

Preface

Document Overview

The CM680 series inverter is a low-voltage high-performance engineering inverter that supports the control of three-phase AC permanent magnet synchronous motors, asynchronous motors, and synchronous reluctance motors. The inverter employs advanced vector control technology, providing high torque output at low speeds, excellent dynamic characteristics, and strong overload capability. It features user-programmable functions, background software monitoring, communication bus functionality, and support for various encoder types, offering rich and powerful combined functions with stable performance.

This manual introduces detailed content on product functionality, communication, fault codes, function codes, and more.

More Information

Document Name	Content Summary
CM680 Series General Purpose Inverters Quick Installation and Commissioning Manual	Introduces detailed content on product installation, wiring, commissioning, troubleshooting, function codes, fault codes, etc.
CM680 Series General Purpose Inverters Hardware Manual	Introduces the system composition, technical specifications, components, dimensions, optional accessories (installation accessories, cables, peripheral electrical components), expansion cards, as well as daily maintenance and care guidelines, compliance certifications, and standards related to the product.
CM680 Series General Purpose Inverters Installation Manual	Introduces the installation dimensions, space design, detailed installation steps, wiring requirements, cabling requirements, installation requirements for optional accessories, and common EMC problem resolution suggestions, among other detailed content.
CM680 Series General Purpose Inverters Communication Manual	This section provides a detailed introduction to the communication expansion card of the product, including its overview, composition, dimensions, installation, electrical connections, communication parameter configuration, fault codes, etc.

Version Change Record

Revision Date	Release Version	Change Content
2023-12	Ver 1.0	First release of the manual.
2024-05	Ver 1.1	Addition and modification of some software function codes.
2024-09	Ver 1.2	Addition and modification of some software function codes.

About Obtaining the Manual

This manual is not shipped with the product. If you need to obtain the electronic PDF version, you can do so through the following methods:

Log in to the official website of Changsha Riye Electric (www.cssunye.com), go to the “Download Center,” search for keywords, and download.

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1 Parameter Overview

Function Code Symbol Explanation as Follows:

“☆”: Indicates that the inverter parameter can be modified during both stop and operation

“★”: Indicates that the inverter parameter cannot be modified while in operation

“○”: Indicates that the parameter is a manufacturer's parameter and cannot be changed by the user

“●”: Indicates the actual detection value of the inverter or the manufacturer's fixed value, which cannot be changed

The communication addresses in the function parameter table are written in hexadecimal.

Function Code	Name	Content	Default Value	Change	Communication Address
F0 Group - Basic Function Group					
F0-00	Model Number	Model Number: Input Voltage, Power, Input Voltage Phases	Model Confirmation	●	0000
F0-01	Light/Heavy Load Selection	1: Heavy Load	1	★	0001
F0-02	Rated Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	Model Confirmation	●	0002
F0-03	Control Mode	0: Speed Mode 1: Point-to-Point Mode 2: Torque Mode 3: Homing Mode	0	★	0003
F0-04	Speed Mode Selection	0: V/F Control 2: VVC Voltage Vector Control 3: Induction Motor Closed-loop Control 4: Permanent Magnet Motor Closed-loop Control 6: SVC Open-loop Vector Control	0	★	0004
F0-05	Run Command Source Selection	0: Digital Operator 1: External Terminal Input 2: RS485 Communication Input 3: CANopen Input 4: Reserved 5: Communication Card Input	0	★	0005

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
F0-06	Frequency Source Selection	0: Digital Operator 1: RS485 Communication 2: Analog Input 3: External Up/Down Input 4: Pulse Input Without Direction 5: Pulse Input With Direction 6: CANopen Input 7: Reserved 8: Communication Card Input 9: PID 10: Digital Terminal 11: Simple PLC	0	★	0006
F0-07	Auxiliary Frequency Source	0: Disabled 1: Digital Operator 2: RS485 Communication 3: Analog Input 4: External Up/Down Input 5: Pulse Input 6: CANopen Input 7: Reserved 8: Communication Card Input	0	★	0007
F0-08	Frequency Source Superposition Selection	0: Main Freq + Aux Freq 1: Main Freq - Aux Freq 2: Aux Freq - Main Freq 3: Auxiliary Frequency	0	★	0008
F0-09	Forward/Reverse Prohibited Selection	0: Forward/Reverse Enabled 1: Reverse Prohibited 2: Forward Prohibited	0	★	0009
F0-10	Upper Limit Frequency	0.00Hz~599.00Hz	599.00Hz	☆	000A
F0-11	Lower Limit Frequency	0.00Hz~599.00Hz	0.00Hz	☆	000B
F0-12	Speed curve time unit	0: Acceleration/deceleration unit is 0.01s 1: Acceleration/deceleration unit is 0.1s	0	★	000C
F0-13	Acceleration time 1	0.00s~600.00s	Model Confirmation	☆	000D
F0-14	Deceleration time 1	0.00s~600.00s	Model Confirmation	☆	000E
F0-15	Carrier frequency	2kHz~15kHz	6kHz	★	000F
F0-16	Reduced Carrier Method	0: Reduce carrier based on current temperature 1: Fixed carrier and limit current 2: Same as setting 0	0	☆	0010
F0-17	High-speed Machine Mode	0~65535	0	★	0011
F0-18	Parameter Management Settings	0: No Function 1: Parameter Write Protection 5: Reset kWh Display to Zero 7: Reset CAN Slave 9: Reset to 50Hz Factory Values	0	★	0012
F0-19	Keyboard Set Frequency	0.00~599.00	50.00Hz	★	0013

Function Code	Name	Content	Default Value	Change	Communication Address
F1 Group - Start/Stop Control Parameters					
F1-00	Startup Speed Tracking	0: No Action 1: Track from Maximum Frequency 2: Track Frequency at Startup 3: Track from Minimum Frequency	0	☆	0100
F1-01	Initial Position Identification Method	0: Do Not Perform Initial Angle Identification 1: Attraction Method 3: Pulse Injection Method 1 4: Pulse Injection Method 2	0	☆	0101
F1-02	Abnormal Restart Method	0: Stop Operation 1: Current Speed Tracking 2: Minimum Frequency Tracking	0	☆	0102
F1-03	Speed Tracking Maximum Current	20%~200%	100%	☆	0103
F1-04	Voltage Increase Rate	1%~200%	100%	☆	0104
F1-05	Start Frequency	0.00Hz~599.00Hz	0.50Hz	★	0105
F1-06	Startup Hold Time	0.00s~600.00s	0.00s	☆	0106
F1-07	Startup Hold Frequency	0.00Hz~599.00Hz	0.00Hz	☆	0107
F1-08	Braking Current Level	0%~100%	0%	☆	0108
F1-09	Startup Braking Time	0.0s~60.0s	0.0s	☆	0109
F1-10	DC Braking Ratio Coefficient	0~65535	2000	☆	010A
F1-11	DC Braking Integral Coefficient	0~65535	100	☆	010B
F1-12	Stopping Method	0: Deceleration Stop 1: Free Stop	0	☆	010C
F1-13	Deceleration Method	0: Deceleration Method 0 1: Deceleration Method 1 2: Deceleration Method 2	0	★	010D
F1-15	1-4 Segment	0.00Hz~599.00Hz	0.00Hz	☆	010F
F1-16	S Acceleration Time 1	0.00s~25.00s	0.20s	☆	0110
F1-17	S Acceleration Time 2	0.00s~25.00s	0.20s	☆	0111
F1-18	S Deceleration Time 1	0.00s~25.00s	0.20s	☆	0112
F1-19	S Deceleration Time 2	0.00s~25.00s	0.20s	☆	0113
F1-20	Automatic Acceleration and Deceleration Selection	0: Linear Acceleration and Deceleration 1: Automatic Acceleration and Linear Deceleration 2: Linear Acceleration and Automatic Deceleration 3: Automatic Acceleration and Deceleration 4: Automatic Acceleration and Deceleration Suppression	0	☆	0114
F1-21	Automatic Acceleration and Deceleration Kp	0~65535	20	☆	0115

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
F1-22	Automatic Acceleration and Deceleration Ki	0.000~65.535	0.400	☆	0116
F1-23	Abnormal Shutdown Method	0: Free Stop 1: According to First Deceleration Time 2: According to Second Deceleration Time 3: According to Third Deceleration Time 4: According to Fourth Deceleration Time 5: According to System Deceleration Time 6: Automatic Deceleration	0	☆	0117
F1-24	Braking Time	0.0s~60.0s	0.0s	☆	0118
F1-25	Braking Start Frequency	0.00Hz~599.00Hz	0.00Hz	☆	0119
F1-26	Stop Holding Time	0.00s~600.00s	0.00s	☆	011A
F1-27	Parking Hold Frequency	0.00Hz~599.00Hz	0.00Hz	☆	011B
F1-28	Speed Tracking Demagnetization Time	0~65535	50	☆	011C
F1-29	Instant Power Failure Restart Method	0: Stop Operation 1: Current Speed Tracking 2: Minimum Frequency Tracking	0	☆	011D
F1-30	Allowed Power Failure Time	0.0s~20.0s	2.0s	☆	011E
F1-31	Base Blockade Interruption Time	0.0s~5.0s	0.5s	☆	011F
F1-32	dEb recovery threshold	0.0~200.0	40.0	☆	0120
F1-33	dEb action bias threshold	0.0~200.0	40.0	☆	0121
F1-34	dEb deceleration selection	0: No Action 1: Enable, no recovery 2: Enable, recovery	0	☆	0122
F1-35	dEb recovery time	0.0s~25.0s	3.0s	☆	0123
F1-36	PM Voltage Pulse Width	0.0ms~3.0ms	1.0ms	☆	0124
F1-37	Reserved	0~65535	0	☆	0125
F1-38	Reserved	0~65535	0	☆	0126
F1-39	Reserved	0~65535	0	☆	0127
F1-40	Reserved	0~65535	0	☆	0128
F1-41	Flux Zero Position Alignment Time	0.0~60.0s	2.0	☆	0129
F1-42	Stop Frequency Mode	0: Follow Current Frequency Command 1: Reset Frequency Command	0	☆	012A
F1-43	Initial Stop Frequency	0.00Hz~599.00Hz	50.00Hz	★	012B
F2 Group - VF Control Parameters					
F2-00	V/F Voltage Selection	0: General V/F Curve 1: 1.5 Power V/F Curve 2: 2 Power V/F Curve	0	★	0200
F2-01	Torque Compensation	0~10	1	☆	0201

Function Code	Name	Content	Default Value	Change	Communication Address
F2-02	Torque Filter Time	0.001s~10.000s	0.500s	☆	0202
F2-03	Reserved	0~65535	0	●	0203
F2-04	M1 Multi-point VF Frequency Point 1	0.00Hz~599.00Hz	0.50Hz	★	0204
F2-05	Multi-point VF Voltage	0.0V~480.0V	2.0V	★	0205
F2-06	Multi-point VF Frequency Point 2	0.00Hz~599.00Hz	1.50Hz	★	0206
F2-07	Multi-point VF Voltage Point 2	0.0V~480.0V	10.0V	★	0207
F2-08	Multi-point VF Frequency Point 3	0.00Hz~599.00Hz	3.00Hz	★	0208
F2-09	Multi-point VF Voltage Point 3	0.0V~480.0V	22.0V	★	0209
F2-10	Slip Filter Time	0.001s~10.000s	0.100s	☆	020A
F2-11	Slip Compensation Gain	0.00~10.00	0.00	☆	020B
F2-12	Power Generation Slip Compensation Gain	0.00~1.00	1.00	☆	020C
F2-13	Maximum Slip Limit Value	0.00Hz~200.00Hz	20.00Hz	☆	020D
F2-14	Oscillation Suppression Gain	0~10000	1000	☆	020E
F2-15	Overexcitation Braking Gain	0~65535	30	☆	020F
F2-16	Voltage Stability Gain	0~200Hz	10	☆	0210
F2-17	Reserved	0~65535	0	☆	0211
F2-18	Reserved	0~65535	0	☆	0212
F2-19	Reserved	0~65535	0	☆	0213
F2-20	Reserved	0~65535	0	☆	0214
F3 Group - Vector Control Parameters					
F3-00	System Control	0000H~FFFFH	0	★	0300
F3-01	ASR1/2 Switching Frequency	5.00Hz~599.00Hz	7.00Hz	☆	0301
F3-02	Zero Speed Bandwidth	1Hz~40Hz	10Hz	☆	0302
F3-03	ASR1 Low-Speed Bandwidth	1Hz~40Hz	10Hz	☆	0303
F3-04	ASR2 High-Speed Bandwidth	1Hz~40Hz	10Hz	☆	0304
F3-05	ASR Zero Speed Gain	0Hz~40Hz	20Hz	☆	0305
F3-06	ASR Zero Speed Integral	0.000s~10.000s	0.100s	☆	0306
F3-07	ASR1 Low-Speed Gain	0Hz~40Hz	10Hz	☆	0307
F3-08	ASR1 Low-Speed Integral Time	0.000s~10.000s	0.100s	☆	0308
F3-09	ASR2 High-Speed Gain	0Hz~40Hz	10Hz	☆	0309
F3-10	ASR2 High-Speed Integral Time	0.000s~10.000s	0.100s	☆	030A
F3-11	ASR Speed Feedforward	0%~200%	0%	☆	030B
F3-12	PDF Coefficient	0~200	30	☆	030C
F3-13	DOB Compensation Gain	0Hz~5000Hz	0Hz	☆	030D

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Function Code	Name	Content	Default Value	Change	Communication Address
F3-14	ASR Output Filter Time	0.000s~0.350s	0.008s	☆	030E
F3-15	Notch Depth	0dB~20dB	0dB	☆	030F
F3-16	Notch Filter Frequency	0.00Hz~200.00Hz	0.00Hz	☆	0310
F3-17	Speed Limit Selection	0: Parameters FE-03&FE-04 1: Frequency Source 2: Absolute Value of Frequency Source 3: Tension Control Line Speed	0	★	0311
F3-18	Current Loop Bandwidth	0Hz~65535Hz	290Hz	☆	0312
F3-19	Iq Current Loop Proportional Gain	0%~65535%	100%	☆	0313
F3-20	Iq Current Loop Integral Time	0s~65535s	100s	☆	0314
F3-21	Id Current Loop Proportional Gain	0%~65535%	100s	☆	0315
F3-22	Id Current Loop Integral Time	0s~65535s	100s	☆	0316
F3-23	I/F Mode Current Command	0%~150%	40%	☆	0317
F3-24	IF Switching Frequency 1	0.00Hz~599.00Hz	20.00Hz	☆	0318
F3-25	IF Switching Frequency 2	0.00Hz~599.00Hz	20.00Hz	☆	0319
F3-26	Weak Magnetism Proportion Coefficient	0.00~655.35	1.00	☆	031A
F3-27	Weak Magnetism Integral Coefficient	0.00~655.35	0.20	☆	031B
F3-28	Output Voltage Limit	0~115	100	☆	031C
F3-29	Torque Filter Time	0.001~10.000	0.500	☆	031D
F3-30	VVC Voltage Feedforward Gain	0.00~2.00	1.00	☆	031E
F3-31	VVC Frequency Compensation Low-pass	0.00s~600.00s	0.05s	☆	031F
F3-32	Forward Motor Torque Upper Limit	0%~500%	500%	☆	0320
F3-33	Forward Braking Torque Upper Limit	0%~500%	500%	☆	0321
F3-34	Reverse Electric Torque Upper Limit	0%~500%	500%	☆	0322
F3-35	Reverse Braking Torque Upper Limit	0%~500%	500%	☆	0323
F3-36	FLUXBEMF Bandwidth	20.0Hz~100.0Hz	40.0Hz	☆	0324
F3-37	PM Flux Weakening Ki	0~65535	32	☆	0325
F3-39	Flux Observer Filter	1ms~1000ms	50ms	☆	0327
F3-40	Flux Rise Time	33%~100%	100%	☆	0328
F3-41	VVC Compensation High Pass	0.00s~600.00s	5.00s	☆	0329
F3-42	VVC Compensation Gain	0.00~655.35	1.00	☆	032A
F3-43	PM Sensorless Control Bit	0000H~FFFFH	0	☆	032B
F3-44	Id filtering time	0.0s~6.0s	0.2s	☆	032C

Function Code	Name	Content	Default Value	Change	Communication Address
F3-45	MTPA low-passfilter coefficient	0~1000	10	☆	032D
F3-46	M1 flux weakening curve	0~200	90	☆	032E
F3-47	M2 flux weakening curve	0~200	90	☆	032F
F3-48	Weak Magnetization Speed Response	0~150	65	☆	0330
F3-49	Weak Magnetization ASR Proportional Coefficient	0%~65535%	7618%	☆	0331
F3-50	Weak Magnetization ASR Integral Coefficient	0s~65535s	30s	☆	0332
F3-51	I Maximum Value	0~250	150	★	0333
F3-52	Torque Limit Value	0~500	200	☆	0334
F3-53	Demagnetizing Current	0~65535	100	☆	0335
F3-54	Frequency Filter Coefficient	0~1000	10	★	0336
F3-55	Us Maximum Value	0~100	100	★	0337
F3-56	Id Demagnetizing Bandwidth	0~546	273	☆	0338
F3-57	MTPA Flux Weakening Voltage Limit	0.0%~12.0%	10.5%	☆	0339
F4 Group - First Motor Parameters					
F4-00	Motor Type Selection	0: Induction Motor 1: Surface-Mounted Permanent Magnet Synchronous Motor 2: Interior Permanent Magnet Synchronous Motor 3: Synchronous Reluctance Motor	0	★	0400
F4-01	Motor Parameter Identification	0: No Function 1: IM Advanced Rotational Identification 2: IM Static Identification 4: PM Motor Magnetic Pole Recognition 5: PM Rotation Recognition 6: IM Rotation Recognition 12: Inertia Recognition 13: PM Static Recognition	0	★	0401
F4-02	M1 Maximum Frequency	0.00Hz~599.00Hz	50.00Hz	★	0402
F4-03	M1 Rated Frequency	0.00Hz~599.00Hz	50.00Hz	★	0403
F4-04	M1 Rated Voltage	0.0V~510.0V	380.0V	★	0404
F4-05	IM1 Rated Power	0.00kW~655.35kW	Model Confirmation	★	0405
F4-06	IM1 Number of Poles	2~20	Model Confirmation	★	0406
F4-07	IM1 Rated Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	F4-05 Confirm	★	0407
F4-08	IM1 Rated Speed	0rpm~65535rpm	F4-05 Confirm	★	0408
F4-09	Inertia Per Unit Value	1pu~65535pu	Model Confirmation	★	0409
F4-10	IM1 No-load Current	0.00A~F4-07	Model Confirmation	★	040A

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
F4-11	IM1 Stator Resistance	0.000Ω~65.535Ω	Model Confirmation	★	040B
F4-12	IM1 Rotor Resistance	0.000Ω~65.535Ω	Model Confirmation	★	040C
F4-13	IM1 Mutual Inductance	0.0mH~6553.5mH	Model Confirmation	★	040D
F4-14	IM1 Leakage Inductance	0.00mH~655.35mH	Model Confirmation	★	040E
F4-15	PM rated power	0.00kW~655.35kW	Model Confirmation	★	040F
F4-16	PM pole number	0~65535	Model Confirmation	★	0410
F4-17	PM rated current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	F4-15 confirmation	★	0411
F4-18	PM rated speed	0rpm~65535rpm	F4-15 confirmation	★	0412
F4-19	PM motor inertia	0.0kgm ² ~6553.5kgm ²	Model Confirmation	★	0413
F4-20	PM Stator Resistance	0.000Ω~65.535Ω	Model Confirmation	★	0414
F4-21	PM D-axis Inductance	0.00mH~655.35mH	Model Confirmation	★	0415
F4-22	PM Q-axis Inductance	0.00mH~655.35mH	Model Confirmation	★	0416
F4-23	PM Ke Parameter	0V~65535V	Model Confirmation	★	0417
F4-24	PM Back EMF Coefficient	0.0~6553.5	Model Confirmation	★	0418
F4-25	PM Current Recognition Threshold	0.00%~100.00%	Model Confirmation	☆	0419
F4-26	PM Magnetic Pole Angle	0.0DEG~360.0DEG	Model Confirmation	★	041A
F4-27	Encoder Type Selection	0: No PG Card 1: ABZ Encoder 2: Reserved 3: Resolver	0	★	041B
F4-28	Encoder Pulse Count	6ppr~20000ppr	1024ppr	★	041C
F4-29	Encoder Pulse Type	0: No Function 1: A phase leads B phase for forward rotation 2: B phase leads A phase for forward rotation 3: A pulse B direction HForwardLReverse 4: A pulse B direction LForwardHReverse 5: Single-phase Input	1	★	041D
F4-30	Reference Pulse Input Type	0: No Function 1: A phase leads B phase for forward rotation 2: B phase leads A phase for forward rotation 3: A pulse B direction HForwardLReverse 4: A pulse B direction LForwardHReverse 5: Single-phase Input	0	★	041E
F4-31	Frequency Division Output Setting	1~255	1	☆	041F
F4-32	Rotary Encoder Pole Pairs	1~50	1	★	0420
F4-33	PG Digital Filter Value	0CNT~65535CNT	100CNT	★	0421
F4-34	PG Feedback High-Speed Filter	0Hz~2000Hz	100Hz	☆	0422
F4-35	PG Feedback Low-Speed Filter	0Hz~2000Hz	50Hz	☆	0423

Function Code	Name	Content	Default Value	Change	Communication Address
F4-36	Load-side Gear A1	1~65535	100	☆	0424
F4-37	Load-side Gear B1	1~65535	100	☆	0425
F4-38	Load-side Gear A2	1~65535	100	☆	0426
F4-39	Load-side Gear B2	1~65535	100	☆	0427
F4-40	Electronic Gear A	1~65535	100	☆	0428
F4-41	Electronic Gear B	1~65535	100	☆	0429
F5 Group - Input Terminals					
F5-00	D11 Terminal Function Selection	0: No Function	0	★	0500
F5-01	D12 Terminal Function Selection	1: Multi-speed/Multi-point Position 1	0	★	0501
F5-02	D13 Terminal Function Selection	2: Multi-speed/Multi-point Position 2	1	★	0502
F5-03	D14 Terminal Function Selection	3: Multi-speed/Multi-point Position 3	2	★	0503
F5-04	D15 Terminal Function Selection	4: Multi-speed/Multi-point Position 4	3	★	0504
F5-05	D16 Terminal Function Selection	5: Fault Reset	4	★	0505
F5-06	D17 Terminal Function Selection	6: Jog	0	★	0506
F5-07	HDI8 Terminal Function Selection	7: Speed Pause	0	★	0507
		8: 1-2 Segment Acceleration/Deceleration Switching			
		9: 3-4 Segment Acceleration/Deceleration Switching			
		10: External Fault (F1-20)			
		11: Base Block			
		12: Stop Output			
		13: Automatic Acceleration/Deceleration Prohibited			
		15: AI1 Input Frequency Command			
		16: AI2 Input Frequency Command			
		17: AI3 Input Frequency Command			
		18: Deceleration Stop (F1-20)			
		19: External Command for Frequency Increase			
		20: External Command for Frequency Decrease			
		21: PID Function Prohibited			
		22: Clear Counter			
		23: Input Count			
		24: External Forward Jog			
		25: External Reverse Jog			
		26: Torque/Speed Mode Switch			
		27: Speed Loop 1/2 Switch			
		28: External Fault Free Stop			
		31: High Torque Compensation			
		32: Intermediate Torque Compensation			
		33: Low Torque			

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		Compensation 34: Multi-Speed/Position Switching 35: Internal Positioning Enable 36: Multi-Point Position Input 37: Pulse Input Position Control 39: Torque Command Direction Switching 40: Motor Free Stop 41: Manual Mode Enable 42: Automatic Mode Enable 44: NL Reverse Limit 45: PL Forward Limit 46: ORG Return to Origin 47: Return to Origin Action Enable 48: Mechanical Gear Ratio Switching 49: Inverter Enable 50: Slave dEb Execution 53: CANopen Quick Stop 56: LOC/REM Switching 70: Auxiliary Frequency Prohibition 71: PID Prohibition, Zero Output 72: PID Prohibition, Maintain Output 73: PID I Gain is 0 74: PID Feedback Reversal 83: Motor Switching Bit0 84: Motor Switching Bit1			
F5-08	Terminal Command Mode	0: No Function 1: 2-Wire Mode 1 2: 2-wire Mode 2 3: 3-wire 4: 2-wire Mode 1/Fast Start 5: 2-wire Mode 2/Fast Start 6: 3-wire Fast Start	1	★	0508
F5-09	UP/DOWN Mode Selection	0: System Acceleration/Deceleration Time 1: F5-10 Fixed Acceleration/Deceleration 2: F5-10 Pulse Signal 3: External Up/Down Input 4: External Up/Down Input 1	0	☆	0509
F5-10	UP/DOWN Rate of Change	0.001Hzms~1.000Hzms	0.001Hzms	☆	050A
F5-15	DI Terminal Valid Logic	0000H~FFFFH	0	☆	050F
F5-16	DI Terminal Response Time	0.000s~30.000s	0.005s	☆	0510
F5-17	Virtual/Real DI Terminal	0000H~FFFFH	0	☆	0511

Function Code	Name	Content	Default Value	Change	Communication Address
	Selection				
F5-18	Virtual Terminal Status Setting	0~65535	0	☆	0512
F5-19	External Operation Selection	0: Invalid 1: Run if there is an operation command	0	☆	0513
F5-20	All signal type selection	0: 0-10V input selection 1: 0-20mA input selection 2: 4-20mA input selection	0	☆	0514
F5-21	All function selection	0: No Function 1: Frequency setting 2: Torque setting 3: Torque compensation setting 4: PID target value 5: PID feedback value 6: Thermistor PTC Input 7: Forward Torque Limit 8: Reverse Torque Limit 9: Regenerative Torque Limit 10: Forward/Reverse Torque Limit 11: Thermistor PT100 Value 12: Auxiliary Frequency Setting 13: PID Offset 14: Tension PID Feedback Value 15: Line Speed Feedback 16: Roll Diameter Feedback 17: Tension PID Setpoint 18: Tension Setpoint 19: Zero-speed Tension Setting 20: Tension Taper Setting	1	☆	0515
F5-22	All Input Bias	-100.0%~100.0%	0.0%	☆	0516
F5-23	All Bias Mode Selection	0: No Bias 1: Below Bias = Bias 2: Above Bias = Bias 3: Absolute Value Bias as Center 4: Bias as Center	0	☆	0517
F5-24	All Gain	-500.0%~500.0%	100.0%	☆	0518
F5-25	All Filter Time	0.00s~20.00s	0.01s	☆	0519
F5-26	All Signal Type Selection	0: 0-10V input selection 1: 0-20mA input selection 2: 4-20mA input selection	0	☆	051A
F5-27	All Function Selection	0: No Function 1: Frequency setting 2: Torque setting 3: Torque compensation setting 4: PID target value 5: PID feedback value 6: Thermistor PTC Input 7: Forward Torque Limit 8: Reverse Torque Limit	0	☆	051B

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communications Address
		9: Regenerative Torque Limit 10: Forward/Reverse Torque Limit 11: Thermistor PT100 Value 12: Auxiliary Frequency Setting 13: PID Offset 14: Tension PID Feedback Value 15: Line Speed Feedback 16: Roll Diameter Feedback 17: Tension PID Setpoint 18: Tension Setpoint 19: Zero-speed Tension Setting 20: Tension Taper Setting			
F5-28	AI2 Input Bias	-100.0%~100.0%	0.0%	☆	051C
F5-29	AI2 Bias Mode Selection	0: No Bias 1: Below Bias = Bias 2: Above Bias = Bias 3: Absolute Value Bias as Center 4: Bias as Center	0	☆	051D
F5-30	AI2 Gain	-500.0%~500.0%	100.0%	☆	051E
F5-31	AI2 Filter Time	0.00s~20.00s	0.01s	☆	051F
F5-32	AI3 Signal Type Selection	0: 0-10V input selection 1: 0-20mA input selection 2: 4-20mA input selection	0	☆	0520
F5-33	AI3 Function Selection	0: No Function 1: Frequency setting 2: Torque setting 3: Torque compensation setting 4: PID target value 5: PID feedback value 6: Thermistor PTC Input 7: Forward Torque Limit 8: Reverse Torque Limit 9: Regenerative Torque Limit 10: Forward/Reverse Torque Limit 11: Thermistor PT100 Value 12: Auxiliary Frequency Setting 13: PID Offset 14: Tension PID Feedback Value 15: Line Speed Feedback 16: Roll Diameter Feedback 17: Tension PID Setpoint 18: Tension Setpoint 19: Zero-speed Tension Setting 20: Tension Taper Setting	0	☆	0521
F5-34	AI3 Input Bias	-100.0%~100.0%	0.0%	☆	0522

Function Code	Name	Content	Default Value	Change	Communication Address
F5-35	AI3 Bias Mode Selection	0: No Bias 1: Below Bias = Bias 2: Above Bias = Bias 3: Absolute Value Bias as Center 4: Bias as Center	0	☆	0523
F5-36	Positive AI3 Gain	-500.0%~500.0%	100.0%	☆	0524
F5-37	AI3 Filter Time	0.00s~20.00s	0.01s	☆	0525
F5-38	Analog frequency negative value reversal	0: Forward/reverse rotation determined by operation source 1: Forward/reverse rotation determined by bias	0	☆	0526
F5-39	Analog input addition enable	0: Disabled 1: Enable	0	☆	0527
F5-40	Reserved	0~65535	0	☆	0528
F5-41	Reserved	0~65535	0	☆	0529
F5-42	4-20mA open circuit action	0: Do not detect open circuit 1: Maintain frequency before open circuit 2: Decelerate to 0Hz 3: Immediate stop due to fault	0	☆	052A
F5-43	4-20mA open circuit	0.00mA~4.00mA	2.00mA	☆	052B
F6 group - output terminals					
F6-00	RLY1 terminal function selection	0: No Function 1: VFD running 2: Reached set speed 3: Reached frequency 1 4: Reached frequency 2 5: Zero speed command running 6: Zero speed command 7: Over-torque threshold 1 8: Over-torque threshold 2 9: VFD ready 10: Low Voltage Warning 11: Fault Indication 12: Brake Release 13: Overheat Warning 14: Braking Unit Activation 15: PID Deviation Warning 16: Excessive Slip 17: Set Count Value Reached 18: Final Count Value Reached 19: Base Block 20: Warning Indication 21: Overvoltage 22: Overcurrent Stall Prevention 23: Overvoltage Stall Prevention 24: Operation Source Not	11	☆	0600
F6-01	RLY2 terminal function selection		1	☆	0601
F6-02	DO1 Terminal Function Selection		0	☆	0602
F6-03	DO2 Terminal Function Selection		0	☆	0603

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		Operator 25: Forward Command 26: Reverse Command 29: Speed Higher than F6-08 Value 30: Below F6-08 speed value 31: Motor Y connection command output 32: Motor D connection command output 33: Zero operation output frequency 34: Zero output frequency 35: Fault option 1 36: Fault option 2 37: Fault option 3 38: Fault option 4 39: Positioning complete 40: Reached set frequency STP 41: Multi-point position positioning complete 42: Crane brake release output 43: Above F6-09 speed 44: Low current output 45: UVW electromagnetic switch enable 46: dEb action output 47: No function 48: No function 49: Return to origin action completed 50: CANopen control output 51: RS485 control output 52: Communication card control output 66: STO action output A 67: Analog level arrival output 68: STO action output B 73: Over-torque threshold 3 74: Over-torque threshold 4 75: Forward operation status 76: Reverse operation status			
F6-04	DO Terminal Valid Logic	0000H~FFFFH	0	☆	0604
F6-05	Source of DO Output AI	0: AI1 1: AI2 2: AI3	0	☆	0605
F6-06	DO Output AI Upper Limit Value	-100.00%~100.00%	50.00%	☆	0606
F6-07	DO Output AI Lower Limit Value	-100.00%~100.00%	10.00%	☆	0607
F6-08	DO Action Frequency	0.00Hz~599.00Hz	0.00Hz	☆	0608
F6-09	Motor Zero Speed Judgment Threshold	0rpm~65535rpm	0rpm	☆	0609
F6-13	AO1 Signal Type Selection	0: 0-10V Output Selection	0	☆	060D

Function Code	Name	Content	Default Value	Change	Communication Address
		1: 0-20mA Output Selection			
F6-14	AO1 output function selection	0: Output frequency (Hz) 1: Frequency command (Hz) 2: Motor operating frequency (Hz) 3: Output current (rms) 4: Output voltage 5: DC Bus Voltage 6: Power factor 7: Power 8: Output torque 9: AI1 percentage 10: AI2 percentage 11: AI3 percentage 12: Iq current command 13: Iq current feedback 14: Id current command 15: Id current feedback 16: Vq voltage command 17: Vd voltage command 18: Torque command 19: PG2 frequency command 20: CANopen analog output 21: RS485 analog output 22: Communication card analog output 23: Fixed voltage output	0	☆	060E
F6-15	AO1 output gain	0.0%~500.0%	100.0%	☆	060F
F6-16	AO1 reverse enable	0: Absolute value output 1: Negative value outputs as 0V 2: 5V as center point	0	☆	0610
F6-17	AO1 Output Bias	-100.00%~100.00%	0.00%	☆	0611
F6-18	AO1 Output Fixed Value	0.00%~100.00%	0.00%	☆	0612
F6-19	AO1 Filter Time	0.00s~20.00s	0.01s	☆	0613
F6-20	AO2 Signal Type Selection	0: 0-10V Output Selection 1: 0-20mA Output Selection	0	☆	0614
F6-21	AO2 Output Function Selection	0: Output frequency (Hz) 1: Frequency command (Hz) 2: Motor operating frequency (Hz) 3: Output current (rms) 4: Output voltage 5: DC Bus Voltage 6: Power factor 7: Power 8: Output torque 9: AI1 percentage 10: AI2 percentage 11: AI3 percentage 12: Iq current command 13: Iq current feedback 14: Id current command 15: Id current feedback 16: Vq voltage command 17: Vd voltage command 18: Torque command	0	☆	0615

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		19: PG2 frequency command 20: CANopen analog output 21: RS485 analog output 22: Communication card analog output 23: Fixed voltage output			
F6-22	AO2 Output Gain	0.0%~500.0%	100.0%	☆	0616
F6-23	AO2 Reverse Enable	0: Absolute value output 1: Negative value outputs as 0V 2: 5V as center point	0	☆	0617
F6-24	AO2 Output Bias	-100.00%~100.00%	0.00%	☆	0618
F6-25	AO2 Output Fixed Value	0.00%~100.00%	0.00%	☆	0619
F6-26	AO2 Filter Time	0.00s~20.00s	0.01s	☆	061A
F6-27	Frequency Reach 1 Detection Value	0.00Hz~599.00Hz	50.00Hz	☆	061B
F6-28	Frequency Reach 1 Amplitude	0.00Hz~599.00Hz	2.00Hz	☆	061C
F6-29	Frequency reaches 2 detection value	0.00Hz~599.00Hz	50.00Hz	☆	061D
F6-30	Frequency reaches 2 amplitude	0.00Hz~599.00Hz	2.00Hz	☆	061E
F7 group - auxiliary functions and keyboard display					
F7-00	JOG frequency setting	0.00Hz~599.00Hz	6.00Hz	☆	0700
F7-01	JOG acceleration time	0.00s~600.00s	10.00s	☆	0701
F7-02	JOG deceleration time	0.00s~600.00s	10.00s	☆	0702
F7-03	acceleration time 2	0.00s~600.00s	Model Confirmation	☆	0703
F7-04	deceleration time 2	0.00s~600.00s	Model Confirmation	☆	0704
F7-05	acceleration time 3	0.00s~600.00s	Model Confirmation	☆	0705
F7-06	deceleration time 3	0.00s~600.00s	Model Confirmation	☆	0706
F7-07	acceleration time 4	0.00s~600.00s	Model Confirmation	☆	0707
F7-08	Deceleration Time 4	0.00s~600.00s	Model Confirmation	☆	0708
F7-09	Jump Frequency 1 Upper Limit	0.00Hz~599.00Hz	0.00Hz	☆	0709
F7-10	Jump Frequency 1 Lower Limit	0.00Hz~599.00Hz	0.00Hz	☆	070A
F7-11	Jump Frequency 2 Upper Limit	0.00Hz~599.00Hz	0.00Hz	☆	070B
F7-12	Jump Frequency 2 Lower Limit	0.00Hz~599.00Hz	0.00Hz	☆	070C
F7-13	Jump Frequency 3 Upper Limit	0.00Hz~599.00Hz	0.00Hz	☆	070D
F7-14	Jump frequency 3 lower limit	0.00Hz~599.00Hz	0.00Hz	☆	070E
F7-15	PMLESS jump frequency upper limit	0.00Hz~599.00Hz	0.00Hz	☆	070F
F7-16	PMLESS jump frequency lower limit	0.00Hz~599.00Hz	0.00Hz	☆	0710

Function Code	Name	Content	Default Value	Change	Communication Address
F7-17	Fan control method	0: Fan runs continuously 1: Stop after 1 minute STOP 2: Stops with the inverter 3: Starts when temperature reaches 50 degrees 4: Stops when temperature falls below 50 degrees	4	☆	0711
F7-18	Reserved	0%~100%	60%	☆	0712
F7-19	Keyboard STOP key enable	0: Disabled 1: Enable	0	☆	0713
F7-20	Startup screen selection	0: Set frequency display 1: Output frequency display 2: User-defined display 3: Output current display	0	☆	0714
F7-21	Page display selection	0: Output current 1: PG card feedback frequency 2: Motor actual operating frequency 3: DC Bus Voltage 4: Output voltage 5: Power factor angle 6: Output power 7: Actual motor operating speed 8: Output torque % 9: PG feedback value 10: PID feedback value % 11: AI1 % 12: AI2 % 13: AI3 % 14: IGBT temperature 15: Ambient temperature 16: Digital input terminal status 17: Digital output terminal status 18: Multi-speed status 19: CPU input terminal status 20: CPU output terminal status 21: Actual motor position 22: Pulse input frequency value 23: Pulse input position 24: Position tracking error 25: Overload count value 26: Ground short-circuit current threshold 27: Bus voltage fluctuation value 29: PM motor pole sector 30: User physical quantity 31: H page value multiplied by coefficient K 32: Encoder Z phase count 33: Motor pulse count	3	☆	0715

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		34: Reserved 35: Speed/torque mode 36: Current carrier frequency 37: Reserved 38: Inverter status 39: Output torque Nt-m 40: Torque command 41: kWh 42: PID target value 43: PID compensation 44: PID output frequency 45: Reserved 46: Auxiliary frequency 47: Main frequency 48: Set frequency display 49: Reserved 50: Reserved 51: PMVVC torque compensation amount 52: AI10 % 53: AI11 % 54: Reserved 55: Current roll diameter 56: Current line speed 57: Tension reference value 58: MI6 count value 59: U phase current AD value 60: V phase current AD value 61: W-phase current AD value			
F7-22	H page display gain	0.00~160.00	0.00	☆	0716
F7-23	FM terminal function selection	0: Operating frequency 1: Set frequency 2: Output current 3: Output voltage 4: Output power 5: AI1 value 6: AI2 value 7: AI3 value 8: Output torque absolute value 9: Motor speed 10: Bus Voltage	0	☆	0717
F7-24	FMP Output Maximum Frequency	1.00%~100.00%	50.00%	☆	0718
F7-25	IGBT Temperature Bias	0.0°C~6553.5°C	0.0°C	☆	0719
F7-26	Cumulative Start-up Times	0~65535	0	●	071A
F7-27	Cumulative Start-up Days	0~65535	0	●	071B
F7-28	Cumulative Operating Minutes	0~1439	0	●	071C
F7-29	Cumulative Operating Days	0~65535	0	●	071D
F7-30	Cumulative Running Minutes	0~65535	0	●	071E
F7-31	Motor Running Time	0min~1439min	0min	☆	071F

Function Code	Name	Content	Default Value	Change	Communication Address
F7-32	Motor Running Days	0~65535	0	☆	0720
F7-33	Password Input	0~65535	0	☆	0721
F7-34	Password Setting	0~65535	0	☆	0722
F7-35	Automatic Energy Saving Setting	0: Disabled 1: Enable	0	☆	0723
F7-36	Energy Saving Gain	10~1000	100	☆	0724
F7-37	Automatic Voltage Regulation	0: Enable AVR Function 1: Disable AVR Function 2: Disable AVR During Deceleration	0	☆	0725
F7-38	Current Display Filter	0.001s~65.535s	0.100s	☆	0726
F7-39	Display Filter Time	0.001s~65.535s	0.100s	☆	0727
F7-40	Soft Start Switch Delay Time	0~65535	7000	☆	0728
F7-41	Operating Frequency Deviation Dead Zone	0.00~599.00	0.00	☆	0729
F7-42	Output Phase Sequence Switching	0: Output Phase Sequence Switching 1: Output Phase Sequence Switching	0	☆	072A
F7-46	CANopen Quick Stop Time	0.00s~600.00s	1.00s	☆	072E
F7-47	Y-D Switching Frequency	0.00Hz~599.00Hz	60.00Hz	☆	072F
F7-48	Y-D Switching Enable	0: Disabled 1: Enable	0	☆	0730
F7-49	Y-D Switching Time	0.000s~60.000s	0.200s	☆	0731
F7-50	ICT Test Dedicated	0~65535	0	☆	0732
F7-51	Electromagnetic Switch Check Value	0~65535	200	☆	0733
F7-52	W-sec Low Byte	0.0~6553.5	0.0	●	0734
F7-53	W-sec High Byte	0.0~6553.5	0.0	●	0735
F7-54	W-hrs	0.0~6553.5	0.0	●	0736
F7-55	KWh Low Byte	0.0~6553.5	0.0	●	0737
F7-56	KWh High Byte	0.0~6553.5	0.0	●	0738
F7-57	Software Version (H)	0.00~655.35	\	●	0739
F7-58	Software Version (L)	0.00~655.35	\	●	073A
F7-59	Software Release Date	0~65535	\	●	073B
F7-60	PG Card Software Version	0.00~655.35	0.00	●	073C
F7-61	Enhanced Parameter	0~1	1	☆	073D
F7-62	High Four Bits of Serial	0~65535	\	●	073E
F7-63	Low Three Bits of Serial	0~65535	\	●	073F
F7-64	Language Setting	0: Simplified Chinese 1: English	\	●	0740
F7-65	Page Display Selection 2	Same as F7-21	2	☆	0741
F8 Group - Communication Parameters					
F8-00	Baud Rate Setting	4.8kbps~115.2kbps	115.2kbps	☆	0800

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
F8-01	Communication Data Format	1: 7,N,2 for ASCII 2: 7,E,1 for ASCII 3: 7,O,1 for ASCII 4: 7,E,2 for ASCII 5: 7,O,2 for ASCII 6: 8,N,1 for ASCII 7: 8,N,2 for ASCII 8: 8,E,1 for ASCII 9: 8,O,1 for ASCII 10: 8,E,2 for ASCII 11: 8,O,2 for ASCII 12: 8,N,1 for RTU 13: 8,N,2 for RTU 14: 8,E,1 for RTU 15: 8,O,1 for RTU 16: 8,E,2 for RTU 17: 8,O,2 for RTU	12	☆	0801
F8-02	Communication Address	1~254	1	☆	0802
F8-03	Response Delay	0.0ms~200.0ms	2.0ms	☆	0803
F8-04	Communication timeout	0.0s~100.0s	0.0s	☆	0804
F8-05	Communication error handling	0: Warning and continue running 1: Warning and decelerate to stop 2: Warning and free stop 3: No warning	3	☆	0805
F8-06	Communication given	0.00Hz~599.00Hz	0.00Hz	●	0806
F8-07	Communication decoding method	0: Use 20XX 1: Use 60XX	1	☆	0807
F8-09	Communication Card Type	0: No Communication Card 1: DeviceNet 2: Profibus-DP 3: CANopen 4: Modbus-TCP 5: EtherNet/IP 6: EtherCAT 7: LonWorks 8: BACNet 9: Reserved 10: 24V Power Supply 11: DMCnet 12: PROFINET	0	●	0809
F8-10	Communication Card Version	0.0~6553.5	0.0	●	080A
F8-11	Communication Card Address	0~65535	0	●	080B
F8-12	Communication Card Speed	0~65535	0	☆	080C
F8-13	Speed Enable Setting	0~65535	0	☆	080D
F8-14	CANopen Node Address	0~127	0	☆	080E

Function Code	Name	Content	Default Value	Change	Communication Address
F8-15	CAN Bus Communication Speed	0: 1Mbps 1: 500kbps 2: 250kbps 3: 125kbps 4: 100kbps 5: 50kbps	0	☆	080F
F8-16	Reserved	0~65535	2	☆	0810
F8-17	Reserved	0.00~2.00	1.00	☆	0811
F8-18	CANopen warning record	0~65535	0	●	0812
F8-19	CiA402 protocol selection	0: Disabled 1: Enable	0	☆	0813
F8-20	CANopen Communication Status	0: Node Reset State 1: Communication Reset State 2: Reset Completed State 3: Pre-operational State 4: Operational State 5: Stopped State	0	●	0814
F8-21	CiA402 Operating State	0: Power-up Not Completed State 1: Operation Prohibited State 2: Pre-magnetization State 3: Magnetization State 4: Operation Permitted State 5: No Function 6: No Function 7: Quick Stop State 8: No Function 9: No Function 10: No Function 11: No Function 12: No Function 13: Trigger Error Action Status 14: Error Status	0	●	0815
F8-22	CANopen Index Reset	0000H~FFFFH	65535	☆	0816
F8-24	Product Code	0~65535	0	●	0818
F8-25	Error Code	0~65535	0	●	0819
F8-26	Communication Card DHCP Enable	0~1	0	☆	081A
F8-27	Communication Card IP 1	0~255	0	☆	081B
F8-28	Communication Card IP 2	0~255	0	☆	081C
F8-29	Communication Card IP 3	0~255	0	☆	081D
F8-30	Communication Card IP 4	0~255	0	☆	081E
F8-31	Communication Card Subnet Mask 1	0~255	0	☆	081F
F8-32	Communication Card Mask 2	0~255	0	☆	0820
F8-33	Communication Card Mask 3	0~255	0	☆	0821
F8-34	Communication Card Mask 4	0~255	0	☆	0822

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
F8-35	Communication Card Gateway 1	0~255	0	☆	0823
F8-36	Communication Card Gateway 2	0~255	0	☆	0824
F8-37	Communication Card Gateway 3	0~255	0	☆	0825
F8-38	Communication Card Gateway 4	0~255	0	☆	0826
F8-39	Communication Card Low Byte Password	0~99	0	☆	0827
F8-40	Communication Card High Byte Password	0~99	0	☆	0828
F8-41	Communication Card Reset	0~65535	0	☆	0829
F8-42	Communication Card Setup	0000H~FFFFH	0	☆	082A
F8-43	Communication Card Status	0000H~FFFFH	0	●	082B
F8-44	Reserved	0: Disabled	0	☆	082C
F8-45	Reserved	0~127	100	☆	082D
F8-46	Reserved	0~65535	0	●	082E
F8-47	Reserved	0~65535	1	☆	082F
F8-48	Communication Card Debugging Parameters	0~65535	0	☆	0830
F9 Group - Faults and Protection					
F9-00	Protection Control Bit	0000h~FFFFh	0000h	☆	0900
F9-01	Motor 1 Overload Selection	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	2	☆	0901
F9-02	Motor 1 Overload Time	30.0s~600.0s	60.0s	☆	0902
F9-03	Oversvoltage Stall Mode	0: Oversvoltage Stall Mode 0 1: Oversvoltage Stall Mode 1 2: Oversvoltage Stall Mode 2 3: Oversvoltage Stall Mode 3	1	☆	0903
F9-04	oversvoltage stall threshold	0.0V~900.0V	760.0V	☆	0904
F9-05	oversvoltage stall deceleration time	0.00s~655.35s	600.00s	☆	0905
F9-06	undervoltage fault automatic reset	0: Disabled 1: Enable	0	☆	0906
F9-07	maximum current limit	0%~250%	150%	☆	0907
F9-08	Acceleration OC Stall Threshold	0%~200%	180%	☆	0908
F9-09	Overcurrent Stall Limit Threshold	0%~100%	100%	☆	0909
F9-10	Running OC Stall Threshold	0%~200%	180%	☆	090A

Function Code	Name	Content	Default Value	Change	Communications Address
F9-11	Constant Speed OC Acceleration/Deceleration Selection	0: System Acceleration/Deceleration Time 1: First Acceleration/Deceleration Time 2: Second Acceleration/Deceleration Time 3: Third Acceleration/Deceleration Time 4: Fourth Acceleration/Deceleration Time 5: Automatic Acceleration/Deceleration Time	0	☆	090B
F9-12	Input Phase Loss Action Selection	0: Warning and decelerate to stop 1: Warning and free stop	0	☆	090C
F9-13	Input Phase Loss Filter Time	0.00s~600.00s	0.20s	☆	090D
F9-14	Input Phase Loss Voltage Threshold	0.0V~320.0V	60.0V	☆	090E
F9-15	Output Phase Loss Action Selection	0: Warning and continue running 1: Warning and decelerate to stop 2: Warning and free stop 3: No warning	3	☆	090F
F9-16	Output Phase Loss Detection Time	0.000s~65.535s	7.5kw and above 0.500; 5.5kW and below 0.100;	☆	0910
F9-17	Output Phase Loss Current Threshold	0.00%~100.00%	7.5kw and above 2.00; 5.5kW and below 6.00;	☆	0911
F9-18	Output Phase Loss Braking Time	0.000s~65.535s	0.000s	☆	0912
F9-19	Ground Short Circuit Test Times	1~20	10	☆	0913
F9-20	Ground Fault Current Threshold	0.0%~6553.5%	60.0%	☆	0914
F9-21	Ground Fault Filter Time	0.00s~655.35s	0.10s	☆	0915
F9-22	Low Current Set Threshold	0.0%~100.0%	0.0%	☆	0916

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
F9-23	Low Current Detection Time	0.00s~360.00s	0.00s	☆	0917
F9-24	Low Current Action Method	0: No Function 1: Alarm and Free Stop 2: Alarm for second deceleration stop 3: Alarm and continue running	0	☆	0918
F9-25	Excessive slip detection value	0.0%~100.0%	0.0%	☆	0919
F9-26	Excessive slip detection time	0.0s~10.0s	1.0s	☆	091A
F9-27	Excessive slip action selection	0: Warning and continue running 1: Warning and decelerate to stop 2: Warning and free stop 3: No warning	0	☆	091B
F9-28	PG feedback error action	0: Warning and continue running 1: Warning and deceleration stop 2: Warning and Free Stop	2	☆	091C
F9-29	PG Feedback Error Time	0.0s~10.0s	1.0s	☆	091D
F9-30	PG Feedback Overspeed Threshold	0%~120%	115%	☆	091E
F9-31	PG Feedback Overspeed Time	0.0s~2.0s	0.1s	☆	091F
F9-32	PG Feedback Overspeed Action	0: Warning and continue running 1: Warning and deceleration stop 2: Warning and Free Stop	2	☆	0920
F9-33	PG Feedback Deviation Range	0%~50%	50%	☆	0921
F9-34	PG Feedback Deviation Time	0.0s~10.0s	0.5s	☆	0922
F9-35	PG Feedback Deviation Action	0: Warning and continue running 1: Warning and deceleration stop 2: Warning and Free Stop	2	☆	0923
F9-36	Over Torque Selection 1	0: Not Detected 1: Constant Speed Detection Continue Running 2: Constant Speed Detection Stop Running 3: Running Detection Continue Running 4: Running Detection Stop Running	0	☆	0924
F9-37	Over-torque threshold 1	10%~250%	120%	☆	0925
F9-38	Over-torque time 1	0.1s~60.0s	0.1s	☆	0926
F9-39	Reserved	0~65535	0	●	0927
F9-40	Reserved	0~65535	0	★	0928

Function Code	Name	Content	Default Value	Change	Communication Address
F9-41	Reserved	0~65535	0	☆	0929
F9-42	Reserved	0~65535	0	☆	092A
F9-43	Reserved	0~65535	0	☆	092B
F9-44	Reserved	0~65535	0	☆	092C
F9-45	Reserved	0~65535	0	☆	092D
F9-46	Abnormal Start Count	0~10	0	☆	092E
F9-47	Abnormal Restart Reset Time	0.0s~6000.0s	60.0s	☆	092F
F9-48	PTC Action Selection	0: Warning and continue running 1: Warning and decelerate to stop 2: Warning and free stop 3: No warning	0	☆	0930
F9-49	PTC Threshold	0.0%~100.0%	50.0%	☆	0931
F9-50	PT Detection Threshold 1	0.000V~10.000V	5.000V	☆	0932
F9-51	PT Detection Threshold 2	0.000V~10.000V	7.000V	☆	0933
F9-52	PT Voltage 1 Protection Frequency	0.00Hz~599.00Hz	0.00Hz	☆	0934
F9-53	PT Action Delay Time	0s~6000s	60s	☆	0935
F9-54	STO Lock Function	0: Locked 1: Unlocked	0	☆	0936
F9-55	Reserved	0~65535	40	☆	0937
F9-56	Reserved	0~65535	0	☆	0938
F9-57	Output Phase Loss Threshold 2	0.00%~100.00%	2.00%	☆	0939
F9-58	Overvoltage Stall Recovery Threshold	0.0V~900.0V	630.0V	☆	093A
FA Group - PID Function					
FA-00	PID Feedback Type Selection	0: No Function 1: Negative Feedback Analog Input 2: Negative Feedback Pulse No Direction 3: Negative Feedback Pulse With Direction 4: Positive Feedback Analog Input 5: Positive Feedback Pulse No Direction 6: Positive Feedback Pulse With Direction 7: Negative Feedback Communication Input 8: Positive Feedback Communication Input	0	☆	0A00
FA-01	PID Setpoint Source Selection	0: Frequency Command 1: Parameter FA-02 2: RS485 Communication 3: Analog Input 4: CANopen	1	☆	0A01

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		5: Retain 6: Communication Card			
FA-02	PID Setpoint	-100.00%~100.00%	50.00%	☆	0A02
FA-03	PID Setpoint Change Time	0.00s~655.35s	0.00s	☆	0A03
FA-04	PID Feedback Filter Time	0.1s~300.0s	5.0s	☆	0A04
FA-05	Proportional Coefficient 1	0.00%~100.00%	88.00%	☆	0A05
FA-06	Integral Time 1	0.00s~100.00s	0.05s	☆	0A06
FA-07	Differential Time 1	0.00s~1.00s	0.00s	☆	0A07
FA-08	Proportional Coefficient 2	0.00~100.00	100.00	☆	0A08
FA-09	Integral Time 2	0.00s~100.00s	0.08s	☆	0A09
FA-10	Differential Time 2	0.00s~1.00s	0.00s	☆	0A0A
FA-11	PID Series/Parallel Selection	0: Kp, Kp*Ki, Kp*Kd 1: Kp, Ki, Kd	1	☆	0A0B
FA-12	PID Control Execution Cycle	0~1	0	☆	0A0C
FA-13	PID Parameter Switching Conditions	0: No Function 1: Switch Based on Output Frequency 2: Switch Based on PID Deviation	0	☆	0A0D
FA-14	PID Parameter Switching err1	0.00%~100.00%	10.00%	☆	0A0E
FA-15	PID Parameter Switching Error 2	0.00%~100.00%	40.00%	☆	0A0F
FA-16	Allow PID Reverse Delay	0.0s~6553.5s	0.0s	☆	0A10
FA-17	PID Direction Change Selection	0: Disabled 1: Enable	0	☆	0A11
FA-18	Feedback Suppression Deviation Rate	0%~65535%	10%	☆	0A12
FA-19	Feedback Suppression Gain	0~1000	800	☆	0A13
FA-20	PID Compensation Selection	0: Parameter Setting 1: Analog Input	0	☆	0A14
FA-21	PID Compensation Value	-100.0~100.0	0.0	☆	0A15
FA-22	PID Deviation Deadband Limit	0.00%~100.00%	0.06%	☆	0A16
FA-23	PID Control Deviation Limit	0.00%~100.00%	0.00%	☆	0A17
FA-24	Integral Separation Level	0.00%~100.00%	0.00%	☆	0A18
FA-25	Integral Upper Limit	0.00%~100.00%	100.0%	☆	0A19
FA-26	Wake-up Integral Limit	0.0%~200.0%	50.0%	☆	0A1A
FA-27	Main Auxiliary Reverse Cut-off Frequency	0.00%~100.00%	10.0%	☆	0A1B
FA-28	PID Output Positive Limit	0.00%~100.00%	100.0%	☆	0A1C
FA-29	PID Output Negative Limit	0.00%~100.00%	100.0%	☆	0A1D
FA-30	PID output frequency reference	0~1	0	☆	0A1E
FA-31	PID output filter time	0.0s~2.5s	0.0s	☆	0A1F
FA-32	soft start-PID switch value	0.00%~100.00%	5.00%	☆	0A20
FA-33	soft start frequency	0.00Hz~599.00Hz	0.00Hz	☆	0A21
FA-34	soft start acceleration time	0.00s~600.00s	3.00s	☆	0A22
FA-35	No-load Current	0.00A~655.35A	0.00A	☆	0A23
FA-36	Soft Start Acceleration	0.00s~600.00s	0.10s	☆	0A24

Function Code	Name	Content	Default Value	Change	Communication Address
	Step				
FA-37	Fuzzy PID Tuning Enable	0: Fuzzy PID Tuning Disabled 1: Fuzzy PID Tuning Enabled	1	☆	0A25
FA-38	Deviation Fuzzy Universe of Discourse - NB	0.00~100.00	5.00	☆	0A26
FA-39	Deviation Fuzzy Domain-NS	0.00~100.00	2.00	☆	0A27
FA-40	Deviation Fuzzy Domain-PS	0.00~100.00	2.00	☆	0A28
FA-41	Deviation Fuzzy Domain-PB	0.00~100.00	5.00	☆	0A29
FA-42	Deviation Rate Fuzzy Domain-NB	0.00~100.00	10.00	☆	0A2A
FA-43	Deviation Rate Fuzzy Domain-NS	0.00~100.00	5.00	☆	0A2B
FA-44	Deviation Rate Fuzzy Domain-PS	0.00~100.00	5.00	☆	0A2C
FA-45	Fuzzy Set of Deviation Rate PB	0.00~100.00	10.00	☆	0A2D
FA-46	Fuzzy PID Inference Rules	0~3	2	☆	0A2E
FA-47	Intermediate Value of Fuzzy Rule KP	0~100	50	☆	0A2F
FA-48	Intermediate Value of Fuzzy Rule KI	0~100	50	☆	0A30
FA-49	Feedback Abnormality Detection Time	0.0s~3600.0s	0.0s	☆	0A31
FA-50	Feedback Disconnection Action Selection	0: Warning and continue running 1: Warning and deceleration stop 2: Warning and Free Stop 3: Run at the Frequency Before Disconnection	0	☆	0A32
FA-51	PID Feedback Abnormal Deviation	1.0%~50.0%	10.0%	☆	0A33
FA-52	Abnormal Deviation Detection Time	0.1s~300.0s	5.0s	☆	0A34
FA-53	PID Control Flag	0~65535	2	☆	0A35
FA-54	PID Feedback Disconnection Threshold	0.00%~100.00%	0.00%	☆	0A36
FB Group - Tension Control Parameters					
FB-00	Tension Control Mode Selection	0~4	0	☆	0B00
FB-01	Curling Mode	0~1	0	☆	0B01
FB-02	Load Side Mechanical Gear A	1~65535	100	☆	0B02
FB-03	Load Side Mechanical Gear B	1~65535	100	☆	0B03
FB-04	PID Setpoint Source Selection	0~2	0	☆	0B04
FB-05	PID Target Setpoint	0.0%~100.0%	50.0%	☆	0B05
FB-06	PID Feedback Source Selection	0~1	0	☆	0B06
FB-07	PID Parameter Adjustment Basis	0~3	0	★	0B07

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
FB-08	PID Proportional Coefficient 1	0.0~1000.0	50.0	☆	0B08
FB-09	PID Integral Time 1	0.00s~500.00s	1.00s	☆	0B09
FB-10	PID Proportional Coefficient 2	0.0~1000.0	50.0	☆	0B0A
FB-11	PID Integral Time 2	0.00s~500.00s	1.00s	☆	0B0B
FB-12	PID Output Positive/Negative Selection	0~1	0	★	0B0C
FB-13	PID Output Positive Limit	0.00%~100.00%	20.00%	★	0B0D
FB-14	PID Output Negative Limit	0.00%~100.00%	20.00%	★	0B0E
FB-15	PID Feedback Upper Limit Value	0.0%~100.0%	100.0%	★	0B0F
FB-16	PID Feedback Lower Limit	0.0%~100.0%	0.0%	★	0B10
FB-17	Linear Speed Input Source	0~5	0	★	0B11
FB-18	Maximum Linear Speed	0.00~650.00	100.00	★	0B12
FB-19	Minimum Linear Speed	0.00~650.00	0.00	★	0B13
FB-20	Pulses per Meter	0.0~6500.0	0.0	★	0B14
FB-21	current linear speed	0.00~650.00	0.00	★	0B15
FB-22	linear speed filter time	0.00s~100.00s	0.10s	☆	0B16
FB-23	linear speed acceleration time	0.00s~655.35s	0.00s	☆	0B17
FB-24	linear speed deceleration time	0.00s~655.35s	0.00s	☆	0B18
FB-25	winding diameter calculation method selection	0~5	0	☆	0B19
FB-26	Maximum Roll Diameter	1.0mm~6000.0mm	500.0mm	☆	0B1A
FB-27	Empty Roll Diameter	1.0mm~6000.0mm	100.0mm	☆	0B1B
FB-28	Initial Roll Diameter Selection	0~1	0	★	0B1C
FB-29	Initial Roll Diameter 0	0.0mm~6000.0mm	100.0mm	★	0B1D
FB-30	Initial Roll Diameter 1	0.0mm~6000.0mm	100.0mm	★	0B1E
FB-31	Initial Roll Diameter 2	0.0mm~6000.0mm	100.0mm	★	0B1F
FB-32	Pulses per Revolution	1ppr~60000ppr	1ppr	★	0B20
FB-33	Number of Coils per Layer	1~10000	1	★	0B21
FB-34	Material Thickness	0.001~65.000	0.001	★	0B22
FB-35	Roll Diameter Filter Time	0.00s~100.00s	1.00s	☆	0B23
FB-36	Roll Diameter Compensation Enable	0~1	0	★	0B24
FB-37	Roll Diameter Calculation Delay Time	0.0s~6553.5s	0.0s	☆	0B25
FB-38	Current Roll Diameter	1.0~6553.5	100.0	●	0B26
FB-39	Minimum Frequency for Roll Diameter Calculation	0.00Hz~599.00Hz	1.00Hz	☆	0B27
FB-40	Pre-drive Mode Selection	0~2	0	★	0B28
FB-41	Pre-drive/PID Switching Point	0.0%~100.0%	15.0%	★	0B29
FB-42	soft start frequency	0.00Hz~599.00Hz	2.00Hz	★	0B2A
FB-43	soft start acceleration time	0.00s~600.00s	3.00s	☆	0B2B
FB-44	Broken Belt Detection Selection	0~1	0	☆	0B2C

Function Code	Name	Content	Default Value	Change	Communication Address
FB-45	Minimum Line Speed for Broken Belt Detection	0.0~3000.0	0.0	★	0B2D
FB-46	Belt Breakage Detection Roll Diameter Change	1.0mm~6000.0mm	100.0mm	★	0B2E
FB-47	Belt Breakage Detection Time	0.00s~100.00s	1.00s	★	0B2F
FB-48	Tension Feedback Error Level	0%~100%	100%	★	0B30
FB-49	Tension Error Detection Time	0.0s~10.0s	0.5s	★	0B31
FB-50	Tension Error Abnormal Handling	0: Warning and Continue Running 1:Faultand Free Stop 2:Faultand Decelerate to Stop	0	★	0B32
FB-51	PID Output Gain	0.0~200.0	100.0	★	0B33
FB-52	Tension Reference Source Selection	0~1	0	★	0B34
FB-53	Maximum Tension Value	0~65535	0	★	0B35
FB-54	Tension Setpoint	0~65535	0	☆	0B36
FB-55	Zero-speed Tension Reference Source	0~2	0	★	0B37
FB-56	Zero-speed Tension Setpoint	0~65535	0	☆	0B38
FB-57	Zero Speed Tension Level	0.00%~100.00%	5.00%	☆	0B39
FB-58	Sliding Friction Compensation Tension	0.0%~100.0%	0.0%	☆	0B3A
FB-59	Material Inertia Compensation Coefficient	0~30000	0	☆	0B3B
FB-60	Acceleration Inertia Compensation Gain	0.0%~1000.0%	0.0%	☆	0B3C
FB-61	Inertia Compensation Filter Time	0.00~100.00	5.00	☆	0B3D
FB-62	Deceleration Inertia Compensation Gain	0.0%~1000.0%	0.0%	★	0B3E
FB-63	Tension Taper Curve Selection	0~4	0	★	0B3F
FB-64	Tension Taper Setting Source	0~1	0	★	0B40
FB-65	Taper Setting Value	0%~100%	0%	☆	0B41
FB-66	Taper Curve Compensation Value	0.0~6000.0	0.0	★	0B42
FB-67	Taper Calculation Roll Diameter 1	1.0~6000.0	6000.0	★	0B43
FB-68	taper calculation roll diameter 2	1.0~6000.0	6000.0	★	0B44
FB-69	multi-segment taper value 1	0~100	0	☆	0B45
FB-70	multi-segment taper value 2	0~100	0	☆	0B46
FB-71	pre-drive frequency gain	-50.0%~50.0%	0.0%	☆	0B47
FB-72	pre-drive acceleration time	0.00s~655.35s	0.00s	☆	0B48
FB-73	pre-drive deceleration time	0.00s~655.35s	0.00s	☆	0B49
FB-74	speed limit gain	0.0s~6553.5s	100.0s	☆	0B4A
FB-75	soft start/PI switch LSErr	0~100	5	★	0B4B

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Function Code	Name	Content	Default Value	Change	Communication Address
FB-76	soft start/PI switch LS1	0.0%~10.0%	0.4%	★	0B4C
FB-77	soft start/PI switch LS2	0.0%~10.0%	0.7%	★	0B4D
FB-78	Soft Start/PI Switch 1 Setting	0.0~40.0%	2.0%	★	0B4E
FB-79	Unwinding Soft Start PI Switch Point	0.0~40.0%	5.0%	★	0B4F
FB-80	Tension Control Flag	0000H~FFFFH	0	☆	0B50
FC Group - Position Control Parameters					
FC-00	P2P Position Mode	0: Relative P2P Position Control 1: Absolute P2P Position Control	0	★	0C00
FC-01	Return-to-Origin Mode Selection	0000H~FFFFH	0	☆	0C01
FC-02	Position Control Command Source	0: External Terminal Input 1: Reserved 2: RS485 Communication 3: CANopen 4: Reserved 5: Communication Expansion Card	0	☆	0C02
FC-03	First Segment Return-to-Origin Speed	0.00Hz~599.00Hz	8.00Hz	☆	0C03
FC-04	Second Segment Return-to-Origin Speed	0.00Hz~599.00Hz	2.00Hz	☆	0C04
FC-05	Machine tool application enable	0: Off 1: Enable	0	☆	0C05
FC-06	Error amount for searching Z point	0~65535	1	☆	0C06
FC-07	Position control acceleration time	0.00s~655.35s	1.00s	☆	0C07
FC-08	Position control deceleration time	0.00s~655.35s	3.00s	☆	0C08
FC-09	APR first deceleration frequency	0.00Hz~655.35Hz	5.00Hz	☆	0C09
FC-10	APR Second Deceleration Frequency	0.00Hz~655.35Hz	1.00Hz	☆	0C0A
FC-11	PG Disconnection Counter	0~65535	0	☆	0C0B
FC-12	Positioning Stiffness Adjustment Coefficient	0.10~10.00	1.00	★	0C0C
FC-13	Positioning Jitter Adjustment Coefficient	0.00~1.20	3.00	★	0C0D
FC-14	PG Low-Speed Filter	0Hz~2000Hz	1Hz	☆	0C0E
FC-15	Position Checkpoint 1 REV	-30000~30000	0	☆	0C0F
FC-16	Position Checkpoint 1 CNT	-32767~32767	0	☆	0C10
FC-17	Position Checkpoint 2 REV	-30000~30000	0	☆	0C11
FC-18	Position Checkpoint 2 CNT	-32767~32767	0	☆	0C12
FC-19	Position Control Error	0~65535	65535	☆	0C13
FC-20	Internal Positioning Command	-32767~32767	0	☆	0C14
FC-21	Feedback Position Arrival Error	0~65535	10	☆	0C15

Function Code	Name	Content	Default Value	Change	Communication Address
FC-22	Pulse Input Filter	0.000~65.535	0.100	☆	0C16
FC-23	Pulse Speed Mode	0: Electrical Frequency 1: Mechanical Frequency (Number of Pole Pairs)	0	★	0C17
FC-24	Position Loop Proportional Coefficient	0.00~40.00	8.00	☆	0C18
FC-25	Position Loop Feedforward Coefficient	0~100	30	☆	0C19
FC-26	Position Curve Time	0.00s~655.35s	3.00s	☆	0C1A
FC-27	P2P Maximum Frequency	0.00Hz~599.00Hz	10.00Hz	☆	0C1B
FC-28	Multi-Segment Position 1 (revs)	-30000~30000	0	☆	0C1C
FC-29	Multi-Segment Position 1 (pulse)	-32767~32767	0	☆	0C1D
FC-30	Multi-segment Position 2 (revs)	-30000~30000	0	☆	0C1E
FC-31	Multi-segment Position 2 (pulse)	-32767~32767	0	☆	0C1F
FC-32	Multi-segment Position 3 (revs)	-30000~30000	0	☆	0C20
FC-33	Multi-segment Position 3 (pulse)	-32767~32767	0	☆	0C21
FC-34	Multi-segment Position 4 (revs)	-30000~30000	0	☆	0C22
FC-35	Multi-segment Position 4 (pulse)	-32767~32767	0	☆	0C23
FC-36	Multi-segment Position 5 (revs)	-30000~30000	0	☆	0C24
FC-37	Multi-segment Position 5 (pulse)	-32767~32767	0	☆	0C25
FC-38	Multi-segment Position 6 (revs)	-30000~30000	0	☆	0C26
FC-39	Multi-segment Position 6 (pulse)	-32767~32767	0	☆	0C27
FC-40	Multi-segment Position 7 (revs)	-30000~30000	0	☆	0C28
FC-41	Multi-segment Position 7 (pulse)	-32767~32767	0	☆	0C29
FC-42	Multi-segment Position 8 (revs)	-30000~30000	0	☆	0C2A
FC-43	Multi-segment Position 8 (pulse)	-32767~32767	0	☆	0C2B
FC-44	Multi-segment Position 9 (revs)	-30000~30000	0	☆	0C2C
FC-45	Multi-segment Position 9 (pulse)	-32767~32767	0	☆	0C2D
FC-46	Multi-segment Position 10 (revs)	-30000~30000	0	☆	0C2E
FC-47	Multi-segment Position 10 (pulse)	-32767~32767	0	☆	0C2F
FC-48	Multi-segment Position 11(revs)	-30000~30000	0	☆	0C30
FC-49	Multi-segment Position 11(pulse)	-32767~32767	0	☆	0C31
FC-50	Multi-segment Position 12(revs)	-30000~30000	0	☆	0C32

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Function Code	Name	Content	Default Value	Change	Communication Address
FC-51	Multi-segment Position 12(pulse)	-32767~32767	0	☆	0C33
FC-52	Multi-segment Position 13(revs)	-30000~30000	0	☆	0C34
FC-53	Multi-segment Position 13(pulse)	-32767~32767	0	☆	0C35
FC-54	Multi-segment Position 14(revs)	-30000~30000	0	☆	0C36
FC-55	Multi-segment Position 14(pulse)	-32767~32767	0	☆	0C37
FC-56	Multi-segment Position 15(revs)	-30000~30000	0	☆	0C38
FC-57	Multi-segment Position 15(pulse)	-32767~32767	0	☆	0C39
FC-58	Multi-segment Position0(revs)	-30000~30000	0	☆	0C40
FC-59	Multi-segment Position0(pulse)	-32767~32767	0	☆	0C41
FD Group - Multi-speed and Simple PLC Function					
FD-00	Multi-Speed 0	-100.00~100.00%	0.00%	☆	0D00
FD-01	Multi-Speed 1	-100.00~100.00%	0.00%	☆	0D01
FD-02	Multi-Speed 2	-100.00~100.00%	0.00%	☆	0D02
FD-03	Multi-Speed 3	-100.00~100.00%	0.00%	☆	0D03
FD-04	Multi-Speed 4	-100.00~100.00%	0.00%	☆	0D04
FD-05	Multi-Speed 5	-100.00~100.00%	0.00%	☆	0D05
FD-06	Multi-speed 6	-100.00~100.00%	0.00%	☆	0D06
FD-07	Multi-speed 7	-100.00~100.00%	0.00%	☆	0D07
FD-08	Multi-speed 8	-100.00~100.00%	0.00%	☆	0D08
FD-09	Multi-speed 9	-100.00~100.00%	0.00%	☆	0D09
FD-10	Multi-speed 10	-100.00~100.00%	0.00%	☆	0D0A
FD-11	Multi-speed 11	-100.00~100.00%	0.00%	☆	0D0B
FD-12	Multi-Speed 12	-100.00~100.00%	0.00%	☆	0D0C
FD-13	Multi-Speed 13	-100.00~100.00%	0.00%	☆	0D0D
FD-14	Multi-Speed 14	-100.00~100.00%	0.00%	☆	0D0E
FD-15	Multi-Speed 15	-100.00~100.00%	0.00%	☆	0D0F
FD-16	PLC Operation Mode	0: Single Run Stop at End 1: Single Run Save at End 2: Continuous Run	0	☆	0D10
FD-17	PLC Power Failure Memory Selection	0: No Memory on Power Failure/Shutdown 1: Memory on Power Failure 2: Memory on Shutdown 3: Memory on Power Failure/Shutdown	0	☆	0D11
FD-18	PLC Operation Time Unit	0: Second 1: Hour	0	☆	0D12
FD-19	Multi-Speed 0 Command Setting	0: Function Code FD-00 Setting 1: AI 2: VR 3: Function Code F0-19 Given	0	☆	0D13
FD-20	PLC Segment 00 Running Time	0.0~6553.5	0.0	☆	0D14

Function Code	Name	Content	Default Value	Change	Communication Address
FD-21	PLC Segment 00 Acceleration/Deceleration Settings	0~3	0	☆	0D15
FD-22	PLC Segment 01 Running Time	0.0~6553.5	0.0	☆	0D16
FD-23	PLC Segment 01 Acceleration/Deceleration Settings	0~3	0	☆	0D17
FD-24	PLC Segment 02 Running Time	0.0~6553.5	0.0	☆	0D18
FD-25	PLC Segment 02 Acceleration/Deceleration Settings	0~3	0	☆	0D19
FD-26	PLC Segment 03 Operation Time	0.0~6553.5	0.0	☆	0D1A
FD-27	PLC Segment 03 Acceleration/Deceleration Settings	0~3	0	☆	0D1B
FD-28	PLC Segment 04 Operation Time	0.0~6553.5	0.0	☆	0D1C
FD-29	PLC Segment 04 Acceleration/Deceleration Settings	0~3	0	☆	0D1D
FD-30	PLC Segment 05 Operation Time	0.0~6553.5	0.0	☆	0D1E
FD-31	PLC Segment 05 Acceleration/Deceleration Settings	0~3	0	☆	0D1F
FD-32	PLC Segment 06 Operation Time	0.0~6553.5	0.0	☆	0D20
FD-33	PLC Segment 06 Acceleration/Deceleration Settings	0~3	0	☆	0D21
FD-34	PLC Segment 07 Operation Time	0.0~6553.5	0.0	☆	0D22
FD-35	PLC Segment 07 Acceleration/Deceleration Settings	0~3	0	☆	0D23
FD-36	PLC Segment 08 Operation Time	0.0~6553.5	0.0	☆	0D24
FD-37	PLC Segment 08 Acceleration/Deceleration Setting	0~3	0	☆	0D25
FD-38	PLC Segment 09 Operation Time	0.0~6553.5	0.0	☆	0D26
FD-39	PLC Segment 09 Acceleration/Deceleration Setting	0~3	0	☆	0D27
FD-40	PLC Segment 10 Operation Time	0.0~6553.5	0.0	☆	0D28
FD-41	PLC Segment 10 Acceleration/Deceleration Setting	0~3	0	☆	0D29
FD-42	PLC Segment 11 Operation Time	0.0~6553.5	0.0	☆	0D2A
FD-43	PLC Segment 11 Acceleration/Deceleration Setting	0~3	0	☆	0D2B

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
FD-44	PLC Segment 12 Operation Time	0.0~6553.5	0.0	☆	0D2C
FD-45	PLC Segment 12 Acceleration/Deceleration Setting	0~3	0	☆	0D2D
FD-46	PLC Segment 13 Operation Time	0.0~6553.5	0.0	☆	0D2E
FD-47	PLC Segment 13 Acceleration/Deceleration Setting	0~3	0	☆	0D2F
FD-48	PLC Segment 14 Operation Time	0.0~6553.5	0.0	☆	0D30
FD-49	PLC Segment 14 Acceleration/Deceleration Setting	0~3	0	☆	0D31
FD-50	PLC Segment 15 Operation Time	0.0~6553.5	0.0	☆	0D32
FD-51	PLC Segment 15 Acceleration/Deceleration Setting	0~3	0	☆	0D33
FD-52	PLC Current Work Step	0~15	0	●	0D34
FD-53	PLC Operation Time High Position	0000H~FFFFH	0	●	0D35
FD-54	PLC runtime low position	0000H~FFFFH	0	●	0D36
FE group - torque control parameters					
FE-00	Torque mode selection	0: TQCPG torque control IM 1: TQCPG torque control PM 2: IM open-loop torque control 3: SVC open-loop torque control	0	★	0E00
FE-01	Torque command source selection	0: Digital Operator 1: RS485 Communication 2: Analog signal input 3: CANopen 4: Reserved 5: Communication Expansion Card	0	☆	0E01
FE-02	Torque digital setting	-100.0%~100.0%	0.0%	☆	0E02
FE-03	Forward Torque Frequency Limit	0%~120%	110%	☆	0E03
FE-04	Reverse Torque Frequency Limit	0%~120%	110%	☆	0E04
FE-05	Torque Bias Selection	0: No Function 1: Analog Input 2: Parameter PE-06 Input 3: External Terminal Control	0	☆	0E05
FE-06	Torque Bias Value	-100.0%~100.0%	0.0%	☆	0E06
FE-07	High Torque Compensation	-100.0%~100.0%	30.0%	☆	0E07
FE-08	Intermediate torque compensation	-100.0%~100.0%	20.0%	☆	0E08
FE-09	Low torque compensation	-100.0%~100.0%	10.0%	☆	0E09

Function Code	Name	Content	Default Value	Change	Communication Address
FE-10	Maximum torque command	0~500	100	☆	0E0A
FE-11	Forward Motor Torque Upper Limit	0~500	500	●	0E0B
FE-12	Forward Braking Torque Upper Limit	0~500	500	●	0E0C
FE-13	Reverse Electric Torque Upper Limit	0~500	500	●	0E0D
FE-14	Reverse Braking Torque Upper Limit	0~500	500	●	0E0E
FE-15	Torque Filter Time	0.000s~1.000s	0.000s	☆	0E0F
FE-16	Torque Output Filter Gain	0.000s~65.535s	0.200s	☆	0E10
FE-17	Zero Torque Mode Selection	0: Torque Mode 1: Speed Mode	0	★	0E11
FF Group - Manufacturer Parameters					
FF-00	Reserved	0~65535	0	○	0F00
U0 Group - Fault Record Parameters					
U0-00	Fault Record 1	0~65535	0	●	1000
U0-01	Fault Record 2	0~65535	0	●	1001
U0-02	Fault Record 3	0~65535	0	●	1002
U0-03	Fault Record 4	0~65535	0	●	1003
U0-04	Fault Record 5	0~65535	0	●	1004
U0-05	Fault Record 6	0~65535	0	●	1005
U0-06	Fault Record 7	0~65535	0	●	1006
U0-07	Fault Record 8	0~65535	0	●	1007
U0-08	Fault Record 9	0~65535	0	●	1008
U0-09	Fault Record 10	0~65535	0	●	1009
U0-10	Fault Output 1	0~65535	0	☆	100A
U0-11	Fault Output 2	0~65535	0	☆	100B
U0-12	Fault Output 3	0~65535	0	☆	100C
U0-13	Fault output 4	0~65535	0	☆	100D
U0-14	Fault 1 - Motor speed	-32767rpm~32767rpm	0rpm	●	100E
U0-15	Fault 1 - Torque command	-3276.7~3276.7	0.0	●	100F
U0-16	Fault 1 - Input terminals	0000H~FFFFH	0	●	1010
U0-17	Fault 1 - Output terminals	0000H~FFFFH	0	●	1011
U0-18	Fault 1 - Inverter Status	0~65535	0	●	1012
U0-19	Fault 1 - Frequency Command Hz	0.00Hz~655.35Hz	0.00Hz	●	1013
U0-20	Fault 1 - Output Frequency	0.00Hz~599.00Hz	0.00Hz	●	1014
U0-21	Fault 1 - Output Voltage	0.0V~6553.5V	0.0V	●	1015
U0-22	Fault 1 - DC Voltage	0.0V~6553.5V	0.0V	●	1016
U0-23	Fault 1-Output Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	0.00A or 0.0A	●	1017
U0-24	Fault 1-IGBT Temperature	-3276.7°C to 3276.7°C	0.0°C	●	1018
U0-25	Fault 1-Capacitor Temperature	-3276.7°C to 3276.7°C	0.0°C	●	1019
U0-26	Fault 2-Output Frequency	0.00Hz~599.00Hz	0.00Hz	●	101A
U0-27	Fault 2-Direct Current Voltage	0.0V~6553.5V	0.0V	●	101B

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
U0-28	Fault 2-Output Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	0.00A or 0.0A	●	101C
U0-29	Fault 2 - IGBT Temperature	-3276.7°C to 3276.7°C	0.0°C	●	101D
U0-30	Fault 3 - Output Frequency	0.00Hz~599.00Hz	0.00Hz	●	101E
U0-31	Fault 3 - DC Voltage	0.0V~6553.5V	0.0V	●	101F
U0-32	Fault 3 - Output Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	0.00A or 0.0A	●	1020
U0-33	Fault 3 - IGBT Temperature	-3276.7°C to 3276.7°C	0.0°C	●	1021
U0-34	Fault 4 - Output Frequency	0.00Hz~599.00Hz	0.00Hz	●	1022
U0-35	Fault 4-Direct Current Voltage	0.0V~6553.5V	0.0V	●	1023
U0-36	Fault 4-Output Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	0.00A or 0.0A	●	1024
U0-37	Fault 4-IGBT Temperature	-3276.7°C to 3276.7°C	0.0°C	●	1025
U0-38	Fault 5-Output Frequency	0.00Hz~599.00Hz	0.00Hz	●	1026
U0-39	Fault 5-Direct Current Voltage	0.0V~6553.5V	0.0V	●	1027
U0-40	Fault 5-Output Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	0.00A or 0.0A	●	1028
U0-41	Fault 5-IGBT Temperature	-3276.7°C to 3276.7°C	0.0°C	●	1029
U0-42	Fault 6-Output Frequency	0.00Hz~599.00Hz	0.00Hz	●	102A
U0-43	Fault 6-Direct Current Voltage	0.0V~6553.5V	0.0V	●	102B
U0-44	Fault 6-Output Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	0.00A or 0.0A	●	102C
U0-45	Fault 6-IGBT Temperature	-3276.7°C to 3276.7°C	0.0°C	●	102D
U0-46	Number of Days Since Fault 1 Occurred	0~65535	0	●	102E
U0-47	Fault 1 Occurrence Minutes	0~1439	0	●	102F
U0-48	Fault 2 Occurrence Days	0~65535	0	●	1030
U0-49	Fault 2 Occurrence Minutes	0~1439	0	●	1031
U0-50	Fault 3 Occurrence Days	0~65535	0	●	1032
U0-51	Fault 3 Occurrence Minutes	0~1439	0	●	1033
U0-52	Fault 4 Occurrence Days	0~65535	0	●	1034

Function Code	Name	Content	Default Value	Change	Communication Address
U0-53	Minutes since Fault 4 occurred	0~1439	0	●	1035
U0-54	Days since Fault 5 occurred	0~65535	0	●	1036
U0-55	Minutes since Fault 5 occurred	0~1439	0	●	1037
U0-56	Days since Fault 6 occurred	0~65535	0	●	1038
U0-57	Minutes since Fault 6 occurred	0~1439	0	●	1039
U1 Group - Status Monitoring Parameters					
U1-00	DI terminal status	0000H~FFFFH	0	●	1100
U1-01	DO terminal status	0000H~FFFFH	0	●	1101
U1-02	Set frequency	0.00Hz~599.00Hz	50.00Hz	●	1102
U1-03	External frequency record	0.00Hz~599.00Hz	60.00Hz	●	1103
U1-04	PID feedback value	-200.00~200.00%	0.00%	●	1104
U1-05	KP gain monitoring value	0.00%~100.00%	88.00%	●	1105
U1-06	KI Gain Monitoring Value	0.00s~100.00s	0.05s	●	1106
U1-07	KD Gain Monitoring Value	0.00~1.00	0.00	●	1107
U1-08	Model Change Record	0~65535	0	☆	1108
U1-09	IO Card ID	0~13	0	●	1109
H0 Group - Other Motor Parameters					
H0-00	IM Motor Selection	1: Induction Motor 1 2: Induction Motor 2 3: Induction Motor 3 4: Induction Motor 4	1	★	1200
H0-01	M2 Maximum Frequency	0.00Hz~599.00Hz	50.00Hz	★	1201
H0-02	M2 Rated Frequency	0.00Hz~599.00Hz	50.00Hz	★	1202
H0-03	M2 Rated Voltage	0.0~510.0V	380.0	★	1203
H0-04	IM2 Rated Power	0.00kW~655.35kW	Model Confirmation	★	1204
H0-05	IM2 Number of Poles	2~20	Model Confirmation	●	1205
H0-06	IM2 Rated Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	H0-04 Confirm	★	1206
H0-07	IM2 Rated Speed	0rpm~65535rpm	H0-04 Confirm	★	1207
H0-08	IM2 No-load Current	0.00A~H0-06	Model Confirmation	★	1208
H0-09	IM2 Stator Resistance	0.000Ω~65.535Ω	Model Confirmation	★	1209
H0-10	IM2 Rotor Resistance	0.000Ω~65.535Ω	Model Confirmation	★	120A
H0-11	IM2 Mutual Inductance	0.0mH~6553.5mH	Model Confirmation	★	120B
H0-12	IM2 Leakage Inductance	0.00mH~655.35mH	Model Confirmation	★	120C
H0-13	M3 Maximum Frequency	0.00Hz~599.00Hz	50.00Hz	★	120D
H0-14	M3 Rated Frequency	0.00Hz~599.00Hz	50.00Hz	★	120E
H0-15	M3 Rated Voltage	0.0V~510.0V	380.0V	★	120F
H0-16	IM3 rated power	0.00kW~655.35kW	Model Confirmation	★	1210
H0-17	IM3 number of poles	2~20	Model Confirmation	●	1211
H0-18	IM3 rated current	0.00A~655.35A	H0-16 confirm	★	1212

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		(93kW and below) 0.0A~6553.5A (110kW and above)			
H0-19	IM3 rated speed	0rpm~65535rpm	H0-16 confirm	★	1213
H0-20	IM3 no-load current	0.00A~H0-18	Model Confirmation	★	1214
H0-21	IM3 stator resistance	0.000Ω~65.535Ω	Model Confirmation	★	1215
H0-22	M4 Maximum Frequency	0.00Hz~599.00Hz	50.00Hz	★	1216
H0-23	M4 Rated Frequency	0.00Hz~599.00Hz	50.00Hz	★	1217
H0-24	M4 Rated Voltage	0.0V~510.0V	380.0V	★	1218
H0-25	IM4 Rated Power	0.00kW~655.35kW	Model Confirmation	★	1219
H0-26	IM4 Number of Poles	2~20	Model Confirmation	●	121A
H0-27	IM4 Rated Current	0.00A~655.35A (93kW and below) 0.0A~6553.5A (110kW and above)	H0-25 Confirm	★	121B
H0-28	IM4 Rated Speed	0rpm~65535rpm	H0-25 Confirm	★	121C
H0-29	IM4 No-load Current	0.00A~H0-27	Model Confirmation	★	121D
H0-30	IM4 Stator Resistance	0.000Ω~65.535Ω	Model Confirmation	★	121E
H1 Group - Other Motor VF Control					
H1-00	M2 Multi-point VF Frequency Point 1	0.00Hz~599.00Hz	0.50Hz	★	1300
H1-01	M2 Multi-point VF Voltage Point 1	0.0V~480.0V	2.0V	☆	1301
H1-02	M2 Multi-point VF Frequency Point 2	0.00Hz~599.00Hz	1.50Hz	★	1302
H1-03	M2 Multi-point VF Voltage Point 2	0.0V~480.0V	10.0V	☆	1303
H1-04	M2 Multi-point VF Frequency Point 3	0.00Hz~599.00Hz	3.00Hz	★	1304
H1-05	M2 Multi-point VF Voltage Point 3	0.0V~480.0V	22.0V	☆	1305
H1-06	M2 Torque Compensation Gain	0~10	1	☆	1306
H1-07	M2 Slip Compensation Gain	0.00~10.00	0.00	☆	1307
H1-08	M3 Multi-point VF Frequency Point 1	0.00Hz~599.00Hz	0.50Hz	★	1308
H1-09	M3 Multi-point VF Voltage Point 1	0.0V~480.0V	2.0V	☆	1309
H1-10	M3 Multi-point VF Frequency Point 2	0.00Hz~599.00Hz	1.50Hz	★	130A
H1-11	M3 Multi-point VF Voltage Point 2	0.0V~480.0V	10.0V	☆	130B
H1-12	M3 Multi-point VF Frequency Point 3	0.00Hz~599.00Hz	3.00Hz	★	130C
H1-13	M3 Multi-point VF Voltage Point 3	0.0V~480.0V	22.0V	☆	130D
H1-14	M3 Torque Compensation Gain	0~10	1	☆	130E
H1-15	M3 Slip Compensation Gain	0.00~10.00	0.00	☆	130F

Function Code	Name	Content	Default Value	Change	Communication Address
H1-16	M4 Multi-point VF Frequency Point 1	0.00Hz~599.00Hz	0.50Hz	★	1310
H1-17	M4 Multi-point VF Voltage Point 1	0.0V~480.0V	2.0V	☆	1311
H1-18	M4 Multi-point VF Frequency Point 2	0.00Hz~599.00Hz	1.50Hz	★	1312
H1-19	M4 Multi-point VF Voltage Point 2	0.0V~480.0V	10.0V	☆	1313
H1-20	M4 Multi-point VF Frequency Point 3	0.00Hz~599.00Hz	3.00Hz	★	1314
H1-21	M4 Multi-point VF Voltage Point 3	0.0V~480.0V	22.0V	☆	1315
H1-22	M4 Torque Compensation Gain	0~10	1	☆	1316
H1-23	M4 Slip Compensation Gain	0.00~10.00	0.00	☆	1317
H2 Group - Other Motor Vector Control Parameters					
H2-00	Reserved	0~65535	0	●	1400
H3 Group - Other Motor Fault Parameters					
H3-00	Over-torque selection 2	0: Not Detected 1: Constant Speed Detection Continue Running 2: Constant Speed Detection Stop Running 3: Running Detection Continue Running 4: Running Detection Stop Running	0	☆	1500
H3-01	Over-torque threshold 2	10%~250%	120%	☆	1501
H3-02	Over-torque time 2	0.1s~60.0s	0.1s	☆	1502
H3-03	Motor 2 overload selection	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	2	☆	1503
H3-04	Motor 2 overload time	30.0s~600.0s	60.0s	☆	1504
H3-05	Over-torque selection 3	0: Not Detected 1: Constant Speed Detection Continue Running 2: Constant Speed Detection Stop Running 3: Running Detection Continue Running 4: Running Detection Stop Running	0	☆	1505
H3-06	Over-torque threshold 3	10%~250%	120%	☆	1506
H3-07	Over-torque time 3	0.1s~60.0s	0.1s	☆	1507
H3-08	Motor 3 overload selection	0: Constant Torque Output Motor 1: Variable Torque Output Motor	2	☆	1508

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
		2: No Motor Overload Protection			
H3-09	Motor 3 overload time	30.0s~600.0s	60.0s	☆	1509
H3-10	Over-torque selection 4	0: Not Detected 1: Constant Speed Detection Continue Running 2: Constant Speed Detection Stop Running 3: Running Detection Continue Running 4: Running Detection Stop Running	0	☆	150A
H3-11	Over-torque threshold 4	10%~250%	120%	☆	150B
H3-12	Over Torque Time 4	30.0s~600.0s	0.1s	☆	150C
H3-13	Motor 4 Overload Selection	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	2	☆	150D
H3-14	Motor 4 Overload Time	30.0s~600.0s	60.0s	☆	150E
L0 Group - System Control Parameters					
L0-00	APP MACRO	0~65535	0	☆	1600
L0-01	System Control Flag	0~65535	0	☆	1601
L0-02	Debugging Flag	0~65535	0	☆	1602
L0-03	Debug Flag 1	0~65535	64	☆	1603
L0-04	Reserved	0~65535	0	☆	1604
L0-05	System Control Parameters	0~65535	0	☆	1605
L0-06	Special Control Flags	0~65535	0	☆	1606
L0-07	Reserved	0~65535	0	★	1607
L0-08	Reserved	0~65535	0	☆	1608
L0-09	KPD Automatic Screen Refresh Enable	0~1	0	☆	1609
L0-10	KPD Screen Refresh Time Setting	0.00s~6.00s	0.15s	☆	160A
L0-11	Low Speed Debugging Position	0~65535	1	☆	160B
L1 Group - User Function Code Customization					
L1-00	Frequency Source Selection (HAND)	0: Digital Operator 1: RS485 Communication 2: Analog Input 3: External Up/Down Input 4: Pulse Input Without Direction 5: Pulse Input With Direction 6: CANopen Input 7: Reserved 8: Communication Card Input	0	★	1700

Function Code	Name	Content	Default Value	Change	Communication Address
		9: PID			
L1-01	Operation Command Source (HAND)	0: Digital Operator 1: External Terminal Input 2: RS485 Communication Input 3: CANopen Input 4: Reserved 5: Communication Card Input	0	★	1701
L1-02	LOC/REM Action Selection	0: Standard HOA Operation 1: L/R Does Not Maintain State 2: Maintain REM State 3: Maintain LOC State 4: Maintain REM/LOC State	0	★	1702
L2 Group - Optimized Control Parameters					
L2-00	PWM Mode Selection	0: DPWM Modulation Mode 1: Reserved 2: SVPWM Modulation Mode	2	★	1800
L2-01	PWM Seven/Five Segment Switching Point	0.00Hz~655.35Hz	15.00Hz	☆	1801
L2-02	PWM Mode Selection	0: SVPWM 66% DPWM 1 1: SVPWM 100% 2: SVPWM 66% 3: SPWM-DPWM 100% 4: SVPWM-DPWM 100% 5: SPWM 100% 6: SVPWM 66%-100%	0	★	1802
L2-03	PWM dead time value	0~666	133	☆	1803
L2-04	PWM narrow pulse width	0~333	66	☆	1804
L2-05	Reserved	0~1440	180	☆	1805
L2-06	Dead Time Compensation Mode	0~65535	5	☆	1806
L2-07	Dead Time Compensation Value	0~65535	180	☆	1807
L2-08	Tube Voltage Drop Compensation Value	0~65535	5	☆	1808
L2-09	Dead Time Compensation 4 Slope	0~65535	200	☆	1809
L2-10	Dead Time Compensation 5 Slope	0~65535	5000	☆	180A
L2-11	Dead-time Compensation Bias Value	-100.0%~100.0%	0.0%	☆	180B
L2-12	Dead-time Compensation Width	0~65535	512	☆	180C
L2-13	Dead-time Compensation Switching Point	0.00Hz~599.00Hz	0.00Hz	☆	180D
L2-14	Dead-time Compensation Filter	0~65535	50000	☆	180E
L2-15	Dead-time Compensation Identification Id	2000pu~65535pu	8000pu	☆	180F

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
L2-17	BrakingUnitStart Voltage	700.0V~900.0V	740.0V	☆	1811
L2-18	Undervoltage Protection Value	250.0V~440.0V	360.0V	☆	1812
L2-19	Zero Speed Operation Selection	0: Wait for Output 1: Zero Speed Position Control Output 2: Output at Minimum Frequency	0	★	1813
L2-20	Reserved	0~65535	0	●	1814
L2-21	Reserved	0~65535	0	●	1815
L2-22	Random PWM	0: Disable 1: Enable	0	★	1816
L2-23	Overmodulation Gain	80~120	100	☆	1817
L2-24	Back EMF Identification Frequency	0~1000%	50	●	1818
L3 Group - Master/Slave Control Parameters					
L3-00	Reserved	0~65535	0	●	1900
L4 Group - Brake Function Parameters					
L4-00	Brake Frequency	0.00~599.00Hz	0.00	☆	1A00
L4-01	Brake Control Enable Selection	0~1	0	☆	1A01
L4-02	Brake Release Frequency	0.00~20.00Hz	2.50	☆	1A02
L4-03	Brake Release Frequency Maintenance	0.0~20.0 seconds	1.0	☆	1A03
L4-04	Brake Current Limit Value	50~200%	120	☆	1A04
L4-05	Brake Close Frequency	0~20.00Hz	1.50	☆	1A05
L4-06	Brake Close Delay Time	0~20.0s	0.0	☆	1A06
L4-07	Brake Close Frequency Maintenance	0~20.0s	1.0	☆	1A07
L5 Group - Sleep Wake Function Parameters					
L5-00	Sleep Method Reference Selection	0: PID Command Arrival 1: PID Feedback Arrival	0	★	1B00
L5-01	Sleep Threshold	0.00Hz~599.00Hz	0.00Hz	☆	1B01
L5-02	Wake Threshold	0.00Hz~599.00Hz	0.00Hz	☆	1B02
L5-03	Sleep Delay	0.0s~6000.0s	0.0s	☆	1B03
L5-04	Wake Delay	0.00s~600.00s	0.00s	☆	1B04
L6 Group - Frequency Swinging, Fixed Length, and Counting					
L6-00	Final Count Value Setting	0~65500	0	☆	1C00
L6-01	Intermediate Count Value Setting	0~65500	0	☆	1C01
L6-02	Count Reached E.F Enable	0: Count Reached, No EF 1: Count Reached, EF	0	☆	1C02
L7 Group - AI Multi-point Curve Setting					
L7-00	AI Curve Selection	0: General Curve 1: AI1 Three-point Curve 2: AI2 Three-point Curve 3: AI1&AI2 Three-point	0	☆	1D00

Function Code	Name	Content	Default Value	Change	Communication Address
		Curve 4: AI3 Three-point Curve 5: AI1&AI3 Three-point Curve 6: AI2&AI3 Three-point Curve 7: AI123 Three-point Curve			
L7-01	AI1 Minimum Point Input Value	0.00~20.00	0.00	☆	1D01
L7-02	AI1 Minimum Point Percentage	0.00%~100.00%	0.00%	☆	1D02
L7-03	AI1 Midpoint Input Value	0.00~20.00	5.00	☆	1D03
L7-04	AI1 Midpoint Percentage	0.00%~100.00%	50.00%	☆	1D04
L7-05	AI1 Maximum Point Input Value	0.00~20.00	10.00	☆	1D05
L7-06	AI1 Maximum Point Percentage	0.00%~100.00%	100.00%	☆	1D06
L7-07	AI2 Minimum Point Input Value	0.00~20.00	0.00	☆	1D07
L7-08	AI2 Minimum Point Percentage	0.00%~100.00%	0.00%	☆	1D08
L7-09	AI2 Midpoint Input Value	0.00~20.00	5.00	☆	1D09
L7-10	AI2 Midpoint Percentage	0.00%~100.00%	50.00%	☆	1D0A
L7-11	AI2 Maximum Point Input Value	0.00~20.00	10.00	☆	1D0B
L7-12	AI2 Maximum Point Percentage	0.00%~100.00%	100.00%	☆	1D0C
L7-13	AI3 Minimum Point Input Value	0.00~20.00	0.00	☆	1D0D
L7-14	AI3 Minimum Point Percentage	0.00%~100.00%	0.00%	☆	1D0E
L7-15	AI3 Midpoint Input Value	0.00~20.00	5.00	☆	1D0F
L7-16	AI3 Intermediate Point Percentage	0.00%~100.00%	50.00%	☆	1D10
L7-17	AI3 Maximum Point Input Value	0.00~20.00	10.00	☆	1D11
L7-18	AI3 Maximum Point Percentage	0.00%~100.00%	100.00%	☆	1D12
L8 Group - Application Macro Parameters					
L8-00	Industry Application Macro Selection	0: No Function 1: User Defined 2: Air Compressor 3: Fan 4: Water Pump 5: Conveyor Belt 6: Machine Tool Application 7: Packaging 8: Textile Application 9: High-Speed Drill Application 10: Production Testing Dedicated 11: PID 12: PID + Auxiliary Frequency	0	★	1E00
L8-01	Application Macro Parameter 1	0.00~29.00	0.00	☆	1E01

Parameter Overview Table

Function Code	Name	Content	Default Value	Change	Communication Address
L8-02	Application Macro Parameter 2	0.00~29.00	0.00	☆	1E02
L8-03	Application Macro Parameter 3	0.00~29.00	0.00	☆	1E03
L8-04	Application Macro Parameter 4	0.00~29.00	0.00	☆	1E04
L8-05	Application Macro Parameter 5	0.00~29.00	0.00	☆	1E05
L8-06	Application Macro Parameter 6	0.00~29.00	0.00	☆	1E06
L8-07	Application Macro Parameter 7	0.00~29.00	0.00	☆	1E07
L8-08	Application Macro Parameter 8	0.00~29.00	0.00	☆	1E08
L8-09	Application Macro Parameter 9	0.00~29.00	0.00	☆	1E09
L8-10	Application Macro Parameter 10	0.00~29.00	0.00	☆	1E0A
L8-11	Application Macro Parameter 11	0.00~29.00	0.00	☆	1E0B
L8-12	Application Macro Parameter 12	0.00~29.00	0.00	☆	1E0C
L8-13	Application Macro Parameter 13	0.00~29.00	0.00	☆	1E0D
L8-14	Application Macro Parameter 14	0.00~29.00	0.00	☆	1E0E
L8-15	Application Macro Parameter 15	0.00~29.00	0.00	☆	1E0F
L8-16	Application Macro Parameter 16	0.00~29.00	0.00	☆	1E10
L8-17	Application Macro Parameter 17	0.00~29.00	0.00	☆	1E11
L8-18	Application Macro Parameter 18	0.00~29.00	0.00	☆	1E12
L8-19	Application Macro Parameter 19	0.00~29.00	0.00	☆	1E13
L8-20	Application Macro Parameter 20	0.00~29.00	0.00	☆	1E14
L8-21	Application Macro Parameter 21	0.00~29.00	0.00	☆	1E15
L8-22	Application Macro Parameter 22	0.00~29.00	0.00	☆	1E16
L8-23	Application Macro Parameter 23	0.00~29.00	0.00	☆	1E17
L8-24	Application Macro Parameter 24	0.00~29.00	0.00	☆	1E18
L8-25	Application Macro Parameter 25	0.00~29.00	0.00	☆	1E19
L8-26	Application Macro Parameter 26	0.00~29.00	0.00	☆	1E1A
L8-27	Application Macro Parameter 27	0.00~29.00	0.00	☆	1E1B
L8-28	Application Macro Parameter 28	0.00~29.00	0.00	☆	1E1C
L8-29	Application Macro Parameter 29	0.00~29.00	0.00	☆	1E1D
L8-30	Application Macro	0.00~29.00	0.00	☆	1E1E

Function Code	Name	Content	Default Value	Change	Communication Address
	Parameter 30				
L8-31	Application Macro Parameter 31	0.00~29.00	0.00	☆	1E1F
L8-32	Application Macro Parameter 32	0.00~29.00	0.00	☆	1E20
L8-33	Application Macro Parameter 33	0.00~29.00	0.00	☆	1E21
L8-34	Application Macro Parameter 34	0.00~29.00	0.00	☆	1E22
L8-35	Application Macro Parameter 35	0.00~29.00	0.00	☆	1E23
L8-36	Application Macro Parameter 36	0.00~29.00	0.00	☆	1E24
L8-37	Application Macro Parameter 37	0.00~29.00	0.00	☆	1E25
L8-38	Application Macro Parameter 38	0.00~29.00	0.00	☆	1E26
L8-39	Application Macro Parameter 39	0.00~29.00	0.00	☆	1E27
L8-40	Application Macro Parameter 40	0.00~29.00	0.00	☆	1E28
L8-41	Application Macro Parameter 41	0.00~29.00	0.00	☆	1E29
L8-42	Application Macro Parameter 42	0.00~29.00	0.00	☆	1E2A
L8-43	Application Macro Parameter 43	0.00~29.00	0.00	☆	1E2B
L8-44	Application Macro Parameter 44	0.00~29.00	0.00	☆	1E2C
L8-45	Application Macro Parameter 45	0.00~29.00	0.00	☆	1E2D
L8-46	Application Macro Parameter 46	0.00~29.00	0.00	☆	1E2E
L8-47	Application Macro Parameter 47	0.00~29.00	0.00	☆	1E2F
L8-48	Application Macro Parameter 48	0.00~29.00	0.00	☆	1E30
L8-49	Application Macro Parameter 49	0.00~29.00	0.00	☆	1E31
L8-50	Application Macro Parameter 50	0.00~29.00	0.00	☆	1E32

2 Parameter Group Description

2.1 F0 Group Basic Function Codes

F0-00	Model Number	Range: 0~65535	Factory value: Model determined
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For user viewing only, cannot be modified.

