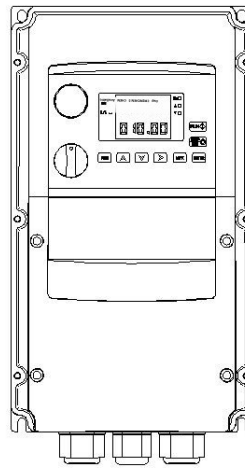
User Manual

ZVF650 Series High-Performance Vector Inverter



All rights reserved · Reproduction without permission is prohibited

All parts of the ZVF650 Series Inverter—including but not limited to the software, appearance, circuit board design, and user manual—are the intellectual property of the manufacturer. Without prior written permission from the manufacturer, no organization or individual may imitate, duplicate, extract, or reproduce this manual in any form. The manufacturer reserves the right to pursue legal responsibility for any violations.

The content provided in this user manual is for reference only. Software programs may be modified or upgraded, and the contents of this manual are subject to change or update at any time without prior notice. For detailed information regarding software changes or upgrades, please contact the manufacturer or supplier through the applicable technical support channel.

The manufacturer assumes no responsibility for errors that may appear in the content of this user manual.

Version No.: V1.11

Published: September 2026

Preface

- Thank you for selecting the ZVF650 series inverter from the manufacturer.

- This manual provides comprehensive instructions on the installation, operation, and function configuration of the ZVF650 series inverter as well as guidance on troubleshooting and related matters.

- Incorrect installation or use may result in damage to the inverter or cause other accidents.

- Before installation, please thoroughly read this manual and ensure correct installation and operation.

- This manual should be given to the end user. Please keep it properly for future reference after reading.

- If you encounter any problems during use, please contact the technical service department of the manufacturer.

Contents

Chapter 1 Safety precautions.....1
1.1 Safety Symbols and Definitions.....1
1.2 Scope of Application.....2
1.3 Installation Environment.....3
1.4 Installation Safety Precautions.....4
1.5 Usage Safety Precautions.....7
1.6 Disposal Precautions.....11
Chapter 2 Product Overview.....12
2.1 Incoming Inspection.....12
2.2 Model Description.....12
2.3 Nameplate Description.....13
2.4 Model Specifications.....14
2.5 Technical Specifications.....15
Chapter 3 Inverter Installation and Wiring.....21
3.1 Inverter Installation.....21
3.1.1 Usage Environment.....21
3.1.2 Installation Space and Orientation.....21
3.2 Inverter Wiring.....22
3.2.1 Basic Inverter Wiring Diagram.....22
3.2.2 Wiring Precautions:.....24
3.2.3 Main Circuit Terminal Description.....30
3.2.4 Control Board and Terminal Description.....35
3.3 Inverter System Wiring Diagram.....38
Chapter 4 Keypad and Operation.....43
4.1 Keypad and Description.....43
4.1.1 Keypad Diagram.....43

4.1.2 Functional Description of Each Key.....44
4.1.3 Description of Keypad Indicator Functions.....45
4.1.4 Usage of the Keypad.....46
Chapter 5 Inverter Usage.....47
5.1 Commissioning.....47
5.1.1 Pre-Commissioning Inspection.....47
5.1.2 Commissioning.....47
5.1.3 Precautions.....49
5.2 Usage Example.....50
5.2.1 Example 1: Keypad control for Start-up and Stop, with frequency set via the keypad up/down keys.....50
5.2.2 Example 2: Start and Stop Control via External Terminals, Frequency Set by External Potentiometer.....51
5.2.3 Example 3: Start-up/Stop and Multi-step Speed Operation via External terminal control.....52
5.2.4 Example 4: External terminal control for start-up and stop; external.....53
Chapter 6 Function Parameters.....56
6.1 Function Parameter Summary Table.....56
6.2 Detailed Description of Function Parameters V1.11.....139
Chapter 7 Common faults, abnormal conditions, and countermeasures.....331
7.1 Fault Codes and Countermeasures.....331
7.2 Abnormal Conditions and Countermeasures.....345
Chapter 8 Inspection and Maintenance of the Inverter.....347
8.1 Inspection and Maintenance.....347
8.1.1 Routine Inspection Items.....347
8.1.2 Regular Inspection Items.....349

8.2 Replacement of Inverter Consumable Components.....353
8.3 Storage of the Inverter.....354
Chapter 9 Outline and Mounting Dimensions.....356
9.1 Outline and Mounting Dimensions of the Inverter.....356
Chapter 10 Quality Assurance.....360
10.1 Inverter Quality Assurance.....360
Appendix 1 Optional Accessories.....362
Appendix 2 RS485 Communication Protocol.....367
Appendix 3 User Warranty Card.....381

Chapter 1 Safety precautions

1.1 Safety Symbols and Definitions

The safety precautions detailed in this user manual are of utmost importance. To ensure safe and proper use and operation of the inverter—and to prevent injury to yourself or others, as well as damage to machinery, equipment, or other property—please be sure to thoroughly understand the following safety symbols and their definitions, and strictly observe all indicated precautions.

Safety symbols	Symbol definitions
	This symbol indicates that failure to operate as required may result in serious personal injury or significant damage to equipment.
	This symbol indicates that failure to operate as required may result in personal injury or damage to equipment to some extent.
	This symbol indicates precautions that must be observed during operation or use.
	This symbol provides helpful information for the user.
	This symbol signifies actions that are strictly prohibited.

Safety symbols	Symbol definitions
	This symbol signifies actions that must be performed.

1.2 Scope of Application



This inverter is intended for use with general industrial three-phase AC asynchronous electric motors.

- This inverter must not be used in equipment where drive failure or malfunction could endanger human life or cause personal injury (such as nuclear power control systems, aerospace equipment, transportation equipment, life-support systems, safety devices, weapon systems, etc.). For special applications, please consult the manufacturer in advance.
- Although this product is manufactured under strict quality management system supervision, appropriate safety measures must be implemented when used in critical applications to prevent escalation of incidents in the event of drive failure.

1.3 Installation Environment



- Install in an indoor, well-ventilated location. Generally, install vertically to ensure optimal cooling. If installing horizontally, additional ventilation may be required.
- The ambient temperature must be within the range of -10 to 40°C. If the temperature exceeds 40°C, remove the top cover; if it exceeds 50°C, external forced cooling is required, or the inverter must be derated. Users are advised not to operate the inverter in such high-temperature environments, as this will significantly reduce its service life.
- Install in a location where vibration does not exceed 0.5 G to prevent damage from falling. The inverter must not be subjected to sudden impacts.
- Install in an environment away from electromagnetic fields and free of flammable or explosive substances.



- Ensure that the inverter is installed on fireproof materials (such as metal) to prevent fire hazards.
- Ensure that no foreign objects enter the inverter, such as wire fragments, solder, zinc or iron pieces, in order to prevent circuit short-circuits that could result in inverter burn-out.

1.4 Installation Safety Precautions

- 

It is strictly prohibited to operate with wet hands.
- It is strictly prohibited to perform wiring work unless the power supply is completely disconnected.
- During power-on operation of the inverter, it is strictly prohibited to open the front cover or carry out wiring work; otherwise, there is a risk of electric shock.
- When performing wiring, inspection, or related operations, ensure that the power supply has been switched off for at least 10 minutes before beginning. Failure to do so may result in electric shock.

- 

Do not install or use an inverter with damaged or missing components, in order to prevent personal injury and property loss.
- The main circuit terminals and cables must be securely connected; otherwise, poor contact may result in damage to the inverter.
- For safety reasons, the ground terminal of the inverter must be reliably grounded. To prevent ground loop interference, the single-point grounding method must be employed when grounding multiple inverters, as shown in Figure 1-1.

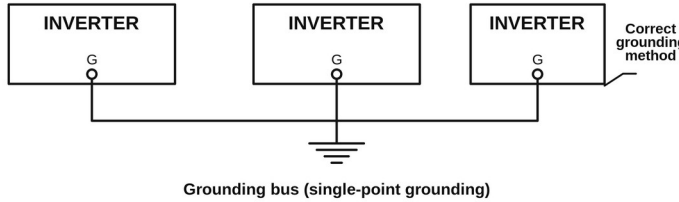


Figure 1-1



- It is strictly prohibited to connect any terminals other than TA, TB, or TC among the control terminals to the AC 220V power supply; otherwise, the inverter may be damaged.
- It is strictly forbidden to connect the AC power supply to the output terminals U, V, or W of the inverter; otherwise, it will cause damage to the inverter, as illustrated in Figure 1-2.

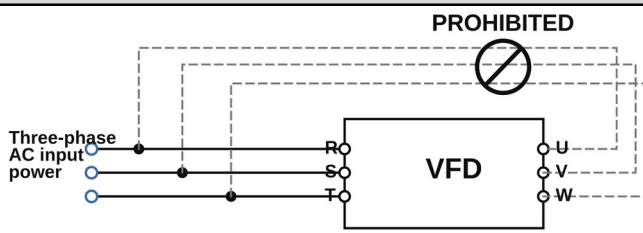


Figure 1-2



- Be sure to install a non-fuse circuit breaker for circuit protection on the input power supply side of the inverter to prevent escalation of accidents caused by inverter malfunctions.



- It is not advisable to install an electromagnetic contactor on the output side of the inverter, as switching the contactor during the motor operation may generate switching overvoltage and damage the inverter. However, in the following three situations, installation is necessary: ① For energy-saving control using a variable frequency speed controller, if the system frequently operates at rated speed, the inverter should be disconnected to enable efficient operation. ② When the inverter is involved in critical process flows and prolonged shutdown is not permissible, it must be capable of switching between various control systems to improve system reliability. ③ When a single inverter controls multiple motors. Users must ensure that the contactor does not operate when the inverter has output present.

1.5 Usage Safety Precautions



- Operation with wet hands is strictly prohibited.
- If the inverter has been stored for more than one year, a charging test must be conducted prior to use to restore the characteristics of the main circuit filter capacitors. When charging, use a voltage regulator to gradually increase the voltage to the rated value. Generally, the charging time should be within 1 to 2 hours; otherwise, there is a risk of electric shock and explosion.
- Do not touch the interior of the inverter after the unit is powered on, and never insert rods or any other objects into the inverter. Failure to comply may result in fatal electric shock or cause the inverter to malfunction.
- Do not open the front cover while the inverter is energized, as there is a risk of electric shock.
- Exercise caution when using the power-off and restart function, as improper operation may cause serious injury or death.



- If operating the inverter above 50 Hz, always confirm that your motor bearing and mechanical device permit operation within this speed range; otherwise, the motor may be damaged. Mechanical devices such as gearboxes and gears that require lubrication should not be operated at low speed for prolonged periods, as this will reduce their service life and may cause equipment damage. When operating an ordinary motor at low frequency, the cooling performance is reduced and derated operation is required. For constant torque load, the motor must employ forced ventilation or a dedicated inverter motor should be used. If the inverter will not be used for an extended period, always disconnect the input power supply to prevent damage to the inverter or even a potential fire hazard caused by the infiltration of foreign matter or other reasons. Since the output voltage of the inverter is a PWM pulse wave, do not install capacitors or surge absorbers (such as varistors) at the inverter output terminals, as this may cause drive faults, trips, or even damage to power devices. If such components are already installed, they must be removed. See Figure 1-3.

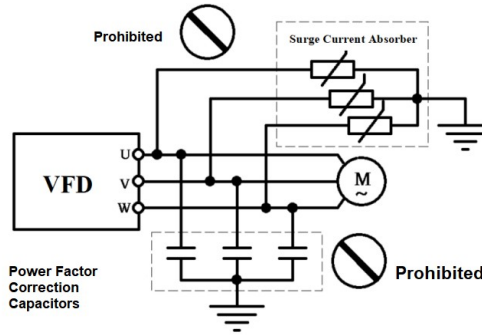


Figure 1-3

WARNING

- Before the Motor is used for the first time or after being left idle for an extended period, an insulation resistance test must be conducted, and the measured insulation resistance shall not be less than 5 MΩ.
- If the inverter is to be used outside the permissible operating voltage range, a step-up or step-down device must be installed for voltage adjustment.
- At Altitudes above 1000 meters, the Cooling efficiency of the inverter decreases due to thinner air, thus derated operation is required. Typically, the rating should be reduced by approximately 10% for every 1000 m increase in altitude. Refer to Figure 1-4 for the derating curve.

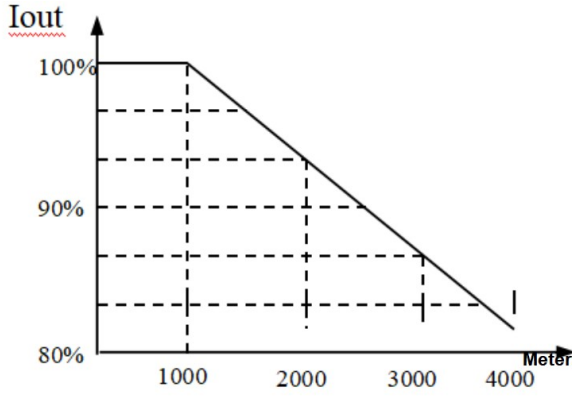


Figure 1-4 Inverter Derating Curve



- Do not touch the heat sink or charging resistor of the inverter by hand, as this may result in burns.
- It is strictly prohibited to use contactors or other switching devices on the power supply side (input side) of the inverter for direct and frequent start-stop operations. Due to the presence of large charging current in the main circuit of the inverter, frequent power cycling can cause the thermal accumulation effect, leading to thermal fatigue of components and significantly reducing the inverter's service life. See Figure 1-5.



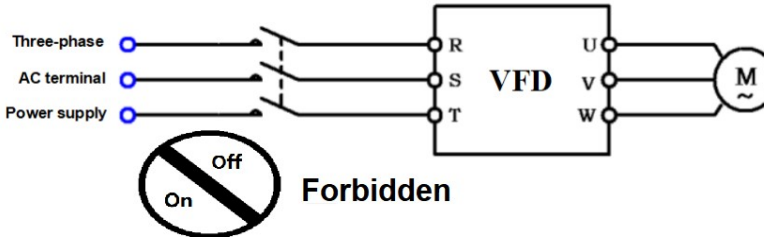


Figure 1-5

- WARNING

  If the inverter emits smoke, abnormal odors, or unusual noises, immediately disconnect the power supply and perform maintenance or contact the agent for service.

1.6 Disposal Precautions

- WARNING

  Electrolytic capacitors in the inverter may explode if incinerated; ensure proper disposal procedures are followed.

- Burning plastic components such as the keypad may release toxic gases; handle disposal in accordance with safety regulations.

- INFORMATION

  Dispose of the inverter as industrial waste.

Chapter 2 Product Overview

2.1 Incoming Inspection

This product is backed by an excellent quality assurance system and undergoes strict inspection, as well as anti-collision and anti-vibration packaging before shipping. However, damage due to severe impact or compression during transportation cannot be entirely ruled out. Therefore, upon receipt, please immediately unpack the product and verify the following items:

① Check whether the product enclosure is damaged or deformed, and whether any components are damaged or detached;

② Inspect the nameplate of the inverter to confirm that the product matches your order specifications;

③ Verify that all items listed in the packing list are present;

If any of the above issues are identified, please contact the supplier or manufacturer immediately for resolution.

2.2 Model Description

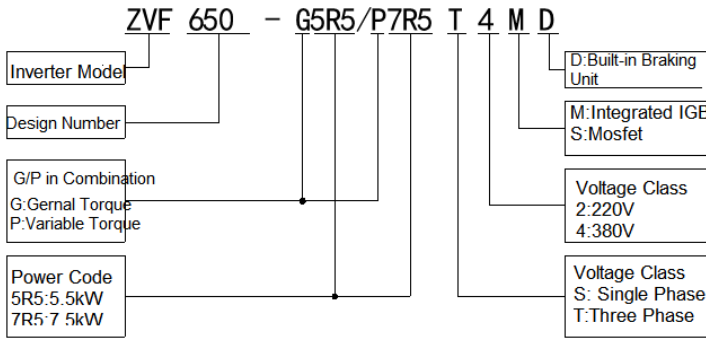


Figure 2-1 Inverter Model Demonstration

2.3 Nameplate Description

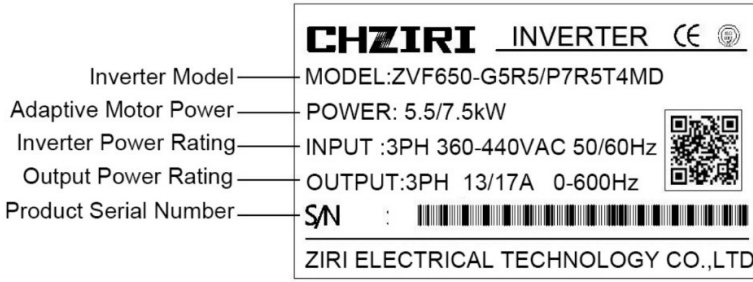


Figure 2-2 Inverter nameplate

2.4 Model Specifications

Table 2-1 Model Specifications of the inverter

Model Specifications (G: Constant torque load)	Input voltage (V)	Rated output Current (A)	Matching Motor Power (kW)
ZVF650-G0R4T2/S2	200-240	2.4	0.4
ZVF650-G0R7T2/S2	200-240	4.5	0.75
ZVF650-G1R5T2/S2	200-240	7.0	1.5
ZVF650-G2R2T2/S2	200-240	10.0	2.2
ZVF650-G3R0T2/S2	200-240	13.0	3.0
ZVF650-G4R0T2	200-240	17.0	4.0
ZVF650-G5R5T2	200-240	20	5.5
ZVF650-G7R5T2	200-240	30	7.5
ZVF650-G0R7T4	360-440	2.5	0.75
ZVF650-G1R5T4	360-440	3.7	1.5
ZVF650-G2R2T4	360-440	5.0	2.2
ZVF650-G3R0T4	360-440	6.8	3.0
ZVF650-G4R0T4	360-440	9.0	4.0
ZVF650-G5R5T4	360-440	13	5.5
ZVF650-G7R5T4	360-440	17	7.5
ZVF650-G011T4	360-440	25	11
ZVF650-G015T4	360-440	32	15
ZVF650-G018T4	360-440	37	18.5

2.5 Technical Specifications

Table 2-2 Technical Specifications Overview

Item		Item Description
Input	Rated Voltage, Frequency	Single-phase/Three-phase 200-240 VAC, Three-phase 360-440 VAC, 50/60 Hz
	Allowable Voltage Operating Range	Voltage fluctuation range: 10%; Voltage imbalance rate: 3%; Frequency fluctuation: ≤5%
Output	Rated voltage	Three-phase 0~input voltage VAC
	Rated frequency	0.00–599.00 Hz
Overload Capacity		G type: 150% for 1 minute, 180% for 3 seconds, 200% instantaneous protection.
Control Functions	Modulation Method	Optimized Space Vector PWM Modulation
	Control Method	Open-loop control (SVC), V/F control
	Frequency Resolution	Digital Setting: 0.01 Hz; Analog Setting: Maximum Frequency × 0.1%
	Starting Torque	0.5 Hz/150% (SVC)
	Speed Control Range	1:100 (SVC)
	Speed Regulation Accuracy	±0.5% (SVC)
	Torque Boost	Automatic torque boost, automatically increases torque according to the output current Manual torque boost, range: 0.1–30.0%

Item		Item Description
	V/F Curve	Three types: linear; multipoint; and N-th power type V/F curve (1.2 power, 1.4 power, 1.6 power, 1.8 power, 2.0 power)
	V/F Separation	Two types: full separation and partial separation
	Acceleration/ Deceleration Curve	Linear or S-curve acceleration/deceleration method. Four Acceleration/Deceleration times, Acceleration/Deceleration time range: 0.0–6500.0 s
Control Functions	Carrier frequency	1. 0~15.0KHz
	Jog Function	Jog frequency range: 0.01 ~50.00 Hz, jog acceleration/deceleration time Configurable from 0.1 to 6500.0.
	Basic PLC, multi-speed Operation	Up to 16-speed operation via built-in PLC or control terminal
	Automatic Voltage Regulation (AVR)	Automatically adjusts PWM output to maintain constant output voltage when the grid voltage fluctuates
	Built-in PID	Easily forms a closed-loop control system, suitable for process control such as pressure and flow regulation
	Overvoltage/ Overcurrent Stall Control	Automatically limits current and voltage during operation to prevent frequent overcurrent and over voltage trip
	Rapid current limiting function	Minimizes overcurrent faults and protects the inverter's normal operation
	Torque limitation and control	'Excavator' characteristic: automatically limits torque during operation to prevent frequent overcurrent trips

Item		Item Description
Distinctive features	Outstanding performance	Implements asynchronous motor control with high-performance current vector control technology
	Instantaneous power-failure ride-through	During momentary power loss, compensates voltage drop with load feedback energy to sustain short-term inverter operation
	Rapid current limiting	Prevents frequent inverter overcurrent faults
	Virtual I/O	Five groups of virtual DIDO enable basic logic control.
	Timer control	Timer control function: configurable time range 0.0 Min to 6500.0 Min.
	Multi-motor switching	Two sets of motor parameters allow control and switching between two motors.
	Bus support	Supports fieldbus: Modbus.
Operation functions	Operation commands	Keypad control, external terminal control, and serial communication control. Multiple mode switching options available.
	frequency setting	Multiple frequency sources: digital reference, analog voltage reference, analog current reference, pulse reference, and serial port reference. Multiple mode switching options available.
	Auxiliary frequency source	Multiple auxiliary frequency sources are available, enabling flexible auxiliary frequency fine-tuning and frequency synthesis.

Item		Item Description
	Input terminal	Standard: 4 digital input terminals. 2 analog input terminals, one supports 0–10V voltage input. One supports 0–10V voltage input or 0–20 mA current input.
	Output terminals	Standard: One high-speed pulse output terminal, supports 0–100 kHz square wave signal output. One digital output terminal. One relay output terminal. Two analog output terminals, support 0–20 mA current output or 0–10V voltage output.
Braking function	Dynamic braking	External braking resistor, maximum braking torque 100%.
	DC braking	Selectable for start-up and stop; operating frequency 0–599 Hz, operating current level 0–150%, operating time 0–50 seconds; all parameters are continuously configurable.
LED Display		Provides real-time display of the inverter's operating status, monitoring parameters, function parameters, fault codes, and other relevant information.

Item		Item Description
Other Functions		Jump frequency, counter, speed tracking, instantaneous power failure restart, frequency upper and lower limit restrictions, adjustable acceleration and deceleration modes, two-wire/three-wire control, swing frequency control, automatic fault reset, frequency reach output, cooling fan control, multi-function key customizable settings, and more.
Protection Functions		Motor short circuit detection on power-up, input/output phase loss protection, overcurrent protection, overvoltage protection, undervoltage protection, overheat protection, overload protection, and more.
Optional Accessories		Braking unit, remote keypad and connection cable, communication board
Ring Environment	Installation site	Indoors, not exposed to direct sunlight, corrosive gases, or flammable and explosive gases
	Altitude	Below 1000 meters
	Ambient temperature	-10 to +40°C [for open-frame units: -10 to +50°C]
	Vibration	Less than 0.5G
	Storage temperature	-20–+60C°
Knot Structure	Degree of protection	IP65
	Cooling method	Forced air cooling
	Installation method	Wall-mounted

Chapter 3 Inverter Installation and Wiring

3.1 Inverter Installation

3.1.1 Usage Environment

- Altitude below 1000 meters
- Ambient temperature -10 to +40℃ [for open unit: -10 to +50℃]
- Indoors, not exposed to direct sunlight,
- No corrosive gases, flammable, or explosive gases
- Vibration Less than 0.5G

3.1.2 Installation Space and Orientation

To ensure effective cooling and facilitate maintenance, sufficient space must be reserved around the inverter during installation, and the unit must be mounted vertically (see Figure 3-1); When installing two or more inverters in the same control cabinet, it is recommended to arrange them horizontally, side by side, to reduce mutual heat effects (see Figure 3-2); If installation above and below is necessary, to prevent the heat generated by the lower inverter from directly affecting the upper unit, a partition plate should be installed between them (see Figure 3-3).

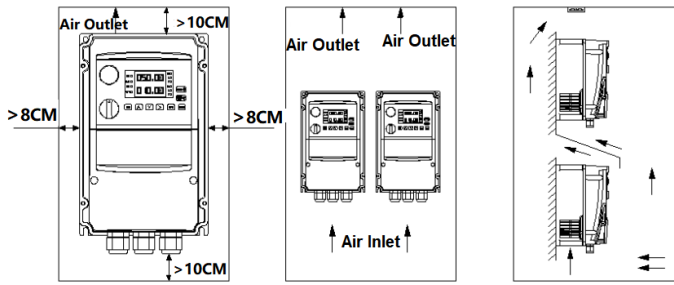


Figure 3-1 Installation Clearance Diagram Figure 3-2 Multiple Units Installation Diagram Figure 3-3 Vertical Installation Diagram

3.2 Inverter Wiring

3.2.1 Basic Inverter Wiring Diagram

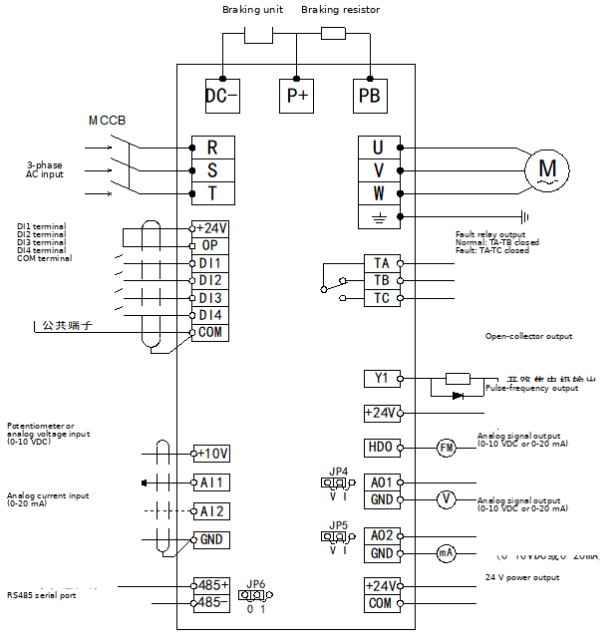


Figure 3-4 Basic wiring diagram

Applicable models: ZVF650-G0R4S2 to 3R7S2 ZVF650-G0R4T2–090T2

ZVF650-G0R7T4–185T4

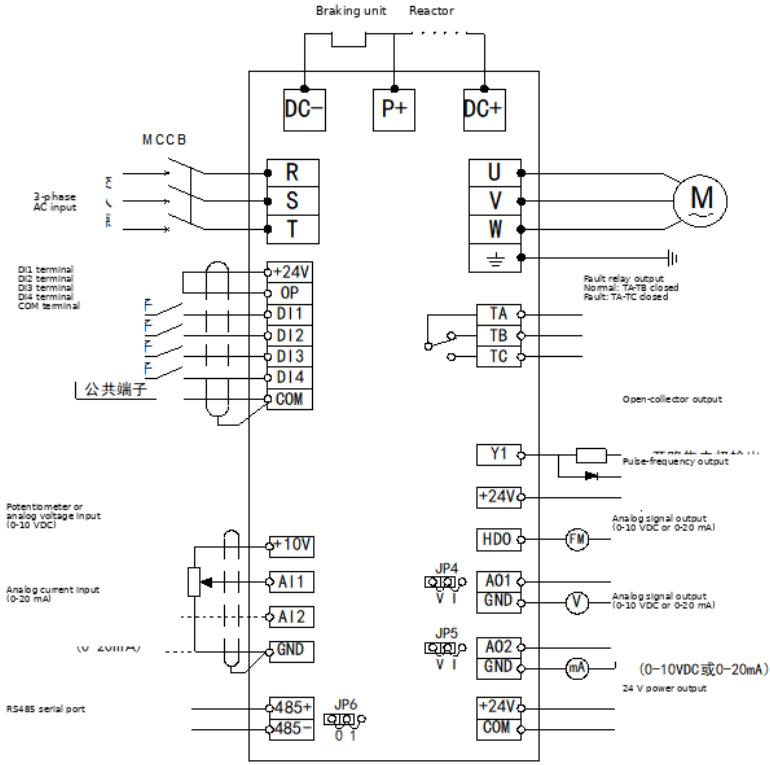


Figure 3-5 Basic wiring diagram

- Analog output **AO1, AO2** Voltage/current selection jumpers: **JP4, JP5**.
- **485** Communication terminal resistor selection: **JP6**.

3.2.2 Wiring Precautions:

- 

Ensure that the power supply is completely disconnected for at least 10 minutes before opening the inverter front cover. Confirm that the inverter charge indicator has turned off and that the voltage between main circuit terminal P and DC- is below 36 VDC before performing any internal wiring work. All internal wiring work must be carried out by qualified professionals who have received appropriate training and authorization.
-
-



- Ensure that the rated input voltage of the inverter is consistent with the voltage of the AC power supply. If the input voltage level does not match, damage to the inverter may occur.
- Install in the prescribed order: complete installation of the main unit before connecting any wiring to prevent electric shock hazards or damage to the inverter.
- The inverter has already passed the dielectric withstand test prior to leaving the factory. Users must not perform this test on the inverter again.





- A fuse circuit breaker must be installed between the power supply and the inverter to prevent the escalation of accidents caused by inverter faults, which could damage the distribution system or cause a fire.
- Be sure to connect the ground terminal of the inverter and the electric motor casing to the grounding conductor. The grounding conductor shall be copper core wire with a cross-sectional area in accordance with relevant national standards; ground resistance must be less than 10Ω.

- If the load connected to the open-collector output terminal is an inductive load (such as a relay coil), be sure to connect a freewheeling diode in parallel across the load.



- Control cables within the inverter or control cabinet must be kept at least 100 mm away from power cables and must never be placed in the same cable tray. If signal cables must cross power cables, they should be routed at a right angle (90°). Control cables must use shielded twisted-pair cable, with the shield connected to the GND terminal; power cables should preferably use armored shielded cable.
- Since inverters inevitably generate significant electromagnetic interference, this can adversely affect various electrical equipment and instruments in the same environment. To reduce this interference, the inverter's output cables can be routed through a grounded metal conduit, or armored shielded cables can be used with the armor shield grounded. Additionally, fitting magnetic rings onto the output cables can also effectively reduce interference.



- The input power lines R, S, and T have no specific phase sequence and can be connected in any order.
- If, after the inverter starts running, the motor's rotation direction does not match the required direction, simply swap any two of the three wires connected to the motor.
- If a ground-fault circuit interrupter (GFCI) is installed on the inverter for ground-fault protection, select a GFCI with a ground-fault current rating of 200 mA or higher and a trip time of 0.1 seconds or longer to prevent false tripping.

3.2.3 Main Circuit Terminal Description

1、The main circuit terminals are shown in Figures 3-6 to 3-9.

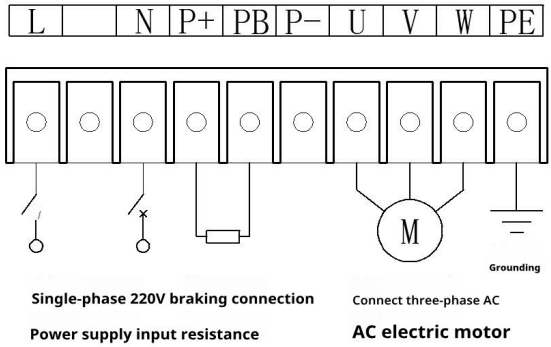


Figure 3-6 Main circuit terminal diagram 1

Applicable models: ZVF650-G0R4S2 to 5R5S2

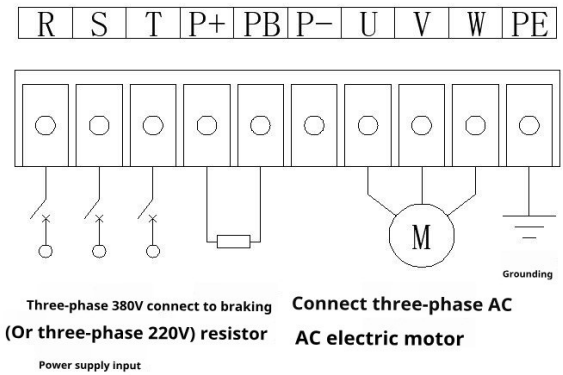


Figure 3-7 Main circuit terminal diagram 2

Applicable models: ZVF650-G0R4T2 to 5R5T2

ZVF650-G0R4T4 to 5R5T4

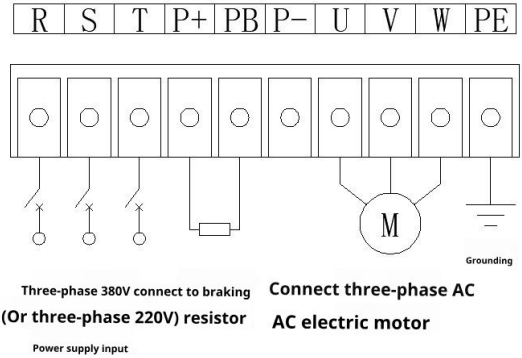


Figure 3-8 Main circuit terminal diagram 3

Applicable models: ZVF650-G7R5S2 to 018S2

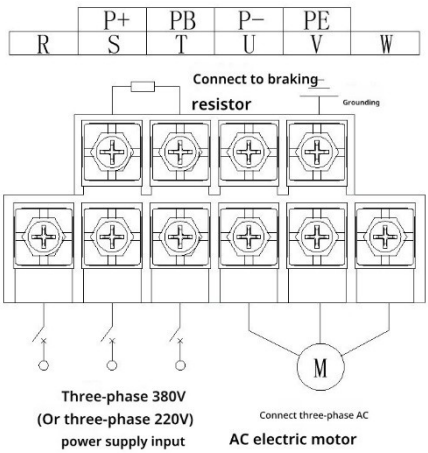
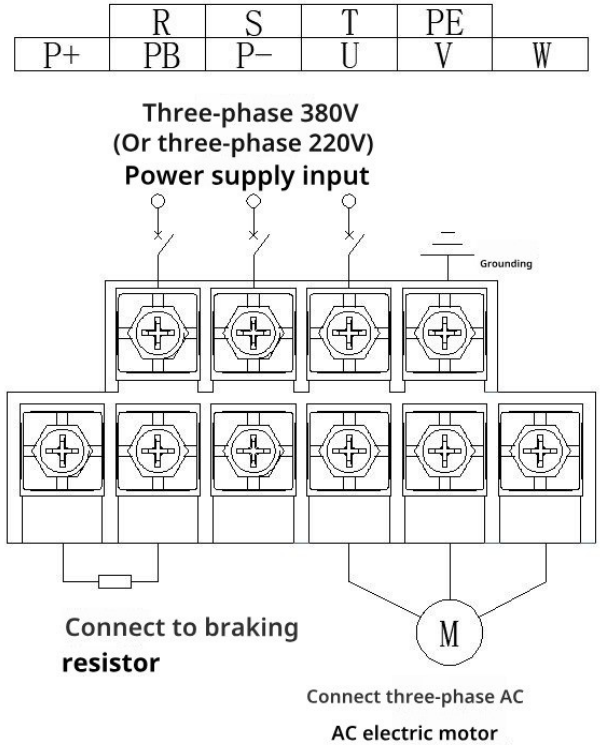


Figure 3-9 Main circuit terminal diagram 4

Applicable models: ZVF650-G7R5T2 to 018T2

ZVF650-G7R5T4 to 018T4



2、Main circuit terminal function description

Table 3-1 Main circuit terminal function description

Terminal designation	Function description
R, S, T	Power supply input terminal; connect to three-phase 380V or 220V AC input power supply
L, N	Power supply input terminal; connect to single-phase 220V AC input power supply
U, V, W	inverter output terminal; connect to three-phase AC electric motor
(+), BR	External braking resistor terminal; connect to both ends of the external braking resistor
(+), (-)	External braking unit terminal; connect P+ to the positive terminal and P- to the negative terminal of the braking unit
⏚ **PE**	Ground terminal; connect the grounding conductor

- G0R4 to G018T2, G0R4 to G018T4 The inverter is equipped with an internal braking unit. When an external braking resistor is required, it can be connected between the P+ and PB terminals.

TIP

3.2.4 Control Board and Terminal Description

1. For the control board and terminals, see Figures 3-12 and 3-13.

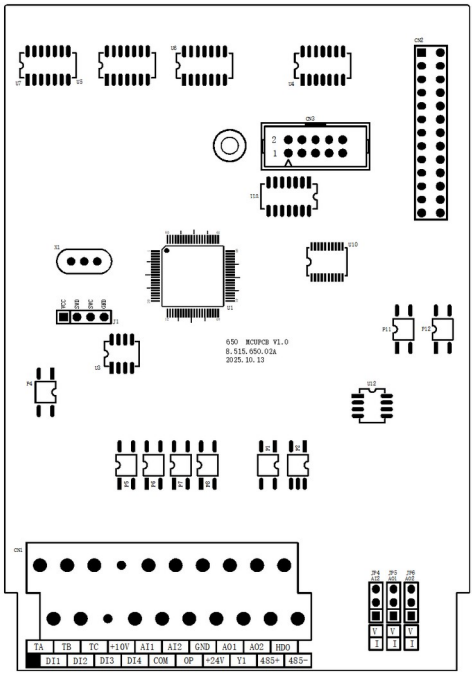


Figure 3-12 Control Board Diagram

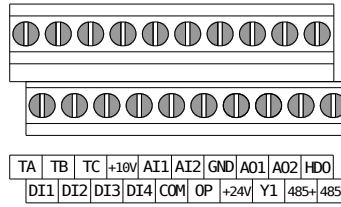


Figure 3-13 Control Circuit Terminals

2. Description of Control Circuit Terminals

Table 3-2 Control Circuit Terminal Function Descriptions

Category	Terminal No./Label	Function description	Electrical Specification
Multi-function Input Terminal	OP	Digital Signal Power Supply Selection Terminal	INPUT, 0~24V voltage level signal, 5 mA
	DI1	DIn(n=1, 2, 3, 4) Active when connected between DIn and COM; the functions of DI1 to DI4 are configured by parameters F4.00 to F4.03.	
	DI2		
	DI3		
	DI4		
	COM	Digital Signal Common Terminal	
Multi-function Output Terminal	Y1	Multi-function open collector output, defined as a switch-type output terminal for multiple functions. The specific function is configured via parameter F5.04, with reference ground as COM.	OUTPUT, maximum load current I ≤ 50 mA

Category	Terminal No./Label	Function description	Electrical Specification
	HDO	Constrained by function code F5.00 'HDO terminal output mode selection.' When configured as high-speed pulse output, the maximum frequency is up to 100 kHz; when configured as open collector output, the specification matches that of Y1.	OUTPUT, maximum load current I ≤ 50 mA
Analog common terminal	GND	Analog signal common terminal	
Analog input terminal	+10V	External analog reference power supply, Reference ground: GND	OUTPUT, 10V DC voltage
	AI1	Analog voltage signal input, Reference ground: GND	INPUT, 0–10V DC voltage
	AI2	Analog current signal input, Reference ground: GND, input impedance 500 Ω	INPUT, 0–10V DC voltage Or 0–20 mA DC current
Analog output terminal	AO1	Programmable analog output, Reference ground: GND	OUTPUT, 0–10V DC voltage Or 0–20 mA DC current

Category	Terminal No./Label	Function description	Electrical Specification
	AO2		OUTPUT, 0–10V DC voltage Or 0–20 mA DC current
Power supply interface	+24V	24 VDC power output (control power supply), Reference ground: COM	24 VDC-100 mA
Programmable relay output terminal	TA	Relay contact output. In normal state: TA-TB closed, TA-TC open When activated: TA-TB open, TA-TC closed; function determined by F5.02.	Contact rated value: NO:240 VAC-3A NC:240 VAC-1A
	TB		
	TC		
Communication terminal	485+	Communication signal positive terminal	
	485-	Communication signal negative terminal	

3.3 Inverter System Wiring Diagram

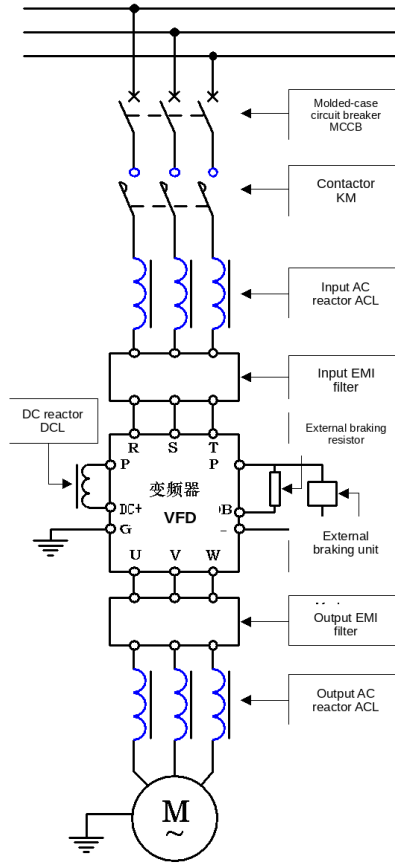


Figure 3-14 Connection between the inverter and the optional accessory



• The circuit breaker provides overcurrent protection to prevent the spread of faults to downstream equipment. Ensure that the circuit breaker is correctly rated; refer to Table 3-3 for selection guidelines.

• The electromagnetic contactor disconnects the main power supply in the event of an inverter fault and prevents restart after a power failure or malfunction.

• An input AC reactor mitigates the effects of three-phase AC power supply imbalance, improves the inverter input power factor, and reduces potential damage to the rectifier circuit caused by connecting large-capacity motors. An AC reactor is required if any of the following conditions are present:

① Power supply imbalance exceeds 3%;

② The power supply capacity is at least 500 kVA and more than ten times the capacity of the inverter;

③ Sudden changes in grid voltage are caused by switching power-factor compensation capacitors or other factors.

It is recommended to install a reactor with a 3% voltage drop at rated current.

For detailed system wiring specifications, refer to Table 3-3.

- Input and output EMI filters are used to reduce electromagnetic or radio-frequency interference originating from either the grid or the inverter.
- The braking unit dissipates energy fed back into the inverter by loads with substantial potential energy or inertia, preventing inverter trips caused by excessive regenerative voltage and enabling rapid stopping.
- The output AC reactor filters high-order harmonic components from the

inverter output current, reduces electromagnetic interference, improves the current waveform, lowers motor noise and temperature rise, and improves motor stability. For long motor cables, an output AC reactor is recommended to mitigate leakage current caused by distributed capacitance.

• For detailed system wiring specifications, refer to Table 3-3.

Table 3-3 Circuit Breaker Capacity and Conductor Cross-sectional Area

Model Specifications	Circuit Breaker Capacity (A)	Main Circuit (mm^2)		Control cable (mm^2)
		Input cable	Output cable	
ZVF650-G0R4T2/S2	6/16	2.5	2.5	0.75
ZVF650-G0R7T2/S2	10/20	2.5	2.5	0.75
ZVF650-G1R5T2/S2	10/20	2.5	2.5	0.75
ZVF650-G2R2T2/S2	16/32	4	4	0.75
ZVF650-G3R0T2/S2	25	4	4	0.75
ZVF650-G4R0T2	25	4	4	0.75
ZVF650-G5R5T2	32	6	6	0.75
ZVF650-G7R5T2	50	6	6	0.75
ZVF650-G0R7T4	6	2.5	2.5	0.75
ZVF650-G1R5T4	6	2.5	2.5	0.75
ZVF650-G2R2T4	10	2.5	2.5	0.75
ZVF650-G3R0T4	10	4	4	0.75
ZVF650-G4R0T4	16	4	4	0.75
ZVF650-G5R5T4	20	4	4	0.75

Model Specifications	Circuit Breaker	Main Circuit (mm²)		Control Line
ZVF650-G7R5T4	25	6	6	0.75
ZVF650-G011T4	40	6	6	0.75
ZVF650-G015T4	50	10	10	0.75
ZVF650-G018T4	63	10	10	0.75

Chapter 4 Keypad and Operation

4.1 Keypad and Description

The keypad of the ZVF650 series inverter is integrated with the main unit, and the available keypads include versions with a potentiometer or with a start/stop switch. If users require other panel styles, this should be specified in advance.

4.1.1 Keypad Diagram

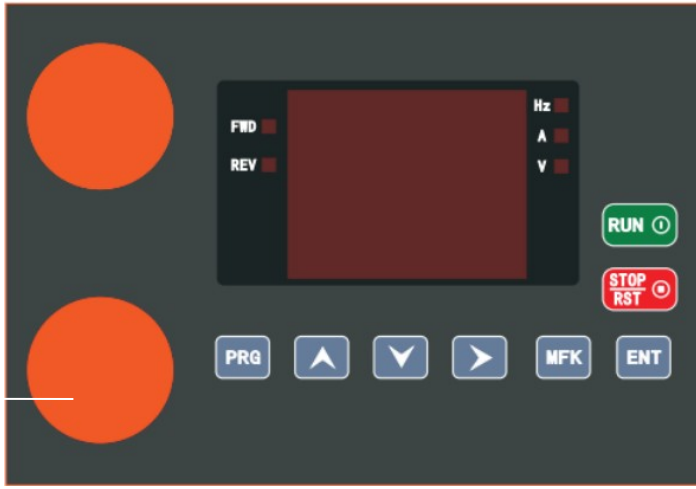


Figure 4-1 E-650 Keypad Schematic

Applicable models: Universal for the entire series

4.1.2 Functional Description of Each Key



Run key: When the run command is set to operator panel control (F0.02=0), pressing this key will start the inverter.



Stop/Reset key: When the run command is set to operator panel control (F0.02=0), and the inverter is in normal operating status, pressing this key will stop operation. When the inverter is in the Fault Alarm state, press this key to clear the fault and restore normal operation.

Mode Selection Key: Press this key to switch the inverter between monitoring parameter mode and function parameter mode.



Confirm/Store Key: Press this key to confirm the current status of the inverter or to store the current parameter value.



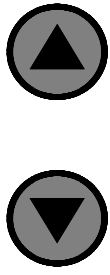
Reverse/Jog Key: Press this key to enable forward and reverse rotation switching or the jog function, as selected by parameter F7.01. The factory default is no function.



Monitor/Shift Key: During data modification, press this key to select the bit to be edited; in monitoring mode, press this key to switch the displayed status parameter.



Increase Key: Press this key or rotate the encoder clockwise to increase data or parameter code. Holding the key or rotating the encoder continuously will speed up the upward adjustment.



Decrease key: Press this key or rotate the encoder counterclockwise to decrease the data or function code. Holding the key or continuously turning the encoder increases the speed of downward modification

4.1.3 Description of Keypad Indicator Functions

Table 4-1 Status Description of Indicators

Display status	Function description

● A	When this indicator is illuminated, the LED displays current data.
● V	When this indicator is illuminated, the LED displays voltage data.
● FWD	When this indicator is illuminated, the inverter is in forward run.
● REV	When this indicator is illuminated, the inverter is in reverse operation.

4.1.4 Usage of the Keypad

Changing parameter values of function codes (restoring all inverter parameters to factory default values)



Chapter 5 Inverter Usage

5.1 Commissioning

5.1.1 Pre-Commissioning Inspection

Prior to commissioning the inverter, confirm and verify the following items:

- The operating environment and installation of the inverter must comply with the requirements of Section 3.1;
- Ensure wiring is correct, especially that the inverter power supply input is connected to the L, N or R, S, T terminals, and that output terminals U, V, W are connected to the motor;
- The ground terminal of the inverter is properly grounded;
- All switches and terminals that should be off or disconnected are in the off or disconnected state;
- There are no short circuits between terminals or between any live parts and ground;
- All terminals, connectors, and screws are securely fastened, with no looseness observed;
- The motor is not connected to any other load.

5.1.2 Commissioning

After completing the checks in Section 5.1.1, commissioning may begin. Whenever possible, commission the motor without load to prevent equipment damage caused by incorrect operation. Set the command source selection (F0.02) to operator-panel RUN/STOP control (default setting). The commissioning procedure is shown in Table 5-1.

