HD20 Series
Multi-function Inverter

HD20 Series

Multi-function Inverter

User Manual

V1.9 2020.03

FOREWORD

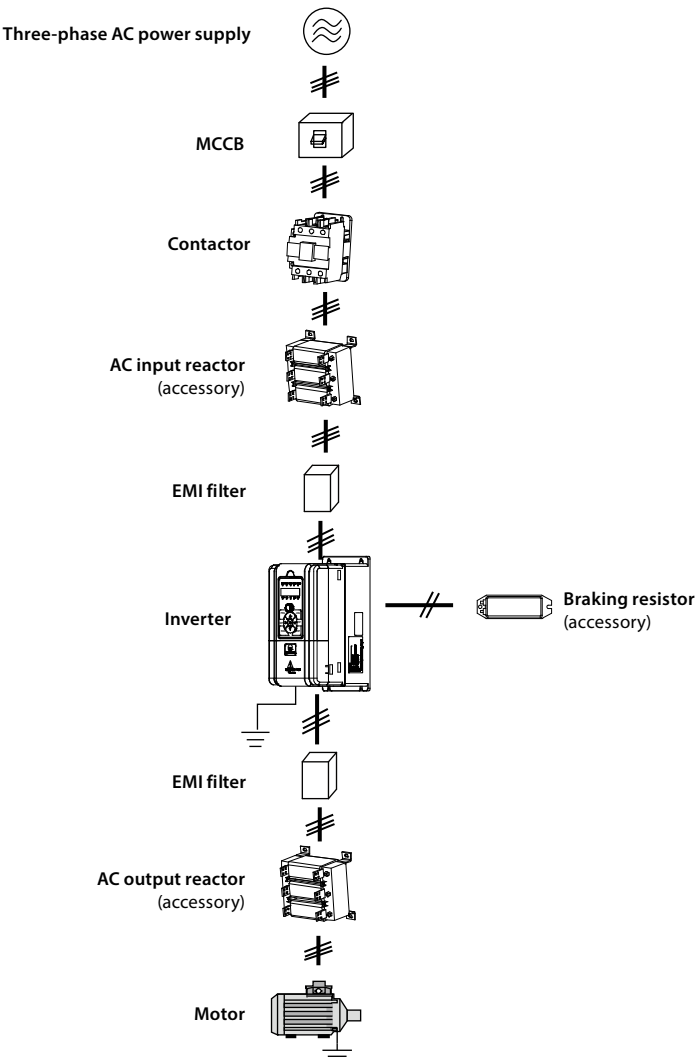
Thank you for purchasing HD20 series multi-function inverter manufactured by Shenzhen Hpmont Technology Co., Ltd.

This User Manual describes how to use HD20 series inverters and their installation wiring, parameter setting, troubleshooting and daily maintenance etc. Before using the product, please read through this User Manual carefully. In addition, please do not use this product until you have fully understood safety precautions.

Note:

- Preserve this Manual for future use.
- If you need the User Manual due to damage, loss or other reasons, please contact the regional distributor of our company or directly contact our company Technical Service Center.
- If you still have some problems during use, please contact our company Technical Service Center.
- Due to product upgrade or specification change, and for the purpose of improving convenience and accuracy of this manual, this manual's contents may be modified.
- Email address: marketing@hpmont.com

Connection with peripheral devices



Version and Revision Records

Time: 2020/3

Version: V1.9

Revised Chapter	Revised Contents

Chapter 6
Appendix A
	• F15.00 - F15.05 added function:
	  • 83: Integration keeping function
	  • 84: Direct input of DC braking
	• F15.39 added function:
	  • Hundred: Analog overrun detection conditions
	  • Ten thousand: Select alarming action
	• F19.32 added function: Ten
	• F19.33, F19.34 added function:
	  • 2: Continue counting
	• Add parameters: F04.23, F15.42, F15.44, F15.45, F15.46
	• Modify the setting range and default of F04.06, F04.08, F04.13, F04.14
	• Modify the default of F04.16, F06.00 - F06.14, F16.19

Quick Start for HD20 Operation

Note:

Some parameters have been set (factory setting) so that you could not set for the initial use.

1. Set the Motor Rating Parameter Correctly

Power on, use keypad to set the following parameters, motor parameters refer to motor nameplate.

Ref. Code	Function	Ref. Code	Function
F08.00	Rated power of motor	F08.03	Rated frequency of motor
F08.01	Rated voltage of motor	F08.04	Rated RPM of motor
F08.02	Rated current of motor		

2. Control the Start/Stop and Set the Running Frequency Via Using the Keypad

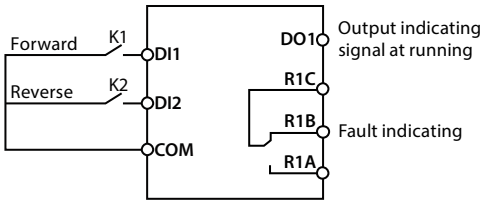
1. Power on. Using the keypad can set motor parameters (see the motor nameplate parameter), running frequency and Acc./Dec. time. See the following table.

Ref. Code	Function	Setting	Meaning
F00.10	Frequency setting source selection	0 (factory setting)	Set by keypad
F00.11	Command setting source selection	0 (factory setting)	Keypad running command channel
F00.13	Starting frequency digital setting	-	Running frequency, adjust according to actual requirement
F03.01	Acc. time 1	-	Acc. time, adjust according to actual requirement
F03.02	Dec. time 1	-	Dec. time, adjust according to actual requirement

2. Pressing panel's **RUN** key can start the inverter, pressing ▲/▼ button increase/decrease set frequency, and pressing **STOP** key can stop the inverter outputting.

3. Control the Start/Stop Via Terminals and Set the Running Frequency Via Keypad

1. The terminal DI1 is forward running signal input, and DI2 is reverse running signal input, their wirings are as following figure.



2. After power on, set the functional parameters in accordance with wirings, as following table.

Ref. Code	Function	Setting	Meaning
F00.10	Frequency setting source selection	3	Analogue setting
F00.11	Command setting source selection	1	Terminal running command source
F15.00	DI1 terminal function selection	2 (factory setting)	Forward running function (terminal forward signal input)
F15.01	DI2 terminal function selection	3 (factory setting)	Rervese running function (terminal rervese signal input)
F16.01	Analogue input AI1 function selection	0	Reserved
F16.00	Display panel with potentiometer function selection	2	Frequency setting source (via potentiometer of display panel)

Note:

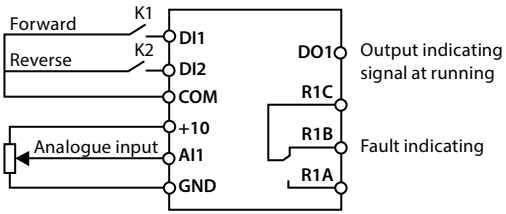
Function parameters F16.00 - F16.02 cannot be the same. If you want to set F16.00 as 2, you should set F16.01 (factory value is 2) as other value (except 2) firstly.

3. By rotating the potentiometer of display panel to set the running frequency.

4. Close the K1 of the wiring diagram, the motor will run forward; Close K2, run reverse; Simultaneously close or disconnect, the motor will stop.

4. Control the Start/Stop Via Terminals and Set the Running Frequency Via Analogue

1. The terminal DI1 is forward running signal input, and DI2 is reverse running signal input, their wirings are as following figure.



2. After power on, set the functional parameters in accordance with wirings, as following table.

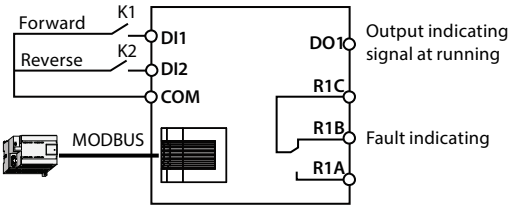
Ref. Code	Function	Setting	Meaning
F00.10	Frequency setting source selection	3	Analogue setting
F00.11	Command setting source selection	1	Terminal running command source
F03.01	Acc. time 1	-	Acc. time, adjust according to actual requirement
F03.02	Dec. time 1	-	Dec. time, adjust according to actual requirement
F15.00	DI1 function	2 (factory setting)	Forward running function (terminal forward signal input)
F15.01	DI2 function	3 (factory setting)	Rervese running function (terminal rervese signal input)
F16.01	AI1 function	2 (factory setting)	Frequency setting source (set by AI1)

3. Set the running frequency by adjusting AI1 analogue input.

4. Close the K1 of the wiring diagram, the motor will run forward. Close K2, run reverse. Simultaneously close or disconnect, the motor will stop.

5. Control the Start/Stop Via Terminals and Set the Running Frequency Via Communication

1. The terminal DI1 is forward running signal input, and DI2 is reverse running signal input, their wirings are as following figure.



2. After power on, set the functional parameters in accordance with wirings, as following table.

Ref. Code	Function	Setting	Meaning
F00.10	Frequency setting source selection	2	SCI communication setting
F00.11	Command setting source selection	1	Terminal running command source
F03.01	Acc. time 1	-	Acc. time, adjust according to actual requirement
F03.02	Dec. time 1	-	Dec. time, adjust according to actual requirement
F15.00	DI1 function	2 (factory setting)	Forward running function (terminal forward signal input)
F15.01	DI2 function	3 (factory setting)	Rervese running function (terminal rervese signal input)
F15.18	DO1 function	2 (factory setting)	Inverter is running
F17.00	Data format	0 (factory setting)	1-8-2 format, no parity, RTU
F17.01	Baud rate	3 (factory setting)	9600bps
F17.02	Local address	2 (factory setting)	

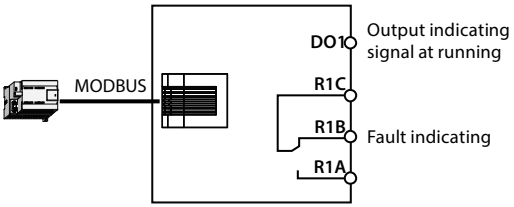
3. Close the K1 of the wiring diagram, the motor will run forward; Close K2, run reverse; Simultaneously close or disconnect, the motor will stop.

4. Modify the running frequency via SCI communication function code 0X06 writing register 0x3201. Such as: Modify the local address two of slave with running frequency of 45.00Hz, as following table.

Command Frame	Address	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E
Response Frame	**Address**	**Code**	**Register Address**		**Register Content**		**Checksum**	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

6. Control the Start/Stop and Set the Running Frequency Via Using Communication

1. The communication wirings are as following figure.



2. After power on, set the functional parameters in accordance with wirings, as following table.

Ref. Code	Function	Setting	Meaning
F00.10	Frequency setting source selection	2	SCI communication setting
F00.11	Command setting source selection	2	SCI communication running command source
F03.01	Acc. time 1	-	Acc. time, adjust according to actual requirement
F03.02	Dec. time 1	-	Dec. time, adjust according to actual requirement
F17.00	Data format	0 (factory setting)	1-8-2 format, no parity, RTU
F17.01	Baud rate	3 (factory setting)	9600bps
F17.02	Local address	2 (factory setting)	

3. Start and stop the local address 2 of inverter via SCI communication function code 0x06 writing register 0x3200, such as forward start command, as following table.

E.g: Forward start command is as following:

Command/ Response Frame	Address	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x01	0x4B	0x41

E.g: Dec stop command is as following:

Command/ Response Frame	Address	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x04	0x8B	0x42

4. Modify the running frequency via SCI communication function code 0x06 writing register 0x3201.

E.g: Set the running frequency of local address = 45.00Hz:

Command/ Response Frame	Address	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

7. Motor Parameter Auto-tuning

1. Motor parameter auto-tuning can be only done in keypad mode.

2. Correct wiring.

3. Power on, set motor parameter (F08.00 - F08.04) by keypad.

4. Parameter auto-tuning, available auto-tuning methods for different control mode are shown as below table.

Control Mode	Auto-tuning Method (recommended)	
V/f control	Manual torque boost Use static, rotate self-tuning	Automatic torque boost Use still, rotate self-tuning
Vector control	Use rotation auto-tuning	

Static Self-tuning:

F08.06 = 1 (static auto-tuning), press **PRG** key to the stop parameter display state, press **RUN** key to start the auto-tuning. Auto-refresh F08.07 - F08.09 after auto-tuning.

Ref. Code	Function	Ref. Code	Function
F08.07	Motor stator resistance	F08.09	Motor leakage inductance
F08.08	Motor rotor resistance		

Rotary Auto-tuning:

Before turning the auto-tuning, first disconnect the motor from the load.

Then set F08.06 = 2 (Rotate Auto Tuning), press **PRG** key to go to the stop parameter display state, press **RUN** key to start auto tuning.

In the motor rotation process, there may be shock or even overcurrent, this time should immediately press **STOP** key to stop the parameter tuning, and adjust the Acc. and Dec. time and F09.15, F09.16 (suppression shock coefficient) to mitigate possible shocks.

After auto tuning, auto refresh F08.07 - F08.16.

Ref. Code	Function	Ref. Code	Function
F08.07	Motor stator resistance	F08.09	Motor leakage inductance
F08.08	Motor rotor resistance	F08.10	Motor mutual resistance
		F08.11	Motor no-load excitation current

8. Input/output Parameter Setting for Analogue AI and AO Current 4 - 20mA

Analogue 4 - 20mA Input

Current inputs through AI2. Default current: 0 - 20mA. Short connect pin 2&pin 3 of CN4.

To use 4 - 20mA signal to adjust frequency 0 - 50Hz, set parameters according to following:

Method	Ref. Code	Function	Setting	Meaning
By setting analogue curve	F00.10	Frequency setting channel	3	Analogue setting
	F05.01	Line 1 min. setting	20.0%	/
	F16.01	AI1 function	0	No function
	F16.02	AI2 function	2	Frequency setting
By setting analogue bias and gain	F00.10	Frequency setting channel	3	Analogue setting
	F00.18	Prevent reverse	1	Forbid reverse
	F16.01	AI1 function	0	No function
	F16.02	AI2 function	2	Frequency setting
	F16.08	AI2 bias	-20.0%	AI2 analogue bias
	F16.09	AI2 gain	1.20	AI2 analogue gain

Analogue 4 - 20mA Output

AO1/AO2 can select current output, default: 0 - 20mA.

Short-connect pin 2&3 on CN5 for AO1, and short-connect pin 2&3 of CN6 for AO2.

To achieve 4 - 20mA output, please change bias and gain:

Output	Ref. Code	Function	Setting	Meaning
AO1	F16.22	AO1 bias	20	AO1 analogue bias
	F16.23	AO1 gain	80	AO1 analogue gain
AO2	F16.24	AO2 bias	20	AO2 analogue bias
	F16.25	AO2 gain	80	AO2 analogue gain

CONTENTS

Chapter 1 Safety Information and Precautions

1.1 Safety Definition

Danger

Danger: A Danger contains information which is critical for avoiding safety hazard.

Warning

Warning: A Warning contains information which is essential for avoiding a risk of damage to products or other equipements.

Note

Note: A Note contains information which helps to ensure correct operation of the product.

1.2 About Motor and Load

Compared to the Standard Frequency Operation

The HD20 series inverters are voltage-type frequency inverter and their output is PWM wave with certain harmonic wave. Therefore, the temperature, noise and vibration of the motor will be a little higher than that at standard frequency operation.

Constant Torque at Low-speed Operation

When the inverter drives a standard motor at low-speed running for a long time, the output torque ratings will become worse due to the motor cooling is less effective. In that case, we suggest that you should choose variable frequency motor.

Motor's Overload Protecting Threshold

When choose the adaptive motor, the inverter can effectively implement the motor thermal protection. Otherwise it must adjust the motor protection parameters or other protection measures to ensure that the motor is at a safe and reliable operation.

Operation above the Motor Rated Frequency

If the motor exceeds its rated frequency operation, the noise will increase. It need play attention to the motor vibration as well as ensure the motor bearings and mechanical devices to meet the requirement of operation speed range.

Lubrication of Mechanical Devices

At long time low-speed operation, it should provide periodical lubrication maintenance for the mechanical devices such as gear box and geared motor etc. to make sure the drive results meet the site need.

Mechanical Resonance Point of Load

By setting the skip frequency of the inverter (F05.17 - F05.19) to avoid the load device or the motor mechanical resonance point.

Check the Insulation of the Motor

For the first time using of the motor or after long time storage, it need check the insulation of the motor to avoid damage the inverter because of the worse insulation motor.

Note:

Please use a 500V Mega-Ohm-Meter to test and the insulation resistance must be higher than 5Mohm.

Energy Feedbacks to Inverter

For the occasion to boost load and the like, negative torque often occurs. You should consider setting proper parameters of the braking unit if the inverter is prone to overcurrent or overvoltage fault trip.

Requirement for Leakage Current Protector RCD

Since the device generates high leakage current which goes through the protective grounding conductor, please install B type leakage current protector RCD on one side of the power supply.

For the selection of RCD, users need to consider the possible problems of ground leakage current in both transient status and steady status at start and during running. It is recommended to choose either special RCD that can suppress the higher harmonics, or general RCD that has more after current.

Warning for Ground Mass Leakage Current

The device generates mass leakage current, so users need to confirm the reliable grounding before connect to the power supply. The grounding should comply with the local relative IEC standard.

1.3 About HD20

No Capacitor or Varistor on the Output Side

Since the inverter output is PWM wave, it is strictly forbidden to connect capacitor for improving the power factor or varistor for lightning protection to the output terminals so as to avoid the inverter fault tripping or component damage.

Contactors and Circuit Breakers Connected to the Output of the Inverter

If circuit breaker or contactor needs to be connected between the inverter and the motor, be sure to operate these circuit breakers or contactor when the inverter has no output, so as to avoid any damage to the inverter.

Running Voltage

The inverter is prohibited to be used beyond the specified range of operation voltage. If needed, please use the suitable voltage regulation device to change the voltage.

Capacitor Energy Storage

When the AC power supply is cut off, capacitor of HD20 sustains deadly power for a while. So to disassemble HD20 that is powered, please cut off the AC power supply for more than 10 minutes, confirm the internal charge indicator is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

Generally, the internal circuit enables the capacitor to discharge. However, the discharging may fail in some exceptions. In these cases, users need to consult Hpmont or our regional distributor.

Change Three-phase Input to Single-phase Input

For three-phase input inverter, the users should not change it to single-phase input.

If you have to use single-phase power supply, you should disable the input phase-loss protection function. And the bus-voltage and current ripple will increase, which not only influences the life of electrolytic capacitor but also deteriorates the performance of the inverter. In that case, the inverter must be derating and should be within the inverter 60% rated value.

Lightning Surge Protection

The inverter internal design has lightning surge overcurrent protection circuit, and has certain self-protection capacity against the lightning.

Altitude and Derating

In area where altitude exceeds 1000 meters, HD20 should be derating since the heatsink efficiency will be reduced because of the tenuous air.

The rated value of output current derates by 1% for each 100m increase of the altitude. I.e for the altitude of 4000m, derated rate is 30% for rated current of HD20. Figure 1-1 is the derating curve of the inverter rated current and the altitude.

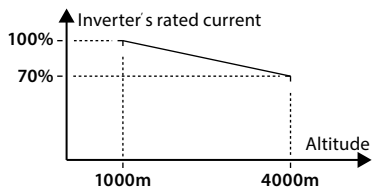


Figure 1-1 Derating curve of rated current and altitude

Chapter 2 Product Information

2.1 Model Code Explanation

HD20-4T5P5G

Product Series

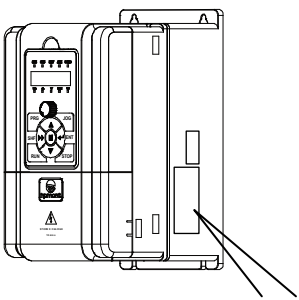
Voltage Rating
200 - 240VAC = 2
380 - 460VAC = 4

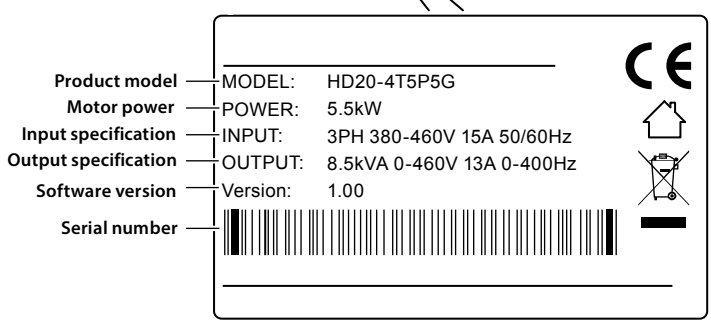
Input phase
Single-phase = S
Single-phase / Three-phase input = D
Three-phase input = T

Power

Product Type
General = G

2.2 Nameplate





2.3 Rated Value

Model	Motor (kW)	Rated Capacity (kVA)	Rated Input Current (A)	Rated Output Current (A)
Single-phase power supply: 200 - 240V, 50/60Hz				
HD20-2S0P2G	0.25	0.6	4.3	1.7
HD20-2S0P4G	0.4	1.0	5.8	2.5
Single/three-phase power supply: 200 - 240V, 50/60Hz				
HD20-2D0P7G	0.75	1.5	10.5	4.0
HD20-2D1P5G	1.5	2.8	18.5	7.5
HD20-2D2P2G	2.2	3.8	24.1	10.0
Three-phase power supply: 380 - 460V, 50/60Hz				
HD20-4T0P4G	0.4	1.0	1.8	1.4
HD20-4T0P7G	0.75	1.5	3.4	2.3
HD20-4T1P5G	1.5	2.5	5.2	3.8
HD20-4T2P2G	2.2	3.4	7.3	5.1
HD20-4T3P0G	3.0	4.8	9.5	7.2
HD20-4T4P0G	4.0	5.9	11.9	9.0
HD20-4T5P5G	5.5	8.5	15	13

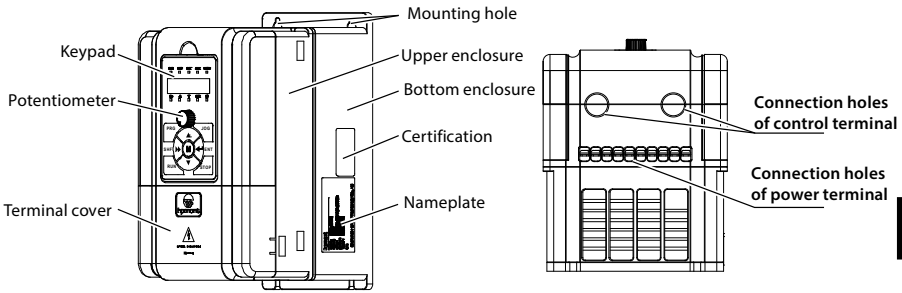
2.4 Technical Data

Electrical	
Input voltage	Single/three-phase: 200 - 240V Three-phase: 380 - 460V Fluctuating within ±10%, unbalance rate <3%
Input frequency	50/60Hz ± 5%
Output voltage	0V - input voltage
Output frequency	0 - 400.00Hz
Performance	
Max. current	150% rated output current for 2 minutes 180% rated output current for 10 seconds
Control mode	V/f, SVC
Running command	Keypad; Terminal; SCI communication
Speed setting	Digital; Analogue/pulse; SCI communication
Speed resulotion	Digital setting: 0.01Hz Analogue setting: 0.1% × max-frequency
Speed control accuracy	SVC: ±0.5%
Speed control range	SVC: 1:100
Torque control response	SVC: <200ms
Start torque	SVC: 180% rated torque/0.5Hz
Torque control accuracy	±5%

Characteristic Functions	
Parameter upload and download function	You can achieve two sets of parameters from the inverter control keypad copied to the control keypad and copied from the operation keypad to the inverter control keypad
Programmable I/O terminals	Input terminal function can be edited and output terminal function can be edited
Process PID adjustment	Internal process PID module
Simple PLC	To achive time and multi-frequency output with internal simple PLC module
Wobble operation	Internal wobble operation module
Length control	Internal length control module
With braking unit	Built-in braking unit
Compatible with a variety of communication protocols	Standard Modbus communication protocol. The optional PROFIBUS bus module is compatible with the PROFIBUS protocol; Optional DeviceNet bus module is compatible with DeviceNet protocol; Optional CAN bus module is compatible with CAN communication protocol
Protection Functions	
Stall overvoltage	Bus voltage can auto-control against overvoltage fault
Auto-limited current protection	Output current can auto-limit against overcurrent fault
Overload pre-alarm and alarm	Overload early pre-alarm and protect
Load loss protection	Load loss alarm function
I/O phase loss protection	I/O phase loss auto-detect and alarm function
Braking unit fault protection	Braking unit detecion and alarming function
Power output grounding fault protection	Power output grounding fault protection is enabled
Power output short circuit protection	Power output short circuit protection is enabled
DC bus short circuit protection	IGBT shoot through protection
Input/output	
Analogue power supply	+10V, max. current 100mA
Digital supply	+24V, max. current 200mA
Analogue input	AI1: 0 - 10V AI2: -10 - +10V/0 - 20mA (selectable voltage/current) Potentiometer on the display panel: 0 - 5V
Analogue output	AO1, AO2: 0 - 10V/0 - 20mA (selectable voltage/current)
Digital input	DI1 - DI6, DI6 can be selected as high-speed pulse signal
Digital output	DO1, DO2, DO2 can be selected as high frequency pulse signal output
Programmable relay output	R1A/R1B/R1C: Contact rating 250VAC/3A or 30VDC/1A
SCI communication	RJ45 interface

Keypad	
LED display	Five LEDs display Setting frequency, output frequency, output voltage, output current, motor speed, output torque, switching value terminal, status parameter, programm menu parameter and fault code etc.
LCD display	Optional (HD-LCD), display operation contents in Chinese or English
Parameter copy	Both LED and LCD keypad can achive quick parameter copy
Indicator	5 unit indicators, 5 status indicators
Environment	
Running temperature	-10 - +40℃, max. 50℃, air temperature fluctuation is less than 0.5℃/min The derating value of output current of HD20 shall be 2% for each degree centigrade above 40℃. Max. allowed temperature is 50℃
Storage temperature	-40 - +70℃
Location for use	Indoor, preventing from direct sunlight, no dust, corrosive, flammable gases, oil mist, water vaper, dripping or salt etc.
Altitude	Less than 1000 meters, otherwise should be derating use
Humidity	Less than 95%RH, non-condensing
Vibration resistance	It is 3.5m/s^2 in 2 - 9Hz, it is 10m/s^2 (IEC60721-3-3) in 9 - 200Hz
Protection class	IP20
Pollution level	Level 2 (dry, non canducting dust pollution)
Accessories	
I/O board	HD20-EIO, HD20-PIO
Bus communication	PROFIBUS option [HDFB-PROFIBUS-DP] DeviceNet option [HDFB-DeviceNet] CAN option [HDFB-CAN]
About keypad	Status keypad [HD-LED-L] Small-size keypad [HD-LED-P-S] LCD keypad [HD-LED] LCD keypad [HD-LCD] Mounting base to keypad [HD-KMB] Small-size external mounting base [HD-KMB-S] 1m/2m/3m/6m extension cable to keypad [HD-CAB-1M/2M/3M/6M]

2.5 Parts of Inverter



Chapter 3 Mechanical Installation

3.1 Precautions

Danger

- Do not install if HD20 is incomplete or impaired.
- Please see the controller size and weight to take appropriate tools for handing, avoid harming from sharp edges or injured by a dropped controller.
- Make sure that HD20 is far from the explosive and flammable things.
- Do not do wiring operation until power supply is cut off for more than 10 minutes, the internal charge indicator of HD20 is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.

Warning

- It is required not only carry the keypad and the cover but also the inverter bottom enclosure.
- Do not let wires, screws or residues fall into HD20 when installing.

3.2 Installation Site Requirement

Ensure the Installation Site Meets the Following Requirements:

- Do not install at the direct sunlight, moisture, water droplet location;
- Do not install at flammable, explosive, corrosive gas and liquid location;
- Do not install at oily dust, fiber and metal powder location;
- Be vertical installed on fire-retardant material with a strong support;
- Make sure adequate cooling space for HD20 so as to keep ambient temperature between -10 - +40℃;
- Install at where the vibration is 3.5m/s^2 in 2 - 9Hz, 10m/s^2 in 9 - 200Hz (IEC60721-3-3);
- Install at where the humidity is less than 95%RH and non-condensing location;
- Protection level of HD20 is IP20 and pollution level is 2 (dry, non-conducting dust pollution).

Note:

1. It needs derating use running temperature exceeds 40 ℃. The derating value of the output current of HD20 shall be 2% for each degree centigrade. Max. allowed temperature is 50 ℃.

2. Keep ambient temperature between -10 - +40 ℃. It can improve the running performance if install at location with good ventilation or cooling devices.

3.3 Installation Direction and Space Requirements

To achieve good cooling efficiency, install the inverter perpendicularly and always provide the following space to allow normal heat dissipation.

HD20 series inverters can be mounted in parallel, shown in Figure 3-1.

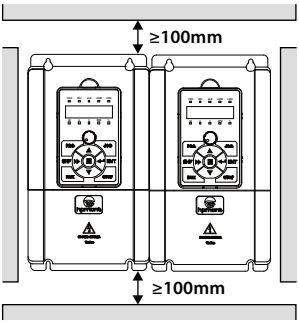


Figure 3-1 Parallel installation of the inverter

When one inverter is mounted on the top of the other, an air flow diverting plate should be fixed in between. Just as shown in Figure 3-2.

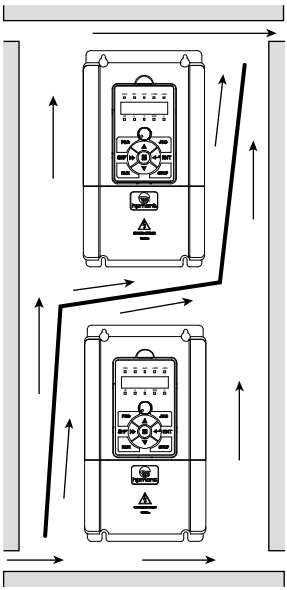


Figure 3-2 Installation of several inverters

3.4 Dimensions and Mounting Size

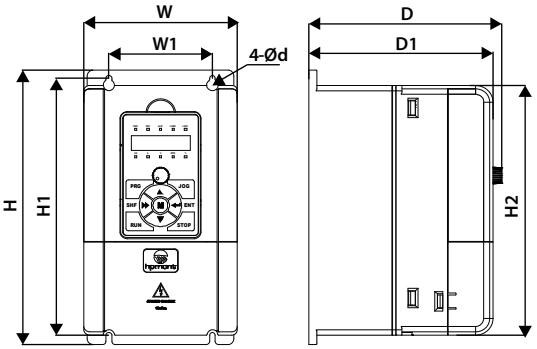


Figure 3-3 Dimensions of HD20 inverter

Table 3-1 HD20 dimensions

Model	Dimension (mm)			Mounting size (mm)					GW
	W	H	D	W1	H1	H2	D1	d	(kg)
HD20-2S0P2G	100	183	140	70	171	160	132	5	1.3
HD20-2S0P4G									
HD20-2D0P7G	115	221	170	87	206	200	162	5	2.1
HD20-2D1P5G									2.1
HD20-4T0P4G									2.0
HD20-4T0P7G									2.0
HD20-4T1P5G									2.1
HD20-2D2P2G	135	241	170	91	226	220	162	5	2.4
HD20-4T2P2G									2.3
HD20-4T3P0G									2.4
HD20-4T4P0G									2.4
HD20-4T5P5G									2.4

3.5 Install and Dismantle Keypad

According to the direction of Figure 3–4, press the keypad until hear a "click" sound.

Do not install the keypad from other directions or it will cause poor contact.

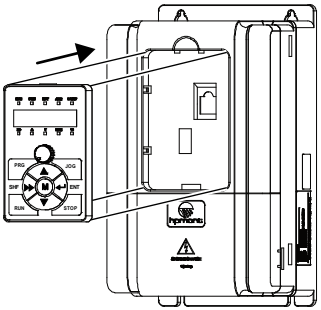


Figure 3–4 Install keypad

There are two steps in Figure 3–5.

First, press the hook of the keypad according to direction 1. Second, take out of the keypad according to direction 2.

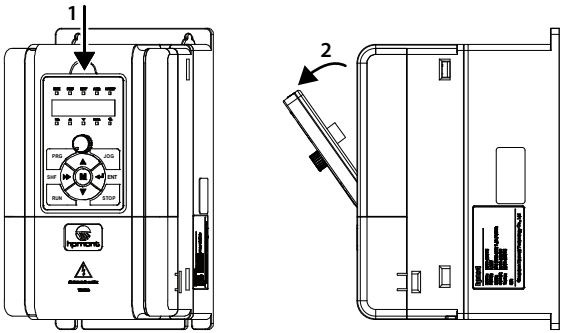
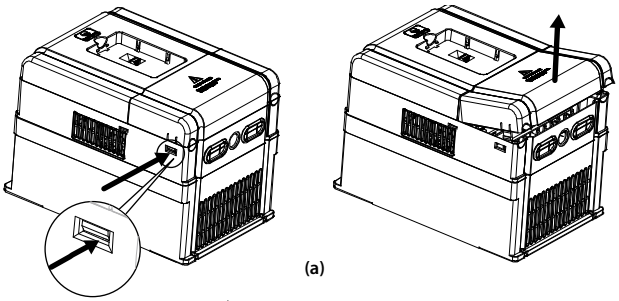


Figure 3–5 Dismantle keypad

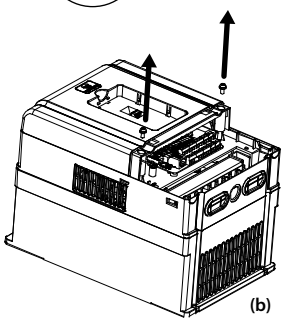
3.6 Dismantle Plastic Cover

The upper cover and the lower cover of the HD20 series inverter are removable. The dismantle step is shown as Figure 3-6.

Before removing the upper cover, please take away the keypad.



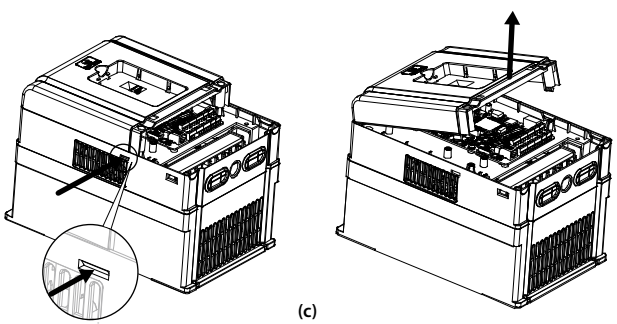
(a)



(b)

The removing processes of plastic cover board:

1. Extrude the hooks at both sides together, take off the lower cover, as (a).
2. Dismantle the screws of upper cover, as (b).
3. Extrude the hooks at both sides together, take off the upper cover, as (c).



(c)

Figure 3-6 Dismantle of the plastic cover

Chapter 4 Electrical Installation

4.1 Wiring Precautions

Danger

- Only qualified electrical engineer can perform wiring job.
- To facilitate the input side over-current protection and outage maintenance, connect HD20 with power supply via the MCCB or fuse.
- Do not dismantle HD20 or do wiring operation until the power is cut-off for more than 10 minutes, the internal charge indicator of HD20 is off and the voltage between (+) and (-) of the main circuit terminals is below 36V.
- Check the wiring carefully before connecting emergency stop or safety circuit.
- There is more than 3mA leakage current in HD20 grounding, depending on the running conditions. To ensure safety, HD20 and the motor must connect to separate and independ grounding wire, so as to ground reliably. It must use Type B mode when utilize ground leakage protection devices (ELCB/RCD).
- Do not touch the wire terminals of HD20 when it is live. The main circuit terminals are neither allowed connecting to the enclosure nor short-circuiting.