The model code meanings are shown in Table2-1.

Table 2-1 Product Model List

Model Number	Inverter Status	Model Number	Meaning
4301	380V ~ 480V three-phase input, 0.75kW	4315	380V ~ 480V three-phase input, 75kW
4302	380V~480V three-phase input, 1.5kW	4316	380V ~ 480V three-phase input, 93kW
4303	380V~480V three-phase input, 2.2kW	4317	380V ~ 480V three-phase input, 110kW
4304	380V~480V three-phase input, 4kW	4318	380V ~ 480V three-phase input, 132kW
4305	380V~480V three-phase input, 5.5kW	4319	380V ~ 480V three-phase input, 160kW
4306	380V~480V three-phase input, 7.5kW	4320	380V ~ 480V three-phase input, 185kW
4307	380V~480V three-phase input, 11kW	4321	380V ~ 480V three-phase input, 200kW
4308	380V~480V three-phase input, 15kW	4322	380V ~ 480V three-phase input, 220kW
4309	380V ~ 480V three-phase input, 18.5kW	4323	380V ~ 480V three-phase input, 250kW
4310	380V~480V three-phase input, 22kW	4324	380V ~ 480V three-phase input, 280kW
4311	380V~480V three-phase input, 30kW	4325	380V ~ 480V three-phase input, 315kW
4312	380V~480V three-phase input, 37kW	4326	380V ~ 480V three-phase input, 355kW
4313	380V~480V three-phase input, 45kW	4327	380V ~ 480V three-phase input, 400kW
4314	380V~480V three-phase input, 55kW	4328	380V ~ 480V three-phase input, 450kW

F0-01	Light/Heavy Load Selection	Range: 1~1	Factory value: 1
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Default value 1: Heavy load, non-modifiable.

This series of inverters only provides heavy load models.

F0-02	Rated Current	Range: 0.00~655.35 or 0.0~6553.5A	Factory value: Model determined
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For user viewing only, cannot be modified.

For inverters up to and including 93kW, the rated current is given to two decimal places; for 110kW and above, the rated current is given to one decimal place.

F0-03	Control Mode	Range: 0~3	Factory value: 0
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- 0: Speed Mode
- 1: Point-to-point position control
- 2: Torque Mode
- 3: Homing Mode

This function code is used to set the operating mode of the inverter, allowing it to operate in speed mode, torque mode, or position mode (including point-to-point and homing).

F0-04	Speed Mode Selection	Range: 0~7	Factory value: 0
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- 0: V/F Control

- 2: VVC Voltage Vector Control
- 3: Induction Motor Closed-loop Control
- 4: Permanent Magnet Motor Closed-loop Control
- 6: SVC Open-loop Vector Control

When the inverter operates in speed mode, this function code is used to select the required control method. When driving an asynchronous motor, if there is an encoder, induction motor closed-loop control can be selected; if there is no encoder, VF control, VVC voltage vector control, or SVC open-loop vector control can be selected; When driving a permanent magnet synchronous motor, if there is an encoder, permanent magnet motor closed-loop control can be selected; if there is no encoder, VVC voltage vector control or SVC open-loop vector control can be selected; When driving a synchronous reluctance motor, VVC voltage vector control or SVC open-loop vector control can be selected.

F0-05	Run Command Source Selection	Range: 0~5	Factory value: 0
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This function code is used to select the input channel for the inverter control command.

Inverter control commands include: start, stop, forward, reverse, jog, etc.

0: Digital Operator

Selecting this command channel allows the inverter to be controlled via the RUN, STOP, JOG, etc., buttons on the keypad to operate and stop the inverter.

1: External Terminal Input

Selecting this command channel allows the inverter to be controlled through digital input terminals.

2: RS485 Communication Input

Selecting this command channel allows commands to be sent to the inverter via RS485 communication to control the inverter to perform actions such as start and stop.

3: CANopen Input

Selecting this command channel requires the installation of a CANopen communication card in the inverter, allowing the master device to send control commands to the inverter using the CANopen protocol.

4: Reserved

5: Communication Card Input

Select this command channel, the inverter needs to be equipped with other communication cards (such as Profinet, Profibus-DP, EtherCAT communication cards), and the host computer can use the corresponding bus communication protocol to send control commands to the inverter.

F0-06	Frequency Source Selection	Range: 0~10	Factory value: 0
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This function code is used to set the main frequency source.

0: Digital Operator

Set the frequency value via the keyboard; set the frequency value at the 'F xx.xx Hz' display on the main interface. Use the up and down buttons to move the arrow icon to the 'F xx.xx Hz' position, then press the 'OK' button, the frequency value will flash. Modify the frequency value using the left and right arrows and the up and down arrows, and press the 'ESC' key to exit after modification.

1: RS485 Communication

Set the frequency value through RS485 communication; the host computer needs to connect to the inverter's 485+, 485- terminals, and then the frequency can be set via communication. For details, refer to Appendix A MODBUS Communication Protocol.

2: Analog Input

Set the frequency value through an analog signal. The frequency value can be set through three analog input channels on the inverter; it is necessary to set the analog input function of the corresponding channel to "frequency setting" (set through F5-21, F5-27, or F5-33).

3: External Up/Down Input

Set the frequency value through DI terminals by setting the DI terminal function in group F5 to 19, 20 (external command for frequency increase, external command for frequency decrease), then adjust the frequency value using the corresponding DI terminals.

4: Pulse Input Without Direction

Select the reference pulse input type (F4-30).

5: Pulse Input With Direction

Select the reference pulse input type (F4-30).

Parameter Group Description

6: CANopen Input

Set the frequency value through CANopen communication; the master device uses the CANopen protocol to communicate with the inverter and set its frequency value.

7: Reserved

8: Communication Card Input

Set the frequency value through a communication card; the inverter must have a communication card installed to communicate with the master device, which can use the corresponding bus communication protocol to set the inverter's frequency.

9: PID

The frequency setpoint comes from process PID control. The PID function can be configured through the FA group function codes, where the output of the PID controller serves as the inverter's frequency setpoint. For details, refer to the introduction of the 'PID function' in the FA group.

10: Digital Terminal Multi-Speed

The frequency value is set through the DI terminals. The F5 group 'Input Terminals' and FD group 'Multi-Speed and Simple PLC Function' function codes can be used to set multi-speeds and the correspondence between DI input signals and multi-speeds. For details, refer to the introductions of these two groups of function codes.

F0-07	Auxiliary Frequency Source	Range: 0~8	Factory value: 0
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This function code is used to select the auxiliary frequency source.

0: Disabled

Disable the auxiliary frequency function.

1: Digital Operator

Set the auxiliary frequency via the keypad; the frequency value is set in the 'F xx.xx Hz' display on the main screen. Use the up and down buttons to move the arrow icon to the 'F xx.xx Hz' position, then press the 'OK' button, the frequency value will flash. Modify the frequency value using the left and right arrows and the up and down arrows, and press the 'ESC' key to exit after modification.

2: RS485 Communication

Set the frequency value through RS485 communication; the host computer needs to connect to the inverter's 485+, 485- terminals, and then the frequency can be set via communication. For details, refer to Appendix A MODBUS Communication Protocol.

3: Analog Input

Set the signal, the frequency value through an analog signal. The frequency value can be set through three analog input channels on the inverter. The corresponding channel's analog input function must be set to 'Auxiliary Frequency Setting' (set through F5-21, F5-27, or F5-33).

4: External Up/Down Input

Set the frequency value through DI terminals by setting the DI terminal function in group F5 to 19, 20 (external command for frequency increase, external command for frequency decrease), then adjust the frequency value using the corresponding DI terminals.

5: Pulse Input

Select the reference pulse input type (F4-30).

6: CANopen Input

Selecting this command channel requires the installation of a CANopen communication card in the inverter, allowing the master device to send control commands to the inverter using the CANopen protocol.

7: Reserved

8: Communication Card Input

Set the frequency value through a communication card; the inverter must have a communication card installed to communicate with the master device, which can use the corresponding bus communication protocol to set the inverter's frequency.

Note:

1. The auxiliary frequency source can only be modified when the inverter is stopped.
2. The main and auxiliary frequency function selection can only be modified when the inverter is stopped.
3. Some command source methods require additional accessories, such as communication cards.
4. The main frequency and auxiliary frequency cannot be set to the same source.

5. When digital inputs (F5-00 ~ F5-06, LC-00 ~ LC-02) are configured to force the auxiliary frequency to 0, the auxiliary frequency output function will be disabled.

6. If the result of subtracting the auxiliary frequency from the main frequency is negative, negative frequency input must be allowed (set F5-38 to 1) for reversal; otherwise, the output frequency will be 0. Additionally, pay attention to the setting of the main-auxiliary reverse stop frequency (FA-27) to avoid limiting the desired reverse output.

F0-08	Frequency Source Superposition Selection	Range: 0~3	Factory value: 0
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0: Main Freq + Aux Freq

The actual set frequency of the inverter is the sum of the main frequency and the auxiliary frequency.

1: Main Frequency-Auxiliary Frequency

The actual set frequency of the inverter is the main frequency minus the auxiliary frequency.

2: Aux Freq - Main Freq

The actual set frequency of the inverter is the auxiliary frequency minus the main frequency.

3: Auxiliary Frequency

The actual set frequency of the inverter is the auxiliary frequency.

F0-09	Forward/Reverse Prohibited Selection	Range: 0~2	Factory value: 0
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0: Forward/Reverse Enabled

Allows the inverter to run forward and reverse.

1: Reverse Prohibited

The inverter can only run forward, not reverse.

2: Forward Prohibited

The inverter can only run reverse, not forward.

F0-10	Upper Limit Frequency	Range: 0.00~599.00Hz	Factory setting: 599.00Hz
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This function code is used to set the maximum frequency that the inverter can output.

F0-11	Lower Limit Frequency	Range: 0.00~F0-10	Factory Value: 0.00Hz
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This function code is used to set the lower limit frequency for the variable speed drive. When the inverter starts running, it begins at the start frequency. During operation, if the set frequency is less than the lower limit frequency, the inverter will continue to run at the lower limit frequency until the inverter stops or the set frequency is 0Hz or greater than the lower limit frequency.

F0-12	Speed curve time unit	Range: 0~1	Factory value: 0
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Used to set the precision of the acceleration and deceleration time units.

0: Acceleration and deceleration unit is 0.01 seconds

1: Acceleration and deceleration unit is 0.1 seconds

By default, this function code is 0, at which point the acceleration and deceleration time is two decimal places, with a maximum value of 600.00 seconds. If longer acceleration and deceleration times are required, this function code can be changed to 1, at which point the acceleration and deceleration time becomes one decimal place, with a maximum value of 6000.0 seconds, to meet the demand for longer acceleration and deceleration times.

F0-13	Acceleration time	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: Model determined
F0-14	Deceleration time	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: Model determined

Acceleration time refers to the time required for the inverter to accelerate from zero frequency to the acceleration/deceleration reference frequency (determined by F4-02), see t1 in Fig.2-1.

Deceleration time refers to the time required for the inverter to decelerate from the acceleration/deceleration reference frequency (determined by F4-02) to zero frequency, see t2 in Fig.2-1.

This series of inverters provides 4 sets of acceleration/deceleration times, which users can switch and select using digital input terminals DI.

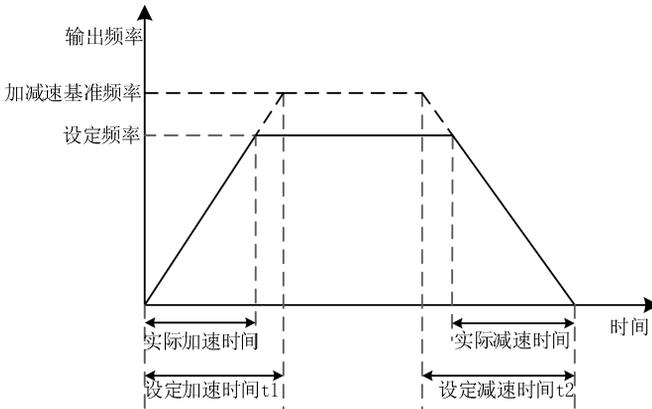


Fig. 2-1 Acceleration/Deceleration Time

F0-15	Carrier frequency	Range: 2~15kHz	Factory setting: 6kHz
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This function code is used to adjust the carrier frequency of the inverter. By adjusting the carrier frequency, motor noise can be reduced, mechanical system resonance points can be avoided, ground leakage current can be reduced, and interference generated by the inverter can be minimized. When the carrier frequency is low, the high-order harmonic components of the output current increase, leading to increased motor losses and motor temperature rise. When the carrier frequency is high, motor losses decrease and motor temperature rise decreases, but inverter losses increase, inverter temperature rise increases, and interference increases. Adjusting the carrier frequency will affect the performance shown in Table 2-2:

Table 2-2 Effects of High and Low Carrier Frequencies

Carrier frequency	Low -> High
Motor noise	High -> Low
Output current waveform	Poor -> Good
Motor temperature rise	High -> Low
Inverter Temperature Rise	Low -> High
Leakage Current	Small -> Large
External Radiated Interference	Small -> Large

The carrier frequency factory settings for inverters of different power ratings are shown in Table 2-3. Although users can modify the settings according to their needs, it should be noted that if the carrier frequency is set higher than the factory value, it will lead to an increase in the temperature rise of the inverter's heat sink. At this time, users need to derate the inverter, otherwise there is a risk of overheating alarms.

Table 2-3 Factory Carrier Frequency Settings for Different Models

Inverter Power	Carrier Frequency Range	Factory Set Carrier Frequency
0.75kW~7.5kW	2~15kHz	6kHz
11kW~93kW	2~10kHz	4kHz
110kW~450kW	2~6kHz	2kHz

F0-16	Reduced Carrier Method	Range: 0~2	Factory value: 0
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This function code is used to set the inverter's carrier frequency reduction method.

0: Reduce carrier based on current temperature

When the inverter output current is too high or the module temperature is too high, it will automatically reduce the inverter's carrier frequency, and simultaneously lower the overcurrent stall prevention level.

1: Fixed carrier and limit current

When the inverter output current is too high or the module temperature is too high, the carrier frequency remains unchanged, but it will automatically reduce the overload protection threshold and the

overcurrent stall prevention threshold.

2: Same as setting 0, but the overcurrent stall prevention threshold remains unchanged

When the inverter output current is too high or the module temperature is too high, it will automatically reduce the inverter's carrier frequency, but the overcurrent stall prevention level remains unchanged.

F0-17	High-speed Machine Mode	Range: 0~65535	Factory value: 0
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This function code can set whether the inverter operates in high-speed machine mode.

By default, the maximum output frequency of this series of inverters is 599Hz. If a higher output frequency is required, this function code can be modified. Set F0-17 to 1 first, then set it to 2, which will enable the inverter to operate in high-speed machine mode. At this point, the maximum output frequency of the inverter becomes 599.00Hz, and the upper limits of function codes such as the motor's maximum frequency and rated frequency will change to 2000.0Hz to meet the control requirements of high-speed machines. To return to normal mode, set F0-17 to 1 first, then set it to zero.

Note: When switching to high-speed machine mode or switching back from high-speed machine mode to normal mode, the inverter will reset to factory settings.

F0-18	Parameter Management Settings	Range: 0~13	Factory value: 0
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0: No Function

1: Parameter Write Protection

After entering 1, most function codes will be locked and cannot be modified; only parameter management (F0-18) and password input (F7-33) can be modified. This value will be written to EEPROM and remains effective even after power loss. Only by setting parameter management (F0-18) to 0 can other parameter values be modified.

5: Reset kWh Display to Zero

Can reset the inverter's energy statistics to zero.

7: Reset CAN Slave

Reset CAN slave

8: No Function

9: Reset to 50Hz Factory Values

Restore factory settings for function codes, which resets the function codes to their default values. If a password has been set for the inverter (via F7-34), the password must be removed (via F7-33) before restoring factory settings.

1. When the parameter management setting is 6 or 7, the control board needs to be repowered after configuration.

2. If the frequency command source is Digital Operator, set parameter management to 7 to achieve reverse function, it is necessary to simultaneously reverse the analog frequency negative value.

(F5-38) Set to 1 (allow negative frequency input, positive frequency forward rotation, negative frequency reverse rotation, digital operator and external terminals cannot control forward/reverse rotation).

F0-19	Keyboard Set Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00Hz
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This function code is used to set the keyboard frequency command.

2.2 F1 Group Start/Stop Control Parameters

F1-00	Startup Speed Tracking	Range: 0~3	Factory value: 0
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This function code sets the speed tracking method.

Speed tracking is applicable for punch presses, fans, and other large inertia load applications.

In control modes with an encoder, when this parameter is non-zero, the inverter will automatically start speed tracking based on the speed feedback from the encoder.

When using free stop (that is, inertial stop) for parking, or when the inverter suddenly stops due to a fault, the motor will decelerate under the effect of friction. If the motor inertia is large, the time required for the motor to come to a complete stop will be longer. If the inverter starts directly while the motor has not completely stopped rotating, it may cause significant impact. The speed tracking function can obtain the motor's speed and then control the motor to run to the set frequency based on this speed. On one hand, this shortens the time required for restarting, and on the other hand, it can avoid excessive impact.

Parameter Group Description

0: No Action

Speed tracking function is off.

1: Track from the maximum output frequency

Upon restart, track the speed downward from the maximum output frequency until the motor speed is detected, then control the motor to run at the set frequency.

2: Track Frequency at Startup

Upon restart, track the speed from the given frequency at startup, ultimately controlling the motor to run at the set frequency.

3: Track from the minimum output frequency

Upon restart, track the speed from the minimum frequency until the motor speed is detected, then control the motor to run at the set frequency.

F1-01	Initial Position Identification Method	Range: 0~5	Factory value: 0
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This function code is used to set the initial position identification method.

0: Do Not Perform Initial Angle Identification

Do not perform initial position identification.

1: Attraction Method

By injecting DC current into the windings, the motor rotor is rotated to the specified position.

3: Pulse Injection Method 1

4: Pulse Injection Method 2

Determine the position of the motor rotor by injecting voltage pulses, giving priority to Pulse Injection Method 1. If Pulse Injection Method 1 is ineffective, Pulse Injection Method 2 can be tried.

F1-02	Abnormal Restart Method	Range: 0~2	Factory value: 0
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This function code sets the abnormal restart method.

When an exception occurs, the inverter generally stops running until the fault is reset and a run command is received, after which it will restart. The abnormal restart function can automatically clear faults and control the inverter to restart when a fault occurs, achieving the goal of continuous motor operation. When the number of automatic fault clearances reaches the set value, it will not be possible to automatically clear the fault and restart. The abnormal start-up times can be set through function code F9-46.

0: Stop Operation

In the event of an anomaly, the system stops; after the fault is reset, the inverter does not automatically restart.

1: Current Speed Tracking

When restarting after an anomaly, the speed is tracked from the current speed, and once the speed is tracked, the motor is controlled to run to the set frequency.

2: Minimum Frequency Tracking

When restarting after an anomaly, the speed is tracked from the minimum frequency, and once the speed is tracked, the motor is controlled to run to the set frequency.

F1-03	Speed tracking maximum current%	Range: 20%~200%	Factory setting: 100%
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The inverter only begins speed tracking when the output current exceeds the value set by this function code. The larger the setting value of this function code, the faster the tracking speed, but if it is too large, it may cause overcurrent or overload faults.

F1-04	Voltage Increase Rate	Range: 1~200	Factory Value: 100
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This function code sets the voltage increase rate during speed tracking. Under normal circumstances, this function code does not need to be changed and should remain at the default setting.

F1-05	Start Frequency	Range: 0~599.00Hz	Factory Value: 0.50Hz
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This function code is used to set the start frequency. If the start frequency is higher than the lower limit frequency, the inverter starts running from the start frequency.

F1-06	Startup Hold Time	Range: 0.00~600.00 seconds	Factory Value: 0.00 seconds
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F1-07	Startup Hold Frequency	Range: 0~599.00Hz	Factory Value: 0.00Hz
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In applications such as cranes and elevators, to improve reliability or positioning accuracy, it is often necessary to run at a certain frequency for a period of time before continuing to accelerate to the set frequency, and when stopping, to run at a certain frequency for a period of time before decelerating to zero speed stop. The frequency hold function can achieve these purposes. The frequency holding

function includes two types: start-up frequency holding and stop frequency holding. The start-up frequency holding function is shown in Figure 2-2, where F1-06 start-up holding time and F6-07 start-up holding frequency can be set for the start-up frequency holding function.

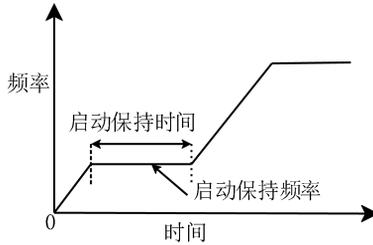


Figure 2-2 Start-up Frequency Holding Function

F1-08	Braking Current Level	Range: 0~100%	Factory Value: 0%
F1-09	Startup Braking Time	Range: 0.0~60.0 seconds	Factory Value: 0.0 seconds
F1-10	DC Braking Ratio Coefficient	Range: 0~65535	Factory Value: 2000
F1-11	DC Braking Integral Coefficient	Range: 0~65535	Factory Value: 100

When the inverter starts, if the motor is still rotating, it may cause significant impact. To avoid this situation, the motor can be braked first, and then started from zero speed after the motor has stopped rotating. To activate the DC braking function, inject DC current into the motor windings to produce a braking torque that stops the motor from rotating, as shown in Figure 2-3.

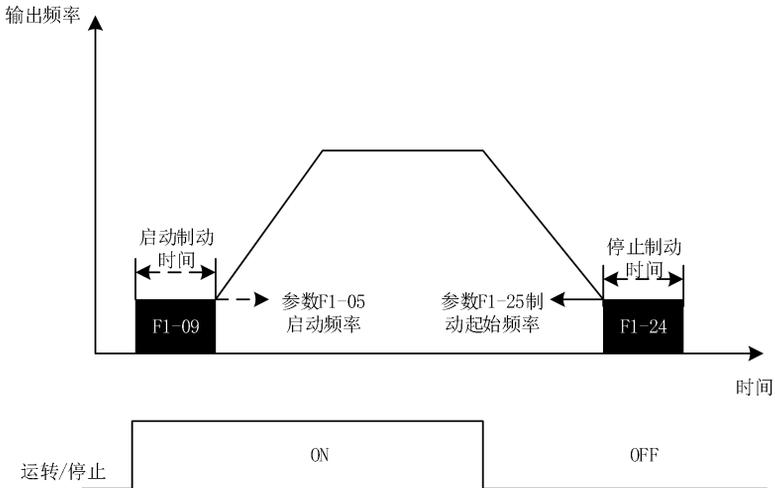


Figure 2-3 DC/Stop Braking Function

If the braking time is not zero, the DC braking function during startup is effective. When the inverter starts, it first applies the set braking current for DC braking, then after the set startup braking time, it begins to run up to the set frequency. The greater the braking current, the greater the braking force.

F1-08 Braking Current Size, used to set the magnitude of the DC braking current during startup and stop, the unit is %, based on the rated current of the motor.

F1-09 Startup Braking Time, used to set the duration of the DC braking during startup. If the startup braking time is set to zero, the DC braking during startup is ineffective.

When using VF or induction motor VVCcontrol, the current PI regulator parameters can be adjusted using F1-10 DC braking ratio coefficient and F1-11 DC braking integral coefficient.

CM680 Inverter Software Manual
Parameter Group Description

F1-12	Stopping Method	Range: 0~1	Factory value: 0
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0: Deceleration Stop

During deceleration stop, the inverter decelerates according to the set deceleration time, down to 0 or M1 multi-point VF frequency point 1 (F2-04) before stopping output.

1: Free Stop

After the stop command becomes effective, the inverter immediately terminates output.

F1-13	Deceleration Method	Range: 0~2	Factory value: 0
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This function code is used to set the deceleration method. When the motor decelerates, it may feed energy back to the inverter, thereby increasing the bus voltage. If the bus voltage becomes too high, it can lead to overvoltage faults. Choosing an appropriate deceleration method can reduce the probability of overvoltage faults.

0: No function

Normal deceleration or stop, without performing regenerative energy suppression.

1: Deceleration method 1

During deceleration, the inverter will automatically adjust the deceleration curve based on the F9-04 overvoltage stall threshold and the bus voltage.

2: Deceleration Method 2

During deceleration, when the bus voltage is too high, deceleration method 2 will be activated, and the inverter will automatically adjust the output frequency and output voltage to achieve the purpose of accelerating the consumption of regenerative energy.

F1-15	1-4 Segment Acceleration/Deceleration Switching Points	Range: 0~599.00Hz	Factory Value: 0.00Hz
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If it is necessary to switch acceleration and deceleration times during operation, this can be achieved by modifying this function code. When the current frequency is less than the switching frequency, the motor adjusts speed according to acceleration/deceleration time 4; when the current frequency is greater than the switching frequency, the motor adjusts speed according to acceleration/deceleration time 1, the 1-4 segment acceleration/deceleration switching function is shown in Figure 2-4.

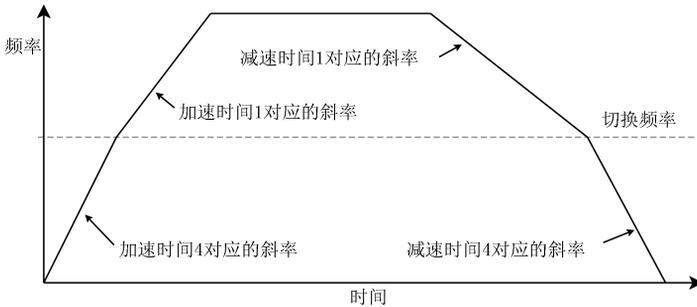


Figure 2-4 1-4 Segment Acceleration/Deceleration Frequency Switching Points

F1-16	S Acceleration Time 1	Range: 0.00~25.00 seconds	Factory Value: 0.20 seconds
F1-17	S Acceleration Time 2	Range: 0.00~25.00 seconds	Factory Value: 0.20 seconds
F1-18	S Deceleration Time 1	Range: 0.00~25.00 seconds	Factory Value: 0.20 seconds
F1-19	S Deceleration Time 2	Range: 0.00~25.00 seconds	Factory Value: 0.20 seconds

There are two modes for the speed curve: normal acceleration/deceleration mode and S-curve acceleration/deceleration mode. When all four function codes are zero, the speed curve operates in normal acceleration/deceleration mode; otherwise, it operates in S-curve acceleration/deceleration mode.

In general acceleration and deceleration modes, the slope of acceleration and deceleration will undergo sudden changes at the start or end of the process, causing significant variations in motor torque within a short period, which can impact both the motor and the load. To reduce this impact, S-curve acceleration and deceleration mode can be used. Under this mode, the slope of the speed curve is

continuous, thereby reducing torque shock. Figure2-5shows the frequency and acceleration waveforms during general acceleration and deceleration. It can be seen that the acceleration is discontinuous and sudden changes occur. In contrast, the acceleration in Figure2-6, which represents S-curve acceleration and deceleration, changes continuously. Therefore, using an S-curve for acceleration and deceleration can mitigate the impact caused by sudden changes in torque.

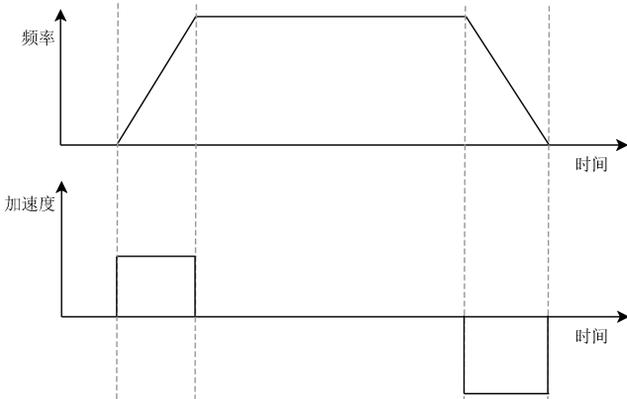


Figure 2-5 General Acceleration and Deceleration Mode

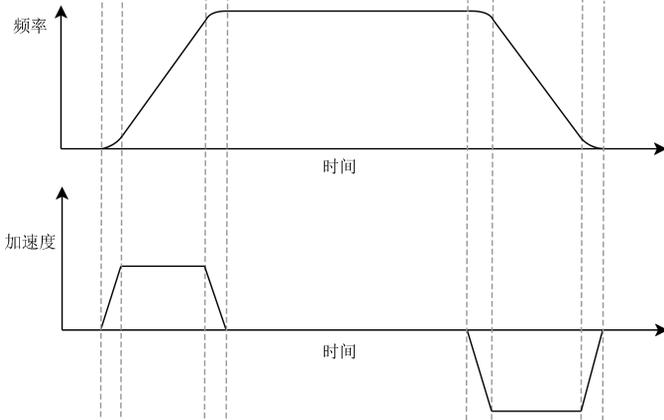


Figure 2-6 S Acceleration and Deceleration Mode

In S acceleration and deceleration mode, the total acceleration and deceleration time will be longer. When accelerating from zero to the maximum operating frequency, the total acceleration time = set acceleration time + (S acceleration time 1)/2 + (S acceleration time 2)/2, the total deceleration time = set deceleration time + (S deceleration time 3)/2 + (S deceleration time 4)/2. As shown in Figure 2-7, in the figure below, S1 represents S acceleration time 1, S2 represents S acceleration time 2, S3 represents S deceleration time 3, S4 represents S deceleration time 4.



Figure 2-7 S Acceleration and Deceleration Mode Time

F1-20	Automatic Acceleration and Deceleration Selection	Range: 0~4	Factory value: 0
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This function code is used to set the automatic acceleration/deceleration mode. In practical applications, the setting of acceleration and deceleration times is influenced by factors such as load conditions and motor inertia, and may require multiple adjustments to determine. If the acceleration time is too short, it may cause excessive acceleration current, leading to overcurrent; If the deceleration time is too short, it may result in excessively high bus voltage, causing overvoltage. The automatic acceleration/deceleration function can automatically adjust the acceleration and deceleration times based on actual conditions, simplifying the debugging process.

0: Linear Acceleration and Deceleration

Both automatic acceleration and automatic deceleration functions are disabled.

1: Automatic Acceleration and Linear Deceleration

The automatic acceleration function is enabled, and the automatic deceleration function is disabled.

2: Linear Acceleration and Automatic Deceleration

Automatic acceleration function off, automatic deceleration function on.

3: Automatic Acceleration and Deceleration

Both automatic acceleration and automatic deceleration functions are on.

4: Automatic Acceleration and Deceleration Suppression

When the current is too high, the automatic acceleration function is enabled; when the bus voltage is too high, the automatic deceleration function is enabled; in other cases, both automatic acceleration and automatic deceleration functions are off.

F1-21	Automatic Acceleration and Deceleration Kp	Range: 0~65535	Factory setting: 20
F1-22	Automatic Acceleration and Deceleration Ki	Range: 0~655.35	Factory setting: 0.400

When the automatic acceleration/deceleration function is enabled, the acceleration/deceleration slope is adjusted via a PI controller, and the above two parameters are used to set the PI controller parameters.

F1-23	Abnormal Shutdown Method	Range: 0~6	Factory value: 0
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This parameter is used to set the abnormal stop method. When the digital input terminal is set to external fault or deceleration stop function, if this terminal receives an effective level, the inverter will stop according to the method set by this parameter.

0: Free Stop

The inverter immediately stops output, allowing for free stop.

1: According to First Deceleration Time

Decelerate according to deceleration time 1.

2: According to Second Deceleration Time

Decelerate according to deceleration time 2.

3: According to Third Deceleration Time

Decelerate according to deceleration time 3.

4: According to Fourth Deceleration Time

Decelerate according to deceleration time 4.

5: According to System Deceleration Time

Decelerate according to the currently set deceleration time.

6: Automatic Deceleration

The inverter automatically adjusts the deceleration time.

F1-24	Braking Time	Range: 0.0~60.0 seconds	Factory Value: 0.0 seconds
F1-25	Braking Start Frequency	Range: 0.00~599.00Hz	Factory Value: 0.00Hz

The above function codes are used to set the stop DC braking function. When the inverter stops, the motor may not come to a complete stop. To prevent this, the stop DC braking function can be used to apply DC braking to the motor after it stops, ensuring that the motor does not rotate after shutdown.

If the stop braking time is not zero, the stop DC braking function is effective. The inverter decelerates to the braking start frequency and then begins DC braking, stopping output after the set stop braking time. The greater the braking current, the greater the braking force.

F1-08 Braking Current Size, used to set the magnitude of the DC braking current during startup and stop, the unit is %, based on the rated current of the motor. F1-24 Stop Braking Time, used to set the duration for stopping DC braking. When stopping, if DC braking is required, F1-12 Motor Stopping Method must be set to deceleration stop for the DC braking function to be effective. When the stop braking time is set to zero, the DC braking function is disabled. F1-25 Braking Start Frequency, this function code sets the starting frequency for stopping DC braking. When the inverter decelerates to the frequency value set by this function code, DC braking begins.

F1-26	Stop Holding Time	Range: 0.00~600.0 seconds	Factory Value: 0.00 seconds
F1-27	Parking Hold Frequency	Range: 0.00~599.00Hz	Factory Value: 0.00Hz

In applications such as elevators and cranes, to improve reliability or positioning accuracy, it is necessary to maintain a certain frequency for a period of time before reducing to zero speed during stopping. This is the stop frequency hold function. The stop frequency holding function is shown in Figure 2-8, F1-26 stop holding time and F1-27 stop holding frequency can be used to set the stop frequency holding function.

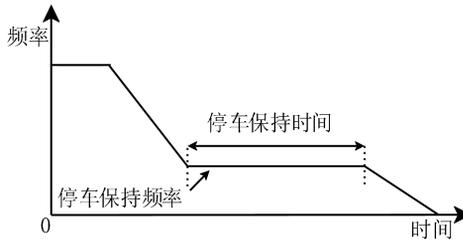


Figure 2-8 Stop Holding Frequency and Time

F1-28	Speed Tracking Demagnetization Time	Range: 0~65535	Factory Value: 50
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This function code is used for speed tracking and generally does not need to be changed.

F1-29	Instant Power Failure Restart Method	Range: 0~2	Factory value: 0
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In general, when power is lost, the inverter will shut down due to undervoltage, and even if the power returns to normal within a short period, the inverter will not restart automatically. The instantaneous power failure restart function allows the inverter to automatically restart after a brief power outage and recovery, achieving continuous motor operation.

0: Stop Operation

An instantaneous power outage has occurred, causing the operation to stop and preventing automatic restart.

1: Current Speed Tracking

The inverter starts from the frequency before the power failure and performs speed tracking downwards. Once the motor frequency is detected, it accelerates from the detected motor frequency to the set frequency. This option is recommended when the motor inertia is large.

2: Minimum Frequency Tracking

The inverter starts tracking upwards from the lowest frequency. Once the motor frequency is detected, it accelerates from the detected motor frequency to the set frequency. This option is

Parameter Group Description

recommended when the motor inertia is small.

F1-30	Allowed Power Failure Time	Range: 0.0~20.0 seconds	Factory setting: 2.0 seconds
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When the power outage duration is less than the value set for this function code, automatic restart according to the settings of F1-29 is allowed. If the power outage duration exceeds the time set for this function code, automatic restart will not be performed.

F1-31	Base Blockade Interruption Time	Range: 0.0~5.0 seconds	Factory Value: 0.5 seconds
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When an external controller detects an abnormal situation, it may be necessary for the inverter to immediately stop output; at this time, the base block function of the inverter can be used. Upon receiving the base block signal, the inverter immediately stops PWM output. After the base block signal is removed, the inverter will restart after waiting for the time set by this function code. Additionally, if the inverter's stopping method is free stop, it must wait for the time set by this function code before it can run again after stopping.

F1-32	dEb recovery threshold	Range: 0.0~200.0	Factory Value: 40.0
F1-33	dEb action bias threshold	Range: 0.0~200.0	Factory Value: 40.0
F1-34	dEb deceleration selection	Range: 0~2	Factory value: 0
F1-35	dEb recovery time	Range: 0.0~25.0 seconds	Factory value: 3.0 seconds

When the grid voltage drops, the inverter may shut down due to undervoltage. Uncontrolled abnormal shutdowns can cause significant impacts, leading to system damage and serious consequences. The ride-through function (also known as KEB, Kinetic Energy Backup, or dEb, Deceleration Energy Backup) can, in such cases, allow the motor to decelerate in a controlled manner, reducing the impact on the system.

F1-32 dEb recovery threshold

This function code is used to set the dEb recovery voltage. By default, dEb recovery voltage = dEb action voltage + (F1-32 setting value).

F1-33 dEb action bias threshold

This function code is used to set the dEb action voltage. By default, dEb action voltage = undervoltage protection value+60V+(F1-33 setting)

F1-34 dEb deceleration selection

This function code is used to set the deceleration mode when the instantaneous stop does not occur.

0: No Action

When the grid voltage drops, the inverter does not decelerate, and the inverter may shut down due to undervoltage.

1: Enable, no recovery

When the grid voltage drops and reaches the dEb action voltage, the inverter controls the motor to decelerate. When the grid voltage returns to normal, it still controls the motor to decelerate to zero, then shuts down.

2: Enable, recovery

When the grid voltage drops and reaches the dEb action voltage, the inverter controls the motor to decelerate. When the grid voltage returns to normal, it maintains the current frequency operation for a period (F1-35) before accelerating to the target frequency.

F1-35 dEb recovery time

This parameter is used to set the time during which the inverter maintains operation at the current frequency when power is restored. After this time ends, the inverter accelerates back to the given frequency.

F1-36	PM Voltage Pulse Width	Range: 0.0~3.0 milliseconds	Factory setting: 1.0 millisecond
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This function code is used for initial position identification, adjusting the pulse width of the voltage.

F1-41	Flux Zero Position Alignment Time	Range: 0.0~60.0 seconds	Factory setting: 2.0 seconds
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This function code is used for initial position identification, adjusting zero alignment time.

2.3 F2 Group VF Control Parameters

The function codes in this group can be used to adjust VF and VVC control modes.

F2-00	V/F Voltage Selection	Range: 0~2	Factory value: 0
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This function code is used to set the type of voltage curve. This inverter provides multiple voltage

curves and allows for custom-defined voltage curves to meet different operating conditions.

0: General V/F Curve

Multi-segment (custom) V/F curves shown in Figure 2-9, define multi-segment V/F curves according to F2-04 ~ F2-09 and F4-03 and F4-04, as shown in the figure below. In Figure 2-9, f_1 , f_2 , f_3 , and f_b are the M1 multi-point VF frequency point 1, M1 multi-point VF frequency point 2, M1 multi-point VF frequency point 3, and M1 rated frequency, respectively; V_1 , V_2 , V_3 , and V_b are the M1 multi-point VF voltage point 1, M1 multi-point VF voltage point 2, M1 multi-point VF voltage point 3, and M1 rated voltage, respectively.

Note: Generally, $V_1 < V_2 < V_3 < V_b$, $f_1 < f_2 < f_3 < f_b$. Setting the voltage too high at low frequencies may cause the motor to overheat or even burn out, and the inverter may experience overcurrent or overvoltage protection.

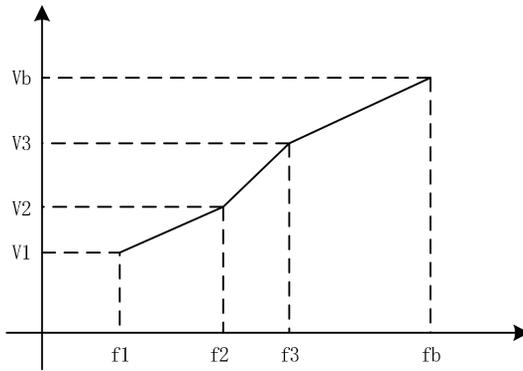


Figure 2-9 Typical V/F Curve

1: 1.5 Power V/F Curve

The output voltage of the inverter is proportional to the 1.5 power of the frequency.

2: 2 Power V/F Curve

The output voltage of the inverter is proportional to the square of the frequency.

F2-01	Torque Compensation Gain	Range: 0~10	Factory value: 1
F2-02	Torque Filter Time	Range: 0.001~10.000 seconds	Factory setting: 0.500

The above two function codes apply only to VF and VVC control modes.

F2-01 Torque compensation gain, used to adjust the torque compensation level. By adjusting the output voltage, the motor's load-carrying capacity can be adjusted. The greater the torque compensation gain, the better the load-carrying capacity, but the output current will increase. If set too high, it may lead to overcurrent faults; reducing the torque compensation gain will decrease the load-carrying capacity accordingly.

F2-02 Torque filter time, used to adjust the filtering time for torque compensation. If the filter time is set too high, control stability improves, but response becomes slower. When the filter time is too short, the response is faster, but it may lead to instability. Adjust according to actual conditions.

F2-04	M1 Multi-point VF Frequency Point 1	Range: 0.00~599.00Hz	Factory Value: 0.50Hz
F2-05	Multi-point VF Voltage Point 1	Range: 0.0~480.0V	Factory setting: 2.0V
F2-06	Multi-point VF Frequency Point 2	Range: 0.00~599.00Hz	Factory setting: 1.50Hz
F2-07	Multi-point VF Voltage Point 2	Range: 0.0~480.0V	Factory setting: 10.0V
F2-08	Multi-point VF Frequency Point 3	Range: 0.00~599.00Hz	Factory setting: 3.00Hz
F2-09	Multi-point VF Voltage Point 3	Range: 0.0~480.0V	Factory setting: 22.0V

The above function codes are used to set the voltage curve, please refer to function code F2-00.

F2-10	Slip Filter Time	Range: 0.001~10.000 seconds	Factory setting: 0.100 seconds
F2-11	Slip Compensation Gain	Range: 0.00~10.00	Factory Value: 0.00

F2-10 Slip Filter Time, used to set the filter time for slip compensation. The larger the value of this

Parameter Group Description

function code, the slower the compensation response; the smaller the value, the faster the response, but it may lead to system instability. Adjust according to actual conditions.

F2-11 Slip Compensation Gain, used to set the gain for slip compensation. By modifying the slip compensation gain, the motor speed accuracy can be improved.

When using VF control: Under electric load conditions, if the motor speed is lower than the actual speed, the slip compensation gain can be appropriately increased; otherwise, reduce the slip compensation gain; In power generation load conditions, if the motor speed is higher than the actual speed, the slip compensation gain can be appropriately increased; conversely, it should be decreased.

When using induction motor VVC control: In electric load conditions, if the motor speed is lower than the actual speed, the slip compensation gain can be appropriately increased; conversely, it should be decreased.

F2-12	Power Generation Slip Compensation Gain	Range: 0.00~1.00	Factory Value: 1.00
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This function code is only applicable to the VVC control mode for induction motors, used to adjust the slip compensation gain in power generation mode.

When using induction motor VVC control, in power generation load conditions, if the motor speed is higher than the actual speed, the slip compensation gain for power generation can be appropriately increased; conversely, it should be decreased.

F2-13	Maximum Slip Limit Value	Range: 0.00~200.00Hz	Factory Value: 20.00Hz
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This function code is used to set the maximum slip.

F2-14	Oscillation Suppression Gain	Range: 0~10000	Factory Value: 1000
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When using VF control to drive an asynchronous motor, there may be vibration issues. If the vibration is severe, it may cause a fault shutdown, thus unable to operate normally. Adjusting this function code can improve the oscillation condition. The greater the oscillation suppression gain, the better the oscillation suppression effect, but the dynamic performance of the motor will decrease. Conversely, the poorer the vibration suppression effect, the better the dynamic performance of the motor. In actual use, the function code can be adjusted according to specific requirements.

F2-15	Overexcitation Braking Gain	Range: 0~65535	Factory value: 30
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This parameter can suppress the increase in bus voltage during the deceleration process of the inverter; the higher the value, the better the suppression effect.

Flux braking increases the output voltage of the inverter to boost the current at the motor terminals, thereby enhancing the consumption of regenerative energy to suppress the rise in bus voltage. The greater the gain, the larger the motor current, so please pay attention when applying it. When a braking resistor is also present, it is recommended to set this value to 0; otherwise, excessive deceleration current during deceleration may cause abnormalities.

F2-16	Voltage Stability Gain	Range: 0~200Hz	Factory value: 10
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This parameter can effectively improve the current control performance and stability during VF operation. Increasing this parameter can effectively enhance the current stability throughout the VF and VVC operation, but increasing this parameter under VF will reduce the load-carrying capacity at startup.

2.4 F3 Group Vector Control Parameters

F3-00	System Control	Range: 0000H~FFFFH	Factory value: 0
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This parameter needs to be set bit by bit, as shown in Table 2-4:

Table 2-4 System Control Bit Description

bit	Function	Description
bit0	Speed Loop Gain Auto Design	0: Speed loop gain auto design off, speed loop response is determined by PI parameters in F3-05 to F3-10.
		1: Speed loop gain auto design on, speed loop response is determined by bandwidth parameters in F3-02 to F3-04.
bit3	Dead time compensation off	0: Dead time compensation on
		1: Dead time compensation off

F3-01	ASR1/2 Switching Frequency	Range: 5.00~599.00 Hz	Factory setting: 7.00 Hz
This parameter sets the switching frequency between ASR1 low speed and ASR2 high speed.			
F3-02	Zero Speed Bandwidth	Range: 1~100 Hz	Factory setting: 10 Hz
F3-03	ASR1 Low-Speed Bandwidth	Range: 1~100 Hz	Factory setting: 10 Hz
F3-04	ASR2 High-Speed Bandwidth	Range: 1~100 Hz	Factory setting: 10 Hz

When bit 0 of parameter F3-00 is set to 1, F3-02, F3-03, and F3-04 are used to set the speed loop bandwidth for the motor at zero speed, low speed, and high speed, respectively. By increasing the bandwidth value, the dynamic response of the speed loop can be accelerated, but an excessively high bandwidth may cause system oscillation.

Note: This parameter can only be modified when bit0=1 in F3-00.

F3-05	ASR Zero Speed Gain	Range: 0~100 Hz	Factory Value: 20 Hz
F3-06	ASR Zero Speed Integration Time	Range: 0.000~10.000 s	Factory Value: 0.100 s
F3-07	ASR1 Low-Speed Gain	Range: 0~100 Hz	Factory setting: 10 Hz
F3-08	ASR1 Low-Speed Integral Time	Range: 0.000~10.000 s	Factory Value: 0.100 s
F3-09	ASR2 High-Speed Gain	Range: 0~100 Hz	Factory setting: 10 Hz
F3-10	ASR2 High-Speed Integral Time	Range: 0.000~10.000 s	Factory Value: 0.100 s

When the bit 0 of parameter F3-00 is set to 0, F3-05~F3-06, F3-07~F3-08, and F3-09~F3-10 are used to set the speed loop PI regulator parameters for the motor at zero speed, low speed, and high speed, respectively. Increasing the gain value or decreasing the integration time can both accelerate the dynamic response of the speed loop, but an excessively large gain value or too small an integration time will cause system oscillation. ASR Adjustment - Manual Design and Automatic Design as Shown in Figure 2-10.

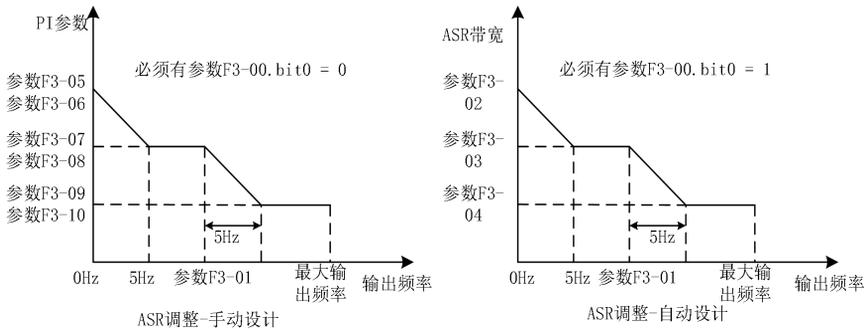


Figure 2-10 ASR Adjustment - Manual Design and Automatic Design

F3-11	ASR Speed Feedforward Coefficient	Range: 0%~200%	Factory Value: 0%
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This parameter is used to set the torque feedforward gain of the speed loop. Increasing this parameter helps improve the speed loop response during sudden load changes. The default value is zero, corresponding to the feedforward function being disabled. If you need to enable it, it is recommended to contact a professional technician to adjust this parameter.

F3-12	PDF Coefficient	Range: 0~200	Factory value: 30
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When bit 0 of parameter F3-00 is set to 1, the pseudo-differential feedforward function is enabled, which helps improve the speed loop response. It is recommended to contact a professional technician to adjust this parameter.

F3-13	DOB Compensation Gain	Range: 0~5000Hz	Factory value: 0
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In inverters, PI controllers are commonly used to control speed; if a higher system speed response is required, the bandwidth of the PI controller needs to be increased. However, in practical applications, the bandwidth of the PI controller is subject to many constraints and may not be adjustable to the required value. At this point, if it is still necessary to further improve the system speed response, load torque compensation can be added on top of the PI controller.

DOB: Disturbance Observer.

F3-13 DOB Compensation Gain

This parameter sets the size of the load torque compensation gain.

F3-14	ASR Output Filter Time	Range: 0.000 to 0.350 s	Factory Value: 0.008 s
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When the speed loop control bandwidth is high, the torque setpoint output by the speed regulator (ASR) usually contains some high-frequency noise. F3-14 is used to set the low-pass filter time constant for the torque setpoint. Increasing this parameter helps improve speed stability. Generally, no modification is required.

F3-15	Notch Depth	Range: 0 to 20 dB	Factory Value: 0 dB
F3-16	Notch Filter Frequency	Range: 0.00 to 200.00 Hz	Factory Value: 0 Hz

When resonance occurs in the mechanical system connected to the controlled motor, oscillations at that frequency will also appear in the motor speed, even though the speed loop control is stable. As shown in Fig. 2-11, setting F3-16 to this resonant frequency can effectively suppress oscillation in the torque setpoint; increasing F3-15 can enhance the suppression of oscillation at the resonant frequency.

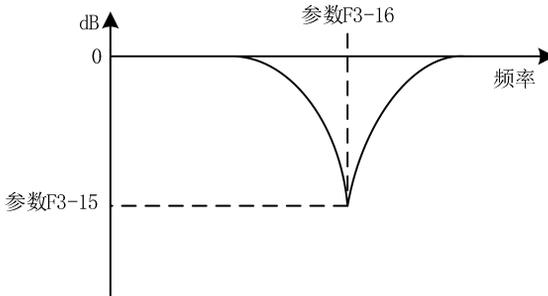


Fig. 2-11 Notch filter frequency and depth

F3-17	Speed Limit Selection	Range: 0~3	Factory value: 0
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This parameter is used to set the speed limit value in torque control mode.

0: Parameters FE-03&FE-04

Forward speed limit is set by FE-03, and reverse speed limit is set by FE-04.

1: Parameter & frequency source given

In closed-loop torque control mode with PG

When torque command ≥ 0 , the forward speed limit is the set value of the specified frequency source (F0-06), and the reverse speed limit is FE-04;

When torque command < 0 , forward speed limit is FE-03, reverse speed limit is the set value of the specified frequency source (F0-06).

In open-loop torque control mode

When torque command ≥ 0 , forward speed limit is FE-03, reverse speed is not limited;

When torque command < 0 , forward speed is not limited, reverse speed limit is FE-04.

2: Frequency source setting

Both forward and reverse speed limits are determined by the set value of the specified frequency source (F0-06).

3: Tension Control Line Speed

Both forward and reverse speed limits are determined by the line speed controlled by tension control. Refer to the detailed tension control description for more information.

F3-18	Current Loop Bandwidth	Range: 0~65535 Hz	Factory Value: 290 Hz
F3-19	Iq Current Loop Proportional Gain	Range: 0%~65535%	Factory setting: 100%
F3-20	Iq Current Loop Integral Gain	Range: 0%~65535%	Factory setting: 100%
F3-21	Id Current Loop Proportional Gain	Range: 0%~65535%	Factory setting: 100%
F3-22	Id Current Loop Integral Gain	Range: 0%~65535%	Factory setting: 100%

F3-19~F3-22: Scale vector control current loop PI regulator parameters by percentage. Generally,

no modification is required after successful motor parameter identification. If oscillation is detected in the current control loop during use, the proportional gain and integral gain here can be appropriately reduced. Conversely, if poor current tracking performance is observed, the proportional gain and integral gain here can be appropriately increased.

F3-23	I/F Mode Current Command	Range: 0%~250%	Factory value: 40%
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When F1-00 is 1, this parameter sets the percentage of the DC drive current relative to the motor rated current during the synchronous motor flux zero position alignment period;

When F3-24 is zero, this parameter sets the percentage of the low-speed magnetization current relative to the motor rated current when the SVC observer mode is running;

When F3-24 is non-zero, this parameter sets the percentage of the current command relative to the motor rated current when the motor I/F mode is running.

F3-24	IF Switching Frequency 1	Range: 0.00~599.00 Hz	Factory value: 20.00 Hz
F3-25	IF Switching Frequency 2	Range: 0.00~599.00 Hz	Factory value: 20.00 Hz

F3-24: When this parameter is non-zero, the synchronous motor is forced to operate in I/F mode below this frequency.

F3-25: This parameter is default equal to F3-25, generally no need for modification.

F3-26	Weak Magnetism Proportion Coefficient	Range: 0.00~655.35	Factory Value: 1.00
F3-27	Weak Magnetism Integral Coefficient	Range: 0.00~655.35	Factory Value: 0.20
F3-28	Output Voltage Limit Value	Range: 0%~115%	Factory setting: 100%

The inverter can output AC voltage to the motor under specific DC bus voltage, which is limited by the PWM modulation degree. Therefore, after the motor operating speed exceeds the rated speed, it is usually necessary to adjust the demagnetization current in real time to control the motor voltage within the range achievable by PWM modulation.

F3-26, F3-27: These parameters are used to set the proportional gain and integral gain of the voltage amplitude PI regulator, respectively.

F3-28: Increasing this parameter can increase the modulation limit of the output voltage, generally set not to exceed 105%.

F3-29	Torque Filter Time	Range: 0.001~10.000 s	Factory value: 0.500 s
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This parameter is used to set the high-pass filter time constant for torque (voltage) compensation under VVC control mode for permanent magnet motors. It generally does not need to be modified.

F3-30	VVC Voltage Feedforward Gain	Range: 0.00~2.00	Factory Value: 1.00
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This parameter is used to adjust the magnitude of the output voltage feedforward under VVC control mode for permanent magnet motors, to meet the demand for rapid response under certain operating conditions.

Parameter F3-30 = 1.00 represents feedforward = back EMF × motor speed / motor rated speed.

When using VVC for induction motors, if L0-04 & 512 is not zero, this parameter is also effective for VVC of induction motors.

F3-31	VVC Compensation Low Pass	Range: 0.00~600.00 s	Factory Value: 0.05 s
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The time constant for high-pass filtering of frequency compensation under VVC mode. This value is typically 1% of F3-41 and generally does not require adjustment. If the actual motor speed oscillation frequency exceeds the filter frequency range corresponding to F3-31 and F3-41, appropriate adjustments can be made.

F3-41	VVC Compensation High Pass	Range: 0.00~655.35 s	Factory Value: 5.00 s
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The time constant for high-pass filtering of frequency compensation under VVC mode. This value is usually 100 times that of F3-31.

F3-42	VVC Compensation Gain	Range: 0.00~655.35	Factory Value: 1.00
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The gain value for frequency compensation under VVC mode; increasing this gain helps improve speed oscillation under VVC mode.

F3-43	PM Sensorless Control Bit	Range: 0000H~FFFFH	Factory value: 0
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This parameter needs to be set bit by bit, as shown in Table 2-5:

Table 2-5 PM Sensorless Control Bit Description

bit (bit)	Function	Description
0	Current Loop Feedforward	0: Feedforward Enabled 1: Feedforward

Parameter Group Description

		Disabled
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F3-45	MTPA Low-pass Filter Coefficient	Range: 0~1000	Factory value: 10
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MTPA low-pass filter coefficient, generally does not need to be modified.

2.5 Parameters for the First Motor in Group F4

F4-00	Motor Type Selection	Range: 0~3	Factory value: 0
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This parameter is used to set the motor type:

0: Induction Motor

1: Surface-Mounted Permanent Magnet Synchronous Motor

Corresponds to equal d-axis and q-axis inductances.

2: Interior Permanent Magnet Synchronous Motor

Corresponds to unequal d-axis and q-axis inductances.

3: Synchronous Reluctance Motor

F4-01	Motor Parameter Identification	Range: 0~13	Factory value: 0
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0: No Function

1: IM Advanced Rotary Identification

Includes static parameter identification, rotary parameter identification, and mutual inductance saturation curve identification of induction motors.

2: IM Static Identification

Used in scenarios where the induction motor cannot rotate initially.

4: PM Motor Pole Identification

5: PM Rotation Identification

Includes static identification and back-EMF parameter identification for permanent magnet motors.

6: IM Rotation Identification

Used in scenarios where the induction motor can rotate; it is recommended that the motor be lightly loaded or unloaded.

12: FOC Inertia Identification

13: PM Static Identification

Includes only the stator resistance and inductance identification for permanent magnet motors, does not include back-EMF parameter identification.

F4-02	M1 Maximum Frequency	Range: 0.00~599.00 Hz	Factory Value: 50.00 Hz
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F4-03	M1 Rated Frequency	Range: 0.00~599.00 Hz	Factory Value: 50.00 Hz
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F4-04	M1 Rated Voltage	Range: 0.0~510.0 V	Factory value: 380.0 V
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When F4-00 motor type is set to 0 (induction motor), the above parameters are used to set induction motor 1; otherwise, they are used to set permanent magnet synchronous motors or synchronous reluctance motors. Note that changing the F4-02 parameter will affect the motor's acceleration and deceleration speed. The current acceleration/deceleration time parameter corresponds to the time it takes for the motor to accelerate/decelerate from zero speed to the highest frequency.

F4-05	IM1 Rated Power	Range: 0.00~655.35 kW	Factory value: Model determined
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This parameter is used to set the rated power of induction motor 1.

F4-06	IM1 Number of Poles	Range: 2~20	Factory value: 4
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This parameter is a read-only parameter used to display the number of poles of induction motor 1. Based on the user input of M1 rated frequency (F4-03) and IM1 rated speed (F4-08), this parameter value is automatically calculated. This parameter equals twice the number of motor pole pairs.

F4-07	IM1 Rated Current	Range:	Factory value: Model determined
		0.00A~655.35A (Model ≤93kW)	
		0.0A~6553.5A (Model ≥110kW)	

This parameter is used to set the rated current of induction motor 1. When the inverter model is ≤93kW, this parameter has two decimal places; for models with higher power, this parameter has one decimal place.

F4-08	IM1 Rated Speed	Range: 0~65535 rpm	Factory Value: 1410 rpm
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This parameter is used to set the rated speed of induction motor 1, measured in rpm (revolutions per minute). The inverter software will automatically calculate the number of poles of induction motor 1

based on this parameter and the M1 rated frequency (F4-03).

F4-09	Inertia Per Unit Value	Range: 1~65535 pu	Factory Value: 256 pu
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This parameter is used to set the per unit value of inertia for induction motor 1 and synchronous motors. For a small number of motors with abnormally high inertia, if the speed loop proportional parameter is set to the maximum value of 100 and the speed response is still too slow, this parameter can be appropriately increased to further speed up the speed loop response.

F4-10	IM1 No-load Current	Range: 0.00A~F4-07	Factory value: Model determined
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This parameter is used to set the no-load current value of induction motor 1, which is typically obtained through induction motor parameter identification.

When the inverter model $\leq 93\text{kW}$, this parameter has two decimal places; for higher power models, this parameter has one decimal place.

F4-11	IM1 Stator Resistance	Range: 0.000~655.35 Ω or m Ω	Factory value: Model determined
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F4-12	IM1 Rotor Resistance	Range: 0.000~655.35 Ω or m Ω	Factory Value: 0.000 Ω or m Ω
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This parameter is used to set the stator resistance and rotor resistance of Induction Motor 1, typically obtained through induction motor parameter identification. When the inverter model $\leq 185\text{kW}$, the unit of this parameter is Ω ; for models with higher power, the unit of this parameter is m Ω .

F4-13	IM1 Mutual Inductance	Range:	Factory Value: 0.0 or 0.00
		0.0~6553.5mH (models $\leq 185\text{kW}$) 0.00~655.35mH (models $\geq 200\text{kW}$)	

This parameter is used to set the mutual inductance value of Induction Motor 1, typically obtained through induction motor parameter identification. For inverter models $\leq 185\text{kW}$, this parameter has one decimal place; for models with higher power, this parameter has two decimal places.

F4-14	IM1 leakage inductance	Range:	Factory value: 0.00 or 0.000
		0.00~655.35mH (models $\leq 185\text{kW}$) 0.000~65.535mH (models $\geq 200\text{kW}$)	

This parameter is used to set the total leakage inductance value of induction motor 1, which is usually obtained through induction motor parameter identification. For models $\leq 185\text{kW}$, this parameter has two decimal places; for higher power models, this parameter has three decimal places.

F4-15	PM rated power	Range: 0.00~655.35 kW	Factory value: Model determined
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This parameter is used to set the rated power of permanent magnet synchronous motors or synchronous reluctance motors.

F4-16	PM pole number	Range: 0~65535	Factory value: 10
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This parameter is a read-only parameter used to display the number of poles of the synchronous motor. Based on the user-input M1 rated frequency (F4-03) and PM rated speed (F4-18), this parameter value is automatically calculated. This parameter equals twice the number of motor pole pairs.

F4-17	PM rated current	Range:	Model Confirmation
		0.00A~655.35A (Model $\leq 93\text{kW}$) 0.0A~6553.5A (Model $\geq 110\text{kW}$)	

This parameter is used to set the rated current for permanent magnet synchronous motors or synchronous reluctance motors. When the inverter model $\leq 93\text{kW}$, this parameter has two decimal places; for higher power models, this parameter has one decimal place.

F4-18	PM rated speed	Range: 0~65535 rpm	2000 rpm
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This parameter is used to set the rated speed of the synchronous motor, with units of rpm (revolutions per minute). The inverter software will automatically calculate the number of poles of the synchronous motor based on this parameter and the M1 rated frequency (F4-03).

F4-19	PM motor inertia	Range: 0.0~6553.5 kg·m ²	Model Confirmation
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This parameter is used to set the moment of inertia of the synchronous motor, and it is generally recommended not to modify it.

F4-20	PM Stator Resistance	Range: 0.000~655.35 Ω or m Ω	Factory value: Model determined
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This parameter is used to set the stator resistance and rotor resistance of the synchronous motor, which are usually obtained through synchronous motor parameter identification.

When the inverter model is $\leq 185\text{kW}$, the unit of this parameter is Ω ; for models with greater power, the unit of this parameter is m Ω .

F4-21	PM D-axis Inductance	Range: 0.00~655.35mH (models $\leq 185\text{kW}$)	Factory value: 0.00 or 0.000
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F4-22	PM Q-axis Inductance		
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This parameter is used to set the D-axis inductance and Q-axis inductance of the synchronous motor, which usually needs to be obtained through synchronous motor parameter identification.

When the inverter model is $\leq 185\text{kW}$, this parameter has 2 decimal places; for models with greater power, this parameter has 3 decimal places.

F4-23	PM Ke Parameter	Range: 0~65535 V/krpm	Factory value: 0 V/krpm
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This parameter is used to set the back EMF constant of the synchronous motor, with units of V/krpm, which usually needs to be obtained through synchronous motor parameter identification.

F4-26	PM Magnetic Pole Angle	Range: 0.0~6553.5 degrees	Factory value: 0.0 degrees
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This parameter is used to set the initial position angle of the synchronous motor. It usually needs to be obtained through initial position identification of the synchronous motor and does not require modification.

F4-27	Encoder Type Selection	Range: 0~5	Factory value: 0
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- 0: No PG card
- 1: ABZ encoder
- 2: Reserved
- 3: Resolver

F4-28	Encoder Pulse Count	Range: 6~20000 ppr	Factory value: 1024 ppr
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This parameter is used to set the number of lines of the selected incremental encoder, indicating the number of A/B signal pulses output by the encoder per rotation. The higher this value, the higher the resolution of the encoder, and the higher the accuracy of speed and position measurement.

If this parameter is set incorrectly, it can cause overcurrent in the inverter output and motor overspeed during closed-loop speed control. When using a permanent magnet motor, it can also result in incorrect initial position identification of the rotor. When changing the encoder results in a change in the number of encoder lines, it is necessary to perform the rotor position dynamic identification again (parameter F4-01=4).

F4-29	Encoder Pulse Type	Range: 0~5	Factory value: 1
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- 0: No Function
- 1: A phase leading B phase indicates forward rotation
- 2: B phase leading A phase indicates forward rotation

The pulse signal diagram for forward rotation where A pulse leads B pulse is shown in Figure 2-12.

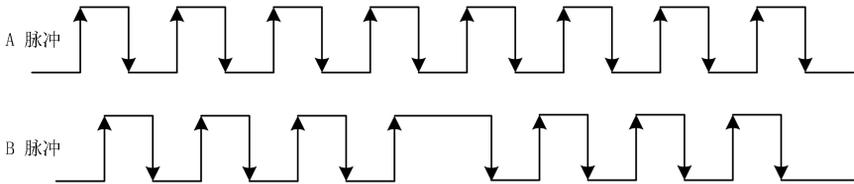


Figure 2-12 A phase pulse leading B phase pulse

The pulse signal diagram for forward rotation where B pulse leads A pulse is shown in Figure 2-13.

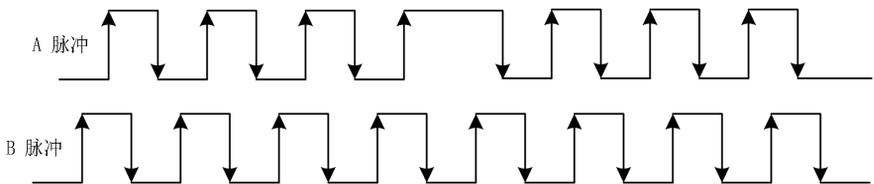


Figure 2-13 B phase pulse leading A phase pulse

F4-30	Reference Pulse Input Type	Range: 0~5	Factory value: 0
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- 0: No Function
- 1: A phase leading B phase indicates forward rotation
- 2: B phase leading A phase indicates forward rotation

The pulse signal diagram for forward rotation where A pulse leads B pulse is shown inFigure 2-14.

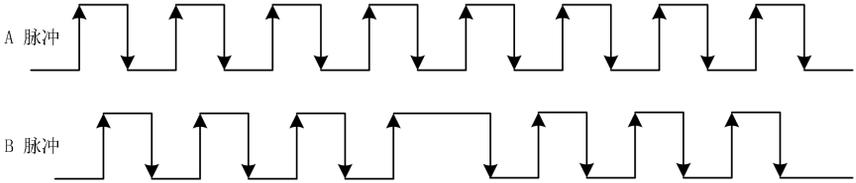


Figure 2-14 A-phase pulse leads B-phase pulse

The diagram showing B-phase pulse leading A-phase pulse for positive rotation isFigure 2-15:

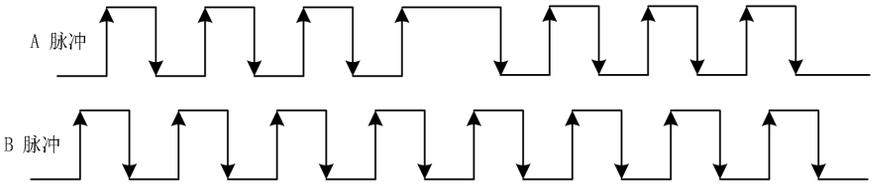


Figure 2-15 B-phase pulse leads A-phase pulse

F4-32	Rotary Encoder Pole Pairs	Range: 1~50	Factory value: 1
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This parameter is used to set the number of pole pairs of the rotary encoder.

Note: This can only be modified when parameter F3-27=3

F4-34	PG feedback filter	Range: 0~2000 Hz	Factory value: 100 Hz
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At normal speed,

PG feedback speed digital low-pass filter cutoff frequency.

F4-35	PG feedback zero-speed filter	Range: 0~2000 Hz	Factory value: 50 Hz
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Near zero speed,PG feedback speed digital low-pass filter cutoff frequency.

F4-36	Load-side Gear A1	Range: 1~65535	Factory Value: 100
F4-37	Motor side gear B1	Range: 1~65535	Factory Value: 100
F4-38	Load-side Gear A2	Range: 1~65535	Factory Value: 100
F4-39	Motor side gear B2	Range: 1~65535	Factory Value: 100

The two sets of gear ratios can be switched via digital input terminals, terminal function set to 48, and when the terminal status is valid, the A2 and B2 gear ratios are effective; otherwise,theA1 and B1 gear ratios are effective. An encoder-equipped variable frequency drive system with mechanical gears is shown in Figure 2-16.

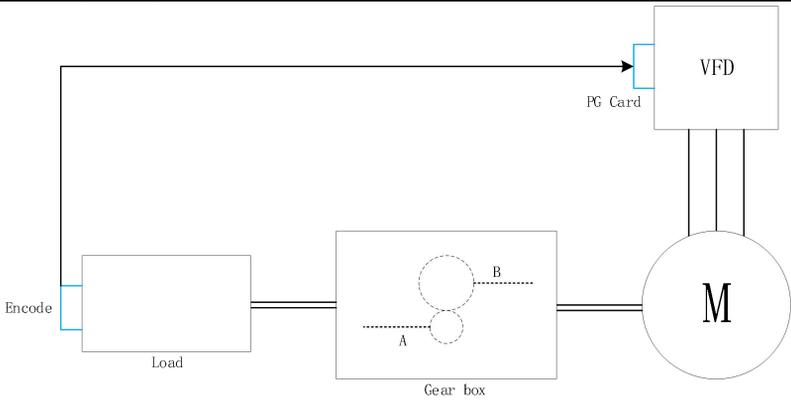


Figure 2-16 Encoder-equipped variable frequency drive system with mechanical gears

F4-40	Electronic Gear A	Range: 1~65535	Factory Value: 100
F4-41	Electronic Gear B	Range: 1~65535	Factory Value: 100
F4-42	Synchronous reluctance no-load current	Range: 0.00~13.00A	Factory Value: 5.20A

The electronic gear is used to set the ratio for amplifying or reducing position control commands; actual position command = position command * F4-40/F4-41. When PG2 is used as a frequency command, actual frequency command = PG2 frequency command × F4-40/F4-41.

2.6 F5 Group Input Terminals

The CM680 series inverter is equipped with 8 multifunctional digital input terminals, among which HDI8 can be used as a high-speed pulse input terminal, and there are also 3 analog input terminals.

F5-00	DI1 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-01	DI2 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-02	DI3 Terminal Function Selection	Range: 0~94	Factory value: 1
F5-03	DI4 Terminal Function Selection	Range: 0~94	Factory Value: 2
F5-04	DI5 Terminal Function Selection	Range: 0~94	Factory Value: 3
F5-05	DI6 Terminal Function Selection	Range: 0~94	Factory value: 4
F5-06	DI7 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-07	HDI8 Terminal Function Selection	Range: 0~94	Factory value: 0

The above function codes are used to set the functions of the multifunctional digital input terminals, as shown in Table2-6.

Note: Only when parameter F5-08 is equal to 0 can F5-00, F5-01, and F5-02 be normally modified (set function). When F5-08 is a non-zero parameter, the functions of F5-00, F5-01, and F5-02 are affected by F5-08. (F5-02 is only controlled by F5-08 when F5-08=3 or F5-08=6; at other times, it can be set to normal MI function), refer to the description section of Table 2-6 for details.

Table 2-6 Functions Corresponding to Digital Multi-function Input Terminals

Set Value	Function	Description
0	No function	The inverter does not process digital terminal signals.
1	Multi-speed/Multi-point Position 1	A total of 16 segments can be set through the combination of states of four digital input terminals, detailed combinations are shown below.
2	Multi-speed/Multi-point Position 2	
3	Multi-speed/Multi-point	

Set Value	Function	Description
	Position 3	
4	Multi-speed/Multi-point Position 4	
5	Fault Reset	External fault reset function. It has the same function as the STOP key on the digital operator.
6	Jog Operation	Jog operation, which has the same function as the JOG key on the digital operator. The jog operation set frequency, acceleration and deceleration times refer to F7-00, F7-01, F7-02.
7	Speed Hold	During the inverter acceleration or deceleration process, if the external terminal function is selected as speed hold and the terminal status is valid, the inverter maintains the current speed operation; when the terminal status is invalid, the inverter continues to accelerate or decelerate to the set value.
8	1-2 segment acceleration/deceleration switching	First and second acceleration/deceleration time switching, default uses the first and fourth acceleration/deceleration times, both switch through the first and fourth acceleration/deceleration switching frequency (F1-15), select multi-function input terminal, can switch terminal status to achieve first and second acceleration/deceleration time switching.
9	3-4 segment acceleration/deceleration switching	Third and fourth acceleration/deceleration time switching, select multi-function input terminal, can switch terminal status to achieve third and fourth acceleration/deceleration time switching.
10	External Fault	External Fault Input (External Fault), when the status of the multifunctional digital terminal is valid, the inverter decelerates and stops according to the emergency or forced shutdown deceleration method (F1-23). The Digital Operator displays EF until the external terminal status returns to normal. After fault reset (RESET), the inverter can continue to operate.
11	Base Block	Base Block (Base Block) Input, when the status of the multifunctional digital terminal is valid, the inverter immediately stops output, and the motor freely decelerates and stops. The Digital Operator displays B.B.
12	Stop Output	Output Stop, when the set multifunctional digital terminal is invalid, the inverter will immediately stop output, the motor will freely decelerate to a stop, and the inverter enters output wait mode until the input IO signal returns to normal, at which point the inverter restarts to the current set frequency.
13	Automatic Acceleration/Deceleration Prohibited	Cancel Auto Acceleration/Deceleration Setting, you need to set the Auto Acceleration/Deceleration setting (F1-20) to non-linear acceleration/deceleration. By switching the state of the multifunctional input IO port, you can switch between Auto Acceleration/Deceleration and linear acceleration/deceleration modes.

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Set Value	Function	Description
15	AI1 Input Frequency Command	Speed command comes from AI1; when the set multifunctional input terminal status is valid, the inverter's frequency command source is forced to AI1. When setting other AI command sources at the same time, AI1 has the highest priority.
16	AI2 Input Frequency Command	Speed Command comes from AI2, when the set multi-function input terminal status is valid, the inverter frequency command source is forcibly set to AI2.
17	AI3 Input Frequency Command	Speed Command comes from AI3, when the set multi-function input terminal status is valid, the inverter frequency command source is forcibly set to AI3.
18	Deceleration Stop	Forced Shutdown, when the set multi-function input terminal status is valid, the inverter will decelerate and stop according to the emergency or forced shutdown deceleration method (F1-23).
19	Frequency Increase External Command	Frequency increment command, requires setting the frequency command source (F0-06 = 3) to external UP/DOWN terminals, when the configured multi-function input terminal status is active, the inverter's frequency setting will increase one unit. If the input terminal remains active, the frequency command will increment according to the settings for the external terminal UP/DOWN key mode (F5-09) and the external terminal UP/DOWN key acceleration/deceleration rate (F5-10) until it reaches the maximum frequency command value.
20	External frequency decrease command	Frequency decrement command, requires setting the frequency command source (F0-06 = 3) to external UP/DOWN terminals, when the configured multi-function input terminal status is active, the inverter's frequency setting will decrement one unit. If the input terminal remains active, the frequency command will decrement according to the settings for the external terminal UP/DOWN key mode (F5-09) and the external terminal UP/DOWN key acceleration/deceleration rate (F5-10) until it reaches the minimum frequency command value.
21	PID function disabled	PID function cancellation, when the set multifunctional input terminal status is valid, the PID function becomes invalid.
22	Clear counter	Counter reset, when the set multifunctional input terminal status is valid, the inverter will reset the current count display value to zero. When the input terminal status switches to invalid, the inverter will resume counting.
23	Input count	Each time the input terminal status is valid, the digital operator will automatically increment the displayed count value by 1. The count value reset judgment is determined by the last count value reaching the set (L6-00).
24	External Forward Jog	Need to set the operation command source to external terminals (F0-05 = 1), when the configured multi-function input terminal status is valid, the

Set Value	Function	Description
		inverter will perform forward jog operation. When executing the JOG command in torque mode, the inverter forcibly switches to speed mode, and after the JOG command disappears, it automatically returns to speed mode.
25	External Reverse Jog	Need to set the operation command source to external terminals (F0-05 = 1), when the configured multi-function input terminal status is valid, the inverter will perform reverse jog operation. When executing the JOG command in torque mode, the inverter forcibly switches to speed mode, and after the JOG command disappears, it automatically returns to speed mode.
26	Torque/Speed Mode Switching	Torque Speed Mode Switching, when the set multifunctional input terminal status is valid, the inverter will operate in torque mode, or otherwise, it will operate in speed mode.
27	Speed Loop 1/2 Switching	ASR1/ASR2 Switching, low-speed and high-speed zone speed loop control parameter switching, when the set multifunctional input terminal status is valid, the inverter will perform speed control with high-speed zone control parameters (ASR2), or otherwise, it will use low-speed zone control parameters (ASR1).
28	External Fault Free Stop	Emergency Stop, when the set multifunctional input terminal status is valid, the inverter immediately stops output and displays EF1 on the digital operator, the motor freely decelerates to a stop, when the external input terminal status returns to normal, fault reset must be performed through RESET before it can continue to run.
31	High torque compensation amount	Torque command bias, torque command bias source (FE-05) set to 3 (torque command bias source is external terminal), multi-function input terminal set to 31, when the multi-function terminal input status is valid, the high torque command bias compensation value is high torque command compensation (FE-07), multi-function input terminal set to 32, when the multi-function terminal input status is valid, the medium torque command bias compensation value is medium torque command compensation (FE-08), multi-function input terminal set to 33, when the multi-function terminal input status is valid, the low torque command bias compensation value is low torque command compensation (FE-09).
32	Intermediate Torque Compensation	Please see the setting value is 31.
33	Low Torque Compensation	Please see the setting value is 31.
34	Multi-speed/Position Switching	Terminal selection for multi-speed and multi-position function switching, the set multifunctional input terminal status is valid when selecting multi-position command terminals, otherwise, they are used to

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Set Value	Function	Description
		select multi-speed command terminals.
35	Internal Positioning Enable	Enable single-point positioning, when the set multifunctional input terminalstatus is valid, the inverter performs internal single-point positioning according to the encoder's internal positioning position (FC-20). Only supports FVCcontrol mode.
36	Multi-point Position Input	When the set multifunctional input terminalstatus is valid, the inverter writes the current position information into the corresponding multi-segment position command parameter for manual calibration of the multi-segment position command parameter setting.
37	Pulse Input Position Control	Enable full-range position control pulse command input, select the inverter frequency command source as pulse input (F0-06 = 4,5). When the set multifunctional input terminalstatus is valid, the pulse input on the PG card serves as the position command. It is recommended to set the APR feedforward gain (FC-25) to 0.
38	Prohibit Writing to EEPROM	Prohibit writing to EEPROM,when the set multifunctional input terminalstatus is valid, some parameter modifications will not be saved toEEPROM, and will not be retained after power loss.
39	Torque Command Direction Switching	Torque Command Direction, Applicable for Torque Control Mode, when the torque command source is A11/A12/A13, if the set multifunctional input terminal status is valid, the torque command automatically converts to a negative value.
40	Motor Free Stop	Forced Free Run Stop, during the operation of the inverter, when the set multifunctional input terminal status is valid, the inverter immediately stops output, and the motor freewheels to a stop.
41	Manual Mode Enable	HAND Switch, when the set multifunctional input terminal status is valid, the inverter switches to HAND mode, and the frequency command source and operation command source switch to being determined by parameters L1-00 and L1-01. When the multi-function input terminalstatus is invalid, the inverter will stop (it will be unable to start in standby mode).
42	Automatic mode enable	When the multi-function input terminal status set for AUTO switching is valid, the inverter switches toAUTO mode, and the frequency command source and operationcommand source switch according to parameters F0-06 and F0-05. When the multi-function input terminalstatus is invalid, the inverter will stop (it will beunable to start in standby mode).
48	Mechanical gear ratio switching	When the multi-function input terminalstatus set for mechanical gear ratio switching is valid, the mechanical gear ratio switches to thesecondset (from F4-36,F4-37 to F4-38, F4-39).
49	Inverter Enable	Inverter Enable, by default, the inverter enable is effective, allowing the inverter to control start and stop. When the inverter is not enabled, the operation command is invalid. If the inverter enable fails during operation,

Set Value	Function	Description
		the motor will freely decelerate and stop. Switching the status of the multi-function input terminal can change the inverter enable status. Once the multi-function input terminal is configured as the inverter enable, the inverter can only be started by setting the multi-function input terminal status to effective.
50	Slave dEB (instant stop without stopping) action input	Slave dEB action input, when the master station experiences a dEB action, this information is input to notify the slave station to also perform a dEB action, ensuring that the slave station can stop simultaneously.
53	CANopen Quick Stop Trigger	CANopen Quick Stop Trigger,When CANopen control is set, if the designated multifunctional input terminal is invalid, the inverter operation state is forcibly switched to quick stop.
56	Local/Remote Switching	LOCAL/REMOTE Switch Selection,When LOCAL/REMOTE action selection is set to LOCAL/REMOTE switching (L1-02 is not 0),at this time, the higher-level machine will displayLOC/REM status. If the designated multifunctional input terminal is invalid, the inverter operates inLOCAL mode; otherwise, REMOTE mode.
70	Auxiliary Frequency Forced to 0	Auxiliary Frequency Forced to 0,When the auxiliary frequency function is enabled (auxiliary frequency source F0-07 is not 0), if the designated multifunctional input terminal is invalid, the auxiliary frequency is forced to 0. If PID is the main frequency, PID will continue to operate.
71	PID function disabled, PID output forced to 0	PID function disabled,PID output forced to 0, auxiliary frequency function enabled (auxiliary frequency source F0-07 not 0), and when using the PID function, if the set multifunctional input terminal is invalid, thePID function stops, integral value is reset, andPID output is reset.
72	PID function disabled, PID maintains current output level	PID function disabled,PID maintains previous output value, auxiliary frequency function enabled (auxiliary frequency source F0-07 not 0), and when using the PID function, if the set multifunctional input terminal is invalid, thePID function stops, andPID maintains previous output.
73	Force PID integral gain to 0	Force PIDintegral gain to 0, integral action is disabled, when the set multifunctional input terminal is ineffective,PID continues to work, but the integrator stops working, and the integrator output is cleared.
74	Invert PID feedback	Invert PID feedback, when the set multifunctional input terminal is effective,the sign of the PID feedback value is reversed; if the PID feedback is positive, it is converted to negative, and if the PID feedback is negative, it is converted to positive.
83	Select bit0 for multiple induction motors	Select multiple (induction) motors, when the set multifunctional input terminal is ineffective,switch different motor parameters based on the terminal state combination, the working frequency and V/F curve parameters corresponding to different motor parameters need to refer to the basic parameter group. The combination relationship is shown in Table

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Set Value	Function	Description
		2-9.
84	Multiple Induction Motor Selection Bit 1	Same as Above.
86	Diameter Reset	Diameter Reset, under Tension Control Mode (Tension Control Mode FB-00 not 0), when the set multifunctional input terminal is effective, the current diameter (FB-38) resets to the initial diameter or empty roll diameter.
87	Initial Diameter Selection 1	Initial Diameter Selection, under Tension Control Mode (Tension Control Mode FB-00 not 0), when the set multifunctional input terminal is effective, the current diameter (FB-38) can reset to the initial diameter (FB-30, FB-31). The terminal selection relationship is shown in Table 2-10.
88	Initial Diameter Selection 2	Same as Above.
89	Tension PID Control Integral Reset	Tension PIDControl Integral Reset, in TensionControl Mode (TensionControl Mode FB-00 is not 0), when the designated multi-function input terminalis effective, the integrator output is reset.
90	Diameter Calculation Hold	Diameter Calculation Hold, when the designated multi-function input terminalis effective, the diameter calculation update stops.
91	Diameter Mode Selection (0: Winding In 1: Winding Out)	Drum Mode Selection, when the designated multi-function input terminalis effective, the drum mode switches to winding out; otherwise, it is winding in.
92	Disable Tension PID	DisableTensionPID, when the set multifunctional input terminalisvalid, disablethetensionPID function.
93	Pause Tension PID	Pause Tension PID, when the set multifunctional input terminalisvalid, pause the tensionPID function.
94	Automatic Diameter Switching	AutoDiameter Switching, when the set multifunctional input terminalisvalid, autoswitch the diameter.

Note:

1. All digital input terminals are trigger-effective, meaning that after each power-on, the terminal status needs to switch from invalid to valid for the inverter to recognize the terminal input status as valid. If the terminal input status remains valid before and after power-on, the inverter will consider the terminal input status as invalid. If the terminal function is selected as 2/3wire or jog operation, you can use function code F5-19 to choose whether the inverter runs directly when the power is turned on or after a fault reset, if the terminal status for the selected terminal operation function is valid.

2. When 2/3 wire control is selected (F5-08 is not 0), digital input terminals DI1 and DI2 are forced to forward and reverse input, and other functions cannot be selected. To select other functions for DI1 and DI2, F5-08 must be set to 0.

3. Before changing the digital terminal function, ensure that the corresponding terminal status has been reset to an invalid state to guarantee that the previously selected function is no longer active when selecting the next function.

Multi-speed/Multi-position 1, 2, 3, 4 function description (set value as 1/2/3/4):

Four multi-segment command terminals can be combined into 16 states, these 16 states correspond

to 16 command set values. Taking the default configuration as an example (F5-02 = 1, F5-03 = 2, F5-04 = 3, F5-05 = 4, F5-16 = 0 low level effective), the relationship between DI status and multi-segment speed mapping is shown in Table 2-7 or Figure 2-17.

Table 2-7 DI Status and Multi-Segment Speed Mapping Relationship

DI6	DI5	DI4	DI3	Frequency setting	Corresponding Function Code
H	H	H	H	Multi-Speed 0	FD-00
H	H	H	L	Multi-Speed 1	FD-01
H	H	L	H	Multi-Speed 2	FD-02
H	H	L	L	Multi-Speed 3	FD-03
H	L	H	H	Multi-Speed 4	FD-04
H	L	H	L	Multi-Speed 5	FD-05
H	L	L	H	Multi-speed 6	FD-06
H	L	L	L	Multi-speed 7	FD-07
L	H	H	H	Multi-speed 8	FD-08
L	H	H	L	Multi-speed 9	FD-09
L	H	L	H	Multi-speed 10	FD-10
L	H	L	L	Multi-speed 11	FD-11
L	L	H	H	Multi-Speed 12	FD-12
L	L	H	L	Multi-Speed 13	FD-13
L	L	L	H	Multi-Speed 14	FD-14
L	L	L	L	Multi-Speed 15	FD-15

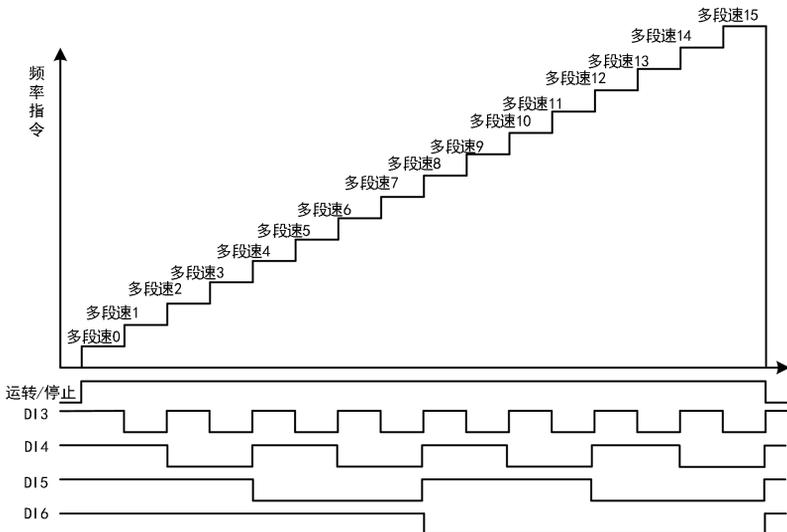


Figure 2-17 DI Corresponding Multi-Segment Speed

Speed Hold Function Description (Set Value is 7):

When this function is invalid, normal acceleration and deceleration occur; When this function is valid, the current frequency remains unchanged, as shown in Figure2-18.