Table 5-1 Commissioning Operation Steps

Sequence	Operation	Description
1	Switch on the inverter.	The inverter enters standby mode; the LED displays 50.00 Hz and flashes.
2	Use ▲/▼ to set 5.00 Hz.	Set the displayed frequency to 5.00 Hz. Skip this step if it already reads 5.00 Hz.
3	Press RUN.	The motor starts. In frequency monitoring mode, the displayed frequency increases from 0.00 to 5.00 Hz.
4	Check the motor and inverter: vibration/noise, faults, rotation direction and displayed speed/frequency.	If any abnormality or trip occurs, stop immediately and disconnect power. Diagnose the cause using Chapter 7; resume only after it is resolved. If rotation is wrong, disconnect power before interchanging any two U/V/W motor leads. If operation is normal, proceed.
5	Hold ▲ until 50.00 Hz is displayed.	The motor accelerates from 5.00 to 50.00 Hz. If operation is normal, continue.
6	Hold ▼ until 0.00 Hz is displayed.	The motor decelerates from 50.00 to 0.00 Hz. If all conditions are normal, continue.
7	Press STOP.	The inverter stops output and the motor stops. If all checks were satisfactory, commissioning is complete.

5.1.3 Precautions

All functions of the Inverter are defined by the set parameters. The parameters of the ZVF650 series inverter comprise general function codes F, enhanced function codes H, and operating status parameters U. For further details, refer to Chapter 6 of this manual. At the time of shipment, the parameter value displayed for each function code of the Inverter corresponds to its default value. Users may modify parameters as required; however, as certain parameters are interrelated, relevant function parameters should also be adjusted simultaneously when changes are made. Unless otherwise specifically necessary, it is recommended that users do not arbitrarily change parameter settings. The Inverter is appropriately configured with suitable settings at the factory in order to avoid parameter disorder and prevent damage to the Inverter or mechanical equipment.

If the user has erroneously changed parameters or disrupted parameter values, perform parameter initialization according to the procedure described in Section 4.1.4, Item ③ (Parameter Initialization—Restoring Factory Settings).

5.2 Usage Example

This manual provides the following usage examples for user reference during the application of the inverter.

5.2.1 Example 1: Keypad control for Start-up and Stop, with frequency set via the keypad up/down keys

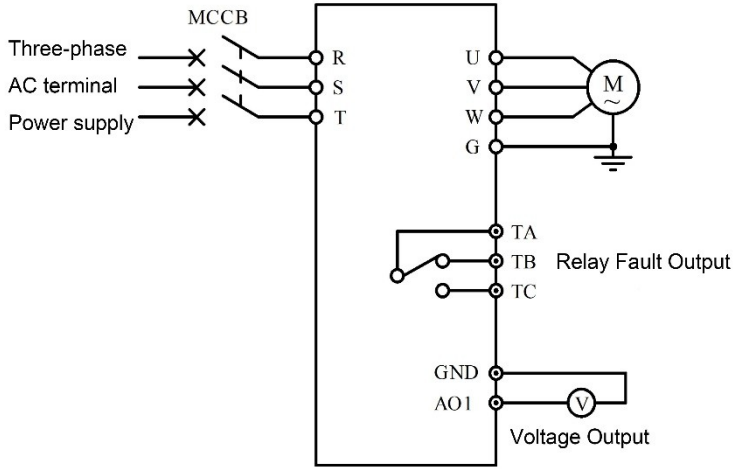


Figure 5-1 Example 1 Wiring Diagram

- F0.02— Command source selection: set to 0 — Keypad control;
- F0.03— Main frequency source X selection: set to 0 — Panel up/down keys setting;
- Use the keypad RUN STOP RESET to execute Start-up and Stop operations;
- Adjust the speed using the panel's up and down keys.

5.2.2 Example 2: Start and Stop Control via External Terminals, Frequency Set by External Potentiometer

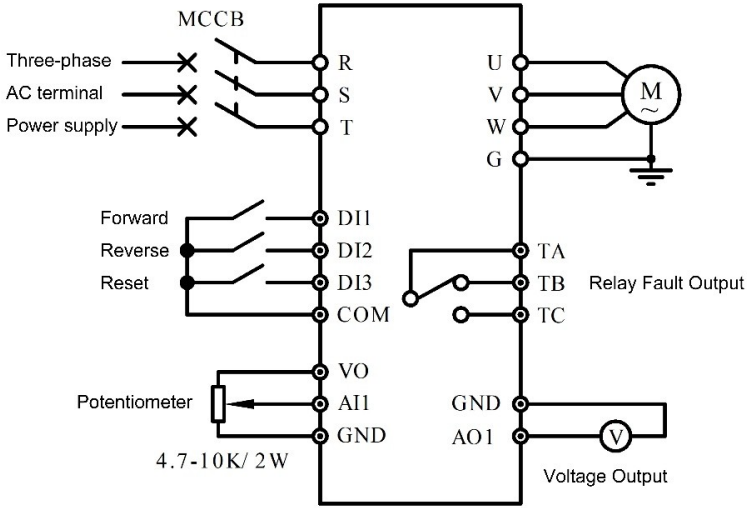


Figure 5-2 Wiring Diagram for Example 2

- F0.02— Command source selection: Set to 1 — External terminal control;
- F0.03— Main frequency source X selection: Set to 02 — External voltage or external potentiometer;
- F4.00— Input terminal DI1 function selection: Set to 1 — Forward Run;
- F4.01— Input terminal DI2 function selection: Set to 2 — Reverse rotation;
- F4.02— Input terminal DI3 function selection: Set to 9 — External reset input;

- DI1 — DI1—COM closed: Motor forward operation; DI2—COM closed: Motor reverse operation; DI1, DI2 — DI1—COM and DI2—COM both closed or both open: inverter stops; During fault alarm, DI3—COM closed: Fault Reset;
- Adjust the AI1 value (controlled by a 4.7–10K/2W Potentiometer) to achieve Speed control.

5.2.3 Example 3: Start-up/Stop and Multi-step Speed Operation via External terminal control

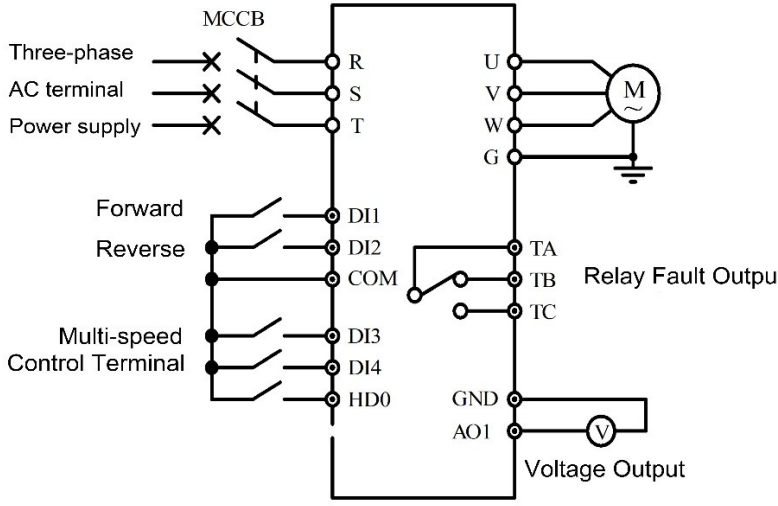


Figure 5-3 Example 3 Wiring diagram

- F0.02— Command source selection: Set to 1 — External terminal control;
- F0.03— Main frequency source X selection: Set to 06 — Multi-step speed

- F4.00— Input terminal DI1 function selection: Set to 1 — Forward Run;
- F4.01— Input terminal DI2 function selection: Set to 2 — Reverse rotation;
- F4.02–F4.05 — DI3–HDI function selection: Set to 12, 13, and 14 — Multi-step speed selection;
- FC.00–FC.15— Multi-step speed frequency setting: Sixteen frequency stages in total; default value is used;
- DI1 — DI1—COM closed: Motor forward operation; DI2—COM closed: Motor reverse operation; When DI1, DI2 — COM are either closed or opened simultaneously, the inverter will stop.
- If one or more of the DI3–HDI terminals are connected to COM (15 combinations in total), the inverter operates at the multi-step speed selected by DI3–HDI.

5.2.4 Example 4: External terminal control for start-up and stop; external potentiometer sets frequency; multiple motors running in parallel.

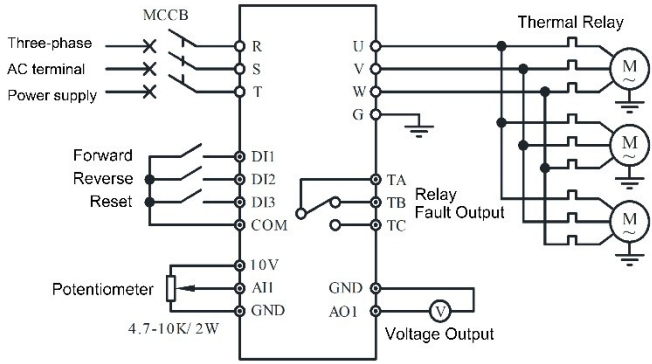


Figure 5-4 Wiring diagram for Example 4

- F0.02— Command source selection: Set to 1 — External terminal control;
- F0.03— Main frequency source X selection: Set to 02 — External voltage or external potentiometer;
- F4.00— Input terminal DI1 function selection: Set to 1 — Forward Run;
- F4.01— Input terminal DI2 function selection: Set to 2 — Reverse rotation;
- F4.02— Input terminal DI3 function selection: Set to 9 — External reset input;
- DI1 — DI1—COM closed: Motor forward operation; DI2—COM closed: Motor reverse operation; DI1, DI2 — DI1—COM and DI2—COM both closed or both open: inverter stops; During fault alarm, DI3—COM closed: Fault Reset;
- Adjust the AI1 value (controlled by a 4.7–10K/2W potentiometer) to implement speed control;

- Each motor must be protected against overload by an electronic thermal relay. The combined total rated power of all motors must not exceed the rated power of the inverter.

Chapter 6 Function Parameters

6.1 Function Parameter Summary Table

"√" indicates that the parameter setting can be modified when the inverter is in either the stop or operating status.

"×" indicates that the parameter setting can be modified only when the inverter is in the stop status and cannot be modified during operating status.

" – " indicates that the parameter is display-only and cannot be modified.

Function Parameter Summary Table

Function code	Name	Setting Range	Default	Modify
F0 Group Basic Function Group				
F0.00	G/P Type Indication	1: G type (Constant torque load model) 2: P type (Fan, water pump load model)	Model Selection	×
F0.01	Primary motor control Mode	0: V/F control 1: Sensorless Vector Control (SVC)	0	×
F0.02	Command source selection	0: Keypad command channel (LED off) 1: Terminal command channel (LED on) 2: Communication command channel (LED flashing) 3: Local switch for start/stop by the machine itself	0	√

Function code	Name	Setting Range	Default	Modify
F0.03	Main frequency source X selection	0: Digital Setting (Preset frequency F0.08; can be modified by UP/DOWN; not retained after power-down) 1: Digital Setting (Preset frequency F0.08; can be modified by UP/DOWN; retained after power-down) 2:AI1 3:AI2 4: Panel Potentiometer Setting 5: Reserved 6: Multi-step speed command 7: Basic PLC 8:PID 9: Communication setpoint 10: Solar-powered Water Supply	1	×
F0.04	Auxiliary frequency source Y selection	Same as F0.03 (Main frequency source X selection)	0	×
F0.05	Auxiliary frequency source Y in superposition mode Range selection	0: Relative to maximum frequency 1: Relative to frequency source X	0	√
F0.06	Auxiliary frequency source Y in superposition mode Range	0%–150%	100%	√

Function code	Name	Setting Range	Default	Modify
F0.07	frequency source superposition selection	Unit digit: frequency source selection 0: Main frequency source X 1: Result of main and auxiliary calculation (relationship defined by tens digit) 2: Switch between main frequency source X and auxiliary frequency source Y 3: Switch between main frequency source X and main–auxiliary calculation result 4: Switch between auxiliary frequency source Y and main–auxiliary calculation result Tens digit: Main and auxiliary frequency source calculation relationship 0: Main + Auxiliary 1: Main − Auxiliary 2: Maximum of the two 3: Minimum of the two	00	√
F0.08	Preset frequency	0.00 Hz–Maximum frequency (F0.10)	50.00 Hz	√
F0.09	Direction of operation	0: Same direction 1: Opposite direction	0	√
F0.10	Maximum frequency	50.00 Hz–599.00 Hz	50.00 Hz	×
F0.11	Upper limit frequency source	0: Set by F0.12 1:AI1 2:AI2 3: Reserved 4: Reserved 5: Communication Specifications	0	×
F0.12	Upper limit frequency	Lower limit frequency (F0.14) – maximum frequency (F0.10)	50.00 Hz	√

Function code	Name	Setting Range	Default	Modify
F0.13	Upper limit frequency offset	0.00 Hz–maximum frequency (F0.10)	0.00 Hz	√
F0.14	Lower Frequency Limit	0.00 Hz to Upper Frequency (F0.12)	0.00 Hz	√
F0.15	Carrier frequency	2.0 kHz to 15.0 kHz	Model Selection	√
F0.16	Carrier Frequency Varies with Temperature Adjustment	0: No 1: Yes	1	√
F0.17	Acceleration Time 1	0.00 s to 650.00 s (F0.19 = 2) 0.0 s to 6500.0 s (F0.19 = 1) 0 s to 65000 s (F0.19 = 0)	Model Selection	√
F0.18	Deceleration Time 1	0.00 s to 650.00 s (F0.19 = 2) 0.0 s–6500.0 s (F0.1 = 1) 0 s to 65000 s (F0.19 = 0)	Model Selection	√
F0.19	Acceleration/ Deceleration time unit	0: 1 second 1: 0.1 second 2: 0.01 second	1	×
F0.21	Auxiliary frequency source (for superposition) Bias frequency	0.00 Hz–maximum frequency (F0.10)	0.00 Hz	√

Function code	Name	Setting Range	Default	Modify
F0.23	Digital setting frequency stop mode Memory retention selection	0: Do not retain 1: Retain	1	√
F0.24	Motor parameter group selection	0: Motor parameter group 1 1: Motor parameter group 2	0	×
F0.25	Acceleration/ Deceleration time reference frequency	0: Maximum frequency (F0.10) 1: Setting frequency 2:100 Hz	0	×
F0.26	Run frequency command UP/DOWN reference	0: Run frequency 1: Setting frequency	1	×

Function code	Name	Setting Range	Default	Modify
F0.27	Command source binding to frequency source	Units digit: Keypad command binding frequency source selection 0: No binding 1: Digital Setting frequency 2:AI1 3:AI2 4: Reserved 5: Reserved 6: Multi-step speed command 7: Basic PLC 8:PID 9: Communication Specifications Tens digit: Terminal command binding frequency source selection Hundreds digit: Communication command binding frequency source selection	000	√
F0.33	Macro function	0: General Function 1: Water Supply Function 1 (refer to description below) 2: Water Supply Function 2 (refer to description below) 3: Water Supply Function 3 (refer to description below) 4: Water Supply Function 4 (refer to description below)		
F1 First Motor Parameter Group				
F1.00	Motor Type Selection	1: Asynchronous Motor 2: Synchronous Motor	1	×
F1.01	Motor Rated Power	0.1kW–1000.0kW	Model Selection	×
F1.02	Motor Rated Voltage	1V–2000V	Model Selection	×

Function code	Name	Setting Range	Default	Modify
F1.03	Motor Rated Current	0.1A–6553.5A	Model Selection	×
F1.04	Motor rated frequency	0.01 Hz–Maximum frequency	Model Selection	×
F1.05	Motor rated speed	1rpm–65535rpm	Model Selection	×
F1.06	Asynchronous motor stator resistance	0.001Ω–65.535Ω	Tuning Parameters	×
F1.07	Asynchronous motor rotor resistance	0.001Ω–65.535Ω	Tuning Parameters	×
F1.08	Asynchronous motor leakage reactance	0.1mH–6553.5mH	Tuning Parameters	×
F1.09	Asynchronous motor mutual reactance	0.1mH–6553.5mH	Tuning Parameters	×
F1.10	Asynchronous motor no-load current	0.1A–6553.5A	Tuning Parameters	×
F1.16	Synchronous Motor stator resistance	0.001Ω–65.535Ω	Tuning Parameters	×

Function code	Name	Setting Range	Default	Modify
F1.17	Synchronous Motor D-axis inductance	0.1mH–6553.5mH	Tuning Parameters	×
F1.18	Synchronous Motor D-axis inductance	0.1mH–6553.5mH	Tuning Parameters	×
F1.19	Synchronous Motor voltage mode	0:PID 1: Feed forward	0	×
F1.20	Synchronous Motor Back Electromotive Force Coefficient	0.1 V – 6553.5 V	Tuning Parameters	×
F1.21	Synchronous Motor Starting Torque	0.0% – 200.0%	50.0%	×
F1.22	Synchronous Motor Low-frequency Excitation	0.0% – 200.0%	10.0%	×
F1.23	Synchronous Motor Open-loop Operation Time	0 ms–60000 ms	100 ms	×
F1.24	Observer Parameters	0.01 – 20	0.3	×

Function code	Name	Setting Range	Default	Modify
F1.25	Observer Parameters	0.001~2.000	0.004	×
F1.26	Observer Parameters	0.01 – 20	0.2	×
F1.37	Tuning Selection	0: No Operation 1: Static Learning 2: Rotational Learning	0	×
F2 First Motor Vector Control Parameter Group				
F2.00	Speed Loop Proportional Gain 1	1–200	20	√
F2.01	Speed Loop Integral Time 1	0.001 s~10.000 s	0.50 s	√
F2.02	Switching Frequency 1	0.00 Hz~F2.05	5.00 Hz	√
F2.03	Speed Loop Proportional Gain 2	1–200	15	√
F2.04	Speed Loop Integral Time 2	0.001 s~10.000 s	1.00 s	√
F2.05	Changeover Frequency 2	F2.02–Maximum Frequency	10.00 Hz	√

Function code	Name	Setting Range	Default	Modify
F2.06	SVC Control Slip Gain	50%–200%	100%	√
F2.07	SVC Speed Feedback Filtering	0–100	8	√
F2.08	SVC Torque Boost Cut-off Frequency	0.00 Hz–Maximum Frequency	20.00 Hz	√
F2.09	SVC Torque Boost	0.0% – 200.0%	10.0%	√
F2.10	Torque in Speed Control Method Upper Limit Source (Motoring)	0: Set by Function Code F3.10 1:AI1 2:AI2 3: Reserved 4: PULSE Pulse Setting 5: Communication Specifications 6:MIN(AI1,AI2) 7:MAX(AI1,AI2) Full scale value of Options 1–7 corresponds to F2.11	0	√
F2.11	Torque in Speed Control Method Upper Limit Digital Setting (Motoring)	0.0% – 200.0%	150.0%	√

Function code	Name	Setting Range	Default	Modify
F2.12	Torque Upper Limit Source in Speed Control Method (Regenerative)	0: Set by Function Code F2.12 1:AI1 2:AI2 3: Reserved 4: PULSE Pulse Setting 5: Communication Specifications 6:MIN(AI1,AI2) 7:MAX(AI1,AI2) Full scale value of Options 1–7 corresponds to F2.13	0	√
F2.13	Torque in Speed Control Method Upper Limit Digital Setting (Regenerative)	0.0% – 200.0%	150.0%	√
F2.14	Excitation Regulation Proportional Gain	0–60000	200	√
F2.15	Excitation Regulation Integral Gain	0–60000	100	√
F2.16	Torque Regulation Proportional Gain	0–60000	200	√
F2.17	Torque Regulation Integral Gain	0–60000	100	√

Function code	Name	Setting Range	Default	Modify
F2.18	Synchronous Motor Field Weakening Mode	0, 1, 2	0	√
F2.19	Synchronous Motor Field Weakening Gain	0–50	5	√
F2.23	Synchronous Motor Output Voltage Upper Margin	0%–50%	5%	√
F2.24	Synchronous Motor Initial Position Angle Measured Current	50%–180%	80%	√
F2.25	Synchronous Motor Start Method	0: Direct Start 1: Forced Positioning 2: High-Frequency Injection 3: Pulse Positioning	3	√
F2.27	Synchronous Motor Salient Pole Frequency Gain Adjustment	50–500	100	√

Function code	Name	Setting Range	Default	Modify
F2.28	Maximum Torque-Current Ratio Control	0,1	0	√
F2.29	High-Frequency Injection Voltage Amplitude	0V–120V	35V	√
F2.30	Observer Parameters	0.01 – 20	1.00	×
F2.31	Observer Parameters	0.01 – 20	1.00	×
F2.36	Low-Speed Excitation Current	0–80%	30%	√
F2.37	Low-Speed Carrier Frequency	2.0 kHz – Carrier frequency	0 Hz	√
F2.38	Synchronous low-frequency braking mode	0,1	0	√
F2.39	Synchronous low-frequency braking activation frequency	0.00 Hz–10.00 Hz	2.00 Hz	√

Function code	Name	Setting Range	Default	Modify
F2.40	Synchronous low-frequency braking frequency variation Increment	0.0005 Hz–1.0000 Hz	0.0010 Hz	√
F2.41	Synchronous low-frequency braking current	0%–80%	50%	√
F3 V/F control parameter group				
F3.00	VF Curve Setting	0: Linear V/F (set to 0 for synchronous motor) 1: Multi-point V/F 2: Square V/F 3: V/F to the 1.2th power 4: V/F to the 1.4th power 6: V/F to the 1.6th power 8: V/F to the 1.8th power 9: Reserved 10: Fully Decoupled VF Mode 11: Semi-decoupled VF Mode	0	×
F3.01	Torque Boost	0.0%: (Automatic Torque Boost) 0.1%–30.0%	Model Selection	√
F3.02	Torque Boost Cutoff Frequency	0.00 Hz–Maximum Frequency	50.00 Hz	×
F3.03	Multi-point VF Frequency Point 1	0.00 Hz – F3.05	12.50 Hz	×

Function code	Name	Setting Range	Default	Modify
F3.04	Multi-point VF Voltage Point 1	0.0% – 100.0%	25.0%	×
F3.05	Multi-point VF Frequency Point 2	F3.03 – F3.07	25.00 Hz	×
F3.06	Multi-point VF Voltage Point 2	0.0% – 100.0%	50.0%	×
F3.07	Multi-point VF Frequency Point 3	F3.05 – Motor Rated Frequency	37.50 Hz	×
F3.08	Multi-point VF Voltage Point 3	0.0% – 100.0%	75.0%	×
F3.09	VF Slip Compensation Gain	0.0% – 200.0%	0.0%	√
F3.10	VF Oversaturation Gain	0–200	50	√
F3.11	VF Oscillation Suppression Gain	0–100	Model Selection	√

Function code	Name	Setting Range	Default	Modify
F3.13	VF Isolated Voltage Source	0: Digital Setting (F3.14) 1:AI1 2:AI2 3: Reserved 4: Pulse Setting (HDI) 5: Multi-step Speed Command 6: Basic PLC 7:PID 8: Communication Specifications Note: 100.0% corresponds to the motor rated voltage	0	√
F3.14	VF Isolated Voltage Digital Setting	0V to Motor Rated Voltage	0V	√
F3.15	VF Separation Voltage Acceleration Time	0.0 s–1000.0 s Note: Indicates the time interval for the voltage to rise from 0V to the motor rated voltage.	0.0 s	√
F3.16	VF Separation Voltage Deceleration Time	0.0 s–1000.0 s Note: Indicates the time interval for the voltage to rise from 0V to the motor rated voltage.	0.0 s	√
F3.17	VF Separation Stop Mode Selection	0: Frequency/Voltage decrease independently to 0 1: Voltage decreases to 0 first, then frequency decreases to 0	0	√
F3.18	Overcurrent Stall Action Current	50%–200%	150%	×
F3.19	Overcurrent Stall Enable	0: Disabled 1: Enabled	1	×

Function code	Name	Setting Range	Default	Modify
F3.20	Overcurrent Stall Suppression Gain	0–100	50	√
F3.21	Multiplied Speed Overcurrent Stall Action Current Compensation Coefficient	50%–200%	100%	×
F3.22	Overvoltage Stall Action Voltage	340.0V–800.0V	760.0V	×
F3.23	Overvoltage Stall Enable	0: Disabled 1: Enabled	1	×
F3.24	Overvoltage Stall Frequency Decrease Gain	0–100	30	√
F3.25	Overvoltage Stall Frequency Increase Gain	0–100	5	√
F3.26	Maximum Overvoltage Stall Frequency Increase Rate Limit	0 Hz–50 Hz	5 Hz	×

Function code	Name	Setting Range	Default	Modify
F3.27	Slip Compensation Time Constant	0.1 s–10.0 s	0.5 s	√
F4 Input Terminal Control Group				
F4.00	DI1 Input Terminal Function Selection	0: No Function 1: Forward Run FWD or Run Command 2: Reverse Operation REV or Forward/Reverse Direction (Note: When set to 1 or 2, it must be used in conjunction with F4.11. For details, refer to the function code parameter description.) 3: Three-Wire Operation Control 4: Forward Jog (FJOG) 5: Reverse Jog (RJOG) 6: Terminal UP	1	×
F4.01	DI2 Terminal Function Selection		2	×

Function code	Name	Setting Range	Default	Modify
F4.02	DI3 Terminal Function Selection	7: Terminal DOWN 8: Free Stop 9: Fault Reset (RESET) 10: Run Pause 11: External Fault Normally Open Input 12: Multi-stage Instruction Terminal 1 13: Multi-stage Instruction Terminal 2 14: Multi-stage Instruction Terminal 3 15: Multi-stage Instruction Terminal 4 16: Acceleration/Deceleration Time Selection Terminal 1 17: Acceleration/Deceleration Time Selection Terminal 2 18: Frequency Source Switching 19: UP/DOWN Setting Reset (Terminal, Keypad) 20: Control Command Switching Terminal 1 21: Acceleration/Deceleration Disable 22: PID Pause 23: PLC State Reset 24: Frequency Swing Pause	9	×
F4.03	DI4 Terminal Function Selection	25: Counter Input 26: Counter Reset 27: Length Counting Input 28: Length Reset 29: Disable Torque Control 30: Reserved 31: Reserved 32: Immediate DC Braking	12	×

Function code	Name	Setting Range	Default	Modify
F4.04	Reserved	33: External Fault Normally Closed Input 34: Frequency Modification Enable 35: Reverse PID Action Direction 36: External Stop Terminal 1 37: Control Command Switching Terminal 2 38: Pause PID Integral 39: Switch Between Frequency Source X and Preset frequency 40: frequency source Y and preset frequency selection 41: Motor terminal selection function 42: Reserved 43: PID parameter selection 44: User-defined fault 1 45: User-defined fault 2 46: Speed control/Torque control selection 47: Emergency stop 48: External stop terminal 2 49: Deceleration DC braking 50: Reset current operation time 51: Two-wire/Three-wire selection 52: Prohibit reverse operation 53-59: Reserved	13	×
F4.05	Reserved		0	×
F4.06 - F4.08	Reserved		-	-
F4.09	DI filter time	0.000 s–1.000 s	0.010 s	√
F4.10	Terminal command mode	0: 2-wire type 1 1: 2-wire type 2 2: 3-wire type 1 3: 3-wire type 2	0	×
F4.11	Terminal UP/DOWN rate of change	0.001 Hz/s–65.535 Hz/s	1.00 Hz/s	√

Function Code	Name	Setting Range	Default	Modify
F4.12	AI curve 1 minimum input	0.00V–F4.15	0.00V	√
F4.13	AI Curve 1 Minimum Input Corresponding Value	-100.0%–+100.0%	0.0%	√
F4.14	AI Curve 1 Maximum Input	F4.13–+10.00V	10.00V	√
F4.15	AI Curve 1 Maximum Input Corresponding Value	-100.0%–+100.0%	100.0%	√
F4.16	AI Curve 1 Filter Time	0.00 s–10.00 s	0.10 s	√
F4.17	AI Curve 2 Minimum Input	0.00V–F4.20	0.00V	√
F4.18	AI Curve 2 Minimum Input Corresponding Value	-100.0%–+100.0%	0.0%	√
F4.19	AI Curve 2 Maximum Input	F4.18–+10.00V	10.00V	√
F4.20	AI Curve 2 Maximum Input Corresponding Value	-100.0%–+100.0%	100.0%	√
F4.21	AI Curve 2 Filtering Time	0.00 s–10.00 s	0.10 s	√

Function Code	Name	Setting Range	Default	Modify
F4.22	AI Curve 3 Minimum Input	0.00V–F4.25	0.00V	√
F4.23	AI Curve 3 Minimum Input Corresponding Value	-100.0%–+100.0%	0.0%	√
F4.24	AI Curve 3 Maximum Input	F4.23–+10.00V	10.00V	√
F4.25	AI Curve 3 Maximum Input Corresponding Value	-100.0%–+100.0%	100.0%	√
F4.26	AI Curve 3 Filter Time	0.00 s–10.00 s	0.10 s	√
F4.28	PULSE Minimum Input	0.00 kHz–F4.30	0.00 kHz	√
F4.32	AI Curve Selection	Units digit: AI1 Curve Selection 1: Curve 1 (2 points, see F4.12–F4.15) 2: Curve 2 (2 points, see F4.17–F4.20) 3: Curve 3 (2 points, see F4.25–F4.25) 4: Curve 4 (4 points, see H6.00–H6.07) 5: Curve 5 (4 points, see H6.08–H6.15) Tens digit: AI2 Curve Selection, same as above Hundreds digit: Reserved	21	√

Function Code	Name	Setting Range	Default	Modify
F4.33	AI Below Minimum Input Setting Selection	Ones digit: Selection for AI1 when below the minimum input setting 0: Corresponds to the minimum input setting 1:0.0% Tens digit: Selection for AI2 when below the minimum input setting, same as above Hundreds digit: Reserved	000	√
F4.34	DI1 delay time	0.0 s–3600.0 s	0.0 s	×
F4.35	DI2 delay time	0.0 s–3600.0 s	0.0 s	×
F4.36	DI3 delay time	0.0 s–3600.0 s	0.0 s	×
F4.38	DI Terminal activation mode selection 1	0: Active High 1: Active Low Ones digit: DI1 Tens digit: DI2 Hundreds digit: DI3 Thousands digit: DI4 Ten-thousands digit: Reserved	00000	×
F4.39	DI terminal valid mode selection 2	0: Active High 1: Active Low Units digit: HDI Tens digit: Reserved Hundreds digit: Reserved Thousands digit: Reserved Ten-thousands digit: Reserved	0	×
F4.40	AI2 terminal function selection	0: Voltage input 1: Current input	1	×
F5 Output terminal control group				

Function Code	Name	Setting Range	Default	Modify
F5.00	HDO output mode selection	0: Pulse output (HDOP) 1: Relay output (HDOR)	0	√
F5.01	HDOR output function selection	0: No output 1: Inverter running 2: Fault output (for faults that trigger coasting stop) 3: Frequency Level Detection FDT1 Output 4: Frequency Reached 5: Zero-speed Operation (No output during stop) 6: Motor Overload Pre-warning 7: Inverter Overload Pre-warning 8: Set Count Value Reached 9: Designated Count Value Reached 10: Length Reached	0	√
F5.02	Relay 1 function selection (TA/TB/TC)		2	√

Function Code	Name	Setting Range	Default	Modify
F5.03	Reserved	11: PLC Cycle Completed 12: Accumulated Operation Time Reached 13: Frequency Limiting Active 14: Torque Limiting Active 15: Ready for Operation 16:AI1>AI2 17: Upper Frequency Limit Reached 18: Lower Frequency Limit Reached (Operation related) 19: Undervoltage Status Output 20: Communication Setting 21: Positioning Completed (Reserved) 22: Positioning proximity (reserved) 23: Zero-speed operation 2 (also outputs when stopped) 24: Accumulated power-on time attained 25: Frequency level detection FDT2 output 26: Frequency 1 attained output 27: Frequency 2 attained output 28: Current 1 attained output 29: Current 2 attained output 30: Timer attained output 31: AI1 input over-limit 32: Underload 33: Reverse operation 35: Module temperature attained	0	√
F5.04	Y1 output function selection	36: Output current over limit 37: Lower limit frequency reached (output during stop as well) 38: Alarm output (all faults) 39: Motor over temperature pre-warning 40: Current operation time reached 41: Fault output (for free stop faults and under voltage no output)	1	√

Function Code	Name	Setting Range	Default	Modify
F5.05	Reserved		-	-
F5.06	HDOP output function selection	0: Run frequency 1: Setting frequency 2: Output current 3: Output torque (absolute value) 4: Output power 5: Output voltage 6: PULSE input (100.0% corresponds to 100.0 kHz) 7:AI1 8:AI2 9: Reserved 10: Length 11: Count value 12: Communication setting 13: Motor speed 14: Output current (100.0% corresponding to 1000.0A) 15: Output voltage (100.0% corresponding to 1000.0V) 16: Output torque (actual value)	0	√
F5.07	AO1 output function selection		0	√
F5.08	AO2 output function selection		1	√
F5.09	HDOP output maximum frequency	0.01 kHz–100.00 kHz	50.00 kHz	√
F5.10	AO1 output lower limit	0.0–100.0%	0.0%	√
F5.11	Lower limit corresponding to AO1 output	0.00–10.00V	0.00V	√
F5.12	AO1 Output Upper Limit	0.0–100.0%	100.0%	√
F5.13	AO1 Output at Upper Limit	0.00–10.00V	10.00V	√
F5.14	AO1 output lower limit	0.0–100.0%	0.0%	√

Function Code	Name	Setting Range	Default	Modify
F5.15	Lower limit corresponding to AO1 output	0.00–10.00V	0.00V	√
F5.16	AO1 Output Upper Limit	0.0–100.0%	100.0%	√
F5.17	AO1 Output at Upper Limit	0.00–10.00V	10.00V	√
F5.18	HDOR Output Delay Time	0.0 s–3600.0 s	0.0 s	√
F5.19	Relay 1 Output Delay Time Time	0.0 s–3600.0 s	0.0 s	√
F5.21	Y1 Output Delay Time	0.0 s–3600.0 s	0.0 s	√
F5.23	Output Terminal Active State Selection	0: Positive Logic 1: Active Low Logic Units Digit: HDOR Tens Digit: RELAY1 Hundreds Digit: RELAY2 Thousands Digit: Y1 Ten-thousands digit: Reserved	0000	√
F6 Start/Stop Control Group				
F6.00	Startup Method	0: Direct Start 1: Speed Tracking Restart 2: Pre-excitation Startup (AC Asynchronous Motor)	0	√
F6.01	Speed Tracking Startup Mode	0: Start from Stop Frequency 1: Start from Rated Frequency 2: Start from Maximum Frequency	0	√

Function Code	Name	Setting Range	Default	Modify
F6.02	Speed Tracking Rate	0–100	20	×
F6.03	Start Frequency	0.00 Hz–10.00 Hz	0.00 Hz	√
F6.04	Start Frequency Dwell Time	0.0 s–100.0 s	0.0 s	×
F6.05	Start DC Braking Current / Pre-Excitation Current	0%–100%	0%	√
F6.06	Start DC Braking Time / Pre-Excitation Time	0.0 s–100.0 s	0.0 s	×
F6.07	Acceleration/ Deceleration Method	0: Linear Acceleration/Deceleration 1: S-curve Acceleration/Deceleration	0	×
F6.08	S-curve Initial Stage Time Ratio	0.0%~(100.0%-F6.09)	30.0%	×
F6.09	S-curve End Segment Time Ratio	0.0%–(100.0%–F6.08)	30.0%	×
F6.10	Stop Mode	0: Deceleration Stop 1: Coast to Stop	0	√
F6.11	DC Braking Start at Stop Frequency	0.00 Hz–Maximum Frequency	0.00 Hz	√

Function Code	Name	Setting Range	Default	Modify
F6.12	DC Braking Delay at Stop Time	0.0 s–100.0 s	0.0 s	×
F6.13	DC Braking Current at Stop	0%–100%	0%	√
F6.14	DC Braking Time at Stop	0.0 s–100.0 s	0.0 s	×
F6.15	DC Braking Usage	0%–100%	100%	√
F7 Keypad and Display Control Group				
F7.00	Reserved		-	-
F7.01	JOG/REV Key Function Selection	0: Invalid 1: Switch between the control panel command channel and the remote command channel (terminal command channel or communication command channel) 2: Forward/reverse switch 3: Forward jog 4: Reverse jog	0	×
F7.02	STOP/ RESET Key Function	0: STOP/RESET key is only effective for stopping in keypad operation mode 1: STOP/RESET key is effective for stopping in any operation mode	1	√

Function Code	Name	Setting Range	Default	Modify
F7.03	LED Operation Display Parameter Selection 1	0000–FFFF Bit00: Running Frequency 1 (Hz) Bit01: Set Frequency (Hz) Bit02: DC Bus Voltage (V) Bit03: Output Voltage (V) Bit04: Output current (A) Bit05: Output power (kW) Bit06: Output torque (%) Bit07: DI input status Bit08: DO output status Bit09: AI1 voltage (V) Bit10: AI2 voltage (V) Bit11: Reserved Bit12: Counter value Bit13: Length value Bit14: Load speed indication Bit15: PID setting	1F	√

Function Code	Name	Setting Range	Default	Modify
F7.04	LED Operation Display Parameter Selection 2	0000–FFFF Bit00: PID feedback Bit01: PLC phase Bit02: PULSE input pulse frequency (kHz) Bit03: Operating frequency 2 (Hz) Bit04: Remaining operation time Bit05: AI1 voltage before calibration (V) Bit06: AI2 voltage before calibration (V) Bit07: Reserved Bit08: Linear speed Bit09: Current power-on duration (Hour) Bit10: Current operation duration (Min) Bit11: PULSE input pulse frequency (Hz) Bit12: Communication set value Bit13: Encoder feedback speed (Hz) Bit14: Main frequency X display (Hz) Bit15: Auxiliary frequency Y display (Hz)	00	√

Function Code	Name	Setting Range	Default	Modify
F7.05	LED display parameter during stop Selection	0000–FFFF Bit00: Set frequency (Hz) Bit01: Bus voltage (V) Bit02: DI input status Bit03: DO output status Bit04: AI1 Voltage (V) Bit05: AI2 Voltage (V) Bit06: Reserved Bit07: Counter Value Bit08: Length Value Bit09: PLC Phase Bit10: Load Speed Bit11: PID Setting Bit12: PULSE Input Pulse Frequency (kHz) Bit13: Input AC Voltage (V) Bit14: PID Feedback	H.2033	√

Function Code	Name	Setting Range	Default	Modify
F7.06	LED2 Run Display Parameter Selection	0: Run Frequency 1 (Hz) 1: Set Frequency (Hz) 2: Bus Voltage (V) 3: Output Voltage (V) 4: Output Current (A) 5: Output Power (kW) 6: Output Torque (%) 7: DI Input Status 8: DO Output Status 9: AI1 Voltage (V) 10: AI2 Voltage (V) 11: Reserved 12: Count Value 13: Length Measurement 14: Load Speed Display 15: PID Setpoint 16: PID Feedback 17: PLC Step 18: Reserved 19: Running Frequency 2 (Hz) 20: Remaining Operating Time 21: AI1 Voltage Before Calibration (V) 22: AI2 Voltage Before Calibration (V) 23: Reserved 24: Linear Speed 25: Current Power-On Time (Hour) 26: Current Operating Time (Min) 27: Reserved 28: Communication Setting Value 29: Encoder Feedback Speed (Hz) 30: Main Frequency X Display (Hz) 31: Auxiliary Frequency Y Display (Hz)	4	√

Function Code	Name	Setting Range	Default	Modify
F7.07	LED2 Stop Display Parameter Selection	0: Set Frequency (Hz) 1: Bus Voltage (V) 2: DI Input Status 3: DO Output Status 4: AI1 Voltage (V) 5: AI2 Voltage (V) 6: Reserved 7: Count Value 8: Length Value 9: PLC Phase 10: Load Speed 11: PID Setpoint 12: Reserved 13: Input AC Voltage (V) 14: PID Feedback		
F7.08	Load Speed Display Coefficient	0.0001~6.5000	1.0000	√
F7.09	Inverter Module Heat Sink Temperature	0℃–120℃	-	-
F7.10	Temporary Software Version Number	-	-	-
F7.11	Cumulative Operating Time	0h–65535h	-	-
F7.12	Product Number	-	-	-
F7.13	Software Version Number	-	-	-

Function Code	Name	Setting Range	Default	Modify
F7.14	Load Speed Display Decimal Places Number of Decimal Places	Unit Digit: Number of decimal places for U0.14 0: 0 decimal places 1: 1 decimal place 2: 2 decimal places 3: 3 decimal places Tens Digit: Number of decimal places for U0.19/U0.29 1: 1 decimal place 2: 2 decimal places	21	√
F7.15	Cumulative Power-On Time	0–65535 hours	-	-
F7.16	Cumulative Power Consumption	0–65535 degrees	-	-
F8 Auxiliary Function Group				
F8.00	Jog Frequency	0.00 Hz–Maximum Frequency	2.00 Hz	√
F8.01	Jog Acceleration Time	0.0 s–6500.0 s	20.0 s	√
F8.02	Jog Deceleration Time	0.0 s–6500.0 s	20.0 s	√
F8.03	Acceleration Time 2	0.0 s–6500.0 s	Model Selection	√
F8.04	Deceleration Time 2	0.0 s–6500.0 s	Model Selection	√
F8.05	Acceleration Time 3	0.0 s–6500.0 s	Model Selection	√

Function Code	Name	Setting Range	Default	Modify
F8.06	Deceleration Time 3	0.0 s–6500.0 s	Model Selection	√
F8.07	Acceleration Time 4	0.0 s–6500.0 s	Model Selection	√
F8.08	Deceleration Time 4	0.0 s–6500.0 s	Model Selection	√
F8.09	Jump Frequency 1	0.00 Hz–Maximum Frequency	0.00 Hz	√
F8.10	Jump Frequency 2	0.00 Hz–Maximum Frequency	0.00 Hz	√
F8.11	Jump Frequency Amplitude	0.00 Hz–Maximum Frequency	0.01 Hz	√
F8.12	Forward/ Reverse Rotation Dead Time	0.0 s–3000.0 s	0.0 s	√
F8.13	Reverse Rotation Control Disable	0: Enable 1: Disable	0	√
F8.14	Operation mode when set frequency is below the lower limit Frequency	0: Run at lower limit Frequency 1: Stop 2: Zero-speed operation	0	√
F8.15	Droop control	0.00 Hz–10.00 Hz	0.00 Hz	√

Function Code	Name	Setting Range	Default	Modify
F8.16	Set accumulated power-on duration	0h–65000h	0h	√
F8.17	Set accumulated operation duration	0h–65000h	0h	√
F8.18	Start-up protection selection	0: No protection 1: Protection	1	√
F8.19	Frequency detection value (FDT1)	0.00 Hz–Maximum Frequency	50.00 Hz	√
F8.20	Frequency Detection Hysteresis Value (FDT1)	0.0%–100.0% (FDT1 level)	5.0%	√
F8.21	Frequency Arrival Detection Width	0.0%–100.0% (Maximum Frequency)	0.0%	√
F8.22	Validity of Jump Frequency During Acceleration/ Deceleration	0: Invalid 1: Valid	0	√
F8.23	Emergency Stop Time	0.1 s–6500.0 s	10.0 s	√

Function Code	Name	Setting Range	Default	Modify
F8.25	Switching Frequency Point Between Acceleration Time 1 and Acceleration Time 2	0.00 Hz–Maximum Frequency	0.00 Hz	√
F8.26	Switching Frequency Point Between Deceleration Time 1 and Deceleration Time 2	0.00 Hz–Maximum Frequency	0.00 Hz	√
F8.27	Terminal jog priority	0: Invalid 1: Valid	0	√
F8.28	Frequency Detection Value (FDT2)	0.00 Hz–Maximum Frequency	50.00 Hz	√
F8.29	Frequency Detection Hysteresis (FDT2)	0.0% to 100.0% (FDT2 level)	5.0%	√
F8.30	Arbitrary Frequency Arrival Detection Value 1	0.00 Hz–Maximum Frequency	50.00 Hz	√
F8.31	Arbitrary Frequency Arrival Detection Bandwidth 1	0.0%–100.0% (Maximum Frequency)	0.0%	√

Function Code	Name	Setting Range	Default	Modify
F8.32	Arbitrary Frequency Arrival Detection Value 2	0.00 Hz–Maximum Frequency	50.00 Hz	√
F8.33	Arbitrary Frequency Arrival Detection Bandwidth 2	0.0%–100.0% (Maximum Frequency)	0.0%	√
F8.34	Zero Current Detection Level	0.0% to 300.0% 100.0% corresponds to the motor rated current	5.0%	√
F8.35	Zero Current Detection Delay Time	0.01 s–600.00 s	0.10 s	√
F8.36	Output Current Over-limit Value	0.0% (Not Detected) 0.1%–300.0% (Motor Rated Current)	200.0%	√
F8.37	Output Current Over-limit Detection Delay Time	0.00 s–600.00 s	0.00 s	√
F8.38	User-defined Current Threshold 1	0.0%–300.0% (Motor Rated Current)	100.0%	√
F8.39	User-defined Current Threshold 1 Duration	0.0%–300.0% (Motor Rated Current)	0.0%	√
F8.40	User-defined Current Threshold 2	0.0%–300.0% (Motor Rated Current)	100.0%	√

Function Code	Name	Setting Range	Default	Modify
F8.41	Arbitrary Arrival Current 2 Width	0.0%–300.0% (Motor Rated Current)	0.0%	√
F8.42	Timing Function Selection	0: Disabled 1: Enabled	0	×
F8.43	Timed Operation Duration Selection	0: Set via F8.44 1:AI1 2:AI2 3: Reserved Analog Input Range corresponds to F8.44	0	×
F8.44	Timed Operation Duration	0.0Min–6500.0Min	0.0Min	×
F8.45	AI1 Input Voltage Protection Lower Limit	0.00V–F8.46	3.10V	√
F8.46	AI1 Input Voltage Protection Upper Limit	F8.45~10.00V	6.80V	√
F8.47	Module Temperature Reached	0℃–100℃	75℃	√
F8.48	Cooling Fan Control	0: Fan operates during running 1: Fan operates continuously	0	√
F8.49	Elapsed Time of Current Operation Setting	0.0~6500.0 minutes	0.0Min	√
F8.50	Output Power Correction Coefficient	0.00%~200.0%	100.0%	√

Function Code	Name	Setting Range	Default	Modify
F9 Protection Control Group				
F9.00	Motor overload protection selection	0: Disable 1: Enable	1	√
F9.01	Motor overload protection gain	0.20 to 10.00	1.0	√
F9.02	Motor overload pre-alarm coefficient	50%–100%	80%	√
F9.03	Overvoltage stall spike suppression Gain	0–100	50	√
F9.04	Reserved	-	-	-
F9.07	Power-on ground short-circuit protection Selection	0: Invalid 1: Valid	1	√
F9.08	Brake unit activation threshold Voltage	700–800V	760 V	√
F9.09	Number of automatic fault resets	0–20	0	√

Function Code	Name	Setting Range	Default	Modify
F9.10	Selection of digital output action during automatic fault reset	0: No action 1: Action	0	√
F9.11	Interval between automatic fault resets Time	0.1 s–100.0 s	1.0 s	√
F9.12	Input phase loss\Contactor activation Protection selection	Units digit: Input phase loss protection selection Tens digit: Contactor activation protection selection 0: Disable 1: Enable	11	√
F9.13	Output phase loss protection setting	0: Disable 1: Enable	1	√
F9.14	First fault type	0: No fault 1: Reserved 2: Overcurrent during acceleration 3: Overcurrent during deceleration 4: Overcurrent at constant speed 5: Overvoltage during acceleration 6: Overvoltage during deceleration 7: Overvoltage at constant speed 8: Braking resistor overload 9: Undervoltage 10: Inverter overload 11: Motor overload	0	-
F9.15	Second fault type		0	-
F9.16	Third (most recent) fault type		0	-

