay output function selection (TA/TB/TC)	26：Output voltage(0～1.2*Ve) 27：DC Bus voltage(0～800V) 28：AI1(0～10V/0～20mA) 29：AI2(0～10V/0～20mA) 30：Output power(0～2*Pe) 31：Upper computer percentage(0～1000) 32：Expansion card AI3(-10~10V)	1	16	×
F6.14	FDT1 level	0.00～550.0Hz	0.01Hz	50.00Hz	○
F6.15	FDT1 lag	0.00～550.0Hz	0.01Hz	1.00Hz	○
F6.16	FDT2 level	0.00～550.0Hz	0.01Hz	25.00Hz	○
F6.17	FDT2 lag	0.00～550.0Hz	0.01Hz	1.00Hz	○
F6.18	Frequency reaches (FAR) detection width	0.00～550.0Hz	0.01Hz	2.50Hz	○
F6.19	Reserved	-	-	0	○
F6.20	DO2 maximum output pulse	0.1～50.0kHz	0.1k	10.0k	○
F6.21	Counter reset value setting (Setting count value reached given value)	F6.22～9999	1	0	○
F6.22	Counter detection value setting (Setting count value reached given value)	0～F6.21	1	0	○
F6.23	Terminal positive and negative logic	Binary system setting 0：Breakover effective 1：Disconnect effective LED units digit： BIT0～BIT3：DI1～DI4 LED tens digit： BIT0～BIT3：DI5～DI8 LED hundreds digit： BIT0～BIT1：DI9; DI10 BIT2～BIT3：DO1; DO2 LED thousands digit：Reserved	1	0000	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F6.24	AO1 output function selection	0：Output frequency (0~F1.06) 1：Reserved 2：Setting frequency (0~F1.06) 3：Output current(0～2* drive rated current) 4：Output current(0～2* Motor rated current) 5：Output torque(0～2*Tem) 6：Output voltage (0～1.2*Ve) 7：DC Bus voltage (0～800V) 8：AI1(0～10V/0～20mA) 9：AI2(0～10V/0～20mA) 10：Output power(0～2*Pe) 11：Upper computer percentage(0～65535) 12： AI3(-10V~10V)	1	0	○
F6.25	Expansion card AO2 output function selection		1	3	○
F6.26	Analog output range selection	LED units digit：AO1 bias selection 0：0～10V or 0～20mA 1：2～10V or 4～20mA LED tens digit：Expansion card AO2 bias selection 0：0～10V or 0～20mA 1：2～10V or 4～20mA	1	00	○
F6.27	AO1 output gain	0.0～200.0%	0.1%	100.0%	○
F6.28	Expansion card AO2 output gain	0.0～200.0%	0.1%	100.0%	○
F6.29	Analog output voltage current type selection	LED digit：AO1 output type selection 0：Voltage 1：Current LED ten digit：Expansion card AO2 output type selection 0：Voltage 1：Current	1	00	○
F6.30	Common IO filtering time	0.000~10.000s	0.001s	0.002s	○
F6.31	Reserved	-	-	-	○
F6.32	Expansion card DI10 input function selection	Same function code with F6.00	1	0	○
F6.33	Expansion card DO3 output function selection	Same function code with F6.11	1	0	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F6.34	Expansion card relay output RA/RB/RC	Same function code F6.13	1	0	○
F6.35	AO1 zero bias coefficient	0.0% ~ 100.0%	0.1%	100.0%	*
F6.36	DO Pulse duty cycle	0 ~100	1	50	×
F6.37	AO2 Zero bias coefficient	0.0% ~100.0%	0.1%	100.0%	×
F7 group Advanced function parameter					
F7.00	Overvoltage stall point	380V Model：110.0 ~ 150.0% 220V Model：100.0 ~ 130.0%	0.1%		×
F7.01	Overvoltage control voltage	0.000~9.999v	0.01V	0.10V	×
F7.02	Overvoltage stall gain Kp1	0~2.00	1	6	×
F7.03	Overvoltage stall integral time Ki1	0~2.00	1	100	×
F7.04	Overvoltage stall gain Kp2	0.0~2.00	0.1	4.0	×
F7.05	Overvoltage stall integral time Ki2	0~2.00	1	10	×
F7.06	Over current stall level	20.0% ~ 200.0%	0.1%	150.0%	×
F7.07	Over current stall action selection	0：Constant speed ineffective 1：Constant speed effective Note：Acceleration and deceleration is always effective	1	1	×
F7.08	Over current stall gain Kp	0~99.99	1	6	×
F7.09	Over current stall integral time	1~2.00	1	100	×
F7.10	Reserved	-	-	-	×
F7.11	Reserved	-	-	-	×
F7.12	Rotational speed tracking acceleration	0~100.0S	1	10	×
F7.13	Reserved	-	-	-	×
F7.14	Instantaneous stop/no stop function selection	0：No action 1：decelerated 2：Ramp to stop	1	0	×

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F7.21	Braking voltage point	110.0~150.0%			
F7.23	Speed display quotiety	0.001~9.999			
F7.24	Linear velocity quotiety	0.001~9.999			
F8 group PID control parameter					
F8.00	Closed loop running control selection	0：No action 1：Action	1	0	×
F8.01	Given channel selection	0：Number given; (Refer to F8.06 when F8.02=6; refer to F8.05 in other conditions) 1：AI1; 2：AI2; Note：For speed closed loop, analog given 10V for synchronous speed of maximum frequency F1.06	1	1	○
F8.02	Feedback channel selection	0：AI1; 1：AI2; 2：AI1+AI2; 3：AI1-AI2; 4：MIN(AI1,AI2); 5：MAX(AI1,AI2); 6：Pulse; 7：AI3(Expansion card) ;	1	1	○
F8.03	Given channel smoothing	0.001 ~ 50.000s	0.001s	0.500s	○
F8.04	Feedback channel smoothing	0.001 ~ 50.000s	0.001s	0.500s	○
F8.05	Given digital quantity setting	0.00V ~ 10.00V	0.01	0.00	○
F8.06	Speed closed loop given	0 ~ 39000RPM	1	0	○
F8.07	Pulse encoder every revolution	1 ~ 20000	1	1024	○
F8.08	Minimum given quantity	0.0% ~ (F8.10) (The percentage of minimum given quantity and reference value 10V;20mA)	0.1%	0.0	○
F8.09	Corresponding feedback quantity of minimum given quantity	0.0 ~ 100.0% (The percentage of corresponding feedback quantity of minimum given quantity and reference value 10V;20mA)	0.1%	0.0%	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F8.10	Maximum given quantity	(F8.08) ~ 100.0% (The percentage of maximum given quantity and reference value 10V;20mA)	0.1%	100.0%	○
F8.11	Corresponding feedback quantity of maximum given quantity	0.0 ~ 100% (The percentage of corresponding feedback quantity of maximum given quantity and reference value 10V;20mA)	0.1%	100.0%	○
F8.12	Proportional gain KP	0.000 ~ 9.999	0.001	2.000	○
F8.13	Integral gain Ki	0.000 ~ 9.999	0.001	0.100	○
F8.14	Sampling period	0.001 ~ 50.000s	0.001s	0.100s	○
F8.15	Deviation limit	0.0 ~ 20.0% (Corresponding closed loop given value)	0.1%	2.0%	○
F8.16	Closed loop regulating characteristic	0：Positive 1：Negative Note：Relation between given speed and rotate speed	1	0	×
F8.17	Sleeping frequency	0.00Hz ~ 550.0Hz	0.01Hz	0	*
F8.18	Closed loop preset frequency	0.00 ~ 550.0Hz	0.01Hz	0.00Hz	○
F8.19	Closed loop preset frequency hold time	0.0 ~ 3600s	0.1s	0.0s	×
F8.20	Multistage closed loop given 1	0.00 ~ 10.00V	0.01V	0.00V	○
F8.21	Multistage closed loop given 2	0.00 ~ 10.00V	0.01V	0.00V	○
F8.22	Multistage closed loop given 3	0.00 ~ 10.00V	0.01V	0.00V	○
F8.23	Multistage closed loop given 4	0.00 ~ 10.00V	0.01V	0.00V	○
F8.24	Multistage closed loop given 5	0.00 ~ 10.00V	0.01V	0.00V	○
F8.25	Multistage closed loop given 6	0.00 ~ 10.00V	0.01V	0.00V	○
F8.26	Multistage closed loop given 7	0.00 ~ 10.00V	0.01V	0.00V	○
F8.27	Multistage closed loop given 8	0.00 ~ 10.00V	0.01V	0.00V	○
F8.28	Multistage closed loop given 9	0.00 ~ 10.00V	0.01V	0.00V	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F8.29	Multistage closed loop given 10	0.00 ~ 10.00V	0.01V	0.00V	○
F8.30	Multistage closed loop given 11	0.00 ~ 10.00V	0.01V	0.00V	○
F8.31	Multistage closed loop given 12	0.00 ~ 10.00V	0.01V	0.00V	○
F8.32	Multistage closed loop given 13	0.00 ~ 10.00V	0.01V	0.00V	○
F8.33	Multistage closed loop given 14	0.00 ~ 10.00V	0.01V	0.00V	○
F8.34	Multistage closed loop given 15	0.00 ~ 10.00V	0.01V	0.00V	○
F8.35	Closed-loop output polarity selection	Digit： 0：Cosed-loop output is negative value, zero frequency run 1：Cosed-loop output is negative value, reverse, But if F2.30 is set to forbid reverse, drive will run at lowest frequency. Ten digit： 0：PID high and low limits do not change 1：PID high and low limits is decided by AI	1	0x00	○
F8.36	Closed-loop feedback lost movement selection	0：no closed-loop feedback loss detection 1：closed-loop feedback loss detection, stop while detection, display fault E20	1	0	○
F8.37	Process closed loop feedback loss detection value	0.0~100% The maximum output frequency is 100%	0.1%	10%	○
F8.38	Process closed loop feedback loss detection time	0.0s~1000.0s	0.1s	1.0s	○
F8.39	Sleeping threshold	0.00V~10.00V	0.01V	10.00V	○
F8.40	Wakeing threshold	0.00V~10.00V	0.01V	0.00V	○
F8.41	Sleeping waiting time	0.1s~600.0s	0.1s	300.0s	○
F8.42	Waking waiting time	0.1s~600.0s	0.1s	300.0s	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F8.43	Differential gain KD	0~9.9(Relative to maximum closed loop feedback)	0.1%	100%	○
F9 group Simple PLC control parameter					
F9.00	Simple PLC running mode selection	LED units digit：PLC running mode 0：No action 1：Stop after single loop 2：Keep final value after single loop 3：Continuous loop LED tens digit： start mode 0：Rerun from the first stage 1 :Continue to run from the stage of halt (or fault) 2：Continue to run from the stage, frequency of halt (or fault) LED hundreds digit： power down storage 0：No storage 1 :Store the stage and frequency of power down moment LED thousands digit： stage time unit selection 0：second 1：minute	1	0000	×
F9.01	Multistage frequency 1	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	5.00Hz	○
F9.02	Multistage frequency 2	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	10.00Hz	○
F9.03	Multistage frequency 3	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	20.00Hz	○
F9.04	Multistage frequency 4	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	30.00Hz	○
F9.05	Multistage frequency 5	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	40.00Hz	○
F9.06	Multistage frequency 6	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	45.00Hz	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.07	Multistage frequency 7	F1.10(lower limit frequency) ~ F1.09(upper limit frequency)	0.01Hz	50.00Hz	○
F9.08	Stage 1 setting	LED units digit： 0：Multistage frequency 1(F9.01) 1：Determined by F1.02 function code 2：Multistage closed loop given 1(F8.20) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0：Acceleration and deceleration time 1 1：Acceleration and deceleration time 2 2：Acceleration and deceleration time 3 3：Acceleration and deceleration time 4	1	000	○
F9.09	Stage 1 running time	0.0 ~ 6500.0s	0.1	20.0	○
F9.10	Stage 2 setting	LED units digit： 0：Multistage frequency 2(F9.02) 1：Determined by F1.02 function code 2：Multistage closed loop given 2(F8.21) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0：Acceleration and deceleration time 1 1：Acceleration and deceleration time 2 2：Acceleration and deceleration time 3 3：Acceleration and deceleration time 4	1	000	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.11	Stage 2 running time	0.0 ~ 6500.0s	0.1	20.0	○
F9.12	Stage 3 setting	LED units digit： 0 :Multistage frequency 3(F9.03) 1：Determined by F1.02 function code 2：Multistage closed loop given 3(F8.22) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.13	Stage 3 running time	0.0 ~ 6500.0s	0.1	20.0	○
F9.14	Stage 4 setting	LED units digit： 0 :Multistage frequency 4(F9.04) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.23) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.15	Stage 4 running time	0.0 ~ 6500.0s	0.1	20.0	○
F9.16	Stage 5 setting	LED units digit : 0 :Multistage frequency 4(F9.04) 1 : Determined by F1.02 function code 2 : Multistage closed loop given 4(F8.23) 3 : Determined by F8.01 function code LED tens digit : 0 : Foreward 1 : Reversal 2 : Determined by run command LED hundreds digit : 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.17	Stage 5 running time	0.0 ~ 6500.0s	0.1	20.0	○
F9.18	Stage 6 setting	LED units digit : 0 :Multistage frequency 4(F9.04) 1 : Determined by F1.02 function code 2 : Multistage closed loop given 4(F8.23) 3 : Determined by F8.01 function code LED tens digit : 0 : Foreward 1 : Reversal 2 : Determined by run command LED hundreds digit : 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.19	Stage 6 running time	0.0 ~ 5500	0.1	20.0	○
F9.20	Stage 7 setting	LED units digit : 0 :Multistage frequency 4(F9.04) 1 : Determined by F1.02 function code 2 : Multistage closed loop given 4(F8.23) 3 : Determined by F8.01 function code LED tens digit : 0 : Foreward 1 : Reversal 2 : Determined by run command LED hundreds digit : 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.21	Stage 7 running time	0.0 ~ 6500.0s	0.1	20.0	○
F9.22	Multistage frequency8	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	40.00Hz	○
F9.23	Multistage frequency9	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	45.00Hz	○
F9.24	Multistage frequency10	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	50.00Hz	○
F9.25	Multistage frequency11	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	50.00Hz	○
F9.26	Multistage frequency12	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	50.00Hz	○
F9.27	Multistage frequency13	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	50.00Hz	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.28	Multistage frequency14	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	50.00Hz	○
F9.29	Multistage frequency15	F1.10(Lowest frequency)~F1.09(Upper limiting frequency)	0.01Hz	50.00Hz	○
F9.30	Stage 8 setting	LED units digit： 0：Multistage frequency 8(F9.23) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.27) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0：Acceleration and deceleration time 1 1：Acceleration and deceleration time 2 2：Acceleration and deceleration time 3 3：Acceleration and deceleration time 4	1	000	○
F9.31	Stage 8 running time	0.0～6500.0s	0.1	0.0	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.32	Stage 9setting	LED units digit： 0：Multistage frequency 9(F9.24) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.28) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0：Acceleration and deceleration time 1 1：Acceleration and deceleration time 2 2：Acceleration and deceleration time 3 3：Acceleration and deceleration time 4	1	000	○
F9.33	Stage 9 running time	0.0～6500.0s	0.1	0.0	○
F9.34	Stage 10 setting	LED units digit： 0：Multistage frequency 10(F9.25) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.29) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0：Acceleration and deceleration time 1 1：Acceleration and deceleration time 2 2：Acceleration and deceleration time 3 3：Acceleration and deceleration time 4	1	000	○
F9.35	Stage 10 running time	0.0～6500.0s	0.1	0.0	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.36	Stage 11 setting	LED units digit : 0 : Multistage frequency 11(F9.26) 1 : Determined by F1.02 function code 2 : Multistage closed loop given 4(F8.30) 3 : Determined by F8.01 function code LED tens digit : 0 : Foreward 1 : Reversal 2 : Determined by run command LED hundreds digit : 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.37	Stage 11 running time	0.0 ~ 6500.0s	0.1	0.0	○
F9.38	Stage 12 setting	LED units digit : 0 : Multistage frequency 12(F9.26) 1 : Determined by F1.02 function code 2 : Multistage closed loop given 4(F8.31) 3 : Determined by F8.01 function code LED tens digit : 0 : Foreward 1 : Reversal 2 : Determined by run command LED hundreds digit : 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.39	Stage 12 running time	0.0 ~ 6500.0s	0.1	0.0	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.40	Stage 13 setting	LED units digit： 0 :Multistage frequency 13F9.27) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.32) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.41	Stage 13 running time	0.0 ~ 5500	0.1	0.0	○
F9.42	Stage 14 setting	LED units digit： 0：Multistage frequency 14(F9.28) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.33) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0 : Acceleration and deceleration time 1 1 : Acceleration and deceleration time 2 2 : Acceleration and deceleration time 3 3 : Acceleration and deceleration time 4	1	000	○
F9.43	Stage 14 running time	0.0 ~ 6500.0s	0.1	0.0	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
F9.44	Stage 15 setting	LED units digit： 0：Multistage frequency 15(F9.29) 1：Determined by F1.02 function code 2：Multistage closed loop given 4(F8.34) 3：Determined by F8.01 function code LED tens digit： 0：Foreward 1：Reversal 2：Determined by run command LED hundreds digit： 0：Acceleration and deceleration time 1 1：Acceleration and deceleration time 2 2：Acceleration and deceleration time 3 3：Acceleration and deceleration time 4	1	000	○
F9.45	Stage 15 running time	0.0～6500.0s	0.1	0.0	○
Parameter code	**Parameter name**	**Setting range**	**Mini munit**	**Default value**	**Mod ition**
FA group Protection function parameter					
FA.00	Motor overload protection mode selection	0：No action 1：Common motor (with low speed reimbursement) 2：Variable frequency motor (without low speed reimbursement)	1	1	×
FA.01	Motor overload protection coefficient	20.0～110.0	0.01	100.0%	×
FA.02	AI3 Analog input function selection	0：Analog frequency input 1：PT100 temperature signal input 2：PT1000 temperature signal input	1	0	*
FA.03	Temperature sampling input gain	50.0%~150.0%			
FA.04	Motor overheating warning threshold	75℃~120℃	0.1	85	*

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FA.07	Protective action selection 0	LED units digit：Alarming function selection 0：No action 1：Auto alarm reset and not run			
FA.09	Automatic reset times	0～10,0 shows no automatic reset function Note： Module protection and external device fault has no reset function.	1	0	×
FA.10	Automatic reset interval time	2.0～20.0s	0.1s	5.0s	×
FA.11	Overload pre-alarm detection setting	LED units digit：Action selection 0：Detecting all the time 1：Detect only in constant speed LED tens digit：Alarming selection 0：No alarming, continue to run 1：Alarm, halt LED hundreds digit：Detection quantity selection 0：Relative to motor rated current(E008) 1：Relative to drive rated current(E009)	1	000	×
FA.12	Overload pre-alarm detection level	20.0%～200.0%	0.1%	130.0%	×
FA.13	Overload pre-alarm detection time	0.0～60.0s	0.1s	5.0s	×
FA.14	Protective action selection 1	LED units digit：Undervoltage fault indication action selection 0：No action 1：Action (regard undervoltage as fault) LED tens digit：reserved LED hundreds digit：reserved LED thousands digit：Default phase action selection 0：Both input and output default phase are protected 1：Input default phase no action 2：Output default phase no action 3：Both input and output default phase no action	1	0000	×

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FA.15	Protective action selection 2	LED units digit：communication abnormal action selection 0：Alarming and free stop 1：No alarming and continue to run 2：No alarming and stop according to stop mode(Only in serial port control mode) 3：No alarming and stop according to stop mode(In all control modes) LED tens digit：Contactor abnormal action selection 0：Alarming and free halt 1：No alarming and continue to run LED hundreds digit：EEPROM abnormal action selection 0：Alarming and free halt 1：No alarming and continue to run	1	0001	×

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FB group Serial port communication parameter					
Fb.00	Local address	0：Main Machine address 1~247：Other machine address	1	1	×
Fb.01	Communication configuration	LED units digit：Baud rate selection 0：1200BPS 1：2400BPS 2：4800BPS 3：9600BPS 4：19200BPS 5：38400BPS LED tens digit：data format 0：1-8-2-N format, RTU 1：1-8-1-E format, RTU 2：1-8-1-O format, RTU 3：1-7-2-N format, ASCII 4：1-7-1-E format, ASCII 5：1-7-1-O format, ASCII 6：1-8-1-N format,RTU LED hundreds digit：analog input terminal 0：Ineffective 1：Effective LED thousands digit：Change parameter through write command 06 0：not storage after power off 1：storage after power off	1	0003	×
Fb.02	Reserved	-	-	0	*
Fb.03	Local response delay	0 ~ 1000mS	1	5ms	×
Fb.04	Communication overtime detection time	0.0 ~ 1000s	0.1	0.0s	×
Fb.05	Host routing	00~11	0	11	×
Fb.06	Communication proportionality coefficient	0.000~2.000	0.01	1.00	○
FC group Auxiliary function parameter					
FC.00	Dynamic braking selection	0：not allowed 1：allowed	1	1	×
FC.01	Braking usage rate	1~5	1	3	×

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FC.02	AVR function	0：No action 1：Action all the time 2：No action only in deceleration	1	2	×
FC.03	Automatic energy saving running	0：No action 1：Action	1	0	○
FC.04	Slip compensation gain	0.0%~200%	1	0	○
FC.05	Slip compensation limit threshold	0.0%~250%			
FC.06	Slip compensation filtering time	0.1～25.0ms	0.1ms	1.0ms	○
FC.07	Reserved				
FC.08	Cooling fan control	0：Automatic running Note：Run for 3 minutes after stop 1：Fan always running when power on 2：Fan starts running when operating temperature is above 45℃,stops when temperature is below 40℃	1	0	×
FC.09	Acceleration and deceleration time unit	0：(second) 1：(minute)	0	0	×
FC.10	Droop control	0.00～10.00Hz	0.01Hz	0.00Hz	○
FC.11	Acceleration and deceleration time filter coefficient	0.1～100.0	0.1	1.0	○
FC.12	Zero frequency running threshold value	0.00～550.00Hz	0.01Hz	0.00Hz	○
FC.13	Zero frequency return difference	0.00～550.00Hz	0.01Hz	0.00Hz	○
FC.14	Length setting	0.00～65.535km	0.001	0.000	○
FC.15	Actual length	0.00～65.535km	0.001	0.000	○
FC.16	Length multiplying power	0.001～30.000	0.001	1.000	○
FC.17	Length correction coefficient	0.001～1.000	0.001	1.000	○
FC.18	Measurement axis perimeter	0.01～100.00(cm)	0.01 (cm)	10.00(cm)	○
FC.19	Axis pulse per turn	1～9999	1	1	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FC.20	Setting running time	0 ~ Max timing 65.535kh	0.001k h	0	○
FC.21	Reserved	-	-	-	×
FC.22	Power failure restart function selection	0：No action 1：Action	1	0	×
FC.23	Power-off restart waiting time	0.0~10.0s			
FC.24	Run command channel binding frequency given channel	LED units digit： Frequency channel selection when keyboard is started or stopped 0：No binding 1：Keyboard given 2：Terminal UP/DN given 3：Serial port given 4：AI1 analog given 5：AI2 analog given 6：Terminal pulse given 7：Reserved 8：Expansion card AI3 analog given LED tens digit：Frequency channel selection when terminal is started or stopped 0：No binding 1：Keyboard given 2：Terminal UP/DN given 3：Serial port given 4：AI1 analog given 5：AI2 analog given 6：Terminal pulse given 7：Reserved 8：Expansion card AI3 analog given LED hundreds digit：Frequency channel selection when serial port is started or stopped 0：No binding 1：Keyboard given 2：Terminal UP/DN given 3：Serial port given 4：AI1 analog given 5：AI2 analog given 6：Terminal pulse given 7：Reserved 8：Expansion card AI3	1	000	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FC.25	Auxiliary given channel	0：No action: 1 :Keyboard ▲ ▼ given (given by FC.27 directly); 2：Terminal UP/DN given (given by FC.27 directly); 3：Serial port given (given by FC.27 directly); 4：AI1; 5：AI2; 6：PULSE; 7：-AI1; 8：-AI2; 9：-PULSE 10：AI1-5; 11：AI2-5; 12：PULSE-1/2*F5.03 13：Reserved 14：AI3(Expansion card) Note：Ineffective when it is the same with main given channel; frequency of item 4-9 are used by parameters confirmed in F5.00	1	0	○
FC.26	Analog auxiliary given coefficient	0.00 ~ 9.99(only for FC.25=4 ~ 12)	0.01	1.00	○
FC.27	Figure auxiliary frequency	0.00 ~ 550.0Hz	0.01	0.00Hz	○
FC.28	Figure auxiliary frequency control	LED units digit：Storage control 0：storage after power off 1：not storage after power off LED tens digit： 0：stop holding 1：stop reset Note：Only effective to FC.25=1,2,3	1	000	○
FC.29	Outage time	0~6553.6s	0.1s	10s	○
FC.30	Pulse breakage detection time	0~6553.6s	0.1s	0s	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
FC.31	Keypad function and lock selection	LED units digit : O/⟳ key function selection 0：Ineffective in non-panel control mode 1：Stop according to stop mode in non-panel mode 2：E015 free halt in non-panel mode LED tens digit：reserved LED hundreds digit：Keyboard lock function 0：No lock 1：All lock 2：All lock except for O/⟳ key 3：All lock except for ENT key 4：All lock except for RUN and key O/⟳	1	000	×
FC.32	Reserved	-	-	0	*
FC.33	Frequency source overlay selection	Digit：Frequency source selection 0：The main frequency source 1：Primary and secondary operation results (the results are determined by the tens digit) 2：The main frequency source switching with the auxiliary frequency source 3：The main frequency source switching with Primary and secondary operation results			

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
		4：The auxiliary frequency source switching with Primary and secondary operation results Ten digit：Frequency source & Primary and secondary operation results relationships 0：Main+Auxiliary 1：Main-Auxiliary 2：Maximum value of the two 3：Minimum value of the two 4：|Main-Auxiliary| 5：(Main*Auxiliary)/F1.06	0	0	○
FD group Additional function parameter					
Fd.00	DO1 output open delay	0.0～600.0	0.1	0	○
Fd.01	DO1 output closed delay	0.0～600.0	0.1	0	○
Fd.02	DO2 output open delay	0.0～600.0	0.1	0	○
Fd.03	DO2 output closed delay	0.0～600.0	0.1	0	○
Fd.04	Relay output open delay	0.0～600.0	0.1	0	○
Fd.05	Relay output closed delay	0.0～600.0	0.1	0	○
Fd.10	Automatic torque rising start delay time	0.00~1.00	0.01	0.2	○

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
Fd.11	Reserved	-	-	-	*
Fd.12	Reserved	-	-	-	*
Fd.13	PID Upper limit	0.0～100.0%	0.1%	100.0%	○
Fd.14	PID Lower limit	0.0～100.0%	0.1%	100.0%	○
U0 group Monitoring parameter					
U0.00	Output frequency(before compensation)	-	-	-	*
U0.01	Output frequency(after compensation)				
U0.02	Setting frequency	-	-	-	*
U0.03	Output current	-	-	-	*
U0.04	Running speed	-	-	-	*
U0.05	Setting speed	-	-	-	*
U0.06	Reserved	-	-	-	*
U0.07	Reserved	-	-	-	*
U0.08	Output power		-	-	*
U0.09	Output torque		-	-	*
U0.10	Output voltage		-	-	*
U0.11	DC Bus voltage		-	-	*
U0.12	AI1		-	-	*
U0.13	AI2		-	-	*
U0.14	Analog closed loop feedback		-	-	*

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
U0.15	Analog closed loop setting		-	-	*
U0.16	External count value		-	-	*
U0.17	Terminal status		-	-	*
U0.18	Actual length		-	-	*
U0.19	Setting length		-	-	*
U0.20	AI3		-	-	*
U0.21	Reserved		-	-	*
U0.22	Drive rated voltage		-	-	*
U0.23	Drive rated current		-	-	*
U0.24	Reserved		-	-	*
U0.25	IGBT temperature		-	-	*
U0.26	First failure type		1	0	*
U0.27	Second failure type		1	0	*
U0.28	Third failure type		1	0	*
U0.29	Bus voltage during last failure	0~999V	1V	0V	*
U0.30	Output current during last failure	0.00~99.99A	0.01A	0.00A	*
U0.31	Output frequency during last failure	0.00Hz~550.00Hz	0.01Hz	0.00Hz	*
U0.32	IGBT temperature during last failure	0.0~100.0℃	0.1	0℃	*
U0.33	Bus voltage during second failure	0~999V	1V	0V	*

Parameter code	Parameter name	Setting range	Mini munit	Default value	Mod ition
U0.34	Output current during second failure	0.00~99.99A	0.01A	0.00A	*
U0.35	Output frequency during second failure	0.00Hz~550.00Hz	0.01Hz	0.00Hz	*
U0.36	IGBT temperature during second failure	0.0~100.0℃	0.1	0℃	*
U0.37	Accumulated running time	-	-	-	*
U0.38	Software version 1	-	-	-	*
U0.39	Encoder feedback speed				

4.3 Fault code table

Fault code	Fault type	Fault code	Fault type
E001	Over current during accelerating operation	E016	485 communication failure
E002	Over current during decelerating operation	E017	current detection circuit failure
E003	Over current during constant speed operation	E018	Self-tuning failure
E004	Over voltage during accelerating operation	E019	EEPROM read&write failure
E005	Over voltage during decelerating operation	E020	Closed-loop feedback loss
E006	Over voltage during constant speed operation	E021	V/F parameters setting failure
E007	Under voltage during running	E022	Reserved
E008	Motor overload	E023	Keypad parameter copy failure
E009	Drive overload	E024	Reserved
E010	IGBT module protection	E025	expansion card communication failure
E011	Input phase loss	E026	Buffer circuit anomaly
E012	Output phase loss	E027	Motor running without load alarm
E013	Overheat of IGBT radiator	E029	Auto current limit timeout protection
E014	Overheat of rectification module radiator	E030	Encoder failure
E015	External fault	E032	Motor overheating failure

Chapter 5 Fault Countermeasures and Abnormality Handling

5.1 Fault Phenomena and Countermeasures

When the drive is abnormal, LED digit tube will display corresponding fault codes and its contents, the drive will stop outputting, when a fault occurs, if the motor is rotating, it will park freely, till it stops rotating. Fault types of the drive which may occur are shown in Table 5-1, when the drive is fault, users should carry out examination according to this table first, and record fault phenomena in details, when technical services are required, please contact the After sale Dept. of our company directly, or contact dealers of the company.

