NO:2021.06

CHINT ELECTRICS

NVF2G Series Inverter

User Instruction

Standard:EN 61800-3
EN 61800-5-1

Preface

Thank you for using the NVF2G series of high performance vector inverters of Chint!

This series of inverters are high-quality, multi-function, low-noise, open-loop vector inverters independently developed by our company. The products adopt the international advanced speed sensorless vector control technology and can realize high-precision control and wide-range speed regulation operation. They have the characteristics of large starting torque, high reliability, strong overload capacity and flexible operation.

NVF2G series inverters are in strict accordance with international standards. In addition to strict electrical performance and environmental testing, the products have also undergone strict conduction immunity, radiation immunity, surge immunity, rapid abrupt pulse group immunity, electrostatic discharge immunity and other EMC tests. The products' reliability and environmental adaptability are enhanced to better meet the needs of various transmission applications.

This manual includes the operating instructions and precautions of the inverter and should be read carefully before using the inverter to ensure that the inverter is used correctly. Please keep the manual properly for later use after reading and using it.

The information herein is subject to change without notice.

⚠ Safety Warnings

1. This product is strictly prohibited from being installed in an environment where there are flammable or explosive gases or moisture or condensation;
2. It is strictly prohibited to touch the conductive parts of the product when it is in operation;
3. Be sure to de-energize the line when installing and maintaining the product;
4. It is strictly prohibited for children to play with the unpacked product or packaging materials;
5. Adequate space and safety distance should be maintained around the place where the product is installed;
6. Do not install the product in places where gaseous media can corrode metals and damage insulation;
7. The product must be installed with standard wires and connected to a power source and loads that meet the requirements;
8. In order to avoid dangerous accidents, the product must be installed and fixed in strict accordance with the requirements of the instructions for use;
9. Please check the product for damage and for completeness of items after unpacking;
10. Please insulate the exposed wire parts to prevent electric shock when installing live wires outside the product;
11. Do not install or operate the inverter when it is damaged or the parts are incomplete; otherwise, there is a danger of fire and injury;
12. Wiring and inspection can only be carried out when the bus voltage between ⊕ and ⊖ is measured with a multimeter to be less than 36 V after power off;
13. Do not replace the fan during power-on; otherwise, it is dangerous;
14. Do not short-circuit ⊕ and B, and never connect any of the control terminals other than R1A, R1B, R1C, R2A, R2B and R2C to the AC 220V signal; otherwise, there is a danger of damage to the equipment;
15. Prevent mental parts such as screws or flammable objects such as paint from entering the inverter;
16. After the control board is replaced, the parameters must be set correctly before operation; otherwise, there is a danger of damage to property;
17. Do not hold the cover only when handling; otherwise, personal injury may be caused due to the equipment falling off;
18. Do not install phase shift capacitors, surge absorbers or resistive loads on the output of the inverter;
19. Do not frequently power on and off to control the start and stop of the inverter; otherwise, there is a danger of damage to the equipment;
20. The load used is limited to a three-phase squirrel-cage asynchronous motor. Connecting the inverter to other electrical equipment may cause equipment damage;
21. The product may cause radio interference in civilian use. In this case, additional suppression measures (reactors, filters, etc.) may be required;
22. An explosion may occur when the electrolytic capacitors on the main circuit and printed board are incinerated, and plastic parts such as panels generate toxic gases when incinerated. Please treat these parts as industrial waste.
23. The product can only be installed and maintained by professionals.

⚠ 📖	Read the user guide of the AC drive carefully before installation or operation.
⚠ 10min	Do not remove the front cover while the power is on or within10 minutes after the power is turned off. Wait for a period of 10 minutes after the AC drive is powered off before starting any repair, maintenance or wiring work.

CHINT
CHINT ELECTRICS

Contents

Chapter I Main Uses and Scope of Application	**01**
1.1 Unpacking Inspection	**01**
1.2 Main Uses	**01**
1.3 Scope of Application	**01**
1.4 Product Selection	**01**
1.5 Model Specifications and Their Meanings	**01**
1.6 Product Models	**02**
Chapter II Conditions for Normal Use, Installation, Transportation and Storage	**04**
2.1 Conditions for Use, Transportation and Storage	**04**
2.2 Installation Conditions	**04**
Chapter III Main Technical Parameters and Performance	**05**
Chapter IV Inverter Appearance and Installation Dimensions	**06**
4.1 Product Appearance, Installation Dimensions and Weight	**06**
4.2 Display Box Dimensions	**10**
Chapter V Inverter Wiring Instructions	**11**
5.1 Wiring Instructions	**11**
5.2 Main Circuit Terminals and Wiring Instructions	**13**
5.3 Description of Main Circuit Peripheral Devices	**16**
5.4 Wiring Instructions	**17**
Chapter VI Operation and Application Examples	**19**

Contents

6.1 Schematic Diagram of Panel Operation	**19**
6.2 Parameter Modification Methods	**20**
6.3 LED Display Description	**20**
6.4 Indicator Description	**21**
Chapter VII Brief List of Function Parameters	**22**
7.1 Description of Function Parameters Table	**22**
7.2 Brief List of Function Parameters	**23**
7.3 Detailed Explanation of Inverter Functions	**34**
Chapter VIII Inverter RS485 Communication Protocol	**67**
8.1 Protocol Contents	**67**
8.2 Application Methods	**67**
8.3 Bus Structure	**67**
8.4 Protocol Description	**67**
8.5 Communication Frame Structure	**67**
8.6 Command Code and Communication Data Description	**69**
8.7 Communication Frame Error Checking Mode	**72**
8.8 Communication Address Description	**74**
8.9 Wiring Instructions	**76**
Chapter IX Maintenance and Troubleshooting	**77**
9.1 Daily Maintenance Precautions and Maintenance Items	**77**
9.2 Regular Maintenance Precautions and Maintenance Items	**77**

CHINT
CHINT ELECTRICS

Contents

9.3 Replacement of Consumable Parts of Inverter	78
9.4 Inverter Storage	79
9.5 Fault Information and Troubleshooting	79
9.6 Common Faults and Their Treatment	80
Chapter X Environmental Protection	**81**
10.1 Environmental Protection	81
Appendix A Options	**82**
A.1 Connection Diagram Between Peripheral Options and the Inverter	82
A.2 Options Table	82
A.3 Braking Resistor Selection	83
A.4 Leakage Protector	84

Chapter I Main Uses and Scope of Application

1.1 Unpacking Inspection

The following inspections are required after receiving the product. If there is any discrepancy, please contact your local distributor:

1) Check if the inverter is damaged or the screws are loose during transportation;
2) An instruction book and a certificate are attached in the box;
3) Check if the nameplate of the inverter is consistent with the product you ordered;
4) Check the machine body for damage, cracks, deformation, etc. and if any foreign matter is in the inverter.

1.2 Main Uses

The inverter is mainly used for frequency conversion speed regulation, soft start, running accuracy improvement, power factor improvement, and overcurrent, overvoltage and overload protection of AC asynchronous motors. It also has the effect of saving energy and reducing equipment noise.

1.3 Scope of Application

T model (constant torque class): The load has constant torque and requires the motor to provide torque and speed that are basically independent of speed, i.e. the torque does not change at different speeds, such as cranes, conveyor belts, trolleys, machine tools, etc.

P model (fan and water pump class): The load has the characteristic of reducing the torque at low speed. Square torque loads represented by fans and pumps. If the speed of fan and water pump loads is increased above the power frequency, the required power will increase sharply, sometimes exceeding the capacity of the motor and the inverter. Therefore, do not increase the frequency easily. Please use an inverter with a larger capacity if it is necessary to increase the frequency above the power frequency.

1.4 Product Selection

1) NVF2G series inverters are designed and manufactured for the current value and parameters of 4-pole motors to meet the operation conditions. When the motor does not feature four poles, the capacity of the inverter should not only be selected according to the power of the motor, but also be checked against the current parameters.
2) Compared to general-purpose cage motors, winding motors are prone to overcurrent tripping caused by harmonic current. Therefore, choose an inverter who capacity is slightly larger than normal.
3) For loads with torque ripple such as compressors and vibrating machines as well as loads with a peak load such as injection molding machines, if the inverter is selected according to the rated current, it may have malfunctions such as peak current protection. Therefore, the current waveform during power frequency operation should be checked. The rated current of the selected inverter should be larger than the maximum current of the motor.
4) For the Roots blower that is mostly used for the air discharge duct of the sewage treatment plant, its torque is approximately constant because its output pressure is basically constant. The torque is not adjustable within the 20% rated speed range. The rated capacity of the selected inverter should be 20% larger than the rated power of the motor. The speed adjustment should be performed above 20% of the rated speed.
5) For a deep well pump, the motor of which has a special structure, it has a larger rated current than a general-purpose motor of the same specification. When selecting the inverter, please note that the rated current of the motor should be less than that of the inverter (consider a higher level of inverter);
6) For a large moment of inertia (of a centrifuge, for example), a large acceleration torque and a long acceleration time are required. It should be ensured that the motor current is less than the rated current of the inverter when the inverter is accelerating.

1.5 Model Specifications and Their Meanings

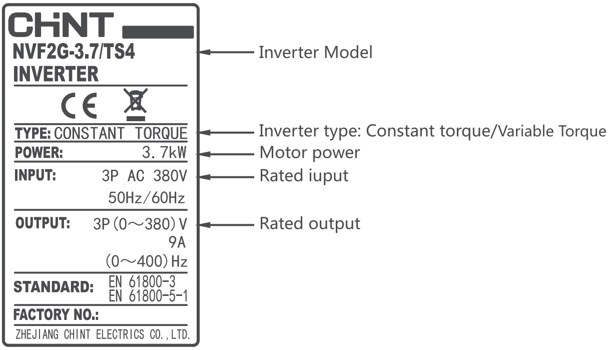


Figure 1.1 Nameplate description

Constant torque type

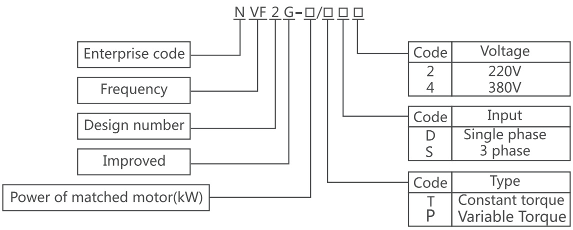


Figure 1.2 Product model naming rules

1.6 Product Models

Table 1.1 Inverter models

Supply Voltage	Model	Power Supply Capacity Kva	Rated Input Current A	Output current A	Matching Motor Kw	Brake unit(excluding braking resistor)
Three-phase AC 220 V	NVF2G-0.4/T(P)S2	3	2.6	2.4	0.4	Built in brake unit as standard
	NVF2G-0.75/T(P)S2	4.2	4.8	4.5	0.75	
	NVF2G-1.5/T(P)S2	7.6	7.5	7.0	1.5	
	NVF2G-2.2/T(P)S2	7.6	10.7	10	2.2	
	NVF2G-3.7/T(P)S2	13	17.2	16	3.7	
	NVF2G-5.5/T(P)S2	18	21.5	20	5.5	
	NVF2G-7.5/T(P)S2	29	32	30	7.5	
	NVF2G-11/T(P)S2	34	45	42	11	
	NVF2G-15/T(P)S2	46	59	55	15	
	NVF2G-18.5/T(P)S2	57	80	75	18.5	Optional built-in brake unit
	NVF2G-22/T(P)S2	69	86	80	22	

Supply Voltage	Model	Power Supply Capacity Kva	Rated Input Current A	Output current A	Matching Motor Kw	Brake unit(excluding braking resistor)
Three-phase AC 220 V	NVF2G-30/T(P)S2	85	118	110	30	Optional built-in brake unit
	NVF2G-37/T(P)S2	114	140	130	37	
	NVF2G-45/T(P)S2	133	172	160	45	
	NVF2G-55/T(P)S2	160	215	200	55	
	NVF2G-75/T(P)S2	236	290	270	75	Optional external brake unit
	NVF2G-90/T(P)S2	267	344	320	90	
	NVF2G-110/T(P)S2	267	408	380	110	

Supply Voltage	Model	Power Supply Capacity	Rated Input Current A	Output current A	Matching Motor kW	Brake unit(excluding braking
Three-phase AC 380 V	NVF2G-1.5/T(P)S4	3	3.9	3.7	1.5	Built in brake unit as standard
	NVF2G-2.2/T(P)S4	4.2	5.8	5.0	2.2	
	NVF2G-3.7/T(P)S4	7.6	10.5	9.0	3.7	
	NVF2G-5.5/PS4	9.9	14.6	11	5.5	
	NVF2G-5.5/TS4	9.9	14.6	13	5.5	
	NVF2G-7.5/T(P)S4	13	17	17	7.5	
	NVF2G-11/PS4	18	26	22	11	
	NVF2G-11/TS4	18	26	25	11	
	NVF2G-15/T(P)S4	25	32	32	15	
	NVF2G-18.5/T(P)S4	29	38.5	37	18.5	
	NVF2G-22/T(P)S4	34	46.5	45	22	
	NVF2G-30/T(P)S4	46	62	60	30	
	NVF2G-37/T(P)S4	57	76	75	37	Optional built-in brake unit
	NVF2G-45/T(P)S4	69	92	90	45	
	NVF2G-55/T(P)S4	85	113	110	55	
	NVF2G-75/PS4	114	157	140	75	
	NVF2G-75/TS4	114	157	150	75	
	NVF2G-90/T(P)S4	133	180	176	90	
	NVF2G-110/T(P)S4	160	214	210	110	
	NVF2G-132/T(P)S4	195	256	253	132	
	NVF2G-160/T(P)S4	236	307	300	160	Optional external brake unit
	NVF2G-185/T(P)S4	267	345	340	185	
	NVF2G-200/T(P)S4	289	385	380	200	
	NVF2G-220/T(P)S4	305	430	420	220	
	NVF2G-245/T(P)S4	350	468	470	245	
	NVF2G-280/T(P)S4	403	525	520	280	

Supply Voltage	Model	Power Supply Capacity	Rated Input Current A	Output current A	Matching Motor kW	Brake unit(excludin g braking
Three-phase AC 380 V	NVF2G-315/T(P)S4	420	590	600	315	Optional external brake unit
	NVF2G-355/T(P)S4	420	665	640	355	
	NVF2G-400/T(P)S4	460	785	690	400	

Note: The maximum matching motor refers to the maximum power motor for the inverter model, based on a 4-pole motor.

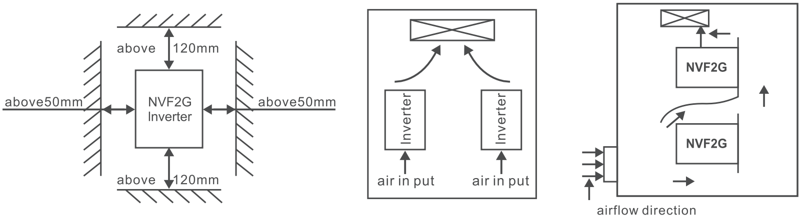
Chapter II Conditions for Normal Use, Installation, Transportation and Storage

2.1 Conditions for Use, Transportation and Storage

1) The operating environment temperature should be -10℃-+40℃. The inverter should be derated when the temperature exceeds 40℃, 1% of rated power to be derated for every 1℃ raised.
2) The relative humidity of the surrounding air should be ≤90%, with no condensation.
3) When the altitude is below 1,000 m, the inverter should be derated by 1% for each 100 m increase in height. The altitude cannot exceed 3,000 m;
4) The inverter should be used indoors, without direct sunlight, dust, electromagnetic radiation, corrosive gases, flammable gases, oil mist, water vapor, dripping water and salt;
5) The amplitude at a (2-9) Hz frequency is ≤0.3 mm, and the vibration acceleration at a (9-200) Hz frequency is ≤5.8m/s^2;

2.2 Installation Conditions

1) Check whether the environment of the installation location of the inverter matches the " environmental conditions of the inverter operation" in this chapter. If not, do not install; otherwise, the inverter will be damaged.
2) The inverter uses plastic parts. Please do not use excessive force when disassembling the cover. Be careful when installing to avoid damage.
3) When the conditions permit, install the inverter with its back or the heat sink exposed outside the electric control cabinet to significantly reduce the temperature inside the electric control cabinet.
4) Install the inverter as much as possible in a clean place or a closed panel that blocks any suspended matter.
5) The inverter should be mounted vertically and securely on the mounting board or wall with screws.
6) Pay attention to the heat dissipation method of the inverter installed in the electric control cabinet: when two or more inverters and the ventilation fan are installed in the same electric control cabinet, pay attention to the correct installation position to ensure that the temperature around the inverter is within the allowable range. If the installation position is not correct, the heat dissipation effect of the inverter will deteriorate.
7) Install the inverter on a non-combustible surface (such as mental, wall, etc.), and in order to make the heat easy to dissipate, leave enough space around the inverter (as shown in Figure 2.1).



a) The space abound the inverter b) The horizotal installation of several inverters c) The vertical installation of several inverters

Figure 2.1 Diagram of inverter installation

Chapter III Main Technical Parameters and Performance

Table 3.1 Main specification parameters and performance

Input and output characteristics	Input voltage range	220 V±33 V or 380 V±57 V
	Input frequency range	47 Hz-63 Hz
	Output voltage range	0-input voltage
	Output frequency range	0 Hz-400 Hz (0 Hz-120 Hz for fans and pumps)
Peripheral interface characteristics	Programmable digital input	6 inputs
	Programmable analog input	AI1: 0 V-10 V input; AI2: 0 V-10 V or 0 mA/4 mA-20 mA input
	Open collector output	1 output
	Relay output	2 output
	Analog output	2 outputs, (0-10) V or (0/4-20) mA selectable therefore respectively
	RS485 communication interface	1 output, supporting Modbus protocol
Technical performance characteristics	Control mode	PG-free vector control; V/F control
	Overload capability	1 min for 150% rated current; fans and pumps: 1 min for 120% rated current
	Start torque	PG-free ventor control: 0.5 Hz/150% (rated torque)
	Speed regulation ratio	PG-free vector control: 1:100; V/F: 1:50
	Speed control accuracy	PG-free vector control: ±0.5% maximum speed
	Switching frequency	Depending on the power; the maximum range: 0.5 kHz-15.0 kHz
Functional characteristics	Frequency setting method	Digital quantity and analog setting, serial communication setting, multi-speed and PID setting, etc.
	Control function	Forward and reverse PID control functions
	Multi-speed control function	8-speed control

Functional characteristics	Special function	Textile machine-specific swing frequency control function
	Speed tracking restart function	Achieve non-impact smooth start of the rotating motor
	Automatic voltage regulation function	Automatically keep the output voltage constant when the grid voltage changes
	Fault protection function	Overcurrent, overvoltage, undervoltage, overheat, phase loss, overload, PID disconnection and other protection functions
Other characteristics	Protection level	IP20
	Cooling method	Forced air cooling
	brake unit	Standard and built-in for NVF2G-0.4/T/(P)S2～NVF2G-7.5/T(P)S2; NVF2G-1.5/PS4-NVF2G-22/PS4, optional and built-in for NVF2G-11/T(P)S2～NVF2G-45/T(P)S2; NVF2G-22/TS4-NVF2G-110/PS4,and optional external for NVF2G-55/T(P)S2 ,NVF2G-110/TS4and above
	External DC reactor	NVF2G-22/T(P)S2～45/T(P)S2;NVF2G-45/TS4～110/PS4 (optional); NVF2G-55/T(P)S2～NVF2G-110/T(P)S2; NVF2G-110/TS4～315/PS4 (standard)
	Built-in DC reactor	NVF2G-315/TS4~400/TS4 (standard)

Chapter IV Inverter Appearance and Installation Dimensions

4.1 Product Appearance, Installation Dimensions and Weight

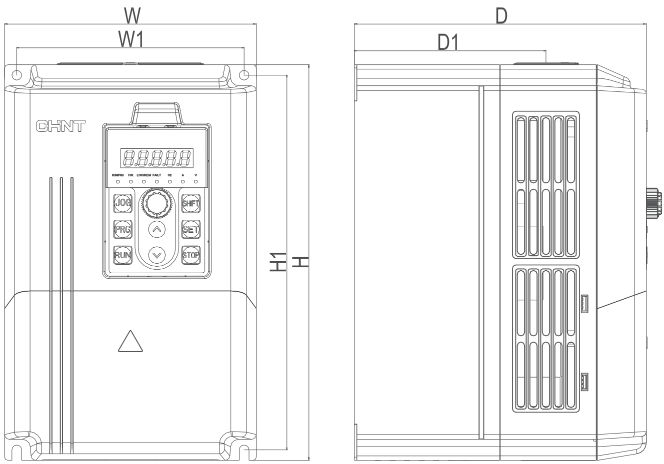


Figure 4.1 Outline drawings of NVF2G-0.4/T(P)S2～NVF2G-3.7/T(P)S NVF2G-1.5/PS4～NVF2G-11/PS4

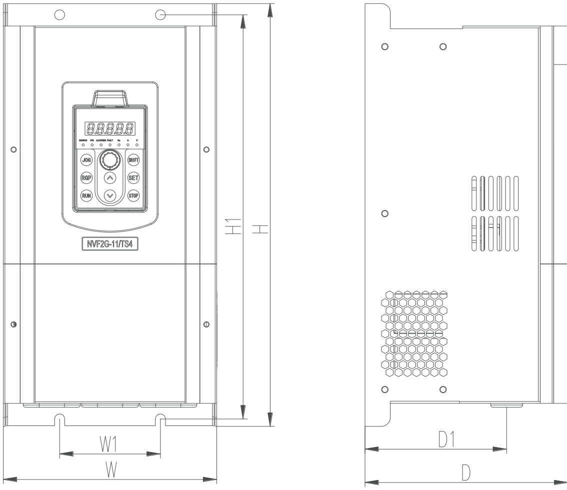


Figure 4.2 Outline drawings of NVF2G-5.5/ T(P)S2 ~ NVF2G-11/ T(P)S2 NVF2G-11/TS4-NVF2G ~ 30/PS4

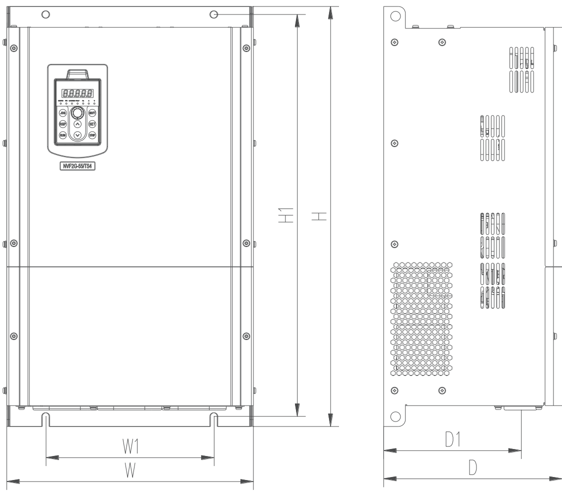


Figure 4.3 Outline drawings of NVF2G-15/T(P)S2 ~ NVF2G-30/T(P) NVF2G-30/TS4 ~ NVF2G-75/PS4

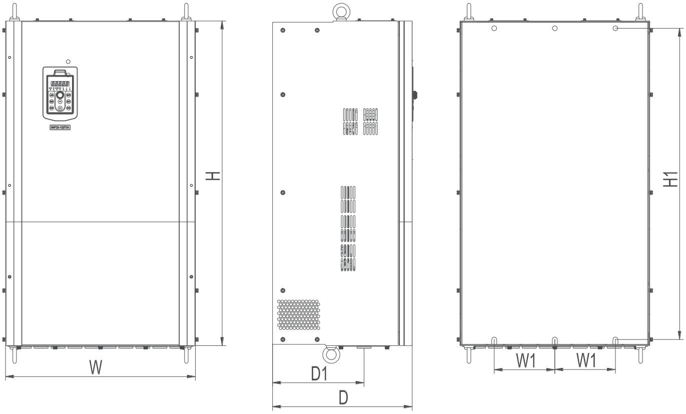


Figure 4.4 Outline drawings of NVF2G-37/T(P)S2 ~ NVF2G-110/T(P)S2 NVF2G-75/TS4 ~ NVF2G-315/PS4