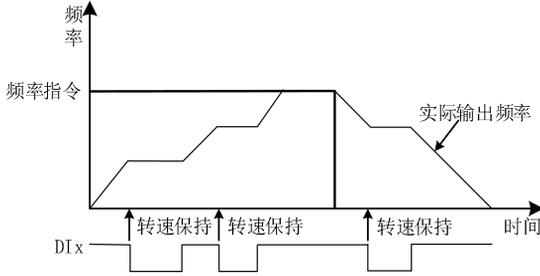


Figure 2-18 Speed Holding Function Schematic

Torque/Speed Mode Switching Function (Setting Value 26) Explanation:

When this function is invalid, the inverter operates in speed mode, running according to the frequency command, with the torque command serving as torque limitation; When this function is valid, the inverter operates in torque mode, running according to the torque command, with the frequency command serving as frequency limiting, as shown in Figure2-19.

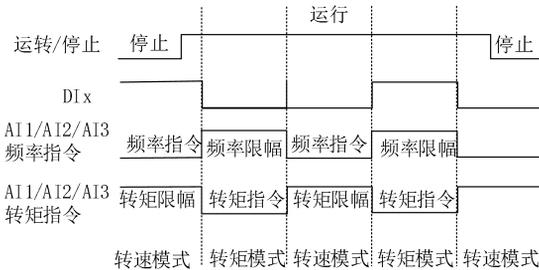


Figure 2-19 Torque/Speed Mode Switching Function

External Fault Free Stop Function (Setting Value 28) Explanation:

When this function is invalid, the inverter operates normally; When this function is effective, the inverter reports an external fault and immediately stops operation; it needs to be reset before it can be restarted, as shown in Figure 2-20.

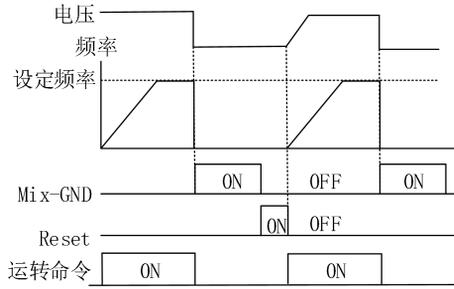


Figure 2-20 External Fault Free Stop Function

Internal Positioning Enable (terminal function selection setting value 35) Explanation:

When this function is ineffective, the inverter operates in normal speed mode; When this function is effective, the inverter will stop at the position set by FC-20, the internal positioning logic is shown in Figure 2-21.

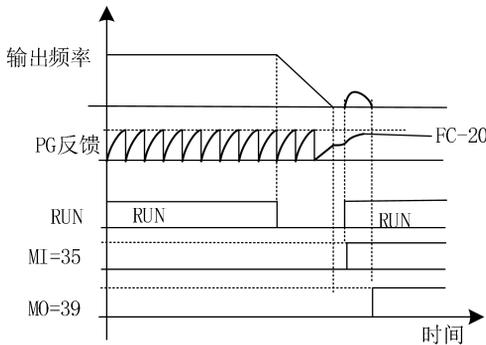


Figure 2-21 Internal Positioning Enable Explanation

Pulse Input Position Control Function (terminal function selection setting value 37) Explanation:

When this function is effective, the inverter performs position control based on the pulse input. If the internal positioning enable is also effective at this time, it will perform home position control, as shown in Figure 2-22.

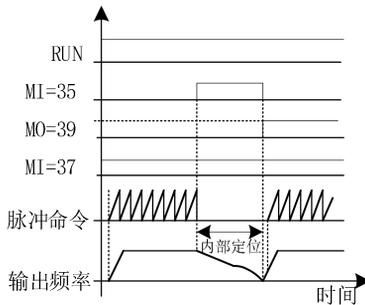


Figure 2-22 pulse input position control function

Manual and automatic mode enable functions (set values 41, 42) description:

Parameter Group Description

The manual and automatic mode enable functions can switch between manual and automatic modes, as shown in Table2-8.

Table 2-8 manual and automatic mode enable functions

Manual mode enable function	Automatic mode enable function	Inverter operating mode
Invalid	Invalid	stop operation
Valid	Invalid	Manual mode
Invalid	Valid	Automatic mode
Valid	Valid	stop operation

Multiple induction motor selection function (set values 83 and 84) description:

The multiple induction motor selection function can select induction motor parameters, as shown in Table2-9.

Table 2-9 multiple induction motor selection function

Multiple Induction Motor Selection Bit 1	Select bit0 for multiple induction motors	Induction Motor
Invalid	Invalid	Motor 1
Invalid	Valid	Motor 2
Valid	Invalid	Motor 3
Valid	Valid	Motor 4

Initial Roll Diameter Selection Function (Set Values 87 and 88) Description:

This function can select the initial roll diameter, as shown in Table2-10.

Table 2-10 Initial Roll Diameter Selection Function

Initial Diameter Selection 2	Initial Diameter Selection 1	Initial Roll Diameter Selection
Invalid	Invalid	Initial Roll Diameter 0 (FB-29)
Invalid	Valid	Initial Roll Diameter 1 (FB-30)
Valid	Invalid	Initial Roll Diameter 2 (FB-31)

F5-08	Terminal Command Mode	Range: 0~6	Factory value: 1
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This function code is used to set the terminal command mode.

- 0: No Function
- 1: 2-Wire Mode 1
- 2: 2-wire Mode 2
- 3: 3-wire
- 4: 2-wire Mode 1/Fast Start
- 5: 2-wire Mode 2/Fast Start
- 6: 3-wire Fast Start

Table 2-11 provides the wiring diagram for the terminal command mode.

Table 2-11 Wiring Diagram for Terminal Command Mode

Terminal Command Mode (F5-08)	External Terminal Wiring Schematic
1: 2-Wire Mode 1	
2: 2-wire Mode 2	

Terminal Command Mode (F5-08)	External Terminal Wiring Schematic
3: 3-wire	<div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>DI1 OFF: 停止, ON: 运行</p> <p>DI3 OFF: 禁能, ON: 使能</p> <p>DI2 OFF: 正向, ON: 反向</p> <p>COM</p> </div>
4: 2-wire Mode 1/Fast Start	Same as Mode 1
5: 2-wire Mode 2/Fast Start	Same as Mode 2
6: 3-wire Fast Start	Same as Mode 3

Note: When set to Quick Start mode, the inverter will immediately respond to the start command.

During shutdown, there will be a relatively large voltage at the inverter output terminals.

F5-09	UP/DOWN Mode Selection	Range: 0~4	Factory value: 0
F5-10	UP/DOWN Rate of Change	Range: 0.001~1.000Hz/ms	Factory setting: 0.001

This function code is used to set the UP/DOWN mode.

0: System Acceleration/Deceleration Time

When the external UP/DOWN signal is valid, the inverter accelerates and decelerates according to the normal acceleration and deceleration times (F0-13, F0-14, F7-03~F7-08).

1: Constant Speed

When the external UP/DOWN signal is valid, the inverter accelerates and decelerates according to the UP/DOWN rate of change (F5-10).

2: Step Acceleration/Deceleration (1step/pulse)

When an external UP/DOWN signal produces a valid pulse, the inverter performs a step acceleration or deceleration according to the UP/DOWN change rate (F5-10).

3: Exponential Curve

When the external UP/DOWN signal is valid, the inverter performs acceleration or deceleration according to the exponential curve.

4: Step Acceleration/Deceleration (1step/100ms)

When the external UP/DOWN signal is valid, the inverter performs a step acceleration or deceleration every 100ms according to the UP/DOWN change rate (F5-10).

F5-15	DI Terminal Valid Logic	Range: 0000H~FFFFH	Factory value: 0
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This function code can be used to set the effective logic level of the DI terminal. The table below lists the effective logic control bits for each DI terminal. If the corresponding control bit is 0, the effective logic level remains unchanged; if the corresponding control bit is 1, the effective logic level is inverted. The effective logic control bits for DI terminals are shown in Table 2-12.

Table 2-12 Valid Logic Control Bits for DI Terminals

Second digit from the right: Hexadecimal 0~F				First digit from the right: Hexadecimal 0~F			
HDI8	DI7	DI6	DI5	DI4	DI3	DI2	DI1
Fourth digit from the right: Hexadecimal 0~F				Third digit from the right: Hexadecimal 0~F			
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

F5-16	DI Terminal Response Time	Range: 0.000s~30.000s	Factory Value: 0.005s
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This function code is used to set the sensitivity of the DI terminals. If the DI terminals experience false triggering due to interference, this parameter can be increased to enhance the DI terminal's resistance to interference, but the sensitivity of the DI terminals will also decrease accordingly.

F5-17	Virtual/Real DI Terminal Selection	Range: 0000H~FFFFH	Factory value: 0
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This function code can be used to set whether the DI terminal signals come from actual terminals or virtual terminals. Table 2-13 lists the virtual/actual control bits for each DI terminal. If the

Parameter Group Description

corresponding control bit is 0, it selects the actual terminal; if the corresponding control bit is 1, it selects the virtual terminal. Virtual terminal signals are set through F5-18.

Table 2-13 Virtual/Actual DI Terminal Selection

Second digit from the right: Hexadecimal 0~F				First digit from the right: Hexadecimal 0~F			
HD18	DI7	DI6	DI5	DI4	DI3	DI2	DI1
Fourth digit from the right: Hexadecimal 0~F				Third digit from the right: Hexadecimal 0~F			
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

F5-18	Virtual Terminal Status Setting	Range: 0~65535	Factory value: 0
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This function code can be used to set the virtual DI terminal signals. Table2-14 lists the signal control bits for each virtual DI terminal. If the corresponding signal control bit is 0, the corresponding virtual terminal signal is invalid; if the corresponding signal control bit is 1, the corresponding virtual terminal signal is valid.

Table 2-14 Virtual Terminal Status Setting

Second digit from the right: Hexadecimal 0~F				First digit from the right: Hexadecimal 0~F			
HD18	DI7	DI6	DI5	DI4	DI3	DI2	DI1
Fourth digit from the right: Hexadecimal 0~F				Third digit from the right: Hexadecimal 0~F			
Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved

F5-19	External Operation Selection	Range: 0~1	Factory value: 0
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This function code is used to set the response of the inverter to external terminal command signals when powered on and after fault reset.

0: Invalid

When powered on or after a fault reset, if there is a terminal operation command, the inverter does not run until the terminal command signal is canceled. The inverter will only run again upon receiving another terminal operation command.

1: Run if there is an operation command

When powered on or after a fault reset, if there is a terminal operation command, the inverter runs.

F5-20	All signal type selection	Range: 0~2	Factory value: 0
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This function code is used to set the All signal type.

0: 0-10V input selection

Voltage signal input, with an input range of 0-10V.

1: 0-20mA input selection

Current signal input, with an input range of 0-20mA.

2: 4-20mA input selection

Current signal input, input range is4-20mA.

F5-21	All function selection	Range: 0~20	Factory value: 1
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This function code is used to set the All function, the analog input function selection is shown inTable 2-15:

Table 2-15 Analog InputFunction Selection

Set Value	Function	Description
0	No function	AI terminal has no function
1	Frequency setting	When used as frequency setting, the frequency source (F0-06) must be set to 2
2	Torque setting	When used as torque setting, the inverter control mode (F0-03) must be set to 2 (torque mode), the torque command source selection (FE-01) must be set to 2, and parameters F5-21, F5-27, or F5-33 must be set to 2.
3	Torque compensation setting	When used as torque compensation, the inverter must set the torque command bias source (FE-05) to 1 (from external analog input).
4	PID target value	When used as a PID target value, the PID feedback terminal (FA-00 not equal to 0) must be set, and there are two other cases: 1. The PID target value source (FA-01) is set to 0 (from frequency setting),

Set Value	Function	Description
		parameters F5-21 or F5-27 or F5-33 are set to 1 or 4; if both 1 and 4 are set in the analog input simultaneously, All is prioritized as the PID target value. 2. The PID target value source (FA-01) is set to 3 (from external analog input). The PID target value will be displayed in percentage form via parameter FA-02 (PID target value setting) (precision 0.01%).
5	PID feedback value	When used as PID feedback, PID feedback selection (FA-00) must be set to 1 or 4, and the feedback value is displayed in percentage form via U1-04 (Communication setting PID feedback value) (precision 0.01%) .
6	Thermistor Input PTC	An external PTC thermistor must be connected to detect whether the motor is overheating.
7	Forward Torque Limit	When the analog input is used as torque limit for four-quadrant operation, parameters F5-21, F5-27, or F5-33 should be set to 7, 8, 9, or 10. The torque limit values are displayed through parameters FE-11 to FE-14 (shared variables with torque limits received via communication), and the diagram below illustrates the torque limit for four-quadrant operation:
8	reverse torque limit	
9	regenerative torque limit	
10	Forward/Reverse Torque Limit	
11	Thermistor value PT100	
12	Auxiliary frequency setting	An external PT100 thermistor is required to detect whether the motor is overheated.
13	PID offset	When used as an auxiliary frequency input, the auxiliary frequency source (FO-07) must be set to 3 (external analog input).
14	Tension Feedback Value PID	When used as a PID compensation amount, the PID feedback selection (FA-00 not equal to 0) must be valid, and the PID compensation amount selection (FA-20) must be set to 1 (external analog input), the intelligent start frequency command (FA-33) to 0, and the application macro parameter (LO-00) to 6 (for air compressor industry applications). The change in the analog input compensation amount can be displayed in parameter FA-21 (PID compensation) as a percentage (precision 0.1%).
15	Line Speed Feedback	When used as tension PID feedback, the tension control mode selection (FB-00) must be set to 1 (speed closed-loop mode).
16	roll diameter feedback	As tension control line speed feedback
17	Tension PID	When used as roll diameter feedback (including initial roll diameter and real-time roll diameter calculation feedback), the tension control selection (FB-00 not zero) must be enabled, the roll diameter source (FB-25) must be set to 1 for analog input as roll diameter feedback (FB-38), and the initial roll diameter source (FB-28) must be set to 1 for analog input as the initial roll diameter (FB-29).
		When used as tension PID setpoint, the tension control mode selection

Set Value	Function	Description
	Setpoint	(FB-00) must be set to 1 (speed closed-loop mode), and the PID target source setting (FB-04) must be set to 2 (analog input). When the inverter is in operation, the PID target value setting (FB-05) is displayed.
18	Tension Setpoint	When setting the tension command, the tension control mode selection (FB-00) must be set to 3/4 (torque mode), the tension command source selection (FB-52) to 1 (analog input), and the maximum tension value (FC-53) should be set according to the site conditions (default value is 0). Parameters F5-21, F5-27, or F5-33 should be set to 18. When the inverter is in operation, the tension setting is displayed through parameter (FB-54).
19	Zero-speed tension setting	When setting the zero-speed tension command, the tension control mode selection (FB-00) must be set to 3/4 (torque mode), the zero-speed tension command source selection (FB-55) to 2 (analog input), and the maximum tension value (FB-53) should be set according to the site conditions (default value is 0). When the inverter is in operation, the zero-speed tension setting is displayed through parameter (FB-56).
20	Tension Setting Taper	When setting the tension taper, the tension control mode selection (FB-00) must be set to 3/4 (torque mode), the tension taper setting source selection (FC-64) must be set to 1 (analog input), and parameters F5-21, F5-27, or F5-33 must be set to 20. During the inverter operation, the tension taper setting is displayed through parameter (FC-65).

F5-22	All Input Bias	Range: -100.0% to 100.0%	Factory Value: 0.0
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This function code is used to set the analog input value corresponding to the 0 point of the All input signal.

F5-23	All Bias Mode Selection	Range: 0~4	Factory value: 0
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This function code is used to set the All bias mode. Properly setting the bias mode can effectively process the input signal to reduce the impact of noise.

- 0: No Bias
- 1: Below Bias = Bias
- 2: Above Bias = Bias
- 3: Absolute Value Bias as Center
- 4: Bias as Center

All various bias modes are illustrated in Figures 2-23 to 2-27, where Bias represents bias, set through F5-22, Gain represents gain, set through F5-24, the horizontal axis is the input signal, and the vertical axis is the signal after bias processing. Bias modes can be selected according to requirements.

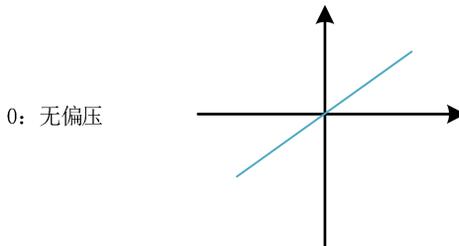


Figure 2-23 No Bias

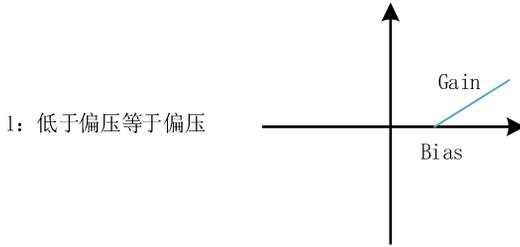


Figure 2-24 Below Bias = Bias

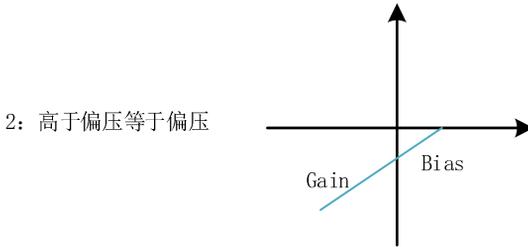


Figure 2-25 Above Bias = Bias

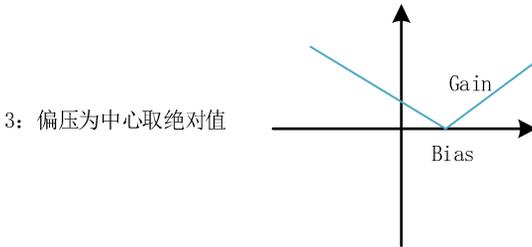


Figure 2-26 Bias Center for Absolute Value



Figure 2-27 Bias Center

F5-24	All Gain	Range: -500.0%~500.0%	Factory value: 100.0%
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This function code is used to set the All signal gain. The All signal gain can proportionally adjust the analog input signal; the gain setting can refer to F5-23.

F5-25	All Filter Time	Range: 0.00~20.00 seconds	Factory value: 0.01 second
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The inverter software filters out noise signals contained in the analog input signal at the control terminal through a digital low-pass filter; this parameter is used to set

Parameter Group Description

the time constant of the digital low-pass filter. The larger this parameter value, the better the filtering effect, but the greater the signal delay, and the control response performance deteriorates; the smaller the setting value, the faster the control response, but the worse the noise filtering effect, which may lead to unstable control. When selecting the optimal setting value, it can be determined by balancing control stability and response delay.

F5-26	AI2 Signal Type Selection	Range: 0~2	Factory value: 0
F5-27	AI2 Function Selection	Range: 0~20	Factory value: 0
F5-28	AI2 Input Bias	Range: -100.0% to 100.0%	Factory Value: 0.0
F5-29	AI2 Bias Mode Selection	Range: 0~4	Factory value: 0
F5-30	AI2 Gain	Range: -500.0%~500.0%	Factory value: 100.0%
F5-31	AI2 Filter Time	Range: 0.00~20.00 seconds	Factory value: 0.01 second

The above function codes are used for setting AI2; refer to F5-20 to F5-25.

F5-32	AI3 Signal Type Selection	Range: 0~2	Factory value: 0
F5-33	AI3 Function Selection	Range: 0~20	Factory value: 0
F5-34	AI3 Input Bias	Range: -100.0% to 100.0%	Factory Value: 0.0
F5-35	AI3 Bias Mode Selection	Range: 0~4	Factory value: 0
F5-36	AI3 Gain	Range: -500.0%~500.0%	Factory value: 100.0%
F5-37	AI3 Filter Time	Range: 0.00~20.00 seconds	Factory value: 0.01 second

The above function codes are used for setting AI3; refer to F5-20 to F5-25.

F5-38	Analog frequency negative value reversal	Range: 0~4	Factory value: 0
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This function code is used to set whether the analog signal can control the inverter direction.

0: Forward/reverse rotation determined by operation source

Negative frequency input from the analog input signal is not allowed; forward and reverse actions are controlled by the keyboard or external terminals.

1: Forward/reverse rotation determined by bias

Negative frequency input from the analog input signal is allowed; positive frequency results in forward rotation, and negative frequency results in reverse rotation. At this time, the keyboard and external terminals cannot control forward and reverse rotation.

The condition for analog signals to input negative frequency is:

1. Set F5-38 to 1;

2. Bias mode setting (F5-23, F5-29, or F5-35) to 4 (centered on bias);

3. The corresponding analog input gain is less than 0, making the calculated input frequency negative. When using the analog input addition function (F5-39), if the added analog signal is negative, this parameter can control whether the inverter reverses.

F5-39	Analog input addition enable	Range: 0~4	Factory value: 0
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This function code is used to set whether the analog input addition function is enabled.

0: Disabled

The analog input addition function is disabled.

1: Enable

The analog input addition function is enabled.

When F5-21 = F5-27 = F5-33 = 1, Frequency Command = AI1 + AI2 + AI3; When F5-21 = F5-27 = 1, and F5-33 ≠ 1, frequency command = AI1 + AI2; When F5-21 = F5-33 = 1, and F5-27 ≠ 1, frequency command = AI1 + AI3; When F5-27 = F5-33 = 1, and F5-21 ≠ 1, frequency command = AI2 + AI3.

When the analog input addition function is invalid, if the analog input functions are selected the same, the effective signal is determined based on the analog input priority (AI1 > AI2 > AI3).

F5-42	4-20mA Wire Break Action	Range: 0~3	Factory value: 0
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This function code is used to set the handling method when an analog input current signal wire break is detected, which is valid when the analog type is selected as 4-20mA input.

0: Do not detect open circuit

Do not perform wire break detection.

1: Maintain frequency before open circuit

After detecting a wire break, continue running and display a wire break warning.

2: Decelerate to 0Hz

After detecting a wire break, reduce the frequency to zero speed while displaying a wire break warning.

3: Immediate stop due to fault

After detecting a wire break, immediately stop operation and report a wire break fault.

F5-43	4-20mA Wire Break Threshold	Range: 0.00mA~4.00mA	Factory Value: 2.00mA
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This function code is used to set the threshold for analog input current signal wire break detection; if the value is below this threshold, a wire break is considered to have occurred.

2.7 F6 Group Output Terminals

This series of inverters is equipped with 2 multifunctional digital output terminals and two multifunctional relay output terminals.

F6-00	RLY1 terminal function selection	Range: 0~76	Factory value: 11
F6-01	RLY2 terminal function selection	Range: 0~76	Factory value: 1
F6-02	DO1 Terminal Function Selection	Range: 0~76	Factory value: 0
F6-03	DO2 Terminal Function Selection	Range: 0~76	Factory value: 0

Multi-function output terminal function selection as Table 2-16 shown:

Table 2-16 Multi-function output terminal function selection

Set Value	Function	Description
0	No function	Disable multi-function digital output function
1	Inverter running	Inverter running, this terminal output is valid.
2	Reach set frequency	Reach set frequency, when the inverter output frequency deviation from the set frequency is within a certain range ($\pm 2\text{Hz}$), this terminal output is valid.
3	Reach frequency 1 detection value	Reach frequency 1 detection value, when the inverter output frequency deviation from the frequency 1 detection value (F6-27) is less than the frequency 1 amplitude (F6-28), this terminal output is valid.
4	Reach frequency 2 detection value	When the inverter output frequency deviates from the frequency arrival 2 detection value (F6-29) by less than the frequency arrival 2 amplitude (F6-30), this terminal is valid.
5	Zero Speed Command Operation	This terminal is valid when the frequency command is 0 during inverter operation.
6	Zero Speed Command Operation (Including STOP)	This terminal is valid when the inverter frequency command is 0 (including when the inverter is stopped).
7	Over Torque 1	When the inverter detects an over torque condition (over torque action method, detection threshold, and detection time refer to parameters F9-36 ~ F9-38), this terminal is valid.
8	Over Torque 2	When the inverter detects an over torque (for over torque action method, detection threshold, and detection time, refer to parameters H3-00 ~ H3-02), this terminal is active.
9	Inverter Ready	When the inverter has no fault (including during stop and operation), this terminal is active.
10	Low Voltage Warning	When the inverter experiences DC bus under-voltage (including during stop and operation, and when the DC bus voltage is below the low voltage threshold L2-18), this terminal is active.
11	Fault Indication	When the inverter experiences a fault (excluding under-voltage during stop, base block fault, and instantaneous power failure without stop fault), this terminal is active.
12	Brake release	This terminal is effective when the inverter operating frequency is not 0 or greater than the motor zero-speed threshold (F6-09).
13	Overtemperature warning	This terminal is effective when the inverter detects an overtemperature warning for the IGBT or bus capacitor.
14	Software brake action indication	This terminal is effective when the inverter's discharge resistor switch actuates.
15	PID feedback abnormality	This terminal is effective when the inverter detects that the deviation between the PID setpoint and feedback exceeds the set threshold (FA-51) and persists for the duration (FA-52).

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Set Value	Function	Description
16	Excessive slip	This terminal is effective when the inverter detects an excessive slip fault.
17	Count Value Does Not Reset to Zero	When the inverter executes the external counter, if the count value equals the set value of parameter L6-01, this terminal outputs effectively. If the set value of parameter L6-01 > the set value of parameter L6-00, this terminal output is invalid.
18	Count Value Resets to Zero	When the inverter executes the external counter, if the count value equals the set value of parameter L6-00, this terminal outputs effectively.
19	Base Block State	When the inverter stops output due to base block (B.B.), this terminal outputs effectively.
20	Warning Indication	When the inverter detects a warning, this terminal outputs effectively.
21	Overvoltage Warning	When the inverter detects that the bus voltage exceeds the set overvoltage warning threshold (0.9 times the overvoltage threshold, no warning state output), this terminal outputs effectively.
22	Overcurrent Slip Warning	When the inverter detects an overcurrent slip prevention warning, this terminal output is valid.
23	Overvoltage Slip Warning	When the inverter detects an overvoltage slip prevention warning, this terminal output is valid.
24	Inverter Operation Source	When the inverter operation command source is not the keyboard (F0-05 is not 0), this terminal output is valid.
25	Forward Command	When the inverter's direction command is forward, this terminal output is valid.
26	Reverse Command	When the inverter's direction command is reverse, this terminal output is valid.
29	Over Frequency	When the actual output frequency of the inverter exceeds the DO action frequency (F6-08), this terminal output is valid.
30	Under Frequency	When the actual output frequency of the inverter is less than the DO action frequency (F6-08), this terminal outputs a valid signal.
31	Motor Star Connection Switch Command	Motor Star Connection Switch Command, set the multi-function digital input terminal for star connection confirmation signal (DIx = 29) and delta connection confirmation signal (DIx = 30), set the motor star-delta switching enable (F7-48 = 1). When the inverter output frequency is below the motor star-delta switching frequency (F7-47) setting minus 2Hz and the duration is greater than the motor star-delta switching delay (F7-49), this terminal outputs a valid signal.
32	Motor Delta Connection Switching Command	To switch the motor connection from star to delta, set the multifunction digital input terminal for star connection confirmation signal (DIx = 29) and delta connection confirmation signal (DIx = 30), enable the motor star-delta switching (F7-48 = 1). When the inverter output frequency is higher than the motor star-delta switching frequency (F7-47) setting plus 2Hz and the duration exceeds the motor star-delta switching delay (F7-49), this terminal becomes active.
33	Zero Frequency Output	When the inverter is running and the output frequency is zero, this terminal becomes active.
34	Output zero	This terminal is valid when the inverter output frequency is zero or stopped.
35	Fault output selection 1	This terminal is valid when the inverter encounters a fault set by U0-10.
36	Fault output selection 2	This terminal is valid when the inverter encounters a fault set by U0-11.
37	Fault output selection 3	This terminal is valid when the inverter encounters a fault set by U0-12.
38	Fault output selection 4	This terminal is valid when the inverter encounters a fault set by U0-13.
39	Position reached	This terminal is valid when the position is reached in the inverter's
40	Target frequency reached	This terminal is valid when the inverter output frequency reaches the set frequency (including stop and frequency command of 0).
41	Multi-point Positioning Arrival	When the position error of multi-point positioning of the inverter is less than the allowable position arrival error range of the encoder (FC-21), this terminal output is valid.
42	Mechanical Brake Release	It is necessary to set the DO action frequency (F6-08) and the brake frequency (L4-00). When the brake release is detected, this terminal output is

Set Value	Function	Description																				
		valid.																				
43	Motor Zero Speed	When using a PG card, if the feedback speed from the PG card is below the motor zero speed judgment threshold (F6-09) set speed, this terminal output is valid.																				
44	Low Current Output	When the inverter has low current output (the undercurrent action method is selected by parameter F9-24, which may not report a low current output fault or low current output warning), this terminal output is valid.																				
45	Three-phase output contactor Action	It is necessary to configure the digital input terminal as 49 (inverter enable) for use together. When the inverter status enable terminal is active, the output terminal is effective.																				
46	dEB action	During the inverter deceleration process, when dEB action occurs, the output terminal is effective.																				
47	Stop brake closure	When the inverter is in a shutdown state, if the discharge resistor switch feedback status is closed, the output terminal is effective.																				
49	Positioning complete	When returning to the origin is completed, the output terminal is effective.																				
50	CANopen control output	<p>CANopen control output, controlling the output terminal based on the status of the corresponding CANopen data bits. The CANopen and digital output port mapping table is as follows:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Parameter setting</th> <th>Attribute</th> <th>Index</th> </tr> </thead> <tbody> <tr> <td>RLY1</td> <td>F6-00=50</td> <td>RW</td> <td>Index:2026 SubIndex:0x41 Data bit0</td> </tr> <tr> <td>RLY2</td> <td>F6-01=50</td> <td>RW</td> <td>Index:2026 SubIndex:0x41 Data bit1</td> </tr> <tr> <td>DO1</td> <td>F6-02=50</td> <td>RW</td> <td>Index:2026 SubIndex:0x41 Data bit3</td> </tr> <tr> <td>DO2</td> <td>F6-03=50</td> <td>RW</td> <td>Index:2026 SubIndex:0x41 Data bit4</td> </tr> </tbody> </table>	Terminal	Parameter setting	Attribute	Index	RLY1	F6-00=50	RW	Index:2026 SubIndex:0x41 Data bit0	RLY2	F6-01=50	RW	Index:2026 SubIndex:0x41 Data bit1	DO1	F6-02=50	RW	Index:2026 SubIndex:0x41 Data bit3	DO2	F6-03=50	RW	Index:2026 SubIndex:0x41 Data bit4
Terminal	Parameter setting	Attribute	Index																			
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RLY2	F6-01=50	RW	Index:2026 SubIndex:0x41 Data bit1																			
DO1	F6-02=50	RW	Index:2026 SubIndex:0x41 Data bit3																			
DO2	F6-03=50	RW	Index:2026 SubIndex:0x41 Data bit4																			
51	RS485 control output	<p>RS-485 (Modbus) control output, controlling output terminals based on the status of RS-485 corresponding data bits. The RS-485 and digital output port mapping table is as follows:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Parameter setting</th> <th>Attribute</th> <th>Index</th> </tr> </thead> <tbody> <tr> <td>RLY1</td> <td>F6-00=51</td> <td>RW</td> <td>2640 data bit0</td> </tr> <tr> <td>RLY2</td> <td>F6-01=51</td> <td>RW</td> <td>2640 data bit1</td> </tr> <tr> <td>DO1</td> <td>F6-02=51</td> <td>RW</td> <td>2640 data bit3</td> </tr> <tr> <td>DO2</td> <td>F6-03=51</td> <td>RW</td> <td>2640 data bit4</td> </tr> </tbody> </table>	Terminal	Parameter setting	Attribute	Index	RLY1	F6-00=51	RW	2640 data bit0	RLY2	F6-01=51	RW	2640 data bit1	DO1	F6-02=51	RW	2640 data bit3	DO2	F6-03=51	RW	2640 data bit4
Terminal	Parameter setting	Attribute	Index																			
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RLY2	F6-01=51	RW	2640 data bit1																			
DO1	F6-02=51	RW	2640 data bit3																			
DO2	F6-03=51	RW	2640 data bit4																			
52	Communication card control output	<p>Communication card control output, controls output terminals based on the status of the corresponding data bits of the communication card. The mapping table for the communication card and digital output ports is as follows:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Parameter setting</th> <th>Attribute</th> <th>Index</th> </tr> </thead> <tbody> <tr> <td>RLY1</td> <td>F6-00=52</td> <td>RW</td> <td>2640 data bit0</td> </tr> <tr> <td>RLY2</td> <td>F6-01=52</td> <td>RW</td> <td>2640 data bit1</td> </tr> <tr> <td>DO1</td> <td>F6-02=52</td> <td>RW</td> <td>2640 data bit3</td> </tr> <tr> <td>DO2</td> <td>F6-03=52</td> <td>RW</td> <td>2640 data bit4</td> </tr> </tbody> </table>	Terminal	Parameter setting	Attribute	Index	RLY1	F6-00=52	RW	2640 data bit0	RLY2	F6-01=52	RW	2640 data bit1	DO1	F6-02=52	RW	2640 data bit3	DO2	F6-03=52	RW	2640 data bit4
Terminal	Parameter setting	Attribute	Index																			
RLY1	F6-00=52	RW	2640 data bit0																			
RLY2	F6-01=52	RW	2640 data bit1																			
DO1	F6-02=52	RW	2640 data bit3																			
DO2	F6-03=52	RW	2640 data bit4																			
66	STO fault	When any type of STO fault occurs in the inverter, the terminal output is active.																				
67	Analog threshold input reached output	The inverter's multi-function output terminal operates when the analog input is between the high threshold and low threshold. Parameter F6-05 selects the analog input channel AI1, AI2, or AI3 to be compared. Parameter F6-06 sets the high threshold for analog input comparison (default 50%). Parameter F6-07 sets the low threshold for analog input comparison (default 10%). When the analog input > Parameter F6-06, the multi-function output terminal operates; When the analog input < Parameter F6-07, the multi-function output terminal stops output.																				

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Set Value	Function	Description
68	STO normal	When any type of STO fault occurs in the inverter, this terminal output is invalid.
69	Maximum roll diameter reached	When using tension control mode, this terminal output is valid when the roll diameter reaches parameter FB-26.
70	Reach empty roll diameter	When using tension control mode, this terminal output is valid when the roll diameter reaches parameter FB-27.
71	Belt break indication	When using tension control mode, if the enable belt break detection is active, the line speed exceeds parameter FB-45, the roll diameter error exceeds parameter FB-46, and the time exceeds parameter FB-47, a belt break occurs, and this terminal output is valid.
72	Tension PID feedback deviation fault	When using tension control mode, if the difference between the tension PID setpoint and the tension PID feedback value exceeds the PID feedback error level (parameter FB-48), and the error time exceeds the PID feedback error detection time (parameter FB-49), a PID feedback error anomaly (refer to PID feedback error handling (parameter FB-50)) occurs, and this terminal output is valid.
73	Over-torque 3	When the inverter detects an over-torque event (over-torque detection threshold H3-06, over-torque judgment delay H3-07), this terminal output is valid.
74	Over-torque 4	When the inverter detects an over-torque event (over-torque detection threshold H3-11, over-torque judgment delay H3-12), this terminal output is valid.

F6-04	DO Terminal Valid Logic	Range: 0000H~FFFFH	Factory value: 0
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This function code can be used to set different DO terminal effective logic levels. The table below lists the effective logic control bits for each DO terminal. If the corresponding control bit is 0, the effective logic level remains unchanged; if the corresponding control bit is 1, the effective level will be inverted. As shown in Table 2-17.

Table 2-17 Effective Logic Control Bits for DO Terminals

Bit 4	Bit 4	Bit 2	Bit 1	Bit 0
DO2	DO1	Reserved	RLY2	RLY1

F6-05	Source of DO Output AI	Range: 0~4	Factory value: 0
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F6-05 Source of AI for DO Output
0: AI1
1: AI2
2: AI3
3: Expansion Card Terminal AI10
4: Expansion Card Terminal AI11

F6-06	DO Output AI Upper Limit Value	Range: -100.00%~100.00%	Factory Value: 50.00%
F6-07	DO Output AI Lower Limit Value	Range: -100.00%~100.00%	Factory Value: 10.00%

When the multi-function digital output terminal (F6-00~F6-03) is configured as 67 (analog input threshold reached output), the corresponding multi-function digital output status is valid when the analog input signal exceeds F6-06; if the analog input signal is less than F6-07, the corresponding multi-function digital output status is invalid. Note that the setting value of F6-06 should be greater than the setting value of F6-07.

F6-08	DO Action Frequency	Range: 0.00Hz~599.00Hz	Factory Value: 0.00Hz
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F6-08 DO Action Frequency

When the actual output frequency of the inverter is greater than the DO action frequency (F6-08), if the output terminal function is set to 29, this terminal output is valid. When the actual output frequency of the inverter is less than the DO action frequency (F6-08), if the output terminal function is set to 30, this terminal output is valid.

F6-09	Motor Zero Speed Judgment Threshold	Range: 0rpm~65535rpm	Factory Value: 0rpm
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This parameter defines the motor zero-speed judgment threshold. When the motor speed is below this parameter setting, the multi-function output terminal set to 43 will output effectively, motor

zero-speed judgment function as shown in Figure 2-28.

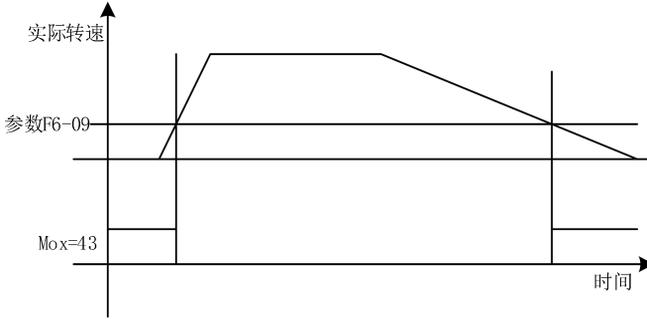


Figure 2-28 Motor Zero-Speed Judgment Function

When parameter F0-04 is set to open-loop control mode, estimated speed calculation is used; When parameter F0-04 is set to closed-loop control mode, actual feedback speed calculation is used, and an encoder must be installed on the motor to provide actual speed feedback, along with a PG card or MI pulse input terminal. With the installation of a PG card and an encoder on the motor for feedback, zero-speed control accuracy can be improved.

F6-13	AO1 Signal Type Selection	Range: 0~1	Factory value: 0
F6-14	AO1 output function selection	Range: 0~23	Factory value: 0

F6-13 AO1 signal type selection

0: 0-10V Output Selection

1: 0-20mA Output Selection

F6-14 AO1 output function selection

Output function selection is shown in Table2-18.

Table 2-18 AO output function selection

Set Value	Function	Description
0	Output frequency	The maximum frequency parameter F4-02 is 100%.
1	Frequency command	The maximum frequency parameter F4-02 is 100%.
2	Motor operating frequency (Hz)	The maximum frequency parameter F4-02 is 100%.
3	Output current (RMS)	Rated at 2.5 times the inverter's rated current as 100%.
4	Output voltage	Rated at 2 times the motor's rated voltage as 100%.
5	DC Bus Voltage	Rated at 900V as 100%.
6	power factor	Rated at ±1.000 as 100%.
7	Power	Rated at 2 times the inverter's rated power as 100%.
8	Output torque	Rated at 2 times the rated torque as 100%
9	AI1 percentage	(0 ~ 10V)/(0 ~ 20mA) corresponds to 0 ~ 100%.
10	AI2 percentage	(0 ~ 10V)/(0 ~ 20mA) corresponds to 0 ~ 100%.
11	AI3 percentage	(0 ~ 10V)/(0 ~ 20mA) corresponds to 0 ~ 100%.
12	Iq current command	Rated at 2.5 times the inverter's rated current as 100%.
13	Iq current feedback	Rated at 2.5 times the inverter's rated current as 100%.
14	Id current command	Rated at 2.5 times the inverter's rated current as 100%.
15	Id current feedback	Rated at 2.5 times the inverter's rated current as 100%.
16	Vq voltage command	With 600V as 100%.
17	Vd voltage command	With 600V as 100%.
18	Torque command	With rated torque as 100%.
19	PG2 frequency command	The maximum frequency parameter F4-02 is 100%.
20	CANopen analog output	Provided for CANopen communication analog output, terminal AO1 corresponds to index 0x2026, sub-index 0xA1, terminal AO2 corresponds to index 0x2026, sub-index 0xA2, extended terminal AO10 corresponds to address 2026-AB, extended terminal AO11 corresponds

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Set Value	Function	Description
		to address 2026-AC.
21	RS485 analog output	Provided for RS-485 communication analog output, terminalAO1 corresponds to address 26A0H, terminalAO2 corresponds to address 26A1H, extended terminalAO10 corresponds to address 26AAH, extended terminalAO11 corresponds to address 26ABH.
22	Communication card analog output	Provided for communication card analog output, terminalAO1 corresponds to address 26A0H, terminalAO2 corresponds to address 26A1H, extended terminalAO10 corresponds to address 26AAH, extended terminalAO11 corresponds to address 26ABH.
23	Fixed voltage output	The output voltage ratio can be set by parameters F6-18 (corresponding to AO1) and F6-25 (corresponding to AO2), parameter settings 0.00 ~ 100.00% correspond to AO output 0 ~ 10V.

F6-15	AO1 output gain	Range: 0.0~500.0%	Factory value: 100.0%
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This parameter is used to adjust the amplitude of the output signal from the multifunctional analog output terminal proportionally.

F6-16	AO1 reverse enable	Range: 0~2	Factory value: 0
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0: Output Absolute Value

1: Reverse Output 0V/0mA, Forward Output (0~10V)/(0~20mA)

2: Reverse Output (5~0V)/(10~0mA), Forward Output (5~10V)/(10~20mA)

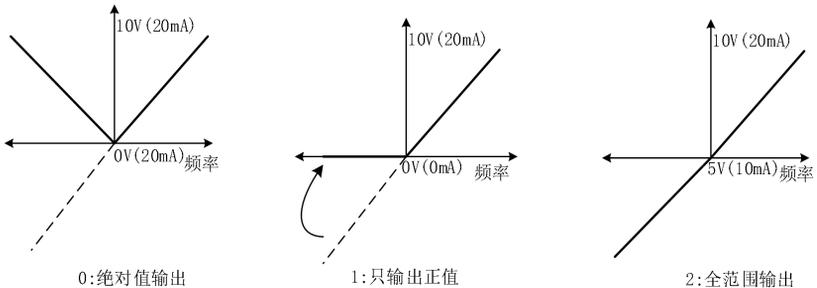


Figure 2-29 AO Reverse Enable

F6-17	AO1 Output Bias	Range: -100.00%~100.00%	Factory Value: 0.00
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For example, using output frequency:

0 ~ 10V: ((Output Frequency/F4-02) * F6-15 + F6-17) * 10V

0 ~ 20mA: ((Output Frequency/F4-02) * F6-15 + F6-17) * 20mA

This parameter sets the voltage or current value corresponding to the 0 point of the analog output.

F6-18	AO1 Output Fixed Value	Range: 0.00~100.00%	Factory Value: 0.00
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This parameter is used to set the percentage of fixed analog output, requiring setting the multi-function analog output to fixed voltage output (F6-14 = 23), the actual analog output terminal voltage or current value = F6-18 * 10V or 20mA.

F6-19	AO1 Filter Time	Range: 0.00~20.00 seconds	Factory value: 0.01 second
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The inverter software uses a digital low-pass filter to remove noise signals contained in the analog output signal from the control terminal. This parameter is used to set the time constant of the digital low-pass filter.

F6-20	AO2 Signal Type Selection	Range: 0~1	Factory value: 0
-------	---------------------------	------------	------------------

F6-21	AO2 Output Function Selection	Range: 0~23	Factory value: 0
-------	-------------------------------	-------------	------------------

F6-20 AO2 Signal Type Selection

0: 0-10V Output Selection

1: 0-20mA Output Selection

F6-21 AO2 Output Function Selection
 Refer to F6-14.

F6-22	AO2 Output Gain	Range: 0.0~500.0%	Factory value: 100.0%
-------	-----------------	-------------------	-----------------------

This parameter is used to adjust the amplitude of the output signal from the multifunctional analog output terminal proportionally.

F6-23	AO2 Reverse Enable	Range: 0~2	Factory value: 0
-------	--------------------	------------	------------------

- 0: Output absolute value;
- 1: Reverse output 0V/0mA, forward output (0~10V)/(0~20mA);
- 2: Reverse output (5~0V)/(10~0mA), forward output (5~10V)/(10~20mA).

F6-24	AO2 Output Bias	Range: -100.00%~100.00%	Factory Value: 0.00
-------	-----------------	-------------------------	---------------------

For example, using output frequency:
 $0 \sim 10V : ((\text{Output frequency}/F4-02) * F6-22) + F6-24) * 10V$
 $0 \sim 20mA : ((\text{output frequency} / F4-02) * F6-22 + F6-24) * 20mA$

This parameter sets the voltage or current value corresponding to the 0 point of the analog output.

F6-25	AO2 Output Fixed Value	Range: 0.00~100.00%	Factory Value: 0.00
-------	------------------------	---------------------	---------------------

This parameter is used to set the percentage of fixed analog output, requiring the multi-function analog output to be set as a fixed voltage output (F6-21 = 23), the actual analog output terminal voltage or current value = F6-25 * 10V or 20mA.

F6-26	AO2 Filter Time	Range: 0.00~20.00 seconds	Factory value: 0.01 second
-------	-----------------	---------------------------	----------------------------

The inverter software filters out noise signals contained in the analog signals output from the control terminals through a digital low-pass filter; this parameter is used to set the time constant of the digital low-pass filter.

F6-27	Frequency Reach 1 Detection Value	Range: 0.00Hz~599.00Hz	Factory Value: 50.00Hz
-------	-----------------------------------	------------------------	------------------------

F6-28	Frequency Reach 1 Amplitude	Range: 0.00Hz~599.00Hz	Factory setting: 2.00Hz
-------	-----------------------------	------------------------	-------------------------

F6-29	Frequency reaches 2 detection value	Range: 0.00Hz~599.00Hz	Factory Value: 50.00Hz
-------	-------------------------------------	------------------------	------------------------

F6-30	Frequency reaches 2 amplitude	Range: 0.00Hz~599.00Hz	Factory setting: 2.00Hz
-------	-------------------------------	------------------------	-------------------------

Two DO output frequency thresholds can be set, including frequency reach 1 detection value (F6-27) and frequency reach 2 detection value (F6-29). Two DO output frequency judgment width thresholds can be set, including frequency arrival 1 amplitude (F6-28) and frequency arrival 2 amplitude (F6-30). When the inverter output speed (frequency) reaches within the set DO output frequency threshold range, the corresponding multi-function output terminal will output effectively if it is set to 3 or 4 (parameters F6-00, F6-01, F6-02, F6-03).

2.8 F7 Group Auxiliary Functions and Keyboard Display

F7-00	JOG frequency setting	Range: 0.00~599.00Hz	Factory Value: 6.00Hz
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F7-01	JOG acceleration time	Range: 0.00~600.00 seconds	Factory Value: 10.00 seconds
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F7-02	JOG deceleration time	Range: 0.00~600.00 seconds	Factory Value: 10.00 seconds
-------	-----------------------	----------------------------	------------------------------

The above parameters are used to set the jogging operation frequency, the time to accelerate from 0.00Hz to the jogging operation frequency, and the time to decelerate from the jogging operation frequency to 0.00Hz. During jogging operation, when a jogging command is received, the inverter controls the motor to accelerate to the jog frequency according to the jogging acceleration time. When the jogging command is removed, depending on the different stop methods, the motor decelerates and stops according to the jogging deceleration time or adopts other stopping methods.

F7-03	acceleration time 2	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: determined	Model
-------	---------------------	--	---------------------------	-------

F7-04	deceleration time 2	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: determined	Model
-------	---------------------	--	---------------------------	-------

F7-05	acceleration time 3	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: determined	Model
-------	---------------------	--	---------------------------	-------

F7-06	deceleration time 3	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: determined	Model
-------	---------------------	--	---------------------------	-------

F7-07	acceleration time 4	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: determined	Model
-------	---------------------	--	---------------------------	-------

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Parameter Group Description

F7-08	Deceleration Time 4	Range: 0.00 ~ 600.00 seconds or 0.0 ~ 6000.0 seconds	Factory value: determined	Model
-------	------------------------	--	------------------------------	-------

For details on function codes F7-03 to F7-08, please refer to F0-13 and F0-14.

F7-09	Jump Frequency 1 Upper Limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-10	Jump Frequency 1 Lower Limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-11	Jump Frequency 2 Upper Limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-12	Jump Frequency 2 Lower Limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-13	Jump Frequency 3 Upper Limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-14	Jump frequency 3 lower limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-15	Jump frequency 4 upper limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00
F7-16	Jump frequency 4 lower limit	Range: 0.00 ~ 599.00Hz	Factory Value: 0.00

When the motor works near the mechanical resonance point of the load, it may cause mechanical resonance of the load, thereby reducing control performance, and in severe cases, it may damage the load. To avoid resonance, the skip frequency function can be used to make the motor bypass mechanical resonance points. When the set frequency is within the skip frequency range, the actual operating frequency will run in the vicinity of the nearest skip frequency boundary. By setting the skip frequency, the inverter avoids the mechanical resonance points of the load. Skip frequency functions as shown in Figure 2-30, this inverter can set 4 skip frequency points, if two adjacent skip frequencies are set to the same value, this function does not work at that frequency.

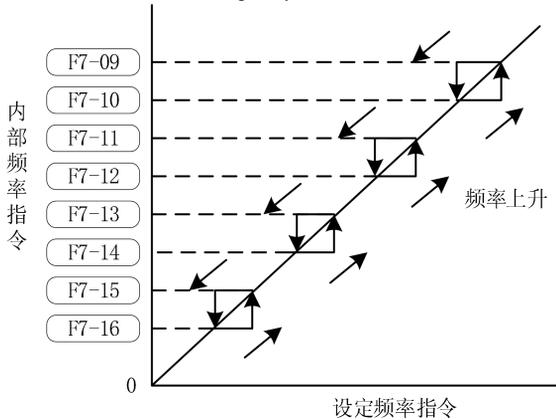


Figure 2-30 Skip Frequency Points

F7-17	Fan control method	Range: 0~4	Factory value: 4
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0: After power-on of the inverter, the fan runs continuously.

1: The fan starts when the inverter is running and stops 1 minute after the inverter stops.

2: The fan operates according to the inverter's operating status; it starts when the inverter is running and stops when the inverter stops.

3: When the module temperature > 50°C, the fan starts; When module temperature < 40°C and the inverter stops operation, the fan shuts off.

4: The variable frequency operation fan starts, after the inverter stops, if the module temperature is below 50°C, the fan shuts off.

F7-19	Keyboard STOP key enable	Range: 0~1	Factory value: 0
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0: The STOP key on the keyboard can only control shutdown when the operation command source selection parameter F0-05 = 0; in other cases, the STOP key on the keyboard is invalid.

1: Regardless of whether the operation command source selection is 0, the STOP key on the keyboard can always control the shutdown.

F7-20	Startup screen selection	Range: 0~3	Factory value: 0
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0: Set frequency display

1: Output frequency display

- 2: User-defined display
- 3: Output current display.

F7-21	Page display selection	Range: 0~61	Factory Value: 3
-------	------------------------	-------------	------------------

- 0: Output current
- 1: PG card feedback frequency
- 2: Motor actual operating frequency
- 3: DC Bus Voltage
- 4: Output voltage
- 5: Power factorangle
- 6: Output power
- 7: Actual motor operating speed
- 8: Output torque%
- 9: PG feedback value
- 10: PID feedback value%
- 11: AI1 %
- 12: AI2 %
- 13: AI3 %
- 14: IGBT temperature
- 15: Ambient temperature
- 16: Digital input terminal status
- 17: Digital output terminal status
- 18: Multi-speed status
- 21: Actual motor position
- 22: Pulse input frequency value
- 23: Pulse input position
- 24: Position tracking error
- 25: Overload count value
- 26: Ground short-circuit current threshold
- 27: Bus voltage fluctuation value
- 30: User physical quantity
- 31: H page value multiplied by coefficient K
- 32: Encoder Z phase count
- 33: Motor pulse count
- 34: Reserved
- 35: Speed/torque mode
- 36: Current carrier frequency
- 37: Reserved
- 38: Inverter status
- 39: Output torque Nt-m
- 40: Torque command
- 41: kWh
- 42: PID target value
- 43: PID compensation
- 44: PID output frequency
- 45: Reserved
- 46: Auxiliary frequency
- 47: Main frequency
- 48: Set frequency display
- 49: Reserved
- 50: Reserved
- 51: PMVVC torque compensation amount
- 54: Reserved
- 55: Current roll diameter
- 56: Current line speed
- 57: Tension reference value
- 59: U phase current AD value

Parameter Group Description

60: V phase current AD value
 61: W phase current AD value

F7-23	FM terminal function selection	Range: 0~10	Factory value: 0
0: Operating frequency 1: Set frequency 2: Output current 3: Output voltage 4: Output power 5: AI1 value 6: AI2 value 7: AI3 value 8: Output torque absolute value 9: Motor speed 10: Bus voltage			

F7-24	FMP Output Maximum Frequency	Range: 1.00%~100.00%	Factory Value: 50.00%
F7-26	Cumulative Start-up Times	Range: 0~65535	Factory value: 0
F7-27	Cumulative Start-up Days	Range: 0~65535	Factory value: 0
F7-28	Cumulative Operating Minutes	Range: 0~1439	Factory value: 0
F7-29	Cumulative Operating Days	Range: 0~65535	Factory value: 0
F7-30	Cumulative Running Minutes	Range: 0~65535	Factory value: 0

The above parameters are used to display the accumulated start-up and operation information of the inverter.

F7-31	Motor Running Time	Range: 0~1439 min	Factory setting: 0 min
F7-32	Motor Running Days	Range: 0~65535	Factory value: 0

The above parameters are used to display the accumulated running time of the motor.

F7-33	Password Input	Range: 0~65535	Factory value: 0
F7-34	Password Setting	Range: 0~65535	Factory value: 0

F7-34 supports user-defined password for keyboard lock. After setting, the keyboard is locked and other parameters cannot be modified. To unlock, enter the corresponding password in F7-33.

F7-35	Automatic Energy Saving Setting	Range: 0~1	Factory value: 0
F7-36	Energy Saving Gain	Range: 10~1000	Factory Value: 100

Using the inverter to drive the motor, one important goal is energy saving. Under the same torque output conditions, the voltage and current output by the inverter can vary, and different conditions correspond to different output powers of the inverter. If a combination of voltage and current can be chosen to reduce the output power of the inverter, the goal of energy saving is achieved.

The inverter, while running, real-time calculates the output power, adjusts the output voltage based on the output power, to make the output power reach the minimum value or maintain near the minimum value. The entire process is performed without external intervention, can be carried out automatically, hence it is called the “automatic energy saving” function. To ensure that the acceleration and deceleration performance is not affected by the automatic energy saving function, during acceleration and deceleration, the automatic energy saving function is turned off, and only during steady-speed operation will it be activated.

F7-37	Automatic Voltage Regulation	Range: 0~4	Factory value: 0
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When the bus voltage changes, the output voltage may also change, which could affect the motor control performance. Bus voltage compensation function (Automatic Voltage Regulation function, AVR) can compensate for output voltage variations caused by bus voltage changes, making motor control performance more stable.

0: Enable AVR Function

When the AVR function is enabled, the inverter calculates the output voltage based on the bus voltage, so the output voltage will not fluctuate with the bus voltage.

1: Disable AVR Function

When the AVR function is disabled, the inverter does not calculate the output voltage based on the bus voltage, causing the output voltage to fluctuate with the bus voltage, which in turn leads to fluctuations in motor current.

2: Disable AVR During Deceleration

The AVR function is disabled during deceleration but enabled in other states. Disabling the AVR function during deceleration can shorten the deceleration time.

F7-42	Output Phase Sequence Switching	Range: 0~1	Factory value: 0
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0: Output according to the command direction.

1: Output frequency opposite to the command direction; forward rotation changes to reverse, and reverse changes to forward.

Note: The output phase sequence switching and forward/reverse prohibition selection can be used together. However, if the prohibited rotation direction set for operation is the same as the direction after phase sequence switching, the output phase sequence switching function will not be realized.

F7-46	CANopen Quick Stop Time	Range: 0.00~600.00 s	Factory setting: 1.00 s
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This parameter is used to set the CANopen quick stop time.

F7-54	W-hrs	Range: 0.0~6553.5	Factory Value: 0.0
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This parameter is used to display the accumulated energy output by the inverter.

F7-57	Software Version (H)	Range: 0.00~655.35	Factory value: Model determined
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F7-58	Software Version (L)	Range: 0.00~655.35	Factory value: Model determined
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F7-59	Software Release Date	Range: 0~65535	Factory value: Model determined
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The above parameters are used to display the software version and release date information of the inverter.

F7-61	Enhanced Parameter Display Selection	Range: 0~1	Factory value: 1
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0: Display only 18 function parameter groups, i.e., F0-FF groups, U0-U1 groups.

1: Default display of 31 function parameter groups, i.e., F0~FF groups, U0~U1 groups, H0~H3 groups, L0~L8 groups.

F7-62	High Four Bits of Serial Code	Range: 0~65535	Factory value:\
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F7-63	Low Three Bits of Serial Code	Range: 0~65535	Factory value:\
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F7-64	Language Setting	Range: 0~1	Factory value: 0
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In actual use, after modifying the language via the keyboard or host computer, it will be saved in this function code for easy recall of the last user-set language type after power loss.

0: Simplified Chinese

1: English

F7-65	Page Display Selection 2	Range: 0~64	Factory Value: 2
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Page display selection 2 functions similar to F7-21, supporting only LED keyboards.

2.9 F8 Group Communication Parameters

F8-00	Baud Rate Setting	Range: 4.8kbps~115.2kbps	Factory value: 115.2kbps
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This parameter configures the baud rate for Modbus communication on the inverter's RS485 terminal. This parameter can only be set to one of the following values; otherwise, it will be forced to 9.6 kbps.

Setting range:

4.8: 4800 bps

9.6: 9600 bps

19.2: 19200 bps

38.4: 38400 bps

57.6: 57600 bps

115.2: 115200 bps

F8-01	Communication Data Format	Range: 1~17	Factory value: 12
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This parameter configures the data format for Modbus communication on the inverter's RS485 terminal.

0: 7,N,1 for ASCII

1: 7,N,2 for ASCII

2: 7,E,1 for ASCII

3: 7,O,1 for ASCII

Parameter Group Description

- 4: 7,E,2 for ASCII
- 5: 7,O,2 for ASCII
- 6: 8,N,1 for ASCII
- 7: 8,N,2 for ASCII
- 8: 8,E,1 for ASCII
- 9: 8,O,1 for ASCII
- 10: 8,E,2 for ASCII
- 11:8,O,2 for ASCII
- 12:8,N,1 for RTU
- 13:8,N,2 for RTU
- 14:8,E,1 for RTU
- 15:8,O,1 for RTU
- 16:8,E,2 for RTU
- 17:8,O,2 for RTU

F8-02	Communication Address	Range: 1~254	Factory value: 1
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This parameter sets the address of the inverter as a slave during Modbus communication on the RS485 terminal.

F8-03	Response Delay	Range: 0.0ms~200.0ms	Factory value: 2.0ms
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This parameter sets the response delay time for Modbus communication on the inverter's RS485 terminal, generally no change is required.

F8-04	Communication timeout time	Range: 0.0s~100.0s	Factory Value: 0.0s
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This parameter sets the Modbus communication timeout time for the inverter's RS485 terminal; generally, it does not need to be changed.

F8-05	Communication error handling	Range: 0~3	Factory Value: 3
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This parameter sets the handling method after the Modbus communication timeout for the inverter's RS485 terminal.

- 0: Warning and continue running
- 1: Warning and decelerate to stop
- 2: Warning and free stop
- 3: No warning

F8-06	Communication given frequency	Range: 0.00Hz~599.00Hz	Factory Value: 0.00Hz
-------	-------------------------------	------------------------	-----------------------

This parameter is read-only and displays the set frequency under Modbus communication for the inverter's RS485 terminal.

F8-07	Communication decoding method	Range: 0~1	Factory value: 1
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- Read/Write Permission: User Setting
 Valid Range: 0: Use Decoding Method 1 (20xx)
 1: Use Decoding Method 2 (60xx)

Table 2-19

Communication Decoding Methods		Decoding Method 1 (20xx)	Decoding Method 2 (60xx)
Control Source	Digital Operator	No effect, control source: Digital Operator button control	
	External terminals	No effect, control: controlled by external terminals	
	RS-485	Reference address area is 2000h~20FFh	Reference address area is 6000h~60FFh
	CANopen	Reference address area is 2020-01h~2020-FFh	Reference address area is 2060-01h~2060-FFh
	Communication card	Reference address area is 2000h~20FFh	Reference address area is 6000h~60FFh

F8-09	Communication Card Type	Range: 0~12	Factory value: 0
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- Read/write permission: User read-only
 Valid range:
 2: PROFIBUS-DP
 3: CANopen
 5: EtherNet/IP

6: EtherCAT
 12: PROFINET

F8-10	Communication Card Version	Range: 0.0~6553.5	Factory value: 0.0
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Read/write permission: User read-only
 Valid range: After module card connection, firmware version number is automatically written

F8-11	Communication Card Address	Range: 0~65535	Factory value: 0
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Read/Write Permission: User Setting
 Valid range: PROFIBUS-DP: 1~125
 EtherCAT: 1~65535

F8-14	CANopen Node Address	Range: 0~127	Factory value: 0
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Read/Write Permission: User Setting
 Valid range: 0: Off ;1~127

F8-15	CAN Bus Communication Speed	Range: 0~5	Factory value: 0
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Read/Write Permission: User Setting
 Valid range:
 0: 1 Mbps
 1: 500 Kbps
 2: 250 Kbps
 3: 125 Kbps
 4: 100 Kbps
 5: 50 Kbps

F8-18	CANopen warning record	Range: 0~65535	Factory value: 0
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Read/write permission: User read-only
 Valid range:
 bit 0: CANopen software disconnection 1 (CANopen Guarding Time out)
 bit 1: CANopen software disconnection 2 (CANopen Heartbeat Time out)
 bit 3: CANopen SDO transmission timeout warning (CANopen SDO Time out)
 bit 4: CANopen SDO receive buffer overflow warning (CANopen SDO buffer overflow)
 bit 5: CANopen hardware disconnection warning (Can Bus Off)
 bit 6: CANopen format error warning (Error protocol of CANopen)

F8-19	CiA402 protocol selection	Range: 0~1	Factory value: 0
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Read/Write Permission: User Setting
 Valid range:
 0: Enable custom communication decoding method (Refer to parameter F8-07 setting)
 1: Enable CANopen standard CiA402 specification

F8-20	CANopen Communication Status	Range: 0~5	Factory value: 0
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Read/write permission: User read-only
 Valid range:
 0: Node reset status
 1: Communication reset status
 2: Reset completion status
 3: Pre-operational status
 4: Operational status
 5: Stop status

F8-21	CiA402 operational status	Range: 0~14	Factory value: 0
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Read/write permission: User read-only
 Valid range:
 0: Power-on incomplete status
 1: Prohibited operation status
 2: Pre-excitation status
 3: Excitation status
 4: Operation allowed status
 7: Quick stop action status
 13: Error trigger action status
 14: Error State

Parameter Group Description

F8-22	CANopen Index Reset	Range: 0000H~FFFFH	Factory Value: 65535
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Read/Write Permission: User Setting

Valid range:

bit 0: When CANopen is reset, reset the value at internal address 20XX to 0

bit 1: When CANopen is reset, reset the value at internal address 264X to 0

bit 2: When CANopen is reset, reset the value at internal address 26AX to 0

bit 3: When CANopen is reset, reset the value at internal address 60XX to 0

F8-26	Communication Card DHCP Enable	Range: 0~1	Factory value: 0
-------	--------------------------------	------------	------------------

Read/Write Permission: User Setting

Valid range:

0: Disable DHCP function, use static IP

1: Enable DHCP function, use dynamic IP

F8-27	Communication Card IP 1	Range: 0~255	Factory value: 0
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F8-28	Communication Card IP 2	Range: 0~255	Factory value: 0
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F8-29	Communication Card IP 3	Range: 0~255	Factory value: 0
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F8-30	Communication Card IP 4	Range: 0~255	Factory value: 0
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Read/Write Permission: User Setting

Valid Range: 0~255

Use parameters specific to the EtherNet/IP communication card.

F8-31	Communication Card Subnet Mask 1	Range: 0~255	Factory value: 0
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F8-32	Communication Card Mask 2	Range: 0~255	Factory value: 0
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F8-33	Communication Card Mask 3	Range: 0~255	Factory value: 0
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F8-34	Communication Card Mask 4	Range: 0~255	Factory value: 0
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Read/Write Permission: User Setting

Valid Range: 0~255

Use parameters specific to the EtherNet/IP communication card.

F8-35	Communication Card Gateway 1	Range: 0~255	Factory value: 0
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F8-36	Communication Card Gateway 2	Range: 0~255	Factory value: 0
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F8-37	Communication Card Gateway 3	Range: 0~255	Factory value: 0
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F8-38	Communication Card Gateway 4	Range: 0~255	Factory value: 0
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Read/Write Permission: User Setting

Valid Range: 0~255

Use parameters specific to the EtherNet/IP communication card.

2.10 Group F9 Fault and Protection Parameters

F9-00	Protection Control Bit	Range: 000h~FFFFh	Factory value: 000h
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This function code can be used to mask certain fault protections.

When the setting value of this function code is 0200H, it can mask three fault protections: U phase current detection error (E033), V phase current detection error (E034), and W phase current detection error (E035).

When the setting value of this function code is 0008H, it can mask low frequency overload fault (E087), which is generally not recommended as it may damage the inverter.

When the setting value of this function code is 0001H, it can mask high ambient temperature fault (E017).

F9-01	Motor 1 Overload Selection	Range: 0~2	Factory Value: 2
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F9-02	Motor 1 Overload Time	Range: 30.0~600.0 seconds	Factory setting: 60.0 seconds
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Function code F9-01 is used to set the overload protection mode.

0: Constant Torque Output Motor

1: Variable Torque Output Motor

2: No Motor Overload Protection

Function code F9-02 is used to set the overload protection time when the motor current reaches 150% of the rated current. By setting an appropriate inverse-time curve, the operating time of Motor 1 under overload conditions can be made less than the set overload protection time for Motor 1, thereby achieving overload protection for Motor 1 and preventing damage due to overheating. When the overload time reaches the overload protection time for Motor 1, an overload fault for Motor 1 (E022)

will be reported. This function is not enabled by default; if it needs to be activated, set F9-01 to 0 or 1.

When F9-01 is 0, the overload protection curve for the motor is shown in Figure 2-31. Here, T equals the set value of parameter F9-02, and “motor current percentage” refers to the ratio of the inverter output current to the motor rated current. When the motor fan is independently controlled, this inverse time curve can be selected. In this case, the fan speed is independent of the motor speed, so the cooling capacity does not decrease as the motor speed decreases, making the inverse time curve independent of the motor operating speed.

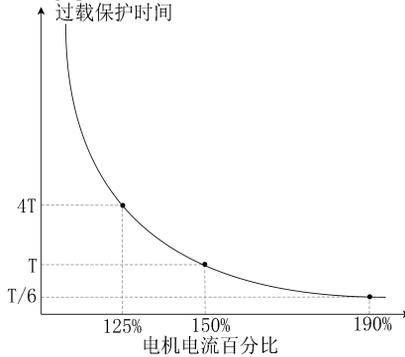


Figure 2-31 Inverse Time Curve1

When F9-01 is 1, the overload protection curve for Motor 1 is shown in Figure 2-32. Among them, the “speed coefficient” is a function of motor speed, when the motor speed is greater than the rated speed, the speed coefficient equals 1, when the motor speed is less than the rated speed, the speed coefficient = $1 / (0.4 + 0.6 * \text{motor speed} / \text{motor rated speed})$.

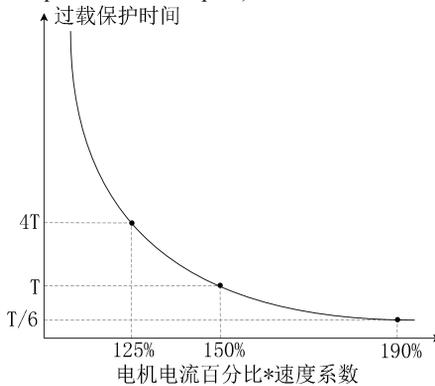


Figure 2-32 Inverse Time Curve2

When the motor uses coaxial cooling (fan connected to the motor shaft), the fan speed is the same as the motor speed, and a decrease in motor speed will reduce the fan's cooling capacity. In this case, it is recommended to set F9-01 to 1, the inverse time curve will be adjusted according to the motor speed, the motor overload capability will decrease with the reduction in speed, preventing overheating due to reduced fan cooling capacity. When the motor speed is zero, the fan stops rotating, at this time the speed factor is 2.5, the corresponding overload curve is shown in Fig.2-33. From Fig. 2-33it can be seen that when the current reaches 60% of the motor's rated current, the motor will report an overload fault after running for T time.

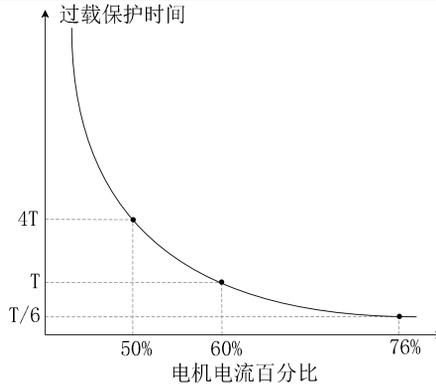


Fig. 2-33 Inverse Time Curve3

F9-03	Overvoltage Stall Mode	Range: 0~3	Factory value: 1
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This function code is used to set the overvoltage stall prevention mode. During motor deceleration, energy feedback may cause the bus voltage to rise; if the bus voltage becomes too high, it can lead to an overvoltage fault. By reducing the deceleration ramp, the increase in bus voltage can be suppressed, thus avoiding shutdown due to overvoltage.

0: Overvoltage Stall Mode 0

If the inverter detects that the bus voltage is higher than the set value of F9-04, the inverter will stop decelerating (the output frequency remains unchanged) until the bus voltage is lower than the set value of F9-58, at which point the inverter will continue to decelerate.

1: Overvoltage Stall Mode 1

During the deceleration process, dynamically adjust the speed curve to prevent overvoltage faults due to excessively high bus voltage.

2: Overvoltage Stall Mode2

During the deceleration process, dynamically accurately and quickly adjust the speed curve to prevent overvoltage faults due to excessively high bus voltage.

3: Overvoltage Stall Mode3

During deceleration, it is mainly used due to energy feedback, which causes overvoltage faults due to excessive bus voltage.

It should be noted that when the overvoltage stall prevention function is activated, the inverter's deceleration time will be longer than the set time. If automatic adjustment of the deceleration time is not allowed, this function needs to be disabled. To prevent overvoltage, the following measures can be taken:

1. Appropriately increase the deceleration time;
2. Install a braking resistor to dissipate the motor's feedback energy.

F9-04	overvoltage stall threshold	Range: 0.0~900.0V	Factory setting: 760.0V
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This function code is used to set the overvoltage stall threshold. When the set value is 0.0, the overvoltage stall prevention function is disabled. When the inverter is equipped with a braking unit and connected to a braking resistor, it is recommended to use this setting. When the set value is not 0.0, the overvoltage stall prevention function is effective. This parameter can be set according to the power supply and load conditions; if set too low, it may extend the deceleration time. If the set value exceeds the overvoltage protection point, the overvoltage stall prevention function is considered to be turned off.

F9-07	maximum current limit	Range: 0~250%	Factory value: 150%
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This function code is used to set the maximum current output of the inverter, which, together with the settings of function codes F3-23 ~ F3-26, determines the output current limit of the inverter. The unit is %, based on the rated current of the inverter.

F9-08	Acceleration OC Stall Threshold	Range: 0%~200%	Factory value: 180%
F9-09	Overcurrent Stall Limit Threshold	Range: 0%~100%	Factory setting: 100%

Generally speaking, the faster the acceleration, the greater the torque current required. If the

acceleration is too fast, it may lead to excessive motor current. To protect the motor and inverter, it is necessary to limit the current. The overcurrent prevention function during acceleration can prevent overcurrent situations caused by excessively fast acceleration. The principle of the overcurrent prevention function during acceleration is not complicated. When the current exceeds the set value, the inverter stops accelerating. Once the current drops below the set value, the inverter resumes acceleration, as shown in Figure2-34.

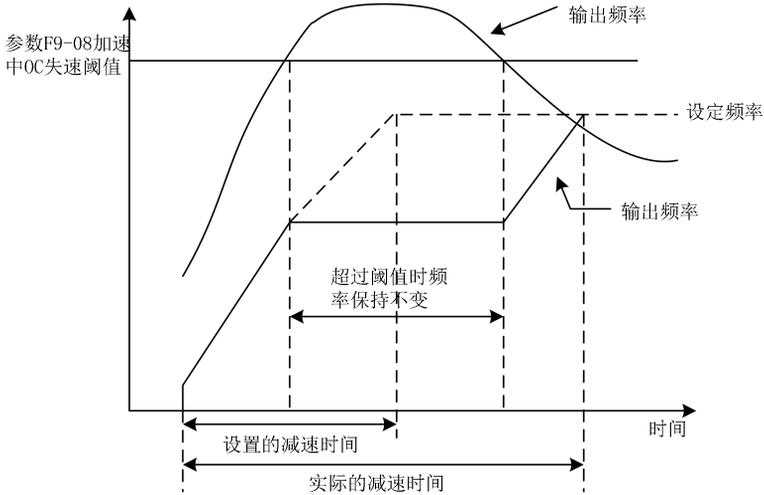


Figure 2-34 Overcurrent Stall Process

F9-08 Overcurrent Stall Threshold During Acceleration

This function code is used to set the overcurrent stall prevention threshold during acceleration, with the unit being %, based on the rated current of the inverter. When the inverter accelerates, if the output current exceeds the value set by F9-08, the inverter will stop accelerating. When the current falls below the value set by F9-08, the inverter resumes acceleration to the set frequency.

F9-09 Overcurrent Stall Limit Threshold

This function code is used to set the overcurrent stall prevention threshold during acceleration when weakening the magnetic field. When the motor operating frequency is greater than the rated frequency, the overcurrent stall prevention threshold during acceleration equals the value set by F9-08 multiplied by the value set by F9-09. For example: If F9-08 = 150%, and F9-09 = 80%, when the motor operating frequency is greater than the motor's rated frequency, the overcurrent stall prevention threshold during acceleration is: F9-08 set value × F9-09 set value = 150% × 80% = 120%.

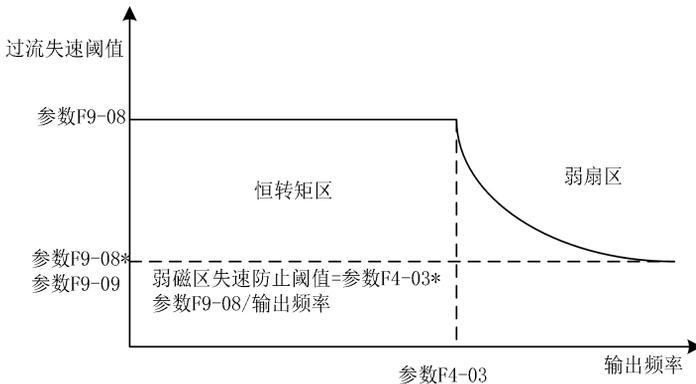


Figure 2-35 Overcurrent Stall Prevention Threshold During Acceleration with Flux Weakening

It is important to note that when the overcurrent stall prevention function activates during acceleration, the inverter's acceleration time will be longer than the set time.

F9-10	Running OC Stall Threshold	Range: 0~200%	Factory value: 180%
F9-11	Constant Speed OC Acceleration/Deceleration Selection	Range: 0~5	Factory value: 0

The above two function codes are used to set the overcurrent stall prevention function during operation. Generally speaking, the larger the motor load, the greater the motor current. If the motor load is too large, it can lead to excessive motor current. If the motor load exceeds the motor's capacity, it may even result in loss of control. The overcurrent stall prevention function during operation can prevent the aforementioned issues of excessive current or loss of control. The principle of the overcurrent stall prevention function during operation is shown in Figure2-36. When the motor current exceeds the set value, the inverter begins to decelerate until the current drops below the allowable value, at which point the motor reaccelerates to the set frequency.

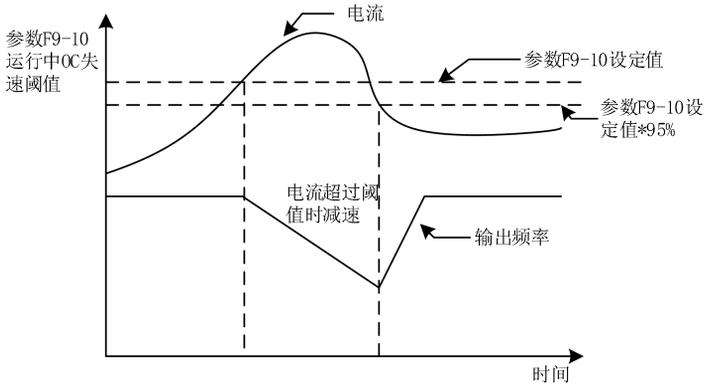


Figure 2-36 Overcurrent Stall Prevention Function During Operation

F9-10 Overcurrent Stall Threshold During Operation

This function code is used to set the overcurrent stall prevention threshold during operation, with the unit being %, based on the rated current of the inverter. When the inverter is running, if the output current exceeds the F9-10 setting, the inverter will decelerate according to the acceleration/deceleration time selected by F9-11 to prevent motor stall. When the output current falls below 95% of the F9-10 setting, the inverter will reaccelerate to the set frequency according to the acceleration/deceleration time selected by parameter F9-11.

F9-11 Constant Speed OC Acceleration/Deceleration Selection

This function code is used for constant speed operation overcurrent acceleration/deceleration selection

- 0: System Acceleration/Deceleration Time
- 1: First acceleration/deceleration time (F0-13 F0-14)
- 2: Second acceleration/deceleration time (F7-03 F7-04)
- 3: Third acceleration/deceleration time (F7-05 F7-06)
- 4: Fourth acceleration/deceleration time (F7-07 F7-08)
- 5: Automatic Acceleration/Deceleration Time

F9-12	Input Phase Loss Action Selection	Range: 0~1	Factory value: 0
F9-13	Input Phase Loss Filter Time	Range: 0.00~600.00 seconds	Factory Value: 0.20 seconds
F9-14	Input Phase Loss Voltage Threshold	Range: 0.0~320.0V	Factory setting: 60.0V

When the power supply is not correctly connected to the inverter, or when there is an abnormality in the power supply, an input phase loss fault may occur. When an input phase loss occurs, the inverter bus voltage may fluctuate significantly, causing fluctuations in motor torque or speed, and also affecting the lifespan of the bus capacitor. The input phase loss detection function can detect whether an input phase loss fault has occurred and take protective measures in time.

F9-12 Input Phase Loss Action Selection

This function code is used to set the inverter's action when a phase loss occurs on the input side.

- 0: Warning and decelerate to stop
- 1: Warning and free stop

F9-13 Input Phase Loss Filter Time

This function code is used to set the low-pass filter time required for phase loss detection, which generally does not need to be modified.

F9-14 Input Phase Loss Voltage Threshold

This function code is used to set the voltage threshold required for phase loss detection, which generally does not need to be modified.

F9-15	Output Phase Loss Action Selection	Range: 0~3	Factory Value: 3
F9-16	Output Phase Loss Detection Time	Range: 0.000 ~ 65.535 seconds	Factory Value: According to model
F9-17	Output Phase Loss Current Threshold	Range: 0.00~100.00%	Factory Value: According to model

7.5kw and above Output phase loss detection time is 0.500; 5.5kW and below Output phase loss detection time is 0.100.

7.5kW and above Output phase loss current threshold is 2.00; 5.5kW and below Output phase loss current threshold is 6.00.

F9-18	Output Phase Loss Braking Time	Range: 0.000~65.535 seconds	Factory setting: 0.000 seconds
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When there is an abnormal connection between the motor and the inverter, output phase loss may occur. During output phase loss, the current in the disconnected phase of the motor is zero. To maintain motor operation, the current in the remaining phases will increase, and at the same time, speed and torque will experience significant fluctuations, which may cause damage to the motor and inverter. Output phase loss detection can identify motor phase loss conditions and take appropriate actions.

F9-15 Output Phase Loss Action Selection

This function code is used to set the inverter's action when output phase loss occurs.

- 0: Warning and continue running
- 1: Warning and decelerate to stop
- 2: Warning and free stop
- 3: No warning

F9-16 Output Phase Loss Detection Time

This function code is used to set the output phase loss detection time during operation, which generally does not need to be modified.

F9-17 Output Phase Loss Current Threshold

This function code is used to set the output phase loss current detection threshold, which generally does not need to be modified.

F9-18 Output Phase Loss Braking Time

This function code is used for output phase loss judgment at startup. If the set value is not zero, output phase loss judgment will be performed immediately upon startup.

The following will introduce four scenarios.

Example 1: F9-18 = 0, no pre-operation output phase loss detection. As shown in Figure 2-37, inverter operation, if any phase output current is less than the threshold set by F9-17 and exceeds the time set by F9-16, the inverter will begin to execute the action set by F9-15.

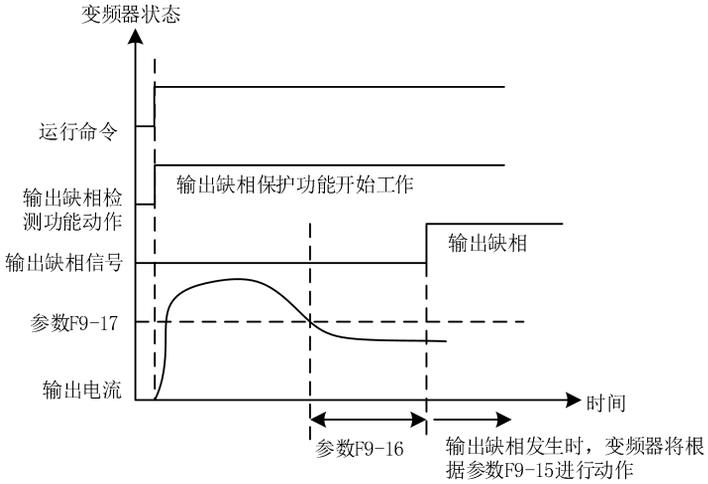


Figure 2-37 F9-18=0

Example 2: The inverter is in a stopstate, $F9-18 = 0$ and $F1-09 \neq 0$. As shown in Figure 2-38, when starting, DC braking is performed according to the settings of $F1-08$ and $F1-09$, during which phase loss detection is not performed. After DC braking is completed, the inverter begins to operate and performs phase loss detection according to method1.

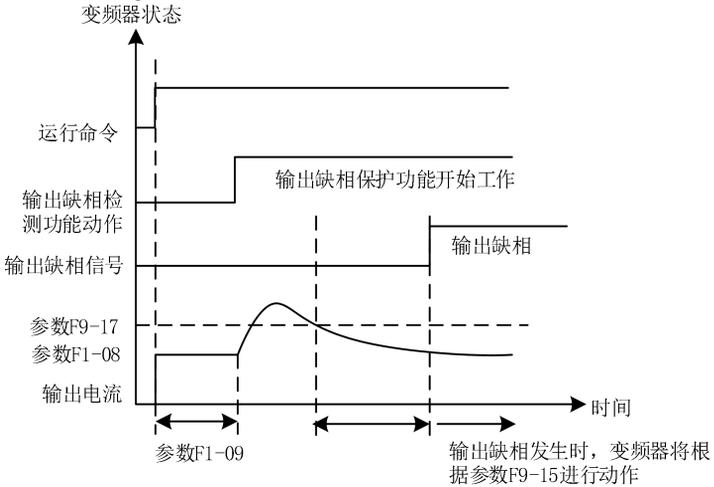


Figure 2-38 F9-18 = 0 and F1-09 ≠ 0

Example 3: The inverter is in a stopstate, $F9-18 \neq 0$ and $F1-09 \neq 0$. During startup, DC braking is performed according to the time set in $F9-18$, followed by DC braking according to the time set in $F1-09$. Within the time set in $F9-18$, the DC braking current size is 20 times the value set in $F9-57$; Within the time set in $F1-09$, the DC braking current size is the value set in $F1-08$. Total DC braking time = the value set in $F9-18$ + the value set in $F1-09$.

Example 3-1: $F9-18 \neq 0$ and $F1-09 \neq 0$ (no output phase loss detected at startup), as shown in Figure 2-39.

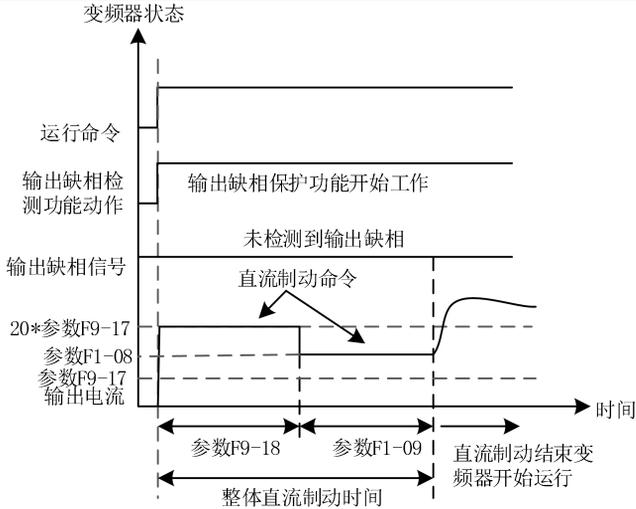


Figure 2-39 F9-18 ≠ 0 and F1-09 ≠ 0 (No output phase loss detected at startup)

Example 3-2: F9-18 ≠ 0 and F1-09 ≠ 0, output phase loss detected at startup. As shown in Figure 2-40, if an output phase loss occurs within the time set by F9-18, after half of the time set by F9-18 has passed, the inverter begins to execute the action set by F9-15.

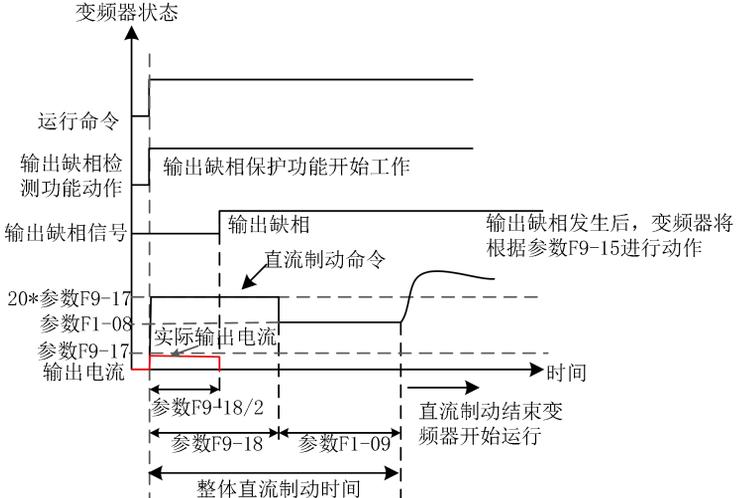


Figure 2-40 F9-18 ≠ 0 and F1-09 ≠ 0, (Output phase loss detected at startup)

Example 4: The inverter is in a stopped state, F9-18 ≠ 0 and F1-09 = 0, at startup, DC braking is performed according to the time set by parameter F9-18, with the DC braking current being 20 times the value set by F9-57.

Example 4-1: F9-18 ≠ 0 and F1-09 = 0 (no output phase loss detected at startup), as shown in Figure 2-41.

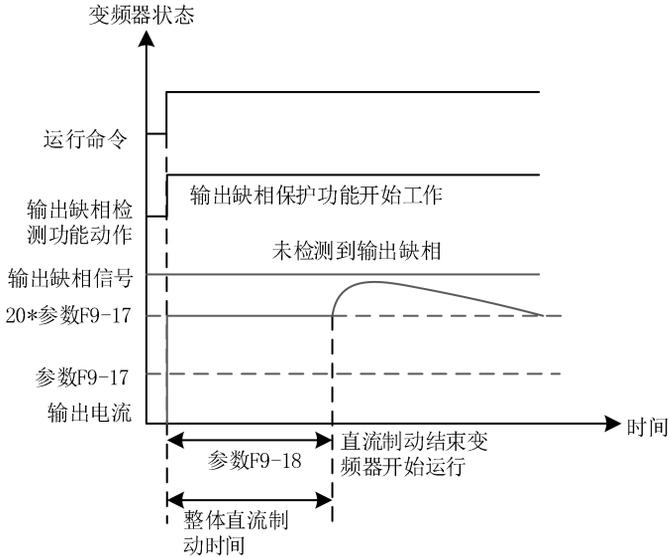


Figure 2-41 F9-18 \neq 0 and F1-09 = 0 (no output phase loss detected at startup)

Example 4-2: F9-18 \neq 0 and F1-09 = 0, output phase loss detected at startup. As shown in Figure 2-42, if an output phase loss occurs within the time set by F9-18, after half of the time set by F9-18 has passed, the inverter begins to execute the action set by F9-15.

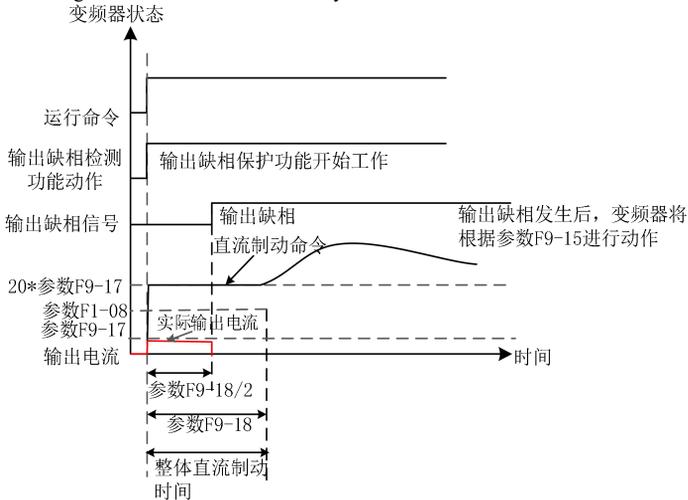


Figure 2-42 F9-18 \neq 0 and F1-09 = 0 (output phase loss detected at startup)

F9-20	Ground Fault Current Threshold	Range: 0.0~6553.5%	Factory Value: 60.0
F9-21	Ground Fault Filter Time	Range: 0.00~655.35 seconds	Factory Value: 0.10

When a ground fault occurs, it may lead to excessive motor winding current, motor overheating, etc., which can severely damage the motor or inverter. Therefore, it is necessary to detect ground faults and address them promptly when they occur.

F9-20 Ground Fault Current Threshold

This function code is used to set the ground fault judgment current threshold, measured in %, based on the inverter's rated current.

F9-21 Ground Fault Filter Time

This function code is used to adjust the low-pass filter time for ground fault detection current, which generally does not need to be changed.

The above two function codes can be used to set the ground fault detection function. When the absolute value of the sum of the three-phase currents exceeds the set value of F9-20, a ground fault is detected.

F9-22	Low Current Set Threshold	Range: 0.0~100.0%	Factory Value: 0.0%
F9-23	Low Current Detection Time	Range: 0.00~360.00 seconds	Factory Value: 0.00 seconds
F9-24	Low Current Action Method	Range: 0~3	Factory value: 0

Low current protection is designed to prevent the inverter or motor from operating for extended periods at low current levels. Current lower than normal values typically will not damage the inverter or motor, but may cause system abnormalities due to the motor's inability to deliver the desired torque.

F9-22 Low current set threshold

F9-23 Low current detection time

The above two function codes are used to set the low current detection conditions. F9-22 low current set threshold is in units of %, based on the rated current of the inverter. When the inverter output current is less than the F9-22 set value and persists for longer than the time set by F9-23, a low current fault is detected, and the inverter will determine subsequent actions according to the low current action method set by F9-24.

F9-24 Low current action method

0: No Function

Low current protection function is disabled, making the low current set threshold (F9-22) and low current detection time (F9-23) invalid.

1: Fault and Free Stop

When the low current protection condition is met, a low current fault is reported, Free shutdown.

2: Second deceleration stop due to fault

When the low current protection condition is met, a low current fault is reported, and the machine decelerates and stops according to the second deceleration time.

3: Alarm and continue running

When the low current protection condition is met, a low current warning is issued, but the machine does not shut down.

F9-25	Excessive slip detection value	Range: 0.0~100.0%	Factory Value: 0.0%
F9-26	Excessive slip detection time	Range: 0.0~10.0 seconds	Factory setting: 1.0 second
F9-27	Excessive slip action selection	Range: 0~3	Factory value: 0

The slip is the difference between the synchronous speed of an asynchronous motor and the actual speed of the motor. Generally speaking, the greater the load torque, the greater the slip. If an excessive slip occurs, it may be due to an overload or other abnormal conditions, so timely action is required.

F9-25 Excessive Slip Detection Value

F9-26 Excessive Slip Detection Time

The above two function codes are used to set the excessive slip detection conditions. F9-25 Excessive Slip Detection Value is in units of %, based on the motor's rated slip. When the actual slip of the induction motor exceeds the F9-25 setting value and persists for longer than the time set by F9-26, an excessive slip fault is detected, and the inverter will take subsequent actions as determined by F9-27 Excessive Slip Action Selection.

F9-27 Excessive slip action selection

0: Warning and continue running

When the over-slip detection condition is met, an over-slip warning is issued, but the machine does not stop.

1: Fault and decelerate to stop

When the over-slip detection condition is met, an over-slip fault is reported, and the machine decelerates to stop.

2: Fault and free stop

When the over-slip detection condition is met, an over-slip fault is reported, Free stop.

3: No warning

Do not perform excessive slip fault detection.

F9-36	Over Torque Selection 1	Range: 0~4	Factory value: 0
F9-37	Over-torque threshold 1	Range: 10~250%	Factory setting: 120%
F9-38	Over-torque time 1	Range: 0.1~60.0 seconds	Factory setting: 0.1 second

The above function codes are used to set up the over-torque detection feature. The inverter issues a warning or stops operation when it detects excessive torque, serving to protect the motor and the inverter.

F9-36 Over-torque selection 1

0: Not Detected

1: Constant Speed Detection Continue Running

When running at constant speed, if Motor 1 experiences over-torque, a warning is issued but operation continues.

2: Constant Speed Detection Stop Running

When running at constant speed, if Motor 1 experiences over-torque, an over-torque fault is reported and operation stops.

3: Running Detection Continue Running

During operation, if Motor 1 experiences over-torque, a warning is issued but operation continues.

4: Running Detection Stop Running

During operation, if Motor 1 experiences over-torque, an over-torque fault is reported and operation stops.

F9-37 Over-torque threshold 1

F9-38 Over-torque time 1

When the inverter output current exceeds F9-37 (unit %, based on the inverter's rated current) and persists for longer than the set time of F9-38, the inverter will determine subsequent actions according to F9-36. As shown in Figure 2-43, when F9-36 is 1 or 3, if over-torque is detected, the inverter will display an over-torque warning, but the inverter will continue to run until the output current is less than 95% of the F9-37 set value, after which the warning will be cleared. As shown in Figure 2-44, when F9-36 is 2 or 4, if over-torque is detected, the inverter will report an over-torque fault and stop running until the fault is reset, after which it can resume operation.