Table 5-1 Fault Alarming Contents and Countermeasures

Fault Code	Fault Type	Possible Fault Reasons	Countermeasures
E001	Over current during acceleration operation	Accelerating time is too short	Lengthen accelerating time
		V/F curve is not suitable	Adjust V/F curve settings, adjust manual torque lifting, or correctly set motor parameters to guarantee normal torque lifting
		When instant stop occurs, restart is implemented for rotating motors.	The start method F2.00 is set to rotational speed tracking restart function
		Power grid voltage is too low	Check input power supply
		Drive power is too low	Select the drive of large power level.
E002	Over current during deceleratin g operation	Decelerating time is too short	Lengthen the decelerating time
		There's any potential energy load or load inertia torque is large.	External proper energy consumption braking parts.
		Drive power is low	Select the drive of large power level.
E003	Over current during constant speed	Load changes in a sudden	Reduce sudden change in load
		Accelerating and decelerating time is set too short	Properly lengthen the accelerating and decelerating time

Fault Code	Fault Type	Possible Fault Reasons	Countermeasures
	operation	Load abnormal	Carry out load check.
		Power grid voltage is low	Check input power supply
		Drive power is low	Select the drive of large power level
E004	Over voltage during acceleratin g operation	Input voltage abnormal	Check input power supply
		Accelerating time is set too short	Properly lengthen the accelerating time
		When instant stop occurs, implement restart on all rotating motors.	Set start method F2.00 as the rotational speed tracking restart function.
E005	Over voltage during deceleratin g operation	Decelerating time is too short (relative to regenerated energy)	Lengthen the decelerating time
		There's potential load or load inertia torque is large.	Select proper energy consumption braking parts.
E006	Over voltage during constant speed operation	Input voltage abnormal	Check input power supply
		Accelerating and decelerating time is set too short.	Properly lengthen the accelerating and decelerating time
		Abnormal change occurred in input voltage.	Install input reactor.
		Load has large inertia.	Consider to adopt energy consumption braking parts.
E007	Under voltage during running	Abnormal input voltage	Examine supply voltage
E008	Motor overload	V/F curve not suitable	Correctly set V/F curve and torque lifting.
		Power grid voltage is too low.	Check power grid voltage
		General motor is under long-term low speed running with huge load.	Special motor could be selected for long-term low speed running.
		Motor overload protection coefficient is set incorrectly.	Correctly set the motor overload protection coefficient
		Motor blocked or sudden change in load is too large.	Check load.
E009	Drive overload	Accelerating time is too short.	Lengthen the accelerating time
		DC braking amount is too large.	Decrease DC braking current, and lengthen braking

Fault Code	Fault Type	Possible Fault Reasons	Countermeasures
			time.
		V/F curve is not suitable	Adjust V/F curve and torque lifting
		When instant stop occurs, implement restart on all rotating motors.	Set start method F2.00 as the rotational speed tracking restart function.
		Power grid voltage is too low.	Check power grid voltage
		Load is too large	Select drive of larger power
E010	IGBT module protection	Instant overcurrent of the drive	See overcurrent countermeasures
		Output three-phase has interface short circuit Or grounding short circuit.	Re-wiring.
		Tunnel blocked or fan damaged.	Smoothen the tunnel or change the fan.
		Ambient temperature is too high.	Reduce ambient temperature.
		Control panel wiring or inserts are loose.	Check and connect again.
		Current waveform abnormal caused by reasons such as output phase fault etc.	Check wiring.
		Auxiliary power supply is damaged, and driving voltage is undervoltage.	Seek for services
		Drive module shoot-through	Seek for services
		Control panel abnormal	Seek for services
E011	Input phase loss	Phase fault for input R, S and T	Check installation assembling line Check input voltage
E012	Output phase loss	Phase fault for output U, V and W	Check output wiring Check motor and cable
E013	Overheat of IGBT radiator	Ambient temperature is too high	Reduce ambient temperature
		Tunnel is blocked	Clean the tunnel
		Fan is damaged	Change the fan
		Drive module is abnormal	Seek for services
E014	Overheat of rectification module radiator	Ambient temperature is too high	Reduce ambient temperature
		Tunnel is blocked	Clean the tunnel
		Fan is damaged	Change the fan
E015	External failure	In non-operation panel mode, use emergency [O/⟳] key.	View function definition of [O/⟳] key in FC.31.

Fault Code	Fault Type	Possible Fault Reasons	Countermeasures
		Use the O/⟳ key under stall situation.	View function definition of O/⟳ key in FC.31.
		If the stall state maintains for 1 minute, it will report E015 automatically and shut down.	Correctly set FA.04 and FA.05.
		External fault emergency stop terminal closed	After handling external fault, external fault terminal will be disconnected.
E016	485 communication failure	Baud rate setting improper	Set the baud rate properly.
		Serial port communication error	Press the O/⟳ key to reset, and seek for services
		Fault alarming parameter setting improper	Modify the settings of Fb.04, Fb.03 and FA.15.
		Upper computer does not work	Check whether the upper computer works or not, and whether the wiring is correct or not.
E017	current detection circuit failure	Control panel wiring or inserts are loose.	Check and connect again.
		Auxiliary power supply is damaged.	Seek for services
		Hall devices are damaged.	Seek for services
		Amplification circuit is abnormal.	Seek for services
E018	Self-tuning failure	Motor nameplate's parameter setting error	Correctly set parameters according to motor nameplate.
		Automatic tuning timeout	Check motor wiring.
E019	EEPROM read/write fault	R/W of control parameters is error.	O/⟳ key reset Seek for services
E020	Closed-loop feedback loss	Feedback line disconnect	Check feedback circuit
E021	V/F parameters setting failure	V/F parameter setting error	CheckF1.17~F1.23
E022	Reserved	-	-
E023	Keypad parameter copy failure	Operation panel parameters incomplete or operation panel version is inconsistent with the main control panel version.	Refresh operation panel data and version, use F0.03=1 to upload parameters first, and then use F0.03=2 or 3 to download.

Fault Code	Fault Type	Possible Fault Reasons	Countermeasures
		Operation panel EEPROM is damaged.	Seek for services
E024	Reserved		
E025	expansion card communication failure	Abnormal communication between extension card with drive	Restart drive Check the pin between extension card with drive
E026	Buffer circuit anomaly	Power grid voltage is too low.	Check power grid voltage
		Thruster is damaged	Change the major loop contactor, and seek for services.
		Power on buffer resistance is damaged	Change the buffer resistance, and seek for services.
		The control loop is damaged	Seek for services
		Input phase loss	Check input R, S and T wiring.

5.2 Operation Abnormalities and Countermeasures

The following abnormalities may occur during the usage, refer to Table 5-2 countermeasures to deal with:

Table 5-2 Operation Abnormalities and Countermeasures

Phenomena	Occurrence Conditions	Possible Reasons	Countermeasures
Operation panel does not respond	Individual keys or all keys do not respond.	Operation panel locking function validates.	Power on of the drive after complete power off.
		Cable contact of the operation panel is unsound.	Check the connecting cable.
		Operation panel keys are damaged.	Change the operation panel or seek for services.
function code cannot be modified	Unable to be modified under running state.	This function code cannot be modified under running state.	Modify under shutdown state.

Phenomena	Occurrence Conditions	Possible Reasons	Countermeasures
	Part of function codes cannot be modified.	Function code F0.00 is set to 1 or 2.	Set F0.00 to 0.
		This function code is actual detection value.	Users cannot change actual parameters.
	Press M-F there's no reaction.	Operation panel locking function validates or others.	See solutions to "No response on operation panel".
	Press M-F system cannot enter, function code display 0.0.0.0.	There's a user password	Correctly input user password
			Seek for services
Unexpected Drive Shutdown during Running	There's no shutdown command, the drive shuts down automatically, and running indicator turns off.	There's a fault alarm.	Find fault reasons, and reset fault.
		A simple PLC single cycle is completed.	Check PLC parameter settings.
		Fixed length shutdown function validates.	Clear actual length or set FC.14 (Set length) to 0.
		Upper computer or remote control box disconnects from the drive communication.	Check communication line and Fb.04, Fb.03 and FA.15 settings.
		Power supply is interrupted.	Check power supply situation.
		Running command channel shifting.	Check operation and settings related to running command channel.
		Control terminal positive/negative logic change.	Check whether F6.23 settings comply with requirements.
	No shutdown command is given, motor shuts down automatically,	Fault automatic reset	Check fault automatic reset settings and fault reasons.
		Simple PLC pause	Check PLC pause function terminal.

Phenomena	Occurrence Conditions	Possible Reasons	Countermeasures
	drive running indicator turns on, and runs at zero frequency.	External interruption	Check external interruption settings and fault sources.
		Zero frequency shutdown	Check zero frequency shutdown parameter settings FC.12 and FC.13.
		Set frequency is 0.	Check the set frequency
		Jump frequency setting problems.	Check the jump frequency settings.
		Positive action, closed-loop feedback>given Negative action, closed-loop feedback<given	Check closed-loop given and feedback.
		Frequency adjustment set to 0.	Check FC.2 and FC.30 settings.
		Select instant low voltage compensation during power off restart, and power supply voltage is low.	Check power off restart function settings and input voltage.
Drive can not run	Press the run key, the drive would not run, and running indicator is off.	Free parking function terminal is valid.	Check the free parking terminal.
		Drive forbid the running terminal is valid.	Check the drive to forbid the running terminal.
		External shutdown function terminal is valid.	Check external shutdown function terminal.
		Fixed length shutdown	Check the fixed length shutdown setting or clear the actual length.
		In three-line control mode, the three-line rotating control function terminal is not closed.	Set and close the three-line rotating control terminal.
		There's a fault alarm.	Troubleshooting

Phenomena	Occurrence Conditions	Possible Reasons	Countermeasures
		Upper computer's virtual terminal function is set improperly.	Cancel the upper computer virtual terminal function or use the upper computer to give proper settings, or modify the F6.23 settings.
		The input terminal positive/negative logic settings are improper.	Check the F6.23 settings.
Drive powers on and runs immediately to report P.OFF	Thyristor or contactor disconnects and drive load is too large.	For thyristor or contactor is not closed, when the drive load is relatively large, the main loop DC bus voltage will decrease during running, and the drive will display P.OFF first, rather than the E026 fault.	Run the drive again after waiting the thyristor or the contactor closed completely.

Note:

(1) Before reset, it is required to check fault reasons completely and carry out troubleshooting, otherwise it may cause permanent damages to the drive.

(2) If any fault occurs again because of unable to reset or after reset, check reasons, while continuous resets may damage the drive.

(3) Overload, it is required to delay for 5 minutes to reset during overheat protection.

Chapter 6 Detailed Description of Parameter Use

6.1 Group F0 system management parameters

F0.00	Parameter write protection	0 ~ 2	0

The settings of this function code determine the protection level of the drive parameters, namely:

0: All parameters are allowed to be rewritten;

1: Except the set frequency (F1.07) and this function code, other function code parameters are not allowed to be rewritten;

1: Except this function code, other function codes are not allowed to be rewritten.

Note: When leaving the factory, the function code parameter is 0, and any parameter is allowed to be modified by default; if only the operating frequency can be modified, and other function codes cannot, set this function code to 1. The user can set this function code to the expected protection level as needed.

F0.01	Multi-function keys selection	0 ~ 3	0

To set this function code, select the specific functions of multi-function keys M-F.

0: Jog function

1: Remote switch function: 485 communication communicates with the upper computer (not save at power failure)

2: Forward and reverse shift (not save at shutdown)

3: Clear the frequency increment set by UP/DOWN.

Note: This function code is restricted by FC.31.

F0.02	Parameter initialization	0 ~ 2	0

0: No operation

1: Reserved

2: Restore factory parameters

When this function code is saved into parameter 2, the function code parameters except group F0, group FF, F1.08, F3.00~F3.11, and F7.06 will be restored to factory parameters according to model.

After clearing memory information or restoring to factory parameters, this function code will automatically restore to 0.

F0.03	Parameter copy	0 ~ 3	0

0: No action

1: Parameter upload

2: Parameter download

3: Parameter download (group F0, group FF, excluding F1.08 and F3.00~F3.11)

Note:

1. During parameter uploading/downloading, it is required to perform parameter uploading first, otherwise, the operation panel memory is null; after one parameter uploading is completed, the function code parameters will be saved in the operation panel memory;

2. Before downloading the parameters to the drive, if the memory is null, or the parameters are incomplete, or the parameter version is inconsistent with the current drive software version (the number of function codes is different), the parameter downloading is not allowed, and system prompts a copy error message;

F0.04	User password	0 ~ 9999	0

The user password setting function is used to prohibit any unauthorized person to view or modify function parameters.

When the user password function is not required, set this function code to 0000.

When the user password function is required, first enter four digits as the user password, press the ENT button to confirm. If there's no key operation within 5 minutes after that, the password will validate automatically.

Change password:

Press the PRG key to enter the password verification status, correctly enter the original four digit password to enter the password edit status, select F0.04 (in this case, F0.04 = 0000), enter a new password, and press the ENT key to confirm, the new password validates.

F0.05	Quick function parameter selection display	0 ~ 1	0

This function is used whether the given pressure value displays in the quick parameter group or not:

When F0.05 = 0, the set value of the quick parameter group is the set frequency, and the display unit is Hz, 2 decimal places.

When F0.05 = 1, the set value of the quick parameter group is the given pressure, and

the display unit is %, 1 decimal place.

F0.07	Quick parameter group display selection	0x0000~0xFFFF	0x2020

LED unit's digit: The first parameter display selection

0: Output frequency (before compensation)

1: Output frequency (after compensation)

2: Set frequency (Hz)

3: Output current (A)

4: Operating speed (rpm)

5: Set speed (rpm)

6: Reserved

7: Reserved

8: Output power (KW)

9: Output torque (%)

A: Output voltage (V)

B: Bus voltage (V)

C: AI1 analog quantity (V)

D: AI2 analog quantity (V)

E: Analog closed-loop feedback value (%)

F: Analog closed-loop given value (%)

LED ten's digit: The second parameter display selection

0~F: Ditto

LED hundred's digit: The third parameter display selection

0~F: Ditto

LED thousand's digit: The fourth parameter display selection

0~F: Ditto

F0.08	Dual-line LED second line display parameter	0~16	3

0: Output frequency (before compensation)

1: Output frequency (after compensation)

2: Set frequency (Hz)

3: Output current (A)

4: Operating speed (rpm)

5: Set speed (rpm)

6: Reserved

7: Reserved

8: Output power (KW)

9: Output torque (%)

10: Output voltage (V)

11: Bus voltage (V)

12: AI1 analog quantity (V)

13: AI2 analog quantity (V)

14: Analog closed-loop feedback value (%)

15: Analog closed-loop given value (%)

16: External count value

6.2 Group F1 basic operating parameters

F1.00	Control mode	0 ~ 2	1

This function code is used to select the control mode:

0: Reserved

1: V/F control

2: SVC open-loop vector control

3: Sensor vector control

F1.01	Run command channel selection	0 ~ 2	0

0: Keyboard control valid

Run commands to control the run and stop of the drive by operating keys such as RUN, STOP/RESET, M-F etc. on the keyboard.

1: Terminal control is valid

The run commands of the drive are controlled by the on and off of external multi-function terminals (the corresponding multi-function terminals must have the corresponding functions defined by F6 parameter group).

2: Communication control is valid

The run commands are given by the upper computer communication.

F1.02	Frequency given channel selection	0 ~ 7	0

0: Digital given 1, adjust at operation panel.

1: If digital given is 2, the multi-function terminal sets the UP/DN to adjust frequency. The initial set value is F1.07, which is adjusted by multi-function terminal UP/DN.

2: If digital given is 3, change the set frequency through the serial port frequency setting command.

3: AI1 analog given (AI1-GND) frequency setting is determined by AI1 terminal analog voltage/current, and the input range is: DC 0 ~ 10V or DC 0 ~ 20mA (selected by F5.12 function code).

4: AI2 analog given (AI2-GND) frequency setting is determined by AI2 terminal analog voltage/current, and the input range is: DC 0 ~ 10V or DC 0 ~ 20mA (selected by F5.12 function code).

5: Terminal pulse given frequency setting is determined by terminal pulse frequency (input by DI4 and DI5. see definition of function code F6.03~F6.04), and the input pulse signal specifications are: Voltage range 9 ~ 30V; dual phase (when DI4 and DI5 are used together), frequency range is 0 ~ 50.0kHz, single phase (when DI4 is used), frequency range is 0 ~ 100.0kHz.

6: Reserved

7: Expansion card AI3 analog given (AI3-GND) frequency setting is determined by AI3 terminal analog voltage, and the input range is: DC-10V ~ 10V.

Note: The frequency calculation relationship curves of mode 3~7 are determined by function code F5.00 ~ F5.11, please refer to Section 6.5.

F1.03	Digital frequency control	00 ~ 11	00

Only valid for F1.02=0, 1, 2

Unit digit:

0 (set to save the frequency at power failure): When the drive is powered down or undervoltage, F1.07 automatically refreshes at the current frequency set value.

0 (set not to save the frequency at power failure): When the drive is powered down or undervoltage, F1.07 keeps unchanged.

Ten digit:

0 (set to maintain the frequency at shutdown): When the drive is shut down, the frequency set value is the final modified value.

1 (set to restore frequency to F1.07 at shutdown): When the drive is shut down, system automatically restores the frequency set value to F1.07.

F1.06	Max. output frequency	F1.09~550.00Hz	50.00Hz

The maximum output frequency is the highest frequency allowed by the drive, as shown in fmax in Figure 6-1.

The F3.04 basic operating frequency is the minimum frequency when the drive outputs the highest voltage, which is usually the rated frequency of the motor. As shown in fb in Table 6-1.

When the maximum output voltage of F3.05 is the basic operating frequency of the drive, the corresponding output voltage is usually the rated voltage of the motor, as shown in Vmax in Figure 6-1.

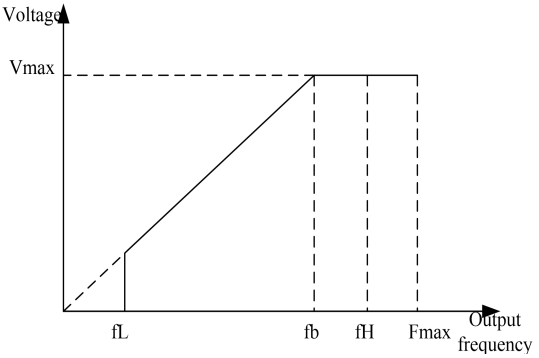


Figure 6-1 Voltage and Frequency Schematic Diagram

fH and fL are defined as upper limit frequency and lower limit frequency respectively in F1.09 and F1.10.

Note: Be sure to set fmax, fb, and Vmax, according to the motor parameters, otherwise the equipment may be damaged.

F1.07	Operating frequency digital setting	Lower limit frequency~upper limit frequency	50.00Hz

When the frequency source is selected as digital setting (F1.02=0, 1, 2), the set value of F1.07 is directly set as the current set frequency of the drive every time the drive is powered on. The operating frequency digital setting is restricted between upper limit frequency and lower limit frequency.

F1.08	Model selection	0 ~ 1	0

0: G type (universal type)

1: P type (load type of fan and pump)

F1.09	Upper limit frequency	Lower limit frequency ~	50.00Hz
F1.10	Lower limit frequency	0.00 ~ Upper limit	0.00Hz

The upper limit frequency is used to set the upper limit of the output frequency, as shown in f3 in the following figure. The lower limit frequency is used to set the lower limit of the output frequency, as shown in f1 in the following figure. The basic operating frequency f2 is the minimum value of the output frequency when the drive outputs the maximum voltage. f4 is the maximum frequency. Vmax in the following figure is the maximum output voltage of the drive.

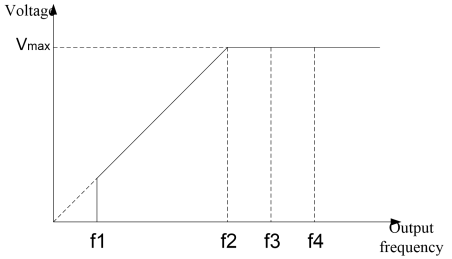


Figure 6-2 Voltage and Frequency Schematic Diagram

🕮 **Description**:

1. The maximum output frequency, upper limit frequency and lower limit frequency shall be carefully set according to the nameplate parameters and the operating status of the actually controlled motor.

2. Except for restricted by the upper limit frequency and the lower limit frequency, the output frequency of the drive during operating is also restricted by the starting frequency, the starting frequency of the stop DC braking, the hopping frequency and other parameter set values.

F1.11	Acceleration time 1	0.01 ~ 600.00	Model determination
F1.12	Deceleration time 1		

The acceleration time refers to the time required for the drive to accelerate from zero frequency to the maximum output frequency, as shown in t1 in Figure 6-3. The deceleration time refers to the time required for the drive to decelerate from the maximum output frequency to zero frequency, as shown in t2 in the following figure.

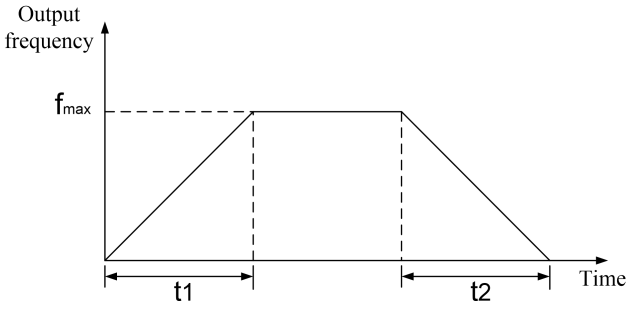


Figure 6-3 Description of Acceleration Time and Deceleration Time Settings

There are four groups of acceleration and deceleration time parameters for this series of drives. Other acceleration and deceleration time (2, 3, 4) are defined in parameters F2.14 ~ F2.19. The factory default acceleration/deceleration time is acceleration/deceleration time 1. To select other acceleration and deceleration time groups, you must select them by terminal (see group F6 parameters). The acceleration and deceleration time when the motor performs automatic tuning operation shall be executed according to acceleration and deceleration time 1. The acceleration and deceleration times during jog operation are set in F2.21 and F2.22 separately.

🕮 **Note**: The acceleration time is only valid for normal acceleration process, excluding start DC braking time and start frequency hold time. The deceleration time is only valid for normal deceleration process, excluding stop DC braking time.

F1.17	V/F curve setting	0 ~ 5	0
F1.18	V/F frequency value F1	0.00 ~ F1.20	15Hz
F1.19	V/F voltage value V1	0~F1.21	30%
F1.20	V/F frequency value F2	F1.18 ~F0.22	25.00Hz
F1.21	V/F voltage value V2	F1.19~F1.23	50.0%
F1.22	V/F frequency value F3	F1.20~F3.04	35Hz
F1.23	V/F voltage value V3	F1.21~100.0%	70%

The V/F setting mode is defined in this function code group, to meet the needs of different load characteristics. According to the definition of F1.17, you can select 3 fixed curves and 1 custom curve.

When 1 is selected, it is a custom curve.

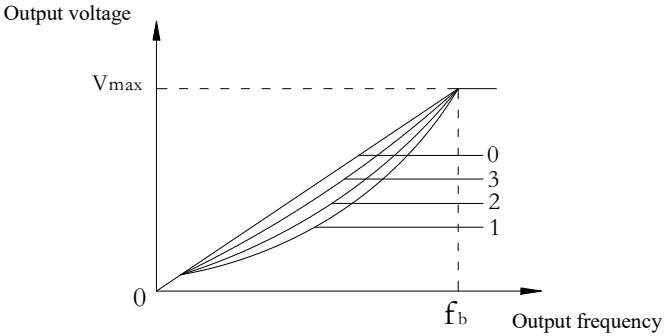
When 2 is selected, it is a 2.0 power reduced torque characteristic; a shown in curve 1 in Figure 6-5.

When 3 is selected, it is a 1.7 power reduced torque characteristic; a shown in curve 2 in Figure 6-5

When 4 is selected, it is a 1.2 power reduced torque characteristic; a shown in curve 3 in Figure 6-5.

When 5 is selected, it is a super startup mode. For detailed functions, refer to use instructions of Fd.06, Fd.07 and Fd.08.

The above curves are suitable for variable torque loads of fans and pumps. Users can adjust according to the load characteristics to achieve the best energy saving effect.



Vmax: Maximum output voltage F3.05 fb: Basic operating frequency F3.04

Figure 6-4 V/F Curve

When the F1.17 is selected to 1, the user can customize the V/F curve through F1.18 ~ F1.23, as shown in Figure 6-5. The V/F curve is defined by adding (V1, F1), (V2, F2), and (V3, F3) three-point broken line, to adapt to special load characteristics.

This function parameter group is used to flexibly set the V/F curve required by the user, as shown in Figure 6-5:

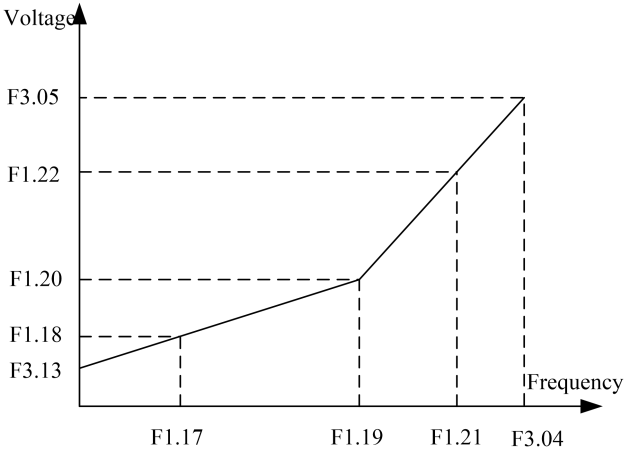


Figure 6-5 V/F Custom Curve

Note: When setting F1.18 ~ F1.23, it is required to observe F1.18 < F1.20 < F1.22, F1.19 < F1.21<F1.23; otherwise the E021 fault will be reported during operation.

F1.24	Running direction setting	0 ~ 1	0

0: Forward

The actual running steering is consistent with the set steering.

1: Reverse

When this mode is selected, the actual output phase sequence of the drive will be contrary to the setting. For example, during terminal control, the function of the RUN key on the keyboard will be reversed.

F1.25	Carrier frequency setting	1 ~ 15kHz	Model

Table 6-1 Relationship between Control Mode and Carrier Frequency

Carrier frequency / Control mode	Maximum carrier frequency (kHz)	Minimum carrier frequency (kHz)	Factory settings (kHz)
Vector mode	8	1	Model determination
V/F mode	15	1	Model determination

Table 6-2 Carrier Frequency Characteristics Table

Carrier frequency	Motor noise	Leakage current	Jamming
Drop	↑	↓	↓
Rise	↓	↑	↑

Note:

1. In order to obtain better control characteristics, it is suggested that the proportion of carrier frequency to the highest operating frequency of drive should be no less than 36.

2. When the carrier frequency is low, the current display value has an error.

F1.26	Automatic adjustment	0 ~ 1	1

0: Invalid

1: Valid

When the automatic adjustment selection of carrier frequency acts, the drive can automatically adjust the carrier frequency according to the operating frequency. In this case, the actual highest working carrier frequency of the drive is restricted by the carrier frequency set by the function code (F1.25).

6.3 Group F2 start-stop control parameters

F2.00	Start mode	00 ~ 12	00

LED single digit: Start mode

0: Start from start frequency

When the drive is put into operation, first start from the start frequency (F2.01) according to the settings of F2.01 and F2.02, and operate at this frequency for a set time (F2.02); then enter the normal acceleration stage according to parameters such as acceleration/deceleration time, acceleration/deceleration time mode, and accelerate to the set frequency.

1: DC braking + start from start frequency

When the drive is put into operation, first perform the DC braking before starting according to the DC braking current and the DC braking time set by F2.03 and F2.04; then start from this frequency and operate the set time according to the regulations of F2.01 and F2.02; then enter the normal acceleration phase according to parameters such as the set acceleration and deceleration times, the acceleration and deceleration time methods, etc. and accelerate to the set frequency.

The process of braking first and then starting from the start frequency is shown in Figure 6-6:

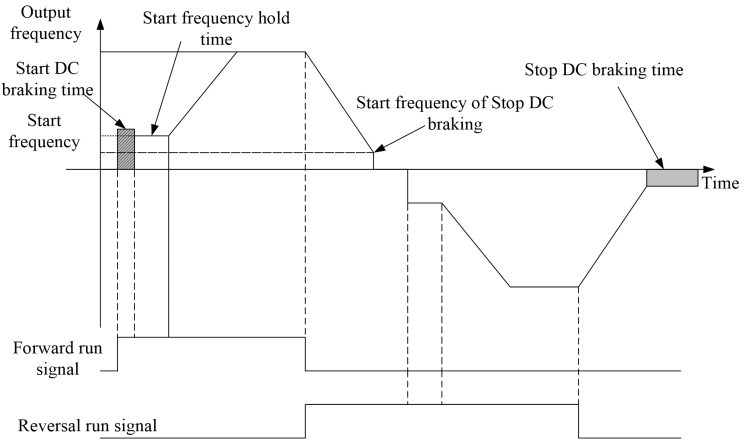


Figure 6-6 Schematic Diagram of Start Mode 1

This method is suitable for small inertia loads where the motor rotates forward or backward when the drive stops, but it is not suitable for large inertia loads at high-speed operation.

2: Speed tracking restart

When the drive is put into operation, first test the speed and direction of the motor, and

then directly track the current speed and direction of the motor, perform smooth start without impact on the motor that is still rotating.

When this start mode is selected, it is required to consider the rotation inertia of the system, and increase the parameter set values of the add-subtract time as appropriate.