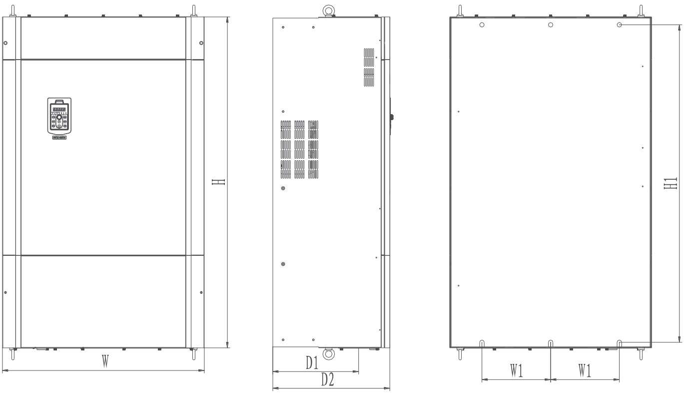


Figure 4.5 Outline drawings of NVF2G ~ 315/TS4-NVF2G-400/TS4

Table 4.1 Dimensions of NVF2G Series Inverters

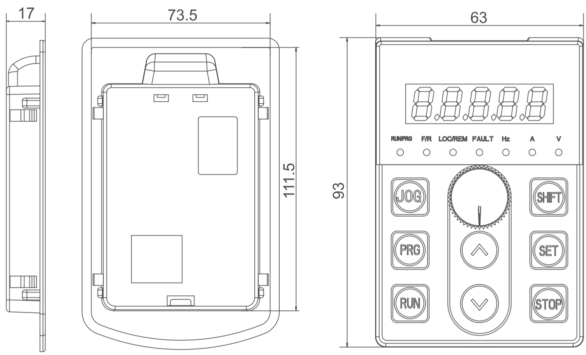
Specifications	W	H	D	W1	H1	D1	Weight (kg)	Remarks
NVF2G-0.4/T(P)S2	118	187	173	107	175	110	2.4	See Figure 4.1
NVF2G-0.75/T(P)S2								
NVF2G-1.5/T(P)S2								
NVF2G-2.2/T(P)S2								

Specifications	W	H	D	W1	H1	D1	Weight (kg)	Remarks
NVF2G-3.7/T(P)S2	155	247	189	140	232	125	3.6	See Figure 4.1
NVF2G-5.5/T(P)S2	191	378	183	90	362	129	10.5	See Figure 4.2
NVF2G-7.5/T(P)S2 NVF2G-11/T(P)S2	215	426	213	120	407	164	15	See Figure 4.2
NVF2G-15/T(P)S2 NVF2G-18.5/T(P)S2	300	527	230	166.6	506	179	26.5	See Figure 4.3
NVF2G-22/T(P)S2 NVF2G-30/T(P)S2	352	603	257	240	577	197.5	34.4	See Figure 4.3
NVF2G-37/T(P)S2 NVF2G-45/T(P)S2	406	631	272	126	600	224	58	See Figure 4.4
NVF2G-55/T(P)S2	470	807	352	150	769	226.5	108	See Figure 4.4
NVF2G-75/T(P)S2 NVF2G-90/T(P)S2 NVF2G-110/T(P)S2	540	892	390	180	848	256	121	See Figure 4.4

Specifications	W	H	D	W1	H1	D1	Weight (kg)	Remarks
NVF2G-1.5/PS4 NVF2G-1.5/TS4（2.2/PS4） NVF2G-2.2/TS4（3.7/PS4） NVF2G-3.7/TS4（5.5/PS4）	118	187	173	107	175	110	2.4	See Figure 4.1
NVF2G-5.5/TS4（7.5/PS4） NVF2G-7.5TS4（11/PS4）	155	247	189	140	232	125	3.6	See Figure 4.1
NVF2G-11/TS4（15/PS4） NVF2G-15/TS4（18.5/PS4）	191	378	183	90	362	129	10.5	See Figure 4.2
NVF2G-18.5/TS4（22/PS4） NVF2G-22/TS4（30/PS4）	215	426	213	120	407	164	15	See Figure 4.2

Specifications	W	H	D	W1	H1	D1	Weight (kg)	Remarks
NVF2G-30/TS4（37/PS4）	300	527	230	166.6	506	179	26.5	See Figure 4.3
NVF2G-37/TS4（45/PS4）								
NVF2G-45/TS4（55/PS4）	352	603	257	240	577	197.5	34.4	See Figure 4.3
NVF2G-55/TS4（75/PS4）								
NVF2G-75/TS4（90/PS4）	406	631	282	126	600	224	58	See Figure 4.4
NVF2G-90/TS4（110/PS4）								
NVF2G-110/TS4（132/PS4）	470	807	352	150	769	226.5	108	See Figure 4.4
NVF2G-132/TS4（160/PS4）								
NVF2G-160/TS4（185/PS4）	540	892	390	180	848	256	121	See Figure 4.4
NVF2G-185/TS4（200/PS4）								
NVF2G-200/TS4（220/PS4）								
NVF2G-220/TS4（245/PS4）	710	1020	386	250	978	284	171.5	See Figure 4.4
NVF2G-245/TS4（280/PS4）								
NVF2G-280/TS4（315/PS4）								
NVF2G-315/TS4（355/PS4）	734	1200	426	250	1152	313	280	See Figure 4.5
NVF2G-355/TS4（400/PS4）								
NVF2G-400/TS4								

4.2 Display Box Dimensions



Opening size of the pallet of the display box: 73.5×111.5

Figure 4.7 Outline drawing of display Box

Chapter V Inverter Wiring Instructions

5.1 Wiring Instructions

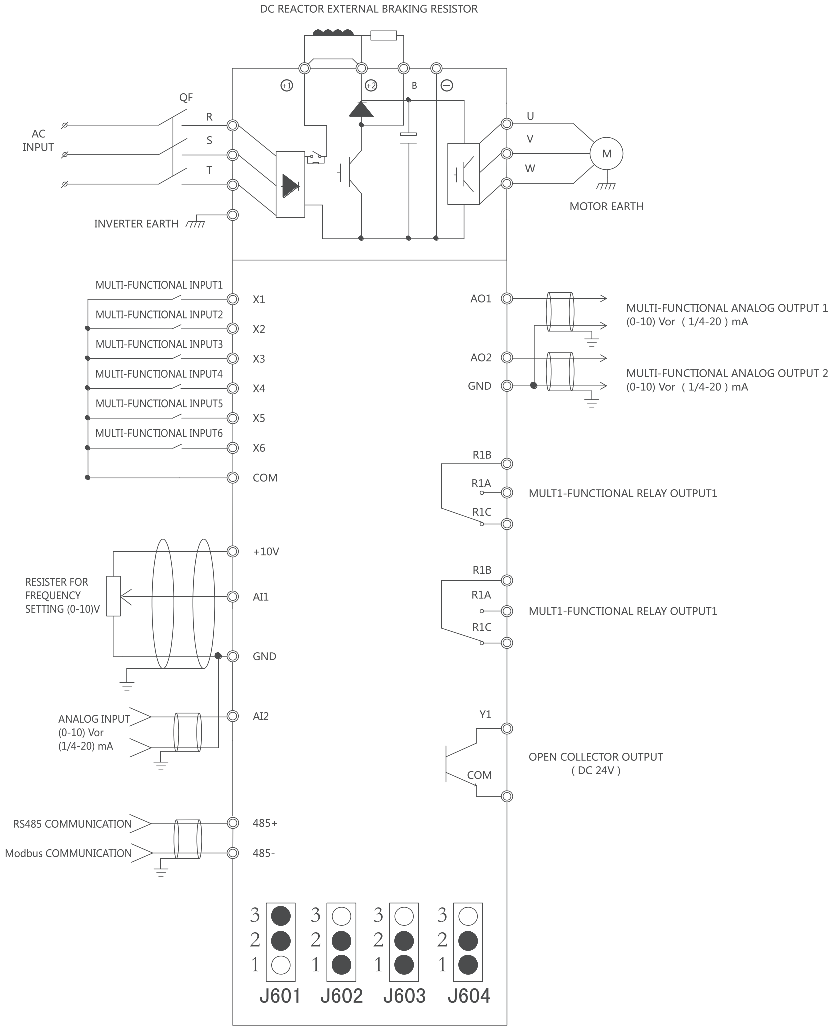


Figure 5.1 Wiring diagram of NVF2G-1.5/PS4-NVF2G-400/TS4 NVF2G-0.4/PS2-NVF2G-110/TS2

Explanation:

J601 (AI1 interface): 1 wired to 2: AI1's 0 V-10 V analog voltage input; 2 wired to 3: panel potentiometer input

J602 (AI2 interface): 1 wired to 2: 0 V-10 V analog voltage input; 2 wired to 3: 0/4 mA-20 mA analog current input

J603 (AO1 interface): 1 wired to 2: 0 V-10 V analog voltage output; 2 wired to 3: 0/4 mA-20 mA analog current output

J604 (AO2 interface): 1 wired to 2: 0 V-10 V analog voltage output; 2 wired to 3: 0/4 mA-20 mA analog current output

Table 5.1 List of terminal blocks of inverter control circuit

485+	485-	X1	X2	X3	X4	X5	X6	Y1	COM	R2A	R2B	R2C
+10V	AI2	AI1	GND	AO1	AO2	GND	COM	+24V	R1A	R1B	R1C	

Table 5.2 Description of control circuit terminals

Terminal Marks	Terminal Name	Description
R1A, R1B, R1C R2A, R2B, R2C	Relay contact output	RA and RB are a normally open contact group. RB and RC are a normally closed group. The functions are set by parameters F6.01 and F6.02. The factory default is fault/operation status signal output.
Y1 and COM	Open collector output	The function is set by parameter F6.00, and the factory default is the forward rotation status signal output.
485+; 485-	Serial communication terminal	The terminal for RS485 serial communication with the outside
+10 V	Frequency set power supply	Connected to the potentiometer (4.7kΩ-10kΩ) together with AI1, AI2 and GND.
AI1 and GND	Analog signal input terminal	Connected to the potentiometer or 0 V-10 V signal, as frequency setting, PID giving or PID feedback.
AI2 and GND	Analog signal input terminal	Input 0 V-10 V / 0(4) mA-20 mA signal, as frequency setting, PID giving or PID feedback.
AO1 and GND	Analog signal output terminal	Connected to a voltmeter of DC 0 V-10 V/0(4) mA-20 mA between AO1 and GND, which can be used to indicate the operating frequency, output current, output voltage, etc.
AO2 and GND	Analog signal output terminal	Connected to a voltmeter of DC 0 V-10 V/0(4) mA-20 mA between AO2 and GND, which can be used to indicate the operating frequency, output current, output voltage, etc.
X1	Multi-function input terminal 1	The factory setting is forward running
X2	Multi-function input terminal 2	The factory setting is reverse running
X3	Multi-function input terminal 3	The factory setting is forward Jog
X4	Multi-function input terminal 4	The factory setting is reverse Jog
X5	Multi-function input terminal 5	The factory setting fault reset
X6	Multi-function input terminal 6	The factory setting is external fault input
COM	Multi-function input terminal common ground	common ground for X1-X6, used with X1-X6
+24V, COM	Auxiliary power supply 24 V output	DC power supply 24 V output (≤50 mA)

Note:

1) Terminal COM is the common of,+24,Y1, X1-X6 digital control signals (multi-function input terminal), and terminal GND is the common of AI1, AI2, AO1 and AO2，+10V. Do not connect them to the ground.

2) The wiring of the control circuit terminals should be shielded wire or twisted pair, and must be separated from the main circuit and the strong current circuit.
3) The control circuit is recommended to be wired with a 0.75 mm^2 cable.
4) Strong current cannot be input to the control circuit, otherwise the inverter may be damaged.

5.2 Main Circuit Terminals and Wiring Instructions

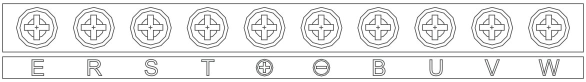


Figure 5.2 Schematic diagram of three-phase/ Single-phase220 V series NVF2G-0.4/T(P)S2 ~ 3.7/T(P)S4 main circuit terminal
Schematic diagram of three-phase 380 V series (NVF2G-1.5/PS4-11/PS4) main circuit terminal

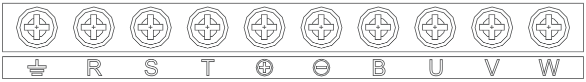


Figure 5.3 Schematic diagram of three-phase/ Single-phase 220 V series NVF2G-5.5/T(P)S2 ~ 11/T(P)S2 main circuit terminal
Schematic diagram of three-phase 380 V series (NVF2G-11/TS4-30/PS4) main circuit terminal

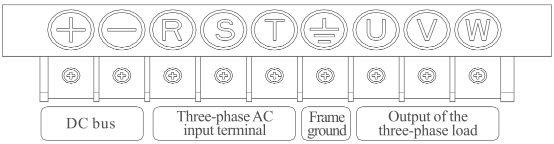


Figure 5.4 Schematic diagram of three-phase/ Single-phase 220 V series NVF2G-15/ T(P)S2 ~ 18.5/ T(P)S2main circuit terminal
Schematic diagram of three-phase 380 V series (NVF2G-30/TS4-45/PS4) main circuit terminal

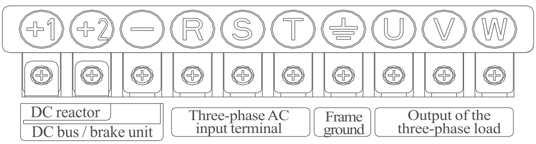


Figure 5.5 Schematic diagram of three-phase/ Single-phase 220 V series NVF2G-22/T(P)S2 ~ 45/T(P)S2main circuit terminal
Schematic diagram of three-phase 380 V series (NVF2G-45/TS4-110/PS4) main circuit terminal

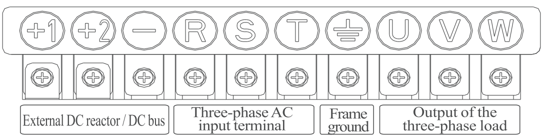


Figure 5.6 Schematic diagram of three-phase/ Single-phase 220 V series NVF2G-55/T(P)S2 main circuit terminal
Schematic diagram of three-phase 380 V series (NVF2G-110/TS4-160/PS4) main circuit terminal

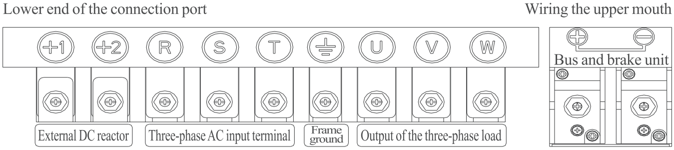


Figure 5.7 Schematic diagram of three-phase/ Single-phase 220 V series (NVF2G-75/T(P)S2～110/T(P)S2)main circuit terminal
Schematic diagram of three-phase 380 V series (NVF2G-160/TS4-315/PS4) main circuit terminal

Table 5.3 Description of Main Circuit Terminals

Terminal Marks	Terminal Name and Description
R, S, T	AC power input terminal, connected to power frequency power supply AC220 V 47 Hz-63 Hz
⊕ , ⊖	DC power input terminal or external brake unit terminal
(+1) 、(+2)	Connected to the external DC reactor terminal
⊕ , B	Connected to the braking resistor
U, V, W	Three-phase AC load output terminal
⏚ , E	Ground terminal, for inverter grounding

Main circuit wiring instructions
1) Please use a terminal with the insulating tube for the crimp terminal of the power supply and motor wiring.
2) Do not connect the power input cable to terminals other than R, S and T, otherwise the inverter will be damaged.
3) After wiring, broken wire ends must be cleaned, otherwise the machine may be abnormal or malfunction. When punching holes in the console, be careful not to let debris powder enter the inverter.
4) To ensure that the output voltage drops within 2%, use a wire of the appropriate size. When the wiring distance between the inverter and the motor is long, especially in the case of low-frequency output, the torque output from the motor will drop due to the voltage drop of the main circuit cable.
5) When the distance between the inverter and the motor exceeds 50 m, the leakage current is too large due to the parasitic capacitance effect of the long cable to the ground, so that the inverter is prone to frequent overcurrent protection. In addition, in order to avoid damage to the motor insulation, the output must be compensated by the output reactor.
6) When emergency braking is required, it is recommended to connect an optional braking resistor between ⊕ and B terminal.
7) It is recommended to connect an optional DC reactor between (+1)、(+2) .
8) The input and output circuits of the inverter contain harmonic components. It is recommended to install noise filters at the input and output sides to minimize interference.
9) Do not install power capacitors or surge suppressors at the output side of the inverter. Otherwise, the inverter may malfunction or devices be damaged.
10) To change the wiring after operation, it is necessary to cut off the power for more than 10 minutes, and the change can only be carried out after the DC bus voltage between ⊕ and ⊖ detected with a multimeter to be less than 36 V.
11) The ground terminal must be grounded.
- Since there is leakage current in the inverter, the inverter and motor must be grounded to prevent electric shock.

- The inverter should be grounded with a separate grounding terminal (do not use screws on the housing, chassis, etc.).
- The grounding cable should be as thick as possible; it must be equal to or larger than the standard shown in the table below. It should be as close as possible to the inverter, and the shorter the better.

Table 5.4 Grounding wire standard

Power line conductor cross-sectional area S (mm^2)	Grounding conductor cross-sectional area (mm^2)
S≤16	S
16<S≤35	16
35<S	S/2

Note:

1) When an external brake unit is connected, the mark of the inverter terminal (⊕,⊖) should be the same as the mark of the brake unit. If they are connected incorrectly, the inverter may be damaged;
2) The wiring distance between the brake unit and the braking resistor should be within 5 m, and should not exceed 10 m even if twisted pair is used.

Table 5.5 Main circuit terminal wiring and mounting torque

Inverter Model	R、S、T、⊕、⊖、(+1)、(+2)、U、V、W		
	Terminal screw	Tightening torque (N·m)	Wire specification (mm^2)
NVF2G-0.4/P (T) S2	M4	1.2 ~ 1.5	2.5
NVF2G-0.75/P(T) S2	M4	1.2 ~ 1.5	2.5
NVF2G-1.5/P (T) S2	M4	1.2 ~ 1.5	4
NVF2G-2.2/P (T) S2	M4	1.2 ~ 1.5	4
NVF2G-3.7/P (T) S2	M4	1.2 ~ 1.5	6
NVF2G-5.5/P (T) S2	M5	2.5 ~ 3.0	6
NVF2G-7.5/P (T) S2	M5	2.5 ~ 3.0	10
NVF2G-11//P (T) S2	M8	9.0 ~ 10.0	16
NVF2G-15/P (T) S2	M8	9.0 ~ 10.0	25
NVF2G-18.5/ P (T) S2	M8	9.0 ~ 10.0	25
NVF2G-22/P (T) S2	M8	9.0 ~ 10.0	35
NVF2G-30/P (T) S2	M8	9.0 ~ 10.0	50
NVF2G-37/P (T) S2	M8	9.0 ~ 10.0	60
NVF2G-45/P (T) S2	M8	9.0 ~ 10.0	70
NVF2G-55/P (T) S2	M10	17.6-22.5	100
NVF2G-75/P (T) S2	M12	31.4-39.5	185
NVF2G-90/P (T) S2	M12	31.4-39.5	185
NVF2G-110/P (T) S2	M12	31.4-39.5	185

Inverter Model	R、S、T、⊕、⊖、(+1)、(+2)、U、V、W		
	Terminal screw	Tightening torque (N·m)	Wire specification (mm^2)
NVF2G-1.5/P（T）S4	M4	1.2-1.5	2.5
NVF2G-2.2/P（T）S4	M4	1.2-1.5	2.5
NVF2G-3.7/P（T）S4	M4	1.2-1.5	4
NVF2G-5.5/P（T）S4	M4	1.2-1.5	6
NVF2G-7.5/P（T）S4	M4	1.2-1.5	6
NVF2G-11/PS4	M4	1.2-1.5	6
NVF2G-11/TS4	M5	2.5-3.0	6
NVF2G-15/P（T）S4	M5	2.5-3.0	6
NVF2G-18.5/P（T）S4	M5	2.5-3.0	10
NVF2G-22/PS4	M5	2.5-3.0	16
NVF2G-22/TS4	M8	9.0-10.0	16
NVF2G-30/P（T）S4	M8	9.0-10.0	25
NVF2G-37/（T）PS4	M8	9.0-10.0	25
NVF2G-45/P（T）S4	M8	9.0-10.0	35
NVF2G-55/P（T）S4	M8	9.0-10.0	50
NVF2G-75/P（T）S4	M8	9.0-10.0	60
NVF2G-90/P（T）S4	M8	9.0-10.0	70
NVF2G-110/PS4	M8	9.0-10.0	100
NVF2G-110/TS4	M10	17.6-22.5	100
NVF2G-132/P（T）S4	M10	17.6-22.5	150
NVF2G-160/PS4	M10	17.6-22.5	185
NVF2G-160/TS4	M12	31.4-39.5	185
NVF2G-185/P（T）S4	M12	31.4-39.5	185
NVF2G-200/P（T）S4	M12	31.4-39.5	240
NVF2G-220/PS4	M12	31.4-39.5	150x2
NVF2G-220/TS4	M16	85.2-90.4	150x2
NVF2G-245/P（T）S4	M16	85.2-90.4	150x2
NVF2G-280/P（T）S4	M16	85.2-90.4	185x2
NVF2G-315/P（T）S4	M16	85.2-90.4	250x2
NVF2G-355/P（T）S4	M16	85.2-90.4	325x2
NVF2G-400/P（T）S4	M16	85.2-90.4	325x2

5.3 Description of Main Circuit Peripheral Devices

1) An isolating switch or other obvious breaking device must be installed between the grid and the inverter to ensure personal safety during equipment maintenance.
2) When the contactor is used for power supply control, do not use it to control the power-on and off of the inverter.

3) DC reactor

In order to reduce the influence of the power supply on the inverter and protect the inverter and suppress high harmonics, a DC reactor should be configured in the following cases:

- There is a switch-type reactive compensation capacitor or a thyristor phase-controlled load on the same power supply node that supplies the inverter, and the reactive transient caused by the switching of the capacitor switch causes sudden changes in the grid voltage or the phase-controlled load causes harmonics and grid waveform gap, so that the input rectifier circuit of the inverter may be damaged;
- The imbalance of the three-phase power supply of the inverter is more than 3%;
- It is required to increase the power factor of the inverter input terminal to above 0.93;
- The inverter is connected to a large-capacity transformer, and the current flowing through the input power supply circuit of the inverter may cause damage to the rectifier circuit. Under normal circumstances, when the capacity of the inverter power supply is greater than 550 kVA or the power supply capacity is greater than 10 times the inverter capacity, the inverter needs to be equipped with a DC reactor.

4) AC input reactor

When the waveform of the grid is severely distorted, or the mutual influence of high harmonics between the inverter and the power supply cannot meet the requirements after the inverter is equipped with a DC reactor, an AC input reactor may be added. The AC input reactor can also increase the power factor at the input side of the inverter.

5) AC output reactor

When the connection line between the inverter and the motor exceeds 80 m, it is recommended to use multiple twisted wires and install an AC output reactor that can suppress high-frequency oscillation. Avoid damage to motor insulation, excessive leakage current, and frequent protection of inverter.

6) EMI filter at input side

An EMI filter is optional to suppress high frequency noise interference from the inverter power line.

The input EMI filter should be installed as close as possible to the inverter.

7) EMI filter at output side

An EMI filter is optional to suppress interference noise and wire leakage current generated at the output side of the inverter.

The output EMI filter should be installed as close as possible to the inverter.

8) Safety ground wire

There is leakage current in the inverter. In order to ensure safety, the inverter and motor must be grounded, and the grounding resistance should be less than 10 Ω.

The ground wire should be as short as possible.

5.4 Wiring Instructions

1) During the installation wiring, the power cable and the control cable should be separated as much as possible, for example, using a separate cable slot. If the control circuit wiring must cross the power cable, the two lines should intersect vertically.
2) When the control circuit is connected with shielded wires or twisted pairs, the unshielded area should be as short as possible, and cable glands should be used where possible.
3) The test instrument and the sensor should be connected with stranded shielded wire and be grounded with cable metal clamps.
4) The grounding wires of the inverter, the motor, etc. should be connected to the same point (see the grounding diagram and other grounding instructions).