Warning

- Do not do dielectric strength test on HD20.
- For HD20 with more than 2 year's storage, please use regulator to power it slowly.
- Do wiring connection of the braking resistor or the braking unit according to the wiring figure.
- Make sure the terminals are fixed tightly.
- Do not connect the AC supply cable to the output terminals U/V/W of HD20.
- Do not connect the phase-shifting capacitors to the output circuit.
- Be sure HD20 has ceased output before switching motor or change-over switches.
- The DC bus terminals of HD20 must not be short-circuited.

4.2 Peripheral Accessories Selection

4.2.1 Wiring Specifications of Input and Output

The AC supply to HD20 must be installed with suitable protection against overload and short-circuits, i.e. MCCB (molded case circuit breaker) or equivalent device.

The recommended specification of MCCB, contactor & cables are shown as Table 4-1.

The size of ground wire should accord with the requirement in 4.3.5.4 of IEC61800-5-1.

Table 4-1 HD20 I/O wiring specification

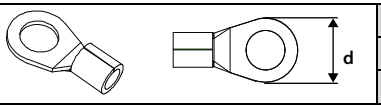
Model	MCCB (A)	Contactor (A)	Supply Cable (mm^2)	Motor Cable (mm^2)	Ground Cable (mm^2)
Single-phase power supply: 200 - 240V, 50/60Hz					
HD20-2S0P2G	16	10	1	0.5	2.5
HD20-2S0P4G	16	10	1	0.5	2.5
Single/three-phase power supply: 200 - 240V, 50/60Hz					
HD20-2D0P7G	16	10	2.5	0.5	2.5
HD20-2D1P5G	20	16	4	1.5	4
HD20-2D2P2G	32	20	6	2.5	6
Three-phase power supply: 380 - 460V, 50/60Hz					
HD20-4T0P4G	10	10	0.5	0.2	2.5
HD20-4T0P7G	10	10	0.5	0.5	2.5
HD20-4T1P5G	16	10	1	0.5	2.5
HD20-4T2P2G	16	10	1.5	1	2.5
HD20-4T3P0G	25	16	2.5	1.5	2.5
HD20-4T4P0G	25	16	2.5	1.5	2.5
HD20-4T5P5G	32	25	4	2.5	4

4.2.2 Power Terminal Lug

Select the lug of power terminal according to the size of terminal, screw size and max. outer diameter of lug. Refer to Table 4-2.

Take the TNR terminal as an example.

Table 4-2 Selection of power terminal lug



Screw Size	M3.5
Tightening Torque (N. M)	0.8 - 1.2
Max. Outer Ciameter d (mm)	7

4.3 Main Circuit Terminals and Wiring

Danger

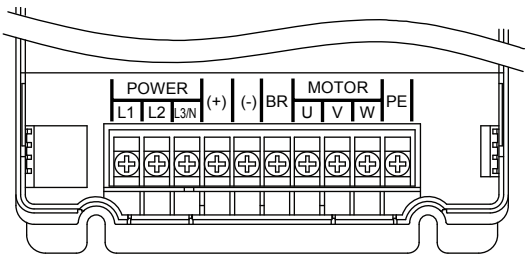
- The bare portions of the power cables must be bound with insulation tapes.

Warning

- Ensure that AC supply voltage is the same as rated input voltage of HD20.

4.3.1 Supply and Motor Terminal

Table 4-3 Supply and motor terminal description

HD20	
• L1, L2, L3/N: Three-phase AC power input terminals • L1, L3/N: Single-phase AC power input terminals • U, V, W: Output terminals, connect to three-phase AC motor • (+), (-): DC supply input terminals • (+), BR: Braking resistor connection terminals • PE: Ground terminal, connect to the ground	

4.3.2 Power Terminal Wiring

During trial operation, make sure the inverter runs forward when the forward command is enabled. If not, switch any two of the output terminals (U, V, W) or modify the setting of parameter F00.17 to change the motor's direction.

The supply and motor connection are shown as Figure 4-1.

For selection of contactor, MCCB, power cable, motor cable and ground cable, refer to section 4.2 Peripheral Accessories Selection (on page 17).

Refer to section 8.2 Braking Resistor (on page 98) for braking resistor and unit.

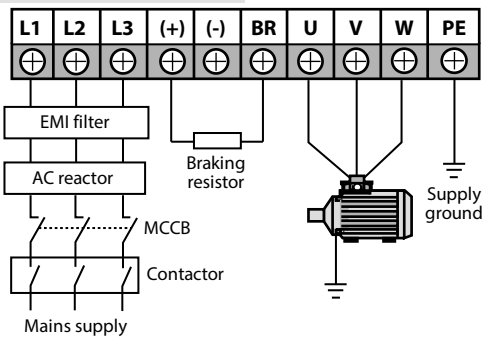


Figure 4-1 Supply and motor connection

4.4 Control Board

Danger

- The control circuit is basically isolated with the power circuit. Do not touch HD20 after it is powered.

Warning

- If the control circuit is connected to external devices with live touchable port, it should increase an additional isolating barrier to ensure that voltage classification of external devices not be changed.
- If connect the communication terminal of the control circuit to the PC, choose the RS485/232 isolating converter which meets the safety requirement.
- Only connect the relay terminal to AC 220V voltage signal. Other control terminals are strictly forbiden for this connection.

4.4.1 Control Board Terminal

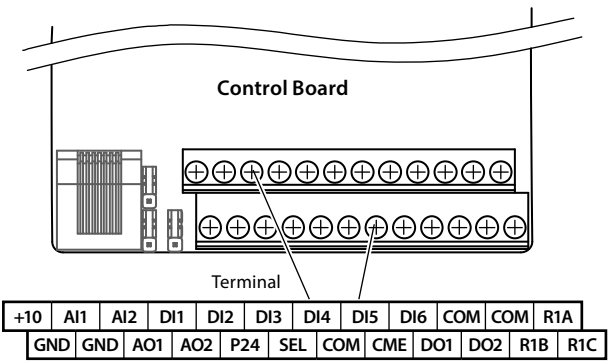


Figure 4-2 Control board terminal

Table 4-3 Control board terminal description

Terminal		Description
+10, GND	+10V power supply	Analogue input use +10V power supply, max. output current is 100mA GND is isolated to COM
AI1, AI2	Anglogue input	AI1 input voltage: 0 - 10V (input impedance: 32kΩ) AI2 input voltage: -10 - +10V (input impedance: 32kΩ) AI2 input current: 0 - 20mA (input impedance: 500Ω) • AI2 can select voltage/current
AO1, AO2	Anglogue output	Output voltage/current signal: 0 - 10V/0 - 20mA Programmable output
GND	Anglogue ground	
DI1 - DI6	Digital input	Programmable bipolar optional input signal Input voltage: 0 - 30VDC DI1 - DI5 input impedance: 4.7kW, DI6 input impedance: 1.6kΩ • DI6 can be selectable for high-frequency input, max-frequency 50kHz

Terminal		Description
P24, COM	Digital power supply	Digital input use +24V as supply, max. output current is 200mA COM is isolated to CME
SEL	Digital input common terminal	SEL and P24 are connected by default (factory setting) • Disconnect SEL and P24 when use external power to drive DI
DO1, CME	Digital output	Programmable optocoupler isolation • DO1, DO2 open collector output, output voltage: 0 - 30VDC, max. output current 50mA • DO2 can be selectable for high-frequency output, max-frequency 50kHz CME is isolated to COM, shortly connected to COM by default • Disconnect CME and COM when they are isolating output
DO2, COM	Digital output	
R1A/R1B/R1C	Relay output	Programmable output, contact rating: 250VAC/3A or 30VDC/1A • R1B,R1C: Normally closed; R1A,R1C: Normally open

Note:

Limit the current within 3A if the relay terminal is to connect to AC 220V voltage signal.

4

4.4.2 Jumper

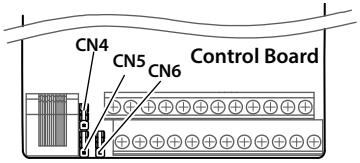
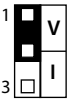
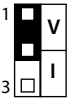
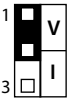
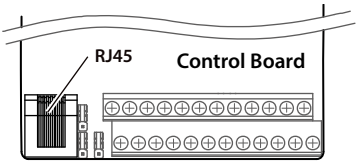


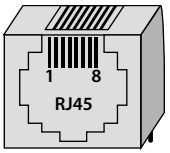
Figure 4-3 Jumper position

Table 4-4 HD20 wire jumper function and setting description

Jumper	Description
CN4 	AI2 can select voltage or current signal. • Pin 1&2 are short-connected, AI2 inputs voltage signal (factory setting). • Pin 2&3 are short-connected, AI2 inputs current signal.
CN5 	AO1 can select voltage or current signal. • Pin 1&2 are short-connected, AO1 outputs voltage signal (factory setting). • Pin 2&3 are short-connected, AO1 outputs current signal.
CN6 	AO2 can select voltage or current signal. • Pin 1&2 are short-connected, AO2 outputs voltage signal (factory setting). • Pin 2&3 are short-connected, AO2 outputs current signal.

4.4.3 Communication Terminal





Pin	Difinition
1,3	+5V
2	485+
4,5,6	GND
7	485-
8	Unused

4.4.4 Control Terminal Wiring

To reduce the interference and attenuation of control signal, length of control cable should limit within 50m. There should be more than 0.3m between the control cable and the motor cable.

The control cable must be shielded cable. The analogue signal cable must be shielded twisted pair.

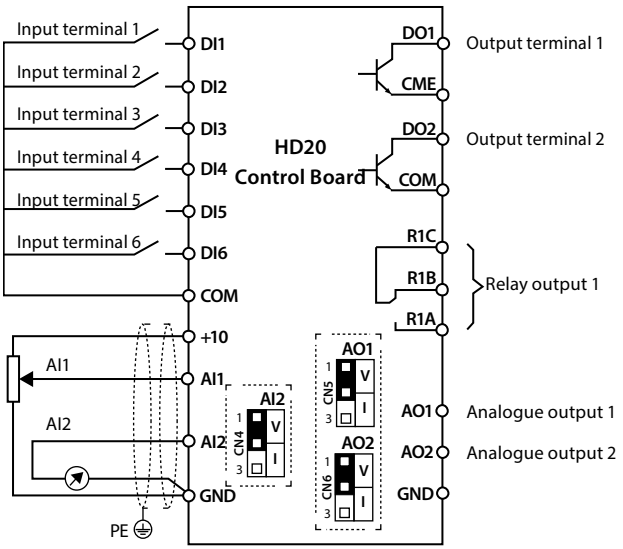


Figure 4-4 HD20 control board connection

Digital Input Connection

Dry Contact

Using the internal 24V power supply (SEL and P24 are short-connected at factory) or external power supply (remove the connector between SEL and P24), their connections are shown in Figure 4-5.

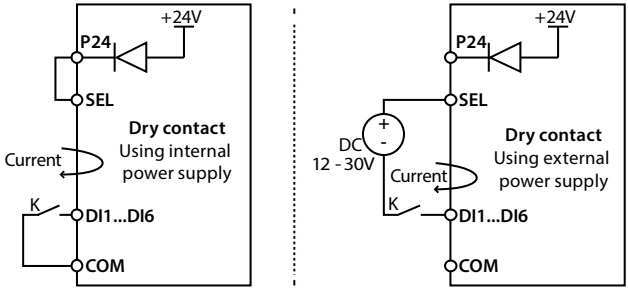


Figure 4-5 Dry contact connection

Source/Drain

Using external power supply, the source/drain connection are shown in Figure 4-6 (remove the connector between SEL and P24).

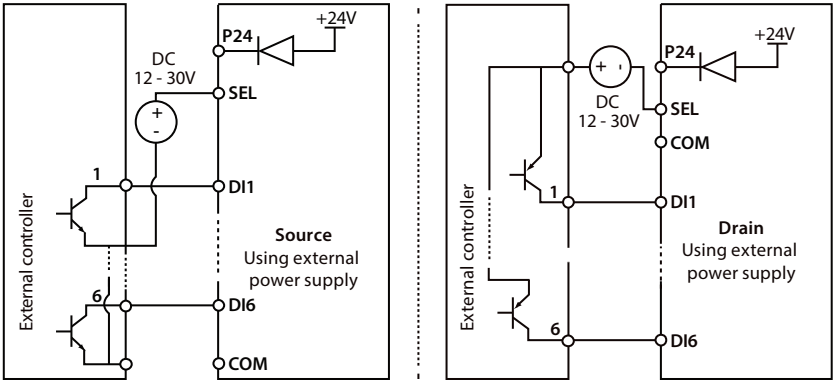


Figure 4-6 Source/Drain connection when using external power

Using internal 24V power supply, it is NPN/PNP connection in which external controller is common emitter output, as shown in Figure 4-7 (for PNP, remove the connector between SEL and P24).

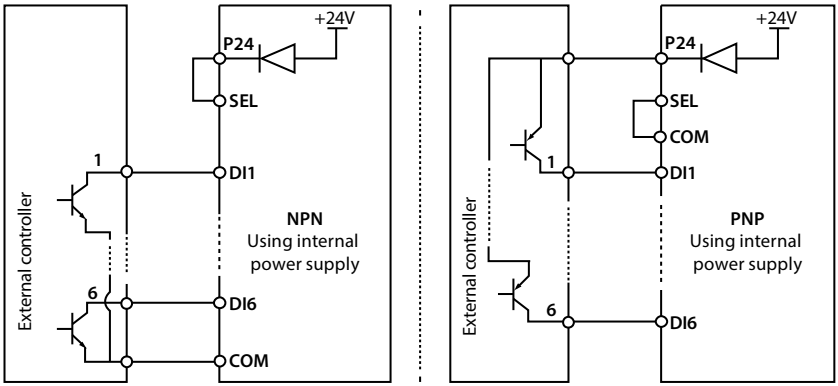


Figure 4-7 NPN (source)/PNP (drain) connection when using internal power supply

Analogue Input (AI) Connection

The AI1 is voltage input and the range is 0 - 10V, as shown in Figure 4-8.

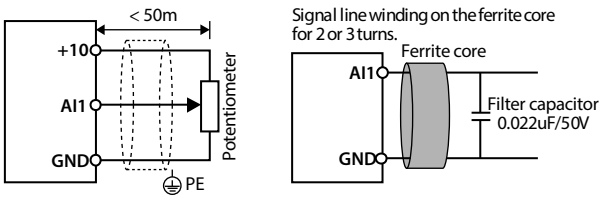


Figure 4-8 AI1 connection

Note:

1. To reduce the interference and attenuation of control signal, length of control cable should limit within 50m, and the shield should be reliably grounded.

2. In serious interference occasions, the analogue input signal should add filter capacitor and ferrite core, as shown in Figure 4-8.

AI2 are selected as voltage input and the range is -10 - +10V. When selecting internal +10V of HD20, refer to Figure 4-8. Selecting +/-10V external supply, refer to Figure 4-9.

AI2 are selected as current input and the range is 0 - 20mA, refer to Figure 4-9.

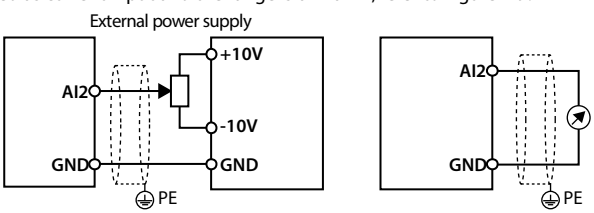


Figure 4-9 AI2 connection

Digital Output (DO) Connection

DO1 is open collective output. DO1 can use internal 24V power supply of inverter or external power supply. The connection is shown in Figure 4-10.

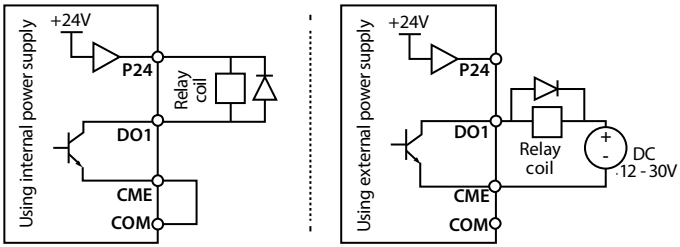


Figure 4-10 DO1 connection

DO2 is open collective output, refer to Figure 4-10.

DO2 is pulse frequency output; DO2 can use internal 24V power supply of inverter or external power supply. The connection is shown in Figure 4-11.

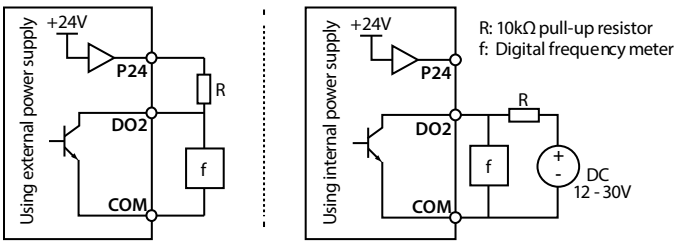


Figure 4-11 DO2 connection

4.5 Meet EMC Requirement of Installation

4.5.1 Correct EMC Installation

According national standards GB/T12668.3, the inverter should meet the two requirements of electromagnetic interference (EMI) and anti-electromagnetic interference. The international standards IEC/61800-3 (VVVF drive system part 3: EMC specifications and test methods) are identical to the national standards GB/T12668.3.

HD20 are designed and produced according to the requirements of IEC/61800-3. Please install the inverter as per the description below so as to achieve good electromagnetic compatibility (EMC).

Divide the installation space into different areas:

- In a drive system, the inverter, control equipment and sensors are installed in the same cabinet, the electromagnetic noise should be suppressed at the main connecting points with the EMI filter and input reactor installed in cabinet to satisfy the EMC requirements.
- The most effective but expensive measure to reduce the interference is to isolate the noise source and the noise receiver, which should be considered in mechanical system design phase. In driving system, the noise source can be inverter, braking unit and contactor. Noise receiver can be automation equipment, encoder and sensor etc.

The mechanical/system is divided into different EMC areas according to its electrical characteristics. The recommended installation positions are shown in Figure 4-12.

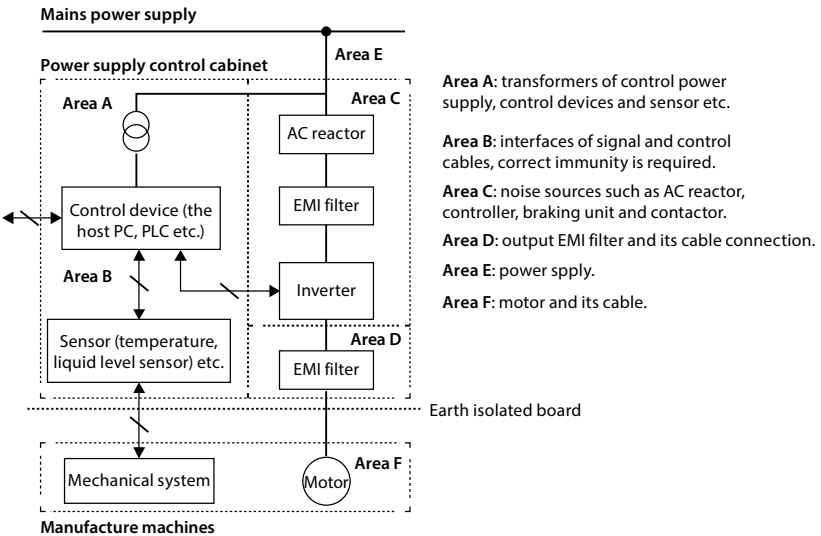


Figure 4-12 System wiring

- All areas should be isolated in space to achieve electromagnetic decoupling effect.
- The min. distance between areas should be 20cm, and use grounding bars for decoupling among areas, the cables from different area should be placed in different tubes.
- EMI filters should be installed at the interfaces between different areas if necessary.
- Bus cable (such as RS485) and signal cable must be shielded.

4.5.2 Wiring Requirement

In order to avoid interference intercoupling, it is recommended to separate the power supply cables, motor cables and the control cables, and keep enough distance among them, especially when the cables are laid in parallel and are long enough.

The signal cables should cross the power supply cables or motor cables, keep it perpendicular (90°) as shown in Figure 4-13.

Distribute the power supply cables, motor cables and control cables in different pipelines.

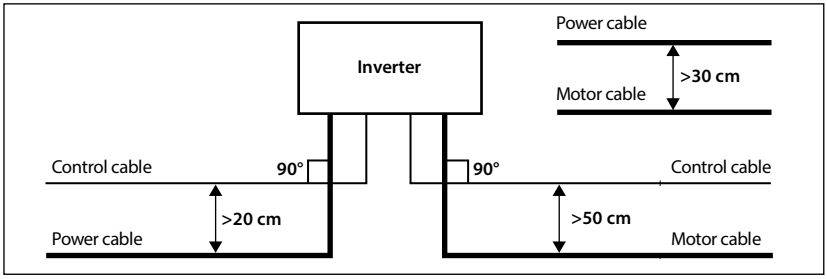


Figure 4-13 System wiring

Shielded/armoured cable: High frequency low impedance shielded cable should be used. For example: Copper net, aluminum net or iron net.

Normally, the control cables must use the shielded cables and the shielding metal net must be connected to the metal enclosure of the inverter by cable clamps as shown in Figure 4-14.

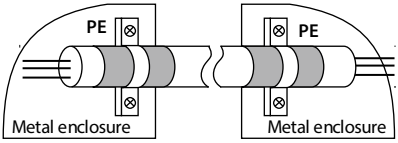


Figure 4-14 Shielded cable connection

4.5.3 Motor Connection

The longer cable between the controller and the motor is, the higher frequency leakage current will be, causing the inverter output current to increase as well. This may affect peripheral devices.

When the cable length is longer than 100 meters, it is recommended to install AC output reactor and adjust the carrier frequency according to Table 4-5.

Table 4-5 Carrier frequency and the cable length between inverter and motor

Cable Length	<30m	30 - 50m	50 - 100m	≥100m
Carrier Frequency	15kHz below	10kHz below	5kHz below	2kHz below

The cross sectional area (CSA) of controller cables should refer to Table 4-1, on page 18.

The controller should be derated if motor cables are too long or their CSA is too large. The current should be decreased by 5% when per level of CSA is increased. If the CSA increase, so do the current to ground and capacitance.

4.5.4 Ground Connection

The grounding terminals PE must be connected to ground properly. The grounding cable should be as short as possible (the grounding point should be as close to the controller as possible) and the grounding area should be as large as possible. The grounding resistance should be less than 10Ω.

Do not share the grounding wire with other devices (A). HD20 can share grounding pole with other devices (C). It achieves the best effect if HD20 and other devices use dedicated grounding poles (B), as shown in Figure 4-15.

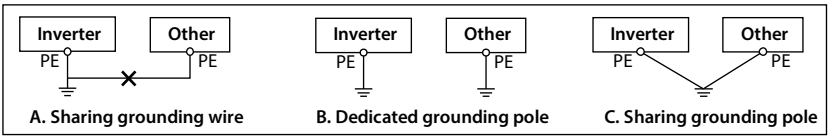


Figure 4-15 Grounding method

When using more than one controller, be careful not to loop the ground wire as shown in Figure 4-16.

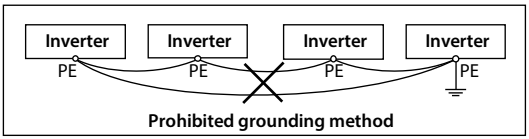


Figure 4-16 Prohibited grounding method

4.5.5 EMI Filter

The EMI filter should be used in the equipment that may generate strong EMI or the equipment that is sensitive to the external EMI. The EMI filter is a dual-way low pass filter through which lower frequency current can flow while higher frequency current can hardly flow.

Function of EMI Filter

1. The EMI filter ensures the equipment not only can satisfy the conducting emission and conducting sensitivity in EMC standard but also can suppress the radiation of the equipment.

2. It can prevent the EMI generated by equipment from entering the power cable and the EMI generated by power cable from entering equipment.

Common Mistakes in Using EMI Filter

1. Too Long the Power Cable is Between the EMI Filter and the Inverter

The filter inside the cabinet should be located near to the input power source. The length of the power cables should be as short as possible.

2. Too Close the Input and Output Cables of the EMI Filter

The distance between input and output cables of the filter should be as far apart as possible. Otherwise the high-frequency noise may be coupled between the cables and bypass the filter. Thus, the filter will become ineffective.

3. Bad Grounding of the EMI Filter

The enclosure of EMI filter must be grounded properly to the metal case of the controller. In order to achieve better grounding effect, make use of a special grounding terminal on the enclosure. If using one cable to connect the filter to the case, the grounding is useless for high frequency interference. When the frequency is high, so is the impedance of cable, hence there is little bypass effect.

The correct installation: The filter should be mounted on the enclosure of equipment. Ensure to clear away the insulation paint between the filter case and the enclosure for good grounding contact.

4.5.6 Countermeasures for Conduction, Radiation and Radio Frequency Interference

EMI of the Inverter

The operating theory of inverter means that some EMI is unavoidable. The inverter is usually installed in a metal cabinet which normally little affects the instruments outside the metal cabinet. The cables are the main EMI source. If connect the cables according to this manual, the EMI can be suppressed effectively.

If the inverter and other control equipment are installed in one cabinet, the area rule must be observed. Pay attention to the isolation between different areas, cable layout and shielding.

Reducing Conducted Interference

Add a noise filter to suppress conducted interference on the output side. Additionally, conducted interference can be efficiently reduced by threading all the output cables through a grounded metal tube. And conducted interference can be dramatically decreased when the distance between the output cables and the signal cables is above 0.3m.

Reducing RF Interference

The I/O cables and the inverter produce radio frequency interference. A noise filter can be installed both on the input side and output side, and shield them with iron utensil to reduce RF interference. The wiring distance between the inverter and the motor should be as short as possible shown in Figure 4-17.

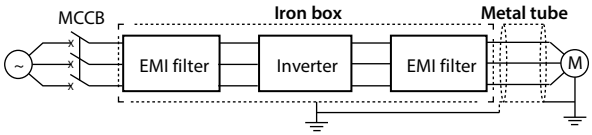


Figure 4-17 RF interference clearing

4.5.7 Reactor

AC Input Reactor

The purpose of installing an AC input reactor: To increase the input power factor; To dramatically reduce the harmonics on the input side at the high voltage point of common coupling and prevent input current unbalance which can be caused by the phase-to-phase unbalance of the power supply.

AC Output Reactor

When the length of cable between inverter and motor is more than 100m, it will cause leakage current and controller tripping. It is suggested that user should consider installing an AC output reactor.

Chapter 5 Operation Instructions

Danger

- Only when the terminal cover of HD20 has been fitted can you switch on AC power source. Do not remove the cover after power is switched on.
- Ensure the motor and the mechnical device are in the use application before HD20 starts.
- Keep away from HD20 if the auto-restart function is enabled at power outage.
- To change the main control PCBA, correctly set the parameters before operating.

Warning

- Do not check or detect the signal during HD20 running.
- Do not randomly change HD20 parameter setting.
- Please thoroughly complete all control debugging and testing, make all adjustments and conduct a full safety assessment before switching the run command source of HD20.
- Do not touch the energy-depletion braking resistor due to the high temperature.

5.1 Function Description

Note:

In the following sections, you may encounter control, running and status of HD20 description many times. Please read this section. It will help you to correctly understand and use the functions to be discussed.

5.1.1 Operation Mode

The physical channel: HD20 receives the run command (start, run, stop, jog, etc.), which can be selected via F00.11 and DI terminals:

Operation Mode	Description
Keypad	With **RUN**, **STOP**, **JOG** on the operation panel to start the inverter, stop, jog run control.
Control terminals	Use the control terminal to start the inverter and stop the operation control.
SCI communicaiton	Through the SCI communication drive start, stop running control.

5.1.2 Inverter Frequency Setting Source

The final setting frequency of the HD20 is calculated (F19.01) by the main setting channel (F00.10) and the auxiliary setting channel (F19.00).

When the auxiliary setting channel is the same as the main setting channel (except analog), the frequency is set by the main set channel.

Master Setting Frequency (F00.10)	Auxiliary Setting Frequency (F19.00)	Remark
/	0: No auxiliary frequency channel	
0: Keypad setting, F00.13 set the initial value	1: Keypad setting, F19.13 set the initial value	Keypad ▲▼ adjust
1: Terminal setting, F00.13 set initial	2: Terminal setting, F19.03 set initial	Terminal UP/DN adjust
2: SCI communicaiton set, initial value is 0	3: SCI communicaiton set, initial value 0	
3: Analogue setting	4: Analogue setting	
4: Terminal pulse setting	5: Terminal pulse setting	DI6 terminals F15.05 set 53
	6: PID output setting	

5.1.3 Inverter Status

Inverter Status	Description
Stop status	After the inverter is powered on, the inverter U/V/W terminal has no output and the operation status indicator of the operation panel flashes if no operation command is input or the stop command is executed during operation.
Run status	After the inverter receives the run command, the inverter U/V/W terminal starts to output, and the operation status indicator of the operation panel is on.
Motor parameters auto-tuning	Set F08.06/F13.17 = 1 or 2, HD20 will receive the run command then enter motor parameters auto-tuning status. If the auto-tuning process is completed, the inverter will enter into stop status.

5.1.4 Inverter Running Mode

Running Mode	Description
Jog	In the keypad control mode, when **JOG** key is pressed, the inverter will run at the jog frequency (F00.15, F03.15 and F03.16 are required to set). In the terminal control mode, the DI terminal jog command (function 20 - 25) is received and run according to the corresponding jog frequency (F00.15, F03.15, F03.16 and F05.21 are required set).
Process PID adjustment	The process PID adjustment operation function is valid (F04.00 = 1). The inverter will select the process PID adjustment operation mode, that is, PID adjustment according to the setting and feedback amount (set F04 group). • The process PID adjustment operation mode can be disabled by the DI terminal (function No. 33) to switch to other operation mode.
MS SPEED	The multi-stage frequency 1 - 15 (F06.00 - F06.14) is selected for multi-step speed operation via the logical combination of DI terminal (function 13 - 16).
Simple PLC	The simple PLC function selection is valid (F06.15 = 1). The inverter will run in simple PLC mode. The inverter will run according to the preset operating parameters (see F06 group parameter). • The simple PLC operation mode can be paused by the DI terminal (function No. 30).
Wobble operation	F07.00 = 1, the inverter will run in accordance with the pre-set operating parameters (see F07 group parameter).

5.2 Operating Instructions

5.2.1 Keypad

The standard HD20 are installed with LED keypad which is shown in Table 5-1.

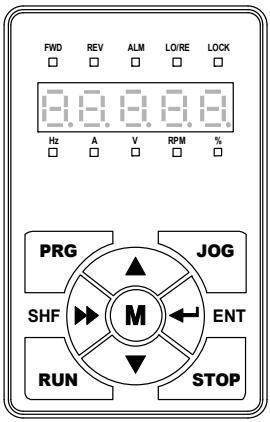


Table 5-1 Key description of keypad

Key	Description
PRG	Entry or exit programming key
JOG	In the keypad control, press the key to jog run HD20
RUN	In the keypad control, press this key to run HD20
STOP	a. In the keypad control, press this key to stop HD20 b. In the detection fault, press this key to reset at fault
M	Set certain function by F00.12
▲	Increase value or parameter
▼	Decrease value or parameter
▶▶	a. Select display parameter and shift bit b. Stop in loop/display the parameter during running
↵	a. Enter lower menu b. Confirm saving the data

The keypad consists of 5 status indicators and 5 unit indicators and shown as Table 5-2.

Table 5-2 Indicator description of the keypad

Mark	Name	■: Lighting	□: Flashing	□: Lightless
FWD	Forward status	HD20 is forward running at the moment	The start of HD20 is forward running next time	
REV	Reverse status	HD20 is reverse running at the moment	The start of HD20 is reverse running next time	
ALM	Alarm status	HD20 is faulty at the moment		HD20 is well at the moment
LO/RE	Remote/local status	HD20 is in terminal control mode	HD20 is in communication control mode	HD20 is in keypad control mode
LOCK	Password locked status	The user password lock of HD20 is avail		There is no user password or unlocked
Hz	Frequency unit	The unit of the present parameter is Hz	The present parameter is output frequency	
A	Current unit	The unit of the present parameter is A		
V	Voltage unit	The unit of the current parameter is V		
RPM	Rotary speed unit	The unit of the present parameter is rpm	The present parameter is rotary speed unit	
%	% unit	The unit of the present function parameter is %		

The keypad of HD20 has five LED displays and their meanings are shown in Table 5-3.

Table 5-3 LED display description

LED display	Meaning	LED display	Meaning	LED display	Meaning	LED display	Meaning
0	0	A	A	J	J	U	U
1	1	b	b	L	L	u	u
2	2	C	C	n	n	y	y
3	3	c	c	o	o	-	-
4	4	d	d	P	P	.	Point
5	5	E	E	q	q	8.	Full display
6	6	F	F	r	r		No display
7	7	H	H	S	S	8.	Flash modifiable
8	8	h	h	T	T		
9	9	i	i	t	t		

5.2.2 Display Status

Parameter Display Status at Stop/Run

When HD20 is in stop/run status, the keypad will display stop or run status and its parameters, as shown in Figure 5-1.

Other parameters (F18.08 - F18.13) or F18.02 - F18.07 can be displayed by pressing ▶▶.

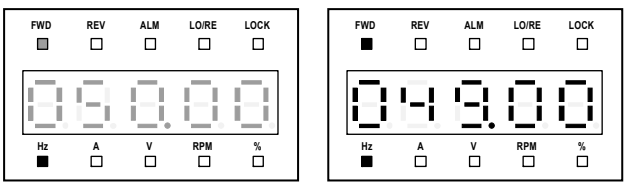


Figure 5-1 Display status of stop (left) and run (right)

Function Parameter Editing Status

At stop, run or fault alarm status, press **PRG** to enter function parameter editing status (see the description of parameter F01.00 and the user password unlock and modify of section 5.2.3), as shown in Figure 5-2.

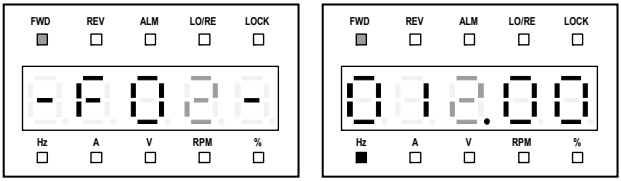


Figure 5-2 Parameter editing status

Fault Alarm Status

If the inverter detects a fault signal, the keypad will enter the fault alarm status and flashing display the fault code, as shown in Figure 5-3.

You can enter F20.21 - F20.37 to check the fault history.

The inverter can be reset by pressing **STOP** key, or by sending the reset commands via the control terminal or communication reset port.

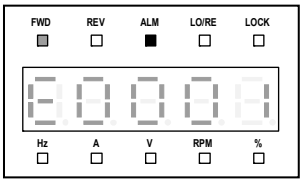


Figure 5-3 Fault alarm status

Special Display Status

The special display status includes the setting and unlocked password status, upload and download parameter, power on initialization, parameter auto-tuning, keypad self-check and restored factory settings, as shown in Figure 5-4.

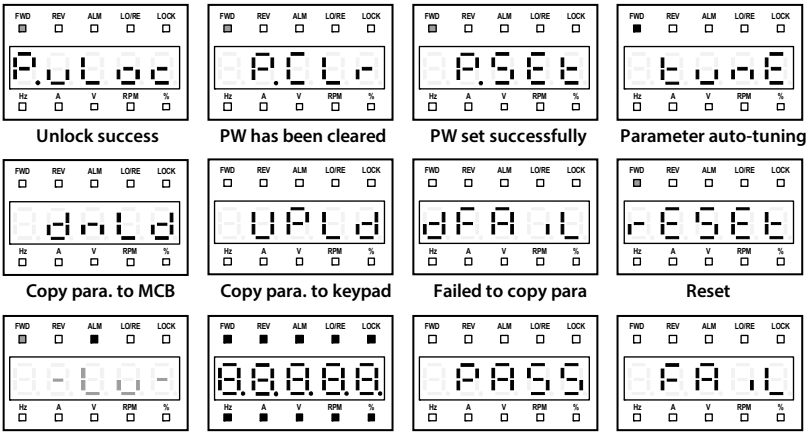


Figure 5-4 Special display status

5.2.3 Keypad Operation Examples

Four-level Menu Switching Operation

The keypad uses four-level menu configuration for parameter setting or other operations.