Function Code	Name	Setting Range	Default	Modify
		12: Input phase loss 13: Output phase loss 14: Module Overtemperature 15: External Fault 16: Communication Error 17: Contactor Fault 18: Current Detection Error 19: Motor Tuning Error 20: Encoder/PG Card Fault 21: Parameter Read/Write Error 22: inverter Hardware Fault 23: Motor Ground Short Circuit 24-25: Reserved 26: Run Time Limit Reached 27: User-Defined Fault 1 28: User-Defined Fault 2 29: Power-On Time Limit Reached 30: Load Drop 31: PID Feedback Loss During Operation 40: Fast Current Limit Timeout 41: Motor switching during operation 42: Excessive speed deviation 43: motor overspeed		

Function Code	Name	Setting Range	Default	Modify
		45: Motor overtemperature 51: Initial position error 55: Slave fault during master-slave control		
F9.17	Frequency at third (most recent) fault		–	-
F9.18	Current at third (most recent) fault		–	-
F9.19	Bus voltage at third (most recent) fault		–	-
F9.20	Input terminal status at third (most recent) fault		–	-
F9.21	Output terminal status at the third (most recent) fault event		–	-
F9.22	inverter status at the third (most recent) fault event		–	-
F9.23	Power-on duration at the third (most recent) fault event		–	-

Function Code	Name	Setting Range	Default	Modify
F9.24	Operating duration at the third (most recent) fault event		–	-
F9.25 - F9.26	Reserved		-	-
F9.27	Frequency at the second fault event		–	-
F9.28	Current at the second fault event		–	-
F9.29	Bus voltage at the second fault event		–	-
F9.30	Input terminal at the second fault event Status		–	-
F9.31	Output terminal status at second fault Status		–	-
F9.32	Inverter status at second fault Status		–	-

Function Code	Name	Setting Range	Default	Modify
F9.33	Power-on status at second fault Time		–	-
F9.34	Operation status at second fault Time		–	-
F9.35 - F9.36	Reserved		-	-
F9.37	Frequency at first fault		–	-
F9.38	Current at first fault		–	-
F9.39	Power-on duration at the third (most recent) fault event		–	-
F9.40	Input terminal status at first fault		–	-
F9.41	Output terminal status at first fault occurrence		–	-
F9.42	inverter status at first fault occurrence		–	-
F9.43	Power status at first fault occurrence Time		–	-

Function Code	Name	Setting Range	Default	Modify
F9.44	Operation status at first fault occurrence Time		–	-
F9.45 - F9.46	Reserved		-	-
F9.47	Fault protection action setting 1	Units digit: Motor overload (11) 0: Coast to stop 1: Stop according to stop mode 2: Continue running Tens digit: Input phase loss (12) Hundreds digit: Output phase loss (13) Thousands place: External Fault (15) Ten-thousands place: Communication Error (16)	00000	√
F9.48	Fault Protection Action Selection 2	Units place: Encoder/PG Card Error (20) 0: Coast to stop Tens place: Function Code Read/Write Error (21) 0: Coast to stop 1: Stop according to stop mode Hundreds digit: Reserved Thousands place: Motor Overheating (25) Ten-thousands place: Operation Time Reached (26)	00000	√

Function Code	Name	Setting Range	Default	Modify
F9.49	Fault Protection Action Selection 3	Units place: User-defined Fault 1 (27) 0: Coast to stop 1: Stop according to stop mode 2: Continue running Tens place: User-defined Fault 2 (28) 0: Coast to stop 1: Stop according to stop mode 2: Continue running Hundreds place: Power-on Duration Reached (29) 0: Coast to stop 1: Stop according to stop mode 2: Continue running Thousands place: Load Shedding (30) 0: Coast to stop 1: Decelerate to stop 2: Jump directly to 7% of rated Motor Frequency and continue operation; When the load resumes, the inverter will automatically restore operation to the set frequency. Ten-thousands digit: PID feedback loss during operation (31) 0: Coast to stop 1: Stop according to stop mode 2: Continue running	00000	√ √
F9.50	Fault protection action selection 4	Units digit: Excessive speed deviation (42) 0: Coast to stop 1: Stop according to stop mode 2: Continue running Tens digit: motor overspeed (43) Hundreds digit: Initial position error (51)	000	√
F9.51 - F9.53	Reserved		-	-

Function Code	Name	Setting Range	Default	Modify
F9.54	Continued operation frequency during fault Selection	0: Operate at the current operating frequency 1: Operate at the set frequency 2: Operate at the upper limit frequency 3: Operate at the lower limit frequency 4: Operate at the abnormal backup frequency	0	√
F9.55	Abnormal backup frequency	0.0% – 100.0% (100.0% corresponds to maximum frequency F0.04)	100.0%	√
F9.56	motor temperature sensor Type	0: No temperature sensor 2:PT1000 1:PT100	0	√
F9.57	Motor Overheat Protection Threshold	0℃–200℃	110℃	√
F9.58	Motor Overheat Pre-alarm Threshold	0℃–200℃	90℃	√
F9.59	Momentary Power Loss Ride-Through Enable	0: Invalid 2: Deceleration to stop 1: Constant DC bus voltage control	0	×
F9.60	Ride-through recovery voltage	85%–120%	85%	×
F9.61	Ride-through voltage detection time	0.1 s–10.0 s	0.5 s	×

Function Code	Name	Setting Range	Default	Modify
F9.62	Ride-through operation bus voltage threshold	60%–85%	80%	×
F9.63	Load shedding protection selection	0: Invalid 1: Effective	0	√
F9.64	Load Drop Detection Level	0.0%–100.0%	10.0%	√
F9.65	Load Drop Detection Time	0.0 s–60.0 s	1.0	√
F9.66	Reserved		-	-
F9.67	Overspeed Detection Threshold	0.0%–50.0% (Maximum Frequency)	20.0%	√
F9.68	Overspeed Detection Time	0.0 s: Not detected 0.1–60.0 s	0.010 s	√
F9.69	Excessive Speed Deviation Detection Threshold	0.0%–50.0% (Maximum Frequency)	20.0%	√
F9.70	Speed Deviation Detection Time	0.0 s: Not detected 0.1–60.0 s	5.0 s	√
F9.71	Non-stop Ride-through Proportional Gain Kp	0–100	40	√

Function Code	Name	Setting Range	Default	Modify
F9.72	Non-stop Ride-through Integral Coefficient Ki	0–100	30	√
F9.73	Non-stop Ride-through Action Deceleration Time	0.0 s–300.0 s	20.0 s	×
FA PID Control Parameter Group				
FA.00	PID Setpoint Source	0: FA.01 Setting 1:AI1 2:AI2 3: Reserved 4: Reserved 5: Communication setpoint 6: Multi-step speed command setting	0	√
FA.01	PID Setpoint Value	0–1000 (Decimal point set by FA.33)	0.50	√
FA.02	PID Feedback Source	0:AI1 1:AI2 2: Reserved 3:AI1-AI2 4: Reserved 5: Communication setpoint 6:AI1+AI2 7:MAX(|AI1|,|AI2|) 8:MIN(|AI1|,|AI2|)	0	√
FA.03	PID Action Direction	0: Direct Action 1: Reverse Action	0	√
FA.04	PID Setpoint Feedback Range	0–65535	1.6	√
FA.05	Proportional Gain Kp1	0.0~100.0	20.0	√

Function Code	Name	Setting Range	Default	Modify
FA.06	Integral Time Ti1	0.01 s~10.00 s	2.00 s	√
FA.07	Derivative Time Td1	0.000 s~10.000 s	0.000 s	√
FA.08	PID Reverse rotation Cutoff Frequency	0.00~Maximum Frequency	0.00 Hz	√
FA.09	PID Deviation Limit	0.0% – 100.0%	0.0%	√
FA.10	PID Derivative Limiting	0.00%~100.00%	0.10%	√
FA.11	PID setpoint ramp time	0.00–650.00 s	0.00 s	√
FA.12	PID feedback filter time	0.00–60.00 s	0.00 s	√
FA.13	PID output filter time	0.00–60.00 s	0.00 s	√
FA.14	Reserved		-	-
FA.15	Proportional gain Kp2	0.0~100.0	20.0	√
FA.16	Integral time Ti2	0.01 s~10.00 s	2.00 s	√
FA.17	Derivative time Td2	0.000 s~10.000 s	0.000 s	√
FA.18	PID parameter switching condition	0: No switching 1: Switch via DI terminal 2: Automatic switching based on deviation 3: Automatic switching based on run frequency	0	√

Function Code	Name	Setting Range	Default	Modify
FA.19	PID parameter switching deviation 1	0.0%–FA.20	20.0%	√
FA.20	PID parameter switching deviation 2	FA.19–100.0%	80.0%	√
FA.21	PID Initial Value	0.0% – 100.0%	0.0%	√
FA.22	PID Initial Value Hold Time	0.00 s–650.00 s	0.00 s	√
FA.23	Maximum Positive Output Deviation	0.00%~100.00%	1.00%	√
FA.24	Maximum Negative Output Deviation	0.00%~100.00%	1.00%	√
FA.25	PID Integral Attribute	Units digit: Integral Separation 0: Invalid 1: Valid Tens digit: Whether to stop integration when output reaches limit 0: Continue integration 1: Stop integration	00	√
FA.26	PID Feedback Loss Detection Threshold	0.0%: Feedback loss not detected 0.1%–100.0%	0.0%	√
FA.27	PID Feedback Loss Detection Time	0.0 s–20.0 s	0.0 s	√
FA.28	PID Calculation During Stop	0: No calculation during Stop 1: Calculation during stop	1	√
FA.29	Wake value	0–1000 (Decimal point set by FA.33)	0	√

Function Code	Name	Setting Range	Default	Modify
FA.30	Wake delay time	0.0 s–6500.0 s	2.0 s	√
FA.31	Sleep Frequency	0.00 Hz–Maximum Frequency	35 Hz	√
FA.32	Sleep delay time	0.0 s–6500.0 s	2.0 s	√
FA.33	Decimal places for PID-related values	0–2	2	√
Fb Oscillation Frequency, Fixed Length, and Counting Parameter Group				
Fb.00	Oscillation frequency setting mode	0: Relative to the center Frequency 1: Relative to the maximum frequency	0	√
Fb.01	Oscillation frequency amplitude	0.0% – 100.0%	0.0%	√
Fb.02	Jerk frequency amplitude	0.0%–50.0%	0.0%	√
Fb.03	Oscillation frequency period	0.1 s–3000.0 s	10.0 s	√
Fb.04	Rising slope of oscillation frequency triangle wave Time	0.1%–100.0%	50.0%	√
Fb.05	Set length	0m–65535m	1000m	√
Fb.06	Actual Length	0m–65535m	0m	√
Fb.07	Number of Pulses per Meter	0.1~6553.5	10	√

Function Code	Name	Setting Range	Default	Modify
Fb.08	Set Count Value	1–65535	10	√
Fb.09	Designated Count Value	1–65535	10	√
FC Multi-step Speed and Basic PLC Control Parameter Group				
FC.00	Multi-step Command 0	-100.0%~100.0%	0.0	√
FC.01	Multi-step Command 1	-100.0%~100.0%	0.0	√
FC.02	Multi-step Command 2	-100.0%~100.0%	0.0	√
FC.03	Multi-step Command 3	-100.0%~100.0%	0.0	√
FC.04	Multi-step Command 4	-100.0%~100.0%	0.0	√
FC.05	Multi-step Command 5	-100.0%~100.0%	0.0	√
FC.06	Multi-step Command 6	-100.0%~100.0%	0.0	√
FC.07	Multi-step Command 7	-100.0%~100.0%	0.0	√
FC.08	Multi-step Command 8	-100.0%~100.0%	0.0	√
FC.09	Multi-step Command 9	-100.0%~100.0%	0.0	√
FC.10	Multi-step Command 10	-100.0%~100.0%	0.0	√
FC.11	Multi-step Instruction 11	-100.0%~100.0%	0.0	√
FC.12	Multi-step Instruction 12	-100.0%~100.0%	0.0	√

Function Code	Name	Setting Range	Default	Modify
FC.13	Multi-step Instruction 13	-100.0%~100.0%	0.0	√
FC.14	Multi-step Instruction 14	-100.0%~100.0%	0.0	√
FC.15	Multi-step Instruction 15	-100.0%~100.0%	0.0	√
FC.16	Basic PLC Operation Mode	0: Stop after single run 1: Hold final value after single run 2: Continuous cycle	0	√
FC.17	Basic PLC Power-down Memory Selection	Units digit: Power-down memory selection 0: Do not retain memory after power-down 1: Retain memory after power-down Tens digit: Stop memory selection 0: Do not retain memory after stop 1: Retain memory after stop	00	√
FC.18	Basic PLC Step 0 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.19	Basic PLC Segment 0 Acceleration/ Deceleration Time Selection	0–3	0	√
FC.20	Basic PLC Segment 1 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√

Function Code	Name	Setting Range	Default	Modify
FC.21	Basic PLC Segment 1 Acceleration/ Deceleration Time Selection	0–3	0	√
FC.22	Basic PLC Segment 2 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.23	Basic PLC Segment 2 Acceleration/ Deceleration Time Selection	0–3	0	√
FC.24	Basic PLC Segment 3 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.25	Basic PLC Segment 3 Acceleration/ Deceleration Time Selection	0–3	0	√
FC.26	Basic PLC Segment 4 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.27	Basic PLC Segment 4 Acceleration/Deceleration Time Selection	0–3	0	√

Function Code	Name	Setting Range	Default	Modify
FC.28	Basic PLC Segment 5 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.29	Basic PLC Segment 5 Acceleration/Deceleration Time Selection	0–3	0	√
FC.30	Basic PLC Segment 6 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.31	Basic PLC Segment 6 Acceleration/Deceleration Time Selection	0–3	0	√
FC.32	Basic PLC Segment 7 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.33	Basic PLC Segment 7 Acceleration/Deceleration Time Selection	0–3	0	√
FC.34	Basic PLC Segment 8 Operation Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.35	Basic PLC Segment 8 Acceleration/Deceleration Time Selection	0–3	0	√

Function Code	Name	Setting Range	Default	Modify
FC.36	Basic PLC Segment 9 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.37	Basic PLC Segment 9 Acceleration/Deceleration Time Selection	0–3	0	√
FC.38	Basic PLC Segment 10 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.39	Basic PLC Segment 10 Acceleration/Deceleration Time Selection	0–3	0	√
FC.40	Basic PLC Segment 11 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.41	Basic PLC Segment 11 Acceleration/Deceleration Time Selection	0–3	0	√
FC.42	Basic PLC Segment 12 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√

Function Code	Name	Setting Range	Default	Modify
FC.43	Basic PLC Segment 12 Acceleration/Deceleration Time Selection	0–3	0	√
FC.44	Basic PLC Segment 13 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.45	Basic PLC Segment 13 Acceleration/Deceleration Time Selection	0–3	0	√
FC.46	Basic PLC Segment 14 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.47	Basic PLC Segment 14 Acceleration/Deceleration Time Selection	0–3	0	√
FC.48	Basic PLC Segment 15 Run Time	0.0 s(h)–6553.5 s(h)	0.0 s(h)	√
FC.49	Basic PLC Segment 15 Acceleration/Deceleration Time Selection	0–3	0	√

Function Code	Name	Setting Range	Default	Modify
FC.50	Basic PLC Run Time Unit	0: s (seconds) 1: h (hours)	0	√
FC.51	Multi-segment Command 0 Preset Method	0: Frequency reference by function code FC.00 1:AI1 2:AI2 3: Reserved 4: PULSE input 5:PID 6: Preset frequency (F0.08) reference, adjustable via UP/DOWN	0	√
Fd Communication Control Group				
Fd.00	Communication Baud Rate	Least significant digit: MODBUS 0:300BPS 1:600BPS 2:1200BPS 3:2400BPS 4:4800BPS 5:9600BPS 6:19200BPS 7:38400BPS 8:57600BPS 9:115200BPS Tens digit: Reserved Hundreds digit: Reserved Thousands digit: Reserved	5	√
Fd.01	MODBUS Data Format	0: No parity (8-N-2) 2: Odd parity (8-O-1) 1: Even parity (8-E-1) 3: No parity (8-N-1)	0	√

Function Code	Name	Setting Range	Default	Modify
Fd.02	Local Address	0: Broadcast Address 1–247	1	√
Fd.03	MODBUS Response Delay	0–20 ms	2	√
Fd.04	Serial Communication Timeout	0.0: Invalid 0.1 ~ 60.0 s	2	√
Fd.05	MODBUS Communication Data Format	Least significant digit: MODBUS 0: Non-standard MODBUS protocol 1: Standard MODBUS protocol Tens digit: Reserved	1	√
Fd.06	Communication read current resolution	0: 0.01A 1: 0.1A	0	√
Fd.07 - Fd.08	Reserved		-	-
FE User-defined Function Code group				
FE.00	User Function Code 0	F0.00~Fx.xx H0.00~Hx.xx U0.00~U0.xx		
FE.01	User Function Code 1			
FE.02	User Function Code 2			
FE.03	User Function Code 3			
FE.04	User Function Code 4			
FE.05	User Function Code 5			

Function Code	Name	Setting Range	Default	Modify
FE.06	User Function Code 6			
FE.07	User Function Code 7			
FE.08	User Function Code 8			
FE.09	User Function Code 9			
FE.10	User Function Code 10			
FE.11	User Function Code 11			
FE.12	User Function Code 12			
FE.13	User Function Code 13			
FE.14	User Function Code 14			
FE.15	User Function Code 15			
FE.16	User Function Code 16			
FE.17	User Function Code 17			
FE.18	User Function Code 18			
FE.19	User Function Code 19			
FE.20	User Function Code 20			
FE.21	User Function Code 21			

Function Code	Name	Setting Range	Default	Modify
FE.22	User Function Code 22	F0.00~Fx.xx H0.00~Hx.xx U0.00~U0.xx		
FE.23	User Function Code 23			
FE.24	User Function Code 24			
FE.25	User Function Code 25			
FE.26	User Function Code 26			
FE.27	User Function Code 27			
FE.28	User function code 28			
FE.29	User function code 29			
FP Function Code Management Group				
FP.00	User password	0–65535	0	√
FP.01	Parameter initialization	0: No Operation 01: Restore factory parameters (excluding motor parameters) 02: Clear recorded information 04: Backup current user parameters 501: Restore user backup parameters	0	×
FP.02	Function parameter group display selection	Unit digit: U group display selection 0: Not displayed 1: Displayed Tens digit: H group display selection 0: Not displayed 1: Displayed	11	×

Function Code	Name	Setting Range	Default	Modify
FP.03	Custom parameter group display Selection	Unit digit: User-defined parameter group display selection 0: Not displayed 1: Displayed Tens digit: User-modified parameter group display selection 0: Not displayed 1: Displayed	11	×
FP.04	Function Code modification attribute	0: Modifiable 1: Non-modifiable	0	√
H0 Torque Control Parameter Group				
H0.00	Speed/Torque Control Mode Selection	0: Speed Control 1: Torque Control	0	×
H0.01	Torque under Torque Control Mode Setting Source Selection	0: Digital Setting 1 (H0.03) 1:AI1 2:AI2 3: Reserved 4: PULSE Input 5: Communication setpoint 6:MIN(AI1,AI2) 7:MAX(AI1,AI2) (The full scale for options 1–7 corresponds to Digital Setting H0.03)	0	×
H0.02	Reserved		-	-
H0.03	Torque under Torque Control Mode Digital Setting	-200.0%~200.0%	150.0%	√
H0.04	Reserved		-	-

Function Code	Name	Setting Range	Default	Modify
H0.05	Forward Maximum Torque Control Frequency	0.00 Hz–Maximum Frequency	50.00 Hz	√
H0.06	Reverse Maximum Torque Control Frequency	0.00 Hz–Maximum Frequency	50.00 Hz	√
H0.07	Torque Rise Filter Time	0.00 s~65000 s	0.0 s	√
H0.08	Torque Fall Filter Time	0.00 s~65000 s	0.0 s	√
H1 Virtual IO Parameter Group				
H1.00	Virtual VDI1 Terminal Function Selection	0–59	0	×
H1.01	Virtual VDI2 Terminal Function Selection	0–59	0	×
H1.02	Virtual VDI3 Terminal Function Selection	0–59	0	×
H1.03	Virtual VDI4 terminal function Selection	0–59	0	×
H1.04	Virtual VDI5 terminal function Selection	0–59	0	×

Function Code	Name	Setting Range	Default	Modify
H1.05	Virtual VDI terminal status setting mode	0: The validity of the VDI is determined by the status of the corresponding virtual VDOx 1: The validity of the VDI is specified by function code H1.06 Ones place: Virtual VDI1 Tens place: Virtual VDI2 Hundreds place: Virtual VDI3 Thousands place: Virtual VDI4 Ten-thousands place: Virtual VDI5	00000	×
H1.06	Virtual VDI terminal status configuration	0: Invalid 1: Valid Ones place: Virtual VDI1 Tens place: Virtual VDI2 Hundreds place: Virtual VDI3 Thousands place: Virtual VDI4 Ten-thousands place: Virtual VDI5	00000	×
H1.07	When AI1 Terminal is used as DI Function selection	0–59	0	×
H1.08	AI2 Terminal as DI function Function selection	0.0 s: Not valid 0.1–60.0 s	0	×
H1.09	Reserved		-	-
H1.10	Valid mode selection when AI Terminal is configured as DI	0: Active High 1: Active Low Units digit: AI1 Tens digit: AI2 Hundreds digit: Reserved	000	×
H1.11	Virtual VDO1 output function Selection	0: Internally shorted to the corresponding physical DIx 1–40: Refer to F6 group, physical DO output selection	0	√

Function Code	Name	Setting Range	Default	Modify
H1.12	Virtual VDO2 output function Selection	0: Internally shorted to the corresponding physical DIx 1–40: Refer to F6 group, physical DO output selection	0	√
H1.13	Virtual VDO3 output function Selection	0: Internally shorted to the corresponding physical DIx 1–40: Refer to F6 group, physical DO output selection	0	√
H1.14	Virtual VDO4 output function Selection	0: Internally shorted to the corresponding physical DIx 1–40: Refer to F6 group, physical DO output selection	0	√
H1.15	Virtual VDO5 Output Function Selection	0: Internally shorted to the corresponding physical DIx 1–40: Refer to F6 group, physical DO output selection	0	√
H1.16	VDO1 Output Delay Time	0.0 s–3600.0 s	0.0	√
H1.17	VDO2 Output Delay Time	0.0 s–3600.0 s	0.0	√
H1.18	VDO3 Output Delay Time	0.0 s–3600.0 s	0.0	√
H1.19	VDO4 Output Delay Time	0.0 s–3600.0 s	0.0	√
H1.20	VDO5 Output Delay Time	0.0 s–3600.0 s	0.0	√
H1.21	Selection of Active State for VDO Output Terminals	0: Positive Logic 1: Active Low Logic Unit digit: VDO1 Tens digit: VDO2 Hundreds digit: VDO3 Thousands digit: VDO4 Ten-thousands place: VDO5	00000	√
H2 Second Motor Parameter Group				

Function Code	Name	Setting Range	Default	Modify
H2.00	Motor Type Selection	0: Reserved 1: Asynchronous Motor	1	×
H2.01	Motor Rated Power	0.1kW–1000.0kW	Model Selection	×
H2.02	Motor Rated Voltage	1V–2000V	Model Selection	×
H2.03	Motor Rated Current	0.1A–6553.5A	Model Selection	×
H2.04	Motor rated frequency	0.01 Hz–Maximum frequency	Model Selection	×
H2.05	Motor rated speed	1rpm–65535rpm	Model Selection	×
H2.06	Asynchronous motor stator resistance	0.001Ω–65.535Ω	Tuning Parameters	×
H2.07	Asynchronous motor rotor resistance	0.001Ω–65.535Ω	Tuning Parameters	×
H2.08	Asynchronous motor leakage reactance	0.1mH–6553.5mH	Tuning Parameters	×
H2.09	Asynchronous motor mutual reactance	0.1mH–6553.5mH	Tuning Parameters	×
H2.10	Asynchronous motor no-load current	0.1A–6553.5A	Tuning Parameters	×

Function Code	Name	Setting Range	Default	Modify
H2.16	Synchronous Motor stator resistance	0.0001Ω–65.535Ω	Tuning Parameters	-
H2.17	Synchronous Motor D-axis inductance	0.1mH–6553.5mH	Tuning Parameters	
H2.18	Synchronous Motor D-axis inductance	0.1mH–6553.5mH	Tuning Parameters	
H2.19	Synchronous Motor voltage mode	0:PID 1: Feedforward	0	
H2.20	Synchronous Motor Back Electromotive Force Coefficient	0.1–6553.5V	Tuning Parameters	
H2.21	Synchronous Motor Starting Torque	0.0% – 200.0%	50.0%	
H2.22	Synchronous Motor Low-frequency Excitation	0.0% – 200.0%	10.0%	
H2.23	Synchronous Motor Open-loop Operation Time	0–60000 ms	500 ms	
H2.24 - H2.26	Reserved		-	-
H2.32 - H2.36	Reserved		-	-

Function Code	Name	Setting Range	Default	Modify
H2.37	Tuning Selection	0: No Operation 2: Complete Auto-tuning of Asynchronous Motor 1: Stationary Auto-tuning of Asynchronous Motor	0	×
H2.38	Speed Loop Proportional Gain 1	1–200	20	√
H2.39	Speed Loop Integral Time 1	0.01 s~10.00 s	0.050 s	√
H2.40	Switching Frequency 1	0.00~H2.43	5.00 Hz	√
H2.41	Speed Loop Proportional Gain 2	1–100	20	√
H2.42	Speed Loop Integral Time 2	0.01 s~10.00 s	0.10 s	√
H2.43	Changeover Frequency 2	H2.40~Maximum Frequency	10.00 Hz	√
H2.44	Vector Control Slip Gain	50%–200%	100%	√
H2.45	Vector Speed Feedback Filtering	0–100	8	√
H2.46	Vector Torque Boost Cutoff Frequency	0.0~Maximum Frequency	20.00 Hz	√
H2.47	Vector Torque Boost	0.0% – 200.0%	10.0%	√

Function Code	Name	Setting Range	Default	Modify
H2.48	Torque in Speed Control Method Upper Limit Source	0: H2.49 Setting 4: PULSE 1: AI1 5: Communication Setpoint 2: AI2 6: MIN(AI1,AI2) 3: Reserved 7: MAX(AI1,AI2) Full scale for options 1–7, corresponding to the numerical setting in H2.48	0	√
H2.49	Torque in Speed Control Method Upper Limit Digital Setting	0.0% – 200.0%	150.0%	√
H2.50	Torque in Speed Control Method Upper Limit Source (Generation Mode)	0: Set by Function Code H2.51 1:AI1 2:AI2 3: Reserved 4: Reserved 5: Communication setpoint 6:MIN(AI1,AI2) 7:MAX(AI1,AI2) The full-scale range for options 1-7 corresponds to H2.51	0	√
H2.51	Torque in Speed Control Method Upper Limit Digital Setting (Regenerative)	0.0% – 200.0%	150.0%	√
H2.52	Excitation Regulation Proportional Gain	0–20000	200	√
H2.53	Excitation Regulation Integral Gain	0–20000	100	√

Function Code	Name	Setting Range	Default	Modify
H2.54	Torque Regulation Proportional Gain	0–20000	200	√
H2.55	Torque Regulation Integral Gain	0–20000	100	√
H2.56	Synchronous Motor Field Weakening Mode	0,1,2	1	
H2.57	Synchronous Motor Weak Magnetic Field Gain	0–50	5	
H2.62	Second motor control Mode	0: V/F control 1: Sensorless Vector Control (SVC) 2: Vector control with speed sensor (FVC)	0	×
H2.63	Second Motor Acceleration/Deceleration Time Selection	0: Same as First Motor 3: Acceleration/Deceleration Time 3 1: Acceleration/Deceleration Time 1 4: Acceleration/Deceleration Time 4 2: Acceleration/Deceleration Time 2	0	√
H2.64	Second Motor Torque Boost	0.0%: Automatic Torque Boost 0.1%–30.0%	Model Selection	√
H2.65	Reserved		-	-
H2.66	Synchronous Motor Output Voltage Upper Margin	0%–50%	5%	√

Function Code	Name	Setting Range	Default	Modify
H2.67	Synchronous Motor Initial Position Angle Measured Current	50%–180%	80%	√
H2.68	Synchronous Motor Initial Position Angle Detection	0,1,2,3	0	√
H2.70	Synchronous Motor Salient Pole Frequency Gain Adjustment	50–500	100	√
H2.71	Maximum Torque-Current Ratio Control	0, 1	0	√
H2.72	High-Frequency Injection Voltage Amplitude	0–120V	35V	√
H2.79	Low-Speed Excitation Current	0–80%	30%	√
H2.80	Low-Speed Carrier Frequency	2.0k~Carrier frequency	2.0 kHz	√
H2.81	SVC low frequency braking mode	0,1	0	√

Function Code	Name	Setting Range	Default	Modify
H2.82	SVC low frequency braking activation frequency	0.00~10.00 Hz	2.00 Hz	√
H2.83	SVC low frequency braking frequency variation Increment	0.0005~1.0000 Hz	0.0010 Hz	√
H2.84	SVC low frequency braking current	0%–80%	50%	√
H2.85	Synchronous motor SVC speed Speed tracking	0–1	0	√
H5 Control optimization parameter group				
H5.00	DPWM Switching Upper Limit Frequency	5.00 Hz to Maximum Frequency	8.00 Hz	√
H5.01	PWM Modulation Method	0: Asynchronous Modulation 1: Synchronous Modulation	0	√
H5.02	Dead Time Compensation Mode Selection	0: No Compensation 1: Compensation Mode 1	1	√
H5.03	Random PWM Depth	0: Random PWM Disabled 1 to 10: PWM Carrier Frequency Randomization Depth	0	√

Function Code	Name	Setting Range	Default	Modify
H5.04	Fast Current Limiting Enable	0: Disabled 1: Enabled	1	√
H5.05	Overmodulation coefficient	0–110	105	√
H5.06	Undervoltage threshold setting	150–400V	Model Selection	√
H5.07	SVC optimization mode selection	1: Optimization Mode 1 2: Optimization Mode 2	1	√
H5.08	Dead time adjustment	100%–200%	150%	×
H5.09	Overvoltage threshold setting	350V–850V	Model Selection	×
H6 AI curve parameter group				
H6.00	Minimum input for AI Curve 4	-10.00V to H6.02	0.00V	√
H6.01	AI Curve 4 Minimum Input Corresponding Setting	-100.0%–+100.0%	0.0%	√
H6.02	AI Curve 4 Knee Point 1 Input	H6.00–H6.04	3.00V	√
H6.03	AI Curve 4 Knee Point 1 Input Corresponding Setting	-100.0%–+100.0%	30.0%	√

Function Code	Name	Setting Range	Default	Modify
H6.04	AI Curve 4 Knee Point 2 Input	H6.02–H6.06	6.00V	√
H6.05	AI Curve 4 Knee Point 2 Input Corresponding Setting	-100.0%–+100.0%	60.0%	√
H6.06	AI Curve 4 Maximum Input	H6.04–+10.00V	10.00V	√
H6.07	AI Curve 4 Maximum Input Corresponding Setting	-100.0%–+100.0%	100.0%	√
H6.08	AI Curve 5 Minimum Input	-10.00V–A6.10	-10.00V	√
H6.09	AI Curve 5 Minimum Input Corresponding Setting	-100.0%–+100.0%	-100.0%	√
H6.10	AI Curve 5 Inflection Point 1 Input	H6.08–H6.12	-3.00V	√
H6.11	AI Curve 5 Inflection Point 1 Input Corresponding Setting	-100.0%–+100.0%	-30.0%	√
H6.12	AI Curve 5 Inflection Point 2 Input	H6.10~H6.14	3.00V	√

Function Code	Name	Setting Range	Default	Modify
H6.13	AI Curve 5 Inflection Point 2 Input Corresponding Setting	-100.0%–+100.0%	30.0%	√
H6.14	AI Curve 5 Maximum Input	H6.12~+10.00V	10.00V	√
H6.15	AI Curve 5 Maximum Input Corresponding Setting	-100.0%–+100.0%	100.0%	√
H6.24	AI1 Jump Point Setting	-100.0%~100.0%	0.0%	√
H6.25	AI1 Jump Amplitude Setting	0.0% – 100.0%	0.5%	√
H6.26	AI2 Jump Point Setting	-100.0%~100.0%	0.0%	√
H6.27	AI2 Jump Amplitude Setting	0.0% – 100.0%	0.5%	√
U0 Basic Monitoring Parameter Group				
U0.00	Operating Frequency (Hz)	0.01 Hz	7000H	-
U0.01	Setting Frequency (Hz)	0.01 Hz	7001H	-
U0.02	Bus Voltage (V)	0.1V	7002H	-
U0.03	Output Voltage (V)	1V	7003H	-

Function Code	Name	Setting Range	Default	Modify
U0.04	Output Current (A)	0.01A	7004H	-
U0.05	Output Power (kW)	0.1kW	7005H	-
U0.06	Output Torque (%)	0.1%	7006H	-
U0.07	DI Input Status	1	7007H	-
U0.08	DO Output Status	1	7008H	-
U0.09	AI1 Voltage (V)	0.01V	7009H	-
U0.10	AI2 Voltage (V) / Current (mA)	0.01V/0.01 mA	700AH	-
U0.11	Reserved		-	-
U0.12	Count Value	1	700CH	-
U0.13	Length Value	1	700DH	-
U0.14	Load Speed Display	1	700EH	-
U0.15	PID Setting	1	700FH	-
U0.16	PID Feedback	1	7010H	-
U0.17	PLC Stage	1	7011H	-
U0.19	Feedback Speed (Hz)	0.01 Hz	7013H	-
U0.20	Remaining Running Time	0.1Min	7014H	-
U0.21	AI1 Pre-calibration Voltage	0.001V	7015H	-

Function Code	Name	Setting Range	Default	Modify
U0.22	AI2 Pre-calibration Voltage (V) / Current (mA)	0.001V/0.01 mA	7016H	-
U0.23	Reserved		-	-
U0.24	Linear velocity	1m/Min	7018H	-
U0.25	Current power-on time	1Min	7019H	-
U0.26	Current run time	0.1Min	701AH	-
U0.28	Communication setpoint	0.01%	701CH	-
U0.29	Encoder feedback speed	0.01 Hz	701DH	-
U0.30	Main frequency X display	0.01 Hz	701EH	-
U0.31	Auxiliary frequency Y display	0.01 Hz	701FH	-
U0.32	View value at any memory address	1	7020H	-
U0.34	motor temperature value	1℃	7022H	-
U0.35	Target torque (%)	0.1%	7023H	-
U0.36	Resolver position	1	7024H	-
U0.37	Power factor angle	0.1°	7025H	-

Function Code	Name	Setting Range	Default	Modify
U0.38	ABZ position	1	7026H	-
U0.39	VF separation target voltage	1V	7027H	-
U0.40	VF separation output voltage	1V	7028H	-
U0.41	DI input status intuitive display	1	7029H	-
U0.42	DO Input Status Indication	1	702AH	-
U0.43	DI Function Status Indication 1 (Function 01–Function 40)	1	702BH	-
U0.44	DI Function Status Indication 2 (Function 41–Function 80)	1	702CH	-
U0.45	Fault Information	1	702DH	-
U0.58	Z Signal Counter	1	703AH	-
U0.59	Set Frequency (%)	0.01%	703BH	-
U0.60	Operating Frequency (%)	0.01%	703CH	-
U0.61	inverter Status	1	703DH	-
U0.62	Current Fault Code	1	703EH	-

Function Code	Name	Setting Range	Default	Modify
U0.63	Point-to-point host communication send value	0.01%	703FH	-
U0.64	Number of slave stations	1	7040H	-
U0.65	Torque upper limit	0.1%	7041H	-
U0.73	Motor number	0: Motor 1 1: Motor 2	7049H	
U0.74	Actual motor output rotation	-300–300%	704AH	
U0.75	Remaining accumulated operating time	0.1Min	704BH	-

6.2 Detailed Description of Function Parameters V1.11

F0 Basic Function Group

F0.00	G/P Type Indication		Default	Model Selection
	Setting Range	1	G type (constant torque load model)	
		2	P type (fan/pump load model)	

This parameter is for user reference to check the factory model only and cannot be modified.

F0.01	Primary motor control Mode		Default	0
	Setting Range	0	V/F control	
		1	Sensorless Vector Control (SVC)	

This function is used to select the control mode of the inverter.

0: V/F control;

Applicable to applications with low load requirements, or where a single inverter operates multiple motors, such as fan and pump loads.

1: Sensorless Vector Control;

Refers to open-loop vector control, suitable for most high-performance applications. In this mode, a single inverter can only operate one motor,

such as in machine tools, centrifuges, wire drawing machines, and injection molding machines.

Note: When selecting vector control, the motor parameter identification process must be completed. Only with accurate motor parameters can the full benefits of vector control be achieved. By adjusting the speed regulator parameters in the F2 group of function codes (H2 group for the second motor), optimal performance can be achieved.

For permanent magnet synchronous motors, vector control is generally selected; however, for some small-capacity motor applications, V/F control may also be chosen.

F0.02	Command source selection			Default	0
	Setting Range	0	Keypad command channel (LED off)		
		1	Terminal command channel (LED on)		
		2	Communication command channel (LED flashing)		
		3	Start/stop via the machine's own switch		

Select the input channel for inverter control commands.

inverter control commands include: start, stop, forward run, reverse rotation, jog, and others.

0: Keypad command channel ("LOCAL/REMOT" indicator off);

Operation commands are controlled via the RUN and STOP/RES keys on the keypad.

1: Input terminal command channel (when the "LOCAL/REMOT" indicator is illuminated)

Operation command control is performed through multifunction input terminals such as FWD, REV, JOGF, and JOGR.

2: Communication command channel (when the "LOCAL/REMOT" indicator is flashing)

Operation commands are transmitted from the host computer via communication.

Control commands are written to address 0x2000; for command definitions, refer to Appendix I: ZVF650 Communication Address Definition.

3: Local machine switch for start/stop (including forward and reverse rotation)

F0.03	Main frequency source X selection		Default	1
	Setting Range	0	Digital Setting (preset frequency F0.08; adjustable via UP/DOWN; not retained after power loss)	
		1	Digital Setting (Preset frequency F0.08, adjustable via UP/DOWN keys, power-down memory)	
		2	AI1	
		3	AI2	
		4	Panel Potentiometer Setting	
		5	Reserved	
		6	Multi-step Command	
		7	PLC	
		8	PID	
		9	Communication setpoint	
		10	Solar water supply	

Select the input channel for the inverter's main frequency setpoint. A total of 10 main frequency channels are available:

0: Digital Setting (non-retentive after power-off)

The initial frequency setting is determined by parameter F0.08 'Preset Frequency'. The setting can be adjusted with the ▲ and ▼ keys on the keypad or through the UP and DOWN multifunction input terminals.

After power is restored, the frequency setting returns to the value of F0.08 'Preset Frequency'.

1: Digital Setting (retentive after power-off)

The initial frequency setting is determined by parameter F0.08 'Preset Frequency'. The setting can be adjusted with the ▲ and ▼ keys on the keypad or through the UP and DOWN multifunction input terminals.

After the inverter loses power and is powered on again, the set frequency will revert to the value configured at the moment of power loss. Any corrections made using the ▲, ▼ keys on the keypad or the UP, DOWN Input terminals will be remembered.

Note that F0.23 is the 'Digital Setting Frequency Stop Memory Selection' parameter. It determines whether the frequency correction is retained or cleared when the inverter stops; it is unrelated to power-loss memory.

2: AI1 3: AI2 4: Reserved 5: Reserved

Specifies that the Frequency is determined by the analog Input terminal. The ZVF650 control board provides two analog Input terminals (AI1 and AI2) as follows:

AI1 and AI2 can be configured as either 0V to 10V voltage inputs or 0 mA to 20 mA current inputs, as selected by parameters F4.39 and F4.40, respectively. The relationship curves between the inputs and the target Frequency can be freely chosen by the user.

The ZVF650 offers five groups of relationship curves: three groups are linear (2-point correspondence), and two groups allow user-defined curves with 4-point correspondence. Users can configure these by using Function Codes F4.12 to F4.26 and the H6 group Function Codes.

Function Code F4.32 is used to set which of the five groups of curves is selected for each of the two analog input channels, AI1 and AI2.

When AI is used as the Frequency reference, a voltage or current input corresponding to 100.0% of the set value indicates the relative maximum frequency.

The percentage of Frequency F0.10.

6. Multi-stage Instruction

When operating in the multi-stage instruction mode, it is necessary to assign different combinations of digital input (DI) terminal states to correspond to different Frequency set values. The ZVF650 can configure 4 multi-stage instruction terminals (terminal functions 12–15). The 16 possible states of these 4 terminals can be mapped via the FC group Function Code to any of 16 'multi-stage instructions.' Each 'multi-stage instruction' is defined as a percentage of the maximum frequency F0.10.

When a digital input (DI) terminal is used as a multi-stage instruction terminal, the corresponding settings must be configured in the F4 group. For detailed information, refer to the relevant Function parameter descriptions in the F4 group.

7. Basic PLC

When the frequency source is set to Basic PLC, the inverter can switch among 1 to 16 arbitrary frequency setpoints. The holding time for

each setpoint and its respective acceleration/deceleration time can be configured by the user. For detailed settings, refer to the relevant instructions in the FC group.

8, PID

Select the output of process PID control as the running Frequency. Typically used for on-site closed-loop process control, such as constant pressure closed-loop control and constant tension closed-loop control.

When using PID as the frequency source, relevant 'PID function' parameters must be configured in the FA group.

9. Communication setpoint: Indicates that the Frequency is specified via the communication interface.

When operating as a point-to-point communication slave and the received data is used as the frequency setpoint, the host transmits the data as the Communication setpoint value (refer to the relevant communication instructions).

	Setting Range	0	Digital Setting (preset frequency F0.08; adjustable via UP/DOWN; not retained after power loss)
		1	Digital Setting (Preset frequency F0.08, adjustable via UP/DOWN keys, power-down memory)
		2	AI1
		3	AI2
		4	Panel Potentiometer Setting
		5	Reserved
		6	Multi-step Command
		7	PLC
		8	PID
		9	Communication setpoint

When the auxiliary frequency source operates as an independent frequency command channel (i.e., when switching frequency source selection from X to Y), its operation is identical to that of the main frequency source X. Please refer to the relevant instructions for F0.03 for details on usage.

When the auxiliary frequency source is used to provide a composite command (i.e., the command frequency is achieved by combining main frequency source X and auxiliary frequency source Y), please observe the following:

1. When the auxiliary frequency source is set as a digital command, the preset frequency (F0.08) is not active. Frequency adjustments made via the ▲, ▼ keys on the keypad (or via the UP and DOWN multifunction input terminals) are applied directly on top of the main command frequency.

2. When the auxiliary frequency source is set as an analog input (AI1, AI2) or pulse input, 100% of the input corresponds to the configured range of the auxiliary frequency source, which can be set using F0.05 and F0.06.

Note: The Auxiliary frequency source Y selection and Main frequency source X selection must not be set to the same channel. Specifically, do not assign the same value to F0.03 and F0.04, as this may cause confusion.

F0.05	Auxiliary frequency source Y range selection when using frequency superposition			Default	0
	Setting Range	0	Relative to the maximum frequency		
		1	Relative to Main frequency source X		

F0.06	Auxiliary frequency source Y range during frequency superposition		Default	100%
	Setting Range	0% – 150%		

When the frequency source is set to 'frequency superposition', these two parameters are used to determine the adjustment range of the auxiliary frequency source.

F0.05 is used to determine the reference for the auxiliary frequency source range. The reference can be set either relative to the maximum frequency or relative to Main frequency source X. If set relative to Main frequency source X, the range of the auxiliary frequency source will vary in accordance with the changes in Main Frequency X.

F0.07	frequency source superposition selection			Default	0
	Setting Range	Units place	frequency source selection		
		0	Main frequency source X		
		1	Main/auxiliary calculation result (operation relationship determined by the tens place)		
		2	Switching between main frequency source X and auxiliary frequency source Y		
		3	Switching between main frequency source X and main/auxiliary calculation result		
		4	Switching between auxiliary frequency source Y and main/auxiliary calculation result		
		Tens place	Main and auxiliary frequency source calculation relationship		
		0	Main + Auxiliary		
		1	Main – Auxiliary		
		2	Maximum of the two		
		3	Minimum of the two		

Select the frequency command channel using this parameter. The frequency command is generated by synthesizing main frequency source X and auxiliary frequency source Y.

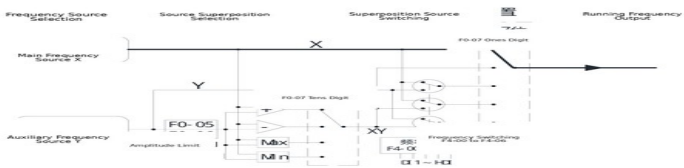


Figure 6-1 Frequency combination schematic

When the frequency source is set to main/auxiliary operation, an offset frequency can be set via F0.21. The offset frequency will be superimposed on the main/auxiliary operation result to flexibly accommodate various requirements.

F0.08	Preset frequency		Default	50.00 Hz
	Setting Range	0.00 ~ maximum frequency (applicable only when the frequency source is set to Digital Setting)		

When the frequency source is configured as 'Digital Setting', this function code value defines the initial frequency digital setting of the inverter.

F0.09	Operating Direction Selection		Default	0
	Setting Range	0	Operates in the default direction; FWD indicator remains illuminated	
		1	Operates in the opposite direction to the default; REV indicator remains illuminated	

By changing this function code, the motor rotation direction can be reversed without altering the motor wiring. This is functionally equivalent to swapping any two of the U, V, or W motor leads to change the rotation direction.

Note: After parameter initialization, the motor operating direction will revert to its original setting. Exercise caution in applications where changing the motor direction is strictly prohibited after system commissioning.

F0.10	Maximum frequency		Default	50.00 Hz
	Setting Range	50.00 Hz–599.00 Hz		

In the ZVF650, when analog input, multi-stage command, or other sources are used as the frequency source, 100.0% for each is defined relative to the scaling of F0.10.

F0.11	Upper limit frequency source		Default	0
	Setting Range	0	F0.12 Setting	
		1	AI1	
		2	AI2	
		3	Reserved	
		4	Reserved	
		5	Communication Setting	

Defines the source of the upper limit frequency. The upper limit frequency can originate from the digital setting (F0.12), analog input, or communication set point.

When analog input (AI1, AI2) or communication set point is used, it functions similarly to the main frequency source; refer to the description in F0.03.

For example, in winding control applications employing torque control mode, to prevent a 'runaway' condition caused by material breakage, the upper limit frequency can be set via analog input. When the inverter reaches this upper limit frequency, it maintains operation at this frequency.

F0.12	Upper limit frequency	Default	50.00 Hz
	Setting Range	Lower Frequency Limit F0.14 to Maximum Frequency F0.10	

Set the upper frequency limit. The setting range is from F0.14 to F0.10.

F0.13	Upper limit frequency offset	Default	0.00 Hz

	Setting Range	0.00 Hz to Maximum Frequency F0.10

When the upper frequency limit source is set to analog input, F0.13 serves as the bias for the set value. This bias frequency is added to the upper frequency limit value set by F0.11 to determine the final upper frequency limit.

F0.14	Lower Frequency Limit		Default	0.00 Hz
	Setting Range	0.00 Hz to Upper Frequency Limit F0.05		

When the frequency command is below the lower frequency limit set by F0.14, the inverter can stop, operate at the lower frequency limit, or run at zero speed. The operating mode can be configured via F8.14 (Operating mode when the set frequency is below the lower frequency limit).

F0.15	Carrier frequency		Default	Model Selection
	Setting Range	0.5 kHz – 16.0 kHz		

This function adjusts the inverter's carrier frequency. Adjusting the carrier frequency can reduce motor noise, avoid resonance points in the mechanical system, decrease leakage current to ground, and reduce electromagnetic interference generated by the inverter.

At lower carrier frequencies, higher-order harmonic components in the output current increase, resulting in increased motor losses and higher motor temperature rise.

At higher carrier frequencies, motor losses and temperature rise decrease, but inverter losses and temperature rise increase, along with increased electromagnetic interference.