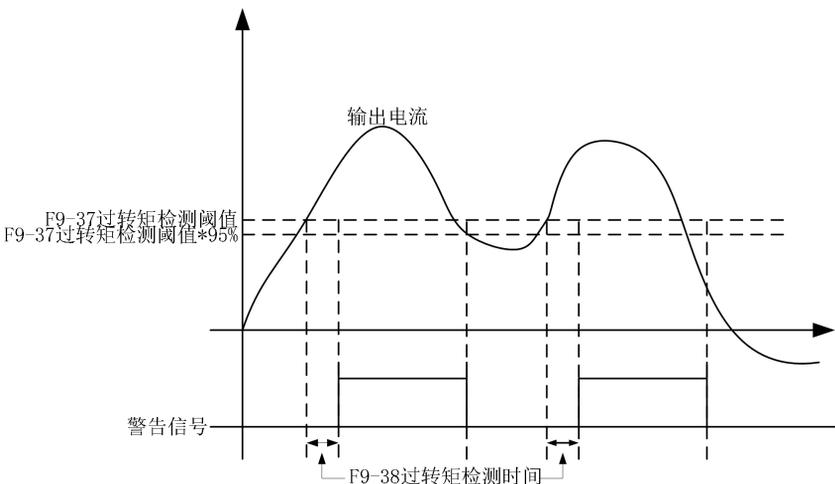


Figure 2-43 Schematic Diagram of Over-torque Detection 1

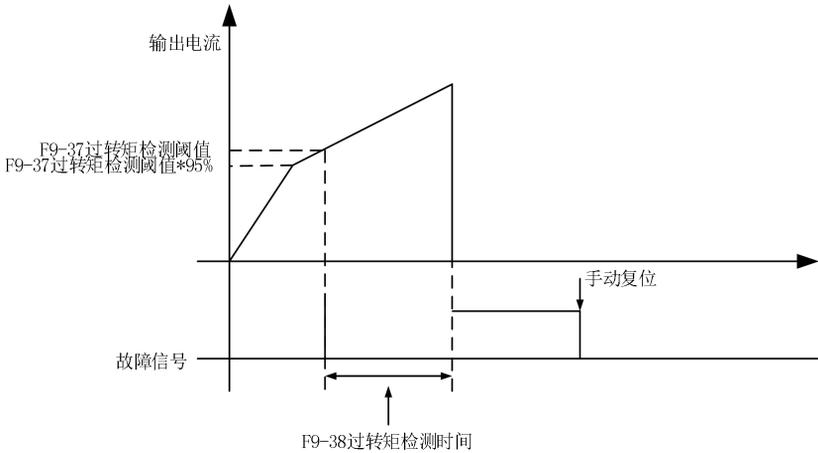


Figure 2-44 Schematic Diagram of Over-torque Detection 2

F9-46	Abnormal Start Count	Range: 0~10	Factory value: 0
F9-47	Abnormal Restart Reset Time	Range: 0.0~6000.0 seconds	Factory Value: 60.0

When an abnormality (overcurrent and overvoltage) occurs, the inverter will generally stop running until the fault is reset and a run command is received, after which it will restart. The automatic restart function can automatically clear faults after they occur and control the inverter to restart, achieving continuous motor operation. After a fault occurs, if the number of automatic restart attempts is not zero, the inverter fault will be cleared, and a speed search will be performed before controlling the motor to run to the set frequency. If the number of retries after an abnormality is zero, the fault will not be cleared, and the inverter will remain in a shutdown state.

F9-46 Abnormal Restart Attempts

This function code is used to set the number of automatic restarts after an abnormality. If set to zero, the inverter will not automatically restart after an abnormality. When automatically restarting after an abnormality, the inverter will start according to the settings in F1-02. If the number of abnormalities exceeds the value set in F9-46, the fault will not automatically reset; it must be manually reset and a new run command received before operation can continue.

F9-47 Abnormal Restart Reset Time

After an abnormal restart occurs, if no further abnormalities occur within the time set by this function code, the F9-46 Abnormal Restart Attempts will be reset to the set value.

F9-48	PTC Action Selection	Range: 0~3	Factory value: 0
F9-49	PTC Threshold	Range: 0.0~100.0%	Factory value: 50.0%
F9-50	PT Detection Threshold 1	Range: 0.000~10.000V	Factory value: 5.000V
F9-51	PT Detection Threshold 2	Range: 0.000~10.000V	Factory value: 7.000V
F9-52	PT protection frequency	Range: 0.00~599.00Hz	Factory Value: 0.00Hz
F9-53	PT Action Delay Time	Range: 0~6000 seconds	Factory value: 60 seconds

Example of PT100 wiring and usage:

Connect PT100 between AO1 and GND, short-circuit AO1 and A11

Step one, F6-13 "AO1 signal type", select 1 "0-20mA output"

Step two, F6-14 "AO1 output function", select 23 "fixed voltage output"

Step three, F6-18 "AO1 output fixed value", can be set to 50.00% (corresponding to 10mA)

Step four, F5-20 "A11 signal type", select 0 "0-10V input selection"

Step five, F5-21 "A11 function selection", select 11 "Thermistor PT100 value"

Step six, based on the AO1 output current and thermistor resistance value, the voltage drop can be calculated, then adjust F9-50 "PT detection threshold 1" and F9-51 "PT detection threshold 2"

By obtaining the motor temperature through sensors, the motor can be protected according to the

motor temperature. When the motor temperature exceeds a certain value, the motor operation will stop to prevent overheating damage. Thermistors are typically used to measure motor temperature, common thermistors include PTC resistors and PT100 resistors.

F9-48 PTC Action Selection

This function code is used to set the inverter action when PTC overheating occurs.

0: Warning and continue running

When motor overheating is detected, a motor overheat warning is issued, and the inverter continues to run.

1: Fault and decelerate to stop

When motor overheating is detected, a motor overheat fault is issued, and the inverter decelerates to stop.

2: Fault and free stop

When motor overheating is detected, a motor overheat fault is issued, and the inverter free stops.

3: No warning

Do not perform PTC detection.

F9-49 PTC Threshold

This function code is used to set the PTC overheating detection threshold, the unit is %, and the reference value is the maximum value of the analog input. When using the PTC overheating detection function, the corresponding analog input terminal must be set to voltage signal input, and the function of this analog input terminal is "Thermistor PTC Input". When the feedback voltage reaches the set value of F9-49, the inverter will operate according to the method set in F9-48.

F9-50 PT Detection Threshold 1

F9-51 PT Detection Threshold 2

The above two function codes are used to set the PT100 over-temperature detection threshold.

F9-52 PT Protection Frequency

F9-53 PT Action Delay Time

The above two function codes are used to set the inverter's action when a PT100 over-temperature is detected. When using the PT100 over-temperature detection function, the corresponding analog input terminal must be set to voltage signal input. The function of this analog input terminal is "Thermistor PT100 Value". When the feedback voltage is less than the set value of F9-50, the motor operates normally; When the feedback voltage is between the set values of F9-50 and F9-51, the inverter will run to the set frequency of F9-52 after the set time of F9-52. When the feedback voltage exceeds the set value of F9-51, the inverter will operate according to the method set in F9-48.

F9-54	STO Lock Function	Range: 0~1	Factory value: 0
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This function code is used to set whether an STO fault is allowed to reset automatically. If F9-54 is 0, after an STO fault is reported, even if the STO signal returns to normal, the STO fault cannot be cleared; it requires a power-off and power-on cycle for the STO fault to be cleared. If F9-54 is 1, after an STO fault is reported, if the STO signal returns to normal, the STO fault will be automatically cleared, and the inverter will return to its normal state.

F9-57	Output Phase Loss Threshold 2	Range: 0.00%~100.00%	Factory Value: 2.00%
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This function code is used to set the current threshold for phase loss detection during startup. For details, refer to F9-15~F9-18.

F9-58	Overvoltage Stall Recovery Threshold	Range: 0.0V~900.0V	Factory Value: 630.0V
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This function code is used to set the recovery threshold for overvoltage stall prevention. For details, refer to F9-03.

2.11 FA Group PID Function

The PID principle block diagram is shown in Figure 2-45:

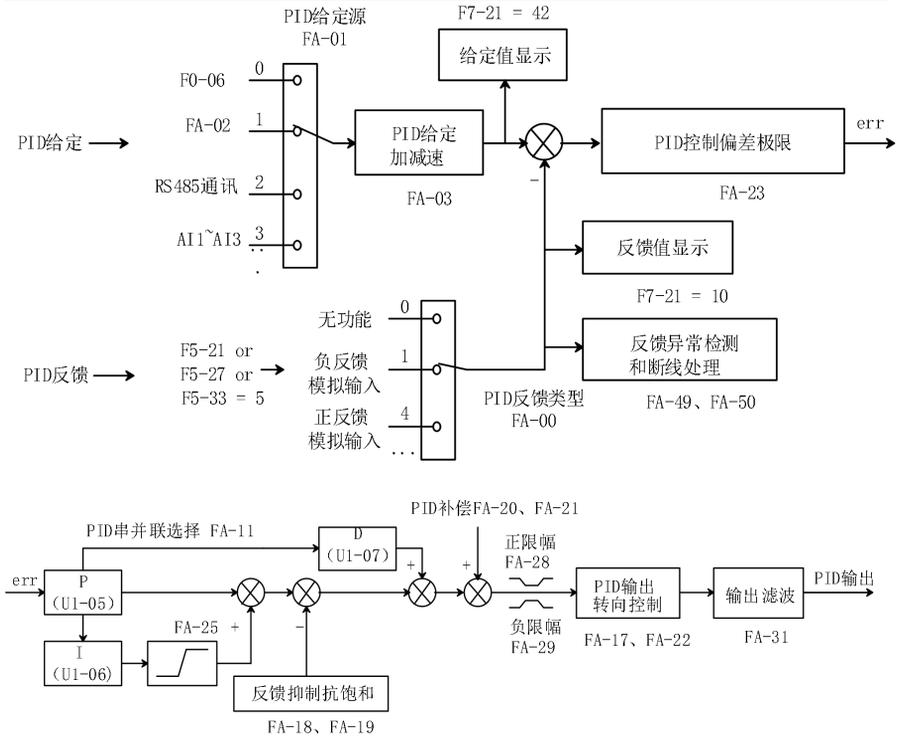


Figure 2-45 PID Principle Block Diagram

FA-00	PID Feedback Type Selection	Range: 0~8	Factory value: 0
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- 0: No Function
- 1: Negative Feedback Analog Input
- 2: Negative Feedback Pulse No Direction
- 3: Negative Feedback Pulse With Direction
- 4: Positive Feedback Analog Input
- 5: Positive Feedback Pulse No Direction
- 6: Positive Feedback Pulse With Direction
- 7: Negative Feedback Communication Input
- 8: Positive Feedback Communication Input

Positive Feedback: If the feedback value is less than the PID setpoint, the inverter output frequency decreases

Negative Feedback: If the feedback value is less than the PID setpoint, the inverter output frequency increases

FA-01	PID Setpoint Source Selection	Range: 0~6	Factory value: 1
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- 0: Frequency Command
- 1: Parameter FA-02
- 2: RS485 Communication
- 3: Analog Input
- 4: CANopen
- 5: Retain
- 6: Communication Card

This parameter selects the channel for the PID target quantity.

CM680 Inverter Software Manual
Parameter Group Description

FA-02	PID Setpoint	Range: -100.00%~100.00%	Factory Value: 50.00%
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When FA-01 (PID setpoint source) is set to 1, this parameter needs to be configured. This parameter is a relative value, where 100% corresponds to the maximum feedback value of the controlled system.

FA-03	PID Setpoint Change Time	Range: 0.00s~655.35s	Factory Value: 0.00
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The time required for the PID setpoint (parameter FA-02) to change from 0.0% to 100.0%. When the PID setpoint changes, the actual setpoint does not respond immediately but changes linearly over the given time to prevent sudden changes in the setpoint.

FA-04	PID Feedback Filter Time	Range: 0.1s~300.0s	Factory value: 5.0
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Filters the PID feedback value; this parameter helps reduce the impact of disturbances on the feedback but may degrade the response performance of the closed-loop control process.

FA-05	Proportional Coefficient 1	Range: 0.00~100.00	Factory Value: 88.00
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The speed at which the deviation decreases depends on the proportional coefficient; the larger the proportional coefficient, the faster the deviation decreases. However, an excessively large proportional coefficient can lead to significant overshoot and oscillation, reducing stability, especially in systems with large lag. Reducing the proportional coefficient decreases the likelihood of system oscillation but slows down the response speed. When performing 2ms enhanced PID control (parameter FA-12 = 0), the number of decimal places for this parameter can be selected by parameter FA-53 bit 1, 0: 1 decimal place, 1: 2 decimal places.

FA-06	Integral Time 1	Range: 0.00s~100.00s	Factory Value: 0.05
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This parameter determines the strength of the integral action of the PID controller. The smaller the integral time, the stronger the integral action, which helps to reduce overshoot, decrease oscillation, and stabilize the system, but it will slow down the elimination of static error in the system.

FA-07	Differential Time 1	Range: 0.00s~1.00s	Factory Value: 0.00
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This parameter determines the strength of the rate-of-change adjustment of the PID controller. The longer the differential time, the greater the adjustment strength. When set appropriately, this parameter can reduce overshoot and shorten the adjustment time. Differential action amplifies noise interference, so excessive differential regulation is detrimental to the system's ability to resist interference. Additionally, when there is no change in the input, the differential action output is zero. Therefore, differential control is often combined with the other two control laws to form a PD controller or a PID controller.

FA-08	Proportional Coefficient 2	Range: 0.00~100.00	Factory value: 100.00
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Refer to parameter FA-05; no further details are provided here.

FA-09	Integral Time 2	Range: 0.00s~100.00s	Factory value: 0.08
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Refer to parameter FA-06; no further details are provided here.

FA-10	Differential Time 2	Range: 0.00s~1.00s	Factory Value: 0.00
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Refer to parameter FA-07; no further details are provided here.

FA-11	PID Series/Parallel Selection	Range: 0~1	Factory value: 1
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0: Series, traditional PID control structure

1: Parallel, which separates proportional control, integral control, and differential control, allowing users to adjust P, I, and D controllers separately according to application needs. The parallel type PID is selected by default.

The block diagram of the PID series control is shown in Figure 2-46:

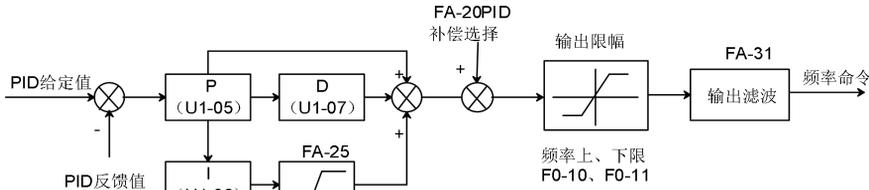


Figure 2-46 PID series control block diagram

The PID parallel control block diagram is shown in Figure 2-47:

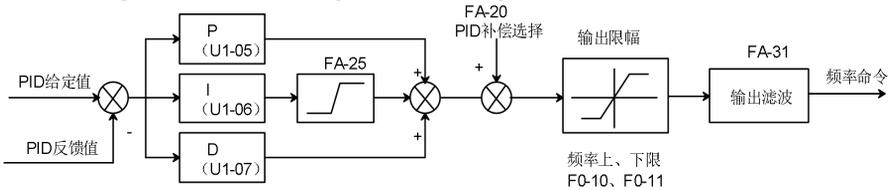


Figure 2-47 PID Parallel Control Block Diagram

FA-12	PID Control Execution Cycle	Range: 0~1	Factory value: 0
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0: Execute 2ms Enhanced PID Control

1: Execute 1ms Traditional PID Control

FA-12 = 0, the user selects to execute process PID control once every 2ms cycle, the PID output frequency reference base can be selected according to parameter FA-30, to choose 100.00% output corresponding to the maximum output frequency, or to choose 100.00% output corresponding to the auxiliary frequency. For example, if the user enables the main and auxiliary frequency function (assuming selecting main frequency + auxiliary frequency, parameter F0-07 = 1, F0-08 = 0), and the PID output frequency base selects the auxiliary frequency (FA-30 = 1), and the keyboard sets the auxiliary frequency to 40Hz, then the maximum PID output frequency is 40Hz.

FA-12 = 1, the user selects a 1ms cycle to execute the process PID control once, where a PID output of 100.00% corresponds to the maximum output frequency, and there is no auxiliary frequency option for the reference benchmark.

Additionally, the enhanced PID option (FA-12 = 0) supports soft start and automatic switching of two sets of PID parameters based on output frequency or deviation, while the traditional PID option (FA-12 = 1) does not have these features.

In some application scenarios, one set of PID parameters cannot meet the requirements of the entire operating process. In such cases, parameter FA-13 can be used to initiate the switching between two sets of PID parameters, with related parameters being FA-13 ~ FA-15.

FA-13	PID Parameter Switching Conditions	Range: 0~2	Factory value: 0
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0: Use the first set of PID parameters FA-05 ~ FA-07

1: Automatically adjust according to the output frequency. Use the first set of PID parameters (FA-05 ~ FA-07) when operating at the minimum frequency (F2-04) or below, use the second set of PID parameters (FA-08 ~ FA-10) when operating at the maximum frequency (F4-02), and use a linear interpolation value of the two sets of PID parameters when the operating frequency is between F2-04 and F4-02.

2: Automatically switch based on the deviation between the setpoint and feedback. Use the first set of PID parameters (FA-05 ~ FA-07) when the absolute value of the deviation between the setpoint and feedback is less than the PID parameter switching deviation 1 (parameter FA-14). Use the second set of PID parameters (FA-08 ~ FA-10) when the absolute value of the deviation between the setpoint and feedback is greater than the PID parameter switching deviation 2 (parameter FA-15). When the absolute value of the deviation between the setpoint and feedback varies between FA-14 ~ FA-15, the PID parameters are the linear interpolation values of the two sets of PID parameters.

When FA-13 = 1, the PI parameter adjustment diagram is shown in Figure 2-48:

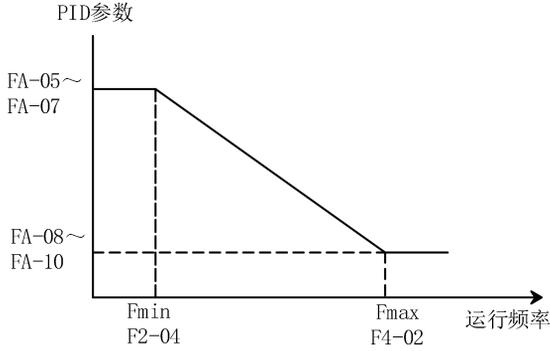


Figure 2-48 PI parameter adjustment diagram

When FA-13 = 2, the PI parameter adjustment diagram is shown in Figure 2-49:

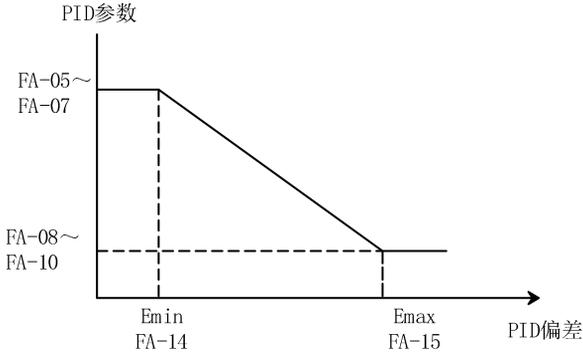


Figure 2-49 PI parameter adjustment diagram

FA-14	PID Parameter Switching err1	Range: 0.00%~100.00%	Factory setting: 10.00
FA-15	PID Parameter Switching Error 2	Range: 0.00%~100.00%	Factory setting: 40.00
FA-16	Allow PID Reverse Delay	Range: 0.0s~6553.5s	Factory Value: 0.0

When parameter FA-16 \neq 0, the reverse operation function is enabled after startup. For example, if FA-16 is set to 2.0, PID control is not allowed to change the direction of operation during the start-up period of 0 ~ 2 seconds (parameter FA-17 = 0), and after 2 seconds of start-up, PID control is automatically allowed to change the direction of operation (parameter FA-17 will be automatically updated to 1).

FA-17	PID Direction Change Selection	Range: 0~1	Factory value: 0
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0: Non-reversible running direction

1: Reversible running direction

FA-18	Feedback Suppression Deviation Rate	Range: 0%~100%	Factory value: 10%
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Parameters FA-18 and FA-19 are only valid when the air compressor application is selected (parameter L0-00 = 6) and 2ms enhanced PID control is performed (parameter FA-12 = 0).

FA-19	Feedback Suppression Gain	Range: 0~1000	Factory value: 800
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When the setpoint and feedback deviation are in opposite directions, parameters FA-18 and FA-19 provide feedback suppression anti-integral windup functionality to quickly exit the saturation state and respond to external inputs, avoiding the controller output lingering in the saturation zone for a long time, thus improving the controller's response capability. The controller performs anti-integral windup suppression based on the relationship between the feedback suppression deviation rate (parameter FA-18) and the 100ms deviation rate.

FA-20	PID Compensation Selection	Range: 0~1	Factory value: 0
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0: Parameter Setting

1: Analog Input

When FA-20 = 0, the PID compensation value (parameter FA-21) must be set.

FA-21	PID Compensation Value	Range: -100.0% to 100.0%	Factory Value: 0.0
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The reference for this parameter is the maximum output frequency F4-02. Example: If the maximum output frequency parameter F4-02 = 50.00 Hz, and FA-21 is 10.0%, the PID compensation will increase the output frequency by 5.00 Hz.

FA-22	PID Deviation Deadband Limit	Range: 0.00%~100.00%	Factory Value: 0.06
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When the PID control output exceeds FA-22, the PID regulation output becomes effective; otherwise, the PID regulator is inhibited. This parameter effectively prevents the actuator from oscillating when the PID output is small.

FA-23	PID Control Deviation Limit	Range: 0.00%~100.00%	Factory Value: 0.00
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This parameter determines the level at which the deviation between the feedback and setpoint signals causes the PID regulation to stop, maintaining the previous output value. PID regulation output is only executed when the deviation between the feedback value and the setpoint exceeds the PID control deviation limit FA-23. Properly setting this parameter can adjust the accuracy and stability of the PID system, the function diagram is shown in Figure 2-50.

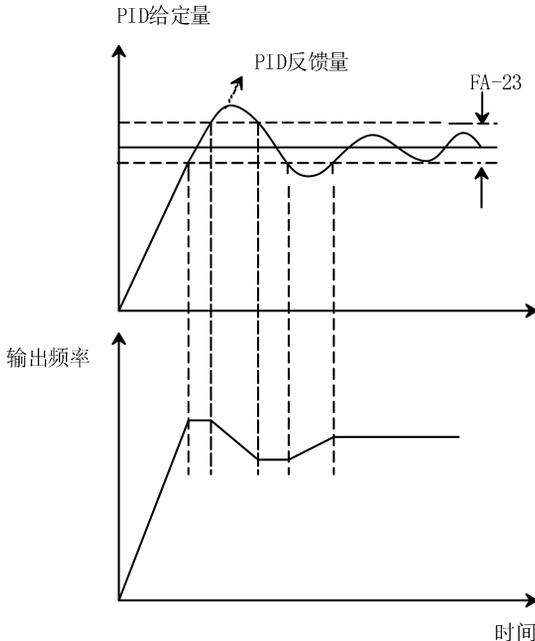


Figure 2-50 Diagram of PID Control Deviation Limit

CM680 Inverter Software Manual
Parameter Group Description

FA-24	Integral Separation Level	Range: 0.00%~100.00%	Factory Value: 0.00
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When the PID feedback overshoot is large at startup, integral separation can be enabled to reduce overshoot, with the parameter benchmark being the PID deviation.

When FA-24 \neq 0, the integral separation function is activated, and it only operates once at startup. When the deviation between the setpoint and the feedback value exceeds the parameter FA-24, integral separation occurs to prevent excessive overshoot due to integral action; When the deviation is less than parameter FA-24, the integral action takes effect to eliminate steady-state error.

FA-25	Integral Upper Limit	Range: 0.00%~100.00%	Factory value: 100.0
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This parameter is the upper limit of integration, with the reference being the maximum output frequency F4-02. When the integral value is too large, if the load suddenly changes, the response speed of the inverter slows down, which may cause motor slippage or mechanical damage. At this time, the parameter FA-25 can be appropriately reduced.

FA-26	Wake-up integral limit	Range: 0.0%~200.0%	Factory value: 50.0
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This parameter is the upper limit of wake-up integration, used to reduce the reaction time from sleep to wake-up, with the reference being the maximum output frequency F4-02.

FA-27	Main Auxiliary Reverse Cut-off Frequency	Range: 0.00%~100.00%	Factory value: 10.0
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In some cases, only when the PID output frequency is negative (i.e., the inverter runs in reverse), can the PID possibly control the setpoint and feedback to the same state. However, an excessive reverse frequency is not allowed in certain situations. Parameter FA-27 is used to determine the upper limit of the reverse frequency. The reference base for this parameter is the maximum output frequency F4-02.

FA-28	PID Output Positive Limit	Range: 0.00%~100.0%	Factory value: 100.0
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This parameter is the upper limit of the PID control output command, with the reference base being the maximum output frequency F4-02.

FA-29	PID Output Negative Limit	Range: 0.00%~100.0%	Factory value: 100.0
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When PID output reversal is allowed, the PID output is negative, and at this time, the output will be limited to the value set by parameter FA-29, which should be used in conjunction with parameter FA-17.

FA-30	PID output frequency reference	Range: 0~1	Factory value: 0
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0: PID control output 100.00% corresponds to maximum output frequency F4-02

1: PID control output 100.00% corresponds to auxiliary frequency (if the auxiliary frequency command changes, the PID output frequency will also change)

This parameter is only valid when the main and auxiliary frequency function is enabled.

FA-31	PID output filter time	Range: 0.0s~2.5s	Factory Value: 0.0
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This parameter is used to set the low-pass filter time for PID control output; the larger the parameter value, the greater the PID output filtering, and the slower the change in output frequency. Improper setting of parameter FA-31 may affect the response speed of the inverter, and even cause system oscillation.

PID soft startas shown in Figure 2-51. When the PID feedback overshoot is large at startup, soft start can be used to reduce the feedback overshoot; the soft start function only operates once at startup. When the soft start is enabled, it will first start according to the soft start frequency FA-33 and acceleration time FA-34. When the PID deviation is less than parameter FA-32, it switches back to normal PID control (when switching from soft start to PID control, the soft start frequency is used as the PID integral value to avoid discontinuity in frequency).

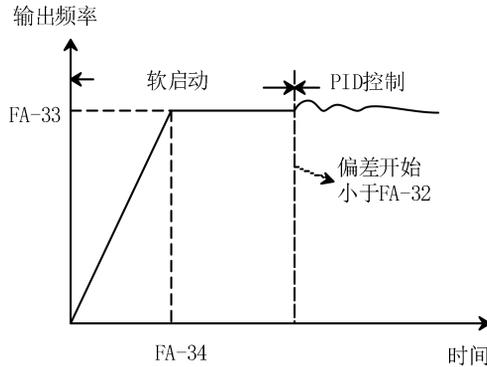


Figure 2-51 PID Soft Start Schematic Diagram

FA-32	soft start-PID switch value	Range: 0.00%~100.00%	Factory Value: 5.00
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This parameter is based on the deviation between the PID setpoint and feedback value.

FA-33	soft start frequency	Range: 0.00Hz~599.00Hz	Factory Value: 0.00
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When parameter FA-33 \neq 0, the soft start function is enabled.

FA-34	soft start acceleration time	Range: 0.00s~600.00s	Factory value: 3.00
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Time to accelerate from start to soft start frequency FA-33

FA-35	No-load current	Range: 0.00A~655.35A	Factory value: 0.00A
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When parameter FA-35 \neq 0 and the inverter output current is greater than FA-35, it starts at the soft start frequency (parameter FA-33) and the soft start acceleration step (parameter FA-36), until the soft start acceleration time (parameter FA-34) is reached, then switches to normal PID control.

FA-36	Soft Start Acceleration Step	Range: 0.00s~600.00s	Factory Value: 0.10
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Fuzzy PID control

FA-37 ~ FA-48 are parameters related to fuzzy PID control. In general, process control only requires ordinary PID adjustment; users do not need to enable fuzzy PID tuning functions unless necessary.

FA-37	Fuzzy PID Tuning Enable	Range: 0~1	Factory value: 1
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0: Fuzzy PID disabled, use only conventional PID

1: When PID control is not allowed to change the direction of operation (FA-17 = 0), enable fuzzy PID control, and perform real-time self-tuning of PID parameters during operation. Fuzzy PID control is enabled only when the air compressor application is selected (parameter L0-00 = 6) and 2ms enhanced PID control (parameter FA-12 = 0) is executed, or 1ms traditional PID control (parameter FA-12 = 1) is executed.

FA-38	Deviation Fuzzy Universe of Discourse - NB	Range: 0.00~100.00	Factory Value: 5.00
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Membership value of the linguistic term 'negative large' in the universe of discourse of the error fuzzy variable

FA-39	Deviation Fuzzy Domain-NS	Range: 0.00~100.00	Factory setting: 2.00
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Membership value of the linguistic term 'negative small' in the universe of discourse of the error fuzzy variable

FA-40	Deviation Fuzzy Domain-PS	Range: 0.00~100.00	Factory setting: 2.00
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The membership value of the linguistic term "positive small" in the domain of the deviation fuzzy variable fuzzy set

FA-41	Deviation Fuzzy Domain-PB	Range: 0.00~100.00	Factory Value: 5.00
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Parameter Group Description

The membership value of the linguistic term “positive large” in the domain of the deviation fuzzy variable fuzzy set

FA-42	Deviation Rate Fuzzy Domain-NB	Range: 0.00~100.00	Factory setting: 10.00
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The membership value of the linguistic term “negative large” in the domain of the deviation rate fuzzy variable fuzzy set

FA-43	Deviation Rate Fuzzy Domain-NS	Range: 0.00~100.00	Factory Value: 5.00
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The membership value of the linguistic term “negative small” in the domain of the deviation rate fuzzy variable fuzzy set

FA-44	Deviation Rate Fuzzy Domain-PS	Range: 0.00~100.00	Factory Value: 5.00
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The membership value of the linguistic term “positive small” in the domain of the deviation rate fuzzy variable fuzzy set

FA-45	Fuzzy Set of Deviation Rate PB	Range: 0.00~100.00	Factory setting: 10.00
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The membership value of the linguistic term “positive large” in the domain of the deviation rate fuzzy variable fuzzy set

FA-46	Fuzzy PID Inference Rules	Range: 0~3	Factory Value: 2
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- 0: Fuzzy PID Inference Rule 0
- 1: Fuzzy PID Inference Rule 1
- 2: Fuzzy PID Inference Rule 2
- 3: Fuzzy PID Inference Rule 3

FA-47	Intermediate Value of Fuzzy Rule KP	Range: 0~100	Factory Value: 50
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FA-48	Intermediate Value of Fuzzy Rule KI	Range: 0~100	Factory Value: 50
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Parameters FA-47 and FA-48 are used to obtain the initial membership values for fuzzy variables in the control rule table where the fuzzy linguistic value is zero.

PID Abnormality Detection

Parameters related to PID abnormality detection processing are FA-49 ~ FB-53. When the AIx signal type parameters F5-20, F5-26, or F5-32 = 2 (i.e., selecting 4~20 mA analog input), parameters FA-49 and FA-50 are set effectively.

FA-49	Feedback Abnormality Detection Time	Range: 0.0s~3600.0s	Factory Value: 0.0
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This parameter is used for detecting abnormal conditions or extremely slow response of the feedback analog signal; when FA-49 = 0, no detection is performed. When the sampled value of the analog signal is below the 4~20mA disconnection threshold (parameter F5-43) and persists for longer than FA-49, the feedback analog signal is considered abnormal, and the inverter performs the abnormal action as set by parameter FA-50, displaying an 'AFE' prompt on the operation panel.

FA-50	Feedback Disconnection Action Selection	Range: 0~3	Factory value: 0
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- 0: Warning and continue running
- 1: Fault and deceleration stop
- 2: Fault and free stop
- 3: Warning and operation at the frequency before disconnection

FA-51	PID Feedback Abnormal Deviation	Range: 1.0%~50.0%	Factory value: 10.0
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When the deviation between the setpoint and feedback signal exceeds the threshold (parameter FA-51) and persists for longer than the deviation abnormality detection time FA-52, a PID deviation fault occurs. If the function selection for output terminals F6-00 ~ F6-03 is 15, the output terminal will indicate a PID deviation warning.

FA-52	Abnormal Deviation Detection Time	Range: 0.1s~300.0s	Factory value: 5.0
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FA-53	PID Control Flag	Range: 0000H~FFFFH	Factory Value: 2
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PID control flag (bits 0 ~ 2 are valid)

bit 0: PID reverse action selection, 0: PID reverse based on PID calculation value, 1: reverse based on parameter F0-09;

bit 1: PID parameter Kp decimal point position selection, 0: 1 decimal place, 1: 2 decimal places;

bit 2: 0: no function, 1: when the main/auxiliary frequency function is enabled, the integral upper limit base value is the auxiliary frequency.

FA-54	PID Feedback Disconnection Threshold	Range: 0.00%~100.00%	Factory value: 0.00%
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When the PID feedback value falls below the PID feedback disconnection threshold and exceeds the time set by FA-52, the system will stop according to the setting in FA-50.

2.12 FB Group Tension Control Parameters

This chapter introduces several tension control schemes, mainly including tension closed-loop speed mode, line speed closed-loop mode, tension open/closed-loop torque mode, among four control methods (corresponding to FB-00 selection).

- Tension Closed-loop Speed Mode

Features: Through the use of a swing arm (floating roller) or tension sensor to feedback material tension, the inverter output frequency is adjusted in a closed loop to achieve constant control of the swing arm position or tension. Suitable for applications where there is a swing arm or tension sensor (where changes in speed have a slow impact on tension changes) and there is sufficient speed regulation margin.

The winder operates in closed-loop tension speed mode, with two AI signals receiving the swing arm position signal and the main traction line speed signal, respectively. Calculate the roll diameter through line speed, calculate the main frequency based on line speed, and adjust the output frequency together with the feedback loop of the rocker position. Compared with the main frequency + PID auxiliary frequency of general inverters, the addition of roll diameter calculation allows the main frequency setting to more accurately follow changes in line speed, thus making the control of the rocker position more stable.

- Constant Line Speed Control

Features: Suitable for applications without primary traction, where one machine in the winding/unwinding process operates in constant line speed mode, serving as the traction unit. The winder also serves as the main traction unit. To maintain the material running at a constant line speed, it is necessary to obtain the roll diameter value. The diagram above shows two feasible methods:

- Using the counting signal input through DI terminals, calculate the roll diameter using the thickness accumulation method.

- Install a speed measuring device on the material, transmit the signal to the inverter via pulse method, and calculate the roll diameter using line speed.

It is not necessary to use both of the above methods simultaneously as shown in the diagram; choose one of them or another feasible method. The winder operates in line speed closed-loop speed mode, with one AI channel receiving the line speed signal. By calculating the roll diameter based on line speed, the main frequency setting is determined according to the given operating line speed and the roll diameter, working together with the line speed feedback closed-loop regulation to decide the output frequency, achieving constant line speed operation without main traction. The unwinder can operate in one of the other three tension modes based on actual conditions.

- Closed-loop tension torque control

Features: Through feedback from tension sensors on material tension, closed-loop regulation of the inverter's output torque achieves constant tension control. This integrates mode 4 open-loop tension control torque method, using open-loop tension calculation to assist closed-loop tension regulation (in practice, mainly relying on closed-loop tension regulation, with the option to superimpose mode 4 open-loop tension control torque based on control effectiveness). The tension accuracy is high, suitable for materials with strong elasticity or situations where there is no speed adjustment margin.

The winder operates in closed-loop tension torque mode, with two AI signals receiving tension sensor signals and the line speed signal from the main traction unit, respectively. In implementation, an open-loop torque setting plus tension closed-loop regulation method is adopted. The calculation of roll diameter in open-loop tension is retained, while inertia and friction compensation can be omitted due to the addition of closed-loop regulation (or can be set to optimize response speed).

For elastic materials (with speed regulation margin) where tension sensors are used, it is also possible to consider using the tension closed-loop speed mode (Mode 1) to avoid the occurrence of elastic oscillation.

- Open-loop tension torque control

Parameter Group Description

Features: No need for a swing arm (floating roller) or tension sensor; no tension closed-loop, slightly lower tension accuracy; suitable for applications with low tension accuracy requirements.

The winder operates in open-loop tension torque mode, using line speed to calculate the roll diameter, and output torque is calculated through material tension. Based on the actual system conditions, friction torque compensation or acceleration/deceleration inertia torque compensation can be selected.

The above typical application methods are only intended to illustrate the scenarios suitable for the four tension control modes and do not strictly limit them to these forms. Under basic conditions being met, flexible handling according to actual conditions is possible.

The previous section introduced four typical applications of tension control, whose implementation is mainly constrained by three essential conditions: roll diameter, line speed, and control quantity feedback, Table 2-20 shows this.

Table 2-20 Necessary Conditions for CM680 Tension Control Mode

Function/Restriction	Roll Diameter[1]	Line Speed	Control Quantity Feedback
Tension Closed-loop Speed Mode	Necessary	Necessary[2]	Necessary
Line Speed Closed-loop Mode	Necessary	Not Necessary	Not Necessary
Tension Closed-loop Torque Mode	Necessary	Not Necessary	Necessary
Tension Open-loop Torque Mode	Necessary	Not Necessary	Not Necessary

Note:

[1]: If the roll diameter source is selected as the line speed calculation channel (FB-25=0), then line speed is a necessary condition.

[2]: Inertia compensation, friction compensation are related to line speed, therefore, if considering improving the open-loop torque tension control accuracy, line speed is a necessary condition.

FB-00	Tension Control Mode Selection	Range: 0~4	Factory value: 0
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Set this parameter to select the tension control mode.

0: Tension control invalid, functions the same as a general inverter.

1: Tension closed-loop speed mode, requires tension/position detection and feedback, operates in speed mode, the inverter adjusts the output frequency by superimposing PID closed-loop calculations on the main frequency given based on line speed and roll diameter, to achieve stable set tension or position. Control methods can be selected from V/F control, sensorless vector control (SVC), and closed-loop speed sensor vector control (FVC).

2: Line speed closed-loop mode, the inverter adjusts the operating frequency according to changes in roll diameter, ensuring the system runs at a constant line speed. Control methods can be selected from V/F control, sensorless vector control (SVC), and closed-loop speed sensor vector control (FVC).

3: Tension closed-loop torque mode, requires tension detection and feedback, torque mode operation, the inverter adjusts by superimposing PID closed-loop calculation on the given torque, including acceleration/deceleration inertia torque compensation, friction torque compensation, etc., and can choose whether to superimpose mode 4 open-loop tension torque based on control effect. Select torque (TQC) control method to achieve ideal control results.

4: Open-loop tension torque mode, does not require tension/position detection and feedback, torque mode operation, the inverter controls the output torque to control the tension on the material. Select torque (TQC) control method to achieve ideal control results.

FB-01	Curling Mode	Range: 0~1	Factory value: 0
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0: Winding mode

1: Unwinding mode

■ The tension taper function is invalid in unwinding mode.

■ In winding mode, the roller diameter will increase; in unwinding mode, the roller diameter will

decrease.

FB-02	Load Side Mechanical Gear A	Range: 1~65535	Factory Value: 100
FB-03	Mechanical gear B on the motor side	Range: 1~65535	Factory Value: 100

Parameters FB-02, FB-03 are only applicable in tension control mode, as shown in Figure 2-52.

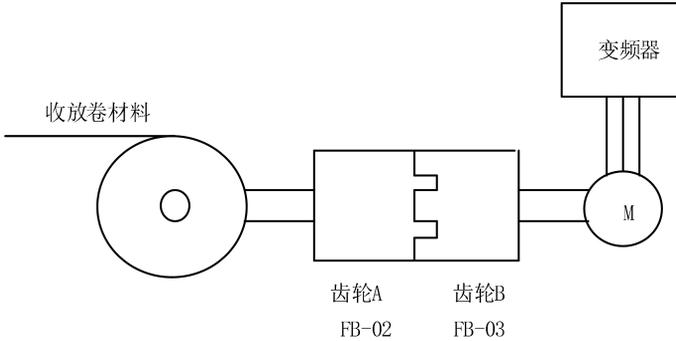


Figure 2-52 Tension control diagram

FB-04	PID Setpoint Source Selection	Range: 0~2	Factory value: 0
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0: Parameter FB-05 serves as the PID target setpoint

1: RS-485 communication settings;

2: Analog input, must first set AI1/AI2/AI3 function to tension PID target value (Parameter F5-21 or F5-27 or F5-33 = 17).

FB-05	PID Target Setpoint	Range: 0.0%~100.0%	Factory value: 50.0%
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Effective when parameter FB-00 = 1 or 2. In line speed closed-loop speed mode (FB-00 = 2), AI1/AI2/AI3 functions must be set to line speed feedback (parameter F5-21 or F5-27 or F5-33 = 15), and FB-05 serves as the line speed PID setpoint. In other modes, when F5-21 or F5-27 or F5-33 = 15, FB-05 represents the actual line speed.

In tension closed-loop speed mode (FB-00 = 1), this parameter range 0.0 ~ 100.0% corresponds to tension feedback voltage 0~10 V; in line speed closed-loop speed mode (FB-00 = 2), it corresponds to 0 ~ maximum line speed (parameter FB-18).

FB-06	PID Feedback Source Selection	Range: 0~1	Factory value: 0
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0: Analog Input

1: Pulse Input

When FB-06 = 0, set the AI1/AI2/AI3 function to Tension PID Feedback Value (Parameter F5-21 or F5-27 or F5-33 = 14).

When FB-06 = 1, set the number of pulses per meter (FB-20).

FB-07	PID Parameter Adjustment Basis	Range: 0~3	Factory value: 0
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0: No Switching

1: Automatic Adjustment Based on Roll Diameter

2: Switching Based on Operating Frequency

3: Automatic Switching Based on Setpoint and Feedback Deviation

When FB-07=0, use the first set of PID parameters FB-08~ FB-09

When FB-07=1, use the first set of PID parameters FB-08~ FB-09 for empty rolls, and the second set of PID parameters FB-10~ FB-11 for full rolls. When the current roll diameter varies between the maximum roll diameter (FB-26) and the minimum roll diameter (FB-27), the PID parameters are linearly interpolated values between the two sets of PID parameters.

FB-07=2, use the first set of PID parameters FB-08 ~ FB-09 when operating at the minimum frequency F2-04 and below, use the second set of PID parameters FB-10 ~ FB-11 when operating at the maximum frequency F4-02, and when the operating frequency varies between F2-04 ~ F4-02, the PID parameters are the linear interpolation values of the two sets of PID parameters.

FB-07=3, use the first set of PID parameters FB-08 ~ FB-09 when the feedback value is at the lower limit FB-16, use the second set of PID parameters FB-10 ~ FB-11 when the feedback value is at the upper limit FB-17, and when the feedback value varies between FB-16 ~ FB-17, the PID parameters are the linear interpolation values of the two sets of PID parameters.

When FB-07=1, the PI parameter adjustment diagram is shown in Figure 2-53:

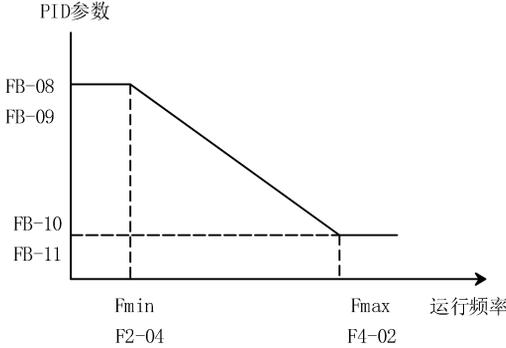


Fig. 2-53 PI Parameter Adjustment Diagram

When FB-07=2, the PI parameter adjustment diagram is shown in Fig. 2-54:

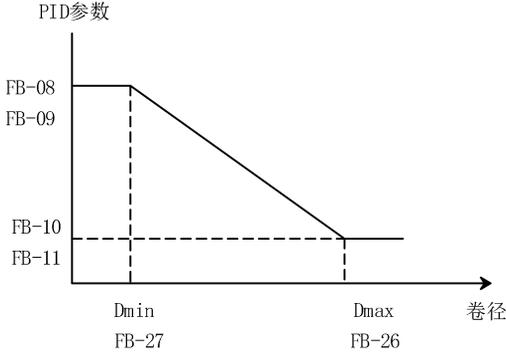


Fig. 2-54 PI Parameter Adjustment Diagram

When FB-07=3, the PI parameter adjustment diagram is shown in Fig. 2-55:

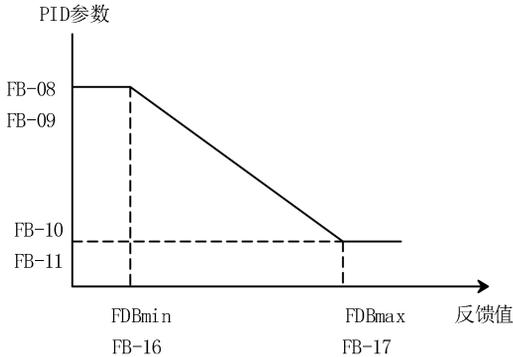


Fig. 2-55 PI Parameter Adjustment Diagram

FB-08	PID Proportional Coefficient 1	Range: 0.0~1000.0	Factory value: 50.0
FB-09	PID Integral Time 1	Range: 0.00s~500.00s	Factory Value: 1.00
FB-10	PID Proportional Coefficient 2	Range: 0.0~1000.0	Factory value: 50.0
FB-11	PID Integral Time 2	Range: 0.00s~500.00s	Factory Value: 1.00
FB-12	PID Output Positive/Negative Selection	Range: 0~1	Factory value: 0

Depending on different customer requirements, you can choose the suitable method based on Table 2-21:

Table 2-21 PID Output Polarity Selection

Tension Feedback Value	Loose 0~100%	Tight	Loose 0~100%	Tight
Winding	Positive Output		Negative Output	
Unwinding	Negative Output		Positive Output	

FB-13	PID Output Positive Limit	Range: 0.00%~100.00%	Factory Value: 20.00
FB-14	PID Output Negative Limit	Range: 0.00%~100.00%	Factory Value: 20.00

Parameters FB-13 and FB-14 define the positive and negative limit percentages for PID control output, PID output limit range = FB-13 or FB-14 * maximum frequency parameter F4-02.

FB-15	PID Feedback Upper Limit Value	Range: 0.0%~100.0%	Factory value: 100.0
FB-16	PID Feedback Lower Limit	Range: 0.0%~100.0%	Factory Value: 0.0

Parameters FB-15 and FB-16 are only valid when FB-00 is set to 1 or 3.

FB-17	Linear Speed Input Source	Range: 0~5	Factory value: 0
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- 0: No Input
- 1: Analog Input
- 2: Communication Setting
- 3: PULSE Input (from PG Card)
- 4: Invalid
- 5: PULSE Input via DI6/DI7 Digital Terminals

When FB-00 = 2, this parameter setting is invalid.

When FB-17 = 1, AI1/AI2/AI3 functions must be set to line speed feedback (F5-21/ F5-27/ F5-33 = 15).

When FB-17 = 2, change the line speed set value through parameter FB-21; When FB-17 ≠ 2, the inverter temporarily stores the analog value or pulse command to parameter FB-21, at this time FB-21 is read-only.

When FB-17 = 3 or 5, it is necessary to set the number of pulses per meter for parameter FB-20.

Line Speed

In closed-loop speed control mode, it is necessary to calculate the winding synchronization frequency based on the line speed; when calculating the roll diameter using the line speed, the line speed is an essential parameter; At the same time, the line speed can be used to achieve pre-driving, inertia compensation, friction compensation, and other functions. Therefore, the line speed is an important part of tension control, and related parameters are FB-18 to FB-24.

FB-18	Maximum Linear Speed	Range: 0.00~650.00	Factory Value: 100.00
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This parameter sets the maximum linear speed. The actual linear speed value corresponding to inputs 100.0% on channels 1~5 of FB-17 (may not be the same as the maximum production line speed; avoid confusion when setting). When using linear speed to calculate reel diameter (FB-25 = 0), the larger this parameter, the larger the reel diameter value, and vice versa. Refer to this rule to adjust this parameter based on the deviation between the calculated reel diameter and the actual value.

FB-19	Minimum Linear Speed	Range: 0.00~650.00	Factory Value: 0.00
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Parameter Group Description

When the linear speed setting is less than parameter FB-19, the inverter will stop calculating the reel diameter and maintain the current reel diameter.

FB-20	Pulses per Meter	Range: 0.0~6500.0	Factory Value: 0.0
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When the PID feedback source is selected as pulse input (FB-06 = 1), this parameter needs to be set;

When the linear speed input source is PULSE input or PULSE input via digital terminals (FB-17 = 3 or 5), this parameter needs to be set.

FB-21	current linear speed	Range: 0.00~650.00	Factory Value: 0.00
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When FB-17 = 2, change the line speed set value through parameter FB-21; When FB-17 ≠ 2, the inverter temporarily stores the analog value or pulse command in parameter FB-21, at which time FB-21 is read-only.

FB-22	linear speed filter time	Range: 0.00s~100.00s	Factory Value: 0.10
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When the linear speed input source is PULSE input or PULSE input via DI6/DI7 digital terminals (FB-17 = 3 or 5), this parameter is valid and can suppress linear speed oscillation.

FB-23	linear speed acceleration time	Range: 0.00s~655.35s	Factory Value: 0.00
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FB-24	linear speed deceleration time	Range: 0.00s~655.35s	Factory Value: 0.00
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Parameters FB-23 and FB-24 are effective in the linear speed closed-loop speed mode (FB-00 = 2).

Roll Diameter

Roll diameter is a necessary parameter for four tension control modes. Choose a reasonable method for calculating roll diameter based on conditions, and set relevant parameters correctly to ensure the relative accuracy of the roll diameter value; otherwise, it can lead to abnormal tension control functions. Parameters related to roll diameter are FB-25 ~ FB-39. Illustration of Roll Diameter Parameter Settings and Calculation As shown in Figure 2-56.

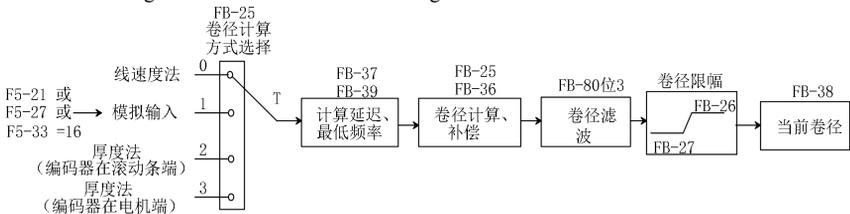


Figure 2-56 Illustration of Roll Diameter Parameter Settings and Calculation

FB-25	winding diameter calculation method selection	Range: 0~5	Factory value: 0
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- 0: Calculated through line speed
- 1: Calculated through analog input
- 2: Calculated through thickness integration, encoder at the load end input via PG card
- 3: Calculated through thickness integration, encoder at the motor end input via PG card
- 4: Calculated through thickness integration, encoder at the load end input via DI6/DI7
- 5: Through thickness integral calculation, the encoder at the motor end is input via DI6/DI7.

When FB-25 = 1, it is necessary to first set the AI1/AI2/AI3 functions to reel diameter (F5-21/ F5-27/ F5-33 = 16), at this time 10 V corresponds to the maximum reel diameter parameter FB-26.

When FB-25 = 2, a PG card must be connected, and the reel diameter is obtained through the encoder on the scroll bar. At this time, the signal pulses are connected to PG2 on the PG card, and the encoder type (F4-27) as well as the reference pulse input type (F4-30), the number of pulses per revolution (FB-32), the number of turns per layer (FB-33), and the material thickness (FB-34) are set to calculate the reel diameter.

When FB-25 = 3, a PG card must be connected, and the roll diameter is calculated by reverse inference through the motor encoder and gear ratio. At this time, the signal pulse should be connected to PG1 on the PG card, and parameters such as gear ratio (FB-02 and FB-03), encoder type (F4-27), encoder pulses (F4-28), number of turns per layer (FB-33), and material thickness (FB-34) should be set to calculate the roll diameter.

When FB-25 = 4 or 5, DI6 and DI7 functions are supported, and the reference pulse input type

should be set to unidirectional input (F4-30 = 5). If the winding direction changes during operation, parameter FB-01 must also be modified.

The relationship between various roll diameter parameters FB-26, FB-27, FB-29/ FB-30/ FB-31, and FB-38 is shown in Figure 2-57.

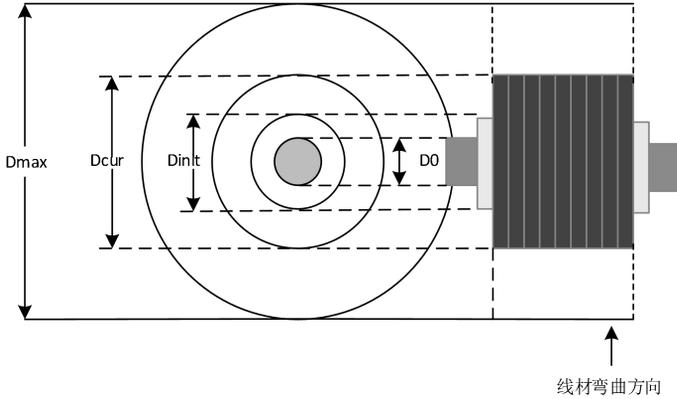


Figure 2-57 Diagram of the relationship between roll diameter parameters

Dmax: Maximum roll diameter, corresponding parameter FB-26;

D0: Empty roll diameter, corresponding parameter FB-27;

Dinit: Initial roll diameter, corresponding parameter FB-29 or FB-30 or FB-31;

Dcur: Current roll diameter, corresponding parameter FB-38;

FB-26	Maximum Roll Diameter	Range: 1.0mm~6000.0mm	Factory value: 500.0
FB-27	Empty Roll Diameter	Range: 1.0mm~6000.0mm	Factory value: 100.0
FB-28	Initial Roll Diameter Selection	Range: 0~1	Factory value: 0
FB-29	Initial Roll Diameter 0	Range: 0.0mm~6000.0mm	Factory value: 100.0
FB-30	Initial Roll Diameter 1	Range: 0.0mm~6000.0mm	Factory value: 100.0
FB-31	Initial Roll Diameter 2	Range: 0.0mm~6000.0mm	Factory value: 100.0
FB-32	Pulses per Revolution	Range: 1ppr~60000ppr	Factory value: 1

This parameter indicates the number of pulses per revolution of the roll shaft.

FB-33	Number of Coils per Layer	Range: 1~10000	Factory value: 1
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This parameter indicates the number of revolutions required for one layer of material to be wound, generally set to 1 for wire and strip materials.

FB-34	Material Thickness	Range: 0.001~65.000	Factory setting: 0.001
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The number of decimal places for this parameter can be selected by parameter FB-80 bit 6, 0: 3 decimal places, 1: 2 decimal places.

FB-35	Roll Diameter Filter Time	Range: 0.00s~100.00s	Factory Value: 1.00
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This parameter filters the calculated roll diameter results, suppressing fluctuations in the roll diameter, which can improve the instability of the roll diameter source (parameter FB-25). The larger the parameter setting, the smoother the calculated roll diameter value, but the greater the delay in roll diameter changes. Rule: When the roll diameter changes linearly, the time lag between the calculated roll diameter and the actual roll diameter is approximately equal to the value of this parameter.

CM680 Inverter Software Manual
Parameter Group Description

FB-36	Roll Diameter Compensation Enable	Range: 0~1	Factory value: 0
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This parameter is only effective when the tension closed-loop speed mode (FB-00 = 1) is set and the line speed input source FB-17 is not zero. When the mechanical gear ratio or linear speed cannot reach the precise condition, set this parameter to compensate for the roll diameter.

FB-37	Roll Diameter Calculation Delay Time	Range: 0.0s~6553.5s	Factory Value: 0.0
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After the pre-drive signal is canceled, the roll diameter calculation restarts after this delay to avoid inaccurate roll diameter calculation results in a short time after the pre-drive ends, which could lead to system instability.

FB-38	Current Roll Diameter	Range: 1.0~6553.5	Factory value: 100.0
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When the inverter is not in a stopped state, this parameter is read-only.

FB-39	Minimum Frequency for Roll Diameter Calculation	Range: 0.00Hz~599.00Hz	Factory Value: 1.00
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When the linear speed is lower than parameter FB-39, maintain the current roll diameter value; when the linear speed exceeds this parameter, perform the roll diameter calculation. For situations where the operating frequency is low or the roll diameter calculation during acceleration is inaccurate, this parameter can be appropriately set to resolve the issue.

To avoid excessive tension causing material breakage and to prevent the wire from being slack during startup, a soft start method is used at the moment of startup. The relevant parameters are FB-40 ~ FB-43, and it is only effective when parameter FB-00 = 1 or 2.

FB-40	Pre-drive Mode Selection	Range: 0~2	Factory value: 0
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- 0: No Function
- 1: Pre-drive for Winding Mode
- 2: Pre-drive for Unwinding Mode

At the moment of winding startup, to prevent the wire from being slack, the tension convergence time can be extended by setting it to pre-drive for winding mode (FB-40 = 1). During unwinding, it can be set to pre-drive for unwinding mode (FB-40 = 2), allowing the motor to rotate in reverse to actively tighten the material. At this time, the output frequency limit is the main and auxiliary frequency reversal cutoff frequency (parameter FA-27). Parameter FB-40 is only valid when parameter FB-00 = 1.

FB-41	Pre-drive/PID Switching Point	Range: 0.0%~100.0%	Factory value: 15.0
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Tension feedback value 0~100% corresponds to tension from loose to tight, parameter FB-41 reference base: FB-05, when setting FB-05 = 50%, FB-41 = 10%, the pre-drive range is 0~40%.

FB-42	soft start frequency	Range: 0.00Hz~599.00Hz	Factory setting: 2.00
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FB-43	soft start acceleration time	Range: 0.00s~600.00s	Factory value: 3.00
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When FB-40 = 1 or 2, at the instant of winding start, the sum of the synchronous frequency calculated based on line speed and the soft start frequency FB-42 is used as the set frequency, and acceleration starts according to time FB-43. After the soft start acceleration time, the system runs with the set frequency being the sum of the synchronous frequency calculated based on line speed and the auxiliary frequency adjusted by PI control.

Belt Breakage Detection

The parameters related to tension control detection and abnormal handling are FB-44 to FB-50. When the line speed input source FB-17 is not 0, and the roll diameter is calculated through the line speed (FB-25 = 0), the setting of parameter FB-44 is valid.

After enabling belt breakage detection, if the line speed exceeds parameter FB-45, the change in roll diameter exceeds parameter FB-46, and the time exceeds the time set by parameter FB-47, a belt breakage will occur. In the event of a belt breakage, the inverter will display bEB, stop in free-run mode, and can simultaneously use the DO1 or DO2 output terminal function (setting value 46) as a belt breakage indication.

FB-44	Broken Belt Detection Selection	Range: 0~1	Factory value: 0
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FB-45	Minimum Line Speed for Broken Belt Detection	Range: 0.0~3000.0	Factory Value: 0.0
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FB-46	Belt Breakage Detection Roll Diameter Change	Range: 1.0mm~6000.0mm	Factory value: 100.0
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FB-47	Belt Breakage Detection Time	Range: 0.00s~100.00s	Factory Value: 1.00
FB-48	Tension Feedback Error Threshold	Range: 0%~100%	Factory setting: 100%
FB-49	Tension Error Detection Time	Range: 0.0s~10.0s	Factory value: 0.5
FB-50	Tension Error Abnormal Handling	Range: 0~2	Factory value: 0

0: Warning and Continue Running

1: Fault and Free Stop

2: Fault and Decelerate to Stop

When the deviation between the Tension PID target setpoint and the Tension PID feedback value exceeds the parameter FB-48 Tension Feedback Error Threshold, and the error time exceeds the parameter FB-49 Tension Error Detection Time, a PID Feedback Deviation Exception is generated, and the inverter reports fault "A011".

FB-51	PID Output Gain	Range: 0.0~200.0	Factory value: 100.0
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This parameter, together with the PID output positive/negative limit parameters FB-13 or FB-14, determines the final output frequency limit in the tension closed-loop or line speed closed-loop modes, with the reference being the current output frequency of the inverter.

FB-52	Tension Reference Source Selection	Range: 0~1	Factory value: 0
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0: RS485 Communication

1: Analog Input

When FB-52 = 0, the zero-speed tension parameter value FB-54 can be set via the operation panel through communication.

When FB-52 = 1, the AI1/AI2/AI3 functions must be set to tension setting (F5-21/ F5-27/ F5-33 = 18), at this time FB-54 is read-only.

FB-53	Maximum Tension Value	Range: 0~65535	Factory value: 0
FB-54	Tension Setpoint	Range: 0~65535	Factory value: 0

When parameter FB-52 = 1, parameter FB-54 is read-only, at this time the analog value 10V corresponds to the maximum tension value FB-53.

Inertia and friction compensation

This section applies only to torque mode. Properly setting these parameters can optimize tension control performance and improve tension stability or enhance system response speed. The parameters related to inertia and friction torque compensation are FB-58 to FB-62. It is recommended to set these parameters in open-loop torque control mode (FB-00 = 4). In closed-loop torque control mode (FB-00 = 3), they generally do not need to be set.

In open-loop torque mode, during system acceleration and deceleration, the output torque must provide material tension as well as additional torque to overcome the system's moment of inertia.

Consider inertia compensation when any of the following phenomena occur:

- Material tension is too low during winding acceleration
- Material tension is too high during winding deceleration
- Material tension is too high during unwinding acceleration
- Material tension is too low during unwinding deceleration

The inertia of the winding/unwinding system generally consists of system inertia and material inertia. When setting parameters, choices can be made based on the relationship between these two quantities. If the material is heavier and the shaft is lighter, then only the material inertia parameter needs to be set, and vice versa.

FB-58	Sliding Friction Compensation Tension	Range: 0.0%~100.0%	Factory Value: 0.0
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During constant speed operation of the motor, the output torque is used not only to establish material tension but also to overcome rotational friction. When this part of the torque cannot be ignored, compensation for the friction torque is required.

FB-59	Material Inertia Compensation Coefficient	Range: 0~30000	Factory value: 0
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Material inertia compensation coefficient = material density × material width. Density unit: kg/m³, width unit: m. The material inertia on the reel changes with the reel diameter. Based on parameters

Parameter Group Description

FB-02, FB-03, FB-27, FB-38, FB-59, etc., the inverter automatically calculates the flywheel inertia of the material to obtain the inertia compensation torque.

FB-60	Acceleration Inertia Compensation Gain	Range: 0.0%~1000.0%	Factory Value: 0.0
FB-61	Inertia Compensation Filter Time	Range: 0.00~100.00	Factory Value: 5.00
FB-62	Deceleration Inertia Compensation Gain	Range: 0.0%~1000.0%	Factory Value: 0.0

In some cases, fine-tuning parameters FB-60 or FB-62 can optimize control performance. For example, during acceleration of the winding process, if the material tension is too low, parameter FB-60 can be increased to enhance the compensation effect; otherwise, reduce this parameter. The same applies to deceleration.

Startup Compensation

In certain situations, the winding shaft may have significant startup friction, which can cause difficulty in starting. At this point, torque compensation can be applied at zero speed during startup, and the compensation should be withdrawn once normal operation resumes to ensure constant tension. Relevant parameters are FB-55 to FB-57.

Zero-speed tension calculation depends on the value of bit 1 of the tension control flag parameter FB-80. By default, bit 1 of FB-80 is 0, which means zero-speed tension calculation is not enabled. At this time, if the operating frequency is less than the zero-speed tension threshold FB-57, the tension setpoint is the zero-speed tension value FB-56; Conversely, the tension setpoint is the target setpoint FB-05, with a hysteresis zone for the tension setpoint in between, maintaining a constant value.

When the tension control flag parameter bit 1 of FB-80 is 1, zero-speed tension calculation is effective, at this time:

When the line speed is less than the zero-speed tension threshold FB-57,

$$\text{零速张力} = \text{线速度} \times \frac{\text{PID 目标设定值 FB-05} - \text{零速张力 FB-56}}{\text{最大线速度 FB-18} * \text{零速张力阈值 FB-57}} + \text{零速张力 FB-56}$$

Conversely, the tension setpoint is the target setpoint FB-05. After startup, the final tension setpoint will vary with the line speed and the zero-speed tension threshold FB-57.

FB-55	Zero-speed Tension Reference Source	Range: 0~2	Factory value: 0
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0: No Input

1: Communication settings

2: Analog Input

When FB-55 = 1, the zero-speed tension parameter value FB-56 can be set via the operation panel through communication;

When FB-55 = 2, it is necessary to first set the AI1/AI2/AI3 function to zero-speed tension setting (F5-21/ F5-27/ F5-33 = 19), at this time FB-56 is read-only.

FB-56	Zero-speed Tension Setpoint	Range: 0~65535	Factory value: 0
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When FB-55 is set to 2, parameter FB-56 is read-only, and the analog input of 10 V corresponds to the maximum tension parameter FB-53.

FB-57	Zero-speed tension threshold	Range: 0.00%~100.00%	Factory Value: 5.00
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When bit 1 of the tension control flag parameter FB-80 is 0, if the operating frequency is less than FB-57, the tension value is the parameter FB-56, achieving static friction tension compensation.

Taper Tension

In certain situations, to ensure flat winding, it is required that the tension decreases as the roll diameter increases. By properly setting the taper-related parameters (FB-63 ~ FB-70), this can be achieved. Parameters FB-63 ~ FB-70 are only valid in the winding mode (FB-01=0). Parameter FB-63 can select different taper tension curves for tension calculation, including single-segment linear or curved lines, as well as multi-segment linear or curved lines. Figure 2-58 shows the settings of taper tension-related parameters and the schematic diagram of taper tension calculation.

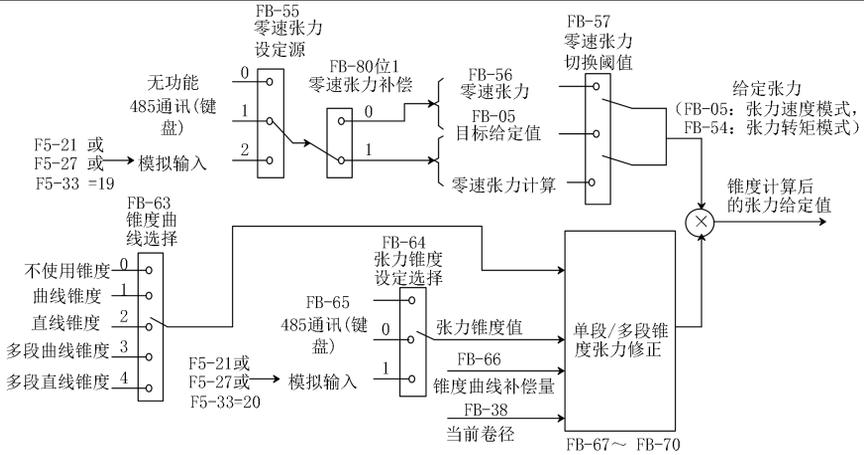


Figure 2-58 Schematic Diagram of Taper Tension-Related Parameter Settings and Taper Tension Calculation

FB-63	Tension Taper Curve Selection	Range: 0~4	Factory value: 0
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- 0: Taper Calculation Invalid
- 1: Curve Taper
- 2: Straight Taper
- 3: Multi-segment Curve Taper
- 4: Multi-segment Straight Taper

When FB-63 = 1, generate a curve based on parameter FB-65, and fine-tune the curve using parameter FB-66.

When FB-63 = 2, generate a straight taper based on parameter FB-65.

When FB-63 = 3, parameters FB-65, FB-69, and FB-70 determine the multi-segment curve taper, and parameters FB-67 and FB-68 determine the curve inflection points.

When FB-63 = 4, parameters FB-65, FB-69, and FB-70 determine the multi-segment straight taper, and parameters FB-67 and FB-68 determine the straight inflection points.

Single-stage linear taper output tension and roll diameter relationships as shown in Fig. 2-59.

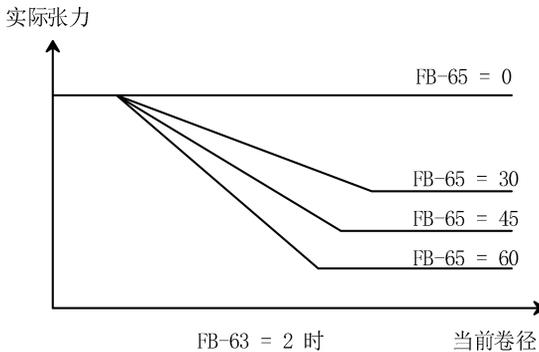


Fig. 2-59 Schematic diagram of single-stage linear taper output tension and roll diameter relationship

Multi-stage linear taper output tension and roll diameter relationships as shown in Fig. 2-60.

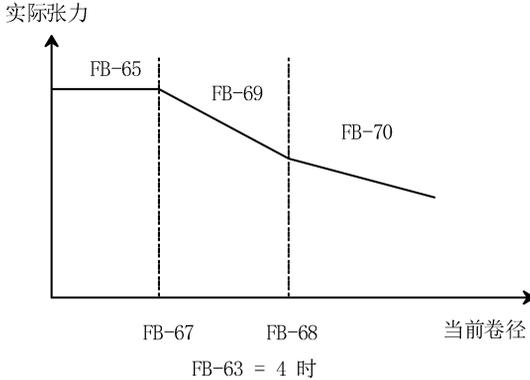


Fig. 2-60 Schematic diagram of multi-stage linear taper output tension and roll diameter relationship

FB-64	Tension Taper Setting Source	Range: 0~1	Factory value: 0
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0: Communication settings

1: Input analog setting

FB-65	Taper Setting Value	Range: 0%~100%	Factory value: 0
FB-66	Taper Curve Compensation Value	Range: 0.0~6000.0	Factory Value: 0.0

When the tension taper curve selects curve taper (FB-63 = 1), the curve is generated by the taper setting value FB-65 and fine-tuned by parameter FB-66.

FB-67	Taper Calculation Roll Diameter 1	Range: 1.0~6000.0	Factory value: 6000.0
FB-68	taper calculation roll diameter 2	Range: 1.0~6000.0	Factory value: 6000.0
FB-69	multi-segment taper value 1	Range: 0~100	Factory value: 0
FB-70	multi-segment taper value 2	Range: 0~100	Factory value: 0

Pre-drive

The pre-drive function is used for automatic roll changing applications. When replacing a full roll with a new one, the new roll needs to be pre-rotated to match the line speed of the material in operation, ensuring a smooth roll change without shock. At this time, the pre-drive function using DI terminals (F5-00 ~ F5-07 = 94) must be utilized. The parameters related to pre-drive are FB-71 ~ FB-73; this function requires accurate line speed and roll diameter measurements. When this function is active, roll diameter calculation and tension PI control are halted, as shown in Figure 2-61.

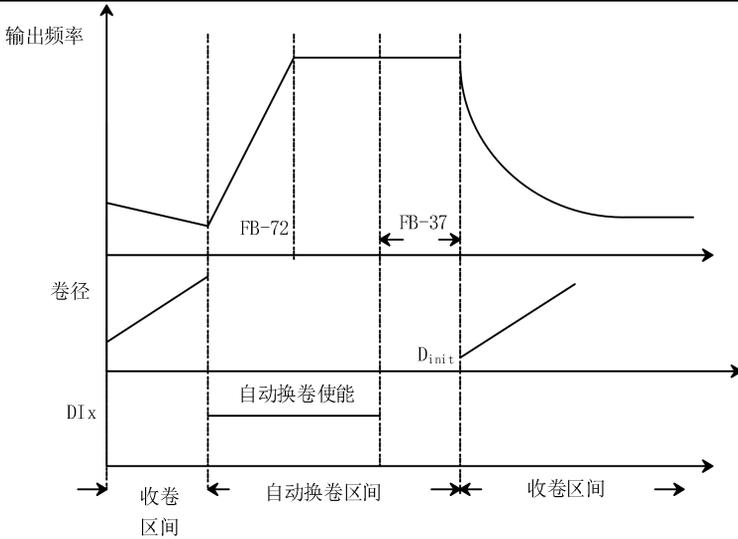


Figure 2-61 Pre-drive Schematic Diagram

FB-71	pre-drive frequency gain	Range: -50.0%~50.0%	Factory Value: 0.0
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When the pre-drive terminal is effective, the inverter automatically calculates the output frequency based on the line speed detection value and the current roll diameter to match the line speed.

FB-72	pre-drive acceleration time	Range: 0.00s~655.35s	Factory Value: 0.00
FB-73	pre-drive deceleration time	Range: 0.00s~655.35s	Factory Value: 0.00

Parameters FB-72 ~ FB-73 are the time for accelerating from the soft start frequency (FB-42) to the pre-drive frequency or decelerating from the pre-drive frequency to the soft start frequency during automatic roll change.

FB-74	speed limit gain	Range: 0.0s~6553.5s	Factory value: 100.0
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In tension control mode, when the analog detection value of line speed is also used as a speed limit (parameter F3-17 = 3), this parameter can be adjusted to change the size of the speed limit.

Parameters FB-75 ~ FB-79 are reserved; their default values should be used, and users should not modify them, as improper settings may cause the winding system to become unbalanced.

FB-75	soft start/PI switch LSErr	Range: 0~100	Factory Value: 5
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Line Speed Closed-loop Mode (FB-00 = 2), Pre-drive/PID Regulation Switching Line Speed Error Level, Reference Benchmark: Maximum Line Speed FB-18.

FB-76	soft start/PI switch LS1	Range: 0.0%~10.0%	Factory Value: 0.4
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Tension Closed-loop Speed Mode (FB-00 = 1) Valid, Pre-drive and PI Regulation Switching Interval Line Speed Critical Value 1, Reference Benchmark: Maximum Line Speed FB-18.

FB-77	soft start/PI switch LS2	Range: 0.0%~10.0%	Factory Value: 0.7
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Tension Closed-loop Speed Mode (FB-00 = 1) Valid, Pre-drive and PI Regulation Switching Interval Line Speed Critical Value 2, Reference Benchmark: Maximum Line Speed FB-18.

FB-78	Soft Start/PI Switch 1 Setting	Range: 0.0~40.0%	Factory Value: 2.0%
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Tension closed-loop speed mode (FB-00 = 1) is valid, the critical value for switching between pre-drive and PI regulation based on line speed when the threshold is 1, reference standard: FB-05.

FB-79	Unwinding Soft Start PI Switch Point	Range: 0.0~40.0%	Factory Value: 5.0%
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Tension closed-loop speed mode (FB-00 = 1) is valid, the threshold for switching between pre-drive and PI regulation during unwinding, reference standard: FB-05.

FB-80	Tension Control Flag	Range: 0000H~FFFFH	Factory Value: 0000H
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Tension control flag (bits 0 ~ 6 are valid)

bit 0: Taper calculation invalid;

bit 1: Enable switching between zero-speed tension command and normal tension command;

bit 2: Inertia torque compensation and acceleration/deceleration compensation switching, 0: Inertia compensation effective, 1: Acceleration/deceleration compensation effective;

bit 3: Reel diameter filtering using moving average method;

bit 4: Inertia torque compensation calculation selection, 0: Based on linear speed, 1: Based on operating frequency;

bit 5: PI output reverse limit selection, 0: PI output reverse limit selection FB-13, 1: Select FB-14;

bit 6: Material thickness display decimal places selection, 0: 3 decimal places, 1: 2 decimal places.

Function Block Diagram

The given torque and frequency are the target control quantities for tension control. Users can refer to the data flow of the above two key variables in the overall block diagram, query some sub-function diagrams, and refer to relevant parameter descriptions to achieve the tension control function. The setting value of parameter FB-00 determines the method of tension control implementation. The product integrates four tension control modes, as shown in Figures 2-62, 2-63, 2-64, and 2-65.

- FB-00 = 1, Tension Closed-loop Speed Mode

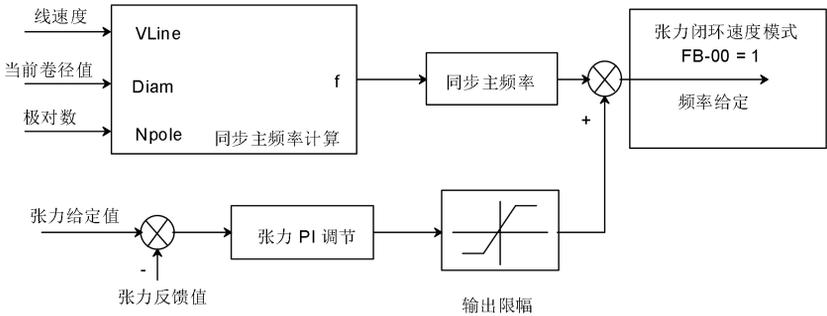


Figure 2-62 Tension Closed-loop Speed Mode Schematic Diagram

- FB-00 = 2, Line Speed Closed-loop Speed Mode

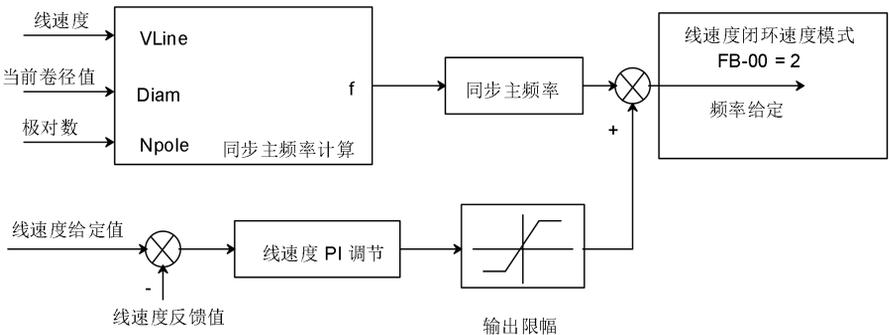


Figure 2-63 Line Speed Closed-loop Speed Mode Schematic Diagram

● FB-00 = 3, Tension Closed-loop Torque Mode

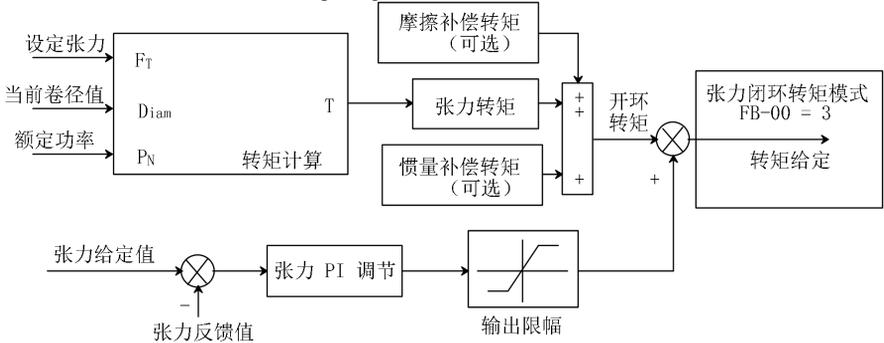


Figure 2-64 Tension Closed-loop Torque Mode Schematic Diagram

● FB-00 = 4, Tension Open-loop Torque Mode

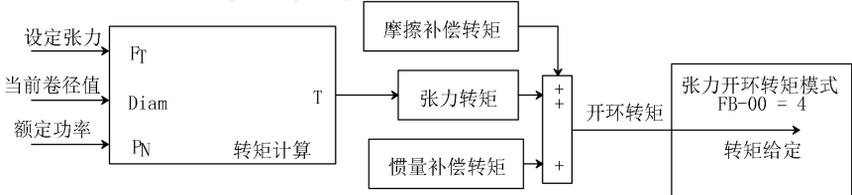


Figure 2-65 Schematic Diagram of Tension Open-loop Torque Mode

2.13 FC Group Position Control Parameters

FC-00	P2P Position Mode	Range: 0~1	Factory value: 0
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This function code is used to set the P2P (point-to-point) position control mode, as shown in Figure 2-66.

0: Relative P2P Position Control

1: Absolute P2P Position Control

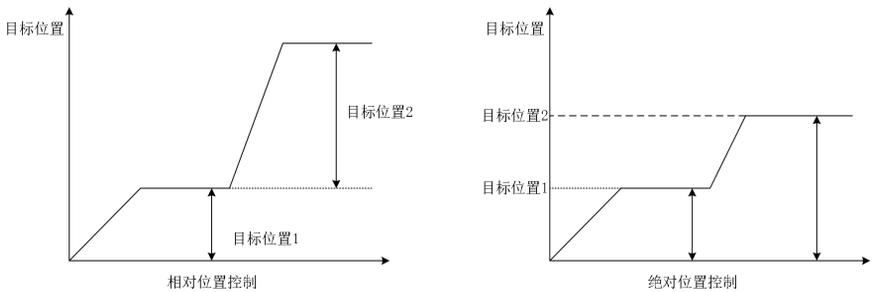


Figure 2-66 P2P Position Control Mode Schematic

FC-01	Return-to-Origin Mode Selection	Range: 0000H~FFFFH	Factory value: 0
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bit0~bit3: Homing Method Selection

0: Home in Forward Direction, PL Forward Limit as Home Enable;

1: Home in Reverse Direction, NL Reverse Limit as Home Enable;

2: Home in Forward Direction, ORG: OFF→ON as Home Enable;

3: Home in Reverse Direction, ORG: OFF→ON as Home Enable;

4: Forward direct search for Z pulse as home position enable;

5: Reverse direct search for Z pulse as home position enable;

6: Forward direction to home position, ORG: ON→OFF as home position enable;

7: Reverse direction to home position, ORG: ON→OFF as home position enable;

8: Current position as home position.

bit4~bit7: Z signal setting (to be used with bit0~bit3 options 0, 1, 2, 3, 6, 7), decimal value meanings are as follows:

0: Return to find Z pulse;

1: Do not return to find Z pulse, continue forward to find Z pulse;

2: Never search for Z pulse.

Greater than 2: Parameter setting is invalid.

bit8~bit11: Selection of action upon reaching limit (to be used with bit0~bit3 options 2, 3, 4, 5, 6, 7), decimal value meanings are as follows:

0: Display fault when position limit is reached;

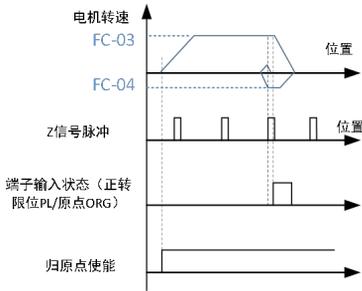
1: Run in reverse direction when position limit is reached.

Greater than 1: Parameter setting is invalid

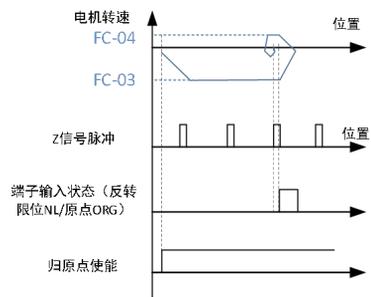
bit12~bit15: Reserved

The return-to-origin method corresponding to the set value of FC-01 is explained through the following diagram, where the decimal value of bit0~3 is represented by A, and the decimal value of bit4~7 is represented by B.

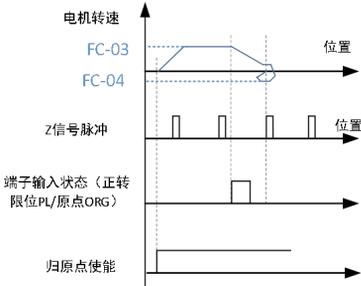
A = 0或2, B = 0



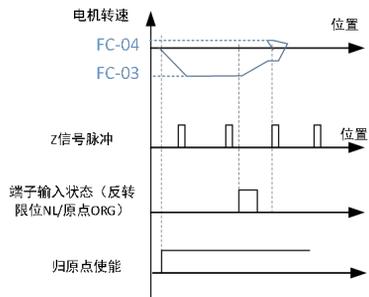
A = 1或3, B = 0



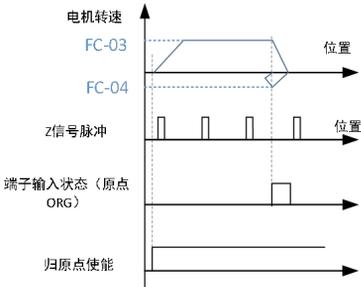
A = 0或2, B = 1



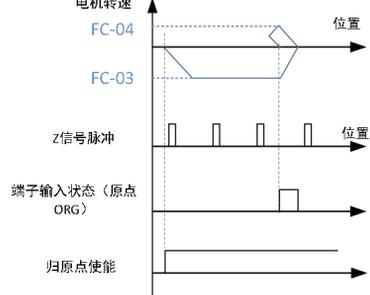
A = 1或3, B = 1



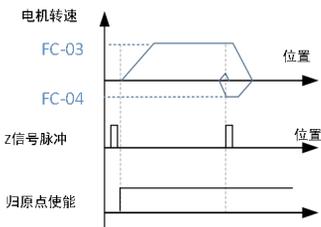
A = 2, B = 2



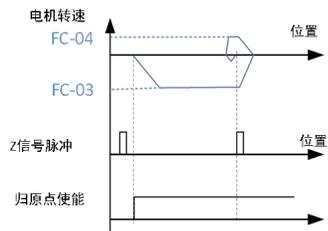
A = 3, B = 2



A = 4 (B值不影响此功能)



A = 5 (B值不影响此功能)



FC-02	Position Control Command Source	Range: 0~5	Factory value: 0
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- 0: External Terminal Input
- 2: RS485 communication
- 3: CANopen
- 5: Communication Expansion Card

FC-03	First Segment Return-to-Origin Speed	Range: 0.00Hz~599.00Hz	Factory default: 8.00Hz
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FC-04	Second Segment Return-to-Origin Speed	Range: 0.00Hz~599.00Hz	Factory setting: 2.00Hz
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First segment return-to-origin speed, used for the initial stage of position control, to run from the starting position to the target position at a faster speed, thereby reducing the time to reach the target position; Second segment return-to-origin speed, used for subsequent stages of position control, to run towards the target position at a slower speed, preventing significant overshoot upon reaching the target position.

FC-05	Machine tool application enable	Range: 0~1	Factory value: 0
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When enabling machine tool application control, this function must be activated.

- 0: Off
- 1: Enable

FC-06	Error amount for searching Z point	Range: 0~65535	Factory value: 1
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This parameter is only used in P2P mode; when the absolute value of the position error is less than this parameter value, it is determined that the search for point Z has been successful.

FC-07	Position control acceleration time	Range: 0.00s~655.35s	Factory setting: 1.00s
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FC-08	Position control deceleration time	Range: 0.00s~655.35s	Factory setting: 3.00s
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The acceleration and deceleration times for position control are shown in Figure 2-67.

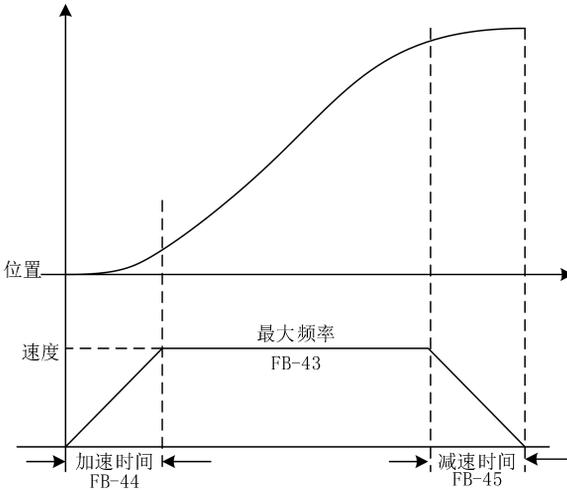


Figure 2-67 Positions Schematic Diagram of Control for Acceleration and Deceleration Time

FC-12	Positioning Stiffness Adjustment Coefficient	Range: 0.10~10.00	Factory Value: 1.00
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Used to adjust the stiffness during the shaft locking period; the higher the stiffness adjustment coefficient, the better the positioning stiffness, but excessive stiffness may lead to system instability.

FC-13	Positioning Jitter Adjustment Coefficient	Range: 0.00~1.20	Factory value: 3.00
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Used to adjust the position loop bandwidth after positioning completion; the smaller this coefficient, the less the effect of the position loop after positioning completion.

FC-20	Internal Positioning Command	Range: -32767~32767	Factory value: 0
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This parameter sets the target position for single-point positioning and must be used in conjunction with the external terminal selection for single-point positioning enable (35).

FC-21	Feedback Position Arrival Error	Range: 0~65535	Factory value: 10
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When the absolute value of the position error is less than this parameter value, it is determined that the feedback position has been reached. For example, setting the target position to 500, FC-21 set to 50, after positioning is completed, positions between 450~550 are considered successful.

FC-22	Pulse Input Filter	Range: 0.000~65.535	Factory Value: 0.100
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PG2 Pulse Input Digital Low-pass Filter Time Constant, the larger this value, the better the input signal interference resistance, but the greater the delay.

FC-23	Pulse Speed Mode	Range: 0~1	Factory value: 0
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PG2 Pulse as Speed Command Mode Selection, 0 indicates PG2 as electrical speed, 1 indicates PG2 as mechanical speed.

FC-24	Position Loop Proportional Coefficient	Range: 0.00~40.00	Factory Value: 8.00
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Position Closed-loop Control Proportional Coefficient, the larger this parameter, the faster the position tracking, but too large may lead to system instability.

FC-25	Position Loop Feedforward Coefficient	Range: 0~100	Factory value: 30
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Only effective for internal positioning (Mlx=35) and pulse tracking position control (Mlx=37). The larger the setting value of this parameter, the smaller the pulse tracking error and the faster the position control response, but it can easily cause position overshoot.

FC-26	Position Curve Time	Range: 0.00s~655.35s	Factory setting: 3.00s
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Effective for single-point positioning (ON) when the multi-function input terminal is set to 35. The longer the setting value, the longer the positioning time.

FC-27	P2P Maximum Frequency	Range: 0.00Hz~599.00Hz	Factory value: 10.00Hz
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This parameter sets the maximum speed frequency during position control acceleration and deceleration periods. Used in conjunction with FC-07 and FC-08.

FC-28	Multi-segment position 1(revs)	Range: -30000~30000	Factory value: 0
FC-29	Multi-segment position 1(pulse)	Range: -32767~32767	Factory value: 0
FC-30	Multi-segment position 2(revs)	Range: -30000~30000	Factory value: 0
FC-31	Multi-segment Position 2(pulse)	Range: -32767~32767	Factory value: 0
FC-32	Multi-segment Position 3(revs)	Range: -30000~30000	Factory value: 0
FC-33	Multi-segment Position 3(pulse)	Range: -32767~32767	Factory value: 0
FC-34	Multi-segment Position 4(revs)	Range: -30000~30000	Factory value: 0
FC-35	Multi-segment Position 4(pulse)	Range: -32767~32767	Factory value: 0
FC-36	Multi-segment Position 5(revs)	Range: -30000~30000	Factory value: 0
FC-37	Multi-segment Position 5(pulse)	Range: -32767~32767	Factory value: 0
FC-38	Multi-segment Position 6(revs)	Range: -30000~30000	Factory value: 0
FC-39	Multi-segment Position 6(pulse)	Range: -32767~32767	Factory value: 0
FC-40	Multi-segment Position 7(revs)	Range: -30000~30000	Factory value: 0
FC-41	Multi-segment Position 7(pulse)	Range: -32767~32767	Factory value: 0
FC-42	Multi-segment Position 8(revs)	Range: -30000~30000	Factory value: 0
FC-43	Multi-segment Position 8(pulse)	Range: -32767~32767	Factory value: 0
FC-44	Multi-segment Position 9(revs)	Range: -30000~30000	Factory value: 0
FC-45	Multi-segment Position 9(pulse)	Range: -32767~32767	Factory value: 0
FC-46	Multi-segment Position 10(revs)	Range: -30000~30000	Factory value: 0
FC-47	Multi-segment Position 10(pulse)	Range: -32767~32767	Factory value: 0
FC-48	Multi-segment Position 11(revs)	Range: -30000~30000	Factory value: 0
FC-49	Multi-segment Position 11(pulse)	Range: -32767~32767	Factory value: 0
FC-50	Multi-segment Position 12(revs)	Range: -30000~30000	Factory value: 0
FC-51	Multi-segment Position 12(pulse)	Range: -32767~32767	Factory value: 0
FC-52	Multi-segment Position 13(revs)	Range: -30000~30000	Factory value: 0
FC-53	Multi-segment Position 13(pulse)	Range: -32767~32767	Factory value: 0
FC-54	Multi-segment Position 14(revs)	Range: -30000~30000	Factory value: 0
FC-55	Multi-segment Position 14(pulse)	Range: -32767~32767	Factory value: 0
FC-56	Multi-segment Position 15(revs)	Range: -30000~30000	Factory value: 0

FC-57	Multi-segment Position 15(pulse)	Range: -32767~32767	Factory value: 0
FC-58	Multi-segment Position 0(revs)	Range: -30000~30000	Factory value: 0
FC-59	Multi-segment Position 0(pulse)	Range: -32767~32767	Factory value: 0

The above parameters can be used to set 16 multi-segment positions, where Multi-segment Position n(revs) indicates the number of revolutions, and Multi-segment Position n(pulse) represents the pulse count. The final position setting is calculated as: Position Setting = Multi-segment Position n(revs) × Pulses per Revolution + Multi-segment Position n(pulse), n=1~15.

When the multifunctional digital input terminal function selection is set to multi-speed/multi-position switching (34) and the terminal status is active, the target position is selected through the multi-segment position terminal status and multi-segment position parameter settings. The correspondence table for multi-segment position selection target positions and terminal status is shown in Table 2-22, where DI terminal status 1 indicates that the terminal status is valid, and 0 indicates that the terminal status is invalid.

Table 2-22 Correspondence Table for Multi-Segment Position Selection Target Positions and Terminal Status

DI4	DI3	DI2	DI1	Position Command Circle Selection	Command Pulse Selection
\	\	\	\	When configuring internal single-point positioning, FC-20 serves as the position command.	
0	0	0	1	FC-28	FC-29
0	0	1	0	FC-30	FC-31
0	0	1	1	FC-32	FC-33
0	1	0	0	FC-34	FC-35
0	1	0	1	FC-36	FC-37
0	1	1	0	FC-38	FC-39
0	1	1	1	FC-40	FC-41
1	0	0	0	FC-42	FC-43
1	0	0	1	FC-44	FC-45
1	0	1	0	FC-46	FC-47
1	0	1	1	FC-48	FC-49
1	1	0	0	FC-50	FC-51
1	1	0	1	FC-52	FC-53
1	1	1	0	FC-54	FC-55
1	1	1	1	FC-56	FC-57
0	0	0	0	FC-58	FC-59

2.14 FD Group Multi-Speed and Simple PLC Function

This inverter can set up to 16 speed segments, and specific configurations can be found in the descriptions for F5-00 to F5-07.

FD-00	Multi-Speed 0	Range: -100% to 100%	Factory value: 0.00%
FD-01	Multi-Speed 1	Range: -100% to 100%	Factory value: 0.00%
FD-02	Multi-Speed 2	Range: -100% to 100%	Factory value: 0.00%
FD-03	Multi-Speed 3	Range: -100% to 100%	Factory value: 0.00%
FD-04	Multi-Speed 4	Range: -100% to 100%	Factory value: 0.00%
FD-05	Multi-Speed 5	Range: -100% to 100%	Factory value: 0.00%
FD-06	Multi-speed 6	Range: -100% to 100%	Factory value: 0.00%
FD-07	Multi-speed 7	Range: -100% to 100%	Factory value: 0.00%

FD-08	Multi-speed 8	Range: -100% to 100%	Factory value: 0.00%
FD-09	Multi-speed 9	Range: -100% to 100%	Factory value: 0.00%
FD-10	Multi-speed 10	Range: -100% to 100%	Factory value: 0.00%
FD-11	Multi-speed 11	Range: -100% to 100%	Factory value: 0.00%
FD-12	Multi-Speed 12	Range: -100% to 100%	Factory value: 0.00%
FD-13	Multi-Speed 13	Range: -100% to 100%	Factory value: 0.00%
FD-14	Multi-Speed 14	Range: -100% to 100%	Factory value: 0.00%
FD-15	Multi-Speed 15	Range: -100% to 100%	Factory value: 0.00%

FD-16	PLC Operation Mode	0: Single Run Stop at End 1: Hold after Single Operation Completion 2: Continuous Run	Factory Value:0
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There are three operating modes for the PLC:

0: Single Run Stop at End

The inverter automatically stops after completing all steps, and to restart, a new operation command must be given.

1: Hold after Single Operation Completion

After completing all steps, the inverter automatically maintains operation at the last step frequency until a stop command is received.

2: Continuous Run

After completing all steps, the inverter automatically starts the next cycle until a stop command is received.

FD-17	PLC Power Failure Memory Selection	0: No Memory on Power Failure/Shutdown 1: Memory on Power Failure 2: Memory on Shutdown 3: Memory on Power Failure/Shutdown	Factory value: 0
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PLC power failure memory refers to remembering the operating step and running time of the PLC before a power failure, and continuing to run from the remembered step and running time when powered on again. Choosing not to remember means that each time it is powered on, the PLC process restarts from step zero.

PLC shutdown memory refers to recording the current operating step and running time of the PLC when it is shut down, and continuing to run from the remembered step and running time when started again. Choosing not to remember means that each start-up restarts the PLC process from step zero.

FD-18	PLC Operation Time Unit	0: Second 1: Hour	Factory value: 0
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The user can select an appropriate time unit based on the duration of operation; changing this setting will affect the runtime of each PLC segment.

FD-19	Multi-Speed 0 Command Setting	0: Function Code FD-00 Setting 1: AI 2: VR 3: Function Code F0-19 Given	Factory value: 0
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For multi-speed 0 command setting, in addition to choosing FD-00, there are multiple other options available for easy switching between multi-speed and other setting methods.