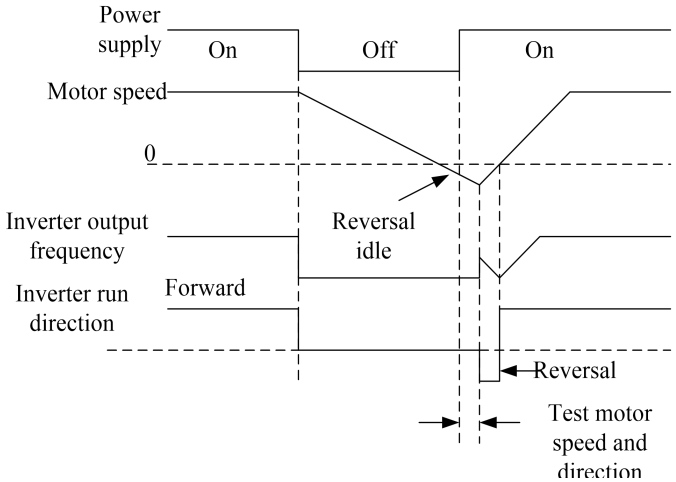


Figure 6-7 Schematic Diagram of Speed Tracking Restart

This method is suitable for the instantaneous restart after power failure of large inertia loads where the motor rotates forward or backward when the drive stops. When this method is used, correctly set the motor rated current F3.02.

LED tens digit: Speed tracking mode

0: This method is usually selected when tracking down from the frequency at power failure.

1: Tracking down from the maximum frequency, usually used for generating loads

F2.01	Start frequency	0.20 ~ 60.00Hz	0.50Hz
F2.02	Start frequency hold time	0.0 ~ 10.0s	0.0s

The start frequency refers to the initial frequency when the drive starts, and start frequency hold time refers to the time when the drive keeps running at the start frequency during the start process, as shown in t1 in Figure 6-8.

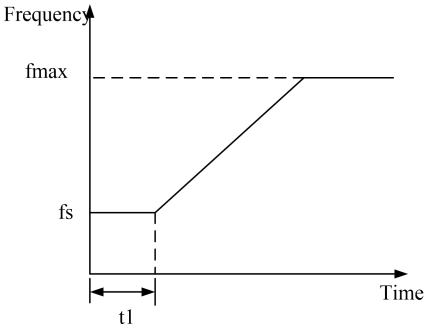


Figure 6-8 Schematic Diagram of Start Frequency and Start Time

Note: The start frequency is not restricted by the lower limit frequency.

F2.03	Start DC braking current	0.0 ~ 100.0% motor rated current	80.0%
F2.04	Start DC braking time	0.0 ~ 30.0s	0.0s

F2.03 and F2.04 are valid only when the first braking then starting (F2.00=1) is selected as start-up mode, as shown in Figure 6-9.

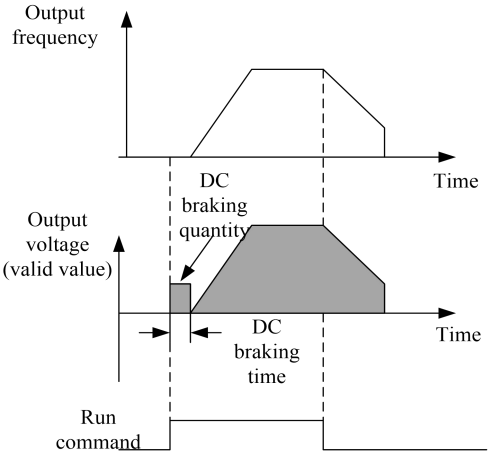


Figure 6-9 Description of Start Mode 1

The setting of start DC braking current is a percentage relative to the rated current of the motor. When the start DC braking time is 0.0s, there is no DC braking process.

F2.05	Acceleration/deceleration	0	0

0: Linear acceleration/deceleration

The output frequency increases or decreases according to a constant slope, as shown in Figure 6-10.

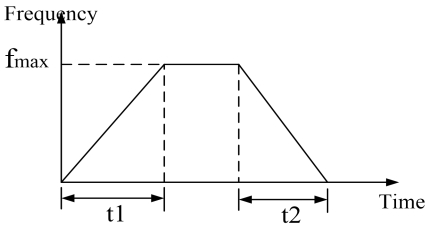


Figure 6-10 Linear Acceleration/Deceleration

F2.06	Reserved	-	-
F2.07	Reserved	-	-
F2.08	Stop mode	0 ~ 4	0

0: Decelerate and stop

After receiving the stop command, the drive will gradually reduce the output frequency according to the deceleration time, and stop when the frequency decreases to zero.

1: Free stop

After receiving the stop command, the drive immediately stops the output, and the load stops freely according to the mechanical inertia.

2: Decelerate and stop + DC brake

After receiving the stop command, the drive reduces the output frequency according to the deceleration time, and starts the DC braking when reaching the stop braking start frequency. The output voltage and frequency are shown in Figure 6-11.

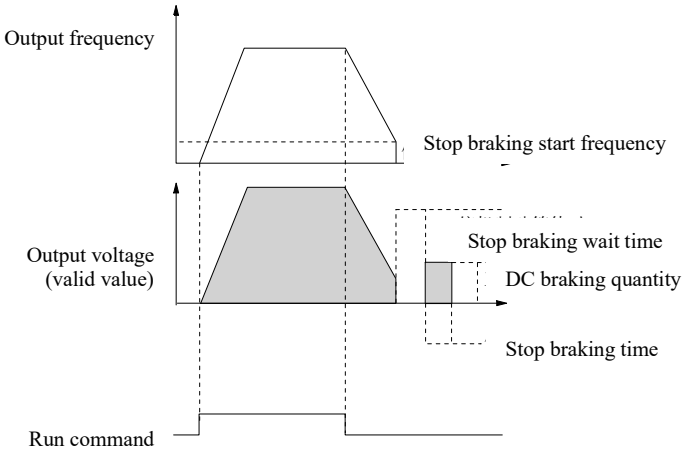
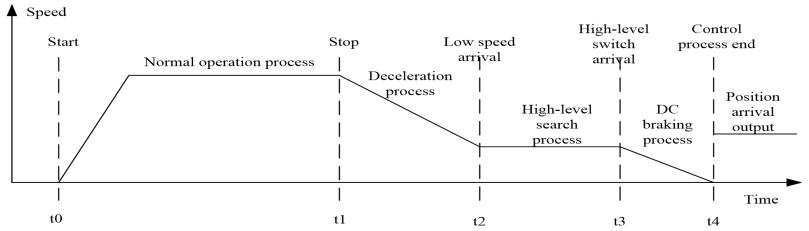


Figure 6-11 Schematic Diagram of Decelerate and Stop + DC Braking

See the definitions in F2.09 ~ F2.12 for functions related to stop DC braking

3: Positioning decelerate and stop

The working process is shown in the following Figure 6-12, and the specific control and setting are as follows.



Terminal connection

DI1	Start button	When closed, the in-place output is disconnected first, and then the forward rotation starts; when disconnected, it switches to low speed operation.
DI4	In-place photoelectric switch	Stop signal, valid at rising edge.

Parameter setting

Function description	Functio	Factory	Set range	Set value
Stop and brake	F208	0	0~3	3
Start frequency of	F209	0	0~50.00Hz	2Hz
DC braking current	F211	0	0~100.0%	80%
Command mode	F101	0	0~2	1
Frequency source	F102	0	0~5	1
DC braking time at	F212		0~30.0s	2.0
Forward start	F600	0	0~63	36
In-place	F603	0	0~63	53
Overtime abnormal	FC29	10.0	0~6553.6	10.0

4: Decelerate and stop (overpressure stall is invalid during deceleration)

F2.09	DC braking start frequency	0.00 ~ 60.00Hz	0.00Hz

Start frequency of stop DC braking: Refers to the switching point frequency when the output frequency of the drive drops along the deceleration curve and suddenly drops to zero during deceleration and stop. During the deceleration and stop process of the drive, when the set frequency is less than the start frequency of stop DC braking, the output frequency is zero.

The start frequency of stop DC braking is also valid during the deceleration process when switching between forward and reversal.

If there is no strict requirement for stop brake under operating conditions, the start frequency of stop DC braking shall be set as small as possible.

F2.10	DC braking wait time at	0.00 ~ 10.0s	0.0s
F2.11	DC braking current at stop	0.0%~100.0%	80.0%
F2.12	DC braking time at stop	0.0~60.0s	0.0s
F2.13	Maximum deceleration of stop DC braking	1.0 ~ 10.0	5.0

Braking wait time at stop: During decelerating and stopping, the time interval from the moment when the operation frequency reaches the start frequency (F2.09) of braking to the moment when the DC braking amount is applied.

There is no output of the drive during the waiting period of stop braking. This time setting can effectively prevent the current overshoot at the brake start moment for high power motors.

The setting of stop DC braking current is a percentage relative to the rated current of the drive. When the stop braking time is 0.0s, there is no DC braking process.

The maximum deceleration of stop DC braking is a multiple of the current deceleration. When the maximum deceleration of stop DC braking is 5.0, it is equivalent to that the deceleration will increase by 5 times when the frequency reaches the start frequency of DC braking.

Note: The stop braking current (F2.11) is a percentage relative to the rated current of the drive.

F2.13	Reserved	-	-
F2.14	Acceleration time 2	0.01 ~ 600.00	Model determination
F2.15	Deceleration time 2	0.01 ~ 600.00	
F2.16	Acceleration time 3	0.01 ~ 600.00	6.00s
F2.17	Deceleration time 3	0.01 ~ 600.00	6.00s
F2.18	Acceleration time 4	0.01 ~ 600.00	6.00s
F2.19	Deceleration time 4	0.01 ~ 600.00	6.00s

The acceleration/deceleration time 1 is defined in F1.11 and F1.12.

The acceleration/deceleration time 1, 2, 3 and 4 can be selected through the multi-function terminal. (Refer to group F6 parameters)

F2.20	Jog run frequency	0.10 ~ 50.00 Hz	5.00Hz
F2.21	Jog interval time	0.0 ~ 100.0s	0.0s
F2.22	Jog acceleration time	0.01 ~ 600.00s	Model determination
F2.23	Jog deceleration time	0.01 ~ 600.00s	

This group of parameters defines related parameters of jog, and the definition of frequency and acceleration/deceleration time is the same as that of drive RUN key operation.

🕮 **Description**:

1. The set value of jog frequency is not restricted by the lower limit frequency, but is restricted by the upper limit frequency.
2. The jog is not restricted by the startup frequency and the start frequency of stop DC braking.

F2.24	Jump frequency 1	0.00 ~ 550.0Hz	0.00Hz
F2.25	Jump frequency 1 range	0.00 ~ 30.00Hz	0.00Hz
F2.26	Jump frequency 2	0.00 ~ 550.0Hz	0.00Hz
F2.27	Jump frequency 2 range	0.00 ~ 30.00Hz	0.00Hz
F2.28	Jump frequency 3	0.00 ~ 550.0Hz	0.00Hz
F2.29	Jump frequency 3 range	0.00 ~ 30.00Hz	0.00Hz

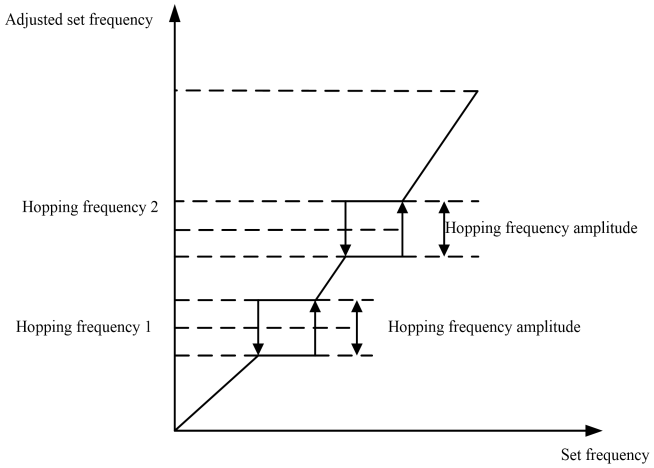


Figure 6-13 Frequency Hopping Diagram

Setting the hopping frequency can make the drive avoid the mechanical resonance point of the load. When the hopping frequency is set to 0, this function is invalid. Once these hopping points are set, the drive will automatically avoid stable operation at these frequency points during operation. As shown in Figure 6-13.

Description:

Do not overlap or nest the two hopping frequency ranges. During the acceleration and deceleration, the output frequency of the drive can cross the hopping frequency zone normally.

F2.30	Anti-reversal selection	0 ~ 1	0

0: Reversal is allowed

1: Reversal is prohibited

It is prohibited to run at zero frequency during reversal, and the running state is determined by F2.32.

Note: This function is valid for all run command channels (operation panel run command channel, terminal run command channel and serial port run command channel).

F2.31	Forward and reverse dead	0.0 ~ 3600s	0.0s

The transition interval during which the drive waits at the output zero frequency during the transition from the current operating direction to the opposite operating direction after receiving the reverse run command. As shown in t1 in Table 6-14.

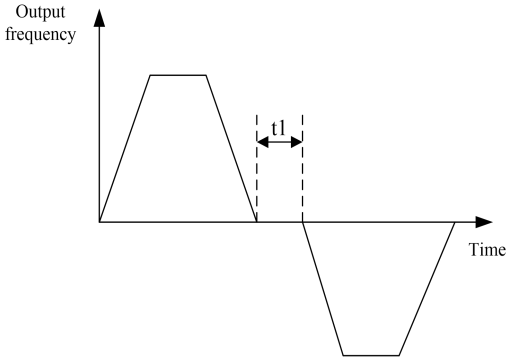


Figure 6-14 Forward and Reversal Dead Zone Time

F2.32	Selection of allowing	0 ~ 1	0

0: Zero-frequency operation is allowed

1: Zero-frequency operation is prohibited

6.4 Group F3 motor and V/F control parameters

F3.00	Motor pole number	2 ~ 14	4
F3.01	Rated power	0.4 ~ 999.9KW	Model
F3.02	Rated current	0.1 ~ 999.9A	Model

Set the parameters of the controlled motor.

In order to guarantee the control performance, make sure to correctly set F3.00 ~ F3.03 according to the nameplate parameters of the motor.

Power levels of motor and drive shall match with each other. Generally, it is only allowed to be two stages smaller or one stage larger than the drive, and the control performance cannot be guaranteed if beyond this range.

F3.03	Rated speed	1rpm ~ 65535rpm	Model

The rated speed of the motor can be obtained from the rated speed of the motor (nameplate identification); after the slip frequency is set, by cooperating with FC.04 ~

FC.06, the slip compensation will act.

F3.04	Motor rated frequency	1.00 ~ 550.00Hz	Model
F3.05	Motor rated voltage	1 ~ 480V	Model
F3.06	No-load current I0	0.1 ~ 999.9A	Model
F3.07	Stator resistance R1	0.000~50.000Ω	Model
F3.08	Leakage inductance X	0.0~999.9mH	Model
F3.09	Rotor resistance R2	0.000~50.000Ω	Model
F3.10	Mutual inductance Xm	0.0~999.9mH	Model

The specific meanings of the above motor parameters are shown in Figure 6-15.

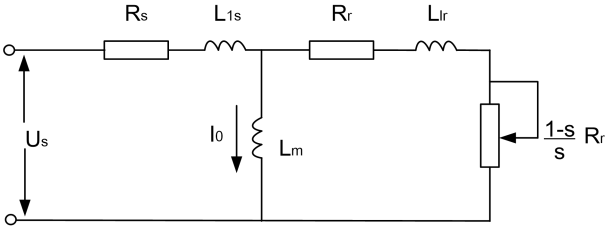


Figure 6-15 Steady-state Equivalent Circuit Diagram of Asynchronous Motor

In Figure 6-15, Rs, Lls, Rr, Llr, Lm and I0 respectively represent stator resistance, stator leakage inductance, rotor resistance, rotor leakage inductance, mutual inductance and no-load current.

After the motor power F3.01 is changed, the drive sets the parameters F3.02 ~ F3.10 as the motor parameters of corresponding power.

If the parameters of the motor are known, please write the values into F3.06 ~ F3.10 accordingly. The real values of these parameters multiplied by the motor power are equal to the set values of the parameters.

If the motor parameters are self-tuned, the set values of F3.06 ~ F3.10 will be updated after the self-tuning is completed normally.

F3.11	Parameter self-tuning	0~2	0

This function can automatically measure and write the parameters of the motor.

0: Parameter self-tuning is not available

1: Motor static setting

Before self-tuning, make sure to enter the nameplate parameters (F3.00 ~ F3.05) of the controlled motor correctly.

During static setting, the motor is in static state, in this case, the stator resistance (Rs), rotor resistance (Rr) and stator leakage inductance (L) of the motor are automatically measured, and the measured parameters are automatically written into F3.06, F3.07 and F3.08 accordingly.

2. Motor rotation setting

During rotation setting, the motor is in static state first, in this case, the stator resistance (Rs), rotor resistance (Rr) and stator leakage inductance (L) of the motor are automatically measured; then the motor is in rotation state, the mutual inductance (Lm) and no-load current (I0) of the motor are automatically measured, and the measured parameters are automatically written into F3.06, F3.07, F3.08, F3.09 and F3.10 accordingly.

After self-tuning, the set value of F3.11 will be automatically set to 0.

Self-tuning steps

1. Correctly set functions "F3.04 basic operating frequency" and "F3.05 maximum output voltage" according to the motor characteristics.

2. Correctly set the functions "F3.00 motor pole number", "F3.01 rated power" and "F3.02 rated current".

3. Set F3.11 to 1 or 2, press the ENT key, and then press the RUN key to start self-tuning.

4. When the run indicator on the LED operation panel lights off, it indicates the self-tuning is completed.

Note:

When F3.11 is set to 2 for rotation setting, the motor shaft shall be separated from the load, and the motor is prohibited from performing rotation self-tuning with load.

Before starting the self-tuning, make sure that the motor is stopped, otherwise the self-tuning cannot be performed normally.

In some occasions (such as the motor cannot be separated from the load, etc.), when it is inconvenient to perform rotation setting or the user has low requirements on motor control performance, static setting can be performed or not. In this case, please correctly enter the nameplate parameters of the motor (F3.00 ~ F3.05).

If self-tuning cannot be performed and the user has already known the accurate motor parameters, in this case, the user shall correctly enter the motor nameplate parameters (F3.00 ~ F3.05), and then enter the values of the motor parameters, and multiply the set values by the drive power (F3.06 ~ F3.10). Make sure to set the parameters accurately.

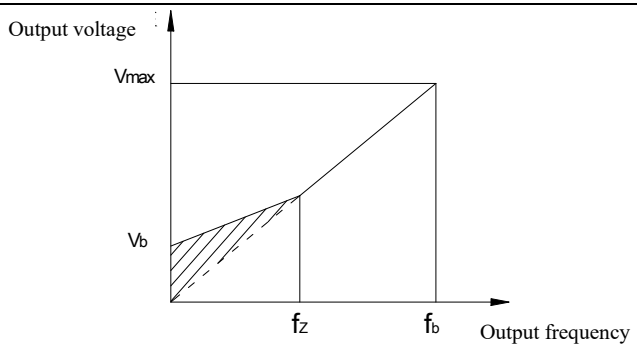
If the self-tuning failed, there will be an E018 alarm, and F3.11 will clear automatically.

F3.12	Motor stability factor	0 ~ 25.5%	1.0%

This function acts in the VF mode, and is used to suppress the natural oscillation generated when the drive cooperates with the motor. If the output current changes repeatedly when operating at a constant load, properly adjusting this function code based on the factory parameters can eliminate oscillation and make the motor operate stably.

F3.13	Torque boost limit	0.1% ~ 30.0%	0.0%
F3.14	Torque boost cutoff point	0.00~F3.04	50.00 Hz

The torque boost is to compensate the output voltage of the drive when the drive is running at low frequency. The torque boost can improve the low frequency characteristics in V/F control mode. The torque boost shall not be set too large, if so, the efficiency of the motor will decrease, and the excitation current of the motor will increase, heating the motor. Torque boost cutoff frequency: At this frequency, the torque boost is valid, and is invalid when the set frequency is exceeded.



Vb: manuall torque boost voltage Vmax: Maximum output voltage

Fz: Cutoff frequency of torque boost fb: Basic operating frequency

Figure 6-16 Torque Boost Diagram

Note:

1. Improper setting of this parameter may cause motor heating or overcurrent protection.

2. See function code F3.14 for the definition of fz.

F3.15	Torque boost gain 1	0 ~ 2.00 (higher than the	0.20
F3.16	Torque boost integral time	0 ~ 10.00 (higher than	0.15
F3.17	Torque boost gain	0.00~Rated power	15.00Hz

This function acts in VF mode, and is used to adjust the scale coefficient of torque boost function. The larger this value, the larger the torque, but a too large value is easy to cause oscillation, so do not change it generally.

F3.18	Torque boost gain 2	0 ~ 2.00 (lower than the	0.40
F3.19	Torque boost integral time	0 ~ 10.00 (lower than the	0.30

This function acts in VF mode, and is to adjust the integral coefficient of torque boost function. The larger this value, the larger the torque, but a too large value is easy to cause oscillation.

F3.20	Automatic torque boost	0.0~30.0%	10.0%

This function acts in VF mode, and is used to increase the low speed load carrying capacity. When this parameter increases, the no-load current will increase, but a high speed is easy to cause oscillation, so properly increase this parameter at a high speed but without oscillation, and guarantee that the no-load current is less than 10% of the rated current.

F3.21	Pre-excitation time	0.00s~10.00s	0.20s

This function acts in vector mode.

6.5 Group F4 vector control parameters

F4.00	Speed filter time	0.1~20.0ms	1.0ms

For the speed feedback filter time constant, the longer the time, the smoother the speed, but the larger the sampling delay, the smaller the value, the better when the noise meets the requirements.

F4.01	Speed loop	0~10.00	2.00
F4.02	Speed loop (ASR) integral	0.01~10.00	0.20

Setting of the ASR (speed loop) proportional gain and integral time point: Increasing the proportional gain can speed up the system's dynamic response, but if the proportional gain is too large, the system is easy to generate oscillation. Reducing the integral time can speed up the system's dynamic response, but if the integral is too small, the system overshoot is large and is easy to generate oscillation. Usually, the proportional gain is adjusted first to maximize under the premise that the system is not oscillating; then the integral time is adjusted to make the system have a fast dynamic response and reduce the system overshoot.

F4.03	Reserved		
F4.04	Reserved		
F4.05	Reserved		
F4.06	Vector motor stability	0~50	10
F4.07	Reserved		
F4.08	Vector torque limit	2.0~200.0	200.0

Maximum torque limit in vector mode, and the reference torque is the rated torque of the motor.

F4.12	Current loop proportional	0.01~10.00	0.20
F4.13	Current loop integral gain	0.01~10.00	0.20

6.6 Group F5 frequency given parameters

F5.00	Frequency given curves	0000 ~ 1111	0000
F5.01	Given channel gain	0.000 ~ 9.999	1.001
F5.02	Given filter time	0.001 ~ 50.000s	0.010s
F5.03	Maximum input pulse	0.1 ~ 50.0kHz	10.0kHz
F5.04	Minimum given of curve 1	0.0% ~ F5.06	0.1%
F5.05	Frequency corresponding	0.0 ~ F1.06	0.00Hz
F5.06	Maximum given of curve 1	F5.04 ~ 100.0%	100.0%
F5.07	Frequency corresponding	0.0 ~ F1.06	50.00Hz
F5.08	Minimum given of curve 2	0.0% ~ F5.10	0.1%
F5.09	Frequency corresponding	0.0 ~ F1.06	0.00Hz
F5.10	Maximum given of curve 2	F5.08 ~ 100.0%	100.0%
F5.11	Frequency corresponding	0.0 ~ F1.06	50.00Hz

Select AI1 or AI2 or pulse frequency or AI3 input of expansion card as the open-loop frequency given channel, the relationship between the given and set frequency is shown in figure 6-17:

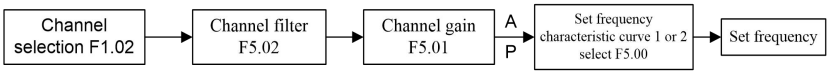
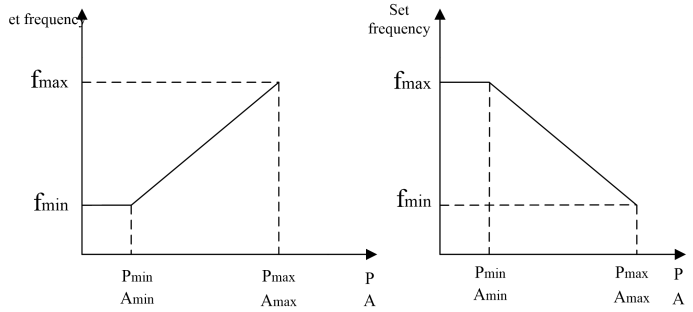


Figure 6-17 Relationship between Given Channel Input and Set Frequency

After filtering and gain processing, the relationship between the given frequency signal and the set frequency is determined by curve 1 or curve 2. Curve 1 is defined by F5.04 ~ F5.07, and curve 2 is defined by F5.08 ~ F5.11. Both can realize positive action and negative action characteristics independently, as shown in Figure 6-18.



(1) Positive action characteristics (2) Negative action characteristics

P: Terminal pulse given A: Analog AI1or AI2 given

Pmin, Amin: Minimum given Pmax, Amax: Maximum given

Fmin: Frequency corresponding to minimum given fmax: Frequency corresponding to maximum given

Figure 6-18 Output Frequency Characteristic Curve

When the analog input A is 100%, it corresponds to 10V or 20mA; when the pulse frequency P is 100%, it corresponds to the maximum input pulse frequency defined in F5.03.

F5.02 defines the channel filter time constant, and filters the input signal. The longer the filter time, the stronger the anti-interference ability, but the slower the response; the shorter the filter time, the faster the response, but the weaker the anti-interference ability.

F5.00 is used for the selection of the output frequency characteristic curves of given channels of AI1, AI2, expansion card AI3 and PULSE frequency, as shown in Figure 6-19.

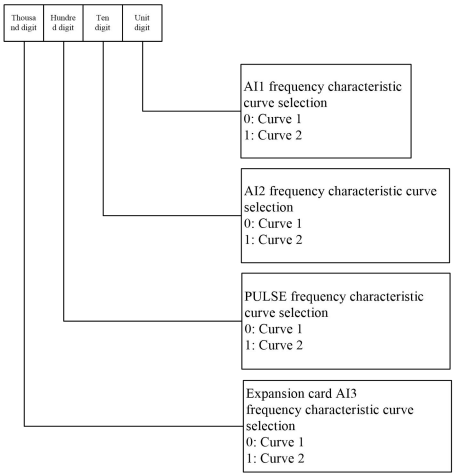


Figure 6-19 Frequency Given Curves

Note: For curve 3 and 4 function codes, refer to group A0 parameters.

Taking requirement analysis as an example:

① Use the pulse signal input from the terminal to set the given frequency;

② The input signal range is: 1kHz ~ 20kHz;

③ The set frequency corresponding to 1kHz input signal is 50Hz, and the set frequency corresponding to 20kHz input signal is 5Hz;

According to the above requirements, the parameter settings are as follows:

① F1.02 = 5, use the terminal PULSE given as the frequency given channel;

② F6.06=45, input pulse signal from DI4 terminal;

③ F5.00=100, select curve 2;

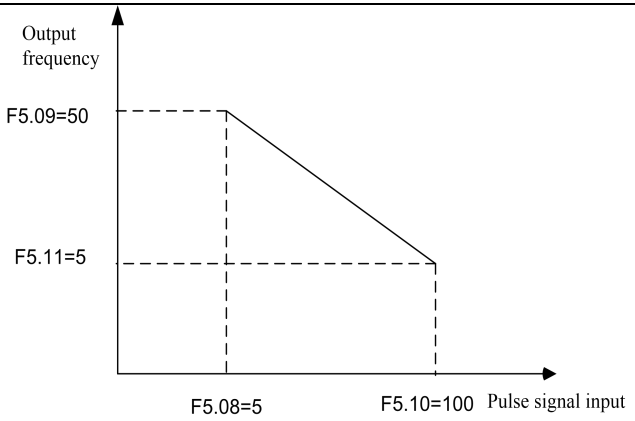
④ F5.03=20.0kHz, set the maximum pulse input frequency to 20kHz;

⑤ F5.08=1÷20×100%=5.0%, set the minimum given of curve 2 as the percentage of 1kHz to 20kHz(F5.03);

⑥ F5.09=50.00Hz, set the set frequency corresponding to the minimum given (1kHz pulse signal);

⑦ F5.10=20÷20×100%=100.0%, set the maximum given of curve 2 as the percentage of 20kHz to 20kHz(F5.03);

⑧ F5.11=5.00Hz, set the set frequency corresponding to the maximum given (20kHz pulse signal);



F1.02=5，F5.00=0100，F5.03=20，F6.06=45

Figure 6-20 Parameter Settings of Pulse Signal Input Instance

F5.12	Analog input voltage and current type selection	000~111	000

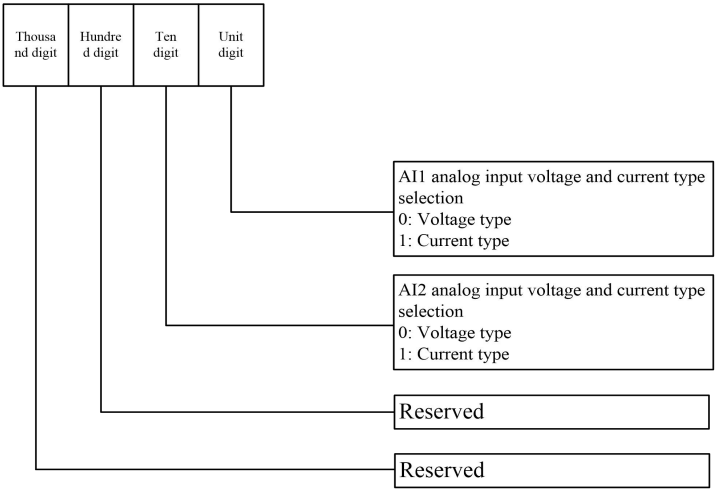


Figure 6-21 Analog Input Sampling Settings

6.7 Group F6 digital terminal parameters

F6.00	Function selection of multi-function input	0 ~ 43, 49 ~ 56	36
F6.01	Function selection of multi-function input	0 ~ 43, 49 ~ 56	37
F6.02	Function selection of multi-function input	0 ~ 43, 49 ~ 56	8
F6.03	Function selection of multi-function input	0 ~ 47, 49 ~ 56	1
F6.04	Function selection of multi-function input	0 ~ 43, 46, 48 ~ 56	2
F6.05	Function selection of multi-function input	0 ~ 43, 49 ~ 56	3
F6.06	Function selection of multi-function input	0 ~ 43, 49 ~ 56	9
F6.07	Function selection of multi-function input	0 ~ 43, 49 ~ 56	0
F6.08	Function selection of multi-function input	0 ~ 43, 49 ~ 56	0
F6.32	Function selection of multi-function input	0 ~ 43, 49 ~ 56	0

The multi-function input terminals DI1 ~ DI5 and expansion card multi-function input terminals DI6 ~ DI10 have rich functions, which can be easily selected according to needs, that is, the functions of DI1 ~ DI10 can be defined respectively by setting the values of F6.00 ~ F6.08 and F6.32, and see Table 6-5 for the set values and functions.