Adjusting the carrier frequency will impact the following performance parameters:

Carrier frequency	Low → High
Motor noise	Large → Small
Output current waveform	Poor → Good
motor temperature rise	High → Low
inverter temperature rise	Low → High
Leakage Current	Small → Large
External radiation interference	Small → Large

The default value of the carrier frequency varies according to the inverter's power rating. Although users may adjust the setting as required, it is important to note: If the carrier frequency is set higher than the default value, the heat sink temperature rise will increase. In such cases, the inverter must be operated under derated conditions; otherwise, an overheating alarm may be triggered.

F0.16	Carrier frequency temperature adaptation		Default	1
	Setting Range	0	No	
		1	Yes	

Carrier frequency temperature adaptation means that when the inverter detects an elevated heat sink temperature, it will automatically reduce the carrier frequency to limit temperature rise. When the heat sink temperature decreases, the carrier frequency will gradually return to the preset value. This function reduces the likelihood of inverter overheating alarms.

F0.17	Acceleration Time 1		Default	Model Selection
	Setting Range	0.00 s – 650.00 s(F0.19=2) 0.0 s – 6500.0 s(F0.19=1) 0 s – 65000 s(F0.19=0)		
F0.18	Deceleration Time 1		Default	Model Selection
	Setting Range	0.00 s – 650.00 s(F0.19=2) 0.0 s – 6500.0 s(F0.19=1) 0 s – 65000 s(F0.19=0)		

Acceleration time refers to the time required for the inverter to increase from zero frequency,
to the Acceleration/Deceleration reference frequency
(as determined by F0.25);
see t1 in Figure 6-2.

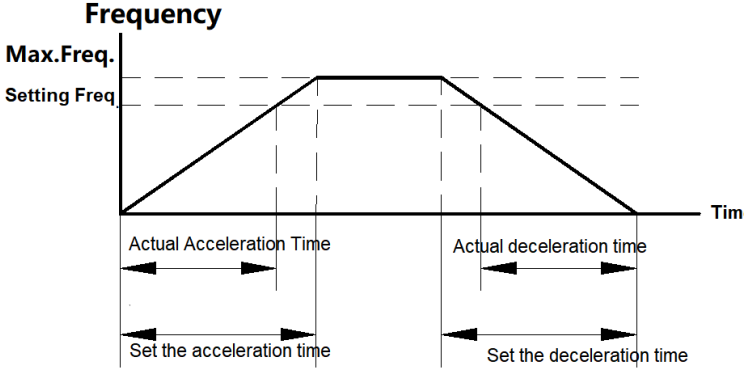


Figure 6-2 Acceleration/Deceleration Time Diagram

Deceleration time refers to the time required for the inverter to decrease from the Acceleration/Deceleration reference Frequency (as determined by F0.25) to zero frequency; see t2 in Figure 6-2.

F0.19	Acceleration/Deceleration time unit		Default	1
	Setting Range	0	1 second	
		1	0.1 second	
		2	0.01 second	

To accommodate various on-site requirements, the ZVF650 provides three acceleration/deceleration time units: 1 second, 0.1 second, and 0.01 second.

Note: When modifying this function parameter, the displayed number of decimal places for the four groups of acceleration/deceleration times will change, as will the corresponding acceleration/deceleration values. Take special care during practical application.

F0.21	Auxiliary frequency source bias frequency for superposition	Default	0.00 Hz
	Setting Range	0.00 Hz to Maximum Frequency F0.10	

This function code is only effective when the frequency source is set to main/auxiliary computation.

When the frequency source is set to main/auxiliary computation, F0.21 acts as the bias frequency and is superimposed with the main/auxiliary computation result to form the final frequency setting, enabling more flexible frequency configuration.

F0.23	Digital Setting Frequency Stop Memory Selection		Default	1
	Setting Range	0	No Memory	
		1	Memory	

This function is only valid when the frequency source is set to Digital Setting.

'No Memory' indicates that after the inverter stops, the digitally set frequency value reverts to the value of F0.08 (preset frequency), and any frequency adjustments made via the ▲, ▼ keys or Terminal UP, DOWN are reset to zero.

'Memory' indicates that after the inverter stops, the digitally set frequency retains the value set at the last stop, and any frequency adjustments made via the ▲, ▼ keys or Terminal UP, DOWN remain effective.

F0.24	Motor parameter group selection			Default	0
	Setting Range	0	Motor Parameter Group 1		
		1	Motor Parameter Group 2		

The ZVF650 supports the application of controlling two motors by time-sharing with a single inverter. Each motor can be configured with its own nameplate parameters, independent parameter tuning, selection of different control methods, and individual parameters related to operational performance.

Motor parameter group 1 corresponds to Function Parameter Groups F1 and F2, and motor parameter group 2 corresponds to Function Parameter Group H2. The user can select the current motor parameter group via Function Code F0.24, or switch the motor parameter group using the digital input terminal DI. If the selection made by function code conflicts with the terminal selection, the terminal selection will take precedence.

F0.25	Acceleration/Deceleration time reference frequency			Default	0
	Setting Range	0	Maximum Frequency (F0.10)		
		1	Set Frequency		
		2	100 Hz		

Acceleration/Deceleration time refers to the time required to accelerate or decelerate from zero frequency to the frequency set by F0.25. Figure 6-1 illustrates the acceleration/deceleration time.

When F0.25 is set to 1, the acceleration/deceleration time depends on the set frequency. If the set frequency changes frequently, the motor acceleration will vary accordingly, which must be considered during application.

F0.26	Frequency command reference during operation: UP/DOWN baseline			Default	1
	Setting Range	0	Operating Frequency		
		1	Set Frequency		

This parameter is effective only when the frequency source is set to Digital Setting.

This parameter determines the method by which the ▲ and ▼ keys on the keypad or the UP/DOWN terminal adjust the set frequency—whether the target frequency is incremented or decremented based on the current operating frequency, or based on the preset frequency.

The distinction between these two settings becomes prominent during acceleration or deceleration. That is, if the operating frequency does not match the preset frequency, different parameter selections will result in significant differences in operation.

F0.27	Command source binding to frequency source	Default	000

	Setting Range	Units place	Keypad command binding frequency source selection
		0	No binding
		1	Digital Setting frequency source
		2	AI1
		3	AI2
		4	Reserved
		5	Reserved
		6	Multi-step Command
		7	Basic PLC
		8	PID
		9	Communication set point
		Tens place	Terminal command-bound frequency source selection (0 ~ 9, same digit place)
		Hundreds digit	Communication command-bound frequency source selection (0 ~ 9, same digit place)

Defines the bundling combinations between the three types of operation command channels and the nine types of frequency setting channels, facilitating synchronized switching. The definitions of the above frequency setting channels are identical to those in the Main frequency source X selection (Function Code F0.03); please refer to the Function Code F0.03 description. Different operation command channels may be bundled with the same frequency setting channel. When a command source has a bundled frequency source, the frequency sources specified by F0.03 to F0.07 will not be in effect during the validity period of that command source.

F0.33	Macro function		Default	0
	Setting Range	0	General Functions	
		1	Water Supply Function 1 (see detailed description below)	
		2	Water Supply Function 2 (see detailed description below)	
		3	Water Supply Function 3 (see detailed description below)	
		4	Water Supply Function 4 (see detailed description below)	

General Function: Display all parameters

Water Supply Function 1: Automatically switches to remote pressure gauge water supply mode, with AI1 used as the feedback pressure.

Water Supply Function 2: Automatically switches to remote pressure gauge water supply mode, with AI2 used as the feedback pressure.

Water Supply Function 3: Automatically switches to pressure sensor water supply mode, with AI1 used as the feedback pressure (4–20 mA).

Water Supply Function 4: Automatically switches to pressure sensor water supply mode, with AI2 used as the feedback pressure (4–20 mA).

The above water supply modes will disable unnecessary parameters.

F1 First Motor Parameter Group

F1.00	Motor Type Selection			Default	1
	Setting Range	1	Asynchronous Motor		
		2	Synchronous Motor		
F1.01	Rated Power			Default	Model Selection
	Setting Range	0.1kW – 1000.0kW			
F1.02	Rated voltage			Default	Model Selection
	Setting Range	1V – 2000V			
F1.03	Rated Current			Default	Model Selection
	Setting Range	0.1A – 6553.5A			
F1.04	Rated Frequency			Default	Model Selection
	Setting Range	0.01 Hz – Maximum Frequency			
F1.05	Rated speed			Default	Model Selection
	Setting Range	1rpm – 65535rpm			

The above function codes are motor nameplate parameters. Whether VF control or vector control is used, these parameters must be accurately set in accordance with the motor nameplate.

To achieve optimal VF or vector control performance, motor parameter tuning is necessary. The accuracy of the tuning results is closely dependent on the correct setting of the motor nameplate parameters.

F1.06	Asynchronous motor stator resistance		Default	Tuning Parameters
	Setting Range	0.001– 65.535		
F1.07	Asynchronous motor rotor resistance		Default	Tuning Parameters
	Setting Range	0.001– 65.535		
F1.08	Asynchronous motor leakage reactance		Default	Tuning Parameters
	Setting Range	0.1mH – 6553.5mH		
F1.09	Asynchronous motor mutual reactance		Default	Tuning Parameters
	Setting Range	0.1mH – 6553.5mH		
F1.10	Asynchronous motor no-load current		Default	Tuning Parameters
	Setting Range	0.1A – 6553.5A		

F1.01~F1.05 are parameters for asynchronous motors. These parameters are generally not indicated on the motor nameplate and must be obtained via automatic tuning by the inverter.

Specifically, 'asynchronous motor stationary tuning' can only obtain the three parameters F1.06~F1.08, whereas 'asynchronous motor dynamic tuning' can obtain all five parameters listed here, as well as the encoder phase sequence, current loop PI parameters, and more.

When the Motor rated power (F1.01) or Motor rated voltage (F1.02) is changed, the inverter will automatically update the parameter values of

F1.06 to F1.10, resetting these five parameters to the standard values commonly used for Y series Motors.

If it is not possible to tune the asynchronous Motor on site, you may enter the relevant function codes above based on the parameters provided by the Motor manufacturer.

F1.16	Synchronous Motor stator resistance		Default	Tuning Parameters
	Setting Range	0.001– 65.535		
F1.17	Synchronous Motor D-axis inductance		Default	Tuning Parameters
	Setting Range	0.1mH – 6553.5mH		
F1.18	Synchronous Motor q-axis inductance		Default	Tuning Parameters
	Setting Range	0.1mH – 6553.5mH		
F1.19	Synchronous Motor voltage mode		Default	0
	Setting Range	0 PID		
		1 Feedforward		
F1.20	Synchronous Motor back EMF coefficient		Default	Tuning Parameters
	Setting Range	0.1V – 6553.5V		
F1.21	Synchronous Motor Starting Torque		Default	50%
	Setting Range	0.0% – 200.%		
F1.22	Synchronous Motor Low-frequency Excitation		Default	10%
	Setting Range	0.0% – 200.%		
F1.23	Synchronous Motor open-loop operation time		Default	100
	Setting Range	0 – 60000 ms		
F1.24	Observation parameters		Default	0.30
	Setting Range	0.01 – 20.00		
F1.25	Observation parameters		Default	0.004

	Setting Range	0.001 – 2.000		
F1.26	Observation parameters		Default	0.2
	Setting Range	0.01 – 20.00		

F1.16~F1.26 are parameters related to the synchronous Motor. Some synchronous Motor nameplates may provide partial parameters, but most do not include the above parameters, which must be obtained via automatic tuning by the inverter.

When modifying the Motor rated power (F1.01) or Motor rated voltage (F1.02), the inverter will automatically update the parameter values for F1.16 to F1.20. Please pay close attention to this adjustment during operation.

The above synchronous machine parameters may also be set directly via the corresponding function codes according to data provided by the manufacturer.

F1.37	Tuning Selection			Default	0
	Setting Range	0	No operation		
		1	Stationary tuning		
		2	Dynamic tuning		

To ensure optimal inverter performance under vector control, disconnect the Load from the Motor and perform Motor parameter auto-tuning using dynamic tuning mode; otherwise, vector control performance may be compromised. If the Motor is coupled to a high-inertia Load that cannot be easily detached but vector control is required, please use stationary tuning.

Before performing parameter auto-tuning, ensure that the correct motor type and nameplate parameters (F1.01~F1.05) are set.

Tuning procedure: Set the motor nameplate parameters and select the auto-tuning type, then press the RUN key. The inverter will execute the tuning process.

0: No operation; tuning is disabled.

1: Stationary tuning—used in scenarios where large inertia loads cannot be decoupled, making rotational tuning infeasible.

2: Dynamic tuning

During dynamic tuning, the inverter first performs stationary tuning, then accelerates to 80% of the motor rated frequency according to the acceleration time (F0.17), holds this speed for a preset duration, and finally decelerates to a stop according to the deceleration time (F0.18), thereby completing the tuning process.

F2 First Motor Vector Control Parameter Group

F2.00	Speed Loop Proportional Gain 1		Default	30
	Setting Range	1 – 100		
F2.01	Speed Loop Integral Time 1		Default	0.50 s
	Setting Range	0.01 s – 10.00 s		
F2.02	Switching Frequency 1		Default	5.00 Hz
	Setting Range	0.00 – F2.05		
F2.03	Speed Loop Proportional Gain 2		Default	15
	Setting Range	0 – 100		
F2.04	Speed Loop Integral Time 2		Default	1.00 s
	Setting Range	0.01 s – 10.00 s		
F2.05	Changeover Frequency 2		Default	10.00 Hz

	Setting Range	F2.02 – Maximum Output Frequency

The inverter allows for the selection of different speed loop PI parameters depending on the operating frequency. When the operating frequency is less than Switching Frequency 1 (F2.02), speed loop PI adjustment parameters F2.00 and F2.01 are applied. When the operating frequency exceeds Switching Frequency 2 (F2.05), speed loop PI adjustment parameters F2.03 and F2.04 are applied. For operating frequencies between Switching Frequency 1 and Switching Frequency 2, the speed loop PI parameters transition linearly between the two sets of PI parameters, as illustrated in Figure 6-3:

Figure 6-3 PI Parameters Diagram

By setting the proportional gain and integral time of the speed regulator, the dynamic response characteristics of vector control speed can be adjusted.

Increasing the proportional gain or decreasing the integral time will both accelerate the speed loop's dynamic response. However, excessive proportional gain or an overly short integral time may cause system oscillation. The recommended adjustment procedure is as follows:

If the default value parameters do not meet the requirements, make fine adjustments based on the default values. First, increase the proportional gain, ensuring there is no system oscillation; Then decrease the integral time to achieve both a fast response and minimal overshoot.

Caution: Improper PI parameter settings may lead to excessive speed overshoot, and can even cause overvoltage faults during the recovery from overshoot.

F2.06	SVC Control Slip Gain		Default	100%
	Setting Range	50% – 200%		

For sensorless vector control, this parameter is used to adjust the steady-state speed accuracy of the motor: if the motor speed under load is too low, increase this parameter; decrease it if the speed is too high.

F2.07	SVC Speed Feedback Filtering		Default	8
	Setting Range	0 – 100		

In vector control mode, the output of the speed regulator is the torque current command. This parameter is used to filter the torque command signal. This parameter typically does not require adjustment. If significant speed fluctuations occur, it is recommended to appropriately increase the filter time; if the motor exhibits oscillation, the parameter should be decreased as appropriate.

When the speed loop filter time constant is set small, the inverter output torque may fluctuate more significantly, but speed response is faster.

F2.08	SVC Torque Boost Cutoff Frequency		Default	20.00 Hz
	Setting Range	0.00 ~ Maximum Frequency		
F2.09	SVC Torque Boost		Default	10
	Setting Range	0.0% ~ 200.0%		

Adjust the torque boost value in SVC mode

F2.10	Torque upper limit source (motoring) in speed control method		Default	0
	Setting Range	0	F2.11 Setting	
		1	AI1	
		2	AI2	
		3	Reserved	
		4	Reserved	
		5	Communication Setting	
		6	MIN(AI1,AI2)	
		7	MAX(AI1,AI2)	

F2.11	Torque upper limit setting (motoring) in speed control method		Default	150.0%
	Setting Range	0.0% ~ 200.0%		

In speed control method, the maximum inverter output torque is controlled by the torque upper limit source.

F2.10 is used to select the setting source for the torque upper limit. When set via analog input or communication, 100% of the corresponding setting matches F2.11, and 100% of F2.11 corresponds to the inverter's rated output current.

For AI1 and AI2 settings, refer to the F4 group AI curve introduction (select each curve via F4.32).

When set to communication setting

If currently operating as a point-to-point communication slave and the received data is used as the torque reference, the torque Digital Setting is directly sent by the master; otherwise, the upper computer writes data

from -100.00% to 100.00% via communication address 0x1000, where 100.00% corresponds to F2.11.

F2.12	Torque upper limit source (generating) under speed control method		Default	0
	Setting Range	0	F2.13 setting	
		1	AI1	
		2	AI2	
		3	Reserved	
		4	Reserved	
		5	Communication Setting	
		6	MIN(AI1,AI2)	
		7	MAX(AI1,AI2)	

F2.13	Torque upper limit setting under speed control method (generating)		Default	150.0%
	Setting Range	0.0% ~ 200.0%		

F2.14	Excitation Regulation Proportional Gain		Default	200
	Setting Range	0 – 60000		
F2.15	Excitation Regulation Integral Gain		Default	100
	Setting Range	0 – 60000		
F2.16	Torque Regulation Proportional Gain		Default	200
	Setting Range	0 – 60000		
F2.17	Torque Regulation Integral Gain		Default	100
	Setting Range	0 – 60000		

The PI adjustment parameter of the vector control current loop is automatically obtained after dynamic tuning of the asynchronous motor, and generally does not require modification. It should be noted that the integral controller of the current loop is not configured using integration time as a parameter, but instead sets the integral gain directly. If the PI gain of the current loop is set too high, it may cause oscillation in the entire control loop. Therefore, if there are current oscillations or significant torque fluctuations, the PI proportional gain or integral gain at this location can be manually reduced.

F2.18	Synchronous Motor Field Weakening Mode		Default	0
	Setting Range	0	Non-Field-Weakening	
		1	Direct Calculation	
		2	Automatic Adjustment	
F2.19	Synchronous Motor Field Weakening Gain		Default	5
	Setting Range	0 – 50		
F2.23	Synchronous Motor Output Voltage Upper Margin		Default	5%
	Setting Range	0% – 50%		
F2.24	Synchronous Motor Initial Position Angle Detection Current		Default	80%
	Setting Range	50% – 180%		
F2.25	Synchronous Motor Start Method		Default	3
	Setting Range	0	Direct Start-up	
		1	Forced Positioning	
		2	High-Frequency Injection	
		3	Pulse Positioning	
F2.27	Synchronous Motor Saliency Ratio Adjustment Gain		Default	100
	Setting Range	50 – 500		
F2.28	Maximum Torque-Current Ratio Control		Default	0
	Setting Range	0		
		1		
F2.29	High-Frequency Injection Voltage Amplitude		Default	35V
	Setting Range	0 – 120V		
F2.30	Observer Parameters		Default	1.00
	Setting Range	0.01 – 20.00		
F2.31	Observer Parameters		Default	1.00
	Setting Range	0.01 – 20.00		

This parameter group is used to configure field-weakening control for synchronous motors.

When F2.18 is set to 0, field-weakening control for the synchronous motor is disabled. In this state, the maximum attainable speed depends on the inverter DC bus voltage. If the maximum speed of the motor does not meet user requirements, the synchronous motor field-weakening function must be enabled to increase speed through field-weakening control.

The ZVF650 offers two field-weakening modes: direct calculation mode and automatic adjustment mode.

In direct calculation mode, the required demagnetizing current is calculated based on the target speed, and can be manually adjusted via parameter F2.19. Reducing the demagnetizing current decreases the total output current, but may also result in insufficient field-weakening performance. When the field-weakening mode is set to automatic adjustment, the system will automatically select the optimal demagnetization current; however, this may impact dynamic performance or result in instability.

F2.36	Low-Speed Excitation Current			Default	30%
	Setting Range	0% – 80%			
F2.37	Low-Speed Carrier Frequency			Default	0 Hz
	Setting Range	2.0 kHz – Carrier frequency			
F2.38	Synchronous motor low-frequency braking method			Default	0
	Setting Range	0	Direct Start-up		
		1	Forced Positioning		
F2.39	Synchronous motor low-frequency braking activation frequency			Default	2.00
	Setting Range	0.00 – 10.00 Hz			
F2.40	Synchronous motor low-frequency braking frequency variation step			Default	0.001
	Setting Range	0.005 – 1.000 Hz			
F2.41	Synchronous motor low-frequency braking current			Default	50%
	Setting Range	0 – 80%			

The above parameters are used to control the excitation and braking functions of the synchronous motor under low-frequency operation.

F3 Group V/F control parameters

This group of function codes is only effective for V/F control and is not applicable to vector control.

V/F control is suitable for general-purpose loads such as fans and pumps, applications where a single inverter drives multiple motors, or where there is a substantial power mismatch between the inverter and the motor.

F3.00	VF Curve Setting		Default	0
	Setting Range	0	Linear V/F (fixed at 0 for synchronous motors)	
		1	Multi-point V/F	
		2	Square V/F	
		3	V/F to the power of 1.2	
		4	V/F to the power of 1.4	
		6	V/F to the power of 1.6	
		8	V/F to the power of 1.8	
		9	Reserved	
		10	VF Fully Isolated Mode	
		11	VF Semi-Isolated Mode	

0: Linear V/F. Suitable for general constant torque load.

1: Multi-point V/F. Suitable for special loads such as dewatering machines and centrifuges. At this stage, by configuring parameters F3.03 to F3.08, any desired VF characteristic curve may be achieved.

2: Square V/F. Suitable for fans, pumps, and other centrifugal loads.

3~8: V/F characteristic curves between linear V/F and square V/F.

10: VF fully separated mode. In this mode, the output Frequency and output voltage of the inverter are independent of each other. The output Frequency is determined by the frequency source, while the output voltage is determined by parameter F3.13 (VF separation voltage source).

The VF fully separated mode is typically applied in scenarios such as induction heating, inverter power supplies, and torque Motor control.

11: VF semi-separated mode.

In this mode, voltage (V) and Frequency (F) are proportional; however, the proportional relationship can be configured via the voltage source F3.13, and the relationship between V and F also depends on the

rated voltage and rated Frequency of the Motor specified in the F1 parameter group.

Assuming the voltage source input is X (where X is a value between 0 and 100%), the relationship between the output voltage V and Frequency F of the inverter is: V/F = 2 × X × (Motor rated voltage) / (motor rated frequency).

F3.01	Torque Boost		Default	Model Selection
	Setting Range	0.0%: (Automatic torque boost) 0.1%–30.0%		
F3.02	Torque Boost Cutoff Frequency		Default	50.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		

To compensate for the low-frequency torque characteristics of V/F control, the output voltage of the inverter is appropriately boosted at low Frequency. However, if the torque boost setting is too high, the Motor may overheat and the inverter may experience overcurrent.

If the Load is heavy and the motor's starting torque is insufficient, it is recommended to increase this Parameter. For lighter loads, the torque boost can be reduced. When torque boost is set to 0.0, the inverter operates in automatic torque boost mode. In this mode, the inverter automatically calculates the required torque boost value based on parameters such as the stator resistance of the motor.

Torque boost cut-off frequency: Below this frequency, torque boost is effective; above this set frequency, torque boost is disabled. For details, refer to Figure 6-4.

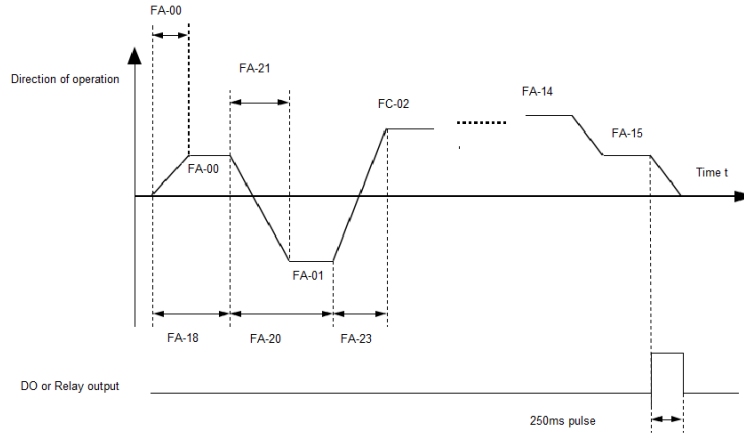


Figure 6-4 Manual Torque Boost Schematic

F3.03	Multi-point VF Frequency Point 1		Default	12.50 Hz
	Setting Range	0.00 Hz – F3.05		
F3.04	Multi-point VF Voltage Point 1		Default	25.0%
	Setting Range	0.0% – 100.0%		
F3.05	Multi-point VF Frequency Point 2		Default	25.00 Hz
	Setting Range	F3.03 – F3.07		
F3.06	Multi-point VF Voltage Point 2		Default	50.0%
	Setting Range	0.0% – 100.0%		
F3.07	Multi-point VF Frequency Point 3		Default	37.50 Hz
	Setting Range	F3.05–Motor Rated Frequency (F1.04)		
F3.08	Multi-point VF Voltage Point 3		Default	75.0%
	Setting Range	0.0% – 100.0%		

Parameters F3.03 to F3.08 define the six-section multi-point V/F curve.

The multi-point V/F curve must be set according to the load characteristics of the motor. Please note that the three voltage points and frequency points must satisfy the relationships: V1 < V2 < V3, F1 < F2 < F3. Figure 6-5 illustrates the setting schematic for the multi-point V/F curve.

Excessive voltage settings at low frequency may cause the motor to overheat or even burn out, and the inverter may experience overcurrent stall or invoke overcurrent protection.

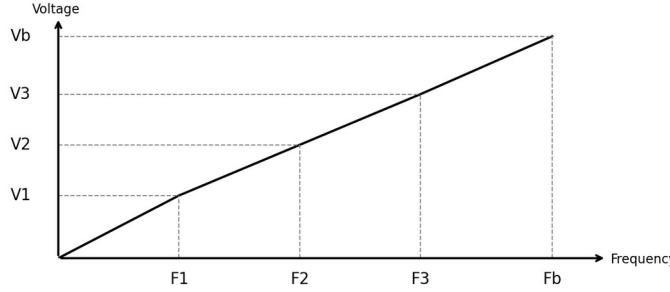


Figure 6-5 Multi-point V/F Curve Setting Schematic

F3.09	VF Slip Compensation Gain		Default	64
	Setting Range	0–200		

This parameter is applicable only to asynchronous motors.

VF slip compensation serves to correct the deviation in motor speed that occurs when the load increases on an asynchronous motor, thereby allowing the motor speed to remain essentially stable during load fluctuations.

When the VF slip compensation gain is set to 100.0%, the compensated slip under rated load corresponds to the motor's rated slip. The inverter automatically computes the rated slip based on the motor's rated frequency and rated speed set in parameter group F1.

When adjusting the VF slip compensation gain, the general principle is to set it so that the Motor speed is approximately equal to the target speed under rated Load. If the Motor speed differs from the target value, the gain should be finely adjusted accordingly.

F3.27	Slip Compensation Time Constant		Default	0.5 s
	Setting Range	0.1–10.0 s		

A smaller response time setting for slip compensation results in a faster compensation response.

F3.10	VF Overexcitation Gain		Default	50
	Setting Range	0–200		

During deceleration of the inverter, over-excitation control can suppress the rise of the DC bus voltage and prevent overvoltage faults. Increasing the over-excitation gain enhances the suppression effect.

In situations where overvoltage alarms are prone to occur during inverter deceleration, the over-excitation gain should be increased. However, excessive over-excitation gain can lead to increased output current and should be balanced appropriately in practical applications.

For applications with very low inertia, where voltage rise does not occur during Motor deceleration, it is recommended to set the over-excitation gain to 0; similarly, for applications equipped with a braking resistor, it is also advised to set the over-excitation gain to 0.

F3.11	VF Oscillation Suppression Gain		Default	Model Selection
	0–400			

The selection method for this gain is to set it as low as possible while still effectively suppressing oscillation, so as to avoid adverse effects on VF operation. If the Motor exhibits no oscillation, this gain should be set to 0. This gain should only be increased if the Motor displays significant oscillation. The greater the gain, the more pronounced the suppression of oscillation will be.

When using the oscillation suppression function, it is required that the Motor rated current and no-load current parameters are accurate; otherwise, the effectiveness of VF oscillation suppression will be compromised.

F3.13	VF Isolated Voltage Source			Default	0
	Setting Range	0	Digital Setting (F3.14)		
		1	AI1		
		2	AI2		
		3	Reserved		
		4	Reserved		
		5	Multi-step Command		
		6	Basic PLC		
		7	PID		
		8	Communication setpoint		
		Note: 100.0% corresponds to the motor rated voltage			
F3.14	VF Isolated Voltage Digital Setting			Default	0V
	Setting Range	0V to Motor Rated Voltage			

VF separation is typically applied in applications such as induction heating, inverter Power supply, and torque Motor control.

When VF separation control is selected, the output voltage can be set via function code F3.14, or provided through analog input, multi-step commands, PLC, PID, or communication setpoint. When using non-digital setting methods, each setting's 100% corresponds to the Motor rated

voltage; if the percentage value set by analog or similar outputs is negative, the absolute value of the setpoint is used as the effective setting.

0: Digital Setting (F3.14) The voltage is set directly through F3.14.

1: AI1 2: AI2 3: Reserved

The voltage is determined by the analog input terminal.

4. Reserved

5. Multi-step Command

When the voltage source is set to Multi-step Command, configure the parameters in Groups F4 and FC to define the mapping between input signals and the corresponding voltage values. For parameters in the FC group, 100.0% for the multi-step command refers to the percentage relative to the Motor's rated voltage.

6. Basic PLC

When the voltage source is Basic PLC, configure the FC group parameters to determine the specified output voltage.

7, PID

The output voltage is generated based on PID closed-loop control. For details, refer to the PID section in Group FA.

8. Communication setpoint

Indicates that the voltage is assigned via communication by the host computer.

The selection method for the separated V/F voltage source and frequency source is similar; refer to the description for F0.03 Main Frequency Source Selection. For each type of selection, the corresponding setting of 100.0% refers to the rated voltage of the motor (i.e., the absolute value of the specified setting).

F3.15	VF Separation Voltage Acceleration Time		Default	0.0 s
	Setting Range	0.0 s–1000.0 s Note: Indicates the time interval for the voltage to rise from 0V to the motor rated voltage.		
F3.16	VF Separation Voltage Deceleration Time		Default	0.0 s

F3.15	VF Separation Voltage Acceleration Time		Default	0.0 s
	Setting Range	0.0 s–1000.0 s Note: Indicates the time interval for the voltage to rise from 0V to the motor rated voltage.		

The acceleration time for the separated V/F voltage refers to the time required for the output voltage to increase from 0 to the motor's rated voltage, as indicated by t1 in the figure.

The deceleration time for the separated V/F voltage refers to the time required for the output voltage to decrease from the motor's rated voltage to 0, as indicated by t2 in the figure.

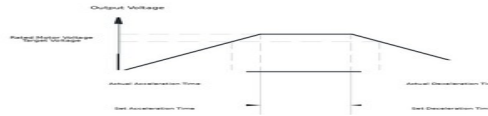


Figure 6-6 V/F Separation Schematic Diagram

F3.17	VF Separation Stop Mode Selection		Default	0
	Setting Range	0	Frequency/Voltage independently decreases to 0	
		1	Frequency reduction occurs after the voltage is decreased to 0	

0: Frequency and voltage independently decrease to 0

In V/F separation mode, the output voltage decreases to 0V according to the voltage deceleration time (F3.15); In V/F separation mode, the output frequency simultaneously decreases to 0 Hz according to the deceleration time (F0.17).

1: Frequency reduction after voltage reaches 0

In V/F separation mode, the output voltage first decreases to 0V according to the voltage deceleration time (F3.15), and then the frequency decreases to 0 Hz according to the deceleration time (F0.18).



Figure 6-7 Independent Decrease of V/F Separation Output Voltage/ Frequency to 0Figure 6-8 Sequential Reduction Diagram of V/F Separation Frequency/Voltage

- Inverter Output Current (Torque) Limitation

During acceleration, constant speed, or deceleration, if the current exceeds the overcurrent stall current threshold (150%), overcurrent stall protection will activate. When the current surpasses the overcurrent stall point, the output frequency will begin to decrease, and only after the current returns below the stall threshold will the frequency increase again toward the target Frequency. The actual acceleration time will be extended automatically. If the resulting acceleration time does not meet application requirements, you may appropriately increase the value of parameter 'F3.18 Overcurrent Stall Action Current.'

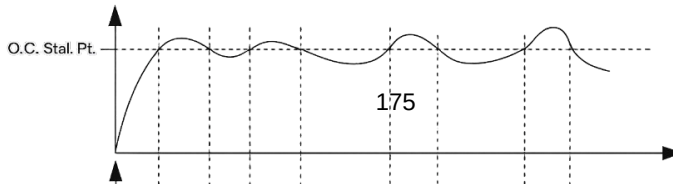


Figure 6-9 Overcurrent Stall Operation Schematic Diagram

F3.18	Overcurrent Stall Action Current		Default	150%
	Setting Range	50–200%		
F3.19	Overcurrent Stall Enable		Default	1
	Setting Range	0	Invalid	
		1	Valid	
F3.20	Overcurrent Stall Suppression Gain		Default	20
	Setting Range	0–100		
F3.21	Over-frequency Overcurrent/Stall Action Current Compensation Coefficient		Default	50%
	Setting Range	50–200%		

In high frequency regions, the motor drive current is relatively low. Compared to operation below the rated frequency, the same stall current causes a much larger drop in motor speed. To optimize motor operating characteristics, the stall action current above the rated frequency can be reduced. In applications such as centrifuges operating at high frequency,

requiring several times field weakening and with large load inertia, this approach can yield significant improvements in acceleration performance.

Stall Action Current During Over-frequency Transition = (fs/fn) × k × LimitCur;

Where fs is the operating frequency, fn is the motor rated frequency, k is parameter F3.21 'Over-frequency Overcurrent/Stall Action Current Compensation Coefficient', and LimitCur is parameter F3.18 'Overcurrent Stall Action Current';

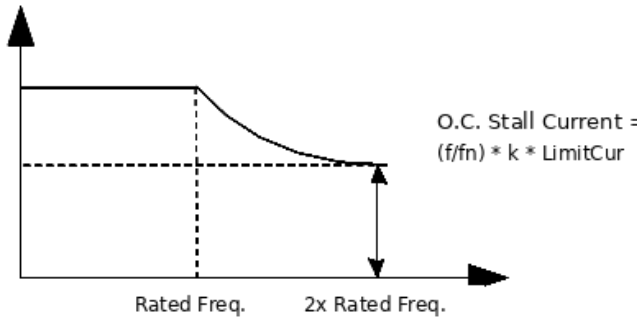


Figure 6-10 Schematic Diagram of Overcurrent Stall Prevention at Multiple Speeds

Note:

An overcurrent stall prevention current of 150% indicates 1.5 times the rated current of the inverter.

For high-power motors, when the carrier frequency is below 2 kHz, increased ripple current may cause the wave-by-wave current limiting to respond before the overcurrent stall prevention function, resulting in insufficient torque. In such cases, please reduce the overcurrent stall prevention current setting.

- inverter DC Bus Voltage Limitation (and Braking Resistor Activation Voltage Setting)

If the DC bus voltage exceeds the overvoltage stall point of 760V, the electromechanical system has entered a regenerative state (motor speed >

output frequency). Overvoltage stall prevention will activate, adjusting the output frequency to dissipate the excess regenerative energy. The actual deceleration time will be automatically extended to prevent tripping. If this deceleration time is insufficient for your requirements, you may appropriately increase the overexcitation gain.

Figure 6-11 Schematic Diagram of Overvoltage Stall Operation

F3.22	Overvoltage Stall Action Voltage		Default	760.0V
	Setting Range	340.0V–800.0V		
F3.23	Overvoltage Stall Enable		Default	1
	Setting Range	0	Invalid	
		1	Valid	
F3.24	Overvoltage Stall Frequency Decrease Gain		Default	30
	Setting Range	0–100		
F3.25	Overvoltage Stall Frequency Increase Gain		Default	5
	Setting Range	0–50 Hz		

F3.22	Overvoltage Stall Action Voltage	Default	760.0V
F3.26	Maximum frequency rise limitation during overvoltage stall	Default	5 Hz
	Setting Range	0–50 Hz	

Note: When using a braking resistor with an additional braking unit or when using an energy feedback unit, please observe the following:
Set F3.10 “Overexcitation Gain” to ‘0’. If it is not set to ‘0’, excessively high current may occur during operation. Set F3.23 “Overvoltage Stall Enable” to ‘0’. If it is not set to ‘0’, the deceleration time may be extended.

F4 Group Input terminal

The ZVF650 series inverter is equipped as standard with six multifunction digital input terminals (one of which, HDI, can be used as a high-speed pulse input terminal) and two analog input terminals.

F4.00	DI1 Input Terminal Function Selection	Default	1
F4.01	DI2 Terminal Function Selection	Default	2
F4.02	DI3 Terminal Function Selection	Default	9
F4.03	DI4 Terminal Function Selection	Default	12
F4.04	Reserved	Default	-
F4.05	Reserved	Default	-
F4.06	Reserved	Default	-
F4.07	Reserved	Default	-
F4.08	Reserved	Default	-

These parameters are used to configure the functions of the digital multifunction input terminals; the available functions are listed in the table below:

Setting Value	Function	Description
0	No Function	Terminals not in use can be set to 'No Function' to prevent unintended operation.
1	Forward Run Command	Forward Run and Reverse Operation of the inverter are controlled via external terminals.
2	Reverse Operation Command	
3	Three-wire Operation Control	This terminal is used to select the three-wire control mode for inverter operation. For details, refer to the description of Function Code F4.10 (Terminal Command Mode).
4	Forward Jog (FJOG)	FJOG is jog Forward Run; RJOG is jog Reverse Operation. For jog frequency and jog acceleration/deceleration time, refer to Function Codes F8.00, F8.01, and F8.02.
5	Reverse Jog (RJOG)	
6	Terminal UP	When the frequency is specified by an external terminal, these commands are used to increment or decrement the frequency. If the frequency source is set to Digital Setting, the set frequency can be adjusted upward or downward accordingly.
8	Free Stop	The inverter output is blocked; in this state, the motor's stopping process is not controlled by the inverter. This function is identical in meaning to the Free Stop as described in F6.10.
9	Fault Reset (RESET)	Enables the Fault Reset function via terminal. This has the same function as the RESET key on the keypad and allows for remote Fault Reset.

Setting Value	Function	Description
10	Pause Operation	The inverter performs a deceleration stop, but all operating parameters—including PLC parameters, swing frequency parameters, and PID parameters—are retained. Once this terminal signal is cleared, the inverter returns to the operating status prior to the stop.
11	External fault normally open input	When this signal is sent to the inverter, the inverter reports fault ERR15 and handles the fault according to the configured protection mode (for details, refer to function code F9.47).
12	Multi-segment instruction terminal 1	These four terminals support 16 different states, enabling the configuration of 16 speed segments or 16 other instructions. For details, refer to Table 1.
13	Multi-segment instruction terminal 2	
14	Multi-segment instruction terminal 3	
15	Multi-segment instruction terminal 4	
16	Acceleration/ Deceleration time selection terminal 1	By means of the 4 possible states of these two terminals, 4 different Acceleration/Deceleration times can be selected. For further details, refer to Table 2.
17	Acceleration/ Deceleration time selection terminal 2	
18	Frequency Source Selection	Used to select between different frequency sources. According to the setting of the frequency source selection function code (F0.07), when switching between two specified frequency sources, this terminal is used to enable switching between the two frequency sources.
19	UP/DOWN Setting Reset (Terminal, Keypad)	When the frequency reference is provided by digital frequency setting, this terminal can clear the frequency value modified by either terminal UP/DOWN or keypad UP/DOWN, restoring the set frequency to the value specified in F0.08.

Setting Value	Function	Description
20	Control Command Switching Terminal 1	When the command source is set to terminal control (F0.02=1), this terminal enables switching between terminal control and keypad control. When the command source is set to communication control (F0.02=2), this terminal enables switching between communication control and keypad control.
21	Prohibit Acceleration/Deceleration	Ensures the inverter is not affected by external signals (except for the stop command) and maintains the current output frequency.
22	PID Pause	PID is temporarily disabled; the inverter maintains the current output frequency and no longer performs PID adjustment of the frequency source.
23	PLC Status Reset	During execution, the PLC is paused. When operation resumes, this terminal returns the inverter to the initial state of the Basic PLC.
24	Swing Frequency Pause	The inverter outputs at the center frequency; the swing frequency function is paused.
25	Counter Input	Input terminal for count pulses.
26	Counter reset	Resets the counter status.
27	Length count input	Input terminal for length counting.
28	Length reset	Resets the length.
29	Torque control disable	Disables torque control; the inverter switches to speed control method.
30	Reserved	
31	Reserved	
32	Immediate DC braking	When this terminal is active, the inverter switches directly to DC braking mode.
33	External fault normally closed input	When an external fault normally closed signal is input to the inverter, the inverter displays fault ERR15 and stops.
34	Frequency modification enable	If the DI1 terminal is active, frequency modification is enabled; if the DI1 terminal is inactive, frequency modification is disabled.

Setting Value	Function	Description
35	Reverse PID action direction	When this terminal is active, the PID control direction is opposite to that set by FA.03.
36	External stop terminal 1	During keypad control, activating this terminal causes the inverter to stop, identical in function to the STOP button on the keypad.
37	Control command switching terminal 2	Used for switching between terminal control and communication control. When the command source selection is set to terminal control, activating this terminal switches the system to communication control; when inactive, the system reverts to terminal control.
38	PID integral pause	When this terminal is active, the PID integral adjustment function is paused, while the PID proportional and derivative adjustment functions remain active.
39	Switching between frequency source X and preset frequency	When this terminal is active, Frequency Source X is replaced with the preset frequency (F0.08).
40	Frequency Source Y and preset frequency switching	When this terminal is active, Frequency Source Y is replaced with the preset frequency (F0.08).
41	Motor terminal selection function	By utilizing the two states of the terminal, two groups of Motor Parameter sets can be switched. For further details, refer to Appendix 3.
42	Reserved	
43	PID Parameter switching	When the PID Parameter switching condition is set to DI terminal (FA.18=1): if this terminal is inactive, PID Parameters FA.05 to FA.07 are used; if this terminal is active, PID Parameters FA.15 to FA.17 are used.
44	User-defined Fault 1	When User-defined Fault 1 and 2 are active, the inverter will display alarms ERR27 and ERR28, respectively. The inverter will respond according to the action mode selected by Parameter F9.49.
45	User-defined Fault 2	

Setting Value	Function	Description
46	Speed Control / Torque Control Switching	Allows the inverter to switch between torque control mode and speed control mode. When this terminal is inactive, the inverter operates in the mode defined by H0.00 (Speed/Torque Control Method); when the terminal is active, it switches to the alternate mode. The switching can be performed via this terminal during operation, and will take effect immediately.
47	Emergency Stop	When this terminal is active, the inverter will decelerate to a stop at the fastest possible rate, with the current limited to the preset upper limit during the stop process. This function is intended to satisfy system requirements for rapidly stopping the inverter in emergency situations.
48	External Stop Terminal 2	In any control mode (Panel control, Terminal control, or communication control), this Terminal can be used to cause the inverter to decelerate and stop. In this situation, the deceleration time is fixed as Deceleration Time 4.
49	Deceleration DC Braking	When this Terminal is activated, the inverter first decelerates to the DC braking start Frequency for stopping, and then switches to the DC braking state.

Setting Value	Function description	Description
50	Reset Current Operation Time	When this Terminal is active, the accumulated time for the current operation of the inverter is reset. This function must be used in conjunction with Timed Operation (F8.42) and Current Operation Time Elapsed (F8.53).
51	Two-wire/Three-wire Switching	Used to switch between two-wire and three-wire control. If F5.11 is set to two-wire mode 1, this terminal function switches to three-wire mode 1 upon activation. This principle applies correspondingly to other modes.

Setting Value	Function description	Description
52	Reverse rotation prohibited	When this terminal is active, reverse rotation of the inverter is prohibited. Function is identical to F8.13.
53-59	Reserved	

There are four multi-segment command terminals, which can be combined into 16 different states. Each of these 16 states corresponds to a command setting value. Refer to Table 1 for details:

Table 1 Multi-segment Command Function Description

Multi-segment Speed 4	Multi-segment Speed 3	Multi-segment Speed 2	Multi-segment Speed 1	Multi-segment Speed selection
OFF	OFF	OFF	OFF	Multi-segment Speed Stage 0: Operating Frequency set by FC.00
OFF	OFF	OFF	ON	Multi-segment Speed Stage 1: Operating Frequency set by FC.01
OFF	OFF	ON	OFF	Multi-segment Speed Stage 2: Operating Frequency set by FC.02
OFF	OFF	ON	ON	Multi-step Speed 3 Operating Frequency is set by FC.03
OFF	ON	OFF	OFF	Multi-step Speed 4 Operating Frequency is set by FC.04
OFF	ON	OFF	ON	Multi-step Speed 5 Operating Frequency is set by FC.05
OFF	ON	ON	OFF	Multi-step Speed 6 Operating Frequency is set by FC.06
OFF	ON	ON	ON	Multi-step Speed 7 Operating Frequency is set by FC.07
ON	OFF	OFF	OFF	Multi-step Speed 8 Operating Frequency is set by FC.08
ON	OFF	OFF	ON	Multi-step Speed 9 Operating Frequency is set by FC.09
ON	OFF	ON	OFF	Multi-step Speed 10 Operating Frequency is set by FC.10
ON	OFF	ON	ON	Multi-step Speed 11 Operating Frequency is set by FC.11
ON	ON	OFF	OFF	Multi-step Speed 12 Operating Frequency is set by FC.12
ON	ON	OFF	ON	Multi-step Speed 13 Operating Frequency is set by FC.13

ON	ON	ON	OFF	Multi-step Speed 14: Frequency determined by FC.14
ON	ON	ON	ON	Multi-step Speed 15: Frequency determined by FC.15

Note: ON indicates connection with the COM terminal; OFF indicates disconnection from the COM terminal.

When the frequency source is set to multi-speed, 100.0% of Function Code FC.00~FC.15 corresponds to the maximum frequency F0.10. In addition to their use in multi-speed functionality, multi-speed commands may also serve as the setpoint source for PID control, the voltage source for VF separate control, or for switching between different setpoints as required.

Table 2 Description of Acceleration/Deceleration Time Selection Terminal Functions

Terminal 1	Terminal 2	Acceleration or Deceleration Time Selection	Corresponding Parameter
OFF	OFF	Acceleration Time 1	F0.17, F0.18
ON	OFF	Acceleration Time 2	F8.03, F8.04
OFF	ON	Acceleration Time 3	F8.05, F8.06
ON	ON	Acceleration Time 4	F8.07, F8.08

Table 3 Description of Motor Selection Terminal Functions

Terminal 1	Motor Selection	Corresponding Parameter
OFF	Motor 1	F1, F2
ON	Motor 2	H2

F4.09	DI filter time		Default	0.010 s
	Setting Range	0.000 s–1.000 s		

Sets the software filter time for the DI terminal status. If input terminals are prone to interference in the application, resulting in malfunction, this parameter can be increased to enhance anti-interference

capability. However, increasing the filter time will cause a slower response of the DI terminals.

F4.10	Terminal command mode		Default	0
	Setting Range	0	Two-wire Type 1	
		1	Two-wire Type 2	
		2	Three-wire Type 1	
		3	Three-wire Type 2	

This parameter defines four distinct methods for controlling the inverter operation via external terminal control.

Note: For illustration, DI1, DI2, and DI3 are selected at random from among the multifunction input terminals DI1 to HDI as external terminals. By configuring the values of F4.00 to F4.02, the functions of the DI1, DI2, and DI3 terminals can be selected. For detailed definitions of each function, refer to the setting ranges for F4.00 to F4.03.