Configuring mode can be displayed in 4-level menu: **Mode setting (first-level) → function parameter group setting (second-level) → function parameter setting (third-level) → parameter setting (fourth-level).** The operation process is shown in Figure 5-5 and the description of the keys is shown in Table 5-4.

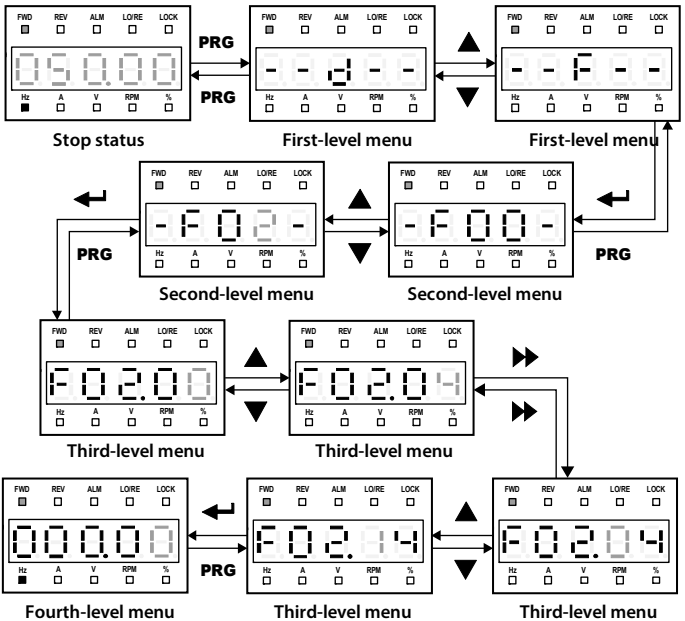


Figure 5-5 Four-level operation process

Table 5-4 Switching four-level description of the key

Key	First-level Menu	Second-level Menu	Third-level Menu	Fourth-level Menu
PRG	Fault, return to fault display; Fault cleared, return to run or stop status display	Return to first-level menu	Return to second-level menu	Do not save the present value and return to third-level
↵	Enter to second-level menu	Enter to third-level menu	Enter to fourth-level menu	Save the present value and return to third-level
▲	Select function group. Cycle according to d-F-U-y	Modify No. function. Increase by 1 when press this key one time	Modify the internal No. of function group. Increase by 1 according to the present modified bit	Modify function value. Increase by 1 according to the present modified bit

Key	First-level Menu	Second-level Menu	Third-level Menu	Fourth-level Menu
▼	Select function group Cycle according to y-U-F-d	Modify No. function. Decrease by 1 when press this key one time	Modify the internal No. of function group. Decrease by 1 according to the present modified bit	Modify function value. Decrease by 1 according to the present modified bit
▶▶	Invalid	Invalid	Switch unit and ten	Switch unit, ten thousand, thousand, hundred, ten

Parameter Setting

For example: To modify the setting value of the F02.14 from 000.00Hz to 012.00Hz, refer to Figure 5-6.

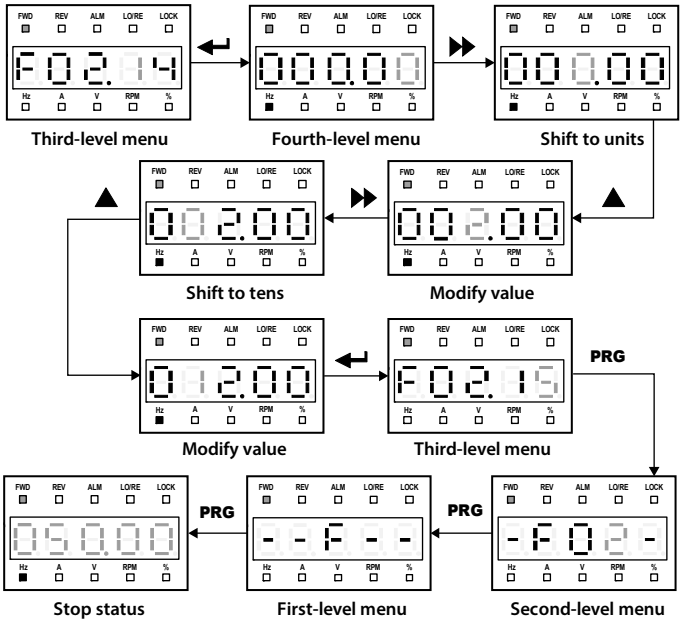


Figure 5-6 Parameter setting

When setting fourth-level menu, if the parameter is not in anti-color displaying, it indicates that this parameter can't be modified. The possible reasons are as follows:

- The function parameter can't be modified, such as the actual detected parameters or recorded parameters etc.
- Only when the controller stops can the function parameter be modified.
- Only input the correct password can it edit the function parameter due to the valid password.

Switching Display Parameters at Stop Status

The keypad can display six stop parameters (F18.08 - F18.13) in loop. Take the default parameter as an example, Figure 5-7 shows the switching process at stop status.

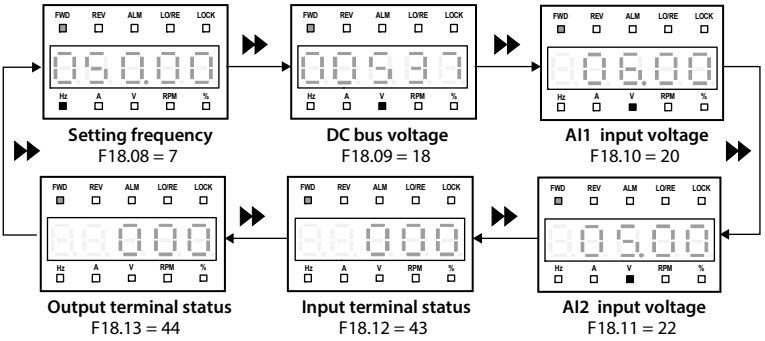


Figure 5-7 Switching display parameters at stop status

Unlock User's Password

F01.00 = non-zero, press **PRG** key to exit to stop/run display status, or detect no press on the keypad for 5 minutes, the user's password will be valid. The LOCK indicator of keypad will be lighting.

The operation of unlock user's password is as shown in Figure 5-8 which takes 4 as the user's password.

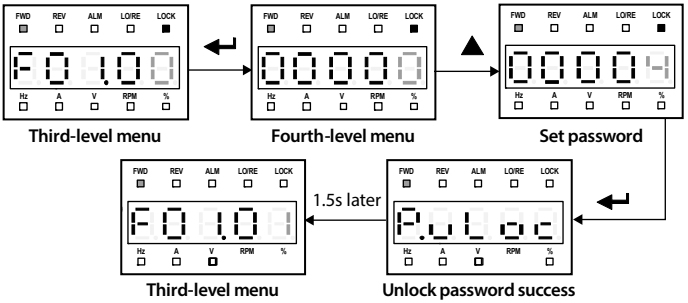


Figure 5-8 Operation of unlocking user's password

Modify User's Password

If no password, directly modify the value of F01.00 according to Figure 5-9.

If there is password, unlock the password according to Figure 5-8. When the lock successfully displays "F01.01", you can set a new password according to Figure 5-9 which takes "02004" as the new password.

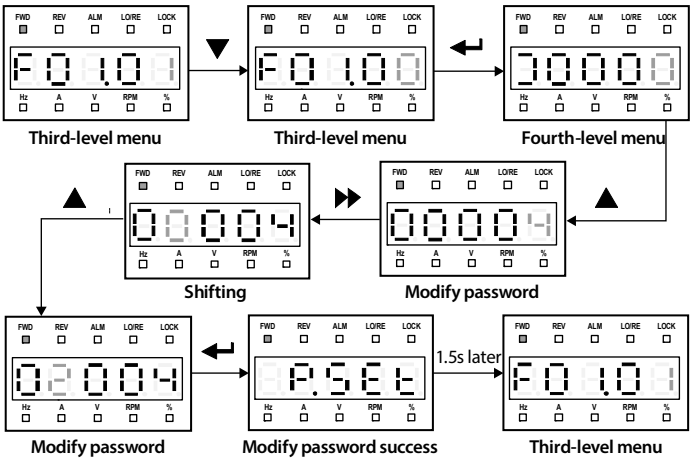


Figure 5-9 Operation of modifying user's password

Clear User's Password

If there is password, unlock according to Figure 5-8. When unlock successfully, the keypad displays "F01.01", clear the user's password according to Figure 5-10.

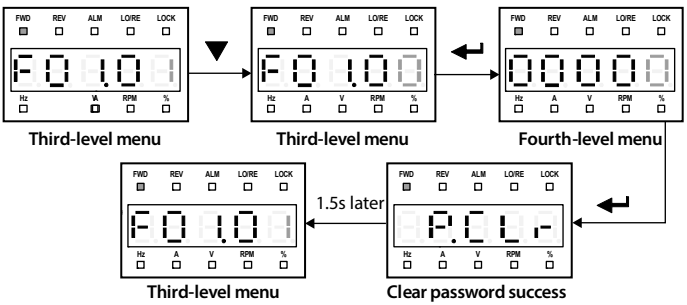
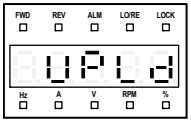


Figure 5-10 Operation of clearing user's password

Parameter Copy

The parameters are copied from the control panel to the operator panel:

When F01.03 = 1/2, the keypad will display "UPLd". When the upload is finished, the keypad will jump to display F01.00.

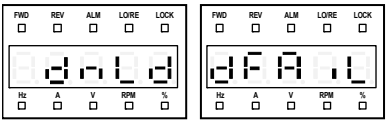


Copied to keypad

Figure 5-11 Parameter copied to keypad

Parameters are Copied from the Operator Panel to the Control Board:

When F01.02 = 2/3 or F01.02 = 5/6, the keypad will display "dnLd". When the download is finished, the keypad will jump to display F01.03.



Copied to control board **Copy failed**

Figure 5-12 Parameter copied to control board

Note:

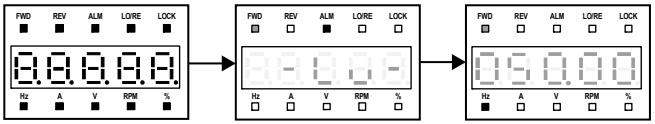
1. When downloading parameters, it displays "dFAiL" which means that the EEPROM storage parameters of keypad do not match with function parameters of HD20.
First, upload the setting value of the correct function code to the EEPROM of keypad, and then download.

2. When copying parameters, the keypad is flashing to display "E0022" which represents that the EEPROM of keypad is fault. It will jump to next function code for 10 seconds later. The troubleshooting is in 7.1 (on page 91).

5.3 Initial Power On

It needs carefully check before power is on. Please wire the inverter according to the specifications supplied by this manual.

After checking the wiring and mains supply voltage, switch on the circuit breaker and the inverter will be initialization. The keypad will display as shown in Figure 5-13.



Firstly display **Then display** **Stop status**

Figure 5-13 Display initialing keypad

Chapter 6 Function Introduction

This chapter will provide user with detail function introduction of each group.

Display Parameters:

General Function Parameters:

6.1 Group d: Display Parameters

Group d is status display parameters. The users can directly check the status parameters by checking the function code of group d.

6.1.1 d00: Status Display Parameters

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.00</td><td>Series of the inverter</td><td>[Actual value]</td></tr>
<tr><td>d00.01</td><td>Software version of the U1</td><td>[Actual value]</td></tr>
<tr><td>d00.02</td><td>Software version of the I1</td><td>[Actual value]</td></tr>
<tr><td>d00.03</td><td>Special software version of the U1</td><td>[Actual value]</td></tr>
<tr><td>d00.04</td><td>Special software version of the I1</td><td>[Actual value]</td></tr>
<tr><td>d00.05</td><td>Software version of the display panel</td><td>[Actual value]</td></tr>
<tr><td>d00.06</td><td>Customized series number</td><td>[Actual value]</td></tr>
<tr><td>d00.07</td><td>Control mode</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display the control mode.
Unit: Reserved
Ten: Control mode
• 0: V/f contorl without PG.
• 2: Vector control without PG.</td></tr>
<tr><td>d00.08</td><td>Rated current of the inverter (A)</td><td>[Actual value]</td></tr>
<tr><td>d00.10</td><td>Inverter status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display the inverter status, as shown in the following table:
<table>
<tr><td>Thousand</td><td>Bit15: Unused</td><td>Bit14: Unused</td><td>Bit13: Current limiting
0: In
1: Not in</td><td>Bit12: Stall overvoltage
0: In
1: Not in</td></tr>
<tr><td>Hundred</td><td>Bit11: Control mode
0: Speed control
1: Torque control</td><td>Bit10: Speed limiting value
0: Not in the limiting
1: In the limiting</td><td>Bit9: Unused</td><td>Bit8: Parameter auto-tuning
0: No auto-tuning
1: Auto-tuning</td></tr>
<tr><td>Ten</td><td>Bit7: DC braking
0: Non-DC braking status
1: In DC braking</td><td>Bit6: Unused</td><td colspan="2">Bit5&Bit4: Acc./Dec./constant
00: Constant 01: Acc.
11: Constant 10: Dec.</td></tr>
<tr><td>Unit</td><td>Bit3: Zero speed running
0: In non-zero speed runing
1: In zero speed running</td><td>Bit2: Forward/reverse
0: Forward
1: Reverse</td><td>Bit1: Run/stop
0: Stop
1: Run</td><td>Bit0: Inverter fault
0: No fault
1: Fault</td></tr>
</table></td></tr>
<tr><td>d00.11</td><td>Master setting frequency source</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display the master setting frequency source, see parameter F00.10.</td></tr>
<tr><td>d00.12</td><td>Master setting frequency (Hz)</td><td>[Actual value]</td></tr>
<tr><td>d00.13</td><td>Auxiliary setting frequency (Hz)</td><td>[Actual value]</td></tr>
<tr><td>d00.14</td><td>Setting frequency (Hz)</td><td>[Actual value]</td></tr>
</table>

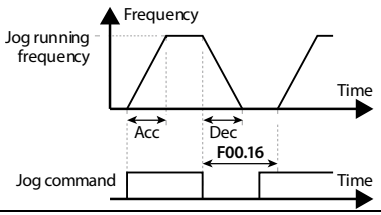
Ref. Code	Function Description	Setting Range [Default]
d00.15	**Reference frequency (after Acc./Dec.) (Hz)**	**[Actual value]**
	Display the given frequency with acceleration and deceleration.	
d00.16	**Output frequency (Hz)**	**[Actual value]**
d00.17	**Setting RPM (rpm)**	**[Actual value]**
d00.18	**Running RPM (rpm)**	**[Actual value]**
d00.20	**Output voltage (V)**	**[Actual value]**
d00.21	**Output current (A)**	
d00.23	**Output torque (%)**	**[Actual value]**
	Display output torque which is the relative percentage of the motor rated torque.	
d00.24	**Output power (kW)**	**[Actual value]**
d00.25	**DC bus voltage (V)**	**[Actual value]**
d00.26	**Potentiometer input voltage of the keypad (V)**	**[Actual value]**
d00.27	**AI1 input voltage**	**[Actual value]**
	Display AI1 input voltage.	
d00.28	**AI1 input voltage (after disposal)**	**[Actual value]**
	Display A1 input voltage which is disposed by the gain, bias, analogue curve and filter.	
d00.29	**AI2 input voltage**	**[Actual value]**
	Display AI2 input voltage. When AI2 selects current input, the corresponding relations are: 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.30	**AI2 input voltage (after disposal)**	**[Actual value]**
	Display A2 input voltage which is disposed by the gain, bias, analogue curve and filter.	
d00.35	**DI6 terminal pulse input frequency (Hz)**	**[Actual value]**
	Display DI6 terminal pulse input frequency (Hz).	
d00.36	**AO1 output**	**[Actual value]**
	Display AO1 output. When AO1 selects current output, the corresponding relations are: 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.37	**AO2 output**	**[Actual value]**
	Display AO2 output. When AO2 selects current output, the corresponding relations are: 0V corresponds to 0mA and 10.00V corresponds to 20mA.	
d00.38	**High-speed output pulse frequency (Hz)**	**[Actual value]**
d00.39	**Heatsink temperature (℃)**	**[Actual value]**
d00.40	**Setting line speed**	**[Actual value]**
d00.41	**Reference line speed**	**[Actual value]**
d00.44	**Process PID reference (%)**	**[Actual value]**
	Display process PID reference relative to full scale (10.00V) percentage.	
d00.45	**Process PID feedback (%)**	**[Actual value]**
	Display process PID feedback relative to full scale (10.00V) percentage.	
d00.46	**Process PID tolerance (%)**	**[Actual value]**
	Display process PID tolerance relative to full scale (10.00V) percentage.	
d00.47	**Process PID integral item (%)**	**[Actual value]**
	Display process PID integral item relative to full scale (10.00V) percentage.	
d00.48	**Process PID output (%)**	**[Actual value]**
	Display process PID output to full scale (10.00V) percentage.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>d00.49</td><td>External counting value</td><td>[Actual value]</td></tr>
<tr><td>d00.50</td><td>Input terminal status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display input terminal status. Each bit (binary) of this function parameter stands for different physical sources which are in the below table.
• 0: The multi-function input terminals are disconnected with corresponding common terminals.
• 1: The multi-function input terminals are connected with corresponding common terminals.
<table>
<tr><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>-</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
</table></td></tr>
<tr><td>d00.51</td><td>Output terminal status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display output terminal status. Each bit (binary) of this function parameter stands for different physical sources which are in the below table.
• 0: The multi-function output terminals are disconnected with corresponding common terminals.
• 1: The multi-function output terminals are connected with corresponding common terminals.
<table>
<tr><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>d00.52</td><td>Modbus communication status</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display Modbus communication status.
0: Normal.
1: Communication timeout.
2: Incorrect data frame head.
3: Incorrect data frame checking.
4: Incorrect data frame content.</td></tr>
<tr><td>d00.53</td><td>Actual length (m)</td><td>[Actual value]</td></tr>
<tr><td>d00.54</td><td>Total length (km)</td><td>[Actual value]</td></tr>
<tr><td>d00.55</td><td>Total time at power-on (h)</td><td>[Actual value]</td></tr>
<tr><td>d00.56</td><td>Total time at operation (h)</td><td>[Actual value]</td></tr>
<tr><td>d00.57</td><td>High bit of motor total energy consumption (k km.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.58</td><td>Low bit of motor total energy consumption (km.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.59</td><td>High bit of energy consumption at this time running (k km.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.60</td><td>Low bit of energy consumption at this time running (km.h)</td><td>[Actual value]</td></tr>
<tr><td>d00.61</td><td>Present fault</td><td>[Actual value]</td></tr>
<tr><td></td><td colspan="2">Display the present fault. Displaying 100 means the undervoltage.</td></tr>
</table>

6.2 Group F: General Function Parameters

6.2.1 F00: Basic Parameters

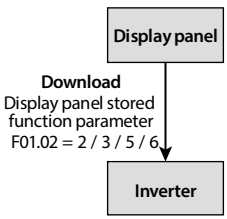
Ref. Code	Function Description	Setting Range [Default]
F00.01	**Motor control mode selection**	**0 - 2 [0]**
	0: V/f control without PG. Constant voltage/frequency ratio control. • It is specially applicable for occasions when one inverter drives more than one motors to achieve proper efficiency. • When select V/f control, please properly set the V/f control parameter of group F09 or group F13 to achieve proper efficiency. 2: Vector control without PG. Sensorless vector control. • It is applicable for application with high requirement on inverter performance and torque. • At first, it must perform motor parameter auto-tuning. And then adjust the settings of F08.00 - F08.04 according to the nameplate of the motor. Start the motor parameter auto-tuning function and properly set group F10 parameters, so as to achieve excellent vector control efficiency.	
F00.06	**Inverter maximum output frequency**	**50.00 - 400.00 [50.00Hz]**
	It defines the highest frequency that the inverter is allowed to output. • It should be careful to set reasonable parameters according to the nameplate of the motor and the actual operating conditions.	
F00.07	**Upper limit of operation frequency setting source**	**0 - 2 [0]**
	It defines the highest frequency that the user is set to operate, and select different setting sources to set the upper limit frequency by F00.07. 0: Digital setting. Set the upper limit frequency by F00.08. 1: Analogue input AI setting. See group F16. 2: Terminal pulse setting. F16.17 sets the max. pulse input frequency according to F00.06.	
F00.08	**Upper limit of operation frequency**	**0.00 - F00.06 [50.00Hz]**
	When F00.07 = 0, the upper limit frequency is set by F00.08.	
F00.09	**Lower limit of operation frequency**	**0.00 - F00.08 [0.00Hz]**
	Use F00.09 to limit the actual output frequency. When the setting frequency value is bigger than the zero frequency threshold (F19.10) but smaller than F00.09, it will operate at lower limit frequency. • Please properly set the parameters according to the nameplate of the motor and actual operating conditions. • No limitation on the motor parameter auto-tuning function. • Besides the lower and upper limit of frequency, the inverter's running frequency is also limited by the parameter settings of start/stop DWELL frequency (F02.02, F02.14), zero frequency threshold (F19.10), stop DC braking starting frequency (F02.16) and skip frequency (F05.17, F05.18, F05.19) etc.	
F00.10	**Frequency setting sources selection**	**0 - 4 [0]**
	0: Display panel digital setting. Change the value by pressing the ▲ or ▼ key of the keypad. Initial value is set by F00.13. 1: Terminal digital setting. Change the value by using the terminals UP/DN. F00.13 sets initial value. 2: SCI communication setting. Change the setting frequency by SCI communication frequency command. • The initial value of the SCI communication frequency is 0. 3: AI analogue setting. It is set by the analogue input voltage. See group F16. • The corresponding relationship between the analogue value of AI1 and the inverter's running frequency setting is refered to group F05. 4: Terminal pulse setting. It is set by the terminal pulse DI6. • Refered to group F05 for the corresponding relationship between the pulse terminal frequency and the inverter's running frequency setting.	

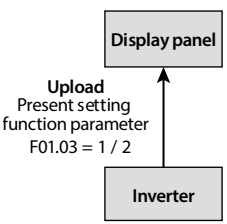
Ref. Code	Function Description	Setting Range [Default]
F00.11	**Command setting source selection**	**0 - 2 [0]**
	0: Display panel running source. Start and stop the inveter by pressing the key **RUN**, **STOP**, **JOG**. 1: Terminal running source. Start and stop by using the corresponding external terminals. • External terminal FWD (multi-function terminal is set to 2), REV (multi-function terminal is set to 3), JOGF1 (DI terminal is set to 20), JOGR1 (DI terminal is set to 21), JOGF2 (DI terminal is set to 22), JOGR2 (DI terminal is set to 23). For more information please see group F15. 2: SCI communication running source. Start and stop by SCI communication port according to communication protocol.	
F00.12	**Function selection of the multi-function key**	**0 - 2 [2]**
	0: Switch the display panel running direction. Switch the display panel running direction by **M** key. • When F00.11 = 0, it is valid. Do not save when power is off. 1: Switch local and remote control. Switch the local and remote control by **M** key. • When F00.11 = 0 or 1, it is valid. 2: The multi-function key is invalid.	
F00.13	**Starting frequency digital setting**	**0.00 - upper limit [50.00Hz]**
	When F00.10 = 0 or 1, F00.13 start to set the initial frequency value.	
F00.14	**Frequency setting control**	**0000 - 1101 [1001]**
	Only when F00.11 = 0 or 1 will it be valid. • The current setting frequency value will be replaced by a new one when the value of the F00.13 has be changed by the parameter setting. **Unit: Frequency setting save selection at power outage** • 0: Frequency setting will not be saved at power outage. • 1: Storage when power down. **Ten: Frequency setting control selection at stop** • 0: Frequency setting will be the same at stop. • 1: Frequency setting will be restored to F00.13 at stop. **Hundred: Communication setting frequency storage selection** • 0: Do not save when power is off. • 1: Storage when power down. **Thousand: Switch the frequency channel to the analogue selection** • 0: Do not save. • 1: Save. When the frequency setting channel is switched from panel setting to terminal digital setting, and then switch back to panel setting, the panel setting frequency remains the last changed frequency.	
F00.15	**Jog operation frequency digital setting 1**	**0.00 - upper limit [5.00Hz]**
F00.16	**Interval of jog operation**	**0.0 - 100.0 [0.0s]**
	After cancel the jog command, the inverter will not respond to the jog command at the interval of jog operation set by F00.16. • After the interval of jog is completed, it immediately execute the arrived jog command. As show in figure. 	

Ref. Code	Function Description	Setting Range [Default]
F00.17	**Operation direction selection**	**0,1 [0]**
	0: The same as run command. 1: Opposite to run command.	
F00.18	**Anti-reverse operation**	**0,1 [0]**
	This function will be valid when F00.11 = 0,1,2. 0: Reverse operation is permitted. 1: Reverse operation is prohibitted. • If the frequency is set to negative at this time, the inverter will run at zero frequency.	
F00.19	**Dead time of direction switch**	**0.0 - 3600.0 [0.0s]**
	F00.19 defines the dead time of direction switch, namely, the time of zero-frequency output in the process of direction switch shown as the right figure.	
F00.20	**Key enable of optional display panel**	**0,1 [0]**
	0: Enabled. When the inverter connects to two keypads, the keys of optional display using the communication port can be operated. 1: Invalid. When the inverter connects to two keypads, the keys of optional display using the communication port can not be operated.	

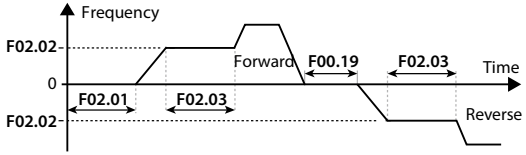
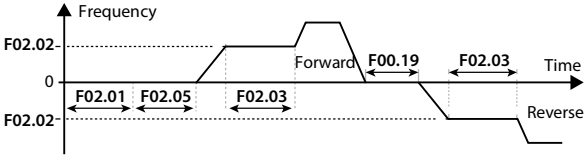
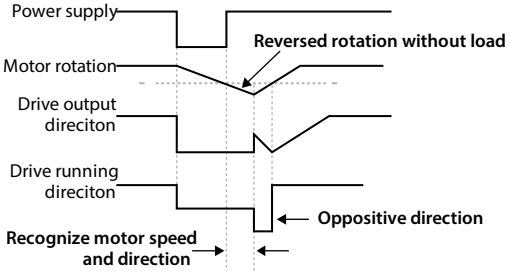
6.2.2 F01: Protection Parameters

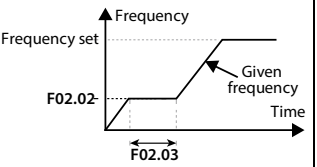
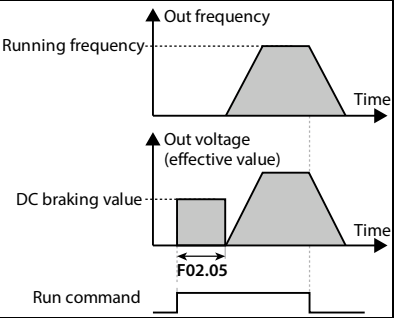
Ref. Code	Function Description	Setting Range [Default]
F01.00	**User's password**	**00000 - 65535 [00000]**
	XXXXX: To enable the password protection function, set any non-zero number as the password. • Once the password is set, if you want to change any parameter you must input correct password. Otherwise, all the parameters cannot be changed but only read. • When input correct password, by pressing the **PRG** key to exit to stop/run display status or by detecting that there is no press on the display panel within 5 minutes, the user's password will be valid. It is necessary to input correct password if you want to change the parameters. It will restart when there is no press on the display panel within 5 minutes. 00000: The factory setting of F01.00 is 0, namely the password protection function is disabled. • If the user unlocks the password, it means clearing the user's password. • To unlock, change and clear the user's password, see section 5.2.3.	
F01.01	**Menu mode selection**	**0,1 [0]**
	0: Full menu mode. All function parameters can be displayed in this menu. 1: Checking menu mode. Only different from factory setting parameters can be displayed.	
F01.02	**Function code parameter initialization (download)**	**0 - 6 [0]**
	0: No operation. The inverter is in regular parameter read/write status. • Whether can change the parameter it depends on the user's password status and the actual operating conditions. 1: Restore to factory settings. • Except F01.00, F01.02, F01.03, group F08, F19.15, F19.19, F19.24, F20.08, F20.09, F20.21 - F20.37, F23.00 and group y. • **Operation steps:** If set F01.02 = 1, press ↵ to ensure and the parameters are restored to factory settings. The keypad dispalys "rESEt". Then the keypad will display parameters in stop status after finish restoring to factory setting. 2,3: Download the keypad EEPROM parameter 1/2 to the current function code settings. 4: Clear fault information. The fault history of F20.21 - F20.37 will be clear. 5,6: Download the keypad EEPROM parameter 1/2 to the current function code settings (including the motor parameters). *Note: F01.00, F01.02, F01.03, F20.21 - F20.37 and group y do not copy.*	
F01.03	**Display panel EEPROM parameter initialization (upload)**	**0 - 2 [0]**
	0: No operation. The inverter is in regular parameter read/write status. 1,2: Upload the current function code settings to the keypad EEPROM parameter 1/2. *Note: F01.00, F01.02, F01.03, F20.21 - F20.37 and group y can not be copied.*	

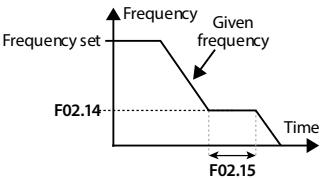
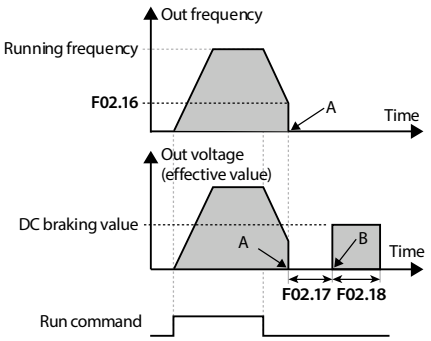




6.2.3 F02: Run/Stop Control Parameters

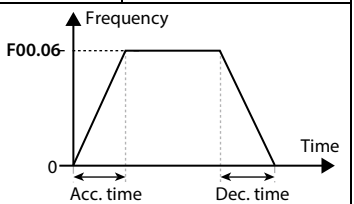
Ref. Code	Function Description	Setting Range [Default]
F02.00	**Start mode selection**	**0 - 2 [0]**
	0: From the DWELL frequency to start. • Refer to F02.02 and F02.03 parameters for the start DWELL frequency.  1: Brake first and then start from DWELL frequency. • Refer to F02.04 and F02.05 parameters for the DC braking. • Starting DC braking is enabled only in the process from the stop status to running status. But it is disabled in the process of direction switch, as shown in the figure. There is no F02.05 (DC braking time) when reverse.  2: Start after speed tracking. If the result of speed tracking is smaller than F02.02, it will start from the starting DWELL frequency. • The inverter automatically searches and catches the motor's running direction and speed, and starts the rotating motor smoothly without impact. As the right figure. • This mode is enabled only in the process from stop status to running status. But it is disabled in the process of direction switch.  	
F02.01	**Starting delay time**	**0.00 - 10.00 [0.00s]**
	When the inverter receives the run command, it will wait for the delay time set by F02.01 and then start running.	
F02.02	**Start DWELL frequency setting**	**0.00 - upper limit [0.00Hz]**

Ref. Code	Function Description	Setting Range [Default]
F02.03	**Retention time of starting DWELL frequency**	**0.00 - 10.00 [0.00s]**
	When starting, temporarily keep the output frequency to prevent the motor into a stall state. When it is loaded with a brake, when the brake is operating slowly, in order to prevent friction from the brake, use DWELL function to accelerate after the brake is fully opened. • During Acc., when the given frequency matches the frequency set by F02.02, the output frequency is maintained at the time set in F02.03 and continues to accelerate. • Set F02.02 or F02.03 as 0, the starting DWELL frequency is disabled. *Note: Torque control, process PID/auxiliary set process PID, simple PLC and wobble, DWELL function is invalid.* 	
F02.04	**DC braking current setting**	**0 - 100 (inverter's rated current) [50%]**
F02.05	**DC braking time at start**	**0.00 - 60.00 [0.50s]**
	F02.04 is a percentage of the inverter's rated current. To set the current value of the DC braking at start and at stop. • If setting is higher than fivefold of motor's rated current, the injection current value is fivefold of the motor's rated current. • The DC braking current is valid to both start and stop DC braking. F02.05 = 0.0s, there is no DC braking process at start. • Only when F02.00 = 1 will F02.05 be enabled. 	
F02.07	**Speed search mode based on current**	**0,1 [1]**
	0: From the max. output frequency to start speed searching. 1: From the stopping moment frequency to start speed searching.	
F02.08	**Setting reference current for speed search**	**0 - 100 (motor's rated current) [50%]**
	Set the motor injection current.	
F02.09	**Acc./Dec. time of the speed search**	**1.0 - 50.0 [5.0s]**
	Frequency rate of decline follows the deceleration time at speed searching.	
F02.10	**Waiting time of speed search**	**0.1 - 5.0 [1.0s]**
	The start should wait for a time according to F02.10 setting when the starting command is enabled. Then start speed searching.	
F02.11	**V/f ratio of speed search**	**0.0 - 100.0 [100.0%]**
	V/f ratio of speed search = F02.11 × motor's rated voltage / motor's rated frequency.	
F02.12	**Disposal time after speed search**	**0.01 - 5.00 [1.00s]**
	Complete the establishment of the time from searching the frequency to output the voltage in speed search process.	

Ref. Code	Function Description	Setting Range [Default]
F02.13	**Stop mode selection**	0 - 2 [0]
	0: Dec. to stop. • After the stop command is received, the inverter reduces its output frequency according to the Dec. time. When the frequency decreases to F02.14 and holds on a time F02.15 set, it will stop. • Refer to the parameter F02.14 and F02.15 in the figure. 1: Coast to stop. • After the stop command is received, the inverter stops output immediately and the motor stops under the effects of mechanical inertia. 2: Dec. to stop with DC braking. • After the stop command is received, the inverter reduces its output frequency according to the Dec. time and starts DC braking when its output frequency reaches F02.16 setting frequency. • Refers to parameter F02.16 - F02.18 in the figure for the DC braking at stop. • Refers to parameter F03.00 - F03.08 for the Dec. time.	
F02.14	**DWELL frequency setting at stop**	0.00 - upper limit [0.00Hz]
F02.15	**Retention time of DWELL frequency at stop**	0.00 - 10.00 [0.00s]
	F02.14 defines inverter's DWELL frequency at stop. F02.15 is a holding time DWELL frequency at stop (F02.14) in inverter stop process. • Only when F02.13 = 0 will it be enabled. • Set F02.14 or F02.15 as 0, DWELL frequency at stop is disabled. 	
F02.16	**DC braking initial frequency at stop**	0.00 - 50.00 [0.50Hz]
F02.17	**DC braking waiting time at stop**	0.00 - 10.00 [0.00s]
F02.18	**DC braking time at stop**	0.00 - 60.00 [0.50s]
	F02.17 is the interval from A to B in the right figure during Dec. stop process. • The inverter has no output during the waiting time. By F02.17 setting the waiting time, the current overshoot in the initial stage (point B in the figure) of braking can be reduced when the inverter drives a high power motor. • By F02.04 setting the DC braking current at stop. F02.18 = 0.00s, there is no DC braking process at stop. • Only when F02.13 = 2 will F02.16 - F02.18 be enabled. 	