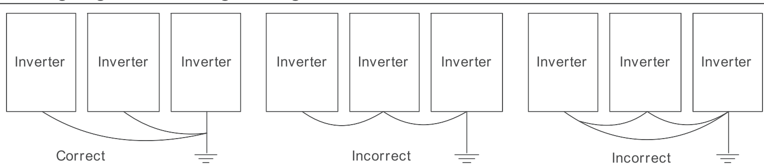


Figure 5.9 Inverter grounding

5) EMC-compliant wiring

According to the EMC characteristics of the inverter, in order to make the electrical equipment in the same system work reliably, this section is dedicated to noise suppression, field wiring, grounding, leakage current, and power filter use.

● Noise suppression

Shielded wires should be used for all control terminal connection lines of the inverter, and the shield layer should be grounded nearby at entrance of the inverter. A cable clip should be used for the grounding to form a 360° loop. It is forbidden to twist the shield into a braid and connect to the inverter because this will result in greatly reduced shielding effect or even loss of shielding effect.

Shielded wires or a separate wireway should be used for the connection line between the inverter and the motor (motor line). One end of the shield of the motor line or the metal casing of the wireway should be connected nearby to the inverter, and the other end be connected to the motor casing. A noise filter may be installed to greatly suppress electromagnetic noise.

● Field wiring and power wiring:

In different control systems, the power income line is independently powered from the power transformer. Generally, 5-core wires are used (3 cores are fire wires, 1 is neutral wire and 1 is ground wire). It is strictly forbidden to use the same wire for the neutral wire and the ground wire.

Wiring in the control cabinet: There are generally signal lines (weak current) and power lines (strong current) in the control cabinet. For the inverter, the power lines are divided into incoming and outgoing lines. The signal line is susceptible to interference from the power line, causing the equipment to malfunction. When wiring, the signal line and the power line should be distributed in different areas. It is forbidden to parallel or stagger the two lines within a short distance (20 cm), nor can they be bundled together. If the signal cable must cross the power line, the two lines should be at an angle of 90°. The incoming and outgoing power lines cannot be staggered or bundled together, especially in the case of installing a noise filter, where electromagnetic noise will be coupled through the distributed capacitance of the income and outgoing lines, thereby rendering the noise filter useless.

● Grounding: The inverter must be safely and reliably grounded during operation

The grounding is not only for equipment and personal safety, but also the simplest, most effective and cheapest method for solving EMC problems. It should be given priority.

There are three kinds of grounding: grounding with the dedicated grounding pole, grounding with the common grounding pole, and grounding with the ground line series. The grounding with the dedicated grounding pole should be used for different control systems. The grounding with the common grounding pole should be used for different equipment in the same control system. The grounding with the ground line series should be used for different equipment in the same power supply line.

● Leakage current

Leakage current includes line-to-line leakage currents and ground leakage currents. Its size depends on the size of the distributed capacitance of the system wiring and the Switching frequency of the inverter. Earth leakage current refers to the leakage current flowing through the common ground line. It will not only flow into the inverter system, but also may flow into other equipment through the ground line. The leakage current may cause the leakage circuit breaker, relay or other equipment to malfunction. Line-to-line leakage current refers to the leakage current flowing through the distributed capacitance between the input and output side cables of the inverter. The magnitude of the current is related to the inverter Switching frequency of the inverter, the length of the motor cable and the cross-sectional area of the cable. The higher the inverter Switching frequency, the longer the motor cable and the larger the cable cross-sectional area, the larger the leakage current.

Countermeasures: Reducing the Switching frequency can effectively reduce the leakage current. If the motor line is long (more than 50 m), an AC reactor or a sine wave filter should be installed at the output side of the inverter. If the motor line is longer, a reactor should be installed at intervals.

● Noise filter

The noise filter can perform a good electromagnetic decoupling function. It is recommended that users install the filter even if the operating conditions are met. For the inverter, the noise filter can be used as follows:

1) Install a noise filter at the input side of the inverter; or
2) Use an isolation transformer or power filter for other equipment to isolate noise.

Chapter VI Operation and Application Examples

6.1 Schematic Diagram of Panel Operation

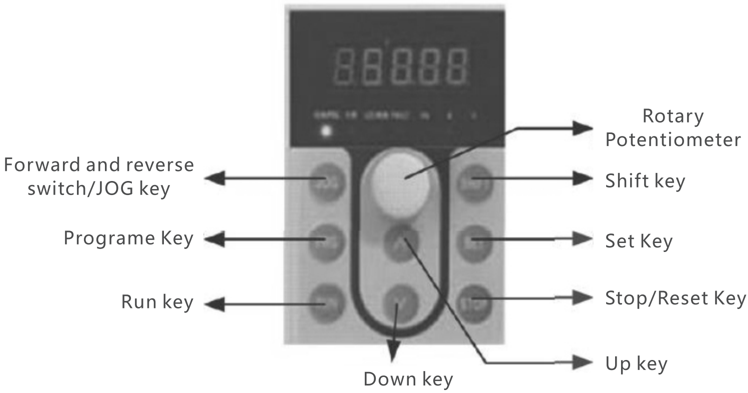


Figure 6.1 Physical panel

The operation panel is the interface for man-machine communication. It consists of a key part and a display part. The keys are to be used by the user to input control commands, and the display part displays parameter data and different operating states. The functions of the keys are shown in Table 6.1:

Table 6.1 Functions of keys of operation panel

Symbol	Key Name	Functions
JOGGING	Forward and reverse switching / Jogging	Press this key to Jogging, and set F7.03=1 to switch between forward and reverse.
PRG	Programming	Press this key to enter the function setting state. After modification is completed, press this key to exit the function setting state.
RUN	Run	Press this key and the inverter will start running. If external terminal control is set, this key is invalid.
▲	Increase	In the programming state, press this key to increase the value of the function code and parameter data. During operation or standby, press this key to increase the operating frequency.
▼	Decrease	In the programming state, press this key to decrease the value of the function code and parameter data. During operation or standby, press this key to decrease the operating frequency.
SHIFT	Shift	Shift is allowed when modifying the parameter data in the programming state. In the standby or running state, press this key to display in turn the working frequency, bus voltage, output voltage, output current, speed, and output power.

Symbol	Key Name	Functions
SET	Confirm	In the programming state, press this key to confirm the function code. After the parameter content is modified, press this key to save the modified data.
STOP	Stop/Reset	Press this key and the inverter will stop running. This function is subject to the F7.04. After a fault alarm occurs, press this key to reset the system.

6.2 Parameter Modification Methods

To modify a parameter, first enter the function code to be modified, and then reset the parameter value. The specific steps are shown in Table 6.2:

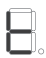
Table 6.2 Inverter parameter modification instructions

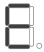
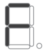
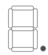
Step	Operations	Description
1	Press PRG	F0 displayed, enter the parameter group.
2	Press ▲ and ▼	Adjust to the appropriate parameter group FX.
3	Press SET	FX-XX displayed, enter the parameter modification code.
4	Press ▲ and ▼	Adjust to the function code to be modified.
5	Press SET	XXXX displayed, enter the parameter modification state.
6	Press ▲ and ▼	Reset the parameter value as needed.
7	Press SET	Save the data and the function code FX-XX is then displayed.
8	Press PRG	Press this key to exit the setting state and return to the standby or running state.

6.3 LED Display Description

There are five 7-segment LED digital tubes, three unit indicators and four status indicators on the LED display panel. The correspondence between the display symbols of the digital tube and the characters/numbers is shown in Table 6.3.

Table 6.3 Digital tube display description

LED display	Meaning	LED display	Meaning	LED display	Meaning	LED display	Meaning
	0		A		I		S
	1		b		J		T
	2		C		L		t
	3		c		N		U
	4		d		n		v

LED display	Meaning	LED display	Meaning	LED display	Meaning	LED display	Meaning
	5		E		O		y
	6		F		o		-
	7		G		P		8.
	8		H		q		.
	9		h		r		:

6.4 Indicator Description

Table 6.4 Panel indicator description

Indicator Sign		Status	Meaning
Status light	RUN/PRG	Off	The inverter is in the stop state
		Flashing	The inverter is in the parameter Auto-Tuning state
		On	The inverter is in the running state
	F/R	Off	The inverter is in the forward direction
		On	The inverter is in the reverse direction
	LOC/REM	Off	The running command of the inverter is the keyboard command channel
		Flashing	The running command of the inverter is the terminal command channel
		On	The running command of the inverter is the communication command channel
	FAULT	Off	The inverter is in a normal state
		Flashing	The inverter is in a fault state
Unit light	Hz	On	The currently displayed parameter is the operating frequency
		Flashing	The currently displayed parameter is the set frequency
	A	On	The currently displayed parameter is the actual output current

Indicator Sign		Status	Meaning
Unit light	V	On	The currently displayed parameter is the DC bus voltage of the inverter
		Flashing	The currently displayed parameter is the output voltage of the inverter
	Hz + A(RPM)	On	The currently displayed parameter is the operating speed
	A + V(%)	On	The currently displayed parameter is the output power
		Flashing	The currently displayed parameter is the output torque

Chapter VII Brief List of Function Parameters

7.1 Description of Function Parameters Table

The function parameters of NVF2G series inverters are grouped by function into 15 groups of F0-FE, and each function group includes several function codes. The function codes are represented as a three-level menu. For example, "F8.08" indicates the No. 8 function code in the F8 group of functions.

In order to facilitate the setting of the function code, when the operation panel is used for operation, the function group number corresponds to the first-level menu, the function code number corresponds to the second-level menu, and the function code parameter corresponds to the third-level menu.

1、 The column contents of the function table are described in Table 7.2.

Table 7.1 Description of Function Parameters Table

Item	Description
Function code	Function parameter group and parameter number
Name	Full name of function parameter
Parameter Detailed Description	Detailed description of the function parameter
Setting Range	The range of valid value of the function parameter
Unit	V: voltage; A: current; ℃: temperature; Ω: ohm; mH: millinery; rpm: speed; %: percentage; bps: baud rate; Hz and kHz: frequency; ms, s, min, h and kh: time; kW: power; /: no unit and otherwise.
Default value	Factory default setting of function parameter
Change	Change attribute of function parameter (ie whether change is allowed and change conditions)
○	Indicates that the set value of the parameter can be changed while the inverter is in the stop state and running state

Item	Description
	Indicates that the set value of the parameter cannot be changed while the inverter is in the running state
●	Indicates that the value of the parameter is the actually detected record value and cannot be changed (The inverter has automatically checked the change attributes of each parameter to help the user to avoid accidental modification)
No.	The serial number of the function code in all function codes, and also indicates the register address at the time of communication

2. The "parameter binary" is decimal (DEC). If the parameter is expressed in hexadecimal, the bits of its data are independent of each other when it is edited, and the value range of some bits can be hexadecimal (0 to F).
3. The "default value" indicates the refreshed value of the function code parameter when the factory parameters are restored; however, the actual detected parameter value or record value will not be refreshed.
4. For more effective parameter protection, the inverter provides password protection for the function code. For details on the setting method, see the F7.00 function description.
5. When the function code parameter is modified using serial communication, the function of user password also follows the above rules.

7.2 Brief List of Function Parameters

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F0.00	Speed control mode	Set by model	0-1	◎	0: No PG vector control 1: V/F control
F0.01	Running command channel	0	0-2	◎	0: Keyboard command channel 1: Terminal command channel 2: Communication command channel
F0.02	Keyboard and terminal UP/DOWN setting	0	0-3	○	0: Valid, and storage in case of inverter power-off 1: Valid, and no storage in case of inverter power-off 2: Reserved 3: Reserved
F0.03	Frequency command selection	0	0-6	○	0: Keyboard setting 1: Analog AI1 setting 2: Analog AI2 setting 3: AI1 + AI2 setting 4: Multi-speed running setting 5: PID control setting 6: Remote communication setting
F0.04	Maximum output frequency	50.00Hz	10.00-600.00	◎	10.00 Hz-400.00 Hz

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F0.05	Upper limit of running frequency	50.00Hz	F0.06-F0.04	○	F0.06-F0.04 (maximum frequency)
F0.06	Lower limit of running frequency	0.00Hz	0.00-F0.05	○	0.00Hz-F0.05 (upper limit of running frequency)
F0.07	Keyboard set frequency	50.00Hz	0.00-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
F0.08	Acceleration time 1	Set by model	0.1-3600.0	○	0.1s-3600.0s
F0.09	Deceleration time 1	Set by model	0.1-3600.0	○	0.1s-3600.0s
F0.10	Running direction selection	0	0-2	◎	0: Run in the default direction 1: Run in the opposite direction 2: Reverse running prohibited
F0.11	Switching frequency setting	Set by model	0.5-15.0	○	0.5 kHz-15.0 kHz
F0.12	Motor parameter Auto-Tuning	0	0-2	◎	0: No operation 1: Parameter full Auto-Tuning 2: Parameter static Auto-Tuning
F0.13	Parameter restored to factor values	0	0-2	◎	0: No operation 1: Restore default value 2: Clear fault record information
F0.14	Automatic voltage regulation function selection	2	0-2	○	0: Invalid 1: Valid throughout 2: Invalid only during deceleration
F1.00	Start mode	0	0-2	◎	0: Direct start 1: DC braking before starting 2: Speed tracking before starting
F1.01	Directly start starting frequency	0.00	0.00-10.00	○	0.00 Hz-10.00 Hz
F1.02	Starting frequency hold time	0.0	0.0-50.0	○	0.0s-50.0s
F1.03	Braking current before starting	0.0	0.0-150.0	○	0.0%-150.0%
F1.04	Braking time before starting	0.0	0.0-50.0	○	0.0 s-50.0 s
F1.05	Stop mode selection	0	0-1	○	0: Deceleration stop 1: Free stop
F1.06	Stop braking starting frequency	0.00	0.00-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
F1.07	Stop braking waiting time	0.0	0.0-50.0	○	0.0 s-50.0 s
F1.08	Stop DC brake current	0.0	0.0-150.0	○	0.0%-150.0%
F1.09	Stop DC brake time	0.0	0.0-50.0	○	0.0 s-50.0 s
F1.10	Forward and reverse dead time	0.0	0.0-3600.0	○	0.0 s-3600.0 s

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F1.11	Power-on terminal running protection selection	0	0-1	○	0: Terminal run command invalid at power-on 1: Terminal run command valid at power-on
F1.12	Reserved	/	/	○	/
F2.00	Inverter type	Set by model	0-1	◎	0: T type 1: P type
F2.01	Motor rated power	Set by model	0.4-900.0	◎	0.4 kW-900.0 kW
F2.02	Motor rated frequency	50.00Hz	0.01-F0.04	◎	0.01Hz-F0.04 (maximum frequency)
F2.03	Motor rated speed	Set by model	0-36000	◎	0 rpm-36,000 rpm
F2.04	Motor rated voltage	Set by model	0-460	◎	0 V-460 V
F2.05	Motor rated current	Set by model	0.1-2000.0	◎	0.1 A-2,000.0 A
F2.06	Motor stator resistance	Set by model	0.001-65.535	○	0.001 Ω-65.535 Ω
F2.07	Motor rotor resistance	Set by model	0.001-65.535	○	0.001 Ω-65.535 Ω
F2.08	Motor stator and rotor inductance	Set by model	0.1-6553.5	○	0.1 mH-6,553.5 mH
F2.09	Motor stator and rotor mutual inductance	Set by model	0.1-6553.5	○	0.1 mH-6,553.5 mH
F2.10	Motor no-load current	Set by model	0.01-655.35	○	0.01 A-655.35 A
F3.00	Speed loop proportion gain 1	20	0-100	○	0-100
F3.01	Speed loop integration time 1	0.50	0.01-10.00	○	0.01 s-10.00 s
F3.02	Switch low frequency	5.00	0.00-F3.05	○	0.00 Hz-F3.05
F3.03	Speed loop proportion gain 2	25	0-100	○	0-100
F3.04	Speed loop integration time 2	1.00	0.01s-10.00	○	0.01 s-10.00 s
F3.05	Switch high frequency	10.00	F3.02-F0.04	○	F3.02-F0.04 (maximum frequency)
F3.06	VC slip compensation coefficient	100	50-200	○	50%-200%
F3.07	Torque upper limit setting	150.0	0.0-200.0	○	0.0%-200.0% (inverter rated current)
F4.00	V/F curve setting	0	0-1	◎	0: Straight line V/F curve 1: 2.0 power torque reduction V/F curve
F4.01	Torque boost	0.0	0.0-30.0	○	0.0%: (Automatic) 0.1%-30.0%
F4.02	Torque boost cutoff	20.0	0.0-50.0	◎	0.0%-50.0% (relative motor rated frequency)

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F4.03	V/F slip compensation limiting	100	0.0-200.0	○	0.0%-200.0%
F4.04	Energy-saving operation selection	0	0-1	◎	0: No action 1: Automatic energy-saving operation
F4.05	Reserved	/	/	●	/
F5.00	X1 terminal function selection	1	0-25	◎	0: No function 1: Forward running 2: Reverse running 3: Three-wire running control 4: Forward Jog 5: Reverse Jog 6: Free stop 7: Fault reset 8: External fault input 9: Frequency setting increment (UP) 10: Frequency setting decrement (DOWN) 11: Frequency increment/decrement setting cleared 12: Multi-speed terminal 1 13: Multi-speed terminal 2 14: Multi-speed terminal 3 15: Acceleration/deceleration time selection 16: PID control pause 17: Swing frequency pause (stop at current frequency) 18: Swing frequency reset (return to center frequency) 19: Acceleration/deceleration prohibited 20: Reserved 21: Frequency increment/decrement setting cleared temporarily 22: Sleep switch 23-25: Reserved
F5.01	X2 terminal function selection	2	0-25	◎	
F5.02	X3 terminal function selection	4	0-25	◎	
F5.03	X4 terminal function selection	5	0-25	◎	
F5.04	X5 terminal function selection	7	0-25	◎	
F5.05	X6 terminal function selection	8	0-25	◎	
F5.06	Switch filter times	5	1-10	○	1-10
F5.07	Terminal control operating mode	0	1-3	◎	0: Two-wire control 1 1: Two-wire control 2 2: Three-wire control 1 3: Three-wire control 2
F5.08	Terminal UP/DOWN Frequency increment change rate	0.50	0.01-50.00	○	0.01 Hz/s-50.00 Hz/s
F5.09	AI1 lower limit value	0.00	0.00-10.00	○	0.00 V-10.00 V
F5.10	AI1 lower limit corresponding setting	0.0	-100.0-100.0	○	-100.0%-100.0%

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F5.11	AI1 upper limit value	10.00	0.00-10.00	○	0.00 V-10.00 V
F5.12	AI1 upper limit corresponding setting	100.0	-100.0-100.0	○	-100.0%-100.0%
F5.13	AI1 input filter time	0.10	0.00-10.00	○	0.00 s-10.00 s
F5.14	AI2 lower limit value	2.00	0.00-10.00	○	0.00 V-10.00 V
F5.15	AI2 lower limit corresponding setting	0.0	-100.0-100.0	○	-100.0%-100.0%
F5.16	AI2 upper limit value	10.00	0.00-10.00	○	0.00 V-10.00 V
F5.17	AI2 upper limit corresponding setting	100.0	-100.0-100.0	○	-100.0%-100.0%
F5.18	AI2 input filter time	0.10	0.00-10.00	○	0.00 s-10.00 s
F6.00	Select Y1 output function	1	0-10	○	0: No output 1: Motor is running forward 2: Motor is running in reverse 3: Fault output 4: Frequency level detection FDT output 5: Frequency arrival 6: Running at zero speed 7: Upper limit frequency arrival 8: Lower limit frequency arrival 9-10: Reserved
F6.01	Select Relay R1 output function	3	0-10	○	
F6.02	Select Relay R2 output function	1	0-10	○	
F6.03	Select AO1 output function	0	0-10	○	0: Running frequency 1: Set frequency 2: Running speed 3: Output current 4: Output voltage 5: Output power 6: Output torque 7: Analog AI1 input value 8: Analog AI2 input value 9-10: Reserved
F6.04	AO1 output lower limit	0.0	0.0-100.0	○	0.0%-100.0%
F6.05	Lower limit corresponding AO1 output	0.00	0.00-10.00	○	0.00 V-10.00 V
F6.06	AO1 output upper limit	100.0	0.0-100.0	○	0.0%-100.0%
F6.07	Upper limit corresponding AO1 output	10.00	0.00-10.00	○	0.00 V-10.00 V

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F6.08	AO2 output selection	0	0-10	○	0: Running frequency 1: Set frequency 2: Running speed 3: Output current 4: Output voltage 5: Output power 6: Output torque 7: Analog AI1 input value 8: Analog AI2 input value 9-10: Reserved
F6.09	AO2 output lower limit	0.0	0.0-100.0	○	0.0%-100.0%
F6.10	Lower limit corresponding AO2 output	0.00	0.00-10.00	○	0.00 V-10.00 V
F6.11	AO2 output upper limit	100.0	0.0-100.0	○	0.0%-100.0%
F6.12	Upper limit corresponding AO2 output	10.00	0.00-10.00	○	0.00 V-10.00 V
F7.00	User password	0	0-65535	○	0-65,535
F7.01	Reserved	/	/	/	/
F7.02	Reserved	/	/	/	/
F7.03	JOGGING key Function selection	0	0-2	◎	0: Jogging operation 1: Forward/reverse switching 2: Clear UP/DOWN setting
F7.04	STOP key stop Function selection	0	0-3	○	0: Valid only for panel control 1: Valid for both panel and terminal control 2: Valid for both panel and communication control 3: Valid for all control modes
F7.05	Reserved	/	/	/	/
F7.06	Parameter selection of operating status display	00FF	0-7FFF	○	0-0x7FFF BIT0: Running frequency BIT1: Set frequency BIT2: Bus voltage BIT3: Output voltage BIT4: Output current BIT5: Running speed BIT6: Output power

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F7.06	Parameter selection of operating status display	00FF	0-7FFF	○	BIT7: Output torque BIT8: PID given value BIT9: PID feedback value BIT10: Input terminal status BIT11: Output terminal status BIT12: Analog AI1 value BIT13: Analog AI2 value BIT14: Multi-speed current number of segments BIT15: Reserved
F7.07	Parameter selection of stop status display	00FF	1-1FF	○	1-0x1FF BIT0: Set frequency BIT1: Bus voltage BIT2: Input terminal status BIT3: Output terminal status BIT4: PID given value BIT5: PID feedback value BIT6: Analog AI1 value BIT7: Analog AI2 value BIT8: Multi-speed current number of segments BIT9-BIT15: Reserved
F7.08	Manufacturer parameter	/	/	●	/
F7.09	Inverter module temperature	/	0-100.0	●	0 ℃-100.0 ℃
F7.10	Manufacturer parameter	/		●	/
F7.11	Cumulative running time of the matching	0	0-65535	●	(0-65,535) h
F7.12	Type of the first two faults	/	0-26	●	0-24 0: No fault 1: Inverter unit protection (OUT1) 2: Reserved 3: Reserved 4: Acceleration overcurrent (OC1) 5: Deceleration overcurrent (OC2) 6: Constant speed overcurrent (OC3) 7: Acceleration overvoltage (OV1) 8: Deceleration overvoltage (OV2) 9: Constant speed overvoltage (OV3) 10: Bus undervoltage fault (UV) 11: Motor overload (OL1) 12: Inverter overload (OL2) 13: Reserved 14: Reserved 15: Reserved 16: Overheat (OH2) 17: External fault (EF) 18: Communication fault (CE) 19: Current detection fault (ItE)
F7.13	Type of previous fault	/	0-26	●	
F7.14	Current fault type	/	0-26	●	