Table 6-5 Multi-function Input Selection Table

Contents	Corresponding function	Contents	Corresponding function
0	No function	1	Multistage frequency terminal 1
2	Multistage frequency terminal 2	3	Multistage frequency terminal 3
4	Acceleration/deceleration time terminal 1	5	Acceleration/deceleration time terminal 2
6	External fault normally on input	7	External fault normally off input

Contents	Corresponding function	Contents	Corresponding function
8	External reset Input	9	External forward jog control input
10	External reversal jog control input	11	Free stop input (FRS)
12	Frequency increment instruction (UP)	13	Frequency decrement instruction (DN)
14	Simple PLC pause instruction	15	Acceleration/deceleration prohibition instruction
16	Three-wire running control	17	External interrupt normally on contact input
18	External interrupt normally off contact input	19	Stop DC braking input instruction (DB)
20	Closed-loop failure	21	PLC failure
22	Frequency given channel selection 1	23	Frequency given channel selection 2
24	Frequency given channel selection 3	25	Frequency switched to AI2
26	Frequency switched to AI3	27	Command switched to terminal
28	Run command channel selection 1	29	Run command channel selection 2
30	Multistage closed-loop given terminal 1	31	Multistage closed-loop given terminal 2
32	Multistage closed-loop given terminal 3	33	Tacking function of roll welder
34	Reserved	35	External stop instruction
36	Forward FWD or run command	37	Reversal REV or forward and reversal direction
38	Drive operation is prohibited	39	Length zeroing
40	Auxiliary given frequency zeroing	41	PLC stopmemory clearing

Contents	Corresponding function	Contents	Corresponding function
42	Counter zeroing signal input	43	Counter triggering signal input
44	Length count input	45	Pulse frequency input
46	Single phase speed measurement input	47	Speed measuring input SM1 (only for DI4)
48	Speed measuring input SM2 (only for DI5)	49	Multistage frequency terminal 4
50	Multistage closed-loop given terminal 4	51	Frequency source switching
52	Deceleration and stop input	53	Position reaching input signal
54	Special for stop of wire drawing machine	55	Left limit of cycloid of wire drawing machine
56	Right limit of cycloid of wire drawing machine		

The functions listed in Table 6-5 are introduced as follows: 1 ~ 3, 49: Multistage speed operation terminals.

By selecting the terminal ON/OFF combination of these functions, you can define up to 16 stages of speed operation curves.

Table 6-6 Multistage Speed Operation Selection Table

K4	K3	K2	K1	Frequency setting
OFF	OFF	OFF	OFF	Normal run frequency
OFF	OFF	OFF	ON	Multistage frequency 1
OFF	OFF	ON	OFF	Multistage frequency 2
OFF	OFF	ON	ON	Multistage frequency 3
OFF	ON	OFF	OFF	Multistage frequency 4
OFF	ON	OFF	ON	Multistage frequency 5

K4	K3	K2	K1	Frequency setting
OFF	ON	ON	OFF	Multistage frequency 6
OFF	ON	ON	ON	Multistage frequency 7
ON	OFF	OFF	OFF	Multistage frequency 8
ON	OFF	OFF	ON	Multistage frequency 9
ON	OFF	ON	OFF	Multistage frequency 10
ON	OFF	ON	ON	Multistage frequency 11
ON	ON	OFF	OFF	Multistage frequency 12
ON	ON	OFF	ON	Multistage frequency 13
ON	ON	ON	OFF	Multistage frequency 14
ON	ON	ON	ON	Multistage frequency 15

These frequencies will be used in multistage speed operation and simple PLC operation, taking multistage speed operation as an example. After the control terminals DI1, DI2 and DI3 are defined as follows: F6.00=1, F6.01=2, F6.02=3 and F6.02=49, DI1, DI2, DI3 and DI4 are used to realize multistage speed operation, as shown in Figure 6-22.

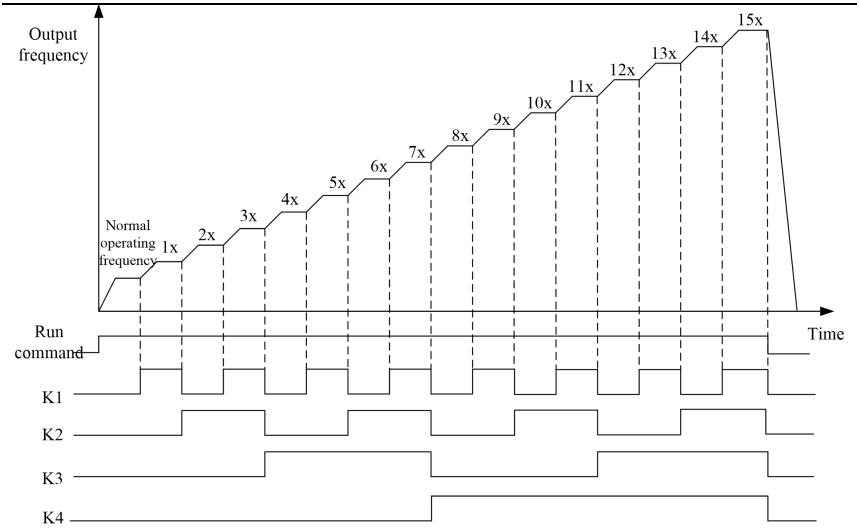


Figure 6-22 Multistage Speed Operation Schematic Diagram

In Figure 6-23, take the terminal run command channel an example, set F6.03=36 and F6.04=37, and you can use K5 and K6 to control the operation direction. Through the different logical combinations between K1, K2, K3 and K4, you can select the normal operation frequency and 1~15 multistage frequencies for multistage speed operation according to the above table.

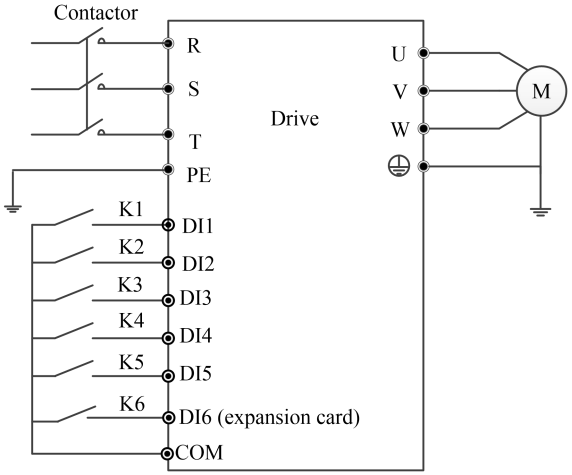


Figure 6-23 Multistage Speed Operation Wiring Diagram

4~5: Acceleration/deceleration time terminal selection

Table 6-7 Acceleration/Deceleration Time Selection Expression

Terminal 2	Terminal 1	Acceleration/deceleration time selection
OFF	OFF	Acceleration time 1/Deceleration time 1
OFF	ON	Acceleration time 2/Deceleration time 2
ON	OFF	Acceleration time 3/Deceleration time 3
ON	ON	Acceleration time 4/Deceleration time 4

The ON/OFF combination of acceleration/deceleration time terminals 1 and 2 can realize the selection of acceleration/deceleration time 1~4.

6 ~ 7: External equipment fault normally on/normally off input

The fault signals of external devices can be input through this terminal, which is convenient for the drive to monitor the faults of external devices. After receiving a fault signal from external equipment, the drive displays “E015”, which is the fault alarm of external equipment. Two input modes of normally on or normally off can be adopted for fault signals.

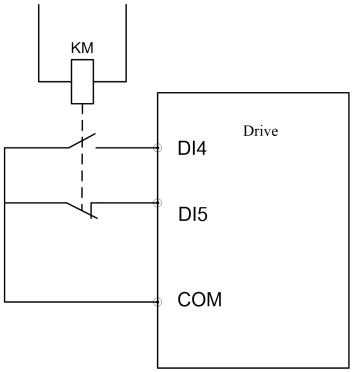


Figure 6-24 External Equipment Fault Normally on/Normally off Input

As shown in Figure 6-24, DI4 is a normally on input mode and DI5 is a normally off input mode. Here, KM is an external equipment fault relay.

8: External reset input

When a fault alarm occurs in the drive, the fault can be reset through this terminal. Its function is consistent with the STOP/RESET key function of the keyboard.

9 ~ 10: External jog operation control input JOGF/JOGR

Used to control jog operation in the terminal mode, JOGF is jog forward, and JOGR is jog reversal, jog running frequency, jog interval time and jog acceleration/deceleration time are defined in F2.20 ~ F2.23.

11: Free stop input

This function has the same meaning as the free running stop defined in F2.08, but here it is realized by control terminal, which is convenient for remote control.

12~13: Frequency increment instruction UP/decrement instruction DN

The frequency increase or decrease is realized through the control terminal, to perform remote control replacing the operation panel. Valid when F1.02=1 under normal operation or FC.25=2 as an auxiliary frequency. The increase/decrease rate is set by F6.10.

14: Simple PLC pause instruction:

Used to realize the pause control of the running PLC process. When this terminal is valid, it runs at zero frequency. The PLC running is not counted; when invalid, the automatic speed tracking starts, and PLC continues running. For usage, refer to the function description of F9.00 and F9.08 ~ F9.21.

15: Acceleration/deceleration prohibition instruction

Keep the motor from being affected by any external signal (except stop command), maintain operating at the current speed.

Note: Invalid during normal deceleration and stop.

16: Three-wire running control

Refer to the function introduction of F6.09 operation modes 2 and 3 (three-wire operation modes 1 and 2).

17~18: External interrupt normally on/normally off contact input

During the operation of the drive, after receiving an external interrupt signal, it blocks the output, and runs at zero frequency. Once the external interrupt signal is released, the drive starts the automatic speed tracking and restores operation.

There are two external interrupt input modes - normally on contact and normally off contact. As shown in Figure 6-24, DI4 is a normally on contact input, and DI5 is a normally off contact input.

Note: Different from functions 6 ~ 7, the external interrupt will not cause any alarm output of the drive, after the interrupt signal is released, the drive restores operation.

19: Stop DC braking input instruction

The control terminal implements DC braking to the motor during stop, to realize emergency stop and precise positioning of the motor. The braking start frequency, braking wait time and braking current are defined in F2.09 ~ F2.11, and the braking time is the larger of the time defined in F2.12 and the effective duration of the control terminal.

20: Closed-loop failure

Used to realize flexible switching with low-level operation mode in the closed-loop operation mode (see introduction in 4.1.4).

Note: When closed-loop operation (F8.00=1) is valid, you can realize the switching between closed-loop and low-level operation modes. When switched to low-level operation mode, the start-stop control, direction, acceleration and deceleration time shall observe the settings of corresponding operation mode.

21: PLC failure

Used to realize flexible switching with low-level operation mode in the PLC operation mode.

Note: When PLC operation (F9.00 unit digit≠0) is valid, you can realize the switching between PLC and low-level operation modes.

When switched to low-level operation mode, the start-stop control, direction, acceleration and deceleration time shall observe the settings of corresponding operation mode.

22 ~ 24: Frequency given channel selection 1 ~ 3

Through the ON/OFF combination of frequency given channel selection terminals 1, 2 and 3, the switching of frequency given channel in Table 6-8 can be realized. The relationship between terminal switching and function code F1.02 setting is later effective.

Table 6 ~ 8 Frequency Given Channel Selection Expression

Frequency given channel selection terminal 3	Frequency given channel selection terminal 2	Frequency given channel selection terminal 1	Frequency given Channel selection
OFF	OFF	OFF	Frequency setting hold
OFF	OFF	ON	Digital given 1
OFF	ON	OFF	Digital given 2
OFF	ON	ON	Communication given
ON	OFF	OFF	AI1 analog given
ON	OFF	ON	AI2 analog given
ON	ON	OFF	Terminal PULSE given
ON	ON	ON	Expansion card AI3 analog given

25: Frequency switched to AI2

When this function terminal is valid, the frequency given channel is switched to AI2 given by force, and the frequency given channel is restored after this function terminal is invalid.

26: Frequency switched to AI3 of expansion card

When this function terminal is valid, the frequency given channel is switched to AI3 given by force, and the frequency given channel is restored after this function terminal is invalid.

27: Command switched to terminal

When this function terminal is valid, the run command channel is switched to terminal run command channel by force, and the run command channel is restored after this function terminal is invalid.

28 ~ 29: Run command channel selection 1 ~ 2

Table 6-9: Run command channel selection expression

Run command channel Selection terminal 2	Run command channel Selection terminal 1	Run command channel
OFF	OFF	Run command channel hold
OFF	ON	Operation panel run command channel
ON	OFF	Terminal run command channel
ON	ON	Serial port run command channel

Through the ON/OFF combination of run command channel selection terminals 1 and 2, the control command selection in Table 6-9 can be realized.

30 ~ 32 and 50: Multistage closed-loop terminal 1 ~ 4

Table 6-10 Multistage Closed-loop Given Selection Expression

Multistage closed-loop terminal 4	Multistage closed-loop terminal 3	Multistage closed-loop terminal 2	Multistage closed-loop terminal 1	Multistage closed-loop given selection
OFF	OFF	OFF	OFF	The closed-loop given is determined by F8.01
OFF	OFF	OFF	ON	Multistage closed-loop given 1
OFF	OFF	ON	OFF	Multistage closed-loop given 2
OFF	OF	ON	ON	Multistage closed-loop given 3
OFF	ON	OFF	OFF	Multistage closed-loop given 4
OFF	ON	OFF	ON	Multistage closed-loop given 5
OFF	ON	ON	OFF	Multistage closed-loop given 6

Multistage closed-loop terminal 4	Multistage closed-loop terminal 3	Multistage closed-loop terminal 2	Multistage closed-loop terminal 1	Multistage closed-loop given selection
OFF	ON	ON	ON	Multistage closed-loop given 7
ON	OFF	OFF	OFF	Multistage closed-loop given 8
ON	OFF	OFF	ON	Multistage closed-loop given 9
ON	OFF	ON	OFF	Multistage closed-loop given 10
ON	OF	ON	ON	Multistage closed-loop given 11
ON	ON	OFF	OFF	Multistage closed-loop given 12
ON	ON	OFF	ON	Multistage closed-loop given 13
ON	ON	ON	OFF	Multistage closed-loop given 14
ON	ON	ON	ON	Multistage closed-loop given 15

Through the ON/OFF combination of multistage closed-loop terminals 1~4, the multistage closed-loop given selection in Table 6-10 can be realized.

33: The special tracking function of roll welder

34: Reserved

35: External stop instruction

This command is valid for all run command channels, if this function terminal is valid, the drive will stop according to F2.08.

36: Forward FWD or run command

37: Reversal REV or forward/reversal direction

38: Drive operation is prohibited

When this terminal is valid, the running drive stops freely, and is prohibited from starting in standby state. It is mainly used for occasions requiring safety linkage.

39: Length zeroing

When this function terminal is valid, the actual length function code FC.15 is cleared to zero.

40: Auxiliary given frequency zeroing

Only valid for digital auxiliary frequency (FC.25=1, 2, 3). When this function terminal is valid, the auxiliary frequency given will be cleared to zero, and the set frequency will be completely determined by the main given.

41: PLC stop state reset

In the stop state of PLC operation mode, when this function terminal is valid, the information such as PLC operation stage, operation time and operation frequency in PLC stop memory will be cleared. Please refer to group F9 function introduction.

42: Counter zeroing signal input

Clear the built-in counter of the drive and use it in conjunction with function 43 (counter trigger signal input).

43: Counter triggering signal input

Count pulse input port of the built-in counter, the highest pulse frequency: 200Hz, and the current count value can be stored and memorized when power is off. See function codes F6.21 and F6.22 for details.

44: Length count input

Only valid for multi-function input terminal DI4, which is used for fixed-length control and calculates the length by pulse input. See FC.14 ~ FC.19 function introduction for details.

45: Pulse frequency input

Only valid for multi-function input terminals DI4 and DI5. During single pulse input, set DI4=45, and set DI4 = 45 and DI5 =45 during orthogonal double pulses. This function terminal receives pulse signals as frequency given. For the relationship between the input signal pulse frequency and the set frequency, refer to the description of group F5 frequency given characteristic curve.

46: Single phase speed measurement input

Only valid for multi-function input terminal DI4, and see Chapter III, Section 3.5 for the description of input characteristics; the speed control precision is ±0.1%. The input port coordinates with the pulse encoder (PG) to realize the single-phase pulse speed feedback control.

47: Speed measuring input SM1

48: Speed measuring input SM2

Only valid for multi-function input terminals DI4 and DI5, and see Chapter III, Section 3.5 for the description of input characteristics; the speed control precision is ±0.1%. Coordinates with the pulse encoder (PG) to realize the double-phase pulse speed feedback control.

51: Frequency source superposition switching

Table 6-11 Frequency Source Superposition Switching Table

FC.33 unit digit	Terminal invalid	Terminal valid
2	Main frequency source	Auxiliary frequency source
3	Main frequency source	Main and auxiliary
4	Auxiliary frequency	Main and auxiliary

52: Deceleration and stop input

When this terminal is valid, in any command mode, the running drive will decelerate and stop.

53: Position reaching input signal

This function is mainly used for positioning deceleration and stop.

54: Special for stop of wire drawing machine

When this function is valid, the drive stops according to acceleration/deceleration time 4, and this function is valid when the percentile of F8.35 is set to 1.

55/56: Left positioning of wire drawing machine cycloid/right positioning of wire drawing machine

This is a special function of wire drawing machine

F6.09	FWD/REV operation mode	0 ~ 3	0

This parameter defines four different ways to control the operation of the drive through external terminals.

0: Two-wire operation mode 1

1: Two-wire operation mode 2

2: Three-wire operation mode 1

3: Three-wire operation mode 2

K2	K1	Run command
0	0	Stop
1	0	Reversal
0	1	Forward
1	1	Stop

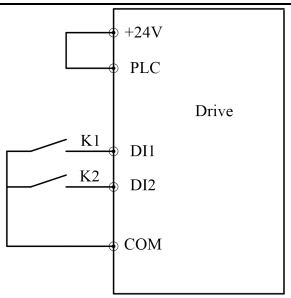


Figure 6-25 Two-wire Operation Mode 1

K2	K1	Run command
0	0	Stop
1	0	Stop
0	1	Forward
1	1	Reversal

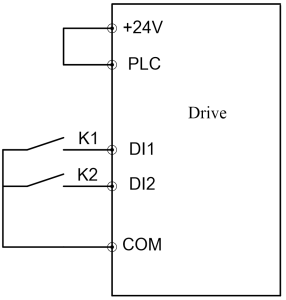


Figure 6-26 Two-wire Operation Mode 2

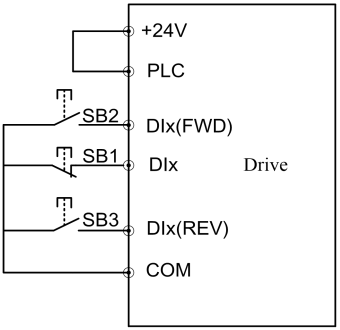


Figure 6-27 Three-wire Operation Mode 1

Including:

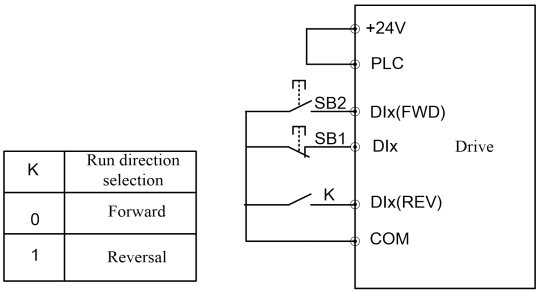
SB1: Stop button

SB2: Forward button

SB3: Reversal button

DIx is the multi-function input terminal of DI1~DI10, in this case, its corresponding terminal function shall be defined as function 16 “three-wire operation control". Terminal function corresponding to DIx(FWD) is defined as function 36, and terminal function corresponding to DIx(REV) is defined as function 37.

3: Three-wire operation mode 2



K	Run direction selection
0	Forward
1	Reversal

Figure 6-28 Three-wire Operation Mode 2

Including:

SB1: Stop button

SB2: Run button

DIx is the multi-function input terminal of DI1~DI2, in this case, its corresponding terminal function shall be defined as function 16 “three-wire operation control". Terminal function corresponding to DIx(FWD) is defined as function 36, and terminal function corresponding to DIx(REV) is defined as function 37.

Note: In terminal control mode, for two-wire operation modes 1 and 2, although the terminal level is valid, when the stop command is generated by other sources to stop the drive, even if the control terminal defined as FWD/REV is still valid, no run command will be generated. To rerun the drive, you need to trigger it again. For example, terminal functions 11 and 35 (see F6.00), PLC single-cycle stop, fixed-length stop, and valid STOP/RESET key stop under terminal run command channel (see FC.31). Things are different for the fault alarm stop. If reset fault when the control terminal defined as FWD/REV is valid, the drive will not start.

F6.10	UP/DN rate	0.01 ~ 99.99Hz/s	1.00Hz/s

This function code defines the change rate of the set frequency modified by the UP/DN terminal.

F6.11	Open collector output	0 ~ 19	0
F6.12	Open collector output	0 ~ 32	1
F6.13	Relay output function selection (TA/TB/TC)	0 ~ 19	16

The output characteristics of open collector output terminals DO1 and DO2 and relay output terminal are described in Section 3.5 of Chapter 3. Table 6-10 list the options for the above three function parameters, and the same output terminal function is allowed to be selected repeatedly.

Table 6-12 Output Terminal Function Selection Table

Contents	Corresponding function	Contents	Corresponding function
0	Drive running signal (RUN)	1	Frequency arrival signal (FAR)
2	Frequency level detection signal (FDT1)	3	Frequency level detection signal (FDT2)
4	Overload detection signal (OL)	5	Undervoltage lockout stopping (LU)
6	External fault stop (EXT)	7	Frequency upper limit (FHL)
8	Frequency lower limit (FLL)	9	Drive running at zero speed
10	Simple PLC phase running completion indication	11	PLC cycle completion indication
12	Set count value arrival	13	Specified count value arrival
14	Set length arrival indication	15	Drive ready to run (RDY)
16	Drive fault	17	Pump increase signal output
18	Drive normal running signal (no output for jog)	19	Set cumulative running time arrival
20	Output frequency (0 ~ maximum operation frequency)	21	Reserved
22	Set frequency (0 ~ maximum operation frequency)	23	Output current (0 ~ 2*Iei)
24	Output current (0 ~ 2*Iem)	25	Output torque (0 ~ 2*Tem)
26	Output voltage (0 ~ 1.2*Ve)	27	Bus voltage (0 ~ 800V)
28	AI1 (0 ~ 10V/0 ~ 20mA)	29	AI2 (0 ~ 10V/0 ~ 20mA)
30	Output power (0 ~ 2*Pe)	31	Upper computer percentage (0~1000)
32	Expansion card AI3 (-10 ~ 10V)	33	Drive forward signal
34	Drive reversal signal	35	Cycloid direction of wire drawing machine

The functions listed in Table 6-11 are introduced as follows:

0: Drive running signal (RUN)

The drive is under the running status and outputs an indication signal.

1: Frequency arrival signal (FAR)

Refer to the function description of F6.18.

2: Frequency level detection signal (FDT1)

Refer to the function description of F6.14 ~ F6.15.

3: Frequency level detection signal (FDT2)

Refer to the function description of F6.16 ~ F6.17.

4: Overload detection signal (OL)

If the output current of the drive exceeds FA.12 overload detection level, and the time is longer than FA.13 overload detection time, it will output an indication signal. Usually used for overload pre-alarm. See the description of Figure 6-55 in group FA.

5: Undervoltage lockout stopping (LU)

When the DC bus voltage is lower than the undervoltage limit level, an indication signal is output, and the LED displays "**P.oFF**".

6: External fault stop (EXT)

When the drive has an external fault trip alarm (E015), it outputs an indication signal.

7: Frequency upper limit (FHL)

When the set frequency ≥ the upper limit frequency and the operation frequency reaches the upper limit, an indication signal is output.

8: Frequency lower limit (FLL): When the set frequency ≤ the lower limit frequency and the operation frequency reaches the lower limit, an indication signal is output.

9: Drive running at zero speed

When the drive output frequency is 0, but under the running status, it will output an indication signal.

10: Simple PLC phase running completion indication

After the simple PLC current stage operation is completed, an indication signal is output (single pulse and the delay is less than 500ms).

11: PLC cycle completion indication

After the simple PLC completes one operation cycle, an indication signal is output (single pulse signal and the delay is less than 500ms).

12: Set count value arrival

13: Specified count value arrival

For 12~13, refer to F6.21~F6.22 function description.

14: Set length arrival indication

When the actual length FC.15≥FC.14 set length, an indication signal is output. The length count terminal is the one set to function 44 in DI1~DI10.

15: Drive ready to run

When this signal output is valid, it indicates that the drive has no fault, the bus voltage is normal, and the drive operation prohibition terminal is invalid. In this case, the start command can be accepted.

16: Drive fault

If the drive fails, an indication is output.

17: Pump increase signal output

Special function for water supply. When the upper limit frequency is reached and the pump switching condition is met, the pump increase signal is valid.

18: Drive normal running signal (RUN)

When the drive is under normal running status, it outputs an indication signal.

19: Set running time arrival

When the accumulated running time of the drive (U0.37) reaches the set running time (FC.20), an indication signal is output.

33: Drive forward signal output

34: Drive reversal signal output

35: Cycloid direction of wire drawing machine output

20~32: The output of all functions corresponds to 0~maximum output pulse frequency of DO2.

F6.14	FDT1 level	0.00 ~ 550.0Hz	50.00Hz
F6.15	FDT1 lag	0.00 ~ 550.0Hz	1.00Hz
F6.16	FDT2 level	0.00 ~ 550.0Hz	25.00Hz
F6.17	FDT2 lag	0.00 ~ 550.0Hz	1.00Hz

F6.14~F6.15 is the supplementary definition of function 2 in Table 6-11, and F6.16~F6.17 is the supplementary definition of function 3 in Table 6-10. Both have the same usage. F6.14 ~ F6.15 are taken as examples in the following. When the output frequency is greater than or equal to a certain set frequency (FDT1 level), an indication signal is output until the output frequency drops to a certain frequency (FDT1 level - FDT1 lag) lower than FDT1 level. As shown in Figure 6-30.

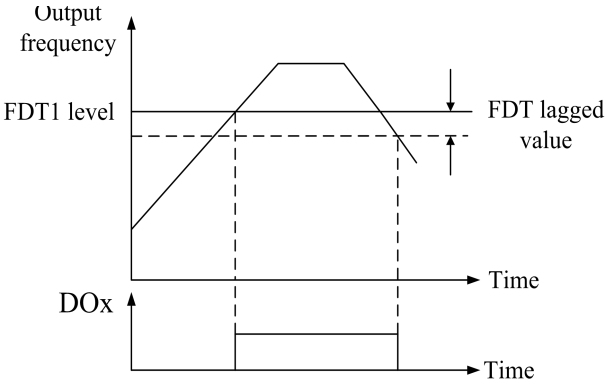


Figure 6-30 Schematic Diagram of Frequency Level Detection

This parameter is a supplementary definition for function 1 in Table 6-11. As shown in Figure 6-33, when the output frequency of the drive is within the positive and negative detection widths of the set frequency, a pulse signal is output.

F6.18	Frequency arrival (FAR) detection width	0.00 ~ 550.0Hz	2.50Hz
F6.19	Reserved	-	-

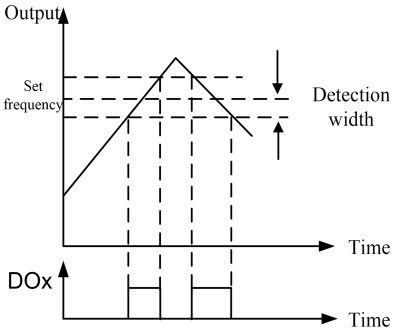


Figure 6-31 Frequency Arrival Signal Output Schematic Diagram

F6.20	DO2 maximum output	0 ~ 50.0kHz	10.0kHz

To define the maximum allowable output frequency of DO2 terminal, refer to the description of F6.12.

Output range of DO2 pulse frequency: 0~maximum output pulse frequency.

F6.21	Counter reset value given	F6.22 ~ 9999	0
F6.22	Counter detection value	0 ~ F6.21	0

The set count value given refers to the number of input pulses from DIx (count trigger signal input function terminal), before the DOx (open collector output terminal) or the relay outputs an indication signal.

As shown in Figure 6-31. When DIx inputs the 8th pulse, DO1 outputs an indication signal. In this case, F6.21=8.

The specified count value given refers to the number of input pulses from DIx, before the DOx or the relay outputs an indication signal, till the set count value is reached.

As shown in Figure 6-32. When DIx inputs the 5th pulse, DO2 starts to output an indication signal. Till the set count value 8 is reached. In this case, F6.22=5. When the specified count value is greater than the set count value, the specified count value is invalid.