Ref. Code	Function Description	Setting Range [Default]
F02.19	**Jog control mode**	00 - 11 [10]
	Unit: • 0: The jog functions of start and stop mode etc are invalid. • In jog running, start mode set by F02.00 and stop mode set by F02.13 are invalid. When the jog command is valid, the inverter starts up and running. When the jog command is invalid, the inverter will decelerate and stop. • 1: The jog functions of start and stop mode etc are enabled. • In jog running, inverter will run in start mode set by F02.00 and stop mode set by F02.13. **Ten:** • 0: Terminal jog is not preferred. Terminal control operation does not respond to terminal jog command. • 1: Terminal jog priority.	

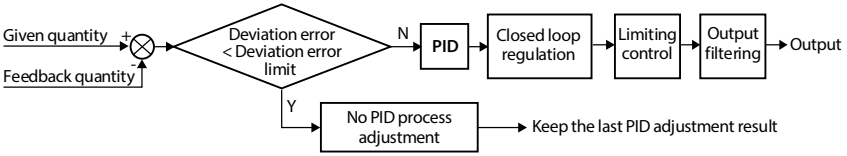
6.2.4 F03: Acc./Dec. Parameters

Ref. Code	Function Description	Setting Range [Default]
F03.01	**Acceleration time 1**	0.01 - 600.00 [10.00s]
F03.02	**Deceleration time 1**	0.01 - 600.00 [10.00s]
F03.03	**Acceleration time 2**	0.01 - 600.00 [10.00s]
F03.04	**Deceleration time 2**	0.01 - 600.00 [10.00s]
F03.05	**Acceleration time 3**	0.01 - 600.00 [10.00s]
F03.06	**Deceleration time 3**	0.01 - 600.00 [10.00s]
F03.07	**Acceleration time 4**	0.01 - 600.00 [10.00s]
F03.08	**Deceleration time 4**	0.01 - 600.00 [10.00s]
	Acceleration time is the time that the inverter's output frequency accelerates from 0Hz to F00.06 (the max-output frequency) in the linear form. As the right figure. Deceleration time is the time that the inverter's output frequency decelerates from F00.06 (the max-output frequency) to 0Hz in the linear form. As the right figure.  • It can only choose the acceleration time or the deceleration time.	
F03.09	**Switching frequency of acceleration time 2 and time 1**	0.00 - upper limit [0.00Hz]
F03.10	**Switching frequency of deceleration time 2 and time 1**	0.00 - upper limit [0.00Hz]
	When the running frequency is smaller than the F03.09 setting, it will accelerate according to Acc. time 2; Otherwise it will accelerate according to Acc. time 1. When the running frequency is smaller than the F03.10 setting, it will decelerate according to Dec. time 2; Otherwise it will decelerate according to Dec. time 1. • When use terminals to select Acc./Dec. time (set multi-function terminal as number 26 and 27 function), F03.10 is disabled.	
F03.15	**Acceleration time of jog operation**	0.01 - 600.00 [6.00s]
F03.16	**Deceleration time of jog operation**	0.01 - 600.00 [6.00s]
	F03.15 and F03.16 define the Acc./Dec. time of jog operation.	
F03.17	**Deceleration time of emergency stop**	0.01 - 600.00 [10.00s]
	It defines the deceleration time of emergency stop.	

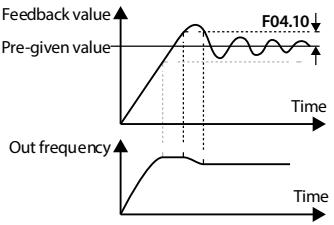
6.2.5 F04: Process PID Control

Closed-loop can be constituted not only by analogue reference and feedback but also by pulse reference and feedback. Generally, the process PID control mode is used to regulate on-site pressure, liquid level and temperature etc.

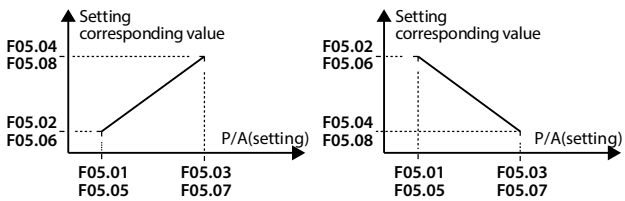
The process PID control is shown in the following figure:



Ref. Code	Function Description	Setting Range [Default]
F04.00	**Process PID control selection**	**0,1 [0]**
	0: PID control is disabled. 1: PID control is enabled.	
F04.01	**Reference source selection**	**0 - 2 [0]**
	0: Digital reference. It is the value of F04.03 reference. 1: AI analogue reference. It is the value of the analogue input voltage AI reference, and refer to group F16. 2: Terminal pulse reference. It is the value of the terminal pulse input reference, and max. input pulse frequency corresponding to 10V of the PID reference.	
F04.02	**Feedback source selection**	**0,1 [0]**
	0: AI analogue feedback. 1: Terminal pulse feedback.	
F04.03	**Setting digital reference**	**-10.00 - +10.00 [0.00V]**
	It defines the process PID regulator reference. • When F04.01 = 0 (digital reference), it is enabled.	
F04.04	**Proportional gain (P)**	**0.00 - 10.00 [2.00]**
F04.05	**Integral time (I)**	**0.01 - 10.00 [1.00s]**
F04.06	**Integral upper limit**	**0.0 - 100.0 [100.0%]**
F04.07	**Differential time (D)**	**0.00 - 10.00 [0.00s]**
F04.08	**Differential amplitude limit value**	**0.0 - 100.0 [20.0%]**
F04.09	**Sampling cycle (T)**	**0.01 - 50.00 [0.10s]**
	F04.04, F04.05 and F04.07 define the process PID parameters. F04.06 defines the process PID integral upper limit. F04.08 defines the process PID differential amplitude limit value. F04.09 defines the sampling cycle of feedback value and the PID regulator calculates once in each sampling cycle. • When F04.07 = 0, the differential is disabled.	

Ref. Code	Function Description	Setting Range [Default]
F04.10	**Bias limit**	**0.0 - 20.0 (reference) [2.0%]**
	F04.10 defines the max. deviation of the output from the reference closed-loop. • PID regulator stops operation when the feedback value is within this range. • Setting this parameter correctly is instructive to improve the system output accuracy and stability. 	
F04.11	**PID regulator upper limit source selection**	**0 - 2 [0]**
	0: Set by F04.13. 1: Set by AI analogue value. Set by analogue input voltage AI and refer to group F16. 2: Set by terminal pulse input.	
F04.12	**PID regulator lower limit source selection**	**0 - 2 [0]**
	It defines the setting source of PID regulator lower limit value. 0: Set by F04.14. 1: Set by AI analogue value. Set by analogue input voltage AI and refer to group F16. 2: Set by terminal pulse.	
F04.13	**PID regulator upper limit value**	**0.0 - 100.0 [100.0%]**
F04.14	**PID regulator lower limit value**	**0.00 - 100.00 [0.00%]**
	It defines that the process PID regulator output digital setting value of upper limit or lower limit.	
F04.15	**PID regulator characteristic**	**0,1 [0]**
	0: Positive. The motor RPM is required to increase with the increase of the reference. 1: Negative. The motor RPM is required to decrease with the increase of the reference.	
F04.16	**Integral regulation selection**	**0,1 [0]**
	0: Stop integral regulation when the frequency reaches the upper or lower limit. 1: Continue the integral regulation when the frequency reaches the upper or lower limit. • It is recommended to disable the integral regulation when the frequency reaches the upper or lower limit on condition that fast response is needed.	
F04.17	**PID output filter time**	**0.01 - 10.00 [0.05s]**
	It defines the filtering time of process PID output.	
F04.18	**PID output reverse selection**	**0,1 [0]**
	0: PID regulation disable reverse. When PID output is negative, 0 is the limit. 1: PID regulation enable reverse. When F00.18 = 1 (disable reverse), 0 is the limit.	
F04.19	**PID output reverse frequency's upper limit**	**0.00 - upper limit [50.00Hz]**
	It defines the PID upper limit frequency when reverse. • When F04.18 = 1 (PID regulation enable reverse), it is enabled.	
F04.23	**PID mode selection**	**0 - 2 [0]**
	0: NO PID mode. 1: Reserved. 2: PID enhancement mode.	

6.2.6 F05: External Reference Curve Parameters

Ref. Code	Function Description	Setting Range [Default]
F05.00	External reference curve selection	00000 - 22222 [00000]
	Unit: AI1 characteristic curve selection Ten: AI2 characteristic curve selection Hundred: Reserved Thousand: Reserved Ten thousand: Pulse input characteristic curve selection	Each bit setting: • 0: Line 1. • 1: Line 2. • 2: Polyline.
F05.01	Min. reference of line 1	0.0 - F05.03 [0.0%]
F05.02	Min. reference corresponding value of line 1	0.0 - 100.0 [0.0%]
F05.03	Max. reference of line 1	F05.01 - 100.0 [100.0%]
F05.04	Max. reference corresponding value of line 1	0.0 - 100.0 [100.0%]
F05.05	Min. reference of line 2	0.0 - F05.07 [0.0%]
F05.06	Min. reference corresponding value of line 2	0.0 - 100.0 [0.0%]
F05.07	Max. reference of line 2	F05.05 - 100.0 [100.0%]
F05.08	Max. reference corresponding value of line 2	0.0 - 100.0 [100.0%]
F05.09	Max. reference of polyline	F05.11 - 100.0 [100.0%]
F05.10	Max. reference corresponding value of polyline	0.0 - 100.0 [100.0%]
F05.11	Inflection point 2 reference of polyline	F05.13 - F05.09 [100.0%]
F05.12	Inflection point 2 corresponding value	0.0 - 100.0 [100.0%]
F05.13	Inflection point 1 reference of polyline	F05.15 - F05.11 [0.0%]
F05.14	Inflection point 1 corresponding value	0.0 - 100.0 [0.0%]
F05.15	Min. reference of polyline	0.0 - F05.13 [0.0%]
F05.16	Min. reference corresponding value of polyline	0.0 - 100.0 [0.0%]
	F05.01 - F05.04 define the line 1. F05.05 - F05.08 define the line 2. F05.09 - F05.16 define the polyline. • Line 1, line 2 and polyline can independly achieve positive and negative characteristics as shown in following figure. • If set the curve's min. reference the same as max. reference, it must be a line. The default frequency is the corresponding frequency of the curve min. reference. **Positive and negative characteristic of line**  	

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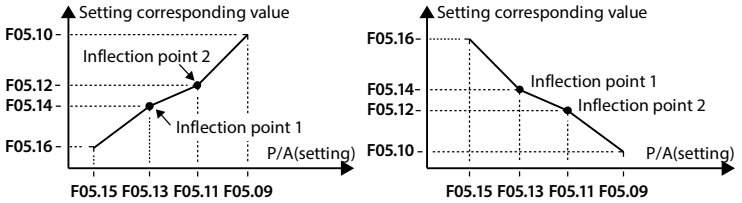
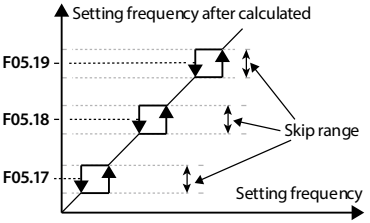
<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td colspan="2">Positive and negative characteristic of polyline
 

In the figure:
• P/A is terminal pulse/analogue reference.
• P (pulse frequency) is 100% corresponding to F16.17 max. input pulse frequency.
• A (analogue input value) is 100% corresponding to 10V or 20mA.</td></tr>
<tr><td>F05.17</td><td>Skip frequency 1</td><td rowspan="2">F00.09 - upper limit [0.00Hz]</td></tr>
<tr><td>F05.18</td><td>Skip frequency 2</td></tr>
<tr><td>F05.19</td><td>Skip frequency 3</td><td></td></tr>
<tr><td>F05.20</td><td>Range of skip frequency</td><td>0.00 - 30.00 [0.00Hz]</td></tr>
<tr><td></td><td colspan="2">The setting of skip frequency is for the inverter's output frequency to avoid resonance with the load.
• The inverter will skip the above frequencies as shown in figure. Up to 3 skip frequency ranges can be set.
• During the process of Acc./Dec.. The inverter will run with countinous frequency output, ignoring the skip frequency ranges. But the inverter will not run at constant speed in the skip frequency ranges.
• Frequency setting is uncontinuous, while frequency output is continuous.
 
</td></tr>
<tr><td>F05.21</td><td>Jog operation frequency digital setting 2</td><td>0.00 - upper limit [5.00Hz]</td></tr>
<tr><td></td><td colspan="2">When select jog operation 2 through terminal, set the jog frequency operation according to F05.21.</td></tr>
</table>

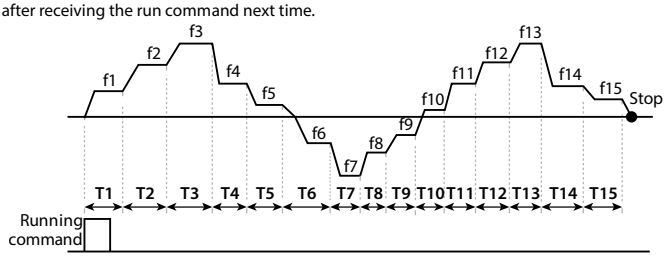
6.2.7 F06: MS SPEED and Simple PLC

Ref. Code	Function Description	Setting Range [Default]
F06.00	Multi-step frequency command 1	F00.09 - upper limit [5.00Hz]
F06.01	Multi-step frequency command 2	F00.09 - upper limit [5.00Hz]
F06.02	Multi-step frequency command 3	F00.09 - upper limit [5.00Hz]
F06.03	Multi-step frequency command 4	F00.09 - upper limit [5.00Hz]
F06.04	Multi-step frequency command 5	F00.09 - upper limit [5.00Hz]
F06.05	Multi-step frequency command 6	F00.09 - upper limit [5.00Hz]
F06.06	Multi-step frequency command 7	F00.09 - upper limit [5.00Hz]
F06.07	Multi-step frequency command 8	F00.09 - upper limit [5.00Hz]
F06.08	Multi-step frequency command 9	F00.09 - upper limit [5.00Hz]
F06.09	Multi-step frequency command 10	F00.09 - upper limit [5.00Hz]
F06.10	Multi-step frequency command 11	F00.09 - upper limit [5.00Hz]
F06.11	Multi-step frequency command 12	F00.09 - upper limit [5.00Hz]
F06.12	Multi-step frequency command 13	F00.09 - upper limit [5.00Hz]
F06.13	Multi-step frequency command 14	F00.09 - upper limit [5.00Hz]
F06.14	Multi-step frequency command 15	F00.09 - upper limit [5.00Hz]
	They define the initial value of each step speed in multi-step speed mode and PLC operation mode.	
F06.15	Simple PLC control selection	0,1 [0]
	0: No PLC operation. 1: Enabling PLC operation. It need reset the value of F06.16 - F06.46 according to actual operation.	
F06.16	Simple PLC operation mode selection	0000 - 1122 [0000]

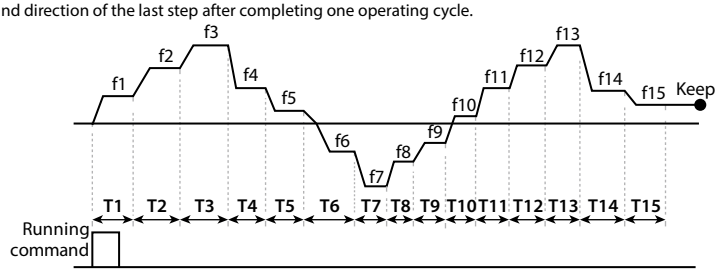
There are 4 parameter settings: Unit (0 - 2), ten (0 - 2), hundred (0,1), thousand (0,1).

Unit: PLC operation mode selection (taking 15-step PLC for example)

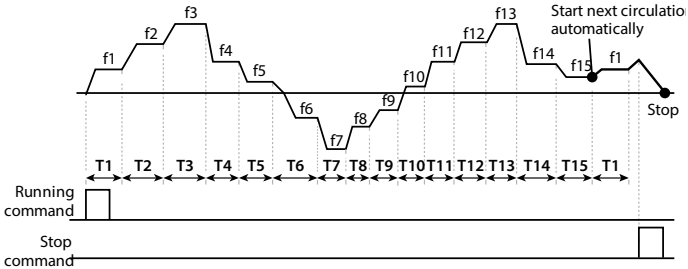
- 0: Stop after single cycle operation. The inverter stops automatically after one operating cycle. It will start only after receiving the run command next time.



- 1: Maintain the final value after single cycle of PLC operation. The inverter will maintain the run frequency and direction of the last step after completing one operating cycle.

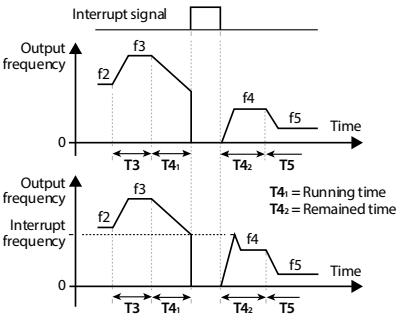


Ref. Code	Function Description	Setting Range [Default]
	• 2: Cycle operation. The inverter will operate with a new cycle from step 1 automatically after completing one operating cycle until receiving the stop command.	



Ten: PLC operation restart mode selection after pause

- 0: Start from step 1.
  - If the inverter stops during PLC operation due to the stop command, fault or power failure, the PLC operation will start from the step 1 next time.
- 1: Continue to operate from the step where the inverter pauses. If the inverter stops during PLC operation due to the stop command or fault, it will record the uptime.
  - When it restarts, the inverter will continue operation from the step where it pauses as shown in figure.
- 2: Continue to operate at the frequency when the inverter pauses.
  - When the inverter stops during PLC operation due to the stop command or fault, it will record not only the operated time but also the current frequency.
  - It will continue to operate at the recorded frequency upon restart, as shown in figure.



Note: The difference between mode 1 and mode 2 is that mode 2 also memorizes the running frequency when the inverter pauses, and the inverter will continue to operate at the frequency upon restart.

Hundred: Save the PLC status after power failure

- 0: Not save. The PLC running status will not be saved after power failure and start running from step 1 next time.
- 1: Save. The operating parameters of PLC operation, including the operating step, operating frequency and operating time of this step, etc, can be saved. The inverter will continue to operate in accordance with the PLC operation restart mode selection after pause (defined by tens of F06.16).

Thousand: Time unit selection of the PLC step

- 0: Second (s).
- 1: Minute (m).

F06.17	Setting of PLC step 1	000 - 321 [000]
F06.19	Setting of PLC step 2	000 - 321 [000]
F06.21	Setting of PLC step 3	000 - 321 [000]
F06.23	Setting of PLC step 4	000 - 321 [000]
F06.25	Setting of PLC step 5	000 - 321 [000]
F06.27	Setting of PLC step 6	000 - 321 [000]

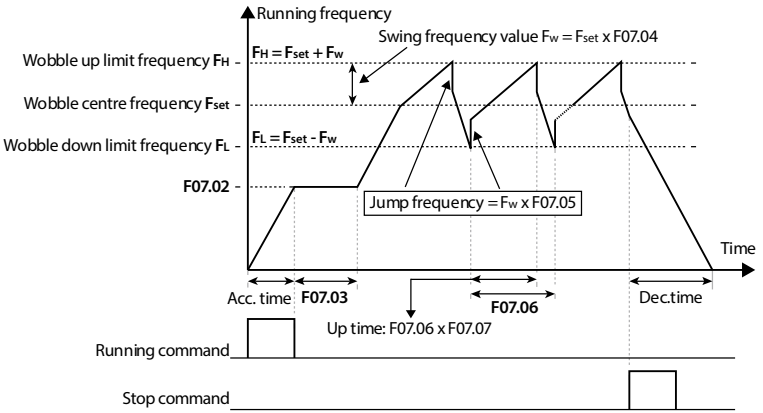
Ref. Code	Function Description	Setting Range [Default]
F06.29	Setting of PLC step 7	000 - 321 [000]
F06.31	Setting of PLC step 8	000 - 321 [000]
F06.33	Setting of PLC step 9	000 - 321 [000]
F06.35	Setting of PLC step 10	000 - 321 [000]
F06.37	Setting of PLC step 11	000 - 321 [000]
F06.39	Setting of PLC step 12	000 - 321 [000]
F06.41	Setting of PLC step 13	000 - 321 [000]
F06.43	Setting of PLC step 14	000 - 321 [000]
F06.45	Setting of PLC step 15	000 - 321 [000]
	F06.17, F06.19, F06.21, F06.23, F06.25, F06.27, F06.29, F06.31, F06.33, F06.35, F06.37, F06.39, F06.41, F06.43, F06.45 are used to configure the running frequency, the direction, acceleration and deceleration time of every PLC step. **Unit: PLC running frequency selection** • 0: Multi-step frequency command. The absolute value of each step frequency is the same as the setting of multi-step frequency. • Example: The absolute value of running frequency in PLC step 15 is the setting value of F06.14. • 1: Depend on F00.10. The running frequency source selectes the reference by F00.10 selection. **Ten: Operation direction selection of PLC at different steps** • 0: Forward. • 1: Reverse. • 2: Depend on run command. The motor's operation direction can be alternated via external direction command. • If the direction is not set, the inverter will run in the direction according to last step. **Hundred: Acc./Dec. time selection of PLC at different steps** • 0: Acc./Dec. time 1. • 1: Acc./Dec. time 2. • 2: Acc./Dec. time 3. • 3: Acc./Dec. time 4.	
F06.18	Running time of step 1	0.0 - 3276.7 [5.0]
F06.20	Running time of step 2	0.0 - 3276.7 [0.0]
F06.22	Running time of step 3	0.0 - 3276.7 [0.0]
F06.24	Running time of step 4	0.0 - 3276.7 [0.0]
F06.26	Running time of step 5	0.0 - 3276.7 [0.0]
F06.28	Running time of step 6	0.0 - 3276.7 [0.0]
F06.30	Running time of step 7	0.0 - 3276.7 [0.0]
F06.32	Running time of step 8	0.0 - 3276.7 [0.0]
F06.34	Running time of step 9	0.0 - 3276.7 [0.0]
F06.36	Running time of step 10	0.0 - 3276.7 [0.0]
F06.38	Running time of step 11	0.0 - 3276.7 [0.0]
F06.40	Running time of step 12	0.0 - 3276.7 [0.0]
F06.42	Running time of step 13	0.0 - 3276.7 [0.0]
F06.44	Running time of step 14	0.0 - 3276.7 [0.0]
F06.46	Running time of step 15	0.0 - 3276.7 [0.0]
	F06.18, F06.20, F06.22, F06.24, F06.26, F06.28, F06.30, F06.32, F06.34, F06.36, F06.38, F06.40, F06.42, F06.44, F06.46 define the running time of PLC at different steps. • When set the running time to 0 at some step, it means that the PLC function of this step is disabled.	

6.2.8 F07: Wobble Operation Parameters

The wobble operation process is shown as below:

First, the inverter accelerates to the preset frequency of wobble operation (F07.02) within the Acc. time and then waits for certain time (F07.03). Hinterher the inverter transits to the central frequency of the wobble operation as per the Acc. time, and ultimately start wobble operation according to the preset wobble amplitude (F07.04), jump frequency (F07.05), wobble cycle (F07.06) and the rise time of wobble operation (F07.07) until it receives a stop command and stops as per the Dec. time.

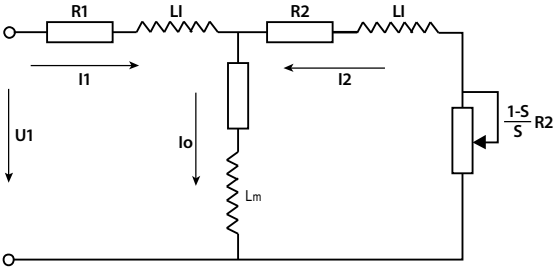
The process is shown in figure:



Ref. Code	Function Description	Setting Range [Default]
F07.00	**Wobble operation selection**	**0,1 [0]**
	0: Disabled. 1: Enabled.	
F07.01	**Wobble operation mode**	**0000 - 1111 [0000]**
	Unit: Start mode of wobble operation • 0: Auto start. The inverter will first operate at the preset frequency of wobble operation (F07.02) for certain time (F07.03), and then enter wobble mode automatically. • 1: Manual start. If the multi-function terminal is set as No. 36 function (set as wobble start function) and the signal is enabled, the inverter will enter wobble mode. If the terminal is disabled, the inverter will end wobble operation and operate at the preset frequency of wobble operation (F07.02). **Ten: Wobble operation amplitude.** Refer to parameter F07.04 • 0: Relative to the wobble central frequency. • 1: Relative to the max. output frequency. **Hundred: Restart mode of wobble operation** • 0: The inverter restarts the wobble operation as per the recorded frequency and direction when it stops last time. • 1: The inverter restarts the wobble operation from 0Hz. **Thousand: Save the wobble operation parameters at power outage** • 0: Saved. When the hundreds of F07.01 is set as 0, the wobble operation parameters will be saved when power outage occurs. • 1: Not be saved.	

Ref. Code	Function Description	Setting Range [Default]
F07.02	**Preset wobble frequency**	**0.00 - upper limit [0.00Hz]**
F07.03	**Holding time of preset wobble frequency**	**0.0 - 999.9 [0.0s]**
	F07.02 defines the inverter's running frequency before entering wobble mode. F07.03 defines the time that the inverter operates at the preset wobble frequency. • Only when select auto start (set unit of F07.01 as 0) will F07.03 be enabled.	
F07.04	**Wobble amplitude**	**0.0 - 50.0 [0.0%]**
	Relative to central frequency: F_W = central frequency × F07.04. • Wobble central frequency is the frequency value set by F00.10 (frequency reference source). Relative to max. output frequency: F_W = max. output frequency F00.06 × F07.04.	
F07.05	**Jump frequency**	**0.0 - F07.04 [0.0%]**
	The setting is the percentage of wobble amplitude. There is not jump frquency if set as 0.	
F07.06	**Wobble operation cycle**	**0.1 - 999.9 [10.0s]**
	F07.06 defines a complete cycle of wobble operation including rising and falling processes.	
F07.07	**Rising time of triangle wave**	**0.0 - 100.0 [50.0%]**
	Relative to wobble operation cycle of the F07.06, F07.07 defines the rising and the falling time of wobble operation and their unit is s. • Rising time of wobble operation = F07.06 × F07.07. • Falling time of wobble operation = F07.06 × (1 - F07.07).	

6.2.9 F08: Asynchronous Motor Parameters



R1=F08.07 (Stator resistance) LI=F08.09 (Leakage inductance)
R2=F08.08 (Rotor resistance) Lm=F08.10 (Mutual inductance)
Io=F08.11 (Excitation current) S=Slip ratio

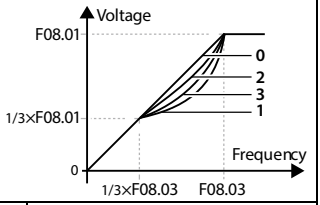
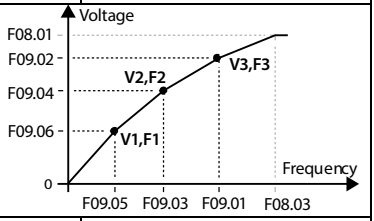
Mutual inductance is calculated by the following formula:

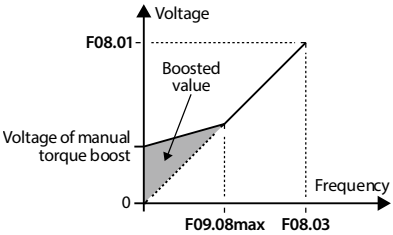
$$\text{Mutual inductance F08.10} = \frac{\text{F08.01}}{2\sqrt{3}\pi \times \text{F08.03} \times \text{F08.11}} - \text{F08.09}$$

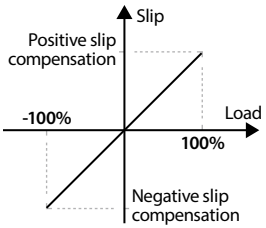
Ref. Code	Function Description	Setting Range [Default]
F08.00	**Rated power of motor**	**0.2 -11.0kW [Depend on HD20]**
F08.01	**Rated voltage of motor**	**0 - 999V [Depend on HD20]**
F08.02	**Rated current of motor**	**0.01 - 99.99A [Depend on HD20]**
F08.03	**Rated frequency of motor**	**1.0 - 400.0 [50.0Hz]**
F08.04	**Rated RPM of motor**	**1 - 24000 [1500rpm]**
	F08.03 and F08.04 should be set in accordance with the parameters of motor nameplate.	
F08.05	**Power factor of motor**	**0.001 - 1.000 [Depend on HD20]**

Ref. Code	Function Description	Setting Range [Default]
F08.06	**Parameter auto-tuning of motor**	**0 - 3 [0]**
	Note: The auto-tuning is enabled only in keypad control mode (F00.11 = 0). 0: Auto-tuning is disabled. 1: Stationary auto-tuning. • In the process of stationary auto-tuning, the motor is at rest. The stator resistance, rotor resistance and leakage inductance will be measured and written into F08.07, F08.08 and F08.09 automatically. 2: Rotary auto-tuning. • In process of rotary auto-tuning, the motor is at rest at the beginning, and the stator resistance, rotor resistance and leakage inductance will be measured. Hinterher the motor will start rotating, accordingly mutual inductance and idling exciting inductance will be measured automatically. All the measured values above will be saved respectively in F08.07, F08.08, F08.09, F08.10 and F08.11. • When the motor is in rotating status, oscillation, even overcurrent, might occur. In this case, please press the **STOP** key to stop auto-tuning and then adjust the F09.15 (oscollation-suppression mode) and F09.16 (oscollation-suppression factor) suitably to mitigate the possible oscillation. **Auto-tuning procedures:** 1. Input correctly the motor parameters as per its nameplate (F08.00 - F08.04). 2. When F08.06 is set as 2, please set the proper Acc. time 1 (F03.01) and Dec. time 1 (F03.02) and make sure the motor is disconnected with the load for security. 3. Set F08.06 as 1 or 2 firstly, then press the ↵ key, and there with press **RUN** key to start auto-tuning. The LED will display "tunE". 4. When the RUN indicator is flashing, it indicates that auto-tuning has been completed. At this time, the inverter displays the parameters of stop status and F08.06 resets to 0.	
F08.07	**Stator resistance of motor**	**0.00 - 99.99Ω [Depend on HD20]**
F08.08	**Rotor resistance of motor**	**0.00 - 99.99Ω [Depend on HD20]**
F08.09	**Leakage inductance of motor**	**0 - 9999mH [Depend on HD20]**
F08.10	**Mutual inductance of motor**	**0 - 5000mH [Depend on HD20]**
F08.11	**Idling exciting current of motor**	**0.0 - 999.9A [Depend on HD20]**

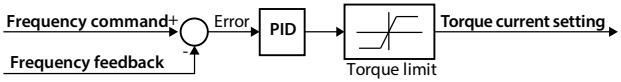
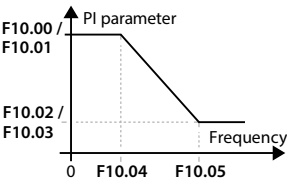
6.2.10 F09: V/f Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F09.00	**V/f curve selection of motor**	**0 - 4 [0]**
	It defines flexible V/f setting modes so as to meet requirements of different load characteristics. • Four preset curves and one user-defined curve can be selected according to the setting of F09.00. 0: Line. Shown as curve 0 in figure. 1: Square curve. Shown as curve 1 in the figure. 2: 1.2 exponential curve. Shown as curve 2 in the figure. 3: 1.7 exponential curve. Shown as curve 3 in the figure. 4: User-defined curve. 	
F09.01	**V/f frequency value F3 of motor**	**F09.03 - F08.03 [0.00Hz]**
F09.02	**V/f voltage value V3 of motor**	**F09.04 - F08.01 [0V]**
F09.03	**V/f frequency value F2 of motor**	**F09.05 - F09.01 [0.00Hz]**
F09.04	**V/f voltage value V2 of motor**	**F09.06 - F09.02 [0V]**
F09.05	**V/f frequency value F1 of motor**	**0.00 - F09.03 [0.00Hz]**
F09.06	**V/f voltage value V1 of motor**	**0 - F09.04 [0V]**
	F09.01 - F09.06 is the user-definable V/f curve. • If F09.00 = 4 (user-definable curve), F09.06 is enabled. • The V/f curve can be defined by connecting 3 points of (V1, F1), (V2, F2) and (V3, F3), to adapt to special load. • According to the actual operation, set proper curve to meet the requirements of load characteristics. 	
F09.07	**Torque boost of motor**	**0.0 - 30.0 [2.0%]**
F09.08	**Cut-off point used for manual torque boost of motor**	**0.0 - 50.0 (F08.03) [30.0%]**

	In order to compensate the torque drop at low frequency, the inverter can boost the voltage so as to boost the torque.
	• Torque boost is valid at any value of F09.00 for V/f curve.
	• When F09.07 ≠ 0, it indicates the manual torque boost mode.
	• When F09.07 = 0, it indicates the automatic torque boost mode.
	  • Set the rated motor speed (F08.03) according to the motor nameplate parameter.
	  • Obtain rated rpm (F08.04) by rotation auto-tuning; And obtain the exact motor stator resistance (F08.07) by auto-tuning.
	  • Set the slip compensation gain F09.09 = 100.0%, to enable slip compensation to obtain a good load capacity.
	• F09.08 is relative to percentage of motor's rated frequency (F08.03).
	 	

Ref. Code	Function Description	Setting Range [Default]
F09.09	**Slip compensation gain of motor**	**0.0 - 300.0 [100.0%]**
F09.10	**Slip compensation filter time of motor**	**0.01 - 10.00 [0.10s]**
F09.11	**Slip compensation limitation of motor**	**0.0 - 250.0 [200.0%]**
F09.12	**Compensation constant of motor**	**0.1 - 25.0 [2.0s]**
	The motor's slip changes with the load torque, which results in the variance of motor speed. Through slip compensation (the inverter will automatically adjust its output frequency according to the load torque) to reduce the influence. • Electric and generating state can increase slip compensation gain (F09.09). • Auto slip compensation depends on rated slip of motor. User should properly set rated frequency (F08.03) and rated rpm (F08.04). Range of slip compensation = Slip compensation limit (F09.11) × rated slip. Rated slip = F08.03 - F08.04 × Np / 60. • Np is the number of the motor pole pairs. 	
F09.14	**AVR (automatic voltage regulation) function of motor**	**0 - 2 [1]**
	0: Disabled. 1: Enabled all the time. 2: Disabled in Dec. process. • The output voltage can be regulated to maintain constant via AVR. Thus, normally the AVR function should be enabled, especially when the input voltage is higher than the rated voltage. • In Dec. process, if the F09.14 = 0 or F09.14 = 2, the running current will be a little higher; While if the F09.14 = 1, the motor will decelerate steadily and the current will be smaller.	
F09.15	**Oscillation-suppression mode of motor**	**0,1 [0]**
	0: Oscillation suppression is depend on the motor's exciting current component. 1: Oscillation suppression is depend on the motor's torque current component.	
F09.16	**Motor high frequency suppression shock coefficient**	**0 - 200 [50]**
	It is used to suppress the natural oscillation generated when the inverter is engaged with the motor. • If the output current changes repeatedly during constant load operation, the oscillation can be eliminated by adjusting the corresponding coefficient to allow the motor to run smoothly.	