Table 4 Two-wire Mode Control Run Command Table

Switch Status		Two-wire Control 1	Two-wire Control 2
K2	K1	Run Command 1	Run Command 2
OFF	OFF	Stop	Stop
ON	OFF	Reverse rotation	Stop
OFF	ON	Forward Run	Forward Run
ON	ON	Stop	Reverse rotation

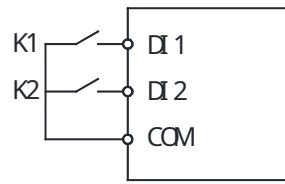


Figure 6-12 Two-Wire Control Wiring Diagram

Note: ON indicates the circuit is closed; OFF indicates the circuit is open.

Three-Wire Mode 1 **Three-Wire Mode 2**

K1—Run Switch K1—Forward Run Switch

K2—Reverse Rotation Switch K2—Forward/Reverse Selection Switch

K3—Stop Switch K3—Stop Switch

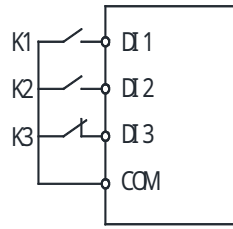


Figure 6-13 Three-Wire Control Wiring Diagram

F4.11	Terminal UP/DOWN rate of change		Default	1.00 Hz/s
	Setting Range	0.001 Hz/s–65.535 Hz/s		

Used to set the frequency change rate per second when adjusting the set frequency via the UP/DOWN terminal.

F4.12	AI curve 1 minimum input		Default	0.00V
	Setting Range	0.00V–F4.14		
F4.13	AI Curve 1 Minimum Input Corresponding Value		Default	0.0%
	Setting Range	-100.0%–+100.0%		
F4.14	AI Curve 1 Maximum Input		Default	10.00V

	Setting Range	F4.12–+10.00V		
F4.15	AI Curve 1 Maximum Input Corresponding Value		Default	100.0%
	Setting Range	-100.0%–+100.0%		
F4.16	AI1 Filter Time		Default	0.10 s
	Setting Range	0.00 s–10.00 s		

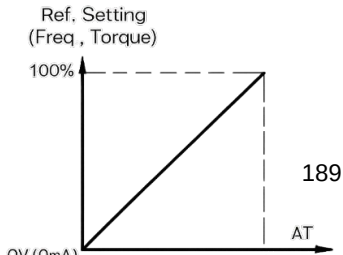
The above function codes are used to define the relationship between the analog input voltage and the corresponding set value.

When the input voltage of the analog signal exceeds the configured 'Maximum Input' (F4.14), the analog voltage is calculated based on the 'Maximum Input' value. Similarly, when the analog input voltage is less than the configured 'Minimum Input' (F4.12), calculation follows the setting of 'AI Below Minimum Input Selection' (F4.33), and will be based on either the Minimum Input or 0.0%. When the analog input is set to current mode, a current of 1 mA corresponds to a voltage of 0.5 V.

AI1 input filter time sets the software filter duration for AI1. If the analog signal on site is easily affected by interference, increase the filter time to improve signal stability. Note, however, that a longer filter time reduces the response speed of analog signal detection. The filter time should be determined according to the practical application requirements.

In different application scenarios, the nominal value represented by 100.0% of the analog setting varies; please refer to the relevant sections for specific details.

The following figures illustrate two typical setting cases:



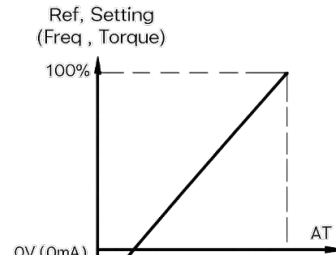


Figure 6-14: Relationship between analog reference and setpoint

F4.17	AI Curve 2 Minimum Input		Default	0.00V
	Setting Range	0.00V–F4.20		
F4.18	AI Curve 2 Minimum Input Corresponding Value		Default	0.0%
	Setting Range	-100.0%–+100.0%		
F4.19	AI Curve 2 Maximum Input		Default	10.00V
	Setting Range	F4.17–+10.00V		
F4.20	AI Curve 2 Maximum Input Corresponding Value		Default	100.0%
	Setting Range	-100.0%–+100.0%		
F4.21	AI2 filter time		Default	0.10 s
	Setting Range	0.00 s–10.00 s		

For the function and usage method of Curve 2, please refer to the instructions for Curve 1.

F4.22	AI Curve 3 Minimum Input	Default	-10.00V
	Setting Range	-10.00V–F4.25	
F4.23	AI Curve 3 Minimum Input Corresponding Value	Default	-100.0%
	Setting Range	-100.0%–+100.0%	
F4.24	AI Curve 3 Maximum Input	Default	10.00V
	Setting Range	F4.22–+10.00V	
F4.25	AI Curve 3 Maximum Input Corresponding Value	Default	100.0%
	Setting Range	-100.0%–+100.0%	
F4.26	AI3 filter time	Default	0.10 s
	Setting Range	0.00 s–10.00 s	

For the function and usage method of Curve 2, please refer to the instructions for Curve 1.

The application of this function group is similar to Curve 1; please refer to the instructions for Curve 1.

F4.32	AI Curve Selection	Default	21

	Setting Range	Units place	AI1 curve selection
		1	Curve 1 (2 points, see F4.12–F4.15)
		2	Curve 2 (2 points; see F4.17 to F4.20)
		3	Curve 3 (2 points; see F4.22 to F4.25)
		4	Curve 4 (4 points; see H6.00 to H6.07)
		5	Curve 5 (4 points; see H6.08 to H6.15)
		Tens place	AI2 curve selection, same as above
		Hundreds digit	Reserved

The units, tens, and hundreds digits of this function code are used to select the respective reference curves for analog inputs AI1 and AI2. Each analog input can independently select any one of the five available curves.

Curves 1, 2, and 3 are 2-point curves configured in the F4 group function codes, while Curves 4 and 5 are 4-point curves configured in the H6 group function codes.

F4.33	AI Below Minimum Input Setting Selection		Default	000
	Setting Range	Units place	AI1 Selection When Below Minimum Input	
		0	Corresponding Minimum Input Setting	
		1	0.0%	
		Tens place	AI2 Selection When Below Minimum Input, as above	
		Hundreds digit	Reserved	

This function code is used to set how the corresponding setting for the analog input will be determined when the input voltage falls below the configured 'minimum input.'

The units and tens digits of this function code respectively correspond to analog inputs AI1 and AI2.

If set to 0, when the AI input falls below the 'minimum input,' the corresponding setting for the analog input is determined by the 'minimum input corresponding setting' curve defined by the function code (F4.12, F4.17, F4.22).

If set to 1, when the AI input falls below the minimum input, the corresponding setting for the analog input is 0.0%.

F4.34	DI1 delay time		Default	0.0 s
	Setting Range	0.0 s–3600.0 s		
F4.35	DI2 delay time		Default	0.0 s
	Setting Range	0.0 s–3600.0 s		
F4.36	DI3 delay time		Default	0.0 s
	Setting Range	0.0 s–3600.0 s		

Sets the delay time for the inverter to respond when the state of the DI input terminal changes.

Currently, only DI1, DI2, and DI3 support the delay time setting function.

F4.38	DI Terminal activation mode selection 1	Default	00000
	Setting Range	0	Active high
		1	Active low
		Units place	DI1
		Tens place	DI2
		Hundreds digit	DI3

		Thousands digit	DI4
		Ten-thousands digit	

F4.39	DI terminal valid mode selection 2		Default	00000
	Setting Range	0	Active high	
		1	Active low	
		Units place		
		Tens place		
		Hundreds digit		
		Thousands digit		
		Ten-thousands digit		

Configures the active state mode for digital input terminals.

When set to active high, the corresponding DI terminal is active when connected to COM and inactive when disconnected.

When set to active low, the corresponding DI terminal is inactive when connected to COM and active when disconnected.

F5 Group Output terminals

The ZVF650 series inverter is equipped by default with two multifunction analog output terminals, one multifunction digital output terminal, one multifunction relay output terminal, and one HDO terminal (which can be configured either as a high-speed pulse output terminal or as an open-collector switching output).

F5.00	HDO Terminal Output Mode Selection		Default	0
	Setting Range	0	0: Pulse output (HDOP)	
		1	1: Relay output (HDOR)	

The HDO terminal is a programmable multiplex terminal that can function either as a high-speed pulse output terminal (HDOP) or as an open-collector digital output terminal (HDOR).

When configured as a pulse output (HDOP), the maximum output pulse frequency is 100 kHz. For details on HDOP-related functions, refer to the description of F5.06.

F5.01	HDOR output function selection	Default	0
F5.02	Control Board Relay 1 (TA/TB/TC) Function Selection	Default	0
F5.03	Reserved	Default	0
F5.04	Y1 output function selection	Default	0
F5.05	Reserved	Default	-

The above four function codes are used to select the respective functions for the four digital output ports.

The multifunction output terminal functions are described as follows:

Setting Value	Function	Description
0	No Output	No function assigned to the output terminal.
1	Operating Status of the inverter	Indicates that the inverter is in operating status, with an output frequency present (which may be zero); in this case, the ON signal is output.
2	Fault Output (Fault Shutdown)	When the inverter experiences a fault and enters a fault shutdown state, an ON signal is output.

Setting Value	Function	Description
3	Frequency Level Detection FDT1 Output	Refer to the descriptions of function codes F8.19 and F8.20.
4	Frequency Arrival	Refer to the description of function code F8.21.
5	Zero-Speed Operation Active (No output during stop)	When the inverter is running and the output frequency is 0, an ON signal is output. When the inverter is in a stop state, this signal is OFF.
6	Motor Overload Pre-Alarm	Before electric motor overload protection is activated, judgment is based on the overload pre-alarm threshold. When the pre-alarm threshold is exceeded, an ON signal is output. For electric motor overload parameter settings, refer to function codes F9.00 to F9.02.
7	inverter Overload Pre-alarm	An ON signal is output 10 seconds prior to the activation of inverter overload protection.
8	Set Count Value Reached	An ON signal is output when the count value reaches the value specified by Fd.08.
9	Specified Count Value Reached	An ON signal is output when the count value reaches the value specified by Fb.09. Refer to the FB group function descriptions for details on counting functions.
10	Length Reached	An ON signal is output when the detected actual length exceeds the value specified by Fb.05.
11	PLC Cycle Complete	After the Basic PLC completes one cycle, a pulse signal with a width of 250 ms is output.
12	Accumulated Operating Time Reached	An ON signal is output when the inverter's accumulated operating time exceeds the value specified by F8.17.
13	Frequency Limiting	When the set frequency exceeds the upper or lower frequency limit and the inverter output frequency likewise reaches the upper or lower limit, an ON signal is output.

Setting Value	Function	Description
14	Torque Limiting	In speed control mode, when the output torque reaches the torque limit value, the inverter enters stall protection status and concurrently outputs an ON signal.
15	Run Ready	When both the main circuit and control circuit Power supply of the inverter are stable, and no faults have been detected, the inverter is ready for operation and outputs an ON signal.
16	AI1>AI2	When the analog input value of AI1 exceeds that of AI2, an ON signal is output.
17	Upper Frequency Limit Reached	An ON signal is output when the operating frequency reaches the upper frequency limit.
18	Lower Frequency Limit Reached (No output during stop)	An ON signal is output when the operating frequency reaches the lower frequency limit. This signal is OFF when stopped.
19	Undervoltage Status Output	An ON signal is output when the inverter is in an undervoltage state.
20	Communication Setting	Refer to the communication protocol.
21-22	Reserved	
23	Zero Speed Operation 2 (Output also occurs during stop)	An ON signal is output when the inverter output frequency is 0. This signal is also ON when stopped.
24	Cumulative Power-On Time Reached	An ON signal is output when the cumulative power-on time of the inverter (F7.11) exceeds the time set by F8.16.
25	Frequency Level Detection FDT2 Output	Refer to the descriptions for function codes F8.28 and F8.29.
26	Frequency 1 reached output	Please refer to the descriptions of function codes F8.30 and F8.31.
27	Frequency 2 reached output	Please refer to the descriptions of function codes F8.32 and F8.33.
28	Current 1 reached output	Please refer to the descriptions of function codes F8.38 and F8.39.
29	Current 2 reached output	Please refer to the descriptions of function codes F8.40 and F8.41.

Setting Value	Function	Description
30	Timer reached output	When the timer function selection (F8.42) is enabled, the inverter will output an ON signal once the current operation time reaches the set timer value.
31	AI1 input exceeded limit	When the value of analog input AI1 exceeds F8.46 (AI1 input protection upper limit) or falls below F8.45 (AI1 input protection lower limit), an ON signal will be output.
32	De-loading in progress	When the inverter is in de-loading state, the ON signal is output.
33	Reverse operation in progress	When the inverter is running in reverse, the ON signal is output.
34	Zero current state	Please refer to the instructions for function codes F8.34 and F8.35.
35	Module Temperature Reached	When the inverter module heat sink temperature (F7.07) reaches the configured module temperature value (F8.47), the ON signal is output.
36	Software current limit exceeded	Please refer to the instructions for function codes F8.36 and F8.37.
37	Lower frequency reached (Output also during stop)	When the operating frequency reaches the lower frequency, the ON signal is output. This signal remains ON during stop.
38	Alarm output	When a fault occurs and the inverter's fault handling mode is set to continue operation, the inverter outputs an alarm.
39	Reserved	
40	Current operation time reached	When the inverter's current operation duration exceeds the time set in F8.53, an ON signal is output.
41	Fault output	In faults with free stop, no output is provided in case of undervoltage.

F5.06	HDOP output function selection	Default	0
F5.07	AO1 output function selection	Default	0
F5.08	AO2 output function selection	Default	0

The output pulse frequency range for the HDOP terminal is 0.01 kHz to F5.09 (the maximum FMP output frequency). F5.09 can be set within 0.01 kHz to 100.00 kHz.

The output range for analog outputs AO1 and AO2 is 0V to 10V, or 0 mA to 20 mA. The output range for pulse or analog outputs and their calibration relationship with the corresponding function are shown in the table below.

Setting Value	Function	Function range (corresponding to 0.0%–100.0% of pulse or analog output)
0	Operating Frequency	0 to maximum output Frequency
1	Set Frequency	0 to maximum output Frequency
2	Output current	0 to 2 times the rated Motor current
3	Motor output torque (absolute value, as a percentage of rated Motor torque)	0 to 2 times the rated Motor torque
4	Output power	0 to 2 times the rated Motor power
5	Output voltage	0 to 1.2 times the rated inverter voltage
6	Reserved	
7	AI1	0V – 10V
8	AI2	0V to 10V (or 0 to 20 mA)
9	Reserved	
Setting Value	Function	Function range (corresponding to 0.0%–100.0% of pulse or analog output)
10	Length	0 to maximum set length
11	Count Value	0 to maximum count value
12	Communication Setting	0.0% to 100.0%
13	Motor speed	0 to the speed corresponding to the maximum output Frequency

14	Output current (100.0% corresponds to 1000.0A)	0.0A ~ 1000.0A
15	Output voltage (100.0% corresponds to 1000.0V)	0.0V ~ 1000.0V
16	Motor output torque (actual value, as a percentage of the motor's rated torque)	–2 times the motor's rated torque to 2 times the motor's rated torque
17	inverter output torque (actual value, as a percentage of the inverter's rated torque)	–2 times the motor's rated torque to 2 times the motor's rated torque

F5.09	FMP maximum output frequency		Default	50.00 kHz
	Setting Range	0.01 kHz–100.00 kHz		

When the HDO terminal is configured for pulse output, this function code is used to set the maximum output pulse frequency.

F5.10	AO1 output lower limit		Default	0.0%
	Setting Range	0.0–100.0%		
F5.11	Lower limit corresponding to AO1 output		Default	0.00V
	Setting Range	0.00–10.00V		
F5.12	AO1 Output Upper Limit		Default	100.0%

	Setting Range	0.0–100.0%	
F5.13	AO1 Output at Upper Limit	Default	10.00V
	Setting Range	0.00–10.00V	
F5.14	AO2 output lower limit	Default	0.0%
	Setting Range	0.0–100.0%	
F5.15	Lower limit corresponding to AO2 output	Default	0.00V
	Setting Range	0.00–10.00V	
F5.16	AO2 Output Upper Limit	Default	100.0%
	Setting Range	0.0–100.0%	
F5.17	Upper Limit Corresponding to AO2 Output	Default	10.00V
	Setting Range	0.00–+10.00	
F5.18	FMR Output Delay Time	Default	0.0 s
	Setting Range	0.0 s–3600.0 s	
F5.19	RELAY1 Output Delay Time	Default	0.0 s
	Setting Range	0.0 s–3600.0 s	
F5.21	DO1 Output Delay Time	Default	0.0 s
	Setting Range	0.0 s–3600.0 s	

Sets the delay time between a state change and the actual output change of terminals HDOR, Relay 1, Relay 2, and DO1.

F5.23	Output Terminal Active State Selection			Default	00000
	Setting Range	0	Positive Logic		
		1	Negative Logic		
		Units place	FMR		
		Tens place	RELAY1		
		Hundreds digit			
		Thousands digit	DO1		
		Ten-thousands digit			

Defines the output logic for terminals FMR, Relay 1, Relay 2, DO1, and DO2.

0: Positive logic. The digital output terminal and its corresponding common terminal are connected in the active state, and disconnected in the inactive state.

1: Negative logic. The digital output terminal and its corresponding common terminal are connected in the inactive state, and disconnected in the active state.

F6 Start/Stop Control Group

F6.00	Startup Method			Default	0
	Setting Range	0	Direct Start		
		1	Speed Tracking Restart		
		2	Pre-excitation Start (AC Asynchronous Motor)		

0: Direct Start

If the start DC braking time is set to 0, the inverter will run from the starting frequency.

If the start DC braking time is not 0, DC braking will be applied first, and then the inverter will run from the starting frequency. Suitable for low-inertia loads, and for applications where the motor may be rotating at start-up.

1: Speed Tracking Restart

The inverter will first determine the speed and direction of the motor, and then start at the detected motor frequency, allowing smooth and shock-free starting of a rotating motor. Suitable for instantaneous power restoration and restart in high-inertia load applications. To ensure optimal speed tracking and restart performance, the Motor Frequency F1 group parameters must be configured accurately.

2: Asynchronous Motor Pre-Excitation Start

Applicable only to asynchronous Motors; used to establish a magnetic field before Motor operation. For details on pre-excitation current and pre-excitation time, refer to Function Code F6.03 and F6.04.

If the pre-excitation time is set to 0, the inverter cancels the pre-excitation process and starts from the initial Frequency. If the pre-excitation time is not 0, pre-excitation is performed before startup, which can enhance the dynamic response performance of the Motor.

F6.01	Speed Tracking Method			Default	0
	Setting Range	0	Start from stop Frequency		
		1	Start from mains Frequency		
		2	Start from maximum frequency		

To complete the speed tracking process in the shortest possible time, select the method by which the inverter tracks the motor speed:

0: Tracks downward from the frequency at the time of power failure; this method is generally recommended.

1: Used for switching from mains frequency to variable frequency operation, or for restarting after an extended power outage.

2: Tracks downward from the maximum frequency; typically used for regenerative loads.

F6.02	Speed Tracking Rate		Default	20
	Setting Range	1 – 100		

When performing speed tracking restart, select the desired tracking rate.

A larger parameter value results in faster tracking speed; however, setting the value excessively high may compromise tracking reliability.

F6.03	Start Frequency		Default	0.00 Hz
	Setting Range	0.00 Hz – 10.00 Hz		
F6.04	Start Frequency Dwell Time		Default	0.0 s
	Setting Range	0.0 s – 100.0 s		

To ensure sufficient motor torque during startup, please set an appropriate starting frequency. To allow the motor to fully establish

magnetic flux during startup, the starting frequency must be held for a certain duration.

The starting frequency F6.03 is not restricted by the lower frequency limit. However, if the target frequency is set lower than the starting frequency, the inverter will not start and will remain in standby mode.

The starting frequency hold time is not active during forward/reverse rotation switching. The starting frequency hold time is not included in the acceleration time, but is included in the Basic PLC operating time.

Example 1:

F0.03 = 0 frequency source: Digital Setting

F0.08 = 2.00 Hz Digital Setting Frequency: 2.00 Hz

F6.03 = 5.00 Hz The start Frequency is 5.00 Hz.

Example 2:

F0.03 = 0 frequency source: Digital Setting

F0.08 = 10.00 Hz The Digital Setting Frequency is 10.00 Hz.

F6.03 = 5.00 Hz The start Frequency is 5.00 Hz.

F6.04 = 2.0 s The start Frequency hold time is 2.0 s.

At this stage, the inverter accelerates to 5.00 Hz, maintains this Frequency for 2.0 s, and then further accelerates to the preset frequency of 10.00 Hz.

F6.05	Start DC Braking Current / Pre-Excitation Current	Default	0%
	Setting Range	0% – 100%	
F6.06	Start DC Braking Time / Pre-Excitation Time	Default	0.0 s

	Setting Range	0.0 s – 100.0 s

Activate DC braking, which is generally used to ensure the operating Motor comes to a stop prior to restart. Pre-excitation is used to establish the magnetic field in the asynchronous motor before startup, thereby improving response speed.

Start DC braking is only effective when the starting mode is set to direct start. In this case, the inverter first performs DC braking according to the configured start DC braking current. After the specified start DC braking time elapses, operation begins. If the DC braking time is set to 0, the inverter will start directly without DC braking. The greater the DC braking current, the greater the braking force.

If the starting mode is asynchronous motor pre-excitation, the inverter first establishes the magnetic field in advance according to the configured pre-excitation current. After the specified pre-excitation time, operation begins. If the pre-excitation time is set to 0, the unit will start directly without the pre-excitation process.

When initiating DC braking current or pre-excitation current, the reference base for calculation is determined by two scenarios.

1) If the motor rated current is less than or equal to 80% of the inverter rated current, the reference base is the motor's rated current (expressed as a percentage).

2) If the motor rated current exceeds 80% of the inverter rated current, the reference base is 80% of the inverter's rated current (expressed as a percentage).

F6.07	Acceleration/Deceleration Method		Default	0
	Setting Range	0	Linear acceleration/deceleration	
		1	S-curve	

Select the mode for frequency variation during inverter start and stop.

0: Linear Acceleration/Deceleration

The output frequency increases or decreases linearly. The ZVF650 provides four types of acceleration/deceleration time, selectable via multifunction digital input terminals

(F4.00 to F4.03).

1: S-Curve Acceleration and Deceleration

When the target frequency is fixed, the output frequency increases or decreases following an S-curve profile. Suitable for applications requiring gentle starting or stopping, such as elevators and conveyor belts.

F6.08	S-Curve Initial Segment Time Ratio		Default	30.0%
	Setting Range	0.0%~(100.0%-F6.09)		
F6.09	S-Curve Final Segment Time Ratio		Default	30.0%
	Setting Range	0.0%~(100.0%-F6.08)		

Function Codes F6.08 and F6.09 define the time ratios of the initial and final segments, respectively, of the static S-curve. The two function codes must satisfy the following condition:

F6.08 + F6.09 ≤ 100.0%.

In Figure 6-18, t1 represents the parameter defined by F6.08. Within this time segment, the slope of the output frequency change gradually increases. t2 refers to the time defined by Parameter F6.09; within this period, the slope of the output Frequency variation gradually decreases to 0. During the interval between t1 and t2, the slope of the output Frequency change remains constant, indicating a linear acceleration or deceleration in this segment.

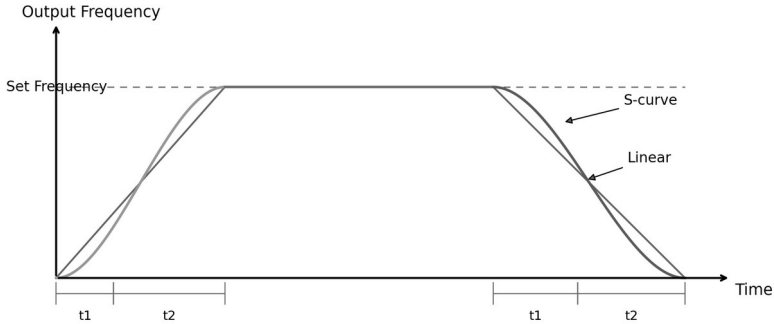


Figure 6-18 S Curve Schematic Diagram

F6.10	Stop Mode			Default	0
	Setting Range	1	Deceleration Stop		
		2	Free Stop		

0: When the deceleration stop command is enabled, the inverter reduces the output Frequency according to the deceleration time, stopping the operation after the Frequency decreases to 0.

1: When the free run stop command is enabled, the inverter immediately ceases output, and the Motor coasts to a stop under mechanical inertia.

F6.11	DC Braking Start Frequency at Stop		Default	0.00 Hz
	Setting Range	0.00 Hz ~ Maximum Frequency		
F6.12	Stop DC Braking Waiting Time		Default	0.0 s
	Setting Range	0.0 s ~ 36.0 s		
F6.13	DC Braking Current at Stop		Default	0%
	Setting Range	0% – 100%		
F6.14	DC Braking Time at Stop		Default	0.0 s
	Setting Range	0.0 s ~ 36.0 s		

Stop DC Braking Start Frequency: During the deceleration to Stop, when the operating Frequency drops to this value, the DC braking process will begin.

Stop DC Braking Waiting Time: After the operating Frequency decreases to the Stop DC Braking Start Frequency, the inverter will first suspend output for a specified period before initiating the DC braking process. This parameter is used to prevent faults such as overcurrent that may arise if DC braking is initiated at higher speeds.

Stop DC Braking Current: The DC braking current during Stop is defined relative to the reference value under two conditions.

1. When the Motor rated current is less than or equal to 80% of the inverter rated current, the reference value is defined as a percentage of the Motor rated current.

2. When the rated current of the motor exceeds 80% of the rated current of the inverter, 80% of the inverter's rated current is taken as the reference value for percentage calculation.

Stop DC braking time: the duration for which the DC braking function is maintained. If this value is set to 0, the DC braking process is disabled.

Refer to Figure 6-19 for the stop DC braking process.

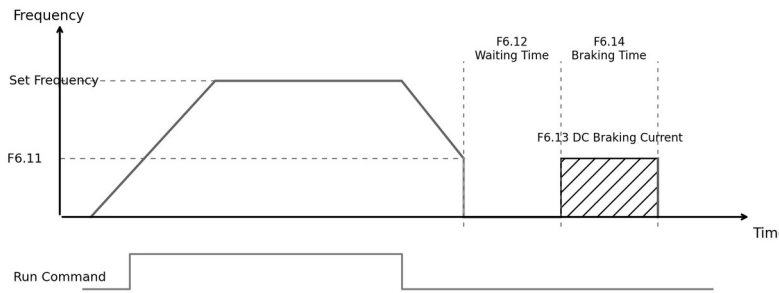


Figure 6-19 Stop DC Braking Process

F6.15	DC Braking Usage	Default	100%

	Setting Range	0% – 100%

Applicable only to inverters equipped with a built-in braking unit.

Used to adjust the duty cycle of the braking unit. Higher braking utilization results in a higher duty cycle for the braking unit and a stronger braking effect; however, the inverter DC bus voltage will exhibit greater fluctuations during the braking process.

F7 Keypad and Display Control Group

F7.01	MF.K Key Function Selection			Default	0
	Setting Range	0	MF.K Invalid		
		1	Switching Between Keypad Command Channel and Remote Command Channel (Terminal Command Channel or Communication Command Channel)		
		2	Forward Run / Reverse Rotation Switching		
		3	Forward Run Jog		
		4	Reverse Rotation Jog		

The MF.K key is a multifunction key. Its function can be configured via this function code. This key can be used for switching both during stop and during operation.

0: This key has no function.

1: Switch between panel command and remote operation.

Refers to command source switching, i.e., switching between the current command source and panel control (local operation). If the current command source is panel control, this key is invalid.

2: Forward/Reverse rotation switch

Use the MF.K key to switch the direction of the frequency command. This function is only valid when the command source is the keypad command channel.

3: Forward Run jog

Initiate Forward Run jog (FJOG) via the MF.K key on the keypad.

4: Reverse rotation jog

Initiate Reverse rotation jog (RJOG) via the MF.K key on the keypad.

F7.02	STOP/RESET Key Function			Default	1
	Setting Range	0	The STOP/RES key stop function is valid only in keypad operation mode.		
		1	The STOP/RES key stop function is valid in all operation modes.		

F7.03	LED operation display parameter selection 1			Default	1F
	Setting Range	0000–FFFF			
		Bit00	Operating Frequency 1 (Hz)		
		Bit01	Setting Frequency (Hz)		
		Bit02	Bus Voltage (V)		
		Bit03	Output Voltage (V)		
		Bit04	Output Current (A)		
		Bit05	Output Power (kW)		
		Bit06	Output Torque (%)		
		Bit07	DI Input Status		
		Bit08	DO Output Status		
		Bit09	AI1 Voltage (V)		
		Bit10	AI2 Voltage (V)		
		Bit11	Reserved		
		Bit12	Count Value		
		Bit13	Length Value		
		Bit14	Load Speed Display		
		Bit15	PID Setting		

F7.04	LED operation display parameter selection 2	Default	00

	Setting Range	0000–FFFF	
		Bit00	PID Feedback
		Bit01	PLC Stage
		Bit02	Reserved
		Bit03	Operating Frequency 2 (Hz)
		Bit04	Remaining Running Time
		Bit05	AI1 Voltage before calibration (V)
		Bit06	AI2 Voltage before calibration (V)
		Bit07	AI3 Voltage before calibration (V)
		Bit08	Linear velocity
		Bit09	Current power-on duration (Hour)
		Bit10	Current running duration (Min)
		Bit11	Reserved
		Bit12	Communication setpoint
		Bit13	Encoder feedback speed (Hz)
		Bit14	Main Frequency X display (Hz)
		Bit15	Auxiliary Frequency Y display (Hz)

A maximum of 32 status parameters can be displayed. The status parameters to be shown are selected according to each binary bit of the Parameter values of F7.03 and F7.04. The display sequence begins with the least significant bit of F7.03.

F7.05	LED stop display parameter selection		Default	H.2033
	Setting Range	0000–7FFF		
		Bit00	Setting Frequency (Hz)	
		Bit01	Bus Voltage (V)	
		Bit02	DI Input Status	
		Bit03	DO Output Status	
		Bit04	AI1 Voltage (V)	

		Bit05	AI2 Voltage (V)
		Bit06	Reserved
		Bit07	Count Value
		Bit08	Length Value
		Bit09	PLC Stage
		Bit10	Load speed
		Bit11	PID Setting
		Bit12	Reserved
		Bit13	Input AC voltage (V)
		Bit14	PID Feedback

F7.06	LED2 Run Display Parameter Selection		Default	4
	Setting Range	0–31		
		0	Operating Frequency 1 (Hz)	
		1	Setting Frequency (Hz)	
		2	Bus Voltage (V)	
		3	Output Voltage (V)	
		4	Output Current (A)	
		5	Output Power (kW)	
		6	Output Torque (%)	
		7	DI Input Status	
		8	DO Output Status	
		9	AI1 Voltage (V)	
		10	AI2 Voltage (V)	
		11	Reserved	
		12	Count Value	
		13	Length Value	
		14	Load Speed Display	
		15	PID Setting	
		16	PID Feedback	
		17	PLC Stage	
		18	Reserved	
		19	Operating Frequency 2 (Hz)	
		20	Remaining Running Time	
		21	AI1 Voltage before calibration (V)	
		22	AI2 Voltage before calibration (V)	
		23	Reserved	
		24	Linear velocity	
		25	Current power-on duration (Hour)	
		26	Current running duration (Min)	
		27	Reserved	
		28	Communication setpoint	
		29	Encoder feedback speed (Hz)	
		30	Main Frequency X display (Hz)	
		31	Auxiliary Frequency Y display (Hz)	

F7.07	LED2 Stop Display Parameter Selection		Default	1
	Setting Range	0–14		
		00	Setting Frequency (Hz)	
		01	Bus Voltage (V)	
		02	DI Input Status	
		03	DO Output Status	
		04	AI1 Voltage (V)	
		05	AI2 Voltage (V)	
		06	Reserved	
		07	Count Value	
		08	Length Value	
		09	PLC Stage	
		10	Load speed	
		11	PID Setting	
		12	Reserved	
		13	Input AC voltage (V)	
		14	PID Feedback	

F7.08	Load Speed Display Coefficient		Default	1.0000
	Setting Range	0.0001~6.5000		

When it is necessary to display load speed, use this Parameter to adjust the correspondence between the inverter output Frequency and the load speed. For specific correspondence, refer to the description of F7.14.

F7.09	Inverter module Heat Sink temperature		Default	
	Setting Range	0℃–120℃		

Displays the temperature of the inverter module IGBT.

The over-temperature protection value for the inverter module IGBT varies between different models.

F7.10	Temporary Software Version Number		Default	
	Setting Range			

Displays the inverter software version number.

F7.11	Cumulative Operating Time		Default	
	Setting Range	0h–65535h		

Displays the cumulative operating time of the inverter. When the run time reaches the set value F8.17, the multifunction digital output function (12) outputs an ON signal.

F7.12	Product Number		Default	
	Setting Range	0–65535		
F7.13	Software Version Number		Default	
	Setting Range	0–65535		

F7.14	Number of decimal places for load speed display		Default	21
	Setting Range	Units place	Number of decimal places in U0.14	
		0	0 decimal places	
		1	1 decimal place	
		2	2 decimal places	
		3	3 decimal places	
		Tens place	Number of decimal places in U0.19/U0.29	
		1	1 decimal place	
		2	2 decimal places	

Ones place: Used to set the number of decimal places displayed for load speed. The following example demonstrates how load speed is calculated:

If the load speed display coefficient F7.08 is set to 2.000 and the load speed decimal places F7.14 is 2 (i.e., two decimal places), then when the inverter running frequency is 40.00 Hz, the load speed will be: 40.00 × 2.000 = 80.00 (displayed with two decimal places). If the inverter is stopped, the load speed display will show the value corresponding to the set frequency, i.e., the 'Preset Load Speed.'For example, if the set frequency is 50.00 Hz, then in stop mode the load speed is: 50.00*2.000 = 100.00 (displayed with two decimal places).

Tens digit:

1: U0.19/U0.29 are each displayed with one decimal place.

2: U0.19/U0.29 are each displayed with two decimal places.

F7.15	Cumulative Power-On Time		Default	
	Setting Range	0–65535 hours		

Displays the total cumulative power-on time of the inverter since factory shipment.

When this value reaches the set power-on time (F8.17), the inverter’s multifunction digital output (function 24) will output an ON signal.

F7.16	Cumulative Power Consumption		Default	
	Setting Range	0–65535 degrees		

Displays the total cumulative power consumption of the inverter to date.

F8 Group Auxiliary Functions

F8.00	Jog Frequency		Default	2.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		
F8.01	Jog Acceleration Time		Default	20.0 s
	Setting Range	0.0 s–6500.0 s		
F8.02	Jog Deceleration Time		Default	20.0 s
	Setting Range	0.0 s–6500.0 s		

Defines the given frequency and acceleration/deceleration time for jog operation of the inverter.

During jog operation, the start mode is fixed to direct start (F6.00=0), and the stop mode is fixed to deceleration stop (F6.10=0).

F8.03	Acceleration Time 2		Default	Model Selection
	Setting Range	0.0 s–6500.0 s		
F8.04	Deceleration Time 2		Default	Model Selection
	Setting Range	0.0 s–6500.0 s		
F8.05	Acceleration Time 3		Default	Model Selection

	Setting Range	0.0 s–6500.0 s		
F8.06	Deceleration Time 3		Default	Model Selection
	Setting Range	0.0 s–6500.0 s		
F8.07	Acceleration Time 4		Default	Model Selection
	Setting Range	0.0 s–6500.0 s		
F8.08	Deceleration Time 4		Default	Model Selection
	Setting Range	0.0 s–6500.0 s		

The ZVF650 provides four groups of Acceleration/Deceleration time, designated as F0.17, F0.18, and the other three groups as described above.

The definitions of all four Acceleration/Deceleration time groups are identical; please refer to the relevant instructions for F0.17 and F0.18.

By using different combinations of multifunction digital Input terminal DI, you can switch between the four groups of Acceleration/Deceleration time. For specific usage, refer to the instructions in Function Code F4.00–F4.03.

F8.09	Jump Frequency 1		Default	0.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		
F8.10	Jump Frequency 2		Default	0.00 Hz

	Setting Range	0.00 Hz–Maximum Frequency		
F8.11	Jump Frequency Amplitude		Default	0.01 Hz
	Setting Range	0.00 Hz–Maximum Frequency		

When the set frequency falls within the skip Frequency range, the actual operating Frequency will correspond to the skip Frequency closest to the set value. By configuring the skip Frequency, the inverter can avoid the mechanical resonance points of the Load.

The ZVF650 allows configuration of two skip frequency points. If both skip frequencies are set to 0, the skip frequency function will be deactivated. For the schematic diagram illustrating the principle of skip frequency and skip frequency amplitude, please refer to Figure 6-20.

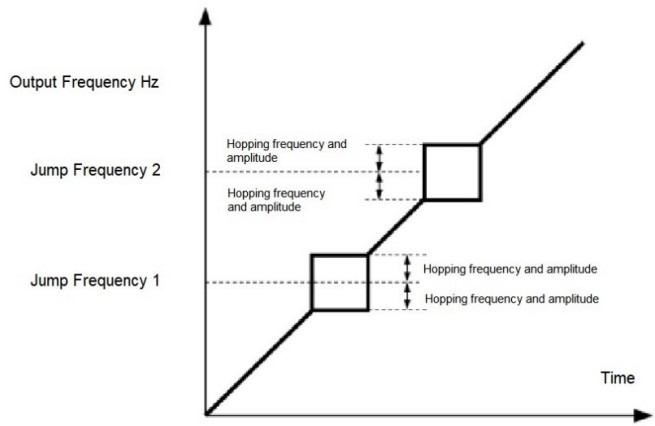


Figure 6-20 Skip Frequency Schematic Diagram

F8.12	Forward/Reverse Rotation Dead Time	Default	0.0 s
	Setting Range	0.0 s–3000.0 s	

During the transition between forward and reverse rotation of the inverter, the transition time at an output of 0 Hz is shown in the diagram below:

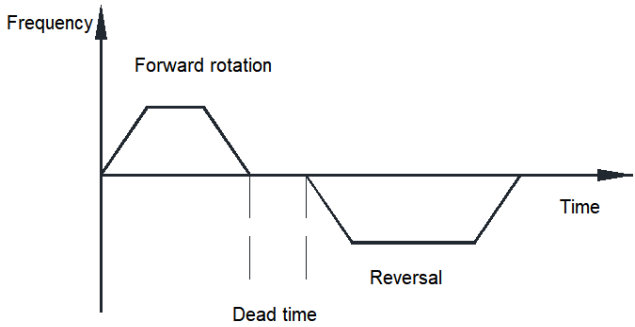


Figure 6-21 Forward and Reverse Dead Zone Time Schematic

F8.13	Reverse Rotation Control Disable	Default	0

	Setting Range	0	Enable
		1	Disable

When the frequency specified by the communication setpoint or analog setpoint is negative, the motor running direction will be reversed; this frequency is referred to as the reverse rotation frequency.

This parameter allows you to configure whether the inverter permits the motor to operate in reverse. For applications where motor reverse operation is not allowed, set F8.13=1; set F8.13=0 to allow motor reverse operation.

F8.14	Operation mode when set frequency is below the lower limit Frequency		Default	0
	Setting Range	0	Operate below lower frequency limit	
		1	Stop	
		2	Zero speed operation	

When the set frequency is below the lower frequency limit, the inverter's operating status can be selected using this parameter. The ZVF650 provides three operating modes to suit various application requirements.

F8.15	Droop control	Default	0.00 Hz
	Setting Range	0.00 Hz–10.00 Hz	

The droop rate allows a slight speed difference between the master and slave stations, thereby avoiding mutual conflict. The default value of this parameter is 0.

Adjustment of the droop rate is required only when both the master and slave operate in speed control mode. The appropriate droop rate for each drive process should be determined through practical testing. It is

recommended not to set F8.15 too high, as this may result in a noticeable decrease in steady-state speed under high load. The droop rate must be set for both the master and slave.

Droop Speed = Synchronous Frequency × Output Torque × Droop Rate ÷ 10

Example: If F8.15 = 1.00, the synchronous Frequency is 50 Hz, and the output torque is 50%, then:

Droop Speed = 50 Hz × 50% × 1.00 ÷ 10 = 2.5 Hz

Actual inverter Frequency = 50 Hz – 2.5 Hz = 47.5 Hz

F8.16	Set accumulated power-on duration		Default	0h
	Setting Range	0h–65000h		

When the accumulated power-on time (F7.13) reaches the value set by F8.16, the inverter's multi-function digital DO outputs an ON signal. The following example illustrates its application:

Example: By utilizing the virtual DI/DO function, configure the inverter to output a Fault Alarm after the power-on time reaches 100 hours.
Solution:

Set the function of the virtual DI1 Terminal to 'User-defined Fault 1': H1.00=44;

The valid state of the virtual DI1 Terminal is set to be sourced from virtual DO1: H1.05=0000; assign the power-on time reached function to virtual DO1: H1.11=24; set the accumulated power-on time threshold to 100 hours: F8.16=100. When the accumulated power-on time reaches 100 hours, the inverter issues error output Err27.

F8.17	Set accumulated operation duration	Default	0h

	Setting Range	0h–65000h

Used to configure the operating time of the inverter.

When the accumulated operating time (F7.09) reaches the specified value, the inverter multifunction digital DO output will switch ON.

F8.18	Start-up protection selection		Default	0
	Setting Range	0	No protection	
		1	Protection	

This parameter pertains to the inverter's safety protection functionality.

If this Parameter is set to 1, and a run command is present when the inverter is powered on (for example, the Terminal run command is closed prior to power-up), the inverter will not execute the run command. The command must first be deactivated, and only after it is re-activated will the inverter respond.

Additionally, if this parameter is set to 1 and the run command is active at the moment of Fault Reset, the inverter will not respond to the run command. The run command must first be disengaged before the run protection status can be cleared.

Setting this parameter to 1 prevents the motor from responding to a run command during power-up or Fault Reset, thereby reducing the risk of unintended operation.

F8.19	Frequency Detection Value (FDT1)		Default	50.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		

F8.20	Frequency Detection Hysteresis Value (FDT1)	Default	5.0%
	Setting Range	0.0%–100.0% (FDT1 level)	

When the operating frequency exceeds the Frequency Detection Value, the multifunction output DO outputs an ON signal; when the frequency subsequently drops below the detection value minus the hysteresis value, the DO ON signal output is cancelled.

These parameters set the detection value for output Frequency, as well as the hysteresis value for releasing the output action. F8.20 specifies the hysteresis Frequency as a percentage of the Frequency detection value F8.19. The following diagram illustrates the FDT function.

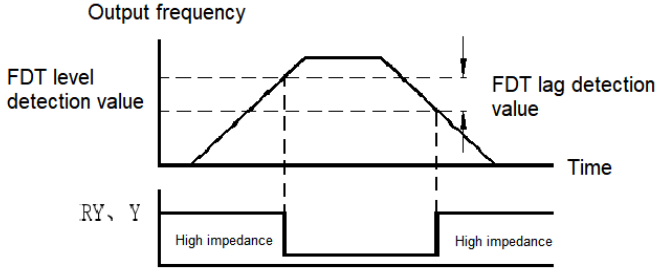


Figure 6-22 FDT Level Schematic

F8.21	Frequency Arrival Detection Width	Default	0.0%

	Setting Range	0.00–100% (Maximum Frequency)

When the inverter's operating Frequency is within a specified range of the target Frequency, the multifunctional DO output turns ON.

This parameter sets the detection range for Frequency arrival, expressed as a percentage of the maximum frequency. The diagram below illustrates the Frequency arrival range.

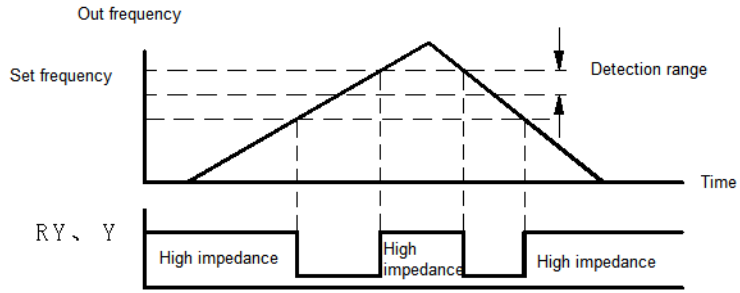


Figure 6-23 Frequency Arrival Detection Range Schematic

F8.23	Emergency Stop Time	Default	10.0 s
	Setting Range	0.1 s–6500.0 s	

This Function Code sets the deceleration time for emergency Stop.

F8.22	Validity of Jump Frequency During Acceleration/Deceleration	Default	0

	Setting Range	0	Invalid
		1	Valid

This function code is used to set whether the skip frequency is enabled during acceleration and deceleration.

When enabled, if the operating frequency falls within the skip frequency range, the actual operating frequency will bypass the set skip frequency boundaries. Figure 6-24 illustrates the case where skip frequency is enabled during acceleration and deceleration.

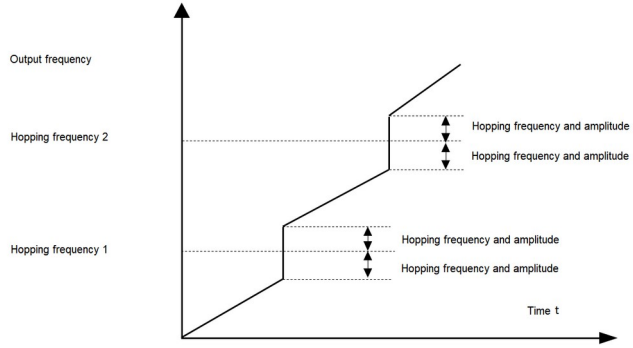


Figure 6-24 Illustration of effective skip frequency during acceleration and deceleration

F8.25	Switching Frequency Point Between Acceleration Time 1 and Acceleration Time 2	Default	0.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency	
F8.26	Switching Frequency Point Between Deceleration Time 1 and Deceleration Time 2	Default	0.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency	

This function is valid when Motor 1 is selected and the acceleration/deceleration time is not switched via the DI terminal. Used to automatically select different acceleration/deceleration times based on the operating frequency range during inverter operation, without switching via DI terminal.

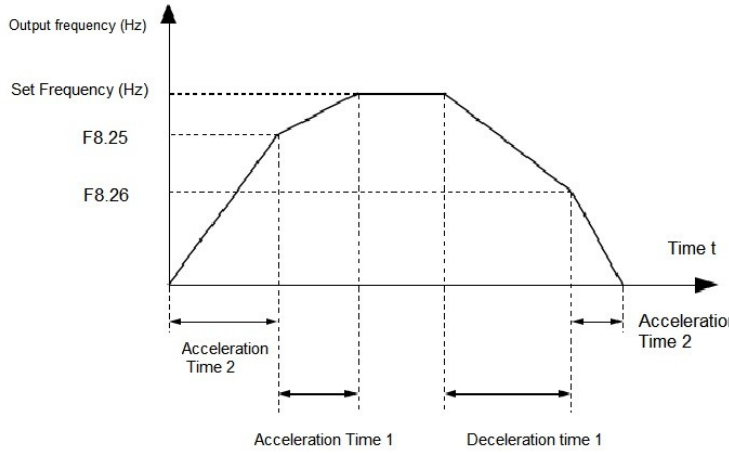


Figure 6-25 Acceleration/Deceleration Time Switching Diagram

Figure 6-25 is a schematic diagram of acceleration/deceleration time switching. During acceleration, if the operating frequency is less than F8.25, acceleration time 2 is selected; if the operating frequency exceeds F8.25, acceleration time 1 is selected.

During deceleration, if the operating frequency is greater than F8.26, deceleration time 1 is selected; if the operating frequency is less than F8.26, deceleration time 2 is selected.

F8.27	Terminal jog priority		Default	0
	Setting Range	0	Invalid	
		1	Valid	

This parameter is used to set whether the terminal jog function has the highest priority. When terminal jog priority is enabled, if a terminal jog command occurs during operation, the inverter switches to the terminal jog operating status.