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Parameter Group Description

FD-20	PLC Segment 00 Running Time	0.0~6553.5	Factory Value: 0.0
FD-21	PLC Segment 00 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-22	PLC Segment 01 Running Time	0.0~6553.5	Factory Value: 0.0
FD-23	PLC Segment 01 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-24	PLC Segment 02 Running Time	0.0~6553.5	Factory Value: 0.0
FD-25	PLC Segment 02 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-26	PLC Segment 03 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-27	PLC Segment 03 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-28	PLC Segment 04 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-29	PLC Segment 04 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-30	PLC Segment 05 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-31	PLC Segment 05 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-32	PLC Segment 06 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-33	PLC Segment 06 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-34	PLC Segment 07 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-35	PLC Segment 07 Acceleration/Deceleration Settings	0~3	Factory value: 0
FD-36	PLC Segment 08	0.0~6553.5	Factory Value: 0.0

	Operation Time		
FD-37	PLC Segment 08 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-38	PLC Segment 09 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-39	PLC Segment 09 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-40	PLC Segment 10 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-41	PLC Segment 10 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-42	PLC Segment 11 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-43	PLC Segment 11 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-44	PLC Segment 12 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-45	PLC Segment 12 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-46	PLC Segment 13 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-47	PLC Segment 13 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-48	PLC Segment 14 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-49	PLC Segment 14 Acceleration/Deceleration Setting	0~3	Factory value: 0
FD-50	PLC Segment 15 Operation Time	0.0~6553.5	Factory Value: 0.0
FD-51	PLC Segment 15 Acceleration/Deceleration Setting	0~3	Factory value: 0

When the Nth segment running time of the PLC is set to greater than 0, the step will be executed; otherwise, it will be skipped directly. For the Nth segment acceleration/deceleration settings of the PLC,

Parameter Group Description

you can choose the acceleration/deceleration time corresponding to the step. The acceleration/deceleration time setting values correspond to the acceleration/deceleration as shown in Table2-23.

Table 2-23Acceleration/Deceleration Setting Table

Set Value	Corresponding Acceleration/Deceleration	Corresponding Parameters
0	Acceleration/Deceleration 1	F0-13F0-14
1	Acceleration and Deceleration 2	F7-03F7-04
2	Acceleration and Deceleration 3	F7-05F7-06
3	Acceleration and Deceleration 4	F7-07F7-08

FD-52	PLC Current Work Step	0~15	Factory value: 0
FD-53	PLC Operation Time High Position	0000H~FFFFH	Factory value: 0
FD-54	PLC runtime low position	0000H~FFFFH	Factory value: 0

Parameter PLC current step records the sequence number of the current step being executed by the PLC, while PLC runtime records the time value that the PLC has been running.

Note: After the inverter completes all steps, it can be configured to output a signal indicating the completion of one cycle. When the PLC operation mode is set to stop after a single run or hold after a single run, the signal will only be output once. For cyclic operation, the signal will be output each time a cycle is completed.

2.15 FE Group Torque Control Parameters

FE-00	Torque mode selection	Range: 0~3	Factory value: 0
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0: TQCPG Torque Control IM

For use in closed-loop torque mode for induction motors when PG card feedback is available.

1: TQCPG Torque Control PM

Used for closed-loop torque mode of permanent magnet synchronous motors with PG card feedback.

3: SVC Open-loop Torque Control

Used for open-loop torque mode of induction motors or permanent magnet synchronous motors without PG card feedback.

FE-01	Torque command source selection	Range: 0~1	Factory value: 0
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0: Digital Operator

1: RS485 Communication

When this parameter is set to 0 or 1, the torque digital setpoint is determined by FE-02.

2: Analog signal input

The corresponding AI function must be selected as torque setting (set F5-21, F5-27, or F5-33 to 2).

3: CANopen

5: Communication Card

In this case, the torque command corresponds to communication address 0x6006; refer to the relevant communication card user manual for details.

FE-02	Torque digital setting	Range: -100.0% to 100.0%	Factory Value: 0.0%
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When FE-01 is set to 0 or 1, this parameter can be written with a torque digital set value; otherwise, this parameter is read-only, displaying only the torque digital set value.

FE-03	Forward Torque Frequency Limit	Range: 0%~120%	Factory value: 110%
FE-04	Reverse Torque Frequency Limit	Range: 0%~120%	Factory value: 110%

When F3-17 is set to 0 or 1, the above parameters are used to set the upper frequency limit for forward and reverse motor rotation, respectively.

FE-05	Torque Bias Selection	Range: 0~3	Factory value: 0
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0: No Function

By default, no torque bias superposition is performed.

1: Analog Input

The corresponding AI function must be selected as torque compensation setting (set F5-21, F5-27, or F5-33 to 3).

2: Parameter FE-06 input

FE-06	Torque Bias Value	Range: -100.0% to 100.0%	Factory Value: 0.0%
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When FE-05=2, the torque bias value can be set through this parameter.

FE-10	Maximum torque command	Range: 0~500	Factory Value: 100
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This parameter sets the upper limit of the torque command, corresponding to 100% of the motor's rated torque.

FE-11	Forward Motor Torque Upper Limit	Range: 0~500	Factory Value: 500
FE-12	Forward Braking Torque Upper Limit	Range: 0~500	Factory Value: 500
FE-13	Reverse Electric Torque Upper Limit	Range: 0~500	Factory Value: 500
FE-14	Reverse Braking Torque Upper Limit	Range: 0~500	Factory Value: 500

FE-11~FE-12, FE-13~FE-14 are the analog and communication given values for motor torque and braking torque limits. When the actual direction of the motor rotation is the same as the direction of the electromagnetic torque generated by the motor, it is in the motor state; otherwise, it is in the braking state.

Note: This parameter is read-only, used to display the torque limit values given by the analog and communication, and cannot be set.

FE-15	Torque Filter Time	Range: 0.000s~1.000s	Factory Value: 0.000s
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This parameter sets the low-pass filter time constant for the torque command. Increasing this parameter can make the torque command change more smoothly, making control more stable, but the response will become slower.

FE-17	Zero Torque Mode Selection	Range: 0~1	Factory value: 0
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This parameter is effective only when FE-00=0 or 1 (closed-loop torque mode) and the speed limit value is 0.

0: Torque Mode

When the speed limit is 0, there is still excitation current in the motor, and the torque limit is set by FE-02 (torque digital setting).

1: Speed Mode

When the speed limit is 0, the actual control method switches from closed-loop torque control to closed-loop speed control, so that the motor always maintains zero speed, and the torque setting output by the speed loop is limited only by parameter F9-07.

2.16 U0 Group Fault Record Parameters

The fault record function records the name, power-on time, frequency, torque, voltage, current, and power device temperature at the moment of fault for a certain number of inverter faults, providing reference for subsequent fault diagnosis.

The current inverter software supports recording the fault codes of the last 10 faults, the power-on times at the moment of the last 6 faults, and physical quantity information.

Only faults that cause the inverter to shut down after they occur are recorded; undervoltage faults during shutdown are not recorded.

Fault record information is stored in EEPROM, and each time a fault occurs, the fault information is automatically updated and written into the EEPROM.

U0-00	Fault Record 1	Range: 0~65535	Factory value: 0
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U0-01	Fault Record 2	Range: 0~65535	Factory value: 0
U0-02	Fault Record 3	Range: 0~65535	Factory value: 0
U0-03	Fault Record 4	Range: 0~65535	Factory value: 0
U0-04	Fault Record 5	Range: 0~65535	Factory value: 0
U0-05	Fault Record 6	Range: 0~65535	Factory value: 0
U0-06	Fault Record 7	Range: 0~65535	Factory value: 0
U0-07	Fault Record 8	Range: 0~65535	Factory value: 0
U0-08	Fault Record 9	Range: 0~65535	Factory value: 0
U0-09	Fault Record 10	Range: 0~65535	Factory value: 0

The above parameters are used to record the fault codes of the last 10 faults of the inverter. The smaller the fault record number (the minimum value is 1), the closer the corresponding fault is to the present. For example, the most recent fault will always be displayed in U0-00, and each subsequent fault will increment the count of all previous faults by 1. If the number of faults exceeds 6 or 10, the earliest fault record information will be overwritten. For the fault codes corresponding to fault types, please refer to the fault table.

U0-10	Fault Output 1	Range: 0~65535	Factory value: 0
U0-11	Fault Output 2	Range: 0~65535	Factory value: 0
U0-12	Fault Output 3	Range: 0~65535	Factory value: 0
U0-13	Fault output 4	Range: 0~65535	Factory value: 0

When the inverter fails, and the set values of parameters U0-10 to U0-13 match the fault code, the corresponding RLY1/RLY2 and DO1/DO2 outputs can be enabled by setting F6-00 to F6-03 to 35 to 38. The four fault outputs can operate independently without affecting each other.

U0-14	Fault 1 - Motor speed	Range: -32767 to 32767 r/min	Factory value: 0
U0-15	Fault 1 - Torque command	Range: -3276.7 to 3276.7	Factory value: 0
U0-16	Fault 1 - Input terminals	Range: 0000H~FFFFH	Factory value: 0
U0-17	Fault 1 - Output terminals	Range: 0000H~FFFFH	Factory value: 0
U0-18	Fault 1 - Inverter Status	Range: 0~65535	Factory value: 0
U0-19	Fault 1 - Frequency Command	Range: 0.00 to 655.35 Hz	Factory Value: 0.00
U0-20	Fault 1 - Output Frequency	Range: 0.00 to 599.99 Hz	Factory Value: 0.00
U0-21	Fault 1 - Output Voltage	Range: 0.0 to 6553.5 V	Factory Value: 0.0
U0-22	Fault 1 - DC Voltage	Range: 0.0 to 6553.5 V	Factory Value: 0.0
U0-23	Fault 1-Output Current	Range: 0.0 to 655.35 A	Factory Value: 0.00
U0-24	Fault 1-IGBT Temperature	Range: -3276.7 ~ 3276.7°C	Factory Value: 0.0
U0-25	Fault 1-Capacitor Temperature	Range: -3276.7 ~ 3276.7°C	Factory Value: 0.0

The above parameters are used to record the relevant information of the inverter during the most recent fault.

U0-26	Fault 2-Output Frequency	Range: 0.00~599.00Hz	Factory Value: 0.00
U0-27	Fault 2-Direct Current Voltage	Range: 0.0~6553.5V	Factory Value: 0.0
U0-28	Fault 2-Output Current	Range: 0.00~655.35A	Factory Value: 0.00
U0-29	Fault 2 - IGBT Temperature	Range: -3276.7~3276.7°C	Factory Value: 0.0

The above parameters are used to record the relevant information of the inverter during the second-to-last fault.

U0-30	Fault 3 - Output Frequency	Range: 0.00 to 599.99 Hz	Factory Value: 0.00
U0-31	Fault 3 - DC Voltage	Range: 0.0 to 6553.5 V	Factory Value: 0.0
U0-32	Fault 3 - Output Current	Range: 0.0 to 655.35 A	Factory Value: 0.00
U0-33	Fault 3 - IGBT Temperature	Range: -3276.7 ~ 3276.7°C	Factory Value: 0.0

The above parameters are used to record the relevant information of the inverter during the

third-to-last fault.

U0-34	Fault 4 - Output Frequency	Range: 0.00 to 599.99 Hz	Factory Value: 0.00
U0-35	Fault 4-Direct Current Voltage	Range: 0.0 to 6553.5 V	Factory Value: 0.0
U0-36	Fault 4-Output Current	Range: 0.0 to 655.35 A	Factory Value: 0.00
U0-37	Fault 4-IGBT Temperature	Range: -3276.7 ~ 3276.7°C	Factory Value: 0.0

The above parameters are used to record the relevant information of the inverter during the fourth-to-last fault.

U0-38	Fault 5-Output Frequency	Range: 0.00 to 599.99 Hz	Factory Value: 0.00
U0-39	Fault 5-Direct Current Voltage	Range: 0.0 to 6553.5 V	Factory Value: 0.0
U0-40	Fault 5-Output Current	Range;0.0 ~ 655.35A	Factory Value: 0.00
U0-41	Fault 5-IGBT Temperature	Range: -3276.7 ~ 3276.7°C	Factory Value: 0.0

The above parameters are used to record the relevant information of the inverter during the fifth-to-last fault.

U0-42	Fault 6-Output Frequency	Range: 0.00 to 599.99 Hz	Factory Value: 0.00
U0-43	Fault 6-Direct Current Voltage	Range: 0.0 to 6553.5 V	Factory Value: 0.0
U0-44	Fault 6-Output Current	Range: 0.0 to 655.35 A	Factory Value: 0.00
U0-45	Fault 6-IGBT Temperature	Range: -3276.7 ~ 3276.7°C	Factory Value: 0.0

The above parameters are used to record the relevant information of the inverter at the time of the sixth last fault.

U0-46	Number of Days Since Fault 1 Occurred	Range: 0 ~ 65536 days	Factory value: 0
U0-47	Fault 1 Occurrence Minutes	Range: 0 ~ 1439 minutes	Factory value: 0
U0-48	Fault 2 Occurrence Days	Range: 0 ~ 65536 days	Factory value: 0
U0-49	Fault 2 Occurrence Minutes	Range: 0 ~ 1439 minutes	Factory value: 0
U0-50	Fault 3 Occurrence Days	Range: 0 ~ 65536 days	Factory value: 0
U0-51	Fault 3 Occurrence Minutes	Range: 0 ~ 1439 minutes	Factory value: 0
U0-52	Fault 4 Occurrence Days	Range: 0 ~ 65536 days	Factory value: 0
U0-53	Minutes since Fault 4 occurred	Range: 0 ~ 1439 minutes	Factory value: 0
U0-54	Days since Fault 5 occurred	Range: 0 ~ 65536 days	Factory value: 0
U0-55	Minutes since Fault 5 occurred	Range: 0 ~ 1439 minutes	Factory value: 0
U0-56	Days since Fault 6 occurred	Range: 0 ~ 65536 days	Factory value: 0
U0-57	Minutes since Fault 6 occurred	Range: 0 ~ 1439 minutes	Factory value: 0

The above parameters are used to record the time elapsed since the inverter control board was powered on at each fault occurrence, regardless of whether the inverter is running.

2.17 U1 Group Status Monitoring Parameters

U1-00	DI terminal status	Range: 0000H~FFFFH	Factory value: 0
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This parameter is read-only and is used to display the status of the inverter's DI terminals. The relationship between each bit and the DI terminals is shown in Table 2-24.

Table 2-24 DI Terminal Status

Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7
DI1	DI2	DI3	DI4	DI5	DI6	DI7	DI8
Bit8	Bit9	Bit10	Bit11	Bit12	Bit13	Bit14	Bit15
Reserved							

U1-01	DO terminal status	Range: 0000H~FFFFH	Factory value: 0
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This parameter is read-only and used to display the status of the inverter's DO terminals. The relationship between each bit and the DO terminals is shown in Table 2-25.

Table 2-25 DO Terminal Status

Parameter Group Description

Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7
RLY1	RLY2	D01	D02	Reserved	Reserved	Reserved	Reserved
Bit8	Bit9	Bit10	Bit11	Bit12	Bit13	Bit14	Bit15
Reserved							

U1-02	Set frequency	Range: 0~599.00Hz	Factory Value: 50.00
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This parameter is read-only and used to display the current set frequency.

U1-03	External frequency record	Range: 0~599.00Hz	Factory Value: 60.00
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This parameter is read-only. When the frequency source is selected as external terminals, this parameter stores the frequency command value when the inverter fails.

U1-04	PID feedback value	Range: -200.00%~200.00%	Factory value: 0.00%
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This parameter is typically read-only and used to display the PID feedback value. However, when the PID feedback type is selected as communication (FA-00=7 or 8), this parameter can be written to set the PID feedback value.

U1-05	KP gain monitoring value	Range: 0.00~100.00%	Factory Value: 0.00
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U1-06	KI Gain Monitoring Value	Range: 0.00~100.00s	Factory Value: 0.00
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U1-07	KD Gain Monitoring Value	Range: 0.00~1.00	Factory Value: 0.00
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The above parameters are read-only, used for displaying the PID proportional, integral, and differential gain values.

2.18 H0 Group Other Motor Parameters

When users need to switch between two or more motors, they can achieve motor switching through H0-00, and the CM680 supports switching of up to four induction motors. Parameters such as nameplate data and motor parameter identification can be set separately for each of the four motors. H0-01~H0-12, H0-13~H0-21, H0-22~H0-30 correspond to the parameters of the second, third, and fourth induction motors, respectively. All parameters in the H0 group have the same content definitions and usage methods as the first motor-related parameters in the F4 group, and will not be repeated here; users can refer to the explanations of the first motor-related parameters in the F4 group.

F0-00	Model Number	Range: 0~65535	Factory value: Model determined
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- 1: Induction Motor 1
- 2: Induction Motor 2
- 3: Induction Motor 3
- 4: Induction Motor 4

H0-01	M2 Maximum Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00
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H0-02	M2 Rated Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00
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H0-03	M2 Rated Voltage	Range: 0.0~510.0V	Factory Value: 380.0
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H0-04	IM2 Rated Power	Range: 0.00~655.35kW	Factory Value: 0.00
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H0-05	IM2 Number of Poles	Range: 2~20	Factory value: 4
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H0-06	IM2 Rated Current	Range: 0.00~655.35A	Factory Value: 13.00
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H0-07	IM2 Rated Speed	Range: 0~65535r/min	Factory Value: 1410
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H0-08	IM2 No-load Current	Range: 0.00~13.00A	Factory Value: 0.00
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H0-09	IM2 Stator Resistance	Range: 0.000~65.535Ω	Factory Value: 0.000
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H0-10	IM2 Rotor Resistance	Range: 0.000~65.535Ω	Factory Value: 0.000
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H0-11	IM2 Mutual Inductance	Range: 0.0~6553.5mH	Factory Value: 0.0
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H0-12	IM2 Leakage Inductance	Range: 0.00~655.35mH	Factory Value: 0.00
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The above parameters correspond to the second induction motor parameters.

H0-13	M3 Maximum Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00
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H0-14	M3 Rated Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00
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H0-15	M3 Rated Voltage	Range: 0.0~510.0V	Factory Value: 380.0
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H0-16	IM3 rated power	Range: 0.00~655.35kW	Factory Value: 0.00
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H0-17	IM3 number of poles	Range: 2~20	Factory value: 4
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H0-18	IM3 rated current	Range: 0.00~655.35A	Factory Value: 13.00
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H0-19	IM3 rated speed	Range: 0~65535r/min	Factory Value: 1410
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H0-20	IM3 no-load current	Range: 0.00~13.00A	Factory Value: 0.00
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H0-21	IM3 Stator Resistance	Range: 0.000~65.535Ω	Factory Value: 0.000
The above parameters correspond to the third induction motor parameters.			
H0-22	M4 Maximum Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00
H0-23	M4 Rated Frequency	Range: 0.00~599.00Hz	Factory Value: 50.00
H0-24	M4 Rated Voltage	Range: 0.0~510.0V	Factory Value: 380.0
H0-25	IM4 Rated Power	Range: 0.00~655.35kW	Factory Value: 0.00
H0-26	IM4 Number of Poles	Range: 2~20	Factory value: 4
H0-27	IM4 Rated Current	Range: 0.00~655.35A	Factory Value: 13.00
H0-28	IM4 Rated Speed	Range: 0~65535r/min	Factory Value: 1410
H0-29	IM4 No-load Current	Range: 0.00~13.00A	Factory Value: 0.00
H0-30	IM4 Stator Resistance	Range: 0.000~65.535Ω	Factory Value: 0.000

The above parameters correspond to the fourth induction motor parameters.

2.19 H1 Group Other Motor VF Control

Used for setting the VF control of the second, third, and fourth induction motors.

H1-00	M2 Multi-point VF Frequency Point 1	Range: 0.00~599.00Hz	Factory value: 0.5
H1-01	M2 Multi-point VF Voltage Point 1	Range: 0.0~480.0V	Factory Value: 2
H1-02	M2 Multi-point VF Frequency Point 2	Range: 0.00~599.00Hz	Factory value: 1.5
H1-03	M2 Multi-point VF Voltage Point 2	Range: 0.0~480.0V	Factory value: 10
H1-04	M2 Multi-point VF Frequency Point 3	Range: 0.00~599.00Hz	Factory Value: 3
H1-05	M2 Multi-point VF Voltage Point 3	Range: 0.0~480.0V	Factory value: 22

The above function codes are used to set the multi-segment (custom) V/F curve for the second induction motor, as shown in Figure 2-68. Define the multi-segment V/F curve according to H1-00 to H1-05 and H0-02 and H0-03, as shown in the figure below. In the figure below, f_1 , f_2 , f_3 , and f_b represent the first, second, third, and fourth frequency points, and the rated frequency of M2 multi-point VF, respectively; V_1 , V_2 , V_3 , and V_b represent the first, second, third voltage points, and the rated voltage of M2 multi-point VF, respectively.

Note: Generally, $V_1 < V_2 < V_3 < V_b$, $f_1 < f_2 < f_3 < f_b$. Setting the voltage too high at low frequencies may cause the motor to overheat or even burn out, and the inverter may experience overcurrent or overvoltage protection.

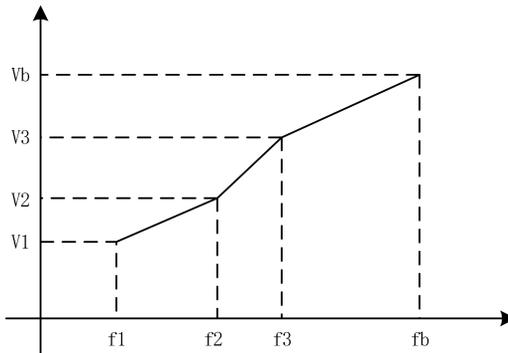


Figure 2-68 Multi-segment (Custom) V/F Curve for the Second Induction Motor

H1-06	M2 Torque Compensation Gain	Range: 0~10	Factory value: 1
H1-07	M2 Slip Compensation Gain	Range: 0.00~10.00	Factory value: 0

The above two function codes are only applicable when driving the second induction motor in VF and VVC control modes.

H1-06 Torque Compensation Gain, used to adjust the torque compensation level. By adjusting the output voltage, the motor's load-carrying capacity is adjusted. The greater the torque compensation gain, the better the load-carrying capacity, but the output current will increase. If set too high, it may lead to overcurrent faults; reducing the torque compensation gain will decrease the load-carrying capacity

accordingly.

H1-07 Torque Filter Time, used to adjust the filter time for torque compensation. If the filter time is set too large, control stability improves, but the control response deteriorates. When the filter time is too small, the response is faster, but it may lead to instability. Adjustments can be made according to actual conditions.

H1-08	M3 Multi-point VF Frequency Point 1	Range: 0.00~599.00Hz	Factory value: 0.5
H1-09	M3 Multi-point VF Voltage Point 1	Range: 0.0~480.0V	Factory Value: 2
H1-10	M3 Multi-point VF Frequency Point 2	Range: 0.00~599.00Hz	Factory value: 1.5
H1-11	M3 Multi-point VF Voltage Point 2	Range: 0.0~480.0V	Factory value: 10
H1-12	M3 Multi-point VF Frequency Point 3	Range: 0.00~599.00Hz	Factory Value: 3
H1-13	M3 Multi-point VF Voltage Point 3	Range: 0.0~480.0V	Factory value: 22

The above function codes are used to set the multi-segment (custom) V/F curve for the third induction motor, as shown in Figure 2-69. Define the multi-segment V/F curve according to H1-08 to H1-13 and H0-14 and H0-15, as shown in the figure below. In the figure below, f_1 , f_2 , f_3 , and f_b represent the M3 multi-point VF frequency points 1, 2, 3, and the M3 rated frequency, respectively, while V_1 , V_2 , V_3 , and V_b represent the M3 multi-point VF voltage points 1, 2, 3, and the M3 rated voltage, respectively.

Note: Generally, $V_1 < V_2 < V_3 < V_b$, $f_1 < f_2 < f_3 < f_b$. Setting the voltage too high at low frequencies may cause the motor to overheat or even burn out, and the inverter may experience overcurrent or overvoltage protection.

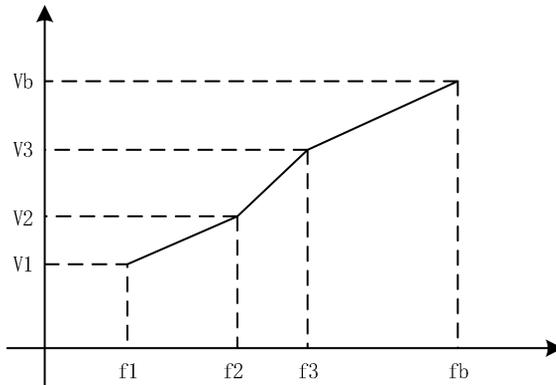


Figure 2-69 Thrinduction Motor Multi-Segment (Custom) V/F Curve

H1-14	M3 Torque Compensation Gain	Range: 0~10	Factory value: 1
H1-15	M3 Slip Compensation Gain	Range: 0.00~10.00	Factory value: 0

The above two function codes are only applicable for driving third induction motors under VF and VVC control modes.

H1-14 Torque compensation gain, used to adjust the torque compensation level. By adjusting the output voltage, the motor's load-carrying capacity is adjusted. The greater the torque compensation gain, the better the load-carrying capacity, but the output current will increase. If set too high, it may lead to overcurrent faults; reducing the torque compensation gain will decrease the load-carrying capacity accordingly.

H1-15 Torque filter time, used to adjust the filter time of the torque compensation. If the filter time is set too large, control stability improves, but the control response deteriorates. When the filter time is too small, the response is faster, but it may lead to instability. Adjustments can be made according to actual conditions.

H1-16	M4 Multi-point VF Frequency Point 1	Range: 0.00~599.00Hz	Factory value: 0.5
H1-17	M4 Multi-point VF Voltage Point 1	Range: 0.0~480.0V	Factory Value: 2
H1-18	M4 Multi-point VF Frequency Point 2	Range: 0.00~599.00Hz	Factory value: 1.5
H1-19	M4 Multi-point VF Voltage Point 2	Range: 0.0~480.0V	Factory value: 10
H1-20	M4 Multi-point VF Frequency Point 3	Range: 0.00~599.00Hz	Factory Value: 3
H1-21	M4 Multi-point VF Voltage Point 3	Range: 0.0~480.0V	Factory value: 22

The above function codes are used to set the multi-segment (custom) V/F curve for the fourth induction motor, as shown in Figure 2-70. Define multi-segment V/F curves according to H1-16 ~ H1-21 and H0-23 and H0-24, as shown in the figure below. In the figure below, f1, f2, f3, and fb represent M4 multi-point VF frequency point 1, M4 multi-point VF frequency point 2, M4 multi-point VF frequency point 3, and M4 rated frequency, respectively. V1, V2, V3, and Vb represent M4 multi-point VF voltage point 1, M4 multi-point VF voltage point 2, M4 multi-point VF voltage point 3, and M4 rated voltage, respectively.

Note: Generally, $V1 < V2 < V3 < Vb$, $f1 < f2 < f3 < fb$. Setting the voltage too high at low frequencies may cause the motor to overheat or even burn out, and the inverter may experience overcurrent or overvoltage protection.

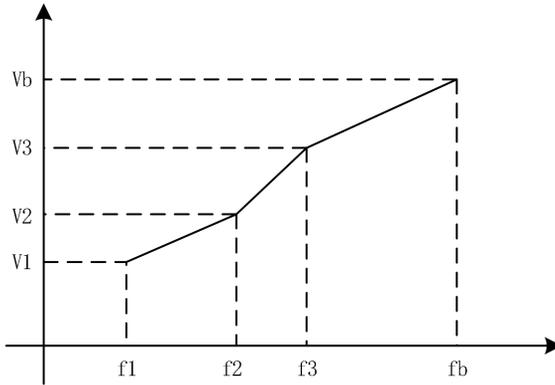


Figure 2-70 Fourth Induction Motor Multi-Segment (Custom) V/F Curve

H1-22	M4 Torque Compensation Gain	Range: 0~10	Factory value: 1
H1-23	M4 Slip Compensation Gain	Range: 0.00~10.00	Factory value: 0

The above two function codes apply only to the situation where the fourth induction motor is driven in VF and VVC control modes.

H1-22 Torque compensation gain, used to adjust the size of torque compensation. By adjusting the output voltage, the motor's load-carrying capacity is adjusted. The greater the torque compensation gain, the better the load-carrying capacity, but the output current will increase. If set too high, it may lead to overcurrent faults; reducing the torque compensation gain will decrease the load-carrying capacity accordingly.

H1-23 Torque filter time, used to adjust the filter time for torque compensation. If the filter time setting is too large, control stability improves, but the control response deteriorates. When the filter time is too short, the response is faster, but it may lead to instability. Adjustments can be made according to actual conditions.

2.20 H3 Group Other motor fault parameters

H3-00	Over-torque selection 2	Range: 0~4	Factory value: 0
H3-01	Over-torque threshold 2	Range: 10%~250%	Factory value: 120
H3-02	Over-torque time 2	Range: 0.1~60.0s	Factory value: 0.1

The above function codes are used to set up the over-torque detection function for Motor 2. The inverter issues a warning or stops when it detects excessive torque on Motor 2, protecting both the motor and the inverter.

H3-00 Over-torque Selection 2

0: Not Detected

1: Constant Speed Detection Continue Running

During constant speed operation, if Motor 2 experiences over-torque, a warning is issued but operation continues.

2: Constant Speed Detection Stop Running

During constant speed operation, if Motor 2 experiences over-torque, an over-torque fault is reported and operation stops.

3: Running Detection Continue Running

During operation, if Motor 2 experiences over-torque, a warning is issued but operation continues.

4: Running Detection Stop Running

During operation, if Motor 2 experiences over-torque, an over-torque fault is reported and operation stops.

H3-01 Over-torque threshold 2

H3-02 Over-torque time 2

When the inverter output current exceeds H3-01 (unit %, based on the rated current of the inverter) and persists for longer than the time set by H3-02, the inverter will determine subsequent actions according to H3-00. When H3-00 is 1 or 3, as shown in Figure 2-71, if over-torque is detected, the inverter will display an over-torque warning but continue to operate until the output current falls below 95% of the H3-01 set value, at which point the warning will be cleared. When H3-00 is 2 or 4, as shown in Figure 2-72, if over-torque is detected, the inverter will report an over-torque fault and stop operation until the fault is reset, after which it can resume operation.

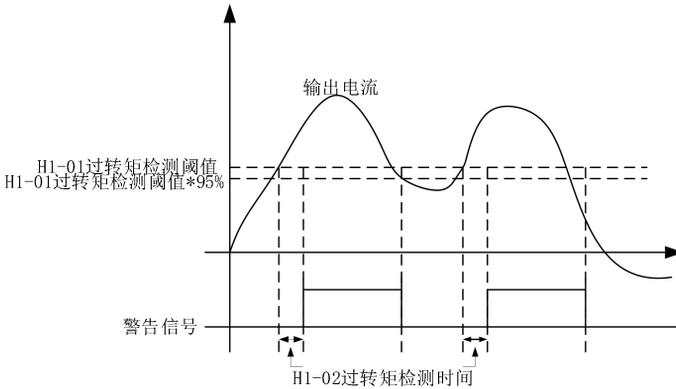


Figure 2-71 Motor 2 Over-torque Detection (H3-00=1or 3)

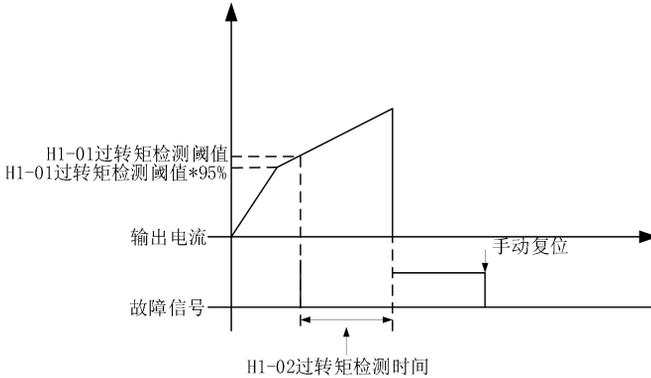


Figure 2-72 Motor 2 Over-torque Detection (H3-00=2or4)

H3-03	Motor 2 overload selection	Range: 0~2	Factory Value: 2
H3-04	Motor 2 overload time	Range: 30.0~600.0s	Factory Value: 60

Function Code H3-03 is used to set the overload protection mode for Motor 2.

- 0: Constant Torque Output Motor
- 1: Variable Torque Output Motor
- 2: No Motor Overload Protection

Function Code H3-04 is used to set the overload protection time for Motor 2 when the current reaches 150% of the rated current. By setting an appropriate inverse-time curve, the operating time of Motor 2 under overload conditions can be made less than the set overload protection time for Motor 2, thereby achieving overload protection and preventing Motor 2 from being damaged due to overheating. When the overload time reaches the motor 2 overload protection time, an alarm for motor 2 overload fault (E023) will be reported. This function is not enabled by default; if it needs to be enabled, set H3-03 to 0 or 1.

When H3-03 is 0, the overload curve of the corresponding motor is determined by H3-04, denoted as time T, and the inverse-time curve determined by it is shown in Figure 2-73. In this, "Motor 2 Current Percentage" refers to the ratio of the inverter output current to the motor rated current. When the motor fan is independently controlled, this inverse time curve can be selected. In this case, the fan speed is independent of the motor speed, so the cooling capacity does not decrease as the motor speed decreases, making the inverse time curve independent of the motor operating speed.

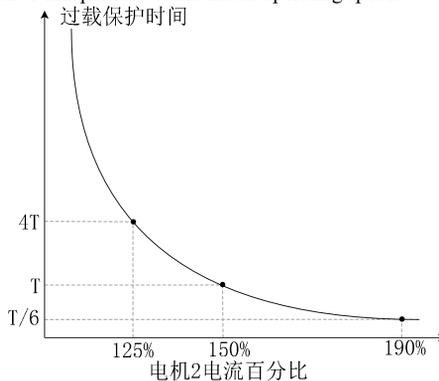


Figure 2-73 Motor 2 Overload Protection Curve (H3-03=0)

When H3-03 is 1, the overload curve of motor 2 is determined by H3-04 and the motor speed, as shown in Figure2-74. The “speed coefficient” is a function of motor speed, when the motor speed exceeds the rated speed, the speed coefficient equals 1, when the motor speed is less than the rated speed, the speed coefficient = $1/(0.4 + 0.6 * \text{motor speed} / \text{motor 2 rated speed})$.

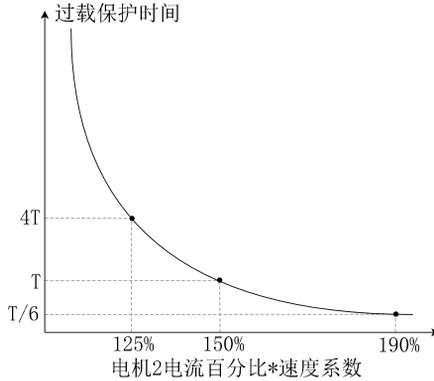


Figure 2-74 Motor 2 Overload Protection Curve (H3-03=1)

When the motor uses coaxial cooling (fan connected to the motor shaft), the fan speed is the same as the motor speed, and a decrease in motor speed will reduce the fan's cooling capacity. In this case, it is recommended to set H3-03 to 1, the inverse time curve will adjust according to the motor speed, the motor overload capacity will decrease as the speed decreases, preventing overheating due to reduced fan cooling capacity. When the motor speed is zero, the fan stops rotating, at this point the speed coefficient is 2.5, the corresponding overload curve is shown in Figure 2-75, according to the figure, when the current reaches 60% of the motor's rated current, the motor will report an overload fault after running for T time.

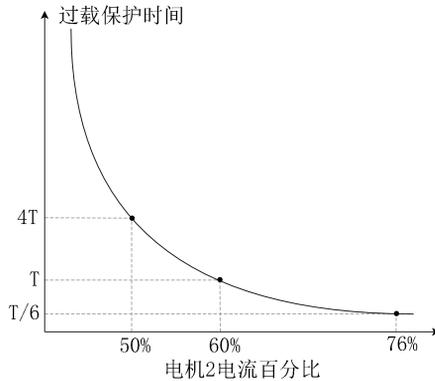


Figure 2-75 Motor 2 Overload Protection Curve (Coaxial Cooling)

H3-05	Over-torque selection 3	Range: 0~4	Factory value: 0
H3-06	Over-torque threshold 3	Range: 10%~250%	Factory value: 120
H3-07	Over-torque time 3	Range: 0.1~60.0s	Factory value: 0.1

The above function codes are used to set up the over-torque detection function for Motor 3. The

inverter issues a warning or stops operation when it detects excessive torque on Motor 3, thus protecting the motor and the inverter.

H3-05 Over-torque Selection 3

0: Not Detected

1: Constant Speed Detection Continue Running

During constant speed operation, if Motor 3 experiences over-torque, a warning is issued but operation continues.

2: Constant Speed Detection Stop Running

During constant speed operation, if Motor 3 experiences over-torque, an over-torque fault is reported and operation stops.

3: Running Detection Continue Running

During operation, if Motor 3 experiences over-torque, a warning is issued but operation continues.

4: Running Detection Stop Running

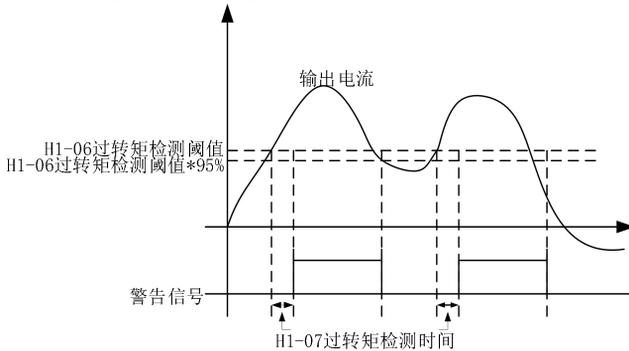
During operation, if motor 3 experiences over-torque, an over-torque fault is reported and the operation stops.

H3-06 Over-torque threshold 3

H3-07 Over-torque time 3

When the inverter output current exceeds H3-06 (unit %, based on the inverter's rated current) and persists for longer than the time set by H3-07, the inverter will determine subsequent actions according to H3-05. When H3-05 is 1 or 3, the over-torque detection is shown in Figure 2-76. If over-torque is detected, the inverter will display an over-torque warning, but the inverter will continue to operate until the output current is less than 95% of the H3-06 set value, after which the warning will be cleared.

When H3-05 is 2 or 4, the over-torque detection is shown in Figure 2-77. If over-torque is detected, the inverter reports an over-torque fault and stops operation until the fault is reset, after which it can resume



operation.

Figure 2-76 Over-torque detection for Motor 3 (H3-05=1or3)

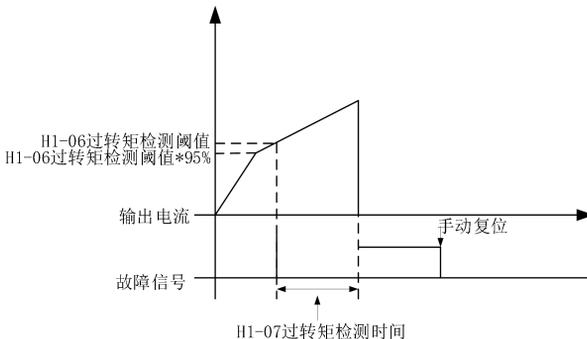


Figure 2-77 Over-torque detection for Motor 3 (H3-05=2or4)

H3-08	Motor 3 overload selection	Range: 0~2	Factory Value: 2
H3-09	Motor 3 overload time	Range: 30.0~600.0s	Factory Value: 60

Function code H3-08 is used to set the overload protection mode for Motor 3.

- 0: Constant Torque Output Motor
- 1: Variable Torque Output Motor
- 2: No Motor Overload Protection

Function code H3-09 is used to set the overload protection time for Motor 3 when the current reaches 150% of the rated current.

By setting an appropriate inverse time curve, the operating time of Motor 3 under overload conditions is made less than the set overload protection time for Motor 3, thereby achieving overload protection for Motor 3 and preventing damage due to overheating. When the overload time reaches the overload protection time for Motor 3, an overload fault for Motor 3 (E134) will be reported. This function is not enabled by default; if it needs to be enabled, H3-08 must be set to 0 or 1.

When H3-08 is 0, the overload curve for the corresponding motor is determined by H3-09, denoted as T, and the inverse time curve determined by it is shown in Figure2-78. In this case, the “Motor 3 current percentage” refers to the ratio of the inverter output current to the rated current of Motor 3. When the motor fan is independently controlled, this inverse time curve can be selected. In this case, the fan speed is independent of the motor speed, so the cooling capacity does not decrease as the motor speed decreases, making the inverse time curve independent of the motor operating speed.

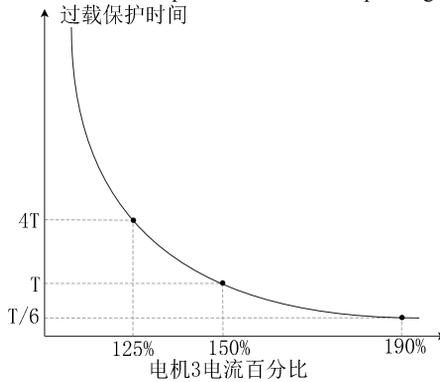


Figure 2-78 Motor 3 Overload Protection Curve (H3-08=0)

When H3-08 is 1, the overload curve of Motor 3 is determined by H3-09 and the motor speed, as shown in Figure7-79. Among them, the “speed coefficient” is a function of the motor speed; when the motor speed exceeds the rated speed, the speed coefficient equals 1; when the motor speed is less than the rated speed, speed coefficient= $1/(0.4+0.6*\text{motor speed}/\text{Motor 3 rated speed})$

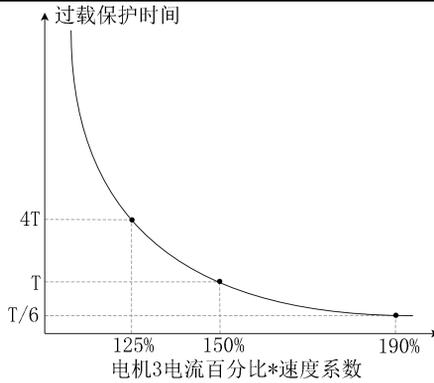


Figure 2-79 Motor 3 Overload Protection Curve (H3-08=1)

When the motor uses coaxial cooling (fan connected to the motor shaft), the fan speed is the same as the motor speed, and a decrease in motor speed will reduce the fan's cooling capacity. In this case, it is recommended to set H3-08 to 1, so that the inverse-time curve adjusts according to the motor speed, reducing the motor's overload capacity as the speed decreases to prevent overheating due to reduced fan cooling efficiency. When the motor speed is zero, the fan stops rotating. At this time, the speed factor is 2.5, and the corresponding overload curve is shown in Figure2-80. From the figure, it can be seen that when the current reaches 60% of the motor's rated current, Motor 3 will report an overload fault after running for T time.

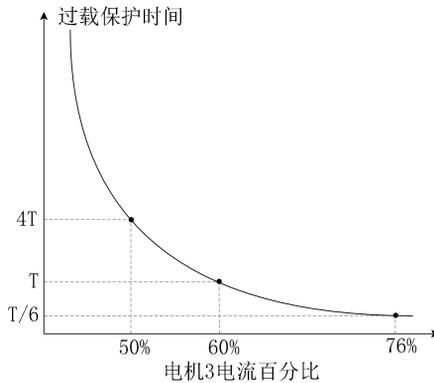


Figure 2-80 Overload Protection Curve for Motor 3 (Axial Cooling)

H3-10	Over-torque selection 4	Range: 0~4	Factory value: 0
H3-11	Over-torque threshold 4	Range: 10%~250%	Factory value: 120
H3-12	Over Torque Time 4	Range: 30.0~600.0s	Factory value: 0.1

The above function codes are used to set the over-torque detection function for Motor 4. The inverter issues a warning or shuts down when it detects excessive torque in Motor 4, protecting both the motor and the inverter.

H3-10 Over-torque Selection 4

0: Not Detected

1: Constant Speed Detection Continue Running

During constant-speed operation, if Motor 4 experiences over-torque, a warning is issued but the operation continues.

2: Constant Speed Detection Stop Running

When running at constant speed, if motor 4 experiences over-torque, an over-torque fault is reported and operation stops.

3: Running Detection Continue Running

During operation, if motor 4 experiences over-torque, a warning is issued but operation continues.

4: Running Detection Stop Running

During operation, if motor 4 experiences over-torque, an over-torque fault is reported and operation stops.

H3-11 Over-torque threshold 4

H3-12 Over-torque time 4

When the inverter output current exceeds H3-11 (unit %, based on the inverter's rated current) and persists for longer than the time set in H3-12, the inverter will determine subsequent actions according to H3-05. When H3-10 is 1 or 3, as shown in Figure 2-81, if over-torque is detected, the inverter will display an over-torque warning, but the inverter will continue to operate until the output current is less than 95% of the H3-11 set value, after which the warning will be cleared. When H3-10 is 2 or 4, as shown in Figure 2-82, if over-torque is detected, the inverter reports an over-torque fault and stops operation until the fault is reset, after which it can resume operation.

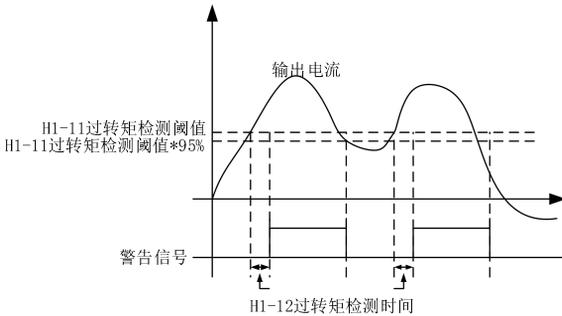


Figure 2-81 Motor 4 Over-Torque Detection (H3-10=1or3)

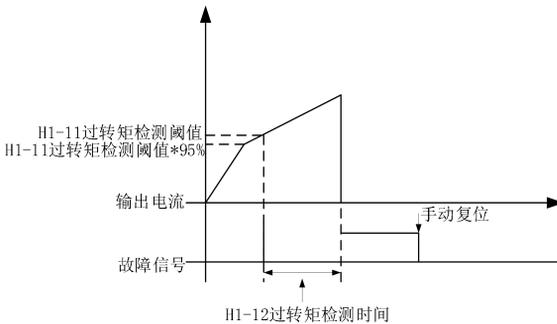


Figure 2-82 Motor 4 Over-Torque Detection (H3-10=2or4)

H3-13	Motor 4 Overload Selection	Range: 0~2	Factory Value: 2
H3-14	Motor 4 Overload Time	Range: 30.0~600.0s	Factory Value: 60

Function code H3-13 is used to set the overload protection mode for Motor 4.

0: Constant Torque Output Motor

1: Variable Torque Output Motor

2: No Motor Overload Protection

Function code H3-14 is used to set the overload protection time for Motor 4 when the current reaches 150% of the rated current. By setting appropriate inverse-time curves, the operating time of Motor 4 under overload conditions is made less than the set overload protection time for Motor 4, thereby achieving overload protection and preventing Motor 4 from being damaged due to overheating. When the overload time reaches the motor 4 overload protection time, an E135 motor 4 overload fault will be reported. This function is not enabled by default; if it needs to be enabled, set H3-13 to 0 or 1.

When H3-13 is 0, the overload curve for the corresponding motor is determined by H3-14, denoted as T, and the inverse-time curve is shown in Figure2-83. In this case, the “Motor 4 Current Percentage” refers to the ratio of the inverter output current to the rated current of Motor 4. When the motor fan is independently controlled, this inverse time curve can be selected. In this case, the fan speed is independent of the motor speed, so the cooling capacity does not decrease as the motor speed decreases, making the inverse time curve independent of the motor operating speed.

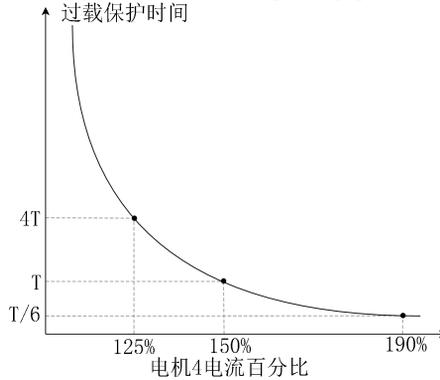


Figure 2-83 Motor 4 Overload Protection Curve (H3-13=0)

When H3-13 is 1, the overload curve for Motor 4 is determined by H3-14 and the motor speed, as shown in Figure2-84. Among them, “speed coefficient” is a function of motor speed, when the motor speed is greater than the rated speed, the speed coefficient equals 1, when the motor speed is less than the rated speed, speed coefficient = $1 / (0.4 + 0.6 * \text{motor speed} / \text{motor 4 rated speed})$

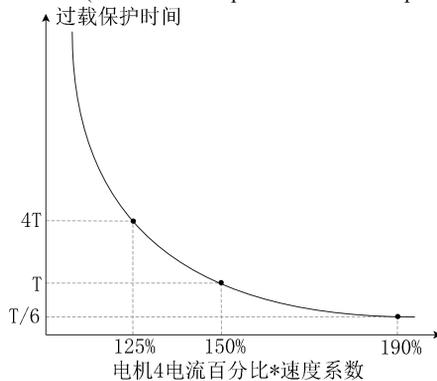


Figure 2-84 Motor 4 overload protection curve (H3-13=1)

When the motor uses coaxial cooling (fan connected to the motor shaft), the fan speed is the same as the motor speed, and a decrease in motor speed will reduce the fan's cooling capacity. In this case, it is recommended to set H3-13 to 1, the inverse time curve will be adjusted according to the motor speed,

the motor overload capacity will decrease as the speed decreases, preventing motor overheating due to reduced fan cooling capacity. When the motor speed is zero, the fan stops rotating. At this time, the speed factor is 2.5, and the corresponding overload curve is shown in Figure2-85. From the figure, it can be seen that when the current reaches 60% of the motor's rated current, Motor 4 will report an overload fault after running for T time.

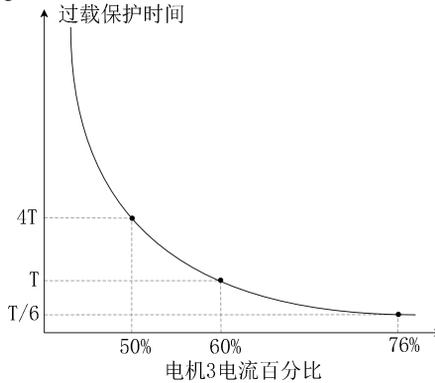


Figure 2-85 Overload Protection Curve for Motor 4 (Axial Cooling)

2.21 L0 Group System Control Parameters

L0-00	APP MACRO	Range: 0~65535	Factory value: 0
L0-01	System Debugging Flag	Range: 0~65535	Factory value: 0
L0-02	Debugging Flag	Range: 0~65535	Factory value: 0
L0-03	Debug Flag 1	Range: 0~65535	Factory Value: 64
L0-05	System Control Parameters	Range: 0~65535	Factory value: 0
L0-06	Special Control Flags	Range: 0~65535	Factory value: 0
L0-09	KPD Automatic Screen Refresh Enable	Range: 0~1	Factory value: 0
L0-10	KPD Screen Refresh Time Setting	0.00~6.00s	Factory Value: 0.15
L0-11	Low Speed Debugging Position	0~65535	Factory value: 1

This group of function codes is used for professional personnel to debug; detailed introduction is not provided here.

2.22 L1 Group User Function Code Customization

L1-00	Frequency Source Selection (HAND)	Range: 0~9	Factory value: 0
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This function code is used to set the frequency source when in manual mode.

- 0: Digital Operator
- 1: RS485 Communication
- 2: Analog Input
- 3: External Up/Down Input
- 4: Pulse Input Without Direction
- 5: Pulse Input With Direction
- 6: CANopen Input
- 7: Reserved
- 8: Communication Card Input
- 9: PID

L1-01	Operation Command Source (HAND)	Range: 0~5	Factory value: 0
-------	---------------------------------	------------	------------------

This function code is used to set the operation command source when in manual mode.

- 0: Digital Operator
- 1: External Terminal Input
- 2: RS485 Communication Input
- 3: CANopen Input
- 4: Reserved

5: Communication Card Input

2.23 L2 Group Optimal Control Parameters

L2-06	Dead Time Compensation Mode	Range: 0~5	Factory value: 4
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This parameter is used to set the dead time compensation method.

- 0: Disable dead time compensation
- 4: Use dead time compensation method 4
- 5: Use dead time compensation method 5

L2-07	Dead Time Compensation Value	Range: 0~65535	Factory Value: 180
L2-08	Tube Voltage Drop Compensation Value	Range: 0~65535	Factory Value: 5
L2-09	Dead Time Compensation 4 Slope	Range: 0~65535	Factory Value: 200
L2-10	Dead Time Compensation 5 Slope	Range: 0~65535	Factory Value: 5000

The above parameters are used to adjust the dead time compensation curve, generally no modification is required.

L2-17	BrakeUnit EnableVoltage	Range:330.0~900.0V	Factory Value: 740.0V
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This parameter sets the DC bus voltage threshold for activating the braking unit. Users can select an appropriate braking resistor to achieve optimal deceleration characteristics; this parameter can be modified during operation.

L2-18	Undervoltage Protection Value	Range: 250.0~440.0V	Factory Value: 360.0V
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This parameter sets the undervoltage threshold for the inverter's DC bus voltage. When the DC bus voltage falls below this value, an undervoltage fault is triggered, causing the inverter to stop output and the motor to free stop.

L2-19	Zero Speed Operation Selection	Range: 0~2	Factory value: 0
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0: Wait for Output

When the control mode is VF or VVC, output waits, and the inverter enters a waiting state (U, V, W 无 voltage output);

In other control modes, zero-speed operation is executed.

1: Zero-speed operation

When the control method is set to induction motor VF, the inverter will enter the operating state, but the actual output will be zero;

When the control method is set to VVC, the inverter works in the DC braking state, and the motor current is DC;

In other control modes, zero-speed operation is executed.

2: Output at Minimum Frequency

The inverter will operate according to the set values of multi-point VF frequency point 1 (F2-04) and multi-point VF voltage point 1 (F2-05).

L2-22	Random PWM	Range: 0~1	Factory value: 0
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0: Off

1: Enable

L2-24	Back EMF Identification Frequency	Range:0~1000%	Factory value:50
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For synchronous motors with higher rated frequencies (e.g., several hundred Hz), the frequency ratio during operation can be appropriately reduced during the rotational self-learning process.

2.24 L4 Group Brake Function Parameters

L4-00	Brake Frequency	Range: 0.00~599.00Hz	Factory Value: 0.00
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This function code is used to set the brake frequency.

L4-01	Brake Control Enable Selection	Range: 0~1	Factory value: 0
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Parameter Group Description

This function code is used to set brakecontrol enable.

L4-02	Brake Release Frequency	Range: 0.00~20.00Hz	Factory Value: 2.5
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This function code is used to setbrake release frequency.

L4-03	Brake Release Frequency Maintenance	Range: 0.00~20.0 seconds	Factory Value: 1.0
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This function code is used to setbrake release frequency hold.

L4-04	Brake Current Limit Value	Range: 50~200%	Factory value: 120
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This function code is used to setbrake current limit value.

L4-05	Brake Close Frequency	Range: 0.00~20.00Hz	Factory Value: 1.50
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This function code is used to setbrake close frequency.

L4-06	Brake Close Delay Time	Range: 0.0~20.0 seconds	Factory Value: 0.0
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This function code is used to setbrake release delay time.

L4-07	Brake Close Frequency Maintenance	Range: 0.0~20.0 seconds	Factory Value: 1.0
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This function code is used to setbrake release frequency maintenance.

2.25 L5 Group Sleep and Wake Function Parameters

This group of parameters is mainly used to achieve sleep and wake functions in constant pressure water supply applications, where the inverter stops running during the sleep period. After the wake-up delay within the sleep zone, the inverter starts running again, ending the sleep mode.

The sleep and wake functions require setting parameters such as sleep threshold, sleep delay, wake threshold, and wake delay. In general, the wake frequency (L5-02) should be set greater than or equal to the sleep frequency (L5-01). When the sleep frequency is 0, the sleep and wake functions are invalid.

Sleep and wake-up are divided into three cases:

1. Frequency command (without using process PID, parameter FA-00 = 0, only valid in VF control, i.e., VF sleep and wake-up)

After the output frequency reaches the sleep frequency (parameter L5-01), the inverter maintains operation at the sleep frequency and begins the sleep delay (parameter L5-03). After the delay time has elapsed, it stops directly at 0 Hz. When the frequency command reaches the wake-up frequency (parameter L5-02), after the wake-up delay (parameter L5-04), the inverter starts to accelerate to the set frequency according to the specified acceleration time. The frequency command sleep and wake-up process is shown in Figure 2-86.

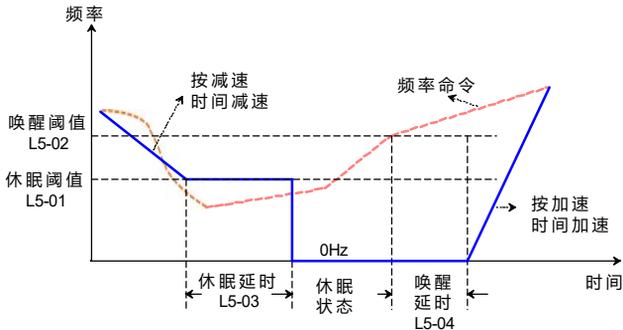


Figure 2-86 Frequency Command Sleep and Wake-up Schematic Diagram

2. PID Output Frequency Command (using process PID, parameter FA-00 ≠ 0 and parameter L5-00 = 0, i.e., PID sleep and wake-up)

When the PID output frequency command reaches the sleep frequency (parameter L5-01), the inverter begins to enter sleep mode. After the sleep delay (parameter L5-03) has elapsed, it stops directly at 0 Hz. If the sleep delay time has not been reached, the output frequency remains at the lower limit frequency (parameter F0-11, and F0-11 ≠ 0) or the minimum output frequency (parameter F2-04, if the lower limit frequency F0-11 = 0), waiting for the sleep time to reach before entering the sleep state. When the PID output frequency command reaches the wake-up frequency (parameter L5-02), the

inverter starts the wake-up delay (parameter L5-04). After the delay time has elapsed, the inverter accelerates to the PID output frequency as set. The PID output frequency command sleep and wake-up process is shown in Figure 2-87.

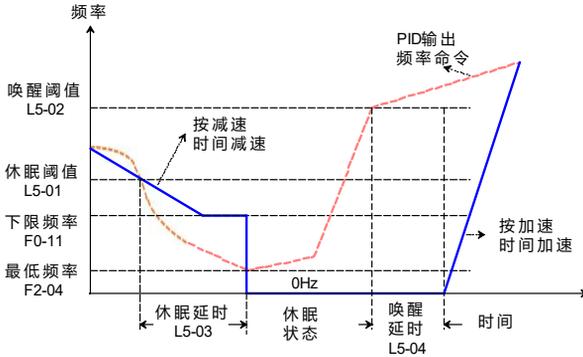


Figure 2-87 PID output frequency commands sleep and wake-up diagram

3. PID feedback value (using process PID, parameter FA-00 $\neq 0$ and parameter L5-00 = 1, also for PID sleep and wake-up)

When the PID feedback value reaches the sleep threshold (parameter L5-01), the inverter begins to sleep. After the sleep delay (parameter L5-03) has elapsed, it stops directly at 0 Hz. If the sleep delay time has not been reached, the output frequency remains at the lower limit frequency (parameter F0-11, and $F0-11 \neq 0$) or the minimum output frequency (parameter F2-04, if the lower limit frequency $F0-11 = 0$), waiting for the sleep time to reach before entering the sleep state. When the PID feedback value reaches the wake-up threshold (parameter L5-02), the inverter starts the wake-up delay (parameter L5-04). After the delay time has elapsed, the inverter accelerates to the PID output frequency according to the set acceleration time. The PID feedback value sleep and wake-up process is shown in Figure 2-88.

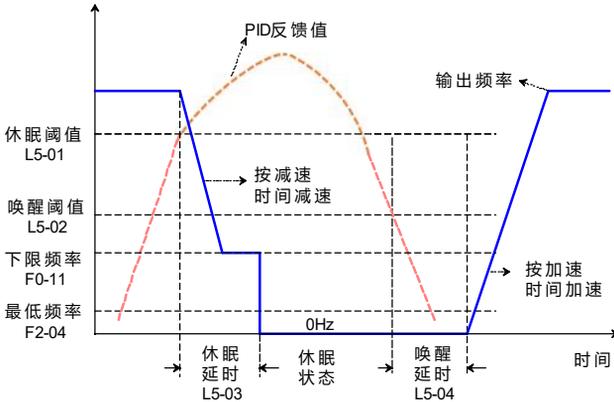


Figure 2-88 PID Feedback Value Sleep and Wake-Up Schematic

When the sleep function is controlled by the PID setpoint and feedback value (the above cases 2 and 3), the inverter frequency source must be selected as PID (parameter F0-06 = 9).

L5-00	Sleep Method Reference Selection	Range: 0~1	Factory value: 0
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- 0: PID Command Arrival
- 1: PID Feedback Arrival

Parameter Group Description

When parameter L5-00 = 0, the units for parameters L5-01 and L5-02 automatically change to frequency, and the setting range automatically changes to 0.00~599.00 Hz.

When parameter L5-00 = 1, parameters L5-01 and L5-02 units automatically change to percentage, and the reference base becomes the percentage of feedback, with the setting range automatically changing to 0.00~200.00%.

L5-01	Sleep Threshold	Range: 0.00Hz~599.00Hz	Factory Value: 0.00
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During the operation of the inverter, when the set frequency is less than the sleep frequency (parameter L5-01, L5-00 = 0), or the PID negative feedback value is greater than the sleep threshold (parameter L5-01, L5-00 = 1), the inverter begins to enter sleep mode. After the sleep delay (parameter L5-03) has elapsed, it stops directly at 0 Hz.

L5-02	Wake Threshold	Range: 0.00Hz~599.00Hz	Factory Value: 0.00
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If the inverter is in sleep mode and the current operating command is valid, when the set frequency is greater than the wake-up frequency (parameter L5-02, L5-00 = 0), or the PID negative feedback value is less than the wake-up threshold (parameter L5-02, L5-00 = 1), after the wake-up delay (L5-04), the inverter starts to accelerate to the PID output frequency according to the set acceleration time.

L5-03	Sleep Delay	Range: 0.0s~6000.0s	Factory Value: 0.0
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L5-04	Wake-up Delay	Range: 0.00s~600.00s	Factory Value: 0.00
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2.26 L6 Group Counting

L6-00	Final Count Value Setting	Range: 0~65500	Factory value: 0
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This function code is used for counting functions, and can set the final count value (maximum value).

When L6-00 is 0, the counting function is disabled. When L6-00 is not 0, the counting function is active. The counter's input point can be triggered by the multifunction terminal DI6 (digital input function set to 23 for input counting), as shown in Figure 2-89, when the count reaches the L6-00 set value, the inverter can issue a final count reached signal through the digital output terminal.

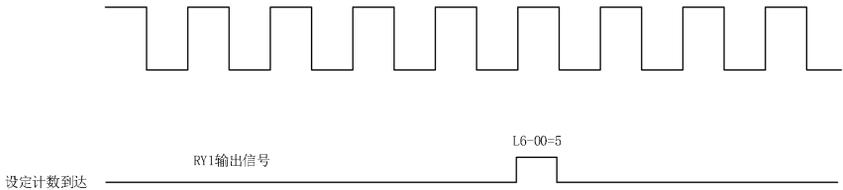


Figure 2-89 Final Count Value Setting Diagram

L6-01	Intermediate Count Value Setting	Range: 0~65500	Factory value: 0
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This function code is used for counting functions, and can set the intermediate (set) count value. This function code must be used in conjunction with the final count value setting (L6-00).

As shown in Fig. 2-90, when the count value increases to the set value of L6-01, the inverter can issue a set count reached signal via digital output terminals and continue counting until the final count value.

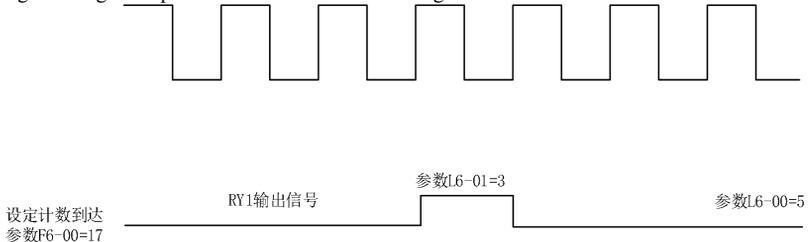


Fig. 2-90 Intermediate Count Value Setting Diagram

L6-02	Count Reached E.F Enable	Range: 0~1	Factory value: 0
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This function code is used to set the inverter's action when the count is reached.
 0: Count reached, no EF;
 When the count is reached, the inverter continues to operate.
 1: Count reached, EF;
 When the count is reached, the inverter stops operation and indicates an external fault.

2.27 L7 Group AI Multi-point Curve Setting

L7-00	AI Curve Selection	Range: 0~7	Factory value: 0
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This function code is used to set the AI curve adjustment method.

0: General Curve

These set values 0, all analog input signals are recalculated using bias and gain methods.

1: AI1 Three-point Curve

Set value to 1, AI1 uses the frequency and voltage/current correspondence method (parameters L7-01 ~ L7-06) for calculation, other analog input signals use the bias and gain method for calculation.

2: AI2 Three-point Curve

Set value to 2, AI2 uses the frequency and voltage/current correspondence method (parameters L7-07 ~ L7-12) for calculation, other analog input signals use the bias and gain method for calculation.

3: Three-point curve for AI1 and AI2

Set value to 3, AI1 and AI2 use the frequency and voltage/current correspondence method (parameters L7-01 ~ L7-12) for calculation, other analog input signals use the bias and gain method for calculation.

4: Three-point Curve for AI3

Set value to 4, AI3 uses the frequency and voltage/current correspondence method (parameters L7-13 ~ L7-18) for calculation, other analog input signals use the bias and gain method for calculation.

5: Three-point Curve for AI1 and AI3

Set value to 5, AI1 and AI3 use the frequency and voltage/current correspondence method (parameters L7-01 ~ L7-06, parameters L7-13 ~ L7-18) for calculation, other analog input signals use the bias and gain method for calculation.

6: Three-point Curve for AI2 and AI3

Set value to 6, AI2 and AI3 use the frequency and voltage/current correspondence method (parameters L7-07 ~ L7-18) for calculation, other analog input signals use the bias and gain method for calculation.

7: Three-point curve for AI1, AI2, and AI3

The set value is 7, and the frequency and voltage/current correspondence method (parameters L7-01 to L7-18) is used for AI1, AI2, and AI3.

L7-01	AI1 Minimum Point Input Value	Range: 0.00~20.00	Factory Value: 0.00
L7-02	AI1 Minimum Point Percentage	Range: 0.00%~100.00%	Factory Value: 0.00
L7-03	AI1 Midpoint Input Value	Range: 0.00~20.00	Factory Value: 5.00
L7-04	AI1 Midpoint Percentage	Range: 0.00~100.00%	Factory Value: 50.00
L7-05	AI1 Maximum Point Input Value	Range: 0.00~20.00	Factory setting: 10.00
L7-06	AI1 Maximum Point Percentage	Range: 0.00~100.00%	Factory value: 100.00

The above function codes are used to adjust the AI1 input signal using a three-point curve, which is effective when the AI1 curve is selected as a three-point curve.

L7-01, L7-03, and L7-05 are the actual input voltage or current values. If the input signal type is 0-10V, entering 1.00 represents 1V; If the input type is 0-20mA or 4-20mA, entering 5.00 represents 5mA. Note that when setting, it must be ensured that L7-01 < L7-03 < L7-05. L7-02, L7-04, and L7-05 are the numerical values corresponding to the respective input values entered into the inverter, with units in %. 100% represents the maximum value; for example, when the analog input function is set to input frequency, 100% corresponds to the maximum frequency (F4-02). When the AI1 input type is 0-10V and used as a frequency command, the curve relationships corresponding to different settings of L7-01 to L7-06 are shown in Figure 2-91.

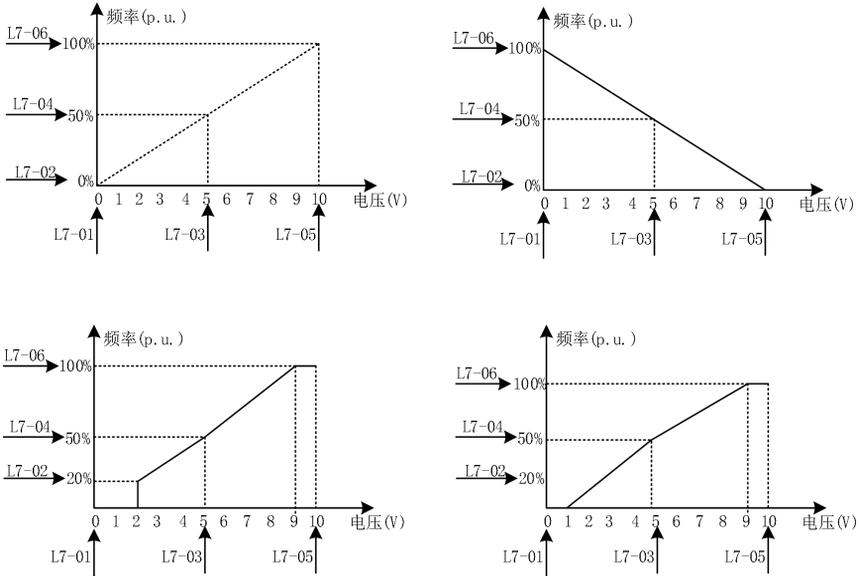


Figure 2-91 AI1 Multi-point Curve

L7-07	AI2 Minimum Point Input Value	Range: 0.00~20.00	Factory Value: 0.00
L7-08	AI2 Minimum Point Percentage	Range: 0.00~100.00%	Factory Value: 0.00
L7-09	AI2 Midpoint Input Value	Range: 0.00~20.00	Factory Value: 5.00
L7-10	AI2 Midpoint Percentage	Range: 0.00~100.00%	Factory Value: 50.00
L7-11	AI2 Maximum Point Input Value	Range: 0.00~20.00	Factory setting: 10.00
L7-12	AI2 Maximum Point Percentage	Range: 0.00~100.00%	Factory value: 100.00

The above function codes are used for adjusting the AI2 input signal using a three-point curve, which is effective when the AI2 curve is selected as a three-point curve. Refer to the relevant descriptions for L7-01 to L7-06.

L7-13	AI3 Minimum Point Input Value	Range: 0.00~20.00	Factory Value: 0.00
L7-14	AI3 Minimum Point Percentage	Range: 0.00~100.00%	Factory Value: 0.00
L7-15	AI3 Midpoint Input Value	Range: 0.00~20.00	Factory Value: 5.00
L7-16	AI3 Intermediate Point Percentage	Range: 0.00~100.00%	Factory Value: 50.00
L7-17	AI3 Maximum Point Input Value	Range: 0.00~20.00	Factory setting: 10.00
L7-18	AI3 Maximum Point Percentage	Range: 0.00~100.00%	Factory value: 100.00

The above function codes are used for adjusting the AI3 input signal using a three-point curve, which is effective when the AI3 curve is selected as a three-point curve. Refer to the relevant descriptions for L7-01 to L7-06.

2.28 L8 Group Application Macro Parameters

By selecting application macro parameters, the system automatically imports function parameters related to the selected industry application, thus simplifying the parameter settings for users when choosing different on-site applications.

Supports custom application macros, allowing users to edit 50 function code indexes themselves, and stores the custom function code indexes and function code values even after power loss. Additionally, there are ten industry application macros: air compressor, fan, water pump, conveyor belt, CNC machine, packaging, textile machine, electric drill high-speed machine, process PID, process PID main-secondary frequency. When different industry applications are selected, the system automatically updates the relevant function parameters, eliminating the need for user settings.

L8-00	Industry Application Macro Selection	Range: 0~12	Factory value: 0
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- 0: No Function
- 1: Custom Application
- 2: Air Compressor Application
- 3: Fan Application
- 4: Pump Application
- 5: Conveyor Belt Application
- 6: CNC Machine Tool Application
- 7: Packaging Application
- 8: Textile Machine Application
- 9: High-Speed Electric Drill
- 10: Not Applicable
- 11: Process PID Application
- 12: Process PID Master-Slave Frequency Application

Note: After selecting an application macro, some parameter default values will be automatically set according to the selected application macro type.

L8-00=1, User-Defined Parameter Setting:

L8-01~L8-50	Application Macro Parameters	Range: 0.00~29.00	Factory Value: 0.00
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The custom option allows users to add up to 50 function code parameter settings (L8-01~L8-50). For example, if a certain on-site application requires setting an asynchronous motor to operate in torque mode with a carrier frequency of 6KHz and a maximum torque of 150%, then the parameters should be set as follows: L8-01=0.03, L8-02=14.00, L8-03=0.15, L8-04=14.10; F0-03=2 (torque mode), FE-00=2 (IM open-loop torque control), F0-15=6 (carrier frequency), FE-10=150% (maximum torque command). After power-off, when powered on again, the parameters added by the custom application macro (L8-00=1) will be automatically imported.

Precautions:

- The setting values of parameters L8-01~L8-50 cannot be the index values of hidden attribute function codes (function codes reserved for display, such as L8-01 cannot be set to 25.00, i.e., L3-00).
- The setting values of parameters L8-01~L8-50 cannot exceed the total number of members in the set function group, for example, the display range of the F0 group is F0-00~F0-18, L8-01 cannot be set to 0.19 (i.e., F0-19).
- The setting values for parameters L8-01 to L8-50 cannot be L8 group parameters, such as L8-01 cannot be set to 29.XX (i.e., L8-XX).
- When the setting values for parameters L8-01 to L8-50 are not 0.00, user-defined index items increase; otherwise, they decrease. For example, if L8-01=1.00, L8-02=1.01 (i.e., F1-00, F1-01), and L8-03=0.00, two custom function parameters are defined.
- When adding application parameters, it is mandatory to set them consecutively starting from L8-01 without skipping over 0.00 to set the next parameter, such as L8-01=1.00 (i.e., F1-00), L8-02=0.00, and L8-03 cannot be set to 1.01.
- When reducing application parameters, they must be set to 0.00 sequentially from the last non-0.00 parameter (L8-XX~L8-01).

If the operation does not follow the above rules, the keyboard will display an "***ERR**" error, indicating that the setting has failed.

L8-00=2, air compressor application parameter settings as shown in Table 2-26.

Table 2-26 Air Compressor Application Parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	2 (Analog Input)
F0-09	Forward/Reverse Selection	Prohibited 1 (Reverse Prohibited)

F0-11	Lower Limit Frequency	20.00 (Hz)
F0-13	Acceleration time 1	20.00 (s)
F0-14	Deceleration time 1	20.00 (s)
F0-15	Carrier frequency	2 (kHz)
F1-12	Stopping Method	0 (Coast to Stop)
F5-21	AI1 function selection	0 (No Function)
F5-27	AI2 Function Selection	1 (Frequency Setting)

L8-00=3, Fan application parameter settings as shown in Table 2-27.

Table 2-27 Fan Application Parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	2 (Analog Input)
F0-09	Forward/Reverse Selection Prohibited	1 (Reverse Prohibited)
F0-10	Upper Limit Frequency	50.00 (Hz)
F0-11	Lower Limit Frequency	35.00 (Hz)
F0-13	Acceleration time 1	15.00 (s)
F0-14	Deceleration time 1	15.00 (s)
F0-15	Carrier frequency	2 (kHz)
F1-12	Stopping Method	1 (Free Stop)
F1-29	Instant Power Failure Restart Method	2 (Minimum Frequency Tracking)
F2-00	V/F Voltage Selection	2 (Square V/F Curve)
F5-04	DI5 Terminal Function Selection	16 (AI2 Input Frequency Command)
F5-20	AI1 signal type selection	0 (0-10V Input Selection)
F5-21	AI1 function selection	1 (Frequency Setting)
F5-26	AI2 Signal Type Selection	1 (0-20mA Input Selection)
F5-27	AI2 Function Selection	1 (Frequency Setting)
F6-02	DO1 Terminal Function Selection	11 (Fault Indication)
F6-03	DO2 Terminal Function Selection	1 (Inverter Running)
F6-20	AO2 Signal Type Selection	0 (0-10V Output Selection)
F9-46	Abnormal Start Count	5
F9-47	Abnormal Restart Reset Time	60.0s
L1-01	Operation Command Source (HAND)	0 (Digital Operator)
L1-00	Frequency Source Selection (HAND)	0 (Digital Operator)
L7-00	AI Curve Selection	1 (AI1 three-point curve)

L8-00=4, Pump application parameter settings as shown in Table 2-28.

Table 2-28 Pump application parameters

Parameter	Parameter Name	Set Value
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Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	2 (Analog Input)
F0-09	Forward/Reverse Prohibited Selection	1 (Reverse Prohibited)
F0-10	Upper Limit Frequency	50.00 (Hz)
F0-11	Lower Limit Frequency	35.00 (Hz)
F0-13	Acceleration time 1	15.00 (s)
F0-14	Deceleration time 1	15.00 (s)
F1-29	Instant Power Failure Restart Method	2 (Minimum Frequency Tracking)
F2-00	V/F Voltage Selection	2 (Square V/F Curve)
F9-46	Abnormal Start Count	5
F9-47	Abnormal Restart Reset Time	60.0s

L8-00=5, Conveyor belt application parameter settings as shown in Table 2-29.

Table 2-29 Conveyor belt application parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	2 (Analog Input)
F0-09	Forward/Reverse Prohibited Selection	1 (Reverse Prohibited)
F0-10	Upper Limit Frequency	50.00 (Hz)
F0-11	Lower Limit Frequency	35.00 (Hz)
F0-13	Acceleration time 1	10.00 (s)
F0-14	Deceleration time 1	10.00 (s)

L8-00=6, Machine tool application parameter settings as shown in Table 2-30.

Table 2-30 Machine tool application parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	2 (Analog Input)
F0-13	Acceleration time 1	5.00 (s)
F0-14	Deceleration time 1	5.00 (s)
F0-15	Carrier frequency	2 (kHz)
F1-08	Braking Current Level	20%

F1-24	Stopping brake time	0.3s
F1-25	Braking Start Frequency	0.00Hz
F5-02	DI3 Terminal Function Selection	1 (Multi-speed/multi-position 1)
F5-03	DI4 Terminal Function Selection	2 (Multi-speed/multi-position 2)
F5-21	All function selection	1 (Frequency Setting)
F5-27	AI2 Function Selection	1 (Frequency Setting)
F6-00	RLY1 terminal function selection	11 (Fault Indication)
F6-02	DO1 Terminal Function Selection	1 (Inverter Running)
F6-03	DO2 Terminal Function Selection	2 (Reach set frequency)
F7-37	Automatic Voltage Regulation	1 (Cancel AVR function)

L8-00=7, Packaging application parameter settings as shown in Table 2-31.

Table 2-31 Packaging Application Parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	2 (RS485 Communication Input)
F0-06	Frequency Source Selection	0 (Digital Operator)
F0-13	Acceleration time 1	10.00 (s)
F0-14	Deceleration time 1	10.00 (s)
F1-16	S Acceleration Time 1	0.20s
F1-17	S Acceleration Time 2	0.20s
F1-18	S Deceleration Time 1	0.20s
F1-19	S Deceleration Time 2	0.20s
F5-08	Terminal Command Mode	1 (2-Wire Mode 1)
F5-20	All signal type selection	0 (0-10V Input Selection)
F5-21	All function selection	1 (Frequency Setting)

L8-00=8, Textile Application Parameter Settings As Shown in Table 2-32.

Table 2-32 Textile Application Parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	1 (RS485 Communication)
F0-13	Acceleration time 1	10.00 (s)
F0-14	Deceleration time 1	10.00 (s)
F1-16	S Acceleration Time 1	0.20s
F1-17	S Acceleration Time 2	0.20s
F1-18	S Deceleration Time 1	0.20s
F1-19	S Deceleration Time 2	0.20s

F9-08	Acceleration OC Stall Threshold	180%
F9-10	Operation OC Stall Threshold	180%
F9-37	Over-torque threshold 1	200%
F7-17	Fan control method	2 (Stop with Inverter Shutdown)

L8-00=9, High-Speed Drill Application Parameter SettingsAs Shown in Table 2-33.

Table 2-33 High-Speed Drill Application Parameters

Parameter	Parameter Name	Set Value
F0-01	Light/Heavy Load Selection	1 (Heavy Load)
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	2 (Analog Input)
F0-09	Forward/Reverse Prohibited Selection	1 (Reverse Prohibited)
F0-13	Acceleration time 1	4.00 (s)
F0-14	Deceleration time 1	3.00 (s)
F0-15	Carrier frequency	2 (kHz)
F1-08	Braking Current Level	20%
F1-24	Stopping brake time	0.3s
F1-25	Braking Start Frequency	0.00Hz
F5-21	All function selection	1 (Frequency Setting)
F6-00	RLY1 terminal function selection	11 (Fault Indication)
F6-02	DO1 Terminal Function Selection	1 (Inverter Running)
F6-03	DO2 Terminal Function Selection	2 (Reach set frequency)
F7-37	Automatic Voltage Regulation	1 (Cancel AVR function)
F9-15	Output Phase Loss Action Selection	1 (Warning and Decelerate to Stop)
F9-36	Over Torque Selection 1	2 (Constant Speed Detection Stop Operation)
F9-37	Over-torque threshold 1	120%
F9-38	Over-torque time 1	0.1s

L8-00=11, Process PID Application Parameter SettingsAs Shown in Table 2-34.

Table 2-34 Process PID Application Parameters

Parameter	Parameter Name	Set Value
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	9 (PID)
F0-13	Acceleration time 1	3.00 (s)
F0-14	Deceleration time 1	3.00 (s)
F5-21	All function selection	5 (PID Feedback Value)
FA-00	PID Feedback Type Selection	1 (Negative Feedback Analog Input)
FA-01	PID Setpoint Source Selection	1 (Parameter FA-02)

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FA-02	PID Setpoint	50.00%
FA-05	Proportional Coefficient 1	10.00
FA-06	Integral Time 1	1.00
FA-11	PID Series/Parallel Selection	1 (Parallel)
FA-17	PID Direction Change Selection	0 (Prohibited)
L7-00	AI Curve Selection	1 (AI1 Three-point Curve)
L7-13	AI3 Minimum Point Input Value	0.00
L7-15	AI3 Midpoint Input Value	9.99
L7-16	AI3 Intermediate Point Percentage	100.00%

L8-00=12, Process PID + Main Auxiliary Frequency Application Related Parameter SettingsAs Shown in Table 2-35.

Table 2-35 PID + Main Frequency Application Parameters

Parameter	Parameter Name	Set Value
F0-03	Control Mode	0 (Speed Mode)
F0-04	Speed Mode Selection	0 (V/F)
F0-05	Run Command Source Selection	1 (External Terminal Input)
F0-06	Frequency Source Selection	9 (PID)
F0-07	Auxiliary Frequency Source	3 (Analog Input)
F0-13	Acceleration time 1	3.00 (s)
F0-14	Deceleration time 1	3.00 (s)
F5-21	AI1 function selection	5 (PID Feedback Value)
F5-26	AI2 Signal Type Selection	1 (0-20mA Input Selection)
F5-27	AI2 Function Selection	12 (Auxiliary Frequency Setting)
F5-38	Analog Bias Negative Frequency	0 (Forward/Reverse by Operator)
F5-30	AI2 Gain	100.0%
FA-00	PID Feedback Type Selection	1 (Negative Feedback Analog Input)
FA-01	PID Setpoint Source Selection	1 (Parameter FA-02)
FA-02	PID Setpoint	50.00%
FA-05	Proportional Coefficient 1	10.00
FA-06	Integral Time 1	1.00
FA-11	PID Series/Parallel Selection	1 (Parallel)
FA-17	PID Direction Change Selection	1 (Enabled)
FA-27	Main Auxiliary Reverse Cut-off Frequency	10.0%
L7-00	AI Curve Selection	1 (AI1 Three-point Curve)
L7-13	AI3 Minimum Point Input Value	0.00
L7-15	AI3 Midpoint Input Value	9.99
L7-16	AI3 Intermediate Point Percentage	100.00%

3 Basic Configuration and Function Application

3.1 VFD Basic Application

3.1.1 Operation Command Setting

The operation command is used to control the inverter's start, stop, forward/reverse rotation, jog operation, etc. The operation commands are divided into three types: keyboard, terminal, and communication. Parameter F0-05 is used to select the operation command method.

Table 3-1 Operation Command Setting Related Parameters

Function Code	Function Code Definition	Value Range	Factory Value	Description
F0-05	Run Command Source Selection	0: Digital Operator 1: External Terminal Input 2: RS485 Communication Input 3: CANopen Input 4: Reserved 5: Communication Card Input	0	Selects the input channel for the inverter control command. Inverter control commands include: start, stop, forward rotation, reverse rotation, jog, etc. 0: Digital Operator Selecting this command channel allows control commands to be input via the RUN, STOP, JOG buttons on the keyboard, suitable for initial debugging. 1: External terminal input Select this command channel to control commands via the inverter's DI terminals. The DI terminal control commands can be set according to different scenarios, such as start/stop, forward/reverse, jogging, two/three-wire mode, multi-speed, etc., suitable for most applications. 2, 3, 5: Communication command channels Communication methods include RS485, CANopen, communication cards. Select this command channel to input control commands via remote communication. The inverter needs to have a communication card installed to achieve communication with the higher-level machine. Suitable for long-distance control or centralized control of multiple equipment systems.

Set operation instructions via the 'keyboard'

When F0-05 is set to 0, use the keyboard buttons "RUN", "STOP", "JOG", etc., to give the inverter operation commands.

Pressing the "RUN" button starts the inverter, and you can see the indicator light above the "RUN" button light up.

Pressing the "STOP" button while the inverter is running will stop the inverter. Before stopping, the "RUN" button indicator light will flash until it stops, at which point the indicator light above the "STOP" button will light up.

Setting operation commands through external terminals

When F0-05 is set to 1, operation commands are given to the inverter through DI terminals to control its start and stop.

Parameter F5-08 sets the terminal command method, with a total of 6 methods, as shown in Table 3-2 below:

Table 3-2 Terminal Command Mode Setting Parameters

Function Code	Function Code Definition	Value Range	Factory Value	Explanation
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F5-08	Run Command Source Selection	0: No Function 1: 2-Wire Mode 1 2: 2-wire Mode 2 3: 3-wire 4: 2-wire Mode 1/Fast Start 5: 2-wire Mode 2/Fast Start 6: 3-wire Fast Start	1	Select different terminal combinations to set the inverter operation mode.
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2-Wire Mode 1

F5-08 = 1, set to commonly used 2-wire mode 1.

The DI1 terminal is used for forward operation, and the DI2 terminal is used for reverse operation. Connect the forward operation switch to the DI1 terminal and the reverse operation switch to the DI2 terminal.

Table 3-3 2-Wire Mode 1 Related Parameters

Function Code	Function Code Definition	Set Value	Explanation
F5-08	Terminal Command Mode	1	2-Wire Mode 1
F5-00	DI1 Terminal Function Selection	0	When F5-08 is changed to 1, the DI1 terminal defaults to forward operation.
F5-01	DI2 Terminal Function Selection	0	When F5-08 is changed to 1, the DI2 terminal defaults to reverse operation.
F0-05	Run Command Source Selection	1	External Terminal Input

Table 3-4 2-Wire Mode 1

SW1	SW2	Run Command
1	0	Forward Operation
0	1	Reverse Operation
1	1	Stop
0	0	Stop



Figure 3-1 Two-Wire Operation Mode 1

Two-Wire Mode 2

F5-08 = 2, set to Two-Wire Mode 2.

The DI1 terminal is used to control the run command, and the DI2 terminal is used to control the forward/reverse direction.

Table 3-5 Parameters Related to Two-Wire Mode 2

Function Code	Function Code Definition	Set Value	Description
F5-08	Terminal Command Mode	2	Two-Wire Mode 2
F5-00	DI1 Terminal Function Selection	0	Default for controlling the run command
F5-01	DI2 Terminal Function Selection	0	Default for controlling the forward/reverse operation direction
F0-05	Run Command Source Selection	1	External Terminal Input

Table 3-6 Two-Wire Mode 2

SW1	SW2	Run Command
1	0	Forward Operation
1	1	Reverse Operation
0	1	Stop
0	0	Stop



Figure 3-2 Two-Wire Operation Mode 2

Three-Wire

F5-08 = 3, set to Three-Wire mode.

The DI1 terminal is used to control the run command, the DI2 terminal is used to control the forward/reverse direction, and the DI3 terminal is used to control the run enable.

Table 3-7 Three-wire Related Parameters

Function Code	Function Code Definition	Set Value	Description
F5-08	Terminal Command Mode	3	Three-Wire
F5-00	DI1 Terminal Function Selection	0	Default for controlling the run command
F5-01	DI2 Terminal Function Selection	0	Default for controlling the forward/reverse operation direction
F5-02	DI3 Terminal Function Selection	0	Default is the Run Enable Terminal
F0-05	Run Command Source Selection	1	External Terminal Input

Table 3-8 Three-wire

SW1	SW2	SW3	Run Command
1	0	1	Forward Operation
1	1	1	Reverse Operation
x	x	0	Stop
0	x	x	Stop



Figure 3-3 Three-wire Operation Mode

Set the operation command via communication

When F0-05 is set to 2, 3, or 5, the inverter's start and stop commands are given through communication.

This series supports multiple communication methods: 485, CANopen, PROFIBUS-DP, EtherCAT,

Profinet, and Ethernet. Except for 485, other communications require the installation of a communication card. According to the communication protocol, relevant parameters need to be set in the F8 group to match the corresponding serial port protocol.

The following uses 485 communication as an example to explain the process of setting the operation command via communication.

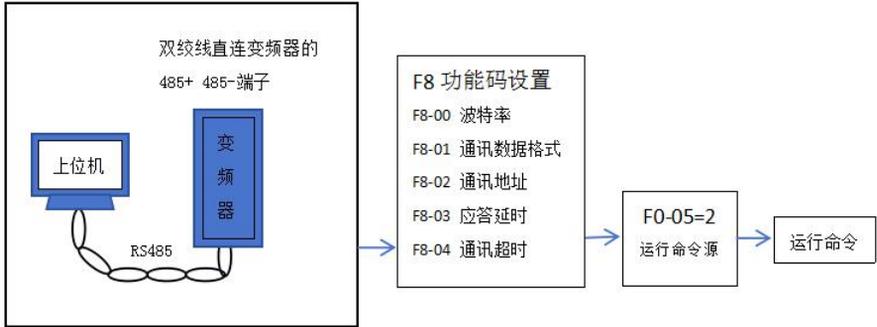


Figure 3-4 Schematic Diagram of Communication Given Operation Command

Application Example, Communication Control of Inverter Forward Operation. Send write command data “01 06 20 00 00 12 02 07”. The data is in hexadecimal, and the meaning of each data bit is shown in the table below. For more communication addresses and commands, see Appendix B.

Table 3-9 Meaning of Instruction Data Bits

Data	Meaning
01	Inverter Communication Address
06	Write Command
20 00	Control Command Communication Address
00 12	Forward Operation Command
02 07	CRC Check Low and High Bits

Complete Data Transmission Process:

Host Sends: 01 06 20 00 00 12 02 07

Slave Responds: 01 06 20 00 00 12 02 07

3.1.2 Frequency Command Setting

The inverter is equipped with 2 frequency setting channels, named as the main frequency source and auxiliary frequency source, which can operate independently or switch at any time, and even be combined through set calculation methods to meet different control requirements on site.

Main Frequency Source Selection

The inverter has 10 main frequency sources, including digital operator, RS485 communication, analog input, external Up/Down, CANopen, PID, multi-speed, etc., one of which can be selected through F0-06.

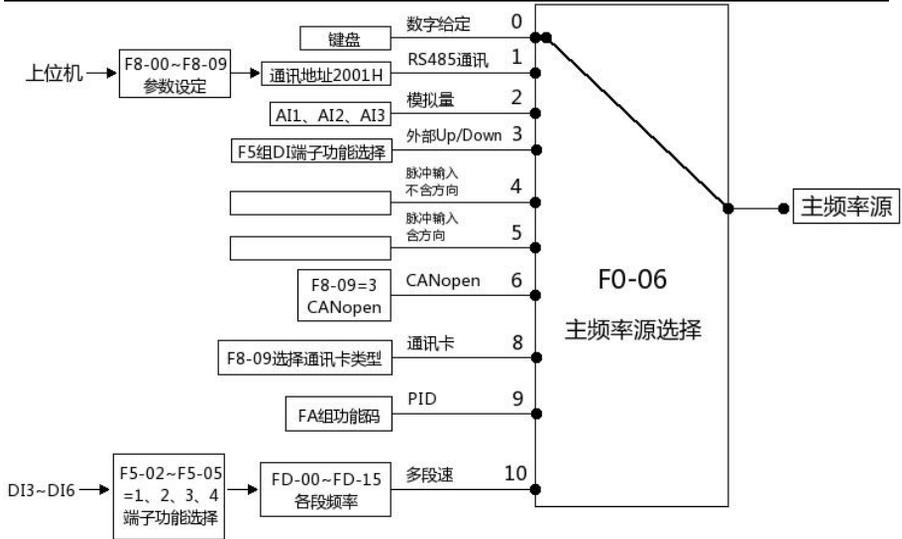


Figure 3-5 Schematic Diagram of Main Frequency Source Selection

From the different frequency sources shown in the figure, it can be seen that the operating frequency of the inverter can be determined by function codes, adjusted manually in real-time, set by an analog signal, given by multi-speed terminal commands, regulated in a closed loop by the built-in PID controller using external feedback signals, or controlled via communication from a higher-level machine.

The figure above provides the function codes related to each frequency source setting; refer to the detailed description of the corresponding function code when setting.

Usage method with auxiliary frequency setting

There are 7 sources for the auxiliary frequency, which are selected through F0-07 setting.

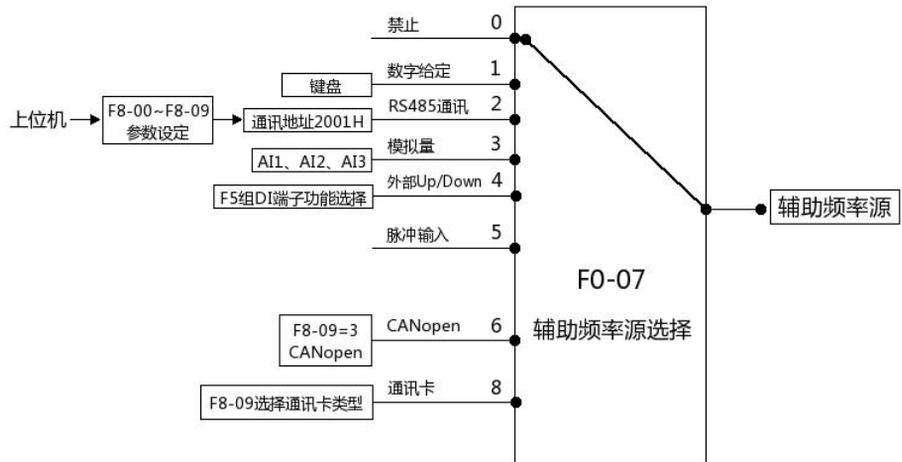


Figure 3-6 Schematic diagram of auxiliary frequency setting sources

In actual use, the relationship between the target frequency and the main and auxiliary frequency sources is set through F0-10.

3.1.3 Start/Stop Methods

Start Method

The inverter has three start modes: direct start, speed tracking start, and asynchronous motor pre-magnetization start, which are selected through function parameter F1-00.

Direct Start

F1-00=0, direct start mode, suitable for most small inertia loads, the frequency curve during the start process is shown in the following figure. The 'DC Braking' function before startup is suitable for driving elevators, hoisting loads, etc. The 'Startup Frequency' is suitable for equipment that requires torque impact at startup, such as concrete mixers.

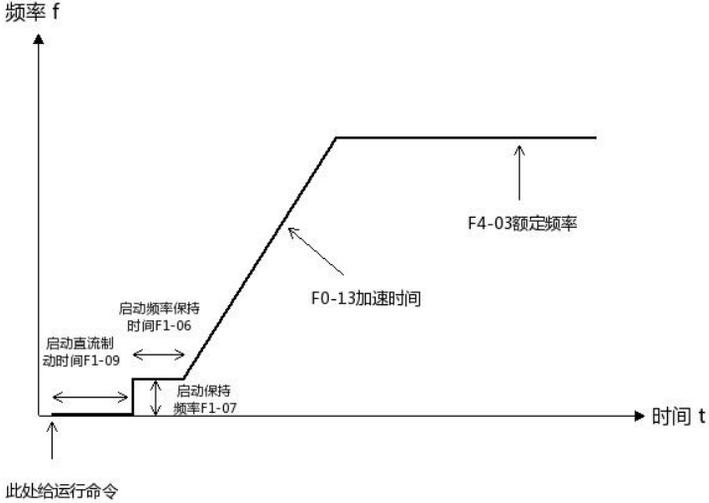


Figure 3-7 Direct Start with DC Braking Schematic

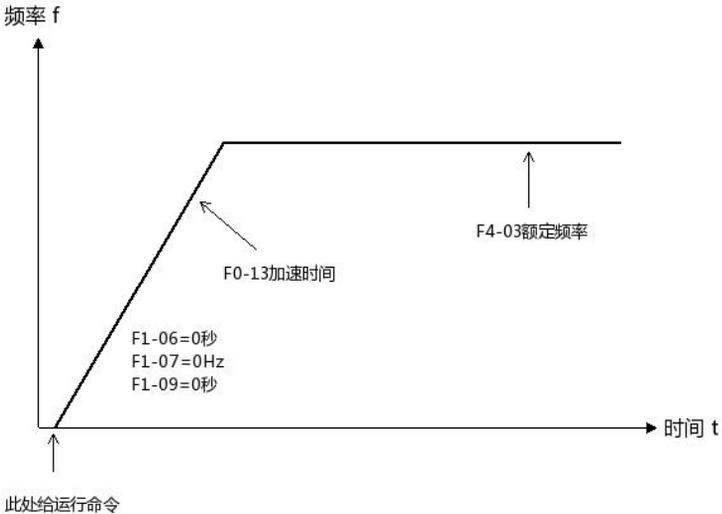


Figure 3-8 Direct Start without DC Braking Schematic

Speed Tracking Start

F1-00≠0, for speed tracking start, speed tracking is applicable to punch presses, fans, and other high-inertia load applications.