6.2.11 F10: Motor Vector Control Speed-loop Parameters

Ref. Code	Function Description	Setting Range [Default]
F10.00	Speed control proportional gain 1 of motor	0.1 - 200.0 [20.0]
F10.01	Speed control integral time 1 of motor	0.00 - 10.00 [0.20s]
F10.02	Speed control proportional gain 2 of motor	0.1 - 200.0 [20.0]
F10.03	Speed control integral time 2 of motor	0.00 - 10.00 [0.20s]
F10.04	Speed-loop PI switching frequency 1 of motor	0.00 - 50.00 [10.00Hz]
F10.05	Speed-loop PI switching frequency 2 of motor	0.00 - 50.00 [15.00Hz]
	F10.00 - F10.05 and F10.07 comfirm the PID parameters of automatic speed regulator (ASR). The structure of ASR is shown in figure.  As the right figure: • When inverter operates within 0 - F10.04, the PI parameters of vector control are F10.00 and F10.01. • When inverter operates above F10.05, the PI parameters of vector control are F10.02 and F10.03. • When inverter operates within F10.04 - F10.05, P is the linear interpolation between F10.00 and F10.02, while I is the linear interpolation between F10.01 and F10.03.  • The system's response can be expedited through increasing the ASR proportional gain P, but oscillation may occur if the value of P is too high. • The system's response can be expedited through increasing the ASR integral constant Ti, but oscillation and high overshoot happen easily if the value of Ti is too high. • If Ti = 0, the integral function is disabled and the speed-loop works only as a proportional controller. • Generally, the proportional gain P should be adjusted firstly to the max. on condition that the system does not vibrate, and then the integral constant Ti should be adjusted to shorten the response time without overshoot. • It need increase proportional gain (P) and decrease integral constant (Ti), on condition that shorter dynamic response time is required during low frequency operation.	
F10.06	Speed-loop integral limitation of motor	0.0 - 200.0 (F08.02) [180.0%]
	It is used to limit the max. value of the vector control speed-loop integral.	
F10.07	Speed-loop differential time of motor	0.00 - 1.00 [0.00s]
	It defines the vector control speed-loop differential time. • Generally, it doesn't need to set F10.07 except for expediting the dynamic response. • There is not the speed-loop differential when F10.07 = 0.	
F10.08	Speed-loop output filter time of motor	0.000 - 1.000 [0.020s]
	It is used to filter the output of ASR regulator. • When F10.08 = 0, the speed-loop filter is disabled.	
F10.11	Motor torque limitation when motor is forward	0.0 - 200.0 (F08.02) [180.0%]
F10.12	Motor torque limitation when motor is reverse	
F10.13	Recreated torque limitation when motor is forward	
F10.14	Recreated torque limitation when motor is reverse	
	Be careful when setting F10.11 - F10.14 as too high value may cause damage to motor.	

6

6.2.12 F15: Digital I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F15.00	DI1 function	0 - 86 [2]
F15.01	DI2 function	0 - 86 [3]
F15.02	DI3 function	0 - 86 [0]
F15.03	DI4 function	0 - 86 [0]
F15.04	DI5 function	0 - 86 [0]
F15.05	DI6 function	0 - 86 [0]

0: Unused.

- It disables the terminal's function. The inverter ignores the signal input via this terminal.
- The unwanted terminal is recommended to be set as 0 so as to avoid wrong connection or action.

1: Inverter enabled.

- When enabled, the inverter is enabled to run.
- When disabled, the inverter is disabled to run and will be in auto stop status.
- If no terminal selects this function, it defaults that the inverter is enabled.

2,3: FWD/REV function.

- You can set any multi-function terminal for the FWD/REV terminal to control the inverter's run and stop.
- The forward/reverse function is only active in the terminal control mode.
- Refer to parameter F15.16.

4: Three-wire operation mode.

- Refer to parameter F15.16.

5 - 7: Frequency source selection 1 - 3.

- Up to 2^n frequency reference sources can be switched through terminal logic combination setting n (the max. n is 3). Refer to the below table.
- Up to 8 frequency reference sources can be switched through selecting 3 terminals.
- Up to 4 frequency reference sources can be switched through selecting 2 terminals.

Source 3 (No. 7)	Source 2 (No. 6)	Source 1 (No. 5)	Setting Channel
0	0	0	Holding
0	0	1	Display panel digital setting
0	1	0	Terminal digital setting
0	1	1	SCI communication digital setting
1	0	0	Analogue value setting
1	0	1	Terminal pulse setting
1	1	X	Hold

8: The frequency source switch to analogue setting.

- If the setting is 8, the frequency reference source can be forcibly switched to analogue setting.
- The priority of frequency sources is shown below:
  Frequency switch to analog (DI terminal is set to function No. 8) > multi-frequency terminal setting channel (DI terminal is set to function 13 - 16) > frequency setting channel selection terminal 1 - 3 setting the channel (function of DI terminal is set to 5 - 7) > F00.10 set the frequency setting channel.

Ref. Code	Function Description	Setting Range [Default]

9,10: Run command source selection 1, 2.

- There are 4 kind control modes selected by the different logic combinations of terminals 1 and 2.

Command Source 2 (No. 10)	Command Source 1 (No. 9)	Selection
0	0	Hold the control mode
0	1	Display panel control mode
1	0	Terminal control mode
1	1	SCI communication control mode

- The inverter can accept that run command source switch changes while running, but only at stop status all switches can be enabled.

11: Switch to terminal control mode. Valid only when HD20 stops.

- When this terminal function is enabled, the run command source will be forcibly switched to the terminal control mode.
- The priority of frequency selection is below:
  Command switched to terminal (DI terminal is set to function 11) > keypad **M** key local remote switching function (F00.12 = 1) > command channel for terminal 1, 2 is selected as run command channel (DI terminal is set to 9,10 function) > running command channel set in F00.11.

12: External stop command input.

- When enabled, the inverter stops according to F02.13. It is valid for all command source.

13 - 16: Multi-step frequency terminal 1 - 4.

- Up to 15 speed references can be set through different 0/1 logic combinations of terminals.
- The inverter can realise 15-step speed operation through the logical combinations of 4 terminals.
- The inverter can realise 7-step speed operation through the logical combinations of 3 terminals.
- The inverter can realise 3-step speed operation through the logical combinations of 2 terminals.
- The inverter can realise the switch between setting frequency and multi-step frequency through one terminal function.
- Refer to the below table. K1 - K4 is corresponding to terminal 1 - 4.

K4 (No. 16)	K3 (No. 15)	K2 (No. 14)	K1 (No. 13)	Frequency Setting
0	0	0	0	Setting frequency
0	0	0	1	Multi-step frequency 1 (F06.00)
0	0	1	0	Multi-step frequency 2 (F06.01)
0	0	1	1	Multi-step frequency 3 (F06.02)
0	1	0	0	Multi-step frequency 4 (F06.03)
0	1	0	1	Multi-step frequency 5 (F06.04)
0	1	1	0	Multi-step frequency 6 (F06.05)
0	1	1	1	Multi-step frequency 7 (F06.06)
1	0	0	0	Multi-step frequency 8 (F06.07)
1	0	0	1	Multi-step frequency 9 (F06.08)
1	0	1	0	Multi-step frequency 10 (F06.09)
1	0	1	1	Multi-step frequency 11 (F06.10)
1	1	0	0	Multi-step frequency 12 (F06.11)
1	1	0	1	Multi-step frequency 13 (F06.12)
1	1	1	0	Multi-step frequency 14 (F06.13)
1	1	1	1	Multi-step frequency 15 (F06.14)

Ref. Code	Function Description	Setting Range [Default]

17,18: Increase (UP)/decrease (DN) frequency.

- If the setting is 17 or 18, the terminal can be used to increase or decrease frequency, and accordingly enables remote control.
- Increase or decrease rate is determined by F15.12. The function refers to below table.
- This terminal is enabled when F00.10 = 1 (terminal digital setting) or F19.00 = 2 (terminal digital setting).

UP Command (No. 17)	DN Command (No. 18)	Frequency Change Trend
0	0	To keep the setting frequency
0	1	To decrease the setting frequency
1	0	To increase the setting frequency
1	1	To keep the setting frequency

19: Clearing auxiliary frequency setting.

- When the setting is 19, this terminal is used to clear the counter to zero, but it is only valid for digital auxiliary setting.

20,21: Command control input for forward and reverse jog 1 (JOGF1/JOGR1).

22,23: Command control input for forward and reverse jog 2 (JOGF2/JOGR2).

24,25: Jog 1 command and direction control input.

- In terminal control mode, if 24 or 25 are enabled, then forward jog or reverse jog operation are enabled. JOGF is forward jog command and JOGR is reverse jog command.
- It need define parameters F00.15 (jog frequency), F00.16 (jog interval), F03.15 (Acc. time of jog operation) and F03.16 (Dec. time of jog operation), refering to below table.

Jog Direction Input (No. 25)	Jog Command Input (No. 24)	Run Command
0	0	Jog command is invalid
1	0	Jog command is invalid
0	1	Jog 1 forward
1	1	Jog 1 reverse

Note: When select 20 and 21, the functions 24 and 25 are invalid.

26,27: Acc./Dec. time selection terminals 1 and 2.

- Acc./Dec. time 1 - 4 can be selected through logic combination of the terminals 1 and 2.
- The inverter can realise 4 groups Acc./Dec. time selection through the function of 2 Acc./Dec. terminals.
- The inverter can realise 2 groups Acc./Dec. time selection through the function of 1 Acc./Dec. terminals.

Acc./Dec. Terminal 2 (No. 27)	Acc./Dec. Terminal 1(No. 26)	Acc./Dec. Selection
0	0	Acc./Dec. time 1
0	1	Acc./Dec. time 2
1	0	Acc./Dec. time 3
1	1	Acc./Dec. time 4

29: Acc./Dec. prohibition.

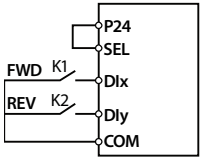
- If the setting is 29, this terminal can make the motor immune to external signals (except stop command) and maintain operation at the current speed.
- The function is disabled in the process of Dec. to stop.

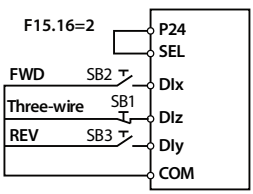
30: Switch to ordinary running mode.

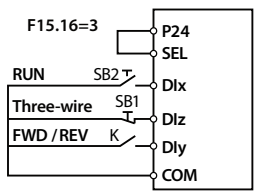
- When this function is enabled, the frequency command (including MS function, simple PLC function, process PID function, wobble function etc.) forced to switch to the ordinary mode operation.

Ref. Code	Function Description	Setting Range [Default]
	31: Reset the stop status of PLC operation. • In the stop status of PLC operation, the memorized PLC operating information (operating step, operating time, operating frequency, etc.) will be cleared when this terminal is enabled, refering to group F06. 32: Pausing the process PID. • If the setting is 32, the process PID function is temporary disabled and the inverter keeps the present frequency output and continue running. 33: Disabling the process PID. • To achieve the flexible switch between the process PID and the lower class operation mode. • When enabled, the operation mode switchs to the lower class. • The priority of operation mode is as: Jog operation > process PID operation > PLC operation > wobble operation > MS speed operation > operation. 34: Holding PID integral. • When enabled, the process PID stops increasing and the integrator keeps the present result. 35: Clearing PID integral. • When enabled, the process PID is cleared. 36: Switch to wobble operation. • The wobble operation mode selects manual start (set the unit of F07.01 to 1). • If the setting is 36, the wobble function is enabled. 37: Reset the wobble operating status. • If wobble operation (set F07.00 to 1) is enabled, connecting this terminal can clear all the memorised information about the wobble operation no matter the inverter is in auto start or manual start mode (depend on F07.01 setting). 38: DC braking start while stopping. • To implement DC braking for the motor in stop status through control terminal and then realise motor's emergency stop and accuracy location. F02.04 defines the DC braking current. • When the terminal is active during deceleration and stop, the motor is braked immediately. When invalid, stop DC braking. 39,40: External pause signal (normally-open/normally-closed input). • After receiving an external pause command during the running process, the inverter will immediately stop. • Once the external signal is removed and the situation meets the running condition, the inverter will start tracking at high speed. 41,42: Coast to stop (normally-open/normally-closed input). • The inverter will stop outputting immediately and the load will coast to stop in accordance with the mechanical inertia when a multi-function terminal is set as 41 or 42. 43: Emergency stop. • After receiving terminal command, the inverter will decelerate to stop during the Dec. time according to the F03.17 (Dec. time of emergency stop). 44,45: External fault signal (normally-open and normally-closed input). • If the setting is 44 or 45, the fault signal of external equipment can be input via the terminal, which is convenient for the inverter to monitor the external equipment and carry out protection according to the value of F15.17. • Once the inverter receives the fault signal, it will display external fault. • The fault signal has two input modes: Normally-open and normally-closed input.	

Ref. Code	Function Description	Setting Range [Default]
	46: External reset (RST) input. • If the setting is 46, the inverter can be reset via this terminal when it has a fault. • Accordingly the terminal has the same function as the **STOP** key on the keypad. 48: Timing function input. • If the setting is 48, the inverter can use the timing function input terminal. • Refer to parameters F15.25 and F15.26. 49: Clearing the length. • If the setting is 49, the inverter can use clearing the length input terminal in the fixed length control. • Refer to parameters F19.26 - F19.34. 50: Clearing the counter to zero. • When the setting is 50, this terminal is used to clear the counter to zero. • It is normally used with function 51 (counter's triggering signal input). 51: Counter's triggering signal input. • It is built-in counter's couting pulse input port and can save the current couting value at power loss. • Pulse's max. frequency: 200Hz. • Refer to parameters F15.37 and F15.38. 52: Length counting input. • If the setting is 52, it can be used as length input terminal in the fixed length control. • Refer to parameters F19.26 - F19.34. 53: Pulse frequency input (only DI6 terminal is enabled). • This terminal is used to input pulse signal as frequency setting. • See group F05 parameters for the relationship between input pulse frequency and frequency setting. 83: Integration keeping function. 84: DC braking is directly activated, which means when the terminal function becomes effective, DC braking becomes effective immediately. 85: Pausing PLC operation. • If the setting is 85, this terminal is used to pause the PLC operation. • The inverter will operate at the frequency of the current step when the terminal is enabled, and there is no timing at PLC operation. When disabled, the timing will continue. 86: Terminal stop DC braking. • After the inverter receives the stop command, if the stop mode is decelerate to stop + DC braking (F02.13 = 2), and the running frequency is lower than the DC braking initial frequency at stop (F02.16), the inverter will begin to DC braking. • The braking current is set by F02.04, and the braking time is the longer time of the terminal function holding time and the DC braking time at stop (F02.18).	
F15.12	**Acc./Dec. rate of UP/DN terminal**	**0.00 - 99.99 [1.00Hz/s]**
	It defines the change rate of setting frequency via the UP/DN terminal.	
F15.13	**Terminal detecting interval**	**0 - 2 [0]**
	0: 2ms. 1: 4ms. 2: 8ms.	
F15.14	**Terminal detecting filter number**	**0 - 10000 [2]**
	The digital input terminal signal should be delayed and confirmed so as to avoid digital input error.	
F15.15	**Terminal input positive and negative logic setting**	**000 - 0x1FF [000]**
	It defines that each bit (binary) of this function represents different physical sources. • 0: Positive logic: When DI terminals are connected to corresponding common port, this logic is enabled. Otherwise the logic is disabled.	

<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td></td><td>
• 1: Negative logic: When DI terminals are connected to corresponding common port, this logic is disabled. Otherwise the logic is enabled.
<table>
<tr><th colspan="4">Ten</th><th colspan="4">Unit</th></tr>
<tr><td>Bit7</td><td>Bit6</td><td>Bit5</td><td>Bit4</td><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>-</td><td>DI6</td><td>DI5</td><td>DI4</td><td>DI3</td><td>DI2</td><td>DI1</td></tr>
</table>
</td><td></td></tr>
<tr><td>F15.16</td><td>FWD/REV operation mode</td><td>0 - 3 [0]</td></tr>
<tr><td></td><td>
• FWD can be selected by DI terminal DIx (F15.00 = F15.05) and represented as "FWD". At this time, the function of this terminal should be defined as No. 2 function.
• REV can be selected by DI terminal DIy (F15.00 = F15.05) and represented as "REV". At this time, the function of this terminal should be defined as No. 3 function.
0: Two-wire operation mode 1.
1: Two-wire operation mode 2.
• When stop command coming from other sources (or PLC single cycle stop, fixed length stop, terminal external stop instruction input valid, terminal free stop instruction input valid, inverter failure/external fault effective) makes the inverter stopping though the terminal logic enabled in the terminal control mode, there is no run command even the control terminal FWD/REV are still valid.
• If you want the inverter to run again, you should trigger the active FWD and REV.


<table>
<tr><th rowspan="2">K2</th><th rowspan="2">K1</th><th colspan="2">Run Command</th></tr>
<tr><th>F15.16=0</th><th>F15.16=1</th></tr>
<tr><td>0</td><td>0</td><td>Stop</td><td>Stop</td></tr>
<tr><td>1</td><td>0</td><td>Reverse</td><td>Stop</td></tr>
<tr><td>0</td><td>1</td><td>Forward</td><td>Forward</td></tr>
<tr><td>1</td><td>1</td><td>Stop</td><td>Reverse</td></tr>
</table>
2: Three-wire operation mode 1.
• If the shift between SB2 and SB3 is disabled, the inverter will hold the control mode.
3: Three-wire operation mode 2.
• If SB2 changes from enabled into disabled, the inverter will keep the same mode.
• DIi can be selected by the DI terminal DIz (F15.00 = F15.05). At this time, the function of this terminal should be defined as No. 4 function of "three-wire operation".
F15.16=2


SB1: Normally closed stop button
SB2: Normally open forward button
SB3: Normally open reverse button
F15.16=3


K: Direction selection terminal (level on)
K = 0(forward) K = 1(reverse)
SB1: Normally closed stop button
SB2: Normally open run button
</td><td></td></tr>
<tr><td>F15.17</td><td>Terminal operating selection due to fault of external equipment</td><td>0 - 3 [0]</td></tr>
<tr><td></td><td>
When there is fault of external equipment, it can select protection.
0: Coast to stop.
1: Emergency stop.
2: Dec. to stop.
3: Continue to run.
</td><td></td></tr>
</table>

Ref. Code	Function Description	Setting Range [Default]
F15.18	DO1 function	0 - 38 [2]
F15.19	DO2 function	0 - 38 [0]
F15.20	RLY1 function	0 - 38 [31]

0: Unused.
- There is no output function and action of the output terminal.

1: Inverter ready.
- The inverter completes power on and no fault occurs, then it can normally run the indicating signal.

2: Inverter is running.
- The inverter is in run status and output indicatiing signal.

3: Inverter is forward running.
- The inverter is forward running the indicating signal.

4: Inverter is reverse running.
- The inverter is reverse running the indicating signal.

5: Inverter is DC braking.
- The inverter is DC braking the indicating signal.

6: Inverter is in zero-frequency status.
- In the zero-frequency range the inverter's output frequency (including in stop status) outputs the indication signal.
- Refer to parameters F15.28 and F15.29.

7: Inverter is in zero-frequency running.
- In the zero-frequency range the inverter's output frequency outputs the indicating signal.
- Refer to parameters F15.28 and F15.29.

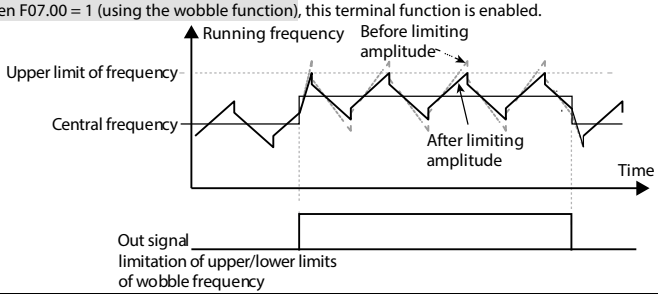
9,10: Frequency detection threshold (FDT1, FDT2).
- Refer to F15.31 - F15.35.

11: Frequency arriving signal (FAR).
- Indication signal will be output when the inverter's output frequency is within the FAR range.
- The FAR is set by F15.27 (FAR range).

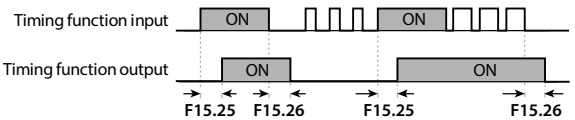
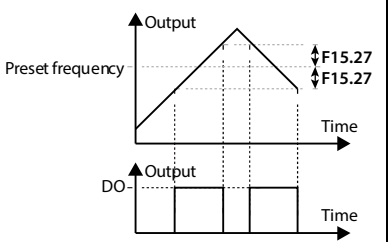
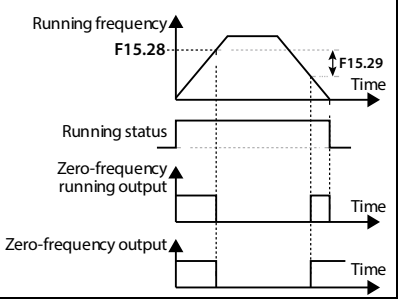
12: Limitation of upper limit of frequency.
- The indicating signal will be output if the setting frequency is beyond the upper limit of frequency.

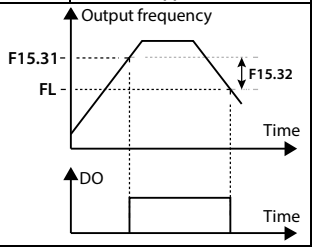
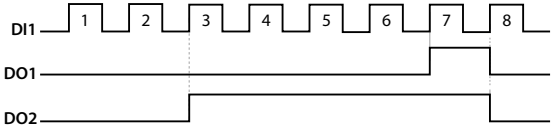
13: Limitation of lower limit of frequency.
- The indicating signal will be output if the setting frequency is lower than the lower limit of frequency.

14: Limitation of upper/lower limits of wobble frequency.
- If the wobble frequency calculated by the central frequency is higher than upper limit of frequency or lower than the lower limit of frequency (F00.09), signal will be output, as shown in figure.
- When F07.00 = 1 (using the wobble function), this terminal function is enabled.



Ref. Code	Function Description	Setting Range [Default]
	15: Simple PLC operating status indication. • The indicating signal will be output when the inverter is at simple PLC operating. 16: Simple PLC pausing indication. • The indicating signal will be output if the simple PLC operation is suspended by external terminals. 17: Simple PLC cycle completion indication. • The indicating signal will be output if one cycle of PLC operation is finished. 18: Completion of simple PLC operation stages. • The indicating signal will be output if the current step of PLC operation is finished. 19: Completion of simple PLC operation. • The indicating signal will be output if the PLC operation is finished. 20: Output data from SCI communication. • Output indicating signal of open collector or relay is controlled by the SCI communication directly. 21: Preset operating time out. • The indicating signal will be output if the inverter's operating time reaches the preset operating time (F15.36). *Note: The No. 17, 18, 19 and 21 functions output indicating signal which is single pulse signal, 500ms.* 22: Timing function output. • If the setting is 22, the inverter can use the timing function output terminal. • Refer to parameters F15.25 and F15.26. 23: Preset counting value reach. 24: Indicating counting value reach. • Refer to F15.37 and F15.38. 25: Setting length arrive. • The indicating signal will be output if the inverter's actual length reaches the preset length. 27: Analog input overrun output. • When the analog value exceeds the upper or lower limit, the indicator is output. 29: Undervoltage lock-up signal (LU). • When the DC bus voltage is lower than the undervoltage threshold, the inverter will output undervoltage signal. The LED on the keypad will display "-Lu-". 30: Overload signal (OL). • The indicating signal can be output when the inverter's output current value is higher than that defined by F20.01(overload pre-alarm detection threshold) and the overload time is longer than that defined by F20.02 (overload pre-alarm detection time). 31: Inverter fault. • The inverter will output fault signal when it has a fault. 32: External fault. • The indicating signal can be output when the inverter detects the external fault signal via terminal. 33: Inverter auto-reset fault. • The indicating signal can be output when the inverter is during fault auto-reset. 38: High-frequency output (only DO2). • DO2 can be selected as high-frequency output. Refer to F16.21.	

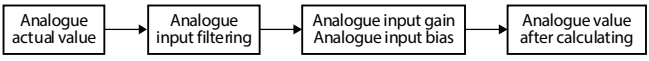
<table>
<tr><th>Ref. Code</th><th>Function Description</th><th>Setting Range [Default]</th></tr>
<tr><td>F15.24</td><td>Output terminal positive and negative logic selection</td><td>00 - 0x3F [00]</td></tr>
<tr><td></td><td colspan="2">It defines that each bit (binary) of this function represents different physical sources.
• 0: Positive logic: When output terminals are connected to corresponding common port, this logic is enabled. Otherwise the logic is disabled.
• 1: Negative logic: When output terminals are connected to corresponding common port, this logic is disabled. Otherwise the logic is enabled.
<table>
<tr><td>Bit3</td><td>Bit2</td><td>Bit1</td><td>Bit0</td></tr>
<tr><td>-</td><td>RLY1</td><td>DO2</td><td>DO1</td></tr>
</table></td></tr>
<tr><td>F15.25</td><td>ON side delay time of timing function</td><td rowspan="2">0.00 - 300.00 [0.00s]</td></tr>
<tr><td>F15.26</td><td>OFF side delay time of timing function</td></tr>
<tr><td></td><td colspan="2">F15.25 and F15.26 can be used to set the ON/OFF side delay time (dead area) of the timing function output relative to the input.
• The timing function output will be ON when the ON time of timing function is longer than that defined by F15.25.
• The timing function output will be OFF when the OFF time of timing function delays behind that defined by F15.26.
The timing function operation figure is shown as follows:
 
</td></tr>
<tr><td>F15.27</td><td>FAR range</td><td>0.00 - 100.00 [2.50Hz]</td></tr>
<tr><td></td><td colspan="2">The pulse signal will be output if the inverter's output frequency is within the FAR range. As shown in the right figure.
 
</td></tr>
<tr><td>F15.28</td><td>Zero-frequency operation threshold</td><td rowspan="2">0.00 - upper limit [0.00Hz]</td></tr>
<tr><td>F15.29</td><td>Zero-frequency hysteresis</td></tr>
<tr><td></td><td colspan="2">F15.28 and F15.29 are used to set the zero-frequency operation output control function, please see the right figure.
 
</td></tr>
</table>

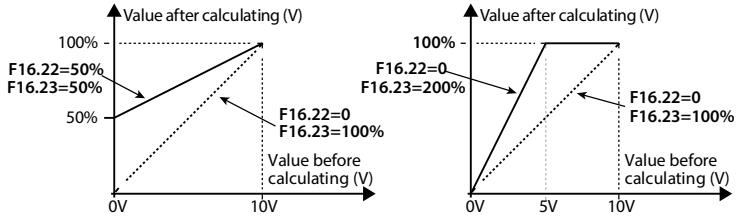
Ref. Code	Function Description	Setting Range [Default]
F15.30	**FDT1 detection mode**	**0,1 [0]**
	0: Detect according to the reference frequency. 1: Detect according to the output frequency.	
F15.31	**FDT1 level**	**0.00 - upper limit [50.00Hz]**
F15.32	**FDT1 lag**	**0.00 - upper limit [1.00Hz]**
	The indicating signal can be output if the setting frequency F15.30 is higher than certain frequency (F15.31), and becomes disabled when the setting frequency is lower than certain frequency of FDT1 level (F15.31 - F15.32). Please refer to FL of the right figure. 	
F15.33	**FDT2 detection mode**	**0,1 [0]**
	0: Detect according to the reference frequency. 1: Detect according to the output frequency.	
F15.34	**FDT2 level**	**0.00 - upper limit [50.00Hz]**
F15.35	**FDT2 lag**	**0.00 - upper limit [1.00Hz]**
	Refer to parameters F15.31 and F15.32.	
F15.36	**Preset operating time**	**0 - 65535 [0h]**
	When the total operating time reaches the preset operating time (F15.36), the inverter will output an indicating signal (500ms).	
F15.37	**Preset counting value arriving**	**F15.38 - 9999 [0]**
F15.38	**Specified counting value arriving**	**0 - F15.37 [0]**
	F15.37 presents that when the number of pulse input by the DI terminals (set as No. 51 function) reaches a certain quantity, the DO terminals or relay will send an indicating signal. F15.38 presents that when the number of pulse input by the DI terminals (set as No. 51 function) reaches a specified quantity, the DO terminals or relay will send an indicating signal until the pulse number hits the preset counting value. Sequence of counting value arriving is shown in figure: • DO2 will output an indicating signal when DI1 inputs the third pulse until the preset count value reachs seven. • DO1 will output an indicating signal when DI1 inputs the seventh pulse; Output signal of DO1 returns to low level when DI1 inputs the eighth pulse. 	

6

Ref. Code	Function Description	Setting Range [Default]
F15.39	**Ananlogue input over-limitation selection**	**00000 - 11133 [11100]**
	Unit: Action drive when the input exceeds the limit • 0: Free stop. • 1: Emergency shutdown. • 2: Dec. stop. • 3: No action. **Ten: Select the analog input port** • 0: No analog port. • 1: Operation panel potentiometer. • 2: AI1 port. • 3: AI2 port. **Hundred: Analog overrun detection conditions** • 0: Always detect. • 1: Only detected by the operation command. **Thousand: Reserved** **Ten thousand: Select alarming action** • 0: Continue running without alarming. • 1: After the analog value exceeds the limit, an external fault is reported and the single-position action is selected.	
F15.40	**Analog input overrun upper limit**	**F15.41 - 100.0 [100.0%]**
F15.41	**Analog input overrun down limit**	**0.0 - F15.40 [0.0%]**
	The DO terminal or relay can be selected as the 27th function. When the analog input is greater than the upper limit or less than the lower limit, it is judged that the analog input exceeds the limit, and the DO terminal or relay works.	
F15.42	**Analog overrun detection time**	**0.00 - 50.00 [5.00s]**
F15.43	**Terminal output delay**	**0.0 - 100.0 [0.0s]**
F15.44	**Start analog overrun detection time**	**0.00 - 50.00 [15.00s]**
F15.45	**PID integration keeping time**	**0.020 - 3.000 [0.500ms]**
F15.46	**Whether jog detects analog overrun**	**0,1 [0]**
	0: No detecting. 1: Detecting.	

6.2.13 F16: Analogue I/O Terminal Parameters

Ref. Code	Function Description	Setting Range [Default]
F16.00	**Display panel with potentiometer function**	**0 - 7 [0]**
F16.01	**AI1 function**	**0 - 7 [2]**
F16.02	**AI2 function**	**0 - 7 [5]**
	0: Unused. 1: Upper limit frequency setting source. • When F00.07 = 1 (upper limit frequency setting source is set by analogue input), the upper limit frequency will be set by the input voltage value corresponding to the analogue source which selects this function. 2: Frequency setting source. • When F00.10 = 3 (frequency setting source is set by analogue input), the setting frequency will be set by the input voltage value corresponding to the analogue source which selects this function. 3: Auxiliary frequency reference. • When F19.00 = 4 (auxiliary frequency reference is set by AI analogue), the auxiliary frequency will be set by the input voltage value corresponding to the analogue source which selects this function. 4: Process PID reference. • When F04.01 = 1 (process PID reference is set by AI analogue), the process PID reference will be set by the input voltage value corresponding to the analogue source which selects this function. 5: Process PID feedback. • When F04.02 = 0 (AI analogue inputs process PID feedback), the process PID feedback will be set by the input voltage value corresponding to the analogue source which selects this function. 6: Process PID regulating uper limit. • When F04.11 = 1 (upper limit value of the PID regulator is set by AI analogue), the process PID regulating upper limit will be set by the input voltage value corresponding to the analogue source which selects this function. 7: Process PID regulating lower limit. • When F04.12 = 1 (lower limit value of the PID regulator is set by AI analogue), the process PID regulating lower limit will be set by the input voltage value corresponding to the analogue source which selects this function.	
F16.05	**Analogue input AI1 bias**	**-100.0 - +100.0 [0.0%]**
F16.06	**Analogue input AI1 gain**	**-10.00 - +10.00 [1.00]**
F16.07	**Analogue input AI1 filtering time**	**0.01 - 10.00 [0.05s]**
F16.08	**Analogue input AI2 bias**	**-100.0 - +100.0 [0.0%]**
F16.09	**Analogue input AI2 gain**	**-10.00 - +10.00 [1.00]**
F16.10	**Analogue input AI2 filtering time**	**0.01 - 10.00 [0.05s]**
	When select AI1 - AI4 inputs as open-loop frequency setting source, the relationship between the analogue input and the setting frequency is shown as figure:  The analogue voltage reasults from setting frequency signal disposed by analogue input filtering, bias and gain. The relationship between the analogue voltage and the setting frequency is set by group F05. • Analogue input gain and bias are involved in analogue calculation is as following formula: Y = kX + bA • Y is analogue after calculating, X is value before adjusting, k is analogue input gain (F16.06 and F16.09), b is analogue input bias (F16.05 and F16.08), A is analogue max input (10V or 20mA). • F16.07 and F16.10 define the channel filter time and filters the input signal. The longer filter time, the stronger immunity ability but the shorter respond time; The shorter filter time, the shorter respond time but the weaker immunity ability.	

Ref. Code	Function Description	Setting Range [Default]
F16.17	**Maximum input pulse frequency**	**0.0 - 50.0 [10.0kHz]**
	When set the DI6 terminal as pulse input, F16.17 defines the maximum input pulse frequency.	
F16.18	**Input pulse filtering time**	**0 - 500 [10ms]**
	It is used to filter the input pulse frequency and filter out the small fluctuations in the pulse frequency.	
F16.19	**AO1 function**	**0 - 19 [2]**
F16.20	**AO2 function**	**0 - 19 [0]**
F16.21	**High-speed pulse output function**	**0 - 19 [0]**
	0: Reversed. 1,2: Output frequency, reference frquency (0 - maximum output frequency). 3: Motor speed (0 - maximum output frequency corresponding to speed). 4: Output current (0 - twice motor's rated current). 5: Output current (0 - twice motor's rated current). 10: Output torque (0 - 3 times motor's rated torque). 11: Output voltage (0 - 1.2 times inverter's rated voltage). 12: Bus voltage (0 - 2.2 times inverter's rated voltage). 13: Output power (0 - twice motor's rated power). 14: AI1 input (0 - max. AI1 after calculating). 15: AI2 input (0 - max. AI2 after calculating). 18,19: Output frequency, reference frequency (-1 - +1 times maximum output frequency).	
F16.22	**AO1 bias**	**-100.0 - +100.0 [0.0%]**
F16.23	**AO1 gain**	**0.0 - 200.0 [100.0%]**
	If the user needs to adjust the proportional relationship of the AO1, it can be realized by the output gain. • Analog output gain and offset participation in the analog calculation formula: Actual output (%) = F16.23 × calculated value (%) + F16.22. 	
F16.24	**AO2 bias**	**-100.0 - +100.0 [0.0%]**
F16.25	**AO2 gain**	**0.0 - 200.0 [100.0%]**
	Refer to parameters F16.22 and F16.23.	
F16.26	**DO2 max. output pulse frequency**	**0.1 - 50.0 [10.0kHz]**
	It defines the DO2 terminal allowable max. output frequency.	