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F7.14	Current fault type	/	0-26	●	20: Motor Auto-Tuning fault (tE) 21: EEPROM operation fault (EEP) 22: PID feedback disconnection fault (PIDE) 23: Reserved 24: Output phase loss protection (SPO) 25. Input phase loss protection (PL) 26: Reserved
F7.15	Current fault running frequency	0.00	/	●	/
F7.16	Current fault output current	0.0	/	●	/
F7.17	Current fault bus voltage	0.0	/	●	/
F7.18	Current fault input terminal status	0	/	●	/
F7.19	Current fault output terminal status	0	/	●	/
F8.00	Acceleration time 2	Set by model	0.1-3600.0	○	0.1 s-3,600.0 s
F8.01	Deceleration time 2	Set by model	0.1-3600.0	○	0.1 s-3,600.0 s
F8.02	Jogging operation frequency	5.00	0.00-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
F8.03	Jogging operation acceleration time	Set by model	0.1-3600.0	○	0.1 s-3,600.0 s
F8.04	Jogging operation deceleration time	Set by model	0.1-3600.0	○	0.1 s-3,600.0 s
F8.05	Jump frequency	0.00	0.00-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
F8.06	Jump frequency amplitude	0.00	0.00-F0.04	○	0.00-F0.04 (maximum frequency)
F8.07	Swing frequency amplitude	0.0	0.0-100.0	○	0.0%-100.0% (relative to set frequency)
F8.08	Sudden jump frequency amplitude	0.0	0.0%-50.0%	○	0.0%-50.0% (relative to swing frequency amplitude)
F8.09	Swing frequency rise time	5.0	0.1-3600.0	○	0.1 s-3,600.0 s
F8.10	Swing frequency fall time	5.0	0.1-3600.0	○	0.1 s-3,600.0 s
F8.11	Number of automatic fault resets	0	0-3	○	0-3
F8.12	Automatic fault reset Interval setting	1.0	0.1-100.0	○	0.1 s-100.0 s
F8.13	FDT level detection value	50.00	0.00-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
F8.14	FDT lag detection value	5.0	0.0-100.0	○	0.0%-100.0% (FDT level)
F8.15	Frequency arrival detection amplitude	0.0	0.0-100.0	○	0.0%-100.0% (maximum frequency)

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
F8.16	Brake threshold voltage	130.0	115.0-140.0	○	115.0%-140.0% (standard bus voltage) (380 V series)
		120.0			115.0%-140.0% (standard bus voltage) (220V series)
F8.17	Speed display series	100.0	0.1-1000.0	○	0.1%-1,000.0% mechanical speed = 120 * running frequency * F8.17/number of motor poles
F9.00	PID given source selection	0	0-4	○	0: Keyboard given (F9.01) 1: Analog channel AI1 given 2: Analog channel AI2 given 3: Remote communication given 4: Multi-segment given
F9.01	Keyboard preset PID given	0.0	0.0-100.0	○	0.0%-100.0%
F9.02	PID feedback source selection	0	0-3	○	0: Analog channel AI1 feedback 1: Analog channel AI2 feedback 2: AI1 + AI2 feedback 3: Remote communication feedback
F9.03	PID output characteristics selection	0	0-1	○	0: PID output characteristics are positive 1: PID output characteristics are negative
F9.04	Proportional gain (K)	1.00	0.00-100.00	○	
F9.05	Integration time (Ti)	0.10	0.01-10.00	○	
F9.06	Differentiation time (TD)	0.00	0.00-10.00	○	
F9.07	Sampling period (T)	0.10	0.01-100.00	○	
F9.08	PID control deviation limit	0.0	0.0-100.0	○	
F9.09	Feedback disconnection detection value	0.0	0.0-100.0	○	
F9.10	Feedback disconnection detection time	1.0	0.0-3600.0	○	
F9.11	Pump sleep enabling	0	0-3	○	
F9.12	Time extension	60.0	0.0-3600.0	○	
F9.13	Awakening pressure difference	80.0	0.0-100.0	○	
F9.14	Speed/current threshold	50.0	0.0-100.0	○	
FA.00	Multi-speed control mode	0	0-3	○	

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
FA.01	Multi-speed 0	0.0	-100.0-100.0	○	
FA.02	Multi-speed 1	0.0	-100.0-100.0	○	
FA.03	Multi-speed 2	0.0	-100.0-100.0	○	
FA.04	Multi-speed 3	0.0	-100.0-100.0	○	
FA.05	Multi-speed 4	0.0	-100.0-100.0	○	
FA.06	Multi-speed 5	0.0	-100.0-100.0	○	
FA.07	Multi-speed 6	0.0	-100.0-100.0	○	
FA.08	Multi-speed 7	0.0	-100.0-100.0	○	
FA.09	Multi-speed time 0	1.0	0.0-3600.0	○	
FA.10	Multi-speed time 1	1.0	0.0-3600.0	○	
FA.11	Multi-speed time 2	1.0	0.0-3600.0	○	
FA.12	Multi-speed time 3	1.0	0.0-3600.0	○	
FA.13	Multi-speed time 4	1.0	0.0-3600.0	○	
FA.14	Multi-speed time 5	1.0	0.0-3600.0	○	
FA.15	Multi-speed time 6	1.0	0.0-3600.0	○	
FA.16	Multi-speed time 7	1.0	0.0-3600.0	○	
Fb.00	Motor overload protection selection	2	0-2	◎	0: No protection 1: Ordinary motor (with low speed compensation) 2: Variable frequency motor (without low speed compensation)
Fb.01	Motor overload protection current	100.0	20.0-120.0	○	20%-120.0% (motor rated current)
Fb.02	Instantaneous power down frequency reduction point	80.0	70.0-110.0	○	70%-110.0% (standard bus voltage)
Fb.03	Instantaneous power down frequency reduction rate	0.00	0.00-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
Fb.04	Overvoltage stall protection	1	0-1	○	0: Prohibited 1: Allowed
Fb.05	Overvoltage stall protection voltage	140	110-150 (380 V series)	○	110%-150% (380 V series)
		115	110-150 (220 V series)		110%-150% (220 V series)
Fb.06	Automatic current limiting level	T type: 160 P type: 120	100-200	○	100%-200%

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
Fb.07	Reserved	/	/	/	/
FC.00	Communication address of this machine	1	0-247	○	1-247; 0 is broadcast address
FC.01	Communication baud rate setting	3	0-5	○	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps
FC.02	Data bit parity setting	0	0-17	○	0: No parity (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 2) for RTU 6: No parity (N, 7, 1) for ASCII 7: Even parity (E, 7, 1) for ASCII 8: Odd parity (O, 7, 1) for ASCII 9: No parity (N, 7, 2) for ASCII 10: Even parity (E, 7, 2) for ASCII 11: Odd parity (O, 7, 2) for ASCII 12: No parity (N, 8, 1) for ASCII 13: Even parity (E, 8, 1) for ASCII 14: Odd parity (O, 8, 1) for ASCII 15: No parity (N, 8, 2) for ASCII 16: Even parity (E, 8, 2) for ASCII 17: Odd parity (O, 8, 2) for ASCII
FC.03	Communication response delay	5	0-200	○	0 ms-200 ms
FC.04	Communication timeout failure time	0.0	0.0-100.0	○	0.0 (invalid), 0.1 s-100.0 s
FC.05	Transmission error handling	1	0-3	○	0: Alarm and free stop 1: No alarm and continue to run 2: No alarm and stop in the stop mode (for communication control mode only) 3: No alarm and stop in the stop mode (for all control modes)
FC.06	Transmission response handling	0	0-1	○	0: Write operation with response 1: Write operation without response

Function Code	Function Code Name	Default value	Setting Range	Attribute	Function Code Options
Fd.00	Suppression oscillation Low frequency threshold point	5	0-500	○	0-500
Fd.01	Suppression oscillation High frequency threshold point	100	0-500	○	0-500
Fd.02	Suppression oscillation limit value	5000	0-10000	○	0-10,000
Fd.03	Suppression oscillation high-low frequency boundary frequency	12.50	0.00Hz-F0.04	○	0.00 Hz-F0.04 (maximum frequency)
Fd.04	Suppression oscillation	1	0-1	○	0: Suppression oscillation valid 1: Suppression oscillation invalid
Fd.05	PWM selection	0	0-1	◎	0: PWM模式1 1: PWM模式2
Fd.06	Reserved	/	/	/	/
Fd.07	Reserved	/	/	/	/
Fd.08	Reserved	/	/	/	/
Fd.09	Reserved	/	/	/	/
FE.00	Manufacturer password	*****	0-65535	●	0-65,535

7.3 Detailed Explanation of Inverter Functions

Group F0: Basic functions

Function Code	Name	Description	Setting Range	Default value
F0.00	Speed control mode	0: No PG vector control 1: V/F control	0-1	Set by model

Select the operating mode of the inverter.

0: No PG vector control:

Open-loop vector control: Suitable for high-performance general-purpose applications without an encoder PG. One inverter can only drive one motor, such as machine tools, centrifuges, wire drawing machines, injection molding machines, etc. This mode requires a high degree of accuracy for the motor parameters.

When it is necessary to control the speed change caused by load fluctuation, please set F3.06: VC slip compensation coefficient.

1: V/F control:

Suitable for applications where the control accuracy requirement is not high, or one inverter drives multiple motors, such as fan and pump loads.

When it is necessary to control the speed change caused by load fluctuation, please set F4.03: V/F slip compensation limit.

This mode requires a low degree of accuracy for the motor parameters.

Function Code	Name	Description	Setting Range	Default value
F0.01	Running command channel	0: Keyboard command channel 1: Terminal command channel 2: Communication command channel	0-2	0

Select the inverter control instruction channel.

Inverter control commands include start, stop, forward, reverse, Jogging, fault, and reset.

0: Keyboard command channel ("LOC/REM" indicator off):

The running command is controlled by the RUN and STOP keys on the keyboard panel. If the JOGGING key is set to the forward/reverse switching function (F7.03 set to 1), the key can be used to change the direction of operation.

1: Terminal command channel ("LOC/REM" indicator flashing):

The running command is controlled by forward, reverse, forward Jogging and reverse Jogging of the multi-function input terminal.

2: Communication command channel ("LOC/REM" indicator on):

The running command is controlled by the host through communication.

Function Code	Name	Description	Setting Range	Default value
F0.02	Keyboard and terminal UP/DOWN setting	0: Valid, and storage in case of inverter power-off 1: Valid, and no storage in case of inverter power-off 2: Reserved 3: Reserved	0-3	0

NVF2G can set the frequency with the "▲" and "▼" on the board and the terminal UP/DOWN (frequency setting increment/decrement) function. Can be combined with any other frequency setting channel. Mainly used to fine-tune the output frequency of the inverter during the control system debugging process.

0: Valid, and storage in case of inverter power-off. The frequency command can be set, and after the inverter is powered off, the set frequency value will be saved. After the next power-on, it is automatically combined with the current set frequency.

1: Valid, and no storage in case of inverter power-off. The frequency command can be set, but the set frequency value is not stored after the inverter is powered off;

2: Reserved;

3: Reserved.

Function Code	Name	Description	Setting Range	Default value
F0.03	Frequency command selection	0: Keyboard setting 1: Analog AI1 setting 2: Analog AI2 setting 3: Analog AI1 + AI2 setting 4: Multi-speed running setting 5: PID control setting 6: Remote communication setting	0-6	0

Select the inverter frequency command input channel. There are 7 main given frequency channels:

0: Keyboard setting

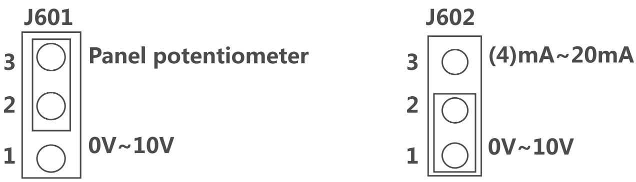
The keyboard set frequency is realized by modifying the value of F0.07 "keyboard set frequency".

1: Analog AI1 setting

2: Analog AI2 setting

3: Analog AI1 + AI2 setting

It means that the frequency is set by the analog input terminal. The NVF2G series inverters come standard with two analog input terminals, of which AI1 uses 0 V-10 V voltage type input. The panel potentiometer or AI1 terminal can be selected through J601 switching to adjust the frequency. AI2 uses 0 V-10 V voltage input, or 0(4) mA-20 mA current input. The current and voltage inputs can be switched by jumper J602.



Note: When 0 mA-20 mA input is selected for analog AI2, 20 mA corresponds to the upper limit frequency (F0.05).

The 100.0% of the analog input setting corresponds to the upper limit frequency (F0.05), and -100.0% corresponds to the upper limit frequency in reverse (F0.05).

4: Multi-speed running setting

When this frequency setting mode is selected, the inverter runs in multi-speed mode. The correspondence between the given percentage and the given frequency is determined by setting Group F5 and Group FA "multi-speed control group" parameters.

5: PID control setting

When this parameter is selected, the inverter operation mode is process PID control. In this case, Group F9 "PID control group" needs to be set. The running frequency of the inverter is the frequency value after the PID is applied. For the meaning of PID given source, given amount and feedback source, see the description of Group F9 "PID functions".

6: Remote communication setting

The frequency command is given by the host though communication. For details, refer to the FC communication protocol.

Function Code	Name	Description	Setting Range	Default value
F0.04	Maximum output frequency	10.00 Hz-400.00 Hz	10.00-400.00	50.00 Hz

Used to set the maximum output frequency of the inverter. It is the basis of frequency setting and of the speed of acceleration and deceleration. Please pay attention to it.

Function Code	Name	Description	Setting Range	Default value
F0.05	Upper limit of running frequency	F0.06-F0.04 (maximum frequency)	F0.06-F0.04	50.00 Hz

Upper limit of inverter output frequency. This value should be smaller or equal to the maximum output frequency.

Function Code	Name	Description	Setting Range	Default value
F0.06	Lower limit of running frequency	0Hz-F0.05 (upper limit of running frequency)	0.00-F0.05	0.00Hz

Lower limit of inverter output frequency.

The inverter runs at the lower limit frequency when the set frequency is lower than the lower limit frequency. Maximum output frequency ≥ upper limit frequency ≥ lower limit frequency.

Function Code	Name	Description	Setting Range	Default value
F0.07	Keyboard set frequency	0.00 Hz-F0.04 (maximum frequency)	0.00-F0.04	50.00 Hz

When the frequency command is selected as "keyboard setting", the value of this function code is the initial value of the inverter frequency digital setting.

Function Code	Name	Description	Setting Range	Default value
F0.08	Acceleration time 1	0.1 s-3,600.0 s	0.1-3,600.0	Set by model
F0.09	Deceleration time 1	0.1 s-3,600.0 s	0.1-3,600.0	Set by model

The acceleration time refers to the time t1 required for the inverter to accelerate from 0 Hz to the maximum output frequency (F0.04).

The deceleration time refers to the time t2 required for the inverter to decelerate from the maximum output frequency (F0.04) to 0 Hz. As shown in Figure 7.1:

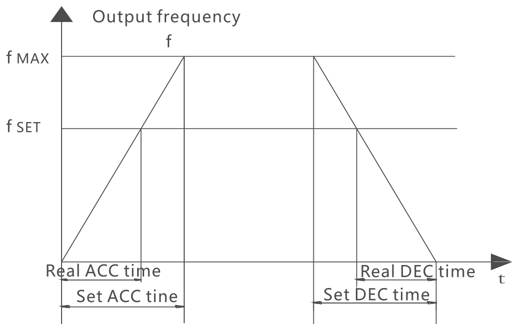


Figure 7.1 Schematic diagram of acceleration/deceleration time

When the set frequency is equal to the maximum frequency, the actual acceleration/deceleration time is the same as the set acceleration/deceleration time. When the set frequency is less than the maximum frequency, the actual acceleration/deceleration time is lower than the set acceleration/deceleration time. Actual acceleration/deceleration time = set acceleration/deceleration time X (set frequency / maximum frequency)

NVF2G series inverters have two sets of acceleration/deceleration time.

Group 1: F0.08, F0.09;

Group 2: F8.00, F8.01.

The acceleration/deceleration time can be selected by a combination of multi-function digital input terminals (Group F5).

The factory default value of acceleration/deceleration time for models of 5.5 kW and below is 10.0 s, the factory default value of acceleration/deceleration time for models of 7.5 kW to 55 kW is 20.0 s, and the factory default value of acceleration/deceleration time for models of 75 kW and above is 40.0 s.

Function Code	Name	Description	Setting Range	Default value
F0.10	Running direction selection	0: Run in the default direction 1: Run in the opposite direction 2: Reverse running prohibited	0-2	0

0: Run in the default direction. After the inverter is powered on, it runs in the actual direction.

1: Run in the opposite direction. Changing this function code can change the steering of the motor without changing any other parameters. The effect is equivalent to the conversion of the motor rotation direction by adjusting any two of the motor wires (U, V and W).

Tip: After the parameter is initialized, the motor running direction will return to the original state. Use caution where it is strictly forbidden to change the motor steering after the system is debugged.

2: Reverse running prohibited. The inverter is prohibited from running in the reverse direction. Suitable for applications where reverse operation is prohibited.

Function Code	Name	Description	Setting Range	Default value
F0.11	Switching frequency setting	0.5 kHz-15.0 kHz	0.5-15.0	Set by model

This function is mainly used to improve the noise during the motor operation and the interference of the inverter to the outside world.

Advantages of high Switching frequency: ideal current waveform, less current harmonics, and low motor noise. Disadvantages of high Switching frequency: increased switching loss, increased temperature rise of the inverter, affected output capability of the inverter, the need to derate the inverter at high Switching frequencies, and increased leakage current of the inverter and increased electromagnetic interference to the outside world.

The use of a low Switching frequency is contrary to the above situation. A Switching frequency that is too low will cause unstable low-frequency operation, torque reduction or even oscillation.

When the inverter is shipped from the factory, the Switching frequency has been set reasonably. Under normal circumstances, the user does not need to change the parameter. The Switching frequency should be adjusted in the following cases:

1. To reduce the motor noise; 2. To reduce the noise interference of the inverter; 3. The cable between the inverter and the motor is long.

Table 7.2 Switching frequency impact on the environment

Frequency	Electromagnetic noise	Noise and leakage current	Heat dissipation
1.0 kHz	Big ↑	Small ↑	Small ↑
10kHz			
15kHz	Small ↓	Big ↓	Big ↓

Table Relationship between model and switching frequency

Model \ Switching frequency	Maximum Switching frequency (kHz)	Minimum Switching frequency (kHz)	Factory default (kHz)
T type: 1.5 kW-7.5 kW P type: 1.5 kW-11 kW	15	1	8
T type: 15 kW-55 kW P type: 18.5 kW-75 kW	8	1	4
T type: 75 kW and above P type: 90 kW and above	6	1	2

Table 7.4 Relationship between the cable length from inverter to motor and the Switching frequency

Length of cable to motor	Switching frequency setting
50 m and below	10 kHz
100 m and below	50 kHz and below
100 m and above	2.5 kHz and below

Function Code	Name	Description	Setting Range	Default value
F0.12	Motor parameter Auto-Tuning	0: No operation 1: Parameter full Auto-Tuning 2: Parameter static Auto-Tuning	0-2	0

0: No operation, i.e. Auto-Tuning prohibited;
1: Parameter full Auto-Tuning.
Before motor parameter Auto-Tuning:

The motor must be disconnected from the load to leave the motor in an unloaded state, and the motor must be at a standstill.

Note: If the parameter obtained for loaded Auto-Tuning is inaccurate, the motor may not work properly.

The motor nameplate parameters (F2.01-F2.05) must be entered correctly, otherwise the result of motor parameter Auto-Tuning may be incorrect.

The acceleration and deceleration time (F0.08, F0.09) should be set appropriately according to the inertia of the motor, otherwise overcurrent fault may occur during motor parameter Auto-Tuning.

Parameter identification operation process: Set F0.12 to 1 and press SET key to start motor parameter Auto-Tuning, and at this time, the LED displays "-TUN-" that flashes. Then press RUN key to start parameter Auto-Tuning, and the LED displays "TUN-0". After the motor starts to run, the LED displays "TUN-1" and the "RUN/TUNE" light flashes. After the parameter Auto-Tuning is finished, the LED displays "-END-", and finally displays the stop status interface. When "-TUN-" flashes, press PRG key to exit the parameter Auto-Tuning state. The parameter Auto-Tuning operation may be aborted by press STOP key in the process of parameter Auto-Tuning.

Note: The start and stop of parameter Auto-Tuning can only be controlled by the keyboard; after the Auto-Tuning is finished, the function code is automatically restored to 0.

2: Parameter static Auto-Tuning

During motor parameter static Auto-Tuning, it is recommended to disconnect the motor from the load. Before motor parameter Auto-Tuning, the motor nameplate parameters (F2.00-F2.04) must be entered correctly. After the Auto-Tuning, the stator resistance and rotor resistance of the motor as well as the leakage inductance of the motor will be detected. The mutual inductance and no-load current of the motor cannot be measured, and the user may enter the corresponding function code according to experience.

Function Code	Name	Description	Setting Range	Default value
F0.13	Parameter restored to factor values	0: No operation 1: Restore default value 2: Clear fault record information	0-2	0

1: The inverter restores all parameters to their default values.
2. The inverter clears the recent fault record.

The function code is automatically restored to 0 after the selected function operation is completed.

Function Code	Name	Description	Setting Range	Default value
F0.14	Automatic voltage regulation function selection	0: Invalid 1: Valid throughout 2: Invalid only during deceleration	0-2	2

This function can automatically keep the output voltage constant when the grid voltage changes.

When the function is invalid, the output voltage will change with the input voltage (or DC bus voltage); when the function is valid, the output voltage will not change with the input voltage (or DC bus voltage) and will remain basically constant within the output capability range.

Note: When the motor is decelerating to stop, turning off the auto-regulation function will stop the motor in a shorter deceleration time without overvoltage.

Group F1: Start/stop control

Function Code	Name	Description	Setting Range	Default value
F1.00	Start mode	0: Direct start 1: DC braking before starting 2: Speed tracking before starting	0-2	0

0: Direct start: Start from starting frequency (F1.01) and starting frequency holding time (F1.02), suitable for most small inertial loads.

1: DC braking before starting: DC brake first (note: setting parameters F1.03 and F1.04) and then start the motor from starting frequency. Suitable for applications where small inertia loads may reverse during start-up.

2: Speed tracking before starting: The inverter first calculates the running speed and direction, and then starts running from the current speed to the set frequency to achieve smooth and shock-free starting of the rotating motor. This mode is suitable for restarting large inertia loads after instantaneous power failure.

Function Code	Name	Description	Setting Range	Default value
F1.01	Directly start starting frequency	0.00 Hz-10.00 Hz	0.00-10.00	0.00Hz
F1.02	Starting frequency hold time	0.00 s-50.0 s	0.00-50.0	0.0 s

Setting an appropriate starting frequency can increase the torque at start-up. During the starting frequency holding time (F1.02), the inverter output frequency is the starting frequency. The inverter runs from the starting frequency to the target frequency. If the target frequency (frequency command) is less than the starting frequency, the inverter will not run and remain in the standby state. The starting frequency is not limited by the upper limit frequency. The starting frequency does not work during the forward and reverse switching.

Function Code	Name	Description	Setting Range	Default value
F1.03	Braking current before starting	0.0%-150.0%	0.0-150.0	0.0%
F1.04	Braking time before starting	0.0s-50.0s	0.0-50.0	0.0s

When the inverter starts, it first performs DC braking according to the pre-start DC braking current, and accelerates after the set pre-start DC braking time. If the set DC braking time is 0, the DC braking is invalid. The greater the DC braking current, the greater the braking force. The pre-start DC braking current is a percentage of the inverter rated current.

Function Code	Name	Description	Setting Range	Default value
F1.05	Stop mode selection	0: Deceleration stop 1: Free stop	0-1	0

0: Deceleration stop

The stop command is valid and the inverter will reduce the output frequency according to the deceleration mode and the defined deceleration time, and will stop when the frequency drops to 0.

1: Free stop

After the stop command takes effect, the inverter immediately terminates the output. The load stops freely according to the mechanical inertia.

Function Code	Name	Description	Setting Range	Default value
F1.06	Stop braking starting frequency	0.00 Hz-10.00 Hz	0.00-10.00	0.00Hz
F1.07	Stop braking waiting time	0.0s-50.0s	0.0-50.0	0.0s
F1.08	Stop DC brake current	0.0%-150.0%	0.0-150.0	0.0%
F1.09	Stop DC brake time	0.0s-50.0s	0.0-50.0	0.0s

Stop DC brake starting frequency: During the deceleration stop, the inverter starts the stop DC braking when the frequency is reached.