Figure 6-32 Schematic Diagram of Setting Count Value Given and Specifying Count Value Given

F6.23	Terminal positive and negative logic settings	000 ~ FFFF	0000

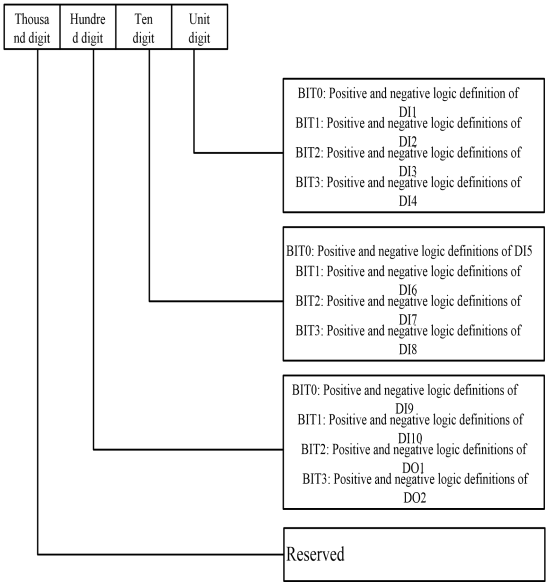


Figure 6-33 Terminal Positive and Negative Logic Settings

This function code defines the positive and negative logic of the terminal.

Positive logic: Valid when DIx and other terminals are connected to the corresponding common terminal, but invalid when disconnected;

Negative logic: Invalid when DIx and other terminals are connected to the corresponding common terminal, but valid when disconnected;

When the BIT selects 0, it indicates positive logic; when selects 1, it indicates negative logic.

For example:

If DI1~DI10 are required to be positive logic, DO1 is required to be positive logic and DO2 is required to be negative logic, the settings are as follows:

The logic state of DI4~DI1 is 0000, corresponding to hexadecimal 0, and the LED unit digit displays 0; the logic state of DI5~DI10 is 0000, corresponding to hexadecimal 0, and the LED ten digit displays 0; the logic state of DO2 and DO1 is hexadecimal 8, corresponding to 1000, and the LED hundred digit displays 8; in this case, the function code F6.23 shall be set to 0800. The determination methods for set values are shown in Table 6-13:

Table 6-13 Corresponding Relationship between Binary Settings and LED Digit Display values

Binary settings				Hexadecimal (LED digit display value)
BIT3	BIT2	BIT1	BIT0	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	A
1	0	1	1	B
1	1	0	0	C
1	1	0	1	D
1	1	1	0	E
1	1	1	1	F

LED digits refer to the thousand, hundred, ten or unit digits displayed by LED on the operation panel.

Note: The factory settings of all terminals are positive logic。

F6.24	AO1 terminal output	0 ~ 12	0
F6.25	AO2 terminal output function selection	0 ~ 12	3

AO1 and AO2 are analog output terminals.

See Section 3.5 of Chapter III for the output characteristics of AO1 and AO2, and the analog output range is determined by function code F6.26.

The linear corresponding relationship between the output of AO1 and AO2 and the indication range is shown in Table 6-14.

Table 6-14 Output Terminal Indication

Contents	Corresponding function	Indication range
0	Output frequency	0~maximum operation frequency
1	Reserved	Reserved
2	Set frequency	0~maximum operation frequency
3	Output current	0~2 times drive rated current
4	Output current	0~2 times motor rated current
5	Output torque	0~2 times rated motor torque
6	Output voltage	0~1.2 times drive rated voltage
7	Bus voltage	0 ~ 800V
8	AI1	0 ~ 10V/0 ~ 20mA
9	AI2	0 ~ 10V/0 ~ 20mA
10	Output power	0~2 times rated power
11	Upper computer extended function 2	0 ~ 1000
12	AI3 (expansion card)	-10 ~ 10V

The extended function 2 of the upper computer is to directly control the output of AO1 and AO2 through the serial port. 1000 corresponds to the maximum output 10V (or 20mA), please refer to this communication protocol.

For example:

AO1 outputs 4~20mA, corresponding to indication bus voltage 0~800V.

The settings are as follows:

① When F6.24=7, it outputs bus voltage;

② When F6.26=01, the AO1 output type is 4~20mA;

③ When F6.27=100%, the output gain is 100%;

④ When F6.29 LED unit digit=1, it outputs current type.

F6.26	Analog output range	00 ~ 11	00

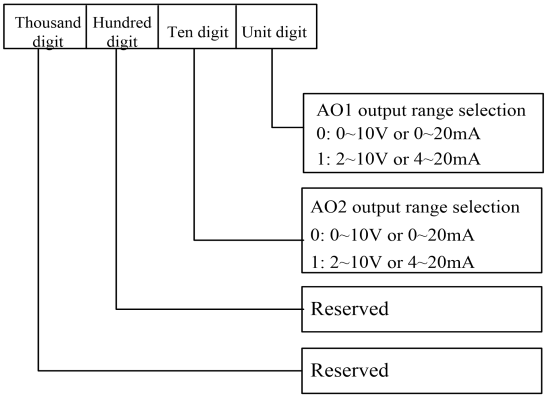


Figure 6-34 Analog Output Offset Setting

This function code is used to select the analog output range of AO1 and AO2.

F6.27	AO1 output gain	0.0 ~ 200.0%	100.0%
F6.28	AO2 output gain	0.0 ~ 200.0%	100.0%

For analog output of AO1 and expansion card AO2, if the user needs to change the display range or correct the meter error, this can be realized by adjusting the output gain.

F6.29	Analog input voltage and	000 ~ 111	000

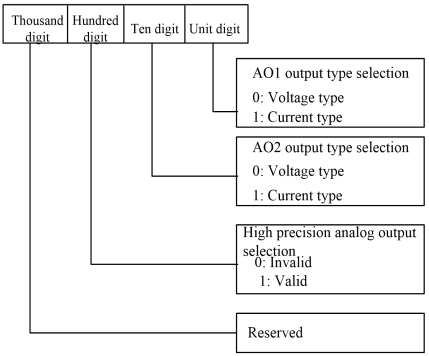


Figure 6-35 Analog Output Type Settings

Note: This function code affects the analog output in real time during modification.

F6.30	Normal IO filter time	0.000 ~ 10.000s	0.008s

Input filter of DI1~DI10 normal terminal functions

F6.32	Expansion card DI10 input function selection	Same as function code F6.00	0
F6.33	Expansion card DO3 output function selection	Same as function code F6.11	0
F6.34	Expansion card relay output RA/RB/RC	Same as function code F6.13	0
F6.35	AO1 zero offset coefficient	0.0%~100.0%	0.0%
F6.36	DO pulse duty cycle	0~100	50
F6.37	AO2 zero offset coefficient	0.0%~100.0%	0.0%

The calculation formula of AO high-precision analog output is shown in the following:

AO output = set value output * output gain - zero offset coefficient.

6.8 Group F7 advanced function parameters

F7.00	Overpressure stall point	110.0~150.0	Model determination
F7.01	Overvoltage control voltage	0.000~9.999V (when it is equal to 0, the overpressure stall 2 will	0.000V
F7.02	Overvoltage stall gain Kp1	0~2.00	0.20
F7.03	Overvoltage stall integral	0~2.00	0.20
F7.04	Overvoltage stall gain Kp2	0.0~2.00	0.40
F7.05	Overvoltage stall integral	0~2.00	0.20

During the deceleration of drive, due to the influence of load inertia, the actual decline rate of motor speed may be lower than that of the output frequency. In this case, the motor will feed back electric energy to the drive, causing the DC bus voltage of the drive to rise. If no measures are taken, overvoltage trip will occur.

The overvoltage stall protection function detects the bus voltage during the deceleration of the drive, and compares it with the stall overvoltage point defined by F7.00 (relative to the standard bus voltage). If it exceeds the stall overvoltage point, the output frequency of the drive will stop falling, when the bus voltage is detected to be lower than the stall overvoltage point again, implement deceleration.

Overvoltage stall gain is used to adjust the drive's ability to suppress overvoltage during deceleration. The larger this value, the stronger the ability to suppress overvoltage. Under the premise of no overvoltage, the smaller the set value of the gain, the better.

For loads with small inertia, the overvoltage stall gain shall be small, otherwise it will cause the dynamic response of the system to slow down. For loads with large inertia, this value shall be large, otherwise the suppression effect will be poor, and the overvoltage fault may occur.

When the overvoltage stall gain is set to 0, the overvoltage stall function is canceled.

Note:

1. When the set stall point is low, it is suggested that the user shall increase the deceleration time appropriately.

F7.06	Overcurrent and current limiting level	20.0%~200.0%	G-type machine: 150.0%
F7.07	Overcurrent and current	0~1	1
F7.08	Overcurrent and current	0~99.99	20.00
F7.09	Overcurrent and current limiting integral gain	1~2.00	0.20

The overcurrent and current limiting function is to limit it not exceeding the set automatic current limiting level (F7.06), through the real-time control of the load current, to prevent fault trips caused by current overshoot. For load occasions with large inertia or intense changes, this function is especially suitable.

The overcurrent and current limiting level (F7.06) defines the current threshold of the overcurrent and current limiting action, and its setting range is relative to the percentage of the drive rated current. G type drive factory value is 150%, and P type drive factory value is 110%. If this parameter is exceeded, the drive starts executing protection function of overcurrent stall.

Overcurrent stall gain (F7.08) is used to adjust the drive's ability to suppress overcurrent during acceleration/deceleration. The larger this value, the stronger the ability to suppress overcurrent. Under the premise of no overcurrent, the smaller the set gain, the better. When the overcurrent gain is set to 0, the overcurrent stall function is invalid.

The overcurrent and current limiting function is always effective under the acceleration/deceleration status. Whether the overcurrent and current limiting function is effective during constant speed operation is determined by the overcurrent and current limiting action selection (F7.07).

If F7.07=0, it indicates that the automatic current limiting is invalid when running at a constant speed;

If F7.07=1, it indicates that the automatic current limiting is valid when running at constant speed.

During overcurrent and current limiting, the output frequency may change, so on occasions where a stable output frequency is required when running at a constant speed, it is better not to use the overcurrent and current limiting function.

When the overcurrent and current limiting is valid, the overload capability of the drive may be affected due to the low setting of the current limiting level.

F7.12	Speed tracking	1 ~ 100	10

When the speed tracking is restarted, select the speed of speed search, the larger the parameter, the faster the tracking speed. If the setting is too large, the tracking effect is unreliable. The tracking acceleration shall be adjusted according to the load inertia on site. When the inertia increases, reduce this value.

F7.14	Instant stop/nonstop	0~2	0
F7.15	Instant stop action pause	80.0~100.0%	93.0%
F7.16	Reserved	-	-
F7.17	Instant stop action	60.0~100.0%	80.0%
F7.18	Instant stop gain Kp	0~100	40
F7.19	Reserved	-	-
F7.20	Reserved	-	-

The instant stop/nonstop function is used to define whether the drive will automatically perform low voltage compensation when the voltage drops or instant undervoltage. Reduce the output frequency appropriately and feed back the energy through the load to maintain the drive operate without tripping.

F7.14 is set to 0, no action.

F7.14 is set to 1, action (deceleration).

If F7.14 is set to 2, decelerate and stop.

IfF7.14=1, in case of a momentary outrage or a sudden drop in voltage, the drive decelerates. When the bus voltage returns to normal, the drive will normally accelerate to the set frequency.

If F7.14=2, the drive will decelerate until it stops when the power is off instantaneously or the voltage drops suddenly.

F7.21	Energy consumption braking voltage point	110.0 ~ 150.0%	125.0%

For the setting of energy consumption braking/starting voltage point, the set value is a percentage. When F7.21 is set to 125%, the reference value is the bus voltage corresponding to the rated voltage 670V of the drive.

F7.22	Overcurrent and current limiting acceleration limit	0~100.0	90.0

When the overcurrent and current limiting is valid, the acceleration will gradually decrease. This parameter limits the change range. When it is set to 100, the acceleration can be reduced to 0; when it is set to 0, the acceleration keeps unchanged.

F7.23	Speed display factor	0.001~9.999	1.000

This function code is used to correct the display error of the speed scale and has no effect on the actual rotation speed.

F7.24	Linear speed coefficient	0.001~9.999	1.000

This function code is used to correct the scale display error of the linear speed and has no effect on the actual speed.

F7.25	Closed-loop analog display coefficient	0.001~9.999	1.000

This function code is used to correct the display error between the actual physical quantities (pressure, flow, etc.) and the given or feedback quantities (voltage and current) during closed-loop control, and has no influence on the closed-loop PI adjustment.

6.9 Group F8 PID control parameters

The commonly used closed-loop control systems can be divided into two types of analog closed-loop and pulse closed-loop according to different feedback quantities. Figure 6-36 and Figure 6-37 shown the wiring diagrams of analog closed-loop control and pulse feedback closed-loop control composed of drives.

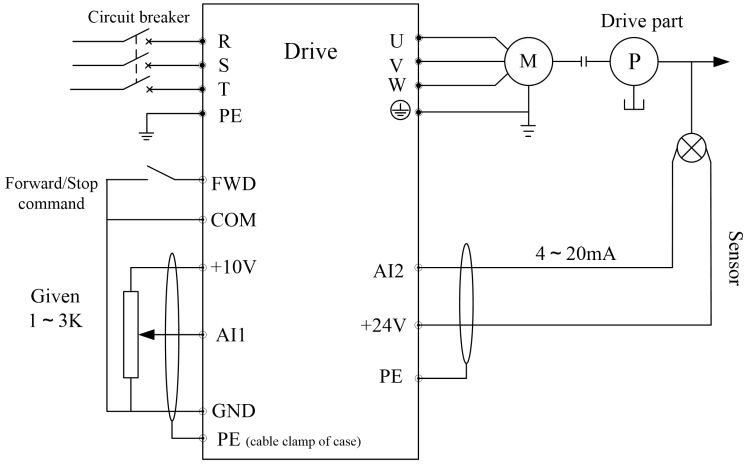


Figure 6-36 Schematic Diagram of Built-in PI Analog Feedback Control System

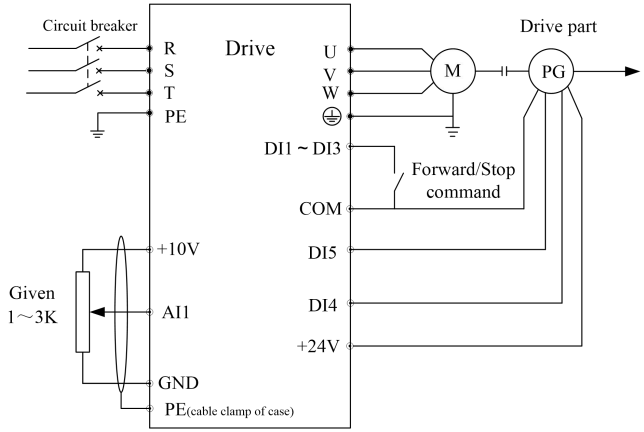


Figure 6-37 Wiring Diagram of PG Speed Closed-loop Control System

Using the pressure transmitter as the feedback sensor of the built-in PI can constitute

an analog feedback control system.

As shown in Figure 6-36, the pressure given quantity is set with potentiometer and input through AI1 port in the form of voltage, while the pressure feedback quantity is input through AI2 port in the form of 0/4~20mA current. Both the given quantity and the feedback quantity are collected through the analog channel, and the terminal defined as FWD realizes the start/stop of the closed-loop operation.

The above system can also be used by TG (tachogenerator) for speed closed-loop control.

PG closed-loop speed control system:

The speed closed-loop control system can be composed of external control terminals DI4 and DI5, under the coordination of the pulse encoder (PG).

As shown in Figure 6-37, the speed closed-loop given quantity is set with potentiometer through analog channel AI1 in the form of voltage, while the PG closed-loop feedback quantity is input with pulse encoder through external terminals DI4 and DI5 in the form of pulse, and the terminal externally defined as FWD realizes the start/stop of the closed-loop operation.

In Figure 6-38, A and B are the two-phase quadrature pulse output of PG;

GND and +24 are connected to the working power supply of PG;

The speed given adopts analog voltage 0~10 V signal, and linearly corresponds to synchronous speed n0 corresponding to 0~maximum frequency (F1.06), fmax is the maximum frequency (F1.06), and p is the number of poles of motor (F3.00).

$$n_0 = 120 \times \frac{f_{\max}}{P}$$

For characteristics of input terminals DI4 and DI5, please refer to F6.00 ~ F6.08 speed measurement input functions 46~48.

Note:

1. Given can also be the digital given and serial port given of the operation panel.

2. The two-phase input pulse helps to improve speed detection precision, and the single-phase pulse input wiring is concise.

3. The two-phase pulse input can only adopt orthogonal mode.

4. If the drive terminal +24 is used to supply power to the encoder, in this case, the maximum load current of the optical encoder shall be ≤200mA.

The working principle block diagram of the drive built-in PID is shown in Figure 6-38:

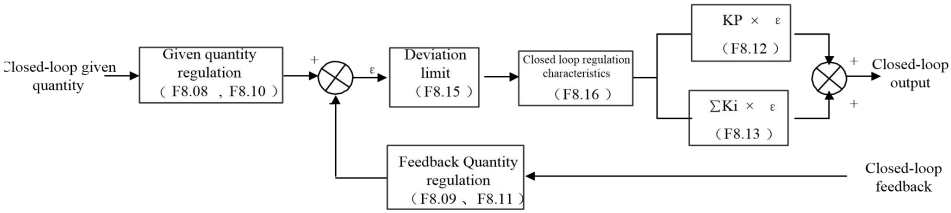


Figure 6-38 PI Principle Block Diagram

In the above figure, KP: Proportional gain; KI: Integral gain

In Figure 6-38, the definitions of closed-loop given quantity, feedback quantity, deviation limit and proportional integral parameters are the same as the meanings of ordinary PI adjustments, see the definitions in F8.01~F8.15.

The drive built-in PI has two characteristics as follows:

The relationship between the given quantity and the corresponding expected feedback quantity is defined by F8.08~F8.11.

For example, in Figure 6-39, when the given quantity is an analog signal of 0~10 V, the expected corresponding controlled quantity is 0~1 MPa, and the corresponding pressure sensor signal is 4~20 mA. The relationship between the given quantity and the expected feedback quantity is shown in Figure 6-39.

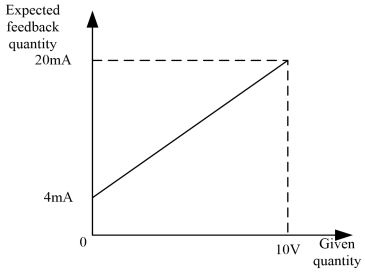


Figure 6-39 Given Quantity and Expected Feedback Quantity

The determination of given quantity takes 10V as the basis; the determination of feedback quantity takes 20mA as the basis. I.e.: The meaning of adjusting the given quantity and the feedback quantity in Figure 6-39 is to adopt an internal unified quantity for given quantity and feedback quantity.

The closed-loop characteristics are selected through F8.16, to meet different applications.

In an actual control system, in order to meet the control requirements, when the given quantity increases, the speed of the motor is required to accelerate, so this closed-loop characteristic is positive; on the contrary, when the given quantity increases, the speed of the motor is required to decrease, so this closed-loop characteristic is negative.

As shown in Figure 6-40, F8.16 is defined to meet the requirements of two closed-loop characteristics.

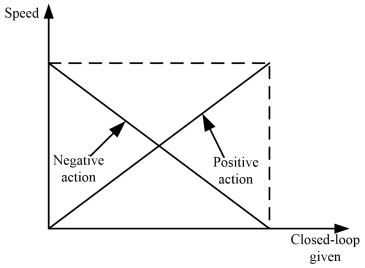


Figure 6-40 Schematic Diagram of Closed-loop Regulation Characteristics

After system confirmation, the basic steps for setting closed-loop parameters are as follows:

① Determine the closed-loop given and feedback channel (F8.01, F8.02);

② For analog closed-loop, it is required to set the relationship between closed-loop given and feedback (F8.08~F8.11);

③ For speed closed-loop, it is required to determine the speed closed-loop given and encoder revolution (F8.06~F8.07);

④ Determine the closed-loop regulation characteristics, and if the relationship between the given and required motor speed is negative, set the closed-loop characteristics regulation to negative action (F8.16=1);

⑤ Set the integral regulation selection and closed-loop preset frequency function (F8.17~F8.19);

⑥ Adjust the closed-loop filter time, sampling period, deviation limit and gain coefficient (F8.12~F8.15).

F8.00	Closed-loop operation control selection	0 ~ 1	0

0: Closed-loop operation control invalid

1: Closed-loop operation control valid

F8.01	Given channel selection	0 ~ 2	0

0: Digital given

Take the value of F8.05 (when set to analog feedback closed-loop, that is, F8.02 = 0 ~ 5);

Take the value of F8.06 (when set to pulse feedback closed-loop, that is, F8.02 = 6).

1: Given by AI1 analog (the input acquisition type is set by function code F5.12)

2: Given by AI2 analog (the input acquisition type is set by function code F5.12)

Note: When pulse feedback is used for speed control, and analog signal is used as given quantity, the analog given 10V(20mA) corresponds to the synchronous speed $n_0 = 120 \times \frac{f_{max}}{P}$ (n_0) of the motor.

F8.02	Feedback channel	0 ~ 7	0

0: Input by AI1 analog (the input acquisition type is set by function code F5.12)

1: Input by AI2 analog (the input acquisition type is set by function code F5.12)

2: AI1+AI2

3: AI1-AI2

4: Min{AI1, AI2}

5: Max{AI1, AI2}

When the current input is selected, it is internally converted to a voltage quantity, and its relationship is: Volt value = milliampere value/2;

6: Pulse: It can be used as PG closed-loop single-phase feedback or two-phase feedback. Please refer to the definitions of multi-function input terminals DI4 and DI5 (terminal functions of F6.03~F6.04).

7: AI3 (expansion card)

F8.03	Given channel filter time	0.001 ~ 50.000s	0.500s
F8.04	Feedback channel filter	0.001 ~ 50.000s	0.100s

The external given signal and feedback signal often overlap a certain interference. The channel is filtered by setting the filter time constants F8.03 and F8.04. The longer the filter time, the stronger the anti-interference ability, but the response becomes slower; the faster the filter time, the faster the response, but the anti-interference ability weakens.

F8.05	Given quantity digital	0.00 ~ 10.00V	0.00

When analog feedback is adopted (F8.02 = 0~5), this function realizes the digital setting of the given quantity of the operation panel or serial port.

F8.06	Speed closed-loop given	0 ~ 39000rpm	0rpm

When PG pulse feedback is used (F8.02=6), set the given value of speed using the operation panel or serial port communication.

F8.07	PPR of pulse encoder	1 ~ 20000	1024

Determined by the characteristic parameters of pulse encoder.

F8.08	Minimum given quantity	0.0% ~ F8.10	0.0%
F8.09	Feedback quantity corresponding to minimum given quantity	0.0 ~ 100.0%	0.0%
F8.10	Maximum given quantity	F8.08 ~ 100.0%	100%
F8.11	Feedback quantity corresponding to maximum given quantity	0.0 ~ 100.0%	100%

F8.08~F8.11 define the relationship curves for the analog closed-loop given and the expected feedback quantities. The set value is the percentage of the actual value of the given quantity and feedback physical quantity relative to the reference value (10V or 20mA).

Feedback positive regulation

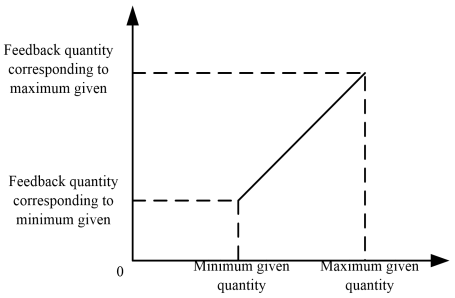


Figure 6-41 Given and Feedback Curves Schematic Diagram 1

Feedback negative regulation

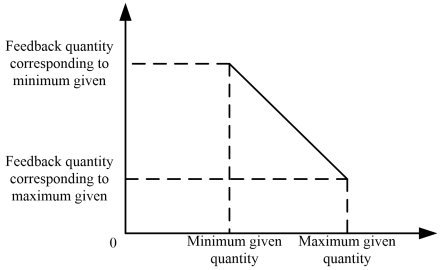


Figure 6-42 Given and Feedback Curves Schematic Diagram 2

F8.12	Proportional gain KP	0.000 ~ 9.999	0.400
F8.13	Integral gain Ki	0.000 ~ 9.999	2.000

F8.14	Setting of sampling period	0.001 ~ 50.000s	0.100s

The larger the proportional gain KP, the faster the response, but if it is too large, oscillation will occur.

Only using the proportional gain KP for regulation cannot eliminate the deviation completely. In order to eliminate the residual deviation, you can use the integral gain Ki to form PI control. The larger the Ki, the faster the response to change deviation, but if it is too large, oscillation will occur.

The sampling period T is a sampling period of the feedback quantity, and the PI regulator operates once in each sampling period. The greater the sampling period, the slower the response.

F8.15	Deviation limit	0.0 ~ 20%	2.0%

The maximum allowable deviation of the system output value relative to the closed-loop given value is shown in Figure 6-43. When the feedback quantity is within this range, the PI regulator stops regulating. The proper setting of this function helps to consider the accuracy and stability of the system output.

Figure 6-43 Deviation Limit Schematic Diagram

F8.16	Closed-loop regulation	0 ~ 1	0

0: Positive action

Selected when a given increases, and the motor speed is required to increase.

1: Negative action

Selected when a given increases, and the motor speed is required to decrease.

F8.17	Sleep frequency	0.0 ~ 550.0Hz	50.00Hz
F8.18	Closed-loop preset	0.0 ~ 550.0Hz	0.00Hz
F8.19	Closed-loop preset	0.0 ~ 3600s	0.0s

Special function for water supply. When the steady-state output frequency of PID is greater than the set frequency of F8.17, the drive will not automatically search for the lower limit frequency, and the running frequency is completely controlled by PID. The purpose is to avoid repeated regulation during peak water consumption, causing unstable water pressure.

Function codes F8.18 and F8.19 allow the closed-loop regulation to quickly enter a stable stage.

After the closed-loop operation is started, the frequency is first accelerated to the closed-loop preset frequency F8.18 according to the acceleration time, and then continuously runs F8.19 at this frequency point for a period of time, before running according to the closed-loop characteristics.

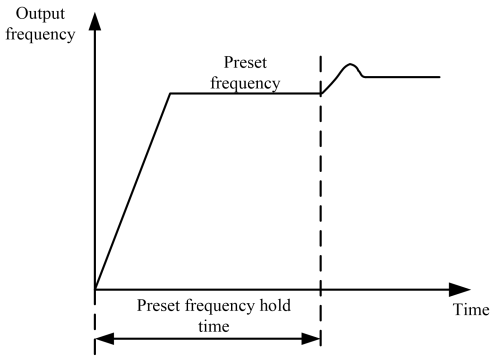


Figure 6-44 Schematic Diagram of Closed-loop Preset Frequency Operation

Note： If the closed-loop preset frequency function is not required, set the preset frequency and hold time to 0.

F8.20	Multistage closed-loop given 1	0.0 ~ 10.00V	0.00V
F8.21	Multistage closed-loop given 2	0.0 ~ 10.00V	0.00V
F8.22	Multistage closed-loop given 3	0.0 ~ 10.00V	0.00V
F8.23	Multistage closed-loop given 4	0.0 ~ 10.00V	0.00V
F8.24	Multistage closed-loop given 5	0.0 ~ 10.00V	0.00V
F8.25	Multistage closed-loop given 6	0.0 ~ 10.00V	0.00V
F8.26	Multistage closed-loop given 7	0.0 ~ 10.00V	0.00V
F8.27	Multistage closed-loop given 8	0.0 ~ 10.00V	0.00V
F8.28	Multistage closed-loop given 9	0.0 ~ 10.00V	0.00V
F8.29	Multistage closed-loop given 10	0.0 ~ 10.00V	0.00V
F8.30	Multistage closed-loop given 11	0.0 ~ 10.00V	0.00V
F8.31	Multistage closed-loop given 12	0.0 ~ 10.00V	0.00V
F8.32	Multistage closed-loop given 13	0.0 ~ 10.00V	0.00V
F8.33	Multistage closed-loop given 14	0.0 ~ 10.00V	0.00V
F8.34	Multistage closed-loop given 15	0.0 ~ 10.00V	0.00V

In the closed-loop given channels, except for the three channels defined in F8.01, the voltage value of multistage closed-loop given defined in F8.20~F8.34 can also be used as closed-loop given.

The voltage selection of multistage closed-loop given 1~15 can realize flexible switching through external terminals, refer to terminal functions of 30~32 and 52 in F6.00 ~ F6.09 and F6.32. It can also be used with simple PLC closed-loop section, see group F9 function code description.

F8.35	Closed-loop output polarity selection	0x721	0x100

Unit digit:

0: Closed-loop output is negative, run at zero-frequency.

1: If the closed-loop output is negative, reverse, but if reversal is prohibited by F2.30, the drive runs at the lower limit frequency.

Ten digit:

0: PID upper and lower limits keep unchanged.

1: PID upper and lower limits are determined by AI.

2. PID upper and lower limits are determined by FC.27.

4. PID upper and lower limits are determined by FD.13 and FD.14.

Hundred digit: This is a special function of wire drawing machine

1. Emergency stop valid

2. Synchronous stop function

4: Jog frequency given switching

F8.36	Closed-loop feedback loss action selection	0 ~ 0x27	0x00
F8.37	Process closed-loop feedback loss detection	0.0 ~ 100.0%	10.0%
F8.38	Process closed-loop feedback loss detection	0.0 ~ 1000.0s	1.0s

F8.36 closed-loop feedback loss action

Unit's digit:

0: No closed-loop feedback loss detection

1: There's a closed-loop feedback loss detection, when the feedback value is less than or equal to the feedback disconnection detection value and the feedback disconnection detection time has passed, the drive reports a PID feedback disconnection fault (E020).

2: There's a closed-loop feedback loss detection, when the feedback value is less than or equal to the feedback disconnection detection value and the feedback disconnection detection time has passed, the drive stops according to deceleration time 4, while the alarm output terminal has an output, after a delay of 10S, the output is disconnected.

4. There's a closed-loop feedback loss detection, with the function same as 2. The difference is that the feedback value is greater than or equal to the feedback disconnection detection value.

5: When the closed-loop feedback is greater than the setting of F8.37 and is hold for the set time of F8.38, the drive starts to sleep, and there's lower limit signal output. This function is used for emergency stop at overpressure during PID water supply.