6.2.14 F17: SCI Communication Parameters

Ref. Code	Function Description	Setting Range [Default]
F17.00	**Data format**	**0 - 6 [0]**
	0: 1-8-2 format, no parity, RTU. 1: 1-8-1 format, even parity, RTU. 2: 1-8-1 format, odd parity, RTU. 3: 1-7-2 format, no parity, ASCII. 4: 1-7-1 format, even parity, ASCII. 5: 1-7-1 format, odd parity, ASCII. 6: 1-8-1 format, no parity, RTU.	
F17.01	**Baud rate selection**	**0 - 5 [3]**
	0: 1200bps. 1: 2400bps. 2: 4800bps. 3: 9600bps. 4: 19200bps. 5: 38400bps.	
F17.02	**Local address**	**0 - 247 [2]**
	F17.02 = 0, it means broadcast address.	
F17.03	**Host PC response time**	**0 - 1000 [1ms]**
F17.04	**Time threshold for detecting communication status**	**0.0 - 600.0 [0.0s]**
	When the time at no communication data exceeds the setting time of F17.04, it will be considered as communication time out. • F17.04 = 0, it will not detect communication time out.	
F17.05	**Detecting time at communication error**	**0.0 - 600.0 [0.0s]**
	When the time at communication error exceeds the setting time of F17.05, it will be considered as communication error detection. • F17.05 = 0, it will not detect the communication error.	
F17.06	**Action selection at communication time out**	**0 - 3 [3]**
F17.07	**Action selection at communication fault**	**0 - 3 [3]**
F17.08	**Action selection at communication peripheral device fault**	**0 - 3 [1]**
	F17.06 defines the action selection at commmunication time out. F17.07 defines the action selection at communication fault. In the communication command setting mode, F17.08 will define the action selection when communication peripheral device fault is alarmed. 0: Coast to stop. 1: Emergency stop. 2: Dec. to stop. 3: Continue to run.	
F17.09	**Communication write function parameter of storage EEPROM method selection**	**00 - 11 [01]**
	When used to change parameter in selecting communicaition, whether stored in EEPROM or not. **Unit: Except of F00.13, F19.03, EEPROM storeage selection in communication** **Ten: For F00.13, F19.03, EEPROM storeage selection in communication** • 0: Not stored in EEPROM. • 1: Stored in EEPROM. *Note:* *1. When ten is set to 1, it may damage the inverter. Please be careful.* *2. Only when using the communication write function parameter, and function code is 0x06 or 0x10, will F17.09 be valid. Refer to of Appendix B for details.*	
F17.10	**Detecting time of network communicaiton overtime**	**0.0 - 600.0 [0.0s]**
	The time interval between two received correct data (including local or non-native data) continues to exceed F17.10 and is detected for communication timeout. The timeout is checked and the timeout protection is selected according to F17.06. • F17.10 = 0, the communication timeout is not detected.	

6.2.15 F18: Display Control Parameters

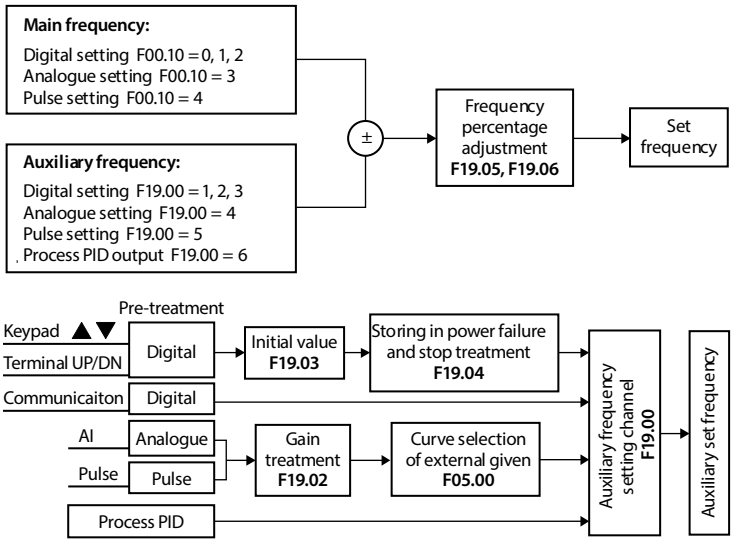
Ref. Code	Function Description	Setting Range [Default]
F18.00	**Language selection**	**0,1 [0]**
	Only when using LCD keypad will F18.00 be enabled. 0: Chinese. 1: English.	
F18.01	**Displaying contrast of the LCD keypad**	**1 - 10 [5]**
	To select LCD displaying contrast. Only when using LCD keypad will F18.01 be enabled.	
F18.02	**Set the display parameter 1 during operation**	**0 - 49 [8]**
F18.03	**Set the display parameter 2 during operation**	**0 - 49 [7]**
F18.04	**Set the display parameter 3 during operation**	**0 - 49 [9]**
F18.05	**Set the display parameter 4 during operation**	**0 - 49 [13]**
F18.06	**Set the display parameter 5 during operation**	**0 - 49 [14]**
F18.07	**Set the display parameter 6 during operation**	**0 - 49 [18]**
F18.08	**Set the display parameter 1 at stop**	**0 - 49 [7]**
F18.09	**Set the display parameter 2 at stop**	**0 - 49 [18]**
F18.10	**Set the display parameter 3 at stop**	**0 - 49 [20]**
F18.11	**Set the display parameter 4 at stop**	**0 - 49 [22]**
F18.12	**Set the display parameter 5 at stop**	**0 - 49 [43]**
F18.13	**Set the display parameter 6 at stop**	**0 - 49 [44]**
	Defines the contents of the operation panel display. Can be loop displayed by the key ▶▶ of keypad operation status and stop status. 0: Unused. 1: Inverter's rated current. 3: The inverter status. • Refer to parameter d00.10. 4: Master setting frequency source. 5: Master setting frequency. 6: Auxiliary setting frequency. 7: Setting frequency. 8: Reference frequency (after Acc./Dec.). 9: Output frequency. • At running state, Hz indicator is flashing. 10: Setting RPM. 11: Running RPM. • At running state, RPM indicator is flashing. 13: Output voltage. 14: Output current. 16: Output torque. 17: Output power. 18: DC bus voltage. 19: Potentiometer input voltage. 20: AI1 input voltage. 21: AI1 input voltage (after disposal). 22: AI2 input voltage. 23: AI2 input voltage (after disposal). 28: DI6 terminal pulse input frequency. 29: AO1 output. 30: AO2 output. 31: High-speed output pulse frequency. 32: Heatsink temperature. 33: Set the line speed. 34: Reference line speed. 37: Process PID reference. 38: Process PID feedback. 39: Process PID error. 40: Process PID integral value. 41: Process PID output. 42: External couting value. 43: Input terminal status. • Bit0 - Bit5 are corresponding to DI1 - DI6. 44: Output terminal status. • Bit0 - Bit2 are corresponding to DO1, DO2, RLY1. 45: Modbus communication status. 46: Actual length. 47: Total length. 48: Total time at power on (hour). 49: Total time at running (hour).	
F18.15	**Max. line speed**	**0 - 65535 [1000]**
F18.16	**Line speed display accuracy**	**0 - 3 [0]**
	0: Integer. 1: One decimal. 2: Two decimal. 3: Three decimal. *Note: The max. linear velocity must be newly set when the display accuracy is changed.*	

6.2.16 F19: Function-boost Parameters

Frequency Auxiliary Setting Sources (F19.00 - F19.06)

The multi-step frequency of HD20 is the result of both master setting frequency and auxiliary setting frequency.

F19.00 defines the auxiliary frequency setting sources. When the auxiliary frequency setting source is the same as the master frequency setting source (except analogue setting), the auxiliary frequency setting source will be disabled.



Ref. Code	Function Description	Setting Range [Default]
F19.00	**Auxiliary frequency setting source selection**	**0 - 6 [0]**
	It defines the setting source of the auxiliary frequency. • When set F19.00 as 1, 2, the initial value is set by F19.03. • When set F19.00 as 4, 5, 6, the initial value is set by the actual analogue input. Refer to F05.00 about the frequency relation characteristic curve selections. • When set F19.00 as 6, set the auxiliary setting frequency according to the relationship of PID setting and feedback. • Please refer to the above figure. 0: No auxiliary source. 1: Keypad setting. Adjusted by ▲ and ▼ keys on the keypad. 2: Terminal setting. Adjusted by terminal UP/DN. 3: SCI communication setting. The initial value is 0. 4: AI analogue setting. 5: Terminal pulse setting. 6: Process PID output.	

Ref. Code	Function Description	Setting Range [Default]
F19.01	**Master/auxiliary setting calculation**	**0,1 [0]**
	It defines the calculating relationship between the final setting frequency and the master/auxiliary freqeuency. 0: Master setting + auxiliary setting. 1: Master setting - auxiliary setting.	
F19.02	**Analogue auxiliary setting coefficient**	**0.00 - 9.99 [1.00]**
	First, calculate the gain by using F19.02, then calculate auxiliary frequency according to the frequency characteristic curve of group F05. • When F19.00 = 4,5, F19.02 is enabled.	
F19.03	**Initial value of digital auxiliary frequency**	**0.00 - F00.06 [0.00Hz]**
	Only when F19.00 = 1 or 2 will F19.03 be enabled and provide the initial value for the two methods.	
F19.04	**Control selection of digital auxiliary frequency**	**00 - 11 [00]**
	Only when F19.00 = 1 or 2 will F19.04 be enabled. **Unit: Save selection at power outage** • 0: Not save auxiliary frequency at power outage. • 1: Save auxiliary frequency at power outage. **Ten: Frequency disposal when the inverter stops** • 0: Maintain the auxiliary frequency when the inverter stops. • 1: The auxiliary frequency will be restored to F19.03 when the inverter stops.	
F19.05	**Adjustment selection of setting frequency**	**0 - 2 [1]**
F19.06	**Adjustment coefficient of setting frequency**	**0.0 - 200.0 [100.0%]**
	F19.05 and F19.06 is to set the adjustment mode of setting frequency (the compounded frequency is computed by master setting frequency plus auxiliary setting frequency). 0: No adjustment. • Setting frequency = compounded frequency. 1: To adjust as per the max. output frequency of F00.06. • Setting frequency = compounded frequency + F00.06 × (F19.06 - 100%). 2: To adjust as per the current frequency. • Setting frequency = compounded frequency × F19.06.	

Fan Control (F19.07 - F19.08)

Ref. Code	Function Description	Setting Range [Default]
F19.07	**Control selection of cooling fan**	**0 - 2 [0]**
F19.08	**Cooling fan controls delaying time**	**0.0 - 600.0 [60.0s]**
	0: Auto stop mode. • The fan runs all the time when the inverter is in running status. After the inverter stops for the time set by F19.08, the fan stops if the inverter is not overheated. The fan will continue running if the overheat protection is activated. 1: Immediate stop mode. • The fan runs all the time when the inverter is in running status and stops when the inverter stops. 2: The fan runs continuously when power on. • The fan runs continuously after the inverter is switched on.	

Droop Control (F19.09)

It is suitable for multiple inverters to drive multiple motors in order to drive the same load.

By setting this function, the uniform distribution of power of multiple inverters can be achieved.

Ref. Code	Function Description	Setting Range [Default]
F19.09	**Droop control**	**0.00 - 10.00 [0.00Hz]**
	This function is used in the application that several inverters drive one motor. The function can make the inverters share the load equally. When the load of one inverter is heavier, this inverter will reduce its output frequency to shed part of the load according to the setting of F19.09.	

Zero-frequency Operation (F19.10 - F19.11)

Refer to below figure for the details.

Fcmd 1 = Setting frequency 1

Fcmd 2 = Setting frequency 2

Fstart = Start DWELL frequency (F02.02)

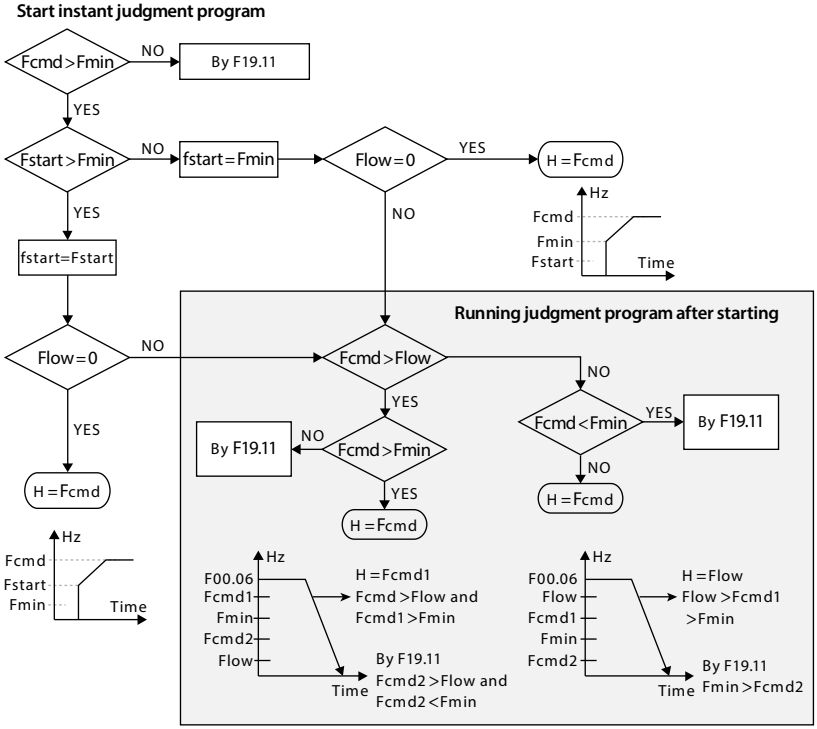
fstart = Actual starting DWELL frequency

Flow = Lower limit frequency (F00.09)

H = Target frequency

Fmin = Zero-frequency threshold (F19.10)

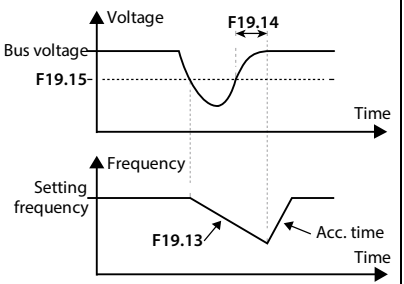
Start instant judgment program



Ref. Code	Function Description	Setting Range [Default]
F19.10	**Zero-frequency threshold**	**0.00 - upper limit [1.00Hz]**
F19.11	**Action selection at setting frequency is lower than zero-frequency threshold**	**0 - 3 [0]**
	0: Run according to frequency command. 1: Holding stop, no output. 2: Run according to zero-frequency threshold. 3: Run according to zero-frequency.	

Trip-free Operation During Momentary Power Loss (F19.12 - F19.15)

The inverter can automatically perform low-voltage compensation when the voltage decreases or instantaneous under-voltage occurs. The inverter can continue to operate without tripping by reducing its output frequency and feedback energy via motor.

Ref. Code	Function Description	Setting Range [Default]
F19.12	**Trip-free selection at momentary power loss**	**0,1 [0]**
	0: Disabled. 1: Enabled. And low-voltage compensation is activated. • If the bus voltage is lower than F19.15, the inverter will decrease the operating frequency according to F19.13. • If the bus voltage is higher than F19.15 and maintains the voltage rise diagnosis time (F19.14), the inverter will reset the setting frequency to run. Otherwise, the inverter will continue to decrease the running frequency.	
F19.13	**Deceleration time at voltage compensation**	**0.01 - 600.00 [5.00s]**
	If F19.13 is set too big, the feedback energy of motor will be too small to achieve voltage compensation effect. If F19.13 is set too small, the feedback energy of motor will be too large and overvoltage protection might be activated.	
F19.14	**Voltage rise diagnosis time of trip-free operation at momentary power loss**	**0.00 - 10.00 [0.10s]**
F19.15	**Reference voltage of trip-free operation at momentary power loss**	**0 - 999V [Depend on HD20]**

Restart after Power Failure (F19.16 - F19.17)

This function decides in different control modes whether the inverter starts automatically or not and the delay time for restart when the inverter is switched off and then switched on.

Ref. Code	Function Description	Setting Range [Default]
F19.16	**Restart after power failure**	**0,1 [0]**
	0: This function is disabled. 1: This function is enabled. In the terminal two-wire control mode and suddenly power failure during running process, when the inverter is powered on again and the terminal is still enabled, it will wait certain time defined by F19.17 and then start operation automatically.	
F19.17	**Delay time for restart after power failure**	**0.00 - 10.00 [2.00s]**

Protection of Stall Overvoltage (F19.18 - F19.19)

During Dec., the motor's decelerate rate may be lower than that of the inverter's output frequency due to the load inertia. At this time, the motor will feed the energy back to the inverter, resulting in voltage rise on the inverter's DC bus. If no measures taken, the inverter will trip due to overvoltage.

Ref. Code	Function Description	Setting Range [Default]
F19.18	**Protection of stall overvoltage**	**0,1 [1]**
	0: Disabled. The braking resistor is recommended to be installed if F19.18 is set to 0. 1: Enabled. During the deceleration, the inverter detects the bus voltage and compares it with the stall overvoltage point defined by F19.18. • If the detecting bus voltage exceeds F19.19 (stall overvoltage point), the inverter will stop reducing its output frequency. When detect again, if the bus voltage becomes lower than F19.19, the deceleration continues. *Note: When the overvoltage stall condition is held for more than 1 minute, the inverter reports overvoltage stall failure (E0007) and stops the output.*	
F19.19	**Stall overvoltage point**	**0 - 999V [depend on HD20]**
	If the stall overvoltage point is set a little lower, deceleration time should be comparatively longer.	

Auto Current Limiting Function (F19.20 - F19.22)

Auto current limiting function is used to limit the load current in real time smaller than the auto current limiting threshold (F19.21). Therefore the inverter will not trip due to surge current. This function is especially suitable for applications with big load inertia or big change of load.

In auto current limiting process, the inverter's output frequency may change; Therefore, it is recommended not to enable this function when stable output frequency is required.

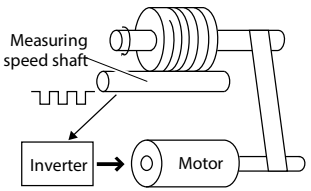
Ref. Code	Function Description	Setting Range [Default]
F19.20	**Auto current limiting selection**	**0 - 2 [1]**
	0: Disabled. 1: Enabled in Acc./Dec. operating process, but disabled in constant speed operating process. 2: Enabled both in Acc./Dec. operating process and in constant speed operating process. • When the auto current limiting function is enabled, the output overload capacity will impaired if auto current limiting threshold is set too low.	
F19.21	**Auto current limiting threshold**	**20.0 - 200.0 [150%]**
	F19.21 defines the threshold of auto current limiting. It is a percentage of the inverter's rated current.	
F19.22	**Deceleration time at auto current limiting**	**0.00 - 600.00 [10.00s]**
	F19.22 defines the speed rate for the output frequency adjustment at auto current limiting action. • If the setting is too small, it will not be easy to over the auto current limiting status and finally result in overload fault. • If the setting is too big, the frequency will change too sharply and therefore, the inverter may be in generating status for a long time, which may result in overvoltage protection.	

Terminal Detecting (F19.23)

Ref. Code	Function Description	Setting Range [Default]
F19.23	**Enabled mode of terminal run command**	**00 - 11 [00]**
	Only valid when the terminal is in 2-wire control. **Unit: Terminal command selection at power-on** **Ten: Terminal command selection after power-on** • 0: Edge valid. • 1: Level is valid.	

Fixed Length Arrive and Stop Function (F19.26 - F19.34)

This group is used to realize fixed length stop function. As the right figure:



The inverter inputs the count pulse from the terminal (multi-function terminal is set as No. 52 function) and gets the count length according to the measuring number of pulses per revolution (F19.31) and shaft diameter (F19.30). Then modify the count length and obtain the actual length (F19.27) via length ratio (F19.28) and length checking coefficient (F19.29) too.

The formula is as follows:

F19.27 = counted length × F19.28 ÷ F19.29 ÷ 100

Counted length = counted pulse number ÷ F19.31 × F19.30 × π

If F19.27 ≥ F19.26, the inverter will automatically send the stop command. Before running again, it need clear F19.27 or changed to F19.27 < F19.26. Otherwise the inverter can't be started.

Ref. Code	Function Description	Setting Range [Default]
F19.26	**Preset length**	**0 - 65535 [0m]**
F19.27	**Actual length**	**0 - 65535 [0m]**
F19.28	**Length ratio**	**0.001 - 30.000 [1.000]**
F19.29	**Length checking coefficient**	**0.001 - 1.000 [1.000]**
F19.30	**Measuring shaft diameter**	**1.00 - 100.00 [10.00cm]**
F19.31	**Number of pulses per revolution**	**1 - 9999 [1]**
F19.32	**Length arrive and output function selection**	**00 - 11 [00]**
	Unit: • 0: Output level signal. • 1: Output 500ms pulse. **Ten:** • 0: Downtime when reach length. • 1: Continue operating when reach length.	
F19.33	**Record of length disposal after length arrive**	**0 - 2 [2]**
F19.34	**Record of length disposal at stop**	**0 - 2 [2]**
	0: Auto-clear. 1: No change. 2: Continue counting.	

Frequency Adjust Range (F19.37)

Ref. Code	Function Description	Setting Range [Default]
F19.37	**Frequency adjust range selection**	**000 - 111 [100]**
	Unit: The main frequency calculation range • 0: 0 to max. frequency. • 1: Negative max. frequency to max. frequency. **Ten: Auxiliary frequency calculation range** • 0: 0 to max. frequency. • 1: Negative max. frequency to max. frequency. **Hundred: Synthetic frequency calculation range** • 0: 0 to the upper limit frequency. • 1: Negative upper limit frequency to upper limit frequency.	

6.2.17 F20: Protection of Fault Parameters

Overload Fault (F20.00 - F20.02)

Ref. Code	Function Description	Setting Range [Default]
F20.00	**Overload pre-alarm detection**	**00000 - 11111 [00000]**
	Unit: Overload pre-alarm detection • 0: It is active all the time in running status. • 1: It is active only at constant speed. **Ten: Action selection for overload pre-alarm** • 0: The inverter doesn't alarm and continues operation when detecting an active overload signal. • 1: The inverter alarms and stops operation when detecting an active overload signal. **Hundred: Overload threshold selection** • 0: Ratio of load current to the motor's rated current (alarm: motor overload "E0019"). • 1: Ratio of load current to the inverter's rated current (alarm: inverter overload "E0017"). **Thousand: Motor type selection** • 0: Standard motor. As the cooling effect of the standard motor deteriorates at low speed, the inverter will automatically make regulation to the motor overload protection time. • 1: Variable frequency. The cooling effect of the variable frequency motor is not affected by the motor's speed due to its forced cooling potential, the inverter will not automatically make regulation to the motor overload protection time, as efficient motor cooling by an external motor fan is assumed. **Ten thousand: Overload protection** • 0: Overload protection is enabled. • 1: Overload protection is disabled.	
F20.01	**Overload pre-alarm detection threshold**	**20.0 - 200.0 [150.0%]**
	F20.01 defines the current threshold for overload pre-alarm protection. The setting range is a percentage value of the motor's or the inverter's rated current.	
F20.02	**Overload pre-alarm detection time**	**0.0 - 60.0 [5.0s]**
	F20.02 defines the time during which the inverter output current exceeds overload pre-alarm detection threshold (F20.01). If the status remains after overload pre-alarm detection time (F20.02), the inverter will output pre-alarm signal.	

Inverter Output Load-loss Detection Fault (F20.03 - F20.05)

Ref. Code	Function Description	Setting Range [Default]
F20.03	**Inverter output load-loss detection**	**0 - 4 [0]**
	0: Disabled. It does not detect inverter output load-loss. 1: It is detecting all the time in running process, and then continues operation after detecting (alarm). 2: It detectes only at the same speed, and then continues operation after detecting (alarm). 3: It is detecting all the time in running process, and then cut off the output after detecting (fault). 4: It is detectes only at the same speed, and then cut off the output after detecting (fault).	
F20.04	**Inverter output load-loss detection threshold**	**0 - 100 [30%]**
	F20.04 defines the current threshold of load-loss. It is a percentage of the inverter's rated current.	
F20.05	**Inverter output load-loss detection time**	**0.00 - 20.00 [1.00s]**
	If the inverter's output current is smaller than the load-loss detection threshold (F20.04) beyond the time defined by load-loss detection time (F20.05), the inverter will alarm inverter load-loss fault (E0018). • F20.04 = 0 or F20.05 = 0, the inverter will not detect load loss fault.	

Input and Output Phase Loss Fault (F20.08 - F20.11)

Ref. Code	Function Description	Setting Range [Default]
F20.08	**Input phase loss detection reference**	**0 - 50 [30%]**
F20.09	**Input phase loss detection time**	**1.00 - 5.00 [1.00s]**
	F20.08 value is a percentage of the inverter's rated voltage. When the inverter detects certain input voltage not hit the preset detection reference (F20.08) and exceed the preset detection time (F20.09), the inverter will perform input phase loss alarm (E0015). • F20.08 = 0, the inverter will not detect input phase loss fault.	
F20.10	**Output phase loss detection reference**	**0 - 50 [20%]**
F20.11	**Output phase loss detection time**	**0.00 - 20.00 [3.00s]**
	F20.10 value is a percentage of the inverter's rated current. When the inverter detects certain output current not hit the preset detection reference (F20.10) and exceed the preset detection time (F20.11), the inverter will perform output phase loss alarm (E0016). • F20.10 = 0, the inverter will not detect output phase loss fault.	

PID Fault (F20.12 - F20.17)

Ref. Code	Function Description	Setting Range [Default]
F20.12	**PID reference lose detected value**	**0 - 100 [0%]**
F20.13	**PID reference loss detection time**	**0.00 - 10.00 [0.20s]**
	F20.12 value is a percentage of the max. reference source. If the PID reference value is lower than the detected value (F20.12) in the detection time (F20.13), the inverter will alarm PID reference loss alarm (E0025). • F20.12 = 0 or F20.13 = 0, the inverter will not detect PID reference loss fault.	
F20.14	**PID feedback loss detected value**	**0 - 100 [0%]**
F20.15	**PID feedback loss detection time**	**0.00 - 10.00 [0.20s]**
	F20.14 value is a percentage of the max. feedback source. If the PID feedback value is lower than the detected value (F20.14) in the detection time (F20.15), the inverter will implement PID feedback loss alarm (E0026). • F20.14 = 0 or F20.15 = 0, the inverter will not detect PID feedback loss fault.	
F20.16	**Detection value at PID feedback out of the limit**	**0 - 100 [100%]**
F20.17	**Detection time at PID feedback out of the limit**	**0.00 - 10.00 [0.20s]**
	F20.16 value is a percentage of the max. feedback source. If the PID feedback value exceed the detection value (F20.16) in the detection time (F20.17), the inverter will alarm PID feedback out of limiting (E0027). • F20.16 = 0 or F20.17 = 0, the inverter will not detect PID feedback out of limiting fault.	

Faulted Auto Reset Function and Faulted Relay Action (F20.18 - F20.20)

Auto reset function enables the inverter to reset the fault as per the preset F20.18 and F20.19.

During the reset interval, the inverter stops output and it will automatically restarts with flying start mode.

The following faults do not have the auto reset function:

E0008: Power modular fault
E0010: Braking unit fault
E0013: Contactor isn't closed at power on
E0014: Current detection circuit fault
E0021: Control board EEPROM read/write fault
E0023: Parameter setting fault
E0024: Peripheral device fault

Ref. Code	Function Description	Setting Range [Default]
F20.18	**Auto reset times**	**0 - 100 [0]**
F20.19	**Auto reset interval**	**0.01 - 200.00 [5.00s/time]**
	When F20.19 = 0, it means "auto reset" is disabled and the protective device will be activated in case of fault. • If no other fault is detected within 5 minutes, the auto reset times will be automatically cleared. • On condition of external fault reset, auto reset time will be cleared.	
F20.20	**Faulted relay action selection**	**00 - 11 [00]**
	Unit: In auto reset process • 0: Faulted relay doesn't act. • 1: Faulted relay acts. **Ten: In the undervoltage process** • 0: Faulted relay doesn't act. • 1: Faulted relay acts. *Note: It need preset the relay function as No. 31 function (F15.20 = 31).*	

Fault History (F20.21 - F20.37)

Ref. Code	Function Description	Setting Range [Default]
F20.21	Type of fifth latest (the last) fault	[Actual value]
F20.22	Setting frequency at the last fault	
F20.23	Running frequency at the last fault	
F20.24	Bus voltage at the last fault	
F20.25	Output voltage at the last fault	
F20.26	Output current at the last fault	
F20.27	Input terminal status at the last fault	
F20.28	Output terminal status at the last fault	
F20.29	Interval of fifth latest fault	
F20.30	Type of fourth latest fault	
F20.31	Interval of fourth latest fault	
F20.32	Type of third latest fault	
F20.33	Interval of third latest fault	
F20.34	Type of second latest fault	
F20.35	Interval of second latest fault	
F20.36	Type of first latest fault	
F20.37	Interval of first latest fault	
	F20.22 - F20.29 record the inverter status parameters at the last fault. F20.30 - F20.37 record the type and interval per time of four faults before the latest. The interval's unit is 0.1 hour.	

6.2.18 F23: PWM Control Parameters

Ref. Code	Function Description	Setting Range [Default]
F23.00	Set the carrier frequency	1 - 16 [8kHz]
	F23.00 defines the carrier frequency of PWM output wave. • The carrier frequency will affect the operating noise of the motor. The higher the carrier frequency, the lower the noise made by the motor. Please properly set the carrier frequency. • When the value is higher than the factory setting, the inverter should be derated by 5% when per 1kHz is increased compared to the factory setting.	
F23.02	PWM overshoot enable	0,1 [1]
	0: Disabled. 1: Enabled.	

6.3 Group y Manufacturer Function Parameters

The group y is the manufacturer parameters group for debugging at the factory before delivery.

Chapter 7 Troubleshooting and Maintenance

7.1 Troubleshooting

HD20 series inverter has inbuilt protective and warning self-diagnostic functions. If a fault occurs, the fault code will be displayed on the keypad. At the same time, fault relay acts, accordingly the inverter stops output and the motor coasts to stop.

When fault or alarm occurs, please record the fault details and take proper actions according to the below Table 7-1. If you need some technical help, please contact to the suppliers or directly call Shenzhen Hpmont Technology Co., Ltd.

After the fault is eliminated, please reset the inverter by any of the following methods:

1. Display panel.
2. External reset terminal (multi-function terminal set as No. 46 function).
3. Communication.
4. Switching on the inverter after switching off.

Table 7-1 Fault alarm description and countermeasure

Fault		Reasons	Countermeasure
-Lu-	DC bus undervoltage	• At the begining of powering on and at the end of powering off • Input voltage is too low • Improper wiring leads to undervoltage of hardware	• It is normal status of powering on and powering off • Please check input power voltage • Please check wiring and wire the inverter properly
E0001	Inverter output overcurrent (in Acc. process)	• Improper connection between inverter and motor • Improper motor parameters • The rating of the used inverter is too small • Acc./Dec. time is too short • Instant stop occurs, the running motor is restarted	• Connect the inverter and motor properly • Please set correct motor parameters (F08.00 - F08.04) • Select inverter with higher rating • Please set proper Acc. time and Dec. time (F03.01 - F03.08) • Please set start mode to be speed tracking (F02.00 = 2)
E0002	Inverter output overcurrent (in Dec. process)		
E0003	Inverter output overcurrent (in constant speed process)		
E0004	DC bus over voltage (in Acc. process)	• Input voltage is too high • Deceleartion time is too short • Improper wiring leads to overvoltage of hardware • Instant stop occurs, the running motor is restarted • Improper selection of the braking devices	• Please check power input • Please set a proper value for Dec. time (F03.02, F03.04, F03.06, F03.08) • Please check wiring and wire the inverter properly • Please set start mode to be speed tracking (F02.00 = 2) • Select according to the recommended braking devices of user manual
E0005	DC bus over voltage (in Dec. process)		
E0006	DC bus over voltage (in constant speed process)		

Fault		Reasons	Countermeasure
E0007	Stall overvoltage	• Bus voltage is too high • The setting of stall overvoltage is too low	• Please check power input or the function of brake • Set the value of stall overvoltage properly
E0008	Fault of power module	• Short circuit between phases output • Short circuit to the ground • Output current is too high • Power module is damaged	• Please check the connection and connect the wire properly • Please check the connection and connect the wire properly • Please check the connection and mechanism • Please contact the supplier for repairing
E0009	Heatsink overheat	• Ambient temperature is too high • Inverter external ventilation is not good • Fan fault • Fault occurs to temperature detection circuit	• Please use inverter with higher power capacity • Improve the ventilation around the inverter • Replace the cooling fan • Please seek technical support
E0010	Fault of braking unit	• Circuit fault of braking unit	• Please seek technical support
E0011	CPU fault	• CPU abnormal	• Please detect at power on after completely power outage • Please seek technical support
E0012	Parameters auto-tuning fault	• Parameter auto-tuning is time out	• Please check the motor's connection • Input the correct motor parameters (F08.00 - F08.04) • Please seek technical support
E0013	Contactor is not actuated	• Contactor fault • Fault of control circuit	• Replace the contactor • Please seek technical support
E0014	Fault of current detection circuit	• Current detection circuit is damaged	• Please contact the supplier for repairing
E0015	Fault of input phase	• For three-phase input inverter, input phase loss fault occurs to power input	• Please check the three-phase power input • Please seek technical support
E0016	Fault of output phase	• Output phase disconnection or loss • Heavy imbalance of inverter's three-phase load	• Please check the connection between inverter and motor • Please check the quality of motor
E0017	Inverter overload	• Acc. time is too short • Incorrect setting of motor parameters • Improper setting of V/f curve or torque boost leads to over current • Instant power-off occurs, the running motor is restarted • Mains supply voltage is too low • Motor load is too high	• Adjust Acc. time (F03.01, F03.03, F03.05, F03.07) • Input the correct motor parameters (F08.00 - F08.04) • Adjust V/f curve (F09.00 - F09.06) or torque boost (F09.07, F09.08) • Please set start mode to be speed tracking (F02.00 = 2) • Please check mains supply voltage • Please use inverter with proper power rating

Fault		Reasons	Countermeasure
E0018	Inverter output is unloaded	• Load disappeared or comes down suddenly • Parameters are not set properly	• Please check load and mechanical transmission devices • Please set the parmeters properly (F20.03 - F20.05)
E0019	Motor overload	• Improper setting of V/f curve • Mains supply voltage is too low • Normal motor runs for a long time with heavy load at low speed • Motor runs with blocked torque or load is too heavy	• Adjust the setting of V/f curve (F09.00 - F09.06) • Check the power input • Please use special motor if the motor needs to operate for a long time with heavy load • Please check the load and mechanical transmission devices
E0021	Access fault of control board EEPROM	• Memory circuit fault of control board EEPROM	• Please contact the supplier for repairing
E0022	Access fault of keypad EEPROM	• Memory circuit fault of keypad EEPROM	• Replace the keypad • Please contact the supplier for repairing
E0023	Fault setting of parameters	• The power rating between motor and inverter is too different • Improper setting of motor parameters	• Select an inverter with suitable power rating • Please set correct value of motor parameters (F08.00 - F08.04)
E0024	Fault of external equipment	• Fault terminal of external equipment operates	• Please check external equipment
E0025	PID reference loss	• Analogue reference signal is smaller than F20.12 • Analogue input circuit fault	• Please check the connection • Please seek technical support
E0026	PID feedback loss	• Analogue setting signal is smaller than F20.14 • Analogue input circuit fault	• Please check the connection • Please seek technical support
E0027	PID feedback out of limiting	• Analogue setting signal is bigger than F20.16 • Analogue input circuit fault	• Please check the connection • Please seek technical support
E0028	SCI communication time-out	• Connection fault of communication cable • Disconnected or not well connected	• Please check the connection
E0029	SCI communication error	• Connection fault of communication cable • Disconnected or not well connected • Communication setting error • Communication data error	• Please check the connection • Please check the connection • Please correctly set the communication format (F17.00) and the baud rate (F17.01) • Send the data according to Modbus protocol

Note: E0022 not affact normal running.

7.2 Maintenance

Factors such as ambient temperature, humidity, PH, dust, oscillation, internal component aging, wear and tear will give rise to the occurrence of potential faults. Therefore, it is necessary to conduct daily maintenance to the controller.

- If HD20 has been transported for a long distance, check whether the components of HD20 are complete and the screws are well tightened.
- Periodically clean the dust inside HD20 and check whether the screws are loose.