F8.28	Frequency detection value (FDT2)		Default	50.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		
F8.29	Frequency Detection Hysteresis Value (FDT2)		Default	5.0%
	Setting Range	0.0% to 100.0% (FDT2 level)		

This frequency detection function is identical to that of FDT1. Please refer to the description of FDT1, specifically function codes F8.19 and F8.20.

F8.30	Arbitrary Frequency Arrival Detection Value 1		Default	50.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		
F8.31	Arbitrary Frequency Arrival Detection Bandwidth 1		Default	0.0%
	Setting Range	0.0%–100.0% (Maximum Frequency)		
F8.32	Arbitrary Frequency Arrival Detection Value 2		Default	50.00 Hz
	Setting Range	0.00 Hz–Maximum Frequency		

F8.33	Arbitrary Frequency Arrival Detection Bandwidth 2		Default	0.0%
	Setting Range	0.0%–100.0% (Maximum Frequency)		

When the inverter's output frequency is within the positive or negative detection amplitude range of the set frequency detection value, the multifunction DO output ON signal is activated.

The ZVF650 provides two sets of arbitrary frequency detection parameters, allowing independent configuration of the frequency value and the detection range. Figure 6-26 illustrates this function.

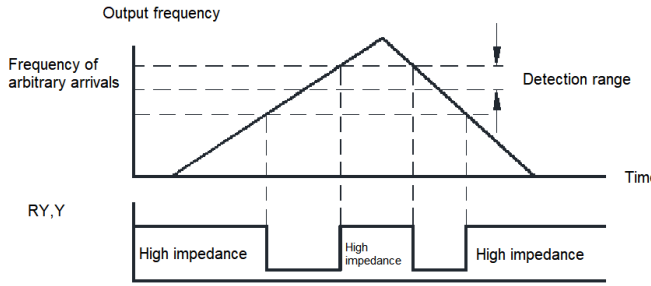


Figure 6-26 Schematic Diagram of Arbitrary Frequency Detection

F8.34	Zero Current Detection Level		Default	5.0%
	Setting Range	0.0–300.0% (Motor Rated Current); 100.0% corresponds to motor rated current.		
F8.35	Zero Current Detection Delay Time		Default	0.10 s

	Setting Range	0.00 s–600.00 s

When the inverter's output current is less than or equal to the zero current detection level and the condition persists beyond the zero current detection delay time, the multifunction DO output ON signal is activated. Figure 6-27 illustrates the zero current detection.

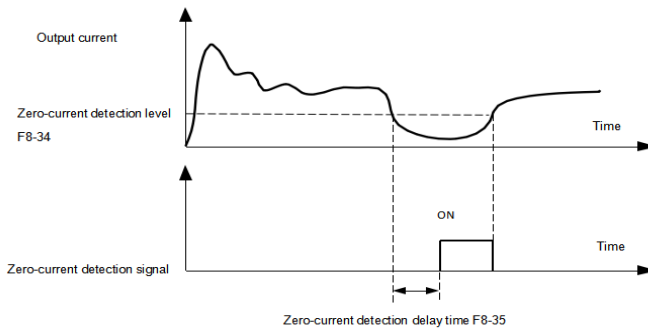


Figure 6-27 Zero current detection schematic diagram

F8.36	Output Current Over-limit Value	Default	200.0%
	Setting Range	0.0% (no detection); 0.1%–300.0% (Motor rated current)	
F8.37	Output Current Over-limit Detection Delay Time	Default	0.00 s

	Setting Range	0.00 s–600.00 s

If the inverter output current exceeds the over-limit detection threshold and the duration exceeds the software overcurrent detection delay time, the multifunctional DO output of the inverter will turn ON. Figure 6-28 illustrates the output current over-limit function.

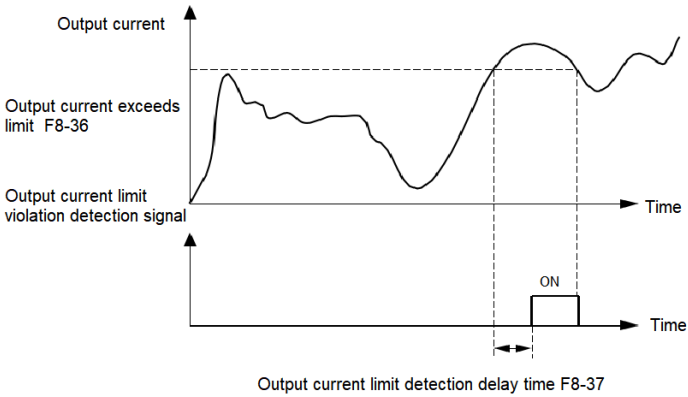


Figure 6-28 Output current over-limit detection schematic diagram

F8.38	User-defined Current Threshold 1	Default	100.0%

	Setting Range	0.0%–300.0% (Motor rated current)	
F8.39	User-defined Current Threshold 1 Duration	Default	0.0%
	Setting Range	0.0%–300.0% (Motor rated current)	
F8.40	User-defined Current Threshold 2	Default	100.0%
	Setting Range	0.0%–300.0% (Motor rated current)	
F8.41	Arbitrary Arrival Current 2 Width	Default	0.0%
	Setting Range	0.0%–300.0% (Motor rated current)	

When the inverter output current falls within the preset positive or negative detection range around any specified current value, the multifunctional DO output of the inverter will turn ON.

The ZVF650 provides two groups of arbitrary target current and detection width parameters. The diagram below illustrates the functionality.

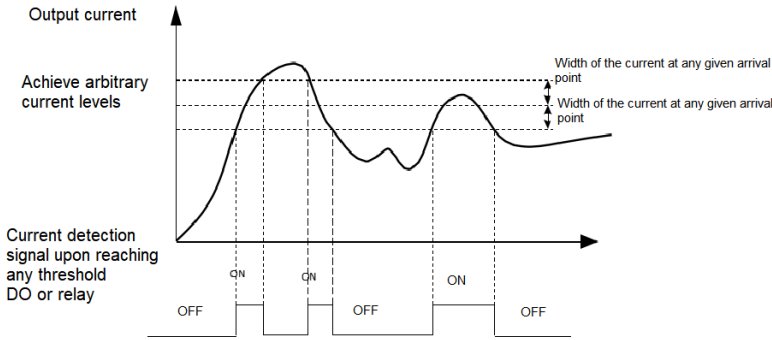


Figure 6-29 Schematic diagram of arbitrary target frequency detection

F8.42	Timing Function Selection			Default	0
	Setting Range	0	Invalid		
		1	Valid		
F8.43	Timed Operation Duration Selection			Default	0
	Setting Range	0	F8.44 setting		
		1	AI1		
		2	AI2		
		3	Reserved		
			Analog Input Range corresponds to F8.44		
F8.44	Timed Operation Duration			Default	0.0Min
	Setting Range	0.0Min–6500.0Min			

This set of parameters is used to implement the inverter's timed operation function.

When function selection F8.42 is enabled, timing commences upon inverter start-up. Once the set timed operation duration elapses, the inverter stops automatically and the multifunction DO output is turned ON.

Each time the inverter starts, timing begins from zero. The remaining timed operation duration can be monitored via U0.20. The timed operation duration is configured via F8.43 and F8.44, with the time unit in minutes.

F8.45	AI1 Input Voltage Protection Lower Limit		Default	3.10V
	Setting Range	0.00V–F8.46		
F8.46	AI1 Input Voltage Protection Upper Limit		Default	6.80V
	Setting Range	F8.45–11.00V		

When the analog input AI1 value exceeds F8.46 or falls below F8.45, the inverter's multi-function digital output (DO) will output an “AI1 input out-of-range” ON signal, which serves to indicate whether the AI1 input voltage is within the specified range.

F8.47	Module Temperature Reached		Default	75℃
	Setting Range	0℃–100℃		

When the inverter heat sink temperature reaches the specified value, the inverter’s multi-function digital output (DO) will output a “module temperature reached” ON signal.

F8.48	Cooling Fan Control			Default	0
	Setting Range	0	Fan operates in operating status		
		1	Fan operates continuously		

Used to select the operating mode of the cooling fan. When set to 0, the fan operates when the inverter is in operating status; if the inverter is stopped and the heat sink temperature exceeds 40°C, the fan will operate, but it remains off when the heat sink temperature is below 40°C. When set to 1, the fan operates continuously after the inverter is powered on.

F8.49	This Run Time Setting		Default	0.0Min
	Setting Range	0.0Min–6500.0Min		

When the runtime for this start-up reaches the set value, the inverter's multifunctional digital DO will output a 'Run Time Reached' ON signal.

F8.50	Output Power Correction Coefficient		Default	100.0%
	Setting Range	0.0% – 200.0%		

If the output power (U0.05) does not match the expected value, this parameter can be used to linearly calibrate the output power.

F9 Fault and Protection Parameter Group

F9.00	Motor overload protection selection			Default	1
	Setting Range	0	In this mode, there is no Motor overload protection function. It is recommended to install a thermal relay before the Motor.		
		1	In this mode, the inverter provides Motor overload protection. For protection settings, refer to F9.01 and F9.02.		
F9.01	Motor overload protection gain			Default	1.00
	Setting Range	0.10 – 10.00			
F9.02	Motor overload pre-alarm coefficient			Default	80%

	Setting Range	50% – 100%

To provide effective protection for different load Motors, this parameter should be set according to the Motor's overload capacity. Motor overload protection is based on an inverse time limit curve. The motor overload protection curve is shown in Figure 6-30:

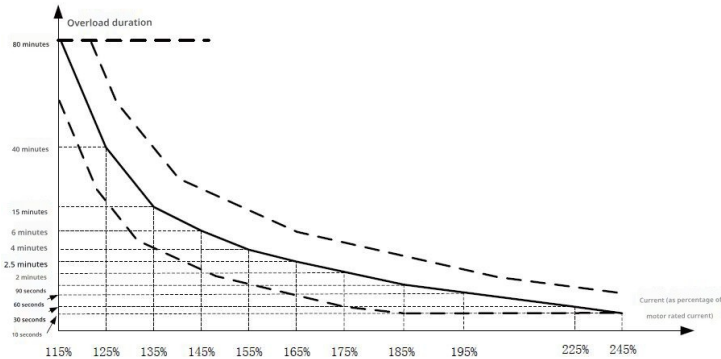


Figure 6-30 Schematic Diagram of the Motor Overload Inverse Time Limit Curve

1) When the motor operating current reaches 175% of the rated motor current and is maintained for 2 minutes, a motor overload (Err11) will be reported;

When the motor operating current reaches 115% of the rated motor current and is maintained for 80 minutes, a motor overload (Err11) will be reported.

Example: Motor rated current is 100A.

If F 9.01 is set to 1.00, when the motor operating current reaches 125% (125A) of the rated current (100A) and is maintained for 40 minutes, the inverter will report a motor overload fault;

If F 9.01 is set to 1.20, when the Motor operating current reaches 125% of 100A (i.e., 125A), and this condition persists for 40*1.2 = 48 minutes, the inverter will trigger a Motor overload fault.

The maximum overload duration is 80 minutes, while the minimum overload duration is 10 seconds.

2) Example of Motor overload protection adjustment: If it is required that the Motor can operate at 150% of its rated current for 2 minutes before an overload is reported, refer to the Motor overload characteristic curve. The 150% (I) current falls between 145% (I1) and 155% (I2) current zones; at 145% current, the overload duration (T1) is 6 minutes, and at 155% current, the overload duration (T2) is 4 minutes. Thus, under default settings, the overload time for 150% of the rated Motor current can be calculated as 5 minutes, as follows:

T = T1 + (T2 - T1) * (I – I1) / (I2 – I1) = 4 + (6 - 4) * (150% – 145%) / (155% – 145%) = 5 (minutes)

Thus, it can be determined that when the Motor operates at 150% of the rated current, an overload should be reported after 2 minutes, and the Motor overload protection gain is:

F9.01 = 2 ÷ 5 = 0.4

Note: Users must set the value of F9.01 correctly according to the actual overload capability of the Motor. If this parameter is set too high, there is a danger that the Motor may overheat and be damaged before the inverter is able to issue a timely alarm and provide protection!

3) Motor overload pre-warning coefficient: When the Motor overload detection level reaches the set value of this parameter, the multifunction output terminal DO or the fault relay (RELAY) will output a Motor overload pre-warning signal. This parameter is calculated as the percentage of time the Motor can continue to run at a specified overload point without triggering an overload fault indication.

For example: When the motor overload protection gain is set to 1.00 and the motor overload pre-warning coefficient is 80%, if the motor current reaches 145% of the rated motor current and continues to run for 4.8 minutes (80% × 6 minutes),the multifunction output terminal DO or fault relay RELAY will output a motor overload pre-warning signal.

F9.07	Power-On Ground Short Circuit Protection Selection			Default	1
	Setting	0	Invalid		
	Range	1	Valid		

You can select whether the inverter checks for a motor-to-ground short circuit upon power-up. If this function is enabled, the inverter UVW terminals will output voltage for a period after power-on.

F9.08	Brake Unit Starting Voltage		Default	760 V
	Setting Range	200.0~2000.0V		

Set the starting voltage (Vbreak) for the built-in brake unit based on the following recommendations:

800 ≥ Vbreak ≥ (1.414Vs+30)

Vs - AC power supply voltage input to the inverter. Note: Improper voltage settings may cause the built-in braking unit to malfunction!

F9.09	Number of automatic fault resets		Default	0
	Setting Range	0 – 20		

When the inverter is configured for automatic fault reset, this sets the allowable number of automatic resets. If this number is exceeded, the inverter will remain in the fault state.

F9.10	Selection of digital output action during automatic fault reset			Default	0
	Setting Range	0	No action		
		1	Action		

If automatic fault reset is enabled for the inverter, you can configure whether the fault DO operates during the automatic reset period via F9.10.

F9.11	Automatic fault reset interval time		Default	1.0 s
	Setting Range	0.1 s ~ 100.0 s		

The waiting time from the inverter fault alarm to the automatic fault reset.

F9.12	Input Phase Loss / Contactor Pull-In Protection Selection			Default	11
	Setting Range	Units place	Input Phase Loss Protection		
		Tens place	Contactor Pull-In Protection		
		0	Disable		

	1	Enable	

Select whether to enable protection for input phase loss or contactor pull-in.

F9.13	Output phase loss protection setting		Default	1
	Setting Range	0	Disable	
		1	Enable	

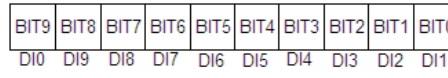
Select whether to enable protection for output phase loss. If 0 is selected and output phase loss actually occurs, no fault will be indicated. In this situation, the actual current will be slightly higher than the current shown on the panel, resulting in a potential risk. Use with caution.

F9.14	First fault type	Default	0
F9.15	Second fault type	Default	0
F9.16	Third (Most Recent) Fault Type	Default	0

Setting Range	0:	No Fault
	1:	Reserved
	2:	Overcurrent During Acceleration
	3:	Overcurrent During Deceleration
	4:	Overcurrent at Constant Speed
	5:	Overcurrent During Acceleration
	6:	Overcurrent During Deceleration
	7:	Overcurrent at Constant Speed
	8:	Braking Resistor Overload
	9:	Undervoltage
	10:	inverter Overload
	11:	Motor Overload
	12:	Input Phase Loss
	13:	Output Phase Loss
	14:	Module Overheat
	15:	External Fault
	16:	Communication Fault
	17:	Contactor Fault

		18:	Current Detection Fault
		19:	Motor Tuning Fault
		20:	Encoder/PG Card Fault

Records the three most recent fault types; 0 indicates no fault. For possible causes and corrective actions, refer to Chapter 7.

F9.17	Frequency at the time of the third most recent fault	Default	-
	Setting Range	Frequency at the time of the most recent fault	
F9.18	Current at the time of the third most recent fault	Default	-
	Setting Range	Current at the time of the most recent fault	
F9.19	Bus voltage at the time of the third most recent fault	Default	-
	Setting Range	Bus voltage at the time of the most recent fault	
F9.20	Input terminal status at the time of the third most recent fault	Default	-
	Setting Range	Digital input terminal status at the time of the most recent fault, in the following order:  When the input terminal is ON, its corresponding binary digit is 1; when OFF, it is 0. The status of all DI inputs is presented as a decimal value.	
F9.21	Output terminal status upon the third fault	Default	-

	Setting Range	The status of all output terminals during the most recent fault, in sequential order  its corresponding binary digit is 1. OFF corresponds to 0. All output terminal states are displayed as a decimal value.		
F9.22	Inverter status upon the third fault		Default	-
	Setting Range	Reserved		
F9.23	Power-on duration at the time of the third fault		Default	-
	Setting Range	Power-on duration during the most recent fault		
F9.24	Operating duration at the time of the third fault		Default	-
	Setting Range	Operating duration during the most recent fault		
F9.27	Frequency at the second fault event		Default	-
	Setting Range	Same as F9.17 ~ F9.24		
F9.28	Current at the second fault event		Default	-
	Setting Range	Same as F9.17 ~ F9.24		
F9.29	Bus voltage at the second fault event		Default	-
	Setting Range	Same as F9.17 ~ F9.24		
F9.30	Input terminal status upon the second fault		Default	-
	Setting Range	Same as F9.17 ~ F9.24		
F9.31	Output terminal status at second fault		Default	-
	Setting Range	Same as F9.17 ~ F9.24		
F9.32	Inverter Status at Second Fault Occurrence		Default	-

	Setting Range	Same as F9.17 ~ F9.24	
F9.33	Power-up Time at Second Fault Occurrence	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.34	Operating Time at Second Fault Occurrence	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.37	Frequency at first fault	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.38	Current at First Fault Occurrence	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.39	DC Bus Voltage at First Fault Occurrence	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.40	Input terminal status at first fault	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.41	Output Terminal at First Fault Occurrence	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.42	inverter status at first fault occurrence	Default	-
	Setting Range	Same as F9.17 ~ F9.24	
F9.43	Power-up Time at First Fault Occurrence	Default	-

	Setting Range	Same as F9.17 ~ F9.24		
F9.44	Operating Time at First Fault Occurrence		Default	-
	Setting Range	Same as F9.17 ~ F9.24		
F9.47	Fault Protection Action Selection 1		Default	00000
	Setting Range	Units place	Motor Overload (Err11)	
		0	Free Stop	
		1	Stop According to Stop Method	
		2	Continue Running	
		Tens place	Input Phase Loss (Err12) (Same Bit Position)	
		Hundreds digit	Output Phase Loss (Err13) (Same Bit Position)	
		Thousands digit	External Fault (Err15) (Same Bit Position)	
		Ten-thousands digit	Communication Error (Err16) (Same Bit Position)	
F9.48	Fault Protection Action Selection 2		Default	00000
	Setting Range	Units place	Encoder fault (Err20)	

		0	Free Stop
		1	Switch to VF; stop according to the configured stop method
		2	Switch to VF; continue operation
		Tens place	Function Code read/write error (Err21)
		0	Free Stop
		1	Stop According to Stop Method
		Hundreds digit	Reserved
		Thousands digit	Motor overheating (Err25) (same as units digit of F9.47)
		Ten-thousands digit	Operating time elapsed (Err26) (same as units digit of F9.47)

F9.49	Fault protection action selection 3		Default	00000
	Setting Range	Units place	User-defined fault 1 (Err27) (same as units digit of F9.47)	
		Tens place	User-defined fault 2 (Err28) (same as units digit of F9.47)	
		Hundreds digit	Power-up time elapsed (Err29) (same as units digit of F9.47)	

		Thousands digit	Load drop (Err30)
		0	Coast to stop
		1	Stop According to Stop Method
		2	Immediately jump to 7% of the motor rated Frequency and continue operation; if load is not dropped, the inverter will automatically resume operation at the set frequency.
		Ten-thousands digit	PID feedback lost during operation (Err31) (same as the ones digit of F9.47)
F9.50	Fault protection action selection 4		Default 00000
	Setting Range	Units place	Excessive speed deviation (Err42) (same as the ones digit of F9.47)
		Tens place	motor overspeed (Err43) (same as the ones digit of F9.47)
		Hundreds digit	Initial position error (Err51) (same as the ones digit of F9.47) (same as the ones digit of F9.47)
		Thousands digit	Speed feedback error (Err52) (same as the ones digit of F9.47)

		Ten-thousands digit	Reserved

When 'Coast to stop' is selected, the inverter displays Err** and stops immediately. When 'Stop according to stop mode' is selected: the inverter displays A**, stops according to the configured stop mode, and, after stopping, displays Err**. When 'Continue running' is selected: the inverter continues to operate and displays A**, with the operating Frequency set by F9.54.

F9.54	Frequency selection during fault continue operation		Default	0
	Setting Range	0	Operate at the current frequency	
		1	Operate at the set frequency	
		2	Operate at the upper limit frequency	
		3	Operate below lower frequency limit	
		4	Operate at the abnormal backup frequency	

F9.55	Abnormal backup frequency	Default	100.0%
	Setting Range	0.0% ~ 100.0% (maximum frequency)	

If a fault occurs during inverter operation and the fault handling method is set to continue operation, the inverter will display A** and operate at the frequency specified by F9.54.

When abnormal backup frequency operation is selected, the value set in F9.55 is a percentage relative to the maximum frequency.

F9.56	motor temperature sensor type		Default	0
	Setting	0	No temperature sensor	

	Range	1	PT100		
		2	PT1000		
F9.57	Motor Overheat Protection Threshold			Default	110℃
	Setting Range	0℃– 200℃			
F9.58	Motor Overheat Pre-alarm Threshold			Default	90℃
	Setting Range	0℃– 200℃			
F9.59	Function selection for ride-through operation during instantaneous power loss			Default	0
	Setting Range	0	Invalid		
		1	DC bus voltage constant control		
		2	Deceleration Stop		
F9.60	Ride-through recovery voltage			Default	85%
	Setting Range	85%~120%			
F9.61	Ride-through voltage detection time			Default	0.5 s
	Setting Range	0.0~100.0 s			
F9.62	Ride-through operation bus voltage threshold			Default	80%
	Setting Range	60%~85%			

● Continuous Operation During Instantaneous Power Loss (Ride-Through Function)

As illustrated below: when the DC bus voltage falls below the 'ride-through operation threshold voltage,' the instantaneous power loss ride-through process is activated. The inverter output frequency automatically

decreases, causing the motor to operate in generator mode. The ride-through function utilizes the regenerative energy to maintain the DC bus voltage at approximately the 'ride-through operation threshold voltage,' enabling the system to decelerate smoothly to 0 Hz.

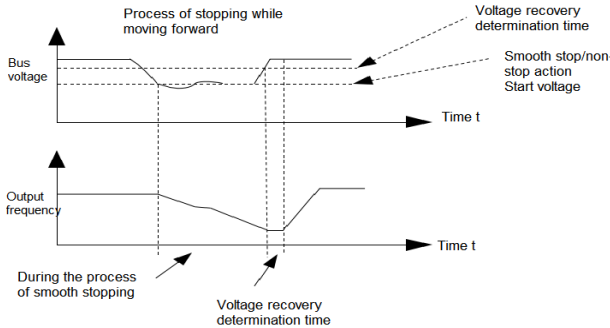


Figure 6-31 Schematic diagram of the ride-through operation during momentary power loss

F9.71	Ride-through gain Kp for momentary power loss		Default	40
	Setting Range	0~100		
F9.72	Ride-through integral coefficient Ki for momentary power loss		Default	30
	Setting Range	0~100		
F9.73	Non-stop Ride-through Action Deceleration Time		Default	0.0 s

	Setting Range	0~300.0 s

Note:

(1) In DC bus voltage regulation control mode, when mains power is restored, the inverter output Frequency resumes operation towards the target Frequency. In deceleration stop mode, when mains power is restored, the inverter continues decelerating to 0 Hz and stops, until a new start command is issued.

(2) The purpose of ride-through operation during momentary power loss is to ensure that when mains power is abnormal, the Motor can decelerate and stop normally. This allows the Motor to restart immediately once power supply is restored, avoiding the Motor free-running to stop due to sudden undervoltage faults during abnormal mains, which may otherwise occur. In high-inertia systems, free-running deceleration requires a long duration. Once power supply returns and the Motor is still running at high speed, an immediate restart can easily cause the inverter to experience overload or Overcurrent fault.

F9.63	Load shedding protection selection			Default	0
	Setting Range	0	Invalid		
		1	Valid		
F9.64	Load Drop Detection Level			Default	10%
	Setting Range	0.0% to 100.0%			
F9.65	Load Drop Detection Time			Default	1.0 s

	Setting Range	0.0 s – 60.0 s

If the load shedding protection function is active, when the inverter output current falls below the load shedding detection level F9.64 and the duration exceeds the load shedding detection time F9.65, the inverter output frequency is automatically reduced to 7% of the rated frequency. During load shedding protection, if the load recovers, the inverter will automatically return to operation at the set frequency.

F9.67	Overspeed Detection Threshold	Default	20%
	Setting Range	0.0% – 50.0% (maximum frequency)	
F9.68	Overspeed Detection Time	Default	0.010 s
	Setting Range	0.001 s – 0.600 s	

This function is effective only when the inverter is operating in vector control mode with a speed sensor.

When the inverter detects that the actual speed of the motor exceeds the maximum frequency by more than the overspeed detection value F9.67, and this condition persists longer than the overspeed detection time F9.68, the inverter issues Fault Alarm Err43 and executes protection actions according to the fault protection mode. When the overspeed detection time is set to 0.0 s, overspeed fault detection is cancelled.

F9.69	Excessive Speed Deviation Detection Threshold	Default	20%
	Setting Range	0.0% – 50.0% (maximum frequency)	
F9.70	Speed Deviation Detection Time	Default	5.0 s
	Setting Range	0.0 (Not Detected) 0.1 s ~ 60.0 s	

This function is effective only when the inverter is operating in vector control mode with a speed sensor.

When the inverter detects that the actual motor speed deviates from the set frequency by more than the speed deviation excess threshold F9.69, and this condition persists for longer than the speed deviation excess detection time F9.70, the inverter triggers Fault Alarm Err42 and responds according to the configured fault protection mode.

If the speed deviation excess detection time is set to 0.0 s, speed deviation excess fault detection is cancelled. 3.

FA Group Process Control PID Function

PID control is a commonly used method in process control. By applying proportional, integral, and derivative calculations to the deviation between the feedback signal of the controlled variable and the target signal, and adjusting the output Frequency of the inverter, a closed-loop system is established to maintain the controlled variable at the target value.

This method is suitable for process control applications such as flow control, pressure control, and temperature control. Figure 6-32 illustrates the block diagram of the process PID control principle.

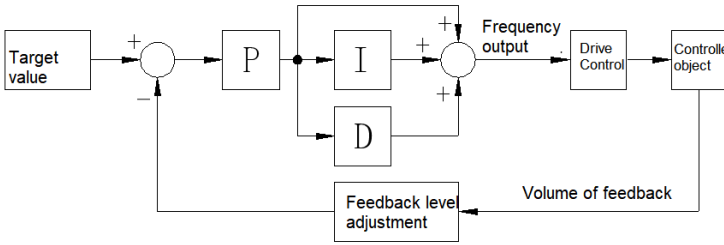


Figure 6-32 Process PID Principle Block Diagram

FA.00	PID Setpoint Source			Default	0
	Setting Range	0	FA.01 Setting		
		1	AI1		
		2	AI2		
		3	Reserved		
		4	Reserved		
		5	Communication setpoint		
		6	Multi-stage Command Input		
FA.01	PID Setpoint Value			Default	0.50
	Setting Range	0–1000 (Decimal point set by FA.33)			

This Parameter is used to select the target setpoint channel for process PID.

The setpoint for the process PID is expressed as a relative value, with a setting range of 0.0%~100.0%. Likewise, the feedback value for the PID is also a relative value,

The purpose of PID is to ensure that these two relative quantities are equal.

FA.02	PID Feedback Source			Default	0
	Setting Range	0	AI1		
		1	AI2		
		2	Reserved		
		3	AI1 – AI2		
		4	Reserved		
		5	Communication setpoint		
		6	AI1+AI2		
		7	MAX(|AI1|,|AI2|)		
		8	MIX(|AI1|,|AI2|)		

This parameter is used to select the feedback signal channel for the process PID.

The process PID feedback value is also a relative value, with a setting range of 0.0%–100.0%.

FA.03	PID Action Direction			Default	0
	Setting Range	0	Direct Action		
		1	Reverse Action		

Direct Action: When the PID feedback signal is less than the setpoint, the inverter output frequency increases. This is typical in tension control during winding.

Reverse Action: When the PID feedback signal is less than the setpoint, the inverter output frequency decreases. This is typical in tension control during unwinding.

This function is affected by the PID action direction inversion via multifunction terminal (Function 35); attention is required during operation.

FA.04	PID Setpoint Feedback Range		Default	1.6
	Setting Range	0–65535		

The range for PID setpoint and feedback is dimensionless, and it applies to PID setpoint display U0.15 and PID feedback display U0.16.

The relative value of the PID setpoint feedback is 100.0%, corresponding to the setpoint feedback range FA.04. For example, if FA.04 is set to 2000, then when the PID setpoint is 100.0%, the PID setpoint display U0.15 will indicate 2000.

FA.05	Proportional Gain Kp1		Default	20.0
	Setting Range	0.0~100.0		
FA.06	Integral Time Ti1		Default	2.00 s
	Setting Range	0.01 s~10.00 s		
FA.07	Derivative Time Td1		Default	0.000 s
	Setting Range	0.000 s~10.000 s		

Proportional gain Kp1:

Determines the overall control strength of the PID regulator. The greater the value of Kp1, the greater the control strength. This Parameter is set to 100. A value of 0 means that when the deviation between the PID feedback and the setpoint is 100.0%, the PID regulator's adjustment range for the output Frequency command reaches the maximum frequency.

Integral time Ti1:

Determines the strength of integral regulation in the PID controller. The shorter the integral time, the greater the regulatory strength. Integral time refers to the period during which, when the deviation between the PID feedback and the setpoint is 100.0%, the integral regulator—after continuously adjusting for this duration—results in the adjustment reaching the maximum frequency.

Differential time Td1:

Determines the strength with which the PID regulator responds to the rate of change of deviation. The longer the differential time, the greater the regulatory intensity. Differential time refers to the period during which, if the feedback value changes by 100.0%, the output of the differential regulator reaches the maximum frequency.

FA.08	PID Reverse Rotation Frequency Limit		Default	0.00 Hz
	Setting Range	0.00 – maximum frequency		

In certain situations, only when the PID output frequency is negative (i.e., the inverter is in reverse rotation) can the PID match the setpoint to the feedback value. However, excessively high reverse rotation frequency is not permitted in some applications. FA.08 is used to set the upper limit of the reverse rotation frequency. When the frequency source is Main + Auxiliary (PID), the upper limit of the PID reverse rotation frequency is not restricted, i.e., FA.08 is invalid.

FA.09	PID Deviation Limit		Default	0.0%
	Setting Range	0.0% – 100.0%		

When the deviation between the PID setpoint and the feedback value is less than FA.09, the PID stops adjustment action. In this manner, when the deviation between the setpoint and feedback is minimal, the output frequency remains stable, which is highly effective in certain closed-loop control scenarios.

FA.10	PID Derivative Limiting		Default	0.10%
	Setting Range	0.00%~100.00%		

In a PID regulator, the derivative function is highly sensitive and can readily cause system oscillation; therefore, the PID derivative action is generally restricted to a relatively small range. FA.10 is used to set the range for the PID derivative output.

FA.11	PID setpoint ramp time		Default	0.00 s
	Setting Range	0.00 s–650.00 s		

The PID setpoint ramp time refers to the time required for the PID setpoint to change from 0.0% to 100.0%.

When the PID setpoint changes, its value transitions linearly over the specified ramp time, thereby reducing the adverse impact of sudden setpoint changes on the system.

FA.12	PID feedback filter time		Default	0.00 s
	Setting Range	0.00 s–60.00 s		
FA.13	PID output filter time		Default	0.00 s
	Setting Range	0.00 s–60.00 s		

FA.12 is used to filter the PID feedback signal. This filtering helps to reduce the impact of interference on the feedback signal, but it will also decrease the response performance of the closed-loop process system.

FA.13 is used to filter the PID output frequency. This filtering reduces abrupt changes in the inverter output frequency, but will also decrease the response performance of the closed-loop process system.

FA.14	Reserved			
FA.15	Proportional gain Kp2		Default	20.0
	Setting Range	0.0~100.0		
FA.16	Integral time Ti2		Default	2.00 s
	Setting Range	0.01 s~10.00 s		
FA.17	Derivative time Td2		Default	0.000 s
	Setting Range	0.000 s~10.000 s		
FA.18	PID parameter switching condition		Default	0
	Setting Range	0	No switching	
		1	Switching via DI terminal	
		2	Automatic switching based on deviation	
		3	Automatic switching based on operating frequency	
FA.19	PID parameter switching deviation 1		Default	20.0%
	Setting Range	0.0%–F9.20		
FA.20	PID parameter switching deviation 2		Default	80.0%
	Setting Range	F9.19–100.0%		

In some applications, one set of PID parameters cannot meet the requirements throughout the entire operation process. Different sets of PID parameters are required under different conditions. This set of

function codes is used to switch between two sets of PID parameters. The configuration method for regulator parameters FA.15~FA.17 is similar to that of parameters FA.05~FA.07.

The two sets of PID parameters can be switched via multifunction digital DI terminals, or automatically switched according to the PID deviation.

When switching by multifunction DI terminal is selected, the terminal Function selection must be set to 43 (PID parameter switching terminal). When the terminal is inactive, parameter group 1 (FA.05~FA.07) is selected; when the terminal is active, parameter group 2 (FA.15~FA.17) is selected.

When automatic switching is selected, if the absolute value of the deviation between the reference and the feedback is less than PID parameter switching deviation 1 (FA.19), the PID parameters select parameter group 1. If the absolute value of the deviation between the reference and the feedback exceeds PID switching deviation 2 (FA.20), the PID parameters select parameter group 2. When the deviation between the reference and feedback falls between Switch Deviation 1 and Switch Deviation 2, the PID parameter is determined by linear interpolation of the two sets of PID parameters, as shown in Figure 6-33.

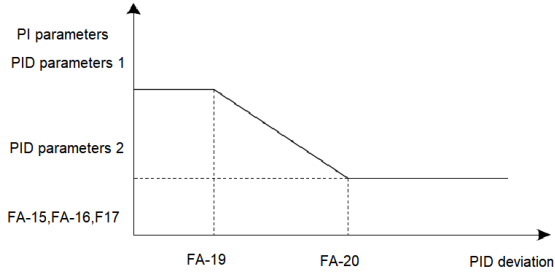


Figure 6-33 PID Parameter Switching

FA.21	PID Initial Value		Default	0.0%
	Setting Range	0.0% – 100.0%		
FA.22	PID Initial Value Hold Time		Default	0.00 s
	Setting Range	0.00 s–650.00 s		

When the inverter is started, the PID output is fixed at the PID initial value FA.21. Only after the initial value holding time set by FA.22 has elapsed does the PID begin closed-loop regulation. Figure 6-34 illustrates the function of the PID initial value.

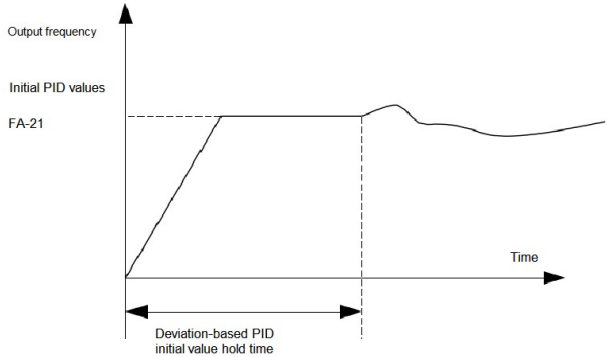


Figure 6-34 Functional Diagram of PID Initial Value

FA.23	Maximum Positive Output Deviation Across Two Sampling Intervals		Default	1.00%
	Setting Range	0.0% – 100.0%		
FA.24	Maximum Negative Output Deviation Across Two Sampling Intervals		Default	1.00%
	Setting Range	0.0% – 100.0%		

This function is used to limit the difference in PID output between two sampling intervals (2 ms per interval), in order to suppress rapid changes in PID output and enhance the stability of inverter operation.

FA.23 and FA.24 correspond to the maximum absolute values of output deviation in the forward and reverse directions, respectively.

FA.25	PID Integral Attribute		Default	00
	Setting Range	Units place	Integral Separation	

		0	Invalid
		1	Valid
		Tens place	Whether to Stop Integration After Output Reaches the Limit
		0	Continue Integration
		1	Stop Integration

Integral Separation:

If integral separation is enabled, then when the multifunction digital DI integration pause (Function 22) is active, PID integration calculation is suspended, and only the proportional and derivative actions of the PID remain operational.

If integral separation is set to invalid, it will remain ineffective regardless of the state of the multifunction digital DI. Whether to stop integration after output reaches the limit:

When the PID operation output reaches its maximum or minimum value, you can select whether to halt the integration function. If 'Stop' integration is selected, PID integration calculation will be suspended during Stop. This may help to reduce PID overshoot.

FA.26	PID Feedback Loss Detection Threshold		Default	0.0%
	Setting Range	0.0%: Feedback loss not detected; 0.1%–100.0%		
FA.27	PID Feedback Loss Detection Time		Default	0.0 s
	Setting Range	0.0 s–20.0 s		

This function code is used to detect whether PID feedback is lost.

If the PID feedback value falls below the feedback loss detection value FA.26 for longer than the feedback loss detection time FA.27, the

inverter will trigger fault alarm Err31 and handle the fault according to the selected treatment method.

FA.28	PID Calculation During Stop		Default	1
	Setting Range	0	No calculation during Stop	
		1	Calculation during Stop	

Used to select whether the PID continues calculation during Stop. In standard applications, the PID should discontinue calculation while in the Stop state.

FA.29	Wake value		Default	0.0
	Setting Range	0.0~100.0		
FA.30	Wake delay time		Default	2.0 s
	Setting Range	0.0 s–6500.0 s		
FA.31	Sleep Frequency		Default	35 Hz
	Setting Range	0.00 Hz–Maximum Frequency		
FA.32	Sleep delay time		Default	2.0 s
	Setting Range	0.0 s–6500.0 s		

This group of parameters is used to enable sleep and wake functions in water supply applications.

During inverter operation, if the set frequency is less than or equal to the FA.31 Sleep Frequency, then after the delay time specified by FA.32, the inverter enters sleep mode and stops automatically.

When the inverter is in sleep mode and the run command remains active, if the feedback pressure drops below the FA.29 Wake Value, then after the delay time specified by FA.30, the inverter will start.

If both the Wake Value and Sleep Frequency are set to zero, the sleep and wake functions are disabled.

When the sleep function is enabled and the frequency source uses PID, whether PID calculation is performed during sleep is determined by Function Code FA.28. In this case, PID operation during stop must be selected (FA.28=1).

FA.33	Decimal places for PID-related values		Default	2
	Setting Range	0–2		

Fb Group: Swing Frequency, Fixed Length, and Counting

The swing frequency function is applicable in industries such as textiles and chemical fibers, as well as in scenarios requiring transverse movement or winding functionalities.

The swing frequency function refers to the inverter output frequency oscillating up and down around the set frequency as the center; the frequency trajectory with respect to time is shown in Figure 6-35. The swing amplitude is defined by Fb.00 and Fb.01. When Fb.01 is set to 0, the swing amplitude is zero, and the swing frequency function is inactive.

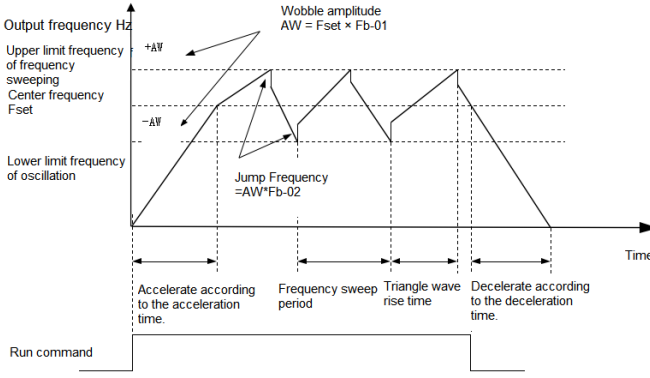


Figure 6-35: Illustration of Swing Frequency Operation

Fb.00	Swing Range Setting Method		Default	0
	Setting Range	0	Relative to center Frequency	
		1	Relative to the maximum frequency	

This parameter is used to determine the reference basis for the swing range.

0: Relative to center Frequency (F0.07 frequency source); for variable swing systems, the swing range varies as the center Frequency (set frequency) changes.

1: Relative to maximum frequency (F0.10); for fixed swing systems, the swing range remains constant.

Fb.01	Oscillation frequency amplitude		Default	0.0%
	Setting Range	0.0% to 100.0%		

Fb.02	Jerk frequency amplitude		Default	0.0%
	Setting Range	0.0% – 50.0%		

This parameter defines the value for the swing range and the jump Frequency.

When the swing range is set relative to the center Frequency (Fb.00=0), the swing range AW = frequency source F0.07 × swing amplitude Fb.01. When the swing amplitude is set relative to the maximum frequency (Fb.00 = 1), the swing amplitude AW is calculated as: maximum frequency F0.10 × swing amplitude Fb.01.

During swing Frequency operation, the skip Frequency amplitude refers to the percentage of the swing amplitude Frequency; that is: skip Frequency = swing amplitude AW × skip Frequency amplitude Fb.02. If the swing amplitude is set relative to the center Frequency (Fb.00 = 0), the skip Frequency is a variable value. If the swing amplitude is set relative to the maximum frequency (Fb.00 = 1), the skip Frequency is a fixed value.

Swing Frequency operation is constrained by both the upper and lower Frequency limits.

Fb.03	Oscillation frequency period		Default	10.0 s
	Setting Range	0.0 s ~ 3000.0 s		
Fb.04	Triangle Wave Rise Time Coefficient		Default	10.0
	Setting Range	0.0% to 100.0%		

Swing frequency period: the duration of one complete swing frequency cycle.

The triangle wave rise time coefficient Fb.04 represents the percentage of the triangle wave rise time relative to the swing frequency period Fb.03. Triangle wave rise time = swing frequency period Fb.03 × triangle wave rise time coefficient Fb.04 (in seconds).

Triangle wave fall time = swing frequency period Fb.03 × (1 - triangle wave rise time coefficient Fb.04) (in seconds).

Fb.05	Set length		Default	1000m
	Setting Range	0m – 65535m		
Fb.06	Actual Length		Default	1000m
	Setting Range	0m – 65535m		
Fb.07	Number of Pulses per Meter		Default	100.0
	Setting Range	0.1 ~ 6553.5		

The above function codes are used for fixed-length control.

Length information must be collected via the multifunction digital input terminal. The actual length Fb.06 is calculated by dividing the number of pulses sampled at the terminal by the number of pulses per meter Fb.07. When the actual length exceeds the set length Fb.05, the multifunction digital DO outputs a 'Length Reached' ON signal.

During fixed-length control, a length reset operation may be executed via a multifunction DI terminal (with the DI function selection set to 28); for details, please refer to F4.00–F4.03.

In this application, assign the corresponding input terminal function to 'Length Count Input' (Function 27).

Fb.08	Set Count Value		Default	1000
	Setting Range	1 – 65535		
Fb.09	Designated Count Value		Default	1000

	Setting Range	1 – 65535

The count value must be acquired through the multifunction digital input terminal. In this application, set the corresponding input terminal function to 'Counter Input' (Function 25). When the pulse frequency is high, it is mandatory to use the HDI port.

When the count value reaches the set count value Fb.08, the multifunction digital DO outputs a 'Set Count Value Reached' ON signal. The counter then stops counting.

When the count value reaches the specified count value Fb.09, the multifunction digital DO outputs an 'arrival at specified count value' ON signal. At this point, the counter continues to count until it reaches the set count value, at which time the counter will Stop.

The specified count value Fb.09 must not exceed the set count value Fb.08. Figure 6-36 illustrates the functions of reaching the set count value and the specified count value.

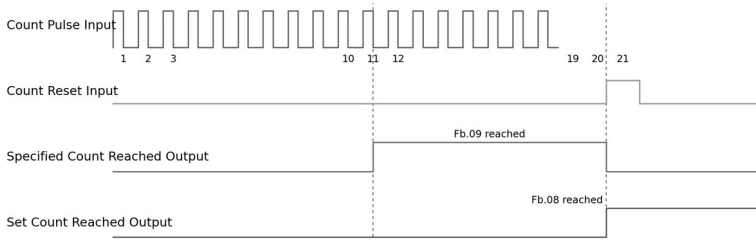


Figure 6-36 Schematic of set count value and specified count value input

FC Group: Multi-segment Commands and Basic PLC Functionality

The ZVF650's multi-segment command functionality offers far more than standard multi-speed operation: in addition to enabling multi-speed modes, it can serve as a voltage source for VF separation and as a reference input for process PID. Consequently, the dimension of the multi-segment command is defined as a relative value.

The Basic PLC function is distinct from the user programmable function of the ZVF650; the Basic PLC can only execute simple combinations of multi-step command operations. The user programmable function is more comprehensive and practical; for details, please refer to the relevant instructions in group A7.

FC.00	Multi-step Command 0		Default	0.0
	Setting Range	-100.0%~100.0%		
FC.01	Multi-step Command 1		Default	0.0

	Setting Range	-100.0%~100.0%	
FC.02	Multi-step Command 2	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.03	Multi-step Command 3	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.04	Multi-step Command 4	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.05	Multi-step Command 5	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.06	Multi-step Command 6	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.07	Multi-step Command 7	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.08	Multi-step Command 8	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.09	Multi-step Command 9	Default	0.0
	Setting Range	-100.0%~100.0%	
FC.10	Multi-step Command 10	Default	0.0

	Setting Range	-100.0%~100.0%		
FC.11	Multi-step Instruction 11		Default	0.0
	Setting Range	-100.0%~100.0%		
FC.12	Multi-step Instruction 12		Default	0.0
	Setting Range	-100.0%~100.0%		
FC.13	Multi-step Instruction 13		Default	0.0
	Setting Range	-100.0%~100.0%		
FC.14	Multi-step Instruction 14		Default	0.0
	Setting Range	-100.0%~100.0%		
FC.15	Multi-step Instruction 15		Default	0.0
	Setting Range	-100.0%~100.0%		

Multi-step commands can be applied in three scenarios: as a frequency source,as a voltage source for VF separation, and as a setpoint source for process PID.

In all three applications, multi-step commands represent relative values within a range of -100.0% to 100.0%.When used as a frequency source, this specifies the percentage of the maximum frequency. When used as a voltage source for VF separation, it specifies the percentage relative to the rated voltage of the Motor. Since the PID setpoint is already a relative value,no dimensional conversion is required when using multi-step commands as the PID setpoint source.

Multi-step commands must be switched and selected according to the different states of the multi-function digital input (DI); for details, please consult the relevant instructions in Group F4.

FC.16	Basic PLC Operation Mode		Default	0
	Setting Range	0	Stop after single operation	
		1	After single operation, retain the final value	
		2	Continuous cycling	

The Basic PLC function serves two purposes: as a frequency source or as the voltage source separated from VF.

Figure 6-37 is a schematic diagram of the Basic PLC when used as a frequency source. When the Basic PLC is used as a frequency source, the sign (positive or negative) of FC.00 to FC.15 determines the operating direction; a negative value indicates the inverter operates in the reverse direction.

Figure 6-37 Schematic diagram of the Basic PLC

When functioning as a frequency source, the PLC supports three operating modes; these modes are unavailable when serving as a VF-separated voltage source. 0: Stop after single operation – After the inverter completes one cycle, it will automatically Stop. A new running command is required to start again. 1: Maintain final value after single operation – After completing one cycle, the inverter will automatically maintain the Frequency and direction of the last segment. 2: Continuous cycling – After one cycle is completed, the inverter will automatically begin the next cycle, and will continue until a Stop command is issued.