Stop brake waiting time: Before the stop DC brake starts, the inverter blocks the output, and it starts DC braking after this delay, which is used to prevent overcurrent faults caused by starting DC braking at high speeds.

Stop DC brake current: Refers to the DC braking amount applied. The higher the current, the stronger the DC braking effect.

Stop DC braking time: The duration of the DC braking amount. When the time is 0, the DC braking is invalid, and the inverter stops according to the set deceleration time. As shown in Figure 7.2:

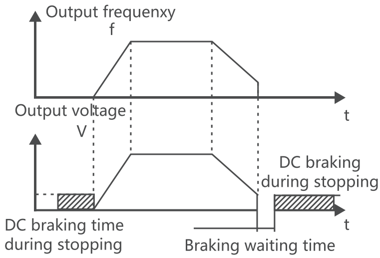


Figure 7.2 Schematic diagram of deceleration stop + DC braking

Function Code	Name	Description	Setting Range	Default value
F1.10	Forward and reverse dead time	0.0s-3600.0s	0.0-3,600.0	0.0s

The transition time at the output zero frequency during the forward/reverse switching of the inverter. As shown in Figure 7.3.

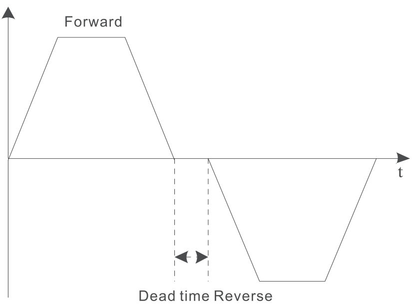


Figure 7.3 Schematic diagram of forward and reverse dead time

Function Code	Name	Description	Setting Range	Default value
F1.11	Terminal function detection selection at power-on	0: Terminal run command invalid at power-on 1: Terminal run command valid at power-on	0-1	0

When the running command channel is under terminal control, the system will automatically detect the status of the running terminal during power-on of the inverter.

0: Terminal run command invalid at power-on. Even if the running command terminal is detected to be valid in the process of power-on, the inverter will not run and the system is in the running protection state until the running command terminal is canceled and then enabled.

1: Terminal run command valid at power-on. During the power-on of the inverter, if the running command terminal is detected to be valid, the system will automatically start the inverter after the initialization is completed.

Note: The user must choose this function carefully, otherwise serious consequences may be caused.

Group F2: Motor parameter

Function Code	Name	Description	Setting Range	Default value
F2.00	Model selection	0: T type 1: P type	0-1	Set by model

0: Suitable for constant torque loads with the specified rated parameter;

1: Suitable for variable torque loads with the specified rated parameter (fan and pump loads);

Function Code	Name	Description	Setting Range	Default value
F2.06	Motor stator resistance	0.001Ω-65.535Ω	0.001-65.535	Set by model
F2.07	Motor rotor resistance	0.001Ω-65.535Ω	0.001-65.535	Set by model
F2.08	Motor stator and rotor inductance	0.1mH-6553.5mH	0.1-6,553.5	Set by model
F2.09	Motor stator and rotor mutual inductance	0.1mH-6553.5mH	0.1-6,553.5	Set by model
F2.10	Motor no-load current	0.01 A-655.35 A	0.01-655.35	Set by model

NVF2G series inverters provide the parameter Auto-Tuning function. Accurate parameter Auto-Tuning comes from the correct setting of the motor nameplate parameters. In order to ensure the control performance, please configure the motor according to the standard matching motor of the inverter. If the motor power is too different from the standard matching motor, the control performance of the inverter will be significantly reduced.

After the motor parameter Auto-Tuning is completed normally, the set values of F2.06-F2.10 will be automatically updated. These are the benchmark parameters for high performance vector control and have a direct impact on the control performance.

Note: The user should not arbitrarily change this group of parameters.

F3 Vector Control Parameters

Function Code	Name	Description	Setting Range	Default value
F3.00	Speed loop proportion gain 1	0-100	0-100	20
F3.01	Speed loop integration time 1	0.01s-10.00s	0.01-10.00	0.50s
F3.02	Switch low frequency	0.00 Hz-F3.05	0.00-F3.05	5.00Hz
F3.03	Speed loop proportion gain 2	0-100	0-100	15
F3.04	Speed loop integration time 2	0.01s-10.00s	0.01-10.00	1.00s
F3.05	Switch high frequency	F3.02-F0.04 (maximum frequency)	F3.02-F0.04	10.00Hz

The above parameters are valid for vector control and invalid for V/F control. Below the switching frequency 1 (F3.02), the speed loop PI parameters are F3.00 and F3.01. Above the switching frequency 2 (F3.05), the speed loop PI parameters are F3.03 and F3.04. Between the switching points, the PI parameters are obtained by the linear change in two groups of parameters, as shown in Figure 7.4:

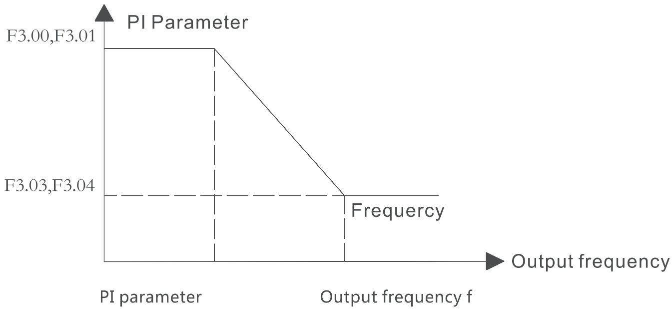


Figure 7.4 Schematic diagram of PI parameters

The speed dynamic response characteristic of the vector control can be regulated by setting the scale factor and integration time of the speed regulator. Increasing the proportional gain and reducing the integration time can speed up the dynamic response of the speed loop. However, if the proportional gain is too large or the integration time is too small, the system will easily oscillate and the overshoot will be too large. Too small a proportional gain also easily leads to steady-state oscillation of the system and possible existence of speed static difference. The speed loop PI parameters are closely related to the inertia of the motor system. The user needs to adjust the default PI parameters for different load characteristics to meet the needs of various occasions.

Function Code	Name	Description	Setting Range	Default value
F3.06	VC slip compensation coefficient	50%-200%	50-200	100%

The slip compensation coefficient is used to adjust the slip frequency of the vector control and improve the speed control accuracy of the system. Appropriately adjusting this parameter can compensate for the motor speed deviation generated by the asynchronous motor when the load increases, so that the motor speed can be basically kept stable when the load changes.

Function Code	Name	Description	Setting Range	Default value
F3.07	Torque upper limit setting	0.0%-200.0% (inverter rated current)	0.0-200.0	T type: 150.0% P type: 120.0%

The setting of 100.0% corresponds to the rated output current of the inverter.

F4: V/F control parameters

This set of function codes are valid for V/F control (F0.00=1) and invalid for vector control.

Function Code	Name	Description	Setting Range	Default value
F4.00	V/F curve setting	0: Straight line V/F curve 1: 2.0 power torque reduction V/F curve	0-1	0

Square V/F control can be selected for fan and pump loads. As shown in Figure 7.5:

0: Straight line V/F curve. Suitable for ordinary constant torque loads.

1: 2.0 power V/F curve. Suitable for Fans, pumps and other centrifugal loads.

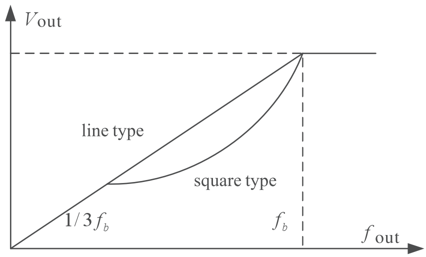
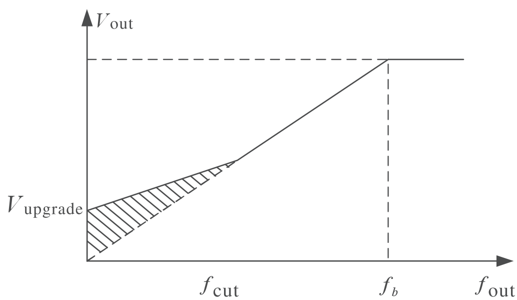


Figure 7.5 Schematic diagram of V/F curve

Function Code	Name	Description	Setting Range	Default value
F4.01	Torque boost	0.0%: (Automatic) 0.1%-30.0%	0.0-30.0	0.0%
F4.02	Torque boost cutoff point	0.0%-50.0% (relative motor rated frequency)	0.0-50.0	20.0%

The torque boost is mainly used under the cutoff frequency (F4.02). The V/V curve after the boost is shown below. The torque boost can improve the low frequency torque characteristics of V/F. The torque should be selected appropriately according to the load size. It may be boosted when the load is large. However, the torque boost should not be set too large, otherwise the motor is overexcited and easy to overheat, and the inverter output current is large and the efficiency is reduced. When the torque boost is set to 0.0%, the inverter will automatically boost the torque. Torque boost cutoff frequency: The torque boost is valid below this frequency and is invalid when this set frequency is exceeded. As shown in Figure 7.6:



Output voltage		
V_{boost}		
	$V_{cut\text{-}off}$	Output frequency

Figure 7.6 Schematic diagram of manual torque boost

Function Code	Name	Description	Setting Range	Default value
F4.03	V/F slip compensation limiting	0.0%-200.0%	0.0-200.0	0.0%

Setting this parameter can compensate for the change of motor speed caused by the load during V/F control to improve the hardness of the mechanical characteristics of the motor. This value should correspond to the rated slip frequency of the motor.

Function Code	Name	Description	Setting Range	Default value
F4.04	Energy-saving operation selection	0: No action 1: Automatic energy-saving operation	0-1	0

When the motor runs at constant speed during no-load or light-load operation, the inverter adjusts the output voltage by detecting the load current to achieve automatic energy saving.

Tip: This function is especially effective for fan and pump loads.

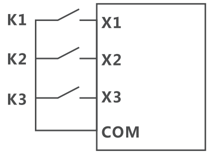
Group F5: Input terminal

The standard unit of NVF2G series inverters has four multi-function digital input terminals and two analog input terminals.

Function Code	Name	Description	Setting Range	Default value
F5.00	X1 terminal function selection	Programmable multi-function terminal	0-25	1
F5.01	X2 terminal function selection	Programmable multi-function terminal	0-25	2
F5.02	X3 terminal function selection	Programmable multi-function terminal	0-25	4
F5.03	X4 terminal function selection	Programmable multi-function terminal	0-25	5
F5.04	X5 terminal function selection	Programmable multi-function terminal	0-25	7
F5.05	X6 terminal function selection	Programmable multi-function terminal	0-25	8

Table 7.5 Corresponding function of multi-function Input Terminal

Set value	Functions	Description
0	No function	The inverter does not operate even if there is a signal input. Unused terminals can be set to no function to avoid malfunction
1	Forward running	Control the forward and reverse of the inverter through external terminals
2	Reverse running	
3	Three-wire running control	This terminal is used to determine that the inverter runs in the three-wire control mode. For details, refer to the F5.05 three-wire control mode function code description.
4	Forward Jogging	For the Jogging operation frequency and Jogging acceleration/deceleration time, refer to the detailed description of F8.02, F8.03 and F8.04 function codes.
5	Reverse Jogging	
6	Free stop	The inverter blocks the output and the motor stop process is not controlled by the inverter. This method is often used for loads with large inertia and when there is no requirement for stopping time. The method has the same meaning as the free stop described in F1.05.
7	Fault reset	External fault reset function. The function is the same as the STOP key on the keyboard. This function can realize remote fault reset.
8	External fault input	When an external fault signal is sent to the inverter, the inverter reports a fault and stops.
9	Frequency setting increment (UP)	Modify the frequency increment and decrement commands when the frequency is given by the external terminal. Adjust the set frequency up and down when the frequency source setting is set to digital setting.
10	Frequency setting decrement (DOWN)	

<table>
<tr><th>Set value</th><th>Functions</th><th>Description</th></tr>
<tr><td>11</td><td>Frequency increment/decrement setting cleared</td><td>
The frequency value set by UP/DOWN can be cleared with the terminal to return the given frequency to the frequency given by the frequency command channel.</td></tr>
<tr><td>12</td><td>Multi-speed terminal 1</td><td rowspan="3">The 8-speed setting can be achieved by the combination of the digital states of the three terminal.
Note: Multi-speed 1 is low and multi-speed 3 is high.</td></tr>
<tr><td>13</td><td>Multi-speed terminal 2</td></tr>
<tr><td>14</td><td>Multi-speed terminal 3</td></tr>
<tr><td>15</td><td>Acceleration/deceleration time selection terminal</td><td>Two kinds of acceleration/deceleration time are selected by the combination of the digital states of these two terminals.
<table><tr><th>Terminal</th><th>Acceleration or deceleration time selection</th><th>Corresponding Parameter</th></tr><tr><td>OFF</td><td>Acceleration time 0</td><td>F0.08, F0.09</td></tr><tr><td>ON</td><td>Acceleration time 1</td><td>F8.00, F8.01</td></tr></table></td></tr>
<tr><td>16</td><td>PID control pause</td><td>PID fails temporarily, and the inverter maintains the current frequency output.</td></tr>
<tr><td>17</td><td>Swing frequency pause</td><td>The inverter is suspended at the current output frequency. After the function is canceled, the inverter starts swing frequency operation at the current frequency.</td></tr>
<tr><td>18</td><td>Swing frequency reset</td><td>The inverter returns to the center frequency output.</td></tr>
<tr><td>19</td><td>Acceleration/deceleration prohibited</td><td>Ensure that the inverter is not affected by external signals (except for the stop command) and maintains the current output frequency.</td></tr>
<tr><td>20</td><td>Reserved</td><td></td></tr>
<tr><td>21</td><td>Frequency increment/decrement setting temporarily cleared</td><td>When the terminal is closed, the frequency value set by UP/DOWN can be cleared to restore the given frequency to the frequency given by the frequency command channel. When the terminal is disconnected, it will return to the frequency value after the frequency increase/decrease setting.</td></tr>
<tr><td>22</td><td>Sleep function</td><td>During the pump control, closing the terminal will make the pump to enter the sleep function.</td></tr>
<tr><td>23-25</td><td>Reserved</td><td>Reserved</td></tr>
</table>

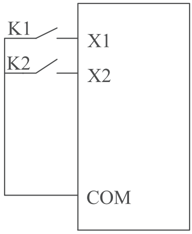
Function Code	Name	Description	Setting Range	Default value
F5.06	Switch filter times	1-10	1-10	5

Set the filtering time for X1-X6 terminal sampling. In the case of large interference, the parameter should be increased to prevent misoperation.

Function Code	Name	Description	Setting Range	Default value
F5.07	Terminal control operating mode	0: Two-wire control 1 1: Two-wire control 2 2: Three-wire control 1 3: Three-wire control 2	0-3	0

This parameter defines four different way to control the operation of the inverter via external terminals.

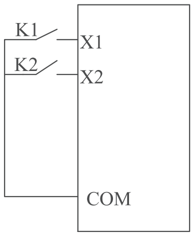
0: Two-wire control 1. This mode is the most commonly used two-wire mode. The forward and reverse rotation of the motor is determined by the X1 and X2 terminal commands.



K1	K2	Run command
OFF	OFF	STOP
ON	OFF	FWD
OFF	ON	REV
ON	ON	STOP

Figure 7.7 Schematic diagram of two-wire operation mode 1

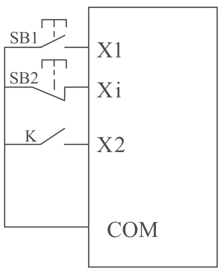
1: Two-wire control 2. When this mode is used, X1 is the enabling terminal. The direction is determined by the status of X2.



K1	K2	Run command
OFF	OFF	STOP
OFF	ON	STOP
ON	OFF	FWD
ON	ON	REV

Figure 7.8 Schematic diagram of two-wire operation mode 2

2: Three-wire control 1.



K	Run command
OFF	FWD
ON	REV

Figure 7.9 Schematic diagram of three-wire operation mode 1

Where, K is the forward/reverse switch, SB1 is the run switch, and SB2 is the stop button

Xi is to define the corresponding terminal function as the No. 3 function "three-wire operation function".

3: Three-wire control 2. In this mode, Xi is the enabling terminal, the run command is generated by SB1 or SB3, and the running direction is controlled at the same time. The stop command is generated by the normally closed input SB2.

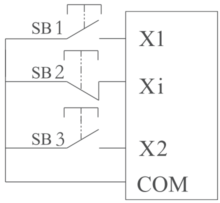


Figure 7.10 Schematic diagram of three-wire operation mode 2

Where, SB1 is the forward running button, SB2 is the stop button, and SB3 is the reverse running button

Xi is to define the corresponding terminal function as the No. 3 function "three-wire operation control".

Tip: For the two-wire operation mode, when the X1/X2 terminal is valid, the stop command is generated by other sources to stop the inverter. Even if the control terminal X1/X2 remains valid, the inverter will not run after the stop command disappears. To make the inverter run, X1/X2 must be triggered again.

Function Code	Name	Description	Setting Range	Default value
F5.08	Terminal UP/DOWN frequency increment change rate	0.01 Hz/s-50.00 Hz/s	0.01-50.00	0.50 Hz/s

The terminal UP/DOWN is used to adjust the rate of change when setting the frequency.

Function Code	Name	Description	Setting Range	Default value
F5.09	AI1 lower limit value	0.00V-10.00 Hz	0.00-10.00	0.00V
F5.10	AI1 lower limit corresponding setting	-100.0%-100.0%	-100.0-100.0	0.0%
F5.11	AI1 upper limit value	0.00V-10.00 Hz	0.00-10.00	10.00V
F5.12	AI1 upper limit corresponding setting	-100.0%-100.0%	-100.0-100.0	100.0%
F5.13	AI1 input filter time	0.00s-10.00s	0.00-10.00	0.10s

The above function code defines the relationship between the analog input voltage and the set value corresponding to the analog input. When the analog input voltage exceeds the set maximum input or minimum input range, the excessive part will be treated as the maximum or minimum input. When the analog input is current input, the 0/4 mA-20 mA current corresponds to 0 V-10 V voltage. In different applications, the nominal value corresponding to the 100.0% analog setting varies. For details, refer to the description of each application section. Several settings are illustrated in Figure 7.11. Note: The lower limit of AI1 must be less than or equal to the upper limit of AI1.

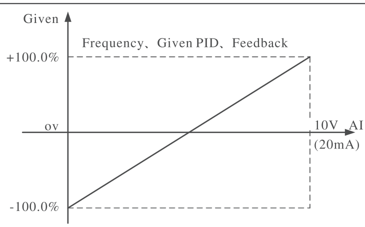


Figure 7.11 Correspondence between analog given and set amount

AI1 input filter time: Determine the sensitivity of the analog input. To prevent the analog from being interfered to cause malfunction, the parameter can be increased to increase the anti-interference ability, the sensitivity of the analog input is thus reduced.

Function Code	Name	Description	Setting Range	Default value
F5.14	AI2 lower limit value	0.00V-10.00 Hz	0.00-10.00	2V
F5.15	AI2 lower limit corresponding setting	-100.0%-100.0%	-100.0-100.0	0.0%
F5.16	AI2 upper limit value	0.00V-10.00 Hz	0.00-10.00	10.00V
F5.17	AI2 upper limit corresponding setting	-100.0%-100.0%	-100.0-100.0	100.0%
F5.18	AI2 input filter time	0.00s-10.00s	0.00-10.00	0.10s

The function of AI2 is set in the same way as AI1. The analog AI2 can support 0 V-10 V or 0/4 mA-20 mA input. When AI2 is set to 0/4 mA-20 mA input, the voltage corresponding to 20 mA is 10 V.

Group F6: Output terminals

The standard unit of NVF2G series inverters has one multi-function digital output terminal, two multi -function relay output terminals and two multi-function analog output terminals.

Function Code	Name	Description	Setting Range	Default value
F6.00	Y1 output selection	Open collector output function	0-10	1
F6.01	Relay R1 output selection	Relay output function	0-10	3
F6.02	Relay R2 output selection	Relay output function	0-10	1

Table 7.6 Open output functions of relay and collector

Set value	Functions	Description
0	No output	The output terminal has no function
1	The inverter is running forward	Indicates that the inverter is running forward and has an output frequency. The ON signal is output in this case.
2	The invert is running in reverse	Indicates that the inverter is running in reverse and has an output frequency. The ON signal is output in this case.
3	Fault output	The ON signal is output when the inverter is fails.
4	Frequency level detection FDT arrival	Please refer to the detailed description of function codes F8.13 and F8.14.
5	Frequency arrival	Please refer to the detailed description of function code F8.15.
6	Running at zero speed	When the inverter output frequency is less than the starting frequency, the ON signal is output.
7	Upper limit frequency arrival	When the running frequency reaches the upper limit frequency, the ON signal is output.
8	Lower limit frequency arrival	When the running frequency reaches the lower limit frequency, the ON signal is output.
9-10	Reserved	Reserved

Function Code	Name	Description	Setting Range	Default value
F6.03	AO1 output selection	Multi-function analog output	0-10	0
F6.04	AO1 output lower limit	0.0%-100.0%	0.0-100.0	0.0%
F6.05	AO1 output corresponding to lower limit	0.00V-10.00 Hz	0.00-10.00	0.00V
F6.06	AO1 output upper limit	0.0%-100.0%	0.0-100.0	100.0%
F6.07	AO1 output corresponding to upper limit	0.00V-10.00 Hz	0.00-10.00	10.00V
F6.08	AO2 output selection	Multi-function analog output	0-10	0
F6.09	AO2 output lower limit	0.0%-100.0%	0.0-100.0	0.0%

Function Code	Name	Description	Setting Range	Default value
F6.10	AO2 output corresponding to lower limit	0.00V-10.00 Hz	0.00-10.00	0.00V
F6.11	AO2 output upper limit	0.0%-100.0%	0.0-100.0	100.0%
F6.12	AO2 output corresponding to upper limit	0.00V-10.00 Hz	0.00-10.00	10.00V

The standard output of AO1 and AO2 analog outputs is 0/4 mA-20 mA (or 0 V-10 V), and the current voltage output can be selected by jumpers J603 and J604. The range of the corresponding amount it indicates is shown in Table 7.7:

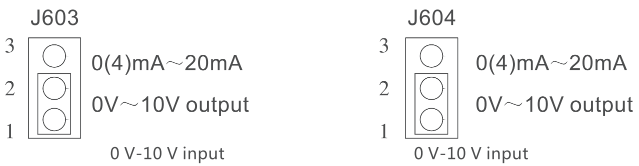


Table 7.7 Output range description

Set value	Functions	Range
0	Running frequency	0-maximum output frequency
1	Set frequency	0-maximum output frequency
2	Motor speed	0-2 times the motor rated speed
3	Output current	0-2 times the inverter rated current
4	Output voltage	0-1.5 times the inverter rated voltage
5	Output power	0-2 times the rated power
6	Output torque	0-2 times the motor rated current
7	Analog AI1 input	0 V-10 V
8	Analog AI2 input	0 V-10 V or 0/4 mA-20 mA
9-10	Reserved	Reserved

The above function code defines the relationship between the output value and the output value corresponding to the analog output. When the input value exceeds the set maximum output or minimum output range, the excessive part will be treated as the maximum or minimum output. When the analog output is current output, a current of 1 mA is equivalent to a voltage of 0.5 V.

In different applications, the analog output corresponding to the 100% output value varies. For details, refer to the description of each application section. Several settings are illustrated in Figure 7.12.

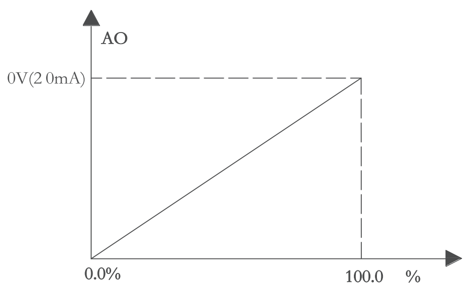


Figure 7.12 Correspondence between given quantity and analog output

Group F7: Human machine interface

Function Code	Name	Description	Setting Range	Default value
F7.00	User password	0-65,535	0-65,535	0

When it is set to any non-zero number, the password function takes effect.
00000: Clear the user password value set previously and invalidate the password protection function. Restoring the factory value can also clear the password.