F8.39	Sleep threshold	0.00 ~ 10.00V	10.00V
F8.40	Wakeup threshold	0.00 ~ 10.00V	0.00V
F8.41	Sleep delay time	0.1 ~ 600.0s	10.0s
F8.42	Wakeup delay time	0.1 ~ 600.0s	2.0s

F8.39 defines the feedback limit when the drive enters the sleep state from the working state. When positive characteristic is selected for PID polarity, if the actual feedback value is greater than the set value and the frequency output by the drive reaches the lower limit frequency, the drive will enter the sleep state after a delay wait time defined in F8.41 (i.e., running at zero speed).

F8.40 defines the feedback limit when the drive enters the sleep state from the working state. When positive characteristic is selected for PID polarity, if the actual feedback value is less than the set value, the drive will leave the sleep state after a delay wait time defined in F8.42, and start working.

So, when PID selects positive characteristic, the sleep threshold needs to be greater than the wakeup threshold.

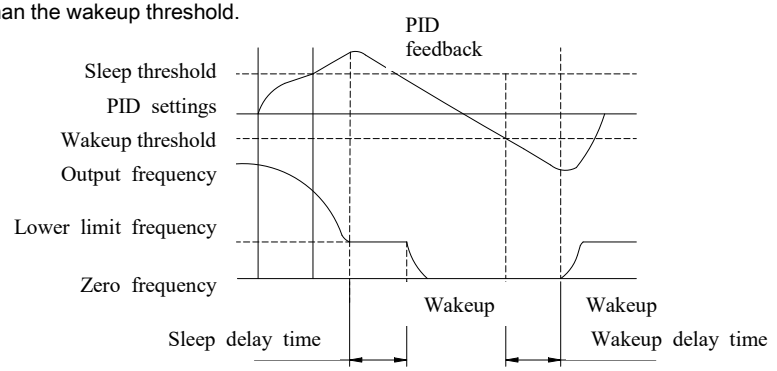


Figure 6-45 Schematic Diagram of Sleep and Wakeup Function

6.10 Group F9 simple PLC control parameters

F9.00	Simple PLC run mode selection	0000 ~ 1123	0000

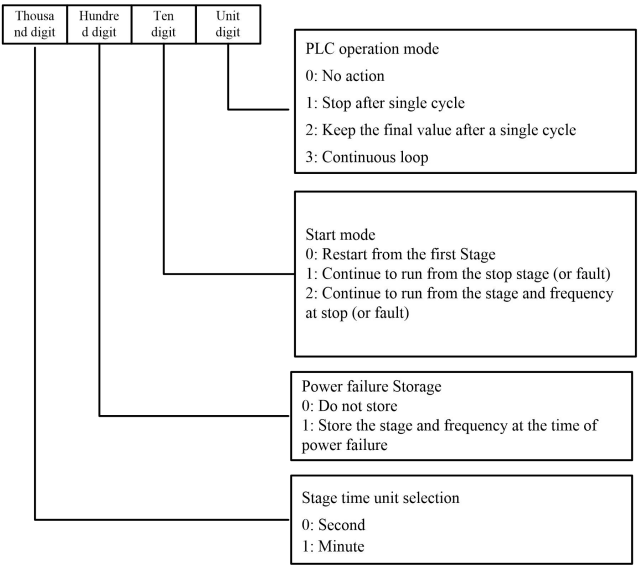


Figure 6-46 Simple PLC Run Mode Selection

Unit digit: PLC run mode selection

0: Do not act

PLC run mode invalid.

1: Stop after a single cycle

As shown in Figure 6-47, the drive will stop automatically after completing one cycle. You need to give a run command again to start.

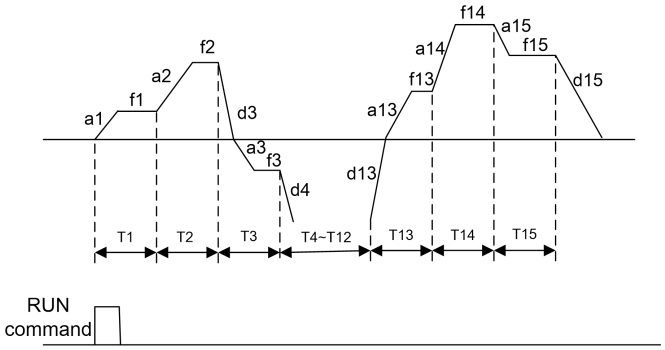


Figure 6-47 Stop after a PLC Single Cycle

2: Keep the final value after a single cycle

As shown in Figure 6-48, the drive will automatically keep the operation frequency and direction of the last stage after completing one cycle.

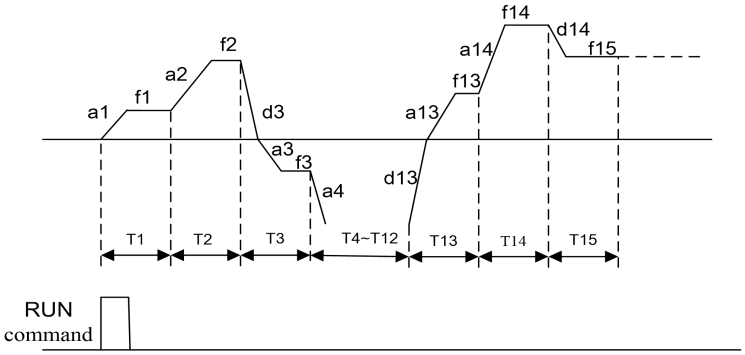


Figure 6-48 Hold after s PLC Single Cycle

3: Continuous cycle

As shown in Figure 6-49, the drive will automatically start the next cycle after completing one cycle, till there's a stop command.

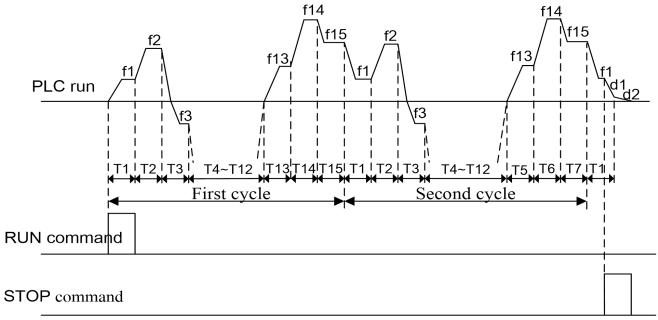


Figure 6-49 PLC Continuous Cycle Mode

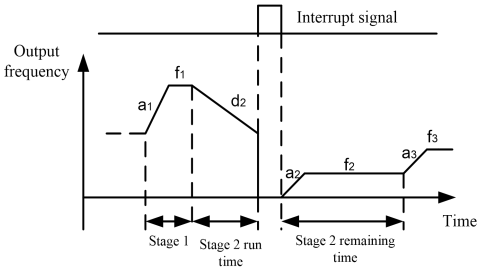
Ten digit: Mode selection for restart after PLC interrupt operation

0: Start running from the first stage

Stop during operation (caused by stop command, fault or power failure), and start from the first stage after restart.

1: Continue running from the stage frequency of interruption

Stop during operation (caused by stop command or fault), the drive automatically records the run time of the current stage, and automatically enters this stage after restarting, and continues the operation in the remaining time at the frequency defined by this stage, as shown in Figure 6-50.



a1: Stage 1 acceleration time a2: Stage 2 acceleration time

a3: Stage 3 acceleration time d2: Stage 2 deceleration time

f1: Stage 1 frequency f2: Stage 2 frequency

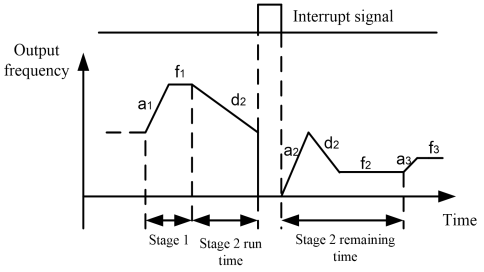
f3: Stage 3 frequency

Figure 6-50 PLC Start Mode 1

2: Continue running from the operating frequency of interruption

Stop during operation (caused by stop command or fault), the drive not only automatically records the run time of the current stage, but records the running frequency at stop, after restart, first restores to the running frequency at stop, and then continues the operation in the remaining time, as shown in Figure 6-51.

Note: The difference between mode 1 and mode 2 is that mode 2 memorizes one more running frequency at stop than mode 1, and continues to run from this frequency after restart.



a1: Stage 1 acceleration time a2: Stage 2 acceleration time

a3: Stage 3 acceleration time d2: Stage 2 deceleration time

f1: Stage 1 frequency f2: Stage 2 frequency

f3: Stage 3 frequency

Figure 6-51 PLC Start Mode 2

Hundred digit: Selection of PLC state parameter storage during power failure

0: Do not store

Do not memorize the PLC running state at power failure, after power-on, restart from the first section.

1: Store

Memorize the PLC running state at power failure, including power failure time stage, running frequency and already run time. After power-on, run according to the restart after PLC interrupt operation defined in ten digit.

Thousand digit: Stage time unit selection

0: Second

1: Minute

The unit is only valid for the time definition of PLC operation stage, and the selection of acceleration/deceleration time unit during PLC operation is determined by FC.09.

F9.01	Multistage frequency 1	Lower limit	5.00Hz
F9.02	Multistage frequency 2	Lower limit	10.00Hz
F9.03	Multistage frequency 3	Lower limit	20.00Hz
F9.04	Multistage frequency 4	Lower limit	30.00Hz
F9.05	Multistage frequency 5	Lower limit	40.00Hz
F9.06	Multistage frequency 6	Lower limit	45.00Hz
F9.07	Multistage frequency 7	Lower limit	50.00Hz
F9.08	Stage 1 setting	000 ~ 323	000
F9.09	Stage 1 run time	0 ~ 6500	20.0s
F9.10	Stage 2 setting	000 ~ 323	000
F9.11	Stage 2 run time	0 ~ 6500	20.0s
F9.12	Stage 3 setting	000 ~ 323	000
F9.13	Stage 3 run time	0 ~ 6500	20.0s
F9.14	Stage 4 setting	000 ~ 323	000
F9.15	Stage 4 run time	0 ~ 6500	20.0s
F9.16	Stage 5 setting	000 ~ 323	000
F9.17	Stage 5 run time	0 ~ 6500	20.0s
F9.18	Stage 6 setting	000 ~ 323	000
F9.19	Stage 6 run time	0 ~ 6500	20.0s
F9.20	Stage 7 setting	000 ~ 323	000
F9.21	Stage 7 run time	0 ~ 6500	20.0s
F9.22	Multistage frequency 8	Lower limit	50.00Hz
F9.23	Multistage frequency 9	Lower limit	50.00Hz
F9.24	Multistage frequency 10	Lower limit	50.00Hz
F9.25	Multistage frequency 11	Lower limit	50.00Hz

F9.26	Multistage frequency 12	Lower limit frequency~upper limit frequency	50.00Hz
F9.27	Multistage frequency 13	Lower limit frequency~upper limit frequency	50.00Hz
F9.28	Multistage frequency 14	Lower limit frequency~upper limit frequency	50.00Hz
F9.29	Multistage frequency 15	Lower limit frequency~upper limit	50.00Hz
F9.30	Stage 8 setting	000 ~ 323	000
F9.31	Stage 8 run time	0 ~ 6500	0.0s
F9.32	Stage 9 setting	000 ~ 323	000
F9.33	Stage 9 run time	0 ~ 6500	0.0s
F9.34	Stage 10 setting	000 ~ 323	000
F9.35	Stage 10 run time	0 ~ 6500	0.0s
F9.36	Stage 11 setting	000 ~ 323	000
F9.37	Stage 11 run time	0 ~ 6500	0.0s
F9.38	Stage 12 setting	000 ~ 323	000
F9.39	Stage 12 run time	0 ~ 6500	0.0s
F9.40	Stage 13 setting	000 ~ 323	000
F9.41	Stage 13 run time	0 ~ 6500	0.0s
F9.42	Stage 14 setting	000 ~ 323	000
F9.43	Stage 14 run time	0 ~ 6500	0.0s
F9.44	Stage 15 setting	000 ~ 323	000
F9.45	Stage 15 run time	0 ~ 6500	0.0s

The F9.08, F9.10, F9.12, F9.14, F9.16, F9.18, F9.20, F9.30, F9.32, F9.34, F9.36, F9.38, F9.40, F9.42, and F9.44 are used to configure the running frequency, direction, and acceleration/deceleration time of each stage of PLC, which is selected by digit. The 15 stages of PLC can be set to MS or closed loop given, which corresponds to each stage set by MS or closed-loop, as shown in figure 6-52.

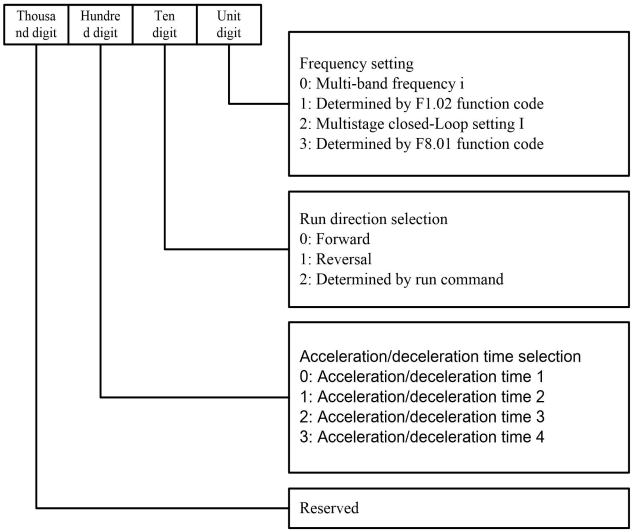


Figure 6-52 PLC Stage i Setting (i=1~15)

Unit digit set in stage i:

0: Select multistage frequency i, for example, when i=3, the frequency of stage 3 is multistage frequency 3, and see F9.01 for related definition of multistage frequency.

1: The frequency is determined by function code F1.02.

2: Multistage closed-loop given i, for example, when i=2, the frequency of stage 2 is multistage closed-loop given 2, and see F8.20~F8.34 for related definition of multistage closed-loop given.

3: Determined by function code F8.01.

PLC can realize running in a closed-loop mode at a certain stage, and the closed-loop given channel can be: Multistage closed-loop given i or determined by function code F8.01; the feedback channel is determined by F8.02. When a given channel is determined by function code F8.01, the closed loop given channel can be switched to the multistage closed-loop given value through the multistage closed-loop given selection terminals. Please refer to the detailed description of function codes F6.00~F6.08, F6.32, and F8.20~F8.34.

Note: When the running direction of PLC stage is determined by run command, the motor running direction can be changed by external direction command in real time. For example, you can realize forward through DIx(FWD)-COM and realize reversal through DIx(REV)-COM. The running direction is the direction determined by the run command; if the direction cannot be determined, follow the running direction of the previous section.

6.11 Group FA protection function parameters

FA.00	Protection mode selection	00 ~ 22	01

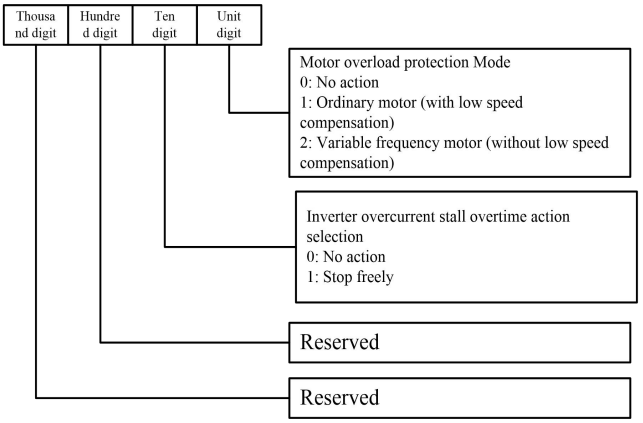


Figure 6-53 Protection Mode Selection Settings

Unit digit: Motor overload protection mode

0: Do not act

There is no motor overload protection characteristics (use with caution), in this case, the drive has no overload protection for the load motor;

1: Normal motor (with low-speed compensation)

Because the heat dissipation effect of normal motor deteriorates at a low speed, the corresponding electronic thermal protection value shall be adjusted as appropriate. The low-speed compensation characteristics here means to lower the overload protection threshold of motor with running frequency lower than 30Hz.

2: Variable frequency motor (without low-speed compensation)

Because the heat dissipation of the frequency conversion special motor is not affected by the rotating speed, there is no need to adjust the protection value during low-speed operation.

Ten digit: Action selection when automatic limit overtime

0: No action

1: Free stop

FA.01	Motor overload protection	20.0 ~ 110.0	100.0
FA.02	AI3 analog input function	0 ~ 2	0
FA.03	Temperature sampling	0.50 ~ 1.50	1.00
FA.04	Motor overtemperature	75.0℃ ~ 120℃	85℃
FA.05	Reserved	-	-
FA.06	Reserved	-	-
FA.07	Protection action selection	0 ~ 1111	110

Under some abnormal conditions, the drive can shield the fault alarm and stop by setting protection action selection, and keep running.

When the second digit of FA.07 is 1, the overload alarm of the second curve of motor is invalid, when it is 0, this function is valid. Special for water jet loom.

When the third digit of FA.07 is 1, the underload alarm of the motor is invalid, when it is 0, this function is valid.

FA.08	Intervals will be cleared automatically for underload	0~6000 minutes	0
FA.09	Automatic reset times	0 ~ 10	0
FA.10	Automatic reset interval	2.0 ~ 20.0s/time	5.0s/ti

When FA.08 is not zero, in PID water supply application, the underload alarm E027 can automatically clear the alarm after the time set by FA.08 in any mode, and if the running terminal is valid, the frequency converter will run automatically.

The fault automatic reset function can automatically reset the running faults according to the set times and intervals. When the number of automatic resets is set to 0, it indicates that automatic reset is prohibited and fault protection is performed immediately.

Note: The drive module protection (E010) and external equipment failure (E015) have no automatic reset function. During reset interval, it blocks output and runs at zero frequency, after the automatic reset is completed, it will automatically perform speed tracking, start and run. Use the automatic fault reset function with caution, otherwise, it may cause personal injuries and property losses.

FA.11	Overload pre-alarm detection selection	000 ~ 111	000
FA.12	Overload pre-alarm detection level	20 ~ 200%	130.0%
FA.13	Overload pre-alarm detection time	0.0 ~ 60.0s	5.0s

The drive has the drive overload and motor overload protection functions, for the drive overload protection, refer to Table 2.1 in Chapter II, for the motor overload protection, refer to FA.00 and FA.01. FA11~FA.13 realizes the monitoring of overload condition before the overload protection function acts.

The overload pre-alarm detection selection (FA.11) defines the relative values of overload pre-alarm detection selection, alarm action selection and detection level.

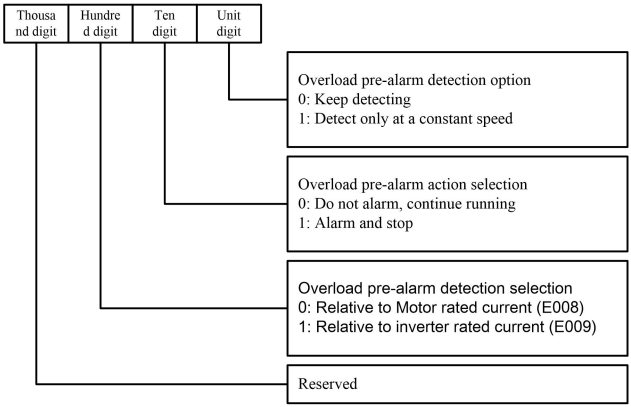


Figure 6-54 Overload Detection Settings

Unit digit: Overload pre-alarm detection selection

0: Overload detection keeps working during the drive running.

1: The overload detection works only when the drive runs at a constant speed.

Ten digit: Overload pre-alarm action selection

0: When overload detection is valid, do not alarm and continue running.

1: When the overload detection is valid, alarm and stop.

Hundred digit: Overload pre-alarm detection selection

0: Detection level relative to the rated current of the motor (fault code E008 when warning).

1: Detection level relative to the rated current of the drive (fault code E008 when warning).

The overload pre-alarm detection level (FA.12) defines the current threshold of overload pre-alarm action, and its set value is the percentage relative to the rated current (see FA.11).

The overload pre-alarm detection time (FA.13) defines the overload pre-alarm signal output when the drive output current is continuously greater than the overload detection level (FA.12) for a period of time.

When the overload pre-alarm state is valid, the working current of the drive exceeds the overload detection level and hold time exceeds the overload detection time.

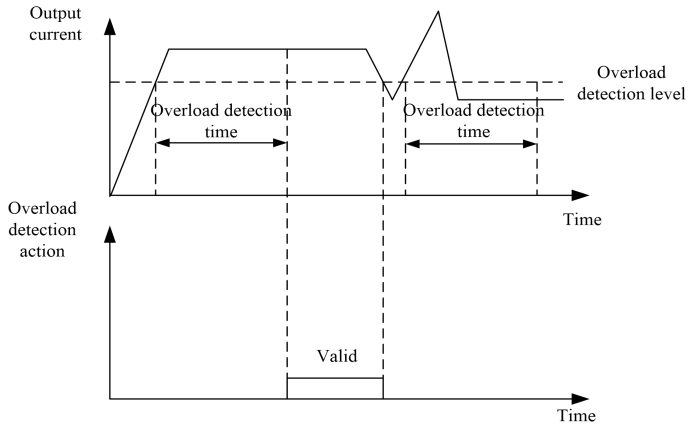


Figure 6-55 Schematic Diagram of Overload Pre-alarm Detection Function

Note:

1. Generally, the overload pre-alarm detection level shall be set below the overload protection level.

2. Within the overload pre-alarm detection time, after the working current is less than the overload pre-alarm detection level, the overload pre-alarm detection time in the machine will recounted.

FA.14	Protection action selection 1	0000 ~ 3211	0001
FA.15	Protection action selection 2	0000 ~ 1113	0001

Under some abnormal conditions, the drive can shield the fault alarm and stop by setting protection action selection (FA.14 and FA.15), and keep running.

FA.14 defines the protection action selection of undervoltage state and automatic reset interval.

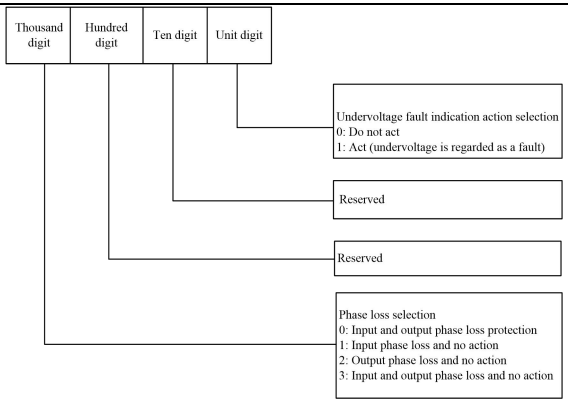


Figure 6-56 Setting of Protection Action Selection 2

FA.15 defines the protection action selection for abnormal communication, abnormal contactor and abnormal EEPROM.

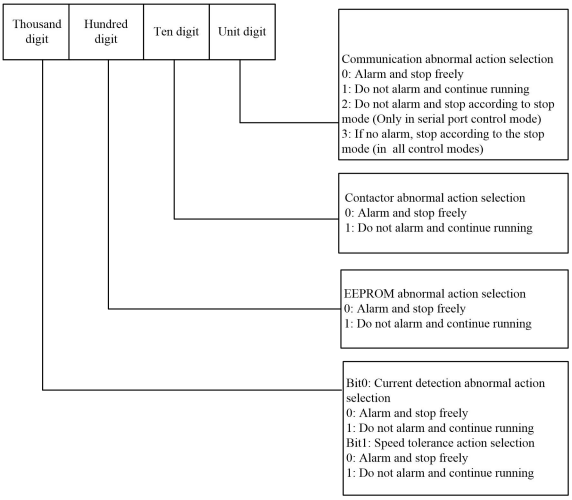


Figure 6-57 Setting of Protection Action Selection 1

For example: If system continues running after speed out of tolerance, the thousand digit is set to 2. If the system continues running without warning when analog input is abnormal, the thousand digit is set to 8; if the system continues running without warning when the speed is out of tolerance and the analog input is abnormal, the thousand digit is set to 2+8=10.

Note: Please select the protection action with caution, and make sure to select correctly after the fault cause is confirmed, otherwise it may cause expansion of accident scope, personal injuries or property damages.

6.12 Group Fb serial communication parameters

Fb.00	Local communication address	0 ~ 247	1

During serial port communication, this function code is used to identify the address of this drive.

Note: When the drive is the master, the slaves can reach up to 31.

Fb.01	Communication	0 ~ 1165	0003

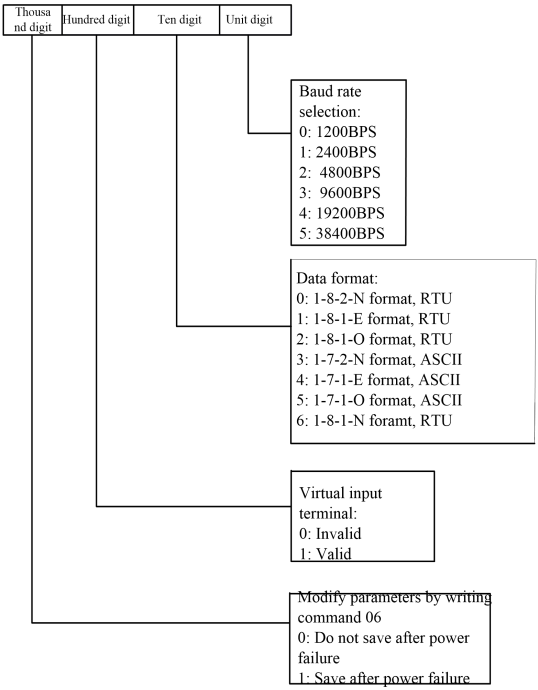


Figure 6-58 Communication Configuration Settings

This function code is set by LED digit, and is used for selection of parameters of serial communication ports.

The virtual terminals are to simulate the actual terminals by instructions sent by the upper computer, each digit of the running data represents on terminal, and the value of

each digit represents corresponding terminal status: BIT0~12: Virtual terminals DI1~DI10, DO1, DO2, and TA/TB/TC. When the virtual terminals of the upper computer are valid, the actual terminals are invalid, and the virtual terminals are equivalent to the actual terminals in application.

The local response delay refers to the delay time required by the serial port of drive to return the response frame to the upper computer after receiving and interpreting the command sent by the upper computer. This function code is used to set this delay. For RTU mode, the actual response delay is no less than the transmission time of 3.5 characters.

Fb.02	Reserved	-	-
Fb.03	Local response delay	0 ~ 1000ms	5ms
Fb.04	Communication timeout detection time	0.0 ~ 1000s	0.0s

If the communication timeout fault time is set to 0, this function is invalid. If the time interval between two communications exceeds the communication timeout fault time, the system reports a communication fault (E016), and the communication condition can be monitored.

Fb.05	Host send selection	00 ~ 11	11

When the drive is set as the communication master, the data it sends to the slave. In this case, the master drive sends a broadcast command, and all slaves will receive the command sent by the master.

The master can send up to 2 frames of data in a polling manner. When set to invalid, no data is sent.

Unit digit: Current host running status

0: Invalid

1: Valid

Tens digit: Current host running frequency

0: Invalid

1: Valid

Hundred's digit: Reserved

Thousand's digit: Reserved

Fb.06	Communication ratio factor	0.000~ 2.000	1.000

This parameter is used to set the weight coefficient of the frequency instruction received by this drive from the RS485 interface as a slave, and the actual running frequency of the localhost is equal to this parameter value multiplied by the value of frequency set instruction received from the RS485 interface. During linkage control, this parameter can be used to set the proportion of running frequency of multiple drives.

6.13 Group FC auxiliary function parameters

FC.00	Energy consumption	0~1	1
FC.01	Energy consumption	1~5	3

Valid for built-in models of the brake unit.

When FC.00=0, the energy consumption braking is prohibited.

When FC.00=1, the energy consumption braking is allowed.

When FC.00=2, the energy consumption braking is allowed, and overvoltage stall control is not performed during deceleration and stop.

FC.01 is used to adjust the duty cycle of the braking unit. If the braking utilization rate is high, the braking unit action duty cycle is high and the braking effect is strong, but the drive bus voltage fluctuates greatly during the braking process.

If the energy consumption braking gain FC.01 is 0, disable the energy consumption braking function. The energy consumption braking voltage and voltage point are F7.21.

Note: The setting of this function shall consider the resistance and power of the braking resistor.

FC.02	AVR function	0 ~ 3	2

0: Do not act.

1: When the input voltage is higher than the rated value, it keeps acting.

2: When the input voltage is higher than the rated value, it only decelerates rather than acts.

3: When the voltage is above 80% of the rated voltage, the AVR function is valid.

AVR is automatic voltage regulation.

When the input voltage deviates from the rated value, this function can keep the output voltage constant, so generally the AVR shall operate, especially when the input voltage is higher than the rated value.

When decelerating and stopping, the AVR does not act, the deceleration time is short, but the running current is slightly larger; when the AVR acts all the time, the motor

decelerates smoothly and the running current is small, but the deceleration time becomes longer.

FC.03	Automatic energy-saving	0 ~ 1	0

0: Do not act

1: Action

During the no-load or light-load operation, the motor detects the load current and adjusts the output voltage appropriately to achieve the purpose of energy saving.

Note: This function is especially effective for fan pump loads.

FC.04	Slip compensation gain	0.0%~200.0%	0.0%
FC.05	Slip compensation limit	0.0%~250.0%	100.0%
FC.06	Slip compensation filter	0.0~25.0s	2.0

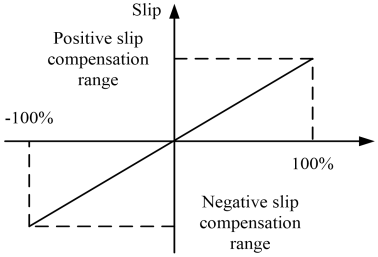


Figure 6-59 Automatic Slip Compensation

Electric status: When the actual speed is lower than the given speed, gradually increase the compensation gain (FC.04).

Generation status: When the actual speed is higher than the given speed, gradually increase the compensation gain (FC.04).

The regulation range of slip compensation is slip compensation limit (FC.05) × rated slip.

FC.07	Reversal overcurrent stall	0.0~100.0%	0.0

When the running direction is switched during the drive running, the limit value of overcurrent stall will be automatically switched to be equal to F7.06+FC0.7.