Danger

- Only a trained and qualified professional person can maintain the controller.
- Maintenance personnel should take off all metal jewellery before carrying out maintenance or internal measurements in the controller. Suitable clothes and tools must be used.
- High voltage exists when the controller is powered up or running.
- Checking and maintaining can only be done after AC power of HD20 is cut off and wait for at least 10 minutes. The cover maintenance can only be done after ensured that the charge indicator inside HD20 and the indicators on the keypad are off and the voltage between power terminals (+) and (-) is below 36V.

Warning

- For HD20 with more than 2 years storage, please use voltage regulator to increase the input voltage gradually.
- Do not leave metal parts like screws or pads inside HD20.
- Do not make modification on the inside of controller without instruction from the supplier.
- There are IC components inside the controller, which are sensitive to stationary electricity. Directly touch the components on the PCB board is forbidden.

Daily Maintenance

HD20 must be operated in the specified environment (refer to section 3.2, page 11). Besides, some unexpected accidents may occur during running.

Therefore maintain it according to the Table 7-2. To prolong the lifetime of HD20, keep good running environment, record the daily run data and detect any abnormal behavior.

Table 7-2 Daily checking items

Items	Content	Criteria
Running environment	Temperature and humidity	-10 - +40℃, derating at 40 - 50℃ Less than 95%RH, non-condensing
	Dust and water dripping	No conductive dust accumulating, no water dripping
	Gas	No strange smell
HD20	Oscillation and heating	Stable oscillation and proper temperature
	Noise	No abnormal sound
Motor	Heating	No overheat
	Noise	Low and regular noise
Running status parameters	Output current	Within rated range
	Output voltage	Within rated range

Periodical Maintenance

Customer should check the inverter in short time or every 3 to 6 months according to the actual environment so as to avoid hidden problems and make sure the inverter runs well for a long time.

General Inspection:

- Check whether the screws of control terminals are loose. If so, tighten them with a screw driver;
- Check whether the main circuit terminals are properly connected; whether the copper bar and mains cables are overheated;
- Check whether the power cables and control cables are damaged, check especially for any wear on the cable tube;
- Check whether the insulating tapes around the cable lugs are stripped, and for signs of overheating near terminations;
- Clean the dust on PCBs and air ducts with a vacuum cleaner.

Note:

1. Dielectric strength test of the controller has already been conducted in the factory. Do not do the test again. Otherwise, the controller might be damaged.

2. If insulation test to the motor is necessary, it should be done after the input terminals U/V/W of motor have been detached from HD20. Otherwise, HD20 will be damaged.

3. For controllers that have been stored for a long time, they must be powered up every 2 years. When supplying AC power to the controller, use a voltage regulator to gradually raise the input voltage to rated input voltage at least 5 hours.

Replacing Damaged Parts

The components that are easily damaged are: Cooling fan and electrolytic capacitors of filters. Their lifetime depends largely on their application environment and preservation. The users can decide the time when the components should be replaced according to their service time.

Easily Damaged	Cooling Fan	Electrolytic Capacitors
Life	60, 000 hours	50, 000 hours
Possible Cause of Damages	Wear of the bearing, aging of the fan vanes	High ambient temperature, aging of electrolyte and large pulse current induced by rapid changing loads
Criteria	After the inverter is switched off, check if the abnormal conditions such as crack existing on fan vanes and other parts. When the inverter is switched on, check if inverter running is normal, and check if there is any abnormal oscillation	Check if frequent overcurrent or overvoltage failures occur during inverter start-up with load. Check if there is any leakage of liquids. Check if the safety valve protrudes. Measure the static capacitance and insulation resistance

Unwanted Inverter Recycling

When disposing the inverter, please pay attention to the following factors:

- The capacitors may explode if they are burnt.
- Poisonous gas may be generated when the plastic parts like front covers are burnt.
- Disposing method: Please dispose unwanted inverters as industrial waste.

Chapter 8 Options

8.1 Panel Installation Assembly

The keypad installation assembly includes mounting base and extension cable.

Mounting Base

The keypad mounting base is an accessory. If needed, please order goods.

Model: HD-KMB. The mounting base and its size are shown as Figure 8-1, the unit is mm.

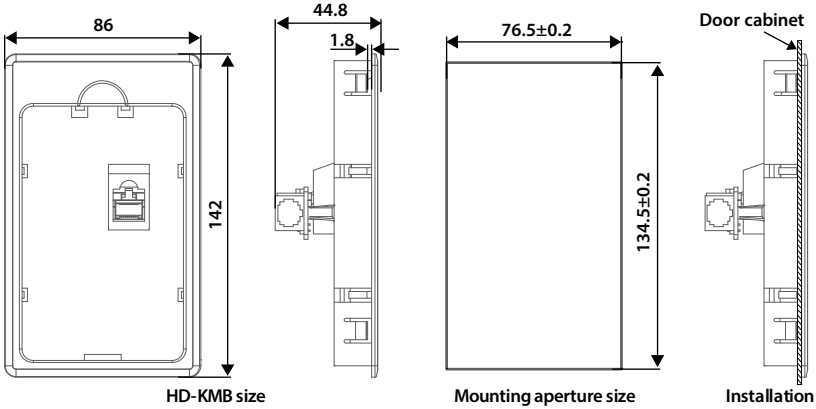


Figure 8-1 Mounting base and its size

Extension Cable

The keypad extension cable is an accessory. If needed, please order goods.

The models are as follows:

- 1m extension cable to keypad: HD-CAB-1M
- 2m extension cable to keypad: HD-CAB-2M
- 3m extension cable to keypad: HD-CAB-3M
- 6m extension cable to keypad: HD-CAB-6M

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8.2 Braking Resistor

Table 8-1 The braking resistor selection

Model	Motor	Braking Resistor Resistance	Braking Resistor Power	Braking Unit
HD20-2S0P2G	0.25kW	250 - 350Ω	50W	Built-in
HD20-2S0P4G	0.4kW	200 - 300Ω	50W	Built-in
HD20-2D0P7G	0.75kW	150 - 250Ω	80W	Built-in
HD20-2D1P5G	1.5kW	100 - 150Ω	100W	Built-in
HD20-2D2P2G	2.2kW	60 - 100Ω	200W	Built-in
HD20-4T0P4G	0.4kW	300 - 400Ω	80W	Built-in
HD20-4T0P7G	0.75kW	250 - 350Ω	100W	Built-in
HD20-4T1P5G	1.5kW	200 - 300Ω	200W	Built-in
HD20-4T2P2G	2.2kW	150 - 250Ω	250W	Built-in
HD20-4T3P0G	3.0kW	100 - 150Ω	300W	Built-in
HD20-4T4P0G	4.0kW	100 - 150Ω	300W	Built-in
HD20-4T5P5G	5.5kW	80 - 100Ω	500W	Built-in

Note:

1. Please select braking resistor based on the above table.
Bigger resistor can protect the braking system in fault condition, but oversized resistor may bring a capacity decrease, lead to over voltage protection.

2. The braking resistor should be mounted in a ventilated metal housing to prevent inadevertent contact during it works, for the temperature is high.

Appendix A Parameters

Attributes are changed:

"*": It denotes that the value of this parameter is the actual value which cannot be modified.

"×": It denotes that the setting of this parameter cannot be modified when the inverter is in run status.

"○": It denotes that the setting of this parameter can be modified when the inverter is in run status.

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00: Status Display Parameters (refer to pages 42 - 45)						
d00.00	Series of the inverter	0x10 - 0x50			*	
d00.01	Software version of the U1	00.00 - 99.99			*	
d00.02	Software version of the I1	00.00 - 99.99			*	
d00.03	Special software version of the U1	00.00 - 99.99			*	
d00.04	Special software version of the I1	00.00 - 99.99			*	
d00.05	Software version of the display panel	00.00 - 99.99			*	
d00.06	Custom series number	0 - 9999			*	
d00.07	Motor and control mode	Unit: Display the present driving motor Ten: Control mode 0: V/f control without PG 2: Vector control without PG			*	
d00.08	Rated current of the inverter	0.00 - 99.99A			*	
d00.10	Inverter status	Bit0: Inverter fault Bit1: Run/stop Bit2: Forward/reverse Bit3: Zero speed Bit5&Bit4: Acc./Dec./constant Bit7: DC brake Bit8: Auto-tuning Bit10: Speed limitation Bit12: Stall overvoltage Bit13: Software current restriction			*	
d00.11	Master setting frequency source	0 - 4			*	
d00.12	Master setting frequency	0.01 - 400.00Hz			*	
d00.13	Auxiliary setting frequency	0.01 - 400.00Hz			*	
d00.14	Setting frequency	0.01 - 400.00Hz			*	
d00.15	Reference frequency (after acceleration/deceleration)	0.01 - 400.00Hz			*	
d00.16	Output frequency	0.01 - 400.00Hz			*	
d00.17	Setting speed	0 - 60000rpm			*	
d00.18	Running speed	0 - 60000rpm			*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
d00.20	Output voltage	0 - 999V			*	
d00.21	Output current	0.1 - 999.9A			*	
d00.23	Output torque	0.0 - 300.0% (motor rated torque)			*	
d00.24	Output power	Actual value (unit: 0.1kW)			*	
d00.25	DC bus voltage	0 - 999V			*	
d00.26	Potentiometer input voltage of the display panel	0.00 - 5.00V			*	
d00.27	AI1 input voltage	0.00 - 10.00V			*	
d00.28	AI1 input voltage (after disposal)	0.00 - 10.00V			*	
d00.29	AI2 input voltage	-10.00 - +10.00V			*	
d00.30	AI2 input voltage (after disposal)	-10.00 - +10.00V			*	
d00.35	DI6 terminal pulse input frequency	0 - 50000Hz			*	
d00.36	AO1 output	0.00 - 10.00V			*	
d00.37	AO2 output	0.00 - 10.00V			*	
d00.38	High-speed output pulse frequency	0 - 50000Hz			*	
d00.39	Heatsink temperature	0.0 - 999.9℃			*	
d00.40	Setting line speed	0 - max output line speed			*	
d00.41	Reference line speed	0 - max output line speed			*	
d00.44	Process PID reference	-100.0 - +100.0%			*	
d00.45	Process PID feedback	-100.0 - +100.0%			*	
d00.46	Process PID tolerance	-100.0 - +100.0%			*	
d00.47	Process PID integral item	-100.0 - +100.0%			*	
d00.48	Process PID output	-100.0 - +100.0%			*	
d00.49	External counting value	0 - 9999			*	
d00.50	Input terminal status	Bit0 - Bit5 correspond to DI1 - DI6 0: Input terminals disconnect with common terminals 1: Input terminals connect with common terminals			*	
d00.51	Output terminal status	Bit0 - Bit1 correspond to DO1 - DO2 Bit2 correspond to RLY1 0: Output terminals disconnect with common terminals 1: Output terminals connect with common terminals			*	
d00.52	Modbus communication status	0: Normal 1: Communication timeout 2: Incorrect data frame head 3: Incorrect data frame checking			*	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		4: Incorrect data frame content				
d00.53	Actual length	0 - 65535m			*	
d00.54	Total length	0 - 65535km			*	
d00.55	Total time at power-on (h)	0 - 65535h			*	
d00.56	Total time at operation (h)	0 - 65535h			*	
d00.57	High bit of motor total energy consumption	0 - 65535k kW.h			*	
d00.58	Low bit of motor total energy consumption	0.0 - 999.9kW.h			*	
d00.59	High bit of energy consum. at this time running	0 - 65535k kW.h			*	
d00.60	Low bit of energy consum. at this time running	0.0 - 999.9kW.h			*	
d00.61	Fault at the moment	1 - 99			*	
F00: Basic Parameter (refer to pages 45 - 47)						
F00.01	Motor control mode	0: V/f control without PG 2: Vector control without PG	0	1	×	
F00.06	Motor control mode	50.00 - 400.00Hz	50.00 Hz	0.01 Hz	×	
F00.07	Max. output frequency of HD20	0: Digital setting (F00.08) 1: Analogue input setting 2: Terminal pulse setting	0	1	×	
F00.08	Upper limit of running frequency setting channel	0.00Hz - F00.06	50.00 Hz	0.01 Hz	×	
F00.09	Upper limit of running frequency	0.00Hz - upper limit	0.00Hz	0.01 Hz	×	
F00.10	Frequency setting channels	0: Display panel digital setting 1: Terminal digital setting 2: SCI communication setting 3: Analogue setting 4: Terminal pulse setting	0	1	×	
F00.11	Command setting channel	0: Display panel running source 1: Terminal running source 2: SCI communication running source	0	1	×	
F00.12	M key function	0: Switch the display panel running direction 1: Switch local and remote control 2: M key invalid	2	1	○	
F00.13	Starting frequency digital setting	0.00Hz - upper limit	50.00 Hz	0.01 Hz	○	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F00.14	Frequency setting control	Unit: Save selection of frequency setting at power outage 0: Do not save at power outage 1: Save at power outage Ten: Control selection of frequency setting at stop 0: Set frequency is kept in stop 1: Restore to F00.13 at stop Hundred: Save selection of communication setting frequency 0: Do not save when power is off 1: Save to F00.13 when power is off Thousand: Save selection of frequency setting when switching frequency source 0: Do not save 1: Save	1001	1	×	
F00.15	Jog running frequency digital setting 1	0.00Hz - upper limit	5.00Hz	0.01 Hz	○	
F00.16	Interval of jog running	0.0 - 100.0s	0.0s	0.1s	×	
F00.17	Running direction	0: The same as run command 1: Opposite to run command	0	1	×	
F00.18	Reverse	0: Reverse operation is permitted 1: Reverse operation is prohibitted	0	1	×	
F00.19	Dead time of direction switch	0.0 - 3600.0s	0.0s	0.1s	×	
F01: Protection Parameters (refer to pages 47 - 49)						
F01.00	User's password	00000 - 65535	0	1	○	
F01.01	Menu mode selection	0: Full menu mode 1: Checking menu mode	0	1	○	
F01.02	Function code parameter initialization (download)	0: No operation 1: Restore to factory settings 2/3: Download the keypad EEPROM parameter 1/2 to the current function code settings 4: Clear fault information 5/6: Copy the keypad EEPROM parameter 1/2 to the current function code settings (including the motor parameters)	0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F01.03	Display panel EEPROM parameter initialization (upload)	0: No operation 1/2: Copy the current function code settings to keypad EEPROM parameter 1/2	0	1	○	
F02: Run/Stop Control Parameters (refer to pages 49 - 52)						
F02.00	Start mode	0: Start from starting DWELL frequency 1: Brake and then start from starting DWELL frequency 2: Rotate speed tracking re-start	0	1	×	
F02.01	Start delay time	0.00 - 10.00s	0.00s	0.01s	×	
F02.02	Starting DWELL frequency setting	0.00Hz - upper limit	0.00Hz	0.01 Hz	×	
F02.03	Starting DWELL retention time	0.00 - 10.00s	0.00s	0.01s	×	
F02.04	Current at DC brake	0 - 100% (inverter's rated current)	50%	1%	×	
F02.05	DC brake starting time	0.00 - 60.00s	0.50s	0.01s	×	
F02.07	Speed search mode based on current	0: From the max. output frequency to start speed searching 1: From at stop moment frequency to start speed searching	1	1	×	
F02.08	Setting reference current for speed search	0 - 100% (motor's rated current)	50%	1%	×	
F02.09	Acc./Dec. time of the speed search	1.0 - 50.0s	5.0s	0.1s	×	
F02.10	Waiting time of speed search	0.1 - 5.0s	1.0s	0.1s	×	
F02.11	V/f ratio of speed search	0.0 - 100.0%	100.0%	0.1%	×	
F02.12	Disposal time after speed search	0.01 - 5.00s	1.00s	0.01s	×	
F02.13	Stop mode selection	0: Decelerate to stop (decreases to DWELL frequency setting and holds on retention time of DWELL frequency, then it will stop) 1: Coast to stop 2: Decelerate to stop with DC braking	0	1	×	
F02.14	DWELL frequency setting at stop	0.00Hz - upper limit	0.00Hz	0.01 Hz	×	
F02.15	Retention time of DWELL frequency at stop	0.00 - 10.00s	0.00s	0.01s	×	
F02.16	DC braking initial frequency at stop	0.00 - 50.00Hz	0.50Hz	0.01 Hz	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F02.17	DC braking waiting time at stop	0.00 - 10.00s	0.00s	0.01s	×	
F02.18	DC braking time at stop	0.00 - 60.00s	0.50s	0.01s	×	
F02.19	Jog control mode	Unit: 0: Can not jog the start and stop function 1: Can jog the start and stop function Ten: 0: Terminal jog is not preferred 1: Terminal jog is preferred	0	1	×	
F03: Acc./Dec. Parameters (refer to pages 52 - 53)						
F03.01	Acc./Dec. modes selection	0.01 - 600.00s	10.00s	0.01s	○	
F03.02	Acc time 1	0.01 - 600.00s	10.00s	0.01s	○	
F03.03	Dec time 1	0.01 - 600.00s	10.00s	0.01s	○	
F03.04	Acc time 2	0.01 - 600.00s	10.00s	0.01s	○	
F03.05	Dec time 2	0.01 - 600.00s	10.00s	0.01s	○	
F03.06	Acc time 3	0.01 - 600.00s	10.00s	0.01s	○	
F03.07	Dec time 3	0.01 - 600.00s	10.00s	0.01s	○	
F03.08	Acc time 4	0.01 - 600.00s	10.00s	0.01s	○	
F03.09	Switching frequency of acc time 1 and 2	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F03.10	Switching frequency of dec time 2 and 1	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F03.15	Acceleration time of jog operation	0.01 - 600.00s	6.00s	0.01s	○	
F03.16	Deceleration time of jog operation	0.01 - 600.00s	6.00s	0.01s	○	
F03.17	Deceleration time of emergency stop	0.01 - 600.00s	10.00s	0.01s	○	
F04: Process PID Control (refer to pages 53 - 55)						
F04.00	Process PID control selection	0: PID control is disabled 1: PID control is enabled	0	1	×	
F04.01	Reference source selection	0: Digital reference 1: Analogue reference 2: Terminal pulse reference	0	1	×	
F04.02	Feedback source selection	0: Analogue feedback 1: Terminal pulse feedback	0	1	×	
F04.03	Setting digital reference	-10.00 - +10.00V	0.00V	0.01V	○	
F04.04	Proportional gain (P)	0.00 - 10.00	2.00	0.01	○	
F04.05	Integral time (I)	0.01 - 10.00s	1.00s	0.01s	○	
F04.06	Integral upper limit	0.0 - 100.0%	100.0%	0.1%	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F04.07	Differential time (D)	0.00 - 10.00s 0.00: F04.07 is invalid	0.00s	0.01s	○	
F04.08	Differential amplitude limit value	0.0 - 100.0%	20.0%	0.1%	○	
F04.09	Sampling cycle (T)	0.01 - 50.00s	0.10s	0.01s	○	
F04.10	Bias limit	0.0 - 20.0% (reference)	2.0%	0.1%	○	
F04.11	PID regulator upper limit source selection	0: Set by F04.13 1: Set by analogue value 2: Set by terminal pulse input	0	1	×	
F04.12	PID regulator lower limit source selection	0: Set by F04.14 1: Set by analogue value 2: Set by terminal pulse input	0	1	×	
F04.13	PID regulator upper limit value	0.0 - 100.0%	100.0%	0.1%	×	
F04.14	PID regulator lower limit value	0.00 - 100.00%	0.00%	0.10%	×	
F04.15	PID regulator characteristic	0: Positive 1: Negative	0	1	×	
F04.16	Integral regulation selection	0: Stop integral regulation when the frequency reaches the upper or lower limit 1: Continue the integral regulation when the frequency reaches the upper or lower limit	0	1	×	
F04.17	PID output filter time	0.01 - 10.00s	0.05s	0.01s	○	
F04.18	PID output reverse selection	0: PID regulation disable reverse (when PID output is negative, 0 is the limit) 1: PID regulation enable reverse (when F00.18 = 1 disable reverse, 0 is the limit)	0	1	×	
F04.19	PID output reverse frequency's upper limit	0.00Hz - upper limit	50.00Hz	0.01Hz	×	
F04.23	PID mode selection	0: NO PID mode 1: Reserved 2: PID enhancement mode	0	1	×	
F05: External Reference Curve Parameters (refer to pages 55 - 57)						
F05.00	External reference curve selection	Unit: AI1 characteristic curve selection Ten: AI2 characteristic curve selection Hundred: Reserved Thousand: Reserved Ten thousand: Pulse input characteristic curve selection	00000	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
		0: Line 1 1: Line 2 2: Polyline				
F05.01	Minimum reference of line 1	0.0% - F05.03	0.0%	0.1%	○	
F05.02	Minimum reference corresponding value of line 1	0.0 - 100.0%	0.0%	0.1%	○	
F05.03	Maximum reference of line 1	F05.01 - 100.0%	100.0%	0.1%	○	
F05.04	Maximum reference corresponding value of line 1	0.0 - 100.0%	100.0%	0.1%	○	
F05.05	Minimum reference of line 2	0.0% - F05.07	0.0%	0.1%	○	
F05.06	Minimum reference corresponding value of line 2	0.0 - 100.0%	0.0%	0.1%	○	
F05.07	Maximum reference of line 2	F05.05 - 100.0%	100.0%	0.1%	○	
F05.08	Maximum reference corresponding value of line 2	0.0 - 100.0%	100.0%	0.1%	○	
F05.09	Maximum reference of polyline	F05.11 - 100.0%	100.0%	0.1%	○	
F05.10	Maximum reference corresponding value of polyline	0.0 - 100.0%	100.0%	0.1%	○	
F05.11	Inflection point 2 reference of polyline	F05.13 - F05.09	100.0%	0.1%	○	
F05.12	Inflection point 2 corresponding value	0.0 - 100.0%	100.0%	0.1%	○	
F05.13	Inflection point 1 reference of polyline	F05.15 - F05.11	0.0%	0.1%	○	
F05.14	Inflection point 1 corresponding value	0.0 - 100.0%	0.0%	0.1%	○	
F05.15	Minimum reference of polyline	0.0% - F05.13	0.0%	0.1%	○	
F05.16	Minimum reference corresponding value of polyline	0.0 - 100.0%	0.0%	0.1%	○	
F05.17	Skip frequency 1	F00.09 - upper limit	0.00Hz	0.01Hz	×	
F05.18	Skip frequency 2	F00.09 - upper limit	0.00Hz	0.01Hz	×	
F05.19	Skip frequency 3	F00.09 - upper limit	0.00Hz	0.01Hz	×	
F05.20	Range of skip frequency	0.00 - 30.00Hz	0.00Hz	0.01Hz	×	
F05.21	Jog operation frequency digital setting 2	0.00Hz - upper limit	5.00Hz	0.01Hz	○	
F06: MS SPEED and Simple PLC (refer to pages 57 - 60)						
F06.00	Multi-step frequency command 1	F00.09 - upper limit	5.00Hz	0.01Hz	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F06.01	Multi-step frequency command 2	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.02	Multi-step frequency command 3	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.03	Multi-step frequency command 4	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.04	Multi-step frequency command 5	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.05	Multi-step frequency command 6	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.06	Multi-step frequency command 7	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.07	Multi-step frequency command 8	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.08	Multi-step frequency command 9	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.09	Multi-step frequency command 10	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.10	Multi-step frequency command 11	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.11	Multi-step frequency command 12	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.12	Multi-step frequency command 13	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.13	Multi-step frequency command 14	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.14	Multi-step frequency command 15	F00.09 - upper limit	5.00Hz	0.01Hz	○	
F06.15	Simple PLC control selection	0: No PLC operation 1: Enabling PLC operation	0	1	×	
F06.16	Simple PLC running mode selection	Unit: PLC running selection 0: Stop after single loop 1: Runs at final value after single loop 2: Continous loop Ten: Restart mode after stop during PLC 0: Start from the first frequency 1: Start from the frequency when HD20 stops 2: Runs at the moment when signal loss	0000	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F06.16	Simple PLC running mode selection	Hundred: PLC state saving selection at power failure 0: Do not save 1: Save Thousand: PLC phase time unit 0: Second (s) 1: Minute (m)	0000	1	×	
F06.17	Setting of PLC step 1	Unit: PLC phase frequency selection 0: Multi frequency commmand 1: Set by F00.1 Ten: PLC phase direction selection 0: Forward 1: Reverse 2: Set by running command Hundred: PLC phase Acc./Dec. time selection 0: Acc./Dec. time 1 1: Acc./Dec. time 2 2: Acc./Dec. time 3 3: Acc./Dec. time 4 4: Set by Acc./Dec. speed	000	1	○	
F06.19	Setting of PLC step 2		000	1	○	
F06.21	Setting of PLC step 3		000	1	○	
F06.23	Setting of PLC step 4		000	1	○	
F06.25	Setting of PLC step 5		000	1	○	
F06.27	Setting of PLC step 6		000	1	○	
F06.29	Setting of PLC step 7		000	1	○	
F06.31	Setting of PLC step 8		000	1	○	
F06.33	Setting of PLC step 9		000	1	○	
F06.35	Setting of PLC step 10		000	1	○	
F06.37	Setting of PLC step 11		000	1	○	
F06.39	Setting of PLC step 12		000	1	○	
F06.41	Setting of PLC step 13		000	1	○	
F06.43	Setting of PLC step 14		000	1	○	
F06.45	Setting of PLC step 15		000	1	○	
F06.18	Running time of step 1	0.0 - 3276.7	5.0	0.1	○	
F06.20	Running time of step 2	0.0 - 3276.7	0.0	0.1	○	
F06.22	Running time of step 3	0.0 - 3276.7	0.0	0.1	○	
F06.24	Running time of step 4	0.0 - 3276.7	0.0	0.1	○	
F06.26	Running time of step 5	0.0 - 3276.7	0.0	0.1	○	
F06.28	Running time of step 6	0.0 - 3276.7	0.0	0.1	○	
F06.30	Running time of step 7	0.0 - 3276.7	0.0	0.1	○	
F06.32	Running time of step 8	0.0 - 3276.7	0.0	0.1	○	
F06.34	Running time of step 9	0.0 - 3276.7	0.0	0.1	○	
F06.36	Running time of step 10	0.0 - 3276.7	0.0	0.1	○	
F06.38	Running time of step 11	0.0 - 3276.7	0.0	0.1	○	
F06.40	Running time of step 12	0.0 - 3276.7	0.0	0.1	○	
F06.42	Running time of step 13	0.0 - 3276.7	0.0	0.1	○	
F06.44	Running time of step 14	0.0 - 3276.7	0.0	0.1	○	
F06.46	Running time of step 15	0.0 - 3276.7	0.0	0.1	○	
F07: Wobble Operation Parameters (refer to pages 60 - 61)						
F07.00	Wobble operation selection	0: Disabled 1: Enabled	0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F07.01	Wobble operation mode	Unit: Entry way 0: Auto entry (refer to F07.03) 1: Manually terminal entry way Ten: Wobble control (refer to F07.04) 0: Relate to wobble centric frequency 1: Relate to max. output frequency Hundred: Start when HD20 stops during wobbling 0: Start according to memory before it stops 1: Restart Ten thousand: Save selection at power failure 0: Save wobble state at power failure 1: Do not wobble state at power failure	0000	1	×	
F07.02	Preset wobble frequency	0.00Hz - upper limit	0.00Hz	0.01Hz	×	
F07.03	Holding time of preset wobble frequency	0.0 - 999.9s	0.0s	0.1s	×	
F07.04	Wobble amplitude	0.0 - 50.0%	0.0%	0.1%	×	
F07.05	Jump frequency	0.0% - F07.04	0.0%	0.1%	×	
F07.06	Wobble operation cycle	0.01 - 600.00s	10.00s	0.01s	×	
F07.07	Rising time of triangle wave	0.0 - 100.0% (F07.06)	50.0%	0.1%	×	
F08: Asynchronous Motor Parameters (refer to pages 61 - 63)						
F08.00	Rated power of motor	0.2 - 11.0kW	Depend on HD20	0.1kW	×	
F08.01	Rated voltage of motor	0 - 999V		1V	×	
F08.02	Rated current of motor	0.01 - 99.99A		0.01A	×	
F08.03	Rated frequency of motor	1.0 - 400.0Hz	50.0Hz	0.1Hz	×	
F08.04	Rated speed of motor	1 - 24000rpm	1500rpm	1rpm	×	
F08.05	Power factor of motor	0.001 - 1.000	Depend on HD20	0.001	×	
F08.06	Parameter auto-tuning of motor	0: Auto-tuning is disabled 1: Stationary auto-tuning 2: Rotary auto-tuning	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F08.07	Stator resistance of motor	0.00 - 99.99Ω	Depend on HD20	0.01Ω	×	
F08.08	Rotor resistance of motor	0.00 - 99.99Ω		0.01Ω	×	
F08.09	Leakage inductance of motor	0 - 9999mH		1mH	×	
F08.10	Mutual inductance of motor	0 - 5000mH		1mH	×	
F08.11	Idling exciting current of motor	0.00 - 99.99A		0.01A	×	
F09: V/f Control Parameters (refer to pages 63 - 65)						
F09.00	V/f curve selection of motor	0: Line 1: Square curve 2: 1.2 exponential curve 3: 1.7 exponential curve 4: User-defined curve	0	1	×	
F09.01	V/f frequency value F3 of motor	F09.03 - F08.03	0.00Hz	0.01Hz	×	
F09.02	V/f voltage value V3 of motor	F09.04 - F08.01	0V	1V	×	
F09.03	V/f frequency value F2 of motor	F09.05 - F09.01	0.00Hz	0.01Hz	×	
F09.04	V/f voltage value V2 of motor	F09.06 - F09.02	0V	1V	×	
F09.05	V/f frequency value F1 of motor	0.00Hz - F09.03	0.00Hz	0.01Hz	×	
F09.06	V/f voltage value V1 of motor	0V - F09.04	0V	1V	×	
F09.07	Torque boost of motor	0.0 - 30.0% 0.0: Auto torque boost	2.0%	0.1%	○	
F09.08	Cut-off point used for manual torque boost of motor	0.0 - 50.0% (F08.03)	30.0%	0.1%	○	
F09.09	Slip compensation gain of motor	0.0 - 300.0%	100.0%	0.1%	○	
F09.10	Slip compensation filter time of motor	0.01 - 10.00s	0.10s	0.01s	○	
F09.11	Slip compensation limitation of motor	0.0 - 250.0%	200.0%	0.1%	×	
F09.12	Compensation constant of motor	0.1 - 25.0s	2.0s	0.1s	○	
F09.14	AVR function of motor	0: Disabled 1: Enabled all the time 2: Disabled in deceleration process	1	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F09.15	Oscillation-suppression mode of motor	0: Oscillation suppression is depend on the motor's exciting current component 1: Oscillation suppression is depend on the motor's torque current component	1	1	○	
F09.16	Oscillation-suppression coefficient of motor	0 - 200	50	1	○	
F10: Motor Vector Control Speed-loop Parameters (refer to pages 65 - 6.2.12)						
F10.00	Speed control proportional gain 1 of motor	0.1 - 200.0	20.0	0.1	○	
F10.01	Speed control integral time 1 of motor	0.00 - 10.00s	0.20s	0.01s	○	
F10.02	Speed control proportional gain 2 of motor	0.1 - 200.0	20.0	0.1	○	
F10.03	Speed control integral time 2 of motor	0.00 - 10.00s	0.20s	0.01s	○	
F10.04	Speed-loop PI switching frequency 1 of motor	0.00 - 50.00Hz	10.00Hz	0.01Hz	○	
F10.05	Speed-loop PI switching frequency 2 of motor	0.00 - 50.00Hz	15.00Hz	0.01Hz	○	
F10.06	Speed-loop integral limitation of motor	0.0 - 200.0% (F08.02)	180.0%	0.1%	○	
F10.07	Speed-loop differential time of motor	0.00 - 1.00s *0.00: There is no speed-loop differential*	0.00s	0.01s	○	
F10.08	Speed-loop output filter time of motor	0.000 - 1.000s *0.000: The speed-loop filter is disabled*	0.020s	0.001s	○	
F10.11	Motor torque limitation when motor is forward	0.0 - 200.0% (F08.02)	180.0%	0.1%	×	
F10.12	Motor torque limitation when motor is reverse	0.0 - 200.0% (F08.02)	180.0%	0.1%	×	
F10.13	Recreated torque limitation when motor is forward	0.0 - 200.0% (F08.02)	180.0%	0.1%	×	
F10.14	Recreated torque limitation when motor is reverse	0.0 - 200.0% (F08.02)	180.0%	0.1%	×	
F15: Digital I/O Terminal Parameters (refer to pages 66 - 77)						