After the user password is set and takes effect, if it is incorrect, the user will not be able to enter the parameter menu. The user can view and modify the parameter only when entering the correct user password. Please keep in mind the user password you have set. Note: If you forget your password, please ask the manufacturer for service.

The password protection takes effect one minute after the function code editing state is exited. When the function code editing state is entered by pressing the PRG key, "0.0.0.0.0" will be displayed, and the operator must correctly input the user password to enter the function code editing state.

Function Code	Name	Description	Setting Range	Default value
F7.01	Reserved			0
F7.02	Reserved			
F7.03	JOGGING key function selection	0: Jogging operation 1: Forward/reverse switching 2: Clear UP/DOWN setting	0-2	0

JOGGING key, can be a multi-function key. The function of the keyboard JOGGING key can be defined by parameter settings.
0: Jogging operation. The keyboard JOGGING key enables Jogging operation.
1: Forward/reverse switching. The keyboard JOGGING key can switch the direction of the frequency command. Valid only for the keyboard command channel
2: Clear UP/DOWN setting. The keyboard JOGGING key can clear the set value of UP/DOWN

Function Code	Name	Description	Setting Range	Default value
F7.04	STOP key function selection	0: Valid only for panel control 1: Valid for both panel and terminal control 2: Valid for both panel and communication control 3: Valid for all control modes	0-3	0

This function code defines the selection that the STOP stop function is valid. For fault reset, the STOP key is active in all conditions.

Function Code	Name	Description	Setting Range	Default value
F7.05	Reserved			

Function Code	Name	Description	Setting Range	Default value
F7.06	Parameter selection for running status display	0-0x7FFF	0-0x7FFF	0xFF

When the NVF2G series inverter is running, the parameter display is affected by this function code, i.e. it is a 16-bit binary number. If a bit is 1, the parameter corresponding to the bit can be viewed by the SHIFT key at runtime. If the bit is 0, the parameter corresponding to the bit will not be displayed. When setting the function code F7.06, to convert the binary number to a hexadecimal number, enter the function code.
The display contents of the lower 8 bits are as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Output torque	Output power	Running speed	Output current	Output voltage	Bus voltage	Set frequency	Running frequency

The display contents of the upper 8 bits are as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved	Multi-speed current speed	Analog AI1 value	Analog AI2 value	Output terminal status	Input terminal status	PID feedback value	PID given value

The status of the input and output terminals is displayed in decimal, with X1 (Y) corresponding to the lowest bit. For example, if the input status is displayed as 3, it means that terminals X1 and X2 are closed and other terminals are open. For details, see the description of F7.18 and F7.19.

Function Code	Name	Description	Setting Range	Default value
F7.07	Parameter selection for shutdown status display	0-0x1FF	0-0xFF	0xFF

The setting of this function is the same as that of F7.06. However, when the NVF2G series inverter is in the stop state, the display of the parameter is affected by this function code.
The display contents of the lower 8 bits are as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Analog AI2 value	Analog AI1 value	PID feedback value	PID given value	Output terminal status	Input terminal status	Bus voltage	Set frequency

The display contents of the upper 8 bits are as follows:

Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Multi-speed current speed

Function Code	Name	Description	Setting Range	Default value
F7.08	Manufacturer parameter			
F7.09	Inverter module temperature	0 ℃-100.0 ℃		
F7.10	Manufacturer parameter			
F7.11	Cumulative running time of the matching	0h-65535h		

These function codes can only be viewed and cannot be modified.

Inverter module temperature: Display the temperature of the inverter module IGBT. The over-temperature protection values of the inverter module IGBT of different models may be different.

Accumulated running time of the machine: Display the accumulated running time of the inverter to the present.

Function Code	Name	Description	Setting Range	Default value
F7.12	Type of first two faults	0-26	0-26	/
F7.13	Type of previous fault	0-26	0-26	/
F7.14	Current fault type	0-26	0-26	/

Record the type of the last three faults of the inverter: 0 indicates no fault, and 1-26 represent 26 types of faults. For details, see the troubleshooting.

Function Code	Name	Description	Setting Range	Default value
F7.15	Current fault running frequency	Output frequency at the current fault	/	/
F7.16	Current fault output current	Output current at the current fault	/	/
F7.17	Current fault bus voltage	Bus voltage at the current fault	/	/
F7.18	Current fault input terminal status	This value is a decimal number. Display the status of all digital input terminals in the most recent fault in the order: BIT5 BIT4 BIT3 BIT2 BIT1 BIT0 X6 X5 X4 X3 X2 X1 When the input terminal is ON, corresponding to 1. OFF corresponding to 0. This value is used to understand the digital input signal at the time.	/	/
F7.19	Current fault output terminal status	This value is a decimal number. Display the status of all input terminals in the most recent fault in the order: BIT2 BIT1 BIT0 R02 R01 Y1 When the input terminal is ON, corresponding to 1. OFF corresponding to 0. This value is used to understand the digital output signal at the time.	/	/

Group F8: Enhanced functions

Function Code	Name	Description	Setting Range	Default value
F8.00	Acceleration time 2	1.0s-3600.0s	1.0-3,600.0	Set by model
F8.01	Deceleration time 2	1.0s-3600.0s	1.0-3,600.0	Set by model

F0.08 and F0.09 and the above three kinds of acceleration/deceleration time can be selected for the acceleration/deceleration time. The meanings are the same. Please refer to the description of F0.08 and F0.09.

The acceleration/deceleration time 1 (F0.08, F0.09) or acceleration/deceleration time 2 (F8.00, F8.01) can be selected by different combinations of multi-function digital input terminals.

Function Code	Name	Description	Setting Range	Default value
F8.02	Jogging operation frequency	0.00-maximum frequency (F0.04)	0.00-F0.04	5.00Hz
F8.03	Jogging operation acceleration time	0.1 s-3,600.0 s	0.1-3,600.0	Determined by model
F8.04	Jogging operation deceleration time	0.1 s-3,600.0 s	0.1-3,600.0	Determined by model

The given frequency and acceleration/deceleration time of the inverter when defining the Jogging operation. The Jogging operation process is started and stopped according to the direct start mode and the deceleration stop mode. The Jogging acceleration time refers to the time required for the inverter to accelerate from 0 Hz to the maximum output frequency (F0.04). The Jogging deceleration time refers to the time required for the inverter to decelerate from the maximum output frequency (F0.04) to 0 Hz.

The factory default value of the acceleration/deceleration time is 10.0 s for models of 5.5 kW and below and 20.0 s for models of 7.5 kW-55 kW. The factory default value of the acceleration/deceleration time is 40.0 s for models of 75 kW and above.

Function Code	Name	Description	Setting Range	Default value
F8.05	Jump frequency	0.00-F0.04 (maximum frequency)	0.00-F0.04	0.00Hz
F8.06	Jump frequency amplitude	0.00-F0.04 (maximum frequency)	0.00-F0.04	0.00Hz

When the set frequency is within the jump frequency range, the actual operating frequency will be at the jump frequency boundary close to the set frequency. By setting the jump frequency, the inverter can avoid the mechanical resonance point of the load. The inverter can set one jump frequency point. This function will not work if the jump frequency is set to 0. As shown in Figure 7.13:

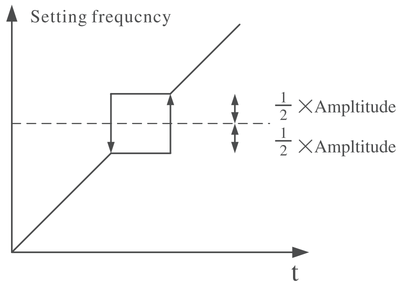


Figure 7.13 Schematic diagram of jump frequency

Function Code	Name	Description	Setting Range	Default value
F8.07	Swing frequency amplitude	0.0%-100.0% (relative to set frequency)	0.0-100.0	0.0%
F8.08	Sudden jump frequency amplitude	0.0%-50.0% (relative to swing frequency amplitude)	0.0-50.0	0.0%
F8.09	Swing frequency rise time	0.1 s-3,600.0 s	0.1-3,600.0	5.0s
F8.10	Swing frequency fall time	0.1 s-3,600.0 s	0.1-3,600.0	5.0s

The swing frequency is suitable for textile, chemical fiber and other industries and applications where traverse and winding functions are required. The swing frequency function means that the inverter output frequency swings up and down with the set frequency as the center. The trajectory of the running frequency in the time axis is shown in Figure 7.14, where the swing amplitude is set by F8.07, and when F8.07 is set to 0, i.e. the swing is 0, the swing frequency does not work.

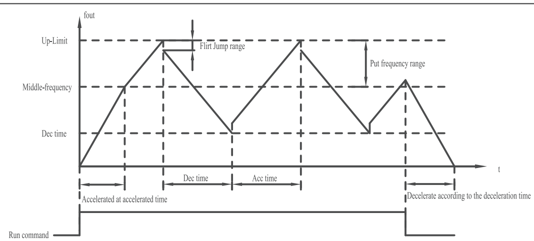


Figure 7.14 Schematic diagram of swing frequency operation

Swing frequency range: The swing frequency operation frequency is limited by the upper and lower limit frequencies.
Relationship between swing amplitude and center frequency: swing amplitude = center frequency X swing amplitude range F8.07.
Burst frequency = swing amplitude X burst jump frequency amplitude F8.08. That is, the value of the relative swing amplitude of the burst frequency when the swing frequency is running.
Swing frequency rise time: The time it takes to run from the lowest point to the highest point of the swing frequency.
Swing frequency fall time: The time it takes to run from the highest point to the lowest point of the swing frequency.

Function Code	Name	Description	Setting Range	Default value
F8.11	Number of automatic fault resets	0-3	0-3	0
F8.12	Automatic fault reset interval setting	0.1 s-100.0 s	0.1-100.0	1.0

Number of automatic fault resets: Used to set the number of automatic resets when automatic fault reset is set for the inverter. If this value is exceeded, the inverter enters the fault standby state and waits for repair. Automatic fault reset interval setting: Select the time interval from the fault occurrence to the auto reset action.

Function Code	Name	Description	Setting Range	Default value
F8.13	FDT level detection value	0.00-F0.04 (maximum frequency)	0.00-F0.04	50.00Hz
F8.14	FDT lag detection value	0.0%-100.0% (FDT level)	0.0-100.0	5.0%

Set the detection value of the output frequency and the lag value of canceling the output action. As shown in Figure 7.15:

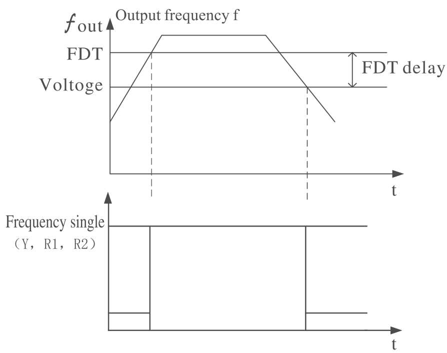


Figure 7.15 Schematic diagram of FDT level

Function Code	Name	Description	Setting Range	Default value
F8.15	Frequency arrival detection amplitude	0.0%-100.0% (maximum frequency)	0.0-100.0	0.0%

This function can adjust the detection amplitude when the output frequency of the inverter reaches the set frequency. As shown in Figure 7.16:

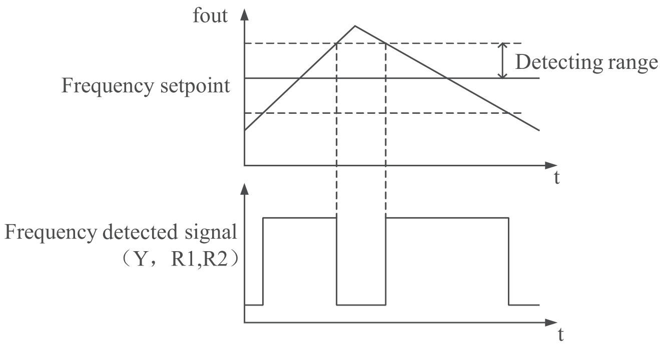


Figure 7.16 Schematic diagram of frequency arrival detection amplitude

Function Code	Name	Description	Setting Range	Default value
F8.16	Brake threshold voltage	115.0%-140.0% (standard bus voltage) (380 V series)	115.0-140.0	130.0%
		115.0%-140.0% (standard bus voltage) (220V series)	115.0-140.0	120.0%

This function code is the starting bus voltage for setting the energy consumption braking, where 100% corresponds to the standard bus voltage. Adjusting this value appropriately can effectively brake the load.

Function Code	Name	Description	Setting Range	Default value
F8.17	Speed display series	0.0%-1,000.0%	0.0-1,000.0	100.0%

Mechanical speed = 120 * running frequency * F8.17 / number of motor pole pairs. This function code is used to correct the speed scale display error and has no impact on the actual speed.

Group F9: PID control

PID control is a common method for process control. It performs proportional, integral and differential operations of the difference between the feedback signal of the controlled quantity and the target signal to adjust the output frequency of the inverter, forming a negative feedback system, so that the controlled amount is stabilized at the target amount. It is suitable for process control such as flow control, pressure control and temperature control. The basic principle block diagram of the control is as follows:

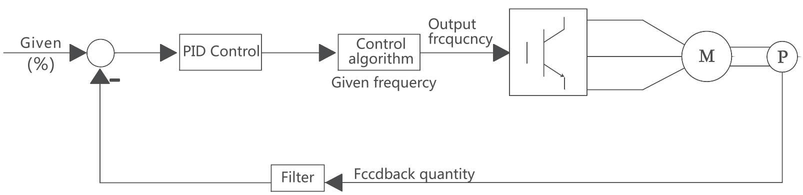
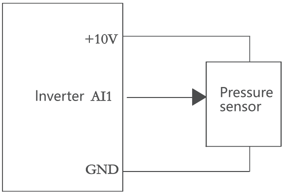
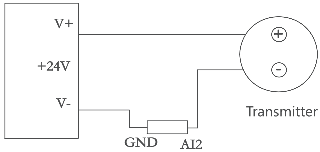


Figure 7.17 Process PID principle block diagram



Wiring of remote pressure sensor

Figure 7.18 Remote pressure gauge wiring diagram



wiring of transmitter

Figure 7.19 Transmitter wiring diagram

Function Code	Name	Description	Setting Range	Default value
F9.00	PID given source selection	0: Keyboard given (F9.01) 1: Analog channel AI1 given 2: Analog channel AI2 given 3: Remote communication given 4: Multi-segment given	0-4	0

When PID is selected for the frequency source, that is, F0.03 is set to 5, this group of functions work. This parameter determines the target giving channel of the process PID. The target amount by the process PID is a relative value, with 100% corresponding to 100% of the feedback signal of the controlled system. The system always executes operations according to the relative value (0-100.0%).

Note: With multiple segments given, the parameter implementation of Group FA can be set.

Function Code	Name	Description	Setting Range	Default value
F9.01	Keyboard preset PID given	0.0%-100.0%	0.0-100.0	0.0%

When F9.00=0, that is, the target source is given by the keyboard, this parameter needs to be set. The baseline value of this parameter is the feedback amount of the system.

Function Code	Name	Description	Setting Range	Default value
F9.02	PID feedback source selection	0: Analog channel AI1 feedback 1: Analog channel AI2 feedback 2: AI1 + AI2 feedback 3: Remote communication feedback	0-3	0

This parameter is used to select the PID feedback channel.

Note: The given channel and the feedback channel cannot be overlapped, otherwise PID cannot be effectively controlled.

Function Code	Name	Description	Setting Range	Default value
F9.03	PID output characteristics selection	0: PID output characteristics are positive 1: PID output characteristics are negative	0-1	0

The PID output is positive: When the feedback signal is greater than the PID giving, the inverter output frequency needs to be reduced so that the PID can be balanced. Such as the tension PID control of winding.

The PID output is negative: When the feedback signal is greater than the PID given, the inverter output frequency needs to be increased so that the PID can be balanced. Such as the tension PID control of unwinding.

Function Code	Name	Description	Setting Range	Default value
F9.04	Proportional gain (KP)	0.00-100.00	0.00-100.00	1.00
F9.05	Integration time (Ti)	0.01s-10.00s	0.01-10.00	0.10s
F9.06	Differentiation time (TD)	0.00s-10.00s	0.00-10.00	0.00s

Proportional gain (KP): Determines the regulation strength of the entire PID regulator. The larger the KP, the greater the regulation strength. This parameter being 100 indicates that the regulation amplitude of the PID regulator for the output frequency command is the maximum frequency (ignoring the integral and differential actions) when the deviation between the PID feedback amount and the given amount.

Integration time (Ti): Determines how fast the PID regulator regulates the deviation between the PID feedback amount and the given amount. The integration time means that when the deviation between the PID feedback amount and the given amount is 100%, the integral regulator (ignoring proportional and differential actions) is continuously adjusted during this time and the adjustment amount reaches the maximum frequency (F0.04). The shorter the integration time, the greater the regulation strength.

Differentiation time (Td): Determines how strongly the PID regulator regulates the deviation between the PID feedback amount and the given amount. The differentiation time means that if the feedback amount changes by 100% during this time, the regulation amount of the differential regulator is the maximum frequency (F0.04) (ignoring the proportional and integral actions). The longer the differentiation time, the greater the regulation strength.

PID is the most commonly used method in process control, and each part of it plays a different role. The working principle and regulation method are briefly described below:

Proportional regulation (P): The regulation amount with the output proportional to the deviation when the feedback deviates from the given value. If the deviation is constant, the regulation amount is too constant. The proportional regulation can quickly respond to the change of the feedback, but the no-deviation control cannot be achieved simply by proportional regulation. The larger the proportional gain, the faster the regulation speed of the system. However, if the speed is too high, oscillation will occur. The regulation method is to set the integration time to be long and set the differentiation time to zero and use only the proportional regulation to make the system run. Change the size of the given amount and observe the stable deviation (static deviation). If the static deviation is in the direction of the change in the given amount (for example, increase the given amount and the feedback amount is always less than the given amount after the system is stabilized), continue to increase the proportional gain; otherwise, reduce the proportional gain and repeat the above process until the static deviation is small (it is difficult to completely eliminate static deviation).

Integration time (I): When the feedback deviates from the given value, the output regulation amount is continuously accumulated. If the deviation persists, the regulation amount continues to increase until there is no deviation. The integral regulator can effectively eliminate static deviation. If the integral regulator is too strong, repeated overshoot will occur and the system will remain unstable until it oscillates. The characteristic of the oscillation caused by the excessive integral action is that the feedback signal swings up and down around a given amount, and the swing amplitude gradually increases until the feedback signal oscillates. The regulation of the integration time parameter is generally from large to small, gradually regulating the integration time. Observe the effect of the system regulation until the speed stabilized by the system meets the requirements.

Differentiation time (D): When the deviation between the feedback and the given value changes and a regulation amount proportional to the rate of change of the deviation is output, the regulation amount is only related to the direction and magnitude of the deviation change and unrelated to the direction and magnitude of the deviation itself. The function of the differential regulation is that when the feedback signal changes, it is regulated according to the changing trend, thereby suppressing the change of the feedback signal. Please use the differential regulator carefully because it can easily amplify the system's interference, especially the interferences changing at high frequencies.

Function Code	Name	Description	Setting Range	Default value
F9.07	Sampling period (T)	0.01s-100.00s	0.01-100.00	0.10s
F9.08	PID control deviation limit	0.0%-100.0%	0.0-100.0	0.0%

Sampling period (T): Refers to a sampling period for the feedback amount, and the regulator operates once every sampling period. The larger the sampling period, the slower the response.

PID control deviation limit: The maximum deviation between the PID system output value and the closed-loop given value, as shown in Figure 7.20. The PID regulator will stop regulation within the deviation limit. Setting this function code can regulate the accuracy and stability of the PID system.

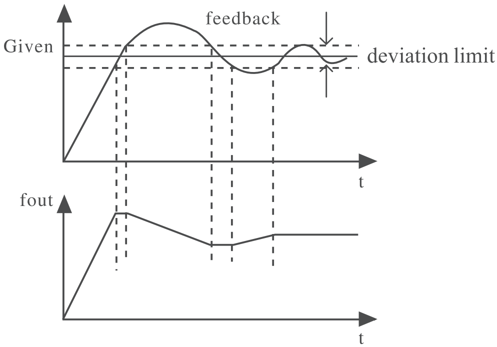


Figure 7.20 Correspondence between deviation limit and output frequency

Function Code	Name	Description	Setting Range	Default value
F9.09	Feedback disconnection detection value	0.0%-100.0%	0.0-100.0	0.0%
F9.10	Feedback disconnection detection time	0.0s-3600.0s	0.0-3,600.0	10.0s

Feedback disconnection detection value: This detection value corresponds to the full scale (100%). The system always detects the feedback amount of the PID. When the feedback value is less than or equal to the feedback disconnection detection value, the system starts to detect the timing. When the detection time exceeds the feedback disconnection detection time, the system will report a PID feedback disconnection fault (PIDE).

Function Code	Name	Description	Setting Range	Default value
F9.11	Pump sleep mode	0-3	0-3	0
F9.12	Time extension	0 s-3,600.0 s	0-3,600.0	60.0s
F9.13	Awakening pressure difference	0%-100.0%	0-100.0	80.0%
F9.14	Speed/current threshold	0%-100.0%	0-100.0	50%

Pump sleep mode:

0: Closed; no sleep function; default mode;
1: Flow switch. When the sleep switch on the terminal is closed, the pump will enter a sleep delay, otherwise it will not sleep;
2: Speed mode. When the output frequency is less than the sleep frequency, the pump will enter a sleep delay, otherwise it will not sleep;
3: Current mode. When the output current is less than the sleep current, the pump will enter a sleep delay, otherwise it will not sleep.

Note: 1. The pump sleep function only works when the PID closed loop is active.
2. When this function is turned on, there is a possibility that the motor rotates instantaneously. Therefore, please pay attention to safety and ensure that the sudden start of the motor will not cause mechanical damage and personal injury.

Pump sleep delay time: When the sleep condition is satisfied, the delay starts. If the sleep condition is still satisfied after the delay time expires, the pump will enter the sleep state. The output frequency becomes 0.

Wake-up pressure: If the feedback pressure is less than the wake-up pressure in the sleep state, the pump will exit the sleep state.

Speed/current sleep threshold: In the speed mode, if the output frequency is less than the sleep frequency (sleep frequency = motor rated frequency * the threshold / 100), the pump will enter the sleep delay. In the current mode, if the output current is less than the sleep current (sleep current = motor rated current * the threshold / 100), the pump will enter the sleep delay.

Group FA: Multi-speed control

Function Code	Name	Description	Setting Range	Default value
FA.00	Multi-speed control mode	0-3	0-3	0

0: The terminal controls the multi-speed, and the given frequency of the multi-speed is determined according to the state of the terminal.
1: Time multi-speed; run stops after the last speed.
2: Time multi-speed; remain running at the last speed after the last speed time.
3: Time multi-speed; the last speed cycles after the last speed time

Function Code	Name	Description	Setting Range	Default value
FA.01	Multi-speed 0	-100.0%-100.0%	-100.0-100.0	0.0%
FA.02	Multi-speed 1	-100.0%-100.0%	-100.0-100.0	0.0%
FA.03	Multi-speed 2	-100.0%-100.0%	-100.0-100.0	0.0%
FA.04	Multi-speed 3	-100.0%-100.0%	-100.0-100.0	0.0%
FA.05	Multi-speed 4	-100.0%-100.0%	-100.0-100.0	0.0%
FA.06	Multi-speed 5	-100.0%-100.0%	-100.0-100.0	0.0%
FA.07	Multi-speed 6	-100.0%-100.0%	-100.0-100.0	0.0%
FA.08	Multi-speed 7	-100.0%-100.0%	-100.0-100.0	0.0%

Note: The symbol of the multi-speed determines the direction of operation. If it is negative, it means running in the opposite direction. The frequency setting 100.0% corresponds to the maximum frequency (F0.04).