FC.08	Cooling fan control	0 ~ 2	0

0: Run in automatic mode

Note: Continue running for 3 minutes after stop

1: The fan keeps rotating during power-on

2: In running state, when the temperature is higher than 45℃, the fan runs; when the temperature is lower than 40℃, the fan stops.

FC.09	Acceleration/Deceleration	0 ~ 1	0

This function determines the time unit of acceleration and deceleration.

0: Second

1: Minute

This function is valid for all acceleration and deceleration processes except jog.

Up to 60 hours of acceleration/deceleration time can be set, which is suitable for occasions requiring long acceleration/deceleration.

Note: It is suggested to select second as the time unit as far as possible.

FC.10	Droop control frequency	0.00 ~ 10.00Hz	0.00Hz

This function is suitable for the occasions where multiple drives drive the same load. By setting this function, multiple drives can reach a uniform distribution of power when driving the same load. For example, the transmission gears shown in Figure 6-60 (5 drives drive the conveyors of 5 motors)

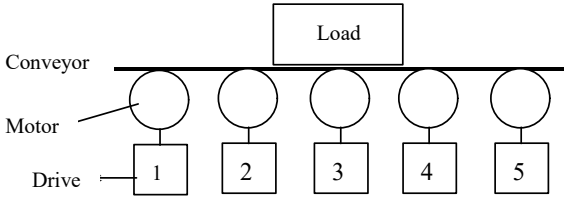


Figure 6-60 Droop Control Schematic Diagram

When the load of a certain drive is heavy, the drive will automatically reduce the output frequency appropriately according to the parameters set by this function to unload part of the load. This value can be adjusted gradually from small to large during debugging. The relationship between load and output frequency is shown in Figure 6-61:

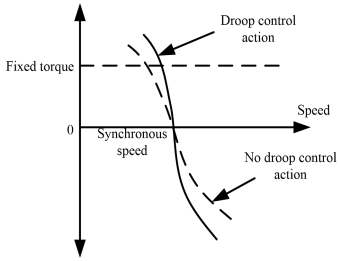


Figure 6-61 Droop Control Motor Characteristics

FC.11	Acceleration/deceleration	0.1~100.0	1.0

The smaller this value, the slower the acceleration changes and the longer the actual acceleration time.

FC.12	Zero frequency operation	0.00 ~ 550.0Hz	0.00Hz
FC.13	Zero frequency return difference	0.00 ~ 550.0Hz	0.00Hz

These two function codes are used to set the zero frequency return difference control function.

Analog AI2 given channel is taken as an example, as shown in figure 6-62:

Start process:

After a run command is sent, the motor starts only when analog AI2 input reaches or exceeds a certain value Ib, and its corresponding set frequency reaches fb, and the motor

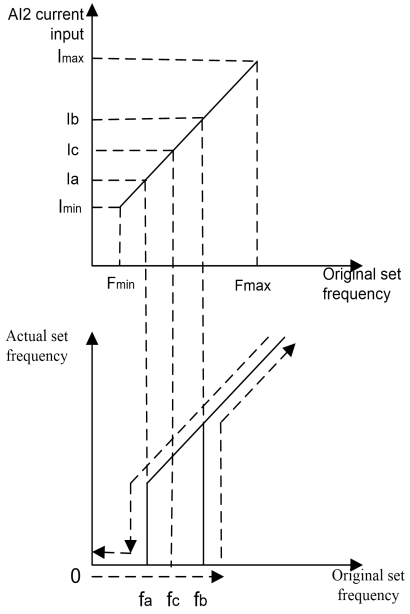
accelerates to the frequency corresponding to analog AI2 input according to the acceleration time.

Stop process:

During running, when AI2 decreases to Ib, the drive will not stop immediately, and the drive will stop outputting only when AI2 continues decreasing to Ia and the corresponding set frequency is fa.

Here, fa is defined as zero frequency operation threshold, which is defined by FC.12, and fb-fa is defined as zero frequency return difference, which is defined by function code FC.13.

Using this function, you can implement the sleep function, realize energy-saving operation, and can avoid frequent starts of the drive at the threshold frequency through the width of the return difference.



fa:a: Zero frequency operation threshold

fb: fa + zero frequency return difference

fc:c: Frequency corresponding to AI2 input Ic

Figure 6-62 Operation at Zero Frequency Return Difference

FC.14	Set length	0.000 ~ 65.535km	0.000km
FC.15	Actual length	0.000 ~ 65.535km	0.000km
FC.16	Length ratio	0.001 ~ 30.000	1.000
FC.17	Length correction	0.001 ~ 1.000	1.000
FC.18	Measuring shaft	0.01 ~ 100.00cm	10.00cm
FC.19	Pulse per revolution	1 ~ 9999	1

This group is used to realize the fixed-length stop function.

The drive inputs counting pulses from the terminal (function 44 for DI4), and obtains the actual length according to the PPR of the speed measuring shaft (FC.19) and the shaft circumference (FC.18).

Calculation length = Number of counting pulses/number of pulses per revolution × circumference of the measuring shaft.

And correct the calculated length through length ratio (FC.16) and length correction coefficient (FC.17), to obtain the actual length.

Actual length = calculated length × length ratio ÷ length correction coefficient

When the actual length (FC.15) ≥ the set length (FC.14), the drive will automatically send a stop command to stop. You need to clear the actual length (FC.15) or modify the actual length (FC.15) to be < the set length (FC.14) before running again, otherwise it will not start.

Note: The multi-function input terminal can be used to clear the actual length (DIi is defined to No. 39 function), the normal counting and the actual length calculation can be performed only after the terminal is disconnected.

The actual length is FC.15, and it is automatically stored during power failure. When the set length FC.14 is 0, the fixed-length stop function is invalid, but the length calculation is still valid.

FC.20	Set the running time	0~maximum timing 65.535kh	0

After the accumulated running time reaches the set running time, the drive can output an indication signal, refer to function introduction of F6.11~F6.13.

U0.37 indicates the cumulative run time of the drive from leaving the factory till now.

FC.21	Reserved	-	-
FC.22	Function selection of restart from power failure	0 ~ 1	0
FC.23	Wait time of restart from power failure	0.0 ~ 10.0s	0.5s

This function realizes whether the drive automatically starts running and the wait time before automatically running under different run command channels when the drive restarts from power failure.

If FC.22 is set to 0, the drive will not run automatically when restarting after power failure.

If FC.22 is set to 1, and the conditions for starting are met, the drive will run automatically after a wait time defined by FC.23 when restarting after power failure.

The setting of this function code, the running state at power failure moment and the control command state at power on moment jointly determine whether the drive will run automatically after power on. See Table 6-15.

Table 6-15 Starting Conditions for Restart from Power Failure

FC.22 settings	Before power failure Status	Operate Panel	Serial port	Terminal three-wire type 1 and 2	Terminal two-wire type 1 and 2	
		Run command at power on moment: None				Yes
0	Stop	0	0	0	0	0
	Run	0	0	0	0	0
1	Stop	0	0	0	0	1
	Run	0	0	0	0	1

Note: Table 6-15 shows the actions of the drive under various combination conditions and after power-on, 0: Enter standby state; 1: Start running automatically. When the operation panel, serial port and terminal three-wire type 1 and 2 control the start and stop, it is a pulse command mode, and there's no run command at power-on moment. If there's a stop command, stop first.

When restart from power failure is valid, if power on not after complete power failure during running (i.e. The drive LED displays "P.OFF"), it will start automatically according to the speed tracking mode during restart; if power on after complete power failure (i.e. The LED on the operation panel lights off), it will start according to the setting of start mode F2.00 during restart.

FC.24	Run command channel binding frequency given	000 ~ 888	000

This function defines the binding combinations between three run command channels and eight frequency given channels, which is convenient to realize synchronous switching.

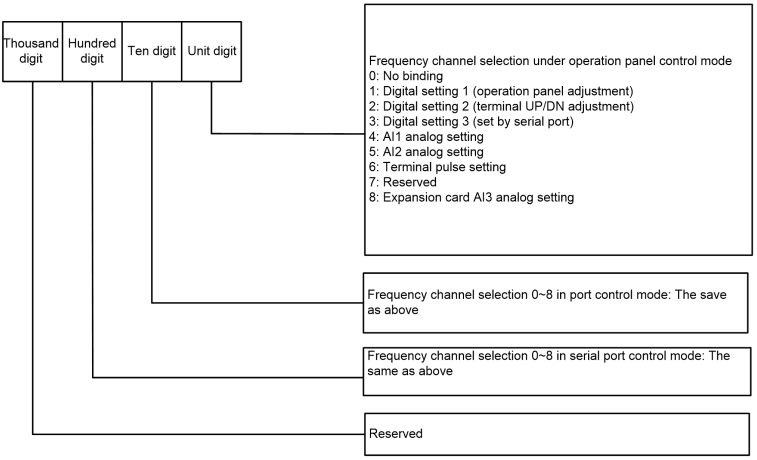


Figure 6-63 Run Command Channel Binding Frequency Given Channel

The meaning of the above frequency given channel is the same as that of frequency setting mode F1.02, please refer to the description in Section 5.1.

Different run command channels can be bound to the same frequency given channel.

The online synchronous switching after binding can be realized as follows:

Mode 1: Modify the function code "Run command channel selection F1.01";

Mode 2: Use M-F and ENT keys;

Mode 3: Use the combinations of the run command channel selection terminal (the terminal functions need to be defined, and DI1~DI10 are set to 28 and 29).

Example:

For convenient three-place control, it is required that:

(1) Switching of the run command channel: The M-F keys can be used to switch keyboard control, the terminal control can be switched by terminals, and the serial port control can be switched by communication.

(2) Use the operation panel to control, press the RUN key to run, and press STOP to stop. The set frequency is adjusted by ▲ and ▼.

(3) Use external terminal control, press the key defined as FWD for forward operation, and press the key defined as REV for reversal operation. The set frequency is adjusted by AI1.

(4) Use serial port control, and modify the command channel and the set frequency through communication.

(5) After power-on, it is the terminal control mode.

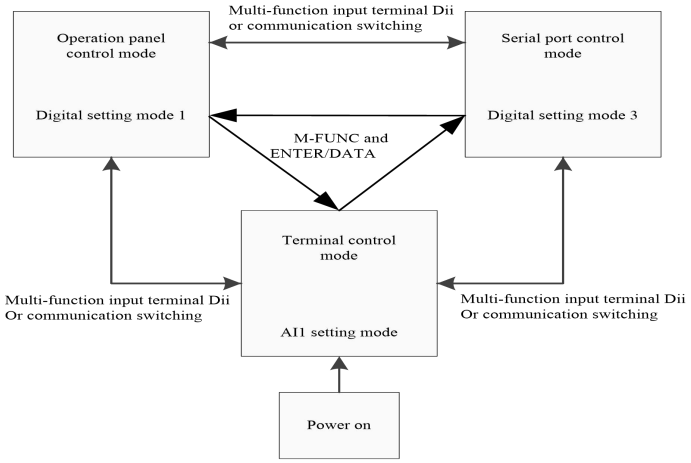


Figure 6-64 Three-place Control Requirements

In order to achieve the above purposes, the following settings are required:

If F1.01=1, set to terminal control mode, and power on for terminal control;

If F6.00=28 and F6.01=29, set multi-function input terminals DI1 and DI2 to run command channel selection;

If F6.32=1, set to two-wire control mode 2, with forward rotation when FWD is valid and reversal rotation when REV is valid;

If FC.33=020, set M-F keys to be valid;

If FC.24=341, set the terminal control mode to bind AI1 analog given, set the operation panel control mode to bind digital setting 1, and set the serial port control mode to bind digital setting 3.

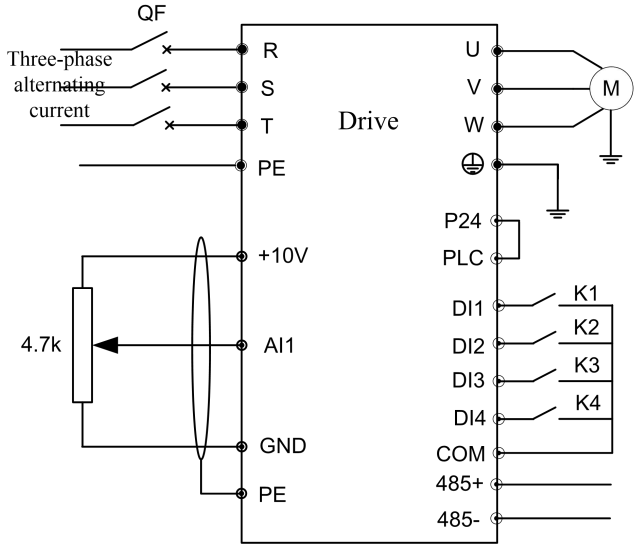


Figure 6-65 Three-place Control Hardware Wiring Diagram

Note: The factory setting is 000: There is no synchronous switching of frequency given channel.

FC.25	Auxiliary given channel	0 ~ 14	0
FC.26	Analog auxiliary given	0.00 ~ 9.99	1.00
FC.27	Initial value of digital	0.00 ~ 550.0Hz	0.00Hz
FC.28	Digital auxiliary frequency	00 ~ 11	00

The set frequency of this drive can be synthesized by the main given frequency and the auxiliary given frequency. FC.25~FC.28 are used to define the auxiliary frequency given channels. Figure 6-66 shows the process of forming a set frequency after the main given frequency and the auxiliary given frequency are adjusted proportionally.

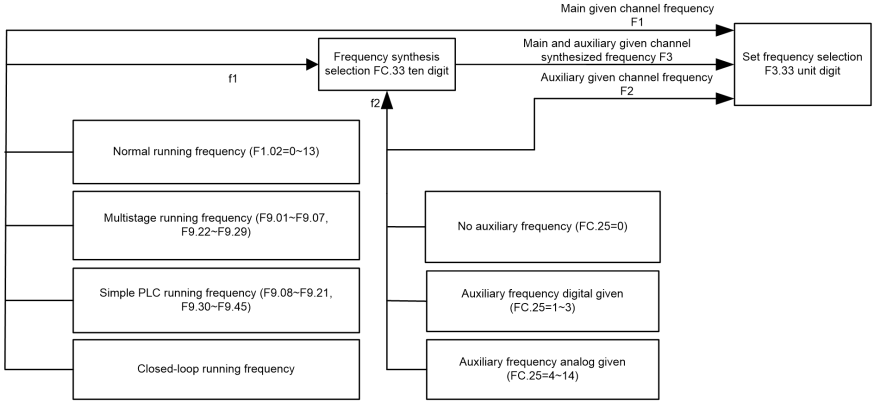


Figure 6-66 Given Frequency Synthesis Schematic Diagram

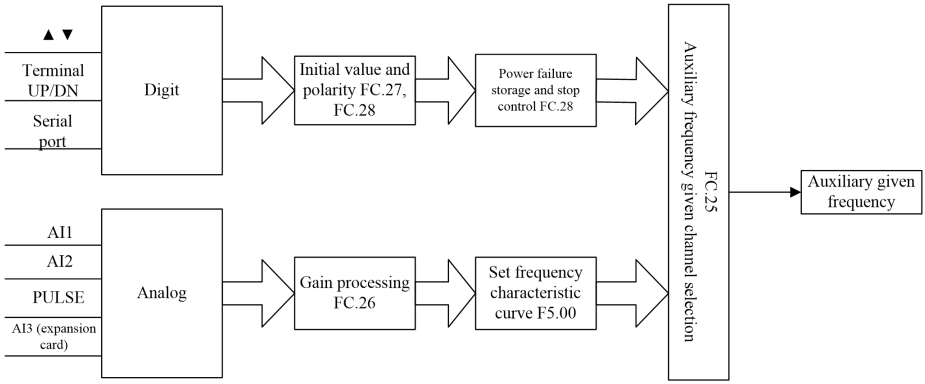


Figure 6-67 Auxiliary Frequency Given Channel Schematic Diagram

FC.25~FC.28 define the control of auxiliary frequency, and FC.25 defines the auxiliary frequency given channel.

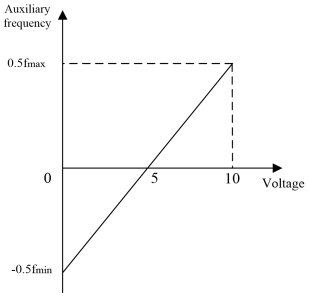
Table 6-16 Selection of Auxiliary Frequency Given Channels

Channel	Channel name	Description of characteristics
0	No auxiliary frequency channel	The auxiliary frequency channel is zero
1	Keyboard given	Directly given by FC.27.

Channel	Channel name	Description of characteristics
2	Terminal UP/DN given	According to the setting of FC.28, the modified frequency can be stored to FC.27 during power failure.
3	Serial port given	
4	AI1 analog given	Determined by actual analog input. See F5.00 for the selection of frequency relationship characteristic curves.
5	AI2 analog given	
6	Terminal PULSE given	
7	- AI1 analog given	
8	- AI2 analog given	
9	- Terminal PULSE given	
10	AI1-5	
11	AI2-5	
12	PULSE-0.5×F5.03	
13	Reserved	
14	AI3 analog given of expansion card	Determined by actual analog input. See F5.00 for the selection of frequency relationship characteristic curves

When the digital setting 3, and the serial port given are selected, the upper computer modifies the auxiliary frequency by setting FC.27.

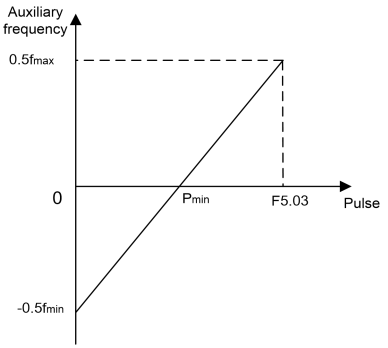
When AI1-5, AI2-5 or PULSE-0.5×F1.03 is selected as the auxiliary frequency given channel, 5V analog input is used as the center point, 0~5v is used for negative regulation, and 5~10v is used for positive regulation. As shown in Figure 6-68:



Fmax - Frequency corresponding to the maximum analog quantity (F5.07 or F5.11)

Figure 6-68 AI1-5 or AI2-5 as Auxiliary Frequency Given Channel

When PULSE-0.5×F5.03 is selected as the auxiliary frequency given channel, the 1/2 F5.03 (maximum pulse frequency input) is used as the center point, 0~0.5 times the maximum pulse frequency input is used for negative regulation, and (0.5~1) times the maximum pulse frequency input is used for positive regulation. As shown in Figure 6-69.



Pmin - 1/2*maximum input pulse frequency (F5.03)

Fmax - Frequency corresponding to the maximum analog quantity (F5.07 or F5.11)

Figure 6-69 PULSE-0.5×F5.03 as Auxiliary Frequency Given Channel

FC.26: Analog auxiliary given coefficient

Valid only when FC.25=4~12, first calculate the gain with FC.26, and then calculate the auxiliary frequency according to the frequency characteristic curve defined by F5.00.

FC.27: Initial value of digital auxiliary frequency

Valid only when FC.25=1~3, the initial values of auxiliary frequency given in these three modes.

FC.28: Digital auxiliary frequency control

Valid only when FC.25=1~3, as shown in Figure 6-70.

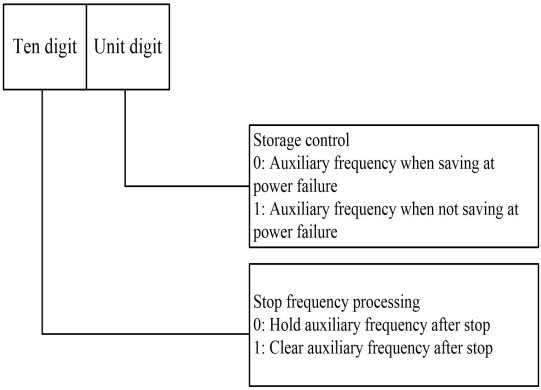


Figure 6-70 Digital Auxiliary Frequency Control Setting

Unit digit: Power failure storage selection

0: Store auxiliary frequency at power failure

The auxiliary frequency will be stored in FC.27 during power failure, and the auxiliary frequency superposition polarity will be stored in FC.28.

1: Do not store auxiliary frequency at power failure

Do not store during power failure

Ten digit: Stop frequency processing

0: Hold auxiliary frequency after stop

Hold the auxiliary frequency during stop.

1: Clear the set frequency after stop

Clear the auxiliary frequency after stop

Note: During combined operation of the main frequency source and the auxiliary frequency source, both have the same channel, and the auxiliary frequency source is invalid.

FC.29	Stop timeout	0~6553.6s	10s

Refer to use instructions of F2.08 for detailed operation.

FC.30	Pulse disconnection	0~6553.6s	0s

When FC.30 is 0, the pulse disconnection detection function is invalid. When FC.30 is greater than zero, if the number of pulse data remains unchanged during the detection interval of FC.30, the drive will decelerate and stop (deceleration time is 4). The function DO17 outputs a fault signal, and the output fault signal is turned off at 10s after stop.

FC.31	Operation panel key functions and locking	000 ~ 422	000

This function defines the functions of M-F keys, STOP/RESET key and locking on the operation panel.

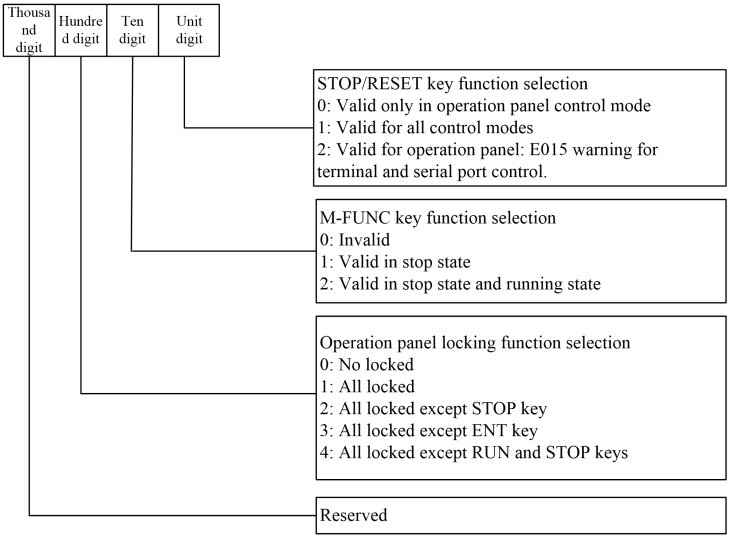


Figure 6-71 Operation Panel Key Functions and Locking Selection Setting.

Unit digit: STOP key function selection

0: Valid only for operation panel run command channel.

This option is used to set the action scope and working mode when the STOPkey on the operation panel is set as the stop key STOP.

1: Valid for operation panel, terminal, and serial port run command channels. Press this key, the drive stops according to the stop mode.

2: Valid for operation panel, terminal, and serial port run command channels.

Under the run command channel of the operation panel, press this key, the drive will stop according to the stop mode; under the run command channel of terminal or serial port, press this key, the drive will alarm (fault code: E015) and stop freely.

When the STOP key is used as the fault reset key STOP, it is valid under various run command channels.

Ten digit: M-F keys function selection

This option is used to set the functions and action scope of M-F keys on the operation panel.

0: The M-F keys are invalid, and you cannot use these keys to switch the run command channels.

1: The M-F keys are valid only in stop state, and you cannot use these keys to switch the run command channels during running.

2: The M-F keys can be used to switch the run command channels in the stop state and the running state.

Switching sequence of run command channels:

Operation panel run command channel (MON light is on) → terminal run command channel (MON light is off) → serial port run command channel (MON light flashes) → operation panel run command channel (MON light is on)

Note: Use the M-F keys to circularly switch to the required run command channel, and press the ENT key within 3 seconds to confirm before taking effect.

Hundred digit: Operation panel locking function

This option is used to set the locking selection and scope of keys on the operation panel.

0: No locking function, any key on the operation panel has no locking.

1: The keys on the operation panel are all locked, and any key on the operation panel is invalid after the locking function takes effect.

2: Except STOP key, other keys are all locked. After the locking function takes effect, only the STOP key can be used normally.

3: Except the key, other keys are all locked. After the locking function takes effect, only the key can be used normally.

4: Except RUN, STOP, and keys, other keys are all locked. After the locking function takes effect, only the Run, STOP and keys can be used normally.

After this option is set as required, it is required to follow the specific operation method to validate locking, see the description in Chapter IV. Similarly, see the description in Section 4.7 of Chapter IV for unlocking method.

FC.32	Reserved	-	-
FC.33	Frequency source superposition selection	0 ~ 54	0

Unit digit: Frequency source selection

0: Main frequency source

1: Main and auxiliary operation results (the operation relationship is determined by the ten digit)

2. Switching between main frequency source and auxiliary frequency source

3: Switching between the main frequency source and main and auxiliary operation results

4: Switching between the auxiliary frequency source and main and auxiliary operation results

Ten digit: Main and auxiliary operation relationship of frequency source

0: Main + auxiliary

1: Main - auxiliary

2: Maximum of the two

3: Minimum of the two

4: |Main - auxiliary|

5: (Main*auxiliary)/F1.06

Hundred digit:

0: No linkage function

1: The communication linkage ratio is valid for frequency, acceleration and deceleration 1.

2: The communication linkage ratio is valid for frequency.

3: The AI2 linkage ratio is valid for frequency, acceleration and deceleration 1.

4: The AI2 linkage ratio is valid for frequency.

5: The frequency and speed switching function is valid, and this function is dedicated. The communication given instruction is the speed unit.

Use instructions of linkage function:

1. There are two linkage ratio channels, i.e. communication linkage ratio or AI2 linkage ratio, which are selected by the hundred digit of function code FC.33.

2. The gain of communication linkage ratio is set by function code Fb.06.

3. When the gain of AI2 linkage ratio is 100%, the corresponding reference voltage is set by function code F5.10, and the actual gain is the ratio of the external given AI2 voltage to the reference voltage.

4. The maximum gain of acceleration/deceleration linkage ratio is limited to 5 times; the gain of frequency linkage ratio is not limited, but the final output frequency is limited by the upper or lower frequency limit.

6.14 Group Fd additional parameter function

Fd.00	DO1 output on delay	0.0 ~ 600.0	0.0
Fd.01	DO1 output off delay	0.0 ~ 600.0	0.0
Fd.02	DO2 output on delay	0.0 ~ 600.0	0.0
Fd.03	DO2 output off delay	0.0 ~ 600.0	0.0
Fd.04	Relay output on delay	0.0 ~ 600.0	0.0
Fd.05	Relay output off delay	0.0 ~ 600.0	0.0

This delay is valid no matter what function is set at the output port.

Fd.06	Overstart overvoltage	50.0 ~ 200.0%	130.0%
Fd.07	Overvoltage hold time	0.001 ~ 20.000s	0.001s
Fd.08	Transition time when overvoltage is switched to normal voltage	0.001 ~ 5.000s	0.001s

Overstart mode: When F1.17=5, the above functions are valid.

Fd.10	Automatic torque boost	0.00 ~ 1.00	0.20

The function code is mainly for the automatic torque boost function in V/F mode.

Fd.13	PID upper limit	0.0 ~ 100.0%	100.0%
Fd.14	Lower PID limit	0.0 ~ 100.0%	100.0%

This function is mainly for the output limit of PID upper and lower limits, which is related to F8.35 function code. Please refer to F8.35 settings for detailed settings.

F6.15 Group U0 monitoring parameters

U0.00	Output frequency (before compensation)	0.01Hz	-
U0.01	Output frequency (after compensation)	0.01Hz	-
U0.02	Set frequency	0.01Hz	-
U0.03	Output current	0.1A	-
U0.04	Running speed	1rpm	-
U0.05	Set speed	1rpm	-
U0.06	Reserved	-	-
U0.07	Reserved	-	-
U0.08	Output power	0.1 kw	-
U0.09	Output torque	0.1%	-
U0.10	Output voltage	1V	-
U0.11	Bus voltage	1V	-
U0.12	AI1	0.01V	-
U0.13	AI2	0.01V	-
U0.14	Analog closed-loop feedback	0.1%	-
U0.15	Analog closed-loop setting	0.1%	-
U0.16	External count value	1	-
U0.17	Terminal status	-	-

The displayed terminal information includes multi-function terminals DI1~DI10, two-way open collector output terminals DO1 and DO2, and the status of relay output terminal TC. The status of each functional terminal is indicated by the on/off of specified section of the LED digital tube. If the digital tube section is on, it indicates the corresponding terminal status is valid, if off, it indicates the corresponding terminal status is invalid, as shown in Figure 6-72:

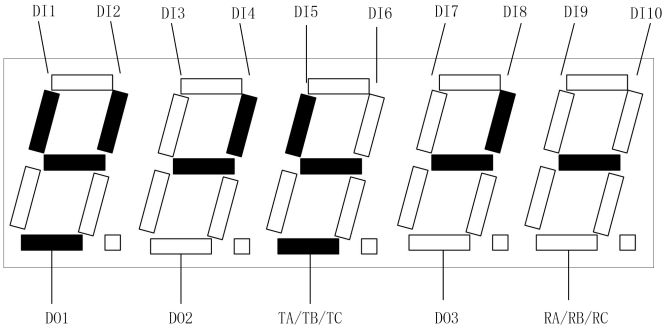


Figure 6-72 Terminal Status Display

According to the terminal status in Figure 6-72, multi-function terminals DI1, DI2, DI4, DI5 and DI8 are valid, DI3, DI6, DI7, DI9 and DI10 are invalid, two-way open collector output terminal DO1 and relay output terminals TA/TB/TC are valid, two-way open collector output terminals DO2 and DO3, and relay output terminals RA/RB/RC are invalid. There are five normally-on pen segments in the digital tube, which is convenient for observation.

U0.18	Actual length	1	-
U0.19	Set length	1	-
U0.20	AI3	0.01V	-
U0.21	Motor temperature	0.1℃	-
U0.22	Drive rated voltage	1V	-
U0.23	Drive rated current	0.1A	-
U0.24	Reserved	-	-
U0.25	IGBT temperature	0.1℃	-
U0.26	The first fault type	1	-
U0.27	The second fault type	1	-
U0.28	The third (last) fault type	1	-
U0.29	Bus voltage during the latest fault	1V	-
U0.30	Output current during the latest fault	0.01A	-
U0.31	Running frequency during the latest fault	0.01Hz	-
U0.32	Running temperature during the latest fault	0.1	-
U0.33	Bus voltage during the latest two faults	1V	-
U0.34	Output current during the latest two faults	0.01A	-
U0.35	Running frequency during the latest two faults	0.01Hz	-
U0.36	Running temperature during the latest two faults	0.1℃	-
U0.37	Running time accumulation	0.001kh	-
U0.38	Software 1 version number	-	-
U0.39	Encoder feedback speed	-	-

Chapter 7 Maintenance

7.1 Maintenance

In case of change of service environment for drive, such as temperature, humidity, smog and aging of drive internal parts, the drive fault may occur. Therefore, the drive must be examined daily and given the regular maintenance in period of storing and using.