First, look at the startup curve process when F1-00=0:

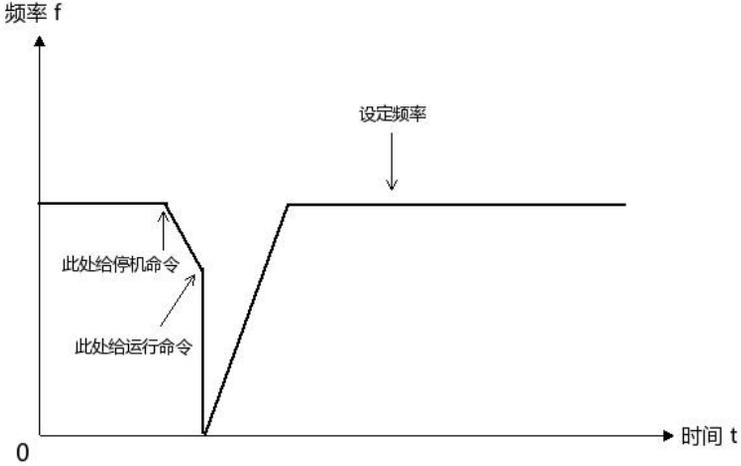


Figure 3-9 Startup Curve When Speed Search Function is Disabled

After giving the stop command, the inverter decelerates to a stop. If the frequency has not reduced to zero and a run command is given again, the frequency accelerates from zero to the set frequency.

When F1-00=1, it is for tracking start from the maximum frequency, and the frequency curve during the start-up process is as shown in the following figure:

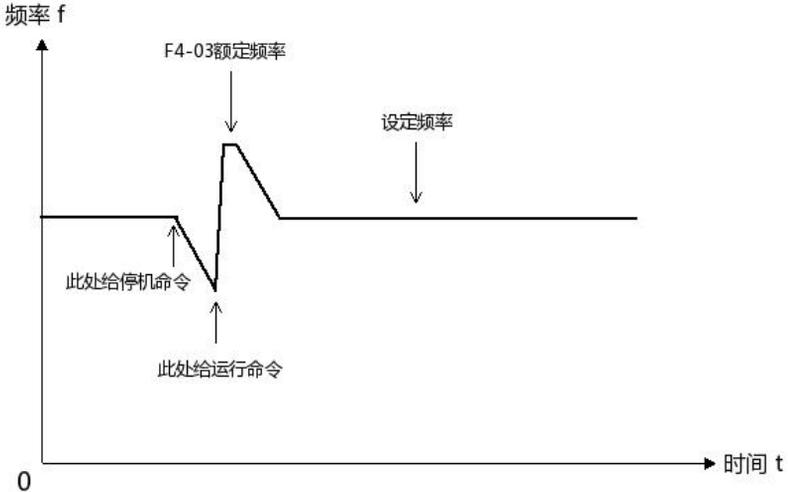


Figure 3-10 Tracking Start from Maximum Frequency

After giving the stop command, the inverter decelerates to a stop. If the frequency has not reduced to zero and a run command is given again, the frequency directly decreases from the rated frequency to the set frequency.

When F1-00=2, it is for tracking start from the current frequency, and the frequency curve during the start-up process is as shown in the following figure:

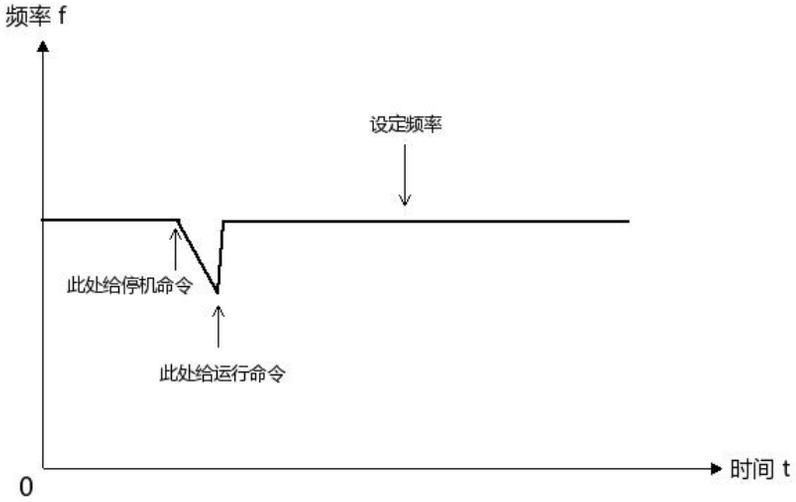


Figure 3-11 Start-up with Tracking from Current Frequency

After a stop command is given, the inverter decelerates to stop. If the frequency has not reduced to zero and a run command is given again, the frequency will directly reach the set frequency. When F1-00=3, it indicates start-up with tracking from the minimum frequency, and the frequency curve during the start-up process is as shown in the following figure:

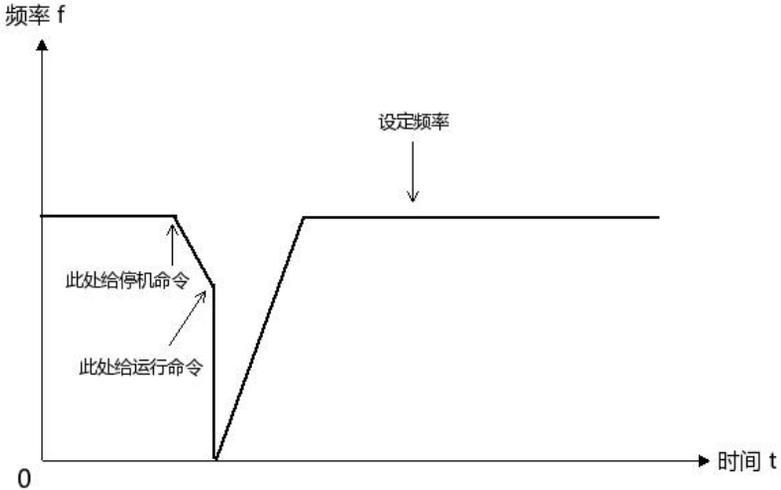


Figure 3-12 Start-up with Tracking from Minimum Frequency

This start-up process is consistent with when F1-00=0.

Stopping Methods

The inverter has two stopping modes: deceleration stop and free stop, which are selected by function code F1-12.

Deceleration Stop

F1-12=0 indicates deceleration stop. After a stop command becomes effective, the inverter reduces the output frequency according to the deceleration time, and stops after the frequency drops to 0.

The frequency curve is as follows:

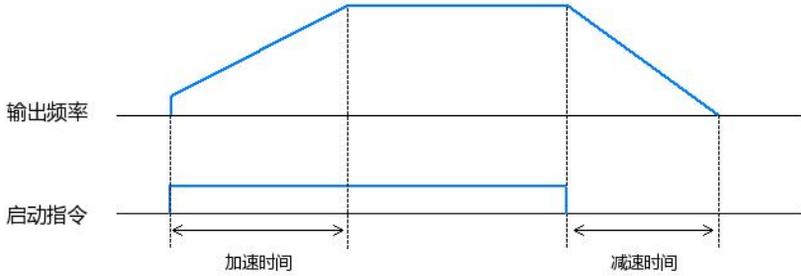


Figure 3-13 Deceleration stop output frequency curve

Free stop

After the stop command becomes effective, the inverter immediately terminates the output, at which point the motor stops freely according to mechanical inertia.

The frequency curve is as follows:

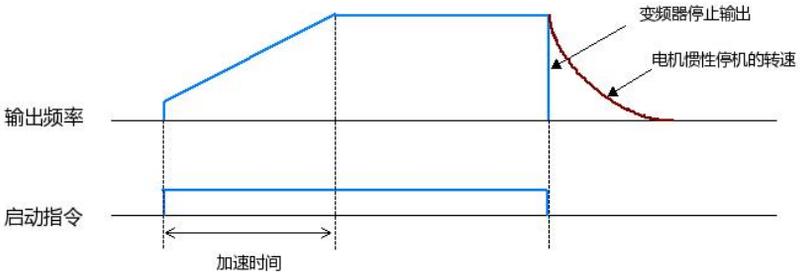


Figure 3-14 Free stop output frequency curve

Acceleration and deceleration time settings

Acceleration time refers to the time required for the inverter to accelerate from zero frequency to F4-03 (rated frequency) base frequency. Deceleration time refers to the time required for the inverter to decelerate from F4-03 (rated frequency) base frequency to zero frequency.

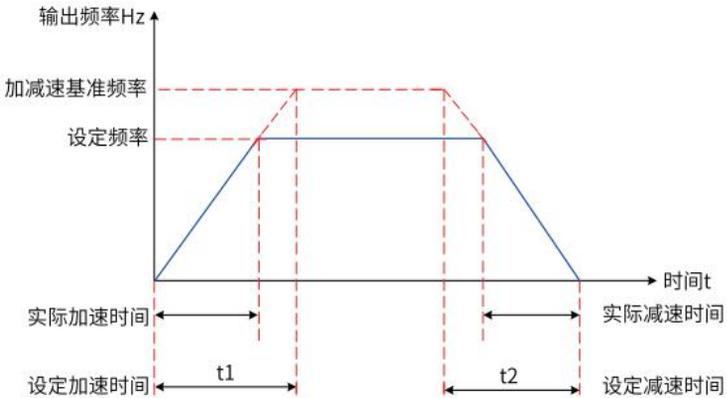


Figure 3-15 Acceleration and deceleration time diagram

The CM680 provides four sets of acceleration and deceleration times, and users can switch and select using digital input terminals DI (terminal input functions 8, 9). The four sets of acceleration and deceleration times are set through the following function codes:

First Group: F0-13 F0-14 Second Group: F7-03 F7-04
 Third Group: F7-05 F7-06 Fourth Group: F7-07 F7-08

Application Example:

Taking DI3 and DI4 as input switching terminals as an example, the following are the setup steps.

1. Set parameters F5-02 and F5-03 to select DI3 and DI4 terminals as input switching terminals.

Table 3-10 Input Terminal Control for Acceleration/Deceleration Switching

Function Code	Function Code Definition	Set Value	Description
F5-02	DI3 Terminal Function Selection	8	1-2 Segment Acceleration/Deceleration Switching
F5-03	DI4 Terminal Function Selection	9	3-4 Segment Acceleration/Deceleration Switching

2. By setting four groups of acceleration/deceleration parameters, set the corresponding acceleration/deceleration times.

Table 3-11 Input Terminal Settings for Acceleration/Deceleration Times

DI4 Terminal Status	DI3 Terminal Status	Acceleration and deceleration time settings
OFF	OFF	First Group Acceleration/Deceleration Time F0-13, F0-14
OFF	ON	Second Acceleration/Deceleration Time F7-03, F7-04
ON	OFF	Third Acceleration/Deceleration Time F7-05, F7-06
ON	ON	Fourth Acceleration/Deceleration Time F7-07, F7-08

3. When setting F0-12 (Speed Curve Time Unit), the decimal point position of the four groups of acceleration/deceleration times will change, and the corresponding acceleration/deceleration times will also change. This should be noted during actual use.

4. Set F1-20 (Automatic Acceleration/Deceleration Selection) to choose the inverter's acceleration/deceleration method.

- 0: Linear Acceleration and Deceleration
- 1: Automatic Acceleration, Linear Deceleration
- 2: Linear Acceleration, Automatic Deceleration
- 3: Automatic Acceleration and Deceleration
- 4: Automatic Acceleration, Deceleration Suppression

3.2 Motor Debugging Methods

3.2.1 Asynchronous Motor VF and VVC Control Debugging Methods

Both asynchronous motor VF control and VVC control can be used to drive asynchronous motors, and their debugging methods are almost identical; this section will introduce them together. The list of parameters related to asynchronous motor VF and VVC debugging is shown in Table3-12.

Table 3-12 List of Parameters Related to Asynchronous Motor VF and VVC Debugging

Parameter Number	Parameter Name
F4-03	M1 Rated Frequency
F4-04	M1 Rated Voltage

Parameter Number	Parameter Name
F2-04	M1 Multi-point VF Frequency Point 1
F2-05	Multi-point VF Voltage Point 1
F2-06	Multi-point VF Frequency Point 2
F2-07	Multi-point VF Voltage Point 2
F2-08	Multi-point VF Frequency Point 3
F2-09	Multi-point VF Voltage Point 3
F2-10	Slip Filter Time
F2-11	Slip Compensation Gain
F2-14	Vibration Compensation Gain
F3-29	Torque Filter Time
F7-37	Automatic Voltage Regulation

3.2.1.1 Basic Settings

The basic settings for asynchronous motor VF and VVC debugging mainly include the setting of motor nameplate parameters, which generally do not require motor parameter identification. The setup process is shown in Figure3-16.

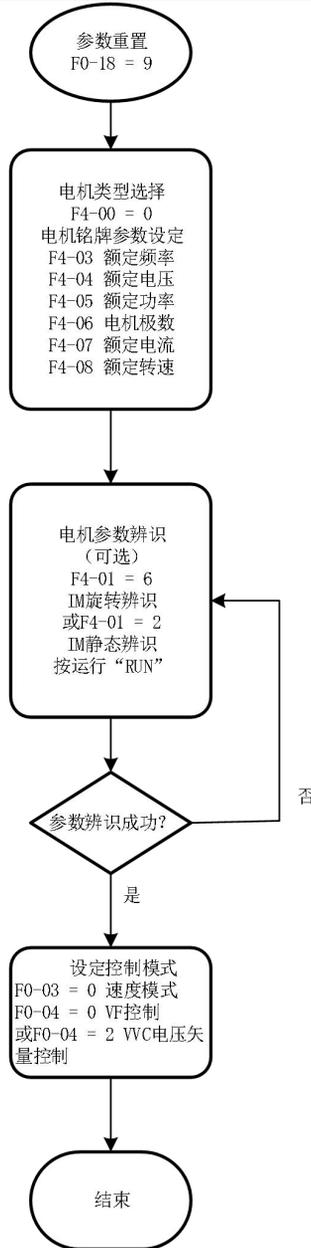


Fig.3-16 Basic Settings for Asynchronous Motor VF and VVC Tuning

The basic settings for VF and VVC are as follows:

- (1) Parameter reset; Set parameter F0-18 to 9 to restore the inverter parameters to factory settings.
- (2) Set motor nameplate parameters; set the parameters as shown in Table3-13:

Table3-13 Motor Nameplate Parameters

Parameter Number	Parameter Name
F4-00	IM/PM Motor Selection
F4-03	IM1 Rated Frequency
F4-04	IM1 Rated Voltage
F4-05	IM1 Rated Power
F4-06	IM1 Number of Poles
F4-07	IM1 Rated Current
F4-08	IM1 Rated Speed

(3) Perform motor parameter identification (optional, generally not required); Set parameter F4-01 to 6 (IM rotational identification) or 2 (IM static identification), press the run button to start the identification, and after calibration, the motor parameters shown in Table3-14 will be automatically updated.

Table3-14 Identified Motor Parameters

Parameter Number	Parameter Name
F4-10	IM1 No-load Current
F4-11	IM1 Stator Resistance
F4-12	IM1 Rotor Resistance
F4-13	IM1 Mutual Inductance
F4-14	IM1 Leakage Inductance

(4) Set the control mode to VF or VVC; Set F0-03 to 0 for speed mode, and set F0-04 to 0 to configure the control mode as VF control; if F0-04 is set to 2, it will be asynchronous motor VVC.

3.2.1.2 No-load Testing

After basic settings are completed, no-load testing can be performed. Operate the motor at different frequencies; if the motor vibrates, increase F2-14 'Oscillation Suppression Gain'.

3.2.1.3 Full-load Testing

After completing no-load testing, load testing can be conducted. If the motor's load capacity is insufficient, try increasing F2-01 'Torque Compensation Gain'. In the case of full load operation, if the actual motor speed is lower than the set speed, you can try increasing F2-11 "Slip Compensation Gain". Conversely, if the actual motor speed is higher than the set speed, you can try decreasing F2-11 "Slip Compensation Gain".

3.2.2 Permanent Magnet Motor VVC Commissioning Method

PMVVC is a sensorless vector control method for permanent magnet synchronous motors, and the parameters required for commissioning are shown in Table3-15:

Table3-15 List of Parameters Related to Permanent Magnet Motor VVC Commissioning

Parameter Number	Parameter Name
------------------	----------------

Parameter Number	Parameter Name
F1-01	Initial Position Identification Method
F1-36	PM Voltage Pulse Width
F1-37	PM High-Frequency Injection Frequency
F1-38	PM High-Frequency Injection Amplitude
F2-01	Torque Compensation Gain
F3-23	I/F Mode Current Command
F3-24	IF Switching Frequency 1
F3-25	IF Switching Frequency 2
F3-29	Torque Filter Time
F3-41	VVC High-Pass Frequency Compensation
F3-42	VVC Frequency Compensation Gain

3.2.2.1 Basic Settings

PMVVC basic setup includes motor nameplate parameter settings and motor parameter identification; the setup process is shown in Figure3-17.

The basic setup steps for PMVVC are as follows:

- (1) Parameter reset; Set parameter F0-18 to 9 to restore the inverter parameters to factory settings.
- (2) Set the motor nameplate parameters; set the parameters as shown in Table3-16:

Table3-16 Motor Nameplate Parameters

Parameter Number	Parameter Name
F4-00	Motor Type Selection
F4-03	M1 Rated Frequency
F4-04	M1 Rated Voltage
F4-15	PM rated power
F4-16	PM pole number
F4-17	PM rated current

Parameter Number	Parameter Name
F4-18	PM rated speed

(3) Perform motor parameter identification; Set parameter F4-01 to 5 (PM rotational identification) or 13 (PM static identification), press the run button to start the identification, and after the adjustment ends, the motor parameters shown in Table3-17 will be automatically updated.

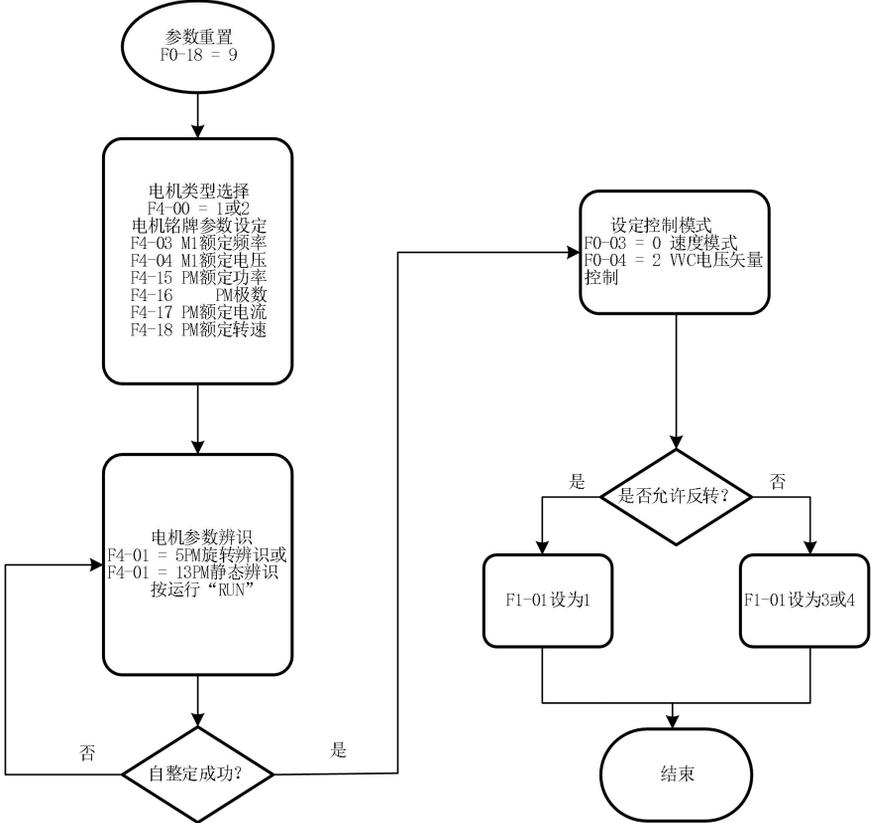


Fig.3-17 Basic Settings for VVC Tuning of Permanent Magnet Motor

Table3-17 Identified Motor Parameters

Parameter Number	Parameter Name
F4-20	PM Stator Resistance
F4-21	PM D-axis Inductance
F4-22	PM Q-axis Inductance

Parameter Number	Parameter Name
F4-23	PM Ke Parameter

In Table3-17, the Ke parameter refers to the effective value of the back EMF at 1000 RPM. The actual Ke value can be obtained during rotational identification, while static identification will estimate Ke based on motor parameters.

If an error occurs during identification or the identification results are not within a reasonable range, re-identification is required. The following table lists possible identification errors. When an error occurs, refer to Table3-18 for troubleshooting.

Table3-18 Identification-related Faults

Fault Code	Fault Description
E040 Motor Parameter Identification Error	Motor Parameter Identification Error
E142 No Feedback Current During Motor Parameter Identification	No Feedback Current During Identification
E143 Motor Phase Missing During Parameter Identification	Phase Missing During Identification

(4) Set the Control Method to PMVVC; Set F0-03 to 0 for Speed Mode, and set F0-04 to 2 to configure the control method as PMVVC.

(5) Initial Angle Identification Method Selection; Select the initial angle identification method via parameter F1-01 as shown in Table3-19.

Table3-19 Initial Position Identification Methods

F1-01	Description
0	Do Not Perform Initial Angle Identification
1	Positive Suction Method
3	Pulse Injection Method 1
4	Pulse Injection Method 2

If reverse start is not allowed, options 3 or 4 should be prioritized; if reverse start is allowed or if methods 3 and 4 are ineffective, the Positive Suction Method can be attempted.

3.2.2.2 No-load Testing

After basic settings are completed, no-load testing can be conducted. The no-load testing procedure for a permanent magnet motor VVC is shown in Figure3-18.

The no-load testing steps for a permanent magnet motor VVC are as follows:

(1) Start the motor and run it to 1/2 rated speed. If overcurrent occurs during startup, handle it according to the F1-01 setting: if F1-01=1, the current loop bandwidth can be reduced; If F1-01=3 or 4, you can reduce F1-36 “PM voltage pulse width”. When reverse operation is not allowed, if the motor reverses, you can increase F1-36 “PM voltage pulse width”. If the no-load current is too high (exceeding 60% of the rated current), you can increase “F2-01 torque compensation gain”.

(2) Control the motor to run at the rated speed

If the motor exhibits periodic low-frequency oscillation, you can try increasing F3-42 “VVC frequency compensation gain”, or increasing F3-41 “VVC frequency compensation high-pass”. If the motor experiences severe vibration, try reducing F3-42 “VVC frequency compensation gain”, or

reducing F3-41 “VVC frequency compensation high-pass”.

(3) Control the motor to run at the maximum speed

If loss of control occurs during acceleration, try increasing F3-42 “VVC frequency compensation gain”, or increase the carrier frequency (parameter F0-15, the carrier frequency generally needs to be more than 10 times the highest output frequency).

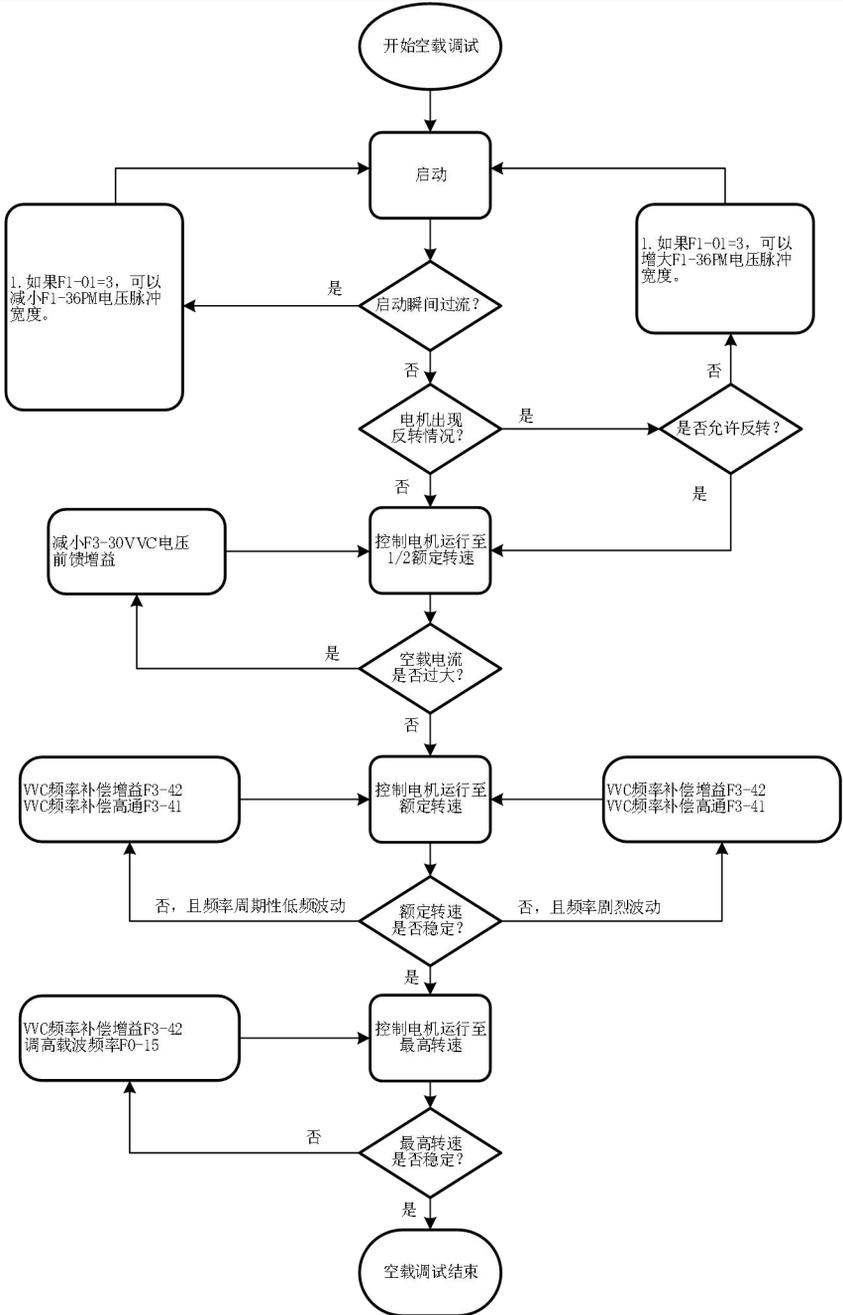


Fig.3-18 Permanent Magnet Motor VVC No-load Debugging Flowchart

3.2.2.3 Full Load Debugging

After the no-load debugging is completed, load testing can be conducted. The permanent magnet motor VVC load debugging process is shown in Fig.3-19.

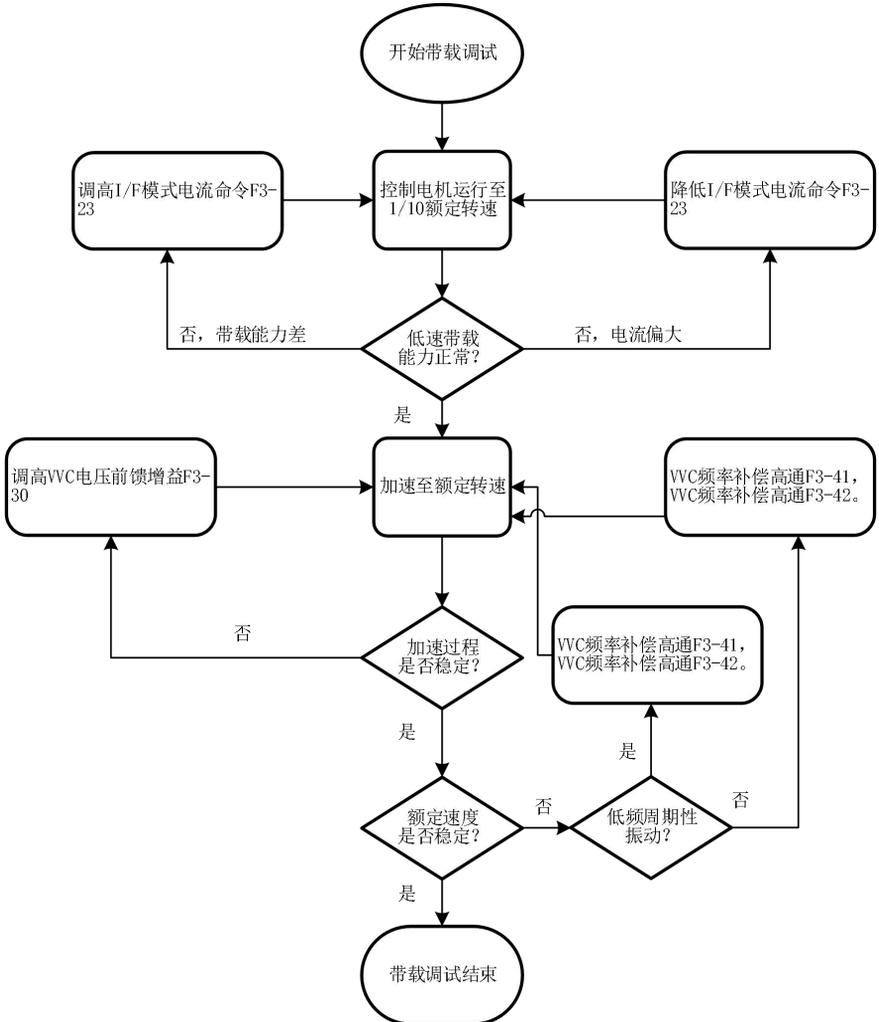


Fig.3-19 Permanent Magnet Motor VVC Load Debugging Flowchart

By default, I/F control is used at 1/10 rated speed. If I/F control is not required, set F3-25 to zero.

The full-load commissioning steps are as follows:

(1) Low-speed load capacity adjustment; Run the motor to 1/10 of the rated speed. If the motor's load-carrying capacity is insufficient, increase F3-23 "I/F mode current command". If the low-frequency current is too high, reduce F3-23 "I/F mode current command".

(2) Load testing during acceleration; Accelerate from 1/10 of the rated speed to the rated speed. If instability occurs, try increasing F3-30 "VVC voltage feedforward gain".

(3) Rated speed load testing; If the motor exhibits periodic low-frequency oscillation, you can try increasing F3-41 "VVC frequency compensation high-pass" or F3-42 "VVC frequency compensation

gain”; If the motor experiences severe vibration, try reducing F3-41 “VVC frequency compensation high-pass” or F3-42 “VVC frequency compensation gain”.

3.2.3 Asynchronous Motor and Permanent Magnet Motor SVC Commissioning Methods

3.2.3.1 SVC Introduction

SVC is a sensorless vector control method that can perform speed or torque control on asynchronous motors, synchronous motors, and synchronous reluctance motors. The SVC commissioning parameters are shown in Table3-20.

Table3-20 SVC Commissioning Parameters Table

Parameter Number	Parameter Name
F3-00	Speed loop PI parameter auto-calculation function enable bit (bit 0 of F3-00, set to 1 to enable)
F3-01	ASR1/2 Switching Frequency
F3-02	Zero Speed Bandwidth
F3-03	ASR1 Low-Speed Bandwidth
F3-04	ASR2 High-Speed Bandwidth
F3-05	ASR Zero Speed Gain
F3-06	ASR Zero Speed Integral
F3-07	ASR1 Low-Speed Gain
F3-08	ASR1 Low-Speed Integral Time
F3-09	ASR2 High-Speed Gain
F3-10	ASR2 High-Speed Integral Time
F3-14	ASR Output Filter Time
F3-23	I/F Mode Current Command
F3-26	Weak Magnetism Proportion Coefficient
F3-27	Weak Magnetism Integral Coefficient
F4-09	Inertia Per Unit Value
L2-09	Dead Time Compensation 4 Slope

3.2.3.2 Basic Settings

The basic settings for induction motor SVC include: setting the motor nameplate parameters, motor parameter identification, etc., as shown in Figure3-20.

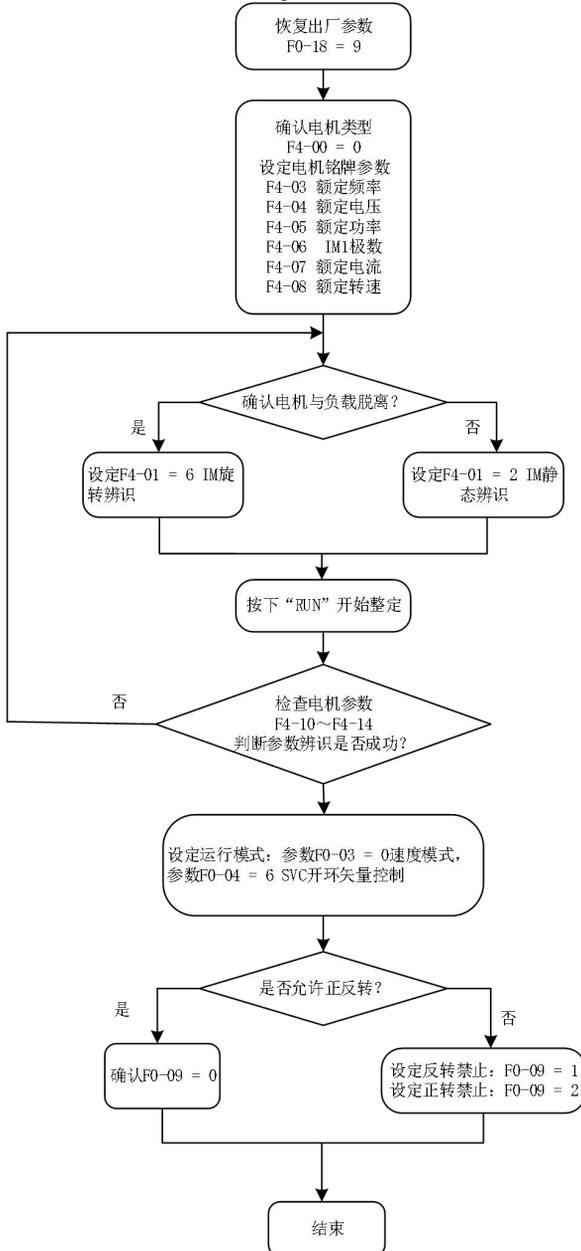


Figure3-20 Induction Motor SVC Basic Settings Flowchart

(1) Parameter Reset

Set parameter F0-18 to 9 to restore the inverter parameters to factory settings.

(2) Select Motor Type

Set parameter F4-00 = 0 for an induction motor.

Set the motor parameters according to the actual motor nameplate parameters as shown in Table3-21:

Table3-21 Motor Nameplate Parameters

Parameter Number	Parameter Name
F4-03	IM1 Rated Frequency
F4-04	IM1 Rated Voltage
F4-05	IM1 Rated Power
F4-06	IM1 Number of Poles
F4-07	IM1 Rated Current
F4-08	IM1 Rated Speed

(4) Perform Motor Parameter Identification

Confirm that the motor is disconnected from the load. In the disconnected state, it is recommended to set F4-01 = 6 for rotating parameter identification; If disconnection is not possible, set F4-01 = 2 for static parameter identification. Press the “RUN” button to start the identification process. After the motor parameter identification is completed, the motor parameters shown in table3-22 will be automatically updated.

Table3-22 Motor Parameters After Identification

Parameter Number	Parameter Name
F4-10	IM1 No-load Current
F4-11	IM1 Stator Resistance
F4-12	IM1 Rotor Resistance
F4-13	IM1 Mutual Inductance
F4-14	IM1 Leakage Inductance

The above parameters refer to the values per phase. If an error occurs during identification or the identification results are not within a reasonable range, re-identification is required.

Basic settings for permanent magnet motor SVC include motor nameplate parameter settings and motor parameter identification, as shown in Figure3-21.

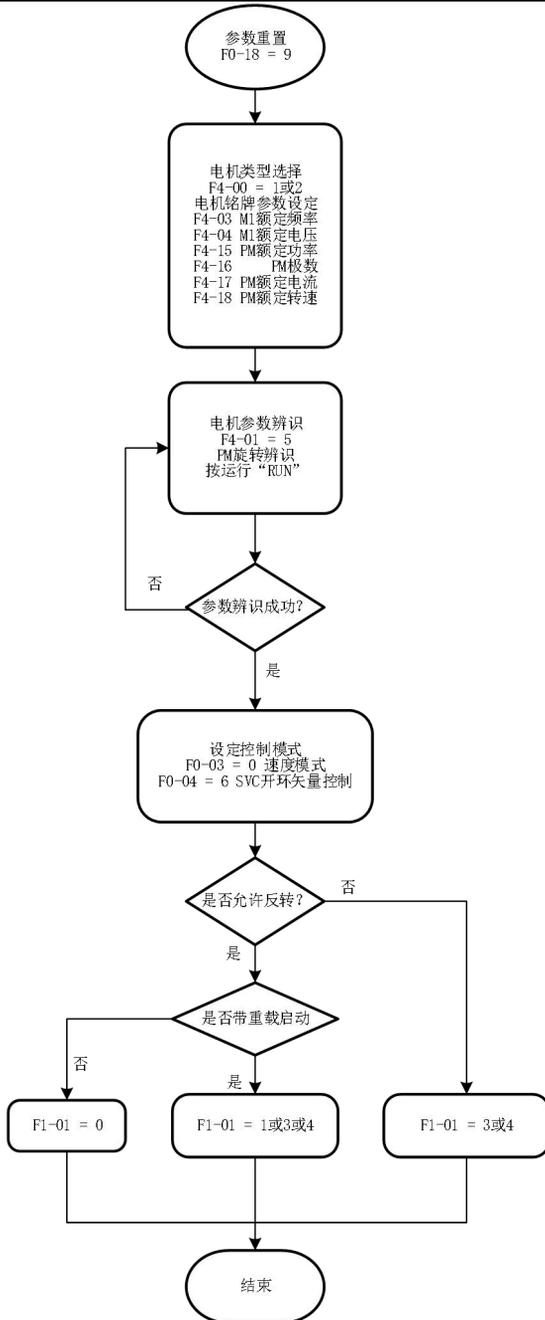


Figure3-21 Basic Setting Flowchart for Permanent Magnet Motor SVC

(1) Parameter Reset

Set parameter F0-18 to 9 to restore the inverter parameters to factory settings.

(2) Select Motor Type

When setting parameter F4-00 = 1, it is for surface-mounted synchronous motors, corresponding to $L_d = L_q$; When F4-00 = 2, it is for interior permanent magnet synchronous motors, corresponding to $L_d \neq L_q$.

(3) Set the motor nameplate parameters according to Table3-23:

Table3-23 Motor Nameplate Parameters

Parameter Number	Parameter Name
F4-03	M1 Rated Frequency
F4-04	M1 Rated Voltage
F4-15	PM rated power
F4-16	PM pole number
F4-17	PM rated current
F4-18	PM rated speed

(4) Perform Motor Parameter Identification

Confirm that the motor is disconnected from the load. In the case of disconnection, it is recommended to set F4-01 = 5 for rotational parameter identification. Press the “RUN” button to start the identification process. After the motor parameter identification is completed, the motor parameters shown in Table3-24 will be automatically updated.

Table3-24 Identified Motor Parameters

Parameter Number	Parameter Name
F4-20	PM Stator Resistance
F4-21	PM D-axis Inductance
F4-22	PM Q-axis Inductance
F4-23	PM Ke Parameter (V/krpm)
F4-26	PM Pole Angle (Degrees)

3.2.3.3 No-Load Testing

After basic settings are completed, no-load testing can be conducted. The SVC no-load testing procedure is shown in Figure3-22.

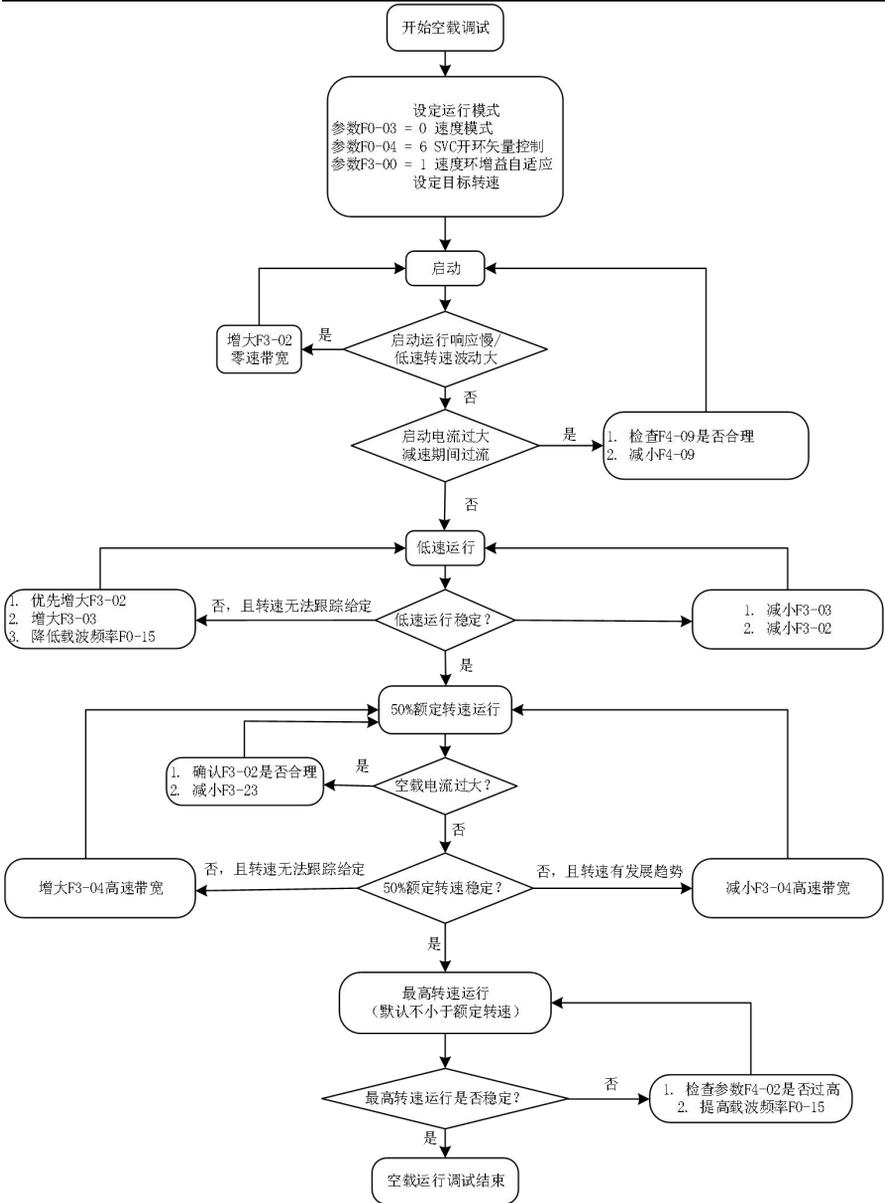


Figure3-22SVC No-Load Testing Flowchart

3.2.3.4 Load Testing

After no-load testing is completed, load testing can be conducted. The SVC load testing procedure

is shown in Figure3-23.

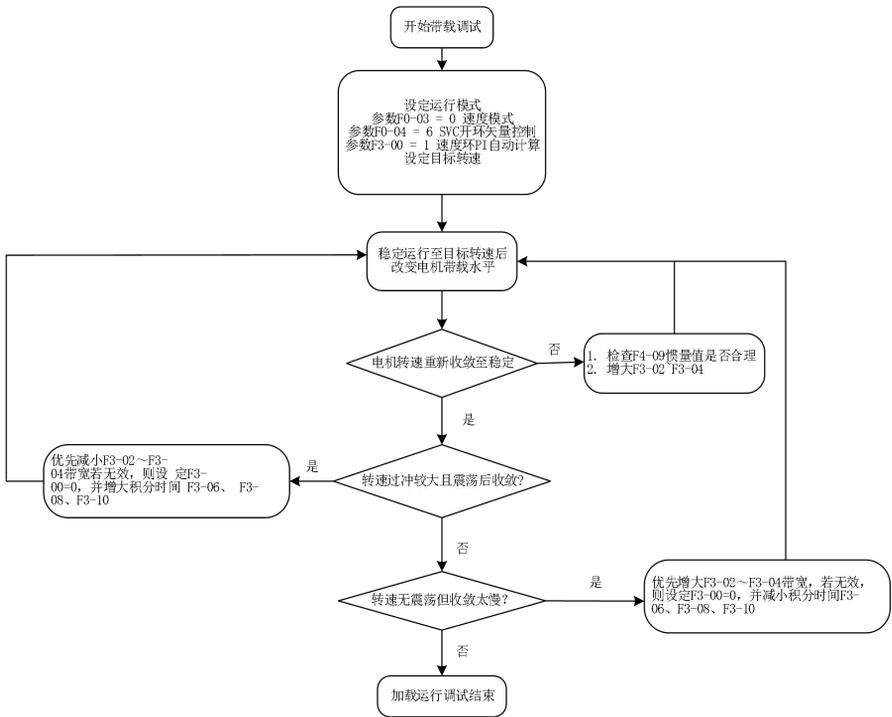


Figure3-23SVC Load Testing Flowchart

3.3 Input and Output Terminal Descriptions

3.3.1 Digital Input Terminal Functions (DI)

The CM680 series inverter is equipped with 8 multifunctional digital input terminals, among which HDI8 can be used as a high-speed pulse input terminal. Each DI terminal can select any one of the DI terminal functions.

Table 3-25 DI Terminal Function Parameters List

Parameter	Terminal Function Selection	Range	Factory value
F5-00	DI1 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-01	DI2 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-02	DI3 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-03	DI4 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-04	DI5 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-05	DI6 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-06	DI7 Terminal Function Selection	Range: 0~94	Factory value: 0
F5-07	HDI8 Terminal Function Selection	Range: 0~94	Factory value: 0

Table 3-26 Detailed Explanation of DI Terminal Function Selection

Set Value	Function	Description
0	No function	Even if there is a signal input to the inverter, it will not operate; unused terminals

Set Value	Function	Description
		can be set to no function to prevent accidental operation.
1	Multi-speed/Multi-point Position 1	A total of 16 segments can be set through the combination of states of four digital input terminals, detailed combinations are shown below.
2	Multi-speed/Multi-point Position 2	A total of 16 segments can be set through the combination of states of four digital input terminals, detailed combinations are shown below.
3	Multi-speed/Multi-point Position 3	A total of 16 segments can be set through the combination of states of four digital input terminals, detailed combinations are shown below.
4	Multi-speed/Multi-point Position 4	A total of 16 segments can be set through the combination of states of four digital input terminals, detailed combinations are shown below.
5	Fault Reset	External fault reset function. It has the same function as the STOP key on the digital operator.
6	Jog	Jog operation, which has the same function as the JOG key on the keyboard. The jog operation set frequency, acceleration and deceleration times refer to F7-00, F7-01, F7-02.
7	Speed Hold	During the inverter's acceleration or deceleration process, if the external terminal status meets the speed hold conditions, the inverter maintains its current speed. When the speed hold condition is canceled, the inverter resumes accelerating or decelerating to the set value.
8	1-2 segment acceleration/deceleration switching	First and second acceleration/deceleration time switching, by default using the first and fourth acceleration/deceleration times, which are switched through the first and fourth acceleration/deceleration switching frequency (F1-15). Selecting multi-function input terminals, the first and second acceleration/deceleration times can be switched by changing the terminal status.
9	3-4 segment acceleration/deceleration switching	Third and Fourth Acceleration/Deceleration Time Switching, Select Multi-function Input Terminal, you can switch between the third and fourth acceleration/deceleration times by changing the terminal status.
10	External Fault (F1-20)	External Fault Input (External Fault), when a multi-function digital IO input is detected as an external fault, the inverter will decelerate and stop according to the emergency or forced shutdown deceleration method (F1-23), displaying EF on the digital operator until the external terminal status returns to normal, after which the inverter can resume operation through fault reset (RESET).
11	Base Block	Base Block (Base Block) Input, when a multi-function digital IO input is detected as base block, the inverter immediately stops output, and the motor freely decelerates to a stop, displaying B.B on the digital operator.
12	Stop Output	Output Stop, when the set multifunctional digital input terminal is valid, the inverter will immediately stop output, and the motor will decelerate to a stop freely. The inverter enters output wait mode until the input IO signal returns to normal, at which point the inverter restarts to the current set frequency.
13	Automatic Acceleration/Deceleration Prohibited	To cancel automatic acceleration/deceleration settings, set the automatic acceleration/deceleration (F1-20) to non-linear acceleration/deceleration. By switching the state of the multifunctional input IO port, you can switch between automatic acceleration/deceleration and linear acceleration/deceleration modes.
14	No function	
15	A11 Frequency Command Input	The speed command comes from A11. When the set multifunctional input terminal status is valid, the inverter's frequency command source is forced to A11. At the same time, if other AI command sources are set, A11 has the highest priority.
16	A12 Frequency Command Input	Speed command comes from A12, when the set multifunctional input terminal status is valid, the inverter's frequency command source is forced to A12.
17	A13 Frequency Command Input	Speed Command comes from A13, when the set multi-function input terminal status is valid, the inverter frequency command source is forcibly set to A13.
18	Deceleration stop (F1-20)	Forced shutdown, when the set multifunctional input terminal status is valid, the inverter will decelerate and stop according to the emergency or forced shutdown deceleration method (F1-23).

Set Value	Function	Description
19	Frequency Increase External Command	Frequency increment command, the frequency command source (F0-06 = 3) needs to be set to external UP/DOWN terminals, when the set multifunctional input terminal status is valid, the inverter's frequency setting will increase by one unit, if the input terminal status remains continuously valid, the frequency command will incrementally increase to the maximum frequency command value based on the settings for the external terminal UP/DOWN key mode (F5-09) and the external terminal UP/DOWN key acceleration/deceleration rate (F5-10).
20	External frequency decrease command	Frequency decrement command, the frequency command source (F0-06 = 3) must be set to external UP/DOWN terminals, when the designated multifunctional input terminal status is valid, the inverter's frequency setting will decrease by one unit. If the input terminal remains valid, the frequency command will decrement to the minimum frequency command value according to the settings for the external terminal UP/DOWN key mode (F5-09) and the external terminal UP/DOWN key acceleration/deceleration rate (F5-10).
21	PID function disabled	PID function cancellation, when the set multifunctional input terminal status is valid, the PID function becomes invalid.
22	Clear counter	Counter reset, when the designated multifunctional input terminal status is valid, the inverter will reset the current display count to zero. When the input terminal status switches to invalid, the inverter will resume counting.
23	Input Count (MI6)	When the status of the DI6 input terminal is valid (once the current software limits it to only the DI6 input terminal), the count value displayed on the digital operator will automatically increase by 1. The reset judgment value for the count value is determined by the final count value reaching the set value (L6-00).
24	External Forward Jog	The operation command source needs to be set to external terminals (F0-05 = 1). When the set multifunctional input terminal status is valid, the inverter will perform forward jogging operation. When executing the JOG command in torque mode, the inverter forcibly switches to speed mode. After the JOG command disappears, it automatically returns to speed mode.
25	External Reverse Jog	The operation command source needs to be set to external terminals (F0-05 = 1). When the set multifunctional input terminal status is valid, the inverter will perform reverse jogging operation. When executing the JOG command in torque mode, the inverter forcibly switches to speed mode, and after the JOG command disappears, it automatically returns to speed mode.
26	Torque/Speed Mode	Torque and Speed Mode Switching, when the set multifunctional input terminal status is valid, the inverter will operate in torque mode; otherwise, it will operate in speed mode.
27	Speed Loop 1/2 Switching	ASR1/ASR2 Switching, switching of speed loop control parameters for low-speed and high-speed zones, when the set multifunctional input terminal status is valid, the inverter will perform speed control using the high-speed zone control parameters (ASR2), otherwise, it will use the low-speed zone control parameters (ASR1).
28	External Fault Free Stop	Emergency Stop, when the set multifunctional input terminal status is valid, the inverter immediately stops output and displays EF1 on the Digital Operator, the motor freely decelerates to a stop. When the external input terminal status returns to normal, a RESET must be performed to clear the fault before operation can resume.
29	Motor Y-connection confirmation signal	Motor coil star connection confirmation, when operating in V/F mode, if the state of the set multifunctional input terminal is effective, the inverter operates according to the first set of V/F curves.
30	Motor delta connection confirmation signal	Motor coil delta connection confirmation, when operating in V/F mode, if the state of the set multifunctional input terminal is effective, the inverter operates according to the second set of V/F curves.
31	High torque compensation amount	Torque command bias, torque command bias source (FE-05) set to 3 (torque command bias source is external terminal), multifunctional input terminal set to 31, when the multifunctional input terminal status is effective, the high torque command bias compensation value is high torque command compensation (FE-07), multifunctional input terminal set to 32, when the multifunctional input terminal status is effective, the medium torque command bias compensation value is medium torque command compensation (FE-08), multifunctional input terminal set to 33, when the multifunctional input terminal status is effective, the low torque command bias compensation value is low

Set Value	Function	Description
		torque command compensation(FE-09).
32	Intermediate Torque Compensation	Please see the setting value is 31.
33	Low Torque Compensation	Please see the setting value is 31.
34	Multi-speed/Position Switching	Terminal selection for multi-speed and multi-position function switching, when the set multifunctional input terminal status is valid, the terminal set for multi-speed/multi-point position function is used to select multi-position commands; otherwise, it is used to select multi-speed commands.
35	Internal Positioning Enable	Enable single-point positioning, when the set multifunctional input terminal status is valid, the inverter performs internal single-point positioning according to the encoder's internal positioning position (FC-20), supporting only the FOC/PG control mode.
36	Multi-point Position Input	When the set multifunctional input terminal status is valid, the inverter writes the current position information into the corresponding multi-segment position command parameter, which is used for manually calibrating the multi-segment position command parameter settings.
37	Pulse Input Position Control	Enable full-range position control pulse command input, when the inverter frequency command source is selected as pulse input (F0-06 = 4, 5), if the set multifunctional input terminal status is valid, the pulse input on the PG card serves as the position command, it is recommended to set the APR feedforward gain (FC-25) to 0.
38	Prohibit Writing to EEPROM	Prohibit writing to EEPROM, when the set multifunctional input terminal status is valid, parameter modifications will not be saved to EEPROM, and will not be retained after power loss.
39	Torque Command Direction Switching	Torque command direction, applicable to torque control mode, when the torque command source is AI1/AI2/AI3, if the set multifunctional input terminal status is valid, the torque command automatically converts to a negative value.
40	Motor Free Stop	Forced free stop, during the operation of the inverter, when the set multifunctional input terminal status is valid, the inverter immediately stops output, and the motor coasts to a stop.
41	Manual Mode Enable	HAND switch, when the set multifunctional input terminal status is valid, the inverter switches to HAND mode, and the frequency command source and operation command source switch to being determined by parameters L1-00 and L1-01. When the multi-function input terminal status is invalid, the inverter will stop (it will not be able to start in standby mode).
42	Automatic mode enable	When AUTO switching is enabled, if the set multi-function input terminal status is valid, the inverter switches to AUTO mode, and the frequency command source and operation command source switch to those determined by parameters F0-06 and F0-05. When the multi-function input terminal status is invalid, the inverter will stop (it will not be able to start in standby mode).
43	Enable resolution switching	Enable resolution switching, when the set multi-function input terminal status is valid, the frequency base value (maximum inverter frequency) for analog input frequency calculation switches from F4-02 to F5-40.
48	Mechanical gear ratio switching	Mechanical gear ratio switching, when the set multifunctional input terminal status is valid, the mechanical gear ratio switches to the second group (switching from F4-36, F4-37 to F4-38, F4-39).
49	Inverter Enable	Inverter enable, by default, the inverter enable is valid, allowing the inverter to control start and stop. When the inverter is not enabled, the run command is invalid. If the inverter enable fails during operation, the motor will freely decelerate to a stop. Switching the set multifunctional input terminal status can switch the inverter enable status. Once the multifunctional input terminal is configured as the inverter enable, the inverter can only be started by setting the multifunctional input terminal status to valid.
50	Slave dEB (instant stop without stopping) action input	Slave station dEb action input, when the master station performs a dEb action, this information is input to notify the slave station to also perform a dEb action, ensuring that the slave station can stop simultaneously.

Set Value	Function	Description
53	CANopen Quick Stop Trigger	CANopen rapid stop trigger, when controlled via CANopen, if the set multifunctional input terminal is effective, the inverter's operating state is forcibly switched to rapid stop.
56	Local/Remote Switching	LOCAL/REMOTE switching selection, when LOCAL/REMOTE actions are selected and set to LOCAL/REMOTE switching (L1-02 is not 0), the higher-level machine will display the LOC/REM status; if the set multifunctional input terminal is effective, the inverter operates in LOCAL mode, otherwise, REMOTE mode.
70	Auxiliary Frequency Forced to 0	Auxiliary frequency forced to 0, when the auxiliary frequency function is enabled (auxiliary frequency source F0-07 is not 0), if the set multifunctional input terminal is effective, the auxiliary frequency is forced to 0; if PID is the main frequency, PID will continue to operate.
71	PID function disabled, PID output forced to 0	PID function disabled, PID output forced to 0, auxiliary frequency function enabled (auxiliary frequency source F0-07 is not 0), and when using the PID function, if the configured multi-function input terminal is effective, the PID function stops, the integral value is reset to zero, and the PID output is cleared.
72	PID function disabled, PID maintains current output level	PID function disabled, PID maintains previous output value, auxiliary frequency function enabled (auxiliary frequency source F0-07 is not 0), and when using the PID function, if the configured multi-function input terminal is effective, the PID function stops, and the PID maintains the previous output.
73	Force PID integral gain to 0	Force PID integral gain to 0, no integration action, if the configured multi-function input terminal is effective, the PID continues to operate, but the integrator stops working, and the integrator output is cleared.
74	Invert PID feedback	Invert PID feedback, when the set multifunctional input terminal is effective, the sign of the PID feedback value is reversed; if the PID feedback is positive, it is converted to negative, and if the PID feedback is negative, it is converted to positive.
83	Select bit0 for multiple induction motors	Multiple (inductive) motor selection, when the set multifunctional input terminal is effective, switch different motor parameters according to the terminal status combination, the operating frequency and V/F curve parameters corresponding to different motor parameters need to refer to the basic parameter group.
84	Multiple Induction Motor Selection Bit 1	Same as Above.
86	Diameter Reset	Diameter reset, under tension control mode (tension control mode FB-00 is not 0), when the set multifunctional input terminal is effective, the current diameter (FB-38) is reset to the initial diameter or empty roll diameter.
87	Initial Diameter Selection 1	Initial diameter selection, under tension control mode (tension control mode FB-00 is not 0), when the set multifunctional input terminal is effective, the current diameter (FB-38) can be reset to the initial diameter (FB-30, FB-31).
88	Initial Diameter Selection 2	Same as Above.
89	Tension Control PID Integral Reset	Tension PID control integral reset, under tension control mode (tension control mode FB-00 is not 0), when the designated multifunctional input terminal is effective, the integrator output is cleared.
90	Diameter Calculation Hold	Winding diameter calculation hold, when the designated multifunctional input terminal is effective, stop updating the winding diameter calculation.
91	Diameter Mode Selection (0: Winding In 1: Winding Out)	Drum Mode Selection, when the designated multi-function input terminal is effective, the drum mode switches to winding out; otherwise, it is winding in.
92	Disable Tension PID	Disable tension PID, when the designated multifunctional input terminal is effective, disable tension PID function.
93	Pause Tension PID	Pause tension PID, when the designated multifunctional input terminal is effective, pause tension PID function.
94	Automatic Diameter Switching	Automatic winding diameter switching, when the designated multifunctional input terminal is effective, automatic switching of winding diameter.

3.3.2 Digital Output Terminal Functions (DO)

The CM680 series inverter is equipped with 2 multi-function digital output terminals and two multi-function relay output terminals.

Table 3-27 List of Parameters Related to D0 Terminal Function

F6-00	RLY1 terminal function selection	Range: 0~76	Factory value: 11
F6-01	RLY2 terminal function selection	Range: 0~76	Factory value: 1
F6-02	DO1 Terminal Function Selection	Range: 0~76	Factory value: 0
F6-03	DO2 Terminal Function Selection	Range: 0~76	Factory value: 0
F6-04	DO Terminal Valid Logic	Range: 0000H~FFFFH	Factory value: 0
F6-05	Source of DO Output AI	0: AI1 1: AI2 2: AI3	Factory value: 0
F6-06	DO Output AI Upper Limit Value	-100.00%~100.00%	50.00
F6-07	DO Output AI Lower Limit Value	-100.00%~100.00%	10.00
F6-08	DO Action Frequency	0.00~599.00Hz	0.00

Table 3-28 Detailed Description of DO Terminal Function

Set Value	Function	Description
0	No function	Disable multi-function digital output function
1	Inverter running	Inverter running, this terminal output is valid.
2	Reach set frequency	Reach set frequency, when the inverter output frequency deviation from the set frequency is within a certain range ($\pm 2\text{Hz}$), this terminal output is valid.
3	Reach frequency 1 detection value	Reach frequency 1 detection value, when the inverter output frequency deviation from the frequency 1 detection value (F6-27) is less than the frequency 1 amplitude (F6-28), this terminal output is valid.
4	Reach frequency 2 detection value	When the inverter output frequency deviates from the frequency arrival 2 detection value (F6-29) by less than the frequency arrival 2 amplitude (F6-30), this terminal is valid.
5	Zero Speed Command Running	This terminal is valid when the frequency command is 0 during inverter operation.
6	Zero Speed Command Operation (Including STOP)	This terminal is valid when the inverter frequency command is 0 (including when the inverter is stopped).
7	Over Torque 1	When the inverter detects an over torque condition (over torque action method, detection threshold, and detection time refer to parameters F9-36 ~ F9-38), this terminal is valid.
8	Over Torque 2	When the inverter detects an over torque (for over torque action method, detection threshold, and detection time, refer to parameters H3-00 ~ H3-02), this terminal is active.
9	Inverter Ready	When the inverter has no fault (including during stop and operation), this terminal is active.
10	Low Voltage Warning	When the inverter experiences DC bus under-voltage (including during stop and operation, and when the DC bus voltage is below the low voltage threshold L2-18), this terminal is active.
11	Fault Indication	This terminal is active when the inverter has a fault (excluding undervoltage during shutdown, B.B. fault, dEb fault).
12	Brake release	This terminal is effective when the inverter operating frequency is not 0 or greater than the motor zero-speed threshold (F6-09).
13	Overtemperature warning	This terminal is effective when the inverter detects an overtemperature warning for the IGBT or bus capacitor.
14	Software Brake	This terminal is effective when the inverter's discharge resistor switch actuates.

Set Value	Function	Description
	Action Indication	
15	PID feedback abnormality	This terminal is effective when the inverter detects that the deviation between the PID setpoint and feedback exceeds the set threshold (FA-51) and persists for the duration (FA-52).
16	Excessive slip	This terminal is effective when the inverter detects an excessive slip fault.
17	Count Value Reached Not Reset	When the inverter executes an external counter, if the count value equals the set value of parameter L6-01, this terminal is active. If the setting value of parameter L6-01 > the setting value of parameter L6-00, this terminal output is invalid.
18	Count Value Resets to Zero	When the inverter executes an external counter, if the count value equals the setting value of parameter L6-00, this terminal output is valid.
19	Base Block State	When the inverter stops output due to base block (B.B.), this terminal outputs effectively.
20	Warning Indication	When the inverter detects a warning, this terminal outputs effectively.
21	Overvoltage Warning	When the inverter detects that the bus voltage exceeds the set overvoltage warning threshold (0.9 times the overvoltage threshold, no warning state output), this terminal outputs effectively.
22	Overcurrent Stall Warning	When the inverter detects an overcurrent slip prevention warning, this terminal output is valid.
23	Overvoltage Stall Warning	When the inverter detects an overvoltage slip prevention warning, this terminal output is valid.
24	Inverter Operation Source	When the inverter operation command source is not the keyboard (F0-05 is not 0), this terminal output is valid.
25	Forward Command	When the inverter's direction command is forward, this terminal output is valid.
26	Reverse Command	When the inverter's direction command is reverse, this terminal output is valid.
29	Over Frequency	When the actual output frequency of the inverter exceeds the DO action frequency (F6-08), this terminal output is valid.
30	Under Frequency	When the actual output frequency of the inverter is less than the DO action frequency (F6-08), this terminal outputs a valid signal.
31	Motor Star Connection Switch Command	Motor Star Connection Switch Command, set the multi-function digital input terminal for star connection confirmation signal (DIx = 29) and delta connection confirmation signal (DIx = 30), set the motor star-delta switching enable (F7-48 = 1). When the inverter output frequency is below the motor star-delta switching frequency (F7-47) setting minus 2Hz and the duration is greater than the motor star-delta switching delay (F7-49), this terminal outputs a valid signal.
32	Motor Delta Connection Switching Command	To switch the motor connection from star to delta, set the multifunction digital input terminal for star connection confirmation signal (DIx = 29) and delta connection confirmation signal (DIx = 30), enable the motor star-delta switching (F7-48 = 1). When the inverter output frequency is higher than the motor star-delta switching frequency (F7-47) setting plus 2Hz and the duration exceeds the motor star-delta switching delay (F7-49), this terminal becomes active.
33	Zero Frequency Operation	When the inverter is running and the output frequency is zero, this terminal becomes active.
34	Output zero frequency (including STOP)	This terminal is valid when the inverter output frequency is zero or stopped.
35	Fault output selection 1	This terminal is valid when the inverter encounters a fault set by U0-10.
36	Fault output selection 2	This terminal is valid when the inverter encounters a fault set by U0-11.
37	Fault output selection 3	This terminal is valid when the inverter encounters a fault set by U0-12.
38	Fault output	This terminal is valid when the inverter encounters a fault set by U0-13.

Set Value	Function	Description																				
	selection 4																					
39	Position reached	This terminal is valid when the position is reached in the inverter's positioning mode.																				
40	Target frequency reached	This terminal is valid when the inverter output frequency reaches the set frequency (including stop and frequency command of 0).																				
41	Multi-point Positioning Arrival	When the position error of multi-point positioning of the inverter is less than the allowable position arrival error range of the encoder (FC-21), this terminal output is valid.																				
42	Mechanical Brake Release	It is necessary to set the DO action frequency (F6-08) and the brake frequency (L4-00). When the brake release is detected, this terminal output is valid.																				
43	Motor Zero Speed	When using a PG card, if the feedback speed from the PG card is below the motor zero speed judgment threshold (F6-09) set speed, this terminal output is valid.																				
44	Low Current Output	When the inverter experiences a low current fault (the low current action method is selected by parameter F9-24, which may not report a low current fault or low current warning), this terminal output is valid.																				
45	Three-phase Output Contactor Action	It is necessary to configure the digital input terminal as 49 (inverter enable) for use together. When the inverter status enable terminal is active, the output terminal is effective.																				
46	dEB action	During the inverter deceleration process, when dEB action occurs, the output terminal is effective.																				
47	Stop brake closure	When the inverter is in a shutdown state, if the discharge resistor switch feedback status is closed, the output terminal is effective.																				
49	Positioning complete	When returning to the origin is completed, the output terminal is effective.																				
50	CANopen control output	<p>CANopen Control Output, controlling the output terminals based on the status of the corresponding CANopen data bits.</p> <p>The mapping table for CANopen and digital outputs is as follows:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Parameter setting</th> <th>Attribute</th> <th>Index</th> </tr> </thead> <tbody> <tr> <td>RLY1</td> <td>F6-00=50</td> <td>RW</td> <td>Index:2026 SubIndex: 0x41 Data bit0</td> </tr> <tr> <td>RLY2</td> <td>F6-01=50</td> <td>RW</td> <td>Index:2026 SubIndex: 0x41 Data bit1</td> </tr> <tr> <td>DO1</td> <td>F6-02=50</td> <td>RW</td> <td>Index:2026 SubIndex: 0x41 Data bit3</td> </tr> <tr> <td>DO2</td> <td>F6-03=50</td> <td>RW</td> <td>Index:2026 SubIndex: 0x41 Data bit4</td> </tr> </tbody> </table>	Terminal	Parameter setting	Attribute	Index	RLY1	F6-00=50	RW	Index:2026 SubIndex: 0x41 Data bit0	RLY2	F6-01=50	RW	Index:2026 SubIndex: 0x41 Data bit1	DO1	F6-02=50	RW	Index:2026 SubIndex: 0x41 Data bit3	DO2	F6-03=50	RW	Index:2026 SubIndex: 0x41 Data bit4
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DO1	F6-02=50	RW	Index:2026 SubIndex: 0x41 Data bit3																			
DO2	F6-03=50	RW	Index:2026 SubIndex: 0x41 Data bit4																			
51	RS485 control output	<p>RS-485 (Modbus) control output, controlling the output terminals based on the status of the corresponding RS-485 data bits.</p> <p>The RS-485 and digital output port mapping table is as follows:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Parameter setting</th> <th>Attribute</th> <th>Index</th> </tr> </thead> <tbody> <tr> <td>RLY1</td> <td>F6-00=51</td> <td>RW</td> <td>2640 data bit0</td> </tr> <tr> <td>RLY2</td> <td>F6-01=51</td> <td>RW</td> <td>2640 data bit1</td> </tr> <tr> <td>DO1</td> <td>F6-02=51</td> <td>RW</td> <td>2640 data bit3</td> </tr> <tr> <td>DO2</td> <td>F6-03=51</td> <td>RW</td> <td>2640 data bit4</td> </tr> </tbody> </table>	Terminal	Parameter setting	Attribute	Index	RLY1	F6-00=51	RW	2640 data bit0	RLY2	F6-01=51	RW	2640 data bit1	DO1	F6-02=51	RW	2640 data bit3	DO2	F6-03=51	RW	2640 data bit4
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DO2	F6-03=51	RW	2640 data bit4																			
52	Communication card Control Output	<p>Communication card control output, controlling the output terminals based on the status of the corresponding communication card data bits.</p> <p>The communication card and digital output port mapping table is as follows:</p> <table border="1"> <thead> <tr> <th>Terminal</th> <th>Parameter setting</th> <th>Attribute</th> <th>Index</th> </tr> </thead> <tbody> <tr> <td>RLY1</td> <td>F6-00=52</td> <td>RW</td> <td>2640 data bit0</td> </tr> <tr> <td>RLY2</td> <td>F6-01=52</td> <td>RW</td> <td>2640 data bit1</td> </tr> <tr> <td>DO1</td> <td>F6-02=52</td> <td>RW</td> <td>2640 data bit3</td> </tr> <tr> <td>DO2</td> <td>F6-03=52</td> <td>RW</td> <td>2640 data bit4</td> </tr> </tbody> </table>	Terminal	Parameter setting	Attribute	Index	RLY1	F6-00=52	RW	2640 data bit0	RLY2	F6-01=52	RW	2640 data bit1	DO1	F6-02=52	RW	2640 data bit3	DO2	F6-03=52	RW	2640 data bit4
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DO1	F6-02=52	RW	2640 data bit3																			
DO2	F6-03=52	RW	2640 data bit4																			
66	STO fault	When any type of STO fault occurs in the inverter, the terminal output is active.																				

Set Value	Function	Description
67	Analog input threshold reached output	The inverter's multi-function output terminal operates when the analog input is between the high threshold and low threshold. Parameter F6-05 selects the analog input channel AI1, AI2, or AI3 to be compared. Parameter F6-06 sets the high threshold for analog input comparison (default 50%). Parameter F6-07 sets the low threshold for analog input comparison (default 10%). When the analog input > Parameter F6-06, the multi-function output terminal operates; When the analog input < Parameter F6-07, the multi-function output terminal stops output.
68	STO normal	When any type of STO fault occurs in the inverter, this terminal output is invalid.
69	Maximum roll diameter reached	When using tension control mode, this terminal output is valid when the roll diameter reaches parameter FB-26.
70	Reach empty roll diameter	When using tension control mode, this terminal output is valid when the roll diameter reaches parameter FB-27.
71	Belt break indication	When using tension control mode, if the enable belt break detection is active, the line speed exceeds parameter FB-45, the roll diameter error exceeds parameter FB-46, and the time exceeds parameter FB-47, a belt break occurs, and this terminal output is valid.
72	Tension PID feedback deviation fault	When using tension control mode, if the difference between the tension PID setpoint and the tension PID feedback value exceeds the PID feedback error level (parameter FB-48), and the error time exceeds the PID feedback error detection time (parameter FB-49), a PID feedback error anomaly (refer to PID feedback error handling (parameter FB-50)) occurs, and this terminal output is valid.
73	Over-torque 3	When the inverter detects an over-torque event (over-torque detection threshold H3-06, over-torque judgment delay H3-07), this terminal output is valid.
74	Over-torque 4	When the inverter detects an over-torque event (over-torque detection threshold H3-11, over-torque judgment delay H3-12), this terminal output is valid.

3.3.3 Analog Input Terminal Functions (AI)

The CM680 series inverter is equipped with 3 AI terminals.

Table 3-29 AI Terminal Function Selection Parameter List

F5-21	AI1 function selection	Range: 0~20	Factory value: 1
F5-27	AI2 Function Selection	Range: 0~20	Factory value: 0
F5-33	AI3 Function Selection	Range: 0~20	Factory value: 0

Table 3-30 Detailed Description of AI Terminal Functions

Set Value	Function	Description
0	No function	AI terminal has no function
1	Frequency setting	When used as frequency setting, the frequency source (F0-06) must be set to 2
2	Torque setting	When used as torque setting, the inverter control mode (F0-03) must be set to 2 (torque mode), the torque command source selection (FE-01) must be set to 2, and parameters F5-21, F5-27, or F5-33 must be set to 2.
3	Torque compensation setting	When used as torque compensation, the inverter must set the torque command bias source (FE-05) to 1 (from external analog input).
4	PID target value	When used as a PID target value, the PID feedback terminal (FA-00 not equal to 0) must be set, and there are two other cases: 1. The PID target value source (FA-01) is set to 0 (from frequency setting), parameters F5-21 or F5-27 or F5-33 are set to 1 or 4; if both 1 and 4 are set in the analog input simultaneously, AI1 is prioritized as the PID target value. 2. The PID target value source (FA-01) is set to 3 (from external analog input). The PID target value will be displayed in percentage form via parameter FA-02 (PID target value setting) (precision 0.01%).
5	PID feedback value	When used as PID feedback, PID feedback selection (FA-00) must be set to 1 or 4, and the feedback value is displayed in percentage form via U1-04 (Communication setting PID feedback value) (precision 0.01%) .
6	Thermistor PTC Input	When used as PTC input, it is necessary to switch between PTC input and PT100 input by checking if parameter F9-52 (PT100 Class 1 Protection Frequency) is set to 0.

Set Value	Function	Description
7	Forward Torque Limit	When the analog input is used as torque limit for four-quadrant operation, parameters F5-21, F5-27, or F5-33 should be set to 7, 8, 9, or 10. The torque limit values are displayed through parameters FE-11 to FE-14 (shared variables with torque limits received via communication), and the diagram below illustrates the torque limit for four-quadrant operation:
8	reverse torque limit	
9	regenerative torque limit	
10	Forward/Reverse Torque Limit	
11	Thermistor PT100 value	An external PT100 thermistor is required to detect whether the motor is overheated.
12	Auxiliary frequency setting	When used as an auxiliary frequency input, the auxiliary frequency source (F0-07) must be set to 3 (external analog input).
13	PID offset	When used as a PID compensation amount, it is necessary to set the PID feedback selection (FA-00 not equal to 0) to be valid, set the PID compensation amount selection (FA-20) to 1 (from external analog input), the intelligent start frequency command (FA-33) to 0, and the application macro parameter (L0-00) to 6 (for air compressor industry applications). The change in the analog input compensation amount can be displayed in parameter FA-21 (PID compensation) as a percentage (precision 0.1%).
14	Tension PID Feedback Value	When used as tension PID feedback, the tension control mode selection (FB-00) must be set to 1 (speed closed-loop mode).
15	Line Speed Feedback	As tension control line speed feedback.
16	roll diameter feedback	When used as roll diameter feedback (including initial roll diameter and real-time roll diameter calculation feedback), the tension control selection (FB-00 not zero) must be enabled, the roll diameter source (FB-25) must be set to 1 for analog input as roll diameter feedback (FB-38), and the initial roll diameter source (FB-28) must be set to 1 for analog input as the initial roll diameter (FB-29).
17	Tension PID Setpoint	When used as tension PID setpoint, the tension control mode selection (FB-00) must be set to 1 (speed closed-loop mode), and the PID target source setting (FB-04) must be set to 2 (analog input). When the inverter is in operation, the PID target value setting (FB-05) is displayed.
18	Tension Setpoint	When setting the tension command, the tension control mode selection (FB-00) must be set to 3/4 (torque mode), the tension command source selection (FB-52) to 1 (analog input), and the maximum tension value (FC-53) should be set according to the site conditions (default value is 0). Parameters F5-21, F5-27, or F5-33 should be set to 18. When the inverter is in operation, the tension setting is displayed through parameter (FB-54).
19	Zero-speed tension setting	When setting the zero-speed tension command, the tension control mode selection (FB-00) must be set to 3/4 (torque mode), the zero-speed tension command source

Set Value	Function	Description
		selection (FB-55) to 2 (analog input), and the maximum tension value (FB-53) should be set according to the site conditions (default value is 0). When the inverter is in operation, the zero-speed tension setting is displayed through parameter (FB-56).
20	Tension Taper Setting	When setting the tension taper, the tension control mode selection (FB-00) must be set to 3/4 (torque mode), the tension taper setting source selection (FC-64) must be set to 1 (analog input), and parameters F5-21, F5-27, or F5-33 must be set to 20. During the inverter operation, the tension taper setting is displayed through parameter (FC-65).

3.3.4 Analog Output Terminal Functions (AO)

The CM680 series inverter is equipped with 2 AO terminals.

Table 3-31 List of Terminal Function Parameters

Set Value	Function	Description	Factory value
F6-13	AO1 Signal Type Selection	0: 0-10V Output Selection 1: 0-20mA Output Selection	0
F6-14	AO1 output function selection	Range: 0~23	0
F6-15	AO1 output gain	Range: 0.0~500.0%	100.0%
F6-16	AO1 reverse enable	0: Absolute value output 1: Negative value outputs as 0V 2: 5V as center point	0
F6-17	AO1 Output Bias	Range: -100.00%~100.00%	0.00%
F6-18	AO1 Output Fixed Value	Range: 0.00~100.00%	0.00%
F6-19	AO1 Filter Time	Range: 0.00~20.00 seconds	0.01 second
F6-20	AO2 Signal Type Selection	0: 0-10V Output Selection 1: 0-20mA Output Selection	0
F6-21	AO2 Signal Type Selection	Range: 0~23	0
F6-22	AO2 Output Gain	Range: 0.0~500.0%	100.0%
F6-23	AO2 Reverse Enable	0: Absolute value output 1: Negative value outputs as 0V 2: 5V as center point	0
F6-24	AO2 Output Bias	Range: -100.00%~100.00%	0.00%
F6-25	AO2 Output Fixed Value	Range: 0.00~100.00%	0.00%
F6-26	AO2 Filter Time	Range: 0.00~20.00 seconds	0.01 second

Table 3-32 Detailed Explanation of Terminal Output Functions

Set Value	Function	Description
0	Output frequency	The maximum frequency parameter F4-02 is 100%.
1	Frequency command	The maximum frequency parameter F4-02 is 100%.
2	Motor operating frequency (Hz)	The maximum frequency parameter F4-02 is 100%.
3	Output current (RMS)	Rated at 2.5 times the inverter's rated current as 100%.
4	Output voltage	Rated at 2 times the motor's rated voltage as 100%.
5	DC Bus Voltage	Rated at 450V (230V model) / 900V (460V model) for 100%.
6	power factor	Rated at ±1.000 as 100%.
7	Power	Rated at 2 times the inverter's rated power as 100%.
8	Output torque	Rated at 2 times the rated torque as 100%
9	AI1 percentage	0 ~ 10V/0 ~ 20mA corresponds to 0 ~ 100%.
10	AI2 percentage	0 ~ 10V/0 ~ 20mA corresponds to 0 ~ 100%.
11	AI3 percentage	0 ~ 10V/0 ~ 20mA corresponds to 0 ~ 100%.
12	Iq Current Command	Rated at 2.5 times the inverter's rated current as 100%.
13	Iq Feedback Current	Rated at 2.5 times the inverter's rated current as 100%.
14	Id Current Command	Rated at 2.5 times the inverter's rated current as 100%.

15	Id Feedback	Current	Rated at 2.5 times the inverter's rated current as 100%.
16	Vq Command	Voltage	Rated at 300V (230V model) / 600V (460V model) for 100%.
17	Vd Command	Voltage	Rated at 300V (230V model) / 600V (460V model) for 100%.
18	Torque command		With rated torque as 100% .
19	PG2 Frequency Command	Frequency	The maximum frequency parameter F4-02 is 100%.
20	CANopen Output	Analog	Provided for CANopen communication analog output, terminalAO1 corresponds to address 2026-A1, terminalAO2 corresponds to address 2026-A2, extended terminalAO10 corresponds to address 2026-AB, extended terminalAO11 corresponds to address 2026-AC.
21	RS485 output	analog	Provided for RS-485 communication analog output, terminalAO1 corresponds to address 26A0H, terminalAO2 corresponds to address 26A1H, extended terminalAO10 corresponds to address 26AAH, extended terminalAO11 corresponds to address 26ABH.
22	Communication card analog output		Provided for communication card analog output, terminalAO1 corresponds to address 26A0H, terminalAO2 corresponds to address 26A1H, extended terminalAO10 corresponds to address 26AAH, extended terminalAO11 corresponds to address 26ABH.
23	Fixed output	voltage	The output voltage ratio can be set by parameters F6-18 (corresponding to AO1) and F6-25 (corresponding to AO2), parameter settings 0.00 ~ 100.00% correspond to AO output 0 ~ 10V.

3.4 Control performance

3.4.1 Setting of VF curves

This inverter is equipped with multiple V/F curves and can customize V/F curves to meet different load conditions. When F2-00=0, it is a multi-segment V/F curve, relevant parameters are shown in Table 3-33. Among them, $V1 < V2 < V3$, $f1 < f2 < f3$. When F2-00=1, the inverter output voltage is proportional to the 1.5 power of frequency. When F2-00=2, the inverter output voltage is proportional to the square of frequency.

Table 3-33 Parameters related to V/F curve setting

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F2-00	V/F Voltage Selection	0	0: General V/F Curve 1: 1.5 Power V/F Curve 2: 2 Power V/F Curve	Multi-segment (custom) V/F curve, defined according to F2-04 to F2-09 and F4-03 and F4-04, as shown in the figure below.
F2-04	M1 Multi-point VF Frequency Point 1	0.50Hz	0.00~599.00Hz	<p>In the figure, f1, f2, f3, and fb represent M1 multi-point VF frequency point 1, M1 multi-point VF frequency point 2, M1 multi-point VF frequency point 3, and M1 rated frequency, respectively. V1, V2, V3, and Vb represent M1 multi-point VF voltage point 1, M1 multi-point VF voltage point 2, M1 multi-point VF voltage point 3, and M1 rated voltage, respectively.</p> <p>Note: Generally, $V1 < V2 < V3 < Vb$, $f1 < f2 < f3 < fb$. Setting the voltage too high at low frequencies may cause the motor to overheat or even burn out, and the inverter</p>
F2-05	M1 Multi-point VF Voltage Point 1	2.0V	0.0~480.0V	
F2-06	M1 Multi-point VF Frequency point 2	1.50Hz	0.00~599.00Hz	
F2-07	M1 Multi-point VF Voltage point 2	10.0V	0.0~480.0V	
F2-08	M1 Multi-point VF Frequency point 3	3.00Hz	0.00~599.00Hz	
F2-09	M1 Multi-point VF Voltage point 3	22.0V	0.0~480.0V	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F4-03	M1 Rated Frequency	50.00Hz	0.00~599.00Hz	may experience overcurrent or overvoltage protection.
F4-04	M1 Rated Voltage	380.0V	0.0~510.0V	

3.4.2 Torque compensation

Torque compensation is a commonly used stage in motor control, which can be used to improve load-carrying capacity and enhance control performance. The torque compensation function in this section can be used for theVFcontrol of asynchronous motors and theSVCcontrol of permanent magnet synchronous motors. Based on the operating state of the motor (such as motor speed), the torque compensation amount is calculated. This compensation amount is then multiplied by a certain gain, passed through a low-pass filter, and added as a voltage compensation value to the output voltage to achieve the purpose of torque compensation. Relevant parameters are shown in Table 3-34.

Table 3-34 Torque Compensation Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F2-01	Torque Compensation Gain	1	Induction Motor: 0~10 Permanent Magnet Synchronous Motor: 0~5000	This parameter is used to adjust the torque compensation level. By adjusting the output voltage, the motor's load-carrying capacity can be adjusted. The greater the torque compensation gain, the better the load-carrying capacity, but the output current will increase. If set too high, it may lead to overcurrent faults; reducing the torque compensation gain will decrease the load-carrying capacity accordingly.
F2-02	Torque Filter Time	0.500s	0.001~10.000s	This parameter is used to adjust the filter time for torque compensation. If the filter time is set too high, control stability improves, but response becomes slower. When the filter time is set too small, the response is faster, but it may lead to instability. Adjust according to actual conditions.
H1-06	M2 Torque Compensation Gain	1	Induction Motor: 0~10 Permanent Magnet Synchronous Motor: 0~5000	This parameter is used to adjust the torque compensation level. By adjusting the output voltage, the motor's load-carrying capacity can be adjusted. The greater the torque compensation gain, the better the load-carrying capacity, but the output current will increase. If set too high, it may lead to overcurrent faults; reducing the torque compensation gain will decrease the load-carrying capacity accordingly.
H1-14	M3 Torque Compensation Gain	1		
H1-22	M4 Torque Compensation Gain	1		

3.4.3 Slip Compensation

Slip compensation is a commonly used stage in the control of asynchronous motors. Due to the existence of slip, the speed of an asynchronous motor often does not equal the synchronous speed. If slip is not compensated for, it may result in insufficient precision in the speed control of the asynchronous motor. Proper slip compensation can improve the speed accuracy of the asynchronous motor. Based on the mathematical model of the motor, the slip is calculated using information such as motor current and voltage. The slip is then added to the synchronous speed to achieve slip compensation. Since the calculated slip may have errors, the slip compensation gain can be increased to adjust it. Additionally, the calculated slip usually contains noise, which can be eliminated or reduced using a low-pass filter. Relevant parameters are shown in Table 3-35.

Table 3-35 Slip Compensation Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F2-10	Slip Compensation Time	0.100s	0.001~10.000s	This parameter is used to set the filter time for slip compensation. The larger the value of this function code, the slower the compensation response; the smaller the value, the faster the response, but it may lead to system instability. Adjust according to actual conditions.

F2-11	Slip Compensation Gain	0.00 (1.00 in VVC mode)	0.00~10.00	This parameter is used to set the gain for slip compensation. By adjusting the slip compensation gain, the motor speed accuracy can be improved. When using VF control: Under electric load conditions, if the motor speed is lower than the actual speed, the slip compensation gain can be appropriately increased; otherwise, it should be decreased. In power generation load conditions, if the motor speed is higher than the actual speed, the slip compensation gain can be appropriately increased; conversely, it should be decreased. When using VVC control for induction motors: Under electric load conditions, if the motor speed is lower than the actual speed, the slip compensation gain can be appropriately increased; otherwise, it should be decreased.
H1-07	M2 Slip Compensation Gain			
H1-15	M3 Slip Compensation Gain			
H1-23	M4 Slip Compensation Gain			
F2-12	Generation Slip Compensation Gain	1.00	0.00~1.00	This parameter is used to adjust the slip compensation gain in generation mode, applicable only to IMVVC control mode. When using induction motor VVC control, under generation load conditions, if the motor speed is higher than the actual speed, the generation slip compensation gain can be appropriately increased; conversely, the generation slip compensation gain should be reduced.

3.4.4 Current Limiting

The current limiting function restricts torque current by limiting the torque current setpoint, as shown in Table 3-36.

Table 3-36 Current Limit Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-07	maximum current limit	150%	0~250%(100% corresponding to the inverter's rated current)	This parameter is used to set the maximum current output of the inverter, which, together with the settings of parameters F3-23 to F3-25, determines the current limit of the inverter's output.
F3-23	I/F Mode Current Command	40%	0%~150%	When F1-00 is 1, this parameter sets the percentage of the DC drive current relative to the motor rated current during the synchronous motor flux zero position alignment period; When F3-24 is zero, this parameter sets the percentage of the low-speed magnetization current relative to the motor rated current when the SVC observer mode is running; When F3-24 is non-zero, this parameter sets the percentage of the current command relative to the motor rated current when the motor I/F mode is running.
F3-24	IF Switching Frequency 1	20.00Hz	0.00~599.00 Hz	When this parameter is non-zero, the synchronous motor will be forced to operate in I/F mode below this frequency.
F3-25	IF Switching Frequency 2	20.00Hz	0.00~599.00 Hz	This parameter defaults to F3-25 and generally does not need to be changed.

3.4.5 Parameter Management Settings

Parameter management settings are achieved through a function code parameter setting, enabling operations such as write protection for related parameters, value reset, parameter reinitialization, modification of read-only parameters, and program reset. Currently, parameter management settings are configured through function code F0-18, as shown in Table 3-37.

Table 3-37 Parameter Management Settings

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F0-18	Parameter Management	0	0: No Function 1: Parameter Write Protection 5: Reset kWh Display to Zero 6: Reset PLC 7: Reset CAN Slave 9: Reset to 50Hz Factory Values 11: Reset to 50Hz Factory Value	0: No Function; 1: After entering 1, most function codes will be locked and cannot be modified; only parameter management (F0-18) and password input (F7-33) can be modified. This value is written to EEPROM and remains effective after power loss. Only by setting parameter management (F0-18) to 0 can other parameter values be modified; 5: Can reset the inverter's energy statistics to zero; 7: Reset CAN Slave; 8: No Function; 9: Restore function codes to factory settings, which resets them to default values. If the inverter has been set with a password (via F7-34), the password must be removed (via F7-33) before restoring factory settings; 11: Restore function codes to factory settings, but retain all user-defined parameter values of the application macro.

Precautions:

1. When the parameter management setting is 6 or 7, the control board needs to be powered off and then powered on again after setting.
2. If the frequency command source is the Digital Operator knob, and the parameter management setting is 7, to achieve reverse operation, it is necessary to simultaneously set the analog frequency negative value reversal (F5-38) to 1 (allowing negative frequency input, positive frequency forward rotation, negative frequency reverse rotation; the Digital Operator and external terminals cannot control forward/reverse rotation).

3.4.6 Command Source Setting (AUTO)

In automatic operation mode (AUTO/REMOTE), users can select the frequency source (F0-06) and the run command source (F0-05) through function code settings to ensure that the inverter operates normally under different input command methods, as shown in Table 3-38.

Table 3-38 Parameters related to command source setting

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F0-06	Frequency command source selection	0	0: Digital Operator 1: RS485 Communication 2: Analog Input 3: External Up/Down Input 4: Pulse Input Without Direction 5: Pulse Input With Direction 6: CANopen Input 8: Communication Card Input 9: PID 10: Digital Terminal Multi-Speed	0: Set the frequency value via the keypad; set the frequency value at the "F xx.xx Hz" display on the main interface. Use the up and down buttons to move the arrow icon to the 'F xx.xx Hz' position, then press the 'OK' button, the frequency value will flash. Modify the frequency value using the left and right arrows and the up and down arrows, and press the 'ESC' key to exit after modification. 1: Set the frequency value via RS485 communication; the master device must be connected to the inverter's 485+ and 485-, then the frequency can be set through the communication method. For details, refer to Appendix A MODBUS Communication Protocol. 2: Set the frequency value via an analog signal. The frequency value can be set through three analog input channels on the inverter; it is necessary to set the analog input function of the

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
				corresponding channel to “frequency setting” (set through F5-21, F5-27, or F5-33). 3: Set the frequency value via DI terminals; set the F5 group DI terminal functions to 19 and 20 (external command for frequency increase, external command for frequency decrease), then use the corresponding DI terminals to adjust the frequency value. 4: Reference pulse input type selection (F4-30). 5: Reference pulse input type selection (F4-30). 6: Set the frequency value through CANopen communication; the master device uses the CANopen protocol to communicate with the inverter and set its frequency value. 7: Reserved 8: Set the frequency value through a communication card; the inverter must be equipped with a communication card to communicate with the master device, which can use the corresponding bus communication protocol to set the inverter's frequency. 9: The frequency setting value comes from process PID control. The PID function can be configured using the FA group function codes; the output of the PID controller serves as the inverter's frequency setting value. For details, refer to the introduction of the 'PID function' in the FA group. 10: Set the frequency value through DI terminals. The F5 group 'Input Terminals' and FD group 'Multi-Speed and Simple PLC Function' function codes can be used to set multi-speeds and the correspondence between DI input signals and multi-speeds. For details, refer to the introductions of these two groups of function codes.
F0-05	Run Command Source Selection	0	0: Digital Operator 1: External Terminal Input 2: RS485 Communication Input 3: CANopen Input 5: Communication Card Input	0: Select this command channel to control the inverter's operation and shutdown via the RUN, STOP, JOG buttons on the keyboard. 1: Select this command channel to control the inverter through digital input terminals. 2: Select this command channel to send commands to the inverter via RS485 communication, controlling the inverter to start, stop, etc. 3: Select this command channel; the inverter requires a CANopen communication card, allowing the master station to send control commands using the CANopen protocol. 4: Reserved 5: Select this command channel; the inverter requires other communication cards (such as Profinet, Profibus-DP, EtherCAT communication cards), allowing the master station to send control commands using the corresponding bus communication protocol.

Precautions:

1. The command source can only be modified when the inverter is stopped;
2. The command source needs to be set through the multifunctional input terminals by selecting the AUTO mode;

3. Some command source methods require additional accessories, such as communication cards;
4. The factory default frequency and operation command source is set toAUTOMode, and it will revert toAUTOMode upon power-up. If the multifunctional input terminal P is configured for switching betweenHANDandAUTO, the mode will be determined based on the status of the multifunctional input terminal. That is, if the external terminal is in theOFFstate, the inverter will not accept any operation signals and cannot executeJOGcommands;
5. At the same time, configure digital inputs (F5-00 ~ F5-06) as multi-speed commands for frequency sources, and configure analog inputs (F5-21, F5-27, F5-33) as frequency command sources. The priority order is: multi-speed> analog input frequency source > frequency command source selection input (F0-06);
6. When digital inputs (F5-00 ~ F5-06) are used as operation command sources, the priority order is: digital inputs > operation command source selection (F0-05).

3.4.7 Stopping Methods

Users can select different normal stopping methods, such as deceleration stop and free-run stop, based on actual application scenarios through function codes. The stopping method can be modified during operation. After the inverter receives a shutdown command, it reduces the output frequency according to the selected stopping method until the output stops. Two stopping methods are shown in Figure 3-24:

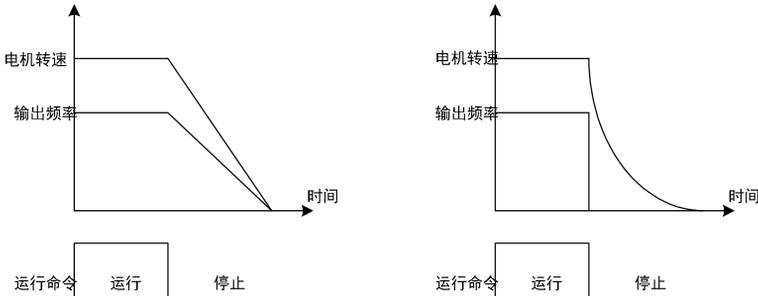


Figure 3-24 Stopping Method Diagram

Relevant parameters are shown in Table 3-39:

Table 3-39 Relevant Parameters Table

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-12	Stopping Method	0	0: Deceleration Stop 1: Free Stop	0: Deceleration Stop, the inverter decelerates according to the set deceleration time until it reaches 0 or the first multi-point VF frequency point M1 (F2-04) and then stops output drive; 1: Free Stop, after receiving the shutdown command, the inverter immediately stops output, and the motor freely runs down to a stop according to the load inertia.