When FA.00 is set to 0 and X1=X2=X3=OFF, the frequency input mode is selected by code F0.03. When X1, X2 and X3 terminals are not all OFF, the inverter will run at multiple speeds. The multi-speed has higher priority than the keyboard, analog and communication frequency input. Up to eight speeds can be selected by encoding with X1, X2 and X3 combinations. As shown in Figure 7.21:

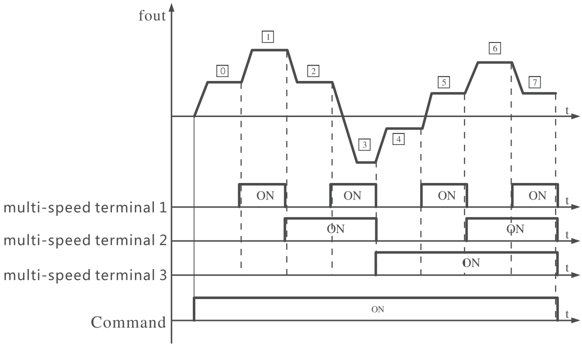


Figure 7.21 Logic diagram for multi-speed operation

The selection of start and stop channels during multi-speed operation is also determined by function code F0.01. The multi-speed control process is shown in Table 7.7.

Table 7.7 Multi-speed terminal control

X1	OFF	ON	OFF	ON	OFF	ON	OFF	ON
X2	OFF	OFF	ON	ON	OFF	OFF	ON	ON
X3	OFF	OFF	OFF	OFF	ON	ON	ON	ON
运行段	0	1	2	3	4	5	6	7

Running segment

Function Code	Name	Description	Setting Range	Default value
FA.09	Multi-speed time 0	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.10	Multi-speed time 1	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.11	Multi-speed time 2	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.12	Multi-speed time 3	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.13	Multi-speed time 4	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.14	Multi-speed time 5	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.15	Multi-speed time 6	0.0s-3600.0s	0.0-3,600.0	1.0s
FA.16	Multi-speed time 7	0.0s-3600.0s	0.0-3,600.0	1.0s

These times work when FA.00 is not selected to be 0. The multi-speed given determines the final size of the given frequency according to the respective time. If a certain speed is not required, its time may be set to 0. Each time corresponds to the respective multi-speed setting.

Group Fb: Protection parameter

Function Code	Name	Description	Setting Range	Default value
Fb.00	Motor overload protection selection	0: No protection 1: Ordinary motor (with low speed compensation) 2: Variable frequency motor (without low speed compensation)	0-2	2

0: No protection. There is no motor overload protection feature (use with caution), and the inverter has no overload protection for the load motor.
1: Ordinary motor (with low speed compensation). Since the heat dissipation effect of ordinary motors at low speed is poor, the corresponding electronic thermal protection value is also appropriately adjusted. The low speed compensation characteristic mentioned here is to lower the overload protection threshold of motors whose running frequency is lower than 30 Hz.
2: Variable frequency motor (without low speed compensation). Since the heat dissipation of the inverter -specific motor is not affected by the speed, the protection value adjustment is not required at low speed.

Function Code	Name	Description	Setting Range	Default value
Pb.01	Motor overload protection current	20.0%-120.0%	20.0-120.0	100.0%

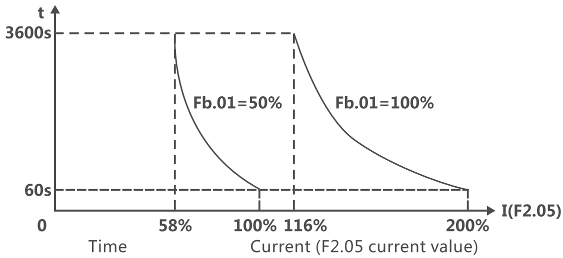


Figure 7.22 Motor overload protection factor setting

This value can be determined by the following formula:
Motor overload protection current = (allowable maximum load current / inverter rated current) * 100%.
The allowable maximum load current is generally defined as the rated current of the load motor. When the rated current value of the load motor does not match that of the inverter, the overload protection of the motor can be realized by setting the value of Fb.00-Fb.01.

Function Code	Name	Description	Setting Range	Default value
Fb.02	Instantaneous power down frequency reduction point	70.0%-110.0% (standard bus voltage)	70.0-110.0	80.0%
Fb.03	Instantaneous power down frequency reduction rate	0.00 Hz-F0.04 (maximum frequency)	0.00-F0.04	0.00Hz

When the instantaneous power-down frequency reduction rate is set to 0, the instantaneous power -down restart function is invalid.

Instantaneous power-down frequency reduction point: Means that after the grid is powered down and the bus voltage drops to the instantaneous power -down frequency reduction point, the inverter starts to reduce the operating frequency according to the instantaneous power-down frequency reduction rate (Fb.03), so that the motor is in the power generation state to maintain the bus voltage with the feedback power to ensure the normal operation of the inverter until the inverter is powered up again.

Note: Appropriate adjustment of these two parameters can achieve good grid switching without causing downtime due to inverter protection.

Function Code	Name	Description	Setting Range	Default value
Fb.04	Overvoltage stall protection	0: Protection prohibited 1: Protection allowed	0-1	1

Function Code	Name	Description	Setting Range	Default value
Fb.05	Overvoltage stall protection voltage	110%-140% (standard bus voltage) (380 V model)	110-150	140%
		110%-140% (standard bus voltage) (220V model)	110-150	115%

During the deceleration operation of the inverter, due to the influence of load inertia, the actual rate of decline of the motor speed may be lower than that of the output frequency. At this time, the motor will feed back electric energy to the inverter, causing the DC bus voltage of the inverter to rise. If no measures are taken, a bus overvoltage circuit fault will occur and cause the inverter to trip. The overvoltage stall protection function detects the bus voltage during the deceleration operation of the inverter, and compares with the stall overvoltage point defined by Fb.05 (relative to the standard bus voltage); if the detected bus voltage exceeds the stall overvoltage point, the inverter's output frequency will stop falling. If the bus voltage is detected to be lower than the stall overvoltage point again, the inverter will decelerate again. As shown in Figure 7.23:

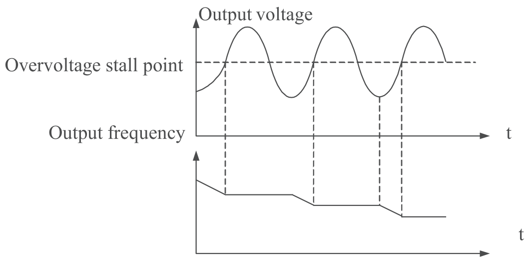


Figure 7.23 Overvoltage stall function

Function Code	Name	Description	Setting Range	Default value
Fb.06	Automatic current limiting level	100%-200%	100-200	T type: 160% P type: 120%
Fb.07	Reserved	/	/	/

Group FC Serial communication

Function Code	Name	Description	Setting Range	Default value
FC.00	Communication address of this machine	0-31; 0 is broadcast address	0-247	1

When the host is writing the frame and the slave communication address is set to 0, the address is the broadcast address, MODBUS.

All slaves on the bus will accept the frame, but the slave does not respond.

Note: The slave address cannot be set to 0.

The host communication address is unique in the communication network, which is the basis for the point-to-point communication between the host computer and the inverter.

Function Code	Name	Description	Setting Range	Default value
FC.01	Communication baud rate selection	0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	0-5	3

This parameter is used to set the data transmission rate between the host and the inverter. Note that the baud rate set by the host and by the inverter must be the same; otherwise, the communication cannot be performed. The larger the baud rate, the faster the communication.

Function Code	Name	Description	Setting Range	Default value
FC.02	Data format	0: No parity (N, 8, 1) for RTU 1: Even parity (E, 8, 1) for RTU 2: Odd parity (O, 8, 1) for RTU 3: No parity (N, 8, 2) for RTU 4: Even parity (E, 8, 2) for RTU 5: Odd parity (O, 8, 2) for RTU 6: No parity (N, 7, 1) for ASCII 7: Even parity (E, 7, 1) for ASCII 8: Odd parity (O, 7, 1) for ASCII 9: No parity (N, 7, 2) for ASCII 10: Even parity (E, 7, 2) for ASCII 11: Odd parity (O, 7, 2) for ASCII 12: No parity (N, 8, 1) for ASCII 13: Even parity (E, 8, 1) for ASCII 14: Odd parity (O, 8, 1) for ASCII 15: No parity (N, 8, 2) for ASCII 16: Even parity (E, 8, 2) for ASCII 17: Odd parity (O, 8, 2) for ASCII	0-17	0

The data formats set by the host and by the inverter must be the same, otherwise the communication cannot be performed.

11-bits(for RTU)

Data format: 8-N-2

Start bit	bit0	bit1	bit2	bit3	bit4	bit5	bit6	bit7	Stop bit	Stop bit
1	8-data bits								2	
11-bits character frame										

Data format: 8-E-1

Start bit	bit0	bit1	bit2	bit3	bit4	bit5	bit6	bit7	Even bit	Stop bit
1	8-data bits								2	
11-bits character frame										

Data format: 8-0-1

Start bit	bit0	bit1	bit2	bit3	bit4	bit5	bit6	bit7	Odd bit	Stop bit
1	8-data bits								2	
11-bits character frame										

10-bits(for ASCII)

Data format: 7-N-2

Start bit	bit0	bit1	bit2	bit3	bit4	bit5	bit6	Stop bit	Stop bit
1	7-data bits							2	
10-bits character frame									

Data format: 7-B-1

Start bit	bit0	bit1	bit2	bit3	bit4	bit5	bit6	Even bit	Stop bit
1	7-data bits							2	
10-bits character frame									

Data format: 7-0-1

Start bit	bit0	bit1	bit2	bit3	bit4	bit5	bit6	Odd bit	Stop bit
1	7-data bits							2	
10-bits character frame									

Function Code	Name	Description	Setting Range	Default value
FC.03	Communication response delay	0ms-200ms	0-200	5ms

Response delay: Refers to the intermediate interval between the end of the inverter data reception and the sending of response data to the host. If the response delay is less than the system processing time, the response delay will be based on the system processing time. If the response delay is longer than the system processing time, the system will wait until the response delay is over before sending data to the host.

Function Code	Name	Description	Setting Range	Default value
FC.04	Communication timeout failure time	0.0 s (invalid), 0.1-100.0 s	0-100.0	0.0 s

When the function code is set to 0.0 s, the communication timeout time parameter is invalid. When this function code is set to a valid value, if the interval between one communication and the next communication exceeds the communication timeout period, the system will report communication failure error (CE). Normally, it is set to be invalid. If it is set in a system with continuous communication, the communication status can be monitored.

Function Code	Name	Description	Setting Range	Default value
FC.05	Transmission error handling	0: Alarm and free stop 1: No alarm and continue to run 2: No alarm and stop by stop mode (for communication control mode only) 3: No alarm and stop by stop mode (for all control modes)	0-3	1

When the inverter communication is abnormal, fault alarms and shutdown can be shielded by setting the protection action, so that the inverter continues to run.

Function Code	Name	Description	Setting Range	Default value
FC.06	Transmission response handling	0: Parameter write operation with response 1: Parameter write operation without response	0-1	0

When the function code is set to 0, the inverter responds to both the read and write commands of the host.

When the function code is set to 1, the inverter only responds to the read command of the host, and does not responds to the write command, thereby improving the communication efficiency.

Group Fd: Supplementary functions

Function Code	Name	Description	Setting Range	Default value
Fd.00	Oscillation suppression low frequency threshold point	0-500	0-500	5
Fd.01	Oscillation suppression high frequency threshold point	0-500	0-500	100

Most motors are prone to current oscillation when running at certain frequency ranges. Light oscillation can cause the motor to run unstably, and heavy oscillation can cause overcurrents in the inverter. When Fd.04=0, the oscillation can be suppressed. When Fd.00 and Fd.01 are set to be small, the oscillation suppression is obvious and the current increase is obvious; when it is set to be large, the oscillation suppression is weak.

Function Code	Name	Description	Setting Range	Default value
Fd.02	Suppression oscillation limit value	0-10,000	0-10,000	5000

The large voltage boost value may be limited during oscillation suppression by setting FD.02.

Function Code	Name	Description	Setting Range	Default value
Fd.03	Suppression oscillation high-low frequency boundary frequency point	0.00 Hz-F0.04 (maximum frequency)	0.00 Hz-F0.04	12.5 0Hz

Fd.03 is the boundary point of function codes Fd.00 and Fd.01.

Function Code	Name	Description	Setting Range	Default value
Fd.04	Suppression oscillation	0: Oscillation suppression valid; 1: Oscillation suppression invalid.	0-1	1

0: Oscillation suppression valid;
1: Oscillation suppression invalid.

The oscillation suppression function is for the V/F control. When the ordinary motor runs at no load or light load, the current oscillation often occurs, resulting in abnormal operation of the motor, or even causing overcurrent in the inverter in serious circumstances. When Fd.04=0, the oscillation suppression function will be enabled, and the inverter will suppress the oscillation of the motor according to the parameters of the Fd.00-Fd.03 function groups.

Function Code	Name	Description	Setting Range	Default value
Fd.05	PWM mode selection	0: PWM mode 1 1: PWM mode 2	0-1	0

0: PWM mode 1: Normal PWM mode. The motor noise is low at low frequencies and high at high frequencies.
1: PWM mode 2: The noise is low and the temperature is high when the motor runs in this mode. If this function is selected, the inverter needs to be derated.

Function Code	Name	Description	Setting Range	Default value
Fd.06	Reserved	/	/	/
Fd.07	Reserved	/	/	/
Fd.08	Reserved	/	/	/
Fd.09	Reserved	/	/	/

Group FE: Manufacturer functions

This is a manufacturer parameter group. The user should not open this group of parameters, otherwise, the inverter will not operate normally or be damaged.

Chapter VIII Inverter RS485 Communication Protocol

The inverter provides the RS485 communication interface and adopts the international standard ModBus communication protocol for master-slave communication. The user can realize centralized control through PC/PLC or by controlling the host (setting the control command and running frequency of the inverter, modifying the relevant function code, and monitoring the working status and fault information of the inverter) to adapt to the specific application requirements.

8.1 Protocol Contents

The Modbus series communication protocol defines the frame content and usage format for asynchronous transmission in serial communication, including the format of host polling and broadcast frame and slave response frame; the frame content organized by the host includes: slave address (or broadcast address), execution command, data and error check. The slave response uses the same structure, including action confirmation, return data and error checking. If the slave has an error when receiving a frame, or cannot complete the action requested by the host, a fault frame will be organized as a response and be fed back to the host .

8.2 Application Methods

The inverter is connected to a "single-host and multi-slave" control network with the RS232/RS485 bus.

8.3 Bus Structure

(1) Interface mode: RS485 hardware interface.

(2) Transmission mode: Asynchronous serial, half-duplex transmission.

Only one of the host and the slave can send data at the same time, and the other receives the data. Data is sent frame by frame in the format of message in the serial asynchronous communication process.

(3) Topology: Single-host and multi-slave system.

The setting range of the slave address is 1-247, and 0 is the broadcast communication address. Each slave address in the network is unique. This is the basis for ensuring Modbus serial communication.

8.4 Protocol Description

The inverter communication protocol is an asynchronous serial host-slave ModuBus communication protocol. Only one device (host) in the network can establish a protocol (called a "query/command"). Other devices (slaves) can only respond to the host's "query/command" by providing data, or act according to the host's "query/command". The host here refers to a personal computer (PC), industrial control device or programmable logic controller (PLC). The slave refers to an inverter or other control device having the same communication protocol. The host can not only communicate with a slave separately, but also issue broadcast information to all slaves. For a host "query/command" that is accessed separately, the slave must return a signal (called a response). For the broadcast information sent by the host, the slave does not need to feed back a response message to the host.

8.5 Communication Frame Structure

The ModBus protocol communication data format of the inverter is divided into RTU (remote terminal unit) mode and ASCII (American Standard Code for Information International Interchange) mode for communication.

In the RTU mode, the format of each byte is as follows: Encoding system: 8-bit binary; hexadecimal 0-9 and A-F; each 8-bit frame domain contains two hexadecimal characters.

In the ASCII mode, the format of each byte is as follows: Encoding system: the communication protocol is hexadecimal, and the meaning of ASCII information characters: "0"..."9", "A"..."F", each hexadecimal represents each ASCII message. For example:

Character	'0'	'1'	'2'	'3'	'4'	'5'	'6'	'7'	'8'	'9'
ASCII CODE	0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39
Character	'A'	'B'	'C'	'D'	'E'	'F'				
ASCII	0x41	0x42	0x43	0x44	0x45	0x46				

Byte bits: Includes the start bit, 7-8 data bits, the parity bit and the stop bit. The byte bits are described in the following table:

11-bit character frame:

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	Bit8	No parity bit Even parity bit Odd parity bit	Stop bit

10-bit character frame:

Start bit	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	No parity bit Even parity bit Odd parity bit	Stop bit

In the RTU mode, the new one is always silent for a transmission time of at least 3.5 bytes as a start. On a network where the transmission rate is calculated at baud rate, the transmission time of 3.5 bytes can be easily grasped. The data domains that are transmitted next are the slave address, operation command code, data and CRC parity word, each domain transmission byte is hexadecimal 0...9 and A...F. Network devices always monitor the activity of the communication bus even during silent intervals. When the first domain (address information) is received, each network device confirms the byte. As the transmission of the last byte is completed, there is a similar 3.5-byte transmission interval for identifying the end of the frame, after which a new frame transmission will start.

RTU data frame format

At the start, at least 3.5 characters are	MODBUS message				At the end, at least 3.5 characters are
	Slave address	Function Code	Data	Parity	

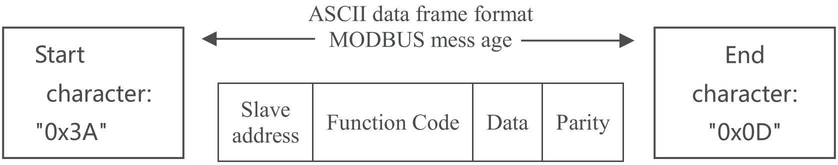
Standard structure of RTU frames:

The information of a frame must be transmitted in a continuous data stream. If there is an interval of more than 1.5 bytes before the end of the entire frame transmission, the receiving device will clear the incomplete information and mistakenly believes that the next byte is the address domain portion of a new frame. Similarly, if the interval between the start of a new frame and the end of the previous frame is less than the time of 3.5 bytes, the receiving device will consider it to be the continuation of the previous frame. Due to the disorder of the frame, the final CRC parity value is incorrect, resulting in communication failure.

Standard structure of RTU frames:

Frame header START	T1-T2-T3-T4 (3.5-byte transmission time)
Slave address domain ADDR	Communication address: 0-247 (decimal) (0 is broadcast address)
Function domain CMD	03H: Read slave parameter; 06H: Write slave parameter
Data domain DATA (N-1) ... DATA (0)	2*N bytes of data. This part is the main content of communication, and also the core of data exchange in communication.
CRC CHK low	Detection value: CRC parity value (16BIT)
CRC CHK high	
Frame end END	T1-T2-T3-T4 (3.5-byte transmission time)

In ASCII mode, the frame header is ":" ("0x3A"), and the frame end is "CRLF" ("0x0D" "0x0A") by default. In ASCII mode, except for the frame header and frame end, all the remaining data bytes are sent in ASCII code. The upper 4 bytes are sent first, and then the lower 4 bytes are sent. The data in ASCII code is 7 or bits long. For "A" to "F", the ASCII code of their uppercase letter is used. At this time, the data is checked by LRC, and the check covers information from the slave address to the data. The checksum is equal to the complement of the characters involved in the check data (discarding the carry bit).



Standard structure of ASCII frames

START	": " (0x3A)
Address Hi	Communication address: 8-bit address is composed of two ASCII codes
Address Lo	
Function Hi	Function code: 8-bit address is composed of two ASCII codes
Function Lo	
DATA (N-1) ... DATA (0)	Data content: nx8-bit data content is composed of 2n ASCII codes n<=16, up to 32 ASCII codes
LRC CHK Lo	LRC check code: 8-bit check code is composed of two ASCII codes
LRC CHK Hi	
END Hi	End character: END Hi=CR (0x0D), END Lo=LF (0x0A)
END Lo	

8.6 Command Code and Communication Data Description

8.6.1 Command Code: 03H (0000 0011)

Read N words (up to 16 words can be read in a row)

For example, for an inverter whose slave address is 01H, the memory start address is 0004, and two words are read in a row, the structure of the frame is described as follows:

RTU host command information

START	T1-T2-T3-T4 (3.5-byte transmission time)
ADDR	01H
CMD	03H
Start address high	00H
Start address low	04H
Data number high	00H
Data number low	02H
CRC CHK low	85H
CRC CHK high	CAH
END	T1-T2-T3-T4 (3.5-byte transmission time)

RTU slave response message

START	T1-T2-T3-T4 (3.5-byte transmission time)
ADDR	01H
CMD	03H
Byte number high	00H
Byte number low	04H
Data address 0004H high	00H
Data address 0004H low	00H
Data address 0005H high	00H
Data address 0005H low	00H
CRC CHK low	43H
CRC CHK high	07H
END	T1-T2-T3-T4 (3.5-byte transmission time)

ASCII host command information

START	':'
ADDR	'0'
	'1'
CMD	'0'
	'3'
Start address high	'0'
	'0'
Start address low	'0'
	'4'
Data number high	'0'
	'0'
Data number low	'0'
	'2'
LRC CHK Lo	'F'
LRC CHK Hi	'6'
END Lo	CR
END Hi	LF

ASCII slave response message

START	':'
ADDR	'0'
	'1'
CMD	'0'
	'3'
Byte number	'0'
	'4'
Data address 0004H high	'0'
	'0'

Data address 0004H low	'0'
	'2'
Data address 0005H high	'0'
	'0'
Data address 0005H low	'0'
	'0'
LRC CHK Hi	'F'
LRC CHK Lo	'6'
END Lo	CR
END Hi	LF

8.6.2 Command Code: 06H (0000 0110) write a word. For example, Write 5000 (1388H) to the 0008H address of the inverter with the slave address of 02H. The structure of the frame is described as follows:

RTU host command information

START	T1-T2-T3-T4 (3.5-byte transmission time)
ADDR	02H
CMD	06H
Write data address high	00H
Write data address low	08H
Data content high	13H
Data content low	88H
CRC CHK low	05H
CRC CHK high	6DH
END	T1-T2-T3-T4 (3.5-byte transmission time)

RTU slave response message

START	T1-T2-T3-T4 (3.5-byte transmission time)
ADDR	02H
CMD	06H
Write data address high	00H
Write data address low	08H
Data content high	13H
Data content low	88H
CRC CHK low	05H
CRC CHK high	6DH
END	T1-T2-T3-T4 (3.5-byte transmission time)

ASCII host command information

START	':'
ADDR	'0'
	'2'
CMD	'0'
	'6'

Write data address high	'0'
	'0'
Write data address low	'0'
	'8'
Data content high	'1'
	'3'
Data content low	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'5'
END Lo	CR
END Hi	LF

ASCII slave response message

START	':'
ADDR	'0'
	'2'
CMD	'0'
	'6'
Write data address high	'0'
	'0'
Write data address low	'0'
	'8'
Data content high	'1'
	'3'
Data content low	'8'
	'8'
LRC CHK Hi	'5'
LRC CHK Lo	'5'
END Lo	CR
END Hi	LF

8.7 Communication Frame Error Checking Mode

The error check mode of the frame mainly includes two parts, that is, the bit check of the byte (odd/even parity) and the entire data check of the frame (CRC check or LRC check).

1. Byte bit check

The user can select different bit checking modes as needed, or select no check. This will affect the check bit setting of each byte.

Meaning of even parity: An even parity bit is added before data transmission to indicate whether the number of "1" in the transmitted data is odd or even. When it is even, the parity position is set to "0", otherwise it is set to "1", thereby keeping the parity of the data unchanged.

Meaning of odd parity: An odd parity bit is added before data transmission to indicate whether the number of "1" in the transmitted data is odd or even. When it is odd, the parity position is set to "0", otherwise it is set to "1", thereby keeping the parity of the data unchanged. For example, "11001110" needs to be transmitted and it contains five "1". If even parity is used, its even parity bit is "1". If odd parity is used, its odd parity bit is "0". When the data is transmitted, the parity bit is calculated and placed at the position of the parity bit of the frame. The receiving device also performs parity check, and it will consider that the communication has an error if finding that the parity of the received data is inconsistent with the preset.