FC.17	Basic PLC Power-down Memory Selection		Default	00
	Setting Range	Units place	Power-off memory selection	
		0	Do not retain memory on power-off	
		1	Retain memory on power-off	
		Tens place	Stop memory selection	
		0	Do not retain memory on Stop	
		1	Retain memory on Stop	

PLC power-off memory means that the running stage and Frequency prior to power-off are retained by the PLC. When powered on again, operation resumes from the memorized stage. If set to not retain memory, the PLC process will restart from the beginning each time power is applied.

The PLC stop memory function records the previous operating stage and Frequency of the Basic PLC upon stopping. When restarted, operation resumes from the recorded stage. If memory is not enabled, every startup will initiate the PLC process from the beginning.

FC.18	Basic PLC step 0 run time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.19	Basic PLC step 0 Acceleration/Deceleration time		Default	0
	Setting Range	0–3		
FC.20	Basic PLC step 1 run time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.21	Basic PLC step 1 Acceleration/Deceleration time		Default	0

	Setting Range	0–3		
FC.22	Basic PLC step 2 run time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.23	Basic PLC step 2 Acceleration/Deceleration time		Default	0
	Setting Range	0–3		
FC.24	Basic PLC step 3 run time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.25	Basic PLC step 3 Acceleration/Deceleration time		Default	0
	Setting Range	0–3		
FC.26	Basic PLC step 4 run time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.27	Basic PLC step 4 Acceleration/Deceleration time		Default	0
	Setting Range	0–3		
FC.28	Basic PLC Step 5 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.29	Basic PLC Step 5 Acceleration/Deceleration Time		Default	0
	Setting Range	0–3		
FC.30	Basic PLC Step 6 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.31	Basic PLC Step 6 Acceleration/Deceleration Time		Default	0

	Setting Range	0–3		
FC.32	Basic PLC Step 7 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.33	Basic PLC Step 7 Acceleration/Deceleration Time		Default	0
	Setting Range	0–3		
FC.34	Basic PLC Step 8 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.35	Basic PLC Step 8 Acceleration/Deceleration Time		Default	0
	Setting Range	0–3		
FC.36	Basic PLC Step 9 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.37	Basic PLC Step 9 Acceleration/Deceleration Time		Default	0
	Setting Range	0–3		
FC.38	Basic PLC Step 10 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		
FC.39	Basic PLC Step 10 Acceleration/Deceleration Time		Default	0
	Setting Range	0–3		
FC.40	Basic PLC Step 11 Running Time		Default	0.0 s(h)
	Setting Range	0.0 s(h) ~ 6553.5 s(h)		

FC.41	Basic PLC Step 11 Acceleration/Deceleration Time	Default	0
	Setting Range: 0–3		
FC.42	Basic PLC Step 11 Running Time	Default	0.0 s(h)
	Setting Range: 0.0 s(h) ~ 6553.5 s(h)		
FC.43	Basic PLC Step 12 Acceleration/Deceleration Time	Default	0
	Setting Range: 0–3		
FC.44	Basic PLC Step 13 Running Time	Default	0.0 s(h)
	Setting Range: 0.0 s(h) ~ 6553.5 s(h)		
FC.45	Basic PLC Step 13 Acceleration/Deceleration Time	Default	0
	Setting Range: 0–3		
FC.46	Basic PLC Segment 14 Operating Time	Default	0.0 s(h)
	Setting Range: 0.0 s(h) ~ 6553.5 s(h)		
FC.47	Basic PLC Segment 14 Acceleration/Deceleration Time	Default	0
	Setting Range: 0–3		
FC.48	Basic PLC Segment 15 Operating Time	Default	0.0 s(h)
	Setting Range: 0.0 s(h) ~ 6553.5 s(h)		
FC.49	Basic PLC Segment 15 Acceleration/Deceleration Time	Default	0
	Setting Range: 0–3		

FC.50	Basic PLC Run Time Unit			Default	0
	Setting Range	0	s (seconds)		
		1	h (hours)		
FC.51	Multi-stage Command 0 Setting Method			Default	0
	Setting Range	0	Function Code FC.00 Setting		
		1	AI1		
		2	AI2		
		3	Reserved		
		4	PULSE		
		5	PID		
		6	Preset frequency (F0.08) setting; adjustable via UP/DOWN		

This parameter determines the input channel for Multi-stage Command 0.

In addition to selecting FC.00, Multi-stage Command 0 offers various options, facilitating convenient switching between multi-stage commands and other input methods. When a multi-stage command or Basic PLC is used as the frequency source, switching between these two frequency sources can be easily realized.

Fd Communication Parameter Group

Fd.00	Baud Rate			Default	0005
	Setting Range	Least Significant Digit: MODBUS Baud Rate			
		0	300BPS		
		1	600BPS		
		2	1200BPS		
		3	2400BPS		
		4	4800BPS		
		5	9600BPS		
		6	19200BPS		

		7	38400BPS
		8	57600BPS
		9	115200BPS

This Parameter is used to set the data transmission rate between the host computer and the inverter. Note: The baud rate settings of the host computer and the inverter must be identical; otherwise, communication cannot be established. A higher baud rate results in faster communication speed.

Fd.01	Data Format		Default	0
	Setting Range	0	No Parity: Data format <8,N,2>	
		1	Even Parity: Data format <8,E,1>	
		2	Odd Parity: Data format <8,O,1>	
		3	No Parity: Data format <8,N,1>	

The data format settings of the host computer and the inverter must be identical; otherwise, communication cannot be established.

Fd.02	Local Address	Default	1
	Setting Range	1~247, 0 indicates the broadcast address	

When the local address is set to 0, it serves as a broadcast address, enabling the broadcast function of the host computer.

The local address is unique (except for the broadcast address), which forms the basis for establishing point-to-point communication between the host computer and the inverter.

Fd.00	Baud Rate		Default	0005
	Setting Range	Least Significant Digit: MODBUS Baud Rate		
		0	300BPS	
		1	600BPS	
		2	1200BPS	
		3	2400BPS	
		4	4800BPS	
		5	9600BPS	
		6	19200BPS	
		7	38400BPS	
		8	57600BPS	
		9	115200BPS	

This Parameter is used to set the data transmission rate between the host computer and the inverter. Note: The baud rate settings of the host computer and the inverter must be identical; otherwise, communication cannot be established. A higher baud rate results in faster communication speed.

Fd.01	Data Format		Default	0
	Setting Range	0	No Parity: Data format <8,N,2>	
		1	Even Parity: Data format <8,E,1>	
		2	Odd Parity: Data format <8,O,1>	
		3	No Parity: Data format <8,N,1>	

The data format settings of the host computer and the inverter must be identical; otherwise, communication cannot be established.

Fd.02	Local Address	Default	1

	Setting Range	1~247, 0 indicates the broadcast address

When the local address is set to 0, it serves as a broadcast address, enabling the broadcast function of the host computer.

The local address is unique (except for the broadcast address), which forms the basis for establishing point-to-point communication between the host computer and the inverter.

Fd.03	Response delay	Default	2 ms
	Setting Range	0~20 ms	

Response delay: the interval between the completion of data reception by the inverter and the start of data transmission to the host computer. If the response delay is shorter than the system processing time, the system processing time takes precedence; if the response delay is longer, the system waits until the response delay time period is complete before sending data to the host computer.

Fd.04	Communication timeout	Default	0.0 s
	Setting Range	0.0 s (invalid); 0.1~60.0 s	

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

When this function code is set to a valid value, if the interval between two consecutive communications exceeds the communication timeout time, the system will report a communication fault (Err16). Under normal

circumstances, this should be set to invalid (disabled). By setting this parameter in a system with continuous communication, the communication status can be monitored.

Fd.05	Communication protocol selection		Default	1
	Setting Range	0:	Non-standard Modbus-RTU protocol;	
		1:	Standard Modbus-RTU protocol	

Fd.05=1: Selects the standard Modbus protocol.

Fd.05=0: When a read command is executed, the slave returns a data field containing two bytes, which is one byte more than the standard Modbus protocol and includes a high-order data byte. For details, refer to Section 5 'Communication Data Structure' of this protocol.

Fd.06	Communication read current resolution		Default	0
	Setting Range	0:	0.01A;	
		1:	0.1A	

Used to determine the output unit of the current value when reading output current via communication.

FE User-Defined Parameter Group

FE.00	User Function Code 0		Default	F0.01
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx		
FE.01	User Function Code 0		Default	F0.02
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx		
FE.02	User Function Code 0		Default	F0.03

FE.00	User Function Code 0	Default	F0.01
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.03	User Function Code 0	Default	F0.07
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.04	User Function Code 0	Default	F0.08
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.05	User Function Code 0	Default	F0.17
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.06	User Function Code 0	Default	F0.18
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.07	User Function Code 0	Default	F3.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.08	User Function Code 0	Default	F3.01
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.09	User Function Code 0	Default	F4.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.10	User Function Code 0	Default	F4.01
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.11	User Function Code 0	Default	F4.02
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	

FE.12	User Function Code 0	Default	F5.04
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.13	User Function Code 0	Default	F5.07
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	

FE.12	User Function Code 0	Default	F5.04
FE.14	User Function Code 0	Default	F6.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.15	User Function Code 0	Default	F6.10
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.16	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.17	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.18	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	

FE.19	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.20	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.21	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.22	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.23	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.24	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.25	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	

FE.26	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.27	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.28	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	
FE.29	User Function Code 0	Default	F0.00
	Setting Range	F0.00–Fx.xx H0.00–Hx.xx U0.00–U0.xx	

This group of function codes constitutes the user-defined parameter group.

Users may gather selected parameters from all ZVF650 function codes into the FE group as user-defined parameters, facilitating easier viewing and modification.

The FE group can accommodate up to 30 user-defined parameters. If an FE group parameter displays a value of F0.00, it indicates that this user function code is vacant. When entering the user-defined parameter mode, the displayed function codes are defined as FE.00 to FE.29, following the FE group function code order; any function code set to F0.00 will be skipped.

FP Function Code Management Parameter Group

FP.00	User password	Default	0
	Setting Range	0–65535	

When any non-zero value is set for FP.00, the password protection function is enabled. The next time you enter the menu, you must enter the correct password; otherwise, you will not be able to view or modify function parameters. Please ensure you remember the user password you have set.

Setting FP.00 to 00000 clears the user password and disables the password protection function.

FP.01	Parameter initialization		Default	0
	Setting Range	0	No operation	
		1	Restore factory parameters (excluding motor parameters)	
		2	Clear recorded information	
		4	Back up user parameters	
		501	Restore user parameters	

1. Restore factory settings (excluding motor parameters)

After setting FP.01 to 1, most function parameters of the inverter will be restored to factory defaults; however, motor parameters, frequency command decimal point (F0.22), fault record information, accumulated running time (F7.11), accumulated power-on time (F7.15), and accumulated energy consumption (F7.16) will not be restored.

2. Clear recorded information

Clear the inverter fault record information, accumulated operation time (F7.11), accumulated power-on time (F7.15), and accumulated energy consumption (F7.16).

4. Back up current user parameters

Back up the parameters currently configured by the user. All present function parameter values will be saved to facilitate recovery if the parameters are inadvertently misadjusted.

501. Restore user backup parameters

Restore previously backed-up user parameters, i.e., the parameters saved by setting FP.01 to 4.

FP.02	Function parameter group display selection		Default	11
	Setting Range	Units place	U group display selection	
		0	Do not display	
		1	Display	
		Tens place	H group display selection	
		0	Do not display	
		1	Display	

FP.03	Personalized parameter group display selection		Default	00
	Setting Range	Units place	User-defined parameter group display selection	
		0	Do not display	
		1	Display	
		Tens place	User-modified parameter group display selection	
		0	Do not display	
		1	Display	

The parameter display mode is primarily designed to facilitate users in viewing different arrangements of function parameters according to their actual requirements, offering three parameter display methods,

Name	Description
Function parameter	Sequentially displays the inverter Function parameters, comprising the Function parameter groups F0~FF, H0~HF, and U0~UF.
User-defined parameter	User-defined individual Function parameters for display (up to 30 in total). The user specifies which Function parameters to display via the FE group.
Modified parameter	Function parameters that differ from the factory settings.

When the personalized parameter display selection (FP.03) contains only one display mode, the QUICK key can be used to switch between different parameter display modes. By default, only the Function parameter display mode is enabled.

Parameter display mode	Display
Function parameter mode	-bASE
User-defined parameter mode	-USEr
Modified parameter mode	-C-

The ZVF650 inverter offers two types of personalized parameter display modes: user-defined parameter mode and user-modified parameter mode.

The user-defined parameter group consists of parameters set by the user in the FE group, with a maximum of 32 selectable parameters. These parameters can be consolidated for easier customer commissioning.

In user-defined parameter mode, a prefix 'u' is automatically added before user-defined function codes.

For example: F1.00, when in user-defined parameter mode, will be displayed as uF1.00.

User-modified parameter mode refers to parameters altered by the user, resulting in a value that differs from the default value. The user-modified parameter group allows customers to easily review all modified parameters, facilitating on-site issue identification.

In user-modified parameter mode, a prefix 'c' is automatically added before user-modified function codes.

For example: F1.00, when in user-modified parameter mode, will be displayed as cF1.00.

FP.04	Function Code modification attribute		Default	0
	Setting Range	0	Modifiable	
		1	Not modifiable	

Specifies whether the function code parameter can be modified by the user, to prevent the danger of unintentional changes to function parameters.

If this function code is set to 0, all function codes are modifiable; When set to 1, all function codes are view-only and cannot be modified.

H0 Group Torque Control and Limiting Parameters

H0.00	Speed/Torque Control Mode Selection		Default	0
	Setting Range	0	Speed Control	
		1	Torque Control	

This is used to select the inverter control mode: speed control or torque control. Note: Switching between control modes using this function code is not allowed while the inverter is running.

The ZVF650 multifunction digital DI terminals provide two torque control-related functions: torque control inhibit (function code 29) and speed/torque control selection (function code 46). These two terminals must be used in conjunction with H0.00 to enable switching between speed control and torque control.

When the speed control/torque control switching terminal is inactive, the control method is determined by parameter H0.00. If the speed control/torque control switching terminal is active, the control method is the inverse of the value set in H0.00.

In all cases, when the torque control inhibit terminal is active, the inverter is fixed to the speed control method.

H0.01	Torque setting source selection under torque control mode		Default	0
	Setting	0	Digital Setting 1 (H0.03)	

	Range	1	AI1
		2	AI2
		3	Reserved
		4	Reserved
		5	Communication setpoint
		6	MIN(AI1,AI2)
		7	MAX(AI1,AI2) (The full scale for options 1–7 corresponds to Digital Setting H0.03)
H0.03	Digital torque setting under torque control mode		Default 150.0%
	Setting Range	-200.0%~200.0%	

Parameter H0.01 is used to select the torque setting source, providing a total of eight torque setting methods.

The torque setting is defined as a relative value, where 100.0% corresponds to the rated torque of the Motor. Setting range: -200.0% to 200.0%, indicating that the maximum torque of the inverter is twice the rated torque.

When the torque reference is positive, the inverter operates in forward rotation.

When the torque reference is negative, the inverter operates in reverse rotation. The descriptions of each torque setting source are as follows: 0: Digital Setting (H0.03), which means the target torque directly uses the value set by H0.03.

1:AI1

2:AI2

3: Reserved

The target torque can also be determined by the analog input terminal. The ZVF650 control board provides two analog input terminals (AI1 and AI2).

Specifically,

AI1 is a 0V to 10V voltage input type.

AI2 can be configured for either 0V to 10V voltage input or 0 mA to 20 mA current input, as selected by jumper J8 on the control board.

The relationship curve between the input voltage of AI1 and AI2 and the target torque can be freely selected by the user via function code F4.33.

The ZVF650 provides five sets of relationship curves: three linear curves (with two-point correspondence) and two arbitrary curves (with four-point correspondence). Users can configure these through function codes F4.13–F4.32 and the H6 group of function codes.

Function Code F4.32 is used to assign, for each of the three analog inputs AI1–AI2, which of the five sets of curves is selected.

When AI is used for Frequency Digital Setting, the voltage/current input corresponding to 100.0% refers to the percentage relative to the torque Digital Setting specified by H0.03.

4. Reserved

5. Communication setpoint indicates that the target torque is specified via communication.

When using Modbus communication, the host computer assigns data through communication address 0x1000. The data format uses two decimal places, with a range of -F0.10 to +F0.10.

H0.05	Maximum forward frequency under torque control	Default	50.00 Hz
	Setting Range	0.00 Hz–maximum frequency (F0.10)	
H0.06	Maximum reverse frequency under torque control	Default	50.00 Hz
	Setting Range	0.00 Hz–maximum frequency (F0.10)	

During torque control, the acceleration/deceleration time for the upper frequency limit is set via F8.07 (acceleration) and F8.08 (deceleration).

Used to set the maximum forward or reverse operating frequency of the inverter in torque control mode.

When the inverter is in torque control mode, if the load torque is less than the motor output torque, the motor speed will continuously rise. To prevent mechanical system accidents such as runaway, it is essential to limit the maximum motor speed during torque control.

If dynamic, continuous adjustment of the maximum frequency in torque control is required, this can be achieved by setting the upper Frequency limit.

H0.07	Torque Rise Filter Time	Default	0.0
	Setting Range	0.00 s~65000 s	
H0.08	Torque Fall Filter Time	Default	0.0
	Setting Range	0.00 s~65000 s	

In torque control mode, the speed change rate of the Motor and Load is determined by the difference between the Motor output torque and the Load torque; therefore, Motor speed may change rapidly, causing noise or excessive mechanical stress. By setting the Acceleration/Deceleration time in torque control, the Motor speed can change more smoothly.

It is not recommended to set the Acceleration/Deceleration time in torque control when starting with small torque. If the Acceleration/Deceleration time is set in torque control, it is recommended to appropriately increase the speed filter coefficient.

In applications requiring rapid torque response, set the torque control acceleration/deceleration time to 0.00 s.

For example: when two motors are rigidly coupled to drive the same load, to ensure uniform load distribution, set one inverter as the master using the speed control method, and set the other inverter as the slave using torque control. The actual output torque of the master serves as the torque command for the slave. In this scenario, the slave's torque must quickly follow the master, so set the torque control acceleration/deceleration time of the slave to 0.00 s.

H1 Group – Virtual DI, Virtual DO

H1.00	Function selection for Virtual VDI1 terminal	Default	0
	Setting Range	0–59	
H1.01	Virtual VDI2 terminal function selection	Default	0
	Setting Range	0–59	
H1.02	Virtual VDI3 terminal function selection	Default	0
	Setting Range	0–59	
H1.03	Virtual VDI4 terminal function selection	Default	0
	Setting Range	0–59	
H1.04	Virtual VDI5 terminal function selection	Default	0
	Setting Range	0–59	

The virtual VDI1~VDI5 terminals are functionally identical to the DI terminals on the control board and can be used as multifunction digital inputs. For detailed configuration, please refer to the description of F4.00 to F4.05.

H1.05	Virtual VDI terminal status setting mode		Default	00000
	Setting Range	0	Whether the VDI is active is determined by the status of the virtual VDOx.	
		1	Whether the VDI is active is set by function code H1.06: unit digit—virtual VDI1	
		Tens place	Hundreds digit—virtual VDI2; thousands digit—virtual VDI3; ten-thousands digit —virtual VDI4	
		Ten-thousands digit	Ten-thousands digit—virtual VDI5	
H1.06	Virtual VDI terminal status configuration		Default	00000
	Setting Range	0	Invalid	
		1	Valid	
		Units place	Virtual VDI1	
		Tens place	Virtual VDI2	
		Hundreds digit	Virtual VDI3	
		Thousands digit	Virtual VDI4	
		Ten-thousands digit	Ten-thousands digit—virtual VDI5	

Unlike standard digital input terminals, the status of a virtual VDI can be configured in two ways, selectable via parameter H1.05.

When the VDI status is determined by the corresponding virtual VDO status, whether a VDI is considered active depends on whether the VDO output is active or inactive. Each VDIx is uniquely linked to a VDOx (where x ranges from 1 to 5).

When the VDI status is set via function code, the status of each virtual input terminal is defined by the binary bits of function code H1.06. The following examples illustrate the method of configuring virtual VDIs.

Example 1: When the VDO status governs the VDI status, to implement the function: 'When the AI1 input exceeds its upper or lower limit, the inverter issues a Fault Alarm and stops operation,' the settings should be configured as follows:

Set the function of VDI1 to 'User-defined Fault 1' (H1.00=44);

Set the valid state mode of the VDI1 terminal to be determined by VDO1 (H1.05=xxx0); Set the VDO1 output function to 'AI1 input exceeds upper or lower limit' (H1.11=31);

When the AI1 input exceeds the upper or lower limit, VDO1 output will be ON. At this point, the VDI1 input terminal state is valid, and the inverter

When VDI1 receives User-defined Fault 1, the inverter will trigger Fault Alarm Err27 and stop.

Example 2: To set the VDI state using function code H1.06 in order to automatically enter operating status after the inverter powers on, configure as follows:

Set the function of VDI1 to 'Forward Run' (H1.00=1);

Set the VDI1 terminal active state mode via function code (H1.05=xxx1); Set the VDI1 terminal to the active state (H1.06=xxx1); set the command source to 'Terminal Control' (F0.02=1); set the start protection selection to 'No Protection' (F8.18=0);

After initialization is complete upon inverter power-up, if VDI1 is detected as active and this terminal is assigned to Forward Run, it is equivalent to the inverter receiving a terminal Forward Run command, and the inverter will immediately start Forward Run.

<table>
<tr><td>H1.07</td><td colspan="2">Function selection for AI1 terminal when used as DI</td><td>Default</td><td>0</td></tr>
<tr><td></td><td>Setting Range</td><td colspan="3">0–59</td></tr>
<tr><td>H1.08</td><td colspan="2">Function selection for AI2 terminal when used as DI</td><td>Default</td><td>0</td></tr>
<tr><td></td><td>Setting Range</td><td colspan="3">0.0 s: Not valid
0.1–60.0 s</td></tr>
<tr><td>H1.10</td><td colspan="2">Valid mode selection when AI Terminal is configured as DI</td><td>Default</td><td>000</td></tr>
<tr><td rowspan="5"></td><td rowspan="5">Setting Range</td><td>0</td><td colspan="2">Active high</td></tr>
<tr><td>1</td><td colspan="2">Active low</td></tr>
<tr><td>Units place</td><td colspan="2">AI1</td></tr>
<tr><td>Tens place</td><td colspan="2">AI2</td></tr>
<tr><td>Hundreds digit</td><td colspan="2">Reserved</td></tr>
</table>

This group of function codes configures the AI terminals for use as DI. When AI is used as DI: if the AI input voltage exceeds 7V, the AI terminal state is high level; if the AI input voltage is below 3V, the AI terminal state

is low level. The range between 3V and 7V serves as the hysteresis window H1.10, which is used to determine whether, when AI is configured as DI, a high or low voltage level is considered the active state. The function settings for AI when used as DI are the same as those for general DI configuration. Please refer to the relevant DI settings in Group F4 for further details.

Figure 6-38 uses the AI input voltage as an example to illustrate the relationship between AI input voltage and the corresponding DI state.

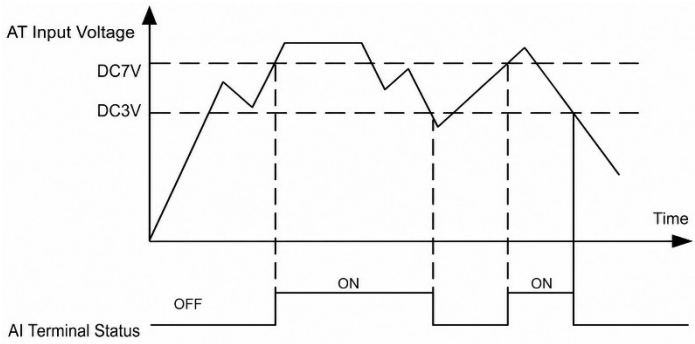


Figure 6-38 Determination of valid AI terminal state

H1.11	Virtual VDO1 output function selection			Default	0
H1.12	Virtual VDO2 output function selection			Default	0
H1.13	Virtual VDO3 output function selection			Default	0
H1.14	Virtual VDO4 output function selection			Default	0
H1.15	Virtual VDO5 output function selection			Default	0
	Setting	0	Internally connected to physical DIx		

	Range	1–40	Refer to Group F5 for physical DO output selection	
H1.16	VDO1 Output Delay Time		Default	0.0
	Setting Range		0.0 s–3600.0 s	
H1.17	VDO2 Output Delay Time		Default	0.0
	Setting Range		0.0 s–3600.0 s	
H1.18	VDO3 Output Delay Time		Default	0.0
	Setting Range		0.0 s–3600.0 s	
H1.19	VDO4 Output Delay Time		Default	0.0
	Setting Range		0.0 s–3600.0 s	
H1.20	VDO5 Output Delay Time		Default	0.0
	Setting Range		0.0 s–3600.0 s	
H1.21	Selection of Active State for VDO Output Terminals		Default	00000
	Setting Range	0	Positive Logic	
		1	Negative Logic	
		Units place	VDO1	
		Tens place	VDO2	
		Hundreds digit	VDO3	
		Thousands digit	VDO4	
		Ten-thousands digit	VDO5	

The virtual digital output function operates similarly to the DO output function on the control board. It can be used in conjunction with virtual digital input (VDIx) to realize simple logic control.

When the virtual VDOx function selection is set to 0, the output status of VDO1 to VDO5 is determined by the input status of DI1 to DI5 on the control board, with a one-to-one correspondence between VDOx and DIx.

When the virtual VDOx function selection is set to a non-zero value, the configuration and usage of VDOx follow the same parameters as the F5 group DO outputs. Please refer to the relevant parameter descriptions in the F5 group.

Similarly, the valid output state of VDOx can be set to either positive logic or negative logic via parameter H1.21. Users can use U0.08 to check whether the current status of VDOx is valid. The application example of VDIx includes the use of VDOx; please refer to this section.

H2 Group 2 Motor Parameters

The ZVF650 can switch operation between two Motors. The parameters for each Motor—such as the Motor nameplate parameters, Motor parameter tuning, selection between VF control and vector control, encoder-related parameters, and other parameters affecting VF or vector control performance—can be configured independently.

The function codes in group H2 correspond to Motor 2. All parameters in the H2 group are defined and used identically to the relevant parameters for Motor 1; therefore, further explanations are not repeated here. Users may refer to the parameter descriptions for Motor1

H2.00	Motor Type Selection	Default	0

	Setting Range	0	Standard asynchronous Motor		
		1	Variable Frequency Asynchronous Motor		
H2.01	Motor Rated Power			Default	Model Selection
	Setting Range	0.1kW–1000.0kW			
H2.02	Motor Rated Voltage			Default	Model Selection
	Setting Range	1V–2000V			
H2.03	Motor Rated Current			Default	Model Selection
	Setting Range	0.1A–6553.5A			
H2.04	Motor rated frequency			Default	Model Selection
	Setting Range	0.01 Hz–Maximum frequency			
H2.05	Motor rated speed			Default	Model Selection
	Setting Range	1rpm–65535rpm			
H2.06	Asynchronous motor stator resistance			Default	Model Selection
	Setting Range	0.001Ω–65.535Ω			

H2.07	Asynchronous motor rotor resistance	Default	Model Selection
	Setting Range	0.001Ω–65.535Ω	
H2.08	Asynchronous motor leakage reactance	Default	Model Selection
	Setting Range	0.1mH–6553.5mH	
H2.09	Asynchronous motor mutual reactance	Default	Model Selection
	Setting Range	0.1mH–6553.5mH	
H2.10	Asynchronous motor no-load current	Default	Model Selection
	Setting Range	0.1A–6553.5A	

H2.16	Synchronous Motor stator resistance	Default	Tuning Parameters
	Setting Range	0.001– 65.535	
H2.17	Synchronous Motor D-axis inductance	Default	Tuning Parameters
	Setting Range	0.1mH – 6553.5mH	
H2.18	Synchronous Motor q-axis inductance	Default	Tuning Parameters
	Setting Range	0.1mH – 6553.5mH	
H2.19	Synchronous Motor voltage mode	Default	0
	Setting	0	PID

	Range	1	Feedforward	
H2.20	Synchronous Motor back EMF coefficient		Default	Tuning Parameters
	Setting Range	0.1V – 6553.5V		
H2.21	Synchronous Motor Starting Torque		Default	50%
	Setting Range	0.0% – 200.%		
H2.22	Synchronous Motor Low-frequency Excitation		Default	10%
	Setting Range	0.0% – 200.%		
H2.23	Synchronous Motor open-loop operation time		Default	100
	Setting Range	0 – 60000 ms		

H2.27	Encoder Line Count	Default	10
	Setting Range	1–65535	
H2.30	ABZ Incremental Encoder AB Phase Sequence	Default	0
	Setting Range	0	Forward
		1	Reverse
H2.31	Tuning Selection	Default	0
	Setting Range	0	No operation
		1	Stationary tuning
		2	Full Tuning

H2.38	Speed Loop Proportional Gain 1	Default	3
	Setting Range	1–100	
H2.39	Speed Loop Integral Time 1	Default	0.5

	Setting Range	0.01 s~10.00 s		
H2.40	Switching Frequency 1		Default	5.00 Hz
	Setting Range	0.00~H2.43		
H2.41	Speed Loop Proportional Gain 2		Default	2
	Setting Range	1–100		
H2.42	Speed Loop Integral Time 2		Default	1.0
	Setting Range	0.01 s~10.00 s		
H2.43	Changeover Frequency 2		Default	10.00 Hz
	Setting Range	H2.40~Maximum Frequency		
H2.44	Vector Control Slip Gain		Default	100%
	Setting Range	50%–200%		
H2.45	Vector Speed Feedback Filtering		Default	0.000 s
	Setting Range	0.000 s–0.100 s		
H2.46	SVC Torque Boost Cutoff Frequency		Default	20.00 Hz
	Setting Range	0.00 ~ Maximum Frequency		
H2.47	SVC Torque Boost		Default	10
	Setting Range	0.0% ~ 200.0%		
H2.48	Torque Upper Limit Source under Speed Control Method (Motoring)		Default	0
	Setting	0	Set via H2.49	

	Range	1	AI1
		2	AI2
		3	Reserved
		4	Reserved
		5	Communication setpoint
		6	MIN(AI1,AI2)
		7	MAX(AI1,AI2) Full scale of options 1–7, corresponding to H2.49 Digital Setting

H2.49	Torque upper limit setting (motoring) in speed control method	Default	150.0%
	Setting Range	0.0% – 200.0%	

H2.50	Torque Upper Limit Source in Speed Control Method (Regenerative)	Default	0
	Setting Range	0	Set via H2.51
		1	AI1
		2	AI2
		3	Reserved
		4	PULSE
		5	Communication setpoint
		6	MIN(AI1,AI2)

		7	MAX(AI1,AI 2) Full scale of options 1–7, correspondi ng to H2.51 Digital Setting
H2.51	Torque upper limit setting under speed control method (generating)	Default	150.0%
	Setting Range	0.0% – 200.0%	
H2.52	Excitation Regulation Proportional Gain	Default	20
	Setting Range	0–20000	
H2.53	Excitation Regulation Integral Gain	Default	13
	Setting Range	0–20000	
H2.54	Torque Regulation Proportional Gain	Default	20
	Setting Range	0–20000	

H2.55	Torque Regulation Integral Gain	Default	13
	Setting Range	0–20000	
H2.56	Synchronous Motor Field Weakening Mode	Default	0
	Setting Range	0	Non-Field-Weakening
		1	Direct Calculation

		2	Automatic Adjustment	
H2.57	Synchronous Motor Field Weakening Gain		Default	5
	Setting Range	0 – 50		
H2.62	Second motor control Mode		Default	0
	Setting Range	0	Sensorless Vector Control (SVC)	
		1	Vector Control with Speed Sensor (FVC)	
		2	V/F control	
H2.63	Second Motor Acceleration/Deceleration Time Selection		Default	0
	Setting Range	0	Same as the first Motor	
		1	Acceleration/Deceleration time 1	
		2	Acceleration/Deceleration time 2	
		3	Acceleration/Deceleration time 3	
		4	Acceleration/Deceleration time 4	
H2.64	Second Motor Torque Boost		Default	Model Selection
	Setting Range	0.0%: Automatic Torque Boost 0.1%–30.0%		
H2.66	Synchronous Motor Output Voltage Upper Margin		Default	5%
	Setting Range	0% – 50%		
H2.67	Synchronous Motor Initial Position Angle Detection Current		Default	80%
	Setting Range	50%–180%		

H2.68	Synchronous Motor Initial Position Angle Detection		Default	0
	Setting Range	0		
		1		
		2		
		3		

H2.70	Synchronous Motor Saliency Ratio Adjustment Gain		Default	100
	Setting Range	50 – 500		
H2.71	Maximum Torque-Current Ratio Control		Default	0
	Setting Range	0		
		1		
H2.72	High-Frequency Injection Voltage Amplitude		Default	35V
	Setting Range	0 – 120V		
H2.79	Low-Speed Excitation Current		Default	30%
	Setting Range	0% – 80%		

H2.80	Low-Speed Carrier Frequency		Default	2.0
	Setting Range	2.0 kHz – Carrier frequency		
H2.81	Synchronous motor low-frequency braking method		Default	0
	Setting Range	0	Direct Start-up	
		1	Forced Positioning	
H2.82	Synchronous motor low-frequency braking activation frequency		Default	2.00
	Setting Range	0.00 – 10.00 Hz		
H2.83	Synchronous motor low-frequency braking frequency variation step		Default	0.001
	Setting Range	0.005 – 1.000 Hz		
H2.84	Synchronous motor low-frequency braking current		Default	50%
	Setting Range	0 – 80%		

H2.85	Synchronous Motor Speed Tracking		Default	50%
	Setting Range	0		
		1		

H3 Group Solar Water Supply Parameters

H3.00	MPPT Voltage Reference Selection		Default	1
	Setting Range	CVT Mode		
		MPPT Mode		

H3.01	MPPT Voltage Reference		Default	Model Selection
	Setting Range	Model Selection		

H3.02	MPPT Adjustment Coefficient		Default	0.010
	Setting Range	0.000 ~2.000		

H3.03	Minimum Outlet Frequency		Default	0.00 Hz
	Setting Range	0.000–F0.14 Hz		

H3.04	Lack-of-water Detection No-load Current Ratio		Default	80.0%
	Setting Range	30.0–200.0%		

H3.05	Lack-of-water Detection Time		Default	0S

	Setting Range	0 (no detection) –300S		
H3.06	MPPT High-point Voltage Reference		Default	Model Selection
	Setting Range	Model Selection		
H3.07	MPPT Low-point Voltage Reference		Default	Model Selection
	Setting Range	Model Selection		
H3.07	MPPT Low-point Voltage Reference		Default	Model Selection
	Setting Range	Model Selection		
H3.07	MPPT Low-point Voltage Reference		Default	Model Selection
	Setting Range	Model Selection		

H5 Group Control Optimization Parameters

H5.00	DPWM Switching Upper Limit Frequency		Default	12.00 Hz
	Setting Range	0.00 Hz–15.00 Hz		

Effective only in VF control mode.

Determines the output waveform method for asynchronous motor VF operation: below this value, 7-segment continuous modulation is used; above this value, 5-segment discontinuous modulation is applied.

In 7-segment continuous modulation, inverter switching losses are higher but current ripple is lower; in 5-segment discontinuous modulation, switching losses are lower but current ripple is increased. However, at high frequency, this may lead to instability in motor operation and generally does not require adjustment.

For VF operation instability, refer to function code F3.11. For inverter losses and temperature rise, refer to function code F0.15.

H5.01	PWM Modulation Method			Default	0
	Setting Range	0	Asynchronous modulation		
		1	Synchronous modulation		

Effective only in VF control mode.

Synchronous modulation means that the carrier frequency changes linearly with the output frequency, maintaining a constant ratio (carrier ratio) between them. This is typically employed at higher output frequencies and helps improve output voltage quality.

At lower output frequencies (below 100 Hz), synchronous modulation is generally unnecessary, as the carrier frequency to output frequency ratio is higher and asynchronous modulation demonstrates greater advantages.

Synchronous modulation takes effect only when the operating Frequency is above 85 Hz. Below this Frequency, asynchronous modulation is used by default.

H5.02	Dead Time Compensation Mode Selection		Default	1
	Setting Range	0	No compensation	
		1	Compensation Mode 1	

This Parameter typically does not need to be modified. Adjustment is only necessary if there are special requirements for output voltage waveform quality or if the Motor experiences oscillation or other abnormal conditions. In such cases, try switching between different compensation modes.

H5.03	Random PWM Depth		Default	0
	Setting Range	0	Random PWM disabled	
		1–10	Random PWM carrier Frequency modulation depth	

Enabling random PWM can soften the monotonous and harsh motor sound and helps to reduce external electromagnetic interference. When the random PWM depth is set to 0, random PWM is disabled. Adjusting the random PWM depth will produce varying effects.

H5.04	Fast Current Limiting Enable		Default	1
	Setting	0		Disabled

	Range	1	Enabled

Enabling the fast current limiting function minimizes the occurrence of inverter overcurrent faults, thereby ensuring continuous operation of the inverter.

If the inverter remains in the fast current limiting state for an extended period, overheating or other damage may occur, which is not permitted. Therefore, if fast current limiting persists, the inverter will issue fault Err40, indicating overloading and requiring shutdown.

H5.05	Current detection compensation		Default	5
	Setting Range	0–100		

Used to configure current detection compensation for the inverter. Setting this parameter too high may degrade control performance. Modification is generally unnecessary.

H6.06	Undervoltage threshold setting		Default	Determined by model
	Setting Range	210–420V		

Used to configure the voltage threshold for inverter undervoltage fault Err09; the default value varies depending on the specific model.

Table 6 Undervoltage Setpoints

Voltage Rating	Undervoltage Base Value
Single-phase 220V	200V
Three-phase 220V	200V
Three-phase 380V	350V

Voltage Rating	Undervoltage Base Value
Three-phase 480V	350V

H5.07	SVC optimization mode selection		Default	1
	Setting Range	1	Optimization Mode 1	
		2	Optimization Mode 2	

Asynchronous Motor SVC optimization mode; typically, adjustment is not required.

H5.08	Dead time adjustment	Default	150%
	Setting Range	100%–200%	

Applicable only to the 1140V voltage rating. Adjusting this value can enhance voltage utilization; setting it too low may cause system instability. Modification by users is not recommended.

H5.09	Overvoltage threshold setting	Default	Model Selection
	Setting Range	200.0V–2500.0V	

This parameter sets the overvoltage fault threshold for the inverter; default values differ by voltage rating as follows:

Table 7 Overvoltage Setpoints

Voltage Rating	Overvoltage Point
Single-phase 220V	400.0V

Voltage Rating	Overvoltage Point
Three-phase 220V	400.0V
Three-phase 380V	810.0V
Three-phase 480V	890.0V

Note: The default value is also the upper limit for the internal overvoltage protection of the inverter. This parameter will only take effect when the H5.09 setting is less than the default value of each voltage rating. If it is set above the default value, the default value will be used.

H6 Group AI Curve Setting

H6.00	Minimum input for AI Curve 4		Default	0.00V
	Setting Range	-10.00V to H6.02		
H6.01	AI Curve 4 Minimum Input Corresponding Setting		Default	0.0
	Setting Range	-100.0%–+100.0%		
H6.02	AI Curve 4 Knee Point 1 Input		Default	3.00V
	Setting Range	H6.00–H6.04		
H6.03	AI Curve 4 Knee Point 1 Input Corresponding Setting		Default	30.0%

	Setting Range	-100.0%–+100.0%	
H6.04	AI Curve 4 Knee Point 2 Input	Default	6.00V
	Setting Range	H6.02–H6.06	
H6.05	AI Curve 4 Knee Point 2 Input Corresponding Setting	Default	60.0%
	Setting Range	-100.0%–+100.0%	
H6.06	AI Curve 4 Maximum Input	Default	10.00V
	Setting Range	H6.06–+10.00V	
H6.07	AI Curve 4 Maximum Input Corresponding Setting	Default	100.0%
	Setting Range	100.0%–+100.0%	
H6.08	AI Curve 5 Minimum Input	Default	-10.00V
	Setting Range	-10.00V–H6.10	
H6.09	AI Curve 5 Minimum Input Corresponding Setting	Default	-100.0%
	Setting Range	-100.0%–+100.0%	
H6.10	AI Curve 5 Inflection Point 1 Input	Default	-3.00V
	Setting Range	H6.08–H6.12	

H6.11	AI Curve 5 Inflection Point 1 Input Corresponding Setting	Default	-30.0%
	Setting Range	-100.0%–+100.0%	
H6.12	AI Curve 5 Inflection Point 2 Input	Default	3.00V
	Setting Range	H6.10~H6.14	
H6.13	AI Curve 5 Inflection Point 2 Input Corresponding Setting	Default	30.0%
	Setting Range	-100.0%–+100.0%	
H6.14	AI Curve 5 Maximum Input	Default	10.00V
	Setting Range	H6.12~+10.00V	
H6.15	AI Curve 5 Maximum Input Corresponding Setting	Default	100.0%
	Setting Range	-100.0%–+100.0%	

The functions of Curve 4 and Curve 5 are similar to those of Curves 1 to 3. However, Curves 1 to 3 are linear, while Curves 4 and 5 are four-point curves, allowing for more flexible mapping relationships. Figure 6-37 illustrates Curves 4 and 5.

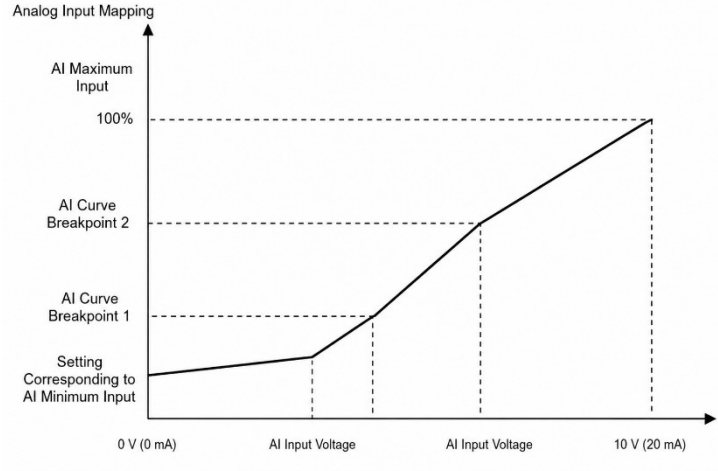


Figure 6-39 Schematic diagram of Curve 4 and Curve 5

When configuring Curve 4 and Curve 5, note that the minimum input voltage, inflection point 1 voltage, inflection point 2 voltage, and maximum voltage for the curve must increase in sequence.

The AI curve selection parameter (F4.33) is used to determine how analog inputs AI1~AI3 select from five available curves.

H6.24	AI1 Jump Point Setting		Default	0.0
	Setting Range	-100.0%~100.0%		
H6.25	AI1 Jump Amplitude Setting		Default	0.5

	Setting Range	0.0% – 100.0%	
H6.26	AI2 Jump Point Setting	Default	0.0
	Setting Range	-100.0%~100.0%	
H6.27	AI2 Jump Amplitude Setting	Default	0.5
	Setting Range	0.0% – 100.0%	
H6.28	AI3 set jump point	Default	0.0
	Setting Range	-100.0%~100.0%	
H6.29	AI3 set jump amplitude	Default	0.5
	Setting Range	0.0% – 100.0%	

All analog inputs AI1~AI3 of the ZVF650 support setpoint jump functionality.

The jump function refers to fixing the analog set value at the specified jump point whenever the analog setting fluctuates within a range above or below this point.

Example:

If the voltage of analog input AI1 fluctuates around 5.00V, within a range of 4.90V to 5.10V, and the minimum input of AI1 (0.00V) corresponds to 0.0% while the maximum input (10.00V) corresponds to 100%, the detected AI1 set value will fluctuate between 49.0% and 51.0%.

By setting AI1 jump point parameter H6.24 to 50.0% and AI1 jump amplitude parameter H6.25 to 1.0%, the above AI1 input, when processed

by the jump function, results in the AI1 set value being fixed at 50.0%. In this way, AI1 is converted into a stable input, eliminating fluctuations.

U0 Monitoring Parameter Group

The U0 parameter group is used for monitoring the inverter's operating status information. The user can view these parameters via the panel for on-site commissioning or retrieve the parameter values via communication for upper-level monitoring. The communication address range is 0x7000~0x7044.

U0.00 to U0.31 correspond to the operating and stop monitoring parameters as defined in F7.03 and F7.05. For specific function codes, parameter names, and minimum units, refer to Table 6-1.

U0.00	Operating Frequency (Hz)	Display Range	0.00 ~ 500.00 Hz (F0.22=2)
U0.01	Setting Frequency (Hz)	Display Range	0.00 ~ 500.00 Hz (F0.22=1)

Displays the theoretical operating frequency and the absolute value of the set frequency.

The actual output frequency of the inverter is shown in U0.19.

U0.02	Bus Voltage (V)	Display Range	0.0V – 3000.0V

Displays the DC bus voltage value of the inverter.

U0.03	Output Voltage (V)	Display Range	0V – 1140V

Displays the output voltage value of the inverter during operation.

U0.04	Output Current (A)	Display Range	0.00A – 655.35A (Inverter power ≤ 55KW) 0.0A – 6553.5A (Inverter power >55KW)

Displays the output current value of the inverter during operation.

U0.05	Output Power (kW)	Display Range	0 – 32767

Displays the output power value of the inverter during operation.

U0.06	Output Torque (%)	Display Range	-200.0% – 200.0%

Displays the output value as a percentage of the Motor rated torque.

U0.07	DI Input Status	Display Range	0 – 32767

Displays the current DI terminal input status value. After conversion to binary data, each bit corresponds to a DI input signal: a value of 1 indicates that the input is at a high logic level, while 0 indicates a low logic level. The correspondence between each bit and the input terminal is as follows:

Table 8 DI Input Status

Bit0	Bit1	Bit2	Bit3
DI1	DI2	DI3	DI4
Bit4	Bit5	Bit6	Bit7
HDI	DI6	DI7	DI8
Bit8	Bit9	Bit10	Bit11
DI9	DI10	VDI1	VDI2
Bit12	Bit13	Bit14	Bit15
VDI3	VDI4	VDI5	–

U0.08	DO Output Status	Display Range	0 – 1023

Displays the current output status value of the DO terminal. After conversion to binary data, each bit represents a DO signal: 1 indicates a high logic level, while 0 indicates a low logic level. The correspondence between each bit and its respective output terminal is as follows:

Table 9 DO Input Status

Bit0	Bit1	Bit2	Bit3
DO3	Relay 1	Relay 2	DO1
Bit4	Bit5	Bit6	Bit7
DO2	VDO1	VDO2	VDO3
Bit8	Bit9	Bit10	Bit11
VDO4	VDO5		

U0.10	AI2 Voltage (V) / Current (mA)	Display Range	0.00V – 10.57V 0.00 mA – 20.00 mA

When F4.40 is set to 0, AI2 sampling data is displayed in units of voltage (V).

When F4.40 is set to 1, AI2 sampling data is displayed in units of current (mA).

U0.14	Load Speed Display	Display Range	0 – 65535

Displayed value as described in F7.12.

U0.15	PID Setting	Display Range	0 – 65535
U0.16	PID Feedback	Display Range	0 – 65535

Displays PID setpoint and feedback value, with the value format as follows:

PID setting = PID setting (percentage) × FA.04

PID feedback = PID feedback (percentage) × FA.04

U0.19	Feedback Speed (Hz)	Display Range	-320.00 Hz – 320.00 Hz -500.0 Hz – 500.0 Hz

Displays the actual output frequency of the inverter.

The tens digit of Function Code F7.15 (number of decimal places for load speed display) indicates the number of decimal places shown for U0.19/U0.29. When set to 2, U0.19 displays two decimal places, with a range of -320.00 Hz – 320.00 Hz. When set to 1, U0.19 displays one decimal place, with a range of -500.0 Hz – 500.0 Hz.

U0.20	Remaining Running Time	Display Range	0.0 ~ 6500.0 minutes

When displaying timed operation, the remaining operating time is shown; for details regarding timed operation, refer to Parameter F8.42 to F8.44.