Precautions:

1. When mechanical stopping is required, to avoid personal injury or material waste, it is recommended to set it to deceleration stop, and the length of the deceleration time should be determined based on the characteristics of the site debugging.
2. When mechanical stopping is required, if the load inertia is very small and there is no requirement for the motor stop time, or if the motor idling has no impact, and the load inertia is large, it is recommended to set it to free stop, such as in applications like fans, punch presses, etc.

3.4.8 Forward/Reverse Rotation Prohibition Selection

In some application scenarios, the motor can only operate in one direction; if it operates in the opposite direction to the predetermined direction, it could cause equipment damage or other unknown

losses. The motor's operating direction can be limited through software. When the motor phase sequence is connected incorrectly, the desired motor rotation can be switched by adjusting the inverter output drive phase sequence without changing the actual wiring order. The diagram for forward/reverse rotation prohibition selection is shown in Figure 3-25:

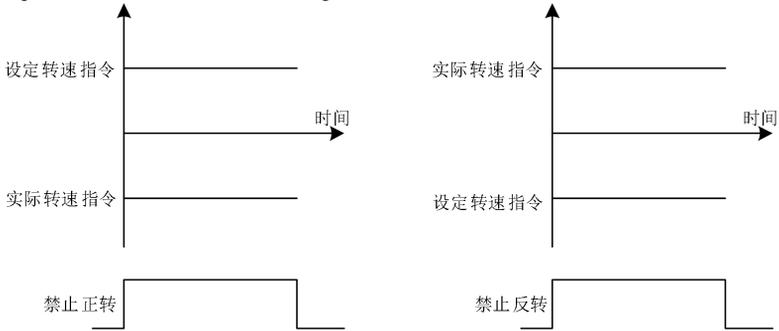


Figure 3-25 Diagram of Forward/Reverse Rotation Prohibition Selection

The phase sequence switching diagram is shown in Figure 3-26:

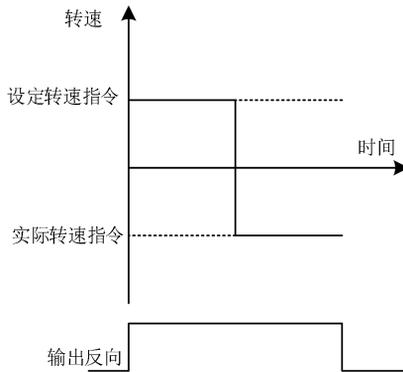


Figure 3-26 Phase Sequence Switching Diagram

Related parameters as shown in Table 3-40:

Table 3-40 Forward/Reverse Rotation Prohibition Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F0-09	Forward/Reverse Prohibited Selection	0	0: Forward/Reverse Enabled 1: Reverse Prohibited 2: Forward Prohibited	Setting value to 0: Normal output according to command direction; Setting value to 1: Only forward rotation regardless of set direction; Setting value to 2: Only reverse rotation regardless of set direction;
F7-42	Output Phase Sequence Switching	0	0~1	0: Output according to the command direction. 1: Output frequency opposite to the command direction; forward rotation changes to reverse, and reverse changes to forward. Note: The output phase sequence switching and forward/reverse prohibition selection can be used together. However, if the prohibited rotation direction set for operation is the same as

				the direction after phase sequence switching, the output phase sequence switching function will not be realized.
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Precautions:

1. Do not modify the forward/reverse prohibition selection during VFD operation;
2. Do not modify the output phase sequence switching during VFD operation;

Output phase sequence switching and forward/reverse prohibition selection can be used together; however, if the prohibited rotation direction setting matches the direction after phase sequence switching, the output phase sequence switching function will not be realized.

3.4.9 Auxiliary Frequency Function (AUTO)

In some application scenarios, without changing the main frequency command, the auxiliary frequency command can be used to correct the main frequency command. Relevant parameters are shown in Table 3-41.

Table 3-41 Parameters for Auxiliary Frequency Function

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F0-07	Auxiliary Frequency Source	0	0: Disabled 1: Digital Operator 2: RS485 Communication 3: Analog Input 4: External Up/Down Input 5: Pulse Input 6: CANopen Input 8: Communication Card Input	0: Disable; turn off the auxiliary frequency function. 1: Digital Operator; Set the auxiliary frequency through the keyboard, set the frequency value at the "Fxx.xxHz" display on the main interface. Use the up and down buttons to move the arrow icon to the 'F xx.xx Hz' position, then press the 'OK' button, the frequency value will flash. Modify the frequency value using the left and right arrows and the up and down arrows, and press the 'ESC' key to exit after modification. 2: RS485 Communication; Set the frequency value through RS485 communication; the host computer needs to connect to the inverter's 485+, 485- terminals, and then the frequency can be set via communication. For details, refer to Appendix A MODBUS Communication Protocol. 3: Analog Input; set the frequency value through an analog signal. The frequency value can be set through three analog input channels on the inverter. The corresponding channel's analog input function must be set to 'Auxiliary Frequency Setting' (set through F5-21, F5-27, or F5-33). 4: External Up/Down Input; Set the frequency value through DI terminals by setting the DI terminal function in group F5 to 19, 20 (external command for frequency increase, external command for frequency decrease), then adjust the frequency value using the corresponding DI terminals. 5: Pulse Input; refer to pulse input type selection (F4-30). 6: CANopen input; Selecting this command channel requires the installation of a CANopen communication card in the inverter, allowing the master device to send control commands to the inverter using the CANopen protocol. 7: Reserved 8: Communication card input; Set the frequency value through a communication

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
				card; the inverter must have a communication card installed to communicate with the master device, which can use the corresponding bus communication protocol to set the inverter's frequency.
F0-08	Frequency Source Superposition Selection	0	0: Main frequency + Auxiliary frequency 1: Main frequency - Auxiliary frequency 2: Auxiliary frequency - Main frequency 3: Auxiliary Frequency	0: Main frequency + Auxiliary frequency; The actual set frequency of the inverter is the sum of the main frequency and the auxiliary frequency. 1: Main frequency - Auxiliary frequency; The actual set frequency of the inverter is the main frequency minus the auxiliary frequency. 2: Auxiliary frequency - Main frequency; The actual set frequency of the inverter is the auxiliary frequency minus the main frequency. 3: Auxiliary frequency; The actual set frequency of the inverter is the auxiliary frequency.

Precautions:

1. The auxiliary frequency source can only be modified when the inverter is stopped;
2. The main and auxiliary frequency function selection can only be modified when the inverter is stopped;
3. Some command source methods require additional accessories, such as communication cards;
4. The main frequency and auxiliary frequency cannot be set to the same source;
5. When the digital input is configured as auxiliary frequency prohibition (F5-00 ~ F5-06), the auxiliary frequency output function will be disabled;
6. If the result of the subtraction between the main and auxiliary frequencies is negative, negative frequency input must be allowed (F5-38 set to 1) to reverse; otherwise, the output frequency will be 0. Additionally, pay attention to the setting of the main and auxiliary reversal cutoff frequency (FA-27) to avoid the desired reverse output being limited.

3.4.10 Rebound Energy Suppression

When the motor decelerates, the inverter may return energy, causing the bus voltage to rise. If the bus voltage is too high, it can lead to overvoltage faults. Rebound energy suppression can increase motor losses, reduce energy feedback, thereby lowering the probability of overvoltage faults, while also allowing the motor to decelerate more quickly.

During deceleration, increasing the motor's magnetic field/flux/excitation current can increase motor losses and reduce the energy fed back to the inverter. This function has two implementation forms, "Deceleration Method 1" and "Deceleration Method 2". "Overvoltage Energy Suppression" will decelerate according to the set deceleration time value; the actual fastest deceleration time will not be less than the set deceleration time. "Traction energy control, automatically adjusts output frequency and output voltage to accelerate consumption of regenerative energy based on the inverter's capability; deceleration time is the result of automatic adjustment by the inverter. Relevant parameters are shown in Table 3-42.

Table 3-42 Parameters related to regenerative energy suppression

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-13	Deceleration Method	0	0~2	0: No function; normal deceleration or stop, without regenerative energy suppression. 1: Deceleration method 1; During deceleration, the inverter will automatically adjust the deceleration curve based on the overvoltage stall threshold F9-04 and the

				bus voltage. 2: Deceleration method 2; During deceleration, when the bus voltage is too high, deceleration method 2 will be activated, and the inverter will automatically adjust the output frequency and output voltage to achieve the purpose of accelerating the consumption of regenerative energy.
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3.4.11 Zero Speed Operation Selection

This function determines the operating mode of the inverter when the given frequency is less than the minimum output frequency of the motor. At this time, there are three operating modes for the inverter: This function determines the operating mode of the inverter when the given frequency is less than the minimum output frequency of the motor. In this case, there are three operating modes for the inverter:

1. Output Wait, which means not operating, UVWthree phases have no output;
2. Zero Speed Operation, which means running at a given frequency of zero;
3. Run at the minimum frequency, as the name suggests, means running at the given frequency as the minimum frequency.

The parameters related to zero speed operation selection are shown in Table 3-43.

Table 3-43 Parameters Related to Zero Speed Operation Selection

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L2-19	Zero Speed Operation Selection	0	0: Wait for Output 1: Zero Speed Position Control Output 2: Output at Minimum Frequency	0: When the control mode is VF or VVC, the output waits, and the inverter will enter a waiting state (UVWno voltage output). Under other control modes, zero-speed operation is performed. 1: When the control mode is induction motor VF, the inverter will enter an operating state, but the actual output is zero; When the control mode is VVC, the inverter works in DC braking state, and the motor current is DC; under other control modes, zero-speed operation is performed. 2: The inverter will operate according to the set values of multi-point VF frequency point 1 (F2-04) and multi-point VF voltage point 1 (F2-05).

3.4.12 Frequency Setting Processing

Process the frequency setpoint sent from the application layer to the drive layer to ensure it is within a reasonable range. When the frequency setpoint exceeds the maximum allowable frequency, the frequency setpoint is set to the maximum frequency. When the frequency setpoint is less than the minimum allowable frequency, it is set to the minimum frequency or zero according to the operating mode. Frequency setpoint processing Relevant parameters are shown in Table 3-44.

Table 3-44 Parameters related to frequency setpoint processing

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L2-19	Zero Speed Operation Selection	0	0: Wait for Output 1: Zero Speed Position Control Output 2: Output at Minimum Frequency	When the given frequency is less than the 'Minimum Motor Output Frequency Setting,' the output mode is determined by this parameter.
F2-04	M1 Multi-point VF Frequency Point 1	0.50Hz	0.00~599.00 Hz	This parameter, together with 'Zero Speed Operation Selection,' determines the motor operation mode when the given frequency is below this parameter. At the same time, this
H1-00	M2 Multi-point VF Frequency			

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
	Point 1			parameter, together with the “ Lower Limit Frequency, ” determines the lower limit value of the given frequency.
H1-08	M3 Multi-point VF Frequency Point 1			
H1-16	M4 Multi-point VF Frequency Point 1			
F0-10	Upper Limit Frequency	599.00Hz	0.0~599.00Hz	The upper limit of the given frequency; when setting this parameter, it must be greater than the “ Lower Limit Frequency.”
F0-11	Lower Limit Frequency	0.00Hz	0.0~599.00Hz	The lower limit of the given frequency; together with the “ Minimum Motor Output Frequency Setting, ” it determines the lower limit value of the given frequency. When setting this parameter, it must be less than the “Upper Limit Frequency.”

3.4.13 External Frequency Command Limitation

If the inverter receives a frequency command that exceeds the upper limit frequency set by the parameter “Maximum Motor Operating Frequency,” the frequency command will be modified to the upper limit frequency set by the parameter “Maximum Motor Operating Frequency.” Relevant parameters are shown in Table 3-45.

Table 3-45 Parameters Related to External Frequency Command Limitation

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F4-02	M1 Maximum Frequency	50.00 or 60.0 Hz	0.00~599.00Hz	This parameter is used to set the highest operating frequency of the inverter. If the input frequency command exceeds the value set by this parameter, the frequency command will be modified to this value. This parameter cannot be modified during operation. It can be selected which group of parameters to use through H0-00, or it can be chosen via digital input functions 83/84.
H0-01	M2 Maximum Frequency			
H0-13	M3 Maximum Frequency			
H0-22	M4 Maximum Frequency			

3.4.14 Speed Curve

There are two modes for the speed curve: normal acceleration/deceleration mode and S-curve acceleration/deceleration mode. When all four function codes are zero, the speed curve operates in normal acceleration/deceleration mode; otherwise, it operates in S-curve acceleration/deceleration mode.

In general acceleration and deceleration modes, the slope of acceleration and deceleration will undergo sudden changes at the start or end of the process, causing significant variations in motor torque within a short period, which can impact both the motor and the load. To reduce this impact, S-curve acceleration and deceleration mode can be used. Under this mode, the slope of the speed curve is continuous, thereby reducing torque shock. Figure 3-27 shows the frequency and acceleration waveforms during normal acceleration and deceleration. It can be seen that the acceleration is discontinuous, with sudden changes occurring. In contrast, the acceleration during S-curve acceleration and deceleration, as shown in Figure 3-28, is continuously variable, thus using an S-curve for acceleration and deceleration can reduce the impact caused by sudden torque changes.

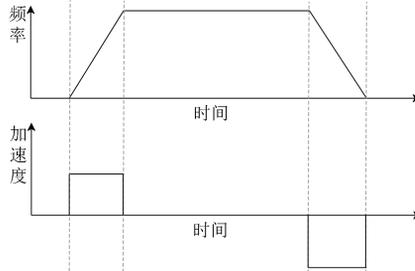


Fig.3-27 General Acceleration and Deceleration Mode

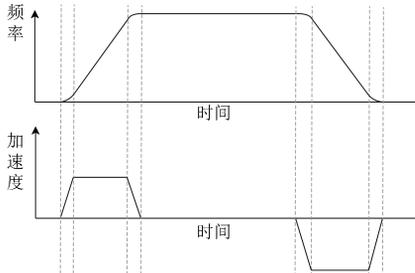


Fig.3-28 S Acceleration and Deceleration Mode

In S acceleration and deceleration mode, the total acceleration and deceleration time will be longer. When accelerating from zero to the maximum operating frequency, the total acceleration time = set acceleration time + (S acceleration time 1)/2 + (S acceleration time 2)/2, the total deceleration time = set deceleration time + (S deceleration time 3)/2 + (S deceleration time 4)/2. As shown in Fig. 3-29, S1 represents S acceleration time 1, S2 represents S acceleration time 2, S3 represents S deceleration time 3, and S4 represents S deceleration time 4.

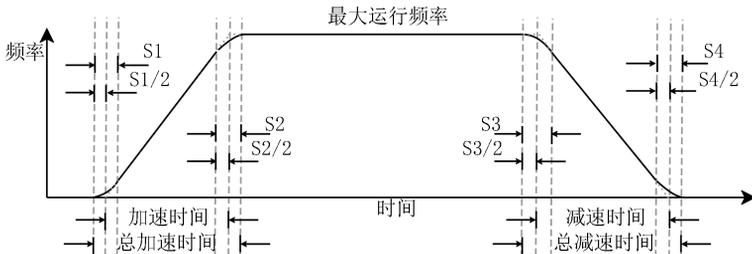


Fig. 3-29 S Acceleration and Deceleration Time

The relevant parameters are shown in Table 3-46:

Table 3-46 Parameters Related to Speed Curves

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-16	S Acceleration Time 1	0.2s	0.00~25.00s (when F0-12=0) or 0.0~250.0s (when F0-12=1)	The above parameters are used to set the S acceleration and deceleration times.
F1-17	S Acceleration Time 2			
F1-18	S Deceleration Time 1			
F1-19	S			

	Deceleration Time 2			
F0-12	Speed curve time unit	0	0: Unit 0.01 seconds 1: Unit 0.1 seconds	This parameter is used to set the unit for speed curve time.

3.4.15 Frequency hopping function

When operating near the mechanical resonance point of the load, it may cause mechanical resonance of the load, thereby degrading control performance, and in severe cases, it may damage the load. To avoid resonance, the skip frequency function can be used to make the motor bypass mechanical resonance points. When the set frequency is within the frequency hopping range, the actual operating frequency will run at the frequency hopping boundary closest to the set frequency. By setting the frequency hopping points, the inverter avoids the mechanical resonance point of the load. This inverter can set 4 frequency hopping points. If two adjacent frequency hopping points are set to the same value, this function will not work at that frequency. The skip frequency function is shown in Figure 3-30, and related parameters are listed in Table 3-47.

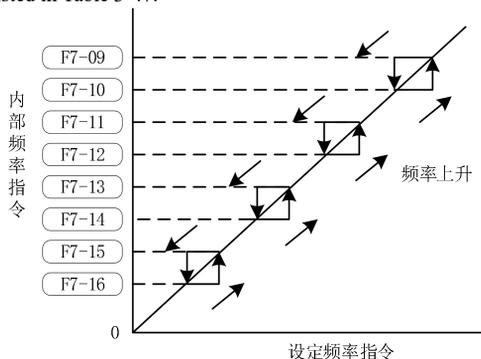


Figure 3-30 Skip Frequency Function

Table 3-47 Parameters for Skip Frequency Function

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F7-09	Jump Frequency 1 Upper Limit	0.00Hz	0.00~599.00Hz	These eight parameters are used to set prohibited frequency ranges; the inverter's frequency setting will skip these ranges, but the frequency output remains continuous. During acceleration and deceleration, the inverter's output frequency will still pass through the prohibited operating frequency ranges.
F7-10	Jump Frequency 1 Lower Limit			
F7-11	Jump Frequency 2 Upper Limit			
F7-12	Jump Frequency 2 Lower Limit			
F7-13	Jump Frequency 3 Upper Limit			
F7-14	Jump frequency 3 lower limit			
F7-15	Jump frequency 4 upper limit			
F7-16	Jump frequency 4 lower limit			

3.4.16 Automatic Acceleration/Deceleration

In practical applications, the setting of acceleration and deceleration times is influenced by factors such as load conditions and motor inertia, and may require multiple adjustments to determine. If the acceleration time is too short, it may cause excessive acceleration current, leading to overcurrent; If the deceleration time is too short, it may result in excessively high bus voltage, causing overvoltage. The automatic acceleration/deceleration function can automatically adjust the acceleration and deceleration

times based on actual conditions, simplifying the commissioning process.

The automatic acceleration/deceleration function consists of two parts: automatic acceleration and automatic deceleration. The automatic acceleration function allows the motor to accelerate to the set frequency at the fastest acceleration time while ensuring a stable starting current and preventing stalling. The automatic deceleration function allows the motor to decelerate to the set frequency or stop operation at the fastest deceleration time while ensuring that overvoltage does not occur in the absence of a braking resistor. The automatic acceleration function and the automatic deceleration function can be individually enabled or disabled to meet different requirements, as shown in Table 3-48.

Table 3-48 Parameters Related to Automatic Acceleration/Deceleration

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-20	Automatic Acceleration and Deceleration Selection	0	0: Linear Acceleration and Deceleration 1: Automatic acceleration with linear deceleration; 2: Linear acceleration with automatic deceleration; 3: Automatic acceleration and deceleration; 4: Automatic Acceleration/Deceleration Suppression.	0: Linear Acceleration/Deceleration; both automatic acceleration and deceleration functions are disabled. 1: Automatic Acceleration with Linear Deceleration; automatic acceleration function is enabled, automatic deceleration function is disabled. 2: Linear Acceleration with Automatic Deceleration; automatic acceleration function is disabled, automatic deceleration function is enabled. 3: Automatic Acceleration/Deceleration; both automatic acceleration and deceleration functions are enabled. 4: Automatic Acceleration/Deceleration Suppression; when current is too high, the automatic acceleration function is enabled; when bus voltage is too high, the automatic deceleration function is enabled; in other cases, both automatic acceleration and deceleration functions are disabled.
F1-21	Automatic Acceleration and Deceleration Kp	2	0~65535	When the automatic acceleration/deceleration function is enabled, this setting is used to configure the PI regulator parameters to adjust the acceleration/deceleration slope.
F1-22	Automatic Acceleration and Deceleration Ki	400	0~65535	

3.4.17 Overcurrent Stall

3.4.17.1 Overcurrent Stall During Acceleration

Generally speaking, the faster the acceleration, the greater the torque current required. If the acceleration is too fast, it may lead to excessive motor current. To protect the motor and inverter, it is necessary to limit the current. The overcurrent stall function during acceleration can prevent overcurrent situations caused by too rapid acceleration.

The principle of the overcurrent stall function during acceleration is shown in Figure 3-31. When the detected current exceeds the set value, the inverter stops accelerating until the current drops below the set value, at which point the inverter resumes acceleration.

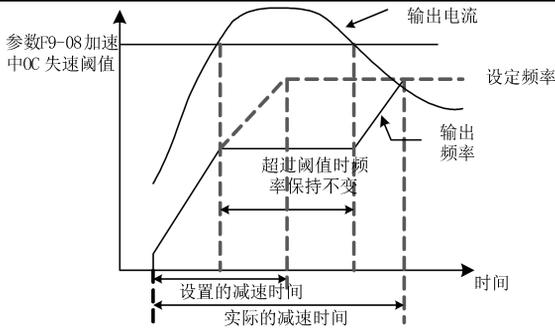


Figure 3-31 Overcurrent Stall During Acceleration

For the weak sector overcurrent stall prevention level, please refer to parameter F9-09 explanation. The protection curve is shown in Figure 3-32.

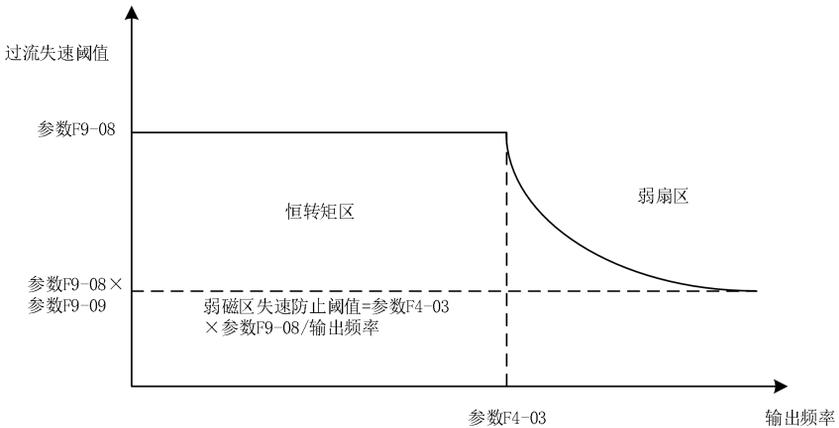


Figure 3-32 Weak Sector Current Stall

When the overcurrent stall prevention function is activated, the inverter's acceleration time will be longer than the set time. If the system enters a stall state due to an undersized motor or operating under factory settings, reduce the parameter F9-08 set value.

If the acceleration time cannot be extended due to this function, it needs to be disabled. To prevent overcurrent, the following measures can be taken:

1. appropriately increase the acceleration time;
2. Set parameter F1-20 automatic acceleration/deceleration selection to 1, 3 or 4 for automatic acceleration.

Relevant parameters are shown in Table 3-49 as follows:

Table 3-49 Parameters Related to Overcurrent Stall During Acceleration

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-08	Acceleration OC Stall Threshold	180%	0~200%	This parameter is used to set the stall prevention threshold during acceleration, the unit is %, based on the rated current of the inverter. When the inverter accelerates, if the output current exceeds the value set by F9-08, the inverter will stop accelerating. When the current falls below the value set by F9-08, the inverter resumes acceleration to the set frequency.
F9-09	Overcurrent Stall Limit	100%	0~100%	This parameter is used to set the overcurrent stall prevention threshold during acceleration when demagnetization occurs. When the motor operating frequency is greater than the

	Threshold			rated frequency, the overcurrent stall prevention threshold during acceleration equals the value set by F9-08 multiplied by the value set by F9-09.
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3.4.17.2 Overcurrent Stall During Operation

Generally speaking, if the motor load is greater, the motor current will also be greater. If the motor load is too high, it can lead to excessive motor current. If the motor load exceeds the motor's capacity, it may even result in loss of control. The overcurrent stall function during operation can prevent the aforementioned situations of excessive current or loss of control.

The principle of overcurrent flux weakening function during operation is shown in Figure 3-33, and the relevant parameters are shown in Table 3-50. When the motor current exceeds the set value, the inverter begins to decelerate until the current drops below the allowable value, at which point the motor reaccelerates to the set frequency.

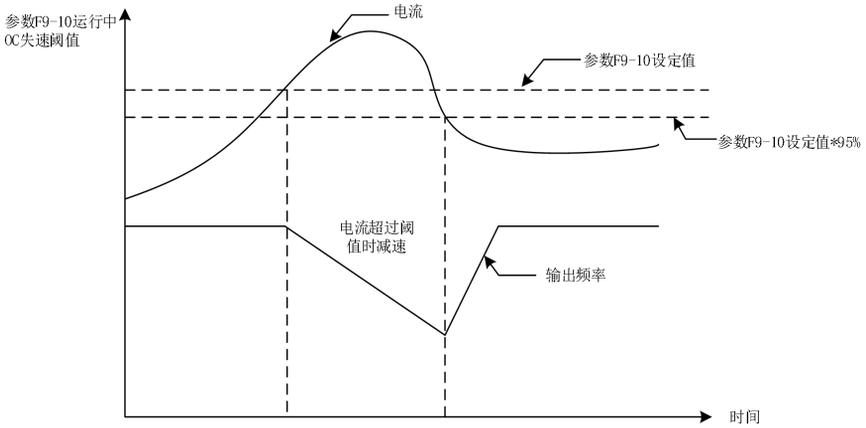


Figure 3-33 Overcurrent Flux Weakening During Operation

Table 3-50 Parameters for Overcurrent Flux Weakening During Operation

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-10	Running OC Stall Threshold	180%	0~200%	This parameter is used to set the threshold for preventing overcurrent flux weakening during operation, with the unit being %, based on the rated current of the inverter. When the inverter is running, if the output current exceeds the F9-10 setting, the inverter will decelerate according to the acceleration/deceleration time selected by F9-11 to prevent motor stall. When the output current is below 95% of the value set in F9-10, the inverter will reaccelerate to the set frequency according to the acceleration/deceleration time selected in parameter F9-11.
F9-11	Constant Speed OC Acceleration/Deceleration Selection	0	0: System Acceleration/Deceleration Time; 1: First	This parameter is used to select the acceleration/deceleration time for overcurrent stall action.

			Acceleration/Deceleration Time; 2: Second Acceleration/Deceleration Time; 3: Third Acceleration/Deceleration Time; 4: Fourth Acceleration/Deceleration Time; 5: Automatic Acceleration/Deceleration Time.	
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3.4.18 Overvoltage Stall

When the motor decelerates, it may feed energy back to the inverter, causing the inverter's bus voltage to rise. If the bus voltage is too high, it may lead to an overvoltage fault. The overvoltage stall function adjusts the slope of the speed curve to avoid overvoltage as much as possible.

When an excessively high bus voltage is detected, the motor deceleration slope is reduced. When the bus voltage is not excessively high, the normal deceleration slope is maintained or the maximum deceleration slope is used for deceleration. In this way, the bus voltage can be maintained within a reasonable range during motor deceleration, avoiding overvoltage conditions.

Overvoltage stall has several implementation methods; Figure 3-34 shows one method. When the bus voltage reaches the overvoltage detection level, the inverter stops decelerating, at which point the bus voltage begins to drop. Once it falls to the overvoltage recovery level, the inverter resumes deceleration.

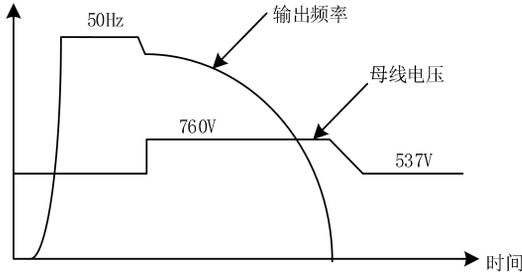


Figure 3-34 Overvoltage Stall Prevention Method 1

When overvoltage stall prevention is activated, the inverter's deceleration time will be longer than the set time. If automatic adjustment of the deceleration time is not allowed, this function must be disabled. To prevent overvoltage, the following measures can be taken:

- 1.Reasonably increase deceleration time;
- 2.Install braking resistor to dissipate motor feedback energy.

Figure 3-35 shows another implementation method, where during motor deceleration, the inverter's deceleration slope is controlled to ensure that the bus voltage does not exceed the set value. Relevant parameters are shown in Table 3-51.

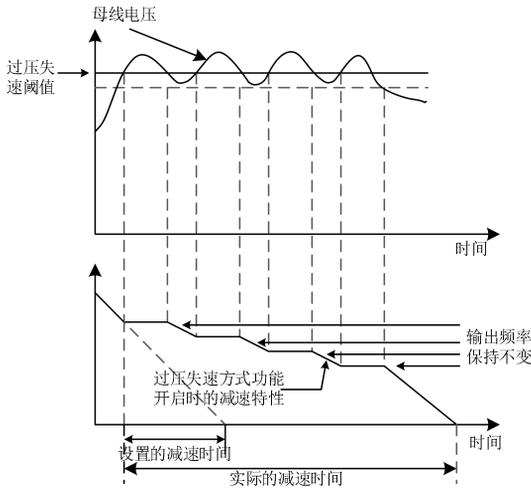


Figure 3-35 Overvoltage Stall Prevention Method 2

Table 3-51 Overvoltage Stall Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-03	Overvoltage Stall Mode	0	0: Overvoltage Stall Mode 0 1: Overvoltage Stall Mode 1	0: Overvoltage stall mode 0; If the inverter detects that the bus voltage is higher than the set value of F9-04, the inverter will stop decelerating (the output frequency remains unchanged) until the bus voltage is lower than the set value of F9-58, at which point the inverter will continue to decelerate. 1: Overvoltage stall mode 1; During the deceleration process, dynamically adjust the speed curve to prevent overvoltage faults due to excessively high bus voltage.
F9-04	overvoltage stall threshold	760.0V	0.0~900.0V	When the set value is 0.0, the overvoltage stall prevention function is disabled. When the inverter is equipped with a braking unit and connected to a braking resistor, it is recommended to use this setting. When the set value is not 0.0, the overvoltage stall prevention function is effective. This parameter can be set according to the power supply and load conditions; if set too low, it may extend the deceleration time. When the set value exceeds the overvoltage protection point, the overvoltage stall prevention function is considered to be disabled.
F9-05	overvoltage stall	600.00	0.00~655.35	overvoltage stall deceleration time

	deceleration time sec			
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3.4.19 Incremental PG Card

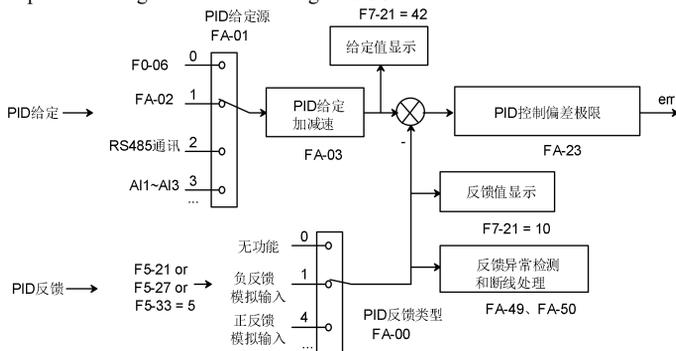
Related parameters are shown in Table 3-52:

Table 3-52 Incremental PG Card Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F4-27	Encoder Selection Type	0	0: No PG Card 1: ABZ Encoder 2: Reserved 3: Resolver	Used to select the encoder type.
F4-28	Encoder Count Pulse	1024	6~20000	This parameter is used to set the number of lines for the selected incremental encoder, indicating the number of A/B signal pulses output per revolution of the encoder. The higher this value, the higher the resolution of the encoder, and the higher the speed and position measurement accuracy. If this parameter is set incorrectly, it can cause overcurrent in the inverter output and motor overspeed during closed-loop speed control. When using a permanent magnet motor, it can also result in incorrect initial rotor position identification. When changing the encoder lines, it is necessary to perform the rotor position dynamic identification again (parameter F4-01=4).
F4-29	Pulse input type	0	0: No Function 1: A phase leading B phase indicates forward rotation; 2: B phase leading A phase indicates forward rotation; 3: A phase pulse B phase direction HL	Used to set the pulse input type.

3.4.20 PID function

PID principle block diagram as shown in Figure 3-36:



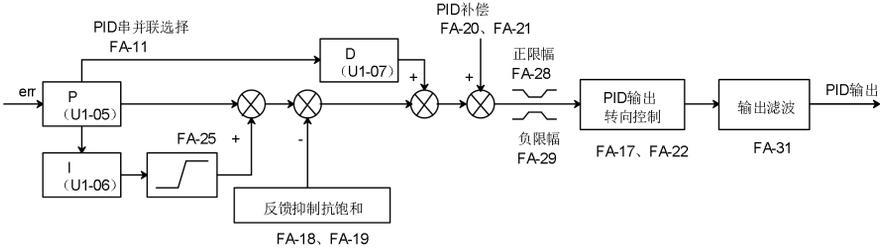


Figure 3-36 PID principle block diagram

PID series control block diagram as shown in Figure 3-37:

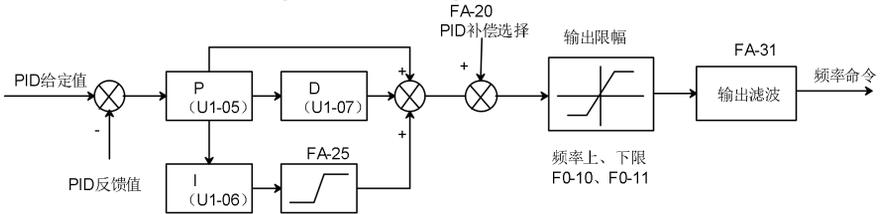


Figure 3-37 PID series control block diagram

PID parallel control block diagram as shown in Figure 3-38:

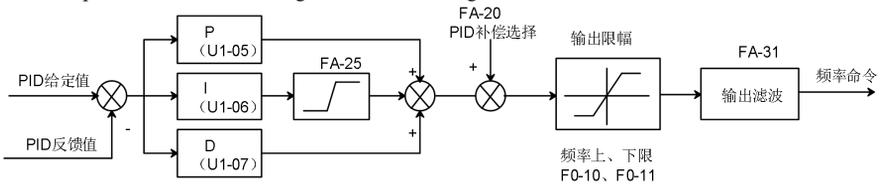


Figure 3-38 PID Parallel Control Block Diagram

Relevant parameters are shown in Table 3-53:

Table 3-53 PID Function Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FA-00	PID Feedback Type Selection	0	0: No Function 1: Negative Feedback Analog Input 2: Negative Feedback Pulse No Direction 3: Negative Feedback Pulse With Direction 4: Positive Feedback Pulse No Direction 5: Positive Feedback Pulse With Direction 6: Positive Feedback Pulse With Direction 7: Negative Feedback Communication Input 8: Positive Feedback Communication Input	Positive Feedback: If the feedback value is less than the PID setpoint, the inverter output frequency increases; Negative Feedback: If the feedback value is less than the PID setpoint, the inverter output frequency decreases.

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FA-01	PID Setpoint Source Selection	0	0: Frequency Command 1: Parameter FA-02 2: RS485 Communication 3: Analog Input 4: CANopen 5: Retain 6: Communication Card	This parameter selects the channel for the PID target value.
FA-02	PID Setpoint	50.00%	-100.00%~100.00%	When FA01 (PID setpoint source) is set to 1, this parameter needs to be configured. This parameter is a relative value, where 100% corresponds to the maximum feedback value of the controlled system.-
FA-03	PID Setpoint Change Time	0.00s	0.00s~655.35s	The time required for the PID setpoint (parameter FA-02) to change from 0.0% to 100.0%. When the PID setpoint changes, the actual setpoint does not respond immediately but changes linearly over the given time to prevent sudden changes in the setpoint.
FA-04	PID Feedback Filter Time	5.0s	0.1s~300.0s	Filters the PID feedback value; this parameter helps reduce the impact of disturbances on the feedback but may degrade the response performance of the closed-loop control process.
FA-05	Proportional Coefficient 1	88.00%	0.00%~100.00%	The speed at which the deviation decreases depends on the proportional coefficient; the larger the proportional coefficient, the faster the deviation decreases. However, an excessively large proportional coefficient can lead to significant overshoot and oscillation, reducing stability, especially in systems with large lag. Reducing the proportional coefficient decreases the likelihood of system oscillation but slows down the response speed. When performing 2ms enhanced PID control (parameter FA-12 = 0), the number of decimal places for this parameter can be selected by parameter FA-53 bit 1, 0: 1 decimal place, 1: 2 decimal places.
FA-06	Integral Time 1	0.05s	0.00s~100.00s	This parameter determines the strength of the integral action of the PID controller. The smaller the integral time, the stronger the integral action, which helps to reduce overshoot, decrease oscillation, and stabilize the system, but it will slow down the elimination of static error in the system.
FA-07	Differential Time 1	0.00s	0.00s~1.00s	This parameter determines the strength of the rate-of-change adjustment of the PID controller. The longer the differential time, the greater the adjustment strength. When set appropriately, this parameter can reduce overshoot and shorten the adjustment time. Differential action amplifies noise interference, so excessive differential regulation is detrimental to the system's ability to resist interference. Additionally, when there is no change in the input, the differential action output is zero. Therefore, differential control is often combined with the other two control laws to form a PD controller or a PID controller.
FA-08	Proportional Coefficient 2	100.00	0.00~100.00	Refer to parameter FA-05; no further details are provided here.
FA-09	Integral	0.08s	0.00s~100.00s	Refer to parameter FA-06; no further details are

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
	Time 2			provided here.
FA-10	Differential Time 2	0.00s	0.00s~1.00s	Refer to parameter FA-07; no further details are provided here.
FA-11	PID Series/Parallel Selection	1	0: Kp, Kp*Ki, Kp*Kd 1: Kp, Ki, Kd	0: Series, traditional PID control structure 1: Parallel, which separates proportional control, integral control, and differential control, allowing users to adjust P, I, and D controllers separately according to application needs. The parallel type PID is selected by default.
FA-12	PID Control Execution Cycle	0	0: Execute Enhanced Control 2ms 1: Execute Traditional Control 1ms	FA-12 = 0, the user selects to execute process PID control once every 2ms cycle, the PID output frequency reference base can be selected according to parameter FA-30, to choose 100.00% output corresponding to the maximum output frequency, or to choose 100.00% output corresponding to the auxiliary frequency. For example, if the user enables the main and auxiliary frequency function (assuming selecting main frequency + auxiliary frequency, parameter F0-07 = 1, F0-08 = 0), and the PID output frequency base selects the auxiliary frequency (FA-30 = 1), and the keyboard sets the auxiliary frequency to 40Hz, then the maximum PID output frequency is 40Hz. FA-12 = 1, the user selects a 1ms cycle to execute the process PID control once, where a PID output of 100.00% corresponds to the maximum output frequency, and there is no auxiliary frequency option for the reference benchmark. Additionally, the enhanced PID option (FA-12 = 0) supports soft start and automatic switching of two sets of PID parameters based on output frequency or deviation, while the traditional PID option (FA-12 = 1) does not have these features.
FA-13	PID Parameter Switching Conditions	0	0: No Function 1: Switch Based on Output Frequency 2: Switch Based on PID Deviation	0: Use the first set of PID parameters FA-05 ~ FA-07 1: Automatically adjust according to the output frequency. Use the first set of PID parameters (FA-05 ~ FA-07) when operating at the minimum frequency (F2-04) or below, use the second set of PID parameters (FA-08 ~ FA-10) when operating at the maximum frequency (F4-02), and use a linear interpolation value of the two sets of PID parameters when the operating frequency is between F2-04 and F4-02.
FA-14	PID Parameter Switching err1	10.00%	0.00%~100.00%	2: Automatically switch based on the deviation between the setpoint and feedback. Use the first set of PID parameters (FA-05 ~ FA-07) when the absolute value of the deviation between the setpoint and feedback is less than the PID parameter switching deviation 1 (parameter FA-14). Use the second set of PID parameters (FA-08 ~ FA-10) when the absolute value of the deviation between the setpoint and feedback is greater than the PID parameter switching deviation 2 (parameter FA-15). When the absolute value of the deviation between the setpoint and feedback varies between FA-14 ~ FA-15, the PID parameters are the linear interpolation values of the two sets of PID parameters.
FA-15	PID Parameter Switching Error 2	40.00%	0.00%~100.00%	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FA-16	Allow PID Reverse Delay	0.0s	0.0s~6553.5s	When parameter FA-16 \neq 0, the reverse operation function is enabled after startup. For example, if FA-16 is set to 2.0, PID control is not allowed to change the direction of operation during the start-up period of 0 ~ 2 seconds (parameter FA-17 = 0), and after 2 seconds of start-up, PID control is automatically allowed to change the direction of operation (parameter FA-17 will be automatically updated to 1).
FA-17	PID Direction Change Selection	0	0: Disabled 1: Enable	0: Non-reversible running direction 1: Reversible running direction
FA-18	Feedback Suppression Deviation Rate	10%	0%~65535%	When the setpoint and feedback deviation are in opposite directions, parameters FA-18 and FA-19 provide feedback suppression anti-integral windup functionality to quickly exit the saturation state and respond to external inputs, avoiding the controller output lingering in the saturation zone for a long time, thus improving the controller's response capability. The controller performs anti-integral windup suppression based on the relationship between the feedback suppression deviation rate (parameter FA-18) and the 100ms deviation rate.
FA-19	Feedback Suppression Gain	800	0~1000	
FA-20	PID Compensation Selection	0	0: Parameter Setting 1: Analog Input	When FA-20 = 0, the PID compensation value (parameter FA-21) must be set.
FA-21	PID Compensation Value	0.0	-100.0~100.0	The reference for this parameter is the maximum output frequency F4-02. Example: If the maximum output frequency parameter F4-02 = 50.00 Hz, and FA-21 is 10.0%, the PID compensation will increase the output frequency by 5.00 Hz.
FA-22	PID Deviation Deadband Limit	0.06%	0.00%~100.00%	When the PID control output exceeds FA-22, the PID regulation output becomes effective; otherwise, the PID regulator is inhibited. This parameter effectively prevents the actuator from oscillating when the PID output is small.
FA-23	PID Control Deviation Limit	0.00%	0.00%~100.00%	This parameter determines the level at which the deviation between the feedback and setpoint signals causes the PID regulation to stop, maintaining the previous output value. PID regulation output is only executed when the deviation between the feedback value and the setpoint exceeds the PID control deviation limit FA-23. Properly setting this parameter can adjust the accuracy and stability of the PID system. The functional diagram is as follows:

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FA-24	Integral Separation Level	0.00%	0.00%~100.00%	When the PID feedback overshoot is large at startup, integral separation can be enabled to reduce overshoot, with the parameter benchmark being the PID deviation. When FA-24 \neq 0, the integral separation function is activated, and it only operates once at startup. When the deviation between the setpoint and the feedback value exceeds the parameter FA-24, integral separation occurs to prevent excessive overshoot due to integral action; When the deviation is less than parameter FA-24, the integral action takes effect to eliminate steady-state error.
FA-25	Integral Upper Limit	100.0%	0.00%~100.00%	This parameter is the upper limit of integration, with the reference being the maximum output frequency F4-02. When the integral value is too large, if the load suddenly changes, the response speed of the inverter slows down, which may cause motor slippage or mechanical damage. At this time, the parameter FA-25 can be appropriately reduced.
FA-26	Wake-up Integral Limit	50.0%	0.0%~200.0%	This parameter is the upper limit of wake-up integration, used to reduce the reaction time from sleep to wake-up, with the reference being the maximum output frequency F4-02.
FA-27	Main Auxiliary Reverse Cut-off Frequency	10.0%	0.00%~100.00%	In some cases, only when the PID output frequency is negative (i.e., the inverter runs in reverse), can the PID possibly control the setpoint and feedback to the same state. However, an excessive reverse frequency is not allowed in certain situations. Parameter FA-27 is used to determine the upper limit of the reverse frequency. The reference base for this parameter is the maximum output frequency F4-02.
FA-28	PID Output Positive Limit	100.0%	0.00%~100.00%	This parameter is the upper limit of the PID control output command, with the reference base being the maximum output frequency F4-02.
FA-29	PID Output Negative Limit	100.0%	0.00%~100.00%	When PID output reversal is allowed, the PID output is negative, and at this time, the output will be limited to the value set by parameter FA-29, which should be used in conjunction with parameter FA-17.

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FA-30	PID output frequency reference	0	0~1	0: PID control output 100.00% corresponds to the maximum output frequency F4-02; 1: PID control output 100.00% corresponds to the auxiliary frequency (if the auxiliary frequency command changes, the PID output frequency will also change).
FA-31	PID output filter time	0.0s	0.0s~2.5s	This parameter is used to set the low-pass filter time for PID control output; the larger the parameter value, the greater the PID output filtering, and the slower the change in output frequency. Improper setting of parameter FA-31 may affect the response speed of the inverter, and even cause system oscillation.
FA-32	Soft Start - PID Switching Value	5.00%	0.00%~100.00%	The reference for this parameter is the deviation between the PID setpoint and feedback value.
FA-33	Soft Start Frequency	0.00Hz	0.00Hz~599.00Hz	When parameter FA-35 \neq 0 and the inverter output current is greater than FA-35, it starts at the soft start frequency (parameter FA-33) and the soft start acceleration step (parameter FA-36), until the soft start acceleration time (parameter FA-34) is reached, then switches to normal PID control.
FA-34	soft start acceleration time	3.00s	0.00s~600.00s	
FA-35	No-load Current	0.00A	0.00A~655.35A	
FA-36	Soft Start Acceleration Step	0.10s	0.00s~600.00s	
FA-37	Fuzzy PID Tuning Enable	1	0: Fuzzy PID Tuning Disabled 1: Fuzzy PID Tuning Enabled	0: Fuzzy PID disabled, use only conventional PID 1: When PID control is not allowed to change the direction of operation (FA-17 = 0), enable fuzzy PID control, and perform real-time self-tuning of PID parameters during operation. Fuzzy PID control is enabled only when the air compressor application is selected (parameter L0-00 = 6) and 2ms enhanced PID control (parameter FA-12 = 0) is executed, or 1ms traditional PID control (parameter FA-12 = 1) is executed.
FA-38	Deviation Fuzzy Universe of Discourse - NB	5.00	0.00~100.00	Membership value of the linguistic term 'negative large' in the fuzzy set domain of the error variable.
FA-39	Deviation Fuzzy Domain-NS	2.00	0.00~100.00	Membership value of the linguistic term 'negative small' in the fuzzy set domain of the error variable.
FA-40	Deviation Fuzzy Domain-PS	2.00	0.00~100.00	Membership value of the linguistic term 'positive small' in the fuzzy set domain of the error variable.
FA-41	Deviation Fuzzy Domain-PB	5.00	0.00~100.00	The membership value of the linguistic term "Positive Large" in the domain of the deviation fuzzy variable fuzzy set.
FA-42	Deviation Rate Fuzzy Domain-NB	10.00	0.00~100.00	The membership value of the linguistic term "Negative Large" in the domain of the deviation rate fuzzy variable fuzzy set.
FA-43	Deviation Rate Fuzzy Domain-NS	5.00	0.00~100.00	The membership value of the linguistic term "Negative Small" in the domain of the deviation rate fuzzy variable fuzzy set.

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FA-44	Deviation Rate Fuzzy Domain-PS	5.00	0.00~100.00	The membership value of the linguistic term "Positive Small" in the domain of the deviation rate fuzzy variable fuzzy set.
FA-45	Fuzzy Set of Deviation Rate PB	10.00	0.00~100.00	The membership value of the linguistic term "Positive Large" in the domain of the deviation rate fuzzy variable fuzzy set.
FA-46	Fuzzy PID Inference Rules	2	0~3	0: Fuzzy PID Inference Rule 0 1: Fuzzy PID Inference Rule 1 2: Fuzzy PID Inference Rule 2 3: Fuzzy PID Inference Rule 3
FA-47	Intermediate Value of Fuzzy Rule KP	50	0~100	Parameters FA-47 and FA-48 are used to obtain the initial membership values for the linguistic terms that are zero in the fuzzy control rule table for fuzzy variables such as Kp, Ki, and Kd.
FA-48	Intermediate Value of Fuzzy Rule KI	50	0~100	
FA-49	Feedback Abnormality Detection Time	0.0s	0.0s~3600.0s	This parameter is used for detecting abnormal conditions or extremely slow response of the feedback analog signal; when FA-49 = 0, no detection is performed. When the sampled value of the analog signal is below the 4~20mA open-circuit threshold (parameter F5-43) for a duration exceeding FA-49, the inverter will feedback an abnormal analog signal and handle the fault according to the setting of parameter FA-50.
FA-50	Feedback Disconnection Action Selection	0	0: Warning and continue running; 1: Warning and decelerate to stop; 2: Warning and free stop; 3: Run at the frequency before the open circuit.	Used to set the handling method for feedback open-circuit faults
FA-51	PID Feedback Abnormal Deviation	10.0%	1.0%~50.0%	When the deviation between the setpoint and feedback signal exceeds the threshold (parameter FA-51) and persists for longer than the deviation abnormality detection time FA-52, a PID deviation fault occurs. If the function selection for output terminals F6-00 ~ F6-03 is 15, the output terminal will indicate a PID deviation warning.
FA-52	Abnormal Deviation Detection Time	5.0s	0.1s~300.0s	
FA-53	PID Control Flag	2	0~65535	PID control flag (bits 0 ~ 2 are valid) bit 0: PID reverse action selection, 0: PID reverse based on PID calculation value, 1: Reverse based on parameter F0-09. bit 1: Selection of decimal places for PID parameter Kp, 0: 1 decimal place, 1: 2 decimal places. bit 2: 0: No function, 1: When the main and auxiliary frequency function is enabled, the integral upper limit base value is the auxiliary frequency.

3.5 Application Control

3.5.1 Jog Operation

Jog operation is a common function of inverters, often used during equipment debugging or when precise adjustments are needed. During jog operation, upon receiving a jog command, the inverter will control the motor to accelerate to the jogging frequency according to the jog acceleration time. After the

jog command is removed, depending on the stopping method, the motor will decelerate and stop according to the jog deceleration time or use other stopping methods, as shown in Table 3-54.

Table 3-54 Jog Operation Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F7-00	JOG frequency setting	6.00Hz	0.00~599.00Hz	The above parameters are used to set the jogging operation frequency, the time to accelerate from 0.00Hz to the jogging operation frequency, and the time to decelerate from the jogging operation frequency to 0.00Hz. During jog operation, when the jog command is received, the inverter controls the motor to accelerate to the electric frequency according to the jog acceleration time. When the jog command is removed, depending on the different stop modes, the motor decelerates and stops according to the jog deceleration time or adopts other stop methods.
F7-01	JOG acceleration time	10.00s	0.00~600.00s or 0.0~6000.0s	
F7-02	JOG deceleration time	10.00s	0.00~600.00s or 0.0~6000.0s	
F0-12	Speed curve time unit	0	0: Acceleration/Deceleration Unit 0.01 seconds 1: Acceleration/Deceleration Unit 0.1 seconds	This parameter is used to set the unit for speed curve time.

3.5.2 Fan Control

Inverters are generally equipped with fans. When the fans operate, they can increase air circulation, thereby reducing the internal temperature of the inverter. The relevant parameters are shown in Table 3-55. The fan operation status can be determined by the inverter's operating status, module temperature, etc. Currently, several different fan operation modes are provided, which can be selected according to needs.

Table 3-55 Fan Control Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F7-17	Fan control method	3	0: Fan runs continuously; 1: STOP one minute after shutdown; 2: Stops running with the inverter; 3: Starts when the temperature reaches 50°C; 4: Stops when the temperature is below 50°C during shutdown.	0: After power-on of the inverter, the fan runs continuously. 1: The fan starts when the inverter is running and stops 1 minute after the inverter stops. 2: The fan operates according to the inverter's operating status; it starts when the inverter is running and stops when the inverter stops. 3: When the module temperature > 50 ° C, the fan starts; When the module temperature < 40 ° C and the inverter stopsoperating, the fan turns off. 4: The fan starts when the inverter is running at variable frequency, and after the inverter stops, the fan turns off when the module temperature is below 50°C.

3.5.3 Load Torque Compensation

In inverters, aPIregulator is commonly used for speed control. If a higher system speed response is required, the bandwidth of thePIregulator needs to be increased. However, in practical applications, the bandwidth of thePIregulator is subject to many constraints and may not be adjustable to the desired value. At this point, if it is still necessary to further improve the system speed response, load torque compensation can be added on top of thePIregulator.

A disturbance observer (DOB) is used to calculate the load torque, which is then added to the output of the speed loopPIregulator to achieve load torque compensation. The parameters related to load

torque compensation are shown in Table 3-56.

Table 3-56 Parameters Related to Load Torque Compensation

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F3-13	DOB Compensation Gain	0	0~5000	This parameter sets the magnitude of the load torque compensation gain.

3.5.4 Base Block

When the external controller detects an abnormal condition, it may be necessary for the inverter to stop immediately; at this time, the base block function of the inverter needs to be used. When a base block signal is received, the inverter stops PWM output, and after the base block signal is removed, the inverter resumes operation after a certain delay (which can be set through parameters). Additionally, if the inverter's stopping method is free stop, after stopping, it must wait for the time set by this function code before it can run again, as shown in Table 3-57.

Table 3-57 Base Block Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-31	Base Blockade Interruption Time	0.5s	0.0~5.0s	Used to set the waiting time from when the inverter stops output to when it restarts.

3.5.5 Bus Voltage Compensation

When the bus voltage changes, the output voltage may also change, which could affect the motor control performance. The bus voltage compensation function (Automatic Voltage Regulation function, AVR) can compensate for changes in output voltage caused by variations in bus voltage, making motor control performance more stable.

When the bus voltage increases, the output duty cycle is appropriately reduced, and when the bus voltage decreases, the output duty cycle is appropriately increased, thus maintaining a constant output voltage. In actual use, the duty cycle calculated by the control algorithm can be multiplied by the reciprocal of the bus voltage reference value and the actual value to achieve this. The bus voltage compensation related parameters are shown in Table 3-58.

Table 3-58 Bus Voltage Compensation Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F7-37	Automatic Voltage Regulation	0	0: Enable AVR function; 1: Disable AVR function; 2: Disable AVR during deceleration.	0: AVR function enabled, the inverter calculates the output voltage based on the bus voltage, ensuring the output voltage does not fluctuate with changes in bus voltage. 1: AVR function disabled, the inverter does not calculate the output voltage based on the bus voltage, leading to fluctuations in output voltage and motor current due to bus voltage variations. 2: AVR function disabled during deceleration, but enabled in other states. Disabling AVR during deceleration can reduce the deceleration time.

3.5.6 Frequency Holding

In applications such as elevators and cranes, to improve reliability or positioning accuracy, it is often necessary to run at a certain frequency for a period of time during startup before accelerating to the set frequency, and during shutdown, to run at a certain frequency for a period of time before decelerating to zero speed. The above can be achieved through the frequency holding function.

The frequency holding function includes start-up holding and stop holding, which process the speed curve during start-up and stop, respectively. As shown in Figure 3-39, the parameters for start-up holding frequency, start-up holding time, stop holding frequency, and stop holding time can be adjusted to meet different requirements.

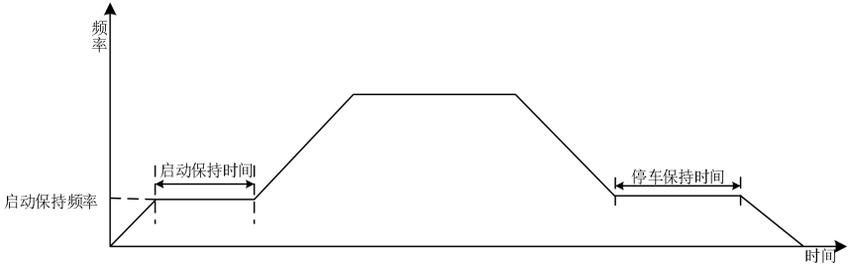


Fig. 3-39 Frequency Holding

Parameters related to frequency holding are shown in Table 3-59:

Table 3-59 Parameters Related to Frequency Holding

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-06	Startup Hold Time	0.00s	0.00~600.00s	F1-06 Start Holding Time and F6-07 Start Holding Frequency can be used to set the start frequency holding function.
F1-07	Startup Hold Frequency	0.00s	0.00~599.00Hz	
F1-26	Stop Holding Time	0.00s	0.00~600.00s	F1-26 Stop Holding Time and F1-27 Stop Holding Frequency can be used to set the stop frequency holding function.
F1-27	Parking Hold Frequency	0.00s	0.00~599.00Hz	

3.5.7 Start/Stop DC Braking

When the inverter starts, if the motor is still rotating, it may cause significant impact. To avoid this situation, the motor can be braked first, and then started at zero speed after it has stopped rotating. The DC braking function is activated by injecting DC current into the motor windings, which generates a braking torque to stop the motor, as shown in Figure 3-40.

When the inverter stops, there may be instances where the motor has not completely stopped. To prevent this, the stop DC braking function can be used to brake the motor after it has stopped, ensuring that the motor does not rotate after stopping. The stop DC braking function injects DC current into the motor windings during the stop process, generating a braking torque to achieve the purpose of braking. Start DC braking is typically applied in situations such as fans, where the motor may still be rotating when the inverter starts. In this case, start DC braking can be used to stop the motor before starting. Stop DC braking ensures that the motor stops rotating when parking.

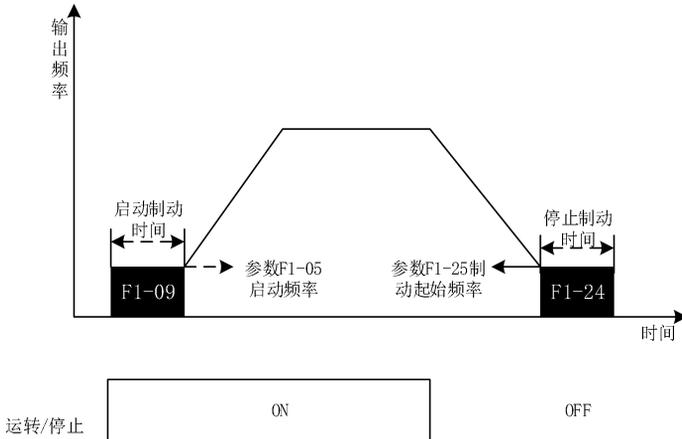


Figure 3-40 Start/Stop DC Braking

Parameters related to start/stop DC braking are shown in Table 3-60:

Table 3-60 Start/Stop DC Braking

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-08	Braking Current Level	0	0~100%	Used to set the magnitude of the start and stop DC braking current, the unit is %, based on the motor's rated current.
F1-09	Startup Braking Time	0.0	0.0~60.0s	Used to set the duration of the start DC braking. When the start braking time is set to zero, the start DC braking is invalid.
F1-10	DC Braking Ratio Coefficient	2000	0~65535	When using VF or induction motor VVC control, F1-10 DC braking ratio coefficient and F1-11 DC braking integral coefficient can be used to adjust the current PI regulator parameters.
F1-11	DC Braking Integral Coefficient	100	0~65535	
F1-24	Braking Time	0.0s	0.0~60.0s	This parameter sets the duration of the stop DC braking. If DC braking is required during stopping, parameter F1-12 motor stop method must be set to deceleration stop for this function to be effective. When the stop brake time is set to 0.0, DC braking during stop is invalid.
F1-25	Braking Start Frequency	0.0Hz	0.00~599.00Hz	This parameter is used to set the starting frequency for stop DC braking. When the inverter decelerates to the frequency value set by this function code, DC braking begins.

3.5.8 Instantaneous Power Failure Restart

Generally, when power is lost, the inverter will shut down due to undervoltage, and even if the power returns to normal within a short period, the inverter will not restart automatically. The instantaneous power failure restart function can automatically start the inverter when power is restored after a brief outage, achieving the goal of continuous motor operation.

After an undervoltage fault occurs, if the bus voltage returns to normal within a certain time (which can be set through parameters), a speed search is performed, followed by controlling the motor to run at the set frequency. If the bus voltage does not return to normal within the specified time, the system will shut down. Parameters related to instantaneous power failure and restart are shown in Table 3-61.

Table 3-61 Instantaneous Power Failure and Restart

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-29	Instant Power Failure Restart Method	0	0: Stop operation; 1: Start speed tracking from the frequency before the power failure; 2: Start speed tracking from the minimum output frequency.	0: Stop operation; in case of an instantaneous power failure, stop operation and cannot automatically restart. 1: Track current speed; The inverter starts from the frequency before power-off and performs speed tracking downwards. Once the motor frequency is detected, it accelerates from the detected motor frequency to the set frequency. It is recommended to select this option when the motor inertia is large. 2: minimum frequency tracking; The inverter starts from the lowest frequency and tracks upwards. Once the motor frequency is detected, it accelerates from the detected motor frequency to the set frequency. It is recommended to select this option when the motor

F1-30	Allowed Power Failure Time	2.0s	0.0~20.0s	inertia is small. When the power outage duration is less than the value set for this function code, automatic restart according to the settings of F1-29 is allowed. If the power outage duration exceeds the time set for this function code, automatic restart will not be performed.
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3.5.9 Instant Stop Without Stopping

When the grid voltage drops, the inverter may shut down due to undervoltage. Uncontrolled abnormal shutdowns can cause significant impacts, leading to system damage and serious consequences. The instant stop without stopping function can, in such cases, allow the motor to decelerate in a controlled manner, reducing the impact on the system.

When a grid voltage sag (bus voltage below a certain value) is detected, the instantaneous stop prevention function starts working, adjusting the deceleration slope to put the motor into a power generation state, feeding energy back to the inverter, preventing the bus voltage from dropping rapidly, thus avoiding the inverter shutting down due to undervoltage. Instantaneous Stop Prevention Relevant parameters are shown in Table 3-62.

Table 3-62 Parameters for Instantaneous Stop Prevention

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-32	dEb recovery threshold	40.0V	0.0~200.0V	This parameter is used to set the dEb recovery voltage value. By default, dEb recovery voltage = dEb action voltage + (F1-32 setting value).
F1-33	dEb action bias threshold	40.0V	0.0~200.0V	This parameter is used to define the voltage value at which dEb begins to act. By default, dEb action voltage = undervoltage protection value + 60V + (F1-33 setting value).
F1-34	dEb deceleration selection	0	0: No Action 1: Enable, no recovery; 2: Enable, recovery;	0: When the grid voltage drops, the inverter does not decelerate, and the inverter may stop due to undervoltage. 1: When the grid voltage drops, reaching the dEb action voltage, the inverter controls the motor to decelerate, and when the grid voltage returns to normal, it still controls the motor to decelerate to zero before stopping. 2: When the grid voltage drops, reaching the dEb action voltage, the inverter controls the motor to decelerate, and when the grid voltage returns to normal, it maintains the current frequency for a period (F1-35) before accelerating to the target frequency.
F1-35	dEb recovery time	3.0s	0.0~25.0s	This parameter is used to set the time that the inverter maintains operation at the current frequency when power is restored. After this period ends, the inverter accelerates back to the given frequency.
L2-18	Undervoltage Protection Value	360.0V	250.0~440.0V	A voltage below this level will trigger under-voltage protection.

3.5.10 Speed Tracking

Speed tracking is applicable for punch presses, fans, and other large inertia load applications. In control modes with an encoder, F1-00 must be set to a non-zero value for the inverter to start speed tracking based on the encoder feedback. When using free stop (that is, inertial stop) for parking, or when the inverter suddenly stops due to a fault, the motor will decelerate under the effect of friction. If the motor inertia is large, the time required for the motor to come to a complete stop will be longer. If the inverter starts directly while the motor has not completely stopped 242 rotating, it may cause significant impact. The speed tracking function can obtain the motor speed and then control the motor to run to the set frequency based on this speed. This not only shortens the restart time but also avoids

excessive shock.

The principle of speed tracking is to inject a certain voltage or current signal into the motor, and determine the actual speed of the motor based on the current or required voltage combined with the motor model. After obtaining the actual speed, it is used as the speed setpoint, and then the motor runs along the normal speed curve to the set frequency. The parameters related to speed tracking are shown in Table 3-63:

Table 3-63 Parameters Related to Speed Tracking

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-00	Startup Speed Tracking	0	0: No action; 1: Track from maximum frequency; 2: Track from start-up frequency; 3: Track from minimum frequency.	0: Speed tracking function disabled. 1: Track using the maximum output frequency; Upon restart, track the speed downward from the maximum output frequency until the motor speed is detected, then control the motor to run at the set frequency. 2: Upon restart, track the speed from the given frequency at startup, and ultimately control the motor to run at the set frequency. 3: Upon restart, track the speed from the minimum frequency, and after tracking the motor speed, control the motor to run at the set frequency.
F1-03	Speed Tracking Maximum Current	100%	20~200%	The inverter starts speed tracking only when the output current exceeds this set value. The larger this parameter is set, the faster the tracking speed, but setting it too large may cause overcurrent or overload faults.

3.5.11 Abnormal Restart

After an abnormality occurs, the inverter usually stops running and will only restart after the fault has been reset and a run command is received. The automatic restart function after an abnormality can automatically clear the fault and control the inverter to restart when a fault occurs, achieving the purpose of continuous motor operation, as shown in Table 3-64.

After a fault occurs, if the number of automatic restart attempts after an abnormality (F9-46) is not zero, the inverter fault will be cleared, and speed search will be performed, followed by controlling the motor to run at the set frequency. If the number of retries after an abnormality is zero, the fault will not be cleared, and the inverter will remain in a shutdown state.

Table 3-64 Parameters for Automatic Restart After Abnormality

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F1-02	Abnormal Restart Method	0	0: Stop operation; 1: Track current speed; 2: Minimum frequency tracking.	0: Shut down after an abnormality, and the inverter does not automatically restart after the fault is reset. 1: When restarting after an abnormality, perform speed tracking from the current speed, and then control the motor to run at the set frequency after the speed is tracked. 2: When an abnormality occurs and the system restarts, it performs speed tracking from the minimum frequency. Once the speed is tracked, the motor is controlled to run to the set frequency.
F9-46	Abnormal restart count	0	0~10	This parameter is used to set the number of automatic restarts after an abnormality. If set to zero, the inverter will not automatically restart after an abnormality. When automatically restarting after an abnormality, the inverter will start according to the settings in F1-02. If the number of abnormalities exceeds the value set in F9-46, the fault will not automatically reset. It must be manually reset and a new operation command received before it can continue running.
F9-47	Abnormal Restart	60.0s	0.0~6000.0s	After an abnormal restart, if no further abnormalities occur within the time set by this function code, the

	Reset Time		F9-46 abnormal restart count will be reset to the set value.
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3.5.12 Vibration Suppression

When using VF control to drive an asynchronous motor, there may be vibration issues. If the vibration is severe, it could lead to a shutdown, preventing normal operation. Therefore, when designing VF control algorithms, vibration suppression functions are generally essential. Some self-tuning algorithms also require vibration suppression functions.

By appropriately adjusting the given frequency based on the motor's operating status, the purpose of vibration suppression can be achieved. Relevant parameters are shown in Table 3-65. The vibration suppression effect can be adjusted through the parameter "Oscillation Suppression Gain". The higher the "Oscillation Suppression Gain", the better the vibration suppression effect, but the dynamic performance of the motor will decrease. Conversely, the worse the vibration suppression effect, the better the dynamic performance of the motor. In actual use, this parameter can be adjusted according to specific needs.

Table 3-65 Parameters Related to Vibration Suppression

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F2-14	Oscillation Suppression Gain	1000	0~10000	If oscillation occurs when the motor is under VF control, this parameter value can be adjusted to improve the oscillation condition. The greater the oscillation suppression gain, the better the oscillation suppression effect, but the dynamic performance of the motor will decrease; conversely, the poorer the vibration suppression effect, the better the dynamic performance of the motor.

3.5.13 Braking Unit Control

When the motor is in generator mode and feeds energy back to the inverter, the bus voltage of the inverter will rise. If not controlled, it may trigger an overvoltage fault, preventing the inverter from continuing to operate. The braking unit can dissipate the energy fed back by the motor, thus avoiding excessive bus voltage. When using this function, an external braking resistor is required for the inverter. When the bus voltage is detected to be higher than the set voltage, the braking unit activates. At this point, the braking resistor is equivalent to being connected in parallel with the bus capacitor, thereby releasing the energy stored in the capacitor and reducing the bus voltage to achieve the purpose of limiting the bus voltage. The parameters related to the control of the braking unit are shown in Table 3-66:

Table 3-66 Parameters Related to Braking Unit Control

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L2-17	Braking Resistor Activation Voltage	740.0V	700.0~900.0 V	This parameter is used to set the activation voltage of the braking unit. Users can select an appropriate braking resistor to achieve optimal deceleration characteristics.

3.5.14 Excessive slip

Slip is the difference between the synchronous speed of an asynchronous motor and the motor's actual speed; generally, the greater the load torque, the larger the slip. If excessive slip occurs, it may be due to an overload or other abnormal conditions, so timely action is necessary. Relevant parameters are shown in Table 3-67.

Detecting excessive slip is relatively straightforward; continuously monitor the slip value of the motor. When the absolute value of the slip exceeds a certain threshold (which can be set via parameters), take appropriate actions such as continuing operation, issuing a warning, or initiating a fault shutdown.

Table 3-67 Parameters related to excessive slip

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-25	Excessive slip detection value	0	0.0~100.0%	The unit for excessive slip detection is %, based on the motor's rated slip. When the actual slip of an asynchronous motor exceeds the set value

F9-26	Excessive slip detection time	1.0s	0.0~10.0s	F9-25 and persists for longer than the time set in F9-26, an over-slip fault is detected, and the inverter will take subsequent actions as determined by the setting in F9-27.
F9-27	Excessive slip action selection	0	0: Warning and continue running; 1: Warning and decelerate to stop; 2: Warning and free stop; 3: No warning.	0: When the over-slip detection conditions are met, an over-slip warning is issued, but the machine does not stop. 1: When the over-slip detection conditions are met, an over-slip fault is reported, and the machine decelerates to stop. 2: When the conditions for excessive slip detection are met, an excessive slip fault is reported, automatic shutdown. 3: No excessive slip fault detection is performed.

3.5.15 Automatic energy saving

Using a frequency converter to drive a motor is primarily aimed at energy conservation. Under the same torque output conditions, the voltage and current output by the frequency converter can vary; different scenarios correspond to different output powers of the frequency converter. If a combination of voltage and current can be selected to reduce the output power of the frequency converter, the goal of energy conservation is achieved.

While running, the frequency converter continuously calculates the output power and adjusts the output voltage based on the output power to achieve the minimum output power or maintain it near the minimum value. The entire process can be carried out automatically without external intervention, hence it is referred to as "automatic energy-saving" function. To ensure that the acceleration and deceleration performance is not affected by the automatic energy-saving function, this feature is disabled during acceleration and deceleration, and only activated during steady-speed operation. The parameters related to automatic energy-saving are shown in Table 3-68 as follows:

Table 3-68 Parameters Related to Automatic Energy-Saving

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F7-35	Automatic Energy Saving Setting	0	0: Disabled 1: Enable	After the automatic energy-saving function is enabled, the voltage will be output normally during acceleration and deceleration. During constant-speed operation, the output voltage will be automatically adjusted based on the load condition. When the load is small, the output voltage will automatically decrease, thereby achieving the purpose of energy saving.
F7-36	Energy Saving Gain	100%	10~1000%	When F7-35 is set to 1, this parameter can be used to adjust the energy-saving gain. The factory setting value is 100%. If the energy-saving effect is poor, F7-36 can be reduced; if the motor oscillates, F7-36 should be increased.

3.6 Tension Control

This chapter introduces several tension control schemes, mainly including tension closed-loop speed mode, line speed closed-loop mode, tension open/closed-loop torque mode, etc., for a total of four control methods (corresponding to FB-00 selection).

- Tension Closed-loop Speed Mode

Features: Through the use of a swing arm (floating roller) or tension sensor to feedback material tension, the inverter output frequency is adjusted in a closed loop to achieve constant control of the swing arm position or tension. Suitable for applications where there is a swing arm or tension sensor (where changes in speed have a slow impact on tension changes) and there is sufficient speed regulation margin.

The winder operates in closed-loop tension speed mode, with two AI signals receiving the position signal of the lever and the line speed signal of the main traction machine, respectively. Calculate the roll diameter through line speed, calculate the main frequency based on line speed, and adjust the output frequency together with the feedback loop of the rocker position. Compared to the main frequency+PID auxiliary frequency of general-purpose inverters, due to the addition of roll diameter

calculation, the main frequency setting can more accurately follow the changes in line speed, thus making the control of the lever position more stable.

- Constant linear speed control

Features: Suitable for occasions without master traction, one machine in the winding/unwinding process operates in constant linear speed mode, serving as the traction role. The winder also serves as the main traction unit. To maintain the material running at a constant line speed, it is necessary to obtain the roll diameter value. The diagram above shows two feasible methods:

- Using theDIterminal input pulse signal, the roll diameter is calculated using the thickness accumulation method.

- A speed measurement device is installed on the material, transmitting pulses to the inverter, which calculates the roll diameter based on the linear speed.

It is not necessary to use both of the above methods simultaneously as shown in the diagram; choose one of them or another feasible method. The winder operates in closed-loop linear speed mode, with oneAIreceiving the linear speed signal. By calculating the roll diameter based on line speed, the main frequency setting is determined according to the given operating line speed and the roll diameter, working together with the line speed feedback closed-loop regulation to decide the output frequency, achieving constant line speed operation without main traction. The unwinder can operate in one of the other three tension modes based on actual conditions.

- Closed-loop tension torque control

Features: Through feedback from a tension sensor, the inverter's output torque is adjusted in a closed loop to achieve constant tension control. This system integrates mode4open-loop tension control torque, using open-loop tension calculation to assist closed-loop tension regulation (in practice, closed-loop tension regulation is the primary method, but mode4open-loop tension control torque can be optionally added based on control performance). The tension accuracy is high, suitable for materials with strong elasticity or situations where there is no speed adjustment margin.

The winder operates in tension closed-loop torque mode, with twoAIsignals receiving tension sensor signals and the main drive line speed signal, respectively. In implementation, an open-loop torque setting plus tension closed-loop regulation method is adopted. The calculation of roll diameter in open-loop tension is retained, while inertia and friction compensation can be omitted due to the addition of closed-loop regulation (or can be set to optimize response speed).

For elastic materials (with speed regulation margin), it is also possible to consider using tension closed-loop speed mode (mode1) to avoid the occurrence of elastic oscillation.

- Open-loop tension torque control

Features: No need for a swing arm (floating roller) or tension sensor; no tension closed-loop, slightly lower tension accuracy; suitable for applications with low tension accuracy requirements.

The winder operates in open-loop tension torque mode, using line speed to calculate the roll diameter, and output torque is calculated through material tension. Based on the actual system conditions, friction torque compensation or acceleration/deceleration inertia torque compensation can be selected.

The above typical application methods are only intended to illustrate the scenarios suitable for the four tension control modes and do not strictly limit them to these forms. Under basic conditions being met, flexible handling according to actual conditions is possible.

The previous section introduced four typical applications of tension control, which are mainly limited by the roll diameter, line speed, and feedback of control variables, as shown in Table 3-69.

Table 3-69 CM680Tension Control Mode Essential Conditions

Function/Limitation	Roll Diameter[1]	Line Speed	Control Quantity Feedback
Tension Closed-loop Speed Mode	Necessary	Necessary[2]	Necessary
Line Speed Closed-loop Mode	Necessary	Not Necessary	Not Necessary
Tension Closed-loop Torque Mode	Necessary	Not Necessary	Necessary
Tension Open-loop Torque Mode	Necessary	Not Necessary	Not Necessary

Note:

[1]: If the roll diameter source is selected as the line speed calculation channel (FB-25=0), then line speed is a necessary condition.

[2]: Inertia compensation, friction compensation, and line speed are related; therefore, if you want to improve the accuracy of open-loop torque tension control, line speed is a necessary condition.

The given torque and frequency are the target control quantities for tension control. Users can refer to the data flow of the above two key variables in the overall block diagram, query some sub-function diagrams, and refer to relevant parameter descriptions to achieve the tension control function. ParameterFB-00set value determines the method of tension control implementation. The product integrates four tension control modes, as shown in Figures 3-41 to Figure3-44.

● FB-00 = 1, Tension Closed-loop Speed Mode

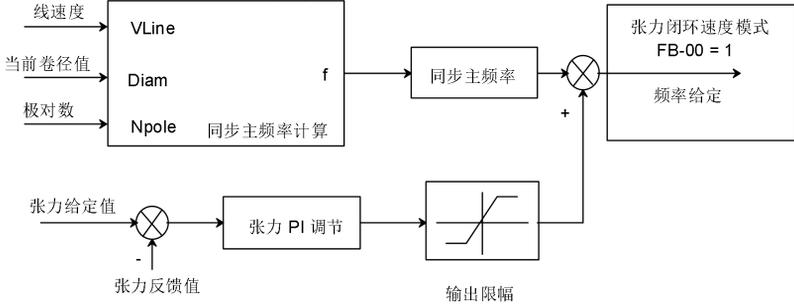


Figure 3-41 Tension Closed-loop Speed Mode

● FB-00 = 2, Line Speed Closed-loop Speed Mode

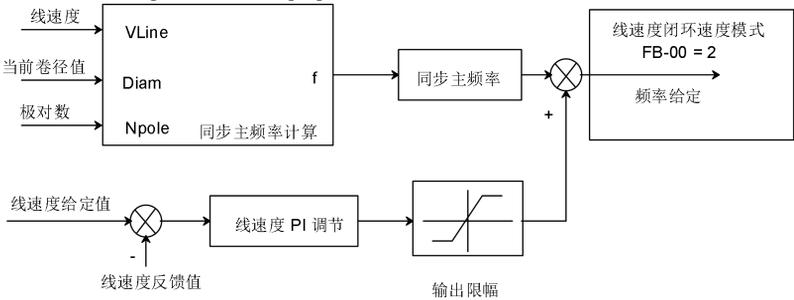


Figure 3-42 Line Speed Closed-loop Speed Mode

● FB-00 = 3, Tension Closed-loop Torque Mode

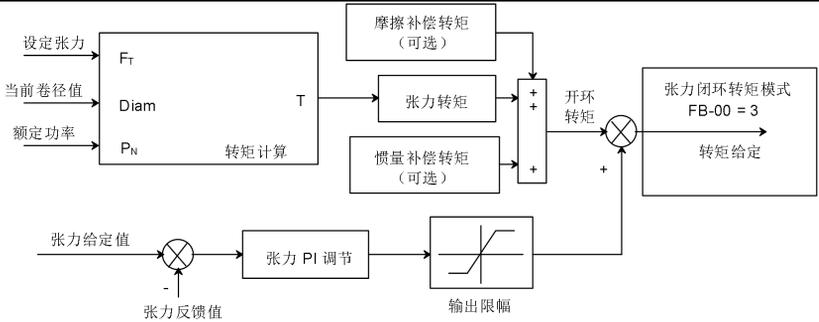


Figure 3-43 Tension Closed-loop Torque Mode

- FB-00 = 4, Tension Open-loop Torque Mode

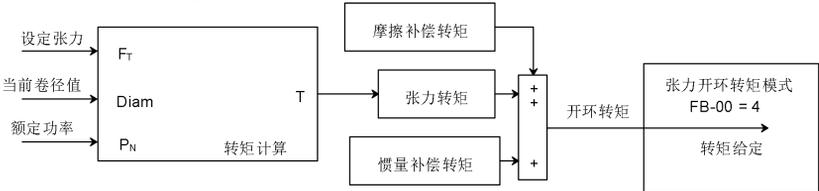


Figure 3-44 Tension Open-loop Torque Mode

Tension control related parameters are shown in Table 3-70:

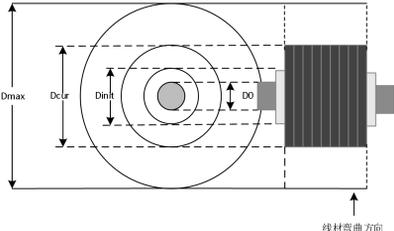
Table 3-70 Tension Control Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FB-00	Tension Control Mode Selection	0	0~4	0: Tension control invalid, functions the same as a general inverter. 1: Tension closed-loop speed mode, requires tension/position detection and feedback, operates in speed mode, the inverter adjusts the output frequency by superimposing PID closed-loop calculations on the main frequency given based on line speed and roll diameter, to achieve stable set tension or position. Control methods can be selected from V/F control, sensorless vector control (SVC), and closed-loop speed sensor vector control (FVC). 2: Line speed closed-loop mode, the inverter adjusts the operating frequency according to changes in roll diameter, ensuring the system runs at a constant line speed. Control methods can be selected from V/F control, sensorless vector control (SVC), and closed-loop speed sensor vector control (FVC). 3: Tension closed-loop torque mode, requires tension detection and feedback, torque mode operation, the inverter adjusts by superimposing PID closed-loop calculation on the given torque, including acceleration/deceleration inertia torque compensation, friction torque compensation, etc., and can choose whether to superimpose mode 4 open-loop tension torque based on control effect. Select torque (TQC) control method to achieve ideal control results. 4: Open-loop tension torque mode, does not require tension/position detection and feedback, torque mode operation, the inverter controls the output torque to control the tension on the material. Select torque (TQC) control

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
				method to achieve ideal control results.
FB-01	Curling Mode	0	0: Winding mode 1: Unwinding mode	The tension taper function is invalid in unwinding mode. In winding mode, the roller diameter will increase; in unwinding mode, the roller diameter will decrease.
FB-02	Load Side Mechanical Gear A	100	1~65535	Parameters FB-02, FB-03 are only applicable in tension control mode.
FB-03	Load Side Mechanical Gear B	100	1~65535	
FB-04	PID Setpoint Source Selection	0	0~2	0: Parameter FB-05 as PID target setpoint; 1: RS-485 communication settings; 2: Analog input, must first set AI1/AI2/AI3 function to tension PID target value (Parameter F5-21 or F5-27 or F5-33 = 17).
FB-05	PID Target Setpoint	50.0%	0.0~100.0%	Effective when parameter FB-00 = 1 or 2. In line speed closed-loop speed mode (FB-00 = 2), AI1/AI2/AI3 functions must be set to line speed feedback (parameter F5-21 or F5-27 or F5-33 = 15), and FB-05 serves as the line speed PID setpoint. In other modes, when F5-21 or F5-27 or F5-33 = 15, FB-05 represents the actual line speed. In tension closed-loop speed mode (FB-00 = 1), this parameter range 0.0 ~ 100.0% corresponds to tension feedback voltage 0~10 V; in line speed closed-loop speed mode (FB-00 = 2), it corresponds to 0 ~ maximum line speed (parameter FB-18).
FB-06	PID Feedback Source Selection	0	0: Analog Input 1: Pulse Input	When FB-06 = 0, set the AI1/AI2/AI3 function to Tension PID Feedback Value (Parameter F5-21 or F5-27 or F5-33 = 14). When FB-06 = 1, set the number of pulses per meter (FB-20).
FB-07	PID Parameter Adjustment Basis	0	0: No Switching 1: Automatic Adjustment Based on Roll Diameter 2: Switching Based on Operating Frequency 3: Automatic Switching Based on Setpoint and Feedback Deviation	When FB-07=0, use the first set of PID parameters FB-08~FB-09 When FB-07=1, use the first set of PID parameters FB-08~FB-09 for empty rolls, and the second set of PID parameters FB-10~FB-11 for full rolls. When the current roll diameter varies between the maximum roll diameter (FB-26) and the minimum roll diameter (FB-27), the PID parameters are linearly interpolated values between the two sets of PID parameters. FB-07=2, use the first set of PID parameters FB-08 ~ FB-09 when operating at the minimum frequency F2-04 and below, use the second set of PID parameters FB-10 ~ FB-11 when operating at the maximum frequency F4-02, and when the operating frequency varies between F2-04 ~ F4-02, the PID parameters are the linear interpolation values of the two sets of PID parameters. FB-07=3, use the first set of PID parameters FB-08 ~ FB-09 when the feedback value is at the lower limit FB-16, use the second set of PID parameters FB-10 ~ FB-11 when the feedback value is at the upper limit FB-17, and when the feedback value varies between FB-16 ~ FB-17, the PID parameters are the linear interpolation values of the two sets of PID parameters.
FB-08	PID Proportional Coefficient	50.0	0.0~1000.0	Depending on different customer requirements, the appropriate method from the table below can be selected:
FB-09	PID Integral	1.00s	0.00~500.00s	

Tension Feedback Value	Loose 0~100% Tight	Loose 0~100% Tight
Winding	Positive	Negative Output

Parameter	Function Definition	Default Value	Setting Range	Parameter Description			
	Time 1						
FB-10	PID Proportional Coefficient 2	50.0	0.0~1000.0	<table border="1"> <tr> <td>Unwinding</td> <td>Output Negative Output</td> <td>Positive Output</td> </tr> </table>	Unwinding	Output Negative Output	Positive Output
Unwinding	Output Negative Output	Positive Output					
FB-11	PID Integral Time 2	1.00s	0.00~500.00s				
FB-12	PID Output Positive/Negative Selection	0	0~1				
FB-13	PID Output Positive Limit	20.00%	0.00~100.00%	Parameters FB-13 and FB-14 define the positive and negative limit percentages for PID control output, PID output limit range = FB-13 or FB-14 * maximum frequency parameter F4-02.			
FB-14	PID Output Negative Limit	20.00%	0.00~100.00%				
FB-15	PID Feedback Upper Limit Value	100.0%	0.0%~100.0%	Parameters FB-15 and FB-16 are only valid when FB-00 is set to 1 or 3.			
FB-16	PID Feedback Lower Limit	0.0%	0.0%~100.0%				
FB-17	Linear Speed Input Source	0	0: No Input 1: Analog Input 2: Communication Setting 3: PULSE Input (from PG Card) 4: Invalid 5: PULSE Input via DI6/DI7 Digital Terminals	When FB-00 = 2, this parameter setting is invalid; When FB-17 = 1, must first set AI1/AI2/AI3 function to line speed feedback (F5-21/ F5-27/ F5-33 = 15); When FB-17 = 2, change the line speed set value through parameter FB-21; When FB-17 ≠ 2, the inverter temporarily stores the analog value or pulse command to parameter FB-21, at this time FB-21 is read-only. When FB-17 = 3 or 5, the parameter FB-20 pulses per meter must be set.			
FB-18	Maximum Linear Speed	100.00	0.00~650.00	This parameter sets the maximum linear speed. The actual linear speed value corresponding to inputs 100.0% on channels 1~5 of FB-17 (may not be the same as the maximum production line speed; avoid confusion when setting). When using linear speed to calculate reel diameter (FB-25 = 0), the larger this parameter, the larger the reel diameter value, and vice versa. Refer to this rule to adjust this parameter based on the deviation between the calculated reel diameter and the actual value.			
FB-19	Minimum Linear Speed	0.00	0.0~650.00	When the linear speed setting is less than parameter FB-19, the inverter will stop calculating the reel diameter and maintain the current reel diameter.			
FB-20	Pulses per Meter	0.0	0.0~6500.0	When the PID feedback source is selected as pulse input (FB-06 = 1), this parameter needs to be set; When the linear speed input source is PULSE input or PULSE input via digital terminals (FB-17 = 3 or 5), this parameter needs to be set.			
FB-21	current	0.00	0.00~650.00	When FB-17 = 2, change the line speed set value through			

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
	linear speed			parameter FB-21; When FB-17 \neq 2, the inverter temporarily stores the analog value or pulse command in parameter FB-21, at which time FB-21 is read-only.
FB-22	linear speed filter time	0.10s	0.00s~100.00s	This parameter is valid when the linear speed input source is PULSE input or PULSE input via digital terminals (FB-17 = 3 or 5), which can suppress linear speed oscillation.
FB-23	linear speed acceleration time	0.00s	0.00s~655.35s	Parameters FB-23 and FB-24 are effective in the linear speed closed-loop speed mode (FB-00 = 2).
FB-24	linear speed deceleration time	0.00s	0.00s~655.35s	
FB-25	winding diameter calculation method selection	0	0~5	<p>When FB-25 = 1, it is necessary to first set the A11/A12/A13 functions to reel diameter (F5-21/ F5-27/ F5-33 = 16), at this time 10 V corresponds to the maximum reel diameter parameter FB-26.</p> <p>When FB-25 = 2, a PG card must be connected, and the reel diameter is obtained through the encoder on the scroll bar. At this time, the signal pulses are connected to PG2 on the PG card, and the encoder type (F4-27) as well as the reference pulse input type (F4-30), the number of pulses per revolution (FB-32), the number of turns per layer (FB-33), and the material thickness (FB-34) are set to calculate the reel diameter.</p> <p>When FB-25 = 3, a PG card must be connected, and the roll diameter is calculated by reverse inference through the motor encoder and gear ratio. At this time, the signal pulse should be connected to PG1 on the PG card, and parameters such as gear ratio (FB-02 and FB-03), encoder type (F4-27), encoder pulses (F4-28), number of turns per layer (FB-33), and material thickness (FB-34) should be set to calculate the roll diameter.</p> <p>When FB-25 = 4 or 5, DI6 and DI7 functions are supported, and the reference pulse input type should be set to unidirectional input (F4-30 = 5). If the winding direction changes during operation, parameter FB-01 must also be modified.</p>
FB-26	Maximum Roll Diameter	500.0mm	1.0~6000.0mm	<p>The relationship diagram for various roll diameter parameters FB-26, FB-27, FB-29/ FB-30/ FB-31, and FB-38 is as follows:</p>  <p>Dmax: Maximum roll diameter, corresponding to parameter FB-26; D0: Empty roll diameter, corresponding to parameter FB-27; Dinit: Initial roll diameter, corresponding to parameter FB-29 or FB-30 or FB-31; Dcur: Current roll diameter, corresponding parameter</p>
FB-27	Empty Roll Diameter	100.0mm	1.0~6000.0mm	
FB-28	Initial Roll Diameter Selection	0	0~1	
FB-29	Initial Roll Diameter 0	100.0mm	0.0~6000.0mm	
FB-30	Initial Roll Diameter 1	100.0mm	0.0~6000.0mm	
FB-31	Initial Roll Diameter 2	100.0mm	0.0~6000.0mm	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
				FB-38.
FB-32	Pulses per Revolution	1ppr	1~60000ppr	This parameter indicates the number of pulses per revolution of the roll shaft.
FB-33	Number of Coils per Layer	1	1~10000	This parameter indicates the number of revolutions required for one layer of material to be wound, generally set to 1 for wire and strip materials.
FB-34	Material Thickness	0.001	0.001~65.000	The number of decimal places for this parameter can be selected by parameter FB-80 bit 6, 0: 3 decimal places, 1: 2 decimal places.
FB-35	Roll Diameter Filter Time	1.00s	0.00s~100.00s	This parameter filters the calculated roll diameter results, suppressing fluctuations in the roll diameter, which can improve the instability of the roll diameter source (parameter FB-25). The larger the parameter setting, the smoother the calculated roll diameter value, but the greater the delay in roll diameter changes. Rule: When the roll diameter changes linearly, the time lag between the calculated roll diameter and the actual roll diameter is approximately equal to the value of this parameter.
FB-36	Roll Diameter Compensation Enable	0	0~1	This parameter is only effective when the tension closed-loop speed mode (FB-00 = 1) is set and the line speed input source FB-17 is not zero. When the mechanical gear ratio or linear speed cannot reach the precise condition, set this parameter to compensate for the roll diameter.
FB-37	Roll Diameter Calculation Delay Time	0.0s	0.0s~6553.5s	After the pre-drive signal is canceled, the roll diameter calculation restarts after this delay to avoid inaccurate roll diameter calculation results in a short time after the pre-drive ends, which could lead to system instability.
FB-38	Current Roll Diameter	100.0	1.0~6553.5	When the inverter is not in a stopped state, this parameter is read-only.
FB-39	Minimum Frequency for Roll Diameter Calculation	1.00Hz	0.00~599.00Hz	When the linear speed is lower than parameter FB-39, maintain the current roll diameter value; when the linear speed exceeds this parameter, perform the roll diameter calculation. For situations where the operating frequency is low or the roll diameter calculation during acceleration is inaccurate, this parameter can be appropriately set to resolve the issue.
FB-40	Pre-drive Mode Selection	0	0: No Function 1: Pre-drive for Winding Mode 2: Pre-drive for Unwinding Mode	At the moment of winding startup, to prevent the wire from being slack, the tension convergence time can be extended by setting it to pre-drive for winding mode (FB-40 = 1). During unwinding, it can be set to pre-drive for unwinding mode (FB-40 = 2), allowing the motor to rotate in reverse to actively tighten the material. At this time, the output frequency limit is the main and auxiliary frequency reversal cutoff frequency (parameter FA-27). Parameter FB-40 is only valid when parameter FB-00 = 1.
FB-41	Pre-drive/PID Switching Point	15.0%	0.0%~100.0%	Tension feedback value 0~100% corresponds to tension from loose to tight, parameter FB-41 reference base: FB-05, when setting FB-05 = 50%, FB-41 = 10%, the pre-drive range is 0~40%.
FB-42	soft start frequency	2.00Hz	0.00~599.00Hz	When FB-40 = 1 or 2, at the instant of winding start, the sum of the synchronous frequency calculated based on line speed and the soft start frequency FB-42 is used as the set frequency, and acceleration starts according to time FB-43.
FB-43	soft start acceleration time	3.00s	0.00s~600.00s	After the soft start acceleration time, the system runs with the set frequency being the sum of the synchronous frequency calculated based on line speed and the auxiliary

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
				frequency adjusted by PI control.
FB-44	Broken Belt Detection Selection	0	0~1	When the line speed input source FB-17 is not 0, and the roll diameter is calculated through the line speed (FB-25 = 0), the setting of parameter FB-44 is valid. After enabling belt breakage detection, if the line speed exceeds parameter FB-45, the change in roll diameter exceeds parameter FB-46, and the time exceeds the time set by parameter FB-47, a belt breakage will occur. When the belt breaks, the inverter will display E144 and stop in free run mode. At the same time, it can be used with DO1 or DO2 output terminal functions (setting value 46) as a broken belt indicator.
FB-45	Minimum Line Speed for Broken Belt Detection	0.0	0.0~3000.0	
FB-46	Belt Breakage Detection Roll Diameter Change	100.0 mm	1.0~6000.0mm	
FB-47	Belt Breakage Detection Time	1.00s	0.00s~100.00s	
FB-48	Tension Feedback Error Level	100%	0%~100%	If the deviation between the tension PID target setpoint and the tension PID feedback value exceeds the tension feedback error threshold (parameter FB-48), and the error duration exceeds the tension error detection time (parameter FB-49), a PID feedback deviation fault is generated, and the inverter reports fault "E147" according to the handling method specified in parameter FB-50.
FB-49	Tension Error Detection Time	0.5s	0.0s~10.0s	
FB-50	Tension Error Abnormal Handling	0	0: Warning and Continue Running 1: Warning and free stop 2: Warning and decelerate to stop	
FB-51	PID Output Gain	100.0	0.0~200.0	Set PID output gain
FB-52	Tension Reference Source Selection	0	0: RS485 Communication 1: Analog Input	When FB-52 = 0, the zero-speed tension parameter value FB-54 can be set via the operation panel through communication. When FB-52 = 1, the A11/A12/A13 functions must be set to tension setting (F5-21/ F5-27/ F5-33 = 18), at this time FB-54 is read-only.
FB-53	Maximum Tension value	0	0~65535	When parameter FB-52 = 1, parameter FB-54 is read-only, at this time the analog value 10V corresponds to the maximum tension value FB-53.
FB-54	Tension Set Value	0	0~65535	
FB-55	Zero-speed Tension Reference Source	0	0: No Input 1: Communication settings 2: Analog Input	When FB-55 = 1, the zero-speed tension parameter value FB-56 can be set via the operation panel through communication; When FB-55 = 2, A11/A12/A13 functions must first be set to zero-speed tension setting (F5-21/ F5-27/ F5-33 = 19), at this time FB-56 is read-only.
FB-56	Zero-speed Tension Setpoint	0	0~65535	When FB-55 is set to 2, parameter FB-56 is read-only, and the analog input of 10 V corresponds to the maximum tension parameter FB-53.