2. CRC check method -- CRC (Cyclical Redundancy Check)

When the RTU frame format is used, the frame includes a frame error detection domain calculated based the CRC method. The CRC domain detects the contents of the entire frame. The CRC domain has two bytes and contains a 16-bit binary value. It is calculated by the transmission device and added to the frame. The receiving device recalculates the CRC of the received frame and compares it with the value in the received CRC domain. If the two CRC values are not equal, the transmission has an error.

In the CRC, 0xFFFF is stored first, and then a procedure is called to process six consecutive bytes in the frame and the value in the current register. The 8-bit data in each character is valid for the CRC, and the start and stop bits and the parity bit are all invalid.

During the CRC generation process, each 8-bit character is individually XORed with the contents of the register, the result moves to the direction of the least significant bit, and the most significant bit is padded with 0. The LSB is extracted and detected. If the LSB is 1, the register is individually XORed with the preset value. If the LSB is 0, no XOR is carried out. The entire process is repeated eight times. After the last bit (the eighth bit) is completed, the next 8-bit byte is individually XORed with the current value of the register. The final value of the register is the CRC value after all bytes in the frame have been executed. This calculation method of the CRC uses the international standard CRC check rule. When editing the CRC algorithm, the user can refer to the CRC algorithm of the relevant standard to write a CRC calculation program that truly meets the requirements.

A simple function for CRC calculation is now available for user reference (it is programmed in C language):

```
unsignedintcrc_cal_value(unsignedchar
*data_value,unsignedchar data_length)
{
    int i;
    unsigned int crc_value=0xffff;
    while(data_length--)
    {
        crc_value^=*data_value++;
        for(i=0;i<8;i++)
        {
            if(crc_value&0x0001)crc_value=(crc_value>>1)^0xa001;
            else crc_value=crc_value>>1;
        }
    }
    return(crc_value);
}:
```

In the ladder logic, CKSM calculates the CRC value according to the frame content and calculates with the look-up table method. This method is simple and the operation speed is fast, but the program occupies a large ROM space. Please use it cautiously if there is a requirement for the program space.

3. ASCII Mode Check (LRC Check)

The check code (LRC Check) is the value added from the Address to the Data Content result, such as the check code of communication information in section 8.6.2 above: 0x02+0x06+0x00+0x08+0x13+0x88 = 0xAB, and then take 2's complement code = 0x55.

8.8 Communication Address Description

Definition of communication data address: This part is the address definition of the communication data and is used to control the operation of the inverter and obtain the status information of the inverter and the inverter-related function parameter settings.

Function code parameter address representation rules: The function code serial number is used as the register address corresponding to the parameter, but it needs to be converted into hexadecimal. For example, the serial number of F5.06 is 59 and the function code address represented in hexadecimal is 003BH. The high and low byte ranges are 00-01 and 00-FF respectively. Note: Some parameters cannot be changed when the inverter is running. Some parameters cannot be changed regardless of the state of the inverter. To change function code parameters, attention should also be paid to the setting range, unit and related instructions of the parameter.

In addition, the frequent storage of EEPROM will reduce its service life. For the user, some function codes do not need to be stored in the communication mode, and changing the value in the on-chip RAM can meet the usage requirements. To achieve this function, change the highest bit of the corresponding function code address from 0 to 1. For example, the function code F0.07 is not stored in the EEFROM, and the address can be set to 8007H by modifying the value in the RAM. This address can only be used to write the on-chip RAM and cannot be used for reading; if it is used for reading, the address is invalid.

Address description of other functions:

Function Description	Address Definition	Data Meaning Description	Read and write characteristics (R/W)
Communication control command	1000H	0001H: Forward running	W/R
		0002H: Reverse running	
		0003H: Forward Jog	
		0004H: Reverse Jog	
		0005H: Stop	
		0006H: Free stop (emergency stop)	
		0007H: Fault reset	
		0008H: Jogging stop	
Inverter status	1001H	0001H: Forward running	R
		0002H: Reverse running	
		0003H: Inverter standing by	
		0004H: Fault	
Set value address	2000H	Range of communication set value (-10000-10000) Note: The communication set value is a percentage of the relative value (-100.00%-100.00%), can be used for communication write operation. When it is set as a frequency source, it corresponds to a percentage of the maximum frequency (F0.04). When it is set as PID given or feedback, it corresponds to a percentage of the PID. The PID given value and PID feedback value are both calculated for PID in the form of a percentage.	W/R
Run/stop parameter address description	3000H	Running frequency	R
	3001H	Set frequency	R
	3002H	Bus voltage	R
	3003H	Output voltage	R
	3004H	Output current	R
	3005H	Running speed	R

Function Description	Address Definition	Data Meaning Description	Read and write characteristics (R/W)
Run/stop parameter address description	3006H	Output power	R
	3007H	Output torque	R
	3008H	PID given value	R
	3009H	PID feedback value	R
	300AH	Terminal input flag status	R
	300BH	Terminal output flag status	R
	300CH	Analog AI1 value	R
	300DH	Analog AI2 value	R
	300EH	Reserved	R
	300FH	Reserved	R
	3010H	Reserved	R
	3011H	Reserved	R
	3012H	Multi-speed current speed	R
Inverter fault address	5000H	The fault information code is consistent with the serial number of the fault type in the function code menu, only that hexadecimal data, instead of fault characters, is returned to the host here.	R
ModBus communication Fault address	5001H	0000H: No fault 0001H: Password error 0002H: Command code error 0003H: CRC check error 0004H: Illegal address 0005H: Illegal data 0006H: Invalid parameter change 0007H: System locked 0008H: Inverter busy (EEPROM being stored)	R

Additional response during error communication. When the inverter is connected, if an error is occurs, the inverter will respond to the error code and respond to the main control system in a fixed format so that the main control system knows that an error has occurred. In the inverter communication, regardless f whether the command code is "03" or "06", the command byte of the failback of the inverter is based on "06", and the data address is fixed to 0x5001. For example,

ASCII slave fault response message

START	':'
ADDR	'0'
	'1'
CMD	'0'
	'6'
Fault return address high	'5'
	'0'
Fault return address low	'0'
	'1'
Error code high	'0'
	'0'
Error code low	'0'

Error code low	'5'
LRC CHK Hi	'A'
LRC CHK Lo	'3'
END Lo	CR
END Hi	LF

Meaning of error code:

Error code	Description
1	Password error
2	Command code error
3	CRC check error
4	Illegal address
5	Illegal data
6	Invalid parameter change
7	System locked
8	Inverter busy (EEPROM being stored)

8.9 Wiring Instructions

8.9.1 Topology

The RS-485-Modbus repeater is not configured. There is a trunk cable that is connected to all devices directly (daisy type) or connected via a short branch cable.

The trunk cable, also known as the bus, can be very long. It must be connected to the line terminal at both ends. It is also possible to use repeaters between multiple RS-485 Modbus. Each slave address in the network is unique, which is the basis for ensuring Modbus serial communication.

8.9.2 Length

The end-to-end length of the trunk cable must be limited. The maximum length is related to the baud rate, cable (specification, capacitance or characteristic impedance), number of loads on the daisy chain, and network configuration (2-wire or 4-wire system).

For AWG26 (or thicker) cables with a high-speed baud rate of 9600 bps, the maximum length is 1,000 m.

The branch must be short and cannot exceed 20m. If a multiport splitter with n branches is used, the maximum length of each branch must be limited to 40 m divided by n.

8.9.3 Grounding Form

The "common" (with the signal and optional power supply) circuit must be directly connected to the protective earth, preferably the entire bus is grounded at a single point. Typically, this point may be selected on the master station or its branches.

8.9.4 Cable

The Modbus cable on the serial link must be shielded. At one end of each cable, the shield must be connected to the protective earth. If a connector is used at this end, the connector housing must be connected to the cable shield. RS485-Modbus must use a pair of balance line and a third line (for the common end).

For RS485-Modbus, a sufficiently wide cable diameter must be selected to allow the maximum length (1,000 m) to be used. AWG24 is capable of meeting the needs of Modbus data transmission.

Chapter IX Maintenance and Troubleshooting

9.1 Daily Maintenance Precautions and Maintenance Items

1) Maintenance personnel must follow the specified methods of maintenance.
2) Maintenance must be carried out by professional qualified personnel.
3) Maintenance must be carried out 10 minutes after the inverter power supply is cut off.
4) Do not directly touch the components on the PCB board, otherwise static electricity will be easily generated to damage the inverter.
5) After the repair is completed, confirm that all screws are tightened.
6) Whether the motor operates according to the setting.
7) Whether the environment of the installation site is abnormal.
8) Whether the cooling system is abnormal.
9) Whether there is abnormal vibration sound.
10) Whether there is overheating and discoloration.
11) Measure the input voltage of the inverter with a multimeter during operation.

In order to prevent the inverter from malfunctioning, ensure the normal operation of the equipment and prolong the service life of the inverter, daily maintenance of the inverter is required. The contents of the daily maintenance are shown in Table 9.1:

Table 9.1 Daily maintenance and inspection instructions

Check Items	Contents
Temperature/Humidity	Confirm that the ambient temperature is between -10 ℃ and 40 ℃ and the humidity is ≤90%
Oil mist and dust	Confirm that there is no oil mist, dust and condensation in the inverter
Inverter	Check if the inverter has abnormal heat and abnormal vibration
Fan	Conform that the fain is running normally, not stuck by debris
Input power	Confirm that the voltage and frequency of the input power are within the allowable range.
Motor	Check the motor for abnormal vibration, heat, abnormal noise and phase loss

9.2 Regular Maintenance Precautions and Maintenance Items

In order to prevent the inverter from malfunctioning and ensure its long-term high-performance stable operation, the user must check the inverter regularly (and as frequently as at least every six months). Before the maintenance of the inverter, the power supply must be cut off. The inspection can only be carried out when the monitor (keyboard) has no display and the main circuit power indicator is off for 10 minutes and the DC bus voltage between the ⊕ and⊖ is measured with a multimeter at the DC range to be less than 36 V. This is to prevent the residual voltage of the capacitor of the inverter from injuring the maintenance personnel.

1) Cooling system: Please clean the air filter and check if the cooling fan is normal.
2) Screws and bolts: Due to the influence of vibration, temperature, etc., fixing parts such as screws and bolts may be loose. Check whether they are securely tightened. If they are loose, tighten them according to the tightening torque.
3) Check conductors and insulators for corrosion and damage.
4) Measure the insulation resistance.
5) Check the filter capacitor for discoloration, odor, bubbling, liquid leakage, etc.

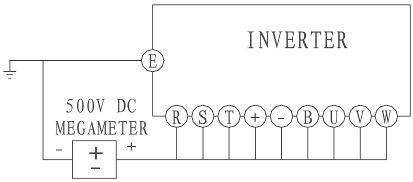


Figure 9.1 Main circuit insulation resistance test

Table 9.2 Regular maintenance and inspection instructions

Check Items	Check Content	Measures Taken
Screws of external terminals	Whether the screws are loose	Tighten
PCB board	Dust, dirt	Completely eliminate debris with dry compressed air
Fan	Whether the accumulated time of abnormal noise and vibration exceeds 20,000 hours	1. Remove debris 2. Replace the fan
Electrolytic capacitor	whether it is discolored or has odor	Replace the electrolytic capacitor
Radiator	Dust, dirt	Completely eliminate debris with dry compressed air
Power components	Dust, dirt	Completely eliminate debris with dry compressed air

9.3 Replacement of Consumable Parts of Inverter

The inverter has many electronic components which age after a certain period due to their composition and physical characteristics, reducing the performance of the inverter and even causing malfunctions. Therefore, it is necessary to replace the components regularly. The parts that need to be replaced regularly are shown in Table 9.3:

Table 9.3 Description of parts requiring replacement

Part Name	Standard Replacement Cycle	Description
Cooling fan	(2-3) years	Replace (depending on inspection)
DC filter capacitor	5 years	Replace (depending on inspection)
Other electrolytic capacitors	5 years	Replace (depending on inspection)
Relay	3 years	Replace (depending on inspection)

1. Cooling fan

The cooling fan used to cool the heat-generating components such as the main circuit semiconductor elements. The service life of its bearing is 10,000-35,000 hours. Therefore, in a continuously operating device, the cooling fan is generally replaced every 2-3-year cycle. In addition, when abnormal sounds or vibration are detected in the inspection, the cooling fan must be replaced immediately.

2. DC filter capacitor

The large-capacity aluminum electrolytic capacitor used for filtering in the DC part of the main circuit, and the aluminum electrolytic capacitor used to stabilize the control power in the control circuit. Their characteristics are deteriorated due to the influence of the pulsating current, surrounding environment and use conditions (replaced every five years in normal air environment), and the deterioration of the capacitor will be rapidly accelerated after a certain period of time. Therefore, the inspection cycle should be at least one (and less than half a year when it is close to its life expectancy).

Judgment criteria for the appearance in the inspection:

1) housing status: Whether the side bottom of the housing expands.

2) Status of the sealing plate: Whether there is obvious bending and cracking.

3) Where there are other packaging cracks, discoloration, leakage of liquid, etc. The capacitor should be replaced when the capacitance is less than 85% of the rated capacity.

3. Relay

Due to possible contact failure, the relay needs to be replaced when a certain cumulative number of switches (switch life) is reached. It needs to be checked and replaced regularly.

9.4 Inverter Storage

After purchasing the inverter, the user should pay attention to the following points for temporary and long-term storage:

1. Avoid storage in places with high temperature, humidity and rich dust and metal dust, and ensure ventilation;
2. Long-term storage will cause deterioration of the electrolytic capacitor. It must be powered on once for at least five hours within two years, and the input voltage must be gradually raised to the rated value with a voltage regulator.

9.5 Fault Information and Troubleshooting

Table 9.4 Types of faults

Fault Code	Fault Type	Possible Causes of Fault	Countermeasures
OUT1	Inverter unit fault	1. Too fast acceleration 2. IGBT internal damage 3. Mis-operation caused by interference 4. Poor grounding 5. Inverter instantaneous overcurrent 6. Phase-to-phase or ground short circuit in output three phases	1. Increase acceleration time 2. Seek service 3. Check peripheral devices for strong interference sources 4. Check the output wiring
P.OFF	DC voltage detection fault	1. DC voltage detection circuit failure 2. Low grid voltage	1. Seek service 2. Check and repair the external power grid
OC1	Acceleration overcurrent	1. Too fast acceleration 2. Low grid voltage 3. Too small inverter power	1. Increase acceleration time 2. Check the input power 3. Select an inverter with higher power
OC2	Deceleration overcurrent	1: Too fast deceleration 2. Large load inertia torque 3. Too small inverter power	1. Increase deceleration time 2. Add a suitable dynamic braking assembly 3. Select an inverter with higher power
OC3	Constant speed operation overcurrent	1. Sudden change or abnormality of load 2. Low grid voltage 3. Too small inverter power	1. Check the load or reduce the sudden change of load 2. Check the input power 3. Select an inverter with higher power
OV1	Acceleration Overvoltage	1. Abnormal input voltage 2. Motor restarting during rotation after momentary power failure	1. Check the input power 2. Avoid stop restart
OV2	Deceleration Overvoltage	1: Too fast deceleration 2. Large load inertia 3. Abnormal input voltage	1. Increase deceleration time 2. Increase dynamic braking assembly 3. Check the input power
OV3	Constant speed operation Overvoltage	1. Abnormal change in input voltage 2. Large load inertia	1. Install an input reactor 2. Add a suitable dynamic braking assembly
UV	DC bus undervoltage	1. Low grid voltage	1. Check the grid input power

Fault Code	Fault Type	Possible Causes of Fault	Countermeasures
OL1	Motor overload	1. Too low grid voltage 2. Incorrect motor rated current setting 3. Motor stalled or too large sudden change of load 4. A small horse pulling a large cart	1. Check grid voltage 2. Reset motor rated current 3. Check the load and regulate the torque boost 4. Select the right motor
OL2	Inverter overload	1. Too fast acceleration 2. Restart the rotating motor 3. Too low grid voltage 4. Too large load	1. Increase acceleration time 2. Avoid stop restart 3. Check grid voltage 4. Select a higher power inverter
OH2	Too high system operating temperature, over 85°	1. Air duct blocked or fan damaged 2. Too high ambient temperature 3. Control panel connection or plug-in loosened 4. Auxiliary power supply damaged; drive voltage undervoltage 5. Power module bridge arm straight through 6. Abnormal control panel	1. Drain the air duct or replace the fan 2. Reduce the ambient temperature 3. Check and reconnect 4. Seek service 5. Seek service 6. Seek service
EF	External fault	1: Xi external fault input terminal action	1. Check external device input
CE	Communication fault	1. Improper baud rate setting 2. Communication error of serial communication 3. Long-term communication interruption	1. Set the appropriate baud rate 2. Press STOP to reset and seek service 3. Check communication interface wiring
ItE	Current detection circuit fault	1. Poor contact of control board connector 2. Control power supply damaged 3. Hall device damaged 4. Abnormal amplification circuit	1. Check the connector and re-wire 2. Seek service 3. Seek service 4. Seek service
TE	Motor Auto-Tuning fault	1. Motor capacity does not match the inverter capacity 2. Improper settings of motor rated parameters 3. Too large deviation between Auto-Tuning parameters and standard parameters 4. Auto-Tuning timeout	1. Change inverter model 2. Set rated parameters according to motor nameplate 3. Make the motor empty and re-identify 4. Check motor wiring and parameter settings
EEP	EEPROM read and write fault	1. Read and write error in control parameter 2. EEPROM damaged	1. Press STOP to reset and seek service 2. Seek service
PL	Input phase loss	Phase loss in inputs R, S and T	1. Check the input power 2. Check installation wiring
SPO	Output phase loss	Phase loss in outputs U, V and W, or severe imbalance in three phases	1. Check output wiring 2. Check motor and cable
PIDE	PID feedback disconnection fault	1. PID feedback disconnection 2. PID feedback source disappears	1. Check PID feedback signal line 2. Check PID feedback source

9.6 Common Faults and Their Treatment

The following faults may be encountered during the use of the inverter. Please refer to the following methods for simple fault analysis:

fault	Fault Analysis and Treatment Method
No display after power on	Use a multimeter to check if the inverter input power is consistent with the rated voltage of the inverter. If there is a problem with the power supply, please check and eliminate it.
	Check if the three-phase rectifier bridge is intact. If the rectifier is damaged, seek service.
	Check if the LED indicator is lit. If the indicator is not lit, the fault is usually concentrated on the rectifier bridge or the charging resistor. If the indicator is on, the fault may be in the switching power supply. Seek service.

fault	Fault Analysis and Treatment Method
No display after power on	Use a multimeter to check if the inverter input power is consistent with the rated voltage of the inverter. If there is a problem with the power supply, please check and eliminate it.
	Check if the three-phase rectifier bridge is intact. If the rectifier is damaged, seek service.
	Check if the LED indicator is lit. If the indicator is not lit, the fault is usually concentrated on the rectifier bridge or the charging resistor. If the indicator is on, the fault may be in the switching power supply. Seek service.
Power air switch turned off after power on	Check input power supply for grounding or short-circuit problems, and eliminate them.
	Check if the rectifier bridge is broken; if it is damaged, seek service.
Motor not rotating after inverter is running	Check if there is balanced three-phase output between U, V and W. If yes, the motor circuit or the motor is damaged, or the motor is blocked due to mechanical failure. Eliminate it.
	If there is output but the three phases are unbalanced, the inverter drive board or output module is damaged. Seek service.
	If there is no output voltage, the drive board or output module is damaged. Seek service.
The inverter has a normal display after power-on, and the power air switch is turned off after the inverter starts running	Check if there is a short circuit between the output phases. If yes, seek service.
	Check if there is a short circuit or grounding problem between motor leads. If yes, eliminate it.
	If the trip occurs occasionally and the distance between the motor and the inverter is long, consider adding an output reactor.

Chapter X Environmental Protection

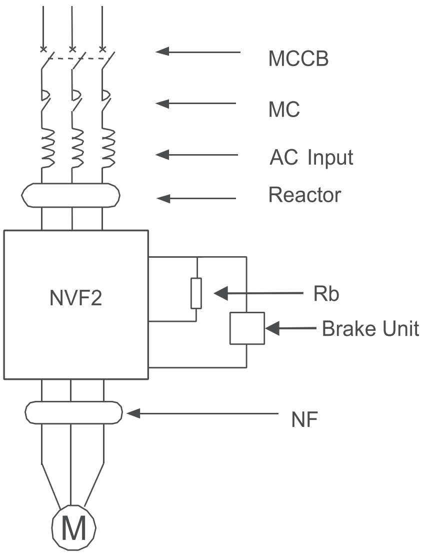
10.1 Environmental Protection

In order to protect the environment, when this product or its components are scrapped, please dispose of them as industrial waste, or hand them over to the recycling station for classified disassembly, recycling and reuse according to the relevant local regulations.

Appendix A Options

A.1 Connection Diagram Between Peripheral Options and the Inverter

Three-phase power supply



A.2 Options Table

Table A.1 Description of peripheral options

Name	Use	Matching inverter
Breaker	Used to quickly cut off the inverter input power	Based on capacity
EMC-approved noise filter	EMC-compliant noise filter	Based on capacity
Surge voltage suppression filter	Suppress the surge voltage on the output side of the inverter	
DC reactor for improving power factor	Used to improve the input power factor (comprehensive power factor is about 95%) and power supply cooperation factor of the inverter	
AC input reactor for improving power factor	Used to improve the input power factor (comprehensive power factor is about 90%) and power supply cooperation factor of the inverter	
Noise filter	Used to reduce noise interference	Suitable for all inverters
Linear noise filter	Used to reduce linear noise interference	
Braking resistor	Used to improve the braking capacity of the inverter (for large inertia loads or reverse loads)	18.5 kW and below

Name	Use	Matching inverter
brake unit	Using the brake unit together with the braking resistor can effectively control the bus voltage pumping, which has a certain protection effect on the inverter and can improve the braking capacity of the inverter. When the inverter communication system needs frequent braking, the brake unit is needed.	22 kW and above
Frequency setting potentiometer	Used to regulate the inverter frequency	Suitable for all inverters
Tachometer	Special tachometer (DC 0 V-10 V), moving coil / digital display DC voltmeter	
Voltmeter	Special voltmeter (DC 0 V-10 V), moving coil / digital display DC voltmeter	
Ammeter	Special ammeter (DC 0 V-10 V), moving coil / digital display DC voltmeter	
Keyboard tray	When the inverter operation panel needs to be installed on the control cabinet door panel, or the control cabinet needs to be operated remotely, the operation panel needs to be installed through the keyboard.	Suitable for all inverters
Display extension cord	Used as an extension cable when remote monitoring is used or the operation panel is pulled	Based on actual situation

A.3 Braking Resistor Selection

Table A.2 Description of braking resistor options

Voltage (V)	Motor Power (kW)	Resistance Value (Ω)	Resistance Power (W)
380	1.5	400	250
	2.2	250	250
	3.7	150	400
	5.5	100	500
	7.5	75	800
	11	50	1000
	15	40	1500
	18.5	30	4000
	22	30	4000
	30	20	6000
	37	16	9000
	45	13.6	9000
	55	10	12000
	75	6.8	18000
	90	6.8	18000
	110	6	18000

A.4 Leakage Protector

Since there is ground electrostatic capacitance inside the inverter, the motor and the input and output leads, and the carrier used by the inverter is high, the ground leakage current of the inverter could be large, which is more obvious for large-capacity models, sometimes causing the protection circuit to malfunction. In case of the above problem, in addition to properly reducing the carrier frequency and shortening the leads, a leakage protector should also be installed. The leakage protector should be located on the input side of the inverter. The operate current of the leakage protector should be greater than the leakage current (sum of the line, noise filter and motor noises) under the power frequency power supply when the inverter is not used.

CHINT

QC PASS

NVF2G Series
Inverter
User Instruction
EN 61800-3
EN61800-5-1

Check 05

Test date: Please see the packing

ZHEJIANG CHINT ELECTRICS CO., LTD.

NVF2G Series Inverter User Instruction

Zhejiang Chint Electrics Co., Ltd.

Add: No.1, CHINT Road, CHINT Industrial Zone,North Baixiang,
Yueqing, Zhejiang 325603,P.R.China
E-mail: global-sales@chint.com
Website: http://en.chint.com
0ZTD.463.856.EN.RU.AR