U0.21	AI1 Pre-calibration Voltage	Display Range	0.000V ~ 10.570V
U0.22	AI2 Pre-calibration Voltage (V) / Current (mA)	Display Range	0.000V ~ 10.570V 0.000 mA ~ 20.000 mA
U0.23	AI3 voltage before calibration	Display Range	-10.570V ~ 10.570V

Displays the actual value of the sampled analog input voltage or current.

The voltage/current in actual use has been subjected to linear calibration to minimize deviation between the sampled and the actual input voltage/current.

Refer to U0.09, U0.10, and U0.11 for the actual calibration voltage/current in use.

U0.24	Linear velocity	Display Range	0 ~ 65535 meters/minute

Displays the line speed sampled by the HDI high-speed pulse, in meters per minute. This value is calculated based on the actual number of sample pulses per minute and FB.07 (number of pulses per meter).

U0.28	Communication setpoint	Display Range	-100.00% ~ 100.00%

Displays the data written through communication address 0x1000.

U0.29	Encoder feedback speed	Display Range	-320.00 Hz – 320.00 Hz -500.0 Hz – 500.0 Hz

Displays the motor operating frequency as detected by the encoder. The tens digit setting of Function Code F7.12 (decimal places for load speed display) specifies the number of decimal places for U0.19/U0.29. When set to 2, U0.29 displays two decimal places, and the display range is -320.00 Hz ~ 320.00 Hz. When set to 1, the number of decimal places for U0.29 is 1, with a display range of -500.0 Hz to 500.0 Hz.

U0.30	Main frequency X display	Display Range	0.00 Hz to 500.00 Hz

Displays the set value of the main frequency source X.

U0.31	Auxiliary frequency Y display	Display Range	0.00 Hz to 500.00 Hz

Displays the set value of the auxiliary frequency source Y.

U0.34	motor temperature value	Display Range	0℃– 200℃

Displays the motor temperature value sampled via AI3. For details on motor temperature detection, refer to section F9.56.

U0.35	Target torque (%)	Display Range	-200.0% – 200.0%

Indicates the currently set torque upper limit value.

U0.36	Resolver position	Display Range	0 – 4095

Displays the current resolver position signal.

U0.37	Power factor angle	Display Range	

Indicates the current operating power factor angle.

U0.39	VF separation target voltage	Display Range	0V to motor rated voltage
U0.40	VF separation output voltage	Display Range	0V to motor rated voltage

Displays the target output voltage and the actual output voltage when operating in VF separation mode.

For VF separation, refer to the relevant information in the F3 parameter group.

U0.59	Set Frequency (%)	Display Range	-100.00% ~ 100.00%
U0.60	Operating Frequency (%)	Display Range	-100.00% ~ 100.00%

Displays the present set frequency and operating frequency. 100.00% corresponds to the inverter's maximum frequency (F0.04).

U0.61	inverter Status	Display Range	0 – 65535

Displays inverter operating status information.

The data definition format is as follows:

U0.61	Bit0	0: Stop; 1: Forward Run; 2: Reverse rotation
	Bit1	
	Bit2	0: Constant speed; 1: Acceleration; 2: Deceleration
	Bit3	
	Bit4	0: DC bus voltage normal; 1: Undervoltage

U0.62	Current Fault Code	Display Range	0– 99

Displays the current fault code.

U0.65	Torque upper limit	Display Range	-200.00% to 200.00%

Displays the present torque upper limit.

U0.74	Actual motor output rotation	Display Range	-300-300%

The torque output value is based on the inverter's current. When using master-slave control via CAN communication (as opposed to other methods), select U0.74 as the slave unit's torque current reference.

Chapter 7 Common faults, abnormal conditions, and countermeasures

7.1 Fault Codes and Countermeasures

Table 7-1 Common Fault Codes and Countermeasures

Fault code	Fault Name	Possible Cause	Countermeasures
Err01	Inverter Unit Protection	1. Short circuit in inverter output circuit 2. Motor cable excessively long 3. Module overheating 4. Loose internal wiring in inverter 5. Main control board abnormality 6. Driver board abnormality 7. Inverter module abnormality	1. Eliminate external faults 2. Install reactor or output filter 3. Check for blocked air duct or faulty fan operation and resolve detected issues 4. Ensure all connection cables are securely inserted 5. Seek technical support 6. Seek technical support 7. Seek technical support

Fault code	Fault Name	Possible Cause	Countermeasures
Err02	Overcurrent During Acceleration	1. The inverter output circuit has a grounding fault or short circuit. 2. The control mode is set to vector, but parameter identification was not performed. 3. Acceleration time is too short. 4. Manual torque boost or V/F curve settings are inappropriate. 5. Voltage is too low. 6. Starting the motor while it is rotating. 7. Sudden load applied during acceleration. 8. The inverter model is undersized for the application.	1. Eliminate external faults 2. Perform motor parameter identification. 3. Increase the acceleration time. 4. Adjust the manual torque boost or V/F curve. 5. Set the voltage within the normal range. 6. Use speed search start or restart after the motor has come to a stop. 7. Avoid sudden load application. 8. Select an inverter with a higher power rating

Err03	Overcurrent During Deceleration	1. The inverter output circuit has a grounding fault or short circuit. 2. The control mode is set to vector, but parameter identification was not performed. 3. Deceleration time is too short 4. Voltage is too low 5. Sudden load applied during deceleration 6. Brake unit and braking resistor are not installed	1. Eliminate external faults 2. Perform motor parameter identification. 3. Increase the deceleration time 4. Adjust the voltage to within the normal range 5. Eliminate sudden load application 6. Install the brake unit and braking resistor

Fault code	Fault Name	Possible Cause	Countermeasures
Err04	Overcurrent at Constant Speed	1. The inverter output circuit has a grounding fault or short circuit. 2. The control mode is set to vector, but parameter identification was not performed. 3. Voltage is too low 4. Check for sudden load application during operation 5. The selected inverter is undersized	1. Eliminate external faults 2. Perform motor parameter identification. 3. Adjust the voltage to within the normal range 4. Eliminate sudden load application 5. Select an inverter with a higher power rating

Err05	Overvoltage during acceleration	1. Input voltage is too high 2. The motor is being driven by an external force during acceleration. 3. Acceleration time is too short. 4. Braking unit and braking resistor are not installed.	1. Adjust the voltage to the specified range. 2. Remove the external force or install a braking resistor. 3. Increase the acceleration time. 4. Install a braking unit and resistor.
Err06	Overvoltage during deceleration.	1. Input voltage is too high 2. The motor is being driven by an external force during deceleration. 3. Deceleration time is too short. 4. Braking unit and braking resistor are not installed.	1. Adjust the voltage to the specified range. 2. Remove the external force or install a braking resistor. 3. Increase the deceleration time 4. Install a braking unit and resistor.

Err05	Overvoltage during acceleration	1. Input voltage is too high 2. The motor is being driven by an external force during acceleration. 3. Acceleration time is too short. 4. Braking unit and braking resistor are not installed.	1. Adjust the voltage to the specified range. 2. Remove the external force or install a braking resistor. 3. Increase the acceleration time. 4. Install a braking unit and resistor.
Err07	Overvoltage during constant speed.	1. Input voltage is too high 2. The motor is being driven by an external force during operation.	1. Adjust the voltage to the specified range. 2. Remove the external force or install a braking resistor.
Err08	Control power supply fault.	1. Input voltage is not within the specified range.	1. Adjust the voltage to be within the specified range.

Err09	Undervoltage Fault	1. Instantaneous power interruption 2. Input voltage at the inverter terminals is outside the specified range 3. DC bus voltage abnormal 4. Rectifier bridge or buffer resistor fault 5. Drive board failure 6. Control board failure	1. Reset the fault 2. Adjust the voltage to the normal range 3. Seek technical support 4. Seek technical support 5. Seek technical support 6. Seek technical support

Fault code	Fault Name	Possible Cause	Countermeasures
Err10	inverter Overload	1. Check if the load is excessive or the motor is stalled 2. inverter model selected is undersized	1. Reduce the load and inspect the motor and mechanical components 2. Select an inverter with a higher power rating

Fault code	Fault Name	Possible Cause	Countermeasures
Err11	Motor Overload	1. Verify that motor protection parameter F9.01 is set appropriately 2. Load is excessive or motor stall has occurred. 3. The selected inverter model is undersized.	1. Set this parameter correctly. 2. Reduce the load and inspect the motor and mechanical components. 3. Select an inverter with a higher power class.
Err12	Input Phase Loss	1. Abnormal three-phase input power supply. 2. Drive board is abnormal. 3. Surge protection board is abnormal. 4. Main control board is abnormal.	1. Inspect and rectify any issues present in the external wiring. 2. Seek technical support. 3. Seek technical support 4. Seek technical support

Fault code	Fault Name	Possible Cause	Countermeasures
Err13	Output Phase Loss	1. Abnormal wiring between inverter and motor. 2. Unbalanced three-phase output of inverter during motor operation. 3. Drive board is abnormal. 4. Module is abnormal.	1. Eliminate external faults 2. Inspect the motor's three-phase windings for normal condition and rectify faults as required. 3. Seek technical support 4. Seek technical support
Err14	Module Overheat	1. Ambient temperature too high 2. Air duct obstruction 3. Fan failure 4. Module thermistor failure 5. Inverter module failure	1. Lower the ambient temperature 2. Clean the air duct 3. Replace the fan 4. Replace the thermistor 5. Replace the inverter module
Err15	External device fault	1. Input external fault signal via multifunction terminal DI 2. Input external fault signal via virtual IO function	1. Reset and resume operation 2. Reset and resume operation

Err16	Communication fault	1. Upper-level controller malfunction 2. Communication cable malfunction 3. Fd group communication parameters incorrectly configured	1. Check wiring of the host controller 2. Inspect the communication cable 3. Configure communication parameters correctly

Fault code	Fault Name	Possible Cause	Countermeasures
Err18	Current detection Fault	1. Check for abnormal Hall device 2. Drive board is abnormal.	1. Replace the Hall device 2. Replace the drive board
Err19	Motor tuning Fault	1. Motor parameters not set according to nameplate 2. Parameter identification process timed out	1. Set Motor parameters according to the nameplate 2. Inspect wiring from inverter to Motor
Err20	Encoder fault	1. Encoder model mismatch 2. Encoder wiring error 3. Encoder damaged 4. PG card fault	1. Set the encoder type correctly based on actual requirements 2. Check for wiring faults 3. Replace the encoder 4. Replace the PG card

Fault code	Fault Name	Possible Cause	Countermeasures
Err21	EEPROM Read/write fault	1. EEPROM chip failure	1. Replace the main control board
Err22	inverter hardware fault	1. Overvoltage detected 2. Overcurrent detected	1. Refer to overvoltage fault handling 2. Refer to overcurrent fault handling
Err23	Ground short circuit Fault	1. Motor-to-ground short circuit	1. Replace the cable or motor
Err26	Cumulative operating time fault	1. Cumulative operating time has reached the preset value	1. Use the Parameter initialization function to clear recorded information.
Err27	User-defined Fault 1	1. Input a signal indicating User-defined Fault 1 via multifunction Terminal DI. 2. Input a signal indicating User-defined Fault 1 via the virtual IO function.	1. Reset and resume operation 2. Reset and resume operation

Fault code	Fault Name	Possible Cause	Countermeasures
Err28	User-defined Fault 2	1. Input a signal indicating User-defined Fault 2 via multifunction Terminal DI. 2. Input a signal indicating User-defined Fault 2 via the virtual IO function.	1. Reset and resume operation 2. Reset and resume operation
Err29	Cumulative Power-on Time Reached Fault	1. Cumulative power-on time reaches the set value.	1. Use the Parameter initialization function to clear recorded information.
Err30	Load Drop Fault	1. The inverter operating current is less than Parameter F9.64.	1. Confirm whether the Load is disconnected or check Parameter F9.64. Are the F9.65 parameters set appropriately
Err31	PID feedback loss fault during operation	1. PID feedback is less than the value set in FA.26	1. Check the PID feedback signal or set FA.26 to an appropriate value

Fault code	Fault Name	Possible Cause	Countermeasures
Err40	Current limiting with wave restraint fault	1. Is the Load excessive or has a Motor stall occurred 2. The inverter model is undersized	1. Reduce the Load and check the Motor and mechanical conditions 2. Select an inverter with a higher power rating
Err41	Motor switching fault during operation	1. Changing the current Motor selection via terminal during inverter operation	1. Switch the Motor only after the inverter has stopped
Err42	Excessive speed deviation fault	1. Encoder parameter settings are incorrect. 2. Motor parameter identification has not been performed. 3. Speed deviation detection parameters F9.69 and F9.70 are set improperly.	1. Correctly set the encoder parameters. 2. Perform motor parameter identification. 3. Adjust the detection parameters appropriately based on actual conditions.

Fault code	Fault Name	Possible Cause	Countermeasures
Err43	motor overspeed fault.	1. Encoder parameter settings are incorrect. 2. Motor parameter identification has not been performed. 3. motor overspeed detection parameters F9.67 and F9.68 are set improperly.	1. Correctly set the encoder parameters. 2. Perform motor parameter identification. 3. Adjust the detection parameters appropriately based on actual conditions.
Err45	Motor overtemperature fault.	1. Temperature sensor wiring is loose. 2. motor temperature is excessively high.	1. Inspect the temperature sensor wiring and resolve any faults. 2. Reduce the carrier frequency or apply other cooling measures to cool the motor.

7.2 Abnormal Conditions and Countermeasures

Table 7-2 Abnormal Conditions and Countermeasures

Abnormal conditions	Possible Cause	Countermeasures
No display upon power-up	1. Grid voltage is too low or a phase is missing. 2. DC auxiliary power supply failure. 3. Charging resistor failure.	1. Check the grid voltage. 2. Contact service. 3. Contact service.
Power supply trip	1. Short circuit on the inverter input side. 2. Circuit breaker capacity is too small.	1. Check the wiring or contact service. 2. Increase the circuit breaker capacity.
Motor does not operate.	1. Wiring error. 2. Incorrect operation mode setting. 3. Load is too heavy or the motor is stalled.	1. Check the wiring. 2. Reset the operation mode. 3. Reduce the load or correct the motor condition.
Motor reverse rotation	1. Motor wiring phase sequence error.	1. Swap any two output connections among U, V, and W.

Abnormal conditions	Possible Cause	Countermeasures
Motor unable to accelerate or decelerate smoothly	1. Acceleration/deceleration time is set incorrectly. 2. The stall overcurrent point is set too low. 3. Overvoltage stall prevention is activated. 4. The carrier frequency is set improperly or oscillation has occurred. 5. The load is too heavy.	1. Adjust the acceleration/deceleration time. 2. Increase the stall overcurrent point setting. 3. Increase the deceleration time or reduce load inertia. 4. Reduce the carrier frequency. 5. Reduce the load or use a higher-power inverter.
Motor speed fluctuates during steady-state operation	1. Excessive load fluctuation. 2. The motor overload protection coefficient is set too low. 3. Poor contact at the frequency-setting potentiometer.	1. Reduce load fluctuation. 2. Increase the motor overload protection coefficient. 3. Replace the potentiometer or contact service.

Chapter 8 Inspection and Maintenance of the Inverter

8.1 Inspection and Maintenance

During prolonged operation in industrial settings, the inverter may develop potential faults due to environmental factors such as temperature, humidity, dust, vibration, as well as component aging and wear. Therefore, it is essential to carry out both routine and periodic inspection and maintenance of the inverter.

8.1.1 Routine Inspection Items

Table 8-1 Routine Inspection Items

Inspection Object	Inspection Content	Inspection Interval	Inspection Method	Compliance Standard	Instrumentation
Operating environment	● Ambient temperature ● Humidity, dust, corrosive gases, oil mist, etc.	Daily	● Test with thermometer ● Olfactory inspection ● Visual inspection	● Ambient temperature: -10 – 40 ℃, no frost ● Humidity 20–90%, no condensation, no abnormal odors	● Thermometer ● Hygrometer

Inspection Object	Inspection Content	Inspection Interval	Inspection Method	Compliance Standard	Instrumentation
Inverter	● Vibration ● Heat generation ● Noise	Daily	● Touch the enclosure ● Auditory check	● Stable vibration ● Normal temperature ● No abnormal noise	
Motor	● Vibration ● Heat generation ● Noise	Daily	● Touch the enclosure ● Auditory check	● Stable vibration ● Normal temperature ● No abnormal noise	
Electrical parameters	● Input voltage ● Output voltage ● Output current	Daily	● Meter test	● All electrical parameters within the rated value range	● Moving iron-type voltmeter ● Rectifier-type voltmeter ● Clamp-type ammeter

Inspection, maintenance, and parts replacement must be performed by qualified technical personnel to prevent accidents.

After turning off the power supply, wait 10 minutes before performing inspection or maintenance to prevent electric shock and accidents.

Ensure that the control Panel indicator light is off, and after opening the Panel, confirm that the CHARGE indicator on the Main circuit terminal is extinguished.

Always use insulated tools during inspection. Do not operate with wet hands to prevent accidents.

Keep the equipment clean and tidy at all times. Do not allow foreign objects to enter the inverter.



Inverter Inspection Checklist

8.1.2 Regular Inspection Items

Table 8-2 Regular Inspection Items

Inspection Object	Inspection Item	Inspection Content	Inspection Interval	Inspection Standard	Compliance Standard
Main circuit	Overall	● Connectors and Terminals ● Check for looseness ● Check for burnt Components	Periodic	● Visual inspection	● Ensure connectors are tight and terminals are secure ● No Components are burnt
	Main Power Module	● Check for damage	Periodic	● Visual inspection	● No signs of damage
	Filter Capacitor	● Check for leakage ● Check for swelling	Periodic	● Visual inspection	● No leakage ● No swelling
	Relay	● Operating sound Whether abnormal ● Dust cleaning	Periodic	● Auditory inspection ● Visual inspection	● Sound is normal ● Clean and tidy

Inspection Object	Inspection Item	Inspection Content	Inspection Interval	Inspection Standard	Compliance Standard
Main circuit	Resistor	● Check for large cracks ● Check for abnormal coloration	Periodic	● Visual inspection	● No cracks ● Color is normal
	Fan	● Check for noise and vibration Whether abnormal	Periodic	● Auditory inspection ● Visual inspection	● Sound is normal, vibration is stable
	PCB board	● Dust cleaning	Periodic	● Visual inspection	● Clean and tidy
Control circuit	FPC connector	● Check for looseness	Periodic	● Visual inspection	● Firmly secured, no looseness
	Overall	● Presence of any abnormal odor or Change in color ● Presence of cracks	Periodic	● Olfactory or visual inspection	● No abnormal odors, no discoloration ● No cracks, surface intact

Control circuit	FPC connector	● Check for looseness	Periodic	● Visual inspection	● Firmly secured, no looseness
Keypad	LED	● Display operating normally	Periodic	● Visual inspection	● Display is normal and clear
	Ribbon cable	● Presence of scratches ● Firmly secured	Periodic	● Visual inspection	● No surface scratches ● Firmly secured, no looseness

During inspection, do not arbitrarily disassemble or shake components, and never disconnect connectors. Otherwise, the inverter may fail to operate properly or may be damaged.
After completing periodic inspections, ensure that no inspection tools (such as screwdrivers) are left inside the equipment, as this may lead to damage to the inverter.

Table 8-2 Regular Inspection Items

8.2 Replacement of Inverter Consumable Components

The primary consumable components of the inverter are the cooling fan and the filter electrolytic capacitors. Under normal circumstances, the service life of the cooling fan is 20,000 to 30,000 hours, and that of the electrolytic capacitors is 40,000 to 50,000 hours. Users may determine the replacement period based on operating hours.

1. Cooling Fan

If the fan displays symptoms such as bearing wear or blade deterioration, abnormal noise may occur,

or even vibration. At this time, the fan should be replaced. The standard replacement interval is 2 to 3 years.

2. Filter Electrolytic Capacitor

The performance of the filter electrolytic capacitor is dependent on the ripple current in the main circuit. If the ambient temperature is high or the load fluctuates frequently, the electrolytic capacitor may be damaged. In general, for every 10℃ rise in temperature, the service life of the capacitor is reduced by half (see Figure 8-1). If electrolyte leakage occurs or the safety valve is ruptured, the capacitor must be replaced immediately. The standard replacement period is 4 to 5 years.

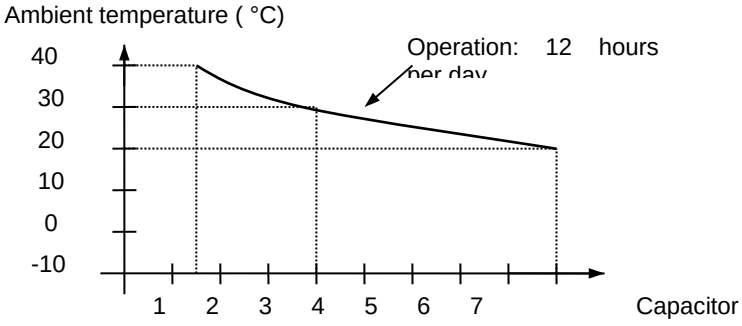


Figure 8-1 Capacitor Service Life Curve

3. The above replacement intervals for vulnerable components of the inverter are based on the following operating conditions:

- Ambient temperature: annual average of 30°C;
- Load: 85% or less;
- Operating time: ≤12 hours per day;

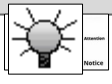
If the above operating conditions are exceeded, the service life of the aforementioned wear-prone components will be shortened.

8.3 Storage of the Inverter

If the inverter will not be used immediately after purchase or requires long-term storage, please observe the following precautions:

Avoid storing the inverter in locations with high temperatures, humidity, significant dust, metallic dust, corrosive gases, or vibration. Ensure that the storage area is well ventilated.

Extended periods of inactivity may degrade the electrolytic capacitors. To mitigate this, power on the inverter at least once every six months for no less than 5 hours. Gradually increase the input voltage to the rated value using a voltage regulator while verifying normal inverter operation and checking for short circuits. If a problem is detected, eliminate it promptly or seek technical assistance.



Chapter 9 Outline and Mounting Dimensions

9.1 Outline and Mounting Dimensions of the Inverter

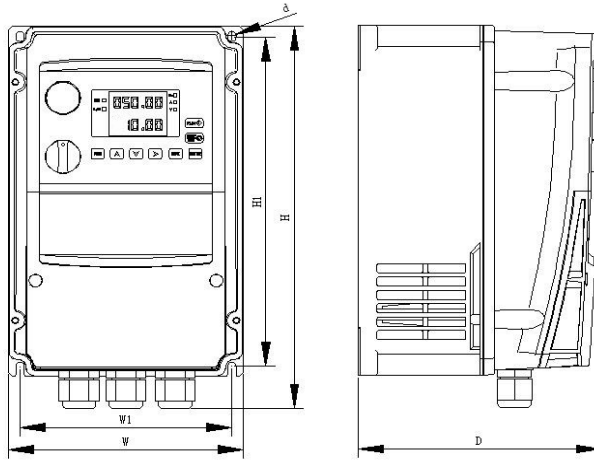


Figure 9-1 (Model A) inverter Dimensional Illustration

Model Specifications	Power (kW)	Dimensions (mm)						Diagram
		H	H1	W	W1	D	d	
ZVF650-G0R4T2	0.4	257	222	150	136	155	Φ6	Figure 9-1
ZVF650-G0R7T2	0.75							
ZVF650-G1R5T2	1.5							
ZVF650-G2R2T2	2.2							
ZVF650-G0R4T4	0.4							
ZVF650-G0R7T4	0.75							
ZVF650-G1R5T4	1.5							
ZVF650-G2R2T4	2.2							

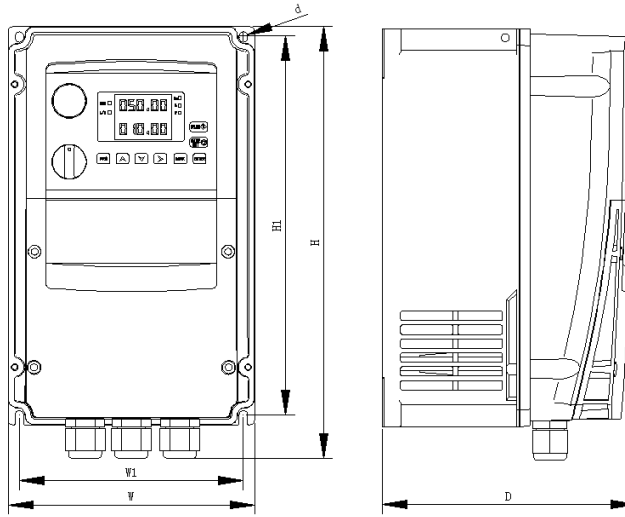


Figure 9-2 (Model B) inverter Dimensional Illustration

Model Specifications	Power (kW)	Dimensions (mm)						Diagram
		H	H1	W	W1	D	d	
ZVF650-G3R0T2	3.0	280	245	160	146	164	Φ6	Figure 9-2
ZVF650-G4R0T2	4.0							
ZVF650-G5R5T2	5.5							
ZVF650-G7R5T2	7.5							
ZVF650-G3R0/P3R0T4	3.0							
ZVF650-G4R0/P4R0T4	4.0							
ZVF650-G5R5/P5R5T4	5.5							
ZVF650-G7R5/P7R5T4	7.5							

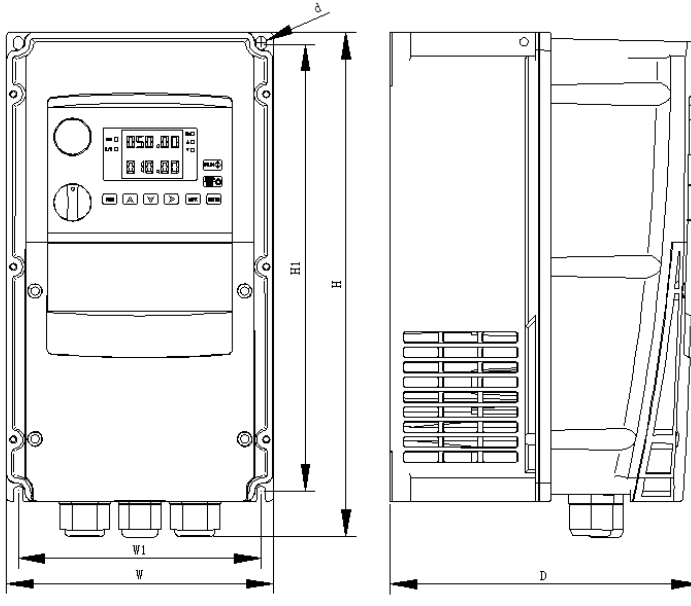


Figure 9-3 (Model C) inverter Dimensional Illustration

Model Specifications	Power (kW)	Dimensions (mm)						Diagram
		H	H1	W	W1	D	d	
ZVF650-G7R5T2	7.5	304	270	160	146	183	Φ7	Figure 9-3
ZVF650-G011T2	11							
ZVF650-G7R5/P7R5T4	7.5							
ZVF650-G011/P011T4	11							

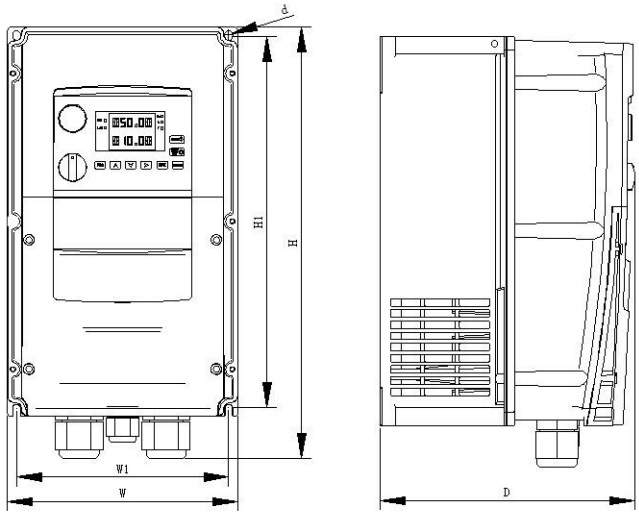


Figure 9-4 (Model D) inverter Dimensional Illustration

Model Specifications	Power (kW)	Dimensions (mm)						Diagram
		H	H1	W	W1	D	d	
ZVF650-G015T2	15	347	301	185	170	203	Φ7	Figure 9-4
ZVF650-G018T2	18.5							
ZVF650-G015/P015T4	15							
ZVF650-G018/P022T4	18.5							

Chapter 10 Quality Assurance

10.1 Inverter Quality Assurance

1. Quality assurance shall be implemented in accordance with the following provisions:

- If a quality issue arises within one month from the date of purchase from the manufacturer, the product will be eligible for return, replacement, or repair (excluding non-standard units);
- If a quality issue arises within three months from the date of purchase from the manufacturer, the product will be eligible for replacement or repair;
- If a quality issue arises within sixteen months from the date of purchase from the manufacturer, the product will be eligible for repair;

2. If the purchase date cannot be confirmed, the warranty period shall be sixteen months from the date of factory shipment. After the warranty period, services will be provided on a chargeable basis. All inverters supplied by the manufacturer are eligible for lifetime paid service, regardless of the time or place of use.
3. If damage to the inverter is caused by any of the following reasons, repair will be chargeable even within the warranty period;

- Damage resulting from failure to operate in accordance with the user manual;
- Damage resulting from use beyond the inverter's specifications or technical requirements;
- Damage caused by natural disasters, such as fire, flood, or abnormal voltage;

- Damage resulting from unauthorized repair or modification;
- Failure or degradation of components caused by adverse environmental conditions;
- Failure to make payment in full and on time as stipulated in the purchase agreement;
- Inability to identify the inverter's nameplate, labels, or date of manufacture;
- Damage caused by improper transportation or storage after purchase;
- Inability to objectively and accurately describe conditions of installation, wiring, operation, or maintenance;
- For return, replacement, or repair services, the product must be returned to the manufacturer. Only after confirming the responsibility will return, replacement, or repair be provided.

4. In the event of product quality issues or accidents, the manufacturer will only assume the responsibilities specified above. If the user requires additional liability coverage, please obtain insurance independently from an insurance provider.

Appendix 1 Optional Accessories

All of the following optional accessories may be ordered from the manufacturer or supplier if required.

1. Braking unit

The braking unit comprises two parts: the braking unit and the braking resistor. For applications featuring potential energy loads (such as elevators) or large inertia loads that require rapid stopping, it is necessary to equip a braking unit.

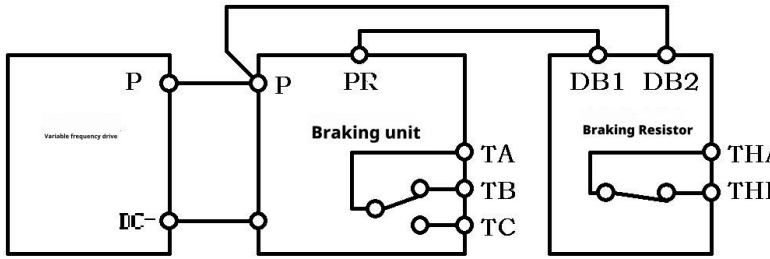


Figure Appendix 1-1 Braking unit wiring diagram

Note: The ZVF650 Series inverter is equipped with an internal braking unit. When the braking torque provided by the built-in unit is insufficient, an external braking unit may be installed. When installing the braking unit, always ensure the safety of the surrounding environment. For specific

parameters and functional descriptions, refer to the braking unit user manual.

Table Appendix 1-1 Recommended Braking Unit Matching Specifications

Inverter		Braking unit		Braking resistor		
Voltage	Motor (kW)	Model	Quantity	Recommended resistance value	Resistance specification	Quantity
220V	0.75	Built-in		80W200Ω	80W200Ω	1
	1.5	Built-in		160W100Ω	160W100Ω	1
	2.2	Built-in		300W70Ω	300W70Ω	1

	3.7	Built-in		400W40Ω	400W40Ω	1
380V	0.75	Built-in		80W750Ω	80W750Ω	1
	1.5	Built-in		160W400Ω	160W400Ω	1
	2.2	Built-in		300W250Ω	300W250Ω	1
	3.7	Built-in		400W150Ω	400W150Ω	1
	5.5	Built-in		600W100Ω	600W100Ω	1
	7.5	Built-in		800W75Ω	800W75Ω	1
	11	Built-in		1000W50Ω	1000W50Ω	1
	15	Built-in		1500W40Ω	1500W40Ω	1
	18.5	Built-in		2500W35Ω	2500W35Ω	1

2. Remote operation adapter and extension cable

There are two options for remote operation of the ZVF650 series inverter. For distances ≤15 m, the keypad can be connected directly using an extended shielded cable. The manufacturer or supplier supplies standard shielded extension cables in 1 m, 1.5 m, 2 m, 3 m, 5

m, and 10 m specifications. If users have special requirements for cable length, custom cables can be provided on request.

When performing remote operation wiring, always

3. Selection Guidelines for Output AC Reactors

The necessity of installing an AC reactor on the output side of the inverter depends on the specific application. The cable between the inverter and the motor should not be excessively long. Excessive cable length increases distributed capacitance, which may result in the generation of higher-order harmonic currents. When the output cable length exceeds 50 meters, an output AC reactor should be installed. Refer to the specifications in the table below.

Table Appendix 1-2 Output AC Reactor Specifications

Voltage	Power	Model Specifications	Voltage	Power	Model Specifications
380	1.5	OCL-0005-EISC-E1M4	380	75	OCL-0200-EISH-E35U
	2.2	OCL-0007-EISC-E1M0		110	OCL-0250-EISH-E28U
	3.7	OCL-0010-EISC-EM70		132	OCL-0290-EISH-E24U

Appendix 1 Optional Accessories

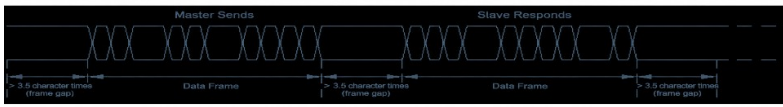
Voltage	Power	Model Specifications	Voltage	Power	Model Specifications
	5.5	OCL-0015-EISC-EM47		160	OCL-0330-EISH-E21U
	7.5	OCL-0020-EISC-EM35		185	OCL-0390-EISH-E18U
	11	OCL-0030-EISCL-EM23		220	OCL-0490-EISH-E14U
	15	OCL-0040-EISCL-EM18		250	OCL-0530-EISH-E13U
	18.5	OCL-0050-EISCL-EM14		280	OCL-0600-EISH-E12U

Appendix 2 RS485 Communication Protocol

The ZVF650 series inverter utilizes the widely adopted MODBUS communication protocol for RS485 communication control. Prior to using RS485 communication, it is mandatory to manually set the inverter address, communication baud rate, and data format. These parameters cannot be modified during the communication process.

The Inverter is connected as a communication slave to a control network consisting of devices such as PC/PLC or HMI equipped with an RS485 communication bus in a 'single-master, multiple-slaves' topology.

Asynchronous serial communication, half-duplex transmission mode. During asynchronous serial communication, data is transmitted in the form of messages, with one data frame being sent at a time. In the MODBUS-RTU protocol, when the idle period on the communication data line exceeds the transmission time of 3.5 bytes, it signifies the beginning of a new communication frame, as illustrated in the figure below.



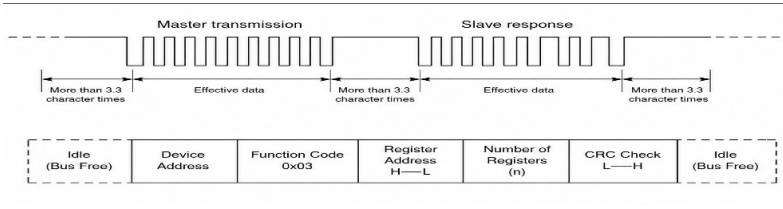
1. Communication Data Format

Appendix 2 RS485 Communication Protocol

The Modbus-RTU protocol communication data format for the ZVF650 series inverter is as follows. The inverter supports read or write operations only for Word-type Parameters; the corresponding communication read command is 0x03, and the write command is 0x06. Read or write operations of bytes or bits are not supported:

>3.5Byte 1Byte 1Byte 2Byte 2Byte 2Byte

Master Read Command Frame



In theory, the host can read multiple consecutive Parameters at once (with n up to a maximum of 12); however, ensure not to exceed the last Parameter of the group, otherwise an error response will result.

>3.5Byte 1Byte 1Byte 2Byte (2n)Byte 2Byte

Slave Read Response Frame

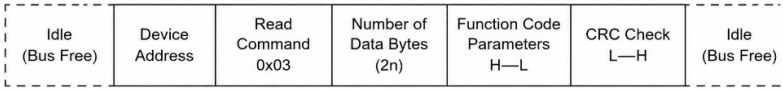
Fd.05=0

Idle (Frame Head)	Target Slave Address	Read Command 0x03	Number of Data Bytes (2n)	Function Code Parameter H—L	CRC Checksum L—H	Idle

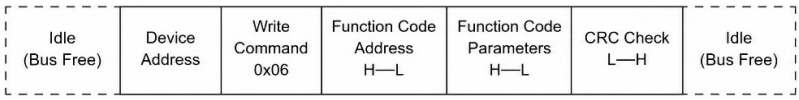
>3.5Byte 1Byte 1Byte 1Byte (2n)Byte 2Byte

Slave Read Response Frame

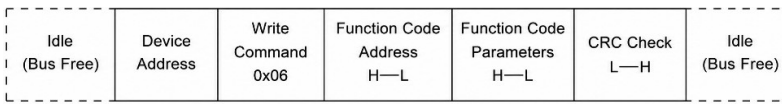
Fd.05=1



Master station write command frame

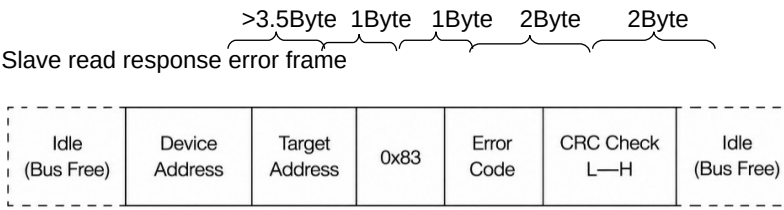


Slave station write response frame



If the slave device detects a communication frame error, or if a read/write operation fails for any other reason, it will respond with an error frame.

Slave read response error frame



Slave write response error frame

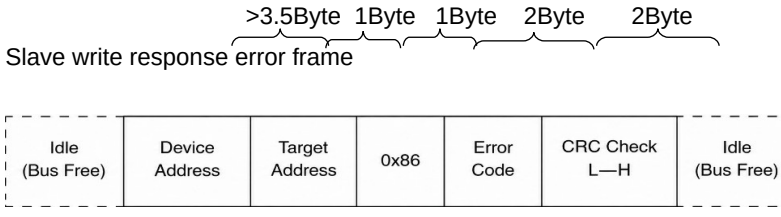


Table Appendix 3-2 Communication Error Type Reference Table

Error Code	Description
01	Command code error
02	Address error
03	Data error
04	Command cannot be processed

Data frame field descriptions:

START	Exceeds 10 ms idle time or 3.5 bytes transmission time
ADR	Communication address: 8-bit address
CMD	Command code: 8-bit instruction
DATA (n-1)	Data content: N×8-bit data, n ≤ 12
…….	
DATA 0	
CRC CHK Low	CRC checksum value:

CRC CHK High	16-bit checksum value composed of two 8-bit bytes
END	Exceeds 10 ms idle time or 3.5 bytes transmission time

CRC verification method:

In RTU mode, the CRC (Cyclical Redundancy Check) checksum value is used. The CRC checksum value is calculated as follows:

Step 1: Initialize a 16-bit CRC register with the value FFFFH.

Step 2: XOR the first byte of the instruction data with the low byte of the 16-bit CRC register, and store the result back in the CRC register.

Step 3: Shift the contents of the CRC register right by 1 bit, filling the most significant bit with 0.

Step 4: Check the value after shifting. If the least significant bit is 0, store the new value from Step 3 back in the CRC register; Otherwise, XOR the CRC register with A001H and store the result back in the CRC register.

Step 5: Repeat Steps 3 and 4 a total of 8 times, so that the CRC register is shifted right by 8 bits. At this point, processing for this byte is complete.

Step 6: Repeat steps 2 to 5 for the next byte of the instruction information, until all bytes have been processed. The final content of the CRC register is the CRC value. When transmitting the CRC value in the instruction information, the low and high bytes must be swapped; that is, the low byte is transmitted first.

Example

The following example generates a CRC value using the C language. This function requires two parameters:

Unsigned char* data ← Pointer to the message buffer

Unsigned char length ← Number of bytes in the message buffer

This function will return an unsigned int type CRC check value.

```
unsigned int crc_chk(unsigned char* data, unsigned char length)
{
    int j;
    unsigned int reg_crc=0xFFFF;
    while(length--)
    {
        reg_crc ^= *data++;
        for(j=0;j<8;j++)
        {
            if(reg_crc & 0x01)   /* LSB(b0)=1 */
            {
                reg_crc=(reg_crc>>1) ^ 0xA001;
            }
                else
                {
                    reg_crc=reg_crc >>1;
                }
        }
    }
        return reg_crc;
```

}

Definition of Communication Data Address

This section defines the address of communication data, used for controlling the operation of the inverter, acquiring inverter status information, and function parameter settings. The address representation uses the function code group number and index number as parameter addresses:

High byte: F0~FF (F group), A0~AF (H group), 70~7F (U group)

Low byte: 00~FF

For example: To access function code F3.12, the access address is denoted as 0xF30C;

Note:

FF group: Parameters can neither be read nor modified; U group: Parameters can be read but cannot be modified. Certain parameters cannot be modified while the inverter is in operating status; others cannot be modified under any status. When modifying function code parameters, also pay close attention to the parameter range, unit, and related instructions.

Function Code group number	Communication access address	Communication modification of function code address in RAM
F0 ~ FE group	0xF000 – 0xFEFF	0x0000 – 0x0EFF
H0 ~ HE group	0xA000 – 0xAEFF	0x4000 – 0x4EFF
U0 Group	0x7000 – 0x70FF	

Note: Frequent storage operations can reduce the service life of EEPROM, so for some function codes, storage is unnecessary in communication mode—simply modifying the value in RAM is sufficient.

1) For F group parameters, to enable this function, simply change the high byte F in the function code address to 0.

2) For H group parameters, to enable this function, simply change the high byte A in the function code address to 4. The corresponding function code addresses are as follows:

High byte: 00~0F (F group), 40~4F (H group)

Low byte: 00~FF

Example:

Function Code F3.12 is not stored in EEPROM; its address is represented as 030C. Function Code H0.05 is not stored in EEPROM; its address is represented as 4005.

This address permits write operations to RAM only; read operations are invalid and the address is inaccessible when reading.

This function can also be implemented for all parameters using command code 07H.

1. Stop/Run Parameters Section:

Parameter Address	Parameter Description	Parameter Address	Parameter Description
1000H	Communication Setting Value (Decimal) –10000 – 10000	1010H	PID Setting
1001H	Operating Frequency	1011H	PID Feedback
1002H	DC bus voltage	1012H	PLC Step

Appendix 2 RS485 Communication Protocol

Parameter Address	Parameter Description	Parameter Address	Parameter Description
1003H	Output voltage	1013H	PULSE Input Pulse Frequency (0.01 kHz)
1004H	Output current	1014H	Feedback Speed (0.1 Hz)
1005H	Output power	1015H	Remaining Running Time
1006H	Output Torque	1016H	AI1 Voltage Before Calibration
1007H	Operating Speed	1017H	AI2 Voltage Before Calibration
1008H	DI Input Status	1018H	Reserved
1009H	DO Output Status	1019H	Linear velocity
100AH	AI1 Voltage	101AH	Current power-on time
100BH	AI2 Voltage	101BH	Current run time
100CH	Reserved	101CH	PULSE input pulse frequency, unit: 1 Hz
100DH	Count value input	101DH	Communication setpoint
100EH	Length value input	101EH	Actual feedback speed
100FH	Load speed	101FH	Main Frequency X display
		1020H	Auxiliary Frequency Y display

Note:

1) The communication setting value is the percentage of the relative value; 10000 corresponds to 100.00% and -10000 corresponds to -100.00%.

2) For data with a frequency dimension, this percentage is relative to the maximum frequency (F0.10); For data with a torque dimension, this percentage references F2.11 or H2.49 (digital torque upper limit setting, corresponding to the first and second Motor respectively).

2. Control command input to the inverter: (write only)

Command address	Function description	
2000H	0001: Forward Run	0005: Free Stop
	0002: Reverse operation	0006: Deceleration Stop
	0003: Forward Jog	0007: Fault Reset
	0004: Reverse Jog	

3. Reading inverter status: (Read only)

Command address	Function description	
3000H	0001: Forward Run	0003: Stop
	0002: Reverse operation	

4. Digital output terminal control: (Write only)

Command address	Function description	
2001H	BIT0: Y1 Output Control	BIT5:VDO1
	BIT1: Reserved	BIT6:VDO2

	BIT2: RELAY1 Output Control	BIT7:VDO3
	BIT3: RELAY2 Output Control	BIT8:VDO4
	BIT4: FMR Output Control	BIT9:VDO5

5. Analog output AO1, AO2, and pulse (FMP) control: (Write only)

Command address	Function description
2002H	0 – 7FFF represents 0% – 100%
2003H	
2004H	

6. Parameter initialization: (If the user password is not 0, communication password verification is required; execution is permitted only after successful verification.)

Command address	Function description	
1F01H	1: Restore default value	3: Restore user backup parameters
	2: Clear recorded information	501: Back up current user parameters

7. Parameter lock password verification: (A return value of 8888H indicates successful password verification.)

Command address	Function description
1F00H	*****

9. inverter fault description

inverter fault address	inverter fault information

8000H	0000: No fault	0015: Parameter read/write exception
	0001: Reserved	0016: inverter hardware fault
	0002: Overcurrent during acceleration	0017: Motor-to-ground short-circuit fault
	0003: Deceleration Overcurrent	0018: Reserved
	0004: Constant Speed Overcurrent	0019: Reserved
	0005: Acceleration Overvoltage	001A: Operating Time Exceeded
	0006: Deceleration Overvoltage	001B: User-Defined Fault 1
	0007: Constant Speed Overvoltage	001C: User-Defined Fault 2
	0008: Braking Resistor Overload Fault	001D: Power-On Time Exceeded
	0009: Undervoltage Fault	001E: Load Loss
	000A: inverter Overload	001F: PID Feedback Loss During Operation
	000B: Motor Overload	0028: Fast Current Limit Timeout Fault
	000C: Input phase loss	0029: Motor switching fault during operation
	000D: Output phase loss	002A: Excessive speed deviation
	000E: Module overheating	002B: motor overspeed

	000F: External fault	002D: Motor overtemperature
	0010: Communication error	005A: Encoder line count setting error
	0011: Contactor error	005B: Encoder not connected
	0012: Current detection fault	005C: Initial position error
	0013: Motor tuning fault	005E: Speed feedback error
	0014: Encoder/PG card fault	

NOTES:

Appendix 3 User Warranty Card

User Information

Distributor Name		Purchase Date	
Model Specifications		Factory Serial Number	
Equipment Name		Motor Power	
Installation Date		Date First Used	

Maintenance Record

Cause of Fault:	
Resolution:	
Date of Maintenance:	Maintenance Personnel Signature:
Cause of Fault:	
Resolution:	
Date of Maintenance:	Maintenance Personnel Signature:

Appendix 3 User Warranty Card

This copy is to be retained by the user. NOTES:



Inverter User Warranty Sheet

User Organization		Telephone	
Address		Postal Code	
Contact Person		Department	
Distributor Name		Address/ Telephone	
Purchase Date		Invoice Number	
Model Specifications		Factory Serial Number	
Equipment Name		Motor Power	
Installation Date		Date First Used	

Description of Usage:

Appendix 3 User Warranty Card

Description of Parameter Modification:

This section must be truthfully and carefully completed by the user and promptly sent back to the manufacturer. This will enable us to provide better service and help prevent installation or usage errors that could cause inconvenience or loss.

ZVF650 Series User Manual

Version V1.11