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
FB-57	Zero Speed Tension Level	5.00%	0.00~100.00%	When bit 1 of the tension control flag parameter FB-80 is 0, if the operating frequency is less than FB-57, the tension value is the parameter FB-56, achieving static friction tension compensation.
FB-58	Sliding Friction Compensation Tension	0.0%	0.0%~100.0%	During constant speed operation of the motor, the output torque is used not only to establish material tension but also to overcome rotational friction. When this part of the torque cannot be ignored, compensation for the friction torque is required.
FB-59	Material Inertia Compensation Coefficient	0	0~30000	Material inertia compensation coefficient = material density × material width. Density unit: kg/m ³ , width unit: m. The material inertia on the reel changes with the reel diameter. Based on parameters FB-02, FB-03, FB-27, FB-38, FB-59, etc., the inverter automatically calculates the flywheel inertia of the material to obtain the inertia compensation torque.
FB-60	Acceleration Inertia Compensation Gain	0.0%	0.0~1000.0%	In some cases, fine-tuning parameters FB-60 or FB-62 can optimize control performance. For example, during acceleration of the winding process, if the material tension is too low, parameter FB-60 can be increased to enhance the compensation effect; otherwise, reduce this parameter. The same applies to deceleration.
FB-61	Inertia Compensation Filter Time	5.00	0.00~100.00	
FB-62	Deceleration Inertia Compensation Gain	0.0%	0.0~1000.0%	
FB-63	Tension Taper Curve Selection	0	0: Taper Calculation Invalid 1: Curve Taper 2: Straight Taper 3: Multi-segment Curve Taper 4: Multi-segment Straight Taper	When FB-63 = 1, generate a curve based on parameter FB-65, and fine-tune the curve using parameter FB-66. When FB-63 = 2, generate a straight taper based on parameter FB-65. When FB-63 = 3, parameters FB-65, FB-69, and FB-70 determine the multi-segment curve taper, and parameters FB-67 and FB-68 determine the curve inflection points. When FB-63 = 4, parameters FB-65, FB-69, and FB-70 determine the multi-segment straight taper, and parameters FB-67 and FB-68 determine the straight inflection points.
FB-64	Tension Taper Setting Source	0	0~1	0: Communication settings 1: Input analog setting
FB-65	Taper Set Value	0%	0%~100%	When the tension taper curve selects curve taper (FB-63 = 1), the curve is generated by the taper setting value FB-65 and fine-tuned by parameter FB-66.
FB-66	Taper Curve Compensation Value	0.0	0.0~6000.0	
FB-67	Taper Calculation Roll Diameter 1	6000.0	1.0~6000.0	Diagram showing the relationship between multi-segment linear taper output tension and roll diameter:
FB-68	taper calculation roll diameter 2	6000.0	1.0~6000.0	
FB-69	multi-segment taper	0	0~100	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
	value 1			实际张力
FB-70	multi-segment taper value 2	0	0~100	
FB-71	pre-drive frequency gain	0.0%	-50.0%~50.0%	When the pre-drive terminal is effective, the inverter automatically calculates the output frequency based on the line speed detection value and the current roll diameter to match the line speed.
FB-72	pre-drive acceleration time	0.00s	0.00s~655.35s	Parameters FB-72 ~ FB-73 are the time for accelerating from the soft start frequency (FB-42) to the pre-drive frequency or decelerating from the pre-drive frequency to the soft start frequency during automatic roll change.
FB-73	pre-drive deceleration time	0.00s	0.00s~655.35s	
FB-74	speed limit gain	100.0s	0.0s~6553.5s	In tension control mode, when the analog detection value of line speed is also used as a speed limit (parameter F3-17 = 3), this parameter can be adjusted to change the size of the speed limit.
FB-75	soft start/PI switch LSErr	5	0~100	Parameters FB-75 ~ FB-79 are reserved; their default values should be used, and users should not modify them, as improper settings may cause the winding system to become unbalanced.
FB-76	soft start/PI switch LS1	0.4%	0.0%~10.0%	
FB-77	soft start/PI switch LS2	0.7%	0.0%~10.0%	
FB-78	Soft start/PI switch 1 Set	2.0	0.0~40.0	
FB-79	Unwinding Soft Start PI Switch Point	5.0	0.0~40.0	
FB-80	Tension Control Flag	0	0~65535	

3.7 Faults and Protection

3.7.1 IGBT Overtemperature Protection

When the IGBT temperature exceeds the overtemperature protection point, an IGBT overtemperature fault is reported, and the motor stops running; When the temperature is detected to be below the over-temperature fault temperature but above the over-temperature warning threshold, an over-temperature fault alarm is triggered, and the motor can continue to operate. IGBT over-temperature protection parameters are shown in Table 3-71:

Table 3-71 IGBT Over-Temperature Protection Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-41	Over-Temperature Warning Threshold	Depends on the model power	0.0~110.0°C	In the inverter specification module, the defined module over-temperature protection point is 95 ° C, and the module over-temperature warning threshold is 90 ° C. When the module temperature exceeds the lower value between the module over-temperature warning threshold and the F9-41 set temperature, an IGBT overheating warning (A009) is issued; When the module temperature exceeds the over-temperature protection point, an IGBT over-temperature fault (E016) is reported. When an IGBT over-temperature warning occurs, it does not affect the operation of the inverter; at this time, cooling measures can be taken in advance to prevent the inverter from experiencing an over-temperature fault.

3.7.2 Low Current Protection

Low current protection is designed to prevent the inverter from operating for extended periods under conditions where the current is below normal levels. Operating below normal current may not cause damage to the inverter, but such abnormal operation could result in the system failing to achieve the expected load-carrying capacity, as shown in Table 3-72.

The user can determine the undercurrent threshold based on the normal operating current and the low current operation time that the system can withstand, and decide the actions the inverter should take after a low current occurs, such as free stop, deceleration stop, or only issuing a warning message while the inverter continues to operate normally. The low current warning can be automatically cleared when the current exceeds the set low current threshold1%. Undercurrent protection does not activate when the inverter is in sleep or standby mode.

Table 3-72 Low Current Protection Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-22	Low Current Set Threshold	0.0%	0.0~100.0%	F9-22 low current set threshold is in units of %, based on the rated current of the inverter. When the inverter output current is less than the F9-22 set value and persists for longer than the time set by F9-23, a low current fault is detected, and the inverter will determine subsequent actions according to the low current action method set by F9-24.
F9-23	Low Current Detection Time	0.00	0.00~360.00s	
F9-24	Low Current Action Method	0	0: No Function 1: Alarm and free stop; 2: Alarm and second deceleration stop; 3: Alarm and continue running.	0: Low current protection function is off, low current setting threshold (F9-22) and low current detection time (F9-23) are both invalid. 1: When the low current protection condition is met, report a low current fault, and automatically stop. 2: When the low current protection condition is met, report a low current fault, and decelerate to stop according to the second deceleration time. 3: When the low current protection condition is met, issue a low current warning, but do not stop.

3.7.3 Motor overheat protection

By obtaining the motor temperature through sensors, the motor can be protected based on its temperature. When the motor temperature exceeds a certain value, the motor operation is stopped to prevent overheating damage. Thermistors are commonly used to measure motor temperature, and

common thermistors include PTC resistors and PT100 resistors. Parameters related to motor overheat protection are shown in Table 3-73.

Table 3-73 Parameters Related to Motor Overheat Protection

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-48	PTC Action Selection	0	0: Warning and continue running 1: Warning and decelerate to stop 2: Warning and free stop 3: No warning	This parameter is used to set the inverter action when PTC overheats.
F9-49	PTC Threshold	50.0%	0.0~100.0%	This parameter is used to set the PTC overtemperature detection threshold, with the unit being %, and the reference value being the maximum analog input value. When using the PTC overheating detection function, the corresponding analog input terminal must be set to voltage signal input, and the function of this analog input terminal is “ Thermistor PTC Input ” . When the feedback voltage reaches the set value of F9-49, the inverter will operate according to the method set in F9-48.
F9-50	PT Detection Threshold 1	5.000	0.000~10.000V	Used to set the PT100 over-temperature detection threshold.
F9-51	PT Detection Threshold 2	7.000	0.000~10.000V	
F9-52	PT Voltage 1 Protection Frequency	0.00Hz	0.00~599.00Hz	When using the PT100 over-temperature detection function, the corresponding analog input terminal must be set to voltage signal input. The function of this analog input terminal is “Thermistor PT100 Value” . When the feedback voltage is less than the set value of F9-50, the motor operates normally; When the feedback voltage is between the set values of F9-50 and F9-51, the inverter will run to the set frequency of F9-52 after the set time of F9-52. When the feedback voltage exceeds the set value of F9-51, the inverter will operate according to the method set in F9-48.
F9-53	PT Action Delay Time	60s	0~6000s	

3.7.4 Motor Overload Protection

By setting an appropriate inverse-time curve, the operating time of the motor under overload conditions is made less than the set overload protection time, thereby achieving overload protection for the motor and preventing damage due to overheating. When the overload time reaches the overload protection time, an overload fault will be reported. This function is not enabled by default. If you need to enable it, set the parameter “Motor Overload Protection Selection” to 0 or 1, 2, 3 or 4.

Taking Motor 1 as an example, when F9-01 is set to 0, the overload protection curve for Motor 1 is shown in Figure 3-45. Here, T equals the set value of parameter F9-02, “Motor Current Percentage” refers to the ratio of the inverter output current to the motor rated current. When the motor fan is independently controlled, this inverse time curve can be selected. In this case, the fan speed is independent of the motor speed, so the cooling capacity does not decrease as the motor speed decreases, making the inverse time curve independent of the motor operating speed.

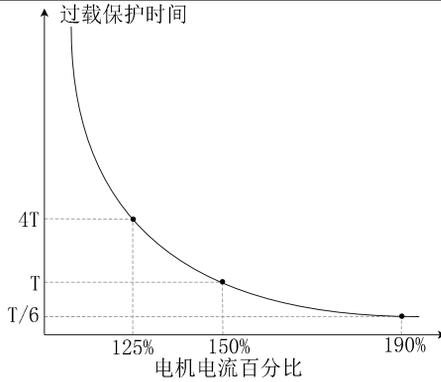


Figure3-45 Inverse Time Curve1

When F9-01 is set to 1, the overload protection curve for Motor 1 is shown in Figure3-46. Among them, the “speed coefficient” is a function of motor speed, when the motor speed is greater than the rated speed, the speed coefficient equals 1, when the motor speed is less than the rated speed, the speed coefficient = $1 / (0.4 + 0.6 * \text{motor speed} / \text{motor rated speed})$.

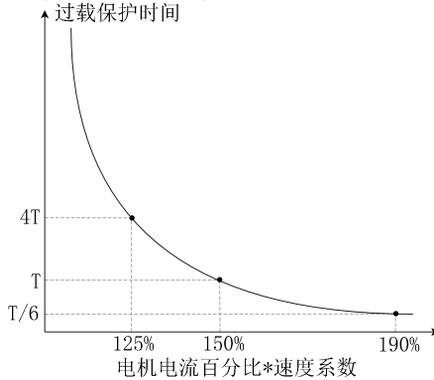


Figure3-46 Inverse Time Curve2

When the motor uses coaxial cooling (fan connected to the motor shaft), the fan speed is the same as the motor speed, and a decrease in motor speed will reduce the fan's cooling capacity. In this case, it is recommended to set F9-01 to 1, the inverse time curve will be adjusted according to the motor speed, the motor overload capability will decrease with the reduction in speed, preventing overheating due to reduced fan cooling capacity. When the motor speed is zero, the fan stops rotating, at which point the speed factor is 2.5, and the corresponding overload curve is shown in Figure 3-47. From Figure3-47, it can be seen that when the current reaches 60% of the motor rated current, the motor will report an overload fault after running for T time.

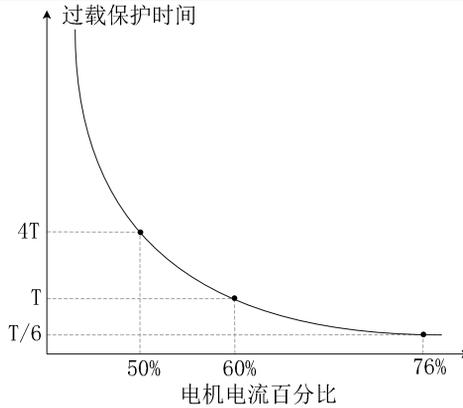


Fig.3-47 Inverse Time Curve3

Parameters related to motor overload protection are shown in Table 3-74:

Table3-74 Parameters Related to Motor Overload Protection

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-01	Motor 1 Overload Selection	2	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	This parameter is used to set the overload protection mode.
F9-02	Motor 1 Overload Time	60.0s	30.0~600.0s	This parameter is used to set the overload protection time when the motor current is 150% of the rated current.
H3-03	Motor 2 overload selection	2	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	Refer to Motor 1 Overload Protection
H3-04	Motor 2 overload time	60.0s	30.0~600.0s	
H3-08	Motor 3 overload selection	2	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	
H3-09	Motor 3 overload time	60.0s	30.0~600.0s	
H3-13	Motor 4 Overload Selection	2	0: Constant Torque Output Motor 1: Variable Torque Output Motor 2: No Motor Overload Protection	
H3-14	Motor 4 Overload Time	60.0s	30.0~600.0s	

3.7.5 Fault Recording Function

The fault record function records the name, power-on time, frequency, torque, voltage, current, and power device temperature at the moment of fault for a certain number of inverter faults, providing

reference for subsequent fault diagnosis.

The current inverter software supports recording the last 10 fault codes, the power-on times of the last 6 fault occurrences, and physical quantity information.

Only faults that cause the inverter to shut down after they occur are recorded; undervoltage faults during shutdown are not recorded.

Fault record information is stored in EEPROM, and it is automatically updated and written to EEPROM each time a fault occurs.

Parameters related to the fault recording function are shown in Table 3-75:

Table 3-75 Parameters Related to Fault Recording

Parameter	Function Definition	Default Value	Setting Range	Parameter Description	
U0-00	Fault Record 1	0	0~65535	This set of parameters is used to record the fault codes of the inverter's last 10 faults. The smaller the fault record number (the minimum value is 1), the closer the corresponding fault is to the present. For example, the most recent fault will always be displayed in U0-00, and each subsequent fault will increment the count of all previous faults by 1. If the number of faults exceeds 6 or 10, the earliest fault record information will be overwritten. For the fault codes corresponding to fault types, please refer to the fault table.	
U0-01	Fault Record 2	0	0~65535		
U0-02	Fault Record 3	0	0~65535		
U0-03	Fault Record 4	0	0~65535		
U0-04	Fault Record 5	0	0~65535		
U0-05	Fault Record 6	0	0~65535		
U0-06	Fault Record 7	0	0~65535		
U0-07	Fault Record 8	0	0~65535		
U0-08	Fault Record 9	0	0~65535		
U0-09	Fault Record 10	0	0~65535		
U0-10	Fault Output 1	0	0~65535	When the inverter fails, and the set values of parameters U0-10 to U0-13 match the fault code, the corresponding RLY1/RLY2 and DO1/DO2 outputs can be enabled by setting F6-00 to F6-03 to 35 to 38. The four fault outputs can operate independently without affecting each other.	
U0-11	Fault Output 2	0	0~65535		
U0-12	Fault Output 3	0	0~65535		
U0-13	Fault output 4	0	0~65535		
U0-14	Fault 1 - Motor speed	0	-32767~32767		Used to record information of the last 6 faults
U0-15	Fault 1 - Torque command	0	-3276.7~3276.7		
U0-16	Fault 1 - Input terminals	0	0000H~FFFFH		
U0-17	Fault 1 - Output terminals	0	0000H~FFFFH		
U0-18	Fault 1 - Inverter Status	0	0~65535		
U0-19	Fault 1 - Frequency Command	0.00	0.00~655.35Hz		
U0-20	Fault 1 - Output Frequency	0.00	0.00~599.00Hz		
U0-21	Fault 1 - Output Voltage	0.0	0.0~6553.5V		
U0-22	Fault 1 - DC Voltage	0.0	0.0~6553.5V		
U0-23	Fault 1-Output Current	0.00	0.00~655.35A		
U0-24	Fault 1-IGBT Temperature	0.0	-3276.7~3276.7°C		
U0-25	Fault 1-Capacitor Temperature	0.0	-3276.7~3276.7°C		
U0-26	Fault 2-Output Frequency	0.00	0.00~599.00Hz		

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
U0-27	Fault 2-Direct Current Voltage	0.0	0.0~6553.5V	
U0-28	Fault 2-Output Current	0.00	0.00~655.35A	
U0-29	Fault 2 - IGBT Temperature	0.0	-3276.7~3276.7°C	
U0-30	Fault 3 - Output Frequency	0.00	0.00~599.00Hz	
U0-31	Fault 3 - DC Voltage	0.0	0.0~6553.5V	
U0-32	Fault 3 - Output Current	0.00	0.00~655.35A	
U0-33	Fault 3 - IGBT Temperature	0.0	-3276.7~3276.7°C	
U0-34	Fault 4 - Output Frequency	0.00	0.00~599.00Hz	
U0-35	Fault 4-Direct Current Voltage	0.0	0.0~6553.5V	
U0-36	Fault 4-Output Current	0.00	0.00~655.35A	
U0-37	Fault 4-IGBT Temperature	0.0	-3276.7~3276.7°C	
U0-38	Fault 5-Output Frequency	0.00	0.00~599.00Hz	
U0-39	Fault 5-Direct Current Voltage	0.0	0.0~6553.5V	
U0-40	Fault 5-Output Current	0.00	0.00~655.35A	
U0-41	Fault 5-IGBT Temperature	0.0	-3276.7~3276.7°C	
U0-42	Fault 6-Output Frequency	0.00	0.00~599.00Hz	
U0-43	Fault 6-Direct Current Voltage	0.0	0.0~6553.5V	
U0-44	Fault 6-Output Current	0.00	0.00~655.35A	
U0-45	Fault 6-IGBT Temperature	0.0	-3276.7~3276.7°C	
U0-46	Number of Days Since Fault 1	0	0~65535	
U0-47	Fault 1 Occurrence Minutes	0	0~1439	
U0-48	Fault 2 Occurrence Days	0	0~65535	
U0-49	Fault 2 Occurrence Minutes	0	0~1439	
U0-50	Fault 3 Occurrence Days	0	0~65535	
U0-51	Fault 3 Occurrence Minutes	0	0~1439	
U0-52	Fault 4 Occurrence Days	0	0~65535	
U0-53	Minutes since Fault 4 occurred	0	0~1439	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
U0-54	Days since Fault 5 occurred	0	0~65535	
U0-55	Minutes since Fault 5 occurred	0	0~1439	
U0-56	Days since Fault 6 occurred	0	0~65535	
U0-57	Minutes since Fault 6 occurred	0	0~1439	

3.7.6 Over-torque Detection

The over-torque detection function protects the motor and inverter by limiting the motor torque. When the current exceeds the over-torque detection threshold and persists for the set time, the over-torque signal is set; when the current is less than 95% of the over-torque detection threshold*95%, the over-torque signal is cleared. Based on the over-torque signal, the inverter will report an over-torque fault and stop operation, or it will report an over-torque warning and continue running. The over-torque detection parameters are shown in Table 3-76:

Table 3-76 Over-torque Detection Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-36	Over Torque Selection 1	0	0: Not Detected 1: Constant speed detection continues running; 2: Constant speed detection stops running; 3: Running detection continues running; 4: Running detection stops running.	0: Not Detected 1: During constant speed operation, if Motor 1 experiences over-torque, a warning is issued but operation continues. 2: During constant speed operation, if Motor 1 experiences over-torque, an over-torque fault is reported and operation stops. 3: During operation, if Motor 1 experiences over-torque, an alarm is issued but operation continues. 4: During operation, if Motor 1 experiences over-torque, an over-torque fault is reported and operation stops.
F9-37	Over-torque threshold 1	120	10%~250%	When the inverter output current exceeds F9-37 (unit %), based on the inverter's rated current) and persists for longer than the set time of F9-38, the inverter will determine subsequent actions according to F9-36. When F9-36 is set to 1 or 3, if over-torque is detected, the inverter will display an over-torque warning, but the inverter will continue to run until the output current is less than 95% of the F9-37 setting, after which the warning will be cleared. When F9-36 is set to 2 or 4, if over-torque is detected, the inverter reports an over-torque fault and stops running until the fault is reset, after which operation can resume.
F9-38	Over-torque time 1	0.1s	0.0~60.0s	
H3-00	Over-torque selection 2	0	0: Not Detected 1: Constant speed detection continues running;	Motor 1 over-torque detection reference

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
			2: Constant speed detection stops running; 3: Running detection continues running; 4: Running detection stops running.	
H3-01	Over-torque threshold 2	120	10%~250%	
H3-02	Over-torque time 2	0.1s	0.0~60.0s	
H3-05	Over-torque selection 3	0	0: Not Detected 1: Constant speed detection continues running; 2: Constant speed detection stops running; 3: Running detection continues running; 4: Running detection stops running.	
H3-06	Over-torque threshold 3	120	10%~250%	
H3-07	Over-torque time 3	0.1s	0.0~60.0s	
H3-10	Over-torque selection 4	0	0: Not Detected 1: Constant speed detection continues running; 2: Constant speed detection stops running; 3: Running detection continues running; 4: Running detection stops running.	
H3-11	Over-torque threshold 4	120	10%~250%	
H3-12	Over Torque Time 4	0.1s	0.0~60.0s	

Taking Motor 1 as an example, when the inverter output current exceeds F9-37 (unit %, based on the inverter's rated current) and persists for more than the time set by F9-38, the inverter will determine subsequent actions according to F9-36. As shown in Figure 3-48, when F9-36 is 1 or 3, if over-torque is detected, the inverter will display an over-torque warning, but the inverter will continue to operate until the output current is less than 95% of the F9-37 set value, at which point the warning will be cleared. As shown in Figure3-49, when F9-36 is 2 or 4, if over-torque is detected, the inverter will report an over-torque fault and stop operation until the fault is reset, after which it can resume operation.

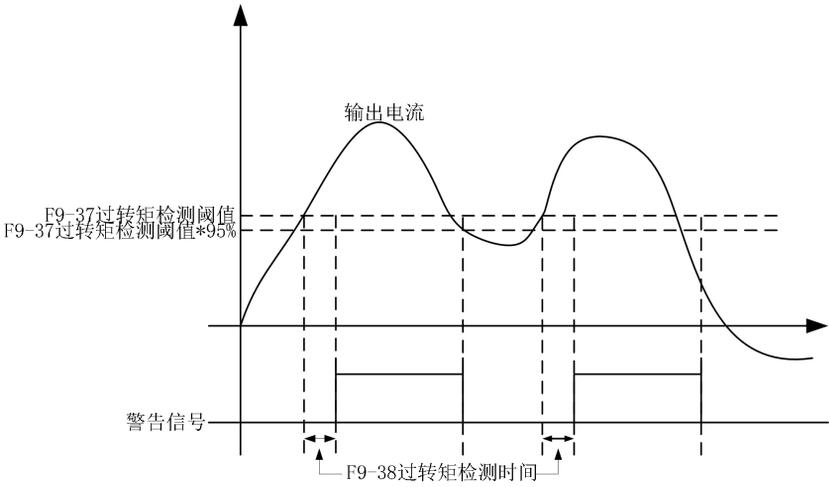


Fig.3-48 Schematic Diagram of Over-torque Detection

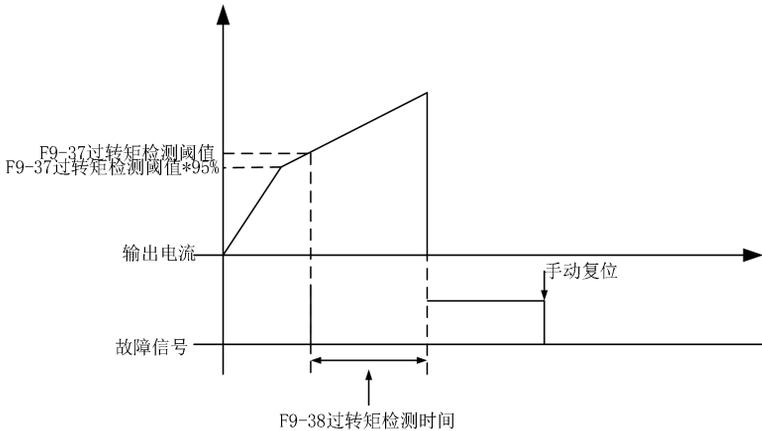


Fig.3-49 Schematic Diagram of Over-torque Detection

Motor2~4Over-torque handling can refer to Motor1, and will not be repeated.

3.7.8 Ground Protection

When a ground fault occurs, it may lead to excessive motor winding current, motor overheating, etc., which can severely damage the motor or inverter. Therefore, it is necessary to detect ground faults and address them promptly when they occur.

According to Kirchhoff's Current Law, the sum of the three-phase currents is zero, but when a ground fault occurs, the sum of the three-phase currents is no longer zero. This phenomenon can be used to determine whether a ground fault has occurred. To prevent misjudgment, it is usually considered that a ground fault has occurred only when the sum of the three-phase currents exceeds a certain value. The parameters related to ground protection are shown in Table 3-77:

Table 3-77 Ground Protection Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-20	Ground Fault Current Threshold	60.0%	0.0~6553.5%	When the inverter detects that the three-phase imbalance of the output current exceeds the set value of parameter F9-20, the ground protection activates, and the inverter immediately stops output.
F9-21	Ground Fault Filter Time	0.10s	0.00~655.35s	This parameter is used to adjust the low-pass filter time for ground fault detection; it generally does not need to be changed.

3.7.9 Undervoltage Protection

When the input voltage is too low, the inverter may not operate correctly. When undervoltage is detected, the inverter should stop running to prevent abnormal conditions. This is known as undervoltage protection, and related parameters are shown in Table 3-78.

Generally, the inverter input voltage detection circuit can indirectly determine whether the input voltage is too low through the bus voltage. When the bus voltage is below the undervoltage protection value, an undervoltage fault is reported; when the bus voltage is above the undervoltage recovery value (undervoltage protection value+60V), the undervoltage fault is automatically cleared, or it can be cleared after receiving a reset command. Depending on the different operating states of the inverter, undervoltage faults can be categorized as undervoltage during stop (E014), undervoltage during acceleration (E011), undervoltage during deceleration (E012), and undervoltage during constant speed (E013).

Table 3-78 Undervoltage Protection Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L2-18	Undervoltage Protection Value	360.0V	300~440.0V	This parameter is used to set the undervoltage protection value. When the inverter bus voltage falls below the undervoltage protection value, an undervoltage fault will be triggered, stopping the output and initiating a free stop. If an undervoltage fault occurs while the inverter is running, the inverter will stop output and initiate a free stop. The fault type depends on the acceleration or deceleration state at the time of the fault, which can be undervoltage during acceleration (E011), undervoltage during deceleration (E012), or undervoltage during constant speed (E013). The undervoltage fault must be cleared by pressing the reset button (STOP). However, if instantaneous stop and restart is set, it will automatically recover; please refer to the relevant descriptions for parameter F1-29 Instantaneous Power Failure Restart Method (F1-29) and Allowed Power Failure Time (F1-30). If an under-voltage fault occurs while the inverter is stopped, it will display Under-voltage During Stop (E014). This fault will not be recorded and can automatically recover when the input voltage exceeds the under-voltage protection value or 60V.
F9-06	undervoltage fault automatic reset	0	0: Disabled 1: Enable	When this parameter is set to 1, Under-voltage During Acceleration (E011), Under-voltage During Deceleration (E012), and Under-voltage During Constant Speed (E013) can automatically recover.

3.7.10 Output Phase Loss

When there is an abnormal connection between the motor and the inverter, output phase loss may occur. When output phase loss occurs, the current in the disconnected phase of the motor is zero. To maintain motor operation, the current in the remaining phases generally increases, and there will be significant fluctuations in speed and torque, which may cause damage to the motor and inverter. Output phase loss detection can identify motor phase loss conditions and take appropriate actions.

When an output phase failure occurs, the current in the disconnected phase of the motor is zero, which can be used to detect the output phase failure. Output phase failure detection can be divided into startup output phase failure detection and operation output phase failure detection. As their names suggest, these methods detect whether an output phase failure has occurred during startup and operation, respectively. After detecting an output phase failure, appropriate actions can be taken as needed to protect the motor and inverter. The parameters related to output phase failure are shown in Table 3-79:

Table 3-79 Parameters Related to Output Phase Failure

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-15	Output Phase Loss Action Selection	3	0: Warning and continue running; 1: Warning and decelerate to stop; 2: Warning and free stop; 3: No warning.	This parameter is used to set the inverter's action when an output phase failure occurs. A setting value not equal to 3 will enable the output phase failure protection.
F9-16	output phase loss deceleration time	0.500s	0.000~65.535s	This parameter is used to set the output phase loss detection time during operation, generally no modification is required.
F9-17	Output Phase Loss Current Threshold	1.00%	0.00~100.00%	This parameter is used to set the output phase loss current detection threshold, generally no modification is required.
F9-18	Output Phase Loss Braking Time	0.000	0.000~65.535s	This parameter is used for output phase loss judgment at startup. If the set value is not zero, the output phase loss judgment will be performed at startup.

The following will introduce four scenarios.

Example 1: F9-18 = 0, no pre-operation output phase loss detection. As shown in Figure3-50,duringoperation,if any phase output current is less than the threshold set by F9-17 and exceeds the time set by F9-16, the inverter will begin to execute the action set by F9-15.

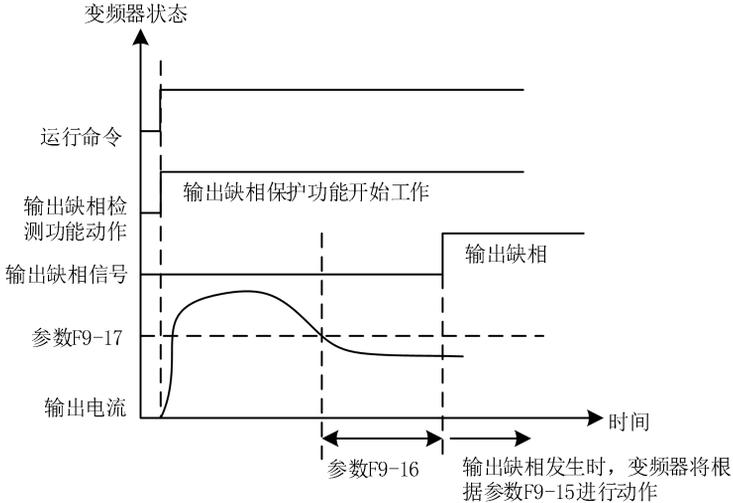


Figure3-50 F9-18=0

Example 2: The inverter is in a stopstate,F9-18 = 0 and F1-09 ≠ 0. As shown in Fig.3-51,when starting, DC braking is performed according to the settings of F1-08 and F1-09,during which output phase loss detection is not performed. After DC braking is completed, the inverter begins to operate and performs phase loss detection according to method1.

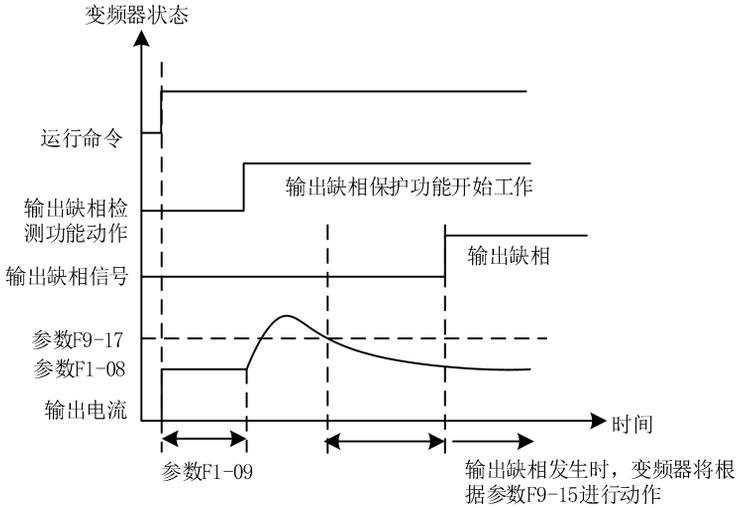


Fig.3-51 F9-18 = 0 and F1-09 ≠ 0

Example 3: The inverter is in a stopstate, $F9-18 \neq 0$ and $F1-09 \neq 0$. During startup, DC braking is performed according to the time set in $F9-18$, followed by DC braking according to the time set in $F1-09$. Within the time set in $F9-18$, the DC braking current size is 20 times the value set in $F9-57$; Within the time set in $F1-09$, the DC braking current size is the value set in $F1-08$. Total DC braking time = the value set in $F9-18$ + the value set in $F1-09$.

Example 3-1: $F9-18 \neq 0$ and $F1-09 \neq 0$ (no output phase loss detected at startup), as shown in Fig. 3-52.

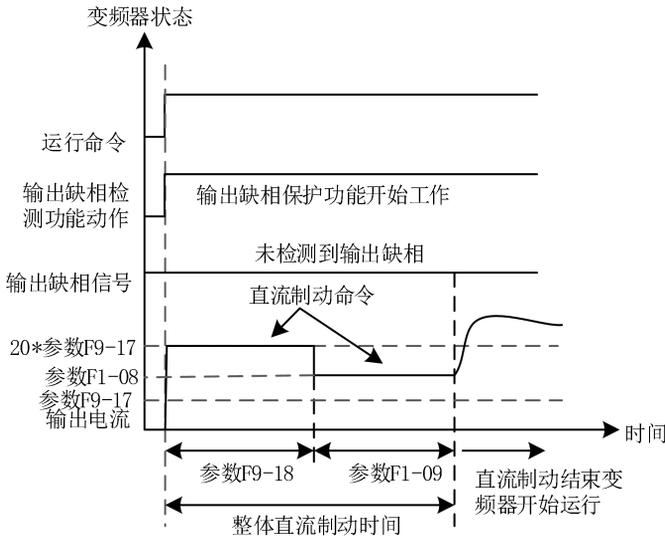


Fig.3-52 F9-18 ≠ 0 and F1-09 ≠ 0 (no output phase loss detected at startup)

Example 3-2: $F9-18 \neq 0$ and $F1-09 \neq 0$, output phase loss detected at startup. As shown in Fig. 3-53, if an output phase loss occurs within the time set by $F9-18$, after half of the time set by $F9-18$ has passed, the inverter begins to execute the action set by $F9-15$.

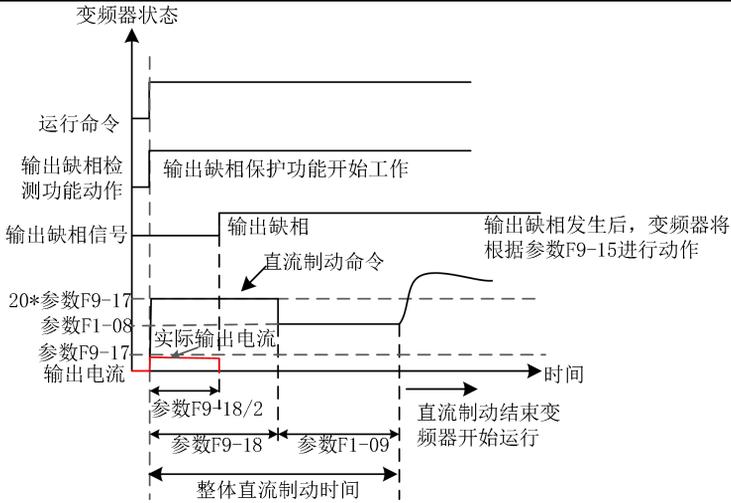


Fig.3-53 F9-18 ≠ 0 and F1-09 ≠ 0 (output phase loss detected at startup)

Example 4: The inverter is in a stopped state, F9-18 ≠ 0 and F1-09 = 0, at startup, DC braking is performed according to the time set by parameter F9-18, with the DC braking current being 20 times the value set by F9-57.

Example 4-1: F9-18 ≠ 0 and F1-09 = 0 (no output phase loss detected at startup), as shown in

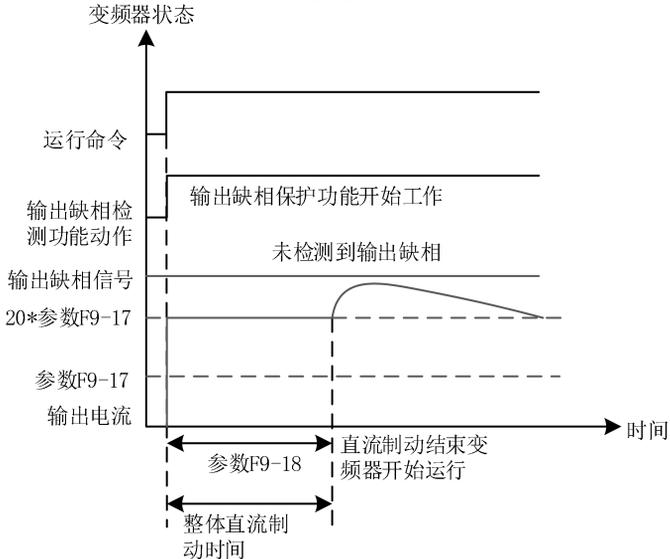


Fig.3-54.

Fig.3-54 F9-18 ≠ 0 and F1-09 = 0 (no output phase loss detected at startup)

Example 4-2: F9-18 ≠ 0 and F1-09 = 0, output phase loss detected at startup. As shown in Fig. 3-55, if an output phase loss occurs within the time set by F9-18, the inverter begins to execute the action set by F9-15 after half of the time set by F9-18 has elapsed.

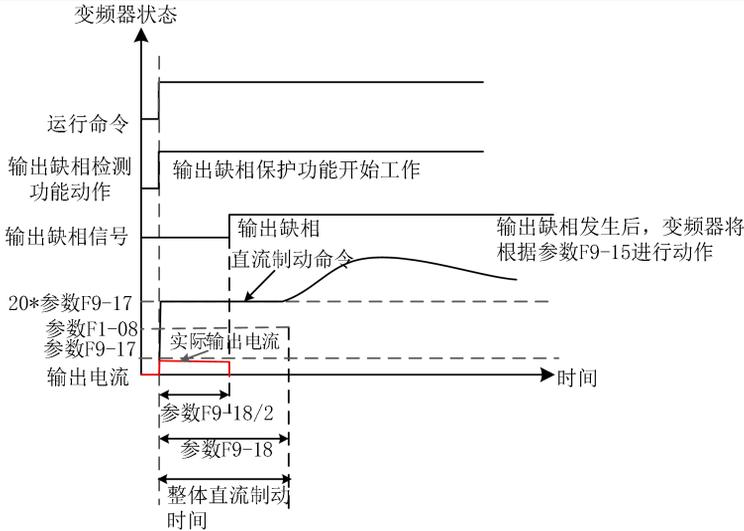


Fig.3-55 F9-18 ≠ 0 and F1-09 = 0 (output phase loss detected at startup)

3.7.11 Input Phase Loss

When the power supply is not correctly connected to the inverter, or when there is an abnormality in the power supply, an input phase loss fault may occur. When an input phase loss occurs, the inverter bus voltage may fluctuate significantly, causing fluctuations in motor torque or speed, and also affecting the lifespan of the bus capacitor. The input phase loss detection function can detect whether an input phase loss fault has occurred and take protective measures in time.

When an input phase loss occurs, if the motor is carrying a heavy load, the bus voltage will fluctuate significantly. By monitoring the fluctuations in the bus voltage, it can be determined whether an input phase loss fault has occurred. When an input phase loss is detected, the machine should be shut down promptly to prevent damage to the motor or inverter. The parameters related to input phase loss are shown in Table 3-80:

Table 3-80 Parameters Related to Input Phase Loss

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F9-12	Input Phase Loss Action Selection	0	0: Warning and decelerate to stop; 1: Warning and free stop.	The inverter will perform protective actions for input phase loss based on the settings of parameter F9-12.
F9-13	Input Phase Loss Filter Time	0.20s	0.00~600.00s	This parameter is used to set the low-pass filter time required for phase loss detection, which generally does not need to be modified.
F9-14	Input Phase Loss Voltage Threshold	60.0V	0.0~320.0V	This parameter is used to set the voltage threshold required for phase loss detection, generally no modification is needed.

3.8 Monitoring

The monitoring function displays the status and parameter information of the inverter on the display area of the digital operator. The parameters to be displayed can be selected by setting function code F7-21. The monitoring function related parameters are shown in Table 3-81:

Table 3-81 Monitoring Function Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
F7-21	Page display selection	3	0: Output current 1: PG card feedback frequency 2: Motor actual operating frequency 3: DC Bus Voltage 4: Output voltage 5: Power Factor Angle 6: Output power 7: Actual motor operating speed 8: Output Torque % 9: PG feedback value 10: PID Feedback Value % 11: AI1 % 12: AI2 % 13: AI3 % 14: IGBT temperature 15: Ambient temperature 16: Digital input terminal status 17: Digital output terminal status 18: Multi-speed status 19: CPU input terminal status 20: CPU output terminal status 21: Actual motor position 22: Pulse input frequency value 23: Pulse input position 24: Position tracking error 25: Overload count value 26: Ground short-circuit current threshold 27: Bus voltage fluctuation value 28: PLC Buffer D1043 Value 29: PM motor pole sector 30: User physical quantity 31: H page value multiplied by coefficient K 32: Encoder Z phase count 33: Motor pulse count 34: Reserved 35: Speed/torque mode 36: Current carrier frequency 37: Reserved 38: Inverter status 39: Output Torque Nt-m 40: Torque command 41: kWh 42: PID target value 43: PID compensation	This parameter can be used to change the LCD page display parameters during stop or operation mode.

			44: PID output frequency 45: Reserved 46: Auxiliary frequency 47: Main frequency 48: Set frequency display 49: Reserved 50: Reserved 51: PMVVC torque compensation amount 52: AI10 % 53: AI11 % 54: Reserved 55: Current roll diameter 56: Current line speed 57: Tension reference value 58: MI6 count value 59: U phase current AD value 60: V phase current AD value 61: W-phase current AD value	
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3.9 User Settings

3.9.1 Application Macros

By selecting application macro parameters, the system automatically imports function parameters related to the selected industry application, thus simplifying the parameter settings for users when choosing different on-site applications. Supports custom application macros, allowing users to edit 50 function code indexes, and retains custom function code indexes and values after power loss. Additionally, there are ten industry-specific application macros: air compressors, fans, pumps, conveyors, CNC machines, packaging, textile machinery, high-speed electric drills, processPID, and processPIDmaster-slave frequency. When different industry applications are selected, the system automatically updates relevant function parameters, eliminating the need for user settings. Application macro-related parameters are shown in Table 3-82:

Table 3-82 Application Macro-Related Parameters

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L8-00	Industry Application Macro Selection	0	0: No Function 1: User Defined 2: Air Compressor 3: Fan 4: Water Pump 5: Conveyor Belt 6: Machine Tool Application 7: Packaging 8: Textile Application 9: High-Speed Drill Application 10: Reserved 11: PID	After selecting an application macro, some parameter default values will be automatically set according to the selected application macro type.

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
			12: PID + Auxiliary Frequency	
L8-01	Application Macro Parameter 1	0.00	0.00~29.00	<p>The custom option allows users to add up to 50 function code parameter settings (L8-01~L8-50). For example, if a certain on-site application requires setting an asynchronous motor to operate in torque mode with a carrier frequency of 6KHz and a maximum torque of 150%, then the parameters should be set as follows: L8-01=0.03, L8-02=14.00, L8-03=0.15, L8-04=14.10; F0-03=2 (torque mode), FE-00=2 (IM open-loop torque control), F0-15=6 (carrier frequency), FE-10=150% (maximum torque command). After power-off, when powered on again, the parameters added by the custom application macro (L8-00=1) will be automatically imported.</p> <p>Precautions:</p> <ul style="list-style-type: none"> ■ The setting values of parameters L8-01~L8-50 cannot be the index values of hidden attribute function codes (function codes reserved for display, such as L8-01 cannot be set to 25.00, i.e., L3-00). ■ The setting values of parameters L8-01~L8-50 cannot exceed the total number of members in the set function group, for example, the display range of the F0 group is F0-00~F0-18, L8-01 cannot be set to 0.19 (i.e., F0-19). ■ The setting values for parameters L8-01 to L8-50 cannot be L8 group parameters, such as L8-01 cannot be set to 29.XX (i.e., L8-XX). ■ When the setting values for parameters L8-01 to L8-50 are not 0.00, user-defined index items increase; otherwise, they decrease. For example, if L8-01=1.00, L8-02=1.01 (i.e., F1-00, F1-01), and L8-03=0.00, two custom function parameters are defined. ■ When adding application parameters, it is mandatory to set them consecutively starting from L8-01 without skipping over 0.00 to set the next parameter, such as L8-01=1.00 (i.e., F1-00), L8-02=0.00, and L8-03 cannot be set to 1.01. ■ When reducing application parameters, they must be set to 0.00 sequentially from the last non-0.00 parameter (L8-XX~L8-01). <p>If the operation does not follow the above rules, the keyboard will display an “**ERR**” error, indicating that the setting has failed.</p>
L8-02	Application Macro Parameter 2	0.00	0.00~29.00	
L8-03	Application Macro Parameter 3	0.00	0.00~29.00	
L8-04	Application Macro Parameter 4	0.00	0.00~29.00	
L8-05	Application Macro Parameter 5	0.00	0.00~29.00	
L8-06	Application Macro Parameter 6	0.00	0.00~29.00	
L8-07	Application Macro Parameter 7	0.00	0.00~29.00	
L8-08	Application Macro Parameter 8	0.00	0.00~29.00	
L8-09	Application Macro Parameter 9	0.00	0.00~29.00	
L8-10	Application Macro Parameter 10	0.00	0.00~29.00	
L8-11	Application Macro Parameter 11	0.00	0.00~29.00	
L8-12	Application Macro Parameter 12	0.00	0.00~29.00	
L8-13	Application Macro Parameter 13	0.00	0.00~29.00	
L8-14	Application Macro Parameter 14	0.00	0.00~29.00	
L8-15	Application Macro Parameter 15	0.00	0.00~29.00	
L8-16	Application Macro Parameter 16	0.00	0.00~29.00	
L8-17	Application Macro Parameter 17	0.00	0.00~29.00	
L8-18	Application Macro Parameter 18	0.00	0.00~29.00	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L8-19	Application Macro Parameter 19	0.00	0.00~29.00	
L8-20	Application Macro Parameter 20	0.00	0.00~29.00	
L8-21	Application Macro Parameter 21	0.00	0.00~29.00	
L8-22	Application Macro Parameter 22	0.00	0.00~29.00	
L8-23	Application Macro Parameter 23	0.00	0.00~29.00	
L8-24	Application Macro Parameter 24	0.00	0.00~29.00	
L8-25	Application Macro Parameter 25	0.00	0.00~29.00	
L8-26	Application Macro Parameter 26	0.00	0.00~29.00	
L8-27	Application Macro Parameter 27	0.00	0.00~29.00	
L8-28	Application Macro Parameter 28	0.00	0.00~29.00	
L8-29	Application Macro Parameter 29	0.00	0.00~29.00	
L8-30	Application Macro Parameter 30	0.00	0.00~29.00	
L8-31	Application Macro Parameter 31	0.00	0.00~29.00	
L8-32	Application Macro Parameter 32	0.00	0.00~29.00	
L8-33	Application Macro Parameter 33	0.00	0.00~29.00	
L8-34	Application Macro Parameter 34	0.00	0.00~29.00	
L8-35	Application Macro Parameter 35	0.00	0.00~29.00	
L8-36	Application Macro Parameter 36	0.00	0.00~29.00	
L8-37	Application Macro Parameter 37	0.00	0.00~29.00	

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L8-38	Application Macro Parameter 38	0.00	0.00~29.00	
L8-39	Application Macro Parameter 39	0.00	0.00~29.00	
L8-40	Application Macro Parameter 40	0.00	0.00~29.00	
L8-41	Application Macro Parameter 41	0.00	0.00~29.00	
L8-42	Application Macro Parameter 42	0.00	0.00~29.00	
L8-43	Application Macro Parameter 43	0.00	0.00~29.00	
L8-44	Application Macro Parameter 44	0.00	0.00~29.00	
L8-45	Application Macro Parameter 45	0.00	0.00~29.00	
L8-46	Application Macro Parameter 46	0.00	0.00~29.00	
L8-47	Application Macro Parameter 47	0.00	0.00~29.00	
L8-48	Application Macro Parameter 48	0.00	0.00~29.00	
L8-49	Application Macro Parameter 49	0.00	0.00~29.00	
L8-50	Application Macro Parameter 50	0.00	0.00~29.00	

3.9.2 Sleep and Wakeup

The sleep and wakeup functions are used to achieve constant pressure water supply applications. During the sleep period, the inverter stops running. After the wake-up delay within the sleep zone, the inverter starts running, ending the sleep mode. The sleep and wake functions require setting parameters such as sleep threshold, sleep delay, wake threshold, and wake delay. In general, the wake-up frequency (L5-02) should be greater than or equal to the sleep frequency (L5-01). When the sleep frequency is 0, the sleep and wake-up functions are invalid.

Sleep and wake-up are divided into three cases:

1、Frequency command (without using processPID, parameterFA-00 = 0, only valid inVFcontrol, i.e.,VFsleep and wake-up)

After the output frequency reaches the sleep frequency (parameterL5-01), the inverter maintains operation at the sleep frequency and begins the sleep delay (parameterL5-03). After the delay time has elapsed, it stops directly at 0 Hz.

When the frequency command reaches the wake-up frequency (parameterL5-02), after the wake-up delay (parameterL5-04), the inverter starts to accelerate to the set frequency according to the specified acceleration time.

This process is shown in Figure 3-56:

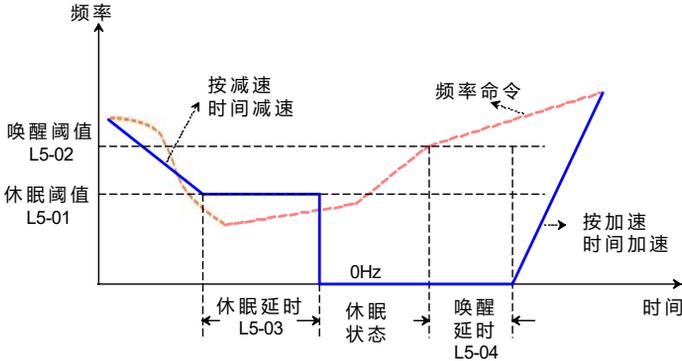


Figure 3-56 frequency command

2、PIDoutput frequency command (using thePIDprocess, parameterFA-00 \neq 0 and parameterL5-00 = 0, i.e.,PIDSleep and wake-up)

When thePIDoutput frequency command reaches the sleep frequency (parameterL5-01), the inverter begins to enter sleep mode. After the sleep delay (parameterL5-03) has elapsed, it stops directly at0 Hz. If the sleep delay time has not been reached, the output frequency remains at the lower limit frequency (parameterF0-11, andF0-11 \neq 0) or the minimum output frequency (parameterF2-04, if the lower limit frequencyF0-11 = 0), waiting for the sleep time to elapse before entering sleep mode.

When thePIDoutput frequency command reaches the wake-up frequency (parameterL5-02), the inverter starts the wake-up delay (parameterL5-04). After the delay time has elapsed, the inverter begins to accelerate according to the set acceleration time to thePIDoutput frequency.

The process is shown in Figure 3-57:

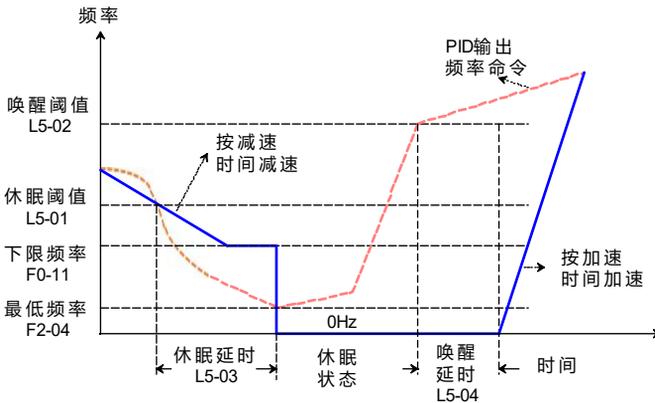


Figure 3-57 PID output frequency command

3、PIDfeedback value (when using processPID, parameterFA-00 \neq 0 and parameterL5-00 = 1, also forPIDSleep and wake-up)

When thePIDfeedback value reaches the sleep threshold (parameterL5-01), the inverter begins to enter sleep mode. After the sleep delay (parameterL5-03) has elapsed, it stops directly at0 Hz. If the sleep delay time has not been reached, the output frequency remains at the lower limit frequency (parameterF0-11, andF0-11 \neq 0) or the minimum output frequency (parameterF2-04, if the lower limit frequencyF0-11 = 0), waiting for the sleep time to elapse before entering sleep mode.

When thePIDfeedback value reaches the wake-up threshold (parameterL5-02), the inverter starts the wake-up delay (parameterL5-04). After the delay time has elapsed, the inverter begins to accelerate

according to the set acceleration time to thePIDOutput frequency.

The process is shown in Figure 3-58:

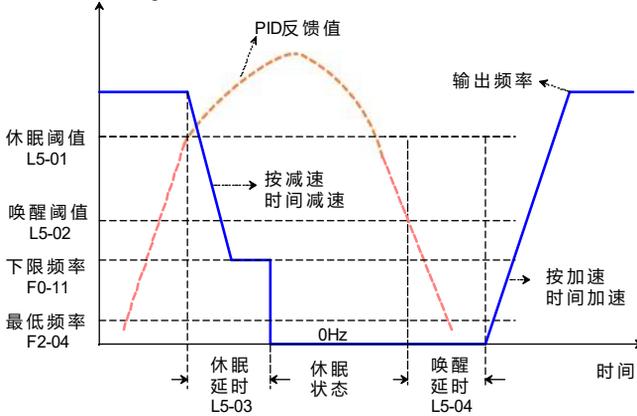


Figure 3-58 PID feedback value

When the sleep function (cases 2 and 3 above) is controlled by the PID setpoint and feedback value, the inverter frequency source must be selected as PID (parameter F0-06 = 9)

Parameters related to the sleep and wake functions are shown in Table 3-83:

Table 3-83 Parameters related to the sleep and wake functions

Parameter	Function Definition	Default Value	Setting Range	Parameter Description
L5-00	Sleep Method Reference Selection	0	0: PID Command Arrival 1: PID Feedback Arrival	When parameter L5-00 = 0, the units for parameters L5-01 and L5-02 automatically change to frequency, and the setting range automatically changes to 0.00~599.00 Hz. When parameter L5-00 = 1, parameters L5-01 and L5-02 units automatically change to percentage, and the reference base becomes the percentage of feedback, with the setting range automatically changing to 0.00~200.00%.
L5-01	Sleep Threshold	0.00Hz	0.00Hz~599.00Hz	During the operation of the inverter, when the set frequency is less than the sleep frequency (parameter L5-01, L5-00 = 0), or the PID negative feedback value is greater than the sleep threshold (parameter L5-01, L5-00 = 1), the inverter begins to enter sleep mode. After the sleep delay (parameter L5-03) has elapsed, it stops directly at 0 Hz.
L5-02	Wake Threshold	0.00Hz	0.00Hz~599.00Hz	
L5-03	Sleep Delay	0.0s	0.0s~6000.0s	

4 Fault Diagnosis and Countermeasures

4.1 Fault Handling

If a fault occurs during system operation, the inverter will immediately stop output to protect the motor from further damage. At the same time, the inverter will trigger the corresponding fault relay contacts, and the control panel will display the fault code for quick diagnosis of the problem. For each fault code, there is a corresponding fault type and common troubleshooting method, which can be found in Table4-1. Please note that the information listed in the table is for reference only and should not be altered arbitrarily. If you cannot resolve the fault, please contact our technical support or product distributor for assistance.

Table 4-1 Fault Alarms and Countermeasures

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E001	Overcurrent During Acceleration	During acceleration, the output current exceeds the inverter's overcurrent threshold. When E001 occurs, the inverter immediately stops output, and the motor will free stop.	<ol style="list-style-type: none"> 1. The set acceleration time is too short; 2. Check if poor insulation of the motor wiring causes an output short circuit; 3. Check if the motor is burned out or has insulation aging; 4. The torque compensation amount is too large; 5. The load is too heavy; 6. Abnormal V/F curve setting; 7. Hardware fault. 	Manual reset; after the status disappears, it can be reset after 5 seconds.
E002	Overcurrent during deceleration	During deceleration or stopping, the output current exceeds the inverter's overcurrent threshold. When E002 occurs, the inverter immediately stops output, and the motor will free stop.	Same as above	Manual reset; after the status disappears, it can be reset after 5 seconds.
E003	Overcurrent during constant speed	During constant speed operation, the output current exceeds the inverter's overcurrent threshold. When E003 occurs, the inverter immediately stops output, and the motor will free stop.	Same as above	Manual reset; after the status disappears, it can be reset after 5 seconds.
E004	Grounding Short circuit	The inverter detects a ground short circuit at the output terminals (U / V / W), and the inverter immediately stops	<ol style="list-style-type: none"> 1. Motor burnout or insulation aging; 2. Ground short circuit due to cable damage, large stray capacitance between cables and terminals leading to false tripping, hardware fault. 	Manual reset; after the status disappears, it can be reset after 5 seconds.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
		output, causing the motor to free stop.		
E005	IGBT upper and lower bridge short circuit	The inverter has detected a short circuit between the upper and lower bridges of the IGBT module.	<ol style="list-style-type: none"> 1. IGBT fault 2. Short circuit between the upper and lower bridges of the IGBT 	Manual reset; after the status disappears, it can be reset after 5 seconds.
E006	Overcurrent during stop	Overcurrent occurs during stop or there is an anomaly in the hardware circuit. After E006 occurs, power off and then power on again. If there is a hardware issue, E033, E034, or E035 will appear.	<ol style="list-style-type: none"> 1. Misoperation due to interference 2. Hardware fault 	Manual reset; after the status disappears, it can be reset after 5 seconds.
E007	Overvoltage during acceleration	The inverter detects that the bus voltage is too high during acceleration. When E007 occurs, the inverter immediately stops output, and the motor will free stop.	<ol style="list-style-type: none"> 1. Acceleration is too small (e.g., when accelerating downward with a lifting load); 2. Whether the setting for stall prevention action is less than the no-load current; 3. Power supply voltage is too high; 4. Switching actions of capacitors in the same power system; 5. The motor is in a generating state; 6. Acceleration time is too short; 7. Ground short circuit occurs in the motor; 8. Incorrect connection of the braking resistor or braking unit; 9. Malfunction due to interference. 	Manual reset; The bus voltage must be below approximately 90% of the overvoltage threshold (810V) to reset.
E008	Overvoltage during deceleration	The inverter detects an excessively high bus voltage during deceleration. When E008 occurs, the inverter immediately stops output, and the motor will free	<ol style="list-style-type: none"> 1. A deceleration time that is too short causes excessive regenerative energy from the load; 2. As above 	Manual reset; The bus voltage must be below approximately 90% of the overvoltage threshold (810V) to reset.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E009	Overvoltage at Constant Speed	stop. During constant speed operation, the inverter detects an overvoltage on the bus. When E009 occurs, the inverter immediately stops output, and the motor will free stop.	1. Sudden changes in load; 2. As above	Manual reset; The bus voltage must be below approximately 90% of the overvoltage threshold (810V) to reset.
E010	Overvoltage During Stop	Overvoltage occurs when the inverter stops.	1. The supply voltage is too high; 2. Switching actions of capacitors in the same power system; 3. Incorrect wiring of the braking resistor or braking unit; 4. Hardware fault (abnormal voltage sampling circuit); 5. Ground short circuit in the motor.	Manual reset; The bus voltage must be below approximately 90% of the overvoltage threshold (810V) to reset.
E011	Undervoltage During Acceleration	During acceleration, the inverter detects that the bus voltage is below the set value of parameter L2-18.	1. Power outage occurs; 2. Power supply voltage fluctuates; 3. Large-capacity motors start up; 4. Overload; 5. Shared DC bus; 6. Consider installing a DC reactor.	Manual reset; The inverter can be reset when the bus voltage exceeds the set value of parameter L2-18 + 60 V.
E012	Undervoltage During Deceleration	During deceleration, the inverter detects that the bus voltage is below the set value of parameter L2-18.	Same as above	Same as above
E013	Undervoltage During Constant Speed	At constant speed, the inverter detects that the bus voltage is below the set value of parameter L2-18.	Same as above	Same as above
E014	Undervoltage During Stop	1. When stopping, the inverter detects that the bus voltage is below the value set in parameter L2-18.	Same as above	Same as above

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E015	Input Phase Loss Protection	Power Input Phase Loss Protection	<ol style="list-style-type: none"> 1. Input power phase loss occurs; 2. Single-phase power input for three-phase models; 3. Power voltage fluctuation occurs; 4. Loose connections at the input power terminals; 5. Whether the input cables of the three-phase power supply have been cut; 6. Unbalanced three-phase input power. 	Manual Reset
E016	IGBT Temperature Too High	The inverter detects that the IGBT temperature is too high, exceeding 95°C.	<ol style="list-style-type: none"> 1. Whether the ambient temperature or the temperature inside the control cabinet is too high, and whether the cooling holes of the cabinet are blocked by foreign objects; 2. Check for foreign objects on the heat sink and whether the fan is rotating; 3. Insufficient ventilation space for the inverter; 4. Whether the load matches the inverter; 5. Continuous operation at 100% or more than 100% of the rated output. 	Manual reset; IGBT temperature must be below 85°C before reset can be performed.
E017	Ambient temperature too high	The inverter has detected that the internal critical components' temperature is too high, exceeding 55°C.	Ambient temperature too high	Manual reset; the ambient temperature sensor's temperature must be below 45°C before reset can be performed.
E021	Inverter overload	Output current exceeds the inverter's rated current, 150% of rated output current for 1 minute.	<ol style="list-style-type: none"> 1. Overload; 2. Acceleration and deceleration times and working cycle times are too short; 3. V/F control voltage is too high; 4. Inverter capacity is too small; 5. Overload occurs during low-speed operation; 6. Torque compensation is too high; 7. Whether the settings for stall prevention are correct; 8. Output phase loss; 9. Speed tracking function parameters are set improperly. 	Manual reset; can only be reset after the error has disappeared for 5 seconds.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E022	Motor 1 Overload Protection	Motor 1 overload protection activated; after activation, free stop occurs.	1. Overload; 2. Acceleration and deceleration times and working cycle times are too short; 3. When using a dedicated inverter motor, set parameter F9-01 Motor 1 Overload Protection Selection = 0 for constant torque output motor; 4. The motor overload action value is incorrect; 5. The set value for the maximum motor frequency is low; 6. Driving multiple motors with one inverter; 7. Whether the settings for stall prevention are correct; 8. The torque compensation amount is too large; 9. The motor fan operation is abnormal; 10. The three-phase impedance of the motor is unbalanced.	Manual reset; can be reset after the error disappears for 5 seconds.
E023	Motor 2 Overload Protection	Motor 2 overload protection has been activated, and free stop will occur after activation.	1. When using a dedicated inverter motor, set parameter H3-03 Motor 2 overload protection selection = 0 for constant torque output motor; 2. Same as above 1~2 and 4~10.	Same as above
E024	Motor Overheat	Motor PTC Overtemperature Warning, when a PTC is installed on the motor and this function is enabled (Parameter F5-21/27/33 = 6 Thermistor PTC Input), if the PTC input exceeds the set value of Parameter F9-49, it will be processed according to the setting of Parameter F9-48.	1. Motor Stalled; 2. Excessive Load; 3. High Ambient Temperature; 4. Abnormal Motor Cooling System/Fan; 5. Frequent Low-Speed Operation; 6. Acceleration/Deceleration Time and Working Cycle Time Too Short; 7. V/F Control Voltage Too High; 8. Whether the Setting of Motor Rated Current Matches the Motor Nameplate; 9. Whether the PTC settings and wiring are appropriate; 10. Whether the stall prevention settings are correct; 11. Unbalanced three-phase impedance of the motor; 12. Excessive harmonic components.	Parameter F9-48 0: Warning and continue running 1: Fault and decelerate to stop 2: Fault and free stop 3: No warning When parameter F9-48 = 0, it is a warning, and automatic reset; when parameter F9-48 = 1 or 2, it is a fault, and manual reset is required. Immediate reset is possible.
E026	Over Torque 1	When the output current exceeds the torque detection value	1. Incorrect parameter settings; 2. Mechanical failure; 3. Overload;	Parameter F9-36 0: Not Detected 1: Over-torque detection during constant speed operation,

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
		F9-37 and exceeds the over-torque detection time set by parameter F9-38, and parameter F9-36 is set to 2 or 4, E026 will be displayed.	4. Acceleration/deceleration time or working cycle time is too short; 5. V/F control voltage is too high; 6. Motor capacity is too small; 7. Overload occurs during low-speed operation; 8. The torque compensation amount is too large; 9. Speed tracking function parameters are set improperly (including instantaneous power failure restart and abnormal restart conditions).	continue running; 2: Over-torque detection during constant speed operation, stop operation; 3: Over-torque detection during operation, continue running; 4: Over-torque detection during operation, stop operation; Reset method: Parameter F9-36 = 1 or 3, when the output current is less than parameter F9-36, it will automatically clear. When parameter F9-36 = 2 or 4, manual reset is required. Reset condition: Can be reset immediately.
E027	Over Torque 2	When the output current exceeds the torque detection value H3-01 and exceeds the over-torque detection time H3-02, and parameter H3-00 is set to 2 or 4, E027 will be displayed.	1. Incorrect parameter settings; 2. Mechanical failure; 3. Overload; 4. Acceleration/deceleration time or working cycle time is too short; 5. V/F control voltage is too high; 6. Motor capacity is too small; 7. Overload occurs during low-speed operation; 8. The torque compensation amount is too large; 9. Speed tracking function parameters are set improperly (including instantaneous power failure restart and abnormal restart conditions).	Parameter H3-00 0: No detection; 1: Over-torque detection during constant speed operation, continue running; 2: Over-torque detection during constant speed operation, stop operation; 3: Over-torque detection during operation, continue running; 4: Over-torque detection during operation, stop operation; Reset method: Parameter H3-00 = 1 or 3, when the output current is less than parameter H3-00, it will automatically clear. When parameter H3-00 = 2 or 4, manual reset is required. Reset condition: Can be reset immediately.
E028	Low Current	Low current condition detected	1. Motor cable disconnected; 2. Low current protection setting is inappropriate; 3. Load too low.	Parameter F9-24 0: No Function; 1: Error and free stop; 2: Error and stop according to second deceleration time; 3: Warning and continue running. When Parameter F9-24 = 3, it is 'Warning'. When the output current exceeds Parameter F9-22 + 0.1 A, the warning will be automatically cleared; When Parameter F9-24 = 1 or 2, it is 'Fault', requiring manual reset; can be reset immediately.
E029	Arrival Limit	In non-PG vector control mode, when the inverter operates in speed mode, this fault is reported after the reverse operation limit or forward operation limit on the DI terminal is activated.	1. Return-to-Origin Mode: Set not to use forward or reverse limit as origin, and set to report a fault when reaching the limit. When the input terminal function is selected as PL forward limit or NL reverse limit and the terminal status is valid, report a limit reached fault. 2. Non-Return-to-Origin Mode: When the input	Manual reset when the limit terminal status is invalid.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
			terminal function is selected as PL forward limit or NL reverse limit and the terminal status is valid, report a limit reached fault.	
E031	Abnormal memory readout	Abnormal EEPROM data readout	Abnormal EEPROM data readout	Manual reset; Can be immediately reset.
E033	U-phase current detection error	When powered on, the inverter's U-phase current detection circuit is abnormal.	Hardware fault	Power off required
E034	V-phase current detection error	During power-up, the V-phase current detection circuit of the inverter is abnormal	Hardware fault	Power off required
E035	W-phase current detection error	During power-up, the W-phase current detection circuit of the inverter is abnormal	Hardware fault	Power off required
E036	cc (current limiting) hardware circuit abnormal	During power-up, the cc hardware protection circuit of the inverter is abnormal	Hardware fault	Power off required
E037	oc (overcurrent) hardware circuit abnormal	During power-up, the oc hardware protection circuit of the inverter is abnormal	Hardware fault	Power off required
E038	ov (overvoltage) hardware circuit abnormal	During power-up, the ov hardware protection circuit of the inverter is abnormal	Hardware fault	Power off required
E040	Motor Parameter Identification Error	Motor Parameter Identification Error	<ol style="list-style-type: none"> 1. The STOP key was pressed during self-learning; 2. Incorrect motor capacity (too large or too small) and parameter settings; 3. Incorrect motor wiring; 4. Motor locked rotor; 5. Using an output contactor, but the output contactor has not engaged; 6. Overload; 7. Acceleration and deceleration times are too short. 	Manual reset; Can be immediately reset.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E041	PID Open Circuit	PID Feedback Error	1. Whether the analog feedback value is abnormal; 2. Whether the negative feedback type is set correctly; 3. PID deviation threshold is set too low causing false alarms.	FA-50 Feedback Signal Open Circuit Handling: 0: Warning and continue running 1: Fault and deceleration stop 2: Fault and free stop 3: Warning and operation at the frequency before the open circuit.
E042	PG Feedback Setting Error	The actual rotation direction of the motor is opposite to the frequency command direction.	1. Incorrect encoder parameter settings; 2. Check for broken wires in the encoder connections; 3. PG card or PG encoder damage; 4. Malfunction due to interference.	Parameter F9-28 0: Warning and continue running 1: Fault and deceleration stop 2: PG and free stop Manual reset; Can be immediately reset.
E043	PG feedback disconnection	In the control mode with PG, if parameters F4-27 and F4-29 are not set, an E043 error will be reported after pressing RUN.	1. Incorrect encoder parameter settings; 2. Incorrect selection of control mode.	Manual reset; Can be immediately reset.
E044	PG feedback over speed	In the mode with PG, when the motor frequency value exceeds the encoder stall threshold (parameter F9-30), it starts to accumulate time. If the error time exceeds the encoder timeout detection time (parameter F9-31), an E044 error occurs.	1. Incorrect encoder parameter settings; 2. Parameter F4-02 is set too low; 3. Speed loop related parameters and acceleration/deceleration settings are inappropriate; 4. PG feedback timeout protection function parameters are set improperly.	Parameter F9-32 0: Warning and continue running 1: Fault and deceleration stop 2: Fault and free stop Manual reset; Can be immediately reset.
E045	PG slip abnormality	In modes with PG, when the difference between the output frequency and the motor frequency exceeds the encoder deviation range (parameter F9-33), the cumulative time starts. If the error time exceeds the encoder deviation detection time (parameter F9-34), an E045 fault occurs.	1. PG feedback deviation abnormality function parameters are set improperly; 2. Speed loop related parameters and acceleration/deceleration settings are inappropriate; 3. Encoder parameters are set incorrectly; 4. Acceleration and deceleration time too short; 5. Torque limit parameters set incorrectly; 6. Motor locked rotor; 7. Mechanical brake not released.	Parameter F9-35: 0: Warning and continue running 1: Fault and deceleration stop 3: Fault and free stop When parameter F9-35 = 0, it is a warning; when the difference between the output frequency and the motor frequency is less than the encoder deviation threshold, the 'warning' will be automatically cleared. When parameter F9-35 = 1 or 2, it is a 'fault', requiring manual reset. It can be reset immediately.
E048	AI current signal	When the 4~20mA open circuit action (parameter F5-42)	Analog Input Current Signal	Reset Method: Manual Reset; Reset Condition: When the disconnection fault condition is not met, manual reset can be

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
	open circuit	is selected as 3, and the signal type of any one of the AI1, AI2, or AI1 analog input terminals is a 4~20mA current signal, and the analog input function is not zero, if the input current signal at that terminal is less than the 4~20mA open circuit threshold (parameter F5-43), an E048 fault will be reported.	Disconnection	performed.
E049	External Fault	External Fault, the inverter decelerates according to the set value of parameter F1-23.	DI Terminal Function = 10 “External Fault”, and the signal is valid	Parameter F1-23 0: Stop in Free Run Mode; 1: Decelerate According to First Deceleration Time; 2: Decelerate According to Second Deceleration Time; 3: Decelerate According to Third Deceleration Time; 4: Decelerate According to Fourth Deceleration Time; 5: System Deceleration (According to Original Deceleration Time) 6: Automatic Deceleration Manual reset; Manual reset can only be performed after the external fault has disappeared.
E050	External emergency stop	When the DI terminal function is set to “External Fault Free Stop”, if the terminal signal is valid, the inverter immediately stops output, and the motor freely stops.	DI terminal function = 28 “External Fault Free Stop”, and the signal is valid	Manual reset; “External Fault Free Stop” signal must disappear before manual reset can be performed.
E051	External Interrupt	When the DI terminal function is set to “Base Block”, the inverter immediately stops output, and the motor freely stops.	DI terminal function = 11 “Base Block”, and the signal is valid	The “Base Block Signal” disappears, and the fault is automatically cleared.
E052	Password entered incorrectly three times	Password decoding failed three consecutive times	Parameter F7-33 password entry error	Manual reset; Reset condition requires power off.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
				times
E054	Invalid communication command	Invalid communication command	<ol style="list-style-type: none"> 1. The communication command transmitted by the higher-level machine is incorrect; 2. Misoperation due to interference; 3. Communication conditions differ from those of the higher-level machine; 4. Communication cable break or poor contact. 	F8-05 Communication Error Handling Method 0: Warning and continue running 1: Error and decelerate to stop 2: Error and free stop 3: No warning and continue operation Reset method: Manual reset; Reset condition: Can be immediately reset.
E055	Invalid Communication Address	Invalid Communication Data Address	Same as above	Reset method: Manual reset; Reset condition: Can be immediately reset.
E056	Communication Data Error	Invalid Communication Data Value	Same as above	Reset method: Manual reset; Reset condition: Can be immediately reset.
E057	Communication Write to Read-Only Address	Writing Data to Read-Only Address	Same as above	Reset method: Manual reset; Reset condition: Can be immediately reset.
E058	Modbus Transmission Timeout	Modbus Transmission Timeout	<ol style="list-style-type: none"> 1. The master device fails to transmit the communication command within the time set by parameter F8-04; 2. Misoperation due to interference; 3. Communication conditions differ from those of the higher-level machine; 4. Communication cable break or poor contact. 	Parameter F8-05 Error Handling Method 0: Warning and continue running 1: Error and decelerate to stop 2: Error and free stop 3: No warning and continue operation Reset method: Manual reset; Reset condition: Can be immediately reset.
E062	Deceleration Regenerative Braking Action	As long as parameter F1-34 is not zero, and a power interruption or outage causes the bus voltage to drop below the deceleration regenerative braking action threshold, the deceleration regenerative braking function will activate, causing the motor to begin decelerating and stopping. During this process, the E062 fault will be displayed.	<ol style="list-style-type: none"> 1. Unstable power supply or power outage; 2. There are other large loads starting in the power system. 	Reset Conditions: Automatic: Select 2 for parameter F1-34; the fault will be automatically cleared after power recovery. Manual: Select 1 for parameter F1-34; the inverter can be manually reset after decelerating to 0 Hz.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E063	Excessive slip	Slip abnormality, using the maximum slip (parameter F2-13) as the reference. When the inverter output is stable, if the deviation between the set speed and the actual speed exceeds the value set in parameter F9-25, and this condition persists for longer than the time set in parameter F9-26, an E063 fault will occur. The E063 fault only occurs when driving induction motors.	<ol style="list-style-type: none"> Whether the motor parameters are correct; Excessive Load; Whether the settings for parameters F9-25, F9-26, and F2-13 are appropriate. 	Parameter F9-27 0: Warning and continue running 1: Error and decelerate to stop 2: Warning and Free Stop 3: No warning Automatic: Parameter F9-27 = 0 is "Warning", when the inverter output is stable, and the deviation between the set speed and the actual speed does not exceed the value set in parameter F9-25, the warning will be automatically cleared. Manual: Parameter F9-27 = 1 or 2 is "Fault", manual reset is required.
E064	Please reset the machine type code	Incorrect machine type code setting	Incorrect machine type code setting	Set product signal F0-00 according to the inverter specification table
E065	PG card hardware error	PG card hardware error	<ol style="list-style-type: none"> Wiring error; Encoder parameter selection error; Incorrect PG card selected. 	Reset method: Manual reset; Reset condition: The error must be reset by re-powering the device.
E069	Feedback speed divergence	Feedback speed exceeds the set value: maximum speed * parameter F9-30.	<ol style="list-style-type: none"> Incorrect encoder parameter settings; Incorrect motor parameters; Motor parameter identification not performed; 	Manual Reset
E070	Excessive feedback speed deviation	The difference in feedback speed is too large, estimated value differs from command by $\pm F9-33$.	<ol style="list-style-type: none"> Incorrect encoder parameter settings; Incorrect motor parameter settings; Motor parameter identification not performed. 	Manual Reset
E072	STO1 Fault	An abnormality has been detected in the internal loop between S1 and +24V	The shorting wire between S1 and +24V is not connected Hardware fault	Reset method: Hardware fault, cannot reset, power off and then power on again; Reset condition: None
E076	STO	Safety Torque Off function activation	Switch operation of S1 / +24V, S2 / +24V	Reset method: Automatic: When parameter F9-54=1, the system can automatically reset after the STO status disappears; Manual: When parameter F9-54=0, manual reset is required after the STO status disappears; Reset condition: Reset can only occur after the STO status has disappeared.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E077	STO2 Fault	An abnormality is detected in the internal circuit between S2 and +24V	The shorting wire between S2 and +24V is not connected Hardware fault	Reset method: Hardware fault, cannot reset, power off and then power on again; Reset condition: None
E079	U-phase overcurrent	U-phase short circuit detected before the inverter starts	1. Incorrect motor wiring; 2. Poor insulation of motor wiring causing output short circuit; 3. Check if the motor is burned out or has insulation aging; 4. Malfunction due to interference 5. The wiring length of the motor cable is too long; 6. Hardware failure.	Reset method: Manual reset; Reset condition: After the status disappears, it can be reset after 5 seconds.
E080	Overcurrent on V phase	Short circuit detected on V phase before the inverter starts	Same as above	Same as above
E081	Overcurrent on W phase	Short circuit detected on W phase before the inverter starts	Same as above	Same as above
E082	Missing U phase output	Missing U phase output	1. Unbalanced three-phase impedance of the motor; 2. Check if there is a problem with the wiring; 3. Whether the motor is a single-phase motor; 4. Whether the current sensor is faulty; 5. Whether the inverter capacity is much larger than the motor capacity.	Parameter F9-15 0: Warning and continue running 1: Error and decelerate to stop 2: Error and free stop 3: No warning Reset method: Manual reset; Reset condition: Can be immediately reset.
E083	V Phase Output Missing	V Phase Output Missing	Same as above	Same as above
E084	W Phase Output Missing	W Phase Output Missing	Same as above	Same as above
E087	Low Frequency Overload Protection	Inverter Low Frequency Overload Operation (<5Hz) for Too Long	1. Overload; 2. Acceleration and deceleration times and working cycle times are too short; 3. V/F control voltage is too high; 4. Inverter capacity is too small; 5. Overload occurs during low-speed operation; 6. Torque compensation is too high; 7. Whether the settings for stall prevention are correct; 8. Output phase loss; 9. Speed Tracking Function Parameter Setting Inappropriate	Reset method: Manual reset; Reset condition: Can be immediately reset.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E101	CANopen Disconnection	CANopen Software Disconnection 1	1. Communication Timeout Time Set Too Short; 2. Misoperation due to interference; 3. Communication Cable Disconnected or Poor Contact.	Reset method: Manual reset; Reset Condition: Clear This Error by Sending a Reset Signal from the Higher-Level Machine.
E102	CANopen Disconnection	CANopen Software Disconnection 2	1. Communication Timeout Time Set Too Short; 2. Misoperation due to interference; 3. Communication Cable Disconnected or Poor Contact.	Reset method: Manual reset; Reset Condition: Clear This Error by Sending a Reset Signal from the Higher-Level Machine.
E104	CANopen Hardware Disconnection	CANopen Hardware Disconnection	1. Confirm whether the CANopen card is installed; 2. Confirm whether the communication format is correct; 3. Misoperation due to interference; 4. Communication cable disconnection or poor contact;	Reset method: Manual reset; Reset Condition: Power must be cycled.
E105	CANopen Index Error	CANopen Communication Index Error	Communication Index Setting Error	Reset method: Manual reset; Reset Condition: Clear This Error by Sending a Reset Signal from the Higher-Level Machine.
E106	CANopen Node Address Error	CANopen Communication Node Address Error (Only supports 1~127)	Communication Node Address Setting Error	Reset Method: Manual reset (Parameter F0-18=7); Reset condition: None
E107	CANopen Memory Error	CANopen Memory Error	CANopen Internal Memory Error	Reset method: Manual reset; Reset Condition: Parameter F0-18 = 7.
E120	EMS Overcurrent	Output current exceeds the inverter overcurrent threshold. When an EMS overcurrent fault occurs, the inverter immediately stops output, and the motor will free stop.	1. The set acceleration time is too short; 2. Check if poor insulation of the motor wiring causes an output short circuit; 3. Check if the motor is burned out or has insulation aging; 4. The torque compensation amount is too large; 5. The load is too heavy; 6. Abnormal V/F curve setting; 7. Hardware fault.	Manual reset; after the status disappears, it can be reset after 5 seconds;

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
E128	Over Torque 3	When the output current exceeds the torque detection value H3-06, and exceeds the over-torque detection time set by parameter H3-07, E128 will occur if parameter H3-05 is set to 2 or 4.	<ol style="list-style-type: none"> 1. Incorrect parameter settings; 2. Mechanical failure; 3. Overload; 4. Acceleration/deceleration time or working cycle time is too short; 5. V/F control voltage is too high; 6. Motor capacity is too small; 7. Overload occurs during low-speed operation; 8. The torque compensation amount is too large; 9. Speed tracking function parameters are set improperly (including instantaneous power failure restart and abnormal restart conditions). 	Parameter H3-05 0: Not Detected 1: Over-torque detection during constant speed operation, continue running; 2: Over-torque detection during constant speed operation, stop operation; 3: Over-torque detection during operation, continue running; 4: Over-torque detection during operation, stop operation; Reset Method: When parameter H3-05 = 1 or 3, it is a 'warning', which will automatically clear when the output current is less than parameter H3-06. When parameter H3-05 = 2 or 4, it is a 'fault', requiring manual reset. Reset condition: Can be reset immediately.
E129	Over Torque 4	When the output current exceeds the torque detection value H3-11, and exceeds the over torque detection time set by parameter H3-12, E129 will occur if parameter H3-10 is set to 2 or 4.	Same as above	Parameter H3-10 0: No detection; 1: Over-torque detection during constant speed operation, continue running; 2: Over-torque detection during constant speed operation, stop operation; 3: Over-torque detection during operation, continue running; 4: Over-torque detection during operation, stop operation; Reset Method: When parameter H3-10 is set to 1 or 3, it is 'Warning', and the warning will automatically clear when the output current is less than parameter H3-11. When parameter H3-10 is set to 2 or 4, it is 'Fault', and manual reset is required. Reset Condition: Can be immediately reset
E134	Motor 3 Overload Protection	Motor 3 overload protection has been activated, and after activation, free stop occurs.	<ol style="list-style-type: none"> 1. Overload; 2. Acceleration and deceleration times and working cycle times are too short; 3. When using a VFD-dedicated motor, set parameter H3-08 Motor 3 Overload Protection Selection = 0 for constant torque output motor; 4. The motor overload action value is incorrect; 5. The set value for the maximum motor frequency is low; 6. Driving multiple motors with one inverter; 	Reset method: Manual reset; Reset Condition: Can only be reset after 5 seconds of the fault disappearing.

Fault Number	Fault Name	Fault Description	Possible Cause	Reset Method and Conditions
			7. Whether the settings for stall prevention are correct; 8. The torque compensation amount is too large; 9. The motor fan operation is abnormal; 10. The three-phase impedance of the motor is unbalanced.	
E135	Motor 4 Overload Protection	Motor 4 Overload Protection Action, after action, free stop.	1. When using a dedicated inverter motor, set parameter H3-13 Motor 4 Overload Protection Selection = 0 for constant torque output motor; 2. Same as above 1~2 and 4~10.	Same as above
E141	Pre-Operation Ground Fault	During the output wiring detection before the inverter operation, a ground short circuit is detected.	1. Incorrect motor wiring; 2. Whether the motor wiring has poor insulation causing an output short circuit; 3. Check if the motor is burned out or has insulation aging;	Reset method: Manual reset; Reset condition: After the status disappears, it can be reset after 5 seconds.
E142	Parameter Identification Error 1	Motor parameter identification without feedback current error	1. Motor not wired; 2. At the inverter output side (U / V / W); 3. Electromagnetic contactor is in an open state.	Reset method: Manual reset. Reset condition: Can be immediately reset.
E143	Parameter identification error 2	Motor phase missing error during motor parameter identification	1. Incorrect motor wiring; 2. Motor fault; 3. Electromagnetic contactor at the inverter output side (U / V / W) is in an open state; 4. Abnormality in the motor U/V/W lines.	Same as above
E144	Tension Belt breakage	Belt breakage detected through speed recognition	1. Whether the analog feedback value is abnormal; 2. Whether the negative feedback type is set correctly.	Reset method: Manual reset.
E147	Excessive tension PID deviation	Excessive deviation between tension feedback value and set value	1. Whether the analog feedback value is abnormal; 2. Tension control PID parameter settings are inappropriate;	FB-50 Tension Error Abnormal Handling: 0: Warning and continue running 1:Faultand Free Stop 2:Faultand decelerate to stop.

4.2 Warning Handling

For some errors that have a minor impact on the system, the inverter only performs warning handling and continues to operate, while displaying the warning name and corresponding warning code on the LCD panel. After the warning reset conditions are met, the warning will be automatically cleared, and the motor will return to normal operation. The warning codes and corresponding warning handling are shown in Table4-2.

Table 4-2 Warning Codes and Warning Handling

Warning Code	Warning Name	Fault Description	Possible Cause	Reset Method and Conditions
A001	Communication Command Error	RS-485 Modbus, invalid communication command	<ol style="list-style-type: none"> 1. The communication command transmitted by the higher-level machine is incorrect; 2. Malfunction due to interference and different communication conditions with the higher-level machine; 3. Communication Cable Disconnected or Poor Contact. 	Parameter F8-05 = 0 warning and continue running when it is "warning", automatically reset upon receiving a correct communication command.
A002	Communication address error	RS-485 Modbus, invalid communication data address	Same as above	Same as above
A003	Communication Data Error	RS-485 Modbus, invalid communication data value	Same as above	Same as above
A004	Inverter cannot process	RS-485 Modbus, writing data to read-only address	Same as above	Same as above
A005	Communication transmission timeout	RS-485 Modbus, transmission timeout	<ol style="list-style-type: none"> 1. The higher-level machine fails to transmit the communication command within the time set in parameter F8-04; 2. Misoperation due to interference; 3. Communication conditions differ from those of the higher-level machine; 4. Communication cable break or poor contact. 	Parameter F8-05 = 0 warning and continue running when it is 「 warning 」, automatically reset upon receiving the next communication packet.
A006	Parameter Copy Error	Digital Operator to Drive COPY Function Error Warning 1	<ol style="list-style-type: none"> 1. Communication Abnormality; 2. Panel Abnormality; 3. Control Board Abnormality. 	Manual Reset
A007	Parameter Copy Error	Digital Operator to Drive COPY Function Error Warning 2	<ol style="list-style-type: none"> 1. Whether there are new parameters added to the inverter software; 2. Misoperation due to interference. 	Manual Reset
A009	IGBT Overheating Warning	The inverter detects that the IGBT temperature is too high, exceeding the IGBT overheating warning protection level (if parameter F9-41 is higher than the IGBT overheating protection level, there will be no IGBT overheating warning, and it will directly trip due to IGBT temperature being too high).	<ol style="list-style-type: none"> 1. Whether the ambient temperature or the temperature inside the control cabinet is too high, and whether the cooling holes of the cabinet are blocked by foreign objects; 2. Check for foreign objects on the heat sink and whether the fan is rotating; 	Automatic Reset; IGBT temperature below 85°C, automatic reset.

Warning Code	Warning Name	Fault Description	Possible Cause	Reset Method and Conditions
			3. Insufficient ventilation space for the inverter; 4. Whether the load matches the inverter; 5. Long-term operation at 100% or greater than 100% of rated output.	
A010	Overheating Warning	The inverter detects that the internal critical component temperature is too high, exceeding the protection level.	Same as above	Manual reset; the ambient temperature sensor's temperature must be below 45°C before reset can be performed.
A011	PID Feedback Signal Warning	PID Feedback Signal Loss Warning (Effective only when PID function is enabled for analog feedback signals)	1. Loose or broken PID feedback wiring; 2. Faulty feedback device; 3. Hardware fault.	Automatic: When parameter FA-50 = 0 or 3, it is "Warning". The warning will be automatically cleared when the feedback signal exceeds 4 mA. Manual: When parameter FA-50 = 1 or 2, it is "Fault", requiring manual reset.
A012	AI current signal open circuit	When the 4 ~ 20mA break action (parameter F5-42) is set to 1 or 2, and the signal type of any one of the AI1, AI2, or AI1 analog input terminals is a 4 ~ 20mA current signal, and the analog input function is not zero, if the input current signal at that terminal is less than the 4 ~ 20mA break threshold (parameter F5-43), an A012 alarm will be triggered.	Analog Input Current Signal Disconnection	The alarm will automatically clear when the break alarm conditions are not met.
A015	PG Feedback Error	PG Feedback Error Alarm	1. Incorrect encoder parameter settings; 2. Encoder wiring break; 3. PG card or PG encoder damage; 4. Malfunction due to interference.	The alarm will automatically reset after the machine stops.
A017	Overspeed Warning	Over-speed Warning	1. When using open-loop control, the setting of parameter F3-36 speed observer bandwidth is inappropriate; 2. The bandwidth setting of the ASR speed controller is inappropriate; 3. The motor parameter settings are incorrect; 4. Malfunction due to	The warning is automatically cleared after stopping.

Warning Code	Warning Name	Fault Description	Possible Cause	Reset Method and Conditions
			interference.	
A018	Excessive speed deviation	Excessive speed deviation warning	<ol style="list-style-type: none"> 1.The feedback deviation abnormal function parameter settings are inappropriate; 2.The ASR related parameters and acceleration/deceleration settings are inappropriate; 3.The acceleration/deceleration time is too short; 4.Motor stall; 5.Mechanical brake not released; 6.Incorrect torque limit related parameter settings cause malfunction. 	The warning is automatically cleared after stopping.
A019	Input Phase loss	Inverter input phase loss	<ol style="list-style-type: none"> 1.Input power phase loss occurs 2. Single-phase power input for three-phase models; 3.The power supply voltage has fluctuated; 4. Loose connections at the input power terminals; 5. Whether the three-phase power input cables have been cut; 6. Unbalanced three-phase input power. 	The warning is automatically cleared after stopping.
A020	Over-torque	Over-torque 1 warning	<ol style="list-style-type: none"> 1. Incorrect parameter settings; 2. Mechanical failure; 3. Overload; 4. Acceleration and deceleration times and working cycle times are too short; 5. V/F control voltage is too high; 6. Motor capacity is too small; 7. Overload occurs during low-speed operation; 8. Torque compensation amount is too large; 9. Speed tracking function parameters are set improperly (including instantaneous power failure restart and abnormal restart conditions). 	When the output current is less than the value set by parameter F9-37, the A020 warning will be automatically cleared.

Warning Code	Warning Name	Fault Description	Possible Cause	Reset Method and Conditions
A021	Over-torque	Over-torque 2 warning	Same as above	When the output current is less than the value set by parameter H3-01, the A021 warning will be automatically cleared.
A022	Motor Overheat	Motor overheating	<ol style="list-style-type: none"> 1. Motor Stalled; 2. Excessive Load; 3. High Ambient Temperature; 4. Abnormal Motor Cooling System/Fan; 5. Frequent Low-Speed Operation; 6. Acceleration/Deceleration Time and Working Cycle Time Too Short; 7. V/F Control Voltage Too High; 8. Whether the rated motor current setting matches the motor nameplate 9. Whether the PTC settings and wiring are appropriate; 10. Whether the stall prevention settings are correct; 11. Three-phase impedance imbalance of the motor 12. Excessive harmonic components. 	Parameter F9-48 = 0 for warning, when the temperature is less than or equal to the set value of parameter F9-49, A022 warning will be automatically cleared.
A024	Over slip	Use the maximum slip (parameter F2-13) as the base, when the inverter output is at a steady speed, if $F > H$ or $F < H$ exceeds the level set by parameter F9-25 and lasts longer than the time set by parameter F9-26, an A024 warning will occur.	<ol style="list-style-type: none"> 1. Whether the motor parameters are correct; 2. Excessive Load; 3. Whether the settings for parameters F9-25, F9-26, and F2-13 are appropriate. 	Parameter F9-27 = 0 for 'warning', when the inverter output is at a steady speed, and the deviation between the given speed and the actual speed does not exceed the set value of parameter F9-25, the A024 warning will be automatically cleared.
A025	Parameter Identification in Progress	Automatic Parameter Identification in Progress. When performing automatic parameter measurement, the panel will display an A025 warning.	The inverter is executing motor parameter identification.	If parameter identification completes without errors, this warning will be automatically cleared.
A028	Output Phase Loss Warning	Inverter Output Phase Loss	<ol style="list-style-type: none"> 1. Unbalanced three-phase impedance of the motor; 2. Check if there is a problem with the wiring; 3. Whether the motor is a single-phase motor; 4. Whether the current sensor is faulty; 5. Whether the inverter capacity is much larger 	If parameter F9-15 is set to 0, the A028 warning will be automatically cleared after the inverter stops.

Warning Code	Warning Name	Fault Description	Possible Cause	Reset Method and Conditions
			than the motor capacity.	
A030	Model Different Parameter Copy Error	Digital Operator to Drive COPY Function Error Warning 3	Copying parameters to a different model inverter.	Manual Reset
A031	Over-torque	Over Torque 3 Warning	1. Incorrect parameter settings; 2. A mechanical fault has occurred (e.g., over torque, mechanical lockup, etc.); 3. Overload; 4. Acceleration/deceleration time or working cycle time is too short; 5. V/F control voltage is too high; 6. Motor capacity is too small; 7. Overload occurs during low-speed operation; 8. The torque compensation amount is too large; 9. Speed tracking function parameters are set improperly; 10. (including automatic restart after instantaneous power failure and restart after abnormal conditions).	When the output current is less than parameter H3-06, the A031 warning will be automatically cleared.
A032	Over-torque	Over-torque 4 warning	Same as above	When the output current is less than parameter H3-11, the A032 warning will be automatically cleared.
A036	CANopen software disconnection	CANopen Disconnection 1 Software	1. The communication timeout setting is too short; 2. Malfunction due to interference.	Manual reset, send a reset signal from the higher-level machine to clear this error.
A037	CANopen software disconnection	CANopen Disconnection 2 Software	1. The communication timeout setting is too short; 2. Misoperation due to interference; 3. Communication Cable Disconnected or Poor Contact.	Manual reset, send a reset signal from the higher-level machine to clear this error.
A039	CANopen Hardware Disconnection	CAN BUS disconnection hardware	1. Verify if the communication format is correct; 2. Misoperation due to interference; 3. Communication Cable Disconnected or Poor	Manual reset, power must be disconnected and then reconnected

Warning Code	Warning Name	Fault Description	Possible Cause	Reset Method and Conditions
			Contact.	
A040	CANopen Index Error	CANopen Communication Index Error	Communication Index Setting Error	Manual reset, the upper computer sends a reset signal to clear this error
A041	CANopen Node Address Error	CANopen communication station number error (only supports 1~127)	Communication Node Address Setting Error	Manual reset, parameter F0-18=7
A042	CANopen Memory Error	CANopen memory error	CANopen Internal Memory Error	Manual reset, parameter F0-18=7
A043	CANopen SDO Transmissi on timeout	SDO transmission timeout (this warning is only for the master station)	1. Slave not connected; 2. Synchronization cycle set too short; 3. Misoperation due to interference; 4. Communication cable break or poor contact.	When the master station resends an SDO and receives a response, this warning will be automatically cleared.
A044	CANopen SDO Receive overflow	CANopen internal stack buffer overflow	The master device sends too many SDOs at once	Manual reset, send a reset signal from the higher-level machine to clear this error.
A045	CANopen startup error	CANopen startup error warning	1. Severe hardware interference; 2. Incorrect communication speed setting; 3. Communication card not connected or loose.	Disable CANopen, power off and then power on again.
A046	CANopen format error	CANopen protocol error	The master device sends incorrect communication packets	Manual reset, send a reset signal from the higher-level machine to clear this error.

Appendix English Abbreviation Meanings

Abbreviation	English Description	Chinese Meaning
VVC	Voltage Vector Control	Voltage Vector Control
SVC	Sensorless Vector Control	Sensorless Vector Control (without encoder)
FVC	Flux Vector Control	Magnetic Flux Vector Control (closed-loop control with encoder)
ASR	Automatic Speed Regulator	Speed Loop Regulator
APR	Automatic Position Regulator	Position Loop Regulator
dEB	Deceleration Energy Backup	Deceleration Energy Feedback
PDFF	Pseudo Differential Feedforward	Differential Feedforward Control
DOB	Disturbance Observer	Disturbance Observer
OC	Over Current	Overcurrent
OV	Over Voltage	Overvoltage
CC	Cycle by Cycle	Cycle-by-Cycle Current Limiting
EF	External Fault	External Fault (Fault occurs in external equipment of the inverter)
B.B.	Base Block	Base Block (Stop PWMOutput)
AI/AO	Analog Input/Output	Analog Signal Input/Output
DI/DO	Digital Input/Output	Digital Signal Input/Output
EMS	Emergency Stop	Emergency Shutdown (Hardware Detection of Severe Overcurrent)
RLY	Relay	Relay Output