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.00	DI1 function	0: Reserved 1: Inverter enabled 2,3: FWD/REV 4: Three-wire running mode 5 - 7: Frequency setting source selection 1 - 4 8: Switch to analogue 9,10: Running command switching 1, 2 11: Command switch to terminal 12: External command for stop 13 - 16: Multi-speed frequency terminal 1 - 4 17: Increase (UP) frequency 18: Decrease (DN) frequency 19: Clear aux setting frequency to 0 20,21: FWD/REV jog 1 command input (JOGF1/JOGR1) 22,23: FWD/REV jog 2 command input (JOGF2/JOGR2) 24: Jog 1 command input 25: Jog 1 direction input *Note: When No. 20 and 21 are selected, No. 24 and 25 are invalid* 26: Acc./Dec. time selection terminals 1 27: Acc./Dec. time selection terminals 2 28: Reserved 29: Acc./Dec. prohibition 30: Switch to ordinary running mode 31: Reset the stop status of PLC operation 32: Pausing the process PID 33: Disabling the process PID 34: Holding PID integral 35: Clearing PID integral 36: Switch to wobble operation 37: Reset wobble state 38: Stop DC brake input 39: External stop NO contact input 40: External stop NC contact input 41,42: Coast to stop NO/NC input 43: Emergency stop	0	1	×	
F15.01	DI2 function		0	1	×	
F15.02	DI3 function		0	1	×	
F15.03	DI4 function		0	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.04	DI5 functionn	44,45: NO/NC input for external fault 46: External reset (RST) input 48: Timing input 49: Input for clearing actual length 50: Signal input to clear counter 51: Triggering signal input of counter 52: Length counting input (DI6 only) 53: Pulse frequency input (DI6 only) 83: Integration keeping function 84: DC braking is directly activated 85: Simple PLC pause command 86: Activate terminal DC brake input	0	1	×	
F15.05	DI6 function		0	1	×	
F15.12	Acc./Dec. rate of UP/DN terminal	0.00 - 99.99Hz/s	1.00Hz/s	0.01Hz/s	×	
F15.13	Terminal detecting interval	0: 2ms 1: 4ms 2: 8ms	0	1	○	
F15.14	Terminal detecting filter number	0 - 10000	2	1	○	
F15.15	Terminal input positive and negative logic setting	Bit0 - Bit5 is corresponding to DI1 - DI6 Bitx: DIy terminal input positive and negative logic 0: Positive logic 1: Negative logic	00	1	○	
F15.16	FWD/REV running mode	0: Two-wire operation mode 1 1: Two-wire operation mode 2 2: Three-wire operation mode 1 3: Three-wire operation mode 2	0	1	×	
F15.17	Action selection when extrenal device has fault	0: Coast to stop 1: Emergency stop 2: Decelerate to stop 3: Continue to run	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.18	DO1 function	0: Reserved 1: Inverter ready 2: Inverter is running (RUN) 3: Inverter is forward running 4: Inverter is reverse running 5: Inverter is DC braking 6: Inverter is in zero-frequency status 7: Inverter is in zero-frequency running 8: Reserved 9,10: Frequency detection threshold (FDT1,FDT2) 11: Frequency arriving signal (FAR) 12: Limitation of upper limit of frequency 13: Limitation of lower limit of frequency 14: Limitation of upper/lower limits of wobble frequency 15: Simple PLC operating status indication 16: Simple PLC pausing indication 17: Simple PLC cycle completion indication 18: Completion of simple PLC operation stages 19: Completion of simple PLC operation 20: Output data from SCI communication 21: Preset operating time out 22: Timing function output 23: Preset counting value reach 24: Indicating counting value reach 25: Setting length arrive 27: Analogue input exceeding limit 29: Stop in under-voltage condition 30: Overload detection signal 31: Inverter fault 32: External fault 33: Fault of inverter is reset automatically 38: High speed pulse output (DO2 only)	2	1	×	
F15.19	DO2 function		0	1	×	
F15.20	RLY1 function		31	1	×	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.24	Output terminal positive and negative logic selection	Bit0 - Bit1 corresponds to DO1 - DO2 Bit2 corresponds to RLY1 Bitx: DOy and RLYy terminals output positive and negative logic 0: Positive logic 1: Negative logic	0	1	○	
F15.25	Delay time at ON side for timing	0.00 - 300.00s	0.00s	0.01s	○	
F15.26	Delay time at OFF side for timing	0.00 - 300.00s	0.00s	0.01s	○	
F15.27	Speed within FAR range	0.00 - 100.00Hz	2.50Hz	0.01Hz	○	
F15.28	Zero speed threshold	0.00Hz - upper limit	0.00Hz	0.01Hz	○	
F15.29	Zero speed tolerance	0.00Hz - upper limit	0.00Hz	0.01Hz	○	
F15.30	FDT1 detection mode	0: Detect according to the reference frequency 1: Detect according to the output frequency	0	1	○	
F15.31	FDT1 level	0.00Hz - upper limit	50.00Hz	0.01Hz	○	
F15.32	FDT1 lag	0.00Hz - upper limit	1.00Hz	0.01Hz	○	
F15.33	FDT2 detection mode	0: Detect according to the reference frequency 1: Detect according to the output frequency	0	1	○	
F15.34	FDT2 level	0.00Hz - F00.06	50.00Hz	0.01Hz	○	
F15.35	FDT2 lag	0.00Hz - F00.06	1.00Hz	0.01Hz	○	
F15.36	Preset operating time	0 - 65535h *0: Preset operating time is disabled*	0h	1h	○	
F15.37	Preset counting value arriving	F15.38 - 9999	0	1	○	
F15.38	Specified counting value arriving	0 - F15.37	0	1	○	
F15.39	Ananlogue input over-limitation selection	Unit: Action drive when the input exceeds the limit 0: Free stop 1: Emergency shutdown 2: Dec. stop 3: No action Ten: Select analogue input terminal 0: No analogue terminal 1: Potentionmeter on keypad 2: AI1 3: AI2	00	11	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F15.39	Ananlogue input over-limitation selection	Hundred: Analog overrun detection conditions 0: Always detect 1: Only detected by the operation command Ten thousand: Select alarming action 0: Continue running without alarming 1: After the analog value exceeds the limit, an external fault is reported and the single-position action is selected	00	11	×	
F15.40	Upper limit of exceeded analogue input	F15.41 - 100.0%	100.0%	0.1%	○	
F15.41	Lower limit of exceeded analogue input	0.0% - F15.40	0.0%	0.1%	○	
F15.42	Analog overrun detection time	0.00 - 50.00s	5.00s	0.01s	○	
F15.43	Terminal output delay	0.0 - 100.0s	0.0s	0.1s	×	
F15.44	Start analog overrun detection time	0.00 - 50.00s	15.00s	0.01s	○	
F15.45	PID Integration keeping time	0.020 - 3.000ms	0.500 ms	0.001 ms	○	
F15.46	Whether jog detects analog overrun	0: No detecting 1: Detecting	0	1	○	
F16: Analogue I/O Terminal Parameters (refer to pages 77 - 79)						
F16.00	Keypad with potentiometer function	0: Reserved 1: Upper limit frequency setting 2: Frequency setting 3: Auxiliary frequency reference 4: Process PID reference 5: Process PID feedback 6: Process PID regulating upper limit 7: Process PID regulating lower limit	0	1	×	
F16.01	AI1 function selection		2	1	×	
F16.02	AI2 function selection		5	1	×	
F16.05	AI1 bias	-100.0 - +100.0%	0.0%	0.1%	○	
F16.06	AI1 gain	-10.00 - +10.00	1.00	0.01	○	
F16.07	AI1 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.08	AI2 bias	-100.0 - +100.0%	0.0%	0.1%	○	
F16.09	AI2 gain	-10.00 - +10.00	1.00	0.01	○	
F16.10	AI2 filtering time	0.01 - 10.00s	0.05s	0.01s	○	
F16.17	Max. input pulse frequency	0.0 - 50.0kHz	10.0kHz	0.1kHz	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F16.18	Input pulse filter time	0 - 500ms	10ms	1ms	○	
F16.19	AO1 function selection	0: Reserved 1: Output frequency (0 - max. output frequency) 2: Reference frquency (0 - max. output frequency) 3: Motor RPM (0 - max. output frequency corresponding to speed) 4: Output current (0 - twice motor's rated current) 5: Output current (0 - twice motor's rated current) 10: Output torque (0 - 3 times motor's rated torque) 11: Output voltage (0 - 1.2 times inverter's rated voltage) 12: Bus voltage (0 - 2.2 times inverter's rated voltage) 13: Output power (0 - twice rated power of motor) 14: AI1 input (0 - max. AI1 after calculating) 15: AI2 input (0 - max. AI2 after calculating) 18: Output frequency (-1 - +1 times maximum output frequency) 19: Reference frequency (-1 - +1 times maximum output frequency)	2	1	○	
F16.20	AO2 function selection		1	1	○	
F16.21	High-speed pulse output function selection		0	1	○	
F16.22	AO1 bias	-100.0 - +100.0%	0.0%	0.1%	○	
F16.23	AO1 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.24	AO2 bias	-100.0 - +100.0%	0.0%	0.1%	○	
F16.25	AO2 gain	0.0 - 200.0%	100.0%	0.1%	○	
F16.26	DO2 maximum output pulse frequency	0.1 - 50.0kHz	10.0kHz	0.1kHz	○	
F17: SCI Communication Parameters (refer to pages 79 - 80)						
F17.00	Data format	0: 1-8-2 format, no parity, RTU 1: 1-8-1 format, even parity, RTU 2: 1-8-1 format, odd parity, RTU 3: 1-7-2 format, no parity, ASCII 4: 1-7-1 format, even parity, ASCII 5: 1-7-1 format, odd parity, ASCII 6: 1-8-1 format, no parity, RTU	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F17.01	Baud rate selection	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3	1	×	
F17.02	Local address	0 - 247	2	1	×	
F17.03	Host PC response time	0 - 1000ms	0ms	1ms	×	
F17.04	Time threshold for detecting communication status	0.0 - 1000.0s 0.0: Not detect communication timeout	0.0s	0.1s	×	
F17.05	Detecting time at communication error	0.0 - 1000.0s 0.0: Not detect communication timeout	0.0s	0.1s	×	
F17.06	Action selection at communication time out	0: Coast to stop 1: Emergency stop 2: Decelerate to stop 3: Continue to run	3	1	×	
F17.07	Action selection at communication fault		3	1	×	
F17.08	Action selection at communication peripheral device fault		1	1	×	
F17.09	EEPROM storage selection under communication read/write function parameter	Unit: Parameters storage selection except F00.13 and F19.03 Ten: F00.13 and F19.03 storage selection 0: Do not store to EEPROM 1: Store to EEPROM	01	1	×	
F17.10	Detection time of networking communication timeout	0.0 - 600.0s 0.0: Not detect communication timeout	0.0s	0.1s	×	
F18: Display Control Parameters (refer to pages 80 - 80)						
F18.00	Language selection	0: Chinese 1: English	0	1	○	
F18.01	Displaying contrast of the LCD display panel	1 - 10	5	1	○	
F18.02	Set the display parameter 1 during operation	0: Reserved 1: Inverter's rated current 3: Inverter status 4: Master setting frequency source 5: Master setting frequency 6: Auxiliary setting frequency 7: Setting frequency	8	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F18.03	Set the display parameter 2 during operation	8: Setting frequency (after Acc./Dec.) 9: Output frequency 10: Setting RPM 11: Running RPM 13: Output voltage 14: Output current 16: Output torque 17: Output power 18: DC bus voltage 19: Potentiometer input voltage 20: AI1 input voltage 21: AI1 input voltage (after disposal) 22: AI2 input voltage 23: AI2 input voltage (after disposal) 28: DI6 terminal pulse input frequency 29: AO1 output 30: AO2 output 31: High-speed output pulse frequency 32: Heatsink temperature 33: Set the line speed 34: Reference line speed 37: Process PID reference 38: Process PID feedback 39: Process PID error 40: Process PID integral value 41: Process PID output 42: External couting value 43: Input terminal status 44: Output terminal status 45: Modbus communication status 46: Actual length 47: Total length 48: Total time at power on (hour) 49: Total time at running (hour)	7	1	○	
F18.04	Set the display parameter 3 during operation		9	1	○	
F18.05	Set the display parameter 4 during operation		13	1	○	
F18.06	Set the display parameter 5 during operation		14	1	○	
F18.07	Set the display parameter 6 during operation		18	1	○	
F18.08	Set the display parameter 1 at stop		7	1	○	
F18.09	Set the display parameter 2 at stop		18	1	○	
F18.10	Set the display parameter 3 at stop		20	1	○	
F18.11	Set the display parameter 4 at stop		22	1	○	
F18.12	Set the display parameter 5 at stop		43	1	○	
F18.13	Set the display parameter 6 at stop		44	1	○	
F18.15	Maximum output line speed	0 - 65535	1000	1	○	
F18.16	Line speed display accuracy	0: Integer 1: One decimal 2: Two decimal 3: Three decimal	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19: Function-boost Parameters (refer to pages 80 - 87)						
F19.00	Auxiliary frequency setting source selection	0: No auxiliary source 1: Keypad 2: Terminal 3: SCI communication setting 4: AI analogue setting 5: Terminal pulse setting 6: Process PID output	0	1	○	
F19.01	Master/auxiliary setting calculation	0: Master setting + auxiliary setting 1: Master setting - auxiliary setting	0	1	○	
F19.02	Analogue auxiliary setting coefficient	0.00 - 9.99	1.00	0.01	○	
F19.03	Initial value of digital auxiliary frequency	0.00Hz - F00.06	0.00Hz	0.01Hz	○	
F19.04	Control selection of digital auxiliary frequency	Unit: Save selection at power outage (only when F19.00 = 1 or 2 will F19.04 be enabled) 0: Not save auxiliary frequency at power outage 1: The auxiliary frequency will be saved to F19.03 at power outage Ten: Frequency disposal when the inverter stops (only when F19.00 = 1 or 2 will F19.04 be enabled) 0: Maintain the auxiliary frequency when the inverter stops 1: The auxiliary frequency restores to F19.03 when the inverter stops	00	1	○	
F19.05	Adjustment selection of setting frequency	0: No adjustment 1: To adjust as per the max. output frequency 2: To adjust as per the current frequency	1	1	○	
F19.06	Adjustment coefficient of setting frequency	0.0 - 200.0%	100.0%	0.1%	○	
F19.07	Control selection of cooling fan	0: Auto stop mode 1: Immediate stop mode 2: The fan runs continuously when power on	0	1	○	
F19.08	Cooling fan controls delaying time	0.0 - 600.0s	30.0s	0.1s	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.09	Droop control	0.00 - 10.00Hz	0.00Hz	0.01Hz	×	
F19.10	Zero-frequency threshold	0.00Hz - F00.06	1.00Hz	0.01Hz	○	
F19.11	IlAction selection at setting frequency is lower than zero-frequency threshold	0: Run according to frequency command 1: Holding stop, no output 2: Run according to zero-frequency threshold 3: Run according to zero-frequency	0	1	×	
F19.12	Trip-free selection at momentary power loss	0: Disabled 1: Enabled	0	1	×	
F19.13	Deceleration time at voltage compensation	0.01 - 600.00s	5.00s	0.01s	○	
F19.14	Voltage rise diagnosis time of trip-free operation at momentary power loss	0.00 - 10.00s	0.10s	0.01s	○	
F19.15	Reference voltage of trip-free operation at momentary power loss	0 - 999V	Depend on HD20	1V	×	
F19.16	Restart after power failure	0: Disabled 1: Enabled	0	1	×	
F19.17	Delay time for restart after power failure	0.00 - 10.00s	2.00s	0.01s	○	
F19.18	Protection of stall overvoltage	0: Disabled (with braking resistance) 1: Enabled	1	1	×	
F19.19	Stall overvoltage point	0 - 999V	Depend on HD20	1V	×	
F19.20	Auto current limiting selection	0: Disabled 1: Enabled in Acc./Dec. running process, but disabled in constant speed runnng process 2: Enabled both in Acc./Dec. and in constant speed running proces	0	1	×	
F19.21	Auto current limiting threshold	20.0 - 200.0%	150.0%	0.1%	×	
F19.22	Deceleration time at auto current limiting	0.00 - 600.00s *0.00: Limited the current without deceleration*	10.00s	0.01s	×	
F19.23	Enabled mode of terminal run command	0: Rise edge enabled mode 1: Level enabled mode	0	1	○	
F19.24	Action voltage of braking unit	220V: 380 - 450V 380V: 630 - 750V	Depend on HD20	1V	×	
F19.26	Preset length	0 - 65535m	0m	1m	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F19.27	Actual length	0 - 65535m	0m	1m	*	
F19.28	Length ratio	0.001 - 30.000	1.000	0.001	×	
F19.29	Length checking coefficient	0.001 - 1.000	1.000	0.001	×	
F19.30	Measuring shaft diameter	1.00 - 100.00cm	10.00cm	0.01cm	×	
F19.31	Number of pulses per revolution	1 - 9999	1	1	×	
F19.32	Length arrive and output function selection	Unit: 0: Output level signal 1: Output 500ms pulse Ten: 0: Downtime when reach length 1: Continue operating when reach length	10	1	○	
F19.33	Record of length disposal after length arrive	0: Auto-clear 1: No change 2: Continue counting	2	1	○	
F19.34	Record of length disposal at stop					
F19.37	Frequency adjust range selection	Unit: The main frequency calculation range 0: 0 to max. frequency 1: Negative max. frequency to max. frequency Ten: Auxiliary frequency calculation range 0: 0 to max. frequency 1: Negative max. frequency to max. frequency Hundred: Synthetic frequency calculation range 0: 0 to the upper limit frequency 1: Negative upper limit frequency to upper limit frequency	0	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20: Protection of Fault Parameters **(refer to pages 87 -90)**						
F20.00	Overload pre-alarm detection	Unit: Overload pre-alarm detection 0: It is active all the time in running status 1: It is active only at constant speed Ten: Action selection for overload pre-alarm 0: The inverter doesn't alarm and continues operation when detecting an active overload signal 1: The inverter alarms and stops operation when detecting an active overload signal Hundred: Overload threshold selection 0: Ratio of load current to the motor's rated current (alarm: motor overload) 1: Ratio of load current to the inverter's rated current (alarm: inverter overload) Thousand: Motor type selection 0: Standard motor 1: Variable frequency Ten thousand: Overload protection 0: Overload protection is enabled 1: Overload protection is disabled	00000	1	×	
F20.01	Overload pre-alarm detection threshold	20.0 - 200.0%	150.0%	0.1%	×	
F20.02	Overload pre-alarm detection time	0.0 - 60.0s	5.0s	0.1s	×	
F20.03	Inverter output load-loss detection	0: Disabled 1: It is detecting all the time in running process, and then continues operation after detecting (alarm) 2: It detectes only at the same speed, and then continues operation after detecting (alarm) 3: It is detecting all the time in running process, and then cut off the output after detecting (fault) 4: It is detectes only at the same speed, and then cut off the output after detecting (fault)	0	1	×	

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Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.04	Inverter output load-loss detection threshold	0 - 100%	30%	1%	×	
F20.05	Inverter output load-loss detection time	0.00 - 20.00s	1.00s	0.01s	×	
F20.08	Input phase loss detection reference	0 - 50% *0: Not detect input phase loss fault*	30%	1%	×	
F20.09	Input phase loss detection time	1.00 - 5.00s	1.00s	0.01s	×	
F20.10	Output phase loss detection reference	0 - 50% *0: Not detect input phase loss fault*	20%	1%	×	
F20.11	Output phase loss detection time	0.00 - 20.00s *0.00: Not detect input phase loss fault*	3.00s	0.01s	×	
F20.12	PID reference lose detected value	0 - 100% *0: Not detect PID reference lose*	0%	1%	×	
F20.13	PID reference loss detection time	0.00 - 10.00s *0.00: Not detect PID reference loss*	0.20s	0.01s	×	
F20.14	PID feedback loss detected value	0 - 100% *0: Does not detect PID feedback loss*	0%	1%	×	
F20.15	PID feedback loss detection time	0.00 - 10.00s *0.00: Not detect PID feedback loss*	0.20s	0.01s	×	
F20.16	Detection value at PID feedback out of the limit	0 - 100% *100: Not detect PID feedback out of the limit*	100%	1%	×	
F20.17	Detection time at PID feedback out of the limit	0.00 - 10.00s *0.00: Not detect PID feedback out of the limit*	0.20s	0.01s	×	
F20.18	Auto reset times	0 - 100 *0: No auto reset function*	0	1	×	
F20.19	Auto reset interval	2.0 - 20.0s/time	5.0 s/time	0.1 s/time	×	
F20.20	Faulted relay action selection	Unit: In auto reset process Ten: In the undervoltage process 0: Faulted relay doesn't act 1: Faulted relay acts	00	1	○	

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.21	Type of fifth latest (the last) fault	-Lu-: DC bus undervoltage E0001: Acc. overcurrent E0002: Dec. overcurrent E0003: Costant overcurrent E0004: Acc. overvoltage E0005: Dec. overvoltage E0006: Constant overvoltage E0007: Stall overvoltage E0008: Fault of power module E0009: Heatsink overheat E0010: Fault of braking unit E0011: CPU fault E0012: Parameters auto-tuning fault E0013: Contactor is not actuated E0014: Fault of current detection circuit E0015: Fault of input phase E0016: Fault of output phase E0017: Inverter overload E0018: Inverter output is unloaded E0019: Motor overload E0021: Access fault of control board EEPROM E0022: Access fault of display panel EEPROM (only displaying without any protection) E0023: Fault setting of parameters E0024: Fault of external equipment E0025: PID reference loss E0026: PID feedback loss E0027: PID feedback out of limiting E0028: SCI communication time-out E0029: SCI communication error	0	1	*	
F20.22	Setting frequency at the last fault	0.00 - 400.00Hz	0.00Hz	0.01Hz	*	
F20.23	Running frequency at the last fault	0.00 - 400.00Hz	0.00Hz	0.01Hz	*	
F20.24	Bus voltage at the last fault	0 - 999V	0V	1V	*	
F20.25	Output voltage at the last fault	0 - 999V	0V	1V	*	

A

Ref. Code	Function	Setting Range	Default	Unit	Attribute	Setting
F20.26	Output current at the last fault	0.00 - 99.99A	0.00A	0.01A	*	
F20.27	Input terminal status at the last fault	0 - 0x3F	0	1	*	
F20.28	Output terminal status at the last fault	0 - 0x7	0	1	*	
F20.29	Interval of fifth latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.30	Type of fourth latest fault	0 - 99	0	1	*	
F20.31	Interval of fourth latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.32	Type of third latest fault	0 - 99	0	1	*	
F20.33	Interval of third latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.34	Type of second latest fault	0 - 99	0	1	*	
F20.35	Interval of second latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F20.36	Type of first latest fault	0 - 99	0	1	*	
F20.37	Interval of first latest fault	0.0 - 6553.5h	0.0h	0.1h	*	
F23: PWM Control Parameters **(refer to pages 90 - 90)**						
F23.00	Set the carrier frequency	1 - 16kHz	8kHz	1kHz	×	
F23.02	PWM overshoot enable	0: Disabled 1: Enabled	1	1	×	

Appendix B Communication Protocol

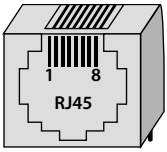
1. Introduction

HD20 series inverters provide one RS485 communication interface which uses the standard Modbus communication protocol.

By using the host computer (including communication devices such as computer and PLC) the user can operate to read-write the inverter's function code, read the status parameters and write the control command etc. The inverter is in slave mode when it is communicating.

Communication Terminal

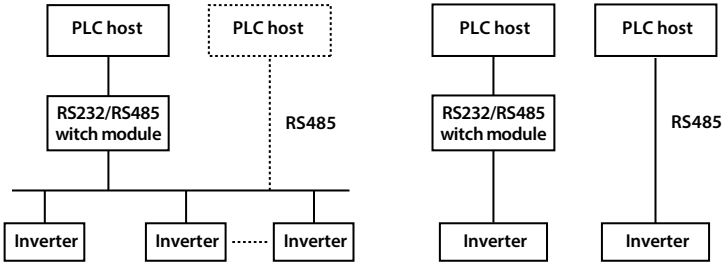
The communication terminal is shown in following table.

Terminal	Description	
 SCI terminal	**Pin**	**Difinition**
	1,3	+5V
	2	485+
	4,5,6	GND
	7	485-
	8	Unused

The transmitting mode is shown in following table.

Port	Asyn, half-duplex
Format	1-8-2 (1 start bit, 8 data bits, 2 stop bits), no parity, RTU
Baud Rate	9600bps
Relative Setting	Refe to F17: SCI Communication Parameters, on page 79

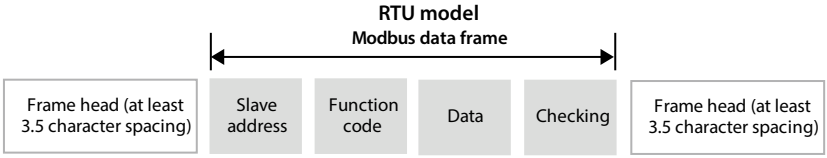
Network Mode

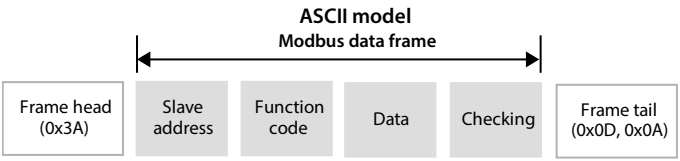


B

Protocol Format

The Modbus protocol simultaneously supports RTU mode and ASCII mode, with corresponding frame format as shown below:





Modbus adopts "Big Endian" encoding mode, higher byte prior to lower byte at sending.

1) **In the RTU Mode**

- The idle time of frame head and frame tail passing bus should be not less than 3.5 bytes.
- Slave address = 0, it means broadcast address.
- Data checking relies on CRC-16. The whole information need be checked. The concrete CRC checking is referred to the page 134.

For example: To read the slave internal register F00.08 = 50.00Hz of No. 1 address:

Command Frame	**Address**	**Parameter**	**Register Address**		**Read Char No.**		**Checksum**	
	0x01	0x03	0x00	0x08	0x00	0x01	0x05	0xC8
Response Frame	**Address**	**Parameter**	**Response Byte**		**Content of Register**		**Checksum**	
	0x01	0x03	0x02		0x13	0x88	0xB5	0x12

2) **ASCII Mode**

- The frame head is "0x3A", while the frame tail default is "0x0D", "0x0A" and the frame tail can be set by the users.
- All the data bytes will be sent via ASCII code except frame head and frame tail, higher 4-byte prior to lower 4-byte at sending.
- Data is 7-byte and for the "A" - "F" will adopt their uppercase of the ASCII code.
- The data adopts LRC checking, covering the slave address and data. Checksum is the character of data that is involved in checking and the complement code of carry bit.

For example: To write 4000 (0x0FA0) to the internal register F00.08 of slave 1.

LRC checking = the complement code of (0x01 + 0x41 + 0x00 + 0x08 + 0x0F + 0xA0) = 0x07

	Frame Head	**Address**		**Parameter**		**Register Address**				**Written Content**				**LRC Checking**		**Frame Tail**	
Character	:	0	1	4	1	0	0	0	8	0	F	A	0	0	7	CR	LF
ASCII	3A	30	31	34	31	30	30	30	38	30	46	41	30	30	37	0D	0A

2. Scaling of Drive Transmitting Values

Except the parameters of the remarks, all other function codes can define the scaling relationship of the specified function code via referring the manual's min. unit.

Remarks:

1. Communication data for F04.03, F21.01, F16.05, F16.08, F16.11, F16.14, F16.22, F16.24 0 - 2000 corresponding data -1000 - +1000.

2. Communication data for F16.06, F16.09 0 - 200 corresponding data -100 - +100.

3. Protocol Function

Supported Function

Modbus protocol supports the below parameter operation:

Supported Function	Code	Instructions
To read function parameters and status parameter	0x03	
To rewrite single function parameter or control parameter	0x06	Saving or not is set by F17.09 in power failure
	0x41	Not saved at power off
To rewrite numbers of function parameters or control parameters	0x10	Saving or not is set by F17.09 in power failure
	0x43	Saved at power off

To Read Function Parameters and Status Parameter

Function code 0x03, command frame and response frame are in below table.

Command Frame	Address	Code	Starting Register Address	No. of Register	CRC/LRC Checking
Data frame bytes	1	1	2	2	2/1
Value or range	0 - 247	0x03	0x0000 - 0xFFFF	0x0001 - 0x000C	

Response Frame	Address	Code	Read Byte No.	Register Content	CRC/LRC Checking
Data frame bytes	1	1	1	2 * no. of registers	2/1
Value or range	1 - 247	0x03	2 * no. of registers		

To Rewrite Single Function Parameter or Control Parameter

Function code 0x06 (saving or not is set by F17.09 in power failure) or 0x41 (not save at power off); Command frame and response frame are in below table.

Command Frame	Address	Code	Register Address	Register Content	CRC/LRC Checking
Data frame bytes	1	1	2	2	2/1
Value or range	0 - 247	0x06, 0x41	0x0000 - 0xFFFF	0x0000 - 0xFFFF	

Response Frame	Address	Code	Register Address	Register Content	CRC/LRC Checking
Data frame bytes	1	1	2	2	2/1
Value or range	1 - 247	0x06, 0x41	0x0000 - 0xFFFF	0x0000 - 0xFFFF	

To Rewrite Numbers of Function Parameters or Control Parameters

Function code 0x06 (saving or not is set by F17.09 in power failure) or 0x43 (save at power off); Command frame and response frame are in below table.

Command Frame	Address	Code	Starting Register Address	No. of Register	Byte No. of Register Content	Register Content	CRC/LRC Checking
Data frame bytes	1	1	2	2	1	2 * no. of operation registers	2/1
Value or range	0 - 247	0x10, 0x43	0x0000 - 0xFFFF	0x0000 - 0x0004	2 * no. of operation registers		

Response Frame	Address	Code	Starting Register Address	No. of Operation Registers	CRC Checking
Data frame bytes	1	1	2	2	2/1
Value or range	1 - 247	0x10, 0x43	0x0000 - 0xFFFF	0x0000 - 0x0004	

This command rewrites the contents of continuous data unit from starting register address where is mapped as function parameter and control parameter of controller, etc.

The inverter will start to save from low address to high address of the register when it continuously saves many register parameters. The saving will return from the firstly failed address if the saving process isn't completely successful.

Fault and Exception Code

If the operation command fails, the response is fault code. The fault code is + 0x80. Below is the instruction for the exception codes.

Exception Code	Instructions
0x01	Illegal function parameters.
0x02	Illegal register address.
0x03	Data fault. Data is exceeded the upper/lower limit.
0x04	Slave operation fails (including fault caused by data invalid).
0x16	Unsupported operation (unsupported to read the attributes, factory default and upper/lower limit for the control parameter and status parameter).
0x17	The register number of command frame is fault.
0x18	Incorrect information frame, including incorrect information length and incorrect checking.
0x20	Parameters cannot be modified.
0x21	Parameters are unchangeable when the controller is in running status.
0x22	Parameters are protected by password.

4. Address Mapping

The function parameters, control parameters and status parameters are all mapped as Modbus's read-write register.

Function Code Address Mapping

Their group numbers are mapped as higher bytes of register address while the relationships are shown as below table.

The inter group indexes are mapped as lower bytes. Please refer to user manual for index of F00 - F23 and U00.

High Bytes of Register Address	Group Number	High Bytes of Register Address	Group Number	High Bytes of Register Address	Group Number
0x00	F00	0x07	F07	0x10	F16
0x01	F01	0x08	F08	0x11	F17
0x02	F02	0x09	F09	0x12	F18
0x03	F03	0x0a	F10	0x13	F19
0x04	F04	0x0b	F11	0x14	F20
0x05	F05	0x0d	F13	0x15	F21
0x06	F06	0x0f	F15	0x17	F23

For instance: The register address of function parameter F03.02 is 0x0302, and that of function parameter F16.01 is 0x1001.

Control Parameter (0x32) Address Mapping

The users can realize the inverter's starting, stopping and running speed setting through the control parameter, and obtain the inverter's running frequency, output current, etc. through indexing the inverter's status parameters.

The status parameters (0x32) are mapped as higher bytes of the register address, and the inter group indexes are as following:

Register Address	Parameter Name	Retained or Not at Power Loss
0x3200	Control command character	No
0x3201	Running frequency setting	Saving or not is set by hundreds bit of F00.14 in power failure
0x3202	Auxiliary running frequency setting	No
0x3204	Virtual terminal control setting	No

Definition of inverter control command words (0x3200):

Bit	Value and Definition		Function Description
Bit0	0: Run command disabled	1: Run command enabled	To control the inverter's starting and stop (in edge triggering mode)
Bit1	0: Forward	1: Reverse	Running direction: Have the same function as terminal FWD/REV
Bit2	0: Unused	1: Stop mode: Dec. to stop	Dec. to stop the inverter (in edge triggering mode)
Bit3	0: Unused	1: Stop mode (emergency to stop)	Emergency to stop the inverter (in edge triggering mode)
Bit4	0: Unused	1: Stop mode (coast to stop)	Coast to stop the inverter (in edge triggering mode)
Bit5	0: Unused	1: Stop mode (external fault)	The inverter is displaying external fault, and will stop in accordance with F17.08 setting mode or continue to run
Bit6	0: Jog forward stop	1: Jog forward run	Jog forward control
Bit7	0: Jog reverse stop	1: Jog reverse run	Jog reverse control
Bit8	0: Fault reset disabled	1: Fault reset enabled	Fault reset control
Bit12	0: Present control disa	1: Present control enabled	The present sending control word is valid
Bit9 - Bit11 Bit13 - Bit15	0: Unused		

The contents of the register can be defined as control commands as shown in the table below, ie the control command word bit logic combination.

Register Content	Control Command	Register Content	Control Command
0x1001	Forward running	0x1020	Stop due to external fault
0x1003	Reverse running	0x1040	Forward jog
0x1004	Dec. to stop	0x1080	Reverse jog
0x1008	Emergency to stop	0x1100	Fault reset
0x1010	Coast to stop		

Definition of virtual terminal control setting word (0x3204):

Bit	Value and Definition	
Bit0	0: DO1 output is disabled	1: DO1 output is enabled
Bit1	0: DO2 output is disabled	1: DO2 output is enabled
Bit2	0: RLY1 output is disabled	1: RLY1 output is enabled
Bit3 - Bit15	Unused	Unused

Status Parameter (0x33) Address Mapping

The status parameters (0x33) are mapped as higher bytes of the register address, and the inter group indexes are as following:

Address	Function	Address	Function
0x3300	Controller series	0x331D	AI2 input voltage
0x3301	Software version of DSP	0x331E	AI2 input voltage (after calculating)
0x3303	Special sofwtware ersion of MCB	0x3323	DI6 terminal pulse input frequency
0x3305	Software of keypad	0x3324	AO1 output
0x3306	Customized serial No.	0x3325	AO2 output
0x3307	Motor and control mode selection	0x3326	High speed output pulse frequency
0x3308	Rated current of inverter	0x3327	Heatsink temperature
0x330A	Inverter status	0x3328	Setting line speed
0x330B	Main setting frequency channel	0x3329	Reference line speed
0x330C	Main setting frequency	0x332C	Process PID setting
0x330D	Aux setting frequency	0x332D	Process PID feedback
0x330E	Setting frequency	0x332E	Process PID tolerance
0x330F	Setting frequency (after calculated)	0x332F	Process PID integral
0x3310	Output frequency	0x3330	Process PID output
0x3311	Setting rpm	0x3331	External counting value
0x3312	Running rpm	0x3332	Input terminal status
0x3313	Input cable voltage	0x3333	Output terminal status
0x3314	Output voltage	0x3334	Modbus status
0x3315	Output current	0x3335	Actrual length
0x3317	Output torque	0x3336	Accumulative length
0x3318	Output frequency	0x3337	Total power up time
0x3319	DC busbar voltage	0x3338	Total running time
0x331A	Input voltage of potentionmeter	0x3339	Total energy consumption high bit of motor
0x331B	AI1 input voltage	0x333A	Total energy consumption low bit of motor
0x331C	AI1 voltage (after calculating)	0x333C	Low byte of this running energy
		0x333D	The present fault code

5. Special Instruction

1. For the data frame in ASCII mode, if the frame length is an even number, the frame is abandoned.

2. Group F08 (Asyn. motor parameter setting) and group F17 (SCI communication parameters) are the inverter parameter which can be read but cannot be modified by the host computer.

3. F01.00 (user password) cannot be set and adjusted through communication as well, but the user can verify the user password by writing F01.00 and get access to adjust inverter function parameters on the host. After adjustment, the user can close the permission by writing invalid password to F01.00.

4. If many multi-function input terminals are set the same function, it may cause dysfunction. Therefore, the user should avoid this case when modify the multi-function terminal function via the Modbus.

6. CRC Checking

Code of online calculating CRC is shown below:

```
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));
}
```

7. Application Case

Remarks: Please verify all the hardware equipments are connected well before controlling the inverter via communication. In addition, please preset the communication data format, baud rate and communication address.

1. To read the command frame of the max. output frequency of slave 2 (to read F00.06), answer 50.00Hz.

Command Frame	Address	Code	Register Address		Word No. of Read		Checksum	
	0x02	0x03	0x00	0x06	0x00	0x01	0x64	0x38
Response Frame	**Address**	**Code**	**Answer Byte**		**Register Content**		**Checksum**	
	0x02	0x03	0x02		0x13	0x88	0XF1	0x12

2. To read the DC bus voltage of slave 2 (to read status parameter), answer 537V.

Command Frame	Address	Code	Register Address		Word No. of Read		Checksum	
	0x02	0x03	0x33	0x19	0x00	0x01	0x5A	0xBA
Response Frame	**Address**	**Code**	**Answer Byte**		**Register Content**		**Checksum**	
	0x02	0x03	0x02		0x02	0x19	0x3C	0xEE

3. To write setting frequency of address 2 (F00.13 = 45.00Hz).

Command/ Response Frame	Address	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x00	0x0D	0x11	0x94	0x15	0xC5

4. F00.10 = 2, write setting running frequency of address 2 = 45.00Hz, register content 0x11,0x94.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x01	0x11	0x94	0xDB	0x7E

5. F00.11 = 2, address 2 is reverse.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x03	0xCA	0x80

6. F00.11 = 2, address 2 decelerates to stop.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x04	0x8B	0x42

7. F00.11 = 2, address 2 emergency stops.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x08	0x8B	0x47

8. F00.11 = 2, address 2 coasts to stop.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x10	0x8B	0x4D

9. Address 2 has external fault.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x10	0x20	0x8B	0x59

10. Address 2 fault reset.

Command/ Response Frame	Add.	Code	Register Address		Register Content		Checksum	
	0x02	0x06	0x32	0x00	0x11	0x00	0x8B	0x11