7.1.1 Daily maintenance

When the drive is turned on normally, please make sure the following items:

(1)Whether the motor has abnormal noise and vibration.

(2)Whether drive and motor heat or occur abnormity.

(3)Whether environment temperature is too high.

(4)Whether the value of load ammeter is in conformity with the former.

(5)Whether the fan of drive rotates normally.

7.2 Regular maintenance

7.2.1 Regular maintenance

Before the drive is maintained and checked, the power supply must be cut off, in addition, the monitor shall have no display and main circuit power indicator lamp goes out. The examined content is shown as table 6-1.

Table 6-1 Regular examined contents

Item	Content	Solution
Screw of main circuit terminal and control circuit terminal	Whether the screw is slack	Tightened by screwdrive
Heat sink	Whether there is dust on it	Blow it away with the dry compressed air of 4-6kg/cm^2 Pressure
PCB(printed circuit board)	Whether there is dust or vapor on it	Clean the surface of PCB board
Fan	Whether it runs normally and makes abnomal sound or vibration ,and whether the accumuiated time runs up to more than 20000 hours	Change the fan
Power unit	Whether there is dust on it	Clear the foreign matter
Aluminum electrolytic capacitor	Whether it has color change,peculiar smell,bubbing,liquid leakge	Changed Aluminum electrolytic capacitor

7.2.2 Regular maintenance

In order to make the drive run normally for a long time, the electronic elements mounted in drive shall be maintained regularly. And the service life of electronic elements is different with the service environment and service condition. The maintenance period of drive as shown in the table 6-2 is provided for referring.

Table 6-2 Changing time of drive parts

Part name	Standard changing time
Fan	2 ~ 3 years
Electrolytic capacitor	4 ~ 5 years
PCB	5 ~ 8 years
Fuse	10 years

Applicable condition for changing time of aforementioned drive parts

(1) Environment temperature：Annual average is 30℃.

(2) Load factor: Less than 80%

(3) Running time: Less than 12 hours every day

Annex Communication Protocol

Interfacing method

RS485: Asynchronous, half duplex Default: 8-N-2, 9600bps.See group FB description for parameter settings.

Communication method

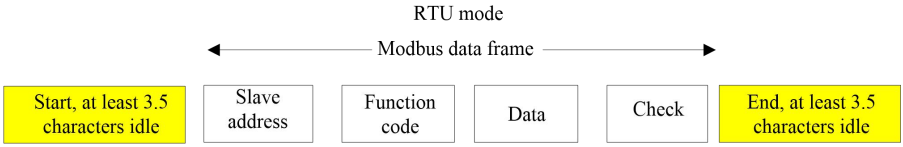
1. Communication protocol of the drive is the Modbus protocol, except for supporting common register read and write, partial commands are also expanded to carry out management on drive function codes.

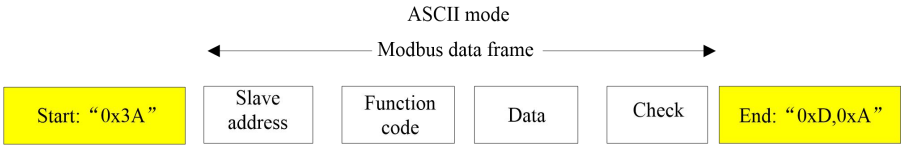
2. The drive is the slave, master-slave point to point communication. When the master sends commands using broadcast address, the slave will not respond.

3. During multi-machine communication or long distance communication, connecting a resistance of 120Ω at both ends of the communication could improve the communication's interference rejection.

Protocol format

Modbus protocol supports both RTU mode and ASCII mode, and corresponding frame format is as follows:





Modbus adopts the "Big Endian" coding method, which sends high bit bytes first, and then low bit bytes.

RTU method: Under RTU method, idle time between frames could select function code setting or observe inner conventions of Modbus. Min. frame idle agreed inside Modbus is as follows: Frame head and end use bus idle time larger than or equal to 3.5 bytes to determine the frame. Data check adopts CRC-16, and the entire information participates in check, while high and low bits of checksum need to be sent

after exchange. For detailed CRC check, please refer to examples in the protocol. It is to be noted that, at least 3.5 characters of bus idle should be kept between frames (or min. bus idle time should be set), while bus idle between frames need not to accumulate start and end idles.

The following is data frame requested for reading parameter 002 of machine 1:

Address	Function Code	Register Address		Read Characters		Checksum	
0x01	0x03	0x00	0x02	0x00	0x01	0x25	0xCA

The following is response frame of machine 1:

Address	Function Code	Response Bytes	Register Content		Checksum	
0x01	0x03	0x02	0x13	0x88	0xB5	0x12

Under ASCII, the frame head is “0x3A”, and the frame end is “0x0D” and “0x0A” by fault, while the frame end could also be set by users. Under ASCII, except for frame head and frame end, other data bytes could all be sent in the form of ASCII code, which are sent to the high 4-bit bytes first, and then to low 4-bit bytes. Under ASCII, the data has a 7-bit length. As for “A” ~ “F”, ASCII of capitalized letters of it are adopted. In this case, data adopts LRC check, which covers information part from slave address to data. Checksum is equal to the supplementary code of character sum (abandoning carry bits) of all data participating in check.

An example of Modbus data frame of ASCII is as follows:

Write 4000 (0xFA0) into the inner register 002 of slave 1, the format of command frame is shown in the following table:

LRC check=supplementary code of (01+06+00+02+0x0F+0xA0)=0x48

	Frame Head	Address		Function Code		Register Address				Write Content				LRC Check		Frame End	
Character	:	0	1	0	6	0	0	0	2	0	F	A	0	4	8	CR	LF
ASCII	3A	30	31	30	36	30	30	30	32	30	46	41	30	34	38	0D	0A

The drive, via function code, could set different response delays to adapt to detailed application needs of various master station, for RTU mode, actual response delay is not less than an interval of 3.5 characters, for ASCII mode, actual response delay is not less than 1ms.

Protocol function

The most important function of Modbus is to read and write parameters, and different function codes decide different operation requests. Drive Modbus protocol supports the following function code operations:

Function Code	Function Code Significance
0x03	Read drive function code parameters and run state parameters.
0x06	Modify single drive function code or control parameter, and do not save after power off.
0x08	Wire diagnosis
0x10	Modify multiple drive function codes or control parameters, and do not save after power off.
0x41	Modify single drive function code or control parameter, and do not save after power off.
0x42	Function code management

Drive's function code parameters, control parameters and state parameters are all mapped to Modbus read/write register. Read/Write characteristics and range of function code parameters all comply with instructions in the drive's user manual. Drive function code's group number is mapped to high byte address of the register, while group index is mapped to low byte address of the register. Drive's control parameters are virtualized to drive function code group 50, while drive's state parameters are virtualized to drive function code group 51.The correspondence between function code group number and its mapped register address high byte is as follows:

Group F0: 0x00; group F1: 0x01; group F2: 0x02; group F3: 0x03; group F4: 0x04; group F5: 0x05; group F6: 0x06; group F7: 0x07; group F8: 0x08; group F9: 0x09; group FA: 0x0A; group Fb: 0x0B; group FC: 0x0C; group Fd: 0x0D; group FE: 0x0E; drive control parameter group: 0x32; drive state parameter group: 0x33.

For example, register address of drive function code parameter F3.02 is F3.02, and register address of drive function code parameter FE.01 is 0xE01.

The overall data frame's format has been introduced in the above, format and significance of Modbus protocol's function code and data part will be introduced in the following, which is the content of "function code" and "data" parts in the above mentioned data frame format. These two parts form the application protocol data unit

of Modbus, and the application protocol data unit in the following refers to these two parts. Description on frame format in the following takes RTU mode as an example, and ASCII mode application layer protocol data unit's length needs to be doubled.

Read drive parameters' application layer protocol data unit as follows:

Request format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function code	1	0x03
Start register address	2	0x0000 ~ 0xFFFF
Register number	2	0x0001 ~ 0x0004

Response format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function code	1	0x03
Read bytes	1	2* Register number
Read contents	2* Register number	

If operation request fails, response should be error codes and abnormal codes. Error code is equal to (function code + 0x80), and abnormal code indicates error reasons. Abnormal codes are listed as follows:

Abnormal Code	Abnormal Code Significance
0x1	Illegal function code.
0x2	Illegal register address.
0x3	Data error, data exceeds upper limit or lower limit.
0x4	Slave operation fails (including data within the range of upper limit and lower limit, but errors caused by invalid data)
0x5	Command valid, under transaction, mainly used in storing data to non-volatile storage.
0x6	Slave is busy, please try later, mainly used in storing data to non-volatile storage.

0x18	Information frame error: Including information length error and check error.
0x20	Parameter unable to be modified.
0x22	Parameters are protected by password.

Modify single drive parameter's application layer protocol data unit, as follows:

Request format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function Code	1	0x06
Register Address	2	0x0000 ~ 0xFFFF
Register Content	2	0x0000 ~ 0xFFFF

Response format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function Code	1	0x06
Register Address	2	0x0000 ~ 0xFFFF
Register Content	2	0x0000 ~ 0xFFFF

If operation request fails, response should be error code and abnormal code. Error code is equal to (function code + 0x80), and see the above description for any abnormal code.

Application layer protocol data unit of wire diagnosis is as follows:

Request format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function Code	1	0x08
Sub Function Code	2	0x0000 ~ 0x0030
Data	2	0x0000 ~ 0xFFFF

Response format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function Code	1	0x08
Sub Function Code	2	0x0000 ~ 0x0030
Data	2	0x0000 ~ 0xFFFF

If operation request fails, response should be error code and unexpected code. Error code is 88H, and see the above description for any abnormal code.

Sub functions supported by wire diagnosis are listed as follows:

Sub Function Code	Data (Request)	Data (Response)	Sub Function Significance
0x0001	0x0000	0x0000	Re-initialize communication: Make no-response mode failure.
	0xFF00	0xFF00	Re-initialize communication: Make no-response mode failure.
0x0003	“New frame end” and “00” occupy high and low bytes respectively.	“New frame end” and “00” occupy high and low bytes respectively.	Set frame end of ASCII mode, and this “new frame end” will replace the old line feeds (Note: The new frame end cannot be larger than 0x7F, and cannot be equal to 0x3A).
0x0004	0x0000	No response	Set the no response mode, and the slave only responds to “re-initialize communication request” from here. It is mainly used to isolate fault slave.
0x0030	0x0000	0x0000	Set slave “never respond” invalid command and error command.
	0x0001	0x0001	Set slave “respond” invalid command and error command.

Modify multiple drive function codes and state parameters’ application layer protocol data unit, as follows:

Request format is as follows:

Application Layer Protocol Data Unit	Data Length (Bytes)	Value or Range
Function Code	1	0x10
Start Register Address	2	0x0000 ~ 0xFFFF
Operation Register Number	2	0x0001 ~ 0x0004
Register Content Bytes	1	2*Operation register number
Register Content	2*Operation register number	

Response format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function Code	1	0x10
Start Register Address	2	0x0000 ~ 0xFFFF
Operation Register Number	2	0x0001 ~ 0x0004

This request modifies the contents of continuous data units from start register address. The mapping of register address is the drive's function code parameters and control parameters etc., for detailed mapping relationship, see the mapping relationship definition of register address in the following. If operation request fails, abnormal response is shown in the above.

When storing multiple register parameters continuously, the drive starts storing from the register at the lowest address, till the one at the highest address, and the storage may success completely or return from the address failing first.

Function code 0x41 is used to modify individual drive function code or control parameter, and store it to the non-volatile storage unit. Its command format is similar to 0x06, and the only difference lies in that parameters operated by command 0x06 will not be saved after power off, while parameters operated by 0x41 will be saved after power off. Some control parameters in the drive cannot be saved into the

non-volatile storage unit, as for these parameters, function codes 0x41 and 0x06 have the same operation effects, and these parameters will be introduced in the following.

The management of drive function codes includes reading upper limit and lower limit of parameters, reading parameter characteristics, reading function code menu's max. group index, reading the next function code group number and the previous function code group number, reading the current display state parameter index as well as displaying the next state parameter etc. Parameter characteristics include information such as parameter readability and writability, parameter unit as well as scaling relation etc. These commands are used to remotely modify drive function code parameters. Application layer protocol data units managed by function codes are as follows:

Request format is as follows:

Application Layer Protocol Data Unit	Data Length(Bytes)	Value or Range
Function Code	1	0x42
Sub Function Code	2	0x0000 ~ 0x0007
Data	2	Detailed range should be decided according to the drive's type.

Response format is as follows:

Application Layer ProtocolData Unit	Data Length (Bytes)	Value or Range
Function Code	1	0x42
Sub Function Code	2	0x0000 ~ 0x0007
Data	2	0x0000 ~ 0xFFFF

If operation request fails, response should be error code and abnormal code. If operation fails, carry out abnormal response, and see the above description for any abnormal response code.

Sub functions managed and supported by function codes are listed in the following:

Sub Function Code	Data (Request)	Data (Response)	Sub Function Significance
0x0000	Function code group number and group index occupy high and low bytes respectively.	The upper limit of function code parameter.	Read the upper limit of function code parameter.
0x0001	Function code group number and group index occupy high and low bytes respectively.	The lower limit of function code parameter.	Read the lower limit of function code parameter.
0x0002	Function code group number and group index occupy high and low bytes respectively.	Function code parameter characteristics, for details, see the description in the following.	Read characteristics of function code parameter.
0x0003	Function code group number occupies high byte, and low byte is “00”.	Max. value of group index.	Read the max. value of group index.
0x0004	Function code group number occupies high byte, and low byte is “00”.	The next function code group number occupies high byte, and low byte is “00”.	Read the next function code group number.
0x0005	Function code group number occupies high byte, and low byte is “00”.	The previous function code group number occupies high byte, and low byte is “00”.	Read the previous function code group number.
0x0006	0x3300	Currently displayed state parameter index	Read the currently displayed state parameter index
0x0007	0x3300	The next state parameter index	Display the next state parameter.

State parameter group cannot be modified and reading upper limit and lower limit operation is not supported.

Function code parameter is featured as a 2-byte length, and bit definition is as follows:

Featured Parameter (BIT)	Value	Significance
BIT2 ~ BIT0	000B	No decimal part
	010B	1 decimal
	011B	2 decimals
	100	3 decimals
	Others	Reserved
BIT3	Reserved	
BIT5 ~ BIT4	00B	Modify step length to 1
	Others	Reserved
BIT7 ~ BIT6	01B	Able to be modified.
	10B	Unable to be modified during running
	11B	Factory set, and users cannot modify.
	00B	Actual parameter, unable to be modified.
BIT11 ~ BIT8	0000B	No unit
	0001B	Unit is HZ
	0010B	Unit is A
	0011B	Unit is V
	0100B	Unit is r/min
	0101B	Unit is linear speed (m/s)
	0110B	Unit is percentage (%)
	Others	Reserved
BIT12	1	Modify the upper limit according to 4-bit byte restriction.
	0	Modify the upper limit according to character restriction.
BIT15 ~ BIT13	Reserved	

The drive control parameters could complete drive start, stop, and set running frequency etc., via retrieving the drive's state parameters, it could obtain the drive's running frequency, output current, output torque etc. Specific drive's control parameters and state parameters are listed in the following:

Drive's Control Parameter Index

Register Address	Parameter Name	Whether Save after Power off
0x3200	Control command Character	No
0x3201	Main setting	Main setting value is the running frequency given.
0x3202	Running frequency setting	Yes
0x3203	Digit closed-loop given	Yes
0x3204	Pulse closed-loop given	Yes
0x3205	Analog output A01 setting	No
0x3206	Analog output AO2 setting	No
0x3207	Digit output DO setting	No
0x3208	Frequency proportion setting	No
0x3209	Virtual terminal control setting	No
0x320A	Set accelerating time 1	Yes
0x320B	Set decelerating time 1	Yes

Drive's State Parameter Index

Register Address	Parameter Name
0x3300	Operation state character 1
0x3301	Actual operation value of the current main setting
0x3302	Slave model
0x3303	Drive model
0x3304	Software version
0x3305	Current running frequency
0x3306	Output Current
0x3307	Output Voltage
0x3308	Output Power

0x3309	Running rotational speed
0x330A	Running linear speed
0x330B	Analog closed-loop feedback
0x330C	Bus voltage
0x330D	External counter
0x330E	Output torque
0x330F	Switching value input/output terminal state: BIT0 ~ 15=X1 ~ X8,Y1,Y2,TC,FAN,BRAKE,FWD,REV
0x3310	Actual length
0x3311	Running frequency after compensation
0x3312	The first running fault
0x3313	The second running fault
0x3314	The third (the latest) running fault
0x3315	Running frequency setting
0x3316	Running rotational speed setting
0x3317	Analog closed-loop given
0x3318	Linear speed setting
0x3319	AI1
0x331A	AI2
0x331B	Set length
0x331C	Set accelerating time 1
0x331D	Set decelerating time 1
0x331E	Running command given channels: 0: Panel control 1: Terminal control 2: Serial port control
0x331F	Drive state character 2
0x3320	Frequency given channels: 0: Digit given 1, keyboard ▲ ▼ adjustment 1: Digit given 2: Terminal UP/DN adjustment 2: Digit given 3: Serial Port 3: AI1 Analog Given 4: AI2 Analog Given 5: Terminal PULSE given 6: Panel analog given
0x3321	Accumulated length

Drive's control bits are defined as follows:

Control Words (Bits)	Value	Significance	Function Description
BIT2, 1, 0	111B	Running command	Start the drive
	110B	Method 0 parking	Park according to the set decelerating time
	101B	Method 1 parking	Park freely
	011B	Method 2 parking	The fastest decelerating time parking.
	100B	External fault parking	Park freely, and the drive displays an external fault.
	Others	No command	
BIT3	1	Reversal	Rotational direction when the running command is set valid (invalid for Jog commands)
	0	Forward rotating	
BIT4	1	Jog forward rotating	
	0	Jog forward rotating invalid	
BIT5	1	Jog reversal	
	0	Jog reversal invalid	
BIT6	1	Allow accelerating and decelerating	Reserved
	0	Prohibit accelerating and decelerating	
BIT7	1	Upper computer control valid	Control word distributed by the current upper computer valid.
	0	Upper computer control invalid	Control word distributed by the current upper computer invalid.
BIT8	1	Main setting valid	
	0	Main setting invalid	
BIT9	1	Fault reset valid	
	0	Fault reset invalid	
BIT15 ~ 10	000000B	Reserved	

Note: For Jog running givens (BIT4, BIT5), they could not be valid together with control words BIT0 ~ BIT2!

Bit definition of the drive's state word 1 is as follows:

State Word (Bit)	Value	Significance	Remarks
BIT0	1	Drive running	
	0	Drive shutdown	
BIT1	1	Drive reversal	
	0	Drive forward rotating	
BIT2	1	Reach main setting	
	0	Do not reach main setting	
BIT3	1	Allow communication control	
	0	Forbid communication	
BIT7 ~ 4	0000B	Reserved	
BIT15 ~ 8	00 ~ 0xFF	Fault code	0: Indicates the drive is normal; Non-0: Indicates there's a fault, and for the significance of specific fault code, please refer to the user manual for drive of related type. For example, the fault code of motor overload E014 is 0x0E, while undervoltage is 0x1F.

Bit definition of the drive's state word 2 is as follows:

State Word (Bit)	Value	Significance
BIT0	1	Jog running
	0	Non-Jog running
BIT1	1	Closed-loop running
	0	Non-closed-loop running
BIT2	1	PLC running
	0	Non-PLC running
BIT3	1	Multi-band frequency running
	0	Non-multi-band frequency running
BIT4	1	Normal running
	0	Abnormal running
BIT5	1	Swing frequency
	0	Non-swing frequency
BIT6	1	Undervoltage
	0	Normal voltage
Others		Reserved

Notes:

1. For data fames of ASCII format, if the frame length is an even, this frame will be discarded.

2. External drive cannot communicate under restoring to default parameters and parameter identification stage, and communication will return to normal after completion.

3. Internal parameters of the drive F3.09, F0.03 and F0.04 cannot be modified via communication settings, and communication cannot modify F0.04, but user password could be verified via writing F0.04.

4. When multiple multifunction input terminal functions are set the same, it will cause function disorders, and it is required to avoid such situation when users modify multifunctional terminal function via MODBUS protocol.

CRC Check

Considering the need to improve speed, CRC-16 is usually realized by adopting the form of table, and the following is the C language source code to realize CRC-16, note that high-low bytes have been exchanged in the final result, which means the result is the CRC checksum to be sent.

```
unsigned short CRC16 ( unsigned char      /* The function returns the CRC as a
*msg, unsigned char length)               unsigned short type */
{

      unsigned char uchCRCHi = 0xFF ;     /* high byte of CRC initialized */
      unsigned char uchCRCLo =            /* low byte of CRC initialized */
0xFF ;
      unsigned uIndex ;                   /* index into CRC lookup table */
      while (length--)                    /* pass through message buffer */
      {
            uIndex = uchCRCLo ^           /* calculate the CRC */
*msg++ ;
            uchCRCLo = uchCRCHi ^
(crcvalue[uIndex] >>8);
            uchCRCHi
=crcvalue[uIndex]&0xff;
       }
       return (uchCRCHi |
uchCRCLo<<8) ;
}
                                          /* Table of CRC values */
const unsigned int   crcvalue[ ] = {
0x0000,0xC1C0,0x81C1,0x4001,0x01C3,0xC003,0x8002,0x41C2,0x01C6,0xC0
06,0x8007,0x41C7,
0x0005,0xC1C5,0x81C4,0x4004,0x01CC,0xC00C,0x800D,0x41CD,0x000F,0xC
1CF,0x81CE,0x400E,
```

0x000A,0xC1CA,0x81CB,0x400B,0x01C9,0xC009,0x8008,0x41C8,0x01D8,0xC018,0x8019,0x41D9,

0x001B,0xC1DB,0x81DA,0x401A,0x001E,0xC1DE,0x81DF,0x401F,0x01DD,0xC01D,0x801C,0x41DC,

0x0014,0xC1D4,0x81D5,0x4015,0x01D7,0xC017,0x8016,0x41D6,0x01D2,0xC012,0x8013,0x41D3,

0x0011,0xC1D1,0x81D0,0x4010,0x01F0,0xC030,0x8031,0x41F1,0x0033,0xC1F3,0x81F2,0x4032,

0x0036,0xC1F6,0x81F7,0x4037,0x01F5,0xC035,0x8034,0x41F4,0x003C,0xC1FC,0x81FD,0x403D,

0x01FF,0xC03F,0x803E,0x41FE,0x01FA,0xC03A,0x803B,0x41FB,0x0039,0xC1F9,0x81F8,0x4038,

0x0028,0xC1E8,0x81E9,0x4029,0x01EB,0xC02B,0x802A,0x41EA,0x01EE,0xC02E,0x802F,0x41EF,

0x002D,0xC1ED,0x81EC,0x402C,0x01E4,0xC024,0x8025,0x41E5,0x0027,0xC1E7,0x81E6,0x4026,

0x0022,0xC1E2,0x81E3,0x4023,0x01E1,0xC021,0x8020,0x41E0,0x01A0,0xC060,0x8061,0x41A1,

0x0063,0xC1A3,0x81A2,0x4062,0x0066,0xC1A6,0x81A7,0x4067,0x01A5,0xC065,0x8064,0x41A4,

0x006C,0xC1AC,0x81AD,0x406D,0x01AF,0xC06F,0x806E,0x41AE,0x01AA,0xC06A,0x806B,0x41AB,

0x0069,0xC1A9,0x81A8,0x4068,0x0078,0xC1B8,0x81B9,0x4079,0x01BB,0xC07B,0x807A,0x41BA,

0x01BE,0xC07E,0x807F,0x41BF,0x007D,0xC1BD,0x81BC,0x407C,0x01B4,0xC074,0x8075,0x41B5,

0x0077,0xC1B7,0x81B6,0x4076,0x0072,0xC1B2,0x81B3,0x4073,0x01B1,0xC071,0x8070,0x41B0,

0x0050,0xC190,0x8191,0x4051,0x0193,0xC053,0x8052,0x4192,0x0196,0xC056,0x8057,0x4197,

```
0x0055,0xC195,0x8194,0x4054,0x019C,0xC05C,0x805D,0x419D,0x005F,0xC1
9F,0x819E,0x405E,
0x005A,0xC19A,0x819B,0x405B,0x0199,0xC059,0x8058,0x4198,0x0188,0xC04
8,0x8049,0x4189,
0x004B,0xC18B,0x818A,0x404A,0x004E,0xC18E,0x818F,0x404F,0x018D,0xC0
4D,0x804C,0x418C,
0x0044,0xC184,0x8185,0x4045,0x0187,0xC047,0x8046,0x4186,0x0182,0xC042
,0x8043,0x4183,
0x0041,0xC181,0x8180,0x4040}
```

If CRC checksum of each sending byte is calculated online, it will take a long time, but could save program space occupied by tables.CRC codes to be calculated on line are as follows:

```
unsigned int crc_check(unsigned char *data,unsigned char length)
{
    int i;
    unsigned crc_result=0xffff;
  while(length--)
{
    crc_result^=*data++;
    for(i=0;i<8;i++)
    {
        if(crc_result&0x01)
            crc_result=(crc_result>>1)^0xa001;
      else
            crc_result=crc_result>>1;
    }
}
return (crc_result=((crc_result&0xff)<<8)|(crc_result>>8));
}
```

Application examples

The command to start 1#drive for forward rotating, and to set the rotational speed at 50.00HZ (which is 5000 internally) is as follows:

	Address	Function Code	Register Address	Register Number	Register Content Bytes	Register Content	Checksum
Request	0x01	0x10	0x3200	0x0002	0x04	0x01C7,0x1388	0x0399
Respon	0x01	0x10	0x3200	0x0002	None	None	0x4F70

1#drive parks at the quickest speed:

Address	Function Code	Register Address	Register Content	Checksum
0x01	0x06	0x3200	0x00C3	0xC723
0x01	0x06	0x3200	0x00C3	0xC723

5#drive Jog rotates forward:

Address	Function Code	Register Address	Register Content	Checksum
0x05	0x06	0x3200	0x00D0	0x876A
0x05	0x06	0x3200	0x00D0	0x876A

5#drive Jog stops:

Address	Function Code	Register Address	Register Content	Checksum
0x05	0x06	0x3200	0x00C0	0x86A6
0x05	0x06	0x3200	0x00C0	0x86A6

5# drive fault resets:

Address	Function Code	Register Address	Register Content	Checksum
0x05	0x06	0x3200	0x0280	0x86C6
0x05	0x06	0x3200	0x0280	0x86C6

Read 4#drive's running frequency, and drive response running frequency is 50.00HZ:

Address	Function Code	Register Address	Register Number or Read Bytes	Register Content	Checksum
0x04	0x03	0x3301	0x0001	None	0xDADB
0x04	0x03	None	0x02	0x1388	0x7912

Read 4#drive's running frequency, and drive response running frequency is 50.00HZ.

Address	Function Code	Register Address	Register Number or Read Bytes	Register Content	Checksum
0x04	0x03	0x3301	0x0001	None	0xDADB
0x04	0x03	None	0x02	0x1388	0x7912

Modify 5#drive's accelerating time 1 (which is function code F0.10) is 10.0s, which does not save after power off.

Address	Function Code	Register Address	Register Content	Checksum
0x05	0x06	0x000A	0x0064	0xA9A7
0x05	0x06	0x000A	0x0064	0xA9A7

Read 5#drive's output current, and drive response output current is 30.0A.

Address	Function Code	Register Address	Register Number or Read bytes	Register Content	Checksum
0x05	0x03	0x3306	0x0001	None	0x6ACB
0x045	0x03	None	0x02	0x12C	0x49C9

Read 5#drive's decelerating time (which is F0.11), and drive response decelerating time is 6.0S.

Address	Function Code	Register Address	Register Number or Read bytes	Register Content	Checksum
0x05	0x03	0x000B	0x0001	None	0xF4C4
0x05	0x03	None	0x02	0x003C	0x4995

Drive's scaling relationship

A) Frequency's scaling is 1: 100

To make the drive rotate at 50Hz, the main setting should be 0x1388 (5000).

B) Time's scaling is 1: 10

To make the drive accelerating time as 30S, the function code should be set to 0x012c (300).

C) Current's scaling is 1: 10

If the drive's feedback current is 0x012c, current of this drive is 30A.

D) Output power is an absolute value.

F) Others (i.e. terminal input and output etc.) Please refer to the drive's user manual.

Warranty Agreement

1. Warranty scope only includes the drive body.
2. For normal use, the drives fail or be damaged within 18 months, the company is responsible for the warranty; more than 18 months, will charge a reasonable maintenance costs.
3. Warranty period starting time is the date of manufacture.
4. Within 18 months, some maintenance fees should be charged in the following situations:
   - Do not follow the operating manual steps to cause the damage to the drive 。
   - Damaging the drive because of fires, water, abnormal voltage and etc..
   - Wiring error causes the damage to the drive.
   - Damaging the drive because of using non-normal functions .
5. Related services fees are according to the actual costs. If the fees are written in the contract , the contract prevails.
6. Please keep this card and show it to the maintenance supporter when the drive is repaired
7. If the problems happen, please contact directly with the supplier, or with our company.

Drive warranty

User's Company:	
Address:	
Zip:	Contact:
Phone:	Fax:
Machine series number:	
Power:	Machine series:
Contract Number:	Purchase Date:
Service company:	
Contact:	Phone:
Repairer:	Phone:
Service Date:	

User opinions and reviews : □Good □Better □General □Poor

Other comments :

User's Signature : day month year

Company re-visitrecord :

Certificate Of Quality

Checker: _____

This product is approved to leave the factory after inspection